

Special Report

Mini Higgs Update & Final Higgs Results Showing Excess Announced by Tevatron

Philip E. Gibbs*

Abstract

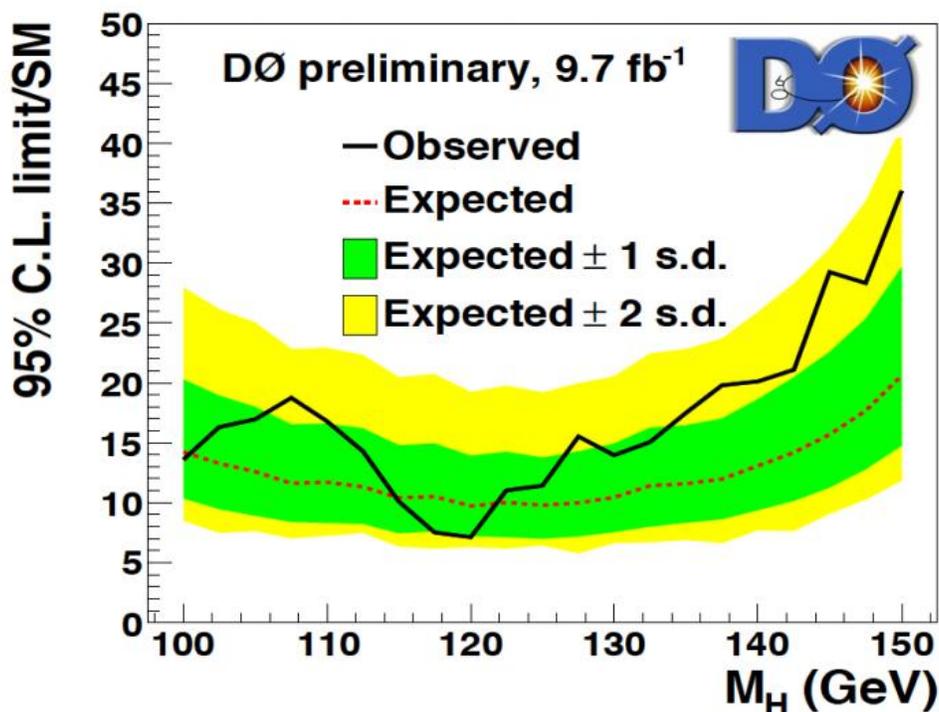
This Special Report contains a mini Higgs update and final Higgs results showing excess announced by Tevatron.

Key Words: Tevatron, final result, Higgs boson, excess signal.

March 2, 2012: [Mini Higgs Update](#)

Today at [La Thuile](#) physicists from the Tevatron and LHC have been giving out a few teasers in preparation for the next Higgs updates expected at Moriond.

Dzero have released a diphoton plot as their first Higgs channel result using the full Tevatron dataset of 9.7/fb ([Satish Desai Desai](#))

