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The SNS Moderator Test Station

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We describe a Moderator Test Station for the Spallation Neutron Source. We will leverage the Beam Test Facility (BTF) at the Spallation Neutron Source (SNS) to provide a moderator neutronics test stand with which we will verify the anticipated performance gains expected and required from innovative moderator concepts central to the SNS Second Target Station (STS), as well as pursue moderator upgrade concepts for the First Target Station (FTS) once the STS is available. These concepts include high brightness parahydrogen tube moderators, high volume parahydrogen moderators, single-crystal reflector-filtered moderators, and very cold neutron moderators, of interest for STS, liquid methane and ammonia at intermediate temperatures and controlled off-equilibrium spin distributions in liquid and supercritical hydrogen at low temperatures for FTS, and exotic moderator configurations of extruded continuously replenished solid methane or ammonia, pelletized mesitylene with liquid helium cooling, convoluted moderators, or spin-polarized moderator materials.

The SNS BTF, already operational, incorporates an ion source and a 2.5 MeV Radio Frequency Quadrupole (RFQ) substantially the same as the SNS front end. We will use a proton beam chopper similar to that already used in the SNS at the RFQ exit, various proton beam transport components, a neutron-producing lithium target, a cryogenic moderator test stand, a reflector-shielding assembly, and a performance assessment neutron beamline. The MTS will provide the ability to test large-volume and compact moderator concepts in a prototypic wing configuration, measuring the wavelength-dependent transverse brightness distribution with imaging detectors and wavelength-dependent emission time distributions with time-focused analyzer arrays of the moderator concept central to STS gains and FTS upgrades with significantly faster and in greater detail than at currently available test facilities. We here describe the planned layout of the Moderator Test Station neutron test beamline and moderator cryostat assembly, as well as outlining the current list of moderator configurations to be tested.

Poster back-up

Yes

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