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CLUSTER OF EXCELLENCE
QUANTUM UNIVERSE

FSP CMS
Erforschung von
Universum und Materie

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und Raumfahrt

H(125) properties measurements - overview

Higgs Hunting 2026

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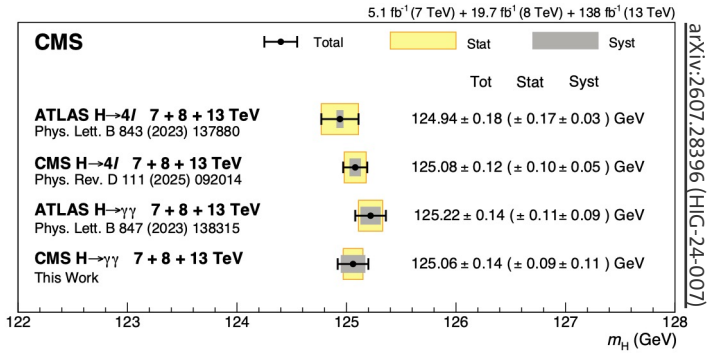
16 SEPTEMBER 2026

Mass and width

Mass



ATLAS H → 4l + H → γγ combination:

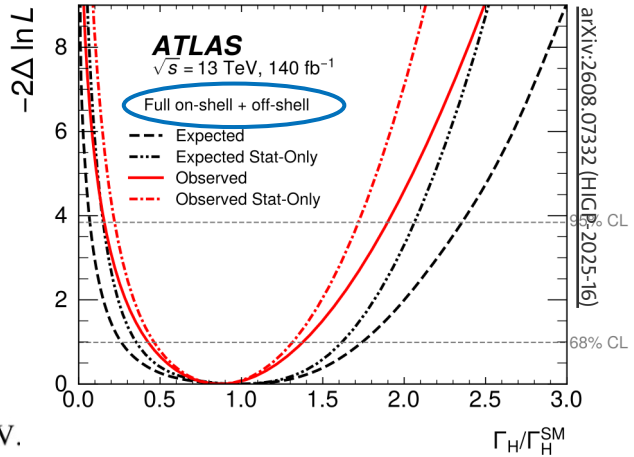
$$m_H = 125.11 \pm 0.09\,(\text{stat.}) \pm 0.06\,(\text{syst.}) = 125.11 \pm 0.11\,\text{GeV}.$$

ATLAS and CMS **close to 100 MeV precision**

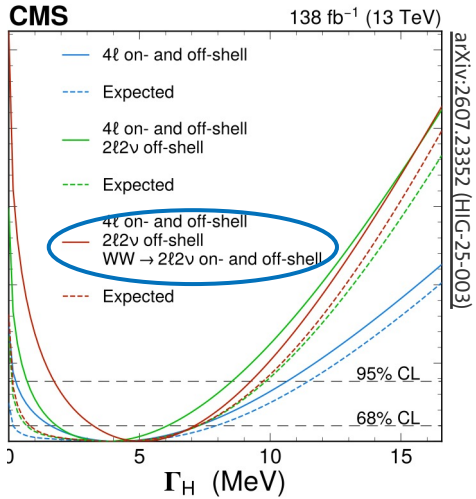
- Statistics limited
- Main systematics from γ/lepton energy scale and resolution

Width

Best precision from **ratio of off-shell and on-shell cross section ~Γ_H**
Indirect – assumption about couplings in on-shell and off-shell region



$$\Gamma_H = 3.6^{+2.1}_{-1.6}\ \text{MeV}$$



$$\Gamma_H = 5.1^{+2.0}_{-1.8}\ \text{MeV}$$

Off-shell production with 3.7(2.9)σ ATLAS and 5.0(2.9)σ CMS

Also: **on-shell H → γγ** exploiting S/B interference: Γ_H < 92 (138) MeV (CMS) and **brand new** 307 (258) MeV (ATLAS)

Couplings, cross sections, rare processes

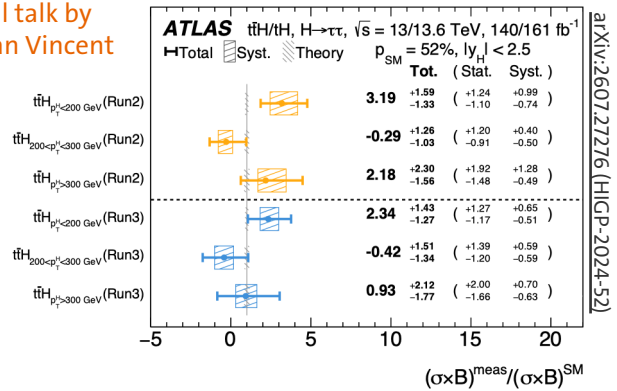
Combination of Run 2 Higgs measurements: precise and comprehensive picture of Higgs couplings, cross sections, differential information (STXS), as well as different BSM interpretations dedicated sessions on BSM + EFT

