Particle spectrograph

Wave operator and propagator

Source constraints			
SO(3) irreps	Fundamental fields		Multiplicities
$\mathcal{T}_{0^+}^{\#2} == 0$	$\partial_\beta \partial_\alpha \mathcal{L}^{\alpha\beta} == 0$		1
$\omega_{0^+}^{\#1} + \mathcal{T}_{0^+}^{\#1} == 0$	$\partial_\beta \partial_\alpha \omega^{\alpha\beta} + \partial_\beta \partial_\alpha \mathcal{T}^{\alpha\beta} == \partial_\beta \partial^\beta \omega^\alpha{}_\alpha + \partial_\beta \partial^\beta \mathcal{T}^\alpha{}_\alpha$		1
$\omega_{0^+}^{\#2} == 0$	$\partial_\beta \partial_\alpha \omega^{\alpha\beta} == 0$		1
$\omega_{1^-}^{\#1\,\alpha} + 2\,\mathcal{T}_{1^-}^{\#1\,\alpha} == 0$	$\partial_\chi \partial^\chi \varrho_\beta \omega^{\beta\chi} + 2\,\partial_\chi \partial_\beta \varrho^\chi \mathcal{T}^{\beta\chi} ==$ $\partial_\chi \partial^\chi \varrho_\beta \omega^{\beta\alpha} + 2\,\partial_\chi \varrho_\beta \varrho^\chi \mathcal{T}^{\alpha\beta}$		3
$\omega_{1^-}^{\#2\,\alpha} == 0$	$\partial^\beta{}^\beta \varrho_\chi \varrho^\chi == \partial_\chi^\alpha \varrho_\beta \varrho^\chi$		3
$\omega_{2^+}^{\#1\,\alpha\beta} + \mathcal{T}_{2^+}^{\#1\,\alpha\beta} == 0$	(long expression)		5
Total constraints/gauge generators:			14

Quadratic (free) action

$$\mathcal{S} == \iiint \left(\theta^{\alpha\beta}\,\omega_{\alpha\beta} + h^{\alpha\beta}\,\mathcal{T}_{\alpha\beta} + \tfrac{1}{1/\kappa}\,(\partial_\nu \theta_{\mu\rho}\,\partial^\rho \theta^{\mu\nu} - \partial_\rho \theta_{\mu\nu}\,\partial^\rho \theta^{\mu\nu} + 2\,\partial_\rho h_{\mu\nu}\,\partial^\rho \theta^{\mu\nu} - \partial_\rho h_{\mu\nu}\,\partial^\rho h^{\mu\nu} + \partial_\nu h_{\mu\rho}(-2\,\partial^\rho \theta^{\mu\nu} + \partial^\rho h^{\mu\nu})) \right)[t,x,y,z]\,dz\,dy\,dx\,dt$$

$\dagger$	$\theta_{0^+}^{\#1}$	$\theta_{0^+}^{\#2}$	$h_{0^+}^{\#1}$	$h_{0^+}^{\#2}$
$h_{0^+}^{\#2}$	0	0	0	0
$h_{0^+}^{\#1}$	$\frac{k^2}{1/\kappa}$	0	$-\frac{k^2}{1/\kappa}$	0
$\theta_{0^+}^{\#2}$	0	0	0	0
$\theta_{0^+}^{\#1}$	$-\frac{k^2}{1/\kappa}$	0	$\frac{k^2}{1/\kappa}$	0

	$\theta_{1^+\alpha\beta}^{\#1}$	$\theta_{1^-\alpha}^{\#1}$	$\theta_{1^-\alpha}^{\#2}$	$h_{1^-\alpha}^{\#1}$
$\theta_{1^+}^{\#1}\dagger^{\alpha\beta}$	$-\frac{k^2}{1/\kappa}$	0	0	0
$\theta_{1^-}^{\#1}\dagger^\alpha$	0	$-\frac{k^2}{1/\kappa}$	0	$\frac{k^2}{\sqrt{2}\,1/\kappa}$
$\theta_{1^-}^{\#2}\dagger^\alpha$	0	0	0	0
$h_{1^-}^{\#1}\dagger^\alpha$	0	$\frac{k^2}{\sqrt{2}\,1/\kappa}$	0	$-\frac{k^2}{2\,1/\kappa}$

	$\omega_{1^+\alpha\beta}^{\#1}$	$\omega_{1^-\alpha}^{\#1}$	$\omega_{1^-\alpha}^{\#2}$	$\mathcal{T}_{1^-\alpha}^{\#1}$
$\omega_{1^+}^{\#1}\dagger^{\alpha\beta}$	$-\frac{1/\kappa}{k^2}$	0	0	0
$\omega_{1^-}^{\#1}\dagger^\alpha$	0	$-\frac{4\,1/\kappa}{9\,k^2}$	0	$\frac{2\sqrt{2}\,1/\kappa}{9\,k^2}$
$\omega_{1^-}^{\#2}\dagger^\alpha$	0	0	0	0
$\mathcal{T}_{1^-}^{\#1}\dagger^\alpha$	0	$\frac{2\sqrt{2}\,1/\kappa}{9\,k^2}$	0	$-\frac{2\,1/\kappa}{9\,k^2}$

$\dagger$	$\omega_{0^+}^{\#1}$	$\omega_{0^+}^{\#2}$	$\mathcal{T}_{0^+}^{\#1}$	$\mathcal{T}_{0^+}^{\#2}$
$\omega_{0^+}^{\#1}$	$-\frac{1/\kappa}{4\,k^2}$	0	$\frac{1/\kappa}{4\,k^2}$	0
$\omega_{0^+}^{\#2}$	0	0	0	0
$\mathcal{T}_{0^+}^{\#1}$	$\frac{1/\kappa}{4\,k^2}$	0	$-\frac{1/\kappa}{4\,k^2}$	0
$\mathcal{T}_{0^+}^{\#2}$	0	0	0	0

	$\theta_{2^+\alpha\beta}^{\#1}$	$h_{2^+\alpha\beta}^{\#1}$
$\theta_{2^+}^{\#1}\dagger^{\alpha\beta}$	$\frac{k^2}{1/\kappa}$	$-\frac{k^2}{1/\kappa}$
$h_{2^+}^{\#1}\dagger^{\alpha\beta}$	$\frac{k^2}{1/\kappa}$	$\frac{k^2}{1/\kappa}$

	$\omega_{2^+\alpha\beta}^{\#1}$	$\mathcal{T}_{2^+\alpha\beta}^{\#1}$
$\omega_{2^+}^{\#1}\dagger^{\alpha\beta}$	$-\frac{1/\kappa}{4\,k^2}$	$\frac{1/\kappa}{4\,k^2}$
$\mathcal{T}_{2^+}^{\#1}\dagger^{\alpha\beta}$	$\frac{1/\kappa}{4\,k^2}$	$\frac{1/\kappa}{4\,k^2}$

Massive and massless spectra

Quadratic pole	
Pole residue:	$-((2+\sqrt{6})\,1/\kappa) > 0$
Polarisations:	2

Quadratic pole	
Pole residue:	$(2+\sqrt{6})\,1/\kappa > 0$
Polarisations:	2

Quadratic pole	
Pole residue:	$-1/\kappa > 0$
Polarisations:	2

Quadratic pole	
Pole residue:	$(-3+\sqrt{5})\,1/\kappa > 0$
Polarisations:	1

(No massive particles)

Quadratic pole	
Pole residue:	$-((3+\sqrt{5})\,1/\kappa) > 0$
Polarisations:	1

Unitarity conditions

(Unitarity is demonstrably impossible)