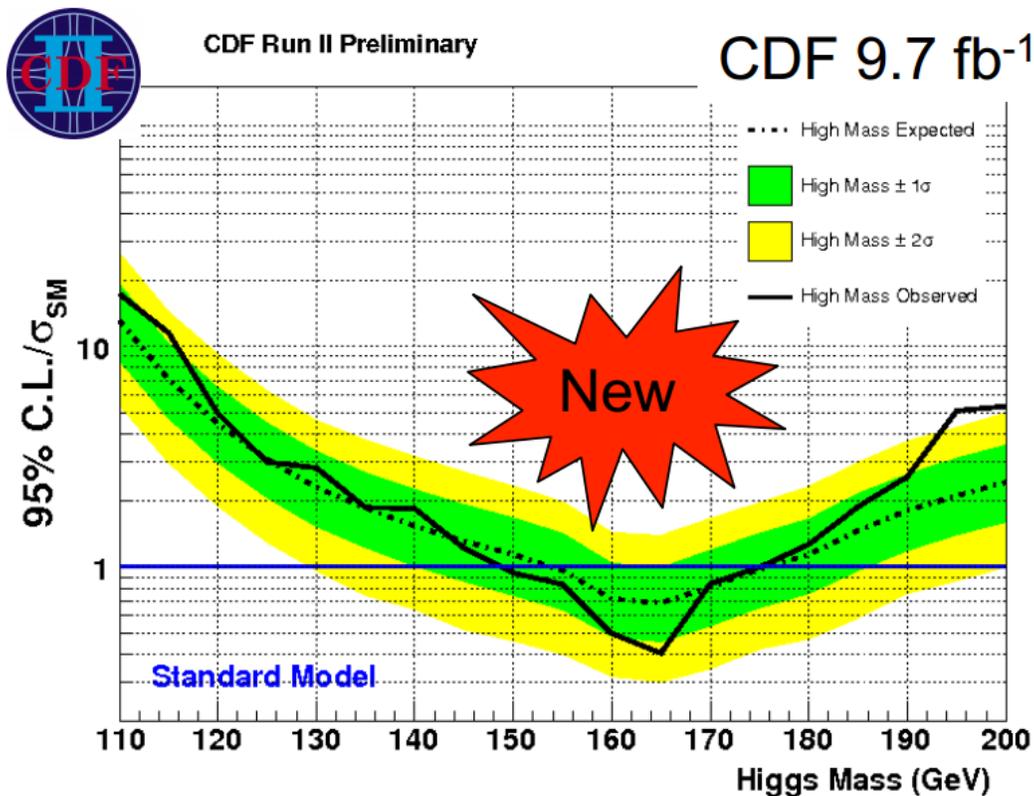


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Note: This report is adopted from <http://blog.vixra.org/2012/03/02/mini-higgs-update/>;
<http://blog.vixra.org/2012/03/07/tevatron-posts-excess-with-final-higgs-results/>

This is a companion to the [equivalent plot from CDF](#) published a month ago. At the LHC this is the most exciting channel but at the Tevatron it does not reach the sensitivity required to tell us anything about a standard model Higgs.

Slightly more interesting is this WW channel plot from CDF which improves on previous limits by about 10% ([Richard StDenis](#)). This is close to the sensitivity where some excess could have emerged but nothing is apparent.

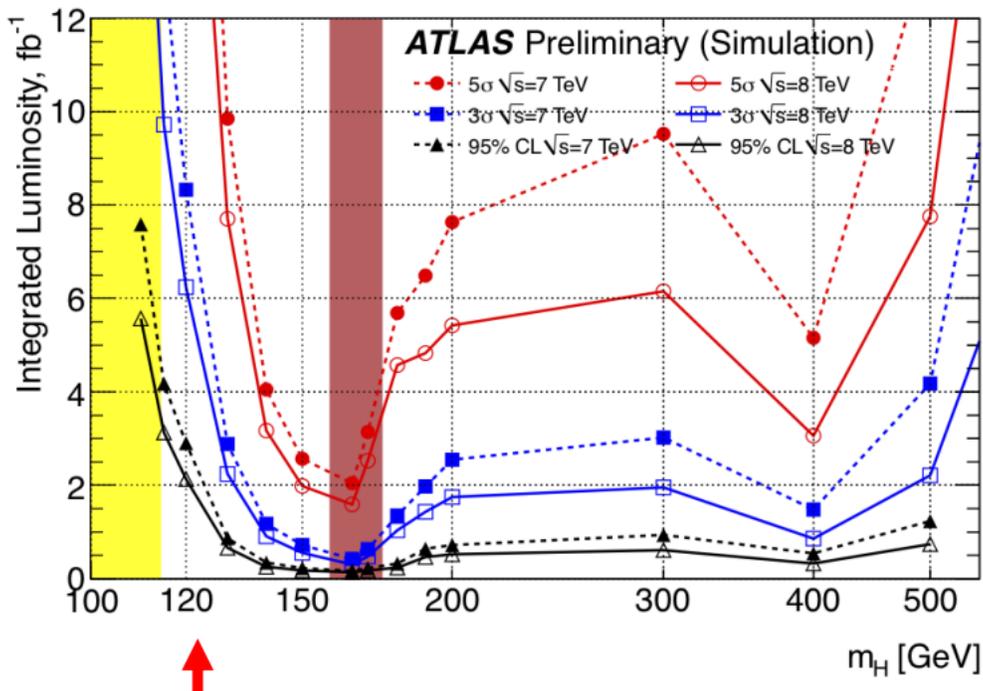


The real interest for the Tevatron is the Higgs decay to two bottom quarks (bb channel) . For that and the combinations we are told to wait until next week which probably means Moriond.

