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Determination of quark-gluon-quark interference within the proton

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Abstract

Quantum Chromodynamics predicts that protons are shaped not only by parton densities but also by quantum interference between quarks and gluons. By combining distinct observables with a full implementation of twist-three evolution, we achieve the first determination of these interference effects, establishing their presence at 2-3σ significance. The extracted distributions reveal flavor-dependent patterns, demonstrating the genuinely quantum nature of the proton and opening a new direction for precision studies of partonic correlations.

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