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# Combined Fit Update With V5 Samples

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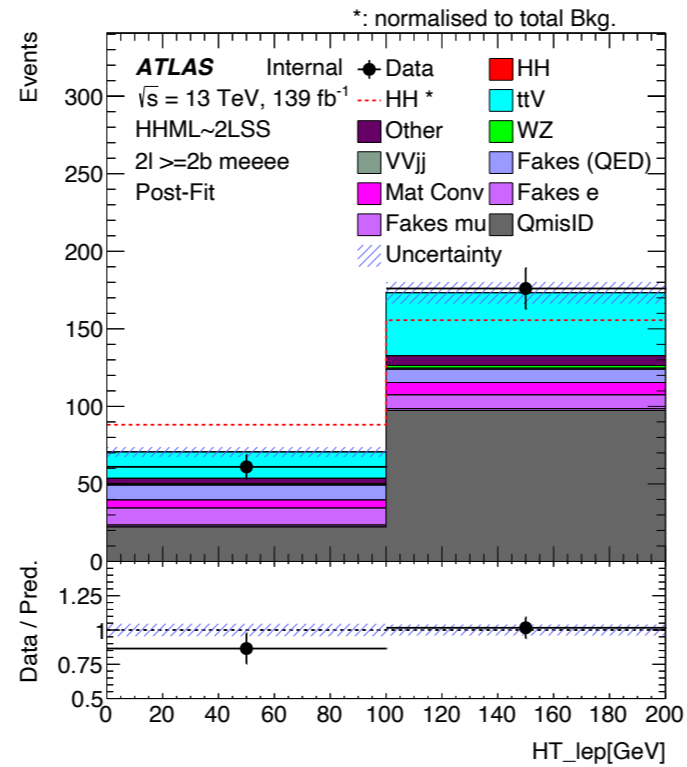
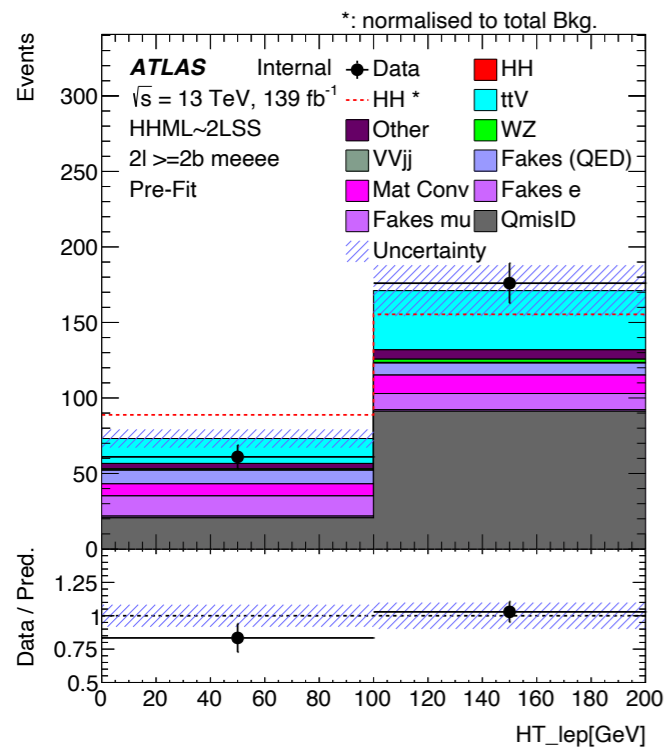
# Introduction

