

Some (BSM) impressions from EPS

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Outline

- 1 H-125
- 2 A new particle
- 3 Light higgs search
- 4 A wiggle

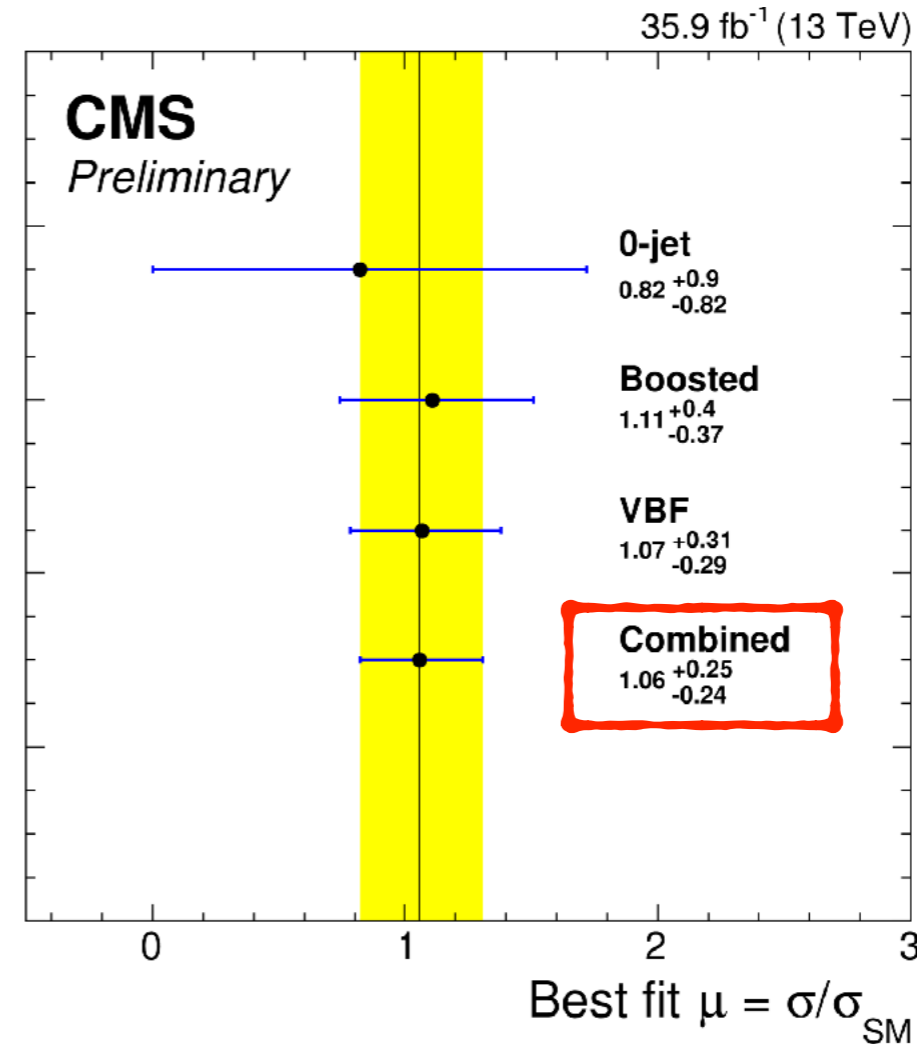
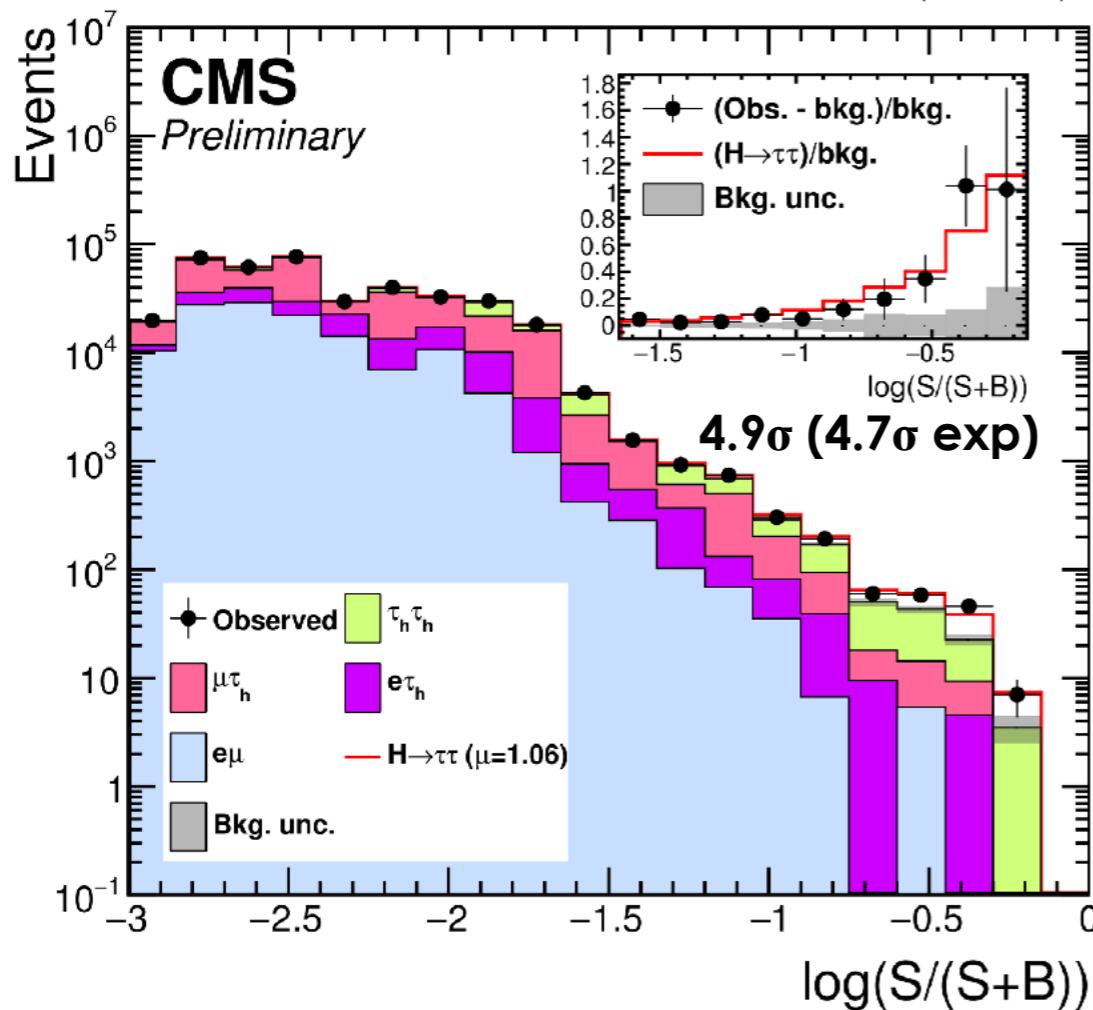
News about the 125 GeV Higgs

