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Neutron Stars in Scalar-tensor Theories: Analytic Scalar Charges and Gravitational-wave Constraints

Monday, 5 July 2021 17:30 (20 minutes)

Neutron stars in scalar-tensor theories may undergo spontaneous scalarization, which is important for probing the theories with binary pulsar and gravitational wave observations. Since the effect is nonlinear, most studies of spontaneous scalarization were carried out numerically. In the first part of my talk, I explain how one can compute the effect of scalarization analytically based on a perturbative analysis and analytic modeling of neutron stars through the Tolman VII solution. I show that the analytic calculations match accurately with numerical ones. These findings improve our understanding of spontaneous scalarization and provide us quick and ready-to-use expressions of scalar charges. In the second part, I present current and future prospects of constraining scalar-tensor theories with gravitational waves from a mixed binary of a black hole and a neutron star. I show that future observations can significantly improve bounds on these theories.

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