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Probing the neutron star equation of state through X-ray timing

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Modeling the amplitudes and shapes of the X-ray pulsations observed from hot, moderately or rapidly rotating neutron stars provides a direct method for measuring neutron-star properties. This method can in principle be applied to thermally emitting rotation-powered millisecond pulsars, millisecond oscillations from thermonuclear X-ray bursters, and accretion-powered millisecond pulsars, and it constitutes an important part of the science case for the forthcoming NICER and proposed LOFT X-ray missions. In this invited review, I will discuss the observables that can be derived from pulse profile modeling and show that analysis of pulse profiles from moderately spinning (300-800 Hz) pulsars in two different energy bands allows separate measurement of the neutron star mass and radius. I will also discuss the signal-to-noise levels required for measurements sufficient to constrain the neutron star equation of state.

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