OBSERVATION OF $H \rightarrow \tau\tau$



CMS HIG-16-043

35.9 fb⁻¹ (13 TeV)



sensitivity driven by VBF & boosted category

4 $\tau\tau$ channels ($\tau_h\tau_h$, $e\tau_h$, $\mu\tau_h$, $e\mu$) x 3 categories (0-jet, boosted, VBF)

2D fit signal extraction: $m_{\tau\tau}$ vs (τ decay mode, $p_{T\tau}$, di-jet mass)

Observation of $\tau\tau$ decay mode from a single experiment: 4.9 σ (4.7 σ exp), 5.9 σ when combined with CMS Run1

EVIDENCE FOR $H \rightarrow bb$

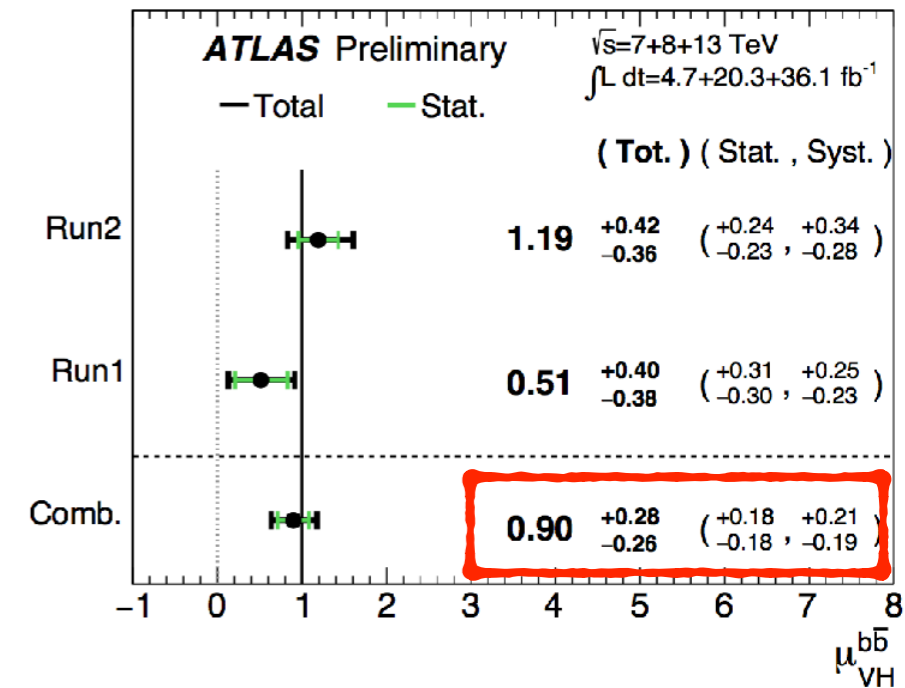
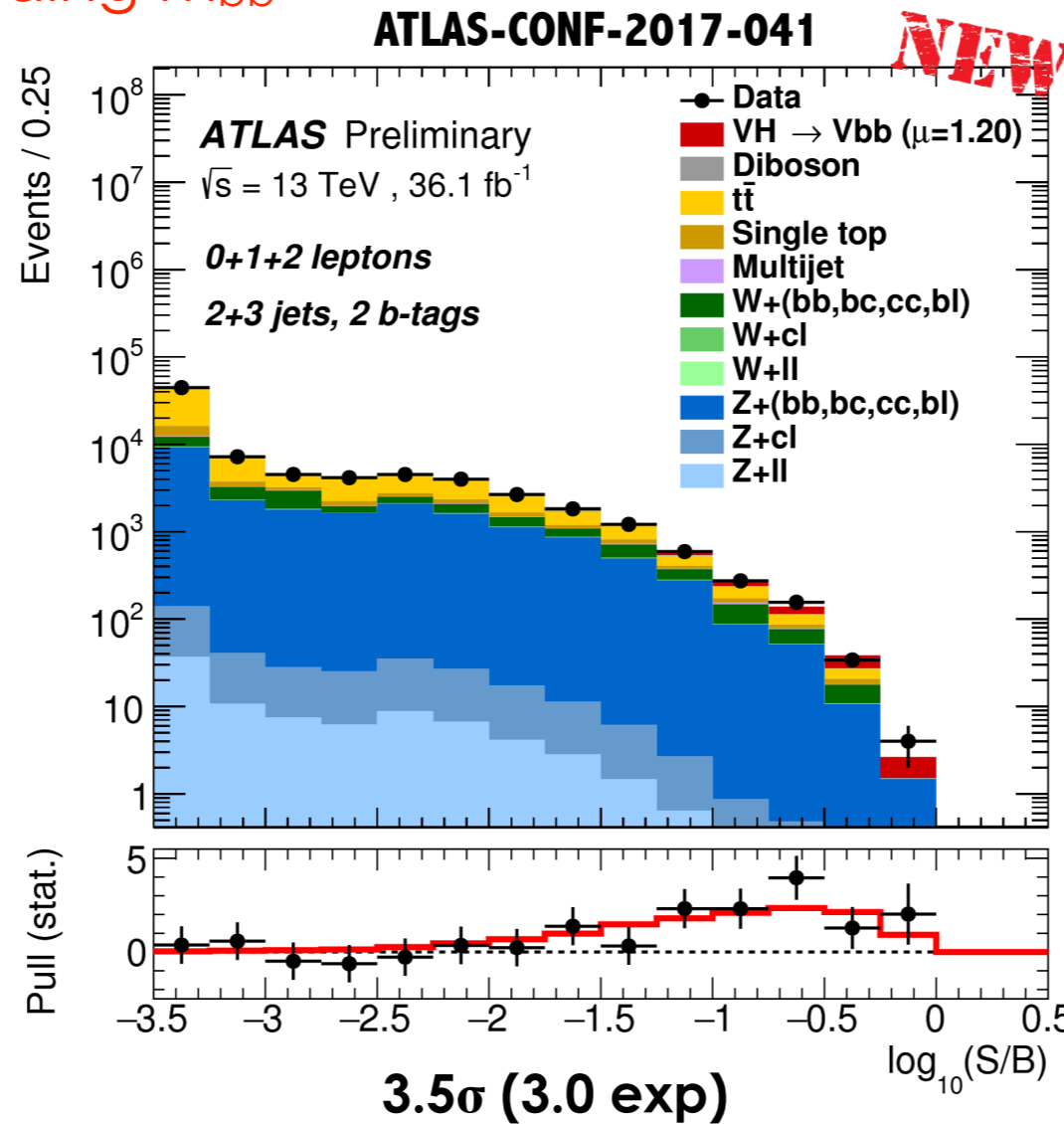
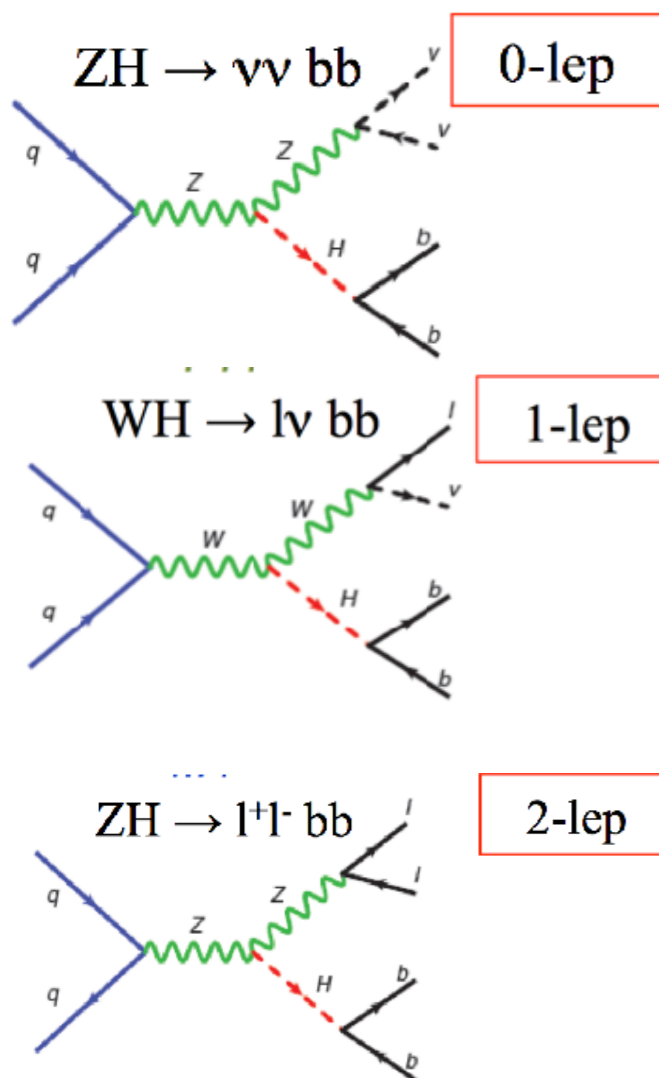
$H \rightarrow bb$: Run1 ATLAS+CMS 2.6σ (3.7 exp)

