



Quadratic pole

Pole residue: $-\frac{1}{a_0} > 0$

Polarisations: 2

Unitarity conditions

$a_0 < 0$

(No massive particles)

$\Delta_{1^+}^{\#1} \Delta_{1^+}^{\#2} \Delta_{1^+}^{\#3} \Delta_{1^+}^{\alpha\beta}$	$\Delta_{1^+}^{\#1} \Delta_{1^+}^{\#2} \Delta_{1^+}^{\alpha}$	$\Delta_{1^+}^{\#3} \Delta_{1^+}^{\alpha}$	$\Delta_{1^+}^{\#4} \Delta_{1^+}^{\alpha}$	$\Delta_{1^+}^{\#5} \Delta_{1^+}^{\alpha}$	$\Delta_{1^+}^{\#6} \Delta_{1^+}^{\alpha}$	$\mathcal{T}_{1^+}^{\#1} \Delta_{1^+}^{\alpha}$
$\Delta_{1^+}^{\#1} \dagger^{\alpha\beta}$	0	$-\frac{2\sqrt{2}}{a_0}$	0	0	0	0
$\Delta_{1^+}^{\#2} \dagger^{\alpha\beta}$	$-\frac{2\sqrt{2}}{a_0}$	0	0	0	0	0
$\Delta_{1^+}^{\#3} \dagger^{\alpha\beta}$	0	0	0	0	0	0
$\Delta_{1^+}^{\#1} \dagger^{\alpha}$	0	0	0	$-\frac{2k^2}{\sqrt{3}a_0(2+k^2)}$	0	$-\frac{2i\sqrt{2}k}{a_0(2+k^2)}$
$\Delta_{1^+}^{\#2} \dagger^{\alpha}$	0	$\frac{\sqrt{2}(4+k^2)}{a_0(2+k^2)}$	$-\frac{(4+k^2)^2}{2a_0(2+k^2)^2}$	$-\frac{\sqrt{5}}{4a_0+2a_0k^2}$	$-\frac{k^2}{\sqrt{6}a_0(2+k^2)}$	$-\frac{i k(4+k^2)}{a_0(2+k^2)^2}$
$\Delta_{1^+}^{\#3} \dagger^{\alpha}$	0	$-\frac{2k^2}{\sqrt{3}(2a_0+a_0k^2)}$	$-\frac{k^2(2+k^2)}{2\sqrt{6}a_0(2+k^2)^2}$	$-\frac{76+52k^2+3k^4}{12a_0(2+k^2)^2}$	$-\frac{1}{-2a_0-\frac{8a_0}{2+3k^2}}$	$-\frac{i k(6+5k^2)}{\sqrt{6}a_0(2+k^2)^2}$
$\Delta_{1^+}^{\#4} \dagger^{\alpha}$	0	0	$-\frac{\sqrt{5}}{4a_0+2a_0k^2}$	$-\frac{\sqrt{5}}{12a_0}$	$-\frac{\sqrt{5}}{6a_0+3a_0k^2}$	$-\frac{i\sqrt{\frac{5}{6}}k}{a_0(2+k^2)}$
$\Delta_{1^+}^{\#5} \dagger^{\alpha}$	0	$\frac{\sqrt{2}k^2}{2a_0+a_0k^2}$	$-\frac{k^2(5+2k^2)}{\sqrt{3}a_0(2+k^2)^2}$	$-\frac{2k^2}{3\sqrt{2}a_0(2+k^2)^2}$	$-\frac{\sqrt{2}(7+3k^2)}{3a_0(2+k^2)}$	$-\frac{2ik(3+k^2)}{\sqrt{3}a_0(2+k^2)^2}$
$\Delta_{1^+}^{\#6} \dagger^{\alpha}$	0	$-\frac{k^2}{\sqrt{6}(2a_0+a_0k^2)}$	$-\frac{72ik}{a_0(16+3k^2)^2}$	$-\frac{5}{-2a_0-\frac{8a_0}{2+3k^2}}$	$-\frac{5}{3a_0}$	$-\frac{i\sqrt{\frac{2}{3}}k}{a_0(2+k^2)}$
$\mathcal{T}_{1^+}^{\#1} \dagger^{\alpha}$	0	$\frac{2i\sqrt{2}k}{2a_0+a_0k^2}$	$-\frac{ik(4+k^2)}{a_0(2+k^2)^2}$	$-\frac{2k^2}{\sqrt{3}a_0(2+k^2)^2}$	$-\frac{i\sqrt{\frac{2}{3}}k}{2a_0+a_0k^2}$	$-\frac{2k^2}{a_0(2+k^2)^2}$