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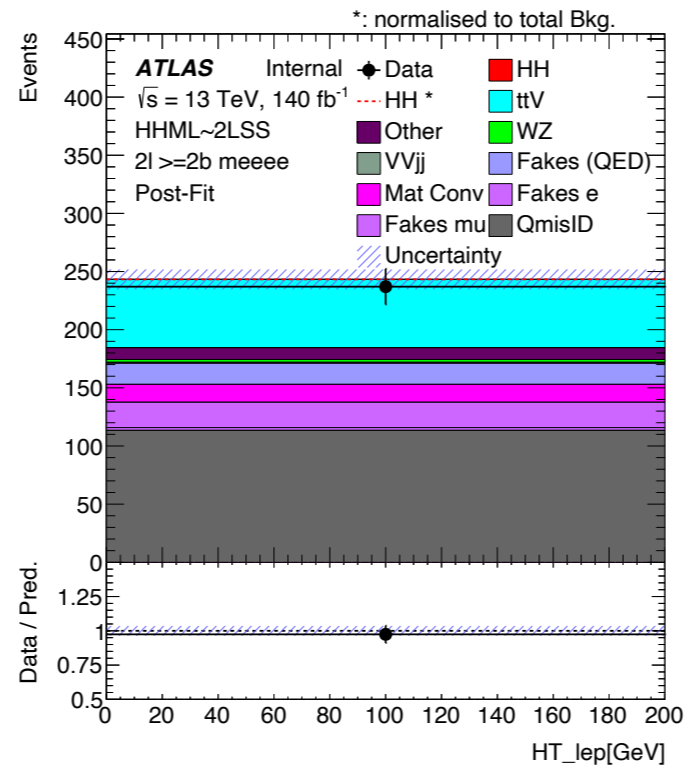
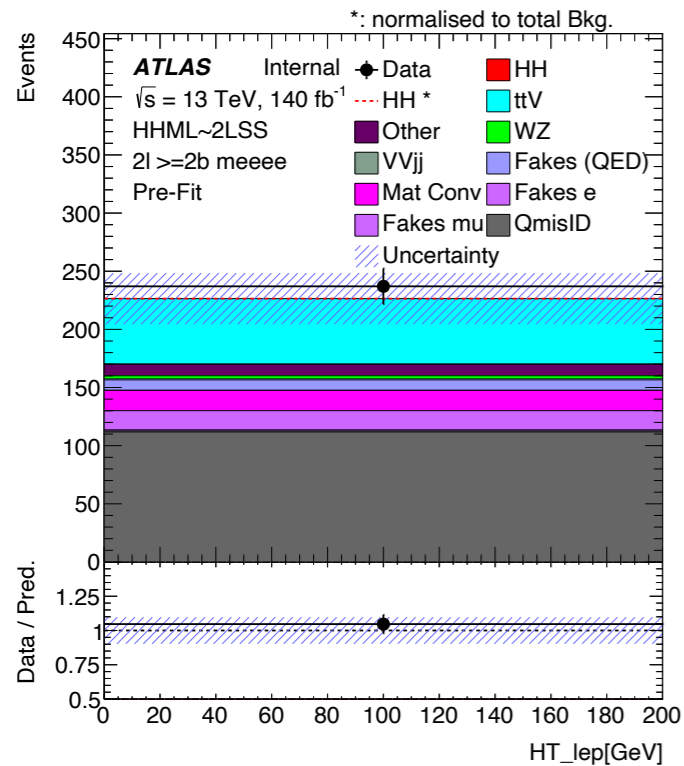
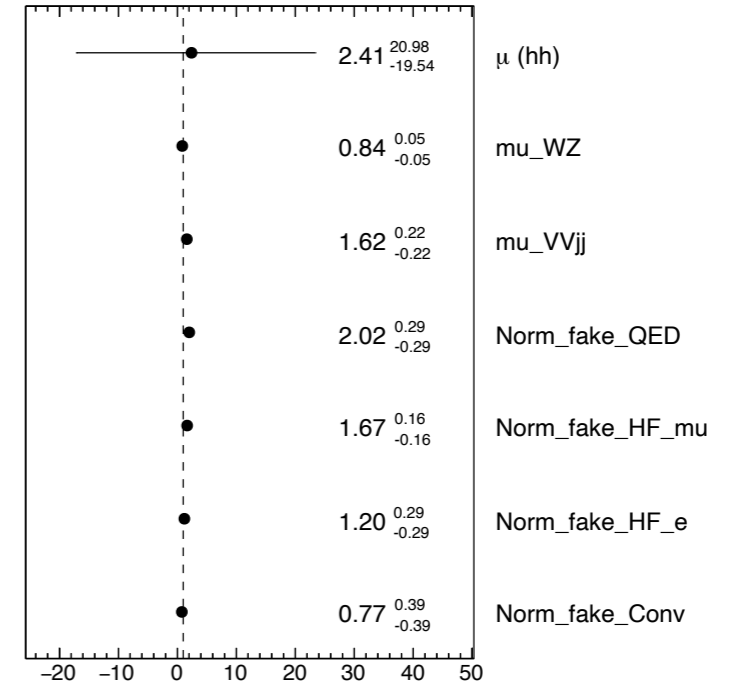
- Updates in this presentation.
  - Produced new slimmed samples with 140-1fb lumi weights and more theory uncertainty information.
  - Merged bins in HT fake electron CR.
  - Optimized SR binning to avoid large fluctuation.

# Binning in CR

► HT\_lep is re-binned.

