Particle spectrograph

Wave operator and propagator

Source constraints/gauge generators

SO(3) irreps	Multiplicities
$\sigma_{0^-}^{\#1} == 0$	1
$\tau_{0^+}^{\#2} == 0$	1
$\sigma_{0^+}^{\#1} == 0$	1
$\tau_{1^-}^{\#2\,\alpha} == 0$	3
$\tau_{1^-}^{\#1\,\alpha} == 0$	3
$\sigma_{1^-}^{\#2\,\alpha} == 0$	3
$\sigma_{1^-}^{\#1\,\alpha} == 0$	3
$\tau_{1^+}^{\#1\,\alpha\beta} == 0$	3
$\sigma_{1^+}^{\#2\,\alpha\beta} == 0$	3
$\sigma_{1^+}^{\#1\,\alpha\beta} == 0$	3
$\sigma_{2^-}^{\#1\,\alpha\beta\chi} == 0$	5
$\sigma_{2^+}^{\#1\,\alpha\beta} == 0$	5
Total constraints:	34

Quadratic (free) Lagrangian density

$$-\lambda\,\omega_{l\kappa\theta}\,\omega^{l\theta\kappa}\text{-}\lambda\,\omega^{l\theta}{}_{l}\,\omega_{\theta}{}^{\kappa}\text{-}\lambda\,\omega_{l}{}^{\alpha l}\,\omega_{\kappa\alpha}{}^{\kappa}\text{-}\lambda\,\omega_{l}{}^{\kappa\zeta}\,\omega_{\kappa\zeta}{}^{l}+f^{\alpha\beta}\,\tau_{\alpha\beta}+$$
$$\omega^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi}\text{-}2\,\lambda\,f^{\prime l\theta}\,\partial_{\theta}\omega^{\kappa}{}_{l\kappa}+2\,\lambda\,f^{\prime l\theta}\,\partial_{\kappa}\omega^{\kappa}{}_{l\theta}\text{-}2\,\lambda\,f^{\prime}{}_{l}\,\partial_{\kappa}\omega^{\theta\kappa}{}_{\theta}\text{-}$$
$$\frac{1}{2}\,\lambda\,\partial^{\alpha}f_{\theta\kappa}\,\partial^{\kappa}f_{\alpha}{}^{\theta}\text{-}\frac{1}{2}\,\lambda\,\partial^{\alpha}f_{\kappa\theta}\,\partial^{\kappa}f_{\alpha}{}^{\theta}+\frac{1}{2}\,\lambda\,\partial^{\alpha}f_{\theta}{}^{\zeta}\,\partial^{\kappa}f_{\alpha\zeta}+\lambda\,\omega_{\kappa\alpha}{}^{\alpha}\,\partial^{\kappa}f^{\prime}{}_{l}+$$
$$\lambda\,\omega_{\kappa\zeta}{}^{\zeta}\,\partial^{\kappa}f^{\prime}{}_{l}+2\,\lambda\,\partial^{\alpha}f_{\kappa\alpha}\,\partial^{\kappa}f^{\prime}{}_{l}\text{-}\lambda\,\omega_{l\kappa\theta}\,\partial^{\kappa}f^{\prime l\theta}\text{-}\lambda\,\omega_{l\alpha}{}^{\alpha}\,\partial^{\kappa}f^{\prime}{}_{\kappa}\text{-}$$
$$\lambda\,\omega_{l\zeta}{}^{\zeta}\,\partial^{\kappa}f^{\prime}{}_{\kappa}+\frac{1}{2}\,\lambda\,\partial^{\alpha}f^{\zeta}{}_{\kappa}\,\partial^{\kappa}f_{\zeta\alpha}+\frac{1}{2}\,\lambda\,\partial_{\kappa}f^{\zeta}{}_{\theta}\,\partial^{\kappa}f_{\zeta}{}^{\theta}\text{-}\lambda\,\partial^{\alpha}f^{\zeta}{}_{\alpha}\,\partial^{\kappa}f_{\zeta\kappa}$$

	$\omega_{2^+}^{\#1}{}_{\alpha\beta}$	$f_{2^+}^{\#1}{}_{\alpha\beta}$	$\omega_{2^-}^{\#1}{}_{\alpha\beta\chi}$
$\omega_{2^+}^{\#1}{}^{\dagger\alpha\beta}$	0	0	0
$f_{2^+}^{\#1}{}^{\dagger\alpha\beta}$	0	$k^2\,\lambda$	0
$\omega_{2^-}^{\#1}{}^{\dagger\alpha\beta\chi}$	0	0	0

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

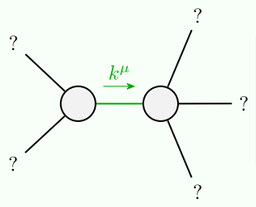
	$\omega_{0^+}^{\#1}$	$f_{0^+}^{\#1}$	$f_{0^+}^{\#2}$	$\omega_{0^-}^{\#1}$
$\omega_{0^+}^{\#1}{}^{\dagger}$	0	0	0	0
$f_{0^+}^{\#1}{}^{\dagger}$	0	$-2\,k^2\,\lambda$	0	0
$f_{0^+}^{\#2}{}^{\dagger}$	0	0	0	0
$\omega_{0^-}^{\#1}{}^{\dagger}$	0	0	0	0

	$\omega_{1^+}^{\#1}{}_{\alpha\beta}$	$\omega_{1^+}^{\#2}{}_{\alpha\beta}$	$f_{1^+}^{\#1}{}_{\alpha\beta}$	$\omega_{1^-}^{\#1}{}_{\alpha}$	$\omega_{1^-}^{\#2}{}_{\alpha}$	$f_{1^-}^{\#1}{}_{\alpha}$	$f_{1^-}^{\#2}{}_{\alpha}$
$\omega_{1^+}^{\#1}{}^{\dagger\alpha\beta}$	0	0	0	0	0	0	0
$\omega_{1^+}^{\#2}{}^{\dagger\alpha\beta}$	0	0	0	0	0	0	0
$f_{1^+}^{\#1}{}^{\dagger\alpha\beta}$	0	0	0	0	0	0	0
$\omega_{1^-}^{\#1}{}^{\dagger\alpha}$	0	0	0	0	0	0	0
$\omega_{1^-}^{\#2}{}^{\dagger\alpha}$	0	0	0	0	0	0	0
$f_{1^-}^{\#1}{}^{\dagger\alpha}$	0	0	0	0	0	0	0
$f_{1^-}^{\#2}{}^{\dagger\alpha}$	0	0	0	0	0	0	0

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

	$\sigma_{0^+}^{\#1}$	$\tau_{0^+}^{\#1}$	$\tau_{0^+}^{\#2}$	$\sigma_{0^-}^{\#1}$
$\sigma_{0^+}^{\#1}{}^{\dagger}$	0	0	0	0
$\tau_{0^+}^{\#1}{}^{\dagger}$	0	$-\frac{1}{2\,k^2\,\lambda}$	0	0
$\tau_{0^+}^{\#2}{}^{\dagger}$	0	0	0	0
$\sigma_{0^-}^{\#1}{}^{\dagger}$	0	0	0	0

Massive and massless spectra



Quadratic pole

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

(No massive particles)

Unitarity conditions

$\lambda > 0$