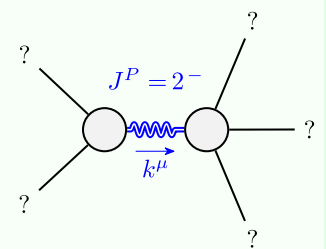


Particle spectrograph

Wave operator and propagator

Source constraints		
SO(3) irreps	Fundamental fields	Multiplicities
$\tau^{#2}_{0+} == 0$	$\partial_\beta \partial_\alpha \tau^{\alpha\beta} == 0$	1
$\tau^{#1}_{0+} - 2 \, i \, k \, \sigma^{#1}_{0+} == 0$	$\partial_\beta \partial_\alpha \tau^{\alpha\beta} == \partial_\beta \partial^\beta \tau^\alpha_\alpha + 2 \, \partial_\chi \partial^X \partial_\sigma \sigma^\alpha_\alpha$	1
$\tau^{#2\alpha}_{1+} + 2 \, i \, k \, \sigma^{#2\alpha}_{1+} == 0$	$\partial_\chi \partial_\beta \partial^\alpha \tau^{\beta\chi} == \partial_\chi \partial^X \partial_\beta \tau^{\alpha\beta} + 2 \, \partial_\delta \partial^\delta \partial_\chi \partial_\sigma \sigma^{\alpha\beta\chi}$	3
$\tau^{#1\alpha}_{1+} == 0$	$\partial_\chi \partial_\beta \partial^\alpha \tau^{\beta\chi} == \partial_\chi \partial^X \partial_\beta \tau^{\beta\alpha}$	3
$\tau^{#1\alpha\beta} - 2 \, i \, k \, \sigma^{#1\alpha\beta}_{1+} == 0$	$\partial_\chi \partial^\alpha \tau^{\beta\chi} + \partial_\chi \partial^\beta \tau^{\alpha\chi} + \partial_\chi \partial^\chi \tau^{\beta\alpha} + 2 \, \partial_\delta \partial_\chi \partial^\beta \sigma^{\alpha\chi\delta} + 2 \, \partial_\delta \partial^\delta \partial_\chi \sigma^{\beta\chi\alpha}$	3
$\tau^{#1\alpha\beta} - 2 \, i \, k \, \sigma^{#1\alpha\beta}_{2+} == 0$	$\partial_\chi \partial^\alpha \partial_\beta \partial^\gamma \tau^{\beta\chi} + 2 \, \partial_\delta \partial^\delta \partial_\beta \partial^\gamma \tau^{\alpha\chi} - 3 \, \partial_\delta \partial^\delta \partial_\chi \partial^\alpha \tau^{\chi\beta} - 3 \, \partial_\delta \partial^\delta \partial_\chi \partial^\beta \tau^{\alpha\chi} - 3 \, \partial_\delta \partial^\delta \partial_\chi \partial^\alpha \tau^{\chi\beta} + 3 \, \partial_\delta \partial^\delta \partial_\chi \partial^\alpha \tau^{\alpha\beta} + 3 \, \partial_\delta \partial^\delta \partial_\chi \partial^\alpha \tau^{\beta\alpha} + 4 \, i \, k^X \, \partial_\epsilon \partial_\chi \partial^\beta \partial^\alpha \sigma^{\delta\epsilon}_\delta - 6 \, i \, k^X \, \partial_\epsilon \partial_\delta \partial_\chi \partial^\alpha \sigma^{\beta\delta\epsilon}_\delta - 6 \, i \, k^X \, \partial_\epsilon \partial_\delta \partial_\chi \partial^\beta \sigma^{\alpha\delta\epsilon}_\delta + 2 \, \eta^{\alpha\beta} \, \partial_\epsilon \partial_\delta \partial_\chi \tau^{\chi\delta} + 6 \, i \, k^X \, \partial_\epsilon \partial^\epsilon \partial_\delta \partial_\chi \sigma^{\alpha\delta\beta}_\delta + 6 \, i \, k^X \, \partial_\epsilon \partial^\epsilon \partial_\delta \partial_\chi \sigma^{\beta\delta\alpha}_\delta - 2 \, \eta^{\alpha\beta} \, \partial_\epsilon \partial^\epsilon \partial_\delta \tau^{\chi}_\chi - 4 \, i \, \eta^{\alpha\beta} \, k^X \, \partial_\phi \partial_\delta \partial_\epsilon \partial_\chi \sigma^{\delta\epsilon}_\delta == 0$	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_\alpha \, \partial_\theta f^\theta_\theta + 6 t_1 \, \partial_\theta f^\alpha_\alpha \, \partial_\theta 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}_{\theta} \, \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\beta} \, \partial^\beta f^\alpha - 2 t_1 \, \partial_\theta f_{\theta\beta} \, \partial^\beta