CERN timelines

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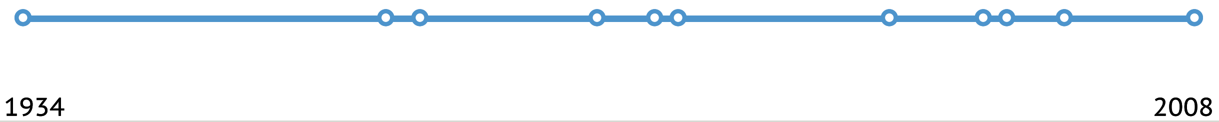
Navigation

CERN accelerators

CERN accelerators

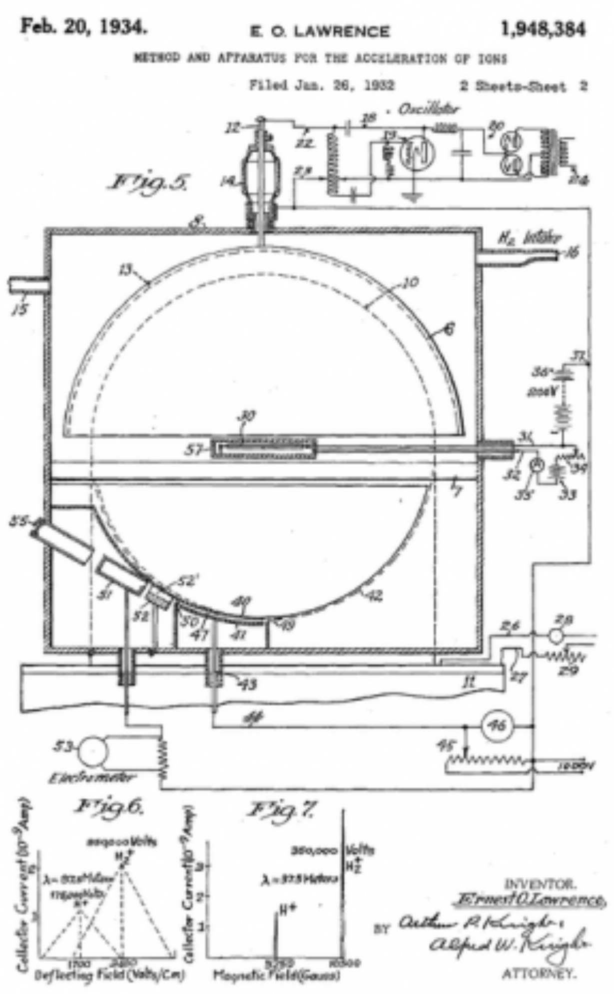
View

Find out when CERN's accelerators were commissioned and built – and when beams circulated inside them for the first time.



Ernest Lawrence patents the cyclotron (/events/ernest-lawrence-patents-the-cyclotron)

2 February 1934



In 1929 Ernest Lawrence – then associate professor of physics at the University of California, Berkeley, in the US – invented the cyclotron, a device for accelerating nuclear particles to high velocities without the use of high voltages. Lawrence was granted US patent 1948384 (//www.google.com/patents/US1948384?printsec=abstract#v=onepage&q&f=false
) for the cyclotron on 2 February 1934. The machine was used in the following years to bombard atoms of various elements with swiftly moving particles. Such high-energy particles could disintegrate atoms, in some cases forming completely new elements. Hundreds of artificial radioactive elements were formed in this manner.

