Particle spectrograph

Wave operator and propagator

	$\Delta^{\#1}_{1^+}{}^{\dagger\alpha\beta}$	$\Delta^{\#2}_{1^+}{}^{\dagger\alpha\beta}$	$\Delta^{\#3}_{1^+}{}^{\dagger\alpha\beta}$	$\Delta^{\#1}_{1^-}{}^{\dagger\alpha}$	$\Delta^{\#2}_{1^-}{}^{\dagger\alpha}$	$\Delta^{\#3}_{1^-}{}^{\dagger\alpha}$	$\Delta^{\#4}_{1^-}{}^{\dagger\alpha}$	$\Delta^{\#5}_{1^-}{}^{\dagger\alpha}$	$\Delta^{\#6}_{1^-}{}^{\dagger\alpha}$	$\mathcal{T}^{\#1}_{1^-}{}^{\dagger\alpha}$
$\Delta^{\#1}_{1^+\alpha\beta}$	0	$-\frac{2\sqrt{2}}{a_0}$	0	0	0	0	0	0	0	0
$\Delta^{\#2}_{1^+\alpha\beta}$	$-\frac{2\sqrt{2}}{a_0}$	$\frac{2}{a_0}$	0	0	0	0	0	0	0	0
$\Delta^{\#3}_{1^+\alpha\beta}$	0	0	$\frac{4}{a_0}$	0	0	0	0	0	0	0
$\Delta^{\#1}_{1^-\alpha}$	0	0	0	0	$\frac{2\sqrt{2}}{a_0}$	0	0	0	0	0
$\Delta^{\#2}_{1^-\alpha}$	0	0	0	$\frac{2\sqrt{2}}{a_0}$	$\frac{2}{a_0}$	0	0	0	0	0
$\Delta^{\#3}_{1^-\alpha}$	0	0	0	0	0	$-\frac{19}{12a_0}$	$\frac{5\sqrt{5}}{12a_0}$	$-\frac{1}{6\sqrt{2}a_0}$	$-\frac{1}{6a_0}$	0
$\Delta^{\#4}_{1^-\alpha}$	0	0	0	0	0	$\frac{5\sqrt{5}}{12a_0}$	$\frac{1}{12a_0}$	$-\frac{\sqrt{\frac{5}{2}}}{6a_0}$	$-\frac{\sqrt{5}}{6a_0}$	0
$\Delta^{\#5}_{1^-\alpha}$	0	0	0	0	0	$-\frac{1}{6\sqrt{2}a_0}$	$-\frac{\sqrt{\frac{5}{2}}}{6a_0}$	$\frac{17}{6a_0}$	$-\frac{7}{3\sqrt{2}a_0}$	0
$\Delta^{\#6}_{1^-\alpha}$	0	0	0	0	0	$-\frac{1}{6a_0}$	$-\frac{\sqrt{5}}{6a_0}$	$-\frac{7}{3\sqrt{2}a_0}$	$\frac{5}{3a_0}$	0
$\mathcal{T}^{\#1}_{1^-\alpha}$	0	0	0	0	0	0	0	0	0	0

	$\Gamma^{\#1}_{1^+}{}^{\dagger\alpha\beta}$	$\Gamma^{\#2}_{1^+}{}^{\dagger\alpha\beta}$	$\Gamma^{\#3}_{1^+}{}^{\dagger\alpha\beta}$	$\Gamma^{\#1}_{1^-}{}^{\dagger\alpha}$	$\Gamma^{\#2}_{1^-}{}^{\dagger\alpha}$	$\Gamma^{\#3}_{1^-}{}^{\dagger\alpha}$	$\Gamma^{\#4}_{1^-}{}^{\dagger\alpha}$	$\Gamma^{\#5}_{1^-}{}^{\dagger\alpha}$	$\Gamma^{\#6}_{1^-}{}^{\dagger\alpha}$	$h^{\#1}_{1^-}{}^{\dagger\alpha}$
$\Gamma^{\#1}_{1^+\alpha\beta}$	$-\frac{a_0}{4}$	$-\frac{a_0}{2\sqrt{2}}$	0	0	0	0	0	0	0	0
$\Gamma^{\#2}_{1^+\alpha\beta}$	$-\frac{a_0}{2\sqrt{2}}$	0	0	0	0	0	0	0	0	0
$\Gamma^{\#3}_{1^+\alpha\beta}$	0	0	$\frac{a_0}{4}$	0	0	0	0	0	0	0
$\Gamma^{\#1}_{1^-\alpha}$	0	0	0	$-\frac{a_0}{4}$	$\frac{a_0}{2\sqrt{2}}$	0	0	0	0	0
$\Gamma^{\#2}_{1^-\alpha}$	0	0	0	$\frac{a_0}{2\sqrt{2}}$	0	0	0	0	0	0
$\Gamma^{\#3}_{1^-\alpha}$	0	0	0	0	0	$-\frac{a_0}{3}$	$\frac{\sqrt{5}a_0}{6}$	$-\frac{a_0}{6\sqrt{2}}$	$-\frac{a_0}{6}$	0
$\Gamma^{\#4}_{1^-\alpha}$	0	0	0	0	0	$\frac{\sqrt{5}a_0}{6}$	$\frac{a_0}{3}$	$-\frac{1}{6}\sqrt{\frac{5}{2}}a_0$	$-\frac{\sqrt{5}a_0}{6}$	0
$\Gamma^{\#5}_{1^-\alpha}$	0	0	0	0	0	$-\frac{a_0}{6\sqrt{2}}$	$-\frac{1}{6}\sqrt{\frac{5}{2}}a_0$	$\frac{a_0}{3}$	$\frac{a_0}{6\sqrt{2}}$	0
$\Gamma^{\#6}_{1^-\alpha}$	0	0	0	0	0	$-\frac{a_0}{6}$	$-\frac{\sqrt{5}a_0}{6}$	$\frac{a_0}{6\sqrt{2}}$	$\frac{5a_0}{12}$	0
$h^{\#1}_{1^-\alpha}$	0	0	0	0	0	0	0	0	0	0

