Particle spectrograph

Wave operator and propagator

	$\Delta_{1^+}^{\#1}{}_{\alpha}$	$\Delta_{1^+}^{\#2}{}_{\alpha}$	$\Delta_{1^+}^{\#3}{}_{\alpha}$	$\Delta_{1^+}^{\#4}{}_{\alpha}$	$\Delta_{1^+}^{\#5}{}_{\alpha}$	$\Delta_{1^+}^{\#6}{}_{\alpha}$	$\mathcal{T}_{1^+}^{\#1}{}_{\alpha}$
$\Delta_{1^+}^{\#1}{}_{\alpha\beta}$	0	0	0	0	0	0	0
$\Delta_{1^+}^{\#2}{}_{\alpha\beta}$	$-\frac{2\sqrt{2}}{a_0}$	0	0	0	0	0	0
$\Delta_{1^+}^{\#3}{}_{\alpha\beta}$	0	0	$\frac{4}{a_0}$	0	0	0	0
$\Delta_{1^-}^{\#1}{}_{\alpha}$	0	0	0	$\frac{\sqrt{2}\,(4+k^2)}{a_0\,(2+k^2)}$	$\frac{\sqrt{\frac{2}{3}}\,k^2}{a_0\,(2+k^2)}$	0	$-\frac{2\,i\,\sqrt{2}\,k}{a_0\,(2+k^2)}$
$\Delta_{1^-}^{\#2}{}_{\alpha}$	0	0	0	$\frac{(4+k^2)^2}{2\,a_0\,(2+k^2)^2}$	$\frac{k^2\,(5+2\,k^2)}{\sqrt{3}\,a_0\,(2+k^2)^2}$	$-\frac{k^2}{\sqrt{6}\,a_0\,(2+k^2)}$	$-\frac{i\,k\,(4+k^2)}{a_0\,(2+k^2)^2}$
$\Delta_{1^-}^{\#3}{}_{\alpha}$	0	0	0	$\frac{k^2\,(-2+k^2)}{2\sqrt{6}\,a_0\,(2+k^2)^2}$	$\frac{-2+k^2}{3\sqrt{2}\,a_0\,(2+k^2)^2}$	$\frac{1}{-2\,a_0-\frac{8\,a_0}{2+3\,k^2}}$	$\frac{i\,k\,(6+5\,k^2)}{\sqrt{6}\,a_0\,(2+k^2)^2}$
$\Delta_{1^-}^{\#4}{}_{\alpha}$	0	0	0	$-\frac{\sqrt{6}\,k^2}{4\,a_0+2\,a_0\,k^2}$	$\frac{\sqrt{5}}{6\,a_0+3\,a_0\,k^2}$	$-\frac{\sqrt{5}}{6\,a_0}$	$-\frac{i\,\sqrt{5}\,k}{a_0\,(2+k^2)}$
$\Delta_{1^-}^{\#5}{}_{\alpha}$	0	0	0	$\frac{k^2\,(5+2\,k^2)}{\sqrt{3}\,a_0\,(2+k^2)^2}$	$\frac{2\,(17+14\,k^2+3\,k^4)}{3\,a_0\,(2+k^2)^2}$	$-\frac{\sqrt{2}\,(7+3\,k^2)}{3\,a_0\,(2+k^2)}$	$\frac{2\,i\,k\,(3+k^2)}{\sqrt{3}\,a_0\,(2+k^2)^2}$
$\Delta_{1^-}^{\#6}{}_{\alpha}$	0	0	0	$-\frac{k^2}{\sqrt{6}\,(2\,a_0+a_0\,k^2)}$	$\frac{\sqrt{2}\,(7+3\,k^2)}{3\,a_0\,(2+k^2)}$	$\frac{5}{3\,a_0}$	$-\frac{i\,\sqrt{\frac{2}{3}}\,k}{a_0\,(2+k^2)}$
$\mathcal{T}_{1^-}^{\#1}{}_{\alpha}$	0	0	0	$\frac{i\,k\,(4+k^2)}{a_0\,(2+k^2)^2}$	$-\frac{2\,i\,k\,(3+k^2)}{\sqrt{3}\,a_0\,(2+k^2)^2}$	$i\,\sqrt{\frac{2}{3}}\,\frac{k}{2\,a_0+a_0\,k^2}$	$\frac{2\,k^2}{a_0\,(2+k^2)^2}$

	$\Delta_{3^-}^{\#1}{}_{\alpha\beta\chi}$
$\Delta_{3^-}^{\#1}{}^{\dagger}{}^{\alpha\beta\chi}$	$-\frac{2}{a_0}$

