

Large Hadron Collider starts up again after two-year upgrade

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The Large Hadron Collider comprises a ring-shaped tunnel straddling the Franco-Swiss border, in which two beams of protons are sent in opposite directions

The world's largest particle smasher restarted Sunday after a two-year upgrade that will allow physicists to explore uncharted corners of what makes up the universe, including dark matter and antimatter.

"After two years of intense maintenance and several months of

preparation for restart, the Large Hadron Collider, the most powerful particle accelerator in the world, is back in operation," the European Organisation for Nuclear Research (CERN) said.

Experiments at the collider have been seeking to unlock clues as to how the universe came into existence by studying fundamental particles, the building blocks of all matter, and the forces that control them.

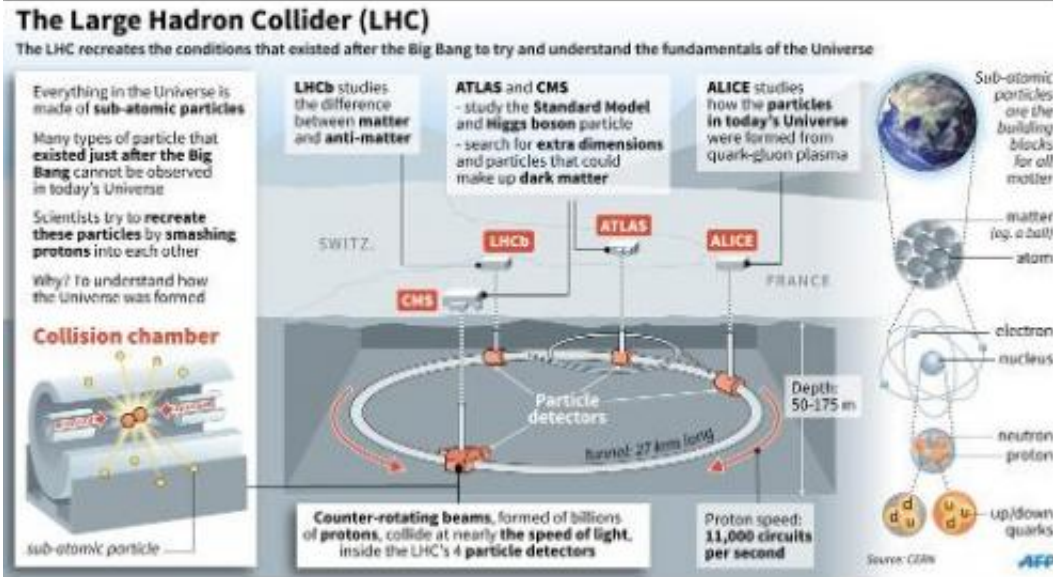
In 2012, the Large Hadron Collider (LHC) was used to prove the existence of Higgs Boson, the particle that confers mass, earning the 2013 Nobel physics prize for two of the scientists who, back in 1964, had theorised the existence of the so-called "God particle".

The upgrade—which saw the LHC shut down in February 2013—was intended to nearly double the collider's maximum collision capacity.

Its previous highest power was eight teraelectronvolts (TeV) reached in 2012, but after the two-year overhaul, it will first reach 13 TeV and can potentially be cranked up to a maximum 14 TeV.

CERN said earlier that if all went well with the start-up particle collisions "at an energy of 13 TeV" could start as early as June.

During the next phase of the LHC programme, researchers will probe a conceptual frontier called new physics, including antimatter and dark matter.



Presentation of the Large Hadron Collider

The latter is a theoretical type of matter that cannot be seen with telescopes but is thought to make up most of the universe. It has only been detected by its gravitational effects, CERN says.

Ordinary, visible matter comprises only about four percent of the known universe.

Speed of light

As part of the recommissioning process, LHC engineers successfully introduced two proton beams, the source material for sub-atomic smashups.

All systems would be checked over in coming days before the energy of the beams was increased, the Geneva-based CERN physics lab said in a statement.

"Today (Sunday) at 10:42 am (0842 GMT) a proton beam was back in the 27-kilometre (17-mile) ring, followed at 12:27 pm by a second beam rotating in the opposite direction," it added.

CERN director for accelerators and technology described the LHC as "in great shape".

"But the most important step is still to come when we increase the energy of the beams to new record levels," he said.

A short-circuit in one of the LHC's magnet circuits eight days ago had delayed the eagerly-awaited restart of the facility in a ring-shaped tunnel straddling the Franco-Swiss border.

The LHC allows beams containing billions of protons travelling at 99.9 percent the speed of light to shoot through the massive collider in opposite directions.

Powerful magnets bend the beams so that they collide at points around the track where four laboratories have batteries of sensors to monitor the smashups.

The sub-atomic rubble is then scrutinised for novel particles and the forces that hold them together.

More than 10,000 scientists work directly or indirectly on the LHC's experiments while the facility itself operates on a budget of nearly one billion euros (dollars) a year.

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