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Direct photon production in proton-nucleus and nucleus-nucleus collisions

Content :

Prompt photons produced in a hard reaction are not expected to be accompanied with any final state interaction, either energy loss or absorption. Therefore, besides the Cronin enhancement at medium-high transverse momenta pT and small isotopic corrections at larger pT, one should not expect any nuclear effects. However, data from the PHENIX experiment indicates a large-pT suppression in d+Au and central Au+Au collisions that cannot be accompanied by coherent phenomena. We demonstrate that such an unexpected result is subject to the energy sharing problem at large pT near the kinematic limit and is universally induced by multiple initial state interactions. We describe production of direct photons in the colour dipole approach and find also a good agreement with available data in p+p collisions. Besides explanation of a significant large-pT nuclear suppression at RHIC we present for the first time predictions for expected strong nuclear effects also in the LHC energy range at different rapidities. We include and analyze also a contribution of gluon shadowing as a leading twist shadowing correction that modifies nuclear effects especially at small pT.

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