EXOTIC GLUE: THE GLUONIC TRANSVERSITY STRUCTURE FUNCTION

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In 1989 Jaffe and Manohar described a leading-twist, double-helicity-flipping structure function $\Delta(x, Q^2)$ which is sensitive to gluonic states in any hadron of spin $J \geq 1$, notably in nuclei. For nuclei, this quantity gives a measure of exotic glue—the contributions from gluons not associated with individual nucleons in a nucleus—as neither nucleons nor pions (nor any state with spin less than one) can transfer two units of helicity to the nuclear target. Currently, the size and x and Q^2-dependence of $\Delta(x, Q^2)$ is unknown. An experimental measurement of $\Delta(x, Q^2)$ has been proposed in a recent letter of intent to Jefferson Lab, with the goal of measurements at low x on nitrogen targets. Further experimental measurements on a variety of light nuclear targets can be expected at the proposed Electron-Ion Collider.

We present the first lattice QCD study of $\Delta(x, Q^2)$, namely a calculation of its low moments in hadronic targets. This constitutes a proof-of-feasibility of this approach, which can be extended to light nuclei in future work. We also explore the gluon structure of hadrons in more general terms, including an investigation of the direct gluonic analogue of the Soffer bound for transversity.