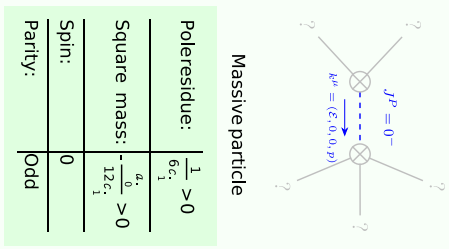
# PSALTer results panel

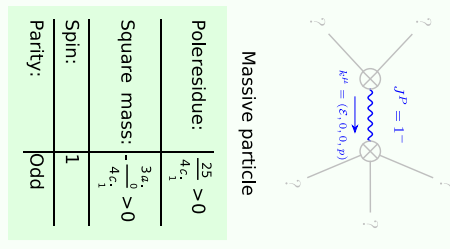
## Wave operator and propagator

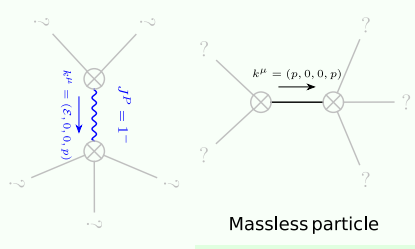
| Spin-parity form | Covariant form | Multiplicities |
|---|---|---|
| $^{0^+}_{\cdot}\mathcal{W}_{s}{}^{\parallel} + 3\,{}^{0^+}_{\cdot}\mathcal{W}_{s}{}^{\perp t} == 2\,{}^{0^+}_{\cdot}\mathcal{W}_{s}{}^{\perp h}$ | $\partial_\alpha \mathcal{W}^{\alpha\beta}{}_{\beta} == 2(\partial_\beta \mathcal{W}^{\alpha}{}_{\alpha}{}^{\beta} + \partial_\beta \mathcal{W}^{\alpha\beta}{}_{\alpha})$ | 1 |
| $^{0^+}_{\cdot}\mathcal{T}^{\perp} == 0$ | $\partial_\beta \partial_\alpha \mathcal{T}^{\alpha\beta} == 0$ | 1 |
| $2(\,{}^{1^-}_{\cdot}\mathcal{W}_{s}{}^{\parallel h\alpha} + {}^{1^-}_{\cdot}\mathcal{W}_{s}{}^{\perp h\alpha}) == {}^{1^-}_{\cdot}\mathcal{W}_{s}{}^{\parallel t\alpha} + {}^{1^-}_{\cdot}\mathcal{W}_{s}{}^{\perp t\alpha}$ | $\partial_\beta \partial^\alpha \mathcal{W}^{\beta\chi}{}_{\chi} + 2(\partial_\chi \partial^\chi \mathcal{W}^{\beta\alpha}{}_{\beta} + \partial_\chi \partial^\chi \mathcal{W}^{\beta}{}_{\beta}{}^{\alpha}) == 2\,\partial_\chi \partial^\alpha \mathcal{W}^{\beta}{}_{\beta}{}^{\chi} + 2\,\partial_\chi \partial^\alpha \mathcal{W}^{\beta\chi}{}_{\beta} + \partial_\chi \partial^\chi \mathcal{W}^{\alpha\beta}{}_{\beta}$ | 3 |
| $^{1^-}_{\cdot}\mathcal{T}^{\perp\alpha} == 0$ | $\partial_\chi \partial_\beta \partial^\alpha \mathcal{T}^{\beta\chi} == \partial_\chi \partial^\chi \partial_\beta \mathcal{T}^{\alpha\beta}$ | 3 |
| Total expected gauge generators: | | 8 |

