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A Study on the Tidal Deformability of Compact Objects

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Neutron stars act as natural laboratories for probing nuclear matter under extreme densities, with their inner layers reaching values several times greater than those found in atomic nuclei. The detection of gravitational waves from neutron star mergers has provided unprecedented experimental data on tidal deformability during the final coalescence phase of binary systems. In this work, we employ the mathematical framework of general relativity to calculate the tidal deformability of a neutron star immediately before merging with its companion. Our goal is to compute key parameters governing nuclear matter behavior under such extreme conditions, employing diverse equations of state (EoS), and compare these results with existing literature. This comparative analysis tests the robustness of current EoS models in describing dense nuclear matter.

Author: DO CARMO DA SILVA, Eduardo (Universidade Federal de Santa Maria)

Co-author: LUCIANO SONEGO FARIAS, Ricardo (Universidade Federal de Santa Maria)

Presenter: DO CARMO DA SILVA, Eduardo (Universidade Federal de Santa Maria)

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