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

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Compact accelerator-based neutron sources (CANS) have the potential to generate neutron beams for scattering studies comparable to research reactors. Such a source is currently developed at Jülich Centre for Neutron Science (JCNS). It is expected to provide thermal and cold neutrons with high brilliance and is therefore called “High Brilliance Source”(HBS). In this framework, the performance of neutron guide systems for the instrument are studied. The guide for a medium resolution time-of-flight diffractometer for nano-scaled and disordered materials, suggested for the HBS, was identified as a typical example. Different shapes of this guide have been simulated, namely an elliptical shape and ballistic shapes with elliptical diverging/converging sections of two different lengths. The moderator-guide distance has been varied between 30 and 140 cm for two different entry cross-sections using the CANS feature to bring the optics very close to the slow neutron source.

The results show that neutron beam properties at the sample position have a strong dependence on the geometry of the guide system, especially the distance from moderator to guide entry. Also, under these conditions - small source and short moderator guide distance - a ballistic guide with a long elliptical converging/diverging part has a performance comparable to that of an elliptical guide and is thus the most promising candidate for such a diffractometer.

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