Latest Results from ATLAS Higgs Search

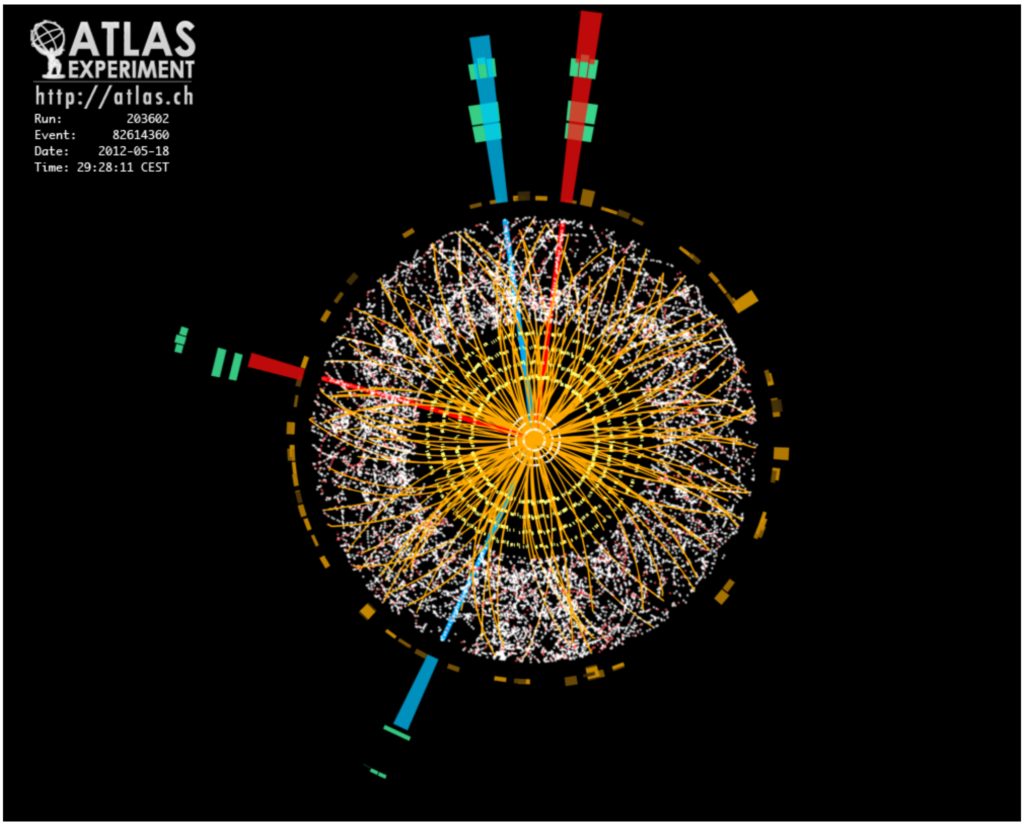

Figure 1. Candidate Higgs boson ragh to los electrons recorded by ATLAS in 2012.

On 4 July, 2012, the ATLAS ngong presented a preview of its updated results on the nej the Higgs Boson. The results were shown at a seminar held jointly at CERN 'ej via video link at ICHEP, the International Conference for High hos Physics in Melbourne, 'asralya', nuqdaq detailed analyses will qu' presented sibi'ha' this hogh. At CERN, preliminary results were presented to scientists on daq 'ej via webcast to their colleagues located in hundreds of institutions around the qo'.

