## $\mathcal{S} = \iiint (\frac{1}{3} \left( 3\, t_{1}\, \mathcal{R}^{\alpha_{i}}_{\phantom{\alpha_{i}}}\, \mathcal{R}^{\theta}_{\phantom{\alpha_{i}}} + 3\, \mathcal{R}^{\alpha\beta\chi}_{\phantom{\alpha_{i}}}\, \sigma_{\alpha\beta\chi} + 3\, f^{\alpha\beta}_{\phantom{\alpha_{i}}}\, \tau \left( \Delta + \mathcal{K} \right)_{\alpha\beta} - 6\, t_{1}\, \mathcal{R}^{\theta}_{\phantom{\alpha_{i}}}\, \partial_{i}f^{\alpha_{i}} + 6\, t_{1}\, \mathcal{R}^{\theta}_{\phantom{\alpha_{i}}}\, \partial_{i}f^{\alpha_{i}}_{\phantom{\alpha_{i}}} - 3\, t_{1}\, \partial_{i}f^{\theta}_{\phantom{\alpha_{i}}}\, \partial^{i}f^{\alpha}_{\phantom{\alpha_{i}}} - 3\, t_{1}\, \partial_{i}f^{\alpha_{i}}\, \partial_{\theta}f^{\alpha}_{\phantom{\alpha_{i}}} + 6\, t_{1}\, \partial^{i}f^{\alpha}_{\phantom{\alpha_{i}}}\, \partial_{\theta}f^{\beta}_{\phantom{\alpha_{i}}} - 4\, r_{1}\, \partial_{\beta}\mathcal{R}_{\alpha_{i}\theta}\, \partial^{\theta}\mathcal{R}^{\alpha\beta_{i}} + 6\, t_{2}\, \partial^{\alpha\beta_{i}}\, \partial^{\alpha$ $2r_{.}\partial_{\beta}\mathcal{A}_{\alpha\theta_{l}}\partial^{\theta}\mathcal{A}^{\alpha\beta_{l}} - 8r_{.}\partial_{\beta}\mathcal{A}_{,\theta\alpha}\partial^{\theta}\mathcal{A}^{\alpha\beta_{l}} - 2r_{.}\partial_{l}\mathcal{A}_{\alpha\beta\theta}\partial^{\theta}\mathcal{A}^{\alpha\beta_{l}} + 2r_{.}\partial_{\theta}\mathcal{A}_{\alpha\beta_{l}}\partial^{\theta}\mathcal{A}^{\alpha\beta_{l}} + 2r_{.}\partial_{\theta}\mathcal{A}_{\alpha\beta_{l}}\partial^{\theta}\mathcal{A}^{\alpha\beta_{l}} + 3r_{.}\partial_{\theta}\mathcal{A}_{\alpha\beta_{l}}\partial^{\theta}\mathcal{A}^{\alpha\beta_{l}} - 3r_{.}\partial_{\theta}\mathcal{A}_{,\kappa}\partial^{\theta}\mathcal{A}^{\alpha\beta_{l}} + 2r_{.}\partial_{\theta}\mathcal{A}_{\alpha\beta_{l}}\partial^{\theta}\mathcal{A}^{\alpha\beta_{l}} + 3r_{.}\partial_{\theta}\mathcal{A}_{\alpha\beta_{l}}\partial^{\theta}\mathcal{A}^{\alpha\beta_{l}} - 3r_{.}\partial_{\theta}\mathcal{A}_{,\kappa}\partial^{\theta}\mathcal{A}^{\alpha\beta_{l}} - 3r_{.}\partial_{\theta}\mathcal{A}_{\alpha\beta_{l}}\partial^{\theta}\mathcal{A}^{\alpha\beta_{l}} + 3r_{.}\partial_{\theta}\mathcal{A}_{\alpha\beta_{l}}\partial^{\theta}\mathcal{A}^{\alpha\beta_{l}} - 3r_{.}\partial_{\theta}\mathcal{A}^{\alpha\beta_{l}}\partial^{\theta}\mathcal{A}^{\alpha\beta_{l}} - 3r_{.}\partial_{\theta}\mathcal{A}^{\alpha\beta_{l}}\partial^{\theta}\mathcal{A}$ $2t\underbrace{_{1}}_{1}\mathcal{A}_{_{\prime}\theta\alpha}\partial^{\theta}f^{\alpha\prime}-2t\underbrace{_{1}}_{1}\partial_{\alpha}f_{_{\prime}\theta}\partial^{\theta}f^{\alpha\prime}-2t\underbrace{_{1}}_{1}\partial_{\alpha}f_{_{\theta\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{_{\prime}}f_{_{\alpha\theta}}\partial^{\theta}f^{\alpha\prime}+2t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f_{_{\alpha\prime}}\partial^{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_{\theta}f^{\alpha\prime}+t\underbrace{_{1}}_{1}\partial_$ $t. \mathcal{A}_{\alpha\theta_{i}} \left( \mathcal{A}^{\alpha_{i}\theta} + 4 \partial^{\theta} f^{\alpha_{i}} \right) - 3r. \partial_{\alpha} \mathcal{A}^{\alpha_{i}\theta} \partial_{\kappa} \mathcal{A}_{i\theta}^{\kappa} + 6r. \partial^{\theta} \mathcal{A}^{\alpha_{i}} \partial_{\kappa} \mathcal{A}_{i\theta}^{\kappa} + 3r. \partial_{\alpha} \mathcal{A}^{\alpha_{i}\theta} \partial_{\kappa} \mathcal{A}_{\theta}^{\kappa} - 6r. \partial^{\theta} \mathcal{A}^{\alpha_{i}} \partial_{\kappa} \mathcal{A}_{\theta}^{\kappa} \right) (t, x, y, z) dz dy dx dt$ Wave operator

