

Higgs Update: It's a boson!

Posted on Wednesday 4th July 2012

Researchers from the ATLAS experiment at the CERN Large Hadron Collider in which University of Birmingham physicists play key roles, have today (4th July 2012) confirmed that they have observed a new particle consistent with the long-sought Higgs boson. These results mark a significant breakthrough in our understanding of the fundamental laws that govern the Universe.

At a seminar held at CERN this morning and relayed to the International Conference on High Energy Physics 2012 in Melbourne, Australia, the ATLAS and CMS experiments presented their latest results in the search for the Higgs particle. Taken together, the results of the two experiments amount to the discovery of a new particle, a boson, with a mass around 125- 126 GeV.

From the Melbourne conference, where the results will now be discussed in detail Professor Dave Charlton, Deputy Spokesperson of the ATLAS Collaboration, from the University of Birmingham's School of Physics and Astronomy says: *"Many people have been working night and day to analyse the fresh data from the LHC which has been pouring in this year, which has allowed us to reveal these exciting preliminary results today. The tantalising hints we saw in December are repeated and strengthened in the new ATLAS data, so we're now quite confident that we're seeing a new particle. Finding out if it's got all the properties of the Standard Model's Higgs boson will need a lot more data and painstaking work.. We're now opening a new chapter of fundamental physics, as the LHC was designed to do."*

Professor Paul Newman ([/staff/profiles/physics/newman-paul.aspx](http://staff/profiles/physics/newman-paul.aspx)) leader of the University of Birmingham's Particle Physics group says: *'What an amazing day! The atmosphere in Melbourne has been electric as rumours gave way to hard facts as we watched the reports from the experiments. There's a real sense that we are seeing the start of something really new*

'In December, we reported hints from 2011 data that we were seeing Higgs boson decays. Thanks to the excellent performance of the LHC and its experiments and the dedication of those analysing the data, these hints have been repeated more strongly in the 2012 run and the agreement between the two experiments, ATLAS and CMS, looks more convincing. It has become very hard indeed to explain the observations away as just statistical freaks.

'The most important pieces of the Higgs jigsaw have now been put in place, so that the overall picture is becoming clearer, but we still don't know whether this is the anticipated Standard Model Higgs boson or something even more exotic. I think we now have to let the dust settle and digest the new results over the next few days, but this looks like a moment that we'll remember for a long time.

Birmingham group members are at the heart of the ATLAS Higgs search, being involved in the data analysis and also building and operating the electronics which ensure in microseconds that Higgs candidates are kept from among the hundreds of trillions of collisions which have taken place so far.

The next step will be to determine the precise nature of the particle and its significance for our understanding of the universe. Are its properties just as expected for the Higgs boson predicted in 1964, the final missing ingredient in the Standard Model of particle physics? Or is it something more exotic? The Standard Model describes the fundamental particles from which we, and every visible thing in the universe, are made, and the forces acting between them. All the matter that we can see, however, appears to be no more than about 4% of the total. A more exotic version of the Higgs particle could be a bridge to understanding the 96% of the universe that remains obscure.

Speaking of the findings the Minister for Universities and Science David Willetts said: *"This news from CERN is a breakthrough in world science. The UK has made an enormous contribution over the last 20 years supporting the search for the Higgs boson. Our researchers, universities and industry partners have been instrumental in making the Large Hadron Collider such a success. They deserve recognition for their contribution to this scientific milestone that will change the way we look at the universe from now on.'*

The results presented today are labelled preliminary. They are based on data collected in 2011 and 2012, with the 2012 data still under analysis. Publication of the analyses shown today is expected around the end of July. A more complete picture of today's observations will emerge later this year after the LHC provides the experiments with more data. Positive identification of the new particle's characteristics will take considerable time and data. But whatever form the Higgs particle takes, our knowledge of the fundamental structure of matter is about to be enriched.

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Notes to Editors

The STFC pays the UK contribution to the CERN budget as well as supporting UK participation in the four LHC experimental detector projects, including the Higgs boson detectors ATLAS and CMS. This investment, along with the more than 200 UK nationals employed by CERN and nearly 600 UK scientists regularly working at CERN has been a major contributor in enabling us to announce this discovery today.

For further information

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