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# The High-Density Symmetry Energy in Heavy Ion Collisions and Compact stars

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The high-density nuclear equation-of-state determines much of the structure of compact objects in the cosmos, which concerns especially neutron rich matter, i.e. the nuclear symmetry energy. Microscopic many-body theories still differ considerably in their predictions, due to the difficulties from short-range tensor interactions. Thus heavy ion collisions at relativistic and ultra-relativistic energies are an important method to obtain information here. Due to their non-equilibrium nature they have to be interpreted by transport approaches. I will discuss the Boltzmann-Vlasov and molecular dynamics approaches used in the hadronic regime and actual developments and challenges. The status of the knowledge of the symmetry energy from the most commonly used observables, like elliptic flow and particle production, will be reviewed and compared to the constraints derived from neutron star observations.

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