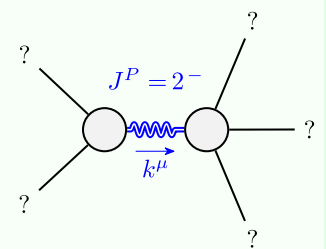


Particle spectrograph

Wave operator and propagator

Source constraints		
SO(3) irreps	Fundamental fields	Multiplicities
$\tau_{0+}^{\#2} == 0$	$\partial_\beta \partial_\alpha \tau^{\alpha\beta} == 0$	1
$\tau_{0+}^{\#1} - 2 \, i \, k \, \sigma_{0+}^{\#1} == 0$	$\partial_\beta \partial_\alpha \tau^{\alpha\beta} == \partial_\beta \partial^\beta \tau^\alpha_\alpha + 2 \, \partial_\chi \partial^X \partial_\sigma \sigma^\alpha_\alpha$	1
$\tau_{1+}^{\#2\alpha} + 2 \, i \, k \, \sigma_{1+}^{\#2\alpha} == 0$	$\partial_\chi \partial_\beta \partial^\alpha \tau^{\beta\chi} == \partial_\chi \partial^X \partial_\beta \tau^{\alpha\beta} + 2 \, \partial_\delta \partial^\delta \partial_\chi \partial_\sigma \sigma^{\alpha\beta\chi}$	3
$\tau_{1+}^{\#1\alpha} == 0$	$\partial_\chi \partial_\beta \partial^\alpha \tau^{\beta\chi} == \partial_\chi \partial^X \partial_\beta \tau^{\beta\alpha}$	3
$\tau_{1+}^{\#1\alpha\beta} - 2 \, i \, k \, \sigma_{1+}^{\#1\alpha\beta} == 0$	$\partial_\chi \partial^\alpha \tau^{\beta\chi} + \partial_\chi \partial^\beta \tau^{\alpha\chi} + \partial_\chi \partial^\chi \tau^{\beta\alpha} + 2 \, \partial_\delta \partial^\delta \partial_\chi \sigma^{\beta\chi\alpha}$	3
$\tau_{2+}^{\#1\alpha\beta} - 2 \, i \, k \, \sigma_{2+}^{\#1\alpha\beta} == 0$	$-i \, (4 \, \partial_\delta \partial_\chi \partial^\beta \partial^\alpha \tau^{\chi\delta} + 2 \, \partial_\delta \partial^\delta \partial^\beta \partial^\alpha \tau^{\chi\chi} - 3 \, \partial_\delta \partial^\delta \partial_\chi \partial^\alpha \tau^{\beta\chi} - 3 \, \partial_\delta \partial^\delta \partial_\chi \partial^\beta \tau^{\alpha\chi} - 3 \, \partial_\delta \partial^\delta \partial_\chi \partial^\alpha \tau^{\beta\alpha} + 4 \, i \, k^X \, \partial_\epsilon \partial_\chi \partial^\beta \partial^\alpha \sigma^{\delta\epsilon}_\delta - 6 \, i \, k^X \, \partial_\epsilon \partial_\delta \partial_\chi \partial^\alpha \sigma^{\beta\delta\epsilon}_\delta - 6 \, i \, k^X \, \partial_\epsilon \partial_\delta \partial_\chi \partial^\beta \sigma^{\alpha\delta\epsilon}_\epsilon + 2 \, \eta^{\alpha\beta} \, \partial_\epsilon \partial^\epsilon \partial_\delta \partial_\chi \tau^{\chi\delta} + 6 \, i \, k^X \, \partial_\epsilon \partial^\epsilon \partial_\delta \partial_\chi \sigma^{\alpha\delta\beta}_\beta + 6 \, i \, k^X \, \partial_\epsilon \partial^\epsilon \partial_\delta \partial_\chi \sigma^{\beta\delta\alpha}_\alpha - 2 \, \eta^{\alpha\beta} \, \partial_\epsilon \partial^\epsilon \partial_\delta \tau^{\chi\chi}_\chi - 4 \, i \, \eta^{\alpha\beta} \, k^X \, \partial_\phi \partial^\phi \partial_\epsilon \partial_\chi \sigma^{\delta\epsilon}_\delta) == 0$	5
Total constraints/gauge generators:		19

