D2Q9 NSE,

a supplementary material for

Lattice Boltzmann Method Analysis Tool (LBMAT)

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1 Global definitions

In $\mathbb{R}^2$, the position and velocity vectors are given by $\boldsymbol{x} = (x_1, x_2)^T$ and $\boldsymbol{v} = (v_1, v_2)^T$, respectively.

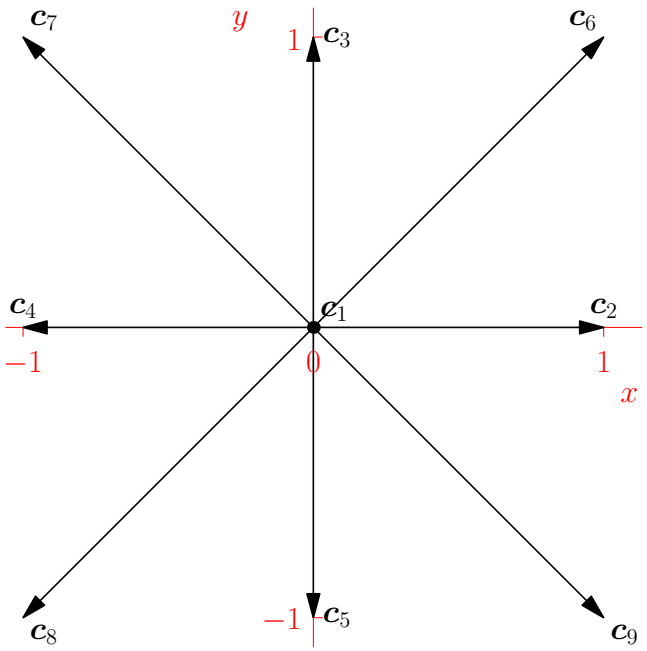
1.1 Discrete velocity vectors

Discrete velocity vectors and the lattice speed of sound are defined by

$$\{\boldsymbol{c}_i\}_{i=1}^{9} = \left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \end{pmatrix}, \begin{pmatrix} -1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ -1 \end{pmatrix}, \begin{pmatrix} 1 \\ 1 \end{pmatrix}, \begin{pmatrix} -1 \\ 1 \end{pmatrix}, \begin{pmatrix} -1 \\ -1 \end{pmatrix}, \begin{pmatrix} 1 \\ -1 \end{pmatrix} \right),$$

$$c_s = \frac{1}{\sqrt{3}},$$

respectively [1].



1.2 Raw and central moments

The raw and central moments are defined by

$$m_{\boldsymbol{\alpha}} := \sum_{i=1}^{9} f_i \boldsymbol{c}_i^{\boldsymbol{\alpha}},$$

and

$$k_{\boldsymbol{\alpha}} := \sum_{i=1}^{9} f_i (\boldsymbol{c}_i - \boldsymbol{v})^{\boldsymbol{\alpha}},$$

respectively, where $\boldsymbol{\alpha} = (\alpha_1, \alpha_2) \in \mathbb{Z}^2$ denotes a multi-index (as a row vector) and $\boldsymbol{c}_i^{\boldsymbol{\alpha}} := \prod_{j=1}^{2} [\boldsymbol{c}_i]_j^{\alpha_j}$.

1.3 Transformation matrix M

Matrix $\mathbf{M}$, that defines macroscopic quantities (moments) $\boldsymbol{\mu}$ by

$$\boldsymbol{\mu} = \mathbf{M}\boldsymbol{f},$$

with $\boldsymbol{f} = (f_1, f_2, \ldots, f_9)^T$, is selected such that

$$\boldsymbol{\mu} = \left(m_{(0,0)}, m_{(1,0)}, m_{(0,1)}, m_{(1,1)}, m_{(2,0)}, m_{(0,2)}, m_{(2,1)}, m_{(1,2)}, m_{(2,2)}\right)^T,$$

i.e., $\mathbf{M}$ is given by

$$\mathbf{M} = \begin{pmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & -1 & 0 & 1 & -1 & -1 & 1 \\ 0 & 0 & 1 & 0 & -1 & 1 & 1 & -1 & -1 \\ 0 & 0 & 0 & 0 & 0 & 1 & -1 & 1 & -1 \\ 0 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 1 & -1 & -1 \\ 0 & 0 & 0 & 0 & 0 & 1 & -1 & -1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \end{pmatrix}.$$

1.4 Equilibrium

The corresponding equilibrium raw moments are defined using the continuous Maxwell–Boltzmann distribution function [1]

$$f^{(eq)}(\boldsymbol{\xi}) = \frac{\rho}{2\pi c_s^2} \exp\left(-\frac{||\boldsymbol{\xi} - \boldsymbol{v}||^2}{2c_s^2}\right)$$

as

$$m_{\boldsymbol{\alpha}}^{(eq)} = \int_{\mathbb{R}^2} \boldsymbol{\xi}^{\boldsymbol{\alpha}} f^{(eq)}(\boldsymbol{\xi}) \mathrm{d}\boldsymbol{\xi},$$

where $\alpha_i \in \{0, 1, 2\}$, $i = 1, 2$. Hence, the equilibrium moments $\boldsymbol{\mu}^{(eq)}$ satisfy

$$\boldsymbol{\mu}^{(eq)} = \begin{pmatrix} \rho \\ \rho v_1 \\ \rho v_2 \\ \rho v_1 v_2 \\ \rho(v_1^2 + c_s^2) \\ \rho(v_2^2 + c_s^2) \\ \rho v_2(c_s^2 + v_1^2) \\ \rho v_1(c_s^2 + v_2^2) \\ \rho\left(c_s^4 + c_s^2(v_1^2 + v_2^2) + v_1^2 v_2^2\right) \end{pmatrix}.$$

2 Spatial EPDEs

2.1 SRT

2.1.1 Definitions

Collision operator $\boldsymbol{C}$:

$$\boldsymbol{C}(\boldsymbol{f}) = \omega\left(\mathbf{M}^{-1}\boldsymbol{\mu}^{(eq)} - \boldsymbol{f}\right),$$

$\omega \in (0, 2)$.

2.1.2 Conservation of mass: ρ

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$$\frac{\partial \rho}{\partial t} + \frac{\delta_l v_1}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{\delta_l \rho}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{\delta_l v_2}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{\delta_l \rho}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-1+3c_s^2+v_1^2)\frac{\delta_l^3 v_1}{12\delta_t}\frac{\partial^3 \rho}{\partial x_1^3} + (-1+c_s^2+3v_1^2)\frac{\delta_l^3 \rho}{12\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} -$$
$$\frac{\delta_l^3 c_s^2 \rho}{6\delta_t}\frac{\partial^3 v_2}{\partial x_1^2 \partial x_2} - \frac{\delta_l^3 c_s^2 \rho}{6\delta_t}\frac{\partial^3 v_1}{\partial x_1 \partial x_2^2} + (-1+3c_s^2+v_2^2)\frac{\delta_l^3 v_2}{12\delta_t}\frac{\partial^3 \rho}{\partial x_2^3} + (-1+c_s^2+3v_2^2)\frac{\delta_l^3 \rho}{12\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} +$$
$$(6v_1^4+\omega c_s^2+2c_s^4+3\omega v_1^2-2c_s^2-3\omega v_1^4+24c_s^2v_1^2-6v_1^2-\omega c_s^4-12\omega c_s^2 v_1^2)\frac{\delta_l^4}{24\omega\delta_t}\frac{\partial^4 \rho}{\partial x_1^4} +$$
$$(-4+2\omega-3\omega c_s^2-5\omega v_1^2+6c_s^2+10v_1^2)\frac{\delta_l^4 \rho v_1}{12\omega\delta_t}\frac{\partial^4 v_1}{\partial x_1^4} + (2-\omega+3\omega c_s^2+\omega v_1^2-6c_s^2-2v_1^2)\frac{\delta_l^4 \rho v_1}{12\omega\delta_t}\frac{\partial^4 v_2}{\partial x_1^3 \partial x_2} +$$
$$(-2+\omega)\frac{\delta_l^4 c_s^4}{6\omega\delta_t}\frac{\partial^4 \rho}{\partial x_1^2 \partial x_2^2} + (2-\omega+3\omega c_s^2+\omega v_2^2-6c_s^2-2v_2^2)\frac{\delta_l^4 v_2 \rho}{12\omega\delta_t}\frac{\partial^4 v_1}{\partial x_1 \partial x_2^3} +$$
$$(\omega c_s^2+6v_2^4+3\omega v_2^2+2c_s^4-2c_s^2+24c_s^2v_2^2-3\omega v_2^4-12\omega c_s^2 v_2^2-6v_2^2-\omega c_s^4)\frac{\delta_l^4}{24\omega\delta_t}\frac{\partial^4 \rho}{\partial x_2^4} +$$
$$(-4+2\omega-3\omega c_s^2-5\omega v_2^2+6c_s^2+10v_2^2)\frac{\delta_l^4 v_2 \rho}{12\omega\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0.$$

2.1.3 Conservation of momentum: ρv_1

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$$v_1\frac{\partial \rho}{\partial t} + \rho\frac{\partial v_1}{\partial t} + (c_s^2+v_1^2)\frac{\delta_l}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{2\delta_l \rho v_1}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{\delta_l v_2 v_1}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{\delta_l v_2 \rho}{\delta_t}\frac{\partial v_1}{\partial x_2} + \frac{\delta_l \rho v_1}{\delta_t}\frac{\partial v_2}{\partial x_2} +$$
$$(-2+\omega-2\omega c_s^2-3\omega v_1^2+4c_s^2+6v_1^2)\frac{\delta_l^2}{\omega\delta_t}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial x_1} + (2-\omega)\frac{3\delta_l^2 \rho v_1}{\omega\delta_t}\left(\frac{\partial v_1}{\partial x_1}\right)^2 + (-2+\omega)\frac{\delta_l^2 c_s^2}{2\omega\delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_1} +$$
$$(-2+\omega)\frac{\delta_l^2 c_s^2}{2\omega\delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_1}{\partial x_2} + (-2+\omega-3\omega c_s^2-\omega v_1^2+6c_s^2+2v_1^2)\frac{\delta_l^2 v_1}{2\omega\delta_t}\frac{\partial^2 \rho}{\partial x_1^2} +$$
$$(-2+\omega-\omega c_s^2-3\omega v_1^2+2c_s^2+6v_1^2)\frac{\delta_l^2 \rho}{2\omega\delta_t}\frac{\partial^2 v_1}{\partial x_1^2} + (-2+\omega)\frac{\delta_l^2 c_s^2 \rho}{2\omega\delta_t}\frac{\partial^2 v_2}{\partial x_1 \partial x_2} + (-2+\omega)\frac{\delta_l^2 c_s^2 \rho}{2\omega\delta_t}\frac{\partial^2 v_1}{\partial x_2^2} + C_1\frac{\delta_l^3}{12\omega^2\delta_t}\frac{\partial^3 \rho}{\partial x_1^3} +$$
$$(-24+24\omega-4\omega^2-36\omega c_s^2-60\omega v_1^2+36c_s^2+11\omega^2 v_1^2+60v_1^2+5\omega^2 c_s^2)\frac{\delta_l^3 \rho v_1}{6\omega^2\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} +$$
$$(12-12\omega+3\omega^2+36\omega c_s^2+12\omega v_1^2-36c_s^2-3\omega^2 v_1^2-12v_1^2-11\omega^2 c_s^2)\frac{\delta_l^3 \rho v_1}{12\omega^2\delta_t}\frac{\partial^3 v_2}{\partial x_1^2 \partial x_2} +$$
$$(-12+12\omega-\omega^2)\frac{\delta_l^3 c_s^4}{6\omega^2\delta_t}\frac{\partial^3 \rho}{\partial x_1 \partial x_2^2} - \frac{\delta_l^3 c_s^2 \rho v_1}{6\delta_t}\frac{\partial^3 v_1}{\partial x_1 \partial x_2^2} + (-1+3c_s^2+v_2^2)\frac{\delta_l^3 v_2 v_1}{12\delta_t}\frac{\partial^3 \rho}{\partial x_2^3} +$$
$$(6-6\omega+\omega^2+18\omega c_s^2+6\omega v_2^2-18c_s^2-\omega^2 v_2^2-3\omega^2 c_s^2-6v_2^2)\frac{\delta_l^3 v_2 \rho}{6\omega^2\delta_t}\frac{\partial^3 v_1}{\partial x_2^3} + (-1+c_s^2+3v_2^2)\frac{\delta_l^3 \rho v_1}{12\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} +$$
$$C_2\frac{\delta_l^4 v_1}{12\omega^3\delta_t}\frac{\partial^4 \rho}{\partial x_1^4} + C_3\frac{\delta_l^4 \rho}{12\omega^3\delta_t}\frac{\partial^4 v_1}{\partial x_1^4} + C_4\frac{\delta_l^4 \rho}{12\omega^3\delta_t}\frac{\partial^4 v_2}{\partial x_1^3 \partial x_2} + C_5\frac{\delta_l^4 c_s^2 v_1}{12\omega^3\delta_t}\frac{\partial^4 \rho}{\partial x_1^2 \partial x_2^2} +$$
$$(-24+36\omega-12\omega^2-18\omega c_s^2-108\omega v_1^2+12c_s^2+36\omega^2 v_1^2-\omega^3 c_s^2+72v_1^2+8\omega^2 c_s^2)\frac{\delta_l^4 c_s^2 \rho}{12\omega^3\delta_t}\frac{\partial^4 v_1}{\partial x_1^2 \partial x_2^2} + C_6\frac{\delta_l^4 c_s^2 v_2}{12\omega^3\delta_t}\frac{\partial^4 \rho}{\partial x_1 \partial x_2^3}$$
$$+ (2-\omega+3\omega c_s^2+\omega v_2^2-6c_s^2-2v_2^2)\frac{\delta_l^4 v_2 \rho v_1}{12\omega\delta_t}\frac{\partial^4 v_1}{\partial x_1 \partial x_2^3} +$$
$$(-12+18\omega-6\omega^2-54\omega v_2^2-\omega^3 c_s^2+18\omega^2 v_2^2+2\omega^2 c_s^2+36v_2^2)\frac{\delta_l^4 c_s^2 \rho}{12\omega^3\delta_t}\frac{\partial^4 v_2}{\partial x_1 \partial x_2^3} +$$
$$(\omega c_s^2+6v_2^4+3\omega v_2^2+2c_s^4-2c_s^2+24c_s^2v_2^2-3\omega v_2^4-12\omega c_s^2 v_2^2-6v_2^2-\omega c_s^4)\frac{\delta_l^4 v_1}{24\omega\delta_t}\frac{\partial^4 \rho}{\partial x_2^4} + C_7\frac{\delta_l^4 \rho}{24\omega^3\delta_t}\frac{\partial^4 v_1}{\partial x_2^4} +$$
$$(-4+2\omega-3\omega c_s^2-5\omega v_2^2+6c_s^2+10v_2^2)\frac{\delta_l^4 v_2 \rho v_1}{12\omega\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$$C_1 = 36v_1^4+\omega^2 c_s^4+12\omega c_s^2+24\omega^2 c_s^2 v_1^2+12c_s^4+7\omega^2 v_1^4+36\omega v_1^2-12c_s^2-7\omega^2 v_1^2-36\omega v_1^4+144c_s^2 v_1^2-36v_1^2-\omega^2 c_s^2-12\omega c_s^4-144\omega c_s^2 v_1^2$$

$$C_2 = 12-9\omega^3 v_1^4-18\omega+144v_1^4+8\omega^2+82\omega^2 c_s^4+198\omega c_s^2-\omega^3+404\omega^2 c_s^2 v_1^2-5\omega^3 c_s^4+144c_s^4+90\omega^2 v_1^4+234\omega v_1^2-34\omega^3 c_s^2 v_1^2-132c_s^2-98\omega^2 v_1^2+6\omega^3 c_s^2-216\omega v_1^4+672c_s^2 v_1^2-156v_1^2-78\omega^2 c_s^2+10\omega^3 v_1^2-216\omega c_s^4-1008\omega c_s^2 v_1^2$$

$$C_3 = 12-29\omega^3 v_1^4-18\omega+504v_1^4+8\omega^2+14\omega^2 c_s^4+54\omega c_s^2-\omega^3+252\omega^2 c_s^2 v_1^2-\omega^3 c_s^4+24c_s^4+310\omega^2 v_1^4+378\omega v_1^2-18\omega^3 c_s^2 v_1^2-36c_s^2-154\omega^2 v_1^2+2\omega^3 c_s^2-756\omega v_1^4+432c_s^2 v_1^2-252v_1^2-22\omega^2 c_s^2+14\omega^3 v_1^2-36\omega c_s^4-648\omega c_s^2 v_1^2$$

$$C_4 = 4\omega^3 v_1^4-36v_1^4+20\omega^2 c_s^4+36\omega c_s^2-42\omega^2 c_s^2 v_1^2-\omega^3 c_s^4+36c_s^4-26\omega^2 v_1^4-54\omega v_1^2+12\omega^3 c_s^2 v_1^2-24c_s^2+26\omega^2 v_1^2+54\omega v_1^4-36c_s^2 v_1^2+36v_1^2-12\omega^2 c_s^2-4\omega^3 v_1^2-54\omega c_s^4+54\omega c_s^2 v_1^2$$

$$C_5 = 24-36\omega+14\omega^2+108\omega c_s^2-\omega^3+36\omega v_1^2-72c_s^2-14\omega^2 v_1^2+5\omega^3 c_s^2-24v_1^2-46\omega^2 c_s^2+\omega^3 v_1^2$$

$$C_6 = 24-36\omega+14\omega^2+108\omega c_s^2-\omega^3+36\omega v_2^2-72c_s^2+3\omega^3 c_s^2-14\omega^2 v_2^2-42\omega^2 c_s^2-24v_2^2+\omega^3 v_2^2$$

$C_7 = -84\omega^2 c_s^2 v_2^2 + 30\omega^2 c_s^4 + 3\omega^3 v_2^4 + 36\omega c_s^2 - 72 v_2^4 - 3\omega^3 c_s^4 - 108\omega v_2^2 + 48 c_s^4 - 42\omega^2 v_2^4 - 24 c_s^2 + \omega^3 c_s^2 - 144 c_s^2 v_2^2 + 108\omega v_2^4 + 6\omega^3 c_s^2 v_2^2 + 42\omega^2 v_2^2 - 14\omega^2 c_s^2 + 216\omega c_s^2 v_2^2 + 72 v_2^2 - 3\omega^3 v_2^2 - 72\omega c_s^4$

2.1.4 Conservation of momentum: ρv_2

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$$v_2 \frac{\partial \rho}{\partial t} + \rho \frac{\partial v_2}{\partial t} + \frac{\delta_l v_2 v_1}{\delta_t} \frac{\partial \rho}{\partial x_1} + \frac{\delta_l v_2 \rho}{\delta_t} \frac{\partial v_1}{\partial x_1} + \frac{\delta_l \rho v_1}{\delta_t} \frac{\partial v_2}{\partial x_1} + (c_s^2 + v_2^2) \frac{\delta_l}{\delta_t} \frac{\partial \rho}{\partial x_2} + \frac{2\delta_l v_2 \rho}{\delta_t} \frac{\partial v_2}{\partial x_2} + (-2+\omega) \frac{\delta_l^2 c_s^2}{2\omega\delta_t} \frac{\partial \rho}{\partial x_1} \frac{\partial v_2}{\partial x_1} +$$
$$(-2+\omega) \frac{\delta_l^2 c_s^2}{2\omega\delta_t} \frac{\partial \rho}{\partial x_1} \frac{\partial v_1}{\partial x_2} + (-2+\omega-2\omega c_s^2 - 3\omega v_2^2 + 4c_s^2 + 6v_2^2) \frac{\delta_l^2}{\omega\delta_t} \frac{\partial \rho}{\partial x_2} \frac{\partial v_2}{\partial x_2} + (2-\omega) \frac{3\delta_l^2 v_2 \rho}{\omega\delta_t} \left(\frac{\partial v_2}{\partial x_2}\right)^2 +$$
$$(-2+\omega) \frac{\delta_l^2 c_s^2 \rho}{2\omega\delta_t} \frac{\partial^2 v_2}{\partial x_1^2} + (-2+\omega) \frac{\delta_l^2 c_s^2 \rho}{2\omega\delta_t} \frac{\partial^2 v_1}{\partial x_1 \partial x_2} + (-2+\omega-3\omega c_s^2 - \omega v_2^2 + 6c_s^2 + 2v_2^2) \frac{\delta_l^2 v_2}{2\omega\delta_t} \frac{\partial^2 \rho}{\partial x_2^2} +$$
$$(-2+\omega-\omega c_s^2 - 3\omega v_2^2 + 2c_s^2 + 6v_2^2) \frac{\delta_l^2 \rho}{2\omega\delta_t} \frac{\partial^2 v_2}{\partial x_2^2} + (-1+3c_s^2+v_1^2) \frac{\delta_l^3 v_2 v_1}{12\delta_t} \frac{\partial^3 \rho}{\partial x_1^3} + (-1+c_s^2+3v_1^2) \frac{\delta_l^3 v_2 \rho}{12\delta_t} \frac{\partial^3 v_1}{\partial x_1^3} +$$
$$(6-6\omega+\omega^2+18\omega c_s^2 + 6\omega v_1^2 - 18c_s^2 - \omega^2 v_1^2 - 6v_1^2 - 3\omega^2 c_s^2) \frac{\delta_l^3 \rho v_1}{6\omega^2\delta_t} \frac{\partial^3 v_2}{\partial x_1^3} + (-12+12\omega-\omega^2) \frac{\delta_l^3 c_s^4}{6\omega^2\delta_t} \frac{\partial^3 \rho}{\partial x_1^2 \partial x_2} -$$
$$\frac{\delta_l^3 c_s^2 v_2 \rho}{6\delta_t} \frac{\partial^3 v_2}{\partial x_1^2 \partial x_2} + (12-12\omega+3\omega^2+36\omega c_s^2 + 12\omega v_2^2 - 36c_s^2 - 3\omega^2 v_2^2 - 11\omega^2 c_s^2 - 12v_2^2) \frac{\delta_l^3 v_2 \rho}{12\omega^2\delta_t} \frac{\partial^3 v_1}{\partial x_1 \partial x_2^2} +$$
$$C_1 \frac{\delta_l^3}{12\omega^2\delta_t} \frac{\partial^3 \rho}{\partial x_2^3} + (-24+24\omega-4\omega^2 - 36\omega c_s^2 - 60\omega v_2^2 + 36c_s^2 + 11\omega^2 v_2^2 + 5\omega^2 c_s^2 + 60v_2^2) \frac{\delta_l^3 v_2 \rho}{6\omega^2\delta_t} \frac{\partial^3 v_2}{\partial x_2^3} +$$
$$(6v_1^4 + \omega c_s^2 + 2c_s^4 + 3\omega v_1^2 - 2c_s^2 - 3\omega v_1^4 + 24 c_s^2 v_1^2 - 6v_1^2 - \omega c_s^4 - 12\omega c_s^2 v_1^2) \frac{\delta_l^4 v_2}{24\omega\delta_t} \frac{\partial^4 \rho}{\partial x_1^4} +$$
$$(-4+2\omega-3\omega c_s^2 - 5\omega v_1^2 + 6c_s^2 + 10v_1^2) \frac{\delta_l^4 v_2 \rho v_1}{12\omega\delta_t} \frac{\partial^4 v_1}{\partial x_1^4} + C_2 \frac{\delta_l^4 \rho}{24\omega^3\delta_t} \frac{\partial^4 v_2}{\partial x_1^4} + C_3 \frac{\delta_l^4 c_s^2 v_1}{12\omega^3\delta_t} \frac{\partial^4 \rho}{\partial x_1^3 \partial x_2} +$$
$$(-12+18\omega-6\omega^2 - 54\omega v_1^2 + 18\omega^2 v_1^2 - \omega^3 c_s^2 + 36 v_1^2 + 2\omega^2 c_s^2) \frac{\delta_l^4 c_s^2 \rho}{12\omega^3\delta_t} \frac{\partial^4 v_1}{\partial x_1^3 \partial x_2} +$$
$$(2-\omega+3\omega c_s^2 + \omega v_1^2 - 6c_s^2 - 2v_1^2) \frac{\delta_l^4 v_2 \rho v_1}{12\omega\delta_t} \frac{\partial^4 v_2}{\partial x_1^3 \partial x_2} + C_4 \frac{\delta_l^4 c_s^2 v_2}{12\omega^3\delta_t} \frac{\partial^4 \rho}{\partial x_1^2 \partial x_2^2} +$$
$$(-24+36\omega-12\omega^2 - 18\omega c_s^2 - 108\omega v_2^2 + 12c_s^2 - \omega^3 c_s^2 + 36\omega^2 v_2^2 + 8\omega^2 c_s^2 + 72 v_2^2) \frac{\delta_l^4 c_s^2 \rho}{12\omega^3\delta_t} \frac{\partial^4 v_2}{\partial x_1^2 \partial x_2^2} + C_5 \frac{\delta_l^4 \rho}{12\omega^3\delta_t} \frac{\partial^4 v_1}{\partial x_1 \partial x_2^3}$$
$$+ C_6 \frac{\delta_l^4 v_2}{12\omega^3\delta_t} \frac{\partial^4 \rho}{\partial x_2^4} + C_7 \frac{\delta_l^4 \rho}{12\omega^3\delta_t} \frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$C_1 = 24\omega^2 c_s^2 v_2^2 + \omega^2 c_s^4 + 12\omega c_s^2 + 36 v_2^4 + 36\omega v_2^2 + 12 c_s^4 + 7\omega^2 v_2^4 - 12 c_s^2 + 144 c_s^2 v_2^2 - 36\omega v_2^4 - 7\omega^2 v_2^2 - \omega^2 c_s^2 - 144\omega c_s^2 v_2^2 - 36 v_2^2 - 12\omega c_s^4$

$C_2 = 3\omega^3 v_1^4 - 72 v_1^4 + 30\omega^2 c_s^4 + 36\omega c_s^2 - 84\omega^2 c_s^2 v_1^2 - 3\omega^3 c_s^4 + 48 c_s^4 - 42\omega^2 v_1^4 - 108\omega v_1^2 + 6\omega^3 c_s^2 v_1^2 - 24 c_s^2 + 42\omega^2 v_1^2 + \omega^3 c_s^2 + 108\omega v_1^4 - 144 c_s^2 v_1^2 + 72 v_1^2 - 14\omega^2 c_s^2 - 3\omega^3 v_1^2 - 72\omega c_s^4 + 216\omega c_s^2 v_1^2$

$C_3 = 24 - 36\omega + 14\omega^2 + 108\omega c_s^2 - \omega^3 + 36\omega v_1^2 - 72 c_s^2 - 14\omega^2 v_1^2 + 3\omega^3 c_s^2 - 24 v_1^2 - 42\omega^2 c_s^2 + \omega^3 v_1^2$

$C_4 = 24 - 36\omega + 14\omega^2 + 108\omega c_s^2 - \omega^3 + 36\omega v_2^2 - 72 c_s^2 + 5\omega^3 c_s^2 - 14\omega^2 v_2^2 - 46\omega^2 c_s^2 - 24 v_2^2 + \omega^3 v_2^2$

$C_5 = -42\omega^2 c_s^2 v_2^2 + 20\omega^2 c_s^4 + 4\omega^3 v_2^4 + 36\omega c_s^2 - 36 v_2^4 - \omega^3 c_s^4 - 54\omega v_2^2 + 36 c_s^4 - 26\omega^2 v_2^4 - 24 c_s^2 - 36 c_s^2 v_2^2 + 54\omega v_2^4 + 12\omega^3 c_s^2 v_2^2 + 26\omega^2 v_2^2 - 12\omega^2 c_s^2 + 54\omega c_s^2 v_2^2 + 36 v_2^2 - 4\omega^3 v_2^2 - 54\omega c_s^4$

$C_6 = 12 + 404\omega^2 c_s^2 v_2^2 - 18\omega + 8\omega^2 + 82\omega^2 c_s^4 - 9\omega^3 v_2^4 + 198\omega c_s^2 + 144 v_2^4 - \omega^3 - 5\omega^3 c_s^4 + 234\omega v_2^2 + 144 c_s^4 + 90\omega^2 v_2^4 - 132 c_s^2 + 6\omega^3 c_s^2 + 672 c_s^2 v_2^2 - 216\omega v_2^4 - 34\omega^3 c_s^2 v_2^2 - 98\omega^2 v_2^2 - 78\omega^2 c_s^2 - 1008\omega c_s^2 v_2^2 - 156 v_2^2 + 10\omega^3 v_2^2 - 216\omega c_s^4$

$C_7 = 12 + 252\omega^2 c_s^2 v_2^2 - 18\omega + 8\omega^2 + 14\omega^2 c_s^4 - 29\omega^3 v_2^4 + 54\omega c_s^2 + 504 v_2^4 - \omega^3 - \omega^3 c_s^4 + 378\omega v_2^2 + 24 c_s^4 + 310\omega^2 v_2^4 - 36 c_s^2 + 2\omega^3 c_s^2 + 432 c_s^2 v_2^2 - 756\omega v_2^4 - 18\omega^3 c_s^2 v_2^2 - 154\omega^2 v_2^2 - 22\omega^2 c_s^2 - 648\omega c_s^2 v_2^2 - 252 v_2^2 + 14\omega^3 v_2^2 - 36\omega c_s^4$

2.2 MRT

2.2.1 Definitions

Collision operator $\boldsymbol{C}$:

$$\boldsymbol{C}(\boldsymbol{f}) = \mathbf{M}^{-1}\mathbf{S}\left(\boldsymbol{\mu}^{(eq)} - \mathbf{M}\boldsymbol{f}\right),$$

where

$$\mathbf{S} = \mathrm{diag}(\omega_1, \omega_2, \omega_3, \omega_4, \omega_5, \omega_6, \omega_7, \omega_8, \omega_9),$$

$\omega_1, \omega_2, \ldots, \omega_9 \in (0, 2)$.

2.2.2 Conservation of mass: ρ

attached text file: `output_d2q9_nse_mrt1_symbolic_pde_00.txt`

$$\frac{\partial \rho}{\partial t} + \frac{\delta_l v_1}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{\delta_l \rho}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{\delta_l v_2}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{\delta_l \rho}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-1 + v_1^2 + 3c_s^2)\frac{\delta_l^3 v_1}{12\delta_t}\frac{\partial^3 \rho}{\partial x_1^3} + (-1 + 3v_1^2 + c_s^2)\frac{\delta_l^3 \rho}{12\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} -$$
$$\frac{\delta_l^3 c_s^2 \rho}{6\delta_t}\frac{\partial^3 v_2}{\partial x_1^2 \partial x_2} - \frac{\delta_l^3 c_s^2 \rho}{6\delta_t}\frac{\partial^3 v_1}{\partial x_1 \partial x_2^2} + (-1 + v_2^2 + 3c_s^2)\frac{\delta_l^3 v_2}{12\delta_t}\frac{\partial^3 \rho}{\partial x_2^3} + (-1 + 3v_2^2 + c_s^2)\frac{\delta_l^3 \rho}{12\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} +$$
$$(2c_s^4 + 24c_s^2 v_1^2 + c_s^2\omega_5 + 6v_1^4 - 3v_1^4\omega_5 - c_s^4\omega_5 - 12c_s^2 v_1^2\omega_5 - 6v_1^2 + 3v_1^2\omega_5 - 2c_s^2)\frac{\delta_l^4}{24\delta_t\omega_5}\frac{\partial^4 \rho}{\partial x_1^4} +$$
$$(-4 - 3c_s^2\omega_5 + 10v_1^2 - 5v_1^2\omega_5 + 6c_s^2 + 2\omega_5)\frac{\delta_l^4 v_1 \rho}{12\delta_t\omega_5}\frac{\partial^4 v_1}{\partial x_1^4} + (-3c_s^2\omega_5 + \omega_7 v_1^2 - \omega_7 - v_1^2\omega_5 + \omega_5 + 3c_s^2\omega_7)\frac{\delta_l^4 v_2 v_1}{4\delta_t\omega_7\omega_5}\frac{\partial^4 \rho}{\partial x_1^3 \partial x_2}$$
$$+ (-c_s^2\omega_5 + 3\omega_7 v_1^2 - \omega_7 - 3v_1^2\omega_5 + \omega_5 + c_s^2\omega_7)\frac{\delta_l^4 v_2 \rho}{4\delta_t\omega_7\omega_5}\frac{\partial^4 v_1}{\partial x_1^3 \partial x_2} + (3\omega_4\omega_5 - 6c_s^2\omega_7\omega_5 + 3c_s^2\omega_7\omega_4\omega_5 - 3c_s^2\omega_4\omega_5 +$$
$$\omega_7\omega_4 v_1^2\omega_5 - \omega_7\omega_4 + \omega_7\omega_4 v_1^2 - \omega_7\omega_4\omega_5 - 3\omega_4 v_1^2\omega_5 + 3c_s^2\omega_7\omega_4)\frac{\delta_l^4 v_1 \rho}{12\delta_t\omega_7\omega_4\omega_5}\frac{\partial^4 v_2}{\partial x_1^3 \partial x_2} + (-2 + \omega_4)\frac{\delta_l^4 c_s^4}{6\delta_t\omega_4}\frac{\partial^4 \rho}{\partial x_1^2 \partial x_2^2} +$$
$$(-\omega_7 + \omega_4)\frac{\delta_l^4 c_s^2 v_1 \rho}{2\delta_t\omega_7\omega_4}\frac{\partial^4 v_1}{\partial x_1^2 \partial x_2^2} + (\omega_4 - \omega_8)\frac{\delta_l^4 c_s^2 v_2 \rho}{2\delta_t\omega_4\omega_8}\frac{\partial^4 v_2}{\partial x_1^2 \partial x_2^2} + (\omega_6 + 3c_s^2\omega_8 - \omega_6 v_2^2 - \omega_8 + v_2^2\omega_8 - 3\omega_6 c_s^2)\frac{\delta_l^4 v_2 v_1}{4\omega_6\delta_t\omega_8}\frac{\partial^4 \rho}{\partial x_1 \partial x_2^3}$$
$$+ (3c_s^2\omega_4\omega_8 - 3\omega_6\omega_4 v_2^2 - \omega_6\omega_4\omega_8 + 3\omega_6 c_s^2\omega_4\omega_8 - 6\omega_6 c_s^2\omega_8 + 3\omega_6\omega_4 - \omega_4\omega_8 + \omega_6\omega_4 v_2^2\omega_8 - 3\omega_6 c_s^2\omega_4 +$$
$$\omega_4 v_2^2\omega_8)\frac{\delta_l^4 v_2 \rho}{12\omega_6\delta_t\omega_4\omega_8}\frac{\partial^4 v_1}{\partial x_1 \partial x_2^3} + (\omega_6 + c_s^2\omega_8 - 3\omega_6 v_2^2 - \omega_8 + 3v_2^2\omega_8 - \omega_6 c_s^2)\frac{\delta_l^4 v_1 \rho}{4\omega_6\delta_t\omega_8}\frac{\partial^4 v_2}{\partial x_1 \partial x_2^3} +$$
$$(24c_s^2 v_2^2 + 2c_s^4 - 12\omega_6 c_s^2 v_2^2 - \omega_6 c_s^4 + 6v_2^4 - 3\omega_6 v_2^4 - 6v_2^2 + 3\omega_6 v_2^2 - 2c_s^2 + \omega_6 c_s^2)\frac{\delta_l^4}{24\omega_6\delta_t}\frac{\partial^4 \rho}{\partial x_2^4} +$$
$$(-4 + 2\omega_6 + 10v_2^2 - 5\omega_6 v_2^2 + 6c_s^2 - 3\omega_6 c_s^2)\frac{\delta_l^4 v_2 \rho}{12\omega_6\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0.$$

2.2.3 Conservation of momentum: ρv_1

attached text file: `output_d2q9_nse_mrt1_symbolic_pde_01.txt`

$$v_1\frac{\partial \rho}{\partial t} + \rho\frac{\partial v_1}{\partial t} + (v_1^2 + c_s^2)\frac{\delta_l}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{2\delta_l v_1 \rho}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{\delta_l v_2 v_1}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{\delta_l v_2 \rho}{\delta_t}\frac{\partial v_1}{\partial x_2} + \frac{\delta_l v_1 \rho}{\delta_t}\frac{\partial v_2}{\partial x_2} +$$
$$(-2 - 2c_s^2\omega_5 + 6v_1^2 - 3v_1^2\omega_5 + 4c_s^2 + \omega_5)\frac{\delta_l^2}{\delta_t\omega_5}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial x_1} + (2 - \omega_5)\frac{3\delta_l^2 v_1 \rho}{\delta_t\omega_5}\left(\frac{\partial v_1}{\partial x_1}\right)^2 + (-2 + \omega_4)\frac{\delta_l^2 c_s^2}{2\delta_t\omega_4}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_1} +$$
$$(-2 + \omega_4)\frac{\delta_l^2 c_s^2}{2\delta_t\omega_4}\frac{\partial \rho}{\partial x_2}\frac{\partial v_1}{\partial x_2} + (-2 - 3c_s^2\omega_5 + 2v_1^2 - v_1^2\omega_5 + 6c_s^2 + \omega_5)\frac{\delta_l^2 v_1}{2\delta_t\omega_5}\frac{\partial^2 \rho}{\partial x_1^2} +$$
$$(-2 - c_s^2\omega_5 + 6v_1^2 - 3v_1^2\omega_5 + 2c_s^2 + \omega_5)\frac{\delta_l^2 \rho}{2\delta_t\omega_5}\frac{\partial^2 v_1}{\partial x_1^2} + (-2 + \omega_4)\frac{\delta_l^2 c_s^2 \rho}{2\delta_t\omega_4}\frac{\partial^2 v_2}{\partial x_1 \partial x_2} + (-2 + \omega_4)\frac{\delta_l^2 c_s^2 \rho}{2\delta_t\omega_4}\frac{\partial^2 v_1}{\partial x_2^2} + C_1\frac{\delta_l^3}{12\delta_t\omega_5^2}\frac{\partial^3 \rho}{\partial x_1^3}$$
$$+ (-24 - 36c_s^2\omega_5 + 5c_s^2\omega_5^2 + 60v_1^2 + 11v_1^2\omega_5^2 - 4\omega_5^2 - 60v_1^2\omega_5 + 36c_s^2 + 24\omega_5)\frac{\delta_l^3 v_1 \rho}{6\delta_t\omega_5^2}\frac{\partial^3 v_1}{\partial x_1^3} + C_2\frac{\delta_l^3 v_2 v_1}{\delta_t\omega_7\omega_4\omega_5^2}\frac{\partial^3 \rho}{\partial x_1^2 \partial x_2} +$$
$$C_3\frac{\delta_l^3 v_2 \rho}{\delta_t\omega_7\omega_4\omega_5^2}\frac{\partial^3 v_1}{\partial x_1^2 \partial x_2} + C_4\frac{\delta_l^3 v_1 \rho}{12\delta_t\omega_7\omega_4^2\omega_5^2}\frac{\partial^3 v_2}{\partial x_1^2 \partial x_2} + (-12 - \omega_4^2 + 12\omega_4)\frac{\delta_l^3 c_s^4}{6\delta_t\omega_4^2}\frac{\partial^3 \rho}{\partial x_1 \partial x_2^2} +$$
$$(12\omega_4\omega_5 + 12\omega_4^2 - 12\omega_7\omega_5 - \omega_7\omega_4^2\omega_5 - 12\omega_7\omega_4 + 12\omega_7\omega_4\omega_5 - 12\omega_4^2\omega_5)\frac{\delta_l^3 c_s^2 v_1 \rho}{6\delta_t\omega_7\omega_4^2\omega_5}\frac{\partial^3 v_1}{\partial x_1 \partial x_2^2} +$$
$$(-\omega_4^2 + \omega_4\omega_8 + 2\omega_4 - 2\omega_8)\frac{\delta_l^3 c_s^2 v_2 \rho}{\delta_t\omega_4^2\omega_8}\frac{\partial^3 v_2}{\partial x_1 \partial x_2^2} + C_5\frac{\delta_l^3 v_2 v_1}{12\omega_6\delta_t\omega_4\omega_8}\frac{\partial^3 \rho}{\partial x_2^3} + C_6\frac{\delta_l^3 v_2 \rho}{6\delta_t\omega_4^2\omega_8}\frac{\partial^3 v_1}{\partial x_2^3} + C_7\frac{\delta_l^3 v_1 \rho}{12\omega_6\delta_t\omega_4\omega_8}\frac{\partial^3 v_2}{\partial x_2^3} +$$
$$C_8\frac{\delta_l^4 v_1}{12\delta_t\omega_5^3}\frac{\partial^4 \rho}{\partial x_1^4} + C_9\frac{\delta_l^4 \rho}{12\delta_t\omega_5^3}\frac{\partial^4 v_1}{\partial x_1^4} + C_{10}\frac{\delta_l^4 v_2}{4\delta_t\omega_7^2\omega_4^2\omega_5^3}\frac{\partial^4 \rho}{\partial x_1^3 \partial x_2} + C_{11}\frac{\delta_l^4 v_2 v_1 \rho}{4\delta_t\omega_7^2\omega_4^2\omega_5^3}\frac{\partial^4 v_1}{\partial x_1^3 \partial x_2} + C_{12}\frac{\delta_l^4 \rho}{12\delta_t\omega_7^2\omega_4^3\omega_5^3}\frac{\partial^4 v_2}{\partial x_1^3 \partial x_2} +$$
$$C_{13}\frac{\delta_l^4 v_1}{12\omega_9\delta_t\omega_7^2\omega_4^3\omega_8\omega_5^3}\frac{\partial^4 \rho}{\partial x_1^2 \partial x_2^2} + C_{14}\frac{\delta_l^4 \rho}{12\omega_9\delta_t\omega_7^2\omega_4^3\omega_8\omega_5^3}\frac{\partial^4 v_1}{\partial x_1^2 \partial x_2^2} + C_{15}\frac{\delta_l^4 v_2 v_1 \rho}{2\omega_9\omega_6\delta_t\omega_7^2\omega_4^3\omega_8^2\omega_5^3}\frac{\partial^4 v_2}{\partial x_1^2 \partial x_2^2} +$$
$$C_{16}\frac{\delta_l^4 v_2}{12\omega_9\omega_6^2\delta_t\omega_7\omega_4^3\omega_8^2\omega_5}\frac{\partial^4 \rho}{\partial x_1 \partial x_2^3} + C_{17}\frac{\delta_l^4 v_2 v_1 \rho}{12\omega_9\omega_6^2\delta_t\omega_7^2\omega_4^3\omega_8^2\omega_5^2}\frac{\partial^4 v_1}{\partial x_1 \partial x_2^3} + C_{18}\frac{\delta_l^4 \rho}{12\omega_9\omega_6^2\delta_t\omega_7\omega_4^3\omega_8^2\omega_5}\frac{\partial^4 v_2}{\partial x_1 \partial x_2^3} + C_{19}\frac{\delta_l^4 v_1}{24\omega_6^2\delta_t\omega_4^2\omega_8^2}\frac{\partial^4 \rho}{\partial x_2^4}$$
$$+ C_{20}\frac{\delta_l^4 \rho}{24\delta_t\omega_4^3\omega_8^2}\frac{\partial^4 v_1}{\partial x_2^4} + C_{21}\frac{\delta_l^4 v_2 v_1 \rho}{12\omega_6^2\delta_t\omega_4^2\omega_8^2}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$$C_1 = 12c_s^4 + 7v_1^4\omega_5^2 + 144c_s^2v_1^2 + 12c_s^2\omega_5 - c_s^2\omega_5^2 + 36v_1^4 - 36v_1^4\omega_5 - 12c_s^4\omega_5 - 144c_s^2v_1^2\omega_5 - 36v_1^2 - 7v_1^2\omega_5^2 + 24c_s^2v_1^2\omega_5^2 + 36v_1^2\omega_5 - 12c_s^2 + c_s^4\omega_5^2$$

$$C_2 = 3c_s^2\omega_4\omega_5^2 + \omega_4\omega_5 + 3c_s^2\omega_7\omega_5 - \omega_7\omega_5 - 3c_s^2\omega_7\omega_4\omega_5 - 3c_s^2\omega_5^2 - 3c_s^2\omega_4\omega_5 - \omega_4\omega_5^2 + \omega_7v_1^2\omega_5 - \omega_7\omega_4v_1^2\omega_5 + \omega_4v_1^2\omega_5^2 - \omega_7\omega_4 + \omega_7\omega_4v_1^2 + \omega_7\omega_4\omega_5 - v_1^2\omega_5^2 + \omega_5^2 - \omega_4v_1^2\omega_5 + 3c_s^2\omega_7\omega_4$$

$$C_3 = c_s^2\omega_4\omega_5^2 + \omega_4\omega_5 + c_s^2\omega_7\omega_5 - \omega_7\omega_5 - c_s^2\omega_7\omega_4\omega_5 - c_s^2\omega_5^2 - c_s^2\omega_4\omega_5 - \omega_4\omega_5^2 + 3\omega_7v_1^2\omega_5 - 3\omega_7\omega_4v_1^2\omega_5 + 3\omega_4v_1^2\omega_5^2 - \omega_7\omega_4 + 3\omega_7\omega_4v_1^2 + \omega_7\omega_4\omega_5 - 3v_1^2\omega_5^2 + \omega_5^2 - 3\omega_4v_1^2\omega_5 + c_s^2\omega_7\omega_4$$

$$C_4 = -12\omega_4^2v_1^2\omega_5 - 12c_s^2\omega_4\omega_5^2 + 42c_s^2\omega_7\omega_4\omega_5^2 - 3\omega_7\omega_4^2v_1^2\omega_5^2 + 3\omega_7\omega_4^2\omega_5^2 - 24c_s^2\omega_7\omega_5^2 - 24c_s^2\omega_7\omega_4\omega_5 - 6\omega_7\omega_4^2v_1^2\omega_5 + 6\omega_7\omega_4^2\omega_5 + 12\omega_7\omega_4^2v_1^2 + 12\omega_4^2v_1^2\omega_5^2 + 12\omega_4\omega_5^2 - 12\omega_4^2\omega_5^2 - 12c_s^2\omega_4^2\omega_5 - 12\omega_4v_1^2\omega_5^2 + 36c_s^2\omega_7\omega_4^2 - 18c_s^2\omega_7\omega_4^2\omega_5 - 11c_s^2\omega_7\omega_4^2\omega_5^2 - 6\omega_7\omega_4\omega_5^2 - 12\omega_7\omega_4^2 + 6\omega_7\omega_4v_1^2\omega_5^2 + 12\omega_4^2\omega_5 + 12c_s^2\omega_4^2\omega_5^2$$

$$C_5 = -18c_s^2\omega_4\omega_8 + 6\omega_6\omega_4v_2^2 + 12\omega_6 + 36c_s^2\omega_8 - \omega_6\omega_4\omega_8 + 3\omega_6c_s^2\omega_4\omega_8 - 6\omega_6\omega_4 + 6\omega_4\omega_8 - 12\omega_6v_2^2 + \omega_6\omega_4v_2^2\omega_8 - 12\omega_8 + 12v_2^2\omega_8 + 18\omega_6c_s^2\omega_4 - 6\omega_4v_2^2\omega_8 - 36\omega_6c_s^2$$

$$C_6 = 15c_s^2\omega_4\omega_8 - 3\omega_4^2 - \omega_4^2v_2^2\omega_8 - 6\omega_4v_2^2 - 12c_s^2\omega_8 - 3\omega_4\omega_8 + 6\omega_4 + \omega_4^2\omega_8 + 3c_s^2\omega_4^2 - 6c_s^2\omega_4 + 3\omega_4^2v_2^2 - 3c_s^2\omega_4^2\omega_8 + 3\omega_4v_2^2\omega_8$$

$$C_7 = -6c_s^2\omega_4\omega_8 + 18\omega_6\omega_4v_2^2 + 12\omega_6 + 12c_s^2\omega_8 - \omega_6\omega_4\omega_8 + \omega_6c_s^2\omega_4\omega_8 - 6\omega_6\omega_4 + 6\omega_4\omega_8 - 36\omega_6v_2^2 + 3\omega_6\omega_4v_2^2\omega_8 - 12\omega_8 + 36v_2^2\omega_8 + 6\omega_6c_s^2\omega_4 - 18\omega_4v_2^2\omega_8 - 12\omega_6c_s^2$$

$$C_8 = 12 + 144c_s^4 + 90v_1^4\omega_5^2 + 672c_s^2v_1^2 + 198c_s^2\omega_5 - 9v_1^4\omega_5^3 - 78c_s^2\omega_5^2 + 144v_1^4 - 216v_1^4\omega_5 + 6c_s^2\omega_5^3 - 216c_s^4\omega_5 + 10v_1^2\omega_5^3 - 1008c_s^2v_1^2\omega_5 - 156v_1^2 - 98v_1^2\omega_5^2 + 8\omega_5^2 + 404c_s^2v_1^2\omega_5^2 + 234v_1^2\omega_5 - 132c_s^2 - 5c_s^4\omega_5^3 - 18\omega_5 - \omega_5^3 - 34c_s^2v_1^2\omega_5^3 + 82c_s^4\omega_5^2$$

$$C_9 = 12 + 24c_s^4 + 310v_1^4\omega_5^2 + 432c_s^2v_1^2 + 54c_s^2\omega_5 - 29v_1^4\omega_5^3 - 22c_s^2\omega_5^2 + 504v_1^4 - 756v_1^4\omega_5 + 2c_s^2\omega_5^3 - 36c_s^4\omega_5 + 14v_1^2\omega_5^3 - 648c_s^2v_1^2\omega_5 - 252v_1^2 - 154v_1^2\omega_5^2 + 8\omega_5^2 + 252c_s^2v_1^2\omega_5^2 + 378v_1^2\omega_5 - 36c_s^2 - c_s^4\omega_5^3 - 18\omega_5 - \omega_5^3 - 18c_s^2v_1^2\omega_5^3 + 14c_s^4\omega_5^2$$

$$C_{10} = -20\omega_7^2\omega_4v_1^2\omega_5 + 13\omega_7\omega_4^2v_1^2\omega_5^3 - 8c_s^2\omega_7\omega_4\omega_5^3 - 4c_s^2\omega_7^2\omega_4^2\omega_5^2 + 8c_s^4\omega_7^2\omega_4^2 + 84c_s^2\omega_7\omega_4v_1^2\omega_5^3 + 4c_s^4\omega_7^2\omega_4\omega_5 - 144c_s^2\omega_7^2\omega_4^2v_1^2\omega_5 + 13\omega_7^2\omega_4^2v_1^4\omega_5^2 - 32\omega_7\omega_4^2v_1^2\omega_5^2 - 4\omega_4v_1^4\omega_5^3 - 4c_s^4\omega_7\omega_5^3 + 8\omega_7v_1^2\omega_5^3 + 4c_s^2\omega_4\omega_5^3 - 4c_s^4\omega_7\omega_4^2\omega_5 + 36c_s^2\omega_7^2v_1^2\omega_5^2 - 48c_s^2\omega_7\omega_4v_1^2\omega_5^2 + 24\omega_7^2\omega_4^2v_1^4 - 4\omega_4^2v_1^2\omega_5^3 - 16\omega_7\omega_4v_1^4\omega_5^2 - 8c_s^2\omega_7^2\omega_4^2 + 8c_s^4\omega_7\omega_4^2\omega_5^2 + 20\omega_7\omega_4^2v_1^2\omega_5 - 8c_s^4\omega_7^2\omega_4\omega_5^2 + 20\omega_7\omega_4v_1^4\omega_5^3 + 4\omega_4^2v_1^2\omega_5^2 - 4c_s^4\omega_7\omega_4^2\omega_5^3 + 51c_s^2\omega_7^2\omega_4^2v_1^2\omega_5^2 - 36\omega_7^2\omega_4^2v_1^4\omega_5 - 24c_s^2\omega_4v_1^2\omega_5^3 + 4c_s^2\omega_7\omega_5^3 + 8\omega_7^2v_1^4\omega_5^2 - 4c_s^4\omega_4\omega_5^3 + 20\omega_7^2\omega_4v_1^2\omega_5^2 + 96c_s^2\omega_7^2\omega_4^2v_1^2 + 12c_s^2\omega_7^2\omega_4^2\omega_5 + 8c_s^4\omega_7\omega_4\omega_5^3 - 72c_s^2\omega_7\omega_4^2v_1^2\omega_5 + 32\omega_7\omega_4^2v_1^4\omega_5^2 + 4\omega_4v_1^2\omega_5^3 + 4c_s^4\omega_7^2\omega_4^2\omega_5^2 - 24c_s^2\omega_4^2v_1^2\omega_5^2 - 8\omega_7v_1^4\omega_5^3 - 24\omega_7^2\omega_4^2v_1^2 + 4c_s^4\omega_4^2\omega_5^3 - 4c_s^2\omega_7^2\omega_4\omega_5 + 20\omega_7^2\omega_4v_1^4\omega_5 + 24c_s^2\omega_4^2v_1^2\omega_5^3 - 4c_s^2\omega_7^2\omega_5^2 - 84c_s^2\omega_7^2\omega_4v_1^2\omega_5^2 - 13\omega_7\omega_4^2v_1^4\omega_5^3 + 4c_s^2\omega_7\omega_4^2\omega_5^2 - 4c_s^4\omega_4^2\omega_5^2 - 13\omega_7^2\omega_4^2v_1^2\omega_5^2 - 8c_s^2\omega_7\omega_4^2\omega_5^2 - 20\omega_7\omega_4v_1^2\omega_5^3 - 4\omega_4^2v_1^4\omega_5^2 + 36\omega_7^2\omega_4^2v_1^2\omega_5 - 20\omega_7^2\omega_4v_1^4\omega_5^2 - 4c_s^2\omega_4^2\omega_5^3 - 8\omega_7^2v_1^2\omega_5^2 + 72c_s^2\omega_7^2\omega_4v_1^2\omega_5 - 36c_s^2\omega_7v_1^2\omega_5^3 - 51c_s^2\omega_7\omega_4^2v_1^2\omega_5^3 + 4c_s^4\omega_7^2\omega_5^2 + 4\omega_4^2v_1^4\omega_5^3 + 16\omega_7\omega_4v_1^2\omega_5^2 + 8c_s^2\omega_7^2\omega_4\omega_5^2 + 4c_s^2\omega_7\omega_4^2\omega_5^3 + 120c_s^2\omega_7\omega_4^2v_1^2\omega_5^2 - 12c_s^4\omega_7^2\omega_4^2\omega_5 - 20\omega_7\omega_4^2v_1^4\omega_5 + 4c_s^2\omega_4^2\omega_5^2$$

$$C_{11} = 64\omega_7^2\omega_4v_1^2\omega_5 + 28\omega_7^2\omega_4\omega_5^2 + 17\omega_7\omega_4^2\omega_5^3 - 43\omega_7\omega_4^2v_1^2\omega_5^3 + 44c_s^2\omega_7\omega_4\omega_5^3 + 25c_s^2\omega_7^2\omega_4^2\omega_5^2 + 12\omega_7\omega_5^3 - 16c_s^2\omega_7\omega_4\omega_5^2 + 104\omega_7\omega_4^2v_1^2\omega_5^2 - 40\omega_7\omega_4^2\omega_5^2 - 28\omega_7v_1^2\omega_5^3 - 16c_s^2\omega_4\omega_5^3 - 32\omega_7^2\omega_4^2 + 8\omega_4\omega_5^3 + 16\omega_4^2v_1^2\omega_5^3 + 48c_s^2\omega_7^2\omega_4^2 - 64\omega_7\omega_4^2v_1^2\omega_5 + 24\omega_7\omega_4^2\omega_5 - 16\omega_4^2v_1^2\omega_5^2 - 20c_s^2\omega_7\omega_5^3 - 24\omega_7^2\omega_4\omega_5 - 68\omega_7^2\omega_4v_1^2\omega_5^2 - 72c_s^2\omega_7^2\omega_4^2\omega_5 - 16\omega_4v_1^2\omega_5^3 + 8\omega_4^2\omega_5^2 + 80\omega_7^2\omega_4^2v_1^2 + 48\omega_7^2\omega_4^2\omega_5 + 32c_s^2\omega_7^2\omega_4\omega_5 + 20c_s^2\omega_7^2\omega_5^2 - 8\omega_4^2\omega_5^3 - 32c_s^2\omega_7\omega_4^2\omega_5 + 43\omega_7^2\omega_4^2v_1^2\omega_5^2 + 56c_s^2\omega_7\omega_4^2\omega_5^2 + 68\omega_7\omega_4v_1^2\omega_5^3 - 120\omega_7^2\omega_4^2v_1^2\omega_5 + 16\omega_7\omega_4\omega_5^2 - 12\omega_7^2\omega_5^2 + 16c_s^2\omega_4^2\omega_5^3 + 28\omega_7^2v_1^2\omega_5^2 - 28\omega_7\omega_4\omega_5^3 - 17\omega_7^2\omega_4^2\omega_5^2 - 48\omega_7\omega_4v_1^2\omega_5^2 - 44c_s^2\omega_7^2\omega_4\omega_5^2 - 25c_s^2\omega_7\omega_4^2\omega_5^3 - 16c_s^2\omega_4^2\omega_5^2$$

$$C_{12} = -19\omega_7^2\omega_4^3v_1^2\omega_5^2 - 48\omega_7\omega_4^2v_1^2\omega_5^3 - 12c_s^2\omega_7\omega_4\omega_5^3 - 6c_s^2\omega_7^2\omega_4^2\omega_5^2 - 12c_s^2\omega_7\omega_4v_1^2\omega_5^3 - 6c_s^4\omega_7\omega_4^3\omega_5^2 - 48c_s^2\omega_7^2v_1^2\omega_5^3 + 12c_s^2\omega_4^3v_1^2\omega_5^3 + 72\omega_7^2\omega_4^3v_1^4 - 108c_s^2\omega_7^2\omega_4^2v_1^2\omega_5 + 12\omega_7^2\omega_4^2v_1^4\omega_5^2 - 27\omega_7\omega_4^3v_1^4\omega_5^3 - 5c_s^2\omega_7^2\omega_4^2\omega_5^3 + 12c_s^4\omega_7^2\omega_4^3 + 252c_s^2\omega_7^2\omega_4^3v_1^2 - 4\omega_7^2\omega_4^3v_1^2\omega_5^3 + 12c_s^2\omega_7^2\omega_4^3\omega_5 + 24\omega_7\omega_4^2v_1^2\omega_5^2 - 18\omega_7^2\omega_4^2v_1^4\omega_5^3 + 60\omega_7\omega_4^3v_1^4\omega_5^2 - 36c_s^2\omega_7\omega_4^3v_1^2\omega_5 - 12c_s^2\omega_4^3v_1^2\omega_5^2 + 6c_s^4\omega_7\omega_4^3\omega_5^3 - 36\omega_7\omega_4^3v_1^4\omega_5 - 81c_s^2\omega_7^2\omega_4^2v_1^2\omega_5^3 + 54c_s^2\omega_7\omega_4^3v_1^2\omega_5^2 + 12\omega_4^2v_1^2\omega_5^3 + 12c_s^4\omega_7\omega_4^2\omega_5^2 - 24c_s^4\omega_7^2\omega_4\omega_5^3 - c_s^2\omega_7^2\omega_4^3\omega_5^2 + 12\omega_4^3v_1^4\omega_5^3 - 12\omega_7^2\omega_4v_1^2\omega_5^3 - 24\omega_7\omega_4v_1^4\omega_5^3 - 18c_s^4\omega_7\omega_4^2\omega_5^3 - 12c_s^2\omega_7^2\omega_4^3 + 162c_s^2\omega_7^2\omega_4^2v_1^2\omega_5^2 - 21c_s^2\omega_7\omega_4^3v_1^2\omega_5^3 - 12\omega_4^3v_1^4\omega_5^2 + 90\omega_7^2\omega_4^3v_1^2\omega_5 + 12c_s^2\omega_7^2\omega_4^2\omega_5 + 12c_s^4\omega_7\omega_4\omega_5^3 - 24\omega_7\omega_4^2v_1^4\omega_5^2 + 4\omega_7^2\omega_4^3v_1^4\omega_5^3 + 6c_s^4\omega_7^2\omega_4^2\omega_5^2 + 102c_s^2\omega_7^2\omega_4v_1^2\omega_5^3 - 60\omega_7\omega_4^3v_1^2\omega_5^2 + 18\omega_7^2\omega_4^2v_1^2\omega_5^3 + 6c_s^2\omega_7\omega_4^3\omega_5^2 - 12c_s^2\omega_4^2v_1^2\omega_5^3 - 48c_s^2\omega_7^2\omega_4v_1^2\omega_5^2 + 48\omega_7\omega_4^2v_1^4\omega_5^3 + 13c_s^4\omega_7^2\omega_4^2\omega_5^3 + 19\omega_7^2\omega_4^3v_1^4\omega_5^2 - 306c_s^2\omega_7^2\omega_4^3v_1^2\omega_5 - 12c_s^4\omega_7^2\omega_4^3\omega_5 - 6c_s^2\omega_7\omega_4^3\omega_5^3 + 27\omega_7\omega_4^3v_1^2\omega_5^3 - 12\omega_7^2\omega_4^2v_1^2\omega_5^2 - 12c_s^2\omega_7\omega_4^2\omega_5^2 + 6c_s^2\omega_7^2\omega_4\omega_5^3 + 24\omega_7\omega_4v_1^2\omega_5^3 - 72\omega_7^2\omega_4^3v_1^2 + 12c_s^4\omega_7^2\omega_5^3 + 12\omega_4^3v_1^2\omega_5^2 - 90\omega_7^2\omega_4^3v_1^4\omega_5 + 30c_s^2\omega_7\omega_4^2v_1^2\omega_5^3 + c_s^4\omega_7^2\omega_4^3\omega_5^2 + 60c_s^2\omega_7^2\omega_4^3v_1^2\omega_5^2 + 36\omega_7\omega_4^3v_1^2\omega_5 - 12\omega_4^2v_1^4\omega_5^3 + 18c_s^2\omega_7\omega_4^2\omega_5^3 - 12c_s^2\omega_7\omega_4^2v_1^2\omega_5^2 - c_s^4\omega_7^2\omega_4^3\omega_5^3 + 12c_s^2\omega_7^2\omega_4^3v_1^2\omega_5^3 - 12c_s^4\omega_7^2\omega_4^2\omega_5 + 12\omega_7^2\omega_4v_1^4\omega_5^3 - 12\omega_4^3v_1^2\omega_5^3$$

$$C_{13} = -12\omega_7\omega_4^3v_2^2\omega_8\omega_5^2 + 36\omega_9c_s^4\omega_7^2\omega_4^3\omega_8 - 12\omega_9\omega_7^2\omega_4^2v_2^2v_1^2\omega_5^2 - 12c_s^2\omega_7^2\omega_4^2\omega_8v_1^2\omega_5^3 + 18\omega_9c_s^2\omega_7^2\omega_4^3v_2^2\omega_5^2 - 42\omega_9c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 + 12\omega_9\omega_4^2v_2^2\omega_8\omega_5^3 - 88\omega_9c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^3 - 18c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 + 36c_s^2\omega_7^2\omega_4^2v_2^2\omega_5^3 + 18\omega_9c_s^2\omega_7\omega_4^2\omega_8v_1^2\omega_5^3 - 12\omega_9c_s^2\omega_7^2\omega_4^3\omega_8v_1^2\omega_5 + 36c_s^4\omega_7\omega_4^2\omega_8\omega_5^3 + 18\omega_9c_s^2\omega_7^2\omega_4^2\omega_8v_1^2\omega_5^2 + 18\omega_9c_s^4\omega_7^2\omega_4^3\omega_5^2 - 12\omega_9\omega_4^2v_2^2\omega_8v_1^2\omega_5^3 - 6\omega_7^2\omega_4^3v_2^2\omega_8v_1^2\omega_5^2 - 12\omega_9c_s^2\omega_4^3\omega_8v_1^2\omega_5^2 - 12c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 + 6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 6\omega_7^2\omega_4^3v_2^2\omega_8\omega_5^3 + 12\omega_9c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 - 12\omega_9c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 + 36\omega_9c_s^2\omega_7^2\omega_4^3v_2^2\omega_8 - 18\omega_9c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 + 18c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^3 - 12c_s^2\omega_7^2\omega_4^2\omega_5^3 + 12\omega_9c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^3 + 30\omega_9c_s^4\omega_7\omega_4^3\omega_8\omega_5^3 + 150\omega_9c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^2 + 6\omega_9\omega_7^2\omega_4^3v_2^2\omega_8v_1^2\omega_5^2 + 12\omega_7\omega_4^3v_2^2\omega_8\omega_5^3 - 18\omega_9c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 6\omega_7^2\omega_4^3v_2^2\omega_8\omega_5^2 + 6\omega_9c_s^2\omega_7\omega_4^3\omega_8\omega_5^3 + 12\omega_9c_s^2\omega_4^3\omega_8\omega_5^2 + 12c_s^2\omega_7\omega_4^2\omega_8v_1^2\omega_5^3 - 6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 + 12\omega_9c_s^2\omega_4^3\omega_8v_1^2\omega_5^3 + 12\omega_9\omega_7^2\omega_4^2v_2^2\omega_5^2 - 12\omega_9c_s^2\omega_7^2\omega_4^2\omega_8v_1^2\omega_5^3 - 12\omega_9c_s^2\omega_7\omega_4^3\omega_8v_1^2\omega_5 + 6\omega_7^2\omega_4^3v_2^2\omega_8v_1^2\omega_5^3 - 12\omega_9\omega_7\omega_4^3v_2^2\omega_8v_1^2\omega_5 - 12\omega_7\omega_4^2v_2^2\omega_8\omega_5^3 + 6\omega_9c_s^2\omega_7^2\omega_4^3v_1^2\omega_5^2 + 12c_s^2\omega_7^2\omega_4^2v_1^2\omega_5^3 - 6c_s^2\omega_7^2\omega_4^3\omega_8v_1^2\omega_5^2 + 24\omega_9\omega_7\omega_4v_2^2\omega_8\omega_5^3 + 12\omega_9c_s^2\omega_7\omega_4\omega_8\omega_5^3 - 36\omega_9c_s^4\omega_7^2\omega_4^2\omega_5^2 + 12\omega_9\omega_7^3v_2^2\omega_8\omega_5^2 + 24\omega_9\omega_7\omega_4^3v_2^2\omega_8v_1^2\omega_5^2 + 18\omega_9c_s^2\omega_7\omega_4^3\omega_8v_1^2\omega_5^2 - 72\omega_9c_s^2\omega_7\omega_4v_2^2\omega_8\omega_5^3 + 72\omega_9c_s^2\omega_7^2\omega_4v_2^2\omega_8\omega_5^2 + \omega_9c_s^2\omega_4^2\omega_7^2\omega_8v_1^2\omega_5^3 - 48\omega_9c_s^4\omega_7^2\omega_4^2\omega_8\omega_5 - 12\omega_9c_s^2\omega_4^2\omega_8v_1^2\omega_5^3 - 24\omega_9\omega_7^2\omega_4v_2^2\omega_8\omega_5^2 - 12c_s^2\omega_7\omega_4^3\omega_8v_1^2\omega_5^3 - 18\omega_9\omega_7^2\omega_4^3v_2^2\omega_8v_1^2\omega_5 - 12\omega_7\omega_4^3v_2^2\omega_8v_1^2\omega_5^3 + 12\omega_9c_s^4\omega_7\omega_4\omega_8\omega_5^3 - 12\omega_9\omega_7\omega_4^3v_2^2\omega_8v_1^2\omega_5^3 - 6\omega_9c_s^2\omega_7\omega_4^3\omega_8v_1^2\omega_5^3 - 12\omega_9\omega_4^3v_2^2\omega_8\omega_5^3 + 6\omega_9\omega_7^2\omega_4^3v_2^2v_1^2\omega_5^2 + 6c_s^2\omega_7^2\omega_4^3\omega_8v_1^2\omega_5^3 + 12\omega_9c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 6\omega_7^2\omega_4^3v_2^2\omega_5^3 + 12\omega_7^2\omega_4^2v_2^2\omega_8\omega_5^3 + 12c_s^2\omega_7\omega_4^3\omega_8v_1^2\omega_5^2 + 12\omega_7\omega_4^3v_2^2\omega_8v_1^2\omega_5^2 + 6c_s^2\omega_7^2\omega_4^3\omega_5^3 + 12\omega_9c_s^4\omega_7\omega_4^3\omega_8\omega_5 - 2\omega_9c_s^2\omega_7^2\omega_4^3\omega_8v_1^2\omega_5^2 - 36c_s^2\omega_7\omega_4^3v_2^2\omega_8\omega_5^3 + 12c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 + 12\omega_7\omega_4^2v_2^2\omega_8v_1^2\omega_5^3 + 12\omega_9\omega_7^2\omega_4^2v_2^2\omega_8v_1^2\omega_5 - 12c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 18\omega_9c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 + 2\omega_9c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9c_s^2\omega_7^2\omega_4^2\omega_8v_1^2\omega_5^2 - 24\omega_9\omega_7\omega_4v_2^2\omega_8v_1^2\omega_5^3 - 6\omega_9\omega_7^2\omega_4^3v_2^2\omega_5^2 - 36\omega_9c_s^2\omega_4^2v_2^2\omega_8\omega_5^3 - 12\omega_9c_s^2\omega_7^2\omega_4^3\omega_8 - 6\omega_9c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 - 42\omega_9c_s^4\omega_7\omega_4^2\omega_8\omega_5^3 - 96\omega_9c_s^4\omega_7^2\omega_8\omega_5^3 + 36c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 - 12\omega_9c_s^4\omega_4^3\omega_8\omega_5^3 -$$

$$36c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^3 - 12\omega_9\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 + 72\omega_9 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 - 12\omega_9 c_s^2\omega_7\omega_4\omega_8 v_1^2\omega_5^3 - 6\omega_9 c_s^2\omega_7^2\omega_4^3\omega_5^2 - 12\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8 - 24\omega_9\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 -$$
$$18c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 + 18\omega_9 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 + 12\omega_9 c_s^2\omega_7^2\omega_4\omega_8 v_1^2\omega_5^3 + 12\omega_9 c_s^2\omega_4^2\omega_8\omega_5^3 + 36c_s^4\omega_7^2\omega_4^2\omega_5^3 - \omega_9 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 - 6\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 +$$
$$36c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 + 12c_s^2\omega_7\omega_4^3\omega_8\omega_5^3 + 18c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^3 - 12\omega_9\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5 + 12\omega_9\omega_7\omega_4^3 v_2^2\omega_8\omega_5^3 + 12\omega_7^2\omega_4^2 v_2^2 v_1^2\omega_5^3 + 12\omega_9 c_s^4\omega_4^3\omega_8\omega_5^2 -$$
$$18c_s^2\omega_7^2\omega_4^3 v_2^2\omega_5^3 - 36c_s^4\omega_7\omega_4^3\omega_8\omega_5^3 - 36\omega_9 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5^3 + 36\omega_9\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^3 + 36\omega_9 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5 + 5\omega_9 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^3 - 36\omega_9 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_5^2 +$$
$$24\omega_9\omega_7^2\omega_4 v_2^2\omega_8 v_1^2\omega_5^2 + 24\omega_9\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5^2 + 12\omega_9 c_s^2\omega_7^2\omega_4^2\omega_5^2 + 180\omega_9 c_s^4\omega_7^2\omega_4\omega_8\omega_5^3 - 72\omega_9 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5^2 + 12\omega_9\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^3 -$$
$$36\omega_9 c_s^2\omega_4^3 v_2^2\omega_8\omega_5^2 - 12\omega_9 c_s^2\omega_7^2\omega_4\omega_8\omega_5^3 - 54\omega_9 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5 + 108\omega_9 c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5^3 + 12\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2 - 6\omega_7^2\omega_4^3 v_2^2 v_1^2\omega_5^3 - 12\omega_7^2\omega_4^2 v_2^2\omega_5^3 -$$
$$36\omega_9\omega_7\omega_4^2 v_2^2\omega_8\omega_5^3 + 18\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5 - 36c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5^3 + 36\omega_9 c_s^2\omega_4^3 v_2^2\omega_8\omega_5^3 - 36\omega_9 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5 - 12\omega_9\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 -$$
$$36\omega_9 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5 - 12\omega_7^2\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^3 - 84\omega_9 c_s^4\omega_7^2\omega_4\omega_8\omega_5^2 + 36c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5^3 + 12\omega_9\omega_7\omega_4^3 v_2^2\omega_8\omega_5 - 18c_s^4\omega_7^2\omega_4^3\omega_5^3 - 24\omega_9\omega_7^2\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 +$$
$$12\omega_9 c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2 - 6c_s^2\omega_7^2\omega_4^3 v_1^2\omega_5^3 + 12\omega_9\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 - 12\omega_9 c_s^2\omega_7^2\omega_4^2 v_1^2\omega_5^2 + 12\omega_9 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 - 36\omega_9 c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 + 12\omega_9 c_s^2\omega_7^2\omega_4\omega_8\omega_5^2$$

$$C_{14} = -12\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 - 36\omega_9\omega_7^2\omega_4^2 v_2^2 v_1^2\omega_5^2 - 36c_s^2\omega_7^2\omega_4^2\omega_8 v_1^2\omega_5^3 + 6\omega_9 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_5^2 - 12\omega_9 c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 + 12\omega_9\omega_4^2 v_2^2\omega_8\omega_5^3 -$$
$$4\omega_9 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^3 - 6c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12c_s^2\omega_7^2\omega_4^2 v_2^2\omega_5^3 - 132\omega_9 c_s^2\omega_7\omega_4^2\omega_8 v_1^2\omega_5^3 + 18\omega_9 c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5 + 12c_s^4\omega_7\omega_4^2\omega_8\omega_5^3 +$$
$$180\omega_9 c_s^2\omega_7^2\omega_4^2\omega_8 v_1^2\omega_5^2 + 6\omega_9 c_s^4\omega_7^2\omega_4^3\omega_5^2 - 36\omega_9\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^3 - 18\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 + 24\omega_9 c_s^2\omega_4^3\omega_8 v_1^2\omega_5^2 - 12c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 + 6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 -$$
$$6\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^3 + 12\omega_9 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8 + 12\omega_9 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 + 6c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^3 - 12c_s^2\omega_7^2\omega_4^2\omega_5^3 + 60\omega_9 c_s^2\omega_7\omega_4^2\omega_8 v_1^2\omega_5^2 + 12\omega_9 c_s^4\omega_7\omega_4^3\omega_8\omega_5^3 +$$
$$24\omega_9 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^2 + 18\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 + 12\omega_7\omega_4^3 v_2^2\omega_8\omega_5^3 - 24\omega_9 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 6\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 - 12\omega_9 c_s^2\omega_7\omega_4^3\omega_8\omega_5^3 + 36c_s^2\omega_7\omega_4^2\omega_8 v_1^2\omega_5^3 -$$
$$6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 - 48\omega_9 c_s^2\omega_7^2\omega_8 v_1^2\omega_5^3 - 24\omega_9 c_s^2\omega_4^3\omega_8 v_1^2\omega_5^3 + 12\omega_9\omega_7^2\omega_4^2 v_2^2\omega_5^2 - 42\omega_9 c_s^2\omega_7^2\omega_4^2\omega_8 v_1^2\omega_5^3 + 72\omega_9 c_s^2\omega_7\omega_4^3\omega_8 v_1^2\omega_5 + 18\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^3 -$$
$$36\omega_9\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5 + 12\omega_9 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 - 12\omega_7\omega_4^2 v_2^2\omega_8\omega_5^3 + 18\omega_9 c_s^2\omega_7^2\omega_4^3 v_1^2\omega_5^2 + 36c_s^2\omega_7^2\omega_4^2 v_1^2\omega_5^3 - 18c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5^2 + 24\omega_9\omega_7\omega_4 v_2^2\omega_8\omega_5^3 -$$
$$12\omega_9 c_s^2\omega_7\omega_4\omega_8\omega_5^3 - 12\omega_9 c_s^4\omega_7^2\omega_4^2\omega_5^2 + 12\omega_9\omega_4^3 v_2^2\omega_8\omega_5^2 + 72\omega_9\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 - 144\omega_9 c_s^2\omega_7\omega_4^3\omega_8 v_1^2\omega_5^2 - 24\omega_9 c_s^2\omega_7\omega_4 v_2^2\omega_8\omega_5^3 +$$
$$24\omega_9 c_s^2\omega_7^2\omega_4 v_2^2\omega_8\omega_5^2 - 12\omega_9 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5 + 24\omega_9 c_s^2\omega_4^2\omega_8 v_1^2\omega_5^3 - 24\omega_9\omega_7^2\omega_4 v_2^2\omega_8\omega_5^2 - 36c_s^2\omega_7\omega_4^3\omega_8 v_1^2\omega_5^3 - 54\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2\omega_5 -$$
$$36\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^3 + 12\omega_9 c_s^4\omega_7\omega_4\omega_8\omega_5^3 - 36\omega_9\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^3 - 108\omega_9 c_s^2\omega_7^2\omega_4^2\omega_8 v_1^2\omega_5 + 78\omega_9 c_s^2\omega_7\omega_4^3\omega_8 v_1^2\omega_5^3 - 12\omega_9\omega_4^3 v_2^2\omega_8\omega_5^3 +$$
$$18\omega_9\omega_7^2\omega_4^3 v_2^2 v_1^2\omega_5^2 + 18c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5^3 + 6\omega_7^2\omega_4^3 v_2^2\omega_5^3 + 12\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5^3 + 36c_s^2\omega_7\omega_4^3\omega_8 v_1^2\omega_5^2 + 36\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 + 6c_s^2\omega_7^2\omega_4^3\omega_5^3 -$$
$$18\omega_9 c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5^2 - 12c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5^3 + 12c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 + 36\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^3 + 36\omega_9\omega_7^2\omega_4^2 v_2^2\omega_8 v_1^2\omega_5 - 12c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 +$$
$$24\omega_9 c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 + 6\omega_9 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 84\omega_9 c_s^2\omega_7^2\omega_4\omega_8 v_1^2\omega_5^2 - 72\omega_9\omega_7\omega_4 v_2^2\omega_8 v_1^2\omega_5^3 - 6\omega_9\omega_7^2\omega_4^3 v_2^2\omega_5^2 - 12\omega_9 c_s^2\omega_4^2 v_2^2\omega_8\omega_5^3 -$$
$$6\omega_9 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 - 24\omega_9 c_s^4\omega_7\omega_4^2\omega_8\omega_5^3 - 12\omega_9 c_s^4\omega_7^2\omega_8\omega_5^3 + 12c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 - 12c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^3 - 36\omega_9\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 + 24\omega_9 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 +$$
$$60\omega_9 c_s^2\omega_7\omega_4\omega_8 v_1^2\omega_5^3 - 6\omega_9 c_s^2\omega_7^2\omega_4^3\omega_5^2 - 12\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8 - 24\omega_9\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 - 6c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 + 6\omega_9 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 + 84\omega_9 c_s^2\omega_7^2\omega_4\omega_8 v_1^2\omega_5^3 -$$
$$12\omega_9 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 + 12c_s^4\omega_7^2\omega_4^2\omega_5^3 - 6\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 + 12c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 + 12c_s^2\omega_7\omega_4^3\omega_8\omega_5^3 + 6c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^3 - 12\omega_9\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5 +$$
$$12\omega_9\omega_7\omega_4^3 v_2^2\omega_8\omega_5^3 + 36\omega_7^2\omega_4^2 v_2^2 v_1^2\omega_5^3 - 6c_s^2\omega_7^2\omega_4^3 v_2^2\omega_5^3 - 12c_s^4\omega_7\omega_4^3\omega_8\omega_5^3 - 12\omega_9 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5^3 + 108\omega_9\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^3 + 12\omega_9 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5 -$$
$$\omega_9 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^3 - 12\omega_9 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_5^2 + 12\omega_9 c_s^4\omega_7\omega_4^2\omega_8\omega_5^2 + 72\omega_9\omega_7^2\omega_4 v_2^2\omega_8 v_1^2\omega_5^2 + 24\omega_9\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5^2 + 12\omega_9 c_s^2\omega_7^2\omega_4^2\omega_5^2 + 18\omega_9 c_s^4\omega_7^2\omega_4\omega_8\omega_5^3 -$$
$$24\omega_9 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5^2 + 36\omega_9\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^3 - 12\omega_9 c_s^2\omega_4^3 v_2^2\omega_8\omega_5^2 - 18\omega_9 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5 + 36\omega_9 c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5^3 + 36\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2 -$$
$$18\omega_7^2\omega_4^3 v_2^2 v_1^2\omega_5^3 - 12\omega_7^2\omega_4^2 v_2^2\omega_5^3 - 36\omega_9\omega_7\omega_4^2 v_2^2\omega_8\omega_5^3 + 18\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5 - 12c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5^3 + 12\omega_9 c_s^2\omega_4^3 v_2^2\omega_8\omega_5^3 + 6\omega_9 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5 -$$
$$36\omega_9\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 - 12\omega_9 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5 - 36\omega_7^2\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^3 - 12\omega_9 c_s^4\omega_7^2\omega_4\omega_8\omega_5^2 + 12c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5^3 + 12\omega_9\omega_7\omega_4^3 v_2^2\omega_8\omega_5 - 6c_s^4\omega_7^2\omega_4^3\omega_5^3 -$$
$$72\omega_9\omega_7^2\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 - 18c_s^2\omega_7^2\omega_4^3 v_1^2\omega_5^3 + 12\omega_9\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 - 36\omega_9 c_s^2\omega_7^2\omega_4^2 v_1^2\omega_5^2 - 6\omega_9 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 - 12\omega_9 c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 + 12\omega_9 c_s^2\omega_7^2\omega_4\omega_8\omega_5^2$$

$$C_{15} = -2\omega_9\omega_6\omega_7\omega_4^2\omega_8^2 v_1^2\omega_5^2 + 8\omega_9\omega_6 c_s^2\omega_4^3\omega_8^2\omega_5^3 - 16\omega_9\omega_6 c_s^2\omega_7^2\omega_8^2\omega_5^3 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8^2 - 4\omega_6 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^3 + 4\omega_6\omega_7\omega_4^2\omega_8^2 v_1^2\omega_5^3 -$$
$$4\omega_6\omega_7\omega_4^3\omega_8^2\omega_5^2 + 4\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5^3 - \omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 9\omega_9\omega_6\omega_7\omega_4^2\omega_8^2\omega_5^3 - \omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2 v_1^2\omega_5^3 + 13\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 4\omega_9\omega_6\omega_7\omega_4^3\omega_8^2 v_1^2\omega_5 -$$
$$8\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^3 + 4\omega_9 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 + 4\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_5^3 - 4\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^3 - 4\omega_6\omega_7^2\omega_4^2\omega_8^2 v_1^2\omega_5^3 + 4\omega_6 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 8\omega_9\omega_6 c_s^2\omega_4^3\omega_8^2\omega_5^2 +$$
$$9\omega_9\omega_6\omega_7\omega_4^2\omega_8^2 v_1^2\omega_5^3 - 5\omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2 v_1^2\omega_5 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4\omega_8\omega_5^3 - 5\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^3 - 3\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2 v_1^2\omega_5^2 - 4\omega_9 c_s^2\omega_7^2\omega_4\omega_8^2\omega_5^3 -$$
$$\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 2\omega_9\omega_6\omega_7\omega_4^2\omega_8^2\omega_5^2 + 4\omega_6\omega_7\omega_4^3\omega_8^2\omega_5^3 + 2\omega_6\omega_7^2\omega_4^3\omega_8\omega_5^3 - 4\omega_9\omega_6\omega_4^3\omega_8^2\omega_5^3 - 2\omega_9\omega_6\omega_7^2\omega_4\omega_8^2\omega_5^3 + 2\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 -$$
$$2\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_5^3 - 4\omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2 + 2\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2 v_1^2\omega_5 - 3\omega_9\omega_6\omega_7\omega_4^3\omega_8^2 v_1^2\omega_5^3 + 8\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 - 6\omega_9\omega_6 c_s^2\omega_7\omega_4\omega_8^2\omega_5^3 +$$
$$2\omega_6\omega_7^2\omega_4^3\omega_8^2 v_1^2\omega_5^3 + 4\omega_6\omega_7\omega_4^3\omega_8^2 v_1^2\omega_5^2 + \omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2 v_1^2\omega_5^2 + 4\omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2 v_1^2 - 2\omega_6\omega_7^2\omega_4^3\omega_8^2 v_1^2\omega_5^2 - 4\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 5\omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5 +$$
$$2\omega_9\omega_6\omega_7^2\omega_4^2\omega_8\omega_5^3 + 7\omega_9\omega_6\omega_7\omega_4^3\omega_8^2 v_1^2\omega_5^2 - 8\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 2\omega_9\omega_6\omega_7^2\omega_4\omega_8^2\omega_5^2 + 4\omega_9\omega_6\omega_4^3\omega_8^2\omega_5^2 - 2\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 - 4\omega_6\omega_7\omega_4^3\omega_8^2 v_1^2\omega_5^3 +$$
$$2\omega_9\omega_6\omega_7^2\omega_4\omega_8^2 v_1^2\omega_5^3 + 3\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 4\omega_9\omega_6\omega_4^3\omega_8^2 v_1^2\omega_5^3 - 2\omega_6\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5^3 + 11\omega_9\omega_6 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^3 + 2\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 4\omega_6\omega_7\omega_4^2\omega_8^2\omega_5^3 -$$
$$7\omega_9\omega_6\omega_7\omega_4^3\omega_8^2\omega_5^2 + \omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5^3 + 2\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^3 + 3\omega_9\omega_6\omega_7\omega_4^3\omega_8^2\omega_5^3 + 3\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 2\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5^3 - 2\omega_9 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 +$$
$$2\omega_9\omega_6\omega_7^2\omega_4\omega_8^2 v_1^2\omega_5^2 + 2\omega_9\omega_6 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^2 - 4\omega_9\omega_6\omega_4^3\omega_8^2 v_1^2\omega_5^2 - 6\omega_9\omega_6\omega_7\omega_4\omega_8^2 v_1^2\omega_5^3 + 4\omega_6 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^3 + \omega_9\omega_6\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5^3 -$$
$$2\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 8\omega_9\omega_6 c_s^2\omega_4^2\omega_8^2\omega_5^3 + 4\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 - 2\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5 + 8\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 2\omega_9\omega_6\omega_7^2\omega_4^2\omega_8 v_1^2\omega_5^3 +$$
$$26\omega_9\omega_6 c_s^2\omega_7^2\omega_4\omega_8^2\omega_5^3 + 6\omega_9\omega_6\omega_7\omega_4\omega_8^2\omega_5^3 - \omega_9\omega_6\omega_7^2\omega_4^3\omega_8\omega_5^3 + 4\omega_6\omega_7^2\omega_4^2\omega_8 v_1^2\omega_5^3 - 4\omega_9\omega_6\omega_4^2\omega_8^2 v_1^2\omega_5^3 - 15\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 + 4\omega_9\omega_6\omega_4^2\omega_8^2\omega_5^3 -$$
$$4\omega_6\omega_7^2\omega_4^2\omega_8\omega_5^3 + 2\omega_9 c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^3 - 6\omega_9\omega_6 c_s^2\omega_7^2\omega_4\omega_8^2\omega_5^2 - 24\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 + 4\omega_9\omega_6\omega_7\omega_4^3\omega_8^2\omega_5$$

$$C_{16} = -24\omega_9\omega_6^2\omega_7\omega_4^2 v_2^2\omega_8 v_1^2 - 36\omega_9\omega_6 c_s^4\omega_7\omega_4\omega_8^2\omega_5 - 12\omega_6^2 c_s^2\omega_4^3\omega_8^2 + \omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 v_2^2\omega_8^2\omega_5 - \omega_9\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6 c_s^2\omega_7\omega_4\omega_8^2\omega_5 -$$
$$12\omega_6^2 c_s^2\omega_7\omega_4^2 v_2^2\omega_8^2\omega_5 + 6\omega_9\omega_6 c_s^2\omega_7\omega_4^3 v_2^2\omega_8^2 - 36\omega_6^2 c_s^2\omega_4^3\omega_8^2 v_1^2\omega_5 + 3\omega_9\omega_6^2 c_s^4\omega_7\omega_4^3\omega_8^2\omega_5 - 9\omega_9\omega_6\omega_7\omega_4^3\omega_8^2 v_1^2\omega_5 - 12\omega_9\omega_6^2 c_s^2\omega_7\omega_4 v_2^2\omega_8\omega_5 -$$
$$36\omega_9\omega_6 c_s^4\omega_4^3\omega_8^2 + 12\omega_9\omega_6\omega_4^3\omega_8^2 v_1^2 - 12\omega_6^2\omega_4^2\omega_8^2 v_1^2\omega_5 - 96\omega_9\omega_6^2 c_s^4\omega_7\omega_8^2\omega_5 + 18\omega_6^2 c_s^4\omega_7\omega_4^3\omega_8^2\omega_5 - 36\omega_9\omega_6 c_s^2\omega_4^2\omega_8^2 v_1^2\omega_5 -$$
$$12\omega_9\omega_6\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5 + 12\omega_9\omega_7\omega_4^2 v_2^2\omega_8^2 v_1^2\omega_5 - 12\omega_9\omega_6\omega_4^3 v_2^2\omega_8^2 v_1^2 - 12\omega_9\omega_6 c_s^2\omega_4^3 v_2^2\omega_8^2 + 12\omega_6^2\omega_7\omega_4^2\omega_8^2 v_1^2\omega_5 + 36\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8 v_1^2\omega_5 +$$
$$18\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 v_1^2\omega_5 - 12\omega_9\omega_6^2\omega_7\omega_4^3\omega_8 v_1^2 + 9\omega_9\omega_6\omega_7\omega_4^3 v_2^2\omega_8^2 v_1^2\omega_5 - 18\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8^2 v_1^2 + 27\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8^2 v_1^2\omega_5 - 45\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8 v_1^2\omega_5 -$$
$$12\omega_9\omega_6 c_s^2\omega_7\omega_4 v_2^2\omega_8^2\omega_5 + 12\omega_9\omega_6^2 c_s^4\omega_7\omega_4^2\omega_5 - 6\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 15\omega_9\omega_6^2\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5 + 12\omega_6^2\omega_4^2 v_2^2\omega_8^2 v_1^2\omega_5 - 18\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8 v_1^2\omega_5 -$$
$$6\omega_6^2\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5 + 24\omega_9\omega_6^2\omega_7\omega_4\omega_8 v_1^2\omega_5 - 6\omega_6^2\omega_7\omega_4^3\omega_8^2 v_1^2\omega_5 - 42\omega_9\omega_6^2 c_s^4\omega_7\omega_4^2\omega_8\omega_5 + 36\omega_9\omega_6 c_s^2\omega_4^3\omega_8^2 v_1^2\omega_5 - 6\omega_6^2 c_s^2\omega_7\omega_4^3 v_2^2\omega_8^2 +$$
$$18\omega_9\omega_6 c_s^4\omega_7\omega_4^3\omega_8^2 - 12\omega_6^2\omega_4^3\omega_8^2 v_1^2 + 36\omega_6^2 c_s^4\omega_4^3\omega_8^2 - 24\omega_9\omega_6\omega_7\omega_4^2\omega_8^2 v_1^2 - 12\omega_6^2 c_s^2\omega_4^2\omega_8^2\omega_5 - 36\omega_9\omega_6 c_s^2\omega_4^3\omega_8^2 v_1^2 - 12\omega_6^2\omega_7\omega_4^2 v_2^2\omega_8^2 v_1^2\omega_5 +$$
$$6\omega_6^2\omega_7\omega_4^3\omega_8^2 v_1^2 - 12\omega_9\omega_6 c_s^2\omega_4^3\omega_8^2\omega_5 - 72\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8 v_1^2 + 12\omega_9\omega_6^2\omega_7\omega_4^2 v_1^2\omega_5 + 144\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8 v_1^2\omega_5 - 108\omega_9\omega_6 c_s^2\omega_7\omega_4^2\omega_8^2 v_1^2\omega_5 +$$
$$12\omega_9\omega_6 c_s^2\omega_4^3\omega_8^2 - 18\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5 - 12\omega_9\omega_6\omega_4^2 v_2^2\omega_8^2 v_1^2\omega_5 + 156\omega_9\omega_6^2 c_s^4\omega_7\omega_4\omega_8^2\omega_5 - 12\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5 + 6\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 v_2^2\omega_5 -$$
$$12\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2 v_2^2\omega_8^2\omega_5 - 36\omega_9\omega_6 c_s^4\omega_4^2\omega_8^2\omega_5 + 5\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 18\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8^2 v_1^2 + 12\omega_9\omega_6^2\omega_7\omega_4^3 v_2^2\omega_8 v_1^2 + 6\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8^2 -$$
$$6\omega_9\omega_6^2 c_s^4\omega_7\omega_4^3\omega_5 + 36\omega_6^2 c_s^4\omega_7\omega_4^2\omega_8\omega_5 - 36\omega_6^2 c_s^4\omega_4^3\omega_8^2\omega_5 + 12\omega_6^2\omega_4^3\omega_8^2 v_1^2\omega_5 - 12\omega_9\omega_6^2 c_s^2\omega_7\omega_4\omega_8^2\omega_5 + 36\omega_9\omega_6\omega_7\omega_4^2\omega_8^2 v_1^2\omega_5 +$$
$$36\omega_6^2 c_s^2\omega_4^2\omega_8^2 v_1^2\omega_5 - 15\omega_9\omega_6 c_s^4\omega_7\omega_4^3\omega_8^2\omega_5 + 6\omega_6^2 c_s^2\omega_7\omega_4^3 v_2^2\omega_8^2\omega_5 + 24\omega_9\omega_6\omega_7\omega_4^2 v_2^2\omega_8^2 v_1^2 + 18\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5 + 12\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 +$$
$$12\omega_9\omega_6^2 c_s^4\omega_7\omega_4\omega_8\omega_5 + 12\omega_6^2\omega_4^3 v_2^2\omega_8^2 v_1^2 + 12\omega_6^2 c_s^2\omega_4^3 v_2^2\omega_8^2 + 12\omega_6^2 c_s^2\omega_4^2 v_2^2\omega_8^2\omega_5 + 6\omega_6^2\omega_7\omega_4^3\omega_8 v_1^2\omega_5 + 18\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8^2 v_1^2\omega_5 +$$
$$6\omega_6^2\omega_7\omega_4^3 v_2^2\omega_8^2 v_1^2\omega_5 + 12\omega_9\omega_6^2 c_s^2\omega_7\omega_4\omega_8\omega_5 - 36\omega_9\omega_6 c_s^2\omega_7\omega_4^2\omega_8 v_1^2\omega_5 - 36\omega_6^2 c_s^4\omega_7\omega_4^2\omega_8^2\omega_5 - 12\omega_9\omega_7\omega_4^2\omega_8^2 v_1^2\omega_5 + 12\omega_6^2\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5 -$$
$$6\omega_6^2 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5 + 24\omega_9\omega_6^2\omega_7\omega_4^2\omega_8 v_1^2 - 36\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2 v_1^2\omega_5 + 36\omega_9 c_s^2\omega_7\omega_4^2\omega_8^2 v_1^2\omega_5 + 6\omega_9\omega_6^2\omega_7\omega_4^3 v_2^2 v_1^2\omega_5 + 18\omega_9\omega_6 c_s^2\omega_7\omega_4^2 v_2^2\omega_8^2\omega_5 -$$

$$
60\omega_9\omega_6^2c_s^4\omega_7\omega_4^2\omega_8^2\omega_5 + 15\omega_9\omega_6^2\omega_7\omega_4^3\omega_8v_1^2\omega_5 + 12\omega_9\omega_6\omega_4^2\omega_8^2v_1^2\omega_5 - 6\omega_6^2\omega_7\omega_4^3v_2^2\omega_8^2v_1^2 + 12\omega_9\omega_6\omega_7\omega_4^2\omega_8v_1^2\omega_5 + 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 +
12\omega_9\omega_6c_s^2\omega_4^3v_2^2\omega_8^2\omega_5 + 12\omega_9\omega_6\omega_4^3v_2^2\omega_8^2v_1^2\omega_5 + 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_5 - 6\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2 - 5\omega_9\omega_6c_s^2\omega_7\omega_4^3v_2^2\omega_8^2\omega_5 - 72\omega_9\omega_6^2c_s^2\omega_7\omega_4\omega_8v_1^2\omega_5 -
12\omega_9\omega_6^2\omega_7\omega_4^2v_2^2v_1^2\omega_5 + 36\omega_6^2c_s^4\omega_4^2\omega_8^2\omega_5 - 18\omega_6^2c_s^4\omega_7\omega_4^3\omega_8\omega_5 + 72\omega_9\omega_6c_s^2\omega_7\omega_4\omega_8^2v_1^2\omega_5 + 54\omega_9\omega_6c_s^4\omega_7\omega_4^2\omega_8^2\omega_5 - 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^2v_2^2\omega_5 +
6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 - 6\omega_9\omega_6\omega_7\omega_4^3\omega_8v_1^2\omega_5 - 12\omega_9\omega_6c_s^2\omega_4^2v_2^2\omega_8^2\omega_5 + 24\omega_9\omega_6\omega_7\omega_4v_2^2\omega_8^2v_1^2\omega_5 + 72\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8^2v_1^2 - 12\omega_9\omega_6\omega_4^3\omega_8^2v_1^2\omega_5 -
18\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 48\omega_9\omega_6^2\omega_7\omega_4^2\omega_8v_1^2\omega_5 + 36\omega_9\omega_6c_s^4\omega_4^3\omega_8^2\omega_5 - 24\omega_9\omega_6^2\omega_7\omega_4v_2^2\omega_8v_1^2\omega_5 - 36\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2v_1^2\omega_5 + 12\omega_9\omega_6c_s^2\omega_4^2\omega_8^2\omega_5 -
6\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_5 - 18\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2 - 12\omega_6^2c_s^2\omega_4^3v_2^2\omega_8^2\omega_5 - 12\omega_6^2\omega_4^3v_2^2\omega_8^2v_1^2\omega_5 - 12\omega_6^2\omega_7\omega_4^2\omega_8v_1^2\omega_5 + 3\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 -
36\omega_9\omega_6\omega_7\omega_4^2v_2^2\omega_8^2v_1^2\omega_5 - 6\omega_9\omega_6\omega_7\omega_4^3v_2^2\omega_8^2v_1^2 + 48\omega_9\omega_6^2\omega_7\omega_4^2v_2^2\omega_8v_1^2\omega_5 - 3\omega_9\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_8\omega_5 - 24\omega_9\omega_6\omega_7\omega_4\omega_8^2v_1^2\omega_5 - 6\omega_9\omega_6^2\omega_7\omega_4^3v_1^2\omega_5 +
36\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8v_1^2 - 18\omega_9c_s^2\omega_7\omega_4^3\omega_8^2v_1^2\omega_5 - 6\omega_9\omega_7\omega_4^3v_2^2\omega_8^2v_1^2\omega_5 + 12\omega_6^2c_s^2\omega_7\omega_4^2v_2^2\omega_8\omega_5 + 6\omega_9\omega_7\omega_4^3\omega_8^2v_1^2\omega_5 + 6\omega_9\omega_6\omega_7\omega_4^3\omega_8^2v_1^2 +
12\omega_6^2c_s^2\omega_4^3\omega_8^2\omega_5 + 6\omega_9\omega_6\omega_7\omega_4^3v_2^2\omega_8v_1^2\omega_5 + 15\omega_9\omega_6^2c_s^4\omega_7\omega_4^3\omega_8\omega_5 + 36\omega_6^2c_s^2\omega_4^3\omega_8^2v_1^2 + 18\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8v_1^2\omega_5 + 12\omega_9\omega_6^2c_s^2\omega_7\omega_4v_2^2\omega_8^2\omega_5
$$

$$
C_{17} = -48\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_5^2 - 24\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 24\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8\omega_5 + 72\omega_9\omega_6^2c_s^2\omega_7\omega_4\omega_8^2\omega_5^2 + 12\omega_9\omega_6^2\omega_7\omega_4^2\omega_8^2\omega_5^2 + 24\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 -
84\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 12\omega_6^2\omega_7^2\omega_4^3v_2^2\omega_8\omega_5^2 - 4\omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 96\omega_9\omega_6^2c_s^2\omega_7^2\omega_8^2\omega_5^2 - 24\omega_9\omega_6^2c_s^2\omega_4^3\omega_8^2\omega_5^2 - 12\omega_9\omega_6\omega_7^2\omega_4^2v_2^2\omega_8\omega_5^2 +
84\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + 24\omega_6^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - \omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 12\omega_9\omega_7^2\omega_4^2v_2^2\omega_8^2\omega_5^2 - 18\omega_9\omega_6^2\omega_7^2\omega_4^3v_2^2\omega_8\omega_5^2 + 24\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 -
24\omega_9\omega_6^2\omega_7^2\omega_4^2v_2^2\omega_8\omega_5 - 42\omega_9\omega_6c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 12\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9\omega_6^2\omega_7^2\omega_4v_2^2\omega_8^2\omega_5^2 + 12\omega_9\omega_6\omega_7^2\omega_4^2\omega_8\omega_5^2 + 66\omega_9\omega_6^2\omega_7^2\omega_4^2v_2^2\omega_8\omega_5^2 -
24\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 6\omega_9\omega_7^2\omega_4^3v_2^2\omega_8^2\omega_5^2 + 6\omega_9\omega_6\omega_7^2\omega_4^3v_2^2\omega_8\omega_5^2 + 12\omega_9\omega_6^2\omega_7^2\omega_4^3v_2^2\omega_5^2 - 24\omega_6^2\omega_7\omega_4^3\omega_8^2\omega_5 - 12\omega_9\omega_7^2\omega_4^2\omega_8^2\omega_5^2 -
66\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 24\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_5^2 + 12\omega_9\omega_6^2\omega_7^2\omega_4^3v_2^2\omega_8\omega_5 - 12\omega_9\omega_6^2\omega_7^2\omega_4\omega_8^2\omega_5^2 + 12\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9\omega_6\omega_7^2\omega_4v_2^2\omega_8^2\omega_5^2 -
18\omega_9c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 24\omega_9\omega_6^2c_s^2\omega_4^3\omega_8^2\omega_5 - 24\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8^2 + 6\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 24\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 12\omega_9\omega_6\omega_7^2\omega_4\omega_8^2\omega_5^2 +
12\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 - 66\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 36\omega_9\omega_6^2c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 + 60\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 + 24\omega_6^2\omega_7^2\omega_4^2v_2^2\omega_8\omega_5^2 + 12\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 -
12\omega_6^2\omega_7^2\omega_4^3v_2^2\omega_8^2\omega_5 + 24\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 12\omega_9\omega_6^2\omega_7\omega_4^3v_2^2\omega_8^2\omega_5 + 12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7\omega_4^2v_2^2\omega_8^2\omega_5^2 - 24\omega_6^2\omega_7\omega_4^2\omega_8^2\omega_5^2 -
24\omega_6^2\omega_7^2\omega_4^2v_2^2\omega_8^2\omega_5^2 + 156\omega_9\omega_6^2c_s^2\omega_7^2\omega_4\omega_8^2\omega_5^2 + 24\omega_9\omega_6^2c_s^2\omega_4^2\omega_8^2\omega_5^2 + 18\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7^2\omega_4^2v_2^2\omega_8^2\omega_5^2 + 24\omega_6^2\omega_7\omega_4^2v_2^2\omega_8^2\omega_5^2 +
4\omega_9\omega_6\omega_7^2\omega_4^3v_2^2\omega_8^2\omega_5^2 - 12\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 - 12\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5 + 90\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 24\omega_6^2\omega_7\omega_4^3v_2^2\omega_8^2\omega_5 + 48\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 -
12\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_5^2 + 36\omega_9\omega_6^2\omega_7^2\omega_4\omega_8\omega_5^2 - 12\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7\omega_4^3\omega_8^2\omega_5^2 + 18\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 24\omega_6^2\omega_7\omega_4^3v_2^2\omega_8^2\omega_5^2 -
18\omega_9\omega_6\omega_7^2\omega_4^2v_2^2\omega_8^2\omega_5^2 - 24\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 + 12\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5 - 132\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^2 + 12\omega_9\omega_6^2\omega_7\omega_4^3\omega_8^2\omega_5 + \omega_9\omega_6^2\omega_7^2\omega_4^3v_2^2\omega_8^2\omega_5^2 +
12\omega_9\omega_6^2\omega_7^2\omega_4^2v_2^2\omega_8^2\omega_5 - 12\omega_9\omega_6c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 36\omega_9c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 36\omega_9\omega_6^2\omega_7^2\omega_4v_2^2\omega_8\omega_5^2 + 12\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 24\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_5^2 -
12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + 3\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 6\omega_9\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 24\omega_6^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 72\omega_9\omega_6^2c_s^2\omega_7^2\omega_4\omega_8^2\omega_5 + 24\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^2 -
6\omega_9\omega_6\omega_7^2\omega_4^3\omega_8\omega_5^2 + 24\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2 + 12\omega_6^2\omega_7^2\omega_4^3v_2^2\omega_8^2\omega_5^2 - 24\omega_9\omega_6^2\omega_7^2\omega_4^2v_2^2\omega_5^2 + 12\omega_9\omega_6c_s^2\omega_7^2\omega_4\omega_8^2\omega_5^2 + 12\omega_9\omega_6^2\omega_7\omega_4^3v_2^2\omega_8^2\omega_5^2
$$

$$
C_{18} = -72\omega_9\omega_6^2\omega_7\omega_4^2v_2^2\omega_8v_1^2 - 12\omega_9\omega_6c_s^4\omega_7\omega_4\omega_8^2\omega_5 - 12\omega_6^2c_s^2\omega_4^3\omega_8^2 + 12\omega_9\omega_6c_s^2\omega_7\omega_4\omega_8^2\omega_5 - 36\omega_6^2c_s^2\omega_7\omega_4^2v_2^2\omega_8^2\omega_5 + 18\omega_9\omega_6c_s^2\omega_7\omega_4^3v_2^2\omega_8^2 -
12\omega_6^2c_s^2\omega_4^3\omega_8^2v_1^2\omega_5 - \omega_9\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2\omega_5 - 9\omega_9\omega_6\omega_7\omega_4^3\omega_8^2v_1^2\omega_5 + 60\omega_9\omega_6^2c_s^2\omega_7\omega_4v_2^2\omega_8\omega_5 - 12\omega_9\omega_6c_s^4\omega_4^3\omega_8^2 + 12\omega_9\omega_6\omega_4^3\omega_8^2v_1^2 -
12\omega_6^2\omega_4^2\omega_8^2v_1^2\omega_5 - 12\omega_9\omega_6^2c_s^4\omega_7\omega_8^2\omega_5 + 6\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2\omega_5 - 12\omega_9\omega_6c_s^2\omega_4^2\omega_8^2v_1^2\omega_5 - 36\omega_9\omega_6\omega_7\omega_4^2v_2^2\omega_8v_1^2\omega_5 + 36\omega_9\omega_7\omega_4^2v_2^2\omega_8^2v_1^2\omega_5 -
36\omega_9\omega_6\omega_4^3v_2^2\omega_8^2v_1^2 - 36\omega_9\omega_6c_s^2\omega_4^3v_2^2\omega_8^2 + 12\omega_6^2\omega_7\omega_4^2\omega_8^2v_1^2\omega_5 + 12\omega_6^2c_s^2\omega_7\omega_4^2\omega_8v_1^2\omega_5 + 6\omega_9\omega_6^2c_s^2\omega_7\omega_4^3v_1^2\omega_5 - 12\omega_9\omega_6^2\omega_7\omega_4^3\omega_8v_1^2 +
27\omega_9\omega_6\omega_7\omega_4^3v_2^2\omega_8^2v_1^2\omega_5 - 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2v_1^2 + 9\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2v_1^2\omega_5 - 15\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8v_1^2\omega_5 - 36\omega_9\omega_6c_s^2\omega_7\omega_4v_2^2\omega_8^2\omega_5 - 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 -
45\omega_9\omega_6^2\omega_7\omega_4^3v_2^2\omega_8v_1^2\omega_5 + 36\omega_6^2\omega_4^2v_2^2\omega_8^2v_1^2\omega_5 - 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8v_1^2\omega_5 - 18\omega_6^2\omega_7\omega_4^3v_2^2\omega_8v_1^2\omega_5 - 48\omega_9\omega_6^2c_s^2\omega_7v_2^2\omega_8^2\omega_5 + 24\omega_9\omega_6^2\omega_7\omega_4\omega_8v_1^2\omega_5 -
6\omega_6^2\omega_7\omega_4^3\omega_8^2v_1^2\omega_5 - 18\omega_9\omega_6^2c_s^4\omega_7\omega_4^2\omega_8\omega_5 + 12\omega_9\omega_6c_s^2\omega_4^3\omega_8^2v_1^2\omega_5 - 18\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_8^2 + 6\omega_9\omega_6c_s^4\omega_7\omega_4^3\omega_8^2 - 12\omega_6^2\omega_4^3\omega_8^2v_1^2 + 12\omega_6^2c_s^4\omega_4^3\omega_8^2 -
24\omega_9\omega_6\omega_7\omega_4^2\omega_8^2v_1^2 - 12\omega_6^2c_s^2\omega_4^2\omega_8^2\omega_5 - 12\omega_9\omega_6c_s^2\omega_4^3\omega_8^2v_1^2 - 36\omega_6^2\omega_7\omega_4^2v_2^2\omega_8^2v_1^2\omega_5 + 6\omega_6^2\omega_7\omega_4^3\omega_8^2v_1^2 - 12\omega_9\omega_6c_s^2\omega_4^3\omega_8^2\omega_5 -
24\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8v_1^2 + 12\omega_9\omega_6^2\omega_7\omega_4^2v_1^2\omega_5 + 48\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8v_1^2\omega_5 - 36\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8^2v_1^2\omega_5 + 12\omega_9\omega_6c_s^2\omega_4^3\omega_8^2 + 18\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8\omega_5 -
36\omega_9\omega_6\omega_4^2v_2^2\omega_8^2v_1^2\omega_5 + 18\omega_9\omega_6^2c_s^4\omega_7\omega_4\omega_8^2\omega_5 - 12\omega_6^2c_s^2\omega_7\omega_4^2\omega_8\omega_5 - 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_5 - 15\omega_9\omega_6^2c_s^2\omega_7\omega_4^2v_2^2\omega_8^2\omega_5 - 12\omega_9\omega_6c_s^4\omega_4^2\omega_8^2\omega_5 +
5\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 6\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2v_1^2 + 36\omega_9\omega_6^2\omega_7\omega_4^3v_2^2\omega_8v_1^2 + 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2 + 12\omega_6^2c_s^4\omega_7\omega_4^2\omega_8\omega_5 - 12\omega_6^2c_s^4\omega_4^3\omega_8^2\omega_5 + 12\omega_6^2\omega_4^3\omega_8^2v_1^2\omega_5 +
36\omega_9\omega_6\omega_7\omega_4^2\omega_8^2v_1^2\omega_5 + 12\omega_6^2c_s^2\omega_4^2\omega_8^2v_1^2\omega_5 - 5\omega_9\omega_6c_s^4\omega_7\omega_4^3\omega_8^2\omega_5 + 18\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_8^2\omega_5 + 72\omega_9\omega_6\omega_7\omega_4^2v_2^2\omega_8^2v_1^2 - 102\omega_9\omega_6^2c_s^2\omega_7\omega_4^2v_2^2\omega_8\omega_5 +
12\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 + 12\omega_9\omega_6^2c_s^4\omega_7\omega_4\omega_8\omega_5 + 36\omega_6^2\omega_4^3v_2^2\omega_8^2v_1^2 + 36\omega_6^2c_s^2\omega_4^3v_2^2\omega_8^2 + 36\omega_6^2c_s^2\omega_4^2v_2^2\omega_8^2\omega_5 + 6\omega_6^2\omega_7\omega_4^3\omega_8v_1^2\omega_5 + 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2v_1^2\omega_5 +
18\omega_6^2\omega_7\omega_4^3v_2^2\omega_8^2v_1^2\omega_5 - 12\omega_9\omega_6^2c_s^2\omega_7\omega_4\omega_8\omega_5 - 12\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8v_1^2\omega_5 - 12\omega_6^2c_s^4\omega_7\omega_4^2\omega_8^2\omega_5 - 12\omega_9\omega_7\omega_4^2\omega_8^2v_1^2\omega_5 + 36\omega_6^2\omega_7\omega_4^2v_2^2\omega_8v_1^2\omega_5 -
18\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_8\omega_5 + 24\omega_9\omega_6^2\omega_7\omega_4^2\omega_8v_1^2 - 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^2v_1^2\omega_5 + 12\omega_9c_s^2\omega_7\omega_4^2\omega_8^2v_1^2\omega_5 + 18\omega_9\omega_6^2\omega_7\omega_4^3v_2^2v_1^2\omega_5 + 54\omega_9\omega_6c_s^2\omega_7\omega_4^2v_2^2\omega_8^2\omega_5 -
5\omega_9\omega_6^2c_s^4\omega_7\omega_4^2\omega_8^2\omega_5 + 15\omega_9\omega_6^2\omega_7\omega_4^3\omega_8v_1^2\omega_5 + 12\omega_9\omega_6\omega_4^2\omega_8^2v_1^2\omega_5 - 18\omega_6^2\omega_7\omega_4^3v_2^2\omega_8^2v_1^2 + 12\omega_9\omega_6\omega_7\omega_4^2\omega_8v_1^2\omega_5 + \omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 +
36\omega_9\omega_6c_s^2\omega_4^3v_2^2\omega_8^2\omega_5 + 36\omega_9\omega_6\omega_4^3v_2^2\omega_8^2v_1^2\omega_5 - 6\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2 - 15\omega_9\omega_6c_s^2\omega_7\omega_4^3v_2^2\omega_8^2\omega_5 - 24\omega_9\omega_6^2c_s^2\omega_7\omega_4\omega_8v_1^2\omega_5 - 36\omega_9\omega_6^2\omega_7\omega_4^2v_2^2v_1^2\omega_5 +
12\omega_6^2c_s^4\omega_4^2\omega_8^2\omega_5 - 6\omega_6^2c_s^4\omega_7\omega_4^3\omega_8\omega_5 + 24\omega_9\omega_6c_s^2\omega_7\omega_4\omega_8^2v_1^2\omega_5 + 18\omega_9\omega_6c_s^4\omega_7\omega_4^2\omega_8^2\omega_5 + 24\omega_9\omega_6^2c_s^2\omega_7\omega_4^2v_2^2\omega_5 + 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 -
6\omega_9\omega_6\omega_7\omega_4^3\omega_8v_1^2\omega_5 - 36\omega_9\omega_6c_s^2\omega_4^2v_2^2\omega_8^2\omega_5 + 72\omega_9\omega_6\omega_7\omega_4v_2^2\omega_8^2v_1^2\omega_5 + 24\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8^2v_1^2 - 12\omega_9\omega_6\omega_4^3\omega_8^2v_1^2\omega_5 - 18\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 -
48\omega_9\omega_6^2\omega_7\omega_4^2\omega_8v_1^2\omega_5 + 12\omega_9\omega_6c_s^4\omega_4^3\omega_8^2\omega_5 - 72\omega_9\omega_6^2\omega_7\omega_4v_2^2\omega_8v_1^2\omega_5 - 12\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2v_1^2\omega_5 + 12\omega_9\omega_6c_s^2\omega_4^2\omega_8^2\omega_5 - 6\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2 -
36\omega_6^2c_s^2\omega_4^3v_2^2\omega_8^2\omega_5 - 36\omega_6^2\omega_4^3v_2^2\omega_8^2v_1^2\omega_5 - 12\omega_6^2\omega_7\omega_4^2\omega_8v_1^2\omega_5 - 6\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 - 108\omega_9\omega_6\omega_7\omega_4^2v_2^2\omega_8^2v_1^2\omega_5 - 18\omega_9\omega_6\omega_7\omega_4^3v_2^2\omega_8^2v_1^2 +
144\omega_9\omega_6^2\omega_7\omega_4^2v_2^2\omega_8v_1^2\omega_5 + 30\omega_9\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_8\omega_5 - 24\omega_9\omega_6\omega_7\omega_4\omega_8^2v_1^2\omega_5 - 6\omega_9\omega_6^2\omega_7\omega_4^3v_1^2\omega_5 + 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8v_1^2 - 6\omega_9c_s^2\omega_7\omega_4^3\omega_8^2v_1^2\omega_5 -
18\omega_9\omega_7\omega_4^3v_2^2\omega_8^2v_1^2\omega_5 + 36\omega_6^2c_s^2\omega_7\omega_4^2v_2^2\omega_8\omega_5 + 6\omega_9\omega_7\omega_4^3\omega_8^2v_1^2\omega_5 + 6\omega_9\omega_6\omega_7\omega_4^3\omega_8^2v_1^2 + 12\omega_6^2c_s^2\omega_4^3\omega_8^2\omega_5 + 18\omega_9\omega_6\omega_7\omega_4^3v_2^2\omega_8v_1^2\omega_5 +
6\omega_9\omega_6^2c_s^4\omega_7\omega_4^3\omega_8\omega_5 + 12\omega_6^2c_s^2\omega_4^3\omega_8^2v_1^2 + 6\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8v_1^2\omega_5 + 60\omega_9\omega_6^2c_s^2\omega_7\omega_4v_2^2\omega_8^2\omega_5
$$

$$
C_{19} = 150\omega_6c_s^2\omega_4^2v_2^2\omega_8^2 + 48\omega_6^2v_2^2\omega_8 - 48\omega_6\omega_4v_2^4\omega_8 - 24\omega_6^2\omega_4v_2^4 - 24\omega_6^2c_s^4\omega_8 - 24\omega_6c_s^2\omega_8^2 - \omega_6^2c_s^4\omega_4^2\omega_8^2 - 36\omega_6\omega_4^2v_2^2\omega_8^2 + 48\omega_6v_2^4\omega_8^2 +
12\omega_6^2c_s^2\omega_4^2\omega_8 - 3\omega_6^2\omega_4^2v_2^4\omega_8^2 + 24\omega_6^2c_s^2\omega_4 + 72\omega_4v_2^4\omega_8^2 + 48\omega_6c_s^2\omega_4\omega_8^2 - 12\omega_6^2c_s^2\omega_4^2v_2^2\omega_8^2 + 24c_s^4\omega_4\omega_8^2 - 96\omega_6^2\omega_4v_2^2\omega_8 - 12\omega_6^2\omega_4^2v_2^2 -
126\omega_6^2c_s^2\omega_4^2v_2^2\omega_8 + 36\omega_4^2v_2^2\omega_8^2 + \omega_6^2c_s^2\omega_4^2\omega_8^2 - 30\omega_6^2\omega_4^2v_2^4\omega_8 - 12\omega_6^2c_s^2\omega_4^2 - 216\omega_6^2c_s^2v_2^2\omega_8 - 12\omega_6^2c_s^4\omega_4^2\omega_8 + 72\omega_6^2c_s^2\omega_4^2v_2^2 - 48\omega_6c_s^4\omega_4\omega_8^2 -
24\omega_6\omega_4^2v_2^2\omega_8 + 288c_s^2\omega_4v_2^2\omega_8^2 + 72\omega_6c_s^2\omega_4^2v_2^2\omega_8 - 96\omega_6\omega_4v_2^4\omega_8^2 - 24c_s^2\omega_4\omega_8^2 - 144\omega_6^2c_s^2\omega_4v_2^2 + 48\omega_6^2c_s^4\omega_4\omega_8 + 3\omega_6^2\omega_4^2v_2^2\omega_8^2 - 24\omega_6^2c_s^4\omega_4 -
72\omega_4v_2^2\omega_8^2 + 432\omega_6^2c_s^2\omega_4v_2^2\omega_8 + 14\omega_6c_s^4\omega_4^2\omega_8^2 + 12c_s^2\omega_4^2\omega_8^2 + 96\omega_6^2\omega_4v_2^4\omega_8 - 144c_s^2\omega_4^2v_2^2\omega_8^2 - 48\omega_6^2v_2^4\omega_8 + 48\omega_6\omega_4v_2^2\omega_8 + 24\omega_6^2c_s^2\omega_8 +
24\omega_6c_s^4\omega_8^2 + 216\omega_6c_s^2v_2^2\omega_8^2 + 36\omega_6\omega_4^2v_2^4\omega_8^2 - 48\omega_6v_2^2\omega_8^2 - 144\omega_6c_s^2\omega_4v_2^2\omega_8 - 48\omega_6^2c_s^2\omega_4\omega_8 - 14\omega_6c_s^2\omega_4^2\omega_8^2 + 24\omega_6\omega_4^2v_2^4\omega_8 - 432\omega_6c_s^2\omega_4v_2^2\omega_8^2 +
96\omega_6\omega_4v_2^2\omega_8^2 + 24\omega_6^2\omega_4v_2^2 - 12c_s^4\omega_4^2\omega_8^2 - 36\omega_4^2v_2^4\omega_8^2 + 12\omega_6^2\omega_4^2v_2^4 + 30\omega_6^2\omega_4^2v_2^2\omega_8 + 12\omega_6^2c_s^4\omega_4^2
$$

$$
C_{20} = -24\omega_4^2v_2^4 - 24c_s^2\omega_4\omega_8 + 6c_s^2\omega_4^3v_2^2\omega_8^2 - 24c_s^2\omega_4v_2^2\omega_8 + 24\omega_4v_2^4\omega_8^2 - 18\omega_4^3v_2^4\omega_8 - 72\omega_4^2v_2^2\omega_8 - 48c_s^4\omega_4\omega_8^2 + 24c_s^4\omega_4\omega_8 + 24\omega_4^2v_2^2\omega_8^2 +
12\omega_4^3v_2^4 - 48\omega_4v_2^4\omega_8 + 3\omega_4^3v_2^4\omega_8^2 - 12c_s^2\omega_4^3v_2^2\omega_8 + 156c_s^2\omega_4v_2^2\omega_8^2 + 12c_s^2\omega_4\omega_8^2 - 12\omega_4^3v_2^2 - 3c_s^4\omega_4^3\omega_8^2 - 24\omega_4v_2^2\omega_8^2 + 18\omega_4^3v_2^2\omega_8 + 24c_s^4\omega_8^2 +
72\omega_4^2v_2^4\omega_8 - 8c_s^2\omega_4^2\omega_8^2 - 72c_s^2\omega_4^2v_2^2\omega_8^2 - 24c_s^4\omega_4^2\omega_8 - 24c_s^2\omega_4^2v_2^2 - 6c_s^2\omega_4^3\omega_8 + c_s^2\omega_4^3\omega_8^2 + 48c_s^2\omega_4^2v_2^2\omega_8 + 24\omega_4^2v_2^2 + 24c_s^4\omega_4^2\omega_8^2 - 96c_s^2v_2^2\omega_8^2 -
24\omega_4^2v_2^4\omega_8^2 + 24c_s^2\omega_4^2\omega_8 + 48\omega_4v_2^2\omega_8 + 12c_s^2\omega_4^3v_2^2 + 6c_s^4\omega_4^3\omega_8 - 3\omega_4^3v_2^2\omega_8^2
$$

$C_{21} = 36\omega_6^2\omega_8 - 84\omega_6^2 v_2^2\omega_8 - 48\omega_4\omega_8^2 + 2\omega_6^2\omega_4^2\omega_8^2 + 60\omega_6 c_s^2\omega_8^2 + 61\omega_6\omega_4^2 v_2^2\omega_8^2 - 33\omega_6^2 c_s^2\omega_4^2\omega_8 + 72\omega_6\omega_4\omega_8^2 - 48\omega_6^2 c_s^2\omega_4 - 120\omega_6 c_s^2\omega_4\omega_8^2 + 168\omega_6^2\omega_4 v_2^2\omega_8 + 24\omega_6^2\omega_4^2 v_2^2 - 60\omega_4^2 v_2^2\omega_8^2 - 3\omega_6^2 c_s^2\omega_4^2\omega_8^2 + 24\omega_6\omega_4\omega_8 + 24\omega_6^2 c_s^2\omega_4^2 - 24\omega_6 c_s^2\omega_4\omega_8 + 36\omega_6\omega_4^2 v_2^2\omega_8 + 21\omega_6^2\omega_4^2\omega_8 + 72 c_s^2\omega_4\omega_8^2 - 5\omega_6^2\omega_4^2 v_2^2\omega_8^2 + 120\omega_4 v_2^2\omega_8^2 + 24\omega_6^2\omega_4 - 36\omega_6\omega_8^2 - 36 c_s^2\omega_4^2\omega_8^2 - 72\omega_6^2\omega_4\omega_8 - 72\omega_6\omega_4 v_2^2\omega_8 - 60\omega_6^2 c_s^2\omega_8 - 12\omega_6\omega_4^2\omega_8 + 12\omega_6 c_s^2\omega_4^2\omega_8 + 84\omega_6 v_2^2\omega_8^2 + 120\omega_6^2 c_s^2\omega_4\omega_8 - 25\omega_6\omega_4^2\omega_8^2 + 39\omega_6 c_s^2\omega_4^2\omega_8^2 - 168\omega_6\omega_4 v_2^2\omega_8^2 - 48\omega_6^2\omega_4 v_2^2 + 24\omega_4^2\omega_8^2 - 51\omega_6^2\omega_4^2 v_2^2\omega_8 - 12\omega_6^2\omega_4^2$

2.2.4 Conservation of momentum: ρv_2

attached text file: `output_d2q9_nse_mrt1_symbolic_pde_02.txt`

$$v_2\frac{\partial\rho}{\partial t} + \rho\frac{\partial v_2}{\partial t} + \frac{\delta_l v_2 v_1}{\delta_t}\frac{\partial\rho}{\partial x_1} + \frac{\delta_l v_2\rho}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{\delta_l v_1\rho}{\delta_t}\frac{\partial v_2}{\partial x_1} + (v_2^2 + c_s^2)\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_2} + \frac{2\delta_l v_2\rho}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-2+\omega_4)\frac{\delta_l^2 c_s^2}{2\delta_t\omega_4}\frac{\partial\rho}{\partial x_1}\frac{\partial v_2}{\partial x_1} +$$
$$(-2+\omega_4)\frac{\delta_l^2 c_s^2}{2\delta_t\omega_4}\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_2} + (-2+\omega_6+6v_2^2-3\omega_6 v_2^2+4c_s^2-2\omega_6 c_s^2)\frac{\delta_l^2}{\omega_6\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_2}{\partial x_2} + (2-\omega_6)\frac{3\delta_l^2 v_2\rho}{\omega_6\delta_t}\left(\frac{\partial v_2}{\partial x_2}\right)^2 +$$
$$(-2+\omega_4)\frac{\delta_l^2 c_s^2\rho}{2\delta_t\omega_4}\frac{\partial^2 v_2}{\partial x_1^2} + (-2+\omega_4)\frac{\delta_l^2 c_s^2\rho}{2\delta_t\omega_4}\frac{\partial^2 v_1}{\partial x_1\partial x_2} + (-2+\omega_6+2v_2^2-\omega_6 v_2^2+6c_s^2-3\omega_6 c_s^2)\frac{\delta_l^2 v_2}{2\omega_6\delta_t}\frac{\partial^2\rho}{\partial x_2^2} +$$
$$(-2+\omega_6+6v_2^2-3\omega_6 v_2^2+2c_s^2-\omega_6 c_s^2)\frac{\delta_l^2\rho}{2\omega_6\delta_t}\frac{\partial^2 v_2}{\partial x_2^2} + C_1\frac{\delta_l^3 v_2 v_1}{12\delta_t\omega_7\omega_4\omega_5}\frac{\partial^3\rho}{\partial x_1^3} + C_2\frac{\delta_l^3 v_2\rho}{12\delta_t\omega_7\omega_4\omega_5}\frac{\partial^3 v_1}{\partial x_1^3} + C_3\frac{\delta_l^3 v_1\rho}{6\delta_t\omega_7\omega_4^2}\frac{\partial^3 v_2}{\partial x_1^3} +$$
$$(-12-\omega_4^2+12\omega_4)\frac{\delta_l^3 c_s^4}{6\delta_t\omega_4^2}\frac{\partial^3\rho}{\partial x_2^2\partial x_2} + (-\omega_4^2-2\omega_7+2\omega_4+\omega_7\omega_4)\frac{\delta_l^3 c_s^2 v_1\rho}{\delta_t\omega_7\omega_4^2}\frac{\partial^3 v_1}{\partial x_2^2\partial x_2} +$$
$$(-12\omega_6\omega_4^2+12\omega_4^2+12\omega_6\omega_4\omega_8+12\omega_6\omega_4-12\omega_4\omega_8-\omega_6\omega_4^2\omega_8-12\omega_6\omega_8)\frac{\delta_l^3 c_s^2 v_2\rho}{6\omega_6\delta_t\omega_4^2\omega_8}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2} + C_4\frac{\delta_l^3 v_2 v_1}{\omega_6^2\delta_t\omega_4\omega_8}\frac{\partial^3\rho}{\partial x_1\partial x_2^2} +$$
$$C_5\frac{\delta_l^3 v_2\rho}{12\omega_6^2\delta_t\omega_4^2\omega_8}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2} + C_6\frac{\delta_l^3 v_1\rho}{\omega_6^2\delta_t\omega_4\omega_8}\frac{\partial^3 v_2}{\partial x_1\partial x_2^2} + C_7\frac{\delta_l^3}{12\omega_6^2\delta_t}\frac{\partial^3\rho}{\partial x_2^3} +$$
$$(-24+5\omega_6^2 c_s^2+24\omega_6+11\omega_6^2 v_2^2-4\omega_6^2+60v_2^2-60\omega_6 v_2^2+36c_s^2-36\omega_6 c_s^2)\frac{\delta_l^3 v_2\rho}{6\omega_6^2\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} + C_8\frac{\delta_l^4 v_2}{24\delta_t\omega_7^2\omega_4^2\omega_5^2}\frac{\partial^4\rho}{\partial x_1^4} +$$
$$C_9\frac{\delta_l^4 v_2 v_1\rho}{12\delta_t\omega_7^2\omega_4^2\omega_5^2}\frac{\partial^4 v_1}{\partial x_1^4} + C_{10}\frac{\delta_l^4\rho}{24\delta_t\omega_7^2\omega_4^3}\frac{\partial^4 v_2}{\partial x_1^4} + C_{11}\frac{\delta_l^4 v_1}{12\omega_9\omega_6\delta_t\omega_7^2\omega_4^3\omega_8\omega_5^2}\frac{\partial^4\rho}{\partial x_1^3\partial x_2} + C_{12}\frac{\delta_l^4\rho}{12\omega_9\omega_6\delta_t\omega_7^2\omega_4^3\omega_8\omega_5^2}\frac{\partial^4 v_1}{\partial x_1^3\partial x_2} +$$
$$C_{13}\frac{\delta_l^4 v_2 v_1\rho}{12\omega_9\omega_6^2\delta_t\omega_7^2\omega_4^3\omega_8^2\omega_5^2}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} + C_{14}\frac{\delta_l^4 v_2}{12\omega_9\omega_6^3\delta_t\omega_7\omega_4^3\omega_8^2}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2} + C_{15}\frac{\delta_l^4 v_2 v_1\rho}{2\omega_9\omega_6^3\delta_t\omega_7^2\omega_4^3\omega_8^2\omega_5}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} +$$
$$C_{16}\frac{\delta_l^4\rho}{12\omega_9\omega_6^3\delta_t\omega_7\omega_4^3\omega_8^2}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2} + C_{17}\frac{\delta_l^4 v_1}{4\omega_6^3\delta_t\omega_4^2\omega_8^2}\frac{\partial^4\rho}{\partial x_1\partial x_2^3} + C_{18}\frac{\delta_l^4\rho}{12\omega_6^3\delta_t\omega_4^3\omega_8^2}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} + C_{19}\frac{\delta_l^4 v_2 v_1\rho}{4\omega_6^3\delta_t\omega_4^2\omega_8^2}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3} +$$
$$C_{20}\frac{\delta_l^4 v_2}{12\omega_6^3\delta_t}\frac{\partial^4\rho}{\partial x_2^4} + C_{21}\frac{\delta_l^4\rho}{12\omega_6^3\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$C_1 = -6\omega_4\omega_5 - 36c_s^2\omega_5 + 12\omega_7 v_1^2 + 3c_s^2\omega_7\omega_4\omega_5 + 18c_s^2\omega_4\omega_5 - 12\omega_7 + \omega_7\omega_4 v_1^2\omega_5 + 6\omega_7\omega_4 - 6\omega_7\omega_4 v_1^2 - \omega_7\omega_4\omega_5 - 12v_1^2\omega_5 + 6\omega_4 v_1^2\omega_5 - 18c_s^2\omega_7\omega_4 + 12\omega_5 + 36c_s^2\omega_7$

$C_2 = -6\omega_4\omega_5 - 12c_s^2\omega_5 + 36\omega_7 v_1^2 + c_s^2\omega_7\omega_4\omega_5 + 6c_s^2\omega_4\omega_5 - 12\omega_7 + 3\omega_7\omega_4 v_1^2\omega_5 + 6\omega_7\omega_4 - 18\omega_7\omega_4 v_1^2 - \omega_7\omega_4\omega_5 - 36v_1^2\omega_5 + 18\omega_4 v_1^2\omega_5 - 6c_s^2\omega_7\omega_4 + 12\omega_5 + 12c_s^2\omega_7$

$C_3 = -6\omega_4 v_1^2 - 3\omega_4^2 - \omega_7\omega_4^2 v_1^2 + 6\omega_4 - 3\omega_7\omega_4 - 3c_s^2\omega_7\omega_4^2 + 3c_s^2\omega_4^2 + 3\omega_7\omega_4 v_1^2 - 6c_s^2\omega_4 + \omega_7\omega_4^2 + 15c_s^2\omega_7\omega_4 - 12c_s^2\omega_7 + 3\omega_4^2 v_1^2$

$C_4 = 3c_s^2\omega_4\omega_8 - 3\omega_6^2 c_s^2 - \omega_6\omega_4 v_2^2 + 3\omega_6^2 c_s^2\omega_4 - \omega_6^2 v_2^2 + \omega_6\omega_4\omega_8 - 3\omega_6 c_s^2\omega_4\omega_8 + 3\omega_6 c_s^2\omega_8 + \omega_6^2 + \omega_6\omega_4 - \omega_4\omega_8 - \omega_6^2\omega_4 - \omega_6\omega_4 v_2^2\omega_8 + \omega_6 v_2^2\omega_8 + \omega_6^2\omega_4 v_2^2 - \omega_6\omega_8 - 3\omega_6 c_s^2\omega_4 + \omega_4 v_2^2\omega_8$

$C_5 = 12\omega_6\omega_4^2 - 11\omega_6^2 c_s^2\omega_4^2\omega_8 - 12\omega_6^2 c_s^2\omega_4 + 12\omega_4^2 v_2^2\omega_8 + 6\omega_6^2\omega_4 v_2^2\omega_8 + 12\omega_6^2\omega_4^2 v_2^2 + 12\omega_6^2 c_s^2\omega_4^2 - 24\omega_6 c_s^2\omega_4\omega_8 - 6\omega_6\omega_4^2 v_2^2\omega_8 + 3\omega_6^2\omega_4^2\omega_8 + 12\omega_6^2\omega_4 - 12\omega_6 c_s^2\omega_4^2 - 12\omega_4^2\omega_8 - 6\omega_6^2\omega_4\omega_8 - 24\omega_6^2 c_s^2\omega_8 + 6\omega_6\omega_4^2\omega_8 - 18\omega_6 c_s^2\omega_4^2\omega_8 + 42\omega_6^2 c_s^2\omega_4\omega_8 - 12\omega_6^2\omega_4 v_2^2 + 36c_s^2\omega_4^2\omega_8 - 3\omega_6^2\omega_4^2 v_2^2\omega_8 - 12\omega_6\omega_4^2 v_2^2 - 12\omega_6^2\omega_4^2$

$C_6 = c_s^2\omega_4\omega_8 - \omega_6^2 c_s^2 - 3\omega_6\omega_4 v_2^2 + \omega_6^2 c_s^2\omega_4 - 3\omega_6^2 v_2^2 + \omega_6\omega_4\omega_8 - \omega_6 c_s^2\omega_4\omega_8 + \omega_6 c_s^2\omega_8 + \omega_6^2 + \omega_6\omega_4 - \omega_4\omega_8 - \omega_6^2\omega_4 - 3\omega_6\omega_4 v_2^2\omega_8 + 3\omega_6 v_2^2\omega_8 + 3\omega_6^2\omega_4 v_2^2 - \omega_6\omega_8 - \omega_6 c_s^2\omega_4 + 3\omega_4 v_2^2\omega_8$

$C_7 = 144c_s^2 v_2^2 - \omega_6^2 c_s^2 + 12c_s^4 - 144\omega_6 c_s^2 v_2^2 - 12\omega_6 c_s^4 - 7\omega_6^2 v_2^2 + 36v_2^4 - 36\omega_6 v_2^4 + 7\omega_6^2 v_2^4 - 36v_2^2 + 36\omega_6 v_2^2 + \omega_6^2 c_s^4 - 12c_s^2 + 24\omega_6^2 c_s^2 v_2^2 + 12\omega_6 c_s^2$

$C_8 = 96\omega_7^2\omega_4 v_1^2\omega_5 + 48\omega_7^2 v_1^4\omega_5 - 24c_s^4\omega_7\omega_5^2 - 24\omega_4 v_1^4\omega_5^2 + c_s^2\omega_7^2\omega_4^2\omega_5^2 - 12c_s^4\omega_7^2\omega_4^2 - 48c_s^4\omega_7^2\omega_4\omega_5 + 24c_s^2\omega_4\omega_5^2 + 150c_s^2\omega_7^2\omega_4^2 v_1^2\omega_5 - 3\omega_7^2\omega_4^2 v_1^4\omega_5^2 + 48\omega_7 v_1^2\omega_5^2 - 48c_s^2\omega_7\omega_4\omega_5^2 + 30\omega_7\omega_4^2 v_1^2\omega_5^2 - 24c_s^2\omega_7^2\omega_4 - 48\omega_7\omega_4 v_1^4\omega_5 + 432c_s^2\omega_7\omega_4 v_1^2\omega_5^2 + 24c_s^2\omega_7\omega_5^2 - 36\omega_7^2\omega_4^2 v_1^4 - 144c_s^2\omega_4 v_1^2\omega_5^2 + 96\omega_7\omega_4 v_1^4\omega_5^2 + 12c_s^2\omega_7^2\omega_4^2 + 216c_s^2\omega_7^2 v_1^2\omega_5 - 12c_s^4\omega_7\omega_4^2\omega_5^2 - 144c_s^2\omega_7\omega_4 v_1^2\omega_5 - 24\omega_7\omega_4^2 v_1^2\omega_5 - 24c_s^4\omega_4\omega_5^2 - 12\omega_4^2 v_1^2\omega_5^2 - 12c_s^2\omega_7^2\omega_4^2 v_1^2\omega_5^2 + 36\omega_7^2\omega_4^2 v_1^4\omega_5 - 72\omega_7^2\omega_4 v_1^2 - 144c_s^2\omega_7^2\omega_4^2 v_1^2 + 24c_s^4\omega_7^2\omega_4 - 14c_s^2\omega_7^2\omega_4^2\omega_5 + 72c_s^2\omega_7\omega_4^2 v_1^2\omega_5 - 30\omega_7\omega_4^2 v_1^4\omega_5^2 - c_s^4\omega_7^2\omega_4^2\omega_5^2 + 72c_s^2\omega_4^2 v_1^2\omega_5^2 + 24c_s^4\omega_7^2\omega_5 + 36\omega_7^2\omega_4^2 v_1^2 + 48\omega_7\omega_4 v_1^2\omega_5 + 48c_s^2\omega_7^2\omega_4\omega_5 + 288c_s^2\omega_7^2\omega_4 v_1^2 - 48\omega_7^2 v_1^2\omega_5 - 96\omega_7^2\omega_4 v_1^4\omega_5 + 72\omega_7^2\omega_4 v_1^4 + 24\omega_4 v_1^2\omega_5^2 + 48c_s^4\omega_7\omega_4\omega_5^2 + 12c_s^4\omega_4^2\omega_5^2 - 48\omega_7 v_1^4\omega_5^2 + 3\omega_7^2\omega_4^2 v_1^2\omega_5^2 + 12c_s^2\omega_7\omega_4^2\omega_5^2 + 12\omega_4^2 v_1^4\omega_5^2 - 36\omega_7^2\omega_4^2 v_1^2\omega_5 - 24c_s^2\omega_7^2\omega_5 - 432c_s^2\omega_7^2\omega_4 v_1^2\omega_5 - 96\omega_7\omega_4 v_1^2\omega_5^2 - 126c_s^2\omega_7\omega_4^2 v_1^2\omega_5^2 + 14c_s^4\omega_7^2\omega_4^2\omega_5 - 216c_s^2\omega_7 v_1^2\omega_5^2 + 24\omega_7\omega_4^2 v_1^4\omega_5 - 12c_s^2\omega_4^2\omega_5^2$

$C_9 = -168\omega_7^2\omega_4 v_1^2\omega_5 - 3c_s^2\omega_7^2\omega_4^2\omega_5^2 - 48c_s^2\omega_4\omega_5^2 - 84\omega_7 v_1^2\omega_5^2 + 120c_s^2\omega_7\omega_4\omega_5^2 - 51\omega_7\omega_4^2 v_1^2\omega_5^2 + 21\omega_7\omega_4^2\omega_5^2 + 36\omega_7\omega_5^2 + 72c_s^2\omega_7^2\omega_4 + 24\omega_7^2\omega_4^2 -$
$60c_s^2\omega_7\omega_5^2 - 36c_s^2\omega_7^2\omega_4^2 - 48\omega_7^2\omega_4 - 24c_s^2\omega_7\omega_4\omega_5 + 36\omega_7\omega_4^2 v_1^2\omega_5 - 12\omega_7\omega_4^2\omega_5 + 24\omega_4^2 v_1^2\omega_5^2 + 24\omega_4\omega_5^2 + 72\omega_7^2\omega_4\omega_5 + 120\omega_7^2\omega_4 v_1^2 +$
$39c_s^2\omega_7^2\omega_4^2\omega_5 - 12\omega_4^2\omega_5^2 - 60\omega_7^2\omega_4^2 v_1^2 - 25\omega_7^2\omega_4^2\omega_5 - 72\omega_7\omega_4 v_1^2\omega_5 - 120c_s^2\omega_7^2\omega_4\omega_5 + 84\omega_7^2 v_1^2\omega_5 - 36\omega_7^2\omega_5 - 48\omega_4 v_1^2\omega_5^2 + 12c_s^2\omega_7\omega_4^2\omega_5 +$
$24\omega_7\omega_4\omega_5 - 5\omega_7^2\omega_4^2 v_1^2\omega_5^2 - 33c_s^2\omega_7\omega_4^2\omega_5^2 + 61\omega_7^2\omega_4^2 v_1^2\omega_5 - 72\omega_7\omega_4\omega_5^2 + 60c_s^2\omega_7^2\omega_5 + 2\omega_7^2\omega_4^2\omega_5^2 + 168\omega_7\omega_4 v_1^2\omega_5^2 + 24c_s^2\omega_4^2\omega_5^2$

$C_{10} = 18\omega_7\omega_4^3 v_1^2 + 24c_s^4\omega_7^2\omega_4^2 + 3\omega_7^2\omega_4^3 v_1^4 - 3c_s^4\omega_7^2\omega_4^3 + 6c_s^2\omega_7^2\omega_4^3 v_1^2 - 24\omega_4^2 v_1^4 + 12c_s^2\omega_7^2\omega_4 + 24c_s^4\omega_7^2 - 24\omega_7^2\omega_4^2 v_1^4 - 8c_s^2\omega_7^2\omega_4^2 - 24c_s^2\omega_7\omega_4 v_1^2 -$
$72\omega_7\omega_4^2 v_1^2 + c_s^2\omega_7^2\omega_4^3 - 48\omega_7\omega_4 v_1^4 + 12\omega_4^3 v_1^4 - 24\omega_7^2\omega_4 v_1^2 - 72c_s^2\omega_7^2\omega_4^2 v_1^2 - 48c_s^4\omega_7^2\omega_4 - 6c_s^2\omega_7\omega_4^3 - 24c_s^2\omega_4^2 v_1^2 + 72\omega_7\omega_4^2 v_1^4 + 24\omega_7^2\omega_4^2 v_1^2 +$
$24c_s^4\omega_7\omega_4 + 156c_s^2\omega_7^2\omega_4 v_1^2 + 24\omega_7^2\omega_4 v_1^4 - 12\omega_4^3 v_1^2 + 24c_s^2\omega_7\omega_4^2 + 48c_s^2\omega_7\omega_4^2 v_1^2 + 48\omega_7\omega_4 v_1^2 + 6c_s^4\omega_7\omega_4^3 - 3\omega_7^2\omega_4^3 v_1^2 + 12c_s^2\omega_4^3 v_1^2 - 96c_s^2\omega_7^2 v_1^2 -$
$18\omega_7\omega_4^3 v_1^4 - 24c_s^2\omega_7\omega_4 - 24c_s^4\omega_7\omega_4^2 - 12c_s^2\omega_7\omega_4^3 v_1^2 + 24\omega_4^2 v_1^2$

$C_{11} = -15\omega_9\omega_6 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5 + 6\omega_9\omega_6\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 + 156\omega_9\omega_6 c_s^4\omega_7^2\omega_4\omega_8\omega_5^2 - 6\omega_9\omega_6\omega_7\omega_4^3 v_2^2\omega_8\omega_5 - 18c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 + 6\omega_9 c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5 -$
$12\omega_9\omega_6\omega_7^2\omega_4^3 v_2^2\omega_5 - 48\omega_9\omega_6\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 + 18\omega_6 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 - 6\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 + 27\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5 + 5\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 -$
$12\omega_9\omega_7^2\omega_4^3 v_2^2 v_1^2\omega_5 + 12\omega_6\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_5 + 6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 - 18\omega_6 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 +$
$12\omega_6\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 + 36\omega_6 c_s^4\omega_7^2\omega_4^2\omega_5^2 - 12\omega_9\omega_6\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5 + 18\omega_9\omega_6 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5 - 12\omega_6\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 - 36\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_5 +$
$12\omega_6 c_s^2\omega_7^2\omega_4^2 v_1^2\omega_5^2 + 18\omega_9\omega_6 c_s^2\omega_4^3 v_2^2\omega_8\omega_5^2 - 12\omega_9 c_s^2\omega_7^2\omega_4^3 v_1^2\omega_5 + 6\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 + 144\omega_9\omega_6 c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4\omega_8 v_1^2\omega_5 -$
$6\omega_9\omega_6\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2 - 9\omega_9\omega_6\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_5 - 36\omega_9\omega_6 c_s^2\omega_4^2 v_2^2\omega_8\omega_5^2 - 12\omega_7^2\omega_4^3 v_2^2\omega_5^2 - 36\omega_9\omega_6\omega_7^2\omega_4^2 v_2^2\omega_8 v_1^2\omega_5 +$
$6\omega_6\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 - 12\omega_6\omega_7^2\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 - 6c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5^2 - 18\omega_9\omega_6 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 - 6\omega_9\omega_6 c_s^4\omega_4^3\omega_8\omega_5^2 + 36\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8 -$
$96\omega_9\omega_6 c_s^4\omega_7^2\omega_8\omega_5^2 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4\omega_8 v_1^2\omega_5^2 + 18\omega_6 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 - 36\omega_9\omega_6 c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5 + 12\omega_9\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 + 36\omega_6 c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 +$
$36\omega_9\omega_6\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5 + 12\omega_9\omega_6\omega_7^2\omega_4^2 v_2^2\omega_8 v_1^2 - 45\omega_9\omega_6 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 + 48\omega_9\omega_6\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 - 12\omega_6\omega_7^2\omega_4^2 v_2^2\omega_5^2 - 12c_s^2\omega_7^2\omega_4^3\omega_5^2 -$
$6\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2\omega_5 - 6\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 42\omega_9\omega_6 c_s^4\omega_7\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6\omega_7\omega_4^2 v_2^2\omega_8\omega_5 - 36\omega_9 c_s^4\omega_7^2\omega_4^3\omega_5 + 36\omega_6 c_s^4\omega_7\omega_4^2\omega_8\omega_5^2 +$
$36\omega_6 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_5^2 - 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2 v_1^2\omega_5 - 24\omega_9\omega_6\omega_7\omega_4 v_2^2\omega_8 v_1^2\omega_5^2 - \omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 6\omega_9\omega_6\omega_7^2\omega_4^3 v_2^2\omega_8 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4\omega_8\omega_5 +$
$24\omega_9\omega_6\omega_7^2\omega_4 v_2^2\omega_8 v_1^2\omega_5 + 3\omega_9\omega_6 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_6 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6 c_s^2\omega_4^2\omega_8\omega_5^2 - 6\omega_6\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^2\omega_7\omega_4\omega_8 v_1^2\omega_5^2 -$
$36\omega_9\omega_6 c_s^4\omega_7^2\omega_4\omega_8\omega_5 - 108\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5 - 36\omega_9 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_5 - 36\omega_6 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5^2 - 36\omega_6 c_s^4\omega_7^2\omega_4^3\omega_5^2 + 15\omega_9\omega_6\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 +$
$24\omega_9\omega_7^2\omega_4^2 v_2^2\omega_8 v_1^2\omega_5 + 12\omega_9\omega_6 c_s^2\omega_7\omega_4\omega_8\omega_5^2 + 24\omega_9\omega_6\omega_7\omega_4 v_2^2\omega_8\omega_5^2 - 3\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8 v_1^2\omega_5^2 - 15\omega_9\omega_6\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 + 36\omega_9\omega_6 c_s^4\omega_7^2\omega_4^3\omega_5 +$
$12\omega_9\omega_6 c_s^4\omega_7\omega_4\omega_8\omega_5^2 + 12\omega_6 c_s^2\omega_7\omega_4^2\omega_8 v_1^2\omega_5^2 + 36c_s^2\omega_7^2\omega_4^3 v_2^2\omega_5^2 - 12\omega_9\omega_6\omega_7^2\omega_4^2 v_2^2 v_1^2\omega_5 - 24\omega_9\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 + 36\omega_9 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 -$
$12\omega_6 c_s^2\omega_7^2\omega_4^3 v_1^2\omega_5^2 + 9\omega_9\omega_6\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2\omega_5 + 36\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_5 - 12\omega_9\omega_6 c_s^2\omega_4^2\omega_8 v_1^2\omega_5^2 + 6\omega_6\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 - 12\omega_9\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 -$
$18c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 + 18\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8 v_1^2\omega_5 - 72\omega_9\omega_6 c_s^2\omega_7\omega_4 v_2^2\omega_8\omega_5^2 - 18\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 - 12\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8 v_1^2\omega_5^2 - 12\omega_6 c_s^2\omega_7^2\omega_4^2\omega_5^2 -$
$24\omega_9\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5 - 12\omega_6\omega_7^2\omega_4^3 v_2^2 v_1^2\omega_5^2 + 54\omega_9\omega_6 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5 + 12\omega_9\omega_6\omega_7^2\omega_4^2 v_2^2\omega_5 - 6\omega_9\omega_6\omega_4^3 v_2^2\omega_8\omega_5^2 + 72\omega_9 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5 +$
$\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5^2 - 6\omega_9\omega_6 c_s^2\omega_4^3\omega_8\omega_5^2 + 6\omega_6 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 60\omega_9\omega_6 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^2 - 36\omega_9\omega_6 c_s^4\omega_7^2\omega_4^2\omega_5 - 24\omega_9\omega_6\omega_7^2\omega_4 v_2^2\omega_8\omega_5 +$
$6\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5^2 - 5\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3 v_1^2\omega_5 - 18\omega_6 c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8 v_1^2\omega_5^2 -$
$36\omega_6 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_5^2 - 18\omega_9 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5 + 12\omega_9\omega_6\omega_4^2 v_2^2\omega_8\omega_5^2 - 12\omega_9\omega_6\omega_7^2\omega_4^2 v_2^2\omega_8 + 36c_s^4\omega_7^2\omega_4^3\omega_5^2 - 12\omega_9\omega_6\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 + 12c_s^2\omega_7^2\omega_4^3 v_1^2\omega_5^2 +$
$12\omega_6\omega_7^2\omega_4^2 v_2^2 v_1^2\omega_5^2 + 6\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5 + 72\omega_9\omega_6 c_s^2\omega_7^2\omega_4 v_2^2\omega_8\omega_5 + 18\omega_9\omega_6 c_s^2\omega_7\omega_4^2\omega_8 v_1^2\omega_5^2 + 12\omega_6\omega_7^2\omega_4^3 v_2^2\omega_5^2 + 18\omega_9 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5 +$
$15\omega_9\omega_6 c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 + 12\omega_9 c_s^2\omega_7^2\omega_4^3\omega_5 + 12\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 24\omega_9\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 + 12\omega_7^2\omega_4^3 v_2^2 v_1^2\omega_5^2 + 12\omega_6 c_s^2\omega_7^2\omega_4^3\omega_5^2 - 6\omega_9 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 +$
$6\omega_9\omega_6 c_s^2\omega_4^3\omega_8 v_1^2\omega_5^2 - 6\omega_6 c_s^2\omega_7\omega_4^3\omega_8 v_1^2\omega_5^2 - 72\omega_9 c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 + 12\omega_9\omega_6\omega_7^2\omega_4^3 v_2^2 v_1^2\omega_5 - 6\omega_6\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 + 6\omega_9\omega_6\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5 -$
$36\omega_6 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6 c_s^4\omega_4^2\omega_8\omega_5^2 + 3\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 + 12\omega_9\omega_7^2\omega_4^3 v_2^2\omega_5 - 18\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8$

