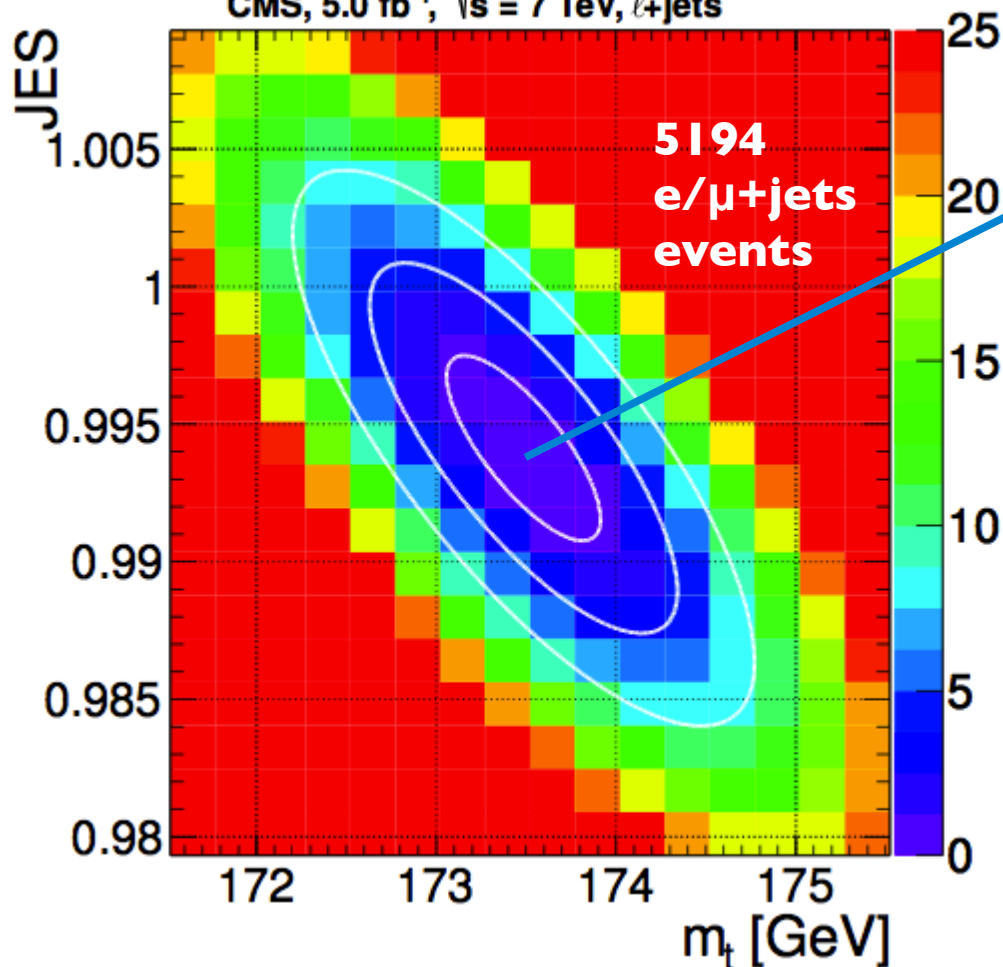


Top mass measurement using lepton+jets final states

JHEP 12 (2012) 105

CMS, 5.0 fb⁻¹, $\sqrt{s} = 7$ TeV, ℓ +jets



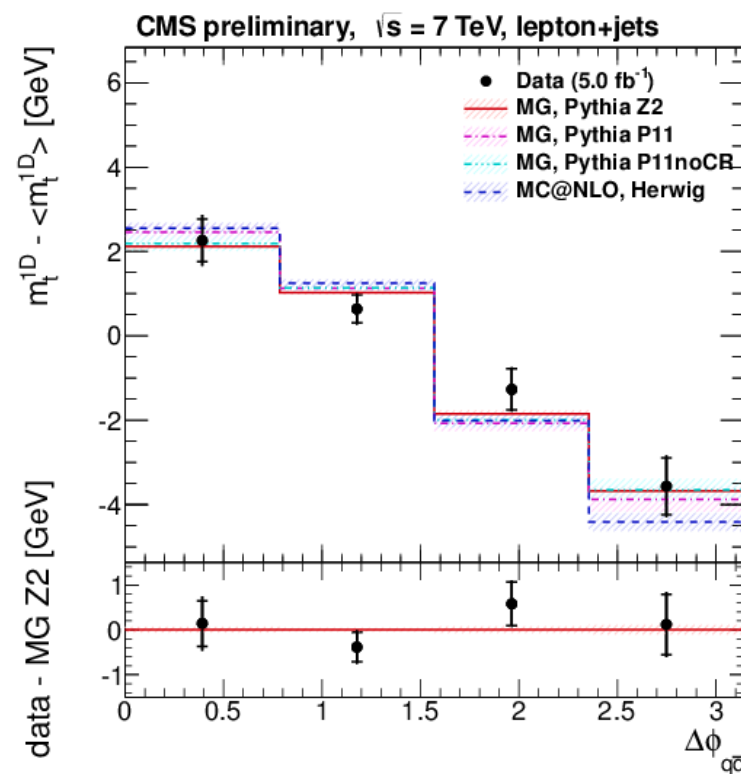
Most precise measurement based on a single channel

$$m_{\text{top}} = 173.49 \pm 0.43_{\text{stat+JES}} \pm 0.98_{\text{syst}} \text{ GeV}$$



TOP-12-029

What is the kinematic dependency of this result?



TOP-12-031

Mass dependency on charge or *CPT* test
Using high statistics 8 TeV sample

Systematic uncertainty	Δm_{top} [GeV]
Calibration	0.06
<i>b</i> -JES	0.61 *
p_T - and η -dependent JES	0.28 *
Lepton energy scale	0.02
Missing transverse energy	0.06
Jet energy resolution	0.23 *
<i>b</i> -tagging	0.12 *
Pile-up	0.07 *
Non- $t\bar{t}$ background	0.13 *
PDF	0.07
μ_R, μ_F	0.24
ME-PS matching threshold	0.18
Underlying event	0.15
Color reconnections	0.54
Total	0.98

