Particle spectrograph

Wave operator and propagator

Quadratic (free) Lagrangian density

$$\omega^{\alpha\beta\chi}\ \sigma_{\alpha\beta\chi}\text{-}r_5\,\partial_\iota\omega^{\kappa\lambda}{}_\kappa\,\partial'\omega_\lambda{}^\alpha{}_\alpha\text{-}\frac{2}{3}r_1\,\partial^\beta\omega^{\theta\alpha}{}_\kappa\,\partial_\theta\omega_{\alpha\beta}{}^\kappa\text{-}\frac{2}{3}r_1\,\partial_\theta\omega_{\alpha\beta}{}^\kappa\,\partial_\kappa\omega^{\alpha\beta\theta}+$$
$$\frac{2}{3}r_1\,\partial_\theta\omega_{\alpha\beta}{}^\kappa\,\partial_\kappa\omega^{\theta\alpha\beta}\text{-}r_5\,\partial_\alpha\omega_\lambda{}^\alpha{}_\theta\,\partial_\kappa\omega^{\theta\kappa\lambda}+r_5\,\partial_\theta\omega_\lambda{}^\alpha{}_\alpha\,\partial_\kappa\omega^{\theta\kappa\lambda}\text{-}r_5\,\partial_\alpha\omega_\lambda{}^\alpha{}_\theta\,\partial_\kappa\omega^{\kappa\lambda\theta}+$$
$$2\,r_5\,\partial_\theta\omega_\lambda{}^\alpha{}_\alpha\,\partial_\kappa\omega^{\kappa\lambda\theta}+\frac{2}{3}r_1\,\partial_\kappa\omega^{\alpha\beta\theta}\,\partial^\kappa\omega_{\alpha\beta\theta}\text{-}\frac{2}{3}r_1\,\partial_\kappa\omega^{\theta\alpha\beta}\,\partial^\kappa\omega_{\alpha\beta\theta}+$$
$$\frac{2}{3}r_1\,\partial^\beta\omega_\iota{}^{\alpha\lambda}\,\partial_\lambda\omega_{\alpha\beta}{}'\text{-}\frac{8}{3}r_1\,\partial^\beta\omega_\iota{}^{\lambda\alpha}\,\partial_\lambda\omega_{\alpha\beta}{}'+r_5\,\partial_\alpha\omega_\lambda{}^\alpha{}_\theta\,\partial^\lambda\omega^{\theta\kappa}{}_\kappa\text{-}r_5\,\partial_\theta\omega_\lambda{}^\alpha{}_\alpha\,\partial^\lambda\omega^{\theta\kappa}{}_\kappa$$

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

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

	$\sigma_{0^+}^{\#1}$	$\sigma_{0^-}^{\#1}$
$\sigma_{0^+}^{\#1}\,\dagger$	0	0
$\sigma_{0^-}^{\#1}\,\dagger$	0	0

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

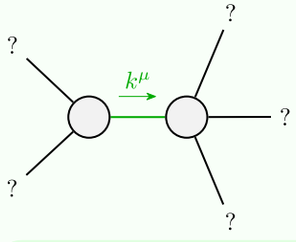
	$\sigma_{2^+}^{\#1}{}_{\alpha\beta}$	$\sigma_{2^-}^{\#1}{}_{\alpha\beta\chi}$
$\sigma_{2^+}^{\#1}\,\dagger^{\alpha\beta}$	0	0
$\sigma_{2^-}^{\#1}\,\dagger^{\alpha\beta\chi}$	0	$\frac{1}{k^2\,r_1}$

Source constraints/gauge generators

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

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

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

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