

# Discussion on “BSM Higgs Searches/Rare Higgs Decays”

*Sven Heinemeyer, IFT (CSIC, Madrid)*

Paris, 09/2022

## Talks:

- Xiaotong Chu
- Yiwen Wen
- Yuan-Tang Chou
- Maxime Gouzevitch

⇒ no full ATLAS – CMS comparison ...

⇒ just a few (personally biased) examples ...

Hopefully slightly provocative ... :-)

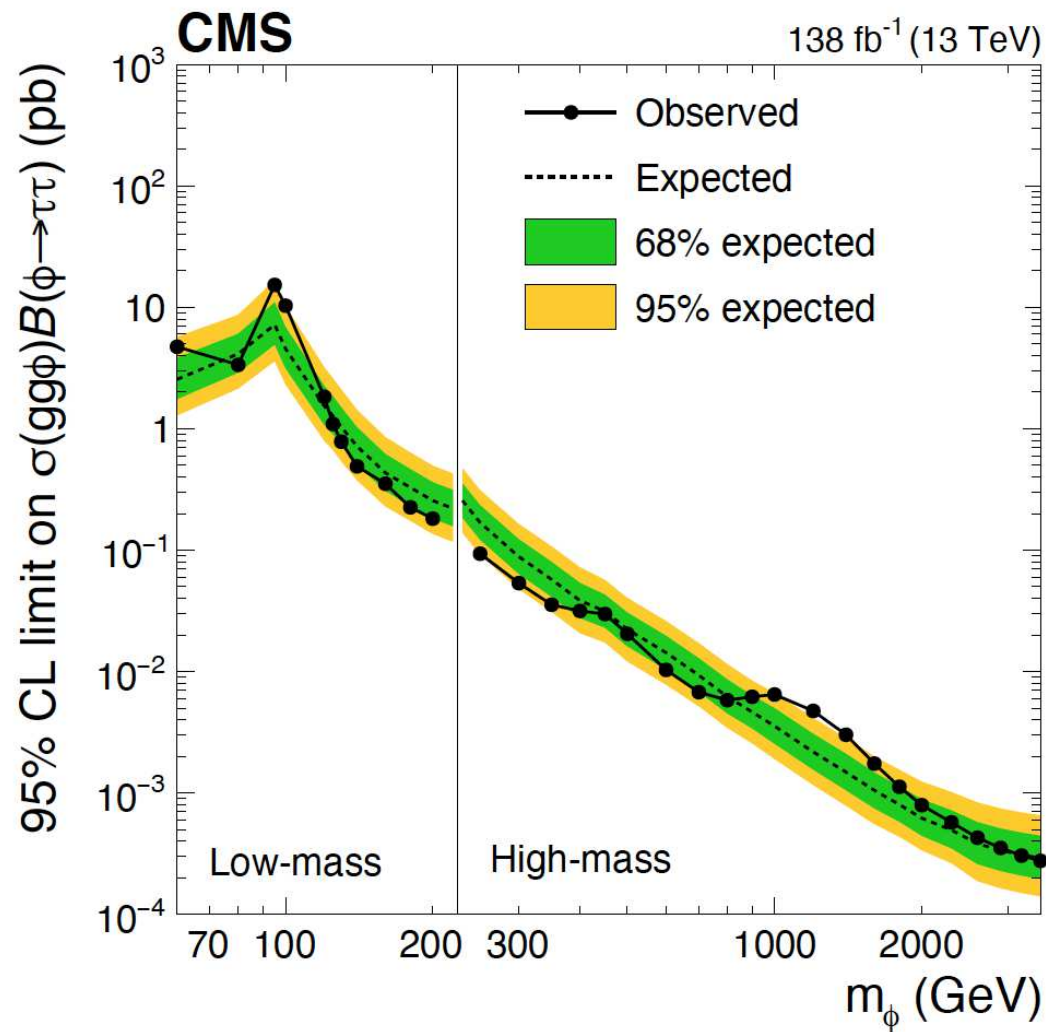
Before I start, one comment on EFTs:

## A Quote from a Model Builder



- “Whatever bound you get from your EFT, I can always write down a model that passes the test against data and violates the bound you claim to have.” – Bhaskar Dutta

