Contribution ID: **170** Type: **Invited Presentation**

Advances on Nucleon Structure from Lattice QCD

Understanding the internal structure of the nucleon remains a fundamental challenge in nuclear and particle physics. Lattice Quantum Chromodynamics (LQCD) provides a rigorous, first-principles framework to study key nucleon properties, including parton distributions, form factors, and moments of generalized parton distributions. Recent advancements in computational algorithms, renormalization techniques, and statistical precision have significantly improved our ability to extract nucleon observables with controlled systematic uncertainties.

In this talk, I will present recent progress in LQCD calculations of nucleon structure, highlighting results on the axial charge, electromagnetic form factors, and partonic distributions. I will discuss the role of novel approaches, such as large-momentum effective theory (LaMET) and pseudo-distributions, in accessing partonic structure directly from lattice simulations. Additionally, I will address challenges related to excited-state contamination, finite-volume effects, and discretization artifacts, and how they are being systematically controlled in state-of-the-art calculations.

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Session Classification: Plenary Session

Track Classification: Hadron Structure, Spectroscopy and Dynamics