First Look at v6 Inputs

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Systematic Yields

- Yields integrated from 200 GeV upwards are provided

$\Rightarrow$ Nominal + statistic and systematic variations

- For pure flavour channels:

signal region	e^+e^+	e^-e^-	m^+m^+	m^-m^-
Central	11.81 ± 3.95	10.45 ± 4.02	6.46 ± 1.37	7.48 ± 1.57
Up-Systematic	19.38 ± 7.11	18.10 ± 7.48	9.26 ± 2.28	10.98 ± 2.67
DOwn-Systematic	4.25 ± 1.15	2.80 ± 0.76	3.67 ± 0.68	3.98 ± 0.74
Up-Statistic	16.59 ± 6.03	15.47 ± 6.32	7.28 ± 1.54	8.41 ± 1.76
Down-Statistic	7.04 ± 1.98	5.43 ± 1.77	5.65 ± 1.20	6.55 ± 1.37

- For mixed flavour channels, also stating which lepton has been misidentified:

signal region	e^+m^+		e^-m^-		m^+e^+		m^-e^-	
	AntiID_e	AntiID_m	AntiID_e	AntiID_m	AntiID_m	AntiID_e	AntiID_m	AntiID_e
Central	21.45 ± 5.86	4.61 ± 1.27	10.79 ± 4.18	4.97 ± 1.11	1.90 ± 1.10	9.45 ± 2.95	2.49 ± 1.27	8.72 ± 2.86
Up-Systematic	38.39 ± 10.66	6.78 ± 2.18	20.14 ± 7.74	6.91 ± 1.78	3.00 ± 2.01	14.60 ± 5.08	4.42 ± 2.40	13.38 ± 4.97
DOwn-Systematic	4.77 ± 1.31	2.44 ± 0.58	1.81 ± 0.78	3.03 ± 0.61	0.79 ± 0.79	4.69 ± 1.51	0.56 ± 0.25	4.29 ± 1.05
Up-Statistic	30.42 ± 8.67	5.16 ± 1.43	16.38 ± 6.39	5.57 ± 1.25	2.14 ± 1.24	12.44 ± 4.20	2.80 ± 1.43	11.58 ± 4.11
Down-Statistic	12.51 ± 3.38	4.05 ± 1.12	5.23 ± 2.14	4.36 ± 0.98	1.65 ± 0.97	6.51 ± 1.86	2.18 ± 1.12	5.88 ± 1.76

Fake Nuisance Parameters

- Define 4 NPs: `f_e_stat`, `f_e_sys`, `f_mu_stat`, `f_mu_sys`
- Normalization uncertainties with gaussian contraint

Nuisance Parameter		ee p	ee n	emme p	emme n	mm p	mm n
`f_e_stat`	up	40.47 %	48.04 %	39.44 %	44.43 %	–	–
	down	40.39 %	48.04 %	39.36 %	44.20 %	–	–
`f_e_sys`	up	64.10 %	73.21 %	77.26 %	84.94 %	–	–
	down	64.01 %	73.21 %	76.19 %	82.15 %	–	–
`f_mu_stat`	up	–	–	25.18 %	25.27 %	12.69 %	12.43 %
	down	–	–	24.89 %	25.20 %	12.54 %	12.43 %
`f_mu_sys`	up	–	–	52.06 %	48.21 %	43.34 %	46.79 %
	down	–	–	49.29 %	46.53 %	43.19 %	46.79 %

- Uncertainty in emme channes calculated based on yields for AntiID_e and AntiID_m
- All NPs are correlated between the channels
- ⇒ Better to treat `stat` NPs uncorrelated?

