

Exotics Jamboree Analyses

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Physics Coordination Meeting



UNIVERSITY OF
LIVERPOOL

Introduction

- Potentially 10 jamboree analyses

- $Z \rightarrow ll$
 - $W' \rightarrow lv$
 - LFV $Z \rightarrow e\mu$
 - Single LQ $\rightarrow 2 \text{ lep} + \text{jet}$
 - QBH $\rightarrow \text{lep} + \text{jet}$
 - Monojet
 - Dijet/dibjet
 - Lepton + dijet (new)
 - Multibjet
 - High $m_{t\bar{t}}$ 0 lep
-
- The diagram shows three groups of analyses grouped by brackets and labeled LPX, JDM, and HQT. The LPX group includes $Z \rightarrow ll$, $W' \rightarrow lv$, LFV $Z \rightarrow e\mu$, Single LQ $\rightarrow 2 \text{ lep} + \text{jet}$, and QBH $\rightarrow \text{lep} + \text{jet}$. The JDM group includes Monojet, Dijet/dibjet, and Lepton + dijet (new). The HQT group includes Multibjet and High $m_{t\bar{t}}$ 0 lep.
- LPX
- JDM
- HQT

$W' \rightarrow l\nu$

<https://glance.cern.ch/atlas/analysis/analyses/details.php?id=1113>

Current status

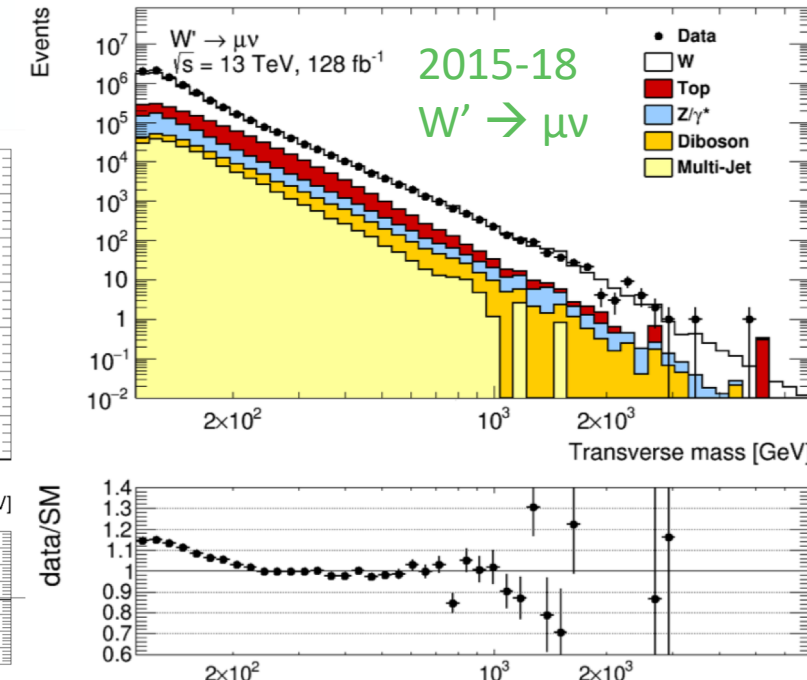
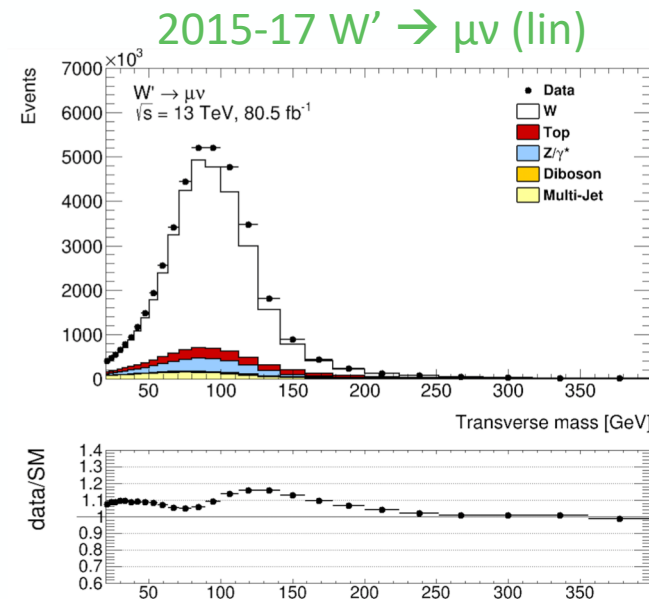
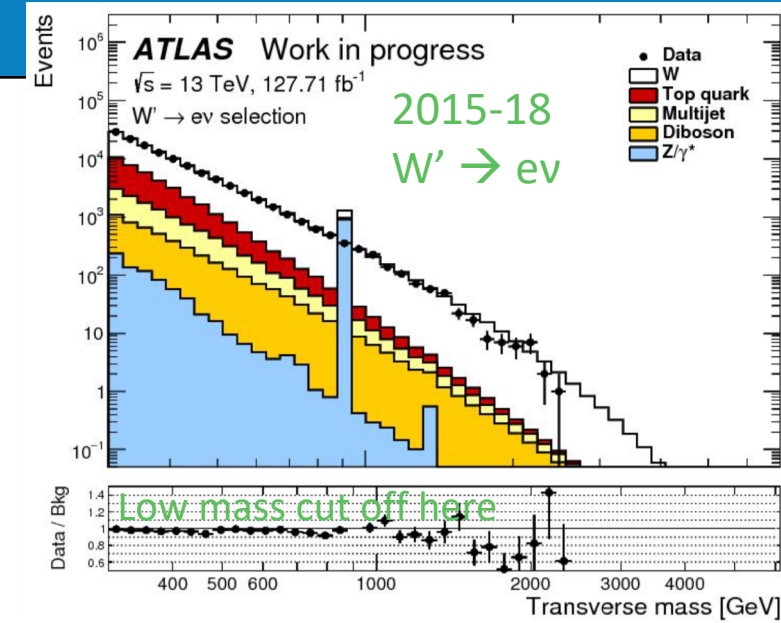
- Looked at full data
- First EB took place
- Aim for LPX approval end of Nov

Still to do

- Mainly addressing low m_T modelling issues
 - Investigated several possibilities: met soft/jet terms, generator effects, METSig
 - No clear culprit \rightarrow Magnar reported back to MET CP group today day

