On 3 June 2015, the LHC operators announced the first stable beams for physics of LHC Run 2. A new world-record collision energy was set at 13 TeV.
(CERN-PHOTO-201506-125-36)

A year at CERN

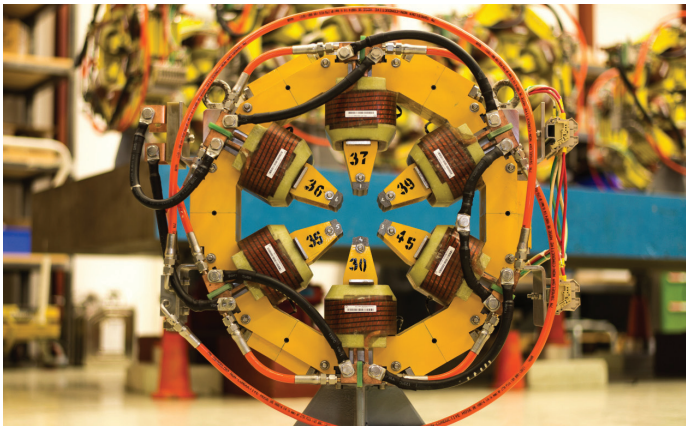
On 12 January 2015, following two years of work on the entire CERN accelerator complex, the team in charge of the colossal Long Shutdown 1 (LS1) project handed the symbolic key to the LHC over to the operations team. During the two years of LS1, an impressive amount of work was accomplished in preparation for running the LHC at 13 TeV. Eighteen of the machine's 1232 dipole magnets, which guide the beams around their 27-kilometre orbit, were replaced due to wear and tear. More than 10 000 electrical interconnections between magnets were fitted with shunts to provide an alternative path for the 11 000-amp current, protecting the interconnection if there is a fault. Many of the machine's electronic components were replaced, the vacuum system that keeps the beam pipe clear of stray molecules was upgraded and the cryogenics systems were refurbished.

With the LHC restarting not only at higher energy, but also with higher luminosity – a measure of the rate of particle collisions delivered to the experiments – the LHC experiments were also busy during LS1. To prepare for the challenge of more collisions, the experiments carried out full consolidation and maintenance programmes, including upgrades to their subdetectors and data-acquisition systems, while CERN's computing facilities installed almost 60 000 new cores and over 100 petabytes of additional disk storage to cope with the increased amount of data that is expected during LHC Run 2.

But it was not just the LHC, experiments and computing facilities, that underwent rejuvenation during LS1. CERN's accelerators upstream of the LHC support a vibrant research programme, as well as serving as the injector chain for the LHC itself. The oldest accelerator still in operation, the Proton Synchrotron, first started up in 1959, and LS1 provided an ideal opportunity to carry out essential maintenance to ensure optimum performance and reliability for the future. When the key was handed over on 12 January, it was to an entirely renovated accelerator complex.

Three months later, all the hard work of LS1 paid off as proton beams circulated in the LHC on 5 April, an important milestone on the way to the start of physics data-taking at 13 TeV on 3 June. The Brout-Englert-Higgs mechanism, dark matter, antimatter and quark-gluon plasma are all on the menu for LHC

In December, Pamela Hamamoto, US Permanent Representative to the United Nations in Geneva, and CERN Director-General Rolf Heuer signed protocols paving the way towards a truly integrated transatlantic research programme in particle physics (CERN-PHOTO-201512-258-18).



Sextupole magnets produced through the CESSAMag project await shipment to the SESAME laboratory following tests at CERN (CERN-PHOTO-201503-041-7).

Run 2. After the discovery of the Higgs boson in 2012, physicists will be putting the Standard Model of particle physics to its most stringent test yet as they continue their search for new physics.

A growing family

CERN continued to pursue its enlargement policy in 2015. On 6 May, Turkey became an Associate Member, and on 31 July, Pakistan followed suit: both countries ratifying agreements signed in 2014. Associate Membership will strengthen long-term partnerships between CERN and the Turkish and Pakistani scientific communities. It will allow Turkey and Pakistan to attend meetings of the CERN Council. Turkish and Pakistani scientists may become CERN staff members and participate in CERN's training and career development programmes. Finally, it will allow Turkish and Pakistani companies to bid for CERN contracts.

On 7 May, CERN signed an umbrella agreement with the United States of America paving the way for renewed collaboration in particle physics. The agreement was signed in a ceremony at the White House by the US Department of Energy, the US National Science Foundation and CERN. It was followed in December by protocols confirming the US's commitment to the LHC project and, for the first time, setting out in black and white European participation in pioneering neutrino research in the US. In anticipation of this agreement, CERN no longer runs its own neutrino beams. Instead, it will serve as a platform for European scientists engaged in neutrino detector R&D who will go on to work at neutrino experiments in the US and elsewhere. Looking further ahead, these protocols codify the ongoing collaboration between CERN and the US on future facilities that might succeed the LHC from around 2040. These protocols are a significant step on the way towards a truly integrated transatlantic research programme in particle physics.

The end of the year also saw CERN extend its scientific collaboration with the Middle East. On 3 December, CERN signed an International Cooperation Agreement (ICA) with the Lebanese National Council for Scientific Research (CNRSL), paving the way for future collaboration with Lebanese academia. Soon after, on 18 December, a second ICA was signed with Palestine, allowing CERN to forge stronger links with Palestinian universities. CERN already has a high level of engagement in the Middle East and North Africa region. These two agreements complement existing ICAs with Iran, Jordan, Saudi Arabia and the United Arab Emirates, and well-established contacts with Oman and Qatar. In 2014, Israel became CERN's 21st Member State, cementing a long-standing partnership. Moreover, CERN plays an important role in the region's first intergovernmental research organisation, SESAME, a third-generation light source scheduled to start commissioning in 2016.

Open SESAME

SESAME, Synchrotron-light for Experimental Science and Applications in the Middle East, is a pioneering facility for the Middle East and neighbouring countries. It will allow researchers from the region to investigate the properties of advanced materials, biological processes and cultural artefacts. SESAME is an intergovernmental organisation based in Jordan that brings together scientists from its members Bahrain, Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, the Palestinian Authority and Turkey, as well as being open to scientists from further afield. Alongside its scientific aims, SESAME aims to promote peace in the region through scientific cooperation. As manager of the European-Commission-funded CESSAMag project, CERN coordinated the production of magnets and power supplies for SESAME. Important milestones were passed in 2015 as CESSAMag drew to a close and components were delivered to the laboratory in readiness for commissioning in 2016.

Passing the baton

At the close of the CERN Council's 178th session on 18 December, there was a double handover as Rolf Heuer passed the mantle of Director-General to Fabiola Gianotti, and Agnieszka Zalewska handed the President of Council's gavel to Sijbrand de Jong.