Spin-1 sector ($J^P = 1^+$, 1^-) Wave operator matrix

	$\sigma^{\#1}_{1^+}{}^{\dagger\alpha\beta}$	$\sigma^{\#2}_{1^+}{}^{\dagger\alpha\beta}$	$\tau^{\#1}_{1^+}{}^{\dagger\alpha\beta}$	$\sigma^{\#1}_{1^-}{}^{\dagger\alpha}$	$\sigma^{\#2}_{1^-}{}^{\dagger\alpha}$	$\tau^{\#1}_{1^-}{}^{\dagger\alpha}$	$\tau^{\#2}_{1^-}{}^{\dagger\alpha}$
$\tau^{\#2}_{1^-}{}^{\alpha}$	0	0	0	$\dfrac{4i}{k(1+2k^2)(r_3+2r_5)}$	$\dfrac{i\sqrt{2}\,(3k^2(r_3+2r_5)+4t_3)}{k(1+2k^2)^2(r_3+2r_5)t_3}$	0	$\dfrac{6k^2(r_3+2r_5)+8t_3}{(1+2k^2)^2(r_3+2r_5)t_3}$
$\tau^{\#1}_{1^-}{}^{\alpha}$	0	0	0	0	0	0	0
$\sigma^{\#2}_{1^-}{}^{\alpha}$	0	0	0	$\dfrac{2\sqrt{2}}{k^2(1+2k^2)(r_3+2r_5)}$	$\dfrac{3k^2(r_3+2r_5)+4t_3}{(k+2k^2)^2(r_3+2r_5)t_3}$	0	$-\dfrac{i\sqrt{2}\,(3k^2(r_3+2r_5)+4t_3)}{k(1+2k^2)^2(r_3+2r_5)t_3}$
$\sigma^{\#1}_{1^-}{}^{\alpha}$	0	0	0	$\dfrac{2}{k^2(r_3+2r_5)}$	$\dfrac{2\sqrt{2}}{k^2(1+2k^2)(r_3+2r_5)}$	0	$-\dfrac{4i}{k(1+2k^2)(r_3+2r_5)}$
$\tau^{\#1}_{1^+}{}^{\alpha\beta}$	0	0	0	0	0	0	0
$\sigma^{\#2}_{1^+}{}^{\alpha\beta}$	0	0	0	0	0	0	0
$\sigma^{\#1}_{1^+}{}^{\alpha\beta}$	$\dfrac{1}{k^2(2r_3+r_5)}$	0	0	0	0	0	0

	$\omega^{\#1}_{1^+}{}^{\dagger\alpha\beta}$	$\omega^{\#2}_{1^+}{}^{\dagger\alpha\beta}$	$f^{\#1}_{1^+}{}^{\dagger\alpha\beta}$	$\omega^{\#1}_{1^-}{}^{\dagger\alpha}$	$\omega^{\#2}_{1^-}{}^{\dagger\alpha}$	$f^{\#1}_{1^-}{}^{\dagger\alpha}$	$f^{\#2}_{1^-}{}^{\dagger\alpha}$
$f^{\#2}_{1^-}{}^{\alpha}$	0	0	0	$-\dfrac{2}{3}ikt_3$	$\dfrac{1}{3}i\sqrt{2}\,kt_3$	0	$\dfrac{2k^2t_3}{3}$
$f^{\#1}_{1^-}{}^{\alpha}$	0	0	0	0	0	0	0
$\omega^{\#2}_{1^-}{}^{\alpha}$	0	0	0	$-\dfrac{\sqrt{2}\,t_3}{3}$	$\dfrac{t_3}{3}$	0	$-\dfrac{1}{3}i\sqrt{2}\,kt_3$
$\omega^{\#1}_{1^-}{}^{\alpha}$	0	0	0	$k^2\!\left(\dfrac{r'_3}{2}+r_5\right)+\dfrac{2t_3}{3}$	$-\dfrac{\sqrt{2}\,t_3}{3}$	0	$\dfrac{2ikt_3}{3}$
$\omega^{\#2}_{1^+}{}^{\alpha\beta}$	0	0	0	0	0	0	0
$f^{\#1}_{1^+}{}^{\alpha\beta}$	0	0	0	0	0	0	0
$\omega^{\#1}_{1^+}{}^{\alpha\beta}$	$k^2(2r_3+r_5)$	0	0	0	0	0	0