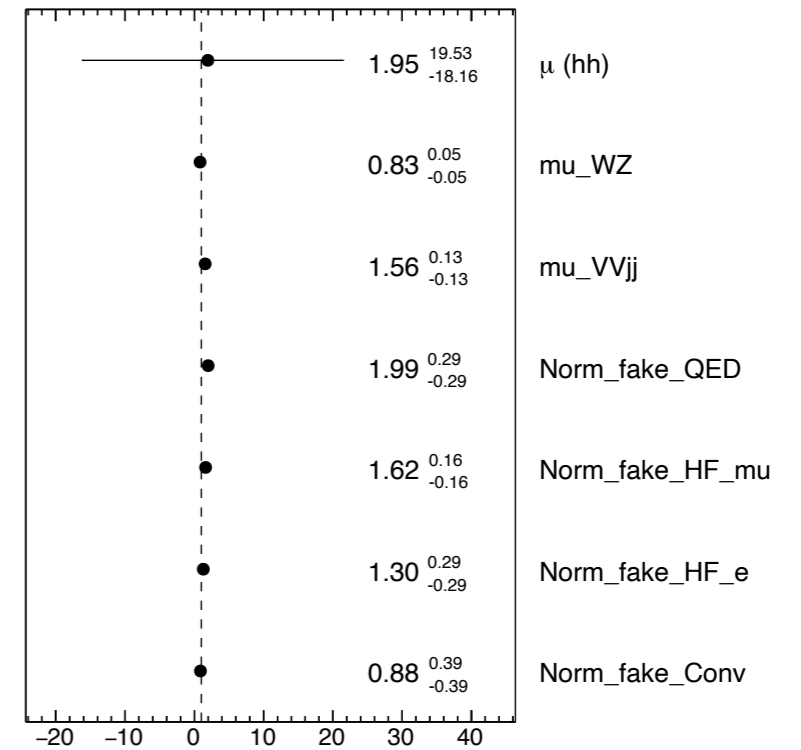


ATLAS Internal



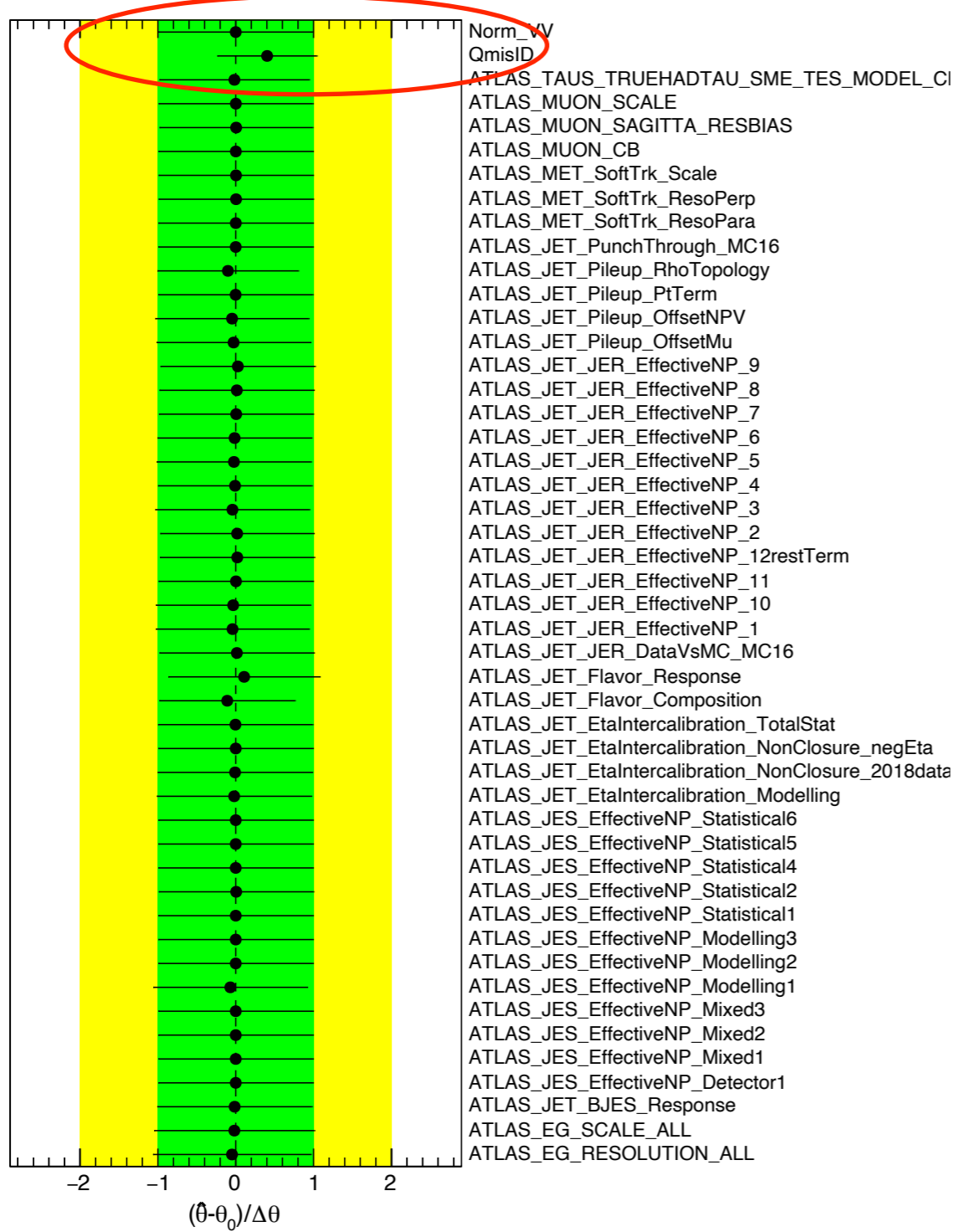
New

ATLAS Work in progress

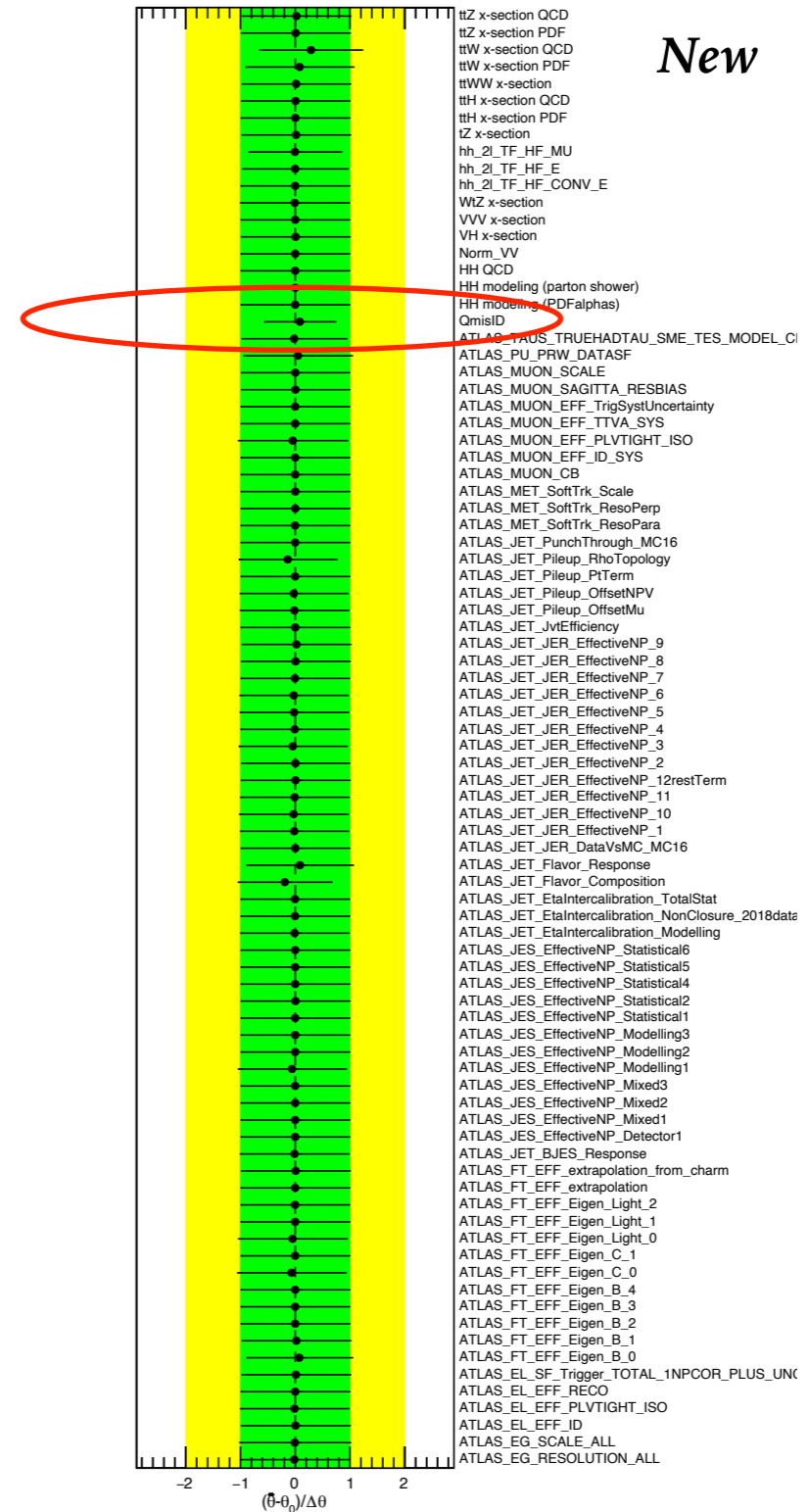


