Updates

- New paper draft (v6) and AN-18-005 v12, AN-18-310 v6
- Corrected error in applying efficiency to unfolded results
- New Bottom Line Test results, waiting response from Olaf
- Z rapidity and HIP effect reviewed in more detail
- First round of language edits done

Documentation:

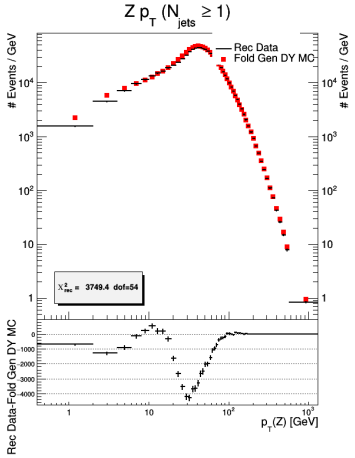
muon: http://cms.cern.ch/iCMS/user/noteinfo?cmsnoteid=CMS%20AN-2018/005

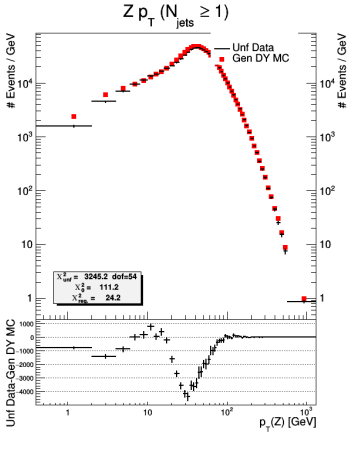
electron: http://cms.cern.ch/iCMS/user/noteinfo?cmsnoteid=CMS%20AN-2018/310

CADI: http://cms.cern.ch/iCMS/analysisadmin/cadilines?line=SMP-19-009&tp=an&id=2285&ancode=SMP-19-009

Additional info: http://physics.bu.edu/~djarcaro/CMS/ZJets_Analysis/home.html

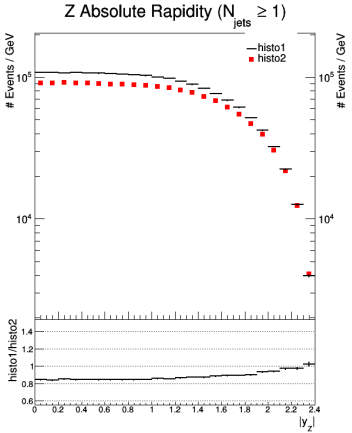
Bottom Line Test





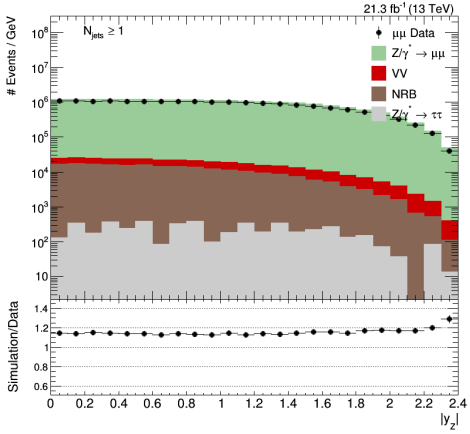
- Example of bottom line test
- χ^2 is calculated by bottom plot (not a ratio) and uncertainty

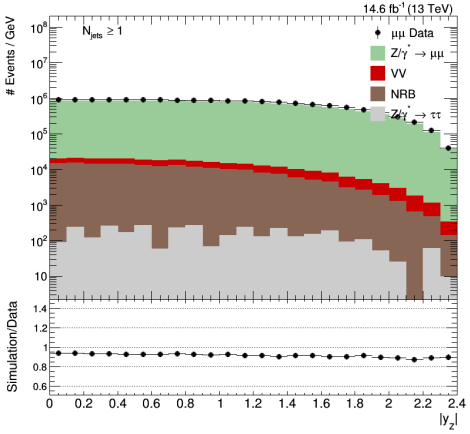
HIP Effect on Rapidity



- Large different between Eras (BF vs GH) caused concern
- Next we looked at how the MC modeled this effect