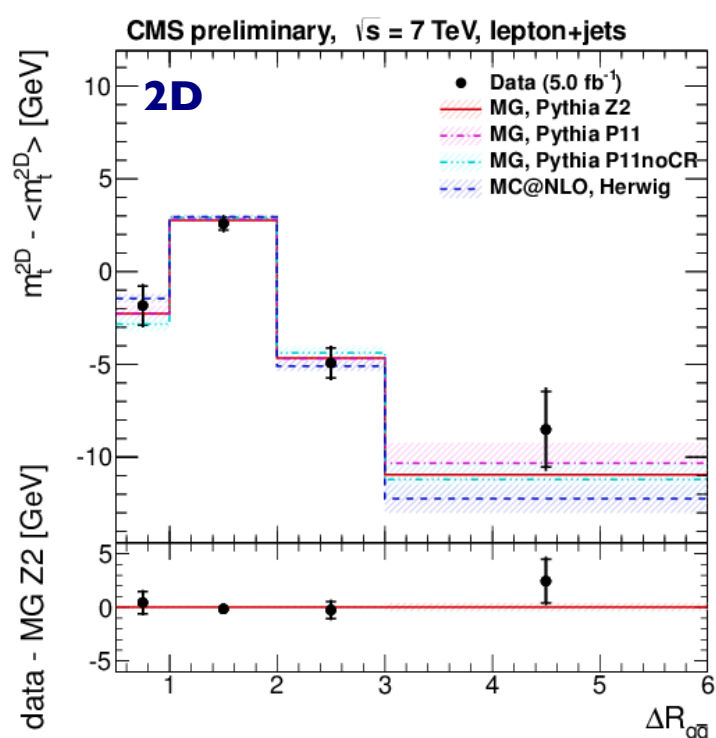
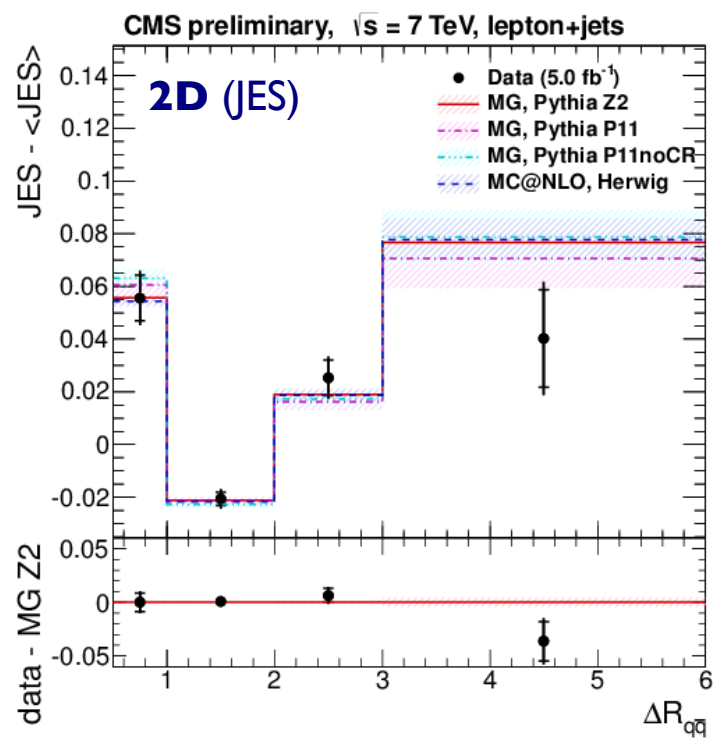
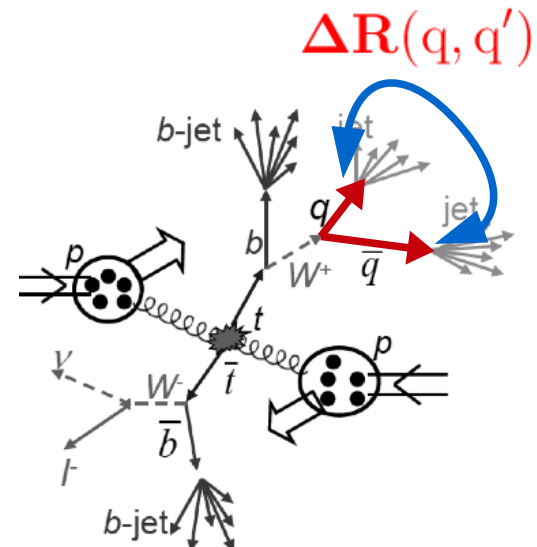
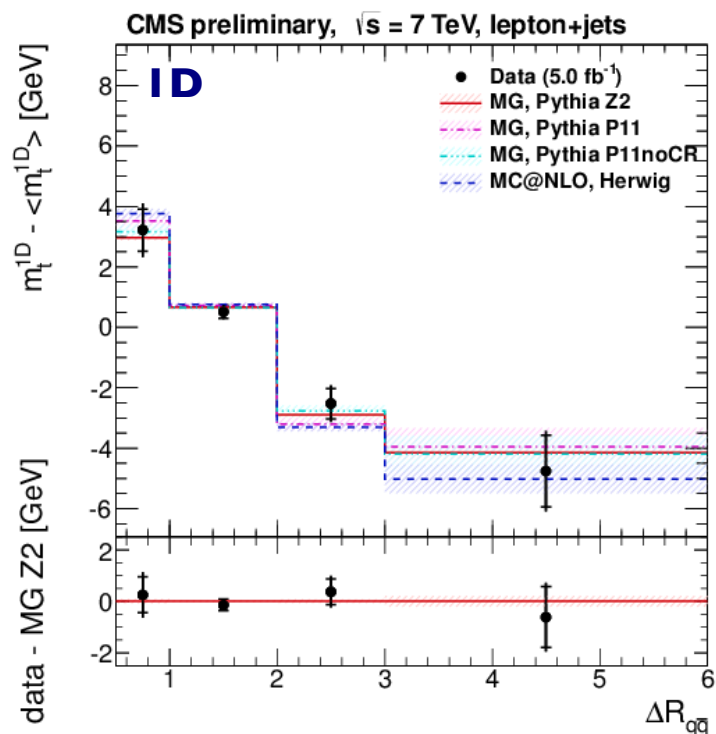
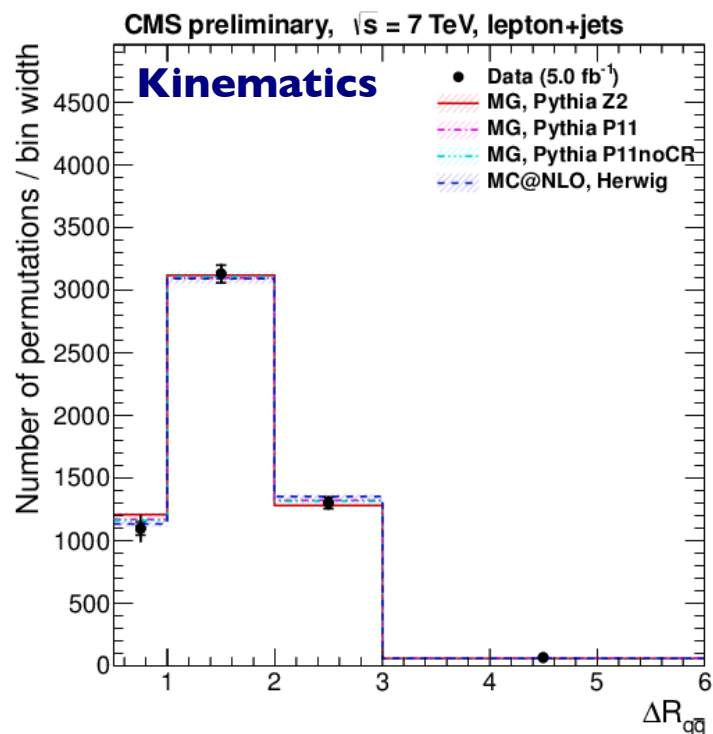
* - systematic uncertainties evaluated for the differential measurements

