Contribution ID: **353** Type: **Talk**

Proton and neutron electromagnetic form factors using Nf=2+1+1 twisted-mass fermions with physical values of the quark masses

Monday 29 July 2024 12:35 (20 minutes)

We compute the electromagnetic form factors of the proton and neutron using lattice QCD with $N_f = 2+1+1$ twisted mass clover-improved fermions and quark masses tuned to their physical values. Three ensembles with lattice spacings of a=0.080 fm, 0.068 fm, and 0.057 fm, and approximately the same physical volume allow us obtain the continuum limit directly at the physical pion mass. Several values of the source-sink time separation ranging from 0.5 fm to 1.5 fm are used, enabling a thorough analysis of excited state effects via multi-state fits. The disconnected contributions are analyzed using high statistics for the two-point functions combined with low-mode deflation and hierarchical probing for the fermion loop estimation. We study the momentum dependence of the form factors using the z-expansion and dipole Ansaetze, thereby enabling the extraction of the electric and magnetic radii, as well as the magnetic moments in the continuum limit.

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Session Classification: Structure of hadrons and nuclei

Track Classification: Structure of Hadrons and Nuclei