Scintillation Light Detection Using VLPCs for a New Search of the Neutron Electric Dipole Moment

AMBER NELSON, Washington and Jefferson College and TUNL, DIPANGKAR DUTTA, TUNL and Duke University, HAIYAN GAO, TUNL and Duke University — The electric dipole moment of the neutron (nEDM) is predicted to be on the order of $10^{-31}$ e.cm. by the Standard Model. Currently, the experimental limit of this quantity is $6 \times 10^{-26}$ e.cm. Any non-zero nEDM is a direct violation of time-reversal symmetry, which may lead to a new understanding of CP violation. A new experiment has been proposed aiming at improving the current experimental limit by two orders of magnitude. A critical component of this new nEDM experiment involves detecting the scintillation light from the $\vec{n} + ^3\bar{He} \rightarrow p + t$ reaction at 300mK. A new light detection technique using a visible light photon counter (VLPC) is being developed for this experiment. The VLPCs are doped silicon based solid state photo multipliers with a high quantum efficiency and are normally operated at 6.5K. The scintillation light is wave-shifted from XUV to blue using deuterated tetraphenyl butadiene (TPB) and then to green using wavelength-shifting (WLS) fiber. Over the summer, the bench set-up was constructed and preliminary results of these tests will be presented.