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Next generation asymmetric horizontal SANS magnet for quantum phenomena in nanostructures and correlated electron systems

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The next generation asymmetric horizontal SANS magnet (NHSM) project will provide a unique toolset to study the quantum phenomena in nanostructures and correlated electron systems [1]. This project includes the idea, design and optimization, of a high-performance compensated asymmetric horizontal magnet for small angle neutron scattering (SANS), reflectometry (REFSANS), and the resonance spin echo technique MIEZE (RESEDA) [2]. It uses the new high-temperature superconducting (HTS) technology with a split coil magnet design of reasonable weight (~750kg) and size (~75cm x 75cm), which enables it to fit on several instruments (SANS I, REFSANS, RESEDA, KWS2) at MLZ.

An asymmetric coil geometry removes zero-field nodes and will allow the use of polarized neutrons and polarization analysis. The use of high-temperature superconductor breaches the limitations of stray fields down to 10G at a 1m distance with active compensation at a central field of 10T. This project proposal is based on the results of two feasibility studies performed in collaboration with the companies Bilfinger-Noell (Germany) and HTS-110 (New Zealand), funded by BMBF.
[1] Magnetic Small-Angle Neutron Scattering, S. Mühlbauer et al.,Reviews of Modern Physics, 91, 015004, 2019
[2] Neutron MIEZE spectroscopy with focal length tuning, J. Jochum, A. Wendl, T. Keller and C. Franz. Measurement Science and Technology, Vol. 31, No.3 2020

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