Outlook: Shape Systematics

- Up to now, no shape variations provided
- Shape uncertainties can be either
  - Correlated between all channels/bins
  - Uncorrelated between all channels/bins
- Liqing will provide histograms within this week

Strategy

- Build likelihood with signal sample 1, but fit to Data containing signal sample 2

- Template = all MC backgrounds + signal 1

- Data = all MC backgrounds + signal 2

- Apply scale factor to signal 2, such that the integral in the SR ($m_{jj} > 500$ GeV) is equal to signal 1

⇒ Scale factors:

Region	Channel	Powheg EW6	Sherpa EW6
'CutCRWZ3Lep'	'all'	1.26	0.79
'CutSRNoMjj'	'een'	0.67	1.48
	'eep'	0.68	1.45
	'emmen'	0.67	1.48
	'emmep'	0.66	1.49
	'mmn'	0.64	1.54
	'mmp'	0.63	1.57

Comparison Plots - Unscaled EW6

ee - p

ee - n

emme - p

emme - n

mm - p

mm - n
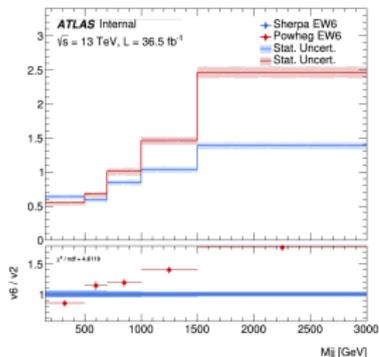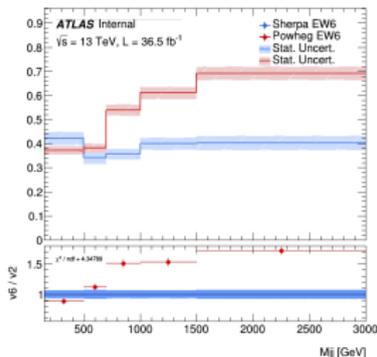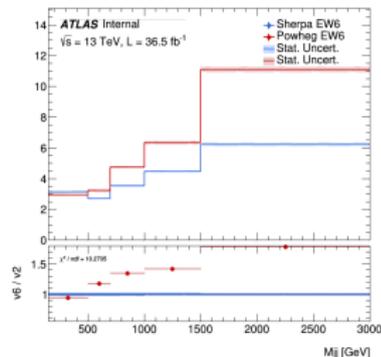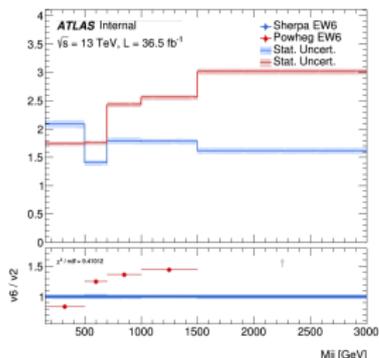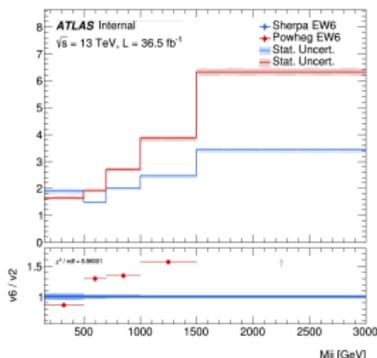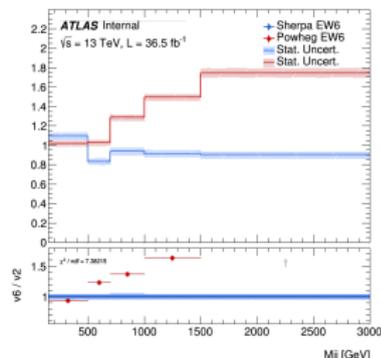
Comparison Plots - Powheg scaled to Sherpa
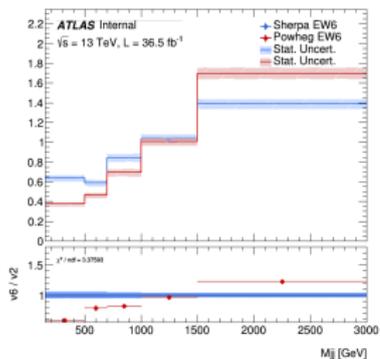
ee - p   ee - n   emme - p
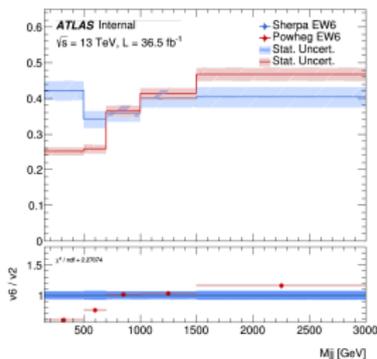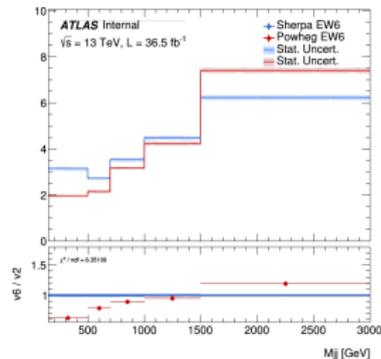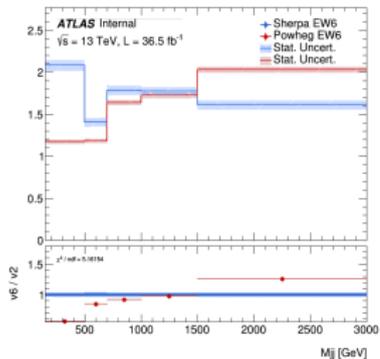
emme - n   mm - p   mm - n
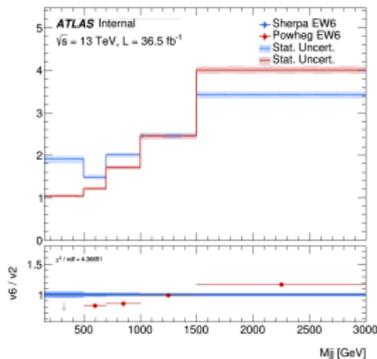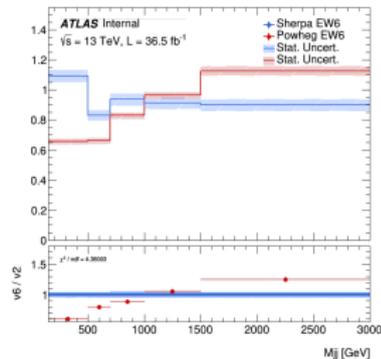
Comparison Plots - Sherpa scaled to Powheg
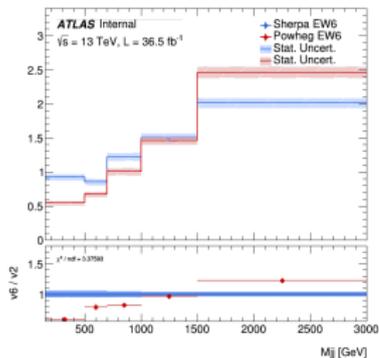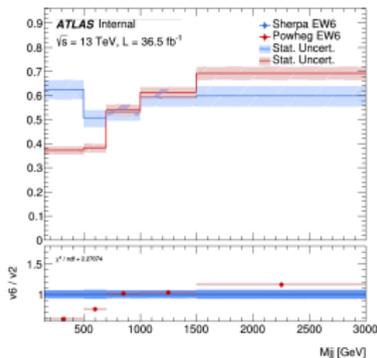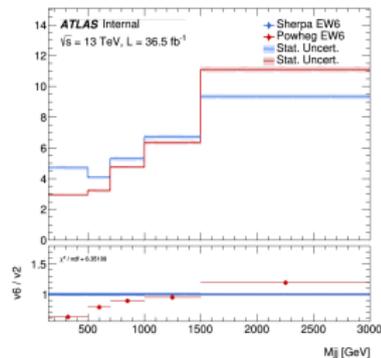
ee - p   ee - n   emme - p
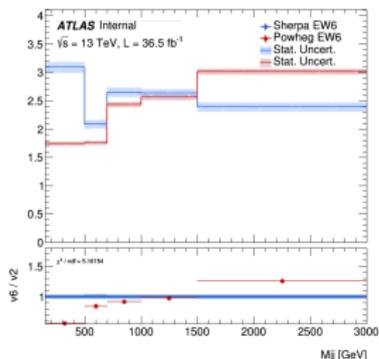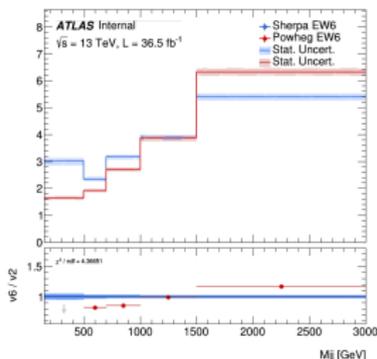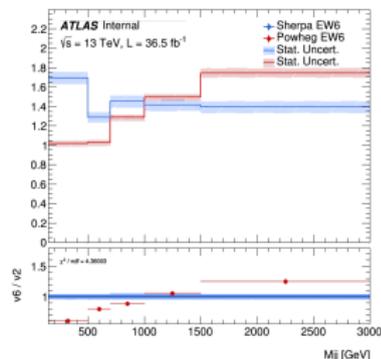
emme - n   mm - p   mm - n

