Studying jet quenching in heavy-ion collisions at $\sqrt{s_{\mathrm{NN}}} = 200$ GeV using inclusive and semi-inclusive jet production at STAR

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The STAR Collaboration reports the first measurements of fully-reconstructed inclusive jets in Au+Au collisions and semi-inclusive hadron-jet (h+jet) correlations in isobar (Zr+Zr and Ru+Ru) collisions, both at $\sqrt{s_{\mathrm{NN}}} = 200$ GeV within mid-rapidity. These measurements probe the interplay between parton-medium interaction driven by the initial energy density and/or collision geometry. Combinatoric jets are removed on a jet-by-jet basis for the inclusive jet measurement by requiring high-transverse-momentum (p_{T}) leading particles in accepted jet candidates, and on an ensemble basis for the semi-inclusive h+jet analysis utilizing the mixed-event technique. The reported distributions are fully corrected for any remaining background fluctuations and detector effects using unfolding techniques.

The high statistics Au+Au dataset allows for reconstructing the jet spectra, with constituent $p_{\mathrm{T}} > 0.2$ GeV/c, up to jet $p_{\mathrm{T}} \sim 50$ GeV/c and resolution parameters $R = 0.2$ - 0.4, extending significantly the kinematic reach of the existing measurements with charged-particle jets. These distributions are compared to those in p+p collisions. In addition, the suppression of recoil charged jet yield in central to peripheral isobar collisions is presented for the charged hadron trigger p_{T} between 7 to 25 GeV/c and the recoil jet radius $R = 0.2$ - 0.5. These results allow for a systematic exploration of partonic process, collision geometry, and jet path length dependence of jet quenching, and thereby provide new insights into the mechanisms underlying jet-medium interaction in heavy-ion collisions at RHIC. Meanwhile, they can be compared to similar measurements at the LHC and state-of-the-art theoretical calculations incorporating jet quenching.