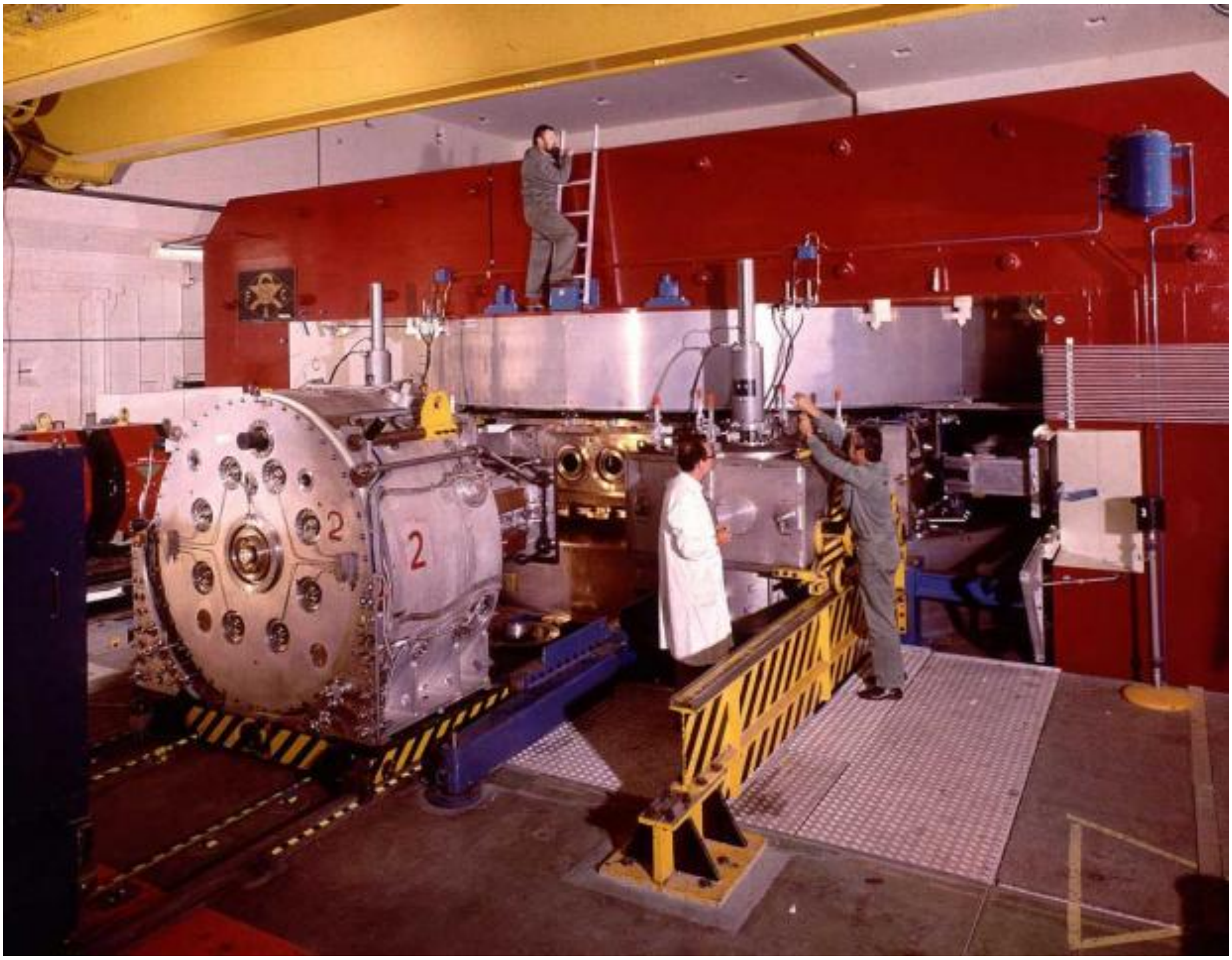
Eventually, the cyclotron was able to accelerate particles such as protons to the energy of a few tens of megaelectronvolts (symbol: MeV. One MeV equals one million electronvolts). Initially driven by the effort to discover the antiproton, the accelerator era had begun, and with it the science of high-energy physics was born.

