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Has the saturation model found its smoking gun?

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With a foundation of almost two decades of theoretical research, the gluon saturation formalism is widely considered a strong candidate to describe the behavior of small-x gluons in high-energy collisions. However, the formalism has proven difficult to test. There is a pressing need for precise numerical results from the saturation formalism to use in comparisons with collider data.

Fortunately, recent progress in the $pA \to h + X$ cross section shows that it may be just the kind of precise result the community needs. The calculation of the NLO corrections, starting in 2012, achieved impressive reductions in the theoretical and numerical uncertainties, although the result becomes negative at high $p_\perp$. Still, precise predictions at moderate $p_\perp$ could be key to showing the viability of the saturation model.

In this talk, I introduce the recent modifications to the dipole splitting functions that complete the NLO corrections and help offset the negativity observed in earlier results. I'll also present the latest numerical results for the full LO+NLO cross section, including the first comparison with LHC pilot run data. For forward rapidity at both RHIC and the LHC, we have found excellent agreement with the data throughout the range in which the calculation is valid.

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