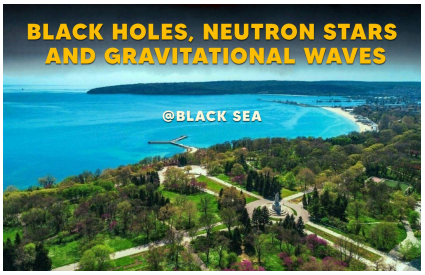

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3D collapse of rapidly rotating neutron stars into black holes in massive scalar-tensor theory

Wednesday 18 June 2025 15:45 (15 minutes)

We present a full 3D numerical evolution code to study rotating neutron stars in massive-scalar-tensor (MST) theories.
The implementation consists in a modified version of the Baumgarte-Shapiro-Shibata-Nakamura (BSSN) formalism such that the simulations are performed in the physical Jordan frame, where the scalar field is directly coupled with the spacetime evolution. This approach allows to preserve the standard hydrodynamic evolution for matter fields,
allowing eventually for the inclusion of more microphysics. As an example of a use case of this implementation, we study the problem of gravitational collapse of rapidly rotating neutron stars in MST theories by exploring the parameter space (couplings and mass of the scalar field) and its impact on the dynamical properties of the process and on the emitted scalar and gravitational radiation.

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