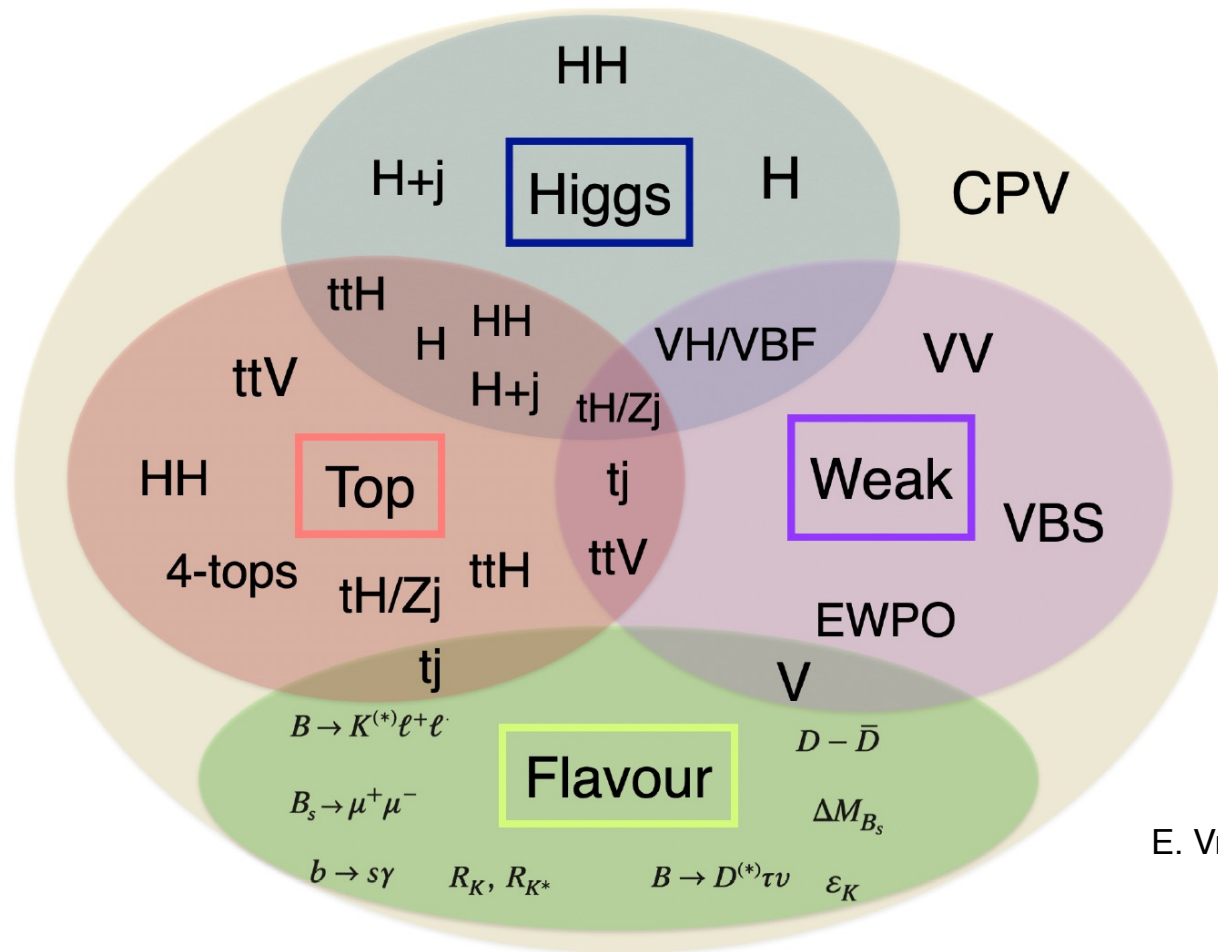


EFT Session Summary and Discussion



Pierre Savard
 University of Toronto and TRIUMF
 Higgs Hunting
 2026

Putting things in context

Maybe New Physics sits above the energy scale probed directly by the LHC

→ If so, could observe its effects indirectly in LHC measurements

Why do EFT fits?

