Particle spectrograph

Wave operator and propagator

Spin-parity form Covariant form	ariant form	Multiplicities
#2 0 ⁺ r ==0	$0 = g_D I^a g_{\bar{g}}$	1
#1 0 ⁺ r ==0	$_{p}^{\alpha}$ $_{1g}$ $_{0}$ $_{$	1
$_{1}^{+2} \alpha + 2 i k_{1}^{+2} \sigma^{\alpha} = 0$	$\partial_\chi \partial_\beta \partial^\alpha t^{\beta\chi} == \tilde{q}_{\varphi} \partial^\chi \partial_\beta t^{\alpha\beta} + 2 \ \partial_\sigma \partial^\delta \partial_\chi \partial_\beta \sigma^{\alpha\beta\chi}$	е
$\frac{*1}{1} \frac{\alpha}{t} = 0$	$_{ng^{1}}^{g}\mathcal{O}_{\mathcal{N}}\mathcal{O}_{\mathcal{N}} = _{ng^{1}}^{g}\mathcal{O}_{\mathcal{N}}\mathcal{O}_{\mathcal{N}}$	8
$\int_{1}^{\#1} r^{\alpha\beta} + i k_{1}^{\#2} \sigma^{\beta} = 0$		м
$2^{+}_{1} r^{\alpha\beta} - 2 i k_{2}^{+} \sigma^{\beta} = 0$	$ 2^{*}_{1}{}_{1}{}^{\alpha\beta} - 2 i k_{2}^{*}{}^{\alpha\beta} = 0 $ $ -i (4 \partial_{\delta} \partial_{\chi} \partial^{\beta} \partial^{\alpha} t^{\chi^{\delta}} + 2 \partial_{\delta} \partial^{\delta} \partial^{\alpha} t^{\chi}{}_{\chi} - 3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\alpha} t^{\beta\chi} - 3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\alpha} t^{\beta\chi} - 3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\alpha} t^{\alpha\beta} + 3 \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\alpha} t^{\alpha\beta} + 3 \partial_{\delta} \partial^{\beta} \partial_{\chi} \partial^{\alpha} t^{\alpha\beta} + 3 \partial_{\delta} \partial^{\beta} \partial_{\chi} \partial^{\alpha} t^{\alpha\beta} + 3 \partial_{\delta} \partial^{\beta} \partial_{\chi} \partial^{\alpha} t^{\alpha\beta} + 3 \partial_{\delta} \partial^{\alpha} \partial^{\alpha} t^{\alpha\beta} + 3 \partial_{\delta} \partial^{\alpha} \partial^{\alpha} \partial^{\alpha} t^{\alpha\beta} + 3 \partial_{\delta} \partial^{\alpha} \partial^{\alpha} t^{\alpha\beta} + 3 \partial_{\delta} \partial^{\alpha} \partial^{\alpha} \partial^{\alpha} \partial^{\alpha} t^{\alpha\beta} + 3 \partial_{\delta} \partial^{\alpha} \partial^$	Ю
	$3\partial_{\delta}\partial^{2}\partial_{\chi}\partial^{\chi}\tau^{\beta\alpha} + 4 \ i \ k^{\chi} \ \partial_{\varepsilon}\partial_{\chi}\partial^{\beta}\partial^{\alpha}G^{\delta\varepsilon} - 6 \ i \ k^{\chi} \ \partial_{\varepsilon}\partial_{\delta}\partial_{\chi}\partial^{\alpha}G^{\beta\delta\varepsilon} - 6 \ i \ k^{\chi} \ \partial_{\varepsilon}\partial_{\delta}\partial_{\chi}\partial^{\alpha}G^{\delta\varepsilon} + 2 \ \eta^{\alpha\beta} \ \partial_{\varepsilon}\partial_{\varepsilon}\partial_{\delta}\partial_{\chi}\tau^{\chi\delta} +$	
	$6i \ k^{X} \ \partial_{e} \partial^{e} \partial_{s} \partial_{\chi} \alpha^{\alpha 6 \beta} + 6i \ k^{X} \ \partial_{e} \partial^{e} \partial_{s} \partial_{\chi} \alpha^{\beta 6 \alpha} - 2i \ \alpha^{\alpha \beta} \ \partial_{e} \partial_{s} \partial_{s} \partial_{\tau} \chi_{\chi} - 4i \ \eta^{\alpha \beta} \ k^{X} \ \partial_{\phi} \partial^{\phi} \partial_{e} \partial_{\chi} \alpha^{6 e} \) = 0$	
Total expected gauge generators:	nerators:	16