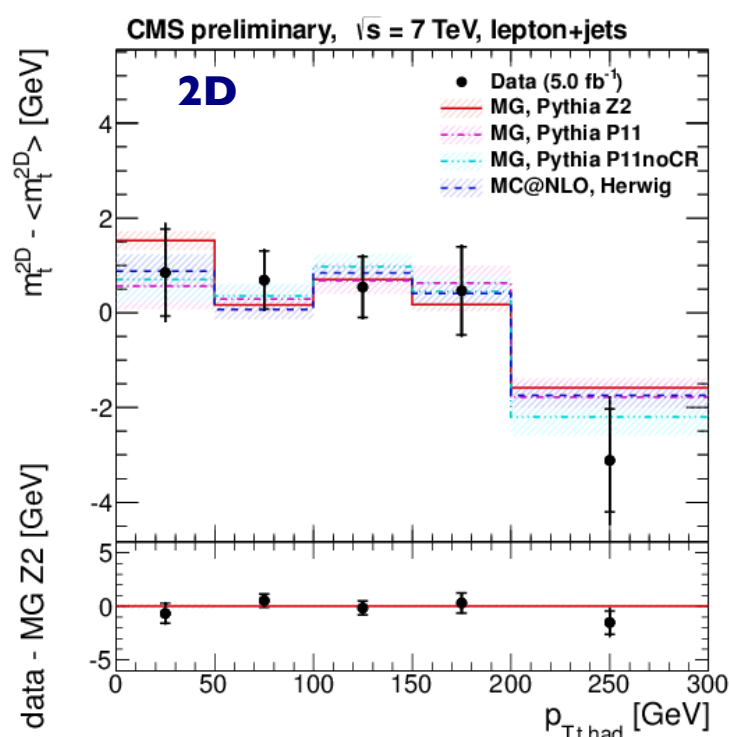
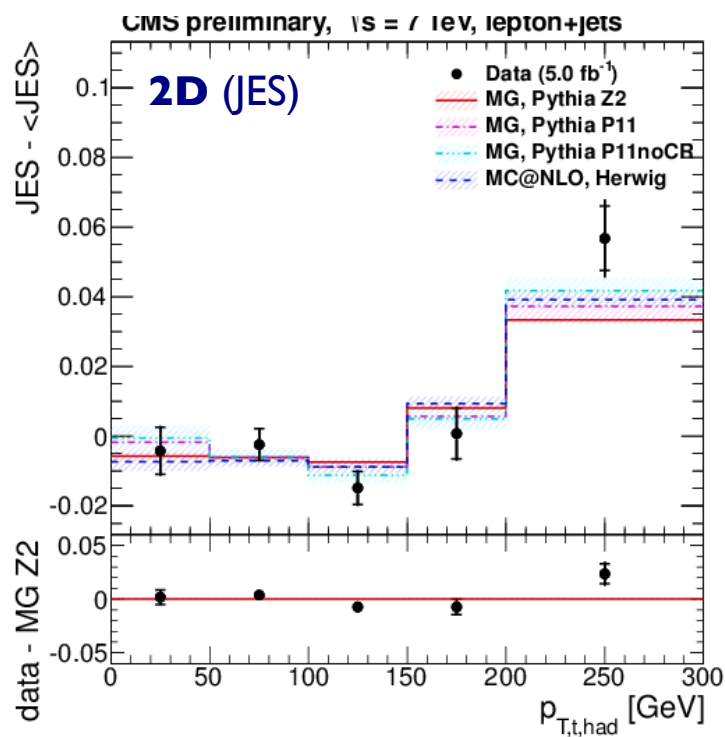
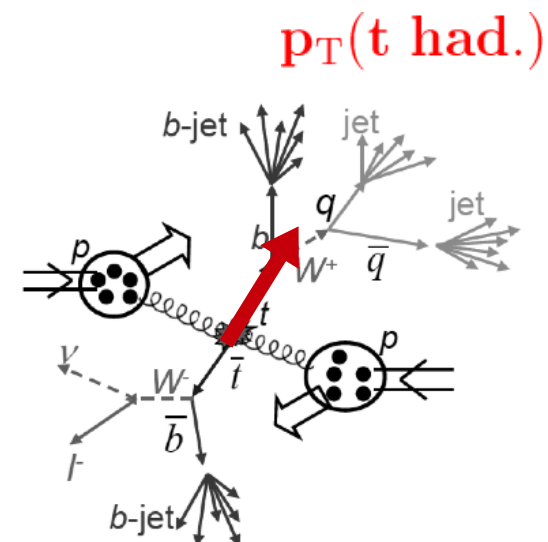
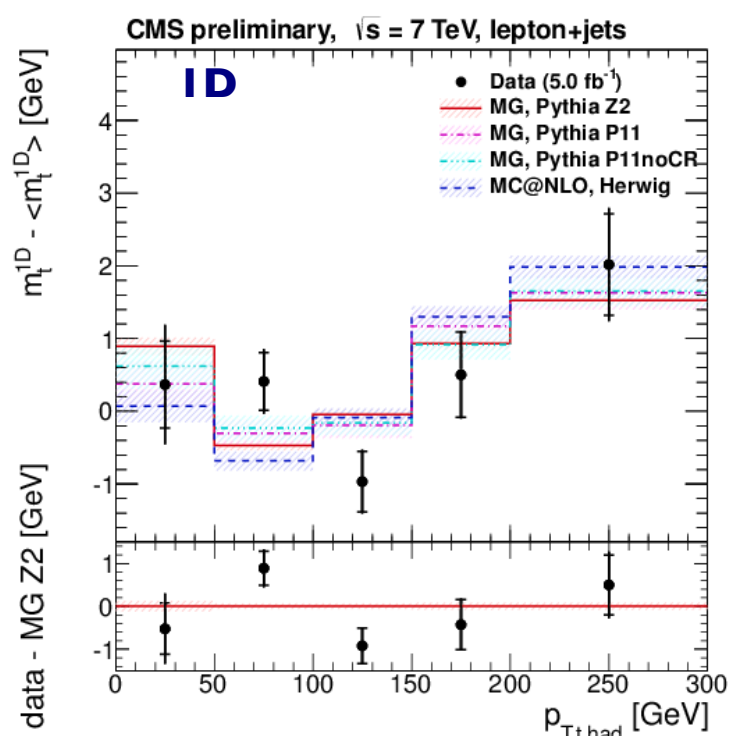
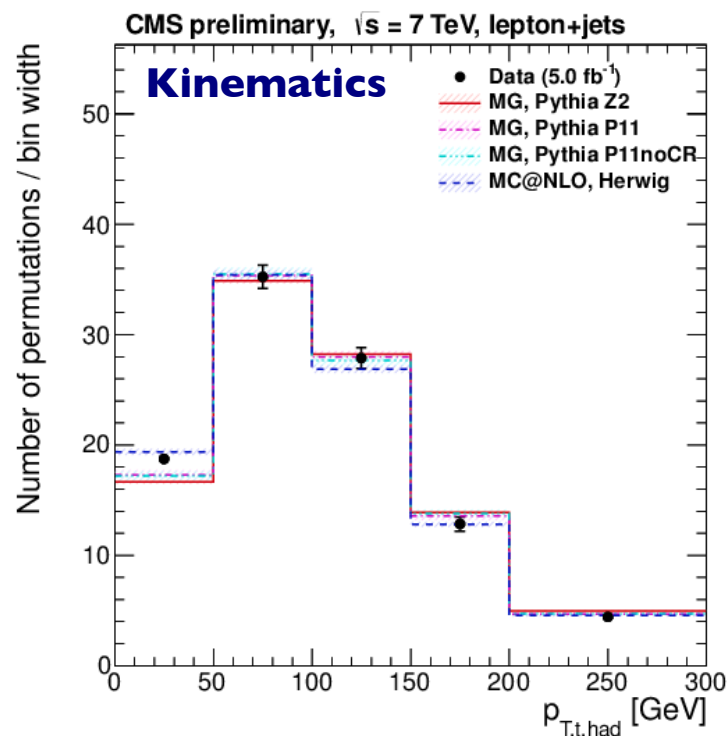
Observable	$m_t^{1D} \chi^2$	JES χ^2	$m_t^{2D} \chi^2$	Ndf	
$\Delta R_{q\bar{q}}$	1.01	3.41	1.49	3	Colour reconnection
$\Delta\phi_{q\bar{q}}$	2.31	2.18	2.89	3	
$p_{T,t, \text{had}}$	9.40	7.83	2.41	4	
$ \eta_{t, \text{had}} $	0.41	3.33	3.17	3	
H_T	3.18	1.19	2.24	4	Radiation effects
$m_{t\bar{t}}$	2.52	2.98	2.25	4	
$p_{T,t\bar{t}}$	3.39	1.67	2.18	4	
Jet multiplicity	1.47	2.00	1.56	2	
$p_{T,b, \text{had}}$	0.81	2.35	2.17	4	b-quark kinematics
$ \eta_{b, \text{had}} $	2.64	0.30	0.48	2	
$\Delta R_{b\bar{b}}$	4.87	2.61	8.01	3	
$\Delta\phi_{b\bar{b}}$	2.87	3.85	6.86	3	

