# PSALTer results panel

$$S == \int\int\int\int \Big( \mathcal{A}^{\alpha\beta\chi}\ \sigma_{\alpha\beta\chi} + f^{\alpha\beta}\ \tau_{(\Delta+\mathcal{K})\alpha\beta} + \frac{1}{3}\, t_{\cdot 1}\, \Big( 3\ \mathcal{A}^{\alpha\prime}{}_{\alpha}\ \mathcal{A}_{\prime}{}^{\theta}{}_{\theta} - 6\ \mathcal{A}_{\alpha}{}^{\theta}{}_{\theta}\ \partial_{\prime} f^{\alpha\prime} + 6\ \mathcal{A}_{\prime}{}^{\theta}{}_{\theta}\ \partial^{\prime} f^{\alpha}{}_{\alpha} - 3\ \partial_{\prime} f^{\theta}{}_{\theta}\ \partial^{\prime} f^{\alpha}{}_{\alpha} - 3\ \partial_{\prime} f^{\alpha\prime}\ \partial_{\theta} f_{\alpha}{}^{\theta} + 6\ \partial^{\prime} f^{\alpha}{}_{\alpha}\ \partial_{\theta} f_{\prime}{}^{\theta} + 2\ \mathcal{A}_{\prime\theta\alpha}\ \partial^{\theta} f^{\alpha\prime} - 2\ \partial_{\alpha} f_{\prime\theta}\ \partial^{\theta} f^{\alpha\prime} - 2\ \partial_{\alpha} f_{\theta\prime}\ \partial^{\theta} f^{\alpha\prime} + \partial_{\prime} f_{\alpha\theta}\ \partial^{\theta} f^{\alpha\prime} + 2\ \partial_{\theta} f_{\alpha\prime}\ \partial^{\theta} f^{\alpha\prime} + \partial_{\theta} f_{\prime\alpha}\ \partial^{\theta} f^{\alpha\prime} + \mathcal{A}_{\alpha\prime\theta}\ \left( \mathcal{A}^{\alpha\prime\theta} + 2\ \partial^{\theta} f^{\alpha\prime} \right) + \mathcal{A}_{\alpha\theta\prime}\ \left( \mathcal{A}^{\alpha\prime\theta} + 4\ \partial^{\theta} f^{\alpha\prime} \right) \Big) + r_{\cdot 5}\, \Big( \partial_{\prime} \mathcal{A}_{\theta}{}^{\kappa}{}_{\kappa}\ \partial^{\theta} \mathcal{A}^{\alpha\prime}{}_{\alpha} - \partial_{\theta} \mathcal{A}_{\prime}{}^{\kappa}{}_{\kappa}\ \partial^{\theta} \mathcal{A}^{\alpha\prime}{}_{\alpha} - \left( \partial_{\alpha} \mathcal{A}^{\alpha\prime\theta} - 2\ \partial^{\theta} \mathcal{A}^{\alpha\prime}{}_{\alpha} \right) \left( \partial_{\kappa} \mathcal{A}_{\prime}{}^{\kappa}{}_{\theta} - \partial_{\kappa} \mathcal{A}_{\theta}{}^{\kappa}{}_{\prime} \right) \Big) \Big) \Big] [t, x, y, z]\, dz\, dy\, dx\, dt$$

