

Higgs Hunting

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ttH and combination: discussion

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ttH SUMMARY



Run1

Run2 13 fb⁻¹ 36 fb⁻¹

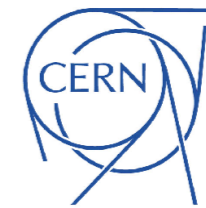
$$\mu_{ttH} = \sigma_{ttH} / \sigma_{SM}$$

	ATLAS	CMS	
Run1 comb.	2.3 ^{+0.7} _{-0.6}		← 4.4σ (2.0σ exp)
bb	2.1 ^{+1.0} _{-0.9}	-0.2 ± 0.8	
multileptons	2.5 ^{+1.3} _{-1.1}	1.5 ± 0.5	← 3.3σ (2.5σ exp)
τ _h +X		0.7 ^{+0.6} _{-0.5}	
γγ	0.5 ^{+0.6} _{-0.6}	2.2 ^{+0.9} _{-0.8}	← 3.3σ (1.5σ exp)
ZZ	<7.5 @ 95%CL	0.0 ^{(*)+1.2} _{-0.0}	

(*): 68% CL interval with μ ≥ 0

Combination for single experiment (once all 36fb⁻¹ results out) could give >3σ expected per experiment. 5σ from ATLAS+CMS?

MAIN ANALYSES STATUS



Run2

13 fb⁻¹

36 fb⁻¹

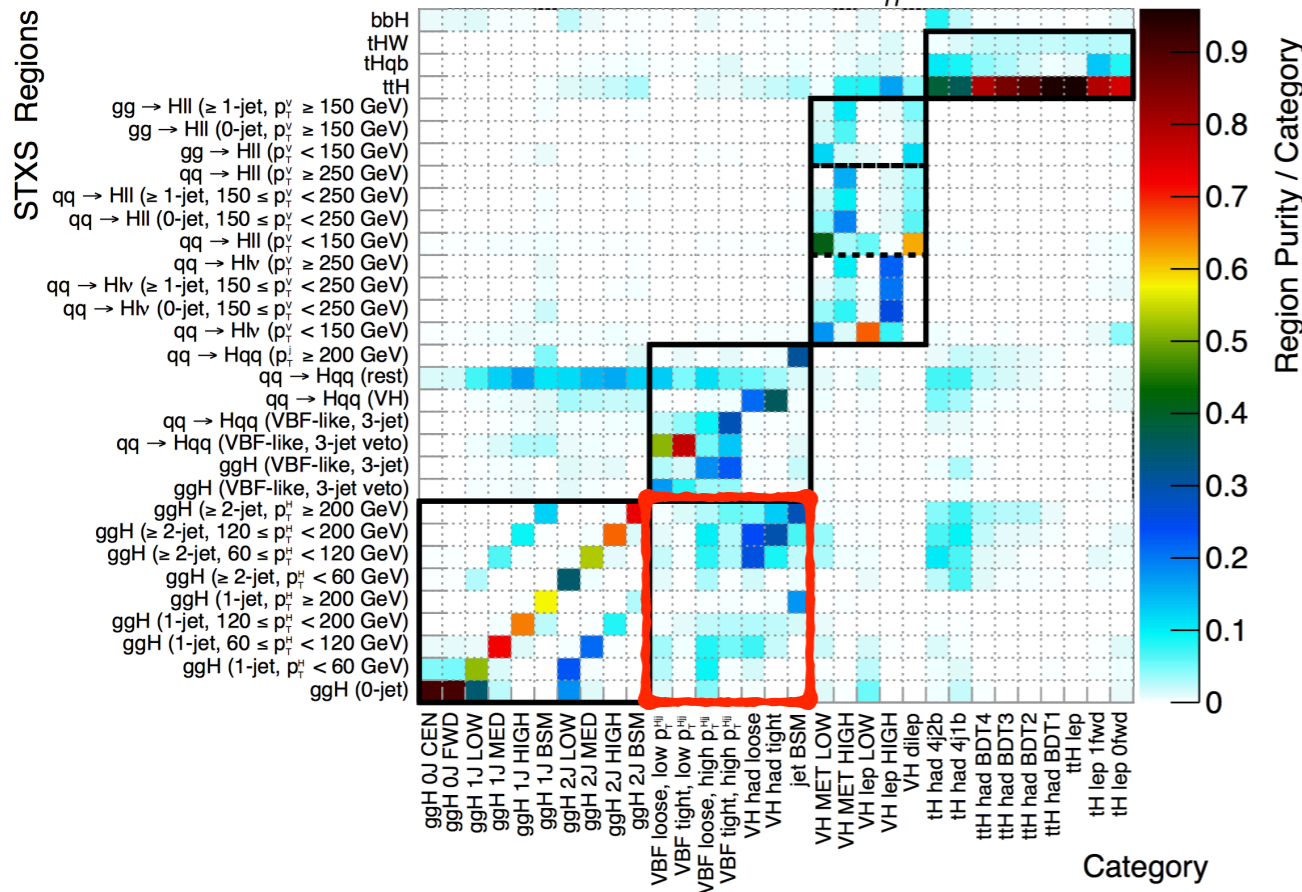
	ATLAS	CMS
H→ZZ	✓ (EPS17)	✓ (Moriond17)
H→γγ	✓ (EPS17)	✓ (LHCP17)
H→WW		✓ (EPS17)
H→ττ		✓ (>5σ LHCP17)
H→bb	✓ (> 3σ EPS17)	
H→μμ	✓ (Moriond17)	

