APR18-2018-000479

Abstract for an Invited Paper
for the APR18 Meeting of
the American Physical Society

Lattice Generalized Parton Distributions and Form Factors of the Nucleon[1]

MARTHA CONSTANTINOU, Temple Univ

Lattice QCD (LQCD) is a theoretical non-perturbative approach for the study of QCD dynamics numerically and from first principles. For more than a decade, LQCD has been very successful in the calculation of the hadronic spectrum, making postdictions of well-measured hadronic masses, as well as, predictions. Nowadays, LQCD is widely used for hadron structure calculations and is becoming a reliable tool, providing input to the experimental and phenomenological communities. Over the last years, progress in the simulation of LQCD has been impressive, driven by improvements in the algorithms and increase in computational power, that have enabled simulations to be carried out at parameters very close to their physical values. In this talk I will present recent results for the electromagnetic and axial form factors using simulations tuned to yield the physical value of the pion mass. Contributions from the valence and sea quark sector will be shown, including the light, as well as the strange and charm quarks. Our findings show non-negligible contributions from the sea quarks, which can be particularly large for certain form factors; this is in contrast to what was anticipated in the past. The high statistical accuracy of the calculation allows one to fit the momentum dependence of the electromagnetic form factors to extract the electric and magnetic radii of the proton and neutron. Similarly for the axial form factors the dipole masses are obtained and compared to experiment, which is of particular interest for neutrino physics. Finally, I will briefly discuss the progress in a new direct approach to compute quark parton distributions functions directly in LQCD.

[1]Supported by NSF (Grant No. PHY-1714407) and DoE (within TMD Topical Collaboration)