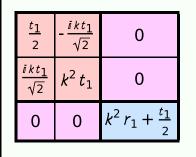
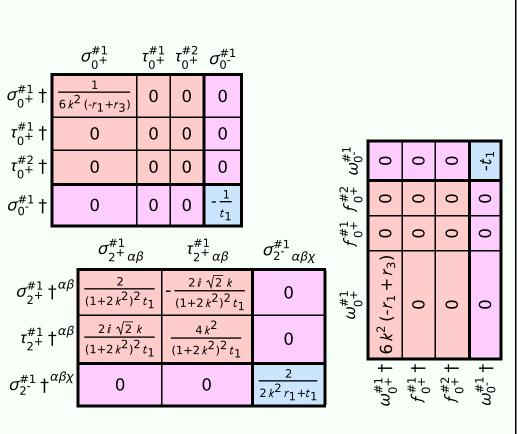
Particle spectrograph

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
$\tau_{0}^{\#1} == 0$	$\partial_{\beta}\partial_{\alpha}\tau^{\alpha\beta} == \partial_{\beta}\partial^{\beta}\tau^{\alpha}_{\ \alpha}$	1
$\frac{\tau_{1}^{\#2}\alpha}{\tau_{1}^{\#2}} + 2ik\sigma_{1}^{\#2}\alpha == 0$	$\partial_{\chi}\partial_{\beta}\partial^{\alpha}\tau^{\beta\chi} = \partial_{\chi}\partial^{\chi}\partial_{\beta}\tau^{\alpha\beta} + 2\partial_{\delta}\partial^{\delta}\partial_{\chi}\partial_{\beta}\sigma^{\alpha\beta\chi}$	3
$\tau_{1}^{\#1}{}^{\alpha} == 0$	$\partial_{\chi}\partial_{\beta}\partial^{\alpha}\tau^{\beta\chi} == \partial_{\chi}\partial^{\chi}\partial_{\beta}\tau^{\beta\alpha}$	3
$\tau_{1+}^{\#1\alpha\beta} + i k \sigma_{1+}^{\#2\alpha\beta} == 0$	$\partial_{\chi}\partial^{\alpha}\tau^{\beta\chi} + \partial_{\chi}\partial^{\beta}\tau^{\chi\alpha} + \partial_{\chi}\partial^{\chi}\tau^{\alpha\beta} +$	3
	$2 \partial_{\delta} \partial_{\chi} \partial^{\alpha} \sigma^{\beta \chi \delta} + 2 \partial_{\delta} \partial^{\delta} \partial_{\chi} \sigma^{\alpha \beta \chi} = =$	
	$\partial_{\chi}\partial^{\alpha}\tau^{\chi\beta} + \partial_{\chi}\partial^{\beta}\tau^{\alpha\chi} +$	
	$\partial_{\chi}\partial^{\chi}\tau^{\beta\alpha} + 2\partial_{\delta}\partial_{\chi}\partial^{\beta}\sigma^{\alpha\chi\delta}$	
$\frac{\tau_{2+}^{\#1}\alpha\beta} - 2ik\sigma_{2+}^{\#1}\alpha\beta} = 0$	$-i \left(4 \partial_{\delta} \partial_{\chi} \partial^{\beta} \partial^{\alpha} \tau^{\chi \delta} + 2 \partial_{\delta} \partial^{\delta} \partial^{\beta} \partial^{\alpha} \tau^{\chi}_{\chi} - \right)$	5
	$3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\alpha} \tau^{\beta \chi} - 3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\alpha} \tau^{\chi \beta} -$	
	$3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\beta} \tau^{\alpha \chi} - 3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\beta} \tau^{\chi \alpha} +$	
	$3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\chi} \tau^{\alpha\beta} + 3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\chi} \tau^{\beta\alpha} +$	
	$4 i k^{\chi} \partial_{\epsilon} \partial_{\chi} \partial^{\beta} \partial^{\alpha} \sigma^{\delta \epsilon}_{\delta} -$	
	$6 i k^{\chi} \partial_{\epsilon} \partial_{\delta} \partial_{\chi} \partial^{\alpha} \sigma^{\beta \delta \epsilon} -$	
	$6 i k^{\chi} \partial_{\epsilon} \partial_{\delta} \partial_{\chi} \partial^{\beta} \sigma^{\alpha \delta \epsilon} +$	
	$2 \eta^{\alpha\beta} \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial_{\chi} \tau^{\chi\delta} +$	
	$6 i k^{\chi} \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial_{\chi} \sigma^{\alpha \delta \beta} +$	
	$6 i k^{\chi} \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial_{\chi} \sigma^{\beta \delta \alpha} -$	
	$2 \eta^{\alpha\beta} \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\delta} \tau^{\chi}_{\gamma}$ -	
	$4 i \eta^{\alpha\beta} k^{X} \partial_{\phi} \partial^{\phi} \partial_{\epsilon} \partial_{\chi} \sigma^{\delta\epsilon} \delta = 0$	
Total constraints/gau	16	

