

Incoherent diffraction and proton structure fluctuations

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Exclusive vector meson production can be used to directly probe the gluon density of a hadron. Measuring the cross section differentially in momentum transfer t makes it possible to determine the transverse density profile (via coherent diffraction) and density fluctuations (incoherent diffraction) of the target hadron. This knowledge on the geometric fluctuations of the proton is particularly important for understanding collective phenomena observed in proton-nucleus collisions.

We calculate coherent and incoherent diffractive vector meson production in photon-proton and photon-nucleus scattering in the Color Glass Condensate framework. The dipole model used in the calculation is constrained by the proton structure function data. By implementing sub-nucleon scale fluctuations using the constituent quark model or the IP-glasma framework we demonstrate that incoherent gamma-p scattering is sensitive to small-scale fluctuations. We also show that the effect of geometric fluctuations can be disentangled from saturation scale fluctuations.

We discuss to what extent the current HERA diffractive deep inelastic scattering data can be used to constrain the proton structure fluctuations and how an Electron Ion Collider (EIC) can improve the picture.

Collaboration

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