# $0^+ f \| + \| -i \sqrt{2} kt \cdot -2k^2 t \cdot 0$

**PSALTer results panel** 

°. <i>f</i> " †	1 12 70.	1	U	U											
$0.^+f^{\perp}$ †	0	0	0	0											
<sup>0⁻</sup> Æ <sup>∥</sup> †	0	0	0	0	${}^{1,^{+}}_{\cdot}\mathcal{F}_{\alpha\beta}^{\parallel}$	$^{1.}_{\cdot}\mathcal{F}^{\perp}{}_{lphaeta}$	$1.^+f^{\parallel}_{\alpha\beta}$	$^{1}\mathcal{H}^{\parallel}{}_{lpha}$	$^{1}\mathcal{H}_{}^{\perp}$	$1 f_{\alpha}$	$\frac{1}{2}f^{\perp}_{\alpha}$				
				$^{1^{+}}\mathcal{A}^{\parallel}$ † $^{lphaeta}$	$k^2 (2r_1 + r_5) + \frac{t_1}{6}$	$-\frac{t_1}{3\sqrt{2}}$	$-\frac{i kt_{1}}{3 \sqrt{2}}$	0	0	0	0				
				$^{1\overset{+}{.}}\mathcal{F}^{\scriptscriptstyle\perp}\dagger^{^{\alpha\beta}}$	$-\frac{t_1}{3\sqrt{2}}$	t. 1/3	$\frac{i kt.}{3}$	0	0	0	0				
				$1.^+f^{\parallel}$ † $^{\alpha\beta}$	$\frac{i kt.}{3 \sqrt{2}}$	$-\frac{1}{3} ikt.$	$\frac{k^2 t_1}{3}$	0	0	0	0				
				${}^{1}\mathcal{A}^{\parallel}\!\uparrow^{lpha}$	0	0	0	$k^{2} (r_{1} + r_{1}) - \frac{t_{1}}{2}$	$\frac{t_1}{\sqrt{2}}$	0	īkt. 1				
				$^{1}\mathcal{A}^{\scriptscriptstyle{\perp}}\dagger^{^{lpha}}$	0	0	0	$\frac{\frac{t_1}{\sqrt{2}}}{\sqrt{2}}$	0	0	0				
				$^{1}f^{\parallel}\dagger^{\alpha}$	0	0	0	0	0	0	0				
				$\frac{1}{2}f^{\perp}\uparrow^{\alpha}$	0	0	0	-īkt. 1	0	0	0	$^{2\overset{+}{.}}\mathcal{A}^{\parallel}{}_{lphaeta}$	$2^+_{\cdot}f^{\parallel}_{\alpha\beta}$	$^{2}\mathcal{A}^{\parallel}_{\alpha\beta\chi}$	
											$^{2\overset{+}{.}}\mathcal{A}^{\parallel}\dagger^{lphaeta}$	$\frac{t}{2}$	$-\frac{i k t}{\sqrt{2}}$	0	
											$2^+f^{\parallel} + ^{\alpha\beta}$	$\frac{i kt}{\sqrt{2}}$	$k^2 t$ .	0	
											$2^{-}\mathcal{A}^{\parallel} \uparrow^{\alpha\beta\chi}$	0	0	$k^2 r_1 + \frac{t_1}{2}$	
Satu	ırated	propa	aga	tor											

