Contribution ID: **251** Type: **Talk**

Photon mass term as an IR regularization for QCD+QED on the lattice

Tuesday, 14 July 2015 17:50 (20 minutes)

The commonly adopted approach for including QED in lattice QCD simulations introduces power-law finite volume corrections to physical quantities. These effects, which are due to the long-range nature of the electromagnetic interaction, must be removed by performing simulations at multiple lattice volumes, followed by an extrapolation to the infinite volume limit. In this work, we explore the advantages and disadvantages of introducing a photon mass term as an alternative means for gaining control over the finite volume effects associated with the inclusion of QED. We present exploratory findings for hadron mass shifts due to electromagnetic interactions (i.e., for the proton, neutron, charged and neutral kaon) and corresponding mass splittings, and compare them with standard QCD+QED calculations. Preliminary results are reported for numerical studies of three flavor electroquenched QCD using ensembles corresponding to 800 MeV pions and three lattice volumes ranging from 3.4 fm to 6.7 fm.

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Session Classification: Hadron Spectroscopy and Interactions

Track Classification: Hadron Spectroscopy and Interactions