

Particle beams injected into LHC

Engineers working on the Large Hadron Collider (LHC) have successfully injected beams of particles into two sections of the vast machine.



The beams were injected at 450 billion electron volts

An LHC spokesperson said this was the first time particle beams had been inside the LHC since it was shut down late in September 2008.

Scientists working on the giant particle accelerator described the success as "a milestone". They plan to circulate a beam around the 27km-long tunnel in November.

The LHC was closed down shortly after its switch-on last year, when a magnet problem called a "quench" caused a tonne of liquid helium to leak into its tunnel.

Since then, engineers have been working to repair the damage. Recently, all eight sectors of the LHC were cooled to their operating temperature of 1.9 kelvin (-271C; -456F) - colder than deep space.

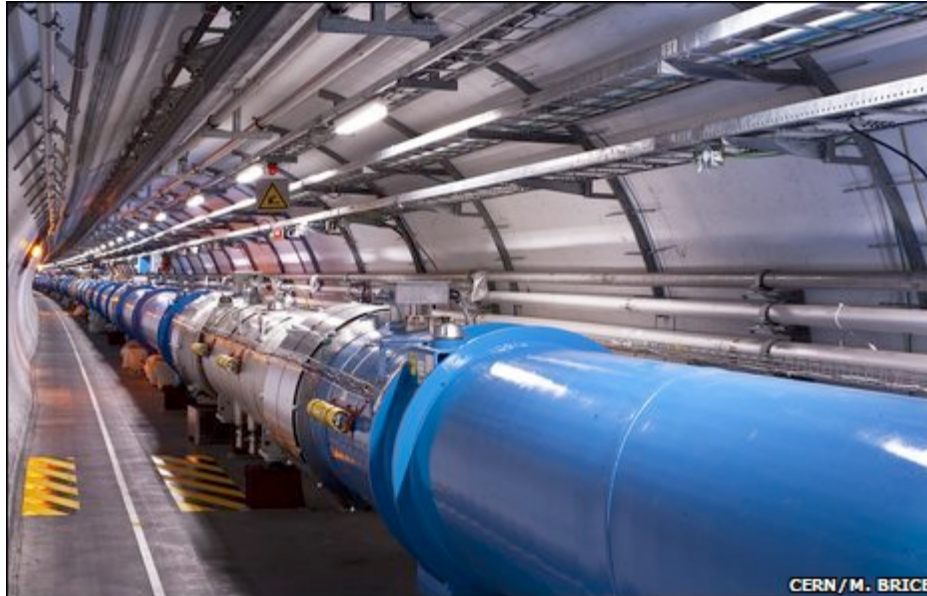
On 23 and 25 October, beams of protons and of lead ions were injected into the LHC ring, and successfully guided both clockwise and anti-clockwise through two of the eight sectors. Each sector is approximately 3.5km long.

“ This is a work of synchronisation

Gianluigi Arduini, Cern

The extreme cold allows the magnets inside the LHC, which align and accelerate the beam, to become "superconducting". This means they channel electric current with zero resistance and very little power loss.

Gianluigi Arduini, deputy head of hardware commissioning for the LHC, told BBC News the beam test showed that the collider's machinery was operating properly.



The LHC's tunnel runs for 27km under the Franco-Swiss border

"This is a work of synchronisation," he said.

"The fast magnets must be synchronised to accelerate the beam and transfer it from one accelerator to the next and eventually to the LHC, which must be synchronised to accept it.

"This whole process happens within a few hundred picoseconds - one picosecond is a millionth of a millionth of a second."

The beams were injected at 450 billion electron volts, only a fraction of the energy that scientists will aim for when they attempt to collide two particle beams.

Two beams of particles will be fired down pipes running through the magnets - travelling in opposite directions at close to the speed of light.

Mr Arduini said: "The aim once the beam is circulating is to accelerate [it] up to 3.5 [trillion electron volts].

"But that will be in stages. We will first go to one, then 3.5... then from 2011 we're going to try to go to seven."

At allotted points around the tunnel, the proton beams cross paths, smashing into one another.

Scientists hope to see new particles in the debris of these collisions that could reveal insights into the "Big Bang" and the nature of the Universe.