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Measurement of path length-dependent v_1 of high- p_T charged hadrons in Au+Au collisions by the STAR experiment

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In heavy-ion collisions, the thermalized matter is tilted in the reaction plane as a function of rapidity, while the production profile of partons from hard scatterings is symmetric in rapidity [1]. This leads to a rapidity-odd asymmetry in the medium path length traversed by the hard partons and results in a rapidity-odd directed flow (v_1). Measurements of high- p_T hadron v_1 can provide valuable constraints on the initial longitudinal distribution of the fireball as well as the path length-dependent momentum loss of the partons. A similar effect, producing significantly large directed flow for heavy flavor mesons, was predicted [2] and has been observed for D^0 mesons (at 3σ significance) by STAR recently.

In this poster, we will present the first measurement of pseudorapidity and centrality dependence of the v_1 of high- p_T (> 5 GeV/c) charged hadrons in Au+Au collisions at $\sqrt{s_{NN}} = 54.4$ and 200 GeV. The v_1 of charged hadrons is found to change sign twice as a function of p_T and show large negative slope at high- p_T , similarly to D^0 mesons. The measurements will be compared to different model calculations and the sensitivity to different initial density distributions will be discussed.

[1] P. Bozek, I. Wyskiel, Phys. Rev. C. 81 (2010) 054902; A. Adil, M. Gyulassy, Phys. Rev. C. 72 (2005) 034907.

[2] S. Chatterjee, P.Bozek, Phys. Rev. Lett. 120 (2018) 192301.

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