Parton shower systematics on qqZZ with VBF cut (update)

Danyi Zhang

2021/2/22

Samples, variable & cut

- qqZZ:

qqZZ samples

DSID	Minitree	Version	Filter	Notes
364250	mc16_13TeV.364250.Sherpa_222_NNPDF30NNLO_llll.root	v25	Overlap removal 100-170 GeV	
364251	mc16_13TeV.364251.Sherpa_222_NNPDF30NNLO_llll_m4l100_300_filt100_150.root	v25	m4l 100-300 GeV, filter 100-150 GeV	[1] [2]
346899	mc16_13TeV.346899.Sherpa_222_NNPDF30NNLO_llll_m4l100_300_filt100_170.root	v25	m4l 100-300 GeV, filter 100-170 GeV	[2]
364252	mc16_13TeV.364252.Sherpa_222_NNPDF30NNLO_llll_m4l300.root	v25	m4l>300 GeV	

[1] It should not be 'combined' with the unfiltered 364250 as the filter window in OverlapRemoval.cxx was changed to 100-170 GeV for 346899.

[2] The 'history' of the 100-150/170 samples is that one can have tau decays or mispairing, etc. which can have m4l_truth above 150 GeV generating m4l_fsr in 100-150 GeV. So the generation is in a broader range.

- The samples are not completely ready, only used a part of the qqZZ samples(marked above) in mc16d campaign.