ATLAS and CMS have not provided any new plots yet but ATLAS have reminded us that they still have to update WW, bb and ττ at 5/fb and we are also told to expect news at Moriond from them.

The ATLAS+CMS combinations previously expected for Moriond have apparently been abandoned. With the peak excesses from the two experiments in slightly different places the benefit of doing the combination may not justify the resources needed to produce it. Instead they look set to aim for independent discoveries from both ATLAS and CMS by the end of the year. This will not be an easy task as this plot at the bottom of the ATLAS talk shows ([Junichi Tanaka](#)) The 8 TeV energy improves the cross section by 30% and 3 sigma sensitivity is within easy reach with 2012 data, perhaps even in time for ICHEP, but 5 sigma discovery quality results

require the full years run and some good luck. A run extension and a combination with 2011 data may be needed to polish it off. The same goes for CMS of course, and there is always the possibility that they will end the year with one team having better luck than the other.

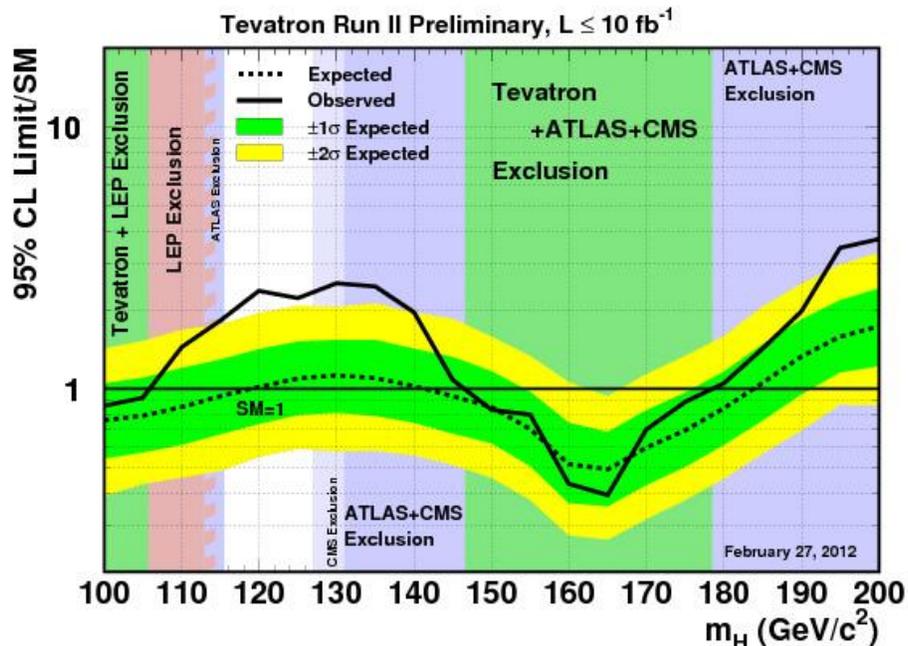


In any case the arrow on this plot shows that they already know where the Higgs is.

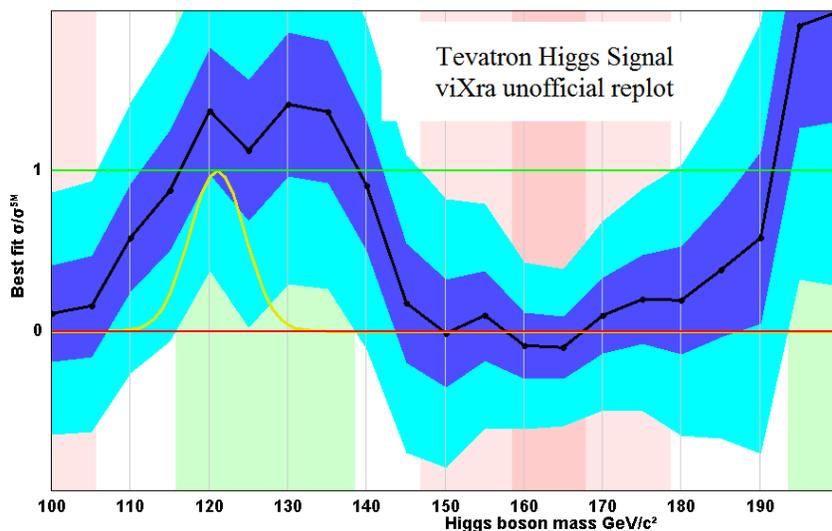
CMS also presented today ([Josh Bendavid](#)) but they have already given us everything they have for Higgs in 2011 data.