Can it make sense to have some “intermediate” ATLAS+CMS combinations?

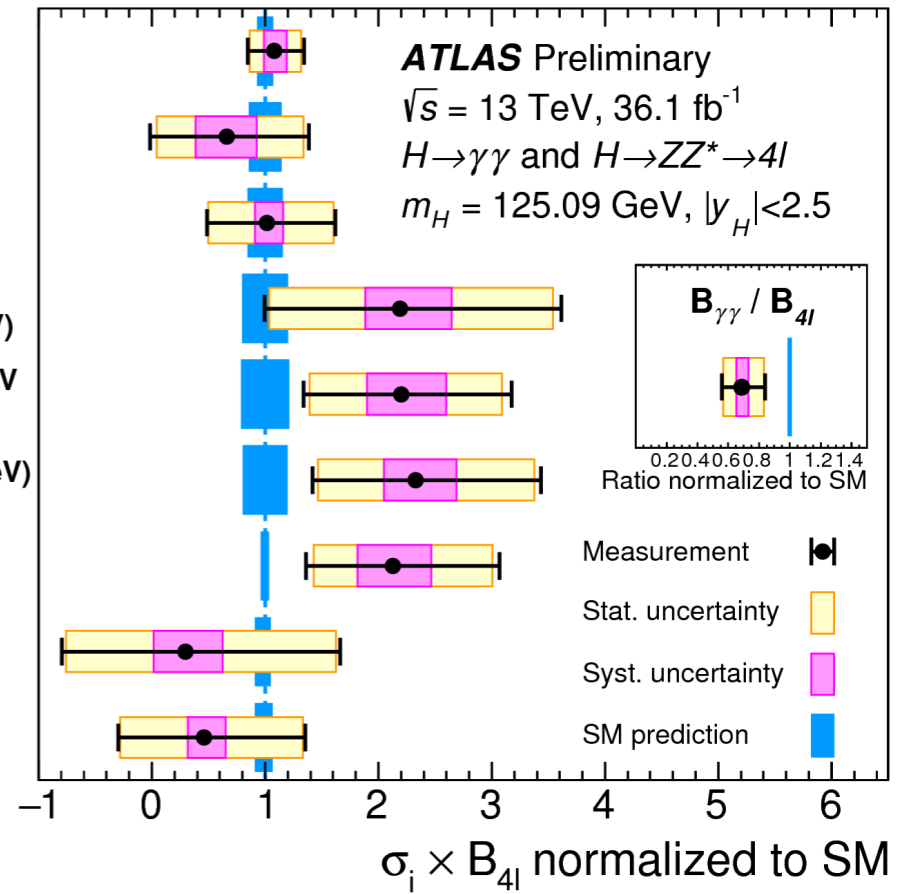
e.g. H→bb ATLAS+CMS Run1+Run2 could potentially give 5σ.
Initial discussions ongoing also for H→μμ in LHCHCG

