

Another World-Record Achievement for National High Magnetic Field Laboratory

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The National High Magnetic Field Laboratory is ending its year with another achievement of international importance as engineers and technicians this week completed testing of a world-record magnet.

With the completion of a new, 35-tesla magnet, the highest-field "resistive" magnet in the world is located at the Tallahassee facility. The state-of-the-art magnet, which incorporates "Florida-Bitter" technology invented at the lab, was designed and built on-site and is immediately available for research.

The 35-tesla magnet is an upgrade of an existing 30-tesla magnet and surpasses the previous record of 33 tesla, also held by the laboratory. "Tesla" is a measurement of the strength of a magnetic field; 1 tesla is equal to 20,000 times the Earth's magnetic field. Typical magnetic resonance imaging (MRI) machines in hospitals provide fields in the range of 1 to 3 tesla. Put another way, the increase from 30 to 35 teslas in the new magnet represents a 17-percent jump, or an increase equal to the magnetic force of two MRI machines.

"With the advances that magnet lab engineers and technicians have made in magnet technology, it would be easy to become nonchalant about the significance of these world records," said Gregory S. Boebinger, director of the facility. "But each increase in field represents world-class engineering and a quarter-of-a-million-dollar investment to provide new and unique opportunities for scientific discovery."

Mark D. Bird, project leader on the 35-tesla upgrade, said that as engineers learn more about existing materials and as new materials become available, the lab is able to upgrade its existing magnets.

"We continuously strive to improve the performance of our magnets both by pushing the

fields higher and by increasing the quality of the fields," said Bird. "Our next new magnet will focus not just on high field, but uniform field as well."

And higher and more stable fields are what the lab's users, who come from all over the world, demand. The magnet lab is funded by the state of Florida and the National Science Foundation to provide the international research community with the highest magnetic fields possible to conduct research in all areas of science. Use of the magnets is free as long as researchers agree to share the results of their work.

The majority of the magnets and instrumentation used at the magnet lab are developed by laboratory staff and operated by in-house researchers who collaborate with the hundreds of scientists who visit each year. The 35-tesla magnet, which has a 32 mm, or 1.25-inch, experimental space, will be used primarily for physics and materials science research.

Magnetism is a critical component of many scientific discoveries and a surprising number of modern technologies, including computer memory and disk drives. High-field magnets now stand beside lasers and microscopes as essential research tools for probing the mysteries of nature. Long used by the physics community to understand the fundamental nature of matter and electronic structures, magnetic fields now are used by biologists, chemists and even pharmacists to better understand complex molecules and tissues, and in fact are responsible for the development of the MRI technology that has changed the face of modern medicine.

Source: Florida State University

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