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Measuring the gluon distribution in nuclei at an Electron-Ion Collider

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Despite the successes of the HERA collider, where much information was gained on the structure of the nucleon, data on the structure of the nucleus at moderate-to-small x remains elusive, as only fixed-target high-x data currently exist. The small-x region, however, is of great interest. The nucleon structure in this region is dominated by gluons which show a rapid rise with decreasing x. At low-x, this growth must be tamed and the gluon distribution will be saturated. This saturation phenomena is expected to be universal, appearing in both nucleons and nuclei. A knowledge of this regime is of vital importance to understanding the underlying physics which governs the initial conditions of heavy-ion collisions at both the LHC and RHIC, where particle production is dominated by gluons from this unknown region.

However, only tantalising hints of this have been observed so far. Therefore, the construction of an Electron-Ion Collider (EIC), colliding polarised electrons with polarised protons and also a wide variety of nuclei, will allow an exploration of the region of small-x in great detail (with luminosities 100x that of HERA), answering questions on both the spatial and momentum distributions of gluons and sea quarks in nuclei. In particular, the saturation region is more accessible in nuclei due to the amplification of the saturation scale with nuclear size (Q_s ~ A^(1/3)).

In this talk I will present the current status of the physics capabilities of e+A collisions at an EIC as outlined in the EIC White paper [1].

[1] A. Deshpande at al, arXiv:1212.1701, (2012)

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