Particle spectrograph

Wave operator and propagator

	$1^+_1\,\sigma_{\alpha\beta}$	$1^+_2\,\sigma_{\alpha\beta}$	$1^+_1\,\tau_{\alpha\beta}$	$1^-_1\,\sigma_\alpha$	$1^-_2\,\sigma_\alpha$	$1^-_1\,\tau_\alpha$	$1^-_2\,\tau_\alpha$
$1^+_1\,\sigma^\dagger_{\alpha\beta}$	0	$\frac{2\sqrt{2}}{(\alpha_0-4\beta_1)(1+2k^2)}$	$\frac{2i\sqrt{2}k}{(\alpha_0-4\beta_1)(1+k^2)}$	0	0	0	0
$1^+_2\,\sigma^\dagger_{\alpha\beta}$	$\frac{2\sqrt{2}}{(\alpha_0-4\beta_1)(1+k^2)}$	$-\frac{2}{(\alpha_0-4\beta_1)(1+2k^2)^2}$	$-\frac{2ik}{(\alpha_0-4\beta_1)(1+k^2)^2}$	0	0	0	0
$1^+_1\,\tau^\dagger_{\alpha\beta}$	$-\frac{2i\sqrt{2}k}{(\alpha_0-4\beta_1)(1+k^2)}$	$-\frac{2ik}{(\alpha_0-4\beta_1)(1+k^2)^2}$	$-\frac{2k^2}{(\alpha_0-4\beta_1)(1+k^2)^2}$	0	0	0	0
$1^-_1\,\sigma^\dagger_\alpha$	0	0	0	0	$-\frac{2\sqrt{2}}{(\alpha_0-4\beta_1)(1+2k^2)}$	0	$-\frac{4ik}{(\alpha_0-4\beta_1)(1+2k^2)}$
$1^-_2\,\sigma^\dagger_\alpha$	0	0	0	$-\frac{2\sqrt{2}}{(\alpha_0-4\beta_1)(1+2k^2)}$	$-\frac{2}{(\alpha_0-4\beta_1)(1+2k^2)^2}$	0	$-\frac{2i\sqrt{2}k}{(\alpha_0-4\beta_1)(1+2k^2)^2}$
$1^-_1\,\tau^\dagger_\alpha$	0	0	0	0	0	0	0
$1^-_2\,\tau^\dagger_\alpha$	0	0	0	$-\frac{4ik}{(\alpha_0-4\beta_1)(1+2k^2)}$	$-\frac{2i\sqrt{2}k}{(\alpha_0-4\beta_1)(1+2k^2)^2}$	0	$-\frac{4k^2}{(\alpha_0-4\beta_1)(1+2k^2)^2}$

Spin-parity	form	Covariant form	Multiplicities
0^+_2	$\tau=0$	$\partial_\beta\partial_\alpha\tau^{\alpha\beta}=0$	1
1^-_2	$\tau^\alpha+2i\,k\,\sigma^\alpha=0$	$\partial_\chi\partial_\beta\partial_\alpha\tau^{\beta\chi}=\partial_\chi\partial^\chi\partial_\beta\tau^{\alpha\beta}+2\,\partial_\delta\partial^\delta\partial_\chi\partial_\beta\sigma^{\alpha\beta\chi}$	3
1^-_1	$\tau^\alpha=0$	$\partial_\chi\partial_\beta\partial_\alpha\tau^{\beta\chi}=\partial_\chi\partial^\chi\partial_\beta\tau^{\beta\alpha}$	3
1^+_1	$\tau^{\alpha\beta}+i\,k\,\sigma^{\alpha\beta}=0$	$\partial_\chi\partial^\alpha\tau^{\beta\chi}+\partial_\chi\partial^\beta\tau^{\alpha\chi}+\partial_\chi\partial^\chi\tau^{\alpha\beta}+2\,\partial_\chi\partial_\alpha\partial_\beta\sigma^{\chi\delta}+2\,\partial_\delta\partial^\delta\partial_\chi\sigma^{\alpha\beta\chi}=$ $\partial_\chi\partial^\alpha\tau^{\chi\beta}+\partial_\chi\partial^\beta\tau^{\alpha\chi}+\partial_\chi\partial^\chi\tau^{\beta\alpha}+2\,\partial_\delta\partial_\chi\partial^\beta\sigma^{\alpha\chi\delta}$	3
Total expected gauge generators:			10

