A Study of Local Multiplicity Fluctuations in Simulated Data at LHC Energies

Ramni Gupta[1*] and Rohni Sharma[1]
[1] *Department of Physics & Electronics, University of Jammu, Jammu 180006, INDIA*

Introduction

One of the goals of relativistic nuclear collisions is to investigate the phase diagram of QCD. The lattice calculations of QCD have predicted the position of the cross over transition at a vanishing baryo-chemical potential (μ_B) at $T = 170$ MeV [1]. However the nature of the phase transition at a finite μ_B value is not yet discovered. Extensive experimental heavy ion collision programs have invigorated at various laboratories for the possibility of observing the evidence of critical point. The search for signals of QCD critical point concerns a dense system of strongly-interacting matter which is in thermal and chemical equilibrium and is at the end of the phase boundary between quark and hadron phases [2]. Thus one requires to study experiments at energies where high baryon density can be produced such as at Large Hadron Collider (LHC). Further to locate the critical point, it has been suggested to look for enhanced fluctuation phenomenon in an event-by-event analysis of relativistic A+A collisions [3]. In hot and dense plasma produced at LHC there may surely be a deconfined system of quarks and gluons, which will undergo transition to the hadron phase. And because hadronization takes place on the surface over a period of time, this transition may or may not be recognizable as a critical phenomenon.

*Electronic address: ragupta@cern.ch

The Analysis

Recently a methodology has been suggested [4] to investigate the fluctuations of spatial patterns during the quark-hadron transition, which gives a low value for a specific index for critical transition in comparison to that for the random hadronization. The measures suggested distinguishes between the critical and non-critical behaviour but are silent about the nature of transition. For each event, fluctuations of bin multiplicities are quantified and then the event-by-event fluctuations of the spatial patterns are analyzed. We propose to present a comparative study of this exponent at LHC energies for simulated Pb-Pb collisions with various models of relativistic heavy ion collisions.

References

[1] Schmidt C PoS **CPOD2009** 024 (2009).
[2] M. Stephanov, Prog. Theor. Phys. Suppl. 153, **139** (2004);J. Phys. G:Nucl. Part. Phys. **38**, 124147 (2011).
[3] Stephanov M A, Rajagopal K and Shuryak E V Phys. Rev. Lett. **81** 4816-9 (1998); Phys. Rev. D **60** 114028.
[4] R.C. Hwa and C.B. Yang Phys. Rev C **85**, 044914 (2012).