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Event-by-event multiplicity fluctuations in relativistic heavy ion collisions

Friday, 3 June 2016 17:00 (30 minutes)

Non-critical thermal fluctuations are important baselines in search of the critical point for the RHIC beam energy scan program. In this talk, we present our investigations on the non-critical baselines of cumulants of (net-conserved) charge distributions in relativistic heavy ion collisions. By deriving a general formula of multiplicity distribution in connect with the method used in experiment, we demonstrate the mismatch between experimental measurements (conditional probability distributions) and previous theoretical calculations (probability distributions in a given thermal system) on multiplicity distributions. From the general formula, we investigate how to obtain the basic statistical expectations of higher order cumulants from experiments with the help of the data of the reference multiplicity distribution and mean value distribution. We find that the improved baseline measure for multiplicity distribution mimics the negative binomial distribution instead of Poisson one, though the Poisson distribution was used as input in a specific statistical ensemble. Recently, we implement this idea to event-by-event hybrid model simulations, and calculate the higher order cumulants of charge (proton) distributions in HIC. Our results reasonably reproduce the data at $\sqrt{s_{NN}} = 200$ GeV but shows deviations at lower collisional energies.

References:

HJX, On the multiplicity distribution in statistical model: (I) negative binomial distribution, arXiv:1602.06378.

Jixin Li, HJX, Huichao Song, Event-by-event multiplicity fluctuations in VISHNU hybrid model, in prepare.

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