# Pulls

ATLAS Internal



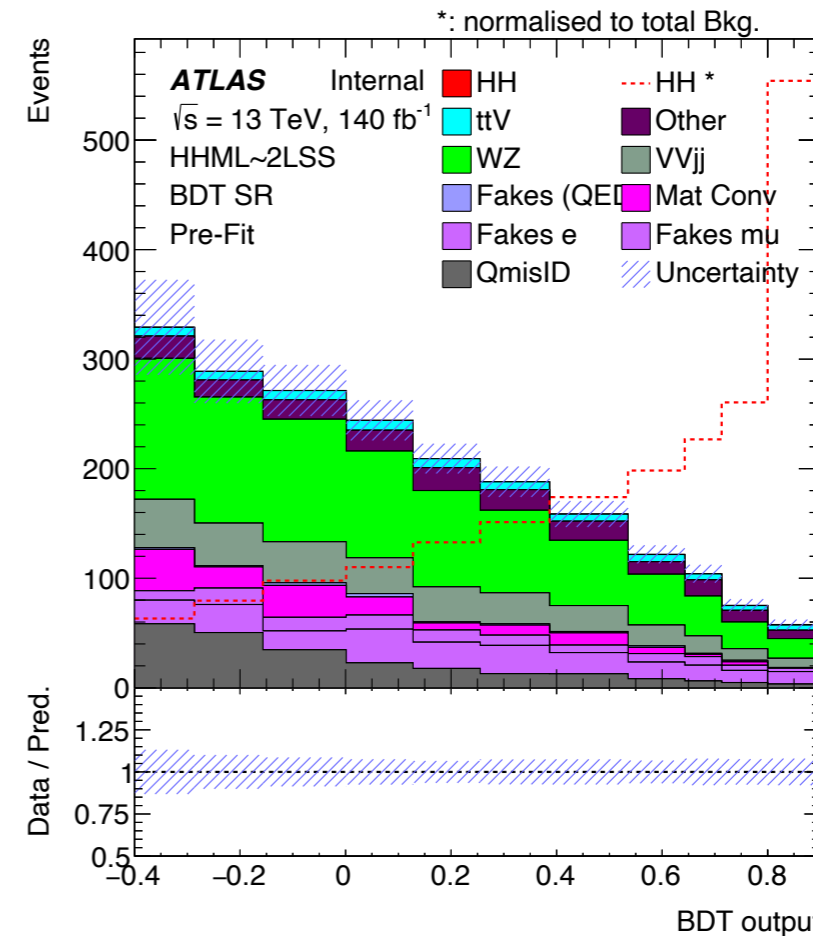
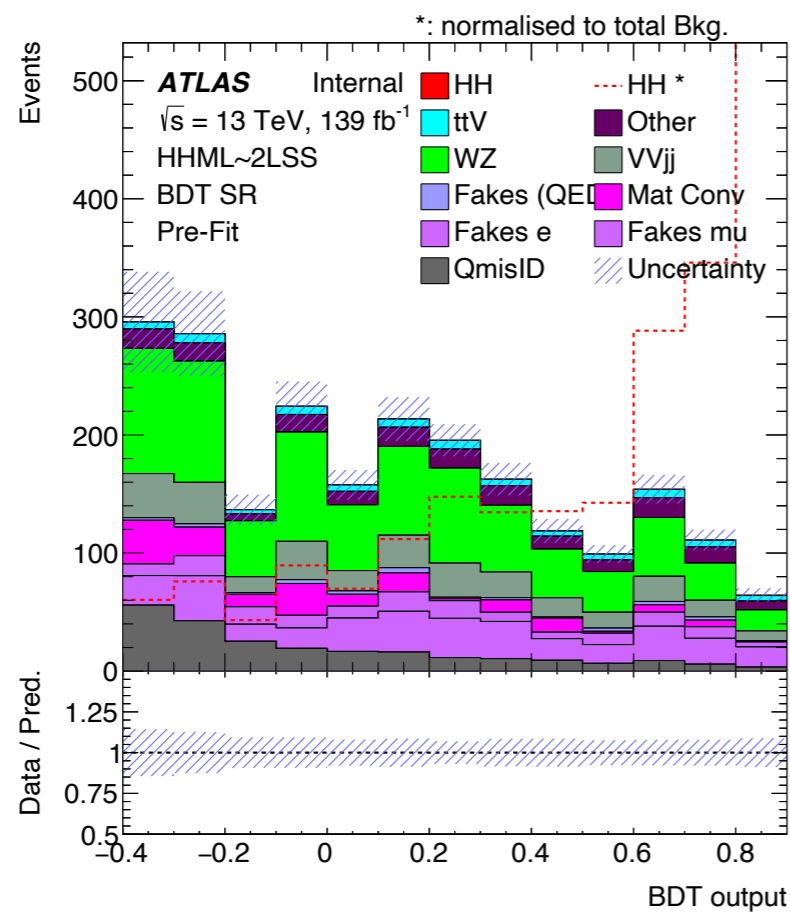
ATLAS Work in progress



# SR optimization

- The BDT distribution is rough and bumpy.
- Use 'AutoBin' to find an optimal set-up. #bins is reduced from 13 to 11.
- Closed to v4 limits.