- VBF cut: m4l>=220 & m4l<=2000 & n_jets>=2 & $\left|\Delta\eta_{jj}\right|$>=4

- Variable: `higgs_m_fidDres_4lsel`

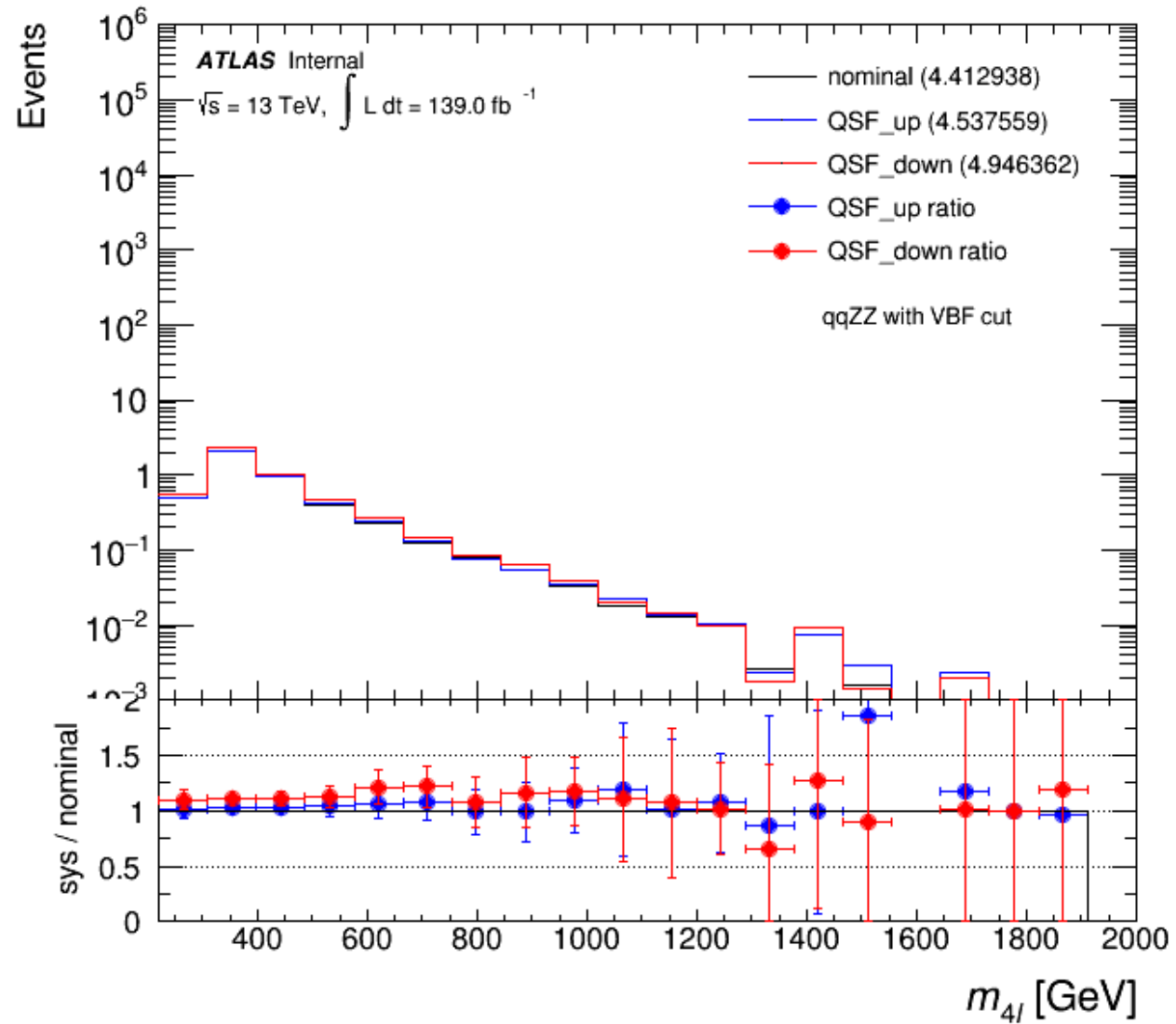# Systematics types

