Particle spectrograph

Wave operator and propagator

Quadratic (free) action

$$S_{\mathrm{F}} == \iiiint \Big(\tfrac{1}{3}\big(3\,\omega^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi} - 3\,r_5\,\partial_{\iota}\omega^{\kappa\lambda}{}_{\kappa}\,\partial^{\iota}\omega_{\lambda}{}^{\alpha}{}_{\alpha} - 2\,r_1\,\partial^{\beta}\omega^{\theta\alpha}{}_{\kappa}\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa} - 2\,r_1\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}\,\partial_{\kappa}\omega^{\alpha\beta\theta} + 2\,r_1\,\partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}\,\partial_{\kappa}\omega^{\theta\alpha\beta} - 3\,r_5\,\partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\,\partial_{\kappa}\omega^{\theta\kappa\lambda} + 3\,r_5\,\partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\,\partial_{\kappa}\omega^{\theta\kappa\lambda} - 3\,r_5\,\partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\,\partial_{\kappa}\omega^{\kappa\lambda\theta} + 6\,r_5\,\partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\,\partial_{\kappa}\omega^{\kappa\lambda\theta} + 2\,r_1\,\partial_{\kappa}\omega^{\alpha\beta\theta}\,\partial^{\kappa}\omega_{\alpha\beta\theta} - 2\,r_1\,\partial_{\kappa}\omega^{\theta\alpha\beta}\,\partial^{\kappa}\omega_{\alpha\beta\theta} + 2\,r_1\,\partial^{\beta}\omega^{\alpha\lambda}{}_{\iota}\,\partial_{\lambda}\omega_{\alpha\beta}{}^{\iota} - 8\,r_1\,\partial^{\beta}\omega^{\lambda\alpha}{}_{\iota}\,\partial_{\lambda}\omega_{\alpha\beta}{}^{\iota} + 3\,r_5\,\partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\,\partial^{\lambda}\omega^{\theta\kappa}{}_{\kappa} - 3\,r_5\,\partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\,\partial^{\lambda}\omega^{\theta\kappa}{}_{\kappa}\big)\Big)[t, x, y, z]\,dz\,dy\,dx\,dt$$

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

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

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

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

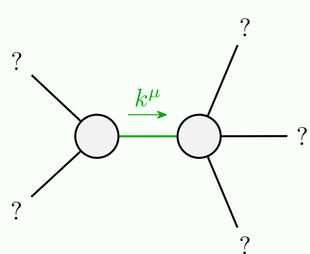
	$\omega^{\#1}_{2^+\,\alpha\beta}$	$\omega^{\#1}_{2^-\,\alpha\beta\chi}$
$\omega^{\#1}_{2^+}\dagger^{\alpha\beta}$	0	0
$\omega^{\#1}_{2^-}\dagger^{\alpha\beta\chi}$	0	$k^2\,r_1$

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

Source constraints/gauge generators

SO(3) irreps	Multiplicities
$\sigma^{\#1}_{0^-} == 0$	1
$\sigma^{\#1}_{0^+} == 0$	1
$\sigma^{\#2\,\alpha}_{1^-} == 0$	3
$\sigma^{\#2\,\alpha\beta}_{1^+} == 0$	3
$\sigma^{\#1\,\alpha\beta}_{2^+} == 0$	5
Total constraints:	13

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

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