Lagrangian density

$$\frac{2}{3} t_3\, \omega_\iota{}^{\alpha\iota}\, \omega_{\kappa\alpha}{}^{\kappa} + f^{\alpha\beta}\, \tau_{\alpha\beta} + \omega^{\alpha\beta\chi}\, \sigma_{\alpha\beta\chi} - \frac{1}{2} r_3\, \partial_\iota \omega^{\kappa\lambda}{}_\kappa\, \partial^\iota \omega_{\lambda}{}^{\alpha}{}_{\alpha} -$$
$$r_5\, \partial_\kappa \omega^{\kappa\lambda}{}_\lambda{}^{\alpha}{}_\alpha + \frac{1}{2} r_3\, \partial_\alpha \omega_\lambda{}^{\alpha}{}_\theta\, \partial_\kappa \omega^{\theta\kappa\lambda} - r_5\, \partial_\alpha \omega_\lambda{}^{\alpha}{}_\theta\, \partial_\kappa \omega^{\theta\kappa\lambda} -$$
$$\frac{1}{2} r_3\, \partial_\theta \omega_\lambda{}^{\alpha}{}_\alpha\, \partial_\kappa \omega^{\theta\kappa\lambda} + r_5\, \partial_\theta \omega_\lambda{}^{\alpha}{}_\alpha\, \partial_\kappa \omega^{\theta\kappa\lambda} - \frac{1}{2} r_3\, \partial_\alpha \omega_\lambda{}^{\alpha}{}_\theta\, \partial_\kappa \omega^{\kappa\lambda\theta} -$$
$$r_5\, \partial_\alpha \omega_\lambda{}^{\alpha}{}_\theta\, \partial_\kappa \omega^{\kappa\lambda\theta} + r_3\, \partial_\theta \omega_\lambda{}^{\alpha}{}_\alpha\, \partial_\kappa \omega^{\kappa\lambda\theta} + 2 r_5\, \partial_\theta \omega_\lambda{}^{\alpha}{}_\alpha\, \partial_\kappa \omega^{\kappa\lambda\theta} -$$
$$\frac{2}{3} t_3\, \omega_{\kappa\alpha}{}^{\alpha}\, \partial^\kappa f^\iota{}_\iota - \frac{2}{3} t_3\, \omega_{\kappa\lambda}{}^{\lambda}\, \partial^\kappa f^\iota{}_\iota - \frac{4}{3} t_3\, \partial^\alpha f_{\kappa\alpha}\, \partial^\kappa f^\iota{}_\iota + \frac{2}{3} t_3\, \partial_\kappa f^\lambda{}_\lambda\, \partial^\kappa f^\iota{}_\iota +$$
$$\frac{2}{3} t_3\, \omega_{\kappa\alpha}{}^{\alpha}\, \partial^\kappa f^\iota{}_\iota - \frac{2}{3} t_3\, \omega_{\kappa\lambda}{}^{\lambda}\, \partial^\kappa f^\iota{}_\iota + \frac{2}{3} t_3\, \partial^\alpha f^\lambda{}_\alpha\, \partial^\kappa f_{\lambda\kappa} - 4 r_3\, \partial^\beta \omega_\iota{}^{\lambda\alpha}\, \partial_\lambda \omega_{\alpha\beta}{}^{\iota} -$$
$$\frac{2}{3} t_3\, \omega_{\iota\alpha}{}^{\alpha}\, \partial^\kappa f^\iota{}_\kappa + \frac{2}{3} t_3\, \omega_{\iota\lambda}{}^{\lambda}\, \partial^\kappa f^\iota{}_\kappa + \frac{2}{3} t_3\, \partial^\alpha f^\lambda{}_\alpha\, \partial^\kappa f_{\lambda\kappa} + \frac{1}{2} r_3\, \partial_\theta \omega_\lambda{}^{\alpha}{}_\alpha\, \partial^\lambda \omega^{\theta\kappa}{}_\kappa -$$
$$\frac{1}{2} r_3\, \partial_\alpha \omega_\lambda{}^{\alpha}{}_\theta\, \partial^\lambda \omega^{\theta\kappa}{}_\kappa + r_5\, \partial_\alpha \omega_\lambda{}^{\alpha}{}_\theta\, \partial^\lambda \omega^{\theta\kappa}{}_\kappa - r_5\, \partial_\theta \omega_\lambda{}^{\alpha}{}_\alpha\, \partial^\lambda \omega^{\theta\kappa}{}_\kappa$$