 $\frac{1}{\sqrt{2} (k^2 + k^4) (2r_1 + r_5)} \frac{0^{k} (2r_1 + r_5)}{2 (k + k^3)^2 (2r_1 + r_5) t_1} \frac{1}{2 k (1 + k^2)^2 (2r_1 + r_5) t_1}$ 

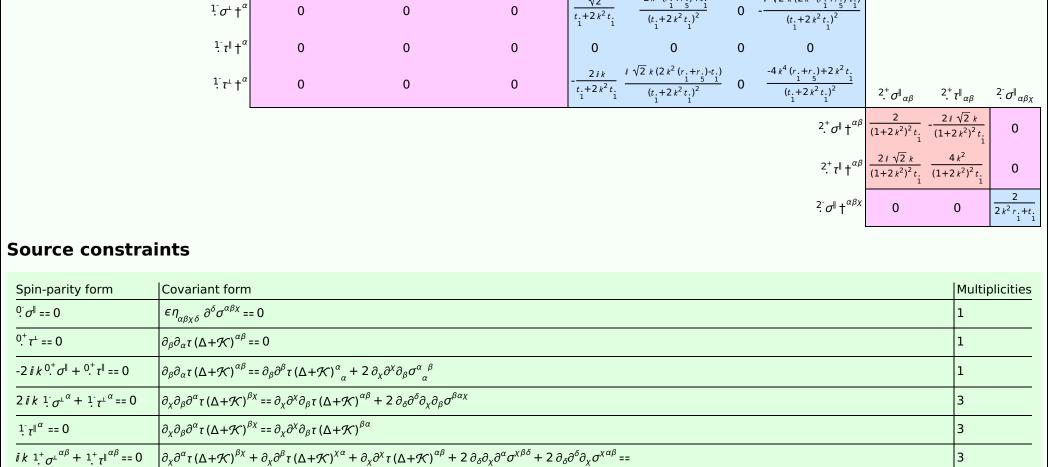
 $\frac{1}{\sqrt{2}(k+k^3)(2r_1+r_2)} - \frac{1}{2k(1+k^2)^2(2r_1+r_2)t_1} \frac{1}{2(1+k^2)^2(2r_1+r_2)t_1} \frac{1}{2(1+k^2)^2(2r_1+r_2)t_1}$ 

 $\partial_{\chi}\partial^{\alpha}\tau\left(\Delta+\mathcal{K}\right)^{\chi\beta}+\partial_{\chi}\partial^{\beta}\tau\left(\Delta+\mathcal{K}\right)^{\alpha\chi}+\partial_{\chi}\partial^{\chi}\tau\left(\Delta+\mathcal{K}\right)^{\beta\alpha}+2\,\partial_{\delta}\partial_{\chi}\partial^{\beta}\sigma^{\chi\alpha\delta}$ 

 $\frac{1}{-2 \, \mathbb{I} \, k \, 2^{+}_{\cdot} \, \sigma^{\parallel}{}^{\alpha\beta} + 2^{+}_{\cdot} \, \tau^{\parallel}{}^{\alpha\beta} = 0 \, \left[ -\mathbb{I} \, (4 \, \partial_{\delta} \partial_{\chi} \partial^{\beta} \partial^{\alpha} \tau \, (\Delta + \mathcal{K})^{\chi \delta} + 2 \, \partial_{\delta} \partial^{\delta} \partial^{\beta} \partial^{\alpha} \tau \, (\Delta + \mathcal{K})^{\chi}_{\chi} - 3 \, \partial_{\delta} \partial^{\delta} \partial_{\chi} \partial^{\alpha} \tau \, (\Delta + \mathcal{K})^{\beta \chi} - 2 \, \partial_{\delta} \partial^{\delta} \partial^{\beta} \partial^{\alpha} \tau \, (\Delta + \mathcal{K})^{\beta \chi} \right] - 0 \, .$ 

