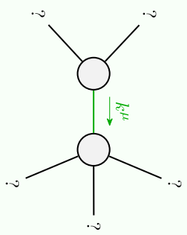
$r_3 < 0 \&\& (r_5 < -\frac{r_3}{2} \,||\, r_5 > -2\,r_3) \,||\, r_3 > 0 \&\& -2\,r_3 < r_5 < -\frac{r_3}{2}$




Quadratic pole

| Pole residue: | $-\frac{1}{r_3\,(2\,r_3+r_5)\,(r_3+2\,r_5)\,p^2} > 0$ |
|---|---|
| Polarisations: | 2 |

(No massive particles)

| | $\sigma_{1^+}^{\#1}{}_{\alpha\beta}$ | $\sigma_{1^+}^{\#2}{}_{\alpha\beta}$ | $\tau_{1^+}^{\#1}{}_{\alpha\beta}$ | $\sigma_{1^-}^{\#1}{}_{\alpha}$ | $\sigma_{1^-}^{\#2}{}_{\alpha}$ | $\tau_{1^-}^{\#1}{}_{\alpha}$ | $\tau_{1^-}^{\#2}{}_{\alpha}$ |
|---|---|---|---|---|---|---|---|
| $\sigma_{1^+}^{\#1}\,\dagger^{\alpha\beta}$ | $\frac{1}{k^2\,(2\,r_3+r_5)}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $\sigma_{1^+}^{\#2}\,\dagger^{\alpha\beta}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| $\tau_{1^+}^{\#1}\,\dagger^{\alpha\beta}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| $\sigma_{1^-}^{\#1}\,\dagger^{\alpha}$ | 0 | 0 | 0 | $\frac{2}{k^2\,(r_3+2\,r_5)}$ | $\frac{2\,\sqrt{2}}{k^2\,(1+2\,k^2)\,(r_3+2\,r_5)}$ | 0 | $\frac{4\,i}{k\,(1+2\,k^2)\,(r_3+2\,r_5)}$ |
| $\sigma_{1^-}^{\#2}\,\dagger^{\alpha}$ | 0 | 0 | 0 | $\frac{2\,\sqrt{2}}{k^2\,(1+2\,k^2)\,(r_3+2\,r_5)}$ | $\frac{3\,k^2\,(r_3+2\,r_5)+4\,t_3}{(k+2\,k^3)^2\,(r_3+2\,r_5)\,t_3}$ | 0 | $\frac{i\,\sqrt{2}\,(3\,k^2\,(r_3+2\,r_5)+4\,t_3)}{k\,(1+2\,k^2)^2\,(r_3+2\,r_5)\,t_3}$ |
| $\tau_{1^-}^{\#1}\,\dagger^{\alpha}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| $\tau_{1^-}^{\#2}\,\dagger^{\alpha}$ | 0 | 0 | 0 | $-\frac{4\,i}{k\,(1+2\,k^2)\,(r_3+2\,r_5)}$ | $-\frac{i\,\sqrt{2}\,(3\,k^2\,(r_3+2\,r_5)+4\,t_3)}{k\,(1+2\,k^2)^2\,(r_3+2\,r_5)\,t_3}$ | 0 | $\frac{6\,k^2\,(r_3+2\,r_5)+8\,t_3}{(1+2\,k^2)^2\,(r_3+2\,r_5)\,t_3}$ |

