Particle spectrograph

Wave operator and propagator

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

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

Quadratic (free) action

$$S_F == \iiiint \Big(\tfrac{1}{8}\big(8\, h^{\alpha\beta}\, \mathcal{T}_{\alpha\beta} - 4\, \Gamma^{\alpha\beta\chi}\,(a_0\, \Gamma_{\beta\chi\alpha} - 2\, \Delta_{\alpha\beta\chi} + a_0\, \partial_{\beta} h_{\alpha\chi}) + 2\, a_0\, \Gamma^{\alpha\beta}{}_{\alpha}\, \partial_{\beta} h^{\chi}{}_{\chi} -$$

$$2\, a_0\, h^{\chi}{}_{\chi}\, \partial_{\beta}\Gamma^{\alpha}{}_{\alpha}{}^{\beta} + 2\, a_0\, h^{\chi}{}_{\chi}\, \partial_{\beta}\Gamma^{\alpha\beta}{}_{\alpha} - 4\, a_0\, h_{\alpha\chi}\, \partial_{\beta}\Gamma^{\alpha\beta\chi} + 4\, a_0\, h^{\alpha\beta}\, \partial_{\beta}\partial_{\alpha} h^{\chi}{}_{\chi} -$$

$$a_0\, \partial_{\beta} h^{\chi}{}_{\chi}\, \partial^{\beta} h^{\alpha}{}_{\alpha} - 4\, a_0\, \partial_{\alpha} h^{\alpha\beta}\, \partial_{\chi} h_{\beta}{}^{\chi} + 4\, a_0\, \partial^{\beta} h^{\alpha}{}_{\alpha}\, \partial_{\chi} h_{\beta}{}^{\chi} +$$

$$2\, a_0\, \Gamma^{\alpha}{}_{\alpha}{}^{\beta}\,(2\, \Gamma^{\chi}{}_{\beta\chi} - \partial_{\beta} h^{\chi}{}_{\chi} + 2\, \partial_{\chi} h_{\beta}{}^{\chi}) - 8\, a_0\, h^{\alpha\beta}\, \partial_{\chi}\partial_{\beta} h_{\alpha}{}^{\chi} +$$

$$2\, a_0\, h^{\alpha}{}_{\alpha}\, \partial_{\chi}\partial_{\beta} h^{\beta\chi} + 4\, a_0\, h^{\alpha\beta}\, \partial_{\chi}\partial^{\chi} h_{\alpha\beta} - 2\, a_0\, h^{\alpha}{}_{\alpha}\, \partial_{\chi}\partial^{\chi} h^{\beta}{}_{\beta} - 2\, a_0\, \partial_{\beta} h_{\alpha\chi}\, \partial^{\chi} h^{\alpha\beta} +$$

$$3\, a_0\, \partial_{\chi} h_{\alpha\beta}\, \partial^{\chi} h^{\alpha\beta} + 4\, a_0\, h_{\beta\chi}\, \partial^{\chi}\Gamma^{\alpha}{}_{\alpha}{}^{\beta}\big)\Big)[t, x, y, z]\, dz\, dy\, dx\, dt$$

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

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

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

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

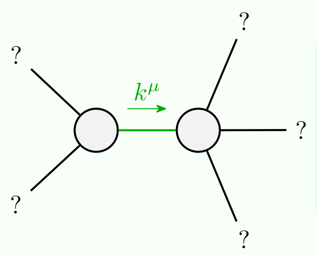
	$\Gamma^{\#1}_{2^+}{}^{\dagger\alpha\beta}$	$\Gamma^{\#2}_{2^+}{}^{\dagger\alpha\beta}$	$\Gamma^{\#3}_{2^+}{}^{\dagger\alpha\beta}$	$h^{\#1}_{2^+}{}^{\dagger\alpha\beta}$	$\Gamma^{\#1}_{2^-}{}^{\dagger\alpha\beta\chi}$	$\Gamma^{\#2}_{2^-}{}^{\dagger\alpha\beta\chi}$
$\Gamma^{\#2}_{2^-}{}_{\alpha\beta\chi}$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

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

Source constraints/gauge generators

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

Massive and massless spectra



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

(No massive particles)

Unitarity conditions

$a_0 < 0$