Summary

- Progressing well
- Depends mostly on low m_T issue



$Z' \rightarrow \ell\ell$

<https://glance.cern.ch/atlas/analysis/analyses/details.php?id=548>

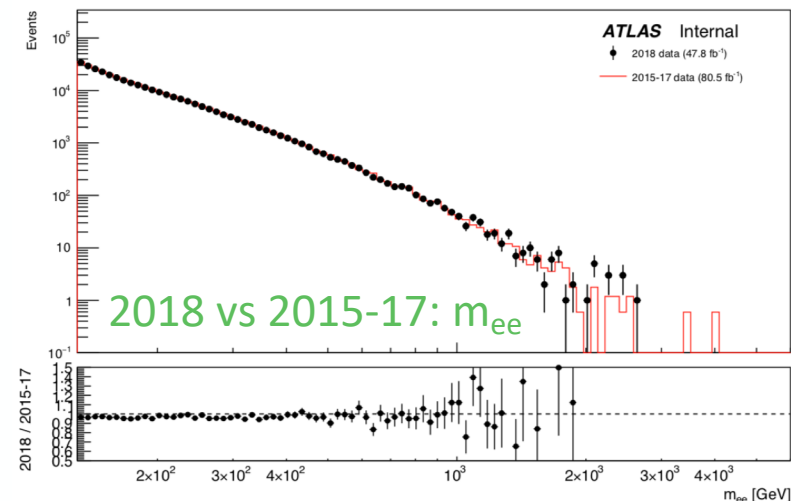
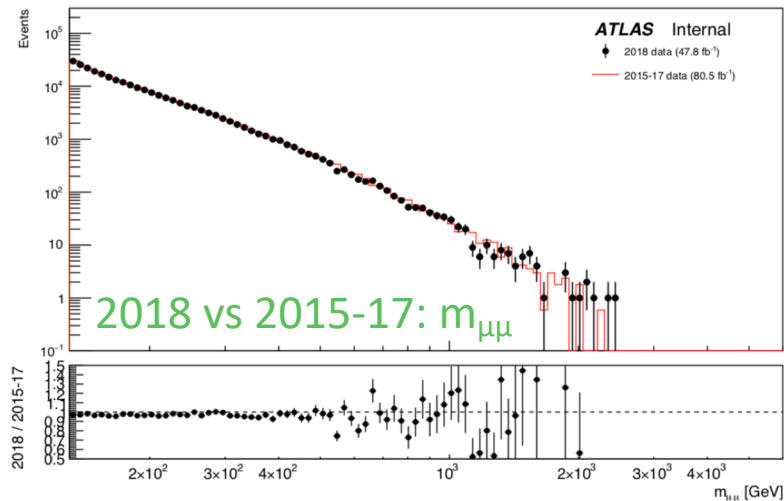
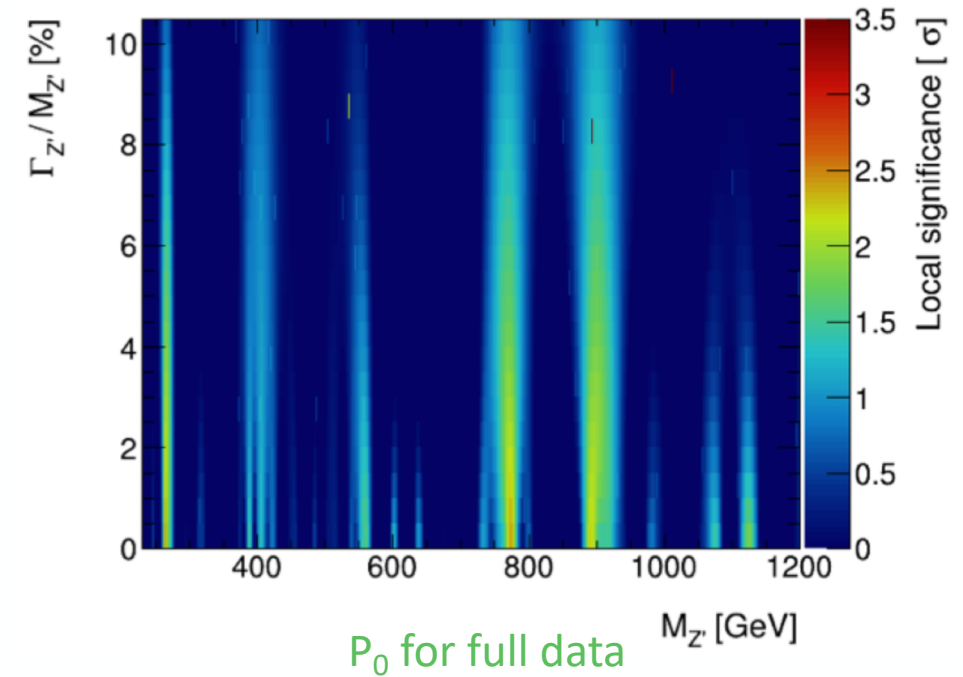
Current status

- Looked at full data
- Subgroup approval took place on 16/10
- EB in place and met twice

Still to do

- Closure items from subgroup approval + final limits
- Finalise non-resonant search strategy

Summary: very advanced and on track



LFV $Z \rightarrow e\mu$

<https://glance.cern.ch/atlas/analysis/analyses/details.php?id=1131>

- Current status

- Full analysis machinery almost in place with 15-17
- EB assigned and met once
- Aim for LPX approval late Nov