Source constraints

SO(3) irreps	#
$\sigma^{\#1}_{0^+} == 0$	1
$\tau^{\#2}_{0^+} == 0$	1
$\tau^{\#1}_{0^+} - 2ik\,\sigma^{\#1}_{0^+} == 0$	1
$\tau^{\#2}_{1}{}^{\alpha} + 2ik\,\sigma^{\#2}_{1}{}^{\alpha} == 0$	3
$\tau^{\#1}_{1}{}^{\alpha} == 0$	3
$\tau^{\#1}_{1^+}{}^{\alpha\beta} == 0$	3
$\sigma^{\#2}_{1}{}^{\alpha\beta} == 0$	3
$\sigma^{\#1}_{2}{}^{\alpha\beta\chi} == 0$	5
$\tau^{\#1}_{2}{}^{\alpha\beta} == 0$	5
Total #:	25

Spin-2 sector (2^+)

	$\sigma^{\#1}_{2^+}{}_{\alpha\beta}$	$\tau^{\#1}_{2^+}{}_{\alpha\beta}$	$\sigma^{\#1}_{2^-}{}_{\alpha\beta\chi}$
$\sigma^{\#1}_{2^+}{}^{\dagger\alpha\beta}$	$-\dfrac{2}{3k^2r_3}$	0	0
$\tau^{\#1}_{2^+}{}^{\dagger\alpha\beta}$	0	0	0
$\sigma^{\#1}_{2^-}{}^{\dagger\alpha\beta\chi}$	0	0	0

	$\omega^{\#1}_{2^+}{}_{\alpha\beta}$	$f^{\#1}_{2^+}{}_{\alpha\beta}$	$\omega^{\#1}_{2^-}{}_{\alpha\beta\chi}$
$\omega^{\#1}_{2^+}{}^{\dagger\alpha\beta}$	$-\dfrac{3k^2r_3}{2}$	0	0
$f^{\#1}_{2^+}{}^{\dagger\alpha\beta}$	0	0	0
$\omega^{\#1}_{2^-}{}^{\dagger\alpha\beta\chi}$	0	0	0

Spin-0 sector

	$\omega^{\#1}_{0^+}$	$f^{\#1}_{0^+}$	$f^{\#2}_{0^+}$	$\omega^{\#1}_{0^-}$
$\omega^{\#1}_{0^+}{}^{\dagger}$	t_3	$-i\sqrt{2}\,kt_3$	0	0
$f^{\#1}_{0^+}{}^{\dagger}$	$i\sqrt{2}\,kt_3$	$2k^2t_3$	0	0
$f^{\#2}_{0^+}{}^{\dagger}$	0	0	0	0
$\omega^{\#1}_{0^-}{}^{\dagger}$	0	0	0	0

	$\sigma^{\#1}_{0^+}{}^{\dagger}$	$\tau^{\#1}_{0^+}{}^{\dagger}$	$\tau^{\#2}_{0^+}{}^{\dagger}$	$\sigma^{\#1}_{0^-}{}^{\dagger}$
$\sigma^{\#1}_{0^-}$	0	0	0	0
$\tau^{\#2}_{0^+}$	0	0	0	0
$\tau^{\#1}_{0^+}$	$-\dfrac{i\sqrt{2}\,k}{(1+2k^2)^2t_3}$	$\dfrac{2k^2}{(1+2k^2)^2t_3}$	0	0
$\sigma^{\#1}_{0^+}$	$\dfrac{1}{(1+2k^2)^2t_3}$	$\dfrac{i\sqrt{2}\,k}{(1+2k^2)^2t_3}$	0	0

Quadratic pole

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

Polarisations: 2

Unitarity conditions

$$r_3 < 0 \;\&\&\; \left(r_5 < -\tfrac{r_3}{2} \,||\, r_5 > -2r_3\right) \,||\, r_3 > 0 \;\&\&\; -2r_3 < r_5 < -\tfrac{r_3}{2}$$

(No massive particles)