

Particle spectrograph

Wave operator and propagator

Source constraints

SO(3) irreps	Fundamental fields	Multiplicities
$\sigma_{0^-}^{\#1} == 0$	$\epsilon \eta_{\alpha\beta\chi\delta} \partial^\delta \sigma^{\alpha\beta\chi} == 0$	1
$\sigma_{0^+}^{\#1} == 0$	$\partial_\beta \sigma^{\alpha\beta}_\alpha == 0$	1
$\sigma_{1^-}^{\#2\alpha} == 0$	$\partial_\chi \partial_\beta \sigma^{\alpha\beta\chi} == 0$	3
$\sigma_{1^+}^{\#2\alpha\beta} == 0$	$\partial_\delta \partial_\chi \partial^\alpha \sigma^{\beta\chi\delta} + \partial_\delta \partial^\delta \partial_\chi \sigma^{\alpha\beta\chi} == \partial_\delta \partial_\chi \partial^\beta \sigma^{\alpha\chi\delta}$	3
$\sigma_{2^-}^{\#1\alpha\beta\chi} == 0$	$3 \partial_\epsilon \partial_\delta \partial^\chi \partial^\alpha \sigma^{\beta\delta\epsilon} + 3 \partial_\epsilon \partial^\epsilon \partial^\chi \partial^\alpha \sigma^{\beta\delta}_\delta +$ $2 \partial_\epsilon \partial^\epsilon \partial_\delta \partial^\beta \sigma^{\alpha\chi\delta} + 4 \partial_\epsilon \partial^\epsilon \partial_\delta \partial^\beta \sigma^{\alpha\delta\chi} +$ $2 \partial_\epsilon \partial^\epsilon \partial_\delta \partial^\beta \sigma^{\chi\delta\alpha} + 4 \partial_\epsilon \partial^\epsilon \partial_\delta \partial^\chi \sigma^{\alpha\beta\delta} +$ $2 \partial_\epsilon \partial^\epsilon \partial_\delta \partial^\chi \sigma^{\alpha\delta\beta} + 2 \partial_\epsilon \partial^\epsilon \partial_\delta \partial^\delta \sigma^{\beta\chi\alpha} +$ $3 \eta^{\beta\chi} \partial_\phi \partial^\phi \partial_\epsilon \partial^\alpha \sigma^{\delta\epsilon}_\delta + 3 \eta^{\alpha\chi} \partial_\phi \partial^\phi \partial_\epsilon \partial_\delta \sigma^{\beta\delta\epsilon} +$ $3 \eta^{\beta\chi} \partial_\phi \partial^\phi \partial_\epsilon \partial^\epsilon \sigma^{\alpha\delta}_\delta == 3 \partial_\epsilon \partial_\delta \partial^\chi \partial^\beta \sigma^{\alpha\delta\epsilon} +$ $3 \partial_\epsilon \partial^\epsilon \partial^\chi \partial^\beta \sigma^{\alpha\delta}_\delta + 2 \partial_\epsilon \partial^\epsilon \partial_\delta \partial^\alpha \sigma^{\beta\chi\delta} +$ $4 \partial_\epsilon \partial^\epsilon \partial_\delta \partial^\alpha \sigma^{\beta\delta\chi} + 2 \partial_\epsilon \partial^\epsilon \partial_\delta \partial^\alpha \sigma^{\chi\delta\beta} +$ $2 \partial_\epsilon \partial^\epsilon \partial_\delta \partial^\chi \sigma^{\beta\delta\alpha} + 4 \partial_\epsilon \partial^\epsilon \partial_\delta \partial^\delta \sigma^{\alpha\beta\chi} +$ $2 \partial_\epsilon \partial^\epsilon \partial_\delta \partial^\delta \sigma^{\alpha\chi\beta} + 3 \eta^{\alpha\chi} \partial_\phi \partial^\phi \partial_\epsilon \partial_\delta \sigma^{\delta\epsilon}_\delta +$ $3 \eta^{\beta\chi} \partial_\phi \partial^\phi \partial_\epsilon \partial_\delta \sigma^{\alpha\delta\epsilon} + 3 \eta^{\alpha\chi} \partial_\phi \partial^\phi \partial_\epsilon \partial^\delta \sigma^{\beta\delta}_\delta$	5
Total constraints/gauge generators:		13