# Wave operator

| | $0^+_\cdot \mathcal{A}^{\parallel}$ | $0^+_\cdot f^{\parallel}$ | $0^+_\cdot f^{\perp}$ | $0^-_\cdot \mathcal{A}^{\parallel}$ | $1^+_\cdot \mathcal{A}^{\parallel}{}_{\alpha\beta}$ | $1^+_\cdot \mathcal{A}^{\perp}{}_{\alpha\beta}$ | $1^+_\cdot f^{\parallel}{}_{\alpha\beta}$ | $1^-_\cdot \mathcal{A}^{\parallel}{}_{\alpha}$ | $1^-_\cdot \mathcal{A}^{\perp}{}_{\alpha}$ | $1^-_\cdot f^{\parallel}{}_{\alpha}$ | $1^-_\cdot f^{\perp}{}_{\alpha}$ | $2^+_\cdot \mathcal{A}^{\parallel}{}_{\alpha\beta}$ | $2^+_\cdot f^{\parallel}{}_{\alpha\beta}$ | $2^-_\cdot \mathcal{A}^{\parallel}{}_{\alpha\beta\chi}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $0^+_\cdot \mathcal{A}^{\parallel}\,\dagger$ | $-t_{\cdot 1}$ | $i\sqrt{2}\ k\, t_{\cdot 1}$ | $0$ | $0$ | | | | | | | | | | |
| $0^+_\cdot f^{\parallel}\,\dagger$ | $-i\sqrt{2}\ k\, t_{\cdot 1}$ | $-2k^2\, t_{\cdot 1}$ | $0$ | $0$ | | | | | | | | | | |
| $0^+_\cdot f^{\perp}\,\dagger$ | $0$ | $0$ | $0$ | $0$ | | | | | | | | | | |
| $0^-_\cdot \mathcal{A}^{\parallel}\,\dagger$ | $0$ | $0$ | $0$ | $0$ | | | | | | | | | | |
| $1^+_\cdot \mathcal{A}^{\parallel}\,\dagger^{\alpha\beta}$ | | | | | $k^2 r_{\cdot 5} + \frac{t_{\cdot 1}}{6}$ | $-\frac{t_{\cdot 1}}{3\sqrt{2}}$ | $-\frac{ikt_{\cdot 1}}{3\sqrt{2}}$ | $0$ | $0$ | $0$ | $0$ | | | |
| $1^+_\cdot \mathcal{A}^{\perp}\,\dagger^{\alpha\beta}$ | | | | | $-\frac{t_{\cdot 1}}{3\sqrt{2}}$ | $\frac{t_{\cdot 1}}{3}$ | $\frac{ikt_{\cdot 1}}{3}$ | $0$ | $0$ | $0$ | $0$ | | | |
| $1^+_\cdot f^{\parallel}\,\dagger^{\alpha\beta}$ | | | | | $\frac{ikt_{\cdot 1}}{3\sqrt{2}}$ | $-\frac{1}{3}ikt_{\cdot 1}$ | $\frac{k^2 t_{\cdot 1}}{3}$ | $0$ | $0$ | $0$ | $0$ | | | |
| $1^-_\cdot \mathcal{A}^{\parallel}\,\dagger^{\alpha}$ | | | | | $0$ | $0$ | $0$ | $k^2 r_{\cdot 5} - \frac{t_{\cdot 1}}{2}$ | $\frac{t_{\cdot 1}}{\sqrt{2}}$ | $0$ | $ikt_{\cdot 1}$ | | | |
| $1^-_\cdot \mathcal{A}^{\perp}\,\dagger^{\alpha}$ | | | | | $0$ | $0$ | $0$ | $\frac{t_{\cdot 1}}{\sqrt{2}}$ | $0$ | $0$ | $0$ | | | |
| $1^-_\cdot f^{\parallel}\,\dagger^{\alpha}$ | | | | | $0$ | $0$ | $0$ | $0$ | $0$ | $0$ | $0$ | | | |
| $1^-_\cdot f^{\perp}\,\dagger^{\alpha}$ | | | | | $0$ | $0$ | $0$ | $-ikt_{\cdot 1}$ | $0$ | $0$ | $0$ | | | |
| $2^+_\cdot \mathcal{A}^{\parallel}\,\dagger^{\alpha\beta}$ | | | | | | | | | | | | $\frac{t_{\cdot 1}}{2}$ | $-\frac{ikt_{\cdot 1}}{\sqrt{2}}$ | $0$ |
| $2^+_\cdot f^{\parallel}\,\dagger^{\alpha\beta}$ | | | | | | | | | | | | $\frac{ikt_{\cdot 1}}{\sqrt{2}}$ | $k^2 t_{\cdot 1}$ | $0$ |
| $2^-_\cdot \mathcal{A}^{\parallel}\,\dagger^{\alpha\beta\chi}$ | | | | | | | | | | | | $0$ | $0$ | $\frac{t_{\cdot 1}}{2}$ |