- Weights:

```
Double_t        weight_var_H41_Shower_UEPS_Sherpa_CKKW__1down;
Double_t        weight_var_H41_Shower_UEPS_Sherpa_CKKW__1up;
Double_t        weight_var_H41_Shower_UEPS_Sherpa_CSSKIN__1up;
Double_t        weight_var_H41_Shower_UEPS_Sherpa_QSF__1down;
Double_t        weight_var_H41_Shower_UEPS_Sherpa_QSF__1up;
```
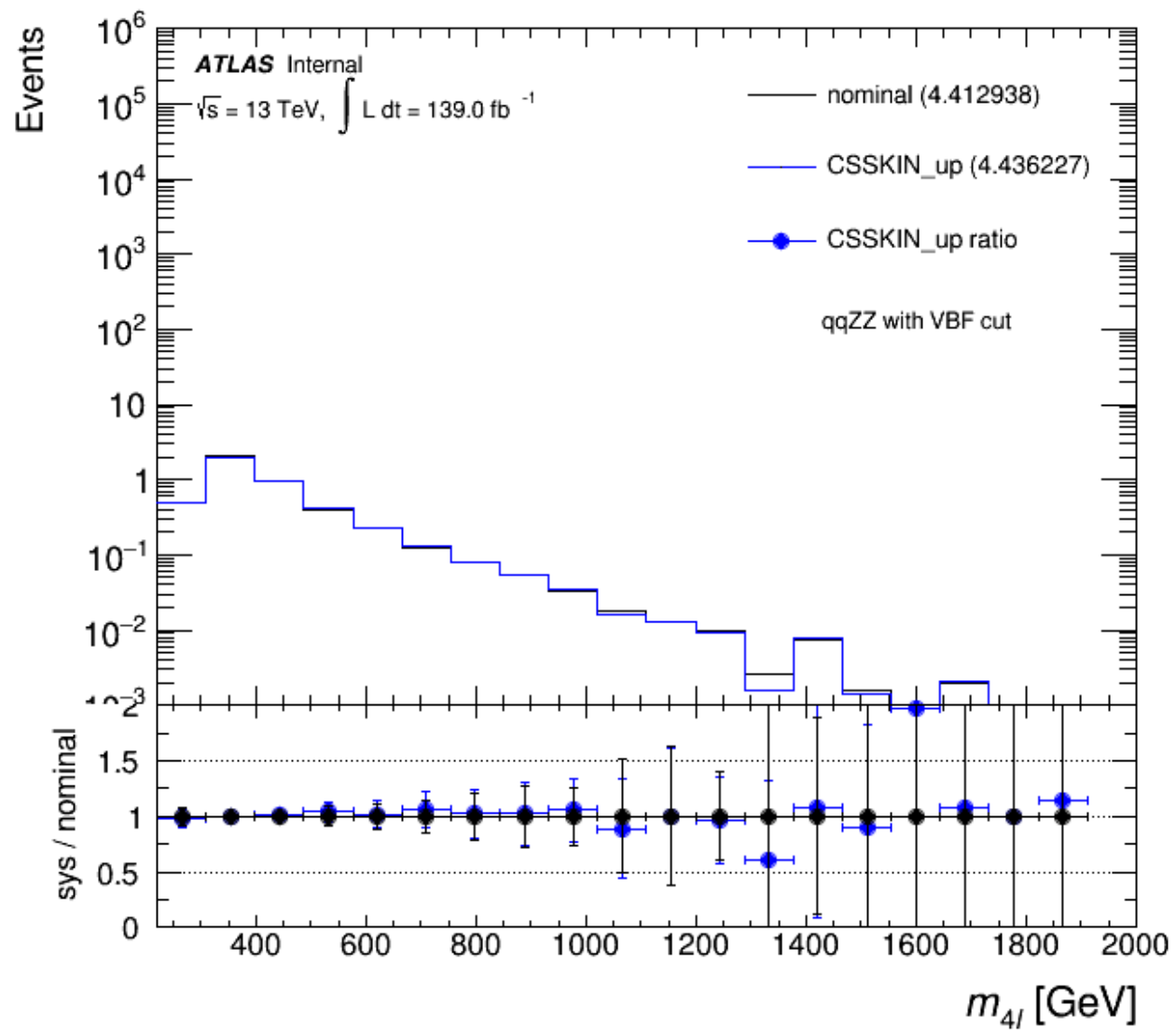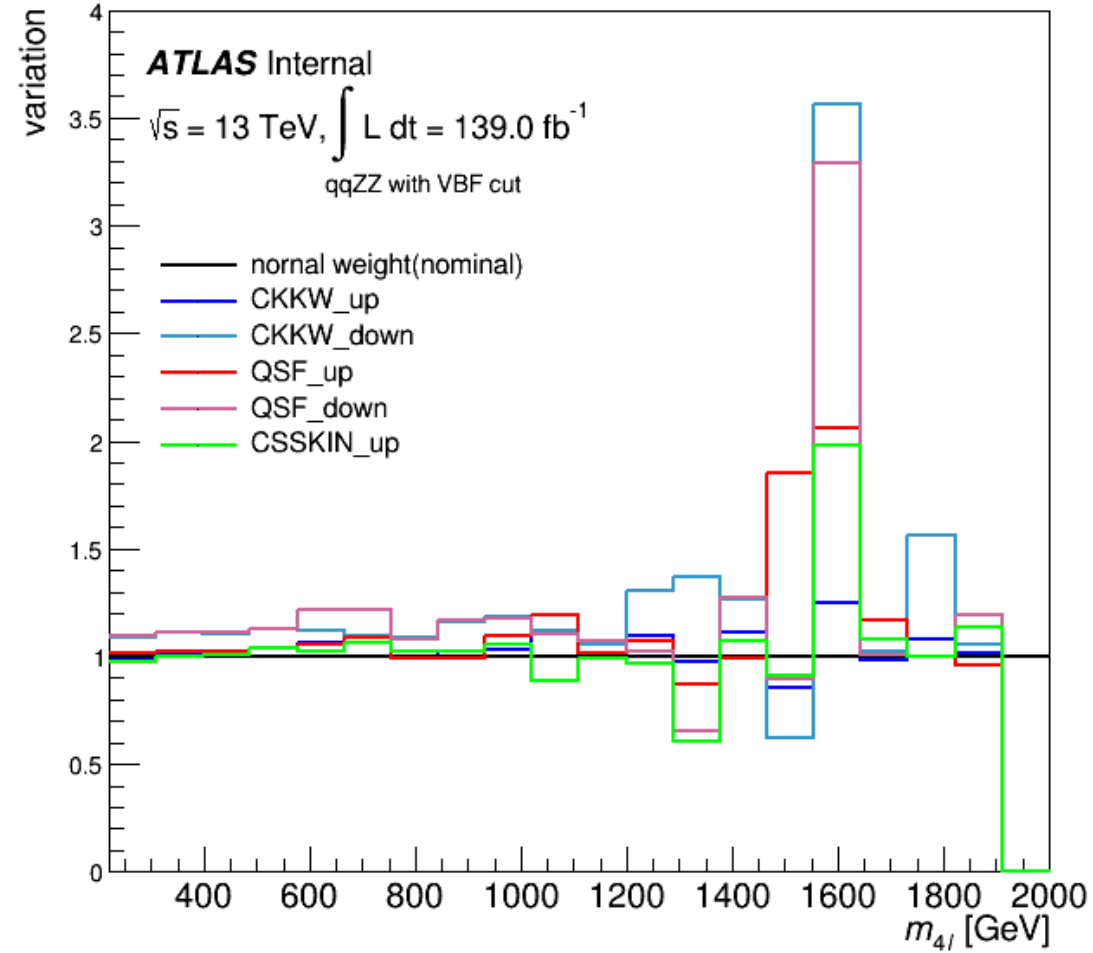
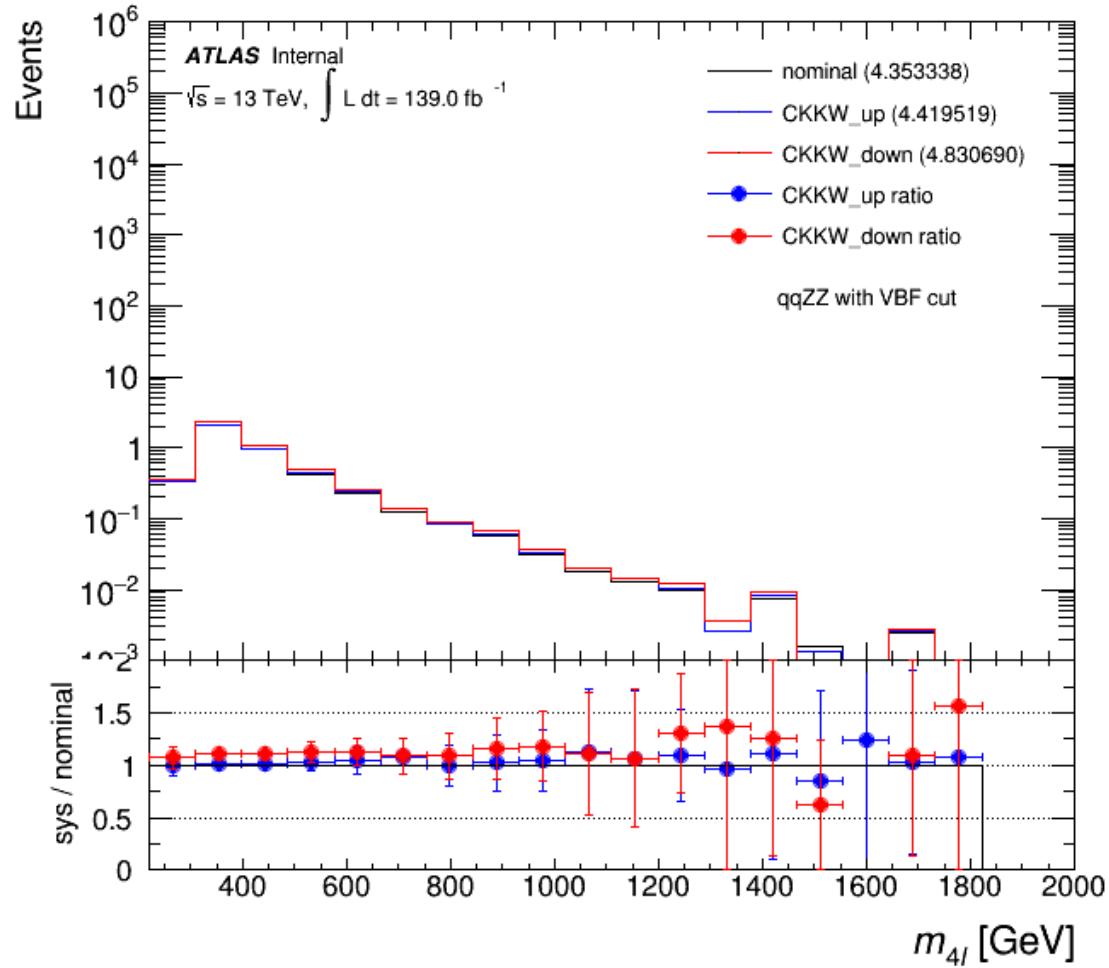# CKKW
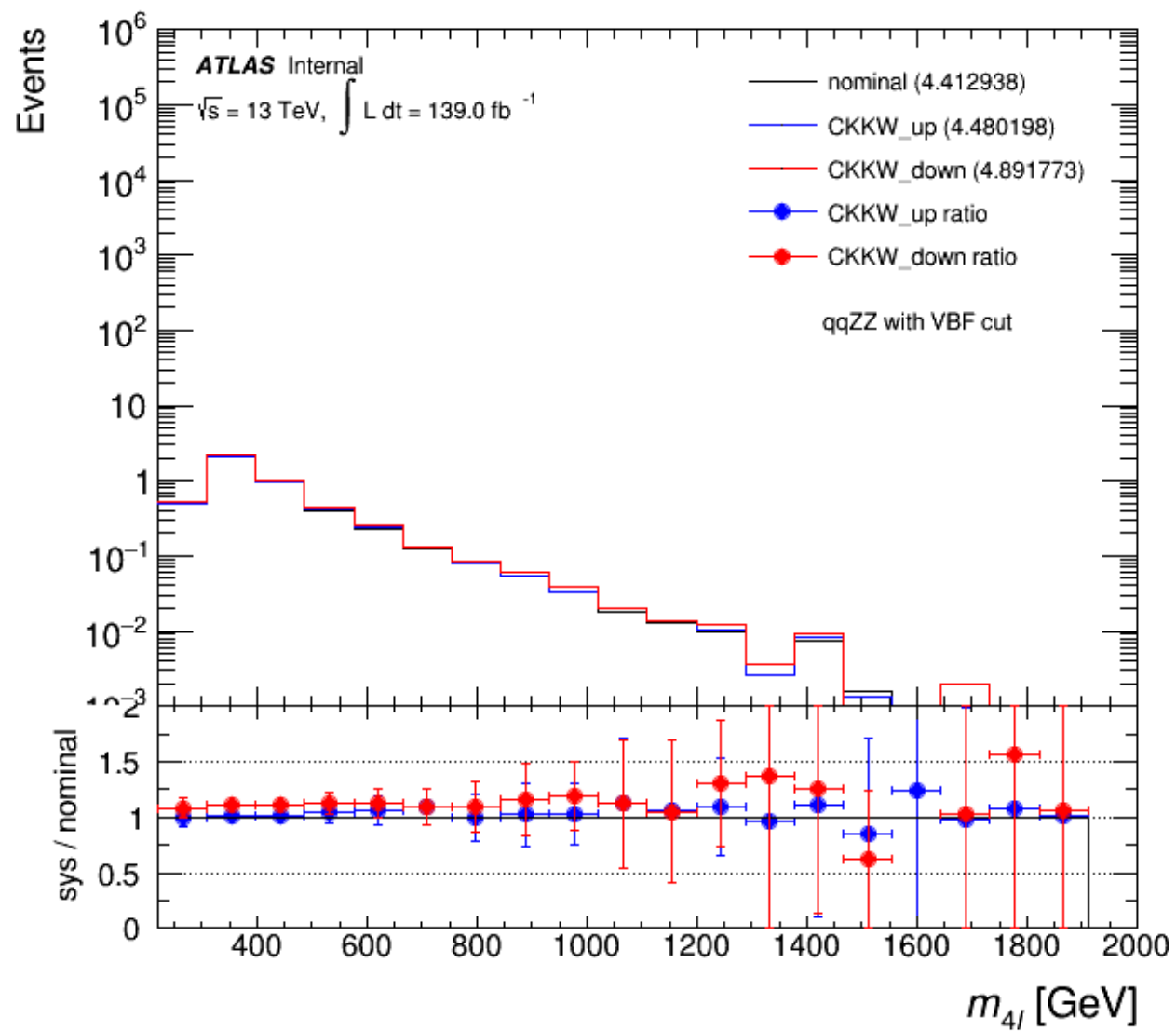
QSF

