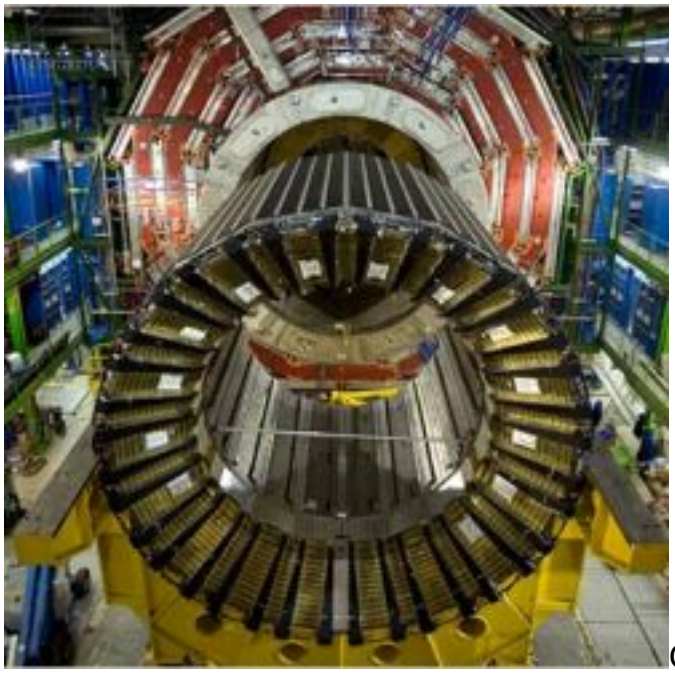
Geneva Big Bang Machine Beats Chicago Lab Record



GENEVA — The world's largest atom smasher on Monday broke the record for proton acceleration previously held by a U.S. lab, sending beams of the particles at 1.18 trillion electron volts around the massive machine.

The Large Hadron Collider eclipsed the previous high of 0.98 1 TeV held by Fermilab, outside Chicago, since 2001, the European Organization for Nuclear Research, also known as CERN, said.

The latest success, which came early in the morning, is part of the preparation to reach even higher levels of energy for significant experiments next year on the make-up of matter and the universe.

It comes on top of a rapid series of operating advances for the $10 billion machine, which underwent extensive repairs and improvements after it collapsed during the opening phase last year.

CERN Director-General Rolf Heuer said early advances in the machine located in a 17-mile (27-kilometer) tunnel under the Swiss-French border have been "fantastic."

"However, we are continuing to take it step by step, and there is still a lot to do before we start physics in 2010," Heuer said in a statement. "I'm keeping my champagne on ice until then."

The organization hopes the next major step will be to collide the proton beams at

about 1.2 TeV before Christmas for an initial look at the tiny particles and what forces might be created.

Ultimately, scientists want to create conditions like those 1 trillionth to 2 trillionths of a second after the Big Bang — which scientists think marked the creation of the universe billions of years ago.

Physicists also hope the collider will help them see and understand other suspected phenomena, such as dark matter, antimatter and supersymmetry.

The level reached Monday isn't significantly higher than what Fermilab has been doing, and real advances are not expected until the LHC raises each beam to 3.5 TeV during the first half of next year.

CERN said one of the two small beams of protons first broke the energy level Sunday evening when it was accelerated from the initial operating energy of 450 billion electron volts late Sunday evening.

"Three hours later both LHC beams were successfully accelerated to 1.18 TeV," shortly after midnight, the organization said.

Beams were colliding last week at low energy, to make sure the machine was working properly. But they have yet to be smashed together at higher intensity.

Steve Myers, CERN's research and technology director, said he had been at CERN when it switched on the last major particle accelerator, the Large Electron-Positron collider that operated from 1989-2000.

"I thought that was a great machine to operate, but this is something else," he said. "What took us days or weeks with LEP, we're doing in hours with the LHC. So far, it all augurs well for a great research program."

CERN said operators will continue preparing the 2,000 superconducting magnets and other parts so that the energy can be increased safely.

Attempts to make new discoveries at the LHC are scheduled for the first quarter of 2010, at a collision energy of 7 TeV (3.5 TeV per beam).

The electron volt is an extremely small measure used in particle physics. One TeV is about the energy of the motion of a flying mosquito, but it becomes signficant in the submicroscopic collisions of the collider.

The energy is concentrated in the hairline beams of particles that whiz around the accelerator at near the speed of light. Although apparently small to the outsider, CERN uses a great amount of electricity and powerful equipment to raise the energy of the beam.

The speed can increase only slightly when the accelerator steps up the power, but that raises the force with which the protons will collide, revealing more insight into

what makes them up.

It may take several years before the LHC can make the discovery of the elusive Higgs boson, the particle or field that theoretically gives mass to other particles. That is widely expected to deserve the Nobel Prize for physics.

The LHC operates at nearly absolute zero temperature, colder than outer space, which allows the superconducting magnets to guide the protons most efficiently.

Physicists have used smaller, room-temperature colliders for decades to study the atom. They once thought protons and neutrons were the smallest components of the atom's nucleus, but the colliders showed that they are made of quarks and gluons and that there are other forces and particles.

More than 8,000 physicists from labs around the world also have work planned for the Large Hadron Collider. The organization is run by its 20 European member nations, with support from other countries, including observers from Japan, India, Russia and the United States, which have made big contributions.