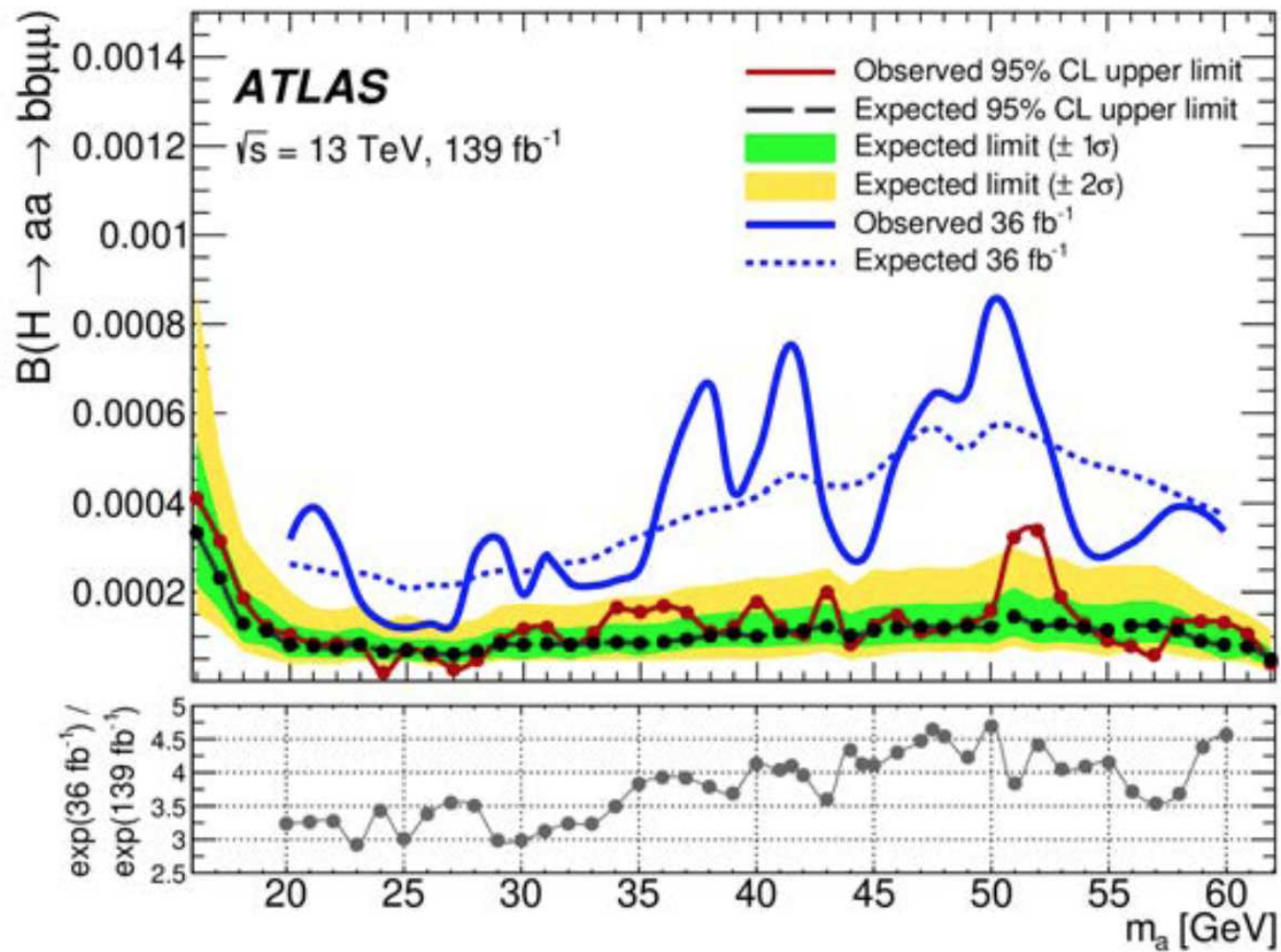
My personal favorite:  $pp \rightarrow \phi \rightarrow \tau^+ \tau^-$ :