	$\Gamma_{3^-}^{\#1}{}_{\alpha\beta\chi}$
$\Gamma_{3^-}^{\#1}{}^{\dagger}{}^{\alpha\beta\chi}$	$-\frac{a_0}{2}$

	$\Delta_{0^+}^{\#1}$	$\Delta_{0^+}^{\#2}{}_{\alpha\beta}$	$\Delta_{0^+}^{\#3}{}_{\alpha}$	$\mathcal{T}_{0^+}^{\#1}{}_{\alpha}$	$\mathcal{T}_{0^+}^{\#2}{}_{\alpha}$	$\Delta_{0^-}^{\#1}$
$\Delta_{0^+}^{\#1}{}^{\dagger}$	0	$\frac{4\sqrt{6}}{16\,a_0+3\,a_0\,k^2}$	$-\frac{8}{\sqrt{3}\,(16\,a_0+3\,a_0\,k^2)}$	$-\frac{2\,i\,\sqrt{2}}{a_0\,k}$	$-\frac{2\,i\,\sqrt{6}\,k}{16\,a_0+3\,a_0\,k^2}$	$-\frac{2}{a_0}$
$\Delta_{0^+}^{\#2}{}^{\dagger}$	$\frac{4\sqrt{6}}{16\,a_0+3\,a_0\,k^2}$	$-\frac{144}{a_0\,(16+3\,k^2)^2}$	$\frac{16\,(19+3\,k^2)}{a_0\,(16+3\,k^2)^2}$	$-\frac{8\,i\,\sqrt{3}}{16\,a_0\,k+3\,a_0\,k^3}$	$\frac{72\,i\,k}{a_0\,(16+3\,k^2)^2}$	0
$\Delta_{0^+}^{\#3}{}^{\dagger}$	$-\frac{4\sqrt{\frac{2}{3}}}{16\,a_0+3\,a_0\,k^2}$	$\frac{16\,(19+3\,k^2)}{a_0\,(16+3\,k^2)^2}$	$-\frac{16\,(35+6\,k^2)}{3\,a_0\,(16+3\,k^2)^2}$	$\frac{8\,i}{\sqrt{3}\,(16\,a_0\,k+3\,a_0\,k^3)}$	$-\frac{8\,i\,k\,(19+3\,k^2)}{a_0\,(16+3\,k^2)^2}$	0
$\Delta_{0^+}^{\#4}{}^{\dagger}$	$-\frac{8}{\sqrt{3}\,(16\,a_0+3\,a_0\,k^2)}$	$\frac{8\,\sqrt{2}\,(10+3\,k^2)}{a_0\,(16+3\,k^2)^2}$	$-\frac{8\,\sqrt{2}\,(22+3\,k^2)}{3\,a_0\,(16+3\,k^2)^2}$	$\frac{8\,i\,\sqrt{\frac{2}{3}}}{16\,a_0\,k+3\,a_0\,k^3}$	$-\frac{4\,i\,\sqrt{2}\,k\,(10+3\,k^2)}{a_0\,(16+3\,k^2)^2}$	0
$\mathcal{T}_{0^+}^{\#1}{}^{\dagger}$	$\frac{2\,i\,\sqrt{2}}{a_0\,k}$	$-\frac{8\,i\,\sqrt{3}}{16\,a_0\,k+3\,a_0\,k^3}$	$\frac{8\,i}{\sqrt{3}\,(16\,a_0\,k+3\,a_0\,k^3)}$	$\frac{4}{a_0\,k^2}$	$-\frac{4\,\sqrt{3}}{16\,a_0+3\,a_0\,k^2}$	0
$\mathcal{T}_{0^+}^{\#2}{}^{\dagger}$	$\frac{2\,i\,\sqrt{6}\,k}{16\,a_0+3\,a_0\,k^2}$	$-\frac{72\,i\,k}{a_0\,(16+3\,k^2)^2}$	$\frac{8\,i\,k\,(19+3\,k^2)}{a_0\,(16+3\,k^2)^2}$	$-\frac{4\,\sqrt{3}}{16\,a_0+3\,a_0\,k^2}$	$\frac{36\,k^2}{a_0\,(16+3\,k^2)^2}$	0
$\Delta_{0^-}^{\#1}{}^{\dagger}$	0	0	0	0	0	$-\frac{2}{a_0}$

