

# $\Delta\eta$ dependence of net-charge fluctuations in Au+Au collisions from the Beam Energy Scan at the STAR experiment

In heavy-ion collision experiments, the study of event-by-event fluctuations provides a powerful tool to characterize and understand the thermodynamic properties of the hot and dense QCD matter.

The fluctuations of conserved quantities in a finite phase space rapidity window ( $\Delta\eta$ ), like the net-charge, are predicted to be one of the most sensitive signals of the QGP formation and phase transition [1].

D-measure which is defined by second order cumulant per unit entropy was obtained as a function of  $\Delta\eta$  in LHC-ALICE experiment at  $\sqrt{s_{NN}} = 2.76$  TeV Pb+Pb collisions, and it is observed to decrease with  $\Delta\eta$  [2]. D-measure is considered to become 3-4 in an equilibrated hadronic medium and 1-1.5 in an equilibrated QGP medium [3]. Thus the ALICE results don't conflict with the theoretical prediction.

$\Delta\eta$  dependence of the higher order cumulant ratios are also important and predicted to decrease as the  $\Delta\eta$  become larger [4].

In this study, D-measure and 1st to 4th order cumulant ratios are calculated in Au+Au collisions at  $\sqrt{s_{NN}} = 7.7, 11.5, 14.5, 19.6, 27, 39, 62.4,$  and 200 GeV during Beam Energy Scan in 2010, 2011 and 2014.

We will report  $\Delta\eta$ , centrality and energy dependence of the net-charge fluctuation and compare STAR Beam Energy Scan results to ALICE results ( $\sqrt{s_{NN}}=2.76$ TeV).

Then, we will discuss an energy dependence of the fluctuation as a function of  $\Delta\eta$  and possible information from the QGP phase transition.

[1] M.A.Stephanov, Phys. Rev. Lett. 102, 032301 (2009)

[2] B. Abelev et al.(ALICE Collaboration), Phys. Rev. Lett 110, 152301 (2013)

[3] S. Jeon and V. Koch, Phys. Rev. Lett. 85, 2076 (2000)

[4] Masayuki Asakawa and Masakiyo Kitazawa, Progress in Particle and Nuclear Physics Volume 90, September 2016, Pages 299-342

## Preferred Track

Baryon-Rich QCD Matter and Astrophysics

## Collaboration

STAR

**Primary author:** SUGIURA, Tetsuro (University of Tsukuba, Japan)

**Presenter:** SUGIURA, Tetsuro (University of Tsukuba, Japan)

**Session Classification:** Poster Session