

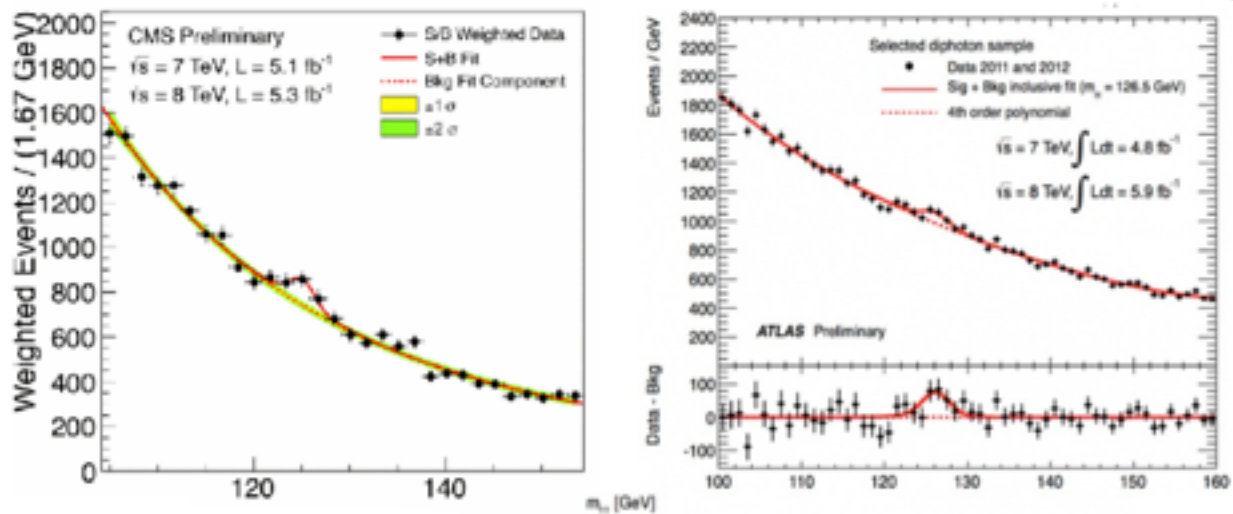
Has Fermi LAT seen the Higgs ?

Frank Dodd (Tony) Smith, Jr. - 2012

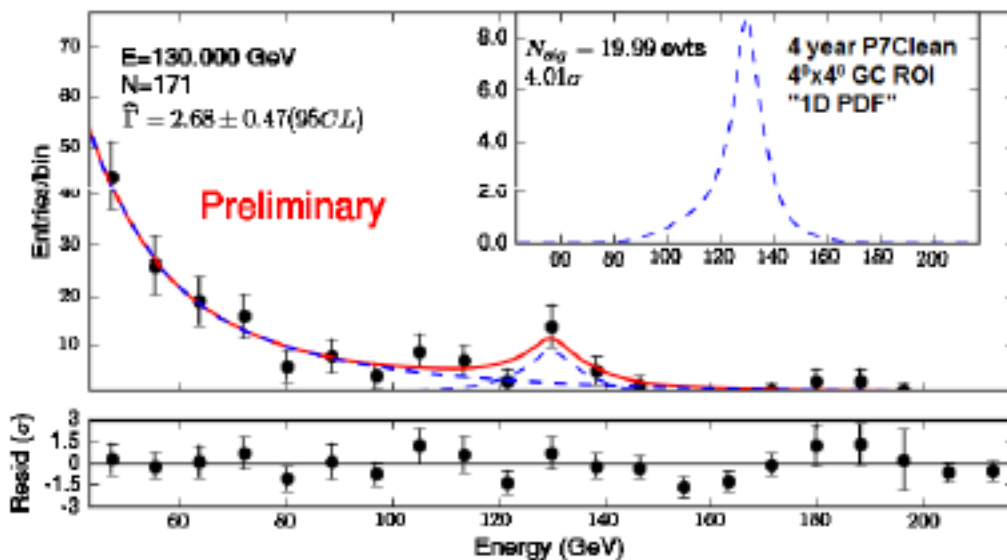
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Sagittarius A* (Sgr A*) is a very massive black hole in the center of our Galaxy into which large amounts of Hydrogen fall. As the Hydrogen approaches Sgr A* it increases in energy, ionizing into protons and electrons, and eventually producing a fairly dense cloud of infalling energetic protons whose collisions with ambient protons are at energies similar to the proton-proton collisions at the LHC.

