

# Field kinematics

| Momentum | Norm                 | Frame                      |
|----------|----------------------|----------------------------|
| $k^\mu$  | $k^2 == k_\mu k^\mu$ | $n^\mu == \frac{k^\mu}{k}$ |

## Fundamental fields

| Fundamental field          | Symmetries                           | Decomposition in SO(3) irreps   | Source                     |
|----------------------------|--------------------------------------|---|----------------------------|
| $\omega_{\alpha\beta\chi}$ | StrongGenSet[{1, 2}, GenSet[-(1,2)]] | $-\frac{1}{2} \eta_{\beta\chi} \omega_{1^- \alpha}^{\#1} + \frac{1}{2} \eta_{\alpha\chi} \omega_{1^- \beta}^{\#1} + \frac{4}{3} \omega_{2^- \alpha\beta\chi}^{\#1} +$ $\frac{1}{3} \eta_{\beta\chi} \omega_{0^+}^{\#1} n_\alpha + \omega_{1^+ \beta\chi}^{\#1} n_\alpha + \omega_{2^+ \beta\chi}^{\#1} n_\alpha - \frac{1}{3} \eta_{\alpha\chi} \omega_{0^+}^{\#1} n_\beta -$ $\omega_{1^+ \alpha\chi}^{\#1} n_\beta - \omega_{2^+ \alpha\chi}^{\#1} n_\beta + \omega_{1^+ \alpha\beta}^{\#2} n_\chi - \frac{1}{2} \omega_{1^- \beta}^{\#1} n_\alpha n_\chi -$ $\omega_{1^- \beta}^{\#2} n_\alpha n_\chi + \frac{1}{2} \omega_{1^- \alpha}^{\#1} n_\beta n_\chi + \omega_{1^- \alpha}^{\#2} n_\beta n_\chi - \frac{1}{6} \epsilon \eta_{\alpha\beta\chi\delta} \omega_{0^-}^{\#1} n^\delta$ | $\sigma_{\alpha\beta\chi}$ |

## SO(3) irreps

| SO(3) irrep                          | Symmetries                           | Expansion in fundamental field  | Source                               |
|--------------------------------------|--------------------------------------|---|--------------------------------------|
| $\omega_{0^+}^{\#1}$                 | StrongGenSet[{}], GenSet[]           | $\omega_\alpha^\beta{}_\beta n^\alpha$  | $\sigma_{0^+}^{\#1}$                 |
| $\omega_{0^-}^{\#1}$                 | StrongGenSet[{}], GenSet[]           | $-\epsilon \eta_{\alpha\beta\chi\delta} \omega^{\beta\chi\delta} n^\alpha$  | $\sigma_{0^-}^{\#1}$                 |
| $\omega_{1^+ \alpha\beta}^{\#1}$     | StrongGenSet[{1, 2}, GenSet[-(1,2)]] | $-\frac{1}{2} \omega_{\alpha\chi\beta} n^\chi + \frac{1}{2} \omega_{\beta\chi\alpha} n^\chi - \frac{1}{2} \omega_{\beta\chi\delta} n_\alpha n^\chi n^\delta + \frac{1}{2} \omega_{\alpha\chi\delta} n_\beta n^\chi n^\delta$  | $\sigma_{1^+ \alpha\beta}^{\#1}$     |
| $\omega_{1^+ \alpha\beta}^{\#2}$     | StrongGenSet[{1, 2}, GenSet[-(1,2)]] | $\omega_{\alpha\beta\chi} n^\chi + \omega_{\beta\chi\delta} n_\alpha n^\chi n^\delta - \omega_{\alpha\chi\delta} n_\beta n^\chi n^\delta$   | $\sigma_{1^+ \alpha\beta}^{\#2}$     |
| $\omega_{1^- \alpha}^{\#1}$          | StrongGenSet[{}], GenSet[]           | $-\omega_\alpha^\beta{}_\beta + \omega_\beta^\chi{}_\chi n_\alpha n^\beta + \omega_{\alpha\beta\chi} n^\beta n^\chi$  | $\sigma_{1^- \alpha}^{\#1}$          |
| $\omega_{1^- \alpha}^{\#2}$          | StrongGenSet[{}], GenSet[]           | $\omega_{\alpha\beta\chi} n^\beta n^\chi$   | $\sigma_{1^- \alpha}^{\#2}$          |
| $\omega_{2^+ \alpha\beta}^{\#1}$     | StrongGenSet[{1, 2}, GenSet[(1,2)]]  | $-\frac{1}{2} \omega_{\alpha\chi\beta} n^\chi - \frac{1}{2} \omega_{\beta\chi\alpha} n^\chi - \frac{1}{3} \eta_{\alpha\beta} \omega_\chi^\delta{}_\delta n^\chi +$ $\frac{1}{3} \omega_\chi^\delta{}_\delta n_\alpha n_\beta n^\chi + \frac{1}{2} \omega_{\beta\chi\delta} n_\alpha n^\chi n^\delta + \frac{1}{2} \omega_{\alpha\chi\delta} n_\beta n^\chi n^\delta$  | $\sigma_{2^+ \alpha\beta}^{\#1}$     |
| $\omega_{2^- \alpha\beta\chi}^{\#1}$ | StrongGenSet[{1, 2}, GenSet[-(1,2)]] | $\frac{1}{2} \omega_{\alpha\beta\chi} + \frac{1}{4} \omega_{\alpha\chi\beta} - \frac{3}{8} \eta_{\beta\chi} \omega_\alpha^\delta{}_\delta - \frac{1}{4} \omega_{\beta\chi\alpha} + \frac{3}{8} \eta_{\alpha\chi} \omega_\beta^\delta{}_\delta -$ $\frac{3}{8} \omega_\beta^\delta{}_\delta n_\alpha n_\chi + \frac{3}{8} \omega_\alpha^\delta{}_\delta n_\beta n_\chi + \frac{1}{4} \omega_{\beta\chi\delta} n_\alpha n^\delta + \frac{1}{2} \omega_{\beta\delta\chi} n_\alpha n^\delta +$ $\frac{1}{4} \omega_{\chi\delta\beta} n_\alpha n^\delta + \frac{3}{8} \eta_{\beta\chi} \omega_\delta^\epsilon{}_\epsilon n_\alpha n^\delta - \frac{1}{4} \omega_{\alpha\chi\delta} n_\beta n^\delta -$ $\frac{1}{2} \omega_{\alpha\delta\chi} n_\beta n^\delta - \frac{1}{4} \omega_{\chi\delta\alpha} n_\beta n^\delta - \frac{3}{8} \eta_{\alpha\chi} \omega_\delta^\epsilon{}_\epsilon n_\beta n^\delta - \frac{1}{2} \omega_{\alpha\beta\delta} n_\chi n^\delta -$ $\frac{1}{4} \omega_{\alpha\delta\beta} n_\chi n^\delta + \frac{1}{4} \omega_{\beta\delta\alpha} n_\chi n^\delta + \frac{3}{8} \eta_{\beta\chi} \omega_{\alpha\delta\epsilon} n^\delta n^\epsilon -$ $\frac{3}{8} \eta_{\alpha\chi} \omega_{\beta\delta\epsilon} n^\delta n^\epsilon - \frac{3}{8} \omega_{\beta\delta\epsilon} n_\alpha n_\chi n^\delta n^\epsilon + \frac{3}{8} \omega_{\alpha\delta\epsilon} n_\beta n_\chi n^\delta n^\epsilon$ | $\sigma_{2^- \alpha\beta\chi}^{\#1}$ |