

Laboratory sets high magnetic field records

Scientists at the National High Magnetic Field Laboratory's Pulsed Field Facility at Los Alamos National Laboratory have set a pair of world records for nondestructive pulsed-magnet performance that puts them in position to deliver a magnet capable of achieving 100 tesla, the longstanding goal of magnet designers and researchers around the globe.

A 100-tesla magnet could have a profound impact on a wide range of scientific investigations, from studies of how materials behave under the influence of very high magnetic fields to research into the microscopic behavior of phase transitions.

Earlier this month, Pulsed Field Facility staff completed commissioning of an outer set of coils for a massive magnet being designed and assembled at Los Alamos. During the commissioning, the coil produced a peak magnetic field intensity of 35 tesla within the coil's 225 millimeter-diameter bore. This achievement is significant because of the record large volume in which the 35-tesla field was produced, and because man-made fields of this strength have never before been produced without the use of highly destructive, explosives-driven, field-generating technologies.

This latest achievement comes on the heels of another record set earlier this summer in which the newly developed pulsed-magnet prototype, in evaluation at the Pulsed Field Facility, was put through a series of tests intended to establish the operational limits of the current generation of pulsed-magnet technology. That magnet reached 80 tesla 10 times before experiencing a fault.

"The ability to produce a record high field in such a large volume is an important milestone in delivering a magnet capable of 100 tesla," said Alex Lacerda, head of the Pulsed Field Facility. "Several other laboratories around the world have attempted to deliver similar magnet systems without success, so the achievement is further evidence of how engineers, scientists, and technicians at the National High Magnetic Field Laboratory continue to set the world standard for magnet technology. We look forward to giving our users routine access to pulsed fields that in the past could only be imagined."

Once completed, the entire magnet will be a combination of seven coil sets weighing nearly 18,000 pounds and powered by jolts from a massive 1,200 megajoules motor generator. When fully commissioned, the magnet will be able to provide hundreds of milliseconds levels of magnetic field intensity never before achieved.

The study of materials behavior at the extreme conditions of temperature, pressure, and magnetic fields is a vital component of Los Alamos research aimed at understanding of the physics of structurally complex systems at a quantum level. These recent successes were enabled by long-term support from the U.S. Department of Energy's Office of Basic Energy Sciences and the National Science Foundation's 100 Tesla Multi-Shot magnet program.

Source: Los Alamos National Laboratory

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