



Wright
Laboratory

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The COHERENT Neutrino Program and the First Search for Neutrino-Induced Nuclear Fission



Over 50 years ago, it was predicted that it is possible to split an atom with a neutrino interaction, but there has never been a concerted experimental effort to confirm this phenomenon. The existence of this process would inform nuclear astrophysics, nuclear reactor monitoring and give a vantage into a process that bridges both the weak and strong fundamental interactions. This would add the neutrino to the selective group of particles confirmed to induce nuclear fission. To that end, the NuThor Detector was built in 2022 as a dedicated neutrino-induced nuclear fission (or “nuFission”) detector on thorium as part of the COHERENT Collaboration detector suite. This apparatus is exposed to the intense neutrino flux of the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory. The intense, pulsed neutrino source coupled with the NuThor detector system presents a unique and promising opportunity to conclusively put this half century mystery of nuFission to rest.

COHERENT simultaneously stewards multiple neutrino detectors designed to measure coherent elastic neutrino-nuclear scattering (CEvNS). The collaboration was the first to successfully observe this phenomena in 2017—40 years after its initial prediction. These CEvNS measurements are capable of rigorously testing the Standard Model and are reaching the ton-scale where they will enjoy significant boosts in sensitivity to physics beyond the Standard Model.

In this seminar, I will present my work designing, building and analyzing the NuThor detector as its primary researcher as well as the COHERENT collaboration-wide effort to elucidate neutrino-nuclear interactions via a systematic program of neutrino measurements at the SNS.

Host: Yu-Han Tseng

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