⇒ finally killed the ATLAS excess at 400 GeV

... but: I will come back to this in a moment

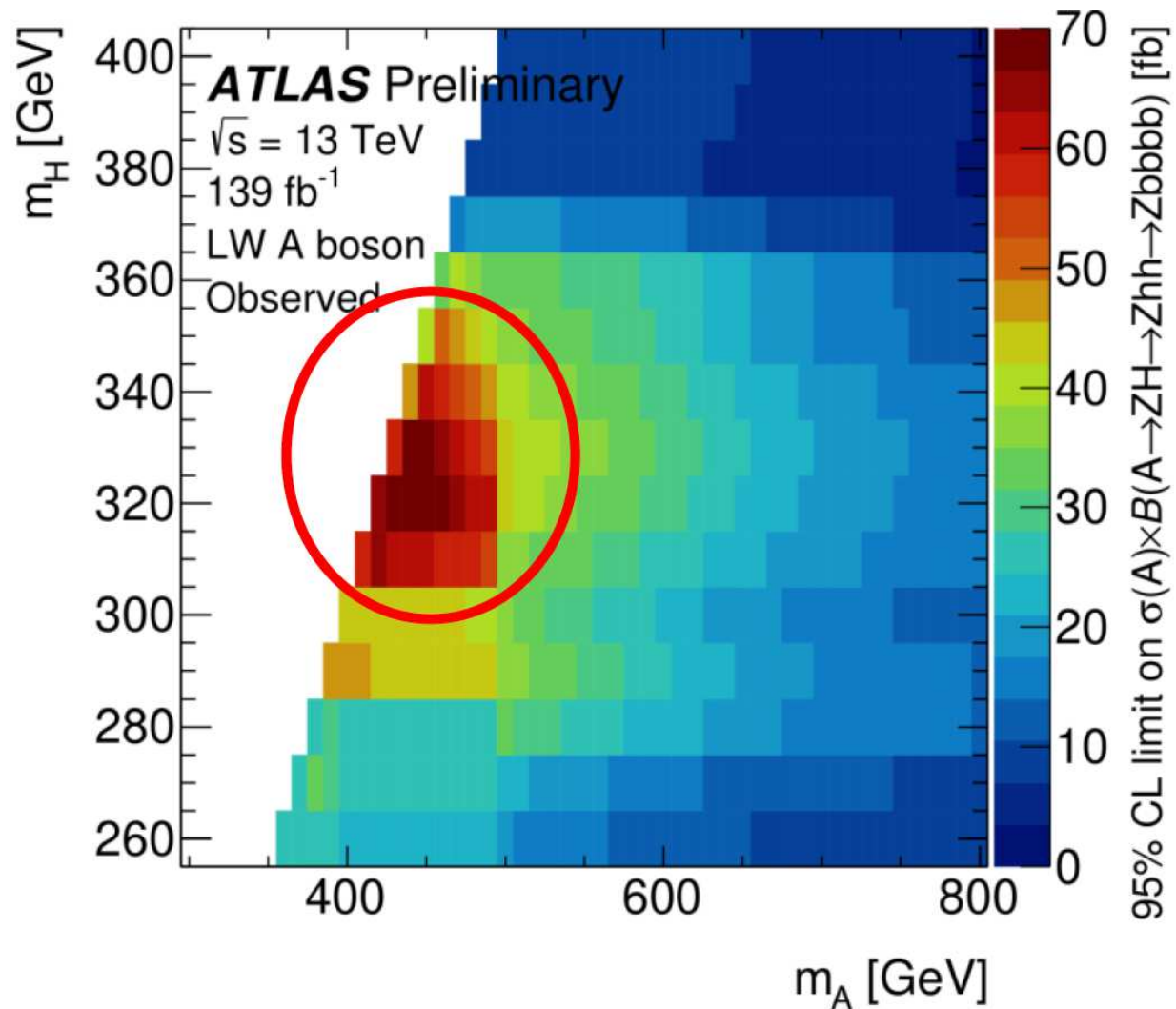
## Discovery? (I)



⇒ CMS???

⇒ general trend: the other experiment's excess does not seem to have high priority ...

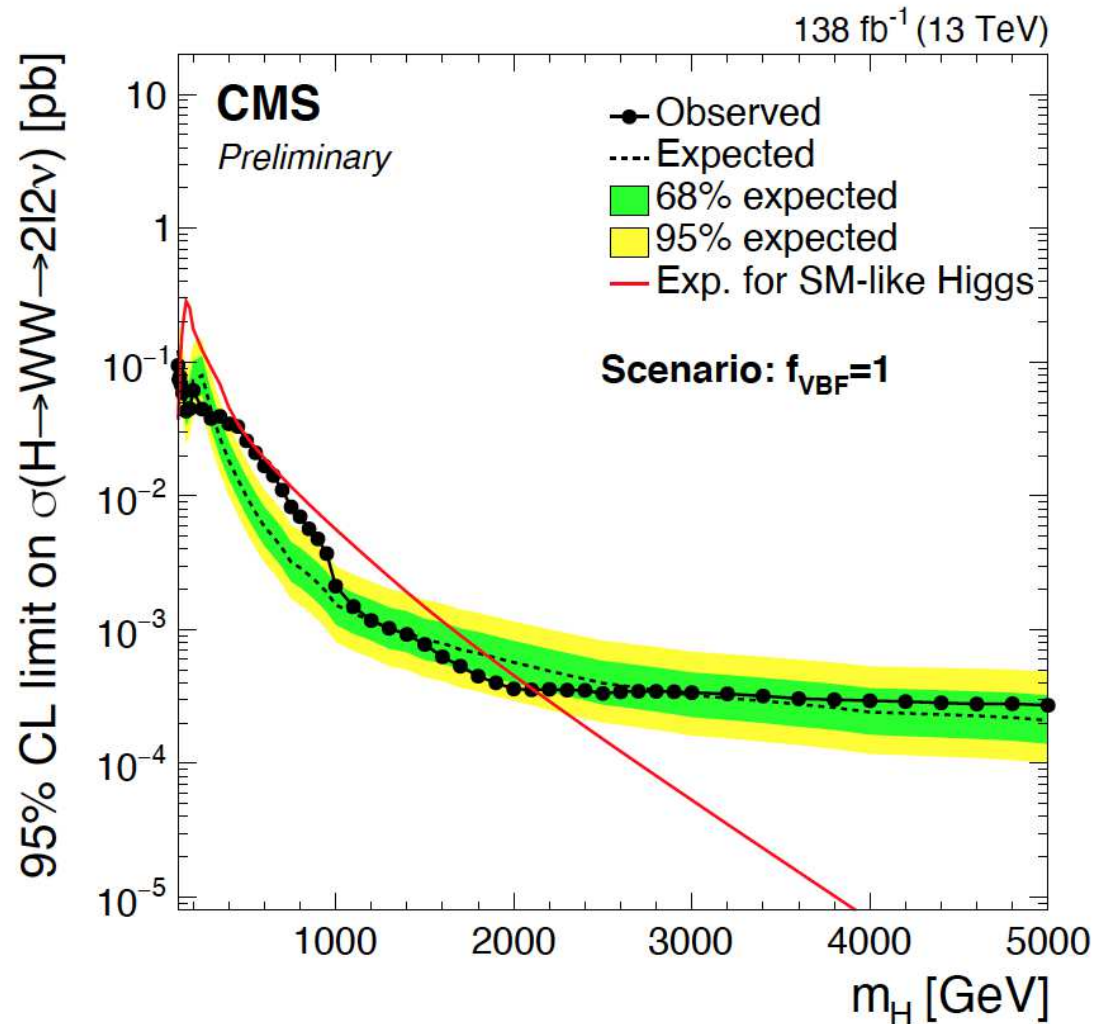
## Discovery? (II)