Lagrangian density

$$\frac{2}{3}\,t_3\;\omega_{\prime}{}^{\alpha\prime}\;\omega_{\kappa\alpha}{}^{\kappa}+f^{\alpha\beta}\;\tau_{\alpha\beta}+\omega^{\alpha\beta\chi}\;\sigma_{\alpha\beta\chi}-\frac{1}{2}\,r_3\,\partial_{\prime}\omega^{\kappa\lambda}{}_{\kappa}\,\partial^{\prime}\omega_{\lambda}{}^{\alpha}{}_{\alpha}-r_5\,\partial_{\prime}\omega^{\kappa\lambda}{}_{\kappa}\,\partial^{\prime}\omega_{\lambda}{}^{\alpha}{}_{\alpha}+$$
$$\frac{2}{3}\,r_2\,\partial^{\beta}\omega^{\theta\alpha}{}_{\kappa}\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}-\frac{1}{3}\,r_2\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}\,\partial_{\kappa}\omega^{\alpha\beta\theta}-\frac{2}{3}\,r_2\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}\,\partial_{\kappa}\omega^{\theta\alpha\beta}+$$
$$\frac{1}{2}\,r_3\,\partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\,\partial_{\kappa}\omega^{\theta\kappa\lambda}-r_5\,\partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\,\partial_{\kappa}\omega^{\theta\kappa\lambda}-\frac{1}{2}\,r_3\,\partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\,\partial_{\kappa}\omega^{\theta\kappa\lambda}+$$
$$r_5\,\partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\,\partial_{\kappa}\omega^{\theta\kappa\lambda}-\frac{1}{2}\,r_3\,\partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\,\partial_{\kappa}\omega^{\kappa\lambda\theta}-r_5\,\partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\,\partial_{\kappa}\omega^{\kappa\lambda\theta}+r_3\,\partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\,\partial_{\kappa}\omega^{\kappa\lambda\theta}+$$
$$2\,r_5\,\partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\,\partial_{\kappa}\omega^{\kappa\lambda\theta}-\frac{2}{3}\,t_3\;\omega_{\kappa\alpha}{}^{\alpha}\,\partial^{\kappa}f^{\prime}{}_{\prime}-\frac{2}{3}\,t_3\;\omega_{\kappa\lambda}{}^{\lambda}\,\partial^{\kappa}f^{\prime}{}_{\prime}-\frac{4}{3}\,t_3\,\partial^{\alpha}f_{\kappa\alpha}\,\partial^{\kappa}f^{\prime}{}_{\prime}+$$
$$\frac{2}{3}\,t_3\,\partial_{\kappa}f^{\lambda}{}_{\lambda}\,\partial^{\kappa}f^{\prime}{}_{\prime}+\frac{2}{3}\,t_3\;\omega_{\prime\alpha}{}^{\alpha}\,\partial^{\kappa}f^{\prime}{}_{\kappa}+\frac{2}{3}\,t_3\;\omega_{\prime\lambda}{}^{\lambda}\,\partial^{\kappa}f^{\prime}{}_{\kappa}+\frac{2}{3}\,t_3\,\partial^{\alpha}f^{\lambda}{}_{\alpha}\,\partial^{\kappa}f_{\lambda\kappa}+$$
$$\frac{1}{3}\,r_2\,\partial_{\kappa}\omega^{\alpha\beta\theta}\,\partial^{\kappa}\omega_{\alpha\beta\theta}+\frac{2}{3}\,r_2\,\partial_{\kappa}\omega^{\theta\alpha\beta}\,\partial^{\kappa}\omega_{\alpha\beta\theta}-\frac{2}{3}\,r_2\,\partial^{\beta}\omega_{\prime}{}^{\alpha\lambda}\,\partial_{\lambda}\omega_{\alpha\beta}{}^{\prime}+$$
$$\frac{2}{3}\,r_2\,\partial^{\beta}\omega_{\prime}{}^{\lambda\alpha}\,\partial_{\lambda}\omega_{\alpha\beta}{}^{\prime}-4\,r_3\,\partial^{\beta}\omega_{\prime}{}^{\lambda\alpha}\,\partial_{\lambda}\omega_{\alpha\beta}{}^{\prime}-\frac{1}{2}\,r_3\,\partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\,\partial^{\lambda}\omega^{\theta\kappa}{}_{\kappa}+$$
$$r_5\,\partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\,\partial^{\lambda}\omega^{\theta\kappa}{}_{\kappa}+\frac{1}{2}\,r_3\,\partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\,\partial^{\lambda}\omega^{\theta\kappa}{}_{\kappa}-r_5\,\partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\,\partial^{\lambda}\omega^{\theta\kappa}{}_{\kappa}$$

| | $\omega_{1^+}^{\#1}{}_{\alpha\beta}$ | $\omega_{1^+}^{\#2}{}_{\alpha\beta}$ | $f_{1^+}^{\#1}{}_{\alpha\beta}$ | $\omega_{1^-}^{\#1}{}_{\alpha}$ | $\omega_{1^-}^{\#2}{}_{\alpha}$ | $f_{1^-}^{\#1}{}_{\alpha}$ | $f_{1^-}^{\#2}{}_{\alpha}$ |
|---|---|---|---|---|---|---|---|
| $\omega_{1^+}^{\#1}\,\dagger^{\alpha\beta}$ | $k^2\,(2\,r_3+r_5)$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $\omega_{1^+}^{\#2}\,\dagger^{\alpha\beta}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| $f_{1^+}^{\#1}\,\dagger^{\alpha\beta}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| $\omega_{1^-}^{\#1}\,\dagger^{\alpha}$ | 0 | 0 | 0 | $k^2\,(\frac{r_3}{2}+r_5)+\frac{2\,t_3}{3}$ | $-\frac{\sqrt{2}\,t_3}{3}$ | 0 | $-\frac{2}{3}\,i\,k\,t_3$ |
| $\omega_{1^-}^{\#2}\,\dagger^{\alpha}$ | 0 | 0 | 0 | $-\frac{\sqrt{2}\,t_3}{3}$ | $\frac{t_3}{3}$ | 0 | $\frac{1}{3}\,i\,\sqrt{2}\;k\,t_3$ |
| $f_{1^-}^{\#1}\,\dagger^{\alpha}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| $f_{1^-}^{\#2}\,\dagger^{\alpha}$ | 0 | 0 | 0 | $\frac{2\,i\,k\,t_3}{3}$ | $-\frac{1}{3}\,i\,\sqrt{2}\;k\,t_3$ | 0 | $\frac{2\,k^2\,t_3}{3}$ |

