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Neutron distribution, electric dipole polarizability and weak form factor of 48Ca from chiral effective field theory[1]

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How large is the ^{48}Ca nucleus? While the electric charge distribution of this nucleus was accurately measured decades ago, both experimental and *ab initio* descriptions of the neutron distribution are deficient. We address this question using *ab initio* calculations of the electric charge , neutron, and weak distributions of ^{48}Ca based on chiral effective field theory. Historically, chiral effective field theory calculations of systems larger than 4 nucleons have been plagued by strong systematic errors which result in theoretical descriptions that are too dense and over bound. We address these errors using a novel approach that permits us to accurately reproduce binding energy and charge radius of ^{48}Ca, and to constrain electroweak observables such as the neutron radius, electric dipole polarizability, and the weak form factor.

[1]For a full list of contributors to this work, please see "Neutron and weak-charge distributions of the 48Ca nucleus", Nature Physics (2015) doi:10.1038/nphys3529