LHC diphoton histograms for ATLAS and CMS as of mid-2012 clearly show a peak that probably is evidence of a Higgs boson with mass around 125 GeV.

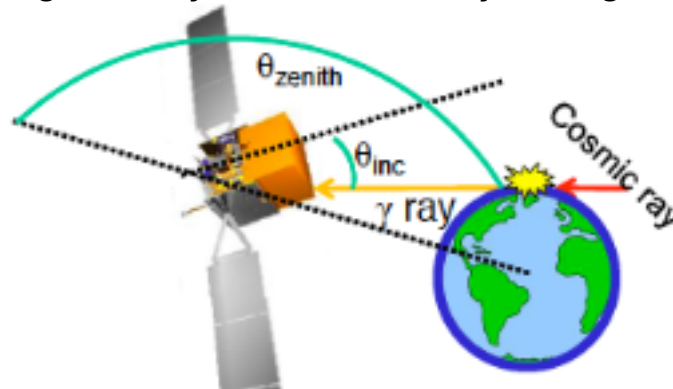


Andrea Albert at The Fermi Symposium 11/2/2012 said: "... gamma rays detectable by the Fermi Large Area Telescope [FLAT] ...



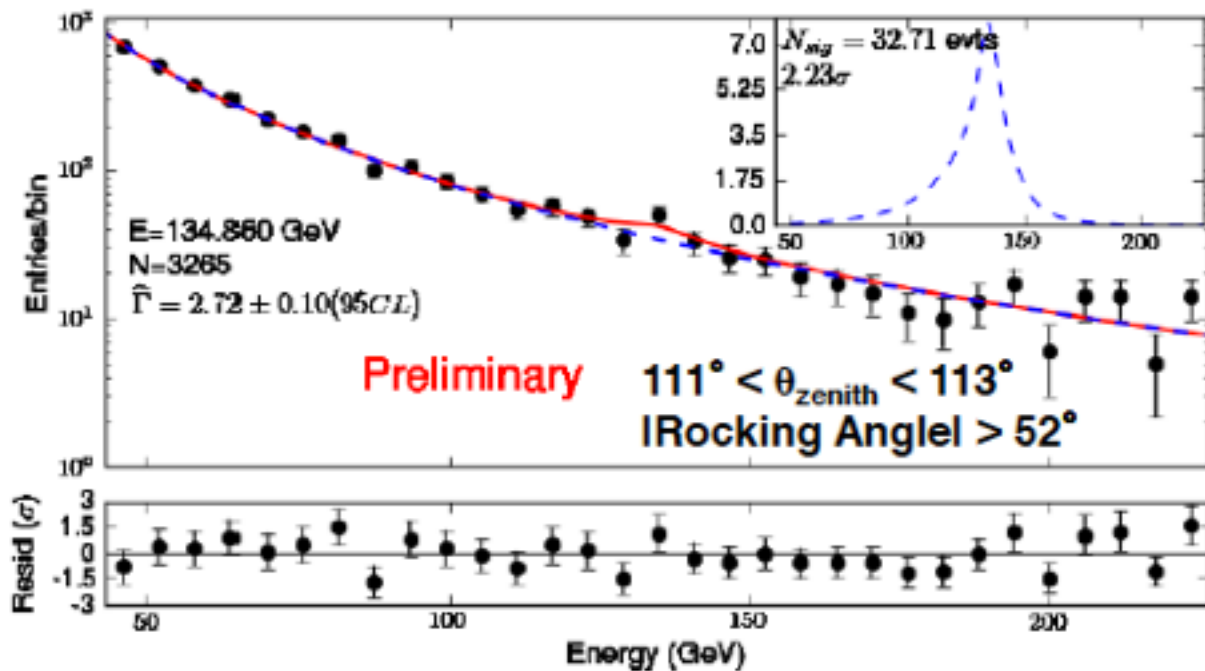
... Line-like Feature near 135 GeV ... localized in the galactic center ...".

In addition to the Galactic Center observations,
Fermi LAT looked at gamma rays from Cosmic Rays hitting Earth's atmosphere



by looking at the Earth Limb.

Andrea Albert at The Fermi Symposium 11/2/2012 also said: "... Earth Limb is a bright gamma-ray source ... From cosmic-ray interactions in the atmosphere ...