$$S == \int\int\int\int \Big( \mathcal{R}^{\alpha\beta\chi}\ \mathcal{W}_{\alpha\beta\chi} + \mathcal{T}^{\alpha\beta}\ h_{\alpha\beta} + \frac{1}{72}\,a_{0}^{\cdot}\,(16\,\mathcal{R}^{\chi}{}_{\alpha}{}^{\chi}{}_{\chi}\ \mathcal{R}^{\alpha\ \beta}{}_{\alpha}{}^{\beta} - 16\,\mathcal{R}^{\alpha\beta}{}_{\beta}\ \mathcal{R}^{\alpha\ \chi}{}_{\beta}{}^{\chi} + 32\,\mathcal{R}^{\alpha\beta}{}_{\alpha}\ \mathcal{R}^{\chi}{}_{\beta}{}^{\chi}{}_{\chi} + 4\,\mathcal{R}^{\alpha\ \beta}{}_{\alpha}{}^{\chi}\ \mathcal{R}^{\chi}{}_{\beta\chi} - 18\,h^{\chi}{}_{\beta\chi}\ \partial_\alpha \mathcal{R}^{\alpha\ \beta}{}_{\alpha} + 18\,h^{\chi}{}_{\chi}\ \partial_\beta \mathcal{R}^{\alpha\beta}{}_{\alpha} - 36\,h_{\alpha\chi}\ \partial_\beta \mathcal{R}^{\alpha\beta\chi} - 36\,\mathcal{R}^{\alpha\beta\chi}\ (\mathcal{R}_{\beta\chi\alpha} + \partial_\beta h_{\alpha\chi}) - 18\,\mathcal{R}^{\alpha}{}_{\alpha}{}^{\beta}{}_{\chi}\ \partial_\beta h^{\chi}{}_{\chi} + 18\,\mathcal{R}^{\alpha\beta}{}_{\alpha}\ h^{\alpha\beta}{}_{\chi}\ \partial_\beta \partial_\alpha h^{\chi}{}_{\chi} - 9\,\partial_\beta h^{\chi}{}_{\chi}\ \partial^\beta h^{\alpha}{}_{\alpha} + 36\,\mathcal{R}^{\alpha\ \beta}{}_{\alpha}{}^{\chi}\ \partial_\chi h^{\alpha}{}_{\beta} - 36\,h^{\alpha\beta}{}_{\alpha}\ \partial_\chi \partial_\beta h_{\alpha}{}^{\chi} + 18\,h^{\alpha}{}_{\alpha}\ \partial_\chi \partial_\beta h^{\beta\chi} + 18\,h^{\alpha\beta}{}_{\alpha}\ \partial_\chi \partial^\chi h_{\alpha\beta} - 18\,h^{\alpha}{}_{\alpha}\ \partial_\chi \partial^\chi h^{\alpha}{}_{\beta} + 36\,h_{\beta\chi}\ \partial^\chi \mathcal{R}^{\alpha\ \beta}{}_{\alpha} - 18\,\partial_\beta h_{\alpha\chi}\ \partial^\chi h^{\alpha\beta} + 9\,\partial_\chi h_{\alpha\beta}\ \partial^\chi h^{\alpha\beta}) + c_{1}^{\cdot}\,(\partial_\alpha \mathcal{R}^{\chi\ \mu}{}_{\chi}\ \partial^\chi \mathcal{R}^{\alpha\beta}{}_{\mu} - \partial_\chi \mathcal{R}^{\chi\ \mu}{}_{\alpha}\ \partial^\chi \mathcal{R}^{\alpha\beta}{}_{\beta} + 2\,\partial_\alpha \mathcal{R}_{\beta\mu}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} - 2\,\partial_\alpha \mathcal{R}_{\chi\beta\mu}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} + 2\,\partial_\alpha \mathcal{R}_{\chi\mu\beta}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} - \partial_\alpha \mathcal{R}_{\mu\beta\chi}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} + 2\,\partial_\beta \mathcal{R}_{\alpha\mu\chi}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} + \partial_\beta \mathcal{R}_{\alpha\mu\chi}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} - \partial_\beta \mathcal{R}_{\chi\mu\alpha}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} + \partial_\chi \mathcal{R}_{\alpha\beta\mu}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} - \partial_\chi \mathcal{R}_{\beta\alpha\mu}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} + 2\,\partial_\chi \mathcal{R}_{\beta\mu\alpha}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} - \partial_\chi \mathcal{R}_{\alpha\beta\mu}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} + \partial_\mu \mathcal{R}_{\alpha\chi\beta}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} - \partial_\mu \mathcal{R}_{\beta\chi\alpha}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} + 2\,\partial_\mu \mathcal{R}_{\chi\beta\alpha}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} + \partial_\mu \mathcal{R}_{\chi\beta\alpha}\ \partial^\mu \mathcal{R}^{\alpha\beta\chi} + \partial_\chi \partial_\beta h_{\alpha\mu}\ \partial^\mu \partial^\chi h^{\alpha\beta} - \partial_\mu \partial_\beta h_{\alpha\chi}\ \partial^\mu \partial^\chi h^{\alpha\beta}) \big)\,[t,\ x,\ y,\ z]\,\mathrm{d}\ z\ \mathrm{d}\ y\ \mathrm{d}\ x\ \mathrm{d}\ t$$

## Massive and massless spectra




## Unitarity conditions

$$a_{0}^{\cdot} < 0\ \&\&\ c_{1}^{\cdot} > 0$$