Results - Sherpa Signal, Powheg Data

- Only including theory uncertainties (normalization)

Unscaled

- 4.87389 (5.04777 sigmas)
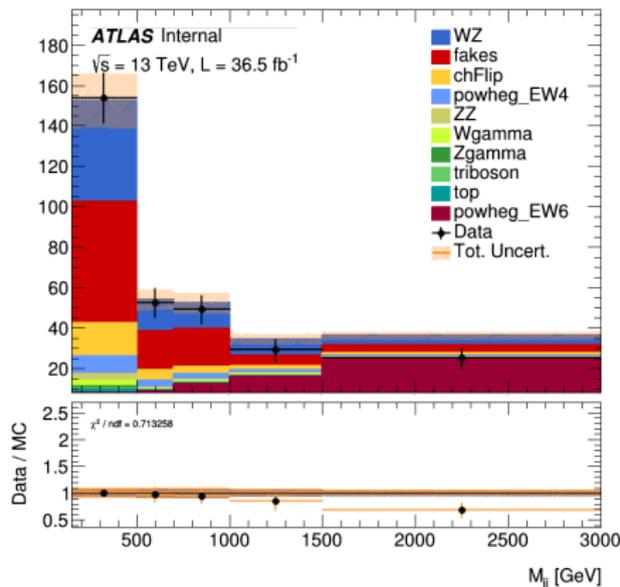
Scaled

- 7.02801 (7.30736 sigmas)
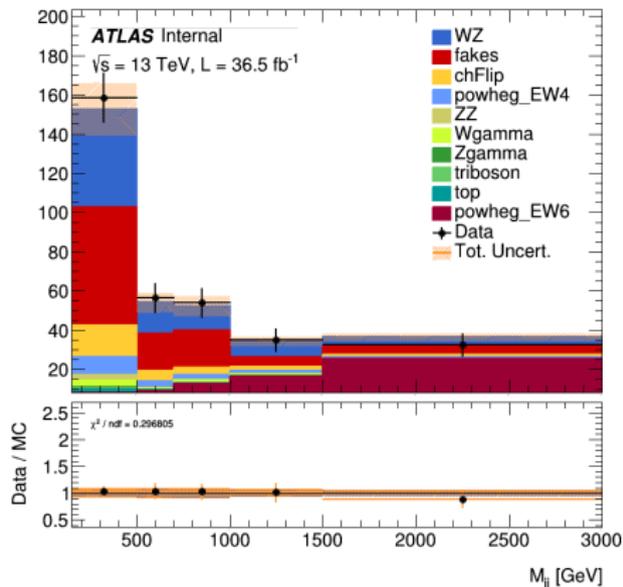
Results - Powheg Signal, Sherpa Data

- Only including theory uncertainties (normalization)

Unscaled   Scaled

- 5.25104 (5.40221 sigmas)   - 7.51722 (7.76083 sigmas)