Physikalisches Institut, Albert-Ludwigs-Universität Freiburg

Übungen zur Vorlesung

Supersymmetrie

WS 07/08

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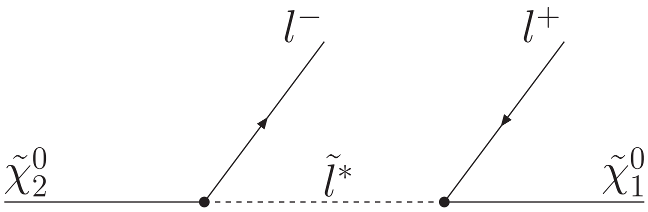
Blatt 12

Präsenz-Aufgabe 13 Dilepton Edges

Consider the following decay chain:



a) Show that in the rest frame of the particle A, the momenta of particles B and C in the decay $A \to B + C$ is given by

$$|\vec{p}_B| = |\vec{p}_C| = \frac{1}{2M_A}\sqrt{\lambda(M_A^2, m_b^2, m_c^2)}$$
$$\lambda(a,b,c) = a^2 + b^2 + c^2 - 2ab - 2ac - 2bc.$$

b) Calculate the dilepton edge, i.e. the maximum invariant mass the lepton pair can have. Neglect the lepton masses. The result should look like

$$(m_{ll}^{\max})^2 = \frac{\left(m^2_{\tilde{\chi}_2^0} - m^2_{\tilde{l}}\right)\left(m^2_{\tilde{l}} - m^2_{\tilde{\chi}_1^0}\right)}{m^2_{\tilde{l}}}.$$

The kinematic endpoint of the dilepton invariant mass distribution is one of the most important observables in SUSY searches at the LHC.