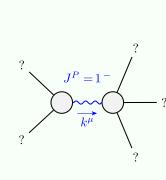
Particle spectrograph

Wave operator and propagator

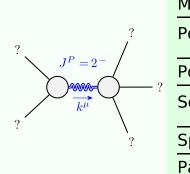
_	$\sigma_{1^{+}lphaeta}^{\sharp1}$	$\sigma_{1^{+}lphaeta}^{\#2}$	$ au_{1}^{\#1}{}_{lphaeta}$	$\sigma_{1}^{\#1}{}_{lpha}$	$\sigma_{1^{-}\alpha}^{\#2}$	$\tau_{1}^{\#1}{}_{\alpha}$	$ au_{1-}^{\#2} lpha$
$\sigma_{1}^{\sharp 1} \dagger^{lpha eta}$	0	$-\frac{\sqrt{2}}{t_1+k^2t_1}$	$-\frac{i\sqrt{2}k}{t_1+k^2t_1}$	0	0	0	0
$\sigma_{1}^{\#2} \dagger^{\alpha\beta}$	$-\frac{\sqrt{2}}{t_1+k^2t_1}$	$\frac{-2 k^2 (2 r_1 + r_5) + t_1}{(1 + k^2)^2 t_1^2}$	$\frac{-2ik^3(2r_1+r_5)+ikt_1}{(1+k^2)^2t_1^{2}}$	0	0	0	0
$ au_{1}^{\#1} \dagger^{lphaeta}$	$\frac{i\sqrt{2}k}{t_1+k^2t_1}$	$\frac{i(2k^3(2r_1+r_5)-kt_1)}{(1+k^2)^2t_1^2}$	$\frac{-2 k^4 (2 r_1 + r_5) + k^2 t_1}{(1+k^2)^2 t_1^2}$	0	0	0	0
$\sigma_{1}^{\sharp 1}\dagger^{lpha}$	0	0	0	$\frac{2(t_1+t_3)}{3t_1t_3+2k^2(r_1+r_5)(t_1+t_3)}$	$-\frac{\sqrt{2} (t_1-2 t_3)}{(1+2 k^2) (3 t_1 t_3+2 k^2 (r_1+r_5) (t_1+t_3))}$	0	$-\frac{2ik(t_1\!-\!2t_3)}{(1\!+\!2k^2)(3t_1t_3\!+\!2k^2(r_1\!+\!r_5)(t_1\!+\!t_3))}$
$\sigma_1^{\#2} \dagger^{\alpha}$	0	0	0	$-\frac{\sqrt{2}\;(t_1\!-\!2t_3)}{(1\!+\!2k^2)(3t_1t_3\!+\!2k^2(r_1\!+\!r_5)(t_1\!+\!t_3))}$	$\frac{6 k^2 (r_1 + r_5) + t_1 + 4 t_3}{(1 + 2 k^2)^2 (3 t_1 t_3 + 2 k^2 (r_1 + r_5) (t_1 + t_3))}$	0	$\frac{i\sqrt{2}k(6k^2(r_1+r_5)+t_1+4t_3)}{(1+2k^2)^2(3t_1t_3+2k^2(r_1+r_5)(t_1+t_3))}$
$\tau_1^{\#1} \uparrow^{\alpha}$	0	0	0	0	0	0	0
$ au_1^{#2} \dagger^{lpha}$	0	0	0	$\frac{2 i k (t_1 - 2 t_3)}{(1 + 2 k^2) (3 t_1 t_3 + 2 k^2 (r_1 + r_5) (t_1 + t_3))}$	$-\frac{i\sqrt{2}k(6k^2(r_1+r_5)+t_1+4t_3)}{(1+2k^2)^2(3t_1t_3+2k^2(r_1+r_5)(t_1+t_3))}$	0	$\frac{2k^2(6k^2(r_1\!+\!r_5)\!+\!t_1\!+\!4t_3)}{(1\!+\!2k^2)^2(3t_1t_3\!+\!2k^2(r_1\!+\!r_5)(t_1\!+\!t_3))}$

