Particle spectrograph

Wave operator and propagator

Spin-parity form	Covariant form	Multiplicities
$\overset{\#1}{0}^{-}\ \sigma == 0$	$\epsilon\eta_{\alpha\beta\gamma\delta}\ \partial^{\delta}\sigma^{\alpha\beta\gamma} == 0$	1
$\overset{\#1}{0}^{+}\ \sigma == 0$	$\partial_{\theta}\sigma^{\alpha\beta}{}_{\alpha} == 0$	1
$\overset{\#2}{1}^{-}\ \sigma^{\alpha} == 0$	$\partial_{\chi}\partial_{\beta}\sigma^{\alpha\beta\chi} == 0$	3
$\overset{\#2}{1}^{+}\ \sigma^{\alpha\beta} == 0$	$\partial_{\theta}\partial_{\chi}\sigma^{\beta\chi\delta} + \partial_{\delta}\partial^{\delta}\partial_{\chi}\sigma^{\alpha\beta\chi} == \partial_{\theta}\partial_{\chi}\partial^{\beta}\sigma^{\alpha\chi\delta}$	3
$\overset{\#1}{2}^{-}\ \sigma^{\alpha\beta\chi} == 0$	$\partial_{\epsilon}\partial_{\theta}\partial^{\chi}\partial^{\alpha}\sigma^{\beta\delta\epsilon} + 3\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\theta}\partial^{\alpha}\sigma^{\beta\delta}{}_{\delta} + 2\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial^{\beta}\sigma^{\alpha\chi\delta} + 4\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial^{\delta}\sigma^{\alpha\beta\chi} +$ $2\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\theta}\partial^{\beta}\sigma^{\chi\alpha}{}_{\delta} + 4\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\theta}\partial^{\chi}\sigma^{\alpha\beta\delta} + 2\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial^{\chi}\sigma^{\alpha\delta\beta} + 2\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial^{\delta}\sigma^{\beta\chi\alpha} +$ $3\ \eta^{\beta\chi}\ \partial_{\phi}\partial^{\phi}\partial_{\epsilon}\partial^{\alpha}\sigma^{\delta\epsilon}{}_{\delta} + 3\ \eta^{\alpha\chi}\ \partial_{\phi}\partial^{\phi}\partial_{\epsilon}\partial_{\delta}\sigma^{\beta\delta\epsilon} + 3\ \eta^{\beta\chi}\ \partial_{\phi}\partial^{\phi}\partial_{\epsilon}\partial^{\epsilon}\sigma^{\alpha\delta}{}_{\delta} ==$ $3\ \partial_{\epsilon}\partial_{\delta}\partial^{\chi}\partial^{\beta}\sigma^{\alpha\delta\epsilon} + 3\ \partial_{\epsilon}\partial^{\epsilon}\partial^{\chi}\partial^{\beta}\sigma^{\alpha\delta}{}_{\delta} + 2\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial^{\alpha}\sigma^{\beta\chi\delta} + 4\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial^{\alpha}\sigma^{\beta\delta\chi} +$ $2\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial^{\alpha}\sigma^{\chi\beta\delta} + 2\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial^{\chi}\sigma^{\alpha\beta\delta} + 4\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial^{\delta}\sigma^{\alpha\chi\beta} + 2\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial^{\delta}\sigma^{\alpha\chi\beta} +$ $3\ \eta^{\alpha\chi}\ \partial_{\phi}\partial^{\phi}\partial_{\epsilon}\partial^{\beta}\sigma^{\delta\epsilon}{}_{\delta} + 3\ \eta^{\beta\chi}\ \partial_{\phi}\partial^{\phi}\partial_{\epsilon}\partial_{\delta}\sigma^{\alpha\delta\epsilon} + 3\ \eta^{\alpha\chi}\ \partial_{\phi}\partial^{\phi}\partial_{\epsilon}\partial^{\epsilon}\sigma^{\beta\delta}{}_{\delta}$	5
Total expected gauge generators:		13

