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Predictions for the upcoming LHC data: an interplay of energy loss and initial disctibutions

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High momentum hadron suppression is considered to be an excellent probe of jet-medium interactions in QCD matter created in ultra-relativistic heavy ion collisions. The dynamical energy loss formalism is shown to be able to accurately explain suppression measurements at 200 GeV Au+Au collisions at RHIC and 2.76 TeV Pb+Pb collisions at the LHC [1,2]. With the upcoming LHC measurements at notably higher collision energies, there is a question of what differences, with respect to the current (2.76 TeV) measurements, can be expected. We will concentrate on light and heavy flavor suppression at the upcoming 5.1 TeV Pb+Pb collisions energy at the LHC. Naively, one would expect a notably (~30%) larger suppression at 5.1 TeV collision energy, due to the estimated (significant) energy loss increase when transitioning from 2.76 to 5.1 TeV. Surprisingly, more detailed calculations predict nearly the same suppression results at these two energies; note that this prediction is in agreement with the similar suppression patterns observed for light flavor observables at lower beam energies at RHIC and LHC. We will show that this unexpected result is due to interplay of the following two effects [3], which essentially cancel each other: i) flattening of the initial distributions with increasing collision energies, and ii) significantly slower than naively expected increase in the energy loss. Therefore, the obtained nearly the same suppression provides a clear (qualitative and quantitative) test of the dynamical energy loss formalism.
[1] M. Djordjevic and M. Djordjevic, Phys. Lett. B 709, 229 (2012)
[2] M. Djordjevic, M. Djordjevic, B. Blagojevic, Phys. Lett. B 737, 298 (2014)
[3] M. Djordjevic and M. Djordjevic, arXiv:1505.04316

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