$C_{12} = -5\omega_9\omega_6 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5 + 18\omega_9\omega_6\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 + 18\omega_9\omega_6 c_s^4\omega_7^2\omega_4\omega_8\omega_5^2 - 6\omega_9\omega_6\omega_7\omega_4^3 v_2^2\omega_8\omega_5 - 6c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 + 18\omega_9 c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5 -$
$12\omega_9\omega_6\omega_7^2\omega_4^3 v_2^2\omega_5 - 48\omega_9\omega_6\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 + 6\omega_6 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 - 18\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 + 9\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5 + 5\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 -$
$36\omega_9\omega_7^2\omega_4^3 v_2^2 v_1^2\omega_5 + 12\omega_6\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_5 + 6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 6\omega_6 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 + 36\omega_6\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 + 12\omega_6 c_s^4\omega_7^2\omega_4^2\omega_5^2 -$
$36\omega_9\omega_6\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5 + 6\omega_9\omega_6 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5 - 12\omega_6\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_5 + 36\omega_6 c_s^2\omega_7^2\omega_4^2 v_1^2\omega_5^2 + 6\omega_9\omega_6 c_s^2\omega_4^3 v_2^2\omega_8\omega_5^2 -$
$36\omega_9 c_s^2\omega_7^2\omega_4^3 v_1^2\omega_5 + 6\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 + 48\omega_9\omega_6 c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 - 36\omega_9\omega_6 c_s^2\omega_7^2\omega_4\omega_8 v_1^2\omega_5 - 18\omega_9\omega_6\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2 - 9\omega_9\omega_6\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5 +$
$12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_5 - 12\omega_9\omega_6 c_s^2\omega_4^2 v_2^2\omega_8\omega_5^2 - 12\omega_7^2\omega_4^3 v_2^2\omega_5^2 - 108\omega_9\omega_6\omega_7^2\omega_4^2 v_2^2\omega_8 v_1^2\omega_5 + 6\omega_6\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 - 36\omega_6\omega_7^2\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 -$
$18c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5^2 + 18\omega_9\omega_6 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8 - 12\omega_9\omega_6 c_s^4\omega_7^2\omega_8\omega_5^2 + 60\omega_9\omega_6 c_s^2\omega_7^2\omega_4\omega_8 v_1^2\omega_5^2 + 6\omega_6 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 -$
$12\omega_9\omega_6 c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5 + 36\omega_9\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 + 12\omega_6 c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 + 36\omega_9\omega_6\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5 + 36\omega_9\omega_6\omega_7^2\omega_4^2 v_2^2\omega_8 v_1^2 -$
$15\omega_9\omega_6 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 + 144\omega_9\omega_6\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 - 12\omega_6\omega_7^2\omega_4^2 v_2^2\omega_5^2 - 12c_s^2\omega_7^2\omega_4^3\omega_5^2 - 18\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2\omega_5 - 6\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 -$
$18\omega_9\omega_6 c_s^4\omega_7\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6\omega_7\omega_4^2 v_2^2\omega_8\omega_5 - 12\omega_9 c_s^4\omega_7^2\omega_4^3\omega_5 + 12\omega_6 c_s^4\omega_7\omega_4^2\omega_8\omega_5^2 + 12\omega_6 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_5^2 - 36\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2 v_1^2\omega_5 -$
$72\omega_9\omega_6\omega_7\omega_4 v_2^2\omega_8 v_1^2\omega_5^2 + 6\omega_9\omega_6\omega_7^2\omega_4^3 v_2^2\omega_8 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4\omega_8\omega_5 + 72\omega_9\omega_6\omega_7^2\omega_4 v_2^2\omega_8 v_1^2\omega_5 - \omega_9\omega_6 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_6 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 -$
$6\omega_6\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 + 60\omega_9\omega_6 c_s^2\omega_7\omega_4\omega_8 v_1^2\omega_5^2 - 12\omega_9\omega_6 c_s^4\omega_7^2\omega_4\omega_8\omega_5 - 36\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5 - 12\omega_9 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_5 - 12\omega_6 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5^2 -$
$12\omega_6 c_s^4\omega_7^2\omega_4^3\omega_5^2 + 15\omega_9\omega_6\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 + 72\omega_9\omega_7^2\omega_4^2 v_2^2\omega_8 v_1^2\omega_5 - 12\omega_9\omega_6 c_s^2\omega_7\omega_4\omega_8\omega_5^2 + 24\omega_9\omega_6\omega_7\omega_4 v_2^2\omega_8\omega_5^2 + 30\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8 v_1^2\omega_5^2 -$
$45\omega_9\omega_6\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 + 12\omega_9\omega_6 c_s^4\omega_7^2\omega_4^3\omega_5 + 12\omega_9\omega_6 c_s^4\omega_7\omega_4\omega_8\omega_5^2 + 36\omega_6 c_s^2\omega_7\omega_4^2\omega_8 v_1^2\omega_5^2 + 12c_s^2\omega_7^2\omega_4^3 v_2^2\omega_5^2 - 36\omega_9\omega_6\omega_7^2\omega_4^2 v_2^2 v_1^2\omega_5 -$
$72\omega_9\omega_7\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 + 12\omega_9 c_s^2\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 - 36\omega_6 c_s^2\omega_7^2\omega_4^3 v_1^2\omega_5^2 + 27\omega_9\omega_6\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2\omega_5 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_5 + 24\omega_9\omega_6 c_s^2\omega_4^2\omega_8 v_1^2\omega_5^2 +$
$18\omega_6\omega_7^2\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 - 12\omega_9\omega_7\omega_4^3 v_2^2\omega_8\omega_5^2 - 6c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5^2 + 54\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8 v_1^2\omega_5 - 24\omega_9\omega_6 c_s^2\omega_7\omega_4 v_2^2\omega_8\omega_5^2 - 18\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 -$
$36\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8 v_1^2\omega_5^2 - 12\omega_6 c_s^2\omega_7^2\omega_4^2\omega_5^2 - 24\omega_9\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5 - 36\omega_6\omega_7^2\omega_4^3 v_2^2 v_1^2\omega_5^2 + 18\omega_9\omega_6 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5 + 12\omega_9\omega_6\omega_7^2\omega_4^2 v_2^2\omega_5 -$
$6\omega_9\omega_6\omega_4^3 v_2^2\omega_8\omega_5^2 + 24\omega_9 c_s^2\omega_7^2\omega_4^2 v_2^2\omega_8\omega_5 + 6\omega_6 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 5\omega_9\omega_6 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^4\omega_7^2\omega_4^2\omega_5 - 24\omega_9\omega_6\omega_7^2\omega_4 v_2^2\omega_8\omega_5 +$
$18\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5^2 - 15\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8 v_1^2\omega_5 + \omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 36\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3 v_1^2\omega_5 - 6\omega_6 c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 - 15\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8 v_1^2\omega_5^2 -$
$12\omega_6 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_5^2 - 6\omega_9 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5 + 12\omega_9\omega_6\omega_4^2 v_2^2\omega_8\omega_5^2 - 12\omega_9\omega_6\omega_7^2\omega_4^2 v_2^2\omega_8 + 12c_s^4\omega_7^2\omega_4^3\omega_5^2 - 36\omega_9\omega_6\omega_4^2 v_2^2\omega_8 v_1^2\omega_5^2 + 36c_s^2\omega_7^2\omega_4^3 v_1^2\omega_5^2 +$
$36\omega_6\omega_7^2\omega_4^2 v_2^2 v_1^2\omega_5^2 + 6\omega_9\omega_7^2\omega_4^3 v_2^2\omega_8\omega_5 + 24\omega_9\omega_6 c_s^2\omega_7^2\omega_4 v_2^2\omega_8\omega_5 - 102\omega_9\omega_6 c_s^2\omega_7\omega_4^2\omega_8 v_1^2\omega_5^2 + 12\omega_6\omega_7^2\omega_4^3 v_2^2\omega_5^2 + 6\omega_9 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5 +$
$6\omega_9\omega_6 c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 + 12\omega_9 c_s^2\omega_7^2\omega_4^3\omega_5 + 12\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 24\omega_9\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 - 48\omega_9\omega_6 c_s^2\omega_7^2\omega_8 v_1^2\omega_5^2 + 36\omega_7^2\omega_4^3 v_2^2 v_1^2\omega_5^2 + 12\omega_6 c_s^2\omega_7^2\omega_4^3\omega_5^2 -$
$6\omega_9 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 - 12\omega_9\omega_6 c_s^2\omega_4^3\omega_8 v_1^2\omega_5^2 - 18\omega_6 c_s^2\omega_7\omega_4^3\omega_8 v_1^2\omega_5^2 - 24\omega_9 c_s^2\omega_7\omega_4^2 v_2^2\omega_8\omega_5^2 + 36\omega_9\omega_6\omega_7^2\omega_4^3 v_2^2 v_1^2\omega_5 - 18\omega_6\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5^2 +$
$18\omega_9\omega_6\omega_7\omega_4^3 v_2^2\omega_8 v_1^2\omega_5 - 12\omega_6 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^2 - 6\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 + 12\omega_9\omega_7^2\omega_4^3 v_2^2\omega_5 - 6\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3 v_2^2\omega_8$

$C_{13} = 24\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^2\omega_5^2 + 60\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 36\omega_9\omega_6^2 c_s^2\omega_7\omega_4\omega_8^2\omega_5^2 + 12\omega_6^2\omega_7^2\omega_4^3\omega_8^2 v_1^2\omega_5^2 - 24\omega_9\omega_6\omega_7\omega_4^2\omega_8^2 v_1^2\omega_5^2 - 66\omega_9\omega_6^2\omega_7\omega_4^2\omega_8^2\omega_5^2 +$
$24\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 6\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 18\omega_9\omega_6^2\omega_7\omega_4^3\omega_8^2 v_1^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7\omega_4^2\omega_8^2 v_1^2\omega_5 - 96\omega_9\omega_6^2 c_s^2\omega_7^2\omega_8^2\omega_5^2 + 24\omega_9\omega_6^2 c_s^2\omega_4^3\omega_8^2\omega_5^2 +$
$12\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 42\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + 12\omega_6^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 18\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2 v_1^2\omega_5 - \omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7^2\omega_4\omega_8^2\omega_5 -$

$$12\omega_6^2\omega_7\omega_4^3\omega_8^2v_1^2\omega_5^2 + 12\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2v_1^2\omega_5^2 + 84\omega_9\omega_6c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 24\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 24\omega_9\omega_6\omega_7\omega_4^2\omega_8^2\omega_5^2 + \omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2v_1^2\omega_5^2 -$$
$$18\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8^2 + 24\omega_9\omega_6^2\omega_4^2\omega_8^2\omega_5^2 - 12\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 + 4\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2v_1^2\omega_5 - 12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2v_1^2\omega_5^2 - 6\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2v_1^2 -$$
$$66\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 4\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5 + 24\omega_6^2\omega_7\omega_4^2\omega_8^2v_1^2\omega_5^2 - 24\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_5^2 - 12\omega_9\omega_6^2\omega_7^2\omega_4\omega_8^2\omega_5^2 + 24\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5^2 +$$
$$24\omega_6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 66\omega_9\omega_6^2\omega_7\omega_4^2\omega_8^2v_1^2\omega_5^2 - 12\omega_6\omega_7^2\omega_4^3\omega_8^2v_1^2\omega_5^2 + 36\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8^2 - 84\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 24\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 +$$
$$24\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_5^2 - 24\omega_6^2\omega_7^2\omega_4^2\omega_8^2v_1^2\omega_5^2 + 12\omega_9\omega_6\omega_7\omega_4^3\omega_8^2v_1^2\omega_5^2 - 24\omega_6\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 72\omega_9\omega_6^2c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 +$$
$$12\omega_9\omega_6^2\omega_7\omega_4^2\omega_8^2\omega_5 + 6\omega_9\omega_6^2\omega_7\omega_4^3\omega_8^2v_1^2\omega_5 - 24\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2 + 24\omega_9c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5^2 -$$
$$12\omega_9\omega_6\omega_7\omega_4^3\omega_8^2\omega_5^2 + 24\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 12\omega_9\omega_6\omega_7^2\omega_4^3\omega_8v_1^2\omega_5^2 - 24\omega_6^2\omega_7\omega_4^2\omega_8^2\omega_5^2 + 12\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 -$$
$$12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8v_1^2\omega_5^2 + 12\omega_9\omega_6^2\omega_4^3\omega_8^2v_1^2\omega_5^2 + 156\omega_9\omega_6^2c_s^2\omega_7^2\omega_4\omega_8^2\omega_5^2 - 48\omega_9\omega_6^2c_s^2\omega_4^2\omega_8^2\omega_5^2 - 12\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 24\omega_6^2\omega_7^2\omega_4^2\omega_8v_1^2\omega_5^2 -$$
$$24\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^2 + 24\omega_6\omega_7^2\omega_4^3\omega_8v_1^2\omega_5^2 - 132\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 + 12\omega_9\omega_6^2\omega_7^2\omega_4\omega_8^2v_1^2\omega_5 - 12\omega_6c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 -$$
$$12\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 18\omega_9\omega_6^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 36\omega_9\omega_6^2\omega_7\omega_4\omega_8^2\omega_5^2 + 12\omega_9\omega_6^2\omega_7^2\omega_4\omega_8^2v_1^2\omega_5^2 - 24\omega_6^2\omega_7^2\omega_4^3\omega_8v_1^2\omega_5^2 +$$
$$90\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^2 - 6\omega_9\omega_6^2\omega_7\omega_4^3\omega_8^2\omega_5 + 48\omega_9\omega_6c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 24\omega_9c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 12\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 6\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2 +$$
$$18\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + 12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2v_1^2 + 3\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 24\omega_6^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6^2c_s^2\omega_7^2\omega_4\omega_8^2\omega_5 - 24\omega_9\omega_6^2\omega_4^2\omega_8^2v_1^2\omega_5^2 +$$
$$24\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^2 + 12\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8v_1^2\omega_5^2 + 12\omega_9\omega_6\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9\omega_6^2\omega_4^3\omega_8^2\omega_5^2 - 36\omega_9\omega_6^2\omega_7\omega_4\omega_8^2v_1^2\omega_5^2 - 72\omega_9\omega_6c_s^2\omega_7^2\omega_4\omega_8^2\omega_5^2$$

$$C_{14} = -18\omega_9\omega_6^3c_s^2\omega_7\omega_4^2\omega_8 + 12\omega_9\omega_6^2\omega_7\omega_4^3v_1^2 + 18\omega_9\omega_6^3c_s^2\omega_7\omega_4^2v_2^2\omega_8 + 18\omega_9\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_8 - 12\omega_9\omega_6^2\omega_7\omega_4^2v_2^2\omega_8v_1^2 + 6\omega_6^3\omega_7\omega_4^3v_2^2\omega_8^2v_1^2 -$$
$$96\omega_9\omega_6^3c_s^4\omega_7\omega_8^2 + 18\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2v_1^2 - 12\omega_9\omega_7\omega_4^3\omega_8^2v_1^2 - 12\omega_9\omega_6^2c_s^2\omega_7\omega_4v_2^2\omega_8^2 - 42\omega_9\omega_6^2c_s^4\omega_7\omega_4^3\omega_8 - 12\omega_9\omega_6\omega_7\omega_4^3v_2^2\omega_8v_1^2 +$$
$$12\omega_9\omega_7\omega_4^3v_2^2\omega_8^2v_1^2 - 48\omega_9\omega_6c_s^4\omega_7\omega_4^2\omega_8^2 - 12\omega_9\omega_6c_s^2\omega_7\omega_4^3v_2^2\omega_8^2 + 36\omega_6^3c_s^4\omega_7\omega_4^2\omega_8 + 6\omega_9\omega_6^2c_s^2\omega_4^3v_2^2\omega_8^2 + 6\omega_9\omega_6^2\omega_4^3v_2^2\omega_8^2v_1^2 - 12\omega_6^2c_s^2\omega_7\omega_4^3\omega_8 +$$
$$12\omega_9\omega_6^3c_s^2\omega_7\omega_4^3v_2^2 + 12\omega_9\omega_6\omega_7\omega_4^3\omega_8v_1^2 + 180\omega_9\omega_6^3c_s^4\omega_7\omega_4\omega_8^2 - 18\omega_6^3c_s^4\omega_4^3\omega_8^2 + 6\omega_6^3\omega_4^3\omega_8^2v_1^2 + 150\omega_9\omega_6^2c_s^4\omega_7\omega_4^2\omega_8^2 - 72\omega_9\omega_6^3c_s^2\omega_7\omega_4\omega_8v_1^2 -$$
$$18\omega_6^3c_s^2\omega_4^3\omega_8^2v_1^2 - \omega_9\omega_6^3c_s^2\omega_7\omega_4^3\omega_8^2 - 24\omega_9\omega_6^3\omega_7\omega_4v_2^2\omega_8v_1^2 - 24\omega_9\omega_6^2\omega_7\omega_4^3\omega_8v_1^2 - 12\omega_9c_s^2\omega_7\omega_4^3\omega_8^2 + 12\omega_6^3\omega_4^2v_2^2\omega_8^2v_1^2 - 36\omega_6^3c_s^2\omega_7\omega_4^2\omega_8^2v_1^2 -$$
$$18\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2v_1^2 + 12\omega_9\omega_6^2\omega_4^2\omega_8^2v_1^2 + 12\omega_9\omega_6^3\omega_7\omega_4^2v_1^2 + 12\omega_9\omega_6c_s^4\omega_7\omega_4^3\omega_8 + 12\omega_6^3c_s^2\omega_7\omega_4^2v_2^2\omega_8 + 36\omega_9\omega_6^3c_s^2\omega_7\omega_4^3v_1^2 + 12\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_8 +$$
$$12\omega_6^3\omega_7\omega_4^2\omega_8^2v_1^2 + 18\omega_6^3c_s^4\omega_7\omega_4^3\omega_8^2 - 12\omega_6^3c_s^2\omega_4^2\omega_8^2 - 36\omega_9\omega_6^3\omega_7\omega_4^2\omega_8v_1^2 - 12\omega_9\omega_6^3c_s^2\omega_7\omega_4^2v_2^2 - 6\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_8^2 - 12\omega_6^3c_s^2\omega_7\omega_4^2v_2^2\omega_8^2 -$$
$$36\omega_9\omega_6c_s^4\omega_7\omega_4^3\omega_8^2 - 36\omega_6^3c_s^4\omega_7\omega_4^3\omega_8 - 12\omega_9\omega_6\omega_7\omega_4^2\omega_8^2v_1^2 + 12\omega_9\omega_6^2c_s^2\omega_7\omega_4\omega_8^2 + 12\omega_6^2\omega_7\omega_4^3v_2^2\omega_8v_1^2 + 6\omega_6^2\omega_7\omega_4^3\omega_8^2v_1^2 - 36\omega_9\omega_6^3c_s^2\omega_7\omega_4^3\omega_8v_1^2 -$$
$$36\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8v_1^2 + 6\omega_9\omega_6^3c_s^2\omega_7\omega_4^3\omega_8 - 6\omega_6^3\omega_4^3v_2^2\omega_8^2v_1^2 - 6\omega_6^3c_s^2\omega_4^3v_2^2\omega_8^2 - 36\omega_6^3c_s^2\omega_7\omega_4^3\omega_8v_1^2 - 36\omega_9\omega_6^3c_s^2\omega_7\omega_4^2v_1^2 + 18\omega_9\omega_6^2c_s^2\omega_4^3\omega_8^2v_1^2 -$$
$$36\omega_6^3c_s^4\omega_7\omega_4^2\omega_8^2 + 6\omega_6^3c_s^2\omega_4^3\omega_8^2 - 12\omega_9\omega_6c_s^2\omega_7\omega_4^3v_2^2\omega_8 - 12\omega_6^3\omega_7\omega_4^2v_2^2\omega_8^2v_1^2 + 12\omega_6^3\omega_7\omega_4^3\omega_8v_1^2 - 54\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2v_1^2 + 12\omega_9\omega_6^3c_s^4\omega_7\omega_4\omega_8 +$$
$$24\omega_9\omega_6^2\omega_7\omega_4^3v_2^2\omega_8v_1^2 + 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2 - 12\omega_9\omega_6^3\omega_7\omega_4^3v_1^2 - 2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_8^2 - 12\omega_9\omega_6^3c_s^2\omega_7\omega_4^2v_2^2\omega_8^2 + 12\omega_9\omega_6^3c_s^2\omega_7\omega_4^2\omega_8^2 +$$
$$72\omega_9\omega_6^2c_s^2\omega_7\omega_4\omega_8^2v_1^2 - 12\omega_9\omega_6^2\omega_4^2v_2^2\omega_8^2v_1^2 + 12\omega_9\omega_6^3\omega_7\omega_4^3v_2^2v_1^2 - 6\omega_9\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2 + 36\omega_6^3c_s^4\omega_4^2\omega_8^2 + 24\omega_9\omega_6^2\omega_7\omega_4v_2^2\omega_8^2v_1^2 + 24\omega_9\omega_6^2\omega_7\omega_4^2\omega_8^2v_1^2 +$$
$$12\omega_9\omega_6\omega_7\omega_4^2v_2^2\omega_8^2v_1^2 - 18\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8 + 12\omega_9\omega_6^3c_s^4\omega_7\omega_4^2 + 18\omega_9\omega_6^2c_s^4\omega_4^3\omega_8^2 - 6\omega_9\omega_6^2\omega_4^3\omega_8^2v_1^2 + 18\omega_6^3c_s^2\omega_7\omega_4^3\omega_8^2v_1^2 + 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^3 +$$
$$6\omega_9\omega_6^2\omega_7\omega_4^3v_2^2\omega_8^2v_1^2 - 42\omega_9\omega_6^3c_s^4\omega_7\omega_4^2\omega_8 - 36\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8v_1^2 + 24\omega_9\omega_6^3\omega_7\omega_4\omega_8v_1^2 - 6\omega_6^3\omega_7\omega_4^3\omega_8^2v_1^2 + 36\omega_9c_s^2\omega_7\omega_4^3\omega_8^2v_1^2 + 12\omega_6^3\omega_7\omega_4^2v_2^2\omega_8v_1^2 -$$
$$12\omega_6^3c_s^2\omega_7\omega_4^3v_2^2\omega_8 + 36\omega_6^3c_s^2\omega_4^2\omega_8^2v_1^2 - 12\omega_9\omega_6^3c_s^2\omega_7\omega_4\omega_8^2 - 12\omega_6^3\omega_4^2\omega_8^2v_1^2 + 36\omega_6^2c_s^4\omega_7\omega_4^3\omega_8 + 12\omega_9\omega_6^2\omega_7\omega_4^2\omega_8v_1^2 - 12\omega_6^3c_s^2\omega_7\omega_4^2\omega_8 +$$
$$12\omega_9\omega_6^2c_s^2\omega_4^2\omega_8^2 + 5\omega_9\omega_6^3c_s^4\omega_7\omega_4^3\omega_8^2 - 12\omega_9\omega_6^2\omega_7\omega_4^3v_2^2v_1^2 - 18\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2 - 12\omega_9\omega_6^2c_s^2\omega_4^2v_2^2\omega_8^2 - 12\omega_9\omega_6^3c_s^4\omega_7\omega_4^3 - 12\omega_6^2\omega_7\omega_4^3\omega_8v_1^2 -$$
$$24\omega_9\omega_6^2\omega_7\omega_4\omega_8^2v_1^2 - 6\omega_6^2\omega_7\omega_4^3v_2^2\omega_8^2v_1^2 + 12\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8 - 6\omega_6^3c_s^2\omega_7\omega_4^3\omega_8^2 + 36\omega_9\omega_6^3\omega_7\omega_4^2v_2^2\omega_8v_1^2 - 6\omega_9\omega_6^3c_s^2\omega_7\omega_4^3v_2^2\omega_8 + 36\omega_9c_s^4\omega_7\omega_4^3\omega_8^2 +$$
$$12\omega_9\omega_6^3c_s^2\omega_7\omega_4v_2^2\omega_8^2 - 72\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2v_1^2 + 12\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2 + 12\omega_9\omega_6^2c_s^4\omega_7\omega_4^3 - 84\omega_9\omega_6^2c_s^4\omega_7\omega_4\omega_8^2 + 18\omega_9\omega_6^2c_s^2\omega_7\omega_4^2v_2^2\omega_8^2 -$$
$$12\omega_9\omega_6^2c_s^2\omega_7\omega_4^3v_2^2 + 12\omega_6^3c_s^2\omega_7\omega_4^3\omega_8 + \omega_9\omega_6^3c_s^2\omega_7\omega_4^3v_2^2\omega_8^2 + 12\omega_9\omega_6^3c_s^2\omega_7\omega_4^2 - 6\omega_9\omega_6^2c_s^2\omega_4^3\omega_8^2 - 6\omega_9\omega_6^2\omega_7\omega_4^3\omega_8^2v_1^2 - 12\omega_9\omega_6^3c_s^2\omega_7\omega_4v_2^2\omega_8 -$$
$$12\omega_9\omega_6^3\omega_7\omega_4^2v_2^2v_1^2 + 30\omega_9\omega_6^3c_s^4\omega_7\omega_4^3\omega_8 + 36\omega_6^3c_s^2\omega_7\omega_4^2\omega_8v_1^2 - 36\omega_9\omega_6^2c_s^2\omega_4^2\omega_8^2v_1^2 + 36\omega_6^2c_s^2\omega_7\omega_4^3\omega_8v_1^2 - 36\omega_9\omega_6^2c_s^4\omega_4^2\omega_8^2 - 12\omega_9\omega_6^3\omega_7\omega_4^3v_2^2\omega_8v_1^2 +$$
$$36\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8^2v_1^2 - 12\omega_6^3\omega_7\omega_4^2\omega_8v_1^2 - 12\omega_6^3\omega_7\omega_4^3v_2^2\omega_8v_1^2 - 36\omega_9\omega_6^2c_s^2\omega_7\omega_4^3v_1^2 - 18\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2 - 24\omega_9\omega_6^2\omega_7\omega_4^2v_2^2\omega_8^2v_1^2 +$$
$$12\omega_9\omega_6^3c_s^2\omega_7\omega_4\omega_8 + 12\omega_6^3c_s^2\omega_4^2v_2^2\omega_8^2 - 12\omega_9\omega_6^3c_s^2\omega_7\omega_4^3 - 18\omega_9\omega_6\omega_7\omega_4^3v_2^2\omega_8^2v_1^2 + 108\omega_9\omega_6^3c_s^2\omega_7\omega_4^2\omega_8v_1^2 + 12\omega_6^3c_s^2\omega_7\omega_4^2\omega_8^2 +$$
$$72\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8v_1^2 + 2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2 + 12\omega_9c_s^2\omega_7\omega_4^3v_2^2\omega_8^2 + 12\omega_9\omega_6^3\omega_7\omega_4^3\omega_8v_1^2 - 88\omega_9\omega_6^3c_s^4\omega_7\omega_4^2\omega_8^2 + 18\omega_9\omega_6\omega_7\omega_4^3\omega_8^2v_1^2 + 6\omega_6^3c_s^2\omega_7\omega_4^3v_2^2\omega_8^2$$

$$C_{15} =$$
$$-2\omega_6^3\omega_7\omega_4^3v_2^2\omega_8^2\omega_5 + 2\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8\omega_5 + 4\omega_9\omega_6^3c_s^2\omega_4^2\omega_8^2\omega_5 - 4\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 24\omega_9\omega_6^3c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 + 6\omega_9\omega_6^3\omega_7^2\omega_4\omega_8\omega_5 + 12\omega_9c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 -$$
$$2\omega_6^3\omega_7^2\omega_4^3\omega_8^2\omega_5 - 8\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 - \omega_9\omega_6^3\omega_7\omega_4^3\omega_8^2\omega_5 - 6\omega_9\omega_6^3\omega_7^2\omega_4v_2^2\omega_8\omega_5 + 2\omega_6^3c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 - \omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 - 8\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_5 -$$
$$2\omega_9\omega_6^3c_s^2\omega_7\omega_4^3\omega_8^2 - 4\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5 - 2\omega_9\omega_6^2\omega_7^2\omega_4\omega_8^2\omega_5 + 2\omega_6^3\omega_7^2\omega_4^3v_2^2\omega_8^2\omega_5 + 4\omega_6^3c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 2\omega_9\omega_6^2\omega_7^2\omega_4^2v_2^2\omega_8\omega_5 + \omega_9\omega_6^3\omega_7\omega_4^3v_2^2\omega_8^2\omega_5 +$$
$$\omega_9\omega_6^3\omega_7^2\omega_4^2\omega_8^2\omega_5 + 4\omega_9\omega_7^2\omega_4^3v_2^2\omega_8^2\omega_5 - 4\omega_6^3\omega_7\omega_4^2\omega_8^2\omega_5 - 4\omega_9\omega_6^2\omega_7^2\omega_4^3v_2^2\omega_5 - 4\omega_9\omega_6\omega_7^2\omega_4^3v_2^2\omega_8\omega_5 - 4\omega_6^3\omega_7^2\omega_4^2\omega_8\omega_5 + 2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 +$$
$$2\omega_9\omega_6^2\omega_7^2\omega_4v_2^2\omega_8^2\omega_5 + 4\omega_6^3c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 + 4\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 - 4\omega_9\omega_6^3\omega_7^2\omega_4^2v_2^2\omega_5 - \omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5 - 2\omega_9\omega_6^3\omega_7\omega_4^2v_2^2\omega_8^2\omega_5 - 4\omega_9\omega_6^3c_s^2\omega_7^2\omega_4\omega_8^2 +$$
$$26\omega_9\omega_6^3c_s^2\omega_7^2\omega_4\omega_8^2\omega_5 + 7\omega_9\omega_6^2\omega_7^2\omega_4^3v_2^2\omega_8\omega_5 - 4\omega_6^3\omega_7^2\omega_4^2v_2^2\omega_8^2\omega_5 + 4\omega_6^2\omega_7^2\omega_4^3v_2^2\omega_8\omega_5 - \omega_9\omega_6^3\omega_7^2\omega_4^2v_2^2\omega_8^2\omega_5 + 5\omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5 + 3\omega_9\omega_6^3\omega_7^2\omega_4^3\omega_8\omega_5 +$$
$$4\omega_6^3\omega_7\omega_4^2v_2^2\omega_8^2\omega_5 + 11\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 + 13\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 4\omega_9\omega_6^3c_s^2\omega_7\omega_4^2\omega_8^2 + 9\omega_9\omega_6^3\omega_7^2\omega_4^2v_2^2\omega_8\omega_5 + 4\omega_9\omega_6\omega_7^2\omega_4^3\omega_8\omega_5 - 2\omega_6^3c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 -$$
$$2\omega_6^2\omega_7^2\omega_4^3v_2^2\omega_8^2\omega_5 + 2\omega_6^3\omega_7\omega_4^3\omega_8^2\omega_5 - 8\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + 3\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 - 4\omega_9\omega_7^2\omega_4^3\omega_8^2\omega_5 + 2\omega_9\omega_6^3\omega_7\omega_4^2\omega_8^2\omega_5 - 4\omega_9\omega_6^3\omega_7^2\omega_4^3\omega_5 +$$
$$4\omega_6^3\omega_7^2\omega_4^2\omega_8^2\omega_5 - 8\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^2\omega_5 - 4\omega_6^3c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 - 2\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 - 7\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5 + 2\omega_9\omega_6\omega_7^2\omega_4^2v_2^2\omega_8^2\omega_5 + 8\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 +$$
$$8\omega_9\omega_6^3c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 + 4\omega_6^3\omega_7^2\omega_4^2v_2^2\omega_8\omega_5 - 6\omega_9\omega_6^3c_s^2\omega_7^2\omega_4\omega_8\omega_5 + \omega_9\omega_6^2\omega_7^2\omega_4^3v_2^2\omega_8^2\omega_5 - 16\omega_9\omega_6^3c_s^2\omega_7^2\omega_8^2\omega_5 + 2\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^2\omega_8^2 - 2\omega_9\omega_6^3c_s^2\omega_4^3\omega_8^2\omega_5 +$$
$$12\omega_9\omega_6^3c_s^2\omega_7\omega_4\omega_8^2\omega_5 - 5\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 + 2\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5 + 4\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_5 - 3\omega_9\omega_6^2\omega_7^2\omega_4^2v_2^2\omega_8^2\omega_5 - 2\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5 -$$
$$4\omega_6^3\omega_7^2\omega_4^3v_2^2\omega_8\omega_5 - 5\omega_9\omega_6\omega_7^2\omega_4^3v_2^2\omega_8^2\omega_5 - 9\omega_9\omega_6^3\omega_7^2\omega_4^2\omega_8\omega_5 + 3\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + 4\omega_9\omega_6^3\omega_7^2\omega_4^3v_2^2\omega_5 - 3\omega_9\omega_6^3\omega_7^2\omega_4^3v_2^2\omega_8\omega_5 - 6\omega_9\omega_6^2c_s^2\omega_7^2\omega_4\omega_8^2\omega_5 -$$
$$15\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 + 8\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^3\omega_5 - 2\omega_9\omega_6^3\omega_7^2\omega_4\omega_8^2\omega_5 + 4\omega_6^3\omega_7^2\omega_4^3\omega_8\omega_5 - 4\omega_6^3c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 2\omega_9\omega_6^3\omega_7^2\omega_4v_2^2\omega_8^2\omega_5 + 4\omega_9\omega_6^3\omega_7^2\omega_4^2\omega_5$$

$$C_{16} = 24\omega_9\omega_6^3c_s^2\omega_7\omega_4^2\omega_8 + 12\omega_9\omega_6^2\omega_7\omega_4^3v_1^2 - 132\omega_9\omega_6^3c_s^2\omega_7\omega_4^2v_2^2\omega_8 - 144\omega_9\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_8 - 36\omega_9\omega_6^2\omega_7\omega_4^2v_2^2\omega_8v_1^2 + 18\omega_6^3\omega_7\omega_4^3v_2^2\omega_8^2v_1^2 -$$
$$12\omega_9\omega_6^3c_s^4\omega_7\omega_8^2 + 6\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2v_1^2 - 12\omega_9\omega_7\omega_4^3\omega_8^2v_1^2 - 84\omega_9\omega_6^2c_s^2\omega_7\omega_4v_2^2\omega_8^2 - 12\omega_9\omega_6^2c_s^4\omega_7\omega_4^3\omega_8 - 36\omega_9\omega_6\omega_7\omega_4^3v_2^2\omega_8v_1^2 - 48\omega_9\omega_6^3c_s^2\omega_7v_2^2\omega_8^2 +$$
$$36\omega_9\omega_7\omega_4^3v_2^2\omega_8^2v_1^2 - 12\omega_9\omega_6c_s^4\omega_7\omega_4^2\omega_8^2 + 18\omega_9\omega_6c_s^2\omega_7\omega_4^3v_2^2\omega_8^2 + 12\omega_6^3c_s^4\omega_7\omega_4^2\omega_8 + 18\omega_9\omega_6^2c_s^2\omega_4^3v_2^2\omega_8^2 + 18\omega_9\omega_6^2\omega_4^3v_2^2\omega_8^2v_1^2 - 12\omega_6^2c_s^2\omega_7\omega_4^3\omega_8 -$$
$$24\omega_9\omega_6^3c_s^2\omega_7\omega_4^3v_2^2 + 12\omega_9\omega_6\omega_7\omega_4^3\omega_8v_1^2 + 18\omega_9\omega_6^3c_s^4\omega_7\omega_4\omega_8^2 - 6\omega_6^3c_s^4\omega_4^3\omega_8^2 + 6\omega_6^3\omega_4^3\omega_8^2v_1^2 + 24\omega_9\omega_6^2c_s^4\omega_7\omega_4^2\omega_8^2 - 24\omega_9\omega_6^3c_s^2\omega_7\omega_4\omega_8v_1^2 -$$
$$6\omega_6^3c_s^2\omega_4^3\omega_8^2v_1^2 - 72\omega_9\omega_6^3\omega_7\omega_4v_2^2\omega_8v_1^2 - 24\omega_9\omega_6^2\omega_7\omega_4^3\omega_8v_1^2 + 36\omega_6^3\omega_4^2v_2^2\omega_8^2v_1^2 - 12\omega_6^3c_s^2\omega_7\omega_4^2\omega_8^2v_1^2 - 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2v_1^2 + 12\omega_9\omega_6^2\omega_4^2\omega_8^2v_1^2 +$$
$$12\omega_9\omega_6^3\omega_7\omega_4^2v_1^2 + 36\omega_6^3c_s^2\omega_7\omega_4^2v_2^2\omega_8 + 12\omega_9\omega_6^3c_s^2\omega_7\omega_4^3v_1^2 + 36\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_8 + 12\omega_6^3\omega_7\omega_4^2\omega_8^2v_1^2 + 6\omega_6^3c_s^4\omega_7\omega_4^3\omega_8^2 - 12\omega_6^3c_s^2\omega_4^2\omega_8^2 -$$
$$36\omega_9\omega_6^3\omega_7\omega_4^2\omega_8v_1^2 + 24\omega_9\omega_6^3c_s^2\omega_7\omega_4^2v_2^2 - 18\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_8^2 - 36\omega_6^3c_s^2\omega_7\omega_4^2v_2^2\omega_8^2 + 6\omega_9\omega_6c_s^4\omega_7\omega_4^3\omega_8^2 - 12\omega_6^3c_s^4\omega_7\omega_4^3\omega_8 - 12\omega_9\omega_6\omega_7\omega_4^2\omega_8^2v_1^2 +$$
$$12\omega_9\omega_6^2c_s^2\omega_7\omega_4\omega_8^2 + 12\omega_9\omega_6^2c_s^4\omega_7\omega_4^2\omega_8 + 36\omega_6^2\omega_7\omega_4^3v_2^2\omega_8v_1^2 + 6\omega_6^2\omega_7\omega_4^3\omega_8^2v_1^2 - 12\omega_9\omega_6^3c_s^2\omega_7\omega_4^3\omega_8v_1^2 - 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8v_1^2 - 12\omega_9\omega_6^3c_s^2\omega_7\omega_4^3\omega_8 -$$
$$18\omega_6^3\omega_4^3v_2^2\omega_8^2v_1^2 - 18\omega_6^3c_s^2\omega_4^3v_2^2\omega_8^2 - 12\omega_6^3c_s^2\omega_7\omega_4^3\omega_8v_1^2 - 12\omega_9\omega_6^3c_s^2\omega_7\omega_4^2v_1^2 + 6\omega_9\omega_6^2c_s^2\omega_4^3\omega_8^2v_1^2 - 12\omega_6^3c_s^4\omega_7\omega_4^2\omega_8^2 + 6\omega_6^3c_s^2\omega_4^3\omega_8^2 +$$
$$72\omega_9\omega_6c_s^2\omega_7\omega_4^3v_2^2\omega_8 - 36\omega_6^3\omega_7\omega_4^2v_2^2\omega_8^2v_1^2 + 12\omega_6^3\omega_7\omega_4^3\omega_8v_1^2 - 18\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2v_1^2 + 12\omega_9\omega_6^3c_s^4\omega_7\omega_4\omega_8 + 72\omega_9\omega_6^2\omega_7\omega_4^3v_2^2\omega_8v_1^2 + 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2 -$$
$$12\omega_9\omega_6^3\omega_7\omega_4^3v_1^2 - 18\omega_9\omega_6^2c_s^2\omega_7\omega_4^3v_2^2\omega_8^2 - 42\omega_9\omega_6^3c_s^2\omega_7\omega_4^2v_2^2\omega_8^2 + 24\omega_9\omega_6^2c_s^2\omega_7\omega_4\omega_8^2v_1^2 - 36\omega_9\omega_6^2\omega_4^2v_2^2\omega_8^2v_1^2 + 36\omega_9\omega_6^3\omega_7\omega_4^3v_2^2v_1^2 - 6\omega_9\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2 +$$

$12\omega_6^3c_s^4\omega_4^2\omega_8^2+72\omega_9\omega_6^2\omega_7\omega_4v_2^2\omega_8^2v_1^2+24\omega_9\omega_6^2\omega_7\omega_4^2\omega_8^2v_1^2+36\omega_9\omega_6\omega_7\omega_4^2v_2^2\omega_8^2v_1^2+12\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8+6\omega_9\omega_6^2c_s^4\omega_4^3\omega_8^2-6\omega_9\omega_6^2\omega_4^3\omega_8^2v_1^2+6\omega_6^3c_s^2\omega_7\omega_4^3\omega_8^2v_1^2+18\omega_9\omega_6^2\omega_7\omega_4^3v_2^2\omega_8^2v_1^2-24\omega_9\omega_6^3c_s^4\omega_7\omega_4^2\omega_8-12\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8v_1^2+24\omega_9\omega_6^3\omega_7\omega_4\omega_8v_1^2-6\omega_6^3\omega_7\omega_4^3\omega_8^2v_1^2+12\omega_9c_s^2\omega_7\omega_4^3\omega_8^2v_1^2+36\omega_6^3\omega_7\omega_4^2v_2^2\omega_8v_1^2-36\omega_6^3c_s^2\omega_7\omega_4^3v_2^2\omega_8+12\omega_6^3c_s^2\omega_4^3\omega_8^2v_1^2-12\omega_6^3\omega_4^3\omega_8^2v_1^2+12\omega_6^2c_s^4\omega_7\omega_4^3\omega_8+12\omega_9\omega_6^2\omega_7\omega_4^2\omega_8v_1^2+12\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8^2-12\omega_6^3c_s^2\omega_7\omega_4^2\omega_8+12\omega_9\omega_6^2c_s^2\omega_4^3\omega_8^2-\omega_9\omega_6^3c_s^4\omega_7\omega_4^3\omega_8^2-108\omega_9\omega_6c_s^2\omega_7\omega_4^2v_2^2\omega_8^2-36\omega_9\omega_6^2\omega_7\omega_4^3v_2^2v_1^2-24\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2-36\omega_9\omega_6^2c_s^2\omega_4^2v_2^2\omega_8^2-12\omega_6^2\omega_7\omega_4^3\omega_8v_1^2-24\omega_9\omega_6^2\omega_7\omega_4\omega_8^2v_1^2-18\omega_6^2\omega_7\omega_4^3v_2^2\omega_8^2v_1^2-6\omega_6^3c_s^2\omega_7\omega_4^3\omega_8^2+108\omega_9\omega_6^3\omega_7\omega_4^2v_2^2\omega_8v_1^2+78\omega_9\omega_6^3c_s^2\omega_7\omega_4^3v_2^2\omega_8+60\omega_9\omega_6^2c_s^2\omega_7\omega_4^2v_2^2\omega_8+84\omega_9\omega_6^3c_s^2\omega_7\omega_4v_2^2\omega_8^2-24\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2v_1^2-6\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2-12\omega_9\omega_6^2c_s^4\omega_7\omega_4\omega_8^2+180\omega_9\omega_6^2c_s^2\omega_7\omega_4^2v_2^2\omega_8^2+24\omega_9\omega_6^2c_s^2\omega_7\omega_4^3v_2^2+12\omega_6^3c_s^2\omega_7\omega_4^3\omega_8-6\omega_9\omega_6^2c_s^2\omega_4^3\omega_8^2-6\omega_9\omega_6^2\omega_7\omega_4^3\omega_8^2v_1^2+60\omega_9\omega_6^3c_s^2\omega_7\omega_4v_2^2\omega_8-36\omega_9\omega_6^3\omega_7\omega_4^2v_2^2v_1^2+12\omega_9\omega_6^3c_s^4\omega_7\omega_4^3\omega_8+12\omega_6^3c_s^2\omega_7\omega_4^2\omega_8v_1^2-12\omega_9\omega_6^2c_s^2\omega_4^2\omega_8^2v_1^2+12\omega_6^2c_s^2\omega_7\omega_4^3\omega_8v_1^2-12\omega_9\omega_6^2c_s^4\omega_4^2\omega_8^2-36\omega_9\omega_6^3\omega_7\omega_4^3v_2^2\omega_8v_1^2-12\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8+12\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8^2v_1^2-12\omega_6^3\omega_7\omega_4^2\omega_8v_1^2-36\omega_6^3\omega_7\omega_4^3v_2^2\omega_8v_1^2-12\omega_9\omega_6^2c_s^2\omega_7\omega_4^3v_1^2-6\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2-72\omega_9\omega_6^2\omega_7\omega_4^2v_2^2\omega_8^2v_1^2-12\omega_9\omega_6^3c_s^2\omega_7\omega_4\omega_8+36\omega_6^3c_s^2\omega_4^2v_2^2\omega_8^2-54\omega_9\omega_6\omega_7\omega_4^3v_2^2\omega_8^2v_1^2+36\omega_9\omega_6^3c_s^2\omega_7\omega_4^2\omega_8v_1^2+12\omega_6^3c_s^2\omega_7\omega_4^2\omega_8^2+24\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8v_1^2+6\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2+12\omega_9\omega_6^3\omega_7\omega_4^3\omega_8v_1^2-4\omega_9\omega_6^3c_s^4\omega_7\omega_4^2\omega_8^2+18\omega_9\omega_6\omega_7\omega_4^3\omega_8^2v_1^2+18\omega_6^3c_s^2\omega_7\omega_4^3v_2^2\omega_8^2$

$C_{17}=-144\omega_6c_s^2\omega_4^2v_2^2\omega_8^2-4\omega_6^3c_s^4\omega_4^2\omega_8+24\omega_6^3c_s^2\omega_4^2v_2^2-8\omega_6^3v_2^4\omega_8+4\omega_6^2c_s^4\omega_4^2\omega_8^2+4\omega_6^3c_s^2\omega_8+36\omega_6\omega_4^2v_2^2\omega_8^2-8\omega_6^2c_s^2\omega_4^2\omega_8+13\omega_6^2\omega_4^2v_2^4\omega_8^2+36\omega_6^2c_s^2v_2^2\omega_8^2-4\omega_6c_s^2\omega_4\omega_8^2-4\omega_6^3c_s^4\omega_4+51\omega_6^2c_s^2\omega_4^2v_2^2\omega_8^2-36\omega_6^3c_s^2v_2^2\omega_8+16\omega_6^2\omega_4v_2^2\omega_8-13\omega_6^3\omega_4^2v_2^4\omega_8+4\omega_6^2\omega_4^2v_2^2+120\omega_6^2c_s^2\omega_4^2v_2^2\omega_8+4\omega_6^3c_s^4\omega_4^2-24\omega_4^2v_2^2\omega_8^2+4\omega_6^3c_s^2\omega_4^2\omega_8+20\omega_6^2\omega_4v_2^2\omega_8^2-20\omega_6^3\omega_4v_2^2\omega_8-4\omega_6^2c_s^2\omega_4^2\omega_8^2+32\omega_6^2\omega_4^2v_2^2\omega_8+84\omega_6^3c_s^2\omega_4v_2^2\omega_8+4\omega_6^2c_s^2\omega_4^2+4\omega_6^3\omega_4^2v_2^4+8\omega_6^2c_s^4\omega_4^2\omega_8-24\omega_6^2c_s^2\omega_4^2v_2^2+4\omega_6c_s^4\omega_4\omega_8^2+20\omega_6\omega_4^2v_2^2\omega_8+4\omega_6^3\omega_4v_2^2-72\omega_6c_s^2\omega_4^2v_2^2\omega_8+20\omega_6\omega_4v_2^4\omega_8^2-8\omega_6^2v_2^2\omega_8^2+4\omega_6^2c_s^4\omega_8^2-13\omega_6^2\omega_4^2v_2^2\omega_8^2-4\omega_6^3\omega_4^2v_2^2-48\omega_6^2c_s^2\omega_4v_2^2\omega_8-12\omega_6c_s^4\omega_4^2\omega_8^2+4\omega_6^3c_s^2\omega_4-51\omega_6^3c_s^2\omega_4^2v_2^2\omega_8-8c_s^2\omega_4^2\omega_8^2+13\omega_6^3\omega_4^2v_2^2\omega_8-16\omega_6^2\omega_4v_2^4\omega_8+96c_s^2\omega_4^2v_2^2\omega_8^2-8\omega_6^3c_s^2\omega_4\omega_8+8\omega_6^3v_2^2\omega_8+8\omega_6^2c_s^2\omega_4\omega_8^2+4\omega_6c_s^2\omega_4^2\omega_8-36\omega_6\omega_4^2v_2^4\omega_8^2-4\omega_6^3c_s^4\omega_8-4\omega_6^3\omega_4v_2^4+12\omega_6c_s^2\omega_4^2\omega_8^2-20\omega_6\omega_4^2v_2^4\omega_8+72\omega_6c_s^2\omega_4v_2^2\omega_8^2-20\omega_6\omega_4v_2^2\omega_8^2+8\omega_6^2v_2^4\omega_8^2-4\omega_6^2c_s^2\omega_8^2+8c_s^4\omega_4^2\omega_8^2-4\omega_6^3c_s^2\omega_4^2+24\omega_4^2v_2^4\omega_8^2-20\omega_6^2\omega_4v_2^4\omega_8^2-24\omega_6^3c_s^2\omega_4v_2^2-4\omega_6^2\omega_4^2v_2^4+8\omega_6^3c_s^4\omega_4\omega_8-32\omega_6^2\omega_4^2v_2^2\omega_8-8\omega_6^2c_s^4\omega_4\omega_8^2+20\omega_6^3\omega_4v_2^4\omega_8-4\omega_6^2c_s^4\omega_4^2-84\omega_6^2c_s^2\omega_4v_2^2\omega_8^2-4\omega_6c_s^4\omega_4^2\omega_8$

$C_{18}=$
$-108\omega_6c_s^2\omega_4^2v_2^2\omega_8^2+12\omega_6^3\omega_4^3v_2^4-\omega_6^2c_s^2\omega_4^3\omega_8^2-18\omega_6^3c_s^4\omega_4^2\omega_8-12\omega_6^3c_s^2\omega_4^2v_2^2-90\omega_6\omega_4^3v_2^4\omega_8^2+252c_s^2\omega_4^3v_2^2\omega_8^2+6\omega_6^2c_s^4\omega_4^2\omega_8^2-6\omega_6^3c_s^2\omega_4^3\omega_8-\omega_6^3c_s^4\omega_4^3\omega_8^2-12\omega_6^2c_s^2\omega_4^2\omega_8+12\omega_6^2\omega_4^2v_2^4\omega_8^2-12\omega_6^2\omega_4v_2^2\omega_8^2+102\omega_6^3c_s^2\omega_4v_2^2\omega_8^2+27\omega_6^3\omega_4^3v_2^2\omega_8-21\omega_6^3c_s^2\omega_4^3v_2^2\omega_8+162\omega_6^2c_s^2\omega_4^2v_2^2\omega_8^2-19\omega_6^2\omega_4^3v_2^2\omega_8^2-12\omega_6^2c_s^2\omega_4^3v_2^2+48\omega_6^3\omega_4^2v_2^4\omega_8-5\omega_6^3c_s^2\omega_4^2\omega_8^2-6\omega_6^2c_s^4\omega_4^3\omega_8-48\omega_6^3c_s^2v_2^2\omega_8^2-12\omega_6^2c_s^2\omega_4^2v_2^2\omega_8-60\omega_6^2\omega_4^3v_2^2\omega_8-18\omega_6^3\omega_4^2v_2^4\omega_8^2+\omega_6^2c_s^4\omega_4^3\omega_8^2+18\omega_6^3c_s^2\omega_4^3\omega_8+12\omega_6^3c_s^2\omega_4^3v_2^2+24\omega_6^3\omega_4v_2^2\omega_8-6\omega_6^2c_s^2\omega_4^2\omega_8^2+6\omega_6^3c_s^4\omega_4^3\omega_8-24\omega_6^2\omega_4^2v_2^4\omega_8-12\omega_6^3c_s^2\omega_4v_2^2\omega_8-4\omega_6^3\omega_4^3v_2^2\omega_8^2-12\omega_6^3\omega_4^2v_2^4+12\omega_6^3c_s^2\omega_4^3v_2^2\omega_8^2+72\omega_4^3v_2^4\omega_8^2+12\omega_6^2\omega_4^3v_2^2+12\omega_6^2c_s^4\omega_4^2\omega_8+13\omega_6^3c_s^4\omega_4^2\omega_8^2+6\omega_6^2c_s^2\omega_4^3\omega_8-36\omega_6\omega_4^3v_2^4\omega_8+12\omega_6^3\omega_4v_2^4\omega_8^2-12\omega_6^2\omega_4^2v_2^2\omega_8^2+12c_s^4\omega_4^3\omega_8^2+60\omega_6^2c_s^2\omega_4^3v_2^2\omega_8^2+12\omega_6^3\omega_4^2v_2^2-27\omega_6^3\omega_4^3v_2^4\omega_8-12\omega_6c_s^2\omega_4^3\omega_8^2+12\omega_6c_s^2\omega_4^3\omega_8^2+19\omega_6^2\omega_4^3v_2^4\omega_8^2+30\omega_6^3c_s^2\omega_4^2v_2^2\omega_8-24\omega_6^3c_s^4\omega_4\omega_8^2-48\omega_6^3\omega_4^2v_2^2\omega_8-12\omega_6^3c_s^2\omega_4\omega_8+90\omega_6\omega_4^3v_2^2\omega_8^2-12\omega_6^2\omega_4^3v_2^4-306\omega_6c_s^2\omega_4^3v_2^2\omega_8^2-12c_s^2\omega_4^3\omega_8^2-36\omega_6c_s^2\omega_4^3v_2^2\omega_8+12\omega_6^3c_s^4\omega_8^2+12\omega_6c_s^2\omega_4^2\omega_8^2-12\omega_6^3\omega_4^3v_2^2-12\omega_6c_s^4\omega_4^3\omega_8^2+6\omega_6^3c_s^2\omega_4\omega_8^2+36\omega_6\omega_4^3v_2^2\omega_8+60\omega_6^2\omega_4^3v_2^4\omega_8-81\omega_6^3c_s^2\omega_4^2v_2^2\omega_8^2+18\omega_6^3\omega_4^2v_2^2\omega_8^2+12\omega_6^3c_s^4\omega_4\omega_8+24\omega_6^2\omega_4^2v_2^2\omega_8-24\omega_6^3\omega_4v_2^4\omega_8+54\omega_6^2c_s^2\omega_4^3v_2^2\omega_8+4\omega_6^3\omega_4^3v_2^4\omega_8^2-48\omega_6^2c_s^2\omega_4v_2^2\omega_8^2-72\omega_4^3v_2^2\omega_8^2$

$C_{19}=-17\omega_6^2\omega_4^2\omega_8^2-20\omega_6^3c_s^2\omega_8-120\omega_6\omega_4^2v_2^2\omega_8^2+56\omega_6^2c_s^2\omega_4^2\omega_8-24\omega_6\omega_4\omega_8^2-28\omega_6^3\omega_4\omega_8+32\omega_6c_s^2\omega_4\omega_8^2-48\omega_6^2\omega_4v_2^2\omega_8-16\omega_6^2\omega_4^2v_2^2+80\omega_4^2v_2^2\omega_8^2-25\omega_6^3c_s^2\omega_4^2\omega_8-68\omega_6^2\omega_4v_2^2\omega_8^2+68\omega_6^3\omega_4v_2^2\omega_8+25\omega_6^2c_s^2\omega_4^2\omega_8^2-16\omega_6^2c_s^2\omega_4^2+12\omega_6^3\omega_8-64\omega_6\omega_4^2v_2^2\omega_8-16\omega_6^3\omega_4v_2^2-12\omega_6^2\omega_8^2+28\omega_6^2v_2^2\omega_8^2-40\omega_6^2\omega_4^2\omega_8+43\omega_6^2\omega_4^2v_2^2\omega_8^2+16\omega_6^3\omega_4^2v_2^2-16\omega_6^3c_s^2\omega_4+48c_s^2\omega_4^2\omega_8^2-43\omega_6^3\omega_4^2v_2^2\omega_8+16\omega_6^2\omega_4\omega_8-8\omega_6^3\omega_4^2+44\omega_6^3c_s^2\omega_4\omega_8-28\omega_6^3v_2^2\omega_8-44\omega_6^2c_s^2\omega_4\omega_8^2+24\omega_6\omega_4^2\omega_8-32\omega_6c_s^2\omega_4^2\omega_8-16\omega_6^2c_s^2\omega_4\omega_8+48\omega_6\omega_4^2\omega_8^2-72\omega_6c_s^2\omega_4^2\omega_8^2+17\omega_6^3\omega_4^2\omega_8+8\omega_6^3\omega_4+64\omega_6\omega_4v_2^2\omega_8^2+20\omega_6^2c_s^2\omega_8^2+16\omega_6^3c_s^2\omega_4^2+28\omega_6^2\omega_4\omega_8^2-32\omega_4^2\omega_8^2+104\omega_6^2\omega_4^2v_2^2\omega_8+8\omega_6^2\omega_4^2$

$C_{20}=12+672c_s^2v_2^2-78\omega_6^2c_s^2+144c_s^4+10\omega_6^3v_2^2-1008\omega_6c_s^2v_2^2-216\omega_6c_s^4-18\omega_6-98\omega_6^2v_2^2-\omega_6^3+144v_2^4+6\omega_6^3c_s^2-34\omega_6^3c_s^2v_2^2+8\omega_6^2-216\omega_6v_2^4+90\omega_6^2v_2^4-156v_2^2-5\omega_6^3c_s^4+234\omega_6v_2^2+82\omega_6^2c_s^4-132c_s^2-9\omega_6^3v_2^4+404\omega_6^2c_s^2v_2^2+198\omega_6c_s^2$

$C_{21}=12+432c_s^2v_2^2-22\omega_6^2c_s^2+24c_s^4+14\omega_6^3v_2^2-648\omega_6c_s^2v_2^2-36\omega_6c_s^4-18\omega_6-154\omega_6^2v_2^2-\omega_6^3+504v_2^4+2\omega_6^3c_s^2-18\omega_6^3c_s^2v_2^2+8\omega_6^2-756\omega_6v_2^4+310\omega_6^2v_2^4-252v_2^2-\omega_6^3c_s^4+378\omega_6v_2^2+14\omega_6^2c_s^4-36c_s^2-29\omega_6^3v_2^4+252\omega_6^2c_s^2v_2^2+54\omega_6c_s^2$

2.3 MRT2

2.3.1 Definitions

Collision operator $\boldsymbol{C}$:

$$\boldsymbol{C}(\boldsymbol{f})=\mathbf{M}_2^{-1}\mathbf{S}\left(\boldsymbol{\mu}_2^{(eq)}-\mathbf{M}_2\boldsymbol{f}\right),$$

where

$$\mathbf{S}=\mathrm{diag}(\omega_1,\omega_2,\omega_3,\omega_4,\omega_5,\omega_6,\omega_7,\omega_8,\omega_9),$$

$\omega_1,\omega_2,\ldots,\omega_9\in(0,2)$.

Matrix $\mathbf{M}_2$ corresponds to the transformation matrix to the raw moment basis defined by

$$\boldsymbol{\mu}_2 = \begin{pmatrix} m_{(0,0)} \\ m_{(1,0)} \\ m_{(0,1)} \\ m_{(1,1)} \\ m_{(2,0)} + m_{(0,2)} \\ m_{(2,0)} - m_{(0,2)} \\ m_{(2,1)} \\ m_{(1,2)} \\ m_{(2,2)} \end{pmatrix},$$

and is given by

$$\mathbf{M}_2 = \begin{pmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & -1 & 0 & 1 & 1 & -1 & -1 \\ 0 & 0 & 1 & 0 & -1 & 1 & -1 & 1 & -1 \\ 0 & 0 & 0 & 0 & 0 & 1 & -1 & -1 & 1 \\ 0 & 1 & 1 & 1 & 1 & 2 & 2 & 2 & 2 \\ 0 & 1 & -1 & 1 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & -1 & 1 & -1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 1 & -1 & -1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \end{pmatrix}.$$

The equilibrium moments $\boldsymbol{\mu}_2^{(eq)}$ are defined by

$$\boldsymbol{\mu}_2^{(eq)} = \mathbf{M}_2 \mathbf{M}^{-1} \boldsymbol{\mu}^{(eq)},$$

i.e.,

$$\boldsymbol{\mu}_2^{(eq)} = \begin{pmatrix} \rho \\ \rho v_1 \\ \rho v_2 \\ \rho v_1 v_2 \\ \rho(v_2^2 + v_1^2 + 2c_s^2) \\ \rho(v_1^2 - v_2^2) \\ \rho v_2(v_1^2 + c_s^2) \\ \rho v_1(v_2^2 + c_s^2) \\ \rho(v_1^2 v_2^2 + c_s^2 v_2^2 + c_s^2 v_1^2 + c_s^4) \end{pmatrix}.$$

2.3.2 Conservation of mass: ρ

attached text file: `output_d2q9_nse_mrt2_symbolic_pde_00.txt`

$$\frac{\partial \rho}{\partial t} + \frac{v_1 \delta_l}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{\rho \delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{v_2 \delta_l}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{\rho \delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-1 + 3c_s^2 + v_1^2)\frac{v_1 \delta_l^3}{12\delta_t}\frac{\partial^3 \rho}{\partial x_1^3} + (-1 + c_s^2 + 3v_1^2)\frac{\rho \delta_l^3}{12\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} - \frac{\rho c_s^2 \delta_l^3}{6\delta_t}\frac{\partial^3 v_2}{\partial x_1^2 \partial x_2} - \frac{\rho c_s^2 \delta_l^3}{6\delta_t}\frac{\partial^3 v_1}{\partial x_1 \partial x_2^2} + (-1 + 3c_s^2 + v_2^2)\frac{v_2 \delta_l^3}{12\delta_t}\frac{\partial^3 \rho}{\partial x_2^3} + (-1 + c_s^2 + 3v_2^2)\frac{\rho \delta_l^3}{12\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} + (-c_s^4\omega_5 + 24v_1^2 c_s^2 - 2c_s^2 + 3v_1^2\omega_5 + 6v_1^4 + 2c_s^4 + c_s^2\omega_5 - 6v_1^2 - 12v_1^2 c_s^2\omega_5 - 3v_1^4\omega_5)\frac{\delta_l^4}{24\delta_t\omega_5}\frac{\partial^4 \rho}{\partial x_1^4} + (-4 + 6c_s^2 - 5v_1^2\omega_5 - 3c_s^2\omega_5 + 10v_1^2 + 2\omega_5)\frac{\rho v_1 \delta_l^4}{12\delta_t\omega_5}\frac{\partial^4 v_1}{\partial x_1^4} + (v_1^2\omega_7 - \omega_7 - v_1^2\omega_5 - 3c_s^2\omega_5 + \omega_5 + 3c_s^2\omega_7)\frac{v_2 v_1 \delta_l^4}{4\delta_t\omega_7\omega_5}\frac{\partial^4 \rho}{\partial x_1^3 \partial x_2} + (3v_1^2\omega_7 - \omega_7 - 3v_1^2\omega_5 - c_s^2\omega_5 + \omega_5 + c_s^2\omega_7)\frac{\rho v_2 \delta_l^4}{4\delta_t\omega_7\omega_5}\frac{\partial^4 v_1}{\partial x_1^3 \partial x_2} + (3c_s^2\omega_7\omega_4 - 3c_s^2\omega_4\omega_5 - 6c_s^2\omega_7\omega_5 - \omega_7\omega_4 - 3v_1^2\omega_4\omega_5 +$$

$$v_1^2\omega_7\omega_4 + 3\omega_4\omega_5 + v_1^2\omega_7\omega_4\omega_5 - \omega_7\omega_4\omega_5 + 3c_s^2\omega_7\omega_4\omega_5)\frac{\rho v_1\delta_l^4}{12\delta_t\omega_7\omega_4\omega_5}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} + (-2+\omega_4)\frac{c_s^4\delta_l^4}{6\delta_t\omega_4}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2} +$$
$$(-\omega_7+\omega_4)\frac{\rho v_1 c_s^2\delta_l^4}{2\delta_t\omega_7\omega_4}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} + (\omega_4-\omega_8)\frac{\rho v_2 c_s^2\delta_l^4}{2\delta_t\omega_4\omega_8}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2} + (\omega_6 + 3c_s^2\omega_8 - 3\omega_6 c_s^2 - \omega_6 v_2^2 - \omega_8 + v_2^2\omega_8)\frac{v_2 v_1\delta_l^4}{4\omega_6\delta_t\omega_8}\frac{\partial^4\rho}{\partial x_1\partial x_2^3}$$
$$+ (-3\omega_6 c_s^2\omega_4 - \omega_4\omega_8 + 3\omega_6 c_s^2\omega_4\omega_8 + \omega_6 v_2^2\omega_4\omega_8 + 3\omega_6\omega_4 - 6\omega_6 c_s^2\omega_8 - 3\omega_6 v_2^2\omega_4 - \omega_6\omega_4\omega_8 + v_2^2\omega_4\omega_8 +$$
$$3c_s^2\omega_4\omega_8)\frac{\rho v_2\delta_l^4}{12\omega_6\delta_t\omega_4\omega_8}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} + (\omega_6 + c_s^2\omega_8 - \omega_6 c_s^2 - 3\omega_6 v_2^2 - \omega_8 + 3v_2^2\omega_8)\frac{\rho v_1\delta_l^4}{4\omega_6\delta_t\omega_8}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3} +$$
$$(-2c_s^2 + 24v_2^2c_s^2 + 6v_2^4 + \omega_6 c_s^2 - 3\omega_6 v_2^4 - 6v_2^2 + 2c_s^4 - 12\omega_6 v_2^2 c_s^2 + 3\omega_6 v_2^2 - \omega_6 c_s^4)\frac{\delta_l^4}{24\omega_6\delta_t}\frac{\partial^4\rho}{\partial x_2^4} +$$
$$(-4 + 2\omega_6 + 6c_s^2 - 3\omega_6 c_s^2 + 10v_2^2 - 5\omega_6 v_2^2)\frac{\rho v_2\delta_l^4}{12\omega_6\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0.$$

2.3.3 Conservation of momentum: ρv_1

attached text file: `output_d2q9_nse_mrt2_symbolic_pde_01.txt`

$$v_1\frac{\partial\rho}{\partial t} + \rho\frac{\partial v_1}{\partial t} + (c_s^2 + v_1^2)\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_1} + \frac{2\rho v_1\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{v_2 v_1\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_2} + \frac{\rho v_2\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_2} + \frac{\rho v_1\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} +$$
$$(-2 + 4c_s^2 - 3v_1^2\omega_5 - 2c_s^2\omega_5 + 6v_1^2 + \omega_5)\frac{\delta_l^2}{\delta_t\omega_5}\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_1} + (2-\omega_5)\frac{3\rho v_1\delta_l^2}{\delta_t\omega_5}\left(\frac{\partial v_1}{\partial x_1}\right)^2 + (-2+\omega_4)\frac{c_s^2\delta_l^2}{2\delta_t\omega_4}\frac{\partial\rho}{\partial x_2}\frac{\partial v_2}{\partial x_1} +$$
$$(-2+\omega_4)\frac{c_s^2\delta_l^2}{2\delta_t\omega_4}\frac{\partial\rho}{\partial x_2}\frac{\partial v_1}{\partial x_2} + (-2 + 6c_s^2 - v_1^2\omega_5 - 3c_s^2\omega_5 + 2v_1^2 + \omega_5)\frac{v_1\delta_l^2}{2\delta_t\omega_5}\frac{\partial^2\rho}{\partial x_1^2} +$$
$$(-2 + 2c_s^2 - 3v_1^2\omega_5 - c_s^2\omega_5 + 6v_1^2 + \omega_5)\frac{\rho\delta_l^2}{2\delta_t\omega_5}\frac{\partial^2 v_1}{\partial x_1^2} + (-2+\omega_4)\frac{\rho c_s^2\delta_l^2}{2\delta_t\omega_4}\frac{\partial^2 v_2}{\partial x_1\partial x_2} + (-2+\omega_4)\frac{\rho c_s^2\delta_l^2}{2\delta_t\omega_4}\frac{\partial^2 v_1}{\partial x_2^2} + C_1\frac{\delta_l^3}{12\delta_t\omega_5^2}\frac{\partial^3\rho}{\partial x_1^3}$$
$$+ (-24 + 11v_1^2\omega_5^2 + 36c_s^2 - 4\omega_5^2 - 60v_1^2\omega_5 - 36c_s^2\omega_5 + 60v_1^2 + 24\omega_5 + 5c_s^2\omega_5^2)\frac{\rho v_1\delta_l^3}{6\delta_t\omega_5^2}\frac{\partial^3 v_1}{\partial x_1^3} + C_2\frac{v_2 v_1\delta_l^3}{\delta_t\omega_7\omega_4\omega_5^2}\frac{\partial^3\rho}{\partial x_1^2\partial x_2} +$$
$$C_3\frac{\rho v_2\delta_l^3}{\delta_t\omega_7\omega_4\omega_5^2}\frac{\partial^3 v_1}{\partial x_1^2\partial x_2} + C_4\frac{\rho v_1\delta_l^3}{12\delta_t\omega_7\omega_4^2\omega_5^2}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2} + (-12 - \omega_4^2 + 12\omega_4)\frac{c_s^4\delta_l^3}{6\delta_t\omega_4^2}\frac{\partial^3\rho}{\partial x_1\partial x_2^2} +$$
$$(-\omega_7\omega_4^2\omega_5 + 12\omega_4^2 - 12\omega_4^2\omega_5 - 12\omega_7\omega_4 + 12\omega_4\omega_5 - 12\omega_7\omega_5 + 12\omega_7\omega_4\omega_5)\frac{\rho v_1 c_s^2\delta_l^3}{6\delta_t\omega_7\omega_4^2\omega_5}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2} +$$
$$(-\omega_4^2 + \omega_4\omega_8 + 2\omega_4 - 2\omega_8)\frac{\rho v_2 c_s^2\delta_l^3}{\delta_t\omega_4^2\omega_8}\frac{\partial^3 v_2}{\partial x_1\partial x_2^2} + C_5\frac{v_2 v_1\delta_l^3}{12\omega_6\delta_t\omega_4\omega_8}\frac{\partial^3\rho}{\partial x_2^3} + C_6\frac{\rho v_2\delta_l^3}{6\delta_t\omega_4^2\omega_8}\frac{\partial^3 v_1}{\partial x_2^3} + C_7\frac{\rho v_1\delta_l^3}{12\omega_6\delta_t\omega_4\omega_8}\frac{\partial^3 v_2}{\partial x_2^3} +$$
$$C_8\frac{v_1\delta_l^4}{12\delta_t\omega_5^3}\frac{\partial^4\rho}{\partial x_1^4} + C_9\frac{\rho\delta_l^4}{12\delta_t\omega_5^3}\frac{\partial^4 v_1}{\partial x_1^4} + C_{10}\frac{v_2\delta_l^4}{4\delta_t\omega_7^2\omega_4^2\omega_5^3}\frac{\partial^4\rho}{\partial x_1^3\partial x_2} + C_{11}\frac{\rho v_2 v_1\delta_l^4}{4\delta_t\omega_7^2\omega_4^2\omega_5^3}\frac{\partial^4 v_1}{\partial x_1^3\partial x_2} + C_{12}\frac{\rho\delta_l^4}{12\delta_t\omega_7^2\omega_4^3\omega_5^3}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} +$$
$$C_{13}\frac{v_1\delta_l^4}{12\omega_9\delta_t\omega_7^2\omega_4^3\omega_8\omega_5^3}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2} + C_{14}\frac{\rho\delta_l^4}{12\omega_9\delta_t\omega_7^2\omega_4^3\omega_8\omega_5^3}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} + C_{15}\frac{\rho v_2 v_1\delta_l^4}{2\omega_9\omega_6\delta_t\omega_7^2\omega_4^3\omega_8^2\omega_5^3}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2} +$$
$$C_{16}\frac{v_2\delta_l^4}{12\omega_9\omega_6^2\delta_t\omega_7\omega_4^3\omega_8^2\omega_5}\frac{\partial^4\rho}{\partial x_1\partial x_2^3} + C_{17}\frac{\rho v_2 v_1\delta_l^4}{12\omega_9\omega_6^2\delta_t\omega_7^2\omega_4^3\omega_8^2\omega_5^2}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} + C_{18}\frac{\rho\delta_l^4}{12\omega_9\omega_6^2\delta_t\omega_7\omega_4^3\omega_8^2\omega_5}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3} + C_{19}\frac{v_1\delta_l^4}{24\omega_6^2\delta_t\omega_4^2\omega_8^2}\frac{\partial^4\rho}{\partial x_2^4}$$
$$+ C_{20}\frac{\rho\delta_l^4}{24\delta_t\omega_4^3\omega_8^2}\frac{\partial^4 v_1}{\partial x_2^4} + C_{21}\frac{\rho v_2 v_1\delta_l^4}{12\omega_6^2\delta_t\omega_4^2\omega_8^2}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$$C_1 = -12c_s^4\omega_5 + 144v_1^2c_s^2 - 7v_1^2\omega_5^2 - 12c_s^2 + 36v_1^2\omega_5 + c_s^4\omega_5^2 + 36v_1^4 + 12c_s^4 + 12c_s^2\omega_5 - 36v_1^2 - 144v_1^2c_s^2\omega_5 + 7v_1^4\omega_5^2 - 36v_1^4\omega_5 + 24v_1^2c_s^2\omega_5^2 - c_s^2\omega_5^2$$

$$C_2 = -v_1^2\omega_5^2 + 3c_s^2\omega_7\omega_4 - 3c_s^2\omega_4\omega_5 + 3c_s^2\omega_7\omega_5 + 3c_s^2\omega_4\omega_5^2 + \omega_5^2 - \omega_7\omega_4 - v_1^2\omega_4\omega_5 + v_1^2\omega_7\omega_4 + \omega_4\omega_5 - \omega_4\omega_5^2 - \omega_7\omega_5 - 3c_s^2\omega_5^2 + v_1^2\omega_7\omega_5 - v_1^2\omega_7\omega_4\omega_5 + v_1^2\omega_4\omega_5^2 + \omega_7\omega_4\omega_5 - 3c_s^2\omega_7\omega_4\omega_5$$

$$C_3 = -3v_1^2\omega_5^2 + c_s^2\omega_7\omega_4 - c_s^2\omega_4\omega_5 + c_s^2\omega_7\omega_5 + c_s^2\omega_4\omega_5^2 + \omega_5^2 - \omega_7\omega_4 - 3v_1^2\omega_4\omega_5 + 3v_1^2\omega_7\omega_4 + \omega_4\omega_5 - \omega_4\omega_5^2 - \omega_7\omega_5 - c_s^2\omega_5^2 + 3v_1^2\omega_7\omega_5 - 3v_1^2\omega_7\omega_4\omega_5 + 3v_1^2\omega_4\omega_5^2 + \omega_7\omega_4\omega_5 - c_s^2\omega_7\omega_4\omega_5$$

$$C_4 = 6\omega_7\omega_4^2\omega_5 - 18c_s^2\omega_7\omega_4^2\omega_5 - 12\omega_4^2\omega_5^2 - 24c_s^2\omega_7\omega_5^2 - 6v_1^2\omega_7\omega_4^2\omega_5 + 12v_1^2\omega_4^2\omega_5^2 - 3v_1^2\omega_7\omega_4^2\omega_5^2 - 12v_1^2\omega_4^2\omega_5 - 12c_s^2\omega_4\omega_5^2 + 36c_s^2\omega_7\omega_4^2 + 12\omega_4^2\omega_5 - 11c_s^2\omega_7\omega_4^2\omega_5^2 + 3\omega_7\omega_4^2\omega_5^2 + 42c_s^2\omega_7\omega_4\omega_5^2 - 6\omega_7\omega_4\omega_5^2 + 12c_s^2\omega_4^2\omega_5^2 + 6v_1^2\omega_7\omega_4\omega_5^2 + 12v_1^2\omega_7\omega_4^2 + 12\omega_4\omega_5^2 - 12c_s^2\omega_4^2\omega_5 - 12\omega_7\omega_4^2 - 12v_1^2\omega_4\omega_5^2 - 24c_s^2\omega_7\omega_4\omega_5$$

$$C_5 = 18\omega_6c_s^2\omega_4 + 12\omega_6 + 6\omega_4\omega_8 + 36c_s^2\omega_8 - 36\omega_6c_s^2 + 3\omega_6c_s^2\omega_4\omega_8 + \omega_6v_2^2\omega_4\omega_8 - 6\omega_6\omega_4 + 6\omega_6v_2^2\omega_4 - \omega_6\omega_4\omega_8 - 12\omega_6v_2^2 - 12\omega_8 - 6v_2^2\omega_4\omega_8 - 18c_s^2\omega_4\omega_8 + 12v_2^2\omega_8$$

$$C_6 = -3c_s^2\omega_4^2\omega_8 - v_2^2\omega_4^2\omega_8 + 3v_2^2\omega_4^2 - 3\omega_4^2 - 6v_2^2\omega_4 - 3\omega_4\omega_8 - 12c_s^2\omega_8 + 6\omega_4 + \omega_4^2\omega_8 + 3c_s^2\omega_4^2 - 6c_s^2\omega_4 + 3v_2^2\omega_4\omega_8 + 15c_s^2\omega_4\omega_8$$

$$C_7 = 6\omega_6c_s^2\omega_4 + 12\omega_6 + 6\omega_4\omega_8 + 12c_s^2\omega_8 - 12\omega_6c_s^2 + \omega_6c_s^2\omega_4\omega_8 + 3\omega_6v_2^2\omega_4\omega_8 - 6\omega_6\omega_4 + 18\omega_6v_2^2\omega_4 - \omega_6\omega_4\omega_8 - 36\omega_6v_2^2 - 12\omega_8 - 18v_2^2\omega_4\omega_8 - 6c_s^2\omega_4\omega_8 + 36v_2^2\omega_8$$

$$C_8 = 12 - 216c_s^4\omega_5 + 672v_1^2c_s^2 - 98v_1^2\omega_5^2 + 10v_1^2\omega_5^3 - 132c_s^2 + 8\omega_5^2 - 5c_s^4\omega_5^3 + 234v_1^2\omega_5 + 82c_s^4\omega_5^2 + 144v_1^4 - \omega_5^3 + 144c_s^4 - 9v_1^4\omega_5^3 + 198c_s^2\omega_5 - 156v_1^2 - 1008v_1^2c_s^2\omega_5 + 90v_1^4\omega_5^2 - 18\omega_5 - 216v_1^4\omega_5 + 404v_1^2c_s^2\omega_5^2 - 78c_s^2\omega_5^2 - 34v_1^2c_s^2\omega_5^3 + 6c_s^2\omega_5^3$$

$$C_9 = 12 - 36c_s^4\omega_5 + 432v_1^2c_s^2 - 154v_1^2\omega_5^2 + 14v_1^2\omega_5^3 - 36c_s^2 + 8\omega_5^2 - c_s^4\omega_5^3 + 378v_1^2\omega_5 + 14c_s^4\omega_5^2 + 504v_1^4 - \omega_5^3 + 24c_s^4 - 29v_1^4\omega_5^3 + 54c_s^2\omega_5 - 252v_1^2 - 648v_1^2c_s^2\omega_5 + 310v_1^4\omega_5^2 - 18\omega_5 - 756v_1^4\omega_5 + 252v_1^2c_s^2\omega_5^2 - 22c_s^2\omega_5^2 - 18v_1^2c_s^2\omega_5^3 + 2c_s^2\omega_5^3$$

$$C_{10} = 8v_1^4\omega_7^2\omega_5^2 + 120v_1^2c_s^2\omega_7\omega_4^2\omega_5^2 + 20v_1^4\omega_7\omega_4\omega_5^3 + 13v_1^4\omega_7^2\omega_4^2\omega_5^2 - 20v_1^2\omega_7^2\omega_4\omega_5 - 4v_1^2\omega_4^2\omega_5^3 + 4c_s^2\omega_7\omega_4^2\omega_5 + 4c_s^2\omega_7\omega_5^3 - 16v_1^4\omega_7\omega_4\omega_5^2 - 24v_1^2\omega_7^2\omega_4^2 - 4c_s^4\omega_4\omega_5^3 + 8c_s^4\omega_7\omega_4\omega_5^3 - 36v_1^2c_s^2\omega_7\omega_5^3 - 51v_1^2c_s^2\omega_7\omega_4^2\omega_5^3 - 84v_1^2c_s^2\omega_7^2\omega_4\omega_5^2 + 4c_s^4\omega_7^2\omega_4^2\omega_5^2 - 4c_s^2\omega_7^2\omega_4\omega_5 + 20v_1^2\omega_7\omega_4^2\omega_5 + 4v_1^2\omega_4^2\omega_5^2 + 8c_s^2\omega_7^2\omega_4\omega_5^2 - 8v_1^2\omega_7^2\omega_5^2 + 4c_s^2\omega_7\omega_4^2\omega_5^3 - 32v_1^2\omega_7\omega_4^2\omega_5^2 + 4v_1^4\omega_4^2\omega_5^3 - 24v_1^2c_s^2\omega_4\omega_5^3 - 4c_s^4\omega_7\omega_5^3 - 12c_s^4\omega_7^2\omega_4^2\omega_5 + 72v_1^2c_s^2\omega_7^2\omega_4\omega_5 + 24v_1^4\omega_7^2\omega_4^2 + 4c_s^2\omega_4\omega_5^3 + 20v_1^2\omega_7^2\omega_4\omega_5^2 + 13v_1^2\omega_7\omega_4^2\omega_5^3 - 8c_s^2\omega_7\omega_4^2\omega_5^2 - 72v_1^2c_s^2\omega_7\omega_4^2\omega_5 - 36v_1^4\omega_7^2\omega_4^2\omega_5 - 4v_1^4\omega_4^2\omega_5^2 - 20v_1^2\omega_7\omega_4\omega_5^3 + 96v_1^2c_s^2\omega_7^2\omega_4^2 - 13v_1^2\omega_7^2\omega_4^2\omega_5^2 - 4c_s^2\omega_4^2\omega_5^3 + 8v_1^2\omega_7\omega_5^3 - 4c_s^4\omega_7\omega_4^2\omega_5 + 4c_s^4\omega_7^2\omega_5^2 + 20v_1^4\omega_7^2\omega_4\omega_5 - 24v_1^2c_s^2\omega_4^2\omega_5^2 - 8c_s^2\omega_7\omega_4\omega_5^3 - 4c_s^2\omega_7^2\omega_4^2\omega_5^2 + 4c_s^2\omega_4^2\omega_5^2 + 16v_1^2\omega_7\omega_4\omega_5^2 + 24v_1^2c_s^2\omega_4^2\omega_5^3 - 20v_1^4\omega_7\omega_4^2\omega_5 - 4v_1^4\omega_4\omega_5^3 - 8c_s^2\omega_7^2\omega_4^2 + 4c_s^4\omega_7^2\omega_4\omega_5 - 144v_1^2c_s^2\omega_7^2\omega_4^2\omega_5 + 32v_1^4\omega_7\omega_4^2\omega_5^2 + 4c_s^4\omega_4^2\omega_5^3 - 8v_1^4\omega_7\omega_5^3 + 51v_1^2c_s^2\omega_7^2\omega_4^2\omega_5^2 - 8c_s^4\omega_7^2\omega_4\omega_5^2 - 4c_s^4\omega_7\omega_4^2\omega_5^3 + 84v_1^2c_s^2\omega_7\omega_4\omega_5^3 + 12c_s^2\omega_7^2\omega_4^2\omega_5 - 4c_s^2\omega_7^2\omega_5^2 - 48v_1^2c_s^2\omega_7\omega_4\omega_5^2 + 36v_1^2c_s^2\omega_7^2\omega_5^2 + 8c_s^4\omega_7\omega_4^2\omega_5^2 - 20v_1^4\omega_7^2\omega_4\omega_5^2 - 4c_s^4\omega_4^2\omega_5^2 - 13v_1^4\omega_7\omega_4^2\omega_5^3 + 4v_1^2\omega_4\omega_5^3 + 8c_s^4\omega_7^2\omega_4^2 + 36v_1^2\omega_7^2\omega_4^2\omega_5$$

$$C_{11} = 24\omega_7\omega_4^2\omega_5 - 8\omega_4^2\omega_5^3 + 64v_1^2\omega_7^2\omega_4\omega_5 + 16v_1^2\omega_4^2\omega_5^3 - 32c_s^2\omega_7\omega_4^2\omega_5 - 20c_s^2\omega_7\omega_5^3 + 8\omega_4^2\omega_5^2 + 80v_1^2\omega_7^2\omega_4^2 - 24\omega_7^2\omega_4\omega_5 + 32c_s^2\omega_7^2\omega_4\omega_5 - 64v_1^2\omega_7\omega_4^2\omega_5 - 16v_1^2\omega_4^2\omega_5^2 - 32\omega_7^2\omega_4^2 - 44c_s^2\omega_7^2\omega_4\omega_5^2 + 28v_1^2\omega_7^2\omega_5^2 - 25c_s^2\omega_7\omega_4^2\omega_5^3 + 104v_1^2\omega_7\omega_4^2\omega_5^2 + 17\omega_7\omega_4^2\omega_5^3 + 28\omega_7^2\omega_4\omega_5^2 - 12\omega_7^2\omega_5^2 - 16c_s^2\omega_4\omega_5^3 - 68v_1^2\omega_7^2\omega_4\omega_5^2 - 43v_1^2\omega_7\omega_4^2\omega_5^3 + 56c_s^2\omega_7\omega_4^2\omega_5^2 - 40\omega_7\omega_4^2\omega_5^2 + 68v_1^2\omega_7\omega_4\omega_5^3 + 43v_1^2\omega_7^2\omega_4^2\omega_5^2 + 16c_s^2\omega_4^2\omega_5^3 - 16c_s^2\omega_7\omega_4\omega_5^2 - 28v_1^2\omega_7\omega_5^3 + 12\omega_7\omega_5^3 + 16\omega_7\omega_4\omega_5^2 + 44c_s^2\omega_7\omega_4\omega_5^3 + 25c_s^2\omega_7^2\omega_4^2\omega_5^2 - 16c_s^2\omega_4^2\omega_5^2 - 48v_1^2\omega_7\omega_4\omega_5^2 - 17\omega_7^2\omega_4^2\omega_5^2 + 48c_s^2\omega_7^2\omega_4^2 - 28\omega_7\omega_4\omega_5^3 + 48\omega_7^2\omega_4^2\omega_5 - 72c_s^2\omega_7^2\omega_4^2\omega_5 + 20c_s^2\omega_7^2\omega_5^2 + 8\omega_4\omega_5^3 - 16v_1^2\omega_4\omega_5^3 - 120v_1^2\omega_7^2\omega_4^2\omega_5$$

$$C_{12} = 13c_s^4\omega_7^2\omega_4^2\omega_5^3 + 102v_1^2c_s^2\omega_7^2\omega_4\omega_5^3 - 12c_s^4\omega_7^2\omega_4^3\omega_5 - 12v_1^2c_s^2\omega_7\omega_4^2\omega_5^2 - 72v_1^2\omega_7^2\omega_4^3 - 24v_1^4\omega_7\omega_4\omega_5^3 + 12v_1^4\omega_4^3\omega_5^3 + 12v_1^4\omega_7^2\omega_4^2\omega_5^2 - 60v_1^2\omega_7\omega_4^3\omega_5^2 + 12v_1^2\omega_4^2\omega_5^3 - 6c_s^2\omega_7\omega_4^3\omega_5^3 - 18v_1^4\omega_7^2\omega_4^2\omega_5^3 - 12v_1^4\omega_4^3\omega_5^2 - 90v_1^4\omega_7^2\omega_4^3\omega_5 + 12c_s^4\omega_7\omega_4\omega_5^3 + 30v_1^2c_s^2\omega_7\omega_4^2\omega_5^3 - 48v_1^2c_s^2\omega_7^2\omega_4\omega_5^2 + 6c_s^4\omega_7^2\omega_4^2\omega_5^2 - 36v_1^2c_s^2\omega_7\omega_4^3\omega_5 + 6c_s^2\omega_7\omega_4^3\omega_5^2 + 27v_1^2\omega_7\omega_4^3\omega_5^3 + 18c_s^2\omega_7\omega_4^2\omega_5^3 + 24v_1^2\omega_7\omega_4^2\omega_5^2 - 12v_1^2\omega_4^3\omega_5^3 + 72v_1^4\omega_7^2\omega_4^3 - 12v_1^2\omega_7^2\omega_4\omega_5^3 - 12v_1^4\omega_4^2\omega_5^3 + 19v_1^4\omega_7^2\omega_4^3\omega_5^2 - c_s^4\omega_7^2\omega_4^3\omega_5^3 + 54v_1^2c_s^2\omega_7\omega_4^3\omega_5^2 - 12c_s^4\omega_7^2\omega_4^2\omega_5 + 36v_1^2\omega_7\omega_4^3\omega_5 + 12v_1^2\omega_4^3\omega_5^2 - 48v_1^2\omega_7\omega_4^2\omega_5^3 - 12c_s^2\omega_7\omega_4^2\omega_5^2 + 6c_s^2\omega_7^2\omega_4\omega_5^3 - 21v_1^2c_s^2\omega_7\omega_4^3\omega_5^3 + c_s^4\omega_7^2\omega_4^3\omega_5^2 + 4v_1^4\omega_7^2\omega_4^3\omega_5^3 + 24v_1^2\omega_7\omega_4\omega_5^3 - 12v_1^2\omega_7^2\omega_4^2\omega_5^2 - 5c_s^2\omega_7^2\omega_4^2\omega_5^3 + 12c_s^2\omega_7^2\omega_4^3\omega_5 + 60v_1^2c_s^2\omega_7^2\omega_4^3\omega_5^2 + 6c_s^4\omega_7\omega_4^3\omega_5^3 - 12c_s^2\omega_7^2\omega_4^3 + 60v_1^4\omega_7\omega_4^3\omega_5^2 - 12c_s^2\omega_7\omega_4\omega_5^3 - 6c_s^2\omega_7^2\omega_4^2\omega_5^2 + 18v_1^2\omega_7^2\omega_4^2\omega_5^3 + 90v_1^2\omega_7^2\omega_4^3\omega_5 + 252v_1^2c_s^2\omega_7^2\omega_4^3 - 12v_1^2c_s^2\omega_4^2\omega_5^3 - 27v_1^4\omega_7\omega_4^3\omega_5^3 - 108v_1^2c_s^2\omega_7^2\omega_4^2\omega_5 - 6c_s^4\omega_7\omega_4^3\omega_5^2 + 12v_1^2c_s^2\omega_7^2\omega_4^3\omega_5^3 + 12c_s^4\omega_7^2\omega_5^3 - 24v_1^4\omega_7\omega_4^2\omega_5^2 + 12v_1^4\omega_7^2\omega_4\omega_5^3 - 12v_1^2c_s^2\omega_4^3\omega_5^2 + 162v_1^2c_s^2\omega_7^2\omega_4^2\omega_5^2 - 18c_s^4\omega_7\omega_4^2\omega_5^3 - 48v_1^2c_s^2\omega_7^2\omega_5^3 - 12v_1^2c_s^2\omega_7\omega_4\omega_5^3 + 12c_s^2\omega_7^2\omega_4^2\omega_5 + 12c_s^4\omega_7^2\omega_4^3 - 19v_1^2\omega_7^2\omega_4^3\omega_5^2 + 12c_s^4\omega_7\omega_4^2\omega_5^2 - 306v_1^2c_s^2\omega_7^2\omega_4^3\omega_5 - 24c_s^4\omega_7^2\omega_4\omega_5^3 - 81v_1^2c_s^2\omega_7^2\omega_4^2\omega_5^3 - 36v_1^4\omega_7\omega_4^3\omega_5 + 12v_1^2c_s^2\omega_4^3\omega_5^3 + 48v_1^4\omega_7\omega_4^2\omega_5^3 - 4v_1^2\omega_7^2\omega_4^3\omega_5^3 - c_s^2\omega_7^2\omega_4^3\omega_5^2$$

$$C_{13} = 36c_s^4\omega_7^2\omega_4^2\omega_5^3 + 36\omega_9v_2^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 - 12\omega_9v_1^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 - 36\omega_9c_s^4\omega_7^2\omega_4^3\omega_8\omega_5 - 24\omega_9v_2^2\omega_7^2\omega_4\omega_8\omega_5^2 + 36\omega_9v_2^2c_s^2\omega_7^2\omega_4^3\omega_8 - 6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 - 6v_2^2v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 84\omega_9c_s^4\omega_7^2\omega_4\omega_8\omega_5^2 - 12\omega_9v_1^2c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 + 12\omega_9c_s^4\omega_4^2\omega_8\omega_5^3 + 12v_2^2v_1^2\omega_7\omega_4^2\omega_8\omega_5^3 + 18\omega_9v_2^2\omega_7^2\omega_4^3\omega_8\omega_5 - 72\omega_9v_2^2c_s^2\omega_7\omega_4\omega_8\omega_5^3 - 36\omega_9c_s^4\omega_7^2\omega_4^2\omega_5^2 + 12\omega_9c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 12\omega_9v_2^2\omega_4^3\omega_8\omega_5^2 - 6v_2^2\omega_7^2\omega_4^3\omega_8\omega_5^3 - 12\omega_9v_1^2c_s^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 + 12\omega_9c_s^2\omega_4^3\omega_8\omega_5^2 + 18c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^3 + 24\omega_9v_2^2v_1^2\omega_7\omega_4^3\omega_8\omega_5^2 + 180\omega_9c_s^4\omega_7^2\omega_4\omega_8\omega_5^3 + 6v_2^2v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^3 + 12\omega_9v_1^2c_s^2\omega_7^2\omega_4\omega_8\omega_5^3 + 12\omega_9v_2^2v_1^2\omega_7^2\omega_4^3\omega_8 + 6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 - 36\omega_9v_2^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 - 12\omega_9c_s^2\omega_4^3\omega_8\omega_5^3 - 24\omega_9v_2^2v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 36c_s^4\omega_7\omega_4^2\omega_8\omega_5^3 - 12\omega_9v_2^2v_1^2\omega_7\omega_4^3\omega_8\omega_5^3 - 18c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9c_s^2\omega_7^2\omega_4\omega_8\omega_5^3 + 6v_2^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9v_1^2c_s^2\omega_4^3\omega_8\omega_5^3 - 12v_2^2\omega_7\omega_4^2\omega_8\omega_5^3 - 12\omega_9v_2^2\omega_4^3\omega_8\omega_5^3 + 12\omega_9v_2^2v_1^2\omega_7^2\omega_4^2\omega_8\omega_5 + 12\omega_9v_2^2v_1^2\omega_4^3\omega_8\omega_5^3 - 24\omega_9v_2^2v_1^2\omega_7\omega_4\omega_8\omega_5^3 - 12v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^3 + 36v_2^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 - 18v_2^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 36\omega_9v_2^2c_s^2\omega_4^3\omega_8\omega_5^2 - \omega_9c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 + 12\omega_9v_2^2\omega_7\omega_4^2\omega_8\omega_5^2 + 18\omega_9c_s^4\omega_7^2\omega_4^3\omega_5^2 - 12\omega_9c_s^2\omega_7^2\omega_4^3\omega_8 + 72\omega_9v_2^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 12\omega_9v_2^2\omega_7^2\omega_4^3\omega_8 + \omega_9v_1^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 + 5\omega_9c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^3 - 18c_s^4\omega_7^2\omega_4^3\omega_5^3 + 12\omega_9v_1^2c_s^2\omega_7^2\omega_4^3\omega_8 + 2\omega_9c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 36\omega_9v_2^2c_s^2\omega_4^3\omega_8\omega_5^3 - 18\omega_9c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 + 12v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 + 18v_2^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 - 12v_1^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 - 12\omega_9v_2^2v_1^2\omega_7\omega_4^3\omega_8\omega_5 - 12\omega_9v_2^2v_1^2\omega_4^3\omega_8\omega_5^2 + 18\omega_9v_1^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 - 42\omega_9c_s^4\omega_7\omega_4^2\omega_8\omega_5^3 - 36\omega_9v_2^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^3 - 2\omega_9v_1^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 6\omega_9c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 - 72\omega_9v_2^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 6\omega_9v_2^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 36\omega_9v_2^2\omega_7\omega_4^2\omega_8\omega_5^3 + 12\omega_9c_s^2\omega_7^2\omega_4^2\omega_5^2 + 36\omega_9v_2^2v_1^2\omega_7\omega_4^2\omega_8\omega_5^3 - 12v_2^2\omega_7^2\omega_4^2\omega_5^3 + 6\omega_9v_2^2v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9c_s^2\omega_4^2\omega_8\omega_5^3 - 36c_s^4\omega_7\omega_4^3\omega_8\omega_5^3 + 12\omega_9v_2^2\omega_4^2\omega_8\omega_5^3 + 12\omega_9c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 12\omega_9v_2^2\omega_7^2\omega_4^2\omega_5^2 - 12c_s^2\omega_7^2\omega_4^2\omega_5^3 + 12v_2^2\omega_7\omega_4^3\omega_8\omega_5^3 - 12\omega_9v_1^2c_s^2\omega_4^2\omega_8\omega_5^3 + 18\omega_9v_2^2c_s^2\omega_7^2\omega_4^3\omega_5^2 - 12\omega_9v_1^2c_s^2\omega_7^2\omega_4^2\omega_5^2 + 12c_s^2\omega_7\omega_4^3\omega_8\omega_5^3 + 12v_2^2v_1^2\omega_7\omega_4^3\omega_8\omega_5^2 + 12\omega_9v_2^2\omega_7\omega_4^3\omega_8\omega_5 + 12\omega_9c_s^4\omega_4^3\omega_8\omega_5^2 - 12v_2^2v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^3 + 12\omega_9c_s^4\omega_7\omega_4^3\omega_8\omega_5 - 12\omega_9v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 12v_2^2v_1^2\omega_7^2\omega_4^2\omega_5^3 - 12v_2^2\omega_7\omega_4^3\omega_8\omega_5^2 + 12v_2^2\omega_7^2\omega_4^2\omega_8\omega_5^3 - 36c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^3 - 12\omega_9v_2^2v_1^2\omega_7\omega_4^2\omega_8\omega_5^2 + 36c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 + 6\omega_9v_2^2v_1^2\omega_7^2\omega_4^3\omega_5^2 + 12\omega_9c_s^2\omega_7\omega_4\omega_8\omega_5^3 - 54\omega_9v_2^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 24\omega_9v_2^2\omega_7\omega_4\omega_8\omega_5^3 - 48\omega_9c_s^4\omega_7^2\omega_4^2\omega_8\omega_5 - 12\omega_9v_1^2c_s^2\omega_7\omega_4\omega_8\omega_5^3 - 12v_2^2v_1^2\omega_7\omega_4^3\omega_8\omega_5^3 + 12\omega_9c_s^4\omega_7\omega_4\omega_8\omega_5^3 - 12\omega_9v_2^2\omega_7^2\omega_4^2\omega_8\omega_5 - 12\omega_9c_s^4\omega_4^3\omega_8\omega_5^3 + 72\omega_9v_2^2c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 - 6v_1^2c_s^2\omega_7^2\omega_4^3\omega_5^3 - 12c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 + 36v_2^2c_s^2\omega_7^2\omega_4^2\omega_5^3 + 12c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 + 150\omega_9c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^2 + 18\omega_9v_1^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 18\omega_9v_2^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 30\omega_9c_s^4\omega_7\omega_4^3\omega_8\omega_5^3 - 6\omega_9v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^3 + 108\omega_9v_2^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 - 6v_2^2v_1^2\omega_7^2\omega_4^3\omega_5^3 + 12\omega_9v_2^2\omega_7\omega_4^3\omega_8\omega_5^3 + 24\omega_9v_2^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 36v_2^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 + 6c_s^2\omega_7^2\omega_4^3\omega_5^3 + 6v_1^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 - 6\omega_9v_2^2\omega_7^2\omega_4^3\omega_5^2 + 36v_2^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 36\omega_9v_2^2c_s^2\omega_7^2\omega_4^2\omega_5^2 + 6\omega_9c_s^2\omega_7\omega_4^3\omega_8\omega_5^3 + 6\omega_9v_1^2c_s^2\omega_7^2\omega_4^3\omega_5^2 - 36\omega_9v_2^2c_s^2\omega_4^2\omega_8\omega_5^3 - 18\omega_9c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 36\omega_9c_s^4\omega_7^2\omega_4^3\omega_8 + 6v_2^2\omega_7^2\omega_4^3\omega_5^3 - 6\omega_9c_s^2\omega_7^2\omega_4^3\omega_5^2 - 24\omega_9v_2^2\omega_7\omega_4^3\omega_8\omega_5^2 + 12v_1^2c_s^2\omega_7^2\omega_4^2\omega_5^3 - 18v_2^2c_s^2\omega_7^2\omega_4^3\omega_5^3 - 88\omega_9c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^3 - 12\omega_9v_1^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 - 36\omega_9v_2^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 - 42\omega_9c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 + 18\omega_9v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 12\omega_9v_2^2v_1^2\omega_4^2\omega_8\omega_5^3 - 18\omega_9v_2^2v_1^2\omega_7^2\omega_4^3\omega_8\omega_5 - 96\omega_9c_s^4\omega_7^2\omega_8\omega_5^3 - 12\omega_9v_2^2v_1^2\omega_7^2\omega_4^2\omega_5^2 - 18\omega_9c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 + 12\omega_9c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 - 6v_1^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 24\omega_9v_2^2v_1^2\omega_7^2\omega_4\omega_8\omega_5^2 + 12v_1^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 - 36v_2^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^3$$

$$C_{14} = 12c_s^4\omega_7^2\omega_4^2\omega_5^3 + 12\omega_9v_2^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 + 18\omega_9v_1^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 6\omega_9c_s^4\omega_7^2\omega_4^3\omega_8\omega_5 - 24\omega_9v_2^2\omega_7^2\omega_4\omega_8\omega_5^2 + 12\omega_9v_2^2c_s^2\omega_7^2\omega_4^3\omega_8 - 6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 - 18v_2^2v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9c_s^4\omega_7^2\omega_4\omega_8\omega_5^2 - 84\omega_9v_1^2c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 + 36v_2^2v_1^2\omega_7\omega_4^2\omega_8\omega_5^3 + 18\omega_9v_2^2\omega_7^2\omega_4^3\omega_8\omega_5 - 24\omega_9v_2^2c_s^2\omega_7\omega_4\omega_8\omega_5^3 - 12\omega_9c_s^4\omega_7^2\omega_4^2\omega_5^2 - 6\omega_9c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 12\omega_9v_2^2\omega_4^3\omega_8\omega_5^2 - 6v_2^2\omega_7^2\omega_4^3\omega_8\omega_5^3 + 24\omega_9v_1^2c_s^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 + 6c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^3 + 72\omega_9v_2^2v_1^2\omega_7\omega_4^3\omega_8\omega_5^2 + 18\omega_9c_s^4\omega_7^2\omega_4\omega_8\omega_5^3 + 18v_2^2v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^3 + 84\omega_9v_1^2c_s^2\omega_7^2\omega_4\omega_8\omega_5^3 + 36\omega_9v_2^2v_1^2\omega_7^2\omega_4^3\omega_8 + 6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 - 12\omega_9v_2^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 - 72\omega_9v_2^2v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 12c_s^4\omega_7\omega_4^2\omega_8\omega_5^3 - 36\omega_9v_2^2v_1^2\omega_7\omega_4^3\omega_8\omega_5^3 - 6c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 + 6v_2^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 24\omega_9v_1^2c_s^2\omega_4^3\omega_8\omega_5^3 - 12v_2^2\omega_7\omega_4^2\omega_8\omega_5^3 - 12\omega_9v_2^2\omega_4^3\omega_8\omega_5^3 + 36\omega_9v_2^2v_1^2\omega_7^2\omega_4^2\omega_8\omega_5 + 36\omega_9v_2^2v_1^2\omega_4^3\omega_8\omega_5^3 - 72\omega_9v_2^2v_1^2\omega_7\omega_4\omega_8\omega_5^3 - 36v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^3 + 12v_2^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 - 6v_2^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9v_2^2c_s^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 + 12\omega_9v_2^2\omega_7\omega_4^2\omega_8\omega_5^2 + 6\omega_9c_s^4\omega_7^2\omega_4^3\omega_5^2 + 24\omega_9v_2^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 + 60\omega_9v_1^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 - 12\omega_9v_2^2\omega_7^2\omega_4^3\omega_8 + 12\omega_9c_s^4\omega_7\omega_4^2\omega_8\omega_5^2 - \omega_9c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^3 - 6c_s^4\omega_7^2\omega_4^3\omega_5^3 + 6\omega_9c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9v_2^2c_s^2\omega_4^3\omega_8\omega_5^3 + 24\omega_9c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 + 36v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 + 6v_2^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 - 36v_1^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 - 36\omega_9v_2^2v_1^2\omega_7\omega_4^3\omega_8\omega_5 -$$

$$36\omega_9v_2^2v_1^2\omega_4^3\omega_8\omega_5^2 - 132\omega_9v_1^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 - 24\omega_9c_s^4\omega_7\omega_4^2\omega_8\omega_5^3 - 12\omega_9v_2^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^3 - 18\omega_9v_1^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 48\omega_9v_1^2c_s^2\omega_7^2\omega_8\omega_5^3 - 6\omega_9c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 - 24\omega_9v_2^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 6\omega_9v_2^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 36\omega_9v_2^2\omega_7\omega_4^2\omega_8\omega_5^3 + 12\omega_9c_s^2\omega_7^2\omega_4^2\omega_5^2 + 108\omega_9v_2^2v_1^2\omega_7\omega_4^2\omega_8\omega_5^2 - 12v_2^2\omega_7^2\omega_4^2\omega_5^3 + 18\omega_9v_2^2v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12c_s^4\omega_7\omega_4^3\omega_8\omega_5^3 + 12\omega_9v_2^2\omega_4^2\omega_8\omega_5^3 + 12\omega_9v_2^2\omega_7^2\omega_4^2\omega_5^3 - 12c_s^2\omega_7^2\omega_4^2\omega_5^3 + 12v_2^2\omega_7\omega_4^3\omega_8\omega_5^3 + 24\omega_9v_1^2c_s^2\omega_4^2\omega_8\omega_5^3 + 6\omega_9v_2^2c_s^2\omega_7^2\omega_4^3\omega_5^2 - 36\omega_9v_1^2c_s^2\omega_7^2\omega_4^2\omega_5^2 + 12c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 + 36v_2^2v_1^2\omega_7\omega_4^3\omega_8\omega_5^2 + 12\omega_9v_2^2\omega_7\omega_4^3\omega_8\omega_5 - 36v_2^2v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^3 + 72\omega_9v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 36v_2^2v_1^2\omega_7^2\omega_4^2\omega_5^3 - 12v_2^2\omega_7\omega_4^3\omega_8\omega_5^2 + 12v_2^2\omega_7^2\omega_4^2\omega_8\omega_5^3 + 12\omega_9c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 - 12c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^3 - 36\omega_9v_2^2v_1^2\omega_7\omega_4^2\omega_8\omega_5^2 + 12c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 + 18\omega_9v_2^2v_1^2\omega_7^2\omega_4^3\omega_5^2 - 12\omega_9c_s^2\omega_7\omega_4\omega_8\omega_5^3 - 18\omega_9v_2^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 24\omega_9v_2^2\omega_7\omega_4\omega_8\omega_5^3 - 12\omega_9c_s^4\omega_7^2\omega_4^2\omega_8\omega_5 - 108\omega_9v_1^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 + 60\omega_9v_1^2c_s^2\omega_7\omega_4\omega_8\omega_5^3 - 36v_2^2v_1^2\omega_7\omega_4^3\omega_8\omega_5^3 + 12\omega_9c_s^4\omega_7\omega_4\omega_8\omega_5^3 - 12\omega_9v_2^2\omega_7^2\omega_4^2\omega_8\omega_5 + 24\omega_9v_2^2c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 - 18v_1^2c_s^2\omega_7^2\omega_4^3\omega_5^3 - 12c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 + 12v_2^2c_s^2\omega_7^2\omega_4^2\omega_8^3\omega_5^3 + 12c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 + 24\omega_9c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^2 + 180\omega_9v_1^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 6\omega_9v_2^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9c_s^4\omega_7\omega_4^3\omega_8\omega_5^3 + 78\omega_9v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^3 + 36\omega_9v_2^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 - 18v_2^2v_1^2\omega_7^2\omega_4^3\omega_5^3 + 12\omega_9v_2^2\omega_7\omega_4^3\omega_8\omega_5^3 + 24\omega_9v_2^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 12v_2^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 + 6c_s^2\omega_7^2\omega_4^3\omega_5^3 + 18v_1^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 - 6\omega_9v_2^2\omega_7^2\omega_4^3\omega_5^2 + 12v_2^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 12\omega_9v_2^2c_s^2\omega_7^2\omega_4^2\omega_5^2 - 12\omega_9c_s^2\omega_7\omega_4^3\omega_8\omega_5^3 + 18\omega_9v_1^2c_s^2\omega_7^2\omega_4^3\omega_5^2 - 12\omega_9v_2^2c_s^2\omega_4^2\omega_8\omega_5^3 - 24\omega_9c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 6v_2^2\omega_7^2\omega_4^3\omega_5^3 - 6\omega_9c_s^2\omega_7^2\omega_4^3\omega_5^2 - 24\omega_9v_2^2\omega_7\omega_4^3\omega_8\omega_5^2 + 36v_1^2c_s^2\omega_7^2\omega_4^2\omega_5^3 - 6v_2^2c_s^2\omega_7^2\omega_4^3\omega_5^2 - 4\omega_9c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^3 - 42\omega_9v_1^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 + 12\omega_9v_2^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 - 12\omega_9c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^3 - 144\omega_9v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 36\omega_9v_2^2v_1^2\omega_4^2\omega_8\omega_5^3 - 54\omega_9v_2^2v_1^2\omega_7^2\omega_4^3\omega_8\omega_5 - 12\omega_9c_s^4\omega_7^2\omega_8\omega_5^3 - 36\omega_9v_2^2v_1^2\omega_7^2\omega_4^2\omega_5^2 + 12\omega_9c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 18v_1^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 72\omega_9v_2^2v_1^2\omega_7^2\omega_4\omega_8\omega_5^2 + 36v_1^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 - 12v_2^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^3$$

$$C_{15} = 4\omega_6c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 + 4\omega_6\omega_7\omega_4^3\omega_8^2\omega_5^3 - 3\omega_9\omega_6v_1^2\omega_7\omega_4^3\omega_8^2\omega_5^3 - 3\omega_9\omega_6v_1^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 4\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 2\omega_6v_1^2\omega_7^2\omega_4^3\omega_8^2\omega_5^3 + 4\omega_9\omega_6\omega_7\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8^2 + 2\omega_9c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^3 - 8\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 + 7\omega_9\omega_6v_1^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - \omega_9\omega_6v_1^2\omega_7^2\omega_4^2\omega_8^2\omega_5^3 + 4\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5^3 - 4\omega_6\omega_7\omega_4^3\omega_8^2\omega_5^2 + 2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 - 2\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5 + 4\omega_6v_1^2\omega_7\omega_4^2\omega_8^2\omega_5^3 - 6\omega_9\omega_6c_s^2\omega_7\omega_4\omega_8^2\omega_5^3 - \omega_9\omega_6\omega_7^2\omega_4^3\omega_8\omega_5^3 - 2\omega_6v_1^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 6\omega_9\omega_6\omega_7\omega_4\omega_8^2\omega_5^3 + 8\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 + 4\omega_9\omega_6v_1^2\omega_4^3\omega_8^2\omega_5^3 + 4\omega_9\omega_6\omega_4^3\omega_8^2\omega_5^2 - \omega_9\omega_6c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 5\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^3 + 3\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 3\omega_9\omega_6\omega_7\omega_4^3\omega_8^2\omega_5^3 + 12\omega_9\omega_6c_s^2\omega_7^2\omega_4\omega_8\omega_5^3 + 4\omega_6v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^3 - 2\omega_9c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 + 2\omega_6c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^3 - 8\omega_9\omega_6c_s^2\omega_4^2\omega_8^2\omega_5^3 - 4\omega_9\omega_6v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 + \omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5^3 - 7\omega_9\omega_6\omega_7\omega_4^3\omega_8^2\omega_5^2 - 8\omega_9\omega_6c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^3 - 4\omega_9\omega_6\omega_4^3\omega_8^2\omega_5^3 + 13\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 + 2\omega_9\omega_6v_1^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + \omega_9\omega_6v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^3 - 4\omega_9\omega_6v_1^2\omega_7^2\omega_4^2\omega_8^2\omega_5^3 + 2\omega_6\omega_7^2\omega_4^3\omega_8\omega_5^3 - 2\omega_6c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 6\omega_9\omega_6v_1^2\omega_7\omega_4\omega_8^2\omega_5^3 + 4\omega_6c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^3 + 5\omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5 - 15\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 - 2\omega_9\omega_6\omega_7^2\omega_4\omega_8^2\omega_5^2 - 24\omega_9\omega_6c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 - 6\omega_9\omega_6c_s^2\omega_7^2\omega_4\omega_8^2\omega_5^2 - 4\omega_6v_1^2\omega_7\omega_4^3\omega_8^2\omega_5^3 + 2\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5^3 + 4\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_5^3 - 2\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5^3 - 4\omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2 - 2\omega_9\omega_6v_1^2\omega_7\omega_4^2\omega_8^2\omega_5^2 + 26\omega_9\omega_6c_s^2\omega_7^2\omega_4\omega_8^2\omega_5^3 - 4\omega_6v_1^2\omega_7^2\omega_4^2\omega_8^2\omega_5^3 + 4\omega_6v_1^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 16\omega_9\omega_6c_s^2\omega_7^2\omega_8^2\omega_5^3 - 2\omega_9\omega_6\omega_7^2\omega_4\omega_8^2\omega_5^3 + 8\omega_9\omega_6c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + \omega_9\omega_6v_1^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 9\omega_9\omega_6v_1^2\omega_7\omega_4^2\omega_8^2\omega_5^3 - 4\omega_6\omega_7\omega_4^2\omega_8^2\omega_5^3 - 2\omega_6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^3 + 2\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 8\omega_9\omega_6c_s^2\omega_4^3\omega_8^2\omega_5^2 - 5\omega_9\omega_6v_1^2\omega_7^2\omega_4^3\omega_8^2\omega_5 - 4\omega_6c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^3 - 4\omega_6\omega_7^2\omega_4^2\omega_8\omega_5^3 + 2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_5^3 + 4\omega_9\omega_6v_1^2\omega_4^3\omega_8^2\omega_5^3 - 2\omega_9\omega_6v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^3 - 4\omega_9c_s^2\omega_7^2\omega_4\omega_8^2\omega_5^3 + 2\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^2 + 4\omega_9\omega_6\omega_4^2\omega_8^2\omega_5^3 + 2\omega_9\omega_6\omega_7\omega_4^2\omega_8^2\omega_5^2 - 4\omega_9\omega_6v_1^2\omega_4^3\omega_8^2\omega_5^3 + 4\omega_6c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 4\omega_6c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^3 + 2\omega_9\omega_6v_1^2\omega_7^2\omega_4\omega_8^2\omega_5^3 + 8\omega_9\omega_6c_s^2\omega_4^3\omega_8^2\omega_5^3 - 9\omega_9\omega_6\omega_7\omega_4^2\omega_8^2\omega_5^3 - 2\omega_6v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^3 - \omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 11\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^3 + 3\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 4\omega_9c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3$$

$$C_{16} = -12\omega_6^2v_2^2v_1^2\omega_7\omega_4^2\omega_8^2\omega_5 - 18\omega_6^2c_s^4\omega_7\omega_4^3\omega_8\omega_5 - 12\omega_9\omega_6^2c_s^2\omega_7\omega_4\omega_8^2\omega_5 - 3\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 12\omega_6^2v_1^2\omega_7\omega_4^2\omega_8^2\omega_5 + 144\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^2\omega_8\omega_5 - 6\omega_6^2v_2^2v_1^2\omega_7\omega_4^3\omega_8^2 + 12\omega_9\omega_6c_s^2\omega_4^2\omega_8^2\omega_5 + 6\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^3\omega_5 + 12\omega_9\omega_6v_1^2\omega_7\omega_4^2\omega_8\omega_5 - 12\omega_9\omega_6v_2^2c_s^2\omega_4^3\omega_8^2\omega_5 - 15\omega_9\omega_6c_s^4\omega_7\omega_4^3\omega_8^2\omega_5 + 24\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4\omega_8^2\omega_5 + 12\omega_9\omega_6^2v_1^2\omega_7\omega_4^2\omega_5 + 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 156\omega_9\omega_6^2c_s^4\omega_7\omega_4\omega_8^2\omega_5 + 36\omega_6^2v_1^2c_s^2\omega_7\omega_4^2\omega_8\omega_5 - 6\omega_6^2v_2^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 12\omega_9\omega_6v_1^2\omega_4^3\omega_8^2 + 5\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 36\omega_6^2v_1^2c_s^2\omega_4^3\omega_8^2\omega_5 - 12\omega_9\omega_6v_2^2c_s^2\omega_4^2\omega_8^2\omega_5 - 24\omega_9\omega_6v_1^2\omega_7\omega_4\omega_8^2\omega_5 + 6\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4^3\omega_5 - 36\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^2\omega_5 + 12\omega_9\omega_6v_1^2\omega_4^2\omega_8^2\omega_5 - 6\omega_6^2v_2^2c_s^2\omega_7\omega_4^3\omega_8^2 - 36\omega_9\omega_6v_1^2c_s^2\omega_4^3\omega_8^2 - 18\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8\omega_5 + 6\omega_9v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 - 18\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2 - 108\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 5\omega_9\omega_6v_2^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_5 - 12\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^2\omega_8\omega_5 + 36\omega_9\omega_6c_s^4\omega_4^3\omega_8^2\omega_5 - 12\omega_9\omega_6v_2^2v_1^2\omega_4^2\omega_8^2\omega_5 + 12\omega_9v_2^2v_1^2\omega_7\omega_4^2\omega_8^2\omega_5 - 12\omega_6^2c_s^2\omega_4^3\omega_8^2 - 42\omega_9\omega_6^2c_s^4\omega_7\omega_4^2\omega_8\omega_5 - 24\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4\omega_8\omega_5 - 36\omega_9\omega_6v_1^2c_s^2\omega_4^2\omega_8^2\omega_5 + 12\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 15\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^3\omega_8\omega_5 - 12\omega_6^2v_2^2c_s^2\omega_4^3\omega_8^2\omega_5 + 18\omega_6^2v_1^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 12\omega_6^2v_2^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 6\omega_9\omega_6^2v_1^2\omega_7\omega_4^3\omega_5 - 36\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2\omega_5 + 12\omega_6^2v_1^2\omega_4^2\omega_8^2\omega_5 + 6\omega_6^2v_1^2\omega_7\omega_4^3\omega_8\omega_5 - 12\omega_9\omega_6v_2^2c_s^2\omega_7\omega_4\omega_8^2\omega_5 - 9\omega_9\omega_6v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 + 18\omega_9\omega_6c_s^4\omega_7\omega_4^3\omega_8^2 - 12\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^2\omega_5 - 12\omega_6^2v_2^2v_1^2\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6c_s^2\omega_7\omega_4\omega_8^2\omega_5 + 9\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 - 6\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_5 + 3\omega_9\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2\omega_5 - 48\omega_9\omega_6^2v_1^2\omega_7\omega_4^2\omega_8\omega_5 - 12\omega_6^2c_s^2\omega_4^3\omega_8^2\omega_5 - 36\omega_9\omega_6c_s^4\omega_7\omega_4\omega_8^2\omega_5 + 36\omega_6^2c_s^4\omega_4^3\omega_8^2 - \omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 12\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4\omega_8\omega_5 - 18\omega_9v_1^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 + 12\omega_6^2v_2^2c_s^2\omega_4^3\omega_8^2 - 18\omega_6^2v_1^2c_s^2\omega_7\omega_4^3\omega_8^2 + 18\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 - 12\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4\omega_8^2\omega_5 + 18\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^3\omega_5 + 6\omega_6^2v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 + 36\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^3\omega_8 + 12\omega_9\omega_6c_s^2\omega_4^3\omega_8^2 - 96\omega_9\omega_6^2c_s^4\omega_7\omega_4^2\omega_8^2\omega_5 + 15\omega_9\omega_6^2c_s^4\omega_7\omega_4^3\omega_8\omega_5 - 6\omega_9v_2^2v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6v_2^2v_1^2\omega_4^3\omega_8^2\omega_5 - 36\omega_9\omega_6c_s^4\omega_4^2\omega_8^2\omega_5 + 6\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^3\omega_8\omega_5 - 18\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4^3\omega_8^2 - 12\omega_9\omega_6v_1^2\omega_4^3\omega_8^2\omega_5 + 27\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 + 18\omega_9\omega_6v_2^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 12\omega_9\omega_6v_2^2v_1^2\omega_4^3\omega_8^2 - 12\omega_9v_1^2\omega_7\omega_4^2\omega_8^2\omega_5 + 3\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 12\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4\omega_8^2\omega_5 - 18\omega_6^2v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 12\omega_6^2v_2^2c_s^2\omega_7\omega_4^2\omega_8\omega_5 - 12\omega_6^2c_s^2\omega_7\omega_4^2\omega_8\omega_5 + 24\omega_9\omega_6^2v_1^2\omega_7\omega_4\omega_8\omega_5 + 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2 - 24\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^2\omega_8 - 24\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^2\omega_8^2 + 12\omega_9\omega_6v_2^2c_s^2\omega_4^3\omega_8^2\omega_5 + 36\omega_6^2v_1^2c_s^2\omega_4^2\omega_8^2\omega_5 - 18\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 12\omega_6^2v_1^2\omega_4^3\omega_8^2 - 12\omega_9\omega_6c_s^2\omega_4^3\omega_8^2\omega_5 + 24\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^2\omega_8^2 + 12\omega_9\omega_6^2v_1^2\omega_7\omega_4^3\omega_8 + 18\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4^2\omega_8\omega_5 + 36\omega_6^2c_s^2\omega_7\omega_4^2\omega_8\omega_5 - 45\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5 - 6\omega_6^2v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 + 6\omega_6^2v_2^2v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6^2c_s^4\omega_7\omega_4^2\omega_5 - 6\omega_9\omega_6v_1^2\omega_7\omega_4^3\omega_8\omega_5 + 54\omega_9\omega_6c_s^4\omega_7\omega_4^2\omega_8^2\omega_5 - 36\omega_9\omega_6c_s^4\omega_4^3\omega_8^2 + 12\omega_6^2c_s^2\omega_4^3\omega_8^2\omega_5 - 36\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4^2\omega_8\omega_5 + 72\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4^2\omega_8^2 + 6\omega_9\omega_6v_2^2c_s^2\omega_7\omega_4^3\omega_8^2 + 36\omega_9v_1^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 + 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 72\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4\omega_8\omega_5 - 6\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2 + 12\omega_6^2v_2^2v_1^2\omega_4^2\omega_8^2\omega_5 - 60\omega_9\omega_6^2c_s^4\omega_7\omega_4^2\omega_8^2\omega_5 + 15\omega_9\omega_6^2v_1^2\omega_7\omega_4^3\omega_8\omega_5 - 36\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^2\omega_8^2\omega_5 - 72\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^2\omega_8 - 6\omega_9\omega_6^2c_s^4\omega_7\omega_4^3\omega_5 + 72\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4\omega_8^2\omega_5 + 18\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2\omega_5 + 12\omega_6^2v_1^2\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6^2c_s^2\omega_7\omega_4\omega_8\omega_5 + \omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 12\omega_6^2v_1^2\omega_7\omega_4^2\omega_8\omega_5 + 12\omega_6^2v_2^2v_1^2\omega_7\omega_4^2\omega_8\omega_5 + 24\omega_9\omega_6^2v_1^2\omega_7\omega_4^2\omega_8 - 6\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^3\omega_8^2 + 36\omega_9\omega_6v_1^2\omega_7\omega_4^2\omega_8^2\omega_5 + 12\omega_6^2v_2^2v_1^2\omega_4^3\omega_8^2 - 36\omega_6^2v_1^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 + 12\omega_6^2v_2^2c_s^2\omega_4^3\omega_8^2\omega_5 + 6\omega_6^2v_2^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 + 36\omega_9\omega_6v_1^2c_s^2\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6^2c_s^4\omega_7\omega_4\omega_8\omega_5 + 6\omega_9\omega_6v_1^2\omega_7\omega_4^3\omega_8^2 + 48\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^2\omega_8\omega_5 + 36\omega_6^2c_s^4\omega_4^2\omega_8^2\omega_5 + 12\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^3\omega_8$$

$$C_{17} = 12\omega_6^2v_2^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + 12\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 60\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 + 6\omega_9\omega_6v_2^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 36\omega_9\omega_6^2c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 + 6\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 36\omega_9\omega_6^2v_2^2\omega_7^2\omega_4\omega_8\omega_5^2 + 6\omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 12\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 12\omega_9\omega_6^2v_2^2\omega_7^2\omega_4^3\omega_8\omega_5 + 24\omega_6^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 66\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 18\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9\omega_6^2\omega_7\omega_4^3\omega_8^2\omega_5 + 24\omega_6^2v_2^2\omega_7\omega_4^2\omega_8^2\omega_5^2 + 12\omega_9v_2^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 36\omega_9c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 24\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 24\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2v_2^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 42\omega_9\omega_6c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 18\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 24\omega_9\omega_6^2c_s^2\omega_4^2\omega_8^2\omega_5^2 + 24\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6^2v_2^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + 24\omega_6^2v_2^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5 + 84\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 - 12\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 36\omega_9\omega_6^2\omega_7^2\omega_4\omega_8\omega_5^2 - 18\omega_9\omega_6v_2^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 12\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9\omega_6^2v_2^2\omega_7\omega_4^3\omega_8^2\omega_5 - 18\omega_9\omega_6^2v_2^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 24\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8^2 + 72\omega_9\omega_6^2c_s^2\omega_7\omega_4\omega_8^2\omega_5^2 - 24\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8^2 + 12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 12\omega_6^2v_2^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 84\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 24\omega_9\omega_6^2v_2^2\omega_7^2\omega_4^2\omega_5^2 - 24\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 + 24\omega_9\omega_6^2c_s^2\omega_4^3\omega_8^2\omega_5 - 12\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 18\omega_9c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 12\omega_9\omega_6\omega_7^2\omega_4\omega_8^2\omega_5^2 + 12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + \omega_9\omega_6^2v_2^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 48\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_5^2 -$$

$$66\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6 v_2^2\omega_7^2\omega_4\omega_8^2\omega_5^2 + 3\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 6\omega_9 v_2^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 72\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4\omega_8^2\omega_5 - 24\omega_6^2 v_2^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2 v_2^2\omega_7\omega_4^2\omega_8^2\omega_5^2 + 12\omega_9\omega_6\omega_7^2\omega_4^2\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 24\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_5^2 - 24\omega_6^2\omega_7\omega_4^2\omega_8^2\omega_5^2 - 24\omega_9\omega_6^2 v_2^2\omega_7^2\omega_4^2\omega_8\omega_5 - 24\omega_6^2 c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 24\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 24\omega_6^2 v_2^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7^2\omega_4\omega_8^2\omega_5^2 - 12\omega_9\omega_6 v_2^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 96\omega_9\omega_6^2 c_s^2\omega_7^2\omega_8^2\omega_5^2 - 132\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^2 - \omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 90\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 6\omega_9\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 48\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 24\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 24\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^3\omega_5^2 + 12\omega_9\omega_6^2 v_2^2\omega_7^2\omega_4^3\omega_5^2 + 66\omega_9\omega_6^2 v_2^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 12\omega_6^2 v_2^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 24\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8^2 + 24\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8\omega_5 + 156\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4\omega_8^2\omega_5^2 + 4\omega_9\omega_6 v_2^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 24\omega_6^2 v_2^2\omega_7\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6^2\omega_7\omega_4^2\omega_8^2\omega_5^2 - 24\omega_9\omega_6^2 c_s^2\omega_7^3\omega_8^2\omega_5^2 - 4\omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 24\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6^2 v_2^2\omega_7^2\omega_4\omega_8^2\omega_5^2 + 12\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_5^2 - 12\omega_6^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2$$

$$C_{18} = -36\omega_6^2 v_2^2 v_1^2\omega_7\omega_4^2\omega_8^2\omega_5 - 6\omega_6^2 c_s^4\omega_7\omega_4^3\omega_8\omega_5 + 30\omega_9\omega_6^2 v_2^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 12\omega_6^2 v_1^2\omega_7\omega_4^2\omega_8^2\omega_5 + 48\omega_9\omega_6^2 v_1^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5 - 18\omega_6^2 v_2^2 v_1^2\omega_7\omega_4^3\omega_8^2 + 12\omega_9\omega_6 c_s^2\omega_4^2\omega_8^2\omega_5 + 18\omega_9\omega_6^2 v_2^2 v_1^2\omega_7\omega_4^3\omega_5 + 12\omega_9\omega_6 v_1^2\omega_7\omega_4^2\omega_8^2\omega_5 - 36\omega_9\omega_6 v_2^2 c_s^2\omega_4^3\omega_8^2 - 5\omega_9\omega_6 c_s^4\omega_7\omega_4^3\omega_8^2\omega_5 + 72\omega_9\omega_6 v_2^2 v_1^2\omega_7\omega_4\omega_8^2\omega_5 + 12\omega_9\omega_6^2 v_1^2\omega_7\omega_4^2\omega_5 + 6\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 18\omega_9\omega_6^2 c_s^4\omega_7\omega_4\omega_8^2\omega_5 + 12\omega_6^2 v_1^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5 - 18\omega_6^2 v_2^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 12\omega_9\omega_6 v_1^2\omega_4^3\omega_8^2 + 5\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 12\omega_6^2 v_1^2 c_s^2\omega_4^3\omega_8^2\omega_5 - 36\omega_9\omega_6 v_2^2 c_s^2\omega_4^2\omega_8^2\omega_5 - 24\omega_9\omega_6 v_1^2\omega_7\omega_4\omega_8^2\omega_5 - 12\omega_9\omega_6^2 v_1^2 c_s^2\omega_7\omega_4^2\omega_5 + 12\omega_9\omega_6 v_1^2\omega_4^2\omega_8^2\omega_5 - 18\omega_6^2 v_2^2 c_s^2\omega_7\omega_4^3\omega_8^2 - 12\omega_9\omega_6 v_1^2 c_s^2\omega_4^3\omega_8^2 + 18\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5 + 6\omega_9 v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 - 6\omega_6^2 c_s^4\omega_7\omega_4^3\omega_8^2 - 36\omega_9\omega_6 v_1^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 15\omega_9\omega_6 v_2^2 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 36\omega_9\omega_6 v_2^2 v_1^2\omega_7\omega_4^2\omega_8\omega_5 + 12\omega_9\omega_6 c_s^4\omega_4^3\omega_8^2\omega_5 - 36\omega_9\omega_6 v_2^2 v_1^2\omega_4^2\omega_8^2\omega_5 + 36\omega_9 v_2^2 v_1^2\omega_7\omega_4^2\omega_8^2\omega_5 - 12\omega_6^2 c_s^2\omega_4^3\omega_8^2 - 18\omega_9\omega_6^2 c_s^4\omega_7\omega_4^2\omega_8\omega_5 - 72\omega_9\omega_6^2 v_2^2 v_1^2\omega_7\omega_4\omega_8\omega_5 - 12\omega_9\omega_6 v_1^2 c_s^2\omega_4^2\omega_8^2\omega_5 + 12\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 45\omega_9\omega_6^2 v_2^2 v_1^2\omega_7\omega_4^3\omega_8\omega_5 - 36\omega_6^2 v_2^2 c_s^2\omega_4^3\omega_8^2\omega_5 + 6\omega_6^2 v_1^2 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 36\omega_6^2 v_2^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 6\omega_9\omega_6^2 v_1^2\omega_7\omega_4^3\omega_5 - 12\omega_6^2 c_s^4\omega_4^3\omega_8^2\omega_5 - 48\omega_9\omega_6^2 v_2^2 c_s^2\omega_7\omega_8^2\omega_5 - 18\omega_6^2 v_2^2 v_1^2\omega_7\omega_4^3\omega_8\omega_5 + 12\omega_6^2 v_1^2 c_s^2\omega_4^3\omega_8^2 - 15\omega_9\omega_6^2 v_2^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 12\omega_6^2 c_s^4\omega_7\omega_4^2\omega_8^2\omega_5 - 12\omega_6^2 v_1^2\omega_4^2\omega_8^2\omega_5 + 6\omega_6^2 v_1^2\omega_7\omega_4^3\omega_8\omega_5 - 36\omega_9\omega_6 v_2^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 9\omega_9\omega_6 v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 + 6\omega_9\omega_6 c_s^4\omega_7\omega_4^3\omega_8^2 - 36\omega_9\omega_6^2 v_2^2 v_1^2\omega_7\omega_4^2\omega_5 - 36\omega_6^2 v_2^2 v_1^2\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6 c_s^2\omega_7\omega_4\omega_8^2\omega_5 + 27\omega_9\omega_6 v_2^2 v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 - \omega_9\omega_6^2 c_s^4\omega_7\omega_4^3\omega_8^2\omega_5 - 48\omega_9\omega_6^2 v_1^2\omega_7\omega_4^2\omega_8\omega_5 - 12\omega_6^2 c_s^2\omega_4^2\omega_8^2\omega_5 - 12\omega_9\omega_6 c_s^4\omega_7\omega_4\omega_8^2\omega_5 + 12\omega_6^2 c_s^4\omega_4^3\omega_8^2 + 60\omega_9\omega_6^2 v_2^2 c_s^2\omega_7\omega_4\omega_8\omega_5 - 6\omega_9 v_1^2 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 + 36\omega_6^2 v_2^2 c_s^2\omega_4^3\omega_8^2 - 6\omega_6^2 v_1^2 c_s^2\omega_7\omega_4^3\omega_8^2 + 6\omega_9\omega_6 v_1^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 24\omega_9\omega_6^2 v_2^2 c_s^2\omega_7\omega_4^2\omega_5 + 6\omega_9\omega_6^2 v_1^2 c_s^2\omega_7\omega_4^3\omega_5 + 6\omega_6^2 v_1^2\omega_7\omega_4^3\omega_8^2 + 12\omega_9\omega_6^2 v_1^2 c_s^2\omega_7\omega_4^3\omega_8 + 12\omega_9\omega_6 c_s^2\omega_4^3\omega_8^2 - 12\omega_9\omega_6^2 c_s^4\omega_7\omega_8^2\omega_5 + 6\omega_9\omega_6^2 c_s^4\omega_7\omega_4^3\omega_8\omega_5 - 18\omega_9 v_2^2 v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 + 36\omega_9\omega_6 v_2^2 v_1^2\omega_4^3\omega_8^2\omega_5 - 12\omega_9\omega_6 c_s^4\omega_4^2\omega_8^2\omega_5 + 18\omega_9\omega_6 v_2^2 v_1^2\omega_7\omega_4^3\omega_8\omega_5 - 6\omega_9\omega_6 v_1^2 c_s^2\omega_7\omega_4^3\omega_8^2 - 12\omega_9\omega_6 v_1^2\omega_4^3\omega_8^2\omega_5 + 9\omega_9\omega_6 v_1^2 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 + 54\omega_9\omega_6 v_2^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 36\omega_9\omega_6 v_2^2 v_1^2\omega_4^3\omega_8^2 - 12\omega_9 v_1^2\omega_7\omega_4^2\omega_8^2\omega_5 - 6\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 60\omega_9\omega_6^2 v_2^2 c_s^2\omega_7\omega_4\omega_8^2\omega_5 - 6\omega_6^2 v_1^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 36\omega_6^2 v_2^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5 - 12\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5 + 24\omega_9\omega_6^2 v_1^2\omega_7\omega_4\omega_8\omega_5 + 24\omega_9\omega_6^2 v_1^2\omega_7\omega_4^2\omega_8 - 24\omega_9\omega_6 v_1^2 c_s^2\omega_7\omega_4^2\omega_8^2 + 36\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5 - 12\omega_9\omega_6^2 v_1^2 c_s^2\omega_7\omega_4^2\omega_8 - 102\omega_9\omega_6^2 v_2^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5 + 12\omega_6^2 c_s^4\omega_7\omega_4^2\omega_8\omega_5 - 15\omega_9\omega_6^2 v_1^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5 - 6\omega_6^2 v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 + 18\omega_6^2 v_2^2 v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 - 6\omega_9\omega_6 v_1^2\omega_7\omega_4^3\omega_8\omega_5 + 18\omega_9\omega_6 c_s^4\omega_7\omega_4^2\omega_8^2\omega_5 - 12\omega_9\omega_6 c_s^2\omega_4^3\omega_8^2 + 12\omega_6^2 c_s^2\omega_4^3\omega_8^2\omega_5 - 12\omega_9\omega_6 v_1^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5 + 24\omega_9\omega_6 v_1^2 c_s^2\omega_7\omega_4^2\omega_8^2 + 18\omega_9\omega_6 v_2^2 c_s^2\omega_7\omega_4^3\omega_8^2 + 12\omega_9 v_1^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 + \omega_9\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 - 24\omega_9\omega_6^2 v_1^2 c_s^2\omega_7\omega_4\omega_8\omega_5 - 6\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8^2 + 36\omega_6^2 v_2^2 v_1^2\omega_4^2\omega_8^2\omega_5 - 5\omega_9\omega_6^2 c_s^4\omega_7\omega_4^2\omega_8^2\omega_5 + 15\omega_9\omega_6^2 v_1^2\omega_7\omega_4^3\omega_8\omega_5 - 108\omega_9\omega_6 v_2^2 v_1^2\omega_7\omega_4^2\omega_8^2\omega_5 - 24\omega_9\omega_6^2 v_1^2 c_s^2\omega_7\omega_4^2\omega_8 + 24\omega_9\omega_6 v_1^2 c_s^2\omega_7\omega_4\omega_8^2\omega_5 + 6\omega_6^2 c_s^4\omega_7\omega_4^3\omega_8^2\omega_5 + 12\omega_6^2 v_1^2\omega_4^3\omega_8^2\omega_5 - 12\omega_9\omega_6^2 c_s^2\omega_7\omega_4\omega_8\omega_5 - 12\omega_6^2 v_1^2\omega_7\omega_4^2\omega_8\omega_5 + 36\omega_6^2 v_2^2 v_1^2\omega_4^3\omega_8 + 12\omega_6^2 v_1^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 + 36\omega_6^2 v_2^2 c_s^2\omega_4^2\omega_8^2\omega_5 + 18\omega_6^2 v_2^2 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 6\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6 v_1^2 c_s^2\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6^2 c_s^4\omega_7\omega_4\omega_8^2\omega_5 + 144\omega_9\omega_6^2 v_2^2 v_1^2\omega_7\omega_4^2\omega_8\omega_5 + 12\omega_6^2 c_s^4\omega_4^2\omega_8^2\omega_5 + 36\omega_9\omega_6^2 v_2^2 v_1^2\omega_7\omega_4^3\omega_8$$

$$C_{19} = 72\omega_6^2 v_2^2 c_s^2\omega_4^2 + 216\omega_6 v_2^2 c_s^2\omega_8^2 + 12\omega_6^2 c_s^4\omega_4^2 + 30\omega_6^2 v_2^2\omega_4^2\omega_8 - 36 v_2^4\omega_4^2\omega_8^2 + 150\omega_6 v_2^2 c_s^2\omega_4^2\omega_8^2 + 12\omega_6^2 c_s^2\omega_4^2\omega_8 - 12 c_s^4\omega_4^2\omega_8^2 + 48\omega_6 c_s^2\omega_4\omega_8^2 + 96\omega_6 v_2^2\omega_4\omega_8^2 - \omega_6^2 c_s^4\omega_4^2\omega_8^2 - 3\omega_6^2 v_2^4\omega_4^2\omega_8^2 - 12\omega_6^2 v_2^2 c_s^2\omega_4^2\omega_8^2 - 48\omega_6 v_2^4\omega_4\omega_8 - 12\omega_6^2 v_2^2\omega_4^2 + 24\omega_6^2 c_s^2\omega_8 - 144 v_2^2 c_s^2\omega_4^2\omega_8^2 - 12\omega_6^2 c_s^4\omega_4^2\omega_8 + 12 c_s^2\omega_4^2\omega_8^2 - 126\omega_6^2 v_2^2 c_s^2\omega_4^2\omega_8 - 30\omega_6^2 v_2^4\omega_4^2\omega_8 + 36 v_2^2\omega_4^2\omega_8^2 + 24\omega_6^2 v_2^2\omega_4 - 96\omega_6 v_2^4\omega_4\omega_8^2 - 48\omega_6 c_s^4\omega_4\omega_8^2 + 24\omega_6 c_s^4\omega_8^2 + 3\omega_6^2 v_2^2\omega_4^2\omega_8^2 - 48\omega_6^2 v_2^4\omega_8 + \omega_6^2 c_s^2\omega_4^2\omega_8^2 + 72\omega_6 v_2^2 c_s^2\omega_4^2\omega_8 + 48\omega_6 v_2^2\omega_4\omega_8 - 24\omega_6^2 c_s^4\omega_4 - 144\omega_6^2 v_2^2 c_s^2\omega_4 - 48\omega_6 v_2^2\omega_8^2 - 144\omega_6 v_2^2 c_s^2\omega_4\omega_8 + 12\omega_6^2 v_2^4\omega_4^2 - 24\omega_6 v_2^2\omega_4^2\omega_8 - 12\omega_6^2 c_s^2\omega_4^2 + 288 v_2^2 c_s^2\omega_4\omega_8^2 - 72 v_2^2\omega_4\omega_8^2 + 96\omega_6^2 v_2^4\omega_4\omega_8 + 432\omega_6^2 v_2^2 c_s^2\omega_4\omega_8 - 24 c_s^2\omega_4\omega_8^2 + 48\omega_6^2 c_s^4\omega_4\omega_8 + 14\omega_6 c_s^4\omega_4^2\omega_8^2 + 36\omega_6 v_2^4\omega_4^2\omega_8^2 + 48\omega_6^2 v_2^2\omega_8 + 24\omega_6 v_2^4\omega_4^2\omega_8 + 24\omega_6^2 c_s^2\omega_4 + 48\omega_6 v_2^4\omega_8^2 - 24\omega_6^2 c_s^4\omega_8 - 216\omega_6^2 v_2^2 c_s^2\omega_8 - 432\omega_6 v_2^2 c_s^2\omega_4\omega_8^2 + 24 c_s^4\omega_4\omega_8^2 - 48\omega_6^2 c_s^2\omega_4\omega_8 + 72 v_2^4\omega_4\omega_8^2 - 96\omega_6^2 v_2^2\omega_4\omega_8 - 36\omega_6 v_2^2\omega_4^2\omega_8^2 - 24\omega_6^2 v_2^2\omega_4 - 24\omega_6 c_s^2\omega_8^2 - 14\omega_6 c_s^2\omega_4^2\omega_8^2$$

$$C_{20} = c_s^2\omega_4^3\omega_8^2 - 3 v_2^2\omega_4^3\omega_8^2 + 6 v_2^2 c_s^2\omega_4^3\omega_8^2 + 12 v_2^2 c_s^2\omega_4^3 - 24 v_2^4\omega_4^2\omega_8^2 + 24 c_s^4\omega_4^2\omega_8^2 - 12 v_2^2\omega_4^3 + 24 c_s^2\omega_4^2\omega_8 - 72 v_2^2\omega_4^2\omega_8 + 24 v_2^2\omega_4^2 + 48 v_2^2 c_s^2\omega_4^2\omega_8 - 18 v_2^4\omega_4^3\omega_8 + 6 c_s^4\omega_4^3\omega_8 - 24 v_2^2 c_s^2\omega_4^2 + 3 v_2^4\omega_4^3\omega_8^2 - 72 v_2^2 c_s^2\omega_4^2\omega_8^2 - 3 c_s^4\omega_4^3\omega_8^2 - 8 c_s^2\omega_4^2\omega_8^2 + 24 v_2^2\omega_4^2\omega_8^2 + 72 v_2^4\omega_4^2\omega_8 - 12 v_2^2 c_s^2\omega_4^3\omega_8 - 24 c_s^4\omega_4^2\omega_8 - 6 c_s^2\omega_4^3\omega_8 + 18 v_2^2\omega_4^3\omega_8 + 24 c_s^4\omega_4\omega_8 - 48 v_2^4\omega_4\omega_8 + 24 c_s^4\omega_8^2 - 24 v_2^4\omega_4^2 - 96 v_2^2 c_s^2\omega_8^2 + 156 v_2^2 c_s^2\omega_4\omega_8^2 - 24 v_2^2\omega_4\omega_8^2 + 12 c_s^2\omega_4\omega_8^2 + 12 v_2^4\omega_4^3 + 48 v_2^2\omega_4\omega_8 - 24 c_s^2\omega_4\omega_8 - 24 v_2^2 c_s^2\omega_4\omega_8 - 48 c_s^4\omega_4\omega_8^2 + 24 v_2^4\omega_4\omega_8^2$$

$$C_{21} = -25\omega_6\omega_4^2\omega_8^2 + 36\omega_6^2\omega_8 - 51\omega_6^2 v_2^2\omega_4^2\omega_8 - 33\omega_6^2 c_s^2\omega_4^2\omega_8 - 120\omega_6 c_s^2\omega_4\omega_8^2 - 168\omega_6 v_2^2\omega_4\omega_8^2 + 24\omega_6^2 v_2^2\omega_4^2 - 48\omega_4\omega_8^2 - 60\omega_6^2 c_s^2\omega_8 - 36 c_s^2\omega_4^2\omega_8^2 - 72\omega_6^2\omega_4\omega_8 - 60 v_2^2\omega_4^2\omega_8^2 - 48\omega_6^2 v_2^2\omega_4 - 5\omega_6^2 v_2^2\omega_4^2\omega_8^2 - 3\omega_6^2 c_s^2\omega_4^2\omega_8^2 - 24\omega_6 c_s^2\omega_4\omega_8 - 72\omega_6 v_2^2\omega_4\omega_8 - 12\omega_6\omega_4^2\omega_8 + 84\omega_6 v_2^2\omega_8^2 - 36\omega_6\omega_8^2 + 24\omega_6^2\omega_4 + 36\omega_6 v_2^2\omega_4^2\omega_8 + 12\omega_6 c_s^2\omega_4^2\omega_8 + 24\omega_6\omega_4\omega_8 + 24\omega_6^2 c_s^2\omega_4^2 + 120 v_2^2\omega_4\omega_8^2 + 21\omega_6^2\omega_4^2\omega_8 + 72 c_s^2\omega_4\omega_8^2 - 84\omega_6^2 v_2^2\omega_8 + 2\omega_6^2\omega_4^2\omega_8^2 - 48\omega_6^2 c_s^2\omega_4 + 24\omega_4^2\omega_8^2 + 72\omega_6\omega_4\omega_8^2 + 120\omega_6^2 c_s^2\omega_4\omega_8 + 168\omega_6^2 v_2^2\omega_4\omega_8 + 61\omega_6 v_2^2\omega_4^2\omega_8^2 - 12\omega_6^2\omega_4^2 + 60\omega_6 c_s^2\omega_8^2 + 39\omega_6 c_s^2\omega_4^2\omega_8^2$$

