DNP19-2019-000049

Abstract for an Invited Paper
for the DNP19 Meeting of
the American Physical Society

The Equation of State of neutron matter and neutron stars

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Recent advances in experiments of the symmetry energy of nuclear matter and in neutron star observations yield important new insights on the equation of state of neutron matter at nuclear densities. In this regime the equation of state of neutron matter plays a critical role in determining the mass-radius relationship for neutron stars. We show how microscopic calculations of neutron matter, based on realistic two- and three-nucleon forces that reproduce very accurately properties of light nuclei, make clear predictions for the relation between the isospin-asymmetry energy of nuclear matter and its density dependence, and the mass and radius for a neutron star. At densities higher than nuclear density the situation is more complicated, as there is still no clear evidence on the composition of matter. We will discuss a model of high density matter based on the speed of sound, and discuss the effect of various constraints to the maximum mass of neutron stars.