



Quadratic pole

Pole residue: $\frac{1}{r_5 t_1^2 p^2} > 0$

Polarisations: 2

$\sigma_{1+}^{\#1} \dagger^{\alpha\beta}$	$\sigma_{1+}^{\#2}$	$\tau_{1+}^{\#1} \alpha\beta$	$\sigma_{1-}^{\#1} \alpha$	$\sigma_{1-}^{\#2} \alpha$	$\tau_{1-}^{\#1} \alpha$	$\tau_{1-}^{\#2} \alpha$
$\frac{1}{k^2 r_5}$	$\frac{1}{\sqrt{2} (k^2 r_5 + k^4 r_5)}$	$\frac{i}{\sqrt{2} (k r_5 + k^3 r_5)}$	0	0	0	0
$\frac{1}{\sqrt{2} (k^2 r_5 + k^4 r_5)}$	$\frac{6 k^2 r_5 + t_1}{2 (k + k^3)^2 r_5 t_1}$	$\frac{i (6 k^2 r_5 + t_1)}{2 k (1 + k^2)^2 r_5 t_1}$	0	0	0	0
$-\frac{i}{\sqrt{2} (k r_5 + k^3 r_5)}$	$-\frac{i (6 k^2 r_5 + t_1)}{2 k (1 + k^2)^2 r_5 t_1}$	$\frac{6 k^2 r_5 + t_1}{2 (1 + k^2)^2 r_5 t_1}$	0	0	0	0
0	0	0	0	$\frac{\sqrt{2}}{t_1 + 2 k^2 t_1}$	0	$\frac{2 i k}{t_1 + 2 k^2 t_1}$
0	0	0	$\frac{\sqrt{2}}{t_1 + 2 k^2 t_1}$	$\frac{-2 k^2 r_5 + t_1}{(t_1 + 2 k^2 t_1)^2}$	0	$-\frac{i \sqrt{2} k (2 k^2 r_5 - t_1)}{(t_1 + 2 k^2 t_1)^2}$
0	0	0	0	0	0	0
0	0	0	$-\frac{2 i k}{t_1 + 2 k^2 t_1}$	$\frac{i \sqrt{2} k (2 k^2 r_5 - t_1)}{(t_1 + 2 k^2 t_1)^2}$	0	$\frac{-4 k^4 r_5 + 2 k^2 t_1}{(t_1 + 2 k^2 t_1)^2}$

Lagrangian density

$$\begin{aligned}
& -t_1 \omega_{\kappa\alpha}^{\alpha'} \omega_{\kappa\alpha}^{\kappa} - \frac{1}{3} t_1 \omega_{\kappa\lambda}^{\kappa\lambda} \omega_{\kappa\lambda}^{\prime} + \frac{1}{3} t_1 \omega_{\kappa\lambda}^{\prime} \omega_{\kappa\lambda}^{\kappa\lambda} - \\
& r_5 \partial_{\lambda} \omega_{\kappa\lambda}^{\kappa\lambda} \partial'_{\kappa} \omega_{\lambda\alpha}^{\alpha} - r_5 \partial_{\alpha} \omega_{\lambda\theta}^{\alpha} \partial_{\kappa} \omega_{\lambda\theta}^{\theta\kappa\lambda} + r_5 \partial_{\theta} \omega_{\lambda\alpha}^{\alpha} \partial_{\kappa} \omega_{\lambda\alpha}^{\theta\kappa\lambda} - \\
& r_5 \partial_{\alpha} \omega_{\lambda\theta}^{\alpha} \partial_{\kappa} \omega_{\lambda\theta}^{\kappa\lambda\theta} + 2 r_5 \partial_{\theta} \omega_{\lambda\alpha}^{\alpha} \partial_{\kappa} \omega_{\lambda\alpha}^{\kappa\lambda\theta} - \frac{1}{3} t_1 \partial_1^{\alpha} f_{\theta\kappa}^{\kappa} \partial^{\kappa} f_{\alpha}^{\theta} - \\
& \frac{2}{3} t_1 \partial^{\alpha} f_{\kappa\theta} \partial^{\kappa} f_{\alpha}^{\theta} - \frac{1}{3} t_1 \partial^{\alpha} f_{\lambda}^{\lambda} \partial^{\kappa} f_{\kappa}^{\alpha} + t_1 \omega_{\kappa\alpha}^{\alpha} \partial^{\kappa} f_{\alpha}^{\prime} + t_1 \omega_{\kappa\lambda}^{\lambda} \partial^{\kappa} f_{\lambda}^{\prime} + \\
& 2 t_1 \partial^{\alpha} f_{\kappa\alpha} \partial^{\kappa} f_{\lambda}^{\prime} - t_1 \partial_{\kappa} f_{\lambda}^{\lambda} \partial^{\kappa} f_{\alpha}^{\prime} + \frac{1}{3} t_1 \omega_{\theta\kappa} \partial^{\kappa} f^{\prime\theta} + \frac{4}{3} t_1 \omega_{\lambda\kappa\theta} \partial^{\kappa} f^{\prime\theta} - \\
& \frac{1}{3} t_1 \omega_{\theta\lambda\kappa} \partial^{\kappa} f^{\prime\theta} + \frac{2}{3} t_1 \omega_{\theta\kappa\lambda} \partial^{\kappa} f^{\prime\theta} - t_1 \omega_{\lambda\alpha}^{\alpha} \partial^{\kappa} f_{\kappa}^{\prime} - t_1 \omega_{\lambda\lambda}^{\lambda} \partial^{\kappa} f_{\kappa}^{\prime} + \\
& \frac{1}{3} t_1 \partial^{\alpha} f_{\lambda}^{\lambda} \partial^{\kappa} f_{\kappa}^{\alpha} + \frac{1}{3} t_1 \partial_{\kappa} f_{\theta}^{\lambda} \partial^{\kappa} f_{\lambda}^{\theta} + \frac{2}{3} t_1 \partial_{\kappa} f_{\theta}^{\lambda} \partial^{\kappa} f_{\lambda}^{\theta} - \\
& t_1 \partial^{\alpha} f_{\alpha}^{\lambda} \partial^{\kappa} f_{\lambda\kappa} + r_5 \partial_{\alpha} \omega_{\lambda\theta}^{\alpha} \partial^{\lambda} \omega_{\lambda\theta}^{\theta\kappa} - r_5 \partial_{\theta} \omega_{\lambda\alpha}^{\alpha} \partial^{\lambda} \omega_{\lambda\alpha}^{\theta\kappa}
\end{aligned}$$

