

# **Materials Research at the Dresden High Magnetic Field Laboratory**

**J. Wosnitza**

Hochfeld-Magnetlabor Dresden, Helmholtz-Zentrum Dresden-Rossendorf, Germany

[j.wosnitza@hzdr.de](mailto:j.wosnitza@hzdr.de)

High magnetic fields are one of the most powerful tools available to scientists for the study, modification, and control of the state of matter. The application of magnetic fields, therefore, has become a commonly used instrument in materials-science research with a strong demand for the highest possible magnetic fields worldwide. The High Magnetic Field Laboratory Dresden (Hochfeld-Magnetlabor Dresden, HLD) at the Helmholtz-Zentrum Dresden-Rossendorf (HZDR) makes available pulsed magnetic fields up to the 90 T range, on a 10 ms timescale, for in-house and external users. The HLD is part of the European Magnetic Field Laboratory (EMFL) with further sites in Grenoble and Nijmegen, for static fields, and in Toulouse for pulsed fields. In the pulsed magnets, a variety of experimental methods are available enabling to measure, for example, electrical transport, magnetization, dilatometry, ultrasound, ESR, and even NMR with very high resolution. As a unique feature, a free-electron-laser facility next door allows high-brilliance radiation to be fed into the pulsed-field cells of the HLD, thus making possible high-field magneto-optical experiments in the range from 5 to 250  $\mu\text{m}$ . In-house research of the HLD focuses on electronic properties of strongly correlated and topological materials at high magnetic fields. This includes the investigation of novel frustrated magnetic materials and the determination of Fermi surfaces of topological and correlated metals by means of measurements of magnetic quantum oscillations. We further investigate unconventional high-magnetic-field states of novel superconductors, but, beyond that, even field-induced plasma waves in liquid metals. Here, I will present a brief overview on the experimental infrastructure and discuss some highlights of the in-house research at the Dresden High Magnetic Field Laboratory.