Beitrag ID: **57** Typ: **Contributed Talk**

Neutron Imaging Instruments for the High Brilliance Neutron Source

Mittwoch, 18. September 2024 09:40 (20 Minuten)

The High Brilliance Neutron Source (HBS) aims to develop a High-Current Accelerator-driven Neutron Source (HiCANS) for neutron scattering, analytics, and imaging. Among the 25 instruments planned and described in the Technical Design Report [1], there will be at least 5 different neutron imaging instruments, covering a wide range of neutron energies from cold to fast, and dedicated to different applications such as hydrogen in metals, nuclear safety, battery processes, strain-phase mapping studies in engineering, automotive, aerospace, geology, and cultural heritage.

Each one of these imaging instruments will provide specific sample positions, which were chosen to optimize the flux, collimation, spatial, wavelength, and time resolutions (applies for the cold, diffractive, and resonance neutron instruments). To optimize the required neutronic parameters Monte Carlo simulations were used, starting from the source and ending at the sample position. For the source simulations, the PHITS code was used, while VITESS and McStas performed the ray transport through the instrument. Also, an open-source code called KDSource was used to increase the statistics by resampling new particles at a given point of the neutron beam trajectory. The obtained computational results were found to agree well with the expected values derived from analytical models.

Finally, in the framework of the HBS project, an experimental platform, the so-called JULIC Neutron Platform [2], was built at the Forschungszentrum Jülich. There, the proof-of-principle capabilities of this kind of platform to perform thermal and fast neutron imaging have been demonstrated.

The objective of this work is to present to the neutron scattering community the conceptual design of these neutron imaging instruments, along with the principal parameters, the potential capabilities, and the simulations performed. Also, the results obtained at the JULIC Neutron Platform will be shown.

[1] T. Brückel et al, 2022. Technical Design Report High Brilliance Neutron Source. Forschungszentrum Jülich. https://doi.org/10.34734/FZJ-2023-03722
[2] P. Zakalek et al, 2023. The JULIC Neutron Platform, a tested for HBS. UCANS10 proceedings.

Autor: SCHMIDT, Norberto (Jülich Centre for Neutron Science - Forschungszentrum Jülich GmbH)

Co-Autoren: Dr. STROBL, Markus (Applied Materials Group, Laboratory of Neutron Scattering and Imaging, Paul Scherrer Institut (PSI), Switzerland); Dr. KARDJILOV, Nikolay (Helmholtz-Centre Berlin for Materials and Energy (HZB), Germany); LOSKO, Adrian (MLZ); Dr. DAWIDOWSKI, Javier (Neutron Physics Department, Comisión Nacional de Energía Atómica (CNEA), Argentina); MAUERHOFER, Eric (Jülich Centre for Neutron Science JCNS); GUTBERLET, Thomas (Jülich Centre for Neutron Science JCNS); ZAKALEK, Paul (Jülich Centre for Neutron Science (JCNS-HBS), Forschungszentrum Jülich GmbH, 52425 Jülich, Germany)

Vortragende(r): SCHMIDT, Norberto (Jülich Centre for Neutron Science - Forschungszentrum Jülich GmbH)

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

Track Klassifizierung: Sources & Upgrades