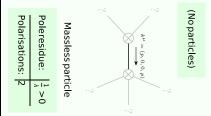
Particle spectrograph

Wave operator and propagator

Multiplicities	1	1	1	8	3	ĸ	м	м	м	м	$\delta x + 5$	$a\delta = a$ $8\delta \lambda \lambda$	$\sigma^{\alpha \lambda \beta} + \sigma^{\beta \lambda \beta} + \sigma^{\beta$.86 5	N	34	#1 0+ \sigma 0+ \tau 0+ \tau 0+ \tau #1 0 \sigma	† 0 † 0 † 0	0 $-\frac{1}{2k^2\lambda}$ 0 0	#2 0+ τ 0 0 0	0 0 0	#1 2 ⁺ σ† 2 ⁺ τ† 2 ⁺ σ†	αβ † αβ †	1 # σαβ 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	$ \begin{array}{c} 1 \\ + \tau \alpha \beta \\ 0 \\ \frac{1}{k^2 \lambda} \end{array} $	#1 σ αβ) 0 0										
								$^{3} + \partial_{\chi}\partial^{\beta}t^{\alpha\chi} + \partial_{\chi}\partial^{\chi}t^{\beta\alpha}$		$\partial_{\sigma}\partial_{\chi}\partial^{\alpha}\sigma^{\beta\chi\delta}+\partial_{\sigma}\partial^{\delta}\partial_{\chi}\sigma^{\alpha\chi\beta}==\partial_{\sigma}\partial_{\chi}\partial^{\beta}\sigma^{\alpha\chi\delta}+\partial_{\sigma}\partial^{\delta}\partial_{\chi}\sigma^{\beta\chi\alpha}$	$_{\delta} + 2 \ \partial_{\varepsilon} \partial^{\varepsilon} \partial_{\delta} \partial^{\beta} \sigma^{\alpha \chi \delta} + 4 \ \partial_{\varepsilon} \partial^{\varepsilon} \partial_{\delta} \partial^{\beta} \sigma^{\alpha \delta \chi} + $ $(\sigma^{\alpha \beta \delta} + 2 \ \partial_{\varepsilon} \partial^{\varepsilon} \partial_{\delta} \partial^{\chi} \sigma^{\alpha \delta \beta} + 2 \ \partial_{\varepsilon} \partial^{\varepsilon} \partial_{\delta} \partial^{\delta} \sigma^{\beta \chi \alpha}$	$\partial_{c}\delta^{2}\partial_{c}\delta^{\partial}X^{\alpha\mu\nu} + 2 \partial_{c}\delta^{2}\partial_{c}\delta^{\alpha}X^{\alpha\nu\nu} + 2 \partial_{c}\delta^{2}\partial_{c}\delta^{2}\sigma^{\nu},$ $_{\delta} + 3 \eta^{\alpha\chi} \partial_{\phi}\partial^{\phi}\partial_{c}\partial_{c}\partial_{c}\delta^{\epsilon} + 3 \eta^{\beta\chi} \partial_{\phi}\partial^{\phi}\partial_{c}\partial^{\epsilon}\sigma^{\epsilon}\sigma^{\delta}_{\delta}$ $\partial^{c}\partial_{c}\partial_{c}\partial_{c}\partial_{c}\partial_{c}\partial_{c}\partial_{c}\partial_$		$2\partial_{\varepsilon}\partial^{\varepsilon}\partial_{\varepsilon}\partial^{\sigma}\partial^{\kappa''} + 2\partial_{\varepsilon}\partial^{\varepsilon}\partial_{\sigma}\partial^{\kappa'''} + 4\partial_{\varepsilon}\partial^{\varepsilon}\partial_{\sigma}\partial^{\kappa''} + 2\partial_{\varepsilon}\partial^{\varepsilon}\partial_{\sigma}\partial^{\sigma}\partial^{\sigma}\partial^{\sigma}\partial^{\sigma}\partial^{\sigma}\partial^{\sigma}\partial^{\sigma}\partial^$	$\partial_{\delta}\partial_{\chi}\partial^{\alpha}\sigma^{\beta\chi\delta} + 3 \ \partial_{\delta}\partial_{\chi}\partial^{\beta}\sigma^{\alpha\chi\delta} + 2 \ \eta^{\alpha\beta} \ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\sigma^{\chi\delta} = = 2 $ $2 \partial_{\delta}\partial^{\beta}\partial^{\alpha}\sigma^{\chi\delta} + 