| | $\omega^{\#1}_{1^+\,\alpha\beta}$ | $\omega^{\#2}_{1^+\,\alpha\beta}$ | $f^{\#1}_{1^+\,\alpha\beta}$ | $\omega^{\#1}_{1^-\,\alpha}$ | $\omega^{\#2}_{1^-\,\alpha}$ | $f^{\#1}_{1^-\,\alpha}$ | $f^{\#2}_{1^-\,\alpha}$ |
|---|---|---|---|---|---|---|---|
| $\omega^{\#1}_{1^+}{}^{\dagger\,\alpha\beta}$ | $k^2\,(2\,r_1+r_5)$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $\omega^{\#2}_{1^+}{}^{\dagger\,\alpha\beta}$ | 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 | $k^2\,(r_1+r_5)+\frac{2\,t_3}{3}$ | $-\frac{\sqrt{2}\,t_3}{3}$ | 0 | $-\frac{2}{3}\,i\,k\,t_3$ |
| $\omega^{\#2}_{1^-}{}^{\dagger\,\alpha}$ | 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 |
| $f^{\#2}_{1^-}{}^{\dagger\,\alpha}$ | 0 | 0 | 0 | $\frac{2\,i\,k\,t_3}{3}$ | $-\frac{1}{3}\,i\,\sqrt{2}\,k\,t_3$ | 0 | $\frac{2\,k^2\,t_3}{3}$ |

| | $\sigma^{\#1}_{2^+\,\alpha\beta}$ | $\tau^{\#1}_{2^+\,\alpha\beta}$ | $\sigma^{\#1}_{2^-\,\alpha\beta\chi}$ |
|---|---|---|---|
| $\sigma^{\#1}_{2^+}{}^{\dagger\,\alpha\beta}$ | 0 | 0 | 0 |
| $\tau^{\#1}_{2^+}{}^{\dagger\,\alpha\beta}$ | 0 | 0 | 0 |
| $\sigma^{\#1}_{2^-}{}^{\dagger\,\alpha\beta\chi}$ | 0 | 0 | $\frac{1}{k^2\,r_1}$ |

| | $\omega^{\#1}_{0^+}$ | $f^{\#1}_{0^+}$ | $f^{\#2}_{0^+}$ | $\omega^{\#1}_{0^-}$ |
|---|---|---|---|---|
| $\omega^{\#1}_{0^+}{}^{\dagger}$ | $t_3$ | $-i\,\sqrt{2}\,k\,t_3$ | 0 | 0 |
| $f^{\#1}_{0^+}{}^{\dagger}$ | $i\,\sqrt{2}\,k\,t_3$ | $2\,k^2\,t_3$ | 0 | 0 |
| $f^{\#2}_{0^+}{}^{\dagger}$ | 0 | 0 | 0 | 0 |
| $\omega^{\#1}_{0^-}{}^{\dagger}$ | 0 | 0 | 0 | 0 |

| | $\omega^{\#1}_{2^+\,\alpha\beta}$ | $f^{\#1}_{2^+\,\alpha\beta}$ | $\omega^{\#1}_{2^-\,\alpha\beta\chi}$ |
|---|---|---|---|
| $\omega^{\#1}_{2^+}{}^{\dagger\,\alpha\beta}$ | 0 | 0 | 0 |
| $f^{\#1}_{2^+}{}^{\dagger\,\alpha\beta}$ | 0 | 0 | 0 |
| $\omega^{\#1}_{2^-}{}^{\dagger\,\alpha\beta\chi}$ | 0 | 0 | $k^2\,r_1$ |

| | $\sigma^{\#1}_{0^+}$ | $\tau^{\#1}_{0^+}$ | $\tau^{\#2}_{0^+}$ | $\sigma^{\#1}_{0^-}$ |
|---|---|---|---|---|
| $\sigma^{\#1}_{0^+}{}^{\dagger}$ | $\frac{1}{(1+2\,k^2)^2\,t_3}$ | $-\frac{i\,\sqrt{2}\,k}{(1+2\,k^2)^2\,t_3}$ | 0 | 0 |
| $\tau^{\#1}_{0^+}{}^{\dagger}$ | $\frac{i\,\sqrt{2}\,k}{(1+2\,k^2)^2\,t_3}$ | $\frac{2\,k^2}{(1+2\,k^2)^2\,t_3}$ | 0 | 0 |
| $\tau^{\#2}_{0^+}{}^{\dagger}$ | 0 | 0 | 0 | 0 |
| $\sigma^{\#1}_{0^-}{}^{\dagger}$ | 0 | 0 | 0 | 0 |