2.3.4 Conservation of momentum: ρv_2

attached text file: `output_d2q9_nse_mrt2_symbolic_pde_02.txt`

$$v_2\frac{\partial\rho}{\partial t} + \rho\frac{\partial v_2}{\partial t} + \frac{v_2 v_1\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_1} + \frac{\rho v_2\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{\rho v_1\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_1} + (c_s^2 + v_2^2)\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_2} + \frac{2\rho v_2\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-2+\omega_4)\frac{c_s^2\delta_l^2}{2\delta_t\omega_4}\frac{\partial\rho}{\partial x_1}\frac{\partial v_2}{\partial x_1} + (-2+\omega_4)\frac{c_s^2\delta_l^2}{2\delta_t\omega_4}\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_2} + (-2+\omega_6+4c_s^2-2\omega_6 c_s^2+6v_2^2-3\omega_6 v_2^2)\frac{\delta_l^2}{\omega_6\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_2}{\partial x_2} + (2-\omega_6)\frac{3\rho v_2\delta_l^2}{\omega_6\delta_t}\left(\frac{\partial v_2}{\partial x_2}\right)^2 + (-2+\omega_4)\frac{\rho c_s^2\delta_l^2}{2\delta_t\omega_4}\frac{\partial^2 v_2}{\partial x_1^2} + (-2+\omega_4)\frac{\rho c_s^2\delta_l^2}{2\delta_t\omega_4}\frac{\partial^2 v_1}{\partial x_1\partial x_2} + (-2+\omega_6+6c_s^2-3\omega_6 c_s^2+2v_2^2-\omega_6 v_2^2)\frac{v_2\delta_l^2}{2\omega_6\delta_t}\frac{\partial^2\rho}{\partial x_2^2} + (-2+\omega_6+2c_s^2-\omega_6 c_s^2+6v_2^2-3\omega_6 v_2^2)\frac{\rho\delta_l^2}{2\omega_6\delta_t}\frac{\partial^2 v_2}{\partial x_2^2} + C_1\frac{v_2 v_1\delta_l^3}{12\delta_t\omega_7\omega_4\omega_5}\frac{\partial^3\rho}{\partial x_1^3} + C_2\frac{\rho v_2\delta_l^3}{12\delta_t\omega_7\omega_4\omega_5}\frac{\partial^3 v_1}{\partial x_1^3} + C_3\frac{\rho v_1\delta_l^3}{6\delta_t\omega_7\omega_4^2}\frac{\partial^3 v_2}{\partial x_1^3} +$$

$$(-12-\omega_4^2+12\omega_4)\frac{c_s^4\delta_l^3}{6\delta_t\omega_4^2}\frac{\partial^3\rho}{\partial x_1^2\partial x_2}+(-\omega_4^2-2\omega_7+2\omega_4+\omega_7\omega_4)\frac{\rho v_1c_s^2\delta_l^3}{\delta_t\omega_7\omega_4^2}\frac{\partial^3 v_1}{\partial x_1^2\partial x_2}+$$
$$(-12\omega_6\omega_4^2+12\omega_4^2-12\omega_4\omega_8+12\omega_6\omega_4-\omega_6\omega_4^2\omega_8+12\omega_6\omega_4\omega_8-12\omega_6\omega_8)\frac{\rho v_2c_s^2\delta_l^3}{6\omega_6\delta_t\omega_4^2\omega_8}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2}+C_4\frac{v_2v_1\delta_l^3}{\omega_6^2\delta_t\omega_4\omega_8}\frac{\partial^3\rho}{\partial x_1\partial x_2^2}+$$
$$C_5\frac{\rho v_2\delta_l^3}{12\omega_6^2\delta_t\omega_4^2\omega_8}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2}+C_6\frac{\rho v_1\delta_l^3}{\omega_6^2\delta_t\omega_4\omega_8}\frac{\partial^3 v_2}{\partial x_1\partial x_2^2}+C_7\frac{\delta_l^3}{12\omega_6^2\delta_t}\frac{\partial^3\rho}{\partial x_2^3}+$$
$$(-24+24\omega_6+36c_s^2+11\omega_6^2v_2^2-36\omega_6c_s^2+60v_2^2+5\omega_6^2c_s^2-60\omega_6v_2^2-4\omega_6^2)\frac{\rho v_2\delta_l^3}{6\omega_6^2\delta_t}\frac{\partial^3 v_2}{\partial x_2^3}+C_8\frac{v_2\delta_l^4}{24\delta_t\omega_7^2\omega_4^2\omega_5^2}\frac{\partial^4\rho}{\partial x_1^4}+$$
$$C_9\frac{\rho v_2v_1\delta_l^4}{12\delta_t\omega_7^2\omega_4^2\omega_5^2}\frac{\partial^4 v_1}{\partial x_1^4}+C_{10}\frac{\rho\delta_l^4}{24\delta_t\omega_7^2\omega_4^3}\frac{\partial^4 v_2}{\partial x_1^4}+C_{11}\frac{v_1\delta_l^4}{12\omega_9\omega_6\delta_t\omega_7^2\omega_4^3\omega_8\omega_5^2}\frac{\partial^4\rho}{\partial x_1^3\partial x_2}+C_{12}\frac{\rho\delta_l^4}{12\omega_9\omega_6\delta_t\omega_7^2\omega_4^3\omega_8\omega_5^2}\frac{\partial^4 v_1}{\partial x_1^3\partial x_2}+$$
$$C_{13}\frac{\rho v_2v_1\delta_l^4}{12\omega_9\omega_6^2\delta_t\omega_7^2\omega_4^3\omega_8^2\omega_5^2}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2}+C_{14}\frac{v_2\delta_l^4}{12\omega_9\omega_6^3\delta_t\omega_7\omega_4^3\omega_8^2}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2}+C_{15}\frac{\rho v_2v_1\delta_l^4}{2\omega_9\omega_6^3\delta_t\omega_7^2\omega_4^3\omega_8^2\omega_5}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2}+$$
$$C_{16}\frac{\rho\delta_l^4}{12\omega_9\omega_6^3\delta_t\omega_7\omega_4^3\omega_8^2}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2}+C_{17}\frac{v_1\delta_l^4}{4\omega_6^3\delta_t\omega_4^2\omega_8^2}\frac{\partial^4\rho}{\partial x_1\partial x_2^3}+C_{18}\frac{\rho\delta_l^4}{12\omega_6^3\delta_t\omega_4^3\omega_8^2}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3}+C_{19}\frac{\rho v_2v_1\delta_l^4}{4\omega_6^3\delta_t\omega_4^2\omega_8^2}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3}+$$
$$C_{20}\frac{v_2\delta_l^4}{12\omega_6^3\delta_t}\frac{\partial^4\rho}{\partial x_2^4}+C_{21}\frac{\rho\delta_l^4}{12\omega_6^3\delta_t}\frac{\partial^4 v_2}{\partial x_2^4}=0,$$

where:

$$C_1=-18c_s^2\omega_7\omega_4+12v_1^2\omega_7+18c_s^2\omega_4\omega_5-12\omega_7-12v_1^2\omega_5-36c_s^2\omega_5+6\omega_7\omega_4+6v_1^2\omega_4\omega_5-6v_1^2\omega_7\omega_4-6\omega_4\omega_5+12\omega_5+v_1^2\omega_7\omega_4\omega_5-\omega_7\omega_4\omega_5+3c_s^2\omega_7\omega_4\omega_5+36c_s^2\omega_7$$

$$C_2=-6c_s^2\omega_7\omega_4+36v_1^2\omega_7+6c_s^2\omega_4\omega_5-12\omega_7-36v_1^2\omega_5-12c_s^2\omega_5+6\omega_7\omega_4+18v_1^2\omega_4\omega_5-18v_1^2\omega_7\omega_4-6\omega_4\omega_5+12\omega_5+3v_1^2\omega_7\omega_4\omega_5-\omega_7\omega_4\omega_5+c_s^2\omega_7\omega_4\omega_5+12c_s^2\omega_7$$

$$C_3=-6v_1^2\omega_4+15c_s^2\omega_7\omega_4-3\omega_4^2-3c_s^2\omega_7\omega_4^2+6\omega_4+3v_1^2\omega_4^2-3\omega_7\omega_4+3v_1^2\omega_7\omega_4+3c_s^2\omega_4^2-6c_s^2\omega_4-v_1^2\omega_7\omega_4^2+\omega_7\omega_4^2-12c_s^2\omega_7$$

$$C_4=\omega_6v_2^2\omega_8-3\omega_6c_s^2\omega_4-\omega_6^2v_2^2-\omega_4\omega_8+\omega_6^2v_2^2\omega_4-3\omega_6c_s^2\omega_4\omega_8-\omega_6v_2^2\omega_4\omega_8+\omega_6\omega_4-3\omega_6^2c_s^2-\omega_6^2\omega_4+3\omega_6c_s^2\omega_8-\omega_6v_2^2\omega_4+\omega_6\omega_4\omega_8+v_2^2\omega_4\omega_8+3c_s^2\omega_4\omega_8+3\omega_6^2c_s^2\omega_4+\omega_6^2-\omega_6\omega_8$$

$$C_5=-3\omega_6^2v_2^2\omega_4^2\omega_8-11\omega_6^2c_s^2\omega_4^2\omega_8+12\omega_6\omega_4^2+36c_s^2\omega_4^2\omega_8+12v_2^2\omega_4^2\omega_8+12\omega_6^2v_2^2\omega_4^2-24\omega_6^2c_s^2\omega_8-6\omega_6^2\omega_4\omega_8-12\omega_6^2v_2^2\omega_4-12\omega_6c_s^2\omega_4^2-24\omega_6c_s^2\omega_4\omega_8+6\omega_6\omega_4^2\omega_8+12\omega_6^2\omega_4-6\omega_6v_2^2\omega_4^2\omega_8-18\omega_6c_s^2\omega_4^2\omega_8+12\omega_6^2c_s^2\omega_4^2-12\omega_4^2\omega_8+3\omega_6^2\omega_4^2\omega_8-12\omega_6^2c_s^2\omega_4-12\omega_6v_2^2\omega_4^2+42\omega_6^2c_s^2\omega_4\omega_8+6\omega_6^2v_2^2\omega_4\omega_8-12\omega_6^2\omega_4^2$$

$$C_6=3\omega_6v_2^2\omega_8-\omega_6c_s^2\omega_4-3\omega_6^2v_2^2-\omega_4\omega_8+3\omega_6^2v_2^2\omega_4-\omega_6c_s^2\omega_4\omega_8-3\omega_6v_2^2\omega_4\omega_8+\omega_6\omega_4-\omega_6^2c_s^2-\omega_6^2\omega_4+\omega_6c_s^2\omega_8-3\omega_6v_2^2\omega_4+\omega_6\omega_4\omega_8+3v_2^2\omega_4\omega_8+c_s^2\omega_4\omega_8+\omega_6^2c_s^2\omega_4+\omega_6^2-\omega_6\omega_8$$

$$C_7=-12c_s^2-7\omega_6^2v_2^2+144v_2^2c_s^2+36v_2^4+24\omega_6^2v_2^2c_s^2+\omega_6^2c_s^4+12\omega_6c_s^2-36\omega_6v_2^4-36v_2^2-\omega_6^2c_s^2+12c_s^4+7\omega_6^2v_2^4-144\omega_6v_2^2c_s^2+36\omega_6v_2^2-12\omega_6c_s^4$$

$$C_8=-126v_1^2c_s^2\omega_7\omega_4^2\omega_5^2-216v_1^2c_s^2\omega_7\omega_5^2+48c_s^4\omega_7\omega_4\omega_5^2-24c_s^4\omega_4\omega_5^2-3v_1^4\omega_7^2\omega_4^2\omega_5^2+96v_1^2\omega_7^2\omega_4\omega_5+72v_1^4\omega_7^2\omega_4+96v_1^4\omega_7\omega_4\omega_5^2+36v_1^2\omega_7^2\omega_4^2-c_s^4\omega_7^2\omega_4^2\omega_5^2+24c_s^2\omega_7\omega_5^2+48c_s^2\omega_7^2\omega_4\omega_5-48v_1^2\omega_7^2\omega_5-24v_1^2\omega_7\omega_4^2\omega_5-12v_1^2\omega_4^2\omega_5^2+30v_1^2\omega_7\omega_4^2\omega_5^2+24c_s^2\omega_4\omega_5^2-72v_1^2\omega_7^2\omega_4-48v_1^4\omega_7\omega_4\omega_5+14c_s^4\omega_7^2\omega_4^2\omega_5-432v_1^2c_s^2\omega_7^2\omega_4\omega_5-36v_1^4\omega_7^2\omega_4^2+12c_s^2\omega_7\omega_4^2\omega_5^2+48v_1^4\omega_7^2\omega_5-24c_s^4\omega_7\omega_5^2+72v_1^2c_s^2\omega_7\omega_4^2\omega_5-144v_1^2c_s^2\omega_4\omega_5^2+36v_1^4\omega_7^2\omega_4^2\omega_5+12v_1^4\omega_4^2\omega_5^2+24c_s^4\omega_7^2\omega_4-144v_1^2c_s^2\omega_7^2\omega_4^2+3v_1^2\omega_7^2\omega_4^2\omega_5^2-48c_s^2\omega_7\omega_4\omega_5^2-144v_1^2c_s^2\omega_7\omega_4\omega_5+216v_1^2c_s^2\omega_7^2\omega_5-24v_1^4\omega_4\omega_5^2-96v_1^4\omega_7^2\omega_4\omega_5+72v_1^2c_s^2\omega_4^2\omega_5^2+48v_1^2\omega_7\omega_5^2-24c_s^2\omega_7^2\omega_5+c_s^2\omega_7^2\omega_4^2\omega_5^2-12c_s^2\omega_4^2\omega_5^2-96v_1^2\omega_7\omega_4\omega_5^2+24v_1^4\omega_7\omega_4^2\omega_5+12c_s^2\omega_7^2\omega_4^2-48c_s^4\omega_7^2\omega_4\omega_5+150v_1^2c_s^2\omega_7^2\omega_4^2\omega_5-30v_1^4\omega_7\omega_4^2\omega_5^2-24c_s^2\omega_7^2\omega_4-12v_1^2c_s^2\omega_7^2\omega_4^2\omega_5^2-14c_s^2\omega_7^2\omega_4^2\omega_5+48v_1^2\omega_7\omega_4\omega_5+24v_1^2\omega_4\omega_5^2+432v_1^2c_s^2\omega_7\omega_4\omega_5^2+24c_s^4\omega_7^2\omega_5-12c_s^4\omega_7\omega_4^2\omega_5^2-48v_1^4\omega_7\omega_5^2+12c_s^4\omega_4^2\omega_5^2-12c_s^4\omega_7^2\omega_4^2+288v_1^2c_s^2\omega_7^2\omega_4-36v_1^2\omega_7^2\omega_4^2\omega_5$$

$$C_9=-12\omega_7\omega_4^2\omega_5-168v_1^2\omega_7^2\omega_4\omega_5+12c_s^2\omega_7\omega_4^2\omega_5-12\omega_4^2\omega_5^2-60v_1^2\omega_7^2\omega_4^2+72\omega_7^2\omega_4\omega_5-36\omega_7^2\omega_5-60c_s^2\omega_7\omega_5^2-120c_s^2\omega_7^2\omega_4\omega_5+84v_1^2\omega_7^2\omega_5+36v_1^2\omega_7\omega_4^2\omega_5+24v_1^2\omega_4^2\omega_5^2+24\omega_7^2\omega_4^2-51v_1^2\omega_7\omega_4^2\omega_5^2-48\omega_7^2\omega_4-48c_s^2\omega_4\omega_5^2+120v_1^2\omega_7^2\omega_4-33c_s^2\omega_7\omega_4^2\omega_5^2+21\omega_7\omega_4^2\omega_5^2-5v_1^2\omega_7^2\omega_4^2\omega_5^2+120c_s^2\omega_7\omega_4\omega_5^2-72\omega_7\omega_4\omega_5^2-84v_1^2\omega_7\omega_5^2+60c_s^2\omega_7^2\omega_5-3c_s^2\omega_7^2\omega_4^2\omega_5^2+24c_s^2\omega_4^2\omega_5^2+168v_1^2\omega_7\omega_4\omega_5^2+2\omega_7^2\omega_4^2\omega_5^2-36c_s^2\omega_7^2\omega_4^2+36\omega_7\omega_5^2-25\omega_7^2\omega_4^2\omega_5+24\omega_4\omega_5^2+72c_s^2\omega_7^2\omega_4+39c_s^2\omega_7^2\omega_4^2\omega_5-72v_1^2\omega_7\omega_4\omega_5-48v_1^2\omega_4\omega_5^2+24\omega_7\omega_4\omega_5+61v_1^2\omega_7^2\omega_4^2\omega_5-24c_s^2\omega_7\omega_4\omega_5$$

$$C_{10}=-3v_1^2\omega_7^2\omega_4^3+24v_1^4\omega_7^2\omega_4-24c_s^4\omega_7\omega_4^2-24v_1^2c_s^2\omega_7\omega_4-24c_s^2\omega_7\omega_4+24v_1^2\omega_7^2\omega_4^2+24c_s^4\omega_7^2+6c_s^4\omega_7\omega_4^3-12v_1^2c_s^2\omega_7\omega_4^3+3v_1^4\omega_7^2\omega_4^3+24c_s^2\omega_7\omega_4^2-24v_1^2\omega_7^2\omega_4-12v_1^2\omega_4^3-24v_1^4\omega_7^2\omega_4^2+24c_s^4\omega_7\omega_4+48v_1^2c_s^2\omega_7\omega_4^2+24v_1^2\omega_4^2-6c_s^2\omega_7\omega_4^3-48c_s^4\omega_7^2\omega_4-72v_1^2c_s^2\omega_7^2\omega_4^2+12v_1^2c_s^2\omega_4^3+72v_1^4\omega_7\omega_4^2-96v_1^2c_s^2\omega_7^2+c_s^2\omega_7^2\omega_4^3-24v_1^2c_s^2\omega_4^2-18v_1^4\omega_7\omega_4^3+6v_1^2c_s^2\omega_7^2\omega_4^3+48v_1^2\omega_7\omega_4-8c_s^2\omega_7^2\omega_4^2-72v_1^2\omega_7\omega_4^2+12c_s^2\omega_7^2\omega_4-24v_1^4\omega_4^2-3c_s^4\omega_7^2\omega_4^3+18v_1^2\omega_7\omega_4^3+24c_s^4\omega_7^2\omega_4^2+156v_1^2c_s^2\omega_7^2\omega_4+12v_1^4\omega_4^3-48v_1^4\omega_7\omega_4$$

$$C_{11}=6\omega_6c_s^2\omega_7\omega_4^3\omega_8\omega_5^2-24\omega_9\omega_6v_2^2\omega_7^2\omega_4\omega_8\omega_5+72\omega_9v_2^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5+6\omega_9v_1^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5+18\omega_9c_s^4\omega_7^2\omega_4^3\omega_8\omega_5+3\omega_9\omega_6c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2-6v_2^2v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^2+12\omega_6v_2^2v_1^2\omega_7^2\omega_4^2\omega_5^2+144\omega_9\omega_6v_2^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^2-3\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^2-36\omega_9\omega_6c_s^4\omega_7^2\omega_4\omega_8\omega_5+12\omega_9\omega_6v_2^2v_1^2\omega_7^2\omega_4^2\omega_8+6\omega_9v_2^2\omega_7^2\omega_4^3\omega_8\omega_5-\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2-6\omega_9c_s^2\omega_7^2\omega_4^3\omega_8\omega_5-18\omega_6c_s^4\omega_7\omega_4^3\omega_8\omega_5^2+9\omega_9\omega_6v_2^2v_1^2\omega_7^2\omega_4^3\omega_8\omega_5+12\omega_9\omega_6c_s^2\omega_7^2\omega_4\omega_8\omega_5-6\omega_6v_1^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^2+12\omega_9\omega_6c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^2+36\omega_6v_2^2c_s^2\omega_7\omega_4^2\omega_8\omega_5^2+6\omega_6v_2^2\omega_7\omega_4^3\omega_8\omega_5^2+36\omega_9\omega_6c_s^4\omega_7^2\omega_4^3\omega_5+6\omega_9\omega_6v_2^2v_1^2\omega_4^3\omega_8\omega_5^2+12\omega_9v_2^2v_1^2\omega_7\omega_4^3\omega_8\omega_5^2-12\omega_9\omega_6v_1^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2-48\omega_9\omega_6v_2^2\omega_7^2\omega_4^2\omega_8\omega_5^2-6\omega_9\omega_6c_s^2\omega_4^3\omega_8\omega_5^2+6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2-36\omega_9c_s^4\omega_7^2\omega_4^3\omega_5-42\omega_9\omega_6c_s^4\omega_7\omega_4^3\omega_8\omega_5^2-36\omega_6c_s^4\omega_7^2\omega_4^3\omega_5^2+72\omega_9\omega_6v_2^2c_s^2\omega_7^2\omega_4\omega_8\omega_5-6\omega_9\omega_6v_2^2\omega_4^3\omega_8\omega_5^2+12\omega_6c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2+36\omega_9\omega_6v_2^2c_s^2\omega_7^2\omega_4^2\omega_8-12\omega_6v_1^2c_s^2\omega_7^2\omega_4^3\omega_5^2+36\omega_6v_2^2c_s^2\omega_7^2\omega_4^2\omega_5^2+12\omega_6v_2^2\omega_7^2\omega_4^2\omega_8\omega_5^2-18c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2+18\omega_6v_2^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2-12\omega_6v_1^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2-12\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^2\omega_8\omega_5+6v_2^2\omega_7^2\omega_4^3\omega_8\omega_5^2-12\omega_9\omega_6v_2^2\omega_7^2\omega_4^2\omega_8-36\omega_6c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^2+18\omega_9\omega_6v_2^2c_s^2\omega_4^3\omega_8\omega_5^2-18\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8\omega_5^2+24\omega_9v_2^2v_1^2\omega_7^2\omega_4^2\omega_8\omega_5-36\omega_9\omega_6c_s^4\omega_7^2\omega_4^2\omega_5-18v_2^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2+48\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^2\omega_8\omega_5^2+27\omega_9\omega_6v_2^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5+18\omega_9\omega_6v_1^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5+12\omega_9\omega_6v_2^2\omega_7\omega_4^2\omega_8\omega_5+24\omega_9v_2^2\omega_7\omega_4^2\omega_8\omega_5^2-6\omega_9\omega_6v_2^2v_1^2\omega_7^2\omega_4^3\omega_8-12\omega_6v_2^2v_1^2\omega_7^2\omega_4^3\omega_5^2+36\omega_9v_2^2c_s^2\omega_7\omega_4^3\omega_8\omega_5^2+12\omega_6v_2^2v_1^2\omega_7\omega_4^2\omega_8\omega_5^2+$$

$6\omega_9\omega_6 v_2^2\omega_7^2\omega_4^3\omega_8 + 5\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 6\omega_9\omega_6 v_1^2 c_s^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 + 24\omega_9\omega_6 v_2^2 v_1^2\omega_7^2\omega_4\omega_8\omega_5 + 6\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^2 +$
$36\omega_6 c_s^4\omega_7^2\omega_4^2\omega_5^2 - 15\omega_9\omega_6 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5 + 12\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^2\omega_5^2 - 36\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_5^2 - 18\omega_9\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_8 + 36 c_s^4\omega_7^2\omega_4^3\omega_5^2 -$
$12\omega_9\omega_6 v_1^2 c_s^2\omega_7\omega_4\omega_8\omega_5^2 + 156\omega_9\omega_6 c_s^4\omega_7^2\omega_4\omega_8\omega_5^2 - 9\omega_9\omega_6 v_2^2\omega_7^2\omega_4^3\omega_8\omega_5 - 36\omega_9\omega_6 v_2^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5 - 36\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 6\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 -$
$24\omega_9\omega_6 v_2^2 v_1^2\omega_7\omega_4\omega_8\omega_5^2 - 6\omega_6 v_2^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 3\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 36\omega_9\omega_6 v_2^2 c_s^2\omega_4^2\omega_8\omega_5^2 + 36\omega_9\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_5 + 18\omega_6 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 -$
$12\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^2\omega_5 + 6\omega_9\omega_6 v_2^2 v_1^2\omega_7\omega_4^3\omega_8\omega_5 + 12 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_5^2 + 12\omega_9\omega_6 c_s^2\omega_4^2\omega_8\omega_5^2 + 15\omega_9\omega_6 v_2^2\omega_7\omega_4^3\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_5 +$
$\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9\omega_6 v_2^2\omega_7^2\omega_4^3\omega_5 - 6\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_4\omega_8\omega_5 + 12\omega_9\omega_6 v_2^2\omega_4^2\omega_8\omega_5^2 + 15\omega_9\omega_6 c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 -$
$36\omega_9\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^2\omega_8\omega_5 + 36\omega_6 c_s^4\omega_7\omega_4^2\omega_8\omega_5^2 + 12\omega_6 c_s^2\omega_7^2\omega_4^3\omega_5^2 + 12\omega_9 v_2^2\omega_7^2\omega_4^3\omega_5 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 12\omega_9 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_5 -$
$12\omega_6 v_2^2\omega_7\omega_4^2\omega_8\omega_5^2 - 24\omega_9 v_2^2 v_1^2\omega_7\omega_4^2\omega_8\omega_5^2 - 12\omega_9\omega_6 v_2^2 v_1^2\omega_4^2\omega_8\omega_5^2 + 12\omega_6 v_2^2\omega_7^2\omega_4^3\omega_5^2 + 12\omega_9 c_s^2\omega_7^2\omega_4^3\omega_5 - 6\omega_9\omega_6 c_s^4\omega_4^3\omega_8\omega_5^2 +$
$12\omega_6 v_1^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_5 - 18\omega_6 v_2^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 60\omega_9\omega_6 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^2 - 18\omega_9 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 - 12\omega_6 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 -$
$24\omega_9 v_2^2\omega_7^2\omega_4^2\omega_8\omega_5 - 45\omega_9\omega_6 v_2^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 + 18\omega_9\omega_6 v_1^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 - 72\omega_9\omega_6 v_2^2 c_s^2\omega_7\omega_4\omega_8\omega_5^2 + 12\omega_9\omega_6 v_2^2\omega_7^2\omega_4^2\omega_5 + 54\omega_9\omega_6 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5 -$
$12\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 36\omega_9\omega_6 v_2^2\omega_7^2\omega_4^2\omega_8\omega_5 + 18\omega_9\omega_6 v_2^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 36 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_5^2 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_5 - 12\omega_9\omega_6 v_1^2 c_s^2\omega_4^2\omega_8\omega_5^2 -$
$18\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 - 36\omega_9\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^2\omega_5 + 12\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_5 - 12\omega_9 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_5 - 96\omega_9\omega_6 c_s^4\omega_7^2\omega_8\omega_5^2 + 12\omega_9\omega_6 c_s^4\omega_7\omega_4\omega_8\omega_5^2 -$
$12\omega_9 v_2^2\omega_7\omega_4^3\omega_8\omega_5^2 - 108\omega_9\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 - 6\omega_9\omega_6 v_2^2\omega_7\omega_4^3\omega_8\omega_5 - 5\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 - 6\omega_6 v_2^2 v_1^2\omega_7\omega_4^3\omega_8\omega_5^2 + 12 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_5^2 +$
$24\omega_9\omega_6 v_2^2\omega_7\omega_4\omega_8\omega_5^2 - 72\omega_9 v_2^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 + 12\omega_9\omega_6 c_s^2\omega_7\omega_4\omega_8\omega_5^2 - 12 v_2^2\omega_7^2\omega_4^3\omega_5^2 - 12\omega_9\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^2\omega_5 -$
$6\omega_9 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_8\omega_5 - 12\omega_6 v_2^2\omega_7^2\omega_4^2\omega_5^2 - 12\omega_6 c_s^2\omega_7^2\omega_4^2\omega_5^2 - 36\omega_9 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_5 - 6 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 15\omega_9\omega_6 v_2^2 v_1^2\omega_7\omega_4^3\omega_8\omega_5^2 - 12 c_s^2\omega_7^2\omega_4^3\omega_5^2$

$C_{12} = 6\omega_6 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 24\omega_9\omega_6 v_2^2\omega_7^2\omega_4\omega_8\omega_5 + 24\omega_9 v_2^2 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 + 18\omega_9 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 6\omega_9 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5 - \omega_9\omega_6 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 -$
$18 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 36\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^2\omega_5^2 + 48\omega_9\omega_6 v_2^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 + 30\omega_9\omega_6 v_1^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^4\omega_7^2\omega_4\omega_8\omega_5 + 36\omega_9\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^2\omega_8 +$
$6\omega_9 v_2^2\omega_7^2\omega_4^3\omega_8\omega_5 - 6\omega_9 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 - 6\omega_6 c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 + 27\omega_9\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_8\omega_5 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4\omega_8\omega_5 - 18\omega_6 v_1^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 +$
$12\omega_6 v_2^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 + 6\omega_6 v_2^2\omega_7\omega_4^3\omega_8\omega_5^2 + 12\omega_9\omega_6 c_s^4\omega_7^2\omega_4^3\omega_5 + 18\omega_9\omega_6 v_2^2 v_1^2\omega_4^3\omega_8\omega_5^2 + 36\omega_9 v_2^2 v_1^2\omega_7\omega_4^3\omega_8\omega_5^2 - 15\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 -$
$48\omega_9\omega_6 v_2^2\omega_7\omega_4^2\omega_8\omega_5^2 + 6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9 c_s^4\omega_7^2\omega_4^3\omega_5 - 18\omega_9\omega_6 c_s^4\omega_7\omega_4^2\omega_8\omega_5^2 - 12\omega_6 c_s^4\omega_7^2\omega_4^3\omega_5^2 + 24\omega_9\omega_6 v_2^2 c_s^2\omega_7^2\omega_4\omega_8\omega_5 -$
$48\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_8\omega_5^2 - 6\omega_9\omega_6 v_2^2\omega_4^3\omega_8\omega_5^2 + 12\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^2\omega_8 - 36\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_5^2 + 12\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^2\omega_5^2 +$
$12\omega_6 v_2^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 6 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 + 6\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 36\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 36\omega_9\omega_6 v_2^2 v_1^2\omega_7\omega_4^2\omega_8\omega_5 + 6 v_2^2\omega_7^2\omega_4^3\omega_8\omega_5^2 -$
$12\omega_9\omega_6 v_2^2\omega_7^2\omega_4^2\omega_8 - 12\omega_6 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^2 + 6\omega_9\omega_6 v_2^2 c_s^2\omega_4^3\omega_8\omega_5^2 + 18\omega_9\omega_6 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 + 72\omega_9 v_2^2 v_1^2\omega_7^2\omega_4^2\omega_8\omega_5 - 12\omega_9\omega_6 c_s^4\omega_7^2\omega_4^2\omega_5 -$
$6 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 144\omega_9\omega_6 v_2^2 v_1^2\omega_7\omega_4^2\omega_8\omega_5^2 + 9\omega_9\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 54\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 + 12\omega_9\omega_6 v_2^2\omega_7\omega_4^2\omega_8\omega_5 + 24\omega_9 v_2^2\omega_7\omega_4^2\omega_8\omega_5^2 -$
$18\omega_9\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_8 - 36\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_5^2 + 12\omega_9 v_2^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 + 36\omega_6 v_2^2 v_1^2\omega_7\omega_4^2\omega_8\omega_5^2 + 6\omega_9\omega_6 v_2^2\omega_7^2\omega_4^3\omega_8 + 5\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 -$
$12\omega_9\omega_6 v_1^2 c_s^2\omega_4^3\omega_8\omega_5^2 + 72\omega_9\omega_6 v_2^2 v_1^2\omega_7^2\omega_4\omega_8\omega_5 + 18\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_6 c_s^4\omega_7^2\omega_4^2\omega_5^2 - 5\omega_9\omega_6 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5 + 36\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^2\omega_5^2 -$
$12\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_5^2 - 6\omega_9\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_8 + 12 c_s^4\omega_7^2\omega_4^3\omega_5^2 + 60\omega_9\omega_6 v_1^2 c_s^2\omega_7\omega_4\omega_8\omega_5^2 + 18\omega_9\omega_6 c_s^4\omega_7^2\omega_4\omega_8\omega_5^2 - 9\omega_9\omega_6 v_2^2\omega_7^2\omega_4^3\omega_8\omega_5 -$
$12\omega_9\omega_6 v_2^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5 - 12\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 18\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 72\omega_9\omega_6 v_2^2 v_1^2\omega_7\omega_4\omega_8\omega_5^2 - 6\omega_6 v_2^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 6\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 -$
$12\omega_9\omega_6 v_2^2 c_s^2\omega_4^2\omega_8\omega_5^2 + 12\omega_9\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_5 + 6\omega_6 c_s^4\omega_7^2\omega_4^3\omega_8\omega_5^2 - 36\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^2\omega_5 + 18\omega_9\omega_6 v_2^2 v_1^2\omega_7\omega_4^3\omega_8\omega_5 + 36 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_5^2 +$
$15\omega_9\omega_6 v_2^2\omega_7\omega_4^3\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_5 - 12\omega_9\omega_6 v_2^2\omega_7^2\omega_4^3\omega_5 - 6\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 36\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_4\omega_8\omega_5 + 12\omega_9\omega_6 v_2^2\omega_4^2\omega_8\omega_5^2 +$
$6\omega_9\omega_6 c_s^4\omega_7\omega_4^3\omega_8\omega_5^2 - 108\omega_9\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^2\omega_8\omega_5 + 12\omega_6 c_s^4\omega_7\omega_4^2\omega_8\omega_5^2 + 12\omega_6 c_s^2\omega_7^2\omega_4^3\omega_5^2 + 12\omega_9 v_2^2\omega_7^2\omega_4^3\omega_5 + \omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 -$
$36\omega_9 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_5 - 12\omega_6 v_2^2\omega_7\omega_4^2\omega_8\omega_5^2 - 72\omega_9 v_2^2 v_1^2\omega_7\omega_4^2\omega_8\omega_5^2 - 36\omega_9\omega_6 v_2^2 v_1^2\omega_4^2\omega_8\omega_5^2 + 12\omega_6 v_2^2\omega_7^2\omega_4^3\omega_5^2 + 12\omega_9 c_s^2\omega_7^2\omega_4^3\omega_5 +$
$36\omega_6 v_1^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 + 36\omega_9\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_5 - 6\omega_6 v_2^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 5\omega_9\omega_6 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5^2 - 6\omega_9 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 - 12\omega_6 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 -$
$24\omega_9 v_2^2\omega_7^2\omega_4^2\omega_8\omega_5 - 15\omega_9\omega_6 v_2^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 102\omega_9\omega_6 v_1^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 - 24\omega_9\omega_6 v_2^2 c_s^2\omega_7\omega_4\omega_8\omega_5^2 + 12\omega_9\omega_6 v_2^2\omega_7^2\omega_4^2\omega_5 + 18\omega_9\omega_6 c_s^4\omega_7^2\omega_4^2\omega_8\omega_5 -$
$36\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 36\omega_9\omega_6 v_2^2\omega_7^2\omega_4^2\omega_8\omega_5 + 6\omega_9\omega_6 v_2^2 c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 12 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_5^2 + 12\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_5 + 24\omega_9\omega_6 v_1^2 c_s^2\omega_4^2\omega_8\omega_5^2 -$
$18\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 - 12\omega_9\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^2\omega_5 + 36\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_5 - 36\omega_9 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_5 - 12\omega_9\omega_6 c_s^4\omega_7^2\omega_8\omega_5^2 + 12\omega_9\omega_6 c_s^4\omega_7\omega_4\omega_8\omega_5^2 -$
$12\omega_9 v_2^2\omega_7\omega_4^3\omega_8\omega_5^2 - 36\omega_9\omega_6 v_2^2 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 - 6\omega_9\omega_6 v_2^2\omega_7\omega_4^3\omega_8\omega_5 - 15\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 - 18\omega_6 v_2^2 v_1^2\omega_7\omega_4^3\omega_8\omega_5^2 + 36 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_5^2 +$
$24\omega_9\omega_6 v_2^2\omega_7\omega_4\omega_8\omega_5^2 - 24\omega_9 v_2^2 c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 + 60\omega_9\omega_6 v_1^2 c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 - 12\omega_9\omega_6 c_s^2\omega_7\omega_4\omega_8\omega_5^2 - 12 v_2^2\omega_7^2\omega_4^3\omega_5^2 - 36\omega_9\omega_6 v_2^2 v_1^2\omega_7^2\omega_4^2\omega_5 -$
$18\omega_9 v_2^2 v_1^2\omega_7^2\omega_4^3\omega_8\omega_5 - 12\omega_6 v_2^2\omega_7^2\omega_4^2\omega_5^2 - 12\omega_6 c_s^2\omega_7^2\omega_4^2\omega_5^2 - 12\omega_9 v_2^2 c_s^2\omega_7^2\omega_4^3\omega_5 - 18 v_1^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 45\omega_9\omega_6 v_2^2 v_1^2\omega_7\omega_4^3\omega_8\omega_5^2 - 12 c_s^2\omega_7^2\omega_4^3\omega_5^2$

$C_{13} = 18\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + 12\omega_9\omega_6 v_1^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 6\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2 - 24\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 6\omega_9\omega_6^2 v_1^2\omega_7^2\omega_4^3\omega_8^2 + 72\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4\omega_8\omega_5^2 +$
$24\omega_6^2 v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 18\omega_9\omega_6^2 v_1^2\omega_7^2\omega_4^2\omega_8^2\omega_5 - 84\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9\omega_6\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_6^2 c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 12\omega_6^2\omega_7\omega_4^3\omega_8^2\omega_5^2 +$
$36\omega_9\omega_6^2\omega_7\omega_4\omega_8^2\omega_5^2 - 66\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9\omega_6 v_1^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 6\omega_9\omega_6^2\omega_7\omega_4^3\omega_8^2\omega_5 - 18\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^3\omega_8^2 -$
$24\omega_9 c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 24\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 12\omega_9\omega_6^2 v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 36\omega_9\omega_6^2 v_1^2\omega_7\omega_4\omega_8^2\omega_5^2 + 24\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^2 - 12\omega_6 v_1^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 +$
$6\omega_9\omega_6^2 v_1^2\omega_7\omega_4^3\omega_8^2\omega_5 + 84\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 12\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 48\omega_9\omega_6^2 c_s^2\omega_4^2\omega_8^2\omega_5^2 + 24\omega_6^2 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 18\omega_9\omega_6^2 v_1^2\omega_7\omega_4^3\omega_8^2\omega_5^2 -$
$24\omega_6\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9\omega_6^2 v_1^2\omega_7^2\omega_4^2\omega_8^2 - 12\omega_9\omega_6 v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 42\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + 18\omega_9\omega_6^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2 +$
$12\omega_6^2 v_1^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 24\omega_9 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 24\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9\omega_6^2 v_1^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 24\omega_9\omega_6^2 v_1^2\omega_4^2\omega_8^2\omega_5^2 - 12\omega_9\omega_6\omega_7\omega_4^3\omega_8^2\omega_5^2 +$
$24\omega_9\omega_6^2\omega_4^2\omega_8^2\omega_5^2 + 12\omega_9\omega_6 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 + 24\omega_6^2 v_1^2\omega_7\omega_4^2\omega_8^2\omega_5^2 - 36\omega_9\omega_6^2 c_s^2\omega_7\omega_4\omega_8^2\omega_5^2 + 60\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 36\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^2\omega_8^2 +$
$12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 6\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 12\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 12\omega_6^2 c_s^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2 v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 12\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 -$
$12\omega_9\omega_6^2 v_1^2\omega_7\omega_4^2\omega_8^2\omega_5 - 72\omega_9\omega_6 c_s^2\omega_7^2\omega_4\omega_8^2\omega_5^2 + 24\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^2\omega_5^2 + 12\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8\omega_5^2 + 3\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 + 24\omega_6 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2 +$
$12\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4\omega_8^2\omega_5 + 12\omega_9\omega_6^2\omega_7\omega_4^2\omega_8^2\omega_5 - 24\omega_9\omega_6 v_1^2\omega_7\omega_4^2\omega_8^2\omega_5^2 + 4\omega_9\omega_6^2 v_1^2\omega_7^2\omega_4^3\omega_8^2\omega_5 + 48\omega_9\omega_6 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 24\omega_6^2\omega_7\omega_4^2\omega_8^2\omega_5^2 -$
$24\omega_6^2 c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 + 12\omega_9\omega_6^2 v_1^2\omega_7^2\omega_4\omega_8^2\omega_5^2 - 4\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5 + 12\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 24\omega_6^2 v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^2 - 12\omega_9\omega_6^2\omega_7^2\omega_4\omega_8^2\omega_5^2 -$
$96\omega_9\omega_6^2 c_s^2\omega_7^2\omega_8^2\omega_5^2 + 90\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^2 - \omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 132\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 12\omega_6^2 v_1^2\omega_7\omega_4^3\omega_8^2\omega_5^2 - 12\omega_9\omega_6^2\omega_7^2\omega_4\omega_8^2\omega_5 -$
$12\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 + 12\omega_9\omega_6^2 v_1^2\omega_4^3\omega_8^2\omega_5^2 + \omega_9\omega_6^2 v_1^2\omega_7^2\omega_4^3\omega_8^2\omega_5^2 - 24\omega_6^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 24\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^3\omega_5^2 - 24\omega_9\omega_6 c_s^2\omega_7\omega_4^2\omega_8^2\omega_5^2 -$
$12\omega_9\omega_6^2\omega_4^3\omega_8^2\omega_5^2 + 24\omega_6 v_1^2\omega_7^2\omega_4^3\omega_8\omega_5^2 + 12\omega_9\omega_6^2 v_1^2\omega_7^2\omega_4\omega_8^2\omega_5 + 24\omega_9\omega_6\omega_7\omega_4^2\omega_8^2\omega_5^2 + 12\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 + 24\omega_9\omega_6 c_s^2\omega_7^2\omega_4^3\omega_5^2 +$
$156\omega_9\omega_6^2 c_s^2\omega_7^2\omega_4\omega_8^2\omega_5^2 - 24\omega_6^2 v_1^2\omega_7^2\omega_4^2\omega_8^2\omega_5^2 - 66\omega_9\omega_6^2\omega_7\omega_4^2\omega_8^2\omega_5^2 + 24\omega_9\omega_6^2 c_s^2\omega_4^3\omega_8^2\omega_5^2 + 66\omega_9\omega_6^2 v_1^2\omega_7\omega_4^2\omega_8^2\omega_5^2 - 24\omega_6^2 c_s^2\omega_7^2\omega_4^3\omega_8\omega_5^2$

$C_{14} = -48\omega_9\omega_6 c_s^4\omega_7\omega_4^2\omega_8^2 - 36\omega_9\omega_6^2 c_s^4\omega_4^2\omega_8^2 + 12\omega_6^3 v_1^2\omega_7\omega_4^2\omega_8^2 - 6\omega_6^2 v_2^2 v_1^2\omega_7\omega_4^3\omega_8^2 + 12\omega_9\omega_6^3 v_2^2 v_1^2\omega_7\omega_4^3 - 12\omega_9\omega_6^3 c_s^2\omega_7\omega_4^3 - 12\omega_6^3 c_s^2\omega_4^2\omega_8^2 +$
$36\omega_6^2 v_1^2 c_s^2\omega_7\omega_4^3\omega_8 + 12\omega_6^3 c_s^2\omega_7\omega_4^3\omega_8 + 180\omega_9\omega_6^3 c_s^4\omega_7\omega_4\omega_8^2 + 36\omega_9\omega_6^3 v_2^2 v_1^2\omega_7\omega_4^2\omega_8 - 12\omega_9\omega_6^2 v_2^2 c_s^2\omega_7\omega_4\omega_8^2 - 18\omega_9\omega_6^3 c_s^2\omega_7\omega_4^2\omega_8 - 18\omega_6^3 c_s^4\omega_4^3\omega_8^2 +$
$18\omega_9\omega_6^2 v_1^2 c_s^2\omega_4^3\omega_8^2 - 42\omega_9\omega_6^2 c_s^4\omega_7\omega_4^3\omega_8 + \omega_9\omega_6^3 v_2^2 c_s^2\omega_7\omega_4^3\omega_8^2 - 6\omega_9\omega_6^2 c_s^2\omega_4^3\omega_8^2 - 6\omega_6^2 v_2^2 c_s^2\omega_7\omega_4^3\omega_8^2 + 12\omega_6^3 c_s^2\omega_7\omega_4^2\omega_8^2 + 12\omega_9\omega_6 c_s^4\omega_7\omega_4^3\omega_8 +$
$12\omega_9\omega_6^3 c_s^2\omega_7\omega_4^2 - 12\omega_9\omega_6^3 v_2^2 v_1^2\omega_7\omega_4^2 - 18\omega_6^2 c_s^4\omega_7\omega_4^3\omega_8^2 + 12\omega_6^3 v_1^2\omega_7\omega_4^3\omega_8 + 12\omega_9\omega_6^2 c_s^4\omega_7\omega_4^3 + 150\omega_9\omega_6^2 c_s^4\omega_7\omega_4^2\omega_8^2 - 36\omega_9\omega_6^3 v_1^2\omega_7\omega_4^2\omega_8 +$
$24\omega_9\omega_6^2 v_2^2 v_1^2\omega_7\omega_4\omega_8^2 + 18\omega_9\omega_6^3 v_2^2 c_s^2\omega_7\omega_4^2\omega_8 - 36\omega_9\omega_6^3 v_1^2 c_s^2\omega_7\omega_4^3\omega_8 - 6\omega_6^3 v_2^2 v_1^2\omega_4^3\omega_8^2 + 6\omega_9\omega_6^2 v_2^2 c_s^2\omega_4^3\omega_8^2 - \omega_9\omega_6^3 c_s^2\omega_7\omega_4^3\omega_8^2 -$
$12\omega_9\omega_6^3 v_2^2 c_s^2\omega_7\omega_4^2\omega_8^2 - 12\omega_9\omega_6^3 c_s^4\omega_7\omega_4^3 + 12\omega_9\omega_6^2 c_s^2\omega_4^2\omega_8^2 + 72\omega_9\omega_6^2 v_1^2 c_s^2\omega_7\omega_4\omega_8^2 + 6\omega_9\omega_6^3 c_s^2\omega_7\omega_4^3\omega_8 - 12\omega_9\omega_6^3 v_2^2 v_1^2\omega_7\omega_4^3\omega_8 -$

$12\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4^3 - 36\omega_9\omega_6^2v_1^2c_s^2\omega_4^2\omega_8^2 + 36\omega_6^3c_s^4\omega_4^2\omega_8^2 + 6\omega_6^3c_s^2\omega_4^3\omega_8^2 - 12\omega_6^3c_s^2\omega_7\omega_4^2\omega_8 + 12\omega_6^2v_2^2c_s^2\omega_7\omega_4^3\omega_8 + 18\omega_9\omega_6^2c_s^4\omega_4^3\omega_8^2 -$
$36\omega_9\omega_6c_s^4\omega_7\omega_4^3\omega_8^2 + 36\omega_6^2c_s^4\omega_7\omega_4^3\omega_8 - 6\omega_6^3v_1^2\omega_7\omega_4^3\omega_8^2 + 12\omega_9\omega_6^2c_s^2\omega_7\omega_4\omega_8^2 - 36\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^3 + 12\omega_9\omega_6^3c_s^2\omega_7\omega_4^2\omega_8^2 - 12\omega_9\omega_6^2v_2^2c_s^2\omega_4^2\omega_8^2 +$
$36\omega_9c_s^4\omega_7\omega_4^3\omega_8^2 - 6\omega_9\omega_6^3v_2^2c_s^2\omega_7\omega_4^3\omega_8 + 108\omega_9\omega_6^3v_1^2c_s^2\omega_7\omega_4^2\omega_8 + 12\omega_9\omega_6^3v_1^2\omega_7\omega_4^3\omega_8 - 6\omega_9\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2 + 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^3 + 12\omega_6^3v_2^2v_1^2\omega_4^2\omega_8^2 +$
$12\omega_9\omega_6^3c_s^4\omega_7\omega_4^2 + 12\omega_6^2v_2^2v_1^2\omega_7\omega_4^3\omega_8 - 12\omega_6^3v_1^2\omega_7\omega_4^2\omega_8 - 6\omega_6^3c_s^2\omega_7\omega_4^3\omega_8^2 - 24\omega_9\omega_6^2v_1^2\omega_7\omega_4\omega_8^2 + 12\omega_9\omega_6^3c_s^4\omega_7\omega_4\omega_8 - 18\omega_6^2v_1^2c_s^2\omega_7\omega_4^3\omega_8^2 +$
$12\omega_9\omega_6v_1^2\omega_7\omega_4^3\omega_8 - 36\omega_6^3c_s^4\omega_7\omega_4^3\omega_8 + 6\omega_6^2v_1^2\omega_7\omega_4^3\omega_8^2 + 72\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^3\omega_8 - 12\omega_9\omega_6^3c_s^2\omega_7\omega_4\omega_8^2 - 18\omega_6^3v_1^2c_s^2\omega_4^3\omega_8^2 - 6\omega_9\omega_6^2v_1^2\omega_4^3\omega_8^2 -$
$72\omega_9\omega_6^3v_1^2c_s^2\omega_7\omega_4\omega_8 + 6\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^3\omega_8^2 - 36\omega_6^3v_1^2c_s^2\omega_7\omega_4^2\omega_8^2 - 18\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8 + 6\omega_6^3v_2^2c_s^2\omega_7\omega_4^3\omega_8^2 - 54\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4^3\omega_8^2 -$
$12\omega_9\omega_6^3v_1^2\omega_7\omega_4^3 + 12\omega_9\omega_6^3v_2^2c_s^2\omega_7\omega_4^3 - 36\omega_9\omega_6^3v_1^2c_s^2\omega_7\omega_4^2 - 12\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^3\omega_8 + 12\omega_6^3v_2^2v_1^2\omega_7\omega_4^2\omega_8 - 12\omega_6^3v_1^2\omega_4^2\omega_8^2 - 42\omega_9\omega_6^3c_s^4\omega_7\omega_4^2\omega_8 +$
$24\omega_9\omega_6^2v_1^2\omega_7\omega_4^2\omega_8^2 + 12\omega_9v_2^2v_1^2\omega_7\omega_4^3\omega_8^2 + 12\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8 + 12\omega_9\omega_6^3v_2^2c_s^2\omega_7\omega_4\omega_8^2 - 6\omega_6^3v_2^2c_s^2\omega_4^3\omega_8^2 + 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2 - 12\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^2\omega_8 -$
$12\omega_9\omega_6v_1^2\omega_7\omega_4^2\omega_8^2 + 6\omega_9\omega_6^2v_2^2v_1^2\omega_4^3\omega_8^2 - 2\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4^3\omega_8^2 - 72\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^2\omega_8^2 - 36\omega_6^3c_s^4\omega_7\omega_4^2\omega_8^2 + 12\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^2\omega_8^2 +$
$6\omega_6^3v_2^2v_1^2\omega_7\omega_4^3\omega_8^2 - 24\omega_9\omega_6^2v_1^2\omega_7\omega_4^3\omega_8 + 5\omega_9\omega_6^3c_s^4\omega_7\omega_4^3\omega_8^2 + 12\omega_9v_2^2c_s^2\omega_7\omega_4^3\omega_8^2 - 18\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2 - 36\omega_6^3v_1^2c_s^2\omega_7\omega_4^3\omega_8 + 12\omega_6^3v_2^2c_s^2\omega_7\omega_4^2\omega_8 -$
$12\omega_9\omega_6^3v_2^2c_s^2\omega_7\omega_4^2 + 36\omega_9\omega_6^3v_1^2c_s^2\omega_7\omega_4^3 + 12\omega_9\omega_6^3v_1^2\omega_7\omega_4^2 - 12\omega_9\omega_6v_2^2c_s^2\omega_7\omega_4^3\omega_8 - 12\omega_6^3v_2^2v_1^2\omega_7\omega_4^3\omega_8 - 6\omega_9\omega_6^2v_1^2\omega_7\omega_4^3\omega_8^2 + 30\omega_9\omega_6^3c_s^4\omega_7\omega_4^3\omega_8 +$
$6\omega_6^3v_1^2\omega_4^3\omega_8^2 + 36\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4^2\omega_8^2 - 12\omega_9\omega_6v_2^2c_s^2\omega_7\omega_4^3\omega_8^2 + 18\omega_6^3v_1^2c_s^2\omega_7\omega_4^3\omega_8^2 - 12\omega_6^3v_2^2c_s^2\omega_7\omega_4^2\omega_8^2 - 12\omega_9v_1^2\omega_7\omega_4^3\omega_8^2 + 36\omega_6^3v_1^2c_s^2\omega_4^2\omega_8^2 +$
$12\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2 + 24\omega_9\omega_6^3v_1^2\omega_7\omega_4\omega_8 - 12\omega_6^2c_s^2\omega_7\omega_4^3\omega_8 - 84\omega_9\omega_6^2c_s^4\omega_7\omega_4\omega_8^2 - 24\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^2\omega_8^2 - 12\omega_9\omega_6^3v_2^2c_s^2\omega_7\omega_4\omega_8 + 12\omega_9\omega_6^2v_1^2\omega_4^2\omega_8^2 -$
$12\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^3 + 18\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4^3\omega_8 - 36\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^2\omega_8 + 36\omega_6^3c_s^4\omega_7\omega_4^2\omega_8 - 36\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4^3\omega_8 + 36\omega_6^3v_1^2c_s^2\omega_7\omega_4^2\omega_8 +$
$2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2 - 12\omega_6^3v_2^2c_s^2\omega_7\omega_4^3\omega_8 + 36\omega_9v_1^2c_s^2\omega_7\omega_4^3\omega_8^2 - 12\omega_9c_s^2\omega_7\omega_4^3\omega_8^2 - 12\omega_6^3v_2^2v_1^2\omega_7\omega_4^2\omega_8^2 - 88\omega_9\omega_6^3c_s^4\omega_7\omega_4^2\omega_8^2 + 12\omega_9\omega_6^2v_1^2\omega_7\omega_4^2\omega_8 -$
$18\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^3\omega_8^2 - 12\omega_9\omega_6^2v_2^2v_1^2\omega_4^2\omega_8^2 + 18\omega_9\omega_6v_1^2\omega_7\omega_4^3\omega_8^2 - 24\omega_9\omega_6^3v_2^2v_1^2\omega_7\omega_4\omega_8 + 18\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4^2\omega_8^2 + 18\omega_6^3c_s^4\omega_7\omega_4^3\omega_8^2 +$
$18\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^3\omega_8^2 + 12\omega_9\omega_6^3c_s^2\omega_7\omega_4\omega_8 - 96\omega_9\omega_6^3c_s^4\omega_7\omega_8^2 - 12\omega_6^2v_1^2\omega_7\omega_4^3\omega_8 + 12\omega_9\omega_6^2v_1^2\omega_7\omega_4^3 + 24\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^3\omega_8 + 12\omega_6^3v_2^2c_s^2\omega_4^2\omega_8^2$

$C_{15} =$
$-4\omega_6^3\omega_7\omega_4^2\omega_8^2\omega_5 + 3\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + 11\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 + 13\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 - 4\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5 - 2\omega_9\omega_6^3\omega_7^2\omega_4\omega_8^2\omega_5 - 16\omega_9\omega_6^3c_s^2\omega_7^2\omega_8^2\omega_5 +$
$9\omega_9\omega_6^3v_2^2\omega_7^2\omega_4^2\omega_8\omega_5 + 7\omega_9\omega_6^2v_2^2\omega_7^2\omega_4^3\omega_8\omega_5 - 8\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^2\omega_5 - 4\omega_6^3v_2^2\omega_7^2\omega_4^3\omega_8\omega_5 - 4\omega_9\omega_6^3v_2^2\omega_7^2\omega_4^2\omega_5 + 26\omega_9\omega_6^3c_s^2\omega_7^2\omega_4\omega_8^2\omega_5 - 2\omega_6^3\omega_7^2\omega_4^3\omega_8^2\omega_5 +$
$2\omega_9\omega_6v_2^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + 2\omega_9\omega_6^3v_2^2\omega_7^2\omega_4\omega_8^2\omega_5 + 2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 - 2\omega_9\omega_6\omega_7^2\omega_4^2\omega_8^2\omega_5 - 9\omega_9\omega_6^3\omega_7^2\omega_4^2\omega_8\omega_5 - 2\omega_9\omega_6^3c_s^2\omega_7\omega_4^3\omega_8^2 - 4\omega_6^3c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 -$
$2\omega_6^3c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 + 2\omega_9\omega_6^3\omega_7\omega_4^2\omega_8^2\omega_5 - 4\omega_9\omega_6^3c_s^2\omega_7^2\omega_4\omega_8^2 - 3\omega_9\omega_6^2v_2^2\omega_7^2\omega_4^2\omega_8^2\omega_5 - 7\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8\omega_5 - \omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 - 2\omega_9\omega_6^3c_s^2\omega_4^3\omega_8^2\omega_5 -$
$2\omega_6^3v_2^2\omega_7\omega_4^3\omega_8^2\omega_5 - 8\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 4\omega_9\omega_6^3c_s^2\omega_7\omega_4^2\omega_8^2 - 2\omega_9\omega_6^3v_2^2\omega_7\omega_4^2\omega_8^2\omega_5 + 4\omega_9\omega_6\omega_7^2\omega_4^3\omega_8\omega_5 - 4\omega_6^3c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 - 2\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 +$
$4\omega_9\omega_6^3v_2^2\omega_7^2\omega_4^3\omega_5 - 4\omega_6^3v_2^2\omega_7^2\omega_4^2\omega_8^2\omega_5 - 2\omega_6^2v_2^2\omega_7^2\omega_4^3\omega_8^2\omega_5 - 4\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 - 24\omega_9\omega_6^3c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 + 8\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^3\omega_5 - 4\omega_6^3\omega_7^2\omega_4^2\omega_8\omega_5 -$
$4\omega_9\omega_6v_2^2\omega_7^2\omega_4^3\omega_8\omega_5 + 5\omega_9\omega_6\omega_7^2\omega_4^3\omega_8^2\omega_5 - 15\omega_9\omega_6c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 + 2\omega_9\omega_6^2v_2^2\omega_7^2\omega_4\omega_8^2\omega_5 + 4\omega_6^3c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 + 4\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 3\omega_9\omega_6^3\omega_7^2\omega_4^3\omega_8\omega_5 +$
$4\omega_9\omega_6^2\omega_7^2\omega_4^3\omega_5 + 4\omega_6^3v_2^2\omega_7^2\omega_4^2\omega_8\omega_5 + 4\omega_6^2v_2^2\omega_7^2\omega_4^3\omega_8\omega_5 - 5\omega_9\omega_6v_2^2\omega_7^2\omega_4^3\omega_8^2\omega_5 + 4\omega_6^3\omega_7^2\omega_4^2\omega_8^2\omega_5 - 6\omega_9\omega_6^2c_s^2\omega_7^2\omega_4\omega_8^2\omega_5 - 8\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_5 -$
$4\omega_9\omega_6^2v_2^2\omega_7^2\omega_4^3\omega_5 - 3\omega_9\omega_6^3v_2^2\omega_7^2\omega_4^3\omega_8\omega_5 - 2\omega_9\omega_6^2v_2^2\omega_7^2\omega_4^2\omega_8\omega_5 + 2\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^2\omega_8^2 - 5\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^3\omega_8\omega_5 + 2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2\omega_8\omega_5 - \omega_9\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5 +$
$2\omega_6^3\omega_7\omega_4^3\omega_8^2\omega_5 + 12\omega_9\omega_6^3c_s^2\omega_7\omega_4\omega_8^2\omega_5 + 4\omega_9\omega_6^3\omega_7^2\omega_4^2\omega_5 - 4\omega_9\omega_7^2\omega_4^3\omega_8^2\omega_5 + 2\omega_6^3v_2^2\omega_7^2\omega_4^3\omega_8^2\omega_5 - 2\omega_9\omega_6^2\omega_7^2\omega_4\omega_8^2\omega_5 - 6\omega_9\omega_6^3c_s^2\omega_7^2\omega_4\omega_8\omega_5 +$
$4\omega_6^3\omega_7^2\omega_4^3\omega_8\omega_5 + 8\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 + 8\omega_9\omega_6^3c_s^2\omega_7\omega_4^3\omega_8^2\omega_5 + \omega_9\omega_6^3v_2^2\omega_7\omega_4^3\omega_8^2\omega_5 - 6\omega_9\omega_6^3v_2^2\omega_7^2\omega_4\omega_8\omega_5 + 2\omega_6^3c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 + \omega_9\omega_6^3\omega_7^2\omega_4^2\omega_8^2\omega_5 -$
$8\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + 3\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 - 4\omega_9\omega_6^3\omega_7^2\omega_4^3\omega_5 + 2\omega_9\omega_6^2\omega_7^2\omega_4^2\omega_8\omega_5 + 4\omega_9v_2^2\omega_7^2\omega_4^3\omega_8^2\omega_5 + 4\omega_6^3v_2^2\omega_7\omega_4^2\omega_8^2\omega_5 + 4\omega_9\omega_6^3c_s^2\omega_4^2\omega_8^2\omega_5 -$
$\omega_9\omega_6^3\omega_7\omega_4^3\omega_8^2\omega_5 + 4\omega_6^3c_s^2\omega_7\omega_4^2\omega_8^2\omega_5 + 6\omega_9\omega_6^3\omega_7^2\omega_4\omega_8\omega_5 + 12\omega_9c_s^2\omega_7^2\omega_4^3\omega_8^2\omega_5 + 2\omega_6^2\omega_7^2\omega_4^3\omega_8^2\omega_5 - \omega_9\omega_6^3v_2^2\omega_7^2\omega_4^2\omega_8^2\omega_5 + \omega_9\omega_6^2v_2^2\omega_7^2\omega_4^3\omega_8^2\omega_5$

$C_{16} = -12\omega_9\omega_6c_s^4\omega_7\omega_4^2\omega_8^2 - 12\omega_9\omega_6^2c_s^4\omega_4^2\omega_8^2 + 12\omega_6^3v_1^2\omega_7\omega_4^2\omega_8^2 - 18\omega_6^2v_2^2v_1^2\omega_7\omega_4^3\omega_8^2 + 36\omega_9\omega_6^3v_2^2v_1^2\omega_7\omega_4^3 - 12\omega_6^3c_s^2\omega_4^2\omega_8^2 + 12\omega_6^2v_1^2c_s^2\omega_7\omega_4^3\omega_8 +$
$12\omega_6^3c_s^2\omega_7\omega_4^3\omega_8 + 18\omega_9\omega_6^3c_s^4\omega_7\omega_4\omega_8^2 + 108\omega_9\omega_6^3v_2^2v_1^2\omega_7\omega_4^2\omega_8 - 84\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4\omega_8^2 + 24\omega_9\omega_6^3c_s^2\omega_7\omega_4^2\omega_8 - 6\omega_6^3c_s^4\omega_4^3\omega_8^2 + 6\omega_9\omega_6^2v_1^2c_s^2\omega_4^3\omega_8^2 -$
$12\omega_9\omega_6^2c_s^4\omega_7\omega_4^3\omega_8 - 6\omega_9\omega_6^2c_s^2\omega_4^3\omega_8^2 - 48\omega_9\omega_6^3v_2^2c_s^2\omega_7\omega_8^2 - 18\omega_6^2v_2^2c_s^2\omega_7\omega_4^3\omega_8^2 + 12\omega_6^3c_s^2\omega_7\omega_4^2\omega_8^2 - 36\omega_9\omega_6^3v_2^2v_1^2\omega_7\omega_4^2 - 6\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2 +$
$12\omega_6^3v_1^2\omega_7\omega_4^3\omega_8 + 24\omega_9\omega_6^2c_s^4\omega_7\omega_4^2\omega_8^2 - 36\omega_9\omega_6^3v_1^2\omega_7\omega_4^2\omega_8 + 72\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4\omega_8^2 - 132\omega_9\omega_6^3v_2^2c_s^2\omega_7\omega_4^2\omega_8 - 12\omega_9\omega_6^3v_1^2c_s^2\omega_7\omega_4^3\omega_8 -$
$18\omega_6^3v_2^2v_1^2\omega_4^3\omega_8^2 + 18\omega_9\omega_6^2v_2^2c_s^2\omega_4^3\omega_8^2 - 42\omega_9\omega_6^3v_2^2c_s^2\omega_7\omega_4^2\omega_8^2 + 12\omega_9\omega_6^2c_s^4\omega_7\omega_4^2\omega_8 + 12\omega_9\omega_6^2c_s^2\omega_4^2\omega_8^2 + 24\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4\omega_8^2 -$
$12\omega_9\omega_6^3c_s^2\omega_7\omega_4^3\omega_8 - 36\omega_9\omega_6^3v_2^2v_1^2\omega_7\omega_4^3\omega_8 + 24\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4^3 - 12\omega_9\omega_6^2v_1^2c_s^2\omega_4^2\omega_8^2 + 12\omega_6^3c_s^4\omega_4^2\omega_8^2 + 6\omega_6^3c_s^2\omega_4^3\omega_8^2 - 12\omega_6^3c_s^2\omega_7\omega_4^2\omega_8 +$
$36\omega_6^2v_2^2c_s^2\omega_7\omega_4^3\omega_8 + 6\omega_9\omega_6^2c_s^4\omega_4^3\omega_8^2 + 6\omega_9\omega_6c_s^4\omega_7\omega_4^3\omega_8^2 + 12\omega_6^2c_s^4\omega_7\omega_4^3\omega_8 - 6\omega_6^3v_1^2\omega_7\omega_4^3\omega_8^2 + 12\omega_9\omega_6^2c_s^2\omega_7\omega_4\omega_8^2 - 12\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^3 -$
$36\omega_9\omega_6^2v_2^2c_s^2\omega_4^2\omega_8^2 + 78\omega_9\omega_6^3v_2^2c_s^2\omega_7\omega_4^3\omega_8 + 36\omega_9\omega_6^3v_1^2c_s^2\omega_7\omega_4^2\omega_8 + 12\omega_9\omega_6^3v_1^2\omega_7\omega_4^3\omega_8 - 6\omega_9\omega_6^2c_s^4\omega_7\omega_4^3\omega_8^2 + 36\omega_6^3v_2^2v_1^2\omega_4^2\omega_8^2 +$
$36\omega_6^2v_2^2v_1^2\omega_7\omega_4^3\omega_8 - 12\omega_6^3v_1^2\omega_7\omega_4^2\omega_8 - 6\omega_6^3c_s^2\omega_7\omega_4^3\omega_8^2 - 24\omega_9\omega_6^2v_1^2\omega_7\omega_4\omega_8^2 + 12\omega_9\omega_6^3c_s^4\omega_7\omega_4\omega_8 - 6\omega_6^2v_1^2c_s^2\omega_7\omega_4^3\omega_8^2 + 12\omega_9\omega_6v_1^2\omega_7\omega_4^3\omega_8 +$
$60\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4^2\omega_8 - 12\omega_6^3c_s^4\omega_7\omega_4^3\omega_8 + 6\omega_6^2v_1^2\omega_7\omega_4^3\omega_8^2 + 24\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^3\omega_8 - 6\omega_6^3v_1^2c_s^2\omega_4^3\omega_8^2 + 12\omega_9\omega_6c_s^2\omega_7\omega_4^2\omega_8^2 - 6\omega_9\omega_6^2v_1^2\omega_4^3\omega_8^2 -$
$24\omega_9\omega_6^3v_1^2c_s^2\omega_7\omega_4\omega_8 + 18\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^3\omega_8^2 - 12\omega_6^3v_1^2c_s^2\omega_7\omega_4^2\omega_8^2 + 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8 + 18\omega_6^3v_2^2c_s^2\omega_7\omega_4^3\omega_8^2 - 18\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4^3\omega_8^2 -$
$108\omega_9\omega_6v_2^2c_s^2\omega_7\omega_4^2\omega_8^2 - 12\omega_9\omega_6^3v_1^2\omega_7\omega_4^3 - 24\omega_9\omega_6^3v_2^2c_s^2\omega_7\omega_4^3 - 12\omega_9\omega_6^3v_1^2c_s^2\omega_7\omega_4^2 - 36\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^3\omega_8 + 36\omega_6^3v_2^2v_1^2\omega_7\omega_4^2\omega_8 - 12\omega_6^3v_1^2\omega_4^2\omega_8^2 -$
$24\omega_9\omega_6^3c_s^4\omega_7\omega_4^2\omega_8 + 24\omega_9\omega_6^2v_1^2\omega_7\omega_4^2\omega_8^2 + 36\omega_9v_2^2v_1^2\omega_7\omega_4^3\omega_8^2 + 84\omega_9\omega_6^3v_2^2c_s^2\omega_7\omega_4\omega_8^2 - 18\omega_6^3v_2^2c_s^2\omega_4^3\omega_8^2 + 6\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2 - 36\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^2\omega_8 -$
$12\omega_9\omega_6v_1^2\omega_7\omega_4^2\omega_8^2 + 18\omega_9\omega_6^2v_2^2v_1^2\omega_4^3\omega_8^2 - 18\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4^3\omega_8^2 - 24\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^2\omega_8^2 - 12\omega_6^3c_s^4\omega_7\omega_4^2\omega_8^2 + 36\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^2\omega_8^2 +$
$18\omega_6^3v_2^2v_1^2\omega_7\omega_4^3\omega_8^2 - 24\omega_9\omega_6^2v_1^2\omega_7\omega_4^3\omega_8 - \omega_9\omega_6^3c_s^4\omega_7\omega_4^3\omega_8^2 - 24\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8^2 - 12\omega_6^3v_1^2c_s^2\omega_7\omega_4^3\omega_8 + 36\omega_6^3v_2^2c_s^2\omega_7\omega_4^2\omega_8 + 24\omega_9\omega_6^3v_2^2c_s^2\omega_7\omega_4^2 +$
$12\omega_9\omega_6^3v_1^2c_s^2\omega_7\omega_4^3 + 12\omega_9\omega_6^3v_1^2\omega_7\omega_4^2 + 72\omega_9\omega_6v_2^2c_s^2\omega_7\omega_4^3\omega_8 - 36\omega_6^3v_2^2v_1^2\omega_7\omega_4^3\omega_8 - 6\omega_9\omega_6^2v_1^2\omega_7\omega_4^3\omega_8^2 + 12\omega_9\omega_6^3c_s^4\omega_7\omega_4^3\omega_8 + 6\omega_6^3v_1^2\omega_4^3\omega_8^2 +$
$12\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4^2\omega_8^2 + 18\omega_9\omega_6v_2^2c_s^2\omega_7\omega_4^3\omega_8^2 - 12\omega_9\omega_6^2c_s^2\omega_7\omega_4^2\omega_8 + 6\omega_6^3v_1^2c_s^2\omega_7\omega_4^3\omega_8^2 - 36\omega_6^3v_2^2c_s^2\omega_7\omega_4^2\omega_8^2 - 12\omega_9v_1^2\omega_7\omega_4^3\omega_8^2 + 12\omega_6^3v_1^2c_s^2\omega_4^2\omega_8^2 -$
$6\omega_9\omega_6c_s^2\omega_7\omega_4^3\omega_8^2 + 24\omega_9\omega_6^3v_1^2\omega_7\omega_4\omega_8 - 12\omega_6^2c_s^2\omega_7\omega_4^3\omega_8 - 12\omega_9\omega_6^2c_s^4\omega_7\omega_4\omega_8^2 - 72\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^2\omega_8^2 + 60\omega_9\omega_6^3v_2^2c_s^2\omega_7\omega_4\omega_8 +$
$12\omega_9\omega_6^2v_1^2\omega_4^2\omega_8^2 - 36\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^3 - 144\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4^3\omega_8 - 12\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^2\omega_8 + 12\omega_6^3c_s^4\omega_7\omega_4^2\omega_8 - 12\omega_9\omega_6v_1^2c_s^2\omega_7\omega_4^3\omega_8 +$
$12\omega_6^3v_1^2c_s^2\omega_7\omega_4^2\omega_8 + 6\omega_9\omega_6^2c_s^2\omega_7\omega_4^3\omega_8^2 - 36\omega_6^3v_2^2c_s^2\omega_7\omega_4^3\omega_8 + 12\omega_9v_1^2c_s^2\omega_7\omega_4^3\omega_8^2 - 36\omega_6^3v_2^2v_1^2\omega_7\omega_4^2\omega_8^2 - 4\omega_9\omega_6^3c_s^4\omega_7\omega_4^2\omega_8^2 + 12\omega_9\omega_6^2v_1^2\omega_7\omega_4^2\omega_8 -$
$54\omega_9\omega_6v_2^2v_1^2\omega_7\omega_4^3\omega_8^2 - 36\omega_9\omega_6^2v_2^2v_1^2\omega_4^2\omega_8^2 + 18\omega_9\omega_6v_1^2\omega_7\omega_4^3\omega_8^2 - 72\omega_9\omega_6^3v_2^2v_1^2\omega_7\omega_4\omega_8 + 180\omega_9\omega_6^2v_2^2c_s^2\omega_7\omega_4^2\omega_8^2 + 6\omega_6^3c_s^4\omega_7\omega_4^3\omega_8^2 +$
$6\omega_9\omega_6^2v_1^2c_s^2\omega_7\omega_4^3\omega_8^2 - 12\omega_9\omega_6^3c_s^2\omega_7\omega_4\omega_8 - 12\omega_9\omega_6^3c_s^4\omega_7\omega_8^2 - 12\omega_6^2v_1^2\omega_7\omega_4^3\omega_8 + 12\omega_9\omega_6^2v_1^2\omega_7\omega_4^3 + 72\omega_9\omega_6^2v_2^2v_1^2\omega_7\omega_4^3\omega_8 + 36\omega_6^3v_2^2c_s^2\omega_4^2\omega_8^2$

$C_{17} = -24\omega_6^2v_2^2c_s^2\omega_4^2 - 4\omega_6^2c_s^4\omega_4^2 + 8\omega_6^2v_2^4\omega_8^2 - 32\omega_6^2v_2^2\omega_4^2\omega_8 + 24v_2^4\omega_4^2\omega_8^2 - 144\omega_6v_2^2c_s^2\omega_4^2\omega_8^2 - 8\omega_6^2c_s^2\omega_4^2\omega_8 + 8c_s^4\omega_4^2\omega_8^2 - 24\omega_6^3v_2^2c_s^2\omega_4 -$
$4\omega_6c_s^2\omega_4\omega_8^2 - 20\omega_6v_2^2\omega_4\omega_8^2 - 4\omega_6^3c_s^2\omega_4^2 + 4\omega_6^2c_s^4\omega_4^2\omega_8^2 + 13\omega_6^2v_2^4\omega_4^2\omega_8^2 + 51\omega_6^2v_2^2c_s^2\omega_4^2\omega_8^2 + 4\omega_6^2v_2^2\omega_4^2 - 4\omega_6^2c_s^2\omega_8^2 - 13\omega_6^3v_2^4\omega_4^2\omega_8 - 4\omega_6^3c_s^4\omega_4^2\omega_8 +$
$4\omega_6^3v_2^4\omega_4^2 + 96v_2^2c_s^2\omega_4^2\omega_8^2 - 4\omega_6^3v_2^4\omega_4 + 8\omega_6^2c_s^4\omega_4^2\omega_8 - 8c_s^2\omega_4^2\omega_8^2 + 120\omega_6^2v_2^2c_s^2\omega_4^2\omega_8 + 32\omega_6^2v_2^4\omega_4^2\omega_8 - 24v_2^2\omega_4^2\omega_8^2 - 4\omega_6^3c_s^4\omega_8 + 20\omega_6v_2^4\omega_4\omega_8^2 +$
$4\omega_6c_s^4\omega_4\omega_8^2 - 13\omega_6^2v_2^2\omega_4^2\omega_8^2 + 24\omega_6^3v_2^2c_s^2\omega_4^2 - 4\omega_6^2c_s^2\omega_4^2\omega_8^2 - 72\omega_6v_2^2c_s^2\omega_4^2\omega_8 + 84\omega_6^3v_2^2c_s^2\omega_4\omega_8 + 4\omega_6^3c_s^2\omega_4 + 8\omega_6^3v_2^2\omega_8 + 4\omega_6^3c_s^2\omega_4^2\omega_8 +$
$13\omega_6^3v_2^2\omega_4^2\omega_8 + 8\omega_6^2c_s^2\omega_4\omega_8^2 + 20\omega_6^2v_2^2\omega_4\omega_8^2 - 4\omega_6^2v_2^4\omega_4^2 + 20\omega_6v_2^2\omega_4^2\omega_8 + 4\omega_6c_s^2\omega_4^2\omega_8 - 51\omega_6^3v_2^2c_s^2\omega_4^2\omega_8 - 36\omega_6^3v_2^2c_s^2\omega_8 + 36\omega_6^2v_2^2c_s^2\omega_8^2 +$
$4\omega_6^2c_s^4\omega_8^2 - 20\omega_6^3v_2^2\omega_4\omega_8 - 4\omega_6^3v_2^2\omega_4^2 - 8\omega_6^3c_s^2\omega_4\omega_8 + 4\omega_6^2c_s^2\omega_4^2 - 16\omega_6^2v_2^4\omega_4\omega_8 - 48\omega_6^2v_2^2c_s^2\omega_4\omega_8 - 8\omega_6^2v_2^2\omega_8^2 - 12\omega_6c_s^4\omega_4^2\omega_8^2 - 36\omega_6v_2^4\omega_4^2\omega_8^2 +$
$4\omega_6^3c_s^4\omega_4^2 - 84\omega_6^2v_2^2c_s^2\omega_4\omega_8^2 - 20\omega_6^2v_2^4\omega_4\omega_8^2 - 8\omega_6^2c_s^4\omega_4\omega_8^2 - 4\omega_6c_s^4\omega_4^2\omega_8 - 4\omega_6^3c_s^4\omega_4 - 20\omega_6v_2^4\omega_4^2\omega_8 - 8\omega_6^3v_2^4\omega_8 + 8\omega_6^3c_s^4\omega_4\omega_8 + 20\omega_6^3v_2^4\omega_4\omega_8 +$
$4\omega_6^3v_2^2\omega_4 + 72\omega_6v_2^2c_s^2\omega_4\omega_8^2 + 16\omega_6^2v_2^2\omega_4\omega_8 + 4\omega_6^3c_s^2\omega_8 + 36\omega_6v_2^4\omega_4^2\omega_8^2 + 12\omega_6c_s^2\omega_4^2\omega_8^2$

$C_{18} = 12\omega_6^2 v_2^2\omega_4^3 - 12c_s^2\omega_4^3\omega_8^2 - 5\omega_6^3 c_s^2\omega_4^2\omega_8^2 - 6\omega_6^2 c_s^4\omega_4^3\omega_8 - 72v_2^2\omega_4^3\omega_8^2 + 18\omega_6^3 v_2^2\omega_4^2\omega_8^2 + 60\omega_6^2 v_2^4\omega_4^3\omega_8 + 54\omega_6^2 v_2^2 c_s^2\omega_4^3\omega_8 + 252v_2^2 c_s^2\omega_4^3\omega_8^2 + 4\omega_6^3 v_2^4\omega_4^3\omega_8^2 + 24\omega_6^2 v_2^2\omega_4^2\omega_8 + 12\omega_6^3 v_2^4\omega_4^3 - 108\omega_6 v_2^2 c_s^2\omega_4^2\omega_8^2 - \omega_6^3 c_s^4\omega_4^3\omega_8^2 - 12\omega_6^2 c_s^2\omega_4^2\omega_8 + 102\omega_6^3 v_2^2 c_s^2\omega_4\omega_8^2 + 6\omega_6^2 c_s^4\omega_4^2\omega_8^2 - 6\omega_6^3 c_s^2\omega_4^3\omega_8 + 12\omega_6^2 v_2^4\omega_4^2\omega_8^2 + 27\omega_6^3 v_2^2\omega_4^3\omega_8 + 12\omega_6^3 c_s^4\omega_8^2 - 12\omega_6^2 v_2^2 c_s^2\omega_4^3 + 162\omega_6^2 v_2^2 c_s^2\omega_4^2\omega_8^2 - 19\omega_6^2 v_2^2\omega_4^3\omega_8^2 + 48\omega_6^3 v_2^4\omega_4^2\omega_8 - 36\omega_6 v_2^2 c_s^2\omega_4^3\omega_8 - \omega_6^2 c_s^2\omega_4^3\omega_8^2 - 18\omega_6^3 c_s^4\omega_4^2\omega_8 - 12\omega_6^3 v_2^4\omega_4^2 + 12\omega_6^3 v_2^2 c_s^2\omega_4^3 + 72v_2^4\omega_4^3\omega_8^2 - 18\omega_6^3 v_2^4\omega_4^2\omega_8^2 - 60\omega_6^2 v_2^2\omega_4^3\omega_8 + 12c_s^4\omega_4^3\omega_8^2 + 13\omega_6^3 c_s^4\omega_4^2\omega_8^2 + 6\omega_6^2 c_s^2\omega_4^3\omega_8 - 306\omega_6 v_2^2 c_s^2\omega_4^3\omega_8^2 + 12\omega_6^2 c_s^4\omega_4^2\omega_8 - 12\omega_6^2 v_2^2 c_s^2\omega_4^2\omega_8 - 4\omega_6^3 v_2^2\omega_4^3\omega_8^2 - 24\omega_6^2 v_2^4\omega_4^2\omega_8 - 12\omega_6^2 v_2^2\omega_4^2\omega_8^2 - 27\omega_6^3 v_2^4\omega_4^3\omega_8 - 12\omega_6^3 v_2^2 c_s^2\omega_4^2 - 6\omega_6^2 c_s^2\omega_4^2\omega_8^2 + 6\omega_6^3 c_s^4\omega_4^3\omega_8 - 12\omega_6^3 v_2^2 c_s^2\omega_4\omega_8 + \omega_6^2 c_s^4\omega_4^3\omega_8^2 + 18\omega_6^3 c_s^2\omega_4^2\omega_8 + 60\omega_6^2 v_2^2 c_s^2\omega_4^3\omega_8^2 + 19\omega_6^2 v_2^4\omega_4^3\omega_8^2 - 48\omega_6^3 v_2^2\omega_4^2\omega_8 + 30\omega_6^3 v_2^2 c_s^2\omega_4^3\omega_8 - 36\omega_6 v_2^4\omega_4^3\omega_8 + 24\omega_6^3 v_2^2\omega_4\omega_8 + 12\omega_6^3 v_2^2\omega_4^2 - 12\omega_6^3 c_s^2\omega_4\omega_8 + 90\omega_6 v_2^2\omega_4^3\omega_8^2 + 12\omega_6 c_s^2\omega_4^3\omega_8^2 - 12\omega_6^2 v_2^4\omega_4^3 + 12\omega_6^3 v_2^2 c_s^2\omega_4^3\omega_8^2 - 24\omega_6^3 c_s^4\omega_4\omega_8^2 + 12\omega_6^3 v_2^4\omega_4\omega_8^2 - 12\omega_6^3 v_2^2\omega_4^3 - 12\omega_6 c_s^4\omega_4^2\omega_8^2 - 48\omega_6^2 v_2^2 c_s^2\omega_4\omega_8^2 + 36\omega_6 v_2^2\omega_4^3\omega_8 - 21\omega_6^3 v_2^2 c_s^2\omega_4^3\omega_8 + 12\omega_6^3 c_s^4\omega_4\omega_8 - 24\omega_6^3 v_2^2\omega_4\omega_8 - 12\omega_6 c_s^4\omega_4^3\omega_8^2 - 90\omega_6 v_2^4\omega_4^3\omega_8^2 - 12\omega_6^3 v_2^2\omega_4\omega_8^2 + 6\omega_6^3 c_s^2\omega_4\omega_8^2 - 81\omega_6^3 v_2^2 c_s^2\omega_4^2\omega_8^2 - 48\omega_6^3 v_2^2 c_s^2\omega_8^2 + 12\omega_6 c_s^2\omega_4^2\omega_8^2$

$C_{19} = 17\omega_6^3\omega_4^2\omega_8 + 48\omega_6\omega_4^2\omega_8^2 + 104\omega_6^2 v_2^2\omega_4^2\omega_8 + 56\omega_6^2 c_s^2\omega_4^2\omega_8 + 32\omega_6 c_s^2\omega_4\omega_8^2 + 64\omega_6 v_2^2\omega_4\omega_8^2 + 16\omega_6^3 c_s^2\omega_4^2 + 28\omega_6^2\omega_4\omega_8^2 - 16\omega_6^2 v_2^2\omega_4^2 + 20\omega_6^2 c_s^2\omega_8^2 + 12\omega_6^3\omega_8 + 48c_s^2\omega_4^3\omega_8^2 + 16\omega_6^2\omega_4\omega_8 + 80v_2^2\omega_4^3\omega_8^2 + 43\omega_6^2 v_2^2\omega_4^2\omega_8^2 - 12\omega_6^2\omega_8^2 + 25\omega_6^2 c_s^2\omega_4^2\omega_8^2 - 16\omega_6^3 c_s^2\omega_4 - 28\omega_6^3 v_2^2\omega_8 - 25\omega_6^3 c_s^2\omega_4^2\omega_8 + 24\omega_6\omega_4^2\omega_8 - 43\omega_6^3 v_2^2\omega_4^2\omega_8 - 44\omega_6^2 c_s^2\omega_4\omega_8^2 - 68\omega_6^2 v_2^2\omega_4\omega_8^2 - 64\omega_6 v_2^2\omega_4^2\omega_8 - 32\omega_6 c_s^2\omega_4^2\omega_8 + 68\omega_6^3 v_2^2\omega_4\omega_8 + 16\omega_6^3 v_2^2\omega_4^2 + 44\omega_6^2 c_s^2\omega_4\omega_8 - 8\omega_6^3\omega_4^2 - 16\omega_6^2 c_s^2\omega_4^2 - 40\omega_6^2\omega_4^2\omega_8 + 28\omega_6^2 v_2^2\omega_8^2 - 17\omega_6^2\omega_4^2\omega_8^2 + 8\omega_6^3\omega_4 - 32\omega_4^2\omega_8^2 - 28\omega_6^3\omega_4\omega_8 - 24\omega_6\omega_4\omega_8^2 - 16\omega_6^3 v_2^2\omega_4 - 16\omega_6^2 c_s^2\omega_4\omega_8 - 48\omega_6^2 v_2^2\omega_4\omega_8 - 20\omega_6^3 c_s^2\omega_8 - 120\omega_6 v_2^2\omega_4^2\omega_8^2 + 8\omega_6^2\omega_4^2 - 72\omega_6 c_s^2\omega_4^2\omega_8^2$

$C_{20} = 12 - 5\omega_6^3 c_s^4 - 18\omega_6 + 10\omega_6^3 v_2^2 - 132c_s^2 - 98\omega_6^2 v_2^2 + 672v_2^2 c_s^2 + 144v_2^4 + 404\omega_6^2 v_2^2 c_s^2 + 82\omega_6^2 c_s^4 + 198\omega_6 c_s^2 - 216\omega_6 v_2^4 - 156v_2^2 - 78\omega_6^2 c_s^2 + 144c_s^4 + 90\omega_6^2 v_2^4 - 1008\omega_6 v_2^2 c_s^2 + 234\omega_6 v_2^2 - 216\omega_6 c_s^4 - \omega_6^3 - 9\omega_6^3 v_2^4 + 6\omega_6^3 c_s^2 + 8\omega_6^2 - 34\omega_6^3 v_2^2 c_s^2$

$C_{21} = 12 - \omega_6^3 c_s^4 - 18\omega_6 + 14\omega_6^3 v_2^2 - 36c_s^2 - 154\omega_6^2 v_2^2 + 432v_2^2 c_s^2 + 504v_2^4 + 252\omega_6^2 v_2^2 c_s^2 + 14\omega_6^2 c_s^4 + 54\omega_6 c_s^2 - 756\omega_6 v_2^4 - 252v_2^2 - 22\omega_6^2 c_s^2 + 24c_s^4 + 310\omega_6^2 v_2^4 - 648\omega_6 v_2^2 c_s^2 + 378\omega_6 v_2^2 - 36\omega_6 c_s^4 - \omega_6^3 - 29\omega_6^3 v_2^4 + 2\omega_6^3 c_s^2 + 8\omega_6^2 - 18\omega_6^3 v_2^2 c_s^2$

2.4 CLBM1

2.4.1 Definitions

Collision operator $\boldsymbol{C}$:

$$\boldsymbol{C}\left(\boldsymbol{f}\right) = \mathbf{K}^{-1}\mathbf{S}\left(\boldsymbol{\kappa}^{(eq)} - \mathbf{K}\boldsymbol{f}\right),$$

where

$$\mathbf{S} = \mathrm{diag}(\omega_1, \omega_2, \omega_3, \omega_4, \omega_5, \omega_6, \omega_7, \omega_8, \omega_9),$$

$\omega_1, \omega_2, \ldots, \omega_9 \in (0, 2)$.
Matrix $\mathbf{K}$ corresponds to the transformation matrix to the central moment basis defined by

$$\boldsymbol{\kappa} = \left(k_{(0,0)}, k_{(1,0)}, k_{(0,1)}, k_{(1,1)}, k_{(2,0)}, k_{(0,2)}, k_{(2,1)}, k_{(1,2)}, k_{(2,2)}\right)^T,$$

and is given by

$$\begin{aligned}
\mathbf{K}_{1,i} &= \left(\boldsymbol{c}_i - \boldsymbol{v}\right)^{(0,0)} \\
\mathbf{K}_{2,i} &= \left(\boldsymbol{c}_i - \boldsymbol{v}\right)^{(1,0)} \\
\mathbf{K}_{3,i} &= \left(\boldsymbol{c}_i - \boldsymbol{v}\right)^{(0,1)} \\
\mathbf{K}_{4,i} &= \left(\boldsymbol{c}_i - \boldsymbol{v}\right)^{(1,1)} \\
\mathbf{K}_{5,i} &= \left(\boldsymbol{c}_i - \boldsymbol{v}\right)^{(2,0)} \\
\mathbf{K}_{6,i} &= \left(\boldsymbol{c}_i - \boldsymbol{v}\right)^{(0,2)} \\
\mathbf{K}_{7,i} &= \left(\boldsymbol{c}_i - \boldsymbol{v}\right)^{(2,1)} \\
\mathbf{K}_{8,i} &= \left(\boldsymbol{c}_i - \boldsymbol{v}\right)^{(1,2)} \\
\mathbf{K}_{9,i} &= \left(\boldsymbol{c}_i - \boldsymbol{v}\right)^{(2,2)},
\end{aligned}$$

$\forall i \in \{1, 2, \cdots, 9\}$.

The equilibrium central moments are defined by

$$\boldsymbol{\kappa}^{(eq)} = \mathbf{K}\mathbf{M}^{-1}\boldsymbol{\mu}^{(eq)},$$

i.e.,

$$\boldsymbol{\kappa}^{(eq)} = \left(\rho, 0, 0, 0, \rho c_s^2, \rho c_s^2, 0, 0, \rho c_s^4\right)^T.$$

2.4.2 Conservation of mass: ρ

attached text file: `output_d2q9_nse_clbm1_symbolic_pde_00.txt`

$$\frac{\partial \rho}{\partial t} + \frac{v_1\delta_l}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{\rho\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{v_2\delta_l}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{\rho\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-1+3c_s^2+v_1^2)\frac{v_1\delta_l^3}{12\delta_t}\frac{\partial^3 \rho}{\partial x_1^3} + (-1+c_s^2+3v_1^2)\frac{\rho\delta_l^3}{12\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} -$$
$$\frac{\rho c_s^2\delta_l^3}{6\delta_t}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2} - \frac{\rho c_s^2\delta_l^3}{6\delta_t}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2} + (-1+3c_s^2+v_2^2)\frac{v_2\delta_l^3}{12\delta_t}\frac{\partial^3 \rho}{\partial x_2^3} + (-1+c_s^2+3v_2^2)\frac{\rho\delta_l^3}{12\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} +$$
$$(-c_s^4\omega_5 - 2c_s^2 - 6v_1^2 - 3v_1^4\omega_5 + c_s^2\omega_5 - 12c_s^2v_1^2\omega_5 + 2c_s^4 + 6v_1^4 + 24c_s^2v_1^2 + 3v_1^2\omega_5)\frac{\delta_l^4}{24\omega_5\delta_t}\frac{\partial^4 \rho}{\partial x_1^4} +$$
$$(-4 + 6c_s^2 + 10v_1^2 + 2\omega_5 - 3c_s^2\omega_5 - 5v_1^2\omega_5)\frac{\rho v_1\delta_l^4}{12\omega_5\delta_t}\frac{\partial^4 v_1}{\partial x_1^4} +$$
$$(v_1^2\omega_7\omega_5 - \omega_7 + 3\omega_5 - 9c_s^2\omega_5 + v_1^2\omega_7 + 3c_s^2\omega_7\omega_5 + 3c_s^2\omega_7 - 3v_1^2\omega_5 - \omega_7\omega_5)\frac{\rho v_1\delta_l^4}{12\omega_7\omega_5\delta_t}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} + (-2+\omega_4)\frac{c_s^4\delta_l^4}{6\omega_4\delta_t}\frac{\partial^4 \rho}{\partial x_1^2\partial x_2^2}$$
$$+ (v_2^2\omega_8\omega_6 - \omega_8\omega_6 - 9c_s^2\omega_6 + 3c_s^2\omega_8\omega_6 + 3c_s^2\omega_8 - \omega_8 - 3v_2^2\omega_6 + v_2^2\omega_8 + 3\omega_6)\frac{\rho v_2\delta_l^4}{12\omega_8\omega_6\delta_t}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} +$$
$$(-3v_2^4\omega_6 + c_s^2\omega_6 + 24c_s^2v_2^2 + 6v_2^4 - 2c_s^2 + 3v_2^2\omega_6 - c_s^4\omega_6 - 6v_2^2 + 2c_s^4 - 12c_s^2v_2^2\omega_6)\frac{\delta_l^4}{24\omega_6\delta_t}\frac{\partial^4 \rho}{\partial x_2^4} +$$
$$(-4 - 3c_s^2\omega_6 + 6c_s^2 - 5v_2^2\omega_6 + 10v_2^2 + 2\omega_6)\frac{\rho v_2\delta_l^4}{12\omega_6\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0.$$

2.4.3 Conservation of momentum: ρv_1

attached text file: `output_d2q9_nse_clbm1_symbolic_pde_01.txt`

$$v_1\frac{\partial \rho}{\partial t} + \rho\frac{\partial v_1}{\partial t} + (c_s^2+v_1^2)\frac{\delta_l}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{2\rho v_1\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{v_1v_2\delta_l}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{\rho v_2\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_2} + \frac{\rho v_1\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} +$$
$$(-2+4c_s^2+6v_1^2+\omega_5-2c_s^2\omega_5-3v_1^2\omega_5)\frac{\delta_l^2}{\omega_5\delta_t}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial x_1} + (2-\omega_5)\frac{3\rho v_1\delta_l^2}{\omega_5\delta_t}\left(\frac{\partial v_1}{\partial x_1}\right)^2 + (-2+\omega_4)\frac{c_s^2\delta_l^2}{2\omega_4\delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_1} +$$
$$(-2+\omega_4)\frac{c_s^2\delta_l^2}{2\omega_4\delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_1}{\partial x_2} + (-2+6c_s^2+2v_1^2+\omega_5-3c_s^2\omega_5-v_1^2\omega_5)\frac{v_1\delta_l^2}{2\omega_5\delta_t}\frac{\partial^2 \rho}{\partial x_1^2} +$$
$$(-2+2c_s^2+6v_1^2+\omega_5-c_s^2\omega_5-3v_1^2\omega_5)\frac{\rho\delta_l^2}{2\omega_5\delta_t}\frac{\partial^2 v_1}{\partial x_1^2} + (-2+\omega_4)\frac{\rho c_s^2\delta_l^2}{2\omega_4\delta_t}\frac{\partial^2 v_2}{\partial x_1\partial x_2} + (-2+\omega_4)\frac{\rho c_s^2\delta_l^2}{2\omega_4\delta_t}\frac{\partial^2 v_1}{\partial x_2^2} + C_1\frac{\delta_l^3}{12\omega_5^2\delta_t}\frac{\partial^3 \rho}{\partial x_1^3}$$
$$+ (-24-4\omega_5^2+36c_s^2+60v_1^2+24\omega_5-36c_s^2\omega_5+11v_1^2\omega_5^2-60v_1^2\omega_5+5c_s^2\omega_5^2)\frac{\rho v_1\delta_l^3}{6\omega_5^2\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} + C_2\frac{\rho v_1\delta_l^3}{12\omega_7\omega_4\omega_5^2\delta_t}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2} +$$
$$(-12-\omega_4^2+12\omega_4)\frac{c_s^4\delta_l^3}{6\omega_4^2\delta_t}\frac{\partial^3 \rho}{\partial x_1\partial x_2^2} - \frac{\rho c_s^2v_1\delta_l^3}{6\delta_t}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2} + (-1+3c_s^2+v_2^2)\frac{v_1v_2\delta_l^3}{12\delta_t}\frac{\partial^3 \rho}{\partial x_2^3} + C_3\frac{\rho v_2\delta_l^3}{6\omega_4\omega_8\delta_t}\frac{\partial^3 v_1}{\partial x_2^3} +$$
$$(-1+c_s^2+3v_2^2)\frac{\rho v_1\delta_l^3}{12\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} + C_4\frac{v_1\delta_l^4}{12\omega_5^3\delta_t}\frac{\partial^4 \rho}{\partial x_1^4} + C_5\frac{\rho\delta_l^4}{12\omega_5^3\delta_t}\frac{\partial^4 v_1}{\partial x_1^4} + C_6\frac{\rho\delta_l^4}{12\omega_7^2\omega_4^3\omega_5^3\delta_t}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} + C_7\frac{c_s^2v_1\delta_l^4}{12\omega_7^2\omega_4^2\omega_8\omega_5^3\omega_9\delta_t}\frac{\partial^4 \rho}{\partial x_1^2\partial x_2^2}$$
$$+ C_8\frac{\rho c_s^2\delta_l^4}{12\omega_7\omega_4^3\omega_8\omega_5^2\omega_9\delta_t}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} + C_9\frac{c_s^2v_2\delta_l^4}{12\omega_7\omega_4^2\omega_8^2\omega_5\omega_9\omega_6\delta_t}\frac{\partial^4 \rho}{\partial x_1\partial x_2^3} +$$
$$(v_2^2\omega_8\omega_6 - \omega_8\omega_6 - 9c_s^2\omega_6 + 3c_s^2\omega_8\omega_6 + 3c_s^2\omega_8 - \omega_8 - 3v_2^2\omega_6 + v_2^2\omega_8 + 3\omega_6)\frac{\rho v_1v_2\delta_l^4}{12\omega_8\omega_6\delta_t}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} +$$
$$C_{10}\frac{\rho c_s^2\delta_l^4}{12\omega_7\omega_4^3\omega_8\omega_5\omega_9\omega_6\delta_t}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3} +$$
$$(-3v_2^4\omega_6 + c_s^2\omega_6 + 24c_s^2v_2^2 + 6v_2^4 - 2c_s^2 + 3v_2^2\omega_6 - c_s^4\omega_6 - 6v_2^2 + 2c_s^4 - 12c_s^2v_2^2\omega_6)\frac{v_1\delta_l^4}{24\omega_6\delta_t}\frac{\partial^4 \rho}{\partial x_2^4} + C_{11}\frac{\rho\delta_l^4}{24\omega_4^3\omega_8^2\delta_t}\frac{\partial^4 v_1}{\partial x_2^4} +$$
$$(-4-3c_s^2\omega_6+6c_s^2-5v_2^2\omega_6+10v_2^2+2\omega_6)\frac{\rho v_1v_2\delta_l^4}{12\omega_6\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$$C_1 = 7v_1^4\omega_5^2 - 12c_s^4\omega_5 - 12c_s^2 + c_s^4\omega_5^2 - 36v_1^2 - 36v_1^4\omega_5 + 12c_s^2\omega_5 - 144c_s^2v_1^2\omega_5 + 12c_s^4 - 7v_1^2\omega_5^2 + 36v_1^4 + 144c_s^2v_1^2 + 36v_1^2\omega_5 - c_s^2\omega_5^2 + 24c_s^2v_1^2\omega_5^2$$

$$C_2 = 12v_1^2\omega_4\omega_5^2 + 6\omega_7\omega_4\omega_5 + 3\omega_7\omega_4\omega_5^2 + 12\omega_5^2 - 12v_1^2\omega_4\omega_5 + 6v_1^2\omega_7\omega_5^2 + 12v_1^2\omega_7\omega_4 + 36c_s^2\omega_4\omega_5^2 - 12\omega_7\omega_4 - 6\omega_7\omega_5^2 - 18c_s^2\omega_7\omega_4\omega_5 - 3v_1^2\omega_7\omega_4\omega_5^2 + 12\omega_4\omega_5 - 12v_1^2\omega_5^2 + 18c_s^2\omega_7\omega_5^2 - 12\omega_4\omega_5^2 - 6v_1^2\omega_7\omega_4\omega_5 + 36c_s^2\omega_7\omega_4 - 11c_s^2\omega_7\omega_4\omega_5^2 - 36c_s^2\omega_4\omega_5 - 36c_s^2\omega_5^2$$

$$C_3 = 6 + 3\omega_4v_2^2 - 3c_s^2\omega_4\omega_8 - 3\omega_4 + \omega_4\omega_8 - 18c_s^2 + 9c_s^2\omega_8 - 3\omega_8 - 6v_2^2 - \omega_4v_2^2\omega_8 + 3v_2^2\omega_8 + 9c_s^2\omega_4$$

$$C_4 = 12 + 90v_1^4\omega_5^2 - 9v_1^4\omega_5^3 - 216c_s^4\omega_5 + 8\omega_5^2 - 132c_s^2 + 82c_s^4\omega_5^2 - 156v_1^2 - \omega_5^3 - 5c_s^4\omega_5^3 - 216v_1^4\omega_5 - 18\omega_5 + 10v_1^2\omega_5^3 + 198c_s^2\omega_5 - 1008c_s^2v_1^2\omega_5 + 144c_s^4 - 98v_1^2\omega_5^2 + 144v_1^4 - 34c_s^2v_1^2\omega_5^3 + 6c_s^2\omega_5^3 + 672c_s^2v_1^2 + 234v_1^2\omega_5 - 78c_s^2\omega_5^2 + 404c_s^2v_1^2\omega_5^2$$

$$C_5 = 12 + 310v_1^4\omega_5^2 - 29v_1^4\omega_5^3 - 36c_s^4\omega_5 + 8\omega_5^2 - 36c_s^2 + 14c_s^4\omega_5^2 - 252v_1^2 - \omega_5^3 - c_s^4\omega_5^3 - 756v_1^4\omega_5 - 18\omega_5 + 14v_1^2\omega_5^3 + 54c_s^2\omega_5 - 648c_s^2v_1^2\omega_5 + 24c_s^4 - 154v_1^2\omega_5^2 + 504v_1^4 - 18c_s^2v_1^2\omega_5^3 + 2c_s^2\omega_5^3 + 432c_s^2v_1^2 + 378v_1^2\omega_5 - 22c_s^2\omega_5^2 + 252c_s^2v_1^2\omega_5^2$$

$$C_6 = 6c_s^2\omega_7^2\omega_4\omega_5^3 - 12c_s^2\omega_7\omega_7^2\omega_4^2\omega_5^2 + c_s^4\omega_7^2\omega_4^3\omega_5^2 - 18c_s^2v_1^2\omega_7^2\omega_4\omega_5^3 + 36c_s^2v_1^2\omega_7\omega_4^2\omega_5^2 + 108c_s^2v_1^2\omega_4^3\omega_5^3 - 72v_1^2\omega_7\omega_4^3\omega_5^2 + 12c_s^4\omega_7^2\omega_4^3 + 18c_s^2\omega_7\omega_4^2\omega_5^3 - 90v_1^4\omega_7^2\omega_4^3\omega_5 - 6v_1^4\omega_7^2\omega_4^2\omega_5^3 + 39v_1^2\omega_7\omega_4^3\omega_5^3 - 108c_s^2v_1^2\omega_4^3\omega_5^2 + 54c_s^2v_1^2\omega_7\omega_4^2\omega_5^3 - 12c_s^4\omega_7^2\omega_4^2\omega_5 - 108c_s^2v_1^2\omega_7\omega_4^3\omega_5 - c_s^4\omega_7^2\omega_4^3\omega_5^3 + 12c_s^4\omega_7^2\omega_5^3 - 108c_s^2v_1^2\omega_4^2\omega_5^3 + 6c_s^4\omega_7^2\omega_4^2\omega_5^2 + 12c_s^4\omega_7\omega_4\omega_5^3 + 198c_s^2v_1^2\omega_7\omega_4^3\omega_5^2 + 6c_s^2\omega_7\omega_4^3\omega_5^2 + 19v_1^4\omega_7^2\omega_4^3\omega_5^2 - 12c_s^4\omega_7^2\omega_4^3\omega_5 - 99c_s^2v_1^2\omega_7\omega_4^3\omega_5^3 - 12c_s^2\omega_7^2\omega_4^3 + 13c_s^4\omega_7^2\omega_4^2\omega_5^3 - 36v_1^2\omega_7\omega_4^2\omega_5^3 + 252c_s^2v_1^2\omega_7^2\omega_4^3 + 36v_1^2\omega_7\omega_4^3\omega_5 + 4v_1^4\omega_7^2\omega_4^3\omega_5^3 - 6c_s^2\omega_7\omega_4^3\omega_5^3 - 24c_s^4\omega_7^2\omega_4\omega_5^3 + 60c_s^2v_1^2\omega_7^2\omega_4^3\omega_5^2 + 72v_1^4\omega_7^2\omega_4^3 + 12c_s^4\omega_7\omega_4^2\omega_5^2 + 72v_1^4\omega_7\omega_4^2\omega_5^2 - c_s^2\omega_7^2\omega_4^3\omega_5^2 + 36v_1^2\omega_4^3\omega_5^2 + 90v_1^2\omega_7^2\omega_4^3\omega_5 + 6v_1^2\omega_7^2\omega_4^2\omega_5^3 - 18c_s^4\omega_7\omega_4^2\omega_5^3 - 36c_s^2v_1^2\omega_7^2\omega_4^2\omega_5 + 12c_s^2v_1^2\omega_7^2\omega_4^3\omega_5^3 - 36v_1^4\omega_4^2\omega_5^3 + 12c_s^2\omega_7^2\omega_4^2\omega_5 - 36v_1^2\omega_4^3\omega_5^3 - 39v_1^4\omega_7\omega_4^3\omega_5^3 - 72v_1^2\omega_7^2\omega_4^3 - 6c_s^2\omega_7^2\omega_4^2\omega_5^2 - 12c_s^2\omega_7\omega_4\omega_5^3 - 19v_1^2\omega_7^2\omega_4^3\omega_5^2 + 18c_s^2v_1^2\omega_7^2\omega_4^2\omega_5^2 - 36v_1^4\omega_4^3\omega_5^2 - 6c_s^4\omega_7\omega_4^3\omega_5^2 + 36c_s^2v_1^2\omega_7\omega_4\omega_5^3 + 36v_1^4\omega_7\omega_4^2\omega_5^3 - 36v_1^4\omega_7\omega_4^3\omega_5 + 36v_1^2\omega_4^2\omega_5^3 + 12c_s^2\omega_7^2\omega_4^3\omega_5 - 5c_s^2\omega_7^2\omega_4^2\omega_5^3 - 306c_s^2v_1^2\omega_7^2\omega_4^3\omega_5 + 6c_s^4\omega_7\omega_4^3\omega_5^3 + 36v_1^4\omega_4^3\omega_5^3 - 3c_s^2v_1^2\omega_7^2\omega_4^2\omega_5^3 - 4v_1^2\omega_7^2\omega_4^3\omega_5^3$$

$$C_7 = 36c_s^2\omega_7^2\omega_4^2\omega_8\omega_9 - 18\omega_7\omega_4\omega_8\omega_5^3\omega_9 + 36c_s^2\omega_7^2\omega_4\omega_5^3 + 5c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3\omega_9 + 12v_1^2\omega_7\omega_4\omega_8\omega_5^3 + 12\omega_7^2\omega_4^2\omega_8\omega_5\omega_9 - 6v_1^2\omega_7\omega_4^2\omega_8\omega_5^3\omega_9 - 36c_s^2\omega_4\omega_8\omega_5^3\omega_9 + 12v_1^2\omega_4^2\omega_8\omega_5^3\omega_9 + 12\omega_7\omega_4^2\omega_8\omega_5^3 - 36c_s^2\omega_7^2\omega_4\omega_8\omega_5^3 + v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^3\omega_9 + 12\omega_7\omega_4^2\omega_8\omega_5\omega_9 + 18c_s^2\omega_7^2\omega_4^2\omega_5^2\omega_9 + 12v_1^2\omega_7^2\omega_8\omega_5^3\omega_9 + 12\omega_7^2\omega_4\omega_8\omega_5^3\omega_9 - 12\omega_7\omega_4^2\omega_8\omega_5^2 - 18c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2\omega_9 - 36c_s^2\omega_7\omega_8\omega_5^3\omega_9 - 12v_1^2\omega_4^2\omega_8\omega_5^2\omega_9 + 12v_1^2\omega_7^2\omega_4\omega_5^3 + 6v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^3 + 12\omega_4\omega_8\omega_5^3\omega_9 + 6\omega_7^2\omega_4^2\omega_5^3 + 18v_1^2\omega_7\omega_4^2\omega_8\omega_5^2\omega_9 - 36c_s^2\omega_7\omega_4^2\omega_8\omega_5^3 + 12\omega_7^2\omega_4\omega_8\omega_5^3 - 12\omega_7^2\omega_4^2\omega_8\omega_9 - 6c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2\omega_9 + 36c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 + 54c_s^2\omega_7\omega_4\omega_8\omega_5^2\omega_9 - 6v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^2 - 12v_1^2\omega_7^2\omega_8\omega_5^2\omega_9 + 12\omega_7\omega_8\omega_5^3\omega_9 - 18\omega_7^2\omega_4\omega_8\omega_5^2\omega_9 - 12v_1^2\omega_7^2\omega_4\omega_5^2\omega_9 - 2v_1^2\omega_7^2\omega_4^2\omega_8\omega_5^2\omega_9 - 6\omega_7^2\omega_4^2\omega_5^2\omega_9 - 12v_1^2\omega_4\omega_8\omega_5^3\omega_9 - 36c_s^2\omega_7\omega_4^2\omega_8\omega_5\omega_9 - 6\omega_7^2\omega_4^2\omega_8\omega_5^3 + 12\omega_4^2\omega_8\omega_5^2\omega_9 + 36c_s^2\omega_7\omega_4\omega_8\omega_5^3 - 12v_1^2\omega_7^2\omega_4\omega_8\omega_5^3 + 18v_1^2\omega_7\omega_4\omega_8\omega_5^3\omega_9 + 36c_s^2\omega_4^2\omega_8\omega_5^3\omega_9 + 12v_1^2\omega_7^2\omega_4^2\omega_8\omega_9 - 40c_s^2\omega_7^2\omega_4\omega_8\omega_5^3\omega_9 - 12v_1^2\omega_7^2\omega_4^2\omega_8\omega_5\omega_9 + 6\omega_7\omega_4^2\omega_8\omega_5^3\omega_9 - 12\omega_7^2\omega_4\omega_5^3 - 6v_1^2\omega_7^2\omega_4^2\omega_5^3 + 54c_s^2\omega_7\omega_4\omega_8\omega_5^3\omega_9 + 36c_s^2\omega_7^2\omega_8\omega_5^3\omega_9 - 12v_1^2\omega_7\omega_8\omega_5^3\omega_9 - \omega_7^2\omega_4^2\omega_8\omega_5^3\omega_9 + 6\omega_7^2\omega_4^2\omega_8\omega_5^2 - 12v_1^2\omega_7\omega_4^2\omega_8\omega_5\omega_9 + 12\omega_7^2\omega_8\omega_5^2\omega_9 + 12\omega_7^2\omega_4\omega_5^2\omega_9 - 36c_s^2\omega_7^2\omega_4^2\omega_8\omega_5\omega_9 - 12v_1^2\omega_7^2\omega_4\omega_8\omega_5^3\omega_9 + 6v_1^2\omega_7^2\omega_4^2\omega_5^2\omega_9 - 18\omega_7\omega_4^2\omega_8\omega_5^2\omega_9 + 54c_s^2\omega_7^2\omega_4\omega_8\omega_5^2\omega_9 + 18c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^3 - 36c_s^2\omega_4^2\omega_8\omega_5^2\omega_9 - 12\omega_7\omega_4\omega_8\omega_5^3 - 12v_1^2\omega_7\omega_4^2\omega_8\omega_5^3 - 12\omega_4^2\omega_8\omega_5^3\omega_9 - 36c_s^2\omega_7^2\omega_4\omega_5^2\omega_9 + 18v_1^2\omega_7^2\omega_4\omega_8\omega_5^2\omega_9 - 18c_s^2\omega_7^2\omega_4^2\omega_5^3 + 12v_1^2\omega_7\omega_4^2\omega_8\omega_5^2 - 12\omega_7^2\omega_8\omega_5^3\omega_9 + 2\omega_7^2\omega_4^2\omega_8\omega_5^2\omega_9 - 36c_s^2\omega_7^2\omega_8\omega_5^2\omega_9 - 18c_s^2\omega_7^2\omega_4^2\omega_8\omega_5^2$$

$$C_8 = 12\omega_7\omega_4^2\omega_5\omega_9 - 12c_s^2\omega_4^3\omega_8\omega_5^2 - c_s^2\omega_7\omega_4^3\omega_8\omega_5^2\omega_9 - 36v_1^2\omega_7\omega_4^2\omega_8\omega_9 + 12c_s^2\omega_7\omega_4^2\omega_5^2 + 12\omega_4^3\omega_8\omega_5\omega_9 - 12\omega_4^2\omega_8\omega_5^2 - 12c_s^2\omega_7\omega_4\omega_8\omega_5\omega_9 - 12\omega_4\omega_8\omega_5^2\omega_9 - 18v_1^2\omega_7\omega_4^3\omega_5^2 - 24\omega_7\omega_4^2\omega_8\omega_5\omega_9 + 6c_s^2\omega_7\omega_4^3\omega_8\omega_9 + 36v_1^2\omega_4^3\omega_8\omega_5^2\omega_9 + 36v_1^2\omega_4^3\omega_8\omega_5 + 12c_s^2\omega_4^2\omega_8\omega_5\omega_9 - 18v_1^2\omega_7\omega_4^3\omega_8\omega_5 + 12\omega_7\omega_4^2\omega_8\omega_5^2 - 36v_1^2\omega_7\omega_4\omega_8\omega_5\omega_9 - 36v_1^2\omega_4^3\omega_8\omega_5^2 - 72v_1^2\omega_4^2\omega_8\omega_5^2\omega_9 + 36v_1^2\omega_7\omega_4^2\omega_5^2 + 18v_1^2\omega_7\omega_4^3\omega_8\omega_5^2 + 12c_s^2\omega_4\omega_8\omega_5^2\omega_9 + 6\omega_7\omega_4^3\omega_8\omega_5\omega_9 - 12c_s^2\omega_7\omega_4^2\omega_5\omega_9 - 6c_s^2\omega_7\omega_4^3\omega_5^2 - 12c_s^2\omega_4^3\omega_8\omega_5\omega_9 - 12\omega_4^2\omega_8\omega_5\omega_9 - 12c_s^2\omega_7\omega_4^2\omega_8\omega_5^2 - 4c_s^2\omega_7\omega_4^2\omega_8\omega_5^2\omega_9 - 12c_s^2\omega_7\omega_8\omega_5^2\omega_9 + 18v_1^2\omega_7\omega_4^3\omega_5\omega_9 + 12c_s^2\omega_4^3\omega_8\omega_5 - 6\omega_7\omega_4^3\omega_8\omega_9 + 24c_s^2\omega_7\omega_4^2\omega_8\omega_5\omega_9 - 6\omega_7\omega_4^3\omega_8\omega_5^2 + 24\omega_4^2\omega_8\omega_5^2\omega_9 - 12c_s^2\omega_7\omega_4^2\omega_8\omega_9 + 12\omega_4^3\omega_8\omega_5^2 - 6c_s^2\omega_7\omega_4^3\omega_8\omega_5 + 36v_1^2\omega_4^2\omega_8\omega_5\omega_9 - 12\omega_7\omega_4^2\omega_5^2 + 72v_1^2\omega_7\omega_4^2\omega_8\omega_5\omega_9 - 6\omega_7\omega_4^3\omega_5\omega_9 + 12c_s^2\omega_4^3\omega_8\omega_5^2\omega_9 + 12\omega_7\omega_4\omega_8\omega_5\omega_9 + 18v_1^2\omega_7\omega_4^3\omega_8\omega_9 + 12c_s^2\omega_4^2\omega_8\omega_5^2 - 18v_1^2\omega_7\omega_4^3\omega_8\omega_5\omega_9 - 36v_1^2\omega_7\omega_4^2\omega_5\omega_9 - 36v_1^2\omega_4^3\omega_8\omega_5\omega_9 + 12\omega_7\omega_4^2\omega_8\omega_9 + 6c_s^2\omega_7\omega_4^3\omega_8\omega_5^2 - 12\omega_4^3\omega_8\omega_5 - 24c_s^2\omega_4^2\omega_8\omega_5^2\omega_9 + 36v_1^2\omega_4\omega_8\omega_5^2\omega_9 + 6c_s^2\omega_7\omega_4^3\omega_5\omega_9 - 12\omega_4^3\omega_8\omega_5^2\omega_9 - 6c_s^2\omega_7\omega_4^3\omega_8\omega_5\omega_9 - 36v_1^2\omega_7\omega_4^2\omega_8\omega_5^2 + 6\omega_7\omega_4^3\omega_8\omega_5 + 36v_1^2\omega_4^2\omega_8\omega_5^2 + 6\omega_7\omega_4^3\omega_5^2 + 18c_s^2\omega_7\omega_4\omega_8\omega_5^2\omega_9$$

$$C_9 = 6\omega_7\omega_4^2\omega_8^2\omega_6 + 6\omega_7\omega_4^2\omega_8\omega_5\omega_6 + 12\omega_4^2\omega_8^2\omega_9 + 12\omega_4v_2^2\omega_8^2\omega_5\omega_6 + 6\omega_7\omega_4^2v_2^2\omega_8^2\omega_9 + 12\omega_4^2v_2^2\omega_8^2\omega_5\omega_9 + 12\omega_7\omega_4\omega_5\omega_9\omega_6 + 36c_s^2\omega_7\omega_8^2\omega_5\omega_9\omega_6 + 3c_s^2\omega_7\omega_4^2\omega_8^2\omega_5\omega_9\omega_6 + 12\omega_7\omega_8^2\omega_5\omega_9 - 12\omega_4\omega_8^2\omega_5\omega_6 - 12\omega_4^2\omega_8^2\omega_6 + 12\omega_7\omega_8\omega_5\omega_9\omega_6 + 18c_s^2\omega_7\omega_4^2\omega_5\omega_9\omega_6 - 12\omega_4v_2^2\omega_8^2\omega_5\omega_9 - 36c_s^2\omega_7\omega_4\omega_8^2\omega_5\omega_9\omega_6 - 6\omega_7\omega_4^2\omega_8^2\omega_9 + 36c_s^2\omega_7\omega_4\omega_8\omega_5\omega_6 - 3\omega_7\omega_4^2v_2^2\omega_8\omega_5\omega_9\omega_6 + 12\omega_4\omega_8^2\omega_5\omega_9 - 6\omega_7\omega_4^2v_2^2\omega_8^2\omega_6 - 12\omega_4^2v_2^2\omega_8^2\omega_5\omega_6 + 12\omega_7\omega_4v_2^2\omega_8\omega_5\omega_6 - 36c_s^2\omega_7\omega_8^2\omega_5\omega_9 - 15c_s^2\omega_7\omega_4^2\omega_8^2\omega_5\omega_9 + 36c_s^2\omega_4\omega_8^2\omega_5\omega_6 - 18c_s^2\omega_7\omega_4^2\omega_8^2\omega_6 + 18\omega_7\omega_4v_2^2\omega_8\omega_5\omega_9\omega_6 - 12\omega_4^2v_2^2\omega_8^2\omega_9 + 12\omega_7\omega_4\omega_8^2\omega_5\omega_6 - \omega_7\omega_4^2\omega_8^2\omega_5\omega_9\omega_6 - 36c_s^2\omega_4\omega_8^2\omega_5\omega_9 + 18c_s^2\omega_7\omega_4^2\omega_8^2\omega_5\omega_6 + 12\omega_7v_2^2\omega_8^2\omega_5\omega_9\omega_6 + 12\omega_7\omega_4\omega_8^2\omega_5\omega_9\omega_6 - 6\omega_7\omega_4^2v_2^2\omega_8\omega_5\omega_6 - 12\omega_7v_2^2\omega_8^2\omega_5\omega_9 - 18\omega_7\omega_4\omega_8^2\omega_5\omega_9 + 18c_s^2\omega_7\omega_4^2\omega_8^2\omega_9 + 12\omega_4^2v_2^2\omega_8^2\omega_6 - 6\omega_7\omega_4^2\omega_5\omega_9\omega_6 - 9c_s^2\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6 - 36c_s^2\omega_7\omega_8\omega_5\omega_9\omega_6 + 12\omega_4^2\omega_8^2\omega_5\omega_6 + 36c_s^2\omega_4^2\omega_8^2\omega_6 - 12\omega_7\omega_4v_2^2\omega_8^2\omega_5\omega_6 - 12\omega_7\omega_4\omega_8\omega_5\omega_6 - 5\omega_7\omega_4^2v_2^2\omega_8^2\omega_5\omega_9 - 36c_s^2\omega_4^2\omega_8^2\omega_9 + 18\omega_7\omega_4v_2^2\omega_8^2\omega_5\omega_9 - 18c_s^2\omega_7\omega_4^2\omega_8\omega_5\omega_6 + \omega_7\omega_4^2v_2^2\omega_8^2\omega_5\omega_9\omega_6 - 12\omega_4^2\omega_8^2\omega_5\omega_9 + 54c_s^2\omega_7\omega_4\omega_8\omega_5\omega_9\omega_6 - 12\omega_7\omega_8^2\omega_5\omega_9\omega_6 - 36c_s^2\omega_7\omega_4\omega_5\omega_9\omega_6 + 6\omega_7\omega_4^2v_2^2\omega_8^2\omega_5\omega_6 - 6\omega_7\omega_4^2\omega_8^2\omega_5\omega_6 + 3\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6 - 12\omega_7\omega_4v_2^2\omega_5\omega_9\omega_6 - 12\omega_7\omega_4v_2^2\omega_8^2\omega_5\omega_9\omega_6 - 36c_s^2\omega_4^2\omega_8^2\omega_5\omega_6 + 54c_s^2\omega_7\omega_4\omega_8^2\omega_5\omega_9 + 5\omega_7\omega_4^2\omega_8^2\omega_5\omega_9 - 18\omega_7\omega_4\omega_8\omega_5\omega_9\omega_6 + 6\omega_7\omega_4^2v_2^2\omega_5\omega_9\omega_6 - 12\omega_7v_2^2\omega_8\omega_5\omega_9\omega_6 - 36c_s^2\omega_7\omega_4\omega_8^2\omega_5\omega_6 + 36c_s^2\omega_4^2\omega_8^2\omega_5\omega_9$$

$$C_{10} = -6c_s^2\omega_7\omega_4^3\omega_8\omega_6 + 36\omega_4^3v_2^2\omega_8\omega_5\omega_9 + 12\omega_7\omega_4^2\omega_8\omega_5\omega_6 - 12\omega_4^3\omega_8\omega_5\omega_9 + 36\omega_7\omega_4^2v_2^2\omega_5\omega_6 - 12\omega_7\omega_4\omega_5\omega_9\omega_6 + 12c_s^2\omega_4^2\omega_8\omega_5\omega_6 - 12c_s^2\omega_7\omega_4\omega_8\omega_5\omega_9 + 18\omega_7\omega_4^3v_2^2\omega_5\omega_9\omega_6 - 18c_s^2\omega_7\omega_4^2\omega_5\omega_9\omega_6 - 18\omega_7\omega_4^2\omega_8\omega_5\omega_9 + 12\omega_4^3\omega_8\omega_5\omega_6 - 36\omega_4^3v_2^2\omega_8\omega_5\omega_6 + 6c_s^2\omega_7\omega_4^3\omega_8\omega_9 - 12\omega_7\omega_4^2\omega_5\omega_6 - 12c_s^2\omega_4^2\omega_8\omega_5\omega_9 - 3\omega_7\omega_4^2v_2^2\omega_8\omega_5\omega_9\omega_6 - 12\omega_4^2\omega_8\omega_5\omega_6 + 5\omega_7\omega_4^3\omega_8\omega_5\omega_9 + 6c_s^2\omega_7\omega_4^3\omega_5\omega_9\omega_6 + 6\omega_7\omega_4^3\omega_8\omega_6 - c_s^2\omega_7\omega_4^3\omega_8\omega_5\omega_9\omega_6 + 54\omega_7\omega_4^2v_2^2\omega_8\omega_5\omega_9 + 12\omega_4^3\omega_8\omega_9 + 12c_s^2\omega_4^3\omega_8\omega_5\omega_9 + 12\omega_4^2\omega_8\omega_5\omega_9 - 6\omega_7\omega_4^3\omega_8\omega_5\omega_6 - 36\omega_7\omega_4v_2^2\omega_8\omega_5\omega_9 - 12\omega_4^3\omega_8\omega_6 - 36\omega_7\omega_4^2v_2^2\omega_8\omega_5\omega_6 - 12c_s^2\omega_4^3\omega_8\omega_5\omega_6 + 12c_s^2\omega_7\omega_4^2\omega_5\omega_6 - 18\omega_7\omega_4^3v_2^2\omega_5\omega_6 - 6\omega_7\omega_4^3\omega_8\omega_9 + 18c_s^2\omega_7\omega_4^2\omega_8\omega_5\omega_9 + 18\omega_7\omega_4^2\omega_5\omega_9\omega_6 - 5c_s^2\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6 - 15\omega_7\omega_4^3v_2^2\omega_8\omega_5\omega_9 - 12c_s^2\omega_7\omega_8\omega_5\omega_9\omega_6 + 6\omega_7\omega_4^3\omega_5\omega_6 + 18\omega_7\omega_4^3v_2^2\omega_8\omega_9 + 18\omega_7\omega_4^3v_2^2\omega_8\omega_5\omega_6 - 12c_s^2\omega_7\omega_4^2\omega_8\omega_5\omega_6 + 18c_s^2\omega_7\omega_4\omega_8\omega_5\omega_9\omega_6 - 18\omega_7\omega_4^3v_2^2\omega_8\omega_6 + 12\omega_7\omega_4\omega_8\omega_5\omega_9 + 12c_s^2\omega_7\omega_4\omega_5\omega_9\omega_6 + 6c_s^2\omega_7\omega_4^3\omega_8\omega_5\omega_6 + \omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6 + 36\omega_7\omega_4v_2^2\omega_5\omega_9\omega_6 - 6c_s^2\omega_7\omega_4^3\omega_5\omega_6 + 12c_s^2\omega_4^3\omega_8\omega_6 - 36\omega_4^2v_2^2\omega_8\omega_5\omega_9 - 36\omega_4^3v_2^2\omega_8\omega_9 - 6\omega_7\omega_4^3\omega_5\omega_9\omega_6 - 5c_s^2\omega_7\omega_4^3\omega_8\omega_5\omega_9\omega_6 + 36\omega_4^2v_2^2\omega_8\omega_5\omega_6 - 12c_s^2\omega_4^3\omega_8\omega_9 + 36\omega_4^3v_2^2\omega_8\omega_6 - 54\omega_7\omega_4^2v_2^2\omega_5\omega_9\omega_6$$

$$C_{11} = -72\omega_4^2v_2^2\omega_8 - 24c_s^2\omega_4\omega_8 - 72c_s^2\omega_4^3v_2^2\omega_8 - 30\omega_4^3v_2^4\omega_8 - 36c_s^2\omega_4v_2^2\omega_8^2 - 48c_s^4\omega_4\omega_8^2 - 72\omega_4^2v_2^4 + 24c_s^4\omega_4\omega_8 + 6c_s^2\omega_4^3v_2^2\omega_8^2 + 12c_s^2\omega_4\omega_8^2 + 72c_s^2\omega_4v_2^2\omega_8 + 3\omega_4^3v_2^4\omega_8^2 + 36\omega_4^3v_2^4 + 12\omega_4^2v_2^2\omega_8^2 - 8c_s^2\omega_4^2\omega_8^2 - 3c_s^4\omega_4^3\omega_8^2 + 144c_s^2\omega_4^2v_2^2\omega_8 - 6c_s^2\omega_4^3\omega_8 + 72\omega_4^2v_2^4\omega_8 - 216c_s^2\omega_4^2v_2^2 - 24c_s^4\omega_4^2\omega_8 + 30\omega_4^3v_2^2\omega_8 + 24c_s^4\omega_8^2 - 36\omega_4^3v_2^2 + 24c_s^4\omega_4^2\omega_8^2 - 3\omega_4^3v_2^2\omega_8^2 - 12c_s^2\omega_4^2v_2^2\omega_8^2 - 12\omega_4^2v_2^4\omega_8^2 + c_s^2\omega_4^3\omega_8^2 + 72\omega_4^2v_2^2 + 6c_s^4\omega_4^3\omega_8 + 108c_s^2\omega_4^3v_2^2 + 24c_s^2\omega_4^2\omega_8$$

2.4.4 Conservation of momentum: ρv_2

attached text file: `output_d2q9_nse_clbm1_symbolic_pde_02.txt`

$$
v_2\frac{\partial \rho}{\partial t} + \rho\frac{\partial v_2}{\partial t} + \frac{v_1 v_2 \delta_l}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{\rho v_2 \delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{\rho v_1 \delta_l}{\delta_t}\frac{\partial v_2}{\partial x_1} + (c_s^2+v_2^2)\frac{\delta_l}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{2\rho v_2 \delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-2+\omega_4)\frac{c_s^2\delta_l^2}{2\omega_4\delta_t}\frac{\partial \rho}{\partial x_1}\frac{\partial v_2}{\partial x_1} +
$$
$$
(-2+\omega_4)\frac{c_s^2\delta_l^2}{2\omega_4\delta_t}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial x_2} + (-2-2c_s^2\omega_6+4c_s^2-3v_2^2\omega_6+6v_2^2+\omega_6)\frac{\delta_l^2}{\omega_6\delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_2} + (2-\omega_6)\frac{3\rho v_2\delta_l^2}{\omega_6\delta_t}\left(\frac{\partial v_2}{\partial x_2}\right)^2 +
$$
$$
(-2+\omega_4)\frac{\rho c_s^2\delta_l^2}{2\omega_4\delta_t}\frac{\partial^2 v_2}{\partial x_1^2} + (-2+\omega_4)\frac{\rho c_s^2\delta_l^2}{2\omega_4\delta_t}\frac{\partial^2 v_1}{\partial x_1\partial x_2} + (-2-3c_s^2\omega_6+6c_s^2-v_2^2\omega_6+2v_2^2+\omega_6)\frac{v_2\delta_l^2}{2\omega_6\delta_t}\frac{\partial^2 \rho}{\partial x_2^2} +
$$
$$
(-2-c_s^2\omega_6+2c_s^2-3v_2^2\omega_6+6v_2^2+\omega_6)\frac{\rho\delta_l^2}{2\omega_6\delta_t}\frac{\partial^2 v_2}{\partial x_2^2} + (-1+3c_s^2+v_1^2)\frac{v_1v_2\delta_l^3}{12\delta_t}\frac{\partial^3 \rho}{\partial x_1^3} + (-1+c_s^2+3v_1^2)\frac{\rho v_2\delta_l^3}{12\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} +
$$
$$
C_1\frac{\rho v_1\delta_l^3}{6\omega_7\omega_4\delta_t}\frac{\partial^3 v_2}{\partial x_1^3} + (-12-\omega_4^2+12\omega_4)\frac{c_s^4\delta_l^3}{6\omega_4^2\delta_t}\frac{\partial^3 \rho}{\partial x_1^2\partial x_2} - \frac{\rho c_s^2 v_2\delta_l^3}{6\delta_t}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2} + C_2\frac{\rho v_2\delta_l^3}{12\omega_4\omega_8\omega_6^2\delta_t}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2} + C_3\frac{\delta_l^3}{12\omega_6^2\delta_t}\frac{\partial^3 \rho}{\partial x_2^3} +
$$
$$
(-24-36c_s^2\omega_6+36c_s^2+5c_s^2\omega_6^2-60v_2^2\omega_6+60v_2^2+24\omega_6-4\omega_6^2+11v_2^2\omega_6^2)\frac{\rho v_2\delta_l^3}{6\omega_6^2\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} +
$$
$$
(-c_s^4\omega_5-2c_s^2-6v_1^2-3v_1^4\omega_5+c_s^2\omega_5-12c_s^2v_1^2\omega_5+2c_s^4+6v_1^4+24c_s^2v_1^2+3v_1^2\omega_5)\frac{v_2\delta_l^4}{24\omega_5\delta_t}\frac{\partial^4 \rho}{\partial x_1^4} +
$$
$$
(-4+6c_s^2+10v_1^2+2\omega_5-3c_s^2\omega_5-5v_1^2\omega_5)\frac{\rho v_1 v_2\delta_l^4}{12\omega_5\delta_t}\frac{\partial^4 v_1}{\partial x_1^4} + C_4\frac{\rho\delta_l^4}{24\omega_7^2\omega_4^3\delta_t}\frac{\partial^4 v_2}{\partial x_1^4} + C_5\frac{c_s^2v_1\delta_l^4}{12\omega_7^2\omega_4^2\omega_8\omega_5\omega_9\omega_6\delta_t}\frac{\partial^4 \rho}{\partial x_1^3\partial x_2} +
$$
$$
C_6\frac{\rho c_s^2\delta_l^4}{12\omega_7\omega_4^3\omega_8\omega_5\omega_9\omega_6\delta_t}\frac{\partial^4 v_1}{\partial x_1^3\partial x_2} +
$$
$$
(v_1^2\omega_7\omega_5-\omega_7+3\omega_5-9c_s^2\omega_5+v_1^2\omega_7+3c_s^2\omega_7\omega_5+3c_s^2\omega_7-3v_1^2\omega_5-\omega_7\omega_5)\frac{\rho v_1 v_2\delta_l^4}{12\omega_7\omega_5\delta_t}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} +
$$
$$
C_7\frac{c_s^2v_2\delta_l^4}{12\omega_7\omega_4^2\omega_8^2\omega_9\omega_6^3\delta_t}\frac{\partial^4 \rho}{\partial x_1^2\partial x_2^2} + C_8\frac{\rho c_s^2\delta_l^4}{12\omega_7\omega_4^3\omega_8\omega_9\omega_6^2\delta_t}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2} + C_9\frac{\rho\delta_l^4}{12\omega_4^3\omega_8^2\omega_6^3\delta_t}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} + C_{10}\frac{v_2\delta_l^4}{12\omega_6^3\delta_t}\frac{\partial^4 \rho}{\partial x_2^4} + C_{11}\frac{\rho\delta_l^4}{12\omega_6^3\delta_t}\frac{\partial^4 v_2}{\partial x_2^4}
= 0,
$$

where:

$$
C_1 = 6-3\omega_7-3\omega_4-18c_s^2-6v_1^2-v_1^2\omega_7\omega_4+\omega_7\omega_4+3v_1^2\omega_7+3v_1^2\omega_4+9c_s^2\omega_7-3c_s^2\omega_7\omega_4+9c_s^2\omega_4
$$

$$
C_2 = 12\omega_4\omega_6-6\omega_4v_2^2\omega_8\omega_6+6\omega_4\omega_8\omega_6+36c_s^2\omega_4\omega_8+36c_s^2\omega_4\omega_6^2+18c_s^2\omega_8\omega_6^2-12\omega_4\omega_8-36c_s^2\omega_4\omega_6-36c_s^2\omega_6^2-3\omega_4v_2^2\omega_8\omega_6^2-12\omega_4\omega_6^2+3\omega_4\omega_8\omega_6^2+6v_2^2\omega_8\omega_6^2-6\omega_8\omega_6^2-12\omega_4v_2^2\omega_6-18c_s^2\omega_4\omega_8\omega_6+12\omega_4v_2^2\omega_8-11c_s^2\omega_4\omega_8\omega_6^2+12\omega_6^2-12v_2^2\omega_6^2+12\omega_4v_2^2\omega_6^2
$$

$$
C_3 = -36v_2^4\omega_6+12c_s^2\omega_6+144c_s^2v_2^2+36v_2^4-12c_s^2+7v_2^4\omega_6^2-c_s^2\omega_6^2+36v_2^2\omega_6-12c_s^4\omega_6-36v_2^2+12c_s^4+24c_s^2v_2^2\omega_6^2-144c_s^2v_2^2\omega_6-7v_2^2\omega_6^2+c_s^4\omega_6^2
$$

$$
C_4 = -72v_1^2\omega_7\omega_4^2+24c_s^4\omega_7^2\omega_4^2+24c_s^4\omega_7^2-3c_s^4\omega_7^2\omega_4^3+30v_1^2\omega_7\omega_4^3-36c_s^2v_1^2\omega_7^2\omega_4+12c_s^2\omega_7^2\omega_4+36v_1^4\omega_4^3-12c_s^2v_1^2\omega_7^2\omega_4^2-8c_s^2\omega_7^2\omega_4^2+72v_1^4\omega_7\omega_4^2-30v_1^4\omega_7\omega_4^3+c_s^2\omega_7^2\omega_4^3+6c_s^2v_1^2\omega_7^2\omega_4^3-72v_1^4\omega_4^2-48c_s^4\omega_7^2\omega_4-6c_s^2\omega_7\omega_4^3+3v_1^4\omega_7^2\omega_4^3-72c_s^2v_1^2\omega_7\omega_4^3+24c_s^4\omega_7\omega_4-216c_s^2v_1^2\omega_4^2+144c_s^2v_1^2\omega_7\omega_4^2-12v_1^4\omega_7^2\omega_4^2+24c_s^2\omega_7\omega_4^2+108c_s^2v_1^2\omega_4^3-3v_1^2\omega_7^2\omega_4^3+6c_s^4\omega_7\omega_4^3+72v_1^2\omega_4^2+72c_s^2v_1^2\omega_7\omega_4-24c_s^2\omega_7\omega_4-36v_1^2\omega_4^3-24c_s^4\omega_7\omega_4^2+12v_1^2\omega_7^2\omega_4^2
$$

$$
C_5 = -36c_s^2\omega_7^2\omega_4\omega_8\omega_5\omega_6+18c_s^2\omega_7^2\omega_4^2\omega_8\omega_9+6\omega_7\omega_4^2\omega_8\omega_5\omega_6+54c_s^2\omega_7^2\omega_4\omega_8\omega_9\omega_6-12\omega_7^2\omega_8\omega_5\omega_9\omega_6-12\omega_7^2\omega_4^2\omega_5-6v_1^2\omega_7^2\omega_4^2\omega_8\omega_5+12v_1^2\omega_7\omega_4\omega_8\omega_5\omega_6+12\omega_7\omega_8\omega_5\omega_9\omega_6-36c_s^2\omega_7^2\omega_8\omega_9\omega_6+5\omega_7^2\omega_4^2\omega_8\omega_9\omega_6-12v_1^2\omega_7^2\omega_4\omega_8\omega_5\omega_6+36c_s^2\omega_7^2\omega_4\omega_5\omega_6+36c_s^2\omega_7\omega_4\omega_8\omega_5\omega_6-36c_s^2\omega_7^2\omega_4^2\omega_9-6\omega_7^2\omega_4^2\omega_8\omega_5\omega_6+18v_1^2\omega_7^2\omega_4\omega_8\omega_9\omega_6-36c_s^2\omega_7^2\omega_4\omega_9\omega_6-6\omega_4^2\omega_8\omega_5\omega_9\omega_6-6\omega_7^2\omega_4^2\omega_8\omega_9+12v_1^2\omega_7^2\omega_4^2\omega_9\omega_6+12\omega_7^2\omega_4\omega_9\omega_6+12\omega_7^2\omega_8\omega_9\omega_6-12v_1^2\omega_7^2\omega_4^2\omega_9-12v_1^2\omega_7^2\omega_4^2\omega_5\omega_6+12\omega_4\omega_8\omega_5\omega_9\omega_6-12\omega_7^2\omega_4\omega_5\omega_6-9c_s^2\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6-36c_s^2\omega_7\omega_8\omega_5\omega_9\omega_6-6v_1^2\omega_7\omega_4^2\omega_8\omega_5\omega_6-15c_s^2\omega_7^2\omega_4^2\omega_8\omega_9\omega_6-12v_1^2\omega_7^2\omega_4\omega_8\omega_5\omega_9\omega_6-18c_s^2\omega_7^2\omega_4^2\omega_8\omega_5+12\omega_7^2\omega_4^2\omega_9+12\omega_7^2\omega_4\omega_8\omega_5\omega_9\omega_6-12\omega_7\omega_4\omega_8\omega_5\omega_6+6v_1^2\omega_7^2\omega_4^2\omega_8\omega_9+18c_s^2\omega_7^2\omega_4^2\omega_8\omega_5\omega_6+12v_1^2\omega_7^2\omega_8\omega_5\omega_9\omega_6-12\omega_7^2\omega_4^2\omega_9\omega_6-\omega_7^2\omega_4^2\omega_8\omega_5\omega_9\omega_6+12\omega_7^2\omega_4\omega_8\omega_5\omega_6-5v_1^2\omega_7^2\omega_4^2\omega_8\omega_9\omega_6-18c_s^2\omega_7\omega_4^2\omega_8\omega_5\omega_6-12v_1^2\omega_7^2\omega_4\omega_9\omega_6-12v_1^2\omega_7\omega_8\omega_5\omega_9\omega_6+54c_s^2\omega_7\omega_4\omega_8\omega_5\omega_9\omega_6+36c_s^2\omega_7^2\omega_8\omega_5\omega_9\omega_6-18\omega_7^2\omega_4\omega_8\omega_9\omega_6+36c_s^2\omega_7^2\omega_4^2\omega_5+12\omega_7^2\omega_4^2\omega_5\omega_6-12v_1^2\omega_7^2\omega_8\omega_9\omega_6+6v_1^2\omega_7^2\omega_4^2\omega_8\omega_5\omega_6+12v_1^2\omega_7^2\omega_4\omega_5\omega_6+v_1^2\omega_7^2\omega_4^2\omega_8\omega_5\omega_9\omega_6+3\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6+6v_1^2\omega_4^2\omega_8\omega_5\omega_9\omega_6-36c_s^2\omega_4\omega_8\omega_5\omega_9\omega_6-36c_s^2\omega_7^2\omega_4\omega_8\omega_5\omega_9\omega_6-3v_1^2\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6+6\omega_7^2\omega_4^2\omega_8\omega_5-36c_s^2\omega_7^2\omega_4^2\omega_5\omega_6+18c_s^2\omega_4^2\omega_8\omega_5\omega_9\omega_6+3c_s^2\omega_7^2\omega_4^2\omega_8\omega_5\omega_9\omega_6+18v_1^2\omega_7\omega_4\omega_8\omega_5\omega_9\omega_6+36c_s^2\omega_7^2\omega_4^2\omega_9\omega_6-18\omega_7\omega_4\omega_8\omega_5\omega_9\omega_6+12v_1^2\omega_7^2\omega_4^2\omega_5-12v_1^2\omega_4\omega_8\omega_5\omega_9\omega_6
$$

$$
C_6 = 12\omega_7\omega_4^3\omega_9+12\omega_7\omega_4^2\omega_8\omega_5\omega_6-36v_1^2\omega_7\omega_4\omega_8\omega_9\omega_6+18v_1^2\omega_4^3\omega_8\omega_5\omega_9\omega_6+12c_s^2\omega_4^2\omega_8\omega_5\omega_6-18\omega_7\omega_4^2\omega_8\omega_9\omega_6-12c_s^2\omega_7\omega_4\omega_8\omega_9\omega_6+6\omega_4^3\omega_8\omega_5\omega_6+12c_s^2\omega_7\omega_4^3\omega_5+6c_s^2\omega_7\omega_4^3\omega_8\omega_9-12\omega_7\omega_4^2\omega_5\omega_6-18v_1^2\omega_7\omega_4^3\omega_8\omega_5+12\omega_7\omega_4^2\omega_9\omega_6+6c_s^2\omega_4^3\omega_8\omega_5\omega_9\omega_6+18\omega_4^2\omega_8\omega_5\omega_9\omega_6-12\omega_4^2\omega_8\omega_5\omega_6+36v_1^2\omega_7\omega_4^3\omega_9\omega_6-c_s^2\omega_7\omega_4^3\omega_8\omega_5\omega_9\omega_6-36v_1^2\omega_7\omega_4^3\omega_5\omega_6-6\omega_7\omega_4^3\omega_8\omega_5\omega_6-12c_s^2\omega_7\omega_4^2\omega_9\omega_6+36v_1^2\omega_7\omega_4^3\omega_5-6c_s^2\omega_4^3\omega_8\omega_5\omega_6-12\omega_4\omega_8\omega_5\omega_9\omega_6+5\omega_7\omega_4^3\omega_8\omega_9\omega_6+12c_s^2\omega_7\omega_4^2\omega_5\omega_6-6\omega_7\omega_4^3\omega_8\omega_9-5c_s^2\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6+12\omega_7\omega_4\omega_8\omega_9\omega_6-12c_s^2\omega_7\omega_8\omega_5\omega_9\omega_6-36v_1^2\omega_7\omega_4^2\omega_8\omega_5\omega_6-12\omega_7\omega_4^2\omega_5\omega_6-12\omega_7\omega_4^3\omega_9\omega_6+36v_1^2\omega_4^2\omega_8\omega_5\omega_6+54v_1^2\omega_7\omega_4^2\omega_8\omega_9\omega_6+12\omega_7\omega_4^3\omega_5\omega_6-6\omega_4^3\omega_8\omega_5\omega_9\omega_6-6c_s^2\omega_7\omega_4^3\omega_8\omega_5-12c_s^2\omega_7\omega_4^2\omega_8\omega_5\omega_6-12c_s^2\omega_7\omega_4^3\omega_9+18c_s^2\omega_7\omega_4\omega_8\omega_5\omega_9\omega_6+18c_s^2\omega_7\omega_4^2\omega_8\omega_9\omega_6+18v_1^2\omega_7\omega_4^3\omega_8\omega_9+6c_s^2\omega_7\omega_4^3\omega_8\omega_5\omega_6+\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6-54v_1^2\omega_4^2\omega_8\omega_5\omega_9\omega_6-12c_s^2\omega_7\omega_4^3\omega_5\omega_6+12c_s^2\omega_4\omega_8\omega_5\omega_9\omega_6-5c_s^2\omega_7\omega_4^3\omega_8\omega_9\omega_6-3v_1^2\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6+12c_s^2\omega_7\omega_4^3\omega_9\omega_6-18v_1^2\omega_4^3\omega_8\omega_5\omega_6-36v_1^2\omega_7\omega_4^3\omega_9-18c_s^2\omega_4^2\omega_8\omega_5\omega_9\omega_6+18v_1^2\omega_7\omega_4^3\omega_8\omega_5\omega_6+36v_1^2\omega_7\omega_4^2\omega_5\omega_6+6\omega_7\omega_4^3\omega_8\omega_5-15v_1^2\omega_7\omega_4^3\omega_8\omega_9\omega_6+36v_1^2\omega_4\omega_8\omega_5\omega_9\omega_6-36v_1^2\omega_7\omega_4^2\omega_9\omega_6
$$

$$
C_7 = -36c_s^2\omega_7\omega_8^2\omega_9\omega_6^2-6c_s^2\omega_7\omega_4^2\omega_8^2\omega_9\omega_6^2+18\omega_7\omega_4v_2^2\omega_8\omega_9\omega_6^3+18c_s^2\omega_7\omega_4^2\omega_8^2\omega_6^3+12\omega_7\omega_4\omega_8^2\omega_9\omega_6^3+18\omega_7\omega_4^2v_2^2\omega_8\omega_9\omega_6^2+12\omega_7v_2^2\omega_8^2\omega_9\omega_6^3+12\omega_7\omega_4^2v_2^2\omega_8^2\omega_9+36c_s^2\omega_4\omega_8^2\omega_6^3+12\omega_7\omega_4^2\omega_8\omega_9\omega_6-36c_s^2\omega_7\omega_4^2\omega_9\omega_6^2+12\omega_7\omega_4v_2^2\omega_8\omega_6^3-6\omega_4^2v_2^2\omega_8^2\omega_6^3-18c_s^2\omega_7\omega_4^2\omega_8^2\omega_6^2+36c_s^2\omega_7\omega_4\omega_8\omega_6^3+
$$

$5c_s^2\omega_7\omega_4^2\omega_8^2\omega_9\omega_6^3+36c_s^2\omega_7\omega_8^2\omega_9\omega_6^3-12\omega_7\omega_4^2\omega_8^2\omega_9-36c_s^2\omega_4\omega_8^2\omega_9\omega_6^2+36c_s^2\omega_7\omega_4^2\omega_9\omega_6^3-12\omega_7v_2^2\omega_8^2\omega_9\omega_6^2-18\omega_7\omega_4\omega_8^2\omega_9\omega_6^2-6\omega_7\omega_4^2v_2^2\omega_8\omega_9\omega_6^3+6\omega_7\omega_4^2\omega_8\omega_9\omega_6^3+12\omega_7\omega_4^2\omega_9\omega_6^2-6\omega_7\omega_4^2v_2^2\omega_8^2\omega_6^2+12\omega_7\omega_8^2\omega_9\omega_6^2+12\omega_7\omega_4^2v_2^2\omega_9\omega_6^3+6\omega_4^2v_2^2\omega_8^2\omega_9\omega_6^2-6\omega_7\omega_4^2\omega_8^2\omega_6^3-12\omega_7\omega_4^2v_2^2\omega_8\omega_9\omega_6+6\omega_7\omega_4^2v_2^2\omega_8^2\omega_6^3-12\omega_7\omega_4^2\omega_9\omega_6^3-18\omega_7\omega_4^2\omega_8\omega_9\omega_6^2-12\omega_4v_2^2\omega_8^2\omega_9\omega_6^2+6\omega_7\omega_4^2\omega_8^2\omega_6^2-12\omega_7\omega_4\omega_8\omega_6^3-36c_s^2\omega_7\omega_4^2\omega_8^2\omega_9\omega_6-12\omega_7\omega_4^2v_2^2\omega_9\omega_6^2+36c_s^2\omega_7\omega_4^2\omega_8^2\omega_9-12\omega_7\omega_8^2\omega_9\omega_6^3+12\omega_4\omega_8^2\omega_9\omega_6^2+6\omega_4^2\omega_8^2\omega_6^3+54c_s^2\omega_7\omega_4\omega_8\omega_9\omega_6^3-12\omega_7\omega_4^2v_2^2\omega_8\omega_6^3-\omega_7\omega_4^2\omega_8^2\omega_9\omega_6^3+12\omega_7\omega_4\omega_8^2\omega_6^3-12\omega_7\omega_4^2\omega_8\omega_6^2+54c_s^2\omega_7\omega_4\omega_8^2\omega_9\omega_6^2+2\omega_7\omega_4^2\omega_8^2\omega_9\omega_6^2+12\omega_7\omega_4^2v_2^2\omega_8\omega_6^2+12\omega_7\omega_4\omega_9\omega_6^3-12\omega_7\omega_4^2v_2^2\omega_8^2\omega_9\omega_6-12\omega_4\omega_8^2\omega_6^3-40c_s^2\omega_7\omega_4\omega_8^2\omega_9\omega_6^3+18c_s^2\omega_4^2\omega_8^2\omega_9\omega_6^2+12\omega_7\omega_8\omega_9\omega_6^3-36c_s^2\omega_7\omega_4^2\omega_8\omega_9\omega_6+12\omega_7\omega_4^2\omega_8\omega_6^3+12\omega_4v_2^2\omega_8^2\omega_6^3-12\omega_7\omega_4v_2^2\omega_8^2\omega_9\omega_6^3-36c_s^2\omega_7\omega_4\omega_8^2\omega_6^3-12\omega_7\omega_4v_2^2\omega_9\omega_6^3+36c_s^2\omega_7\omega_4^2\omega_8\omega_6^2+54c_s^2\omega_7\omega_4^2\omega_8\omega_9\omega_6^2+12\omega_7\omega_4^2\omega_8^2\omega_9\omega_6-18c_s^2\omega_4^2\omega_8^2\omega_6^3-12\omega_7v_2^2\omega_8\omega_9\omega_6^3-18\omega_7\omega_4\omega_8\omega_9\omega_6^3-2\omega_7\omega_4^2v_2^2\omega_8^2\omega_9\omega_6^2-6\omega_4^2\omega_8^2\omega_9\omega_6^2-36c_s^2\omega_7\omega_8\omega_9\omega_6^3-18c_s^2\omega_7\omega_4^2\omega_8\omega_9\omega_6^3-36c_s^2\omega_7\omega_4^2\omega_8\omega_6^3+18\omega_7\omega_4v_2^2\omega_8^2\omega_9\omega_6^2+\omega_7\omega_4^2v_2^2\omega_8^2\omega_9\omega_6^3-12\omega_7\omega_4v_2^2\omega_8^2\omega_6^3-36c_s^2\omega_7\omega_4\omega_9\omega_6^3$

$C_8=-6c_s^2\omega_7\omega_4^3\omega_8\omega_6+6\omega_4^3\omega_8\omega_6^2+36\omega_7\omega_4^2v_2^2\omega_9\omega_6-12\omega_7\omega_4^2\omega_6^2-12c_s^2\omega_4^2\omega_8\omega_9\omega_6+36\omega_7\omega_4^2v_2^2\omega_6^2+36\omega_7\omega_4^3v_2^2\omega_9\omega_6^2-24\omega_7\omega_4^2\omega_8\omega_9\omega_6-24c_s^2\omega_7\omega_4^2\omega_9\omega_6^2+12c_s^2\omega_4^2\omega_8\omega_6^2-12c_s^2\omega_7\omega_4\omega_8\omega_9\omega_6-6\omega_7\omega_4^3\omega_8\omega_6^2+6c_s^2\omega_7\omega_4^3\omega_8\omega_9-12\omega_7\omega_4^3\omega_6-6\omega_4^3\omega_8\omega_9\omega_6+18\omega_4^3v_2^2\omega_8\omega_9\omega_6-12\omega_7\omega_4^2\omega_9\omega_6+24\omega_7\omega_4^2\omega_9\omega_6^2+6\omega_7\omega_4^3\omega_8\omega_6-36\omega_7\omega_4v_2^2\omega_8\omega_9\omega_6+18c_s^2\omega_7\omega_4\omega_8\omega_9\omega_6^2+12\omega_4^2\omega_8\omega_9\omega_6+12\omega_7\omega_4^3\omega_6^2+72\omega_7\omega_4^2v_2^2\omega_8\omega_9\omega_6+6c_s^2\omega_4^3\omega_8\omega_9\omega_6+12c_s^2\omega_7\omega_4^2\omega_9\omega_6-36\omega_7\omega_4^3v_2^2\omega_9\omega_6+6c_s^2\omega_7\omega_4^3\omega_8\omega_6^2+6\omega_7\omega_4^3\omega_8\omega_9\omega_6-72\omega_7\omega_4^2v_2^2\omega_9\omega_6^2-6\omega_7\omega_4^3\omega_8\omega_9+12\omega_7\omega_4\omega_8\omega_9\omega_6-18\omega_4^3v_2^2\omega_8\omega_6^2+12c_s^2\omega_7\omega_4^3\omega_6-12\omega_7\omega_4\omega_9\omega_6^2+12\omega_7\omega_4^3\omega_9\omega_6+12\omega_7\omega_4^2\omega_8\omega_6^2-12c_s^2\omega_7\omega_4^2\omega_8\omega_9+18\omega_7\omega_4^3v_2^2\omega_8\omega_9-c_s^2\omega_7\omega_4^3\omega_8\omega_9\omega_6^2-36\omega_7\omega_4^2v_2^2\omega_8\omega_6^2-6c_s^2\omega_4^3\omega_8\omega_6^2+12c_s^2\omega_7\omega_4^2\omega_6^2-36\omega_7\omega_4^3v_2^2\omega_6^2+12c_s^2\omega_7\omega_4^3\omega_9\omega_6^2-12\omega_4^2\omega_8\omega_6^2-18\omega_7\omega_4^3v_2^2\omega_8\omega_6+24c_s^2\omega_7\omega_4^2\omega_8\omega_9\omega_6-18\omega_7\omega_4^3v_2^2\omega_8\omega_9\omega_6-12c_s^2\omega_7\omega_4^2\omega_8\omega_6^2+18\omega_7\omega_4^3v_2^2\omega_8^2\omega_6^2-4c_s^2\omega_7\omega_4^2\omega_8\omega_9\omega_6^2-12c_s^2\omega_7\omega_8\omega_9\omega_6^2+12\omega_7\omega_4^2\omega_8\omega_9-6c_s^2\omega_7\omega_4^3\omega_8\omega_9\omega_6+12c_s^2\omega_7\omega_4\omega_9\omega_6^2-12c_s^2\omega_7\omega_4^3\omega_9\omega_6+36\omega_7\omega_4^3v_2^2\omega_6-36\omega_4^2v_2^2\omega_8\omega_9\omega_6+36\omega_4^2v_2^2\omega_8\omega_6^2+36\omega_7\omega_4v_2^2\omega_9\omega_6^2-36\omega_7\omega_4^2v_2^2\omega_8\omega_9-12c_s^2\omega_7\omega_4^3\omega_6^2-12\omega_7\omega_4^3\omega_9\omega_6^2$

$C_9=-12c_s^4\omega_4^2\omega_8^2\omega_6+36\omega_4^3v_2^4\omega_6^3+108c_s^2\omega_4^3v_2^2\omega_6^3+4\omega_4^3v_2^4\omega_8^2\omega_6^3+36c_s^2\omega_4v_2^2\omega_8\omega_6^3+6c_s^4\omega_4^3\omega_8\omega_6^3+90\omega_4^3v_2^2\omega_8^2\omega_6+36\omega_4^2v_2^2\omega_6^3+6c_s^2\omega_4\omega_8^2\omega_6^3-12c_s^2\omega_4^2\omega_8\omega_6^2+12c_s^2\omega_4^3v_2^2\omega_8^2\omega_6^3-6c_s^4\omega_4^3\omega_8\omega_6^2+6\omega_4^2v_2^2\omega_8^2\omega_6^3-108c_s^2\omega_4^3v_2^2\omega_6^2+19\omega_4^3v_2^4\omega_8^2\omega_6^2-36c_s^2\omega_4^2v_2^2\omega_8^2\omega_6-36\omega_4^3v_2^4\omega_6^2+18c_s^2\omega_4^2\omega_8\omega_6^3+60c_s^2\omega_4^3v_2^2\omega_8^2\omega_6^2+12c_s^2\omega_4^3\omega_8^2\omega_6-306c_s^2\omega_4^3v_2^2\omega_8^2\omega_6-c_s^2\omega_4^3\omega_8^2\omega_6^2-4\omega_4^3v_2^2\omega_8^2\omega_6^3-90\omega_4^3v_2^4\omega_8^2\omega_6+13c_s^4\omega_4^2\omega_8^2\omega_6^3+18c_s^2\omega_4^2v_2^2\omega_8^2\omega_6^2+252c_s^2\omega_4^3v_2^2\omega_8^2-19\omega_4^3v_2^2\omega_8^2\omega_6^2-6\omega_4^2v_2^4\omega_8^2\omega_6^3+72\omega_4^3v_2^4\omega_8^2+6c_s^4\omega_4^2\omega_8^2\omega_6^2-3c_s^2\omega_4^2v_2^2\omega_8^2\omega_6^3+12c_s^4\omega_4\omega_8\omega_6^3+36\omega_4^2v_2^4\omega_8\omega_6^3-72\omega_4^3v_2^2\omega_8\omega_6^2-6c_s^2\omega_4^3\omega_8\omega_6^3+12c_s^2\omega_4^2\omega_8^2\omega_6+36\omega_4^3v_2^2\omega_6^2-24c_s^4\omega_4\omega_8^2\omega_6^3+54c_s^2\omega_4^2v_2^2\omega_8\omega_6^3+12c_s^4\omega_4^2\omega_8\omega_6^2+12c_s^4\omega_4^3\omega_8^2-36\omega_4^3v_2^2\omega_6^3-108c_s^2\omega_4^3v_2^2\omega_8\omega_6+12c_s^4\omega_8^2\omega_6^3+39\omega_4^3v_2^2\omega_8\omega_6^3+6c_s^2\omega_4^3\omega_8\omega_6^2-36\omega_4^3v_2^4\omega_8\omega_6-36\omega_4^2v_2^4\omega_6^3-12c_s^4\omega_4^3\omega_8^2\omega_6+36c_s^2\omega_4^2v_2^2\omega_8\omega_6^2-18c_s^4\omega_4^2\omega_8\omega_6^3-108c_s^2\omega_4^2v_2^2\omega_6^3+72\omega_4^3v_2^4\omega_8\omega_6^2-36\omega_4^2v_2^2\omega_8\omega_6^3+c_s^4\omega_4^3\omega_8^2\omega_6^2-72\omega_4^3v_2^2\omega_8^2\omega_6^2-198c_s^2\omega_4^3v_2^2\omega_8\omega_6^2-5c_s^2\omega_4^2\omega_8^2\omega_6^3-12c_s^2\omega_4^3\omega_8^2-18c_s^2\omega_4v_2^2\omega_8^2\omega_6^3-c_s^4\omega_4^3\omega_8^2\omega_6^3-39\omega_4^3v_2^4\omega_8\omega_6^3+36\omega_4^3v_2^2\omega_8\omega_6-99c_s^2\omega_4^3v_2^2\omega_8\omega_6^3-6c_s^2\omega_4^2\omega_8^2\omega_6^2-12c_s^2\omega_4\omega_8\omega_6^3$