⇒ CMS???

⇒ general trend: the other experiment's excess does not seem to have high priority ...

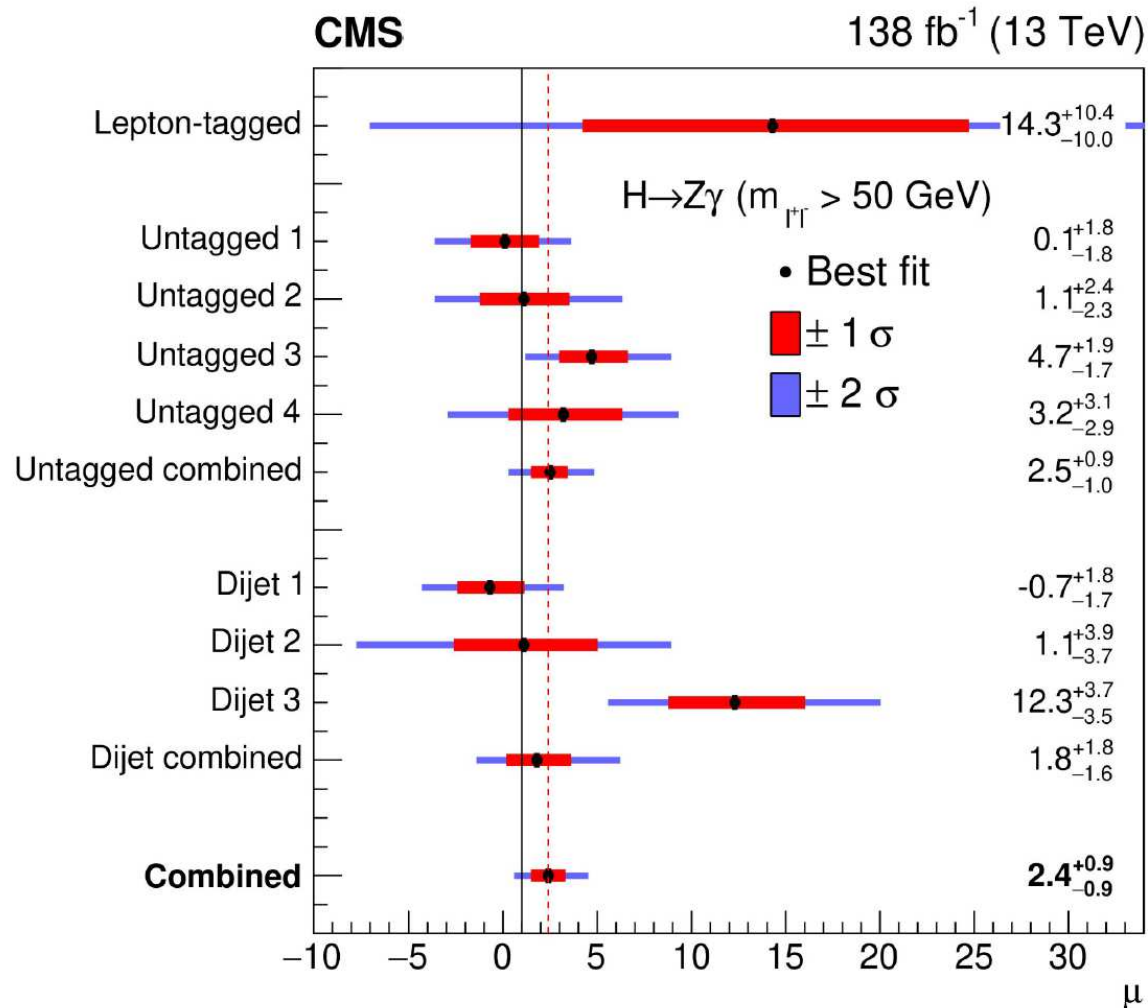
## Discovery? (III)



⇒ ATLAS results comparable?

