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Measurement of rapidity-odd directed flow for D^0 and \overline{D}^0 mesons using the STAR detector at RHIC

Heavy quarks, owing to their large masses, are predominantly created in the initial hard scatterings in heavy-ion collisions. Therefore, they can play a crucial role in probing the initial-time dynamics in these collisions. Hydrodynamic model calculations suggest that the rapidity-odd directed flow ($v_1(y)$) of particles produced at mid-rapidity can originate from a tilt in the reaction plane of the thermalized matter caused by the asymmetry between the number of participants from projectile and target nuclei as a function of rapidity. Recently, it has been predicted that the slope of the directed flow at mid-rapidity of D^0 mesons, arising from the transport of charm quarks in the tilted medium, can be several times larger than that of light flavor hadrons. A notable feature from the model calculation is the enhanced sensitivity of the D -meson v_1 slope (dv_1/dy), compared to that of light flavor hadrons, to the initial longitudinal profile of the QGP source. It has also been predicted that the transient electromagnetic field at early times can induce a much larger charge dependent directed flow for heavy quarks than for light quarks.

The Heavy Flavor Tracker (HFT) detector at STAR has demonstrated an excellent performance in reconstructing D^0 and \overline{D}^0 via hadronic decay channels. In this talk, we will report on the first evidence for a non-zero rapidity-odd directed flow for D^0 and \overline{D}^0 mesons in 10-80% central Au+Au collisions at $\sqrt{s_{NN}} = 200$ -GeV using high statistics data collected with the HFT during the 2014 and 2016 RHIC runs. The average dv_1/dy for D^0 and \overline{D}^0 mesons is $-0.081 \pm 0.021 \pm 0.017$, while that of charged kaons is $-0.0030 \pm 0.0001 \pm 0.0002$, suggesting a significantly larger slope of the D^0 mesons. The results will be compared to model calculations and physics implications will also be discussed.

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