

Universidad de Oviedo
Universidá d'Uviéu
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Round table: anomalies

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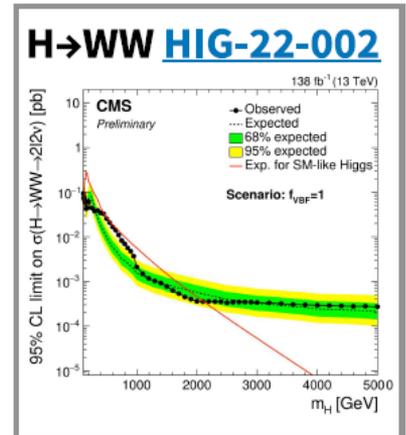
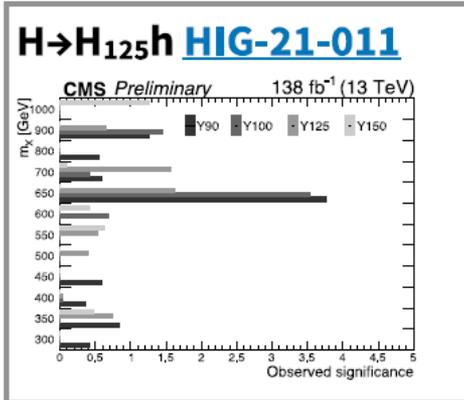
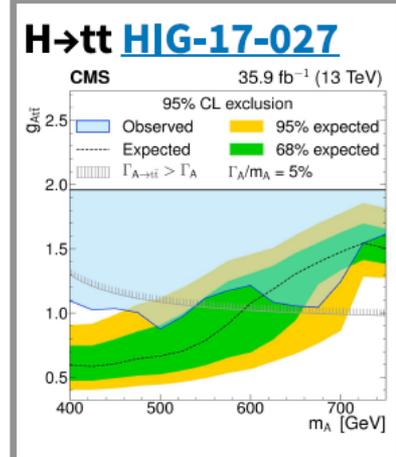
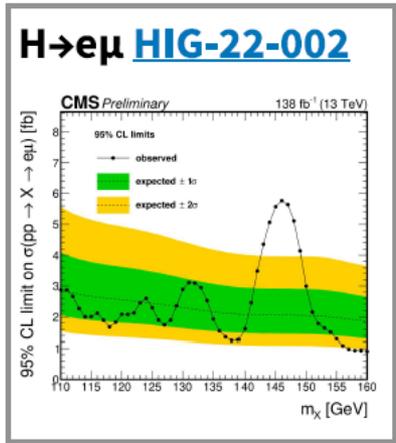
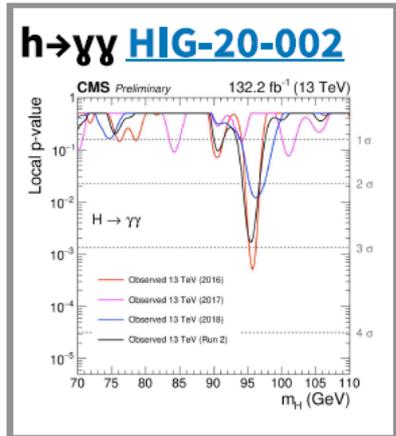
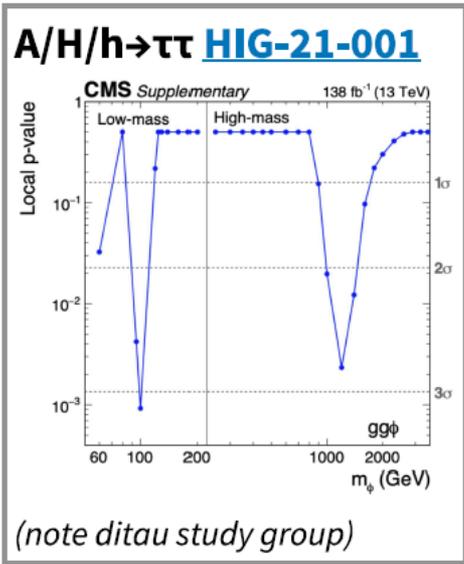