$$S=\iiiint(-\tfrac{1}{2}(\alpha_0-4\beta_1)\,\mathcal{A}^{\alpha\beta}{}_\alpha\,\mathcal{A}_\beta{}^\chi{}_\chi+f^{\alpha\beta}\,\tau_{\alpha\beta}+\mathcal{A}^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi}-4\beta_1\,\mathcal{A}_\alpha{}^\chi{}_\chi\,\partial_\beta f^{\alpha\beta}-\alpha_0\,f^{\alpha\beta}\,\partial_\beta\mathcal{A}_\alpha{}^\chi{}_\chi+$$
$$\alpha_0\,\partial_\beta\mathcal{A}^{\alpha\beta}{}_\alpha+4\beta_1\,\mathcal{A}_\beta{}^\chi{}_\chi\,\partial^\beta f^\alpha{}_\alpha-2\beta_1\,\partial_\beta f^\chi{}_\chi\,\partial^\beta f^\alpha{}_\alpha-2\beta_1\,\partial_\beta f^{\alpha\beta}\,\partial_\chi f_\alpha{}^\chi+$$
$$4\beta_1\,\partial^\beta f^\alpha{}_\alpha\,\partial_\chi f_\beta{}^\chi+\alpha_0\,f^{\alpha\beta}\,\partial_\chi\mathcal{A}_\alpha{}^\chi{}_\beta-\alpha_0\,f^\alpha{}_\alpha\,\partial_\chi\mathcal{A}^{\beta\chi}{}_\beta-2\beta_1\,\partial_\alpha f_{\beta\chi}\,\partial^\chi f^{\alpha\beta}-$$
$$\beta_1\,\partial_\alpha f_{\chi\beta}\,\partial^\chi f^{\alpha\beta}+\beta_1\,\partial_\beta f_{\alpha\chi}\,\partial^\chi f^{\alpha\beta}+\beta_1\,\partial_\chi f_{\alpha\beta}\,\partial^\chi f^{\alpha\beta}+\beta_1\,\partial_\chi f_{\beta\alpha}\,\partial^\chi f^{\alpha\beta}-$$
$$\tfrac{1}{2}\,\mathcal{A}_{\alpha\chi\beta}\,((\alpha_0-4\beta_1)\,\mathcal{A}^{\alpha\beta\chi}-8\beta_1\,\partial^\chi f^{\alpha\beta})+\tfrac{2}{3}\,\alpha_6\,\partial_\beta\mathcal{A}^{\alpha\beta}{}_\alpha\,\partial_\delta\mathcal{A}^{\chi\delta}{}_\chi)[t,x,y,z]\,dl\,z\,dl\,y\,dl\,x\,dl$$

	$1^+_1\,\mathcal{A}_{\alpha\beta}$	$1^+_2\,\mathcal{A}_{\alpha\beta}$	$1^+_1\,f_{\alpha\beta}$	$1^-_1\,\mathcal{A}_\alpha$	$1^-_2\,\mathcal{A}_\alpha$	$1^-_1\,f_\alpha$	$1^-_2\,f_\alpha$
$1^+_1\,\mathcal{A}^\dagger_{\alpha\beta}$	$\frac{1}{4}(\alpha_0-4\beta_1)$	$\frac{\alpha_0-4\beta_1}{2\sqrt{2}}$	$\frac{i(\alpha_0-4\beta_1)k}{2\sqrt{2}}$	0	0	0	0
$1^+_2\,\mathcal{A}^\dagger_{\alpha\beta}$	$\frac{\alpha_0-4\beta_1}{2\sqrt{2}}$	0	0	0	0	0	0
$1^+_1\,f^\dagger_{\alpha\beta}$	$-\frac{i(\alpha_0-4\beta_1)k}{2\sqrt{2}}$	0	0	0	0	0	0
$1^-_1\,\mathcal{A}^\dagger_\alpha$	0	0	$\frac{1}{4}(\alpha_0-4\beta_1)$	$-\frac{\alpha_0-4\beta_1}{2\sqrt{2}}$	0	$-\frac{1}{2}i(\alpha_0-4\beta_1)k$	0
$1^-_2\,\mathcal{A}^\dagger_\alpha$	0	0	0	$-\frac{\alpha_0-4\beta_1}{2\sqrt{2}}$	0	0	0
$1^-_1\,f^\dagger_\alpha$	0	0	0	0	0	0	$\frac{1}{2}(\alpha_0-4\beta_1)$
$1^-_2\,f^\dagger_\alpha$	0	0	$\frac{1}{2}i(\alpha_0-4\beta_1)k$	0	0	0	0

