



Quadratic pole

Pole residue:

$\frac{1}{\beta_1}$

Polarisations:

2

(No massive particles)

Lagrangian density

$$\begin{aligned}
 &-2\beta_1\omega_{\alpha\chi\beta}\omega^{\alpha\beta\chi}-2\beta_1\omega_{\alpha}^{\chi\delta}\omega_{\chi\delta}^{\alpha}-2\beta_1\omega_{\alpha}^{\chi}\omega_{\chi}^{\alpha}\partial_{\beta}f^{\alpha\beta}-2\beta_1\omega_{\alpha}^{\delta}\partial_{\delta}f^{\alpha\beta}- \\
 &4\beta_1f^{\alpha\beta}\partial_{\beta}\omega_{\alpha}^{\chi}+4\beta_1\partial_{\beta}\omega_{\alpha}^{\alpha\beta}+\frac{2}{3}\alpha_3\partial^{\alpha}\omega_{\alpha}^{\beta\zeta}\partial_{\beta}\omega_{\zeta\alpha}^{\chi}+ \\
 &2\beta_1\omega_{\beta}^{\chi}\partial_{\chi}f^{\alpha}_{\alpha}+2\beta_1\omega_{\beta}^{\delta}\partial_{\delta}f^{\alpha}_{\alpha}-2\beta_1\partial_{\beta}f^{\alpha}_{\chi}\partial^{\beta}f^{\alpha}_{\alpha}+4\beta_1f^{\alpha\beta}\partial_{\chi}\omega_{\alpha}^{\chi}\beta^{-} \\
 &4\beta_1f^{\alpha}_{\alpha}\partial_{\chi}\omega^{\beta\chi}_{\beta}-\frac{2}{3}\alpha_3\partial_{\beta}\omega_{\zeta\alpha}^{\chi}\partial_{\chi}\omega^{\beta\zeta\alpha}_{\alpha}-\frac{1}{3}\alpha_3\partial_{\beta}\omega_{\zeta\alpha}^{\chi}\partial_{\chi}\omega^{\zeta\alpha\beta}_{\beta}+ \\
 &4\beta_1\omega_{\alpha\chi\beta}\partial^{\chi}f^{\alpha\beta}_{\beta}+\beta_1\partial_{\chi}f^{\delta}_{\beta}\partial^{\chi}f^{\beta}_{\delta}+\beta_1\partial_{\chi}f^{\delta}_{\beta}\partial^{\chi}f^{\beta}_{\delta}+ \\
 &\frac{2}{3}\alpha_3\partial_{\chi}\omega^{\beta\zeta\alpha}_{\alpha}\partial^{\chi}\omega_{\zeta\alpha\beta}^{\chi}+\frac{1}{3}\alpha_3\partial_{\chi}\omega^{\zeta\alpha\beta}_{\alpha}\partial^{\chi}\omega_{\zeta\alpha\beta}^{\chi}+4\beta_1\partial^{\beta}f^{\alpha}_{\alpha}\partial_{\delta}f^{\delta}_{\beta}- \\
 &2\beta_1\partial_{\beta}f^{\beta}_{\chi}\partial_{\delta}f^{\chi\delta}_{\alpha}+\frac{2}{3}\alpha_3\partial^{\beta}\omega_{\alpha}^{\delta\zeta}\partial_{\delta}\omega_{\zeta\beta}^{\alpha}-\frac{2}{3}\alpha_3\partial^{\beta}\omega_{\alpha}^{\zeta\delta}\partial_{\delta}\omega_{\zeta\beta}^{\alpha}- \\
 &\beta_1\partial^{\chi}f^{\beta}_{\zeta}\partial^{\zeta}f^{\alpha}_{\beta\chi}-\beta_1\partial^{\chi}f^{\beta}_{\zeta}\partial^{\zeta}f^{\alpha}_{\chi\beta}+\beta_1\partial^{\chi}f_{\delta\zeta}\partial^{\zeta}f^{\delta}_{\chi}-\beta_1\partial^{\chi}f_{\zeta\delta}\partial^{\zeta}f^{\delta}_{\chi}
 \end{aligned}$$

Added source term:

$f^{\alpha\beta}\tau_{\alpha\beta}+\omega^{\alpha\beta\chi}\sigma_{\alpha\beta\chi}$