3 (\partial_{\delta}\partial^{\delta}\partial_{\chi}\sigma^{\alpha\chi\beta} + \partial_{\delta}\partial^{\delta}\partial_{\chi}\sigma^{\beta\chi\alpha})$	ς (3	S ==	$\int (f^{\alpha\beta})$	$\tau_{\alpha\beta}$	+ Α ^{αβ}	$\sigma_{lpha_{eta}}^{3\chi}$ $\sigma_{lpha_{eta}}^{3\chi}$	$_{\theta X}^{\beta X}$ + $_{\theta}^{\alpha}$ $\partial_{x}f^{\alpha}$	f ^{αı} (∂ ₁ G	η _{αθ} -	$\partial_{ heta}\mathcal{R}_{lpha}^{ heta}$)-4 f	$\alpha = \partial_{\theta} S$	A' ^θ , +	-4 A	$_{\alpha\theta_{I}}$ $\partial^{\theta_{I}}$	" ∂ _θ f α θ - f α - 2 ∂ α z] d z α	$f_{i\theta} \partial^{\theta} f$	c ^{αι} -		
							χ _g	$==$ $Q_{\alpha} \tau^{\chi \beta}$	$\partial_t \partial_\chi \partial^\beta \sigma^{\alpha\chi\delta}$	$^{\chi_{\alpha}} \rho_{\beta} \rho_{\alpha \chi}$	$\partial_{\varepsilon}\partial^{\varepsilon}\partial^{\chi}\partial^{\alpha}\sigma^{\beta\delta}_{\delta} + 2 \varepsilon$ $+4 \partial_{\varepsilon}\partial^{\varepsilon}\partial_{\kappa}\partial^{\chi}\sigma^{\alpha\beta\delta}$	Õ	δ +. 8δα	$^{3\chi}$ $\partial_{\phi}\partial_{\phi}$	$2 \eta^{\alpha\beta}$ $^3 + \partial_{\alpha}\partial^{\alpha}$		$f_{\alpha} \stackrel{#2}{1} f_{\alpha}$	0 0	0 0	0 0	0 0			0 0 0		0	0	0	0	0	0		#1	#	#1	#1
							$_{\beta} = _{\beta} = _{\beta} \partial_{\beta} \sigma^{\alpha \beta \chi}$.αβ ==	== 36	== &	$\partial^{\alpha}\sigma^{\beta \zeta}$	F3 7	$+3 \ o_{e} \partial^{+} \partial^{+} \partial^{+} \partial^{-} \partial^{-}$	+3 n ^t	$+\frac{\chi\chi_{\mathcal{O}}}{2}$	<	$\mathcal{A}_{\alpha} \stackrel{\#1}{1^-} f_{\alpha}$							-1,	٠ <u>ـــــ</u>	0	0	0	0	0	0	#1 .		<i>Ά</i> αβ 2	! ⁺ f αβ	$2^{\frac{1}{2}}\mathcal{A}_{\alpha\beta\chi}$
				βκ	3α		= .	$\partial_{\chi}\partial^{\chi} \tau$	$\sigma^{\alpha \beta \chi}$	$\sigma^{\alpha\chi\beta}$	εθεθχ _ι +4 θε	766 H	ο _ε σ ⁻ ι F2 ο _ε	$r^{\delta\epsilon}_{\delta}$ +	$\partial^{\beta} \sigma^{\beta}$		# ₂	0	0	0	0	0	0	0 7	0	0	0	0	0	0	0	2 ⁺ <i>A</i> †		0	0	0
	0 ==			$\partial_{\chi}\partial_{\beta}\partial^{\alpha}\tau^{\beta\chi} := \partial_{\zeta}\partial^{\chi}\partial_{\beta}\tau^{\alpha\beta}$	$a_{\partial^X} \partial_\beta \tau^{\beta\alpha}$		$\alpha^{\alpha\beta}_{\beta}$	$\partial_{\chi}\partial^{\alpha}\tau^{\beta\chi} + \partial_{\chi}\partial^{\beta}\tau^{\chi\alpha} + \partial_{\chi}\partial^{\chi}\tau^{\alpha\beta}$	$\partial_{\delta}\partial_{\chi}\partial^{\alpha}\sigma^{\beta\chi\delta} + \partial_{\delta}\partial^{\delta}\partial_{\chi}\sigma^{\alpha\beta\chi}$	$^{5}\partial^{\delta}\partial_{\chi}$		∂^{α}	+ 3 ₁ χδβ ₊	$\partial_{\epsilon}\partial^{\beta}c$	$\frac{\partial_{\delta}\partial_{\chi}\partial^{\alpha}\sigma^{\beta\chi\delta}+3}{2\delta_{\delta}\partial_{\chi}\partial^{\beta}\sigma^{\alpha\chi\delta}}+3}$ $\frac{2}{\delta_{\lambda}\partial^{\beta}\partial^{\alpha}\sigma^{\chi\delta}}+3\left(\frac{\partial_{\lambda}\partial^{\delta}\partial_{\lambda}\sigma^{\alpha\chi\beta}}{2}\right)$	· .:	1^*							į	g 🗀							$2^{+1}f$		0	$k^2 \lambda$	0
