Non-radial oscillations of rapidly rotating neutron stars as sources of gravitational waves

Boutloukos S.[1], Nollert H.-P.[1]

[1]University of Tübingen

ABSTRACT: We use perturbation theory and the relativistic Cowling approximation to compute numerically characteristic oscillation modes of rapidly rotating neutron stars which consist of a perfect fluid obeying a polytropic equation of state. We find the expected infinite pressure mode spectrum extending towards higher frequencies, but also what appears to be an infinite number of inertial modes confined to a finite, well-defined frequency range, depending on the compactness and the rotation frequency of the star. We observe the shift of this range towards negative frequencies for non-axisymmetric modes with respect to the axisymmetric ones, making all $m > 2$ modes unstable. Individual modes are still being identified, with most important for gravitational wave emission the fundamental r-mode. We discuss whether our results indicate the existence of a continuous part of the star's spectrum, and how would this affect individuals modes and their detection.