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Small-Angle Scattering at HBS

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Small-angle neutron scattering is a very versatile technique which can be applied in virtually any field of neutron science, be it soft matter, biological or medical sciences, material science, hard matter or magnetic materials. In all those fields, SANS helps investigate structure on the nano-scale from a few nanometers up to several hundred nanometers.

In order to achieve this, SANS has very specific requirements concerning the collimation of the beam, selection of the wavelength band at time-of-flight sources, detector setup and beam extraction, all of which heavily impact instrumental resolution, background and available neutron flux at the sample. Several SANS instruments at the High Brilliance Neutron Source (HBS) optimized for high resolution and GISANS have been outlined [1]. In this contribution we will describe the considerations which went into the design of a SANS at the HBS to optimize instrument length, chopper positions and pulse shaping as well as the detector requirements. Special emphasis will be put on how to obtain a state of the art instrument by using the full potential of the high brilliance neutron beams from dedicated moderators at the HBS to allow for low background measurements that can achieve a competitive Q-range and measurement time-scale compared to instruments at high flux neutron sources.

This work is part of the collaboration within ELENA and LENS on the development of HiCANS.

[1] Gutberlet, T. (2020). Conceptual Design Report-Jülich High Brilliance Neutron Source (HBS). T. Brückel (Ed.). Forschungszentrum Jülich GmbH.

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