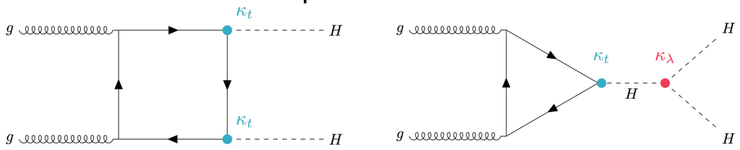
→The measuring the H self-coupling (λ_{HHH}) will be (one of) the major HL-LHC results

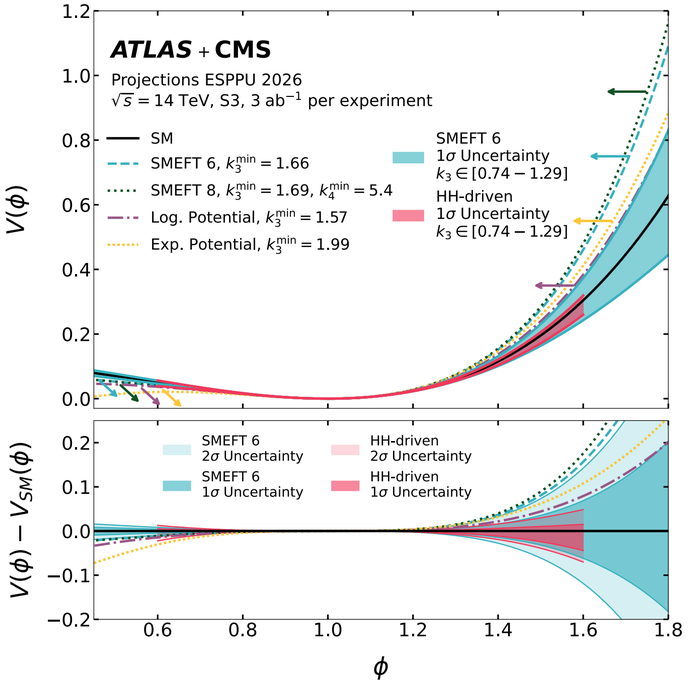
→The final measurement will be preceded by

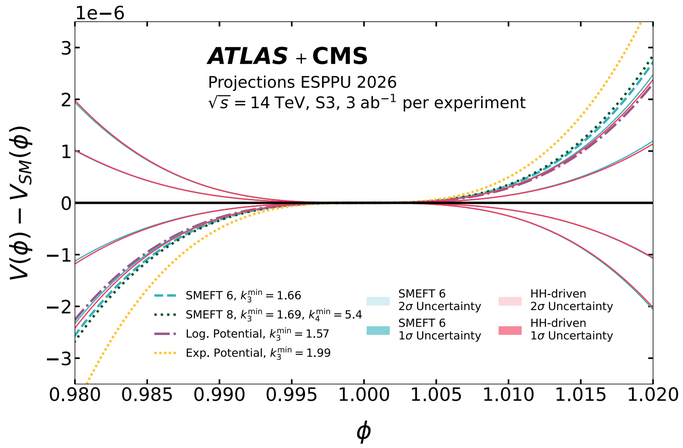
- Observation of HH production
  - Evidence of HH production
    - 95% CL sensitivity for HH production
      - Exclusion of λ_{HHH} = 0 (e.g. triangle diagram exists)

HH production



2 (3?) steps are achievable using the whole LHC dataset (Run1+Run2+Run3 ~ 500/fb)

