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Hyperonic neutron star matter in light of GW170817

Since 2013 the mass of pulsar PSR J0348+0432 ($M = 2.01\ M_\odot$) has provided a tight constraint on the neutron star equation of state. However, a number of different analyses of the recently detected binary neutron star merger (GW170817) point to a higher maximum neutron star mass of around $2.16\ M_\odot$. In addition, a recent study determined the mass of the millisecond pulsar PSR J2215+5135 to be $2.27^{+0.17}_{-0.15}\ M_\odot$. In this work we investigate the presence of hyperons in neutron star matter in light of these new mass measurements using equations of state calculated in the relativistic mean-field (RMF) approximation. Particular attention is paid to the use of the available empirical data from the study of hypernuclei and that of the SU(3) symmetry relations in fixing the meson-hyperon coupling constants. We find that hyperonic equations of state with reasonable choices for the meson-hyperon coupling constants can satisfy these new mass constraints, with hyperons potentially accounting for more than 10% of the baryons in the core of a neutron star.

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