# PSALTer results panel

$$\mathcal{S} == \iiiint\Big( \mathcal{A}^{\alpha\beta\chi}\ \sigma_{\alpha\beta\chi} + f^{\alpha\beta}\ \tau(\Delta+\mathcal{K})_{\alpha\beta} - \tfrac{1}{2}\alpha_{0}\big(\mathcal{A}_{\alpha\chi\beta}\ \mathcal{A}^{\alpha\beta\chi} + \mathcal{A}^{\alpha\beta}{}_{\alpha}\ \mathcal{A}_{\beta}{}^{\chi}{}_{\chi} + 2\ f^{\alpha\beta}\ \partial_{\beta}\mathcal{A}_{\alpha}{}^{\chi}{}_{\chi} - 2\,\partial_{\beta}\mathcal{A}^{\alpha\beta}{}_{\alpha} - 2\ f^{\alpha\beta}\ \partial_{\chi}\mathcal{A}_{\alpha}{}^{\chi}{}_{\beta} + 2\ f^{\alpha}{}_{\alpha}\ \partial_{\chi}\mathcal{A}^{\beta\chi}{}_{\beta}\big) -$$
$$\alpha_{1}\big(\partial_{\chi}\mathcal{A}_{\beta}{}^{\delta}{}_{\delta}\partial^{\chi}\mathcal{A}^{\alpha\beta}{}_{\alpha} + (\partial_{\alpha}\mathcal{A}^{\alpha\beta\chi} - 2\,\partial^{\chi}\mathcal{A}^{\alpha\beta}{}_{\alpha})\,\partial_{\delta}\mathcal{A}_{\beta}{}^{\delta}{}_{\chi}\big) + 4\,\alpha_{3}\,\partial_{\beta}\mathcal{A}^{\alpha\beta}{}_{\alpha}\partial_{\delta}\mathcal{A}^{\chi\delta}{}_{\chi} -$$
$$\alpha_{2}\big(\partial_{\chi}\mathcal{A}_{\delta}{}^{\zeta}{}_{\zeta}\partial^{\delta}\mathcal{A}^{\beta\chi}{}_{\beta} + (\partial_{\beta}\mathcal{A}^{\beta\chi\delta} - 2\,\partial^{\delta}\mathcal{A}^{\beta\chi}{}_{\beta})\,\partial_{\zeta}\mathcal{A}_{\delta}{}^{\zeta}{}_{\chi}\big)\Big)[t, x, y, z]\,dz\,dy\,dx\,dt$$

# Wave operator

| | $0^+\mathcal{A}^\parallel$ | $0^+ f^\parallel$ | $0^+ f^\perp$ | $0^-\mathcal{A}^\parallel$ |
|---|---|---|---|---|
| $0^+\mathcal{A}^\parallel\dagger$ | $\frac{1}{2}(\alpha_{0} + 4(\alpha_{1} + \alpha_{2} + 3\alpha_{3})k^2)$ | $-\frac{i\alpha_{0}k}{\sqrt{2}}$ | $0$ | $0$ |
| $0^+ f^\parallel\dagger$ | $\frac{i\alpha_{0}k}{\sqrt{2}}$ | $0$ | $0$ | $0$ |
| $0^+ f^\perp\dagger$ | $0$ | $0$ | $0$ | $0$ |
| $0^-\mathcal{A}^\parallel\dagger$ | $0$ | $0$ | $0$ | $\frac{\alpha_{0}}{2}$ |

| | $1^+\mathcal{A}^\parallel{}_{\alpha\beta}$ | $1^+\mathcal{A}^\perp{}_{\alpha\beta}$ | $1^+ f^\parallel{}_{\alpha\beta}$ | $1^-\mathcal{A}^\parallel{}_{\alpha}$ | $1^-\mathcal{A}^\perp{}_{\alpha}$ | $1^- f^\parallel{}_{\alpha}$ | $1^- f^\perp{}_{\alpha}$ |
|---|---|---|---|---|---|---|---|
| $1^+\mathcal{A}^\parallel\dagger^{\alpha\beta}$ | $\frac{1}{4}(\alpha_{0} + 2(\alpha_{1} - \alpha_{2})k^2)$ | $\frac{\alpha_{0}}{2\sqrt{2}}$ | $\frac{i\alpha_{0}k}{2\sqrt{2}}$ | $0$ | $0$ | $0$ | $0$ |
| $1^+\mathcal{A}^\perp\dagger^{\alpha\beta}$ | $\frac{\alpha_{0}}{2\sqrt{2}}$ | $0$ | $0$ | $0$ | $0$ | $0$ | $0$ |
| $1^+ f^\parallel\dagger^{\alpha\beta}$ | $-\frac{i\alpha_{0}k}{2\sqrt{2}}$ | $0$ | $0$ | $0$ | $0$ | $0$ | $0$ |
| $1^-\mathcal{A}^\parallel\dagger^{\alpha}$ | $0$ | $0$ | $0$ | $\frac{\alpha_{0}}{4} + \alpha_{1}k^2$ | $-\frac{\alpha_{0}}{2\sqrt{2}}$ | $0$ | $-\frac{1}{2}i\alpha_{0}k$ |
| $1^-\mathcal{A}^\perp\dagger^{\alpha}$ | $0$ | $0$ | $0$ | $-\frac{\alpha_{0}}{2\sqrt{2}}$ | $0$ | $0$ | $0$ |
| $1^- f^\parallel\dagger^{\alpha}$ | $0$ | $0$ | $0$ | $0$ | $0$ | $0$ | $0$ |
| $1^- f^\perp\dagger^{\alpha}$ | $0$ | $0$ | $0$ | $\frac{i\alpha_{0}k}{2}$ | $0$ | $0$ | $0$ |