- Still to do

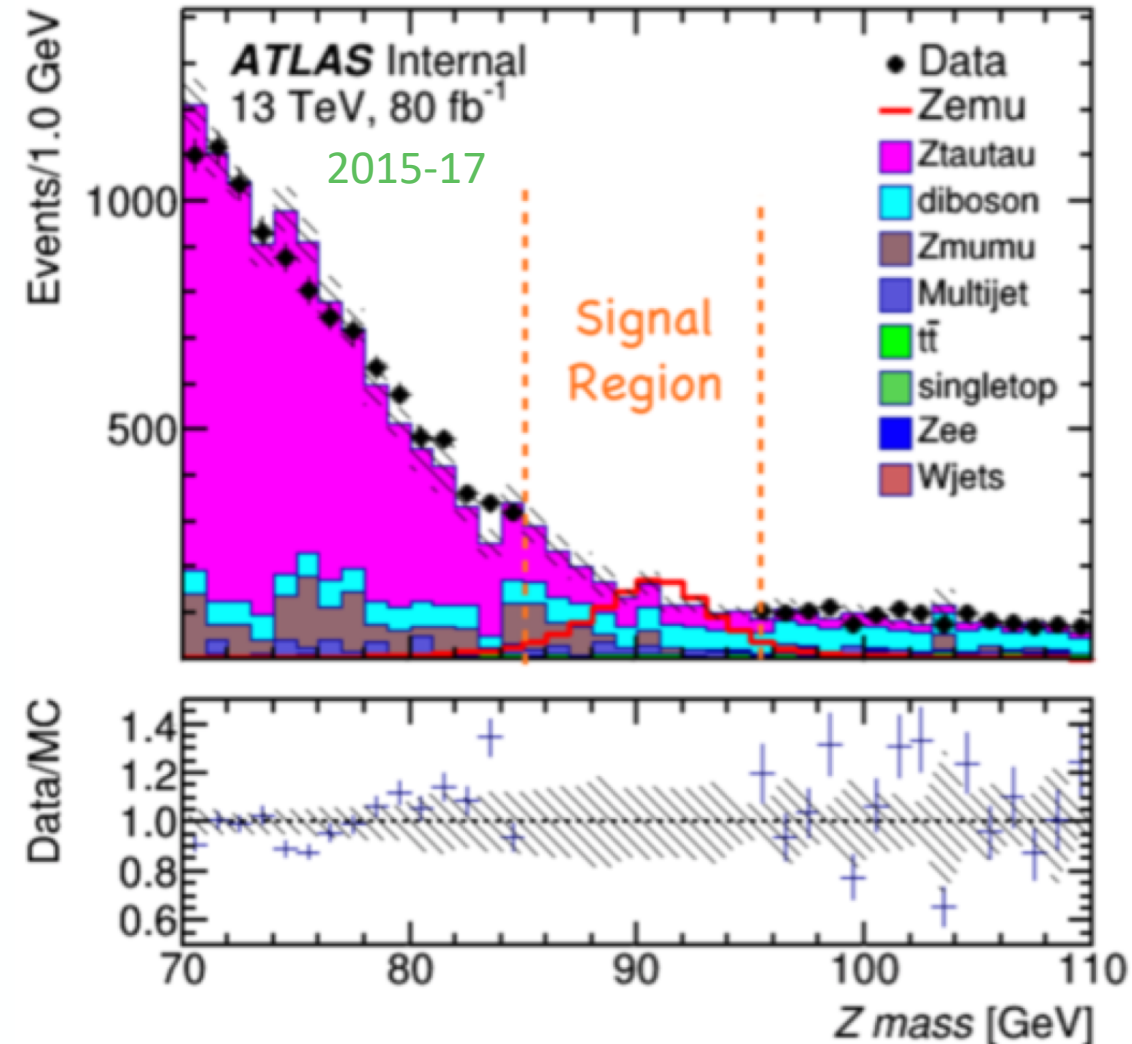
- Looking at 2018 data atm
- Final optimisation of selection & BDT with full MC

- Summary

- Good progress and on track, though tight

Cuts status	Bands	95%UL(Events)	Branch ratio(Zemu)
BR limits 2015-17	Expected(Median)	83.43	1.89E-07
	Expected(-1sigma)	59.85	1.36E-07
	Expected(+1sigma)	116.92	2.65E-07
	Expected(-2sigma)	44.90	1.02E-07
	Expected(+2sigma)	159.20	3.61E-07

