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A SANS design study for the HBS Science Demonstrator

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Aiming to develop a high-current accelerator-driven neutron source (HiCANS), the High Brilliance Neutron Source (HBS) project has extensively detailed its technical aspects in the conceptual and technical design reports [1][2]. The facility, based on a high-power linear proton accelerator delivering a 70 MeV proton beam with a peak current of 100 mA, is designed to supply three distinct target stations operating at different pulse frequencies. Each target station will provide pulses optimized for specific instrument groups, ensuring efficient use of the available beam and supporting a competitive suite of instruments.

A next step is the realization of an HBS Science Demonstrator, which aims to assess the scientific potential of HiCANS, providing a proton beam power of approximately 10 kW. It will feature a selection of highly demanded neutron instruments, among them a small angle neutron scattering (SANS) instrument. For this, we will present a conceptual design including ray-tracing Monte Carlo simulations using the software VITESS to optimize instrument parameters. Virtual experiments on select samples, representing typical use cases, will be used to quantify the instrument performance.

[1] Thomas Brückel et al. Conceptual Design Report Jülich High Brilliance Neutron Source (HBS). Ed. by Thomas Brückel and Thomas Gutberlet. Vol. 8. Reihe Allgemeines/General. Schriften des Forschungszentrums Jülich, 2020. ISBN: 978-3-95806-501-7.

[2] Thomas Brückel et al. Technical Design Report HBS. Ed. by Thomas Brückel and Thomas Gutberlet. Vol. 8. Reihe Allgemeines/General. Schriften des Forschungszentrums Jülich, 2023. ISBN: 978-3-95806-711-0.

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