$C_{10}=12-216v_2^4\omega_6+198c_s^2\omega_6+672c_s^2v_2^2+144v_2^4-132c_s^2+90v_2^4\omega_6^2-78c_s^2\omega_6^2+6c_s^2\omega_6^3-9v_2^4\omega_6^3+234v_2^2\omega_6-34c_s^2v_2^2\omega_6^3-216c_s^4\omega_6-156v_2^2+144c_s^4+404c_s^2v_2^2\omega_6^2-\omega_6^3-1008c_s^2v_2^2\omega_6-5c_s^4\omega_6^3-18\omega_6+10v_2^2\omega_6^3+8\omega_6^2-98v_2^2\omega_6^2+82c_s^4\omega_6^2$

$C_{11}=12-756v_2^4\omega_6+54c_s^2\omega_6+432c_s^2v_2^2+504v_2^4-36c_s^2+310v_2^4\omega_6^2-22c_s^2\omega_6^2+2c_s^2\omega_6^3-29v_2^4\omega_6^3+378v_2^2\omega_6-18c_s^2v_2^2\omega_6^3-36c_s^4\omega_6-252v_2^2+24c_s^4+252c_s^2v_2^2\omega_6^2-\omega_6^3-648c_s^2v_2^2\omega_6-c_s^4\omega_6^3-18\omega_6+14v_2^2\omega_6^3+8\omega_6^2-154v_2^2\omega_6^2+14c_s^4\omega_6^2$

2.5 CLBM2

2.5.1 Definitions

Collision operator $\boldsymbol{C}$:

$$\boldsymbol{C}(\boldsymbol{f})=\mathbf{K}^{-1}\mathbf{S}\left(\boldsymbol{\kappa}^{(eq)}-\mathbf{K}\boldsymbol{f}\right),$$

where

$$\mathbf{S}=\mathrm{diag}(\omega_1,\omega_2,\omega_3,\omega_4,\omega_5,\omega_6,\omega_7,\omega_8,\omega_9),$$

$\omega_1,\omega_2,\ldots,\omega_9\in(0,2)$.
Matrix $\mathbf{K}$ corresponds to the transformation matrix to the central moment basis defined by

$$\boldsymbol{\kappa}=\begin{pmatrix}k_{(0,0)}\\k_{(1,0)}\\k_{(0,1)}\\k_{(1,1)}\\k_{(2,0)}+k_{(0,2)}\\k_{(2,0)}-k_{(0,2)}\\k_{(2,1)}\\k_{(1,2)}\\k_{(2,2)}\end{pmatrix},$$

thus, the transformation matrix $\mathbf{K}$ satisfies

$$\begin{aligned}
\mathbf{K}_{1,i} &= (\boldsymbol{c}_i - \boldsymbol{v})^{(0,0)} \\
\mathbf{K}_{2,i} &= (\boldsymbol{c}_i - \boldsymbol{v})^{(1,0)} \\
\mathbf{K}_{3,i} &= (\boldsymbol{c}_i - \boldsymbol{v})^{(0,1)} \\
\mathbf{K}_{4,i} &= (\boldsymbol{c}_i - \boldsymbol{v})^{(1,1)} \\
\mathbf{K}_{5,i} &= (\boldsymbol{c}_i - \boldsymbol{v})^{(2,0)} + (\boldsymbol{c}_i - \boldsymbol{v})^{(0,2)} \\
\mathbf{K}_{6,i} &= (\boldsymbol{c}_i - \boldsymbol{v})^{(2,0)} - (\boldsymbol{c}_i - \boldsymbol{v})^{(0,2)} \\
\mathbf{K}_{7,i} &= (\boldsymbol{c}_i - \boldsymbol{v})^{(2,1)} \\
\mathbf{K}_{8,i} &= (\boldsymbol{c}_i - \boldsymbol{v})^{(1,2)} \\
\mathbf{K}_{9,i} &= (\boldsymbol{c}_i - \boldsymbol{v})^{(2,2)},
\end{aligned}$$

$\forall i \in \{1, 2, \cdots, 9\}$.
The equilibrium central moments are defined by

$$\boldsymbol{\kappa}^{(eq)} = \mathbf{K}\mathbf{M}^{-1}\boldsymbol{\mu}^{(eq)},$$

i.e.,

$$\boldsymbol{\kappa}^{(eq)} = \left(\rho, 0, 0, 0, 2\rho c_s^2, 0, 0, 0, \rho c_s^4\right)^T.$$

2.5.2 Conservation of mass: ρ

attached text file: `output_d2q9_nse_clbm2_symbolic_pde_00.txt`

$$\frac{\partial \rho}{\partial t} + \frac{v_1\delta_l}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{\rho\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{v_2\delta_l}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{\rho\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-1 + 3c_s^2 + v_1^2)\frac{v_1\delta_l^3}{12\delta_t}\frac{\partial^3 \rho}{\partial x_1^3} + (-1 + c_s^2 + 3v_1^2)\frac{\rho\delta_l^3}{12\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} -$$
$$\frac{\rho\delta_l^3 c_s^2}{6\delta_t}\frac{\partial^3 v_2}{\partial x_1^2 \partial x_2} - \frac{\rho\delta_l^3 c_s^2}{6\delta_t}\frac{\partial^3 v_1}{\partial x_1 \partial x_2^2} + (-1 + 3c_s^2 + v_2^2)\frac{v_2\delta_l^3}{12\delta_t}\frac{\partial^3 \rho}{\partial x_2^3} + (-1 + c_s^2 + 3v_2^2)\frac{\rho\delta_l^3}{12\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} +$$
$$(\omega_5 c_s^2 + 3\omega_5 v_1^2 + 6v_1^4 + 2c_s^4 - 2c_s^2 - 6v_1^2 - 12\omega_5 v_1^2 c_s^2 + 24v_1^2 c_s^2 - 3\omega_5 v_1^4 - \omega_5 c_s^4)\frac{\delta_l^4}{24\omega_5\delta_t}\frac{\partial^4 \rho}{\partial x_1^4} +$$
$$(-4 - 3\omega_5 c_s^2 - 5\omega_5 v_1^2 + 2\omega_5 + 6c_s^2 + 10v_1^2)\frac{\rho v_1\delta_l^4}{12\omega_5\delta_t}\frac{\partial^4 v_1}{\partial x_1^4} +$$
$$(3\omega_7\omega_5 c_s^2 + \omega_7\omega_5 v_1^2 - \omega_7 - 9\omega_5 c_s^2 - 3\omega_5 v_1^2 + 3\omega_5 + 3\omega_7 c_s^2 + \omega_7 v_1^2 - \omega_7\omega_5)\frac{\rho v_1\delta_l^4}{12\omega_7\omega_5\delta_t}\frac{\partial^4 v_2}{\partial x_1^3 \partial x_2} + (-2 + \omega_4)\frac{\delta_l^4 c_s^4}{6\omega_4\delta_t}\frac{\partial^4 \rho}{\partial x_1^2 \partial x_2^2}$$
$$+ (v_2^2\omega_8\omega_6 - \omega_8\omega_6 - \omega_8 + 3\omega_8\omega_6 c_s^2 + 3\omega_8 c_s^2 - 3v_2^2\omega_6 + 3\omega_6 + v_2^2\omega_8 - 9\omega_6 c_s^2)\frac{\rho v_2\delta_l^4}{12\omega_8\omega_6\delta_t}\frac{\partial^4 v_1}{\partial x_1 \partial x_2^3} +$$
$$(-3v_2^4\omega_6 - \omega_6 c_s^4 + 2c_s^4 + 6v_2^4 + 3v_2^2\omega_6 - 2c_s^2 + 24v_2^2 c_s^2 - 6v_2^2 - 12v_2^2\omega_6 c_s^2 + \omega_6 c_s^2)\frac{\delta_l^4}{24\omega_6\delta_t}\frac{\partial^4 \rho}{\partial x_2^4} +$$
$$(-4 - 5v_2^2\omega_6 + 6c_s^2 + 10v_2^2 + 2\omega_6 - 3\omega_6 c_s^2)\frac{\rho v_2\delta_l^4}{12\omega_6\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0.$$

2.5.3 Conservation of momentum: ρv_1

attached text file: `output_d2q9_nse_clbm2_symbolic_pde_01.txt`

$$v_1\frac{\partial \rho}{\partial t} + \rho\frac{\partial v_1}{\partial t} + (c_s^2 + v_1^2)\frac{\delta_l}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{2\rho v_1\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{v_2 v_1\delta_l}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{\rho v_2\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_2} + \frac{\rho v_1\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} +$$
$$(-2 - 2\omega_5 c_s^2 - 3\omega_5 v_1^2 + \omega_5 + 4c_s^2 + 6v_1^2)\frac{\delta_l^2}{\omega_5\delta_t}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial x_1} + (2 - \omega_5)\frac{3\rho v_1\delta_l^2}{\omega_5\delta_t}\left(\frac{\partial v_1}{\partial x_1}\right)^2 + (-2 + \omega_4)\frac{\delta_l^2 c_s^2}{2\omega_4\delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_1} +$$

$$(-2+\omega_4)\frac{\delta_l^2 c_s^2}{2\omega_4\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_1}{\partial x_2} + (-2-3\omega_5 c_s^2-\omega_5 v_1^2+\omega_5+6c_s^2+2v_1^2)\frac{v_1\delta_l^2}{2\omega_5\delta_t}\frac{\partial^2\rho}{\partial x_1^2} +$$
$$(-2-\omega_5 c_s^2-3\omega_5 v_1^2+\omega_5+2c_s^2+6v_1^2)\frac{\rho\delta_l^2}{2\omega_5\delta_t}\frac{\partial^2 v_1}{\partial x_1^2} + (-2+\omega_4)\frac{\rho\delta_l^2 c_s^2}{2\omega_4\delta_t}\frac{\partial^2 v_2}{\partial x_1\partial x_2} + (-2+\omega_4)\frac{\rho\delta_l^2 c_s^2}{2\omega_4\delta_t}\frac{\partial^2 v_1}{\partial x_2^2} + C_1\frac{\delta_l^3}{12\omega_5^2\delta_t}\frac{\partial^3\rho}{\partial x_1^3}$$
$$+ (-24-36\omega_5 c_s^2-60\omega_5 v_1^2+24\omega_5-4\omega_5^2+36c_s^2+60v_1^2+5\omega_5^2 c_s^2+11\omega_5^2 v_1^2)\frac{\rho v_1\delta_l^3}{6\omega_5^2\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} + C_2\frac{\rho v_1\delta_l^3}{12\omega_7\omega_4\omega_5^2\delta_t}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2} +$$
$$(-12-\omega_4^2+12\omega_4)\frac{\delta_l^3 c_s^4}{6\omega_4^2\delta_t}\frac{\partial^3\rho}{\partial x_1\partial x_2^2} - \frac{\rho v_1\delta_l^3 c_s^2}{6\delta_t}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2} + (-1+3c_s^2+v_2^2)\frac{v_2 v_1\delta_l^3}{12\delta_t}\frac{\partial^3\rho}{\partial x_2^3} + C_3\frac{\rho v_2\delta_l^3}{6\omega_4\omega_8\delta_t}\frac{\partial^3 v_1}{\partial x_2^3} +$$
$$(-1+c_s^2+3v_2^2)\frac{\rho v_1\delta_l^3}{12\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} + C_4\frac{v_1\delta_l^4}{12\omega_5^3\delta_t}\frac{\partial^4\rho}{\partial x_1^4} + C_5\frac{\rho\delta_l^4}{12\omega_5^3\delta_t}\frac{\partial^4 v_1}{\partial x_1^4} + C_6\frac{\rho\delta_l^4}{12\omega_7^2\omega_4^2\omega_5^3\delta_t}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} + C_7\frac{v_1\delta_l^4 c_s^2}{12\omega_7^2\omega_4^2\omega_8\omega_5^3\omega_9\delta_t}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2}$$
$$+ C_8\frac{\rho\delta_l^4 c_s^2}{12\omega_7\omega_4^3\omega_8\omega_5^2\omega_9\delta_t}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} + C_9\frac{v_2\delta_l^4 c_s^2}{12\omega_7\omega_4^2\omega_8^2\omega_5\omega_9\omega_6\delta_t}\frac{\partial^4\rho}{\partial x_1\partial x_2^3} +$$
$$(v_2^2\omega_8\omega_6-\omega_8\omega_6-\omega_8+3\omega_8\omega_6 c_s^2+3\omega_8 c_s^2-3v_2^2\omega_6+3\omega_6+v_2^2\omega_8-9\omega_6 c_s^2)\frac{\rho v_2 v_1\delta_l^4}{12\omega_8\omega_6\delta_t}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} +$$
$$C_{10}\frac{\rho\delta_l^4 c_s^2}{12\omega_7\omega_4^3\omega_8\omega_5\omega_9\omega_6\delta_t}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3} +$$
$$(-3v_2^4\omega_6-\omega_6 c_s^4+2c_s^4+6v_2^4+3v_2^2\omega_6-2c_s^2+24v_2^2 c_s^2-6v_2^2-12v_2^2\omega_6 c_s^2+\omega_6 c_s^2)\frac{v_1\delta_l^4}{24\omega_6\delta_t}\frac{\partial^4\rho}{\partial x_2^4} + C_{11}\frac{\rho\delta_l^4}{24\omega_4^3\omega_8^2\delta_t}\frac{\partial^4 v_1}{\partial x_2^4} +$$
$$(-4-5v_2^2\omega_6+6c_s^2+10v_2^2+2\omega_6-3\omega_6 c_s^2)\frac{\rho v_2 v_1\delta_l^4}{12\omega_6\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$$C_1 = 7\omega_5^2 v_1^4+24\omega_5^2 v_1^2 c_s^2+\omega_5^2 c_s^4+12\omega_5 c_s^2+36\omega_5 v_1^2+36v_1^4+12c_s^4-12c_s^2-36v_1^2-\omega_5^2 c_s^2-7\omega_5^2 v_1^2-144\omega_5 v_1^2 c_s^2+144v_1^2 c_s^2-36\omega_5 v_1^4-12\omega_5 c_s^4$$

$$C_2 = 12\omega_4\omega_5-3\omega_7\omega_4\omega_5^2 v_1^2-11\omega_7\omega_4\omega_5^2 c_s^2+6\omega_7\omega_4\omega_5+3\omega_7\omega_4\omega_5^2+36\omega_7\omega_4 c_s^2+12\omega_7\omega_4 v_1^2+12\omega_4\omega_5^2 v_1^2-12\omega_4\omega_5^2-12\omega_7\omega_4+36\omega_4\omega_5^2 c_s^2+12\omega_5^2-12\omega_4\omega_5 v_1^2-36\omega_4\omega_5 c_s^2-6\omega_7\omega_5^2-36\omega_5^2 c_s^2-6\omega_7\omega_4\omega_5 v_1^2-12\omega_5^2 v_1^2-18\omega_7\omega_4\omega_5 c_s^2+18\omega_7\omega_5^2 c_s^2+6\omega_7\omega_5^2 v_1^2$$

$$C_3 = 6-3\omega_4+\omega_4\omega_8+3\omega_4 v_2^2-3\omega_8+9\omega_4 c_s^2-\omega_4 v_2^2\omega_8+9\omega_8 c_s^2-18c_s^2-6v_2^2+3v_2^2\omega_8-3\omega_4\omega_8 c_s^2$$

$$C_4 = 12+90\omega_5^2 v_1^4+404\omega_5^2 v_1^2 c_s^2+82\omega_5^2 c_s^4+198\omega_5 c_s^2+234\omega_5 v_1^2+144v_1^4-5\omega_5^3 c_s^4-9\omega_5^3 v_1^4+144c_s^4-18\omega_5+8\omega_5^2+10\omega_5^3 v_1^2-132c_s^2-156v_1^2+6\omega_5^3 c_s^2-\omega_5^3-34\omega_5^3 v_1^2 c_s^2-78\omega_5^2 c_s^2-98\omega_5^2 v_1^2-1008\omega_5 v_1^2 c_s^2+672v_1^2 c_s^2-216\omega_5 v_1^4-216\omega_5 c_s^4$$

$$C_5 = 12+310\omega_5^2 v_1^4+252\omega_5^2 v_1^2 c_s^2+14\omega_5^2 c_s^4+54\omega_5 c_s^2+378\omega_5 v_1^2+504v_1^4-\omega_5^3 c_s^4-29\omega_5^3 v_1^4+24c_s^4-18\omega_5+8\omega_5^2+14\omega_5^3 v_1^2-36c_s^2-252v_1^2+2\omega_5^3 c_s^2-\omega_5^3-18\omega_5^3 v_1^2 c_s^2-22\omega_5^2 c_s^2-154\omega_5^2 v_1^2-648\omega_5 v_1^2 c_s^2+432v_1^2 c_s^2-756\omega_5 v_1^4-36\omega_5 c_s^4$$

$$C_6 = \omega_7^2\omega_4^3\omega_5^2 c_s^4+39\omega_7\omega_4^3\omega_5^3 v_1^2-6\omega_7\omega_4^3\omega_5^3 c_s^2+36\omega_4^3\omega_5^2 v_1^2+19\omega_7^2\omega_4^3\omega_5^2 v_1^4+198\omega_7\omega_4^3\omega_5^2 v_1^2 c_s^2-72\omega_7^2\omega_4^3 v_1^2+6\omega_7^2\omega_4^2\omega_5^3 v_1^2-24\omega_7^2\omega_4\omega_5^3 c_s^4-36\omega_4^2\omega_5^3 v_1^4+12\omega_7\omega_4^2\omega_5^2 c_s^4+60\omega_7^2\omega_4^3\omega_5^2 v_1^2 c_s^2+90\omega_7^2\omega_4^3\omega_5\omega_7^2 v_1^2+12\omega_7^2\omega_4^3\omega_5 c_s^2+108\omega_4^3\omega_5^3 v_1^2 c_s^2-5\omega_7^2\omega_4^2\omega_5^3 c_s^2-12\omega_7^2\omega_4^3 c_s^2-36\omega_4^3\omega_5^3 v_1^2+4\omega_7^2\omega_4^3\omega_5^3 v_1^4+18\omega_7^2\omega_4^2\omega_5^2 v_1^2 c_s^2+6\omega_7\omega_4^3\omega_5^2 c_s^2-72\omega_7\omega_4^3\omega_5^2 v_1^2-108\omega_4^2\omega_5^3 v_1^2 c_s^2-12\omega_7^2\omega_4^2\omega_5 c_s^4+36\omega_7\omega_4\omega_5^3 v_1^2 c_s^2-\omega_7^2\omega_4^3\omega_5^3 c_s^4-6\omega_7^2\omega_4^2\omega_5^2 c_s^2-36\omega_7\omega_4^3\omega_5 v_1^4-18\omega_7^2\omega_4\omega_5^3 v_1^2 c_s^2+36\omega_7\omega_4^2\omega_5^3 v_1^4-12\omega_7\omega_4\omega_5^3 c_s^2-18\omega_7\omega_4^2\omega_5^3 c_s^4+36\omega_7\omega_4^2\omega_5^2 v_1^2 c_s^2+72\omega_7\omega_4^3\omega_5^2 v_1^4+12\omega_7^2\omega_4^2\omega_5 c_s^2-36\omega_7^2\omega_4^2\omega_5 v_1^2 c_s^2-108\omega_4^3\omega_5^2 v_1^2 c_s^2+36\omega_4^3\omega_5^3 v_1^4-4\omega_7^2\omega_4^3\omega_5^3 v_1^2+12\omega_7^2\omega_4^3\omega_5^3 v_1^2 c_s^2-6\omega_7\omega_4^3\omega_5^2 c_s^4+18\omega_7\omega_4^2\omega_5^3 c_s^2-99\omega_7\omega_4^3\omega_5^3 v_1^2 c_s^2+12\omega_7^2\omega_5^3 c_s^4+6\omega_7^2\omega_4^2\omega_5^2 c_s^4+36\omega_7\omega_4^3\omega_5 v_1^2-36\omega_7\omega_4^2\omega_5^3 v_1^2+12\omega_7\omega_4\omega_5^3 c_s^4+6\omega_7\omega_4^3\omega_5^3 c_s^4+54\omega_7\omega_4^2\omega_5^3 v_1^2 c_s^2-36\omega_4^3\omega_5^2 v_1^4-19\omega_7^2\omega_4^3\omega_5^2 v_1^2-108\omega_7\omega_4^3\omega_5^2 v_1^2 c_s^2-\omega_7^2\omega_4^3\omega_5^2 c_s^2-39\omega_7\omega_4^3\omega_5^3 v_1^4-306\omega_7^2\omega_4^3\omega_5^3 v_1^2 c_s^2-12\omega_7^2\omega_4^3\omega_5 c_s^4+13\omega_7^2\omega_4^3\omega_5^3 c_s^4+12\omega_7^2\omega_4^3 c_s^4+72\omega_7^2\omega_4^3 v_1^4-6\omega_7^2\omega_4^3\omega_5^3 v_1^4+36\omega_4^2\omega_5^3 v_1^2+6\omega_7^2\omega_4\omega_5^3 c_s^2-3\omega_7^2\omega_4^2\omega_5^3 v_1^2 c_s^2+252\omega_7^2\omega_4^3 v_1^2 c_s^2-12\omega_7\omega_4^2\omega_5^2 c_s^2-90\omega_7^2\omega_4^3\omega_5 v_1^4$$

$$C_7 = -12\omega_4^2\omega_8\omega_5^3\omega_9-36\omega_7^2\omega_4\omega_5^2\omega_9 c_s^2+18\omega_7\omega_4^2\omega_8\omega_5^2 v_1^2\omega_9-18\omega_7\omega_4\omega_8\omega_5^3\omega_9-18\omega_7^2\omega_4^2\omega_8\omega_5^2 c_s^2-36\omega_4^2\omega_8\omega_5^2\omega_9 c_s^2-6\omega_7^2\omega_4^2\omega_8\omega_5^2 v_1^2+12\omega_7^2\omega_4^2\omega_8\omega_5\omega_9-12\omega_7^2\omega_4^2\omega_8\omega_9-12\omega_4^2\omega_8\omega_5^2 v_1^2\omega_9+12\omega_7\omega_4^2\omega_8\omega_5^2 v_1^2-6\omega_7^2\omega_4^2\omega_5^3 v_1^2-12\omega_7^2\omega_4\omega_5^2 v_1^2\omega_9-12\omega_7^2\omega_8\omega_5^3\omega_9+12\omega_7\omega_4^2\omega_8\omega_5\omega_9+54\omega_7\omega_4^2\omega_8\omega_5^2\omega_9 c_s^2+12\omega_7^2\omega_4\omega_8\omega_5^3-18\omega_7^2\omega_4^2\omega_5^3 c_s^2+36\omega_7\omega_4^2\omega_8\omega_5^2 c_s^2+12\omega_7^2\omega_4\omega_8\omega_5^3\omega_9-12\omega_7\omega_4^2\omega_8\omega_5^2+6\omega_7^2\omega_4^2\omega_5^3-6\omega_7^2\omega_4^2\omega_8\omega_5^2\omega_9 c_s^2+6\omega_7^2\omega_4^2\omega_8\omega_5^3 v_1^2+18\omega_7^2\omega_4\omega_8\omega_5^2 v_1^2\omega_9+18\omega_7^2\omega_4^2\omega_8\omega_5^3 c_s^2+12\omega_4^2\omega_8\omega_5^2\omega_9-36\omega_7^2\omega_8\omega_5^2\omega_9 c_s^2+12\omega_7^2\omega_4\omega_5^2\omega_9-18\omega_7^2\omega_4\omega_8\omega_5^2\omega_9-2\omega_7^2\omega_4^2\omega_8\omega_5^2 v_1^2\omega_9-36\omega_7\omega_4^2\omega_8\omega_5^3 c_s^2+12\omega_7\omega_4^2\omega_8\omega_5^3+12\omega_7^2\omega_8\omega_5^2\omega_9-12\omega_7^2\omega_8\omega_5^2 v_1^2\omega_9+54\omega_7^2\omega_4\omega_8\omega_5^2\omega_9 c_s^2-12\omega_7\omega_4^2\omega_8\omega_5^3 v_1^2+18\omega_7\omega_4\omega_8\omega_5^3 v_1^2\omega_9-36\omega_7^2\omega_4^2\omega_8\omega_5\omega_9 c_s^2-36\omega_4\omega_8\omega_5^3\omega_9 c_s^2+12\omega_4^2\omega_8\omega_5^3 v_1^2\omega_9+6\omega_7\omega_4^2\omega_8\omega_5^3\omega_9-6\omega_7^2\omega_4^2\omega_5^2\omega_9-18\omega_7\omega_4^2\omega_8\omega_5^3\omega_9 c_s^2+12\omega_4\omega_8\omega_5^3\omega_9+18\omega_7^2\omega_4^2\omega_5^2\omega_9 c_s^2-12\omega_7\omega_4\omega_8\omega_5^3-\omega_7^2\omega_4^2\omega_8\omega_5^3\omega_9-12\omega_4\omega_8\omega_5^3 v_1^2\omega_9-12\omega_7^2\omega_4\omega_5^3+54\omega_7\omega_4\omega_8\omega_5^3\omega_9 c_s^2-12\omega_7^2\omega_4^2\omega_8\omega_5 v_1^2\omega_9+6\omega_7^2\omega_4^2\omega_5^2 v_1^2\omega_9-6\omega_7\omega_4^2\omega_8\omega_5^3 v_1^2\omega_9+12\omega_7\omega_8\omega_5^3\omega_9+36\omega_4^2\omega_8\omega_5^3\omega_9 c_s^2+12\omega_7^2\omega_8\omega_5^3 v_1^2\omega_9-12\omega_7\omega_4^2\omega_8\omega_5 v_1^2\omega_9-18\omega_7\omega_4^2\omega_8\omega_5^2\omega_9-36\omega_7^2\omega_4\omega_8\omega_5^3 c_s^2-40\omega_7^2\omega_4\omega_8\omega_5^3\omega_9 c_s^2+12\omega_7^2\omega_4^2\omega_8 v_1^2\omega_9+\omega_7^2\omega_4^2\omega_8\omega_5^3 v_1^2\omega_9-12\omega_7^2\omega_4\omega_8\omega_5^3 v_1^2+6\omega_7^2\omega_4^2\omega_8\omega_5^2-36\omega_7\omega_8\omega_5^3\omega_9 c_s^2-36\omega_7\omega_4^2\omega_8\omega_5\omega_9 c_s^2-12\omega_7^2\omega_4\omega_8\omega_5^3 v_1^2\omega_9+12\omega_7\omega_4\omega_8\omega_5^3 v_1^2+12\omega_7^2\omega_4\omega_5^3 v_1^2+36\omega_7^2\omega_8\omega_5^3\omega_9 c_s^2-6\omega_7^2\omega_4^2\omega_8\omega_5^3-12\omega_7\omega_8\omega_5^3 v_1^2\omega_9+36\omega_7^2\omega_4\omega_5^3 c_s^2+36\omega_7\omega_4\omega_8\omega_5^3 c_s^2+2\omega_7^2\omega_4^2\omega_8\omega_5^2\omega_9+36\omega_7^2\omega_4^2\omega_8\omega_9 c_s^2+5\omega_7^2\omega_4^2\omega_8\omega_5^3\omega_9 c_s^2$$

$$C_8 = 6\omega_7\omega_4^3\omega_5\omega_9 c_s^2-12\omega_4^2\omega_8\omega_5^2-24\omega_4^2\omega_8\omega_5^2\omega_9 c_s^2-6\omega_7\omega_4^3\omega_8\omega_9-18\omega_7\omega_4^3\omega_8\omega_5 v_1^2\omega_9+36\omega_4\omega_8\omega_5^2 v_1^2\omega_9-12\omega_4^3\omega_8\omega_5\omega_9 c_s^2+18\omega_7\omega_4\omega_8\omega_5^2\omega_9 c_s^2+12\omega_4^3\omega_8\omega_5 c_s^2+18\omega_7\omega_4^3\omega_5 v_1^2\omega_9-72\omega_4^2\omega_8\omega_5^2 v_1^2\omega_9-36\omega_7\omega_4^2\omega_8\omega_5^2 v_1^2-24\omega_7\omega_4^2\omega_8\omega_5\omega_9-4\omega_7\omega_4^2\omega_8\omega_5^2\omega_9 c_s^2-36\omega_4^3\omega_8\omega_5 v_1^2\omega_9-12\omega_4^3\omega_8\omega_5^2\omega_9-6\omega_7\omega_4^3\omega_8\omega_5\omega_9 c_s^2-12\omega_7\omega_4^2\omega_8\omega_5^2 c_s^2+36\omega_4^3\omega_8\omega_5 v_1^2+12\omega_4\omega_8\omega_5^2\omega_9 c_s^2+6\omega_7\omega_4^3\omega_8\omega_5\omega_9+12\omega_7\omega_4^2\omega_8\omega_5^2+18\omega_7\omega_4^3\omega_8\omega_5^2 v_1^2-6\omega_7\omega_4^3\omega_5^2 c_s^2-36\omega_7\omega_4^2\omega_5 v_1^2\omega_9-18\omega_7\omega_4^3\omega_5^2 v_1^2+6\omega_7\omega_4^3\omega_8\omega_5^2 c_s^2-6\omega_7\omega_4^3\omega_5\omega_9+24\omega_4^2\omega_8\omega_5^2\omega_9-12\omega_7\omega_4^2\omega_5\omega_9 c_s^2-12\omega_7\omega_8\omega_5^2\omega_9 c_s^2+6\omega_7\omega_4^3\omega_8\omega_5+18\omega_7\omega_4^3\omega_8 v_1^2\omega_9-12\omega_7\omega_4^2\omega_5^2+6\omega_7\omega_4^3\omega_8\omega_9 c_s^2+12\omega_4^2\omega_8\omega_5^2 c_s^2-18\omega_7\omega_4^3\omega_8\omega_5 v_1^2-6\omega_7\omega_4^3\omega_8\omega_5 c_s^2+12\omega_7\omega_4\omega_8\omega_5\omega_9+36\omega_4^2\omega_8\omega_5^2 v_1^2+12\omega_7\omega_4^2\omega_8\omega_9+12\omega_4^2\omega_8\omega_5\omega_9 c_s^2-12\omega_4\omega_8\omega_5^2\omega_9-12\omega_4^3\omega_8\omega_5^2 c_s^2+72\omega_7\omega_4^2\omega_8\omega_5 v_1^2\omega_9-12\omega_4^3\omega_8\omega_5-12\omega_7\omega_4^2\omega_8\omega_9 c_s^2-12\omega_7\omega_4\omega_8\omega_5\omega_9 c_s^2+12\omega_4^3\omega_8\omega_5\omega_9+12\omega_4^3\omega_8\omega_5^2\omega_9 c_s^2-36\omega_4^3\omega_8\omega_5^2 v_1^2+24\omega_7\omega_4^2\omega_8\omega_5\omega_9 c_s^2-36\omega_7\omega_4^2\omega_8 v_1^2\omega_9+36\omega_7\omega_4^2\omega_5^2 v_1^2+36\omega_4^2\omega_8\omega_5 v_1^2\omega_9+12\omega_7\omega_4^2\omega_5\omega_9-\omega_7\omega_4^3\omega_8\omega_5^2\omega_9 c_s^2-6\omega_7\omega_4^3\omega_8\omega_5^2+12\omega_7\omega_4^2\omega_5^2 c_s^2-36\omega_7\omega_4\omega_8\omega_5 v_1^2\omega_9+6\omega_7\omega_4^3\omega_5^2+36\omega_4^3\omega_8\omega_5^2 v_1^2\omega_9$$

$C_9 = 18\omega_7\omega_4^2\omega_8^2\omega_9c_s^2 + 12\omega_4v_2^2\omega_8^2\omega_5\omega_6 - 12\omega_4\omega_8^2\omega_5\omega_6 - 6\omega_7\omega_4^2\omega_8^2\omega_5\omega_6 + 36\omega_7\omega_4\omega_8\omega_5\omega_6c_s^2 + 6\omega_7\omega_4^2v_2^2\omega_8^2\omega_5\omega_6 - 36\omega_7\omega_4\omega_8^2\omega_5\omega_9\omega_6c_s^2 + 12\omega_4^2\omega_8^2\omega_9 - 12\omega_7\omega_8^2\omega_5\omega_9\omega_6 - 12\omega_7\omega_4v_2^2\omega_8^2\omega_5\omega_6 + 54\omega_7\omega_4\omega_8\omega_5\omega_9\omega_6c_s^2 + 12\omega_4^2v_2^2\omega_8^2\omega_6 - 12\omega_7\omega_4v_2^2\omega_8^2\omega_5\omega_9\omega_6 - 12\omega_4^2v_2^2\omega_8^2\omega_5\omega_6 - 18\omega_7\omega_4^2\omega_8\omega_5\omega_6c_s^2 - 36\omega_7\omega_8^2\omega_5\omega_9c_s^2 - 9\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6c_s^2 - 12\omega_7v_2^2\omega_8\omega_5\omega_9\omega_6 + 54\omega_7\omega_4\omega_8^2\omega_5\omega_9c_s^2 + 36\omega_4^2\omega_8^2\omega_6c_s^2 + 18\omega_7\omega_4^2\omega_5\omega_9\omega_6c_s^2 + 6\omega_7\omega_4^2v_2^2\omega_8^2\omega_9 + \omega_7\omega_4^2v_2^2\omega_8^2\omega_5\omega_9\omega_6 - 12\omega_7\omega_4v_2^2\omega_5\omega_9\omega_6 + 12\omega_7\omega_4\omega_8^2\omega_5\omega_9\omega_6 + 36\omega_4^2\omega_8^2\omega_5\omega_9c_s^2 - 12\omega_7\omega_4\omega_8\omega_5\omega_6 - 6\omega_7\omega_4^2\omega_8^2\omega_9 + 6\omega_7\omega_4^2v_2^2\omega_5\omega_9\omega_6 - \omega_7\omega_4^2\omega_8^2\omega_5\omega_9\omega_6 - 36\omega_4\omega_8^2\omega_5\omega_9c_s^2 - 12\omega_4^2\omega_8^2\omega_5\omega_9 + 3\omega_7\omega_4^2\omega_8^2\omega_5\omega_9\omega_6c_s^2 - 18\omega_7\omega_4\omega_8^2\omega_5\omega_9 - 15\omega_7\omega_4^2\omega_8^2\omega_5\omega_9c_s^2 - 6\omega_7\omega_4^2\omega_5\omega_9\omega_6 - 36\omega_7\omega_4\omega_5\omega_9\omega_6c_s^2 - 36\omega_4^2\omega_8^2\omega_5\omega_6c_s^2 - 36\omega_4^2\omega_8^2\omega_9c_s^2 - 36\omega_7\omega_4\omega_8^2\omega_5\omega_6c_s^2 + 12\omega_7\omega_4\omega_8^2\omega_5\omega_6 + 12\omega_4^2\omega_8^2\omega_5\omega_6 + 18\omega_7\omega_4^2\omega_8^2\omega_5\omega_6c_s^2 + 18\omega_7\omega_4v_2^2\omega_8\omega_5\omega_9\omega_6 + 6\omega_7\omega_4^2\omega_8^2\omega_6 + 36\omega_4\omega_8^2\omega_5\omega_6c_s^2 + 12\omega_7\omega_8\omega_5\omega_9\omega_6 - 12\omega_7v_2^2\omega_8^2\omega_5\omega_9 - 6\omega_7\omega_4^2v_2^2\omega_8^2\omega_6 - 12\omega_4^2v_2^2\omega_8^2\omega_9 + 12\omega_7\omega_8^2\omega_5\omega_9 + 6\omega_7\omega_4^2\omega_8\omega_5\omega_6 + 18\omega_7\omega_4v_2^2\omega_8^2\omega_5\omega_9 - 3\omega_7\omega_4^2v_2^2\omega_8\omega_5\omega_9\omega_6 - 18\omega_7\omega_4\omega_8\omega_5\omega_9\omega_6 - 36\omega_7\omega_8\omega_5\omega_9\omega_6c_s^2 - 6\omega_7\omega_4^2v_2^2\omega_8\omega_5\omega_6 + 12\omega_4^2v_2^2\omega_8^2\omega_5\omega_9 - 18\omega_7\omega_4^2\omega_8^2\omega_6c_s^2 + 12\omega_7v_2^2\omega_8^2\omega_5\omega_9\omega_6 + 5\omega_7\omega_4^2\omega_8^2\omega_5\omega_9 + 12\omega_7\omega_4\omega_5\omega_9\omega_6 + 12\omega_4\omega_8^2\omega_5\omega_9 - 12\omega_4v_2^2\omega_8^2\omega_5\omega_9 + 12\omega_7\omega_4v_2^2\omega_8\omega_5\omega_6 - 12\omega_4^2\omega_8^2\omega_6 - 5\omega_7\omega_4^2v_2^2\omega_8^2\omega_5\omega_9 + 36\omega_7\omega_8^2\omega_5\omega_9\omega_6c_s^2 + 3\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6$

$C_{10} = -12\omega_7\omega_4^2\omega_5\omega_6 + 18\omega_7\omega_4^3v_2^2\omega_8\omega_5\omega_6 - 36\omega_7\omega_4v_2^2\omega_8\omega_5\omega_9 + 36\omega_7\omega_4^2v_2^2\omega_5\omega_6 - 6\omega_7\omega_4^3\omega_8\omega_9 - 36\omega_4^2v_2^2\omega_8\omega_5\omega_9 - 6\omega_7\omega_4^3\omega_5\omega_9\omega_6 + 12\omega_4^3\omega_8\omega_5\omega_9c_s^2 + 12\omega_4^2\omega_8\omega_5\omega_6c_s^2 - 36\omega_4^3v_2^2\omega_8\omega_5\omega_6 + 18\omega_7\omega_4\omega_8\omega_5\omega_9\omega_6c_s^2 - 18\omega_7\omega_4^2\omega_8\omega_5\omega_9 - 12\omega_4^3\omega_8\omega_9c_s^2 - 18\omega_7\omega_4^3v_2^2\omega_8\omega_6 + 54\omega_7\omega_4^2v_2^2\omega_8\omega_5\omega_9 - 5\omega_7\omega_4^3\omega_8\omega_5\omega_9c_s^2 - 12\omega_7\omega_4^2\omega_8\omega_5\omega_6c_s^2 + 12\omega_4^3\omega_8\omega_5\omega_6 + 5\omega_7\omega_4^3\omega_8\omega_5\omega_9 - 5\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6c_s^2 + 12\omega_4^3\omega_8\omega_9 - 36\omega_4^3v_2^2\omega_8\omega_9 - 18\omega_7\omega_4^2\omega_5\omega_9\omega_6c_s^2 - 12\omega_4^2\omega_8\omega_5\omega_6 + 36\omega_7\omega_4v_2^2\omega_5\omega_9\omega_6 - 18\omega_7\omega_4^3v_2^2\omega_5\omega_6 - 54\omega_7\omega_4^2v_2^2\omega_5\omega_9\omega_6 + 18\omega_7\omega_4^2\omega_5\omega_9\omega_6 - 6\omega_7\omega_4^3\omega_8\omega_6c_s^2 + 12\omega_7\omega_4\omega_5\omega_9\omega_6c_s^2 + 6\omega_7\omega_4^3\omega_5\omega_9\omega_6c_s^2 + 6\omega_7\omega_4^3\omega_8\omega_9c_s^2 + 36\omega_4^3v_2^2\omega_8\omega_6 - 12\omega_4^3\omega_8\omega_6 - 6\omega_7\omega_4^3\omega_8\omega_5\omega_6 + 12\omega_7\omega_4\omega_8\omega_5\omega_9 + 6\omega_7\omega_4^3\omega_5\omega_6 + 12\omega_7\omega_4^2\omega_5\omega_6c_s^2 + 18\omega_7\omega_4^3v_2^2\omega_5\omega_9\omega_6 + 12\omega_4^2\omega_8\omega_5\omega_9 - 12\omega_4^2\omega_8\omega_5\omega_9c_s^2 + 12\omega_7\omega_4^2\omega_8\omega_5\omega_6 - 12\omega_4^2\omega_8\omega_5\omega_6c_s^2 - 3\omega_7\omega_4^2v_2^2\omega_8\omega_5\omega_9\omega_6 + 36\omega_4^3v_2^2\omega_8\omega_5\omega_9 - 12\omega_7\omega_8\omega_5\omega_9\omega_6c_s^2 - 12\omega_7\omega_4\omega_8\omega_5\omega_9c_s^2 - 12\omega_4^3\omega_8\omega_5\omega_9 - 6\omega_7\omega_4^3\omega_5\omega_6c_s^2 - 36\omega_7\omega_4^2v_2^2\omega_8\omega_5\omega_9 + 18\omega_7\omega_4^3\omega_8\omega_5\omega_6 + 12\omega_7\omega_4\omega_5\omega_9\omega_6 + 6\omega_7\omega_4^3\omega_8\omega_6 + 6\omega_7\omega_4^3\omega_8\omega_5\omega_6c_s^2 - 15\omega_7\omega_4^3v_2^2\omega_8\omega_5\omega_9 + 12\omega_4^3\omega_8\omega_6c_s^2 - \omega_7\omega_4^3\omega_8\omega_5\omega_9\omega_6c_s^2 + 36\omega_4^2v_2^2\omega_8\omega_5\omega_6 + \omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6$

$C_{11} = 30\omega_4^3v_2^2\omega_8 + 24\omega_4^2\omega_8^2c_s^2 + 72\omega_4^2v_2^4\omega_8 + 24\omega_4\omega_8^2c_s^4 + 36\omega_4^3v_2^4 + 12\omega_4\omega_8^2c_s^2 - 12\omega_4^2v_2^2\omega_8^2c_s^2 + 24\omega_4^2\omega_8^2c_s^4 + 24\omega_8^2c_s^4 + 72\omega_4v_2^2\omega_8c_s^2 + 108\omega_4^3v_2^2c_s^2 + \omega_4^3\omega_8^2c_s^2 + 6\omega_4^3v_2^2\omega_8^2c_s^2 + 6\omega_4^3\omega_8c_s^4 - 12\omega_4^2v_2^4\omega_8^2 - 3\omega_4^3v_2^2\omega_8^2 - 72\omega_4^2v_2^4 - 3\omega_4^3\omega_8^2c_s^4 - 30\omega_4^3v_2^4\omega_8 - 36\omega_4v_2^2\omega_8^2c_s^2 + 72\omega_4^2v_2^2 - 6\omega_4^3\omega_8c_s^2 - 72\omega_4^2v_2^2\omega_8 - 72\omega_4^3v_2^2\omega_8c_s^2 + 12\omega_4^2v_2^2\omega_8^2 - 24\omega_4\omega_8c_s^2 + 3\omega_4^3v_2^4\omega_8^2 - 24\omega_4^2\omega_8c_s^4 + 144\omega_4^2v_2^2\omega_8c_s^2 - 216\omega_4^2v_2^2c_s^2 - 8\omega_4^2\omega_8^2c_s^2 - 36\omega_4^3v_2^2 - 48\omega_4\omega_8^2c_s^4$

2.5.4 Conservation of momentum: ρv_2

attached text file: `output_d2q9_nse_clbm2_symbolic_pde_02.txt`

$$v_2\frac{\partial\rho}{\partial t} + \rho\frac{\partial v_2}{\partial t} + \frac{v_2v_1\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_1} + \frac{\rho v_2\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{\rho v_1\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_1} + (c_s^2+v_2^2)\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_2} + \frac{2\rho v_2\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-2+\omega_4)\frac{\delta_l^2c_s^2}{2\omega_4\delta_t}\frac{\partial\rho}{\partial x_1}\frac{\partial v_2}{\partial x_1} + (-2+\omega_4)\frac{\delta_l^2c_s^2}{2\omega_4\delta_t}\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_2} + (-2-3v_2^2\omega_6+4c_s^2+6v_2^2+\omega_6-2\omega_6c_s^2)\frac{\delta_l^2}{\omega_6\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_2}{\partial x_2} + (2-\omega_6)\frac{3\rho v_2\delta_l^2}{\omega_6\delta_t}\left(\frac{\partial v_2}{\partial x_2}\right)^2 + (-2+\omega_4)\frac{\rho\delta_l^2c_s^2}{2\omega_4\delta_t}\frac{\partial^2v_2}{\partial x_1^2} + (-2+\omega_4)\frac{\rho\delta_l^2c_s^2}{2\omega_4\delta_t}\frac{\partial^2v_1}{\partial x_1\partial x_2} + (-2-v_2^2\omega_6+6c_s^2+2v_2^2+\omega_6-3\omega_6c_s^2)\frac{v_2\delta_l^2}{2\omega_6\delta_t}\frac{\partial^2\rho}{\partial x_2^2} + (-2-3v_2^2\omega_6+2c_s^2+6v_2^2+\omega_6-\omega_6c_s^2)\frac{\rho\delta_l^2}{2\omega_6\delta_t}\frac{\partial^2v_2}{\partial x_2^2} + (-1+3c_s^2+v_1^2)\frac{v_2v_1\delta_l^3}{12\delta_t}\frac{\partial^3\rho}{\partial x_1^3} + (-1+c_s^2+3v_1^2)\frac{\rho v_2\delta_l^3}{12\delta_t}\frac{\partial^3v_1}{\partial x_1^3} + C_1\frac{\rho v_1\delta_l^3}{6\omega_7\omega_4\delta_t}\frac{\partial^3v_2}{\partial x_1^3} + (-12-\omega_4^2+12\omega_4)\frac{\delta_l^3c_s^4}{6\omega_4^2\delta_t}\frac{\partial^3\rho}{\partial x_1^2\partial x_2} - \frac{\rho v_2\delta_l^3c_s^2}{6\delta_t}\frac{\partial^3v_2}{\partial x_1^2\partial x_2} + C_2\frac{\rho v_2\delta_l^3}{12\omega_4\omega_8\omega_6^2\delta_t}\frac{\partial^3v_1}{\partial x_1\partial x_2^2} + C_3\frac{\delta_l^3}{12\omega_6^2\delta_t}\frac{\partial^3\rho}{\partial x_2^3} + (-24+5\omega_6^2c_s^2-60v_2^2\omega_6+36c_s^2+60v_2^2+24\omega_6-4\omega_6^2-36\omega_6c_s^2+11v_2^2\omega_6^2)\frac{\rho v_2\delta_l^3}{6\omega_6^2\delta_t}\frac{\partial^3v_2}{\partial x_2^3} + (\omega_5c_s^2+3\omega_5v_1^2+6v_1^4+2c_s^4-2c_s^2-6v_1^2-12\omega_5v_1^2c_s^2+24v_1^2c_s^2-3\omega_5v_1^4-\omega_5c_s^4)\frac{v_2\delta_l^4}{24\omega_5\delta_t}\frac{\partial^4\rho}{\partial x_1^4} + (-4-3\omega_5c_s^2-5\omega_5v_1^2+2\omega_5+6c_s^2+10v_1^2)\frac{\rho v_2v_1\delta_l^4}{12\omega_5\delta_t}\frac{\partial^4v_1}{\partial x_1^4} + C_4\frac{\rho\delta_l^4}{24\omega_7^2\omega_4^3\delta_t}\frac{\partial^4v_2}{\partial x_1^4} + C_5\frac{v_1\delta_l^4c_s^2}{12\omega_7^2\omega_4^2\omega_8\omega_5\omega_9\omega_6\delta_t}\frac{\partial^4\rho}{\partial x_1^3\partial x_2} + C_6\frac{\rho\delta_l^4c_s^2}{12\omega_7\omega_4^3\omega_8\omega_5\omega_9\omega_6\delta_t}\frac{\partial^4v_1}{\partial x_1^3\partial x_2} + (3\omega_7\omega_5c_s^2+\omega_7\omega_5v_1^2-\omega_7-9\omega_5c_s^2-3\omega_5v_1^2+3\omega_5+3\omega_7c_s^2+\omega_7v_1^2-\omega_7\omega_5)\frac{\rho v_2v_1\delta_l^4}{12\omega_7\omega_5\delta_t}\frac{\partial^4v_2}{\partial x_1^3\partial x_2} + C_7\frac{v_2\delta_l^4c_s^2}{12\omega_7\omega_4^2\omega_8^2\omega_9\omega_6^3\delta_t}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2} + C_8\frac{\rho\delta_l^4c_s^2}{12\omega_7\omega_4^3\omega_8\omega_9\omega_6^2\delta_t}\frac{\partial^4v_2}{\partial x_1^2\partial x_2^2} + C_9\frac{\rho\delta_l^4}{12\omega_4^3\omega_8^2\omega_6^3\delta_t}\frac{\partial^4v_1}{\partial x_1\partial x_2^3} + C_{10}\frac{v_2\delta_l^4}{12\omega_6^3\delta_t}\frac{\partial^4\rho}{\partial x_2^4} + C_{11}\frac{\rho\delta_l^4}{12\omega_6^3\delta_t}\frac{\partial^4v_2}{\partial x_2^4} = 0,$$

where:

$C_1 = 6 - 3\omega_7 - 3\omega_4 - 3\omega_7\omega_4c_s^2 - \omega_7\omega_4v_1^2 + 9\omega_4c_s^2 + 3\omega_4v_1^2 + \omega_7\omega_4 - 18c_s^2 - 6v_1^2 + 9\omega_7c_s^2 + 3\omega_7v_1^2$

$C_2 = -36\omega_6^2c_s^2 - 12\omega_4\omega_6^2 - 6\omega_8\omega_6^2 - 18\omega_4\omega_8\omega_6c_s^2 - 3\omega_4v_2^2\omega_8\omega_6^2 - 12\omega_4v_2^2\omega_6 - 12\omega_4\omega_8 + 6v_2^2\omega_8\omega_6^2 + 12\omega_4v_2^2\omega_6^2 - 6\omega_4v_2^2\omega_8\omega_6 - 36\omega_4\omega_6c_s^2 + 12\omega_4\omega_6 + 12\omega_4v_2^2\omega_8 + 18\omega_8\omega_6^2c_s^2 + 3\omega_4\omega_8\omega_6^2 + 36\omega_4\omega_6^2c_s^2 + 36\omega_4\omega_8c_s^2 + 6\omega_4\omega_8\omega_6 + 12\omega_6^2 - 12v_2^2\omega_6^2 - 11\omega_4\omega_8\omega_6^2c_s^2$

$C_3 = -\omega_6^2c_s^2 - 36v_2^4\omega_6 - 12\omega_6c_s^4 + 24v_2^2\omega_6^2c_s^2 + 7v_2^4\omega_6^2 + 12c_s^4 + 36v_2^4 + 36v_2^2\omega_6 - 12c_s^2 + 144v_2^2c_s^2 - 36v_2^2 - 144v_2^2\omega_6c_s^2 + \omega_6^2c_s^4 + 12\omega_6c_s^2 - 7v_2^2\omega_6^2$

$C_4 = 36\omega_4^3v_1^4 + 72\omega_7\omega_4v_1^2c_s^2 + 6\omega_7\omega_4^3c_s^4 - 3\omega_7^2\omega_4^3v_1^2 + 108\omega_4^3v_1^2c_s^2 - 30\omega_7\omega_4^3v_1^4 + \omega_7^2\omega_4^3c_s^2 - 72\omega_4^2v_1^4 - 24\omega_7\omega_4c_s^2 - 12\omega_7^2\omega_4^2v_1^2c_s^2 - 48\omega_7^2\omega_4c_s^4 - 72\omega_7\omega_4^3v_1^2c_s^2 + 72\omega_7\omega_4^2v_1^4 - 8\omega_7^2\omega_4^2c_s^2 - 24\omega_7\omega_4^2c_s^4 + 12\omega_7^2\omega_4^2v_1^2 + 12\omega_7^2\omega_4c_s^2 - 36\omega_7^2\omega_4v_1^2c_s^2 + 72\omega_4^2v_1^2 + 24\omega_7^2c_s^4 + 24\omega_7\omega_4c_s^4 - 216\omega_4^2v_1^2c_s^2 + 24\omega_7\omega_4^2c_s^2 - 12\omega_7^2\omega_4^2v_1^4 - 72\omega_7\omega_4^2v_1^2 + 24\omega_7^2\omega_4^2c_s^4 - 36\omega_4^3v_1^2 + 144\omega_7\omega_4^2v_1^2c_s^2 + 30\omega_7\omega_4^3v_1^2 - 3\omega_7^2\omega_4^3c_s^2 - 6\omega_7\omega_4^3c_s^2 + 3\omega_7^2\omega_4^3v_1^2 + 6\omega_7^2\omega_4^3v_1^2c_s^2$

$C_5 = 18\omega_4^2\omega_8\omega_5\omega_9\omega_6c_s^2 + 12\omega_7^2\omega_4\omega_5v_1^2\omega_6 - 5\omega_7^2\omega_4^2\omega_8v_1^2\omega_9\omega_6 + 36\omega_7\omega_4\omega_8\omega_5\omega_6c_s^2 + 36\omega_7^2\omega_4\omega_5\omega_6c_s^2 + 12\omega_7\omega_4\omega_8\omega_5v_1^2\omega_6 - 12\omega_4\omega_8\omega_5v_1^2\omega_9\omega_6 - 12\omega_7^2\omega_8v_1^2\omega_9\omega_6 - 12\omega_7^2\omega_4^2\omega_5 - 6\omega_7^2\omega_4^2\omega_8\omega_9 - 6\omega_7\omega_4^2\omega_8\omega_5v_1^2\omega_6 + 54\omega_7\omega_4\omega_8\omega_5\omega_9\omega_6c_s^2 - 3\omega_7\omega_4^2\omega_8\omega_5v_1^2\omega_9\omega_6 - 36\omega_7^2\omega_4\omega_9\omega_6c_s^2 + 18\omega_7^2\omega_4\omega_8v_1^2\omega_9\omega_6 - 18\omega_7\omega_4^2\omega_8\omega_5\omega_6c_s^2 - 9\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6c_s^2 + 6\omega_7^2\omega_4^2\omega_8\omega_5v_1^2\omega_6 - 12\omega_7^2\omega_4v_1^2\omega_9\omega_6 + 12\omega_7^2\omega_4\omega_9\omega_6 + 54\omega_7^2\omega_4\omega_8\omega_9\omega_6c_s^2 + 18\omega_7\omega_4\omega_8\omega_5v_1^2\omega_9\omega_6 - 12\omega_7^2\omega_4\omega_5\omega_6 + 18\omega_7^2\omega_4^2\omega_8\omega_5\omega_6c_s^2 - 12\omega_7\omega_4\omega_8\omega_5\omega_6 - 36\omega_4\omega_8\omega_5\omega_9\omega_6c_s^2 + 12\omega_7^2\omega_4\omega_8\omega_5\omega_6 + 12\omega_7^2\omega_8\omega_9\omega_6 - 36\omega_7^2\omega_4\omega_8\omega_5\omega_6c_s^2 - 36\omega_7^2\omega_8\omega_9\omega_6c_s^2 - 12\omega_7^2\omega_4\omega_8\omega_5v_1^2\omega_6 + 6\omega_4^2\omega_8\omega_5v_1^2\omega_9\omega_6 - 18\omega_7^2\omega_4\omega_8\omega_9\omega_6 - 15\omega_7^2\omega_4^2\omega_8\omega_9\omega_6c_s^2 + 36\omega_7^2\omega_4^2\omega_5c_s^2 - 36\omega_7^2\omega_4^2\omega_5\omega_6c_s^2 + 3\omega_7^2\omega_4^2\omega_8\omega_5\omega_9\omega_6c_s^2 - 12\omega_7^2\omega_8\omega_5\omega_9\omega_6 - 12\omega_7^2\omega_4^2\omega_9\omega_6 - 12\omega_7^2\omega_4^2\omega_5v_1^2\omega_6 - 36\omega_7^2\omega_4^2\omega_9c_s^2 + 12\omega_7^2\omega_4^2\omega_9 - \omega_7^2\omega_4^2\omega_8\omega_5\omega_9\omega_6 + 12\omega_7^2\omega_4^2\omega_5\omega_6 + 12\omega_7^2\omega_4^2\omega_5v_1^2 - 12\omega_7^2\omega_4\omega_8\omega_5v_1^2\omega_9\omega_6 + 36\omega_7^2\omega_8\omega_5\omega_9\omega_6c_s^2 + 12\omega_7^2\omega_4\omega_8\omega_5\omega_9\omega_6 + 6\omega_7^2\omega_4^2\omega_8\omega_5 + 36\omega_7^2\omega_4^2\omega_9\omega_6c_s^2 - 12\omega_7\omega_8\omega_5v_1^2\omega_9\omega_6 + 12\omega_7\omega_8\omega_5\omega_9\omega_6 - 12\omega_7^2\omega_4^2v_1^2\omega_9 + 6\omega_7\omega_4^2\omega_8\omega_5\omega_6 - 18\omega_7\omega_4\omega_8\omega_5\omega_9\omega_6 - 36\omega_7\omega_8\omega_5\omega_9\omega_6c_s^2 + 6\omega_7^2\omega_4^2\omega_8v_1^2\omega_9 + 12\omega_7^2\omega_4^2v_1^2\omega_9\omega_6 + 12\omega_7^2\omega_8\omega_5v_1^2\omega_9\omega_6 - 6\omega_4^2\omega_8\omega_5\omega_9\omega_6 + 5\omega_7^2\omega_4^2\omega_8\omega_9\omega_6 - 36\omega_7^2\omega_4\omega_8\omega_5\omega_9\omega_6c_s^2 + 12\omega_4\omega_8\omega_5\omega_9\omega_6 - 18\omega_7^2\omega_4^2\omega_8\omega_5c_s^2 - 6\omega_7^2\omega_4^2\omega_8\omega_5\omega_6 - 6\omega_7^2\omega_4^2\omega_8\omega_5v_1^2 + 3\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6 + 18\omega_7^2\omega_4^2\omega_8\omega_9c_s^2 + \omega_7^2\omega_4^2\omega_8\omega_5v_1^2\omega_9\omega_6$

$C_6 = 12\omega_7\omega_4^3\omega_9 - 12\omega_7\omega_4^2\omega_5\omega_6 - 18\omega_4^2\omega_8\omega_5\omega_9\omega_6c_s^2 + 36\omega_4^2\omega_8\omega_5v_1^2\omega_6 - 6\omega_4^3\omega_8\omega_5\omega_9\omega_6 - 6\omega_7\omega_4^3\omega_8\omega_9 + 12\omega_7\omega_4^2\omega_9\omega_6 + 36\omega_4\omega_8\omega_5v_1^2\omega_9\omega_6 + 18\omega_7\omega_4^2\omega_8\omega_9\omega_6c_s^2 + 12\omega_4^2\omega_8\omega_5\omega_6c_s^2 - 36\omega_7\omega_4^2\omega_8\omega_5v_1^2\omega_6 + 18\omega_7\omega_4\omega_8\omega_5\omega_9\omega_6c_s^2 - 12\omega_7\omega_4\omega_8\omega_9\omega_6c_s^2 - 3\omega_7\omega_4^2\omega_8\omega_5v_1^2\omega_9\omega_6 - 12\omega_7\omega_4^2\omega_8\omega_5\omega_6c_s^2 + 6\omega_4^3\omega_8\omega_5\omega_6 - 5\omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6c_s^2 + 12\omega_7\omega_4\omega_8\omega_9\omega_6 - 12\omega_4^2\omega_8\omega_5\omega_6 - 36\omega_7\omega_4\omega_8v_1^2\omega_9\omega_6 + 12\omega_4\omega_8\omega_5\omega_9\omega_6c_s^2 + 54\omega_7\omega_4^2\omega_8v_1^2\omega_9\omega_6 - 54\omega_4^2\omega_8\omega_5v_1^2\omega_9\omega_6 + 6\omega_7\omega_4^3\omega_8\omega_5 + 36\omega_7\omega_4^3v_1^2\omega_9\omega_6 - 12\omega_7\omega_4^3\omega_5 + 18\omega_7\omega_4^3\omega_8v_1^2\omega_9 - 36\omega_7\omega_4^3v_1^2\omega_9 - 12\omega_7\omega_4^2\omega_9\omega_6c_s^2 + 36\omega_7\omega_4^2\omega_5v_1^2\omega_6 + 6\omega_7\omega_4^3\omega_8\omega_9c_s^2 - 12\omega_7\omega_4^3\omega_9\omega_6 + 12\omega_7\omega_4^3\omega_5c_s^2 - 18\omega_7\omega_4^3\omega_8\omega_5v_1^2 - 6\omega_7\omega_4^3\omega_8\omega_5\omega_6 - 6\omega_7\omega_4^3\omega_8\omega_5c_s^2 + 6\omega_4^3\omega_8\omega_5\omega_9\omega_6c_s^2 - 15\omega_7\omega_4^3\omega_8v_1^2\omega_9\omega_6 + 36\omega_7\omega_4^3\omega_5v_1^2 + 12\omega_7\omega_4^3\omega_5\omega_6 + 12\omega_7\omega_4^2\omega_5\omega_6c_s^2 - 12\omega_7\omega_4^3\omega_9c_s^2 + 5\omega_7\omega_4^3\omega_8\omega_9\omega_6 + 12\omega_7\omega_4^2\omega_8\omega_5\omega_6 - 5\omega_7\omega_4^3\omega_8\omega_9\omega_6c_s^2 - 6\omega_4^3\omega_8\omega_5\omega_6c_s^2 + 18\omega_4^3\omega_8\omega_5v_1^2\omega_9\omega_6 - 36\omega_7\omega_4^3\omega_5v_1^2\omega_6 - 12\omega_7\omega_8\omega_5\omega_9\omega_6c_s^2 - 18\omega_7\omega_4^2\omega_8\omega_9\omega_6 - 12\omega_7\omega_4^3\omega_5\omega_6c_s^2 - 18\omega_4^3\omega_8\omega_5v_1^2\omega_6 + 18\omega_4^2\omega_8\omega_5\omega_9\omega_6 + 6\omega_7\omega_4^3\omega_8\omega_5\omega_6c_s^2 - 36\omega_7\omega_4^2v_1^2\omega_9\omega_6 - 12\omega_4\omega_8\omega_5\omega_9\omega_6 + 12\omega_7\omega_4^3\omega_9\omega_6c_s^2 - \omega_7\omega_4^3\omega_8\omega_5\omega_9\omega_6c_s^2 + 18\omega_7\omega_4^3\omega_8\omega_5v_1^2\omega_6 + \omega_7\omega_4^2\omega_8\omega_5\omega_9\omega_6$

$C_7 = 36\omega_7\omega_4^2\omega_8^2\omega_9c_s^2 - 12\omega_7\omega_4^2v_2^2\omega_8^2\omega_9\omega_6 - 12\omega_7\omega_4^2v_2^2\omega_8\omega_6^3 + 12\omega_7\omega_4^2\omega_8\omega_6^3 - 40\omega_7\omega_4\omega_8^2\omega_9\omega_6^3c_s^2 - 18\omega_7\omega_4\omega_8\omega_9\omega_6^3 - 36\omega_7\omega_4^2\omega_8\omega_9\omega_6c_s^2 + 12\omega_7\omega_4^2\omega_8^2\omega_9\omega_6 + 12\omega_7v_2^2\omega_8^2\omega_9\omega_6^3 + 12\omega_7\omega_4\omega_8^2\omega_6^3 - 36\omega_7\omega_8^2\omega_9\omega_6^2c_s^2 + 36\omega_7\omega_4^2\omega_9\omega_6^3c_s^2 - 12\omega_7\omega_4^2\omega_8\omega_6^2 + 12\omega_7\omega_4^2v_2^2\omega_8\omega_6^2 - 12\omega_7v_2^2\omega_8^2\omega_9\omega_6^2 + 36\omega_7\omega_4\omega_8\omega_6^3c_s^2 - 18\omega_7\omega_4^2\omega_8^2\omega_6^2c_s^2 + 5\omega_7\omega_4^2\omega_8^2\omega_9\omega_6^3c_s^2 + 12\omega_7\omega_4^2v_2^2\omega_9\omega_6^3 - \omega_7\omega_4^2\omega_8^2\omega_9\omega_6^3 + 18\omega_4^2\omega_8^2\omega_9\omega_6^2c_s^2 + 18\omega_7\omega_4v_2^2\omega_8^2\omega_9\omega_6^2 + 12\omega_7\omega_8^2\omega_9\omega_6^2 - 12\omega_7\omega_4^2\omega_9\omega_6^3 + 12\omega_7\omega_4^2v_2^2\omega_8^2\omega_9 + 54\omega_7\omega_4\omega_8^2\omega_9\omega_6^2c_s^2 + 6\omega_4^2v_2^2\omega_8^2\omega_9\omega_6^2 + \omega_7\omega_4^2v_2^2\omega_8^2\omega_9\omega_6^3 - 12\omega_7\omega_4^2\omega_8^2\omega_9 + 18\omega_7\omega_4^2\omega_8^2\omega_6^2c_s^2 + 12\omega_7\omega_4^2\omega_9\omega_6^2 - 12\omega_7\omega_8^2\omega_9\omega_6^3 - 12\omega_4v_2^2\omega_8^2\omega_9\omega_6^2 - 6\omega_7\omega_4^2\omega_8^2\omega_9\omega_6^2c_s^2 + 12\omega_4\omega_8^2\omega_9\omega_6^2 + 36\omega_4\omega_8^2\omega_6^3c_s^2 - 12\omega_4\omega_8^2\omega_6^3 - 12\omega_7\omega_4v_2^2\omega_8^2\omega_9\omega_6^3 - 12\omega_7\omega_4^2v_2^2\omega_9\omega_6^2 + 2\omega_7\omega_4^2\omega_8^2\omega_9\omega_6^2 - 6\omega_4^2v_2^2\omega_8^2\omega_6^3 - 2\omega_7\omega_4^2v_2^2\omega_8^2\omega_9\omega_6^2 - 36\omega_4\omega_8^2\omega_9\omega_6^2c_s^2 - 12\omega_7\omega_4v_2^2\omega_8^2\omega_6^3 - 36\omega_7\omega_4^2\omega_9\omega_6^2c_s^2 + 36\omega_7\omega_8^2\omega_9\omega_6^3c_s^2 - 36\omega_7\omega_4^2\omega_8^2\omega_9\omega_6c_s^2 + 12\omega_7\omega_4\omega_9\omega_6^3 + 6\omega_7\omega_4^2\omega_8\omega_9\omega_6^3 - 6\omega_7\omega_4^2v_2^2\omega_8\omega_9\omega_6^3 + 54\omega_7\omega_4\omega_8\omega_9\omega_6^3c_s^2 + 12\omega_7\omega_4v_2^2\omega_8\omega_6^3 - 18\omega_7\omega_4^2\omega_8\omega_9\omega_6^2 + 6\omega_4^2\omega_8^2\omega_6^3 - 18\omega_7\omega_4^2\omega_8\omega_9\omega_6^3c_s^2 + 18\omega_7\omega_4v_2^2\omega_8^2\omega_9\omega_6^2 + 12\omega_7\omega_8^2\omega_9\omega_6^2 - 12\omega_7\omega_4^2v_2^2\omega_8\omega_9\omega_6^2 - 36\omega_7\omega_4^2\omega_8\omega_6^3c_s^2 + 12\omega_7\omega_8\omega_9\omega_6^3 - 12\omega_7\omega_4^2v_2^2\omega_8\omega_9\omega_6 - 6\omega_7\omega_4^2v_2^2\omega_8^2\omega_6^2 + 12\omega_7\omega_4^2\omega_8\omega_9\omega_6 - 12\omega_7v_2^2\omega_8\omega_9\omega_6^3 - 12\omega_7\omega_4v_2^2\omega_9\omega_6^3 + 12\omega_7\omega_4\omega_8^2\omega_9\omega_6^3 + 6\omega_7\omega_4^2v_2^2\omega_8^2\omega_6^3 - 36\omega_7\omega_8\omega_9\omega_6^3c_s^2 + 12\omega_4v_2^2\omega_8^2\omega_6^3 - 6\omega_7\omega_4^2\omega_8^2\omega_6^3 - 18\omega_4^2\omega_8^2\omega_6^3c_s^2 - 18\omega_7\omega_4\omega_8^2\omega_9\omega_6^2 + 36\omega_7\omega_4^2\omega_8\omega_6^2c_s^2 - 36\omega_7\omega_4\omega_8^2\omega_6^3c_s^2 + 54\omega_7\omega_4^2\omega_8\omega_9\omega_6^2c_s^2 - 6\omega_4^2\omega_8^2\omega_9\omega_6^2$

$C_8 = 36\omega_7\omega_4^3v_2^2\omega_9\omega_6^2 + 36\omega_7\omega_4^3v_2^2\omega_6 - 6\omega_4^3\omega_8\omega_6^2c_s^2 - 6\omega_7\omega_4^3\omega_8\omega_9 - 18\omega_7\omega_4^3v_2^2\omega_8\omega_9\omega_6 - 12\omega_7\omega_4^2\omega_9\omega_6 + 12\omega_7\omega_4^3\omega_9\omega_6^2c_s^2 + 24\omega_7\omega_4^2\omega_8\omega_9\omega_6c_s^2 + 36\omega_7\omega_4^2v_2^2\omega_9\omega_6 - \omega_7\omega_4^3\omega_8\omega_9\omega_6^2c_s^2 + 12\omega_7\omega_4^2\omega_8\omega_6^2 - 36\omega_7\omega_4^2v_2^2\omega_8\omega_6^2 - 12\omega_7\omega_4\omega_8\omega_9\omega_6c_s^2 - 6\omega_4^3\omega_8\omega_9\omega_6 + 18\omega_4^3v_2^2\omega_8\omega_9\omega_6 + 12\omega_7\omega_4^2\omega_6^2c_s^2 - 18\omega_7\omega_4^3v_2^2\omega_8\omega_6 - 12\omega_4^2\omega_8\omega_9\omega_6c_s^2 + 12\omega_4^2\omega_8\omega_9\omega_6 + 18\omega_7\omega_4^3v_2^2\omega_8\omega_6^2 + 12\omega_7\omega_4\omega_8\omega_9\omega_6^2 + 24\omega_7\omega_4^2\omega_9\omega_6^2 + 12\omega_7\omega_4^3\omega_6c_s^2 + 12\omega_4^2\omega_8\omega_6^2c_s^2 - 72\omega_7\omega_4^2v_2^2\omega_9\omega_6^2 - 12\omega_4^2\omega_8\omega_6^2 - 36\omega_7\omega_4^3v_2^2\omega_9\omega_6 - 36\omega_7\omega_4^3v_2^2\omega_6^2 - 24\omega_7\omega_4^2\omega_9\omega_6^2c_s^2 - 6\omega_7\omega_4^3\omega_8\omega_6c_s^2 - 12\omega_7\omega_4^3\omega_6^2c_s^2 - 6\omega_7\omega_4^3\omega_8\omega_6^2 + 6\omega_7\omega_4^3\omega_8\omega_6^2c_s^2 + 12\omega_7\omega_4^3\omega_6^2 + 12\omega_7\omega_4^2\omega_9\omega_6c_s^2 + 6\omega_7\omega_4^3\omega_8\omega_9c_s^2 + 12\omega_7\omega_4^3\omega_9\omega_6 - 12\omega_7\omega_4\omega_9\omega_6^2 - 36\omega_7\omega_4^2v_2^2\omega_8\omega_9 - 12\omega_7\omega_8\omega_9\omega_6^2c_s^2 + 12\omega_7\omega_4^2\omega_8\omega_9 + 36\omega_4^2v_2^2\omega_8\omega_6^2 + 6\omega_7\omega_4^3\omega_8\omega_9\omega_6 + 36\omega_7\omega_4^2v_2^2\omega_6^2 - 6\omega_7\omega_4^3\omega_8\omega_9\omega_6c_s^2 - 12\omega_7\omega_4^2\omega_6^2 + 72\omega_7\omega_4^2v_2^2\omega_8\omega_9\omega_6 + 18\omega_7\omega_4\omega_8\omega_9\omega_6^2c_s^2 - 12\omega_7\omega_4^2\omega_8\omega_9c_s^2 - 24\omega_7\omega_4^2\omega_8\omega_9\omega_6 - 18\omega_4^3v_2^2\omega_8\omega_6^2 - 12\omega_7\omega_4^3\omega_9\omega_6^2 + 6\omega_4^3\omega_8\omega_6^2 + 18\omega_7\omega_4^3v_2^2\omega_8\omega_9 + 6\omega_4^3\omega_8\omega_9\omega_6c_s^2 + 12\omega_7\omega_4\omega_9\omega_6^2c_s^2 + 6\omega_7\omega_4^3\omega_8\omega_6 - 36\omega_4^2v_2^2\omega_8\omega_9\omega_6 - 12\omega_7\omega_4^3\omega_6 - 12\omega_7\omega_4^3\omega_9\omega_6c_s^2 + 36\omega_7\omega_4v_2^2\omega_9\omega_6^2 - 12\omega_7\omega_4^2\omega_8\omega_6^2c_s^2 - 36\omega_7\omega_4v_2^2\omega_8\omega_9\omega_6 - 4\omega_7\omega_4^2\omega_8\omega_9\omega_6^2c_s^2$

$C_9 =$
$18\omega_4^2v_2^2\omega_8^2\omega_6^2c_s^2 - 90\omega_4^3v_2^4\omega_8^2\omega_6 - 36\omega_4^2v_2^4\omega_6^3 + 6\omega_4^3\omega_8\omega_6^2c_s^2 - 36\omega_4^3v_2^2\omega_6^3 + 198\omega_4^3v_2^2\omega_8\omega_6^2c_s^2 + \omega_4^3\omega_8^2\omega_6^2c_s^4 - 4\omega_4^3v_2^2\omega_8^2\omega_6^3 + 13\omega_4^2\omega_8^2\omega_6^3c_s^4 + 12\omega_4^3\omega_8^2\omega_6c_s^2 - 19\omega_4^3v_2^2\omega_8^2\omega_6^2 - 6\omega_4^2v_2^4\omega_8^2\omega_6^3 + 18\omega_4^2\omega_8\omega_6^3c_s^2 + 36\omega_4^3v_2^2\omega_6^2 - 306\omega_4^3v_2^2\omega_8^2\omega_6c_s^2 + 90\omega_4^3v_2^2\omega_8^2\omega_6 + 12\omega_4^2\omega_8^2\omega_6c_s^2 - \omega_4^3\omega_8^2\omega_6^3c_s^4 - 99\omega_4^3v_2^2\omega_8\omega_6^3c_s^2 - 6\omega_4^3\omega_8\omega_6^3c_s^2 - 12\omega_4^3\omega_8^2c_s^2 + 4\omega_4^3v_2^4\omega_8^2\omega_6^3 - 3\omega_4^2v_2^2\omega_8^2\omega_6^3c_s^2 + 252\omega_4^3v_2^2\omega_8^2c_s^2 - 12\omega_4^2\omega_8\omega_6^2c_s^2 + 6\omega_4\omega_8^2\omega_6^3c_s^2 - 18\omega_4v_2^2\omega_8^2\omega_6^3c_s^2 + 6\omega_4^2v_2^2\omega_8^2\omega_6^3 - 72\omega_4^3v_2^2\omega_8^2 + 12\omega_4\omega_8\omega_6^3c_s^4 + 19\omega_4^3v_2^4\omega_8^2\omega_6^2 + 6\omega_4^2\omega_8^2\omega_6^2c_s^4 + 6\omega_4^3\omega_8\omega_6^3c_s^4 + 12\omega_4^3v_2^2\omega_8^2\omega_6^3c_s^2 + 12\omega_4^3\omega_8^2c_s^4 + 72\omega_4^3v_2^4\omega_8\omega_6^2 + 54\omega_4^2v_2^2\omega_8\omega_6^3c_s^2 - 36\omega_4^3v_2^2\omega_8\omega_6^3 - 36\omega_4^3v_2^4\omega_6^2 - 12\omega_4^2\omega_8^2\omega_6^2c_s^4 + 108\omega_4^3v_2^2\omega_6^3c_s^2 - 12\omega_4\omega_8\omega_6^3c_s^2 + 36\omega_4^3v_2^2\omega_8\omega_6 + 36\omega_4^2v_2^2\omega_6^3 + 36\omega_4v_2^2\omega_8\omega_6^3c_s^2 - 6\omega_4^2\omega_8^2\omega_6^2c_s^2 + 36\omega_4^3v_2^4\omega_6^3 + 12\omega_4^2\omega_8\omega_6^2c_s^4 - 24\omega_4\omega_8^2\omega_6^3c_s^4 - 39\omega_4^3v_2^4\omega_8\omega_6^3 - 108\omega_4^3v_2^2\omega_6^2c_s^2 - \omega_4^3\omega_8^2\omega_6^2c_s^2 + 36\omega_4^2v_2^2\omega_8\omega_6^2c_s^2 + 72\omega_4^3v_2^4\omega_8^2 + 36\omega_4^2v_2^4\omega_8\omega_6^3 - 72\omega_4^3v_2^2\omega_8\omega_6^2 + 60\omega_4^3v_2^2\omega_8^2\omega_6^2c_s^2 - 6\omega_4^3\omega_8\omega_6^2c_s^4 + 12\omega_8^2\omega_6^3c_s^4 - 36\omega_4^3v_2^4\omega_8\omega_6 - 36\omega_4^2v_2^2\omega_8^2\omega_6c_s^2 - 18\omega_4^2\omega_8\omega_6^3c_s^4 - 12\omega_4^3\omega_8^2\omega_6c_s^4 - 5\omega_4^2\omega_8^2\omega_6^3c_s^2 - 108\omega_4^2v_2^2\omega_6^3c_s^2 - 108\omega_4^3v_2^2\omega_8\omega_6c_s^2 + 39\omega_4^3v_2^2\omega_8\omega_6^3$

$C_{10} = 12 - 78\omega_6^2c_s^2 - 34v_2^2\omega_6^3c_s^2 - 216v_2^4\omega_6 - 216\omega_6c_s^4 + 404v_2^2\omega_6^2c_s^2 + 90v_2^4\omega_6^2 + 6\omega_6^3c_s^2 + 144c_s^4 - 9v_2^4\omega_6^3 + 144v_2^4 + 234v_2^2\omega_6 - 5\omega_6^3c_s^4 - 132c_s^2 + 672v_2^2c_s^2 - 156v_2^2 - 1008v_2^2\omega_6c_s^2 - 18\omega_6 - \omega_6^3 + 82\omega_6^2c_s^4 + 10v_2^2\omega_6^3 + 8\omega_6^2 + 198\omega_6c_s^2 - 98v_2^2\omega_6^2$

$C_{11} = 12 - 22\omega_6^2c_s^2 - 18v_2^2\omega_6^3c_s^2 - 756v_2^4\omega_6 - 36\omega_6c_s^4 + 252v_2^2\omega_6^2c_s^2 + 310v_2^4\omega_6^2 + 2\omega_6^3c_s^2 + 24c_s^4 - 29v_2^4\omega_6^3 + 504v_2^4 + 378v_2^2\omega_6 - \omega_6^3c_s^4 - 36c_s^2 + 432v_2^2c_s^2 - 252v_2^2 - 648v_2^2\omega_6c_s^2 - 18\omega_6 - \omega_6^3 + 14\omega_6^2c_s^4 + 14v_2^2\omega_6^3 + 8\omega_6^2 + 54\omega_6c_s^2 - 154v_2^2\omega_6^2$

2.6 CuLBM1

2.6.1 Definitions

Based on [2], collision operator $\boldsymbol{C}$:

$$\boldsymbol{C}\left(\boldsymbol{f}\right)=\mathbf{M}^{-1}\boldsymbol{G}^{-1}\left(\mathbf{S}\left(\boldsymbol{\gamma}^{(eq)}-\boldsymbol{G}\left(\mathbf{M}\boldsymbol{f}\right)\right)\right),$$

where

$$\mathbf{S}=\mathrm{diag}(0,0,0,\omega_1,\omega_2,\omega_3,\omega_4,\omega_5,\omega_6),$$

$\omega_1,\omega_2,\ldots,\omega_6\in(0,2)$.
The nonlinear operator $\boldsymbol{G}$ (with its inverse $\boldsymbol{G}^{-1}$) transforms the raw moment vector $\boldsymbol{\mu}$ defined by matrix $\mathbf{M}$ to the cumulant vector

$$\boldsymbol{\gamma}=\boldsymbol{G}(\boldsymbol{\mu})=\left(\gamma_{(0,0)},\gamma_{(1,0)},\gamma_{(0,1)},\gamma_{(2,0)},\gamma_{(0,2)},\gamma_{(1,1)},\gamma_{(2,1)},\gamma_{(1,2)},\gamma_{(2,2)}\right)^T$$

as
$\gamma_{(0,0)}=m_{(0,0)}$,
$\gamma_{(1,0)}=\frac{m_{(1,0)}}{m_{(0,0)}}$,
$\gamma_{(0,1)}=\frac{m_{(0,1)}}{m_{(0,0)}}$,
$\gamma_{(2,0)}=-\frac{m_{(1,0)}^2}{m_{(0,0)}^2}+\frac{m_{(2,0)}}{m_{(0,0)}}$,
$\gamma_{(0,2)}=-\frac{m_{(0,1)}^2}{m_{(0,0)}^2}+\frac{m_{(0,2)}}{m_{(0,0)}}$,
$\gamma_{(1,1)}=-\frac{m_{(1,0)}m_{(0,1)}}{m_{(0,0)}^2}+\frac{m_{(1,1)}}{m_{(0,0)}}$,
$\gamma_{(2,1)}=\frac{m_{(2,1)}}{m_{(0,0)}}-\frac{m_{(0,1)}m_{(2,0)}}{m_{(0,0)}^2}-2\frac{m_{(1,0)}m_{(1,1)}}{m_{(0,0)}^2}+2\frac{m_{(1,0)}^2m_{(0,1)}}{m_{(0,0)}^3}$,
$\gamma_{(1,2)}=\frac{m_{(1,2)}}{m_{(0,0)}}-\frac{m_{(1,0)}m_{(0,2)}}{m_{(0,0)}^2}-2\frac{m_{(0,1)}m_{(1,1)}}{m_{(0,0)}^2}+2\frac{m_{(0,1)}^2m_{(1,0)}}{m_{(0,0)}^3}$,
$\gamma_{(2,2)}=-6\frac{m_{(1,0)}^2m_{(0,1)}^2}{m_{(0,0)}^4}+2\frac{m_{(0,1)}^2m_{(2,0)}+m_{(1,0)}^2m_{(0,2)}}{m_{(0,0)}^2}+8\frac{m_{(1,0)}m_{(0,1)}m_{(1,1)}}{m_{(0,0)}^3}-2\frac{m_{(1,0)}m_{(1,2)}+m_{(0,1)}m_{(2,1)}}{m_{(0,0)}^2}+\frac{m_{(2,2)}}{m_{(0,0)}}-\frac{m_{(2,0)}m_{(0,2)}+2m_{(1,1)}^2}{m_{(0,0)}^2}$.
The equilibrium cumulant vector $\boldsymbol{\gamma}^{(eq)}$ is defined by

$$\boldsymbol{\gamma}^{(eq)}=\left(\rho,v_1,v_2,c_s^2,c_s^2,0,0,0\right)^T.$$

2.6.2 Conservation of mass: ρ

attached text file: `output_d2q9_nse_culbm1_symbolic_pde_00.txt`

$\frac{\partial\rho}{\partial t}+\frac{\delta_l v_1}{\delta_t}\frac{\partial\rho}{\partial x_1}+\frac{\delta_l\rho}{\delta_t}\frac{\partial v_1}{\partial x_1}+\frac{v_2\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_2}+\frac{\delta_l\rho}{\delta_t}\frac{\partial v_2}{\partial x_2}+(-1+3c_s^2+v_1^2)\frac{\delta_l^3v_1}{12\delta_t}\frac{\partial^3\rho}{\partial x_1^3}+(-1+c_s^2+3v_1^2)\frac{\delta_l^3\rho}{12\delta_t}\frac{\partial^3v_1}{\partial x_1^3}-\frac{\delta_l^3\rho c_s^2}{6\delta_t}\frac{\partial^3v_2}{\partial x_1^2\partial x_2}-\frac{\delta_l^3\rho c_s^2}{6\delta_t}\frac{\partial^3v_1}{\partial x_1\partial x_2^2}+(-1+3c_s^2+v_2^2)\frac{v_2\delta_l^3}{12\delta_t}\frac{\partial^3\rho}{\partial x_2^3}+(-1+c_s^2+3v_2^2)\frac{\delta_l^3\rho}{12\delta_t}\frac{\partial^3v_2}{\partial x_2^3}+$
$(-2c_s^2-\omega_1c_s^4-3\omega_1v_1^4-6v_1^2+3\omega_1v_1^2+6v_1^4-12\omega_1v_1^2c_s^2+24v_1^2c_s^2+2c_s^4+\omega_1c_s^2)\frac{\delta_l^4}{24\omega_1\delta_t}\frac{\partial^4\rho}{\partial x_1^4}+$
$(-4+6c_s^2+2\omega_1+10v_1^2-5\omega_1v_1^2-3\omega_1c_s^2)\frac{\delta_l^4v_1\rho}{12\omega_1\delta_t}\frac{\partial^4v_1}{\partial x_1^4}+$
$(3\omega_1+3\omega_1c_s^2\omega_4+3c_s^2\omega_4-3\omega_1v_1^2+\omega_1v_1^2\omega_4+v_1^2\omega_4-\omega_1\omega_4-9\omega_1c_s^2-\omega_4)\frac{\delta_l^4v_1\rho}{12\omega_1\delta_t\omega_4}\frac{\partial^4v_2}{\partial x_1^3\partial x_2}+(-2+\omega_3)\frac{\delta_l^4c_s^4}{6\omega_3\delta_t}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2}$

$$+ (3\omega_2\omega_6c_s^2 + v_2^2\omega_6 + 3\omega_2 - \omega_2\omega_6 - \omega_6 + 3\omega_6c_s^2 - 9\omega_2c_s^2 + \omega_2v_2^2\omega_6 - 3\omega_2v_2^2)\frac{v_2\delta_l^4\rho}{12\omega_2\omega_6\delta_t}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} +$$
$$(-12\omega_2v_2^2c_s^2 - 2c_s^2 - 3\omega_2v_2^4 - 6v_2^2 - \omega_2c_s^4 + 6v_2^4 + 24v_2^2c_s^2 + \omega_2c_s^2 + 2c_s^4 + 3\omega_2v_2^2)\frac{\delta_l^4}{24\omega_2\delta_t}\frac{\partial^4\rho}{\partial x_2^4} +$$
$$(-4 + 6c_s^2 + 2\omega_2 + 10v_2^2 - 3\omega_2c_s^2 - 5\omega_2v_2^2)\frac{v_2\delta_l^4\rho}{12\omega_2\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0.$$

2.6.3 Conservation of momentum: ρv_1

attached text file: `output_d2q9_nse_culbm1_symbolic_pde_01.txt`

$$v_1\frac{\partial\rho}{\partial t} + \rho\frac{\partial v_1}{\partial t} + (c_s^2 + v_1^2)\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_1} + \frac{2\delta_l v_1\rho}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{v_2\delta_l v_1}{\delta_t}\frac{\partial\rho}{\partial x_2} + \frac{v_2\delta_l\rho}{\delta_t}\frac{\partial v_1}{\partial x_2} + \frac{\delta_l v_1\rho}{\delta_t}\frac{\partial v_2}{\partial x_2} +$$
$$(-2 + 4c_s^2 + \omega_1 + 6v_1^2 - 3\omega_1v_1^2 - 2\omega_1c_s^2)\frac{\delta_l^2}{\omega_1\delta_t}\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_1} + (2 - \omega_1)\frac{3\delta_l^2 v_1\rho}{\omega_1\delta_t}\left(\frac{\partial v_1}{\partial x_1}\right)^2 + (-2 + \omega_3)\frac{\delta_l^2c_s^2}{2\omega_3\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_2}{\partial x_1} +$$
$$(-2 + \omega_3)\frac{\delta_l^2c_s^2}{2\omega_3\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_1}{\partial x_2} + (-2 + 6c_s^2 + \omega_1 + 2v_1^2 - \omega_1v_1^2 - 3\omega_1c_s^2)\frac{\delta_l^2 v_1}{2\omega_1\delta_t}\frac{\partial^2\rho}{\partial x_1^2} +$$
$$(-2 + 2c_s^2 + \omega_1 + 6v_1^2 - 3\omega_1v_1^2 - \omega_1c_s^2)\frac{\delta_l^2\rho}{2\omega_1\delta_t}\frac{\partial^2 v_1}{\partial x_1^2} + (-2 + \omega_3)\frac{\delta_l^2\rho c_s^2}{2\omega_3\delta_t}\frac{\partial^2 v_2}{\partial x_1\partial x_2} + (-2 + \omega_3)\frac{\delta_l^2\rho c_s^2}{2\omega_3\delta_t}\frac{\partial^2 v_1}{\partial x_2^2} + C_1\frac{\delta_l^3}{12\omega_1^2\delta_t}\frac{\partial^3\rho}{\partial x_1^3}$$
$$+ (-24 + 36c_s^2 + 24\omega_1 + 5\omega_1^2c_s^2 + 11\omega_1^2v_1^2 + 60v_1^2 - 60\omega_1v_1^2 - 4\omega_1^2 - 36\omega_1c_s^2)\frac{\delta_l^3 v_1\rho}{6\omega_1^2\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} + C_2\frac{\delta_l^3 v_1\rho}{12\omega_1^2\omega_3\delta_t\omega_4}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2} +$$
$$(-12 + 12\omega_3 - \omega_3^2)\frac{\delta_l^3c_s^4}{6\omega_3^2\delta_t}\frac{\partial^3\rho}{\partial x_1\partial x_2^2} - \frac{\delta_l^3 v_1\rho c_s^2}{6\delta_t}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2} + (-1 + 3c_s^2 + v_2^2)\frac{v_2\delta_l^3 v_1}{12\delta_t}\frac{\partial^3\rho}{\partial x_2^3} + C_3\frac{v_2\delta_l^3\rho}{6\omega_6\omega_3\delta_t}\frac{\partial^3 v_1}{\partial x_2^3} +$$
$$(-1 + c_s^2 + 3v_2^2)\frac{\delta_l^3 v_1\rho}{12\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} + C_4\frac{\delta_l^4 v_1}{12\omega_1^3\delta_t}\frac{\partial^4\rho}{\partial x_1^4} + C_5\frac{\delta_l^4\rho}{12\omega_1^3\delta_t}\frac{\partial^4 v_1}{\partial x_1^4} + C_6\frac{\delta_l^4\rho}{12\omega_1^3\omega_3^3\delta_t\omega_4^2}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} + C_7\frac{\delta_l^4 v_1c_s^2}{12\omega_1^3\omega_3^2\delta_t\omega_4^2}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2} +$$
$$C_8\frac{\delta_l^4\rho c_s^2}{12\omega_1^2\omega_3^3\delta_t\omega_4}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} + C_9\frac{v_2\delta_l^4c_s^2}{12\omega_2\omega_6^2\omega_3^2\delta_t}\frac{\partial^4\rho}{\partial x_1\partial x_2^3} +$$
$$(3\omega_2\omega_6c_s^2 + v_2^2\omega_6 + 3\omega_2 - \omega_2\omega_6 - \omega_6 + 3\omega_6c_s^2 - 9\omega_2c_s^2 + \omega_2v_2^2\omega_6 - 3\omega_2v_2^2)\frac{v_2\delta_l^4 v_1\rho}{12\omega_2\omega_6\delta_t}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} + C_{10}\frac{\delta_l^4\rho c_s^2}{12\omega_2\omega_6\omega_3^3\delta_t}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3}$$
$$+ (-12\omega_2v_2^2c_s^2 - 2c_s^2 - 3\omega_2v_2^4 - 6v_2^2 - \omega_2c_s^4 + 6v_2^4 + 24v_2^2c_s^2 + \omega_2c_s^2 + 2c_s^4 + 3\omega_2v_2^2)\frac{\delta_l^4 v_1}{24\omega_2\delta_t}\frac{\partial^4\rho}{\partial x_2^4} + C_{11}\frac{\delta_l^4\rho}{24\omega_6^2\omega_3^3\delta_t}\frac{\partial^4 v_1}{\partial x_2^4}$$
$$+ (-4 + 6c_s^2 + 2\omega_2 + 10v_2^2 - 3\omega_2c_s^2 - 5\omega_2v_2^2)\frac{v_2\delta_l^4 v_1\rho}{12\omega_2\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$$C_1 = -12c_s^2 + 24\omega_1^2v_1^2c_s^2 - \omega_1^2c_s^2 - 12\omega_1c_s^4 - 36\omega_1v_1^4 - 7\omega_1^2v_1^2 - 36v_1^2 + 36\omega_1v_1^2 + 36v_1^4 + 7\omega_1^2v_1^4 - 144\omega_1v_1^2c_s^2 + \omega_1^2c_s^4 + 144v_1^2c_s^2 + 12c_s^4 + 12\omega_1c_s^2$$

$$C_2 = 6\omega_1^2v_1^2\omega_4 - 6\omega_1v_1^2\omega_3\omega_4 - 6\omega_1^2\omega_4 + 36\omega_3c_s^2\omega_4 - 36\omega_1^2c_s^2 + 12v_1^2\omega_3\omega_4 - 18\omega_1\omega_3c_s^2\omega_4 + 12\omega_1\omega_3 - 12\omega_1v_1^2\omega_3 - 12\omega_3\omega_4 - 12\omega_1^2v_1^2 - 36\omega_1\omega_3c_s^2 + 6\omega_1\omega_3\omega_4 - 3\omega_1^2v_1^2\omega_3\omega_4 + 12\omega_1^2 + 12\omega_1^2v_1^2\omega_3 - 11\omega_1^2\omega_3c_s^2\omega_4 + 3\omega_1^2\omega_3\omega_4 - 12\omega_1^2\omega_3 + 36\omega_1^2\omega_3c_s^2 + 18\omega_1^2c_s^2\omega_4$$

$$C_3 = 6 + \omega_6\omega_3 - 18c_s^2 + 3v_2^2\omega_3 + 3v_2^2\omega_6 - 6v_2^2 + 9\omega_3c_s^2 - 3\omega_6 + 9\omega_6c_s^2 - 3\omega_3 - 3\omega_6\omega_3c_s^2 - v_2^2\omega_6\omega_3$$

$$C_4 = 12 - 132c_s^2 - 18\omega_1 + 404\omega_1^2v_1^2c_s^2 - 78\omega_1^2c_s^2 - 216\omega_1c_s^4 + 10\omega_1^3v_1^2 + 6\omega_1^3c_s^2 - 216\omega_1v_1^4 - 98\omega_1^2v_1^2 - 156v_1^2 + 234\omega_1v_1^2 - 5\omega_1^3c_s^4 + 8\omega_1^2 + 144v_1^4 - \omega_1^3 - 34\omega_1^3v_1^2c_s^2 + 90\omega_1^2v_1^4 - 1008\omega_1v_1^2c_s^2 + 82\omega_1^2c_s^4 + 672v_1^2c_s^2 + 144c_s^4 - 9\omega_1^3v_1^4 + 198\omega_1c_s^2$$

$$C_5 = 12 - 36c_s^2 - 18\omega_1 + 252\omega_1^2v_1^2c_s^2 - 22\omega_1^2c_s^2 - 36\omega_1c_s^4 + 14\omega_1^3v_1^2 + 2\omega_1^3c_s^2 - 756\omega_1v_1^4 - 154\omega_1^2v_1^2 - 252v_1^2 + 378\omega_1v_1^2 - \omega_1^3c_s^4 + 8\omega_1^2 + 504v_1^4 - \omega_1^3 - 18\omega_1^3v_1^2c_s^2 + 310\omega_1^2v_1^4 - 648\omega_1v_1^2c_s^2 + 14\omega_1^2c_s^4 + 432v_1^2c_s^2 + 24c_s^4 - 29\omega_1^3v_1^4 + 54\omega_1c_s^2$$

$$C_6 = \omega_1^2\omega_3^3c_s^2\omega_4^2 - 39\omega_1^3v_1^4\omega_3^3\omega_4 + 18\omega_1^3\omega_3^2c_s^2\omega_4 - 12\omega_3^3c_s^2\omega_4^2 - 108\omega_1^3v_1^2\omega_3^2c_s^2 - 24\omega_1^3\omega_3c_s^4\omega_4^2 - 6\omega_1^2\omega_3^2c_s^2\omega_4^2 - 36\omega_1^3v_1^2\omega_3^2\omega_4 + 19\omega_1^2v_1^4\omega_3^3\omega_4^2 + 6\omega_1^3\omega_3^3c_s^4\omega_4 + 36\omega_1^2v_1^2\omega_3^2c_s^2\omega_4 - 108\omega_1^2v_1^2\omega_3^3c_s^2 - 72\omega_1^2v_1^2\omega_3^3\omega_4 - 12\omega_1\omega_3^2c_s^4\omega_4^2 - 6\omega_1^3v_1^4\omega_3^2\omega_4^2 + 36\omega_1^3v_1^2\omega_3c_s^2\omega_4 - 4\omega_1^3v_1^2\omega_3^3\omega_4^2 + 12\omega_1\omega_3^3c_s^2\omega_4^2 + 12\omega_1^3v_1^2\omega_3^3c_s^2\omega_4^2 + 39\omega_1^3v_1^2\omega_3^3\omega_4 - 18\omega_1^3v_1^2\omega_3c_s^2\omega_4^2 - 99\omega_1^3v_1^2\omega_3^3c_s^2\omega_4 + 108\omega_1^3v_1^2\omega_3^3c_s^2 - 36\omega_1^3v_1^2\omega_3^3 + 18\omega_1^2v_1^2\omega_3^2c_s^2\omega_4^2 - 36\omega_1^2v_1^4\omega_3^3 + 36\omega_1^3v_1^4\omega_3^2\omega_4 - 19\omega_1^2v_1^2\omega_3^3\omega_4^2 + 36\omega_1^3v_1^2\omega_3^3 - 36\omega_1v_1^2\omega_3^2c_s^2\omega_4^2 - 12\omega_1^2\omega_3^2c_s^2\omega_4 + 12\omega_1^3\omega_3c_s^4\omega_4 + 72\omega_1^2v_1^4\omega_3^3\omega_4 + 6\omega_1^3v_1^2\omega_3^3\omega_4^2 - \omega_1^3\omega_3^3c_s^4\omega_4^2 - 6\omega_1^2\omega_3^3c_s^4\omega_4 + 4\omega_1^3v_1^4\omega_3^3\omega_4^2 - 5\omega_1^3\omega_3^2c_s^2\omega_4^2 + 252v_1^2\omega_3^3c_s^2\omega_4^2 - 90\omega_1v_1^4\omega_3^3\omega_4^2 + 12\omega_1^3c_s^4\omega_4^2 - 3\omega_1^3v_1^2\omega_3^2c_s^2\omega_4^2 + 12\omega_1\omega_3^2c_s^2\omega_4^2 + 198\omega_1^2v_1^2\omega_3^3c_s^2\omega_4 - 12\omega_1\omega_3^3c_s^4\omega_4^2 - \omega_1^2\omega_3^3c_s^2\omega_4^2 - 108\omega_1v_1^2\omega_3^3c_s^2\omega_4 - 18\omega_1^3\omega_3^2c_s^4\omega_4 + 72v_1^4\omega_3^3\omega_4^2 + 12\omega_3^3c_s^4\omega_4^2 + 36\omega_1v_1^2\omega_3^3\omega_4 + 6\omega_1^2\omega_3^2c_s^4\omega_4^2 + 6\omega_1^3\omega_3c_s^2\omega_4^2 - 6\omega_1^3\omega_3^3c_s^2\omega_4 - 36\omega_1^3v_1^4\omega_3^2 - 12\omega_1^3\omega_3c_s^2\omega_4 + 12\omega_1^2\omega_3^2c_s^4\omega_4 + 90\omega_1v_1^2\omega_3^3\omega_4^2 - 306\omega_1v_1^2\omega_3^2c_s^2\omega_4^2 + 6\omega_1^2\omega_3^3c_s^2\omega_4 + 13\omega_1^3\omega_3^2c_s^2\omega_4^2 + 60\omega_1^2v_1^2\omega_3^3c_s^2\omega_4^2 + 36\omega_1^3v_1^4\omega_3^3 - 72v_1^2\omega_3^3\omega_4^2 - 36\omega_1v_1^4\omega_3^3\omega_4 + 36\omega_1^2v_1^2\omega_3^3 + 54\omega_1^3v_1^2\omega_3^2c_s^2\omega_4$$

$$C_7 = 4\omega_1^2v_1^2\omega_3^2\omega_4^2 - 18\omega_1^3\omega_3\omega_4 - 18\omega_1^3\omega_3^2c_s^2\omega_4 - 36\omega_1^3\omega_3c_s^2 - 12\omega_1^3v_1^2\omega_3 + 12\omega_1^2\omega_3^2c_s^2\omega_4^2 - 6\omega_1^3v_1^2\omega_3^2\omega_4 + 36\omega_1^3c_s^2\omega_4^2 - 4\omega_1^2\omega_3^2\omega_4^2 - 12\omega_1^3\omega_4^2 + 12\omega_1^3\omega_4 - 36\omega_1^3c_s^2\omega_4 - 6\omega_1^2\omega_3^2\omega_4 - 36\omega_1^2\omega_3^2c_s^2 + 12\omega_1^3v_1^2\omega_3^2 + 12\omega_1^2\omega_4^2 + 18\omega_1^2\omega_3^2c_s^2\omega_4 + \omega_1^3v_1^2\omega_3^2\omega_4^2 + 12\omega_1^3\omega_3\omega_4^2 - 12\omega_1^2v_1^2\omega_4^2 + 6\omega_1^2v_1^2\omega_3^2\omega_4 + 5\omega_1^3\omega_3^2c_s^2\omega_4^2 - 12\omega_1^3v_1^2\omega_3\omega_4^2 - 54\omega_1\omega_3^2c_s^2\omega_4^2 + 12\omega_1^2v_1^2\omega_3\omega_4 - \omega_1^3\omega_3^2\omega_4^2 - 36\omega_1^2c_s^2\omega_4^2 - 18\omega_1v_1^2\omega_3^2\omega_4^2 - 12\omega_1^3\omega_3^2 + 36\omega_3^2c_s^2\omega_4^2 + 36\omega_1^2\omega_3c_s^2\omega_4 - 12\omega_1^3v_1^2\omega_4 - 12\omega_1^2\omega_3\omega_4 + 12v_1^2\omega_3^2\omega_4^2 - 40\omega_1^3\omega_3c_s^2\omega_4^2 + 12\omega_1^3v_1^2\omega_4^2 - 6\omega_1^2\omega_3\omega_4^2 + 54\omega_1^3\omega_3c_s^2\omega_4 + 12\omega_1^2\omega_3^2 - 12\omega_1^2v_1^2\omega_3^2 + 18\omega_1^2\omega_3c_s^2\omega_4^2 + 6\omega_1^3\omega_3^2\omega_4 + 6\omega_1^2v_1^2\omega_3\omega_4^2 + 36\omega_1^3\omega_3^2c_s^2 + 18\omega_1\omega_3^2\omega_4^2 + 12\omega_1^3\omega_3 + 18\omega_1^3v_1^2\omega_3\omega_4 - 12\omega_3^2\omega_4^2$$

$C_8 = 12\omega_1^2\omega_3^3c_s^2 - 36\omega_1v_1^2\omega_3\omega_4 + 24\omega_1\omega_3^3 + 72\omega_1v_1^2\omega_3^2 - 24\omega_1\omega_3^2 + 36v_1^2\omega_3^3 - 12\omega_1\omega_3c_s^2\omega_4 - 72\omega_1v_1^2\omega_3^3 - 24\omega_1^2\omega_3^2c_s^2 - 4\omega_1^2\omega_3^2c_s^2\omega_4 + 12\omega_1\omega_3\omega_4 + 12\omega_3^2\omega_4 + 24\omega_1\omega_3^2c_s^2 - 12\omega_1\omega_3^2\omega_4 + 36\omega_1^2v_1^2\omega_3 + 18\omega_1^2\omega_3c_s^2\omega_4 - 12\omega_1^2\omega_3 + 12\omega_1^2\omega_3c_s^2 - 36v_1^2\omega_3^2\omega_4 + 24\omega_1^2\omega_3^2 - 24\omega_1\omega_3^3c_s^2 - \omega_1^2\omega_3^3c_s^2\omega_4 - 12\omega_3^2c_s^2\omega_4 - 72\omega_1^2v_1^2\omega_3^2 + 12\omega_3^3c_s^2 - 12\omega_1^2c_s^2\omega_4 - 12\omega_1^2\omega_3^3 + 36\omega_1v_1^2\omega_3^2\omega_4 + 36\omega_1^2v_1^2\omega_3^3 + 12\omega_1\omega_3^2c_s^2\omega_4 - 12\omega_3^3$

$C_9 = -12\omega_2\omega_6^2 - 12\omega_6\omega_3 - 12\omega_2v_2^2\omega_6^2\omega_3 - \omega_2\omega_6^2\omega_3^2 - 9\omega_2\omega_6\omega_3^2c_s^2 + 12\omega_2\omega_3 + 18\omega_2\omega_3^2c_s^2 + 18\omega_6^2\omega_3c_s^2 - 12v_2^2\omega_6^2 - 36\omega_2\omega_6^2\omega_3c_s^2 - 36\omega_2\omega_6c_s^2 - 18\omega_6\omega_3^2c_s^2 + 6v_2^2\omega_6^2\omega_3 + v_2^2\omega_6^2\omega_3^2 - 36\omega_6^2c_s^2 - 6\omega_2\omega_3^2 + \omega_2v_2^2\omega_6^2\omega_3^2 + 12\omega_2\omega_6 + 6\omega_6\omega_3^2 + 12\omega_2\omega_6^2\omega_3 - 3\omega_2v_2^2\omega_6\omega_3^2 - \omega_6^2\omega_3^2 - 18\omega_2\omega_6\omega_3 - 12\omega_2v_2^2\omega_3 - 6v_2^2\omega_6\omega_3^2 + 12\omega_6^2 + 12\omega_2v_2^2\omega_6^2 + 3\omega_2\omega_6^2\omega_3^2c_s^2 - 12\omega_2v_2^2\omega_6 + 36\omega_2\omega_6^2c_s^2 + 36\omega_6\omega_3c_s^2 + 6\omega_2v_2^2\omega_3^2 + 12v_2^2\omega_6\omega_3 - 6\omega_6^2\omega_3 + 18\omega_2v_2^2\omega_6\omega_3 + 54\omega_2\omega_6\omega_3c_s^2 + 3\omega_2\omega_6\omega_3^2 + 3\omega_6^2\omega_3^2c_s^2 - 36\omega_2\omega_3c_s^2$

$C_{10} = 12\omega_6\omega_3 - 5\omega_2\omega_6\omega_3^2c_s^2 - 12\omega_2\omega_3 - 18\omega_2\omega_3^2c_s^2 - 12\omega_2\omega_6c_s^2 + 6\omega_6\omega_3^2c_s^2 + 6\omega_2\omega_3^3c_s^2 + 36v_2^2\omega_3^2 - 6\omega_2\omega_3^3 - \omega_2\omega_6\omega_3^3c_s^2 - \omega_6\omega_3^3 + 18\omega_2\omega_3^2 - 18v_2^2\omega_3^3 + \omega_6\omega_3^3c_s^2 - 6\omega_6\omega_3^2 + 3v_2^2\omega_6\omega_3^3 + 12\omega_3^2c_s^2 - 3\omega_2v_2^2\omega_6\omega_3^2 + 36\omega_2v_2^2\omega_3 + 18v_2^2\omega_6\omega_3^2 - 12\omega_3^2 - 12\omega_6\omega_3c_s^2 - 54\omega_2v_2^2\omega_3^2 - 6\omega_3^3c_s^2 - 36v_2^2\omega_6\omega_3 + 18\omega_2\omega_6\omega_3c_s^2 + \omega_2\omega_6\omega_3^2 + 18\omega_2v_2^2\omega_3^3 + 12\omega_2\omega_3c_s^2 + 6\omega_3^3$

$C_{11} = 24\omega_6\omega_3c_s^4 + 108v_2^2\omega_3^3c_s^2 - 12v_2^4\omega_6^2\omega_3^2 + 12\omega_6^2\omega_3c_s^2 + 6v_2^2\omega_6^2\omega_3^3c_s^2 + 3v_2^4\omega_6^2\omega_3^3 + 24\omega_6^2\omega_3^2c_s^4 + 24\omega_6\omega_3^2c_s^2 + 72v_2^2\omega_3^2 - 12v_2^2\omega_6^2\omega_3^2c_s^2 + 12v_2^2\omega_6^2\omega_3^2 - 216v_2^2\omega_3^2c_s^2 - 3v_2^2\omega_6^2\omega_3^3 - 36v_2^2\omega_3^3 + 72v_2^2\omega_6\omega_3c_s^2 - 6\omega_6\omega_3^3c_s^2 - 3\omega_6^2\omega_3^3c_s^4 + 30v_2^2\omega_6\omega_3^3 + 144v_2^2\omega_6\omega_3^2c_s^2 + 24\omega_6^2c_s^4 + \omega_6^2\omega_3^2c_s^2 - 36v_2^2\omega_6^2\omega_3c_s^2 - 72v_2^2\omega_6\omega_3^2 + 6\omega_6\omega_3^3c_s^4 - 30v_2^4\omega_6\omega_3^3 + 36v_2^4\omega_3^3 - 48\omega_6^2\omega_3c_s^4 - 72v_2^2\omega_6\omega_3^3c_s^2 - 24\omega_6\omega_3c_s^2 - 72v_2^4\omega_3^2 - 24\omega_6\omega_3^2c_s^4 + 72v_2^4\omega_6\omega_3^2 - 8\omega_6^2\omega_3^2c_s^2$

2.6.4 Conservation of momentum: ρv_2

attached text file: `output_d2q9_nse_culbm1_symbolic_pde_02.txt`

$$v_2\frac{\partial\rho}{\partial t} + \rho\frac{\partial v_2}{\partial t} + \frac{v_2\delta_l v_1}{\delta_t}\frac{\partial\rho}{\partial x_1} + \frac{v_2\delta_l\rho}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{\delta_l v_1\rho}{\delta_t}\frac{\partial v_2}{\partial x_1} + (c_s^2+v_2^2)\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_2} + \frac{2v_2\delta_l\rho}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-2+\omega_3)\frac{\delta_l^2c_s^2}{2\omega_3\delta_t}\frac{\partial\rho}{\partial x_1}\frac{\partial v_2}{\partial x_1} +$$
$$(-2+\omega_3)\frac{\delta_l^2c_s^2}{2\omega_3\delta_t}\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_2} + (-2+4c_s^2+\omega_2+6v_2^2-2\omega_2c_s^2-3\omega_2v_2^2)\frac{\delta_l^2}{\omega_2\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_2}{\partial x_2} + (2-\omega_2)\frac{3v_2\delta_l^2\rho}{\omega_2\delta_t}\left(\frac{\partial v_2}{\partial x_2}\right)^2 +$$
$$(-2+\omega_3)\frac{\delta_l^2\rho c_s^2}{2\omega_3\delta_t}\frac{\partial^2 v_2}{\partial x_1^2} + (-2+\omega_3)\frac{\delta_l^2\rho c_s^2}{2\omega_3\delta_t}\frac{\partial^2 v_1}{\partial x_1\partial x_2} + (-2+6c_s^2+\omega_2+2v_2^2-3\omega_2c_s^2-\omega_2v_2^2)\frac{v_2\delta_l^2}{2\omega_2\delta_t}\frac{\partial^2\rho}{\partial x_2^2} +$$
$$(-2+2c_s^2+\omega_2+6v_2^2-\omega_2c_s^2-3\omega_2v_2^2)\frac{\delta_l^2\rho}{2\omega_2\delta_t}\frac{\partial^2 v_2}{\partial x_2^2} + (-1+3c_s^2+v_1^2)\frac{v_2\delta_l^3v_1}{12\delta_t}\frac{\partial^3\rho}{\partial x_1^3} + (-1+c_s^2+3v_1^2)\frac{v_2\delta_l^3\rho}{12\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} +$$
$$C_1\frac{\delta_l^3v_1\rho}{6\omega_3\delta_t\omega_4}\frac{\partial^3 v_2}{\partial x_1^3} + (-12+12\omega_3-\omega_3^2)\frac{\delta_l^3c_s^4}{6\omega_3^2\delta_t}\frac{\partial^3\rho}{\partial x_1^2\partial x_2} - \frac{v_2\delta_l^3\rho c_s^2}{6\delta_t}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2} + C_2\frac{v_2\delta_l^3\rho}{12\omega_2^2\omega_6\omega_3\delta_t}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2} + C_3\frac{\delta_l^3}{12\omega_2^2\delta_t}\frac{\partial^3\rho}{\partial x_2^3} +$$
$$(-24+36c_s^2+11\omega_2^2v_2^2-4\omega_2^2+5\omega_2^2c_s^2+24\omega_2+60v_2^2-36\omega_2c_s^2-60\omega_2v_2^2)\frac{v_2\delta_l^3\rho}{6\omega_2^2\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} +$$
$$(-2c_s^2-\omega_1c_s^4-3\omega_1v_1^4-6v_1^2+3\omega_1v_1^2+6v_1^4-12\omega_1v_1^2c_s^2+24v_1^2c_s^2+2c_s^4+\omega_1c_s^2)\frac{v_2\delta_l^4}{24\omega_1\delta_t}\frac{\partial^4\rho}{\partial x_1^4} +$$
$$(-4+6c_s^2+2\omega_1+10v_1^2-5\omega_1v_1^2-3\omega_1c_s^2)\frac{v_2\delta_l^4v_1\rho}{12\omega_1\delta_t}\frac{\partial^4 v_1}{\partial x_1^4} + C_4\frac{\delta_l^4\rho}{24\omega_3^2\delta_t\omega_4^2}\frac{\partial^4 v_2}{\partial x_1^4} + C_5\frac{\delta_l^4v_1c_s^2}{12\omega_1\omega_3^2\delta_t\omega_4^2}\frac{\partial^4\rho}{\partial x_1^3\partial x_2} +$$
$$C_6\frac{\delta_l^4\rho c_s^2}{12\omega_1\omega_3^2\delta_t\omega_4}\frac{\partial^4 v_1}{\partial x_1^3\partial x_2} + (3\omega_1+3\omega_1c_s^2\omega_4+3c_s^2\omega_4-3\omega_1v_1^2+\omega_1v_1^2\omega_4+v_1^2\omega_4-\omega_1\omega_4-9\omega_1c_s^2-\omega_4)\frac{v_2\delta_l^4v_1\rho}{12\omega_1\delta_t\omega_4}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} +$$
$$C_7\frac{v_2\delta_l^4c_s^2}{12\omega_2^2\omega_6^2\omega_3^2\delta_t}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2} + C_8\frac{\delta_l^4\rho c_s^2}{12\omega_2^2\omega_6\omega_3^2\delta_t}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2} + C_9\frac{\delta_l^4\rho}{12\omega_2^2\omega_6^2\omega_3^2\delta_t}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} + C_{10}\frac{v_2\delta_l^4}{12\omega_2^2\delta_t}\frac{\partial^4\rho}{\partial x_2^4} + C_{11}\frac{\delta_l^4\rho}{12\omega_2^2\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$C_1 = 6 - 18c_s^2 - 3\omega_3c_s^2\omega_4 - v_1^2\omega_3\omega_4 + 9c_s^2\omega_4 + 9\omega_3c_s^2 + \omega_3\omega_4 - 6v_1^2 + 3v_1^2\omega_3 - 3\omega_3 + 3v_1^2\omega_4 - 3\omega_4$

$C_2 = -12\omega_6\omega_3 + 6\omega_2^2v_2^2\omega_6 - 12\omega_2^2v_2^2 + 12\omega_2\omega_3 + 36\omega_2^2\omega_3c_s^2 + 12\omega_2^2 + 3\omega_2^2\omega_6\omega_3 - 36\omega_2^2c_s^2 + 12\omega_2^2v_2^2\omega_3 - 11\omega_2^2\omega_6\omega_3c_s^2 - 3\omega_2^2v_2^2\omega_6\omega_3 - 6\omega_2^2\omega_6 + 6\omega_2\omega_6\omega_3 - 12\omega_2v_2^2\omega_3 + 36\omega_6\omega_3c_s^2 + 12v_2^2\omega_6\omega_3 - 6\omega_2v_2^2\omega_6\omega_3 - 18\omega_2\omega_6\omega_3c_s^2 - 12\omega_2^2\omega_3 + 18\omega_2^2\omega_6c_s^2 - 36\omega_2\omega_3c_s^2$

$C_3 = -144\omega_2v_2^2c_s^2 - 12c_s^2 - 7\omega_2^2v_2^2 - 36\omega_2v_2^4 - \omega_2^2c_s^2 - 36v_2^2 - 12\omega_2c_s^4 + \omega_2^2c_s^4 + 36v_2^4 + 144v_2^2c_s^2 + 12\omega_2c_s^2 + 24\omega_2^2v_2^2c_s^2 + 12c_s^4 + 7\omega_2^2v_2^4 + 36\omega_2v_2^2$

$C_4 = 24\omega_3^2c_s^4\omega_4^2 + 72v_1^2\omega_3^2 + \omega_3^2c_s^2\omega_4^2 - 24\omega_3c_s^2\omega_4 - 36v_1^2\omega_3^3 - 12v_1^2\omega_3^2c_s^2\omega_4^2 + 144v_1^2\omega_3^2c_s^2\omega_4 - 6\omega_3^2c_s^2\omega_4 + 12\omega_3c_s^2\omega_4^2 - 24\omega_3^2c_s^4\omega_4 + 36v_1^4\omega_3^3 + 6v_1^2\omega_3^3c_s^2\omega_4^2 + 72v_1^4\omega_3^2\omega_4 + 72v_1^2\omega_3c_s^2\omega_4 + 108v_1^2\omega_3^3c_s^2 + 30v_1^2\omega_3^2\omega_4 - 8\omega_3^2c_s^2\omega_4^2 + 3v_1^4\omega_3^3\omega_4^2 - 72v_1^4\omega_3^3 - 3\omega_3^3c_s^4\omega_4^2 + 12v_1^2\omega_3^2\omega_4^2 + 24\omega_3c_s^4\omega_4 + 6\omega_3^3c_s^4\omega_4 - 72v_1^2\omega_3^2\omega_4 - 48\omega_3c_s^4\omega_4^2 - 216v_1^2\omega_3^2c_s^2 + 24\omega_3^2c_s^2\omega_4 - 30v_1^4\omega_3^2\omega_4 + 24c_s^4\omega_4^2 - 3v_1^2\omega_3^3\omega_4^2 - 12v_1^4\omega_3^2\omega_4^2 - 72v_1^2\omega_3^3c_s^2\omega_4 - 36v_1^2\omega_3c_s^2\omega_4^2$

$C_5 = 18\omega_1v_1^2\omega_3\omega_4 + 12\omega_1\omega_3\omega_4^2 + 36\omega_3c_s^2\omega_4 + 6\omega_1v_1^2\omega_3^2 - 6\omega_3\omega_4^2 + 12v_1^2\omega_3\omega_4 - 6\omega_1\omega_3^2 - 36\omega_1c_s^2\omega_4 + 54\omega_1\omega_3c_s^2\omega_4 - 36\omega_1\omega_3c_s^2\omega_4^2 - 36c_s^2\omega_4^2 + 12\omega_1\omega_3 + 6v_1^2\omega_3\omega_4^2 + 36\omega_1c_s^2\omega_4^2 - 12\omega_1v_1^2\omega_3 - 12\omega_3\omega_4 + 18\omega_3c_s^2\omega_4^2 + 12\omega_4^2 - 36\omega_1\omega_3c_s^2 - 12\omega_1v_1^2\omega_3\omega_4^2 - 18\omega_1\omega_3\omega_4 - 12\omega_1\omega_4^2 + 6\omega_3^2\omega_4 + 3\omega_1\omega_3^2c_s^2\omega_4^2 + 18\omega_1\omega_3^2c_s^2 + 3\omega_1\omega_3^2\omega_4 + \omega_1v_1^2\omega_3^2\omega_4^2 + 3\omega_3^2c_s^2\omega_4^2 - 12v_1^2\omega_4^2 + v_1^2\omega_3^2\omega_4^2 + 12\omega_1v_1^2\omega_4^2 - 6v_1^2\omega_3^2\omega_4 - 12\omega_1v_1^2\omega_4 - 18\omega_3^2c_s^2\omega_4 - \omega_1\omega_3^2\omega_4^2 - 3\omega_1v_1^2\omega_3^2\omega_4 + 12\omega_1\omega_4 - 9\omega_1\omega_3^2c_s^2\omega_4 - \omega_3^2\omega_4^2$

$C_6 = -6\omega_1\omega_3^3 + 36v_1^2\omega_3^2 - 12\omega_3c_s^2\omega_4 - 54\omega_1v_1^2\omega_3^2 - 36v_1^2\omega_3\omega_4 + 18\omega_1\omega_3^2 - 18v_1^2\omega_3^3 - 12\omega_1c_s^2\omega_4 + 18\omega_1\omega_3c_s^2\omega_4 + 18\omega_1v_1^2\omega_3^3 - \omega_1\omega_3^3c_s^2\omega_4 - 12\omega_1\omega_3 + \omega_3^3c_s^2\omega_4 + 36\omega_1v_1^2\omega_3 + 12\omega_3\omega_4 + 12\omega_1\omega_3c_s^2 + 12\omega_3^2c_s^2 - 6\omega_3^2\omega_4 - 18\omega_1\omega_3^2c_s^2 + \omega_1\omega_3^2\omega_4 + 3v_1^2\omega_3^3\omega_4 + 18v_1^2\omega_3^2\omega_4 + 6\omega_1\omega_3^3c_s^2 - 12\omega_3^2 + 6\omega_3^2c_s^2\omega_4 - \omega_3^3\omega_4 - 6\omega_3^3c_s^2 - 3\omega_1v_1^2\omega_3^2\omega_4 - 5\omega_1\omega_3^2c_s^2\omega_4 + 6\omega_3^3$

$C_7 = 12\omega_2^3\omega_6^2\omega_3 + 18\omega_2\omega_6^2\omega_3^2 + 6\omega_2^2v_2^2\omega_6\omega_3^2 + 18\omega_2^3v_2^2\omega_6\omega_3 - 12\omega_2^2v_2^2\omega_3^2 - 36\omega_2^2\omega_6^2c_s^2 + 54\omega_2^3\omega_6\omega_3c_s^2 - 6\omega_2^2\omega_6\omega_3^2 + 5\omega_2^3\omega_6^2\omega_3^2c_s^2 + 12v_2^2\omega_6^2\omega_3^2 - 36\omega_2^3\omega_6c_s^2 - 12\omega_2^2\omega_6\omega_3 + 12\omega_2^2\omega_6^2\omega_3^2c_s^2 + 36\omega_2^3\omega_3^2c_s^2 - 6\omega_2^3v_2^2\omega_6\omega_3^2 + 36\omega_2^2\omega_6\omega_3c_s^2 - 12\omega_2^2v_2^2\omega_6^2 - \omega_2^3\omega_6^2\omega_3^2 - 18\omega_2v_2^2\omega_6^2\omega_3^2 + 12\omega_2^2v_2^2\omega_6\omega_3 + 12\omega_2^2\omega_3^2 - 36\omega_2^3\omega_3c_s^2 + \omega_2^3v_2^2\omega_6^2\omega_3^2 - 12\omega_6^2\omega_3^2 + 6\omega_2^3\omega_6\omega_3^2 + 18\omega_2^2\omega_6\omega_3^2c_s^2 + 6\omega_2^2v_2^2\omega_6^2\omega_3 + 12\omega_2^3v_2^2\omega_3^2 + 36\omega_2^3\omega_6^2c_s^2 + 12\omega_2^3\omega_3 - 12\omega_2^3v_2^2\omega_6 - 6\omega_2^2\omega_6^2\omega_3 + 18\omega_2^2\omega_6^2\omega_3c_s^2 - 12\omega_2^3\omega_6^2 - 54\omega_2\omega_6^2\omega_3^2c_s^2 - 4\omega_2^2\omega_6^2\omega_3^2 + 12\omega_2^3v_2^2\omega_6^2 + 12\omega_2^3\omega_6 - 40\omega_2^3\omega_6^2\omega_3c_s^2 - 12\omega_2^3v_2^2\omega_3 - 36\omega_2^2\omega_3^2c_s^2 - 12\omega_2^3\omega_3^2 + 12\omega_2^2\omega_6^2 - 18\omega_2^3\omega_6\omega_3 + 4\omega_2^2v_2^2\omega_6^2\omega_3^2 - 12\omega_2^3v_2^2\omega_6^2\omega_3 + 36\omega_6^2\omega_3^2c_s^2 - 18\omega_2^3\omega_6\omega_3^2c_s^2$

$C_8 = 12\omega_2\omega_6\omega_3^2c_s^2 - 72\omega_2^2v_2^2\omega_3^2 + 24\omega_2\omega_3^2c_s^2 + 12\omega_2^2\omega_3c_s^2 - 12\omega_6\omega_3^2c_s^2 + 36\omega_2^2v_2^2\omega_3^3 - 24\omega_2\omega_3^3c_s^2 + 24\omega_2\omega_3^3 - 24\omega_2\omega_3^2 + 36\omega_2^2v_2^2\omega_3 + 36v_2^2\omega_3^3 + 18\omega_2^2\omega_6\omega_3c_s^2 + 12\omega_6\omega_3^2 + 24\omega_2^2\omega_3^2 + 12\omega_2^2\omega_3^2c_s^2 + 36\omega_2v_2^2\omega_6\omega_3^2 - 4\omega_2^2\omega_6\omega_3^2c_s^2 + 12\omega_2\omega_6\omega_3 - 36v_2^2\omega_6\omega_3^2 - 12\omega_2^2\omega_3^3 - \omega_2^2\omega_6\omega_3^2c_s^2 - 24\omega_2^2\omega_3^2c_s^2 + 72\omega_2v_2^2\omega_3^2 + 12\omega_3^2c_s^2 - 36\omega_2v_2^2\omega_6\omega_3 - 12\omega_2\omega_6\omega_3c_s^2 - 12\omega_2\omega_6\omega_3^2 - 12\omega_2^2\omega_3 - 72\omega_2v_2^2\omega_3^2 - 12\omega_2^2\omega_6c_s^2 - 12\omega_3^2$

$C_9 = -36\omega_2^3v_2^4\omega_3^2 - \omega_2^2\omega_6^2\omega_3^3c_s^2 - 24\omega_2^3\omega_6^2\omega_3c_s^4 + 18\omega_2^2v_2^2\omega_6^2\omega_3^2c_s^2 - 39\omega_2^3v_2^4\omega_6\omega_3^3 + 54\omega_2^3v_2^2\omega_6\omega_3^2c_s^2 - 12\omega_2\omega_6^2\omega_3^2c_s^4 - 90\omega_2v_2^4\omega_6^2\omega_3^3 + 252v_2^2\omega_6^2\omega_3^3c_s^2 - 12\omega_2^3\omega_6\omega_3c_s^2 - 6\omega_2^2\omega_6\omega_3^3c_s^4 - 72\omega_2^2v_2^2\omega_6\omega_3^3 + 72v_2^4\omega_6^2\omega_3^3 + 36\omega_2^3v_2^4\omega_6\omega_3^2 - 18\omega_2^3\omega_6\omega_3^2c_s^4 + 36\omega_2^3v_2^4\omega_3^3 - 5\omega_2^3\omega_6^2\omega_3^2c_s^2 - 36\omega_2v_2^2\omega_6^2\omega_3^2c_s^2 + 36\omega_2^2v_2^2\omega_3^3 - 18\omega_2^3v_2^2\omega_6^2\omega_3c_s^2 + 12\omega_2^2\omega_6\omega_3^2c_s^4 - 99\omega_2^3v_2^2\omega_6\omega_3^3c_s^2 - 12\omega_2\omega_6^2\omega_3^3c_s^4 + 39\omega_2^3v_2^2\omega_6\omega_3^3 - 6\omega_2^2\omega_6^2\omega_3^2c_s^2 + 90\omega_2v_2^2\omega_6^2\omega_3^3 + 60\omega_2^2v_2^2\omega_6^2\omega_3^2c_s^2 - 36\omega_2^3v_2^2\omega_6\omega_3^2 + 72\omega_2^2v_2^4\omega_6\omega_3^3 - 72v_2^2\omega_6^2\omega_3^3 - 306\omega_2v_2^2\omega_6^2\omega_3^2c_s^2 + 12\omega_6^2\omega_3^2c_s^4 + 6\omega_2^3\omega_6\omega_3^2c_s^4 + 12\omega_2^3\omega_6^2c_s^4 + 19\omega_2^2v_2^4\omega_6^2\omega_3^3 + 12\omega_2^3v_2^2\omega_6^2\omega_3^2c_s^2 + 6\omega_2^3v_2^2\omega_6^2\omega_3^2 + 6\omega_2^2\omega_6^2\omega_3^2c_s^4 - 36\omega_2^3v_2^2\omega_3^3 + 198\omega_2^2v_2^2\omega_6\omega_3^2c_s^2 - 108\omega_2^3v_2^2\omega_3^2c_s^2 - 12\omega_2^2\omega_6\omega_3^2c_s^2 + 12\omega_2\omega_6^2\omega_3^2c_s^2 - 36\omega_2^2v_2^4\omega_3^3 - 108\omega_2v_2^2\omega_6\omega_3^2c_s^2 - 12\omega_6^2\omega_3^2c_s^2 - 6\omega_2^3\omega_6\omega_3^2c_s^2 - 108\omega_2^2v_2^2\omega_3^2c_s^2 + 36\omega_2^3v_2^2\omega_3^2 - 4\omega_2^3v_2^2\omega_6^2\omega_3^3 + 36\omega_2v_2^2\omega_6\omega_3^3 - \omega_2^3\omega_6^2\omega_3^2c_s^4 + 12\omega_2\omega_6^2\omega_3^2c_s^2 - 6\omega_2^3v_2^4\omega_6^2\omega_3^2 - 19\omega_2^2v_2^2\omega_6^2\omega_3^3 + 36\omega_2^2v_2^2\omega_6\omega_3^2c_s^2 + 6\omega_2^2\omega_6\omega_3^3c_s^2 + 12\omega_2^3\omega_6\omega_3c_s^4 + 108\omega_2^3v_2^2\omega_3^3c_s^2 + 6\omega_2^3\omega_6^2\omega_3c_s^2 + \omega_2^2\omega_6^2\omega_3^3c_s^4 - 3\omega_2^3v_2^2\omega_6^2\omega_3^2c_s^2 + 13\omega_2^3\omega_6^2\omega_3^2c_s^4 + 4\omega_2^3v_2^4\omega_6^2\omega_3^3 + 36\omega_2^3v_2^2\omega_6\omega_3c_s^2 + 18\omega_2^3\omega_6\omega_3^2c_s^2 - 36\omega_2v_2^4\omega_6\omega_3^3$

$C_{10} = 12 + 6\omega_2^3c_s^2 - 1008\omega_2v_2^2c_s^2 - 132c_s^2 - 98\omega_2^2v_2^2 - \omega_2^3 - 216\omega_2v_2^4 + 8\omega_2^2 + 10\omega_2^3v_2^2 - 78\omega_2^2c_s^2 - 18\omega_2 - 156v_2^2 - 216\omega_2c_s^4 - 34\omega_2^3v_2^2c_s^2 - 9\omega_2^3v_2^4 + 82\omega_2^2c_s^4 + 144v_2^4 + 672v_2^2c_s^2 + 198\omega_2c_s^2 + 404\omega_2^2v_2^2c_s^2 - 5\omega_2^3c_s^4 + 144c_s^4 + 90\omega_2^2v_2^4 + 234\omega_2v_2^2$

$C_{11} = 12 + 2\omega_2^3c_s^2 - 648\omega_2v_2^2c_s^2 - 36c_s^2 - 154\omega_2^2v_2^2 - \omega_2^3 - 756\omega_2v_2^4 + 8\omega_2^2 + 14\omega_2^3v_2^2 - 22\omega_2^2c_s^2 - 18\omega_2 - 252v_2^2 - 36\omega_2c_s^4 - 18\omega_2^3v_2^2c_s^2 - 29\omega_2^3v_2^4 + 14\omega_2^2c_s^4 + 504v_2^4 + 432v_2^2c_s^2 + 54\omega_2c_s^2 + 252\omega_2^2v_2^2c_s^2 - \omega_2^3c_s^4 + 24c_s^4 + 310\omega_2^2v_2^4 + 378\omega_2v_2^2$

2.7 CuLBM2

2.7.1 Definitions

Collision operator $\boldsymbol{C}$:

$$\boldsymbol{C}(\boldsymbol{f}) = \mathbf{M}^{-1}\boldsymbol{G}^{-1}\left(\mathbf{N}^{-1}\mathbf{S}\mathbf{N}\left(\boldsymbol{\gamma}^{(eq)} - \boldsymbol{G}(\mathbf{M}\boldsymbol{f})\right)\right),$$

where

$$\mathbf{S} = \mathrm{diag}(0,0,0,\omega_1,\omega_2,\omega_1,\omega_3,\omega_3,\omega_4),$$

$\omega_1,\omega_2,\omega_3,\omega_4 \in (0,2)$.
Matrix $\mathbf{N}$ defines the combination of cumulants for the collision as

$$\mathbf{N} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix}.$$

The nonlinear operator $\boldsymbol{G}$ is the same as in CuLBM1 in Section **??** and, again, the equilibrium cumulant vector $\boldsymbol{\gamma}^{(eq)}$ is defined by

$$\boldsymbol{\gamma}^{(eq)} = \left(\rho, v_1, v_2, 2c_s^2, 0, 0, 0, 0, 0\right)^T.$$

2.7.2 Conservation of mass: ρ

attached text file: `output_d2q9_nse_culbm2_symbolic_pde_00.txt`

$$\frac{\partial\rho}{\partial t} + \frac{v_1\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_1} + \frac{\rho\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{v_2\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_2} + \frac{\rho\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-1+3c_s^2+v_1^2)\frac{v_1\delta_l^3}{12\delta_t}\frac{\partial^3\rho}{\partial x_1^3} + (-1+c_s^2+3v_1^2)\frac{\rho\delta_l^3}{12\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} -$$
$$\frac{c_s^2\rho\delta_l^3}{6\delta_t}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2} - \frac{c_s^2\rho\delta_l^3}{6\delta_t}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2} + (-1+3c_s^2+v_2^2)\frac{v_2\delta_l^3}{12\delta_t}\frac{\partial^3\rho}{\partial x_2^3} + (-1+c_s^2+3v_2^2)\frac{\rho\delta_l^3}{12\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} + C_1\frac{\delta_l^4}{24\delta_t\omega_1\omega_2}\frac{\partial^4\rho}{\partial x_1^4} +$$
$$(5v_1^2\omega_2 + 2\omega_1\omega_2 - 5\omega_1 v_1^2\omega_2 + 5\omega_1 v_1^2 - 2\omega_1 + 3c_s^2\omega_1 - 3c_s^2\omega_1\omega_2 - 2\omega_2 + 3c_s^2\omega_2)\frac{\rho v_1\delta_l^4}{12\delta_t\omega_1\omega_2}\frac{\partial^4 v_1}{\partial x_1^4} +$$
$$(\omega_1 v_2^2 - \omega_1 - \omega_2 v_2^2 + 3c_s^2\omega_1 + \omega_2 - 3c_s^2\omega_2)\frac{v_1 v_2\delta_l^4}{8\delta_t\omega_1\omega_2}\frac{\partial^4\rho}{\partial x_1^3\partial x_2} +$$
$$(\omega_1 v_2^2 - \omega_1 - \omega_2 v_2^2 + 3c_s^2\omega_1 + \omega_2 - 3c_s^2\omega_2)\frac{\rho v_2\delta_l^4}{24\delta_t\omega_1\omega_2}\frac{\partial^4 v_1}{\partial x_1^3\partial x_2} + C_2\frac{\rho v_1\delta_l^4}{24\omega_3\delta_t\omega_1\omega_2}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} +$$
$$(-3v_1^2\omega_2 + 3\omega_1 v_2^2 + 3\omega_1 v_1^2 - 2\omega_1 - 3\omega_2 v_2^2 + 2c_s^2\omega_1 + 4c_s^2\omega_1\omega_2 + 2\omega_2 - 10c_s^2\omega_2)\frac{c_s^2\delta_l^4}{24\delta_t\omega_1\omega_2}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2} +$$
$$(-v_1^2\omega_2 + \omega_1 v_1^2 - \omega_1 + 3c_s^2\omega_1 + \omega_2 - 3c_s^2\omega_2)\frac{\rho v_1\delta_l^4}{24\delta_t\omega_1\omega_2}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} +$$
$$(\omega_1 v_2^2 - \omega_1 - \omega_2 v_2^2 + 3c_s^2\omega_1 + \omega_2 - 3c_s^2\omega_2)\frac{\rho v_2\delta_l^4}{24\delta_t\omega_1\omega_2}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2} +$$
$$(-v_1^2\omega_2 + \omega_1 v_1^2 - \omega_1 + 3c_s^2\omega_1 + \omega_2 - 3c_s^2\omega_2)\frac{v_1 v_2\delta_l^4}{8\delta_t\omega_1\omega_2}\frac{\partial^4\rho}{\partial x_1\partial x_2^3} + C_3\frac{\rho v_2\delta_l^4}{24\omega_3\delta_t\omega_1\omega_2}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} +$$
$$(-v_1^2\omega_2 + \omega_1 v_1^2 - \omega_1 + 3c_s^2\omega_1 + \omega_2 - 3c_s^2\omega_2)\frac{\rho v_1\delta_l^4}{24\delta_t\omega_1\omega_2}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3} + C_4\frac{\delta_l^4}{24\delta_t\omega_1\omega_2}\frac{\partial^4\rho}{\partial x_2^4} +$$
$$(2\omega_1\omega_2 + 5\omega_1 v_2^2 - 2\omega_1 + 5\omega_2 v_2^2 + 3c_s^2\omega_1 - 3c_s^2\omega_1\omega_2 - 2\omega_2 + 3c_s^2\omega_2 - 5\omega_1\omega_2 v_2^2)\frac{\rho v_2\delta_l^4}{12\delta_t\omega_1\omega_2}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$$C_1 = -3v_1^2\omega_2+c_s^4\omega_1+3\omega_1 v_1^2\omega_2-3\omega_1 v_1^2+c_s^4\omega_2-c_s^4\omega_1\omega_2+12c_s^2\omega_1 v_1^2+3\omega_1 v_1^4+3v_1^4\omega_2-c_s^2\omega_1+12c_s^2 v_1^2\omega_2+c_s^2\omega_1\omega_2-c_s^2\omega_2-3\omega_1 v_1^4\omega_2-12c_s^2\omega_1 v_1^2\omega_2$$

$$C_2 = \omega_3\omega_1 v_1^2+6\omega_1\omega_2+9\omega_3\omega_1 v_2^2+6\omega_3 c_s^2\omega_1\omega_2-6\omega_1 v_1^2\omega_2+\omega_3 v_1^2\omega_2-2\omega_3\omega_1\omega_2+2\omega_3\omega_2+2\omega_3\omega_1 v_1^2\omega_2+6\omega_3 c_s^2\omega_1-18c_s^2\omega_1\omega_2-4\omega_3\omega_1-9\omega_3\omega_2 v_2^2$$

$$C_3 = 9\omega_3\omega_1 v_1^2+6\omega_1\omega_2+2\omega_3\omega_1\omega_2 v_2^2+\omega_3\omega_1 v_2^2+6\omega_3 c_s^2\omega_1\omega_2-9\omega_3 v_1^2\omega_2-2\omega_3\omega_1\omega_2+2\omega_3\omega_2+6\omega_3 c_s^2\omega_1-18c_s^2\omega_1\omega_2-6\omega_1\omega_2 v_2^2-4\omega_3\omega_1+\omega_3\omega_2 v_2^2$$

$$C_4 = -3\omega_1\omega_2 v_2^4+c_s^4\omega_1+12c_s^2\omega_2 v_2^2+3\omega_2 v_2^4-3\omega_1 v_2^2+c_s^4\omega_2-12c_s^2\omega_1\omega_2 v_2^2+12c_s^2\omega_1 v_2^2-c_s^4\omega_1\omega_2+3\omega_1 v_2^4-3\omega_2 v_2^2-c_s^2\omega_1+c_s^2\omega_1\omega_2-c_s^2\omega_2+3\omega_1\omega_2 v_2^2$$

