



Contribution ID: 66

Type: **Presentation**

The Moderator Test Station at the Spallation Neutron Source

Wednesday, 22 October 2025 16:30 (15 minutes)

Oak Ridge National Laboratory operates the Spallation Neutron Source (SNS), which provides high-intensity slow neutron beams for a variety of condensed matter, engineering, and basic physics applications with a 2 MW 1.3 GeV proton beam incident on a mercury target. The fast neutrons produced in the target must be efficiently moderated to low energies via moderators, sometimes called cold sources, which in turn are tailored to the specific needs and characteristics associated with given neutron instruments. A good moderator choice can improve instrument productivity by an order of magnitude, so innovative, efficient, and practical moderator designs are called for in the operation of the SNS facility as it stands, and through any future upgrades and expansions.

We describe a moderator test and development facility, the Moderator Test Station (MTS), now in the final design phase at the SNS. We will leverage the already-operational Beam Test Facility (BTF) at the Spallation Neutron Source (SNS) to provide a moderator neutronics test stand, where we will verify the anticipated performance gains expected from planned upgrades for the First Target Station as well as innovative moderator concepts central to the SNS Second Target Station (STS) project. These upgrades and concepts include high-brightness low-dimensional moderators like the tube moderator, intermediate temperature (i.e., 100 – 200 K) moderators such as ammonia, pelletized moderators, and moderators with extended lifetime against decoupler and poison burnup. The MTS will add various proton beam transport components, a neutron-producing target, a cryogenic moderator and gas handling system, a reflector-shielding assembly, and a neutron beamline to assess the performance of the moderator under test. This neutron beamline is a stand-alone instrument, optimized exclusively for moderator performance characterization, relying on advanced yet straightforward optical design, analyzers, and detectors.

This presentation will describe the Science Case for the Moderator Test Station, including the first moderators to be characterized and their potential benefits to SNS, a brief overview of the MTS design, and the project status.

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Session Classification: NEUTRON SOURCES