PCTI
ASTURIAS



GOBIERNO DEL
PRINCIPADO DE ASTURIAS

Some analysis with local “excesses” in Higgs Physics in CMS



BACKUP

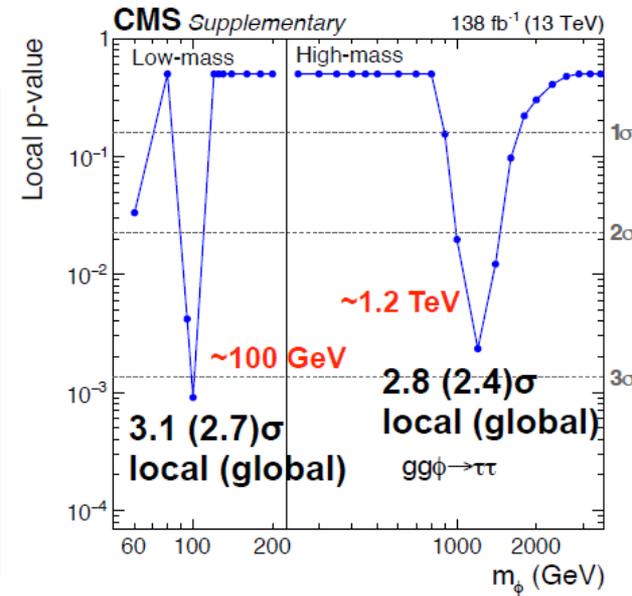
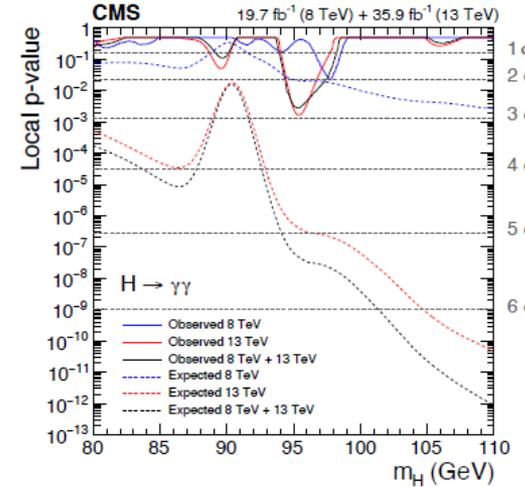
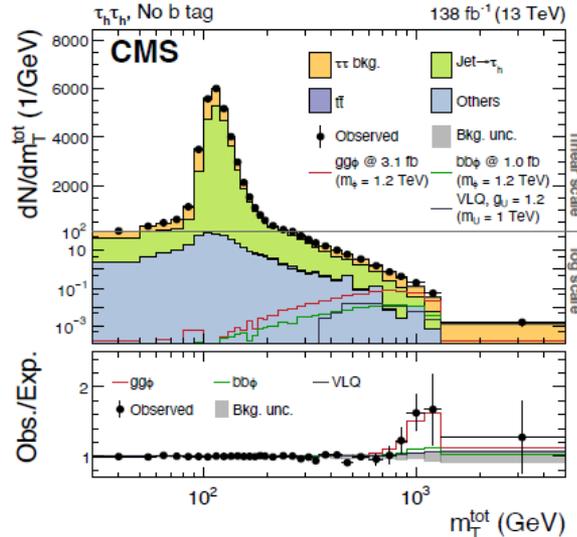
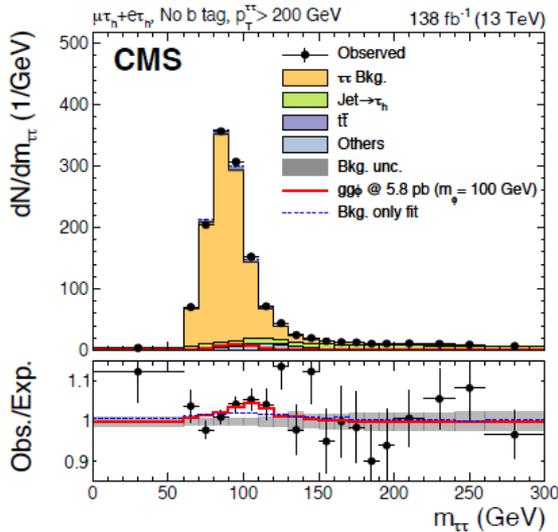
Search for MSSM Higgs bosons decaying into the $\tau\tau$ final state also reinterpreted as a search for VLQs

★ Sophisticated background prediction using the " τ -embedding" method

Two $\sim 3\sigma$ excesses are seen in the ditau mass distributions (or its proxy) around 0.1 and 1.2 TeV

★ Excesses are reasonably distributed between various τ decay channels

★ The ~ 100 GeV excess appears to be well aligned with the low-mass diphoton excess seen in an earlier analysis of Run 1 + 2016 data

