# PSALTer results panel

$$\mathcal{S} == \int\int\int\int (\frac{1}{6}(2(t_1 - 2t_3)\,\mathcal{A}^{\alpha\prime}{}_{\alpha}\,\mathcal{A}_{\prime}{}^{\theta}{}_{\theta} + 6\,\mathcal{A}^{\alpha\beta\chi}\,\sigma_{\alpha\beta\chi} + 6\,f^{\alpha\beta}\,\tau(\Delta+\mathcal{K})_{\alpha\beta} - 4t_1\,\mathcal{A}_{\alpha}{}^{\theta}{}_{\theta}\,\partial_{\prime}f^{\alpha\prime} + 8t_3\,\mathcal{A}_{\alpha}{}^{\theta}{}_{\theta}\,\partial_{\prime}f^{\alpha\prime} - 6r_1\,\partial_{\beta}\mathcal{A}_{\prime}{}^{\theta}{}_{\theta}\partial^{\prime}\mathcal{A}^{\alpha\beta}{}_{\alpha} + 6r_1\,\partial_{\prime}\mathcal{A}_{\beta}{}^{\theta}{}_{\theta}\partial^{\prime}\mathcal{A}^{\alpha\beta}{}_{\alpha} + 4t_1\,\mathcal{A}_{\prime}{}^{\theta}{}_{\theta}\,\partial^{\prime}f^{\alpha}{}_{\alpha} - 8t_3\,\mathcal{A}_{\prime}{}^{\theta}{}_{\theta}\,\partial^{\prime}f^{\alpha}{}_{\alpha} - 2t_1\,\partial_{\prime}f^{\theta}{}_{\theta}\partial^{\prime}f^{\alpha}{}_{\alpha} + 4t_3\,\partial_{\prime}f^{\theta}{}_{\theta}\partial^{\prime}f^{\alpha}{}_{\alpha} + 6r_1\,\partial_{\alpha}\mathcal{A}^{\alpha\beta\prime}\partial_{\theta}\mathcal{A}_{\beta}{}^{\theta}{}_{\prime} - 12r_1\,\partial^{\prime}\mathcal{A}^{\alpha\beta}{}_{\alpha}\partial_{\theta}\mathcal{A}_{\prime}{}^{\theta}{}_{\beta} - 6r_1\,\partial_{\alpha}\mathcal{A}^{\alpha\beta\prime}\partial_{\theta}\mathcal{A}_{\prime}{}^{\theta}{}_{\beta} + 12r_1\,\partial^{\prime}\mathcal{A}^{\alpha\beta}{}_{\alpha}\partial_{\theta}\mathcal{A}_{\prime}{}^{\theta}{}_{\beta} - 2t_1\,\partial_{\prime}f^{\alpha\prime}\partial_{\theta}f_{\alpha}{}^{\theta} + 4t_3\,\partial_{\prime}f^{\alpha\prime}\partial_{\theta}f_{\alpha}{}^{\theta} + 4t_1\,\partial^{\prime}f^{\alpha}{}_{\alpha}\partial_{\theta}f_{\prime}{}^{\theta} - 8t_3\,\partial^{\prime}f^{\alpha}{}_{\alpha}\partial_{\theta}f_{\prime}{}^{\theta} - 8r_1\,\partial_{\beta}\mathcal{A}_{\alpha\prime\theta}\partial^{\theta}\mathcal{A}^{\alpha\beta\prime} + 4r_1\,\partial_{\beta}\mathcal{A}_{\alpha\theta\prime}\partial^{\theta}\mathcal{A}^{\alpha\beta\prime} - 16r_1\,\partial_{\beta}\mathcal{A}_{\prime\theta\alpha}\partial^{\theta}\mathcal{A}^{\alpha\beta\prime} - 4r_1\,\partial_{\prime}\mathcal{A}_{\alpha\beta\theta}\partial^{\theta}\mathcal{A}^{\alpha\beta\prime} + 4r_1\,\partial_{\theta}\mathcal{A}_{\alpha\beta\prime}\partial^{\theta}\mathcal{A}^{\alpha\beta\prime} + 4r_1\,\partial_{\theta}\mathcal{A}_{\alpha\prime\beta}\partial^{\theta}\mathcal{A}^{\alpha\beta\prime} - 6t_1\,\partial_{\alpha}f_{\prime\theta}\partial^{\theta}f^{\alpha\prime} - 3t_1\,\partial_{\alpha}f_{\theta\prime}\partial^{\theta}f^{\alpha\prime} + 3t_1\,\partial_{\prime}f_{\alpha\theta}\partial^{\theta}f^{\alpha\prime} + 3t_1\,\partial_{\theta}f_{\alpha\prime}\partial^{\theta}f^{\alpha\prime} + 3t_1\,\partial_{\theta}f_{\prime\alpha}\partial^{\theta}f^{\alpha\prime} + 6t_1\,\mathcal{A}_{\alpha\theta\prime}\,(\mathcal{A}^{\alpha\prime\theta} + 2\,\partial^{\theta}f^{\alpha\prime})))[t, x, y, z]\,dz\,dy\,dx\,dt$$

