

ELEMENTARY PARTICLE PHYSICS

WS 2016/2017: Exercise sheet 8

25. Draw all Feynman diagrams for $e^+e^- \rightarrow e^+e^-$ scattering (Bhabha scattering) in second order e and translate the diagrams into a formula for the scattering amplitude.
26. Draw all Feynman diagrams for electron positron annihilation into two photons, $e^+e^- \rightarrow \gamma\gamma$, in second order e and translate the diagrams into a formula for the scattering amplitude.
27. Show that the flux factor of a two-particle scattering $1 + 2 \rightarrow \dots$ can be written as $4\sqrt{s} |\vec{p}_1|$ in the CMS. Here \sqrt{s} is the CMS energy, $s = (p_1 + p_2)^2$.
28. The Mandelstam variables s, t, u for a two-particle scattering $A + B \rightarrow 1 + 2$ are defined as $s = (p_A + p_B)^2, t = (p_A - p_1)^2$ und $u = (p_A - p_2)^2$. Show that

$$s + t + u = m_A^2 + m_B^2 + m_1^2 + m_2^2$$