Higgs 2011: Will LEE Hide the Higgs ?

by Frank Dodd (Tony) Smith Jr.

Abstract:

An ATLAS plot at EPS HEP 2011 showed 3 Higgs state peaks:
low mass state (Higgs mass around 150 GeV)
middle mass state (Higgs mass around 200 GeV)
high mass state (Higgs mass around 250 GeV)

A preliminary CMS plot for EPS HEP 2011 showed the same 3 Higgs state peaks
but for the plot shown at EPS HEP 2011CMS used a Look Elsewhere Effect (LEE)
that flattened the 200 GeV and 250 GeV peaks into insignificance.

Since the same location of the 3 peaks was independently shown by ATLAS
the CMS use of LEE was improper
so CMS should remove the LEE processing from its plot.

(References are included in the body of the paper and in linked material.)

Higgs 2011:
? Will LEE Hide the Higgs ?

Frank Dodd (Tony) Smith Jr - 2011

EPS HEP 2011 was held in Grenoble 21-27 July 2011.

On 21 July 2011 Fermilab issued a press release saying:
"... The Higgs particle, if it exists, most likely has a mass between 114-137 GeV...".

On 22 July 2011 the LHC collaboration CMS issued a press release saying:
"... At a ... confidence level of 90%,
the existence of a Higgs boson is excluded for the range 145-480 GeV ...
a modest excess of events is observed for Higgs boson masses below 145 GeV ...".

On 22 July 2011 a Nature News article by Geoff Brumfiel said:
"... ATLAS and CMS ... are seeing an unusual surplus of events in a rough mass range of 130-150 ...[GeV]... The data are far from conclusive, but physicists believe this could be the first indication of the Higgs particle ...".

So, the superficial Press Release / Nature version
of the EPS HEP 2011 Higgs search seems to be:

There is only one Higgs Boson.
It is the Standard Model Version with mass around 145 GeV.

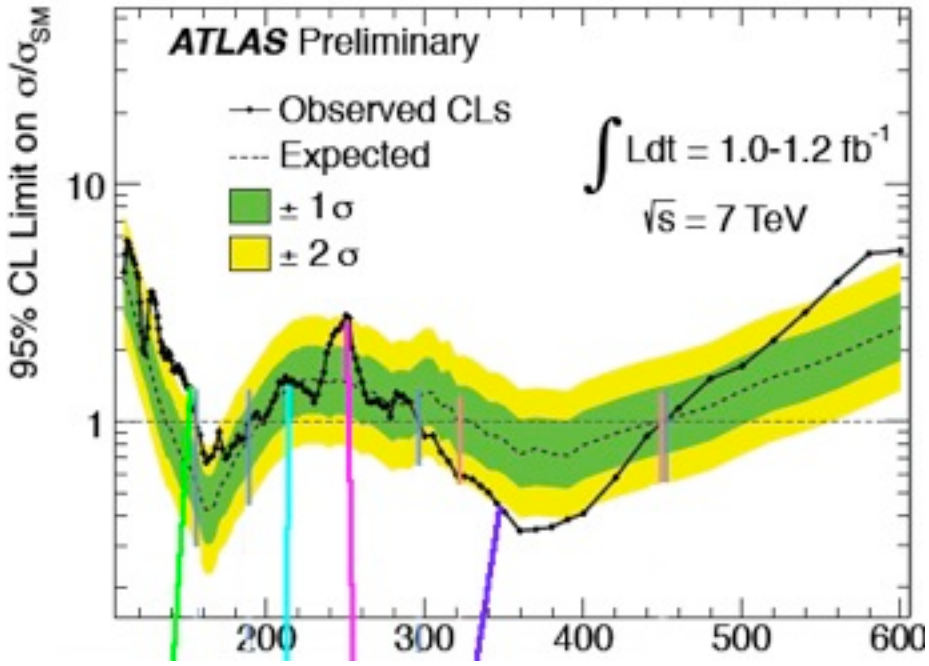
There are no more Higgs Bosons up to 480 GeV.
Now we only need to do more experiments around 145 GeV to get better statistics and more data on detailed properties.

BUT, on 23 July 2011 a BBC article by Paul Rincon said:
"... The most significant excess ... seen by both the Atlas and CMS teams ... is seen at a mass of 145 GeV ...
Another fluctuation is seen by ... Atlas ... at the higher mass of 250 GeV ..."