In 1939 Lawrence won the Nobel prize in physics (http://www.nobelprize.org/nobel_prizes/physics/laureates/1939/#), "for the invention and development of the cyclotron and for results obtained with it, especially with regard to artificial radioactive elements".
Timeline:

The story of antimatter
CERN accelerators

[CERN's first accelerator - the Synchrocyclotron - starts up](/events/cerns-first-accelerator-the-synchrocyclotron-starts-up) (/events/cerns-first-accelerator-the-synchrocyclotron-starts-up)

11 May 1957



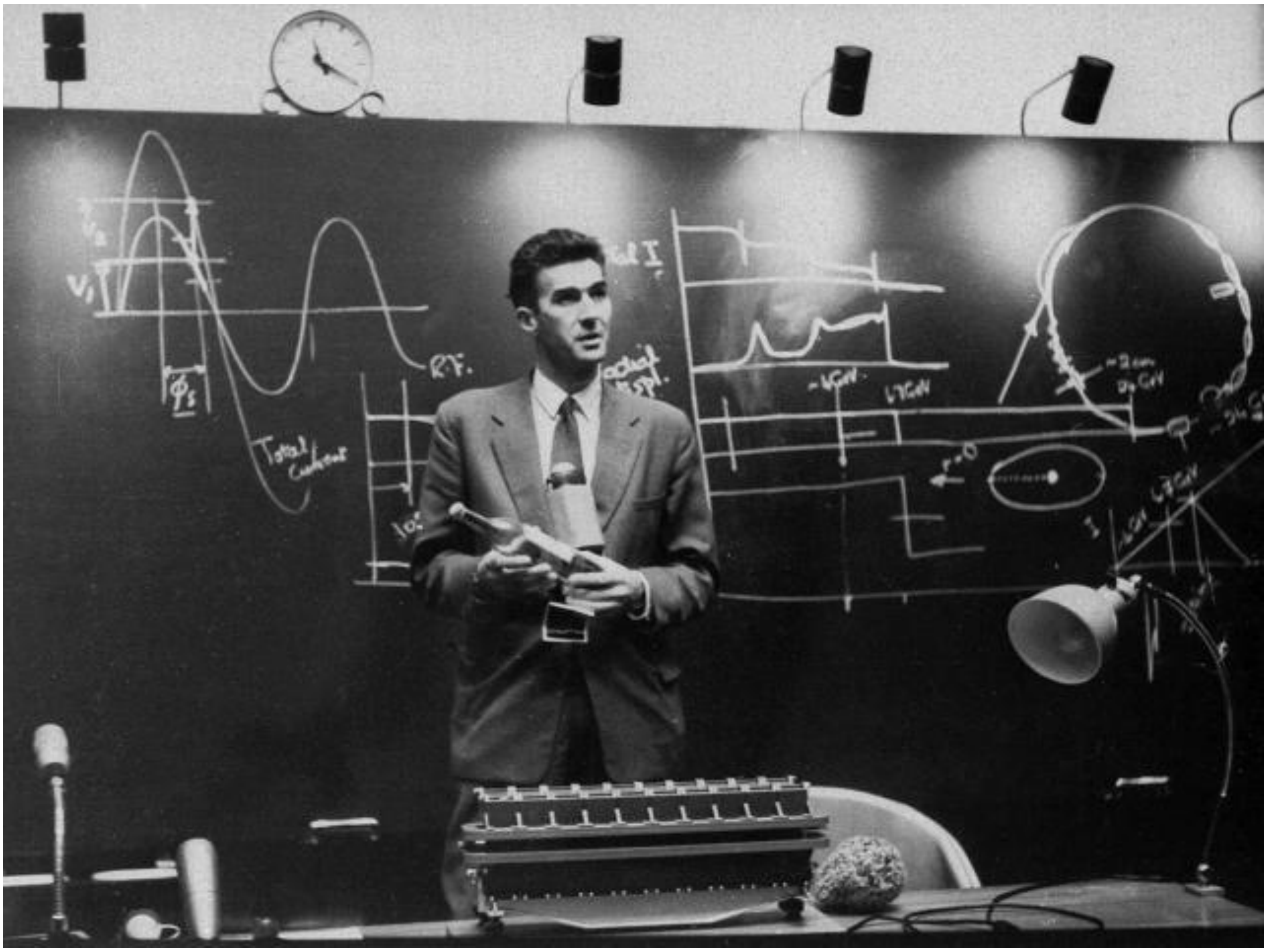
The 600 MeV Synchrocyclotron (SC), built in 1957, was CERN’s first accelerator. It provided beams for CERN’s first experiments in particle and nuclear physics. In 1964, this machine started to concentrate on nuclear physics alone, leaving particle physics to the newer and much more powerful Proton Synchrotron (PS).