2.7.3 Conservation of momentum: ρv_1

attached text file: `output_d2q9_nse_culbm2_symbolic_pde_01.txt`

$$v_1\frac{\partial\rho}{\partial t} + \rho\frac{\partial v_1}{\partial t} + (c_s^2+v_1^2)\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_1} + \frac{2\rho v_1\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{v_1 v_2\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_2} + \frac{\rho v_2\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_2} + \frac{\rho v_1\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} +$$
$$(3v_1^2\omega_2 + \omega_1\omega_2 - 3\omega_1 v_1^2\omega_2 + 3\omega_1 v_1^2 - \omega_1 + 2c_s^2\omega_1 - 2c_s^2\omega_1\omega_2 - \omega_2 + 2c_s^2\omega_2)\frac{\delta_l^2}{\delta_t\omega_1\omega_2}\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_1} +$$
$$(-\omega_1\omega_2 + \omega_1 + \omega_2)\frac{3\rho v_1\delta_l^2}{\delta_t\omega_1\omega_2}\left(\frac{\partial v_1}{\partial x_1}\right)^2 + (3\omega_1 v_2^2 - \omega_1 - 3\omega_2 v_2^2 + c_s^2\omega_1 + \omega_2 - c_s^2\omega_2)\frac{\delta_l^2}{2\delta_t\omega_1\omega_2}\frac{\partial\rho}{\partial x_1}\frac{\partial v_2}{\partial x_2} +$$
$$(\omega_1 - \omega_2)\frac{3\rho v_2\delta_l^2}{\delta_t\omega_1\omega_2}\frac{\partial v_2}{\partial x_1}\frac{\partial v_2}{\partial x_2} + (3\omega_1 v_2^2 - \omega_1 - 3\omega_2 v_2^2 + 3c_s^2\omega_1 + c_s^2\omega_1\omega_2 + \omega_2 - 5c_s^2\omega_2)\frac{\delta_l^2}{2\delta_t\omega_1\omega_2}\frac{\partial\rho}{\partial x_2}\frac{\partial v_2}{\partial x_1} +$$
$$(-2+\omega_1)\frac{c_s^2\delta_l^2}{2\delta_t\omega_1}\frac{\partial\rho}{\partial x_2}\frac{\partial v_1}{\partial x_2} + (v_1^2\omega_2 + \omega_1\omega_2 - \omega_1 v_1^2\omega_2 + \omega_1 v_1^2 - \omega_1 + 3c_s^2\omega_1 - 3c_s^2\omega_1\omega_2 - \omega_2 + 3c_s^2\omega_2)\frac{v_1\delta_l^2}{2\delta_t\omega_1\omega_2}\frac{\partial^2\rho}{\partial x_1^2} +$$
$$(3v_1^2\omega_2 + \omega_1\omega_2 - 3\omega_1 v_1^2\omega_2 + 3\omega_1 v_1^2 - \omega_1 + c_s^2\omega_1 - c_s^2\omega_1\omega_2 - \omega_2 + c_s^2\omega_2)\frac{\rho\delta_l^2}{2\delta_t\omega_1\omega_2}\frac{\partial^2 v_1}{\partial x_1^2} +$$
$$(\omega_1 v_2^2 - \omega_1 - \omega_2 v_2^2 + 3c_s^2\omega_1 + \omega_2 - 3c_s^2\omega_2)\frac{v_2\delta_l^2}{2\delta_t\omega_1\omega_2}\frac{\partial^2\rho}{\partial x_1\partial x_2} +$$
$$(3\omega_1 v_2^2 - \omega_1 - 3\omega_2 v_2^2 + c_s^2\omega_1 + c_s^2\omega_1\omega_2 + \omega_2 - 3c_s^2\omega_2)\frac{\rho\delta_l^2}{2\delta_t\omega_1\omega_2}\frac{\partial^2 v_2}{\partial x_1\partial x_2} + (-2+\omega_1)\frac{c_s^2\rho\delta_l^2}{2\delta_t\omega_1}\frac{\partial^2 v_1}{\partial x_2^2} + C_1\frac{\delta_l^3}{12\delta_t\omega_1^2\omega_2^2}\frac{\partial^3\rho}{\partial x_1^3} +$$
$$C_2\frac{\rho v_1\delta_l^3}{12\delta_t\omega_1^2\omega_2^2}\frac{\partial^3 v_1}{\partial x_1^3} + C_3\frac{3v_1 v_2\delta_l^3}{4\delta_t\omega_1^2\omega_2^2}\frac{\partial^3\rho}{\partial x_1^2\partial x_2} + C_4\frac{\rho v_2\delta_l^3}{4\omega_3\delta_t\omega_1^2\omega_2^2}\frac{\partial^3 v_1}{\partial x_1^2\partial x_2} + C_5\frac{\rho v_1\delta_l^3}{12\omega_3\delta_t\omega_1^2\omega_2^2}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2} + C_6\frac{\delta_l^3}{12\delta_t\omega_1^2\omega_2^2}\frac{\partial^3\rho}{\partial x_1\partial x_2^2} -$$
$$\frac{c_s^2\rho v_1\delta_l^3}{6\delta_t}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2} + C_7\frac{\rho v_2\delta_l^3}{4\delta_t\omega_1^2\omega_2^2}\frac{\partial^3 v_2}{\partial x_1\partial x_2^2} + (-1+3c_s^2+v_2^2)\frac{v_1 v_2\delta_l^3}{12\delta_t}\frac{\partial^3\rho}{\partial x_2^3} + C_8\frac{\rho v_2\delta_l^3}{6\omega_3\delta_t\omega_1}\frac{\partial^3 v_1}{\partial x_2^3} + (-1+c_s^2+3v_2^2)\frac{\rho v_1\delta_l^3}{12\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} +$$
$$C_9\frac{v_1\delta_l^4}{24\omega_3\delta_t\omega_1^3\omega_2^3}\frac{\partial^4\rho}{\partial x_1^4} + C_{10}\frac{\rho\delta_l^4}{24\omega_3\delta_t\omega_1^3\omega_2^3}\frac{\partial^4 v_1}{\partial x_1^4} + C_{11}\frac{v_2\delta_l^4}{24\omega_3^2\delta_t\omega_1^3\omega_2^3}\frac{\partial^4\rho}{\partial x_1^3\partial x_2} + C_{12}\frac{\rho v_1 v_2\delta_l^4}{24\omega_3\delta_t\omega_1^3\omega_2^3}\frac{\partial^4 v_1}{\partial x_1^3\partial x_2} +$$
$$C_{13}\frac{\rho\delta_l^4}{24\omega_3^2\delta_t\omega_1^3\omega_2^3}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} + C_{14}\frac{v_1\delta_l^4}{24\omega_3^2\delta_t\omega_1^3\omega_2^3}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2} + C_{15}\frac{\rho\delta_l^4}{24\omega_3^2\delta_t\omega_1^3\omega_2^3}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} + C_{16}\frac{\rho v_1 v_2\delta_l^4}{24\omega_3\delta_t\omega_1^3\omega_2^3}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2} +$$

$$C_{17}\frac{v_2\delta_t^4}{24\omega_3^2\delta_t\omega_1^3\omega_2^3}\frac{\partial^4\rho}{\partial x_1\partial x_2^3}+C_{18}\frac{\rho v_1v_2\delta_t^4}{24\omega_3\delta_t\omega_1\omega_2}\frac{\partial^4v_1}{\partial x_1\partial x_2^3}+C_{19}\frac{\rho\delta_t^4}{24\omega_3\delta_t\omega_1^3\omega_2^3}\frac{\partial^4v_2}{\partial x_1\partial x_2^3}+C_{20}\frac{v_1\delta_t^4}{24\delta_t\omega_1\omega_2}\frac{\partial^4\rho}{\partial x_2^4}+C_{21}\frac{\rho\delta_t^4}{24\omega_3^2\delta_t\omega_1^3}\frac{\partial^4v_1}{\partial x_2^4}+$$
$$(2\omega_1\omega_2+5\omega_1v_2^2-2\omega_1+5\omega_2v_2^2+3c_s^2\omega_1-3c_s^2\omega_1\omega_2-2\omega_2+3c_s^2\omega_2-5\omega_1\omega_2v_2^2)\frac{\rho v_1v_2\delta_t^4}{12\delta_t\omega_1\omega_2}\frac{\partial^4v_2}{\partial x_2^4}=0,$$

where:

$$C_1=6c_s^4\omega_2^2+c_s^4\omega_1^2\omega_2^2+6c_s^2\omega_1^2\omega_2+18\omega_1v_1^2\omega_2^2-72c_s^2\omega_1^2v_1^2\omega_2-18\omega_1^2v_1^4\omega_2+9\omega_1^2v_1^4+45c_s^2\omega_1^2v_1^2+24c_s^2\omega_1^2v_1^2\omega_2^2+7\omega_1^2v_1^4\omega_2^2-c_s^2\omega_1^2\omega_2^2-18\omega_1v_1^2\omega_2-9v_1^2\omega_2^2-6c_s^4\omega_1^2\omega_2+6c_s^4\omega_1^2-18\omega_1v_1^4\omega_2^2-72c_s^2\omega_1v_1^2\omega_2^2-9\omega_1^2v_1^2+18\omega_1^2v_1^2\omega_2-6c_s^2\omega_2^2+45c_s^2v_1^2\omega_2^2+6c_s^2\omega_1\omega_2^2+9v_1^4\omega_2^2-6c_s^2\omega_1^2-7\omega_1^2v_1^2\omega_2^2-6c_s^4\omega_1\omega_2^2+18\omega_1v_1^4\omega_2+54c_s^2\omega_1v_1^2\omega_2$$

$$C_2=-18\omega_1\omega_2-36c_s^2\omega_1^2\omega_2-60\omega_1v_1^2\omega_2^2+10c_s^2\omega_1^2\omega_2^2+54\omega_1v_1^2\omega_2+33v_1^2\omega_2^2+24\omega_1\omega_2^2-8\omega_1^2\omega_2^2-15\omega_1^2+33\omega_1^2v_1^2-60\omega_1^2v_1^2\omega_2+27c_s^2\omega_2^2-36c_s^2\omega_1\omega_2^2+18c_s^2\omega_1\omega_2+27c_s^2\omega_1^2+22\omega_1^2v_1^2\omega_2^2-15\omega_2^2+24\omega_1^2\omega_2$$

$$C_3=-\omega_1^2\omega_2v_2^2+2\omega_1\omega_2-3c_s^2\omega_1^2\omega_2+\omega_1\omega_2^2v_2^2-2\omega_1v_1^2\omega_2+v_1^2\omega_2^2-\omega_1\omega_2^2-\omega_2^2v_2^2-2\omega_1^2+\omega_1^2v_1^2+\omega_1^2v_2^2+3c_s^2\omega_1\omega_2^2-6c_s^2\omega_1\omega_2+6c_s^2\omega_1^2+\omega_1^2\omega_2$$

$$C_4=-2\omega_3\omega_2^2v_2^2-2\omega_1^2\omega_2v_2^2+9\omega_3v_1^2\omega_2^2-\omega_3\omega_1\omega_2^2-6c_s^2\omega_1^2\omega_2-6\omega_3c_s^2\omega_1\omega_2+2\omega_1\omega_2^2v_2^2+3\omega_3c_s^2\omega_1\omega_2^2-2\omega_1\omega_2^2+6\omega_3\omega_1\omega_2+\omega_3\omega_1^2\omega_2-5\omega_3\omega_1^2-18\omega_3\omega_1v_1^2\omega_2+9\omega_3c_s^2\omega_1^2+6c_s^2\omega_1\omega_2^2+\omega_3\omega_1\omega_2^2v_2^2+2\omega_3\omega_1^2v_2^2-3\omega_3c_s^2\omega_2^2-3\omega_3c_s^2\omega_1^2\omega_2-\omega_3\omega_1^2\omega_2v_2^2+9\omega_3\omega_1^2v_1^2+2\omega_1^2\omega_2-\omega_3\omega_2^2$$

$$C_5=-27\omega_3\omega_2^2v_2^2-3\omega_3\omega_1^2v_1^2\omega_2^2+6\omega_3v_1^2\omega_2^2-12\omega_3\omega_1\omega_2^2-18c_s^2\omega_1^2\omega_2-18\omega_1v_1^2\omega_2^2+18\omega_3c_s^2\omega_1\omega_2^2+36c_s^2\omega_1^2\omega_2^2-3\omega_3\omega_1^2v_1^2\omega_2+18\omega_1\omega_2^2-12\omega_1^2\omega_2^2+12\omega_3\omega_1^2\omega_2-6\omega_1^2v_1^2\omega_2-15\omega_3\omega_1^2-11\omega_3c_s^2\omega_1^2\omega_2^2+27\omega_3c_s^2\omega_1^2-54c_s^2\omega_1\omega_2^2+27\omega_3\omega_1\omega_2^2v_2^2+27\omega_3\omega_1^2v_2^2+9\omega_3c_s^2\omega_2^2-18\omega_3c_s^2\omega_1^2\omega_2+3\omega_3\omega_1v_1^2\omega_2^2-27\omega_3\omega_1^2\omega_2v_2^2+12\omega_1^2v_1^2\omega_2^2+6\omega_3\omega_1^2v_1^2+6\omega_1^2\omega_2+3\omega_3\omega_1^2\omega_2^2+3\omega_3\omega_2^2$$

$$C_6=-30c_s^4\omega_2^2+9\omega_1^2\omega_2v_2^2-2c_s^4\omega_1^2\omega_2^2+6c_s^2\omega_1^2\omega_2-9\omega_1\omega_2^2v_2^2+9\omega_1^2v_2^4+45c_s^2\omega_1^2v_2^2-6c_s^4\omega_1^2\omega_2+6c_s^4\omega_1^2+9\omega_2^2v_2^2+45c_s^2\omega_1\omega_2^2v_2^2-9\omega_2^2v_2^4-45c_s^2\omega_2^2v_2^2+6c_s^2\omega_2^2-45c_s^2\omega_1^2\omega_2v_2^2-9\omega_1^2v_2^2-6c_s^2\omega_1\omega_2^2-9\omega_1^2\omega_2v_2^4-6c_s^2\omega_1^2+9\omega_1\omega_2^2v_2^4+30c_s^4\omega_1\omega_2^2$$

$$C_7=-11\omega_1^2\omega_2v_2^2-9c_s^2\omega_1^2\omega_2+11\omega_1\omega_2^2v_2^2-5\omega_1\omega_2^2-11\omega_2^2v_2^2-5\omega_1^2-9c_s^2\omega_2^2+11\omega_1^2v_2^2+9c_s^2\omega_1\omega_2^2+9c_s^2\omega_1^2+5\omega_2^2+5\omega_1^2\omega_2$$

$$C_8=6+9\omega_3c_s^2-3\omega_3-18c_s^2-\omega_3\omega_1v_2^2+3\omega_1v_2^2-3\omega_1+9c_s^2\omega_1-3\omega_3c_s^2\omega_1+3\omega_3v_2^2-6v_2^2+\omega_3\omega_1$$

$$C_9=90\omega_3\omega_1^3v_1^4\omega_2^2+54\omega_3c_s^4\omega_1\omega_2^2+210\omega_3\omega_1^2v_1^2\omega_2^2-36c_s^4\omega_1^2\omega_2^2+404\omega_3c_s^2\omega_1^3v_1^2\omega_2^2+6\omega_3\omega_1\omega_2^2-171\omega_3c_s^4\omega_1\omega_2^3-18\omega_3\omega_1^3v_1^4\omega_2^3-68\omega_3c_s^2\omega_1^3v_1^2\omega_2^3-12\omega_3\omega_1\omega_2^3-51\omega_3v_1^2\omega_2^3+18c_s^4\omega_1^3\omega_2+90\omega_3c_s^4\omega_1^3-98\omega_3\omega_1^2v_1^2\omega_2^3-60\omega_3c_s^2\omega_1\omega_2^2-12c_s^2\omega_1^2v_1^2\omega_2^2-600\omega_3c_s^2\omega_1v_1^2\omega_2^3-117\omega_3\omega_1v_1^4\omega_2^3+12c_s^2\omega_1^2\omega_2^2+90\omega_3c_s^4\omega_2^3+45\omega_3\omega_1^3v_1^4-105\omega_3\omega_1^2v_1^2\omega_2+411\omega_3c_s^2\omega_1v_1^2\omega_2^2+261\omega_3c_s^2v_1^2\omega_2^3+141\omega_3c_s^2\omega_1\omega_2^3-600\omega_3c_s^2\omega_1^3v_1^2\omega_2-117\omega_3\omega_1^3v_1^4\omega_2-6c_s^2\omega_1^3\omega_2+99\omega_3\omega_1v_1^4\omega_2^2+6c_s^2\omega_1^3v_1^2\omega_2+404\omega_3c_s^2\omega_1^2v_1^2\omega_2^3-78\omega_3c_s^2\omega_1^2\omega_2^3+20\omega_3\omega_1^3v_1^2\omega_2^3+6\omega_3\omega_1^2\omega_2+141\omega_3c_s^2\omega_1^3\omega_2-2\omega_3\omega_1^3\omega_2^3+54\omega_3c_s^4\omega_1^2\omega_2+45\omega_3v_1^4\omega_2^3-10\omega_3c_s^4\omega_1^3\omega_2^3-6c_s^2\omega_1\omega_2^3-72\omega_3c_s^2\omega_1^3+90\omega_3\omega_1^2v_1^4\omega_2^3+8\omega_3\omega_1^3\omega_2^3+6c_s^2\omega_1v_1^2\omega_2^3-98\omega_3\omega_1^3v_1^2\omega_2^2+114\omega_3c_s^2\omega_1^2\omega_2^2-816\omega_3c_s^2\omega_1^2v_1^2\omega_2^2-198\omega_3\omega_1^2v_1^4\omega_2^2-51\omega_3\omega_1^3v_1^2+6\omega_3\omega_1^3+82\omega_3c_s^4\omega_1^3\omega_2^2+99\omega_3\omega_1^2v_1^4\omega_2-171\omega_3c_s^4\omega_1^3\omega_2+82\omega_3c_s^4\omega_1^2\omega_2^3+6\omega_3\omega_2^3-12\omega_3\omega_1^3\omega_2+12\omega_3c_s^2\omega_1^3\omega_2^3+8\omega_3\omega_1^2\omega_2^3-60\omega_3c_s^2\omega_1^2\omega_2+129\omega_3\omega_1^3v_1^2\omega_2+411\omega_3c_s^2\omega_1^2v_1^2\omega_2-105\omega_3\omega_1v_1^2\omega_2^2+18c_s^4\omega_1\omega_2^2-90\omega_3c_s^4\omega_1^2\omega_2^2+261\omega_3c_s^2\omega_1^3v_1^2+129\omega_3\omega_1v_1^2\omega_2^3-12\omega_3\omega_1^2\omega_2^2-78\omega_3c_s^2\omega_1^3\omega_2^2-72\omega_3c_s^2\omega_2^3$$

$$C_{10}=310\omega_3\omega_1^3v_1^4\omega_2^2+6\omega_3c_s^4\omega_1\omega_2^2+306\omega_3\omega_1^2v_1^2\omega_2^2-12c_s^4\omega_1^2\omega_2^2+252\omega_3c_s^2\omega_1^3v_1^2\omega_2^2+6\omega_3\omega_1\omega_2^2-33\omega_3c_s^4\omega_1\omega_2^3-58\omega_3\omega_1^3v_1^4\omega_2^3-36\omega_3c_s^2\omega_1^3v_1^2\omega_2^3-12\omega_3\omega_1\omega_2^3-99\omega_3v_1^2\omega_2^3+6c_s^4\omega_1^3\omega_2+18\omega_3c_s^4\omega_1^3-154\omega_3\omega_1^2v_1^2\omega_2^3-12\omega_3c_s^2\omega_1\omega_2^2-36c_s^2\omega_1^2v_1^2\omega_2^2-432\omega_3c_s^2\omega_1v_1^2\omega_2^3-423\omega_3\omega_1v_1^4\omega_2^3+12c_s^2\omega_1^2\omega_2^2+18\omega_3c_s^4\omega_2^3+171\omega_3\omega_1^3v_1^4-153\omega_3\omega_1^2v_1^2\omega_2+225\omega_3c_s^2\omega_1v_1^2\omega_2^2+207\omega_3c_s^2v_1^2\omega_2^3+45\omega_3c_s^2\omega_1\omega_2^3-432\omega_3c_s^2\omega_1^3v_1^2\omega_2-423\omega_3\omega_1^3v_1^4\omega_2-6c_s^2\omega_1^3\omega_2+333\omega_3\omega_1v_1^4\omega_2^2+18c_s^2\omega_1^3v_1^2\omega_2+252\omega_3c_s^2\omega_1^2v_1^2\omega_2^3-22\omega_3c_s^2\omega_1^3\omega_2^3+28\omega_3\omega_1^3v_1^2\omega_2^3+6\omega_3\omega_1^2\omega_2+45\omega_3c_s^2\omega_1^3\omega_2-2\omega_3\omega_1^3\omega_2^3+6\omega_3c_s^4\omega_1^2\omega_2+171\omega_3v_1^4\omega_2^3-2\omega_3c_s^4\omega_1^3\omega_2^3-6c_s^2\omega_1\omega_2^3-24\omega_3c_s^2\omega_1^3+310\omega_3\omega_1^2v_1^4\omega_2^3+8\omega_3\omega_1^3\omega_2^3+18c_s^2\omega_1v_1^2\omega_2^3-154\omega_3\omega_1^3v_1^2\omega_2^2+18\omega_3c_s^2\omega_1^2\omega_2^2-432\omega_3c_s^2\omega_1^2v_1^2\omega_2^2-666\omega_3\omega_1^2v_1^4\omega_2^2-99\omega_3\omega_1^3v_1^2+6\omega_3\omega_1^3+14\omega_3c_s^4\omega_1^3\omega_2^2+333\omega_3\omega_1^2v_1^4\omega_2-33\omega_3c_s^4\omega_1^3\omega_2+14\omega_3c_s^4\omega_1^2\omega_2^3+6\omega_3\omega_2^3-12\omega_3\omega_1^3\omega_2+4\omega_3c_s^2\omega_1^3\omega_2^3+8\omega_3\omega_1^2\omega_2^3-12\omega_3c_s^2\omega_1^2\omega_2+225\omega_3\omega_1^3v_1^2\omega_2+225\omega_3c_s^2\omega_1^2v_1^2\omega_2-153\omega_3\omega_1v_1^2\omega_2^2+6c_s^4\omega_1\omega_2^3-6\omega_3c_s^4\omega_1^2\omega_2^2+207\omega_3c_s^2\omega_1^3v_1^2+225\omega_3\omega_1v_1^2\omega_2^3-12\omega_3\omega_1^2\omega_2^2-22\omega_3c_s^2\omega_1^3\omega_2^2-24\omega_3c_s^2\omega_2^3$$

$$C_{11}=9\omega_3^2\omega_1^2v_1^2\omega_2v_2^2-45\omega_3^2v_1^2\omega_2^3v_2^2+12c_s^2\omega_1^2\omega_2^3v_2^2-54\omega_3^2c_s^4\omega_1^2\omega_2+12c_s^2\omega_1^3\omega_2^2+45\omega_3^2\omega_1^3v_1^2v_2^2+18\omega_3c_s^2\omega_1^3\omega_2^2v_2^2-6\omega_3^2\omega_1\omega_2^3v_2^2+5\omega_3^2c_s^2\omega_1^2\omega_2^3+75\omega_3^2c_s^2\omega_1^3\omega_2-\omega_3^2\omega_1^2\omega_2^3-6\omega_3^2\omega_1^3\omega_2+21\omega_3^2c_s^2\omega_1\omega_2^3v_2^2+6\omega_3^2c_s^4\omega_1^3\omega_2^2+72\omega_3^2\omega_1v_1^2\omega_2^3v_2^2+108\omega_3^2\omega_1^2v_1^4\omega_2^2+18\omega_3c_s^4\omega_1\omega_2^3+6\omega_3c_s^2\omega_1\omega_2^3v_2^2-\omega_3^2\omega_1^3\omega_2^2v_2^2+72\omega_3^2c_s^2\omega_1^3v_1^2\omega_2^2-6\omega_3^2\omega_2^3+36c_s^4\omega_1^2\omega_2^3-72\omega_3^2c_s^2\omega_1^2\omega_2^2-24\omega_3^2\omega_1^3v_1^2\omega_2^2+2\omega_3^2c_s^2\omega_1^3\omega_2^2v_2^2+6\omega_3^2c_s^2\omega_1\omega_2^2v_2^2-6\omega_3^2\omega_1^2\omega_2+63\omega_3^2\omega_1v_1^2\omega_2^2+126\omega_3^2\omega_1^3v_1^2\omega_2+60\omega_3^2c_s^2\omega_1^2\omega_2-36c_s^4\omega_1^3\omega_2^2-72\omega_3^2c_s^2\omega_1^3-99\omega_3^2c_s^4\omega_1^3\omega_2+18\omega_3^2c_s^2\omega_1^3v_2^2+6\omega_3^2\omega_1^3-6\omega_3^2c_s^4\omega_1^2\omega_2^3-297\omega_3^2c_s^2\omega_1v_1^2\omega_2^2-6\omega_3^2\omega_1\omega_2^2v_2^2-6\omega_3^2\omega_1^3v_2^2+54\omega_3^2v_1^4\omega_2^3-54\omega_3^2\omega_1^2v_1^4\omega_2-486\omega_3^2c_s^2\omega_1^3v_1^2\omega_2-5\omega_3^2c_s^2\omega_1^3\omega_2^2-18\omega_3^2\omega_1v_1^2\omega_2^3-72\omega_3^2\omega_1^3v_1^2\omega_2v_2^2-6\omega_3^2c_s^2\omega_1^2\omega_2v_2^2-6\omega_3c_s^2\omega_1\omega_2^3+\omega_3^2\omega_1^3\omega_2^2+405\omega_3^2c_s^2\omega_1^3v_1^2+72\omega_3^2c_s^4\omega_1^2\omega_2^2-54\omega_3^2c_s^2\omega_1v_1^2\omega_2^3-12c_s^2\omega_1^2\omega_2^3+6\omega_3^2\omega_1^2\omega_2v_2^2-99\omega_3^2\omega_1^3v_1^2-9\omega_3^2\omega_1v_1^2\omega_2^2v_2^2+18\omega_3c_s^2\omega_1^2\omega_2^3+24\omega_3^2\omega_1^3v_1^2\omega_2^2-108\omega_3^2\omega_1^2v_1^2\omega_2^2+6\omega_3c_s^2\omega_1^3\omega_2-18\omega_3^2c_s^4\omega_1^3-18\omega_3^2c_s^2\omega_1^3v_2^2+540\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^2+6\omega_3^2\omega_1^3v_2^2-18\omega_3^2c_s^4\omega_1\omega_2^2+24\omega_3^2\omega_1^2v_1^2\omega_2^3+54\omega_3^2\omega_1^3v_1^4+27\omega_3^2c_s^4\omega_1\omega_2^3-72\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^3+54\omega_3c_s^4\omega_1^3\omega_2^2-24\omega_3^2\omega_1^2v_1^2\omega_2^3v_2^2+\omega_3^2\omega_1^2\omega_2^3v_2^2-54\omega_3^2\omega_1v_1^4\omega_2^3-18\omega_3c_s^4\omega_1^2\omega_2+6\omega_3^2\omega_1^3\omega_2v_2^2-54\omega_3c_s^4\omega_1^2\omega_2^3-2\omega_3^2c_s^2\omega_1^2\omega_2^3v_2^2+6\omega_3^2\omega_1\omega_2^2-21\omega_3^2c_s^2\omega_1^3\omega_2v_2^2+12\omega_3^2c_s^2\omega_1\omega_2^2-18\omega_3c_s^2\omega_1^2\omega_2^3v_2^2-54\omega_3^2\omega_1v_1^4\omega_2^2-12c_s^2\omega_1^3\omega_2^2v_2^2-6\omega_3c_s^2\omega_1^3\omega_2v_2^2-54\omega_3c_s^4\omega_1^2\omega_2^3-2\omega_3^2c_s^2\omega_1^2\omega_2^3v_2^2+6\omega_3^2\omega_1\omega_2^2-21\omega_3^2c_s^2\omega_1^3\omega_2v_2^2+12\omega_3^2c_s^2\omega_1\omega_2^2-18\omega_3c_s^2\omega_1^2\omega_2^3v_2^2-54\omega_3^2\omega_1v_1^4\omega_2^2-12c_s^2\omega_1^3\omega_2^2v_2^2-6\omega_3c_s^2\omega_1^3\omega_2v_2^2-243\omega_3^2c_s^2\omega_1^2v_1^2\omega_2-54\omega_3^2\omega_1^3v_1^4\omega_2+90\omega_3^2c_s^4\omega_1^3+135\omega_3^2c_s^2v_1^2\omega_2^3-3\omega_3^2c_s^2\omega_1\omega_2^3+45\omega_3^2\omega_1^2v_1^2\omega_2-9\omega_3^2v_1^2\omega_2^3-18\omega_3c_s^2\omega_1^3\omega_2^2+6\omega_3^2\omega_1\omega_2^3$$

$$C_{12}=54c_s^2\omega_1^3\omega_2^2+396\omega_3\omega_1^2v_1^2\omega_2^2+90\omega_3\omega_1\omega_2^2+45\omega_3\omega_1\omega_2^3+198\omega_3v_1^2\omega_2^3+18\omega_1^3\omega_2^2v_2^2-162\omega_3c_s^2\omega_1\omega_2^2-18\omega_1\omega_2^3-36\omega_3\omega_2^3v_2^2-45\omega_3\omega_1^3\omega_2v_2^2-10\omega_3\omega_1^2\omega_2^3v_2^2+18\omega_1\omega_2^3v_2^2-198\omega_3\omega_1^2v_1^2\omega_2-27\omega_3c_s^2\omega_1\omega_2^3-54c_s^2\omega_1^3\omega_2-54c_s^2\omega_1^2\omega_2^2-30\omega_3c_s^2\omega_1^2\omega_2^3+90\omega_3\omega_1^2\omega_2-297\omega_3c_s^2\omega_1^3\omega_2+36\omega_3\omega_1^3v_2^2+45\omega_3\omega_1\omega_2^3v_2^2+54c_s^2\omega_1\omega_2^3+270\omega_3c_s^2\omega_1^3-10\omega_3\omega_1^3\omega_2^2+324\omega_3c_s^2\omega_1^2\omega_2^2-18\omega_1^3\omega_2v_2^2+18\omega_1^3\omega_2-18\omega_1^2\omega_2^3v_2^2+18\omega_1^2\omega_2^3+198\omega_3\omega_1^3v_1^2-126\omega_3\omega_1^3+10\omega_3\omega_1^3\omega_2^2v_2^2-54\omega_3\omega_2^3+135\omega_3\omega_1^3\omega_2+10\omega_3\omega_1^2\omega_2^3-162\omega_3c_s^2\omega_1^2\omega_2-198\omega_3\omega_1^3v_1^2\omega_2-18\omega_1^3\omega_2^2-198\omega_3\omega_1v_1^2\omega_2^2-198\omega_3\omega_1v_1^2\omega_2^3-180\omega_3\omega_1^2\omega_2^2+30\omega_3c_s^2\omega_1^3\omega_2^2+54\omega_3c_s^2\omega_2^3$$

$$C_{13}=27\omega_3^2\omega_1^2v_1^2\omega_2v_2^2+24\omega_3^2c_s^2\omega_1^3v_1^2\omega_2^3-135\omega_3^2v_1^2\omega_2^3v_2^2+7\omega_3^2\omega_1^2v_1^4\omega_2^3+72\omega_3\omega_1^3v_1^4\omega_2^2-30\omega_3^2c_s^4\omega_1^2\omega_2+135\omega_3^2\omega_1^3v_1^2v_2^2-36\omega_3c_s^2\omega_1^3\omega_2^2v_2^2-18\omega_3^2\omega_1\omega_2^3v_2^2-2\omega_3^2c_s^4\omega_1^3\omega_2^3-8\omega_3^2\omega_1^3v_1^2\omega_2^3-12\omega_3^2c_s^2\omega_1^2\omega_2^3+36\omega_3\omega_1^2v_1^2\omega_2^2+21\omega_3^2c_s^2\omega_1^3\omega_2-\omega_3^2\omega_1^2\omega_2^3+198\omega_3c_s^2\omega_1^3v_1^2\omega_2^2-6\omega_3^2\omega_1^3\omega_2-$$

$$9\omega_3^2c_s^2\omega_1\omega_2^3v_2^2-\omega_3^2c_s^4\omega_1^3\omega_2^2+216\omega_3^2\omega_1v_1^2\omega_2^3v_2^2-54\omega_3^2\omega_1^2v_1^4\omega_2^2+18\omega_3c_s^4\omega_1\omega_2^3-78\omega_3\omega_1^3v_1^4\omega_2^3-54\omega_3c_s^2\omega_1\omega_2^3v_2^2-3\omega_3^2\omega_1^3\omega_2^2v_2^2+$$
$$84\omega_3^2c_s^2\omega_1^3v_1^2\omega_2^2-198\omega_3c_s^2\omega_1^3v_1^2\omega_2^3-6\omega_3^2\omega_2^3-12\omega_3^2c_s^2\omega_1^2\omega_2^2-43\omega_3^2\omega_1^3v_1^2\omega_2^2-6\omega_3^2c_s^2\omega_1^3\omega_2^2v_2^2-144\omega_3\omega_1^2v_1^2\omega_2^3+18\omega_3^2c_s^2\omega_1\omega_2^2v_2^2-6\omega_3^2\omega_1^2\omega_2-$$
$$27\omega_3^2\omega_1v_1^2\omega_2^2+54\omega_3c_s^2\omega_1v_1^2\omega_2^3+135\omega_3^2\omega_1^3v_1^2\omega_2+36\omega_3^2c_s^2\omega_1^2\omega_2+36\omega_1^3v_1^2\omega_2^2-24\omega_3^2c_s^2\omega_1^3-18\omega_3\omega_1v_1^4\omega_2^3-15\omega_3^2c_s^4\omega_1^3\omega_2+18\omega_3^2c_s^2\omega_1^3v_2^2+$$
$$6\omega_3^2\omega_1^3+29\omega_3^2c_s^4\omega_1^2\omega_2^3+99\omega_3^2c_s^2\omega_1v_1^2\omega_2^2-18\omega_3^2\omega_1\omega_2^2v_2^2-18\omega_3^2\omega_1^3v_2^2+36\omega_3^2v_1^4\omega_2^3+36\omega_3^2\omega_1^2v_1^4\omega_2-297\omega_3^2c_s^2\omega_1^3v_1^2\omega_2-108\omega_1^2v_1^4\omega_2^3-$$
$$9\omega_3^2\omega_1v_1^2\omega_2^3-216\omega_3^2\omega_1^3v_1^2\omega_2v_2^2-324c_s^2\omega_1^2v_1^2\omega_2^3-54\omega_3^2c_s^2\omega_1^2\omega_2v_2^2-18\omega_3c_s^2\omega_1\omega_2^3+\omega_3^2\omega_1^3\omega_2^2-54\omega_3c_s^2\omega_1^3v_1^2\omega_2+189\omega_3^2c_s^2\omega_1^3v_1^2-18\omega_3\omega_1^3v_1^4\omega_2+$$
$$12\omega_3^2c_s^4\omega_1^2\omega_2^2-171\omega_3^2c_s^2\omega_1v_1^2\omega_2^3-72\omega_1^3v_1^2\omega_2^3+18\omega_3^2\omega_1^2\omega_2v_2^2-81\omega_3^2\omega_1^3v_1^2-27\omega_3^2\omega_1v_1^2\omega_2^2v_2^2+306\omega_3c_s^2\omega_1^2v_1^2\omega_2^3+18\omega_3^2c_s^2\omega_1^2\omega_2^2v_2^2+$$
$$30\omega_3c_s^2\omega_1^2\omega_2^3+78\omega_3\omega_1^3v_1^2\omega_2^3+72\omega_3^2\omega_1^3v_1^2\omega_2^2v_2^2+54\omega_3^2\omega_1^2v_1^2\omega_2^2-6\omega_3c_s^2\omega_1^3\omega_2+30\omega_3^2c_s^4\omega_2^3+18\omega_3^2c_s^2\omega_2^3v_2^2+12\omega_3c_s^4\omega_1^3\omega_2^3-144\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^2+$$
$$18\omega_3^2\omega_2^3v_2^2+144\omega_3\omega_1^2v_1^4\omega_2^3+6\omega_3^2c_s^4\omega_1\omega_2^2+19\omega_3^2\omega_1^3v_1^4\omega_2^2-72\omega_3\omega_1^3v_1^2\omega_2^2-24\omega_3c_s^2\omega_1^2\omega_2^2+17\omega_3^2\omega_1^2v_1^2\omega_2^3-72\omega_3c_s^2\omega_1^2v_1^2\omega_2^2+36\omega_3^2\omega_1^3v_1^4-$$
$$36\omega_3\omega_1^2v_1^4\omega_2^2+8\omega_3^2\omega_1^3v_1^4\omega_2^3-57\omega_3^2c_s^4\omega_1\omega_2^3+30\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^3+36\omega_3c_s^2\omega_1^2\omega_2^2v_2^2-18\omega_3c_s^4\omega_1^3\omega_2^2-72\omega_3^2\omega_1^2v_1^2\omega_2^3v_2^2+3\omega_3^2\omega_1^2\omega_2^3v_2^2-63\omega_3^2\omega_1v_1^4\omega_2^3+$$
$$6\omega_3c_s^4\omega_1^3\omega_2+18\omega_3^2\omega_1^3\omega_2v_2^2+108\omega_1^2v_1^2\omega_2^3-30\omega_3c_s^4\omega_1^2\omega_2^3+6\omega_3^2c_s^2\omega_1^2\omega_2^3v_2^2-12\omega_3c_s^2\omega_1^3\omega_2^3+6\omega_3^2\omega_1\omega_2^2+18\omega_3\omega_1^3v_1^2\omega_2-9\omega_3^2c_s^2\omega_1^3\omega_2v_2^2+$$
$$216c_s^2\omega_1^3v_1^2\omega_2^3-12\omega_3^2c_s^2\omega_1\omega_2^2+72\omega_1^3v_1^4\omega_2^3+24\omega_3c_s^4\omega_1^2\omega_2^2+36\omega_3c_s^2\omega_1^2\omega_2^3v_2^2+36\omega_3^2\omega_1v_1^4\omega_2^2+18\omega_3c_s^2\omega_1^3\omega_2v_2^2+81\omega_3^2c_s^2\omega_1^2v_1^2\omega_2-63\omega_3^2\omega_1^3v_1^4\omega_2+$$
$$18\omega_3^2c_s^4\omega_1^3-36\omega_1^3v_1^4\omega_2^2+63\omega_3^2c_s^2v_1^2\omega_2^3+18\omega_3\omega_1v_1^2\omega_2^3-108c_s^2\omega_1^3v_1^2\omega_2^2+15\omega_3^2c_s^2\omega_1\omega_2^3-45\omega_3^2\omega_1^2v_1^2\omega_2+9\omega_3^2v_1^2\omega_2^3+18\omega_3c_s^2\omega_1^3\omega_2^2+6\omega_3^2\omega_1\omega_2^3$$

$$C_{14}=-45\omega_3^2\omega_1^2v_1^2\omega_2v_2^2+2\omega_3^2c_s^2\omega_1^3v_1^2\omega_2^3+45\omega_3^2v_1^2\omega_2^3v_2^2-18\omega_3^2c_s^4\omega_1^2\omega_2+12c_s^2\omega_1^3\omega_2^2+45\omega_3^2\omega_1^3v_1^2v_2^2-9\omega_3^2\omega_1\omega_2^3v_2^2+10\omega_3^2c_s^4\omega_1^3\omega_2^3-$$
$$27\omega_3^2\omega_1^2\omega_2^3v_2^4+41\omega_3^2c_s^2\omega_1^2\omega_2^3+93\omega_3^2c_s^2\omega_1^3\omega_2-54\omega_3^2\omega_1^3\omega_2v_2^4-6\omega_3^2\omega_1^3\omega_2+189\omega_3^2c_s^2\omega_1\omega_2^3v_2^2+35\omega_3^2c_s^4\omega_1^3\omega_2^2-45\omega_3^2\omega_1v_1^2\omega_2^3v_2^2-24c_s^2\omega_1^3\omega_2^3-$$
$$90\omega_3c_s^4\omega_1\omega_2^3-27\omega_3^2\omega_1^3\omega_2^2v_2^2+8\omega_3^2c_s^2\omega_1^3v_1^2\omega_2^2-12\omega_3c_s^2\omega_1^3v_1^2\omega_2^3+12\omega_3^2\omega_1^2\omega_2^2+6\omega_3^2\omega_2^3-108c_s^4\omega_1^2\omega_2^3-54\omega_3^2c_s^2\omega_1^2\omega_2^2+138\omega_3^2c_s^2\omega_1^3\omega_2^2v_2^2+$$
$$27\omega_3^2c_s^2\omega_1\omega_2^2v_2^2-6\omega_3^2\omega_1^2\omega_2+6\omega_3^2\omega_1v_1^2\omega_2^2-2\omega_3^2c_s^2\omega_1^3\omega_2^3-30\omega_3c_s^2\omega_1v_1^2\omega_2^3-54\omega_3^2\omega_2^3v_2^4+6\omega_3^2\omega_1^3v_1^2\omega_2+24\omega_3^2c_s^2\omega_1^2\omega_2-36c_s^4\omega_1^3\omega_2^2-72\omega_3^2c_s^2\omega_1^3-$$
$$117\omega_3^2c_s^4\omega_1^3\omega_2+405\omega_3^2c_s^2\omega_1^3v_2^2+6\omega_3^2\omega_1^3-91\omega_3^2c_s^4\omega_1^2\omega_2^3-30\omega_3^2c_s^2\omega_1v_1^2\omega_2^2-9\omega_3^2\omega_1\omega_2^2v_2^2-99\omega_3^2\omega_1^3v_2^2-21\omega_3^2c_s^2\omega_1^3v_1^2\omega_2+72c_s^4\omega_1^3\omega_2^3-$$
$$25\omega_3^2c_s^2\omega_1^3\omega_2^2+6\omega_3^2\omega_1v_1^2\omega_2^3-45\omega_3^2\omega_1^3v_1^2\omega_2v_2^2-36c_s^2\omega_1^2v_1^2\omega_2^3-297\omega_3^2c_s^2\omega_1^2\omega_2v_2^2+30\omega_3c_s^2\omega_1\omega_2^3-6\omega_3c_s^2\omega_1^3v_1^2\omega_2+18\omega_3^2c_s^2\omega_1^3v_1^2+54\omega_3^2c_s^4\omega_1^2\omega_2^2+$$
$$3\omega_3^2c_s^2\omega_1v_1^2\omega_2^3+36c_s^2\omega_1^2\omega_2^3+99\omega_3^2\omega_1^2\omega_2v_2^2-6\omega_3^2\omega_1^3v_1^2-45\omega_3^2\omega_1v_1^2\omega_2^2v_2^2+54\omega_3^2\omega_1\omega_2^2v_2^4+48\omega_3c_s^2\omega_1^2v_1^2\omega_2^3+270\omega_3^2c_s^2\omega_1^2\omega_2^2v_2^2-48\omega_3c_s^2\omega_1^2\omega_2^3+$$
$$54\omega_3^2\omega_1^3v_2^4-12\omega_3^2\omega_1^2v_1^2\omega_2^2+6\omega_3c_s^2\omega_1^3\omega_2+18\omega_3^2c_s^4\omega_2^3-135\omega_3^2c_s^2\omega_2^3v_2^2-36\omega_3c_s^4\omega_1^3\omega_2^3+18\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^2-90\omega_3^2\omega_1^2\omega_2^2v_2^2+9\omega_3^2\omega_2^3v_2^2-$$
$$90\omega_3^2c_s^4\omega_1\omega_2^2-36\omega_3c_s^2\omega_1^2\omega_2^2+36\omega_3c_s^2\omega_1^2v_1^2\omega_2^2-54\omega_3^2\omega_1^2\omega_2v_2^4+63\omega_3^2c_s^4\omega_1\omega_2^3-24\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^3+27\omega_3^2\omega_1^2\omega_2^3v_2^2-18\omega_3c_s^4\omega_1^3\omega_2+99\omega_3^2\omega_1^3\omega_2v_2^2+$$
$$144\omega_3c_s^4\omega_1^2\omega_2^3-138\omega_3^2c_s^2\omega_1^2\omega_2^3v_2^2+12\omega_3c_s^2\omega_1^3\omega_2^3-6\omega_3^2\omega_1\omega_2^2-459\omega_3^2c_s^2\omega_1^3\omega_2v_2^2+24c_s^2\omega_1^3v_1^2\omega_2^3+48\omega_3^2c_s^2\omega_1\omega_2^2+54\omega_3^2\omega_1\omega_2^3v_2^4+108\omega_3c_s^4\omega_1^2\omega_2^2+$$
$$90\omega_3^2\omega_1^2v_1^2\omega_2^2v_2^2-6\omega_3^2c_s^2\omega_1^2v_1^2\omega_2+90\omega_3^2c_s^4\omega_1^3+18\omega_3^2c_s^2v_1^2\omega_2^3-12c_s^2\omega_1^3v_1^2\omega_2^2-39\omega_3^2c_s^2\omega_1\omega_2^3+6\omega_3^2\omega_1^2v_1^2\omega_2-6\omega_3^2v_1^2\omega_2^3+27\omega_3^2\omega_1^3\omega_2^2v_2^4-6\omega_3^2\omega_1\omega_2^3$$

$$C_{15}=-135\omega_3^2\omega_1^2v_1^2\omega_2v_2^2+135\omega_3^2v_1^2\omega_2^3v_2^2-\omega_3^2\omega_1^2v_1^4\omega_2^3+108c_s^2\omega_1^2\omega_2^3v_2^2-30\omega_3^2c_s^4\omega_1^2\omega_2+135\omega_3^2\omega_1^3v_1^2v_2^2+144\omega_3c_s^2\omega_1^3\omega_2^2v_2^2-2\omega_3^2c_s^4\omega_1^3\omega_2^3-$$
$$9\omega_3^2\omega_1^2\omega_2^3v_2^4+2\omega_3^2c_s^2\omega_1^2\omega_2^3+21\omega_3^2c_s^2\omega_1^3\omega_2-45\omega_3^2\omega_1^3\omega_2v_2^4-90\omega_3c_s^2\omega_1^3v_1^2\omega_2^2-6\omega_3^2\omega_1^3\omega_2+108\omega_3^2c_s^2\omega_1\omega_2^3v_2^2+2\omega_3^2c_s^4\omega_1^3\omega_2^2-135\omega_3^2\omega_1v_1^2\omega_2^3v_2^2+$$
$$30\omega_3c_s^4\omega_1\omega_2^3+18\omega_3c_s^2\omega_1\omega_2^3v_2^2-9\omega_3^2\omega_1^3\omega_2^2v_2^2+6\omega_3^2c_s^2\omega_1^3v_1^2\omega_2^2+72\omega_3c_s^2\omega_1^3v_1^2\omega_2^3+12\omega_3^2\omega_1^2\omega_2^2+6\omega_3^2\omega_2^3-42\omega_3^2c_s^2\omega_1^2\omega_2^2-\omega_3^2\omega_1^3v_1^2\omega_2^2+30\omega_3^2c_s^2\omega_1^3\omega_2^2v_2^2+$$
$$36\omega_1^3\omega_2^2v_2^2-45\omega_3^2c_s^2\omega_1\omega_2^2v_2^2+18\omega_3\omega_1\omega_2^3v_2^4-6\omega_3^2\omega_1^2\omega_2+18\omega_3^2\omega_1v_1^2\omega_2^2+126\omega_3c_s^2\omega_1v_1^2\omega_2^3-36\omega_3^2\omega_2^3v_2^4+18\omega_3^2\omega_1^3v_1^2\omega_2+36\omega_3^2c_s^2\omega_1^2\omega_2-$$
$$24\omega_3^2c_s^2\omega_1^3-15\omega_3^2c_s^4\omega_1^3\omega_2+189\omega_3^2c_s^2\omega_1^3v_2^2+18\omega_3\omega_1^3\omega_2v_2^2+6\omega_3^2\omega_1^3-10\omega_3^2c_s^4\omega_1^2\omega_2^3-90\omega_3^2c_s^2\omega_1v_1^2\omega_2^2+45\omega_3^2\omega_1\omega_2^2v_2^2-81\omega_3^2\omega_1^3v_2^2+54\omega_3\omega_1^2\omega_2^3v_2^2-$$
$$9\omega_3^2c_s^2\omega_1^3v_1^2\omega_2+54\omega_3\omega_1^3\omega_2^2v_2^4-2\omega_3^2c_s^2\omega_1^3\omega_2^2+18\omega_3^2\omega_1v_1^2\omega_2^3-135\omega_3^2\omega_1^3v_1^2\omega_2v_2^2-81\omega_3^2c_s^2\omega_1^2\omega_2v_2^2-30\omega_3c_s^2\omega_1\omega_2^3+18\omega_3c_s^2\omega_1^3v_1^2\omega_2+18\omega_3^2c_s^2\omega_1^3v_1^2+$$
$$30\omega_3^2c_s^4\omega_1^2\omega_2^2+9\omega_3^2c_s^2\omega_1v_1^2\omega_2^3+36\omega_1^2\omega_2^3v_2^4+45\omega_3^2\omega_1^2\omega_2v_2^2-18\omega_3^2\omega_1^3v_1^2-135\omega_3^2\omega_1v_1^2\omega_2^2v_2^2-18\omega_3\omega_1^3\omega_2v_2^4-198\omega_3c_s^2\omega_1^2v_1^2\omega_2^3+108\omega_3^2c_s^2\omega_1^2\omega_2^2v_2^2-$$
$$54\omega_3\omega_1^2\omega_2^3v_2^4+60\omega_3c_s^2\omega_1^2\omega_2^3+36\omega_3^2\omega_1^3v_2^4-36\omega_3^2\omega_1^2v_1^2\omega_2^2-6\omega_3c_s^2\omega_1^3\omega_2-30\omega_3^2c_s^4\omega_2^3-36\omega_1^3\omega_2^2v_2^4-18\omega_3\omega_1\omega_2^3v_2^2-63\omega_3^2c_s^2\omega_2^3v_2^2+24\omega_3c_s^4\omega_1^3\omega_2^3+$$
$$72\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^2-90\omega_3^2\omega_1^2\omega_2^2v_2^2-9\omega_3^2\omega_2^3v_2^2-30\omega_3^2c_s^4\omega_1\omega_2^2+\omega_3^2\omega_1^3v_1^4\omega_2^2-60\omega_3c_s^2\omega_1^2\omega_2^2+\omega_3^2\omega_1^2v_1^2\omega_2^3+144\omega_3c_s^2\omega_1^2v_1^2\omega_2^2-36\omega_1^2\omega_2^3v_2^2+45\omega_3^2c_s^4\omega_1\omega_2^3-$$
$$54\omega_3\omega_1^3\omega_2^2v_2^2-6\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^3+36\omega_3c_s^2\omega_1^2\omega_2^2v_2^2-36\omega_3c_s^4\omega_1^3\omega_2^2+9\omega_3^2\omega_1^2\omega_2^3v_2^2+6\omega_3c_s^4\omega_1^3\omega_2+90\omega_3^2\omega_1^3\omega_2v_2^2-60\omega_3c_s^4\omega_1^2\omega_2^3-30\omega_3^2c_s^2\omega_1^2\omega_2^3v_2^2-$$
$$24\omega_3c_s^2\omega_1^3\omega_2^3-6\omega_3^2\omega_1\omega_2^2-216\omega_3^2c_s^2\omega_1^3\omega_2v_2^2+36\omega_3^2c_s^2\omega_1\omega_2^2+45\omega_3^2\omega_1\omega_2^3v_2^4+60\omega_3c_s^4\omega_1^2\omega_2^2-144\omega_3c_s^2\omega_1^2\omega_2^3v_2^2-108c_s^2\omega_1^3\omega_2^2v_2^2+270\omega_3^2\omega_1^2v_1^2\omega_2^2v_2^2-$$
$$54\omega_3c_s^2\omega_1^3\omega_2v_2^2-54\omega_3^2c_s^2\omega_1^2v_1^2\omega_2+18\omega_3^2c_s^4\omega_1^3-18\omega_3^2c_s^2v_1^2\omega_2^3-3\omega_3^2c_s^2\omega_1\omega_2^3+18\omega_3^2\omega_1^2v_1^2\omega_2-18\omega_3^2v_1^2\omega_2^3+9\omega_3^2\omega_1^3\omega_2^2v_2^4+36\omega_3c_s^2\omega_1^3\omega_2^2-6\omega_3^2\omega_1\omega_2^3$$

$$C_{16}=$$
$$-18\omega_1v_1^2\omega_2^3+54\omega_3\omega_1^2v_1^2\omega_2^2-18\omega_3\omega_1\omega_2^2-18\omega_1^3v_1^2\omega_2-81\omega_3\omega_1\omega_2^3+36\omega_3v_1^2\omega_2^3-54\omega_3c_s^2\omega_1\omega_2^2+18\omega_1\omega_2^3-198\omega_3\omega_2^3v_2^2+108c_s^2\omega_1^2\omega_2^2-216\omega_3\omega_1^3\omega_2v_2^2-$$
$$100\omega_3\omega_1^2\omega_2^3v_2^2-36\omega_3\omega_1^2v_1^2\omega_2+135\omega_3c_s^2\omega_1\omega_2^3-54c_s^2\omega_1^3\omega_2-36\omega_1^2\omega_2^2-84\omega_3c_s^2\omega_1^2\omega_2^3+90\omega_3\omega_1^2\omega_2-297\omega_3c_s^2\omega_1^3\omega_2+198\omega_3\omega_1^3v_2^2+216\omega_3\omega_1\omega_2^3v_2^2-$$
$$54c_s^2\omega_1\omega_2^3+270\omega_3c_s^2\omega_1^3-46\omega_3\omega_1^3\omega_2^2+162\omega_3c_s^2\omega_1^2\omega_2^2+18\omega_1^3\omega_2+36\omega_3\omega_1^3v_1^2-126\omega_3\omega_1^3+100\omega_3\omega_1^3\omega_2^2v_2^2+162\omega_3\omega_1\omega_2^2v_2^2+54\omega_3\omega_2^3+135\omega_3\omega_1^3\omega_2+$$
$$46\omega_3\omega_1^2\omega_2^3-162\omega_3c_s^2\omega_1^2\omega_2-27\omega_3\omega_1^3v_1^2\omega_2-36\omega_3\omega_1v_1^2\omega_2^2-162\omega_3\omega_1^2\omega_2v_2^2+36\omega_1^2v_1^2\omega_2^2-27\omega_3\omega_1v_1^2\omega_2^3-54\omega_3\omega_1^2\omega_2^2+84\omega_3c_s^2\omega_1^3\omega_2^2-54\omega_3c_s^2\omega_2^3$$

$$C_{17}=-3\omega_3^2\omega_1^2v_1^4\omega_2^3-24c_s^2\omega_1^2\omega_2^3v_2^2+18\omega_3^2c_s^4\omega_1^2\omega_2-18\omega_3c_s^2\omega_1^3\omega_2^2v_2^2-102\omega_3^2\omega_1\omega_2^3v_2^2+6\omega_3^2c_s^4\omega_1^3\omega_2^3-39\omega_3^2\omega_1^2\omega_2^3v_2^4+81\omega_3^2c_s^2\omega_1^2\omega_2^3+$$
$$123\omega_3^2c_s^2\omega_1^3\omega_2-7\omega_3^2\omega_1^2\omega_2^3-90\omega_3^2\omega_1^3\omega_2v_2^4-12\omega_3^2\omega_1^3\omega_2+489\omega_3^2c_s^2\omega_1\omega_2^3v_2^2+72\omega_3^2c_s^4\omega_1^3\omega_2^2-12c_s^2\omega_1^3\omega_2^3-90\omega_3c_s^4\omega_1\omega_2^3-30\omega_3c_s^2\omega_1\omega_2^3v_2^2-$$
$$46\omega_3^2\omega_1^3\omega_2^2v_2^2+9\omega_3^2c_s^2\omega_1^3v_1^2\omega_2^2+72\omega_3^2c_s^2\omega_2^3-6\omega_3^2\omega_2^3-72c_s^4\omega_1^2\omega_2^3-12\omega_3^2c_s^2\omega_1^2\omega_2^2-3\omega_3^2\omega_1^3v_1^2\omega_2^2+197\omega_3^2c_s^2\omega_1^3\omega_2^2v_2^2-165\omega_3^2c_s^2\omega_1\omega_2^2v_2^2+6\omega_3^2\omega_1^2\omega_2-$$
$$2\omega_3^2c_s^2\omega_1^3\omega_2^3-45\omega_3^2\omega_2^3v_2^4-24\omega_3^2c_s^2\omega_1^2\omega_2-72\omega_3^2c_s^2\omega_1^3-153\omega_3^2c_s^4\omega_1^3\omega_2+261\omega_3^2c_s^2\omega_1^3v_2^2+6\omega_3^2\omega_1^3-138\omega_3^2c_s^4\omega_1^2\omega_2^3-6\omega_3c_s^2\omega_1^3\omega_2^3v_2^2+51\omega_3^2\omega_1\omega_2^2v_2^2-$$
$$51\omega_3^2\omega_1^3v_2^2+36c_s^4\omega_1^3\omega_2^3+2\omega_3^2c_s^2\omega_1^3\omega_2^3v_2^2-59\omega_3^2c_s^2\omega_1^3\omega_2^2+141\omega_3^2c_s^2\omega_1^2\omega_2v_2^2+30\omega_3c_s^2\omega_1\omega_2^3+7\omega_3^2\omega_1^3\omega_2^2+36\omega_3^2c_s^4\omega_1^2\omega_2^2+24c_s^2\omega_1^2\omega_2^3-51\omega_3^2\omega_1^2\omega_2v_2^2-$$
$$45\omega_3^2\omega_1\omega_2^2v_2^4+12\omega_3^2c_s^2\omega_1^2\omega_2^2v_2^2-42\omega_3c_s^2\omega_1^2\omega_2^3+45\omega_3^2\omega_1^3v_2^4-6\omega_3c_s^2\omega_1^3\omega_2-90\omega_3^2c_s^4\omega_2^3-261\omega_3^2c_s^2\omega_2^3v_2^2-18\omega_3c_s^4\omega_1^3\omega_2^3+51\omega_3^2\omega_2^3v_2^2-90\omega_3^2c_s^4\omega_1\omega_2^2+$$
$$3\omega_3^2\omega_1^3v_1^4\omega_2^2-24\omega_3c_s^2\omega_1^2\omega_2^2+3\omega_3^2\omega_1^2v_1^2\omega_2^3+45\omega_3^2\omega_1^2\omega_2v_2^4+225\omega_3^2c_s^4\omega_1\omega_2^3-9\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^3+24\omega_3c_s^2\omega_1^2\omega_2^2v_2^2-54\omega_3c_s^4\omega_1^3\omega_2^2+12c_s^2\omega_1^3\omega_2^3v_2^2+$$
$$46\omega_3^2\omega_1^2\omega_2^3v_2^2+18\omega_3c_s^4\omega_1^3\omega_2+102\omega_3^2\omega_1^3\omega_2v_2^2+126\omega_3c_s^4\omega_1^2\omega_2^3-219\omega_3^2c_s^2\omega_1^2\omega_2^3v_2^2+6\omega_3c_s^2\omega_1^3\omega_2^3-6\omega_3^2\omega_1\omega_2^2-465\omega_3^2c_s^2\omega_1^3\omega_2v_2^2+48\omega_3^2c_s^2\omega_1\omega_2^2+$$
$$90\omega_3^2\omega_1\omega_2^3v_2^4+72\omega_3c_s^4\omega_1^2\omega_2^2+42\omega_3c_s^2\omega_1^2\omega_2^3v_2^2+6\omega_3c_s^2\omega_1^3\omega_2v_2^2+90\omega_3^2c_s^4\omega_1^3-147\omega_3^2c_s^2\omega_1\omega_2^3+39\omega_3^2\omega_1^3\omega_2^2v_2^4+18\omega_3c_s^2\omega_1^3\omega_2^2+12\omega_3^2\omega_1\omega_2^3$$

$$C_{18}=9\omega_3\omega_1v_1^2+6\omega_1\omega_2+2\omega_3\omega_1\omega_2v_2^2+\omega_3\omega_1v_2^2+6\omega_3c_s^2\omega_1\omega_2-9\omega_3v_1^2\omega_2-2\omega_3\omega_1\omega_2+2\omega_3\omega_2+6\omega_3c_s^2\omega_1-18c_s^2\omega_1\omega_2-6\omega_1\omega_2v_2^2-4\omega_3\omega_1+\omega_3\omega_2v_2^2$$

$$C_{19}=18c_s^2\omega_1^3\omega_2v_2^2+\omega_3\omega_1^3v_1^4\omega_2^2-30\omega_3c_s^4\omega_1\omega_2^2-90c_s^2\omega_1^2\omega_2^3v_2^2+18c_s^2\omega_1^3\omega_2^2+153\omega_3c_s^2\omega_1^3\omega_2^2v_2^2-207\omega_3c_s^2\omega_2^3v_2^2+24c_s^4\omega_1^2\omega_2^2+3\omega_3c_s^2\omega_1^3v_1^2\omega_2^2-$$
$$6\omega_3\omega_1\omega_2^2-135\omega_3\omega_1\omega_2^2v_2^4-12c_s^2\omega_1^3\omega_2^3+69\omega_3c_s^4\omega_1\omega_2^3+351\omega_3c_s^2\omega_1\omega_2^3v_2^2+12\omega_3\omega_1\omega_2^3+135\omega_3\omega_1^2\omega_2v_2^4-30c_s^4\omega_1^2\omega_2^3+6c_s^4\omega_1^3\omega_2+18\omega_3c_s^4\omega_1^3+$$
$$\omega_3\omega_1^2v_1^2\omega_2^3+36\omega_3c_s^2\omega_1\omega_2^2+324\omega_3\omega_1\omega_2^3v_2^4+171\omega_3\omega_1^3v_2^4-18c_s^4\omega_1^3\omega_2^2+99\omega_3\omega_2^3v_2^2-24c_s^2\omega_1^2\omega_2^2+180\omega_3\omega_1^3\omega_2v_2^2+72c_s^2\omega_1^2\omega_2^2v_2^2+81\omega_3\omega_1^2\omega_2^3v_2^2-$$
$$42\omega_3c_s^4\omega_2^3+63\omega_3c_s^2\omega_1^2\omega_2v_2^2+12c_s^4\omega_1^3\omega_2^3+138\omega_3\omega_1^3\omega_2^2v_2^4-45\omega_3c_s^2\omega_1\omega_2^3-135\omega_3c_s^2\omega_1\omega_2^2v_2^2-6c_s^2\omega_1^3\omega_2+30c_s^2\omega_1^2\omega_2^3-171\omega_3\omega_2^3v_2^4-$$
$$324\omega_3\omega_1^3\omega_2v_2^4-3\omega_3c_s^2\omega_1^2v_1^2\omega_2^3-138\omega_3\omega_1^2\omega_2^3v_2^4+24\omega_3c_s^2\omega_1^2\omega_2^3+6\omega_3\omega_1^2\omega_2+45\omega_3c_s^2\omega_1^3\omega_2+6\omega_3c_s^4\omega_1^2\omega_2-99\omega_3\omega_1^3v_2^2-180\omega_3\omega_1\omega_2^3v_2^2-$$
$$2\omega_3c_s^4\omega_1^3\omega_2^3-18c_s^2\omega_1\omega_2^3-24\omega_3c_s^2\omega_1^3-\omega_3\omega_1^2v_1^4\omega_2^3+7\omega_3\omega_1^3\omega_2^2-\omega_3\omega_1^3v_1^2\omega_2^2-12\omega_3c_s^2\omega_1^2\omega_2^2+6\omega_3\omega_1^3-81\omega_3\omega_1^3\omega_2^2v_2^2+36\omega_3c_s^2\omega_1^2\omega_2^2v_2^2+$$
$$17\omega_3c_s^4\omega_1^3\omega_2^2+36c_s^2\omega_1^3\omega_2^3v_2^2+54c_s^2\omega_1\omega_2^3v_2^2+207\omega_3c_s^2\omega_1^3v_2^2-33\omega_3c_s^4\omega_1^3\omega_2-25\omega_3c_s^4\omega_1^2\omega_2^3+63\omega_3\omega_1\omega_2^2v_2^2-6\omega_3\omega_2^3-12\omega_3\omega_1^3\omega_2-7\omega_3\omega_1^2\omega_2^3-$$
$$12\omega_3c_s^2\omega_1^2\omega_2+18c_s^4\omega_1\omega_2^3+12\omega_3c_s^4\omega_1^2\omega_2^2-153\omega_3c_s^2\omega_1^2\omega_2^3v_2^2-63\omega_3\omega_1^2\omega_2v_2^2-54c_s^2\omega_1^3\omega_2^2v_2^2-351\omega_3c_s^2\omega_1^3\omega_2v_2^2-24\omega_3c_s^2\omega_1^3\omega_2^2+24\omega_3c_s^2\omega_2^3$$

$C_{20} =$
$-3\omega_1\omega_2 v_2^4 + c_s^4\omega_1 + 12c_s^2\omega_2 v_2^2 + 3\omega_2 v_2^4 - 3\omega_1 v_2^2 + c_s^4\omega_2 - 12c_s^2\omega_1\omega_2 v_2^2 + 12c_s^2\omega_1 v_2^2 - c_s^4\omega_1\omega_2 + 3\omega_1 v_2^4 - 3\omega_2 v_2^2 - c_s^2\omega_1 + c_s^2\omega_1\omega_2 - c_s^2\omega_2 + 3\omega_1\omega_2 v_2^2$

$C_{21} = 12\omega_3^2\omega_1^2 v_2^2 - 12\omega_3^2 c_s^2\omega_1^2 v_2^2 + 12\omega_3^2 c_s^2\omega_1 - 24\omega_3 c_s^4\omega_1^2 + 72\omega_3\omega_1^2 v_2^4 + 108c_s^2\omega_1^3 v_2^2 + 24\omega_3^2 c_s^4 + 6\omega_3 c_s^4\omega_1^3 + 36\omega_1^3 v_2^4 - 30\omega_3\omega_1^3 v_2^4 + \omega_3^2 c_s^2\omega_1^3 + 6\omega_3^2 c_s^2\omega_1^3 v_2^2 - 3\omega_3^2\omega_1^3 v_2^2 + 24\omega_3 c_s^4\omega_1 - 72\omega_1^2 v_2^4 - 216c_s^2\omega_1^2 v_2^2 + 72\omega_3 c_s^2\omega_1 v_2^2 - 8\omega_3^2 c_s^2\omega_1^2 + 3\omega_3^2\omega_1^3 v_2^4 + 144\omega_3 c_s^2\omega_1^2 v_2^2 + 30\omega_3\omega_1^3 v_2^2 - 6\omega_3 c_s^2\omega_1^3 - 48\omega_3^2 c_s^4\omega_1 + 24\omega_3 c_s^2\omega_1^2 + 72\omega_1^2 v_2^2 - 24\omega_3 c_s^2\omega_1 - 72\omega_3 c_s^2\omega_1^3 v_2^2 - 72\omega_3\omega_1^2 v_2^2 - 12\omega_3^2\omega_1^2 v_2^4 + 24\omega_3^2 c_s^4\omega_1^2 - 36\omega_3^2 c_s^2\omega_1 v_2^2 - 36\omega_1^3 v_2^2 - 3\omega_3^2 c_s^4\omega_1^3$

2.7.4 Conservation of momentum: ρv_2

attached text file: `output_d2q9_nse_culbm2_symbolic_pde_02.txt`

$$
\begin{aligned}
&v_2\frac{\partial\rho}{\partial t} + \rho\frac{\partial v_2}{\partial t} + \frac{v_1 v_2\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_1} + \frac{\rho v_2\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{\rho v_1\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_1} + (c_s^2+v_2^2)\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_2} + \frac{2\rho v_2\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-2+\omega_1)\frac{c_s^2\delta_l^2}{2\delta_t\omega_1}\frac{\partial\rho}{\partial x_1}\frac{\partial v_2}{\partial x_1} + \\
&(-3v_1^2\omega_2 + 3\omega_1 v_1^2 - \omega_1 + 3c_s^2\omega_1 + c_s^2\omega_1\omega_2 + \omega_2 - 5c_s^2\omega_2)\frac{\delta_l^2}{2\delta_t\omega_1\omega_2}\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_2} + (\omega_1-\omega_2)\frac{3\rho v_1\delta_l^2}{\delta_t\omega_1\omega_2}\frac{\partial v_1}{\partial x_1}\frac{\partial v_1}{\partial x_2} + \\
&(-3v_1^2\omega_2 + 3\omega_1 v_1^2 - \omega_1 + c_s^2\omega_1 + \omega_2 - c_s^2\omega_2)\frac{\delta_l^2}{2\delta_t\omega_1\omega_2}\frac{\partial\rho}{\partial x_2}\frac{\partial v_1}{\partial x_1} + \\
&(\omega_1\omega_2 + 3\omega_1 v_2^2 - \omega_1 + 3\omega_2 v_2^2 + 2c_s^2\omega_1 - 2c_s^2\omega_1\omega_2 - \omega_2 + 2c_s^2\omega_2 - 3\omega_1\omega_2 v_2^2)\frac{\delta_l^2}{\delta_t\omega_1\omega_2}\frac{\partial\rho}{\partial x_2}\frac{\partial v_2}{\partial x_2} + \\
&(-\omega_1\omega_2 + \omega_1 + \omega_2)\frac{3\rho v_2\delta_l^2}{\delta_t\omega_1\omega_2}\left(\frac{\partial v_2}{\partial x_2}\right)^2 + (-2+\omega_1)\frac{c_s^2\rho\delta_l^2}{2\delta_t\omega_1}\frac{\partial^2 v_2}{\partial x_1^2} + \\
&(-v_1^2\omega_2 + \omega_1 v_1^2 - \omega_1 + 3c_s^2\omega_1 + \omega_2 - 3c_s^2\omega_2)\frac{v_1\delta_l^2}{2\delta_t\omega_1\omega_2}\frac{\partial^2\rho}{\partial x_1\partial x_2} + \\
&(-3v_1^2\omega_2 + 3\omega_1 v_1^2 - \omega_1 + c_s^2\omega_1 + c_s^2\omega_1\omega_2 + \omega_2 - 3c_s^2\omega_2)\frac{\rho\delta_l^2}{2\delta_t\omega_1\omega_2}\frac{\partial^2 v_1}{\partial x_1\partial x_2} + \\
&(\omega_1\omega_2 + \omega_1 v_2^2 - \omega_1 + \omega_2 v_2^2 + 3c_s^2\omega_1 - 3c_s^2\omega_1\omega_2 - \omega_2 + 3c_s^2\omega_2 - \omega_1\omega_2 v_2^2)\frac{v_2\delta_l^2}{2\delta_t\omega_1\omega_2}\frac{\partial^2\rho}{\partial x_2^2} + \\
&(\omega_1\omega_2 + 3\omega_1 v_2^2 - \omega_1 + 3\omega_2 v_2^2 + c_s^2\omega_1 - c_s^2\omega_1\omega_2 - \omega_2 + c_s^2\omega_2 - 3\omega_1\omega_2 v_2^2)\frac{\rho\delta_l^2}{2\delta_t\omega_1\omega_2}\frac{\partial^2 v_2}{\partial x_2^2} + (-1+3c_s^2+v_1^2)\frac{v_1 v_2\delta_l^3}{12\delta_t}\frac{\partial^3\rho}{\partial x_1^3} + \\
&(-1+c_s^2+3v_1^2)\frac{\rho v_2\delta_l^3}{12\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} + C_1\frac{\rho v_1\delta_l^3}{6\omega_3\delta_t\omega_1}\frac{\partial^3 v_2}{\partial x_1^3} + C_2\frac{\delta_l^3}{12\delta_t\omega_1^2\omega_2^2}\frac{\partial^3\rho}{\partial x_1^2\partial x_2} + C_3\frac{\rho v_1\delta_l^3}{4\delta_t\omega_1^2\omega_2^2}\frac{\partial^3 v_1}{\partial x_1^2\partial x_2} - \frac{c_s^2\rho v_2\delta_l^3}{6\delta_t}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2} + \\
&C_4\frac{3v_1 v_2\delta_l^3}{4\delta_t\omega_1^2\omega_2^2}\frac{\partial^3\rho}{\partial x_1\partial x_2^2} + C_5\frac{\rho v_2\delta_l^3}{12\omega_3\delta_t\omega_1^2\omega_2^2}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2} + C_6\frac{\rho v_1\delta_l^3}{4\omega_3\delta_t\omega_1^2\omega_2^2}\frac{\partial^3 v_2}{\partial x_1\partial x_2^2} + C_7\frac{\delta_l^3}{12\delta_t\omega_1^2\omega_2^2}\frac{\partial^3\rho}{\partial x_2^3} + C_8\frac{\rho v_2\delta_l^3}{12\delta_t\omega_1^2\omega_2^2}\frac{\partial^3 v_2}{\partial x_2^3} + \\
&C_9\frac{v_2\delta_l^4}{24\delta_t\omega_1\omega_2}\frac{\partial^4\rho}{\partial x_1^4} + (5v_1^2\omega_2 + 2\omega_1\omega_2 - 5\omega_1 v_1^2\omega_2 + 5\omega_1 v_1^2 - 2\omega_1 + 3c_s^2\omega_1 - 3c_s^2\omega_1\omega_2 - 2\omega_2 + 3c_s^2\omega_2)\frac{\rho v_1 v_2\delta_l^4}{12\delta_t\omega_1\omega_2}\frac{\partial^4 v_1}{\partial x_1^4} + \\
&C_{10}\frac{\rho\delta_l^4}{24\omega_3^2\delta_t\omega_1^3}\frac{\partial^4 v_2}{\partial x_1^4} + C_{11}\frac{v_1\delta_l^4}{24\omega_3^2\delta_t\omega_1^3\omega_2^3}\frac{\partial^4\rho}{\partial x_1^3\partial x_2} + C_{12}\frac{\rho\delta_l^4}{24\omega_3\delta_t\omega_1^3\omega_2^3}\frac{\partial^4 v_1}{\partial x_1^3\partial x_2} + C_{13}\frac{\rho v_1 v_2\delta_l^4}{24\omega_3\delta_t\omega_1\omega_2}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} + \\
&C_{14}\frac{v_2\delta_l^4}{24\omega_3^2\delta_t\omega_1^3\omega_2^3}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2} + C_{15}\frac{\rho v_1 v_2\delta_l^4}{24\omega_3\delta_t\omega_1^3\omega_2^3}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} + C_{16}\frac{\rho\delta_l^4}{24\omega_3^2\delta_t\omega_1^3\omega_2^3}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2} + C_{17}\frac{v_1\delta_l^4}{24\omega_3^2\delta_t\omega_1^3\omega_2^3}\frac{\partial^4\rho}{\partial x_1\partial x_2^3} + \\
&C_{18}\frac{\rho\delta_l^4}{24\omega_3^2\delta_t\omega_1^3\omega_2^3}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} + C_{19}\frac{\rho v_1 v_2\delta_l^4}{24\omega_3\delta_t\omega_1^3\omega_2^3}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3} + C_{20}\frac{v_2\delta_l^4}{24\omega_3\delta_t\omega_1^3\omega_2^3}\frac{\partial^4\rho}{\partial x_2^4} + C_{21}\frac{\rho\delta_l^4}{24\omega_3\delta_t\omega_1^3\omega_2^3}\frac{\partial^4 v_2}{\partial x_2^4} = 0,
\end{aligned}
$$

where:

$C_1 = 6 + 9\omega_3 c_s^2 - \omega_3\omega_1 v_1^2 - 3\omega_3 - 18c_s^2 + 3\omega_1 v_1^2 - 3\omega_1 + 9c_s^2\omega_1 - 3\omega_3 c_s^2\omega_1 + \omega_3\omega_1 + 3\omega_3 v_1^2 - 6v_1^2$

$C_2 = -30c_s^4\omega_2^2 - 2c_s^4\omega_1^2\omega_2^2 + 6c_s^2\omega_1^2\omega_2 - 9\omega_1 v_1^2\omega_2^2 - 45c_s^2\omega_1^2 v_1^2\omega_2 - 9\omega_1^2 v_1^4\omega_2 + 9\omega_1^2 v_1^4 + 45c_s^2\omega_1^2 v_1^2 + 9v_1^2\omega_2^2 - 6c_s^4\omega_1^2\omega_2 + 6c_s^4\omega_1^2 + 9\omega_1 v_1^4\omega_2^2 + 45c_s^2\omega_1 v_1^2\omega_2^2 - 9\omega_1^2 v_1^2 + 9\omega_1^2 v_1^2\omega_2 + 6c_s^2\omega_2^2 - 45c_s^2 v_1^2\omega_2^2 - 6c_s^2\omega_1\omega_2^2 - 9v_1^4\omega_2^2 - 6c_s^2\omega_1^2 + 30c_s^4\omega_1\omega_2^2$

$C_3 = -9c_s^2\omega_1^2\omega_2 + 11\omega_1 v_1^2\omega_2^2 - 11v_1^2\omega_2^2 - 5\omega_1\omega_2^2 - 5\omega_1^2 + 11\omega_1^2 v_1^2 - 11\omega_1^2 v_1^2\omega_2 - 9c_s^2\omega_2^2 + 9c_s^2\omega_1\omega_2^2 + 9c_s^2\omega_1^2 + 5\omega_2^2 + 5\omega_1^2\omega_2$

$C_4 = 2\omega_1\omega_2 - 3c_s^2\omega_1^2\omega_2 + \omega_1 v_1^2\omega_2^2 - v_1^2\omega_2^2 - \omega_1\omega_2^2 + \omega_2^2 v_2^2 - 2\omega_1^2 + \omega_1^2 v_1^2 - \omega_1^2 v_1^2\omega_2 + \omega_1^2 v_2^2 + 3c_s^2\omega_1\omega_2^2 - 6c_s^2\omega_1\omega_2 + 6c_s^2\omega_1^2 - 2\omega_1\omega_2 v_2^2 + \omega_1^2\omega_2$

$C_5 = -3\omega_3\omega_1^2\omega_2^2 v_2^2 + 6\omega_3\omega_2^2 v_2^2 - 6\omega_1^2\omega_2 v_2^2 - 27\omega_3 v_1^2\omega_2^2 - 12\omega_3\omega_1\omega_2^2 - 18c_s^2\omega_1^2\omega_2 - 18\omega_1\omega_2^2 v_2^2 + 18\omega_3 c_s^2\omega_1\omega_2^2 + 36c_s^2\omega_1^2\omega_2^2 - 27\omega_3\omega_1^2 v_1^2\omega_2 + 18\omega_1\omega_2^2 - 12\omega_1^2\omega_2^2 + 12\omega_3\omega_1^2\omega_2 - 15\omega_3\omega_1^2 - 11\omega_3 c_s^2\omega_1^2\omega_2^2 + 27\omega_3 c_s^2\omega_1^2 - 54c_s^2\omega_1\omega_2^2 + 3\omega_3\omega_1\omega_2^2 v_2^2 + 6\omega_3\omega_1^2 v_2^2 + 9\omega_3 c_s^2\omega_2^2 - 18\omega_3 c_s^2\omega_1^2\omega_2 + 27\omega_3\omega_1 v_1^2\omega_2^2 - 3\omega_3\omega_1^2\omega_2 v_2^2 + 27\omega_3\omega_1^2 v_1^2 + 6\omega_1^2\omega_2 + 12\omega_1^2\omega_2^2 v_2^2 + 3\omega_3\omega_1^2\omega_2^2 + 3\omega_3\omega_2^2$

$C_6 = 9\omega_3\omega_2^2 v_2^2 - 2\omega_3 v_1^2\omega_2^2 - \omega_3\omega_1\omega_2^2 - 6c_s^2\omega_1^2\omega_2 - 18\omega_3\omega_1\omega_2 v_2^2 + 2\omega_1 v_1^2\omega_2^2 - 6\omega_3 c_s^2\omega_1\omega_2 + 3\omega_3 c_s^2\omega_1\omega_2^2 - \omega_3\omega_1^2 v_1^2\omega_2 - 2\omega_1\omega_2^2 + 6\omega_3\omega_1\omega_2 + \omega_3\omega_1^2\omega_2 - 2\omega_1^2 v_1^2\omega_2 - 5\omega_3\omega_1^2 + 9\omega_3 c_s^2\omega_1^2 + 6c_s^2\omega_1\omega_2^2 + 9\omega_3\omega_1^2 v_2^2 - 3\omega_3 c_s^2\omega_2^2 - 3\omega_3 c_s^2\omega_1^2\omega_2 + \omega_3\omega_1 v_1^2\omega_2^2 + 2\omega_3\omega_1^2 v_1^2 + 2\omega_1^2\omega_2 - \omega_3\omega_2^2$

$C_7 = 6c_s^4\omega_2^2 + 18\omega_1\omega_2 v_2^4 + 18\omega_1^2\omega_2 v_2^2 + c_s^4\omega_1^2\omega_2^2 + 6c_s^2\omega_1^2\omega_2 + 7\omega_1^2\omega_2^2 v_2^4 + 18\omega_1\omega_2^2 v_2^2 - c_s^2\omega_1^2\omega_2^2 + 24c_s^2\omega_1^2\omega_2^2 v_2^2 + 9\omega_1^2 v_2^4 + 45c_s^2\omega_1^2 v_2^2 - 6c_s^4\omega_1^2\omega_2 + 6c_s^4\omega_1^2 - 9\omega_2^2 v_2^2 + 54c_s^2\omega_1\omega_2 v_2^2 - 72c_s^2\omega_1\omega_2^2 v_2^2 + 9\omega_2^2 v_2^4 + 45c_s^2\omega_2^2 v_2^2 - 6c_s^2\omega_2^2 - 72c_s^2\omega_1^2\omega_2 v_2^2 - 9\omega_1^2 v_2^2 + 6c_s^2\omega_1\omega_2^2 - 18\omega_1^2\omega_2 v_2^4 - 6c_s^2\omega_1^2 - 18\omega_1\omega_2 v_2^2 - 18\omega_1\omega_2^2 v_2^4 - 6c_s^4\omega_1\omega_2^2 - 7\omega_1^2\omega_2^2 v_2^2$

$$C_8 = -60\omega_1^2\omega_2v_2^2 - 18\omega_1\omega_2 - 36c_s^2\omega_1^2\omega_2 - 60\omega_1\omega_2^2v_2^2 + 10c_s^2\omega_1^2\omega_2^2 + 24\omega_1\omega_2^2 + 33\omega_2^2v_2^2 - 8\omega_1^2\omega_2^2 - 15\omega_1^2 + 27c_s^2\omega_2^2 + 33\omega_1^2v_2^2 - 36c_s^2\omega_1\omega_2^2 + 18c_s^2\omega_1\omega_2 + 27c_s^2\omega_1^2 + 54\omega_1\omega_2v_2^2 - 15\omega_2^2 + 24\omega_1^2\omega_2 + 22\omega_1^2\omega_2^2v_2^2$$

$$C_9 = -3v_1^2\omega_2 + c_s^4\omega_1 + 3\omega_1v_1^2\omega_2 - 3\omega_1v_1^2 + c_s^4\omega_2 - c_s^4\omega_1\omega_2 + 12c_s^2\omega_1v_1^2 + 3\omega_1v_1^4 + 3v_1^4\omega_2 - c_s^2\omega_1 + 12c_s^2v_1^2\omega_2 + c_s^2\omega_1\omega_2 - c_s^2\omega_2 - 3\omega_1v_1^4\omega_2 - 12c_s^2\omega_1v_1^2\omega_2$$

$$C_{10} = 12\omega_3^2c_s^2\omega_1 - 24\omega_3c_s^4\omega_1^2 + 108c_s^2\omega_1^3v_1^2 + 36\omega_1^3v_1^4 + 12\omega_3^2\omega_1^2v_1^2 - 12\omega_3^2c_s^2\omega_1^2v_1^2 + 72\omega_3\omega_1^2v_1^4 + 24\omega_3^2c_s^4 + 6\omega_3c_s^4\omega_1^3 - 72\omega_1^2v_1^4 - 216c_s^2\omega_1^2v_1^2 + 72\omega_3c_s^2\omega_1v_1^2 + \omega_3^2c_s^2\omega_1^3 - 30\omega_3\omega_1^3v_1^4 + 24\omega_3c_s^4\omega_1 + 6\omega_3^2c_s^2\omega_1^3v_1^2 - 8\omega_3^2c_s^2\omega_1^2 - 3\omega_3^2\omega_1^3v_1^2 + 72\omega_1^2v_1^2 - 6\omega_3c_s^2\omega_1^3 - 48\omega_3^2c_s^4\omega_1 + 3\omega_3^2\omega_1^3v_1^4 + 30\omega_3\omega_1^3v_1^2 + 24\omega_3c_s^2\omega_1^2 + 144\omega_3c_s^2\omega_1^2v_1^2 - 24\omega_3c_s^2\omega_1 - 36\omega_3^2c_s^2\omega_1v_1^2 - 36\omega_1^3v_1^2 + 24\omega_3^2c_s^4\omega_1^2 - 72\omega_3\omega_1^2v_1^2 - 72\omega_3c_s^2\omega_1^3v_1^2 - 3\omega_3^2c_s^4\omega_1^3 - 12\omega_3^2\omega_1^2v_1^4$$

$$C_{11} = 2\omega_3^2c_s^2\omega_1^3v_1^2\omega_2^3 - 39\omega_3^2\omega_1^2v_1^4\omega_2^3 + 18\omega_3^2c_s^4\omega_1^2\omega_2 + 6\omega_3^2c_s^4\omega_1^3\omega_2^3 - 3\omega_3^2\omega_1^2\omega_2^3v_2^4 + 81\omega_3^2c_s^2\omega_1^2\omega_2^3 + 123\omega_3^2c_s^2\omega_1^3\omega_2 - 7\omega_3^2\omega_1^2\omega_2^3 - 18\omega_3c_s^2\omega_1^3v_1^2\omega_2^2 - 12\omega_3^2\omega_1^3\omega_2 + 72\omega_3^2c_s^4\omega_1^3\omega_2^2 - 12c_s^2\omega_1^3\omega_2^3 - 90\omega_3c_s^4\omega_1\omega_2^3 - 3\omega_3^2\omega_1^3\omega_2^2v_2^2 + 197\omega_3^2c_s^2\omega_1^3v_1^2\omega_2^2 - 6\omega_3c_s^2\omega_1^3v_1^2\omega_2^3 + 72\omega_3^2c_s^2\omega_2^3 - 6\omega_3^2\omega_2^3 - 72c_s^4\omega_1^2\omega_2^3 - 12\omega_3^2c_s^2\omega_1^2\omega_2^2 - 46\omega_3^2\omega_1^3v_1^2\omega_2^2 + 9\omega_3^2c_s^2\omega_1^3\omega_2^2v_2^2 + 6\omega_3^2\omega_1^2\omega_2 + 51\omega_3^2\omega_1v_1^2\omega_2^2 - 2\omega_3^2c_s^2\omega_1^3\omega_2^3 - 30\omega_3c_s^2\omega_1v_1^2\omega_2^3 + 102\omega_3^2\omega_1^3v_1^2\omega_2 - 24\omega_3^2c_s^2\omega_1^2\omega_2 - 72\omega_3^2c_s^2\omega_1^3 - 153\omega_3^2c_s^4\omega_1^3\omega_2 + 6\omega_3^2\omega_1^3 - 138\omega_3^2c_s^4\omega_1^2\omega_2^3 - 165\omega_3^2c_s^2\omega_1v_1^2\omega_2^2 - 45\omega_3^2v_1^4\omega_2^3 + 45\omega_3^2\omega_1^2v_1^4\omega_2 - 465\omega_3^2c_s^2\omega_1^3v_1^2\omega_2 + 36c_s^4\omega_1^3\omega_2^3 - 59\omega_3^2c_s^2\omega_1^3\omega_2^2 - 102\omega_3^2\omega_1v_1^2\omega_2^3 - 24c_s^2\omega_1^2v_1^2\omega_2^3 + 30\omega_3c_s^2\omega_1\omega_2^3 + 7\omega_3^2\omega_1^3\omega_2^2 + 6\omega_3c_s^2\omega_1^3v_1^2\omega_2 + 261\omega_3^2c_s^2\omega_1^3v_1^2 + 36\omega_3^2c_s^4\omega_1^2\omega_2^2 + 489\omega_3^2c_s^2\omega_1v_1^2\omega_2^3 + 24c_s^2\omega_1^2\omega_2^3 - 51\omega_3^2\omega_1^3v_1^2 + 42\omega_3c_s^2\omega_1^2v_1^2\omega_2^3 - 42\omega_3c_s^2\omega_1^2\omega_2^3 - 6\omega_3c_s^2\omega_1^3\omega_2 - 90\omega_3^2c_s^4\omega_2^3 - 18\omega_3c_s^4\omega_1^3\omega_2^3 + 12\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^2 - 90\omega_3^2c_s^4\omega_1\omega_2^2 + 39\omega_3^2\omega_1^3v_1^4\omega_2^2 - 24\omega_3c_s^2\omega_1^2\omega_2^2 + 46\omega_3^2\omega_1^2v_1^2\omega_2^3 + 24\omega_3c_s^2\omega_1^2v_1^2\omega_2^2 + 45\omega_3^2\omega_1^3v_1^4 + 225\omega_3^2c_s^4\omega_1\omega_2^3 - 219\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^3 - 54\omega_3c_s^4\omega_1^3\omega_2^2 + 3\omega_3^2\omega_1^3\omega_2^2v_2^2 + 90\omega_3^2\omega_1v_1^4\omega_2^3 + 18\omega_3c_s^4\omega_1^3\omega_2 + 126\omega_3c_s^4\omega_1^2\omega_2^3 - 9\omega_3^2c_s^2\omega_1^2\omega_2^3v_2^2 + 6\omega_3c_s^2\omega_1^3\omega_2^3 - 6\omega_3^2\omega_1\omega_2^2 + 12c_s^2\omega_1^3v_1^2\omega_2^3 + 48\omega_3^2c_s^2\omega_1\omega_2^2 + 72\omega_3c_s^4\omega_1^2\omega_2^2 - 45\omega_3^2\omega_1v_1^4\omega_2^2 + 141\omega_3^2c_s^2\omega_1^2v_1^2\omega_2 - 90\omega_3^2\omega_1^3v_1^4\omega_2 + 90\omega_3^2c_s^4\omega_1^3 - 261\omega_3^2c_s^2v_1^2\omega_2^3 - 147\omega_3^2c_s^2\omega_1\omega_2^3 - 51\omega_3^2\omega_1^2v_1^2\omega_2 + 51\omega_3^2v_1^2\omega_2^3 + 3\omega_3^2\omega_1^3\omega_2^2v_2^4 + 18\omega_3c_s^2\omega_1^3\omega_2^2 + 12\omega_3^2\omega_1\omega_2^3$$

$$C_{12} = 138\omega_3\omega_1^3v_1^4\omega_2^2 - 30\omega_3c_s^4\omega_1\omega_2^2 + 18c_s^2\omega_1^3\omega_2^2 + 3\omega_3c_s^2\omega_1^3\omega_2^2v_2^2 + 24c_s^4\omega_1^2\omega_2^2 + 153\omega_3c_s^2\omega_1^3v_1^2\omega_2^2 - 6\omega_3\omega_1\omega_2^2 - 12c_s^2\omega_1^3\omega_2^3 + 69\omega_3c_s^4\omega_1\omega_2^3 + 12\omega_3\omega_1\omega_2^3 + 99\omega_3v_1^2\omega_2^3 - 30c_s^4\omega_1^2\omega_2^3 + 6c_s^4\omega_1^3\omega_2 + 18\omega_3c_s^4\omega_1^3 + 81\omega_3\omega_1^2v_1^2\omega_2^3 + 36\omega_3c_s^2\omega_1\omega_2^2 + 72c_s^2\omega_1^2v_1^2\omega_2^2 + 351\omega_3c_s^2\omega_1v_1^2\omega_2^3 - 18c_s^4\omega_1^3\omega_2^2 + 324\omega_3\omega_1v_1^4\omega_2^3 - 24c_s^2\omega_1^2\omega_2^2 + \omega_3\omega_1^2\omega_2^3v_2^2 - 42\omega_3c_s^4\omega_2^3 + 171\omega_3\omega_1^3v_1^4 - 63\omega_3\omega_1^2v_1^2\omega_2 + 12c_s^4\omega_1^3\omega_2^3 + \omega_3\omega_1^3\omega_2^2v_2^4 - 135\omega_3c_s^2\omega_1v_1^2\omega_2^2 - 207\omega_3c_s^2v_1^2\omega_2^3 - 90c_s^2\omega_1^2v_1^2\omega_2^3 - 45\omega_3c_s^2\omega_1\omega_2^3 - 351\omega_3c_s^2\omega_1^3v_1^2\omega_2 - 324\omega_3\omega_1^3v_1^4\omega_2 - 6c_s^2\omega_1^3\omega_2 + 30c_s^2\omega_1^2\omega_2^3 - 135\omega_3\omega_1v_1^4\omega_2^2 + 18c_s^2\omega_1^3v_1^2\omega_2 - 153\omega_3c_s^2\omega_1^2v_1^2\omega_2^3 - \omega_3\omega_1^2\omega_2^3v_2^4 + 24\omega_3c_s^2\omega_1^2\omega_2^3 + 6\omega_3\omega_1^2\omega_2 + 45\omega_3c_s^2\omega_1^3\omega_2 + 6\omega_3c_s^4\omega_1^2\omega_2 - 171\omega_3v_1^4\omega_2^3 - 2\omega_3c_s^4\omega_1^3\omega_2^3 - 18c_s^2\omega_1\omega_2^3 - 24\omega_3c_s^2\omega_1^3 - 138\omega_3\omega_1^2v_1^4\omega_2^3 + 7\omega_3\omega_1^3\omega_2^2 + 54c_s^2\omega_1v_1^2\omega_2^3 - 81\omega_3\omega_1^3v_1^2\omega_2^2 - 12\omega_3c_s^2\omega_1^2\omega_2^2 + 36\omega_3c_s^2\omega_1^2v_1^2\omega_2^2 - 99\omega_3\omega_1^3v_1^2 + 6\omega_3\omega_1^3 - \omega_3\omega_1^3\omega_2^2v_2^2 + 17\omega_3c_s^4\omega_1^3\omega_2^2 + 135\omega_3\omega_1^2v_1^4\omega_2 - 33\omega_3c_s^4\omega_1^3\omega_2 - 25\omega_3c_s^4\omega_1^2\omega_2^3 - 6\omega_3\omega_2^3 - 12\omega_3\omega_1^3\omega_2 - 7\omega_3\omega_1^2\omega_2^3 - 12\omega_3c_s^2\omega_1^2\omega_2 + 180\omega_3\omega_1^3v_1^2\omega_2 + 36c_s^2\omega_1^3v_1^2\omega_2^3 + 63\omega_3c_s^2\omega_1^2v_1^2\omega_2 + 63\omega_3\omega_1v_1^2\omega_2^2 + 18c_s^4\omega_1\omega_2^3 + 12\omega_3c_s^4\omega_1^2\omega_2^2 - 3\omega_3c_s^2\omega_1^2\omega_2^3v_2^2 + 207\omega_3c_s^2\omega_1^3v_1^2 - 180\omega_3\omega_1v_1^2\omega_2^3 - 54c_s^2\omega_1^3v_1^2\omega_2^2 - 24\omega_3c_s^2\omega_1^2\omega_2^2 + 24\omega_3c_s^2\omega_2^3$$

$$C_{13} = \omega_3\omega_1v_1^2 + 6\omega_1\omega_2 + 9\omega_3\omega_1v_2^2 + 6\omega_3c_s^2\omega_1\omega_2 - 6\omega_1v_1^2\omega_2 + \omega_3v_1^2\omega_2 - 2\omega_3\omega_1\omega_2 + 2\omega_3\omega_2 + 2\omega_3\omega_1v_1^2\omega_2 + 6\omega_3c_s^2\omega_1 - 18c_s^2\omega_1\omega_2 - 4\omega_3\omega_1 - 9\omega_3\omega_2v_2^2$$

$$C_{14} = -45\omega_3^2\omega_1^2v_1^2\omega_2v_2^2 + 45\omega_3^2v_1^2\omega_2^3v_2^2 - 27\omega_3^2\omega_1^2v_1^4\omega_2^3 - 36c_s^2\omega_1^2\omega_2^3v_2^2 - 18\omega_3^2c_s^4\omega_1^2\omega_2 + 12c_s^2\omega_1^3\omega_2^2 + 45\omega_3^2\omega_1^3v_1^2v_2^2 + 6\omega_3^2\omega_1\omega_2^3v_2^2 + 10\omega_3^2c_s^4\omega_1^3\omega_2^3 + 41\omega_3^2c_s^2\omega_1^2\omega_2^3 + 93\omega_3^2c_s^2\omega_1^3\omega_2 - 6\omega_3^2\omega_1^3\omega_2 + 3\omega_3^2c_s^2\omega_1\omega_2^3v_2^2 + 35\omega_3^2c_s^4\omega_1^3\omega_2^2 - 45\omega_3^2\omega_1v_1^2\omega_2^3v_2^2 - 24c_s^2\omega_1^3\omega_2^3 - 90\omega_3c_s^4\omega_1\omega_2^3 - 30\omega_3c_s^2\omega_1\omega_2^3v_2^2 + 138\omega_3^2c_s^2\omega_1^3v_1^2\omega_2^2 + 12\omega_3^2\omega_1^2\omega_2^2 + 6\omega_3^2\omega_2^3 - 108c_s^4\omega_1^2\omega_2^3 - 54\omega_3^2c_s^2\omega_1^2\omega_2^2 - 27\omega_3^2\omega_1^3v_1^2\omega_2^2 + 8\omega_3^2c_s^2\omega_1^3\omega_2^2v_2^2 - 30\omega_3^2c_s^2\omega_1\omega_2^2v_2^2 - 6\omega_3^2\omega_2^2\omega_2 - 9\omega_3^2\omega_1v_1^2\omega_2^2 - 2\omega_3^2c_s^2\omega_1^3\omega_2^3 + 99\omega_3^2\omega_1^3v_1^2\omega_2 + 24\omega_3^2c_s^2\omega_1^2\omega_2 - 36c_s^4\omega_1^3\omega_2^2 - 72\omega_3^2c_s^2\omega_1^3 - 117\omega_3^2c_s^4\omega_1^3\omega_2 + 18\omega_3^2c_s^2\omega_1^3v_2^2 + 6\omega_3^2\omega_1^3 - 91\omega_3^2c_s^4\omega_1^2\omega_2^3 + 27\omega_3^2c_s^2\omega_1v_1^2\omega_2^2 - 12\omega_3c_s^2\omega_1^3\omega_2^3v_2^2 + 6\omega_3^2\omega_1\omega_2^2v_2^2 - 6\omega_3^2\omega_1^3v_2^2 - 54\omega_3^2v_1^4\omega_2^3 - 54\omega_3^2\omega_1^2v_1^4\omega_2 - 459\omega_3^2c_s^2\omega_1^3v_1^2\omega_2 + 72c_s^4\omega_1^3\omega_2^3 + 2\omega_3^2c_s^2\omega_1^3\omega_2^3v_2^2 - 25\omega_3^2c_s^2\omega_1^3\omega_2^2 - 9\omega_3^2\omega_1v_1^2\omega_2^3 - 45\omega_3^2\omega_1^3v_1^2\omega_2v_2^2 - 6\omega_3^2c_s^2\omega_1^2\omega_2v_2^2 + 30\omega_3c_s^2\omega_1\omega_2^3 + 405\omega_3^2c_s^2\omega_1^3v_1^2 + 54\omega_3^2c_s^4\omega_1^2\omega_2^2 + 189\omega_3^2c_s^2\omega_1v_1^2\omega_2^3 + 36c_s^2\omega_1^2\omega_2^3 + 6\omega_3^2\omega_1^2\omega_2v_2^2 - 99\omega_3^2\omega_1^3v_1^2 - 45\omega_3^2\omega_1v_1^2\omega_2^2v_2^2 + 18\omega_3^2c_s^2\omega_1^2\omega_2^2v_2^2 - 48\omega_3c_s^2\omega_1^3\omega_2^3 - 90\omega_3^2\omega_1^2v_1^2\omega_2^2 + 6\omega_3c_s^2\omega_1^3\omega_2 + 18\omega_3^2c_s^4\omega_2^3 + 18\omega_3^2c_s^2\omega_2^2v_2^2 - 36\omega_3c_s^4\omega_1^3\omega_2^3 + 270\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^2 - 12\omega_3^2\omega_1^2\omega_2^2v_2^2 - 6\omega_3^2\omega_2^2v_2^2 - 90\omega_3^2c_s^4\omega_1\omega_2^2 + 27\omega_3^2\omega_1^3v_1^4\omega_2^2 - 36\omega_3c_s^2\omega_1^2\omega_2^2 + 27\omega_3^2\omega_1^2v_1^2\omega_2^3 + 54\omega_3^2\omega_1^3v_1^4 + 63\omega_3^2c_s^4\omega_1\omega_2^3 - 138\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^3 + 36\omega_3c_s^2\omega_1^2\omega_2^2v_2^2 + 24c_s^2\omega_1^3\omega_2^3v_2^2 + 54\omega_3^2\omega_1v_1^4\omega_2^3 - 18\omega_3c_s^4\omega_1^3\omega_2 + 6\omega_3^2\omega_1^3\omega_2v_2^2 + 144\omega_3c_s^4\omega_1^2\omega_2^3 - 24\omega_3^2c_s^2\omega_1^2\omega_2^3v_2^2 + 12\omega_3c_s^2\omega_1^3\omega_2^3 - 6\omega_3^2\omega_1\omega_2^2 - 21\omega_3^2c_s^2\omega_1^3\omega_2v_2^2 + 48\omega_3^2c_s^2\omega_1\omega_2^2 + 108\omega_3c_s^4\omega_1^2\omega_2^2 + 48\omega_3c_s^2\omega_1^2\omega_2^3v_2^2 + 54\omega_3^2\omega_1v_1^4\omega_2^2 - 12c_s^2\omega_1^3\omega_2^2v_2^2 + 90\omega_3^2\omega_1^2v_1^2\omega_2^2v_2^2 - 6\omega_3c_s^2\omega_1^3\omega_2v_2^2 - 297\omega_3^2c_s^2\omega_1^2v_1^2\omega_2 - 54\omega_3^2\omega_1^3v_1^4\omega_2 + 90\omega_3^2c_s^4\omega_1^3 - 135\omega_3^2c_s^2v_1^2\omega_2^3 - 39\omega_3^2c_s^2\omega_1\omega_2^3 + 99\omega_3^2\omega_1^2v_1^2\omega_2 + 9\omega_3^2v_1^2\omega_2^3 - 6\omega_3^2\omega_1\omega_2^3$$

$$C_{15} = 54\omega_3\omega_1^2\omega_2^2v_2^2 - 18\omega_3\omega_1\omega_2^2 - 81\omega_3\omega_1\omega_2^3 - 198\omega_3v_1^2\omega_2^3 - 100\omega_3\omega_1^2v_1^2\omega_2^3 - 54\omega_3c_s^2\omega_1\omega_2^2 + 18\omega_1\omega_2^3 + 36\omega_3\omega_2^3v_2^2 + 108c_s^2\omega_1^2\omega_2^2 - 27\omega_3\omega_1^2\omega_2\omega_2^2v_2^2 - 18\omega_1\omega_2^3v_2^2 - 162\omega_3\omega_1^2v_1^2\omega_2^2 + 135\omega_3c_s^2\omega_1\omega_2^3 - 54c_s^2\omega_1^3\omega_2 - 36\omega_1^2\omega_2^2 - 84\omega_3c_s^2\omega_1^2\omega_2^3 + 90\omega_3\omega_1^2\omega_2 - 297\omega_3c_s^2\omega_1^3\omega_2 + 36\omega_3\omega_1^3v_2^2 - 27\omega_3\omega_1\omega_2^3v_2^2 - 54c_s^2\omega_1\omega_2^3 + 270\omega_3c_s^2\omega_1^3 - 46\omega_3\omega_1^3\omega_2^2 + 100\omega_3\omega_1^3v_1^2\omega_2^2 + 162\omega_3c_s^2\omega_1^2\omega_2^2 - 18\omega_1^3\omega_2v_2^2 + 18\omega_1^3\omega_2 + 198\omega_3\omega_1^3v_1^2 - 126\omega_3\omega_1^3 - 36\omega_3\omega_1\omega_2^2v_2^2 + 54\omega_3\omega_2^3 + 135\omega_3\omega_1^3\omega_2 + 46\omega_3\omega_1^2\omega_2^3 - 162\omega_3c_s^2\omega_1^2\omega_2 - 216\omega_3\omega_1^3v_1^2\omega_2 + 162\omega_3\omega_1v_1^2\omega_2^2 - 36\omega_3\omega_1^2\omega_2v_2^2 + 216\omega_3\omega_1v_1^2\omega_2^3 + 36\omega_1^2\omega_2^2v_2^2 - 54\omega_3\omega_1^2\omega_2^2 + 84\omega_3c_s^2\omega_1^3\omega_2^2 - 54\omega_3c_s^2\omega_2^3$$

$$C_{16} = -135\omega_3^2\omega_1^2v_1^2\omega_2v_2^2 + 135\omega_3^2v_1^2\omega_2^3v_2^2 - 9\omega_3^2\omega_1^2v_1^4\omega_2^3 + 54\omega_3\omega_1^3v_1^4\omega_2^2 - 30\omega_3^2c_s^4\omega_1^2\omega_2 + 135\omega_3^2\omega_1^3v_1^2v_2^2 - 90\omega_3c_s^2\omega_1^3\omega_2^2v_2^2 + 18\omega_3^2\omega_1\omega_2^3v_2^2 - 2\omega_3^2c_s^4\omega_1^3\omega_2^3 - \omega_3^2\omega_1^2\omega_2^3v_2^4 + 2\omega_3^2c_s^2\omega_1^2\omega_2^3 + 21\omega_3^2c_s^2\omega_1^3\omega_2 + 144\omega_3c_s^2\omega_1^3v_1^2\omega_2^2 - 6\omega_3^2\omega_1^3\omega_2 + 9\omega_3^2c_s^2\omega_1\omega_2^3v_2^2 + 2\omega_3^2c_s^4\omega_1^3\omega_2^2 - 135\omega_3^2\omega_1v_1^2\omega_2^3v_2^2 + 30\omega_3c_s^4\omega_1\omega_2^3 + 126\omega_3c_s^2\omega_1\omega_2^3v_2^2 - \omega_3^2\omega_1^3\omega_2^2v_2^2 + 30\omega_3^2c_s^2\omega_1^3v_1^2\omega_2 + 12\omega_3^2\omega_1^2\omega_2^2 + 6\omega_3^2\omega_2^3 - 42\omega_3^2c_s^2\omega_1^2\omega_2^2 - 9\omega_3^2\omega_1^3v_1^2\omega_2^2 + 6\omega_3^2c_s^2\omega_1^3\omega_2^2v_2^2 + 54\omega_3\omega_1^2v_1^2\omega_2^3 - 90\omega_3^2c_s^2\omega_1\omega_2^2v_2^2 - 6\omega_3^2\omega_1^2\omega_2 + 45\omega_3^2\omega_1v_1^2\omega_2^2 + 18\omega_3c_s^2\omega_1v_1^2\omega_2^3 + 90\omega_3^2\omega_1^3v_1^2\omega_2 + 36\omega_3^2c_s^2\omega_1^2\omega_2 + 36\omega_1^3v_1^2\omega_2^2 - 24\omega_3^2c_s^2\omega_1^3 + 18\omega_3\omega_1v_1^4\omega_2^3 - 15\omega_3^2c_s^4\omega_1^3\omega_2 + 18\omega_3^2c_s^2\omega_1^3v_2^2 + 6\omega_3^2\omega_1^3 - 10\omega_3^2c_s^4\omega_1^2\omega_2^3 - 45\omega_3^2c_s^2\omega_1v_1^2\omega_2^2 + 72\omega_3c_s^2\omega_1^3\omega_2^2v_2^2 + 18\omega_3^2\omega_1\omega_2^2v_2^2 - 18\omega_3^2\omega_1^3v_2^2 - 36\omega_3^2v_1^4\omega_2^3 - 216\omega_3^2c_s^2\omega_1^3v_1^2\omega_2 - 2\omega_3^2c_s^2\omega_1^3\omega_2^2 + 36\omega_1^2v_1^4\omega_2^3 - 135\omega_3^2\omega_1^3v_1^2\omega_2v_2^2 + 108c_s^2\omega_1^2v_1^2\omega_2^3 - 54\omega_3^2c_s^2\omega_1^2\omega_2v_2^2 - 30\omega_3c_s^2\omega_1\omega_2^3 - 54\omega_3c_s^2\omega_1^3v_1^2\omega_2 + 189\omega_3^2c_s^2\omega_1^3v_1^2 - 18\omega_3\omega_1^3v_1^4\omega_2 + 30\omega_3^2c_s^4\omega_1^2\omega_2^2 + 108\omega_3^2c_s^2\omega_1v_1^2\omega_2^3 + 18\omega_3^2\omega_1^2\omega_2v_2^2 - 81\omega_3^2\omega_1^3v_1^2 - 135\omega_3^2\omega_1v_1^2\omega_2^2v_2^2 - 144\omega_3c_s^2\omega_1^2v_1^2\omega_2^3 + 72\omega_3^2c_s^2\omega_1^2\omega_2^2v_2^2 + 60\omega_3c_s^2\omega_1^2\omega_2^3 - 90\omega_3^2\omega_1^2v_1^2\omega_2^2 - 6\omega_3c_s^2\omega_1^3\omega_2 - 30\omega_3^2c_s^4\omega_2^3 - 18\omega_3^2c_s^2\omega_2^3v_2^2 + 24\omega_3c_s^4\omega_1^3\omega_2^3 + 108\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^2 - 36\omega_3^2\omega_1^2\omega_2^2v_2^2 - 18\omega_3^2\omega_2^3v_2^2 - 54\omega_3\omega_1^2v_1^4\omega_2^3 - 30\omega_3^2c_s^4\omega_1\omega_2^2 + 9\omega_3^2\omega_1^3v_1^4\omega_2^2 - 54\omega_3\omega_1^3v_1^2\omega_2^2 - 60\omega_3c_s^2\omega_1^2\omega_2^2 + 9\omega_3^2\omega_1^2v_1^2\omega_2^3 + 36\omega_3c_s^2\omega_1^2v_1^2\omega_2^2 + 36\omega_3^2\omega_1^3v_1^4 + 45\omega_3^2c_s^4\omega_1\omega_2^3 - 30\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^3 + 144\omega_3c_s^2\omega_1^2\omega_2^2v_2^2 - 36\omega_3c_s^4\omega_1^3\omega_2^2 + \omega_3^2\omega_1^2\omega_2^3v_2^2 + 45\omega_3^2\omega_1v_1^4\omega_2^3 + 6\omega_3c_s^4\omega_1^3\omega_2 + 18\omega_3^2\omega_1^3\omega_2v_2^2 - 36\omega_1^2v_1^2\omega_2^3 - 60\omega_3c_s^4\omega_1^2\omega_2^3 - 6\omega_3^2c_s^2\omega_1^2\omega_2^3v_2^2 - 24\omega_3c_s^2\omega_1^3\omega_2^3 - 6\omega_3^2\omega_1\omega_2^2 + 18\omega_3\omega_1^3v_1^2\omega_2 - 9\omega_3^2c_s^2\omega_2^3v_2^2 + 36\omega_3^2c_s^2\omega_1\omega_2^2 + 60\omega_3c_s^4\omega_1^2\omega_2^2 - 198\omega_3c_s^2\omega_1^2\omega_2^3v_2^2 + 270\omega_3^2\omega_1^2v_1^2\omega_2^2v_2^2 + 18\omega_3c_s^2\omega_1^3\omega_2v_2^2 - 81\omega_3^2c_s^2\omega_1^2v_1^2\omega_2 - 45\omega_3^2\omega_1^3v_1^4\omega_2 + 18\omega_3^2c_s^4\omega_1^3 - 36\omega_1^3v_1^4\omega_2^2 - 63\omega_3^2c_s^2v_1^2\omega_2^3 - 18\omega_3\omega_1v_1^2\omega_2^3 - 198c_s^2\omega_1^3v_1^2\omega_2^2 - 3\omega_3^2c_s^2\omega_1\omega_2^3 + 45\omega_3^2\omega_1^2v_1^2\omega_2 - 9\omega_3^2v_1^2\omega_2^3 + \omega_3^2\omega_1^3\omega_2^2v_2^4 + 36\omega_3c_s^2\omega_1^3\omega_2^2 - 6\omega_3^2\omega_1\omega_2^3$$

$$C_{17} = 9\omega_3^2\omega_1^2v_1^2\omega_2v_2^2 - 45\omega_3^2v_1^2\omega_2^3v_2^2 - 54\omega_3^2c_s^4\omega_1^2\omega_2 + 12c_s^2\omega_1^3\omega_2^2 + 45\omega_3^2\omega_1^3v_1^2v_2^2 - 18\omega_3^2\omega_1\omega_2^3v_2^2 + 5\omega_3^2c_s^2\omega_1^2\omega_2^3 + 75\omega_3^2c_s^2\omega_1^3\omega_2 - \omega_3^2\omega_1^2\omega_2^3 - 54\omega_3^2\omega_1^3\omega_2v_2^4 + 18\omega_3c_s^2\omega_1^3v_1^2\omega_2^2 - 6\omega_3^2\omega_1^3\omega_2 - 54\omega_3^2c_s^2\omega_1\omega_2^3v_2^2 + 6\omega_3^2c_s^4\omega_1^3\omega_2^2 + 72\omega_3^2\omega_1v_1^2\omega_2^3v_2^2 + 18\omega_3c_s^4\omega_1\omega_2^3 - 24\omega_3^2\omega_1^3\omega_2^2v_2^2 + 2\omega_3^2c_s^2\omega_1^3v_1^2\omega_2^2 - 6\omega_3^2\omega_2^3 + 36c_s^4\omega_1^2\omega_2^3 - 72\omega_3^2c_s^2\omega_1^2\omega_2^2 - \omega_3^2\omega_1^3v_1^2\omega_2^2 + 72\omega_3^2c_s^2\omega_1^3\omega_2^2v_2^2 - 297\omega_3^2c_s^2\omega_1\omega_2^2v_2^2 - 6\omega_3^2\omega_1^2\omega_2 - 6\omega_3^2\omega_1v_1^2\omega_2^2 + 108\omega_3^2\omega_1^2\omega_2^2v_2^4 + 6\omega_3^2c_s^2\omega_1v_1^2\omega_2^3 + 54\omega_3^2\omega_2^3v_2^4 + 6\omega_3^2\omega_1^3v_1^2\omega_2 + 60\omega_3^2c_s^2\omega_1^2\omega_2 - 36c_s^4\omega_1^3\omega_2^2 - 72\omega_3^2c_s^2\omega_1^3 - 99\omega_3^2c_s^4\omega_1^3\omega_2 + 405\omega_3^2c_s^2\omega_1^3v_2^2 + 6\omega_3^2\omega_1^3 - 6\omega_3^2c_s^4\omega_1^2\omega_2^3 +$$

$$6\omega_3^2c_s^2\omega_1v_1^2\omega_2^2+63\omega_3^2\omega_1\omega_2^2v_2^2-99\omega_3^2\omega_1^3v_2^2-21\omega_3^2c_s^2\omega_1^3v_1^2\omega_2-5\omega_3^2c_s^2\omega_1^3\omega_2^2-6\omega_3^2\omega_1v_1^2\omega_2^3-72\omega_3^2\omega_1^3v_1^2\omega_2v_2^2+12c_s^2\omega_1^2v_1^2\omega_2^3-243\omega_3^2c_s^2\omega_1^2\omega_2v_2^2-6\omega_3c_s^2\omega_1\omega_2^3+\omega_3^2\omega_1^3\omega_2^2-6\omega_3c_s^2\omega_1^3v_1^2\omega_2+18\omega_3^2c_s^2\omega_1^3v_1^2+72\omega_3^2c_s^4\omega_1^2\omega_2^2+21\omega_3^2c_s^2\omega_1v_1^2\omega_2^3-12c_s^2\omega_1^2\omega_2^3+45\omega_3^2\omega_1^2\omega_2v_2^2-6\omega_3^2\omega_1^3v_1^2-9\omega_3^2\omega_1v_1^2\omega_2^2v_2^2-54\omega_3^2\omega_1\omega_2^2v_2^4-18\omega_3c_s^2\omega_1^2v_1^2\omega_2^3+540\omega_3^2c_s^2\omega_1^2\omega_2^2v_2^2+18\omega_3c_s^2\omega_1^2\omega_2^3+54\omega_3^2\omega_1^3v_2^4+24\omega_3^2\omega_1^3v_1^2\omega_2^2v_2^2+6\omega_3c_s^2\omega_1^3\omega_2-18\omega_3^2c_s^4\omega_2^3+135\omega_3^2c_s^2\omega_2^3v_2^2-108\omega_3^2\omega_1^2\omega_2^2v_2^2-9\omega_3^2\omega_2^3v_2^2-18\omega_3^2c_s^4\omega_1\omega_2^2+\omega_3^2\omega_1^2v_1^2\omega_2^3-54\omega_3^2\omega_1^2\omega_2v_2^4+27\omega_3^2c_s^4\omega_1\omega_2^3-2\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^3+54\omega_3c_s^4\omega_1^3\omega_2^2-24\omega_3^2\omega_1^2v_1^2\omega_2^3v_2^2+24\omega_3^2\omega_1^2\omega_2^3v_2^2-18\omega_3c_s^4\omega_1^3\omega_2+126\omega_3^2\omega_1^3\omega_2v_2^2-54\omega_3c_s^4\omega_1^2\omega_2^3-72\omega_3^2c_s^2\omega_1^2\omega_2^3v_2^2+6\omega_3^2\omega_1\omega_2^2-486\omega_3^2c_s^2\omega_1^3\omega_2v_2^2+12\omega_3^2c_s^2\omega_1\omega_2^2-54\omega_3^2\omega_1\omega_2^3v_2^4-6\omega_3^2c_s^2\omega_1^2v_1^2\omega_2+90\omega_3^2c_s^4\omega_1^3-18\omega_3^2c_s^2v_1^2\omega_2^3-12c_s^2\omega_1^3v_1^2\omega_2^2-3\omega_3^2c_s^2\omega_1\omega_2^3+6\omega_3^2\omega_1^2v_1^2\omega_2+6\omega_3^2v_1^2\omega_2^3-18\omega_3c_s^2\omega_1^3\omega_2^2+6\omega_3^2\omega_1\omega_2^3$$

$$C_{18}=27\omega_3^2\omega_1^2v_1^2\omega_2v_2^2+36\omega_3\omega_1^2\omega_2^2v_2^2-135\omega_3^2v_1^2\omega_2^3v_2^2-324c_s^2\omega_1^2\omega_2^3v_2^2-30\omega_3^2c_s^4\omega_1^2\omega_2+135\omega_3^2\omega_1^3v_1^2v_2^2+198\omega_3c_s^2\omega_1^3\omega_2^2v_2^2-9\omega_3^2\omega_1\omega_2^3v_2^2-2\omega_3^2c_s^4\omega_1^3\omega_2^3+7\omega_3^2\omega_1^2\omega_2^3v_2^4-12\omega_3^2c_s^2\omega_1^2\omega_2^3+21\omega_3^2c_s^2\omega_1^3\omega_2-\omega_3^2\omega_1^2\omega_2^3-63\omega_3^2\omega_1^3\omega_2v_2^4-72\omega_3^2\omega_2^3v_2^2-36\omega_3c_s^2\omega_1^3v_1^2\omega_2^2-6\omega_3^2\omega_1^3\omega_2-171\omega_3^2c_s^2\omega_1\omega_2^3v_2^2-\omega_3^2c_s^4\omega_1^3\omega_2+216\omega_3^2\omega_1v_1^2\omega_2^3v_2^2+18\omega_3c_s^4\omega_1\omega_2^3+54\omega_3c_s^2\omega_1\omega_2^3v_2^2-43\omega_3^2\omega_1^3\omega_2^2v_2^2-6\omega_3^2c_s^2\omega_1^3v_1^2\omega_2^2-6\omega_3^2\omega_2^3-12\omega_3^2c_s^2\omega_1^2\omega_2^2-3\omega_3^2\omega_1^3v_1^2\omega_2^2-78\omega_3\omega_1^3\omega_2^3v_2^4+84\omega_3^2c_s^2\omega_1^3\omega_2^2v_2^2+36\omega_1^3\omega_2^2v_2^2+99\omega_3^2c_s^2\omega_1\omega_2^2v_2^2-18\omega_3\omega_1\omega_2^3v_2^4-6\omega_3^2\omega_1^2\omega_2-18\omega_3^2\omega_1v_1^2\omega_2^2-54\omega_3^2\omega_1^2\omega_2^2v_2^4-54\omega_3c_s^2\omega_1v_1^2\omega_2^3+36\omega_3^2\omega_2^3v_2^4+18\omega_3^2\omega_1^3v_1^2\omega_2+36\omega_3^2c_s^2\omega_1^2\omega_2-24\omega_3^2c_s^2\omega_1^3-15\omega_3^2c_s^4\omega_1^3\omega_2+189\omega_3^2c_s^2\omega_1^3v_2^2+18\omega_3\omega_1^3\omega_2v_2^2+6\omega_3^2\omega_1^3+29\omega_3^2c_s^4\omega_1^2\omega_2^3+18\omega_3^2c_s^2\omega_1v_1^2\omega_2^2-198\omega_3c_s^2\omega_1^3\omega_2^3v_2^2-27\omega_3^2\omega_1\omega_2^3v_2^2-81\omega_3^2\omega_1^3v_2^2-144\omega_3\omega_1^2\omega_2^3v_2^2-9\omega_3^2c_s^2\omega_1^3v_1^2\omega_2+24\omega_3^2c_s^2\omega_1^3\omega_2^3v_2^2+72\omega_3\omega_1^3\omega_2^2v_2^4-18\omega_3^2\omega_1v_1^2\omega_2^3-216\omega_3^2\omega_1^3v_1^2\omega_2v_2^2+81\omega_3^2c_s^2\omega_1^2\omega_2v_2^2-18\omega_3c_s^2\omega_1\omega_2^3+\omega_3^2\omega_1^3\omega_2^2+18\omega_3c_s^2\omega_1^3v_1^2\omega_2+18\omega_3^2c_s^2\omega_1^3v_1^2-8\omega_3^2\omega_1^3\omega_2^3v_2^2+12\omega_3^2c_s^4\omega_1^2\omega_2^2-9\omega_3^2c_s^2\omega_1v_1^2\omega_2^3-108\omega_1^2\omega_2^3v_2^4-45\omega_3^2\omega_1^2\omega_2v_2^2-18\omega_3^2\omega_1^3v_1^2-27\omega_3^2\omega_1v_1^2\omega_2^2v_2^2-18\omega_3\omega_1^3\omega_2v_2^4+36\omega_3^2\omega_1\omega_2^2v_2^4+36\omega_3c_s^2\omega_1^2v_1^2\omega_2^3-144\omega_3^2c_s^2\omega_1^2\omega_2^2v_2^2+144\omega_3\omega_1^2\omega_2^3v_2^4+30\omega_3c_s^2\omega_1^2\omega_2^3+36\omega_3^2\omega_1^3v_2^4+72\omega_3^2\omega_1^3v_1^2\omega_2^2v_2^2-6\omega_3c_s^2\omega_1^3\omega_2+30\omega_3^2c_s^4\omega_2^3-36\omega_1^3\omega_2^2v_2^4+18\omega_3\omega_1\omega_2^3v_2^2+63\omega_3^2c_s^2\omega_1^3v_2^2+12\omega_3c_s^4\omega_1^3\omega_2^3+18\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^2+54\omega_3^2\omega_1^2\omega_2^2v_2^2+9\omega_3^2\omega_2^3v_2^2+6\omega_3^2c_s^4\omega_1\omega_2^2-24\omega_3c_s^2\omega_1^2\omega_2^2+3\omega_3^2\omega_1^2v_1^2\omega_2^3+8\omega_3^2\omega_1^3\omega_2^3v_2^4+36\omega_3c_s^2\omega_1^2v_1^2\omega_2^2+36\omega_3^2\omega_1^2\omega_2v_2^4+108\omega_1^2\omega_2^3v_2^2-57\omega_3^2c_s^4\omega_1\omega_2^3-72\omega_3\omega_1^3\omega_2^2v_2^2+6\omega_3^2c_s^2\omega_1^2v_1^2\omega_2^3-72\omega_3c_s^2\omega_1^2\omega_2^2v_2^2-18\omega_3c_s^4\omega_1^3\omega_2^2-72\omega_3^2\omega_1^2v_1^2\omega_2^3v_2^2+216c_s^2\omega_1^3\omega_2^3v_2^2+17\omega_3^2\omega_1^2\omega_2^3v_2^2+6\omega_3c_s^4\omega_1^3\omega_2+72\omega_1^3\omega_2^3v_2^4+135\omega_3^2\omega_1^3\omega_2v_2^2-30\omega_3c_s^4\omega_1^2\omega_2^3-36\omega_3\omega_1^2\omega_2^2v_2^4+30\omega_3^2c_s^2\omega_1^2\omega_2^3v_2^2-12\omega_3c_s^2\omega_1^3\omega_2^3+6\omega_3^2\omega_1\omega_2^2-297\omega_3^2c_s^2\omega_1^3\omega_2v_2^2-12\omega_3^2c_s^2\omega_1\omega_2^2-63\omega_3^2\omega_1\omega_2^3v_2^4+24\omega_3c_s^4\omega_1^2\omega_2^2+306\omega_3c_s^2\omega_1^2\omega_2^3v_2^2-108c_s^2\omega_1^3\omega_2^2v_2^2-54\omega_3c_s^2\omega_1^3\omega_2v_2^2-54\omega_3^2c_s^2\omega_1^2v_1^2\omega_2+78\omega_3\omega_1^3\omega_2^3v_2^2+18\omega_3^2c_s^4\omega_1^3+18\omega_3^2c_s^2v_1^2\omega_2^3+15\omega_3^2c_s^2\omega_1\omega_2^3+18\omega_3^2\omega_1^2v_1^2\omega_2+18\omega_3^2v_1^2\omega_2^3+19\omega_3^2\omega_1^3\omega_2^2v_2^4+18\omega_3c_s^2\omega_1^3\omega_2^2+6\omega_3^2\omega_1\omega_2^3$$

$$C_{19}=396\omega_3\omega_1^2\omega_2^2v_2^2+18\omega_1v_1^2\omega_2^3+54c_s^2\omega_1^3\omega_2^2+90\omega_3\omega_1\omega_2^2-18\omega_1^3v_1^2\omega_2+45\omega_3\omega_1\omega_2^3-36\omega_3v_1^2\omega_2^3-10\omega_3\omega_1^2v_1^2\omega_2^3-162\omega_3c_s^2\omega_1\omega_2^2-18\omega_1\omega_2^3+18\omega_1^3v_1^2\omega_2^2+198\omega_3\omega_2^3v_2^2-198\omega_3\omega_1^3\omega_2v_2^2-27\omega_3c_s^2\omega_1\omega_2^3-54c_s^2\omega_1^3\omega_2-54c_s^2\omega_1^2\omega_2^3-30\omega_3c_s^2\omega_1^2\omega_2^3+90\omega_3\omega_1^2\omega_2-297\omega_3c_s^2\omega_1^3\omega_2+198\omega_3\omega_1^3v_2^2-198\omega_3\omega_1\omega_2^3v_2^2+54c_s^2\omega_1\omega_2^3+270\omega_3c_s^2\omega_1^3-10\omega_3\omega_1^3\omega_2^2+10\omega_3\omega_1^3v_1^2\omega_2^2+324\omega_3c_s^2\omega_1^2\omega_2^2+18\omega_1^3\omega_2+18\omega_1^2\omega_2^3+36\omega_3\omega_1^3v_1^2-126\omega_3\omega_1^3-18\omega_1^2v_1^2\omega_2^3-198\omega_3\omega_1\omega_2^2v_2^2-54\omega_3\omega_2^3+135\omega_3\omega_1^3\omega_2+10\omega_3\omega_1^2\omega_2^3-162\omega_3c_s^2\omega_1^2\omega_2-45\omega_3\omega_1^3v_1^2\omega_2-18\omega_1^3\omega_2^2-198\omega_3\omega_1^2\omega_2v_2^2+45\omega_3\omega_1v_1^2\omega_2^3-180\omega_3\omega_1^2\omega_2^2+30\omega_3c_s^2\omega_1^3\omega_2^2+54\omega_3c_s^2\omega_2^3$$

$$C_{20}=210\omega_3\omega_1^2\omega_2^2v_2^2+6c_s^2\omega_1^3\omega_2v_2^2+54\omega_3c_s^4\omega_1\omega_2^2+404\omega_3c_s^2\omega_1^3\omega_2^2v_2^2+261\omega_3c_s^2\omega_2^3v_2^2-36c_s^4\omega_1^2\omega_2^2+6\omega_3\omega_1\omega_2^2+99\omega_3\omega_1\omega_2^2v_2^4-171\omega_3c_s^4\omega_1\omega_2^3-600\omega_3c_s^2\omega_1\omega_2^3v_2^2-12\omega_3\omega_1\omega_2^3+99\omega_3\omega_1^2\omega_2v_2^4+18c_s^4\omega_1^3\omega_2+90\omega_3c_s^4\omega_1^3-18\omega_3\omega_1^3\omega_2^3v_2^4-60\omega_3c_s^2\omega_1\omega_2^2-117\omega_3\omega_1\omega_2^3v_2^4+45\omega_3\omega_1^3v_2^4-51\omega_3\omega_2^3v_2^2+12c_s^2\omega_1^2\omega_2^2+129\omega_3\omega_1^3\omega_2v_2^2-12c_s^2\omega_1^2\omega_2^2v_2^2-68\omega_3c_s^2\omega_1^3\omega_2^2v_2^2-98\omega_3\omega_1^2\omega_2^3v_2^2+90\omega_3c_s^4\omega_2^3+411\omega_3c_s^2\omega_1^2\omega_2v_2^2+90\omega_3\omega_1^3\omega_2^2v_2^4+141\omega_3c_s^2\omega_1\omega_2^3+411\omega_3c_s^2\omega_1\omega_2^2v_2^2-6c_s^2\omega_1^3\omega_2+45\omega_3\omega_2^3v_2^4-117\omega_3\omega_1^3\omega_2v_2^4+90\omega_3\omega_1^2\omega_2^3v_2^4-78\omega_3c_s^2\omega_1^2\omega_2^3+6\omega_3\omega_1^2\omega_2+141\omega_3c_s^2\omega_1^3\omega_2-2\omega_3\omega_1^3\omega_2^3+54\omega_3c_s^4\omega_1^2\omega_2-51\omega_3\omega_1^3v_2^2+129\omega_3\omega_1\omega_2^3v_2^2-10\omega_3c_s^4\omega_1^3\omega_2^3-6c_s^2\omega_1\omega_2^3-72\omega_3c_s^2\omega_1^3+8\omega_3\omega_1^3\omega_2^2+114\omega_3c_s^2\omega_1^2\omega_2^2+6\omega_3\omega_1^3-98\omega_3\omega_1^3\omega_2^2v_2^2-816\omega_3c_s^2\omega_1^2\omega_2^2v_2^2+82\omega_3c_s^4\omega_1^3\omega_2^2+6c_s^2\omega_1\omega_2^3v_2^2+261\omega_3c_s^2\omega_1^3v_2^2-171\omega_3c_s^4\omega_1^3\omega_2+82\omega_3c_s^4\omega_1^2\omega_2^3-105\omega_3\omega_1\omega_2^2v_2^2+6\omega_3\omega_2^3-12\omega_3\omega_1^3\omega_2-198\omega_3\omega_1^2\omega_2^2v_2^4+12\omega_3c_s^2\omega_1^3\omega_2^3+8\omega_3\omega_1^2\omega_2^3-60\omega_3c_s^2\omega_1^2\omega_2+18c_s^4\omega_1\omega_2^3-90\omega_3c_s^4\omega_1^2\omega_2^2+404\omega_3c_s^2\omega_1^2\omega_2^3v_2^2-105\omega_3\omega_1^2\omega_2v_2^2-600\omega_3c_s^2\omega_1^3\omega_2v_2^2+20\omega_3\omega_1^3\omega_2^3v_2^2-12\omega_3\omega_1^2\omega_2^2-78\omega_3c_s^2\omega_1^3\omega_2^2-72\omega_3c_s^2\omega_2^3$$

$$C_{21}=306\omega_3\omega_1^2\omega_2^2v_2^2+18c_s^2\omega_1^3\omega_2v_2^2+6\omega_3c_s^4\omega_1\omega_2^2+252\omega_3c_s^2\omega_1^3\omega_2^2v_2^2+207\omega_3c_s^2\omega_2^3v_2^2-12c_s^4\omega_1^2\omega_2^2+6\omega_3\omega_1\omega_2^2+333\omega_3\omega_1\omega_2^2v_2^4-33\omega_3c_s^4\omega_1\omega_2^3-432\omega_3c_s^2\omega_1\omega_2^3v_2^2-12\omega_3\omega_1\omega_2^3+333\omega_3\omega_1^2\omega_2v_2^4+6c_s^4\omega_1^3\omega_2+18\omega_3c_s^4\omega_1^3-58\omega_3\omega_1^3\omega_2^3v_2^4-12\omega_3c_s^2\omega_1\omega_2^2-423\omega_3\omega_1\omega_2^3v_2^4+171\omega_3\omega_1^3v_2^4-99\omega_3\omega_2^3v_2^2+12c_s^2\omega_1^2\omega_2^2+225\omega_3\omega_1^3\omega_2v_2^2-36c_s^2\omega_1^2\omega_2^2v_2^2-36\omega_3c_s^2\omega_1^3\omega_2^3v_2^2-154\omega_3\omega_1^2\omega_2^3v_2^2+18\omega_3c_s^4\omega_2^3+225\omega_3c_s^2\omega_1^2\omega_2v_2^2+310\omega_3\omega_1^3\omega_2^2v_2^4+45\omega_3c_s^2\omega_1\omega_2^3+225\omega_3c_s^2\omega_1\omega_2^2v_2^2-6c_s^2\omega_1^3\omega_2+171\omega_3\omega_2^3v_2^4-423\omega_3\omega_1^3\omega_2v_2^4+310\omega_3\omega_1^2\omega_2^3v_2^4-22\omega_3c_s^2\omega_1^2\omega_2^3+6\omega_3\omega_1^2\omega_2+45\omega_3c_s^2\omega_1^3\omega_2-2\omega_3\omega_1^3\omega_2^3+6\omega_3c_s^4\omega_1^2\omega_2-99\omega_3\omega_1^3v_2^2+225\omega_3\omega_1\omega_2^3v_2^2-2\omega_3c_s^4\omega_1^3\omega_2^3-6c_s^2\omega_1\omega_2^3-24\omega_3c_s^2\omega_1^3+8\omega_3\omega_1^3\omega_2^2+18\omega_3c_s^2\omega_1^2\omega_2^2+6\omega_3\omega_1^3-154\omega_3\omega_1^3\omega_2^2v_2^2-432\omega_3c_s^2\omega_1^2\omega_2^2v_2^2+14\omega_3c_s^4\omega_1^3\omega_2^2+18c_s^2\omega_1\omega_2^3v_2^2+207\omega_3c_s^2\omega_1^3v_2^2-33\omega_3c_s^4\omega_1^3\omega_2+14\omega_3c_s^4\omega_1^2\omega_2^3-153\omega_3\omega_1\omega_2^2v_2^2+6\omega_3\omega_2^3-12\omega_3\omega_1^3\omega_2-666\omega_3\omega_1^2\omega_2^2v_2^4+4\omega_3c_s^2\omega_1^3\omega_2^3+8\omega_3\omega_1^2\omega_2^3-12\omega_3c_s^2\omega_1^2\omega_2+6c_s^4\omega_1\omega_2^3-6\omega_3c_s^4\omega_1^2\omega_2^2+252\omega_3c_s^2\omega_1^2\omega_2^3v_2^2-153\omega_3\omega_1^2\omega_2v_2^2-432\omega_3c_s^2\omega_1^3\omega_2v_2^2+28\omega_3\omega_1^3\omega_2^3v_2^2-12\omega_3\omega_1^2\omega_2^2-22\omega_3c_s^2\omega_1^3\omega_2^2-24\omega_3c_s^2\omega_2^3$$

3 Comparison of SRT, MRT, CLBM, and CuLBM

3.1 Conservation of mass: ρ

$$\frac{\partial\rho}{\partial t}+v_1\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_1}+\rho\frac{\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1}+v_2\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_2}+\rho\frac{\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2}+(-1+v_1^2+3c_s^2)\frac{v_1}{12}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_1^3}+(-1+3v_1^2+c_s^2)\frac{\rho}{12}\frac{\delta_l^3}{\delta_t}\frac{\partial^3v_1}{\partial x_1^3}-\frac{\rho c_s^2}{6}\frac{\delta_l^3}{\delta_t}\frac{\partial^3v_2}{\partial x_1^2\partial x_2}-\frac{\rho c_s^2}{6}\frac{\delta_l^3}{\delta_t}\frac{\partial^3v_1}{\partial x_1\partial x_2^2}+(-1+3c_s^2+v_2^2)\frac{v_2}{12}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_2^3}+(-1+c_s^2+3v_2^2)\frac{\rho}{12}\frac{\delta_l^3}{\delta_t}\frac{\partial^3v_2}{\partial x_2^3}+C^{(0)}_{\mathrm{D}_x^4\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1^4}+C^{(0)}_{\mathrm{D}_x^4v_1}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_1}{\partial x_1^4}+C^{(0)}_{\mathrm{D}_x^3\mathrm{D}_y\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1^3\partial x_2}+C^{(0)}_{\mathrm{D}_x^3\mathrm{D}_yv_1}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_1}{\partial x_1^3\partial x_2}+C^{(0)}_{\mathrm{D}_x^3\mathrm{D}_yv_2}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_2}{\partial x_1^3\partial x_2}+C^{(0)}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2}+C^{(0)}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_1}{\partial x_1^2\partial x_2^2}+C^{(0)}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_2}{\partial x_1^2\partial x_2^2}+C^{(0)}_{\mathrm{D}_x\mathrm{D}_y^3\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1\partial x_2^3}+C^{(0)}_{\mathrm{D}_x\mathrm{D}_y^3v_1}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_1}{\partial x_1\partial x_2^3}+C^{(0)}_{\mathrm{D}_x\mathrm{D}_y^3v_2}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_2}{\partial x_1\partial x_2^3}+C^{(0)}_{\mathrm{D}_y^4\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_2^4}+C^{(0)}_{\mathrm{D}_y^4v_2}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_2}{\partial x_2^4}=0,$$

where:

coefficient $C^{(0)}_{\mathrm{D}^4_x\rho}$ **at** $\frac{\partial^4\rho}{\partial x_1^4}$**:**

$C^{(0),\mathrm{SRT}}_{\mathrm{D}^4_x\rho} = (-3v_1^4\omega - 6v_1^2 - 2c_s^2 + c_s^2\omega + 24v_1^2c_s^2 - 12v_1^2c_s^2\omega + 3v_1^2\omega + 2c_s^4 - c_s^4\omega + 6v_1^4)\frac{1}{24\omega}$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}^4_x\rho} = (3\omega_5 v_1^2 - 6v_1^2 - 2c_s^2 - 12\omega_5 v_1^2c_s^2 + \omega_5 c_s^2 + 24v_1^2c_s^2 + 2c_s^4 - \omega_5 c_s^4 - 3\omega_5 v_1^4 + 6v_1^4)\frac{1}{24\omega_5}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}^4_x\rho} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^4_x\rho}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}^4_x\rho} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^4_x\rho}$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}^4_x\rho} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^4_x\rho}$

$C^{(0),\mathrm{CuLBM1}}_{\mathrm{D}^4_x\rho} = (-6v_1^2 - 3v_1^4\omega_1 - 2c_s^2 - 12v_1^2c_s^2\omega_1 + c_s^2\omega_1 + 24v_1^2c_s^2 + 2c_s^4 + 3v_1^2\omega_1 - c_s^4\omega_1 + 6v_1^4)\frac{1}{24\omega_1}$

$C^{(0),\mathrm{CuLBM2}}_{\mathrm{D}^4_x\rho} = (3\omega_2 v_1^4 - \omega_2 c_s^4\omega_1 + 3v_1^4\omega_1 + \omega_2 c_s^4 + 3\omega_2 v_1^2\omega_1 + 12v_1^2c_s^2\omega_1 - c_s^2\omega_1 + 12\omega_2 v_1^2c_s^2 - \omega_2 c_s^2 + \omega_2 c_s^2\omega_1 - 3v_1^2\omega_1 - 12\omega_2 v_1^2c_s^2\omega_1 - 3\omega_2 v_1^4\omega_1 + c_s^4\omega_1 - 3\omega_2 v_1^2)\frac{1}{24\omega_2\omega_1}$

coefficient $C^{(0)}_{\mathrm{D}^4_x v_1}$ **at** $\frac{\partial^4 v_1}{\partial x_1^4}$**:**

$C^{(0),\mathrm{SRT}}_{\mathrm{D}^4_x v_1} = (-4 + 10v_1^2 + 6c_s^2 - 3c_s^2\omega - 5v_1^2\omega + 2\omega)\frac{v_1\rho}{12\omega}$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}^4_x v_1} = (-4 - 5\omega_5 v_1^2 + 2\omega_5 + 10v_1^2 + 6c_s^2 - 3\omega_5 c_s^2)\frac{v_1\rho}{12\omega_5}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}^4_x v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^4_x v_1}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}^4_x v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^4_x v_1}$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}^4_x v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^4_x v_1}$

$C^{(0),\mathrm{CuLBM1}}_{\mathrm{D}^4_x v_1} = (-4 + 10v_1^2 + 6c_s^2 - 3c_s^2\omega_1 - 5v_1^2\omega_1 + 2\omega_1)\frac{v_1\rho}{12\omega_1}$

$C^{(0),\mathrm{CuLBM2}}_{\mathrm{D}^4_x v_1} = (-2\omega_2 + 2\omega_2\omega_1 - 5\omega_2 v_1^2\omega_1 + 3c_s^2\omega_1 + 3\omega_2 c_s^2 - 3\omega_2 c_s^2\omega_1 + 5v_1^2\omega_1 - 2\omega_1 + 5\omega_2 v_1^2)\frac{v_1\rho}{12\omega_2\omega_1}$

coefficient $C^{(0)}_{\mathrm{D}^3_x\mathrm{D}_y\rho}$ **at** $\frac{\partial^4\rho}{\partial x_1^3\partial x_2}$**:**

$C^{(0),\mathrm{SRT}}_{\mathrm{D}^3_x\mathrm{D}_y\rho} = 0$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}^3_x\mathrm{D}_y\rho} = (-\omega_5 v_1^2 + \omega_5 + v_1^2\omega_7 - 3\omega_5 c_s^2 + 3c_s^2\omega_7 - \omega_7)\frac{v_1 v_2}{4\omega_5\omega_7}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}^3_x\mathrm{D}_y\rho} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^3_x\mathrm{D}_y\rho}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}^3_x\mathrm{D}_y\rho} = 0$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}^3_x\mathrm{D}_y\rho} = 0$

$C^{(0),\mathrm{CuLBM1}}_{\mathrm{D}^3_x\mathrm{D}_y\rho} = 0$

$C^{(0),\mathrm{CuLBM2}}_{\mathrm{D}^3_x\mathrm{D}_y\rho} = (-\omega_2 v_2^2 + \omega_2 + v_2^2\omega_1 + 3c_s^2\omega_1 - 3\omega_2 c_s^2 - \omega_1)\frac{v_1 v_2}{8\omega_2\omega_1}$

coefficient $C^{(0)}_{\mathrm{D}^3_x\mathrm{D}_y v_1}$ **at** $\frac{\partial^4 v_1}{\partial x_1^3\partial x_2}$**:**

$C^{(0),\mathrm{SRT}}_{\mathrm{D}^3_x\mathrm{D}_y v_1} = 0$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}^3_x\mathrm{D}_y v_1} = (-3\omega_5 v_1^2 + \omega_5 + 3v_1^2\omega_7 - \omega_5 c_s^2 + c_s^2\omega_7 - \omega_7)\frac{\rho v_2}{4\omega_5\omega_7}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}^3_x\mathrm{D}_y v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^3_x\mathrm{D}_y v_1}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}^3_x\mathrm{D}_y v_1} = 0$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}^3_x\mathrm{D}_y v_1} = 0$

$C^{(0),\mathrm{CuLBM1}}_{\mathrm{D}^3_x\mathrm{D}_y v_1} = 0$

$C^{(0),\mathrm{CuLBM2}}_{\mathrm{D}^3_x\mathrm{D}_y v_1} = (-\omega_2 v_2^2 + \omega_2 + v_2^2\omega_1 + 3c_s^2\omega_1 - 3\omega_2 c_s^2 - \omega_1)\frac{\rho v_2}{24\omega_2\omega_1}$

coefficient $C^{(0)}_{\mathrm{D}^3_x\mathrm{D}_y v_2}$ **at** $\frac{\partial^4 v_2}{\partial x_1^3\partial x_2}$**:**

$C^{(0),\mathrm{SRT}}_{\mathrm{D}^3_x\mathrm{D}_y v_2} = (2 - 2v_1^2 - 6c_s^2 + 3c_s^2\omega + v_1^2\omega - \omega)\frac{v_1\rho}{12\omega}$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}^3_x\mathrm{D}_y v_2} = (v_1^2\omega_7\omega_4 - \omega_7\omega_4 - \omega_5\omega_7\omega_4 + \omega_5 v_1^2\omega_7\omega_4 - 3\omega_5 c_s^2\omega_4 - 6\omega_5 c_s^2\omega_7 + 3\omega_5\omega_4 - 3\omega_5 v_1^2\omega_4 + 3c_s^2\omega_7\omega_4 + 3\omega_5 c_s^2\omega_7\omega_4)\frac{v_1\rho}{12\omega_5\omega_7\omega_4}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}^3_x\mathrm{D}_y v_2} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^3_x\mathrm{D}_y v_2}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}^3_x\mathrm{D}_y v_2} = (-3\omega_5 v_1^2 + 3\omega_5 + \omega_5 v_1^2\omega_7 - \omega_5\omega_7 + v_1^2\omega_7 - 9\omega_5 c_s^2 + 3\omega_5 c_s^2\omega_7 + 3c_s^2\omega_7 - \omega_7)\frac{v_1\rho}{12\omega_5\omega_7}$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}^3_x\mathrm{D}_y v_2} = C^{(0),\mathrm{CLBM1}}_{\mathrm{D}^3_x\mathrm{D}_y v_2}$

$C^{(0),\mathrm{CuLBM1}}_{\mathrm{D}^3_x\mathrm{D}_y v_2} = (3c_s^2\omega_4\omega_1 + 3c_s^2\omega_4 - 9c_s^2\omega_1 - 3v_1^2\omega_1 + v_1^2\omega_4 - \omega_4 + 3\omega_1 - \omega_4\omega_1 + v_1^2\omega_4\omega_1)\frac{v_1\rho}{12\omega_4\omega_1}$

$C^{(0),\mathrm{CuLBM2}}_{\mathrm{D}^3_x\mathrm{D}_y v_2} = (6\omega_3 c_s^2\omega_1 + 2\omega_2\omega_3 - 4\omega_3\omega_1 + \omega_2 v_1^2\omega_3 + v_1^2\omega_3\omega_1 + 6\omega_2\omega_1 - 6\omega_2 v_1^2\omega_1 - 18\omega_2 c_s^2\omega_1 + 9v_2^2\omega_3\omega_1 + 2\omega_2 v_1^2\omega_3\omega_1 - 2\omega_2\omega_3\omega_1 - 9\omega_2 v_2^2\omega_3 + 6\omega_2\omega_3 c_s^2\omega_1)\frac{v_1\rho}{24\omega_2\omega_3\omega_1}$

coefficient $C^{(0)}_{\mathrm{D}^2_x\mathrm{D}^2_y\rho}$ **at** $\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2}$**:**

$C^{(0),\mathrm{SRT}}_{\mathrm{D}^2_x\mathrm{D}^2_y\rho} = (-2 + \omega)\frac{c_s^4}{6\omega}$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}^2_x\mathrm{D}^2_y\rho} = (-2 + \omega_4)\frac{c_s^4}{6\omega_4}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}^2_x\mathrm{D}^2_y\rho} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^2_x\mathrm{D}^2_y\rho}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}^2_x\mathrm{D}^2_y\rho} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^2_x\mathrm{D}^2_y\rho}$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}^2_x\mathrm{D}^2_y\rho} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^2_x\mathrm{D}^2_y\rho}$

$C^{(0),\mathrm{CuLBM1}}_{\mathrm{D}^2_x\mathrm{D}^2_y\rho} = (-2 + \omega_3)\frac{c_s^4}{6\omega_3}$

$C^{(0),\mathrm{CuLBM2}}_{\mathrm{D}^2_x\mathrm{D}^2_y\rho} = (-3\omega_2 v_2^2 + 2\omega_2 + 3v_2^2\omega_1 + 2c_s^2\omega_1 - 10\omega_2 c_s^2 + 4\omega_2 c_s^2\omega_1 + 3v_1^2\omega_1 - 2\omega_1 - 3\omega_2 v_1^2)\frac{c_s^2}{24\omega_2\omega_1}$

coefficient $C^{(0)}_{\mathrm{D}^2_x\mathrm{D}^2_y v_1}$ **at** $\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2}$**:**

$C^{(0),\mathrm{SRT}}_{\mathrm{D}^2_x\mathrm{D}^2_y v_1} = 0$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}^2_x\mathrm{D}^2_y v_1} = (-\omega_7 + \omega_4)\frac{v_1\rho c_s^2}{2\omega_7\omega_4}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_1}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_1} = 0$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_1} = 0$

$C^{(0),\mathrm{CuLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_1} = 0$

$C^{(0),\mathrm{CuLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_1} = (\omega_2 + 3c_s^2\omega_1 - 3\omega_2 c_s^2 + v_1^2\omega_1 - \omega_1 - \omega_2 v_1^2)\frac{v_1\rho}{24\omega_2\omega_1}$

coefficient $C^{(0)}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2}$ **at** $\frac{\partial^4 v_2}{\partial x_1^2 \partial x_2^2}$**:**

$C^{(0),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2} = 0$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2} = (-\omega_8 + \omega_4)\frac{\rho v_2 c_s^2}{2\omega_8\omega_4}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2} = 0$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2} = 0$

$C^{(0),\mathrm{CuLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2} = 0$

$C^{(0),\mathrm{CuLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2} = (-\omega_2 v_2^2 + \omega_2 + v_2^2\omega_1 + 3c_s^2\omega_1 - 3\omega_2 c_s^2 - \omega_1)\frac{\rho v_2}{24\omega_2\omega_1}$

coefficient $C^{(0)}_{\mathrm{D}_x\mathrm{D}_y^3\rho}$ **at** $\frac{\partial^4 \rho}{\partial x_1 \partial x_2^3}$**:**

$C^{(0),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = 0$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = (-\omega_8 - v_2^2\omega_6 + 3\omega_8 c_s^2 + \omega_6 + \omega_8 v_2^2 - 3\omega_6 c_s^2)\frac{v_1 v_2}{4\omega_8\omega_6}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3\rho}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = 0$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = 0$

$C^{(0),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = 0$

$C^{(0),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = (\omega_2 + 3c_s^2\omega_1 - 3\omega_2 c_s^2 + v_1^2\omega_1 - \omega_1 - \omega_2 v_1^2)\frac{v_1 v_2}{8\omega_2\omega_1}$

coefficient $C^{(0)}_{\mathrm{D}_x\mathrm{D}_y^3 v_1}$ **at** $\frac{\partial^4 v_1}{\partial x_1 \partial x_2^3}$**:**

$C^{(0),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1} = (2 + v_2^2\omega - 6c_s^2 + 3c_s^2\omega - 2v_2^2 - \omega)\frac{\rho v_2}{12\omega}$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1} = (-6\omega_8\omega_6 c_s^2 + 3\omega_6\omega_4 + 3\omega_8 c_s^2\omega_4 - 3\omega_6 c_s^2\omega_4 + \omega_8 v_2^2\omega_6\omega_4 - \omega_8\omega_6\omega_4 + \omega_8 v_2^2\omega_4 - 3v_2^2\omega_6\omega_4 - \omega_8\omega_4 + 3\omega_8\omega_6 c_s^2\omega_4)\frac{\rho v_2}{12\omega_8\omega_6\omega_4}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1} = (-\omega_8 + 3\omega_8\omega_6 c_s^2 - 3v_2^2\omega_6 + 3\omega_8 c_s^2 + 3\omega_6 + \omega_8 v_2^2 - \omega_8\omega_6 + \omega_8 v_2^2\omega_6 - 9\omega_6 c_s^2)\frac{\rho v_2}{12\omega_8\omega_6}$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1} = C^{(0),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1}$

$C^{(0),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1} = (-3\omega_2 v_2^2 - \omega_2\omega_6 + v_2^2\omega_6 + 3\omega_2 + 3\omega_2\omega_6 c_s^2 - \omega_6 - 9\omega_2 c_s^2 + 3\omega_6 c_s^2 + \omega_2 v_2^2\omega_6)\frac{\rho v_2}{12\omega_2\omega_6}$

$C^{(0),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1} = (6\omega_3 c_s^2\omega_1 + 2\omega_2\omega_3 - 4\omega_3\omega_1 - 9\omega_2 v_1^2\omega_3 + 9v_1^2\omega_3\omega_1 + 2\omega_2 v_2^2\omega_3\omega_1 + 6\omega_2\omega_1 - 18\omega_2 c_s^2\omega_1 - 6\omega_2 v_2^2\omega_1 + v_2^2\omega_3\omega_1 - 2\omega_2\omega_3\omega_1 + \omega_2 v_2^2\omega_3 + 6\omega_2\omega_3 c_s^2\omega_1)\frac{\rho v_2}{24\omega_2\omega_3\omega_1}$

coefficient $C^{(0)}_{\mathrm{D}_x\mathrm{D}_y^3 v_2}$ **at** $\frac{\partial^4 v_2}{\partial x_1\partial x_2^3}$**:**

$C^{(0),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^3 v_2} = 0$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_2} = (-\omega_8 - 3v_2^2\omega_6 + \omega_8 c_s^2 + \omega_6 + 3\omega_8 v_2^2 - \omega_6 c_s^2)\frac{v_1\rho}{4\omega_8\omega_6}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y^3 v_2} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_2}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_2} = 0$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3 v_2} = 0$

$C^{(0),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_2} = 0$

$C^{(0),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3 v_2} = (\omega_2 + 3c_s^2\omega_1 - 3\omega_2 c_s^2 + v_1^2\omega_1 - \omega_1 - \omega_2 v_1^2)\frac{v_1\rho}{24\omega_2\omega_1}$

coefficient $C^{(0)}_{\mathrm{D}_y^4\rho}$ **at** $\frac{\partial^4\rho}{\partial x_2^4}$**:**

$C^{(0),\mathrm{SRT}}_{\mathrm{D}_y^4\rho} = (6v_2^4 + 3v_2^2\omega - 2c_s^2 + c_s^2\omega + 2c_s^4 + 24v_2^2c_s^2 - c_s^4\omega - 6v_2^2 - 12v_2^2c_s^2\omega - 3v_2^4\omega)\frac{1}{24\omega}$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}_y^4\rho} = (6v_2^4 + 3v_2^2\omega_6 - 12v_2^2\omega_6 c_s^2 - 2c_s^2 - \omega_6 c_s^4 - 3v_2^4\omega_6 + 2c_s^4 + 24v_2^2c_s^2 + \omega_6 c_s^2 - 6v_2^2)\frac{1}{24\omega_6}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}_y^4\rho} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_y^4\rho}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}_y^4\rho} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_y^4\rho}$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}_y^4\rho} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_y^4\rho}$

$C^{(0),\mathrm{CuLBM1}}_{\mathrm{D}_y^4\rho} = (6v_2^4 + 3\omega_2 v_2^2 - 12\omega_2 v_2^2c_s^2 - 2c_s^2 - \omega_2 c_s^4 + 2c_s^4 + \omega_2 c_s^2 + 24v_2^2c_s^2 - 6v_2^2 - 3\omega_2 v_2^4)\frac{1}{24\omega_2}$

$C^{(0),\mathrm{CuLBM2}}_{\mathrm{D}_y^4\rho} = (-3\omega_2 v_2^4\omega_1 - 12\omega_2 v_2^2c_s^2\omega_1 - 3\omega_2 v_2^2 - \omega_2 c_s^4\omega_1 + 12\omega_2 v_2^2c_s^2 + \omega_2 c_s^4 - 3v_2^2\omega_1 - c_s^2\omega_1 - \omega_2 c_s^2 + \omega_2 c_s^2\omega_1 + 3\omega_2 v_2^2\omega_1 + 3\omega_2 v_2^4 + c_s^4\omega_1 + 12v_2^2c_s^2\omega_1 + 3v_2^4\omega_1)\frac{1}{24\omega_2\omega_1}$

coefficient $C^{(0)}_{\mathrm{D}_y^4 v_2}$ **at** $\frac{\partial^4 v_2}{\partial x_2^4}$**:**

$C^{(0),\mathrm{SRT}}_{\mathrm{D}_y^4 v_2} = (-4 - 5v_2^2\omega + 6c_s^2 - 3c_s^2\omega + 10v_2^2 + 2\omega)\frac{\rho v_2}{12\omega}$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}_y^4 v_2} = (-4 - 5v_2^2\omega_6 + 6c_s^2 + 2\omega_6 - 3\omega_6 c_s^2 + 10v_2^2)\frac{\rho v_2}{12\omega_6}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}_y^4 v_2} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_y^4 v_2}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}_y^4 v_2} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_y^4 v_2}$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}_y^4 v_2} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_y^4 v_2}$

$C^{(0),\mathrm{CuLBM1}}_{\mathrm{D}_y^4 v_2} = (-4 - 5\omega_2 v_2^2 + 2\omega_2 + 6c_s^2 - 3\omega_2 c_s^2 + 10 v_2^2)\frac{\rho v_2}{12\omega_2}$

$C^{(0),\mathrm{CuLBM2}}_{\mathrm{D}_y^4 v_2} = (5\omega_2 v_2^2 - 2\omega_2 + 5v_2^2\omega_1 + 2\omega_2\omega_1 + 3c_s^2\omega_1 + 3\omega_2 c_s^2 - 3\omega_2 c_s^2\omega_1 - 5\omega_2 v_2^2\omega_1 - 2\omega_1)\frac{\rho v_2}{12\omega_2\omega_1}$