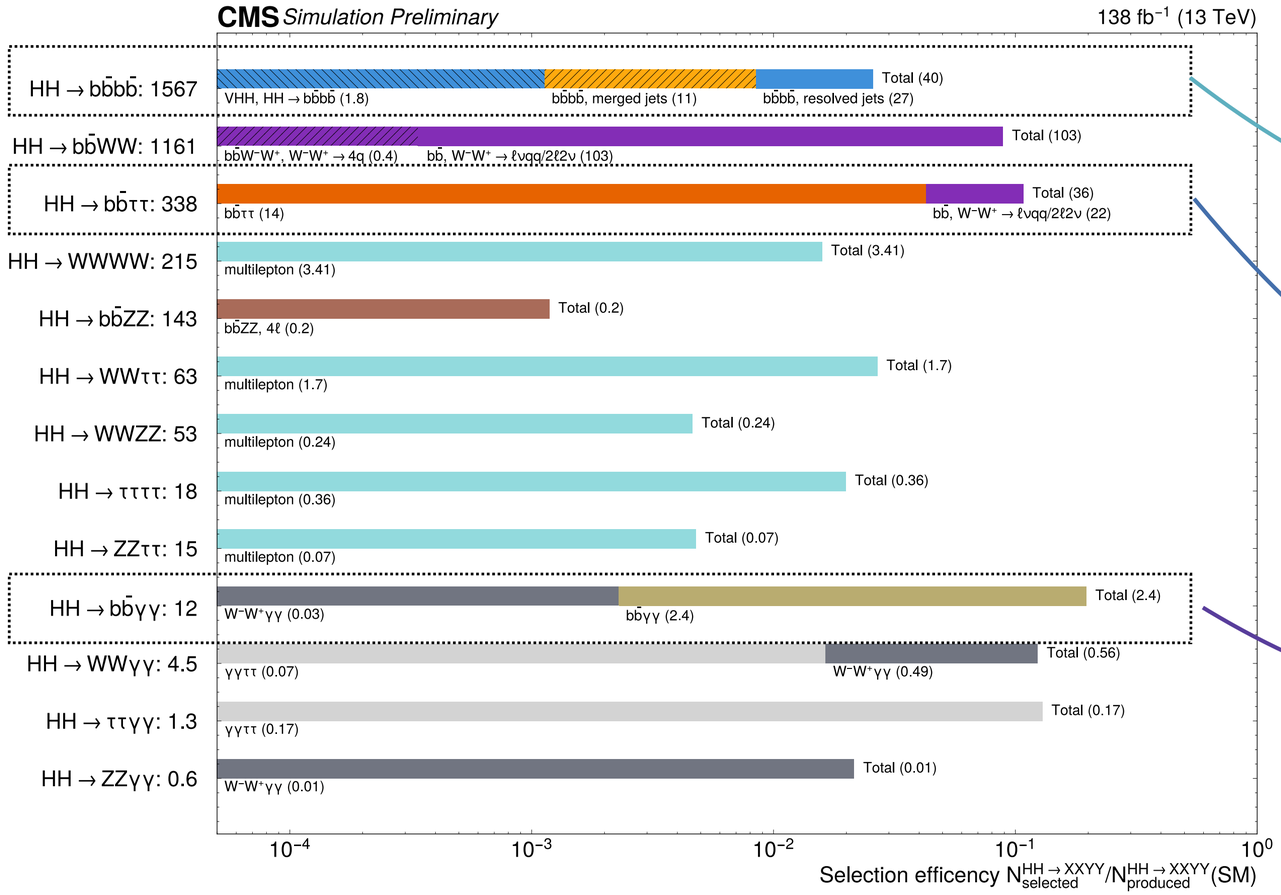




→ Combinations

Combining various decay-productions channels is mandatory (not a golden channel many silver ones)