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

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

Quadratic (free) action

$$\begin{aligned} S = & \iiint (\frac{1}{3} (3 t_1 \omega^\alpha_\alpha \omega^\theta_\theta + 3 f^{\alpha\beta} \tau_{\alpha\beta} + 3 \omega^{\alpha\beta\chi} \sigma_{\alpha\beta\chi} - 6 t_1 \omega^\theta_\alpha \partial_\theta f^\alpha + 6 t_1 \omega^\theta_{,\theta} \partial_\theta f^\alpha_\alpha - 3 t_1 \partial_\theta f^\theta_\theta \partial_\theta f^\alpha_\alpha - 6 r_1 \partial_\beta \omega^\theta_{,\theta} \partial^\beta \omega^\alpha_\alpha + 6 r_1 \partial_\theta \omega^\theta_\beta \partial^\beta \omega^\alpha_\alpha - 3 t_1 \partial_\theta f^\alpha_{,\theta} \partial_\theta f^\alpha_\alpha + 6 t_1 \partial_\theta f^\theta_\alpha \partial^\alpha f^\theta_\theta + 6 r_1 \partial_\alpha \omega^{\alpha\beta\theta}_{,\theta} \partial_\theta \omega^\theta_{,\beta} - 12 r_1 \partial^\theta \omega^{\alpha\beta}_\alpha \partial_\theta \omega^\theta_{,\beta} - 6 r_1 \partial_\alpha \omega^{\alpha\beta\theta}_{,\beta} \partial_\theta \omega^\theta_{,\beta} + 12 r_1 \partial^\theta \omega^{\alpha\beta}_\alpha \partial_\theta \omega^\theta_{,\beta} + 2 t_1 \omega_{,\theta\alpha} \partial^\theta f^\alpha - 2 t_1 \partial_\theta f_{,\theta} \partial^\theta f^\alpha - 2 t_1 \partial_\theta f_{,\theta\alpha} \partial^\theta f^\alpha + t_1 \partial_\theta f_{\alpha\theta} \partial^\theta f^\alpha + 2 t_1 \partial_\theta f_{\alpha\theta} \partial^\theta f^\alpha + t_1 \partial_\theta f_{\alpha\theta} \partial^\theta f^\alpha + t_1 \omega_{\alpha\theta} (\omega^{\alpha\theta} + 2 \partial^\theta f^\alpha) + t_1 \omega_{\alpha\theta\theta} (\omega^{\alpha\theta} + 4 \partial^\theta f^\alpha) - 4 r_1 \partial_\beta \omega_{\alpha\theta} \partial^\theta \omega^{\alpha\beta\theta}_{,\beta} + 4 r_2 \partial_\beta \omega_{\alpha\theta} \partial^\theta \omega^{\alpha\beta\theta}_{,\beta} + 2 r_1 \partial_\beta \omega_{\alpha\theta\theta} \partial^\theta \omega^{\alpha\beta\theta}_{,\beta} - 2 r_2 \partial_\beta \omega_{\alpha\theta\theta} \partial^\theta \omega^{\alpha\beta\theta}_{,\beta} - 8 r_1 \partial_\beta \omega_{,\theta\alpha} \partial^\theta \omega^{\alpha\beta\theta}_{,\beta} + 2 r_2 \partial_\beta \omega_{,\theta\alpha} \partial^\theta \omega^{\alpha\beta\theta}_{,\beta} - 2 r_1 \partial_\theta \omega_{\alpha\beta\theta} \partial^\theta \omega^{\alpha\beta\theta}_{,\beta} - r_2 \partial_\theta \omega_{\alpha\beta\theta} \partial^\theta \omega^{\alpha\beta\theta}_{,\beta} + 2 r_1 \partial_\theta \omega_{\alpha\beta\theta} \partial^\theta \omega^{\alpha\beta\theta}_{,\beta} - \partial^\theta \omega^{\alpha\beta\theta}_{,\beta} + r_2 \partial_\theta \omega_{\alpha\beta\theta} \partial^\theta \omega^{\alpha\beta\theta}_{,\beta} + 2 r_1 \partial_\theta \omega_{\alpha\beta\theta} \partial^\theta \omega^{\alpha\beta\theta}_{,\beta} - 2 r_2 \partial_\theta \omega_{\alpha\beta\theta} \partial^\theta \omega^{\alpha\beta\theta}_{,\beta})) [t, x, y, z] dz dy dx dt \end{aligned}$$

