

**Space Science Seminar**  
**Monday, 2022 November 14**  
**10:30 a.m.**

NASA/MSFC TEAMS and NSSTC room 2096

*Using Gamma Rays to Search for Low-Frequency Gravitational Waves*

Dr. Matthew Kerr / U.S. Naval Research Laboratory

Host: Dr. Michelle Hui (Sponsored by ST12)

The hierarchical merger of galaxies and their supermassive black holes is expected to fill the universe with a low-frequency (nHz) background of gravitational waves (GWB). The amplitude and spectral shape of this GWB encodes information about black hole masses and merger dynamics. Pulsar timing arrays (PTAs) are long-term monitoring campaigns with sensitive radio telescopes of many millisecond pulsars, and their key science goal is the detection and characterization of this background. Recently, several PTAs have published three-sigma evidence for a data feature which could correspond to the GWB. I will review these developments and then present a new, complementary method of searching for the GWB, using gamma-ray data from the Fermi Large Area Telescope. The LAT has detected more than 100 MSPs, and with its accurate and precise timestamping, it is a gamma-ray PTA. Sensitivity to the GWB increases dramatically with longer data sets, and using 12.5yr of data, we derived an independent upper limit on the GWB which is competitive with radio PTAs but free from many confounding effects, like propagation through the ionized interstellar medium. I will present these original results, discuss prospects for the eventual detection and characterization of the low-frequency GWB, and give an update of the LAT analysis based on proposed improvements.

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