ABC News

Atom smasher closing in on 'God particle'

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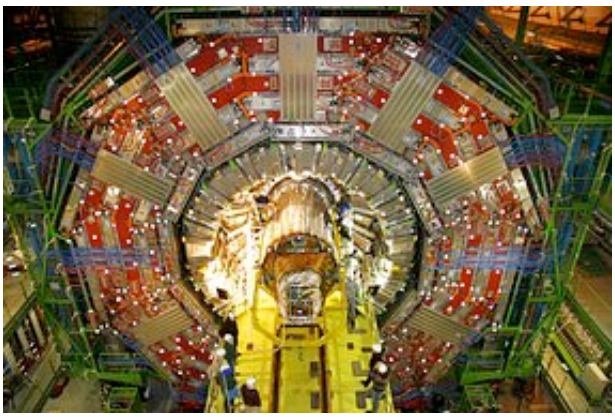
The world's biggest atom smasher has scaled up in power even faster than hoped for and may soon unlock some of the universe's deepest secrets, scientists at a top physics conference said.



Search for the Higgs Boson: The Large Hadron Collider (www.cern.ch)

After a shaky start and a 14-month delay, experiments at Europe's Large Hadron Collider (LHC) have in a few months replicated discoveries it took decades to complete at the rival Tevatron accelerator in the United States.

At this pace, the more powerful LHC could begin to deliver new insights into the fundamental nature of the cosmos within months, the scientists said.

It may even put researchers on a discovery fast track for the elusive Higgs Boson, or God particle.

Already in March, the 27-kilometre circular accelerator buried under the French-Swiss border set records for smashing protons fired in beams approaching the speed of light.

"It is barely four months since the first collisions with this machine at high energy levels, and we have increased the collision rates by more than a factor of 1,000," said Rolf Heur, director of the European Organisation for Nuclear Research (CERN), which operates the LHC.

Scientists sift through the wreckage of the sub-atomic crashes for new particles.

"The experiments show that the LHC is ready to see new physics - if there is a new physics," he said at a International Conference on High Energy Physics in Paris running to July 28.

Quarks

One goal of the massive 3.9 billion euro ($5.6 billion) machine is to affirm or disprove the so-called Standard Model.

Experiments at the Tevatron's Fermilab in the US have found most of the tiny and ephemeral matter predicted to exist by the theory, including a family of particles called quarks.

The heaviest among them, known as the "top quark," is so fleeting that it only exists for a millionth of a billionth of a billionth of a second before turning into something else.

In its brief period of operation, the LHC has already zeroed in on the top quark, isolating a handful of candidate particles.

"The scientific community thought it would take one, maybe two years to get to this level, but it happened in three months," said Guy Wormser, a top French physicist and chairman of the conference.

The only fundamental particle predicted by the Model yet to be observed is the Higgs Boson, but only the LHC

may be powerful enough to detect it, scientists say.

So far, CERN has cranked the cathedral-sized machine up to energy levels of 7.0 trillion (tera) electronvolts (TeV), more than three times the level attained by any other accelerator.

It is aiming to trigger collisions at 14 TeV - equivalent to 99.99 per cent of the speed of light - in the cryogenically-cooled machine after 2011.

At full throttle, the collisions should create powerful but microscopic bursts of energy that mimic conditions close to the Big Bang.

"The LHC should give us results on the Higgs Boson in 2014 or 2015," Mr Wormser said. "If it has a big mass, it could be at the end of 2011 or the beginning of 2012."

If the European collider does uncover the God particle, physicists would be confronted with another problem, he said.

"We'll need a new tool to study it in detail. We should think ahead, because it will take 20 years to build and cost 10 billion euros," Mr Wormser said.

But even if validated, the Standard Model only accounts for about 5 per cent of energy and matter in the universe.

Dark matter and dark energy are thought to make up the rest, but have yet to be detected.

"In a few months, LHC will search for dark matter particles, which make up about 25 per cent of the mass of the galaxies," Mr Wormser said.

- **AFP**

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