Particle spectrograph

Wave operator and propagator

Quadratic (free) action

$$S == \int\int\int\int (\omega^{\alpha\beta\chi} \sigma_{\alpha\beta\chi} + \frac{1}{3} r_2 (4 \partial_\beta \omega_{\alpha\theta} - 2 \partial_\beta \omega_{\alpha\theta\iota} + 2 \partial_\beta \omega_{\iota\theta\alpha} - \partial_\iota \omega_{\alpha\beta\theta} + \partial_\theta \omega_{\alpha\beta\iota} - 2 \partial_\theta \omega_{\alpha\iota\beta}) \partial^\theta \omega^{\alpha\beta\iota} - \frac{1}{2} r_3 (\partial_\beta \omega_\iota{}^\theta{}_\theta \partial' \omega^{\alpha\beta}{}_\alpha + \partial_\iota \omega_\beta{}^\theta{}_\theta \partial' \omega^{\alpha\beta}{}_\alpha + \partial_\alpha \omega^{\alpha\beta\iota} \partial_\theta \omega_\beta{}^\theta{}_\iota - 2 \partial' \omega^{\alpha\beta}{}_\alpha \partial_\theta \omega_\beta{}^\theta{}_\iota + \partial_\alpha \omega^{\alpha\beta\iota} \partial_\theta \omega_\iota{}^\theta{}_\beta - 2 \partial' \omega^{\alpha\beta}{}_\alpha \partial_\theta \omega_\iota{}^\theta{}_\beta + 8 \partial_\beta \omega_{\iota\theta\alpha} \partial^\theta \omega^{\alpha\beta\iota}) + r_5 (\partial_\iota \omega_\theta{}^\kappa{}_\kappa \partial^\theta \omega^{\alpha\iota}{}_\alpha - \partial_\theta \omega_\iota{}^\kappa{}_\kappa \partial^\theta \omega^{\alpha\iota}{}_\alpha - (\partial_\alpha \omega^{\alpha\iota\theta} - 2 \partial^\theta \omega^{\alpha\iota}{}_\alpha) (\partial_\kappa \omega_\iota{}^\kappa{}_\theta - \partial_\kappa \omega_\theta{}^\kappa{}_\iota))) [t, x, y, z] \, dz \, dy \, dx \, dt$$

	$\sigma_{2^+}^{\#1}{}^{\alpha\beta}$	$\sigma_{2^-}^{\#1}{}^{\alpha\beta\chi}$
$\sigma_{2^+}^{\#1}{}^\dagger{}_{\alpha\beta}$	$-\frac{2}{3 k^2 r_3}$	0
$\sigma_{2^-}^{\#1}{}^\dagger{}_{\alpha\beta\chi}$	0	0

	$\omega_{0^+}^{\#1}$	$\omega_{0^-}^{\#1}$
$\omega_{0^+}^{\#1}{}^\dagger$	0	0
$\omega_{0^-}^{\#1}{}^\dagger$	0	$k^2 r_2$

	$\sigma_{0^+}^{\#1}$	$\sigma_{0^-}^{\#1}$
$\sigma_{0^+}^{\#1}{}^\dagger$	0	0
$\sigma_{0^-}^{\#1}{}^\dagger$	0	$\frac{1}{k^2 r_2}$

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

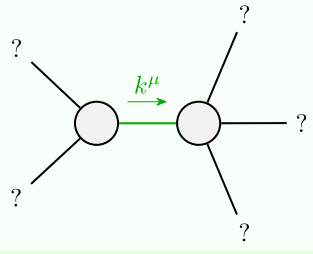
	$\sigma_{1^+}^{\#1}{}_{\alpha\beta}$	$\sigma_{1^+}^{\#2}{}_{\alpha\beta}$	$\sigma_{1^-}^{\#1}{}_{\alpha}$	$\sigma_{1^-}^{\#2}{}_{\alpha}$
$\sigma_{1^+}^{\#1}{}^{\alpha\beta}$	$\frac{1}{k^2 (2 r_3 + r_5)}$	0	0	0
$\sigma_{1^+}^{\#2}{}^{\alpha\beta}$	0	0	0	0
$\sigma_{1^-}^{\#1}{}^{\alpha}$	0	0	$\frac{2}{k^2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

	$\omega_{1^+}^{\#1}{}^{\alpha\beta}$	$\omega_{1^+}^{\#2}{}^{\alpha\beta}$	$\omega_{1^-}^{\#1}{}^{\alpha}$	$\omega_{1^-}^{\#2}{}^{\alpha}$
$\omega_{1^+}^{\#1}{}_{\alpha\beta}$	$k^2 (2 r_3 + r_5)$	0	0	0
$\omega_{1^+}^{\#2}{}_{\alpha\beta}$	0	0	0	0
$\omega_{1^-}^{\#1}{}_{\alpha}$	0	0	$\frac{1}{2} k^2 (r_3 + 2 r_5)$	0
$\omega_{1^-}^{\#2}{}_{\alpha}$	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
$\sigma_{2^-}^{\#1}{}^{\alpha\beta\chi} == 0$	5
Total constraints:	12

Massive and massless spectra



Quadratic pole

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

(No massive particles)

Unitarity conditions

$$r_3 < 0 \,\&\&\, (r_5 < -\frac{r_3}{2} \,||\, r_5 > -2 r_3) \,||\, r_3 > 0 \,\&\&\, -2 r_3 < r_5 < -\frac{r_3}{2}$$