⇒ Howie's plea: put in the production cross section allowed by the "sum rule" ... (well, there is always GM)

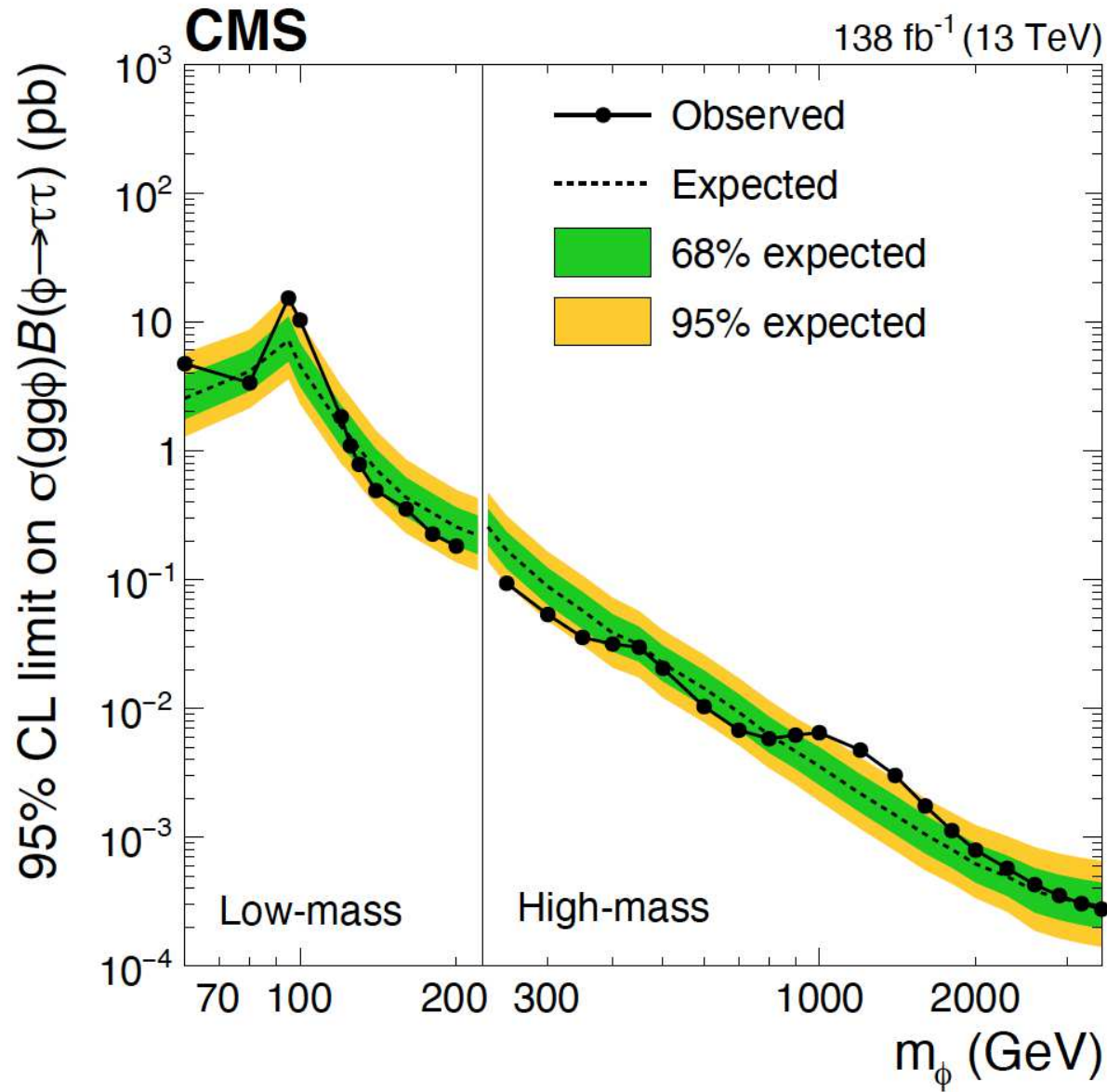
# First glimpse at $h_{125} \rightarrow Z\gamma$



⇒ “Above the SM prediction, but compatible at  $1.5 \sigma$

⇒ general trend: new signals come out too high,  
later converge to the SM prediction ...

