

Wave operator and propagator

$$\begin{aligned}
& \text{Quadratic (free) action} \\
& S = \iiint (\frac{1}{6} (2 \omega_{\alpha}^{\alpha} (t_1 \omega_{\theta}^{\theta} - 2 t_3 \omega_{\kappa}^{\kappa}) + 6 f^{\alpha\beta} \tau_{\alpha\beta} + 6 \omega^{\alpha\beta\chi} \sigma_{\alpha\beta\chi} - \\
& 4 t_1 \omega_{\alpha}^{\theta} \partial_{\theta} f^{\alpha\kappa} + 8 t_3 \omega_{\kappa}^{\kappa} \partial_{\kappa} f^{\alpha\kappa} + 4 t_1 \omega_{\theta}^{\theta} \partial_{\theta} f^{\alpha\alpha} - \\
& 8 t_3 \omega_{\kappa}^{\kappa} \partial_{\kappa} f^{\alpha\alpha} - 2 t_1 \partial_{\theta} f^{\theta} \partial_{\theta} f^{\alpha\alpha} + 4 t_3 \partial_{\kappa} f^{\kappa} \partial_{\kappa} f^{\alpha\alpha} - \\
& 6 r_1 \partial_{\beta} \omega_{\theta}^{\theta} \partial_{\theta} \omega^{\alpha\beta} + 6 r_1 \partial_{\theta} \omega_{\beta}^{\theta} \partial_{\theta} \omega^{\alpha\beta} - \\
& 2 t_1 \partial_{\theta} f^{\alpha\kappa} \partial_{\theta} f^{\theta\alpha} + 4 t_1 \partial_{\theta} f^{\alpha\alpha} \partial_{\theta} f^{\theta\theta} + 6 r_1 \partial_{\alpha} \omega^{\alpha\beta\kappa} \partial_{\theta} \omega_{\beta}^{\theta} - \\
& 12 r_1 \partial_{\theta} \omega^{\alpha\beta} \partial_{\theta} \omega_{\beta}^{\theta} - 6 t_1 \partial_{\alpha} \omega^{\alpha\beta\kappa} \partial_{\beta} \omega_{\kappa}^{\theta} + \\
& 12 r_1 \partial_{\theta} \omega^{\alpha\beta} \partial_{\theta} \omega_{\beta}^{\theta} - 6 t_1 \partial_{\theta} f^{\alpha\kappa} \partial_{\theta} f^{\theta\alpha} - \\
& 3 t_1 \partial_{\theta} \omega_{\theta}^{\theta} \partial_{\theta} f^{\alpha\kappa} + 3 t_1 \partial_{\theta} f^{\alpha\kappa} \partial_{\theta} f^{\theta\alpha} + 3 t_1 \partial_{\theta} f^{\alpha\kappa} \partial_{\theta} f^{\theta\alpha} + \\
& 3 t_1 \partial_{\theta} f^{\alpha\kappa} \partial_{\theta} f^{\theta\alpha} + 6 t_1 \omega_{\alpha\theta} (\omega^{\alpha\theta} + 2 \partial^{\theta} f^{\alpha\kappa}) - \\
& 8 r_1 \partial_{\beta} \omega_{\alpha}^{\theta} \partial_{\theta} \omega^{\alpha\beta\kappa} + 4 r_1 \partial_{\beta} \omega_{\alpha\theta} \partial_{\theta} \omega^{\alpha\beta\kappa} - \\
& 16 r_1 \partial_{\beta} \omega_{\theta}^{\theta} \partial_{\theta} \omega^{\alpha\beta\kappa} - 4 r_1 \partial_{\theta} \omega_{\alpha\beta} \partial_{\theta} \omega^{\alpha\beta\kappa} + \\
& 4 r_1 \partial_{\theta} \omega_{\alpha\beta} \partial_{\theta} \omega^{\alpha\beta\kappa} + 4 r_1 \partial_{\theta} \omega_{\alpha\beta} \partial_{\theta} \omega^{\alpha\beta\kappa} + \\
& 4 t_3 \partial_{\theta} f^{\alpha\kappa} \partial_{\kappa} f^{\theta\alpha} - 8 t_3 \partial_{\theta} f^{\alpha\kappa} \partial_{\kappa} f^{\theta\alpha}) [t, x, y, z] dz dy dx dt
\end{aligned}$$

The diagram shows two vertices connected by a wavy line representing a massive particle. The left vertex has two incoming lines (top-left and bottom-left) and two outgoing lines (top-right and bottom-right). The right vertex has two incoming lines (top-right and bottom-right) and two outgoing lines (top-left and bottom-left). The wavy line is labeled with $J^P = 2^-$ and k^μ . To the right of the diagram is a table listing the properties of the exchanged particle.