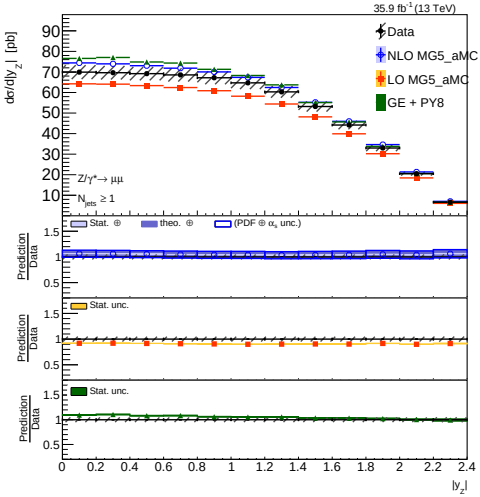
HIP Effect on Rapidity





- Only poorly modeled in the last two bins for the BF era (where HIP was present)

HIP Effect on Rapidity



- When combined with electrons and unfolded the effect is insignificant
- Small improvement at reco level only when using the updated Medium muon id (Medium2016)

BACKUP

Datasets

Sample
/SingleMuon/Run2016B-17Jul2018_ver2-v1/MINIAOD
/SingleMuon/Run2016C-17Jul2018-v1/MINIAOD
/SingleMuon/Run2016D-17Jul2018-v1/MINIAOD
/SingleMuon/Run2016E-17Jul2018-v1/MINIAOD
/SingleMuon/Run2016F-17Jul2018-v1/MINIAOD
/SingleMuon/Run2016G-17Jul2018-v1/MINIAOD
/SingleMuon/Run2016H-17Jul2018-v1/MINIAOD

Datasets

MC	Events	Eff. Events	XSec (pb)
DYJetsToLL_M-50_TuneCUETP8M1_13TeV-amcatnloFXFX-pythia8	122055388	81781064	5931.9
DYToLL_0J_13TeV-amcatnloFXFX-pythia8	93832853	76690000	4620.52
DYToLL_1J_13TeV-amcatnloFXFX-pythia8	91500283	41572416	859.59
DYToLL_2J_13TeV-amcatnloFXFX-pythia8	90299356	26282782	338.26

Inclusive + Binned

- Shift in values caused by DY xsec value changing from 5932 to 5818 (sum of npNLO xsec values)
- Improvement is coming from changing weights (applied to inclusive sample as well):
  - npNLO = 0: 1.00 to 1.15
  - npNLO = 1: 0.24 to 0.57
  - npNLO = 2: 0.17 to 0.38

Datasets

MC	Events	XSec (pb)
ZZTo2L2Nu_13TeV_powheg_pythia8		
ZZTo2L2Q_13TeV_amcatnloFXFX_madspin_pythia8		
ZZTo4L_13TeV_powheg_pythia8		
WZTo2L2Q_13TeV_amcatnloFXFX_madspin_pythia8		
WZTo3LNu_TuneCUETP8M1_13TeV-powheg-pythia8		
WWZ_TuneCUETP8M1_13TeV-amcatnlo-pythia8		
WZZ_TuneCUETP8M1_13TeV-amcatnlo-pythia8		
ZZZ_TuneCUETP8M1_13TeV-amcatnlo-pythia8		

Event Selections

Reco Level

- HLT_IsoMu24 and HLT_Ele25_eta2p1_WPTight_Gsf
- Opposite sign, same flavor leptons with $|m_{ll} - m_Z| < 20\text{GeV}$, $p_T > 30/20\text{GeV}$, $|\eta| < 2.4$
- Muons pass Medium ID + 0.15 Isolation
- Electrons pass Medium ID
- AK4PF chs jets with $p_T > 30\text{GeV}$, $|\eta| < 2.4$
- Jets pass Loose ID and Loose WP for PU MVA
- $\Delta R(\mu, jets) < 0.4$

Gen Level

- Opposite sign, same flavor $|m_{ll} - m_Z| < 20\text{GeV}$, $p_T > 30/20\text{GeV}$, $|\eta| < 2.4$
- AK4PF chs jets with $p_T > 30\text{GeV}$, $|\eta| < 2.4$
- Leptons dressed with photons (R=0.1)
- $\Delta R(\mu, jets) < 0.4$

Predictions

Madgraph5 aMC@NLO

- LO MEs for five processes: pp $\to Z +$ Njets with $N = 0...4$
- NLO ME calculations for pp $\to Z +$ Njets with $N = 0...2$

GENEVA MC framework

- NNLO DY + NNLL resummation