Not so fast...

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Start-up of the world's largest particle accelerator hasn't been exactly smooth...

The CMS's role is to search for the forces and fundamental building blocks of the early universe.

The Sept. 20 news release from Geneva was terse: An incident the previous day had caused a large helium leak into a section of the 17-mile (27 km) circular tunnel under the French-Swiss border that is home of the world's most powerful particle accelerator—the Large Hadron Collider, or LHC. No injuries or risk to people occurred, reported the European Organization for Nuclear Research (CERN), but apparently a connection between two important magnets had melted during a gradual increase of the electrical current.

This malfunction happened 10 days after the successful first test run of the LHC, in which separate beams of protons—positively charged particles from, in this case, hydrogen atoms—had circulated in first one direction and then the opposite direction through the tunnel. The beams' paths traversed the Compact Muon Solenoid (CMS)
experiment, a major piece of equipment to which UC Santa Barbara scientists and engineers made key contributions.

Super-cooled, superconducting electromagnets are fundamental to the efficient and effective functioning of the collider. During the planned experiments, which will seek to prove the existence of subatomic particles new to science, the magnets guide the paths of tiny bunches of protons as they race through special beam tubes at speeds approaching that of light. Two high-energy beams will be forced to collide at specific experiment sites, propelling particles through layers of detectors.

Circulating liquid helium keeps the magnets at a temperature colder than outer space. This eliminates electrical resistance, but cooling the magnets down to, or warming them up from, that temperature takes weeks. CERN has announced that the accelerator’s affected sectors must be warmed again so that the magnets in question can be retrieved and examined. Faced with a two-month delay for warming and re-cooling cycles, and an obligatory winter maintenance period, the restart of the LHC must wait until early spring 2009, the agency said.

UCSB particle physicist Joe Incandela says the delay could be longer than six months if repairs or upgrades, beyond replacing the immediate failed magnets, are necessary. He is part of the UCSB team that helped construct the primary tracking device for the 27-million-pound, four-story-tall CMS, one of LHC’s two broad-spectrum particle detectors. Incandela is also deputy physics coordinator for the experiment, and is based at CERN’s Geneva headquarters through late 2009.

Other principals from the campus’s high-energy physics group who are involved with the collider experiments include scientists Claudio Campagnari, Jeffrey Richman, David Stuart, and Michael Witherell (who is also UCSB’s Vice Chancellor for Research). They and the more than 30 other UCSB engineers, post-doctoral researchers, graduate and undergraduate students, and technicians working on the CMS experiment have mixed feelings about the delay.

Stuart, who has focused on cosmic ray particle tracking data, admits to being disappointed by the delay after the effort invested in preparing the CMS for its role in searching for the forces and fundamental building blocks of the early universe.

Richman pointed out that while the magnet accident was really unfortunate, bringing a
new accelerator into operation typically takes a year or more?

Campagnari, who co-leads one of the physics analysis groups, said his group is using the extra time to refine some of the data analysis techniques they plan to use. Though it’s not the end of the world, he said, he and others noted that a six-month delay could cause major problems for grad students and postdocs.

Incandela was also philosophical about the delay: We will keep working at a pretty intense level to further our understanding of the detector and its smooth operation. We were all a bit down when the problem with the machine was announced, but we have too much to do to spend much time dwelling on it.

Relevant Links:

- The Large Hadron Collider [2]
- Compact Muon Solenoid [3]
- UCSB LHC/CMS Group [4]
- BBC Guide to the Large Hadron Collider (Go to bbc.co.uk [5] and search for LHC)

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