March 7, 2012: [Tevatron Posts Excess with Final Higgs Results](#)

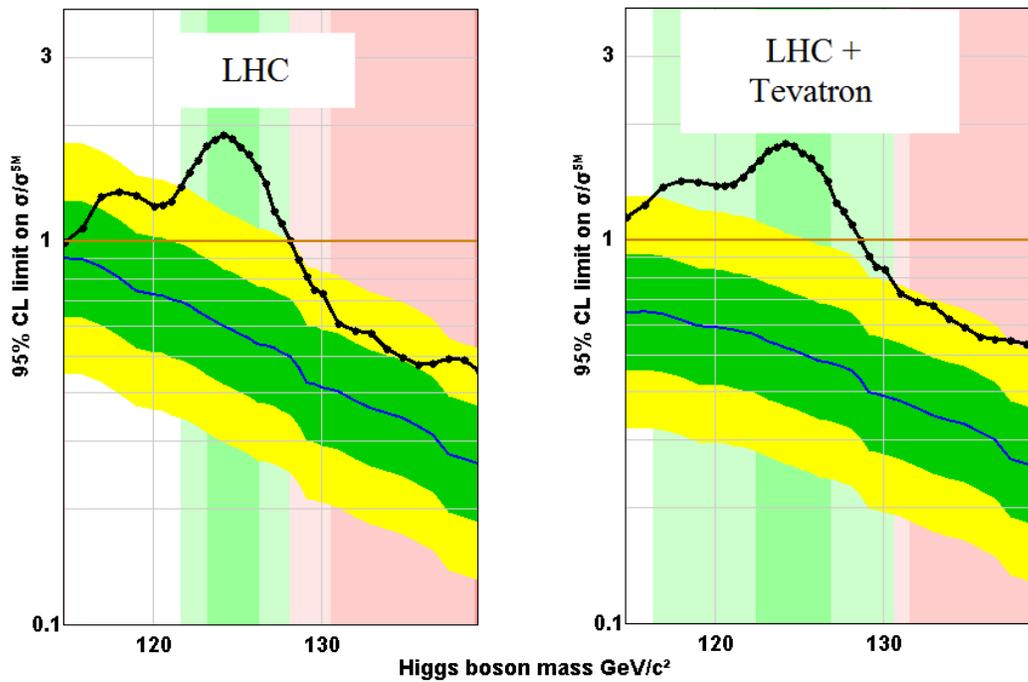
Today is another big day for the Higgs boson and this time it is the turn of Fermilab to give us some new information. The venue for the latest offerings is the conference in Moriond. The talks are still ongoing but the main plot has already been shown. (see [QDS](#))



Later I will give a new combination with the LHC results which may also be updated today, but for now here is a useful variation on the plot showing it as a Signal curve. In this plot the zero line represents no Higgs boson while the line at one is expected for the standard model Higgs boson. What we see is a signal perfectly consistent with a boson in the mass region of about 115 GeV to 140 GeV. The mass resolution is not as good as the LHC results and the significance of the excess is less but consistency with the other results is what we were hoping for, so well done to CDF and D0 for this nice final Higgs result from them.



Update: Here is the combination of the new Tevatron data with the latest ATLAS and CMS. On the left is just ATLAS+CMS on their own, and on the right the Tevatron is included. (Remember these are just my unofficial approximate combinations) The result is a small improvement in the overall level of the peak excess.



References

1. <http://blog.vixra.org/2012/03/02/mini-higgs-update/>
2. <http://blog.vixra.org/2012/03/07/tevatron-posts-excess-with-final-higgs-results/>