Quadratic (free) action

$$S == \iiiint\Big(\tfrac{1}{8}\big(8\,h^{\alpha\beta}\,\mathcal{T}_{\alpha\beta} - 4\,\Gamma^{\alpha\beta\chi}\,(a_0\,\Gamma_{\beta\chi\alpha} - 2\,\Delta_{\alpha\beta\chi} + a_0\,\partial_\beta h_{\alpha\chi}) + 2\,a_0\,\Gamma^{\alpha\beta}{}_{\alpha}\,\partial_\beta h^\chi{}_\chi -$$
$$2\,a_0\,h^\chi{}_\chi\,\partial_\beta\Gamma^{\alpha}{}_{\alpha}{}^{\beta} + 2\,a_0\,h^\chi{}_\chi\,\partial_\beta\Gamma^{\alpha\beta}{}_{\alpha} - 4\,a_0\,h_{\alpha\chi}\,\partial_\beta\Gamma^{\alpha\beta\chi} +$$
$$4\,a_0\,h^{\alpha\beta}\,\partial_\beta\partial_\alpha h^\chi{}_\chi - a_0\,\partial_\beta h^\chi{}_\chi\,\partial^\beta h^\alpha{}_\alpha - 4\,a_0\,\partial_\alpha h^{\alpha\beta}\,\partial_\chi h_\beta{}^\chi +$$
$$4\,a_0\,\partial^\beta h^\alpha{}_\alpha\,\partial_\chi h_\beta{}^\chi + 2\,a_0\,\Gamma^{\alpha}{}_{\alpha}{}^{\beta}\,(2\,\Gamma^\chi{}_{\beta\chi} - \partial_\beta h^\chi{}_\chi + 2\,\partial_\chi h_\beta{}^\chi) -$$
$$8\,a_0\,h^{\alpha\beta}\,\partial_\chi\partial_\beta h^\chi{}_\alpha + 2\,a_0\,h^\alpha{}_\alpha\,\partial_\chi\partial_\beta h^{\beta\chi} +$$
$$4\,a_0\,h^{\alpha\beta}\,\partial_\chi\partial^\chi h_{\alpha\beta} - 2\,a_0\,h^\alpha{}_\alpha\,\partial_\chi\partial^\chi h^\beta{}_\beta -$$
$$2\,a_0\,\partial_\beta h_{\alpha\chi}\,\partial^\chi h^{\alpha\beta} + 3\,a_0\,\partial_\chi h_{\alpha\beta}\,\partial^\chi h^{\alpha\beta} +$$
$$4\,a_0\,h_{\beta\chi}\,\partial^\chi\Gamma^{\alpha}{}_{\alpha}{}^{\beta}\big)\Big)[t, x, y, z]\,dz\,dy\,dx\,dt$$

Source constraints

SO(3) irreps	Fundamental fields	Multiplicities
$\mathcal{T}^{\#2}_{0^+} == 0$	$\partial_\beta\partial_\alpha\mathcal{T}^{\alpha\beta} == 0$	1
$\Delta^{\#3}_{0^+} + 2\,\Delta^{\#4}_{0^+} + 3\,\Delta^{\#2}_{0^+} == 0$	$\partial_\alpha\Delta^{\alpha\beta}{}_\beta == 0$	1
$\mathcal{T}^{\#1\alpha}_{1^-} == 0$	$\partial_\chi\partial_\beta\partial^\alpha\mathcal{T}^{\beta\chi} == \partial_\chi\partial^\chi\partial_\beta\mathcal{T}^{\alpha\beta}$	3
$2\,\Delta^{\#6\alpha}_{1^-} + \Delta^{\#4\alpha}_{1^-} + 2\,\Delta^{\#5\alpha}_{1^-} + \Delta^{\#3\alpha}_{1^-} == 0$	$\partial_\beta\partial^\alpha\Delta^{\beta\chi}{}_\chi == \partial_\chi\partial^\chi\Delta^{\alpha\beta}{}_\beta$	3
Total constraints/gauge generators:		8

