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Strong and Electromagnetic Collective Effects from NA61/SHINE

The NA61/SHINE experiment at the CERN SPS obtained new data on proton and pion collective flow in Pb+Pb collisions, and on the distortion of charged pion spectra by the spectator electromagnetic field in Ar+Sc reactions. The latter is the first ever measurement of this effect in small systems at the CERN SPS.

The data on both effects are shown as a function of collision centrality and energy and compared to model predictions, as well as to existing results from the NA49 experiment. In Pb+Pb collisions, the negative pion directed flow changes sign as a function of transverse momentum, an effect which strongly depends on collision energy. For protons and pions, the difference in sign of directed flow slope at midrapidity reflects the momentum exchange between expanding matter and spectators.

In Ar+Sc collisions, in spite of their small spectator charge, a very significant electromagnetic distortion of π^+ and π^- distributions is apparent as a function of transverse momentum and rapidity, qualitatively similar to heavy ion reactions where the spectator charge also results in splitting of π^+ and π^- directed flow. This brings specific implications for the space-time evolution of the fireball which are studied by model calculations. The latter also point at the role of spectator fragmentation, and estimate the influence of vorticity in the observed phenomena.

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