# Wave operator

| | $0^+_{\cdot}\mathcal{A}^{\parallel}$ | $0^+_{\cdot}f^{\parallel}$ | $0^+_{\cdot}f^{\perp}$ | $0^-_{\cdot}\mathcal{A}^{\parallel}$ |
|---|---|---|---|---|
| $0^+_{\cdot}\mathcal{A}^{\parallel}\,\dagger$ | $t_3$ | $-i\sqrt{2}\,k t_3$ | 0 | 0 |
| $0^+_{\cdot}f^{\parallel}\,\dagger$ | $i\sqrt{2}\,k t_3$ | $2k^2 t_3$ | 0 | 0 |
| $0^+_{\cdot}f^{\perp}\,\dagger$ | 0 | 0 | 0 | 0 |
| $0^-_{\cdot}\mathcal{A}^{\parallel}\,\dagger$ | 0 | 0 | 0 | $-t_1$ |

| | $1^+_{\cdot}\mathcal{A}^{\parallel}{}_{\alpha\beta}$ | $1^+_{\cdot}\mathcal{A}^{\perp}{}_{\alpha\beta}$ | $1^+_{\cdot}f^{\parallel}{}_{\alpha\beta}$ | $1^-_{\cdot}\mathcal{A}^{\parallel}{}_{\alpha}$ | $1^-_{\cdot}\mathcal{A}^{\perp}{}_{\alpha}$ | $1^-_{\cdot}f^{\parallel}{}_{\alpha}$ | $1^-_{\cdot}f^{\perp}{}_{\alpha}$ |
|---|---|---|---|---|---|---|---|
| $1^+_{\cdot}\mathcal{A}^{\parallel}\,\dagger^{\alpha\beta}$ | $k^2 r_1 - \frac{t_1}{2}$ | $-\frac{t_1}{\sqrt{2}}$ | $-\frac{ikt_1}{\sqrt{2}}$ | 0 | 0 | 0 | 0 |
| $1^+_{\cdot}\mathcal{A}^{\perp}\,\dagger^{\alpha\beta}$ | $-\frac{t_1}{\sqrt{2}}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $1^+_{\cdot}f^{\parallel}\,\dagger^{\alpha\beta}$ | $\frac{ikt_1}{\sqrt{2}}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $1^-_{\cdot}\mathcal{A}^{\parallel}\,\dagger^{\alpha}$ | 0 | 0 | 0 | $\frac{1}{6}(t_1 + 4t_3)$ | $\frac{t_1 - 2t_3}{3\sqrt{2}}$ | 0 | $\frac{1}{3}ik(t_1 - 2t_3)$ |
| $1^-_{\cdot}\mathcal{A}^{\perp}\,\dagger^{\alpha}$ | 0 | 0 | 0 | $\frac{t_1 - 2t_3}{3\sqrt{2}}$ | $\frac{t_1 + t_3}{3}$ | 0 | $\frac{1}{3}i\sqrt{2}\,k(t_1 + t_3)$ |
| $1^-_{\cdot}f^{\parallel}\,\dagger^{\alpha}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| $1^-_{\cdot}f^{\perp}\,\dagger^{\alpha}$ | 0 | 0 | 0 | $-\frac{1}{3}ik(t_1 - 2t_3)$ | $-\frac{1}{3}i\sqrt{2}\,k(t_1 + t_3)$ | 0 | $\frac{2}{3}k^2(t_1 + t_3)$ |