Combining experiments is crucial



Decay channels

Analysis categories

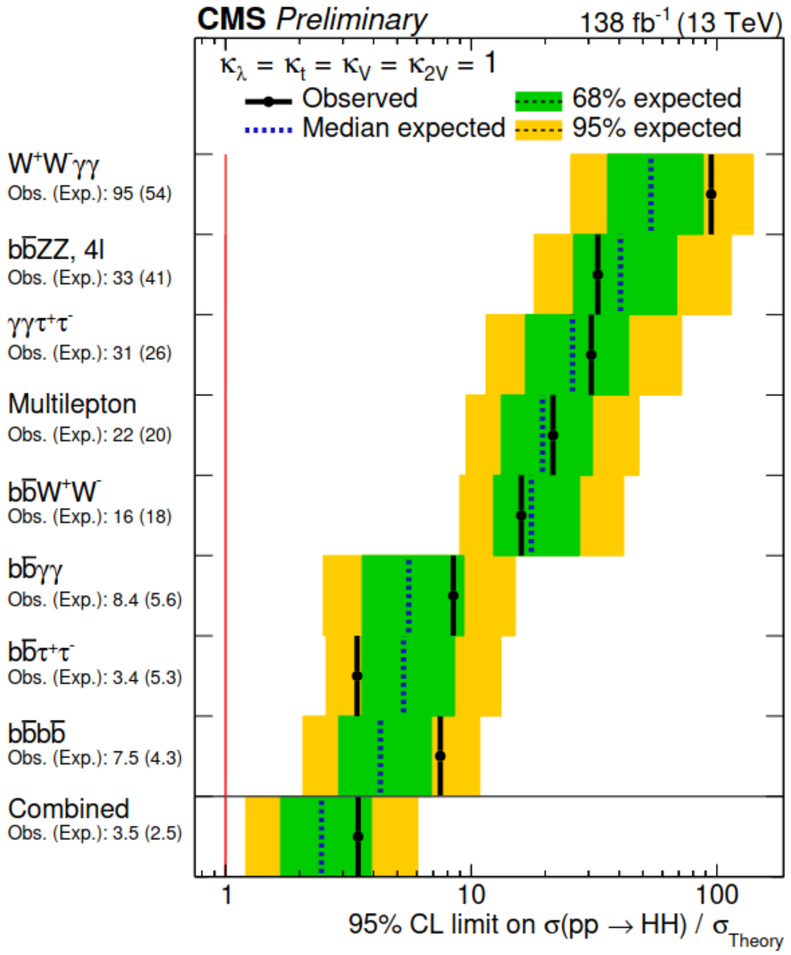
	bb	WW	ττ	ZZ	γγ
bb	34%				
WW	25%	4.6%			
ττ	7.3%	2.7%	0.39%		
ZZ	3.1%	1.1%	0.33%	0.069%	
γγ	0.26%	0.10%	0.028%	0.012%	0.0005%

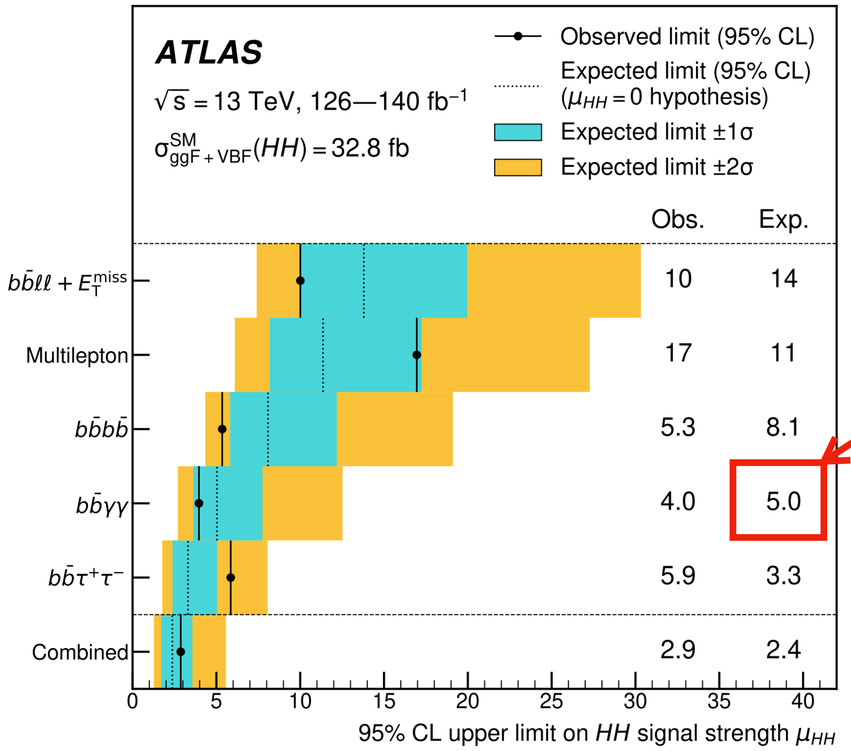
Could we improve the optimization of our decay channel coverage?
The merged-boosted and ggHH-VBF categories are optimally managed in terms of coverage?

