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Predictions for the Spatial Distribution of Gluons in the Initial Nuclear State

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We demonstrate measurable, falsifiable differences between the DGLAP and CGC predictions for the t-differential cross section of exclusive vector meson production (EVMP) in electron-ion collisions. These predictions permit an experimental determination of the dominant physical processes for low-x gluons in a high-energy nucleus. At eRHIC energies, J/psi photoproduction in e+A collisions provides an ideal experimental probe for the spatial distribution of gluons. EVMP grants experimental access to the edge region of the highly-boosted nuclear wavefunction, where the saturation scale for CGC calculations becomes inaccessible to pQCD. On the other hand, DGLAP evolution requires careful consideration of unitarity effects.

Under these different small-x frameworks we obtain a measurable distinction in both the shape and normalization of the differential cross section predictions. An eRHIC measurement of such an EVMP cross section will therefore constrain the initial state in heavy ion collisions, allowing for a more quantitative study of the properties of the quark-gluon plasma.

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