

Abstract Submitted
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Improved Universal No-Hair Relations for Neutron Stars¹ BARUN MAJUMDER, Montana State Univ, KENT YAGI, Princeton University, NICOLAS YUNES, Montana State Univ — The exterior gravitational field of an astrophysical body can be characterized by its multipole moments. No-hair theorems for black holes state that the exterior gravitational field can be completely described in terms of their mass and spin angular momentum. Similar no-hair like relations have been recently found for neutron stars which are approximately independent of the internal structure of the star. Missions like NICER and LOFT will observe the pulse profiles of millisecond pulsars and thermonuclear bursters. The equation-of-state (EoS) independent relations may break degeneracies among the relevant observables in the modeling of X-ray pulse and atomic line profiles. The amount of EoS independence of these approximately universal relations depends on how one adimensionalizes the multipole moments of the star with stellar mass, spin and radius. We show that for slowly-rotating neutron stars in both non-relativistic limit and full General Relativity, the optimal normalization of the multipole moments exist that minimizes the EoS dependence in the universal relations. The relations among the moment of inertia and higher order moments can be improved from the original ones approximately by a factor of two.

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Barun Majumder
Montana State Univ

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