3.2 Conservation of momentum: ρv_1

$$v_1\frac{\partial\rho}{\partial t} + \rho\frac{\partial v_1}{\partial t} + (v_1^2 + c_s^2)\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_1} + 2v_1\rho\frac{\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + v_1 v_2\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_2} + \rho v_2\frac{\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_2} + v_1\rho\frac{\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} + C^{(1)}_{\mathrm{D}_x\rho,\mathrm{D}_x v_1}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_1} +$$
$$C^{(1)}_{\mathrm{D}_x v_1,\mathrm{D}_x v_1}\frac{\delta_l^2}{\delta_t}\left(\frac{\partial v_1}{\partial x_1}\right)^2 + C^{(1)}_{\mathrm{D}_x\rho,\mathrm{D}_y v_2}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_1}\frac{\partial v_2}{\partial x_2} + C^{(1)}_{\mathrm{D}_x v_2,\mathrm{D}_y v_2}\frac{\delta_l^2}{\delta_t}\frac{\partial v_2}{\partial x_1}\frac{\partial v_2}{\partial x_2} + C^{(1)}_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_2}{\partial x_1} +$$
$$C^{(1)}_{\mathrm{D}_y\rho,\mathrm{D}_y v_1}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_1}{\partial x_2} + C^{(1)}_{\mathrm{D}_x^2\rho}\frac{\delta_l^2}{\delta_t}\frac{\partial^2\rho}{\partial x_1^2} + C^{(1)}_{\mathrm{D}_x^2 v_1}\frac{\delta_l^2}{\delta_t}\frac{\partial^2 v_1}{\partial x_1^2} + C^{(1)}_{\mathrm{D}_x\mathrm{D}_y\rho}\frac{\delta_l^2}{\delta_t}\frac{\partial^2\rho}{\partial x_1\partial x_2} + C^{(1)}_{\mathrm{D}_x\mathrm{D}_y v_2}\frac{\delta_l^2}{\delta_t}\frac{\partial^2 v_2}{\partial x_1\partial x_2} + C^{(1)}_{\mathrm{D}_y^2 v_1}\frac{\delta_l^2}{\delta_t}\frac{\partial^2 v_1}{\partial x_2^2}$$
$$+ C^{(1)}_{\mathrm{D}_x^3\rho}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_1^3} + C^{(1)}_{\mathrm{D}_x^3 v_1}\frac{\delta_l^3}{\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} + C^{(1)}_{\mathrm{D}_x^2\mathrm{D}_y\rho}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_1^2\partial x_2} + C^{(1)}_{\mathrm{D}_x^2\mathrm{D}_y v_1}\frac{\delta_l^3}{\delta_t}\frac{\partial^3 v_1}{\partial x_1^2\partial x_2} + C^{(1)}_{\mathrm{D}_x^2\mathrm{D}_y v_2}\frac{\delta_l^3}{\delta_t}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2} +$$
$$C^{(1)}_{\mathrm{D}_x\mathrm{D}_y^2\rho}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_1\partial x_2^2} + C^{(1)}_{\mathrm{D}_x\mathrm{D}_y^2 v_1}\frac{\delta_l^3}{\delta_t}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2} + C^{(1)}_{\mathrm{D}_x\mathrm{D}_y^2 v_2}\frac{\delta_l^3}{\delta_t}\frac{\partial^3 v_2}{\partial x_1\partial x_2^2} + C^{(1)}_{\mathrm{D}_y^3\rho}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_2^3} + C^{(1)}_{\mathrm{D}_y^3 v_1}\frac{\delta_l^3}{\delta_t}\frac{\partial^3 v_1}{\partial x_2^3} + C^{(1)}_{\mathrm{D}_y^3 v_2}\frac{\delta_l^3}{\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} +$$
$$C^{(1)}_{\mathrm{D}_x^4\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1^4} + C^{(1)}_{\mathrm{D}_x^4 v_1}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_1}{\partial x_1^4} + C^{(1)}_{\mathrm{D}_x^3\mathrm{D}_y\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1^3\partial x_2} + C^{(1)}_{\mathrm{D}_x^3\mathrm{D}_y v_1}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_1}{\partial x_1^3\partial x_2} + C^{(1)}_{\mathrm{D}_x^3\mathrm{D}_y v_2}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} + C^{(1)}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2}$$
$$+ C^{(1)}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_1}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} + C^{(1)}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2} + C^{(1)}_{\mathrm{D}_x\mathrm{D}_y^3\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1\partial x_2^3} + C^{(1)}_{\mathrm{D}_x\mathrm{D}_y^3 v_1}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} + C^{(1)}_{\mathrm{D}_x\mathrm{D}_y^3 v_2}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3} +$$
$$C^{(1)}_{\mathrm{D}_y^4\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_2^4} + C^{(1)}_{\mathrm{D}_y^4 v_1}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_1}{\partial x_2^4} + C^{(1)}_{\mathrm{D}_y^4 v_2}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

coefficient $C^{(1)}_{\mathrm{D}_x\rho,\mathrm{D}_x v_1}$ **at** $\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_1}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\rho,\mathrm{D}_x v_1} = (-2 + 6v_1^2 + 4c_s^2 - 2c_s^2\omega - 3v_1^2\omega + \omega)\frac{1}{\omega}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\rho,\mathrm{D}_x v_1} = (-2 - 3\omega_5 v_1^2 + \omega_5 + 6v_1^2 + 4c_s^2 - 2\omega_5 c_s^2)\frac{1}{\omega_5}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x\rho,\mathrm{D}_x v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\rho,\mathrm{D}_x v_1}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x\rho,\mathrm{D}_x v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\rho,\mathrm{D}_x v_1}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x\rho,\mathrm{D}_x v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\rho,\mathrm{D}_x v_1}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x\rho,\mathrm{D}_x v_1} = (-2 + 6v_1^2 + 4c_s^2 - 2c_s^2\omega_1 - 3v_1^2\omega_1 + \omega_1)\frac{1}{\omega_1}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x\rho,\mathrm{D}_x v_1} = (-\omega_2 + \omega_2\omega_1 - 3\omega_2 v_1^2\omega_1 + 2c_s^2\omega_1 + 2\omega_2 c_s^2 - 2\omega_2 c_s^2\omega_1 + 3v_1^2\omega_1 - \omega_1 + 3\omega_2 v_1^2)\frac{1}{\omega_2\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}_x v_1,\mathrm{D}_x v_1}$ **at** $\left(\frac{\partial v_1}{\partial x_1}\right)^2$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x v_1,\mathrm{D}_x v_1} = (2 - \omega)\frac{3v_1\rho}{\omega}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x v_1,\mathrm{D}_x v_1} = (2 - \omega_5)\frac{3v_1\rho}{\omega_5}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x v_1,\mathrm{D}_x v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x v_1,\mathrm{D}_x v_1}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x v_1,\mathrm{D}_x v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x v_1,\mathrm{D}_x v_1}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x v_1,\mathrm{D}_x v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x v_1,\mathrm{D}_x v_1}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x v_1,\mathrm{D}_x v_1} = (2 - \omega_1)\frac{3v_1\rho}{\omega_1}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x v_1,\mathrm{D}_x v_1} = (\omega_2 - \omega_2\omega_1 + \omega_1)\frac{3v_1\rho}{\omega_2\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}_x\rho,\mathrm{D}_y v_2}$ **at** $\frac{\partial \rho}{\partial x_1}\frac{\partial v_2}{\partial x_2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\rho,\mathrm{D}_y v_2} = 0$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\rho,\mathrm{D}_y v_2} = 0$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x\rho,\mathrm{D}_y v_2} = 0$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x\rho,\mathrm{D}_y v_2} = 0$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x\rho,\mathrm{D}_y v_2} = 0$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x\rho,\mathrm{D}_y v_2} = 0$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x\rho,\mathrm{D}_y v_2} = (-3\omega_2 v_2^2 + \omega_2 + 3v_2^2\omega_1 + c_s^2\omega_1 - \omega_2 c_s^2 - \omega_1)\frac{1}{2\omega_2\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}_x v_2,\mathrm{D}_y v_2}$ **at** $\frac{\partial v_2}{\partial x_1}\frac{\partial v_2}{\partial x_2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x v_2,\mathrm{D}_y v_2} = 0$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x v_2,\mathrm{D}_y v_2} = 0$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x v_2,\mathrm{D}_y v_2} = 0$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x v_2,\mathrm{D}_y v_2} = 0$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x v_2,\mathrm{D}_y v_2} = 0$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x v_2,\mathrm{D}_y v_2} = 0$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x v_2,\mathrm{D}_y v_2} = (-\omega_2 + \omega_1)\frac{3\rho v_2}{\omega_2\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}$ **at** $\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_1}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_y\rho,\mathrm{D}_x v_2} = (-2+\omega)\frac{c_s^2}{2\omega}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y\rho,\mathrm{D}_x v_2} = (-2+\omega_4)\frac{c_s^2}{2\omega_4}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_y\rho,\mathrm{D}_x v_2} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_y\rho,\mathrm{D}_x v_2} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_y\rho,\mathrm{D}_x v_2} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_y\rho,\mathrm{D}_x v_2} = (-2+\omega_3)\frac{c_s^2}{2\omega_3}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_y\rho,\mathrm{D}_x v_2} = (-3\omega_2 v_2^2 + \omega_2 + 3v_2^2\omega_1 + 3c_s^2\omega_1 - 5\omega_2 c_s^2 + \omega_2 c_s^2\omega_1 - \omega_1)\frac{1}{2\omega_2\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}_y\rho,\mathrm{D}_y v_1}$ **at** $\frac{\partial \rho}{\partial x_2}\frac{\partial v_1}{\partial x_2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_y\rho,\mathrm{D}_y v_1} = (-2+\omega)\frac{c_s^2}{2\omega}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y\rho,\mathrm{D}_y v_1} = (-2+\omega_4)\frac{c_s^2}{2\omega_4}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_y\rho,\mathrm{D}_y v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y\rho,\mathrm{D}_y v_1}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_y\rho,\mathrm{D}_y v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y\rho,\mathrm{D}_y v_1}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_y\rho,\mathrm{D}_y v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y\rho,\mathrm{D}_y v_1}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_y\rho,\mathrm{D}_y v_1} = (-2+\omega_3)\frac{c_s^2}{2\omega_3}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_y\rho,\mathrm{D}_y v_1} = (-2+\omega_1)\frac{c_s^2}{2\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}_x^2\rho}$ **at** $\frac{\partial^2\rho}{\partial x_1^2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x^2\rho} = (-2+2v_1^2+6c_s^2-3c_s^2\omega-v_1^2\omega+\omega)\frac{v_1}{2\omega}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\rho} = (-2-\omega_5 v_1^2+\omega_5+2v_1^2+6c_s^2-3\omega_5 c_s^2)\frac{v_1}{2\omega_5}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x^2\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\rho}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^2\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\rho}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x^2\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\rho}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x^2\rho} = (-2+2v_1^2+6c_s^2-3c_s^2\omega_1-v_1^2\omega_1+\omega_1)\frac{v_1}{2\omega_1}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x^2\rho} = (-\omega_2+\omega_2\omega_1-\omega_2 v_1^2\omega_1+3c_s^2\omega_1+3\omega_2 c_s^2-3\omega_2 c_s^2\omega_1+v_1^2\omega_1-\omega_1+\omega_2 v_1^2)\frac{v_1}{2\omega_2\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}_x^2 v_1}$ **at** $\frac{\partial^2 v_1}{\partial x_1^2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x^2 v_1} = (-2+6v_1^2+2c_s^2-c_s^2\omega-3v_1^2\omega+\omega)\frac{\rho}{2\omega}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2 v_1} = (-2-3\omega_5 v_1^2+\omega_5+6v_1^2+2c_s^2-\omega_5 c_s^2)\frac{\rho}{2\omega_5}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x^2 v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2 v_1}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^2 v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2 v_1}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x^2 v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2 v_1}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x^2 v_1} = (-2+6v_1^2+2c_s^2-c_s^2\omega_1-3v_1^2\omega_1+\omega_1)\frac{\rho}{2\omega_1}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x^2 v_1} = (-\omega_2+\omega_2\omega_1-3\omega_2 v_1^2\omega_1+c_s^2\omega_1+\omega_2 c_s^2-\omega_2 c_s^2\omega_1+3v_1^2\omega_1-\omega_1+3\omega_2 v_1^2)\frac{\rho}{2\omega_2\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}_x\mathrm{D}_y\rho}$ **at** $\frac{\partial^2\rho}{\partial x_1\partial x_2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y\rho} = (-\omega_2 v_2^2 + \omega_2 + v_2^2\omega_1 + 3c_s^2\omega_1 - 3\omega_2 c_s^2 - \omega_1)\frac{v_2}{2\omega_2\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}_x\mathrm{D}_y v_2}$ **at** $\frac{\partial^2 v_2}{\partial x_1 \partial x_2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y v_2} = (-2+\omega)\frac{\rho c_s^2}{2\omega}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y v_2} = (-2+\omega_4)\frac{\rho c_s^2}{2\omega_4}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y v_2} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y v_2}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y v_2} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y v_2}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y v_2} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y v_2}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y v_2} = (-2+\omega_3)\frac{\rho c_s^2}{2\omega_3}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y v_2} = (-3\omega_2 v_2^2 + \omega_2 + 3v_2^2\omega_1 + c_s^2\omega_1 - 3\omega_2 c_s^2 + \omega_2 c_s^2\omega_1 - \omega_1)\frac{\rho}{2\omega_2\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}_y^2 v_1}$ **at** $\frac{\partial^2 v_1}{\partial x_2^2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_y^2 v_1} = (-2+\omega)\frac{\rho c_s^2}{2\omega}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y^2 v_1} = (-2+\omega_4)\frac{\rho c_s^2}{2\omega_4}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_y^2 v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y^2 v_1}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_y^2 v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y^2 v_1}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_y^2 v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y^2 v_1}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_y^2 v_1} = (-2+\omega_3)\frac{\rho c_s^2}{2\omega_3}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_y^2 v_1} = (-2+\omega_1)\frac{\rho c_s^2}{2\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}_x^3\rho}$ **at** $\frac{\partial^3 \rho}{\partial x_1^3}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x^3\rho} = (24v_1^2c_s^2\omega^2 - c_s^2\omega^2 - 36v_1^4\omega - 36v_1^2 + 7v_1^4\omega^2 - 12c_s^2 + 12c_s^2\omega + 144v_1^2c_s^2 - 144v_1^2c_s^2\omega + 36v_1^2\omega + 12c_s^4 + c_s^4\omega^2 - 12c_s^4\omega - 7v_1^2\omega^2 + 36v_1^4)\frac{1}{12\omega^2}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3\rho} =$
$(36\omega_5 v_1^2 - 36v_1^2 + 7\omega_5^2 v_1^4 + \omega_5^2 c_s^4 - 12c_s^2 - 144\omega_5 v_1^2 c_s^2 + 12\omega_5 c_s^2 + 144v_1^2c_s^2 + 12c_s^4 - \omega_5^2 c_s^2 - 12\omega_5 c_s^4 + 24\omega_5^2 v_1^2 c_s^2 - 36\omega_5 v_1^4 - 7\omega_5^2 v_1^2 + 36v_1^4)\frac{1}{12\omega_5^2}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x^3\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3\rho}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^3\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3\rho}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x^3\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3\rho}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x^3\rho} =$
$(-c_s^2\omega_1^2 + 24v_1^2c_s^2\omega_1^2 - 36v_1^2 - 36v_1^4\omega_1 + 7v_1^4\omega_1^2 - 12c_s^2 - 144v_1^2c_s^2\omega_1 + 12c_s^2\omega_1 + 144v_1^2c_s^2 + 12c_s^4 + 36v_1^2\omega_1 + c_s^4\omega_1^2 - 12c_s^4\omega_1 - 7v_1^2\omega_1^2 + 36v_1^4)\frac{1}{12\omega_1^2}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x^3\rho} = (-6c_s^2\omega_1^2 - 18\omega_2^2 v_1^4\omega_1 - 72\omega_2^2 v_1^2 c_s^2\omega_1 + 18\omega_2 v_1^2\omega_1^2 + 45v_1^2c_s^2\omega_1^2 - 9\omega_2^2 v_1^2 - \omega_2^2 c_s^2\omega_1^2 + 6\omega_2^2 c_s^2\omega_1 + 9v_1^4\omega_1^2 + 45\omega_2^2 v_1^2 c_s^2 -$

$6\omega_2 c_s^4\omega_1^2 - 18\omega_2 v_1^2\omega_1 - 6\omega_2^2 c_s^2 + 7\omega_2^2 v_1^4\omega_1^2 + 24\omega_2^2 v_1^2 c_s^2\omega_1^2 + \omega_2^2 c_s^4\omega_1^2 + 54\omega_2 v_1^2 c_s^2\omega_1 + 18\omega_2^2 v_1^2\omega_1 + 6c_s^4\omega_1^2 - 18\omega_2 v_1^4\omega_1^2 + 6\omega_2^2 c_s^4 + 18\omega_2 v_1^4\omega_1 + 9\omega_2^2 v_1^4 - 7\omega_2^2 v_1^2\omega_1^2 - 72\omega_2 v_1^2 c_s^2\omega_1^2 - 9v_1^2\omega_1^2 - 6\omega_2^2 c_s^4\omega_1 + 6\omega_2 c_s^2\omega_1^2)\frac{1}{12\omega_2^2\omega_1^2}$

coefficient $C^{(1)}_{\mathrm{D}_x^3 v_1}$ **at** $\frac{\partial^3 v_1}{\partial x_1^3}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x^3 v_1} = (-24 + 5c_s^2\omega^2 + 60v_1^2 + 36c_s^2 - 36c_s^2\omega - 60v_1^2\omega + 24\omega - 4\omega^2 + 11v_1^2\omega^2)\frac{v_1\rho}{6\omega^2}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3 v_1} = (-24 - 60\omega_5 v_1^2 + 24\omega_5 + 60v_1^2 - 4\omega_5^2 + 36c_s^2 - 36\omega_5 c_s^2 + 5\omega_5^2 c_s^2 + 11\omega_5^2 v_1^2)\frac{v_1\rho}{6\omega_5^2}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x^3 v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3 v_1}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^3 v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3 v_1}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x^3 v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3 v_1}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x^3 v_1} = (-24 + 5c_s^2\omega_1^2 + 60v_1^2 + 36c_s^2 - 36c_s^2\omega_1 - 60v_1^2\omega_1 - 4\omega_1^2 + 24\omega_1 + 11v_1^2\omega_1^2)\frac{v_1\rho}{6\omega_1^2}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x^3 v_1} = (27c_s^2\omega_1^2 + 24\omega_2\omega_1^2 - 60\omega_2 v_1^2\omega_1^2 + 33\omega_2^2 v_1^2 - 15\omega_2^2 + 10\omega_2^2 c_s^2\omega_1^2 - 36\omega_2^2 c_s^2\omega_1 - 18\omega_2\omega_1 + 54\omega_2 v_1^2\omega_1 + 27\omega_2^2 c_s^2 + 24\omega_2^2\omega_1 + 18\omega_2 c_s^2\omega_1 - 60\omega_2^2 v_1^2\omega_1 - 15\omega_1^2 + 22\omega_2^2 v_1^2\omega_1^2 + 33v_1^2\omega_1^2 - 8\omega_2^2\omega_1^2 - 36\omega_2 c_s^2\omega_1^2)\frac{v_1\rho}{12\omega_2^2\omega_1^2}$

coefficient $C^{(1)}_{\mathrm{D}_x^2\mathrm{D}_y\rho}$ **at** $\frac{\partial^3\rho}{\partial x_1^2\partial x_2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y\rho} = (v_1^2\omega_7\omega_4 - \omega_7\omega_4 + \omega_5\omega_7\omega_4 - \omega_5 v_1^2\omega_7\omega_4 + \omega_5 v_1^2\omega_7 - \omega_5\omega_7 + \omega_5^2 - 3\omega_5 c_s^2\omega_4 - \omega_5^2\omega_4 + \omega_5^2 v_1^2\omega_4 - 3\omega_5^2 c_s^2 + 3\omega_5^2 c_s^2\omega_4 + 3\omega_5 c_s^2\omega_7 + \omega_5\omega_4 - \omega_5 v_1^2\omega_4 - \omega_5^2 v_1^2 + 3c_s^2\omega_7\omega_4 - 3\omega_5 c_s^2\omega_7\omega_4)\frac{v_1 v_2}{\omega_5^2\omega_7\omega_4}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x^2\mathrm{D}_y\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y\rho}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y\rho} =$
$(6c_s^2\omega_1^2 + \omega_2\omega_1^2 + \omega_2^2 v_1^2 + v_2^2\omega_1^2 + 3\omega_2^2 c_s^2\omega_1 + 2\omega_2\omega_1 - 2\omega_2 v_1^2\omega_1 + \omega_2^2 v_2^2\omega_1 - \omega_2^2\omega_1 - 6\omega_2 c_s^2\omega_1 - 2\omega_1^2 - \omega_2 v_2^2\omega_1^2 + v_1^2\omega_1^2 - 3\omega_2 c_s^2\omega_1^2 - \omega_2^2 v_2^2)\frac{3v_1 v_2}{4\omega_2^2\omega_1^2}$

coefficient $C^{(1)}_{\mathrm{D}_x^2\mathrm{D}_y v_1}$ **at** $\frac{\partial^3 v_1}{\partial x_1^2\partial x_2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y v_1} = 0$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y v_1} = (3v_1^2\omega_7\omega_4 - \omega_7\omega_4 + \omega_5\omega_7\omega_4 - 3\omega_5 v_1^2\omega_7\omega_4 + 3\omega_5 v_1^2\omega_7 - \omega_5\omega_7 + \omega_5^2 - \omega_5 c_s^2\omega_4 - \omega_5^2\omega_4 + 3\omega_5^2 v_1^2\omega_4 - \omega_5^2 c_s^2 + \omega_5^2 c_s^2\omega_4 + \omega_5 c_s^2\omega_7 + \omega_5\omega_4 - 3\omega_5 v_1^2\omega_4 - 3\omega_5^2 v_1^2 + c_s^2\omega_7\omega_4 - \omega_5 c_s^2\omega_7\omega_4)\frac{\rho v_2}{\omega_5^2\omega_7\omega_4}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x^2\mathrm{D}_y v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y v_1}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y v_1} = 0$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y v_1} = 0$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y v_1} = 0$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}^2_x\mathrm{D}_y v_1} = (-\omega_2^2\omega_3\omega_1 + 2\omega_2\omega_1^2 - \omega_2 v_2^2\omega_3\omega_1^2 - 2\omega_2^2 v_2^2\omega_3 + 6\omega_2^2 c_s^2\omega_1 + 9v_1^2\omega_3\omega_1^2 - 5\omega_3\omega_1^2 + 3\omega_2^2\omega_3 c_s^2\omega_1 + 2\omega_2^2 v_2^2\omega_1 + 9\omega_3 c_s^2\omega_1^2 - 2\omega_2^2\omega_1 - 3\omega_2\omega_3 c_s^2\omega_1^2 + \omega_2\omega_3\omega_1^2 - 18\omega_2 v_1^2\omega_3\omega_1 - \omega_2^2\omega_3 + \omega_2^2 v_2^2\omega_3\omega_1 - 2\omega_2 v_2^2\omega_1^2 + 2v_2^2\omega_3\omega_1^2 + 6\omega_2\omega_3\omega_1 + 9\omega_2^2 v_1^2\omega_3 - 6\omega_2 c_s^2\omega_1^2 - 6\omega_2\omega_3 c_s^2\omega_1 - 3\omega_2^2\omega_3 c_s^2)\frac{\rho v_2}{4\omega_2^2\omega_3\omega_1^2}$

coefficient $C^{(1)}_{\mathrm{D}^2_x\mathrm{D}_y v_2}$ **at** $\frac{\partial^3 v_2}{\partial x_1^2\partial x_2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}^2_x\mathrm{D}_y v_2} = (12 - 11c_s^2\omega^2 - 12v_1^2 - 36c_s^2 + 36c_s^2\omega + 12v_1^2\omega - 12\omega + 3\omega^2 - 3v_1^2\omega^2)\frac{v_1\rho}{12\omega^2}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}^2_x\mathrm{D}_y v_2} = (12\omega_5^2 v_1^2\omega_4^2 - 11\omega_5^2 c_s^2\omega_7\omega_4^2 - 12\omega_5 c_s^2\omega_4^2 - 12\omega_5^2\omega_4^2 - 12\omega_7\omega_4^2 + 6\omega_5\omega_7\omega_4^2 - 6\omega_5 v_1^2\omega_7\omega_4^2 + 12v_1^2\omega_7\omega_4^2 + 12\omega_5^2\omega_4 + 42\omega_5^2 c_s^2\omega_7\omega_4 - 24\omega_5^2 c_s^2\omega_7 - 12\omega_5^2 v_1^2\omega_4 + 3\omega_5^2\omega_7\omega_4^2 - 18\omega_5 c_s^2\omega_7\omega_4^2 - 12\omega_5^2 c_s^2\omega_4 + 36c_s^2\omega_7\omega_4^2 + 6\omega_5^2 v_1^2\omega_7\omega_4 - 12\omega_5 v_1^2\omega_4^2 + 12\omega_5\omega_4^2 - 3\omega_5^2 v_1^2\omega_7\omega_4^2 + 12\omega_5^2 c_s^2\omega_4^2 - 6\omega_5^2\omega_7\omega_4 - 24\omega_5 c_s^2\omega_7\omega_4)\frac{v_1\rho}{12\omega_5^2\omega_7\omega_4^2}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}^2_x\mathrm{D}_y v_2} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}^2_x\mathrm{D}_y v_2}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}^2_x\mathrm{D}_y v_2} = (12v_1^2\omega_7\omega_4 - 12\omega_7\omega_4 + 6\omega_5\omega_7\omega_4 - 6\omega_5 v_1^2\omega_7\omega_4 + 12\omega_5^2 - 36\omega_5 c_s^2\omega_4 - 12\omega_5^2\omega_4 - 11\omega_5^2 c_s^2\omega_7\omega_4 + 18\omega_5^2 c_s^2\omega_7 + 12\omega_5^2 v_1^2\omega_4 + 6\omega_5^2 v_1^2\omega_7 - 36\omega_5^2 c_s^2 + 36\omega_5^2 c_s^2\omega_4 - 6\omega_5^2\omega_7 - 3\omega_5^2 v_1^2\omega_7\omega_4 + 12\omega_5\omega_4 - 12\omega_5 v_1^2\omega_4 - 12\omega_5^2 v_1^2 + 36c_s^2\omega_7\omega_4 + 3\omega_5^2\omega_7\omega_4 - 18\omega_5 c_s^2\omega_7\omega_4)\frac{v_1\rho}{12\omega_5^2\omega_7\omega_4}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}^2_x\mathrm{D}_y v_2} = C^{(1),\mathrm{CLBM1}}_{\mathrm{D}^2_x\mathrm{D}_y v_2}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}^2_x\mathrm{D}_y v_2} = (-36\omega_3 c_s^2\omega_1 - 36c_s^2\omega_1^2 - 12\omega_3\omega_4 + 12v_1^2\omega_3\omega_4 + 12\omega_3\omega_1 + 36\omega_3 c_s^2\omega_4 - 12v_1^2\omega_3\omega_1 + 18c_s^2\omega_4\omega_1^2 + 12v_1^2\omega_3\omega_1^2 - 12\omega_3\omega_1^2 + 36\omega_3 c_s^2\omega_1^2 + 6v_1^2\omega_4\omega_1^2 - 6\omega_4\omega_1^2 + 6\omega_3\omega_4\omega_1 - 11\omega_3 c_s^2\omega_4\omega_1^2 - 6v_1^2\omega_3\omega_4\omega_1 + 12\omega_1^2 - 18\omega_3 c_s^2\omega_4\omega_1 - 3v_1^2\omega_3\omega_4\omega_1^2 + 3\omega_3\omega_4\omega_1^2 - 12v_1^2\omega_1^2)\frac{v_1\rho}{12\omega_3\omega_4\omega_1^2}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}^2_x\mathrm{D}_y v_2} = (-12\omega_2^2\omega_3\omega_1 - 11\omega_2^2\omega_3 c_s^2\omega_1^2 + 6\omega_2\omega_1^2 - 6\omega_2 v_1^2\omega_1^2 - 27\omega_2 v_2^2\omega_3\omega_1^2 - 3\omega_2^2 v_1^2\omega_3\omega_1^2 - 27\omega_2^2 v_2^2\omega_3 + 36\omega_2^2 c_s^2\omega_1^2 - 54\omega_2^2 c_s^2\omega_1 + 6v_1^2\omega_3\omega_1^2 - 15\omega_3\omega_1^2 + 3\omega_2^2 v_1^2\omega_3\omega_1 + 3\omega_2^2\omega_3\omega_1^2 + 18\omega_2^2\omega_3 c_s^2\omega_1 + 27\omega_3 c_s^2\omega_1^2 + 18\omega_2^2\omega_1 - 18\omega_2\omega_3 c_s^2\omega_1^2 - 18\omega_2^2 v_1^2\omega_1 + 12\omega_2\omega_3\omega_1^2 - 3\omega_2 v_1^2\omega_3\omega_1^2 + 3\omega_2^2\omega_3 + 27\omega_2^2 v_2^2\omega_3\omega_1 + 12\omega_2^2 v_1^2\omega_1^2 + 27v_2^2\omega_3\omega_1^2 + 6\omega_2^2 v_1^2\omega_3 - 12\omega_2^2\omega_1^2 - 18\omega_2 c_s^2\omega_1^2 + 9\omega_2^2\omega_3 c_s^2)\frac{v_1\rho}{12\omega_2^2\omega_3\omega_1^2}$

coefficient $C^{(1)}_{\mathrm{D}_x\mathrm{D}^2_y\rho}$ **at** $\frac{\partial^3\rho}{\partial x_1\partial x_2^2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}^2_y\rho} = (-12 + 12\omega - \omega^2)\frac{c_s^4}{6\omega^2}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}^2_y\rho} = (-12 + 12\omega_4 - \omega_4^2)\frac{c_s^4}{6\omega_4^2}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}^2_y\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}^2_y\rho}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}^2_y\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}^2_y\rho}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}^2_y\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}^2_y\rho}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}^2_y\rho} = (-12 + 12\omega_3 - \omega_3^2)\frac{c_s^4}{6\omega_3^2}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}^2_y\rho} = (-6c_s^2\omega_1^2 - 9\omega_2^2 v_2^4 - 9v_2^2\omega_1^2 - 6\omega_2^2 c_s^2\omega_1 - 6\omega_2 c_s^4\omega_1^2 + 6\omega_2^2 c_s^2 - 9\omega_2^2 v_2^2\omega_1 - 45\omega_2 v_2^2 c_s^2\omega_1^2 - 9\omega_2 v_2^4\omega_1^2 - 45\omega_2^2 v_2^2 c_s^2 + 45v_2^2 c_s^2\omega_1^2 + 9v_2^4\omega_1^2 - 2\omega_2^2 c_s^4\omega_1^2 + 45\omega_2^2 v_2^2 c_s^2\omega_1 + 6c_s^4\omega_1^2 - 30\omega_2^2 c_s^4 + 9\omega_2^2 v_2^4\omega_1 + 9\omega_2 v_2^4\omega_1^2 + 30\omega_2^2 c_s^4\omega_1 + 6\omega_2 c_s^2\omega_1^2 + 9\omega_2^2 v_2^2)\frac{1}{12\omega_2^2\omega_1^2}$

coefficient $C^{(1)}_{\mathrm{D}_x\mathrm{D}^2_y v_1}$ **at** $\frac{\partial^3 v_1}{\partial x_1\partial x_2^2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}^2_y v_1} = \frac{-v_1\rho c_s^2}{6}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}^2_y v_1} = (-12\omega_7\omega_4 + 12\omega_5\omega_7\omega_4 - 12\omega_5\omega_7 - \omega_5\omega_7\omega_4^2 + 12\omega_5\omega_4 - 12\omega_5\omega_4^2 + 12\omega_4^2)\frac{v_1\rho c_s^2}{6\omega_5\omega_7\omega_4^2}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}^2_y v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}^2_y v_1}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1} = C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1} = C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1} = C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1} = C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1}$

coefficient $C^{(1)}_{\mathrm{D}_x\mathrm{D}_y^2 v_2}$ **at** $\frac{\partial^3 v_2}{\partial x_1 \partial x_2^2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = 0$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = (-2\omega_8 + 2\omega_4 - \omega_4^2 + \omega_8\omega_4)\frac{\rho v_2 c_s^2}{\omega_8 \omega_4^2}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = 0$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = 0$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = 0$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = (9c_s^2\omega_1^2 + 5\omega_2\omega_1^2 + 5\omega_2^2 + 11v_2^2\omega_1^2 + 9\omega_2^2 c_s^2\omega_1 - 9\omega_2^2 c_s^2 + 11\omega_2^2 v_2^2\omega_1 - 5\omega_2^2\omega_1 - 5\omega_1^2 - 11\omega_2 v_2^2\omega_1^2 - 9\omega_2 c_s^2\omega_1^2 - 11\omega_2^2 v_2^2)\frac{\rho v_2}{4\omega_2^2\omega_1^2}$

coefficient $C^{(1)}_{\mathrm{D}_y^3\rho}$ **at** $\frac{\partial^3 \rho}{\partial x_2^3}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_y^3\rho} = (-1 + 3c_s^2 + v_2^2)\frac{v_1 v_2}{12}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y^3\rho} = (-12\omega_8 - 12v_2^2\omega_6 + 36\omega_8 c_s^2 + 12\omega_6 - 6\omega_6\omega_4 + 12\omega_8 v_2^2 - 36\omega_6 c_s^2 - 18\omega_8 c_s^2\omega_4 + 18\omega_6 c_s^2\omega_4 + \omega_8 v_2^2\omega_6\omega_4 - \omega_8\omega_6\omega_4 - 6\omega_8 v_2^2\omega_4 + 6v_2^2\omega_6\omega_4 + 6\omega_8\omega_4 + 3\omega_8\omega_6 c_s^2\omega_4)\frac{v_1 v_2}{12\omega_8\omega_6\omega_4}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_y^3\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y^3\rho}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_y^3\rho} = C^{(1),\mathrm{SRT}}_{\mathrm{D}_y^3\rho}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_y^3\rho} = C^{(1),\mathrm{SRT}}_{\mathrm{D}_y^3\rho}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_y^3\rho} = C^{(1),\mathrm{SRT}}_{\mathrm{D}_y^3\rho}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_y^3\rho} = C^{(1),\mathrm{SRT}}_{\mathrm{D}_y^3\rho}$

coefficient $C^{(1)}_{\mathrm{D}_y^3 v_1}$ **at** $\frac{\partial^3 v_1}{\partial x_2^3}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_y^3 v_1} = (6 - 3c_s^2\omega^2 - v_2^2\omega^2 + 6v_2^2\omega - 18c_s^2 + 18c_s^2\omega - 6v_2^2 - 6\omega + \omega^2)\frac{\rho v_2}{6\omega^2}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y^3 v_1} = (3v_2^2\omega_4^2 + 3c_s^2\omega_4^2 - 12\omega_8 c_s^2 - 6c_s^2\omega_4 - 6v_2^2\omega_4 + \omega_8\omega_4^2 - \omega_8 v_2^2\omega_4^2 - 3\omega_8 c_s^2\omega_4^2 + 15\omega_8 c_s^2\omega_4 + 6\omega_4 + 3\omega_8 v_2^2\omega_4 - 3\omega_4^2 - 3\omega_8\omega_4)\frac{\rho v_2}{6\omega_8\omega_4^2}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_y^3 v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y^3 v_1}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_y^3 v_1} = (6 - 3\omega_8 + 9\omega_8 c_s^2 + 9c_s^2\omega_4 - 18c_s^2 + 3v_2^2\omega_4 + 3\omega_8 v_2^2 - 6v_2^2 - 3\omega_8 c_s^2\omega_4 - 3\omega_4 - \omega_8 v_2^2\omega_4 + \omega_8\omega_4)\frac{\rho v_2}{6\omega_8\omega_4}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}^3_y v_1} = C^{(1),\mathrm{CLBM1}}_{\mathrm{D}^3_y v_1}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}^3_y v_1} = (6 + 3v_2^2\omega_3 + \omega_6\omega_3 + 3v_2^2\omega_6 - 3\omega_6\omega_3 c_s^2 - 18c_s^2 - 3\omega_6 - 3\omega_3 - v_2^2\omega_6\omega_3 + 9\omega_6 c_s^2 - 6v_2^2 + 9\omega_3 c_s^2)\frac{\rho v_2}{6\omega_6\omega_3}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}^3_y v_1} = (6 - 3\omega_3 c_s^2\omega_1 + 3v_2^2\omega_3 + \omega_3\omega_1 - 18c_s^2 + 3v_2^2\omega_1 + 9c_s^2\omega_1 - 3\omega_3 - v_2^2\omega_3\omega_1 - 6v_2^2 + 9\omega_3 c_s^2 - 3\omega_1)\frac{\rho v_2}{6\omega_3\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}^3_y v_2}$ at $\frac{\partial^3 v_2}{\partial x_2^3}$:

$C^{(1),\mathrm{SRT}}_{\mathrm{D}^3_y v_2} = (-1 + c_s^2 + 3v_2^2)\frac{v_1\rho}{12}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}^3_y v_2} = (-12\omega_8 - 36v_2^2\omega_6 + 12\omega_8 c_s^2 + 12\omega_6 - 6\omega_6\omega_4 + 36\omega_8 v_2^2 - 12\omega_6 c_s^2 - 6\omega_8 c_s^2\omega_4 + 6\omega_6 c_s^2\omega_4 + 3\omega_8 v_2^2\omega_6\omega_4 - \omega_8\omega_6\omega_4 - 18\omega_8 v_2^2\omega_4 + 18v_2^2\omega_6\omega_4 + 6\omega_8\omega_4 + \omega_8\omega_6 c_s^2\omega_4)\frac{v_1\rho}{12\omega_8\omega_6\omega_4}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}^3_y v_2} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}^3_y v_2}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}^3_y v_2} = C^{(1),\mathrm{SRT}}_{\mathrm{D}^3_y v_2}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}^3_y v_2} = C^{(1),\mathrm{SRT}}_{\mathrm{D}^3_y v_2}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}^3_y v_2} = C^{(1),\mathrm{SRT}}_{\mathrm{D}^3_y v_2}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}^3_y v_2} = C^{(1),\mathrm{SRT}}_{\mathrm{D}^3_y v_2}$

coefficient $C^{(1)}_{\mathrm{D}^4_x \rho}$ at $\frac{\partial^4 \rho}{\partial x_1^4}$:

$C^{(1),\mathrm{SRT}}_{\mathrm{D}^4_x \rho} = (12 + 404v_1^2c_s^2\omega^2 - 78c_s^2\omega^2 - 216v_1^4\omega - 34v_1^2c_s^2\omega^3 - 156v_1^2 + 6c_s^2\omega^3 + 90v_1^4\omega^2 - 132c_s^2 + 198c_s^2\omega + 672v_1^2c_s^2 - 1008v_1^2c_s^2\omega - 9v_1^4\omega^3 + 234v_1^2\omega + 144c_s^4 - 5c_s^4\omega^3 + 82c_s^4\omega^2 - 216c_s^4\omega - 18\omega + 10v_1^2\omega^3 + 8\omega^2 - 98v_1^2\omega^2 - \omega^3 + 144v_1^4)\frac{v_1}{12\omega^3}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}^4_x \rho} = (12 + 234\omega_5 v_1^2 - 34\omega_5^3 v_1^2 c_s^2 - 18\omega_5 - 5\omega_5^3 c_s^4 - 156v_1^2 + 90\omega_5^2 v_1^4 + 82\omega_5^2 c_s^4 + 8\omega_5^2 - 132c_s^2 - 9\omega_5^3 v_1^4 - 1008\omega_5 v_1^2 c_s^2 + 198\omega_5 c_s^2 + 672v_1^2c_s^2 - \omega_5^3 + 144c_s^4 - 78\omega_5^2 c_s^2 - 216\omega_5 c_s^4 + 404\omega_5^2 v_1^2 c_s^2 + 10\omega_5^3 v_1^2 + 6\omega_5^3 c_s^2 - 216\omega_5 v_1^4 - 98\omega_5^2 v_1^2 + 144v_1^4)\frac{v_1}{12\omega_5^3}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}^4_x \rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}^4_x \rho}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}^4_x \rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}^4_x \rho}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}^4_x \rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}^4_x \rho}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}^4_x \rho} = (12 - 78c_s^2\omega_1^2 + 404v_1^2c_s^2\omega_1^2 - 156v_1^2 + 6c_s^2\omega_1^3 - 216v_1^4\omega_1 - 34v_1^2c_s^2\omega_1^3 + 90v_1^4\omega_1^2 - 132c_s^2 - 1008v_1^2c_s^2\omega_1 - 9v_1^4\omega_1^3 + 198c_s^2\omega_1 + 672v_1^2c_s^2 + 144c_s^4 - 5c_s^4\omega_1^3 + 234v_1^2\omega_1 + 82c_s^4\omega_1^2 + 10v_1^2\omega_1^3 + 8\omega_1^2 - 216c_s^4\omega_1 - 18\omega_1 - 98v_1^2\omega_1^2 - \omega_1^3 + 144v_1^4)\frac{v_1}{12\omega_1^3}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}^4_x \rho} = (90\omega_2^3 v_1^4\omega_3\omega_1^2 - 171\omega_2\omega_3 c_s^4\omega_1^3 - 98\omega_2^2 v_1^2\omega_3\omega_1^3 + 141\omega_2^3\omega_3 c_s^2\omega_1 + 6\omega_2^2\omega_3\omega_1 + 114\omega_2^2\omega_3 c_s^2\omega_1^2 + 99\omega_2^2 v_1^4\omega_3\omega_1 + 45v_1^4\omega_3\omega_1^3 + 210\omega_2^2 v_1^2\omega_3\omega_1^2 - 600\omega_2^3 v_1^2\omega_3 c_s^2\omega_1 - 18\omega_2^3 v_1^4\omega_3\omega_1^3 + 54\omega_2\omega_3 c_s^4\omega_1^2 + 12\omega_2^2 c_s^2\omega_1^2 + 129\omega_2^3 v_1^2\omega_3\omega_1 - 78\omega_2^2\omega_3 c_s^2\omega_1^3 + 90\omega_2^2 v_1^4\omega_3\omega_1^3 - 98\omega_2^3 v_1^2\omega_3\omega_1^2 - 72\omega_2^3\omega_3 c_s^2 + 8\omega_2^2\omega_3\omega_1^3 + 18\omega_2^3 c_s^4\omega_1 + 12\omega_2^3\omega_3 c_s^2\omega_1^3 - 51\omega_2^3 v_1^2\omega_3 + 404\omega_2^3 v_1^2\omega_3 c_s^2\omega_1^2 - 105\omega_2^2 v_1^2\omega_3\omega_1 - 72\omega_3 c_s^2\omega_1^3 + 261v_1^2\omega_3 c_s^2\omega_1^3 - 12\omega_2^2\omega_3\omega_1^2 - 51v_1^2\omega_3\omega_1^3 + 6\omega_2^3 v_1^2 c_s^2\omega_1 - 60\omega_2^2\omega_3 c_s^2\omega_1 + 20\omega_2^3 v_1^2\omega_3\omega_1^3 - 198\omega_2^2 v_1^4\omega_3\omega_1^2 - 117\omega_2^3 v_1^4\omega_3\omega_1 - 68\omega_2^3 v_1^2\omega_3 c_s^2\omega_1^3 + 18\omega_2 c_s^4\omega_1^3 - 78\omega_2^3\omega_3 c_s^2\omega_1^2 + 6\omega_3\omega_1^3 - 12\omega_2^2 v_1^2 c_s^2\omega_1^2 - 816\omega_2^2 v_1^2\omega_3 c_s^2\omega_1^2 - 12\omega_2\omega_3\omega_1^3 - 60\omega_2\omega_3 c_s^2\omega_1^2 - 36\omega_2^2 c_s^4\omega_1^2 + 90\omega_2^3\omega_3 c_s^4 + 82\omega_2^2\omega_3 c_s^4\omega_1^3 - 600\omega_2 v_1^2\omega_3 c_s^2\omega_1^3 + 129\omega_2 v_1^2\omega_3\omega_1^3 + 6\omega_2^3\omega_3 + 141\omega_2\omega_3 c_s^2\omega_1^3 - 12\omega_2^3\omega_3\omega_1 - 171\omega_2^3\omega_3 c_s^4\omega_1 + 6\omega_2\omega_3\omega_1^2 + 404\omega_2^2 v_1^2\omega_3 c_s^2\omega_1^3 - 105\omega_2 v_1^2\omega_3\omega_1^2 + 411\omega_2 v_1^2\omega_3 c_s^2\omega_1^2 - 90\omega_2^2\omega_3 c_s^4\omega_1^2 + 54\omega_2^2\omega_3 c_s^4\omega_1 + 6\omega_2 v_1^2 c_s^2\omega_1^3 + 8\omega_2^3\omega_3\omega_1^2 - 6\omega_2 c_s^2\omega_1^3 - 117\omega_2 v_1^4\omega_3\omega_1^3 + 261\omega_2^2 v_1^2\omega_3 c_s^2 + 82\omega_2^3\omega_3 c_s^4\omega_1^2 + 411\omega_2^2 v_1^2\omega_3 c_s^2\omega_1 - 6\omega_2^3 c_s^2\omega_1 + 99\omega_2 v_1^4\omega_3\omega_1^2 + 45\omega_2^3 v_1^4\omega_3 - 10\omega_2^3\omega_3 c_s^4\omega_1^3 - 2\omega_2^3\omega_3\omega_1^3 + 90\omega_3 c_s^4\omega_1^3)\frac{v_1}{24\omega_2^3\omega_3\omega_1^3}$

coefficient $C^{(1)}_{\mathrm{D}^4_x v_1}$ at $\frac{\partial^4 v_1}{\partial x_1^4}$:

$C^{(1),\mathrm{SRT}}_{\mathrm{D}^4_x v_1} = (12 + 252v_1^2c_s^2\omega^2 - 22c_s^2\omega^2 - 756v_1^4\omega - 18v_1^2c_s^2\omega^3 - 252v_1^2 + 2c_s^2\omega^3 + 310v_1^4\omega^2 - 36c_s^2 + 54c_s^2\omega + 432v_1^2c_s^2 - 648v_1^2c_s^2\omega - 29v_1^4\omega^3 +$

$378v_1^2\omega + 24c_s^4 - c_s^4\omega^3 + 14c_s^4\omega^2 - 36c_s^4\omega - 18\omega + 14v_1^2\omega^3 + 8\omega^2 - 154v_1^2\omega^2 - \omega^3 + 504v_1^4) \frac{\rho}{12\omega^3}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^4 v_1} = (12 + 378\omega_5 v_1^2 - 18\omega_5^3 v_1^2 c_s^2 - 18\omega_5 - \omega_5^3 c_s^4 - 252v_1^2 + 310\omega_5^2 v_1^4 + 14\omega_5^2 c_s^4 + 8\omega_5^2 - 36c_s^2 - 29\omega_5^3 v_1^4 - 648\omega_5 v_1^2 c_s^2 + 54\omega_5 c_s^2 + 432v_1^2 c_s^2 - \omega_5^3 + 24c_s^4 - 22\omega_5^2 c_s^2 - 36\omega_5 c_s^4 + 252\omega_5^2 v_1^2 c_s^2 + 14\omega_5^3 v_1^2 + 2\omega_5^3 c_s^2 - 756\omega_5 v_1^4 - 154\omega_5^2 v_1^2 + 504v_1^4) \frac{\rho}{12\omega_5^3}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x^4 v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^4 v_1}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^4 v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^4 v_1}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x^4 v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^4 v_1}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x^4 v_1} = (12 - 22c_s^2\omega_1^2 + 252v_1^2 c_s^2\omega_1^2 - 252v_1^2 + 2c_s^2\omega_1^3 - 756v_1^4\omega_1 - 18v_1^2 c_s^2\omega_1^3 + 310v_1^4\omega_1^2 - 36c_s^2 - 648v_1^2 c_s^2\omega_1 - 29v_1^4\omega_1^3 + 54c_s^2\omega_1 + 432v_1^2 c_s^2 + 24c_s^4 - c_s^4\omega_1^3 + 378v_1^2\omega_1 + 14c_s^4\omega_1^2 + 14v_1^2\omega_1^3 + 8\omega_1^2 - 36c_s^4\omega_1 - 18\omega_1 - 154v_1^2\omega_1^2 - \omega_1^3 + 504v_1^4) \frac{\rho}{12\omega_1^3}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x^4 v_1} = (310\omega_2^3 v_1^4\omega_3\omega_1^2 - 33\omega_2\omega_3 c_s^4\omega_1^3 - 154\omega_2^2 v_1^2\omega_3\omega_1^3 + 45\omega_2^3\omega_3 c_s^2\omega_1 + 6\omega_2^2\omega_3\omega_1 + 18\omega_2^2\omega_3 c_s^2\omega_1^2 + 333\omega_2^2 v_1^4\omega_3\omega_1 + 171v_1^4\omega_3\omega_1^3 + 306\omega_2^2 v_1^2\omega_3\omega_1^2 - 432\omega_2^3 v_1^2\omega_3 c_s^2\omega_1 - 58\omega_2^3 v_1^4\omega_3\omega_1^3 + 6\omega_2\omega_3 c_s^4\omega_1^2 + 12\omega_2^2 c_s^2\omega_1^2 + 225\omega_2^3 v_1^2\omega_3\omega_1 - 22\omega_2^2\omega_3 c_s^2\omega_1^3 + 310\omega_2^2 v_1^4\omega_3\omega_1^3 - 154\omega_2^3 v_1^2\omega_3\omega_1^2 - 24\omega_2^3\omega_3 c_s^2 + 8\omega_2^2\omega_3\omega_1^3 + 6\omega_2^3 c_s^4\omega_1 + 4\omega_2^3\omega_3 c_s^2\omega_1^3 - 99\omega_2^3 v_1^2\omega_3 + 252\omega_2^3 v_1^2\omega_3 c_s^2\omega_1^2 - 153\omega_2^2 v_1^2\omega_3\omega_1 - 24\omega_3 c_s^2\omega_1^3 + 207v_1^2\omega_3 c_s^2\omega_1^3 - 12\omega_2^2\omega_3\omega_1^2 - 99v_1^2\omega_3\omega_1^3 + 18\omega_2^3 v_1^2 c_s^2\omega_1 - 12\omega_2^2\omega_3 c_s^2\omega_1 + 28\omega_2^3 v_1^2\omega_3\omega_1^3 - 666\omega_2^2 v_1^4\omega_3\omega_1^2 - 423\omega_2^3 v_1^4\omega_3\omega_1 - 36\omega_2^3 v_1^2\omega_3 c_s^2\omega_1^3 + 6\omega_2 c_s^4\omega_1^3 - 22\omega_2^3\omega_3 c_s^2\omega_1^2 + 6\omega_3\omega_1^3 - 36\omega_2^2 v_1^2 c_s^2\omega_1^2 - 432\omega_2^2 v_1^2\omega_3 c_s^2\omega_1^2 - 12\omega_2\omega_3\omega_1^3 - 12\omega_2\omega_3 c_s^2\omega_1^2 - 12\omega_2^2 c_s^4\omega_1^2 + 18\omega_2^3\omega_3 c_s^4 + 14\omega_2^2\omega_3 c_s^4\omega_1^3 - 432\omega_2 v_1^2\omega_3 c_s^2\omega_1^3 + 225\omega_2 v_1^2\omega_3\omega_1^3 + 6\omega_2^3\omega_3 + 45\omega_2\omega_3 c_s^2\omega_1^3 - 12\omega_2^3\omega_3\omega_1 - 33\omega_2^3\omega_3 c_s^4\omega_1 + 6\omega_2\omega_3\omega_1^2 + 252\omega_2^2 v_1^2\omega_3 c_s^2\omega_1^3 - 153\omega_2 v_1^2\omega_3\omega_1^2 + 225\omega_2 v_1^2\omega_3 c_s^2\omega_1^2 - 6\omega_2^2\omega_3 c_s^4\omega_1^2 + 6\omega_2^2\omega_3 c_s^4\omega_1 + 18\omega_2 v_1^2 c_s^2\omega_1^3 + 8\omega_2^3\omega_3\omega_1^2 - 6\omega_2 c_s^2\omega_1^3 - 423\omega_2 v_1^4\omega_3\omega_1^3 + 207\omega_2^3 v_1^2\omega_3 c_s^2 + 14\omega_2^3\omega_3 c_s^4\omega_1^2 + 225\omega_2^2 v_1^2\omega_3 c_s^2\omega_1 - 6\omega_2^3 c_s^2\omega_1 + 333\omega_2 v_1^4\omega_3\omega_1^2 + 171\omega_2^3 v_1^4\omega_3 - 2\omega_2^3\omega_3 c_s^4\omega_1^3 - 2\omega_2^3\omega_3\omega_1^3 + 18\omega_3 c_s^4\omega_1^3) \frac{\rho}{24\omega_2^3\omega_3\omega_1^3}$

coefficient $C^{(1)}_{\mathrm{D}_x^3\mathrm{D}_y\rho}$ **at** $\frac{\partial^4\rho}{\partial x_1^3\partial x_2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x^3\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3\mathrm{D}_y\rho} = (4\omega_5^2 v_1^2\omega_4^2 - 20\omega_5^2 v_1^4\omega_7^2\omega_4 - 20\omega_5 v_1^4\omega_7\omega_4^2 - 8\omega_5^3 c_s^2\omega_7\omega_4 + 4\omega_5^3 v_1^4\omega_4^2 - 8\omega_5^2 c_s^2\omega_7\omega_4^2 + 72\omega_5 v_1^2 c_s^2\omega_7^2\omega_4 + 84\omega_5^3 v_1^2 c_s^2\omega_7\omega_4 - 4\omega_5 c_s^2\omega_7^2\omega_4 - 4\omega_5^2 c_s^2\omega_7^2 + 4\omega_5^3 c_s^2\omega_4 - 84\omega_5^2 v_1^2 c_s^2\omega_7^2\omega_4 - 12\omega_5 c_s^4\omega_7^2\omega_4^2 - 13\omega_5^2 v_1^2\omega_7^2\omega_4^2 + 8\omega_5^3 v_1^2\omega_7 - 4\omega_5^3 c_s^4\omega_7\omega_4^2 + 8c_s^4\omega_7^2\omega_4^2 + 20\omega_5^2 v_1^2\omega_7^2\omega_4 + 96v_1^2 c_s^2\omega_7^2\omega_4^2 - 4\omega_5^2 c_s^4\omega_4^2 + 36\omega_5^2 v_1^2 c_s^2\omega_7^2 + 20\omega_5 v_1^2\omega_7\omega_4^2 + 8\omega_5^3 c_s^4\omega_7\omega_4 + 8\omega_5^2 c_s^4\omega_7\omega_4^2 - 36\omega_5^3 v_1^2 c_s^2\omega_7 - 4\omega_5^3 c_s^2\omega_4^2 + 51\omega_5^2 v_1^2 c_s^2\omega_7^2\omega_4^2 + 4\omega_5 c_s^4\omega_7^2\omega_4 + 8\omega_5^2 v_1^4\omega_7^2 - 4\omega_5^3 v_1^4\omega_4 - 144\omega_5 v_1^2 c_s^2\omega_7\omega_4^2 + 12\omega_5 c_s^2\omega_7^2\omega_4^2 - 51\omega_5^3 v_1^2 c_s^2\omega_7\omega_4^2 + 13\omega_5^2 v_1^4\omega_7^2\omega_4^2 + 4\omega_5^3 c_s^2\omega_7\omega_4^2 - 4\omega_5^3 c_s^4\omega_7 - 8c_s^2\omega_7^2\omega_4^2 + 8\omega_5^2 c_s^2\omega_7^2\omega_4 - 72\omega_5 v_1^2 c_s^2\omega_7\omega_4^2 - 4\omega_5^3 c_s^4\omega_4 + 4\omega_5 c_s^2\omega_7\omega_4^2 + 20\omega_5^3 v_1^4\omega_7\omega_4 + 32\omega_5^2 v_1^4\omega_7\omega_4^2 - 8\omega_5^3 v_1^4\omega_7 + 20\omega_5 v_1^4\omega_7^2\omega_4 - 4\omega_5^2 v_1^4\omega_4^2 + 16\omega_5^2 v_1^2\omega_7\omega_4 - 24\omega_5^3 v_1^2 c_s^2\omega_4 + 36\omega_5 v_1^2\omega_7^2\omega_4^2 + 120\omega_5^2 v_1^2 c_s^2\omega_7\omega_4^2 - 4\omega_5^3 v_1^2\omega_4^2 - 24\omega_5^2 v_1^2 c_s^2\omega_4^2 + 4\omega_5^2 c_s^4\omega_7^2\omega_4^2 + 13\omega_5^3 v_1^2\omega_7\omega_4^2 - 24v_1^2\omega_7^2\omega_4^2 + 4\omega_5^2 c_s^4\omega_7^2 + 4\omega_5^3 v_1^2\omega_4 - 48\omega_5^2 v_1^2 c_s^2\omega_7\omega_4 - 8\omega_5^2 c_s^4\omega_7^2\omega_4 - 4\omega_5 c_s^4\omega_7\omega_4^2 - 20\omega_5^3 v_1^2\omega_7\omega_4 - 32\omega_5^2 v_1^2\omega_7\omega_4^2 - 20\omega_5 v_1^2\omega_7^2\omega_4 + 4\omega_5^3 c_s^2\omega_7 + 24\omega_5^3 v_1^2 c_s^2\omega_4^2 - 16\omega_5^2 v_1^4\omega_7\omega_4 + 4\omega_5^2 c_s^2\omega_4^2 - 36\omega_5 v_1^4\omega_7^2\omega_4^2 + 4\omega_5^3 c_s^4\omega_4^2 - 4\omega_5^2 c_s^2\omega_7^2\omega_4^2 - 13\omega_5^3 v_1^4\omega_7\omega_4^2 - 8\omega_5^2 v_1^2\omega_7^2 + 24v_1^4\omega_7^2\omega_4^2) \frac{v_2}{4\omega_5^3\omega_7^2\omega_4^2}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x^3\mathrm{D}_y\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3\mathrm{D}_y\rho}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^3\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x^3\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x^3\mathrm{D}_y\rho} = 0$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x^3\mathrm{D}_y\rho} = (-18\omega_2\omega_3 c_s^4\omega_1^3 + 6\omega_2^3 v_2^2\omega_3 c_s^2\omega_1 - 18\omega_2^2\omega_3^2 c_s^4\omega_1 - 6\omega_2^3\omega_3 c_s^2\omega_1 + 6\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1 - 54\omega_2 v_1^4\omega_3^2\omega_1^2 - 6v_2^2\omega_3^2\omega_1^3 - 24\omega_2^3 v_1^2 v_2^2\omega_3^2\omega_1^2 - 6\omega_2^3\omega_3^2 c_s^4\omega_1^2 + 12\omega_2^2 c_s^2\omega_1^3 + 36\omega_2^3 c_s^4\omega_1^2 - 9\omega_2^3 v_1^2\omega_3^2 - 6\omega_2^2 v_2^2\omega_3^2\omega_1 + 45v_1^2 v_2^2\omega_3^2\omega_1^3 + 90\omega_2^3 c_s^4\omega_1^3 - \omega_2^2\omega_3^2\omega_1^2 + \omega_2^3 v_2^2\omega_3^2\omega_1^2 - 18\omega_2^2\omega_3 c_s^2\omega_1^3 - 297\omega_2^2 v_1^2\omega_3^2 c_s^2\omega_1 - 54\omega_2 v_1^4\omega_3^2\omega_1^3 + 135\omega_2^3 v_1^2\omega_3^2 c_s^2 + 6\omega_2^3\omega_3^2\omega_1 + 60\omega_2\omega_3^2 c_s^2\omega_1^2 - 6\omega_2^3 v_2^2\omega_3^2\omega_1 - 6\omega_2\omega_3^2\omega_1^2 + 540\omega_2^2 v_1^2\omega_3^2 c_s^2\omega_1^2 + 2\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1^2 - 6\omega_2 v_2^2\omega_3^2 c_s^2\omega_1 - 486\omega_2 v_1^2\omega_3^2 c_s^2\omega_1^3 + 45\omega_2 v_1^2\omega_3^2\omega_1^2 + 6\omega_2^2\omega_3^2 c_s^4\omega_1^3 + 72\omega_2^2 v_1^2\omega_3^2 c_s^2\omega_1^3 + 27\omega_2^3\omega_3^2 c_s^4\omega_1 - 6\omega_2\omega_3^2\omega_1^3 + 72\omega_2^3 v_1^2 v_2^2\omega_3^2\omega_1 + 75\omega_2\omega_3^2 c_s^2\omega_1^3 - \omega_2^2 v_2^2\omega_3^2\omega_1^3 - 18\omega_2^3 v_2^2\omega_3 c_s^2\omega_1^2 + 18\omega_2^3\omega_3 c_s^2\omega_1^2 + 72\omega_2^2\omega_3^2 c_s^4\omega_1^2 + 126\omega_2 v_1^2\omega_3^2\omega_1^3 - 21\omega_2 v_2^2\omega_3^2 c_s^2\omega_1^3 - 243\omega_2 v_1^2\omega_3^2 c_s^2\omega_1^2 - 18\omega_2^3\omega_3^2 c_s^4 - 45\omega_2^3 v_1^2 v_2^2\omega_3^2 - 12\omega_2^3 c_s^2\omega_1^2 + 18v_2^2\omega_3^2 c_s^2\omega_1^3 + 18\omega_2^2 v_2^2\omega_3 c_s^2\omega_1^3 - 99v_1^2\omega_3^2\omega_1^3 + 12\omega_2^3 v_2^2 c_s^2\omega_1^2 + 54\omega_2^3 v_1^4\omega_3^2 + 108\omega_2^2 v_1^4\omega_3^2\omega_1^2 - 72\omega_2^3 c_s^2\omega_1^3 - 54\omega_2^3 v_1^4\omega_3^2\omega_1 - 72\omega_2^3 v_1^2\omega_3^2 c_s^2\omega_1^2 + 6\omega_3^2\omega_1^3 + 54\omega_2^2\omega_3 c_s^4\omega_1^3 + 6\omega_2\omega_3 c_s^2\omega_1^3 + 24\omega_2^3 v_1^2\omega_3^2\omega_1^2 + 18\omega_2^3\omega_3 c_s^4\omega_1 - 18\omega_2^3 v_2^2\omega_3^2 c_s^2 + \omega_2^2\omega_3^2\omega_1^3 + 12\omega_2^2\omega_3^2 c_s^2\omega_1 + 405v_1^2\omega_3^2 c_s^2\omega_1^3 - 6\omega_2 v_2^2\omega_3 c_s^2\omega_1^3 + 5\omega_2^3\omega_3^2 c_s^2\omega_1^2 - 2\omega_2^3 v_2^2\omega_3^2 c_s^2\omega_1^2 - 36\omega_2^2 c_s^4\omega_1^3 + 63\omega_2^2 v_1^2\omega_3^2\omega_1 - 9\omega_2^2 v_1^2 v_2^2\omega_3^2\omega_1 + 54v_1^4\omega_3^2\omega_1^3 + 6\omega_2 v_2^2\omega_3^2\omega_1^2 - 12\omega_2^2 v_2^2 c_s^2\omega_1^3 - 3\omega_2^3\omega_3^2 c_s^2\omega_1 + 21\omega_2^3 v_2^2\omega_3^2 c_s^2\omega_1 - 99\omega_2\omega_3^2 c_s^4\omega_1^3 - 108\omega_2^2 v_1^2\omega_3^2\omega_1^2 - 72\omega_2 v_1^2 v_2^2\omega_3^2\omega_1^3 - 18\omega_2^3 v_1^2\omega_3^2\omega_1 - 72\omega_2^2\omega_3^2 c_s^2\omega_1^2 - 54\omega_2^3\omega_3 c_s^4\omega_1^2 + 24\omega_2^2 v_1^2 v_2^2\omega_3^2\omega_1^2 - 24\omega_2^2 v_1^2\omega_3^2\omega_1^3 - 54\omega_2\omega_3^2 c_s^4\omega_1^2 - 54\omega_2^3 v_1^2\omega_3^2 c_s^2\omega_1 - 6\omega_2^3\omega_3^2 + 6\omega_2 v_2^2\omega_3^2\omega_1^3 + 6\omega_2^3 v_2^2\omega_3^2 - 5\omega_2^2\omega_3^2 c_s^2\omega_1^3 + 6\omega_2^2\omega_3^2\omega_1 - 54\omega_2^2 v_1^4\omega_3^2\omega_1 + 9\omega_2 v_1^2 v_2^2\omega_3^2\omega_1^2) \frac{v_2}{24\omega_2^3\omega_3^2\omega_1^3}$

coefficient $C^{(1)}_{\mathrm{D}_x^3\mathrm{D}_y v_1}$ **at** $\frac{\partial^4 v_1}{\partial x_1^3 \partial x_2}$**:**

$$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x^3\mathrm{D}_y v_1} = 0$$

$$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3\mathrm{D}_y v_1} = (-16\omega_5^2 v_1^2\omega_4^2 + 8\omega_5^3\omega_4 + 44\omega_5^3 c_s^2\omega_7\omega_4 + 28\omega_5^2\omega_7^2\omega_4 + 56\omega_5^2 c_s^2\omega_7\omega_4^2 + 32\omega_5 c_s^2\omega_7^2\omega_4 + 20\omega_5^2 c_s^2\omega_7^2 - 16\omega_5^3 c_s^2\omega_4 + 8\omega_5^2\omega_4^2 + 17\omega_5^3\omega_7\omega_4^2 + 43\omega_5^2 v_1^2\omega_7^2\omega_4^2 - 28\omega_5^3 v_1^2\omega_7 - 68\omega_5^2 v_1^2\omega_7^2\omega_4 - 28\omega_5^3\omega_7\omega_4 + 24\omega_5\omega_7\omega_4^2 - 64\omega_5 v_1^2\omega_7\omega_4^2 + 16\omega_5^3 c_s^2\omega_4^2 - 17\omega_5^2 c_s^2\omega_7^2\omega_4^2 - 16\omega_5^2 c_s^2\omega_7\omega_4 - 72\omega_5 c_s^2\omega_7^2\omega_4^2 - 8\omega_5^3\omega_4^2 - 25\omega_5^3 c_s^2\omega_7\omega_4^2 + 48 c_s^2\omega_7^2\omega_4^2 - 44\omega_5^2 c_s^2\omega_7^2\omega_4 - 40\omega_5^2\omega_7\omega_4^2 - 32\omega_5 c_s^2\omega_7\omega_4^2 - 32\omega_7^2\omega_4^2 - 48\omega_5^2 v_1^2\omega_7\omega_4 - 120\omega_5 v_1^2\omega_7^2\omega_4^2 + 48\omega_5\omega_7^2\omega_4^2 + 16\omega_5^3 v_1^2\omega_4^2 - 43\omega_5^3 v_1^2\omega_7\omega_4^2 + 80 v_1^2\omega_7^2\omega_4^2 - 16\omega_5^3 v_1^2\omega_4 + 68\omega_5^3 v_1^2\omega_7\omega_4 + 104\omega_5^2 v_1^2\omega_7\omega_4^2 - 12\omega_5^2\omega_7^2 + 64\omega_5 v_1^2\omega_7^2\omega_4 - 20\omega_5^3 c_s^2\omega_7 - 24\omega_5\omega_7^2\omega_4 - 16\omega_5^2 c_s^2\omega_4^2 + 25\omega_5^2 c_s^2\omega_7^2\omega_4^2 + 16\omega_5^2\omega_7\omega_4 + 28\omega_5^2 v_1^2\omega_7^2 + 12\omega_5^3\omega_7)\frac{v_1\rho v_2}{4\omega_5^3\omega_7^2\omega_4^2}$$

$$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x^3\mathrm{D}_y v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3\mathrm{D}_y v_1}$$

$$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^3\mathrm{D}_y v_1} = 0$$

$$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x^3\mathrm{D}_y v_1} = 0$$

$$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x^3\mathrm{D}_y v_1} = 0$$

$$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x^3\mathrm{D}_y v_1} = (-27\omega_2^3\omega_3 c_s^2\omega_1 - 45\omega_2 v_2^2\omega_3\omega_1^3 + 90\omega_2^2\omega_3\omega_1 + 324\omega_2^2\omega_3 c_s^2\omega_1^2 + 54\omega_2^2 c_s^2\omega_1^3 + 396\omega_2^2 v_1^2\omega_3\omega_1^2 + 18\omega_2^2 v_2^2\omega_1^3 - 198\omega_2^3 v_1^2\omega_3\omega_1 + 18\omega_2\omega_1^3 + 30\omega_2^2\omega_3 c_s^2\omega_1^3 + 54\omega_2^3\omega_3 c_s^2 - 10\omega_2^2\omega_3\omega_1^3 + 198\omega_2^3 v_1^2\omega_3 - 198\omega_2^2 v_1^2\omega_3\omega_1 + 270\omega_3 c_s^2\omega_1^3 - 180\omega_2^2\omega_3\omega_1^2 + 198 v_1^2\omega_3\omega_1^3 - 162\omega_2^2\omega_3 c_s^2\omega_1 - 30\omega_2^3\omega_3 c_s^2\omega_1^2 - 126\omega_3\omega_1^3 - 54\omega_2^3 c_s^2\omega_1^2 + 135\omega_2\omega_3\omega_1^3 - 162\omega_2\omega_3 c_s^2\omega_1^2 + 10\omega_2^2 v_2^2\omega_3\omega_1^3 - 36\omega_2^3 v_2^2\omega_3 - 198\omega_2 v_1^2\omega_3\omega_1^3 - 54\omega_2^3\omega_3 - 297\omega_2\omega_3 c_s^2\omega_1^3 + 45\omega_2^3 v_2^2\omega_3\omega_1 + 45\omega_2^2\omega_3\omega_1 + 18\omega_2^3\omega_1^2 - 18\omega_2^3 v_2^2\omega_1^2 + 90\omega_2\omega_3\omega_1^2 - 198\omega_2 v_1^2\omega_3\omega_1^2 - 10\omega_2^3 v_2^2\omega_3\omega_1^2 + 10\omega_2^3\omega_3\omega_1^2 - 54\omega_2 c_s^2\omega_1^3 + 18\omega_2^3 v_2^2\omega_1 - 18\omega_2^3\omega_1 - 18\omega_2^2\omega_1^3 + 54\omega_2^3 c_s^2\omega_1 + 36 v_2^2\omega_3\omega_1^3 - 18\omega_2 v_2^2\omega_1^3)\frac{v_1\rho v_2}{24\omega_2^3\omega_3\omega_1^3}$$

coefficient $C^{(1)}_{\mathrm{D}_x^3\mathrm{D}_y v_2}$ **at** $\frac{\partial^4 v_2}{\partial x_1^3 \partial x_2}$**:**

$$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x^3\mathrm{D}_y v_2} = (-42 v_1^2 c_s^2\omega^2 - 12 c_s^2\omega^2 + 54 v_1^4\omega + 12 v_1^2 c_s^2\omega^3 + 36 v_1^2 - 26 v_1^4\omega^2 - 24 c_s^2 + 36 c_s^2\omega - 36 v_1^2 c_s^2 + 54 v_1^2 c_s^2\omega + 4 v_1^4\omega^3 - 54 v_1^2\omega + 36 c_s^4 - c_s^4\omega^3 + 20 c_s^4\omega^2 - 54 c_s^4\omega - 4 v_1^2\omega^3 + 26 v_1^2\omega^2 - 36 v_1^4)\frac{\rho}{12\omega^3}$$

$$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3\mathrm{D}_y v_2} = (-12\omega_5 c_s^4\omega_7^2\omega_4^3 + 12\omega_5^3 c_s^4\omega_7^2 - 12\omega_5^3 c_s^2\omega_7\omega_4 + 6\omega_5^3 c_s^4\omega_7\omega_4^3 - 12\omega_5^3 v_1^4\omega_4^2 + 12 c_s^4\omega_7^2\omega_4^3 - 12\omega_5^2 c_s^2\omega_7\omega_4^2 - 12\omega_5^3 v_1^2 c_s^2\omega_7\omega_4 - 18\omega_5^3 v_1^4\omega_7^2\omega_4^2 - 19\omega_5^2 v_1^2\omega_7^2\omega_4^3 - 48\omega_5^3 v_1^2 c_s^2\omega_7^2 - 36\omega_5 v_1^4\omega_7\omega_4^3 - 48\omega_5^2 v_1^2 c_s^2\omega_7^2\omega_4 + 12\omega_5^2 v_1^2\omega_4^3 - 12\omega_5^3 v_1^2\omega_7^2\omega_4 - 12\omega_5 c_s^4\omega_7^2\omega_4^2 - 12\omega_5^2 v_1^2\omega_7^2\omega_4^2 + 4\omega_5^3 v_1^4\omega_7^2\omega_4^2 + 6\omega_5^2 c_s^2\omega_7\omega_4^3 - 18\omega_5^3 c_s^4\omega_7\omega_4^2 + 12\omega_5^3 v_1^4\omega_4^3 - 21\omega_5^3 v_1^2 c_s^2\omega_7\omega_4^3 + 12\omega_5 c_s^2\omega_7^2\omega_4^3 - 306\omega_5 v_1^2 c_s^2\omega_7^2\omega_4^3 + 12\omega_5^3 c_s^4\omega_7\omega_4 + 12\omega_5^2 c_s^4\omega_7\omega_4^2 - 6\omega_5^3 c_s^2\omega_7\omega_4^3 + 162\omega_5^2 v_1^2 c_s^2\omega_7^2\omega_4^2 - 12 c_s^2\omega_7^2\omega_4^3 + 19\omega_5^2 v_1^4\omega_7^2\omega_4^3 + 18\omega_5^3 v_1^2\omega_7^2\omega_4^2 + 36\omega_5 v_1^2\omega_7\omega_4^3 - 108\omega_5 v_1^2 c_s^2\omega_7^2\omega_4^2 + 12\omega_5^3 v_1^4\omega_7^2\omega_4 + 252 v_1^2 c_s^2\omega_7^2\omega_4^3 + 12\omega_5 c_s^2\omega_7^2\omega_4^2 + 30\omega_5^3 v_1^2 c_s^2\omega_7\omega_4^2 - 4\omega_5^3 v_1^2\omega_7^2\omega_4^3 + 12\omega_5^2 v_1^4\omega_7^2\omega_4^2 + 18\omega_5^3 c_s^2\omega_7\omega_4^2 + 60\omega_5^2 v_1^2 c_s^2\omega_7^2\omega_4^3 - 6\omega_5^2 c_s^4\omega_7\omega_4^3 + 90\omega_5 v_1^2\omega_7^2\omega_4^3 - 12\omega_5^2 v_1^4\omega_4^3 - 81\omega_5^3 v_1^2 c_s^2\omega_7^2\omega_4^2 - 24\omega_5^3 v_1^4\omega_7\omega_4 - 24\omega_5^2 v_1^4\omega_7\omega_4^2 + 27\omega_5^3 v_1^2\omega_7\omega_4^3 - 72 v_1^2\omega_7^2\omega_4^3 + \omega_5^2 c_s^4\omega_7^2\omega_4^3 - 12\omega_5^2 v_1^2 c_s^2\omega_4^3 + 54\omega_5^2 v_1^2 c_s^2\omega_7\omega_4^3 - 5\omega_5^3 c_s^2\omega_7^2\omega_4^2 - 12\omega_5^3 v_1^2\omega_4^3 + 12\omega_5^3 v_1^2 c_s^2\omega_7^2\omega_4^3 - 24\omega_5^3 c_s^4\omega_7^2\omega_4 - 36\omega_5 v_1^2 c_s^2\omega_7\omega_4^3 - 12\omega_5^2 v_1^2 c_s^2\omega_7\omega_4^2 + 12\omega_5^3 v_1^2\omega_4^2 + 6\omega_5^2 c_s^4\omega_7^2\omega_4^2 - 48\omega_5^3 v_1^2\omega_7\omega_4^2 + 60\omega_5^2 v_1^4\omega_7\omega_4^3 - 90\omega_5 v_1^4\omega_7^2\omega_4^3 + 24\omega_5^3 v_1^2\omega_7\omega_4 - 27\omega_5^3 v_1^4\omega_7\omega_4^3 + 72 v_1^4\omega_7^2\omega_4^3 + 24\omega_5^2 v_1^2\omega_7\omega_4^2 - 12\omega_5^3 v_1^2 c_s^2\omega_4^2 + 13\omega_5^3 c_s^4\omega_7^2\omega_4^2 - \omega_5^2 c_s^2\omega_7^2\omega_4^3 + 6\omega_5^3 c_s^2\omega_7^2\omega_4 - 6\omega_5^2 c_s^2\omega_7^2\omega_4^2 - \omega_5^3 c_s^4\omega_7^2\omega_4^3 + 12\omega_5^3 v_1^2 c_s^2\omega_4^3 - 60\omega_5^2 v_1^2\omega_7\omega_4^3 + 48\omega_5^3 v_1^4\omega_7\omega_4^2 + 102\omega_5^3 v_1^2 c_s^2\omega_7^2\omega_4)\frac{\rho}{12\omega_5^3\omega_7^2\omega_4^3}$$

$$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x^3\mathrm{D}_y v_2} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^3\mathrm{D}_y v_2}$$

$$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^3\mathrm{D}_y v_2} = (-12\omega_5 c_s^4\omega_7^2\omega_4^3 + 12\omega_5^3 c_s^4\omega_7^2 - 12\omega_5^3 c_s^2\omega_7\omega_4 + 6\omega_5^3 c_s^4\omega_7\omega_4^3 - 36\omega_5^3 v_1^4\omega_4^2 + 12 c_s^4\omega_7^2\omega_4^3 - 12\omega_5^2 c_s^2\omega_7\omega_4^2 + 36\omega_5^3 v_1^2 c_s^2\omega_7\omega_4 - 6\omega_5^3 v_1^4\omega_7^2\omega_4^2 - 19\omega_5^2 v_1^2\omega_7^2\omega_4^3 - 36\omega_5 v_1^4\omega_7\omega_4^3 + 36\omega_5^2 v_1^2\omega_4^3 - 12\omega_5 c_s^4\omega_7^2\omega_4^2 + 4\omega_5^3 v_1^4\omega_7^2\omega_4^3 + 6\omega_5^2 c_s^2\omega_7\omega_4^3 - 18\omega_5^3 c_s^4\omega_7\omega_4^2 + 36\omega_5^3 v_1^4\omega_4^3 - 99\omega_5^3 v_1^2 c_s^2\omega_7\omega_4^3 + 12\omega_5 c_s^2\omega_7^2\omega_4^3 - 306\omega_5 v_1^2 c_s^2\omega_7^2\omega_4^3 + 12\omega_5^3 c_s^4\omega_7\omega_4 + 12\omega_5^2 c_s^4\omega_7\omega_4^2 - 6\omega_5^3 c_s^2\omega_7\omega_4^3 + 18\omega_5^2 v_1^2 c_s^2\omega_7^2\omega_4^2 - 12 c_s^2\omega_7^2\omega_4^3 + 19\omega_5^2 v_1^4\omega_7^2\omega_4^3 + 6\omega_5^3 v_1^2\omega_7^2\omega_4^2 + 36\omega_5 v_1^2\omega_7\omega_4^3 - 36\omega_5 v_1^2 c_s^2\omega_7^2\omega_4^2 + 252 v_1^2 c_s^2\omega_7^2\omega_4^3 + 12\omega_5 c_s^2\omega_7^2\omega_4^2 + 54\omega_5^3 v_1^2 c_s^2\omega_7\omega_4^2 - 4\omega_5^3 v_1^2\omega_7^2\omega_4^3 + 18\omega_5^3 c_s^2\omega_7\omega_4^2 + 60\omega_5^2 v_1^2 c_s^2\omega_7^2\omega_4^3 - 6\omega_5^2 c_s^4\omega_7\omega_4^3 + 198\omega_5^2 v_1^2 c_s^2\omega_7\omega_4^3 - 5\omega_5^3 c_s^2\omega_7^2\omega_4^2 - 36\omega_5^3 v_1^2\omega_4^3 + 12\omega_5^3 v_1^2 c_s^2\omega_7^2\omega_4^3 - 24\omega_5^3 c_s^4\omega_7^2\omega_4 - 108\omega_5 v_1^2 c_s^2\omega_7\omega_4^3 + 36\omega_5^2 v_1^2 c_s^2\omega_7\omega_4^2 + 36\omega_5^3 v_1^2\omega_4^2 + 6\omega_5^2 c_s^4\omega_7^2\omega_4^2 - 36\omega_5^3 v_1^2\omega_7\omega_4^2 + 72\omega_5^2 v_1^4\omega_7\omega_4^3 - 90\omega_5 v_1^4\omega_7^2\omega_4^3 - 39\omega_5^3 v_1^4\omega_7\omega_4^3 + 72 v_1^4\omega_7^2\omega_4^3 - 108\omega_5^3 v_1^2 c_s^2\omega_4^2 + 13\omega_5^3 c_s^4\omega_7^2\omega_4^2 - \omega_5^2 c_s^2\omega_7^2\omega_4^3 + 6\omega_5^3 c_s^2\omega_7^2\omega_4 - 6\omega_5^2 c_s^2\omega_7^2\omega_4^2 - \omega_5^3 c_s^4\omega_7^2\omega_4^3 + 108\omega_5^3 v_1^2 c_s^2\omega_4^3 - 72\omega_5^2 v_1^2\omega_7\omega_4^3 + 36\omega_5^3 v_1^4\omega_7\omega_4^2 - 18\omega_5^3 v_1^2 c_s^2\omega_7^2\omega_4)\frac{\rho}{12\omega_5^3\omega_7^2\omega_4^3}$$

$$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x^3\mathrm{D}_y v_2} = C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^3\mathrm{D}_y v_2}$$

$$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x^3\mathrm{D}_y v_2} = (-99 v_1^2\omega_3^3 c_s^2\omega_4\omega_1^3 - 39 v_1^4\omega_3^3\omega_4\omega_1^3 - 6\omega_3^3 c_s^4\omega_4\omega_1^2 + 252 v_1^2\omega_3^3 c_s^2\omega_4^2 + 18\omega_3^2 c_s^2\omega_4\omega_1^3 - 18 v_1^2\omega_3 c_s^2\omega_4^2\omega_1^3 + 108 v_1^2\omega_3^3 c_s^2\omega_1^3 + 198 v_1^2\omega_3^3 c_s^2\omega_4\omega_1^2 + 72 v_1^4\omega_3^3\omega_4\omega_1^2 - 12\omega_3^3 c_s^2\omega_4^2 - 24\omega_3 c_s^4\omega_4^2\omega_1^3 + 90 v_1^2\omega_3^3\omega_4^2\omega_1 - 108 v_1^2\omega_3^3 c_s^2\omega_1^2 - 12\omega_3^2 c_s^2\omega_4\omega_1^2 - 36 v_1^2\omega_3^2\omega_4\omega_1^3 + 6\omega_3^3 c_s^4\omega_4\omega_1^3 + 36 v_1^2\omega_3^2 c_s^2\omega_4\omega_1^2 - 19 v_1^2\omega_3^3\omega_4^2\omega_1^2 - 18\omega_3^2 c_s^4\omega_4\omega_1^3 + 6\omega_3^3 c_s^2\omega_4\omega_1^2 - 6 v_1^4\omega_3^2\omega_4^2\omega_1^3 - 36 v_1^4\omega_3^3\omega_4\omega_1 - 108 v_1^2\omega_3^3 c_s^2\omega_4\omega_1 + 54 v_1^2\omega_3^2 c_s^2\omega_4\omega_1^3 +$$

$$6\omega_3 c_s^2\omega_4^2\omega_1^3 - 4v_1^2\omega_3^3\omega_4^2\omega_1^3 - 6\omega_3^3 c_s^2\omega_4\omega_1^3 + 12\omega_3^2 c_s^4\omega_4\omega_1^2 - 12\omega_3^3 c_s^4\omega_4^2\omega_1 + 36v_1^2\omega_3^2\omega_1^3 + 39v_1^2\omega_3^3\omega_4\omega_1^3 - 12\omega_3 c_s^2\omega_4\omega_1^3 - 3v_1^2\omega_3^2 c_s^2\omega_4^2\omega_1^3 + 12\omega_3^3 c_s^4\omega_4^2 + 72v_1^4\omega_3^3\omega_4^2 + 6\omega_3^2 c_s^4\omega_4^2\omega_1^2 + 36v_1^4\omega_3^3\omega_4^3 - 72v_1^2\omega_3^3\omega_4\omega_1^2 + 18v_1^2\omega_3^2 c_s^2\omega_4^2\omega_1^2 + 12\omega_3^2 c_s^2\omega_4^2\omega_1 - 108v_1^2\omega_3^2 c_s^2\omega_1^3 + 36v_1^4\omega_3^2\omega_4\omega_1^3 - \omega_3^3 c_s^2\omega_4^2\omega_1^2 - 36v_1^4\omega_3^3\omega_4^2\omega_1^2 + 13\omega_3^2 c_s^4\omega_4^2\omega_1^3 - 306v_1^2\omega_3^3 c_s^2\omega_4^2\omega_1 - 90v_1^4\omega_3^3\omega_4^2\omega_1 - 36v_1^4\omega_3^2\omega_4^3 + 12\omega_3^3 c_s^2\omega_4^2\omega_1 + 12c_s^4\omega_4^2\omega_1^3 + 12\omega_3 c_s^4\omega_4\omega_1^3 + 19v_1^4\omega_3^3\omega_4^2\omega_1^2 + 60v_1^2\omega_3^3 c_s^2\omega_4^2\omega_1^2 - 36v_1^2\omega_3^2 c_s^2\omega_4^2\omega_1 + 36v_1^2\omega_3^3\omega_4\omega_1 - 72v_1^2\omega_3^3\omega_4^2 - \omega_3^3 c_s^4\omega_4^2\omega_1^3 + 6v_1^2\omega_3^2\omega_4^2\omega_1^3 - 36v_1^2\omega_3^3\omega_1^3 - 6\omega_3^2 c_s^2\omega_4^2\omega_1^2 + 4v_1^4\omega_3^3\omega_4^2\omega_1^3 + 12v_1^2\omega_3^3 c_s^2\omega_4^2\omega_1^3 - 12\omega_3^2 c_s^4\omega_4^2\omega_1 + 36v_1^2\omega_3 c_s^2\omega_4\omega_1^3 - 5\omega_3^2 c_s^2\omega_4^2\omega_1^3 + 36v_1^2\omega_3^3\omega_1^2 + \omega_3^3 c_s^4\omega_4^2\omega_1^2)\frac{\rho}{12\omega_3^3\omega_4^2\omega_1^3}$$

$$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x^3\mathrm{D}_y v_2} = (144\omega_2^3 v_1^4\omega_3\omega_1^2 + 6\omega_2\omega_3 c_s^4\omega_1^3 - 72\omega_2^2 v_1^2\omega_3\omega_1^3 - 54\omega_2^3 v_2^2\omega_3 c_s^2\omega_1 + 6\omega_2^2\omega_3^2 c_s^4\omega_1 - 18\omega_2^3\omega_3 c_s^2\omega_1 + 18\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1 - 324\omega_2^3 v_1^2 c_s^2\omega_1^2 + 36\omega_2 v_1^4\omega_3^2\omega_1^2 - 18v_2^2\omega_3^2\omega_1^3 - 72\omega_2^3 v_1^2 v_2^2\omega_3^2\omega_1^2 - 24\omega_2^2\omega_3 c_s^2\omega_1^2 + 29\omega_2^3\omega_3^2 c_s^4\omega_1^2 + 9\omega_2^3 v_1^2\omega_3^2 + 36\omega_2^2 v_1^2\omega_3\omega_1^2 + 54\omega_2^3 v_1^2\omega_3 c_s^2\omega_1 - 18\omega_2^2 v_2^2\omega_3^2\omega_1 - 78\omega_2^3 v_1^4\omega_3\omega_1^3 + 135v_1^2 v_2^2\omega_3^2\omega_1^3 + 18\omega_2^3 c_s^4\omega_1^3 - \omega_2^3\omega_3^2\omega_1^2 + 3\omega_2^3 v_2^2\omega_3^2\omega_1^2 + 18\omega_2^3 v_1^2\omega_3\omega_1 + 18\omega_2^2\omega_3 c_s^2\omega_1^3 - 2\omega_2^3\omega_3^2 c_s^4\omega_1^3 + 216\omega_2^3 v_1^2 c_s^2\omega_1^3 + 99\omega_2^2 v_1^2\omega_3^2 c_s^2\omega_1 - 63\omega_2 v_1^4\omega_3^2\omega_1^3 + 63\omega_2^3 v_1^2\omega_3^2 c_s^2 + 72\omega_2^2 v_1^4\omega_3\omega_1^3 + 6\omega_2^3\omega_3^2\omega_1 + 36\omega_2\omega_3^2 c_s^2\omega_1^2 - 144\omega_2^3 v_1^2\omega_3\omega_1^2 - 18\omega_2^3 v_2^2\omega_3^2\omega_1 - 6\omega_2\omega_3^2\omega_1^2 - 72\omega_2^3 v_1^2\omega_1^3 - 144\omega_2^2 v_1^2\omega_3^2 c_s^2\omega_1^2 - 6\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1^3 - 108\omega_2^2 v_1^2 c_s^2\omega_1^3 - 54\omega_2 v_2^2\omega_3^2 c_s^2\omega_1^2 - 297\omega_2 v_1^2\omega_3^2 c_s^2\omega_1^3 - 12\omega_2^3\omega_3 c_s^2\omega_1^3 - 45\omega_2 v_1^2\omega_3^2\omega_1^2 - \omega_2^2\omega_3^2 c_s^4\omega_1^3 + 306\omega_2^3 v_1^2\omega_3 c_s^2\omega_1^2 - 36\omega_2^2 v_1^4\omega_1^3 + 108\omega_2^3 v_1^2\omega_1^2 + 84\omega_2^2 v_1^2\omega_3^2 c_s^2\omega_1^3 + 18\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1^2 - 57\omega_2^3\omega_3^2 c_s^4\omega_1 - 6\omega_2\omega_3^2\omega_1^3 + 216\omega_2^3 v_1^2 v_2^2\omega_3^2\omega_1 + 78\omega_2^3 v_1^2\omega_3\omega_1^3 + 21\omega_2\omega_3^2 c_s^2\omega_1^3 - 36\omega_2^2 v_1^4\omega_3\omega_1^2 - 18\omega_2^3 v_1^4\omega_3\omega_1 - 198\omega_2^3 v_1^2\omega_3 c_s^2\omega_1^3 - 3\omega_2^2 v_2^2\omega_3^2\omega_1^3 + 36\omega_2^3 v_2^2\omega_3 c_s^2\omega_1^2 + 30\omega_2^3\omega_3 c_s^2\omega_1^2 + 12\omega_2^2\omega_3^2 c_s^4\omega_1^2 + 135\omega_2 v_1^2\omega_3^2\omega_1^3 - 9\omega_2 v_2^2\omega_3^2 c_s^2\omega_1^3 + 81\omega_2 v_1^2\omega_3^2 c_s^2\omega_1^2 + 30\omega_2^3\omega_3^2 c_s^4 - 135\omega_2^3 v_1^2 v_2^2\omega_3^2 + 18v_2^2\omega_3^2 c_s^2\omega_1^3 - 72\omega_2^2 v_1^2\omega_3 c_s^2\omega_1^2 - 36\omega_2^2 v_2^2\omega_3 c_s^2\omega_1^3 - 81v_1^2\omega_3^2\omega_1^3 + 36\omega_2^3 v_1^4\omega_3^2 - 54\omega_2^2 v_1^4\omega_3^2\omega_1^2 - 8\omega_2^3 v_1^2\omega_3^2\omega_1^3 - 24\omega_2^2 c_s^2\omega_1^3 - 63\omega_2^3 v_1^4\omega_3^2\omega_1 + 30\omega_2^3 v_1^2\omega_3^2 c_s^2\omega_1^2 + 6\omega_2^3\omega_1^3 - 18\omega_2^2\omega_3 c_s^4\omega_1^3 - 54\omega_2 v_1^2\omega_3 c_s^2\omega_1^3 + 18\omega_2 v_1^2\omega_3\omega_1^3 - 6\omega_2\omega_3 c_s^2\omega_1^3 + 17\omega_2^3 v_1^2\omega_3^2\omega_1^2 + 19\omega_2^2 v_1^4\omega_3^2\omega_1^3 + 18\omega_2^3\omega_3 c_s^4\omega_1 + 18\omega_2^3 v_2^2\omega_3^2 c_s^2 + \omega_2^2\omega_3^2\omega_1^3 - 12\omega_2^3\omega_3^2 c_s^2\omega_1 + 189v_1^2\omega_3^2 c_s^2\omega_1^3 + 198\omega_2^2 v_1^2\omega_3 c_s^2\omega_1^3 + 36\omega_2^2 v_2^2\omega_3 c_s^2\omega_1^2 + 18\omega_2 v_2^2\omega_3 c_s^2\omega_1^3 - 12\omega_2^3\omega_3^2 c_s^2\omega_1^2 + 24\omega_2^2\omega_3 c_s^4\omega_1^2 + 24\omega_2^3 v_1^2\omega_3^2 c_s^2\omega_1^3 + 6\omega_2^3 v_2^2\omega_3^2 c_s^2\omega_1^2 - 27\omega_2^2 v_1^2\omega_3^2\omega_1 - 27\omega_2^2 v_1^2 v_2^2\omega_3^2\omega_1 + 36v_1^4\omega_3^2\omega_1^3 + 18\omega_2 v_2^2\omega_3^2\omega_1^2 - 108\omega_2^3 v_1^4\omega_1^2 + 15\omega_2^3\omega_3^2 c_s^2\omega_1 + 8\omega_2^3 v_1^4\omega_3^2\omega_1^3 - 9\omega_2^3 v_2^2\omega_3^2 c_s^2\omega_1 - 15\omega_2\omega_3^2 c_s^4\omega_1^3 + 54\omega_2^2 v_1^2\omega_3^2\omega_1^2 - 216\omega_2 v_1^2 v_2^2\omega_3^2\omega_1^3 - 9\omega_2^3 v_1^2\omega_3^2\omega_1 - 18\omega_2 v_1^4\omega_3\omega_1^3 - 12\omega_2^2\omega_3^2 c_s^2\omega_1^2 - 30\omega_2^3\omega_3 c_s^4\omega_1^2 + 72\omega_2^2 v_1^2 v_2^2\omega_3^2\omega_1^3 - 43\omega_2^2 v_1^2\omega_3^2\omega_1^3 - 30\omega_2\omega_3^2 c_s^4\omega_1^2 - 171\omega_2^3 v_1^2\omega_3^2 c_s^2\omega_1 + 7\omega_2^3 v_1^4\omega_3^2\omega_1^2 - 6\omega_2^3\omega_3^2 + 18\omega_2 v_2^2\omega_3^2\omega_1^3 + 72\omega_2^3 v_1^4\omega_1^3 + 18\omega_2^3 v_2^2\omega_3^2 + 12\omega_2^3\omega_3 c_s^4\omega_1^3 + 6\omega_2^2\omega_3^2\omega_1 + 36\omega_2^2 v_1^4\omega_3^2\omega_1 + 36\omega_2^2 v_1^2\omega_1^3 + 27\omega_2 v_1^2 v_2^2\omega_3^2\omega_1^2)\frac{\rho}{24\omega_2^3\omega_3^2\omega_1^3}$$

coefficient $C^{(1)}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho}$ **at** $\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2}$**:**

$$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = (24 - 46c_s^2\omega^2 - 24v_1^2 + 5c_s^2\omega^3 - 72c_s^2 + 108c_s^2\omega + 36v_1^2\omega - 36\omega + v_1^2\omega^3 + 14\omega^2 - 14v_1^2\omega^2 - \omega^3)\frac{v_1 c_s^2}{12\omega^3}$$

$$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = (-24\omega_8\omega_5^2\omega_9 v_2^2\omega_7\omega_4^3 + 6\omega_5^2 v_1^2\omega_9 v_2^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^3 v_1^2\omega_9 c_s^2\omega_7\omega_4 - 88\omega_8\omega_5^3\omega_9 c_s^4\omega_7^2\omega_4^2 + 12\omega_8\omega_5^3 c_s^2\omega_7\omega_4^3 + 24\omega_8\omega_5^2 v_1^2\omega_9 v_2^2\omega_7^2\omega_4 - 12\omega_8\omega_5^3 v_1^2\omega_9 v_2^2\omega_7\omega_4^3 - 36\omega_8\omega_5\omega_9 v_2^2 c_s^2\omega_7\omega_4^3 + 6\omega_8\omega_5^3 v_1^2 c_s^2\omega_7^2\omega_4^3 - 36\omega_8\omega_5^3 v_2^2 c_s^2\omega_7^2\omega_4^2 - 2\omega_8\omega_5^2 v_1^2\omega_9 c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_9 v_2^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5 v_1^2\omega_9 v_2^2\omega_7^2\omega_4^2 - 42\omega_8\omega_5^2\omega_9 c_s^4\omega_7\omega_4^3 - 6\omega_5^2\omega_9 c_s^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5^3\omega_9 c_s^4\omega_4^2 + 36\omega_8\omega_5^2 v_2^2 c_s^2\omega_7\omega_4^3 + 36\omega_8\omega_9 c_s^4\omega_7^2\omega_4^3 + 12\omega_8\omega_5\omega_9 c_s^4\omega_7\omega_4^3 - 12\omega_8\omega_5^3 v_1^2 c_s^2\omega_7^2\omega_4^2 + 18\omega_8\omega_5^3 v_2^2 c_s^2\omega_7^2\omega_4^3 + 18\omega_8\omega_5^2 v_1^2\omega_9 c_s^2\omega_7^2\omega_4^2 + 36\omega_8\omega_5^3 v_1^2\omega_9 v_2^2\omega_7\omega_4^2 + 36\omega_8\omega_5^2 c_s^4\omega_7\omega_4^3 - 12\omega_5^2 v_1^2\omega_9 v_2^2\omega_7^2\omega_4^2 + 12\omega_8\omega_5^2\omega_9 v_2^2\omega_7\omega_4^2 - 12\omega_8\omega_5^3 c_s^2\omega_7\omega_4^2 + 5\omega_8\omega_5^3\omega_9 c_s^4\omega_7^2\omega_4^3 - 12\omega_8\omega_5^3\omega_9 c_s^4\omega_4^3 + 12\omega_8\omega_5^2 v_1^2 c_s^2\omega_7\omega_4^3 + 12\omega_5^2\omega_9 c_s^2\omega_7^2\omega_4^2 + 12\omega_8\omega_5\omega_9 v_2^2\omega_7\omega_4^3 - 12\omega_8\omega_5^3\omega_9 c_s^2\omega_7^2\omega_4 - 12\omega_8\omega_5^2 v_2^2\omega_7\omega_4^3 - 18\omega_8\omega_5 v_1^2\omega_9 v_2^2\omega_7^2\omega_4^3 - 36\omega_8\omega_5^2\omega_9 v_2^2 c_s^2\omega_7\omega_4^2 - 36\omega_8\omega_5^3 c_s^4\omega_7\omega_4^3 + 12\omega_8\omega_5^3\omega_9 c_s^2\omega_7^2\omega_4^2 - 6\omega_5^2\omega_9 v_2^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2 v_1^2\omega_9 c_s^2\omega_7^2\omega_4 + 12\omega_8\omega_5^3 v_1^2\omega_9 v_2^2\omega_4^3 + 12\omega_8\omega_5^3 v_2^2\omega_7\omega_4^3 - 18\omega_8\omega_5^2\omega_9 c_s^2\omega_7\omega_4^3 + 6\omega_5^2 v_2^2\omega_9 c_s^2\omega_7^2\omega_4^3 - 24\omega_8\omega_5^3 v_1^2\omega_9 v_2^2\omega_7\omega_4 - 12\omega_8\omega_5^3 v_1^2\omega_9 c_s^2\omega_7^2\omega_4^2 - 12\omega_8\omega_9 c_s^2\omega_7^2\omega_4^3 + 6\omega_8\omega_5^2 v_1^2\omega_9 v_2^2\omega_7^2\omega_4^2 + 18\omega_5^2\omega_9 c_s^4\omega_7^2\omega_4^3 + 6\omega_8\omega_5^3\omega_9 c_s^2\omega_7^2\omega_4^3 + 6\omega_8\omega_5^3 v_1^2\omega_9 c_s^2\omega_7\omega_4^3 - 36\omega_8\omega_5^2\omega_9 v_2^2 c_s^2\omega_4^3 + 12\omega_8\omega_5\omega_9 c_s^2\omega_7\omega_4^3 + 12\omega_8\omega_5^2 v_1^2\omega_9 v_2^2\omega_7\omega_4^3 + 12\omega_5^2\omega_9 v_2^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5 v_1^2\omega_9 c_s^2\omega_7\omega_4^3 - \omega_8\omega_5^3\omega_9 c_s^2\omega_7^2\omega_4^3 + 36\omega_8\omega_5^3 c_s^4\omega_7\omega_4^2 + 72\omega_8\omega_5^2\omega_9 v_2^2 c_s^2\omega_7\omega_4^3 - 12\omega_8\omega_5^2 c_s^2\omega_7\omega_4^3 + 180\omega_8\omega_5^3\omega_9 c_s^4\omega_7^2\omega_4 + 18\omega_8\omega_5^3 v_1^2\omega_9 c_s^2\omega_7\omega_4^2 - 36\omega_5^2\omega_9 c_s^4\omega_7^2\omega_4^2 - 24\omega_8\omega_5^2 v_1^2\omega_9 v_2^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5^3 v_1^2 v_2^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5^3 v_2^2\omega_7\omega_4^2 + 12\omega_8\omega_5^3 v_1^2\omega_9 c_s^2\omega_7^2\omega_4^3 - 12\omega_5^2 v_1^2\omega_9 c_s^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5^3 v_1^2\omega_9 v_2^2\omega_4^2 - 6\omega_8\omega_5^2 v_1^2 v_2^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5\omega_9 c_s^2\omega_4^3 + 24\omega_8\omega_5^3\omega_9 v_2^2\omega_7\omega_4 - 72\omega_8\omega_5^3\omega_9 v_2^2 c_s^2\omega_7\omega_4 + 6\omega_8\omega_5^2 c_s^2\omega_7^2\omega_4^3 + 12\omega_8 v_1^2\omega_9 v_2^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2 v_1^2\omega_9 v_2^2\omega_4^3 + 18\omega_8\omega_5^2\omega_9 v_2^2 c_s^2\omega_7^2\omega_4^3 - 18\omega_5^3 v_2^2 c_s^2\omega_7^2\omega_4^3 + 12\omega_5^3 v_1^2 c_s^2\omega_7^2\omega_4^2 - 36\omega_8\omega_5^3 c_s^4\omega_7^2\omega_4^2 + 6\omega_8\omega_5^3\omega_9 c_s^2\omega_7\omega_4^3 - 12\omega_8\omega_5 v_1^2\omega_9 c_s^2\omega_7\omega_4^3 + 12\omega_8\omega_5^2 v_1^2\omega_9 v_2^2\omega_7\omega_4^2 - 12\omega_8\omega_5^3\omega_9 c_s^2\omega_4^3 - 12\omega_8\omega_5^3 v_1^2\omega_9 c_s^2\omega_7^2\omega_4^3 - 36\omega_8\omega_5^2\omega_9 v_2^2 c_s^2\omega_4^2 + 12\omega_8\omega_5^3\omega_9 v_2^2\omega_4^2 + 12\omega_8\omega_5^3\omega_9 c_s^4\omega_7\omega_4 - 18\omega_8\omega_5^2\omega_9 c_s^2\omega_7^2\omega_4^2 - 12\omega_5^3 c_s^2\omega_7^2\omega_4^2 + 12\omega_8\omega_5^3 v_2^2\omega_7^2\omega_4^2 - 18\omega_8\omega_5^3\omega_9 c_s^2\omega_7\omega_4^2 + 18\omega_8\omega_5^2 c_s^4\omega_7^2\omega_4^3 + 36\omega_5^3 v_2^2 c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2 v_1^2\omega_9 c_s^2\omega_7^2\omega_4^2 - 84\omega_8\omega_5^2\omega_9 c_s^4\omega_7^2\omega_4 + 2\omega_8\omega_5^2\omega_9 c_s^2\omega_7^2\omega_4^3 - 6\omega_8\omega_5^3 v_2^2\omega_7^2\omega_4^3 + 6\omega_5^3 c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^3\omega_9 v_2^2\omega_4^3 + 36\omega_8\omega_5^3\omega_9 v_2^2 c_s^2\omega_4^3 + \omega_8\omega_5^3 v_1^2\omega_9 c_s^2\omega_7^2\omega_4^3 - 24\omega_8\omega_5^2\omega_9 v_2^2\omega_7^2\omega_4 - 12\omega_8\omega_5^3 v_1^2 v_2^2\omega_7\omega_4^3 + 12\omega_8\omega_5^3\omega_9 c_s^2\omega_4^3 + 24\omega_8\omega_5^2 v_1^2\omega_9 v_2^2\omega_7\omega_4^3 + 36\omega_8\omega_5\omega_9 v_2^2 c_s^2\omega_7^2\omega_4^2 - 36\omega_8\omega_5^3 v_2^2 c_s^2\omega_7\omega_4^3 + 12\omega_8\omega_5^3 v_1^2 c_s^2\omega_7\omega_4^2 - 36\omega_8\omega_5\omega_9 c_s^4\omega_7^2\omega_4^3 + 30\omega_8\omega_5^3\omega_9 c_s^4\omega_7\omega_4^3 + 12\omega_8\omega_5^3 c_s^2\omega_7^2\omega_4^2 - 12\omega_5^3 v_2^2\omega_7^2\omega_4^2 + 24\omega_8\omega_5^2\omega_9 v_2^2\omega_7^2\omega_4^2 - 18\omega_8\omega_5^2 c_s^4\omega_7^2\omega_4^3 + 18\omega_5^2\omega_9 v_2^2 c_s^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5^3\omega_9 c_s^2\omega_7\omega_4 + 72\omega_8\omega_5^2\omega_9 v_2^2 c_s^2\omega_7^2\omega_4 + 12\omega_8\omega_5^2\omega_9 v_2^2\omega_4^3 + 18\omega_8\omega_5\omega_9 v_2^2\omega_7^2\omega_4^3 - 6\omega_8\omega_5^2 v_1^2 c_s^2\omega_7^2\omega_4^3 + 150\omega_8\omega_5^2\omega_9 c_s^4\omega_7^2\omega_4^2 + 12\omega_5^3 v_1^2 v_2^2\omega_7^2\omega_4^2 + 12\omega_8\omega_5^3\omega_9 v_2^2\omega_7\omega_4^3 - 12\omega_8\omega_5 v_1^2\omega_9 v_2^2\omega_7\omega_4^3 + 36\omega_5^3 c_s^4\omega_7^2\omega_4^2 - 36\omega_8\omega_5^3\omega_9 v_2^2 c_s^2\omega_7\omega_4^3 + 12\omega_8 v_1^2\omega_9 c_s^2\omega_7^2\omega_4^3 + 6\omega_8\omega_5^2 v_2^2\omega_7^2\omega_4^3 + 6\omega_5^3 v_2^2\omega_7^2\omega_4^3 - 6\omega_8\omega_5^3 c_s^2\omega_7^2\omega_4^3 - 42\omega_8\omega_5^3\omega_9 c_s^4\omega_7\omega_4^2 - 96\omega_8\omega_5^3\omega_9 c_s^4\omega_7^2 - 6\omega_8\omega_5^2\omega_9 v_2^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5^3 v_1^2\omega_9 c_s^2\omega_7^2\omega_4 + 18\omega_8\omega_5^2 v_1^2\omega_9 c_s^2\omega_7\omega_4^3 + 36\omega_8\omega_5^3 v_2^2 c_s^2\omega_7\omega_4^2 - 48\omega_8\omega_5\omega_9 c_s^4\omega_7^2\omega_4^2 - 12\omega_8\omega_5^3 v_1^2 c_s^2\omega_7\omega_4^3 + 12\omega_8\omega_5^2\omega_9 c_s^2\omega_7^2\omega_4 - 54\omega_8\omega_5\omega_9 v_2^2 c_s^2\omega_7^2\omega_4^3 - 6\omega_8\omega_5^2\omega_9 c_s^4\omega_7^2\omega_4^3 + 108\omega_8\omega_5^3\omega_9 v_2^2 c_s^2\omega_7\omega_4^2 - 18\omega_5^3 c_s^4\omega_7^2\omega_4^3 - 36\omega_8\omega_5^3\omega_9 v_2^2\omega_7\omega_4^2 - 6\omega_5^3 v_1^2 v_2^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5\omega_9 v_2^2\omega_7^2\omega_4^2 - 18\omega_8\omega_5^2 v_2^2 c_s^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5^2\omega_9 c_s^2\omega_4^3 - 36\omega_5^2\omega_9 v_2^2 c_s^2\omega_7^2\omega_4^2)\frac{v_1}{12\omega_8\omega_5^3\omega_9\omega_7^2\omega_4^3}$$

$$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho}$$

$$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = (-6\omega_5^2\omega_9\omega_7^2\omega_4^2 - 12\omega_8\omega_5^3 v_1^2\omega_9\omega_4 - 2\omega_8\omega_5^2 v_1^2\omega_9\omega_7^2\omega_4^2 + 6\omega_8\omega_5^3 v_1^2\omega_7^2\omega_4^2 + 12\omega_8\omega_5^3\omega_9\omega_7 - 12\omega_8\omega_5^2 v_1^2\omega_9\omega_4^2 + 12\omega_8\omega_5^3\omega_7\omega_4^2 - 18\omega_8\omega_5^2\omega_9\omega_7^2\omega_4 + 12\omega_8\omega_5\omega_9\omega_7\omega_4^2 - 36\omega_8\omega_5^2\omega_9 c_s^2\omega_7^2 + 12\omega_5^3 v_1^2\omega_7^2\omega_4 - 36\omega_8\omega_5^3 c_s^2\omega_7\omega_4^2 + 18\omega_5^2\omega_9 c_s^2\omega_7^2\omega_4^2 - 40\omega_8\omega_5^3\omega_9 c_s^2\omega_7^2\omega_4 - 6\omega_8\omega_5^3 v_1^2\omega_9\omega_7\omega_4^2 + 12\omega_8\omega_5^2\omega_9\omega_4^2 - 36\omega_8\omega_5^3\omega_9 c_s^2\omega_7 - 12\omega_8\omega_5 v_1^2\omega_9\omega_7^2\omega_4^2 - \omega_8\omega_5^3\omega_9\omega_7^2\omega_4^2 - 36\omega_5^2\omega_9 c_s^2\omega_7^2\omega_4 + 36\omega_8\omega_5^2 c_s^2\omega_7\omega_4^2 + 36\omega_8\omega_5^3\omega_9 c_s^2\omega_7^2 + 18\omega_8\omega_5^3 v_1^2\omega_9\omega_7\omega_4 + 5\omega_8\omega_5^3\omega_9 c_s^2\omega_7^2\omega_4^2 + 12\omega_8\omega_5^3\omega_9\omega_7^2\omega_4 - 36\omega_8\omega_5\omega_9 c_s^2\omega_7\omega_4^2 + 6\omega_8\omega_5^2\omega_7^2\omega_4^2 + 2\omega_8\omega_5^2\omega_9\omega_7^2\omega_4^2 + 36\omega_8\omega_5^3 c_s^2\omega_7\omega_4 - 6\omega_5^3 v_1^2\omega_7^2\omega_4^2 - 6\omega_8\omega_5^2 v_1^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5^3\omega_7\omega_4 + 12\omega_5^2\omega_9\omega_7^2\omega_4 + 12\omega_8\omega_5^3 v_1^2\omega_9\omega_4^2 + 36\omega_8\omega_9 c_s^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5^3\omega_9\omega_7^2 - 12\omega_8\omega_5^3 v_1^2\omega_7^2\omega_4 + 18\omega_8\omega_5^2 v_1^2\omega_9\omega_7^2\omega_4 + 54\omega_8\omega_5^2\omega_9 c_s^2\omega_7\omega_4^2 - 12\omega_8\omega_5^3\omega_9\omega_4^2 + 12\omega_8\omega_5^2 v_1^2\omega_7\omega_4^2 + 12\omega_8\omega_5^3\omega_7^2\omega_4 + 12\omega_8\omega_5^3 v_1^2\omega_9\omega_7^2 + 12\omega_8\omega_5^3 v_1^2\omega_7\omega_4 - 6\omega_8\omega_5^2\omega_9 c_s^2\omega_7^2\omega_4^2 - 18\omega_5^3 c_s^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5^3 v_1^2\omega_9\omega_7^2\omega_4 - 18\omega_8\omega_5^3\omega_9 c_s^2\omega_7\omega_4^2 - 12\omega_8\omega_9\omega_7^2\omega_4^2 + 6\omega_5^2 v_1^2\omega_9\omega_7^2\omega_4^2 - 12\omega_5^3\omega_7^2\omega_4 - 18\omega_8\omega_5^2 c_s^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5^2\omega_7^2\omega_4^2 - 18\omega_8\omega_5^3\omega_9\omega_7\omega_4 - 36\omega_8\omega_5\omega_9 c_s^2\omega_7^2\omega_4^2 - 18\omega_8\omega_5^2\omega_9\omega_7\omega_4^2 - 36\omega_8\omega_5^3 c_s^2\omega_7^2\omega_4 + 36\omega_8\omega_5^3\omega_9 c_s^2\omega_4^2 + 18\omega_8\omega_5^2 c_s^2\omega_7^2\omega_4^2 + 12\omega_8\omega_5^2\omega_9\omega_7^2 - 36\omega_8\omega_5^3\omega_9 c_s^2\omega_4 + 12\omega_8\omega_5\omega_9\omega_7^2\omega_4^2 + 54\omega_8\omega_5^3\omega_9 c_s^2\omega_7\omega_4 +$$

$\omega_8\omega_5^3v_1^2\omega_9\omega_7^2\omega_4^2 - 36\omega_8\omega_5^2\omega_9c_s^2\omega_4^2 + 6\omega_5^3\omega_7^2\omega_4^2 - 12\omega_5^2v_1^2\omega_9\omega_7^2\omega_4 - 12\omega_8\omega_5v_1^2\omega_9\omega_7\omega_4^2 + 6\omega_8\omega_5^3\omega_9\omega_7\omega_4^2 + 12\omega_8v_1^2\omega_9\omega_7^2\omega_4^2 - 12\omega_8\omega_5^2v_1^2\omega_9\omega_7^2 + 36\omega_5^3c_s^2\omega_7^2\omega_4 + 54\omega_8\omega_5^2\omega_9c_s^2\omega_7^2\omega_4 + 18\omega_8\omega_5^2v_1^2\omega_9\omega_7\omega_4^2 - 12\omega_8\omega_5^3v_1^2\omega_7\omega_4^2 + 12\omega_8\omega_5^3\omega_9\omega_4 - 12\omega_8\omega_5^3v_1^2\omega_9\omega_7 - 6\omega_8\omega_5^3\omega_7^2\omega_4^2)\frac{v_1c_s^2}{12\omega_8\omega_5^3\omega_9\omega_7^2\omega_4^2}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = (-6\omega_3\omega_4^2\omega_1^2 + 6\omega_3^2\omega_4\omega_1^3 - 12v_1^2\omega_3\omega_4^2\omega_1^3 - 18\omega_3^2c_s^2\omega_4\omega_1^3 + 6v_1^2\omega_3^2\omega_4\omega_1^2 - 6\omega_3^2\omega_4\omega_1^2 + 12\omega_3\omega_4^2\omega_1^3 + 18\omega_3^2c_s^2\omega_4\omega_1^2 - 6v_1^2\omega_3^2\omega_4\omega_1^3 + 6v_1^2\omega_3\omega_4^2\omega_1^2 + 18\omega_3c_s^2\omega_4^2\omega_1^2 + 12v_1^2\omega_4^2\omega_1^3 - 12\omega_4^2\omega_1^3 - 36\omega_3c_s^2\omega_1^3 - 36c_s^2\omega_4\omega_1^3 - 12v_1^2\omega_3\omega_1^3 - 12v_1^2\omega_4^2\omega_1^2 - 40\omega_3c_s^2\omega_4^2\omega_1^3 + 12\omega_4^2\omega_1^2 + 12\omega_3\omega_1^3 - 18v_1^2\omega_3^2\omega_4^2\omega_1 + 12v_1^2\omega_3^2\omega_1^3 + 36c_s^2\omega_4^2\omega_1^3 + 12v_1^2\omega_3^2\omega_4^2 + 54\omega_3c_s^2\omega_4\omega_1^3 - 12\omega_3^2\omega_4^2 + 36\omega_3^2c_s^2\omega_1^3 - 12\omega_3^2\omega_1^3 + 36\omega_3^2c_s^2\omega_4^2 + 36\omega_3c_s^2\omega_4\omega_1^2 - 12v_1^2\omega_4\omega_1^3 - 12v_1^2\omega_3^2\omega_1^2 - 36c_s^2\omega_4^2\omega_1^2 - 54\omega_3^2c_s^2\omega_4^2\omega_1 + 12\omega_3^2\omega_1^2 + 18\omega_3^2\omega_4^2\omega_1 - 36\omega_3^2c_s^2\omega_1^2 + 12\omega_4\omega_1^3 - 18\omega_3\omega_4\omega_1^3 - 4\omega_3^2\omega_4^2\omega_1^2 + 12v_1^2\omega_3\omega_4\omega_1^2 + v_1^2\omega_3^2\omega_4^2\omega_1^3 + 12\omega_3^2c_s^2\omega_4^2\omega_1^2 - \omega_3^2\omega_4^2\omega_1^3 - 12\omega_3\omega_4\omega_1^2 + 4v_1^2\omega_3^2\omega_4^2\omega_1^2 + 5\omega_3^2c_s^2\omega_4^2\omega_1^3 + 18v_1^2\omega_3\omega_4\omega_1^3)\frac{v_1c_s^2}{12\omega_3^2\omega_4^2\omega_1^3}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = (-18\omega_2\omega_3c_s^4\omega_1^3 + 54\omega_2^3v_2^4\omega_3^2\omega_1 - 90\omega_2^2\omega_3^2c_s^4\omega_1 + 30\omega_2^3\omega_3c_s^2\omega_1 + 72\omega_2^3c_s^4\omega_1^3 + 27\omega_2^2v_2^2\omega_3^2c_s^2\omega_1 - 36\omega_2^3v_1^2c_s^2\omega_1^2 - 99v_2^2\omega_3^2\omega_1^3 - 36\omega_2^2\omega_3c_s^2\omega_1^2 - 91\omega_2^3\omega_3^2c_s^4\omega_1^2 + 12\omega_2^2c_s^2\omega_1^3 - 108\omega_3^2c_s^4\omega_1^2 - 6\omega_2^3v_1^2\omega_3^2 - 30\omega_2^3v_1^2\omega_3c_s^2\omega_1 - 9\omega_2^2v_2^2\omega_3^2\omega_1 + 45v_1^2v_2^2\omega_3^2\omega_1^3 + 90\omega_3^2c_s^4\omega_1^3 + 27\omega_2^2v_2^4\omega_3^2\omega_1^3 + 27\omega_2^3v_2^2\omega_3^2\omega_1^2 + 10\omega_2^3\omega_3^2c_s^4\omega_1^3 + 24\omega_2^3v_1^2c_s^2\omega_1^3 - 30\omega_2^2v_1^2\omega_3^2c_s^2\omega_1 + 18\omega_2^3v_1^2\omega_3^2c_s^2 - 6\omega_2^3\omega_3^2\omega_1 + 24\omega_2\omega_3^2c_s^2\omega_1^2 - 9\omega_2^3v_2^2\omega_3^2\omega_1 - 6\omega_2\omega_3^2\omega_1^2 - 54\omega_2^3v_2^4\omega_3^3 + 18\omega_2^2v_1^2\omega_3^2c_s^2\omega_1^2 + 138\omega_2^2v_2^2\omega_3^2c_s^2\omega_1^3 - 12\omega_2^2v_1^2c_s^2\omega_1^3 - 297\omega_2v_2^2\omega_3^2c_s^2\omega_1^2 - 21\omega_2v_1^2\omega_3^2c_s^2\omega_1^3 + 12\omega_3^2\omega_3c_s^2\omega_1^3 + 6\omega_2v_1^2\omega_3^2\omega_1^2 + 54v_2^4\omega_3^2\omega_1^3 + 35\omega_2^2\omega_3^2c_s^4\omega_1^3 - 90\omega_2^2v_2^2\omega_3^2\omega_1^2 + 48\omega_3^2v_1^2\omega_3c_s^2\omega_1^2 + 8\omega_2^2v_1^2\omega_3^2c_s^2\omega_1^3 + 270\omega_2^2v_2^2\omega_3^2c_s^2\omega_1^2 + 63\omega_2^2\omega_3^2c_s^4\omega_1 - 6\omega_2\omega_3^2\omega_1^3 - 45\omega_2^3v_1^2v_2^2\omega_3^2\omega_1 + 93\omega_2\omega_3^2c_s^2\omega_1^3 + 54\omega_2^2v_2^4\omega_3^2\omega_1 - 27\omega_2^3v_2^4\omega_3^2\omega_1^2 - 12\omega_2^3v_1^2\omega_3c_s^2\omega_1^3 - 27\omega_2^2v_2^2\omega_3^2\omega_1^3 - 48\omega_2^3\omega_3c_s^2\omega_1^2 + 54\omega_2^2\omega_3^2c_s^4\omega_1^2 + 6\omega_2v_1^2\omega_3^2\omega_1^3 - 459\omega_2v_2^2\omega_3^2c_s^2\omega_1^3 - 6\omega_2v_1^2\omega_3^2c_s^2\omega_1^2 + 18\omega_2^3\omega_3^2c_s^4 + 45\omega_2^3v_1^2v_2^2\omega_3^2 + 36\omega_2^2c_s^2\omega_1^2 + 405v_2^2\omega_3^2c_s^2\omega_1^3 + 36\omega_2^2v_1^2\omega_3c_s^2\omega_1^2 + 12\omega_2^2\omega_3^2\omega_1^2 - 6v_1^2\omega_3^2\omega_1^3 - 54\omega_2v_2^4\omega_3^2\omega_1^2 - 72\omega_3^2c_s^2\omega_1^3 - 24\omega_2^3v_1^2\omega_3^2c_s^2\omega_1^2 - 2\omega_2^3\omega_3^2c_s^2\omega_1^3 + 6\omega_3^2\omega_1^3 - 6\omega_2v_1^2\omega_3c_s^2\omega_1^3 + 6\omega_2\omega_3c_s^2\omega_1^3 - 90\omega_3^2\omega_3c_s^4\omega_1 - 54\omega_2v_2^4\omega_3^2\omega_1^3 - 135\omega_2^3v_2^2\omega_3^2c_s^2 + 48\omega_2^2\omega_3^2c_s^2\omega_1 + 18v_1^2\omega_3^2c_s^2\omega_1^3 - 24\omega_2^3c_s^2\omega_1^3 + 41\omega_2^3\omega_3^2c_s^2\omega_1^2 + 108\omega_2^2\omega_3c_s^4\omega_1^2 + 2\omega_2^3v_1^2\omega_3^2c_s^2\omega_1^3 - 138\omega_2^3v_2^2\omega_3^2c_s^2\omega_1^2 - 36\omega_2^2c_s^4\omega_1^3 + 6\omega_2^2v_1^2\omega_3^2\omega_1 - 45\omega_2^2v_1^2v_2^2\omega_3^2\omega_1 + 99\omega_2v_2^2\omega_3^2\omega_1^2 - 39\omega_2^3\omega_3^2c_s^2\omega_1 + 189\omega_2^3v_2^2\omega_3^2c_s^2\omega_1 - 117\omega_2\omega_3^2c_s^4\omega_1^3 - 12\omega_2^2v_1^2\omega_3^2\omega_1^2 + 90\omega_2^2v_1^2v_2^2\omega_3^2\omega_1^2 - 45\omega_2v_1^2v_2^2\omega_3^2\omega_1^3 + 6\omega_2^3v_1^2\omega_3^2\omega_1 - 54\omega_2^2\omega_3^2c_s^2\omega_1^2 + 144\omega_2^3\omega_3c_s^4\omega_1^2 - 18\omega_2\omega_3^2c_s^4\omega_1^2 + 3\omega_2^3v_1^2\omega_3^2c_s^2\omega_1 + 6\omega_2^3\omega_3^2 + 99\omega_2v_2^2\omega_3^2\omega_1^3 + 9\omega_2^3v_2^2\omega_3^2 - 25\omega_2^2\omega_3^2c_s^2\omega_1^3 - 36\omega_2^3\omega_3c_s^4\omega_1^3 - 6\omega_2^2\omega_3^2\omega_1 - 45\omega_2v_1^2v_2^2\omega_3^2\omega_1^2)\frac{v_1}{24\omega_2^3\omega_3^2\omega_1^3}$

coefficient $C^{(1)}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1}$ **at** $\frac{\partial^4v_1}{\partial x_1^2\partial x_2^2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1} = (-24 + 8c_s^2\omega^2 + 72v_1^2 - c_s^2\omega^3 + 12c_s^2 - 18c_s^2\omega - 108v_1^2\omega + 36\omega - 12\omega^2 + 36v_1^2\omega^2)\frac{\rho c_s^2}{12\omega^3}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1} = (-24\omega_8\omega_5^2\omega_9v_2^2\omega_7\omega_4^3 + 18\omega_5^2v_1^2\omega_9v_2^2\omega_7^2\omega_4^3 + 60\omega_8\omega_5^3v_1^2\omega_9c_s^2\omega_7\omega_4 - 4\omega_8\omega_5^3\omega_9c_s^4\omega_7^2\omega_4^2 + 12\omega_8\omega_5^3c_s^2\omega_7\omega_4^3 + 72\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_7^2\omega_4 - 36\omega_8\omega_5^3v_1^2\omega_9v_2^2\omega_7\omega_4^3 - 12\omega_8\omega_5\omega_9v_2^2c_s^2\omega_7\omega_4^3 + 18\omega_8\omega_5^3v_1^2c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^3v_2^2c_s^2\omega_7^2\omega_4^2 - 18\omega_8\omega_5^2v_1^2\omega_9c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_9v_2^2\omega_7^2\omega_4^3 + 36\omega_8\omega_5v_1^2\omega_9v_2^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5^2\omega_9c_s^4\omega_7\omega_4^3 - 6\omega_5^2\omega_9c_s^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5^2v_2^2c_s^2\omega_7\omega_4^3 - 36\omega_8\omega_5^3v_1^2c_s^2\omega_7^2\omega_4^2 + 6\omega_8\omega_5^3v_2^2c_s^2\omega_7^2\omega_4^3 + 180\omega_8\omega_5^2v_1^2\omega_9c_s^2\omega_7^2\omega_4^2 + 108\omega_8\omega_5^3v_1^2\omega_9v_2^2\omega_7\omega_4^2 + 12\omega_8\omega_5^2c_s^4\omega_7\omega_4^3 - 36\omega_5^2v_1^2\omega_9v_2^2\omega_7^2\omega_4^2 + 12\omega_8\omega_5^2\omega_9v_2^2\omega_7\omega_4^2 - 12\omega_8\omega_5^3c_s^2\omega_7\omega_4^2 - \omega_8\omega_5^3\omega_9c_s^4\omega_7^2\omega_4^3 + 36\omega_8\omega_5^2v_1^2c_s^2\omega_7\omega_4^3 + 12\omega_5^2\omega_9c_s^2\omega_7^2\omega_4^2 + 12\omega_8\omega_5\omega_9v_2^2\omega_7\omega_4^3 - 12\omega_8\omega_5^2\omega_9v_2^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5^2\omega_9c_s^4\omega_7\omega_4^2 - 12\omega_8\omega_5^2\omega_9v_2^2c_s^2\omega_7\omega_4^2 - 12\omega_8\omega_5^2c_s^2\omega_7\omega_4^3 - 108\omega_8\omega_5v_1^2\omega_9c_s^2\omega_7^2\omega_4^2 - 6\omega_5^2\omega_9v_2^2\omega_7^2\omega_4^3 - 84\omega_8\omega_5^2v_1^2\omega_9c_s^2\omega_7^2\omega_4 + 36\omega_8\omega_5^3v_1^2\omega_9v_2^2\omega_7^2\omega_4^2 + 12\omega_8\omega_5^3v_2^2\omega_7\omega_4^3 + 12\omega_8\omega_5^2\omega_9c_s^2\omega_7\omega_4^3 + 18\omega_5^2v_1^2\omega_9c_s^2\omega_7^2\omega_4^3 - 72\omega_8\omega_5^3v_1^2\omega_9v_2^2\omega_7\omega_4 + 24\omega_8\omega_5^3v_1^2\omega_9c_s^2\omega_4^2 + 18\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_7^2\omega_4^3 + 6\omega_5^2\omega_9c_s^4\omega_7^2\omega_4^3 + 12\omega_8\omega_9v_2^2c_s^2\omega_7^2\omega_4^3 + 18\omega_8\omega_5^3v_1^2v_2^2\omega_7^2\omega_4^3 + 78\omega_8\omega_5^3v_1^2\omega_9c_s^2\omega_7\omega_4^3 - 12\omega_8\omega_5^2\omega_9v_2^2c_s^2\omega_4^3 + 36\omega_8\omega_5^2v_1^2v_2^2\omega_7\omega_4^3 + 12\omega_5^2\omega_9v_2^2\omega_7^2\omega_4^2 + 18\omega_8\omega_5v_1^2\omega_9c_s^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5^3c_s^4\omega_7\omega_4^2 + 24\omega_8\omega_5^2\omega_9v_2^2c_s^2\omega_7\omega_4^3 - 12\omega_8\omega_5^2c_s^2\omega_7\omega_4^3 + 18\omega_8\omega_5^3\omega_9c_s^4\omega_7^2\omega_4 - 132\omega_8\omega_5^3v_1^2\omega_9c_s^2\omega_7\omega_4^2 - 12\omega_5^2\omega_9c_s^4\omega_7^2\omega_4^2 - 72\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_7^2\omega_4^2 - 36\omega_8\omega_5^2v_1^2v_2^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5^3v_2^2\omega_7\omega_4^2 - 24\omega_8\omega_5^3v_1^2\omega_9c_s^2\omega_7^2\omega_4^3 - 36\omega_5^2v_1^2\omega_9c_s^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5^2\omega_9c_s^2\omega_7\omega_4^2 - 36\omega_8\omega_5^3v_1^2\omega_9v_2^2\omega_4^2 - 18\omega_8\omega_5^2v_1^2v_2^2\omega_7^2\omega_4^3 - 6\omega_8\omega_5\omega_9c_s^2\omega_7^2\omega_4^3 + 24\omega_8\omega_5^3\omega_9v_2^2\omega_7\omega_4 - 24\omega_8\omega_5^3\omega_9v_2^2c_s^2\omega_7\omega_4 + 6\omega_8\omega_5^2c_s^2\omega_7^2\omega_4^3 + 36\omega_8v_1^2\omega_9v_2^2\omega_7^2\omega_4^3 - 36\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_4^3 + 6\omega_8\omega_5^2\omega_9v_2^2c_s^2\omega_7^2\omega_4^3 - 6\omega_5^3v_2^2c_s^2\omega_7^2\omega_4^3 + 36\omega_5^3v_1^2c_s^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5^3c_s^4\omega_7^2\omega_4^2 - 12\omega_8\omega_5^3\omega_9c_s^2\omega_7\omega_4^3 + 72\omega_8\omega_5v_1^2\omega_9c_s^2\omega_7\omega_4^3 + 36\omega_8\omega_5^3v_1^2v_2^2\omega_7\omega_4^2 - 36\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_7\omega_4^2 - 42\omega_8\omega_5^3v_1^2\omega_9c_s^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5^3\omega_9v_2^2c_s^2\omega_4^2 + 12\omega_8\omega_5^3\omega_9v_2^2\omega_4^2 + 12\omega_8\omega_5^3\omega_9c_s^4\omega_7\omega_4 - 24\omega_8\omega_5^2\omega_9c_s^2\omega_7^2\omega_4^2 - 12\omega_5^2c_s^2\omega_7^2\omega_4^2 + 12\omega_8\omega_5^3v_2^2\omega_7^2\omega_4^2 + 24\omega_8\omega_5^2\omega_9c_s^2\omega_7\omega_4^2 + 6\omega_8\omega_5^3c_s^4\omega_7^2\omega_4^3 + 12\omega_5^3v_2^2c_s^2\omega_7^2\omega_4^3 - 18\omega_5^3v_1^2c_s^2\omega_7^2\omega_4^3 + 24\omega_8\omega_5^3v_2^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2\omega_9c_s^4\omega_7^2\omega_4^2 + 48\omega_8\omega_5^3v_1^2\omega_9c_s^2\omega_7^2\omega_4^2 + 6\omega_8\omega_5^2\omega_9c_s^2\omega_7^2\omega_4^3 + 6\omega_5^3c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^3\omega_9v_2^2\omega_4^3 + 12\omega_8\omega_5^3\omega_9v_2^2c_s^2\omega_4^3 - 24\omega_8\omega_5^2\omega_9v_2^2\omega_7^2\omega_4 - 36\omega_8\omega_5^3v_1^2v_2^2\omega_7^2\omega_4^3 + 72\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5\omega_9v_2^2c_s^2\omega_7^2\omega_4^2 + 60\omega_8\omega_5^2v_1^2\omega_9c_s^2\omega_7\omega_4^2 - 12\omega_8\omega_5^3v_2^2c_s^2\omega_7\omega_4^3 + 36\omega_8\omega_5^3v_1^2c_s^2\omega_7^2\omega_4^2 + 6\omega_8\omega_5\omega_9c_s^4\omega_7^2\omega_4^3 + 12\omega_8\omega_5^3\omega_9c_s^2\omega_7\omega_4^3 + 12\omega_8\omega_5^3c_s^2\omega_7^2\omega_4^2 - 12\omega_5^3v_2^2\omega_7^2\omega_4^2 + 24\omega_8\omega_5^2\omega_9v_2^2\omega_7^2\omega_4^2 - 6\omega_8\omega_5^2c_s^4\omega_7^2\omega_4^3 + 6\omega_5^2\omega_9v_2^2c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^3\omega_9c_s^2\omega_7\omega_4 + 24\omega_8\omega_5^2\omega_9v_2^2c_s^2\omega_7^2\omega_4 + 12\omega_8\omega_5^2c_s^2\omega_7^2\omega_4^3 + 18\omega_8\omega_5\omega_9v_2^2\omega_7^2\omega_4^3 - 18\omega_8\omega_5^2v_1^2c_s^2\omega_7^2\omega_4^3 + 24\omega_8\omega_5^2\omega_9c_s^4\omega_7^2\omega_4^2 + 36\omega_5^3v_1^2v_2^2\omega_7^2\omega_4^2 + 12\omega_8\omega_5^3\omega_9v_2^2\omega_7\omega_4^3 - 36\omega_8\omega_5v_1^2\omega_9v_2^2\omega_7\omega_4^3 + 12\omega_5^3c_s^4\omega_7^2\omega_4^2 - 12\omega_8\omega_5^3\omega_9v_2^2c_s^2\omega_7\omega_4^3 + 6\omega_8\omega_5^2v_2^2\omega_7^2\omega_4^3 + 6\omega_5^3v_2^2\omega_7^2\omega_4^3 - 6\omega_8\omega_5^3c_s^2\omega_7^2\omega_4^3 - 24\omega_8\omega_5^3\omega_9c_s^4\omega_7\omega_4^2 - 12\omega_8\omega_5^3\omega_9c_s^4\omega_7^2 - 6\omega_8\omega_5^2\omega_9v_2^2\omega_7^2\omega_4^3 + 84\omega_8\omega_5^3v_1^2\omega_9c_s^2\omega_7^2\omega_4 - 144\omega_8\omega_5^2v_1^2\omega_9c_s^2\omega_7\omega_4^3 + 12\omega_8\omega_5^3v_2^2c_s^2\omega_7\omega_4^2 - 12\omega_8\omega_5\omega_9c_s^4\omega_7^2\omega_4^2 - 36\omega_8\omega_5^3v_1^2c_s^2\omega_7\omega_4^3 + 12\omega_8\omega_5^2\omega_9c_s^2\omega_7^2\omega_4 - 18\omega_8\omega_5\omega_9v_2^2c_s^2\omega_7^2\omega_4^3 - 6\omega_8\omega_5^2\omega_9c_s^4\omega_7^2\omega_4^3 + 36\omega_8\omega_5^3\omega_9v_2^2c_s^2\omega_7\omega_4^2 - 6\omega_5^3c_s^4\omega_7^2\omega_4^3 - 36\omega_8\omega_5^3\omega_9v_2^2\omega_7\omega_4^2 - 18\omega_5^3v_1^2v_2^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5\omega_9v_2^2\omega_7^2\omega_4^2 - 6\omega_8\omega_5^2v_2^2c_s^2\omega_7^2\omega_4^3 - 12\omega_5^2\omega_9v_2^2c_s^2\omega_7^2\omega_4^2)\frac{\rho}{12\omega_8\omega_5^3\omega_9\omega_7^2\omega_4^3}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1} = (-36\omega_8\omega_5^2v_1^2\omega_4^3 + 6\omega_8\omega_5\omega_9\omega_7\omega_4^3 - 36\omega_8v_1^2\omega_9\omega_7\omega_4^2 + 18\omega_8\omega_5^2\omega_9c_s^2\omega_7\omega_4 + 12\omega_5^2c_s^2\omega_7\omega_4^2 - 72\omega_8\omega_5^2v_1^2\omega_9\omega_4^2 - 12\omega_8\omega_5^2\omega_9\omega_4^3 - 24\omega_8\omega_5\omega_9\omega_7\omega_4^2 + 18\omega_8v_1^2\omega_9\omega_7\omega_4^3 + 12\omega_8\omega_5c_s^2\omega_4^3 + 36\omega_8\omega_5^2v_1^2\omega_4^2 + 36\omega_8\omega_5^2v_1^2\omega_9\omega_4^3 + 24\omega_8\omega_5^2\omega_9\omega_4^2 - 18\omega_8\omega_5v_1^2\omega_7\omega_4^3 - 6\omega_5^2c_s^2\omega_7\omega_4^3 - 12\omega_8\omega_5\omega_9c_s^2\omega_7\omega_4 - 12\omega_8\omega_5^2c_s^2\omega_7\omega_4^2 + 12\omega_8\omega_9\omega_7\omega_4^2 - 12\omega_8\omega_5^2\omega_9\omega_4 + 24\omega_8\omega_5\omega_9c_s^2\omega_7\omega_4^2 + 12\omega_8\omega_5\omega_9c_s^2\omega_4^2 + 6\omega_8\omega_5\omega_7\omega_4^3 - 6\omega_5\omega_9\omega_7\omega_4^3 - \omega_8\omega_5^2\omega_9c_s^2\omega_7\omega_4^3 - 12\omega_8\omega_5^2\omega_9c_s^2\omega_7 + 12\omega_8\omega_5\omega_9\omega_7\omega_4 + 18\omega_5v_1^2\omega_9\omega_7\omega_4^3 - 6\omega_8\omega_5\omega_9c_s^2\omega_7\omega_4^3 - 12\omega_8\omega_5\omega_9c_s^2\omega_4^3 - 6\omega_8\omega_9\omega_7\omega_4^3 + 36\omega_8\omega_5^2v_1^2\omega_9\omega_4 + 6\omega_8\omega_5^2c_s^2\omega_7\omega_4^3 - 36\omega_5v_1^2\omega_9\omega_7\omega_4^2 - 12\omega_8\omega_5\omega_4^3 - 4\omega_8\omega_5^2\omega_9c_s^2\omega_7\omega_4^2 + 12\omega_5\omega_9\omega_7\omega_4^2 - 6\omega_8\omega_5^2\omega_7\omega_4^3 + 36\omega_8\omega_5v_1^2\omega_9\omega_4^2 - 36\omega_8\omega_5^2v_1^2\omega_7\omega_4^2 - 12\omega_5^2\omega_7\omega_4^2 -$

$12\omega_8\omega_9c_s^2\omega_7\omega_4^2+12\omega_8\omega_5^2\omega_4^3+12\omega_8\omega_5^2\omega_9c_s^2\omega_4+6\omega_5^2\omega_7\omega_4^3+12\omega_8\omega_5^2\omega_7\omega_4^2-36\omega_8\omega_5v_1^2\omega_9\omega_4^3-36\omega_8\omega_5v_1^2\omega_9\omega_7\omega_4+18\omega_8\omega_5^2v_1^2\omega_7\omega_4^3-12\omega_8\omega_5^2\omega_4^2+6\omega_8\omega_9c_s^2\omega_7\omega_4^3+6\omega_5\omega_9c_s^2\omega_7\omega_4^3+36\omega_8\omega_5v_1^2\omega_4^3+12\omega_8\omega_5^2c_s^2\omega_4^2-24\omega_8\omega_5^2\omega_9c_s^2\omega_4^2+36\omega_5^2v_1^2\omega_7\omega_4^2+12\omega_8\omega_5\omega_9\omega_4^3+72\omega_8\omega_5v_1^2\omega_9\omega_7\omega_4^2-12\omega_8\omega_5^2c_s^2\omega_4^3-12\omega_5\omega_9c_s^2\omega_7\omega_4^2-18\omega_8\omega_5v_1^2\omega_9\omega_7\omega_4^3-6\omega_8\omega_5c_s^2\omega_7\omega_4^3-18\omega_5^2v_1^2\omega_7\omega_4^3-12\omega_8\omega_5\omega_9\omega_4^2+12\omega_8\omega_5^2\omega_9c_s^2\omega_4^3)\frac{\rho c_s^2}{12\omega_8\omega_5^2\omega_9\omega_7\omega_4^3}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1}=C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1}=(12\omega_3^3c_s^2\omega_1^2-4\omega_3^2c_s^2\omega_4\omega_1^2+12\omega_3^2c_s^2\omega_4\omega_1-12c_s^2\omega_4\omega_1^2+36v_1^2\omega_3\omega_1^2-12\omega_3\omega_1^2-\omega_3^2c_s^2\omega_4\omega_1^2-12\omega_3^2\omega_4\omega_1+36v_1^2\omega_3^2\omega_4\omega_1+12\omega_3^3c_s^2+12\omega_3c_s^2\omega_1^2-24\omega_3^2c_s^2\omega_1-72v_1^2\omega_3^3\omega_1+36v_1^2\omega_3^3+12\omega_3\omega_4\omega_1+24\omega_3^2\omega_1+18\omega_3c_s^2\omega_4\omega_1^2-12\omega_3^3-72v_1^2\omega_3^2\omega_1^2-36v_1^2\omega_3\omega_4\omega_1+24\omega_3^2\omega_1^2-24\omega_3^2c_s^2\omega_1^2-24\omega_3^2\omega_1+24\omega_3^2c_s^2\omega_1-12\omega_3c_s^2\omega_4\omega_1+72v_1^2\omega_3^2\omega_1+12\omega_3^2\omega_4-12\omega_3^2c_s^2\omega_4-12\omega_3^3\omega_1^2+36v_1^2\omega_3^3\omega_1^2-36v_1^2\omega_3^2\omega_4)\frac{\rho c_s^2}{12\omega_3^3\omega_4\omega_1^2}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1}=(6\omega_2\omega_3c_s^4\omega_1^3+45\omega_2^3v_2^4\omega_3^2\omega_1+18\omega_2^3v_2^2\omega_3c_s^2\omega_1-30\omega_2^2\omega_3^2c_s^4\omega_1+36\omega_2^3v_2^4\omega_1^2-30\omega_2^3\omega_3c_s^2\omega_1+18\omega_2v_2^2\omega_3\omega_1^3-45\omega_2^2v_2^2\omega_3^2c_s^2\omega_1-81v_2^2\omega_3^2\omega_1^3-60\omega_2^2\omega_3c_s^2\omega_1^2-10\omega_3^3\omega_3^2c_s^4\omega_1^2-18\omega_2^3v_1^2\omega_3^2+126\omega_2^3v_1^2\omega_3c_s^2\omega_1+45\omega_2^3v_2^2\omega_3^2\omega_1+135v_1^2v_2^2\omega_3^2\omega_1^3+18\omega_3^2c_s^4\omega_1^3+36\omega_2^2v_2^2\omega_1^3+9\omega_2^2v_2^4\omega_3^2\omega_1^3+9\omega_2^3v_2^2\omega_3^2\omega_1^2+36\omega_2^2\omega_3c_s^2\omega_1^3-2\omega_2^3\omega_3^2c_s^4\omega_1^3-90\omega_2^2v_1^2\omega_3^2c_s^2\omega_1-18\omega_2^3v_1^2\omega_3^2c_s^2-6\omega_2^3\omega_3^2\omega_1+36\omega_2\omega_3^2c_s^2\omega_1^2-6\omega_2\omega_3^2\omega_1^2-36\omega_2^3v_2^4\omega_3^2+72\omega_2^2v_1^2\omega_3^2c_s^2\omega_1^2-18\omega_2v_2^4\omega_3\omega_1^3+30\omega_2^2v_2^2\omega_3^2c_s^2\omega_1^2-81\omega_2v_2^2\omega_3^2c_s^2\omega_1^2-9\omega_2v_1^2\omega_3^2c_s^2\omega_1^3-24\omega_2^3\omega_3c_s^2\omega_1^3+18\omega_2v_1^2\omega_3^2\omega_1^2+36v_2^2\omega_3^2\omega_1^3+2\omega_2^2\omega_3^2c_s^4\omega_1^3-90\omega_2^2v_2^2\omega_3^2\omega_1^2-198\omega_2^3v_1^2\omega_3c_s^2\omega_1^2+6\omega_2^2v_1^2\omega_3^2c_s^2\omega_1^3+108\omega_2^2v_2^2\omega_3^2c_s^2\omega_1^2+45\omega_2^3\omega_3^2c_s^4\omega_1-6\omega_2\omega_3^2\omega_1^3-135\omega_2^3v_1^2v_2^2\omega_3^2\omega_1+21\omega_2\omega_3^2c_s^2\omega_1^3-9\omega_2^3v_2^4\omega_3^2\omega_1^2+72\omega_2^3v_1^2\omega_3c_s^2\omega_1^3-9\omega_2^2v_2^2\omega_3^2\omega_1^3-144\omega_2^3v_2^2\omega_3c_s^2\omega_1^2+60\omega_2^3\omega_3c_s^2\omega_1^2+30\omega_2^2\omega_3^2c_s^4\omega_1^2+18\omega_2v_1^2\omega_3^2\omega_1^3-216\omega_2v_2^2\omega_3^2c_s^2\omega_1^3-54\omega_2v_1^2\omega_3^2c_s^2\omega_1^2-30\omega_2^2\omega_3^2c_s^4+135\omega_2^3v_1^2v_2^2\omega_3^2+189v_2^2\omega_3^2c_s^2\omega_1^3+144\omega_2^2v_1^2\omega_3c_s^2\omega_1^2+144\omega_2^2v_2^2\omega_3c_s^2\omega_1^3+12\omega_2^2\omega_3^2\omega_1^2-18v_1^2\omega_3^2\omega_1^3+108\omega_2^3v_2^2c_s^2\omega_1^2-54\omega_2^2v_2^2\omega_3\omega_1^3-36\omega_2^2v_2^4\omega_1^3-24\omega_2^3c_s^2\omega_1^3-6\omega_2^3v_1^2\omega_3^2c_s^2\omega_1^2-54\omega_3^3v_2^4\omega_3\omega_1^2+6\omega_3^2\omega_1^3-36\omega_2^2\omega_3c_s^4\omega_1^3+18\omega_2v_1^2\omega_3c_s^2\omega_1^3-6\omega_2\omega_3c_s^2\omega_1^3-18\omega_2^3v_2^2\omega_3\omega_1+\omega_2^3v_1^2\omega_3^2\omega_1^2+\omega_2^2v_1^4\omega_3^2\omega_1^3+30\omega_2^3\omega_3c_s^4\omega_1-45\omega_2v_2^4\omega_3^2\omega_1^3-63\omega_2^3v_2^2\omega_3^2c_s^2-36\omega_2^3v_2^2\omega_1^2+36\omega_2^2\omega_3^2c_s^2\omega_1+18v_1^2\omega_3^2c_s^2\omega_1^3-90\omega_2^2v_1^2\omega_3c_s^2\omega_1^3+36\omega_2^2v_2^2\omega_3c_s^2\omega_1^2-54\omega_2v_2^2\omega_3c_s^2\omega_1^3+2\omega_2^3\omega_3^2c_s^2\omega_1^2+60\omega_2^2\omega_3c_s^4\omega_1^2-30\omega_2^3v_2^2\omega_3^2c_s^2\omega_1^2+18\omega_2^2v_1^2\omega_3^2\omega_1-135\omega_2^2v_1^2v_2^2\omega_3^2\omega_1+45\omega_2v_2^2\omega_3^2\omega_1^2-108\omega_2^3v_2^2c_s^2\omega_1^3-3\omega_2^3\omega_3^2c_s^2\omega_1+108\omega_2^3v_2^2\omega_3^2c_s^2\omega_1-15\omega_2\omega_3^2c_s^4\omega_1^3-36\omega_2^2v_1^2\omega_3^2\omega_1^2+270\omega_2^2v_1^2v_2^2\omega_3^2\omega_1^2-135\omega_2v_1^2v_2^2\omega_3^2\omega_1^3+18\omega_2^3v_1^2\omega_3^2\omega_1+54\omega_2^3v_2^2\omega_3\omega_1^2+54\omega_2^2v_2^4\omega_3\omega_1^3-42\omega_2^2\omega_3^2c_s^2\omega_1^2-60\omega_2^3\omega_3c_s^4\omega_1^2-\omega_2^2v_1^2\omega_3^2\omega_1^3-30\omega_2\omega_3^2c_s^4\omega_1^2+18\omega_2^3v_2^4\omega_3\omega_1+9\omega_2^3v_1^2\omega_3^2c_s^2\omega_1-\omega_2^3v_1^4\omega_3^2\omega_1^2+6\omega_2^3\omega_3^2+90\omega_2v_2^2\omega_3^2\omega_1^3-9\omega_2^3v_2^2\omega_3^2-2\omega_2^2\omega_3^2c_s^2\omega_1^3+24\omega_2^3\omega_3c_s^4\omega_1^3-6\omega_2^2\omega_3^2\omega_1-135\omega_2v_1^2v_2^2\omega_3^2\omega_1^2)\frac{\rho}{24\omega_3^3\omega_3^2\omega_1^3}$

coefficient $C^{(1)}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2}$ **at** $\frac{\partial^4v_2}{\partial x_1^2\partial x_2^2}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2}=0$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2}=(-16\omega_8^2\omega_5^3\omega_9\omega_6c_s^2\omega_7^2-4\omega_8^2\omega_5^2\omega_6\omega_7\omega_4^3-\omega_8^2\omega_5^3v_1^2\omega_9\omega_6\omega_7^2\omega_4^2-24\omega_8\omega_5^3\omega_9\omega_6c_s^2\omega_7^2\omega_4^2-5\omega_8^2\omega_5^3\omega_9\omega_6c_s^2\omega_7\omega_4^3+4\omega_8^2\omega_5^2v_1^2\omega_6\omega_7\omega_4^3-6\omega_8^2\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4-8\omega_8^2\omega_5^2\omega_9\omega_6c_s^2\omega_4^3-2\omega_8^2\omega_5^3\omega_9\omega_6\omega_7^2\omega_4+4\omega_8\omega_5^3\omega_6c_s^2\omega_7^2\omega_4^2-4\omega_8^2\omega_5^3v_1^2\omega_6\omega_7^2\omega_4^2+2\omega_8\omega_5^3\omega_9\omega_6\omega_7^2\omega_4^2-4\omega_8^2\omega_5v_1^2\omega_9\omega_6\omega_7\omega_4^3-4\omega_8^2\omega_5^3v_1^2\omega_9\omega_6\omega_4^2+2\omega_8^2\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^2+2\omega_8^2\omega_5^3\omega_9c_s^2\omega_7^2\omega_4^2+11\omega_8^2\omega_5^3\omega_9\omega_6c_s^2\omega_7\omega_4^2+8\omega_8\omega_5^3\omega_9\omega_6c_s^2\omega_7^2\omega_4^2+12\omega_8^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3-15\omega_8^2\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^3+4\omega_8^2\omega_5^3v_1^2\omega_9\omega_6\omega_4^3+2\omega_8^2\omega_5^3v_1^2\omega_6\omega_7^2\omega_4^3-2\omega_8\omega_5^3\omega_6c_s^2\omega_7^2\omega_4^3-\omega_8\omega_5^3\omega_9\omega_6\omega_7^2\omega_4^3-4\omega_8^2\omega_9\omega_6\omega_7^2\omega_4^3-4\omega_8^2\omega_5^3\omega_6\omega_7\omega_4^2+2\omega_8^2\omega_5^2\omega_9\omega_6\omega_7\omega_4^2+4\omega_8\omega_5^3\omega_9c_s^2\omega_7^2\omega_4^2-4\omega_8^2\omega_5^3\omega_9c_s^2\omega_7^2\omega_4+2\omega_8^2\omega_5^3\omega_6c_s^2\omega_7^2\omega_4^3-2\omega_8\omega_5^3v_1^2\omega_6\omega_7^2\omega_4^3-2\omega_8^2\omega_5^2v_1^2\omega_9\omega_6\omega_7\omega_4^2+3\omega_8^2\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3-6\omega_8^2\omega_5^3\omega_9\omega_6c_s^2\omega_7\omega_4+4\omega_8^2\omega_5\omega_9\omega_6\omega_7\omega_4^3+4\omega_5^3\omega_9\omega_6c_s^2\omega_7^2\omega_4^2-2\omega_8\omega_5^3\omega_9c_s^2\omega_7^2\omega_4^3+4\omega_8^2\omega_5^3\omega_6\omega_7\omega_4^3+4\omega_8^2\omega_5^2\omega_6c_s^2\omega_7\omega_4^3-7\omega_8^2\omega_5^2\omega_9\omega_6\omega_7\omega_4^3-2\omega_5^3\omega_9\omega_6c_s^2\omega_7^2\omega_4^3+2\omega_8^2\omega_5^3v_1^2\omega_9\omega_6\omega_7^2\omega_4+12\omega_8\omega_5^3\omega_9\omega_6c_s^2\omega_7^2\omega_4-\omega_8^2\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2+4\omega_8\omega_5^3v_1^2\omega_6\omega_7^2\omega_4^2-4\omega_8^2\omega_5^3\omega_6c_s^2\omega_7^2\omega_4^2+7\omega_8^2\omega_5^2v_1^2\omega_9\omega_6\omega_7\omega_4^3+\omega_8^2\omega_5^3\omega_9\omega_6\omega_7^2\omega_4^2-\omega_8^2\omega_5^2\omega_9\omega_6\omega_7^2\omega_4^3-2\omega_8^2\omega_5^3\omega_6\omega_7^2\omega_4^3-2\omega_8^2\omega_5^2\omega_6c_s^2\omega_7^2\omega_4^3-4\omega_8^2\omega_5^3\omega_9\omega_6\omega_4^3-4\omega_8\omega_5^3\omega_6\omega_7^2\omega_4^2-6\omega_8^2\omega_5^3v_1^2\omega_9\omega_6\omega_7\omega_4-2\omega_8^2\omega_5\omega_9\omega_6\omega_7^2\omega_4^2+\omega_8^2\omega_5^2v_1^2\omega_9\omega_6\omega_7^2\omega_4^3-9\omega_8^2\omega_5^3\omega_9\omega_6\omega_7\omega_4^2+4\omega_8^2\omega_5^3\omega_6c_s^2\omega_7\omega_4^2+2\omega_8^2\omega_5^2\omega_9\omega_6c_s^2\omega_7\omega_4^2-4\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3+4\omega_8^2\omega_5^3\omega_9\omega_6\omega_7^2\omega_4^2+3\omega_8^2\omega_5^2\omega_9\omega_6\omega_7^2\omega_4^2+4\omega_8^2\omega_5^3\omega_6\omega_7^2\omega_4^2+8\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2+13\omega_8^2\omega_5^2\omega_9\omega_6c_s^2\omega_7\omega_4^3+3\omega_8^2\omega_5^3\omega_9\omega_6\omega_7\omega_4^3-3\omega_8^2\omega_5^2v_1^2\omega_9\omega_6\omega_7^2\omega_4^2-4\omega_8^2\omega_5^3\omega_6c_s^2\omega_7\omega_4^3+2\omega_8\omega_5^3\omega_6\omega_7^2\omega_4^3+5\omega_8^2\omega_5\omega_9\omega_6\omega_7^2\omega_4^3+26\omega_8^2\omega_5^3\omega_9\omega_6c_s^2\omega_7^2\omega_4+2\omega_8^2\omega_5^2v_1^2\omega_9\omega_6\omega_7^2\omega_4-3\omega_8^2\omega_5^3v_1^2\omega_9\omega_6\omega_7\omega_4^3-2\omega_8\omega_5^3v_1^2\omega_9\omega_6\omega_7^2\omega_4^2-8\omega_8^2\omega_5^3\omega_9\omega_6c_s^2\omega_7^2\omega_4^2+2\omega_8^2\omega_5v_1^2\omega_9\omega_6\omega_7^2\omega_4^2-4\omega_8^2\omega_5^3v_1^2\omega_6\omega_7\omega_4^3-2\omega_8^2\omega_5^2\omega_9\omega_6\omega_7^2\omega_4-8\omega_8^2\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4^3+8\omega_8^2\omega_5^3\omega_9\omega_6c_s^2\omega_4^3+4\omega_8^2\omega_5^2\omega_9\omega_6\omega_4^3+\omega_8\omega_5^3v_1^2\omega_9\omega_6\omega_7^2\omega_4^3+9\omega_8^2\omega_5^3v_1^2\omega_9\omega_6\omega_7\omega_4^2+4\omega_8^2v_1^2\omega_9\omega_6\omega_7^2\omega_4^3+2\omega_8^2\omega_5^2\omega_6\omega_7^2\omega_4^3-4\omega_8^2\omega_5^2v_1^2\omega_9\omega_6\omega_4^3+6\omega_8^2\omega_5^3\omega_9\omega_6\omega_7\omega_4-2\omega_8^2\omega_5^2v_1^2\omega_6\omega_7^2\omega_4^3-8\omega_8^2\omega_5^3\omega_9\omega_6c_s^2\omega_4^2-5\omega_8^2\omega_5v_1^2\omega_9\omega_6\omega_7^2\omega_4^3+4\omega_8^2\omega_5^3v_1^2\omega_6\omega_7\omega_4^2)\frac{v_1\rho v_2}{2\omega_8^2\omega_5^3\omega_9\omega_6\omega_7^2\omega_4^3}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2}=C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2}=0$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2}=0$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2}=0$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2}=(135\omega_2^3\omega_3c_s^2\omega_1-216\omega_2v_2^2\omega_3\omega_1^3-18\omega_2^2\omega_3\omega_1-18\omega_2^3v_1^2\omega_1+162\omega_2^2\omega_3c_s^2\omega_1^2-162\omega_2v_2^2\omega_3\omega_1^2+54\omega_2^2v_1^2\omega_3\omega_1^2+108\omega_2^2c_s^2\omega_1^2-18\omega_2v_1^2\omega_1^3-27\omega_2^3v_1^2\omega_3\omega_1+18\omega_2\omega_1^3+84\omega_2^2\omega_3c_s^2\omega_1^3-54\omega_2^3\omega_3c_s^2-46\omega_2^2\omega_3\omega_1^3+36\omega_2^3v_1^2\omega_3-36\omega_2^2v_1^2\omega_3\omega_1+270\omega_3c_s^2\omega_1^3-54\omega_2^2\omega_3\omega_1^2+36v_1^2\omega_3\omega_1^3-54\omega_2^2\omega_3c_s^2\omega_1-84\omega_2^2\omega_3c_s^2\omega_1^2-126\omega_3\omega_1^3+135\omega_2\omega_3\omega_1^3-162\omega_2\omega_3c_s^2\omega_1^2+100\omega_2^2v_2^2\omega_3\omega_1^3-198\omega_2^3v_2^2\omega_3-27\omega_2v_1^2\omega_3\omega_1^3+54\omega_3^2\omega_3-297\omega_2\omega_3c_s^2\omega_1^3+216\omega_2^3v_2^2\omega_3\omega_1-81\omega_2^3\omega_3\omega_1+90\omega_2\omega_3\omega_1^2-36\omega_2v_1^2\omega_3\omega_1^2+162\omega_2^2v_2^2\omega_3\omega_1-100\omega_2^3v_2^2\omega_3\omega_1^2+46\omega_2^3\omega_3\omega_1^2+36\omega_2^2v_1^2\omega_1^2-$