VH($\rightarrow bb$) production: overcome large QCD background

3 channels: 0,1,2 leptons

Backgrounds: W/Z +jets, $t\bar{t}$

Observable: **BDT including m_{bb}**



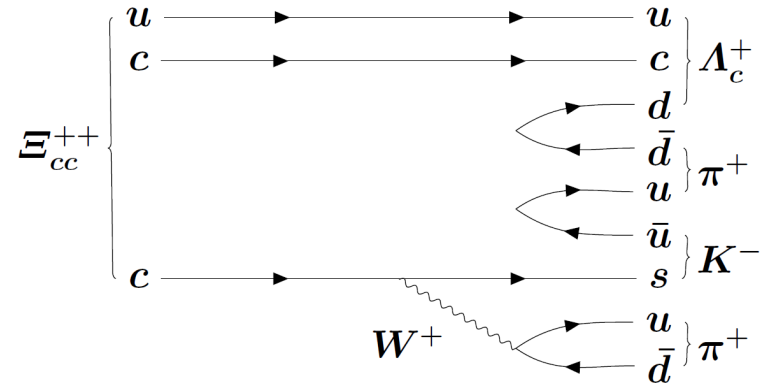
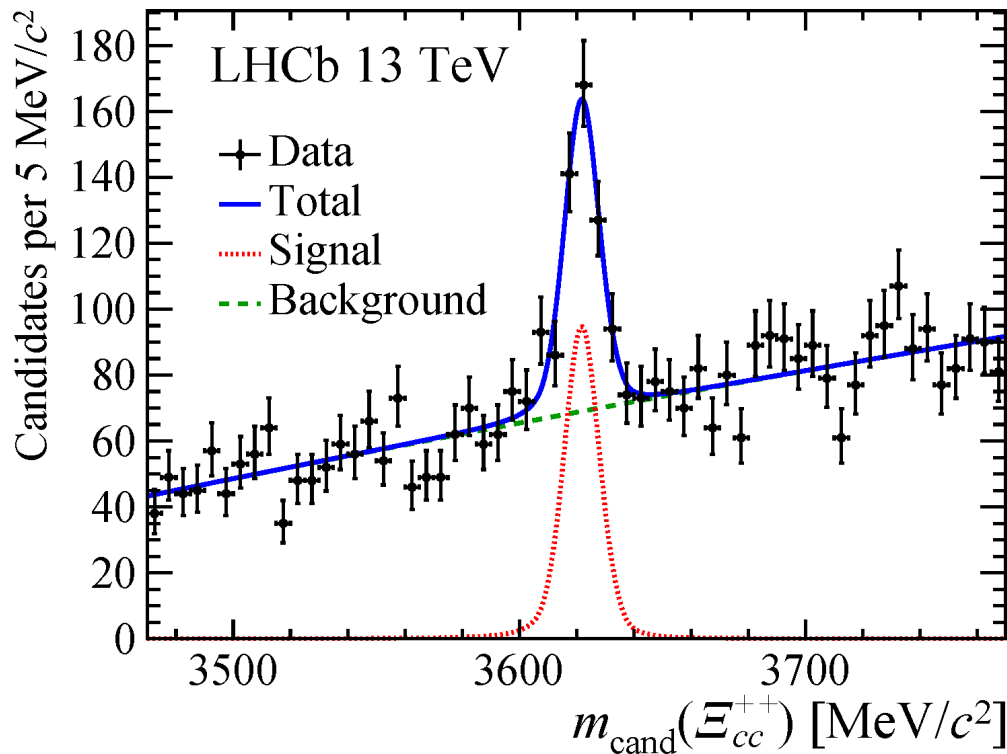
Evidence for VH(bb): 3.6σ when combined with ATLAS Run1

A new particle

There was a **discovery**, after
all ...

LHCb highlights

- ▶ Exceptionally charming particle: doubly charmed particle
 - ▶ Ξ_{cc}^{++} , a baryon



This discovery opens a new field of particle physics research.

