Particle spectrograph

Wave operator and propagator

Quadratic (free) action

$$S == \iiint\int (\omega^{\alpha\beta\chi}\ \sigma_{\alpha\beta\chi} \cdot 2\, r_3\, (\partial_\beta \omega_{\iota\ \theta}^{\ \theta}\, \partial' \omega^{\alpha\beta}_{\ \ \alpha} + \partial_\iota \omega_{\beta\ \theta}^{\ \theta}\, \partial' \omega^{\alpha\beta}_{\ \ \alpha} + \partial_\alpha \omega^{\alpha\beta\iota}\, \partial_\theta \omega_{\beta\ \iota}^{\ \theta} \cdot$$
$$2\, \partial' \omega^{\alpha\beta}_{\ \ \alpha}\, \partial_\theta \omega_{\beta\ \iota}^{\ \theta} + \partial_\alpha \omega^{\alpha\beta\iota}\, \partial_\theta \omega_{\iota\ \beta}^{\ \theta} \cdot 2\, \partial' \omega^{\alpha\beta}_{\ \ \alpha}\, \partial_\theta \omega_{\iota\ \beta}^{\ \theta} + 2\, \partial_\beta \omega_{\iota\theta\alpha}\, \partial^\theta \omega^{\alpha\beta\iota}) +$$
$$\tfrac{2}{3}\, r_1\, (3\, \partial_\beta \omega_{\iota\ \theta}^{\ \theta}\, \partial' \omega^{\alpha\beta}_{\ \ \alpha} + 3\, \partial_\iota \omega_{\beta\ \theta}^{\ \theta}\, \partial' \omega^{\alpha\beta}_{\ \ \alpha} + 3\, \partial_\alpha \omega^{\alpha\beta\iota}\, \partial_\theta \omega_{\beta\ \iota}^{\ \theta} \cdot 6\, \partial' \omega^{\alpha\beta}_{\ \ \alpha}\, \partial_\theta \omega_{\beta\ \iota}^{\ \theta} +$$
$$3\, \partial_\alpha \omega^{\alpha\beta\iota}\, \partial_\theta \omega_{\iota\ \beta}^{\ \theta} \cdot 6\, \partial' \omega^{\alpha\beta}_{\ \ \alpha}\, \partial_\theta \omega_{\iota\ \beta}^{\ \theta} \cdot 2\, \partial_\beta \omega_{\alpha\iota\theta}\, \partial^\theta \omega^{\alpha\beta\iota} + \partial_\beta \omega_{\alpha\theta\iota}\, \partial^\theta \omega^{\alpha\beta\iota} +$$
$$2\, \partial_\beta \omega_{\iota\theta\alpha}\, \partial^\theta \omega^{\alpha\beta\iota} \cdot \partial_\iota \omega_{\alpha\beta\theta}\, \partial^\theta \omega^{\alpha\beta\iota} + \partial_\theta \omega_{\alpha\beta\iota}\, \partial^\theta \omega^{\alpha\beta\iota}) +$$
$$r_5\, (\partial_\iota \omega_{\theta\ \kappa}^{\ \kappa}\, \partial^\theta \omega^{\alpha\iota}_{\ \ \alpha} \cdot \partial_\theta \omega_{\iota\ \kappa}^{\ \kappa}\, \partial^\theta \omega^{\alpha\iota}_{\ \ \alpha} \cdot (\partial_\alpha \omega^{\alpha\iota\theta} \cdot 2\, \partial^\theta \omega^{\alpha\iota}_{\ \ \alpha})\, (\partial_\kappa \omega_{\iota\ \theta}^{\ \kappa} \cdot \partial_\kappa \omega_{\theta\ \iota}^{\ \kappa}))) [$$
$$t, x, y, z]\, dz\, dy\, dx\, dt$$

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

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

	$\omega_{0^+}^{\#1}$	$\omega_{0^-}^{\#1}$
$\omega_{0^+}^{\#1}\,\dagger$	$6\, k^2\, (-r_1 + r_3)$	0
$\omega_{0^-}^{\#1}\,\dagger$	0	0

	$\omega_{1^+}^{\#1}{}_{\alpha\beta}$	$\omega_{1^+}^{\#2}{}_{\alpha\beta}$	$\omega_{1^-}^{\#1}{}_{\alpha}$	$\omega_{1^-}^{\#2}{}_{\alpha}$
$\omega_{1^+}^{\#1}\,\dagger^{\alpha\beta}$	$k^2\, (2\, r_3 + r_5)$	0	0	0
$\omega_{1^+}^{\#2}\,\dagger^{\alpha\beta}$	0	0	0	0
$\omega_{1^-}^{\#1}\,\dagger^{\alpha}$	0	0	$k^2\, (-r_1 + 2\, r_3 + r_5)$	0
$\omega_{1^-}^{\#2}\,\dagger^{\alpha}$	0	0	0	0

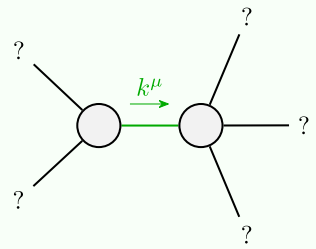
	$\sigma_{0^+}^{\#1}$	$\sigma_{0^-}^{\#1}$
$\sigma_{0^+}^{\#1}\,\dagger$	$\frac{1}{6\, k^2\, (-r_1 + r_3)}$	0
$\sigma_{0^-}^{\#1}\,\dagger$	0	0

	$\sigma_{1^+}^{\#1}{}_{\alpha\beta}$	$\sigma_{1^+}^{\#2}{}_{\alpha\beta}$	$\sigma_{1^-}^{\#1}{}_{\alpha}$	$\sigma_{1^-}^{\#2}{}_{\alpha}$
$\sigma_{1^+}^{\#1}\,\dagger^{\alpha\beta}$	$\frac{1}{k^2\, (2\, r_3 + r_5)}$	0	0	0
$\sigma_{1^+}^{\#2}\,\dagger^{\alpha\beta}$	0	0	0	0
$\sigma_{1^-}^{\#1}\,\dagger^{\alpha}$	0	0	$\frac{1}{k^2\, (-r_1 + 2\, r_3 + r_5)}$	0
$\sigma_{1^-}^{\#2}\,\dagger^{\alpha}$	0	0	0	0

Source constraints/gauge generators

SO(3) irreps	Multiplicities
$\sigma_{0^-}^{\#1} == 0$	1
$\sigma_{1^-}^{\#2\,\alpha} == 0$	3
$\sigma_{1^+}^{\#2\,\alpha\beta} == 0$	3
$\sigma_{2^+}^{\#1\,\alpha\beta} == 0$	5
Total constraints:	12

Massive and massless spectra



Quadratic pole

Pole residue:	$\frac{1}{r_1\, (r_1 - 2\, r_3 - r_5)\, (2\, r_3 + r_5)} > 0$
Polarisations:	2

(No massive particles)

Unitarity conditions

$$r_1 < 0 \,\&\&\, (r_5 < r_1 - 2\, r_3 \,||\, r_5 > -2\, r_3) \,\|\, r_1 > 0 \,\&\&\, -2\, r_3 < r_5 < r_1 - 2\, r_3$$