Particle spectrograph

Wave operator and propagator

Source constraints

SO(3) irreps	Fundamental fields	Multiplicities
$\sigma^{\#1}_{0^-} == 0$	$\epsilon\, \eta_{\alpha\beta\chi\delta}\, \partial^{\delta}\sigma^{\alpha\beta\chi} == 0$	1
$\sigma^{\#1}_{0^+} == 0$	$\partial_{\beta}\sigma^{\alpha\beta}{}_{\alpha} == 0$	1
$\sigma^{\#2}_{1^-}{}^{\alpha} == 0$	$\partial_{\chi}\partial_{\beta}\sigma^{\alpha\beta\chi} == 0$	3
$\sigma^{\#2}_{1^+}{}^{\alpha\beta} == 0$	$\partial_{\delta}\partial_{\chi}\partial^{\alpha}\sigma^{\beta\chi\delta} + \partial_{\delta}\partial^{\delta}\partial_{\chi}\sigma^{\alpha\beta\chi} == \partial_{\delta}\partial_{\chi}\partial^{\beta}\sigma^{\alpha\chi\delta}$	3
$\sigma^{\#1}_{2^+}{}^{\alpha\beta} == 0$	$3\,\partial_{\delta}\partial_{\chi}\partial^{\alpha}\sigma^{\beta\chi\delta} + 3\,\partial_{\delta}\partial_{\chi}\partial^{\beta}\sigma^{\alpha\chi\delta} + 2\,\eta^{\alpha\beta}\,\partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\sigma^{\chi\delta}{}_{\chi} == 2\,\partial_{\delta}\partial^{\beta}\partial^{\alpha}\sigma^{\chi\delta}{}_{\chi} + 3\,(\partial_{\delta}\partial^{\delta}\partial_{\chi}\sigma^{\alpha\chi\beta} + \partial_{\delta}\partial^{\delta}\partial_{\chi}\sigma^{\beta\chi\alpha})$	5
Total constraints/gauge generators:		13

Quadratic (free) action

$$S == \iiiint \Big(\omega^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi} - \tfrac{2}{3}\, r_1\,(2\,\partial_{\beta}\omega_{\alpha\iota\theta} - \partial_{\beta}\omega_{\alpha\theta\iota} + 4\,\partial_{\beta}\omega_{\iota\theta\alpha} + \partial_{\iota}\omega_{\alpha\beta\theta} - \partial_{\theta}\omega_{\alpha\beta\iota} - \partial_{\theta}\omega_{\alpha\iota\beta})\,\partial^{\theta}\omega^{\alpha\beta\iota} + r_5\,(\partial_{\iota}\omega_{\theta}{}^{\kappa}{}_{\kappa}\,\partial^{\theta}\omega^{\alpha\iota}{}_{\alpha} - \partial_{\theta}\omega_{\iota}{}^{\kappa}{}_{\kappa}\,\partial^{\theta}\omega^{\alpha\iota}{}_{\alpha} - (\partial_{\alpha}\omega^{\alpha\iota\theta} - 2\,\partial^{\theta}\omega^{\alpha\iota}{}_{\alpha})(\partial_{\kappa}\omega_{\iota}{}^{\kappa}{}_{\theta} - \partial_{\kappa}\omega_{\theta}{}^{\kappa}{}_{\iota}))\Big)[t,x,y,z]\,dz\,dy\,dx\,dt$$

	$\omega^{\#1}_{2^+\,\alpha\beta}$	$\omega^{\#1}_{2^-\,\alpha\beta\chi}$
$\omega^{\#1}_{2^+}{}^{\dagger\,\alpha\beta}$	0	0
$\omega^{\#1}_{2^-}{}^{\dagger\,\alpha\beta\chi}$	0	$k^2\, r_1$

	$\sigma^{\#1}_{2^+\,\alpha\beta}$	$\sigma^{\#1}_{2^-\,\alpha\beta\chi}$
$\sigma^{\#1}_{2^+}{}^{\dagger\,\alpha\beta}$	0	0
$\sigma^{\#1}_{2^-}{}^{\dagger\,\alpha\beta\chi}$	0	$\frac{1}{k^2\, r_1}$

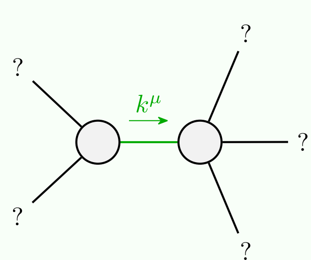
	$\sigma^{\#1}_{0^+}$	$\sigma^{\#1}_{0^-}$
$\sigma^{\#1}_{0^+}{}^{\dagger}$	0	0
$\sigma^{\#1}_{0^-}{}^{\dagger}$	0	0

	$\omega^{\#1}_{0^+}$	$\omega^{\#1}_{0^-}$
$\omega^{\#1}_{0^+}{}^{\dagger}$	0	0
$\omega^{\#1}_{0^-}{}^{\dagger}$	0	0

	$\sigma^{\#1}_{1^+\,\alpha\beta}$	$\sigma^{\#2}_{1^+\,\alpha\beta}$	$\sigma^{\#1}_{1^-\,\alpha}$	$\sigma^{\#2}_{1^-\,\alpha}$
$\sigma^{\#1}_{1^+}{}^{\dagger\,\alpha\beta}$	$\frac{1}{k^2\,(2\,r_1+r_5)}$	0	0	0
$\sigma^{\#2}_{1^+}{}^{\dagger\,\alpha\beta}$	0	0	0	0
$\sigma^{\#1}_{1^-}{}^{\dagger\,\alpha}$	0	0	$\frac{1}{k^2\,(r_1+r_5)}$	0
$\sigma^{\#2}_{1^-}{}^{\dagger\,\alpha}$	0	0	0	0

	$\omega^{\#1}_{1^+\,\alpha\beta}$	$\omega^{\#2}_{1^+\,\alpha\beta}$	$\omega^{\#1}_{1^-\,\alpha}$	$\omega^{\#2}_{1^-\,\alpha}$
$\omega^{\#1}_{1^+}{}^{\dagger\,\alpha\beta}$	$k^2\,(2\,r_1+r_5)$	0	0	0
$\omega^{\#2}_{1^+}{}^{\dagger\,\alpha\beta}$	0	0	0	0
$\omega^{\#1}_{1^-}{}^{\dagger\,\alpha}$	0	0	$k^2\,(r_1+r_5)$	0
$\omega^{\#2}_{1^-}{}^{\dagger\,\alpha}$	0	0	0	0

Massive and massless spectra



Quadratic pole

Pole residue:	$-\frac{1}{r_1\,(r_1+r_5)\,(2\,r_1+r_5)} > 0$
Polarisations:	2

(No massive particles)

Unitarity conditions

$r_1 < 0\;\&\&\;(r_5 < -r_1 \;||\; r_5 > -2\,r_1) \;||\; r_1 > 0\;\&\&\; -2\,r_1 < r_5 < -r_1$