

News

LHC End of Proton-run Update & a Christmas Rumour

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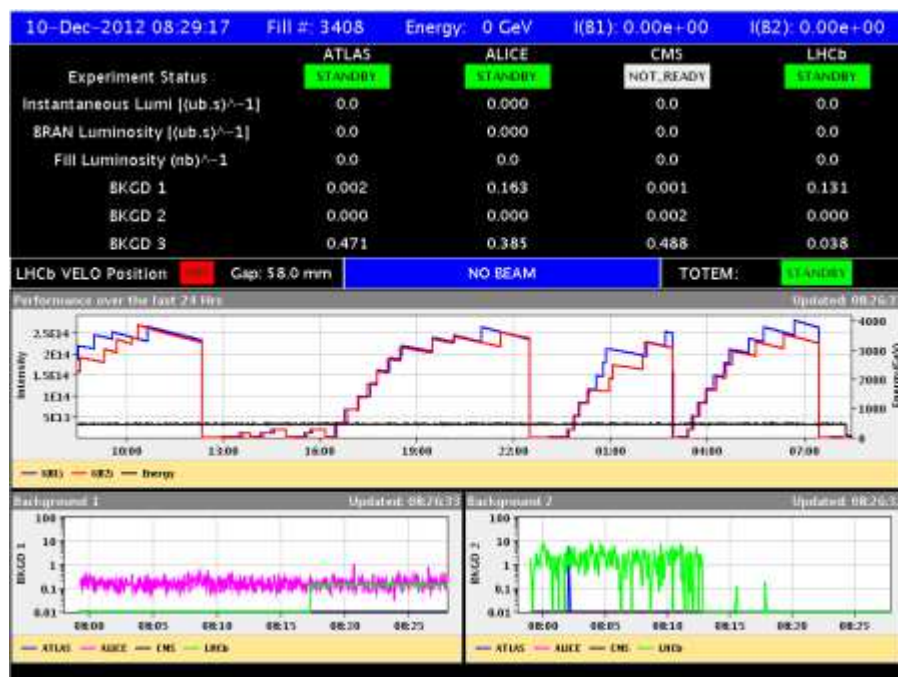
Abstract

This news is adapted from viXra log (<http://blog.vixra.org>) and reports LHC end of proton-run update and a Christmas rumour.

Key Words: LHC, ATLAS, CMS, Higgs.

December 11, 2012: [LHC end of proton-run Update](#)

This week marks the end of proton physics runs at the LHC. The last days are dedicated to machine development and in particular test runs at 25 ns. This shot shows the scrubbing runs during which they filled the collider to its full capacity for the first time. Record intensities of 270 trillion protons per beam were reached with 2748 bunches injected in 288 bunch trains with 25ns spacing. This doubles the intensity numbers used in the proton physics runs this year but it comes at a cost. In the pictures you can see how fast the beam intensity drops due to losses from the e-cloud effect. The purpose of the scrubbing runs this weekend was to clean out the e-cloud and improve beam lifetime. After nine runs the effect was significantly reduced but not fully removed. During the last few remaining days we may see some runs bringing 25ns beams into collision, but perhaps not at these intensities.