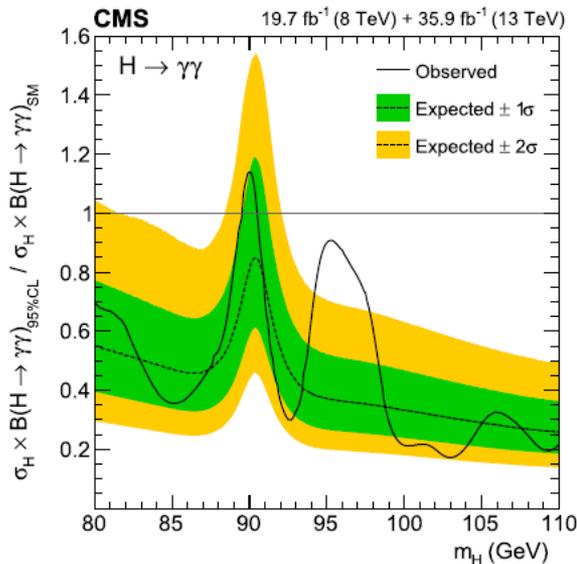


CMS, arXiv:2208.02717

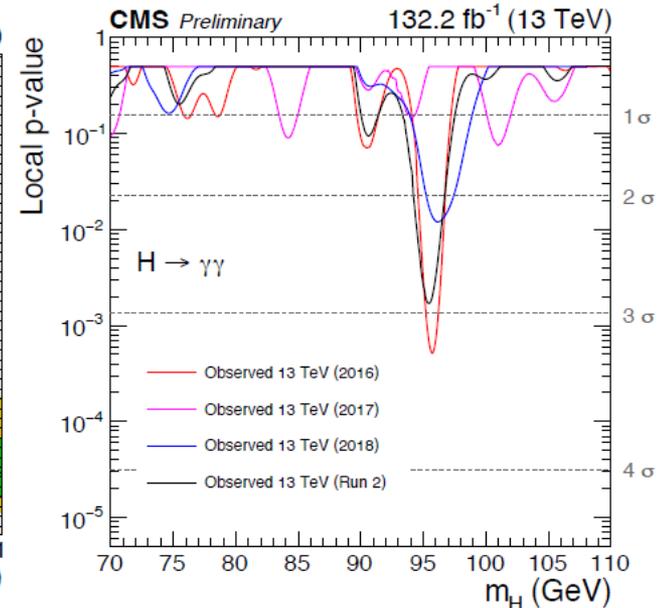
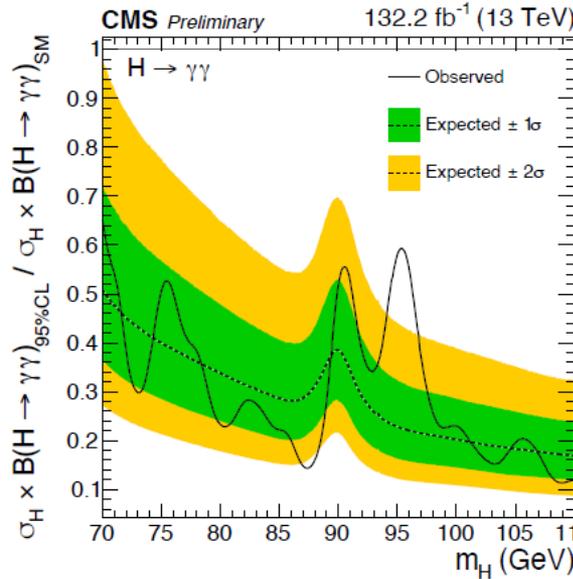
CMS, PRL 793 (2019) 320

- CMS has just released a new low-mass $h(\gamma\gamma)$ analysis based on full Run 2 data
- The overall excess is still there, with about the same significance (2.9σ local; 1.3σ global) albeit with twice as low cross section
- Still need more data (ATLAS Run 2?) to understand whether the excess is real

