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Heavy Quark Energy Loss in a Strongly Interacting Quark Gluon Plasma

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One of the fundamental predictions of QCD is that, at extremely high energy densities, a new form of matter may be formed. This state of matter, consisting of interacting quarks, antiquarks and gluons, is called the Quark-Gluon Plasma (QGP). The QGP is predicted to exist at extreme values of temperature and/or baryon number density. Today, UltraRelativistic Heavy Ion Colliders (RHIC and LHC) are constructed with an aim to form, observe and understand the properties of this new state of matter. Heavy quark production and attenuation patterns provide unique probes of QCD matter. In this talk, I will review the current state of theory and experiment in the heavy quark tomography. I will present the radiative energy loss formalism that we developed, as well as the heavy flavor suppression results obtained from this energy loss. I will show that radiative energy loss alone cannot explain the currently available indirect heavy flavor measurements at RHIC. However, we have recently further improved the heavy quark energy loss formalism by including important collisional energy loss effects, which were previously considered to be negligible. I will show that the inclusion of collisional energy loss in the jet quenching significantly improves the agreement with the available heavy flavor data. We expect that the developed theoretical methods and the obtained predictions will significantly contribute toward understanding of the RHIC and LHC experimental results.
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