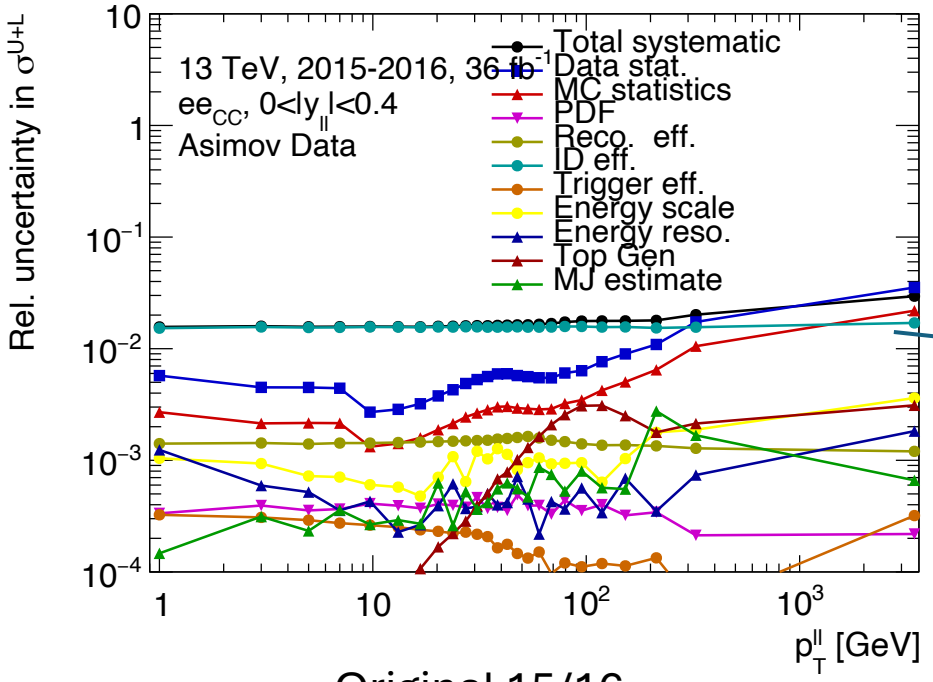
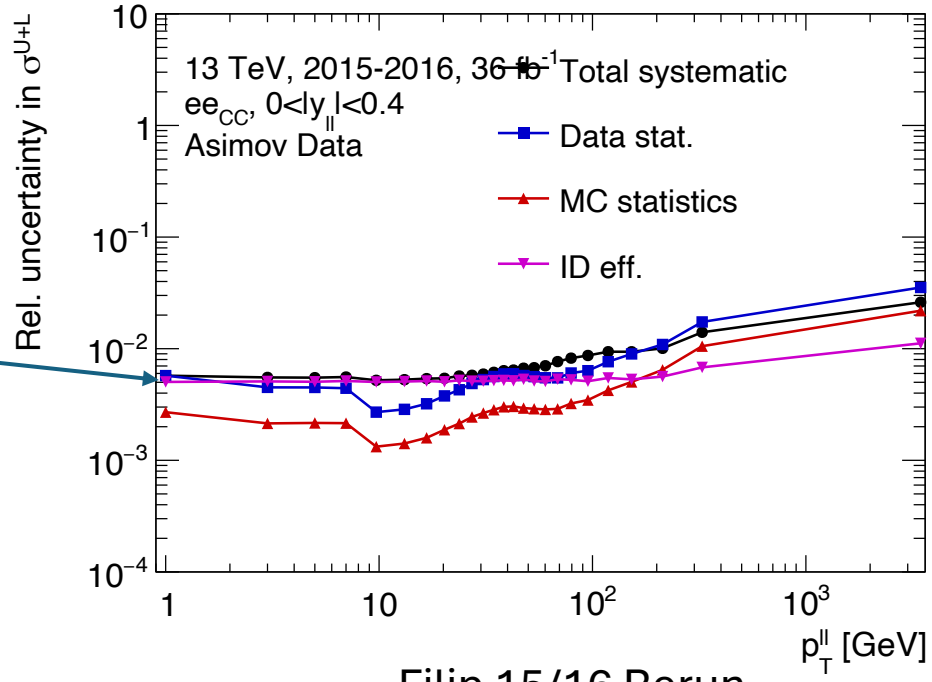
CC – Problematic ID Efficiency Systematics