	$0^+_1\,\mathcal{A}$	$0^+_1\,f$	$0^+_2\,f$	$0^-_1\,\mathcal{A}$
$0^+_1\,\mathcal{A}^\dagger$	$\frac{\alpha_0}{2}-2\beta_1+\alpha_6k^2$	$\frac{i(\alpha_0-4\beta_1)k}{\sqrt{2}}$	0	0
$0^+_1\,f^\dagger$	$\frac{i(\alpha_0-4\beta_1)k}{\sqrt{2}}$	$-4\beta_1k^2$	0	$\frac{1}{2}(\alpha_0-4\beta_1)$
$0^+_2\,f^\dagger$	0	0	0	0
$0^-_1\,\mathcal{A}^\dagger$	0	$\frac{1}{2}(\alpha_0-4\beta_1)$	0	0

	$2^+_1\,\tau_{\alpha\beta}$	$2^+_2\,\sigma_{\alpha\beta\chi}$
$2^+_1\,\sigma^\dagger_{\alpha\beta}$	$-\frac{16\beta_1}{\alpha_0^2-4\alpha_0\beta_1}$	0
$2^+_1\,\tau^\dagger_{\alpha\beta}$	$-\frac{2i\sqrt{2}}{\alpha_0k}$	0
$2^+_2\,\sigma^\dagger_{\alpha\beta\chi}$	$-\frac{2}{\alpha_0k^2}$	$\frac{1}{-\frac{\alpha_0}{4}+\beta_1}$

	$0^+_1\,\sigma$	$0^+_1\,\tau$	$0^+_2\,\tau$	$0^-_1\,\sigma$
$0^+_1\,\sigma^\dagger$	$\frac{8\beta_1}{\alpha_0^2-4\alpha_0\beta_1+8\alpha_6\beta_1k^2}$	$-\frac{i\sqrt{2}(\alpha_0-4\beta_1)}{\alpha_0(\alpha_0-4\beta_1)k+8\alpha_6\beta_1k^3}$	0	0
$0^+_1\,\tau^\dagger$	$\frac{i\sqrt{2}(\alpha_0-4\beta_1)}{\alpha_0(\alpha_0-4\beta_1)k+8\alpha_6\beta_1k^3}$	$-\frac{\alpha_0-4\beta_1+2\alpha_6k^2}{k^2(\alpha_0^2-4\alpha_0\beta_1+8\alpha_6\beta_1k^2)}$	0	0
$0^+_2\,\tau^\dagger$	0	0	0	0
$0^-_1\,\sigma^\dagger$	0	0	0	$\frac{2}{\alpha_0-4\beta_1}$

	$2^+_1\,\mathcal{A}_{\alpha\beta}$	$2^+_1\,f_{\alpha\beta}$	$2^+_2\,f_{\alpha\beta}$	$2^-_1\,\mathcal{A}_{\alpha\beta\chi}$
$2^+_1\,\mathcal{A}^\dagger_{\alpha\beta}$	$-\frac{\alpha_0}{4}+\beta_1$	$\frac{i(\alpha_0-4\beta_1)k}{2\sqrt{2}}$	0	0
$2^+_1\,f^\dagger_{\alpha\beta}$	$-\frac{i(\alpha_0-4\beta_1)k}{2\sqrt{2}}$	$2\beta_1k^2$	0	0
$2^-_1\,\mathcal{A}^\dagger_{\alpha\beta\chi}$	0	0	$-\frac{\alpha_0}{4}+\beta_1$	0

Massive and massless spectra

Massive particle

Poleresidue:	$\frac{1}{\alpha_0}+\frac{1}{\alpha_0}-\frac{1}{4\beta_1}>0$
Square mass:	$\frac{\alpha_0(\alpha_0-4\beta_1)}{8\alpha_6\beta_1}>0$
Spin:	0
Parity:	Even

Massless particle

Poleresidue:	$\frac{1}{\alpha_0}>0$
Polarisations:	2

Unitarity conditions