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Orbital resonance widths in an uniformly rotating second degree and order gravity field

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This work analyses the stability of orbits in uniformly rotating second degree and order gravity fields using analytical and numerical methods. A Deprit perturbation series is used to derive Hamiltonians valid close to mean motion resonances. These expressions are further reduced to the Hamiltonian of a pendulum through canonical transformations. Analytical expressions for the orbital resonance widths are derived and tested against numerical simulations. Surprisingly, the widths of these mean motion resonances are independent of the rotation rate and the mass of the central body, although the location of the resonances depend on both. Regions of stable and unstable orbits are explained by the resonance widths and the overlap criteria.