Massive particle	
Pole residue:	$-\frac{1}{r_1} > 0$
Polarisations:	5
Square mass:	$-\frac{t_1}{2r_1} > 0$
Spin:	2
Parity:	Odd

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

$$\begin{array}{c}
\begin{array}{c} \omega_{0+}^{\#1} \quad f_{0+}^{\#1} \quad f_{0+}^{\#2} \quad \omega_{0+}^{\#1} \\ \omega_{0+}^{\#1} \dagger \quad \begin{array}{|c|c|c|c|} \hline t_3 & -i\sqrt{2}kt_3 & 0 & 0 \\ \hline \end{array} \\ f_{0+}^{\#1} \dagger \quad \begin{array}{|c|c|c|c|} \hline i\sqrt{2}kt_3 & 2k^2t_3 & 0 & 0 \\ \hline \end{array} \\ f_{0+}^{\#2} \dagger \quad \begin{array}{|c|c|c|c|} \hline 0 & 0 & 0 & 0 \\ \hline \end{array} \\ \omega_{0+}^{\#1} \dagger \quad \begin{array}{|c|c|c|c|} \hline 0 & 0 & 0 & -t_1 \\ \hline \end{array} \end{array} \\
\begin{array}{c} \sigma_{0+}^{\#1} \quad \tau_{0+}^{\#1} \quad \tau_{0+}^{\#2} \quad \sigma_{0+}^{\#1} \\ \sigma_{0+}^{\#1} \dagger \quad \begin{array}{|c|c|c|c|} \hline \frac{1}{(1+2k^2)^2t_3} & -\frac{i\sqrt{2}k}{(1+2k^2)^2t_3} & 0 & 0 \\ \hline \end{array} \\ \tau_{0+}^{\#1} \dagger \quad \begin{array}{|c|c|c|c|} \hline \frac{i\sqrt{2}k}{(1+2k^2)^2t_3} & \frac{2k^2}{(1+2k^2)^2t_3} & 0 & 0 \\ \hline \end{array} \\ \tau_{0+}^{\#2} \dagger \quad \begin{array}{|c|c|c|c|} \hline 0 & 0 & 0 & 0 \\ \hline \end{array} \\ \sigma_{0+}^{\#1} \dagger \quad \begin{array}{|c|c|c|c|} \hline 0 & 0 & 0 & -\frac{1}{t_1} \\ \hline \end{array} \end{array}
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\begin{array}{c}
\begin{array}{c} \omega_{2+}^{\#1} \quad f_{2+}^{\#1} \quad \omega_{2+}^{\#1} \\ \omega_{2+}^{\#1} \dagger \quad \begin{array}{|c|c|c|} \hline \frac{t_1}{2} & -\frac{ikt_1}{\sqrt{2}} & 0 \\ \hline \end{array} \\ f_{2+}^{\#1} \dagger \quad \begin{array}{|c|c|c|} \hline \frac{ikt_1}{\sqrt{2}} & k^2t_1 & 0 \\ \hline \end{array} \\ \omega_{2+}^{\#1} \dagger \quad \begin{array}{|c|c|c|} \hline 0 & 0 & k^2r_1 + \frac{t_1}{2} \\ \hline \end{array} \end{array} \\
\begin{array}{c} \sigma_{2+}^{\#1} \quad \tau_{2+}^{\#1} \quad \sigma_{2+}^{\#1} \\ \sigma_{2+}^{\#1} \dagger \quad \begin{array}{|c|c|c|} \hline 0 & 0 & \frac{2}{2k^2r_1+t_1} \\ \hline \end{array} \\ \tau_{2+}^{\#1} \dagger \quad \begin{array}{|c|c|c|} \hline -\frac{2i\sqrt{2}k}{(1+2k^2)^2t_1} & \frac{4k^2}{(1+2k^2)^2t_1} & 0 \\ \hline \end{array} \\ \sigma_{2+}^{\#1} \dagger \quad \begin{array}{|c|c|c|} \hline \frac{2}{(1+2k^2)^2t_1} & \frac{2i\sqrt{2}k}{(1+2k^2)^2t_1} & 0 \\ \hline \end{array} \end{array}
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