

Probing nuclear parton densities and parton energy loss processes through photon + heavy-quark jet production in p-A and A-A collisions

We present a detailed phenomenological study of the associated production of a prompt photon and a heavy quark jet (charm or bottom) in proton-nucleus (p-A) and nucleus-nucleus (A-A) collisions. The dominant contribution to the cross-section comes from the gluon-heavy-quark (gQ) initiated subprocess, making this process very sensitive to the gluon and the heavy-quark nuclear parton densities. We show that the future p-A data to be collected at the LHC should allow one to disentangle the various nPDF sets currently available. In heavy-ion collisions, the photon transverse momentum can be used to gauge the initial energy of the massive parton which is expected to propagate through the dense QCD medium produced in those collisions. The two-particle final state provides a range of observables (jet asymmetry, photon-jet pair momentum, among others), through the use of which a better understanding of parton energy loss processes in the massive quark sector can be achieved, as shown by the present phenomenological analysis carried out in Pb-Pb collisions at the LHC.

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