- Use framework to observe (indirectly) physics beyond the SM
- In the absence of a significant deviation, set limits on the Wilson coefficients of BSM operators
- Regarding observation:
 - from Eleni's talk "Is SMEFT a discovery tool?" (assuming we don't observe a significant deviation in individual measurements)
 - At the LHC, power of EFT fit would come from combination of many measurements and combining ATLAS and CMS results
- Regarding limits on coefficients
 - Many assumptions, approximations are made: can we reduce them?
- What is needed from experiments and theory to maximize sensitivity?

Ingredients

$$\Delta \text{Obs}_n = \text{Obs}_n^{\text{EXP}} - \text{Obs}_n^{\text{SM}} = \frac{1}{\Lambda^2} \sum_i c_i^6(\mu) a_{n,i}^6(\mu) + \mathcal{O}\left(\frac{1}{\Lambda^4}\right)$$

The diagram illustrates the components of the equation for ΔObs_n . The terms $\text{Obs}_n^{\text{EXP}}$ and Obs_n^{SM} are circled in blue and green, respectively. A blue arrow points from $\text{Obs}_n^{\text{EXP}}$ to the text "Precise experimental measurements". A green arrow points from Obs_n^{SM} to the text "Precise SM predictions". The term $a_{n,i}^6(\mu)$ is circled in red, and a red arrow points from it to the text "Precise SMEFT predictions". The term $\mathcal{O}\left(\frac{1}{\Lambda^4}\right)$ is also circled in red.

E. Vryonidou

- Need a sufficient set of observables (measuring inclusive rates not enough)

A. Gilbert

- Where to start?

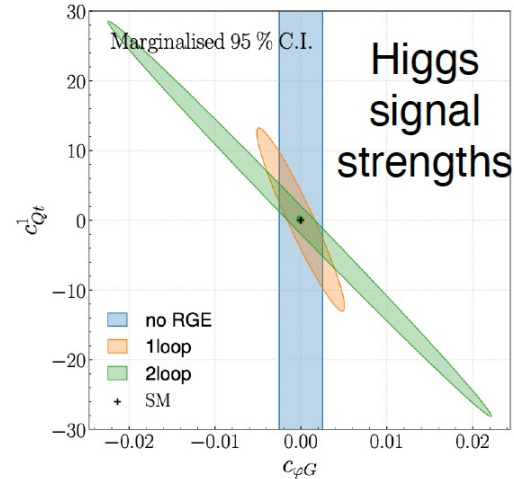
- State-of-the-art single Higgs combinations of all available production & decay channels
- Analyses target "simplified template cross section" (STXS) fiducial cross sections (target specific prod. phase space)

Theory Considerations (from E. Vryonidou)

Advances in predictions (e.g. Higgs decays at NLO in SMEFT) and:

RGE Effects

- Introduction of correlations between coefficients
- Constraints can be more or less stringent



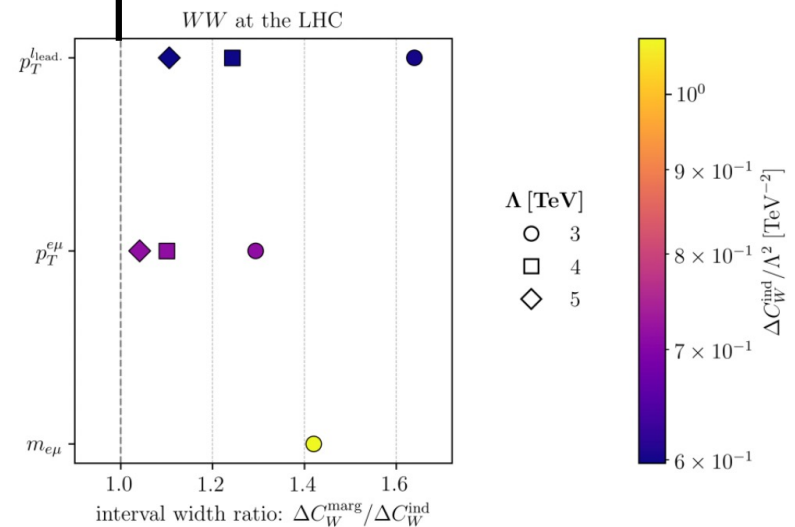
E. Vryonidou

Mantani, Olgoso, Rossia arXiv:2604.16599

no dim-8

Addressing whether “dim-6 is enough”

- For C_W , marginalisation over dim-8 coefficients can change bounds on dim-6



Experiments not using state-of the art?

