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Conceptual design of neutron imaging instruments for the HBS

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The High Brilliance Neutron Source (HBS) project aims to develop a High-Current Accelerator-driven Neutron Source (HiCANS) for neutron scattering, analytics, and imaging. Amongst the instruments planned at HBS, there will be at least 5 different neutron imaging instruments to cover the different neutron energy ranges: cold, Bragg edge, thermal, resonance/epithermal, and fast.

Each one of these imaging instruments will have different sample positions, which will be selected to optimize the flux, collimation, spatial, wavelength, and time resolutions. The selection of the positions will be best suited for studies considering the specific energy ranges to investigate hydrogen in metals, strain phase mapping studies, energy conversion processes, archeological characterization, aerospace applications, or battery processes.

For the neutronic design, Monte Carlo simulations are used. The target and moderators are simulated with PHITS, while VITESS and McStas perform the ray transport through the instruments. Also, KDSource is used to estimate the source distribution at a given point in the beam trajectory, and then resample new particles that respect the correlations of the original source.

The objective of this talk is to present to the neutron community the conceptual design of these instruments, the procedure for the simulations, the principal parameters, and the potential capabilities.

This work is part of the collaboration within ELENA and LENS on the development of HiCANS.

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