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Nuclear and neutron-star matter from local chiral interactions[1]
DIEGO LONARDONI, FRIB-MSU and LANL — The nuclear equation of state (EOS) is of great interest for nuclear physics and nuclear astrophysics. At different proton fractions, the EOS sets the bulk properties of atomic nuclei and the properties of neutron stars. The energy difference of nuclear matter at different proton fractions is governed by the nuclear symmetry energy. The nuclear symmetry energy is a fundamental quantity that affects a range of neutron-star properties and is deeply connected to properties of atomic nuclei. Understanding the properties of the nuclear EOS has recently become even more critical with the advent of gravitational-wave (GW) astronomy and the first-ever detection of GWs from a binary neutron-star merger. In this talk I will present the first quantum Monte Carlo calculation of the equation of state of symmetric nuclear matter using chiral effective field theory interactions. The empirical saturation properties are well reproduced within statistical and systematic uncertainties. The symmetry energy is in good agreement with available experimentally derived constraints at saturation and twice saturation density. The corresponding pressure is also in excellent agreement with recent constraints extracted from GWs of the neutron-star merger GW170817 by the LIGO-Virgo detection.

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