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Bulk of the particle production and collective behavior study for searching the QGP in small collision system

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The quark-gluon plasma (QGP), a new state of nuclear matter at extremely high temperature and pressure where quarks and gluons are deconfined can be produced in relativistic heavy-ion collisions. Experimentally QGP is regularly produced in the laboratory by colliding ions in relativistic energy to create such an extreme temperature and pressure. An extensive study of the formation of the QGP and its characterization in ion-ion (AA) collisions have been reported by many experiments (ALICE, STAR, CMS). Parallel developments of the theoretical and phenomenological aspects of QGP formation are notable. The bulk of the particle production, their collective behavior like radial flow, multi-strange particle production and strangeness enhancement, anisotropic flow with respect to the symmetry plane of the collision and quarkonia suppression and enhancement are signals of the QGP formation and its thermodynamical property study.

Recent studies show that particle production in high multiplicity pp and p—Pb collisions at LHC energies, exhibits features that mimic the behaviors observed in AA collisions (e.g. hardening of the transverse momenta spectra pT and radial flow, strangeness enhancement, azimuthal asymmetries in the particle productions with respect to the symmetry plane of the collision). These features are a typical sign of the formation of a deconfined state of matter (quark—gluon plasma). In this presentation, the comparative latest results of the light flavor hadron transverse momentum spectra, relative abundances in different collision systems and anisotropic flow measurements shall be discussed as crucial information on the collective behavior of the small collision system in relativistic energy.

References:
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[2] ALICE Collaoration, S. Acharya et al., Phys. Rev. Lets. 123, 142301 (2019)

Author: PATRA, Rajendra Nath (INFN Bari)

Presenter: PATRA, Rajendra Nath (INFN Bari)

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