Particle spectrograph

Wave operator and propagator

Spin-parity form	Covariant form	Multiplicities
$\overset{\#1}{0^-}\sigma == 0$	$\epsilon\eta_{\alpha\beta\chi\delta}\ \partial^\delta\sigma^{\alpha\beta\chi} == 0$	1
$\overset{\#2}{0^+}\tau == 0$	$\partial_\beta\partial_\alpha\tau^{\alpha\beta} == 0$	1
$\overset{\#1}{0^+}\sigma == 0$	$\partial_\beta\sigma^{\alpha\beta}{}_\alpha == 0$	1
$\overset{\#2}{1^-}\tau^\alpha == 0$	$\partial_\chi\partial_\beta\partial^\alpha\tau^{\beta\chi} == \partial_\chi\partial^\chi\partial_\beta\tau^{\alpha\beta}$	3
$\overset{\#1}{1^-}\tau^\alpha == 0$	$\partial_\chi\partial_\beta\partial^\alpha\tau^{\beta\chi} == \partial_\chi\partial^\chi\partial_\beta\tau^{\beta\alpha}$	3
$\overset{\#2}{1^-}\sigma^\alpha == 0$	$\partial_\chi\partial_\beta\sigma^{\alpha\beta\chi} == 0$	3
$\overset{\#1}{1^-}\sigma^\alpha == 0$	$\partial_\chi\partial^\alpha\sigma^{\beta\chi}{}_\beta + \partial_\chi\partial^\chi\sigma^{\alpha\beta}{}_\beta == \partial_\chi\partial_\beta\sigma^{\alpha\beta\chi}$	3
$\overset{\#1}{1^+}\tau^{\alpha\beta} == 0$	$\partial_\chi\partial^\alpha\tau^{\beta\chi} + \partial_\chi\partial^\beta\tau^{\chi\alpha} + \partial_\chi\partial^\chi\tau^{\alpha\beta} == \partial_\chi\partial^\alpha\tau^{\chi\beta} + \partial_\chi\partial^\beta\tau^{\alpha\chi} + \partial_\chi\partial^\chi\tau^{\beta\alpha}$	3
$\overset{\#2}{1^+}\sigma^{\alpha\beta} == 0$	$\partial_\delta\partial_\chi\partial^\alpha\sigma^{\beta\chi\delta} + \partial_\delta\partial^\delta\partial_\chi\sigma^{\alpha\beta\chi} == \partial_\delta\partial_\chi\partial^\beta\sigma^{\alpha\chi\delta}$	3
$\overset{\#1}{1^+}\sigma^{\alpha\beta} == 0$	$\partial_\delta\partial_\chi\partial^\alpha\sigma^{\beta\chi\delta} + \partial_\delta\partial^\delta\partial_\chi\sigma^{\alpha\chi\beta} == \partial_\delta\partial_\chi\partial^\beta\sigma^{\alpha\chi\delta} + \partial_\delta\partial^\delta\partial_\chi\sigma^{\beta\chi\alpha}$	3
$\overset{\#1}{2^-}\sigma^{\alpha\beta\chi} == 0$ 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}{}_\delta + 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^{\beta\chi}\ \partial_\phi\partial^\phi\partial_\epsilon\partial^\alpha\sigma^{\delta\epsilon}{}_\delta + 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}{}_\delta + 3\ \eta^{\beta\chi}\ \partial_\phi\partial^\phi\partial_\epsilon\partial_\delta\sigma^{\alpha\delta\epsilon} + 3\ \eta^{\alpha\chi}\ \partial_\phi\partial^\phi\partial_\epsilon\partial^\epsilon\sigma^{\beta\delta}{}_\delta$	5
$\overset{\#1}{2^+}\sigma^{\alpha\beta} == 0$ 3	$\partial_\delta\partial_\chi\partial^\alpha\sigma^{\beta\chi\delta} + 3\ \partial_\delta\partial_\chi\partial^\beta\sigma^{\alpha\chi\delta} + 2\ \eta^{\alpha\beta}\ \partial_\epsilon\partial^\epsilon\partial_\delta\sigma^{\chi\delta}{}_\chi == 2\ \partial_\delta\partial^\beta\partial^\alpha\sigma^{\chi\delta}{}_\chi + 3(\partial_\delta\partial^\delta\partial_\chi\sigma^{\alpha\chi\beta} + \partial_\delta\partial^\delta\partial_\chi\sigma^{\beta\chi\alpha})$	5
Total expected gauge generators:		34

	$\overset{\#1}{0^+}\sigma$	$\overset{\#1}{0^+}\tau$	$\overset{\#2}{0^+}\tau$	$\overset{\#1}{0^-}\sigma$
$\overset{\#1}{0^+}\sigma\dagger$	0	0	0	0
$\overset{\#1}{0^+}\tau\dagger$	0	$-\frac{1}{2k^2\lambda}$	0	0
$\overset{\#2}{0^+}\tau\dagger$	0	0	0	0
$\overset{\#1}{0^-}\sigma\dagger$	0	0	0	0

