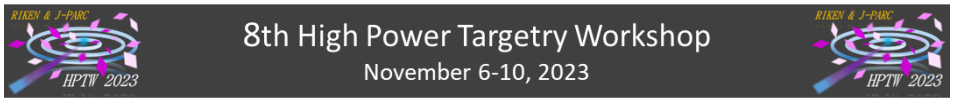


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# Design of Rotating Tungsten Target with Segmented Modules for Replacement

*Monday, 6 November 2023 16:45 (15 minutes)*

The Second Target Station will be a world-leading neutron facility with cold neutron brightness an order of magnitude better than the ORNL Spallation Neutron Source First Target Station. This facility aims to produce world-class brightness neutrons to advance fundamental science.

A rotating 1.2m diameter target disk of 59mm thick Tungsten water-cooled bricks has been selected for the Second Target Station. The disk is attached to a 5m long shaft. A drive system is attached to the top of the shaft that provides rotation and cooling water. Tungsten has a long history of successful spallation target operation; however, little is known regarding the irradiated fatigue limits of tungsten material. The STS design has developed two approaches for developing a high-reliability rotating tungsten target encased under 5m of shielding: 1) improve the reliability of the target by utilizing a design that accommodates tungsten failures and 2) improve the recovery time after a target failure by segmenting the circular disk so that sections that can be removed through a small opening in the shielding.

The solid tungsten target design for the STS employs an encased construction of Inconel 718, copper, and tungsten. Water is routed within the tubing attached to the Inconel housing. The separation between water and spallation material provides significant protection against crack propagation and isolates the tungsten from contaminating the cooling water. Geometry, fabrication techniques, current R&D results, and analysis demonstrate the reliability of the selected target design.

To address the concerns over increased risk and the increased complexity required to change a full target disc, a segmented concept has been chosen for STS. The chosen segmented design splits the target disc into 20 individual sections. Each segment is independent and when placed in a circular array on the rotating shaft makes up a complete circular disc. The segments are removed through a narrow opening in the shielding located downstream of the rotating shaft. To remove more than 1 segment, the shaft is rotated; sequentially bringing each segment into the removal position. All connections, fasteners, and remote handling operations are accomplished above the core vessel shielding with long-handled tooling. It is estimated that a segment may be removed in 10 days, whereas a disc replacement was estimated to take 50 days.

This talk will present the current state of the target design along with a brief overview of the design evolution for the Second Target Station.

## Themes for the contribution

4 Target design, analysis, and validation of concepts:

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