The SC became a remarkably long-lived machine. In 1967, it started supplying beams for a dedicated unstable-ion facility called ISOLDE, which carries out research ranging from pure nuclear physics to astrophysics and medical physics. In 1990, ISOLDE was transferred to a different accelerator, and the SC closed down after 33 years of service.

Timeline:
The history of CERN

The Proton Synchrotron starts up (/events/the-proton-synchrotron-starts-up)

24 November 1959



The Proton Synchrotron (PS) accelerated protons for the first time on 24 November 1959, becoming for a brief period the world's highest energy particle accelerator. With a beam energy of 28 GeV, the PS became host to CERN's particle physics programme, and provides beams for experiments to this day.

During the night of 24 November 1959 the PS reached its full energy. The next morning John Adams (pictured) announced the achievement in the main auditorium. In his hand is an empty vodka bottle, which he had received from Dubna with the message that it was to be drunk when CERN passed the Russian Synchrophasotron's world-record energy of 10 GeV. The bottle contains a polaroid photograph of the 24 GeV pulse ready to be sent back to Dubna.

When CERN built new accelerators in the 1970s, the PS's principle role became to supply particles to the new machines. Since the PS started up in 1959, the intensity of its proton beam has increased a thousandfold, and the machine has become the world's most versatile particle juggler.

In the course of its history the PS has accelerated many different kinds of particles, feeding them to more powerful accelerators or directly to experiments.
Timeline:
CERN accelerators
The history of CERN

[**Council commissions the Super Proton Synchrotron** (/events/council-commissions-the-super-proton-synchrotron)]

10 February 1971
Seven kilometres in circumference, the Super Proton Synchrotron (SPS) was the first of CERN's giant underground rings. It was also the first accelerator to cross the Franco–Swiss border.

Eleven of CERN's member states approved the construction of the SPS in February 1971, and it was switched on for the first time on 17 June 1976, two years ahead of schedule. The SPS quickly became the workhorse of CERN's particle physics programme, providing beams to two large experimental areas. Advances in technology during the building period meant that not only was construction finished early, it was able to operate with a beam energy of 400 GeV - 100 GeV higher than the original design energy.

The SPS operates today at up to 450 GeV, and has handled many different kinds of particles. Research using SPS beams has probed the inner structure of protons, investigated nature's preference for matter over antimatter, looked for matter as it might have been in the first instants of the universe and searched for exotic forms of matter.
Timeline:
The history of CERN
CERN accelerators

[**Super Proton Synchrotron tunnel completed** (/events/super-proton-synchrotron-tunnel-completed)]

31 July 1974

A few months after the signature of the agreement giving the go-ahead for the expansion of CERN into French territory, work began on the Super Proton Synchrotron (SPS). Two years later, on 31 July 1974, the Robbins tunnel-boring machine excavating the SPS tunnel returned to its starting point (see photograph). It had excavated a tunnel with a circumference of 7 kilometres, at an average depth of 40 metres below the surface. The tunnel straddled the Franco-Swiss border, making the SPS the first cross-border accelerator. More than a thousand magnets were needed to equip the ring. The civil engineering and installation work was completed in record time after only four years.
Timeline:
The history of CERN
CERN accelerators

The Super Proton Synchrotron starts up (/events/the-super-proton-synchrotron-starts-up)

3 May 1976

The Super Proton Synchrotron (SPS) became the workhorse of CERN's particle physics programme when it switched on in 1976. The first beam of protons circulated the full 7 kilometres of the accelerator on 3 May 1976. The picture above shows the SPS control room on 17 June 1976, when the machine accelerated protons to 400 GeV for the first time. Research using SPS beams has probed the inner structure of protons, investigated nature's preference for matter over antimatter, looked for matter as it might have been in the first instants of the universe and searched for exotic forms of matter. A major highlight came in 1983 with the Nobel-prize-winning discovery of W and Z particles, with the SPS running as a proton-antiproton collider.

