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Gravitational Self-Lensing of X-rays Emitted by Neutron Stars

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Neutron stars are the densest known gravitationally-stable objects in the Universe. Their strong gravitational fields, rapid rotation rates, and supra-nuclear central densities allow for a fascinating interplay between general relativistic effects and nuclear physics theory. Pulse-profile modeling is a technique that uses the gravitationally-lensed X-ray flux emitted from hot spots on the neutron star's surface to infer its mass and radius. General relativity is a crucial ingredient in this analysis. The Neutron Star Interior Composition ExploreR (NICER) is a NASA X-ray telescope mounted on the International Space Station. NICER is a timing instrument designed to make the measurements required to implement pulse-profile modelling. In this talk, I will give an overview of how NICER data is used to infer a neutron star's radius (and its mass), along with the latest results and future observations of other pulsars.

Keyword-1

Astrophysics

Keyword-2

General Relativity

Keyword-3

Neutron Stars

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