

1 Precision measurement of (Net-)proton Number Fluctuations in
2 Au+Au Collisions from BES-II Program at RHIC-STAR

3 *Bappaditya Mondal*
(for the STAR Collaboration)

School of Physical Sciences, National Institute of Science Education and Research, HBNI, Jatni-752050, INDIA

4 **Abstract**

5 Higher-order cumulants of (net-)proton multiplicity distributions are sensitive observables
6 for studying the QCD phase structure. At low baryon chemical potential (μ_B), lattice QCD
7 calculations establish the quark-hadron transition to be a crossover, while at large μ_B , QCD-
8 based models predict a first-order phase transition that ends at a critical point.

9 Here, we focus on the search for the possible existence of the QCD critical point. We report
10 precision measurements of cumulants (C_n) and factorial cumulants (κ_n) of (net-)proton multi-
11 plicity distribution upto fourth order in Au+Au collisions measured in the STAR experiment
12 during BES-II at RHIC. Using the high statistics data collected with upgraded detectors, we
13 select protons and antiprotons at mid-rapidity $|y| < 0.5$ within $0.4 < p_T(\text{GeV}/c) < 2.0$. The
14 dependence of measured cumulants and factorial cumulants on the collision energy and central-
15 ity will be presented. The measured data will be compared with calculations from lattice QCD,
16 and expectations from various non-critical point models, such as the transport model UrQMD
17 and the thermal model HRG.