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Constrainingts the color-charge effects of energy loss with jet axis-based substructure studies in PbPb collisions at 5.02 TeV

Jets are well-established tools for studying the properties of the QGP. In this talk, we present a new measurement of jet substructure modification using the observable Δj, which characterizes the distance between two types of jet axes constructed from the same jet constituents. We use E-scheme and WTA axes, which have different sensitivities to soft and semi-hard medium-induced radiation. The reported fully unfolded distributions represent the first CMS measurements of the angular separation between these axes for anti-k_T $R = 0.4$ jets in 5.02 TeV PbPb collisions across several collision centralities and jet p_T intervals. Significant modifications in the Δj distributions are observed in central compared to peripheral collisions across all p_T intervals, suggesting a progressive narrowing of angular correlations, likely due to QGP-induced jet substructure modification. Alternatively, this narrowing could be explained by the predicted color-charge dependence of energy loss, leading to a larger migration of gluon-initiated jets toward lower final-state energies. We compared the data to predictions from several models, including two energy loss models with modified quark/gluon fractions due to in-medium energy loss. We found that differences in quark/gluon energy loss alone cannot fully describe the central data, suggesting the need to account for medium-induced substructure modification. These measurements probe jet substructure in a previously unexplored kinematic domain and provide new constraints on the color-charge dependence of energy loss.

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