Fermi LAT Spectral Line Search

11/02/2012

... Line-like feature ... at 135 GeV .. Appears when LAT is pointing at the Limb ...".

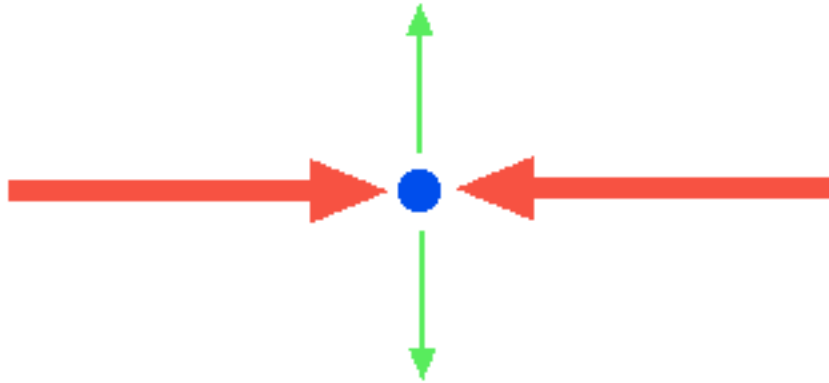
Since 90% of high-energy Cosmic Rays are Protons and since their collisions with Protons and other nuclei in Earth's atmosphere produce gamma rays, the 135 GeV Earth Limb Line seen by Fermi LAT is also likely to be the Higgs produced by collisions analogous to those at the LHC.

Olivier K. in a comment in Jester's blog on 10 November 2012 said:
"... Could the 135GeV bump be related ... to current Higgs ... properties ? ...
The coincidence between GeV figures ...[for LHC] Higgs mass and this [FermiLAT] bump is thrilling for an amateur like me..."

Jester in his resonances blog on 17 April 2012 said, about Fermi LAT:
"... the plot shows the energy of *single* photons as measured by Fermi, not the invariant mass of photon pairs ...".

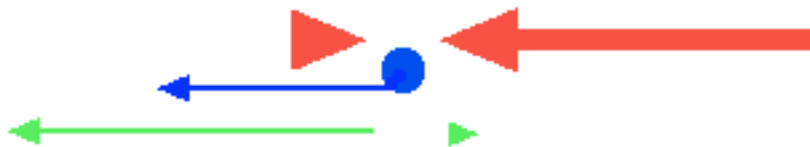
Since the LHC 125 GeV peak is for "invariant mass of photon pairs" and the Fermi LAT 135 GeV peak is for ""single" photons" how could both correspond to a Higgs mass state around 130 GeV ?

The LHC sees collisions of high-energy protons (red arrows) forming Higgs (blue dot)



with the Higgs at rest decaying into a photon pair (green arrows) giving the observed Higgs peak (around 130 GeV) at **invariant mass of photon pairs**.

Fermi LAT at Galactic Center and Earth Limb sees collisions of one high-energy proton with a low-energy (relatively at rest) proton forming Higgs



with Higgs moving fast from momentum inherited from the high-energy proton decaying into two photons: one with low energy not observed by Fermi LAT and the other being observed by Fermi LAT as a high-energy gamma ray carrying almost all of the Higgs decay energy (around 130 GeV) as a **"single" photon**.

Therefore, **the coincidence noted by Olivier K. is probably a realistic phenomenon.**

Jester, replying to the comment by Olivier K., dismissed the proposal that Fermi LAT may have seen the Higgs, saying on 11 November 2012:

"Afaik,
there's no model connecting the 130(5)GeV Fermi line to the 125 GeV Higgs."

so

I hereby propose a model:

Protons from Hydrogen infalling into Sgr A* acquire enough energy and density to produce proton-proton collisions similar to those at the LHC, as could Cosmic Ray Protons hitting the Earth's atmosphere, and the 135 GeV Line observed by Fermi LAT is due to proton-proton collisions producing Higgs in the diphoton channel and the 125 GeV Higgs-like evidence observed by ATLAS and CMS is also due to proton-proton collisions producing Higgs in the diphoton channel and the difference between 135 GeV at Fermi LAT and 125 GeV at LHC can be accounted for by comparing details of experimental setup and analysis-related assumptions.

Given that model,

I propose that Olivier K. be given credit for stating the possibility that both Fermi LAT and the LHC have indeed seen the Higgs,

which is an interesting example of

mutual confirmation of Collider Physics and Astrophysics observations.