$\Delta_{0^+}^{\#1} \Delta_{0^+}^{\#2} \Delta_{0^+}^{\#3} \Delta_{0^+}^{\alpha\beta}$	$\Delta_{0^+}^{\#1} \Delta_{0^+}^{\#2} \Delta_{0^+}^{\alpha}$	$\Delta_{0^+}^{\#3} \Delta_{0^+}^{\alpha}$	$\Delta_{0^+}^{\#4} \Delta_{0^+}^{\alpha}$	$\Delta_{0^+}^{\#5} \Delta_{0^+}^{\alpha}$	$\Delta_{0^+}^{\#6} \Delta_{0^+}^{\alpha}$	$\mathcal{T}_{0^+}^{\#1} \Delta_{0^+}^{\alpha}$
$\Delta_{0^+}^{\#1} \dagger$	0	$-\frac{4\sqrt{\frac{2}{3}}}{16a_0+3a_0k^2}$	$-\frac{8}{\sqrt{3}(16a_0+3a_0k^2)}$	$-\frac{8i\sqrt{\frac{2}{3}}}{16a_0k+3a_0k^3}$	$-\frac{2i\sqrt{6}k}{16a_0+3a_0k^2}$	0
$\Delta_{0^+}^{\#2} \dagger$	$\frac{4\sqrt{6}}{16a_0+3a_0k^2}$	$-\frac{144}{a_0(16+3k^2)^2}$	$-\frac{8\sqrt{2}(10+3k^2)}{a_0(16+3k^2)^2}$	$-\frac{8i\sqrt{3}}{16a_0k+3a_0k^3}$	$-\frac{72ik}{a_0(16+3k^2)^2}$	0
$\Delta_{0^+}^{\#3} \dagger$	$-\frac{4\sqrt{\frac{2}{3}}}{16a_0+3a_0k^2}$	$-\frac{16(19+3k^2)}{a_0(16+3k^2)^2}$	$-\frac{8\sqrt{2}(22+3k^2)}{3a_0(16+3k^2)^2}$	$-\frac{8i}{\sqrt{3}(16a_0k+3a_0k^3)}$	$-\frac{8ik(19+3k^2)}{a_0(16+3k^2)^2}$	0
$\Delta_{0^+}^{\#4} \dagger$	$-\frac{8}{\sqrt{3}(16a_0+3a_0k^2)}$	$-\frac{8\sqrt{2}(10+3k^2)}{a_0(16+3k^2)^2}$	$-\frac{32(13+3k^2)}{3a_0(16+3k^2)^2}$	$-\frac{8i\sqrt{\frac{2}{3}}}{16a_0k+3a_0k^3}$	$-\frac{4i\sqrt{2}k(10+3k^2)}{a_0(16+3k^2)^2}$	0
$\mathcal{T}_{0^+}^{\#1} \dagger$	$\frac{2i\sqrt{2}}{a_0k}$	$-\frac{8i\sqrt{3}}{\sqrt{3}(16a_0k+3a_0k^3)}$	$-\frac{4i\sqrt{2}}{16a_0k+3a_0k^3}$	$-\frac{4}{a_0k^2}$	$-\frac{4\sqrt{3}}{16a_0+3a_0k^2}$	0
$\mathcal{T}_{0^+}^{\#2} \dagger$	$\frac{2i\sqrt{6}k}{16a_0+3a_0k^2}$	$-\frac{72ik}{a_0(16+3k^2)^2}$	$-\frac{4i\sqrt{2}k(10+3k^2)}{a_0(16+3k^2)^2}$	$-\frac{4\sqrt{3}}{16a_0+3a_0k^2}$	$-\frac{36k^2}{a_0(16+3k^2)^2}$	0
$\Delta_{0^+}^{\#1} \dagger$	0	0	0	0	0	$-\frac{2}{a_0}$