c.f. Run 1 limit of 7.5e-7



Single LQ \rightarrow 2 lepton + (b)-jet

<https://glance.cern.ch/atlas/analysis/analyses/details.php?id=691>

Current status

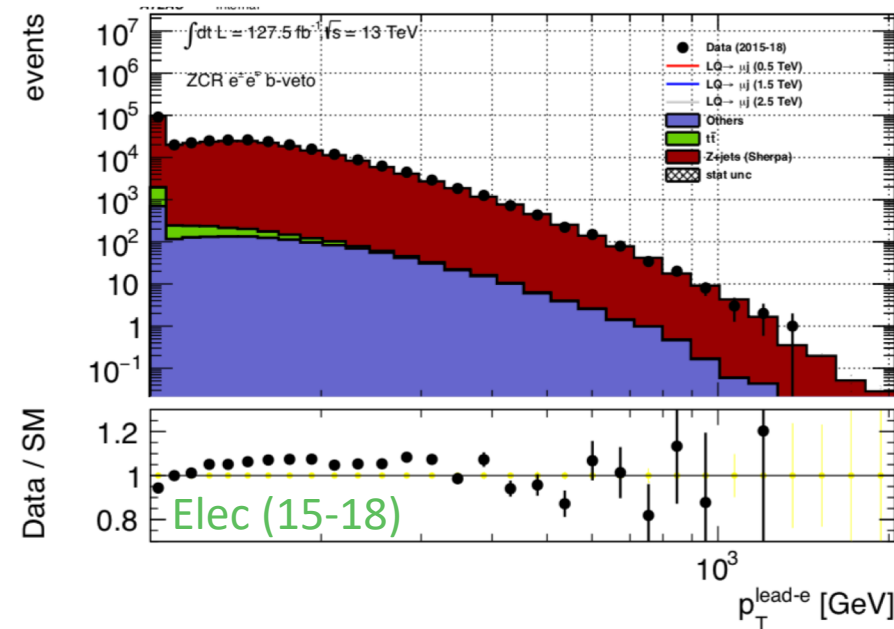
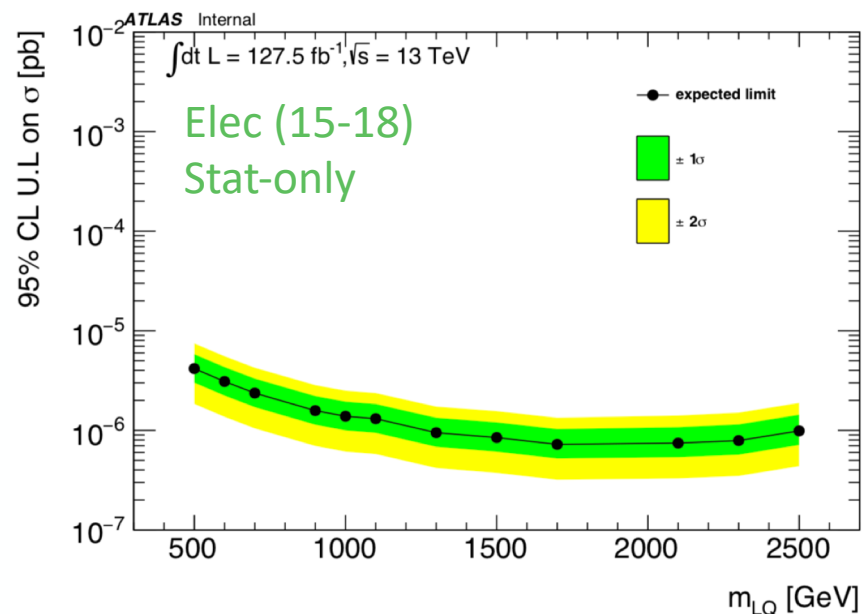
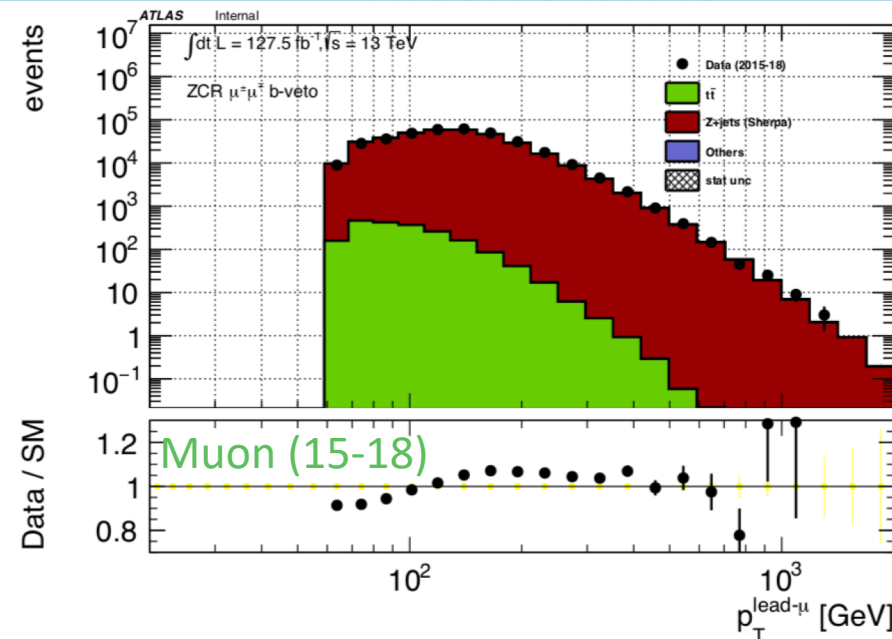
- Looking at full data
- EB in place and met once
- Aim for LPX approval end of Nov

Still to do

- Finalisation of bkg modelling and CR checks
- Address EB comments

Summary

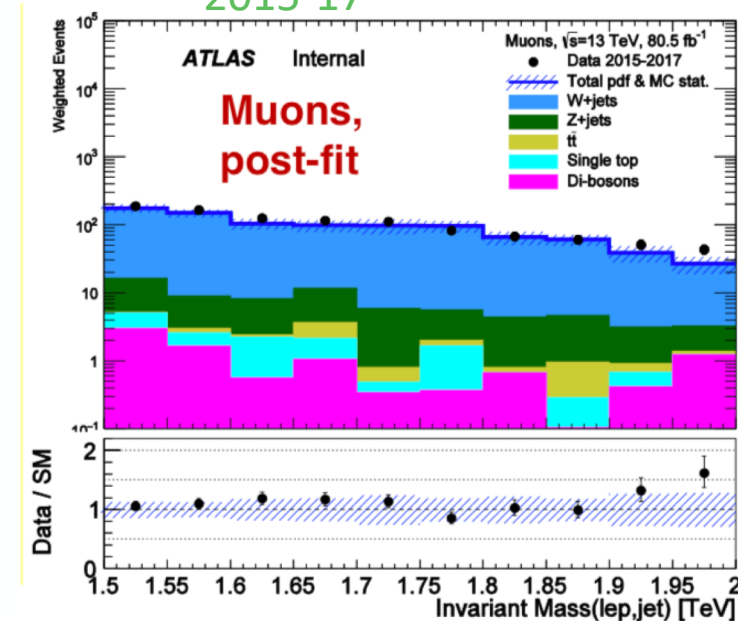
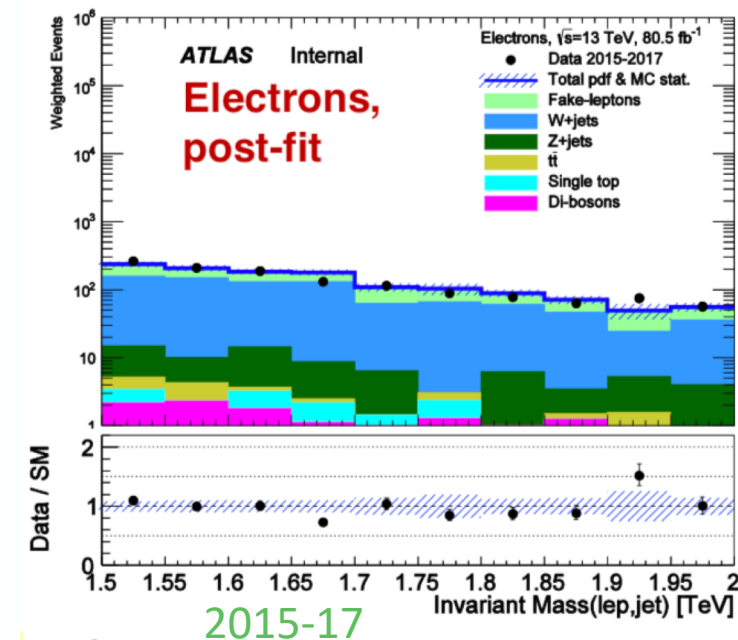
- Progressing well
- On track, though tight



