Unitarity conditions

$r_2 < 0 \;\&\&\; r_3 < 0 \;\&\&\; r_5 < -\frac{r_3}{2} \;\&\&\; t_2 > 0 \;\|\|\; r_2 < 0 \;\&\&\; r_3 < 0 \;\&\&\; r_5 > -2\, r_3 \;\&\&\; t_2 > 0 \;\|\|$

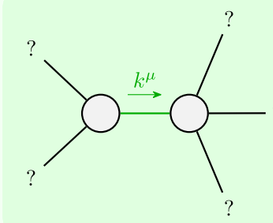
$r_2 < 0 \;\&\&\; r_3 > 0 \;\&\&\; -2\, r_3 < r_5 < -\frac{r_3}{2} \;\&\&\; t_2 > 0$

Massive particle

Pole residue:	$-\frac{1}{r_2} > 0$
Polarisations:	1
Square mass:	$-\frac{t_2}{r_2} > 0$
Spin:	0
Parity:	Odd

Quadratic pole

Pole residue:	$-\frac{1}{r_3\,(2\,r_3+r_5)\,(r_3+2\,r_5)\,p^2} > 0$
Polarisations:	2



Lagrangian density

$$\frac{2}{3} t_3\, \omega_{,\alpha\prime}\, \omega_{\kappa\alpha}{}^{\kappa} + \frac{2}{3} t_2\, \omega_{,\kappa\lambda}{}^{\prime}\, \omega_{\kappa\lambda}{}^{\prime} + \frac{1}{3} t_2\, \omega_{\kappa\lambda}{}^{\prime}\, \omega^{\kappa\lambda}{}_{,\prime} -$$
$$\frac{1}{2} r_3\, \partial_{\prime}\omega^{\kappa\lambda}{}_{\kappa}\, \partial^{\prime}\omega_{\lambda}{}^{\alpha} - r_5\, \partial_{\prime}\omega^{\kappa\lambda}{}_{\kappa}\, \partial^{\prime}\omega_{\lambda}{}^{\alpha} + \frac{2}{3} r_2\, \partial^{\beta}\omega^{\theta\alpha}{}_{\kappa}\, \partial_{\theta}\omega_{\alpha\beta}{}^{\kappa} -$$
$$\frac{1}{3} r_2\, \partial_{\kappa}\omega^{\alpha\beta\theta}\, \partial^{\kappa}\omega_{\alpha\beta\theta} + \frac{2}{3} r_2\, \partial_{\kappa}\omega^{\theta\alpha\beta}\, \partial^{\kappa}\omega_{\alpha\beta\theta} - \frac{2}{3} r_2\, \partial^{\beta}\omega_{,\alpha\lambda}\, \partial_{\lambda}\omega_{\alpha\beta}{}^{\prime} +$$
$$\frac{1}{3} r_2\, \partial^{\beta}\omega_{,\lambda\alpha}\, \partial_{\lambda}\omega_{\alpha\beta}{}^{\prime} - 4\, r_3\, \partial^{\beta}\omega_{,\lambda\alpha}\, \partial_{\lambda}\omega_{\alpha\beta}{}^{\prime} - \frac{1}{2} r_3\, \partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\, \partial^{\lambda}\omega^{\theta\kappa}{}_{\kappa} +$$
$$r_5\, \partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\, \partial^{\lambda}\omega^{\theta\kappa}{}_{\kappa} + \frac{1}{2} r_3\, \partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\, \partial^{\lambda}\omega^{\theta\kappa}{}_{\kappa} - r_5\, \partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\, \partial^{\lambda}\omega^{\theta\kappa}{}_{\kappa} +$$
$$\frac{1}{6} t_2\, \partial_{\kappa} f_{\theta}{}^{\lambda}\, \partial^{\kappa} f_{\lambda}{}^{\theta} + \frac{1}{6} t_2\, \partial_{\kappa} f_{\lambda}{}^{\theta}\, \partial^{\kappa} f_{\theta}{}^{\lambda} + \frac{2}{3} t_3\, \partial^{\alpha} f_{\lambda}{}^{\theta}\, \partial^{\kappa} f_{\lambda\alpha}{}^{\theta} +$$
$$\frac{2}{3} t_2\, \omega_{\theta\kappa\prime}\, \partial^{\kappa} f^{\prime\theta} + \frac{2}{3} t_3\, \omega_{\prime\alpha}{}^{\alpha}\, \partial^{\kappa} f^{\prime}{}_{\kappa} + \frac{2}{3} t_3\, \omega_{\prime\lambda}{}^{\lambda}\, \partial^{\kappa} f^{\prime}{}_{\kappa} - \frac{1}{6} t_2\, \partial^{\alpha} f^{\lambda}{}_{\kappa}\, \partial^{\kappa} f_{\lambda\alpha} -$$
