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New results on Coulomb effects in meson production in relativistic heavy ion collisions

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Collaboration

Abstract content

We propose a new method of investigating the space-time evolution of meson production in heavy ion collisions, by making use of spectator-induced Coulomb effects. The presence of two nuclear remnants ("spectator systems") in the non-central collision generates a strong Coulomb field, which modifies the trajectories of charged final state hadrons. This results in: - large distortions of charged meson spectra and ratios (π^+/π^-, K^+/K^-), - azimuthal anisotropies in charged meson production. In our approach, these effects can be computed numerically by means of a high-statistics Monte Carlo simulation, using the distance between the meson formation zone and the spectator system as (unique) free parameter. Our simulation correctly describes: - the very sizeable distortion of π^+/π^- ratios in peripheral Pb+Pb collisions at top SPS energy, known from NA52 [1] and NA49 [2] experiments; - the Coulomb effect on azimuthal anisotropies observed for π^+ and π^- mesons in Au+Au collisions at lower RHIC energy, known from data recently reported by the STAR Collaboration [3]. We also predict large azimuthal anisotropies for positive pions at target and beam rapidities, in agreement with data from the WA98 experiment [4], and a very large Coulomb distortion of K^+/K^- ratios at high values of x_F [5]. In all the cases studied above we find that spectator-induced Coulomb effects offer sensitivity to the position of the meson formation zone with respect to the spectator system. Therefore, we conclude that these effects can serve as a new tool to investigate the space-time evolution of meson production, and the dynamics of the heavy ion collision. More details on this work can be found in [6,7].

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