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

Quadratic (free) action

$$S == \int\int\int\int (\tfrac{1}{4}\,(2\,a_0\,\Gamma^{\alpha}{}_{\alpha}{}^{\beta}\,\Gamma^{\chi}{}_{\beta\chi} + 4\,h^{\alpha\beta}\,\mathcal{T}_{\alpha\beta} + \Gamma^{\alpha\beta\chi}\,(-2\,a_0\,\Gamma_{\beta\chi\alpha} + 4\,\Delta_{\alpha\beta\chi}) - a_0\,h^{\chi}{}_{\chi}\,\partial_{\beta}\Gamma^{\alpha}{}_{\alpha}{}^{\beta} + a_0\,h^{\chi}{}_{\chi}\,\partial_{\beta}\Gamma^{\alpha\beta}{}_{\alpha} - 2\,a_0\,h_{\alpha\chi}\,\partial_{\beta}\Gamma^{\alpha\beta\chi} + 2\,a_0\,h_{\beta\chi}\,\partial^{\chi}\Gamma^{\alpha}{}_{\alpha}{}^{\beta}))[t, x, y, z]\,dz\,dy\,dx\,dt$$

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

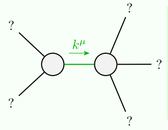
	$h_{1^-}^{\#1}{}_{\alpha}$	$\Gamma_{1^-}^{\#6}{}_{\alpha}$	$\Gamma_{1^-}^{\#5}{}_{\alpha}$	$\Gamma_{1^-}^{\#4}{}_{\alpha}$	$\Gamma_{1^-}^{\#3}{}_{\alpha}$	$\Gamma_{1^-}^{\#2}{}_{\alpha}$	$\Gamma_{1^-}^{\#1}{}_{\alpha}$
$\Gamma_{1^+}^{\#1}{}^{\dagger}{}^{\alpha\beta}$	0	0	0	0	0	0	0
$\Gamma_{1^+}^{\#2}{}^{\dagger}{}^{\alpha\beta}$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

	$\Gamma_{0^+}^{\#1}$	$\Gamma_{0^+}^{\#2}$	$\Gamma_{0^+}^{\#3}$	$\Gamma_{0^+}^{\#4}$	$h_{0^+}^{\#1}$	$h_{0^+}^{\#2}$	$\Gamma_{0^-}^{\#1}$
$\Gamma_{0^+}^{\#1}{}^{\dagger}$	$-\frac{a_0}{2}$	0	0	0	$-\frac{i\,a_0\,k}{2\,\sqrt{2}}$	0	0
$\Gamma_{0^+}^{\#2}{}^{\dagger}$	0	0	$\frac{a_0}{2}$	$-\frac{a_0}{2\,\sqrt{2}}$	0	0	0
$\Gamma_{0^+}^{\#3}{}^{\dagger}$	0	$\frac{a_0}{2}$	0	$-\frac{a_0}{2\,\sqrt{2}}$	$-\frac{1}{4}\,i\,a_0\,k$	0	0
$\Gamma_{0^+}^{\#4}{}^{\dagger}$	0	$-\frac{a_0}{2\,\sqrt{2}}$	$-\frac{a_0}{2\,\sqrt{2}}$	$\frac{a_0}{2}$	$-\frac{i\,a_0\,k}{4\,\sqrt{6}}$	$\frac{i\,a_0\,k}{4\,\sqrt{2}}$	0
$h_{0^+}^{\#1}{}^{\dagger}$	$\frac{i\,a_0\,k}{2\,\sqrt{2}}$	0	$-\frac{i\,a_0\,k}{4\,\sqrt{3}}$	$\frac{i\,a_0\,k}{4\,\sqrt{6}}$	0	0	0
$h_{0^+}^{\#2}{}^{\dagger}$	0	0	$\frac{i\,a_0\,k}{4}$	$-\frac{i\,a_0\,k}{4\,\sqrt{2}}$	0	0	0
$\Gamma_{0^-}^{\#1}{}^{\dagger}$	0	0	0	0	0	0	$-\frac{a_0}{2}$

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

Source constraints	Multiplicities
SO(3) irreps	1
$2\,\mathcal{T}_{0^+}^{\#2} - i\,k\,\Delta_{0^+}^{\#2} == 0$	1
$\Delta_{0^+}^{\#3} + 2\,\Delta_{0^+}^{\#4} + 3\,\Delta_{0^+}^{\#2} == 0$	3
$6\,\mathcal{T}_{1^-}^{\#1\,\alpha} - i\,k\,(3\,\Delta_{1^-}^{\#2\,\alpha} - \Delta_{1^-}^{\#5\,\alpha} + \Delta_{1^-}^{\#3\,\alpha}) == 0$	3
$2\,\Delta_{1^-}^{\#6\,\alpha} + \Delta_{1^-}^{\#4\,\alpha} + 2\,\Delta_{1^-}^{\#5\,\alpha} + \Delta_{1^-}^{\#3\,\alpha} == 0$	3
Total constraints/gauge generators:	8

Massive and massless spectra



Quadratic pole

Pole residue:	$-\frac{1}{a_0} > 0$
Polarisations:	2

(No massive particles)

Unitarity conditions

$a_0 < 0$