Particle spectrograph

Wave operator and propagator

Quadratic (free) action

$$S_F == \iiint (\tfrac{1}{6}(6\,\omega^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi} - 3\,(r_3+2\,r_5)\,\partial_\iota\omega^{\kappa\lambda}{}_\kappa\,\partial'\omega_{\lambda\ \alpha}^{\ \alpha} + 4\,r_2\,\partial^\beta\omega^{\theta\alpha}{}_\kappa\,\partial_\theta\omega_{\alpha\beta}{}^\kappa - 2\,r_2\,\partial_\theta\omega_{\alpha\beta}{}^\kappa\,\partial_\kappa\omega^{\theta\alpha\beta} - 4\,r_2\,\partial_\theta\omega^{\kappa\ \alpha}_{\ \alpha\beta}\,\partial_\kappa\omega^{\theta\alpha\beta} + 3\,r_3\,\partial_\alpha\omega_{\lambda\ \theta}^{\ \alpha}\,\partial_\kappa\omega^{\theta\kappa\lambda} - 6\,r_5\,\partial_\alpha\omega_{\lambda\ \theta}^{\ \alpha}\,\partial_\kappa\omega^{\theta\kappa\lambda} + 3\,r_3\,\partial_\theta\omega_{\lambda\ \alpha}^{\ \alpha}\,\partial_\kappa\omega^{\theta\kappa\lambda} + 6\,r_5\,\partial_\theta\omega_{\lambda\ \alpha}^{\ \alpha}\,\partial_\kappa\omega^{\theta\kappa\lambda} - 3\,r_3\,\partial_\alpha\omega_{\lambda\ \theta}^{\ \alpha}\,\partial_\kappa\omega^{\kappa\lambda\theta} + 6\,r_5\,\partial_\alpha\omega_{\lambda\ \theta}^{\ \alpha}\,\partial_\kappa\omega^{\kappa\lambda\theta} + 6\,r_3\,\partial_\theta\omega_{\lambda\ \alpha}^{\ \alpha}\,\partial_\kappa\omega^{\kappa\lambda\theta} + 12\,r_5\,\partial_\theta\omega_{\lambda\ \alpha}^{\ \alpha}\,\partial_\kappa\omega^{\kappa\lambda\theta} + 4\,r_2\,\partial_\kappa\omega^{\theta\alpha\beta}\,\partial^\kappa\omega_{\alpha\beta\theta} - 4\,r_2\,\partial^\beta\omega_\iota^{\ \alpha\lambda}\,\partial_\lambda\omega_{\alpha\beta}{}' + 4\,r_2\,\partial^\beta\omega_\iota^{\ \lambda\alpha}\,\partial_\lambda\omega_{\alpha\beta}{}' - 3\,r_3\,\partial_\alpha\omega_{\lambda\ \theta}^{\ \alpha}\,\partial^\lambda\omega^{\theta\kappa}{}_\kappa + 6\,r_5\,\partial_\alpha\omega_{\lambda\ \theta}^{\ \alpha}\,\partial^\lambda\omega^{\theta\kappa}{}_\kappa + 3\,r_3\,\partial_\theta\omega_{\lambda\ \alpha}^{\ \alpha}\,\partial^\lambda\omega^{\theta\kappa}{}_\kappa - 6\,r_5\,\partial_\theta\omega_{\lambda\ \alpha}^{\ \alpha}\,\partial^\lambda\omega^{\theta\kappa}{}_\kappa))[t,\,x,\,y,\,z]\,dz\,dy\,dx\,dt$$

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

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

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

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

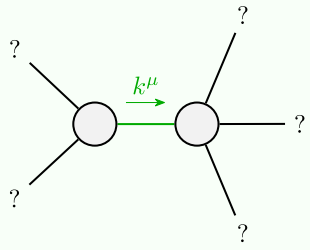
Source constraints/gauge generators

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

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

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

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

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