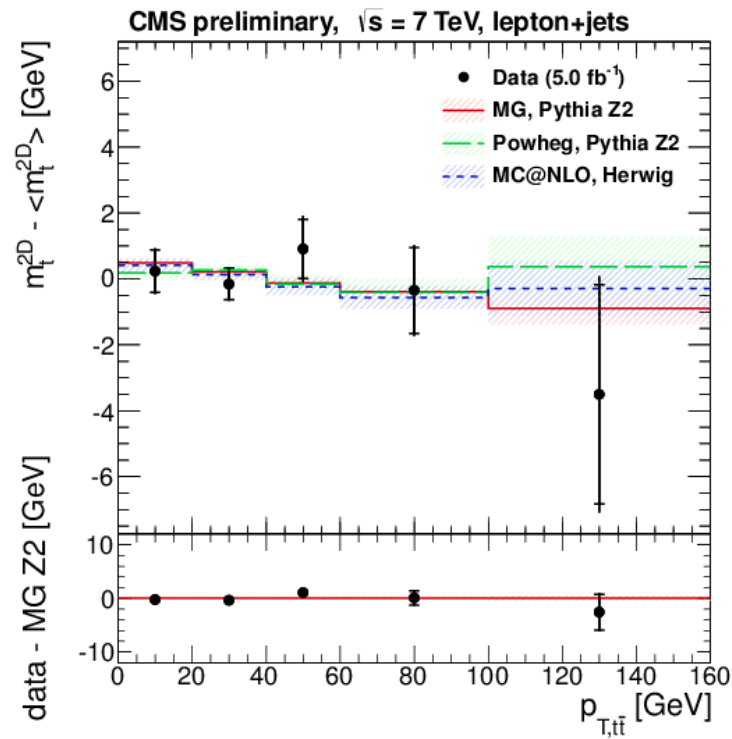
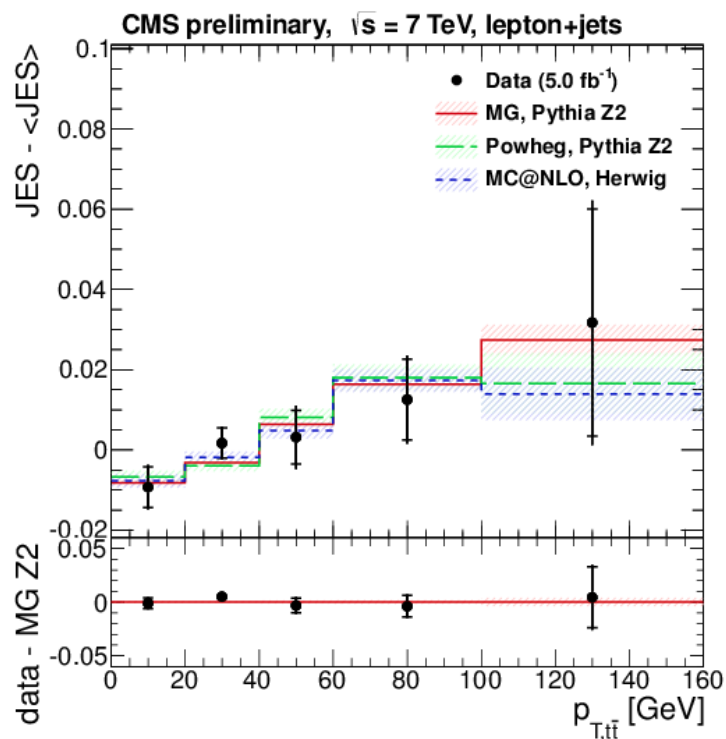
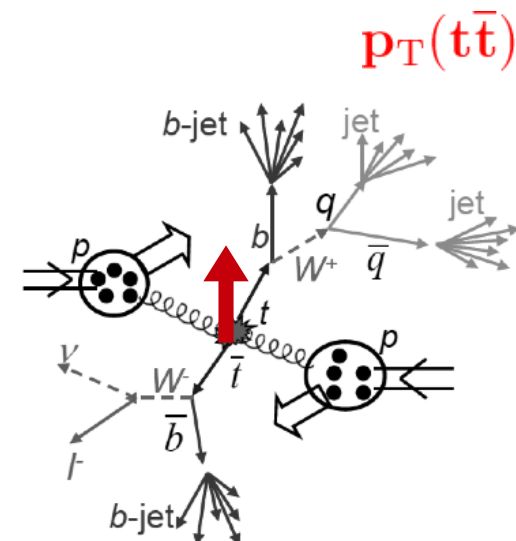
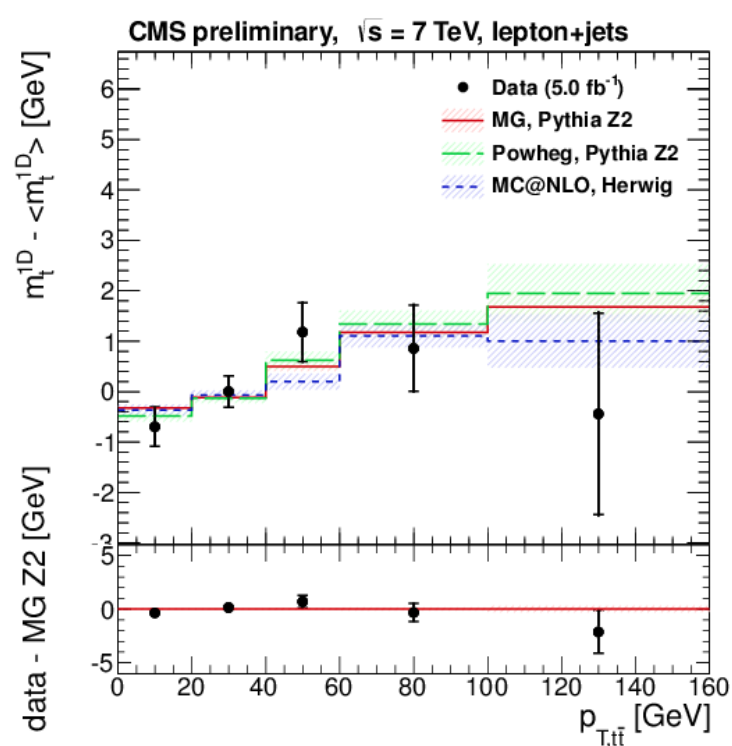
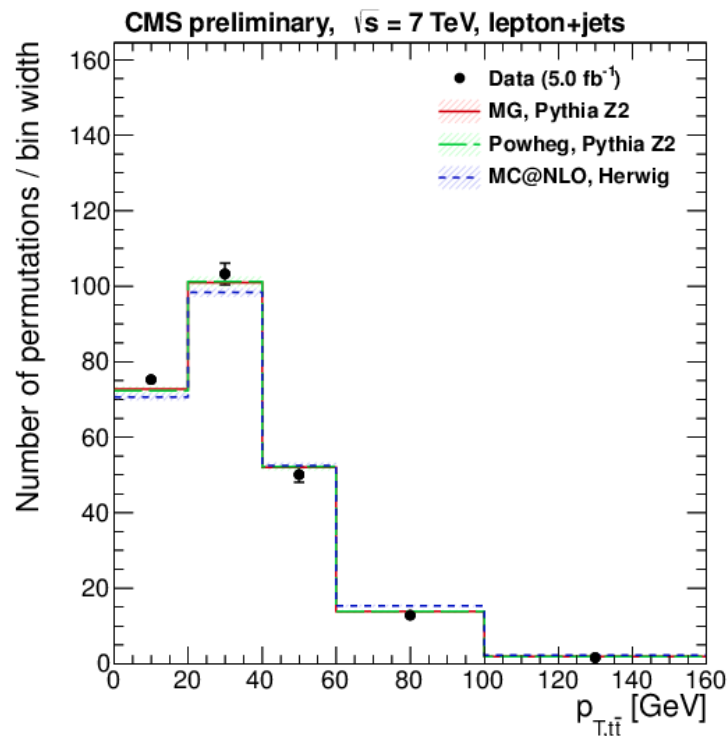
$$\chi^2 = \sum \frac{(\text{Data} - \text{MC})^2}{\sigma_{\text{data}}^2 + \sigma_{\text{MC}}^2}$$