$\Gamma_{1^+}^{\#1} \Gamma_{1^+}^{\#2} \Gamma_{1^+}^{\#3} \Gamma_{1^+}^{\alpha\beta}$	$\Gamma_{1^+}^{\#1} \Gamma_{1^+}^{\#2} \Gamma_{1^+}^{\alpha}$	$\Gamma_{1^+}^{\#3} \Gamma_{1^+}^{\alpha}$	$\Gamma_{1^+}^{\#4} \Gamma_{1^+}^{\alpha}$	$\Gamma_{1^+}^{\#5} \Gamma_{1^+}^{\alpha}$	$\Gamma_{1^+}^{\#6} \Gamma_{1^+}^{\alpha}$	$h_{1^+}^{\#1} \Gamma_{1^+}^{\alpha}$
$\Gamma_{1^+}^{\#1} \dagger^{\alpha\beta}$	$-\frac{a_0}{4}$	0	0	0	0	0
$\Gamma_{1^+}^{\#2} \dagger^{\alpha\beta}$	$-\frac{a_0}{2\sqrt{2}}$	0	0	0	0	0
$\Gamma_{1^+}^{\#3} \dagger^{\alpha\beta}$	0	0	0	0	0	0
$\Gamma_{1^+}^{\#1} \dagger^{\alpha}$	0	$-\frac{a_0}{4}$	$-\frac{a_0}{2\sqrt{2}}$	0	0	$-\frac{ia_0k}{4\sqrt{2}}$
$\Gamma_{1^+}^{\#2} \dagger^{\alpha}$	0	$\frac{a_0}{2\sqrt{2}}$	0	0	0	0
$\Gamma_{1^+}^{\#3} \dagger^{\alpha}$	0	0	$-\frac{a_0}{3}$	$-\frac{a_0}{6\sqrt{2}}$	$-\frac{a_0}{6}$	$\frac{ia_0k}{4\sqrt{6}}$
$\Gamma_{1^+}^{\#4} \dagger^{\alpha}$	0	0	$\frac{\sqrt{5}a_0}{6}$	$-\frac{a_0}{\sqrt{2}}$	$-\frac{\sqrt{5}a_0}{6}$	$-\frac{1}{4}i\sqrt{\frac{5}{6}}a_0k$
$\Gamma_{1^+}^{\#5} \dagger^{\alpha}$	0	$-\frac{a_0}{6\sqrt{2}}$	$-\frac{a_0}{3}$	$-\frac{a_0}{6}$	$-\frac{a_0}{6\sqrt{2}}$	$\frac{ia_0k}{4\sqrt{3}}$
$\Gamma_{1^+}^{\#6} \dagger^{\alpha}$	0	$-\frac{a_0}{6}$	$-\frac{a_0}{6}$	$-\frac{a_0}{6\sqrt{2}}$	$-\frac{5a_0}{12}$	$\frac{ia_0k}{4\sqrt{6}}$
$h_{1^+}^{\#1} \dagger^{\alpha}$	0	$-\frac{ia_0k}{4\sqrt{2}}$	$-\frac{ia_0k}{4\sqrt{6}}$	$-\frac{ia_0k}{4\sqrt{3}}$	$-\frac{ia_0k}{4\sqrt{6}}$	0