| | $2^+_{\cdot}\mathcal{A}^{\parallel}{}_{\alpha\beta}$ | $2^+_{\cdot}f^{\parallel}{}_{\alpha\beta}$ | $2^-_{\cdot}\mathcal{A}^{\parallel}{}_{\alpha\beta\chi}$ |
|---|---|---|---|
| $2^+_{\cdot}\mathcal{A}^{\parallel}\,\dagger^{\alpha\beta}$ | $\frac{t_1}{2}$ | $-\frac{ikt_1}{\sqrt{2}}$ | 0 |
| $2^+_{\cdot}f^{\parallel}\,\dagger^{\alpha\beta}$ | $\frac{ikt_1}{\sqrt{2}}$ | $k^2 t_1$ | 0 |
| $2^-_{\cdot}\mathcal{A}^{\parallel}\,\dagger^{\alpha\beta\chi}$ | 0 | 0 | $k^2 r_1 + \frac{t_1}{2}$ |

# Saturated propagator

| | $0^+_{\cdot}\sigma^{\parallel}$ | $0^+_{\cdot}\tau^{\parallel}$ | $0^+_{\cdot}\tau^{\perp}$ | $0^-_{\cdot}\sigma^{\parallel}$ |
|---|---|---|---|---|
| $0^+_{\cdot}\sigma^{\parallel}\,\dagger$ | $\frac{1}{(1+2k^2)^2 t_3}$ | $-\frac{i\sqrt{2}\,k}{(1+2k^2)^2 t_3}$ | 0 | 0 |
| $0^+_{\cdot}\tau^{\parallel}\,\dagger$ | $\frac{i\sqrt{2}\,k}{(1+2k^2)^2 t_3}$ | $\frac{2k^2}{(1+2k^2)^2 t_3}$ | 0 | 0 |
| $0^+_{\cdot}\tau^{\perp}\,\dagger$ | 0 | 0 | 0 | 0 |
| $0^-_{\cdot}\sigma^{\parallel}\,\dagger$ | 0 | 0 | 0 | $-\frac{1}{t_1}$ |

