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**Effective and intrinsic three-body interactions in ultracold harmonically-trapped few-atom systems** X.Y. YIN, D. BLUME, Washington State University, P.R. JOHNSON, American University, E. TIESINGA, National Institute of Standards and Technology and University of Maryland — We derive the ground state energy for a small number of ultracold atoms in an isotropic harmonic trap using quantum field theory. Atoms are assumed to interact through pairwise energy-independent and energy-dependent delta-function potentials with strengths proportional to the scattering length $a_s$ and effective-range volume $V_{\rm eff}$, respectively. Additionally, an intrinsic three-body potential with strength proportional to $g_3^{(0)}$ is accounted for. The calculations are performed systematically up to order $(a_{\rm ho})^{-4}$, where $a_{\rm ho}$ denotes the harmonic oscillator length. Effective-range volume dependent energy contributions are calculated up to order $(a_{\rm ho})^{-5}$. We explain how our effective field theoretical results can be, if combined with independent energy calculations or measurements, used to obtain the renormalization scheme independent three-body contribution. The need for three-body counter-term interactions is discussed in the context of the effective-range volume dependent effective interactions.

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