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Characterizing the away-side jet, devoid of flow background, via two-particle and three-particle correlations in Au+Au collisions at $\sqrt{s_{NN}}$ = 200˜GeV in STAR

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Jets are modified in relativistic heavy-ion collisions due to jet-medium interactions. Measurements of jet medium modifications have so far been obscure because of the large underlying anisotropic flow background. In this analysis we devise a novel method to subtract the flow background using data themselves. We select events with a large recoil momentum (P_x) within a pseudorapidity (η) window of $0.5 < \eta < 1$ ($-1 < \eta < -0.5$) from a high-p_T trigger particle to enhance the away-side jet population. Di-hadron azimuthal correlations are analyzed with associated particles in two η ranges ($-0.5 < \eta < 0$ and $0 < \eta < 0.5$) symmetric about midrapidity, one (close-region) close to and the other (far-region) far away from the P_x selection η window. The away-side jet contributes to the "close-region" but not as much to the "far-region" due to the large η gap, while the flow contributions are equal. Assuming the $\Delta\phi$ shape of jet-like correlations does not depend on $\Delta\eta$, the correlation difference measures the away-side jet shape where the anisotropic flow background is cleanly subtracted.

The away-side jet correlation width is studied as a function of centrality and associated particle p_T. The width is found to increase with centrality at modest to high associated particle p_T. The increase can arise from jet-medium modifications, event averaging of away-side jets deflected by medium flow, and/or simply nuclear k_T broadening. To further discriminate various physics mechanisms, a three-particle correlation analysis is conducted with robust flow background subtraction also using data themselves. Based on this analysis we discuss possible physics mechanisms of away-side broadening of jet-like correlations.

On behalf of collaboration:

STAR

Primary author: JIANG, Kun (University of Science and Technology of China & Purdue University)

Presenter: JIANG, Kun (University of Science and Technology of China & Purdue University)

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