El Faham, Ventura, EV arXiv: 2511.04338

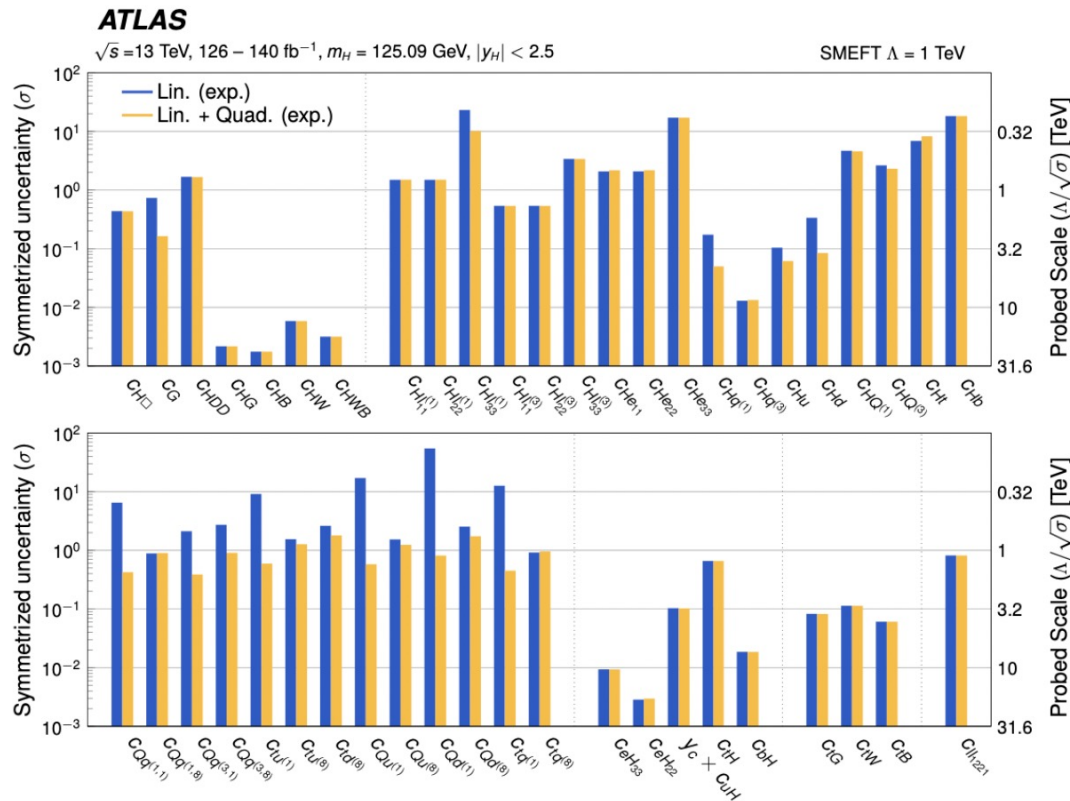
see also Gilles et al arXiv: 2412.16020, 2601.19495

Existing Combinations (ATLAS and CMS)

Combination of Higgs results performed by both experiments:

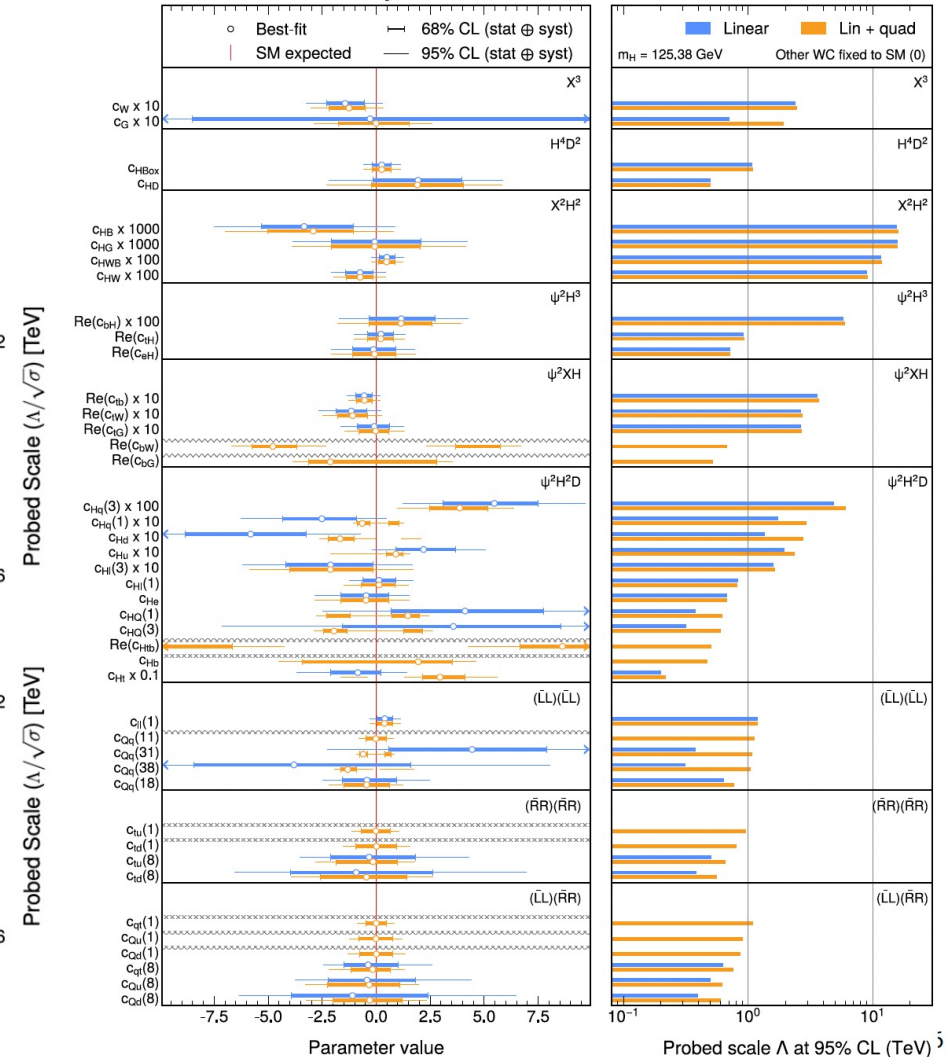
- Can set limits on one parameter at a time, but not realistic

M. Veen and
A. Gilbert



CMS Preliminary

138 fb⁻¹ (13 TeV)