SO(3) irreps	Fundamental fields	Multiplicities
$\tau_{0^{+}}^{\#2} == 0$	$\partial_{\beta}\partial_{\alpha}\tau^{\alpha\beta} == 0$	1
$\tau_{0^{+}}^{\#1} - 2 \bar{\imath} k \sigma_{0^{+}}^{\#1} == 0$	$\partial_{\beta}\partial_{\alpha}\tau^{\alpha\beta} = \partial_{\beta}\partial^{\beta}\tau^{\alpha}_{\alpha} + 2\partial_{\chi}\partial^{\chi}\partial_{\beta}\sigma^{\alpha\beta}_{\alpha}$	1
$\tau_1^{\#2\alpha} + 2 i k \sigma_1^{\#2\alpha} == 0$	$\partial_{\chi}\partial_{\beta}\partial^{\alpha}\tau^{\beta\chi} == \partial_{\chi}\partial^{\chi}\partial_{\beta}\tau^{\alpha\beta} + 2\partial_{\delta}\partial^{\delta}\partial_{\chi}\partial_{\beta}\sigma^{\alpha\beta\chi}$	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
	$2 \partial_{\delta} \partial_{\chi} \partial^{\alpha} \sigma^{\beta \chi \delta} + 2 \partial_{\delta} \partial^{\delta} \partial_{\chi} \sigma^{\alpha \beta \chi} = =$	
	$\partial_{\chi}\partial^{\alpha}\tau^{\chi\beta} + \partial_{\chi}\partial^{\beta}\tau^{\alpha\chi} +$	
	$\partial_{\chi}\partial^{\chi}\tau^{\beta\alpha} + 2\partial_{\delta}\partial_{\chi}\partial^{\beta}\sigma^{\alpha\chi\delta}$	
$\tau_{2+}^{\#1}{}^{\alpha\beta} - 2 i k \sigma_{2+}^{\#1}{}^{\alpha\beta} == 0$	$-i \left(4 \partial_{\delta} \partial_{\chi} \partial^{\beta} \partial^{\alpha} \tau^{\chi \delta} + 2 \partial_{\delta} \partial^{\delta} \partial^{\beta} \partial^{\alpha} \tau^{\chi}_{\chi} - \right)$	5
	$3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\alpha} \tau^{\beta \chi} - 3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\alpha} \tau^{\chi \beta} -$	
	$3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\beta} \tau^{\alpha \chi} - 3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\beta} \tau^{\chi \alpha} +$	
	$3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\chi} \tau^{\alpha\beta} + 3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\chi} \tau^{\beta\alpha} +$	
	$4 i k^{\chi} \partial_{\epsilon} \partial_{\chi} \partial^{\beta} \partial^{\alpha} \sigma^{\delta \epsilon}_{ \delta} -$	
	$6 i k^{\chi} \partial_{\epsilon} \partial_{\delta} \partial_{\chi} \partial^{\alpha} \sigma^{\beta \delta \epsilon} -$	
	$6 i k^{\chi} \partial_{\epsilon} \partial_{\delta} \partial_{\chi} \partial^{\beta} \sigma^{\alpha \delta \epsilon} +$	
	$2 \eta^{\alpha\beta} \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial_{\chi} \tau^{\chi\delta} +$	
	$6ik^{\chi}\partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial_{\chi}\sigma^{\alpha\delta\beta}+$	
	$6 i k^{\chi} \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial_{\chi} \sigma^{\beta \delta \alpha} -$	
	$2 \eta^{\alpha\beta} \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\delta} \tau^{\chi}_{\chi} -$	
	$4 \bar{\imath} \eta^{\alpha\beta} k^{\chi} \partial_{\phi} \partial^{\phi} \partial_{\epsilon} \partial_{\chi} \sigma^{\delta\epsilon} \delta) == 0$	
 Total constraints/gau		16

Massive and massless spectra



Massive particle						
Pole residue:	$-\frac{3(-2t_1t_3(t_1+t_3)+r_1(t_1^2+2t_3^2)+r_5(t_1^2+2t_3^2))}{2(r_1+r_5)(t_1+t_3)(-3t_1t_3+r_1(t_1+t_3)+r_5(t_1+t_3))}>0$					
Polarisations:	3					
Square mass:	$-\frac{3t_1t_3}{2(r_1+r_5)(t_1+t_3)} > 0$					
Spin:	1					
Parity:	Odd					

