

Operation status of CSNS Target Station

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The China Spallation Neutron Source (CSNS) marked its inaugural operational milestone by generating a neutron beam in August 2017. In August 2018, it passed national acceptance and officially started operation. The CSNS target station is distinguished by its stationary tungsten target and three distinct moderators: Decoupled and Poisoned Hydrogen Moderator (DPHM), Coupled Hydrogen Moderator (CHM), and Decoupled Water Moderator (DWM). The Target-Moderator-Reflector (TMR) are integrated into a compact, coupled configuration, which optimizes the neutron flux yield. At present, the power of the incident proton beam on the target has been increased to 160 kW, which notably exceeds the 100 kW goal set for the CSNS phase-I. The target station's subsystem, encompassing the target assembly, moderator and reflector, water-cooling loops, and cryogenic system, exhibits robust operational integrity and demonstrates the potential for further increase of power ahead of the CSNS phase-II implementation. Remote maintenance has been successfully executed, with three target plug replaced to date. Additionally, remote inspection and analyses of target plug failed seal rings have been performed. The fourth target plug is currently in service. The condition of the moderator-reflector Plug has been maintained satisfactorily, with no discernible deterioration in neutronic performance observed, even with the increased power output and extended operational periods. In pursuit of a comprehensive understanding of the target material's behavior and performance under conditions of intense proton irradiation and high-velocity water flow, the CSNS target station has initiated post-irradiation examination on the target plug. To facilitate these studies, specialized equipment for the precision cutting, sampling, and preparation of target material specimens has been developed. Furthermore, a dedicated testing room has been established to conduct post-irradiation mechanical property evaluations. In parallel, preparations for the remote replacement of the proton beam window are underway.

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