f^\alpha + t_1 \, \partial_\theta f_{\alpha\theta} \, \partial^\beta f^\alpha + 2 t_1 \, \partial_\theta f_{\alpha\theta} \, \partial^\beta f^\alpha + t_1 \, \partial_\theta f_{\alpha\theta} \, \partial^\beta f^\alpha + t_1 \, \omega_{\alpha\theta} \, (\omega^{\alpha\theta} + 2 \, \partial^\theta f^\alpha) + t_1 \, \omega_{\alpha\theta\beta} \, (\omega^{\alpha\theta} + 4 \, \partial^\theta f^\alpha) - 4 r_1 \, \partial_\beta \omega_{\alpha\theta} \, \partial^\theta \omega^{\alpha\beta\theta}_{\theta} + 4 r_2 \, \partial_\beta \omega_{\alpha\theta} \, \partial^\theta \omega^{\alpha\beta\theta}_{\theta} + 2 r_1 \, \partial_\beta \omega_{\alpha\theta\beta} \, \partial^\theta \omega^{\alpha\beta\theta}_{\theta} - 2 r_2 \, \partial_\beta \omega_{\alpha\theta\beta} \, \partial^\theta \omega^{\alpha\beta\theta}_{\theta} - 8 r_1 \, \partial_\beta \omega_{\theta\alpha} \, \partial^\theta \omega^{\alpha\beta\theta}_{\theta} + 2 r_2 \, \partial_\beta \omega_{\theta\alpha} \, \partial^\theta \omega^{\alpha\beta\theta}_{\theta} - 2 r_1 \, \partial_\theta \omega_{\alpha\beta\theta} \, \partial^\theta \omega^{\alpha\beta\theta}_{\theta} - r_2 \, \partial_\theta \omega_{\alpha\beta\theta} \, \partial^\theta \omega^{\alpha\beta\theta}_{\theta} + 2 r_1 \, \partial_\theta \omega_{\alpha\beta\theta} \, \partial^\theta \omega^{\alpha\beta\theta}_{\theta} - \partial^\theta \omega^{\alpha\beta\theta}_{\theta} + r_2 \, \partial_\theta \omega_{\alpha\beta\theta} \, \partial^\theta \omega^{\alpha\beta\theta}_{\theta} + 2 r_1 \, \partial_\theta \omega_{\alpha\beta\theta} \, \partial^\theta \omega^{\alpha\beta\theta}_{\theta} - 2 r_2 \, \partial_\theta \omega_{\alpha\beta\theta} \, \partial^\theta \omega^{\alpha\beta\theta}_{\theta})) [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
$\sigma^{#2}_{1+} \dagger^{\alpha\beta}$	$-\frac{6\sqrt{2}}{(3+2k^2)^2} t_1$	$\frac{12}{(3+2k^2)^2} t_1$	$\frac{12ik}{(3+2k^2)^2} t_1$	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	$\frac{2ik}{t_1+2k^2} t_1$
$\sigma^{#2}_{1-} \dagger^\alpha$	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
$\tau^{#2}_{1-} \dagger^\alpha$	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	$\sigma^{#1}_{0+}$
$\omega^{#2}_{1+} \dagger^{\alpha\beta}$	$-\frac{t_1}{3\sqrt{2}}$	$\frac{t_1}{3}$	$\frac{ik t_1}{3}$	0	0	0	$\tau^{#1}_{0+}$
$f^{#1}_{1+} \dagger^{\alpha\beta}$	$\frac{ik t_1}{3\sqrt{2}}$	$-\frac{1}{3} i k t_1$	$\frac{k^2 t_1}{3}$	0	0	0	$\tau^{#2}_{0+}$
$\omega^{#1}_{1-} \dagger^\alpha$	0	0	0	$-k^2 r_1 - \frac{t_1}{2}$	$\frac{t_1}{\sqrt{2}}$	0	$\sigma^{#1}_{0-}$
$\omega^{#2}_{1-} \dagger^\alpha$	0	0	0	$\frac{t_1}{\sqrt{2}}$	0	0	
$f^{#1}_{1-} \dagger^\alpha$	0	0	0	0	0	0	
$f^{#2}_{1-} \dagger^\alpha$	0	0	0	$-i k t_1$	0	0	

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

$\omega^{#1}_{0+} \dagger^{\alpha\beta}$	$-t_1$	$i\sqrt{2} k t_1$	0	0	$\omega^{#1}_{2+} \dagger^{\alpha\beta}$	$\frac{t_1}{2}$	$-\frac{ik t_1}{\sqrt{2}}$	0
$f^{#1}_{0+} \dagger^{\alpha\beta}$	$-i\sqrt{2} k t_1$	$-2 k^2 t_1$	0	0	$\omega^{#1}_{2+} \dagger^{\alpha\beta}$	$f^{#1}_{2+} \dagger^{\alpha\beta}$	$k^2 t_1$	0
$f^{#2}_{0+} \dagger^{\alpha\beta}$	0	0	0	0	$\omega^{#1}_{2+} \dagger^{\alpha\beta\chi}$	0	0	$\frac{t_1}{2}$
$\omega^{#1}_{0-} \dagger^{\alpha\beta}$	0	0	0	$k^2 r_2$				