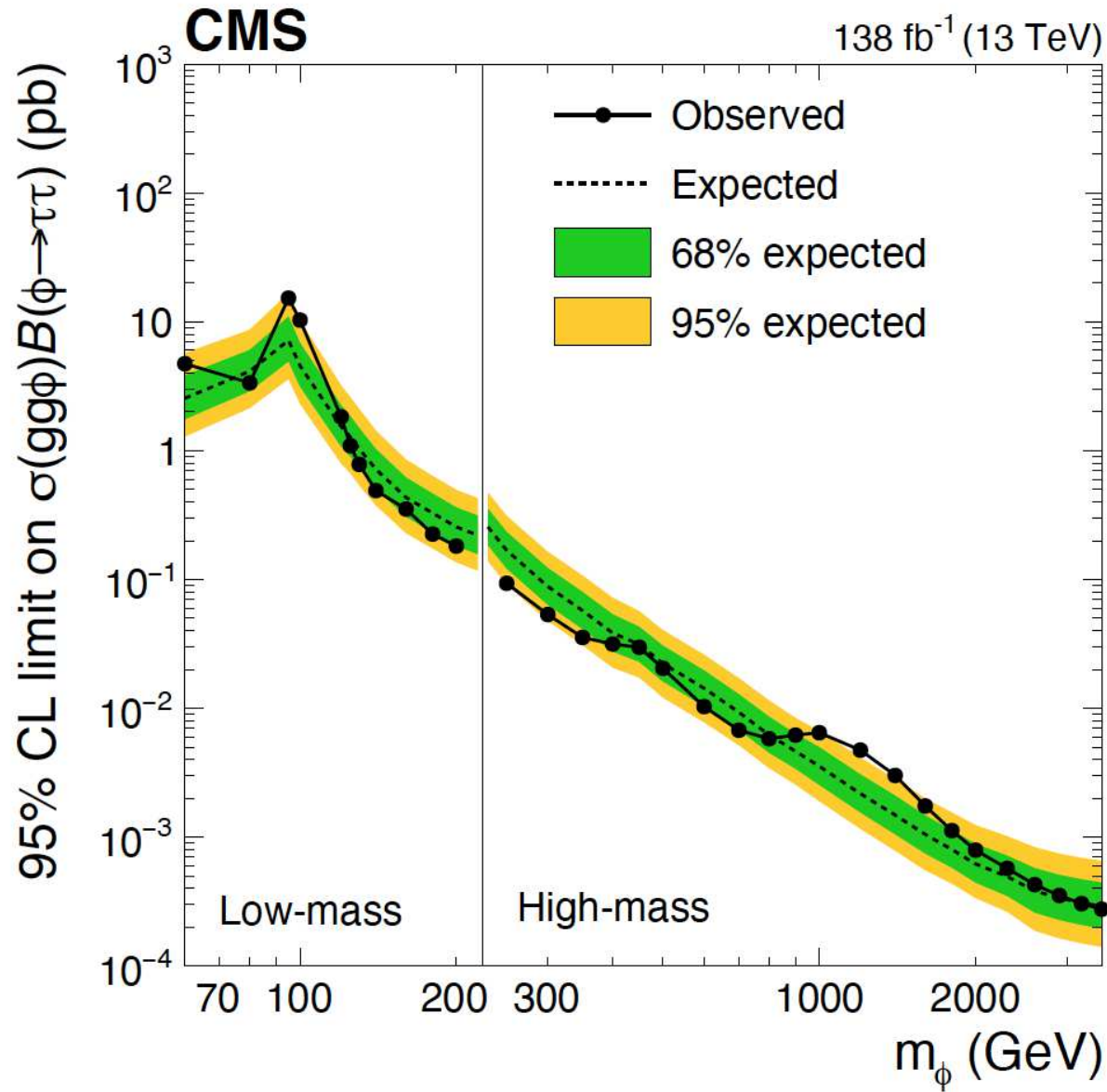
Coming back to the  $\tau\tau$  analysis:



Can you spot the excess?

