

Special Report

Refined Higgs Rumours

Philip E. Gibbs*

Abstract

We report here refined Higgs rumours before the December 13, 2011 announcement by CERN about Higgs search results of LHC.

Key Words: Higgs Boson, rumour, CERN, LHC.

December 12, 2011: [Refined Higgs Rumours](#)

Jester has kindly provided some [more refined rumours](#) to give us something to talk about and make the time go quickly while we wait for the Big Event. Here are my comments

“The Standard Model Higgs boson is excluded down to approximately 130 GeV, but not below.”

Very nice but this will be using the WW channel. I don't fully trust this decay mode for exclusions in the lower energy range because of the poor energy resolution. Previously we have seen both exclusions and excesses near this region. It could mean that there is a non-standard Higgs Boson at 140 GeV that might appear to have lower signal because e.g. it decays to something unknown. It could also just be an effect of the poor WW resolution. I will be looking to see what happens at the 140 GeV point in the combined diphoton and $ZZ \rightarrow 4l$ channel without WW to understand this better.

“As already reported widely on blogs, both experiments have an excess of events consistent with the Higgs particle of mass around 125 GeV.”

The interesting thing here is going to be to see how big the excess is when the two experiments are combined. Combining the excess strengths is not just a matter of adding in quadrature. That gives just a crude approximation. I will do a better approximation when I have the data. I am also wondering whether the size of the signal is consistent with a Standard Higgs or bigger. I think it has to be bigger by a factor of two because we only expect 2-sigma significance without the WW channel. I will also look forward to seeing how this shows up on the raw event count plots. Overall a lot of what is seen here will be noise because the sensitivity is still relatively low, but a high sigma combined excess would mean there is probably something.

“The excess is larger at ATLAS, where it is driven by the $H \rightarrow \gamma\gamma$ channel, and supported by 3 events reconstructed in the $H \rightarrow ZZ^* \rightarrow 4l$ channel at that mass. The combined significance is around 3 sigma, the precise number depending on statistical methods used, in particular on how one includes the look-elsewhere-effect.”

* Correspondence: Philip E. Gibbs, Ph.D., Independent Researcher, UK. E-Mail: phil@royalgenes.com

Note: This report is adopted from <http://blog.vixra.org/2011/12/12/refined-higgs-rumours/>

How close in energy are these three events? That could be key. In any case we should not expect much contribution from ZZ at 125 GeV yet. The channel is just not sensitive enough with 10/fb and will be mostly weighted out in the combination with diphoton.

“CMS has a smaller excess at 125 GeV, mainly in the $H \rightarrow \gamma\gamma$ channel, but their excess in $H \rightarrow 4l$ is oddly shifted to somewhat lower masses of order 119 GeV. All in all, the significance at 125 GeV in CMS is only around 2 sigma.”

No surprise that the CMS ZZ result is inconsistent. There is too much noise in this channel at < 130 GeV to know what is the real signal at this point. At the end of next year it will start to come through. For now it will add just a little contribution to the diphoton channel. 2 sigma is very little but when combined with ATLAS it adds up.

“With some good faith, one could cherish other 2-sigmish bumps in the $\gamma\gamma$ channel, notably around 140 GeV. Those definitely cannot be the signal of the Standard Model Higgs, but could well be due to Higgs-like particles in various extensions of the Standard Model.”

Indeed, but the big question is whether the 140 GeV bumps previously seen in the ZZ channel are still there. This is now very sensitive at 140 GeV so we should know something. Since there is no rumour about this it might mean that nothing is there and the diphoton bump is just the remainder of the big excess seen there in the summer.

Aside from all that we are interested to see what remains at higher mass, especially around 240 GeV and 600 GeV. Stay tuned.

References

1. <http://blog.vixra.org/2011/12/12/refined-higgs-rumours/>