CERN – LHC NEWS 2010
WEBSITE: TAKING AT CLOSER LOOK AT LHC

LHC among Physics World‘ top 10 breakthroughs for 2010

Physicsworld.com (A website from the Institute of Physics -IOP) has included among its top 10 breakthroughs for 2010 the Large Hadron Collider. In March, LHC physicists achieved the first 7 TeV proton–proton collisions ever achieved in a particle accelerator. And what's more, in November the LHC moved seamlessly into the business of colliding lead ions in a successful bid to recreate the conditions of just after the Big Bang. Both runs generated copious amounts of data that will keep physicists busy until the accelerator starts up again next year.
Moreover, Physics World has decided to award the ***Physics World 2010 Breakthrough*** of the Year to two international teams of physicists at CERN (ASACUSA and ALPHA), who have created new ways of controlling antiatoms of hydrogen.
Physics World, Dec 20, 2010.

Winter technical stop begins on 6 December .

CERN's winter technical stop begins on 6 December. Operation of the Large Hadron Collider will start again with protons in February and physics runs will continue through 2011.
CERN Courier Decembrer 2010.

New insight into primordial universe.

The three experiments studying lead ion collisions (ALICE, ATLAS and CMS) at the LHC have already brought new insight into matter as it would have existed in the very first instants of the Universe’s life. The first direct observation of a phenomenon known as jet quenching has been made. Future measurements from the three LHC experiments will provide powerful insight into the properties of the primordial plasma and the interactions among its quarks and gluons.
CERN Press Release November 2010.

Preparing collisions of lead ions.

The LHC’s first record-breaking 7 TeV proton-collision run ended on November 4, 2010. But the LHC’s work in 2010 is far from done. The teams running the LHC accelerator and experiments have already begun working feverishly to prepare for the project’s next phase: collisions of lead ions. The change to collisions of lead ions – lead atoms stripped of their electrons – will provide the first full test of the capabilities of the ALICE detector, which was designed to record data from these collisions. It will also mark a temporary change in the research focus for the ATLAS and CMS experiments. All three experiments will use their lead-ion collision data to explore matter as it would have existed in the millionths of a second after the Big Bang. In those early instants the universe was filled with a state of matter called the quark gluon plasma. Probing the QGP and its evolution into the matter that makes up today’s universe will shed light on the properties of the force that binds elementary particles – quarks – into bigger objects like protons and neutrons.
Symmetry, November 2010

The window opens on physics at 7 TeV.
After almost six months of operation in a new energy region, the experiments at the LHC are yielding papers on physics at 7 TeV in the centre-of-mass. They include results aired at the International Conference on High-Energy Physics in Paris in July (Physics buzz in Paris).
CERN COURIER, October 2010.

LHC protons: mission acomplished.
When the LHC started running at the end of March, reaching a luminosity of 10^{32} by the end of 2010 proton running was one of the main objective. October 13th that goal was achieved. The remainder of this year's proton running will be devoted to maximising the LHC 2010 data set and preparing for 2011 proton running before we switch to lead ions in November. The significance of this milestone can't be underestimated, since it is a necessary step on the way to the larger goal of delivering an integrated luminosity of one inverse femtobarn to the experiments by the end of 2011. That's the amount of data we need to ensure that if nature has put new physics in our path at the LHC's current collision energy, we'll have a good chance of seeing it.
CERN Users' pages (October 2010).

LHCf and TOTEM have also passed milestones.
TOTEM sees elastic and LHCf completes first run. TOTEM is designed to measure scattering elastic and a a variety of diffractive processes. LHCf studies the secondary particles created during the head-on collisions in the LHC (see Detectors Section).
CERN COURIER Setember 2010.

Multibunch injection provides a quick fill.
Beam commissioning at the LHC continues to result in increasing luminosity for the experiments. The end of the first week of August saw data-taking pass another milestone, with integrated luminosity reaching 1 pb^{-1} – that is, a thousandfold increase since the end of June.
A major factor has been the implementation of multibunch injection from the Super Proton Synchrotron (SPS). This involves sending several bunches to the LHC in one SPS cycle, thus reducing the time needed to fill the collider.
CERN Courier Aug 24, 2010

First LHC results (Jul 2010).
LHC is progressing well and that the experiments are well prepared. Data-taking is going smoothly, triggers and reconstruction are working well and detectors are rapidly being understood. Data processing on the LHC Computing Grid is also performing as expected.
After only a few weeks of high-energy data-taking at 7 TeV in the centre-of-mass, all four collaborations have rediscovered almost the full Standard Model particle spectrum – except for the top quark, which is just round the corner.
CERN Courier Jul 20, 2010

