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Conventional effects in higher cumulant ratios of conserved charges in relativistic heavy ion collisions

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Higher cumulant ratios of conserved charges are suggested to be sensitive probe of QCD critical end point [1] in relativistic heavy ion collisions. Their behaviors at current relativistic heavy ion collisions are highly interested and studied intensively [2,3]. Before we draw the critical-like fluctuations from the measured higher cumulants, it is necessary to know what the contributions of conventional effects are.

In the present work, we firstly derive the Poisson-like statistical fluctuations of net-proton number [4], and net-electric charge. It shows that net-proton kurtosis at top incident energy of RHIC [3] is dominated by Poisson-liked statistical fluctuations [4]. So dynamical higher moments, subtracting the statistical parts, are suggested.

Secondly, the influences of the centrality, the efficiency of the detector, and the cuts of transverse momentum (p_T) and rapidity in higher cumulant ratios of net-proton are systematically studied by using the sample of Au + Au collisions at 39GeV generated by APMT default model. It is found: (1) Both dynamical and directly measured cumulant ratios are sensitive to the definitions of centrality. (2) Dynamical cumulant ratios are little efficiency dependent. (3) Both dynamical and directly measured cumulant ratios are the cuts of phase-space dependent.

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