Source constraints	
SO(3) irreps	#
$2\mathcal{T}_{0^+}^{\#2}-ik\Delta_{0^+}^{\#2}==0$	1
$\Delta_{0^+}^{\#3}+2\Delta_{0^+}^{\#4}+3\Delta_{0^+}^{\#2}==0$	1
$6\mathcal{T}_{1^+}^{\#1\alpha}-ik(3\Delta_{1^+}^{\#2\alpha}-\Delta_{1^+}^{\#5\alpha}+\Delta_{1^+}^{\#3\alpha})==0$	3
$2\Delta_{1^+}^{\#6\alpha}+\Delta_{1^+}^{\#4\alpha}+2\Delta_{1^+}^{\#5\alpha}+\Delta_{1^+}^{\#3\alpha}==0$	3
Total #:	8

Lagrangian density
$-\frac{1}{2}a_0\Gamma^{\alpha\beta\chi}_{\beta\chi\alpha}+\frac{1}{2}a_0\Gamma^{\alpha\beta}_{\alpha}{}^{\beta}\Gamma^{\chi}_{\beta\chi}{}^{\alpha}-$
$\frac{1}{4}a_0h^{\chi}_{\chi}{}^{\alpha}\partial_{\beta}\Gamma^{\alpha\beta}_{\alpha}{}^{\beta}+\frac{1}{4}a_0h^{\chi}_{\chi}{}^{\alpha}\partial_{\beta}\Gamma^{\alpha\beta}_{\alpha}{}^{\beta}-$
$\frac{1}{2}a_0h_{\alpha\chi}{}^{\alpha}\partial_{\beta}\Gamma^{\alpha\beta\chi}_{\beta\chi\alpha}+\frac{1}{2}a_0h_{\beta\chi}{}^{\alpha}\partial^{\chi}\Gamma^{\alpha\beta}_{\alpha}{}^{\beta}$
Added source term: $\left h^{\alpha\beta}\mathcal{T}_{\alpha\beta}+\Gamma^{\alpha\beta\chi}_{\alpha\beta\chi}\Delta_{\alpha\beta\chi}\right.$

$\Gamma_{2^+}^{\#1} \Gamma_{2^+}^{\#2} \Gamma_{2^+}^{\#3} \Gamma_{2^+}^{\alpha\beta}$	$\Gamma_{2^+}^{\#1} \Gamma_{2^+}^{\#2} \Gamma_{2^+}^{\alpha}$	$\Gamma_{2^+}^{\#3} \Gamma_{2^+}^{\alpha}$	$h_{2^+}^{\#1} \Gamma_{2^+}^{\alpha}$	$\Gamma_{2^+}^{\#1} \Gamma_{2^+}^{\alpha\beta\chi}$	$\Gamma_{2^+}^{\#2} \Gamma_{2^+}^{\alpha\beta\chi}$
$\Gamma_{2^+}^{\#1} \dagger^{\alpha\beta}$	$\frac{a_0}{4}$	0	0	$\frac{ia_0k}{4\sqrt{2}}$	0
$\Gamma_{2^+}^{\#2} \dagger^{\alpha\beta}$	0	$-\frac{a_0}{2}$	0	$\frac{ia_0k}{4\sqrt{3}}$	0
$\Gamma_{2^+}^{\#3} \dagger^{\alpha\beta}$	0	0	$\frac{a_0}{4}$	$-\frac{ia_0k}{4\sqrt{6}}$	0
$h_{2^+}^{\#1} \dagger^{\alpha\beta}$	$-\frac{ia_0k}{4\sqrt{2}}$	$-\frac{ia_0k}{4\sqrt{3}}$	$\frac{ia_0k}{4\sqrt{6}}$	0	0
$\Gamma_{2^+}^{\#1} \dagger^{\alpha\beta\chi}$	0	0	0	$\frac{a_0}{4}$	0
$\Gamma_{2^+}^{\#2} \dagger^{\alpha\beta\chi}$	0	0	0	0	$\frac{a_0}{4}$