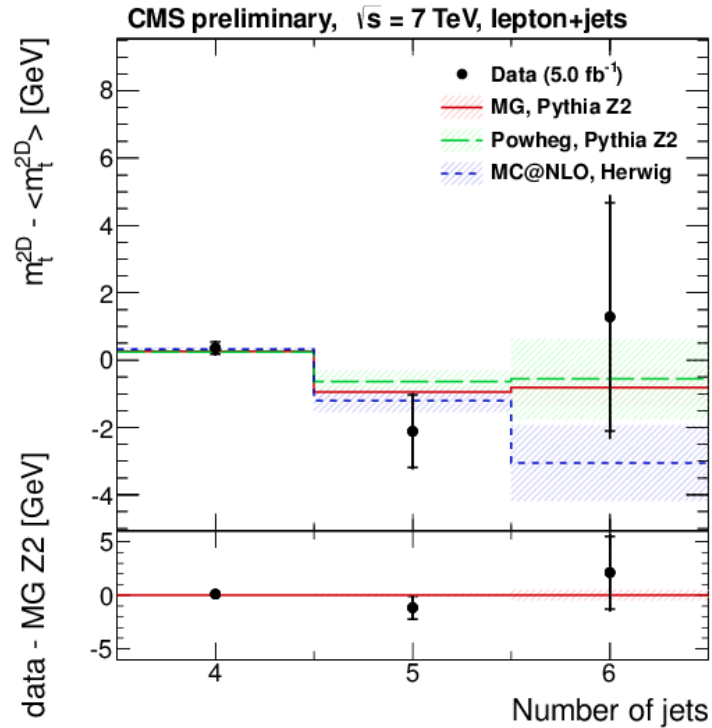
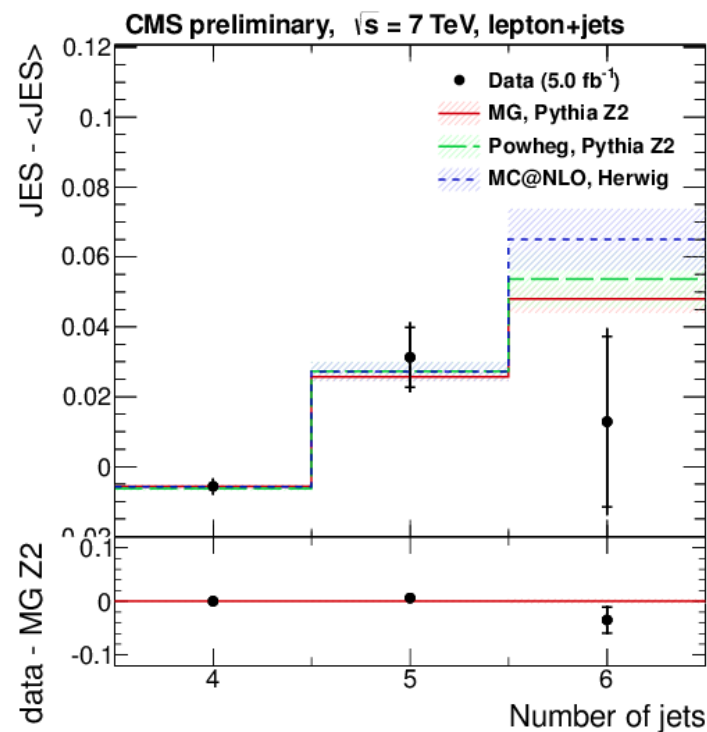
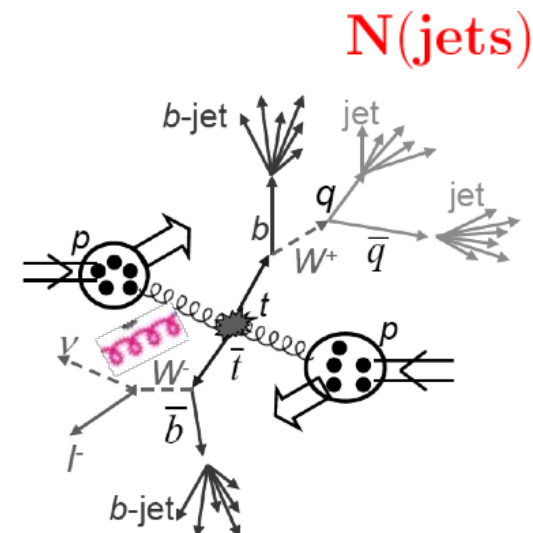
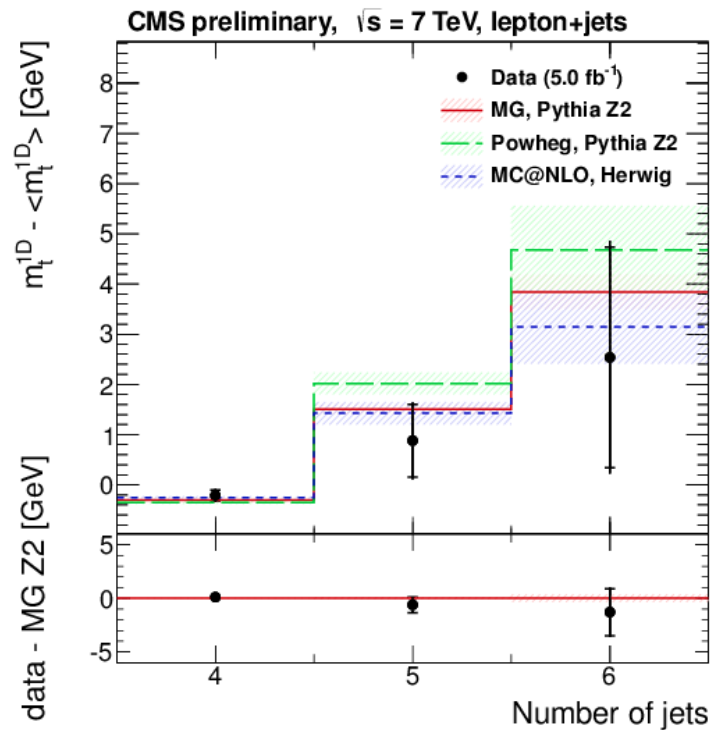
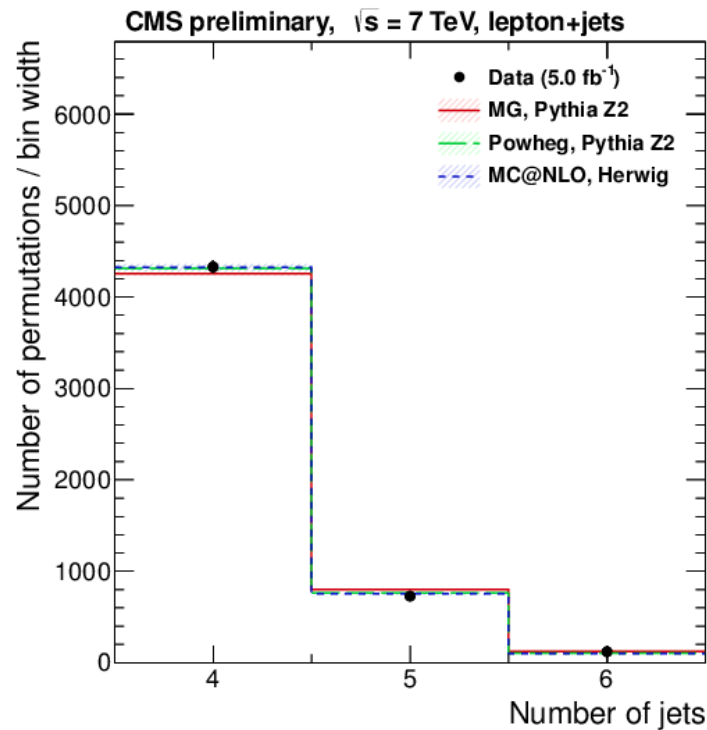
$$\chi^2/\text{ndof} = 68.58/78 \rightarrow$$