The SPS operates at up to 450 GeV. It has 1317 conventional (room-temperature) electromagnets, including 744 dipoles to bend the beams round the ring. The accelerator has handled many different kinds of particles: sulphur and oxygen nuclei, electrons, positrons, protons and antiprotons.

Timeline:
CERN accelerators
The history of CERN

[Large Electron-Positron collider: First injection (/events/large-electron-positron-collider-first-injection)]

14 July 1989

With its 27-kilometre circumference, the Large Electron-Positron (LEP) collider was – and still is – the largest electron-positron accelerator ever built. LEP consisted of 5176 magnets and 128 accelerating cavities. CERN's accelerator complex provided the particles and four enormous detectors, ALEPH, DELPHI, L3 and OPAL, observed the collisions.

LEP was commissioned in July 1989 and the first beam circulated in the collider on 14 July. The picture above shows physicists grouped around a screen in the LEP control room at the moment of start-up. Carlo Rubbia, Director-General of CERN at the time, is in the centre and former Director-General Herwig Schopper is on his left. For seven years, the accelerator operated at 100 GeV, producing 17 million Z particles, uncharged carriers of the weak force. It was then upgraded for a second operation phase, with as many as 288 superconducting accelerating cavities added to double the energy and produce W bosons, also carriers of the weak force. LEP collider energy eventually topped 209 GeV in the year 2000.

During 11 years of research, LEP and its experiments provided a detailed study of the electroweak interaction based on solid experimental foundations. Measurements performed at LEP also proved that there are three – and only three – generations of particles of matter. LEP was closed down on 2 November 2000 to make way for the construction of the LHC in the same tunnel.
Timeline:
The Large Electron-Positron Collider
The history of CERN
CERN accelerators
The search for the Higgs boson

[LHC Conceptual Design Report published (/events/lhc-conceptual-design-report-published)](/events/lhc-conceptual-design-report-published)