$\sigma_{1+}^{\#1} \dagger^{\alpha\beta}$	$\frac{6}{(3+2k^2)^2} t_1$	$-\frac{6\sqrt{2}}{(3+2k^2)^2} t_1$	$-\frac{6i\sqrt{2}k}{(3+2k^2)^2} t_1$	0	0	0	0
$\sigma_{1+}^{\#2} \dagger^{\alpha\beta}$	$-\frac{6\sqrt{2}}{(3+2k^2)^2} t_1$	$\frac{12}{(3+2k^2)^2} t_1$	$\frac{12ik}{(3+2k^2)^2} t_1$	0	0	0	0
$\tau_{1+}^{\#1} \dagger^{\alpha\beta}$	$\frac{6i\sqrt{2}k}{(3+2k^2)^2} t_1$	$-\frac{12ik}{(3+2k^2)^2} t_1$	$\frac{12k^2}{(3+2k^2)^2} t_1$	0	0	0	0
$\sigma_{1+}^{\#1} \dagger^\alpha$	0	0	0	0	$\frac{\sqrt{2}}{t_1+2k^2} t_1$	0	$\frac{2ik}{t_1+2k^2} t_1$
$\sigma_{1+}^{\#2} \dagger^\alpha$	0	0	0	0	$\frac{\sqrt{2}}{t_1+2k^2} t_1$	0	$\frac{i\sqrt{2}k(2k^2r_1+t_1)}{(t_1+2k^2t_1)^2}$
$\tau_{1+}^{\#1} \dagger^\alpha$	0	0	0	0	0	0	0
$\tau_{1+}^{\#2} \dagger^\alpha$	0	0	0	0	$-\frac{2ik}{t_1+2k^2} t_1$	$-\frac{i\sqrt{2}k(2k^2r_1+t_1)}{(t_1+2k^2t_1)^2}$	$\frac{2k^2(2k^2r_1+t_1)}{(t_1+2k^2t_1)^2}$

$\omega_{1+}^{\#1} \dagger^{\alpha\beta}$	$\frac{t_1}{6}$	$-\frac{t_1}{3\sqrt{2}}$	$-\frac{ik t_1}{3\sqrt{2}}$	0	0	0	$\sigma_{0+}^{\#1} \dagger$
$\omega_{1+}^{\#2} \dagger^{\alpha\beta}$	$-\frac{t_1}{3\sqrt{2}}$	$\frac{t_1}{3}$	$\frac{ik t_1}{3}$	0	0	0	$\tau_{0+}^{\#1} \dagger$
$f_{1+}^{\#1} \dagger^{\alpha\beta}$	$\frac{ik t_1}{3\sqrt{2}}$	$-\frac{1}{3} ik t_1$	$\frac{k^2 t_1}{3}$	0	0	0	$\tau_{0+}^{\#2} \dagger$
$\omega_{1+}^{\#1} \dagger^\alpha$	0	0	0	$-k^2 r_1 - \frac{t_1}{2}$	$\frac{t_1}{\sqrt{2}}$	0	$\sigma_{0+}^{\#1}$
$\omega_{1+}^{\#2} \dagger^\alpha$	0	0	0	$\frac{t_1}{\sqrt{2}}$	0	0	$\tau_{0+}^{\#1}$
$f_{1+}^{\#1} \dagger^\alpha$	0	0	0	0	0	0	$\tau_{0+}^{\#2}$
$f_{1+}^{\#2} \dagger^\alpha$	0	0	0	$-ik t_1$	0	0	$\sigma_{0+}^{\#1}$

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

$\omega_{0+}^{\#1} \dagger$	$-t_1$	$i\sqrt{2}kt_1$	0	$\omega_{2+}^{\#1} \dagger^{\alpha\beta}$	$\frac{t_1}{2}$	$-\frac{ik t_1}{\sqrt{2}}$	$\omega_{2+}^{\#1} \dagger^{\alpha\beta}$
$f_{0+}^{\#1} \dagger$	$-i\sqrt{2}kt_1$	$-2k^2t_1$	0	$\omega_{2+}^{\#1} \dagger^{\alpha\beta}$	$\frac{t_1}{2}$	$-\frac{ik t_1}{\sqrt{2}}$	$\omega_{2+}^{\#1} \dagger^{\alpha\beta}$
$f_{0+}^{\#2} \dagger$	0	0	0	$f_{2+}^{\#1} \dagger^{\alpha\beta}$	$\frac{ik t_1}{\sqrt{2}}$	$k^2 t_1$	0
$\omega_{0+}^{\#1} \dagger$	0	0	0	$\omega_{2+}^{\#1} \dagger^{\alpha\beta\chi}$	0	0	$k^2 r_1 + \frac{t_1}{2}$