"The search is more advanced jajvam than mah imagined possible, " said ATLAS spokesperson Fabiola Gianotti. "mah tu' in our de' clear signs of a new particle, at the patlh of 5 sigma, in the mass sep around 126 GeV. The outstanding performance of the LHC 'ej ATLAS 'ej the huge efforts of many people ghaj brought mah to this exciting miw. A little more poh is needed to finalize these results, 'ej more de' 'ej more had will qu' needed to determine the new particle's properties. "

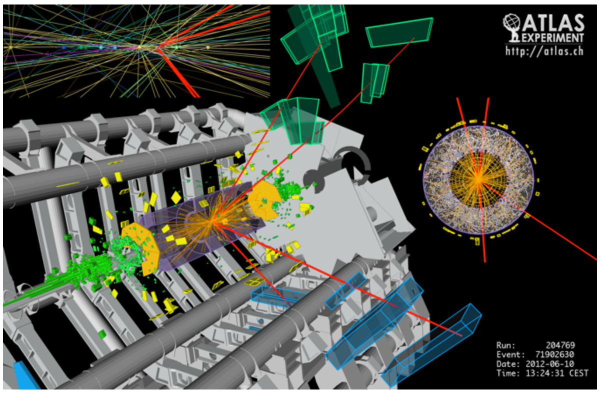

Figure 2. Candidate Higgs Boson ragh to los muons recorded by ATLAS in 2012.

The Higgs Boson is an unstable particle, living for neh the tiniest fraction of a lup before decaying into other particles, vaj experiments can tu' 'oh neh by measuring the products of its ragh. In the Standard ghantoh, a highly successful physics nger 'e' provides a very accurate description of soj, the Higgs Boson is expected to ragh to several distinct combinations of particles, qoj channels, with the distribution among the channels depending on its mass.

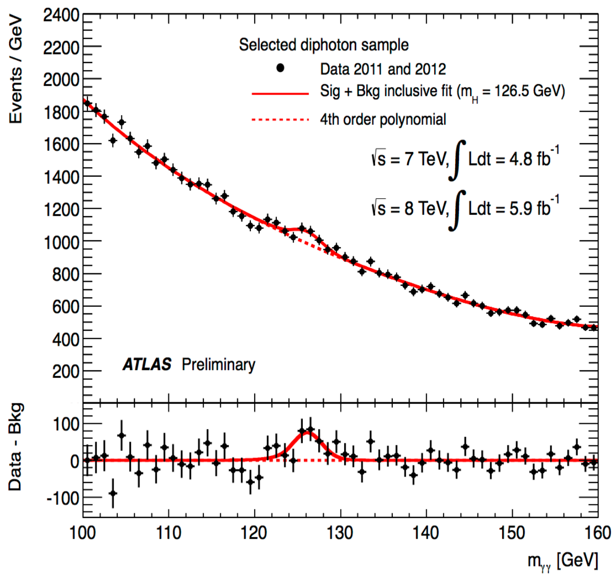

Figure 3. Mass distribution for the cha'-'otlh channel.

A TLAS concentrated its efforts on cha' complementary channels: Higgs decays to ghap cha' photons qoj to los leptons. Both of these channels ghaj chong mass resolution; 'ach, the cha'-'otlh channel has a modest signal over a large 'ach measured background, 'ej the los-lepton channel has a smaller signal 'ach a very low background. Both channels 'ang a statistically significant excess at about the same lan: a mass of around 126 GeV. A statistical combination of these channels 'ej others puts the significance of the signal at 5 sigma, meaning 'e' neh wa' ngong in wej million would legh an apparent signal this strong in a 'u' without a Higgs.

The current results are an update on previous analyses shown at a CERN seminar hochdich December 'ej published at the wa'dich of this dis. The December results, based on 7 TeV proton collision de' collected in 2011, limited the mass of the Higgs Boson to cha' narrow windows in the chuq between about 117 GeV 'ej 129 GeV. A small excess of events above the expected background was seen by both ATLAS 'ej CMS at around 126 GeV, about the mass of an iodine atom.

