General Relativity and Quantum Cosmology

On the Shear Instability in Relativistic Neutron Stars

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We present new results on instabilities in rapidly and differentially rotating neutron stars. We model the stars in full general relativity and describe the stellar matter adopting a cold realistic equation of state based on the unified SLy prescription. We provide evidence that rapidly and differentially rotating stars that are below the expected threshold for the dynamical bar-mode instability, beta_c = T/|W| ~ 0.25, do nevertheless develop a shear instability on a dynamical timescale and for a wide range of values of beta. This class of instability, which has so far been found only for small values of beta and with very small growth rates, is therefore more generic than previously found and potentially more effective in producing strong sources of gravitational waves. Overall, our findings support the phenomenological predictions made by Watts, Andersson and Jones on the nature of the low-T/|W|.

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