# Saturated propagator

| | $0^+_\cdot \sigma^{\parallel}$ | $0^+_\cdot \tau^{\parallel}$ | $0^+_\cdot \tau^{\perp}$ | $0^-_\cdot \sigma^{\parallel}$ | $1^+_\cdot \sigma^{\parallel}{}_{\alpha\beta}$ | $1^+_\cdot \sigma^{\perp}{}_{\alpha\beta}$ | $1^+_\cdot \tau^{\parallel}{}_{\alpha\beta}$ | $1^-_\cdot \sigma^{\parallel}{}_{\alpha}$ | $1^-_\cdot \sigma^{\perp}{}_{\alpha}$ | $1^-_\cdot \tau^{\parallel}{}_{\alpha}$ | $1^-_\cdot \tau^{\perp}{}_{\alpha}$ | $2^+_\cdot \sigma^{\parallel}{}_{\alpha\beta}$ | $2^+_\cdot \tau^{\parallel}{}_{\alpha\beta}$ | $2^-_\cdot \sigma^{\parallel}{}_{\alpha\beta\chi}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $0^+_\cdot \sigma^{\parallel}\,\dagger$ | $-\frac{1}{\left(1+2k^2\right)^2 t_{\cdot 1}}$ | $\frac{i\sqrt{2}\ k}{\left(1+2k^2\right)^2 t_{\cdot 1}}$ | $0$ | $0$ | | | | | | | | | | |
| $0^+_\cdot \tau^{\parallel}\,\dagger$ | $-\frac{i\sqrt{2}\ k}{\left(1+2k^2\right)^2 t_{\cdot 1}}$ | $-\frac{2k^2}{\left(1+2k^2\right)^2 t_{\cdot 1}}$ | $0$ | $0$ | | | | | | | | | | |
| $0^+_\cdot \tau^{\perp}\,\dagger$ | $0$ | $0$ | $0$ | $0$ | | | | | | | | | | |
| $0^-_\cdot \sigma^{\parallel}\,\dagger$ | $0$ | $0$ | $0$ | $0$ | | | | | | | | | | |
| $1^+_\cdot \sigma^{\parallel}\,\dagger^{\alpha\beta}$ | | | | | $\frac{1}{k^2 r_{\cdot 5}}$ | $\frac{1}{\sqrt{2}\left(k^2 r_{\cdot 5}+k^4 r_{\cdot 5}\right)}$ | $\frac{i}{\sqrt{2}\left(k r_{\cdot 5}+k^3 r_{\cdot 5}\right)}$ | $0$ | $0$ | $0$ | $0$ | | | |
| $1^+_\cdot \sigma^{\perp}\,\dagger^{\alpha\beta}$ | | | | | $\frac{1}{\sqrt{2}\left(k^2 r_{\cdot 5}+k^4 r_{\cdot 5}\right)}$ | $\frac{6k^2 r_{\cdot 5}+t_{\cdot 1}}{2(k+k^3)^2 r_{\cdot 5}\, t_{\cdot 1}}$ | $\frac{i\left(6k^2 r_{\cdot 5}+t_{\cdot 1}\right)}{2k\left(1+k^2\right)^2 r_{\cdot 5}\, t_{\cdot 1}}$ | $0$ | $0$ | $0$ | $0$ | | | |
| $1^+_\cdot \tau^{\parallel}\,\dagger^{\alpha\beta}$ | | | | | $-\frac{i}{\sqrt{2}\left(k r_{\cdot 5}+k^3 r_{\cdot 5}\right)}$ | $-\frac{i\left(6k^2 r_{\cdot 5}+t_{\cdot 1}\right)}{2k\left(1+k^2\right)^2 r_{\cdot 5}\, t_{\cdot 1}}$ | $\frac{6k^2 r_{\cdot 5}+t_{\cdot 1}}{2\left(1+k^2\right)^2 r_{\cdot 5}\, t_{\cdot 1}}$ | $0$ | $0$ | $0$ | $0$ | | | |
| $1^-_\cdot \sigma^{\parallel}\,\dagger^{\alpha}$ | | | | | $0$ | $0$ | $0$ | $0$ | $\frac{\sqrt{2}}{t_{\cdot 1}+2k^2 t_{\cdot 1}}$ | $0$ | $\frac{2ik}{t_{\cdot 1}+2k^2 t_{\cdot 1}}$ | | | |
| $1^-_\cdot \sigma^{\perp}\,\dagger^{\alpha}$ | | | | | $0$ | $0$ | $0$ | $\frac{\sqrt{2}}{t_{\cdot 1}+2k^2 t_{\cdot 1}}$ | $\frac{-2k^2 r_{\cdot 5}+t_{\cdot 1}}{\left(t_{\cdot 1}+2k^2 t_{\cdot 1}\right)^2}$ | $0$ | $-\frac{i\sqrt{2}\ k\left(2k^2 r_{\cdot 5}-t_{\cdot 1}\right)}{\left(t_{\cdot 1}+2k^2 t_{\cdot 1}\right)^2}$ | | | |
| $1^-_\cdot \tau^{\parallel}\,\dagger^{\alpha}$ | | | | | $0$ | $0$ | $0$ | $0$ | $0$ | $0$ | $0$ | | | |
| $1^-_\cdot \tau^{\perp}\,\dagger^{\alpha}$ | | | | | $0$ | $0$ | $0$ | $-\frac{2ik}{t_{\cdot 1}+2k^2 t_{\cdot 1}}$ | $\frac{i\sqrt{2}\ k\left(2k^2 r_{\cdot 5}-t_{\cdot 1}\right)}{\left(t_{\cdot 1}+2k^2 t_{\cdot 1}\right)^2}$ | $0$ | $\frac{-4k^4 r_{\cdot 5}+2k^2 t_{\cdot 1}}{\left(t_{\cdot 1}+2k^2 t_{\cdot 1}\right)^2}$ | | | |
| $2^+_\cdot \sigma^{\parallel}\,\dagger^{\alpha\beta}$ | | | | | | | | | | | | $\frac{2}{\left(1+2k^2\right)^2 t_{\cdot 1}}$ | $-\frac{2i\sqrt{2}\ k}{\left(1+2k^2\right)^2 t_{\cdot 1}}$ | $0$ |
| $2^+_\cdot \tau^{\parallel}\,\dagger^{\alpha\beta}$ | | | | | | | | | | | | $\frac{2i\sqrt{2}\ k}{\left(1+2k^2\right)^2 t_{\cdot 1}}$ | $\frac{4k^2}{\left(1+2k^2\right)^2 t_{\cdot 1}}$ | $0$ |
| $2^-_\cdot \sigma^{\parallel}\,\dagger^{\alpha\beta\chi}$ | | | | | | | | | | | | $0$ | $0$ | $\frac{2}{t_{\cdot 1}}$ |