$^{+1}_{1}$ $^{+1}_{1\alpha\beta}$ $^{+2}_{1}$ $^{+2}_{1}$ $^{+2}_{1}$ $^{+2}_{1}$ $^{-1}_{1}$ $^{-1}_{1}$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\frac{-21 R^{2} C_{23} + \epsilon_{3} + \epsilon_{4} \epsilon_{4}}{(1 + k^{2})^{2} \delta_{5}^{2}} \qquad 0 \qquad 0 \qquad 0 \qquad 0$	$\frac{1}{5} \frac{-2k^4(2r_3+r_3)+k^2r_4}{(1+k^2)^2r_4^2} \qquad 0 \qquad 0 \qquad 0 \qquad 0$	$0 \qquad \frac{1}{k^2(2r_3+r_5)} \qquad -\frac{1}{\sqrt{2}(k^2+2k^4)(2r_3+r_5)} \qquad 0 \qquad \frac{i}{k(1+2k^2)(2r_3+r_5)}$	$0 \qquad \frac{1}{\sqrt{2}(k^2 + 2k^4)(2r_2 + r_5)} \left \frac{6k^2 (2r_3 + r_5) + t_1}{2(k + 2k^2)^2 (2r_2 + r_5)^2 t_1} \right 0 \left \frac{i(6k^2 (2r_3 + r_5) + t_1)}{\sqrt{2}\kappa(1 + 2k^2)^2 (2r_3 + r_5) t_1} \right $	0 0 0 0	$0 \qquad \frac{i}{k(1+2k^2)(2r_3+r_5)} - \frac{i(6k^2(2r_3+r_5)+t_1)}{\sqrt{2}k(1+2k^2)^2(2r_3+r_5)t_1} \qquad 0 \qquad \frac{6k^2(2r_3+r_5)+t_1}{(1+2k^2)^2(2r_3+r_5)t_1}$	$== \iiint (f^{\alpha\beta} \ \tau_{\alpha\beta} + \mathcal{R}^{\alpha\beta\chi} \ \sigma_{\alpha\beta\chi} + \frac{1}{6}t_1(2\ \mathcal{R}^{\alpha}_{\alpha}\ \mathcal{R}^{\theta}_{\beta}\ -4\ \mathcal{R}^{\theta}_{\alpha}\ \partial f^{\alpha} + 4\ \mathcal{R}^{\theta}_{i\theta}\ \partial^i f^{\alpha}_{\alpha}\ -2\ \partial_i f^{\theta}_{\theta}\ \partial^i f^{\alpha}_{\alpha}\ -2\ \partial_i f^{\alpha}_{\theta}$
	$\frac{i\sqrt{2}k}{t_1+k^2t_1}$			0	0	0	0	$\sigma_{\alpha\beta\chi} + \frac{1}{6}t_1(2)$
κβ	2 2 2	+r ₅)-	$t^3 (2r_3 + r_5) - t_4 (1 + t^2)^2 t_1^2$					Яαβх
$^{#2}_{\imath \beta}$ $1^+ \sigma_{lpha eta}$	$\frac{\sqrt{2}}{t_1 + k^2 t_1}$	$t_1 = \frac{-2k^2(2r_3+r_5)+t_1}{(1+k^2)^2t_1^2}$	$\frac{k}{i_1} = \frac{i(2k^3(2r))}{(1+k^2)}$	0	0	0	0	$\tau_{\alpha\beta} + 3$
$1^+ \sigma_{\alpha\beta}$ $1^+ \sigma_c$	0	$-\frac{\sqrt{2}}{t_1+k^2t_1}$	$\frac{i\sqrt{2}k}{t_1+k^2t_1} = \frac{i(2, -1)}{t_1+k^2t_1}$	0	0	0 0	0 0	$\int (f^{\alpha \beta} t^{\alpha \beta} + 1)$
	$\begin{array}{ccc} & & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ &$			$\frac{#1}{1}\sigma + \frac{\alpha}{\sigma}$ 0 0	$\frac{#^2}{1^2}\sigma^{\dagger}^{\alpha}$ 0 0	$\frac{\#1}{1}\tau^{+}$ 0 0	$\frac{#2}{1}\tau^{+}$ 0 0	$S == S = \iiint (f^{\alpha\beta} t_{\alpha\beta} + S)$

