DRESDEN HIGH MAGNETIC FIELD LABORATORY

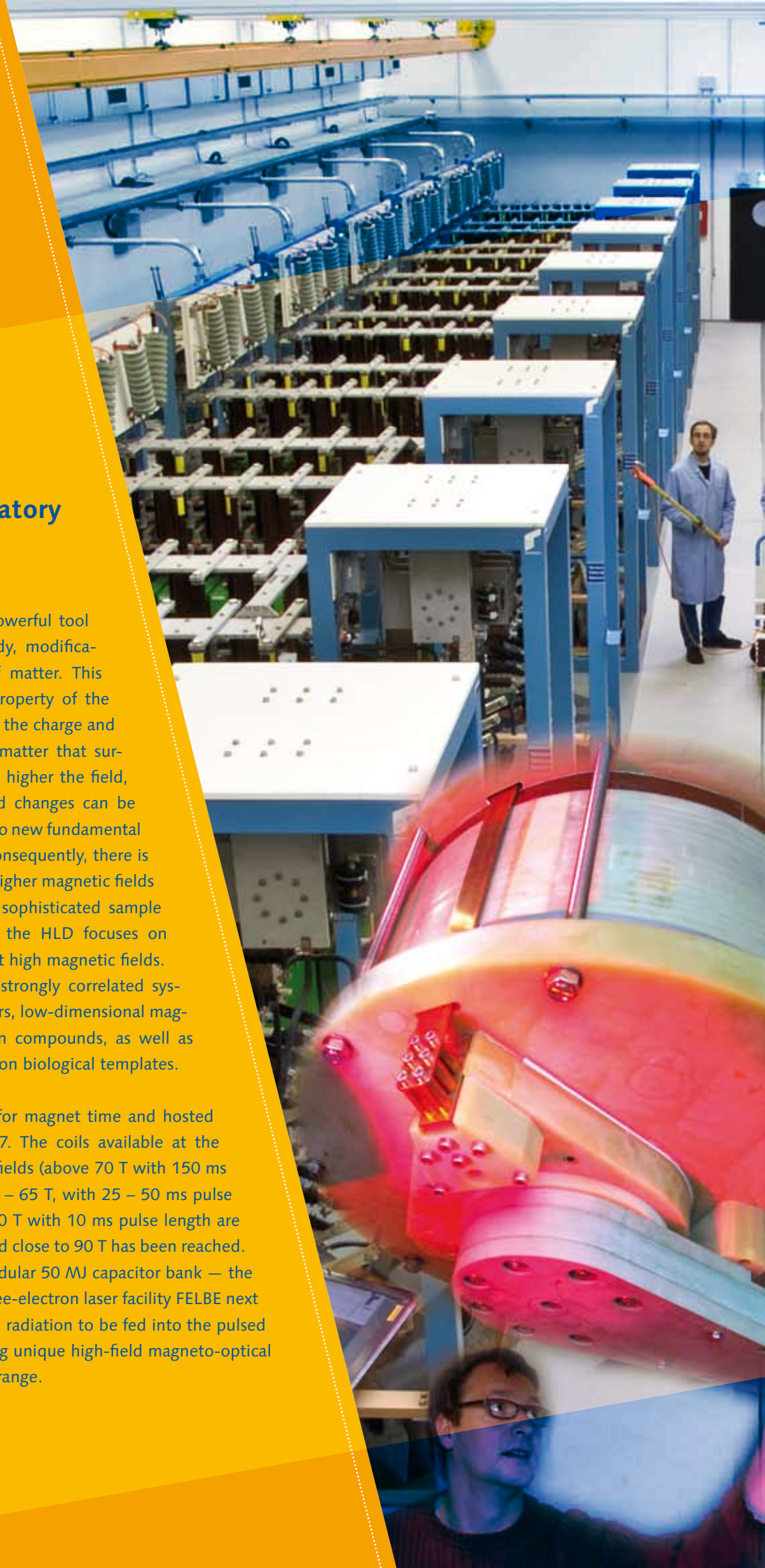
Forschungszentrum Dresden Rossendorf

Facilities for Europe

The Dresden High Magnetic Field Laboratory (HLD)

High magnetic fields are a very powerful tool available to scientists for the study, modification, and control of the state of matter. This versatility is due to the unique property of the magnetic field to act universally on the charge and spin of particles constituting the matter that surrounds us. Generally speaking, the higher the field, the more clearly the field-induced changes can be observed and the more transitions to new fundamental states of matter become visible. Consequently, there is a growing demand for higher and higher magnetic fields in combination with reliable and sophisticated sample diagnostics. In-house research at the HLD focuses on electronic properties of materials at high magnetic fields. Research is being carried out on strongly correlated systems, such as novel superconductors, low-dimensional magnetic materials, and heavy-fermion compounds, as well as semiconductors and nanoparticles on biological templates.

