Abstract Submitted
for the DNP19 Meeting of
The American Physical Society

Measurement of the Free-Neutron Lifetime Using Space-based Neutron Data from NASA's MESSENGER Mission[1] JACK WILSON, DAVID LAWRENCE, PATRICK PEPLOWSKI, Johns Hopkins University Applied Physics Laboratory, VINCENT EKE, JACOB KEGERREIS, Institute for Computational Cosmology, Durham University — Precise knowledge of the free neutron lifetime, τ_n, is required to test the consistency of the standard model and uncertainties in τ_n dominate those in predicted primordial ^{4}He abundance from Big Bang nucleosynthesis. Presently, there exist two classes of experiments that have successfully made measurements of τ_n. The 'Beam' class involves measuring the activation of cold neutron beams and the 'Bottle' class uses storage (material, magnetic and/or gravitational) to trap neutrons and measure the rate of decay during storage. However, there currently exists a 4 σ disagreement between the 'beam' and 'bottle' measurements. We have developed a new technique for using space-based neutron spectroscopy measurements to determine τ_n. Under this technique the change in planet-originating neutron flux with planet-to-spacecraft distance yields a measure of τ_n. Here, we will present an analysis of data from the neutron spectrometer on NASA's MESSENGER mission as a proof-of-principle demonstration of a space-based τ_n measurement. In this talk, we will discuss the basis of the technique, statistical and systematic errors of the measurement, and preliminary results will be presented.

[1]This work was funded under DOE Office of Science grant DE-SC0019343.

Jack Wilson
Johns Hopkins University Applied Physics Laboratory

Date submitted: 01 Jul 2019 Electronic form version 1.4