"SIMPLIFIED TEMPLATE" XSECTIONS

ATLAS Preliminary $H \rightarrow \gamma\gamma, m_H = 125.09 \text{ GeV}$



- $gg \rightarrow H$ (0-jet)
- $gg \rightarrow H$ (1-jet, $p_T^H < 60 \text{ GeV}$)
- $gg \rightarrow H$ (1-jet, $60 \leq p_T^H < 120 \text{ GeV}$)
- $gg \rightarrow H$ (1-jet, $120 \leq p_T^H < 200 \text{ GeV}$)
- $gg \rightarrow H$ (≥ 2 -jet, $p_T^H < 200 \text{ GeV}$ or VBF-like)
- $gg \rightarrow H$ (≥ 1 -jet, $p_T^H \geq 200 \text{ GeV}$) + $qq \rightarrow Hqq$ ($p_T^j \geq 200 \text{ GeV}$)
- $qq \rightarrow Hqq$ ($p_T^j < 200 \text{ GeV}$)
- $gg/qq \rightarrow Hll/Hlv$
- $gg/qq \rightarrow ttH$

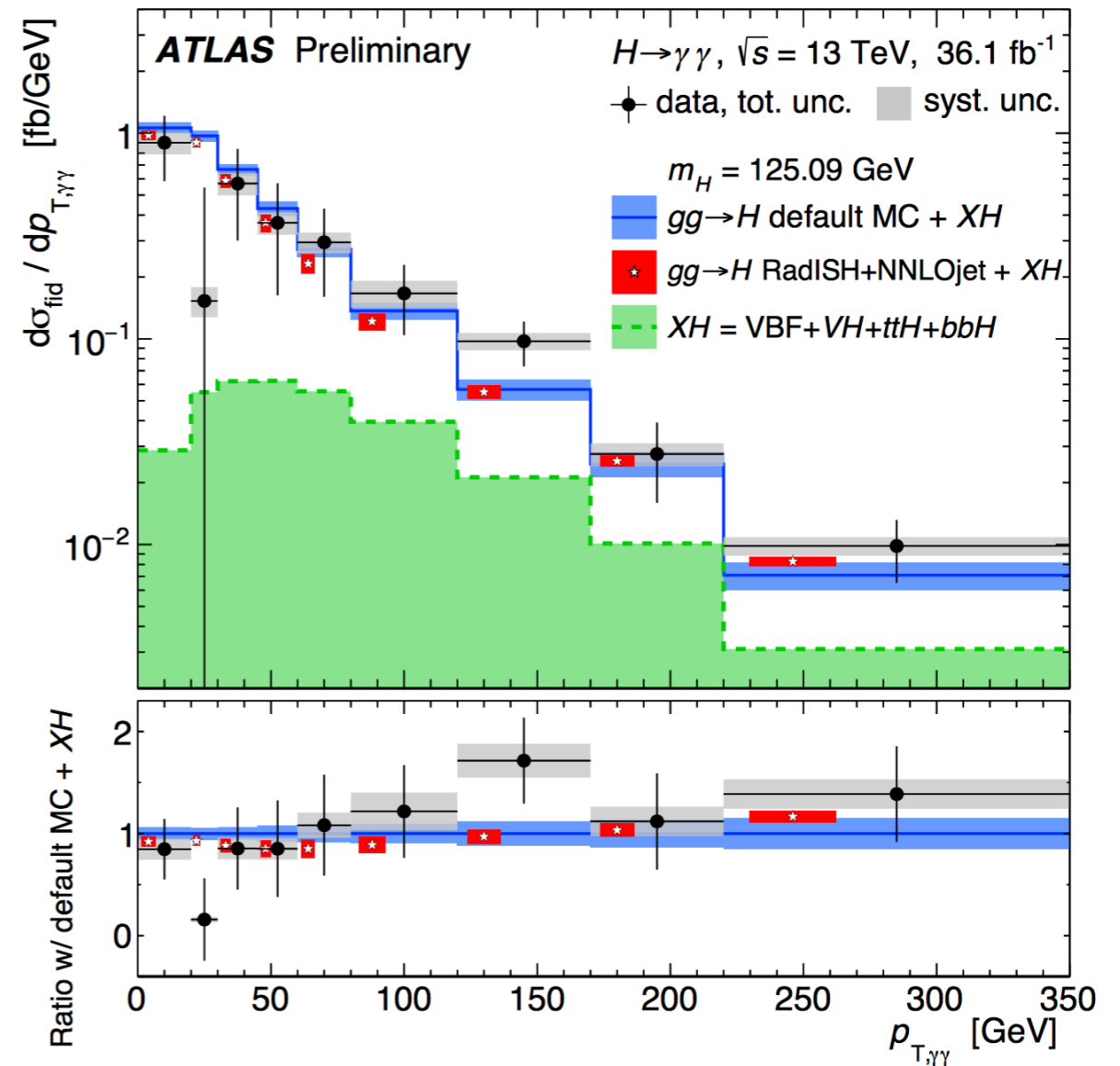
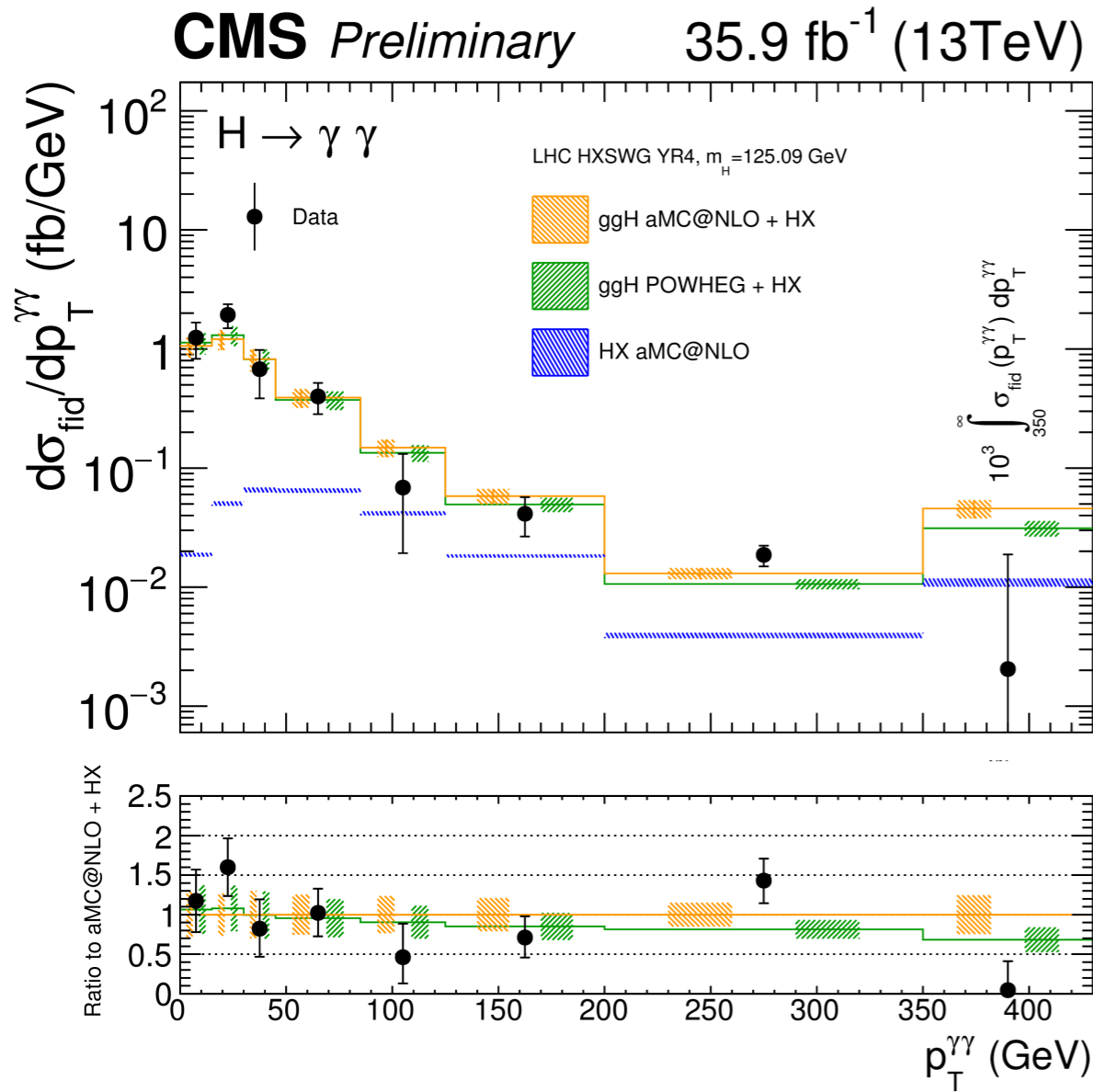