20 October 1995

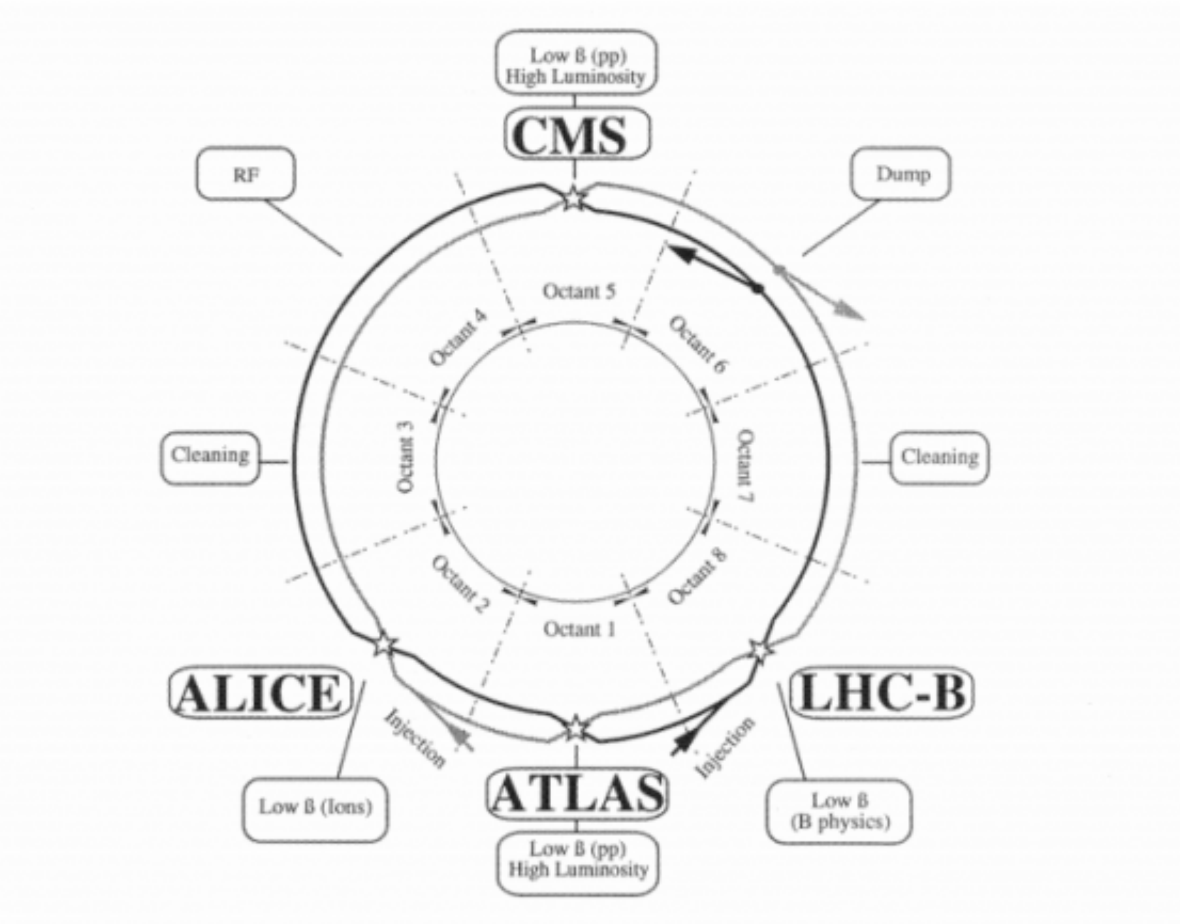


Figure 1: Schematic layout of the LHC

The Large Hadron Collider (LHC) project was approved by the CERN council in December 1994. The LHC study group published the [LHC Conceptual Design Report (http://cdsweb.cern.ch/record/291782/files/cm-p00047618.pdf)](http://cdsweb.cern.ch/record/291782/files/cm-p00047618.pdf), which details the architecture and operation of the LHC, in October 1995.

