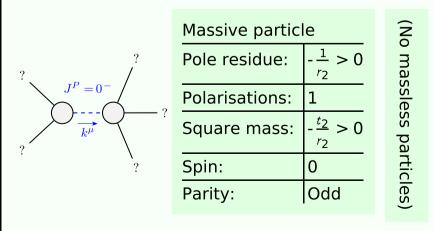
## Particle spectrograph

## Wave operator and propagator

SO(3) irreps $\tau_{o+}^{\#2} == 0$	Findamental fields	Multiplicities
== 0		
	$\partial_{\beta}\partial_{\alpha}\tau^{\alpha\beta}==0$	1
$\tau_{0+}^{\#1} == 0$	$\partial_{\beta}\partial_{\alpha}t^{\alpha\beta} == \partial_{\beta}\partial^{\beta}t^{\alpha}_{\ \alpha}$	1
$\sigma_{0}^{#1} == 0$	$\partial_{\beta}\sigma^{\alpha\beta}_{\alpha} == 0$	1
$\tau_1^{\#2}{}^{\alpha} == 0$	$\partial_{\chi}\partial_{\beta}\partial^{\alpha}\tau^{\beta\chi} == \partial_{\chi}\partial^{\chi}\partial_{\beta}\tau^{\alpha\beta}$	8
$\tau_{1}^{\#1}{}^{\alpha} == 0$	$\partial_{\chi}\partial_{\beta}\partial^{\alpha}\tau^{\beta\chi} == \partial_{\chi}\partial^{\chi}\partial_{\beta}\tau^{\beta\alpha}$	(m
$\sigma_{1}^{\#2}\alpha == 0$	$\partial_{\chi}\partial_{\beta}\sigma^{\alpha\beta\chi} == 0$	3
$\tau_{1+}^{\#1}\alpha\beta + ik \ \sigma_{1+}^{\#1}\alpha\beta == 0$	$\partial_{\chi}\partial^{\alpha} \tau^{\beta\chi} + \partial_{\chi}\partial^{\beta} \tau^{\chi\alpha} + \partial_{\chi}\partial^{\chi} \tau^{\alpha\beta} +$	3
	$\partial_{\delta}\partial_{\chi}\partial^{\beta}\sigma^{\alpha\chi\delta} + \partial_{\delta}\partial^{\delta}\partial_{\chi}\sigma^{\beta\chi\alpha} = =$	
	$\partial_{\chi}\partial^{\alpha}\tau^{\chi\beta} + \partial_{\chi}\partial^{\beta}\tau^{\alpha\chi} + \partial_{\chi}\partial^{\chi}\tau^{\beta\alpha} +$	
	$\partial_{\delta}\partial_{\chi}\partial^{\alpha}\sigma^{eta\chi\delta}+\partial_{\delta}\partial^{\delta}\partial_{\chi}\sigma^{a\chieta}$	
$\sigma_{1}^{\#1}\alpha\beta == \sigma_{1}^{\#2}\alpha\beta$	$3 \partial_{\delta} \partial_{\chi} \partial^{\alpha} \sigma^{\beta \chi \delta} +$	3
	$2 \partial_{\delta} \partial^{\delta} \partial_{\chi} \sigma^{\alpha \beta \chi} + \partial_{\delta} \partial^{\delta} \partial_{\chi} \sigma^{\alpha \chi \beta} = =$	
	$3\partial_{\delta}\partial_{\chi}\partial^{\beta}\sigma^{\alpha\chi\delta} + \partial_{\delta}\partial^{\delta}\partial_{\chi}\sigma^{\beta\chi\alpha}$	
$\sigma_{2^{-}}^{\#1}\alpha\beta\chi == 0$	$3 \partial_{\epsilon} \partial_{\delta} \partial^{\chi} \partial^{\alpha} \sigma^{\beta \delta \epsilon} + 3 \partial_{\epsilon} \partial^{\epsilon} \partial^{\chi} \partial^{\alpha} \sigma^{\beta \delta} +$	5
	$2 \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\beta} \sigma^{\alpha \chi \delta} + 4 \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\beta} \sigma^{\alpha \delta \chi} +$	
	$2 \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\beta} \sigma^{\chi \delta \alpha} + 4 \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\chi} \sigma^{\alpha \beta \delta} +$	
