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Executive Summary

Color Transparency and Light-Front Holographic QCD

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Quantum chromodynamics (QCD) makes the astounding prediction that initial-state and final-state interactions are diminished in reactions that are measured under extremely particular circumstances. In most cases, when a strongly interacting particle strikes a nucleus, it does not travel through the nucleus with the same amount of energy. The effective cross-section may be substantially smaller than, according to QCD. Due to the absence of the typical diffractive shadow that a nucleus typically casts, this amazing feat represents a form of quantum mechanical invisibility.

According to the study's conclusion, colour transparency is not predicted by light-front holographic wave functions since they lack a PLC. The recent astounding experimental observation that colour transparency does not occur in reactions with momentum transfer squared, Q2, up to 14.2 GeV2, is compatible with this. The current findings demonstrate that, regardless of any significant value of Q2, these wave functions do not anticipate the occurrence of colour transparency. The soft dynamics involved in the temporal evolution of a wave packet can be well described by the wave functions. Additionally, the high-energy (500 GeV) nuclear-coherent dijet-production reaction +AJJA has revealed a significant signal. The latter response is distinct.

The ultimate pionic state is not the ground-state wave function, hence the physics differs from the form factor physics that was previously explained. On the other hand, a PLC is formed. One straightforward explanation is that forming a PLC in a quark-antiquark system is simpler than in a three-quark system.

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