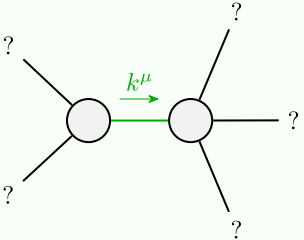
Quadratic (free) action

$S ==$

$$\int \int \int \int (\mathcal{A}^{\alpha\beta\chi} \sigma_{\alpha\beta\chi} - \frac{1}{2} r_3 (\partial_\beta \mathcal{A}_{\theta}^\theta \partial^\theta \mathcal{A}^{\alpha\beta}_\alpha + \partial_\beta \mathcal{A}_{\beta}^\theta \partial^\theta \mathcal{A}^{\alpha\beta}_\alpha + \partial_\alpha \mathcal{A}^{\alpha\beta\theta} \partial_\theta \mathcal{A}_{\beta}^\theta - 2 \partial^\theta \mathcal{A}^{\alpha\beta}_\alpha \partial_\theta \mathcal{A}_{\beta}^\theta + \partial_\alpha \mathcal{A}^{\alpha\beta\theta} \partial_\theta \mathcal{A}_{\beta}^\theta - 2 \partial^\theta \mathcal{A}^{\alpha\beta\theta} \partial_\theta \mathcal{A}_{\beta}^\theta) +$$
$$r_5 (\partial_\theta \mathcal{A}_{\theta}^\kappa \partial^\theta \mathcal{A}^{\alpha\theta}_\alpha - \partial_\theta \mathcal{A}_{\theta}^\kappa \partial^\theta \mathcal{A}^{\alpha\theta}_\alpha - (\partial_\alpha \mathcal{A}^{\alpha\theta\theta} - 2 \partial^\theta \mathcal{A}^{\alpha\theta}_\alpha) (\partial_\kappa \mathcal{A}_{\theta}^\kappa - \partial_\kappa \mathcal{A}_{\theta}^\kappa))) [t, x, y, z] dz dy dx dt$$

$\mathcal{A}_{2^+}^{\#1\alpha\beta} \quad \mathcal{A}_{2^+}^{\#1\alpha\beta\chi}$				$\sigma_{2^+}^{\#1\alpha\beta} \quad \sigma_{2^+}^{\#1\alpha\beta\chi}$			
$\mathcal{A}_{2^+}^{\#1\alpha\beta}$	$-\frac{3k^2 r_3}{2}$	0		$\sigma_{2^+}^{\#1\alpha\beta}$	$-\frac{2}{3k^2 r_3}$	0	
$\mathcal{A}_{2^+}^{\#1\alpha\beta\chi}$	0	0		$\sigma_{2^+}^{\#1\alpha\beta\chi}$	0	0	
$\mathcal{A}_{1^+}^{\#1\alpha\beta} \quad \mathcal{A}_{1^+}^{\#2\alpha\beta} \quad \mathcal{A}_{1^+}^{\#1\alpha} \quad \mathcal{A}_{1^+}^{\#2\alpha}$				$\sigma_{1^+}^{\#1\alpha\beta} \quad \sigma_{1^+}^{\#2\alpha\beta} \quad \sigma_{1^+}^{\#1\alpha} \quad \sigma_{1^+}^{\#2\alpha}$			
$\mathcal{A}_{1^+}^{\#1\alpha\beta}$	$\frac{1}{k^2 (2r_3 + r_5)}$	0	0	$\sigma_{1^+}^{\#1\alpha\beta}$	$k^2 (2r_3 + r_5)$	0	0
$\mathcal{A}_{1^+}^{\#2\alpha\beta}$	0	0	0	$\sigma_{1^+}^{\#2\alpha\beta}$	0	0	0
$\mathcal{A}_{1^+}^{\#1\alpha}$	0	0	$\frac{2}{k^2 (r_3 + 2r_5)}$	$\sigma_{1^+}^{\#1\alpha}$	0	0	0
$\mathcal{A}_{1^+}^{\#2\alpha}$	0	0	0	$\sigma_{1^+}^{\#2\alpha}$	0	0	0
$\mathcal{A}_{0^+}^{\#1\alpha\beta} \quad \mathcal{A}_{0^+}^{\#2\alpha\beta} \quad \mathcal{A}_{0^+}^{\#1\alpha} \quad \mathcal{A}_{0^+}^{\#2\alpha}$				$\sigma_{0^+}^{\#1\alpha\beta} \quad \sigma_{0^+}^{\#2\alpha\beta} \quad \sigma_{0^+}^{\#1\alpha} \quad \sigma_{0^+}^{\#2\alpha}$			
$\mathcal{A}_{0^+}^{\#1\alpha\beta}$	0	0	0	$\sigma_{0^+}^{\#1\alpha\beta}$	0	0	0
$\mathcal{A}_{0^+}^{\#2\alpha\beta}$	0	0	0	$\sigma_{0^+}^{\#2\alpha\beta}$	0	0	0
$\mathcal{A}_{0^+}^{\#1\alpha}$	0	0	0	$\sigma_{0^+}^{\#1\alpha}$	0	0	0
$\mathcal{A}_{0^+}^{\#2\alpha}$	0	0	0	$\sigma_{0^+}^{\#2\alpha}$	0	0	0

Massive and massless spectra



Quadratic pole	
Pole residue:	$-\frac{1}{r_3 (2r_3 + r_5) (r_3 + 2r_5)} > 0$
Polarisations:	2

(No massive particles)

Unitarity conditions

$r_3 < 0 \&\& (r_5 < -\frac{r_3}{2} \parallel r_5 > -2r_3) \parallel r_3 > 0 \&\& -2r_3 < r_5 < -\frac{r_3}{2}$