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Sensitivity of jet observables to event-by-event medium fluctuations

Hard probes have historically been central in the study of the fluid of quarks and gluons produced in the collisions of relativistic heavy ions. Objects such as the highly collimated sprays of particles known as jets are produced at very early times in the collision and, therefore, experience the entire evolution of the system. In this work, we explore different jet observables and how they are modified by the medium using the JEWEL (Jet Evolution With Energy Loss) event generator. We compare the results obtained from a simplified smooth medium to those emerging from a realistic hydrodynamically evolving plasma obtained with the software Trajectum. We show that jet substructure observables tend to not be as sensitive to the event-by-event fluctuations of the medium as, for example, the azimuthal anisotropy of high $p_{\perp}$ particles. We also explore the same observables across different system sizes and conclude that, in small systems, the medium fluctuations are more likely to leave signatures on the jet structure.

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