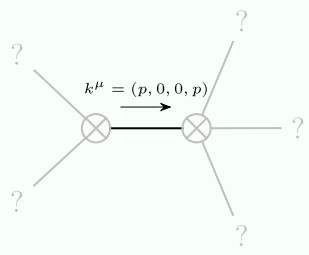
# Source constraints

| Spin-parity form | Covariant form | Multiplicities |
|---|---|---|
| $0^-_\cdot \sigma^{\parallel} == 0$ | $\epsilon \eta_{\alpha\beta\chi\delta}\ \partial^{\delta} \sigma^{\alpha\beta\chi} == 0$ | 1 |
| $0^+_\cdot \tau^{\perp} == 0$ | $\partial_{\beta}\partial_{\alpha} \tau_{(\Delta+\mathcal{K})}{}^{\alpha\beta} == 0$ | 1 |
| $-2\,i\,k\ 0^+_\cdot \sigma^{\parallel} + 0^+_\cdot \tau^{\parallel} == 0$ | $\partial_{\beta}\partial_{\alpha} \tau_{(\Delta+\mathcal{K})}{}^{\alpha\beta} == \partial_{\beta}\partial^{\beta} \tau_{(\Delta+\mathcal{K})}{}^{\alpha}{}_{\alpha} + 2\ \partial_{\chi}\partial^{\chi}\partial_{\beta} \sigma^{\alpha}{}_{\alpha}{}^{\beta}$ | 1 |
| $2\,i\,k\ 1^-_\cdot \sigma^{\perp}{}^{\alpha} + 1^-_\cdot \tau^{\perp}{}^{\alpha} == 0$ | $\partial_{\chi}\partial_{\beta}\partial^{\alpha} \tau_{(\Delta+\mathcal{K})}{}^{\beta\chi} == \partial_{\chi}\partial^{\chi}\partial_{\beta} \tau_{(\Delta+\mathcal{K})}{}^{\alpha\beta} + 2\ \partial_{\delta}\partial^{\delta}\partial_{\chi}\partial_{\beta} \sigma^{\beta\alpha\chi}$ | 3 |
| $1^-_\cdot \tau^{\parallel}{}^{\alpha} == 0$ | $\partial_{\chi}\partial_{\beta}\partial^{\alpha} \tau_{(\Delta+\mathcal{K})}{}^{\beta\chi} == \partial_{\chi}\partial^{\chi}\partial_{\beta} \tau_{(\Delta+\mathcal{K})}{}^{\beta\alpha}$ | 3 |
| $i\,k\ 1^+_\cdot \sigma^{\perp}{}^{\alpha\beta} + 1^+_\cdot \tau^{\parallel}{}^{\alpha\beta} == 0$ | $\partial_{\chi}\partial^{\alpha} \tau_{(\Delta+\mathcal{K})}{}^{\beta\chi} + \partial_{\chi}\partial^{\beta} \tau_{(\Delta+\mathcal{K})}{}^{\chi\alpha} + \partial_{\chi}\partial^{\chi} \tau_{(\Delta+\mathcal{K})}{}^{\alpha\beta} + 2\ \partial_{\delta}\partial_{\chi}\partial^{\alpha} \sigma^{\chi\beta\delta} + 2\ \partial_{\delta}\partial^{\delta}\partial_{\chi} \sigma^{\chi\alpha\beta} == \partial_{\chi}\partial^{\alpha} \tau_{(\Delta+\mathcal{K})}{}^{\chi\beta} + \partial_{\chi}\partial^{\beta} \tau_{(\Delta+\mathcal{K})}{}^{\alpha\chi} + \partial_{\chi}\partial^{\chi} \tau_{(\Delta+\mathcal{K})}{}^{\beta\alpha} + 2\ \partial_{\delta}\partial_{\chi}\partial^{\beta} \sigma^{\chi\alpha\delta}$ | 3 |