CSSKIN

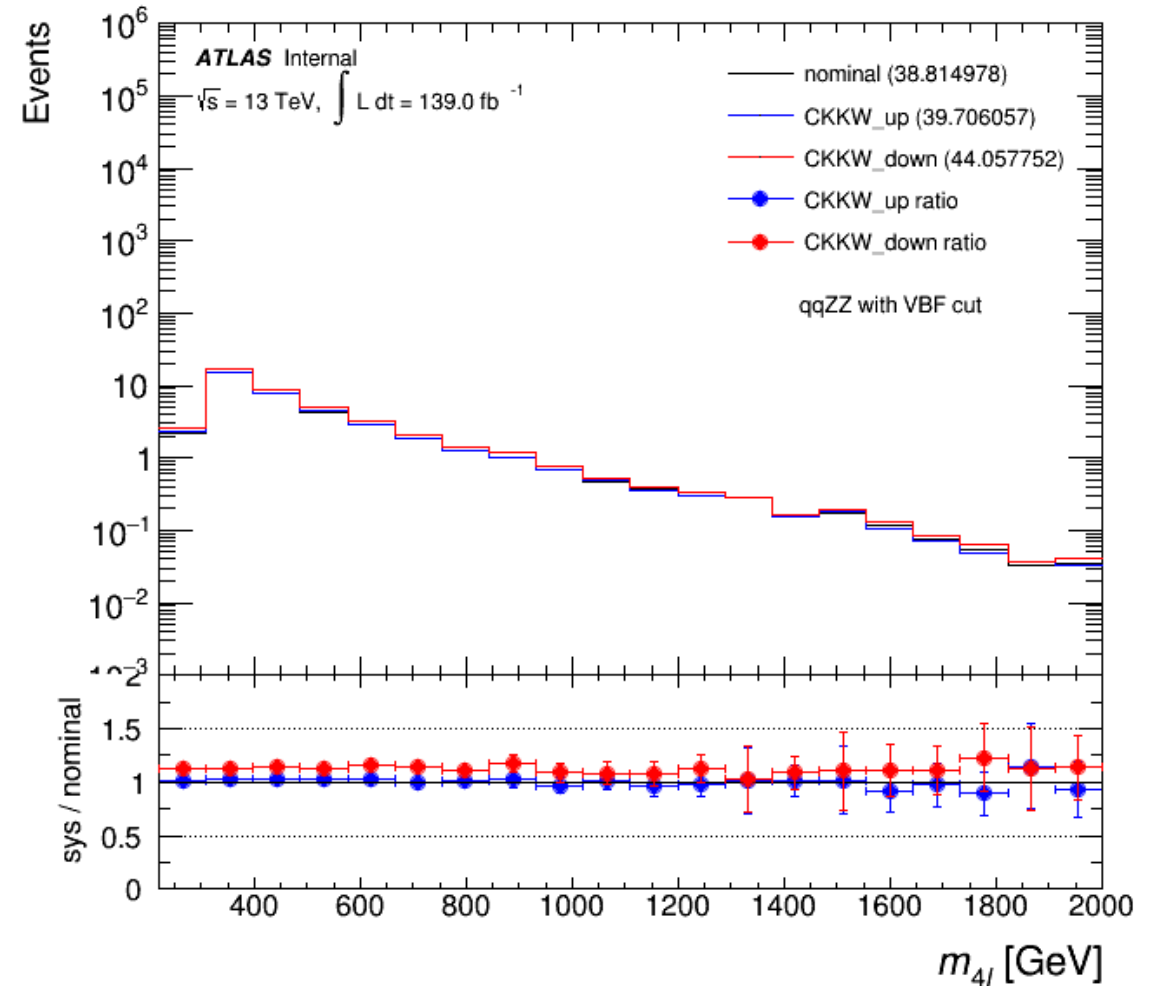# Put them together

Variables

- There are 4 types of variables in total:

```
higgs_m_fidBorn_4lsel;
higgs_m_fidBorn_truth;
higgs_m_fidDres_4lsel;
higgs_m_fidDres_truth;
```

