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Comparative multi-probe study of jet energy-loss in QGP

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An important sign of the creation of the Quark-Gluon Plasma in heavy-ion collisions is the observation of jet energy-loss. Energetic, high transverse momentum (p_T) partons produced at the moment of initial hard scattering are influenced by the evolution history of the medium and lose energy via interactions. In this work we compare two models of low virtuality radiative energy loss: MARTINI [1] and CUJET [2] using the JETSCAPE framework. We integrate CUJET into the JETSCAPE workflow and perform full jet simulations using DGLV [3-5] radiative rates, for the first time. We consider strongly interacting probes (charged hadrons, jets, jet shape and jet fragmentation function) as well as electromagnetic probes; photons from jet-medium interactions have a similar structure to the gluon radiation channel but experience no final state interactions [6]. We present the first realistic calculation of jet-medium photons from CUJET and compare it to jet-medium photons from MARTINI. We find that these photons contribute significantly in the phenomenologically interesting intermediate p_T domain (4-12 GeV).

[1] B. Schenke et al., Phys.Rev.C 80 (2009) 054913

[2] J. Xu et al., JHEP 08 (2014) 063

[3] M. Gyulassy et al., Nucl.Phys.B 571 (2000) 197-233

[4] M. Gyulassy et al., Nucl.Phys.B 594 (2001) 371-419

[5] M. Djordjevic et al., Nucl.Phys.A 733 (2004) 265-298

[6] C. Gale et al., Phys.Rev.C 105 (2022) 1, 014909

Experiment/Theory

Theory/Phenomenology

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