Source constraints

| SO(3) irreps | # |
|---|---|
| $\tau_{0^+}^{\#2} == 0$ | 1 |
| $\tau_{0^+}^{\#1} - 2\,i\,k\,\sigma_{0^+}^{\#1} == 0$ | 1 |
| $\tau_{1^-}^{\#2\,\alpha} + 2\,i\,k\;\sigma_{1^-}^{\#2\,\alpha} == 0$ | 3 |
| $\tau_{1^-}^{\#1\,\alpha} == 0$ | 3 |
| $\tau_{1^+}^{\#1\,\alpha\beta} == 0$ | 3 |
| $\sigma_{1^+}^{\#2\,\alpha\beta} == 0$ | 3 |
| $\sigma_{2^-}^{\#1\,\alpha\beta\chi} == 0$ | 5 |
| $\tau_{2^+}^{\#1\,\alpha\beta} == 0$ | 5 |
| Total #: | 24 |

| | $\sigma_{0^+}^{\#1}\,\dagger$ | $\tau_{0^+}^{\#1}\,\dagger$ | $\tau_{0^+}^{\#2}\,\dagger$ | $\sigma_{0^-}^{\#1}\,\dagger$ |
|---|---|---|---|---|
| $\sigma_{0^+}^{\#1}$ | $\frac{1}{(1+2\,k^2)^2\,t_3}$ | $-\frac{i\,\sqrt{2}\,k}{(1+2\,k^2)^2\,t_3}$ | 0 | 0 |
| $\tau_{0^+}^{\#1}$ | $\frac{i\,\sqrt{2}\,k}{(1+2\,k^2)^2\,t_3}$ | $\frac{2\,k^2}{(1+2\,k^2)^2\,t_3}$ | 0 | 0 |
| $\tau_{0^+}^{\#2}$ | 0 | 0 | 0 | 0 |
| $\sigma_{0^-}^{\#1}$ | 0 | 0 | 0 | $\frac{1}{k^2\,r_2}$ |

| | $\sigma_{2^+}^{\#1}\,\dagger^{\alpha\beta}$ | $\tau_{2^+}^{\#1}\,\dagger^{\alpha\beta}$ | $\sigma_{2^-}^{\#1}\,\dagger^{\alpha\beta\chi}$ |
|---|---|---|---|
| $\sigma_{2^+}^{\#1}{}_{\alpha\beta}$ | $-\frac{2}{3\,k^2\,r_3}$ | 0 | 0 |
| $\tau_{2^+}^{\#1}{}_{\alpha\beta}$ | 0 | 0 | 0 |
| $\sigma_{2^-}^{\#1}{}_{\alpha\beta\chi}$ | 0 | 0 | 0 |

| | $\omega_{0^+}^{\#1}$ | $f_{0^+}^{\#1}$ | $f_{0^+}^{\#2}$ | $\omega_{0^-}^{\#1}$ |
|---|---|---|---|---|
| $\omega_{0^+}^{\#1}\,\dagger$ | $t_3$ | $-i\,\sqrt{2}\;k\,t_3$ | 0 | 0 |
| $f_{0^+}^{\#1}\,\dagger$ | $i\,\sqrt{2}\;k\,t_3$ | $2\,k^2\,t_3$ | 0 | 0 |
| $f_{0^+}^{\#2}\,\dagger$ | 0 | 0 | 0 | 0 |
| $\omega_{0^-}^{\#1}\,\dagger$ | 0 | 0 | 0 | $k^2\,r_2$ |

| | $\omega_{2^+}^{\#1}\,\dagger^{\alpha\beta}$ | $f_{2^+}^{\#1}\,\dagger^{\alpha\beta}$ | $\omega_{2^-}^{\#1}\,\dagger^{\alpha\beta\chi}$ |
|---|---|---|---|
| $\omega_{2^+}^{\#1}{}_{\alpha\beta}$ | $-\frac{3\,k^2\,r_3}{2}$ | 0 | 0 |
| $f_{2^+}^{\#1}{}_{\alpha\beta}$ | 0 | 0 | 0 |
| $\omega_{2^-}^{\#1}{}_{\alpha\beta\chi}$ | 0 | 0 | 0 |