New



-2sigma	-1sigma	Medium	1sigma	2sigma
22.2	29.8	41.4	60.2	87.6

V5

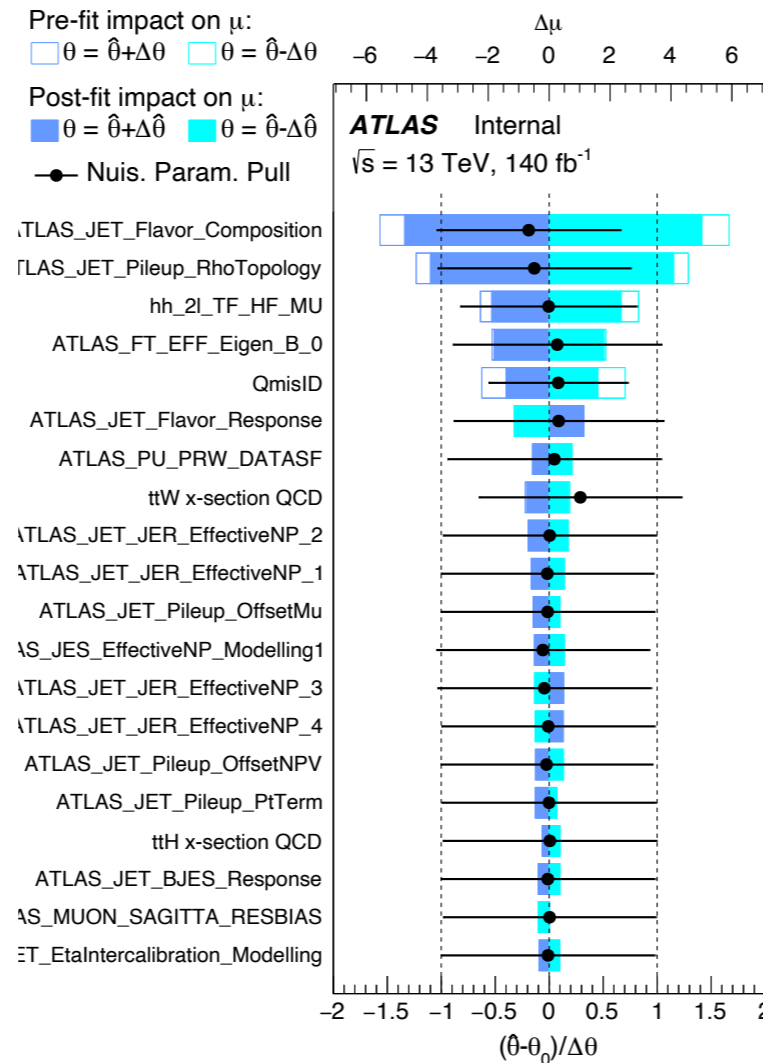
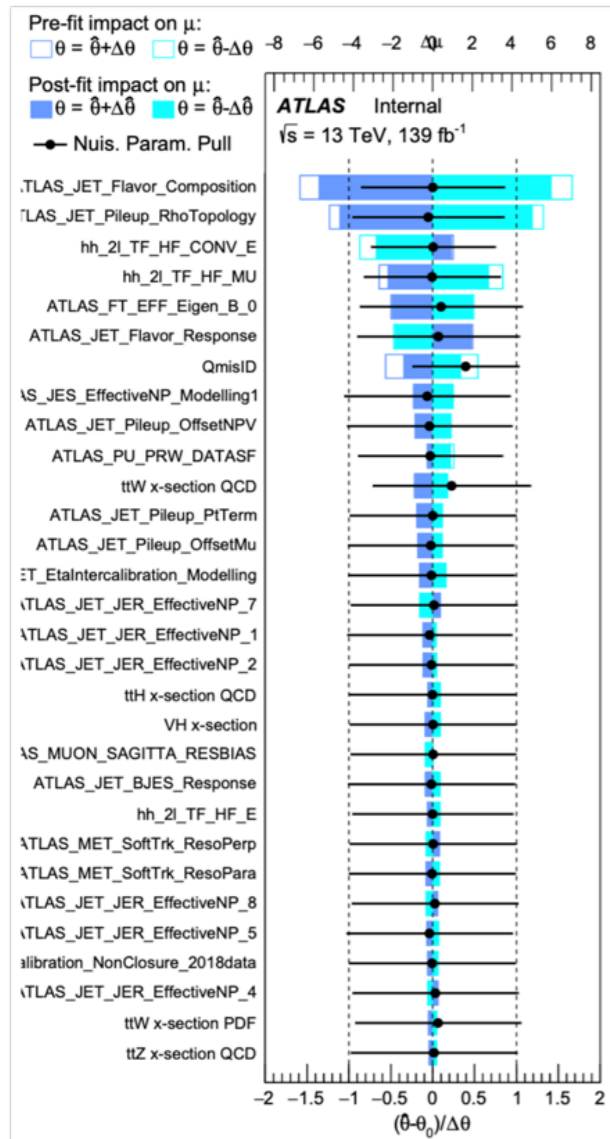
-2sigma	-1sigma	Medium	1sigma	2sigma
19.3	25.9	36.0	52.5	76.4