| | $2^+\mathcal{A}^\parallel{}_{\alpha\beta}$ | $2^+ f^\parallel{}_{\alpha\beta}$ | $2^-\mathcal{A}^\parallel{}_{\alpha\beta\chi}$ |
|---|---|---|---|
| $2^+\mathcal{A}^\parallel\dagger^{\alpha\beta}$ | $\frac{1}{4}(-\alpha_{0} + 2(\alpha_{1} + \alpha_{2})k^2)$ | $\frac{i\alpha_{0}k}{2\sqrt{2}}$ | $0$ |
| $2^+ f^\parallel\dagger^{\alpha\beta}$ | $-\frac{i\alpha_{0}k}{2\sqrt{2}}$ | $0$ | $0$ |
| $2^-\mathcal{A}^\parallel\dagger^{\alpha\beta\chi}$ | $0$ | $0$ | $-\frac{\alpha_{0}}{4}$ |

# Saturated propagator

| | $0^+\sigma^\parallel$ | $0^+\tau^\parallel$ | $0^+\tau^\perp$ | $0^-\sigma^\parallel$ |
|---|---|---|---|---|
| $0^+\sigma^\parallel\dagger$ | $0$ | $-\frac{i\sqrt{2}}{\alpha_{0}k}$ | $0$ | $0$ |
| $0^+\tau^\parallel\dagger$ | $\frac{i\sqrt{2}}{\alpha_{0}k}$ | $-\frac{4(\alpha_{1}+\alpha_{2}+3\alpha_{3})+\frac{\alpha_{0}}{k^2}}{\alpha_{0}^2}$ | $0$ | $0$ |
| $0^+\tau^\perp\dagger$ | $0$ | $0$ | $0$ | $0$ |
| $0^-\sigma^\parallel\dagger$ | $0$ | $0$ | $0$ | $\frac{2}{\alpha_{0}}$ |

| | $1^+\sigma^\parallel{}_{\alpha\beta}$ | $1^+\sigma^\perp{}_{\alpha\beta}$ | $1^+\tau^\parallel{}_{\alpha\beta}$ | $1^-\sigma^\parallel{}_{\alpha}$ | $1^-\sigma^\perp{}_{\alpha}$ | $1^-\tau^\parallel{}_{\alpha}$ | $1^-\tau^\perp{}_{\alpha}$ |
|---|---|---|---|---|---|---|---|
| $1^+\sigma^\parallel\dagger^{\alpha\beta}$ | $0$ | $\frac{2\sqrt{2}}{\alpha_{0}+\alpha_{0}k^2}$ | $\frac{2i\sqrt{2}k}{\alpha_{0}+\alpha_{0}k^2}$ | $0$ | $0$ | $0$ | $0$ |
| $1^+\sigma^\perp\dagger^{\alpha\beta}$ | $\frac{2\sqrt{2}}{\alpha_{0}+\alpha_{0}k^2}$ | $-\frac{2(\alpha_{0}+2(\alpha_{1}-\alpha_{2})k^2)}{\alpha_{0}^2(1+k^2)^2}$ | $-\frac{2ik(\alpha_{0}+2(\alpha_{1}-\alpha_{2})k^2)}{\alpha_{0}^2(1+k^2)^2}$ | $0$ | $0$ | $0$ | $0$ |
| $1^+\tau^\parallel\dagger^{\alpha\beta}$ | $-\frac{2i\sqrt{2}k}{\alpha_{0}+\alpha_{0}k^2}$ | $\frac{2ik(\alpha_{0}+2(\alpha_{1}-\alpha_{2})k^2)}{\alpha_{0}^2(1+k^2)^2}$ | $-\frac{2k^2(\alpha_{0}+2(\alpha_{1}-\alpha_{2})k^2)}{\alpha_{0}^2(1+k^2)^2}$ | $0$ | $0$ | $0$ | $0$ |
| $1^-\sigma^\parallel\dagger^{\alpha}$ | $0$ | $0$ | $0$ | $0$ | $-\frac{2\sqrt{2}}{\alpha_{0}+2\alpha_{0}k^2}$ | $0$ | $-\frac{4ik}{\alpha_{0}+2\alpha_{0}k^2}$ |
| $1^-\sigma^\perp\dagger^{\alpha}$ | $0$ | $0$ | $0$ | $-\frac{2\sqrt{2}}{\alpha_{0}+2\alpha_{0}k^2}$ | $-\frac{2(\alpha_{0}+4\alpha_{1}k^2)}{(\alpha_{0}+2\alpha_{0}k^2)^2}$ | $0$ | $-\frac{2i\sqrt{2}k(\alpha_{0}+4\alpha_{1}k^2)}{(\alpha_{0}+2\alpha_{0}k^2)^2}$ |
| $1^-\tau^\parallel\dagger^{\alpha}$ | $0$ | $0$ | $0$ | $0$ | $0$ | $0$ | $0$ |
| $1^-\tau^\perp\dagger^{\alpha}$ | $0$ | $0$ | $0$ | $\frac{4ik}{\alpha_{0}+2\alpha_{0}k^2}$ | $\frac{2i\sqrt{2}k(\alpha_{0}+4\alpha_{1}k^2)}{(\alpha_{0}+2\alpha_{0}k^2)^2}$ | $0$ | $-\frac{4k^2(\alpha_{0}+4\alpha_{1}k^2)}{(\alpha_{0}+2\alpha_{0}k^2)^2}$ |