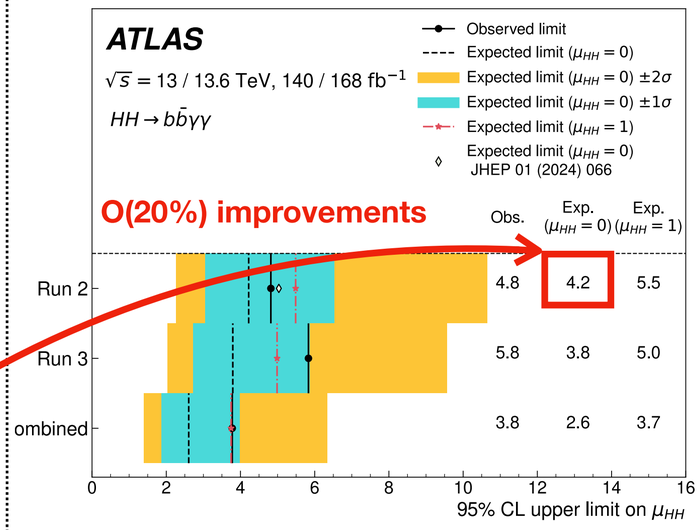
Run2

Similar sensitivity from ATLAS and CMS but different hierarchy across channels

Results are limited by stat. uncertainties







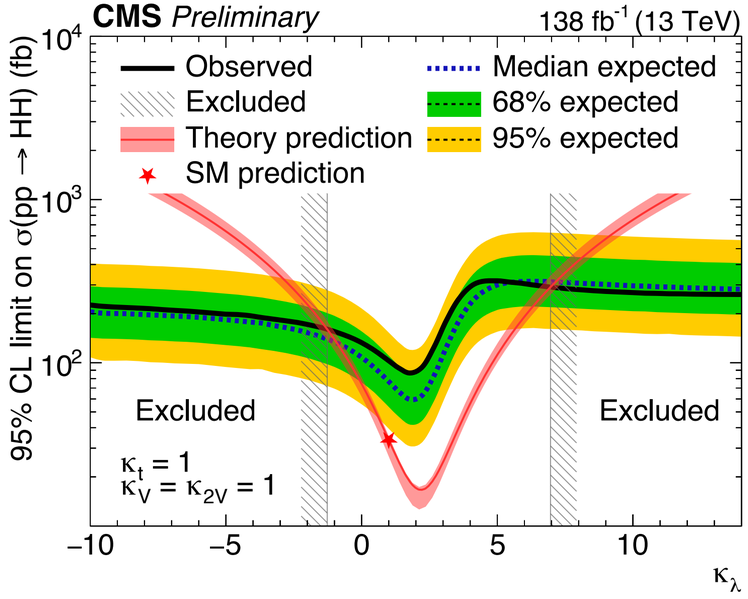
ATLAS - CMS combination (on-going) of Run2 analysis could be <1.7

We can expect it to reach ~1 with new improvements, given 500/fb (Run1+Run2+Run3)

