Semi-inclusive jet mass measurement in Au+Au collisions at $\sqrt{s_{\mathrm{NN}}} = 200\,\mathrm{GeV}$ with STAR

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In relativistic heavy-ion collisions, a hot and dense QCD medium, known as the Quark-Gluon Plasma, is formed. Simultaneously, hard-scattered partons from these collisions interact with the medium, leading to the production of particle cascades called jets. These jets are modified as they traverse the QGP, a phenomenon referred to as jet quenching. Various jet observables, including jet mass (M_{jet}), have been studied to explore this modification process.

For jets with low transverse momenta ($p_{\mathrm{T,jet}}$), distinguishing jets originating from hard scattering remains a significant challenge due to the large contributions from combinatorial background in heavy-ion collisions. To address this issue, methods for measuring recoil jets with respect to high-p_{T} trigger particles ($9 \leq p_{\mathrm{T,trigger}} < 30$) in a semi-inclusive manner have been developed. In particular, the STAR Collaboration has employed a mixed-event technique in combination with semi-inclusive recoil jet measurements to provide a data-driven method for correction of uncorrelated background effects. In this study, we extend the method of semi-inclusive recoil jet measurement to the measurement of jet mass (M_{jet}) in central heavy-ion collisions, introducing a two-dimensional measurement methodology as a function of ($p_{\mathrm{T,jet}}, M_{\mathrm{jet}}$) with R = 0.4 as a jet resoultion parameter. The validity of this method is evaluated through the Monte Carlo simulations and closure tests, and initial technical results using STAR data will also be presented.