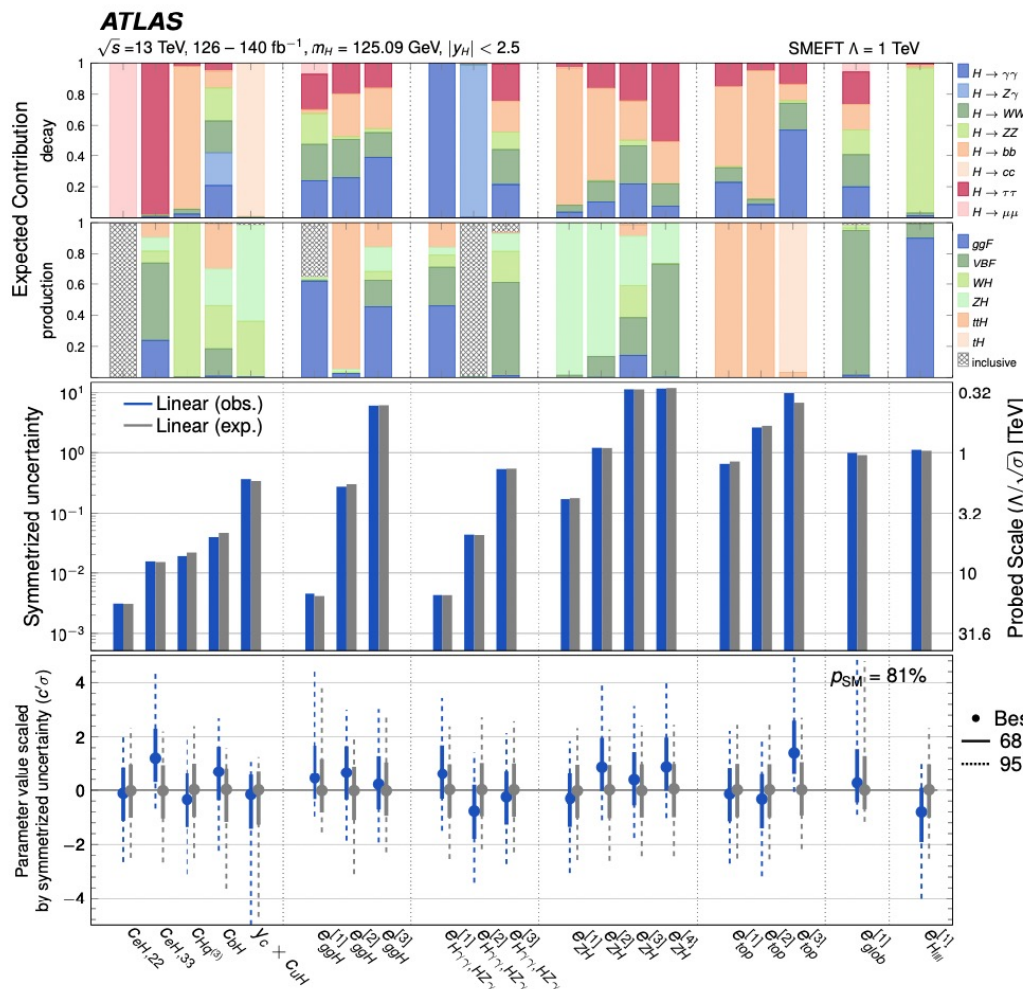


Existing Combinations (ATLAS and CMS)

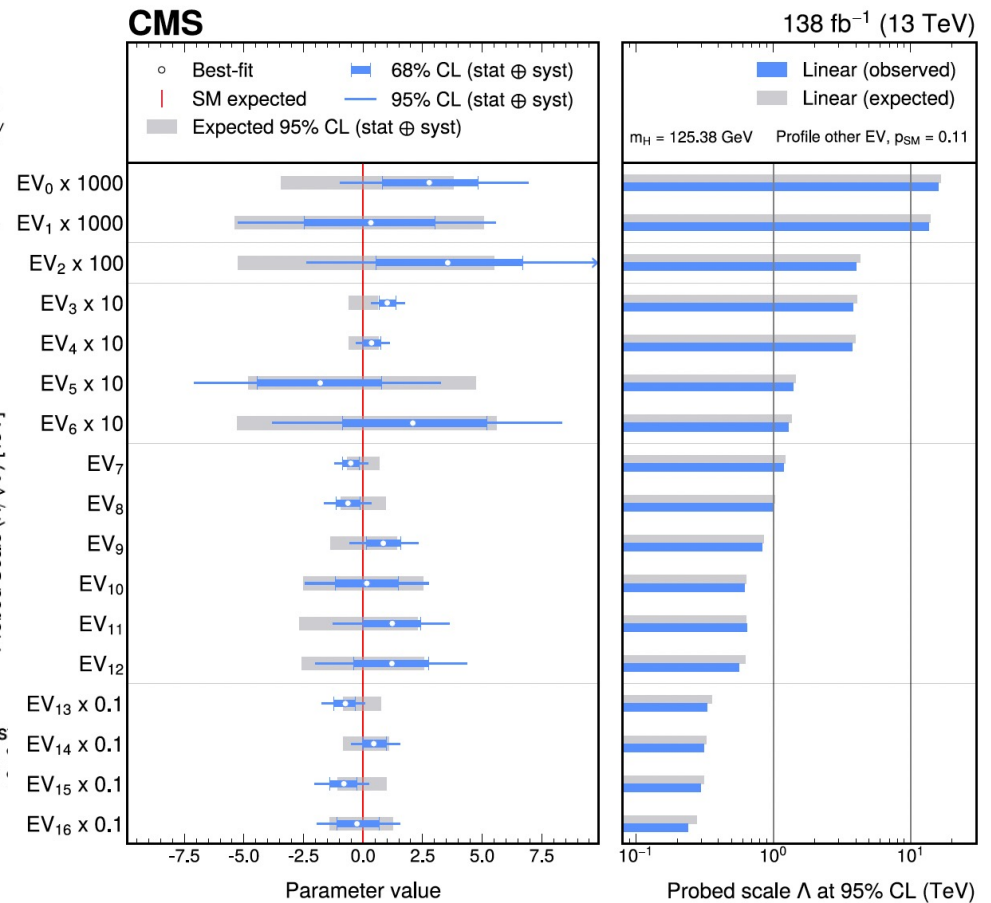
Combination of Higgs Results performed by both experiments

- “Basis rotation”, PCA: Are these results, as presented, useful?