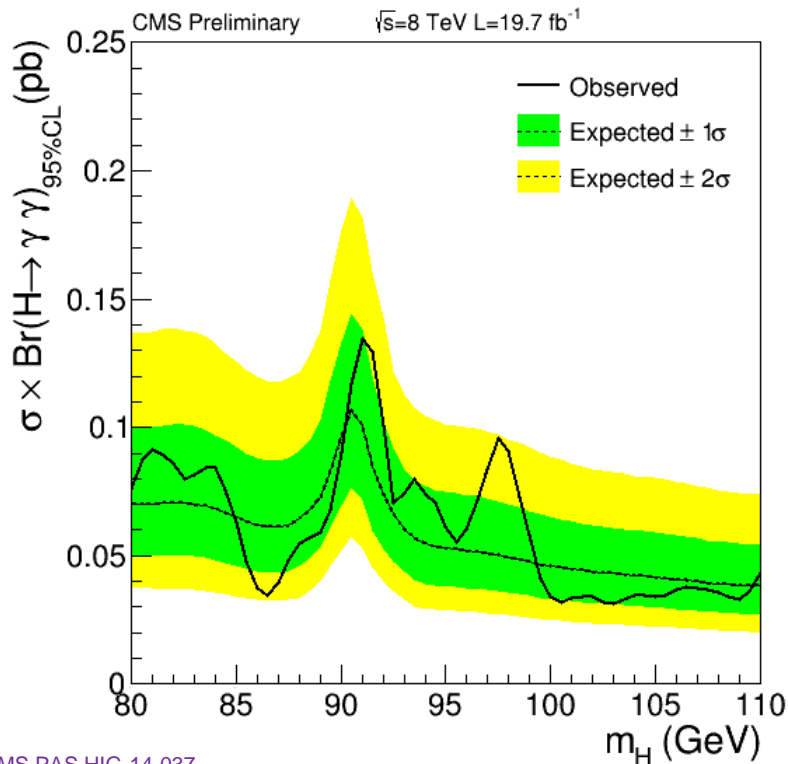
→ An entire family of doubly charmed baryons related to the Ξ_{cc}^{++} is predicted!

Light higgs search

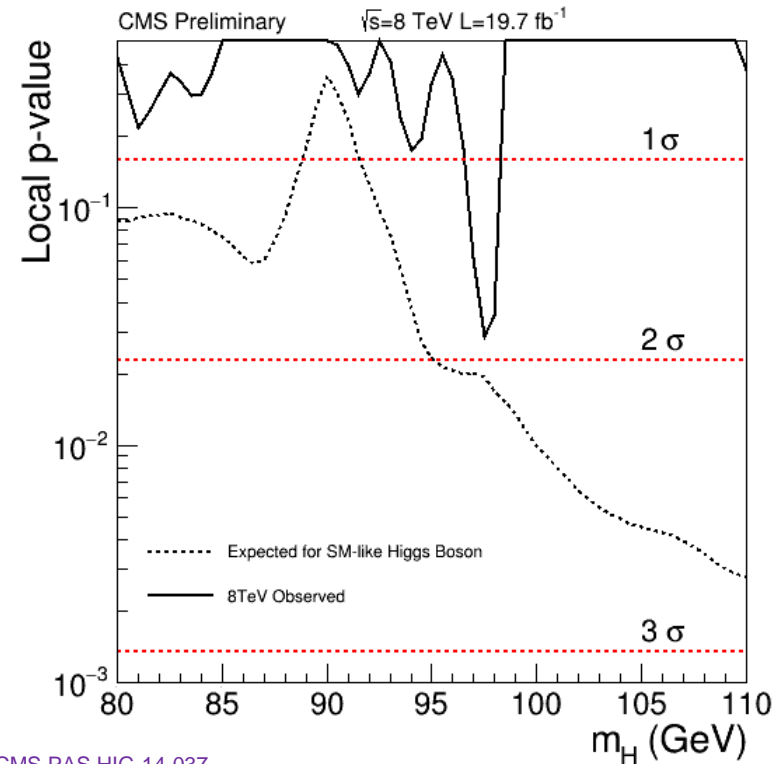
Finally, a search for a lighter Higgs.

