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Quenching of heavy flavors at the LHC

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Theoretical and experimental advances in understanding light jet/hadron production and modification in Pb+Pb reactions have been a highlight of the LHC heavy ion program. At the same time, the detailed mechanisms of heavy quark propagation and energy loss in dense QCD matter are not yet fully understood. With this motivation, we present theoretical predictions for the
nuclear-induced attenuation of the differential cross section for inclusive b-jet production in heavy ion collisions and comparison to CMS data [1]. We find that the attenuation is comparable to the one observed for light jets in the large transverse momentum region. We then extend this study to photon and B-meson tagged b-jet to enhance the sample of events with heavy quarks produced at the early stages of the collision. Theoretical predictions for the quenching of such tagged b-jet events at the LHC and the QGP-induced modification of the related momentum imbalance and asymmetry are presented [2]. We find these tagged b-jets have a much more direct connection to the b-quark energy loss. To facilitate further constrain of the flavor origin of final state observed heavy flavor particles, we present our calculation for heavy meson production inside jets by using Soft Collinear Effective Theory [3]. We find that the jet fragmentation function for heavy meson production is very sensitive to the gluon-to-heavy-meson fragmentation function, which can be used to clarify which aspects of heavy flavor dynamics are probed in heavy ion reactions at the LHC.

[1]. J. Huang, Z. Kang and I. Vitev, Phys. Lett. B726, 251.
[2]. J. Huang, Z. Kang, I. Vitev and H. Xing, Phys. Lett. B750, 287.
[3]. Y. Chien, Z. Kang, F. Ringer, I. Vitev and H. Xing, arXiv: 1512.06851.

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