QBH lepton + jet

<https://glance.cern.ch/atlas/analysis/analyses/details.php?id=689>

- Current status
 - CR/VR plts with 2015-17, but now looking at full data
 - EB in place and first meeting last Friday
- Still to do
 - Fix muon discrepancies (sagitta bias)
 - Finalise background modelling
 - Address large set of significant EB comments
 - Some concerns about analysis methods
 - Include 2018 data
- Summary
 - Just a two-person team with communication issues
 - Very unlikely to make Jamboree
 - Can maybe show some CRs



Monojet

<https://glance.cern.ch/atlas/analysis/analyses/details.php?id=274>

- Current status

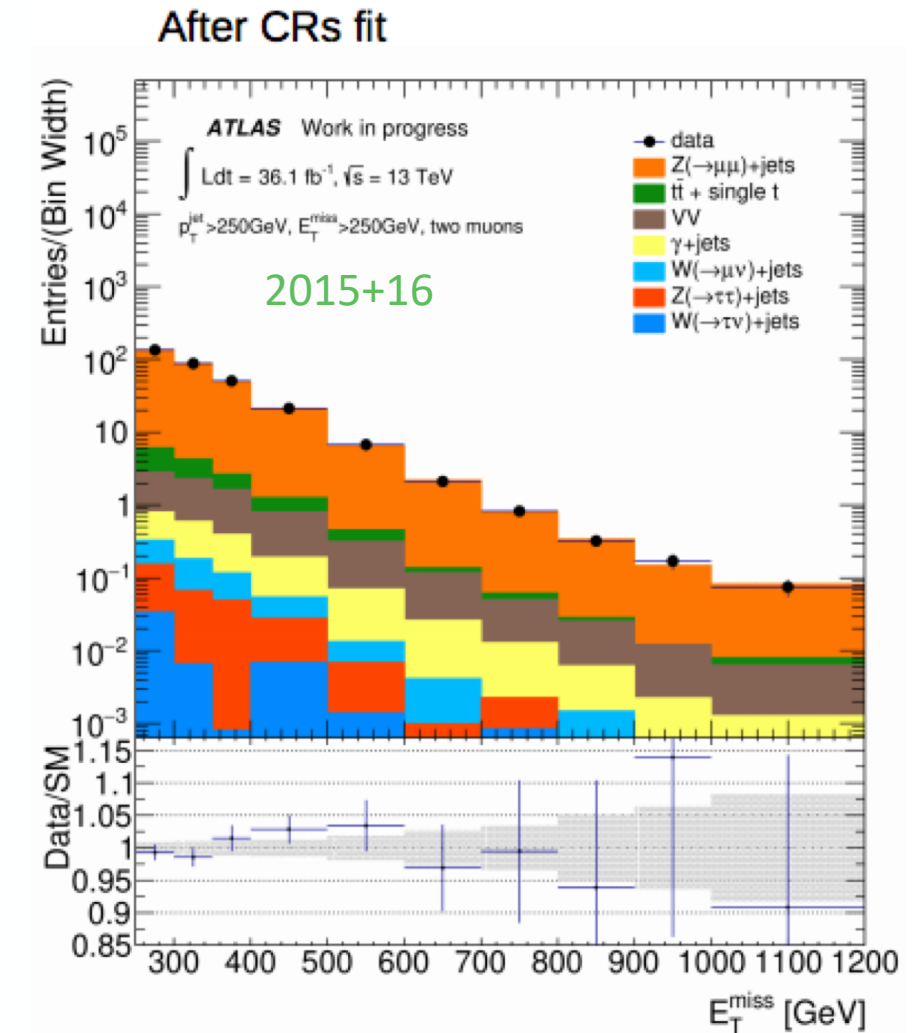
- Refining r21 version of analysis with 15+16 data
- EB in place & MET 3 times
- Aim for JDM approval late November

- Still to do

- Selection optimisation
- Going to lower MET + trigger studies
- Re-generate signal with looser filters
 - Submitting asap
- QCD/NCB estimation + SF evaluation
- Look at new data

- Summary

- Low on personpower and behind schedule
- Tight for Jamboree



Dijet/Dibjet

<https://glance.cern.ch/atlas/analysis/analyses/details?id=1134>

- Current status

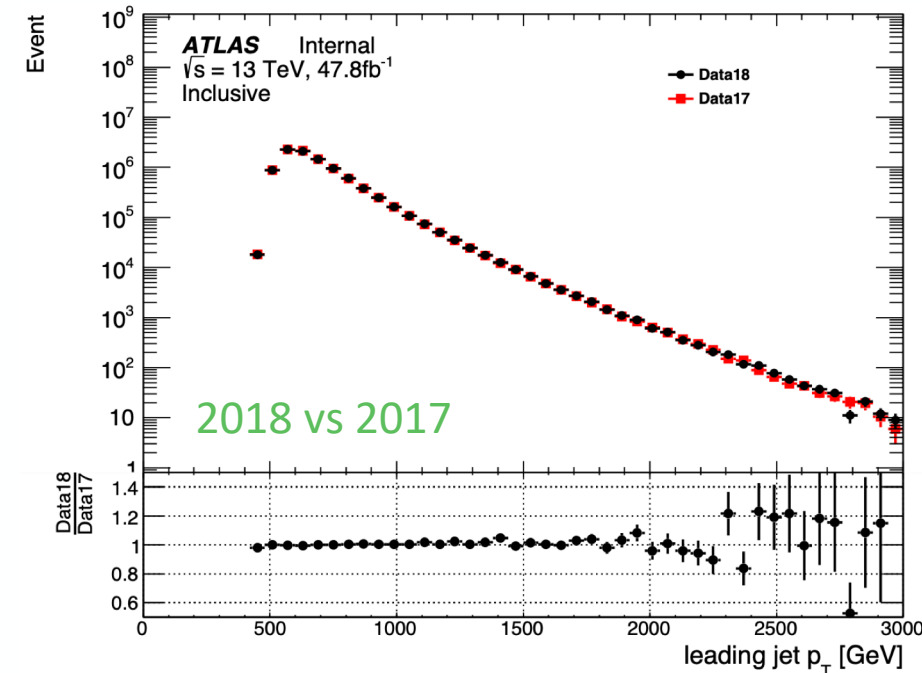
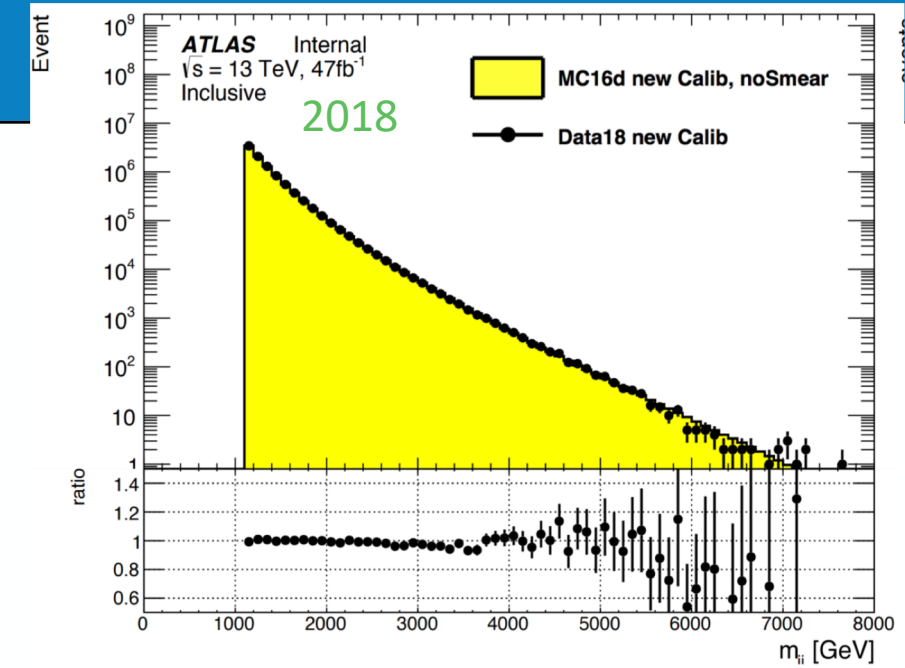
- Studying full data and NN-based q/g tagging (~20% gain)
- Aim for EB request next week
- Aiming to unblind only inclusive for Jamboree
 - Not b-tagged analysis