$$\frac{2}{3} t_3\, \partial_{\kappa} f^{\lambda}{}_{\prime}\, \partial^{\kappa} f^{\prime}{}_{\lambda} + \frac{1}{3} t_2\, \omega_{\prime\theta\kappa}\, \partial^{\kappa} f^{\prime\theta} - \frac{2}{3} t_2\, \omega_{\prime\kappa\theta}\, \partial^{\kappa} f^{\prime\theta} - \frac{1}{3} t_2\, \omega_{\theta\prime\kappa}\, \partial^{\kappa} f^{\prime\theta} +$$
$$\frac{1}{6} t_2\, \partial^{\alpha} f_{\kappa}{}^{\lambda}\, \partial^{\kappa} f_{\alpha\lambda} - \frac{2}{3} t_3\, \omega_{\kappa\alpha}\, \partial^{\kappa} f^{\prime}{}_{\prime} - \frac{2}{3} t_3\, \omega_{\kappa\lambda}\, \partial^{\kappa} f^{\prime}{}_{\prime} - \frac{4}{3} t_3\, \partial^{\alpha} f_{\kappa\alpha}\, \partial^{\kappa} f^{\prime}{}_{\prime} +$$
$$2\, r_5\, \partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\kappa}\, \partial^{\kappa}\omega_{\kappa\lambda\theta} + \frac{1}{6} t_2\, \partial^{\alpha} f_{\theta\kappa}\, \partial^{\kappa} f_{\alpha}{}^{\theta} - \frac{1}{6} t_2\, \partial^{\alpha} f_{\kappa\theta}\, \partial^{\kappa} f_{\alpha}{}^{\theta} +$$
$$\frac{1}{2} r_3\, \partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\, \partial_{\kappa}\omega^{\kappa\lambda\theta} - r_5\, \partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\, \partial_{\kappa}\omega^{\kappa\lambda\theta} + r_3\, \partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\, \partial_{\kappa}\omega^{\kappa\lambda\theta} +$$
$$r_5\, \partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\, \partial_{\kappa}\omega^{\theta\kappa\lambda} - \frac{1}{2} r_3\, \partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\, \partial_{\kappa}\omega^{\theta\kappa\lambda} + r_5\, \partial_{\theta}\omega_{\lambda}{}^{\alpha}{}_{\alpha}\, \partial_{\kappa}\omega^{\theta\kappa\lambda} -$$
$$\frac{1}{3} r_2\, \partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}\, \partial_{\kappa}\omega^{\alpha\beta\theta} - \frac{2}{3} r_2\, \partial_{\theta}\omega_{\alpha\beta}{}^{\kappa}\, \partial_{\kappa}\omega^{\theta\alpha\beta} + \frac{1}{2} r_3\, \partial_{\alpha}\omega_{\lambda}{}^{\alpha}{}_{\theta}\, \partial_{\kappa}\omega^{\theta\kappa\lambda} -$$
$$\frac{1}{2} r_3\, \partial_{\prime}\omega^{\kappa\lambda}{}_{\kappa}\, \partial^{\prime}\omega_{\lambda}{}^{\alpha} - r_5\, \partial_{\prime}\omega^{\kappa\lambda}{}_{\kappa}\, \partial^{\prime}\omega_{\lambda}{}^{\alpha} + \frac{2}{3} r_2\, \partial^{\beta}\omega^{\theta\alpha}{}_{\kappa}\, \partial_{\theta}\omega_{\alpha\beta}{}^{\kappa} -$$
$$\frac{2}{3} t_3\, \omega_{,\alpha\prime}\, \omega_{\kappa\alpha}{}^{\kappa} + \frac{2}{3} t_2\, \omega_{,\kappa\lambda}{}^{\prime}\, \omega_{\kappa\lambda}{}^{\prime} + \frac{1}{3} t_2\, \omega_{\kappa\lambda}{}^{\prime}\, \omega^{\kappa\lambda}{}_{,\prime} -$$

Added source term: $f^{\alpha\beta}\; \tau_{\alpha\beta} + \omega^{\alpha\beta\chi}\; \sigma_{\alpha\beta\chi}$