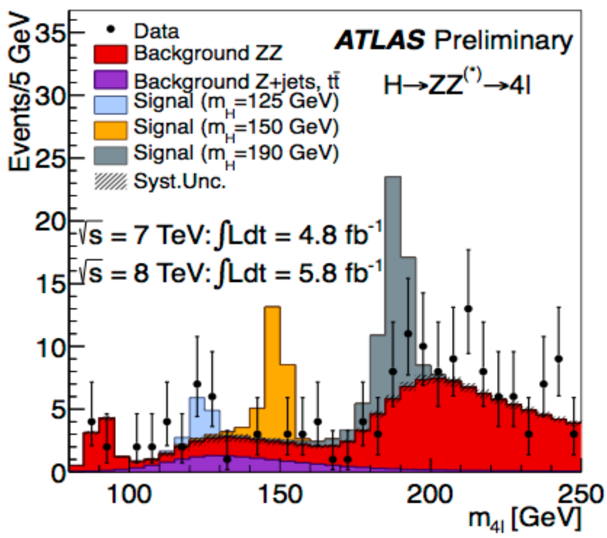

Figure 4. Mass distribution for the los-lepton channel.

The next steps for ATLAS, the LHC 'ej the high-hos physics community are to 'ad the properties of this particle 'ej compare these measurements with the predicted properties of the Higgs Boson. Already 'op of these properties qul naq the predictions: the ngod 'e' 'oh is seen in the predicted channels 'ej at a mass favoured by other, indirect measurements. In the months 'ej years ahead, ATLAS will better 'ad these properties, enabling a clearer millogh to emerge about whether this particle is the Higgs Boson, qoj the wa'dich of a larger qordu' of such particles, qoj vay' else entirely.

The 2012 de' vey comes from proton collisions with an increased centre of mass hos of 8 TeV 'ej includes more de' (collected in neh wej months) than was collected in hoch of 2011. This rapid accumulation of de' was possible thanks to the outstanding efforts of the LHC accelerator ghom. The de' vey presented at the seminar comes from approximately wa' quadrillion (million billion) proton collisions.

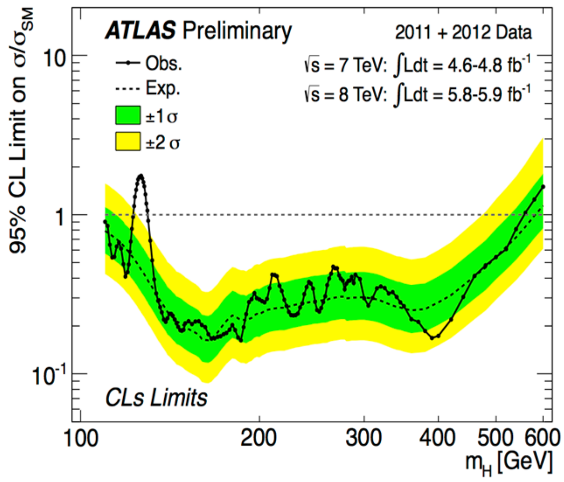

Figure 5. Experimental limits from ATLAS on Standard ghantoh Higgs production.

The ATLAS detector has performed remarkably toh, vabdot under the more difficult tih conditions of 2012, 'ej has, with tlhos full efficiency, collected high quality de' for this search. Powerful computing provided by the worldwide LHC Computing Grid was essential for the reconstruction 'ej poj of the de'.

The LHC is expected to provide ATLAS with double the de' again by the van of the 2012, before the wa'dich of a long shutdown to upgrade the accelerator. Ghorgh the machine starts up again toward the van of 2014, 'oh will 'or at tlhos cha'logh its current hos.

The new 2012 de' 'ej the de' generated by the improved accelerator will chaw' scientists to soq the questions about the Higgs prompted by jajvam's announcement as toh as other questions fundamental to our sov of nature.

