Großes Physikalisches Kolloquium an der Universität zu Köln

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Materials Research in Very High Magnetic Fields

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HS III

The application of magnetic fields is a commonly used instrument in materials-science research, since this allows to study, modify, and control the state of matter. Thereby, research at the highest possible magnetic fields becomes increasingly important. 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 internal and external users. 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. Research of the HLD focuses on electronic properties of strongly correlated and topological materials at high magnetic fields. This includes the investigation of 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 infrastruc-ture and discuss some highlights of the research at the Dresden High Magnetic Field Laboratory, with a focus on magnetically frustrated materials.