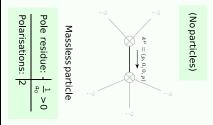
## Particle spectrograph

## Wave operator and propagator

	$\frac{2i\sqrt{2}h}{a_0(2+k^2)}$	$\frac{i \ k(4+k^2)}{a_0 (2+k^2)}$	$i  k(6+5k)$ $\sqrt{6}  a_0 (2+k)$ $i  \sqrt{\frac{5}{6}}  k$	2 i k(3+k² $\sqrt{3}$ a <sub>0</sub> (2+k	$\frac{i\sqrt{\frac{2}{3}}k}{a_0(2+k^2)}$	$\frac{2k^2}{a_0(2+k^2)^2}$	#1 3	$3^{1}\mathcal{A}_{\alpha\beta}$	γ 3 Δ †	$\frac{3^{1}}{3}\Delta_{a}$																					
0	0	$\frac{k^2}{\sqrt{6} a_0 (2+k^2)}$	$ \begin{array}{c c}  & 1 \\  & 2a_0 - \frac{8a_0}{2 + 3k^2} \\ \hline  & \sqrt{5} \\  & 6a_0 \end{array} $	ı.		$i \sqrt{\frac{2}{3}} k$ $2a_0 + a_0 k^2$	S	$S = \iiint \left(\frac{1}{4} \left(2 a_0 \mathcal{A}^{\alpha \beta}_{\alpha} \mathcal{A}^{\chi}_{\beta \chi} + 4 h^{\alpha \beta} \mathcal{T}_{\alpha \beta} + \mathcal{A}^{\alpha \beta \chi} \left(-2 a_0 \mathcal{A}_{\beta \chi \alpha} + 4 \Delta_{\alpha \beta \chi}\right) - a_0 h^{\chi}_{\chi} \partial_{\beta} \mathcal{A}^{\alpha \beta} + a_0 h^{\chi}_{\chi} \partial_{\beta} \mathcal{A}^{\alpha \beta}_{\alpha} - 2 a_0 h_{\alpha \chi} \partial_{\beta} \mathcal{A}^{\alpha \beta \chi} + 2 a_0 h_{\beta \chi} \partial^{\chi} \mathcal{A}^{\alpha \beta}_{\alpha}\right) ) [t,  \chi,  y,  z] d z d y d \chi d t$																		<u>-</u>					
	$\frac{\sqrt{\frac{2}{3}} k^2}{a_0 (2+k^2)}$	$\frac{k^2 (5+2k^2)}{\sqrt{3} \ a_0 (2+k^2)^2}$	$\frac{-2+k^2}{3\sqrt{2} \ a_0 (2+k^2)^2}$ $\sqrt{\frac{5}{2}}$ $6a_0 + 3a_0 k^2$	$\frac{2(17+14  k^2+3  k^4)}{3  a_0  (2+k^2)^2}$	$-\frac{\sqrt{2}(7+3 \ k^2)}{3 a_0 (2+k^2)}$	$\frac{2i \ k(3+k^2)}{\sqrt{3} \ a_0 (2+k^2)^2}$	$\frac{#1}{1}h\alpha$	0 0	0 4 4 4	4 1/2	i & k 4 √6	$\frac{1}{4} \tilde{l} \sqrt{\frac{5}{6}} a_0 k$ $\frac{i \cdot a_k}{4 \cdot \sqrt{3}}$	1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	0				·	M	1ultiplicitie	c 4		×								
0	0	$\sqrt{\frac{5}{6}} k^2$ $4a_0 + 2a_0 k^2$	$\frac{\sqrt{5(10+3 \ k^2)}}{12  a_0  (2+k^2)}$ $\frac{1}{12  a_0}$	1.01		$i \sqrt{\frac{5}{6}} k$ $2a_0 + a_0 k^2$	#6 1- Aα	0	0	0	- e	$\frac{\sqrt{5} a_0}{6 \sqrt{2}}$		= 1 \(\frac{i \alpha k}{4 \sqrt{6}}\)	#3 0	#3 0 <sup>+</sup> Δ + 2 0 <sup>+</sup> Δ + 3 0 <sup>+</sup> Δ ==0	$\partial_{\alpha}\Delta^{\alpha\beta}_{\beta} == 0$		1		_ 5	ااه	loi Iloi	-		0					
	$\frac{2 k^2}{\overline{s} a_0 (2 + k^2)}$			12.			1. B		0		$\frac{a_0}{6\sqrt{2}}$	$-\frac{1}{6}\sqrt{\frac{5}{2}}$	$\frac{a_0}{6\sqrt{2}}$	0 k			$2\partial_{\chi}\partial^{\chi}\partial_{\beta}\mathcal{T}^{\alpha\beta}+\partial_{\delta}\partial_{\chi}\partial_{\beta}$		3		85	0 0	0 2	2 \(\sigma^2\)		<del>)</del>					
0 0	1		LOI	lπ	1.0	(2)2	1-1	0 0	0	0	, i	Ηİ«		414	To	Total expected gauge generators:	, , , , , , , , , , , , , , , , , , , ,		8		0+1 B+1	2 2		i ab k	0 0	<b>D</b>	٠,	0	0 0	0 8	<b>4</b>