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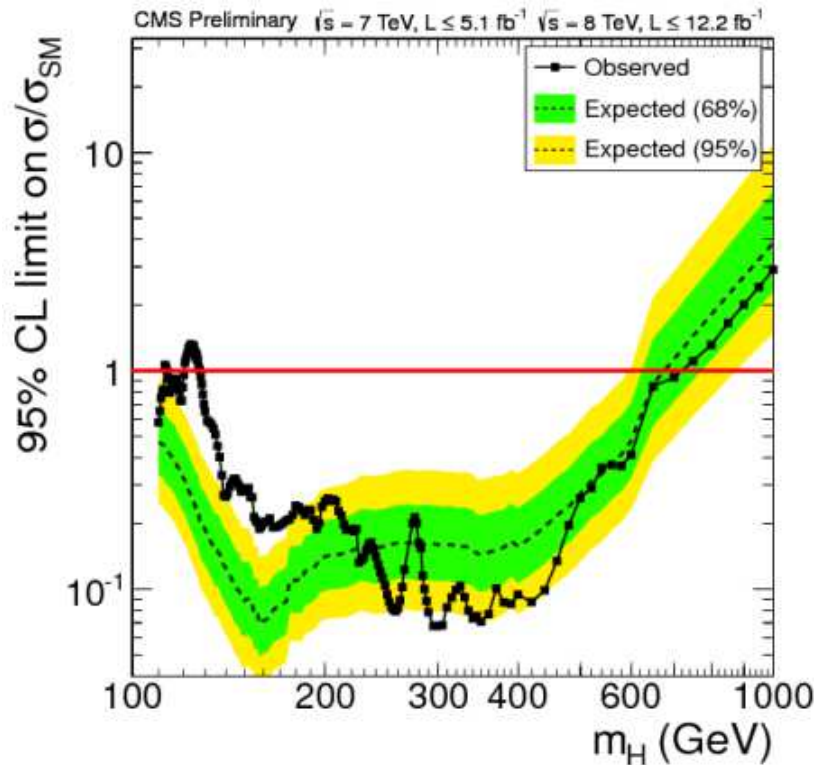
The point of these tests is to work out if and how the next runs can work at 25ns spacing rather than 50ns. That will happen when the LHC restarts at 13 TeV in 2015 after the long shutdown. We still have some heavy ion runs before the shutdown but otherwise it is going to be a long wait for new data.. During the LHCC meeting last week Steve Myres gave an overview of the main considerations for running at 25ns vs 50ns. You can watch the video from [here](#). Myres revealed that other tests had shown that they can increase the brightness of the beams from the injectors by 50% using new optics. In addition to this the beta* in the next runs will come down to 0.5m or perhaps even 0.4m, so with all other things being equal luminosities could be three times as high. The problem is that pile-up with 50ns spacing is already near the limit of what the experiments can take. Switching to 25ns will half the pile-up making the situation much more tolerable. The other alternative would be to use luminosity levelling to artificially keep the luminosity down during the first part of any run.

This means the pressure to run at 25ns is high, it will make a big difference to the physics reach, but the technical issues get very troublesome. As well as the e-cloud problems which could mean losing maximum luminosity far too fast, they also have to worry about excess heating which has already been a problem with this years run forcing them to wait for things to cool down before refills. Another big worry is that UFO events become much more frequent at 25ns so even if they can maintain the luminosity they may keep losing the beams through unplanned dumps. Switching between 25ns and 50ns can lose a week of runs so they must decide which setting to use from the start of 2015 and try to stick to it. This makes the present 25ns tests very important. they had been planned for a few weeks ago to allow plenty of time but some injector problems set them back as explained by Myres in his talk. hopefully they will get all the data they need this week.

Meanwhile this week is also the occasion of the annual [Cern Council Meetings](#). Remember that last year this was the event where they announced the first signs of an excess at 125 GeV in the Higgs searches. There are rumours coming in via twitter of new updates from CMS on Wednesday and ATLAS on Thursday (see calendar comments). There is nothing yet scheduled in indico that I can find apart from a [status update on 13th](#) (not physics) and the [CCM open session](#) on Thursday. We are still waiting for reports of the analysis using 12/fb at 8 TeV that were missing this year at the HCP meeting in Tokyo, especially the diphoton channel. In anticipation here is the latest CMS combo plot that has been around for a few weeks but which has not been much discussed.

The peak at 125 GeV is clear but what about the excesses that continue up to 200 GeV? No doubt these are due to systematic errors and fluctuations that will go away, bur any new updates will be keenly awaited, just in case.

The LHC has now delivered 23/fb to CMS and ATLAS at 8 TeV of which about 20/fb will be usable data. The complete analysis could be ready in time for [Moriond in March](#) with the diphoton over-excess being the most likely centre of attention.

