Abstract Submitted
for the SES21 Meeting of
The American Physical Society

Development of a Prototype Electron Detector for Use in UCNA+ Experiment RICHARD MCDONALD, ROBERT PATTIE, East Tennessee State University, UCNA COLLABORATION — The UCNA Experiment at the Los Alamos Neutron Science Center (LANSCE) uses an electron spectrometer to observe angular correlations between the spin polarization of ultracold neutrons and the momenta of β particles emitted from the beta-decay of free neutrons. The asymmetry of these beta-emissions yields a value of λ, defined as the ratio between the axial vector and vector coupling constants ($\lambda = g_A/g_V$). In combination with the neutron lifetime, these parameters have the capability of pointing out physics Beyond the Standard Model by testing the unitarity of the Cabibbo-Kobayashi-Maskawa Matrix. The UCNA Collaboration is exploring ways to increase the sensitivity of the experiment, and one improvement that can be made is updating the organic scintillator detector. Rather than using PMTs, this study plans to evaluate the possibility of using edge coupled solid state silicon photomultiplier detectors (SiPMs), which can record energy, position, and time data. The new configuration of the detector may also result in lower systematic uncertainties; namely the ˜2 meter path the produced light must travel to reach the PMTs and the SiPMs' quantum efficiency being a factor of 2 greater than the PMTs'. Over the course of the past summer, Dr. Pattie and I have been building a prototype detector and automated source positioner for evaluating the SiPMs as the only detectors present, the goal being to compare the position and energy resolution with that of the current detector used by UCNA.

Richard McDonald
East Tennessee State University

Date submitted: 30 Sep 2021 Electronic form version 1.4