| | $\sigma^{\#1}_{1^+\,\alpha\beta}$ | $\sigma^{\#2}_{1^+\,\alpha\beta}$ | $\tau^{\#1}_{1^+\,\alpha\beta}$ | $\sigma^{\#1}_{1^-\,\alpha}$ | $\sigma^{\#2}_{1^-\,\alpha}$ | $\tau^{\#1}_{1^-\,\alpha}$ | $\tau^{\#2}_{1^-\,\alpha}$ |
|---|---|---|---|---|---|---|---|
| $\sigma^{\#1}_{1^+}{}^{\dagger\,\alpha\beta}$ | $\frac{1}{k^2\,(2\,r_1+r_5)}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $\sigma^{\#2}_{1^+}{}^{\dagger\,\alpha\beta}$ | 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 | $\frac{1}{k^2\,(r_1+r_5)}$ | $\frac{\sqrt{2}}{k^2\,(1+2\,k^2)\,(r_1+r_5)}$ | 0 | $\frac{2\,i}{k\,(1+2\,k^2)\,(r_1+r_5)}$ |
| $\sigma^{\#2}_{1^-}{}^{\dagger\,\alpha}$ | 0 | 0 | 0 | $\frac{\sqrt{2}}{k^2\,(1+2\,k^2)\,(r_1+r_5)}$ | $\frac{3\,k^2\,(r_1+r_5)+2\,t_3}{(k+2\,k^3)^2\,(r_1+r_5)\,t_3}$ | 0 | $\frac{i\,\sqrt{2}\,(3\,k^2\,(r_1+r_5)+2\,t_3)}{k\,(1+2\,k^2)^2\,(r_1+r_5)\,t_3}$ |
| $\tau^{\#1}_{1^-}{}^{\dagger\,\alpha}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| $\tau^{\#2}_{1^-}{}^{\dagger\,\alpha}$ | 0 | 0 | 0 | $-\frac{2\,i}{k\,(1+2\,k^2)\,(r_1+r_5)}$ | $-\frac{i\,\sqrt{2}\,(3\,k^2\,(r_1+r_5)+4\,t_3}{(1+2\,k^2)^2\,(r_1+r_5)\,t_3}$ | 0 | $\frac{6\,k^2\,(r_1+r_5)+4\,t_3}{(1+2\,k^2)^2\,(r_1+r_5)\,t_3}$ |

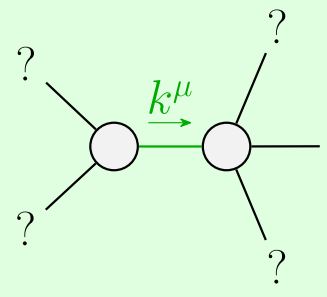
Source constraints

| SO(3) irreps | # |
|---|---|
| $\sigma^{\#1}_{0^-} == 0$ | 1 |
| $\tau^{\#2}_{0^+} == 0$ | 1 |
| $\tau^{\#1}_{0^+} - 2\,i\,k\,\sigma^{\#1}_{0^+} == 0$ | 1 |
| $\tau^{\#2\,\alpha}_{1^-} + 2\,i\,k\;\sigma^{\#2\,\alpha}_{1^-} == 0$ | 3 |
| $\tau^{\#1\,\alpha}_{1^-} == 0$ | 3 |
| $\tau^{\#1\,\alpha\beta}_{1^+} == 0$ | 3 |
| $\sigma^{\#2\,\alpha\beta}_{1^+} == 0$ | 3 |
| $\tau^{\#1\,\alpha\beta}_{2^+} == 0$ | 5 |
| $\sigma^{\#1\,\alpha\beta}_{2^+} == 0$ | 5 |
| Total #: | 25 |