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

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

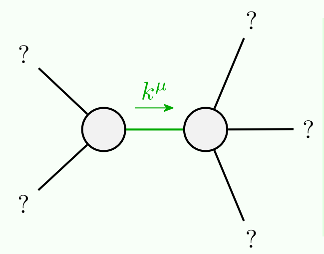
	$\Delta^{\#1}_{0^+}{}^{\dagger}$	$\Delta^{\#2}_{0^+}{}^{\dagger}$	$\Delta^{\#3}_{0^+}{}^{\dagger}$	$\Delta^{\#4}_{0^+}{}^{\dagger}$	$\mathcal{T}^{\#1}_{0^+}{}^{\dagger}$	$\mathcal{T}^{\#2}_{0^+}{}^{\dagger}$	$\Delta^{\#1}_{0^-}{}^{\dagger}$
$\Delta^{\#1}_{0^+}$	$-\frac{2}{a_0}$	0	0	0	0	0	0
$\Delta^{\#2}_{0^+}$	0	$-\frac{3}{4a_0}$	$\frac{5}{4a_0}$	$-\frac{1}{2\sqrt{2}a_0}$	0	0	0
$\Delta^{\#3}_{0^+}$	0	$\frac{5}{4a_0}$	$-\frac{3}{4a_0}$	$-\frac{1}{2\sqrt{2}a_0}$	0	0	0
$\Delta^{\#4}_{0^+}$	0	$-\frac{1}{2\sqrt{2}a_0}$	$-\frac{1}{2\sqrt{2}a_0}$	$\frac{1}{2a_0}$	0	0	0
$\mathcal{T}^{\#1}_{0^+}$	0	0	0	0	$\frac{4}{a_0k^2}$	0	0
$\mathcal{T}^{\#2}_{0^+}$	0	0	0	0	0	0	0
$\Delta^{\#1}_{0^-}$	0	0	0	0	0	0	$-\frac{2}{a_0}$

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

	$\Gamma^{\#1}_{0^+}{}^{\dagger}$	$\Gamma^{\#2}_{0^+}{}^{\dagger}$	$\Gamma^{\#3}_{0^+}{}^{\dagger}$	$\Gamma^{\#4}_{0^+}{}^{\dagger}$	$h^{\#1}_{0^+}{}^{\dagger}$	$h^{\#2}_{0^+}{}^{\dagger}$	$\Gamma^{\#1}_{0^-}{}^{\dagger}$
$\Gamma^{\#1}_{0^+}$	$-\frac{a_0}{2}$	0	0	0	0	0	0
$\Gamma^{\#2}_{0^+}$	0	0	$\frac{a_0}{2}$	$-\frac{a_0}{2\sqrt{2}}$	0	0	0
$\Gamma^{\#3}_{0^+}$	0	$\frac{a_0}{2}$	0	$-\frac{a_0}{2\sqrt{2}}$	0	0	0
$\Gamma^{\#4}_{0^+}$	0	$-\frac{a_0}{2\sqrt{2}}$	$-\frac{a_0}{2\sqrt{2}}$	$\frac{a_0}{2}$	0	0	0
$h^{\#1}_{0^+}$	0	0	0	0	$\frac{a_0k^2}{4}$	0	0
$h^{\#2}_{0^+}$	0	0	0	0	0	0	0
$\Gamma^{\#1}_{0^-}$	0	0	0	0	0	0	$-\frac{a_0}{2}$

	$\Gamma^{\#1}_{2^+\alpha\beta}$	$\Gamma^{\#2}_{2^+\alpha\beta}$	$\Gamma^{\#3}_{2^+\alpha\beta}$	$h^{\#1}_{2^+\alpha\beta}$	$\Gamma^{\#1}_{2^-\alpha\beta\chi}$	$\Gamma^{\#2}_{2^-\alpha\beta\chi}$
$\Gamma^{\#1}_{2^+}{}^{\dagger\alpha\beta}$	$\frac{a_0}{4}$	0	0	0	0	0
$\Gamma^{\#2}_{2^+}{}^{\dagger\alpha\beta}$	0	$-\frac{a_0}{2}$	0	0	0	0
$\Gamma^{\#3}_{2^+}{}^{\dagger\alpha\beta}$	0	0	$\frac{a_0}{4}$	0	0	0
$h^{\#1}_{2^+}{}^{\dagger\alpha\beta}$	0	0	0	$-\frac{a_0k^2}{8}$	0	0
$\Gamma^{\#1}_{2^-}{}^{\dagger\alpha\beta\chi}$	0	0	0	0	$\frac{a_0}{4}$	0
$\Gamma^{\#2}_{2^-}{}^{\dagger\alpha\beta\chi}$	0	0	0	0	0	$\frac{a_0}{4}$

Massive and massless spectra



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

(No massive particles)

Unitarity conditions

$a_0 < 0$