The HLD has accepted proposals for magnet time and hosted users since the beginning of 2007. The coils available at the HLD produce both high magnetic fields (above 70 T with 150 ms pulse length) and smaller ones (60 – 65 T, with 25 – 50 ms pulse lengths). Pulsed magnets up to 100 T with 10 ms pulse length are under design. In 2009, a record field close to 90 T has been reached. Energy for this is provided by a modular 50 MJ capacitor bank — the only of its kind in the world. The free-electron laser facility FELBE next door allows high-brilliance infrared radiation to be fed into the pulsed field cells of the HLD, thus enabling unique high-field magneto-optical experiments in the 3,5 to 250 µm range.



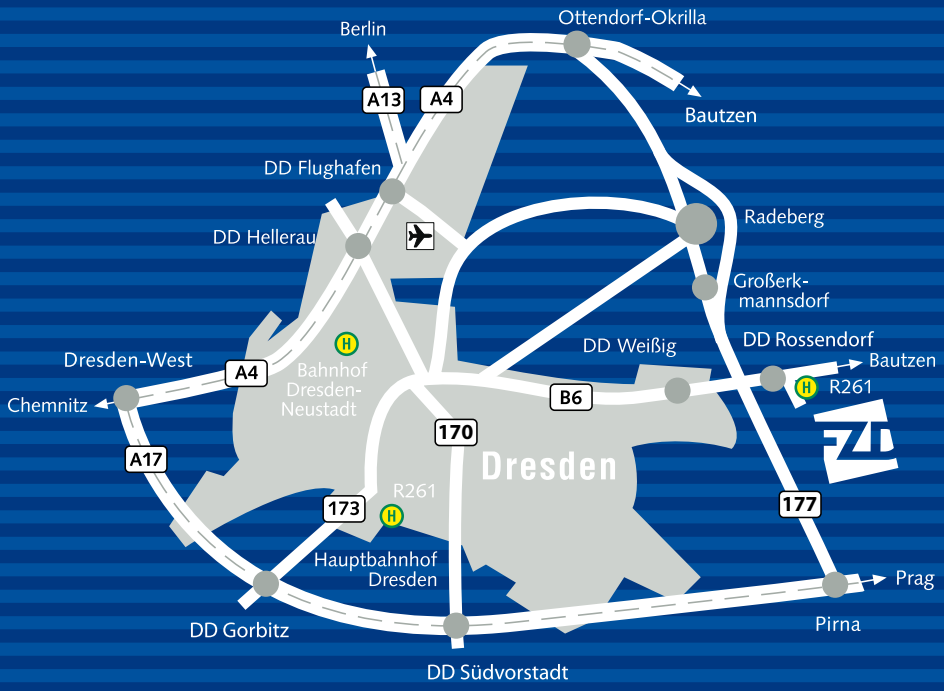
At the moment, the HLD operates three types of user magnets with the above shown temporal field profiles. In combination with these magnets, the experimental techniques listed below are available for users.

- electrical transport
- magnetization
- ultrasound velocity and absorption
- magnetostriction
- cyclotron resonance
- electron spin resonance

Further experimental methods (such as calorimetry in a 60 T (1 s) long-pulse magnet as well as nuclear spin resonance) are in preparation. The sample temperature can be varied in the range 0.4 K < T < 300 K. Extensions to the mK-temperature range for experiments in pulsed magnetic fields are in preparation.

Proposals for experiments in pulsed High Magnetic Fields are administrated and evaluated in the frame of the EuroMagNET II user program. Application forms are available via the following website:
www.euromagnet2.eu

There are two deadlines per year: mid May and mid November; the accepted experiments are then scheduled in the ensuing term. It is highly recommended to contact the local staff at HLD to discuss the feasibility of the planned experiments beforehand (**www.fzd.de/HLD**).



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Member of the Leibniz Association

07/2009