Fluctuation probes of quark deconfinement

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Abstract

Fluctuations in the multiplicities and momentum distributions of particles emitted in relativistic heavy-ion collisions have been intensively studied. We here draw attention to a different type of fluctuations: fluctuations of locally conserved charges which are sensitive to the microscopic structure of the dense matter. We focus on the net baryon number and net electric charge as such probes.

We show that the average size of their fluctuations differs significantly between confined hadronic matter and deconfined quark-gluon matter. We demonstrate that for the quantities here considered fluctuations established during the early collision stages survive until freeze-out, due to the rapid fireball expansion. The size of these fluctuations may thus be exploited as indicators for quark deconfinement in relativistic heavy-ion collisions.

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