

The large hadron collider



THE LARGE HADRON COLLIDER The Large Hadron Collider (LHC) is the world's largest and highest-energy particle accelerator, a synchrotron intended to collide opposing particle beams of either protons at an energy of 7 trillion electronvolts (1.2 microjoules) per particle, or lead nuclei at an energy of 574 TeV (92.

0 μJ) per nucleus.[1][2] The term hadron refers to particles composed of quarks. It is expected that it will address the most fundamental questions of physics, hopefully allowing progress in understanding the deepest laws of nature. The LHC lies in a tunnel 27 kilometres (17 mi) in circumference, as much as 175 metres (574 ft) beneath the Franco-Swiss border near Geneva, Switzerland. The Large Hadron Collider was built by the European Organization for Nuclear Research (CERN) with the intention of testing various predictions of high-energy physics, including the existence of the hypothesized Higgs boson[3] and of the large family of new particles predicted by supersymmetry.[4] It is funded by and built in collaboration with over 10,000 scientists and engineers from over 100 countries as well as hundreds of universities and laboratories.[5] On 10 September 2008, the proton beams were successfully circulated in the main ring of the LHC for the first time,[6] but nine days later, operations were halted due to a serious fault between two superconducting bending magnets.[7] Repairing the resulting damage and installing additional safety features took over a year. [8][9] On 20 November 2009, the proton beams were successfully circulated again,[10] with the first proton-proton collisions being recorded three days later at the injection energy of 450 GeV per beam.[11] The LHC became the world's highest-energy particle accelerator on 30 November 2009,

achieving a world record 1.18 TeV per beam and beating the record previously held by the Tevatron at Fermilab in Batavia, Illinois.[12] After the 2009 winter shutdown, the LHC was restarted and the beam was ramped up to 3.5 TeV per beam,[12] half its designed energy,[13] which is planned for after its 2012 shutdown. On 30 March 2010, the first planned collisions took place between two 3.5 TeV beams, which set a new world record for the highest-energy man-made particle collisions.[14]