a			7 11 . Ω ^ε Ω Ω ^ο	γ . /, -4 . / . / . / . / . / . / . / . / . / .	$Z : I : O_{\varepsilon}O \circ O_{\delta}O : I : X : O_{\phi}O : O_{\varepsilon}O_{\chi}O : O_{\delta}I = O_{\delta}O$		
Total e	xpected	Total expected gauge generators:	ators:				
	$1^{+1} \sigma_{\alpha\beta}$	$_{1}^{\#2}$	$\overset{\#1}{1}^+\tau\alpha\beta$	$^{*1}_{1}\sigma_{lpha}$	$^{#2}_{1}\sigma_{lpha}$	$\overset{\#1}{1}^{r}\tau_{\alpha}$	
$1^+ \sigma^{\dagger}$	0	$\frac{\sqrt{2}}{t_1 + k^2 t_1}$	$\frac{i \sqrt{2} k}{t_1 + k^2 t_1}$	0	0	0	
$1^+ \sigma^+$	$\frac{\sqrt{2}}{t_1 + k^2 t_1}$	$\frac{-2 k^2 (2 r_3 + r_5) + t_1}{(1 + k^2)^2 t_1^2}$	$\frac{-2i \ k^{2} (2r_{3}+r_{5})+i \ k \ \underline{t}}{(1+k^{2})^{2} t_{1}^{2}}$	0	0	0	
1^{+1} τ	$\frac{i\sqrt{2}k}{t_1+k^2t_1}$	$\frac{i(2k^3(2r_3+r_5)-k\ \underline{4})}{(1+k^2)^2t_1^2}$	$\frac{1}{(1+k^2)^2 t_1^2} \frac{-2 k^4 (2 r_3 + r_5) + k^2 t_1}{(1+k^2)^2 t_1^2}$	0	0	0	
$\frac{#1}{1^{\circ}}\sigma^{\dagger}$	0	0	0	$\frac{1}{k^2 \left(2 r_3 + r_5\right)}$	$-\frac{1}{\sqrt{2}(k^2+2k^4)(2r_3+r_5)}$	0	- "
$\frac{#2}{1^{-}}\sigma^{+}$	0	0	0	$-\frac{1}{\sqrt{2}\left(k^2+2k^4\right)(2r_3+r_5)}$	$\frac{6 k^2 (2 r_3 + r_5) + t_1}{2 (k + 2 k^3)^2 (2 r_3 + r_5) t_1}$	0	i √2 μ
$\frac{#1}{1}r^{\alpha}$	0	0	0	0	0 0		
$\frac{#2}{1^-}$ τ	0	0	0	$\frac{i}{k(1+2k^2)(2 r_3+r_5)}$	$-\frac{i(6k^2(2r_3+r_5)+t_1)}{\sqrt{2}k(1+2k^2)^2(2r_3+r_5)t_1}$	0	(1
# S) ($c_{\alpha\beta} + \mathcal{A}^{\alpha\beta\chi} c$ $\frac{1}{3} r_2 (4 \partial $	$a_{0X} + \frac{1}{6}t_{1}(2\mathcal{A}^{\alpha})$ $a_{0\delta} a + 4\partial f^{\alpha} a \partial \partial \partial g^{\alpha} + 3\partial a_{0}$ $a_{0\delta} a - 2\partial_{\beta}\mathcal{A}_{\alpha 0} + 3\partial \partial \partial \partial \partial \partial g^{\beta} + 3\partial \partial \partial \partial \partial g^{\beta} \partial g^{\beta} + 3\partial \partial \partial \partial g^{\beta} \partial g^{$	$\begin{array}{lll} & \mathcal{A}_{\beta}^{\theta} - 4 \mathcal{A}_{\alpha\theta}^{\theta} \hat{c} \\ & \delta f_{\beta}^{\alpha} - 6 \delta f_{\beta\theta} \delta^{\beta} f^{\alpha \alpha} \\ & f_{\alpha} \delta^{\beta} f^{\alpha \alpha} + 6 \mathcal{A}_{\alpha\theta\theta} \\ & - 2 \delta_{\beta} \mathcal{A}_{\beta\alpha} - \delta_{\beta} \mathcal{A}_{\alpha\theta\theta} \\ & \theta \delta^{\beta} \mathcal{A}_{\alpha\beta} + \delta_{\alpha} \mathcal{A}^{\beta} \\ & \mathcal{A}_{\alpha\beta} \delta_{\beta} \mathcal{A}_{\beta} + 2 \hat{c} \\ & \mathcal{A}^{\alpha\beta} \delta_{\beta} \mathcal{A}_{\beta} + 2 \hat{c} \\ & \mathcal{A}^{\alpha\theta} - 2 \delta^{\beta} \mathcal{A}_{\alpha}^{\alpha} \delta_{\beta} + 2 \hat{c} \end{array}$	$= = \int_{\partial \beta_{\alpha}} f_{\alpha\beta} d_{\alpha\beta} + \frac{1}{6} t_{1} (2 \mathcal{A}^{\alpha}_{\alpha} \mathcal{A}_{\beta}^{\theta} - 4 \mathcal{A}_{\alpha\theta}^{\theta} \partial_{\beta} f^{\alpha} + 4 \mathcal{A}_{\beta}^{\theta} \partial^{\beta} f^{\alpha} - 2 \partial_{\beta} f^{\theta} \partial^{\beta} f^{\alpha} + 4 \mathcal{A}_{\beta}^{\theta} \partial^{\beta} f^{\alpha} - 2 \partial_{\beta} f^{\theta} \partial^{\beta} f^{\alpha} + 4 \mathcal{A}_{\beta}^{\theta} \partial^{\beta} f^{\alpha} + 3 \partial_{\beta} f^{\alpha} + 3 \partial_{\beta} f^{\alpha} \partial^{\beta} f^{\alpha} + 3 \partial_{\beta} f^{\alpha} \partial^{\beta} f^{\alpha} + 3 \partial_{\beta} f^{\alpha} \partial^{\beta} f^{\alpha} + 6 \mathcal{A}_{\alpha\theta} (\mathcal{A}^{\alpha\theta} + 2 \partial_{\beta} f^{\alpha}) + 3 \partial_{\beta} f^{\alpha} \partial^{\beta} f^{\alpha} \partial^{\beta} f^{\alpha} \partial^{\beta} f^{\alpha} \partial^{\beta} f^{\alpha} \partial^{\beta} $	-2 0f' \alpha \theta \theta^4; \alpha \theta \theta^4; \alpha \theta \t	9 9 9 + 1
	1+1	1^{*1}_{1} $\mathcal{A}_{lphaeta}$ 1^{+}_{5}	$_{1}^{*2}$ $_{3}^{*1}$ $_{4}^{*2}$ $_{4}^{*2}$ $_{5}^{*3}$	$\stackrel{\#1}{1^-}\mathcal{A}_lpha \qquad \stackrel{\#2}{1^-}\mathcal{A}_lpha$	$rac{\#1}{lpha} rac{\#2}{1^-f_lpha} rac{\#2}{1^-f_lpha}$	2 σ† 	#1 2 σ†
						ſ	c