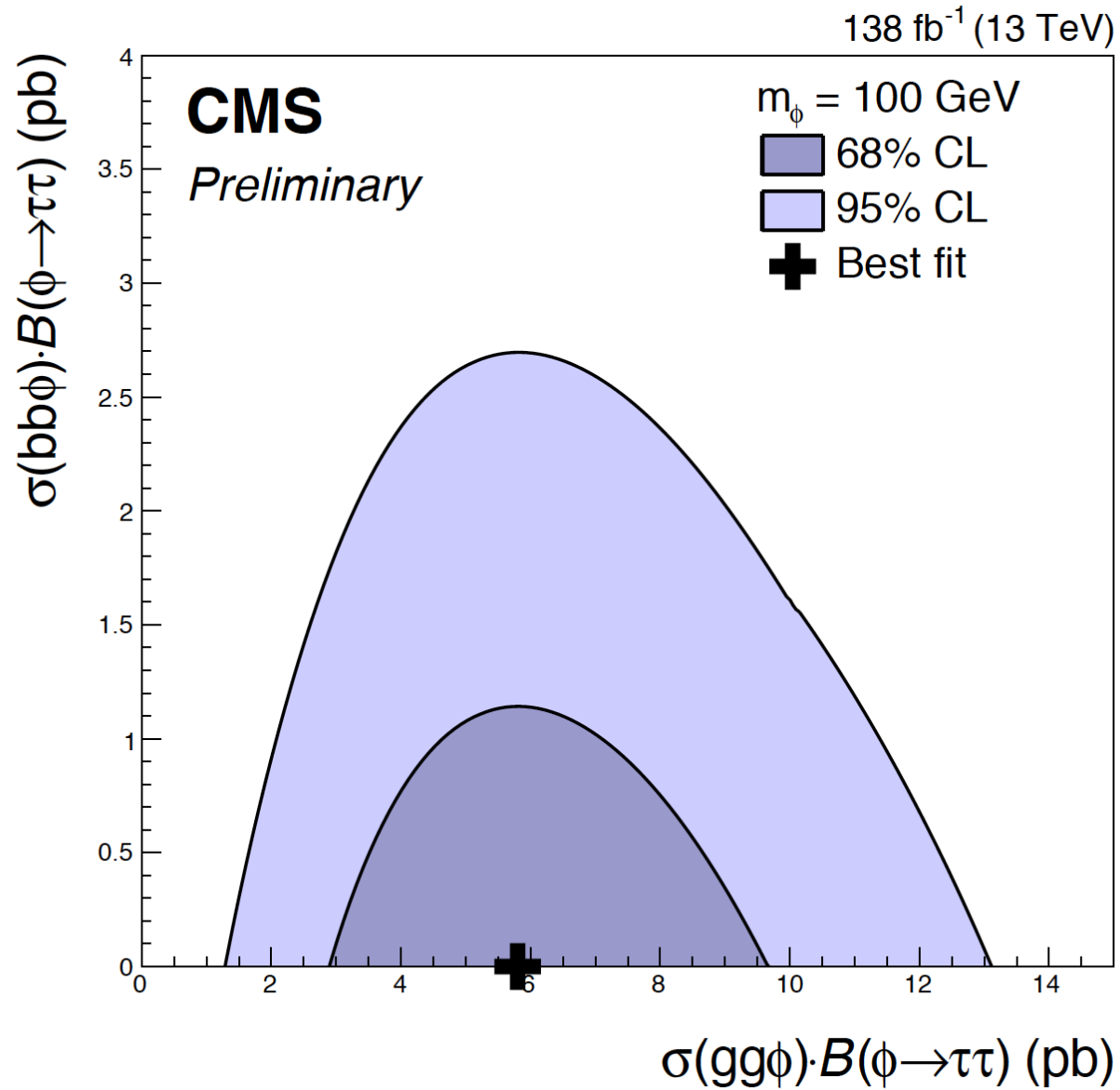


Coming back to the  $\tau\tau$  analysis:



Can you spot the excess? **At 95 – 100 GeV?**

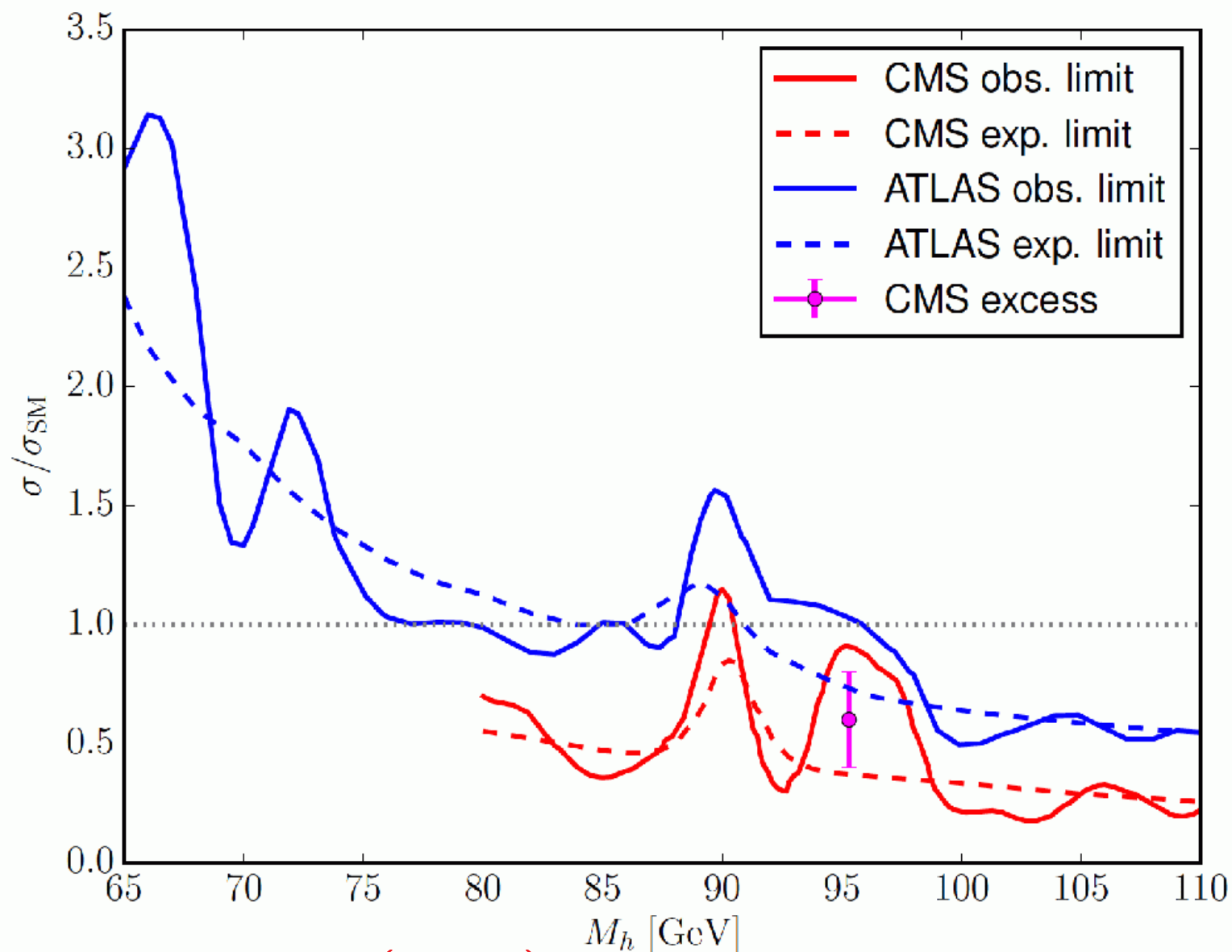
Better visible here, focusing on 100 GeV:



