

Design of the macromolecular diffractometer at the High Brilliance Neutron Source (HBS)

As a novel approach to neutron research facilities, High-Current Accelerator-driven Neutron Sources (Hi-CANS) are currently being developed for use as future national neutron sources. One of these facilities is the High Brilliance neutron Source (HBS), designed at the Jülich Center of Neutron Science (JCNS) in Germany. HBS uses a pulsed proton beam of 70 MeV energy and 100 kW time-averaged power at each of the three target stations. A reference instrument suite of 24 instruments has been planned for HBS. Due to its time structure, low background, and flexible, high-brilliance moderator setups, the instruments at HBS are expected to be highly competitive with existing state-of-the-art scattering instruments. In this work, we will present a concept for a macromolecular diffractometer for HBS. SELENE neutron guides will be used in this instrument, and the neutron optics have been optimized using VITESS Monte Carlo simulations. With the optimized neutron optics, we can achieve a low background and a very bright, tunable neutron beam spot at the sample, with a cross-section as small as 1 mm². This promises a viable instrument for the life science community. Virtual neutron scattering experiments have been performed to explore the instrument's capabilities to study samples with large unit cells.

Primary authors: MA, Zhanwen (PSI); Dr LIEUTENANT, Klaus (Jülich Centre for Neutron Science); Dr VOIT, Jorg (Jülich Centre for Neutron Science); Dr SCHRADER, Tobias (Jülich Centre for Neutron Science); Dr GUTBERLET, Thomas (Jülich Centre for Neutron Science); Prof. BRUCKEL, Thomas (Jülich Centre for Neutron Science)

Presenter: MA, Zhanwen (PSI)

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