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Status of the STS Target Assembly Design

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The Second Target Station will be a world-leading neutron facility with cold neutron brightness an order of magnitude better than the Oak Ridge National Laboratory (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 58mm thick Tungsten has been selected for the Second Target Station. The target disk has been divided into twenty segments with separate cooling water passages. Individual target segments can be replaced without removing significant amounts of shielding. The segmented approach was selected in 2021 and has progressed into detailed design.

This talk will provide a general update on the target design, emphasizing the tungsten target, drive mechanism, and shaft arrangement.

The tungsten target design for the STS involves a solution-annealed Inconel 718 outer casing, a compliant copper intermediate layer, and a laminated stack of tungsten and tantalum. The Inconel layer provides structural support and passages for water cooling the target. Details will be presented on the general design approach, fabrication methods, fluid analysis, and remaining design challenges.

The target drive mechanism is a compact drive arrangement that rotates the target system, directs water to individual target segments, and provides for fast target removal in unexpected failure. The design centers around a compact arrangement employing an open-frame motor, high-capacity bearings, and a dry-running gas seal. The presentation will describe the general arrangement, key trade-offs, and expected maintenance activities.

The shaft of the Target Assembly provides stiffness, shielding, and a locating feature for the target segments. The talk will cover the design challenges of the shaft, including deflection requirements, clearances to surrounding shielding, and their influence on the prompt radiation levels.

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