## **Deutsche Neutronenstreutagung**



Beitrag ID: 89

Typ: Contributed Talk

## A Star-like Moderator-Reflector Structure to Enhance Neutron Brightness for the High Brilliance Neutron Source (HBS)

Mittwoch, 18. September 2024 09:20 (20 Minuten)

The High Brilliance Neutron Source (HBS) project is developing a high-current accelerator-driven neutron source (HiCANS). It will facilitate three target stations with a large suite of instruments for neutron scattering, imaging and analytic. Each target station has its own optimized moderator structure and thus provides a high extractable neutron brightness. One target station will be dedicated to cold neutron instruments with a large pulse length and a large neutron bandwidth and therefore requires a cryogenic moderator. The existing moderator setups for low power CANS or spallation-based neutron sources need to adjusted to the specific characteristics of a HiCANS and the need to provide cold neutrons to a large number of instruments.

Following the basic principle of a low-dimensional moderator, three different liquid parahydrogen moderators have been investigated using Monte Carlo simulations: a one-dimensional moderator, a pancake moderator and a combination of both named star-like moderator. Each moderator shows a different coupling strength between the thermal water moderator and the parahydrogen due to the different surface-to-volume ratios. Our results show that increasing the thermal neutron feeding surface can significantly boost cold neutron brightness.

At the DN2024, we will present the simulations we have done. We will show that an optimized moderator structure shows very promising results for target stations that serve a large number of instruments.

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Sitzung Einordnung: Session 7: Sources and Upgrades (Chairs: Wiebke Lohstroh & Paul Zakalek)

Track Klassifizierung: Sources & Upgrades