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Differential rotation of the unstable nonlinear r-mode[1] JOHN FRIEDMAN, University of Wisconsin-Milwaukee, LEE LINDBLOM, Caltech, KEITH LOCKITCH, Ayn Rand Center — To second order in perturbation theory, the r-modes of uniformly rotating stars include an axisymmetric part that can be identified with a growing differential rotation of the background star. If one does not include radiation-reaction, the differential rotation is constant in time and has been computed by Sá. It has a gauge dependence associated with a choice of equilibrium configuration: Adding to the time-independent second-order solution arbitrary differential rotation that is stratified on cylinders: $\delta\Omega = \delta\Omega(\varpi)$. For the radiation-reaction driven r-mode, however, the differential rotation includes an exponentially growing part that is unique, gauge-independent, and vorticity-conserving. We compute this differential rotation for slowly rotating Newtonian models, acted on by the radiation-reaction force of the unstable mode.

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