

First Hybrid Magnet for Neutron Scattering at Helmholtz-Centre Berlin

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Abstract — Helmholtz-Centre Berlin operates two large scale facilities: the research reactor BER 2 and the synchrotron source BESSY 2. This year HZB's neutron instrument suite has been strengthened by a unique high field facility for neutron scattering. Its main components are the High Field Magnet (HFM), the most powerful DC magnet for neutron scattering worldwide, and the Extreme Environment Diffractometer (EXED), the dedicated neutron instrument for time-of-flight technique. The magnet system is projected according to the special geometric constraints of analyzing samples in a high field magnet.

Following our past experience only steady state fields are adequate to achieve the goals of the project. In particular inelastic scattering studies would virtually be excluded when using pulsed magnets. The new series-connected hybrid magnet with horizontal field orientation was designed and constructed in collaboration with NHMFL. With a set consisting of a superconducting cable-in-conduit coil and different resistive coils of conical shape, maximum fields between 26 T - 31 T are possible with cooling power between 4 MW - 8 MW for the resistive part.

A series of commissioning activities of the magnet components and the technical infrastructure systems (20 kA power supply, water cooling and 4 K Helium refrigerator) was completed at HZB. The maximum field achieved with a 4 MW resistive coil was 26.2 T.

Keywords (Index Terms) — Neutron scattering, hybrid magnets, resistive magnets, superconducting magnets, Nb₃Sn, cable-in-conduit conductors.