



$a_0 < 0$

Unitarity conditions

(No massive particles)

$\Delta_1^{\#1} \dagger^{\alpha\beta}$	$\Delta_1^{\#2} \dagger^{\alpha\beta}$	$\Delta_1^{\#3} \dagger^{\alpha\beta}$	$\Delta_1^{\#1} \alpha$	$\Delta_1^{\#2} \alpha$	$\Delta_1^{\#3} \alpha$	$\Delta_1^{\#4} \alpha$	$\Delta_1^{\#5} \alpha$	$\Delta_1^{\#6} \alpha$	$\mathcal{T}_1^{\#1} \alpha$
$\Delta_1^{\#1} \dagger^{\alpha\beta}$	0	$-\frac{2\sqrt{2}}{a_0}$	0	0	0	0	0	0	0
$\Delta_1^{\#2} \dagger^{\alpha\beta}$	$-\frac{2\sqrt{2}}{a_0}$	$\frac{2}{a_0}$	0	0	0	0	0	0	0
$\Delta_1^{\#3} \dagger^{\alpha\beta}$	0	0	$\frac{4}{a_0}$	0	0	0	0	0	0
$\Delta_1^{\#1} \dagger^\alpha$	0	0	0	$\frac{\sqrt{2}(4+k^2)}{a_0(2+k^2)}$	$-\frac{2k^2}{\sqrt{3}a_0(2+k^2)}$	0	$\frac{\sqrt{\frac{2}{3}}k^2}{a_0(2+k^2)}$	0	$-\frac{2i\sqrt{2}k}{a_0(2+k^2)}$
$\Delta_1^{\#2} \dagger^\alpha$	0	0	0	$\frac{\sqrt{2}(4+k^2)}{a_0(2+k^2)}$	$\frac{k^2(2+k^2)}{2\sqrt{6}a_0(2+k^2)}$	$-\frac{\sqrt{\frac{5}{6}}k^2}{4a_0+2a_0k^2}$	$\frac{k^2(5+2k^2)}{\sqrt{3}a_0(2+k^2)}$	$-\frac{k(4+k^2)}{a_0(2+k^2)}$	$\frac{i k(6+5k^2)}{\sqrt{6}a_0(2+k^2)}$
$\Delta_1^{\#3} \dagger^\alpha$	0	0	0	$-\frac{2k^2}{\sqrt{3}(2a_0+a_0k^2)}$	$\frac{k^2(2+k^2)}{2\sqrt{6}a_0(2+k^2)}$	$-\frac{\sqrt{\frac{5}{6}}k^2}{4a_0+2a_0k^2}$	$-\frac{\sqrt{\frac{2}{3}}k^2}{3\sqrt{2}a_0(2+k^2)}$	$-\frac{1}{2a_0-\frac{8a_0}{2+3k^2}}$	$-\frac{i\sqrt{\frac{5}{6}}k}{a_0(2+k^2)}$
$\Delta_1^{\#4} \dagger^\alpha$	0	0	0	$-\frac{\sqrt{\frac{5}{6}}k^2}{4a_0+2a_0k^2}$	$\frac{\sqrt{5}(10+3k^2)}{12a_0(2+k^2)}$	$\frac{1}{12a_0}$	$-\frac{\sqrt{5}}{6a_0+3a_0k^2}$	$-\frac{\sqrt{5}}{6a_0}$	$-\frac{i\sqrt{\frac{5}{6}}k}{a_0(2+k^2)}$
$\Delta_1^{\#5} \dagger^\alpha$	0	0	0	$\frac{\sqrt{\frac{2}{3}}k^2}{2a_0+a_0k^2}$	$\frac{k^2(5+2k^2)}{\sqrt{3}a_0(2+k^2)}$	$-\frac{\sqrt{\frac{2}{3}}k^2}{3\sqrt{2}a_0(2+k^2)}$	$-\frac{2(17+14k^2+3k^4)}{3a_0(2+k^2)}$	$-\frac{\sqrt{2}(7+3k^2)}{3a_0(2+k^2)}$	$\frac{2i k(3+k^2)}{\sqrt{3}a_0(2+k^2)}$
$\Delta_1^{\#6} \dagger^\alpha$	0	0	0	$-\frac{k^2}{\sqrt{6}(2a_0+a_0k^2)}$	$-\frac{k(6+5k^2)}{\sqrt{6}a_0(2+k^2)}$	$-\frac{k^2}{\sqrt{6}(2a_0+a_0k^2)}$	$-\frac{5}{3a_0}$	$-\frac{5}{3a_0}$	$-\frac{i\sqrt{\frac{2}{3}}k}{a_0(2+k^2)}$
$\mathcal{T}_1^{\#1} \dagger^\alpha$	0	0	0	$\frac{2i\sqrt{2}k}{2a_0+a_0k^2}$	$-\frac{i k(4+k^2)}{a_0(2+k^2)}$	$-\frac{i k(4+k^2)}{a_0(2+k^2)}$	$-\frac{2i k(3+k^2)}{\sqrt{3}a_0(2+k^2)}$	$\frac{i\sqrt{\frac{2}{3}}k}{2a_0+a_0k^2}$	$\frac{2k^2}{a_0(2+k^2)}$

