

Deep Inelastic Scattering 2025



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Entanglement as a probe of hadronization

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In this talk, we present our extension of the concept of maximal quantum entanglement from proton structure to jet fragmentation in proton-proton collisions, establishing a connection between jet fragmentation functions and charged hadron multiplicity [1]. This relationship is tested using ATLAS data from the Large Hadron Collider, showing excellent agreement. As the first study to apply quantum entanglement concepts to hadronization within jets, our results provide new insights into the quantum aspects of hadronization and the transition between perturbative and non-perturbative QCD, deepening our understanding of confined nuclear matter.

[1] J. Datta, A. Deshpande, D. E. Kharzeev, **C. J. Naïm**, and Z. Tu, “Entanglement as a probe of hadronization,” arXiv, no. 2410.22331, Oct. 2024.

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