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Systematic study of real photon and Drell-Yan pair production in p+A (d+A) interactions

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We investigate nuclear effects in production of Drell-Yan pairs and direct photons in proton-nucleus collisions. For the first time, these effects are studied within the color dipole approach using the Green function formalism which naturally incorporates the color transparency and quantum coherence effects. Numerical results for the nuclear modification factor are compared with available data. Besides, we present a variety of predictions for the nuclear suppression as function of transverse momentum pT, rapidity and invariant mass of the lepton pair that can be verified by experiments at RHIC and LHC. We found that the nuclear suppression is caused predominantly by effects of quantum coherence (shadowing corrections) and by the effective energy loss induced by multiple initial state interactions. Whereas the former dominates at small Bjorken x2 in the target, the latter turns out to be significant at large x1 in the projectile beam and is universal at different energies and pT.

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