M. Veen and
A. Gilbert



CMS



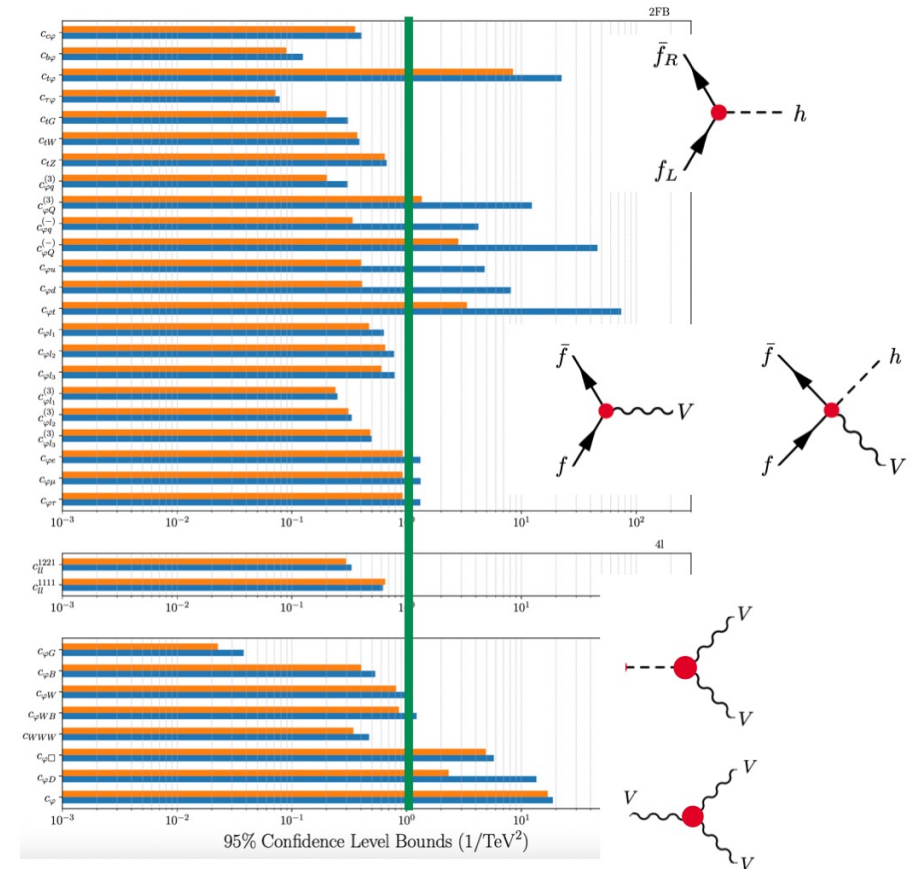
Combinations (from theory community)

One example below, note linear vs quadratic

E. Vryonidou



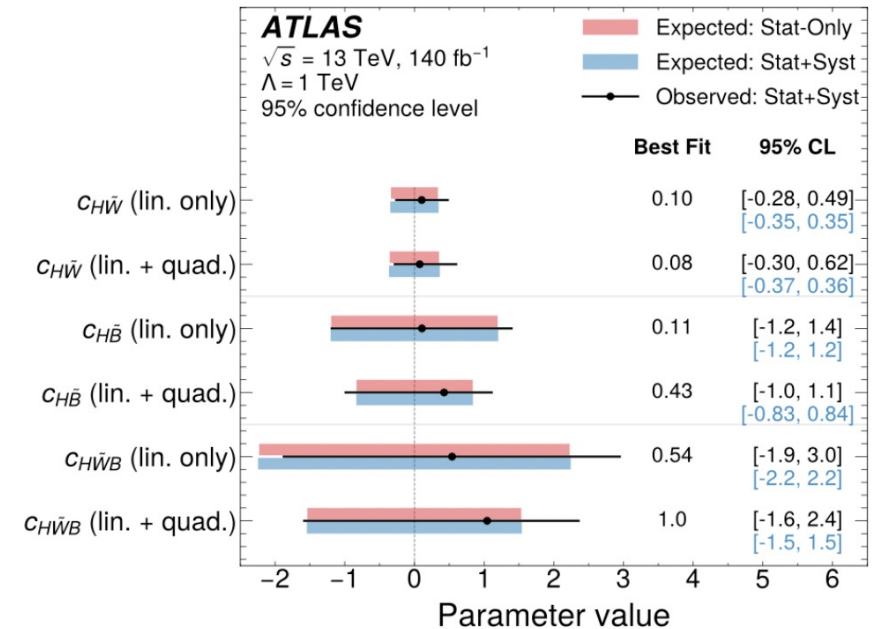
- Bounds varying between operators (~60 operators fitted)
- Most Wilson coefficient bounds **below 1** for $\Lambda=1$ TeV
- Quadratic terms important (especially for 4-fermion operators)
- Least constrained coefficients are 4-top operators