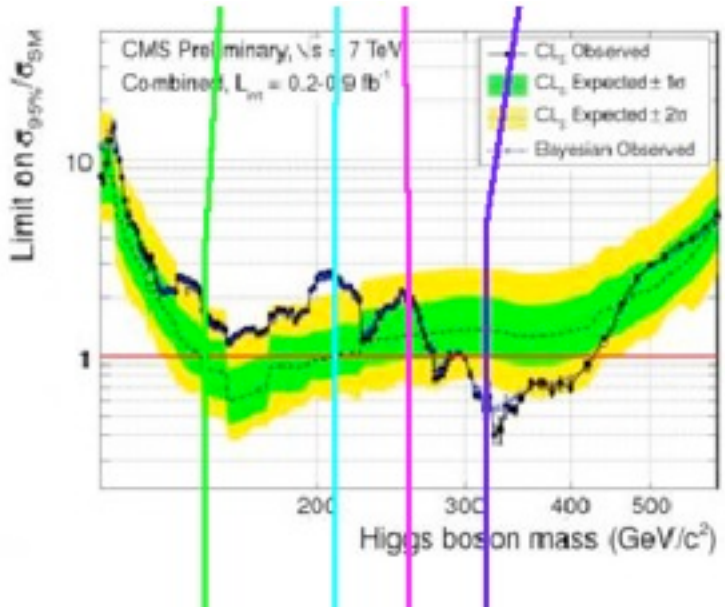
which is in the CMS 90% exclusion zone for the range 145-480 GeV.

??? WHAT IS GOING ON ???

The ATLAS 250 GeV fluctuation peak (nearly 3 sigma) is shown on the ATLAS EPS HEP 2011 plot immediately below indicated by a magenta line (I added the green, cyan, magenta, and purple indicator lines).



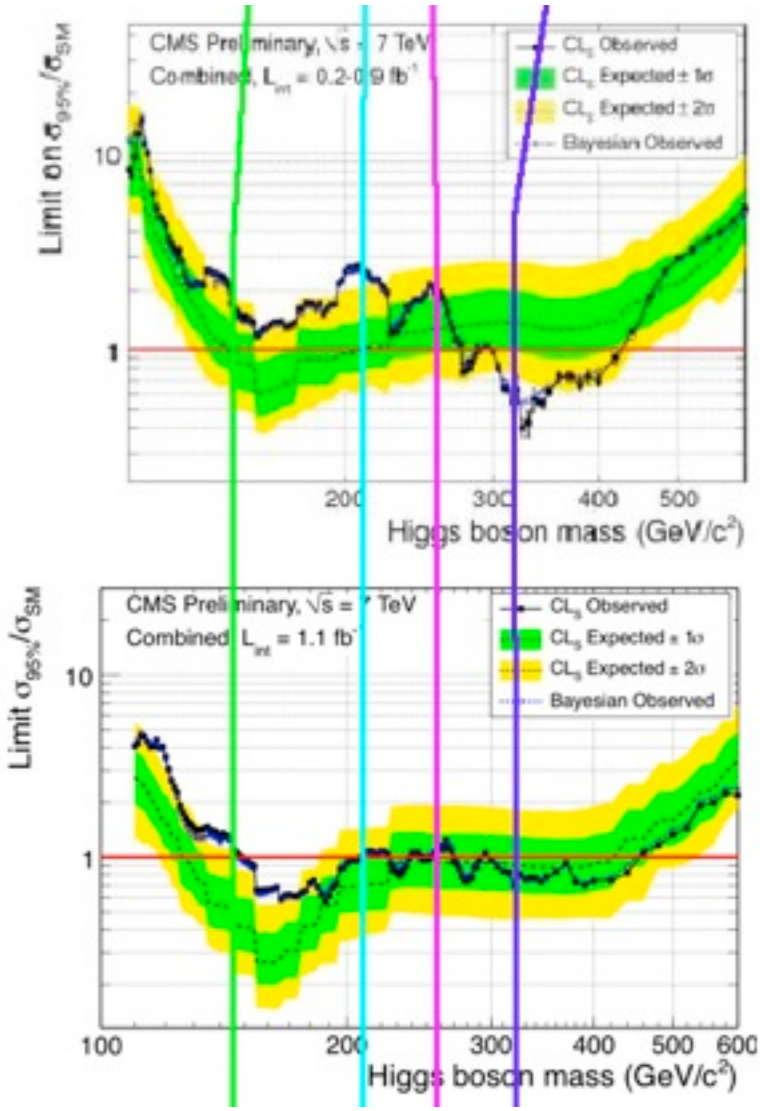
It corresponds to a peak (nearly 2 sigma) in a preliminary CMS plot shown at Fermilab prior to EPS HEP 2011 which peak is also indicated by a magenta line.