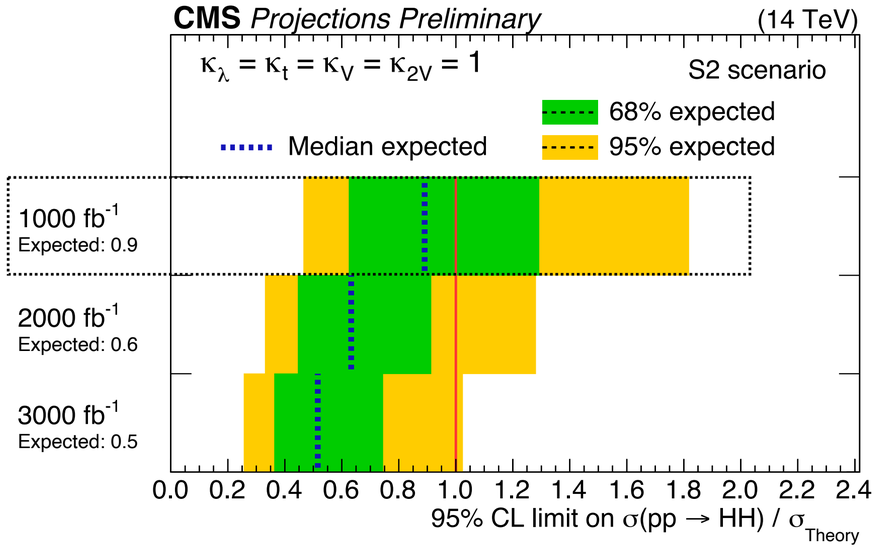
Run3 getting in the game

Opportunity to maximise the analysis sensitivity (data streams, triggers, object reconstruction, analysis techniques)

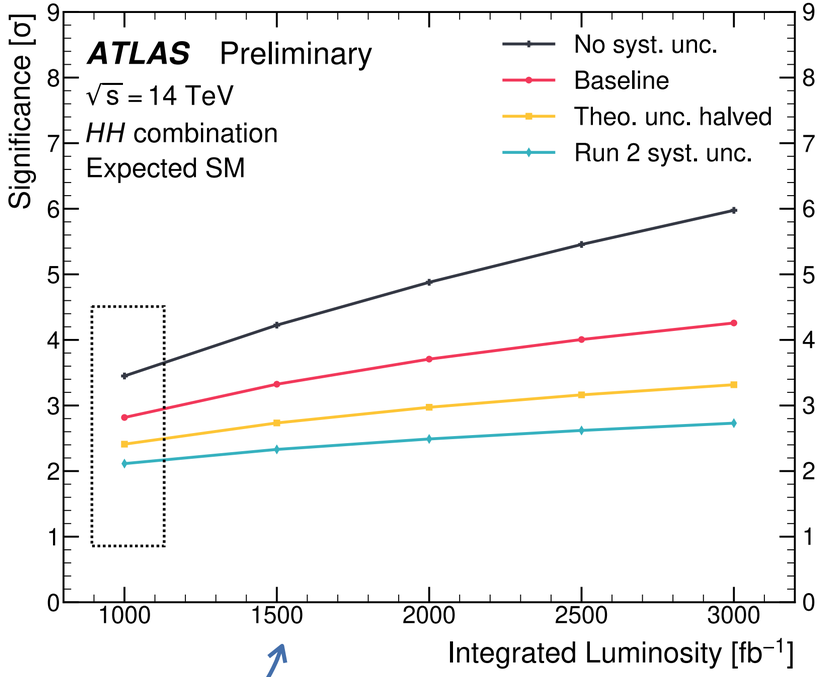
Sensitivity to exclude of $\lambda_{HHH} = 0$ by the the end of Run3



95% CL sensitivity for HH production combining ATLAS and CMS. Sensitivity with single experiment?



HH evidence at the end of Run3 combining ATLAS and CMS?



Single experiment 1000/fb projection as a gauge of two experiments combinations