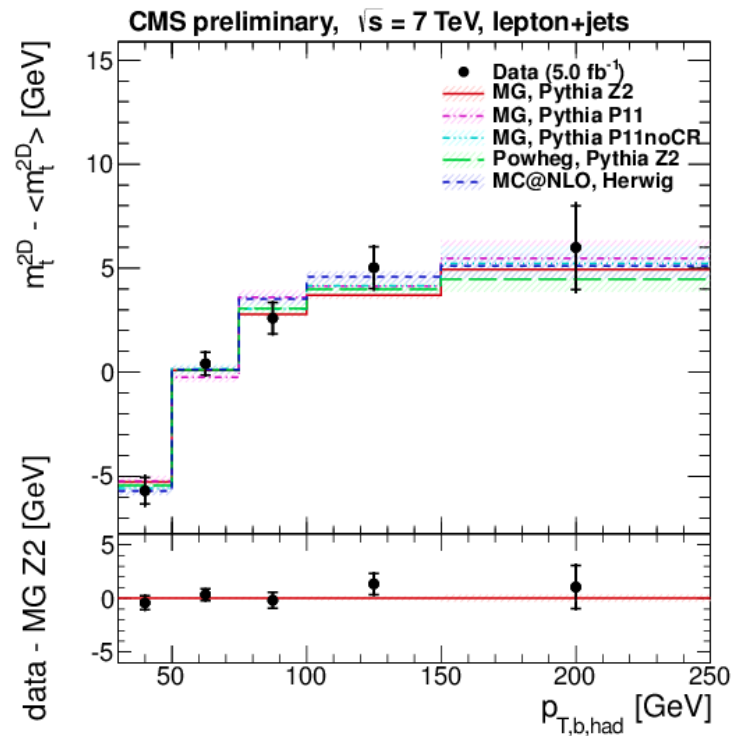
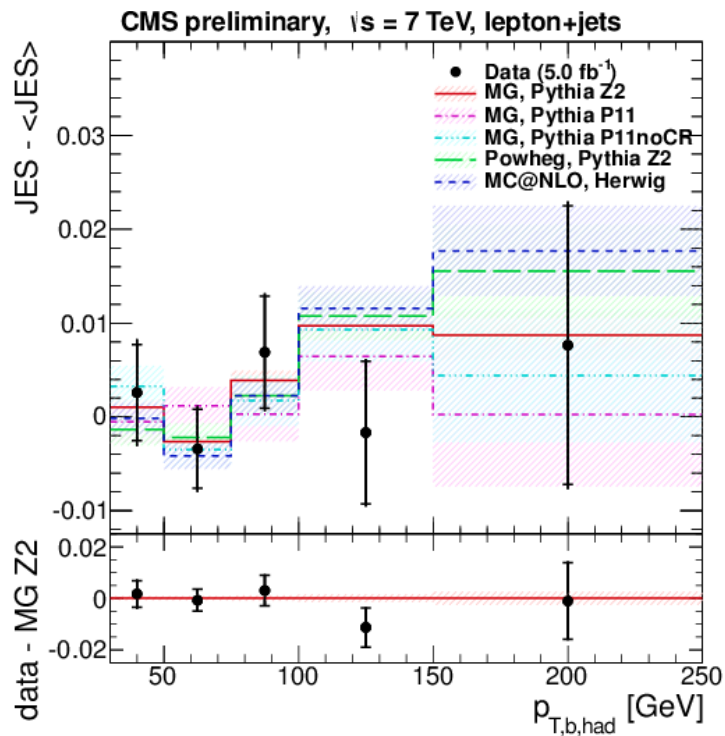
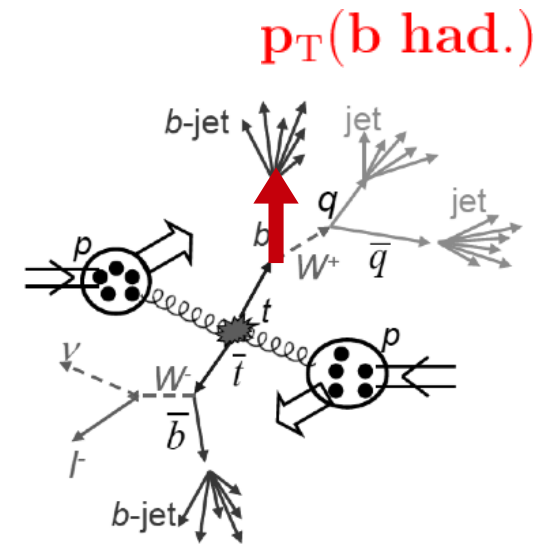
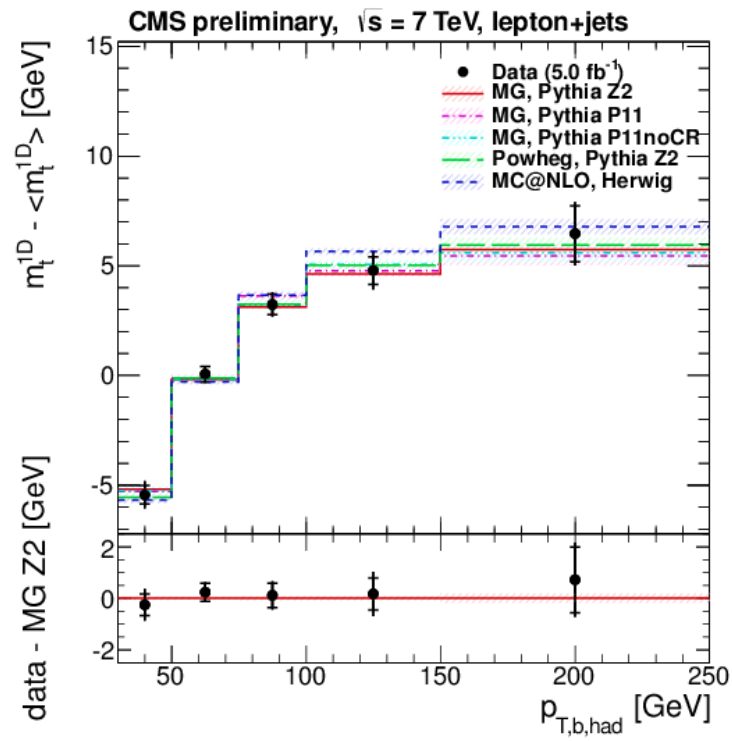
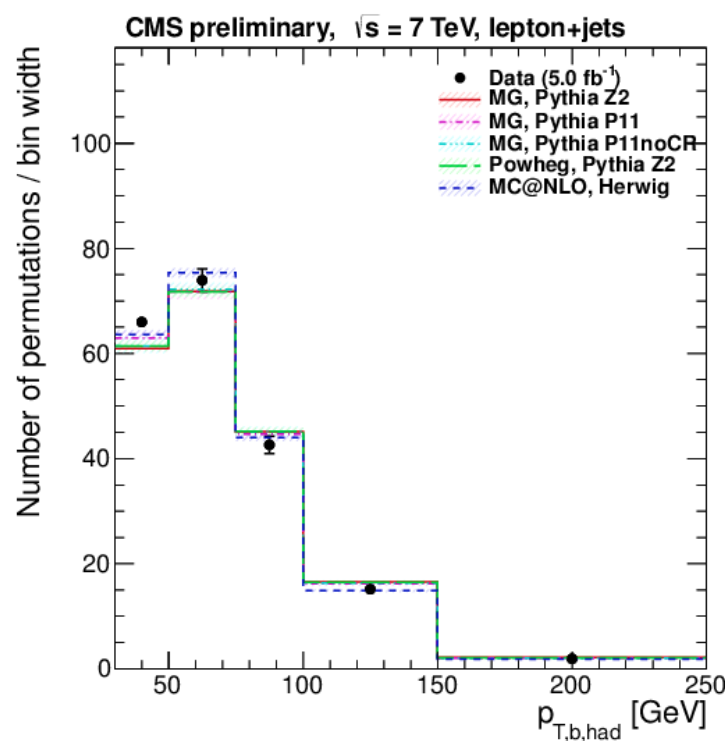
$$\text{p-value} = 0.77$$

