Contribution ID: **39** Type: **Parallel contribution**

Extracting nucleon electroweak properties from Lattice QCD using Chiral Perturbation Theory

The quark mass dependence provided by Lattice QCD results encodes valuable information about hadronic properties. Chiral Perturbation Theory (ChPT) predicts both the low momentum and light quark-mass dependence of hadronic quantities in a model independent way, being therefore well suited to analyze Lattice data. Relying on our calculation of the nucleon isovector axial form factor in relativistic ChPT at next to leading one-loop order we have performed a meta-analysis of an ensemble of recent lattice determinations. We take into account the error associated with the truncation of the perturbative series in the determination of the nucleon axial charge, axial radius (a key ingredient of neutrino-nucleon cross sections) and the low-energy constants such as d16. The later drives the light-quark mass dependence of the axial charge and is a source of uncertainty in the corresponding dependence of nuclear ground state and binding energies. Furthermore, we take advantage of the available determinations of the quark-mass dependence of pion-pion scattering to study the pion mass dependence of the nucleon electromagnetic form factors using dispersion theory with ChPT input.

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Track Classification: Electromagnetic and weak interactions