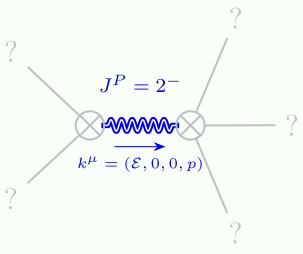
| | $1^+_{\cdot}\sigma^{\parallel}{}_{\alpha\beta}$ | $1^+_{\cdot}\sigma^{\perp}{}_{\alpha\beta}$ | $1^+_{\cdot}\tau^{\parallel}{}_{\alpha\beta}$ | $1^-_{\cdot}\sigma^{\parallel}{}_{\alpha}$ | $1^-_{\cdot}\sigma^{\perp}{}_{\alpha}$ | $1^-_{\cdot}\tau^{\parallel}{}_{\alpha}$ | $1^-_{\cdot}\tau^{\perp}{}_{\alpha}$ |
|---|---|---|---|---|---|---|---|
| $1^+_{\cdot}\sigma^{\parallel}\,\dagger^{\alpha\beta}$ | 0 | $-\frac{\sqrt{2}}{t_1 + k^2 t_1}$ | $-\frac{i\sqrt{2}\,k}{t_1 + k^2 t_1}$ | 0 | 0 | 0 | 0 |
| $1^+_{\cdot}\sigma^{\perp}\,\dagger^{\alpha\beta}$ | $-\frac{\sqrt{2}}{t_1 + k^2 t_1}$ | $\frac{-2k^2 r_1 + t_1}{(1+k^2)^2 t_1^2}$ | $-\frac{i(2k^3 r_1 - k t_1)}{(1+k^2)^2 t_1^2}$ | 0 | 0 | 0 | 0 |
| $1^+_{\cdot}\tau^{\parallel}\,\dagger^{\alpha\beta}$ | $\frac{i\sqrt{2}\,k}{t_1 + k^2 t_1}$ | $\frac{i(2k^3 r_1 - k t_1)}{(1+k^2)^2 t_1^2}$ | $\frac{-2k^4 r_1 + k^2 t_1}{(1+k^2)^2 t_1^2}$ | 0 | 0 | 0 | 0 |
| $1^-_{\cdot}\sigma^{\parallel}\,\dagger^{\alpha}$ | 0 | 0 | 0 | $\frac{2(t_1 + t_3)}{3 t_1 t_3}$ | $-\frac{\sqrt{2}(t_1 - 2t_3)}{3(1+2k^2) t_1 t_3}$ | 0 | $-\frac{2ikt_1 - 4ikt_3}{3 t_1 t_3 + 6k^2 t_1 t_3}$ |
| $1^-_{\cdot}\sigma^{\perp}\,\dagger^{\alpha}$ | 0 | 0 | 0 | $-\frac{\sqrt{2}(t_1 - 2t_3)}{3(1+2k^2) t_1 t_3}$ | $\frac{t_1 + 4t_3}{3(1+2k^2)^2 t_1 t_3}$ | 0 | $\frac{i\sqrt{2}\,k(t_1 + 4t_3)}{3(1+2k^2)^2 t_1 t_3}$ |
| $1^-_{\cdot}\tau^{\parallel}\,\dagger^{\alpha}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| $1^-_{\cdot}\tau^{\perp}\,\dagger^{\alpha}$ | 0 | 0 | 0 | $\frac{2ikt_1 - 4ikt_3}{3 t_1 t_3 + 6k^2 t_1 t_3}$ | $-\frac{i\sqrt{2}\,k(t_1 + 4t_3)}{3(1+2k^2)^2 t_1 t_3}$ | 0 | $\frac{2k^2(t_1 + 4t_3)}{3(1+2k^2)^2 t_1 t_3}$ |

| | $2^+_{\cdot}\sigma^{\parallel}{}_{\alpha\beta}$ | $2^+_{\cdot}\tau^{\parallel}{}_{\alpha\beta}$ | $2^-_{\cdot}\sigma^{\parallel}{}_{\alpha\beta\chi}$ |
|---|---|---|---|
| $2^+_{\cdot}\sigma^{\parallel}\,\dagger^{\alpha\beta}$ | $\frac{2}{(1+2k^2)^2 t_1}$ | $-\frac{2i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$ | 0 |
| $2^+_{\cdot}\tau^{\parallel}\,\dagger^{\alpha\beta}$ | $\frac{2i\sqrt{2}\,k}{(1+2k^2)^2 t_1}$ | $\frac{4k^2}{(1+2k^2)^2 t_1}$ | 0 |
| $2^-_{\cdot}\sigma^{\parallel}\,\dagger^{\alpha\beta\chi}$ | 0 | 0 | $\frac{2}{2k^2 r_1 + t_1}$ |