Source constraints

SO(3) irreps	#
$\tau_{0^+}^{\#2} == 0$	1
$\tau_{0^+}^{\#1} - 2\, i\, k\, \sigma_{0^+}^{\#1} == 0$	1
$\tau_{1^-}^{\#2\,\alpha} + 2\, i\, k\, \sigma_{1^-}^{\#2\,\alpha} == 0$	3
$\tau_{1^-}^{\#1\,\alpha} == 0$	3
$\tau_{1^+}^{\#1\,\alpha\beta} + i\, k\, \sigma_{1^+}^{\#2\,\alpha\beta} == 0$	3
$\sigma_{2^-}^{\#1\,\alpha\beta\chi} == 0$	5
$\tau_{2^+}^{\#1\,\alpha\beta} == 0$	5
Total #:	21

$\omega_{0^+}^{\#1}$ $f_{0^+}^{\#1}$ $f_{0^+}^{\#2}$ $\omega_{0^-}^{\#1}$

$\omega_{0^+}^{\#1} +$	t_3	$-i\,\sqrt{2}\,k\,t_3$	0
$f_{0^+}^{\#1} +$	$i\,\sqrt{2}\,k\,t_3$	$2\,k^2\,t_3$	0
$f_{0^+}^{\#2} +$	0	0	0
$\omega_{0^-}^{\#1} +$	0	0	$k^2\,r_2 + t_2$

$\sigma_{0^+}^{\#1}$ $\tau_{0^+}^{\#1}$ $\tau_{0^+}^{\#2}$ $\sigma_{0^-}^{\#1}$

$\sigma_{0^+}^{\#1} +$	$\frac{1}{(1+2\,k^2)^2\,t_3}$	$-\frac{i\,\sqrt{2}\,k}{(1+2\,k^2)^2\,t_3}$	0
$\tau_{0^+}^{\#1} +$	$\frac{i\,\sqrt{2}\,k}{(1+2\,k^2)^2\,t_3}$	$\frac{2\,k^2}{(1+2\,k^2)^2\,t_3}$	0
$\tau_{0^+}^{\#2} +$	0	0	0
$\sigma_{0^-}^{\#1} +$	0	0	$\frac{1}{k^2\,r_2+t_2}$

$\omega_{2^+}^{\#1\,\alpha\beta}$ $f_{2^+}^{\#1\,\alpha\beta}$ $\omega_{2^-}^{\#1\,\alpha\beta\chi}$

$\omega_{2^+}^{\#1\,\alpha\beta} +$	$-\frac{3\,k^2\,r_3}{2}$	0	0
$f_{2^+}^{\#1\,\alpha\beta} +$	0	0	0
$\omega_{2^-}^{\#1\,\alpha\beta\chi} +$	0	0	0

$\sigma_{2^+}^{\#1\,\alpha\beta}$ $\tau_{2^+}^{\#1\,\alpha\beta}$ $\sigma_{2^-}^{\#1\,\alpha\beta\chi}$

$\sigma_{2^+}^{\#1\,\alpha\beta} +$	$-\frac{2}{3\,k^2\,r_3}$	0	0
$\tau_{2^+}^{\#1\,\alpha\beta} +$	0	0	0
$\sigma_{2^-}^{\#1\,\alpha\beta\chi} +$	0	0	0

$\omega_{1^+}^{\#1\,\alpha\beta}$ $\omega_{1^+}^{\#2\,\alpha\beta}$ $f_{1^+}^{\#1\,\alpha\beta}$ $\omega_{1^-}^{\#1\,\alpha}$ $\omega_{1^-}^{\#2\,\alpha}$ $f_{1^-}^{\#1\,\alpha}$ $f_{1^-}^{\#2\,\alpha}$

$\omega_{1^+}^{\#1\,\alpha\beta} +$	$k^2\,(2\,r_3+r_5)+\frac{2\,t_2}{3}$	$\frac{\sqrt{2}\,t_2}{3}$	$-\frac{1}{3}\,i\,\sqrt{2}\,k\,t_2$	0	$-\frac{\sqrt{2}\,t_3}{3}$	0	$-\frac{2}{3}\,i\,k\,t_3$
$\omega_{1^+}^{\#2\,\alpha\beta} +$	$\frac{\sqrt{2}\,t_2}{3}$	$\frac{t_2}{3}$	$-\frac{1}{3}\,i\,k\,t_2$	0	$\frac{t_3}{3}$	0	$\frac{1}{3}\,i\,\sqrt{2}\,k\,t_3$
$f_{1^+}^{\#1\,\alpha\beta} +$	$-\frac{1}{3}\,i\,\sqrt{2}\,k\,t_2$	$\frac{i\,k\,t_2}{3}$	$\frac{k^2\,t_2}{3}$	0	0	0	0
$\omega_{1^-}^{\#1\,\alpha} +$	0	0	0	$k^2\,(\frac{r_3}{2}+r_5)+\frac{2\,t_3}{3}$	$-\frac{\sqrt{2}\,t_3}{3}$	0	$-\frac{2}{3}\,i\,k\,t_3$
$\omega_{1^-}^{\#2\,\alpha} +$	0	0	0	$-\frac{\sqrt{2}\,t_3}{3}$	$\frac{t_3}{3}$	0	$\frac{1}{3}\,i\,\sqrt{2}\,k\,t_3$
$f_{1^-}^{\#1\,\alpha} +$	0	0	0	0	0	0	0
$f_{1^-}^{\#2\,\alpha} +$	0	0	0	$\frac{2\,i\,k\,t_3}{3}$	$-\frac{1}{3}\,i\,\sqrt{2}\,k\,t_3$	0	$\frac{2\,k^2\,t_3}{3}$

