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A macromolecular diffractometer for the High Brilliance Neutron Source (HBS)

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The HBS project for a High Current Accelerator-based Neutron Source (HiCANS) uses a pulsed proton beam of 70 MeV energy and 100 kW of time-averaged power for each target station. With the benefit of the time structure, a low background, and flexible, high brilliance moderator set-ups, the instruments at the HBS are expected to be very competitive to existing state-of-the-art scattering instruments [1]. The low dimensional moderators of the HBS are well suited for instruments studying small samples. A prototypical example is neutron macromolecular diffractometers, where typical sample volumes reach from 0.01 mm³ to 1 mm³. In this work, the design progress of a macromolecular diffractometer for the HBS will be presented. SELENE neutron guides will be used in this instrument. The neutron optics have been optimized with VITESS Monte Carlo simulations. With the optimized neutron optics, we can obtain a low background, and a very bright, tunable neutron beam spot at the sample with a cross-section as small as 1 mm², thus promising a very competitive instrument for the life science community.

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

E-mail of the corresponding author: zh.ma@fz-juelich.de

Co-authors: LIEUTENANT, Klaus (FZJ); VOIGT, Jörg (Forschungszentrum Jülich); SCHRADER, Tobias; GUTBERLET, Thomas (Forschungszentrum Jülich); BRÜCKEL, Thomas (Forschungszentrum Jülich GmbH)

Presenter: MA, Zhanwen (PSI)

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