	$2 \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\chi} \sigma^{\alpha \delta \beta} + 2 \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\delta} \sigma^{\beta \chi \alpha} +$	
	$3 \eta^{eta\chi}  \partial_\phi \partial^\phi \partial_\epsilon \partial^\alpha \sigma^{\delta\epsilon}_{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	
	$3 \eta^{\alpha\chi} \partial_{\phi} \partial^{\phi} \partial_{\epsilon} \partial_{\delta} \sigma^{\beta \delta \epsilon} +$	
	$3 \eta^{\beta \chi} \partial_{\phi} \partial^{\phi} \partial_{\epsilon} \partial^{\epsilon} \sigma^{\alpha \delta}{}_{\delta} ==$	
	$3 \partial_{\epsilon} \partial_{\delta} \partial^{\chi} \partial^{\beta} \sigma^{\alpha \delta \epsilon} + 3 \partial_{\epsilon} \partial^{\epsilon} \partial^{\chi} \partial^{\beta} \sigma^{\alpha \delta}{}_{\delta} +$	
	$2 \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\alpha} \sigma^{\beta \chi \delta} + 4 \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\alpha} \sigma^{\beta \delta \chi} +$	
	$2 \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\alpha} \sigma^{\chi \delta \beta} + 2 \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\chi} \sigma^{\beta \delta \alpha} +$	
	$4 \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\delta} \sigma^{\alpha \beta \chi} + 2 \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\delta} \sigma^{\alpha \chi \beta} +$	
	$3 \eta^{\alpha\chi} \partial_{\phi} \partial^{\phi} \partial_{\epsilon} \partial^{\beta} \sigma^{\delta \epsilon}$	
	$3 \eta^{eta\chi}  \partial_\phi \partial^\phi \partial_\epsilon \partial_\delta \sigma^{\alpha\delta\epsilon} +$	
	$3~\eta^{lpha\chi}~\partial_{\phi}\partial^{\phi}\partial_{\epsilon}\partial^{\epsilon}\sigma^{eta\delta}{}_{\delta}$	
$\tau_2^{\#1}\alpha\beta == 0$	$4 \partial_{\delta} \partial_{\chi} \partial^{\beta} \partial^{\alpha} t^{\chi \delta} + 2 \partial_{\delta} \partial^{\delta} \partial^{\beta} \partial^{\alpha} t^{\chi}_{\chi} +$	5
	$3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\chi} \tau^{\alpha \beta} + 3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\chi} \tau^{\beta \alpha} +$	
	$2 \eta^{\alpha\beta} \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial_{\chi} \tau^{\chi\delta} ==$	
	$3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\alpha} \tau^{\beta \chi} + 3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\alpha} \tau^{\chi \beta} +$	
	$3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\beta} \tau^{\alpha \chi} + 3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\beta} \tau^{\chi \alpha} +$	
	$2 \eta^{\alpha\beta} \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\delta} \tau^{\chi}_{\chi}$	
Total constraints/gauge generators:		28