$\sigma_{1^+}^{\#1\,\alpha\beta}$ $\sigma_{1^+}^{\#2\,\alpha\beta}$ $\tau_{1^+}^{\#1\,\alpha\beta}$ $\sigma_{1^-}^{\#1\,\alpha}$ $\sigma_{1^-}^{\#2\,\alpha}$ $\tau_{1^-}^{\#1\,\alpha}$ $\tau_{1^-}^{\#2\,\alpha}$

$\sigma_{1^+}^{\#1\,\alpha\beta} +$	$\frac{1}{k\,(2\,r_3+r_5)}$	$-\frac{\sqrt{2}}{k\,(1+k^2)\,(2\,r_3+r_5)}$	$-\frac{i\,\sqrt{2}}{k\,(1+k^2)\,(2\,r_3+r_5)}$	0	0	0	0
$\sigma_{1^+}^{\#2\,\alpha\beta} +$	$-\frac{\sqrt{2}}{k^2\,(2\,r_3+r_5)}$	$\frac{3\,k^2\,(2\,r_3+r_5)+2\,t_2}{(k+k^3)\,(2\,r_3+r_5)\,t_2}$	$-\frac{i\,(3\,k^2\,(2\,r_3+r_5)+2\,t_2)}{k\,(1+k^2)^2\,(2\,r_3+r_5)\,t_2}$	0	0	0	0
$\tau_{1^+}^{\#1\,\alpha\beta} +$	$\frac{i\,\sqrt{2}}{k\,(1+k^2)\,(2\,r_3+r_5)}$	$-\frac{i\,(3\,k^2\,(2\,r_3+r_5)+2\,t_2)}{k\,(1+k^2)^2\,(2\,r_3+r_5)\,t_2}$	$\frac{3\,k^2\,(2\,r_3+r_5)+2\,t_2}{(1+k^2)^2\,(2\,r_3+r_5)\,t_2}$	0	0	0	0
$\sigma_{1^-}^{\#1\,\alpha} +$	0	0	0	$\frac{2}{k^2\,(r_3+2\,r_5)}$	$\frac{2\,\sqrt{2}}{k^2\,(1+2\,k^2)\,(r_3+2\,r_5)}$	0	$\frac{4\,i}{k\,(1+2\,k^2)\,(r_3+2\,r_5)}$
$\sigma_{1^-}^{\#2\,\alpha} +$	0	0	0	$\frac{2\,\sqrt{2}}{k^2\,(1+2\,k^2)\,(r_3+2\,r_5)}$	$\frac{3\,k^2\,(r_3+2\,r_5)+4\,t_3}{(k+2\,k^3)^2\,(r_3+2\,r_5)\,t_3}$	0	$\frac{i\,\sqrt{2}\,(3\,k^2\,(r_3+2\,r_5)+4\,t_3)}{k\,(1+2\,k^2)^2\,(r_3+2\,r_5)\,t_3}$
$\tau_{1^-}^{\#1\,\alpha} +$	0	0	0	0	0	0	0
$\tau_{1^-}^{\#2\,\alpha} +$	0	0	0	$-\frac{4\,i}{k\,(1+2\,k^2)\,(r_3+2\,r_5)}$	$-\frac{i\,\sqrt{2}\,(3\,k^2\,(r_3+2\,r_5)+4\,t_3)}{k\,(1+2\,k^2)^2\,(r_3+2\,r_5)\,t_3}$	0	$\frac{6\,k^2\,(r_3+2\,r_5)+8\,t_3}{(1+2\,k^2)^2\,(r_3+2\,r_5)\,t_3}$