Design and Fabrication of a Split User Magnet

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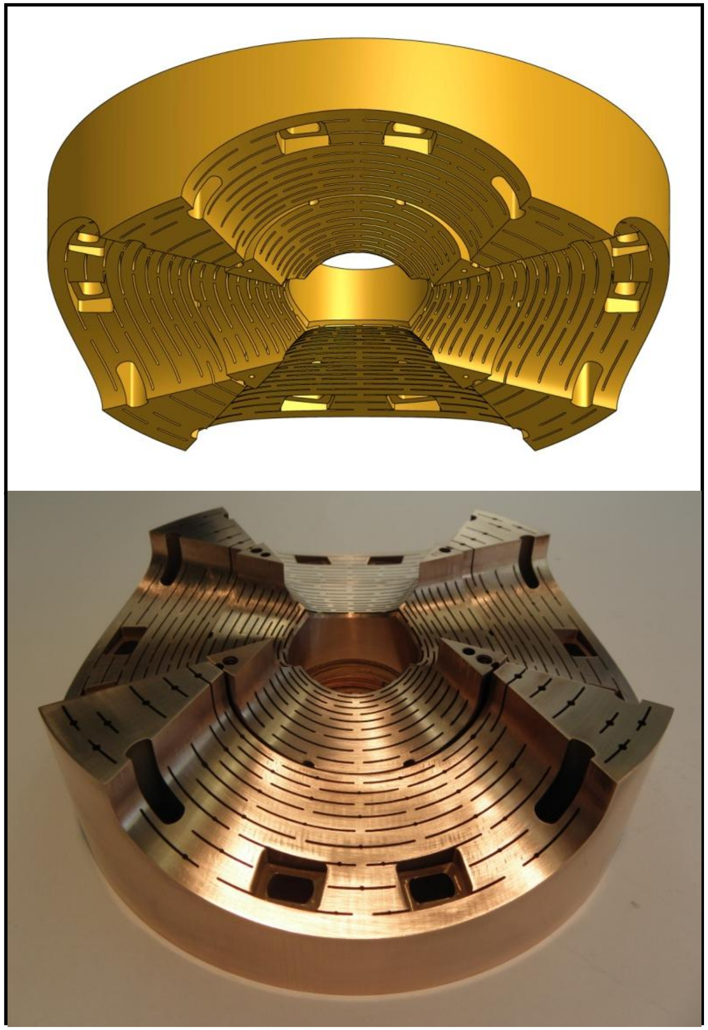
Magnet Science and Technology Program

The NHMFL has completed the design and started fabrication of a high-field split resistive magnet for use in photon-scattering experiments. The magnet includes four large scattering ports of elliptical shape at the mid-plane. Such a magnet configuration results in unique design challenges being especially severe for the windings in the mid-plane region of the innermost coils. Consequently, the NHMFL incorporated its newly developed technology - called the split Florida-Helix (U.S patent #7,609,139) - into the design.

The user magnet, to be operated at the Magnet Lab's DC Facility in Tallahassee, will consist of 5 resistive coils providing a flux-density of at least 25 T at the center of the user space. All coils employ axial current grading for field optimization and stress management. Advanced finite element analysis (FEA) served as the essential tool guiding the design optimization of the overall system and the various components. Fabrication of the Split user magnet is well underway for commissioning in the Magnet Lab's user program in the coming year.



CAD-Model (top) and actual Florida-Helix magnet parts (bottom) of the innermost coils.

The New 25T Split Magnet

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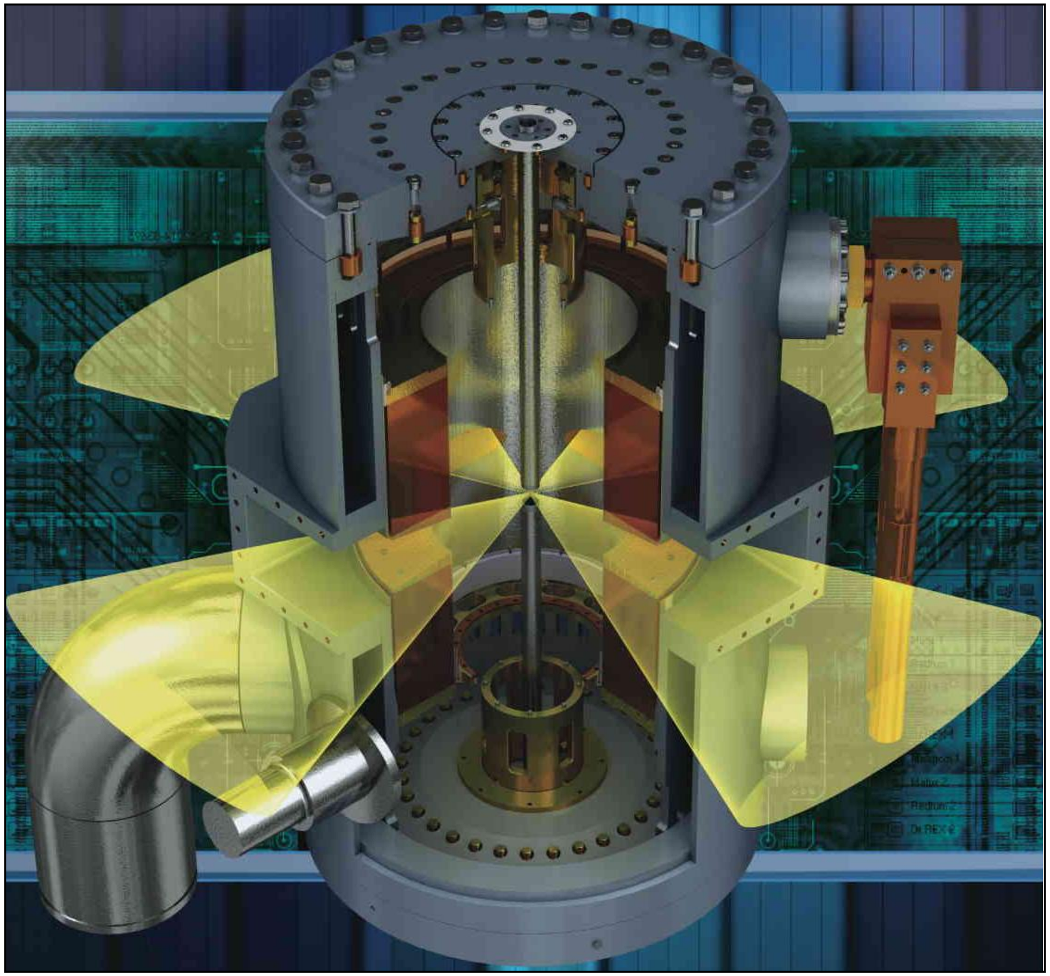

CAD Model of the Split User Magnet illustrated in cut view including light cones available for light scattering experiments.

When completed in the coming year, the Split Magnet will permit optical experiments that have not been possible in other resistive magnets at the Magnet Lab.

Magnet Lab users will soon will have the ability to develop and perform high-resolution Raman experiments, non-linear spectroscopies (such as second harmonic generation), and a greater variety of time-resolved experiments (such as 4-wave mixing and THz Time-Domain Spectro-scopy).

These new optical techniques will allow Magnet Lab users to create versatile optical probes for novel field-induced states that complement other techniques already performed in the Magnet Lab's user program.