

Abstract Submitted
for the APR05 Meeting of
The American Physical Society

Diagnosing low T/W dynamical instabilities in differentially rotating stars SHIN'ICHIROU YOSHIDA, Department of Physics, University of Wisconsin-Milwaukee, MOTOYUKI SAIJO, Kyoto University, Japan — We investigate dynamical instabilities appearing in differentially rotating stars with rather low value of $T/|W|$ parameter (a ratio of rotational to gravitational energy), by using numerical non-linear hydrodynamics and linear eigenmode analysis. Particular attention are paid to the one-armed spiral instability and low $T/|W|$ bar instability, both of which are found recently ¹ and are very interesting channels of possible gravitational radiation from rotating neutron stars. The nature of the dynamical instabilities is studied by using the canonical angular momentum ² as a diagnostics. We find that the canonical angular momentum change its sign around the corotation radius and the instability grows through the interaction between inside and outside the corotation radius. This is in clear contrast with that of the classical dynamical instability without corotations, whose distribution of canonical angular momentum shows no feature.

¹Centrella et al., 2001, ApJL, 550, 193 ; Saijo et al., 2003, ApJ, 595, 352; Shibata et al., 2002, MNRAS, 334, 27

²Friedman & Schutz, 1978, ApJ, 221, 937

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Date submitted: 31 Jan 2005

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