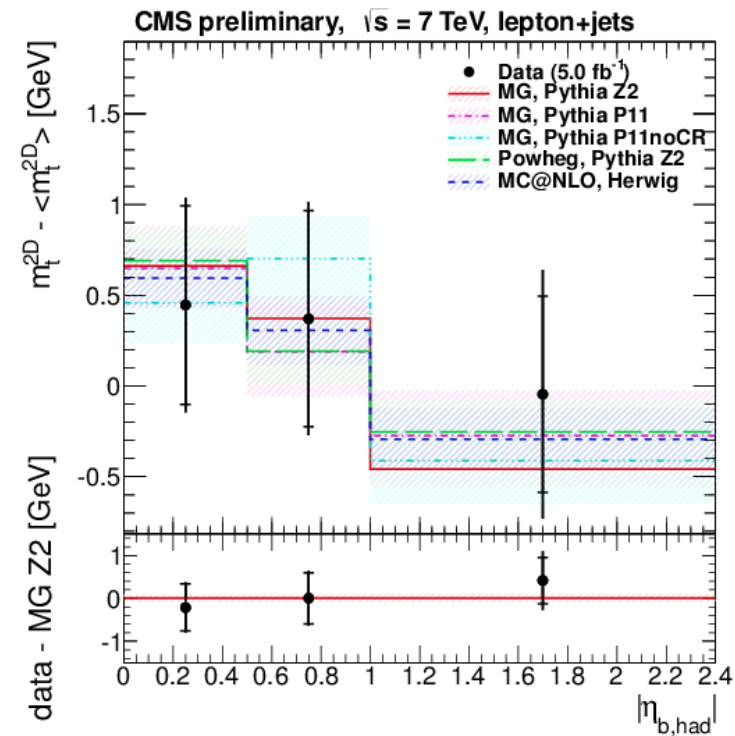
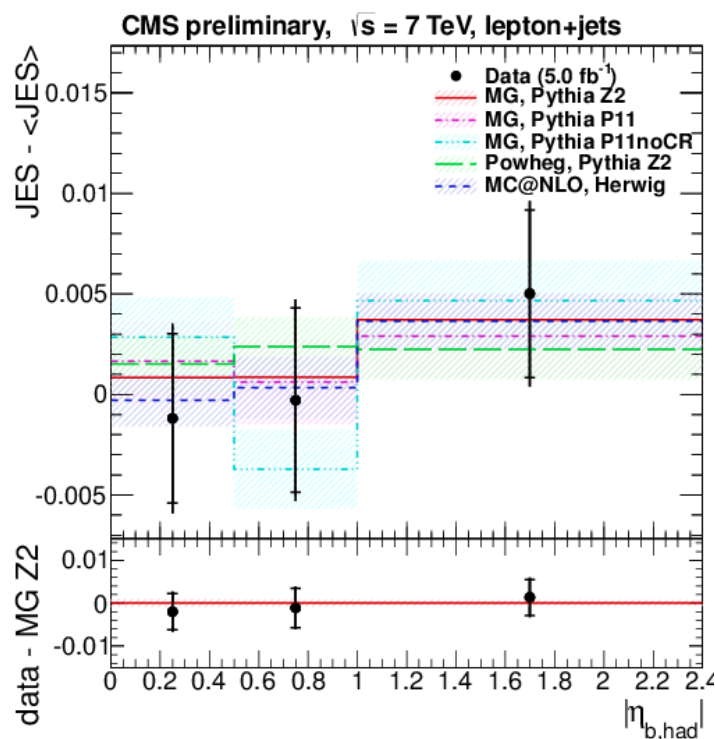
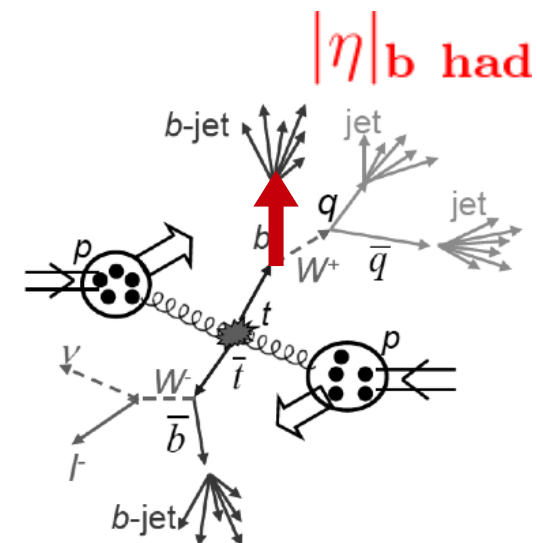
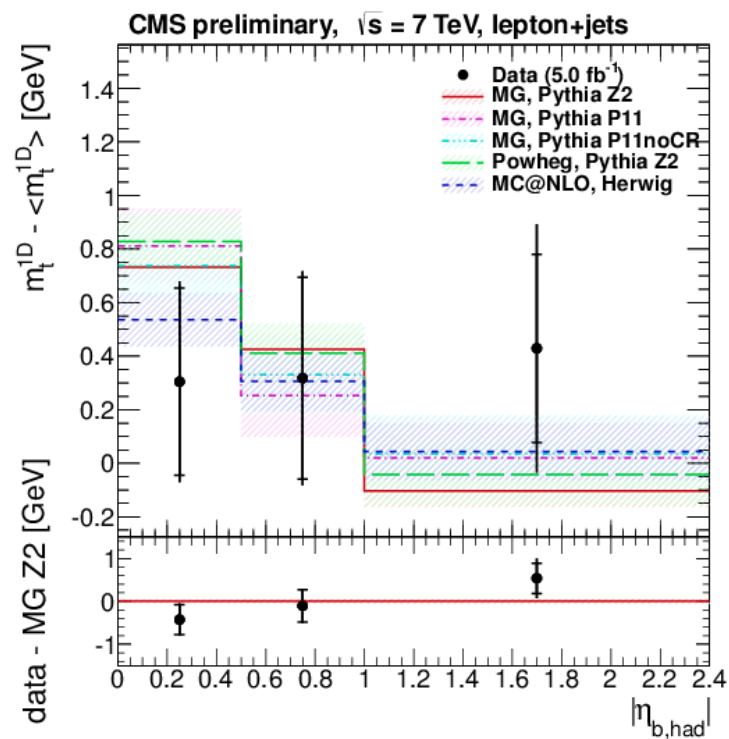
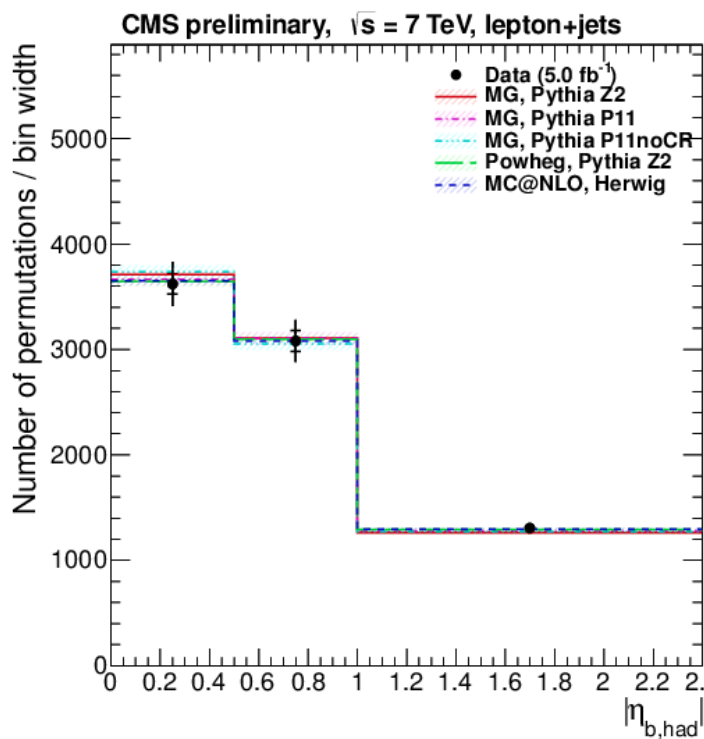