Lagrangian density

$$\begin{aligned}
&\tfrac{2}{3}\,t_3\;\omega_{\prime}{}^{\alpha\prime}\;\omega_{\kappa\alpha}{}^{\kappa} - r_5\,\partial_{\prime}\omega^{\kappa\lambda}{}_{\kappa}\,\partial^{\prime}\omega_{\lambda\;\alpha}{}^{\alpha} - \tfrac{2}{3}\,r_1\,\partial^{\beta}\omega^{\theta\alpha}{}_{\kappa}\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa} - \\
&\tfrac{2}{3}\,r_1\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}\,\partial_{\kappa}\omega^{\alpha\beta\theta} + \tfrac{2}{3}\,r_1\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}\,\partial_{\kappa}\omega^{\theta\alpha\beta} - r_5\,\partial_{\alpha}\omega_{\lambda\;\theta}{}^{\alpha}\,\partial_{\kappa}\omega^{\theta\kappa\lambda} + \\
&r_5\,\partial_{\theta}\omega_{\lambda\;\alpha}{}^{\alpha}\,\partial_{\kappa}\omega^{\theta\kappa\lambda} - r_5\,\partial_{\alpha}\omega_{\lambda\;\theta}{}^{\alpha}\,\partial_{\kappa}\omega^{\kappa\lambda\theta} + 2\,r_5\,\partial_{\theta}\omega_{\lambda\;\alpha}{}^{\alpha}\,\partial_{\kappa}\omega^{\kappa\lambda\theta} - \\
&\tfrac{2}{3}\,t_3\;\omega_{\kappa\alpha}{}^{\alpha}\,\partial^{\kappa}f^{\prime}{}_{\prime} - \tfrac{2}{3}\,t_3\;\omega_{\kappa\lambda}{}^{\lambda}\,\partial^{\kappa}f^{\prime}{}_{\prime} - \tfrac{4}{3}\,t_3\,\partial^{\alpha}f_{\kappa\alpha}\,\partial^{\kappa}f^{\prime}{}_{\prime} + \tfrac{2}{3}\,t_3\,\partial_{\kappa}f^{\lambda}{}_{\lambda}\,\partial^{\kappa}f^{\prime}{}_{\prime} + \\
&\tfrac{2}{3}\,t_3\;\omega_{\prime\alpha}{}^{\alpha}\,\partial^{\kappa}f^{\prime}{}_{\kappa} + \tfrac{2}{3}\,t_3\;\omega_{\prime\lambda}{}^{\lambda}\,\partial^{\kappa}f^{\prime}{}_{\kappa} + \tfrac{2}{3}\,t_3\,\partial^{\alpha}f^{\lambda}{}_{\alpha}\,\partial^{\kappa}f_{\lambda\kappa} + \\
&\tfrac{2}{3}\,r_1\,\partial_{\kappa}\omega^{\alpha\beta\theta}\,\partial^{\kappa}\omega_{\alpha\beta\theta} - \tfrac{2}{3}\,r_1\,\partial_{\kappa}\omega^{\theta\alpha\beta}\,\partial^{\kappa}\omega_{\alpha\beta\theta} + \tfrac{2}{3}\,r_1\,\partial^{\beta}\omega_{\prime}{}^{\alpha\lambda}\,\partial_{\lambda}\omega_{\alpha\beta}{}^{\prime} - \\
&\tfrac{8}{3}\,r_1\,\partial^{\beta}\omega_{\prime}{}^{\lambda\alpha}\,\partial_{\lambda}\omega_{\alpha\beta}{}^{\prime} + r_5\,\partial_{\alpha}\omega_{\lambda\;\theta}{}^{\alpha}\,\partial^{\lambda}\omega^{\theta\kappa}{}_{\kappa} - r_5\,\partial_{\theta}\omega_{\lambda\;\alpha}{}^{\alpha}\,\partial^{\lambda}\omega^{\theta\kappa}{}_{\kappa}
\end{aligned}$$

Added source term: $f^{\alpha\beta}\;\tau_{\alpha\beta} + \omega^{\alpha\beta\chi}\;\sigma_{\alpha\beta\chi}$




Quadratic pole

| | |
|---|---|
| Pole residue: | $-\frac{1}{r_1\,(r_1+r_5)\,(2\,r_1+r_5)\,p^2} > 0$ |
| Polarisations: | 2 |

Unitarity conditions

$r_1 < 0\;\&\&\;(r_5 < -r_1\;||\;r_5 > -2\,r_1)\;||\;r_1 > 0\;\&\&\;-2\,r_1 < r_5 < -r_1$

(No massive particles)