

Exclusive vector meson production off nuclei

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Thanks to $A^{1/3}$ enhancement on the saturation scale in a heavy nucleus compared to that of the proton, nonlinearities are enhanced in nuclei compared to proton. This makes nuclear DIS an ideal laboratory to study the small- x structure of the nucleus. Probably the most powerful process for this is exclusive vector meson production, which at leading order is proportional to the squared gluon density. Exclusive J/Ψ and ρ production is thus especially sensitive to the non-linear small- x structure of the nuclei.

We show that gluon saturation gives rise to a strong modification of the scaling in both the nuclear mass number A and the virtuality Q^2 of the vector meson production cross-section in exclusive deep-inelastic scattering off nuclei. As reported in [1], we show that in the future Electron-Ion Collider the kinematical lever arm in Q^2 is expected to be enough to observe the qualitative transition from the saturated to the dilute region.

Before EIC, exclusive processes off nuclei in the photoproduction region can be studied in ultraperipheral heavy ion collisions (UPCs). We show that depending on the momentum transfer $-t$ of the process, the incoherent cross section is sensitive to either fluctuations of the nucleon positions from the Woods Saxon distribution (small $-t$), or to the fluctuations of the proton/neutron substructure (larger $-t$). Including the nucleon substructure is found to be necessary for a good description of the recent ALICE UPC data [2].

[1] H. Mäntysaari, R. Venugopalan, arXiv:1712.02508

[2] H. Mäntysaari, B. Schenke, Phys.Lett. B772 (2017) 681-686, arXiv:1705.03177

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