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

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

Lagrangian density

$$\tfrac{2}{3}\,t_3\;\omega_{\prime}{}^{\alpha\prime}\;\omega_{\kappa\alpha}{}^{\kappa}-\tfrac{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}+\tfrac{2}{3}\,r_2\,\partial^{\beta}\omega^{\theta\alpha}{}_{\kappa}\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}-\tfrac{1}{3}\,r_2\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}\,\partial_{\kappa}\omega^{\alpha\beta\theta}-\tfrac{2}{3}\,r_2\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}\,\partial_{\kappa}\omega^{\theta\alpha\beta}+\tfrac{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}-\tfrac{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}-r_5\,\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}-\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^{\prime}{}_{\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}{}^{\lambda}{}_{\alpha}\,\partial^{\kappa}f_{\lambda\kappa}+\tfrac{1}{3}\,r_2\,\partial_{\kappa}\omega^{\alpha\beta\theta}\,\partial^{\kappa}\omega_{\alpha\beta\theta}+\tfrac{2}{3}\,r_2\,\partial_{\kappa}\omega^{\theta\alpha\beta}\,\partial^{\kappa}\omega_{\alpha\beta\theta}-\tfrac{2}{3}\,r_2\,\partial^{\beta}\omega_{\prime}{}^{\alpha\lambda}\,\partial_{\lambda}\omega_{\alpha\beta}{}^{\prime}+\tfrac{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}-\tfrac{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}+\tfrac{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}$$

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

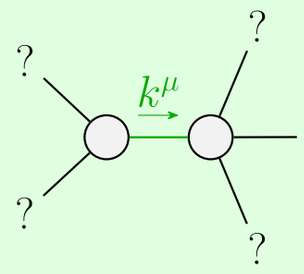
| | $\omega_{0^+}^{\#1}$ | $f_{0^+}^{\#1}$ | $f_{0^+}^{\#2}$ | $\omega_{0^-}^{\#1}$ |
|---|---|---|---|---|
| $\omega_{0^+}^{\#1}\,\dagger$ | $t_3$ | $-i\sqrt{2}\,k\,t_3$ | 0 | 0 |
| $f_{0^+}^{\#1}\,\dagger$ | $i\sqrt{2}\,k\,t_3$ | $2k^2 t_3$ | 0 | 0 |
| $f_{0^+}^{\#2}\,\dagger$ | 0 | 0 | 0 | 0 |
| $\omega_{0^-}^{\#1}\,\dagger$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

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

| | $\omega_{1^+}^{\#1}{}_{\alpha\beta}$ | $\omega_{1^+}^{\#2}{}_{\alpha\beta}$ | $f_{1^+}^{\#1}{}_{\alpha\beta}$ | $\omega_{1^-}^{\#1}{}_{\alpha}$ | $\omega_{1^-}^{\#2}{}_{\alpha}$ | $f_{1^-}^{\#1}{}_{\alpha}$ | $f_{1^-}^{\#2}{}_{\alpha}$ |
|---|---|---|---|---|---|---|---|
| $\omega_{1^+}^{\#1}\,\dagger^{\alpha\beta}$ | $k^2(2r_3+r_5)$ | 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 | $k^2(\frac{r_3}{2}+r_5)+\frac{2t_3}{3}$ | $-\frac{\sqrt{2}\,t_3}{3}$ | 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 | $\frac{2ikt_3}{3}$ | $-\frac{1}{3}\,i\sqrt{2}\,k\,t_3$ | 0 | $\frac{2k^2 t_3}{3}$ |

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

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




Quadratic pole

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

Unitarity conditions

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

(No massive particles)