

News & Comments

The Onset of Colour Transparency*Rasha Kamal*

The phenomena of Colour Transparency (CT), despite being a core QCD prediction has long been the subject of contentious interpretations of experimental data. The rise in Nuclear Transparency (NT) ratio with the relevant hard scale is thought to be a key indicator of the beginning of a collinear QCD factorization regime, when hadrons' transverse diameters decline correspondingly to $1/Q$, significantly reducing the cross-sections of final-state interactions. Most of the information now accessible is now understood in terms of a collinear QCD factorized amplitude, where the pertinent hadronic matrix elements are generalized Parton distributions (GPDs). The information on nuclear transparency points to the necessity for more research into the phenomenon of colour transparency. This is crucial in the case of the nucleon. There have been numerous discussions and interpretations based on past measurements of the large-angle proton-proton (pp) elastic and quasi-elastic ($p,2p$) scattering. Recent data on the reaction disproved the leading twist dominance of the nucleon form factors at empirically available energy by showing the absence of any positive signal for the development of colour transparency in this straightforward reaction up to $Q^2 = 14 \text{ GeV}^2$. It is too early to determine what causes the absence of the onset of CT in the proton scenario because transparency measurements have only been performed on a small number of reactions and kinematics.

For the first time, the collinear QCD factorization framework connects backward meson electroproduction on nuclei to CT research. It is significant to note that the Transition Distribution Amplitude (TDA) predictions are supported by the experimental results since the observation of CT is predicated on the idea that a short distance process dominates the amplitude at accessible energy. Like this idea, one may investigate nuclear transparency in many experiments, where TDAs emerge as the collinear factorized hadronic matrix element and colour transparency should also be observed in hard scattering processes. This is true not just for the antiproton nucleus electromagnetic processes at the PANDA experiment but also for a time like Compton scattering with a quasi-real photon beam. After the suggested measurement is finished, a larger community discussion is required to decide the implications and the overall significance of the experimental facts that were seen, such as the validation of the TDA formalism and the presence or absence of onset of CT.

JOURNAL REFERENCE

Huber, G.M.; Li, W.B.; Cosyn, W.; Pire, B. u-Channel Color Transparency Observables. [Physics 2022, 4, 451–461](#).

KEYWORDS

Colour transparency, u-channel meson production, colinear factorization

