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Probing the short-length structure of the QGP with jet observables

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High-energy partons are capable of triggering high-momentum exchanges with quark-like and gluon-like QGP quasi-particles that can be observed at sufficiently short length scales. In this work we present an implementation of a central aspect of this physics within the hybrid strong/weak coupling model. Interaction with the quasi-particles results in elastic, Moliere scatterings, leading to deflection of the direction of the jet parton that induced the process as well as the excitation of partons from the thermal medium that recoil after being kicked. Throughout the in-medium evolution, the system of jet partons and recoils, which might further re-scatter, inject energy and momentum into the QGP, producing wakes. Given the large impact of the wakes generated by the hydrodynamic response of the medium on jet observables, finding distinctive signatures of scattering off quasi-particles in the QGP is a challenging task. What makes the hybrid model particularly valuable as a tool for identifying observables that are more/less sensitive to scattering off quasi-particles and less/more sensitive to consequences of wakes in the QGP is that when we turn Moliere scattering off the model contains no effects of scattering —energy loss in the model arises from strongly coupled physics not from scattering. We can therefore use our investigation to suggest observables and strategies that may be followed with a view toward discerning separate consequences of the effects under consideration.

Experiment/Theory

Theory/Phenomenology

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