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Measurement of charge-dependent directed flow in STAR Beam Energy Scan (BES-II) Au+Au and U+U Collisions

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The presence of ultra-strong electromagnetic (EM) fields can give rise to various important phenomena in heavy ion collisions (HIC). During the early stages of HI collisions an ultra-strong EM field ($B \approx 10^{18}$ Gauss) is expected to be generated, which can have profound implications for QCD phase transitions as well as chiral symmetry restoration. The charge-dependent directed flow (v_1) serves as a potential tool for detecting EM field effects and QCD medium properties [1].

In this talk, we will present measurements of directed flow (v_1) for identified particles (π^\pm , K^\pm , and p/\bar{p}) and their charge dependence, conducted by the STAR experiment in Au+Au collisions at $\sqrt{s_{NN}} = 7.7-200$ GeV including the RHIC Beam Energy Scan, as well as in isobar (Ru+Ru and Zr+Zr) collisions at $\sqrt{s_{NN}} = 200$ GeV and U+U collisions at $\sqrt{s_{NN}} = 193$ GeV. The v_1 values will be reported as functions of rapidity, transverse momentum and collision centrality. Comparisons of the slope (dv_1/dy) and the charge-dependent difference, $\Delta(dv_1/dy)$, across different collision systems and energies, including U+U, Au+Au, and isobar (Ru+Ru and Zr+Zr) collisions, aim to provide insights into electromagnetic field effects and transport coefficients of the QCD medium, such as electrical conductivity.

[1] STAR Collaboration, Phys. Rev. X 14, 011028

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