Performance of the guide systems for instruments at the high brilliance source (HBS)

Low Energy accelerator-driven Neutron sources have the potential to become competitive to research reactors and spallation sources to generate neutron beams for scattering experiments. The Jülich Centre for Neutron Science (JCNS) investigates the concept of a powerful low energy accelerator-driven neutron source called “High Brilliance neutron Source” (HBS), which is aiming at a performance comparable to existing reactor and spallation neutron sources [1]. The target of the HBS will be built as compact as possible to achieve high brilliance and the instruments are grouped around each target station operating at different frequencies.

Neutron guides are used to efficiently transport neutrons from a source to a neutron scattering instrument. HBS produces fewer fast neutrons and less amount of high-energy radiation, enabling the use of a compact moderator and shielding structure [2,3]. Therefore, the guide system can be located close to the moderator and a larger phase-space volume can be extracted. Previously, neutron guide with ballistic, elliptical, dual-elliptical, and parabolic geometry was introduced and some has been installed at existing instruments with studied for existing neutron sources with large moderators and a long moderator to guide distance [4–8].

However, it is not clear what is the optimal shape, size, and moderator to guide distance for HBS, where the moderator is compact and the moderator to guide can be as small as 30 cm. In this talk, I will present the performance of neutron guide systems for the instrument at the HBS. The guide system for a medium resolution time-of-flight diffractometer for nano-scaled and disordered materials, suggested for the HBS, will be identified as a typical example.

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