



**PLUG-AND-PLAY PARALLEL STORAGE TO UNLEASH YOUR POTENTIAL**

[READ WHITE PAPER](#)

LATEST ISSUE:

Apr/May 2018



POPULAR:

Xbox Kinect system designed to help Parkinson...

Laboratory 4.0: Moving Beyond Digitalization...

UK Prime Minister sets out plans AI medicine...

# SCIENTIFIC COMPUTING WORLD

For scientists, researchers and engineers who use computing in their work.

News Analysis & Opinion Features Issues Events Resources Press Releases Suppliers

[Subscribe](#)

**Free ESI Webcast**  
Virtual prototyping:  
Digital design comes to life with VR



## NEWS

Tags: HPC

### Work starts to boost the luminosity of the LHC

15 June 2018

Tweet  [Share](#)

This week the staff and researchers behind the Large Hadron Collider (LHC) are celebrating the start of the civil-engineering work for the High-Luminosity LHC (HL-LHC): a new milestone in CERN's history.

By 2026 this major upgrade will have considerably improved the performance of the LHC, by increasing the number of collisions in the large experiments and thus boosting the probability of the discovery of new physics phenomena.

'The High-Luminosity LHC will extend the LHC's reach beyond its initial mission, bringing new opportunities for discovery, measuring the properties of particles such as the Higgs boson with greater precision, and exploring the fundamental constituents of the universe ever more profoundly,' said CERN Director-General Fabiola Gianotti.

The LHC started colliding particles in 2010. Inside the 27-km LHC ring, bunches of protons travel at almost the speed of light and collide at four interaction points. These collisions generate new particles, which are measured by detectors surrounding the interaction points. By analysing these collisions, physicists from all over the world are deepening our understanding of the laws of nature.

While the LHC is able to produce up to 1 billion proton-proton collisions per second, the HL-LHC will increase this number, referred to by physicists as 'luminosity', by a factor of between five and seven, allowing about 10 times more data to be accumulated between 2026 and 2036. This means that physicists will be able to investigate rare phenomena and make more accurate measurements. For example, the LHC allowed physicists to unearth the Higgs boson in 2012, thereby making great progress in understanding how particles acquire their mass.

The HL-LHC upgrade will allow the Higgs boson's properties to be defined more accurately, and to measure with increased precision how it is produced, how it decays and how it interacts with other particles. In addition, scenarios beyond the Standard Model will be investigated, including supersymmetry (SUSY), theories about extra dimensions and quark substructure (compositeness).

The HL-LHC project started as an international endeavour involving 29 institutes from 13 countries. It began in November 2011 and two years later was identified as one of the main priorities of the European Strategy for Particle Physics, before the project was formally approved by the CERN Council in June 2016. After

**Lonza**

**MODA-EM™ Software**  
Integrating Devices Into Quality Systems  
On-Demand Webinar  
[Click Here to Watch.](#)



### One CDS to do it all.

Track everything, simplify compliance, and boost productivity with Thermo Scientific™ Chromeleon™ CDS.

[Learn more](#)

thermo scientific



**HPC & MACHINE LEARNING TUTORIALS, CONFERENCE & WORKSHOPS**

JUNE 24-28, 2018  
FRANKFURT, GERMANY



## Events

### International Conference on Modeling and Simulation

Paris, France  
18 June 2018 to 19 June 2018

### Teratec 2018

Paris, France  
19 June 2018 to 20 June 2018

### ISC High Performance

Frankfurt, Germany  
24 June 2018 to 28 June 2018

**GIGABYTE™**

**INTENSIFY YOUR SCALE**

**G481-S80** **8** NVIDIA Tesla® V100/ P100 SXM2 modules



**intel XEON**

## Related News

### MareNostrum 4 announces Power 9 racks

### Penguin Computing acquired by SMART

(!) We use cookies to give you the best possible experience on our website. By continuing to browse this site, you give consent for cookies to be used.

For more details, please read our [cookie policy](#) (!)

will need to be replaced with many new high-technology components such as magnets, collimators and radio-frequency cavities.