V4

	-2 $\sigma$	-1 $\sigma$	Expected	+1 $\sigma$	+2 $\sigma$	Observed
$\sigma_{HH}/\sigma_{HH}^{SM}$ Stats.	16.39	22.01	30.55	43.15	59.21	blinded
$\sigma_{HH}/\sigma_{HH}^{SM}$ Sys.	19.06	25.59	35.52	50.49	69.91	blinded

# Ranking

- ▶ The order of NP ranking does not change very much.
- ▶ Leading impact: Normalization factors, MC stats, JER & JES , Fake uncertainty (on BDTG shape)

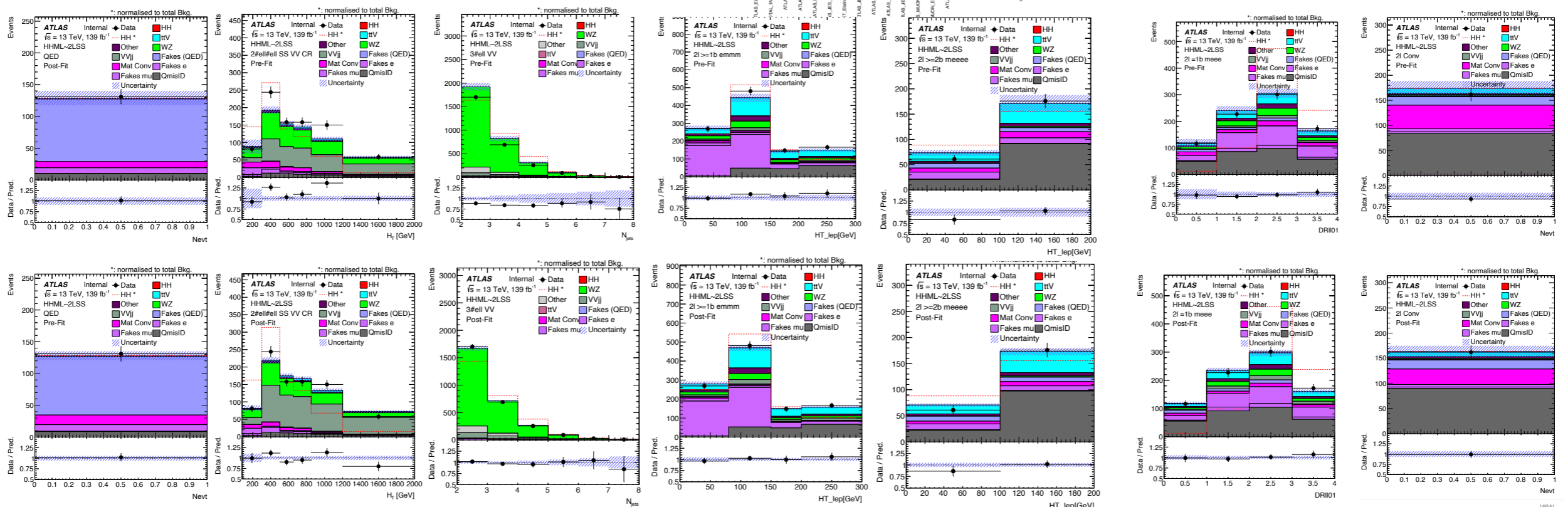
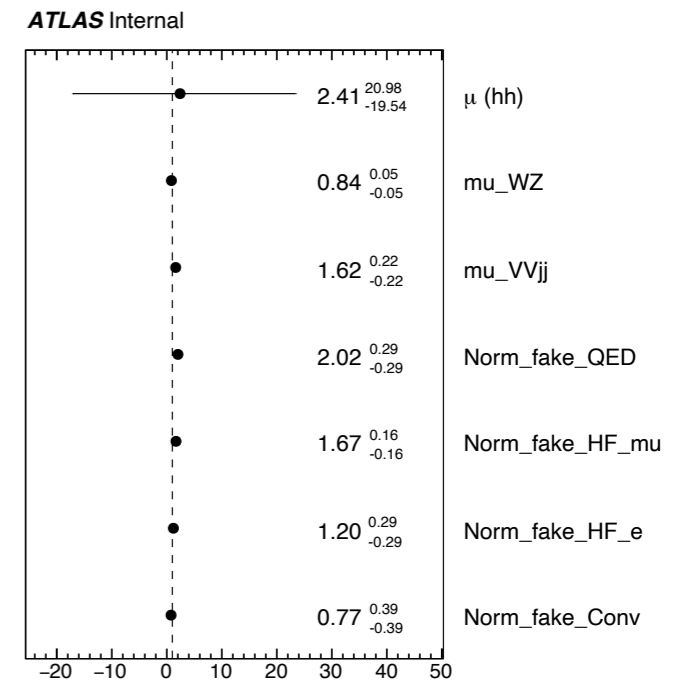
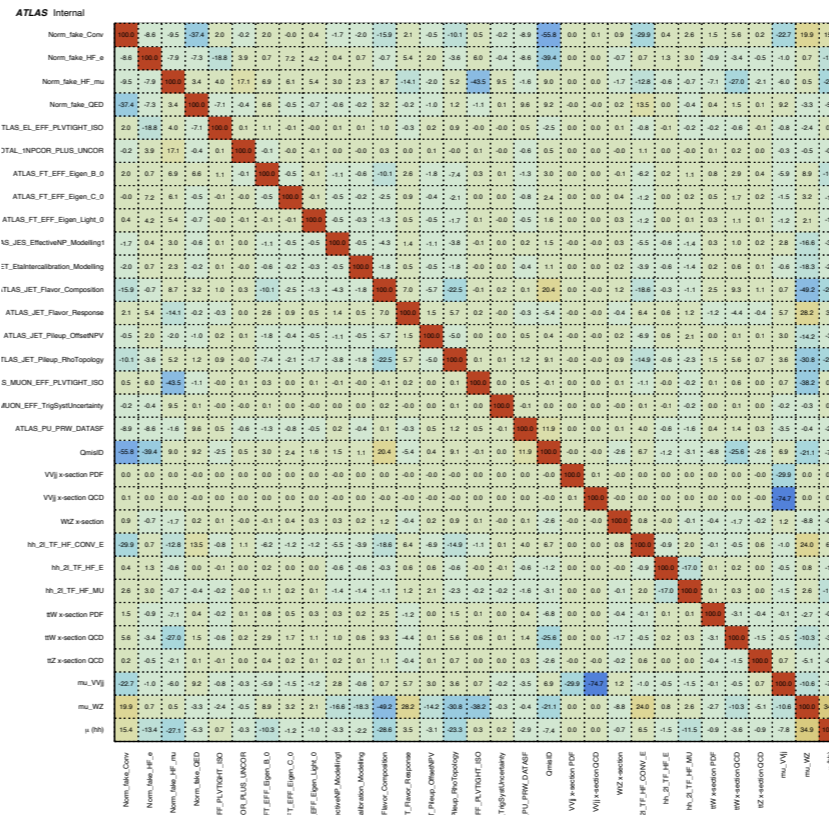


Sources of uncertainty	impact on signal strength(%)	
NormFactors	9.32	-8.54
Gammas	7.35	-6.18
Jet	8.65	-7.72
Fake uncertainty	2.31	-2.25
Jet tagging	1.82	-1.92
QmisID	1.51	-1.53
ttV theory	0.88	-0.63
Lepton efficiency	0.58	-0.18
MET	0.44	-0.47
Other theory	0.34	-0.34
PileUp Rweighting	0.63	-0.65
single Higgs theory	0.34	-0.32
Uncategorised	0.012	-0.020
Luminosity	0.	-0.

- ▶ Next plan: looking into theory uncertainty branches

# Fit 1

- ▶ HT lep  $\geq 2$ bjet region has small fake electron purity comparing to  $\geq 1$ bjet
- ▶ Pre-fit close to Post-fit yields is because initial value of NFs are set to some values (eg. mu\_QED nominal value = 1.9)



# Fit 2: 1 bin for $m_{ee} \geq 2b$ jets