Stage1 STXS regions: currently not enough statistics for full stage1, more important for the end of Run2

Main channels $H \rightarrow ZZ, \gamma\gamma$. $H \rightarrow WW$ could play an important role, but also $H \rightarrow \tau\tau$ (VBF & boosted) and $H \rightarrow bb$ (VH)

Anti-correlations between qqH (VBF & VH) & VBF in ≥ 2 jets regions

DIFFERENTIAL XSECTIONS

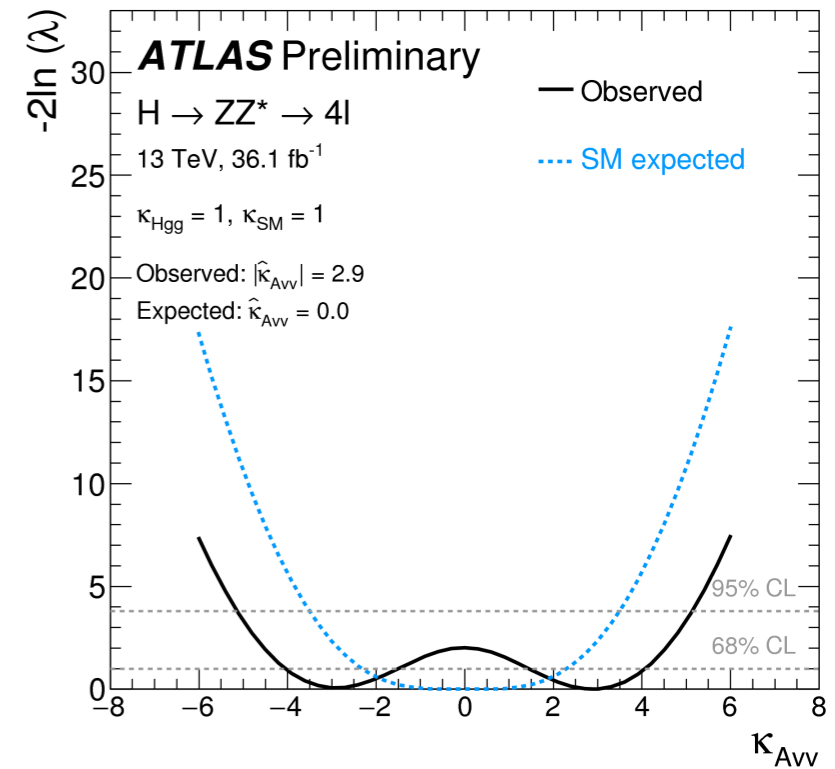
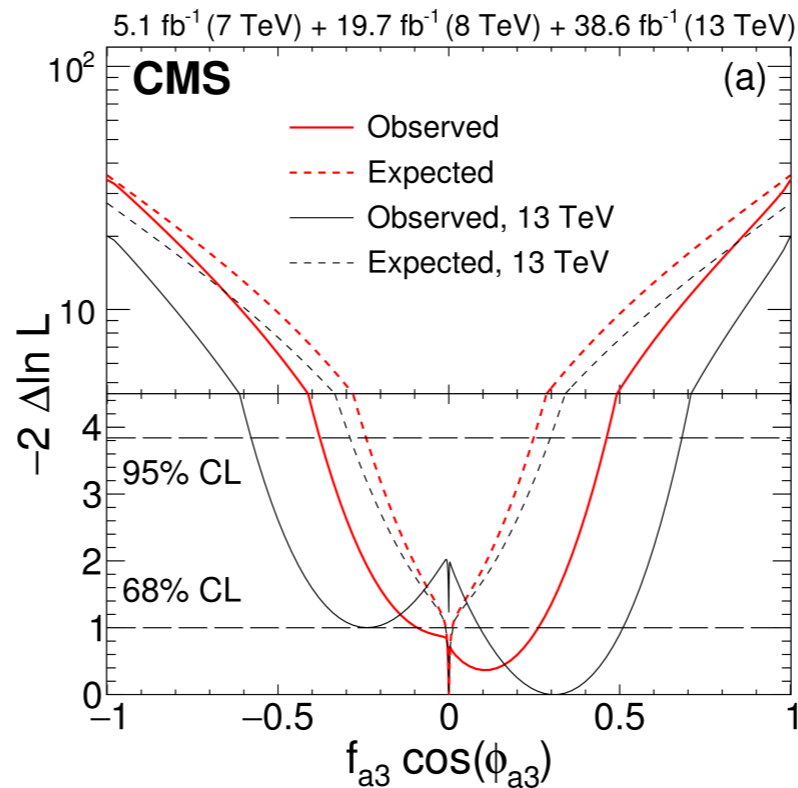
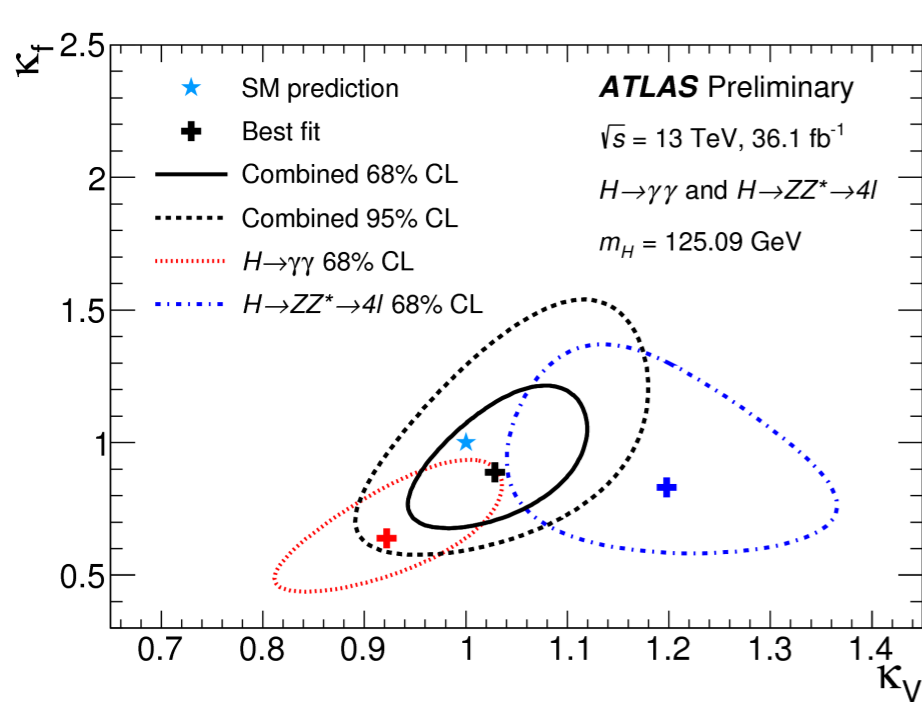


Measurements of $d\sigma/dp_T^H, d\sigma/dy^H, d\sigma/dp_T^{\text{jet}}, d\sigma/dm^{jj}$...

ZZ, $\gamma\gamma$ main actors: all stat dominated, food for combination (ZZ+ $\gamma\gamma$, ATLAS+CMS)

Caveats: binning, fiducial volumes, unfolding/regularisation methods...

BEYOND K, TOWARDS EFT/PO



Run2 goal: provide a consistent interpretation (possibly) combining all relevant EWK + Higgs measurements (rates, differential, angular...) in the EFT or PO framework

First steps in this direction from ATLAS & CMS, still a lot of work to be done