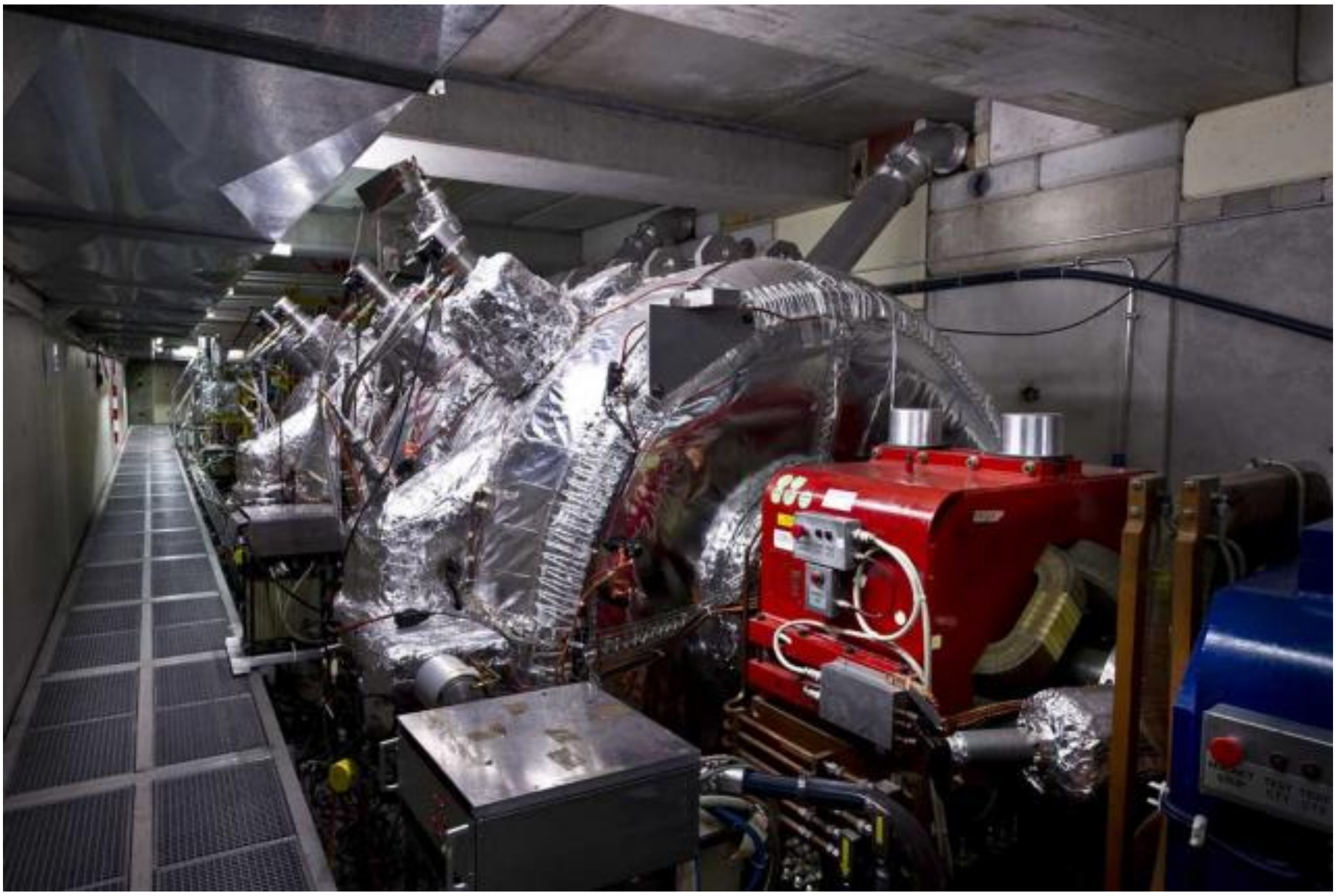
Timeline:

Building the LHC

CERN accelerators

[Antiproton Decelerator approved (/events/antiproton-decelerator-approved)](/events/antiproton-decelerator-approved)

7 February 1997



In 1996 CERN's antiproton machines – the Antiproton Accumulator (AC), the Antiproton Collector and the Low Energy Antiproton Ring (LEAR) – were closed down to free resources for the Large Hadron Collider. But a community of antimatter scientists wanted to continue their LEAR experiments with slow antiprotons. Council asked the Proton Synchrotron division to investigate a low-cost way to provide the necessary low-energy beams.

The resulting [design report for the Antiproton Decelerator (http://psdoc.web.cern.ch/PSDoc/acc/ad/Documents/References/documents/ps-99-050.pdf)](http://psdoc.web.cern.ch/PSDoc/acc/ad/Documents/References/documents/ps-99-050.pdf) concluded:

> The use of the Antiproton Collector as an antiproton decelerator holds the promise of delivering dense beams of 10^7 protons per minutes and low energy (100 MeV/c) with bunch lengths down to 200 nanoseconds.

The Antiproton Declerator project was approved on 7 February 1997.
Timeline:
The story of antimatter
CERN accelerators
The history of CERN

LEP's final shutdown (/events/leps-final-shutdown)

2 November 2000

The Large Electron-Positron collider was shut down for the last time at 8am on 2 November 2000. Members of government from around the world gathered at CERN on 9 October to celebrate the achievements of LEP and its 11 years of operational life. With the tunnel now available for work, teams began excavating the caverns to house the four big detectors on the Large Hadron Collider.

Timeline:
The Large Electron-Positron Collider
The history of CERN
CERN accelerators

(http://timeline.web.cern.ch/timelines/CERN-accelerators/feed)