

Abstract Submitted
for the APR17 Meeting of
The American Physical Society

Measuring the radius of PSR J0437–4715 using NICER observations of X-ray oscillations FREDERICK LAMB, University of Illinois at Urbana-Champaign, M. COLEMAN MILLER, University of Maryland at College Park — The Neutron Star Interior Composition Explorer (NICER) will launch early in 2017. Its first scientific objective is to precisely and reliably measure the radius of several neutron stars, thereby constraining the properties of cold matter at supranuclear densities. This will be done by fitting energy-dependent waveform models to the observed thermal X-ray waveforms of selected rotation-powered millisecond pulsars. A key target is the 174-Hz pulsar PSR J0437–4715. Using synthetic waveform data and Bayesian methods, we have estimated the precisions with which its mass M and radius R can be measured by NICER. When generating the synthetic data, we assumed $M = 1.4M_{\odot}$ and $R = 13$ km. When generating the data and when analyzing it, we assumed the X-ray spectrum and radiation beaming pattern given by models with cool hydrogen atmospheres and two hot spots. Assuming NICER observations lasting a total of 1.0 Msec, current knowledge of M and the distance, and knowledge of the pulsar’s spin axis to within 1° , the 1σ credible region in R extends from 11.83 to 13.73 km (7.4%) and in M , from 1.307 to 1.567 M_{\odot} (9.1%). Marginalizing over M , we find the 1σ credible interval for R alone extends from 12.62 to 13.68 km (4%).

Frederick Lamb
University of Illinois at Urbana-Champaign

Date submitted: 30 Sep 2016

Electronic form version 1.4