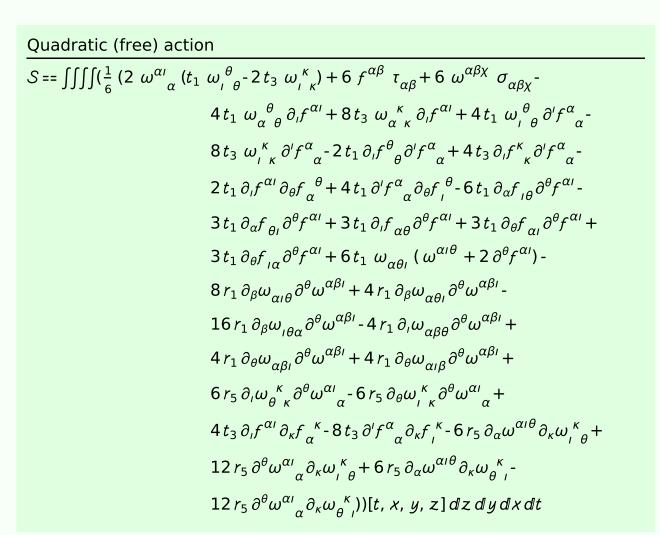


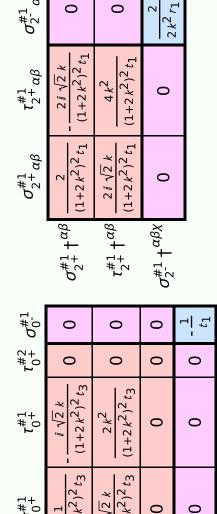
	Massive particle				
?	Pole residue:	$-\frac{1}{r_1} > 0$			
2 = 2 -	Polarisations:	5			
k^{μ} ?	Square mass:	$-\frac{t_1}{2r_1} > 0$			
?	Spin:	2			
	Parity:	Odd			

:	е	(N
	$-\frac{1}{r_1} > 0$	(NO MASSIESS
	5	915
	$-\frac{t_1}{2r_1} > 0$	
	2	ורכ
	Odd	particles)

,	$\omega_0^{\sharp 1}$	$f_{0}^{#1}$	$f_{0}^{#2}$	$\omega_{0}^{#1}$		$\omega_{2^{+}\alpha\beta}^{\#1}$	$f_{2^{+}\alpha\beta}^{\#1}$	$\omega_{2^{-}\alpha\beta\chi}^{\#1}$
$\omega_{0}^{\#1}$ †	t_3	$-i\sqrt{2} kt_3$	0	0	$\omega_{2^{+}}^{\sharp 1}\dagger^{lphaeta}$	<u>t</u> 1	$-\frac{ikt_1}{\sqrt{2}}$	0
$f_{0}^{#1}$ †	$i\sqrt{2}kt_3$	$2k^2t_3$	0	0			,	
$f_{0}^{#2} \dagger$	0	0	0	0	$f_{2^{+}}^{#1} \dagger^{\alpha\beta}$	$\frac{i k t_1}{\sqrt{2}}$	$k^2 t_1$	U
$\omega_{0}^{\#1}$ †	0	0	0	$-t_1$	$\omega_2^{\#_1} \dagger^{\alpha\beta\chi}$	0	0	$k^2 r_1 + \frac{t_1}{2}$

_	$\omega_{1}^{\#1}{}_{lphaeta}$	$\omega_{1}^{\#2}{}_{\alpha\beta}$	$f_{1+\alpha\beta}^{\#1}$	$\omega_{1}^{\sharp 1}{}_{lpha}$	$\omega_{1^{-}\ lpha}^{$ #2}	$f_{1-\alpha}^{\#1}$	$f_{1-\alpha}^{#2}$
$\omega_{1}^{\sharp 1} \dagger^{lpha eta}$	$k^2 (2r_1 + r_5) - \frac{t_1}{2}$	$-\frac{t_1}{\sqrt{2}}$	$-\frac{ikt_1}{\sqrt{2}}$	0	0	0	0
$\omega_{1}^{\#2} \dagger^{lphaeta}$	$-\frac{t_1}{\sqrt{2}}$	0	0	0	0	0	0
$f_{1}^{\#1} \dagger^{\alpha\beta}$	$\frac{ikt_1}{\sqrt{2}}$	0	0	0	0	0	0
$\omega_1^{\sharp 1}\dagger^lpha$	0	0	0	$\frac{1}{6} \left(6 k^2 \left(r_1 + r_5 \right) + t_1 + 4 t_3 \right)$	$\frac{t_1-2t_3}{3\sqrt{2}}$	0	$\frac{1}{3}$ i k (t ₁ - 2t ₃)
$\omega_1^{\#2} \uparrow^{lpha}$	0	0	0	$\frac{t_1 - 2t_3}{3\sqrt{2}}$	<u>t₁+t₃</u> 3	0	$\frac{1}{3} i \sqrt{2} k (t_1 + t_3)$
$f_{1}^{#1} \dagger^{\alpha}$	0	0	0	0	0	0	0
$f_{1}^{#2} \dagger^{\alpha}$	0	0	0	$-\frac{1}{3} \bar{i} k (t_1 - 2 t_3)$	$-\frac{1}{3}\bar{l}\sqrt{2}k(t_1+t_3)$	0	$\frac{2}{3}k^2(t_1+t_3)$





Unitarity conditions

 $r_1 < 0 \&\& r_5 < -r_1 \&\& t_1 > 0 \&\& t_3 < -t_1 || t_3 > 0$