Results

- **No significant excess** is observed
- Maximum significance of **1.9 σ** (no Look-Elsewhere Effect) at **97.5 GeV**, about the same value observed at LEP
- **Worse sensitivity** around the **Z boson mass**



CMS PAS HIG-14-037



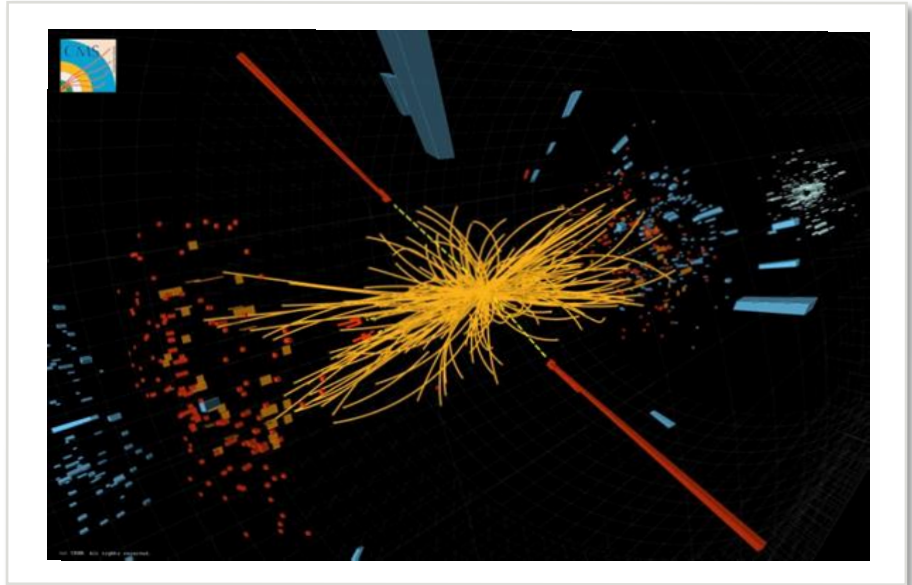
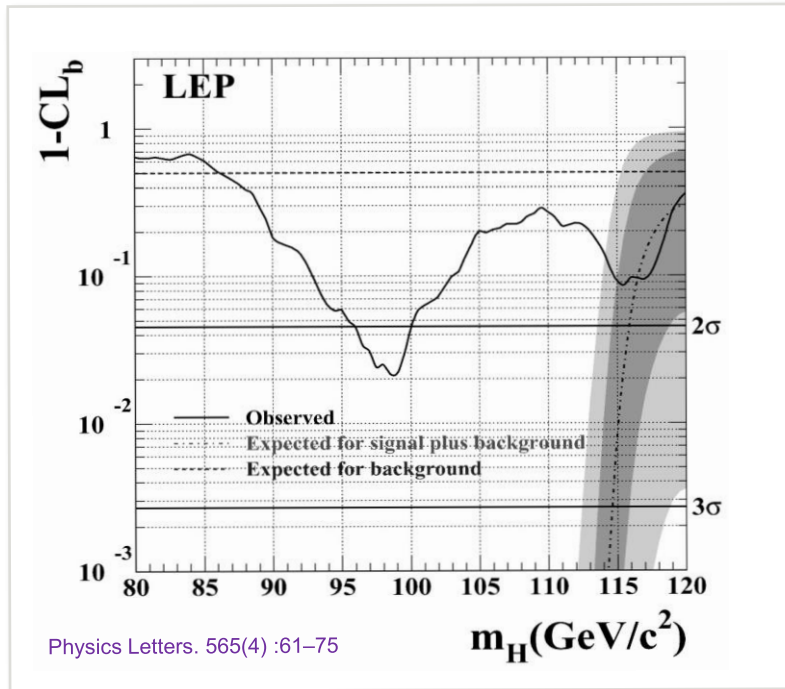
CMS PAS HIG-14-037

Light higgs search

And ???

Experimental Motivations

- **Small excess** of events ($\sim 2\sigma$) at **LEP** observed by 3 of the 4 experiments in $bb/\tau\tau$ channels



- During LHC Run I, the standard $H \rightarrow \gamma\gamma$ **search range** was **[110,150] GeV**
- Clean signature with two **isolated and highly energetic photons**
- Final state fully reconstructed with **excellent mass resolution**
- **Background** from QCD ($\gamma\gamma - \gamma j - jj$) large enough to be **evaluated directly on data**