$\Delta_3^{\#1} \dagger^{\alpha\beta\chi}$

$-\frac{2}{a_0}$

$\Gamma_3^{\#1} \dagger^{\alpha\beta\chi}$

$-\frac{a_0}{2}$

$\Delta_0^{\#1} \dagger$	$\Delta_0^{\#2} \dagger$	$\Delta_0^{\#3} \dagger$	$\Delta_0^{\#4} \dagger$	$\mathcal{T}_0^{\#1} \dagger$	$\mathcal{T}_0^{\#2} \dagger$	$\Delta_0^{\#0} \dagger$
$\Delta_0^{\#1} \dagger$	0	$-\frac{4\sqrt{\frac{2}{3}}}{16a_0+3a_0k^2}$	$-\frac{8}{\sqrt{3}(16a_0+3a_0k^2)}$	$-\frac{2i\sqrt{2}}{a_0k}$	$-\frac{2i\sqrt{6}k}{16a_0+3a_0k^2}$	0
$\Delta_0^{\#2} \dagger$	$\frac{4\sqrt{6}}{16a_0+3a_0k^2}$	$-\frac{144}{a_0(16+3k^2)}$	$-\frac{8\sqrt{2}(10+3k^2)}{a_0(16+3k^2)}$	$-\frac{8i\sqrt{3}}{16a_0k+3a_0k^3}$	$\frac{72ik}{a_0(16+3k^2)}$	0
$\Delta_0^{\#3} \dagger$	$-\frac{4\sqrt{\frac{2}{3}}}{16a_0+3a_0k^2}$	$\frac{16(19+3k^2)}{a_0(16+3k^2)}$	$-\frac{16(35+6k^2)}{3a_0(16+3k^2)}$	$-\frac{8i}{\sqrt{3}(16a_0k+3a_0k^3)}$	$-\frac{8i k(19+3k^2)}{a_0(16+3k^2)}$	0
$\Delta_0^{\#4} \dagger$	$-\frac{8}{\sqrt{3}(16a_0+3a_0k^2)}$	$\frac{8\sqrt{2}(10+3k^2)}{a_0(16+3k^2)}$	$-\frac{8\sqrt{2}(22+3k^2)}{3a_0(16+3k^2)}$	$\frac{8i\sqrt{\frac{2}{3}}}{16a_0k+3a_0k^3}$	$\frac{4i\sqrt{2}k(10+3k^2)}{a_0(16+3k^2)}$	0
$\mathcal{T}_0^{\#1} \dagger$	$\frac{2i\sqrt{2}}{a_0k}$	$\frac{8i\sqrt{3}}{16a_0k+3a_0k^3}$	$-\frac{8i}{\sqrt{3}(16a_0k+3a_0k^3)}$	$\frac{4}{a_0k^2}$	$\frac{4\sqrt{3}}{16a_0+3a_0k^2}$	0
$\mathcal{T}_0^{\#2} \dagger$	$\frac{2i\sqrt{6}k}{16a_0+3a_0k^2}$	$-\frac{72ik}{a_0(16+3k^2)}$	$-\frac{4i\sqrt{2}k(10+3k^2)}{a_0(16+3k^2)}$	$\frac{4\sqrt{3}}{16a_0+3a_0k^2}$	$-\frac{36k^2}{a_0(16+3k^2)}$	0
$\Delta_0^{\#1} \dagger$	0	0	0	0	0	$-\frac{2}{a_0}$

