STAR's measurement of Long-range forward-backward multiplicity correlations as the signature of "dense partonic matter" in the Heavy Ion collisions at $\sqrt{s_{NN}}$ =200 GeV.

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The investigation of high energy nucleus-nucleus collisions provides a unique tool to study the properties of hot and dense matter. The motivation is drawn from lattice QCD calculations, which predicts a phase transition from hadronic matter to a system of deconfined quarks and gluons (QGP) at high temperature [1]. The study of event-by-event correlations and fluctuations provides a novel probe to explore such transition in the search for the QGP. In particular the measurement of particle correlations has been suggested as a method to search for the existence of a phase transition in ultra-relativistic heavy ion collisions. In this work we present the forward-backward multiplicity correlations measured with the large acceptance STAR detector for peripheral and central Au+Au and Cu+Cu collisions as well as *pp* collisions . A strong, long-range correlation is observed for central heavy ion collisions at $\sqrt{s_{NN}}$ = 200 GeV that vanishes in semi-peripheral events and *pp* collisions. There is no apparent scaling with the number of participants involved in the collision. Both the Dual Parton Model [2] and the Color Glass condensate [3] indicate that the long range correlations are due to multiple parton interactions. This argues that the dense partonic matter is created in mid-central and central Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV.

References

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