⇒ clear excess of  $\sim 3\sigma$  at  $\sim 100$  GeV

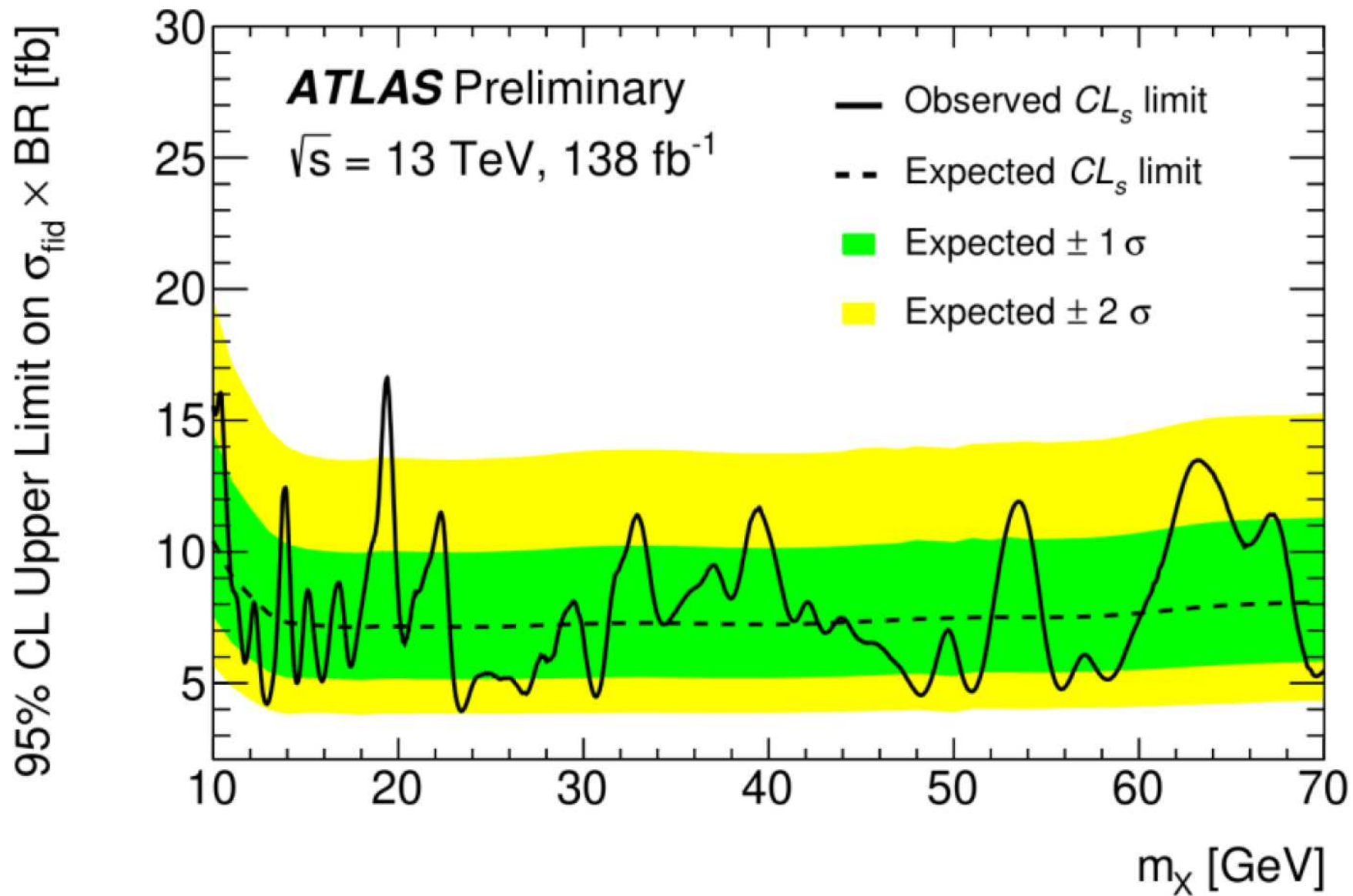
Slide that I repeat over the years: CMS and ATLAS in direct comparison:

[S.H., T. Stefaniak '18]



⇒ Can ATLAS and CMS (finally) clarify this?

Even worse: ATLAS put out a low mass  $\gamma\gamma$  analysis:



⇒ but they stop at 70 GeV. Argh.