- Born: born leptons, generated directly from truth

- Dres: leptons with FSR correction

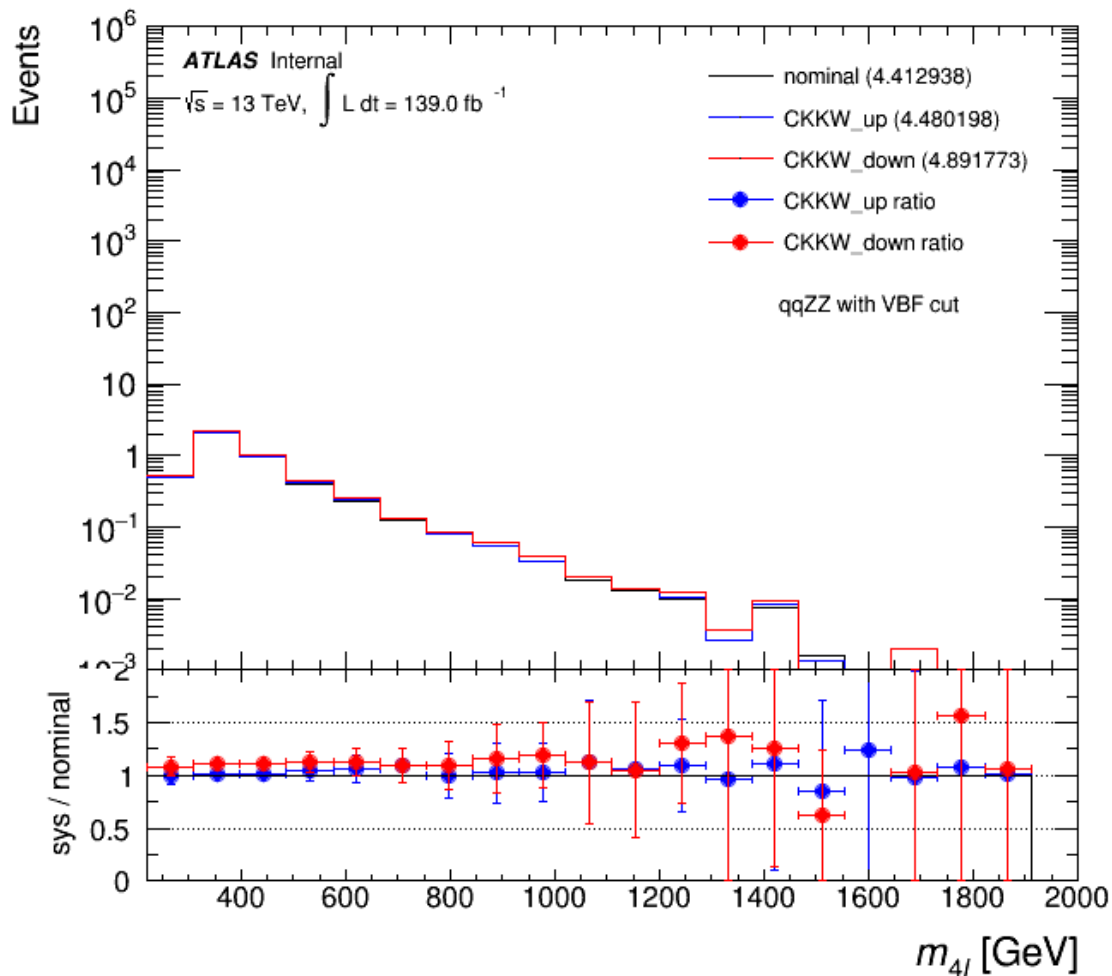- Truth: with no fiducial cut

