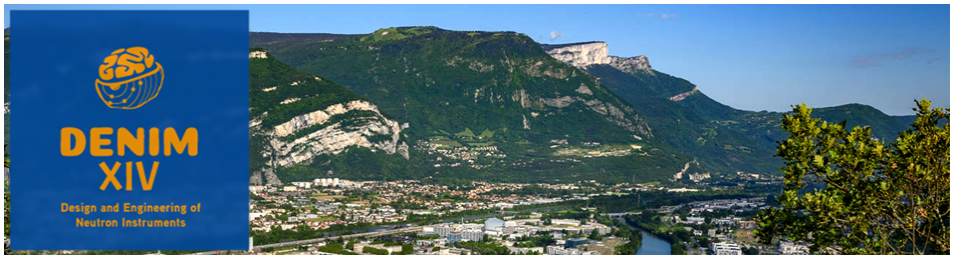

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Design and development of a 3 MeV lithium target for the High Brilliance Neutron Source (HBS)

Wednesday, 22 October 2025 16:15 (15 minutes)

Within the High Brilliance Neutron Source (HBS) project, Forschungszentrum Jülich is developing a novel High Current Accelerator-driven Neutron Source (HiCANS). The concept is scalable, ranging from low-flux university-based sources to high-flux facilities equipped with a full instrument suite for user operation. At the heart of any neutron source is the target, which determines both neutron yield and the operational limits of the system. For compact accelerator-based sources such as HiCANS, the key challenge is to achieve efficient neutron production while ensuring thermal and structural robustness under high-current proton beams.

As part of the HBS technical design report, a 70 MeV tantalum target was developed, manufactured, and successfully tested. It was then operated at the HBS target station demonstrator at the JULIC accelerator, Forschungszentrum Jülich. Following the shutdown of JULIC in 2023, the target station will be relocated to Spain to enable continued operation and further experience, using the 3 MeV accelerator at ESS Bilbao. For it's operation at the ESS Bilbao, The HBS system requires a new target that is optimized for low-energy operation while remaining compatible with the existing station geometry and it's cooling structures.

A thin lithium target (0.2 mm) has been identified as a suitable option, provided it is supported by a robust backing plate to ensure effective heat dissipation, mitigate blistering, and extend target lifetime. In parallel, measures to protect against lithium corrosion are being developed. This presentation will outline the initial design process of the lithium target, highlighting key challenges such as heat removal of atleast 5 kW, structural integrity of the lithium layer, bonding methods with the backing plate, material compatibility, hydrogen implantation, activation properties and overall lifetime.

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