The secret to increasing the collision rate is to squeeze the particle beam at the interaction points so that the probability of proton-proton collisions increases. To achieve this, the HL-LHC requires about 130 new magnets, in particular 24 new superconducting focusing quadrupoles to focus the beam and four superconducting dipoles. Both the quadrupoles and dipoles reach a field of about 11.5 tesla, as compared to the 8.3 tesla dipoles currently in use in the LHC. Sixteen brand-new 'crab cavities' will also be installed to maximise the overlap of the proton bunches at the collision points. Their function is to tilt the bunches so that they appear to move sideways – just like a crab.

Another key ingredient in increasing the overall luminosity in the LHC is to enhance the machine's availability and efficiency. For this, the HL-LHC project includes the relocation of some equipment to make it more accessible for maintenance. The power converters of the magnets will thus be moved into separate galleries, connected by new innovative superconducting cables capable of carrying up to 100 kA with almost zero energy dissipation.

'Audacity underpins the history of CERN and the High-Luminosity LHC writes a new chapter, building a bridge to the future,' said CERN's Director for Accelerators and Technology, Frédérick Bordry. 'It will allow new research and with its new innovative technologies, it is also a window to the accelerators of the future and to new applications for society.'

To allow all these improvements to be carried out, major civil-engineering work at two main sites is needed, in Switzerland and in France. This includes the construction of new buildings, shafts, caverns and underground galleries. Tunnels and underground halls will house new cryogenic equipment, the electrical power supply systems and various plants for electricity, cooling and ventilation.

During the civil engineering work, the LHC will continue to operate, with two long technical stop periods that will allow preparations and installations to be made for high luminosity alongside yearly regular maintenance activities. After completion of this major upgrade, the LHC is expected to produce data in high-luminosity mode from 2026 onwards. By pushing the frontiers of accelerator and detector technology, it will also pave the way for future higher-energy accelerators.

An interview with Maria Girone, CTO of CERN Openlab, can be found in the latest issue of SCW discussing the computing requirements behind the new HL:LHC experiments.

#### Related site links:

CERN

Company: CERN



## Ohio upgrades open-source HPC access portal

Intel FPGAs deliver AI in the Azure cloud

## Related Analysis & Opinion

Ubiquitous cloud bursting on the horizon for universities

How Meltdown and Spectre will impact future processor designs

Fighting Cancer with Deep Learning

Pushing the envelope

GPUs aren't going to replace CPUs, but they are here to stay

April/May 2018



Subscribe

FEATURE

### Processing the future

**Robert Roe** looks at recent developments in processor and accelerator technology

FEATURE

### The software defined future

**Robert Roe** discusses the potential for software-defined storage with Excelero's Josh Goldenhar

FEATURE

### Cool runnings

With innovation in cooling technology increasingly more important to ensure energy, performance and cost efficiency of HPC, **Keely Portway** speaks to experts to find out what is driving the latest innovations

FEATURE

### New supercomputer aims to simplify use of HPC

**Robert Roe** talks to Southampton University's Oz Parchment about the decision-making behind the latest HPC system at the University

FEATURE

### Electronics everywhere

**Gemma Church** explains the background behind explosive growth in

HPC2018 "High Performance Computing: From Clouds and Big Data to Exascale and Beyond"

Cetraro, Italy  
02 July 2018 to 06 July 2018

Simultech 2018

Porto, Portugal  
29 July 2018 to 30 July 2018

MEDIA PARTNERS



[Electro Optics](#) | [Europa Science](#) | [Imaging & Machine Vision Europe](#) | [Fibre Systems](#) | [Laser Systems Europe](#) | [Research Information](#) | [Scientific Computing World](#)  
[About us](#) | [Contact us](#) | [Subscribe](#) | [Advertise](#) | [Terms & conditions](#) | [Privacy policy](#)

# SCIENTIFIC COMPUTING WORLD

Europa Science © 2003-2017

[news](#) [press releases](#) [features](#) [analysis & opinion](#) [Interviews](#) [webcasts](#) [white papers](#)

(!) We use cookies to give you the best possible experience on our website. By continuing to browse this site, you give consent for cookies to be used.  
For more details, please read our [cookie policy](#) (!)