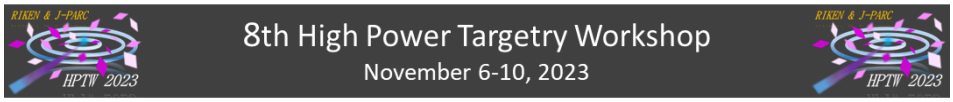

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ORNL Second Target Station Vessel Systems Preliminary Design Update

Monday, 6 November 2023 16:30 (15 minutes)

The Second Target Station (STS) is currently under preliminary design at Oak Ridge National Laboratory (ORNL). STS will significantly expand the existing capabilities of the Spallation Neutron Source (SNS) at ORNL by constructing a second target station that utilizes the existing SNS accelerator and provides a world leading source of cold (long wavelength) neutrons. The Target System design of STS differs significantly from the SNS First Target Station design due to the use of a rotating Tungsten target wheel. In order to accommodate the target wheel design, a unique vessel and shielding system is being developed. I will present an overview of the STS target monolith, followed by the preliminary design and analysis of the Vessel Systems components, and share several trade studies that have been undertaken to make critical design choices.

The Vessel Systems scope within STS consists primarily of the Core Vessel, Core Vessel Shielding and Core Vessel Nozzle Extensions. The Core Vessel surrounds the STS Target and Moderator Reflector Assembly (MRA) and provides an optimal environment for Neutron production and transport. Core Vessel shielding is comprised of an assembly of liquid cooled and uncooled shield blocks contained within the Core Vessel that absorb radiation from the spallation process and cool the areas surrounding the Target and MRA. Core Vessel Nozzle Extensions extend radially from the outside diameter of the Core Vessel to the outside diameter of the target monolith in the instrument bunker. Each nozzle extension houses a monolith insert that makes up the first section of optical guide between the MRA and the neutron instruments.

Significant advances in the preliminary design of the Vessel Systems components have been made over the past three years, and some of these advances will be presented. The overall design and fabrication approach of the Core Vessel will be presented, with a focus of Core Vessel simplification to reduce manufacturing complexity and cost. The results from preliminary thermal and structural analyses will also be presented. A design study of a core vessel cooled shield block will be presented that shows a number of concept designs and compares their cooling performance and pressure drop under expected operating conditions. Finally, the results of a Nozzle Extension trade study will be presented that highlights the design, construction approach and connection method to the Core Vessel.

Themes for the contribution

5 Target facility challenges:

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