$54\omega_2 c_s^2\omega_1^3 + 18\omega_2^3\omega_1 - 36\omega_2^2\omega_1^2 - 54\omega_2^3 c_s^2\omega_1 + 198 v_2^2\omega_3\omega_1^3)\frac{v_1\rho v_2}{24\omega_2^3\omega_3\omega_1^3}$

coefficient $C^{(1)}_{\mathrm{D}_x\mathrm{D}_y^3\rho}$ **at** $\frac{\partial^4\rho}{\partial x_1\partial x_2^3}$**:**

$$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = (24 - 42c_s^2\omega^2 + v_2^2\omega^3 - 14v_2^2\omega^2 + 3c_s^2\omega^3 + 36v_2^2\omega - 72c_s^2 + 108c_s^2\omega - 24v_2^2 - 36\omega + 14\omega^2 - \omega^3)\frac{v_2 c_s^2}{12\omega^3}$$

$$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = (6\omega_8^2 v_1^2\omega_9\omega_6\omega_7\omega_4^3 - 12\omega_8\omega_5\omega_9 v_2^2\omega_6^2 c_s^2\omega_7\omega_4 + 72\omega_8^2\omega_5 v_1^2\omega_9\omega_6 c_s^2\omega_7\omega_4 - 72\omega_8\omega_5 v_1^2\omega_9\omega_6^2 c_s^2\omega_7\omega_4 + 3\omega_8^2\omega_5\omega_9\omega_6^2 c_s^4\omega_7\omega_4^3 +$$
$$24\omega_8^2 v_1^2\omega_9 v_2^2\omega_6\omega_7\omega_4^2 - 24\omega_8^2 v_1^2\omega_9 v_2^2\omega_6^2\omega_7\omega_4^2 - 12\omega_8^2\omega_5\omega_9 v_2^2\omega_6 c_s^2\omega_7\omega_4 - 18\omega_8^2\omega_6^2 c_s^4\omega_7\omega_4^3 + 9\omega_8^2\omega_5 v_1^2\omega_9 v_2^2\omega_6\omega_7\omega_4^3 - 36\omega_8^2\omega_9\omega_6 c_s^2\omega_4^3 -$$
$$12\omega_8^2\omega_5\omega_9\omega_6^2 c_s^2\omega_7\omega_4 - 6\omega_8^2\omega_5 v_1^2\omega_9 v_2^2\omega_7\omega_4^3 - 6\omega_8\omega_5 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^3 - 72\omega_8 v_1^2\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2 + 12\omega_8^2\omega_5\omega_9\omega_6 c_s^2\omega_4^2 - 24\omega_8\omega_5 v_1^2\omega_9 v_2^2\omega_6^2\omega_7\omega_4 +$$
$$12\omega_8^2 v_1^2 v_2^2\omega_6^2\omega_4^3 + 36\omega_8^2 v_1^2\omega_6^2 c_s^2\omega_4^3 - 9\omega_8^2\omega_5 v_1^2\omega_9\omega_6\omega_7\omega_4^3 - 12\omega_8^2\omega_5\omega_6^2 c_s^2\omega_4^2 + 15\omega_8\omega_5 v_1^2\omega_9\omega_6^2\omega_7\omega_4^3 + 12\omega_8 v_1^2\omega_9 v_2^2\omega_6^2\omega_7\omega_4^3 -$$
$$6\omega_8^2 v_1^2\omega_9 v_2^2\omega_6\omega_7\omega_4^3 - 60\omega_8^2\omega_5\omega_9\omega_6^2 c_s^4\omega_7\omega_4^2 - 24\omega_8^2 v_1^2\omega_9\omega_6\omega_7\omega_4^2 - 48\omega_8\omega_5 v_1^2\omega_9\omega_6^2\omega_7\omega_4^2 + 12\omega_8^2 v_2^2\omega_6^2 c_s^2\omega_4^3 + 36\omega_8^2\omega_5 v_1^2\omega_9\omega_6\omega_7\omega_4^2 +$$
$$12\omega_8^2\omega_5\omega_6^2 c_s^2\omega_4^3 + 36\omega_8 v_1^2\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 + 12\omega_8^2\omega_5 v_1^2\omega_9 v_2^2\omega_7\omega_4^2 + 12\omega_8\omega_5 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^2 - 36\omega_8^2\omega_5 v_1^2\omega_9 v_2^2\omega_6\omega_7\omega_4^2 - 12\omega_8^2\omega_5\omega_9\omega_6 c_s^2\omega_4^3 +$$
$$24\omega_8\omega_5 v_1^2\omega_9\omega_6^2\omega_7\omega_4 + 72\omega_8^2 v_1^2\omega_9\omega_6 c_s^2\omega_7\omega_4^2 - 6\omega_5 v_1^2\omega_9\omega_6^2\omega_7\omega_4^3 - 24\omega_8^2\omega_5 v_1^2\omega_9\omega_6\omega_7\omega_4 - 12\omega_8^2 v_1^2\omega_9 v_2^2\omega_6\omega_4^3 - 18\omega_8^2\omega_5 v_1^2\omega_9 c_s^2\omega_7\omega_4^3 -$$
$$18\omega_8\omega_5 v_1^2\omega_6^2 c_s^2\omega_7\omega_4^3 - 15\omega_8\omega_5 v_1^2\omega_9 v_2^2\omega_6^2\omega_7\omega_4^3 + 6\omega_8^2\omega_6^2 c_s^2\omega_7\omega_4^3 + 24\omega_8^2\omega_5 v_1^2\omega_9 v_2^2\omega_6\omega_7\omega_4 - \omega_8^2\omega_5\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 - 5\omega_8^2\omega_5\omega_9 v_2^2\omega_6 c_s^2\omega_7\omega_4^3 +$$
$$36\omega_8^2\omega_6^2 c_s^4\omega_4^3 + 156\omega_8^2\omega_5\omega_9\omega_6^2 c_s^4\omega_7\omega_4 - 36\omega_8^2\omega_5 v_1^2\omega_9\omega_6 c_s^2\omega_4^2 + 12\omega_8^2 v_1^2\omega_9\omega_6\omega_4^3 - 6\omega_8\omega_5 v_1^2 v_2^2\omega_6^2\omega_7\omega_4^3 - 45\omega_8\omega_5 v_1^2\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 +$$
$$27\omega_8^2\omega_5 v_1^2\omega_9\omega_6 c_s^2\omega_7\omega_4^3 + 12\omega_8^2\omega_5 v_1^2\omega_9 v_2^2\omega_6\omega_4^3 - 3\omega_8\omega_5\omega_9 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^3 - 36\omega_8^2 v_1^2\omega_9\omega_6 c_s^2\omega_4^3 + 12\omega_8^2\omega_5\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2 + 6\omega_8^2\omega_9 v_2^2\omega_6 c_s^2\omega_7\omega_4^3 +$$
$$48\omega_8\omega_5 v_1^2\omega_9 v_2^2\omega_6^2\omega_7\omega_4^2 + 36\omega_8\omega_5 v_1^2\omega_6^2 c_s^2\omega_7\omega_4^2 - 12\omega_8^2 v_1^2\omega_6^2\omega_4^3 + 12\omega_5 v_1^2\omega_9\omega_6^2\omega_7\omega_4^2 + 36\omega_8^2\omega_5 v_1^2\omega_9 c_s^2\omega_7\omega_4^2 - 18\omega_8^2 v_1^2\omega_9\omega_6 c_s^2\omega_7\omega_4^3 -$$
$$12\omega_8^2\omega_5 v_1^2\omega_9 v_2^2\omega_6\omega_4^2 + 18\omega_8\omega_5\omega_9 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^2 - 108\omega_8^2\omega_5 v_1^2\omega_9\omega_6 c_s^2\omega_7\omega_4^2 + 36\omega_8^2\omega_5 v_1^2\omega_9\omega_6 c_s^2\omega_4^3 + 6\omega_8^2 v_1^2\omega_6^2\omega_7\omega_4^3 + 144\omega_8\omega_5 v_1^2\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2 +$$
$$12\omega_8\omega_5 v_1^2 v_2^2\omega_6^2\omega_7\omega_4^2 + 18\omega_8^2\omega_5\omega_9 v_2^2\omega_6 c_s^2\omega_7\omega_4^2 + 18\omega_8^2\omega_5 v_1^2\omega_6^2 c_s^2\omega_7\omega_4^3 + 18\omega_8^2\omega_5\omega_6^2 c_s^4\omega_7\omega_4^3 - 12\omega_8^2\omega_5 v_1^2\omega_6^2\omega_4^2 + 3\omega_8\omega_5\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 +$$
$$24\omega_8 v_1^2\omega_9\omega_6^2\omega_7\omega_4^2 - 6\omega_8^2 v_1^2 v_2^2\omega_6^2\omega_7\omega_4^3 + 6\omega_8\omega_5 v_1^2\omega_9 v_2^2\omega_6\omega_7\omega_4^3 + 18\omega_8^2\omega_9\omega_6 c_s^4\omega_7\omega_4^3 + 12\omega_8^2\omega_5\omega_9\omega_6 c_s^2\omega_7\omega_4 - 12\omega_8\omega_5\omega_6^2 c_s^2\omega_7\omega_4^2 +$$
$$6\omega_8\omega_5 v_1^2\omega_6^2\omega_7\omega_4^3 - 15\omega_8^2\omega_5\omega_9\omega_6 c_s^4\omega_7\omega_4^3 + 6\omega_8^2\omega_5 v_1^2\omega_9\omega_7\omega_4^3 - 36\omega_8^2\omega_5\omega_6^2 c_s^4\omega_4^3 - 36\omega_8^2\omega_5 v_1^2\omega_6^2 c_s^2\omega_4^3 + 12\omega_8^2\omega_5 v_2^2\omega_6^2 c_s^2\omega_4^2 +$$
$$12\omega_8^2\omega_5\omega_9 v_2^2\omega_6^2 c_s^2\omega_7\omega_4 - 6\omega_5\omega_9\omega_6^2 c_s^4\omega_7\omega_4^3 - 18\omega_8^2 v_1^2\omega_6^2 c_s^2\omega_7\omega_4^3 - 12\omega_8^2\omega_5 v_1^2 v_2^2\omega_6^2\omega_4^3 + 36\omega_8^2\omega_5\omega_9\omega_6 c_s^2\omega_4^3 + 6\omega_8^2\omega_5 v_1^2 v_2^2\omega_6^2\omega_7\omega_4^3 +$$
$$12\omega_8\omega_5\omega_9\omega_6^2 c_s^2\omega_7\omega_4 + 6\omega_8\omega_5\omega_6^2 c_s^2\omega_7\omega_4^3 - 12\omega_8 v_1^2\omega_9\omega_6^2\omega_7\omega_4^3 - 18\omega_8\omega_5\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2 - 12\omega_8\omega_5 v_1^2\omega_9 v_2^2\omega_6\omega_7\omega_4^2 - 36\omega_8^2\omega_5 v_1^2\omega_6^2 c_s^2\omega_7\omega_4^2 -$$
$$36\omega_8^2\omega_5\omega_6^2 c_s^4\omega_7\omega_4^2 + 12\omega_8^2\omega_5 v_1^2\omega_6^2\omega_4^3 - 12\omega_8^2\omega_5 v_1^2 v_2^2\omega_6^2\omega_7\omega_4^2 - 36\omega_8^2\omega_5\omega_9\omega_6 c_s^4\omega_4^2 + 12\omega_8^2\omega_9\omega_6 c_s^2\omega_4^3 + 12\omega_5\omega_9\omega_6^2 c_s^4\omega_7\omega_4^2 + 12\omega_8^2\omega_5 v_1^2 v_2^2\omega_6^2\omega_4^2 +$$
$$36\omega_8^2\omega_5 v_1^2\omega_6^2 c_s^2\omega_4^2 - 12\omega_8^2\omega_5 v_2^2\omega_6^2 c_s^2\omega_4^3 + 36\omega_8^2\omega_5\omega_6^2 c_s^4\omega_4^2 - 12\omega_8^2\omega_5 v_1^2\omega_9\omega_7\omega_4^2 + 54\omega_8^2\omega_5\omega_9\omega_6 c_s^4\omega_7\omega_4^2 - 12\omega_8\omega_5 v_1^2\omega_6^2\omega_7\omega_4^2 - 6\omega_8^2 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^3 +$$
$$15\omega_8\omega_5\omega_9\omega_6^2 c_s^4\omega_7\omega_4^3 - 12\omega_5\omega_9 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^2 - 6\omega_8^2\omega_5\omega_6^2 c_s^2\omega_7\omega_4^3 + \omega_8^2\omega_5\omega_9 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^3 - 36\omega_5 v_1^2\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2 + 36\omega_8\omega_5\omega_6^2 c_s^4\omega_7\omega_4^2 -$$
$$36\omega_8^2\omega_5\omega_9\omega_6 c_s^4\omega_7\omega_4 - 6\omega_8^2\omega_9\omega_6 c_s^2\omega_7\omega_4^3 + 18\omega_8\omega_5 v_1^2\omega_9\omega_6 c_s^2\omega_7\omega_4^3 - 6\omega_8\omega_5 v_1^2\omega_9\omega_6\omega_7\omega_4^3 - 12\omega_8^2\omega_5\omega_9 v_2^2\omega_6 c_s^2\omega_4^2 + 5\omega_8^2\omega_5\omega_9\omega_6 c_s^2\omega_7\omega_4^3 -$$
$$12\omega_5 v_1^2\omega_9 v_2^2\omega_6^2\omega_7\omega_4^2 - 12\omega_8^2\omega_5 v_1^2\omega_9\omega_6\omega_4^3 + 12\omega_8^2\omega_5 v_1^2\omega_6^2\omega_7\omega_4^2 + 12\omega_8\omega_5\omega_9\omega_6^2 c_s^2\omega_7\omega_4 + 6\omega_8^2\omega_5 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^3 - 6\omega_5\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 -$$
$$36\omega_8\omega_5 v_1^2\omega_9\omega_6 c_s^2\omega_7\omega_4^2 - 12\omega_8^2\omega_5\omega_9 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^2 - 12\omega_8^2\omega_9 v_2^2\omega_6 c_s^2\omega_4^3 - 18\omega_8\omega_5\omega_6^2 c_s^4\omega_7\omega_4^3 + 18\omega_5 v_1^2\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 + 12\omega_8^2\omega_5\omega_6^2 c_s^2\omega_7\omega_4^2 -$$
$$42\omega_8\omega_5\omega_9\omega_6^2 c_s^4\omega_7\omega_4^2 + 6\omega_5\omega_9 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^3 - 12\omega_8^2\omega_6^2 c_s^2\omega_4^3 + 12\omega_5\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2 - 96\omega_8^2\omega_5\omega_9\omega_6^2 c_s^4\omega_7 + 12\omega_8^2\omega_5 v_1^2\omega_9\omega_6\omega_4^2 - 12\omega_8^2\omega_5 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^2 -$$
$$6\omega_8^2\omega_5 v_1^2\omega_6^2\omega_7\omega_4^3 + 6\omega_5 v_1^2\omega_9 v_2^2\omega_6^2\omega_7\omega_4^3 - 18\omega_8^2\omega_5\omega_9\omega_6 c_s^2\omega_7\omega_4^2 + 12\omega_8^2\omega_5\omega_9 v_2^2\omega_6 c_s^2\omega_4^3 + 12\omega_8\omega_5 v_1^2\omega_9\omega_6\omega_7\omega_4^2)\frac{v_2}{12\omega_8^2\omega_5\omega_9\omega_6^2\omega_7\omega_4^3}$$

$$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3\rho}$$

$$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = (-36\omega_8^2\omega_5\omega_6 c_s^2\omega_7\omega_4 + 12\omega_8^2\omega_5\omega_9\omega_6\omega_7\omega_4 + 18\omega_8^2\omega_5\omega_9 v_2^2\omega_7\omega_4 + 18\omega_8\omega_5\omega_9 v_2^2\omega_6\omega_7\omega_4 - 36\omega_8^2\omega_5\omega_9 c_s^2\omega_4 + 12\omega_8^2\omega_5\omega_9\omega_4 +$$
$$36\omega_8^2\omega_6 c_s^2\omega_4^2 + 3\omega_8\omega_5\omega_9\omega_6\omega_7\omega_4^2 - 18\omega_8\omega_5\omega_6 c_s^2\omega_7\omega_4^2 + 5\omega_8^2\omega_5\omega_9\omega_7\omega_4^2 - 36\omega_5\omega_9\omega_6 c_s^2\omega_7\omega_4 - 12\omega_8^2\omega_5\omega_9 v_2^2\omega_4 + 6\omega_5\omega_9 v_2^2\omega_6\omega_7\omega_4^2 -$$
$$15\omega_8^2\omega_5\omega_9 c_s^2\omega_7\omega_4^2 + 12\omega_8\omega_5 v_2^2\omega_6\omega_7\omega_4 - 9\omega_8\omega_5\omega_9\omega_6 c_s^2\omega_7\omega_4^2 + 12\omega_8^2 v_2^2\omega_6\omega_4^2 + 6\omega_8^2\omega_5 v_2^2\omega_6\omega_7\omega_4^2 + 54\omega_8\omega_5\omega_9\omega_6 c_s^2\omega_7\omega_4 - 12\omega_8^2\omega_5 v_2^2\omega_6\omega_7\omega_4 -$$
$$12\omega_5\omega_9 v_2^2\omega_6\omega_7\omega_4 + 12\omega_8^2\omega_5\omega_9 v_2^2\omega_4^2 - 12\omega_8^2\omega_6\omega_4^2 - 6\omega_8\omega_5 v_2^2\omega_6\omega_7\omega_4^2 + 54\omega_8^2\omega_5\omega_9 c_s^2\omega_7\omega_4 - 12\omega_8^2\omega_5\omega_9\omega_4^2 + 36\omega_8\omega_5\omega_6 c_s^2\omega_7\omega_4 -$$
$$18\omega_8\omega_5\omega_9\omega_6\omega_7\omega_4 + 18\omega_5\omega_9\omega_6 c_s^2\omega_7\omega_4^2 - 18\omega_8^2\omega_5\omega_9\omega_7\omega_4 - \omega_8^2\omega_5\omega_9\omega_6\omega_7\omega_4^2 + 18\omega_8^2\omega_5\omega_6 c_s^2\omega_7\omega_4^2 + 6\omega_8^2\omega_6\omega_7\omega_4^2 + 36\omega_8^2\omega_5\omega_9 c_s^2\omega_4^2 -$$
$$3\omega_8\omega_5\omega_9 v_2^2\omega_6\omega_7\omega_4^2 - 5\omega_8^2\omega_5\omega_9 v_2^2\omega_7\omega_4^2 + 12\omega_8^2\omega_9\omega_4^2 + 12\omega_8^2\omega_5 v_2^2\omega_6\omega_4 + 6\omega_8\omega_5\omega_6\omega_7\omega_4^2 - 36\omega_8^2\omega_5\omega_9\omega_6 c_s^2\omega_7\omega_4 - 12\omega_8^2\omega_9 v_2^2\omega_4^2 +$$
$$36\omega_8^2\omega_5\omega_9\omega_6 c_s^2\omega_7 + 18\omega_8^2\omega_9 c_s^2\omega_7\omega_4^2 + 36\omega_8^2\omega_5\omega_6 c_s^2\omega_4 + \omega_8^2\omega_5\omega_9 v_2^2\omega_6\omega_7\omega_4^2 + 12\omega_8^2\omega_5\omega_6\omega_4^2 - 6\omega_8^2\omega_5\omega_6\omega_7\omega_4^2 - 6\omega_8^2 v_2^2\omega_6\omega_7\omega_4^2 -$$
$$6\omega_5\omega_9\omega_6\omega_7\omega_4^2 + 12\omega_8^2\omega_5\omega_9 v_2^2\omega_6\omega_7 - 36\omega_8^2\omega_9 c_s^2\omega_4^2 - 12\omega_8^2\omega_5\omega_9 v_2^2\omega_6\omega_7\omega_4 + 12\omega_8^2\omega_5\omega_6\omega_7\omega_4 - 12\omega_8^2\omega_5\omega_6\omega_4 + 12\omega_5\omega_9\omega_6\omega_7\omega_4 -$$
$$36\omega_8^2\omega_5\omega_6 c_s^2\omega_4^2 - 12\omega_8^2\omega_5\omega_9 v_2^2\omega_7 - 12\omega_8\omega_5\omega_9 v_2^2\omega_6\omega_7 - 6\omega_8^2\omega_9\omega_7\omega_4^2 - 12\omega_8^2\omega_5\omega_9\omega_6\omega_7 + 12\omega_8^2\omega_5\omega_9\omega_7 + 12\omega_8\omega_5\omega_9\omega_6\omega_7 - 36\omega_8^2\omega_5\omega_9 c_s^2\omega_7 -$$
$$12\omega_8^2\omega_5 v_2^2\omega_6\omega_4^2 - 12\omega_8\omega_5\omega_6\omega_7\omega_4 + 6\omega_8^2\omega_9 v_2^2\omega_7\omega_4^2 + 3\omega_8^2\omega_5\omega_9\omega_6 c_s^2\omega_7\omega_4^2 - 18\omega_8^2\omega_6 c_s^2\omega_7\omega_4^2 - 36\omega_8\omega_5\omega_9\omega_6 c_s^2\omega_7)\frac{v_2 c_s^2}{12\omega_8^2\omega_5\omega_9\omega_6\omega_7\omega_4^2}$$

$$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3\rho}$$

$$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = (v_2^2\omega_6^2\omega_3^2 + 12\omega_2\omega_6^2\omega_3 - 3\omega_2 v_2^2\omega_6\omega_3^2 - 12\omega_6\omega_3 + 12\omega_2\omega_6 + 12\omega_2\omega_3 - 36\omega_2\omega_3 c_s^2 - 36\omega_2\omega_6 c_s^2 + 36\omega_6\omega_3 c_s^2 - 36\omega_6^2 c_s^2 - 6\omega_2\omega_3^2 -$$
$$12v_2^2\omega_6^2 - 9\omega_2\omega_6\omega_3^2 c_s^2 + 3\omega_6^2\omega_3^2 c_s^2 + 18\omega_2 v_2^2\omega_6\omega_3 - 12\omega_2\omega_6^2 + 6\omega_6\omega_3^2 + 6v_2^2\omega_6^2\omega_3 - \omega_2\omega_6^2\omega_3^2 - 36\omega_2\omega_6^2\omega_3 c_s^2 + 18\omega_6^2\omega_3 c_s^2 - \omega_6^2\omega_3^2 -$$
$$12\omega_2 v_2^2\omega_6^2\omega_3 + 3\omega_2\omega_6\omega_3^2 + 6\omega_2 v_2^2\omega_3^2 + 12v_2^2\omega_6\omega_3 + 3\omega_2\omega_6^2\omega_3^2 c_s^2 + 12\omega_2 v_2^2\omega_6^2 - 18\omega_6\omega_3^2 c_s^2 + 36\omega_2\omega_6^2 c_s^2 + 54\omega_2\omega_6\omega_3 c_s^2 + 12\omega_6^2 + 18\omega_2\omega_3^2 c_s^2 -$$
$$12\omega_2 v_2^2\omega_6 - 18\omega_2\omega_6\omega_3 - 12\omega_2 v_2^2\omega_3 - 6v_2^2\omega_6\omega_3^2 - 6\omega_6^2\omega_3 + \omega_2 v_2^2\omega_6^2\omega_3^2)\frac{v_2 c_s^2}{12\omega_2\omega_6^2\omega_3^2}$$

$$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = (18\omega_2\omega_3 c_s^4\omega_1^3 + 90\omega_2^3 v_2^4\omega_3^2\omega_1 - 30\omega_2^3 v_2^2\omega_3 c_s^2\omega_1 - 90\omega_2^2\omega_3^2 c_s^4\omega_1 + 30\omega_2^3\omega_3 c_s^2\omega_1 + 36\omega_2^3 c_s^4\omega_1^3 - 165\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1 - 51 v_2^2\omega_3^2\omega_1^3 -$$
$$24\omega_2^2\omega_3 c_s^2\omega_1^2 - 138\omega_2^3\omega_3^2 c_s^4\omega_1^2 - 72\omega_2^3 c_s^4\omega_1^2 + 51\omega_2^2 v_2^2\omega_3^2\omega_1 + 90\omega_2^2 c_s^4\omega_1^2 + 39\omega_2^2 v_2^4\omega_3^2\omega_1^2 - 7\omega_2^3\omega_3^2\omega_1^2 + 46\omega_2^3 v_2^2\omega_3^2\omega_1^2 + 18\omega_2^2\omega_3 c_s^2\omega_1^3 + 6\omega_2^3\omega_3^2 c_s^4\omega_1^3 +$$
$$12\omega_2^3\omega_3^2\omega_1 - 24\omega_2\omega_3^2 c_s^2\omega_1^2 - 102\omega_2^3 v_2^2\omega_3^2\omega_1 + 6\omega_2\omega_3^2\omega_1^2 - 45\omega_2^3 v_2^4\omega_3^2 + 197\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1^3 + 141\omega_2 v_2^2\omega_3^2 c_s^2\omega_1^2 + 6\omega_2^3\omega_3 c_s^2\omega_1^3 + 45 v_2^4\omega_3^2\omega_1^3 + 72\omega_2^2\omega_3^2 c_s^4\omega_1^3 -$$
$$6\omega_2^3 v_2^2\omega_3 c_s^2\omega_1^3 + 9\omega_2^2 v_1^2\omega_3^2 c_s^2\omega_1^3 + 12\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1^2 + 225\omega_2^3\omega_3^2 c_s^4\omega_1 - 12\omega_2\omega_3^2\omega_1^3 + 123\omega_2\omega_3^2 c_s^2\omega_1^3 - 45\omega_2^2 v_2^4\omega_3^2\omega_1 - 39\omega_2^3 v_2^4\omega_3^2\omega_1^2 - 46\omega_2^2 v_2^2\omega_3^2\omega_1^3 +$$
$$42\omega_2^3 v_2^2\omega_3 c_s^2\omega_1^2 - 42\omega_2^3\omega_3 c_s^2\omega_1^2 + 36\omega_2^2\omega_3^2 c_s^4\omega_1^2 - 465\omega_2 v_2^2\omega_3^2 c_s^2\omega_1^3 - 90\omega_2^3\omega_3^2 c_s^4 + 24\omega_2^3 c_s^2\omega_1^2 + 261 v_2^2\omega_3^2 c_s^2\omega_1^3 - 18\omega_2^2 v_2^2\omega_3 c_s^2\omega_1^3 + 45\omega_2 v_2^4\omega_3^2\omega_1^2 -$$

$24\omega_2^3v_2^2c_s^2\omega_1^2-72\omega_3^2c_s^2\omega_1^3-9\omega_2^3v_1^2\omega_3^2c_s^2\omega_1^2+2\omega_2^3v_2^2\omega_3^2c_s^2\omega_1^3-2\omega_2^3\omega_3^2c_s^2\omega_1^3+6\omega_3^2\omega_1^3-54\omega_2^2\omega_3c_s^4\omega_1^3-6\omega_2\omega_3c_s^2\omega_1^3+3\omega_2^3v_1^2\omega_3^2\omega_1^2+3\omega_2^2v_1^4\omega_3^2\omega_1^3-90\omega_2^3\omega_3c_s^4\omega_1-90\omega_2v_2^4\omega_3^2\omega_1^3-261\omega_2^3v_2^2\omega_3^2c_s^2+7\omega_2^2\omega_3^2\omega_1^3+48\omega_2^2\omega_3^2c_s^2\omega_1+12\omega_2^3v_2^2c_s^2\omega_1^3-12\omega_2^3c_s^2\omega_1^3+72\omega_2^3\omega_3^2c_s^2+24\omega_2^2v_2^2\omega_3c_s^2\omega_1^2+6\omega_2v_2^2\omega_3c_s^2\omega_1^3+81\omega_2^3\omega_3^2c_s^2\omega_1^2+72\omega_2^2\omega_3c_s^4\omega_1^2-219\omega_2^3v_2^2\omega_3^2c_s^2\omega_1^2-51\omega_2v_2^2\omega_3^2\omega_1^2-147\omega_2^3\omega_3^2c_s^2\omega_1+489\omega_2^3v_2^2\omega_3^2c_s^2\omega_1-153\omega_2\omega_3^2c_s^4\omega_1^3-12\omega_2^2\omega_3^2c_s^2\omega_1^2+126\omega_2^3\omega_3c_s^4\omega_1^2-3\omega_2^2v_1^2\omega_3^2\omega_1^3+18\omega_2\omega_3^2c_s^4\omega_1^2-3\omega_2^3v_1^4\omega_3^2\omega_1^2-6\omega_2^3\omega_3^2+102\omega_2v_2^2\omega_3^2\omega_1^3+51\omega_2^3v_2^2\omega_3^2-59\omega_2^2\omega_3^2c_s^2\omega_1^3-18\omega_2^3\omega_3c_s^4\omega_1^3-6\omega_2^2\omega_3^2\omega_1)\frac{v_2}{24\omega_2^3\omega_3^2\omega_1^3}$

coefficient $C^{(1)}_{\mathrm{D}_x\mathrm{D}_y^3v_1}$ **at** $\frac{\partial^4v_1}{\partial x_1\partial x_2^3}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^3v_1}=(2+v_2^2\omega-6c_s^2+3c_s^2\omega-2v_2^2-\omega)\frac{v_1\rho v_2}{12\omega}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3v_1}=(24\omega_8^2\omega_5^2\omega_6^2\omega_7^2\omega_4^2-132\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^2-24\omega_8\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3+12\omega_8^2\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4-66\omega_8\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4^2+12\omega_8^2\omega_5^2v_2^2\omega_6^2\omega_7^2\omega_4^3+12\omega_8^2\omega_5^2\omega_6^2c_s^2\omega_7^2\omega_4^3-12\omega_8\omega_5\omega_9\omega_6^2\omega_7^2\omega_4^3-96\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2+12\omega_8\omega_5^2\omega_6^2\omega_7^2\omega_4^3-12\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4-18\omega_8\omega_5^2\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^3-12\omega_8^2\omega_5^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^3+4\omega_8^2\omega_5^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^3-12\omega_8^2\omega_5\omega_6^2c_s^2\omega_7\omega_4^3+18\omega_8\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4^3-24\omega_8^2\omega_5^2v_2^2\omega_6^2\omega_7^2\omega_4^2+90\omega_8\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2+60\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3-12\omega_8^2\omega_5^2\omega_6^2\omega_7^2\omega_4^3-18\omega_8^2\omega_5^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^2-24\omega_8\omega_5^2\omega_6^2\omega_7^2\omega_4^2+12\omega_8^2\omega_5^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^3+66\omega_8\omega_5^2\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^2-12\omega_8^2\omega_5v_2^2\omega_6^2\omega_7^2\omega_4^3+24\omega_8\omega_5\omega_9\omega_6^2\omega_7^2\omega_4^2-24\omega_8^2\omega_5^2\omega_6^2c_s^2\omega_7^2\omega_4^2+12\omega_8^2\omega_5^2\omega_9v_2^2\omega_6\omega_7^2\omega_4+12\omega_8^2\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^3-\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4^3-36\omega_8\omega_5^2\omega_9v_2^2\omega_6^2\omega_7^2\omega_4+24\omega_8\omega_5^2v_2^2\omega_6^2\omega_7^2\omega_4^2+6\omega_8^2\omega_5^2\omega_9\omega_7^2\omega_4^3-84\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7\omega_4^3-24\omega_8\omega_5\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2-24\omega_8\omega_5\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^2-12\omega_8^2\omega_5\omega_9v_2^2\omega_6^2\omega_7\omega_4^3-24\omega_8^2\omega_5\omega_6^2\omega_7^2\omega_4^3+24\omega_8^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3+12\omega_8^2\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3-36\omega_8\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4+24\omega_8\omega_5^2\omega_6^2c_s^2\omega_7^2\omega_4^2-12\omega_8^2\omega_5\omega_9\omega_6^2\omega_7^2\omega_4^2+24\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3+12\omega_8\omega_5\omega_9\omega_6^2c_s^2\omega_7^3\omega_4^3+48\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2-12\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^2+12\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4^2-12\omega_8\omega_5^2\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^3-24\omega_5^2\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^2-48\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2+72\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7\omega_4-12\omega_8\omega_5^2\omega_6^2c_s^2\omega_7^2\omega_4^3-42\omega_8^2\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2+12\omega_8\omega_5\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^3+36\omega_8\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4-6\omega_8^2\omega_5^2\omega_9v_2^2\omega_7^2\omega_4^3+84\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2-4\omega_8^2\omega_5^2\omega_9\omega_6\omega_7^2\omega_4^3-12\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4^3+12\omega_8^2\omega_5^2\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^2+12\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_7\omega_4^2+12\omega_8^2\omega_5\omega_9\omega_6^2\omega_7\omega_4^3+156\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4+12\omega_8^2\omega_5\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^2+6\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3-24\omega_8^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2+24\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4^2-12\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_7\omega_4^3+18\omega_8^2\omega_5^2\omega_9\omega_6\omega_7^2\omega_4^2+12\omega_8^2\omega_5^2\omega_9v_2^2\omega_7^2\omega_4^2+12\omega_8^2\omega_5\omega_6^2\omega_7^2\omega_4^3-12\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2-24\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_4^3+12\omega_8\omega_5^2\omega_9\omega_6\omega_7^2\omega_4^2+24\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4^2+24\omega_8^2\omega_5\omega_6^2c_s^2\omega_7\omega_4^3+3\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3+24\omega_8^2\omega_5^2\omega_6^2\omega_7\omega_4^3+\omega_8^2\omega_5^2\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^3-18\omega_8^2\omega_5^2\omega_9c_s^2\omega_7^2\omega_4^3-12\omega_8^2\omega_5^2\omega_9\omega_6\omega_7^2\omega_4+6\omega_8\omega_5^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^3+24\omega_8^2\omega_5^2\omega_6^2c_s^2\omega_7\omega_4^2+24\omega_8^2\omega_5v_2^2\omega_6^2\omega_7^2\omega_4^3-66\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2-24\omega_8^2\omega_5^2v_2^2\omega_6^2\omega_7\omega_4^3-6\omega_8\omega_5^2\omega_9\omega_6\omega_7^2\omega_4^3+24\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_4^2+24\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_4^3-24\omega_8^2\omega_5^2\omega_6^2c_s^2\omega_7\omega_4^3-72\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7^2\omega_4+36\omega_8^2\omega_5^2\omega_9c_s^2\omega_7^2\omega_4^2-12\omega_8\omega_5^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^2-12\omega_8^2\omega_5^2\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^2)\frac{v_1\rho v_2}{12\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4^3}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y^3v_1}=C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3v_1}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3v_1}=(-\omega_8+3\omega_8\omega_6c_s^2-3v_2^2\omega_6+3\omega_8c_s^2+3\omega_6+\omega_8v_2^2-\omega_8\omega_6+\omega_8v_2^2\omega_6-9\omega_6c_s^2)\frac{v_1\rho v_2}{12\omega_8\omega_6}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3v_1}=C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3v_1}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3v_1}=(-3\omega_2v_2^2-\omega_2\omega_6+v_2^2\omega_6+3\omega_2+3\omega_2\omega_6c_s^2-\omega_6-9\omega_2c_s^2+3\omega_6c_s^2+\omega_2v_2^2\omega_6)\frac{v_1\rho v_2}{12\omega_2\omega_6}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3v_1}=(6\omega_3c_s^2\omega_1+2\omega_2\omega_3-4\omega_3\omega_1-9\omega_2v_1^2\omega_3+9v_1^2\omega_3\omega_1+2\omega_2v_2^2\omega_3\omega_1+6\omega_2\omega_1-18\omega_2c_s^2\omega_1-6\omega_2v_2^2\omega_1+v_2^2\omega_3\omega_1-2\omega_2\omega_3\omega_1+\omega_2v_2^2\omega_3+6\omega_2\omega_3c_s^2\omega_1)\frac{v_1\rho v_2}{24\omega_2\omega_3\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}_x\mathrm{D}_y^3v_2}$ **at** $\frac{\partial^4v_2}{\partial x_1\partial x_2^3}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^3v_2}=(-12+2c_s^2\omega^2+18v_2^2\omega^2-c_s^2\omega^3-54v_2^2\omega+36v_2^2+18\omega-6\omega^2)\frac{\rho c_s^2}{12\omega^3}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3v_2}=(6\omega_8^2v_2^2\omega_9\omega_6\omega_7\omega_4^3+60\omega_8\omega_5\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4+24\omega_8^2\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4-24\omega_8\omega_5v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4-\omega_8^2\omega_5\omega_9\omega_6^2c_s^4\omega_7\omega_4^3+72\omega_8^2v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^2-72\omega_8v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^2-36\omega_8^2\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7\omega_4-6\omega_8^2\omega_6^2c_s^4\omega_7\omega_4^3+27\omega_8^2\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^3-12\omega_8^2\omega_9\omega_6c_s^4\omega_4^3-18\omega_8^2\omega_5v_1^2\omega_9v_2^2\omega_7\omega_4^3-18\omega_8\omega_5v_2^2\omega_6^2c_s^2\omega_7\omega_4^3-24\omega_8v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^2+12\omega_8^2\omega_5\omega_9\omega_6c_s^2\omega_4^2-72\omega_8\omega_5v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4+36\omega_8^2v_1^2v_2^2\omega_6^2\omega_4^3+12\omega_8^2v_1^2\omega_6^2c_s^2\omega_4^3-9\omega_8^2\omega_5v_1^2\omega_9\omega_6\omega_7\omega_4^3-12\omega_8^2\omega_5\omega_6^2c_s^2\omega_4^2+15\omega_8\omega_5v_1^2\omega_9\omega_6^2\omega_7\omega_4^3+36\omega_8v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^3-18\omega_8^2v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^3+5\omega_8^2\omega_5\omega_9\omega_6^2c_s^4\omega_7\omega_4^2-24\omega_8^2v_1^2\omega_9\omega_6\omega_7\omega_4^2-48\omega_8\omega_5v_1^2\omega_9\omega_6^2\omega_7\omega_4^2+36\omega_8^2v_2^2\omega_6^2c_s^2\omega_4^3+36\omega_8^2\omega_5v_1^2\omega_9\omega_6\omega_7\omega_4^2+12\omega_8^2\omega_5\omega_6^2c_s^2\omega_4^3+12\omega_8v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3+36\omega_8^2\omega_5v_1^2\omega_9v_2^2\omega_7\omega_4^2+36\omega_8\omega_5v_2^2\omega_6^2c_s^2\omega_7\omega_4^2-108\omega_8^2\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^2-12\omega_8^2\omega_5\omega_9\omega_6c_s^2\omega_4^3+24\omega_8\omega_5v_1^2\omega_9\omega_6^2\omega_7\omega_4+24\omega_8^2v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4^2-6\omega_5v_1^2\omega_9\omega_6^2\omega_7\omega_4^3-24\omega_8^2\omega_5v_1^2\omega_9\omega_6\omega_7\omega_4-36\omega_8^2v_1^2\omega_9v_2^2\omega_6\omega_4^3-6\omega_8^2\omega_5v_1^2\omega_9c_s^2\omega_7\omega_4^3-6\omega_8\omega_5v_1^2\omega_6^2c_s^2\omega_7\omega_4^3-45\omega_8\omega_5v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^3+6\omega_8^2\omega_6^2c_s^2\omega_7\omega_4^3+72\omega_8^2\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4-15\omega_8^2\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7\omega_4^3+12\omega_8^2\omega_6^2c_s^4\omega_4^3+18\omega_8^2\omega_5\omega_9\omega_6^2c_s^4\omega_7\omega_4-12\omega_8^2\omega_5v_1^2\omega_9\omega_6c_s^2\omega_4^2+12\omega_8^2v_1^2\omega_9\omega_6\omega_4^3-18\omega_8\omega_5v_1^2v_2^2\omega_6^2\omega_7\omega_4^3-15\omega_8\omega_5v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3+9\omega_8^2\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4^3+36\omega_8^2\omega_5v_1^2\omega_9v_2^2\omega_6\omega_4^3+30\omega_8\omega_5\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4^3-12\omega_8^2v_1^2\omega_9\omega_6c_s^2\omega_4^3+\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7\omega_4^2+18\omega_8^2\omega_9v_2^2\omega_6c_s^2\omega_7\omega_4^3+144\omega_8\omega_5v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^2+12\omega_8\omega_5v_1^2\omega_6^2c_s^2\omega_7\omega_4^2-12\omega_8^2v_1^2\omega_6^2\omega_4^3+12\omega_5v_1^2\omega_9\omega_6^2\omega_7\omega_4^2+12\omega_8^2\omega_5v_1^2\omega_9c_s^2\omega_7\omega_4^2-6\omega_8^2v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4^3-36\omega_8^2\omega_5v_1^2\omega_9v_2^2\omega_6\omega_4^2-102\omega_8\omega_5\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4^2-36\omega_8^2\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4^2+12\omega_8^2\omega_5v_1^2\omega_9\omega_6c_s^2\omega_4^3+6\omega_8^2v_1^2\omega_6^2\omega_7\omega_4^3+48\omega_8\omega_5v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^2+36\omega_8\omega_5v_1^2v_2^2\omega_6^2\omega_7\omega_4^2+54\omega_8^2\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7\omega_4^2+6\omega_8^2\omega_5v_1^2\omega_6^2c_s^2\omega_7\omega_4^3+6\omega_8^2\omega_5\omega_6^2c_s^4\omega_7\omega_4^3-12\omega_8^2\omega_5v_1^2\omega_6^2\omega_4^2-6\omega_8\omega_5\omega_9\omega_6^2c_s^2\omega_7\omega_4^3+24\omega_8v_1^2\omega_9\omega_6^2\omega_7\omega_4^2-18\omega_8^2v_1^2v_2^2\omega_6^2\omega_7\omega_4^3+18\omega_8\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^3+6\omega_8^2\omega_9\omega_6c_s^4\omega_7\omega_4^3+12\omega_8^2\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4-12\omega_8\omega_5\omega_6^2c_s^2\omega_7\omega_4^2+6\omega_8\omega_5v_1^2\omega_6^2\omega_7\omega_4^3-5\omega_8^2\omega_5\omega_9\omega_6c_s^4\omega_7\omega_4^3+6\omega_8^2\omega_5v_1^2\omega_9\omega_7\omega_4^3-12\omega_8^2\omega_5\omega_6^2c_s^4\omega_4^3-12\omega_8^2\omega_5v_1^2\omega_6^2c_s^2\omega_4^3-48\omega_8^2\omega_5\omega_9v_2^2\omega_6^2c_s^2\omega_7+36\omega_8^2\omega_5v_2^2\omega_6^2c_s^2\omega_4^2+60\omega_8^2\omega_5\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4-6\omega_8^2v_1^2\omega_6^2c_s^2\omega_7\omega_4^3-$

$36\omega_8^2\omega_5v_1^2v_2^2\omega_6^2\omega_4^3+12\omega_8^2\omega_5\omega_9\omega_6c_s^4\omega_4^3+18\omega_8^2\omega_5v_1^2v_2^2\omega_6^2\omega_7\omega_4^3+12\omega_8\omega_5\omega_9\omega_6^2c_s^4\omega_7\omega_4+6\omega_8\omega_5\omega_6^2c_s^2\omega_7\omega_4^3-12\omega_8v_1^2\omega_9\omega_6^2\omega_7\omega_4^3+18\omega_8\omega_5\omega_9\omega_6^2c_s^2\omega_7\omega_4^2-36\omega_8\omega_5v_1^2\omega_6^2c_s^2\omega_7\omega_4^2-12\omega_8^2\omega_5v_1^2\omega_6^2c_s^4\omega_4^2+12\omega_8^2\omega_5v_1^2\omega_6^2\omega_4^3-36\omega_8^2\omega_5v_1^2v_2^2\omega_6^2\omega_7\omega_4^2-12\omega_8^2\omega_5\omega_9\omega_6c_s^4\omega_4^2+12\omega_8^2\omega_9\omega_6c_s^2\omega_4^3+36\omega_8^2\omega_5v_1^2v_2^2\omega_6^2\omega_4^2+12\omega_8^2\omega_5v_1^2\omega_6^2c_s^2\omega_4^2-36\omega_8^2\omega_5v_2^2\omega_6^2c_s^2\omega_4^3+12\omega_8^2\omega_5\omega_6^2c_s^4\omega_4^2-12\omega_8^2\omega_5v_1^2\omega_9\omega_7\omega_4^2+18\omega_8^2\omega_5\omega_9\omega_6c_s^4\omega_7\omega_4^2-12\omega_8\omega_5v_1^2\omega_6^2\omega_7\omega_4^2-18\omega_8^2v_2^2\omega_6^2c_s^2\omega_7\omega_4^3+6\omega_8\omega_5\omega_9\omega_6^2c_s^4\omega_7\omega_4^3+24\omega_5\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4^2-6\omega_8^2\omega_5\omega_6^2c_s^2\omega_7\omega_4^3-12\omega_5v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^2+12\omega_8\omega_5\omega_6^2c_s^4\omega_7\omega_4^2-12\omega_8^2\omega_5\omega_9\omega_6c_s^4\omega_7\omega_4-6\omega_8^2\omega_9\omega_6c_s^2\omega_7\omega_4^3+6\omega_8\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4^3-6\omega_8\omega_5v_1^2\omega_9\omega_6\omega_7\omega_4^3-36\omega_8^2\omega_5\omega_9v_2^2\omega_6c_s^2\omega_4^2+5\omega_8^2\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4^3-36\omega_5v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^2-12\omega_8^2\omega_5v_1^2\omega_9\omega_6\omega_4^3+12\omega_8^2\omega_5v_1^2\omega_6^2\omega_7\omega_4^2-12\omega_8\omega_5\omega_9\omega_6^2c_s^2\omega_7\omega_4+18\omega_8^2\omega_5v_2^2\omega_6^2c_s^2\omega_7\omega_4^3-12\omega_8\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4^2-15\omega_8^2\omega_5\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4^2-36\omega_8^2\omega_9v_2^2\omega_6c_s^2\omega_4^3-6\omega_8\omega_5\omega_6^2c_s^4\omega_7\omega_4^3+6\omega_5v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3+12\omega_8^2\omega_5\omega_6^2c_s^2\omega_7\omega_4^2-18\omega_8\omega_5\omega_9\omega_6^2c_s^4\omega_7\omega_4^2-12\omega_5\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4^3-12\omega_8^2\omega_6^2c_s^2\omega_4^3-12\omega_8^2\omega_5\omega_9\omega_6^2c_s^4\omega_7+12\omega_8^2\omega_5v_1^2\omega_9\omega_6\omega_4^2-36\omega_8^2\omega_5v_2^2\omega_6^2c_s^2\omega_7\omega_4^2-6\omega_8^2\omega_5v_1^2\omega_6^2\omega_7\omega_4^3+18\omega_5v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^3-18\omega_8^2\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4^2+36\omega_8^2\omega_5\omega_9v_2^2\omega_6c_s^2\omega_4^3+12\omega_8\omega_5v_1^2\omega_9\omega_6\omega_7\omega_4^2)\frac{\rho}{12\omega_8^2\omega_5\omega_9\omega_6^2\omega_7\omega_4^3}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y^3v_2}=C^{(1),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3v_2}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3v_2}=(12\omega_8\omega_5\omega_6\omega_4^3+5\omega_8\omega_5\omega_9\omega_7\omega_4^3-12\omega_8\omega_9c_s^2\omega_4^3+18\omega_5\omega_9v_2^2\omega_6\omega_7\omega_4^3+\omega_8\omega_5\omega_9\omega_6\omega_7\omega_4^2-12\omega_8\omega_5\omega_6c_s^2\omega_7\omega_4^2+12\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4-\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4^3+54\omega_8\omega_5\omega_9v_2^2\omega_7\omega_4^2-54\omega_5\omega_9v_2^2\omega_6\omega_7\omega_4^2-36\omega_8\omega_9v_2^2\omega_4^3-18\omega_8\omega_5\omega_9\omega_7\omega_4^2-12\omega_8\omega_5\omega_6\omega_4^2-5\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4^2-15\omega_8\omega_5\omega_9v_2^2\omega_7\omega_4^3-12\omega_8\omega_5\omega_9c_s^2\omega_7\omega_4+6\omega_8\omega_5\omega_6c_s^2\omega_7\omega_4^3+18\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4+6\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4^3+18\omega_8\omega_5\omega_9c_s^2\omega_7\omega_4^2-12\omega_8\omega_5\omega_9c_s^2\omega_4^2+36\omega_8\omega_5\omega_9v_2^2\omega_4^3+36\omega_5\omega_9v_2^2\omega_6\omega_7\omega_4+12\omega_8\omega_5\omega_9\omega_7\omega_4-36\omega_8\omega_5v_2^2\omega_6\omega_7\omega_4^2+12\omega_8\omega_9\omega_4^3-36\omega_8\omega_5\omega_9v_2^2\omega_4^2-5\omega_8\omega_5\omega_9c_s^2\omega_7\omega_4^3+12\omega_8\omega_5\omega_9c_s^2\omega_4^3-6\omega_8\omega_9\omega_7\omega_4^3-18\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4^2-36\omega_8\omega_5\omega_9v_2^2\omega_7\omega_4+18\omega_8\omega_5v_2^2\omega_6\omega_7\omega_4^2-3\omega_8\omega_5\omega_9v_2^2\omega_6\omega_7\omega_4^2+36\omega_8v_2^2\omega_6\omega_4^3+12\omega_8\omega_5\omega_6\omega_7\omega_4^2-6\omega_5\omega_9\omega_6\omega_7\omega_4^3-6\omega_5\omega_6c_s^2\omega_7\omega_4^3+12\omega_8\omega_6c_s^2\omega_4^3-18\omega_8v_2^2\omega_6\omega_7\omega_4^3-6\omega_8\omega_5\omega_6\omega_7\omega_4^3-12\omega_8\omega_6\omega_4^3+18\omega_5\omega_9\omega_6\omega_7\omega_4^2+12\omega_5\omega_6c_s^2\omega_7\omega_4^2+6\omega_8\omega_9c_s^2\omega_7\omega_4^3+36\omega_8\omega_5v_2^2\omega_6\omega_4^2+6\omega_8\omega_6\omega_7\omega_4^3-12\omega_8\omega_5\omega_6c_s^2\omega_4^3-12\omega_5\omega_9\omega_6\omega_7\omega_4-12\omega_5\omega_6\omega_7\omega_4^2-12\omega_8\omega_5\omega_9\omega_4^3-18\omega_5v_2^2\omega_6\omega_7\omega_4^3-6\omega_8\omega_6c_s^2\omega_7\omega_4^3+12\omega_8\omega_5\omega_6c_s^2\omega_4^2+18\omega_8\omega_9v_2^2\omega_7\omega_4^3-36\omega_8\omega_5v_2^2\omega_6\omega_4^3+36\omega_5v_2^2\omega_6\omega_7\omega_4^2+12\omega_8\omega_5\omega_9\omega_4^2+6\omega_5\omega_6\omega_7\omega_4^3-12\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7)\frac{\rho c_s^2}{12\omega_8\omega_5\omega_9\omega_6\omega_7\omega_4^3}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3v_2}=C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3v_2}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3v_2}=(-\omega_2\omega_6\omega_3^3c_s^2-3\omega_2v_2^2\omega_6\omega_3^2+12\omega_6\omega_3-12\omega_2\omega_3+12\omega_3^2c_s^2+12\omega_2\omega_3c_s^2-\omega_6\omega_3^3-18v_2^2\omega_3^3-12\omega_2\omega_6c_s^2-12\omega_6\omega_3c_s^2+18\omega_2\omega_3^2-5\omega_2\omega_6\omega_3^2c_s^2+36v_2^2\omega_3^2-6\omega_6\omega_3^2-6\omega_3^2c_s^2-6\omega_2\omega_3^2+6\omega_2\omega_3^2c_s^2-12\omega_3^2+\omega_2\omega_6\omega_3^2-54\omega_2v_2^2\omega_3^2-36v_2^2\omega_6\omega_3+6\omega_3^2+6\omega_6\omega_3^2c_s^2+18\omega_2\omega_6\omega_3c_s^2+18\omega_2v_2^2\omega_3^2+3v_2^2\omega_6\omega_3^2-18\omega_2\omega_3^2c_s^2+36\omega_2v_2^2\omega_3+18v_2^2\omega_6\omega_3^2+\omega_6\omega_3^3c_s^2)\frac{\rho c_s^2}{12\omega_2\omega_6\omega_3^3}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3v_2}=(-\omega_2^3v_1^4\omega_3\omega_1^2-33\omega_2\omega_3c_s^4\omega_1^3-\omega_2^2v_1^2\omega_3\omega_1^3+351\omega_2^3v_2^2\omega_3c_s^2\omega_1-45\omega_2^3\omega_3c_s^2\omega_1+180\omega_2v_2^2\omega_3\omega_1^3+12\omega_2^3c_s^4\omega_1^3-6\omega_2^2\omega_3\omega_1-12\omega_2^2\omega_3c_s^2\omega_1^2+18\omega_2^2c_s^2\omega_1^3-30\omega_2^3c_s^4\omega_1^2-63\omega_2v_2^2\omega_3\omega_1^2+6\omega_2\omega_3c_s^4\omega_1^2-24\omega_2^2c_s^2\omega_1^2-24\omega_2^2\omega_3c_s^2\omega_1^3-171\omega_2^3v_2^2\omega_3+\omega_2^2v_1^4\omega_3\omega_1^3+\omega_2^3v_1^2\omega_3\omega_1^2+24\omega_2^3\omega_3c_s^2+207v_2^2\omega_3c_s^2\omega_1^3-324\omega_2v_2^4\omega_3\omega_1^3-207\omega_2^3v_2^2\omega_3c_s^2+7\omega_2^2\omega_3\omega_1^3+18\omega_2^3c_s^4\omega_1-3\omega_2^3v_1^2\omega_3c_s^2\omega_1^2-24\omega_3c_s^2\omega_1^3+18\omega_2v_2^2c_s^2\omega_1^3+135\omega_2v_2^4\omega_3\omega_1^2+36\omega_2^2\omega_3c_s^2\omega_1-153\omega_2^3v_2^2\omega_3c_s^2\omega_1^2+6\omega_2c_s^4\omega_1^3+24\omega_2^3\omega_3c_s^2\omega_1^2+6\omega_3\omega_1^3+30\omega_2^3c_s^2\omega_1^2+153\omega_2^2v_2^2\omega_3c_s^2\omega_1^3-12\omega_2\omega_3\omega_1^3-90\omega_2^3v_2^2c_s^2\omega_1^2-135\omega_2^2v_2^4\omega_3\omega_1-12\omega_2\omega_3c_s^2\omega_1^2-81\omega_2^2v_2^2\omega_3\omega_1^3+24\omega_2^2c_s^4\omega_1^2-138\omega_2^3v_2^4\omega_3\omega_1^2-42\omega_2^3\omega_3c_s^4+17\omega_2^2\omega_3c_s^4\omega_1^3+99\omega_2^3v_2^2\omega_3+63\omega_2v_2^2\omega_3c_s^2\omega_1^2-6\omega_2^3\omega_3+45\omega_2\omega_3c_s^2\omega_1^3-180\omega_2^3v_2^2\omega_3\omega_1+12\omega_2^3\omega_3\omega_1+69\omega_2^3\omega_3c_s^4\omega_1+36\omega_2^3v_2^2c_s^2\omega_1^3-12\omega_2^3c_s^2\omega_1^3+6\omega_2\omega_3\omega_1^2+3\omega_2^2v_1^2\omega_3c_s^2\omega_1^3+36\omega_2^2v_2^2\omega_3c_s^2\omega_1^2+171v_2^4\omega_3\omega_1^3-351\omega_2v_2^2\omega_3c_s^2\omega_1^3+12\omega_2^2\omega_3c_s^4\omega_1^2-18\omega_2^2c_s^4\omega_1^3-30\omega_2^2\omega_3c_s^4\omega_1-54\omega_2^2v_2^2c_s^2\omega_1^3+63\omega_2^2v_2^2\omega_3\omega_1+81\omega_2^3v_2^2\omega_3\omega_1^2-7\omega_2^3\omega_3\omega_1^2-6\omega_2c_s^2\omega_1^3+138\omega_2^2v_2^4\omega_3\omega_1^3-25\omega_2^3\omega_3c_s^4\omega_1^2-135\omega_2^2v_2^2\omega_3c_s^2\omega_1+324\omega_2^3v_2^4\omega_3\omega_1+72\omega_2^2v_2^2c_s^2\omega_1^2-18\omega_2^3c_s^2\omega_1+54\omega_2^3v_2^2c_s^2\omega_1-99v_2^2\omega_3\omega_1^3-2\omega_2^3\omega_3c_s^4\omega_1^3+18\omega_3c_s^4\omega_1^3)\frac{\rho}{24\omega_2^3\omega_3\omega_1^3}$

coefficient $C^{(1)}_{\mathrm{D}_y^4\rho}$ **at** $\frac{\partial^4\rho}{\partial x_2^4}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}_y^4\rho}=(6v_2^4+3v_2^2\omega-2c_s^2+c_s^2\omega+2c_s^4+24v_2^2c_s^2-c_s^4\omega-6v_2^2-12v_2^2c_s^2\omega-3v_2^4\omega)\frac{v_1}{24\omega}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y^4\rho}=(-96\omega_8^2v_2^4\omega_6\omega_4-24\omega_8^2c_s^2\omega_4-30\omega_8v_2^4\omega_6^2\omega_4^2-144v_2^2\omega_6^2c_s^2\omega_4-14\omega_8^2\omega_6c_s^2\omega_4^2+24v_2^2\omega_6^2\omega_4-24\omega_8\omega_6^2c_s^4-12\omega_8^2v_2^2\omega_6^2c_s^2\omega_4^2-144\omega_8^2v_2^2c_s^2\omega_4^2+24\omega_6^2c_s^2\omega_4-72\omega_8^2v_2^2\omega_4+12v_2^4\omega_6^2\omega_4^2-126\omega_8v_2^2\omega_6^2c_s^2\omega_4^2-36\omega_8^2v_2^2\omega_6\omega_4^2-48\omega_8\omega_6^2c_s^2\omega_4-96\omega_8v_2^2\omega_6^2\omega_4+24\omega_8^2\omega_6c_s^4+12\omega_8\omega_6^2c_s^2\omega_4^2+96\omega_8^2v_2^2\omega_6\omega_4+30\omega_8v_2^2\omega_6^2\omega_4^2+36\omega_8^2v_2^2\omega_4^2-24v_2^4\omega_6^2\omega_4+432\omega_8v_2^2\omega_6^2c_s^2\omega_4-48\omega_8v_2^4\omega_6^2-12v_2^2\omega_6^2\omega_4^2+48\omega_8^2\omega_6c_s^2\omega_4+288\omega_8^2v_2^2c_s^2\omega_4-12\omega_6^2c_s^2\omega_4^2+36\omega_8^2v_2^4\omega_6\omega_4^2+12\omega_8^2c_s^2\omega_4^2+96\omega_8v_2^4\omega_6^2\omega_4+72v_2^2\omega_6^2c_s^2\omega_4^2-48\omega_8^2v_2^2\omega_6-\omega_8^2\omega_6^2c_s^4\omega_4^2+72\omega_8^2v_2^4\omega_4+216\omega_8^2v_2^2\omega_6c_s^2-144\omega_8v_2^2\omega_6c_s^2\omega_4+48\omega_8\omega_6^2c_s^4\omega_4-3\omega_8^2v_2^4\omega_6^2\omega_4^2-48\omega_8v_2^4\omega_6\omega_4-432\omega_8^2v_2^2\omega_6c_s^2\omega_4+24\omega_8^2c_s^4\omega_4-24\omega_8v_2^2\omega_6\omega_4^2+14\omega_8^2\omega_6c_s^4\omega_4^2-24\omega_6^2c_s^4\omega_4-48\omega_8^2\omega_6c_s^4\omega_4+48\omega_8v_2^2\omega_6^2+24\omega_8\omega_6^2c_s^2+12\omega_6^2c_s^4\omega_4^2+3\omega_8^2v_2^2\omega_6^2\omega_4^2+150\omega_8^2v_2^2\omega_6c_s^2\omega_4^2-12\omega_8^2c_s^4\omega_4^2+\omega_8^2\omega_6^2c_s^2\omega_4^2+48\omega_8v_2^2\omega_6\omega_4+48\omega_8^2v_2^4\omega_6+72\omega_8v_2^2\omega_6c_s^2\omega_4^2-12\omega_8\omega_6^2c_s^4\omega_4^2+24\omega_8v_2^4\omega_6\omega_4^2-24\omega_8^2\omega_6c_s^2-36\omega_8^2v_2^4\omega_4^2-216\omega_8v_2^2\omega_6^2c_s^2)\frac{v_1}{24\omega_8^2\omega_6^2\omega_4^2}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}_y^4\rho}=C^{(1),\mathrm{MRT1}}_{\mathrm{D}_y^4\rho}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_y^4\rho}=(6v_2^4+3v_2^2\omega_6-12v_2^2\omega_6c_s^2-2c_s^2-\omega_6c_s^4-3v_2^4\omega_6+2c_s^4+24v_2^2c_s^2+\omega_6c_s^2-6v_2^2)\frac{v_1}{24\omega_6}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}_y^4\rho}=C^{(1),\mathrm{CLBM1}}_{\mathrm{D}_y^4\rho}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}_y^4\rho}=(6v_2^4+3\omega_2v_2^2-12\omega_2v_2^2c_s^2-2c_s^2-\omega_2c_s^4+2c_s^4+\omega_2c_s^2+24v_2^2c_s^2-6v_2^2-3\omega_2v_2^4)\frac{v_1}{24\omega_2}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}^4_y\rho} = (-3\omega_2 v_2^4\omega_1 - 12\omega_2 v_2^2 c_s^2\omega_1 - 3\omega_2 v_2^2 - \omega_2 c_s^4\omega_1 + 12\omega_2 v_2^2 c_s^2 + \omega_2 c_s^4 - 3v_2^2\omega_1 - c_s^2\omega_1 - \omega_2 c_s^2 + \omega_2 c_s^2\omega_1 + 3\omega_2 v_2^2\omega_1 + 3\omega_2 v_2^4 + c_s^4\omega_1 + 12v_2^2 c_s^2\omega_1 + 3v_2^4\omega_1)\frac{v_1}{24\omega_2\omega_1}$

coefficient $C^{(1)}_{\mathrm{D}^4_y v_1}$ **at** $\frac{\partial^4 v_1}{\partial x_2^4}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}^4_y v_1} = (-14c_s^2\omega^2 - 72v_2^4 - 3v_2^2\omega^3 + 42v_2^2\omega^2 + c_s^2\omega^3 - 108v_2^2\omega - 24c_s^2 + 36c_s^2\omega + 48c_s^4 - 84v_2^2c_s^2\omega^2 - 42v_2^4\omega^2 - 3c_s^4\omega^3 + 30c_s^4\omega^2 - 144v_2^2c_s^2 + 3v_2^4\omega^3 + 6v_2^2c_s^2\omega^3 - 72c_s^4\omega + 72v_2^2 + 216v_2^2c_s^2\omega + 108v_2^4\omega)\frac{\rho}{24\omega^3}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}^4_y v_1} = (12\omega_8^2c_s^2\omega_4 + 24\omega_8^2c_s^4 + 24v_2^2\omega_4^2 - 18\omega_8v_2^4\omega_4^3 - 24\omega_8c_s^4\omega_4^2 - 72\omega_8^2v_2^2c_s^2\omega_4^2 - 24\omega_8^2v_2^2\omega_4 - 12v_2^2\omega_4^3 + 6\omega_8^2v_2^2c_s^2\omega_4^3 + 6\omega_8c_s^4\omega_4^3 + 72\omega_8v_2^4\omega_4^2 - 48\omega_8v_2^4\omega_4 + 24\omega_8^2v_2^2\omega_4^2 + \omega_8^2c_s^2\omega_4^3 + 24\omega_8c_s^4\omega_4 + 156\omega_8^2v_2^2c_s^2\omega_4 - 8\omega_8^2c_s^2\omega_4^2 - 3\omega_8^2v_2^2\omega_4^3 + 48\omega_8v_2^2c_s^2\omega_4^2 + 24\omega_8^2v_2^4\omega_4 + 12v_2^2c_s^2\omega_4^3 + 12v_2^4\omega_4^3 - 6\omega_8c_s^2\omega_4^3 - 72\omega_8v_2^2\omega_4^2 - 48\omega_8^2c_s^4\omega_4 - 24v_2^4\omega_4^2 - 24v_2^2c_s^2\omega_4^2 - 12\omega_8v_2^2c_s^2\omega_4^3 + 18\omega_8v_2^2\omega_4^3 + 24\omega_8c_s^2\omega_4^2 - 24\omega_8c_s^2\omega_4 + 24\omega_8^2c_s^4\omega_4^2 + 3\omega_8^2v_2^4\omega_4^3 - 96\omega_8^2v_2^2c_s^2 + 48\omega_8v_2^2\omega_4 - 24\omega_8^2v_2^4\omega_4^2 - 24\omega_8v_2^2c_s^2\omega_4 - 3\omega_8^2c_s^4\omega_4^3)\frac{\rho}{24\omega_8^2\omega_4^3}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}^4_y v_1} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}^4_y v_1}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}^4_y v_1} = (12\omega_8^2c_s^2\omega_4 + 24\omega_8^2c_s^4 + 72v_2^2\omega_4^2 - 30\omega_8v_2^4\omega_4^3 - 24\omega_8c_s^4\omega_4^2 - 12\omega_8^2v_2^2c_s^2\omega_4^2 - 36v_2^2\omega_4^3 + 6\omega_8^2v_2^2c_s^2\omega_4^3 + 6\omega_8c_s^4\omega_4^3 + 72\omega_8v_2^4\omega_4^2 + 12\omega_8^2v_2^2\omega_4^2 + \omega_8^2c_s^2\omega_4^3 + 24\omega_8c_s^4\omega_4 - 36\omega_8^2v_2^2c_s^2\omega_4 - 8\omega_8^2c_s^2\omega_4^2 - 3\omega_8^2v_2^2\omega_4^3 + 144\omega_8v_2^2c_s^2\omega_4^2 + 108v_2^2c_s^2\omega_4^3 + 36v_2^4\omega_4^3 - 6\omega_8c_s^2\omega_4^3 - 72\omega_8v_2^2\omega_4^2 - 48\omega_8^2c_s^4\omega_4 - 72v_2^4\omega_4^2 - 216v_2^2c_s^2\omega_4^2 - 72\omega_8v_2^2c_s^2\omega_4^3 + 30\omega_8v_2^2\omega_4^3 + 24\omega_8c_s^2\omega_4^2 - 24\omega_8c_s^2\omega_4 + 24\omega_8^2c_s^4\omega_4^2 + 3\omega_8^2v_2^4\omega_4^3 - 12\omega_8^2v_2^4\omega_4^2 + 72\omega_8v_2^2c_s^2\omega_4 - 3\omega_8^2c_s^4\omega_4^3)\frac{\rho}{24\omega_8^2\omega_4^3}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}^4_y v_1} = C^{(1),\mathrm{CLBM1}}_{\mathrm{D}^4_y v_1}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}^4_y v_1} = (12v_2^2\omega_6^2\omega_3^2 + 6\omega_6\omega_3^3c_s^4 - 3v_2^2\omega_6^2\omega_3^3 + 6v_2^2\omega_6^2\omega_3^3c_s^2 + \omega_6^2\omega_3^3c_s^2 - 12v_2^4\omega_6^2\omega_3^2 - 36v_2^2\omega_3^3 - 24\omega_6\omega_3c_s^2 - 48\omega_6^2\omega_3c_s^4 + 72v_2^2\omega_6\omega_3c_s^2 - 8\omega_6^2\omega_3^2c_s^2 + 3v_2^4\omega_6^2\omega_3^3 + 72v_2^2\omega_3^2 - 12v_2^2\omega_6^2\omega_3^2c_s^2 - 24\omega_6\omega_3^2c_s^4 + 24\omega_6^2c_s^4 + 12\omega_6^2\omega_3c_s^2 - 30v_2^4\omega_6\omega_3^3 - 36v_2^2\omega_6^2\omega_3c_s^2 + 24\omega_6\omega_3c_s^4 - 216v_2^2\omega_3^2c_s^2 + 72v_2^4\omega_6\omega_3^2 + 24\omega_6\omega_3^2c_s^2 + 24\omega_6^2\omega_3^2c_s^4 + 144v_2^2\omega_6\omega_3^2c_s^2 - 72v_2^4\omega_3^2 + 30v_2^2\omega_6\omega_3^3 - 72v_2^2\omega_6\omega_3^2c_s^2 + 36v_2^4\omega_3^2 - 72v_2^2\omega_6\omega_3^2 - 3\omega_6^2\omega_3^2c_s^4 - 6\omega_6\omega_3^3c_s^2 + 108v_2^2\omega_3^2c_s^2)\frac{\rho}{24\omega_6^2\omega_3^3}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}^4_y v_1} = (-24\omega_3c_s^2\omega_1 - 36v_2^2\omega_1^2 + 72v_2^2\omega_3c_s^2\omega_1 - 3v_2^2\omega_3^2\omega_1^2 + 24\omega_3^2c_s^4\omega_1^2 + 72v_2^2\omega_1^2 - 3\omega_3^2c_s^4\omega_1^3 + 12v_2^2\omega_3^2\omega_1^2 - 72v_2^2\omega_3c_s^2\omega_1^3 + 3v_2^4\omega_3^2\omega_1^3 - 6\omega_3c_s^2\omega_1^3 + 144v_2^2\omega_3c_s^2\omega_1^2 - 48\omega_3^2c_s^4\omega_1 + 24\omega_3c_s^2\omega_1^2 - 12v_2^4\omega_3^2\omega_1^2 + 6v_2^2\omega_3^2c_s^2\omega_1^3 - 216v_2^2c_s^2\omega_1^2 - 72v_2^4\omega_1^2 + \omega_3^2c_s^2\omega_1^3 + 72v_2^4\omega_3\omega_1^2 + 36v_2^4\omega_1^3 + 108v_2^2c_s^2\omega_1^3 + 24\omega_3c_s^4\omega_1 - 12v_2^2\omega_3^2c_s^2\omega_1^2 - 30v_2^4\omega_3\omega_1^3 - 8\omega_3^2c_s^2\omega_1^2 + 12\omega_3^2c_s^2\omega_1 - 24\omega_3c_s^4\omega_1^2 - 72v_2^2\omega_3\omega_1^2 - 36v_2^2\omega_3^2c_s^2\omega_1 + 30v_2^2\omega_3\omega_1^3 + 24\omega_3^2c_s^4 + 6\omega_3c_s^4\omega_1^3)\frac{\rho}{24\omega_3^2\omega_1^3}$

coefficient $C^{(1)}_{\mathrm{D}^4_y v_2}$ **at** $\frac{\partial^4 v_2}{\partial x_2^4}$**:**

$C^{(1),\mathrm{SRT}}_{\mathrm{D}^4_y v_2} = (-4 - 5v_2^2\omega + 6c_s^2 - 3c_s^2\omega + 10v_2^2 + 2\omega)\frac{v_1\rho v_2}{12\omega}$

$C^{(1),\mathrm{MRT1}}_{\mathrm{D}^4_y v_2} = (72\omega_8^2c_s^2\omega_4 - 72\omega_8\omega_6^2\omega_4 - 48\omega_8^2\omega_4 + 39\omega_8^2\omega_6c_s^2\omega_4^2 - 48v_2^2\omega_6^2\omega_4 - 48\omega_6^2c_s^2\omega_4 + 120\omega_8^2v_2^2\omega_4 + 72\omega_8^2\omega_6\omega_4 + 61\omega_8^2v_2^2\omega_6\omega_4^2 + 120\omega_8\omega_6^2c_s^2\omega_4 + 168\omega_8v_2^2\omega_6^2\omega_4 - 33\omega_8\omega_6^2c_s^2\omega_4^2 - 168\omega_8^2v_2^2\omega_6\omega_4 - 51\omega_8v_2^2\omega_6^2\omega_4^2 - 36\omega_8^2\omega_6 - 60\omega_8^2v_2^2\omega_4^2 - 25\omega_8^2\omega_6\omega_4^2 + 24v_2^2\omega_6^2\omega_4^2 - 120\omega_8^2\omega_6c_s^2\omega_4 + 24\omega_8^2\omega_4^2 + 24\omega_6^2c_s^2\omega_4^2 - 36\omega_8^2c_s^2\omega_4^2 + 84\omega_8^2v_2^2\omega_6 + 21\omega_8\omega_6^2\omega_4^2 + 12\omega_8\omega_6c_s^2\omega_4^2 - 12\omega_8\omega_6\omega_4^2 + 24\omega_6^2\omega_4 + 36\omega_8v_2^2\omega_6\omega_4^2 + 2\omega_8^2\omega_6^2\omega_4^2 - 84\omega_8v_2^2\omega_6^2 - 60\omega_8\omega_6^2c_s^2 - 5\omega_8^2v_2^2\omega_6^2\omega_4^2 + 36\omega_8\omega_6^2 - 3\omega_8^2\omega_6^2c_s^2\omega_4^2 - 72\omega_8v_2^2\omega_6\omega_4 + 24\omega_8\omega_6\omega_4 - 12\omega_6^2\omega_4^2 + 60\omega_8^2\omega_6c_s^2 - 24\omega_8\omega_6c_s^2\omega_4)\frac{v_1\rho v_2}{12\omega_8^2\omega_6^2\omega_4^2}$

$C^{(1),\mathrm{MRT2}}_{\mathrm{D}^4_y v_2} = C^{(1),\mathrm{MRT1}}_{\mathrm{D}^4_y v_2}$

$C^{(1),\mathrm{CLBM1}}_{\mathrm{D}^4_y v_2} = (-4 - 5v_2^2\omega_6 + 6c_s^2 + 2\omega_6 - 3\omega_6c_s^2 + 10v_2^2)\frac{v_1\rho v_2}{12\omega_6}$

$C^{(1),\mathrm{CLBM2}}_{\mathrm{D}^4_y v_2} = C^{(1),\mathrm{CLBM1}}_{\mathrm{D}^4_y v_2}$

$C^{(1),\mathrm{CuLBM1}}_{\mathrm{D}^4_y v_2} = (-4 - 5\omega_2v_2^2 + 2\omega_2 + 6c_s^2 - 3\omega_2c_s^2 + 10v_2^2)\frac{v_1\rho v_2}{12\omega_2}$

$C^{(1),\mathrm{CuLBM2}}_{\mathrm{D}^4_y v_2} = (5\omega_2v_2^2 - 2\omega_2 + 5v_2^2\omega_1 + 2\omega_2\omega_1 + 3c_s^2\omega_1 + 3\omega_2c_s^2 - 3\omega_2c_s^2\omega_1 - 5\omega_2v_2^2\omega_1 - 2\omega_1)\frac{v_1\rho v_2}{12\omega_2\omega_1}$

3.3 Conservation of momentum: ρv_2

$$v_2\frac{\partial\rho}{\partial t}+\rho\frac{\partial v_2}{\partial t}+v_1v_2\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_1}+\rho v_2\frac{\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1}+v_1\rho\frac{\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_1}+(c_s^2+v_2^2)\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_2}+2\rho v_2\frac{\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2}+C^{(2)}_{\mathrm{D}_x\rho,\mathrm{D}_xv_2}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_1}\frac{\partial v_2}{\partial x_1}+$$
$$C^{(2)}_{\mathrm{D}_x\rho,\mathrm{D}_yv_1}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_2}+C^{(2)}_{\mathrm{D}_xv_1,\mathrm{D}_yv_1}\frac{\delta_l^2}{\delta_t}\frac{\partial v_1}{\partial x_1}\frac{\partial v_1}{\partial x_2}+C^{(2)}_{\mathrm{D}_y\rho,\mathrm{D}_xv_1}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_1}{\partial x_1}+C^{(2)}_{\mathrm{D}_y\rho,\mathrm{D}_yv_2}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_2}{\partial x_2}+$$
$$C^{(2)}_{\mathrm{D}_yv_2,\mathrm{D}_yv_2}\frac{\delta_l^2}{\delta_t}\left(\frac{\partial v_2}{\partial x_2}\right)^2+C^{(2)}_{\mathrm{D}_x^2v_2}\frac{\delta_l^2}{\delta_t}\frac{\partial^2v_2}{\partial x_1^2}+C^{(2)}_{\mathrm{D}_x\mathrm{D}_y\rho}\frac{\delta_l^2}{\delta_t}\frac{\partial^2\rho}{\partial x_1\partial x_2}+C^{(2)}_{\mathrm{D}_x\mathrm{D}_yv_1}\frac{\delta_l^2}{\delta_t}\frac{\partial^2v_1}{\partial x_1\partial x_2}+C^{(2)}_{\mathrm{D}_y^2\rho}\frac{\delta_l^2}{\delta_t}\frac{\partial^2\rho}{\partial x_2^2}+C^{(2)}_{\mathrm{D}_y^2v_2}\frac{\delta_l^2}{\delta_t}\frac{\partial^2v_2}{\partial x_2^2}$$
$$+C^{(2)}_{\mathrm{D}_x^3\rho}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_1^3}+C^{(2)}_{\mathrm{D}_x^3v_1}\frac{\delta_l^3}{\delta_t}\frac{\partial^3v_1}{\partial x_1^3}+C^{(2)}_{\mathrm{D}_x^3v_2}\frac{\delta_l^3}{\delta_t}\frac{\partial^3v_2}{\partial x_1^3}+C^{(2)}_{\mathrm{D}_x^2\mathrm{D}_y\rho}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_1^2\partial x_2}+C^{(2)}_{\mathrm{D}_x^2\mathrm{D}_yv_1}\frac{\delta_l^3}{\delta_t}\frac{\partial^3v_1}{\partial x_1^2\partial x_2}+C^{(2)}_{\mathrm{D}_x^2\mathrm{D}_yv_2}\frac{\delta_l^3}{\delta_t}\frac{\partial^3v_2}{\partial x_1^2\partial x_2}$$
$$+C^{(2)}_{\mathrm{D}_x\mathrm{D}_y^2\rho}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_1\partial x_2^2}+C^{(2)}_{\mathrm{D}_x\mathrm{D}_y^2v_1}\frac{\delta_l^3}{\delta_t}\frac{\partial^3v_1}{\partial x_1\partial x_2^2}+C^{(2)}_{\mathrm{D}_x\mathrm{D}_y^2v_2}\frac{\delta_l^3}{\delta_t}\frac{\partial^3v_2}{\partial x_1\partial x_2^2}+C^{(2)}_{\mathrm{D}_y^3\rho}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_2^3}+C^{(2)}_{\mathrm{D}_y^3v_2}\frac{\delta_l^3}{\delta_t}\frac{\partial^3v_2}{\partial x_2^3}+C^{(2)}_{\mathrm{D}_x^4\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1^4}$$
$$+C^{(2)}_{\mathrm{D}_x^4v_1}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_1}{\partial x_1^4}+C^{(2)}_{\mathrm{D}_x^4v_2}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_2}{\partial x_1^4}+C^{(2)}_{\mathrm{D}_x^3\mathrm{D}_y\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1^3\partial x_2}+C^{(2)}_{\mathrm{D}_x^3\mathrm{D}_yv_1}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_1}{\partial x_1^3\partial x_2}+C^{(2)}_{\mathrm{D}_x^3\mathrm{D}_yv_2}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_2}{\partial x_1^3\partial x_2}+$$
$$C^{(2)}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2}+C^{(2)}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_1}{\partial x_1^2\partial x_2^2}+C^{(2)}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_2}{\partial x_1^2\partial x_2^2}+C^{(2)}_{\mathrm{D}_x\mathrm{D}_y^3\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1\partial x_2^3}+C^{(2)}_{\mathrm{D}_x\mathrm{D}_y^3v_1}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_1}{\partial x_1\partial x_2^3}+$$
$$C^{(2)}_{\mathrm{D}_x\mathrm{D}_y^3v_2}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_2}{\partial x_1\partial x_2^3}+C^{(2)}_{\mathrm{D}_y^4\rho}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_2^4}+C^{(2)}_{\mathrm{D}_y^4v_2}\frac{\delta_l^4}{\delta_t}\frac{\partial^4v_2}{\partial x_2^4}=0,$$

where:

coefficient $C^{(2)}_{\mathrm{D}_x\rho,\mathrm{D}_xv_2}$ **at** $\frac{\partial\rho}{\partial x_1}\frac{\partial v_2}{\partial x_1}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x\rho,\mathrm{D}_xv_2}=(-2+\omega)\frac{c_s^2}{2\omega}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\rho,\mathrm{D}_xv_2}=(-2+\omega_4)\frac{c_s^2}{2\omega_4}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x\rho,\mathrm{D}_xv_2}=C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\rho,\mathrm{D}_xv_2}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x\rho,\mathrm{D}_xv_2}=C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\rho,\mathrm{D}_xv_2}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x\rho,\mathrm{D}_xv_2}=C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\rho,\mathrm{D}_xv_2}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x\rho,\mathrm{D}_xv_2}=(-2+\omega_3)\frac{c_s^2}{2\omega_3}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x\rho,\mathrm{D}_xv_2}=(-2+\omega_1)\frac{c_s^2}{2\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}_x\rho,\mathrm{D}_yv_1}$ **at** $\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x\rho,\mathrm{D}_yv_1}=(-2+\omega)\frac{c_s^2}{2\omega}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\rho,\mathrm{D}_yv_1}=(-2+\omega_4)\frac{c_s^2}{2\omega_4}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x\rho,\mathrm{D}_yv_1}=C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\rho,\mathrm{D}_yv_1}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x\rho,\mathrm{D}_yv_1}=C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\rho,\mathrm{D}_yv_1}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x\rho,\mathrm{D}_yv_1}=C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\rho,\mathrm{D}_yv_1}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x\rho,\mathrm{D}_yv_1}=(-2+\omega_3)\frac{c_s^2}{2\omega_3}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x\rho,\mathrm{D}_yv_1}=(\omega_2+3c_s^2\omega_1-5\omega_2c_s^2+\omega_2c_s^2\omega_1+3v_1^2\omega_1-\omega_1-3\omega_2v_1^2)\frac{1}{2\omega_2\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}_xv_1,\mathrm{D}_yv_1}$ **at** $\frac{\partial v_1}{\partial x_1}\frac{\partial v_1}{\partial x_2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_xv_1,\mathrm{D}_yv_1}=0$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_xv_1,\mathrm{D}_yv_1}=0$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x v_1,\mathrm{D}_y v_1} = 0$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x v_1,\mathrm{D}_y v_1} = 0$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x v_1,\mathrm{D}_y v_1} = 0$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x v_1,\mathrm{D}_y v_1} = 0$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x v_1,\mathrm{D}_y v_1} = (-\omega_2 + \omega_1)\frac{3v_1\rho}{\omega_2\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}_y \rho,\mathrm{D}_x v_1}$ **at** $\frac{\partial \rho}{\partial x_2}\frac{\partial v_1}{\partial x_1}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_y \rho,\mathrm{D}_x v_1} = 0$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y \rho,\mathrm{D}_x v_1} = 0$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_y \rho,\mathrm{D}_x v_1} = 0$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_y \rho,\mathrm{D}_x v_1} = 0$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_y \rho,\mathrm{D}_x v_1} = 0$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_y \rho,\mathrm{D}_x v_1} = 0$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_y \rho,\mathrm{D}_x v_1} = (\omega_2 + c_s^2\omega_1 - \omega_2 c_s^2 + 3v_1^2\omega_1 - \omega_1 - 3\omega_2 v_1^2)\frac{1}{2\omega_2\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}_y \rho,\mathrm{D}_y v_2}$ **at** $\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_y \rho,\mathrm{D}_y v_2} = (-2 - 3v_2^2\omega + 4c_s^2 - 2c_s^2\omega + 6v_2^2 + \omega)\frac{1}{\omega}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y \rho,\mathrm{D}_y v_2} = (-2 - 3v_2^2\omega_6 + 4c_s^2 + \omega_6 - 2\omega_6 c_s^2 + 6v_2^2)\frac{1}{\omega_6}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_y \rho,\mathrm{D}_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y \rho,\mathrm{D}_y v_2}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_y \rho,\mathrm{D}_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y \rho,\mathrm{D}_y v_2}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_y \rho,\mathrm{D}_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y \rho,\mathrm{D}_y v_2}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_y \rho,\mathrm{D}_y v_2} = (-2 - 3\omega_2 v_2^2 + \omega_2 + 4c_s^2 - 2\omega_2 c_s^2 + 6v_2^2)\frac{1}{\omega_2}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_y \rho,\mathrm{D}_y v_2} = (3\omega_2 v_2^2 - \omega_2 + 3v_2^2\omega_1 + \omega_2\omega_1 + 2c_s^2\omega_1 + 2\omega_2 c_s^2 - 2\omega_2 c_s^2\omega_1 - 3\omega_2 v_2^2\omega_1 - \omega_1)\frac{1}{\omega_2\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}_y v_2,\mathrm{D}_y v_2}$ **at** $\left(\frac{\partial v_2}{\partial x_2}\right)^2$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_y v_2,\mathrm{D}_y v_2} = (2 - \omega)\frac{3\rho v_2}{\omega}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y v_2,\mathrm{D}_y v_2} = (2 - \omega_6)\frac{3\rho v_2}{\omega_6}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_y v_2,\mathrm{D}_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y v_2,\mathrm{D}_y v_2}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_y v_2,\mathrm{D}_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y v_2,\mathrm{D}_y v_2}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_y v_2,\mathrm{D}_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y v_2,\mathrm{D}_y v_2}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_y v_2,\mathrm{D}_y v_2} = (2 - \omega_2)\frac{3\rho v_2}{\omega_2}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_y v_2,\mathrm{D}_y v_2} = (\omega_2 - \omega_2\omega_1 + \omega_1)\frac{3\rho v_2}{\omega_2\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}_x^2 v_2}$ **at** $\frac{\partial^2 v_2}{\partial x_1^2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x^2 v_2} = (-2+\omega)\frac{\rho c_s^2}{2\omega}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^2 v_2} = (-2+\omega_4)\frac{\rho c_s^2}{2\omega_4}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x^2 v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^2 v_2}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x^2 v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^2 v_2}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x^2 v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^2 v_2}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x^2 v_2} = (-2+\omega_3)\frac{\rho c_s^2}{2\omega_3}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x^2 v_2} = (-2+\omega_1)\frac{\rho c_s^2}{2\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}_x\mathrm{D}_y \rho}$ **at** $\frac{\partial^2 \rho}{\partial x_1 \partial x_2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y \rho} = 0$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y \rho} = 0$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y \rho} = 0$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y \rho} = 0$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y \rho} = 0$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y \rho} = 0$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y \rho} = (\omega_2 + 3c_s^2\omega_1 - 3\omega_2 c_s^2 + v_1^2\omega_1 - \omega_1 - \omega_2 v_1^2)\frac{v_1}{2\omega_2\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}_x\mathrm{D}_y v_1}$ **at** $\frac{\partial^2 v_1}{\partial x_1 \partial x_2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y v_1} = (-2+\omega)\frac{\rho c_s^2}{2\omega}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y v_1} = (-2+\omega_4)\frac{\rho c_s^2}{2\omega_4}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y v_1} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y v_1}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y v_1} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y v_1}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y v_1} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y v_1}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y v_1} = (-2+\omega_3)\frac{\rho c_s^2}{2\omega_3}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y v_1} = (\omega_2 + c_s^2\omega_1 - 3\omega_2 c_s^2 + \omega_2 c_s^2\omega_1 + 3v_1^2\omega_1 - \omega_1 - 3\omega_2 v_1^2)\frac{\rho}{2\omega_2\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}_y^2 \rho}$ **at** $\frac{\partial^2 \rho}{\partial x_2^2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_y^2 \rho} = (-2 - v_2^2\omega + 6c_s^2 - 3c_s^2\omega + 2v_2^2 + \omega)\frac{v_2}{2\omega}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y^2 \rho} = (-2 - v_2^2\omega_6 + 6c_s^2 + \omega_6 - 3\omega_6 c_s^2 + 2v_2^2)\frac{v_2}{2\omega_6}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}^2_y\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^2_y\rho}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^2_y\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^2_y\rho}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^2_y\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^2_y\rho}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}^2_y\rho} = (-2-\omega_2 v_2^2+\omega_2+6c_s^2-3\omega_2 c_s^2+2v_2^2)\frac{v_2}{2\omega_2}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}^2_y\rho} = (\omega_2 v_2^2-\omega_2+v_2^2\omega_1+\omega_2\omega_1+3c_s^2\omega_1+3\omega_2 c_s^2-3\omega_2 c_s^2\omega_1-\omega_2 v_2^2\omega_1-\omega_1)\frac{v_2}{2\omega_2\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}^2_y v_2}$ **at** $\frac{\partial^2 v_2}{\partial x_2^2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}^2_y v_2} = (-2-3v_2^2\omega+2c_s^2-c_s^2\omega+6v_2^2+\omega)\frac{\rho}{2\omega}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}^2_y v_2} = (-2-3v_2^2\omega_6+2c_s^2+\omega_6-\omega_6 c_s^2+6v_2^2)\frac{\rho}{2\omega_6}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}^2_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^2_y v_2}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^2_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^2_y v_2}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^2_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^2_y v_2}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}^2_y v_2} = (-2-3\omega_2 v_2^2+\omega_2+2c_s^2-\omega_2 c_s^2+6v_2^2)\frac{\rho}{2\omega_2}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}^2_y v_2} = (3\omega_2 v_2^2-\omega_2+3v_2^2\omega_1+\omega_2\omega_1+c_s^2\omega_1+\omega_2 c_s^2-\omega_2 c_s^2\omega_1-3\omega_2 v_2^2\omega_1-\omega_1)\frac{\rho}{2\omega_2\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}^3_x\rho}$ **at** $\frac{\partial^3 \rho}{\partial x_1^3}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}^3_x\rho} = (-1+v_1^2+3c_s^2)\frac{v_1 v_2}{12}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}^3_x\rho} = (-12\omega_5 v_1^2+12\omega_5-6v_1^2\omega_7\omega_4+6\omega_7\omega_4-\omega_5\omega_7\omega_4+\omega_5 v_1^2\omega_7\omega_4+12v_1^2\omega_7+18\omega_5 c_s^2\omega_4-36\omega_5 c_s^2+36c_s^2\omega_7-12\omega_7-6\omega_5\omega_4+6\omega_5 v_1^2\omega_4-18c_s^2\omega_7\omega_4+3\omega_5 c_s^2\omega_7\omega_4)\frac{v_1 v_2}{12\omega_5\omega_7\omega_4}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}^3_x\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^3_x\rho}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^3_x\rho} = C^{(2),\mathrm{SRT}}_{\mathrm{D}^3_x\rho}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^3_x\rho} = C^{(2),\mathrm{SRT}}_{\mathrm{D}^3_x\rho}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}^3_x\rho} = C^{(2),\mathrm{SRT}}_{\mathrm{D}^3_x\rho}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}^3_x\rho} = C^{(2),\mathrm{SRT}}_{\mathrm{D}^3_x\rho}$

coefficient $C^{(2)}_{\mathrm{D}^3_x v_1}$ **at** $\frac{\partial^3 v_1}{\partial x_1^3}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}^3_x v_1} = (-1+3v_1^2+c_s^2)\frac{\rho v_2}{12}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}^3_x v_1} = (-36\omega_5 v_1^2+12\omega_5-18v_1^2\omega_7\omega_4+6\omega_7\omega_4-\omega_5\omega_7\omega_4+3\omega_5 v_1^2\omega_7\omega_4+36v_1^2\omega_7+6\omega_5 c_s^2\omega_4-12\omega_5 c_s^2+12c_s^2\omega_7-12\omega_7-6\omega_5\omega_4+18\omega_5 v_1^2\omega_4-6c_s^2\omega_7\omega_4+\omega_5 c_s^2\omega_7\omega_4)\frac{\rho v_2}{12\omega_5\omega_7\omega_4}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}^3_x v_1} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^3_x v_1}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^3_x v_1} = C^{(2),\mathrm{SRT}}_{\mathrm{D}^3_x v_1}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^3_x v_1} = C^{(2),\mathrm{SRT}}_{\mathrm{D}^3_x v_1}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}^3_x v_1} = C^{(2),\mathrm{SRT}}_{\mathrm{D}^3_x v_1}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}^3_x v_1} = C^{(2),\mathrm{SRT}}_{\mathrm{D}^3_x v_1}$

coefficient $C^{(2)}_{\mathrm{D}^3_x v_2}$ **at** $\frac{\partial^3 v_2}{\partial x_1^3}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}^3_x v_2} = (6 - 3c_s^2\omega^2 - 6v_1^2 - 18c_s^2 + 18c_s^2\omega + 6v_1^2\omega - 6\omega + \omega^2 - v_1^2\omega^2)\frac{v_1\rho}{6\omega^2}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}^3_x v_2} = (3c_s^2\omega_4^2 + 3v_1^2\omega_7\omega_4 - 3\omega_7\omega_4 + \omega_7\omega_4^2 - 6c_s^2\omega_4 - v_1^2\omega_7\omega_4^2 - 3c_s^2\omega_7\omega_4^2 - 12c_s^2\omega_7 - 6v_1^2\omega_4 + 3v_1^2\omega_4^2 + 6\omega_4 - 3\omega_4^2 + 15c_s^2\omega_7\omega_4)\frac{v_1\rho}{6\omega_7\omega_4^2}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}^3_x v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^3_x v_2}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^3_x v_2} = (6 - 6v_1^2 - v_1^2\omega_7\omega_4 + \omega_7\omega_4 + 3v_1^2\omega_7 + 9c_s^2\omega_4 - 18c_s^2 + 9c_s^2\omega_7 + 3v_1^2\omega_4 - 3\omega_7 - 3\omega_4 - 3c_s^2\omega_7\omega_4)\frac{v_1\rho}{6\omega_7\omega_4}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^3_x v_2} = C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^3_x v_2}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}^3_x v_2} = (6 + \omega_3\omega_4 - v_1^2\omega_3\omega_4 - 3\omega_3c_s^2\omega_4 - 6v_1^2 + 9c_s^2\omega_4 - 18c_s^2 - 3\omega_3 + 3v_1^2\omega_4 - 3\omega_4 + 9\omega_3c_s^2 + 3v_1^2\omega_3)\frac{v_1\rho}{6\omega_3\omega_4}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}^3_x v_2} = (6 - 3\omega_3c_s^2\omega_1 + \omega_3\omega_1 - 6v_1^2 - v_1^2\omega_3\omega_1 - 18c_s^2 + 9c_s^2\omega_1 - 3\omega_3 + 3v_1^2\omega_1 + 9\omega_3c_s^2 + 3v_1^2\omega_3 - 3\omega_1)\frac{v_1\rho}{6\omega_3\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}^2_x \mathrm{D}_y \rho}$ **at** $\frac{\partial^3 \rho}{\partial x_1^2 \partial x_2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}^2_x \mathrm{D}_y \rho} = (-12 + 12\omega - \omega^2)\frac{c_s^4}{6\omega^2}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}^2_x \mathrm{D}_y \rho} = (-12 + 12\omega_4 - \omega_4^2)\frac{c_s^4}{6\omega_4^2}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}^2_x \mathrm{D}_y \rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^2_x \mathrm{D}_y \rho}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^2_x \mathrm{D}_y \rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^2_x \mathrm{D}_y \rho}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^2_x \mathrm{D}_y \rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^2_x \mathrm{D}_y \rho}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}^2_x \mathrm{D}_y \rho} = (-12 + 12\omega_3 - \omega_3^2)\frac{c_s^4}{6\omega_3^2}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}^2_x \mathrm{D}_y \rho} = (-6c_s^2\omega_1^2 + 9\omega_2^2v_1^4\omega_1 + 45\omega_2^2v_1^2c_s^2\omega_1 + 9\omega_2v_1^2\omega_1^2 + 45v_1^2c_s^2\omega_1^2 + 9\omega_2^2v_1^2 - 6\omega_2^2c_s^2\omega_1 + 9v_1^4\omega_1^2 - 45\omega_2^2v_1^2c_s^2 - 6\omega_2c_s^4\omega_1^2 + 6\omega_2^2c_s^2 - 2\omega_2^2c_s^4\omega_1^2 - 9\omega_2^2v_1^2\omega_1 + 6c_s^4\omega_1^2 - 9\omega_2v_1^4\omega_1^2 - 30\omega_2^2c_s^4 - 9\omega_2^2v_1^4 - 45\omega_2v_1^2c_s^2\omega_1^2 - 9v_1^2\omega_1^2 + 30\omega_2^2c_s^4\omega_1 + 6\omega_2c_s^2\omega_1^2)\frac{1}{12\omega_2^2\omega_1^2}$

coefficient $C^{(2)}_{\mathrm{D}^2_x \mathrm{D}_y v_1}$ **at** $\frac{\partial^3 v_1}{\partial x_1^2 \partial x_2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}^2_x \mathrm{D}_y v_1} = 0$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}^2_x \mathrm{D}_y v_1} = (\omega_7\omega_4 - 2\omega_7 + 2\omega_4 - \omega_4^2)\frac{v_1\rho c_s^2}{\omega_7\omega_4^2}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}^2_x \mathrm{D}_y v_1} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^2_x \mathrm{D}_y v_1}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^2_x \mathrm{D}_y v_1} = 0$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^2_x \mathrm{D}_y v_1} = 0$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y v_1} = 0$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y v_1} = (9c_s^2\omega_1^2 + 5\omega_2\omega_1^2 - 11\omega_2 v_1^2\omega_1^2 - 11\omega_2^2 v_1^2 + 5\omega_2^2 + 9\omega_2^2 c_s^2\omega_1 - 9\omega_2^2 c_s^2 - 5\omega_2^2\omega_1 + 11\omega_2^2 v_1^2\omega_1 - 5\omega_1^2 + 11v_1^2\omega_1^2 - 9\omega_2 c_s^2\omega_1^2)\frac{v_1\rho}{4\omega_2^2\omega_1^2}$

coefficient $C^{(2)}_{\mathrm{D}_x^2\mathrm{D}_y v_2}$ **at** $\frac{\partial^3 v_2}{\partial x_1^2\partial x_2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y v_2} = \frac{-\rho v_2 c_s^2}{6}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y v_2} = (-12\omega_6\omega_4^2 + 12\omega_6\omega_4 - \omega_8\omega_6\omega_4^2 - 12\omega_8\omega_6 + 12\omega_8\omega_6\omega_4 + 12\omega_4^2 - 12\omega_8\omega_4)\frac{\rho v_2 c_s^2}{6\omega_8\omega_6\omega_4^2}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x^2\mathrm{D}_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y v_2}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y v_2} = C^{(2),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y v_2}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y v_2} = C^{(2),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y v_2}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y v_2} = C^{(2),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y v_2}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y v_2} = C^{(2),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y v_2}$

coefficient $C^{(2)}_{\mathrm{D}_x\mathrm{D}_y^2\rho}$ **at** $\frac{\partial^3\rho}{\partial x_1\partial x_2^2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^2\rho} = 0$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^2\rho} = (v_2^2\omega_6^2\omega_4 + 3\omega_6^2 c_s^2\omega_4 + 3\omega_8\omega_6 c_s^2 - 3\omega_6^2 c_s^2 - v_2^2\omega_6^2 + \omega_6\omega_4 - \omega_6^2\omega_4 - \omega_8\omega_6 + \omega_8 v_2^2\omega_6 + \omega_6^2 + 3\omega_8 c_s^2\omega_4 - 3\omega_6 c_s^2\omega_4 - \omega_8 v_2^2\omega_6\omega_4 + \omega_8\omega_6\omega_4 + \omega_8 v_2^2\omega_4 - v_2^2\omega_6\omega_4 - \omega_8\omega_4 - 3\omega_8\omega_6 c_s^2\omega_4)\frac{v_1 v_2}{\omega_8\omega_6^2\omega_4}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y^2\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^2\rho}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^2\rho} = 0$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^2\rho} = 0$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^2\rho} = 0$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^2\rho} =$
$(6c_s^2\omega_1^2 + \omega_2\omega_1^2 - \omega_2 v_1^2\omega_1^2 - \omega_2^2 v_1^2 + v_2^2\omega_1^2 + 3\omega_2^2 c_s^2\omega_1 + 2\omega_2\omega_1 - \omega_2^2\omega_1 - 6\omega_2 c_s^2\omega_1 - 2\omega_2 v_2^2\omega_1 + \omega_2^2 v_1^2\omega_1 - 2\omega_1^2 + v_1^2\omega_1^2 - 3\omega_2 c_s^2\omega_1^2 + \omega_2^2 v_2^2)\frac{3v_1 v_2}{4\omega_2^2\omega_1^2}$

coefficient $C^{(2)}_{\mathrm{D}_x\mathrm{D}_y^2 v_1}$ **at** $\frac{\partial^3 v_1}{\partial x_1\partial x_2^2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1} = (12 - 11c_s^2\omega^2 - 3v_2^2\omega^2 + 12v_2^2\omega - 36c_s^2 + 36c_s^2\omega - 12v_2^2 - 12\omega + 3\omega^2)\frac{\rho v_2}{12\omega^2}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1} = (-6\omega_8\omega_6^2\omega_4 + 12\omega_6\omega_4^2 - 12v_2^2\omega_6^2\omega_4 - 12\omega_6^2 c_s^2\omega_4 + 42\omega_8\omega_6^2 c_s^2\omega_4 + 6\omega_8 v_2^2\omega_6^2\omega_4 - 11\omega_8\omega_6^2 c_s^2\omega_4^2 - 3\omega_8 v_2^2\omega_6^2\omega_4^2 + 12v_2^2\omega_6^2\omega_4^2 + 12\omega_6^2 c_s^2\omega_4^2 + 3\omega_8\omega_6^2\omega_4^2 - 12\omega_8\omega_4^2 - 12v_2^2\omega_6\omega_4^2 - 18\omega_8\omega_6 c_s^2\omega_4^2 + 6\omega_8\omega_6\omega_4^2 + 12\omega_6^2\omega_4 + 12\omega_8 v_2^2\omega_4^2 - 12\omega_6 c_s^2\omega_4^2 - 6\omega_8 v_2^2\omega_6\omega_4^2 + 36\omega_8 c_s^2\omega_4^2 - 24\omega_8\omega_6^2 c_s^2 - 12\omega_6^2\omega_4^2 - 24\omega_8\omega_6 c_s^2\omega_4)\frac{\rho v_2}{12\omega_8\omega_6^2\omega_4^2}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1} = (3\omega_8\omega_6^2\omega_4 + 12v_2^2\omega_6^2\omega_4 + 36\omega_6^2 c_s^2\omega_4 - 11\omega_8\omega_6^2 c_s^2\omega_4 - 3\omega_8 v_2^2\omega_6^2\omega_4 - 36\omega_6^2 c_s^2 - 12v_2^2\omega_6^2 + 12\omega_6\omega_4 - 12\omega_6^2\omega_4 + 12\omega_6^2 + 6\omega_8 v_2^2\omega_6^2 + 18\omega_8\omega_6^2 c_s^2 + 36\omega_8 c_s^2\omega_4 - 36\omega_6 c_s^2\omega_4 - 6\omega_8\omega_6^2 - 6\omega_8 v_2^2\omega_6\omega_4 + 6\omega_8\omega_6\omega_4 + 12\omega_8 v_2^2\omega_4 - 12v_2^2\omega_6\omega_4 - 12\omega_8\omega_4 - 18\omega_8\omega_6 c_s^2\omega_4)\frac{\rho v_2}{12\omega_8\omega_6^2\omega_4}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1} = C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1} = (6\omega_2^2 v_2^2\omega_6 - 12\omega_6\omega_3 + 12\omega_2\omega_3 - 11\omega_2^2\omega_6\omega_3 c_s^2 + 12\omega_2^2 v_2^2\omega_3 + 12\omega_2^2 + 3\omega_2^2\omega_6\omega_3 - 36\omega_2\omega_3 c_s^2 + 36\omega_6\omega_3 c_s^2 - 6\omega_2 v_2^2\omega_6\omega_3 - 36\omega_2^2 c_s^2 + 18\omega_2^2\omega_6 c_s^2 + 12v_2^2\omega_6\omega_3 - 18\omega_2\omega_6\omega_3 c_s^2 - 12\omega_2^2\omega_3 + 6\omega_2\omega_6\omega_3 - 12\omega_2 v_2^2\omega_3 - 3\omega_2^2 v_2^2\omega_6\omega_3 - 6\omega_2^2\omega_6 - 12\omega_2^2 v_2^2 + 36\omega_2^2\omega_3 c_s^2)\frac{\rho v_2}{12\omega_2^2\omega_6\omega_3}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^2 v_1} = (-12\omega_2^2\omega_3\omega_1 - 11\omega_2^2\omega_3 c_s^2\omega_1^2 + 6\omega_2\omega_1^2 + 12\omega_2^2 v_2^2\omega_1^2 - 3\omega_2 v_2^2\omega_3\omega_1^2 + 6\omega_2^2 v_2^2\omega_3 + 36\omega_2^2 c_s^2\omega_1^2 - 54\omega_2^2 c_s^2\omega_1 + 27v_1^2\omega_3\omega_1^2 - 15\omega_3\omega_1^2 + 27\omega_2^2 v_1^2\omega_3\omega_1 + 3\omega_2^2\omega_3\omega_1^2 + 18\omega_2^2\omega_3 c_s^2\omega_1 - 18\omega_2^2 v_2^2\omega_1 + 27\omega_3 c_s^2\omega_1^2 + 18\omega_2^2\omega_1 - 18\omega_2\omega_3 c_s^2\omega_1^2 + 12\omega_2\omega_3\omega_1^2 - 27\omega_2 v_1^2\omega_3\omega_1^2 - 3\omega_2^2 v_2^2\omega_3\omega_1^2 + 3\omega_2^2\omega_3 + 3\omega_2^2 v_2^2\omega_3\omega_1 - 6\omega_2 v_2^2\omega_1^2 + 6v_2^2\omega_3\omega_1^2 - 27\omega_2^2 v_1^2\omega_3 - 12\omega_2^2\omega_1^2 - 18\omega_2 c_s^2\omega_1^2 + 9\omega_2^2\omega_3 c_s^2)\frac{\rho v_2}{12\omega_2^2\omega_3\omega_1^2}$

coefficient $C^{(2)}_{\mathrm{D}_x\mathrm{D}_y^2 v_2}$ **at** $\frac{\partial^3 v_2}{\partial x_1\partial x_2^2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = 0$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = (3v_2^2\omega_6^2\omega_4 + \omega_6^2 c_s^2\omega_4 + \omega_8\omega_6 c_s^2 - \omega_6^2 c_s^2 - 3v_2^2\omega_6^2 + \omega_6\omega_4 - \omega_6^2\omega_4 - \omega_8\omega_6 + 3\omega_8 v_2^2\omega_6 + \omega_6^2 + \omega_8 c_s^2\omega_4 - \omega_6 c_s^2\omega_4 - 3\omega_8 v_2^2\omega_6\omega_4 + \omega_8\omega_6\omega_4 + 3\omega_8 v_2^2\omega_4 - 3v_2^2\omega_6\omega_4 - \omega_8\omega_4 - \omega_8\omega_6 c_s^2\omega_4)\frac{v_1\rho}{\omega_8\omega_6^2\omega_4}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = 0$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = 0$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = 0$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^2 v_2} = (-\omega_2^2\omega_3\omega_1 + 2\omega_2\omega_1^2 - 2\omega_2 v_1^2\omega_1^2 + 9\omega_2^2 v_2^2\omega_3 + 6\omega_2^2 c_s^2\omega_1 + 2v_1^2\omega_3\omega_1^2 - 5\omega_3\omega_1^2 - 18\omega_2 v_2^2\omega_3\omega_1 + \omega_2^2 v_1^2\omega_3\omega_1 + 3\omega_2^2\omega_3 c_s^2\omega_1 + 9\omega_3 c_s^2\omega_1^2 - 2\omega_2^2\omega_1 - 3\omega_2\omega_3 c_s^2\omega_1^2 + 2\omega_2^2 v_1^2\omega_1 + \omega_2\omega_3\omega_1^2 - \omega_2 v_1^2\omega_3\omega_1^2 - \omega_2^2\omega_3 + 9v_2^2\omega_3\omega_1^2 + 6\omega_2\omega_3\omega_1 - 2\omega_2^2 v_1^2\omega_3 - 6\omega_2 c_s^2\omega_1^2 - 6\omega_2\omega_3 c_s^2\omega_1 - 3\omega_2^2\omega_3 c_s^2)\frac{v_1\rho}{4\omega_2^2\omega_3\omega_1^2}$

coefficient $C^{(2)}_{\mathrm{D}_y^3\rho}$ **at** $\frac{\partial^3\rho}{\partial x_2^3}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_y^3\rho} = (-c_s^2\omega^2 + 36v_2^4 - 7v_2^2\omega^2 + 36v_2^2\omega - 12c_s^2 + 12c_s^2\omega + 12c_s^4 + 24v_2^2 c_s^2\omega^2 + 7v_2^4\omega^2 + c_s^4\omega^2 + 144v_2^2 c_s^2 - 12c_s^4\omega - 36v_2^2 - 144v_2^2 c_s^2\omega - 36v_2^4\omega)\frac{1}{12\omega^2}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y^3\rho} =$
$(36v_2^4 + 36v_2^2\omega_6 - 144v_2^2\omega_6 c_s^2 - \omega_6^2 c_s^2 - 12c_s^2 - 7v_2^2\omega_6^2 - 12\omega_6 c_s^4 + \omega_6^2 c_s^4 - 36v_2^4\omega_6 + 12c_s^4 + 144v_2^2 c_s^2 + 12\omega_6 c_s^2 - 36v_2^2 + 24v_2^2\omega_6^2 c_s^2 + 7v_2^4\omega_6^2)\frac{1}{12\omega_6^2}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_y^3\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y^3\rho}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_y^3\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y^3\rho}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_y^3\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y^3\rho}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_y^3\rho} =$
$(36v_2^4 + 36\omega_2 v_2^2 + 7\omega_2^2 v_2^4 - 144\omega_2 v_2^2 c_s^2 - 12c_s^2 - 12\omega_2 c_s^4 - \omega_2^2 c_s^2 + 24\omega_2^2 v_2^2 c_s^2 + 12c_s^4 + 12\omega_2 c_s^2 + 144v_2^2 c_s^2 + \omega_2^2 c_s^4 - 36v_2^2 - 36\omega_2 v_2^4 - 7\omega_2^2 v_2^2)\frac{1}{12\omega_2^2}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_y^3\rho} = (18\omega_2 v_2^4\omega_1 + 54\omega_2 v_2^2 c_s^2\omega_1 - 6c_s^2\omega_1^2 - 7\omega_2^2 v_2^2\omega_1^2 + 9\omega_2^2 v_2^4 - 9v_2^2\omega_1^2 - \omega_2^2 c_s^2\omega_1^2 + 6\omega_2^2 c_s^2\omega_1 - 6\omega_2 c_s^4\omega_1^2 - 6\omega_2^2 c_s^2 + 18\omega_2^2 v_2^2\omega_1 - 72\omega_2 v_2^2 c_s^2\omega_1^2 - 18\omega_2 v_2^4\omega_1^2 + 45\omega_2^2 v_2^2 c_s^2 + 45v_2^2 c_s^2\omega_1^2 + 9v_2^4\omega_1^2 + \omega_2^2 c_s^4\omega_1^2 - 72\omega_2^2 v_2^2 c_s^2\omega_1 - 18\omega_2 v_2^2\omega_1 + 6c_s^4\omega_1^2 + 6\omega_2^2 c_s^4 + 7\omega_2^2 v_2^4\omega_1^2 - 18\omega_2^2 v_2^4\omega_1 + 18\omega_2 v_2^2\omega_1^2 - 6\omega_2^2 c_s^4\omega_1 + 24\omega_2^2 v_2^2 c_s^2\omega_1^2 + 6\omega_2 c_s^2\omega_1^2 - 9\omega_2^2 v_2^2)\frac{1}{12\omega_2^2\omega_1^2}$

coefficient $C^{(2)}_{\mathrm{D}_y^3 v_2}$ **at** $\frac{\partial^3 v_2}{\partial x_2^3}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_y^3 v_2} = (-24 + 5c_s^2\omega^2 + 11v_2^2\omega^2 - 60v_2^2\omega + 36c_s^2 - 36c_s^2\omega + 60v_2^2 + 24\omega - 4\omega^2)\frac{\rho v_2}{6\omega^2}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}^3_y v_2} = (-24 - 60v_2^2\omega_6 + 5\omega_6^2 c_s^2 + 36c_s^2 + 11v_2^2\omega_6^2 + 24\omega_6 - 4\omega_6^2 - 36\omega_6 c_s^2 + 60v_2^2)\frac{\rho v_2}{6\omega_6^2}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}^3_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^3_y v_2}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^3_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^3_y v_2}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^3_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^3_y v_2}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}^3_y v_2} = (-24 - 60\omega_2 v_2^2 + 24\omega_2 - 4\omega_2^2 + 36c_s^2 + 5\omega_2^2 c_s^2 - 36\omega_2 c_s^2 + 60v_2^2 + 11\omega_2^2 v_2^2)\frac{\rho v_2}{6\omega_2^2}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}^3_y v_2} = (27c_s^2\omega_1^2 + 24\omega_2\omega_1^2 + 22\omega_2^2 v_2^2\omega_1^2 - 15\omega_2^2 + 33v_2^2\omega_1^2 + 10\omega_2^2 c_s^2\omega_1^2 - 36\omega_2^2 c_s^2\omega_1 - 18\omega_2\omega_1 + 27\omega_2^2 c_s^2 - 60\omega_2^2 v_2^2\omega_1 + 24\omega_2^2\omega_1 + 18\omega_2 c_s^2\omega_1 + 54\omega_2 v_2^2\omega_1 - 15\omega_1^2 - 60\omega_2 v_2^2\omega_1^2 - 8\omega_2^2\omega_1^2 - 36\omega_2 c_s^2\omega_1^2 + 33\omega_2^2 v_2^2)\frac{\rho v_2}{12\omega_2^2\omega_1^2}$

coefficient $C^{(2)}_{\mathrm{D}^4_x \rho}$ at $\frac{\partial^4 \rho}{\partial x_1^4}$:

$C^{(2),\mathrm{SRT}}_{\mathrm{D}^4_x \rho} = (-3v_1^4\omega - 6v_1^2 - 2c_s^2 + c_s^2\omega + 24v_1^2 c_s^2 - 12v_1^2 c_s^2\omega + 3v_1^2\omega + 2c_s^4 - c_s^4\omega + 6v_1^4)\frac{v_2}{24\omega}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}^4_x \rho} = (-12\omega_5^2 v_1^2\omega_4^2 + 24\omega_5 v_1^4\omega_7\omega_4^2 - 24c_s^2\omega_7^2\omega_4 + 12\omega_5^2 c_s^2\omega_7\omega_4^2 - 432\omega_5 v_1^2 c_s^2\omega_7^2\omega_4 + 48\omega_5 c_s^2\omega_7^2\omega_4 + 48\omega_5^2 c_s^4\omega_7\omega_4 - 48\omega_5^2 v_1^4\omega_7 + 14\omega_5 c_s^4\omega_7^2\omega_4^2 - 48\omega_5 v_1^2\omega_7^2 + 3\omega_5^2 v_1^2\omega_7^2\omega_4^2 - 24\omega_5^2 c_s^4\omega_4 + 288v_1^2 c_s^2\omega_7^2\omega_4 + 48\omega_5 v_1^2\omega_7\omega_4 - 12c_s^4\omega_7^2\omega_4^2 - 216\omega_5^2 v_1^2 c_s^2\omega_7 - 144v_1^2 c_s^2\omega_7^2\omega_4^2 + 12\omega_5^2 c_s^4\omega_4^2 + 24c_s^4\omega_7^2\omega_4 - 24\omega_5 v_1^2\omega_7\omega_4^2 - 12\omega_5^2 c_s^4\omega_7\omega_4^2 - 12\omega_5^2 v_1^2 c_s^2\omega_7^2\omega_4^2 - 48\omega_5 c_s^4\omega_7^2\omega_4 + 150\omega_5 v_1^2 c_s^2\omega_7^2\omega_4^2 - 48\omega_5^2 c_s^2\omega_7\omega_4 - 14\omega_5 c_s^2\omega_7^2\omega_4^2 + 24\omega_5^2 c_s^2\omega_7 + 24\omega_5 c_s^4\omega_7^2 + 24\omega_5^2 v_1^2\omega_4 - 3\omega_5^2 v_1^4\omega_7^2\omega_4^2 + 12c_s^2\omega_7^2\omega_4^2 - 48\omega_5 v_1^4\omega_7\omega_4 + 72\omega_5 v_1^2 c_s^2\omega_7\omega_4^2 + 48\omega_5^2 v_1^2\omega_7 + 72v_1^4\omega_7^2\omega_4 + 48\omega_5 v_1^4\omega_7^2 - 30\omega_5^2 v_1^4\omega_7\omega_4^2 + 24\omega_5^2 c_s^2\omega_4 - 96\omega_5 v_1^4\omega_7^2\omega_4 + 12\omega_5^2 v_1^4\omega_4^2 - 96\omega_5^2 v_1^2\omega_7\omega_4 - 36\omega_5 v_1^2\omega_7^2\omega_4^2 - 126\omega_5^2 v_1^2 c_s^2\omega_7\omega_4^2 + 72\omega_5^2 v_1^2 c_s^2\omega_4^2 - \omega_5^2 c_s^4\omega_7^2\omega_4^2 + 36v_1^2\omega_7^2\omega_4^2 + 432\omega_5^2 v_1^2 c_s^2\omega_7\omega_4 - 144\omega_5^2 v_1^2 c_s^2\omega_4 - 72v_1^2\omega_7^2\omega_4 - 24\omega_5^2 c_s^4\omega_7 - 24\omega_5 c_s^2\omega_7^2 + 30\omega_5^2 v_1^2\omega_7\omega_4^2 + 216\omega_5 v_1^2 c_s^2\omega_7^2 - 24\omega_5^2 v_1^4\omega_4 + 96\omega_5 v_1^2\omega_7^2\omega_4 + 96\omega_5^2 v_1^4\omega_7\omega_4 - 12\omega_5^2 c_s^2\omega_4^2 + 36\omega_5 v_1^4\omega_7^2\omega_4^2 - 144\omega_5 v_1^2 c_s^2\omega_7\omega_4 + \omega_5^2 c_s^2\omega_7^2\omega_4^2 - 36v_1^4\omega_7^2\omega_4^2)\frac{v_2}{24\omega_5^2\omega_7^2\omega_4^2}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}^4_x \rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^4_x \rho}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^4_x \rho} = (3\omega_5 v_1^2 - 6v_1^2 - 2c_s^2 - 12\omega_5 v_1^2 c_s^2 + \omega_5 c_s^2 + 24v_1^2 c_s^2 + 2c_s^4 - \omega_5 c_s^4 - 3\omega_5 v_1^4 + 6v_1^4)\frac{v_2}{24\omega_5}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^4_x \rho} = C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^4_x \rho}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}^4_x \rho} = (-6v_1^2 - 3v_1^4\omega_1 - 2c_s^2 - 12v_1^2 c_s^2\omega_1 + c_s^2\omega_1 + 24v_1^2 c_s^2 + 2c_s^4 + 3v_1^2\omega_1 - c_s^4\omega_1 + 6v_1^4)\frac{v_2}{24\omega_1}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}^4_x \rho} = (3\omega_2 v_1^4 - \omega_2 c_s^4\omega_1 + 3v_1^4\omega_1 + \omega_2 c_s^4 + 3\omega_2 v_1^2\omega_1 + 12v_1^2 c_s^2\omega_1 - c_s^2\omega_1 + 12\omega_2 v_1^2 c_s^2 - \omega_2 c_s^2 + \omega_2 c_s^2\omega_1 - 3v_1^2\omega_1 - 12\omega_2 v_1^2 c_s^2\omega_1 - 3\omega_2 v_1^4\omega_1 + c_s^4\omega_1 - 3\omega_2 v_1^2)\frac{v_2}{24\omega_2\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}^4_x v_1}$ at $\frac{\partial^4 v_1}{\partial x_1^4}$:

$C^{(2),\mathrm{SRT}}_{\mathrm{D}^4_x v_1} = (-4 + 10v_1^2 + 6c_s^2 - 3c_s^2\omega - 5v_1^2\omega + 2\omega)\frac{v_1\rho v_2}{12\omega}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}^4_x v_1} = (24\omega_5^2 v_1^2\omega_4^2 + 72c_s^2\omega_7^2\omega_4 - 33\omega_5^2 c_s^2\omega_7\omega_4^2 - 120\omega_5 c_s^2\omega_7^2\omega_4 - 12\omega_5^2\omega_4^2 - 36\omega_5\omega_7^2 + 84\omega_5 v_1^2\omega_7^2 - 5\omega_5^2 v_1^2\omega_7^2\omega_4^2 + 24\omega_5\omega_7\omega_4 - 72\omega_5 v_1^2\omega_7\omega_4 - 12\omega_5\omega_7\omega_4^2 + 36\omega_5 v_1^2\omega_7\omega_4^2 + 24\omega_5^2\omega_4 + 2\omega_5^2\omega_7^2\omega_4^2 + 120\omega_5^2 c_s^2\omega_7\omega_4 + 39\omega_5 c_s^2\omega_7^2\omega_4^2 - 60\omega_5^2 c_s^2\omega_7 - 48\omega_5^2 v_1^2\omega_4 - 36c_s^2\omega_7^2\omega_4^2 + 21\omega_5^2\omega_7\omega_4^2 + 12\omega_5 c_s^2\omega_7\omega_4^2 - 84\omega_5^2 v_1^2\omega_7 - 48\omega_5^2 c_s^2\omega_4 + 24\omega_7^2\omega_4^2 + 36\omega_5^2\omega_7 + 168\omega_5^2 v_1^2\omega_7\omega_4 + 61\omega_5 v_1^2\omega_7^2\omega_4^2 - 25\omega_5\omega_7^2\omega_4^2 - 60v_1^2\omega_7^2\omega_4^2 + 120v_1^2\omega_7^2\omega_4 + 60\omega_5 c_s^2\omega_7^2 - 51\omega_5^2 v_1^2\omega_7\omega_4^2 - 48\omega_7^2\omega_4 - 168\omega_5 v_1^2\omega_7^2\omega_4 + 72\omega_5\omega_7^2\omega_4 + 24\omega_5^2 c_s^2\omega_4^2 - 3\omega_5^2 c_s^2\omega_7^2\omega_4^2 - 72\omega_5^2\omega_7\omega_4 - 24\omega_5 c_s^2\omega_7\omega_4)\frac{v_1\rho v_2}{12\omega_5^2\omega_7^2\omega_4^2}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}^4_x v_1} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^4_x v_1}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^4_x v_1} = (-4 - 5\omega_5 v_1^2 + 2\omega_5 + 10v_1^2 + 6c_s^2 - 3\omega_5 c_s^2)\frac{v_1\rho v_2}{12\omega_5}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^4_x v_1} = C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^4_x v_1}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}^4_x v_1} = (-4 + 10v_1^2 + 6c_s^2 - 3c_s^2\omega_1 - 5v_1^2\omega_1 + 2\omega_1)\frac{v_1\rho v_2}{12\omega_1}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}^4_x v_1} = (-2\omega_2 + 2\omega_2\omega_1 - 5\omega_2 v_1^2\omega_1 + 3c_s^2\omega_1 + 3\omega_2 c_s^2 - 3\omega_2 c_s^2\omega_1 + 5v_1^2\omega_1 - 2\omega_1 + 5\omega_2 v_1^2)\frac{v_1\rho v_2}{12\omega_2\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}^4_x v_2}$ **at** $\frac{\partial^4 v_2}{\partial x_1^4}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}^4_x v_2} = (-84v_1^2c_s^2\omega^2 - 14c_s^2\omega^2 + 108v_1^4\omega + 6v_1^2c_s^2\omega^3 + 72v_1^2 + c_s^2\omega^3 - 42v_1^4\omega^2 - 24c_s^2 + 36c_s^2\omega - 144v_1^2c_s^2 + 216v_1^2c_s^2\omega + 3v_1^4\omega^3 - 108v_1^2\omega + 48c_s^4 - 3c_s^4\omega^3 + 30c_s^4\omega^2 - 72c_s^4\omega - 3v_1^2\omega^3 + 42v_1^2\omega^2 - 72v_1^4)\frac{\rho}{24\omega^3}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}^4_x v_2} = (12c_s^2\omega_7^2\omega_4 - 3c_s^4\omega_7^2\omega_4^3 + 12v_1^2c_s^2\omega_4^3 + 72v_1^4\omega_7\omega_4^2 + 48v_1^2\omega_7\omega_4 - 18v_1^4\omega_7\omega_4^3 + 156v_1^2c_s^2\omega_7^2\omega_4 - 24v_1^2c_s^2\omega_4^2 + 24c_s^4\omega_7^2\omega_4^2 - 72v_1^2c_s^2\omega_7^2\omega_4^2 - 48c_s^4\omega_7^2\omega_4 + 12v_1^4\omega_4^3 + c_s^2\omega_7^2\omega_4^3 - 72v_1^2\omega_7\omega_4^2 - 24v_1^4\omega_4^2 + 6v_1^2c_s^2\omega_7^2\omega_4^3 - 48v_1^4\omega_7\omega_4 + 18v_1^2\omega_7\omega_4^3 + 24c_s^4\omega_7^2 - 8c_s^2\omega_7^2\omega_4^2 + 24v_1^4\omega_7^2\omega_4 - 12v_1^2c_s^2\omega_7\omega_4^3 - 3v_1^2\omega_7^2\omega_4^3 + 24c_s^2\omega_7\omega_4^2 + 48v_1^2c_s^2\omega_7\omega_4^2 + 24c_s^4\omega_7\omega_4 - 6c_s^2\omega_7\omega_4^3 + 24v_1^2\omega_7^2\omega_4^2 + 24v_1^2\omega_4^2 - 96v_1^2c_s^2\omega_7^2 - 24v_1^2\omega_7^2\omega_4 - 24v_1^2c_s^2\omega_7\omega_4 + 3v_1^4\omega_7^2\omega_4^3 - 24c_s^4\omega_7\omega_4^2 - 12v_1^2\omega_4^3 - 24c_s^2\omega_7\omega_4 + 6c_s^4\omega_7\omega_4^3 - 24v_1^4\omega_7^2\omega_4^2)\frac{\rho}{24\omega_7^2\omega_4^3}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}^4_x v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^4_x v_2}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^4_x v_2} = (12c_s^2\omega_7^2\omega_4 - 3c_s^4\omega_7^2\omega_4^3 + 108v_1^2c_s^2\omega_4^3 + 72v_1^4\omega_7\omega_4^2 - 30v_1^4\omega_7\omega_4^3 - 36v_1^2c_s^2\omega_7^2\omega_4 - 216v_1^2c_s^2\omega_4^2 + 24c_s^4\omega_7^2\omega_4^2 - 12v_1^2c_s^2\omega_7^2\omega_4^2 - 48c_s^4\omega_7^2\omega_4 + 36v_1^4\omega_4^3 + c_s^2\omega_7^2\omega_4^3 - 72v_1^2\omega_7\omega_4^2 - 72v_1^4\omega_4^2 + 6v_1^2c_s^2\omega_7^2\omega_4^3 + 30v_1^2\omega_7\omega_4^3 + 24c_s^4\omega_7^2 - 8c_s^2\omega_7^2\omega_4^2 - 72v_1^2c_s^2\omega_7\omega_4^3 - 3v_1^2\omega_7^2\omega_4^3 + 24c_s^2\omega_7\omega_4^2 + 144v_1^2c_s^2\omega_7\omega_4^2 + 24c_s^4\omega_7\omega_4 - 6c_s^2\omega_7\omega_4^3 + 12v_1^2\omega_7^2\omega_4^2 + 72v_1^2\omega_4^2 + 72v_1^2c_s^2\omega_7\omega_4 + 3v_1^4\omega_7^2\omega_4^3 - 24c_s^4\omega_7\omega_4^2 - 36v_1^2\omega_4^3 - 24c_s^2\omega_7\omega_4 + 6c_s^4\omega_7\omega_4^3 - 12v_1^4\omega_7^2\omega_4^2)\frac{\rho}{24\omega_7^2\omega_4^3}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^4_x v_2} = C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^4_x v_2}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}^4_x v_2} = (-72v_1^4\omega_3^2 + 6v_1^2\omega_3^2c_s^2\omega_4^2 + 72v_1^2\omega_3c_s^2\omega_4 - 24\omega_3c_s^2\omega_4 + \omega_3^2c_s^2\omega_4^2 + 36v_1^4\omega_3^2 - 216v_1^2\omega_3^2c_s^2 + 24\omega_3^2c_s^4\omega_4^2 - 24\omega_3^2c_s^4\omega_4 + 12\omega_3c_s^2\omega_4^2 - 6\omega_3^2c_s^2\omega_4 - 72v_1^2\omega_3^2c_s^2\omega_4 - 36v_1^2\omega_3c_s^2\omega_4^2 + 108v_1^2\omega_3^2c_s^2 + 24c_s^4\omega_4^2 + 24\omega_3c_s^4\omega_4 - 36v_1^2\omega_3^2 + 12v_1^2\omega_3^2\omega_4^2 - 3\omega_3^2c_s^4\omega_4^2 + 3v_1^4\omega_3^2\omega_4^2 - 8\omega_3^2c_s^2\omega_4^2 + 72v_1^2\omega_3^2 - 12v_1^2\omega_3^2c_s^2\omega_4^2 + 30v_1^2\omega_3^2\omega_4 + 72v_1^4\omega_3^2\omega_4 - 12v_1^4\omega_3^2\omega_4^2 - 3v_1^2\omega_3^2\omega_4^2 + 144v_1^2\omega_3^2c_s^2\omega_4 - 30v_1^4\omega_3^2\omega_4 + 24\omega_3^2c_s^2\omega_4 - 48\omega_3c_s^4\omega_4^2 + 6\omega_3^2c_s^4\omega_4 - 72v_1^2\omega_3^2\omega_4)\frac{\rho}{24\omega_3^3\omega_4^2}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}^4_x v_2} = (-24\omega_3c_s^2\omega_1 + 72v_1^4\omega_3\omega_1^2 - 216v_1^2c_s^2\omega_1^2 + 24\omega_3^2c_s^4\omega_1^2 - 30v_1^4\omega_3\omega_1^3 - 3\omega_3^2c_s^4\omega_1^3 + 108v_1^2c_s^2\omega_1^3 + 72v_1^2\omega_3c_s^2\omega_1 - 72v_1^4\omega_1^2 + 144v_1^2\omega_3c_s^2\omega_1^2 - 72v_1^2\omega_3\omega_1^2 - 6\omega_3c_s^2\omega_1^3 - 72v_1^2\omega_3c_s^2\omega_1^3 + 30v_1^2\omega_3\omega_1^3 + 36v_1^4\omega_1^3 - 48\omega_3^2c_s^4\omega_1 + 24\omega_3c_s^2\omega_1^2 - 12v_1^2\omega_3^2c_s^2\omega_1^2 - 3v_1^2\omega_3^2\omega_1^3 + \omega_3^2c_s^2\omega_1^3 + 24\omega_3c_s^4\omega_1 + 12v_1^2\omega_3^2\omega_1^2 + 6v_1^2\omega_3^2c_s^2\omega_1^3 - 8\omega_3^2c_s^2\omega_1^2 + 3v_1^4\omega_3^2\omega_1^3 - 36v_1^2\omega_1^3 + 12\omega_3^2c_s^2\omega_1 - 24\omega_3c_s^4\omega_1^2 + 72v_1^2\omega_1^2 - 12v_1^4\omega_3^2\omega_1^2 - 36v_1^2\omega_3^2c_s^2\omega_1 + 24\omega_3^2c_s^4 + 6\omega_3c_s^4\omega_1^3)\frac{\rho}{24\omega_3^2\omega_1^3}$

coefficient $C^{(2)}_{\mathrm{D}^3_x \mathrm{D}_y \rho}$ **at** $\frac{\partial^4 \rho}{\partial x_1^3 \partial x_2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}^3_x \mathrm{D}_y \rho} = (24 - 42c_s^2\omega^2 - 24v_1^2 + 3c_s^2\omega^3 - 72c_s^2 + 108c_s^2\omega + 36v_1^2\omega - 36\omega + v_1^2\omega^3 + 14\omega^2 - 14v_1^2\omega^2 - \omega^3)\frac{v_1c_s^2}{12\omega^3}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}^3_x \mathrm{D}_y \rho} = (-12\omega_8\omega_5^2\omega_9v_2^2\omega_7\omega_4^3 + 18\omega_8\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 - 3\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4^3 - 36\omega_5^2\omega_6c_s^4\omega_7^2\omega_4^3 + 6\omega_8\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 - 12\omega_5^2v_1^2\omega_6c_s^2\omega_7^2\omega_4^3 + 6\omega_8\omega_5^2\omega_6c_s^2\omega_7\omega_4^3 - 6\omega_8v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 + 18\omega_8\omega_5^2v_2^2\omega_6c_s^2\omega_7^2\omega_4^3 + 12\omega_5^2v_2^2\omega_6\omega_7^2\omega_4^3 - 108\omega_8\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^2 - 45\omega_8\omega_5^2\omega_9v_2^2\omega_6c_s^2\omega_7\omega_4^3 - 42\omega_8\omega_5^2\omega_9\omega_6c_s^4\omega_7\omega_4^2 + 24\omega_8\omega_5v_1^2\omega_9v_2^2\omega_7^2\omega_4^2 - 24\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4 + 6\omega_8\omega_5^2v_1^2v_2^2\omega_6\omega_7^2\omega_4^3 - 48\omega_8\omega_5^2\omega_9v_2^2\omega_6\omega_7\omega_4^2 - 96\omega_8\omega_5^2\omega_9\omega_6c_s^4\omega_7^2 + 144\omega_8\omega_5^2\omega_9v_2^2\omega_6c_s^2\omega_7\omega_4^2 + 27\omega_8\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2\omega_6c_s^2\omega_7\omega_4^2 + 12\omega_5^2v_1^2\omega_6c_s^2\omega_7^2\omega_4^2 - 12\omega_5^2v_2^2\omega_6\omega_7^2\omega_4^2 + 12\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7\omega_4 - 36\omega_8\omega_5^2v_2^2\omega_6c_s^2\omega_7^2\omega_4^2 + 12\omega_8v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 + 18\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4^2 - 5\omega_8\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3 + 36\omega_5^2\omega_6c_s^4\omega_7^2\omega_4^2 - 12\omega_8\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 + 12\omega_5^2v_1^2v_2^2\omega_7^2\omega_4^3 + 24\omega_8\omega_5^2\omega_9v_2^2\omega_7\omega_4^2 + 12\omega_5\omega_9c_s^2\omega_7^2\omega_4^3 + 15\omega_8\omega_5^2\omega_9v_2^2\omega_6\omega_7\omega_4^3 - 12\omega_5v_1^2\omega_9c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2v_1^2v_2^2\omega_6\omega_7^2\omega_4^2 - 6\omega_8\omega_5v_1^2\omega_9v_2^2\omega_7^2\omega_4^3 + 15\omega_8\omega_5^2\omega_9\omega_6c_s^4\omega_7\omega_4^3 + 24\omega_8\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4 - 12\omega_5^2v_1^2v_2^2\omega_6\omega_7^2\omega_4^3 - 72\omega_8\omega_5^2\omega_9v_2^2c_s^2\omega_7\omega_4^2 + 6\omega_8\omega_5^2v_2^2\omega_6\omega_7\omega_4^3 + 12\omega_5^2\omega_6c_s^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_4^2 - 18\omega_8\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^3 - 36\omega_8\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 - 18\omega_8\omega_5^2\omega_6c_s^4\omega_7\omega_4^3 - 6\omega_8\omega_5^2\omega_9v_2^2\omega_6\omega_4^3 - 15\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^3 + 6\omega_8\omega_5^2v_1^2\omega_6c_s^2\omega_7^2\omega_4^3 - 72\omega_8\omega_5^2\omega_9v_2^2\omega_6c_s^2\omega_7\omega_4^2 - 36\omega_5^2v_2^2\omega_6c_s^2\omega_7^2\omega_4^3 + 18\omega_8\omega_5^2\omega_9v_2^2\omega_6c_s^2\omega_4^3 - 6\omega_8\omega_5\omega_9v_2^2\omega_6\omega_7\omega_4^3 - 18\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7\omega_4^2 + 36\omega_5^2v_2^2c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4 + 48\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^2 + 12\omega_8\omega_5^2\omega_9v_2^2\omega_6\omega_4^2 + 36\omega_8\omega_5^2\omega_6c_s^4\omega_7\omega_4^2 + 9\omega_8\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 + 12\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7\omega_4 - 12\omega_5v_1^2\omega_9v_2^2\omega_7^2\omega_4^3 + 36\omega_8\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^2 - 6\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_4^3 - 36\omega_5\omega_9c_s^4\omega_7^2\omega_4^3 + 6\omega_8\omega_5v_1^2\omega_9c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2v_2^2\omega_6\omega_7\omega_4^2 + 36\omega_8\omega_5^2\omega_9v_2^2c_s^2\omega_7\omega_4^3 + 12\omega_5^2v_1^2v_2^2\omega_6\omega_7^2\omega_4^2 - 12\omega_5^2\omega_6c_s^2\omega_7^2\omega_4^2 + 24\omega_8\omega_5^2\omega_9v_2^2\omega_6\omega_7\omega_4 - 12\omega_8\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4 + 3\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7\omega_4^3 + 12\omega_5\omega_9v_2^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5v_2^2\omega_6\omega_7^2\omega_4^2 + 12\omega_5v_1^2c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2v_1^2\omega_6c_s^2\omega_7^2\omega_4^2 - 36\omega_8\omega_5^2\omega_9v_2^2\omega_6c_s^2\omega_4^2 - 6\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 + 72\omega_8\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^2 + 36\omega_5^2v_2^2\omega_6c_s^2\omega_7^2\omega_4^2 - 6\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 + 6\omega_8\omega_5^2c_s^2\omega_7^2\omega_4^3 - 12\omega_5^2v_2^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5^2v_2^2\omega_6\omega_7^2\omega_4^2 + 12\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 + 36\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^3 - 24\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_7\omega_4^2 + 54\omega_8\omega_5\omega_9\omega_6c_s^4\omega_7^2\omega_4^2 + 12\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5^2v_1^2\omega_6c_s^2\omega_7\omega_4^2 + 36\omega_5^2c_s^4\omega_7^2\omega_4^3 - \omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3 + 36\omega_8\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 - 12\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4^2 - 6\omega_8\omega_5^2v_2^2\omega_6\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^2 + 18\omega_8\omega_5^2\omega_6c_s^4\omega_7^2\omega_4^2 - 9\omega_8\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 + 12\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 - 12\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 - 6\omega_8\omega_5^2v_1^2\omega_6c_s^2\omega_7\omega_4^3 - 36\omega_5\omega_9v_2^2c_s^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4 - 36\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^2 - 15\omega_8\omega_5\omega_9\omega_6c_s^4\omega_7^2\omega_4^3 + 12\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_7\omega_4^3 - 12\omega_5^2c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2v_2^2\omega_6\omega_7^2\omega_4^2 + 6\omega_8\omega_5\omega_9v_2^2\omega_7^2\omega_4^3 - 18\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 + 6\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_4^3 + 3\omega_8\omega_5^2\omega_9\omega_6c_s^4\omega_7^2\omega_4^3 - 12\omega_5^2v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 + 6\omega_8\omega_5^2\omega_9v_2^2\omega_6\omega_4^2 + 6\omega_8\omega_5^2v_2^2\omega_7^2\omega_4^3 - 36\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 + 6\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^4\omega_7^2\omega_4^2 - 12\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 - 36\omega_8\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7\omega_4^2 - 24\omega_8\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 + \omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3 + 36\omega_5\omega_9\omega_6c_s^4\omega_7^2\omega_4^3 + 12\omega_8\omega_5^2\omega_9\omega_6c_s^4\omega_7^2\omega_4^2 - 12\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 - 36\omega_8\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7\omega_4^2 - 24\omega_8\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 + 18\omega_8\omega_5^2v_2^2\omega_6c_s^2\omega_7\omega_4^3 - 6\omega_8\omega_5^2\omega_6c_s^2\omega_7^2\omega_4^3 - 18\omega_8\omega_5\omega_9v_2^2c_s^2\omega_7^2\omega_4^3 + 6\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_6\omega_4^3 - 60\omega_8\omega_5^2\omega_9\omega_6c_s^4\omega_7^2\omega_4^2 - 24\omega_8\omega_5\omega_9v_2^2\omega_7^2\omega_4^2 -$

$18\omega_8\omega_5^2v_2^2c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_4^2 + 5\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^3 - 12\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 - 6\omega_8\omega_5^2v_1^2v_2^2\omega_6\omega_7\omega_4^3)\frac{v_1}{12\omega_8\omega_5^2\omega_9\omega_6\omega_7^2\omega_4^3}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}^3_x\mathrm{D}_y\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^3_x\mathrm{D}_y\rho}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^3_x\mathrm{D}_y\rho} = (12\omega_8\omega_5v_1^2\omega_6\omega_7\omega_4 + 12v_1^2\omega_9\omega_6\omega_7^2\omega_4^2 - 36\omega_8\omega_5\omega_9\omega_6c_s^2\omega_4 + 12\omega_9\omega_6\omega_7^2\omega_4 + 54\omega_8\omega_9\omega_6c_s^2\omega_7^2\omega_4 + 12\omega_8\omega_5\omega_6\omega_7^2\omega_4 + 3\omega_8\omega_5\omega_9\omega_6\omega_7\omega_4^2 + 12\omega_8\omega_5\omega_9\omega_6\omega_4 - 18\omega_8\omega_5\omega_6c_s^2\omega_7\omega_4^2 - 12\omega_8\omega_5v_1^2\omega_9\omega_6\omega_7 + \omega_8\omega_5v_1^2\omega_9\omega_6\omega_7^2\omega_4^2 - 36\omega_9c_s^2\omega_7^2\omega_4^2 + 5\omega_8\omega_9\omega_6\omega_7^2\omega_4^2 + 36\omega_5\omega_6c_s^2\omega_7^2\omega_4 - 9\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4^2 + 12\omega_5\omega_6\omega_7^2\omega_4^2 - 12\omega_5v_1^2\omega_6\omega_7^2\omega_4^2 - 18\omega_8\omega_5c_s^2\omega_7^2\omega_4^2 + 54\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4 - 12\omega_5\omega_6\omega_7^2\omega_4 + 12\omega_5v_1^2\omega_6\omega_7^2\omega_4 - 36\omega_8\omega_9\omega_6c_s^2\omega_7^2 - 18\omega_8\omega_9\omega_6\omega_7^2\omega_4 - 36\omega_5\omega_6c_s^2\omega_7^2\omega_4^2 - 6\omega_8\omega_5\omega_6\omega_7^2\omega_4^2 - 15\omega_8\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 - 6\omega_8\omega_5\omega_9\omega_6\omega_4^2 + 36\omega_8\omega_5\omega_6c_s^2\omega_7\omega_4 - 18\omega_8\omega_5\omega_9\omega_6\omega_7\omega_4 - 12\omega_8\omega_5v_1^2\omega_9\omega_6\omega_7^2\omega_4 + 12\omega_8\omega_5v_1^2\omega_9\omega_6\omega_7^2 + 36\omega_5c_s^2\omega_7^2\omega_4^2 - 12v_1^2\omega_9\omega_6\omega_7^2\omega_4 - 6\omega_8\omega_5v_1^2\omega_6\omega_7\omega_4^2 + 18\omega_8\omega_9c_s^2\omega_7^2\omega_4^2 + 18\omega_8\omega_5\omega_9\omega_6c_s^2\omega_4^2 - 12\omega_9\omega_6\omega_7^2\omega_4^2 + 12\omega_8\omega_5\omega_9\omega_6\omega_7^2\omega_4 - 36\omega_8\omega_5\omega_6c_s^2\omega_7^2\omega_4 + 6\omega_8\omega_5\omega_7^2\omega_4^2 + 6\omega_8\omega_5\omega_6\omega_7\omega_4^2 + 12\omega_9\omega_7^2\omega_4^2 + 36\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7^2 + 18\omega_8\omega_5v_1^2\omega_9\omega_6\omega_7\omega_4 + 6\omega_8\omega_5v_1^2\omega_9\omega_6\omega_4^2 + 6\omega_8\omega_5v_1^2\omega_6\omega_7^2\omega_4^2 - 12\omega_8\omega_5\omega_9\omega_6\omega_7^2 - 6\omega_8\omega_9\omega_7^2\omega_4^2 - 36\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4 + 12\omega_5v_1^2\omega_7^2\omega_4^2 - 12\omega_5\omega_7^2\omega_4^2 - 5\omega_8v_1^2\omega_9\omega_6\omega_7^2\omega_4^2 - 12\omega_8v_1^2\omega_9\omega_6\omega_7^2 - 12v_1^2\omega_9\omega_7^2\omega_4^2 - 36\omega_9\omega_6c_s^2\omega_7^2\omega_4 + 36\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 + 3\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 + 18\omega_8v_1^2\omega_9\omega_6\omega_7^2\omega_4 + 6\omega_8v_1^2\omega_9\omega_7^2\omega_4^2 - 12\omega_8\omega_5v_1^2\omega_9\omega_6\omega_4 - 12\omega_8\omega_5v_1^2\omega_6\omega_7^2\omega_4 + 12\omega_8\omega_5\omega_9\omega_6\omega_7 + 18\omega_8\omega_5\omega_6c_s^2\omega_7^2\omega_4^2 - \omega_8\omega_5\omega_9\omega_6\omega_7^2\omega_4^2 + 12\omega_8\omega_9\omega_6\omega_7^2 - 12\omega_8\omega_5\omega_6\omega_7\omega_4 - 6\omega_8\omega_5v_1^2\omega_7^2\omega_4^2 - 3\omega_8\omega_5v_1^2\omega_9\omega_6\omega_7\omega_4^2 - 36\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7)\frac{v_1c_s^2}{12\omega_8\omega_5\omega_9\omega_6\omega_7^2\omega_4^2}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^3_x\mathrm{D}_y\rho} = C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^3_x\mathrm{D}_y\rho}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}^3_x\mathrm{D}_y\rho} = (-36\omega_3c_s^2\omega_1 - 12\omega_4^2\omega_1 - 12\omega_3\omega_4 + 12v_1^2\omega_4^2\omega_1 + 12v_1^2\omega_3\omega_4 - 36c_s^2\omega_4^2 + 12\omega_3\omega_1 + 36\omega_3c_s^2\omega_4 - 36\omega_3c_s^2\omega_4^2\omega_1 - 12v_1^2\omega_3\omega_1 - 36c_s^2\omega_4\omega_1 - 9\omega_3^2c_s^2\omega_4\omega_1 - 12v_1^2\omega_3\omega_4^2\omega_1 + 18\omega_3c_s^2\omega_4^2 + 3\omega_3^2\omega_4\omega_1 - 3v_1^2\omega_3^2\omega_4\omega_1 + 6v_1^2\omega_3\omega_4^2 + 12\omega_3\omega_4^2\omega_1 - 6\omega_3\omega_4^2 + v_1^2\omega_3^2\omega_4^2\omega_1 + v_1^2\omega_3^2\omega_4^2 - \omega_3^2\omega_4^2 - 18\omega_3\omega_4\omega_1 + 3\omega_3^2c_s^2\omega_4^2 + 18v_1^2\omega_3\omega_4\omega_1 + 3\omega_3^2c_s^2\omega_4^2\omega_1 - \omega_3^2\omega_4^2\omega_1 - 12v_1^2\omega_4^2 - 6\omega_3^2\omega_1 + 18\omega_3^2c_s^2\omega_1 + 54\omega_3c_s^2\omega_4\omega_1 + 36c_s^2\omega_4^2\omega_1 + 6v_1^2\omega_3^2\omega_1 + 6\omega_3^2\omega_4 + 12\omega_4\omega_1 - 18\omega_3^2c_s^2\omega_4 + 12\omega_4^2 - 6v_1^2\omega_3^2\omega_4 - 12v_1^2\omega_4\omega_1)\frac{v_1c_s^2}{12\omega_3^2\omega_4^2\omega_1}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}^3_x\mathrm{D}_y\rho} =$
$(18\omega_2\omega_3c_s^4\omega_1^3 - 90\omega_2^2\omega_3^2c_s^4\omega_1 + 30\omega_2^2\omega_3c_s^2\omega_1 + 36\omega_2^2c_s^4\omega_1^3 - 24\omega_2^2v_1^2c_s^2\omega_1^2 + 45\omega_2v_1^4\omega_3^2\omega_1^2 - 24\omega_2^2\omega_3c_s^2\omega_1^2 - 138\omega_2^2\omega_3^2c_s^4\omega_1^2 - 72\omega_2^2c_s^4\omega_1^2 + 51\omega_2^2v_1^2\omega_3^2 - 30\omega_2^3v_1^2\omega_3c_s^2\omega_1 + 90\omega_2^2c_s^4\omega_1^3 + 3\omega_2^2v_2^4\omega_3^2\omega_1^3 - 7\omega_2^3\omega_3^2\omega_1^2 + 3\omega_2^3v_2^2\omega_3^2\omega_1^2 + 18\omega_2^2\omega_3c_s^2\omega_1^3 + 6\omega_2^3\omega_3^2c_s^4\omega_1^3 + 12\omega_2^3v_1^2c_s^2\omega_1^3 - 165\omega_2^2v_1^2\omega_3^2c_s^2\omega_1 - 90\omega_2v_1^4\omega_3^2\omega_1^3 - 261\omega_2^3v_1^2\omega_3^2c_s^2 + 12\omega_2^3\omega_3^2\omega_1 - 24\omega_2\omega_3^2c_s^2\omega_1^2 + 6\omega_2\omega_3^2\omega_1^2 + 12\omega_2^2v_1^2\omega_3^2c_s^2\omega_1^2 + 9\omega_2^2v_2^2\omega_3^2c_s^2\omega_1^3 - 465\omega_2v_1^2\omega_3^2c_s^2\omega_1^3 + 6\omega_2^3\omega_3c_s^2\omega_1^3 - 51\omega_2v_1^2\omega_3^2\omega_1^2 + 72\omega_2^2\omega_3^2c_s^4\omega_1^3 + 42\omega_2^3v_1^2\omega_3c_s^2\omega_1^2 + 197\omega_2^2v_1^2\omega_3^2c_s^2\omega_1^3 + 225\omega_2^3\omega_3^2c_s^4\omega_1 - 12\omega_2\omega_3^2\omega_1^3 + 123\omega_2\omega_3^2c_s^2\omega_1^3 - 3\omega_2^3v_2^4\omega_3^2\omega_1^2 - 6\omega_2^3v_1^2\omega_3c_s^2\omega_1^3 - 3\omega_2^2v_2^2\omega_3^2\omega_1^3 - 42\omega_2^3\omega_3c_s^2\omega_1^2 + 36\omega_2^2\omega_3^2c_s^4\omega_1^2 + 102\omega_2v_1^2\omega_3^2\omega_1^3 + 141\omega_2v_1^2\omega_3^2c_s^2\omega_1^2 - 90\omega_2^3\omega_3^2c_s^4 + 24\omega_2^3c_s^2\omega_1^2 + 24\omega_2^2v_1^2\omega_3c_s^2\omega_1^2 - 51v_1^2\omega_3^2\omega_1^3 - 45\omega_2^3v_1^4\omega_3^2 - 72\omega_2^3c_s^2\omega_1^3 + 90\omega_2^3v_1^4\omega_3^2\omega_1 - 219\omega_2^3v_1^2\omega_3^2c_s^2\omega_1^2 - 2\omega_2^3\omega_3^2c_s^2\omega_1^3 + 6\omega_2^3\omega_1^3 - 54\omega_2^2\omega_3c_s^4\omega_1^3 + 6\omega_2v_1^2\omega_3c_s^2\omega_1^3 - 6\omega_2\omega_3c_s^2\omega_1^3 + 46\omega_2^3v_1^2\omega_3^2\omega_1^2 + 39\omega_2^2v_1^4\omega_3^2\omega_1^3 - 90\omega_2^3\omega_3c_s^4\omega_1 + 7\omega_2^3\omega_3^2\omega_1^3 + 48\omega_2^2\omega_3^2c_s^2\omega_1 + 261v_1^2\omega_3^2c_s^2\omega_1^3 - 12\omega_2^3c_s^2\omega_1^3 - 18\omega_2^2v_1^2\omega_3c_s^2\omega_1^3 + 72\omega_2^3\omega_3^2c_s^2 + 81\omega_2^3\omega_3^2c_s^2\omega_1^2 + 72\omega_2^2\omega_3c_s^4\omega_1^2 + 2\omega_2^3v_1^2\omega_3^2c_s^2\omega_1^3 - 9\omega_2^3v_2^2\omega_3^2c_s^2\omega_1^2 + 51\omega_2^2v_1^2\omega_3^2\omega_1 + 45v_1^4\omega_3^2\omega_1^3 - 147\omega_2^3\omega_3^2c_s^2\omega_1 - 153\omega_2\omega_3^2c_s^4\omega_1^3 - 102\omega_2^3v_1^2\omega_3^2\omega_1 - 12\omega_2^2\omega_3^2c_s^2\omega_1^2 + 126\omega_2^3\omega_3c_s^4\omega_1^2 - 46\omega_2^2v_1^2\omega_3^2\omega_1^3 + 18\omega_2\omega_3^2c_s^4\omega_1^2 + 489\omega_2^3v_1^2\omega_3^2c_s^2\omega_1 - 39\omega_2^3v_1^4\omega_3^2\omega_1^2 - 6\omega_2^3\omega_3^2 - 59\omega_2^2\omega_3^2c_s^2\omega_1^3 - 18\omega_2^3\omega_3c_s^4\omega_1^3 - 6\omega_2^2\omega_3^2\omega_1 - 45\omega_2^2v_1^4\omega_3^2\omega_1)\frac{v_1}{24\omega_2^3\omega_3^2\omega_1^3}$

coefficient $C^{(2)}_{\mathrm{D}^3_x\mathrm{D}_yv_1}$ **at** $\frac{\partial^4v_1}{\partial x_1^3\partial x_2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}^3_x\mathrm{D}_yv_1} = (-12 + 2c_s^2\omega^2 + 36v_1^2 - c_s^2\omega^3 - 54v_1^2\omega + 18\omega - 6\omega^2 + 18v_1^2\omega^2)\frac{\rho c_s^2}{12\omega^3}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}^3_x\mathrm{D}_yv_1} = (-48\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_7^2 - 12\omega_8\omega_5^2\omega_9v_2^2\omega_7\omega_4^3 + 54\omega_8\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 + 30\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4^3 - 12\omega_5^2\omega_6c_s^4\omega_7^2\omega_4^3 + 6\omega_8\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 - 36\omega_5^2v_1^2\omega_6c_s^2\omega_7^2\omega_4^3 + 6\omega_8\omega_5^2\omega_6c_s^2\omega_7\omega_4^3 - 18\omega_8v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 + 6\omega_8\omega_5^2v_2^2\omega_6c_s^2\omega_7^2\omega_4^3 + 12\omega_5^2v_2^2\omega_6\omega_7^2\omega_4^3 - 36\omega_8\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^2 - 15\omega_8\omega_5^2\omega_9v_2^2\omega_6c_s^2\omega_7\omega_4^3 - 18\omega_8\omega_5^2\omega_9\omega_6c_s^4\omega_7\omega_4^2 + 72\omega_8\omega_5v_1^2\omega_9v_2^2\omega_7^2\omega_4^2 - 72\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4 + 18\omega_8\omega_5^2v_1^2v_2^2\omega_6\omega_7^2\omega_4^3 - 48\omega_8\omega_5^2\omega_9v_2^2\omega_6\omega_7\omega_4^2 - 12\omega_8\omega_5^2\omega_9\omega_6c_s^4\omega_7^2 + 48\omega_8\omega_5^2\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^2 + 9\omega_8\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2\omega_6c_s^2\omega_7\omega_4^2 + 36\omega_5^2v_1^2\omega_6c_s^2\omega_7^2\omega_4^2 - 12\omega_5^2v_2^2\omega_6\omega_7^2\omega_4^2 - 12\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7\omega_4 - 12\omega_8\omega_5^2v_2^2\omega_6c_s^2\omega_7^2\omega_4^2 + 36\omega_8v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 - 102\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4^2 - 15\omega_8\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3 + 12\omega_5^2\omega_6c_s^4\omega_7^2\omega_4^2 - 12\omega_8\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 + 36\omega_5^2v_1^2v_2^2\omega_7^2\omega_4^3 + 24\omega_8\omega_5^2\omega_9v_2^2\omega_7\omega_4^2 + 12\omega_5\omega_9c_s^2\omega_7^2\omega_4^3 + 15\omega_8\omega_5^2\omega_9v_2^2\omega_6\omega_7\omega_4^3 - 36\omega_5^2v_1^2\omega_9c_s^2\omega_7^2\omega_4^3 - 36\omega_8\omega_5^2v_1^2v_2^2\omega_6\omega_7^2\omega_4^2 - 18\omega_8\omega_5v_1^2\omega_9v_2^2\omega_7^2\omega_4^3 + 6\omega_8\omega_5^2\omega_9\omega_6c_s^4\omega_7\omega_4^3 + 72\omega_8\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4 - 36\omega_5^2v_1^2v_2^2\omega_6\omega_7^2\omega_4^3 - 24\omega_8\omega_5^2\omega_9v_2^2c_s^2\omega_7\omega_4^2 + 6\omega_8\omega_5^2v_2^2\omega_6\omega_7\omega_4^3 + 12\omega_5^2\omega_6c_s^2\omega_7^2\omega_4^3 - 6\omega_8\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^3 - 108\omega_8\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 - 6\omega_8\omega_5^2\omega_6c_s^4\omega_7\omega_4^3 - 6\omega_8\omega_5^2\omega_9v_2^2\omega_6\omega_4^3 - 45\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^3 + 18\omega_8\omega_5^2v_1^2\omega_6c_s^2\omega_7^2\omega_4^3 - 24\omega_8\omega_5^2\omega_9v_2^2\omega_6c_s^2\omega_7\omega_4 - 12\omega_5^2v_2^2\omega_6c_s^2\omega_7^2\omega_4^3 + 6\omega_8\omega_5^2\omega_9v_2^2\omega_6c_s^2\omega_4^3 - 6\omega_8\omega_5\omega_9v_2^2\omega_6\omega_7\omega_4^3 + 18\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7\omega_4^2 + 12\omega_5^2v_2^2c_s^2\omega_7^2\omega_4^3 + 60\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4 + 144\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^2 + 12\omega_8\omega_5^2\omega_9v_2^2\omega_6\omega_4^2 + 12\omega_8\omega_5^2\omega_6c_s^4\omega_7\omega_4^2 + 27\omega_8\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 + 12\omega_8\omega_5^2\omega_9\omega_6c_s^4\omega_7\omega_4 - 36\omega_5v_1^2\omega_9v_2^2\omega_7^2\omega_4^3 + 12\omega_8\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^2 - 12\omega_5\omega_9c_s^4\omega_7^2\omega_4^3 + 18\omega_8\omega_5v_1^2\omega_9c_s^2\omega_7^2\omega_4^3 - 12\omega_8\omega_5^2v_2^2\omega_6\omega_7\omega_4^2 + 12\omega_8\omega_5^2\omega_9v_2^2c_s^2\omega_7\omega_4^3 + 36\omega_5^2v_1^2v_2^2\omega_6\omega_7^2\omega_4^2 - 12\omega_5^2\omega_6c_s^2\omega_7^2\omega_4^2 + 24\omega_8\omega_5^2\omega_9v_2^2\omega_6\omega_7\omega_4 - 36\omega_8\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4 - 6\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7\omega_4^3 + 12\omega_5\omega_9v_2^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5\omega_9v_2^2\omega_6\omega_7\omega_4^2 + 36\omega_5^2v_1^2c_s^2\omega_7^2\omega_4^3 - 36\omega_8\omega_5^2v_1^2\omega_6c_s^2\omega_7^2\omega_4^2 - 12\omega_8\omega_5^2\omega_9v_2^2\omega_6c_s^2\omega_4^2 + 24\omega_8\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4 + 12\omega_5^2v_2^2\omega_6c_s^2\omega_7^2\omega_4^2 - 18\omega_8\omega_5^2v_1^2v_2^2\omega_7^2\omega_4^3 - 6\omega_8\omega_5\omega_9c_s^2\omega_7^2\omega_4^3 + 18\omega_8\omega_5^2\omega_9\omega_6c_s^4\omega_7^2\omega_4 - 12\omega_8\omega_5^2\omega_6c_s^4\omega_7^2\omega_4^2 + 18\omega_8\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^3 + 6\omega_8\omega_5^2c_s^2\omega_7^2\omega_4^3 - 12\omega_5^2v_2^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5^2v_2^2\omega_6\omega_7^2\omega_4^2 + 12\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 + 12\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^3 - 72\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_7\omega_4^2 + 18\omega_8\omega_5\omega_9\omega_6c_s^4\omega_7^2\omega_4^2 + 36\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3 + 36\omega_8\omega_5^2v_1^2\omega_6c_s^2\omega_7\omega_4^2 + 12\omega_5^2c_s^4\omega_7^2\omega_4^3 + 36\omega_8\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 - 12\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^3 + 12\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4 - 6\omega_8\omega_5^2v_2^2\omega_6\omega_7^2\omega_4^3 - 36\omega_8\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^2 + 6\omega_8\omega_5^2\omega_6c_s^4\omega_7^2\omega_4^3 - 9\omega_8\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 + \omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 - 36\omega_5v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 - 18\omega_8\omega_5^2v_1^2\omega_6c_s^2\omega_7\omega_4^3 - 12\omega_5\omega_9v_2^2c_s^2\omega_7^2\omega_4^3 + 60\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4 - 12\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7^2\omega_4^2 - 5\omega_8\omega_5\omega_9\omega_6c_s^4\omega_7^2\omega_4^3 + 36\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_7\omega_4^3 + 12\omega_8\omega_5^2v_2^2\omega_6c_s^2\omega_7\omega_4^2 + 24\omega_8\omega_5\omega_9v_2^2c_s^2\omega_7^2\omega_4^2 + 12\omega_8\omega_5^2\omega_6c_s^2\omega_7^2\omega_4^2 + 6\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4^3 + 12\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 + 6\omega_8\omega_5\omega_9\omega_6c_s^4\omega_7^2\omega_4^3 - 12\omega_5\omega_9\omega_6c_s^4\omega_7^2\omega_4^2 - 6\omega_8\omega_5^2c_s^4\omega_7^2\omega_4^3 - 15\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 + 36\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 + 36\omega_8\omega_5^2v_1^2v_2^2\omega_6\omega_7\omega_4^2 +$

