

Triaxially-deformed Freely-precessing Neutron Stars: Continuous electromagnetic and gravitational radiation

A rapidly rotating, asymmetric neutron star (NS) in the Milky Way undergoes free precession, making it a potential source for multi-messenger observation. The free precession could manifest in (i) the spectra of continuous gravitational waves (GWs), and (ii) the timing behavior and pulse-profile of radio and/or X-ray pulsars. We extend previous work and investigate in great detail the free precession of a triaxially deformed NS with analytical and numerical approaches. In particular, its associated continuous GWs and pulse signals are derived. Explicit examples are illustrated for the continuous GWs, as well as timing residuals in both time and frequency domains.

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