Particle spectrograph

Wave operator and propagator

Quadratic (free) Lagrangian density

$$\omega^{\alpha\beta\chi}\ \sigma_{\alpha\beta\chi} \left(-\frac{1}{2} r_3\, \partial_l \omega^{\kappa\lambda}{}_{\kappa}\, \partial' \omega_{\lambda\ \alpha}^{\ \alpha} - r_5\, \partial_l \omega^{\kappa\lambda}{}_{\kappa}\, \partial' \omega_{\lambda\ \alpha}^{\ \alpha} + \frac{1}{2} r_3\, \partial_\alpha \omega_{\lambda\ \theta}^{\ \alpha}\, \partial_\kappa \omega^{\theta\kappa\lambda} - r_5\, \partial_\alpha \omega_{\lambda\ \theta}^{\ \alpha}\, \partial_\kappa \omega^{\theta\kappa\lambda} - \frac{1}{2} r_3\, \partial_\theta \omega_{\lambda\ \alpha}^{\ \alpha}\, \partial_\kappa \omega^{\kappa\lambda\theta} + r_5\, \partial_\theta \omega_{\lambda\ \alpha}^{\ \alpha}\, \partial_\kappa \omega^{\kappa\lambda\theta} - 4\, r_3\, \partial^\beta \omega_l^{\ \lambda\alpha}\, \partial_\lambda \omega_{\alpha\beta}{}' - r_5\, \partial_\alpha \omega_{\lambda\ \theta}^{\ \alpha}\, \partial_\kappa \omega^{\kappa\lambda\theta} + r_3\, \partial_\theta \omega_{\lambda\ \alpha}^{\ \alpha}\, \partial_\kappa \omega^{\kappa\lambda\theta} + 2\, r_5\, \partial_\theta \omega_{\lambda\ \alpha}^{\ \alpha}\, \partial_\kappa \omega^{\kappa\lambda\theta} - 4\, r_3\, \partial^\beta \omega_l^{\ \lambda\alpha}\, \partial_\lambda \omega_{\alpha\beta}{}' - \frac{1}{2} r_3\, \partial_\alpha \omega_{\lambda\ \theta}^{\ \alpha}\, \partial^\lambda \omega^{\theta\kappa}{}_{\kappa} + r_5\, \partial_\alpha \omega_{\lambda\ \theta}^{\ \alpha}\, \partial^\lambda \omega^{\theta\kappa}{}_{\kappa} + \frac{1}{2} r_3\, \partial_\theta \omega_{\lambda\ \alpha}^{\ \alpha}\, \partial^\lambda \omega^{\theta\kappa}{}_{\kappa} - r_5\, \partial_\theta \omega_{\lambda\ \alpha}^{\ \alpha}\, \partial^\lambda \omega^{\theta\kappa}{}_{\kappa}$$

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

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

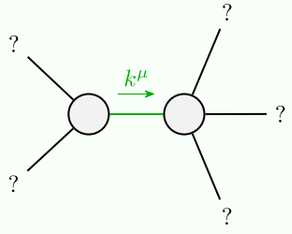
	$\omega_{2^+}^{\#1}{}_{\alpha\beta}$	$\omega_{2^-}^{\#1}{}_{\alpha\beta\chi}$
$\omega_{2^+}^{\#1}{}^{\alpha\beta}$	$-\frac{3\,k^2\,r_3}{2}$	0
$\omega_{2^-}^{\#1}{}^{\alpha\beta\chi}$	0	0

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
$\sigma_{2^-}^{\#1\,\alpha\beta\chi} == 0$	5
Total constraints:	13

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

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

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