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Bayesian Analysis of a Modified Power Counting in Chiral Effective Field Theory

Chiral effective field theory (χEFT) is an approach to describe the force between nucleons as arising from the more fundamental principles of quantum chromodynamics. A vital part is to have a power counting (PC) that describes the relative importance of the EFT order-by-order contributions to nuclear observables. The definition of the PC is not unique, and the fact that nuclear systems are non-perturbative makes finding a proper PC a non-trivial problem. We have done a Bayesian analysis of a renormalization-group invariant PC at leading order (LO) [1], and we analyze the posterior probability density of the low-energy constants (LECs) for momentum cutoffs in the range 400 – 4000 MeV. We find multi-modal posteriors for the LECs, some overly repulsive P-wave phase shifts, a decent LO description of scattering observables and a slight under-binding of the deuteron. In this PC corrections beyond LO are included perturbatively. Recent developments regarding the analysis of higher orders will also be presented.

[1] O. Thim, E. May, A. Ekström, C. Forssén, arXiv:2302.12624 (2023)

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