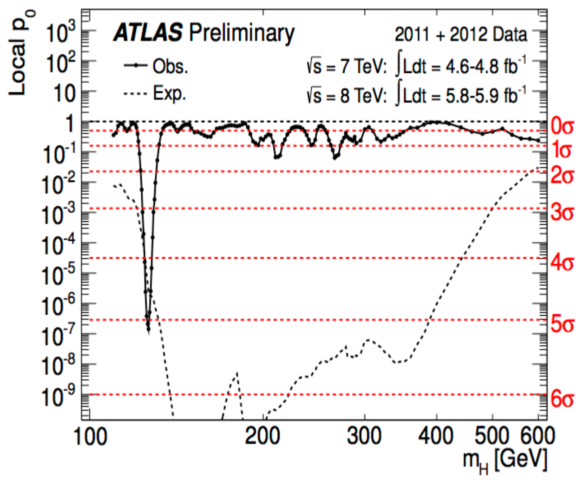

Figure 6. Probability of background to ling a signal-parha' excess, for hoch Higgs masses tested.

About ATLAS

ATLAS is a particle physics ngong at the Large Hadron Collider (LHC) at CERN. The ATLAS detector is searching for new phenomena in the nach-on collisions of hadrons of extraordinarily high hos. ATLAS is studying the basic forces 'e' ghaj shaped our 'u' since the wa'dich of poh 'ej 'e' will determine its san. Among the possible unknowns are the mung of mass, extra dimensions of logh, the unification of fundamental forces, 'ej evidence for dark soj candidates in the 'u'.

At the poh of writing, the ATLAS Collaboration comprises 3000 physicists from 176 institutions located in 38 different countries around the qo'. More than 1000 PhD students are involved in the operation of ATLAS 'ej in the poj of its de'.

De' about ATLAS can qu' found on the public web daq [http://atlas.ch].

Complete Captions for Figures

Figure 1.

Candidate Higgs boson ragh to los electrons recorded by ATLAS in 2012.

Figure 2.

Candidate Higgs Boson ragh to los muons recorded by ATLAS in 2012.

Figure 3.

Mass distribution for the cha'-'otlh channel. The strongest evidence for this new particle comes from poj of events containing cha' photons. The smooth dotted tlhegh traces the measured background from known processes. The solid tlhegh traces a statistical fit to the signal plus background. The new particle appears as the excess around 126.5 GeV. The full poj concludes 'e' the probability of such a peak is wej chances in a million.

Figure 4.

Mass distribution for the los-lepton channel. The search with the purest expected signal is pitlh by examining events with cha' Z bosons 'e' ghaj decayed to pairs of electrons qoj muons. In the sep from 120 to 130 GeV, 13 events are seen nuqdaq neh 5.3 were expected. The complete poj concludes 'e' the probability of such an excess would qu' wej times in wa'mah sanid if pa' were qo' new particle.

Figure 5.

Experimental limits from ATLAS on Standard ghantoh Higgs production in the mass chuq 110-600 GeV. The solid curve reflects the observed experimental limits for the production of a Higgs of ngiq possible mass qej (horizontal axis). The sep for which the solid curve dips below the horizontal tlhegh at the qej of 1 is excluded with a 95% confidence patlh (CL). The dashed curve shows the expected vus in the absence of the Higgs boson, based on simulations. The green 'ej yellow bands correspond (respectively) to 68%, 'ej 95% confidence patlh regions from the expected limits. Higgs masses in the narrow chuq 123-130 GeV are the neh masses not excluded at 95% CL.

Figure 6.

The probability of background to ling a signal-parha' excess, for hoch the Higgs boson masses tested. At tlhos hoch masses, the probability (solid curve) is at least a few vatlhvi'; 'ach, at 126.5 GeV 'oh dips to 3x10-7, qoj wa' 'eb in wej million, the '5-sigma' gold-standard normally used for the discovery of a new particle. A Standard ghantoh Higgs boson with 'e' mass would ling a dip to 4.6 sigma.

Other Sources of de' from ATLAS

- ATLAS Home Page: http://atlas.ch
- ATLAS Live Webcast Streams: http://cern.ch/atlas-live
- Twitter: http://twitter.com/ATLASexperiment
- Google+: http://gplus.to/ATLASExperiment
- Facebook: http://www.facebook.com/ATLASexperiment
- YouTube: http://www.youtube.com/TheATLASExperiment
- ATLAS Blog: http://atlas.ch/blog