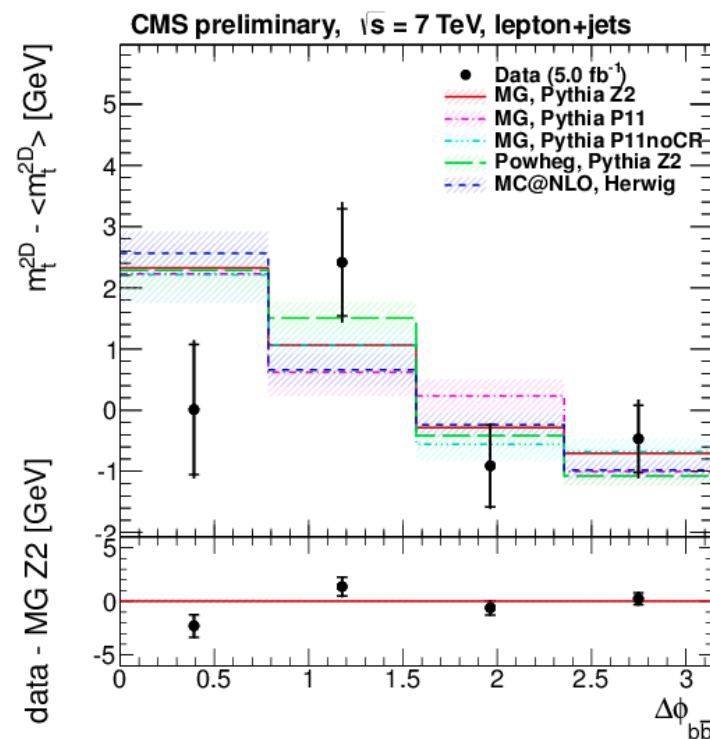
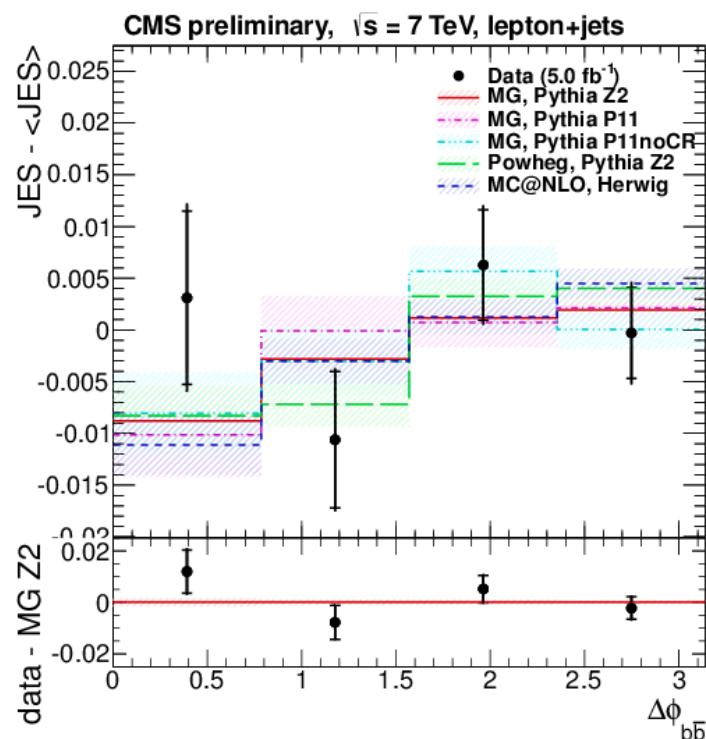
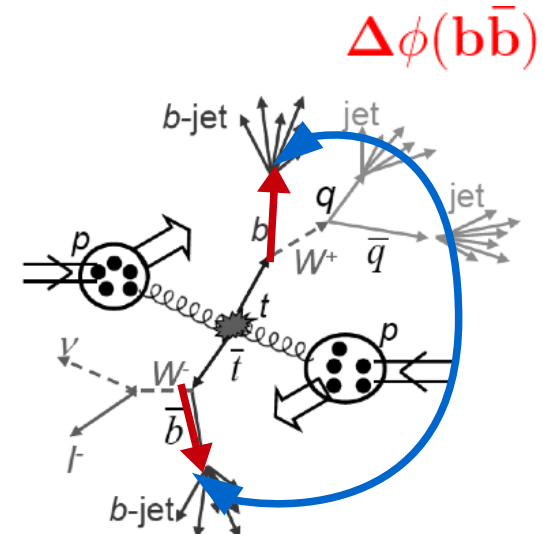
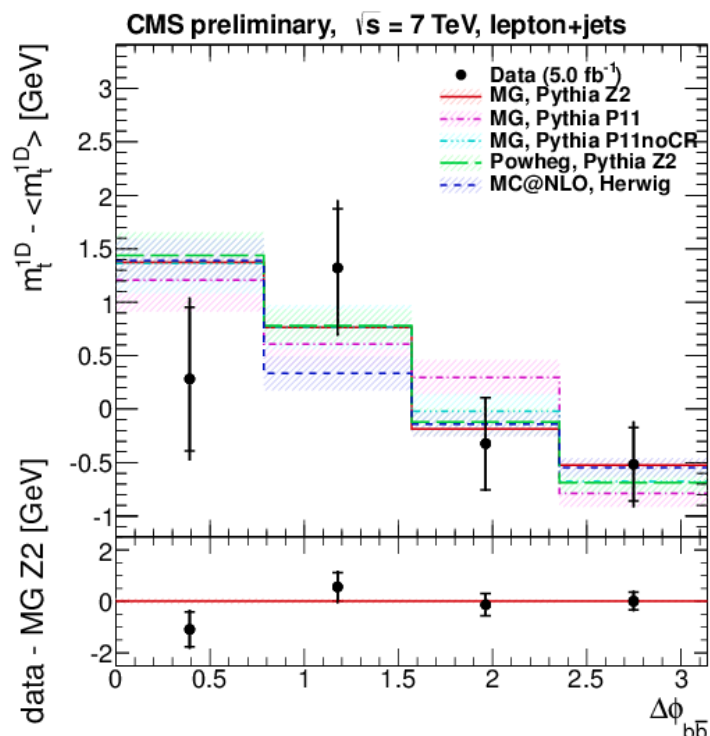
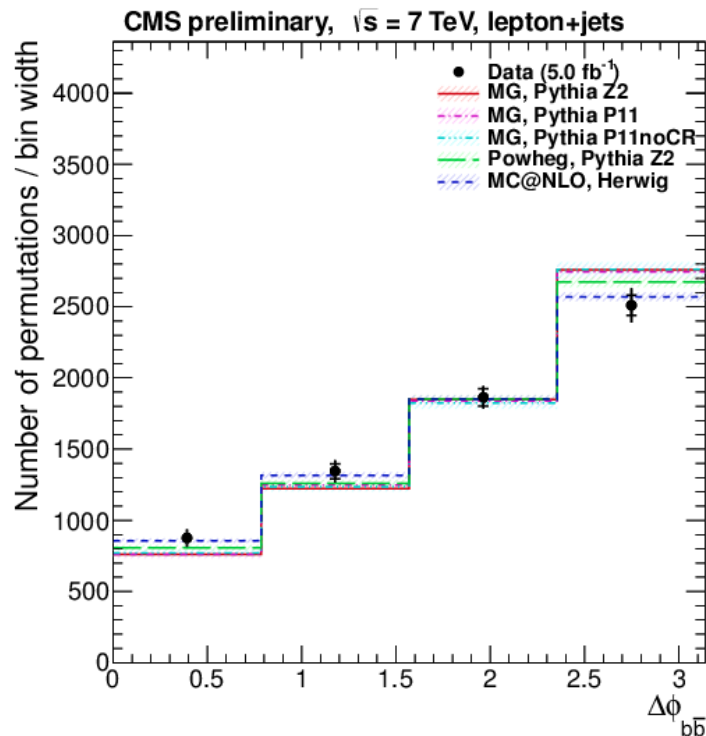


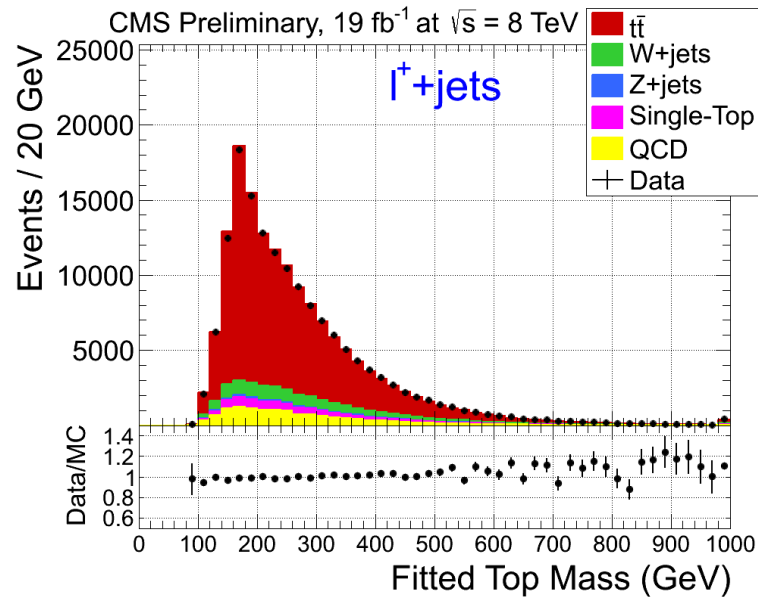






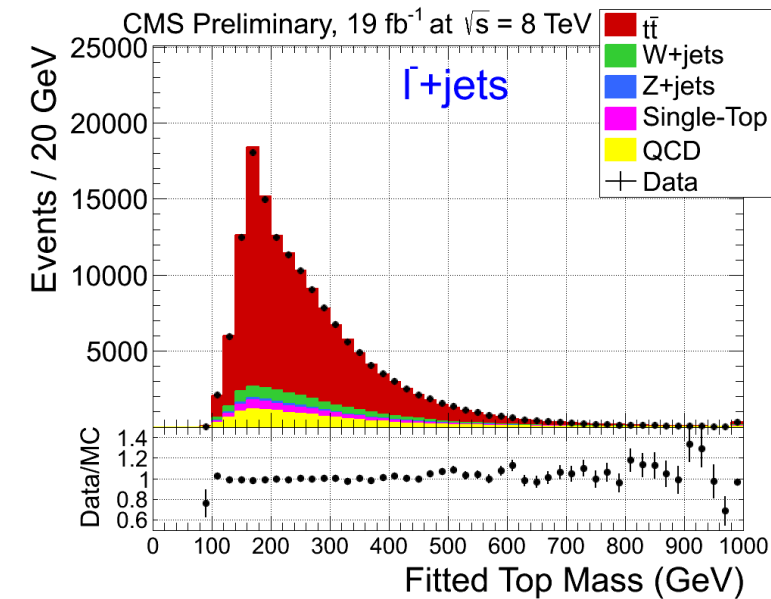
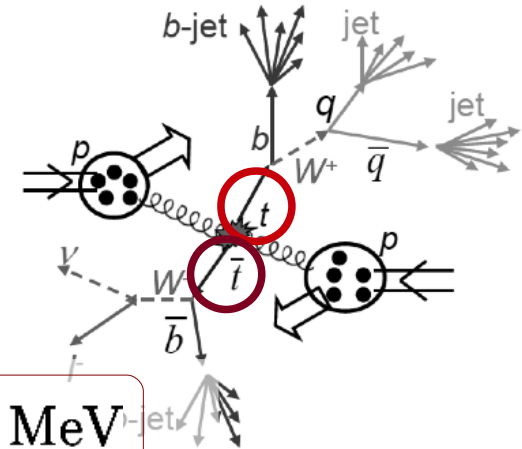






World's best

$$\Delta m_{\text{top}} = 272 \pm 196_{\text{stat}} \pm 122_{\text{syst}} \text{ MeV}$$



Source	Estimated effect (MeV)
Jet energy scale	17 ± 15
Jet energy resolution	8 ± 11
b vs. \bar{b} jet response	64 ± 7
Signal fraction	45 ± 2
Background charge asymmetry	12.43 ± 0.03
Background composition	50 ± 1
Pileup	17.4 ± 0.4
b-tagging efficiency	20 ± 8
b vs. \bar{b} tagging efficiency	43 ± 6
Method calibration	15 ± 54
Parton distribution functions	12 ± 3
Total	122