Los Alamos achieves world-record pulsed magnetic field

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National High Magnetic Field Laboratory moves closer to 100-tesla mark

LOS ALAMOS, New Mexico, August 23, 2011—Researchers at the National High Magnetic Field Laboratory's Pulsed Field Facility at Los Alamos National Laboratory have set a new world record for the strongest magnetic field produced by a nondestructive magnet.The ability to create pulses of extremely high magnetic fields nondestructively (high-power magnets routinely rip themselves to pieces due to the large forces involved) provides researchers with an unprecedented tool for studying fundamental properties of materials, from metals and superconductors to semiconductors and insulators. The interaction of high magnetic fields with electrons within these materials provides valuable clues for scientists about the properties of materials. With the recent record-breaking achievement, the Pulsed Field Facility at

LANL, a national user facility, will routinely provide scientists with magnetic pulses of 95 tesla, enticing the worldwide user community to Los Alamos for a chance to use this one-of-a-kind capability.The record puts the Los Alamos team within reach of delivering a magnet capable of achieving 100 tesla, a goal long sought by researchers from around the world, including scientists working at competing magnet labs in Germany, China, France, and Japan.Such a powerful nondestructive magnet could have a profound impact on a wide range of scientific investigations, from how to design and control material functionality to research into the microscopic behavior of phase transitions. This type of magnet allows researchers to carefully tune material parameters while perfectly reproducing the non-invasive magnetic field. Such high magnetic fields confine electrons to nanometer scale orbits, thereby helping to reveal the fundamental quantum nature of a material.With Mike Gordon commanding the controls that draw power off of a massive 1.4-gigawatt generator system and directs it to the magnet, all eyes and ears were keyed to video monitors showing the massive 100 tesla Multishot Magnet and the capacitor bank located in the now eerily empty Large Magnet Hall next door. The building had been emptied as a standard safety protocol.Scientists heard a low warping hum, followed by a spine-tingling metallic screech signaling that the magnet was spiking with a precisely distributed electric current of more than 100 megajoules of energy. As the sound dissipated and the monitors confirmed that the magnet performed perfectly, attention turned to data acquired during the shot through two in-situ measurements—proof positive that the magnet had achieved 92.5 tesla, thus yanking back from a team of German scientists a record that Los Alamos had previously held for five years.The next day's even higher 97.4-tesla achievement was met with high-fives and congratulatory pats on the back. Later, researchers Charles Mielke, Neil Harrison, Susan Seestrom, and Albert Migliori certified with their signatures the data that would be sent to the Guiness Book of World Records.The NHMFL is sponsored primarily by the National Science Foundation, Division of Materials Research, with additional support from the State of Florida and the DOE. 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.

Los Alamos National Laboratory **www.lanl.gov** **(505) 667-7000** **Los Alamos, NM**

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