$\Gamma_{0^+}^{\#1} \Gamma_{0^+}^{\#2} \Gamma_{0^+}^{\#3} \Gamma_{0^+}^{\alpha}$	$\Gamma_{0^+}^{\#4} \Gamma_{0^+}^{\alpha}$	$h_{0^+}^{\#1} \Gamma_{0^+}^{\alpha}$	$h_{0^+}^{\#2} \Gamma_{0^+}^{\alpha}$	$\Gamma_{0^+}^{\#1} \Gamma_{0^+}^{\alpha\beta\chi}$
$\Gamma_{0^+}^{\#1} \dagger$	$-\frac{a_0}{2}$	0	0	$-\frac{ia_0k}{2\sqrt{2}}$
$\Gamma_{0^+}^{\#2} \dagger$	0	0	$\frac{a_0}{2}$	$-\frac{ia_0k}{2\sqrt{2}}$
$\Gamma_{0^+}^{\#3} \dagger$	0	$\frac{a_0}{2}$	0	$-\frac{ia_0k}{2\sqrt{2}}$
$\Gamma_{0^+}^{\#4} \dagger$	0	$-\frac{a_0}{2\sqrt{2}}$	$-\frac{a_0}{2\sqrt{2}}$	$\frac{ia_0k}{4\sqrt{3}}$
$h_{0^+}^{\#1} \dagger$	$\frac{ia_0k}{2\sqrt{2}}$	0	$-\frac{ia_0k}{4\sqrt{3}}$	$\frac{ia_0k}{4\sqrt{6}}$
$h_{0^+}^{\#2} \dagger$	0	0	$\frac{ia_0k}{4\sqrt{2}}$	$-\frac{ia_0k}{4\sqrt{2}}$
$\Gamma_{0^+}^{\#1} \dagger$	0	0	0	$-\frac{a_0}{2}$

$\Delta_{2^+}^{\#1} \Delta_{2^+}^{\alpha\beta}$	$\Delta_{2^+}^{\#2} \Delta_{2^+}^{\alpha\beta}$	$\Delta_{2^+}^{\#3} \Delta_{2^+}^{\alpha\beta}$	$\mathcal{T}_{2^+}^{\#1} \Delta_{2^+}^{\alpha\beta}$	$\Delta_{2^+}^{\#1} \Delta_{2^+}^{\alpha\beta\chi}$	$\Delta_{2^+}^{\#2} \Delta_{2^+}^{\alpha\beta\chi}$
$\Delta_{2^+}^{\#1} \dagger^{\alpha\beta}$	0	$\frac{2\sqrt{\frac{2}{3}}}{a_0}$	$\frac{4}{\sqrt{3}a_0}$	$\frac{4i\sqrt{2}}{a_0k}$	0
$\Delta_{2^+}^{\#2} \dagger^{\alpha\beta}$	$\frac{2\sqrt{\frac{2}{3}}}{a_0}$	$-\frac{8}{3a_0}$	$-\frac{2\sqrt{2}}{3a_0}$	$-\frac{4i}{\sqrt{3}a_0k}$	0
$\Delta_{2^+}^{\#3} \dagger^{\alpha\beta}$	$\frac{4}{\sqrt{3}a_0}$	$-\frac{2\sqrt{2}}{3a_0}$	$\frac{8}{3a_0}$	$-\frac{4i\sqrt{\frac{2}{3}}}{a_0k}$	0
$\mathcal{T}_{2^+}^{\#1} \dagger^{\alpha\beta}$	$-\frac{4i\sqrt{2}}{a_0k}$	$\frac{4i}{\sqrt{3}a_0k}$	$\frac{4i\sqrt{\frac{2}{3}}}{a_0k}$	$-\frac{8}{a_0k^2}$	0
$\Delta_{2^+}^{\#1} \dagger^{\alpha\beta\chi}$	0	0	0	$\frac{4}{a_0}$	0
$\Delta_{2^+}^{\#2} \dagger^{\alpha\beta\chi}$	0	0	0	0	$\frac{4}{a_0}$