

Problemset 1 – Quark Gluon Plasma Physics – SS 2023

Discussion in the lecture: Friday April 28

1.1 Rapidity and c.m. energy

Using the definition of the rapity given in the introduction to jupyter notebook (also the wikipedia entry is quite good), calculate the rapidity for different beams used in accelerators to create a Quark-Gluon Plasma (QGP). Note: to compute rapidity, you have to select a coordinate system. Usually one picks the lab system with the z-axis along the beam.

- a) On slides 35, 36, 37, 38 of lecture 1, beam momenta or center of mass energies per colliding nucleon pair are given for Au and Pb beams at the Brookhaven AGS, at the CERN SPS, at RHIC and at the LHC. Compute in each case the total center of mass energy and the beam rapidity.
- b) As a warm-up exercise for jupyter, plot rapidity as a function of the energy per nucleon of the beam.
- c) For fixed target experiments at AGS and SPS, at what rapidity is the target? At colliders, what is the rapidity of the other beam (the one going in negative z-direction)?