$$\mathcal{S} == \int\int\int\int \left(\mathcal{A}^{\alpha\beta\chi}\ \sigma_{\alpha\beta\chi} - \frac{1}{2} r_3 \left(\partial_{\rho}\mathcal{A}_{\iota}{}^{\theta}\ \partial'\mathcal{A}^{\alpha\beta}{}_{\theta}\ + \partial_{\iota}\mathcal{A}_{\beta}{}^{\theta}\ \partial'\mathcal{A}^{\alpha\beta}{}_{\alpha}\ + \partial_{\alpha}\mathcal{A}^{\alpha\beta\iota}\ \partial_{\theta}\mathcal{A}_{\beta}{}^{\theta}\ - 2\ \partial'\mathcal{A}^{\alpha\beta}{}_{\alpha}\ \partial_{\theta}\mathcal{A}_{\beta}{}^{\theta}\ + \partial_{\alpha}\mathcal{A}^{\alpha\beta\iota} \right) \right.$$
$$\partial_{\theta}\mathcal{A}_{\iota}{}^{\theta}{}_{\beta}\ - 2\ \partial\mathcal{A}^{\alpha\beta}{}_{\alpha}\ \partial_{\theta}\mathcal{A}_{\iota}{}^{\theta}{}_{\beta}\ + 8\ \partial_{\rho}\mathcal{A}_{\iota\theta\alpha}\ \partial^{\theta}\mathcal{A}^{\alpha\beta\iota}) + r_5\ (\partial_{\iota}\mathcal{A}_{\theta}{}^{\kappa}\ \partial^{\theta}\mathcal{A}^{\alpha\iota}{}_{\alpha}\ -$$
$$\left. \partial_{\theta}\mathcal{A}_{\iota}{}^{\kappa}\ \partial^{\theta}\mathcal{A}^{\alpha\iota}{}_{\alpha}\ - (\partial_{\alpha}\mathcal{A}^{\alpha\theta}\ - 2\ \partial^{\theta}\mathcal{A}^{\alpha\iota}{}_{\alpha}) (\partial_{\kappa}\mathcal{A}_{\iota}{}^{\kappa}{}_{\theta}\ - \partial_{\kappa}\mathcal{A}_{\theta}{}^{\kappa}{}_{\iota}) \right)))) [t, x, y, z] \mathrm{d}t\ \mathrm{d}z\ \mathrm{d}y\ \mathrm{d}x\ \mathrm{d}t$$

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

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

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

$\overset{\#1}{0}^{+}\sigma$	0	0
$\overset{\#1}{0}^{-}\sigma$	0	0

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

$\overset{\#1}{2}^{+}\mathcal{A}\dagger^{\alpha\beta}$	$-\frac{3 k^2 r_3}{2}$	0
$\overset{\#1}{2}^{-}\mathcal{A}\dagger^{\alpha\beta\chi}$	0	0

$\overset{\#1}{2}^{+}\sigma\dagger^{\alpha\beta}$ | $\overset{\#1}{2}^{-}\sigma\dagger^{\alpha\beta\chi}$

$\overset{\#1}{2}^{+}\sigma^{\alpha\beta}$	$-\frac{2}{3 k^2 r_3}$	0
$\overset{\#1}{2}^{-}\sigma^{\alpha\beta\chi}$	0	0

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

$\overset{\#1}{1}^{+}\sigma\dagger^{\alpha\beta}$	$\frac{1}{k^2 (2 r_3 + r_5)}$	0	0	0
$\overset{\#2}{1}^{+}\sigma\dagger^{\alpha\beta}$	0	0	0	0
$\overset{\#1}{1}^{-}\sigma\dagger^{\alpha}$	0	0	$\frac{2}{k^2 (r_3 + 2 r_5)}$	0
$\overset{\#2}{1}^{-}\sigma\dagger^{\alpha}$	0	0	0	0

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

$\overset{\#1}{1}^{+}\mathcal{A}\dagger^{\alpha\beta}$	$k^2 (2 r_3 + r_5)$	0	0	0
$\overset{\#2}{1}^{+}\mathcal{A}\dagger^{\alpha\beta}$	0	0	0	0
$\overset{\#1}{1}^{-}\mathcal{A}\dagger^{\alpha}$	0	0	$\frac{1}{2} k^2 (r_3 + 2 r_5)$	0
$\overset{\#2}{1}^{-}\mathcal{A}\dagger^{\alpha}$	0	0	0	0

Massive and massless spectra

Massless particle

Polarisations:	2
Pole residue:	$\frac{1}{r_3 (2 r_3 + r_5) (r_3 + 2 r_5)} > 0$

(No particles)

Unitarity conditions