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

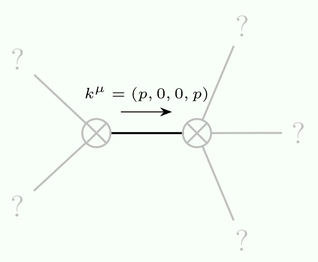
# Source constraints

| Spin-parity form | Covariant form | Multiplicities |
|---|---|---|
| $0^+\tau^\perp == 0$ | $\partial_{\beta}\partial_{\alpha}\tau(\Delta+\mathcal{K})^{\alpha\beta} == 0$ | 1 |
| $2ik\ 1^-\sigma^{\perp\alpha} + 1^-\tau^{\perp\alpha} == 0$ | $\partial_{\chi}\partial_{\beta}\partial^{\alpha}\tau(\Delta+\mathcal{K})^{\beta\chi} == \partial_{\chi}\partial^{\chi}\partial_{\beta}\tau(\Delta+\mathcal{K})^{\alpha\beta} + 2\,\partial_{\delta}\partial^{\delta}\partial_{\chi}\partial_{\beta}\sigma^{\beta\alpha\chi}$ | 3 |
| $1^-\tau^{\parallel\alpha} == 0$ | $\partial_{\chi}\partial_{\beta}\partial^{\alpha}\tau(\Delta+\mathcal{K})^{\beta\chi} == \partial_{\chi}\partial^{\chi}\partial_{\beta}\tau(\Delta+\mathcal{K})^{\beta\alpha}$ | 3 |
| $ik\ 1^+\sigma^{\perp\alpha\beta} + 1^+\tau^{\parallel\alpha\beta} == 0$ | $\partial_{\chi}\partial^{\alpha}\tau(\Delta+\mathcal{K})^{\beta\chi} + \partial_{\chi}\partial^{\beta}\tau(\Delta+\mathcal{K})^{\chi\alpha} + \partial_{\chi}\partial^{\chi}\tau(\Delta+\mathcal{K})^{\alpha\beta} + 2\,\partial_{\delta}\partial_{\chi}\partial^{\alpha}\sigma^{\chi\beta\delta} + 2\,\partial_{\delta}\partial^{\delta}\partial_{\chi}\sigma^{\chi\alpha\beta} ==$ $\partial_{\chi}\partial^{\alpha}\tau(\Delta+\mathcal{K})^{\chi\beta} + \partial_{\chi}\partial^{\beta}\tau(\Delta+\mathcal{K})^{\alpha\chi} + \partial_{\chi}\partial^{\chi}\tau(\Delta+\mathcal{K})^{\beta\alpha} + 2\,\partial_{\delta}\partial_{\chi}\partial^{\beta}\sigma^{\chi\alpha\delta}$ | 3 |
| Total expected gauge generators: | | 10 |

# Massive spectrum

(No particles)

# Massless spectrum




Massless particle

| | |
|---|---|
| Pole residue: | $\frac{p^2}{\alpha_{0}} > 0$ |
| Polarisations: | 2 |

# Unitarity conditions

$\alpha_{0} > 0$