ı							
$\tau_{1}^{\#2}{}_{\alpha}$	0	0	0	$\frac{i}{k(1+2k^2)(r_1-2r_3-r_5)}$	$\frac{i(6k^2(r_1-2r_3-r_5)-t_1)}{\sqrt{2}k(1+2k^2)^2(r_1-2r_3-r_5)t_1}$	0	$\frac{1}{\frac{-r_1+2r_3+r_5}{(1+2k^2)^2}} + \frac{6k^2}{t_1}$
$\tau_{1^{-}}^{\#1}\alpha$	0	0	0	0	0	0	0
$\sigma_{1}^{\#2}{}_{\alpha}$	0	0	0	$\frac{1}{\sqrt{2} (k^2 + 2k^4) (r_1 - 2r_3 - r_5)}$	$\frac{1}{-71+2r_3+r_5} + \frac{6k^2}{t_1}$ $2(k+2k^3)^2$	0	$-\frac{i(6k^2(r_1-2r_3-r_5)-t_1)}{\sqrt{2}k(1+2k^2)^2(r_1-2r_3-r_5)t_1}$
$\sigma_{1^{-}}^{\#1}{}_{\alpha}$	0	0	0	$\frac{1}{k^2 (-r_1+2 r_3+r_5)}$	$\frac{1}{\sqrt{2} (k^2 + 2k^4) (r_1 - 2r_3 - r_5)}$	0	$\frac{i}{k(1+2k^2)(-r_1+2r_3+r_5)}$
$\tau_{1}^{\#1}_{+\alpha\beta}$	$-\frac{i\sqrt{2}k}{t_1+k^2t_1}$	$\frac{-2ik^3(2r_3+r_5)+ikt_1}{(1+k^2)^2t_1^2}$	$\frac{-2k^4(2r_3+r_5)+k^2t_1}{(1+k^2)^2t_1^2}$	0	0	0	0
$\sigma_{1}^{\#2}{}_{\alpha\beta}$	$-\frac{\sqrt{2}}{t_1+k^2t_1}$	$\frac{-2 k^2 (2 r_3 + r_5) + t_1}{(1 + k^2)^2 t_1^2}$	$\frac{i(2k^3(2r_3+r_5)-kt_1)}{(1+k^2)^2t_1^2}$	0	0	0	0
$\sigma_{1}^{\#1}{}_{\alpha\beta}$	0	$-\frac{\sqrt{2}}{t_1+k^2t_1}$	$\frac{i\sqrt{2}k}{t_1+k^2t_1}$	0	0	0	0
	$\sigma_{1}^{\#1} + ^{lphaeta}$	$\sigma_{1}^{#2} + \alpha \beta$	$\tau_1^{\#1} + \alpha \beta$	$\sigma_{1^{\text{-}}}^{\#1} \dag^{\alpha}$	$\sigma_{1}^{#2} +^{\alpha}$	$\tau_{1}^{\#1} +^{\alpha}$	$t_1^{#2} + \alpha$

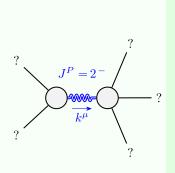


 $\frac{ikt_1}{3}$

 $\frac{1}{3} i \sqrt{2} k t_1$

 $\frac{2k^2t_1}{3}$

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		

?	<i>,</i> '
$\frac{k^{\mu}}{2}$?
?	

Quadratic pole				
Pole residue:	$\left \frac{1}{(r_1 - 2r_3 - r_5)t_1^2} > 0 \right $			
Polarisations:	2			

Unitarity conditions

 $r_1 < 0 \&\& r_5 < r_1 - 2 r_3 \&\& t_1 > 0$