The World's Smallest Neutrino Detector: First Measurement of Coherent Elastic Neutrino Nucleus Scattering (CEvNS)

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Coherent Elastic Neutrino Nucleus Scattering (CEvNS) was first predicted over 40 years ago, but was not detected until August 2017. The COHERENT experiment made the first measurement with the world's smallest neutrino detector, a 14.6 kg cesium iodide (CsI) detector. The cross section for CEvNS contains an explicit number of neutrons squared dependence. This process was very difficult to measure due to the requirements of a low detector threshold and small acceptable background levels. CEvNS has broad physics implications, especially in the field of dark matter detection. The COHERENT experiment uses the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory (ORNL) as the neutrino source for this measurement. COHERENT aims to measure this cross section dependence through the use of multiple detector technologies and nuclear targets. COHERENT also deploys or will deploy a 22 kg single phase liquid argon (LAr) detector CENNS-10, a 185 kg sodium iodide (NaI) crystal array, and 10 kg of high purity germanium (HPGe) detectors. In this talk, I will cover the physics of CEvNS, what made it so difficult to measure, and some of the detector technologies used in COHERENT and around the world to continue making CEvNS measurements in other nuclei.