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Relativistic description of neutron star matter with latest experimental and observational constraints

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Astrophysical observations of neutron stars allow us to study the physics of matter at extreme conditions which are beyond the scope of any terrestrial experiments. In this work, we perform a Bayesian analysis putting together the available knowledge from the nuclear physics experiments, observations of different X-ray sources, and gravitational wave events to constrain the equation of state of supranuclear matter. In particular, we employ a covariant density functional to incorporate the uncertainties of the saturation properties of nuclear matter i.e. the symmetry energy and its slope parameter, the incompressibility, the effective mass of the nucleon, the binding energy per nucleon, and the saturation density. Then, we investigate whether it is possible to reconcile the inferred values of those quantities from the multimessenger data, and finally compute a joint posterior distribution of these quantities incorporating all the available knowledge.

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