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Conceptual Design of the Moderator Reflector Assembly for the Second Target Station

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The proposed Second Target Station (STS) addition to the Spallation Neutron Source will provide world leading neutron scattering capabilities based on cold neutron beams optimized for high brightness.

The Moderator Reflector Assembly (MRA) surrounds the neutron production zone of the STS solid rotating tungsten target and is comprised of 2 coupled hydrogen moderators, one cylindrical and one consisting of tubes arranged in a triangle, nested within light water premoderators assembled within 2 beryllium reflectors. The moderator and premoderator vessels have been designed from shapes and sizes resulting from neutronic optimization and the wall thicknesses and gaps have been minimized. The beryllium reflector is designed to be edge cooled in order to maximize the volume of reflector adjacent to the moderators. The hydrogen moderators are extremely compact and located as close to the target as possible; therefore, alignment of the MRA is critical. The geometry of the rotating target requires horizontal translation of the MRA to during installation and removal, further complicating precision alignment.

The Moderator Reflector Assembly for the STS has been designed to produce high brightness cold neutron beams from the 0.7 MW 15 Hz target station.

Primary author: JANNEY, James (Oak Ridge National Laboratory)

Co-authors: DAYTON, Michael (Oak Ridge National Laboratory); GAWNE, Ken (Oak Ridge National Laboratory); REMEC, Igor (Oak Ridge National Laboratory); RENNICH, Mark (UT-Battelle); ROSENBLAD, Peter (Oak Ridge National Laboratory)

Presenter: JANNEY, James (Oak Ridge National Laboratory)

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