$6\omega_8\omega_5\omega_9v_2^2\omega_7^2\omega_4^3-18\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^2-18\omega_8\omega_5^2v_1^2c_s^2\omega_7^2\omega_4^3-12\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_4^3-\omega_8\omega_5^2\omega_9\omega_6c_s^4\omega_7^2\omega_4^3-12\omega_5^2c_s^2\omega_7^2\omega_4^3-36\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_6\omega_4^2+6\omega_8\omega_5^2v_2^2\omega_7^2\omega_4^3-12\omega_8\omega_5\omega_9\omega_6c_s^4\omega_7^2\omega_4^3-12\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4^3-12\omega_8\omega_5\omega_9v_2^2\omega_6c_s^2\omega_7\omega_4^2-24\omega_8\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4-6\omega_8\omega_5^2v_2^2\omega_6c_s^2\omega_7\omega_4^3-6\omega_8\omega_5^2\omega_6c_s^2\omega_7^2\omega_4^3-6\omega_8\omega_5\omega_9v_2^2c_s^2\omega_7^2\omega_4^3+18\omega_8\omega_5^2v_1^2\omega_9v_2^2\omega_6\omega_4^3-5\omega_8\omega_5^2\omega_9\omega_6c_s^4\omega_7^2\omega_4^2-24\omega_8\omega_5\omega_9v_2^2\omega_7^2\omega_4^2-6\omega_8\omega_5^2v_2^2c_s^2\omega_7^2\omega_4^3+24\omega_8\omega_5^2v_1^2\omega_9\omega_6c_s^2\omega_4^2+5\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^3-36\omega_5v_1^2\omega_9v_2^2\omega_6\omega_7^2\omega_4^2-18\omega_8\omega_5^2v_1^2v_2^2\omega_6\omega_7\omega_4^3)\frac{\rho}{12\omega_8\omega_5^2\omega_9\omega_6\omega_7^2\omega_4^3}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x^3\mathrm{D}_y v_1}=C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^3\mathrm{D}_y v_1}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x^3\mathrm{D}_y v_1}=(6\omega_8\omega_5\omega_6\omega_4^3+12\omega_9\omega_6c_s^2\omega_7\omega_4^3+12\omega_8\omega_5\omega_9\omega_6c_s^2\omega_4+\omega_8\omega_5\omega_9\omega_6\omega_7\omega_4^2-12\omega_8\omega_5\omega_9\omega_6\omega_4-12\omega_8\omega_5\omega_6c_s^2\omega_7\omega_4^2-\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4^3-12\omega_9\omega_6c_s^2\omega_7\omega_4^2+18\omega_8v_1^2\omega_9\omega_7\omega_4^3-12\omega_8\omega_5\omega_6\omega_4^2-5\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4^2-18\omega_8\omega_5v_1^2\omega_7\omega_4^3+6\omega_8\omega_5\omega_6c_s^2\omega_7\omega_4^3-36\omega_8v_1^2\omega_9\omega_6\omega_7\omega_4+12\omega_9\omega_7\omega_4^3+18\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7\omega_4+54\omega_8v_1^2\omega_9\omega_6\omega_7\omega_4^2-6\omega_8\omega_5\omega_9\omega_6\omega_4^3+6\omega_8\omega_5\omega_7\omega_4^3+36\omega_8\omega_5v_1^2\omega_6\omega_4^2+6\omega_8\omega_5\omega_9\omega_6c_s^2\omega_4^3+18\omega_8\omega_5v_1^2\omega_6\omega_7\omega_4^3+36\omega_5v_1^2\omega_7\omega_4^3+18\omega_8\omega_5\omega_9\omega_6\omega_4^2-15\omega_8v_1^2\omega_9\omega_6\omega_7\omega_4^3-12\omega_5\omega_7\omega_4^3-6\omega_8\omega_9\omega_7\omega_4^3-36\omega_8\omega_5v_1^2\omega_6\omega_7\omega_4^2-18\omega_8\omega_5\omega_9\omega_6c_s^2\omega_4^2-18\omega_8\omega_5v_1^2\omega_6\omega_4^3-36v_1^2\omega_9\omega_7\omega_4^3+18\omega_8\omega_9\omega_6c_s^2\omega_7\omega_4^2+12\omega_8\omega_5\omega_6\omega_7\omega_4^2-54\omega_8\omega_5v_1^2\omega_9\omega_6\omega_4^2-12\omega_5\omega_6c_s^2\omega_7\omega_4^3+12\omega_9\omega_6\omega_7\omega_4^2+12\omega_5c_s^2\omega_7\omega_4^3-5\omega_8\omega_9\omega_6c_s^2\omega_7\omega_4^3-6\omega_8\omega_5\omega_6\omega_7\omega_4^3-12\omega_9\omega_6\omega_7\omega_4^3+12\omega_5\omega_6c_s^2\omega_7\omega_4^2+18\omega_8\omega_5v_1^2\omega_9\omega_6\omega_4^3+12\omega_8\omega_9\omega_6\omega_7\omega_4+6\omega_8\omega_9c_s^2\omega_7\omega_4^3-6\omega_8\omega_5\omega_6c_s^2\omega_4^3+36v_1^2\omega_9\omega_6\omega_7\omega_4^3-18\omega_8\omega_9\omega_6\omega_7\omega_4^2-12\omega_5\omega_6\omega_7\omega_4^2+36\omega_5v_1^2\omega_6\omega_7\omega_4^2+5\omega_8\omega_9\omega_6\omega_7\omega_4^3+36\omega_8\omega_5v_1^2\omega_9\omega_6\omega_4-36v_1^2\omega_9\omega_6\omega_7\omega_4^2+12\omega_8\omega_5\omega_6c_s^2\omega_4^2-12\omega_9c_s^2\omega_7\omega_4^3-36\omega_5v_1^2\omega_6\omega_7\omega_4^3-12\omega_8\omega_9\omega_6c_s^2\omega_7\omega_4-6\omega_8\omega_5c_s^2\omega_7\omega_4^3+12\omega_5\omega_6\omega_7\omega_4^3-3\omega_8\omega_5v_1^2\omega_9\omega_6\omega_7\omega_4^2-12\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7)\frac{\rho c_s^2}{12\omega_8\omega_5\omega_9\omega_6\omega_7\omega_4^3}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x^3\mathrm{D}_y v_1}=C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x^3\mathrm{D}_y v_1}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x^3\mathrm{D}_y v_1}=(12\omega_3c_s^2\omega_1+12\omega_3\omega_4-36v_1^2\omega_3\omega_4-12\omega_3\omega_1-12\omega_3c_s^2\omega_4-\omega_3^3c_s^2\omega_4\omega_1+12\omega_3^2c_s^2+36v_1^2\omega_3\omega_1-12c_s^2\omega_4\omega_1-5\omega_3^2c_s^2\omega_4\omega_1+\omega_3^2\omega_4\omega_1+\omega_3^2c_s^2\omega_4-3v_1^2\omega_3^2\omega_4\omega_1-6\omega_3^2c_s^2+6\omega_3^2c_s^2\omega_1+18v_1^2\omega_3^2\omega_1-18v_1^2\omega_3^2-12\omega_3^2-6\omega_3^2\omega_1+36v_1^2\omega_3^2+6\omega_3^2+3v_1^2\omega_3^2\omega_4-\omega_3^2\omega_4+18\omega_3^2\omega_1-18\omega_3^2c_s^2\omega_1+18\omega_3c_s^2\omega_4\omega_1-54v_1^2\omega_3^2\omega_1-6\omega_3^2\omega_4+6\omega_3^2c_s^2\omega_4+18v_1^2\omega_3^2\omega_4)\frac{\rho c_s^2}{12\omega_3^2\omega_4\omega_1}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x^3\mathrm{D}_y v_1}=(-138\omega_2^3v_1^4\omega_3\omega_1^2-33\omega_2\omega_3c_s^4\omega_1^3-81\omega_2^2v_1^2\omega_3\omega_1^3-45\omega_2^3\omega_3c_s^2\omega_1+12\omega_2^3c_s^4\omega_1^3-90\omega_2^3v_1^2c_s^2\omega_1^2-6\omega_2^2\omega_3\omega_1-12\omega_2^2\omega_3c_s^2\omega_1^2+18\omega_2^2c_s^2\omega_1^3-135\omega_2^2v_1^4\omega_3\omega_1-30\omega_2^3c_s^4\omega_1^2+171v_1^4\omega_3\omega_1^3+351\omega_2^3v_1^2\omega_3c_s^2\omega_1+6\omega_2\omega_3c_s^4\omega_1^2-24\omega_2^2c_s^2\omega_1^2-180\omega_2^3v_1^2\omega_3\omega_1-24\omega_2^2\omega_3c_s^2\omega_1^3+36\omega_2^3v_1^2c_s^2\omega_1^3+138\omega_2^2v_1^4\omega_3\omega_1^3+81\omega_2^3v_1^2\omega_3\omega_1^2+24\omega_2^3\omega_3c_s^2+7\omega_2^2\omega_3\omega_1^3-54\omega_2^2v_1^2c_s^2\omega_1^3+18\omega_2^3c_s^4\omega_1+99\omega_2^3v_1^2\omega_3-153\omega_2^3v_1^2\omega_3c_s^2\omega_1^2+63\omega_2^2v_1^2\omega_3\omega_1-24\omega_3c_s^2\omega_1^3+207v_1^2\omega_3c_s^2\omega_1^3-99v_1^2\omega_3\omega_1^3+54\omega_2^3v_1^2c_s^2\omega_1+36\omega_2^2\omega_3c_s^2\omega_1+324\omega_2^3v_1^4\omega_3\omega_1-3\omega_2^3v_2^2\omega_3c_s^2\omega_1^2+6\omega_2c_s^4\omega_1^3+24\omega_2^3\omega_3c_s^2\omega_1^2+6\omega_3\omega_1^3+72\omega_2^2v_1^2c_s^2\omega_1^2+30\omega_2^2c_s^2\omega_1^2+36\omega_2^2v_1^2\omega_3c_s^2\omega_1^2+3\omega_2^2v_2^2\omega_3c_s^2\omega_1^3-12\omega_2\omega_3\omega_1^3-12\omega_2\omega_3c_s^2\omega_1^2-\omega_2^2v_2^2\omega_3\omega_1^3+24\omega_2^2c_s^4\omega_1^2-\omega_2^3v_2^4\omega_3\omega_1^2-42\omega_2^3\omega_3c_s^4+17\omega_2^2\omega_3c_s^4\omega_1^3-351\omega_2v_1^2\omega_3c_s^2\omega_1^3+180\omega_2v_1^2\omega_3\omega_1^3-6\omega_2^3\omega_3+45\omega_2\omega_3c_s^2\omega_1^3+12\omega_2^3\omega_3\omega_1+69\omega_2^3\omega_3c_s^4\omega_1-12\omega_2^3c_s^2\omega_1^3+6\omega_2\omega_3\omega_1^2+153\omega_2^2v_1^2\omega_3c_s^2\omega_1^3-63\omega_2v_1^2\omega_3\omega_1^2+63\omega_2v_1^2\omega_3c_s^2\omega_1^2+12\omega_2^2\omega_3c_s^4\omega_1^2-18\omega_2^2c_s^4\omega_1^3-30\omega_2^2\omega_3c_s^4\omega_1+18\omega_2v_1^2c_s^2\omega_1^3+\omega_2^3v_2^2\omega_3\omega_1^2-7\omega_2^3\omega_3\omega_1^2-6\omega_2c_s^2\omega_1^3+\omega_2^2v_2^4\omega_3\omega_1^3-324\omega_2v_1^4\omega_3\omega_1^3-207\omega_2^3v_1^2\omega_3c_s^2-25\omega_2^3\omega_3c_s^4\omega_1^2-135\omega_2^2v_1^2\omega_3c_s^2\omega_1-18\omega_2^3c_s^2\omega_1+135\omega_2v_1^4\omega_3\omega_1^2-171\omega_2^2v_1^4\omega_3-2\omega_2^3\omega_3c_s^4\omega_1^3+18\omega_3c_s^4\omega_1^3)\frac{\rho}{24\omega_2^3\omega_3\omega_1^3}$

coefficient $C^{(2)}_{\mathrm{D}_x^3\mathrm{D}_y v_2}$ **at** $\frac{\partial^4 v_2}{\partial x_1^3\partial x_2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x^3\mathrm{D}_y v_2}=(2-2v_1^2-6c_s^2+3c_s^2\omega+v_1^2\omega-\omega)\frac{v_1\rho v_2}{12\omega}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^3\mathrm{D}_y v_2}=(-12\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_4^3+24\omega_8^2\omega_5^2\omega_6^2\omega_7^2\omega_4^2+90\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^2+12\omega_8^2v_1^2\omega_9\omega_6^2\omega_7^2\omega_4^2+60\omega_8\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3+12\omega_8^2\omega_5^2v_1^2\omega_9\omega_6^2\omega_7^2\omega_4-72\omega_8^2\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4+12\omega_8\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4^2+12\omega_8^2\omega_5^2v_1^2\omega_9\omega_6^2\omega_4^3-24\omega_8^2\omega_5^2v_1^2\omega_6^2\omega_7^2\omega_4^2+12\omega_8^2\omega_5^2\omega_6^2c_s^2\omega_7^2\omega_4^3-96\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2+24\omega_8\omega_5^2\omega_6^2\omega_7^2\omega_4^3-12\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4-18\omega_8^2\omega_5v_1^2\omega_9\omega_6^2\omega_7^2\omega_4^2-12\omega_8\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4^3-24\omega_8^2\omega_5^2v_1^2\omega_9\omega_6^2\omega_4^2+12\omega_8^2\omega_5^2v_1^2\omega_6^2\omega_7^2\omega_4^3-12\omega_8^2\omega_5\omega_9\omega_6^2\omega_7^2\omega_4+24\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_4^2-132\omega_8\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2-24\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3-6\omega_8^2v_1^2\omega_9\omega_6^2\omega_7^2\omega_4^3-12\omega_8^2\omega_5^2\omega_6^2\omega_7^2\omega_4^3+4\omega_8^2\omega_5v_1^2\omega_9\omega_6^2\omega_7^2\omega_4^3-24\omega_8\omega_5^2\omega_6^2\omega_7^2\omega_4^2-24\omega_8^2\omega_5^2\omega_6^2c_s^2\omega_7^2\omega_4^2+24\omega_8^2\omega_5^2\omega_9\omega_6\omega_7\omega_4^2-\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4^3-24\omega_8\omega_5^2v_1^2\omega_6^2\omega_7^2\omega_4^3+6\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7\omega_4^3-12\omega_8\omega_5^2v_1^2\omega_9\omega_6\omega_7\omega_4^2+\omega_8^2\omega_5^2v_1^2\omega_9\omega_6^2\omega_7^2\omega_4^3+72\omega_8\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4+24\omega_8\omega_5^2\omega_6^2c_s^2\omega_7^2\omega_4^2+18\omega_8^2\omega_5\omega_9\omega_6^2\omega_7^2\omega_4^2-24\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3-12\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7\omega_4^2+12\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4^2+24\omega_8\omega_5^2v_1^2\omega_6^2\omega_7^2\omega_4^2-12\omega_8^2\omega_5^2\omega_9\omega_6\omega_7\omega_4^3+12\omega_8^2\omega_5v_1^2\omega_9\omega_6^2\omega_7^2\omega_4+24\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2-36\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7\omega_4-4\omega_8^2\omega_5\omega_9\omega_6^2\omega_7^2\omega_4^3-24\omega_8\omega_5^2\omega_6^2c_s^2\omega_7^2\omega_4^3+84\omega_8^2\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2-12\omega_8^2\omega_5^2v_1^2\omega_9\omega_6^2\omega_7^2\omega_4^2+12\omega_8^2\omega_5^2v_1^2\omega_9\omega_6\omega_7\omega_4^3-42\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2+24\omega_8\omega_5^2v_1^2\omega_6\omega_7^2\omega_4^3-12\omega_8^2\omega_5^2\omega_6c_s^2\omega_7^2\omega_4^3-66\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_7\omega_4^2-6\omega_8^2\omega_5\omega_9\omega_6^2\omega_7\omega_4^3+156\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4-24\omega_8^2\omega_5^2\omega_9\omega_6c_s^2\omega_7\omega_4^2-84\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3+36\omega_8^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2+66\omega_8^2\omega_5^2v_1^2\omega_9\omega_6^2\omega_7\omega_4^2+12\omega_8\omega_5^2v_1^2\omega_9\omega_6^2\omega_7^2\omega_4^3+18\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_7\omega_4^3-12\omega_8^2\omega_5^2\omega_9\omega_6\omega_7^2\omega_4^2+12\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3+24\omega_8\omega_5^2\omega_9c_s^2\omega_7^2\omega_4^3-12\omega_8\omega_5^2v_1^2\omega_9\omega_6^2\omega_7^2\omega_4^2-18\omega_8^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3-18\omega_8^2\omega_5^2v_1^2\omega_9\omega_6^2\omega_7\omega_4^3+48\omega_8\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^2+12\omega_8^2\omega_5^2\omega_9\omega_6c_s^2\omega_7\omega_4^3+12\omega_8^2\omega_5^2v_1^2\omega_9\omega_6\omega_7^2\omega_4^2+12\omega_8^2\omega_5\omega_9\omega_6^2\omega_7\omega_4^2+24\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_4^3-12\omega_8^2\omega_5^2v_1^2\omega_6^2\omega_7\omega_4^3+24\omega_5^2\omega_9\omega_6c_s^2\omega_7^2\omega_4^3+3\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3+12\omega_8^2\omega_5^2\omega_6^2\omega_7\omega_4^3-24\omega_8^2\omega_5^2\omega_6\omega_7^2\omega_4^3-12\omega_8^2\omega_9\omega_6^2\omega_7^2\omega_4^2+6\omega_8^2\omega_5v_1^2\omega_9\omega_6^2\omega_7\omega_4^3+24\omega_8^2\omega_5^2\omega_6^2c_s^2\omega_7\omega_4^2-24\omega_8^2\omega_5^2\omega_6^2\omega_7\omega_4^2-66\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2+12\omega_8^2\omega_5^2\omega_6\omega_7^2\omega_4^3+24\omega_8^2\omega_5^2v_1^2\omega_6^2\omega_7\omega_4^2-36\omega_8^2\omega_5^2v_1^2\omega_9\omega_6^2\omega_7\omega_4+12\omega_8\omega_5^2\omega_9\omega_6\omega_7^2\omega_4^3-48\omega_8^2\omega_5^2\omega_9\omega_6^2c_s^2\omega_4^2+24\omega_8\omega_5^2\omega_6c_s^2\omega_7^2\omega_4^3-12\omega_8^2\omega_5^2v_1^2\omega_6\omega_7^2\omega_4^3-12\omega_8^2\omega_5^2\omega_6^2c_s^2\omega_7\omega_4^3+12\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7^2\omega_4-24\omega_8^2\omega_5^2\omega_9c_s^2\omega_7^2\omega_4^2-12\omega_8^2\omega_5v_1^2\omega_9\omega_6^2\omega_7\omega_4^2+6\omega_8^2\omega_9\omega_6^2\omega_7^2\omega_4^3+36\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_7\omega_4)\frac{v_1\rho v_2}{12\omega_8^2\omega_5^2\omega_9\omega_6^2\omega_7^2\omega_4^3}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x^3\mathrm{D}_y v_2}=C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^3\mathrm{D}_y v_2}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x^3\mathrm{D}_y v_2}=(-3\omega_5v_1^2+3\omega_5+\omega_5v_1^2\omega_7-\omega_5\omega_7+v_1^2\omega_7-9\omega_5c_s^2+3\omega_5c_s^2\omega_7+3c_s^2\omega_7-\omega_7)\frac{v_1\rho v_2}{12\omega_5\omega_7}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x^3\mathrm{D}_y v_2} = C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x^3\mathrm{D}_y v_2}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x^3\mathrm{D}_y v_2} = (3c_s^2\omega_4\omega_1 + 3c_s^2\omega_4 - 9c_s^2\omega_1 - 3v_1^2\omega_1 + v_1^2\omega_4 - \omega_4 + 3\omega_1 - \omega_4\omega_1 + v_1^2\omega_4\omega_1)\frac{v_1\rho v_2}{12\omega_4\omega_1}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x^3\mathrm{D}_y v_2} = (6\omega_3c_s^2\omega_1 + 2\omega_2\omega_3 - 4\omega_3\omega_1 + \omega_2v_1^2\omega_3 + v_1^2\omega_3\omega_1 + 6\omega_2\omega_1 - 6\omega_2v_1^2\omega_1 - 18\omega_2c_s^2\omega_1 + 9v_2^2\omega_3\omega_1 + 2\omega_2v_1^2\omega_3\omega_1 - 2\omega_2\omega_3\omega_1 - 9\omega_2v_2^2\omega_3 + 6\omega_2\omega_3c_s^2\omega_1)\frac{v_1\rho v_2}{24\omega_2\omega_3\omega_1}$

coefficient $C^{(2)}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho}$ **at** $\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = (24 - 46c_s^2\omega^2 + v_2^2\omega^3 - 14v_2^2\omega^2 + 5c_s^2\omega^3 + 36v_2^2\omega - 72c_s^2 + 108c_s^2\omega - 24v_2^2 - 36\omega + 14\omega^2 - \omega^3)\frac{v_2c_s^2}{12\omega^3}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = (18\omega_8^2v_1^2\omega_9\omega_6\omega_7\omega_4^3 + 12\omega_9v_2^2\omega_6^3c_s^2\omega_7\omega_4^3 + 12\omega_8\omega_9\omega_6^3c_s^2\omega_7\omega_4 + 12v_1^2\omega_9\omega_6^2\omega_7\omega_4^3 - 12\omega_8\omega_9v_2^2\omega_6^3c_s^2\omega_7\omega_4 - 12\omega_8^2\omega_9v_2^2\omega_6^2c_s^2\omega_4^2 + 36v_1^2\omega_9\omega_6^3c_s^2\omega_7\omega_4^3 + 12\omega_8^2v_1^2\omega_9v_2^2\omega_7\omega_4^3 + 12\omega_8^2\omega_9\omega_6^2c_s^2\omega_7\omega_4 + 12\omega_8^2v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^2 + 12\omega_8^2\omega_6^3c_s^2\omega_7\omega_4^2 - 12\omega_8v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^2 - 18\omega_8^2\omega_6^2c_s^4\omega_7\omega_4^3 - 72\omega_8v_1^2\omega_9\omega_6^3c_s^2\omega_7\omega_4 - 6\omega_8^2\omega_9\omega_6^2c_s^4\omega_7\omega_4^3 - 36\omega_8v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^2 + 12\omega_8\omega_6^3c_s^2\omega_7\omega_4^3 + 12\omega_8^2\omega_9\omega_6^3c_s^2\omega_7\omega_4^2 + 30\omega_8\omega_9\omega_6^3c_s^4\omega_7\omega_4^3 - 12\omega_8^2v_1^2\omega_9\omega_7\omega_4^3 - 12\omega_8^2v_1^2v_2^2\omega_6^3\omega_7\omega_4^2 - 12\omega_8^2v_1^2\omega_6^3\omega_4^2 + 12\omega_8v_1^2\omega_9\omega_6^3\omega_7\omega_4^3 + 24\omega_8v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^3 + 180\omega_8^2\omega_9\omega_6^3c_s^4\omega_7\omega_4 - 36v_1^2\omega_9\omega_6^3c_s^2\omega_7\omega_4^2 - 6\omega_8^2\omega_6^3c_s^2\omega_7\omega_4^3 - 18\omega_8^2v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^3 + 6\omega_8^2\omega_9v_2^2\omega_6^2c_s^2\omega_4^3 - 12\omega_8^2v_1^2\omega_9\omega_6\omega_7\omega_4^2 - 12\omega_9v_2^2\omega_6^3c_s^2\omega_7\omega_4^2 + 6\omega_8^2v_1^2v_2^2\omega_6^3\omega_7\omega_4^3 - 18\omega_8\omega_9\omega_6^2c_s^2\omega_7\omega_4^3 - 36\omega_8v_1^2\omega_9\omega_6^3\omega_7\omega_4^2 + 6\omega_8^2v_1^2\omega_6^3\omega_4^3 - 42\omega_8\omega_9\omega_6^3c_s^4\omega_7\omega_4^2 + 18\omega_8\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4^3 - \omega_8^2\omega_9\omega_6^3c_s^2\omega_7\omega_4^3 - 12\omega_8\omega_6^3c_s^2\omega_7\omega_4^2 + 36\omega_8\omega_6^2c_s^4\omega_7\omega_4^3 + 72\omega_8v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3 + 150\omega_8^2\omega_9\omega_6^2c_s^4\omega_7\omega_4^2 + 24\omega_8v_1^2\omega_9\omega_6^3\omega_7\omega_4 + 36\omega_8^2v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4^2 + 6\omega_8^2\omega_6^3c_s^2\omega_4^3 + 12\omega_8\omega_9\omega_6^3c_s^4\omega_7\omega_4 - 12\omega_8v_1^2\omega_6^2\omega_7\omega_4^3 + 6\omega_8^2\omega_6^2c_s^2\omega_7\omega_4^3 - 6\omega_8^2v_1^2v_2^2\omega_6^3\omega_4^3 - 36\omega_8^2\omega_6^3c_s^4\omega_7\omega_4^2 - 84\omega_8^2\omega_9\omega_6^2c_s^4\omega_7\omega_4 - 88\omega_8^2\omega_9\omega_6^3c_s^4\omega_7\omega_4^2 - 36\omega_8v_1^2\omega_9\omega_6^3c_s^2\omega_7\omega_4^3 - 36\omega_8\omega_6^3c_s^4\omega_7\omega_4^3 + 12\omega_8^2\omega_9\omega_6^2c_s^2\omega_4^2 + 2\omega_8^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3 - 12\omega_8v_1^2v_2^2\omega_6^3\omega_7\omega_4^3 - 6\omega_8\omega_9v_2^2\omega_6^3c_s^2\omega_7\omega_4^3 + 6\omega_8\omega_9\omega_6^3c_s^2\omega_7\omega_4^3 + 36\omega_8^2v_1^2\omega_9c_s^2\omega_7\omega_4^3 + 12\omega_8^2v_1^2v_2^2\omega_6^3\omega_4^2 + 18\omega_8^2\omega_6^3c_s^4\omega_7\omega_4^3 - 36v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3 + 12\omega_8v_1^2\omega_9\omega_6\omega_7\omega_4^3 - 12\omega_8^2\omega_9v_2^2\omega_6c_s^2\omega_7\omega_4^3 - 12\omega_8^2\omega_9\omega_6^3c_s^2\omega_7\omega_4 - 12\omega_8^2\omega_6^3c_s^2\omega_4^2 - 12\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4^3 - 54\omega_8^2v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4^3 - 18\omega_8\omega_9\omega_6^3c_s^2\omega_7\omega_4^2 - 42\omega_8\omega_9\omega_6^2c_s^4\omega_7\omega_4^3 + 18\omega_8\omega_9v_2^2\omega_6^3c_s^2\omega_7\omega_4^2 - 12v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^3 + 12\omega_8v_1^2v_2^2\omega_6^3\omega_7\omega_4^2 - 18\omega_8^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3 - 12\omega_8\omega_6^2c_s^2\omega_7\omega_4^3 + 6\omega_8^2v_1^2\omega_6^2\omega_7\omega_4^3 + 108\omega_8v_1^2\omega_9\omega_6^3c_s^2\omega_7\omega_4^2 + 36\omega_8\omega_6^3c_s^4\omega_7\omega_4^2 + 5\omega_8^2\omega_9\omega_6^3c_s^4\omega_7\omega_4^3 - 6\omega_8^2\omega_9\omega_6^2c_s^2\omega_4^3 - 12\omega_8^2v_2^2\omega_6^3c_s^2\omega_7\omega_4^2 + 36\omega_8^2v_1^2\omega_6^3c_s^2\omega_4^2 - 36\omega_8^2v_1^2\omega_9\omega_6^2c_s^2\omega_4^2 - 6\omega_8^2v_2^2\omega_6^3c_s^2\omega_4^3 + 12\omega_8v_1^2\omega_9\omega_6^2\omega_7\omega_4^2 - 6\omega_8^2v_1^2v_2^2\omega_6^2\omega_7\omega_4^3 - 36\omega_8^2\omega_9\omega_6c_s^4\omega_7\omega_4^3 - 12\omega_8^2v_1^2\omega_9v_2^2\omega_6^2\omega_4^2 - 12\omega_8^2v_1^2\omega_9v_2^2\omega_6^3\omega_7\omega_4 - 24\omega_8^2v_1^2\omega_9\omega_6^2\omega_7\omega_4 - 36\omega_8v_1^2\omega_9\omega_6^3c_s^2\omega_7\omega_4^3 + \omega_8^2\omega_9v_2^2\omega_6^3c_s^2\omega_7\omega_4^3 - 12\omega_8v_1^2\omega_9v_2^2\omega_6^3\omega_7\omega_4^3 + 12\omega_9\omega_6^3c_s^4\omega_7\omega_4^2 - 18\omega_8^2v_1^2\omega_6^2c_s^2\omega_7\omega_4^3 + 12v_1^2\omega_9\omega_6^3\omega_7\omega_4^2 + 12\omega_8^2v_1^2\omega_9\omega_6^2\omega_4^2 - 12\omega_8^2\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4 + 6\omega_8^2v_1^2\omega_9v_2^2\omega_6^2\omega_4^3 + 12\omega_8v_2^2\omega_6^2c_s^2\omega_7\omega_4^3 - 18\omega_8^2v_1^2\omega_6^3c_s^2\omega_4^3 + 18\omega_8^2v_1^2\omega_9\omega_6^2c_s^2\omega_4^3 + 12\omega_8^2v_2^2\omega_6^3c_s^2\omega_4^2 - 6\omega_8^2v_1^2\omega_9\omega_6^2\omega_4^3 - 12v_1^2\omega_9\omega_6^3\omega_7\omega_4^3 + 24\omega_8^2v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4 - 12\omega_9\omega_6^3c_s^4\omega_7\omega_4^3 + 36\omega_8v_1^2\omega_9v_2^2\omega_6^3\omega_7\omega_4^2 - 12\omega_8^2\omega_9v_2^2\omega_6^3c_s^2\omega_7\omega_4^2 + 36\omega_8v_1^2\omega_6^3c_s^2\omega_7\omega_4^3 - 6\omega_8^2v_2^2\omega_6^2c_s^2\omega_7\omega_4^3 - 24\omega_8^2v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^2 - 24\omega_8v_1^2\omega_9v_2^2\omega_6^3\omega_7\omega_4 + 36\omega_8^2\omega_6^3c_s^4\omega_4^2 - 12\omega_8v_2^2\omega_6^3c_s^2\omega_7\omega_4^3 + 36\omega_8^2\omega_9c_s^4\omega_7\omega_4^3 - 6\omega_8^2v_1^2\omega_9\omega_6^2\omega_7\omega_4^3 - 6\omega_8^2v_1^2\omega_6^3\omega_7\omega_4^3 + 12\omega_8^2\omega_9v_2^2\omega_6^3c_s^2\omega_7\omega_4 + 12\omega_8^2\omega_9\omega_6c_s^2\omega_7\omega_4^3 + 12v_1^2\omega_9v_2^2\omega_6^3\omega_7\omega_4^3 - 96\omega_8^2\omega_9\omega_6^3c_s^4\omega_7 + 18\omega_8^2\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4^2 - 12\omega_8^2v_1^2\omega_6^3\omega_7\omega_4^2 + 12\omega_9\omega_6^2c_s^4\omega_7\omega_4^3 + 12\omega_8^2\omega_9v_2^2c_s^2\omega_7\omega_4^3 - 72\omega_8^2v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^2 - 36\omega_8^2v_1^2\omega_6^3c_s^2\omega_7\omega_4^2 + 18\omega_8^2\omega_9\omega_6^2c_s^4\omega_4^3 + 24\omega_8^2v_1^2\omega_9\omega_6^2\omega_7\omega_4^2 + 12\omega_8^2v_1^2\omega_6^3\omega_7\omega_4^2 - 12v_1^2\omega_9v_2^2\omega_6^3\omega_7\omega_4^2 + 12\omega_8v_1^2v_2^2\omega_6^3\omega_7\omega_4^3 - 18\omega_8^2\omega_6^3c_s^4\omega_4^3 + 12\omega_8v_2^2\omega_6^3c_s^2\omega_7\omega_4^3 + 18\omega_8^2v_1^2\omega_6^3c_s^2\omega_7\omega_4^3 + 18\omega_8^2v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3 - 2\omega_8^2\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4^3 + 12\omega_8v_1^2\omega_6^3\omega_7\omega_4^3 + 36\omega_8v_1^2\omega_6^2c_s^2\omega_7\omega_4^3)\frac{v_2}{12\omega_8^2\omega_9\omega_6^3\omega_7\omega_4^3}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = (18\omega_8\omega_9v_2^2\omega_6^2\omega_7\omega_4^2 - 18\omega_8\omega_9\omega_6^2\omega_7\omega_4^2 + 54\omega_8\omega_9\omega_6^3c_s^2\omega_7\omega_4 + 12\omega_8^2\omega_9\omega_6^2\omega_4 - 6\omega_8^2\omega_6^3\omega_7\omega_4^2 + 54\omega_8^2\omega_9\omega_6^2c_s^2\omega_7\omega_4 + 18\omega_8^2\omega_6^3c_s^2\omega_7\omega_4^2 + 5\omega_8^2\omega_9\omega_6^3c_s^2\omega_7\omega_4^2 + 18\omega_8^2\omega_9v_2^2\omega_6^2\omega_7\omega_4 + 36\omega_8^2\omega_6^3c_s^2\omega_4 + 12\omega_9v_2^2\omega_6^3\omega_7\omega_4^2 + 54\omega_8\omega_9\omega_6^2c_s^2\omega_7\omega_4^2 - 36\omega_8^2\omega_9\omega_6^2c_s^2\omega_4 - 12\omega_8\omega_6^2\omega_7\omega_4^2 - 12\omega_8^2\omega_9v_2^2\omega_6^2\omega_4 + 2\omega_8^2\omega_9\omega_6^2\omega_7\omega_4^2 - 36\omega_8\omega_6^3c_s^2\omega_7\omega_4^2 + 12\omega_8\omega_9\omega_6^3\omega_7 - 18\omega_8^2\omega_9\omega_6^2\omega_7\omega_4 + 12\omega_8v_2^2\omega_6^2\omega_7\omega_4^2 + 36\omega_8\omega_6^3c_s^2\omega_7\omega_4 + 18\omega_8^2\omega_9\omega_6^2c_s^2\omega_4^2 + 36\omega_8\omega_6^2c_s^2\omega_7\omega_4^2 + 12\omega_9\omega_6^2\omega_7\omega_4^2 + 6\omega_8^2\omega_9v_2^2\omega_6^2\omega_4^2 - 36\omega_8\omega_9\omega_6^3c_s^2\omega_7 - 2\omega_8^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^2 - 18\omega_8^2\omega_6^2c_s^2\omega_7\omega_4^2 - 40\omega_8^2\omega_9\omega_6^3c_s^2\omega_7\omega_4 - 12\omega_9v_2^2\omega_6^3\omega_7\omega_4 - 18\omega_8^2\omega_6^3c_s^2\omega_4^2 + 36\omega_8^2\omega_9\omega_6^3c_s^2\omega_7 - 18\omega_8\omega_9\omega_6^3c_s^2\omega_7\omega_4^2 - 6\omega_8^2\omega_9\omega_6^2\omega_4^2 - 36\omega_8^2\omega_6^3c_s^2\omega_7\omega_4 - 6\omega_8^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^2 - 6\omega_8^2v_2^2\omega_6^2\omega_7\omega_4^2 + 12\omega_8^2\omega_6^3\omega_7\omega_4 - 36\omega_8\omega_9\omega_6c_s^2\omega_7\omega_4^2 - \omega_8^2\omega_9\omega_6^3\omega_7\omega_4^2 - 6\omega_8^2v_2^2\omega_6^3\omega_4^2 + 12\omega_8v_2^2\omega_6^3\omega_7\omega_4 + 12\omega_8^2\omega_9v_2^2\omega_6^3\omega_7 + 12\omega_8\omega_6^3\omega_7\omega_4^2 + 12\omega_9\omega_6^3\omega_7\omega_4 - 12\omega_8^2\omega_6^3\omega_4 - 12\omega_8^2\omega_9v_2^2\omega_6^3\omega_7\omega_4 + 36\omega_8^2\omega_9c_s^2\omega_7\omega_4^2 - 12\omega_8^2\omega_9\omega_6^3\omega_7 - 12\omega_8^2\omega_9v_2^2\omega_6\omega_7\omega_4^2 - 12\omega_9v_2^2\omega_6^2\omega_7\omega_4^2 - 36\omega_9\omega_6^3c_s^2\omega_7\omega_4 - 36\omega_9\omega_6^2c_s^2\omega_7\omega_4^2 + 6\omega_8\omega_9\omega_6^3\omega_7\omega_4^2 - 6\omega_8\omega_9v_2^2\omega_6^3\omega_7\omega_4^2 - 12\omega_8\omega_9v_2^2\omega_6^3\omega_7 + 6\omega_8^2\omega_6^2\omega_7\omega_4^2 - 12\omega_8^2v_2^2\omega_6^3\omega_7\omega_4 + 18\omega_8\omega_9v_2^2\omega_6^3\omega_7\omega_4 - 18\omega_8\omega_9\omega_6^3\omega_7\omega_4 - 12\omega_8\omega_9v_2^2\omega_6\omega_7\omega_4^2 + 6\omega_8^2v_2^2\omega_6^3\omega_7\omega_4^2 + 12\omega_8\omega_9\omega_6\omega_7\omega_4^2 + \omega_8^2\omega_9v_2^2\omega_6^3\omega_7\omega_4^2 - 12\omega_8^2\omega_9v_2^2\omega_6^2\omega_7 - 36\omega_8^2\omega_9\omega_6^2c_s^2\omega_7 - 12\omega_8^2\omega_9\omega_7\omega_4^2 + 36\omega_9\omega_6^3c_s^2\omega_7\omega_4^2 - 36\omega_8^2\omega_9\omega_6c_s^2\omega_7\omega_4^2 - 12\omega_9\omega_6^3\omega_7\omega_4^2 - 12\omega_8\omega_6^3\omega_7\omega_4 + 6\omega_8^2\omega_6^3\omega_4^2 + 12\omega_8^2\omega_9\omega_6^3\omega_7\omega_4 + 12\omega_8^2\omega_9v_2^2\omega_7\omega_4^2 + 12\omega_8^2v_2^2\omega_6^3\omega_4 + 12\omega_8^2\omega_9\omega_6\omega_7\omega_4^2 - 12\omega_8v_2^2\omega_6^3\omega_7\omega_4^2 + 12\omega_8^2\omega_9\omega_6^2\omega_7)\frac{v_2c_s^2}{12\omega_8^2\omega_9\omega_6^3\omega_7\omega_4^2}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = (12v_2^2\omega_6^2\omega_3^2 + 12\omega_2^2\omega_6^2\omega_3^2c_s^2 + \omega_3^2v_2^2\omega_6^2\omega_3^2 - \omega_3^2\omega_6^2\omega_3^2 + 6\omega_2^2v_2^2\omega_6^2\omega_3 - 36\omega_2^2\omega_3^2c_s^2 + 36\omega_2^2\omega_6\omega_3c_s^2 - 12\omega_2^2\omega_6\omega_3 - 36\omega_3^2\omega_6c_s^2 + 54\omega_3^2\omega_6\omega_3c_s^2 - 36\omega_2^2\omega_3^2c_s^2 - 12\omega_2^2v_2^2\omega_3^2 - 6\omega_2^2\omega_6\omega_3^2 - 36\omega_2^2\omega_6^2c_s^2 - 12\omega_2^2v_2^2\omega_6^2 + 36\omega_6^2\omega_3^2c_s^2 + 4\omega_2^2v_2^2\omega_6^2\omega_3^2 + 5\omega_3^2\omega_6^2\omega_3^2c_s^2 + 18\omega_2\omega_6^2\omega_3^2 - 12\omega_2^3v_2^2\omega_6^2\omega_3 + 12\omega_2^3\omega_6^2\omega_3 + 6\omega_2^2v_2^2\omega_6\omega_3^2 - 12\omega_6^2\omega_3^2 - 40\omega_2^3\omega_6^2\omega_3c_s^2 + 12\omega_2^2\omega_6^2 - 18\omega_2^3\omega_6\omega_3 - 54\omega_2\omega_6^2\omega_3^2c_s^2 - 12\omega_2^3v_2^2\omega_3 + 12\omega_2^3\omega_3 + 18\omega_2^3v_2^2\omega_6\omega_3 - 12\omega_2^3v_2^2\omega_6 + 12\omega_2^3\omega_6 - 18\omega_2^3\omega_6\omega_3^2c_s^2 + 36\omega_2^3\omega_3^2c_s^2 + 12\omega_2^2\omega_3^2 - 4\omega_2^2\omega_6^2\omega_3^2 - 6\omega_2^2\omega_6^2\omega_3 + 18\omega_2^2\omega_6\omega_3^2c_s^2 - 12\omega_2^3\omega_6^2 + 12\omega_2^3v_2^2\omega_6^2 + 36\omega_2^3\omega_6^2c_s^2 + 18\omega_2^2\omega_6^2\omega_3c_s^2 + 6\omega_2^3\omega_6\omega_3^2 - 12\omega_2^3\omega_3^2 - 6\omega_2^3v_2^2\omega_6\omega_3^2 + 12\omega_2^3v_2^2\omega_3^2 + 12\omega_2^2v_2^2\omega_6\omega_3 - 18\omega_2v_2^2\omega_6^2\omega_3^2)\frac{v_2c_s^2}{12\omega_2^3\omega_6^2\omega_3^2}$

$$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2\rho} = (-18\omega_2\omega_3c_s^4\omega_1^3 - 30\omega_2^3v_2^2\omega_3c_s^2\omega_1 - 90\omega_2^2\omega_3^2c_s^4\omega_1 + 30\omega_2^3\omega_3c_s^2\omega_1 + 72\omega_2^3c_s^4\omega_1^3 - 30\omega_2^2v_2^2\omega_3^2c_s^2\omega_1 - 54\omega_2v_1^4\omega_3^2\omega_1^2 - 6v_2^2\omega_3^2\omega_1^3 - 36\omega_2^2\omega_3c_s^2\omega_1^2 - 91\omega_2^3\omega_3^2c_s^4\omega_1^2 + 12\omega_2^2c_s^2\omega_1^3 - 108\omega_2^3c_s^4\omega_1^2 + 9\omega_2^3v_1^2\omega_3^2 + 6\omega_2^2v_2^2\omega_3^2\omega_1 + 45v_1^2v_2^2\omega_3^2\omega_1^3 + 90\omega_2^3c_s^4\omega_1^3 + 10\omega_2^3\omega_3^2c_s^4\omega_1^3 + 27\omega_2^2v_1^2\omega_3^2c_s^2\omega_1 - 54\omega_2v_1^4\omega_3^2\omega_1^3 - 135\omega_2^3v_1^2\omega_3^2c_s^2 - 6\omega_2^3\omega_3^2\omega_1 + 24\omega_2\omega_3^2c_s^2\omega_1^2 + 6\omega_2^3v_2^2\omega_3^2\omega_1 - 6\omega_2\omega_3^2\omega_1^2 + 270\omega_2^2v_1^2\omega_3^2c_s^2\omega_1^2 + 8\omega_2^2v_2^2\omega_3^2c_s^2\omega_1^3 - 6\omega_2v_2^2\omega_3^2c_s^2\omega_1^2 - 459\omega_2v_1^2\omega_3^2c_s^2\omega_1^3 + 12\omega_2^3\omega_3c_s^2\omega_1^3 + 99\omega_2v_1^2\omega_3^2\omega_1^2 + 35\omega_2^2\omega_3^2c_s^4\omega_1^3 - 12\omega_2^2v_2^2\omega_3^2\omega_1^2 - 12\omega_2^3v_2^2\omega_3c_s^2\omega_1^3 + 138\omega_2^2v_1^2\omega_3^2c_s^2\omega_1^3 + 18\omega_2^2v_2^2\omega_3^2c_s^2\omega_1^2 + 63\omega_2^3\omega_3^2c_s^4\omega_1 - 6\omega_2\omega_3^2\omega_1^3 - 45\omega_2^3v_1^2v_2^2\omega_3^2\omega_1 + 93\omega_2\omega_3^2c_s^2\omega_1^3 + 48\omega_2^3v_2^2\omega_3c_s^2\omega_1^2 - 48\omega_2^2\omega_3c_s^2\omega_1^2 + 54\omega_2^2\omega_3^2c_s^4\omega_1^2 + 99\omega_2v_1^2\omega_3^2\omega_1^3 - 21\omega_2v_2^2\omega_3^2c_s^2\omega_1^3 - 297\omega_2v_1^2\omega_3^2c_s^2\omega_1^2 + 18\omega_2^3\omega_3^2c_s^4 + 45\omega_2^3v_1^2v_2^2\omega_3^2 + 36\omega_2^3c_s^2\omega_1^2 + 18v_2^2\omega_3^2c_s^2\omega_1^3 + 12\omega_2^2\omega_3^2\omega_1^2 - 99v_1^2\omega_3^2\omega_1^3 - 36\omega_2^3v_2^2c_s^2\omega_1^2 - 54\omega_2^3v_1^4\omega_3^2 - 72\omega_2^3c_s^2\omega_1^3 + 54\omega_2^3v_1^4\omega_3^2\omega_1 - 138\omega_2^3v_1^2\omega_3^2c_s^2\omega_1^2 + 2\omega_2^3v_2^2\omega_3^2c_s^2\omega_1^3 - 2\omega_2^3\omega_3^2c_s^2\omega_1^3 + 6\omega_2^3\omega_1^3 + 6\omega_2\omega_3c_s^2\omega_1^3 + 27\omega_2^3v_1^2\omega_3^2\omega_1^2 + 27\omega_2^2v_1^4\omega_3^2\omega_1^3 - 90\omega_2^3\omega_3c_s^4\omega_1 + 18\omega_2^3v_2^2\omega_3^2c_s^2 + 48\omega_2^2\omega_3^2c_s^2\omega_1 + 24\omega_2^3v_2^2c_s^2\omega_1^3 + 405v_1^2\omega_3^2c_s^2\omega_1^3 - 24\omega_2^3c_s^2\omega_1^3 + 36\omega_2^2v_2^2\omega_3c_s^2\omega_1^2 - 6\omega_2v_2^2\omega_3c_s^2\omega_1^3 + 41\omega_2^3\omega_3^2c_s^2\omega_1^2 + 108\omega_2^2\omega_3c_s^4\omega_1^2 - 24\omega_2^3v_2^2\omega_3^2c_s^2\omega_1^2 - 36\omega_2^2c_s^4\omega_1^3 - 9\omega_2^2v_1^2\omega_3^2\omega_1 - 45\omega_2^2v_1^2v_2^2\omega_3^2\omega_1 + 54v_1^4\omega_3^2\omega_1^3 + 6\omega_2v_2^2\omega_3^2\omega_1^2 - 12\omega_2^2v_2^2c_s^2\omega_1^3 - 39\omega_2^3\omega_3^2c_s^2\omega_1 + 3\omega_2^3v_2^2\omega_3^2c_s^2\omega_1 - 117\omega_2\omega_3^2c_s^4\omega_1^3 - 90\omega_2^3v_1^2\omega_3^2\omega_1^2 + 90\omega_2^2v_1^2v_2^2\omega_3^2\omega_1^2 - 45\omega_2v_1^2v_2^2\omega_3^2\omega_1^3 - 9\omega_2^3v_1^2\omega_3^2\omega_1 - 54\omega_2^2\omega_3^2c_s^2\omega_1^2 + 144\omega_2^3\omega_3c_s^4\omega_1^2 - 27\omega_2^2v_1^2\omega_3^2\omega_1^3 - 18\omega_2\omega_3^2c_s^4\omega_1^2 + 189\omega_2^3v_1^2\omega_3^2c_s^2\omega_1 - 27\omega_2^3v_1^4\omega_3^2\omega_1^2 + 6\omega_2^3\omega_3^2 + 6\omega_2v_2^2\omega_3^2\omega_1^3 - 6\omega_2^3v_2^2\omega_3^2 - 25\omega_2^2\omega_3^2c_s^2\omega_1^3 - 36\omega_2^3\omega_3c_s^4\omega_1^3 - 6\omega_2^2\omega_3^2\omega_1 + 54\omega_2^2v_1^4\omega_3^2\omega_1 - 45\omega_2v_1^2v_2^2\omega_3^2\omega_1^2)\frac{v_2}{24\omega_2^3\omega_3^2\omega_1^3}$$

coefficient $C^{(2)}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1}$ **at** $\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2}$**:**

$$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1} = 0$$

$$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1} = (-2\omega_8^2\omega_5\omega_6^3\omega_7^2\omega_4^3 + 4\omega_8\omega_5\omega_6^3c_s^2\omega_7^2\omega_4^2 - 4\omega_5\omega_9\omega_6^3\omega_7^2\omega_4^3 + 2\omega_8^2\omega_5\omega_9\omega_6^3\omega_7\omega_4^2 - 24\omega_8^2\omega_5\omega_9\omega_6^3c_s^2\omega_7\omega_4^2 - 5\omega_8\omega_5\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^3 - 7\omega_8\omega_5\omega_9\omega_6^2\omega_7^2\omega_4^3 + 4\omega_8^2\omega_9\omega_6^3c_s^2\omega_7\omega_4^2 - 4\omega_8\omega_5\omega_6^3\omega_7^2\omega_4^2 + 2\omega_8^2\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^2 - 2\omega_8^2\omega_5\omega_6^2c_s^2\omega_7^2\omega_4^3 + 11\omega_8\omega_5\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^2 + 8\omega_8^2\omega_5\omega_9\omega_6^3c_s^2\omega_7\omega_4^3 + 4\omega_5\omega_9\omega_6^3\omega_7^2\omega_4^2 - 4\omega_5\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^3 - \omega_8^2\omega_5\omega_9\omega_6^3\omega_7\omega_4^3 - 2\omega_8^2\omega_5\omega_9\omega_6^2\omega_7^2\omega_4 - 4\omega_8\omega_5\omega_6^3c_s^2\omega_7^2\omega_4^3 + 4\omega_8^2\omega_5\omega_6^3\omega_7^2\omega_4^2 - \omega_8^2\omega_5\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^2 - 15\omega_8^2\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^3 + 4\omega_8\omega_5\omega_6^3\omega_7^2\omega_4^3 - 2\omega_8^2\omega_9\omega_6^3c_s^2\omega_7\omega_4^3 - 8\omega_5\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3 - 2\omega_8^2\omega_5v_2^2\omega_6^2\omega_7^2\omega_4^3 + 2\omega_8\omega_5\omega_9\omega_6^2\omega_7^2\omega_4^2 + 4\omega_8^2\omega_5v_2^2\omega_6^3\omega_7\omega_4^2 - 2\omega_8^2\omega_5\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^3 + 4\omega_8\omega_5\omega_6^2c_s^2\omega_7^2\omega_4^3 + 2\omega_8^2\omega_5\omega_6^3c_s^2\omega_7^2\omega_4^3 - 4\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7\omega_4^3 + 2\omega_8\omega_5\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2 - 6\omega_8\omega_5\omega_9\omega_6^3c_s^2\omega_7^2\omega_4 - 2\omega_8\omega_5\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^2 + 2\omega_8^2\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4^2 + 8\omega_5\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^3 + 4\omega_8\omega_5v_2^2\omega_6^2\omega_7^2\omega_4^3 + 3\omega_8^2\omega_5\omega_9\omega_6^2\omega_7^2\omega_4^2 + 2\omega_8^2\omega_5\omega_9v_2^2\omega_6^3\omega_7^2\omega_4 - 4\omega_8^2\omega_5\omega_6^3c_s^2\omega_7^2\omega_4^2 + 13\omega_8\omega_5\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3 + 8\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7\omega_4^2 + 4\omega_8^2\omega_5\omega_9\omega_6^3c_s^2\omega_4^2 - 2\omega_8^2\omega_5v_2^2\omega_6^3\omega_7\omega_4^3 - \omega_8^2\omega_5\omega_9\omega_6^2\omega_7^2\omega_4^3 - 5\omega_8^2\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 - 8\omega_5\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^2 + 12\omega_8^2\omega_5\omega_9\omega_6^3c_s^2\omega_7\omega_4 + 7\omega_8\omega_5\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^3 - 4\omega_8\omega_5\omega_6^2\omega_7^2\omega_4^3 - 4\omega_8^2\omega_9\omega_6^3c_s^2\omega_7^2\omega_4 - \omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^2 + 4\omega_8^2\omega_5\omega_6^3c_s^2\omega_7\omega_4^2 - 9\omega_8\omega_5\omega_9\omega_6^3\omega_7^2\omega_4^2 + 2\omega_8^2\omega_5v_2^2\omega_6^3\omega_7^2\omega_4^3 + 4\omega_5\omega_9v_2^2\omega_6^3\omega_7^2\omega_4^3 - 16\omega_8^2\omega_5\omega_9\omega_6^3c_s^2\omega_7^2 - 6\omega_8\omega_5\omega_9v_2^2\omega_6^3\omega_7^2\omega_4 - 2\omega_8^2\omega_5\omega_9\omega_6\omega_7^2\omega_4^2 - 3\omega_8^2\omega_5\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^2 + 26\omega_8^2\omega_5\omega_9\omega_6^3c_s^2\omega_7^2\omega_4 - 2\omega_8^2\omega_5\omega_9\omega_6^3\omega_7^2\omega_4 + 3\omega_8\omega_5\omega_9\omega_6^3\omega_7^2\omega_4^3 - 4\omega_8^2\omega_5v_2^2\omega_6^3\omega_7^2\omega_4^2 + 3\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7^2\omega_4^3 - 2\omega_8^2\omega_5\omega_6^3c_s^2\omega_7\omega_4^3 + 4\omega_8^2\omega_5\omega_9v_2^2\omega_7^2\omega_4^3 + 2\omega_8^2\omega_5\omega_6^2\omega_7^2\omega_4^3 - 4\omega_8\omega_5\omega_9v_2^2\omega_6\omega_7^2\omega_4^3 + \omega_8^2\omega_5\omega_9v_2^2\omega_6^2\omega_7^2\omega_4^3 + 5\omega_8^2\omega_5\omega_9\omega_6\omega_7^2\omega_4^3 - 4\omega_5\omega_9v_2^2\omega_6^3\omega_7^2\omega_4^2 + 4\omega_5\omega_9\omega_6^2\omega_7^2\omega_4^3 + 4\omega_8\omega_5v_2^2\omega_6^3\omega_7^2\omega_4^2 - 3\omega_8\omega_5\omega_9v_2^2\omega_6^3\omega_7^2\omega_4^3 - 2\omega_8^2\omega_5\omega_9v_2^2\omega_6^3\omega_7^2\omega_4^2 - 4\omega_8^2\omega_5\omega_6^3\omega_7\omega_4^2 - 4\omega_8^2\omega_5\omega_9\omega_7^2\omega_4^3 + 4\omega_8\omega_5\omega_9\omega_6\omega_7^2\omega_4^3 + 2\omega_8^2\omega_5\omega_6^3\omega_7\omega_4^3 + \omega_8^2\omega_5\omega_9v_2^2\omega_6^3\omega_7\omega_4^3 + 9\omega_8\omega_5\omega_9v_2^2\omega_6^3\omega_7^2\omega_4^2 + 12\omega_8^2\omega_5\omega_9c_s^2\omega_7^2\omega_4^3 - 8\omega_8^2\omega_5\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^2 + 2\omega_8^2\omega_5\omega_9v_2^2\omega_6^2\omega_7^2\omega_4 + \omega_8^2\omega_5\omega_9\omega_6^3\omega_7^2\omega_4^2 - 4\omega_8\omega_5v_2^2\omega_6^3\omega_7^2\omega_4^3 + 2\omega_8^2\omega_9\omega_6^3c_s^2\omega_7^2\omega_4^2 - 6\omega_8^2\omega_5\omega_9\omega_6^2c_s^2\omega_7^2\omega_4 + 6\omega_8\omega_5\omega_9\omega_6^3\omega_7^2\omega_4 - 8\omega_8\omega_5\omega_9\omega_6c_s^2\omega_7^2\omega_4^3)\frac{v_1\rho v_2}{2\omega_8^2\omega_5\omega_9\omega_6^3\omega_7^2\omega_4^3}$$

$$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1}$$

$$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1} = 0$$

$$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1} = 0$$

$$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1} = 0$$

$$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_1} = (100\omega_2^2v_1^2\omega_3\omega_1^3 + 135\omega_2^3\omega_3c_s^2\omega_1 - 27\omega_2v_2^2\omega_3\omega_1^3 - 18\omega_2^2\omega_3\omega_1 + 162\omega_2^2\omega_3c_s^2\omega_1^2 + 36\omega_2^2v_2^2\omega_1^2 - 36\omega_2v_2^2\omega_3\omega_1^2 + 108\omega_2^2c_s^2\omega_1^2 + 216\omega_2^3v_1^2\omega_3\omega_1 + 18\omega_2\omega_3^2 + 84\omega_2^2\omega_3c_s^2\omega_1^3 - 100\omega_2^3v_1^2\omega_3\omega_1^2 - 54\omega_2^3\omega_3c_s^2 - 46\omega_2^2\omega_3\omega_1^3 - 198\omega_2^3v_1^2\omega_3 + 162\omega_2^2v_1^2\omega_3\omega_1 + 270\omega_3c_s^2\omega_1^3 - 54\omega_2^2\omega_3\omega_1^2 + 198v_1^2\omega_3\omega_1^3 - 54\omega_2^2\omega_3c_s^2\omega_1 - 84\omega_2^3\omega_3c_s^2\omega_1^2 - 126\omega_3\omega_1^3 + 135\omega_2\omega_3\omega_1^3 - 162\omega_2\omega_3c_s^2\omega_1^2 + 36\omega_2^3v_2^2\omega_3 - 216\omega_2v_1^2\omega_3\omega_1^3 + 54\omega_2^3\omega_3 - 297\omega_2\omega_3c_s^2\omega_1^3 - 27\omega_2^3v_2^2\omega_3\omega_1 - 81\omega_2^3\omega_3\omega_1 + 90\omega_2\omega_3\omega_1^2 - 162\omega_2v_1^2\omega_3\omega_1^2 + 54\omega_2^2v_2^2\omega_3\omega_1^2 - 36\omega_2^2v_2^2\omega_3\omega_1 + 46\omega_2^3\omega_3\omega_1^2 - 54\omega_2c_s^2\omega_1^3 - 18\omega_2^3v_2^2\omega_1 + 18\omega_2^3\omega_1 - 36\omega_2^2\omega_1^2 - 54\omega_2^3c_s^2\omega_1 + 36v_2^2\omega_3\omega_1^3 - 18\omega_2v_2^2\omega_1^3)\frac{v_1\rho v_2}{24\omega_2^3\omega_3\omega_1^3}$$

coefficient $C^{(2)}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2}$ **at** $\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2}$**:**

$$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2} = (-24 + 8c_s^2\omega^2 + 36v_2^2\omega^2 - c_s^2\omega^3 - 108v_2^2\omega + 12c_s^2 - 18c_s^2\omega + 72v_2^2 + 36\omega - 12\omega^2)\frac{\rho c_s^2}{12\omega^3}$$

$$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2v_2} = (18\omega_8^2v_1^2\omega_9\omega_6\omega_7\omega_4^3 - 24\omega_9v_2^2\omega_6^3c_s^2\omega_7\omega_4^3 - 12\omega_8\omega_9\omega_6^3c_s^2\omega_7\omega_4 + 12v_1^2\omega_9\omega_6^2\omega_7\omega_4^3 + 60\omega_8\omega_9v_2^2\omega_6^3c_s^2\omega_7\omega_4 - 36\omega_8^2\omega_9v_2^2\omega_6^2c_s^2\omega_4^2 + 12v_1^2\omega_9\omega_6^3c_s^2\omega_7\omega_4^3 + 36\omega_8^2v_1^2\omega_9v_2^2\omega_7\omega_4^3 + 12\omega_8^2\omega_9\omega_6^2c_s^2\omega_7\omega_4 + 36\omega_8^2v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^2 + 12\omega_8^2\omega_6^3c_s^2\omega_7\omega_4^2 - 36\omega_8v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^2 - 6\omega_8^2\omega_6^2c_s^4\omega_7\omega_4^3 - 24\omega_8v_1^2\omega_9\omega_6^3c_s^2\omega_7\omega_4 - 6\omega_8^2\omega_9\omega_6^2c_s^4\omega_7\omega_4^3 - 12\omega_8v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^2 + 12\omega_8\omega_6^3c_s^2\omega_7\omega_4^3 + 60\omega_8\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4^2 + 12\omega_8\omega_9\omega_6^3c_s^4\omega_7\omega_4^3 - 12\omega_8^2v_1^2\omega_9\omega_7\omega_4^3 - 12\omega_8\omega_9\omega_6^2c_s^2\omega_7\omega_4^2 - 36\omega_8^2v_1^2v_2^2\omega_6^3\omega_7\omega_4^2 - 12\omega_8^2v_1^2\omega_6^3\omega_4^2 + 12\omega_8v_1^2\omega_9\omega_6^3\omega_7\omega_4^3 + 72\omega_8v_1^2\omega_9v_2^2\omega_6^2\omega_7\omega_4^3 + 18\omega_8^2\omega_9\omega_6^3c_s^4\omega_7\omega_4 - 12v_1^2\omega_9\omega_6^3c_s^2\omega_7\omega_4^2 - 6\omega_8^2\omega_6^3c_s^2\omega_7\omega_4^3 - 54\omega_8^2v_1^2\omega_9v_2^2\omega_6\omega_7\omega_4^3 + 18\omega_8^2\omega_9v_2^2\omega_6^2c_s^2\omega_4^3 - 12\omega_8^2v_1^2\omega_9\omega_6\omega_7\omega_4^2 + 24\omega_9v_2^2\omega_6^3c_s^2\omega_7\omega_4^2 + 18\omega_8^2v_1^2v_2^2\omega_6^3\omega_7\omega_4^3 + 12\omega_8\omega_9\omega_6^2c_s^2\omega_7\omega_4^3 - 36\omega_8v_1^2\omega_9\omega_6^3\omega_7\omega_4^2 + 6\omega_8^2v_1^2\omega_6^3\omega_4^3 - 24\omega_8\omega_9\omega_6^3c_s^4\omega_7\omega_4^2 - 144\omega_8\omega_9v_2^2\omega_6^2c_s^2\omega_7\omega_4^3 - 48\omega_8^2\omega_9v_2^2\omega_6^3c_s^2\omega_7 - 12\omega_8\omega_6^3c_s^2\omega_7\omega_4^2 + 12\omega_8\omega_6^2c_s^4\omega_7\omega_4^3 + 24\omega_8v_1^2\omega_9\omega_6^2c_s^2\omega_7\omega_4^3 + 24\omega_8^2\omega_9\omega_6^2c_s^4\omega_7\omega_4^2 + 24\omega_8v_1^2\omega_9\omega_6^3\omega_7\omega_4 + 12\omega_8^2v_1^2\omega_9\omega_6c_s^2\omega_7\omega_4^2 + 6\omega_8^2\omega_6^3c_s^2\omega_4^3 + 12\omega_8\omega_9\omega_6^3c_s^4\omega_7\omega_4 -$$

$$12\omega_8 v_1^2\omega_6^2\omega_7\omega_4^3 - 108\omega_8^2\omega_9 v_2^2\omega_6 c_s^2\omega_7\omega_4^2 + 6\omega_8^2\omega_6^2 c_s^2\omega_7\omega_4^3 - 18\omega_8^2 v_1^2 v_2^2\omega_6^3\omega_4^3 - 12\omega_8^2\omega_6^3 c_s^4\omega_7\omega_4^2 - 12\omega_8^2\omega_9\omega_6^2 c_s^4\omega_7\omega_4 - 4\omega_8^2\omega_9\omega_6^3 c_s^4\omega_7\omega_4^2 -
12\omega_8 v_1^2\omega_9\omega_6^3 c_s^2\omega_7\omega_4^3 - 12\omega_8\omega_6^3 c_s^4\omega_7\omega_4^3 + 12\omega_8^2\omega_9\omega_6^2 c_s^2\omega_4^2 + 6\omega_8^2\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 - 36\omega_8 v_1^2 v_2^2\omega_6^3\omega_7\omega_4^3 + 78\omega_8\omega_9 v_2^2\omega_6^3 c_s^2\omega_7\omega_4^3 + 12\omega_8\omega_9\omega_6^2 c_s^4\omega_7\omega_4^2 -
12\omega_8\omega_9\omega_6^3 c_s^2\omega_7\omega_4^3 + 12\omega_8^2 v_1^2\omega_9 c_s^2\omega_7\omega_4^3 + 36\omega_8^2 v_1^2 v_2^2\omega_6^3\omega_4^2 + 6\omega_8^2\omega_6^3 c_s^4\omega_7\omega_4^3 - 12 v_1^2\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 + 12\omega_8 v_1^2\omega_9\omega_6\omega_7\omega_4^3 + 18\omega_8^2\omega_9 v_2^2\omega_6 c_s^2\omega_7\omega_4^3 -
12\omega_8^2\omega_6^3 c_s^2\omega_4^2 + 24\omega_9 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^3 - 18\omega_8^2 v_1^2\omega_9\omega_6 c_s^2\omega_7\omega_4^3 + 24\omega_8\omega_9\omega_6^3 c_s^2\omega_7\omega_4^2 - 12\omega_8\omega_9\omega_6^2 c_s^4\omega_7\omega_4^3 - 132\omega_8\omega_9 v_2^2\omega_6^3 c_s^2\omega_7\omega_4^2 -
36 v_1^2\omega_9 v_2^2\omega_6^2\omega_7\omega_4^3 + 36\omega_8 v_1^2 v_2^2\omega_6^3\omega_7\omega_4^2 - 24\omega_8^2\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2 - 12\omega_8\omega_6^2 c_s^2\omega_7\omega_4^3 + 6\omega_8^2 v_1^2\omega_6^2\omega_7\omega_4^3 + 36\omega_8 v_1^2\omega_9\omega_6^3 c_s^2\omega_7\omega_4^2 + 12\omega_8\omega_6^3 c_s^4\omega_7\omega_4^2 -
\omega_8^2\omega_9\omega_6^3 c_s^4\omega_7\omega_4^3 - 6\omega_8^2\omega_9\omega_6^2 c_s^2\omega_4^3 - 36\omega_8^2 v_2^2\omega_6^3 c_s^2\omega_7\omega_4^2 + 12\omega_8^2 v_1^2\omega_6^3 c_s^2\omega_4^2 - 12\omega_8^2 v_1^2\omega_9\omega_6^2 c_s^2\omega_4^2 - 18\omega_8^2 v_2^2\omega_6^3 c_s^2\omega_4^3 + 12\omega_8 v_1^2\omega_9\omega_6^2\omega_7\omega_4^2 -
18\omega_8^2 v_1^2 v_2^2\omega_6^2\omega_7\omega_4^3 + 6\omega_8^2\omega_9\omega_6 c_s^4\omega_7\omega_4^3 - 36\omega_8^2 v_1^2\omega_9 v_2^2\omega_6^2\omega_4^2 - 24\omega_8^2 v_1^2\omega_9\omega_6^2\omega_7\omega_4 - 12\omega_8 v_1^2\omega_6^3 c_s^2\omega_7\omega_4^3 - 36\omega_8 v_1^2\omega_9 v_2^2\omega_6^3\omega_7\omega_4^3 -
6\omega_8^2 v_1^2\omega_6^2 c_s^2\omega_7\omega_4^3 + 12 v_1^2\omega_9\omega_6^3\omega_7\omega_4^2 + 12\omega_8^2 v_1^2\omega_9\omega_6^2\omega_4^2 - 84\omega_8^2\omega_9 v_2^2\omega_6^2 c_s^2\omega_7\omega_4 + 18\omega_8^2 v_1^2\omega_9 v_2^2\omega_6^2\omega_4^3 + 36\omega_8 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^3 - 12\omega_8 v_1^2\omega_9\omega_6 c_s^2\omega_7\omega_4^3 -
12\omega_8^2\omega_9\omega_6 c_s^4\omega_7\omega_4^2 - 24\omega_8 v_1^2\omega_9\omega_6^2\omega_7\omega_4^3 + 24\omega_8^2 v_1^2\omega_9\omega_6^2 c_s^2\omega_7\omega_4 + 72\omega_8\omega_9 v_2^2\omega_6 c_s^2\omega_7\omega_4^3 + 18\omega_8^2 v_2^2\omega_6^3 c_s^2\omega_7\omega_4^3 - 6\omega_8^2 v_1^2\omega_6^3 c_s^2\omega_4^3 +
6\omega_8^2 v_1^2\omega_9\omega_6^2 c_s^2\omega_4^3 + 36\omega_8^2 v_2^2\omega_6^3 c_s^2\omega_4^2 - 6\omega_8^2 v_1^2\omega_9\omega_6^2\omega_4^3 - 12 v_1^2\omega_9\omega_6^3\omega_7\omega_4^3 + 72\omega_8^2 v_1^2\omega_9 v_2^2\omega_6^2\omega_7\omega_4 + 108\omega_8 v_1^2\omega_9 v_2^2\omega_6^3\omega_7\omega_4^2 - 42\omega_8^2\omega_9 v_2^2\omega_6^3 c_s^2\omega_7\omega_4^2 +
12\omega_8 v_1^2\omega_6^3 c_s^2\omega_7\omega_4^2 - 18\omega_8^2 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^3 - 72\omega_8^2 v_1^2\omega_9 v_2^2\omega_6^2\omega_7\omega_4^2 - 72\omega_8 v_1^2\omega_9 v_2^2\omega_6^3\omega_7\omega_4 + 12\omega_8^2\omega_6^3 c_s^4\omega_4^2 - 36\omega_8 v_2^2\omega_6^3 c_s^2\omega_7\omega_4^3 - 6\omega_8^2 v_1^2\omega_9\omega_6^2\omega_7\omega_4^3 -
6\omega_8^2 v_1^2\omega_6^3\omega_7\omega_4^3 + 84\omega_8^2\omega_9 v_2^2\omega_6^3 c_s^2\omega_7\omega_4 - 6\omega_8^2\omega_9\omega_6 c_s^2\omega_7\omega_4^3 + 36 v_1^2\omega_9 v_2^2\omega_6^3\omega_7\omega_4^3 - 12\omega_8^2\omega_9\omega_6^3 c_s^4\omega_7 + 180\omega_8^2\omega_9 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^2 - 12\omega_8 v_1^2\omega_6^3\omega_7\omega_4^2 -
24\omega_8^2 v_1^2\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2 - 12\omega_8^2 v_1^2\omega_6^3 c_s^2\omega_7\omega_4^2 + 6\omega_8^2\omega_9\omega_6^2 c_s^4\omega_4^3 + 12\omega_8^2\omega_9\omega_6 c_s^2\omega_7\omega_4^2 + 24\omega_8^2 v_1^2\omega_9\omega_6^2\omega_7\omega_4^2 + 12\omega_8^2 v_1^2\omega_6^3\omega_7\omega_4^2 - 36 v_1^2\omega_9 v_2^2\omega_6^3\omega_7\omega_4^2 +
36\omega_8 v_1^2 v_2^2\omega_6^2\omega_7\omega_4^3 - 6\omega_8^2\omega_6^3 c_s^4\omega_4^3 + 36\omega_8 v_2^2\omega_6^3 c_s^2\omega_7\omega_4^2 + 18\omega_8^2 v_1^2\omega_9 v_2^2\omega_6^2\omega_7\omega_4^3 - 36\omega_8 v_1^2\omega_9 v_2^2\omega_6\omega_7\omega_4^3 - 12\omega_8^2\omega_9\omega_6^2 c_s^4\omega_4^2 + 6\omega_8^2 v_1^2\omega_6^3 c_s^2\omega_7\omega_4^3 +
6\omega_8^2 v_1^2\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 - 18\omega_8^2\omega_9 v_2^2\omega_6^2 c_s^2\omega_7\omega_4^3 + 12\omega_8 v_1^2\omega_6^3\omega_7\omega_4^3 + 12\omega_8 v_1^2\omega_6^2 c_s^2\omega_7\omega_4^3)\frac{\rho}{12\omega_8^2\omega_9\omega_6^3\omega_7\omega_4^3}$$

$$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2}$$

$$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2} = (12\omega_6^2 c_s^2\omega_7\omega_4^2 - 12\omega_9\omega_6 c_s^2\omega_7\omega_4^3 + 12\omega_8\omega_9\omega_6\omega_4^2 - 6\omega_8\omega_6^2\omega_7\omega_4^3 - 12\omega_6^2\omega_7\omega_4^2 - 4\omega_8\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2 + 36 v_2^2\omega_6^2\omega_7\omega_4^2 + 12\omega_6^2\omega_7\omega_4^3 -
6\omega_8\omega_9\omega_6\omega_4^3 + 12\omega_8\omega_6^2\omega_7\omega_4^2 - 12\omega_9\omega_6^2\omega_7\omega_4 + 12\omega_9\omega_6 c_s^2\omega_7\omega_4^2 - 12\omega_6^2 c_s^2\omega_7\omega_4^3 - \omega_8\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 - 36 v_2^2\omega_6^2\omega_7\omega_4^3 + 12\omega_8\omega_6^2 c_s^2\omega_4^2 + 12\omega_8\omega_9\omega_7\omega_4^2 -
36\omega_8 v_2^2\omega_6^2\omega_7\omega_4^2 + 36\omega_8 v_2^2\omega_6^2\omega_4^2 - 36\omega_9 v_2^2\omega_6\omega_7\omega_4^3 + 6\omega_8\omega_6^2\omega_4^3 - 12\omega_8\omega_6^2 c_s^2\omega_7\omega_4^2 + 24\omega_9\omega_6^2\omega_7\omega_4^2 + 36\omega_9 v_2^2\omega_6\omega_7\omega_4^2 + 18\omega_8 v_2^2\omega_6^2\omega_7\omega_4^3 -
18\omega_8 v_2^2\omega_6^2\omega_4^3 - 6\omega_8\omega_9\omega_7\omega_4^3 - 6\omega_8\omega_6^2 c_s^2\omega_4^3 + 18\omega_8\omega_9\omega_6^2 c_s^2\omega_7\omega_4 - 12\omega_9\omega_6^2\omega_7\omega_4^3 + 6\omega_8\omega_6^2 c_s^2\omega_7\omega_4^3 - 12\omega_8\omega_6^2\omega_4^2 + 6\omega_8\omega_9\omega_6 c_s^2\omega_4^3 + 36\omega_9 v_2^2\omega_6^2\omega_7\omega_4^3 +
24\omega_8\omega_9\omega_6 c_s^2\omega_7\omega_4^2 - 36\omega_8\omega_9 v_2^2\omega_6\omega_4^2 - 12\omega_8\omega_9 c_s^2\omega_7\omega_4^2 - 12\omega_9\omega_6\omega_7\omega_4^2 + 12\omega_9\omega_6^2 c_s^2\omega_7\omega_4^3 + 18\omega_8\omega_9 v_2^2\omega_6\omega_4^3 - 6\omega_8\omega_9\omega_6 c_s^2\omega_7\omega_4^3 -
18\omega_8 v_2^2\omega_6\omega_7\omega_4^3 - 72\omega_9 v_2^2\omega_6^2\omega_7\omega_4^2 - 12\omega_8\omega_9\omega_6 c_s^2\omega_4^2 - 24\omega_9\omega_6^2 c_s^2\omega_7\omega_4^2 + 12\omega_9\omega_6\omega_7\omega_4^3 + 12\omega_6 c_s^2\omega_7\omega_4^3 + 12\omega_8\omega_9\omega_6\omega_7\omega_4 + 6\omega_8\omega_9 c_s^2\omega_7\omega_4^3 -
36\omega_8\omega_9 v_2^2\omega_6\omega_7\omega_4 + 12\omega_9\omega_6^2 c_s^2\omega_7\omega_4 - 36\omega_8\omega_9 v_2^2\omega_7\omega_4^2 + 6\omega_8\omega_6\omega_7\omega_4^3 + 72\omega_8\omega_9 v_2^2\omega_6\omega_7\omega_4^2 - 24\omega_8\omega_9\omega_6\omega_7\omega_4^2 + 36\omega_9 v_2^2\omega_6^2\omega_7\omega_4 - 6\omega_8\omega_6 c_s^2\omega_7\omega_4^3 -
18\omega_8\omega_9 v_2^2\omega_6\omega_7\omega_4^3 + 6\omega_8\omega_9\omega_6\omega_7\omega_4^3 + 18\omega_8\omega_9 v_2^2\omega_7\omega_4^3 - 12\omega_8\omega_9\omega_6^2 c_s^2\omega_7 - 12\omega_6\omega_7\omega_4^3 - 12\omega_8\omega_9\omega_6 c_s^2\omega_7\omega_4 + 36 v_2^2\omega_6\omega_7\omega_4^3)\frac{\rho c_s^2}{12\omega_8\omega_9\omega_6^2\omega_7\omega_4^3}$$

$$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2} = C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2}$$

$$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2} = (36\omega_2 v_2^2\omega_6\omega_3^2 - 24\omega_2^2\omega_3^2 c_s^2 + 18\omega_2^2\omega_6\omega_3 c_s^2 + 36\omega_2^2 v_2^2\omega_3 + 12\omega_2^2\omega_3^3 c_s^2 + 36 v_2^2\omega_3^3 - 24\omega_2\omega_3^2 + 12\omega_2\omega_6\omega_3^2 c_s^2 - 72\omega_2^2 v_2^2\omega_3^2 -
36\omega_2 v_2^2\omega_6\omega_3 + 12\omega_6\omega_3^2 + 12\omega_3^3 c_s^2 + 36\omega_2^2 v_2^2\omega_3^3 + 24\omega_2\omega_3^3 - 12\omega_2^2\omega_6 c_s^2 - 24\omega_2\omega_3^3 c_s^2 - 12\omega_2\omega_6\omega_3^2 + 72\omega_2 v_2^2\omega_3^2 - \omega_2^2\omega_6\omega_3^3 c_s^2 - 12\omega_2^2\omega_3^3 - 12\omega_3^3 -
12\omega_6\omega_3^2 c_s^2 - 12\omega_2\omega_6\omega_3 c_s^2 + 24\omega_2^2\omega_3^2 - 72\omega_2 v_2^2\omega_3^3 - 12\omega_2^2\omega_3 - 4\omega_2^2\omega_6\omega_3^2 c_s^2 + 24\omega_2\omega_3^2 c_s^2 + 12\omega_2\omega_6\omega_3 - 36 v_2^2\omega_6\omega_3^2 + 12\omega_2^2\omega_3 c_s^2)\frac{\rho c_s^2}{12\omega_2^2\omega_6\omega_3^3}$$

$$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2} = (-54\omega_2^3 v_1^4\omega_3\omega_1^2 + 6\omega_2\omega_3 c_s^4\omega_1^3 - 54\omega_2^2 v_1^2\omega_3\omega_1^3 + 126\omega_2^3 v_2^2\omega_3 c_s^2\omega_1 - 30\omega_2^2\omega_3^2 c_s^4\omega_1 - 30\omega_2^3\omega_3 c_s^2\omega_1 - 90\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1 +
108\omega_2^3 v_1^2 c_s^2\omega_1^2 - 18 v_2^2\omega_3^2\omega_1^3 - 60\omega_2^2\omega_3 c_s^2\omega_1^2 - 10\omega_2^3\omega_3^2 c_s^4\omega_1^2 - 9\omega_2^3 v_1^2\omega_3^2 + 18\omega_2^3 v_1^2\omega_3 c_s^2\omega_1 + 18\omega_2^2 v_2^2\omega_3^2\omega_1 + 135 v_1^2 v_2^2\omega_3^2\omega_1^3 + 18\omega_3^2 c_s^4\omega_1^3 +
\omega_2^2 v_2^4\omega_3^2\omega_1^3 + \omega_2^3 v_2^2\omega_3^2\omega_1^2 - 18\omega_2^3 v_1^2\omega_3\omega_1 + 36\omega_2^2\omega_3 c_s^2\omega_1^3 - 2\omega_2^3\omega_3^2 c_s^4\omega_1^3 - 45\omega_2^2 v_1^2\omega_3^2 c_s^2\omega_1 - 45\omega_2 v_1^4\omega_3^2\omega_1^3 - 63\omega_2^3 v_1^2\omega_3^2 c_s^2 + 54\omega_2^2 v_1^4\omega_3\omega_1^3 -
6\omega_2^3\omega_3^2\omega_1 + 36\omega_2\omega_3^2 c_s^2\omega_1^2 + 54\omega_2^3 v_1^2\omega_3\omega_1^2 + 18\omega_2^3 v_2^2\omega_3^2\omega_1 - 6\omega_2\omega_3^2\omega_1^2 + 108\omega_2^2 v_1^2\omega_3^2 c_s^2\omega_1^2 + 6\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1^3 - 108\omega_2^2 v_1^2 c_s^2\omega_1^3 - 54\omega_2 v_2^2\omega_3^2 c_s^2\omega_1^2 -
216\omega_2 v_1^2\omega_3^2 c_s^2\omega_1^3 - 24\omega_2^3\omega_3 c_s^2\omega_1^3 + 45\omega_2 v_1^2\omega_3^2\omega_1^2 + 2\omega_2^2\omega_3^2 c_s^4\omega_1^3 - 36\omega_2^2 v_2^2\omega_3^2\omega_1^2 - 144\omega_2^3 v_1^2\omega_3 c_s^2\omega_1^2 + 72\omega_2^3 v_2^2\omega_3 c_s^2\omega_1^3 - 36\omega_2^2 v_1^4\omega_1^3 - 36\omega_2^3 v_1^2\omega_1^2 +
30\omega_2^2 v_1^2\omega_3^2 c_s^2\omega_1^3 + 72\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1^2 + 45\omega_2^3\omega_3^2 c_s^4\omega_1 - 6\omega_2\omega_3^2\omega_1^3 - 135\omega_2^3 v_1^2 v_2^2\omega_3^2\omega_1 + 21\omega_2\omega_3^2 c_s^2\omega_1^3 - \omega_2^3 v_2^4\omega_3^2\omega_1^2 + 18\omega_2^3 v_1^4\omega_3\omega_1 - \omega_2^2 v_2^2\omega_3^2\omega_1^3 -
198\omega_2^3 v_2^2\omega_3 c_s^2\omega_1^2 + 60\omega_2^3\omega_3 c_s^2\omega_1^2 + 30\omega_2^2\omega_3^2 c_s^4\omega_1^2 + 90\omega_2 v_1^2\omega_3^2\omega_1^3 - 9\omega_2 v_2^2\omega_3^2 c_s^2\omega_1^3 - 81\omega_2 v_1^2\omega_3^2 c_s^2\omega_1^2 - 30\omega_2^3\omega_3^2 c_s^4 + 135\omega_2^3 v_1^2 v_2^2\omega_3^2 +
18 v_2^2\omega_3^2 c_s^2\omega_1^3 + 36\omega_2^2 v_1^2\omega_3 c_s^2\omega_1^2 - 90\omega_2^2 v_2^2\omega_3 c_s^2\omega_1^3 + 12\omega_2^2\omega_3^2\omega_1^2 - 81 v_1^2\omega_3^2\omega_1^3 - 36\omega_2^3 v_1^4\omega_3^2 - 24\omega_3^2 c_s^2\omega_1^3 + 45\omega_2^3 v_1^4\omega_3^2\omega_1 - 30\omega_2^3 v_1^2\omega_3^2 c_s^2\omega_1^2 +
6\omega_3^2\omega_1^3 - 36\omega_2^2\omega_3 c_s^4\omega_1^3 - 54\omega_2 v_1^2\omega_3 c_s^2\omega_1^3 + 18\omega_2 v_1^2\omega_3\omega_1^3 - 6\omega_2\omega_3 c_s^2\omega_1^3 + 9\omega_2^3 v_1^2\omega_3^2\omega_1^2 + 9\omega_2^2 v_1^4\omega_3^2\omega_1^3 + 30\omega_2^3\omega_3 c_s^4\omega_1 - 18\omega_2^3 v_2^2\omega_3^2 c_s^2 +
36\omega_2^2\omega_3^2 c_s^2\omega_1 + 189 v_1^2\omega_3^2 c_s^2\omega_1^3 + 144\omega_2^2 v_1^2\omega_3 c_s^2\omega_1^3 + 144\omega_2^2 v_2^2\omega_3 c_s^2\omega_1^2 + 18\omega_2 v_2^2\omega_3 c_s^2\omega_1^3 + 2\omega_2^3\omega_3^2 c_s^2\omega_1^2 + 60\omega_2^2\omega_3 c_s^4\omega_1^2 - 6\omega_2^3 v_2^2\omega_3^2 c_s^2\omega_1^2 +
45\omega_2^2 v_1^2\omega_3^2\omega_1 - 135\omega_2^2 v_1^2 v_2^2\omega_3^2\omega_1 + 36 v_1^4\omega_3^2\omega_1^3 + 18\omega_2 v_2^2\omega_3^2\omega_1^2 + 36\omega_2^3 v_1^4\omega_1^2 - 3\omega_2^3\omega_3^2 c_s^2\omega_1 + 9\omega_2^3 v_2^2\omega_3^2 c_s^2\omega_1 - 15\omega_2\omega_3^2 c_s^4\omega_1^3 - 90\omega_2^2 v_1^2\omega_3^2\omega_1^2 +
270\omega_2^2 v_1^2 v_2^2\omega_3^2\omega_1^2 - 135\omega_2 v_1^2 v_2^2\omega_3^2\omega_1^3 - 18\omega_2 v_1^4\omega_3\omega_1^3 - 42\omega_2^2\omega_3^2 c_s^2\omega_1^2 - 60\omega_2^3\omega_3 c_s^4\omega_1^2 - 9\omega_2^2 v_1^2\omega_3^2\omega_1^3 - 30\omega_2\omega_3^2 c_s^4\omega_1^2 + 108\omega_2^3 v_1^2\omega_3^2 c_s^2\omega_1 -
9\omega_2^3 v_1^4\omega_3^2\omega_1^2 + 6\omega_2^3\omega_3^2 + 18\omega_2 v_2^2\omega_3^2\omega_1^3 - 18\omega_2^3 v_2^2\omega_3^2 - 2\omega_2^2\omega_3^2 c_s^2\omega_1^3 + 24\omega_2^3\omega_3 c_s^4\omega_1^3 - 6\omega_2^2\omega_3^2\omega_1 + 36\omega_2^2 v_1^2\omega_1^3 - 135\omega_2 v_1^2 v_2^2\omega_3^2\omega_1^2)\frac{\rho}{24\omega_2^3\omega_3^2\omega_1^3}$$

coefficient $C^{(2)}_{\mathrm{D}_x\mathrm{D}_y^3\rho}$ at $\frac{\partial^4\rho}{\partial x_1\partial x_2^3}$:

$$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = 0$$

$$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = (20\omega_8^2 v_2^4\omega_6\omega_4 - 4\omega_6^3 c_s^4\omega_4 - 4\omega_8^2\omega_6^2 c_s^2 - 8\omega_8^2\omega_6^2 c_s^4\omega_4 - 4 v_2^4\omega_6^3\omega_4 - 8\omega_8^2 v_2^2\omega_6^2 + 32\omega_8 v_2^4\omega_6^2\omega_4^2 + 13\omega_8 v_2^2\omega_6^3\omega_4^2 + 12\omega_8^2\omega_6 c_s^2\omega_4^2 +
51\omega_8^2 v_2^2\omega_6^2 c_s^2\omega_4^2 + 96\omega_8^2 v_2^2 c_s^2\omega_4^2 + 8\omega_8\omega_6^3 c_s^4\omega_4 - 4 v_2^4\omega_6^2\omega_4^2 + 20\omega_8 v_2^4\omega_6^3\omega_4 - 4\omega_8\omega_6 c_s^4\omega_4^2 + 120\omega_8 v_2^2\omega_6^2 c_s^2\omega_4^2 + 36\omega_8^2 v_2^2\omega_6\omega_4^2 + 16\omega_8 v_2^2\omega_6^2\omega_4 -
4 v_2^2\omega_6^3\omega_4^2 - 8\omega_8\omega_6^2 c_s^2\omega_4^2 - 20\omega_8^2 v_2^2\omega_6\omega_4 + 4 v_2^2\omega_6^3\omega_4 - 32\omega_8 v_2^2\omega_6^2\omega_4^2 - 8\omega_8 v_2^4\omega_6^3 - 4\omega_8\omega_6^3 c_s^4 - 4\omega_8\omega_6^3 c_s^4\omega_4^2 - 24\omega_8^2 v_2^2\omega_4^2 - 13\omega_8 v_2^4\omega_6^3\omega_4^2 -
48\omega_8 v_2^2\omega_6^2 c_s^2\omega_4 + 4 v_2^2\omega_6^2\omega_4^2 - 20\omega_8 v_2^2\omega_6^3\omega_4 - 4\omega_8^2\omega_6 c_s^2\omega_4 - 84\omega_8^2 v_2^2\omega_6^2 c_s^2\omega_4 + 36\omega_8^2 v_2^2\omega_6^2 c_s^2 + 4\omega_6^2 c_s^2\omega_4^2 - 36\omega_8^2 v_2^4\omega_6\omega_4^2 - 8\omega_8^2 c_s^2\omega_4^2 + 4\omega_6^3 c_s^4\omega_4^2 -
16\omega_8 v_2^4\omega_6^2\omega_4 - 24 v_2^2\omega_6^2 c_s^2\omega_4^2 + 4 v_2^4\omega_6^3\omega_4^2 + 4\omega_8^2\omega_6^2 c_s^4\omega_4^2 - 8\omega_8\omega_6^3 c_s^2\omega_4 + 4\omega_8\omega_6 c_s^2\omega_4^2 + 13\omega_8^2 v_2^4\omega_6^2\omega_4^2 - 51\omega_8 v_2^2\omega_6^3 c_s^2\omega_4^2 + 4\omega_8\omega_6^3 c_s^2 +
20\omega_8^2 v_2^2\omega_6^2\omega_4 + 72\omega_8^2 v_2^2\omega_6 c_s^2\omega_4 - 36\omega_8 v_2^2\omega_6^3 c_s^2 + 4\omega_6^3 c_s^2\omega_4 + 20\omega_8 v_2^2\omega_6\omega_4^2 + 8\omega_8^2 v_2^4\omega_6^2 + 8\omega_8^2\omega_6^2 c_s^2\omega_4 - 12\omega_8^2\omega_6 c_s^4\omega_4^2 - 24 v_2^2\omega_6^3 c_s^2\omega_4 +$$

$4\omega_8^2\omega_6 c_s^4\omega_4 + 24v_2^2\omega_6^3 c_s^2\omega_4^2 - 4\omega_6^2 c_s^4\omega_4^2 - 13\omega_8^2 v_2^2\omega_6^2\omega_4^2 - 144\omega_8^2 v_2^2\omega_6 c_s^2\omega_4^2 + 4\omega_8^2\omega_6^2 c_s^4 - 4\omega_6^3 c_s^2\omega_4^2 + 8\omega_8^2 c_s^4\omega_4^2 - 4\omega_8^2\omega_6^2 c_s^2\omega_4^2 - 20\omega_8^2 v_2^4\omega_6^2\omega_4 - 72\omega_8 v_2^2\omega_6 c_s^2\omega_4^2 + 8\omega_8\omega_6^2 c_s^4\omega_4^2 - 20\omega_8 v_2^4\omega_6\omega_4^2 + 84\omega_8 v_2^2\omega_6^3 c_s^2\omega_4 + 8\omega_8 v_2^2\omega_6^3 + 24\omega_8^2 v_2^4\omega_4^2 + 4\omega_8\omega_6^3 c_s^2\omega_4^2)\frac{v_1}{4\omega_8^2\omega_6^3\omega_4^2}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3\rho}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = 0$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = 0$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = 0$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3\rho} = (-18\omega_2\omega_3 c_s^4\omega_1^3 - 54\omega_2^3 v_2^4\omega_3^2\omega_1 - 18\omega_2^2\omega_3^2 c_s^4\omega_1 - 6\omega_2^3\omega_3 c_s^2\omega_1 - 297\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1 + 12\omega_2^3 v_1^2 c_s^2\omega_1^2 - 99v_2^2\omega_3^2\omega_1^3 - 24\omega_2^3 v_1^2 v_2^2\omega_3^2\omega_1^2 - 6\omega_2^3\omega_3^2 c_s^4\omega_1^2 + 12\omega_2^2 c_s^2\omega_1^3 + 108\omega_2^2 v_2^4\omega_3^2\omega_1^2 + 36\omega_3^2 c_s^4\omega_1^2 + 6\omega_2^3 v_1^2\omega_3^2 + 6\omega_2^3 v_1^2\omega_3 c_s^2\omega_1 + 63\omega_2^2 v_2^2\omega_3^2\omega_1 + 45v_1^2 v_2^2\omega_3^2\omega_1^3 + 90\omega_3^2 c_s^4\omega_1^3 - \omega_2^3\omega_3^2\omega_1^2 + 24\omega_2^3 v_2^2\omega_3^2\omega_1^2 - 18\omega_2^2\omega_3 c_s^2\omega_1^3 + 6\omega_2^2 v_1^2\omega_3^2 c_s^2\omega_1 - 18\omega_2^3 v_1^2\omega_3^2 c_s^2 + 6\omega_2^3\omega_3^2\omega_1 + 60\omega_2\omega_3^2 c_s^2\omega_1^2 - 18\omega_2^3 v_2^2\omega_3^2\omega_1 - 6\omega_2\omega_3^2\omega_1^2 + 54\omega_2^3 v_2^4\omega_3^2 + 72\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1^3 - 12\omega_2^2 v_1^2 c_s^2\omega_1^3 - 243\omega_2 v_2^2\omega_3^2 c_s^2\omega_1^2 - 21\omega_2 v_1^2\omega_3^2 c_s^2\omega_1^3 + 6\omega_2 v_1^2\omega_3^2\omega_1^2 + 54v_2^4\omega_3^2\omega_1^3 + 6\omega_2^2\omega_3^2 c_s^4\omega_1^3 - 108\omega_2^2 v_2^2\omega_3^2\omega_1^2 - 18\omega_2^3 v_1^2\omega_3 c_s^2\omega_1^2 + 2\omega_2^2 v_1^2\omega_3^2 c_s^2\omega_1^3 + 540\omega_2^2 v_2^2\omega_3^2 c_s^2\omega_1^2 + 27\omega_2^3\omega_3^2 c_s^4\omega_1 - 6\omega_2\omega_3^2\omega_1^3 + 72\omega_2^3 v_1^2 v_2^2\omega_3^2\omega_1 + 75\omega_2\omega_3^2 c_s^2\omega_1^3 - 54\omega_2^2 v_2^4\omega_3^2\omega_1 - 24\omega_2^2 v_2^2\omega_3^2\omega_1^3 + 18\omega_2^3\omega_3 c_s^2\omega_1^2 + 72\omega_2^2\omega_3^2 c_s^4\omega_1^2 + 6\omega_2 v_1^2\omega_3^2\omega_1^3 - 486\omega_2 v_2^2\omega_3^2 c_s^2\omega_1^3 - 6\omega_2 v_1^2\omega_3^2 c_s^2\omega_1^2 - 18\omega_2^3\omega_3^2 c_s^4 - 45\omega_2^3 v_1^2 v_2^2\omega_3^2 - 12\omega_2^3 c_s^2\omega_1^2 + 405v_2^2\omega_3^2 c_s^2\omega_1^3 - 6v_1^2\omega_3^2\omega_1^3 - 54\omega_2 v_2^4\omega_3^2\omega_1^2 - 72\omega_3^2 c_s^2\omega_1^3 - 2\omega_2^3 v_1^2\omega_3^2 c_s^2\omega_1^2 + 6\omega_3^2\omega_1^3 + 54\omega_2^2\omega_3 c_s^4\omega_1^3 - 6\omega_2 v_1^2\omega_3 c_s^2\omega_1^3 + 6\omega_2\omega_3 c_s^2\omega_1^3 + \omega_2^3 v_1^2\omega_3^2\omega_1^2 + 18\omega_2^3\omega_3 c_s^4\omega_1 - 54\omega_2 v_2^4\omega_3^2\omega_1^3 + 135\omega_2^3 v_2^2\omega_3^2 c_s^2 + \omega_2^2\omega_3^2\omega_1^3 + 12\omega_2^2\omega_3^2 c_s^2\omega_1 + 18v_1^2\omega_3^2 c_s^2\omega_1^3 + 18\omega_2^2 v_1^2\omega_3 c_s^2\omega_1^3 + 5\omega_2^3\omega_3^2 c_s^2\omega_1^2 - 72\omega_2^3 v_2^2\omega_3^2 c_s^2\omega_1^2 - 36\omega_2^2 c_s^4\omega_1^3 - 6\omega_2^2 v_1^2\omega_3^2\omega_1 - 9\omega_2^2 v_1^2 v_2^2\omega_3^2\omega_1 + 45\omega_2 v_2^2\omega_3^2\omega_1^2 - 3\omega_2^3\omega_3^2 c_s^2\omega_1 - 54\omega_2^3 v_2^2\omega_3^2 c_s^2\omega_1 - 99\omega_2\omega_3^2 c_s^4\omega_1^3 - 72\omega_2 v_1^2 v_2^2\omega_3^2\omega_1^3 - 6\omega_2^3 v_1^2\omega_3^2\omega_1 - 72\omega_2^2\omega_3^2 c_s^2\omega_1^2 - 54\omega_2^3\omega_3 c_s^4\omega_1^2 + 24\omega_2^2 v_1^2 v_2^2\omega_3^2\omega_1^3 - \omega_2^2 v_1^2\omega_3^2\omega_1^3 - 54\omega_2\omega_3^2 c_s^4\omega_1^2 + 21\omega_2^3 v_1^2\omega_3^2 c_s^2\omega_1 - 6\omega_2^3\omega_3^2 + 126\omega_2 v_2^2\omega_3^2\omega_1^3 - 9\omega_2^3 v_2^2\omega_3^2 - 5\omega_2^2\omega_3^2 c_s^2\omega_1^3 + 6\omega_2^2\omega_3^2\omega_1 + 9\omega_2 v_1^2 v_2^2\omega_3^2\omega_1^2)\frac{v_1}{24\omega_2^3\omega_3^2\omega_1^3}$

coefficient $C^{(2)}_{\mathrm{D}_x\mathrm{D}_y^3 v_1}$ **at** $\frac{\partial^4 v_1}{\partial x_1\partial x_2^3}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1} = (-12c_s^2\omega^2 - 36v_2^4 - 4v_2^2\omega^3 + 26v_2^2\omega^2 - 54v_2^2\omega - 24c_s^2 + 36c_s^2\omega + 36c_s^4 - 42v_2^2 c_s^2\omega^2 - 26v_2^4\omega^2 - c_s^4\omega^3 + 20c_s^4\omega^2 - 36v_2^2 c_s^2 + 4v_2^4\omega^3 + 12v_2^2 c_s^2\omega^3 - 54c_s^4\omega + 36v_2^2 + 54v_2^2 c_s^2\omega + 54v_2^4\omega)\frac{\rho}{12\omega^3}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1} = (54\omega_8 v_2^2\omega_6^2 c_s^2\omega_4^3 - 12v_2^4\omega_6^2\omega_4^3 - 24\omega_8 v_2^4\omega_6^2\omega_4^2 - 48\omega_8 v_2^2\omega_6^3\omega_4^2 + 12\omega_8^2\omega_6 c_s^2\omega_4^2 - 12v_2^2\omega_6^3\omega_4^3 + 162\omega_8^2 v_2^2\omega_6^2 c_s^2\omega_4^2 + 90\omega_8^2 v_2^2\omega_6\omega_4^3 + 6\omega_8^2\omega_6^2 c_s^2\omega_4 + 60\omega_8 v_2^4\omega_6^2\omega_4^3 + 12\omega_8\omega_6^2 c_s^4\omega_4 - 24\omega_8 v_2^4\omega_6^3\omega_4 - 12\omega_8^2 v_2^2\omega_6^2 c_s^2\omega_4^2 - 48\omega_8^2 v_2^2\omega_6^3 c_s^2 + 60\omega_8^2 v_2^2\omega_6^2 c_s^2\omega_4^3 + 252\omega_8^2 v_2^2 c_s^2\omega_4^3 + 12v_2^2\omega_6^3\omega_4^2 + 12\omega_8^2\omega_6^2 c_s^2\omega_4^3 + 27\omega_8 v_2^2\omega_6^3\omega_4^3 - 12\omega_8\omega_6^2 c_s^2\omega_4^2 + 24\omega_8 v_2^2\omega_6^2\omega_4^2 + 12v_2^2\omega_6^2\omega_4^3 - 18\omega_8\omega_6^3 c_s^4\omega_4^2 - 12v_2^2\omega_6^2 c_s^2\omega_4^3 + \omega_8^2\omega_6^2 c_s^4\omega_4^3 + 12v_2^4\omega_6^3\omega_4^3 - 12\omega_8^2 c_s^2\omega_4^3 + 48\omega_8 v_2^4\omega_6^3\omega_4^2 - 90\omega_8^2 v_2^4\omega_6\omega_4^3 + 24\omega_8 v_2^2\omega_6^3\omega_4 - 60\omega_8 v_2^2\omega_6^2\omega_4^3 + 6\omega_8\omega_6^2 c_s^2\omega_4^3 - 48\omega_8^2 v_2^2\omega_6^2 c_s^2\omega_4 - 5\omega_8^2\omega_6^2 c_s^2\omega_4^2 - 27\omega_8 v_2^4\omega_6^3\omega_4^3 + 6\omega_8\omega_6^2 c_s^4\omega_4^3 - 72\omega_8^2 v_2^2\omega_4^3 - 12v_2^4\omega_6^2\omega_4^2 + 6\omega_8^2\omega_6^2 c_s^4\omega_4^2 - 12\omega_8\omega_6^3 c_s^2\omega_4 + 36\omega_8 v_2^2\omega_6\omega_4^3 + 12\omega_8^2\omega_6^3 c_s^4 + 12\omega_8^2 v_2^2\omega_6^3 c_s^2\omega_4^3 + 18\omega_8^2 v_2^2\omega_6^3\omega_4^2 + 12\omega_8^2 v_2^4\omega_6^2\omega_4^2 + 30\omega_8 v_2^2\omega_6^3 c_s^2\omega_4^2 - 12\omega_8^2\omega_6 c_s^4\omega_4^3 - 4\omega_8^2 v_2^2\omega_6^3\omega_4^3 - 81\omega_8^2 v_2^2\omega_6^3 c_s^2\omega_4^2 - 21\omega_8 v_2^2\omega_6^3 c_s^2\omega_4^3 - 12\omega_8^2\omega_6 c_s^4\omega_4^2 - 24\omega_8^2\omega_6^3 c_s^4\omega_4 + 19\omega_8^2 v_2^4\omega_6^2\omega_4^3 + 12\omega_8^2 v_2^4\omega_6^3\omega_4 - 36\omega_8 v_2^4\omega_6\omega_4^3 + 13\omega_8^2\omega_6^3 c_s^4\omega_4^2 - 12v_2^2\omega_6^3 c_s^2\omega_4^2 - 6\omega_8\omega_6^2 c_s^4\omega_4^3 - 36\omega_8 v_2^2\omega_6 c_s^2\omega_4^3 - 18\omega_8^2 v_2^4\omega_6^3\omega_4^2 - 12\omega_8^2 v_2^2\omega_6^2\omega_4^2 - 108\omega_8^2 v_2^2\omega_6 c_s^2\omega_4^2 - 6\omega_8^2\omega_6^2 c_s^2\omega_4^2 + 102\omega_8^2 v_2^2\omega_6^2 c_s^2\omega_4 + 72\omega_8^2 v_2^4\omega_4^3 - 6\omega_8\omega_6^3 c_s^2\omega_4^3 + 4\omega_8^2 v_2^4\omega_6^2\omega_4^3 - \omega_8^2\omega_6^3 c_s^4\omega_4^3 + 12\omega_8\omega_6^2 c_s^4\omega_4^2 + 12v_2^2\omega_6^3 c_s^2\omega_4^3 - 12\omega_8 v_2^2\omega_6^3 c_s^2\omega_4 - \omega_8^2\omega_6^2 c_s^2\omega_4^3 + 18\omega_8\omega_6^3 c_s^2\omega_4^2 + 12\omega_8^2 c_s^4\omega_4^3 - 306\omega_8^2 v_2^2\omega_6 c_s^2\omega_4^3 - 12\omega_8^2 v_2^2\omega_6^3\omega_4 - 19\omega_8^2 v_2^2\omega_6^2\omega_4^3)\frac{\rho}{12\omega_8^2\omega_6^3\omega_4^3}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1} = (198\omega_8 v_2^2\omega_6^2 c_s^2\omega_4^3 - 36v_2^4\omega_6^2\omega_4^3 - 36\omega_8 v_2^2\omega_6^3\omega_4^2 + 12\omega_8^2\omega_6 c_s^2\omega_4^2 - 36v_2^2\omega_6^3\omega_4^3 + 18\omega_8^2 v_2^2\omega_6^2 c_s^2\omega_4^2 + 90\omega_8^2 v_2^2\omega_6\omega_4^3 + 6\omega_8^2\omega_6^2 c_s^2\omega_4 + 72\omega_8 v_2^4\omega_6^2\omega_4^3 + 12\omega_8\omega_6^3 c_s^4\omega_4 + 36\omega_8 v_2^2\omega_6^2 c_s^2\omega_4^2 + 60\omega_8^2 v_2^2\omega_6^2 c_s^2\omega_4^3 + 252\omega_8^2 v_2^2 c_s^2\omega_4^3 + 36v_2^2\omega_6^3\omega_4^2 + 12\omega_8^2\omega_6 c_s^2\omega_4^3 + 39\omega_8 v_2^2\omega_6^3\omega_4^3 - 12\omega_8\omega_6^2 c_s^2\omega_4^2 + 36v_2^2\omega_6^3\omega_4^3 - 18\omega_8\omega_6^3 c_s^4\omega_4^2 - 108v_2^2\omega_6^2 c_s^2\omega_4^3 + \omega_8^2\omega_6^2 c_s^4\omega_4^3 + 36v_2^4\omega_6^3\omega_4^3 - 12\omega_8^2 c_s^2\omega_4^3 + 36\omega_8 v_2^4\omega_6^3\omega_4^2 - 90\omega_8^2 v_2^4\omega_6\omega_4^3 - 72\omega_8 v_2^2\omega_6^2\omega_4^3 + 6\omega_8\omega_6^2 c_s^2\omega_4^3 - 5\omega_8^2\omega_6^2 c_s^2\omega_4^2 - 39\omega_8 v_2^4\omega_6^3\omega_4^3 + 6\omega_8\omega_6^3 c_s^4\omega_4^3 - 72\omega_8^2 v_2^2\omega_4^3 - 36v_2^4\omega_6^3\omega_4^2 + 6\omega_8^2\omega_6^2 c_s^4\omega_4^2 - 12\omega_8\omega_6^3 c_s^2\omega_4 + 36\omega_8 v_2^2\omega_6\omega_4^3 + 12\omega_8^2\omega_6^3 c_s^4 + 12\omega_8^2 v_2^2\omega_6^3 c_s^2\omega_4^3 + 6\omega_8^2 v_2^2\omega_6^3\omega_4^2 + 54\omega_8 v_2^2\omega_6^3 c_s^2\omega_4^2 - 12\omega_8^2\omega_6 c_s^4\omega_4^3 - 4\omega_8^2 v_2^2\omega_6^3\omega_4^3 - 3\omega_8^2 v_2^2\omega_6^3 c_s^2\omega_4^2 - 99\omega_8 v_2^2\omega_6^3 c_s^2\omega_4^3 - 12\omega_8^2\omega_6 c_s^4\omega_4^2 - 24\omega_8^2\omega_6^3 c_s^2\omega_4 + 19\omega_8^2 v_2^4\omega_6^2\omega_4^3 - 36\omega_8 v_2^4\omega_6\omega_4^3 + 13\omega_8^2\omega_6^3 c_s^4\omega_4^2 - 108v_2^2\omega_6^3 c_s^2\omega_4^2 - 6\omega_8\omega_6^2 c_s^4\omega_4^3 - 108\omega_8 v_2^2\omega_6 c_s^2\omega_4^3 - 6\omega_8^2 v_2^4\omega_6^3\omega_4^2 - 36\omega_8^2 v_2^2\omega_6 c_s^2\omega_4^2 - 6\omega_8^2\omega_6^2 c_s^2\omega_4^2 - 18\omega_8^2 v_2^2\omega_6^3 c_s^2\omega_4 + 72\omega_8^2 v_2^4\omega_4^3 - 6\omega_8\omega_6^3 c_s^2\omega_4^3 + 4\omega_8^2 v_2^4\omega_6^3\omega_4^3 - \omega_8^2\omega_6^3 c_s^4\omega_4^3 + 12\omega_8\omega_6^2 c_s^4\omega_4^2 + 108v_2^2\omega_6^3 c_s^2\omega_4^3 + 36\omega_8 v_2^2\omega_6^3 c_s^2\omega_4 - \omega_8^2\omega_6^2 c_s^2\omega_4^3 + 18\omega_8\omega_6^3 c_s^2\omega_4^2 + 12\omega_8^2 c_s^4\omega_4^3 - 306\omega_8^2 v_2^2\omega_6 c_s^2\omega_4^3 - 19\omega_8^2 v_2^2\omega_6^2\omega_4^3)\frac{\rho}{12\omega_8^2\omega_6^3\omega_4^3}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1} = C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3 v_1} = (-6\omega_2^2\omega_6^2\omega_3^2 c_s^2 + 12\omega_2^3\omega_6^2 c_s^4 + 6\omega_2^3 v_2^2\omega_6^2\omega_3^2 + 19\omega_2^2 v_2^4\omega_6^2\omega_3^3 - 12\omega_2\omega_6^2\omega_3^3 c_s^4 - 108\omega_2 v_2^2\omega_6\omega_3^3 c_s^2 + 12\omega_2^2\omega_6\omega_3^2 c_s^4 - 4\omega_2^3 v_2^2\omega_6^2\omega_3^3 + 6\omega_2^3\omega_6\omega_3^3 c_s^4 - 72v_2^2\omega_6^2\omega_3^3 + 252v_2^2\omega_6^2\omega_3^3 c_s^2 + 198\omega_2^2 v_2^2\omega_6\omega_3^3 c_s^2 + 36\omega_2 v_2^2\omega_6\omega_3^3 + 12\omega_2^3 v_2^2\omega_6^2\omega_3^3 c_s^2 - 12\omega_6^2\omega_3^3 c_s^2 - 6\omega_2^2\omega_6\omega_3^2 c_s^4 - 12\omega_2^3\omega_6\omega_3 c_s^2 + 36\omega_2^3 v_2^2\omega_6\omega_3 c_s^2 - 12\omega_2\omega_6^2\omega_3^2 c_s^4 - 19\omega_2^2 v_2^2\omega_6^2\omega_3^3 - 36\omega_2^3 v_2^4\omega_3^3 - 6\omega_2^3 v_2^4\omega_6^2\omega_3^3 - 24\omega_2^3\omega_6^2\omega_3 c_s^4 - \omega_2^2\omega_6^2\omega_3^3 c_s^2 + 36\omega_2^3 v_2^4\omega_3^3 - 3\omega_2^3 v_2^2\omega_6^2\omega_3^2 c_s^2 + 4\omega_2^3 v_2^4\omega_6^2\omega_3^3 + 72v_2^4\omega_6^2\omega_3^3 - 5\omega_2^3\omega_6^2\omega_3^2 c_s^2 - 36\omega_2 v_2^4\omega_6\omega_3^3 - 18\omega_2^3\omega_6\omega_3^2 c_s^4 + 36\omega_2^2 v_2^2\omega_3^3 + 36\omega_2^2 v_2^2\omega_6\omega_3^3 c_s^2 - 18\omega_2^3 v_2^2\omega_6^2\omega_3 c_s^2 - 39\omega_2^3 v_2^4\omega_6\omega_3^3 + \omega_2^2\omega_6^2\omega_3^3 c_s^4 + 6\omega_2^3\omega_6^2\omega_3 c_s^2 - 36\omega_2 v_2^2\omega_6^2\omega_3^2 c_s^2 + 12\omega_2^3\omega_6\omega_3 c_s^4 + 6\omega_2^2\omega_6\omega_3^3 c_s^2 - 90\omega_2 v_2^4\omega_6^2\omega_3^3 + 12\omega_2\omega_6^2\omega_3^2 c_s^2 - 108\omega_2^2 v_2^2\omega_3^3 c_s^2 + 18\omega_2^3\omega_6\omega_3^2 c_s^2 +$

$36\omega_2^3v_2^4\omega_6\omega_3^2 - 108\omega_2^3v_2^2\omega_3^2c_s^2 - 72\omega_2^2v_2^2\omega_6\omega_3^3 + 54\omega_2^3v_2^2\omega_6\omega_3^2c_s^2 + 18\omega_2^2v_2^2\omega_6^2\omega_3^2c_s^2 + 13\omega_2^3\omega_6^2\omega_3^2c_s^4 + 12\omega_2\omega_6^2\omega_3^3c_s^2 + 39\omega_2^3v_2^2\omega_6\omega_3^3 - 36\omega_2^3v_2^2\omega_3^3 - 12\omega_2^2\omega_6\omega_3^2c_s^2 - 306\omega_2v_2^2\omega_6^2\omega_3^3c_s^2 + 6\omega_2^2\omega_6^2\omega_3^2c_s^4 + 90\omega_2v_2^2\omega_6^2\omega_3^3 - 36\omega_2^2v_2^4\omega_3^3 + 60\omega_2^2v_2^2\omega_6^2\omega_3^3c_s^2 - \omega_2^3\omega_6^2\omega_3^3c_s^4 + 72\omega_2^2v_2^4\omega_6\omega_3^3 - 36\omega_2^3v_2^2\omega_6\omega_3^2 + 36\omega_2^3v_2^2\omega_3^2 + 12\omega_6^2\omega_3^3c_s^4 + 108\omega_2^3v_2^2\omega_3^3c_s^2 - 99\omega_2^3v_2^2\omega_6\omega_3^3c_s^2 - 6\omega_2^3\omega_6\omega_3^3c_s^2)\frac{\rho}{12\omega_2^3\omega_6^2\omega_3^3}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3v_1} = (6\omega_2\omega_3c_s^4\omega_1^3 - 63\omega_2^3v_2^4\omega_3^2\omega_1 + 54\omega_2^3v_2^2\omega_3c_s^2\omega_1 + 6\omega_2^2\omega_3^2c_s^4\omega_1 - 108\omega_2^3v_2^4\omega_1^2 - 18\omega_2^3\omega_3c_s^2\omega_1 + 18\omega_2v_2^2\omega_3\omega_1^3 + 99\omega_2^2v_2^2\omega_3^2c_s^2\omega_1 - 81v_2^2\omega_3^2\omega_1^3 - 72\omega_2^3v_1^2v_2^2\omega_3^2\omega_1^2 - 24\omega_2^2\omega_3c_s^2\omega_1^2 + 29\omega_2^3\omega_3^2c_s^4\omega_1^2 - 8\omega_2^3v_2^2\omega_3^2\omega_1^3 - 54\omega_2^2v_2^4\omega_3^2\omega_1^2 + 18\omega_2^3v_1^2\omega_3^2 + 72\omega_2^3v_2^4\omega_1^3 - 54\omega_2^3v_1^2\omega_3c_s^2\omega_1 - 27\omega_2^2v_2^2\omega_3^2\omega_1 + 135v_1^2v_2^2\omega_3^2\omega_1^3 + 18\omega_2^3c_s^4\omega_1^3 + 36\omega_2^2v_2^2\omega_1^3 + 19\omega_2^2v_2^4\omega_3^2\omega_1^3 - \omega_2^3\omega_3^2\omega_1^2 + 17\omega_2^3v_2^2\omega_3^2\omega_1^2 + 18\omega_2^2\omega_3c_s^2\omega_1^3 - 2\omega_2^3\omega_3^2c_s^4\omega_1^3 + 18\omega_2^2v_1^2\omega_3^2c_s^2\omega_1 + 18\omega_2^3v_1^2\omega_3^2c_s^2 + 6\omega_2^3\omega_3^2\omega_1 + 36\omega_2\omega_3^2c_s^2\omega_1^2 - 9\omega_2^3v_2^2\omega_3^2\omega_1 - 6\omega_2\omega_3^2\omega_1^2 + 36\omega_2^2v_2^4\omega_3^2 + 18\omega_2^2v_1^2\omega_3^2c_s^2\omega_1^2 - 18\omega_2v_2^4\omega_3\omega_1^3 + 84\omega_2^2v_2^2\omega_3^2c_s^2\omega_1^3 + 81\omega_2v_2^2\omega_3^2c_s^2\omega_1^2 - 9\omega_2v_1^2\omega_3^2c_s^2\omega_1^3 - 12\omega_2^3\omega_3c_s^2\omega_1^3 + 18\omega_2v_1^2\omega_3^2\omega_1^2 + 36v_2^4\omega_3^2\omega_1^3 - \omega_2^2\omega_3^2c_s^4\omega_1^3 + 54\omega_2^2v_2^2\omega_3^2\omega_1^2 + 36\omega_2^3v_1^2\omega_3c_s^2\omega_1^2 - 198\omega_2^3v_2^2\omega_3c_s^2\omega_1^3 + 8\omega_2^3v_2^4\omega_3^2\omega_1^3 - 6\omega_2^2v_1^2\omega_3^2c_s^2\omega_1^3 - 144\omega_2^2v_2^2\omega_3^2c_s^2\omega_1^2 - 57\omega_2^3\omega_3^2c_s^4\omega_1 - 6\omega_2\omega_3^2\omega_1^3 + 216\omega_2^3v_1^2v_2^2\omega_3^2\omega_1 + 21\omega_2\omega_3^2c_s^2\omega_1^3 + 36\omega_2^2v_2^4\omega_3^2\omega_1 + 7\omega_2^3v_2^4\omega_3^2\omega_1^2 - 43\omega_2^2v_2^2\omega_3^2\omega_1^3 + 306\omega_2^3v_2^2\omega_3c_s^2\omega_1^2 + 30\omega_2^3\omega_3c_s^2\omega_1^2 + 12\omega_2^2\omega_3^2c_s^4\omega_1^2 + 18\omega_2v_1^2\omega_3^2\omega_1^3 - 297\omega_2v_2^2\omega_3^2c_s^2\omega_1^3 - 54\omega_2v_1^2\omega_3^2c_s^2\omega_1^2 + 30\omega_2^3\omega_3^2c_s^4 - 135\omega_2^3v_1^2v_2^2\omega_3^2 + 189v_2^2\omega_3^2c_s^2\omega_1^3 + 36\omega_2^2v_1^2\omega_3c_s^2\omega_1^2 + 198\omega_2^2v_2^2\omega_3c_s^2\omega_1^3 - 18v_1^2\omega_3^2\omega_1^3 + 36\omega_2v_2^4\omega_3^2\omega_1^2 - 324\omega_2^3v_2^2c_s^2\omega_1^2 - 72\omega_2^3v_2^2\omega_1^3 - 72\omega_2^2v_2^2\omega_3\omega_1^3 - 36\omega_2^2v_2^4\omega_1^3 - 24\omega_2^3c_s^2\omega_1^3 + 6\omega_2^3v_1^2\omega_3^2c_s^2\omega_1^2 + 24\omega_2^3v_2^2\omega_3^2c_s^2\omega_1^3 + 144\omega_2^3v_2^4\omega_3\omega_1^2 + 6\omega_2^3\omega_1^3 - 18\omega_2^2\omega_3c_s^4\omega_1^3 + 18\omega_2v_1^2\omega_3c_s^2\omega_1^3 - 6\omega_2\omega_3c_s^2\omega_1^3 + 18\omega_2^3v_2^2\omega_3\omega_1 + 3\omega_2^3v_1^2\omega_3^2\omega_1^2 + 18\omega_2^3\omega_3c_s^4\omega_1 - 63\omega_2v_2^4\omega_3^2\omega_1^3 + 63\omega_2^3v_2^2\omega_3^2c_s^2 + \omega_2^2\omega_3^2\omega_1^3 + 108\omega_2^3v_2^2\omega_1^2 - 12\omega_2^2\omega_3^2c_s^2\omega_1 + 216\omega_2^3v_2^2c_s^2\omega_1^3 + 18v_1^2\omega_3^2c_s^2\omega_1^3 - 36\omega_2^2v_1^2\omega_3c_s^2\omega_1^3 - 72\omega_2^2v_2^2\omega_3c_s^2\omega_1^2 - 54\omega_2v_2^2\omega_3c_s^2\omega_1^3 - 12\omega_2^3\omega_3^2c_s^2\omega_1^2 + 24\omega_2^2\omega_3c_s^4\omega_1^2 + 30\omega_2^3v_2^2\omega_3^2c_s^2\omega_1^2 - 78\omega_2^3v_2^4\omega_3\omega_1^3 - 18\omega_2^2v_1^2\omega_3^2\omega_1 - 27\omega_2^2v_1^2v_2^2\omega_3^2\omega_1 + 36\omega_2^2v_2^2\omega_3\omega_1^2 - 45\omega_2v_2^2\omega_3^2\omega_1^2 - 108\omega_2^2v_2^2c_s^2\omega_1^3 + 15\omega_2^3\omega_3^2c_s^2\omega_1 - 171\omega_2^3v_2^2\omega_3^2c_s^2\omega_1 - 15\omega_2\omega_3^2c_s^4\omega_1^3 - 216\omega_2v_1^2v_2^2\omega_3^2\omega_1^3 - 18\omega_2^3v_1^2\omega_3^2\omega_1 - 144\omega_2^3v_2^2\omega_3\omega_1^2 + 72\omega_2^2v_2^4\omega_3\omega_1^3 - 12\omega_2^2\omega_3^2c_s^2\omega_1^2 - 30\omega_2^3\omega_3c_s^4\omega_1^2 + 72\omega_2^2v_1^2v_2^2\omega_3^2\omega_1^3 - 3\omega_2^2v_1^2\omega_3^2\omega_1^3 - 30\omega_2\omega_3^2c_s^4\omega_1^2 - 18\omega_2^3v_2^4\omega_3\omega_1 - 9\omega_2^3v_1^2\omega_3^2c_s^2\omega_1 - 6\omega_2^3\omega_3^2 + 135\omega_2v_2^2\omega_3^2\omega_1^3 + 9\omega_2^3v_2^2\omega_3^2 + 12\omega_2^3\omega_3c_s^4\omega_1^3 + 6\omega_2^2\omega_3^2\omega_1 - 36\omega_2^2v_2^4\omega_3\omega_1^2 + 27\omega_2v_1^2v_2^2\omega_3^2\omega_1^2 + 78\omega_2^3v_2^2\omega_3\omega_1^3)\frac{\rho}{24\omega_2^3\omega_3^2\omega_1^3}$

coefficient $C^{(2)}_{\mathrm{D}_x\mathrm{D}_y^3v_2}$ **at** $\frac{\partial^4v_2}{\partial x_1\partial x_2^3}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_x\mathrm{D}_y^3v_2} = 0$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3v_2} = (20\omega_8^2\omega_6^2c_s^2 + 28\omega_8^2v_2^2\omega_6^2 + 16\omega_8\omega_6^2\omega_4 - 43\omega_8v_2^2\omega_6^3\omega_4^2 - 72\omega_8^2\omega_6c_s^2\omega_4^2 - 24\omega_8^2\omega_6\omega_4 + 17\omega_8\omega_6^3\omega_4^2 - 120\omega_8^2v_2^2\omega_6\omega_4^2 - 16\omega_8\omega_6^2c_s^2\omega_4 - 48\omega_8v_2^2\omega_6^2\omega_4 + 16v_2^2\omega_6^3\omega_4^2 - 12\omega_8^2\omega_6^2 + 56\omega_8\omega_6^2c_s^2\omega_4^2 + 64\omega_8^2v_2^2\omega_6\omega_4 - 16v_2^2\omega_6^3\omega_4 + 104\omega_8v_2^2\omega_6^2\omega_4^2 + 80\omega_8^2v_2^2\omega_4^2 - 28\omega_8\omega_6^3\omega_4 + 48\omega_8^2\omega_6\omega_4^2 - 16v_2^2\omega_6^2\omega_4^2 + 68\omega_8v_2^2\omega_6^3\omega_4 + 32\omega_8^2\omega_6c_s^2\omega_4 - 32\omega_8^2\omega_4^2 - 16\omega_6^2c_s^2\omega_4^2 + 48\omega_8^2c_s^2\omega_4^2 - 40\omega_8\omega_6^2\omega_4^2 + 44\omega_8\omega_6^3c_s^2\omega_4 - 32\omega_8\omega_6c_s^2\omega_4^2 + 24\omega_8\omega_6\omega_4^2 - 20\omega_8\omega_6^3c_s^2 - 68\omega_8^2v_2^2\omega_6^2\omega_4 - 16\omega_6^3c_s^2\omega_4 - 64\omega_8v_2^2\omega_6\omega_4^2 - 44\omega_8^2\omega_6^2c_s^2\omega_4 - 17\omega_8^2\omega_6^2\omega_4^2 - 8\omega_6^3\omega_4^2 + 8\omega_6^3\omega_4 + 28\omega_8^2\omega_6^2\omega_4 + 43\omega_8^2v_2^2\omega_6^2\omega_4^2 + 16\omega_6^3c_s^2\omega_4^2 + 25\omega_8^2\omega_6^2c_s^2\omega_4^2 + 8\omega_6^2\omega_4^2 - 28\omega_8v_2^2\omega_6^3 - 25\omega_8\omega_6^3c_s^2\omega_4^2 + 12\omega_8\omega_6^3)\frac{v_1\rho v_2}{4\omega_8^2\omega_6^3\omega_4^2}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_x\mathrm{D}_y^3v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_x\mathrm{D}_y^3v_2}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3v_2} = 0$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3v_2} = 0$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}_x\mathrm{D}_y^3v_2} = 0$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}_x\mathrm{D}_y^3v_2} = (10\omega_2^2v_1^2\omega_3\omega_1^3 - 27\omega_2^3\omega_3c_s^2\omega_1 - 198\omega_2v_2^2\omega_3\omega_1^3 + 90\omega_2^2\omega_3\omega_1 + 18\omega_2^3v_1^2\omega_1 + 324\omega_2^2\omega_3c_s^2\omega_1^2 + 54\omega_2^2c_s^2\omega_1^3 - 198\omega_2v_2^2\omega_3\omega_1^2 - 18\omega_2v_1^2\omega_1^3 + 45\omega_2^3v_1^2\omega_3\omega_1 + 18\omega_2\omega_1^3 + 30\omega_2^2\omega_3c_s^2\omega_1^3 - 10\omega_2^3v_1^2\omega_3\omega_1^2 + 54\omega_2^3\omega_3c_s^2 - 10\omega_2^2\omega_3\omega_1^3 - 36\omega_2^3v_1^2\omega_3 + 270\omega_3c_s^2\omega_1^3 - 18\omega_2^3v_1^2\omega_1^2 - 180\omega_2^2\omega_3\omega_1^2 + 36v_1^2\omega_3\omega_1^3 - 162\omega_2^2\omega_3c_s^2\omega_1 - 30\omega_2^3\omega_3c_s^2\omega_1^2 - 126\omega_3\omega_1^3 - 54\omega_2^3c_s^2\omega_1^2 + 135\omega_2\omega_3\omega_1^3 - 162\omega_2\omega_3c_s^2\omega_1^2 + 198\omega_2^3v_2^2\omega_3 - 45\omega_2v_1^2\omega_3\omega_1^3 - 54\omega_2^3\omega_3 - 297\omega_2\omega_3c_s^2\omega_1^3 - 198\omega_2^3v_2^2\omega_3\omega_1 + 45\omega_2^3\omega_3\omega_1 + 18\omega_2^3\omega_1^2 + 90\omega_2\omega_3\omega_1^2 + 396\omega_2^2v_2^2\omega_3\omega_1^2 - 198\omega_2^2v_2^2\omega_3\omega_1 + 10\omega_2^3\omega_3\omega_1^2 - 54\omega_2c_s^2\omega_1^3 - 18\omega_2^3\omega_1 - 18\omega_2^2\omega_1^3 + 54\omega_2^3c_s^2\omega_1 + 198v_2^2\omega_3\omega_1^3 + 18\omega_2^2v_1^2\omega_1^3)\frac{v_1\rho v_2}{24\omega_2^3\omega_3\omega_1^3}$

coefficient $C^{(2)}_{\mathrm{D}_y^4\rho}$ **at** $\frac{\partial^4\rho}{\partial x_2^4}$**:**

$C^{(2),\mathrm{SRT}}_{\mathrm{D}_y^4\rho} = (12 - 78c_s^2\omega^2 + 144v_2^4 + 10v_2^2\omega^3 - 98v_2^2\omega^2 + 6c_s^2\omega^3 + 234v_2^2\omega - 132c_s^2 + 198c_s^2\omega + 144c_s^4 + 404v_2^2c_s^2\omega^2 + 90v_2^4\omega^2 - 5c_s^4\omega^3 + 82c_s^4\omega^2 + 672v_2^2c_s^2 - 9v_2^4\omega^3 - 34v_2^2c_s^2\omega^3 - 216c_s^4\omega - 156v_2^2 - 18\omega + 8\omega^2 - 1008v_2^2c_s^2\omega - 216v_2^4\omega - \omega^3)\frac{v_2}{12\omega^3}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y^4\rho} = (12 + 6\omega_6^3c_s^2 + 144v_2^4 + 234v_2^2\omega_6 - 1008v_2^2\omega_6c_s^2 - 78\omega_6^2c_s^2 - 132c_s^2 - 98v_2^2\omega_6^2 - 18\omega_6 - 216\omega_6c_s^4 + 10v_2^2\omega_6^3 + 82\omega_6^2c_s^4 - 34v_2^2\omega_6^3c_s^2 - 216v_2^4\omega_6 + 144c_s^4 - \omega_6^3 + 8\omega_6^2 + 672v_2^2c_s^2 + 198\omega_6c_s^2 - 156v_2^2 - 9v_2^4\omega_6^3 + 404v_2^2\omega_6^2c_s^2 - 5\omega_6^3c_s^4 + 90v_2^4\omega_6^2)\frac{v_2}{12\omega_6^3}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}_y^4\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y^4\rho}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}_y^4\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}_y^4\rho}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^4_y\rho} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^4_y\rho}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}^4_y\rho} = (12 - \omega_2^3 + 144v_2^4 + 234\omega_2 v_2^2 - 18\omega_2 + 90\omega_2^2 v_2^4 + 8\omega_2^2 + 6\omega_2^3 c_s^2 - 34\omega_2^3 v_2^2 c_s^2 - 1008\omega_2 v_2^2 c_s^2 - 132c_s^2 - 216\omega_2 c_s^4 - 78\omega_2^2 c_s^2 - 9\omega_2^3 v_2^4 + 404\omega_2^2 v_2^2 c_s^2 + 144c_s^4 + 198\omega_2 c_s^2 + 10\omega_2^3 v_2^2 + 672v_2^2 c_s^2 + 82\omega_2^2 c_s^4 - 156v_2^2 - 216\omega_2 v_2^4 - 5\omega_2^3 c_s^4 - 98\omega_2^2 v_2^2)\frac{v_2}{12\omega_2^3}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}^4_y\rho} = (-171\omega_2\omega_3 c_s^4\omega_1^3 - 600\omega_2^3 v_2^2\omega_3 c_s^2\omega_1 + 141\omega_2^3\omega_3 c_s^2\omega_1 + 129\omega_2 v_2^2\omega_3\omega_1^3 + 6\omega_2^2\omega_3\omega_1 + 114\omega_2^2\omega_3 c_s^2\omega_1^2 - 105\omega_2 v_2^2\omega_3\omega_1^2 + 54\omega_2\omega_3 c_s^4\omega_1^2 + 12\omega_2^2 c_s^2\omega_1^2 - 78\omega_2^2\omega_3 c_s^2\omega_1^3 + 45\omega_2^3 v_2^4\omega_3 - 72\omega_2^3\omega_3 c_s^2 + 261v_2^2\omega_3 c_s^2\omega_1^3 - 117\omega_2 v_2^4\omega_3\omega_1^3 + 261\omega_2^3 v_2^2\omega_3 c_s^2 + 8\omega_2^2\omega_3\omega_1^3 + 18\omega_2^3 c_s^4\omega_1 + 12\omega_2^3\omega_3 c_s^2\omega_1^3 - 68\omega_2^3 v_2^2\omega_3 c_s^2\omega_1^3 - 72\omega_3 c_s^2\omega_1^3 + 6\omega_2 v_2^2 c_s^2\omega_1^3 - 12\omega_2^2\omega_3\omega_1^2 + 99\omega_2 v_2^4\omega_3\omega_1^2 - 60\omega_2^2\omega_3 c_s^2\omega_1 + 404\omega_2^3 v_2^2\omega_3 c_s^2\omega_1^2 + 18\omega_2 c_s^4\omega_1^3 - 78\omega_2^3\omega_3 c_s^2\omega_1^2 + 6\omega_3\omega_1^3 + 404\omega_2^2 v_2^2\omega_3 c_s^2\omega_1^3 - 12\omega_2\omega_3\omega_1^3 + 99\omega_2^2 v_2^4\omega_3\omega_1 - 60\omega_2\omega_3 c_s^2\omega_1^2 - 98\omega_2^2 v_2^2\omega_3\omega_1^3 - 36\omega_2^2 c_s^4\omega_1^2 + 90\omega_2^3 v_2^4\omega_3\omega_1^2 + 90\omega_2^3\omega_3 c_s^4 + 82\omega_2^2\omega_3 c_s^4\omega_1^3 - 51\omega_2^3 v_2^2\omega_3 + 411\omega_2 v_2^2\omega_3 c_s^2\omega_1^2 + 6\omega_2^3\omega_3 + 141\omega_2\omega_3 c_s^2\omega_1^3 + 129\omega_2^3 v_2^2\omega_3\omega_1 - 12\omega_2^3\omega_3\omega_1 - 171\omega_2^3\omega_3 c_s^4\omega_1 + 6\omega_2\omega_3\omega_1^2 - 816\omega_2^2 v_2^2\omega_3 c_s^2\omega_1^2 + 45v_2^4\omega_3\omega_1^3 - 600\omega_2 v_2^2\omega_3 c_s^2\omega_1^3 - 90\omega_2^2\omega_3 c_s^4\omega_1^2 - 18\omega_2^3 v_2^4\omega_3\omega_1^3 + 210\omega_2^2 v_2^2\omega_3\omega_1^2 + 54\omega_2^2\omega_3 c_s^4\omega_1 - 105\omega_2^2 v_2^2\omega_3\omega_1 - 98\omega_2^3 v_2^2\omega_3\omega_1^2 + 8\omega_2^3\omega_3\omega_1^2 - 6\omega_2 c_s^2\omega_1^3 + 90\omega_2^2 v_2^4\omega_3\omega_1^3 + 82\omega_2^3\omega_3 c_s^4\omega_1^2 + 411\omega_2^2 v_2^2\omega_3 c_s^2\omega_1 - 117\omega_2^3 v_2^4\omega_3\omega_1 - 12\omega_2^2 v_2^2 c_s^2\omega_1^2 - 6\omega_2^3 c_s^2\omega_1 + 6\omega_2^3 v_2^2 c_s^2\omega_1 - 51v_2^2\omega_3\omega_1^3 - 10\omega_2^3\omega_3 c_s^4\omega_1^3 - 2\omega_2^3\omega_3\omega_1^3 - 198\omega_2^2 v_2^4\omega_3\omega_1^2 + 90\omega_3 c_s^4\omega_1^3 + 20\omega_2^3 v_2^2\omega_3\omega_1^3)\frac{v_2}{24\omega_2^3\omega_3\omega_1^3}$

coefficient $C^{(2)}_{\mathrm{D}^4_y v_2}$ at $\frac{\partial^4 v_2}{\partial x_2^4}$:

$C^{(2),\mathrm{SRT}}_{\mathrm{D}^4_y v_2} = (12 - 22c_s^2\omega^2 + 504v_2^4 + 14v_2^2\omega^3 - 154v_2^2\omega^2 + 2c_s^2\omega^3 + 378v_2^2\omega - 36c_s^2 + 54c_s^2\omega + 24c_s^4 + 252v_2^2 c_s^2\omega^2 + 310v_2^4\omega^2 - c_s^4\omega^3 + 14c_s^4\omega^2 + 432v_2^2 c_s^2 - 29v_2^4\omega^3 - 18v_2^2 c_s^2\omega^3 - 36c_s^4\omega - 252v_2^2 - 18\omega + 8\omega^2 - 648v_2^2 c_s^2\omega - 756v_2^4\omega - \omega^3)\frac{\rho}{12\omega^3}$

$C^{(2),\mathrm{MRT1}}_{\mathrm{D}^4_y v_2} = (12 + 2\omega_6^3 c_s^2 + 504v_2^4 + 378v_2^2\omega_6 - 648v_2^2\omega_6 c_s^2 - 22\omega_6^2 c_s^2 - 36c_s^2 - 154v_2^2\omega_6^2 - 18\omega_6 - 36\omega_6 c_s^4 + 14v_2^2\omega_6^3 + 14\omega_6^2 c_s^4 - 18v_2^2\omega_6^3 c_s^2 - 756v_2^4\omega_6 + 24c_s^4 - \omega_6^3 + 8\omega_6^2 + 432v_2^2 c_s^2 + 54\omega_6 c_s^2 - 252v_2^2 - 29v_2^4\omega_6^3 + 252v_2^2\omega_6^2 c_s^2 - \omega_6^3 c_s^4 + 310v_2^4\omega_6^2)\frac{\rho}{12\omega_6^3}$

$C^{(2),\mathrm{MRT2}}_{\mathrm{D}^4_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^4_y v_2}$

$C^{(2),\mathrm{CLBM1}}_{\mathrm{D}^4_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^4_y v_2}$

$C^{(2),\mathrm{CLBM2}}_{\mathrm{D}^4_y v_2} = C^{(2),\mathrm{MRT1}}_{\mathrm{D}^4_y v_2}$

$C^{(2),\mathrm{CuLBM1}}_{\mathrm{D}^4_y v_2} = (12 - \omega_2^3 + 504v_2^4 + 378\omega_2 v_2^2 - 18\omega_2 + 310\omega_2^2 v_2^4 + 8\omega_2^2 + 2\omega_2^3 c_s^2 - 18\omega_2^3 v_2^2 c_s^2 - 648\omega_2 v_2^2 c_s^2 - 36c_s^2 - 36\omega_2 c_s^4 - 22\omega_2^2 c_s^2 - 29\omega_2^3 v_2^4 + 252\omega_2^2 v_2^2 c_s^2 + 24c_s^4 + 54\omega_2 c_s^2 + 14\omega_2^3 v_2^2 + 432v_2^2 c_s^2 + 14\omega_2^2 c_s^4 - 252v_2^2 - 756\omega_2 v_2^4 - \omega_2^3 c_s^4 - 154\omega_2^2 v_2^2)\frac{\rho}{12\omega_2^3}$

$C^{(2),\mathrm{CuLBM2}}_{\mathrm{D}^4_y v_2} = (-33\omega_2\omega_3 c_s^4\omega_1^3 - 432\omega_2^3 v_2^2\omega_3 c_s^2\omega_1 + 45\omega_2^3\omega_3 c_s^2\omega_1 + 225\omega_2 v_2^2\omega_3\omega_1^3 + 6\omega_2^2\omega_3\omega_1 + 18\omega_2^2\omega_3 c_s^2\omega_1^2 - 153\omega_2 v_2^2\omega_3\omega_1^2 + 6\omega_2\omega_3 c_s^4\omega_1^2 + 12\omega_2^2 c_s^2\omega_1^2 - 22\omega_2^2\omega_3 c_s^2\omega_1^3 + 171\omega_2^3 v_2^4\omega_3 - 24\omega_2^3\omega_3 c_s^2 + 207v_2^2\omega_3 c_s^2\omega_1^3 - 423\omega_2 v_2^4\omega_3\omega_1^3 + 207\omega_2^3 v_2^2\omega_3 c_s^2 + 8\omega_2^2\omega_3\omega_1^3 + 6\omega_2^3 c_s^4\omega_1 + 4\omega_2^3\omega_3 c_s^2\omega_1^3 - 36\omega_2^3 v_2^2\omega_3 c_s^2\omega_1^3 - 24\omega_3 c_s^2\omega_1^3 + 18\omega_2 v_2^2 c_s^2\omega_1^3 - 12\omega_2^2\omega_3\omega_1^2 + 333\omega_2 v_2^4\omega_3\omega_1^2 - 12\omega_2^2\omega_3 c_s^2\omega_1 + 252\omega_2^3 v_2^2\omega_3 c_s^2\omega_1^2 + 6\omega_2 c_s^4\omega_1^3 - 22\omega_2^3\omega_3 c_s^2\omega_1^2 + 6\omega_3\omega_1^3 + 252\omega_2^2 v_2^2\omega_3 c_s^2\omega_1^3 - 12\omega_2\omega_3\omega_1^3 + 333\omega_2^2 v_2^4\omega_3\omega_1 - 12\omega_2\omega_3 c_s^2\omega_1^2 - 154\omega_2^2 v_2^2\omega_3\omega_1^3 - 12\omega_2^2 c_s^4\omega_1^2 + 310\omega_2^3 v_2^4\omega_3\omega_1^2 + 18\omega_2^3\omega_3 c_s^4 + 14\omega_2^2\omega_3 c_s^4\omega_1^3 - 99\omega_2^3 v_2^2\omega_3 + 225\omega_2 v_2^2\omega_3 c_s^2\omega_1^2 + 6\omega_2^3\omega_3 + 45\omega_2\omega_3 c_s^2\omega_1^3 + 225\omega_2^3 v_2^2\omega_3\omega_1 - 12\omega_2^3\omega_3\omega_1 - 33\omega_2^3\omega_3 c_s^4\omega_1 + 6\omega_2\omega_3\omega_1^2 - 432\omega_2^2 v_2^2\omega_3 c_s^2\omega_1^2 + 171v_2^4\omega_3\omega_1^3 - 432\omega_2 v_2^2\omega_3 c_s^2\omega_1^3 - 6\omega_2^2\omega_3 c_s^4\omega_1^2 - 58\omega_2^3 v_2^4\omega_3\omega_1^3 + 306\omega_2^2 v_2^2\omega_3\omega_1^2 + 6\omega_2^2\omega_3 c_s^4\omega_1 - 153\omega_2^2 v_2^2\omega_3\omega_1 - 154\omega_2^3 v_2^2\omega_3\omega_1^2 + 8\omega_2^3\omega_3\omega_1^2 - 6\omega_2 c_s^2\omega_1^3 + 310\omega_2^2 v_2^4\omega_3\omega_1^3 + 14\omega_2^3\omega_3 c_s^4\omega_1^2 + 225\omega_2^2 v_2^2\omega_3 c_s^2\omega_1 - 423\omega_2^3 v_2^4\omega_3\omega_1 - 36\omega_2^2 v_2^2 c_s^2\omega_1^2 - 6\omega_2^3 c_s^2\omega_1 + 18\omega_2^3 v_2^2 c_s^2\omega_1 - 99v_2^2\omega_3\omega_1^3 - 2\omega_2^3\omega_3 c_s^4\omega_1^3 - 2\omega_2^3\omega_3\omega_1^3 - 666\omega_2^2 v_2^4\omega_3\omega_1^2 + 18\omega_3 c_s^4\omega_1^3 + 28\omega_2^3 v_2^2\omega_3\omega_1^3)\frac{\rho}{24\omega_2^3\omega_3\omega_1^3}$

References

[1] T. Krüger, H. Kusumaatmaja, A. Kuzmin, O. Shardt, G. Silva, E. M. Viggen, The lattice Boltzmann method, Springer International Publishing 10 (978-3) (2017) 4–15.

[2] C. Coreixas, B. Chopard, J. Latt, Comprehensive comparison of collision models in the lattice boltzmann framework: Theoretical investigations, Physical Review E 100 (3) (2019) 033305.