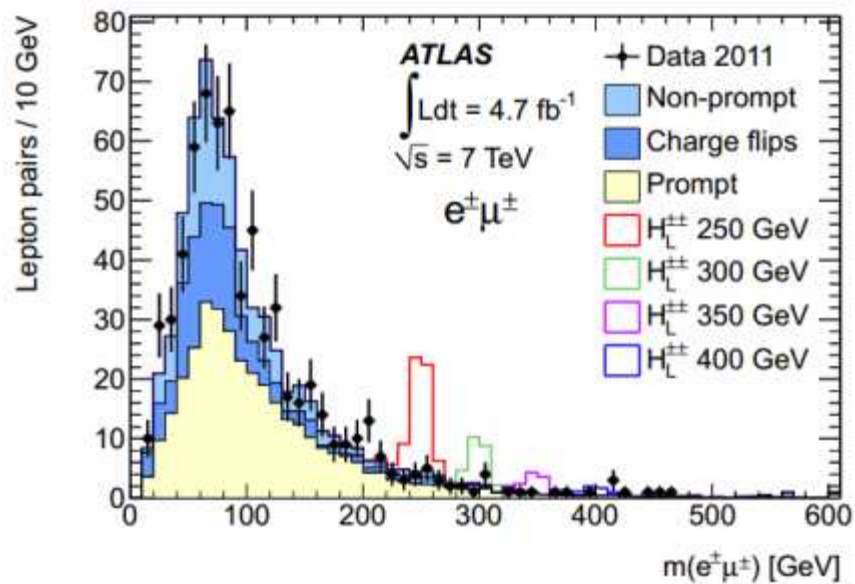


Update: Indications are that the CMS and ATLAS updates were cancelled.

Update: [Peter Woit thinks](#) that ATLAS will give new diphoton and ZZ results at the [LHC status meeting](#) tomorrow. Meetings with this title usually indicate technical updates on the running of the collider and its experiments, not new physics results. It looks a lot like they are trying to spring a surprise by stealth, A presentation later at [KITP](#) confirms that they are planning to talk. It still seems that CMS are not ready to give their diphoton update but they do have a status update.

December 25, 2012: [Christmas Rumour](#)

A rumour has surfaced in the [comments at Not Even Wrong](#) that ATLAS has a 5 sigma signal (local significance?) in like-sign dimuons at 105 GeV. This plot shows the relevant events from an [earlier analysis](#) with 2011 data where a small excess can already be seen.



First thoughts are of a doubly charged Higgs boson as predicted in Higgs triplet models with the potential to also explain the digamma over-excess in the Higgs decays. However, the signal is much weaker than expected for a doubly charged Higgs because CMS and ATLAS have already set lower limits around 300 – 400 GeV for H^{++} . In a [comment here yesterday](#) on the digamma excess Frank Close pointed out that if a doubly charged Higgs is responsible for the digamma excess it should also affect the B_s to dimuon decay ([see e.g. Resonances](#)) which is disappointingly inline with the Standard Model.

Of course the rumour could be incorrect or based on an analysis too preliminary to hold water, but if it pans out it will certainly pose an intriguing puzzle. A particle that decays to two like-signed muons must have lepton number two as well as charge two, unless the decay breaks lepton number conservation or there are missing neutrinos. It could be a spin two particle rather than a scalar. Working out what best fits other observations is not an exercise that can be done in the head, but it will be interesting to see what other first thoughts come out. It is also possible that this could be related to signals in multi-lepton channels that have been seen in the past (see e.g. [Motl at TRF](#)). Until we get an official report at perhaps Moriond 2013 this should not be taken too seriously. Some rumours evaporate during internal review and never see the light of day.

Merry Christmas.

Update: Indication over at NEW are that this rumour is not being backed up by other ATLAS sources. Chances are it will melt away and we will never know its origins.

Update: of course it could also be that the analysis has not been communicated to the whole team yet.

References

1. <http://blog.vixra.org/2012/12/11/lhc-end-of-proton-run-update/>
2. <http://blog.vixra.org/2012/12/25/christmas-rumour/>