Exploring Electromagnetic-field Effects using Charge-Dependent Directed Flow from BES-II Data at STAR

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Charge-dependent directed flow can reveal the influence of electromagnetic fields in heavy-ion collisions. For instance, Faraday induction is predicted to contribute negatively to $\Delta(dv_1/dy)$, defined as the difference in the slope of rapidity-odd directed flow (dv_1/dy), between positively and negatively charged particles. Recent STAR data from peripheral Au+Au collisions at $\sqrt{s_{NN}} = 200$ and 27 GeV supported this scenario. In this poster, we present the STAR BES-II results of v_1 and Δv_1 for $\pi^{\pm}$, $K^{\pm}$, $p(\bar{p})$ and $\Lambda(\bar{\Lambda})$ as functions of rapidity, transverse momentum (p_T), and centrality at midrapidity in Au+Au collisions at $\sqrt{s_{NN}} = 19.6$, 17.3, 14.6, 11.5, 9.2 and 7.7 GeV. In peripheral collisions, the sign of $\Delta(dv_1/dy)$ is consistent with the expectation from the dominance of Faraday+Coulomb effect over Hall+transported quark effect, and $\Delta(dv_1/dy)$ becomes more negative at lower collision energies, as expected from a longer lifetime of the electromagnetic field and/or a shorter lifetime of the fireball at these energies. We also discuss the expected electromagnetic-field effects on the constituent quarks in Λ and $\bar{\Lambda}$, and consequently on their $\Delta(dv_1/dy)$ within the coalescence framework.