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

Source constraints	
SO(3) irreps	#
$\sigma_{0-}^{\#1} == 0$	1
$\tau_{0+}^{\#2} == 0$	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
$\tau_{1+}^{\#1\alpha\beta} + i k \sigma_{1+}^{\#2\alpha\beta} == 0$	3
$\tau_{2+}^{\#1\alpha\beta} - 2 i k \sigma_{2+}^{\#1\alpha\beta} == 0$	5
Total #:	17

	$\omega_{0+}^{\#1}$	$f_{0+}^{\#1}$	$f_{0+}^{\#2}$	$\omega_{0-}^{\#1}$
$\omega_{0+}^{\#1} \dagger$	$-t_1$	$i \sqrt{2} k t_1$	0	0
$f_{0+}^{\#1} \dagger$	$-i \sqrt{2} k t_1$	$-2 k^2 t_1$	0	0
$f_{0+}^{\#2} \dagger$	0	0	0	0
$\omega_{0-}^{\#1} \dagger$	0	0	0	0

	$\omega_{2+}^{\#1} \alpha\beta$	$f_{2+}^{\#1} \alpha\beta$	$\omega_{2-}^{\#1} \alpha\beta\chi$
$\omega_{2+}^{\#1} \dagger^{\alpha\beta}$	$\frac{t_1}{2}$	$-\frac{i k t_1}{\sqrt{2}}$	0
$f_{2+}^{\#1} \dagger^{\alpha\beta}$	$\frac{i k t_1}{\sqrt{2}}$	$k^2 t_1$	0
$\omega_{2-}^{\#1} \dagger^{\alpha\beta\chi}$	0	0	$\frac{t_1}{2}$

	$\sigma_{0+}^{\#1}$	$\tau_{0+}^{\#1}$	$\tau_{0+}^{\#2}$	$\sigma_{0-}^{\#1}$
$\sigma_{0+}^{\#1} \dagger$	$-\frac{1}{(1+2 k^2)^2 t_1}$	$\frac{i \sqrt{2} k}{(1+2 k^2)^2 t_1}$	0	0
$\tau_{0+}^{\#1} \dagger$	$-\frac{i \sqrt{2} k}{(1+2 k^2)^2 t_1}$	$-\frac{2 k^2}{(1+2 k^2)^2 t_1}$	0	0
$\tau_{0+}^{\#2} \dagger$	0	0	0	0
$\sigma_{0-}^{\#1} \dagger$	0	0	0	0

	$\omega_{1+}^{\#1} \alpha\beta$	$\omega_{1+}^{\#2} \alpha\beta$	$f_{1+}^{\#1} \alpha\beta$	$\omega_{1-}^{\#1} \alpha$	$\omega_{1-}^{\#2} \alpha$	$f_{1-}^{\#1} \alpha$	$f_{1-}^{\#2} \alpha$
$\omega_{1+}^{\#1} \dagger^{\alpha\beta}$	$k^2 r_5 + \frac{t_1}{6}$	$-\frac{t_1}{3 \sqrt{2}}$	$-\frac{i k t_1}{3 \sqrt{2}}$	0	0	0	0
$\omega_{1+}^{\#2} \dagger^{\alpha\beta}$	$-\frac{t_1}{3 \sqrt{2}}$	$\frac{t_1}{3}$	$\frac{i k t_1}{3}$	0	0	0	0
$f_{1+}^{\#1} \dagger^{\alpha\beta}$	$\frac{i k t_1}{3 \sqrt{2}}$	$-\frac{1}{3} i k t_1$	$\frac{k^2 t_1}{3}$	0	0	0	0
$\omega_{1-}^{\#1} \dagger^{\alpha}$	0	0	0	$k^2 r_5 - \frac{t_1}{2}$	$\frac{t_1}{\sqrt{2}}$	0	$i k t_1$
$\omega_{1-}^{\#2} \dagger^{\alpha}$	0	0	0	$\frac{t_1}{\sqrt{2}}$	0	0	0
$f_{1-}^{\#1} \dagger^{\alpha}$	0	0	0	0	0	0	0
$f_{1-}^{\#2} \dagger^{\alpha}$	0	0	0	$-i k t_1$	0	0	0

Unitarity conditions

$$r_5 > 0 \ \&\& \ t_1 < 0 \ || \ t_1 > 0$$

(No massive particles)