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Tidal effects in GR and beyond: novel scalar-tensor Love numbers and dynamical response from scattering

Tuesday 4 July 2023 15:20 (40 minutes)

Scalar-tensor theories are one of the long-standing alternatives to General Relativity (GR). These theories introduce an extra degree of freedom through a scalar field coupled to gravity, which affects the dynamics and internal composition of neutron stars. In this talk we use an effective field theory approach in order to describe an isolated body with size effects, characterised through the tidal deformability or, equivalently, the Love number. In particular, we introduce a novel tidal deformability and distinguish between different contributions to the induced multipole moments, clarifying the correct identifications with respect to previous literature. Additionally, we present a gauge-invariant method to extract the tidal response, the frequency-dependent tidal deformability, in GR using scattering. Our work is important for interpreting upcoming gravitational-wave data for subatomic physics of ultradense matter in neutron stars, probing black holes and gravity, and looking for beyond-standard-model fields.

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