$\Gamma_1^{\#1} \dagger^{\alpha\beta}$	$\Gamma_1^{\#2} \dagger^{\alpha\beta}$	$\Gamma_1^{\#3} \dagger^{\alpha\beta}$	$\Gamma_1^{\#1} \alpha$	$\Gamma_1^{\#2} \alpha$	$\Gamma_1^{\#3} \alpha$	$\Gamma_1^{\#4} \alpha$	$\Gamma_1^{\#5} \alpha$	$\Gamma_1^{\#6} \alpha$	$\mathcal{H}_1^{\#1} \alpha$
$\Gamma_1^{\#1} \dagger^{\alpha\beta}$	$-\frac{a_0}{4}$	$-\frac{a_0}{2\sqrt{2}}$	0	0	0	0	0	0	0
$\Gamma_1^{\#2} \dagger^{\alpha\beta}$	$-\frac{a_0}{2\sqrt{2}}$	0	0	0	0	0	0	0	0
$\Gamma_1^{\#3} \dagger^{\alpha\beta}$	0	$\frac{a_0}{4}$	0	0	0	0	0	0	0
$\Gamma_1^{\#1} \dagger^\alpha$	0	0	$-\frac{a_0}{4}$	$\frac{a_0}{2\sqrt{2}}$	0	0	0	0	$-\frac{ia_0k}{4\sqrt{2}}$
$\Gamma_1^{\#2} \dagger^\alpha$	0	0	$\frac{a_0}{2\sqrt{2}}$	0	0	0	0	0	0
$\Gamma_1^{\#3} \dagger^\alpha$	0	0	0	0	$-\frac{a_0}{3}$	$-\frac{a_0}{6\sqrt{2}}$	$-\frac{a_0}{6\sqrt{2}}$	$-\frac{a_0}{6}$	$\frac{ia_0k}{4\sqrt{6}}$
$\Gamma_1^{\#4} \dagger^\alpha$	0	0	0	0	$\frac{\sqrt{5}a_0}{6}$	$-\frac{1}{6}\sqrt{\frac{5}{2}}a_0$	$-\frac{1}{6}\sqrt{\frac{5}{2}}a_0$	$-\frac{\sqrt{5}a_0}{6}$	$-\frac{1}{4}i\sqrt{\frac{5}{6}}a_0k$
$\Gamma_1^{\#5} \dagger^\alpha$	0	0	0	0	$-\frac{a_0}{6\sqrt{2}}$	$-\frac{a_0}{6}$	$\frac{a_0}{3}$	$\frac{a_0}{6\sqrt{2}}$	$\frac{ia_0k}{4\sqrt{3}}$
$\Gamma_1^{\#6} \dagger^\alpha$	0	0	0	0	$-\frac{a_0}{6}$	$-\frac{\sqrt{5}a_0}{6}$	$\frac{a_0}{6\sqrt{2}}$	$\frac{5a_0}{12}$	$\frac{ia_0k}{4\sqrt{6}}$
$\mathcal{H}_1^{\#1} \dagger^\alpha$	0	0	$-\frac{ia_0k}{4\sqrt{2}}$	0	$-\frac{ia_0k}{4\sqrt{6}}$	$\frac{1}{4}i\sqrt{\frac{5}{6}}a_0k$	$-\frac{ia_0k}{4\sqrt{3}}$	$-\frac{ia_0k}{4\sqrt{6}}$	0

Source constraints	
SO(3) irreps	#
$2\mathcal{T}_0^{\#2}-i k \Delta_0^{\#2}==0$	1
$\Delta_{0+}^{\#3}+2\Delta_{0+}^{\#4}+3\Delta_{0+}^{\#2}==0$	1
$6\mathcal{T}_1^{\#1\alpha}-i k(3\Delta_1^{\#2\alpha}-\Delta_1^{\#5\alpha}+\Delta_1^{\#3\alpha})==0$	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
$-\frac{1}{2}a_0\Gamma^{\alpha\beta\chi}\Gamma_{\beta\chi\alpha}+\frac{1}{2}a_0\Gamma^\alpha{}_\alpha{}^\beta{}_\beta\Gamma^\chi{}_\chi{}^\alpha{}_\alpha-$
$\frac{1}{4}a_0h^\chi{}_\chi\partial_\beta\Gamma^\alpha{}_\alpha{}^\beta{}_\beta+\frac{1}{4}a_0h^\chi{}_\chi\partial_\beta\Gamma^{\alpha\beta}{}_\alpha{}^\beta{}_\beta-$
$\frac{1}{2}a_0h_{\alpha\chi}\partial_\beta\Gamma^{\alpha\beta\chi}+\frac{1}{2}a_0h_{\beta\chi}\partial^\chi\Gamma^\alpha{}_\alpha{}^\beta{}_\beta$
Added source term: $\left h^{\alpha\beta}\mathcal{T}_{\alpha\beta}+\Gamma^{\alpha\beta\chi}\Delta_{\alpha\beta\chi}\right.$