- Still to do

- Data fitting validation (lots of stats)
- Finalise q/g tagging and modelling
 - Based on neutral constituents via (sub)lead jet kinematics + n90
 - Developed by analysis team but in contact with JSS
- Tagged analysis working on including MV2c10/DL1 + RNN
 - Team contributing to WP definition and calibration

- Summary

- Inclusive analysis on target modulo q/g tagging, which is behind



Lepton + dijet

<https://glance.cern.ch/atlas/analysis/analyses/details.php?id=1115>

- Current status

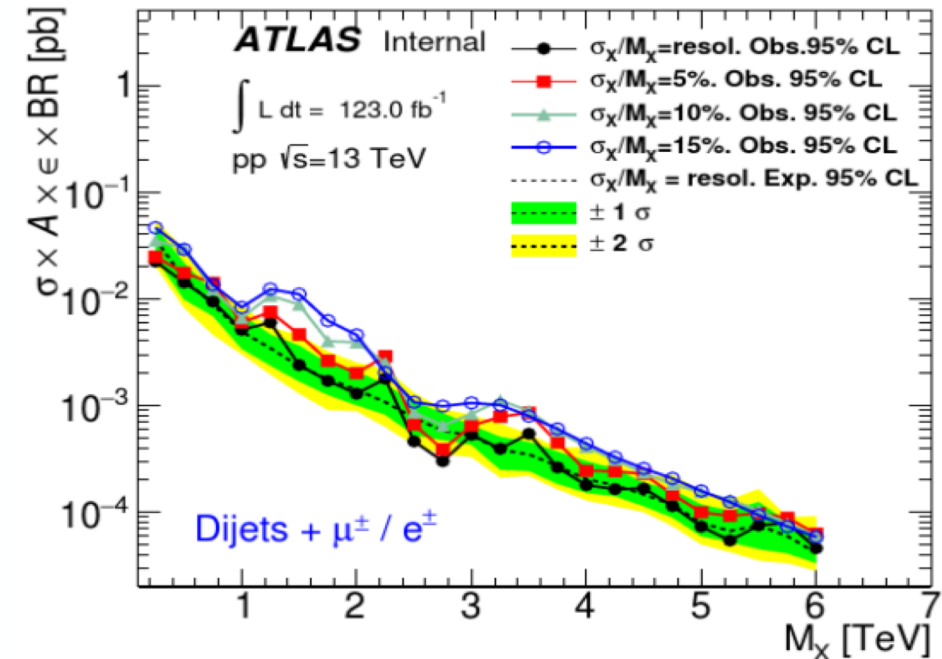
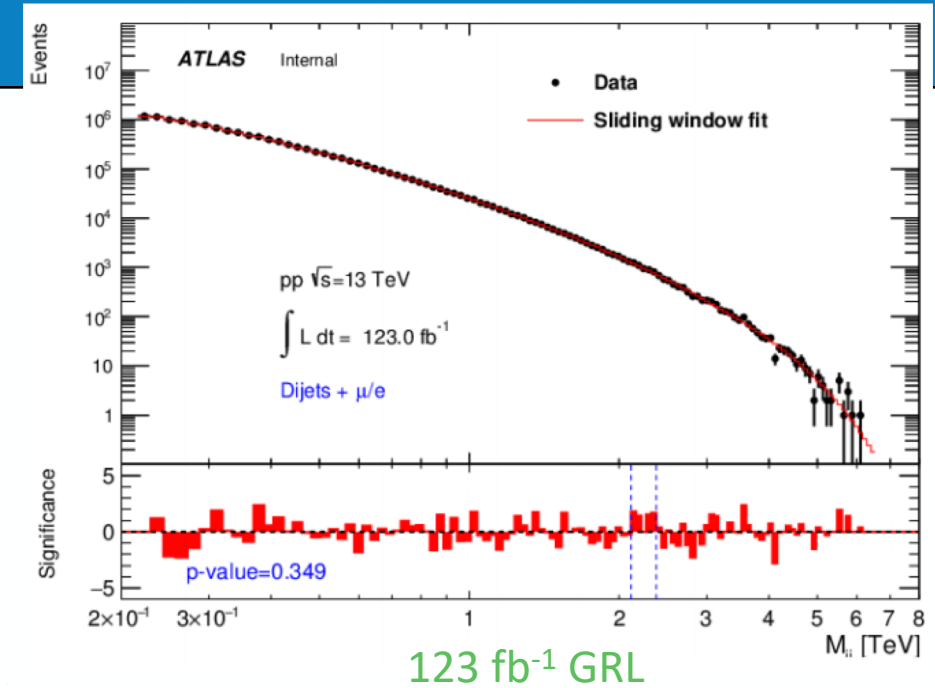
- Looking at 123 fb^{-1} with CONF selection
- EB request next week
- Unblind optimised analysis in winter

