Massachusetts Institute of Technology

Department of Physics

Course: 8.701 – Introduction to Nuclear and Particle Physics
Term: Fall 2020
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Discussion Problems

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Problem 1: Scintillator counter

Consider two particles with masses m_1 and m_2 and the same momentum p. Evaluate the difference Δt between the times taken to cross a distance L. Suppose we have two scintillator counters that measure Δt with a resolution of 300 ps. How large must L be to distinguish π and K of 4 GeV momentum with two standard deviations?

Problem 2: Syncrotron radiation

Calculated the energy loss per turn for a circular collider due to syncrotron radiation. Assume an electron-positron collider with a center-of-mass energy of 200 GeV and a proton-proton collider of 14 TeV both with radius $R = 4.3\,\text{km}$.

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