$\Gamma_2^{\#1} \dagger^{\alpha\beta}$	$\Gamma_2^{\#2} \dagger^{\alpha\beta}$	$\Gamma_2^{\#3} \dagger^{\alpha\beta}$	$h_2^{\#1} \dagger^{\alpha\beta}$	$\Gamma_2^{\#1} \alpha\beta\chi$	$\Gamma_2^{\#2} \alpha\beta\chi$
$\Gamma_2^{\#1} \dagger^{\alpha\beta}$	$\frac{a_0}{4}$	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	$\frac{a_0}{4}$

$\Gamma_0^{\#1} \dagger$	$\Gamma_0^{\#2} \dagger$	$\Gamma_0^{\#3} \dagger$	$\Gamma_0^{\#4} \dagger$	$h_0^{\#1} \dagger$	$h_0^{\#2} \dagger$	$\Gamma_0^{\#1} \dagger$
$\Gamma_0^{\#1} \dagger$	$-\frac{a_0}{2}$	0	0	$-\frac{ia_0k}{2\sqrt{2}}$	0	0
$\Gamma_0^{\#2} \dagger$	0	0	$\frac{a_0}{2}$	$-\frac{a_0}{2\sqrt{2}}$	0	0
$\Gamma_0^{\#3} \dagger$	0	$\frac{a_0}{2}$	0	$-\frac{a_0}{2\sqrt{2}}$	$\frac{ia_0k}{4\sqrt{3}}$	$-\frac{1}{4}ia_0k$
$\Gamma_0^{\#4} \dagger$	0	$-\frac{a_0}{2\sqrt{2}}$	$-\frac{a_0}{2\sqrt{2}}$	$\frac{a_0}{2}$	$-\frac{ia_0k}{4\sqrt{6}}$	$\frac{ia_0k}{4\sqrt{2}}$
$h_0^{\#1} \dagger$	$\frac{ia_0k}{2\sqrt{2}}$	0	$-\frac{ia_0k}{4\sqrt{3}}$	$\frac{ia_0k}{4\sqrt{6}}$	0	0
$h_0^{\#2} \dagger$	0	0	$\frac{ia_0k}{4}$	$-\frac{ia_0k}{4\sqrt{2}}$	0	0
$\Gamma_0^{\#1} \dagger$	0	0	0	0	0	$-\frac{a_0}{2}$

$\Delta_2^{\#1} \dagger^{\alpha\beta}$	$\Delta_2^{\#2} \dagger^{\alpha\beta}$	$\Delta_2^{\#3} \dagger^{\alpha\beta}$	$\mathcal{T}_2^{\#1} \dagger^{\alpha\beta}$	$\Delta_2^{\#1} \alpha\beta\chi$	$\Delta_2^{\#2} \alpha\beta\chi$
$\Delta_2^{\#1} \dagger^{\alpha\beta}$	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
$\Delta_2^{\#3} \dagger^{\alpha\beta}$	$\frac{4}{\sqrt{3}a_0}$	$-\frac{2\sqrt{2}}{3a_0}$	$\frac{8}{3a_0}$	$-\frac{4i\sqrt{2}}{a_0k}$	0
$\mathcal{T}_2^{\#1} \dagger^{\alpha\beta}$	$-\frac{4i\sqrt{2}}{a_0k}$	$\frac{4i}{\sqrt{3}a_0k}$	$\frac{4i\sqrt{3}}{a_0k}$	$-\frac{8}{a_0k^2}$	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	$\frac{4}{a_0}$