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Correlations between hard probes and bulk dynamics in small systems

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Experimental exploration of small systems has produced several observables that indicate the existence of non-negligible correlations between hard and soft dynamics. When studying heavy ion collisions, the initial conditions and early stages of the bulk evolution are assumed independent of the dynamics of jets and high-p_T partons. For such large systems, the production of rare high-p_T probes is a small perturbation, but for small systems hard probes extract a significant fraction of the energy and momentum from the collision. This becomes unavailable for, and thus strongly affects, bulk evolution.
We investigate correlations between hard probes and bulk dynamics in small systems. We use a multi-stage approach where the hard scatterings are sampled first, followed by an initial state shower, yielding the energy and momenta of the originating hard partons, which are then subtracted from the incoming nucleons. The remaining energy is used for soft-particle production, modeled by 3D-Glauber + hydrodynamics. We present results for the nuclear modification factor as a function of event activity, azimuthal correlations between hard probes and soft particles, and transverse energy (at large rapidities) as a function of the jet p_T. Our results demonstrate that hard-soft correlations are crucial to understand the dynamics in small systems. The X-SCAPE framework allows for systematic studies of the interplay between flow and non-flow correlations in small systems.

Category

Theory

Collaboration

JETSCAPE

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