	$\frac{\sqrt{2}(4)}{a_0(2)}$		$\frac{k^2(-2)}{2\sqrt{6}a_0}$ $\frac{\sqrt{\frac{5}{6}}}{\sqrt{4a_0+1}}$	$\frac{k^2 (5+)}{\sqrt{3} a_0 (6+)}$	<u>γ</u> √6(2 a			0	0	-									2i √6 k	<sup>#1</sup> Δ 0	#	# 0 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	### ### ### ##########################	2 # # # # # # # # # # # # # # # # # # #	#1 #1 #1 #1 #1 #1 #1 #1 #1 #1 #1 #1 #1 #	+ # # # .0 #	Χθα	0	0	D 0 4 C	0
0	0	$\frac{\sqrt{2}(4+k^2)}{a_0(2+k^2)}$	$\frac{2k^2}{\sqrt{3}(2 a_0 + a_0)}$	$\frac{\sqrt{\frac{2}{3}} k^2}{2 a_0 + a_0 k^2}$	0	$\frac{2i\sqrt{2}k}{2a_0+a_0k^2}$	$^{*1}_{1}\mathcal{A}_{\alpha}$ $^{*2}_{1}$	0								$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$\frac{1.9+3 k^2)}{6.6+3k^2)^2} - \frac{8 \sqrt{2}(10+3 k^2)}{a_0 (16+3k^2)^2}$	$-\frac{8i\sqrt{3}}{16a_0k+3a_0k^3}$	$\frac{72i \ k}{a_0 \left(16 + 3k^2\right)^2}$	0 #1 2 <sup>+</sup> /	Δ † αβ	$0 \frac{2\sqrt{a}}{a}$	T-	_	0		$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1 0 k 4 4 4 3 3 4 4 4 3	4 16		
O 4 °				0	_		8 1 <sub>+</sub> 3	0	<u>0</u> 4	0 0	0	0 0	0		#4	4 8 $8\sqrt{2}(10+3k^2)$ $8\sqrt{2}$	$\frac{16+3k^2)^2}{3a_0(16+3k^2)^2}$		$\frac{1}{a_0 (16+3k^2)^2}$ $i \sqrt{2} k (10+3k^2)$		_				0	0 #	αβ 2 <sup>#</sup> -9αα	0 ;		0 4 10	<u> </u>
a <sub>0</sub>	0 0	0	0 0	0	0 0		$^{#2}_{\alpha\beta}$ $^{1+}_{3}$ $^{a_0}$	2 1/2	0	0 0	0	0 0	0	0	#1	$^{+}\Delta$ $^{+}$ $\sqrt{3} (16 a_0 + 3 a_0 k^2) {a_0 (16 + 3 k^2)^2} {3 a_0}$	$ \begin{array}{c c} \hline (16+3k^2)^2 & \overline{3a_0(16+3k^2)^2} \\ \hline 8i & 8i\sqrt{\frac{2}{3}} \end{array} $	$\frac{16a_0k+3a_0k^3}{4}$	$a_0 (16+3k^2)^2$ $4 \sqrt{3}$						0	#	αβ 2+ Ac	- <u>a</u> 0	<u> </u>		
3 0	0	0	0 0	0	0 z	0	#	!						α 0	#2	2 2i√6k 72ik 8ik	$(19+3k^2)   4i\sqrt{2}k(10+3k^2)$		36 k²			$a_0 k$ $\sqrt{3}$ $\sqrt{3}$	$a_0 k$ $a_0 k$	$a_0 k^2$		0 #	$2^{+}\beta$	87 8	<del>3</del> α	* * *	<b>&gt;</b>
$1^+\Delta^{\dagger}$ $^{#3}$ $^{\alphaeta}$	$1^{*1}_{1}\Delta^{\circ}_{1}$	#2 1-Ơ	#3 1-\(\Delta\)+ 1-\(\Delta\)+	#5 1- \(\rac{\chi}{1}\)	#6 1-Ơ	$1^{*1}$	#1	1+3+2 1+3+4 1+3+4	$1^{+}_{\mathcal{A}}\mathcal{A}^{+}$	1-3+ 1-3+ 1-3+	1-3+	1 # # # # # # # # # # # # # # # # # # #	#6 1 <sup>-</sup> A+	#1 1-h+		102013201 20(10+31) 20(1		0 0	a <sub>0</sub> (10+3x-)		_	0 0	0	0	0	$\frac{4}{a_0}$	#1 2 <sup>+</sup> 34+	2+3+ 2+3+	2+3+	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	2.91
		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Covariant form   Cov	Selection of the select	Sumparity of the control of the cont	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	S =	□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	Color   Colo

## Massive and massless spectra



## **Unitarity conditions**