Run 3 data + new methods allow pushing further: differential measurements and rare processes + kin. regimes

dedicated session on analysis methods

Top couplings: ttH+tH with H→ ττ / γγ

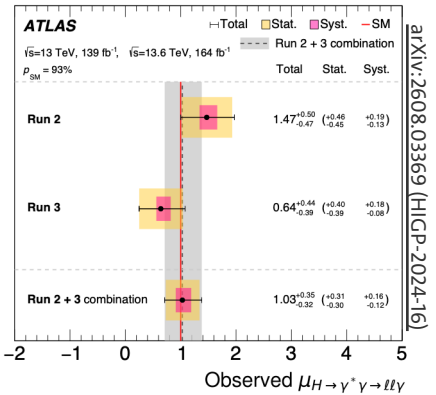
topical talk by Morvan Vincent



Combination of tH searches: μ(tH)<6.1 (2.7) at 95% CL

H→ γ*γ → llγ with m_{ll}<30 GeV

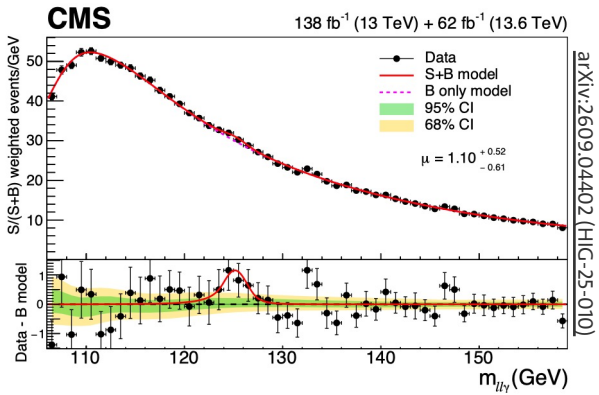
3.4 (3.3)σ significance



H→ Zγ → llγ

1.9 (2.3)σ significance

topical talk by Jiehan He



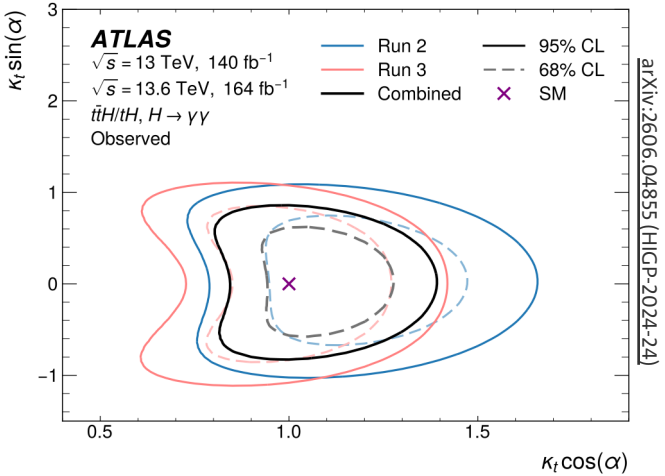
Other results:

- ATLAS boosted H → bb/ττ; CMS H(→ γγ/WW)+c and H(→ bb/4l)+γ, excluding $y_{u,c} = y_t$ and $y_{d,s} = y_b$
- Differential cross sections in H → 4l

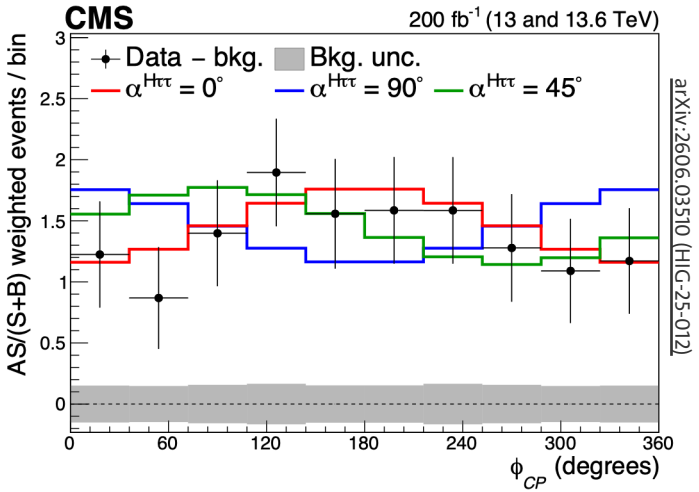
topical talk by Elena Cuppini

CP and spin correlations

Yukawa couplings: CP-odd components possible at tree level $\mathcal{L} = -\frac{m_t}{v}\left\{\bar{\psi}_t \kappa_t \left[\cos(\alpha) + \mathrm{i}\sin(\alpha)\gamma_5\right]\psi_t\right\} H$



ttH/tH(→γγ): excluding |α|>38° at 95% CL



H→ ττ: α= 7 +/- 16°

topical talk by Lucas Russell

Spin correlations in 4l decays: test of anomaluous coupling scenarios and CP violation in the polarization of the Z bosons, interpretation in context of quantum entanglement of the Z bosons

Discussion