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Constraints on neutron star properties from neutron matter calculations[1]

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Microscopic calculations based on chiral effective field theory interactions constrain the properties of neutron-rich matter below nuclear densities to a much higher degree than is reflected in current neutron star modeling. Combined with the heaviest $2\,M_\odot$ neutron star, our results constrain the radius of a typical $1.4\,M_\odot$ star to $R = 10.9 - 13.9\,\mathrm{km}$. This theoretical range is due, in about equal amounts, to the uncertainty in many-nucleon forces and to the extrapolation to high densities. The radius range is consistent with independent astrophysical results obtained from modeling X-ray burst sources. In addition, we predict the neutron skin thickness of ^{208}Pb to $0.17 - 0.03\,\mathrm{fm}$.

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