- Still to do

- Optimize selection
- Finalising how to present results

- Summary

- Not originally on our Jamboree timeline
- But progressing faster than thought
- However, small team with two main analysers



Multibjet

<https://glance.cern.ch/atlas/analysis/analyses/details.php?id=625>

- Current status

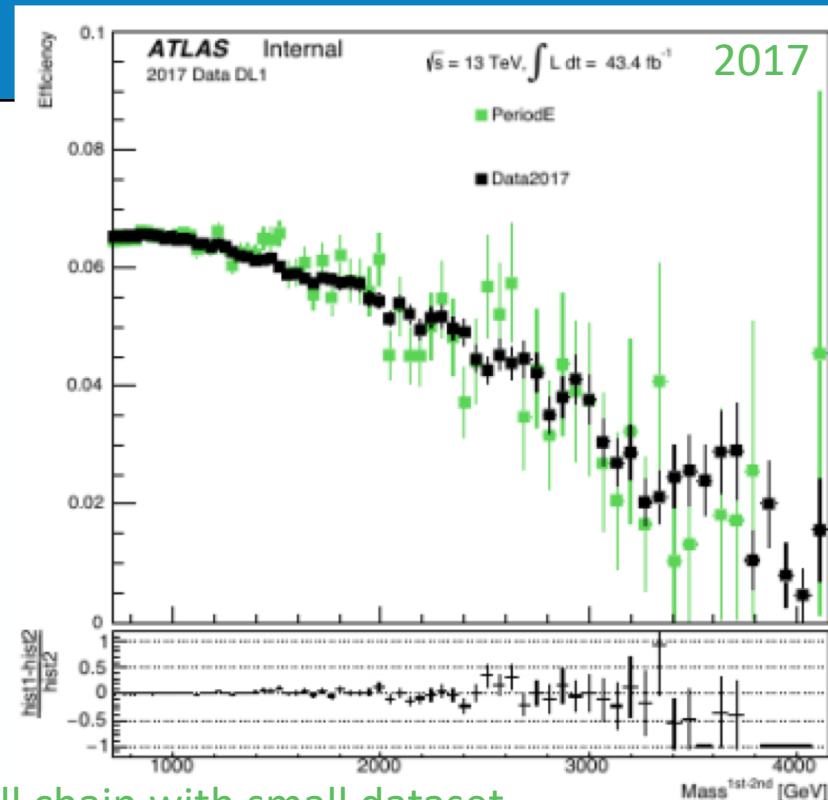
- Implementing full chain with new functional decomposition
- Looking at 2017 data
- EB request next week

- Still to do

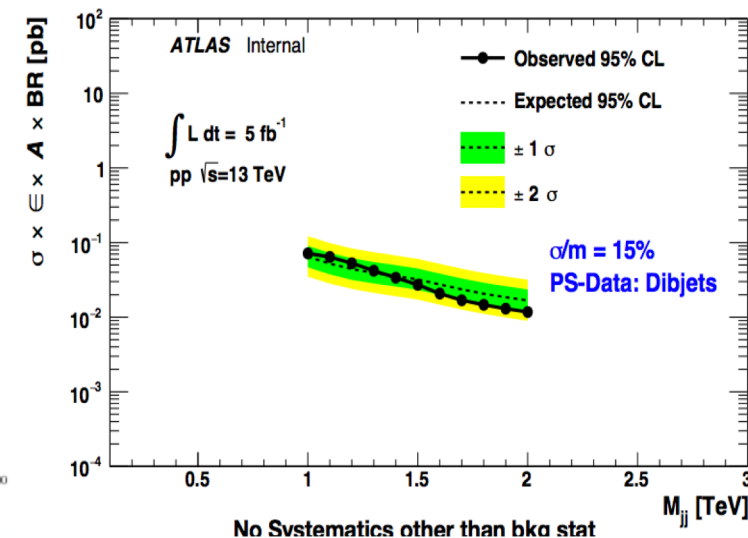
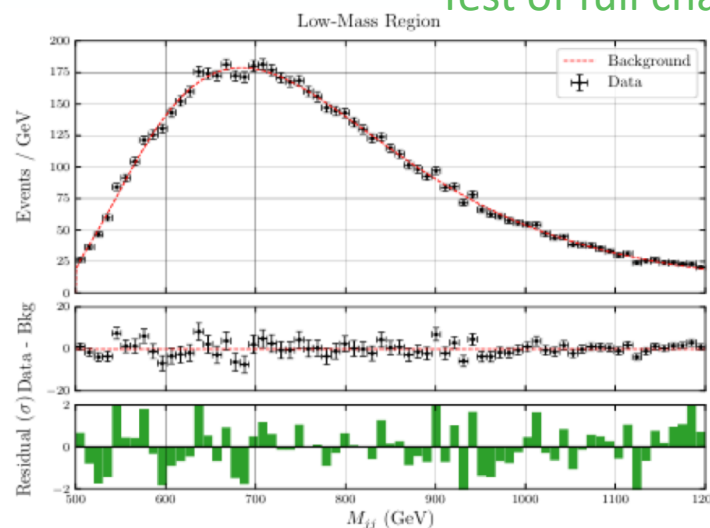
- Validation of functional decomposition background
 - Allows to model lower mass where not smoothly falling
 - Not done in ATLAS before
- Look at 2018 data

- Summary

- Progressing well but functional decomposition doesn't add much and worry will take longer to review
- Tight for Jamboree but could show functional decomposition technique



