Constraints on the Nuclear Saturation Properties using Experimental Data and Astrophysical Observations

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We discuss the constraint on the saturation properties using the astronomical observations and experimental data. The equation of state (EoS) for nuclear matter, which is expressed as the energy density function, is important for finite-nuclei and neutron-star properties. At the saturation density, the binding energy, symmetry energy, slope parameter (L), and incompressibility (K_0) are also the significant physical quantities in nuclear physics. The binding energy and symmetry energy are well determined by many researches which have been so far. However, L and K_0 still have uncertainties. In general, the properties of a neutron star depend on the EoS for nuclear matter. In Fig.1, we present the allowed region of K_0 and L at the effective mass ratio, $M^*_N / M_N = 0.7$. We find that the tidal deformability from the neutron-star binary merger seen in gravitational waves [1], the discovery of two-solar mass neutron stars [2], and heavy-ion collisions [3] can be useful to make constraints on these quantities.

[1] B. P. Abbott *et al.,* [LIGO Scientific and Virgo Collaborations], Phys. Rev. Lett. 121, 161101 (2018)
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[3] M. B. Tsang *et al.*, Phys. Rev. C, 015803 (2012)

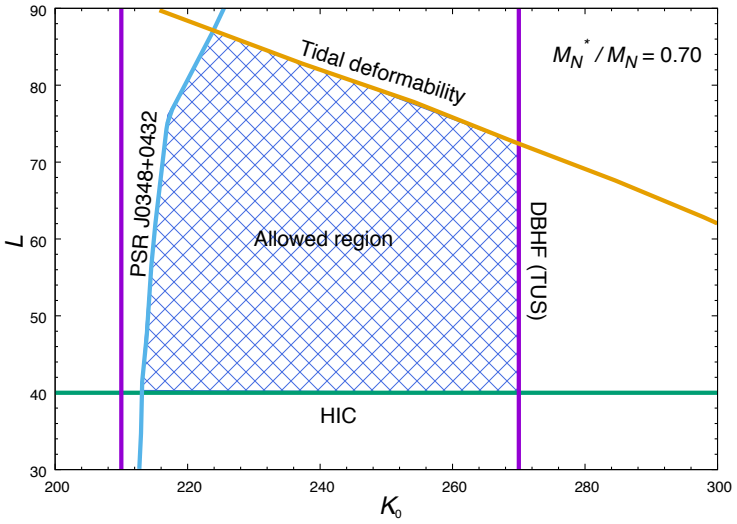

Fig. 1 Allowed region of K_0 and L at $M^*_N / M_N = 0.7$.