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Neutrinos at the Spallation Neutron Source[1]

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The neutrinos produced at the Spallation Neutron Source are ideally suited for a set of exploratory and high-precision neutrino physics measurements due to the accelerator's intensity, pulsed-structure, and proton beam-energy. The Oak Ridge National Laboratory recently converted a service corridor only 20 meters from the SNS target into a dedicated neutrino laboratory capable of supporting ton scale experiments. The COHERENT experiment is the first to take advantage of this new capability at ORNL with the deployment of four neutrino detectors. The first installed instrument was a 14kg CsI detector that recently completed two years of SNS exposure to make the first observation of coherent neutrino nuclear scattering. This most frequent of all neutrino interactions was predicted over forty years ago, but had eluded observation due to enormous experimental challenges. This basic interaction now provides a new tool to address a host of physics topics including electromagnetic properties, searches for physics beyond the standard model, and nuclear form factors. The experimental features of this new capability at ORNL will be presented. The recent first-observation measurement and the anticipated results from currently operating detectors will be discussed.

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