$\beta_1 > 0$

Unitarity conditions

	$\omega_{1+}^{\#1} \dagger^{\alpha\beta}$	$\omega_{1+}^{\#2} \dagger^{\alpha\beta}$	$f_{1+}^{\#1} \dagger^{\alpha\beta}$	$\omega_{1-}^{\#1} \dagger^{\alpha}$	$\omega_{1-}^{\#2} \dagger^{\alpha}$	$f_{1-}^{\#1} \dagger^{\alpha}$	$f_{1-}^{\#2} \dagger^{\alpha}$
$\omega_{1+}^{\#1} \dagger^{\alpha\beta}$	0	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	0	0	0	0
$\omega_{1-}^{\#2} \dagger^{\alpha}$	0	0	0	0	0	0	0
$f_{1-}^{\#1} \dagger^{\alpha}$	0	0	0	0	0	0	0
$f_{1-}^{\#2} \dagger^{\alpha}$	0	0	0	0	0	0	0

Source constraints	SO(3) irreps	#
	$\tau_{0+}^{\#2} == 0$	1
	$\sigma_{0+}^{\#1} == 0$	1
	$\tau_{1-}^{\#2\alpha} == 0$	3
	$\tau_{1-}^{\#1\alpha} == 0$	3
	$\sigma_{1-}^{\#2\alpha} == 0$	3
	$\sigma_{1-}^{\#1\alpha} == 0$	3
	$\tau_{1+}^{\#1\alpha\beta} == 0$	3
	$\sigma_{1+}^{\#2\alpha\beta} == 0$	3
	$\sigma_{1+}^{\#1\alpha\beta} == 0$	3
	$\sigma_{2+}^{\#1\alpha\beta} == 0$	5
	$\sigma_{2-}^{\#1\alpha\beta\chi} == 0$	5
	Total #:	33

	$\sigma_{1+}^{\#1} \dagger^{\alpha\beta}$	$\sigma_{1+}^{\#2} \dagger^{\alpha\beta}$	$\tau_{1+}^{\#1} \dagger^{\alpha\beta}$	$\sigma_{1-}^{\#1} \dagger^{\alpha}$	$\sigma_{1-}^{\#2} \dagger^{\alpha}$	$\tau_{1-}^{\#1} \dagger^{\alpha}$	$\tau_{1-}^{\#2} \dagger^{\alpha}$
$\sigma_{1+}^{\#1} \dagger^{\alpha\beta}$	0	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	0	0	0	0
$\sigma_{1-}^{\#2} \dagger^{\alpha}$	0	0	0	0	0	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	0

	$\omega_{0+}^{\#1} \dagger$	$f_{0+}^{\#1} \dagger$	$f_{0+}^{\#2} \dagger$	$\omega_{0-}^{\#1} \dagger$
$\omega_{0+}^{\#1} \dagger$	0	0	0	0
$f_{0+}^{\#1} \dagger$	0	$-4\beta_1k^2$	0	0
$f_{0+}^{\#2} \dagger$	0	0	0	0
$\omega_{0-}^{\#1} \dagger$	0	0	0	α_3k^2

	$\omega_{2+}^{\#1} \dagger^{\alpha\beta}$	$f_{2+}^{\#1} \dagger^{\alpha\beta}$	$\omega_{2-}^{\#1} \dagger^{\alpha\beta\chi}$
$\omega_{2+}^{\#1} \dagger^{\alpha\beta}$	0	0	0
$f_{2+}^{\#1} \dagger^{\alpha\beta}$	0	$2\beta_1k^2$	0
$\omega_{2-}^{\#1} \dagger^{\alpha\beta\chi}$	0	0	0

	$\sigma_{0+}^{\#1} \dagger$	$\tau_{0+}^{\#2} \dagger$	$\sigma_{0-}^{\#1} \dagger$
$\sigma_{0+}^{\#1} \dagger$	0	0	0
$\tau_{0+}^{\#1} \dagger$	0	$-\frac{1}{4\beta_1k^2}$	0
$\tau_{0+}^{\#2} \dagger$	0	0	0
$\sigma_{0-}^{\#1} \dagger$	0	0	$\frac{1}{\alpha_3k^2}$

	$\sigma_{2+}^{\#1} \dagger^{\alpha\beta}$	$\tau_{2+}^{\#1} \dagger^{\alpha\beta}$	$\sigma_{2-}^{\#1} \dagger^{\alpha\beta\chi}$
$\sigma_{2+}^{\#1} \dagger^{\alpha\beta}$	0	0	0
$\tau_{2+}^{\#1} \dagger^{\alpha\beta}$	0	$\frac{1}{2\beta_1k^2}$	0
$\sigma_{2-}^{\#1} \dagger^{\alpha\beta\chi}$	0	0	0