

Particle spectrograph

Wave operator and propagator

$\sigma_{1+}^{\#1} \dagger^{\alpha\beta}$	$\sigma_{1+}^{\#2} \alpha\beta$	$\tau_{1+}^{\#1} \alpha$	$\tau_{1+}^{\#2} \alpha$
0	$-\frac{\sqrt{2}}{t_1+k^2 t_1}$	0	0
$-\frac{\sqrt{2}}{t_1+k^2 t_1}$	$\frac{-2k^2(2r_1+r_5)+t_1}{(1+k^2)^2 t_1^2}$	0	0
$\frac{i\sqrt{2}k}{t_1+k^2 t_1}$	$\frac{i(2k^3(2r_1+r_5)+k^2 t_1)}{(1+k^2)^2 t_1^2}$	0	0
0	0	0	$\frac{2ik}{t_1+2k^2 t_1}$
0	0	$\frac{\sqrt{2}}{t_1+2k^2 t_1}$	$-\frac{i\sqrt{2}k(2k^2(r_1+r_5)+t_1)}{(t_1+2k^2 t_1)^2}$
0	0	0	0
0	0	$-\frac{2ik}{t_1+2k^2 t_1}$	$\frac{-4k^4(r_1+r_5)+2k^2 t_1}{(t_1+2k^2 t_1)^2}$

$\sigma_{2+}^{\#1} \dagger^{\alpha\beta}$	$\tau_{2+}^{\#1} \alpha\beta$	$\sigma_{2+}^{\#1} \alpha\beta\chi$
$\frac{2}{(1+2k^2)^2 t_1}$	$-\frac{2i\sqrt{2}k}{(1+2k^2)^2 t_1}$	0
$\frac{2i\sqrt{2}k}{(1+2k^2)^2 t_1}$	$\frac{4k^2}{(1+2k^2)^2 t_1}$	0
0	0	$\frac{2}{2k^2 r_1+t_1}$

$\omega_{0+}^{\#1}$	$f_{0+}^{\#1}$	$f_{0+}^{\#2}$	$\omega_{0-}^{\#1}$
$-t_1$	$i\sqrt{2}kt_1$	0	0
$-i\sqrt{2}kt_1$	$-2k^2 t_1$	0	0
0	0	0	0
0	0	0	$-t_1$

Quadratic (free) action

$$S_F == \iiint \left(\frac{1}{6} (-6t_1 \omega_{\kappa\alpha}^{\alpha'} \omega_{\kappa\alpha}^{\kappa\lambda} \omega_{\kappa\lambda}^{\alpha'} - 6t_1 \omega_{\kappa\lambda}^{\alpha'} \omega_{\kappa\lambda}^{\kappa\alpha} \omega_{\kappa\alpha}^{\alpha'} + 6f^{\alpha\beta} \tau_{\alpha\beta} \sigma_{\alpha\beta\chi} - 6r_5 \partial_\theta \omega_{\alpha}^{\alpha'} \partial_\kappa \omega_{\alpha\beta}^{\kappa\lambda\theta} - 3t_1 \partial_\theta \omega_{\alpha\beta}^{\kappa} \partial_\kappa \omega_{\alpha\beta}^{\theta\lambda} + 4r_1 \partial_\theta \omega_{\alpha\beta}^{\kappa} \partial_\kappa \omega_{\alpha\beta}^{\theta\lambda} - 6r_5 \partial_\alpha \omega_{\lambda}^{\alpha} \partial_\kappa \omega_{\lambda}^{\theta\kappa\lambda} - 6r_5 \partial_\theta \omega_{\lambda}^{\alpha} \partial_\kappa \omega_{\lambda}^{\theta\kappa\lambda} + 12r_5 \partial_\theta \omega_{\lambda}^{\alpha} \partial_\kappa \omega_{\lambda}^{\kappa\lambda\theta} - 3t_1 \partial_\theta \omega_{\kappa}^{\kappa\lambda\theta} \partial_\kappa f_{\alpha}^{\theta} - 3t_1 \partial_\alpha f_{\kappa\theta}^{\kappa\lambda} \partial_\kappa f_{\alpha}^{\theta} - 6t_1 \partial_\alpha f_{\kappa}^{\kappa\lambda} \partial_\kappa f_{\alpha}^{\theta} + 6t_1 \omega_{\kappa\alpha}^{\alpha} \partial_\kappa f_{\alpha}^{\kappa\lambda\theta} + 6t_1 \omega_{\kappa\lambda}^{\lambda} \partial_\kappa f_{\alpha}^{\kappa\lambda\theta} + 12t_1 \partial_\alpha f_{\kappa\alpha}^{\kappa\lambda\theta} \partial_\kappa f_{\alpha}^{\theta} - 6t_1 \partial_\alpha f_{\kappa}^{\kappa\lambda} \partial_\kappa f_{\alpha}^{\theta} + 12t_1 \omega_{\kappa\alpha}^{\alpha} \partial_\kappa f_{\alpha}^{\kappa\lambda\theta} - 6t_1 \omega_{\kappa\alpha}^{\alpha} \partial_\kappa f_{\alpha}^{\kappa\lambda\theta} - 6t_1 \omega_{\kappa\alpha}^{\alpha} \partial_\kappa f_{\alpha}^{\kappa\lambda\theta} + 3t_1 \partial_\alpha f_{\kappa}^{\kappa\lambda\theta} \partial_\kappa f_{\alpha}^{\theta} - 6t_1 \partial_\alpha f_{\kappa}^{\kappa\lambda\theta} \partial_\kappa f_{\alpha}^{\theta} + 4r_1 \partial_\kappa \omega_{\alpha\beta\theta}^{\theta\alpha\beta} \partial_\kappa \omega_{\alpha\beta\theta}^{\theta\alpha\beta} + 4r_1 \partial_\kappa \omega_{\alpha\beta\theta}^{\theta\alpha\beta} \partial_\kappa \omega_{\alpha\beta\theta}^{\theta\alpha\beta} - 16r_1 \partial_\theta \omega_{\alpha\beta}^{\lambda\alpha} \partial_\lambda \omega_{\alpha\beta}^{\lambda\alpha} + 6r_5 \partial_\alpha \omega_{\lambda}^{\alpha} \partial_\theta \omega_{\lambda}^{\theta\kappa} \partial_\kappa \omega_{\alpha}^{\alpha} \partial_\lambda \omega_{\alpha}^{\theta\kappa} \right) [t, x, y, z] dz dy dx dt$$