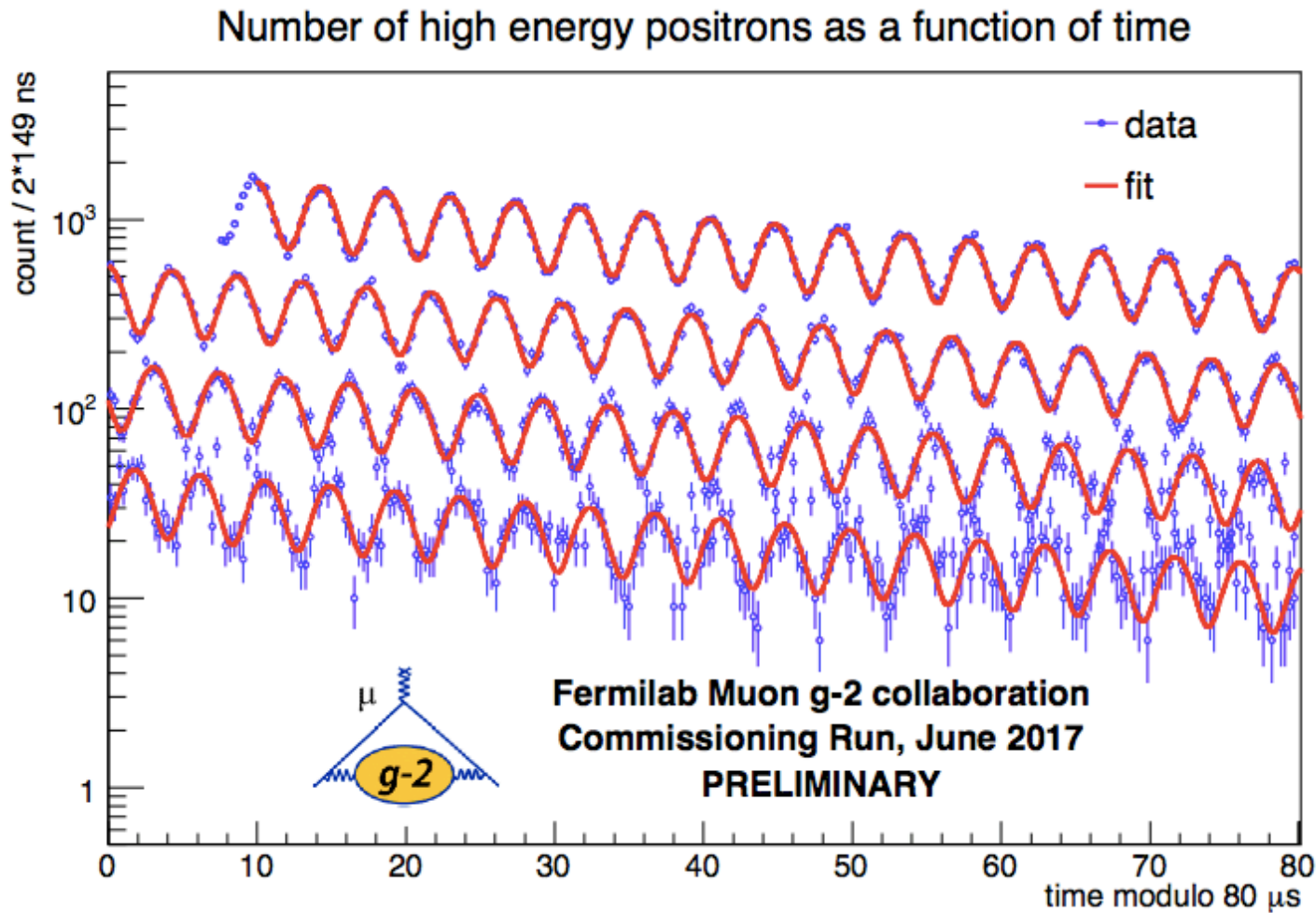
A wiggle

News from FNAL: the muon $g-2$

First “wobble” plot....



4 years after groundbreaking, g-2 is now taking data.
1st commissioning run completed & shows that everything is working



10⁻⁵ of final
stats !!

A wiggle

IF they find the same central value as the BNL experiment:

5 σ from the SM by mid
2019 !!!

(and then the J-PARC experiment starts ...)