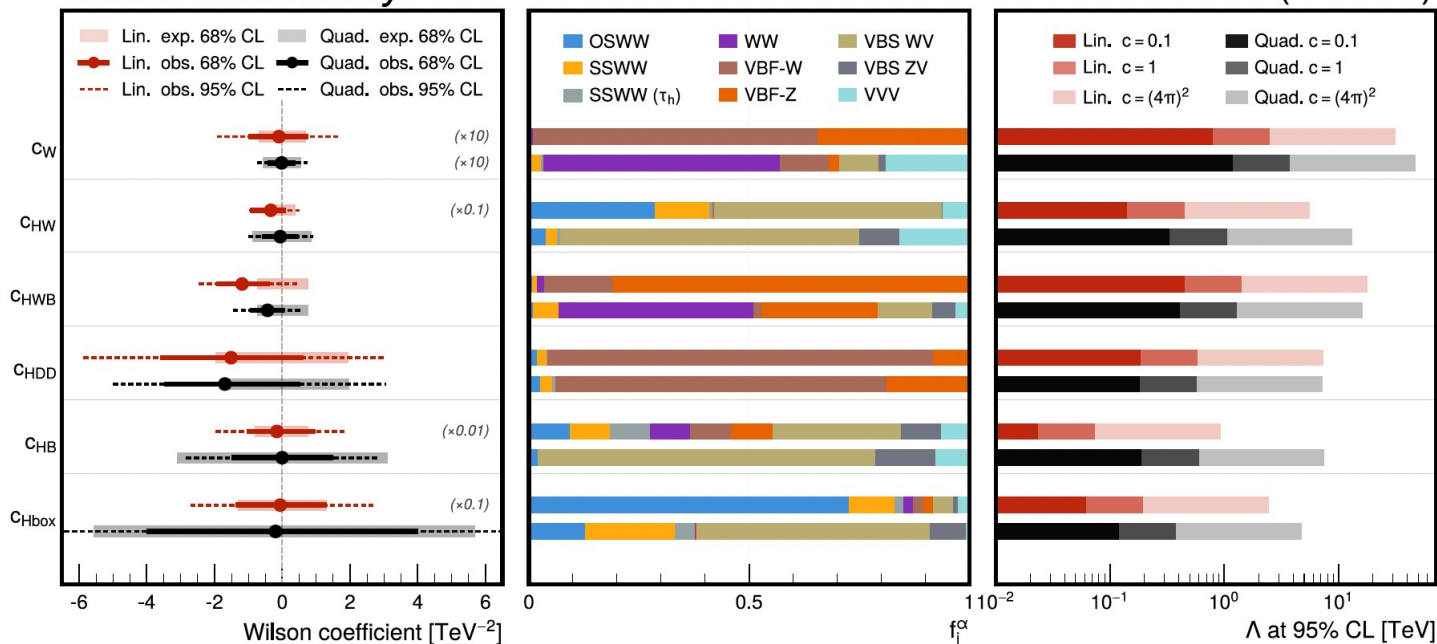
Armadillo, Celada, ter Hoeve, Maltoni, Mantani, Rojo, Rossia, Tentori, Thomas, EV arXiv:2604.16595

Some Interesting Results

- Right: ATLAS Higgs combination provided simultaneous constraints on the three CP-violating coefficients
- Bottom: CMS combination of single and multi-boson measurements. Note:
 - Constraints on operators that involve the Higgs
 - Contributions of many channels to WC constraints (middle plot)