CMS, PLB 793 (2019) 320

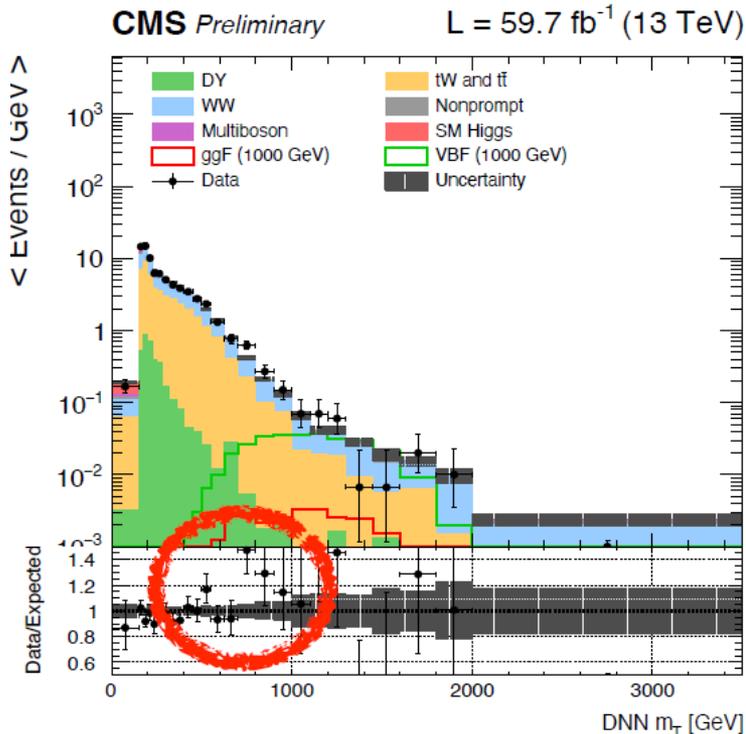


CMS PAS HIG-20-002

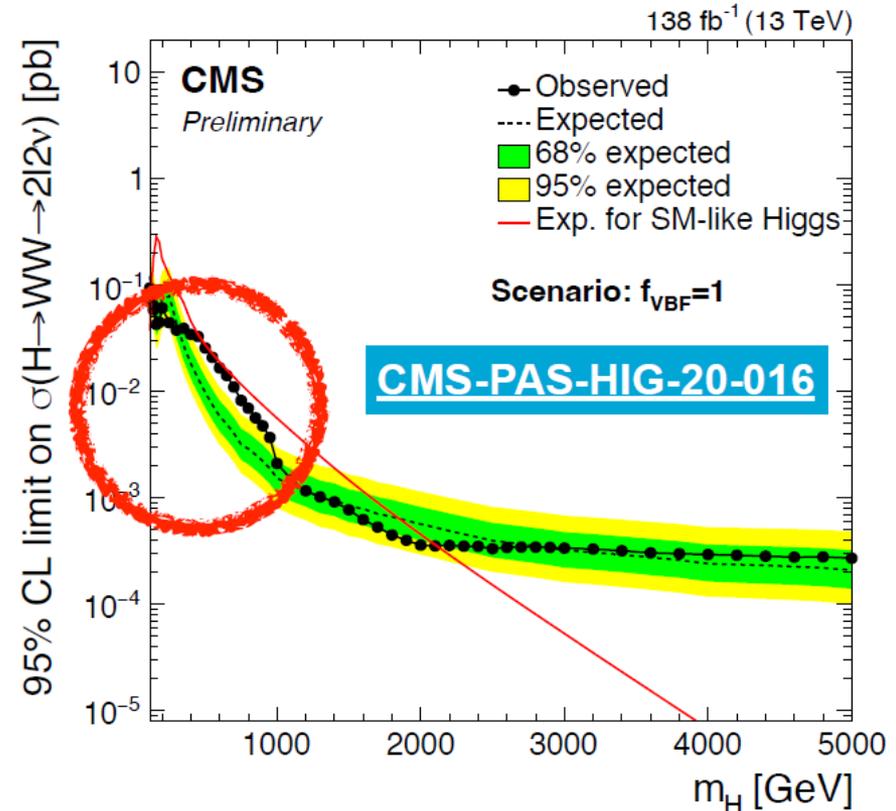


Curiously, a 650 GeV bump is also observed in the recent CMS high-mass $H(WW)$ search in dilepton channel (low resolution), but only in the VBF category with a 3.8σ (2.8σ global) significance

- ★ ATLAS 2016 leptonic $H(WW)$ doesn't have an excess, but the sensitivity is not sufficient to rule out the CMS excess; neither does the full Run 2 $Z'(WW)$ semileptonic analysis
- ★ However, there is a small VBF $H(ZZ \rightarrow 4l + 2l2\nu)$ excess at 620 GeV (2.4σ ; 0.9σ global) in the ATLAS data



CMS-PAS-HIG-20-016



- **New CMS search for LFV Higgs boson decay $H(e\mu)$**
- **Apart from setting a stringent limit on the $H(125)$ LFV decay, it also scans the $e\mu$ mass**
- **An excess with a local (global) significance of 3.8 (2.8) σ is seen at a mass of 146 GeV**