Particle spectrograph

Wave operator and propagator

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

Quadratic (free) action

$$S == \int\int\int (\mathcal{A}^{\alpha\beta\chi}\ \sigma_{\alpha\beta\chi} - \frac{2}{3}\,r_1\,(2\,\partial_\beta\mathcal{A}_{\alpha\iota\theta}\cdot\partial_\beta\mathcal{A}_{\alpha\theta\iota} + 4\,\partial_\beta\mathcal{A}_{\iota\theta\alpha}\cdot\partial_\iota\mathcal{A}_{\alpha\beta\theta} - \partial_\theta\mathcal{A}_{\alpha\beta\iota} - \partial_\theta\mathcal{A}_{\alpha\iota\beta})\,\partial^\theta\mathcal{A}^{\alpha\beta\iota} + r_5\,(\partial_\iota\mathcal{A}_\theta{}^\kappa\,\partial^\theta\mathcal{A}^{\alpha\iota}{}_\alpha - \partial_\theta\mathcal{A}_\iota{}^\kappa\,\partial^\theta\mathcal{A}^{\alpha\iota}{}_\alpha - (\partial_\alpha\mathcal{A}^{\alpha\iota\theta} - 2\,\partial^\theta\mathcal{A}^{\alpha\iota}{}_\alpha)\cdot(\partial_\kappa\mathcal{A}_\iota{}^\kappa{}_\theta - \partial_\kappa\mathcal{A}_\theta{}^\kappa{}_\iota)))[t, x, y, z]\,dz\,dy\,dx\,dt$$

$\mathcal{A}_{2^+}^{\#1\,\alpha\beta}\dagger^{\alpha\beta}$, $\mathcal{A}_{2^-}^{\#1\,\alpha\beta\chi}\dagger^{\alpha\beta\chi}$

0	$k^2\,r_1$
0	0

$\sigma_{2^+}^{\#1\,\alpha\beta}\dagger^{\alpha\beta}$, $\sigma_{2^-}^{\#1\,\alpha\beta\chi}\dagger^{\alpha\beta\chi}$

0	$\frac{1}{k^2\,r_1}$
0	0

$\sigma_{0^+}^{\#1}$, $\sigma_{0^-}^{\#1}$

$\sigma_{0^+}^{\#1}\dagger$	0	0
$\sigma_{0^-}^{\#1}\dagger$	0	0

$\mathcal{A}_{0^+}^{\#1}$, $\mathcal{A}_{0^-}^{\#1}$

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

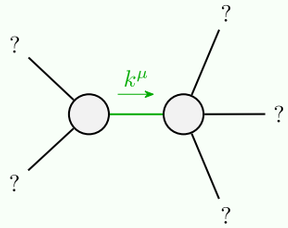
$\sigma_{1^+}^{\#1\,\alpha\beta}$, $\sigma_{1^+}^{\#2\,\alpha\beta}$, $\sigma_{1^-}^{\#1\,\alpha}$, $\sigma_{1^-}^{\#2\,\alpha}$

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

$\mathcal{A}_{1^+}^{\#1\,\alpha\beta}$, $\mathcal{A}_{1^+}^{\#2\,\alpha\beta}$, $\mathcal{A}_{1^-}^{\#1\,\alpha}$, $\mathcal{A}_{1^-}^{\#2\,\alpha}$

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

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