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Coupling HICANS with SELENE guides for tunable beam at small samples

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Abstract

For modern neutron scattering facilities, effective generation of neutrons and their transmittance to small volume samples are very important. Particularly, in neutron macro-molecular crystallography, the samples are very small, sometimes between 0.01 mm^3 and 1 mm^3 [1, 2]. A high-intensity compact neutron source (HICANS) will be ideally suited for experiments that require the measurement of small samples [3, 4], and SELENE neutron guides are a promising option to enables the beam spot shaping at a virtual source position far away from the sample [5, 6]. In this work, SELENE neutron guides have been simulated for a potential neutron diffractometer for macro-molecular crystals at the Jülich High Brilliance Source (HBS). With the optimized guide geometry, we can obtain a low background tunable neutron beam for a sample with a cross section as small as 1 mm^2 with a flux comparable or even higher than that of existing instruments at spallation neutron sources or medium flux reactor sources.

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