| $-2\,i\,k\ 2^+_\cdot \sigma^{\parallel}{}^{\alpha\beta} + 2^+_\cdot \tau^{\parallel}{}^{\alpha\beta} == 0$ | $-i \Big( 4\ \partial_{\delta}\partial_{\chi}\partial^{\beta}\partial^{\alpha} \tau_{(\Delta+\mathcal{K})}{}^{\chi\delta} + 2\ \partial_{\delta}\partial^{\delta}\partial^{\beta}\partial^{\alpha} \tau_{(\Delta+\mathcal{K})}{}^{\chi}{}_{\chi} - 3\ \partial_{\delta}\partial^{\delta}\partial_{\chi}\partial^{\alpha} \tau_{(\Delta+\mathcal{K})}{}^{\beta\chi} - 3\ \partial_{\delta}\partial^{\delta}\partial_{\chi}\partial^{\alpha} \tau_{(\Delta+\mathcal{K})}{}^{\chi\beta} - 3\ \partial_{\delta}\partial^{\delta}\partial_{\chi}\partial^{\beta} \tau_{(\Delta+\mathcal{K})}{}^{\alpha\chi} - 3\ \partial_{\delta}\partial^{\delta}\partial_{\chi}\partial^{\beta} \tau_{(\Delta+\mathcal{K})}{}^{\chi\alpha} + 3\ \partial_{\delta}\partial^{\delta}\partial_{\chi}\partial^{\chi} \tau_{(\Delta+\mathcal{K})}{}^{\alpha\beta} + 3\ \partial_{\delta}\partial^{\delta}\partial_{\chi}\partial^{\chi} \tau_{(\Delta+\mathcal{K})}{}^{\beta\alpha} + 4\,i\ k^{\chi}\ \partial_{\epsilon}\partial_{\chi}\partial^{\beta}\partial^{\alpha} \sigma^{\delta}{}_{\delta}{}^{\epsilon} - 6\,i\ k^{\chi}\ \partial_{\epsilon}\partial_{\delta}\partial_{\chi}\partial^{\alpha} \sigma^{\delta\beta\epsilon} - 6\,i\ k^{\chi}\ \partial_{\epsilon}\partial_{\delta}\partial_{\chi}\partial^{\beta} \sigma^{\delta\alpha\epsilon} + 6\,i\ k^{\chi}\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial_{\chi} \sigma^{\alpha\beta\delta} + 6\,i\ k^{\chi}\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial_{\chi} \sigma^{\beta\alpha\delta} + 2\ \eta^{\alpha\beta}\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial_{\chi} \tau_{(\Delta+\mathcal{K})}{}^{\chi\delta} - 2\ \eta^{\alpha\beta}\ \partial_{\epsilon}\partial^{\epsilon}\partial_{\delta}\partial^{\delta} \tau_{(\Delta+\mathcal{K})}{}^{\chi}{}_{\chi} - 4\,i\ \eta^{\alpha\beta}\ k^{\chi}\ \partial_{\phi}\partial^{\phi}\partial_{\epsilon}\partial_{\chi} \sigma^{\delta}{}_{\delta}{}^{\epsilon} \Big) == 0$ | 5 |
| Total expected gauge generators: | | 17 |

# Massive spectrum

(No particles)

# Massless spectrum




Massless particle

| | |
|---|---|
| Pole residue: | $\frac{9}{r_{\cdot 5}} + \frac{2p^2}{t_{\cdot 1}} + \frac{2r_{\cdot 5}\, p^4}{t_{\cdot 1}^2} > 0$ |
| Polarisations: | 2 |

# Unitarity conditions

$$r_{\cdot 5} > 0\ \&\&\ \left( t_{\cdot 1} < 0 \,\|\, t_{\cdot 1} > 0 \right)$$