

Measurement of jet v_1 to study path length dependent jet energy loss in heavy-ion collisions at $\sqrt{s_{NN}} = 200$ GeV by STAR

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1 A path length asymmetry along impact parameter direction (x) exists for hard probes
2 in heavy-ion collisions at finite rapidity, as the Quark Gluon Plasma (QGP) bulk is tilted
3 in reaction plane, while the hard scattering profile is not [1]. Jet v_1 and $\langle p_x \rangle$ measurements
4 provide access to path length dependent energy loss of partons in the QGP. Such a measure-
5 ment has several advantages. Energy loss can be measured without measurements in p+p
6 collisions. Event-by-event fluctuations in geometry and energy loss do not contribute to v_1
7 (and $\langle p_x \rangle$), unlike to the elliptic anisotropy, v_2 . Non-flow contributions are also minimal as
8 measurements use reaction plane determined from spectators.

9 In this talk we present the first measurement of jet v_1 and $\langle p_x \rangle$ in heavy-ion collisions
10 using Au+Au and Ru+Ru, Zr+Zr collisions at $\sqrt{s_{NN}} = 200$ GeV by STAR. Centrality, jet p_T
11 and radius dependence of the observables will be shown. We will also present an evaluation
12 of the initial path length asymmetry utilizing models describing the measured pseudorapidity
13 dependence of particle production in asymmetric collisions. The measurements open up a
14 new avenue to study path length dependent energy loss of partons in QGP and its mass,
15 flavor and fragmentation dependences.

16 References

17 [1] PRL 123, 162301 (2019); PRL 120, 192301 (2018); PRC 72, 034907 (2005)