

Particle spectrograph

Wave operator and propagator

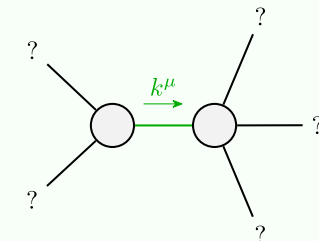
Source constraints		Fundamental fields	Multiplicities
SO(3) irreps			
$\sigma_0^{1-} == 0$		$\epsilon \eta_{\alpha\beta\chi\delta} \partial^\delta \sigma^{\alpha\beta\chi} == 0$	1
$\sigma_0^{1+} == 0$		$\partial_\beta \sigma^{\alpha\beta}{}_\alpha == 0$	1
$\sigma_1^{2\alpha} == 0$		$\partial_\chi \partial_\beta \sigma^{\alpha\beta\chi} == 0$	3
$\sigma_{1+}^{2\alpha\beta} == 0$		$\partial_\delta \partial_\chi \partial^\alpha \sigma^{\beta\chi\delta} + \partial_\delta \partial^\delta \partial_\chi \sigma^{\alpha\beta\chi} == \partial_\delta \partial_\chi \partial^\beta \sigma^{\alpha\chi\delta}$	3
$\sigma_{2+}^{1\alpha\beta} == 0$		$3 \partial_\delta \partial_\chi \partial^\alpha \sigma^{\beta\chi\delta} + 3 \partial_\delta \partial_\chi \partial^\beta \sigma^{\alpha\chi\delta} + 2 \eta^{\alpha\beta} \partial_\epsilon \partial^\epsilon \partial_\delta \sigma^{\chi\delta}{}_x == 2 \partial_\delta \partial^\delta \partial_\chi \sigma^{\beta\chi\alpha}$	5
Total constraints/gauge generators:			13

Quadratic (free) action

$$S = \iiint (\omega^{\alpha\beta\chi} \sigma_{\alpha\beta\chi} - \frac{2}{3} r_1 (2 \partial_\beta \omega_{\alpha\iota\theta} - \partial_\beta \omega_{\alpha\theta\iota} + 4 \partial_\beta \omega_{\iota\theta\alpha} + \partial_\iota \omega_{\alpha\beta\theta} - \partial_\theta \omega_{\alpha\beta\iota} - \partial_\theta \omega_{\alpha\iota\beta}) \partial^\theta \omega^{\alpha\beta\iota} + r_5 (\partial_\iota \omega_{\theta}{}^\kappa \partial^\theta \omega_{\kappa}{}^{\alpha\iota} - \partial_\theta \omega_{\iota}{}^\kappa \partial^\theta \omega_{\kappa}{}^{\alpha\iota} - (\partial_\alpha \omega^{\alpha\iota\theta} - \partial_\alpha \omega^{\theta\alpha\iota}) - 2 \partial^\theta \omega^{\alpha\iota}{}_\alpha) (\partial_\kappa \omega^{\kappa}{}_\theta - \partial_\kappa \omega^{\kappa}{}_\theta{}^\iota)) [t, x, y, z] dz dy dx dt$$

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

Massive and massless spectra



Quadratic pole
Pole residue: $-\frac{1}{r_1(r_1+r_5)(2r_1+r_5)} > 0$
Polarisations: 2

(No massive particles)

Unitarity conditions

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