 $2^{+1} \sigma_{\alpha\beta}$

 $(1+2k^2)^2t$

2 i √2 k

 $(1+2k^2)^2t_1$

))[t,x,y,z]dzdydx

 $1+r_5(\partial_i\mathcal{A}_{\theta \ \kappa}^{\ \kappa}\partial^\theta\mathcal{A}^{\alpha_i})$

^{#1} σ†

^{#1}₂ τ †

0 0 0

0

0 0

 $k^2 (2 r_3 + r_5)$ -

0 0

0

 $\frac{t_1}{\sqrt{2}}$

 $^{\#2}_{1}$ $^{#1}_{1}f^{\alpha\beta}$

#1 2⁺ ταβ

2 i √2 k

 $(1+2k^2)^2t$

 $(1+2k^2)^2t_1$

0 0

0

 $k^2 (2 r_3 + r_5) +$

0

0 0

 $^{\#2}_{1}\mathcal{A}^{\dag}_{}$ $^{*1}_{1}\mathcal{A}^{\dagger}$

 $2^{+1}\sigma_{\alpha\beta\chi}$

3 1

 $\overset{\#1}{2^+}\mathcal{A}\dagger^{\alpha\beta}$

 $\overset{\#1}{2}\mathcal{F}(\uparrow)$

 $2k^2t_1$ 0

0

0

0 0 $2^{+1}\mathcal{A}_{\alpha\beta}$ $2^{+}f_{\alpha\beta}$ $2^{-}\mathcal{A}_{\alpha\beta\chi}$

 $-\frac{i \ k \ t}{\sqrt{2}}$

 $k^2 t_1$

 ${\overset{\#1}{0^{+}}} \sigma \overset{\#1}{0^{+}} \tau \overset{\#2}{0^{+}} \tau \overset{\#1}{0^{-}} \sigma$

0

0 0

0

0

 $\frac{1}{6 k^2 r_3}$

0

#1 0⁺ τ†

 0^{+}_{f}

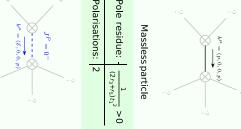
85

0

#1 0+ A+ #1 0⁺f†

Massive and massless spectra

Parity:	Spin:	Squaremass:	Pole residue: -	ייומטטיאר שמו נוכוכ
Odd	0	$\frac{t_1}{t_2} > 0$	$\frac{1}{r_2} > 0$	<u>.</u>



Unitarity conditions