form	$\partial_{\delta}\sigma_{\alpha\beta\chi}$	0 ==	0	== 46	== 46	0 ::	$\partial_{\chi}\partial^{\alpha}\sigma^{\beta\chi}_{\beta} + \partial_{\chi}\partial^{\chi}\sigma^{\alpha\beta}_{\beta}$	$\partial_{\chi}\partial^{\beta}$	5 + 0,	5 + 0,	$\partial_{\delta}\partial^{\chi}\partial^{\alpha}\sigma^{\beta\delta\varepsilon} + 3$	90,00	$3 \sigma_{\epsilon} \sigma_{\delta} \sigma^{\lambda} \sigma^{\mu} \sigma^{\mu\nu}$ $2 \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\alpha} \sigma^{\lambda \mu}$	$\partial_{\phi}\partial_{\phi}$	3x6 +	x rator	$\frac{*1}{1^+f^{\alpha\beta}}$	0	0	0	0	0	0	0 #1		0	0	0	0	0	0	#1 2 <i>Α</i> †	BX	0	0	0
riant		r ^{αβ} ==	β == 0	$^{)\alpha}t^{\beta\chi}$	βα ¹ βχ	$\partial_{\chi}\partial_{\beta}\sigma^{\alpha\beta\chi} == 0$	J ^{BX} .	ι ^{βχ} +	$^{\beta a}\sigma ^{eta \chi}$	$\partial^{\alpha}\sigma^{eta\chi}$,60×0°	3 n ⁸ X	, _E 0 ₅ 0° 2 0 _E 0 ^E	3 n ^{aX}	$^{\chi}\partial^{\alpha}\sigma$	gene	#1 τβ 1 ⁺	•	•	•	-	•	•	- #-	٠L				•	•	•		#1 0 ⁺ <i>A</i> (#1 0 ⁺ f	#2 0 ⁺ f	#1 0 <i>A</i>
Covariant form	$\epsilon \eta_{\alpha\beta\chi\delta}$	$\partial_{\beta}\partial_{\alpha} \tau^{\alpha\beta}$	$\partial_{\beta}\sigma^{\alpha\beta}$	$\partial_\chi\partial_\beta\dot{c}$	$\partial_{\chi}\partial_{\beta}\partial^{\alpha}\iota^{\beta\chi} == 0$	$\partial_{\chi}\partial_{\beta}\iota$	$\partial_{\chi}\partial^{\alpha}$	$\partial_{\chi}\partial^{\alpha}$	$\partial_{\delta}\partial_{\chi}\dot{\epsilon}$	$\partial_{\delta}\partial_{\chi}\dot{\epsilon}$. , .	η .,	.,,	$\partial_{\delta}\hat{c}$	Jauge	1^{+2}_{-} $\mathcal{A}_{\alpha\beta}$	0	0	0	0	0	0	0 7 + 5	0	0	0	0	0	0	0	#1 0 ⁺ <i>A</i> †	0	0	0	0
Spin-parity form								0	0	0	= 0 3				0 3	Total expected gauge generators:	$_{1}^{*1}^{*1}$ $\mathcal{A}^{lphaeta}$	0	0	0	0	0	0	0 9	d o		0	0	0	0	0	#1 0 ⁺ f †		-2 k ² λ	0	0
parit	0==	0==	0==	$1^{\#2}_{1}{}^{\alpha} == 0$	0 ==	$\frac{#^2}{1^-\sigma} = 0$	$\frac{#1}{1}^{\alpha} = 0$	$_{1^{+}t}^{\#1}\alpha\beta==0$	0 == θπ	0 == θπ					$\sigma^{\alpha\beta} ==$	expe	1,4		αβ	βκ	αŢ	α	a T o	 *- *-	αβ	βι	gι	ø.	α.	8	α.	#2 0 ⁺ f †	0	0	0	0
Spin-	#1 0 <u>-</u> σ :	$0^{+2} = 0$	#1 0+ 0	$\frac{#2}{1} \alpha$	$1^{\#1} \stackrel{\alpha}{\tau}$	$\frac{#2}{1^{-}\sigma}$	$\frac{*1}{1}^{a}$	#1 a	$^{#2}_{1}^{\alpha\beta}$	$\frac{*1}{1^+\sigma}$	$^{#1}_{2} \alpha^{\beta\chi}$				#1 2+0	Total		$1^{*1}_{}\mathcal{A}^{\dagger}$	$^{\#2}_{1}$ 34	$1^{*1}f^{\dagger}$	$^{\#1}_{1}\mathcal{A}^{\pi}$	1. A	$1^{*1}f^{\alpha}$ $1^{*2}f^{\alpha}$	1-f+	+ + -+ -#	$1 - \frac{\alpha\beta}{1}$	1^{+1}_{1} $\alpha\beta$	$\frac{#1}{1}\sigma \uparrow^{\alpha}$	$\frac{#2}{1}\sigma \uparrow^{\alpha}$	$\frac{#1}{1}\tau^{\alpha}$	$\frac{#2}{1}$ τ \uparrow	#1 0 <i>A</i> †	0	0	0	0

Massive and massless spectra



Unitarity conditions