The ATLAS plot and preliminary CMS plot also have in common:
a peak around 150 GeV (green line); a peak around 200 GeV (cyan line); and a valley around 300-400 GeV (purple line) mass of a Higgs condensate t-tbar pair.

With clear data peaks around 200 GeV and 250 GeV
in both the ATLAS plot and the CMS preliminary plot:
How could CMS justify its 22 July 2011 press release saying:
"... At a ... confidence level of 90%,
the existence of a Higgs boson is excluded for the range 145-480 GeV ...".
???

The CMS plot that was released at EPS HEP 2011 on slides by Andrey Korytov had only one peak: around 150 GeV (over 2 sigma). The 200 GeV and 250 GeV high-mass (that is, over 180 GeV) peaks were shrunken to insignificance:



How did CMS justify shrinking the high-mass peaks and valley
???

The CMS EPS HEP 2011 slides indicate that the data for the two high-mass peaks came mostly from Higg to ZZ decays, as to which the slides said

"… **Interpretation requires look-elsewhere correction** …"

and (for the Higgs -> ZZ -> 4l)

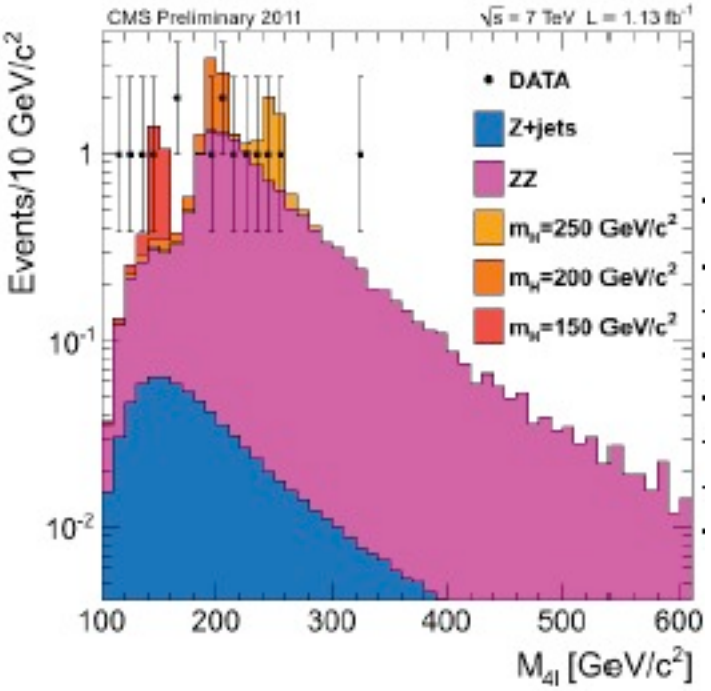
"… **LEE is about O(100) and washes out significance of excesses** …"

so it appears that application of LEE (Look Elsewhere Effect) flattened the 200 GeV and 250 GeV peaks and (with respect to CMS analysis) killed them.

Although such LEE flattening may be justifiable for a blind search over a wide range of hundreds of GeV, **it is improper to use LEE when an independent source such as ATLAS has indicated the locations of three peaks (150 GeV, 200 GeV, and 250 GeV) and a valley (300-400 GeV) and CMS data shows three peaks and a valley that correspond to those of ATLAS**.

CMS might say that they did not know of the ATLAS results when CMS did the LEE flattening, but now CMS knows about the ATLAS results and therefore should remove LEE flattening from its plot.

Further, CMS itself used a 3-peak plot with peaks around 150 GeV, 200 GeV, and 250 GeV in its analysis of Higgs -> ZZ -> 4l decay



so that CMS itself has considered it useful to look for 3 Higgs mass states in the same mass regions as the 3 mass states caculated by my E8 Physics model.