	$\overset{\#1}{2^+}\sigma_{\alpha\beta}$	$\overset{\#1}{2^+}\tau_{\alpha\beta}$	$\overset{\#1}{2^-}\sigma_{\alpha\beta\chi}$
$\overset{\#1}{2^+}\sigma\dagger^{\alpha\beta}$	0	0	0
$\overset{\#1}{2^+}\tau\dagger^{\alpha\beta}$	0	$\frac{1}{k^2\lambda}$	0
$\overset{\#1}{2^-}\sigma\dagger^{\alpha\beta\chi}$	0	0	0

$$S == \iiiint (f^{\alpha\beta}\ \tau_{\alpha\beta} + \mathcal{A}^{\alpha\beta\chi}\ \sigma_{\alpha\beta\chi} + \tfrac{1}{2}\lambda(-4\ \mathcal{A}_\alpha{}^\theta{}_\theta\ \partial_\iota f^{\alpha\iota} + 4\ \partial_\iota\mathcal{A}^{\alpha\iota}{}_\alpha + 4\ \mathcal{A}_\iota{}^\theta{}_\theta\ \partial^\iota f^\alpha{}_\alpha - 2\ \partial_\iota f^\theta{}_\theta\ \partial^\iota f^\alpha{}_\alpha - 2\ \partial_\iota f^{\alpha\iota}\ \partial_\theta f_\alpha{}^\theta + 4\ \partial^\iota f^\alpha{}_\alpha\ \partial_\theta f_\iota{}^\theta - 4\ f^{\alpha\iota}\ (\partial_\iota\mathcal{A}_\alpha{}^\theta{}_\theta - \partial_\theta\mathcal{A}_\alpha{}^\theta{}_\iota) - 4\ f^\alpha{}_\alpha\ \partial_\theta\mathcal{A}^{\iota\theta}{}_\iota + 4\ \mathcal{A}_{\alpha\theta\iota}\ \partial^\theta f^{\alpha\iota} - 2\ \partial_\alpha f_{\iota\theta}\ \partial^\theta f^{\alpha\iota} - \partial_\alpha f_{\theta\iota}\ \partial^\theta f^{\alpha\iota} + \partial_\iota f_{\alpha\theta}\ \partial^\theta f^{\alpha\iota} + \partial_\theta f_{\alpha\iota}\ \partial^\theta f^{\alpha\iota} + \partial_\theta f_{\iota\alpha}\ \partial^\theta f^{\alpha\iota}))[t, x, y, z]\,dz\,dy\,dx\,dt$$

	$\overset{\#1}{1^+}\mathcal{A}_{\alpha\beta}$	$\overset{\#2}{1^+}\mathcal{A}_{\alpha\beta}$	$\overset{\#1}{1^+}f_{\alpha\beta}$	$\overset{\#1}{1^-}\mathcal{A}_\alpha$	$\overset{\#2}{1^-}\mathcal{A}_\alpha$	$\overset{\#1}{1^-}f_\alpha$	$\overset{\#2}{1^-}f_\alpha$
$\overset{\#1}{1^+}\mathcal{A}\dagger^{\alpha\beta}$	0	0	0		0	0	0
$\overset{\#2}{1^+}\mathcal{A}\dagger^{\alpha\beta}$	0	0	0		0	0	0
$\overset{\#1}{1^+}f\dagger^{\alpha\beta}$	0	0	0		0	0	0
$\overset{\#1}{1^-}\mathcal{A}\dagger^\alpha$	0	0	0		0	0	0
$\overset{\#2}{1^-}\mathcal{A}\dagger^\alpha$	0	0	0		0	0	0
$\overset{\#1}{1^-}f\dagger^\alpha$	0	0	0		0	0	0
$\overset{\#2}{1^-}f\dagger^\alpha$	0	0	0		0	0	0

	$\overset{\#1}{1^+}\sigma_{\alpha\beta}$	$\overset{\#2}{1^+}\sigma_{\alpha\beta}$	$\overset{\#1}{1^+}\tau_{\alpha\beta}$	$\overset{\#1}{1^-}\sigma_\alpha$	$\overset{\#2}{1^-}\sigma_\alpha$	$\overset{\#1}{1^-}\tau_\alpha$	$\overset{\#2}{1^-}\tau_\alpha$
$\overset{\#1}{1^+}\sigma\dagger^{\alpha\beta}$	0	0	0		0	0	0
$\overset{\#2}{1^+}\sigma\dagger^{\alpha\beta}$	0	0	0		0	0	0
$\overset{\#1}{1^+}\tau\dagger^{\alpha\beta}$	0	0	0		0	0	0
$\overset{\#1}{1^-}\sigma\dagger^\alpha$	0	0	0		0	0	0
$\overset{\#2}{1^-}\sigma\dagger^\alpha$	0	0	0		0	0	0
$\overset{\#1}{1^-}\tau\dagger^\alpha$	0	0	0		0	0	0
$\overset{\#2}{1^-}\tau\dagger^\alpha$	0	0	0		0	0	0

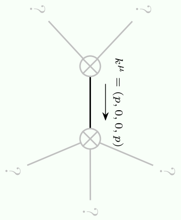
	$\overset{\#1}{2^+}\mathcal{A}_{\alpha\beta}$	$\overset{\#1}{2^+}f_{\alpha\beta}$	$\overset{\#1}{2^-}\mathcal{A}_{\alpha\beta\chi}$
$\overset{\#1}{2^+}\mathcal{A}\dagger^{\alpha\beta}$	0	0	0
$\overset{\#1}{2^+}f\dagger^{\alpha\beta}$	0	$k^2\lambda$	0
$\overset{\#1}{2^-}\mathcal{A}\dagger^{\alpha\beta\chi}$	0	0	0

	$\overset{\#1}{0^+}\mathcal{A}$	$\overset{\#1}{0^+}f$	$\overset{\#2}{0^+}f$	$\overset{\#1}{0^-}\mathcal{A}$
$\overset{\#1}{0^+}\mathcal{A}\dagger$	0	0	0	0
$\overset{\#1}{0^+}f\dagger$	0	$-2k^2\lambda$	0	0
$\overset{\#2}{0^+}f\dagger$	0	0	0	0
$\overset{\#1}{0^-}\mathcal{A}\dagger$	0	0	0	0

Massive and massless spectra

Poleresidue:	$\frac{1}{\lambda} > 0$
Polarisations:	2

Massless particle



(No particles)

Unitarity conditions