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Two-Body Scattering Observables in a Truncated Harmonic Oscillator Basis J. TORKKOLA, B. BARRETT, I. STETCU, U. VAN KOLCK, University of Arizona — The no-core shell model (NCSM) is a powerful many-body method which provides the solution to the Schrödinger equation for A interacting nucleons in a restricted space [1]. The conventional approach uses high precision nucleon-nucleaon (NN) potentials (and three-body forces) and involves a unitary transformation that takes into account the truncation of the (infinite) Hilbert space to a model space which allows for an exact large-scale diagonalization. However, in the process, one has to make a cluster approximation, which is under control for some observables (short-range observables), but less so for others (long-range observables) [2]. Based on a effective field theory (EFT) that integrates out the pions as degrees of freedom (pionless theory), we present a new approach to the derivation of effective interactions suitable for many-body calculations to be used within a NCSM framework. In this contribution, we concentrate on the description of two-body scattering observables in a restricted harmonic oscillator (HO) basis, and the inherent Gibbs oscillation problem that arises from the truncation of the Hilbert space using HO wave functions. In particular, we investigate the connection between the results obtained in leading order in the restricted HO basis and the corresponding continuum results. [1] P. Navratil, J. P. Vary, and B. R. Barrett, Phys. Rev. Lett. 84, 5728 (2000). [2] I. Stetcu, B. R. Barrett, P. Navratil, and J. P. Vary, Phys. Rev. C 71, 044325 (2005); ibid. 73, 037307 (2006).

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