CMS Preliminary



M. Veen and
A. Gilbert

Regarding Combinations

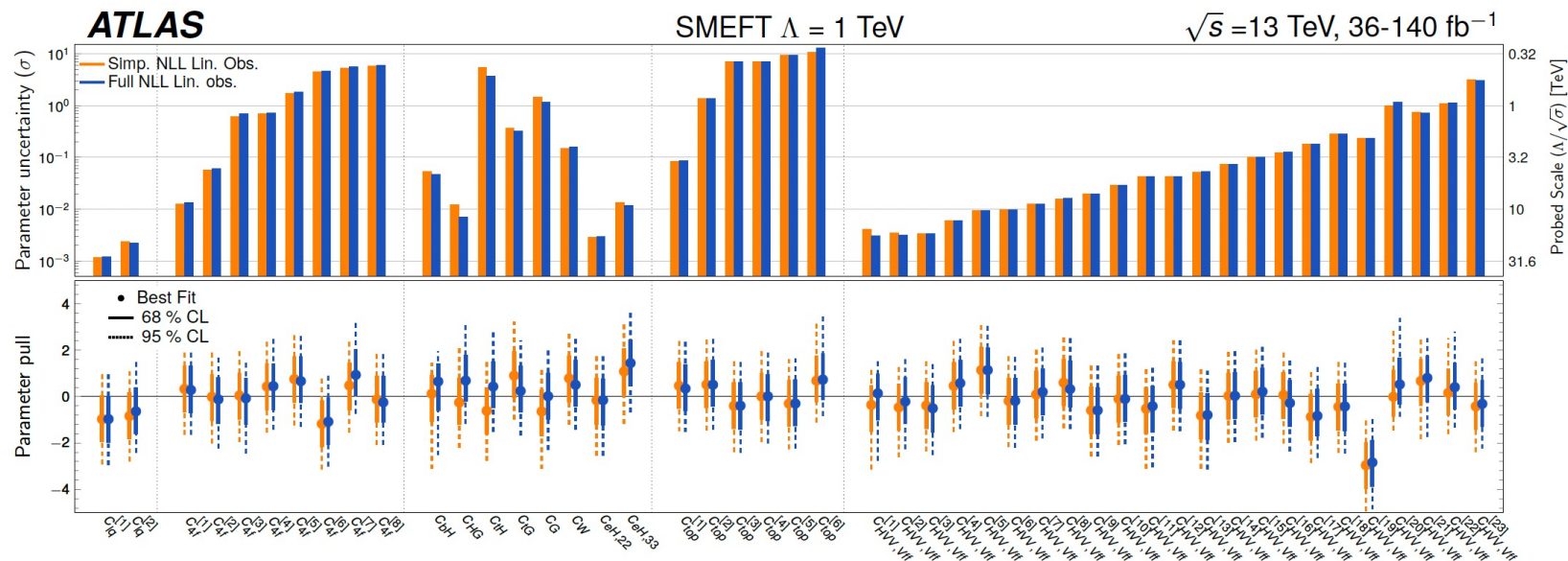
Points mentioned by A. Gilbert regarding combinations:

- We are generally not accounting for EFT effects in the background
 - Most relevant for channels with backgrounds from MC: $VH(bb)$, $H \rightarrow WW$, $H \rightarrow \tau\tau$
 - Mitigation: use of control regions to float MC norm (less often shape)
 - Should really start doing this soon...
- Theory uncertainties in EFT predictions not yet incorporated
- Presentation of results:
 - Useful if all analyses can present version results in same format
 - 1-by-1 scans with both expected and observed 95% CL intervals should always be possible - good for benchmarking

Future LHC Combination

Planning a global SMEFT combination of LHC data ($\sim 1 \text{ ab}^{-1}$ with both experiments)

- What can all the future measurements tell us about physics above the TeV scale, what is there or what is not there...
- Will need Full Run 3 measurement results (will take a while)
 - "Proper" EFT fit may have implications on analysis design (A. Gilbert)
- Monster fit, technically and computationally difficult
 - What is gained or lost when using simplified likelihoods vs full likelihoods?
 - If we are forced to simplify due to the complexity, then are there any gains from experimental collaboration fits?



Your questions

?

Backup