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Event-by-Event Charge Fluctuations in pp and AA collisions at RHIC and LHC energies

Content :

Various measures of event by event net charge and charge ratio fluctuations in pp and AA collisions at RHIC and LHC energies are studied using the Monte-Carlo models, HIJING-1.35, URQMD-3.3 and VNI-4.21b. Corrections for the influence of global charge conservation in large rapidity windows and a non-zero net charge due to non negligible baryon stopping power are applied to the D-measure of the net charge fluctuations, D(Q). Variations of D-measures with the width of the pseudorapidity η window and with the position of the η centers are examined at widely different energies, from \(\sqrt{s}\) = 200GeV to 14TeV. The findings are compared with the theoretical predictions for the independent emission, resonance gas and QGP phase. Charge ratio fluctuations, \(R^+ = n^+/n^-\) and \(R^- = n^-/n^+\) are also studied in terms of their D-measures, \(D(R^+)\) and \(D(R^-)\). It is observed that the trends of variations of \(D(R^+)\) and \(D(R^-)\) with η-bin width and(or) with η centers are quite different from that observed for the net charge fluctuations. Furthermore, the results based on the analysis of the events simulated by assigning the random charge, indicates that such analysis may be successfully applied to the data from the detectors of limited phase space acceptance.

Data on AA collisions with different centrality are also analysed and the results are compared with those obtained from the pp data. It is observed that behaviour of the D-measures for the various pp and AA data are nearly consistent. Thus, any deviation, if observed with the real data, would lead to conclude that either a re-scattering effect plays a pre-donminant role in AA collisions or there might be some new physics present in AA collisions.

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