									$\omega_{2^{+}\alpha\beta}^{\#1} f_{2^{+}\alpha\beta}^{\#1} \omega_{2^{-}\alpha\beta\chi}^{\#1}$					$\sigma_{2^{+}lphaeta}^{\sharp1} au_{2^{+}lphaeta}^{\sharp1}\sigma_{2^{-}lphaeta\chi}^{\sharp1}$						
								$\omega_{2}^{\sharp 1} \dagger^{lphaeta}$		$\frac{3k^2r_3}{2}$	0	0		$\sigma_{2}^{\sharp 1} \dagger^{\alpha \beta}$		$-\frac{2}{3k^2r_1^2}$	$\frac{2}{2_{r_3}}$ 0		0	
								$f_{2}^{\#1} \dagger^{\alpha\beta}$		0	0	0		$ au_2^{\#1} \dagger^{lphaeta}$		0	0		0	
,								$\omega_2^{\#1}$	$\dagger^{\alpha\beta\chi}$	0	0	0	$0 \qquad \sigma_2^4$		$\dagger^{\alpha\beta\chi}$	0		0	0	
$f_{1^{ ext{-}}}^{\#2}$	0	0	0	0	0	0	0	${\mathfrak t}_1^{\#2}$	0	0	0	0	0	0	0					
$f_{1^-}^{\#1} \alpha$	0	0	0	0	0	0	0	α												
$\omega_{1^{\bar{-}}}^{\#2}{}_{\alpha}$	0	0	0	0	0	0	0		0	0	0	0	0	0	0					
α			0	$\frac{3k^2r_3}{2}$	0			$\sigma_1^{\#2}$	0	0	0	0 - 0	0	0	0	$\sigma_{0}^{\#1}$	0	0	0	$\frac{1}{k^2 r_2 + t_2}$
$\omega_{1^{\bar{-}}}^{\#1}$	0	0	O	- 3 k	0	0	0	$\sigma_{1^-}^{\#1} lpha$	0	0	0	$\frac{2}{3k^2r_3}$	0	0	0					<sup>k2</sup> <sup>r</sup> 2
$f_{1}^{\#1}_{\alpha\beta}$	$i\sqrt{2} kt_2$	<u>i k t 2</u> 3	$\frac{k^2 t_2}{3}$	0	0	0	0	αβ	$\frac{2}{2} \frac{k}{t_2}$	k 2 t2	$\frac{2}{12t_2}$	•				$^{1}_{+} \tau_{0}^{#2}$	0	0	0	0
$f_{1}^{\#}$	$\frac{1}{3}$ $\vec{i}$ $$	i k	<sup>k2</sup>		)			$\tau_{1}^{\#1}{}_{\alpha\beta}$	$\frac{3i\sqrt{2}k}{(3+k^2)^2t_2}$	$\frac{3ik}{(3+k^2)^2t_2}$	$\frac{3k^2}{(3+k^2)^2t_2}$	0	0	0	0	$\sigma_{0}^{\#1}$ $\tau_{0}^{\#1}$	0 0	0 0	0 0	0 0
$\omega_1^{\#2}{}_+^2$	$\sqrt{2} t_2$	3 3	īkt2	0	0	0	0	$\alpha \beta$			_					Q				
$\omega_1^{\#}$	<del> </del>	7	- <del>1</del> 3					$\sigma_{1}^{\#2}$	$\frac{3\sqrt{2}}{(3+k^2)^2t_2}$	$\frac{3}{(3+k^2)^2 t_2}$	$\frac{3ik}{(3+k^2)^2t_2}$	0	0	0	0		$\sigma_{0}^{\#1}\dagger$	$\tau_{0}^{\#1}  \dagger$	τ#2 τ <sub>0</sub> +	$\sigma_{0}^{\#1}\dagger$
$\omega_1^{\#1}{}_+^{\alpha\beta}$	$\frac{2t_2}{3}$	$\sqrt{2} t_2$	$\sqrt{2} kt_2$	0	0	0	0	αβ			$\frac{\overline{2} k}{)^2 t_2}$									
$\omega_1^{\#}$	7		$-\frac{1}{3}\vec{I}$		)			$\sigma_{1}^{\#1}{}_{\alpha\beta}$	$\frac{6}{(3+k^2)^2 t_2}$	$\frac{3\sqrt{2}}{(3+k^2)^2t_2}$	$\frac{3 i \sqrt{2} k}{(3+k^2)^2 t_2}$	0	0	0	0					
	$\omega_1^{\#1} + \alpha \beta$	$\omega_1^{#2} + ^{\alpha\beta}$	$f_{1+}^{#1} + ^{\alpha \beta}$	$\omega_{1}^{\#_{1}} +^{lpha}$	$\omega_{1}^{\#2} +^{\alpha}$	$f_{1}^{#1} \dagger^{\alpha}$	$f_{1}^{\#2} +^{\alpha}$		$\sigma_1^{\#1} + \alpha^{\beta}$	$\sigma_{1}^{#2} + \alpha \beta$	$\tau_1^{\#1} + \alpha \beta$	$\sigma_{1}^{\#1} + ^{lpha}$	$\sigma_{1}^{\#2} + \alpha$	$\tau_{1}^{\#_{1}} + \alpha$	$\tau_1^{\#2} + \alpha$					
	$\omega_1^{\#1}$	$\omega_1^{\#2}$	$f_1^{\#1}$	$\omega_{1}^{*}$	$\omega_{1}^{\#}$	$f_1^*$	$f_1^{\#}$		$\sigma_{1}^{\#1}$	$\sigma_{1}^{\#2}$	$\tau_1^{\#1}$	$\sigma_1^*$	$\sigma_{1}^{\#}$	$ au_1^{\#}$	$ au_1^{\#}$					

## Massive and massless spectra



## Unitarity conditions