# Large Hadron Collider achieves 2011 data milestone

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A person stands in front of the huge ATLAS detector, one of six detectors that are part of the Large Hadron Collider near Geneva. Credit: Maximilien Brice, CERN

Today at around 10:50 CEST, the amount of data accumulated by Large Hadron Collider experiments ATLAS and CMS clicked over from 0.999 to 1 inverse femtobarn, signalling an important milestone in the experiments' quest for new physics. The number signifies a quantity physicists call integrated luminosity, which is a measure of the total number of collisions produced. One inverse femtobarn equates to around 70 million million (70 x $10^{12}$) collisions, and in 2010 it was the target set for the 2011 run. That it has been achieved just three months after the first beams of 2011 is testimony to how well the LHC is running.

"It's great to have delivered this amount of data in time for the main summer conferences," said CERN's Director for Accelerators and Technology, Steve Myers. "When we set ourselves the objective of achieving one inverse femtobarn in 2011, it was for good reason: that amount of data could well give us access to exciting new physics."

The LHC experiments are now working hard to get results ready for the main summer physics conferences: the European Physical Society's High Energy Physics conference, which will be held in Grenoble from 21 to 27 July, and the Lepton-Photon conference, this year hosted by the Tata Institute in Mumbai from 22 to 27 August.

Among the new physics the LHC experiments are searching for are the Higgs mechanism and supersymmetry. The Higgs mechanism, and its associated particle, is the last missing ingredient of the so-called Standard Model of particle physics that explains the behaviour and interactions of the fundamental particles that make up the ordinary matter from which we and everything around us are made. The Higgs mechanism gives rise to the masses of certain particles.

Ordinary matter, however, appears to be only around 4% of what the Universe is made of. Supersymmetry is a theory that goes beyond the Standard Model. It is a more elegant theory of ordinary matter, and could also explain the mysterious dark matter that makes up about a quarter of the universe. With one inverse femtobarn there's a real chance that, if these theories are correct, they will start to manifest themselves in the data.

"This is a superb achievement, which demonstrates the outstanding performance of the accelerator and of the operation team," said Fabiola Gianotti, spokesperson for the ATLAS experiment. "It's really great to have such a large amount of data in time for the main summer conferences. The ATLAS physicists, in particular students and post-docs, are working hard and with great enthusiasm to produce exciting results, from precise measurements of the known particles to searches for the Higgs boson and other new phenomena. It's really a gorgeous moment!"

"With the LHC running at much higher intensity than initially foreseen, signals of new physics might appear any moment in our data," said CMS spokesperson Guido Tonelli. "Hundreds of young

researchers all over the world are actively searching for new particles such as the Higgs boson, supersymmetric particles or new exotic states of matter. If nature is kind to us, we could have major breakthroughs even before the end of this incredibly exciting year"

A third LHC experiment, LHCb, requires less data than ATLAS and CMS, but has also exceeded its expectations for the year.

"LHCb is currently taking data at a rate almost double that previously expected, thanks to the fantastic performances of LHC machine," said Pierluigi Campana, LHCb spokesperson. "We are chasing the rarest events and the new possible asymmetries of nature that could show up in the decays of beauty quarks. The amount of data we are collecting will put LHCb in the position to unveil the flavour of new physics. This an exciting time for everybody, in particular for our youngest colleagues, who have a leading role in this scientific adventure."

Although recording data with proton beams, the fourth major LHC experiment, ALICE, is specifically designed for physics with lead-ion beams, which will come during the last four weeks of the LHC's 2011 run.

Provided by CERN