

The “Shoulder” and the “Ridge” in PHENIX: Medium Response to Fast Partons in Heavy Ion Collisions via Di-hadron Correlations

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The observation of jet quenching in ultra-relativistic heavy ion collisions demonstrates significant energy loss of fast partons when passing through the created medium. Correlations between final-state hadrons at intermediate transverse momentum ($1.0 \lesssim p_T \lesssim 4.0 \text{ GeV}/c$) allow for detailed study of the medium and its response to deposited energy. Comparison of these measurements in heavy ion collisions with baseline measurements in proton collisions show strong modification of the correlation shape and particle yields. Two new structures are created, both extended in $\Delta\eta$, one centered at $\Delta\phi = 0$ (“ridge”) and the other occurring at $\Delta\phi \approx \pi \pm 1.1$ (“shoulder”).

Decomposition of the away-side distributions to quantify the medium response to the passage of a fast parton will be discussed. New PHENIX results in particle yields and spectra within the “shoulder” are consistent with a scenario of parton-medium interaction. Including work on the most recent Run7 data set, we will present new analysis on the path-length, angle relative to reaction plane, particle ID, and p_T dependence of hadrons with a specific focus on how the medium responds to fast partons in Cu+Cu and Au+Au collisions. The status of 3 particle correlations and first direct PHENIX analysis of near-side “ridge” correlations will also be reported. In order to extract as much information on the medium response as possible, the data will be compared to baseline p+p results and theoretical predictions.