Test of full chain with small dataset



High-mass $t\bar{t}b\bar{b}$ 0 lepton

<https://glance.cern.ch/atlas/analysis/analyses/details.php?id=1665>

Current status

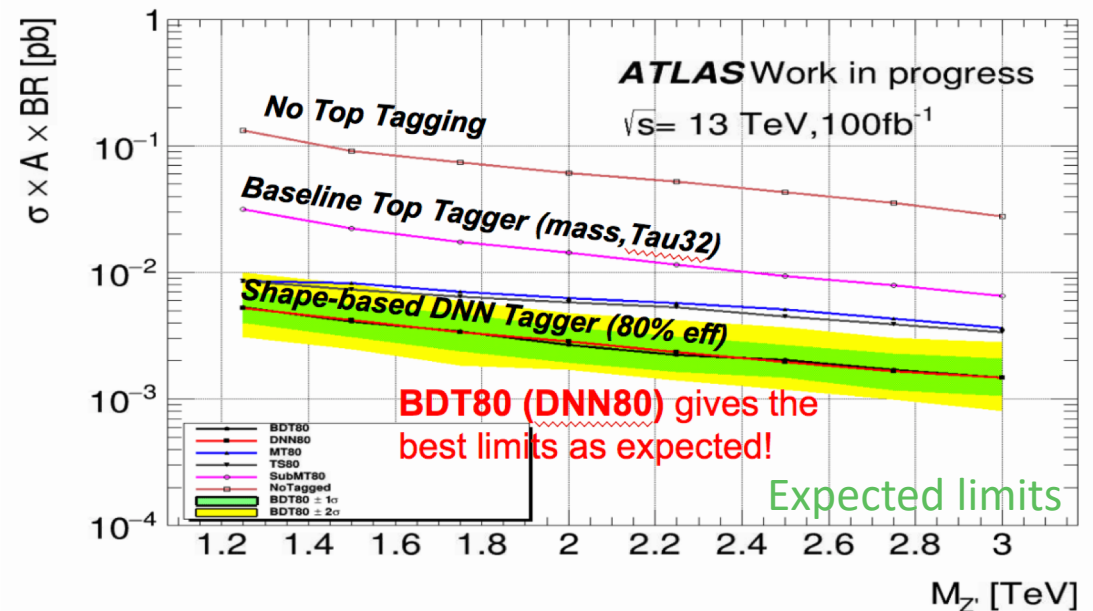
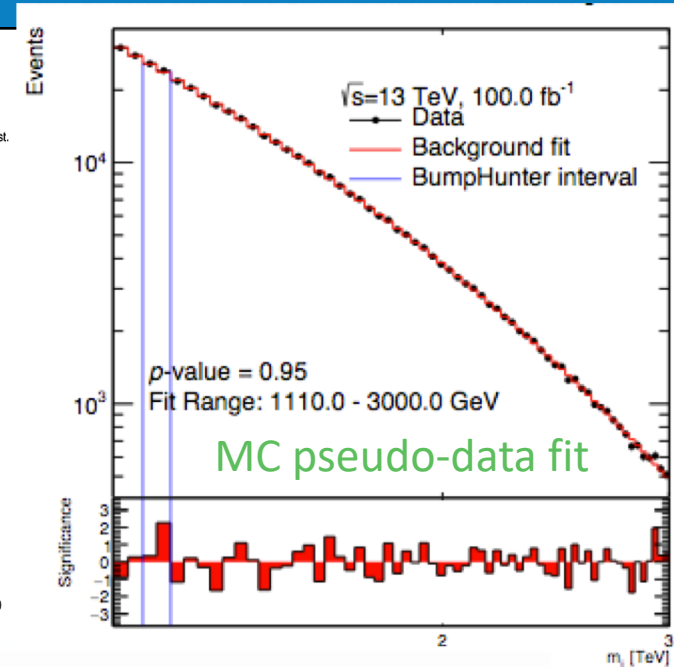
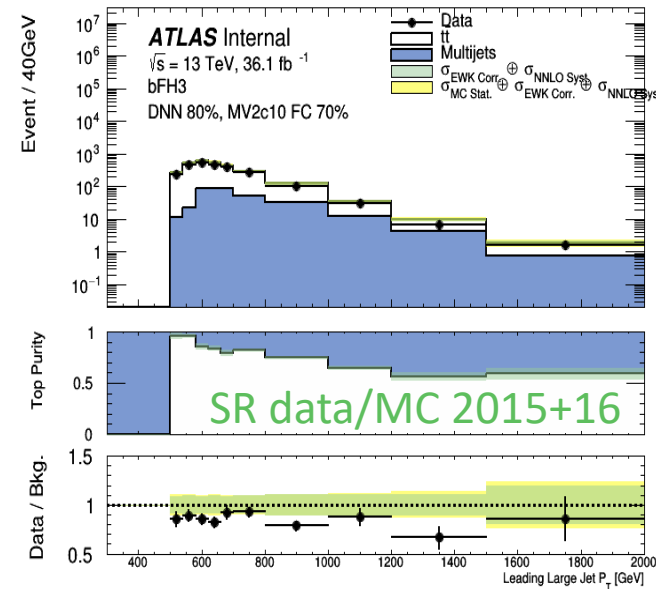
- Looking at 100 fb⁻¹
- Finalising DNN top-tagging
- Aim for EB request this week

Still to do

- Finalise b-tagging optimisation
- Establish sensitivity-based top-tagging WPs + setup SF tools together with JSS W/t tag
 - Dependent on large-R jet recommendations
- Event selection optimisation and define CRs
- May switch to RooStats framework
- HVT signal interpretation and interpolation

Summary

- Unlikely to unblind in time for Jamboree
- Plan to show impressive DNN top tagging

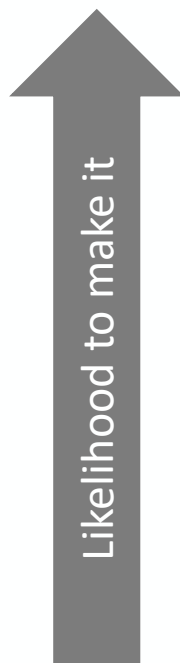


Summary

- Potential jamboree analyses

- $Z \rightarrow ll$
- $W' \rightarrow lv$
- $LFV Z \rightarrow e\mu$
- Single LQ $\rightarrow 2 \text{ lep} + \text{jet}$
- Lepton + dijet
- Dijet/dibjet
- Monojet
- Multibjet
- QBH $\rightarrow \text{lep} + \text{jet}$
- High $m_{t\bar{t}}$ 0 lep

- But will show DNN top tagger development



jamboree

/ˌdʒambəˈriː/ 

noun

1. a large celebration or party, typically a lavish and boisterous one.
2. a large rally of Scouts or Guides.

It's clearly not 2, so it must be a party, right?



- See HDBS for VBF HH $\rightarrow 4b$ and VV $\rightarrow JJ$...

Backup: $Z \rightarrow \ell\ell$