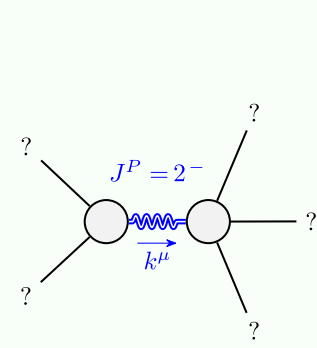
Source constraints/gauge generators	
SO(3) irreps	Multiplicities
$\tau_{0+}^{\#2} == 0$	1
$\tau_{0+}^{\#1} - 2ik \sigma_{0+}^{\#1} == 0$	1
$\tau_{1-}^{\#2\alpha} + 2ik \sigma_{1-}^{\#2\alpha} == 0$	3
$\tau_{1-}^{\#1\alpha} == 0$	3
$\tau_{1+}^{\#1\alpha\beta} + ik \sigma_{1+}^{\#2\alpha\beta} == 0$	3
$\tau_{2+}^{\#1\alpha\beta} - 2ik \sigma_{2+}^{\#1\alpha\beta} == 0$	5
Total constraints:	16

$\sigma_{0+}^{\#1} \dagger$	$\sigma_{0+}^{\#1}$	$\tau_{0+}^{\#1}$	$\tau_{0+}^{\#2}$	$\sigma_{0-}^{\#1}$
$-\frac{1}{(1+2k^2)^2 t_1}$	$\frac{i\sqrt{2}k}{(1+2k^2)^2 t_1}$	0	0	0
$-\frac{i\sqrt{2}k}{(1+2k^2)^2 t_1}$	$-\frac{2k^2}{(1+2k^2)^2 t_1}$	0	0	0
0	0	0	0	0
0	0	0	0	$-\frac{1}{t_1}$

$\omega_{2+}^{\#1} \dagger^{\alpha\beta}$	$f_{2+}^{\#1} \dagger^{\alpha\beta}$	$\omega_{2-}^{\#1} \alpha\beta\chi$
$\frac{t_1}{2}$	$-\frac{ikt_1}{\sqrt{2}}$	0
$\frac{ikt_1}{\sqrt{2}}$	$k^2 t_1$	0
0	0	$k^2 r_1 + \frac{t_1}{2}$

$\omega_{1+}^{\#1} \dagger^{\alpha\beta}$	$\omega_{1+}^{\#2} \alpha\beta$	$f_{1+}^{\#1} \dagger^{\alpha\beta}$	$\omega_{1-}^{\#1} \alpha$	$\omega_{1-}^{\#2} \alpha$	$f_{1-}^{\#1} \alpha$	$f_{1-}^{\#2} \alpha$
$k^2(2r_1+r_5) - \frac{t_1}{2}$	$-\frac{t_1}{\sqrt{2}}$	$-\frac{ikt_1}{\sqrt{2}}$	0	0	0	0
$-\frac{t_1}{\sqrt{2}}$	0	0	0	0	0	0
$\frac{ikt_1}{\sqrt{2}}$	0	0	0	0	0	0
0	0	0	$k^2(r_1+r_5) - \frac{t_1}{2}$	$\frac{t_1}{\sqrt{2}}$	0	ikt_1
0	0	0	$\frac{t_1}{\sqrt{2}}$	0	0	0
0	0	0	0	0	0	0
0	0	0	$-ikt_1$	0	0	0

Massive and massless spectra



Massive particle	
Pole residue:	$-\frac{1}{r_1} > 0$
Polarisations:	5
Square mass:	$-\frac{t_1}{2r_1} > 0$
Spin:	2
Parity:	Odd

(No massless particles)

Unitarity conditions

$$r_1 < 0 \ \&\& \ t_1 > 0$$