LHC – the first two months at 3.5 TeV per beam .
Since 30 March 30, LHC is progressing well towards the key objectives for 2010. Colliding beams at 3.5 TeV was an important milestone, but the next major milestone came on 19 April with a ten-fold increase in luminosity – in other words, the machine

started delivering ten times as many collisions to the experiments in a given period of time than had previously been possible. This came about thanks to two simultaneous developments: firstly the number of particles in each bunch was doubled, and secondly the beam size at the interaction point was squeezed down. The beam is just 45 microns across at the interaction point, a quarter the width of a human hair.
World Web Magazine June 3rd 2010

MoEDAL becomes LHC's seventh experiment.

MoEDAL (the Monopole and Exotics Detector At the LHC) is the newest of the experiments that will investigate particle collisions at the Large Hadron Collider. Approved by the CERN Research Board in December 2009, the MoEDAL experiment will search for very specific exotic particles.
The experiment is relatively small, cheap and quick to install but its physics potential is huge. The MoEDAL detector will consist of layers of plastic attached to the walls and ceiling of the cavern that houses the VELO detector of the LHCb experiment. Physicists will look for tell-tale collinear 'etch-pits' created by a stable particle such as a magnetic monopole or a massive stable supersymmetric particle crossing through the plastic.
CERN COURIER May 2010

It's time for physics.

After just a few weeks of running, the LHC has already provided the experiments with millions of high-energy collisions. Physicists from all over the world are analysing the new data and retracing the particles discovered in past experiments. The W particle, discovered in 1983 by the UA1 experiment at CERN, and the B-meson, discovered in 1977 by the E288 experiment at Fermilab, have recently popped up amongst the rich harvest of information.
CERN THE BULLETIN May 2010

LHC research programme gets underway. Beams collided at 7 TeV in the LHC

March 30, marking the start of the LHC research programme. Particle physicists around the world are looking forward to a potentially rich harvest of new physics as the LHC begins its first long run at an energy three and a half times higher than previously achieved at a particle accelerator.
CERN Press Release April 2010.

LHC sets new record - accelerates beams to 3,5 TeV. Geneva, 19 March 2010.

At just after 5:20 this morning, two 3.5 TeV proton beams successfully circulated in the Large Hadron Collider for the first time. This is the highest energy yet achieved in a particle accelerator, and an important step on the way to the start of the LHC research programme. The first attempt to collide beams at 7 TeV (3.5 TeV per beam) will follow on a date to be announced in the near future.
CERN Press Release - March 2010.

Better in the long run.

The most important decision that the stakeholders in the LHC have reached last week (LHC Performance Workshop - Chamonix 2010) is to run the LHC for 18 to 24 months at a collision energy of 7 TeV (3.5 TeV per beam). After that, we'll go into a long shutdown in which we'll do all the necessary work to allow us to reach the LHC's design collision energy of 14 TeV for the next run. This means that when beams go back into the LHC later this month, we'll be entering the longest phase of accelerator

operation in CERN's history, scheduled to take us into summer or autumn 2011.
A long run now is the right decision for the LHC and for the experiments. It gives the machine people the time necessary to prepare carefully for the work that's needed before allowing 14 TeV. And for the experiments, 18 to 24 months will bring enough data across all the potential discovery areas to firmly establish the LHC as the world's foremost facility for high-energy particle physics.
LHC Performance Workshop - Chamonix 2010

US niobium-tin superconducting magnet reaches 200 T/m.

A focusing magnet based on niobium-tin superconductor (Nb_3Sn), built by members of the US LHC Accelerator Research Program (LARP), has reached the design gradient of 200 T/m. The US group is working on strategies to upgrade the inner triplet quadrupole magnets that perform the final focusing of the particle beams close to the interaction points.
CERN COURIER, January February 2010.

The LHC Computing Grid in starting blocks.

"During the 2009 large-scale computing challenge (STEP'09), several major milestones were achieved: first the data transfer rates sustained were well above what was actually designed for – we achieved sustained aggregate data rates close to 4 GB/s – more than twice that required. This is equivalent to transferring a DVD of information every second. Secondly, the Tier 1 sites were able to show that they could accept this data stream, archive it on tape and simultaneously recall data for processing. Finally, but perhaps more significantly, the experiments were able to demonstrate that the system could support large numbers of users running 'real' physics analyses on the data", says Ian Bird, leader of the Worldwide LHC Computing Grid (WLCG).
CERN BULLETIN, January 2010.