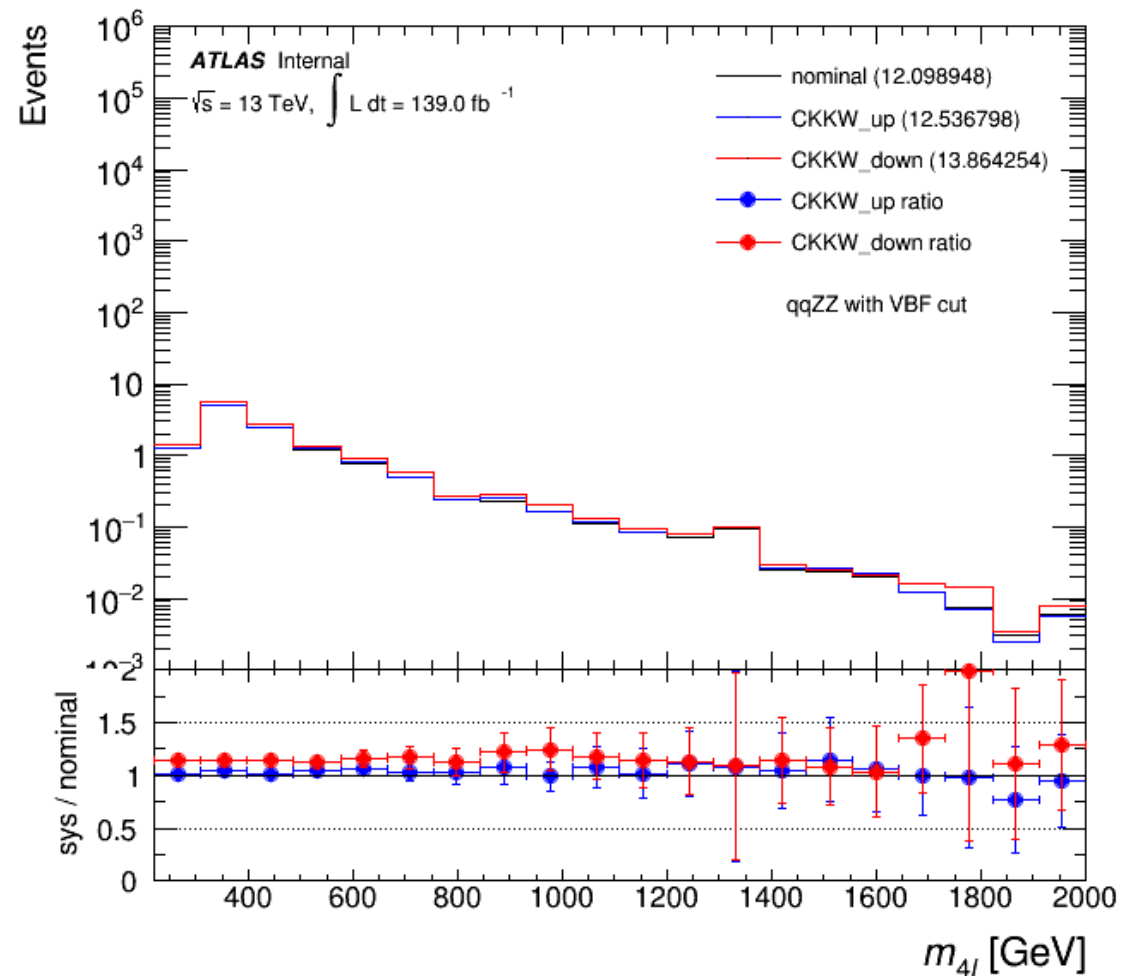- 4lsel: with fiducial cut

Variables

higgs_m_fidBorn_4lsel

higgs_m_fidBorn_truth

Variables

higgs_m_fidDres_4lsel

higgs_m_fidDres_truth