 $\frac{1}{2}\sigma^{\parallel} + \alpha$ 

 $0.^{+}\tau^{\perp}$  †  $^{0.}\sigma^{\parallel}$ †



 $3\,\partial_{\delta}\partial^{\delta}\partial_{\chi}\partial^{\chi}\tau\,(\Delta+\mathcal{K})^{\beta\alpha} + 4\,i\,\,k^{\chi}\,\,\partial_{\epsilon}\partial_{\chi}\partial^{\beta}\partial^{\alpha}\sigma^{\delta}_{\phantom{\delta}\delta}^{\phantom{\delta}\epsilon} - 6\,i\,\,k^{\chi}\,\,\partial_{\epsilon}\partial_{\delta}\partial_{\chi}\partial^{\alpha}\sigma^{\delta\beta\epsilon} - 6\,i\,\,k^{\chi}\,\,\partial_{\epsilon}\partial_{\delta}\partial_{\chi}\partial^{\beta}\sigma^{\delta\alpha\epsilon} + 6\,i\,\,k^{\chi}\,\,\partial_{\epsilon}\partial_{\delta}\partial_{\chi}\sigma^{\alpha\beta\delta} + 6\,i\,\,k^{\chi}\,\,\partial_{\epsilon}\partial_{\delta}\partial_{\chi}\partial^{\alpha}\sigma^{\delta\beta\epsilon} - 6\,i\,\,k^{\chi}\,\,\partial_{\epsilon}\partial_{\delta}\partial_{\chi}\partial^{\alpha}\sigma^{\delta\beta\epsilon} + 6\,i\,\,k^{\chi}\,\,\partial_{\epsilon}\partial_{\lambda}\partial^{\alpha}\sigma^{\delta\beta\epsilon} + 6\,i\,\,k^{\chi}\,\,\partial_{\epsilon}\partial_{\delta}\partial_{\lambda}\partial^{\alpha}\sigma^{\delta\beta\epsilon} + 6\,i\,\,k^{\chi}\,\,\partial_{\epsilon}\partial_{\delta}\partial_{\lambda}\partial^{\alpha}\partial_{\delta}\partial^{\alpha}\partial_{\lambda}\partial^{\alpha}\partial_{\delta}\partial^{\alpha}\partial_{\lambda}\partial^{\alpha}\partial_{\delta}\partial^{\alpha}\partial_{\lambda}\partial^{\alpha}\partial_{\delta}\partial^{\alpha}\partial_{\lambda}\partial^{\alpha}\partial_{\delta}\partial^{\alpha}\partial_{\lambda}\partial^{\alpha}\partial_{\delta}\partial^{\alpha}\partial_{\lambda}\partial$ 

17

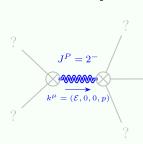
 $6 \ \emph{i} \ \emph{k}^{\chi} \ \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial_{\chi} \sigma^{\beta \alpha \delta} + 2 \ \eta^{\alpha \beta} \ \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial_{\chi} \tau \left( \Delta + \mathcal{K} \right)^{\chi \delta} - 2 \ \eta^{\alpha \beta} \ \partial_{\epsilon} \partial^{\epsilon} \partial_{\delta} \partial^{\delta} \tau \left( \Delta + \mathcal{K} \right)^{\chi}_{\ \chi} - 4 \ \emph{i} \ \eta^{\alpha \beta} \ \emph{k}^{\chi} \ \partial_{\phi} \partial^{\phi} \partial_{\epsilon} \partial_{\chi} \sigma^{\delta}_{\ \delta}{}^{\epsilon} \right) = 0$ 

 $i(6k^2(2r_1+r_1)+t_1)$ 

0

## **Massive spectrum**

Total expected gauge generators:



Massive particle

Pole residue:	$-\frac{1}{r} > 0$
Square mass:	$-\frac{\frac{t}{1}}{2r} >$
Spin:	2
Parity:	Odd

**Massless spectrum** 

?
$$k^{\mu} = (p, 0, 0, p)$$
?
Massless particle

<b>Unitarity conditions</b>	
omitarity conditions	

r. < 0 && r. > -2 r. && t. > 0

Pole residue:

Polarisations: