Electromagnetic processes in few-nucleon systems with the Chiral Effective Field Theory

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Rm 124 NSH

Chiral Effective Field Theory provides a systematic and model-independent framework for studying hadronic processes in accordance with the spontaneously broken approximate chiral symmetry of the QCD. This approach is a powerful tool for the derivation of the nuclear forces and current operators. Chiral nucleon-nucleon potentials have been known for a long time up to the fourth order. However, the potential regularization used within this framework in many cases leads to a large uncertainty in the predictions.

A new approach to the regularization of the chiral nucleon-nucleon potentials derived in the chiral effective field theory up to fifth order has been proposed recently. The new potentials do not require the additional spectral function regularization to cut off the short-range components of the two-pion exchange and make use of the low-energy constants determined from pion-nucleon scattering.

In this talk, a novel procedure for estimating the theoretical uncertainty from the truncation of the chiral expansion that replaces previous reliance on cutoff variation will be introduced. The results for low energy electromagnetic reactions obtained with the old and novel approaches to the regularization of the potentials will be presented. The differential cross section and many polarization observables will be shown. The calculations were performed for the selected chiral orders (up to fifth) and for all observables the procedure for estimating the theoretical uncertainties was applied. The results will be compared with those based on the AV18 potential with the corresponding meson exchange currents.

Refreshments served prior to the seminar in Rm 124.