# Source constraints

| Spin-parity form | Covariant form | Multiplicities |
|---|---|---|
| $0^+_{\cdot}\tau^{\perp} == 0$ | $\partial_\beta\partial_\alpha\tau(\Delta+\mathcal{K})^{\alpha\beta} == 0$ | 1 |
| $-2ik\,0^+_{\cdot}\sigma^{\parallel} + 0^+_{\cdot}\tau^{\parallel} == 0$ | $\partial_\beta\partial_\alpha\tau(\Delta+\mathcal{K})^{\alpha\beta} == \partial_\beta\partial^\beta\tau(\Delta+\mathcal{K})^{\alpha}{}_{\alpha} + 2\,\partial_\chi\partial^\chi\partial_\beta\sigma^{\alpha}{}_{\alpha}{}^{\beta}$ | 1 |
| $2ik\,1^-_{\cdot}\sigma^{\perp\alpha} + 1^-_{\cdot}\tau^{\perp\alpha} == 0$ | $\partial_\chi\partial_\beta\partial^\alpha\tau(\Delta+\mathcal{K})^{\beta\chi} == \partial_\chi\partial^\chi\partial_\beta\tau(\Delta+\mathcal{K})^{\alpha\beta} + 2\,\partial_\delta\partial^\delta\partial_\chi\partial_\beta\sigma^{\beta\alpha\chi}$ | 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 |
| $ik\,1^+_{\cdot}\sigma^{\perp\alpha\beta} + 1^+_{\cdot}\tau^{\parallel\alpha\beta} == 0$ | $\partial_\chi\partial^\alpha\tau(\Delta+\mathcal{K})^{\beta\chi} + \partial_\chi\partial^\beta\tau(\Delta+\mathcal{K})^{\chi\alpha} + \partial_\chi\partial^\chi\tau(\Delta+\mathcal{K})^{\alpha\beta} + 2\,\partial_\delta\partial_\chi\partial^\alpha\sigma^{\chi\beta\delta} + 2\,\partial_\delta\partial^\delta\partial_\chi\sigma^{\chi\alpha\beta} == \partial_\chi\partial^\alpha\tau(\Delta+\mathcal{K})^{\chi\beta} + \partial_\chi\partial^\beta\tau(\Delta+\mathcal{K})^{\alpha\chi} + \partial_\chi\partial^\chi\tau(\Delta+\mathcal{K})^{\beta\alpha} + 2\,\partial_\delta\partial_\chi\partial^\beta\sigma^{\chi\alpha\delta}$ | 3 |
| $-2ik\,2^+_{\cdot}\sigma^{\parallel\alpha\beta} + 2^+_{\cdot}\tau^{\parallel\alpha\beta} == 0$ | $-i(4\,\partial_\delta\partial_\chi\partial^\beta\partial^\alpha\tau(\Delta+\mathcal{K})^{\chi\delta} + 2\,\partial_\delta\partial^\delta\partial^\beta\partial^\alpha\tau(\Delta+\mathcal{K})^{\chi}{}_{\chi} - 3\,\partial_\delta\partial^\delta\partial_\chi\partial^\alpha\tau(\Delta+\mathcal{K})^{\beta\chi} - 3\,\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau(\Delta+\mathcal{K})^{\chi\alpha} - 3\,\partial_\delta\partial^\delta\partial_\chi\partial^\beta\tau(\Delta+\mathcal{K})^{\alpha\chi} + 3\,\partial_\delta\partial^\delta\partial_\chi\partial^\chi\tau(\Delta+\mathcal{K})^{\alpha\beta} + 3\,\partial_\delta\partial^\delta\partial_\chi\partial^\chi\tau(\Delta+\mathcal{K})^{\beta\alpha} + 4i\,k^\chi\,\partial_\epsilon\partial_\chi\partial^\beta\partial^\alpha\sigma^{\delta}{}_{\delta}{}^{\epsilon} - 6i\,k^\chi\,\partial_\epsilon\partial_\delta\partial_\chi\partial^\alpha\sigma^{\delta\beta\epsilon} - 6i\,k^\chi\,\partial_\epsilon\partial_\delta\partial_\chi\partial^\beta\sigma^{\delta\alpha\epsilon} + 6i\,k^\chi\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial_\chi\sigma^{\alpha\beta\delta} + 6i\,k^\chi\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial_\chi\sigma^{\beta\alpha\delta} + 2\,\eta^{\alpha\beta}\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial_\chi\tau(\Delta+\mathcal{K})^{\chi\delta} - 2\,\eta^{\alpha\beta}\,\partial_\epsilon\partial^\epsilon\partial_\delta\partial^\delta\tau(\Delta+\mathcal{K})^{\chi}{}_{\chi} - 4i\,\eta^{\alpha\beta}\,k^\chi\,\partial_\phi\partial^\phi\partial_\epsilon\partial_\chi\sigma^{\delta}{}_{\delta}{}^{\epsilon}) == 0$ | 5 |
| Total expected gauge generators: | | 16 |

# Massive spectrum




Massive particle

| | |
|---|---|
| Pole residue: | $-\frac{1}{r_1} > 0$ |
| Square mass: | $-\frac{t_1}{2r_1} > 0$ |
| Spin: | 2 |
| Parity: | Odd |

# Massless spectrum

(No particles)

# Unitarity conditions

$r_1 < 0\ \&\&\ t_1 > 0$