Original 15/16

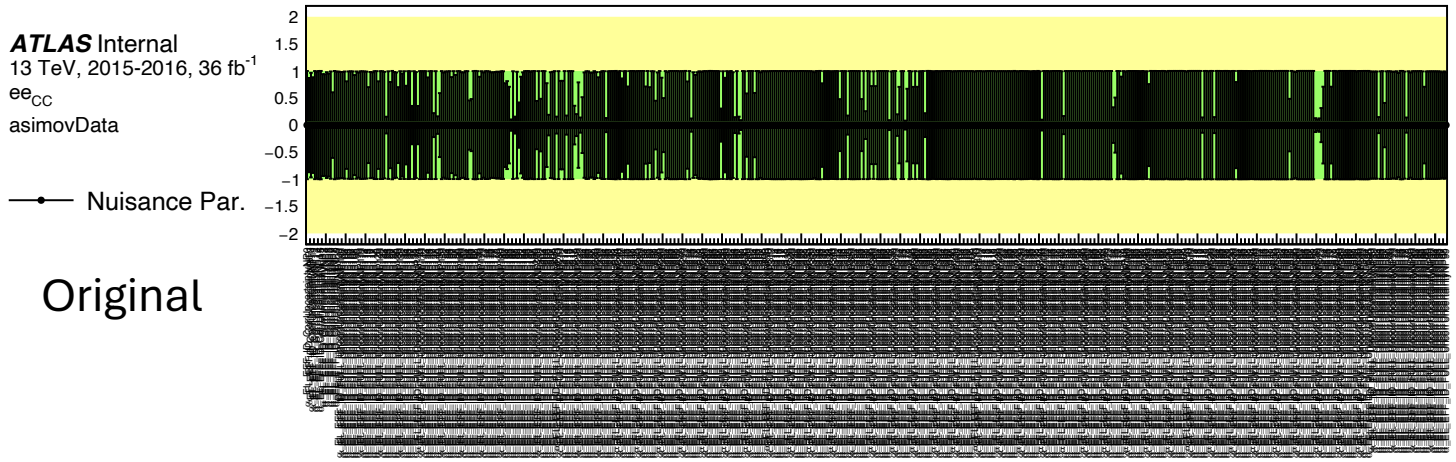


Filip 15/16 Rerun

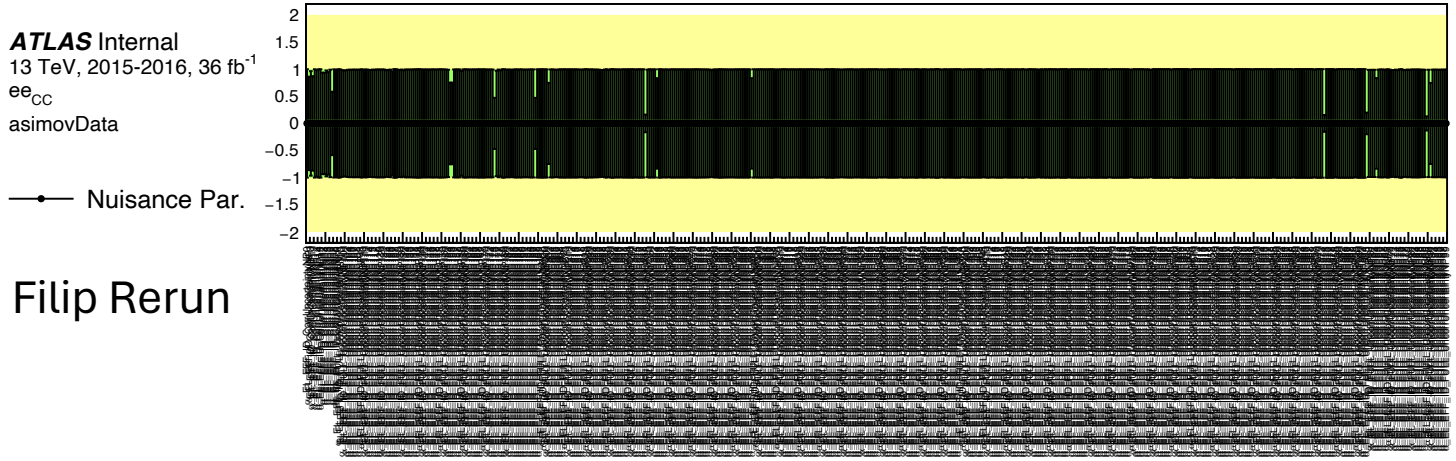
- Previously seeing that in 15/16 the ID efficiency systematic was far too large (>1%!)
- Filip reran 15/16 with a different job submission and now the situation has been significantly improved (<6 permille)
- Still too high, should be closer to 1 permille!

CC- Problematic ID Efficiency Systematic

- Improvements in uncertainty mean the pull plots look more reasonable as well.
- Will give you a list of NPs to rerun if that's ok Filip!

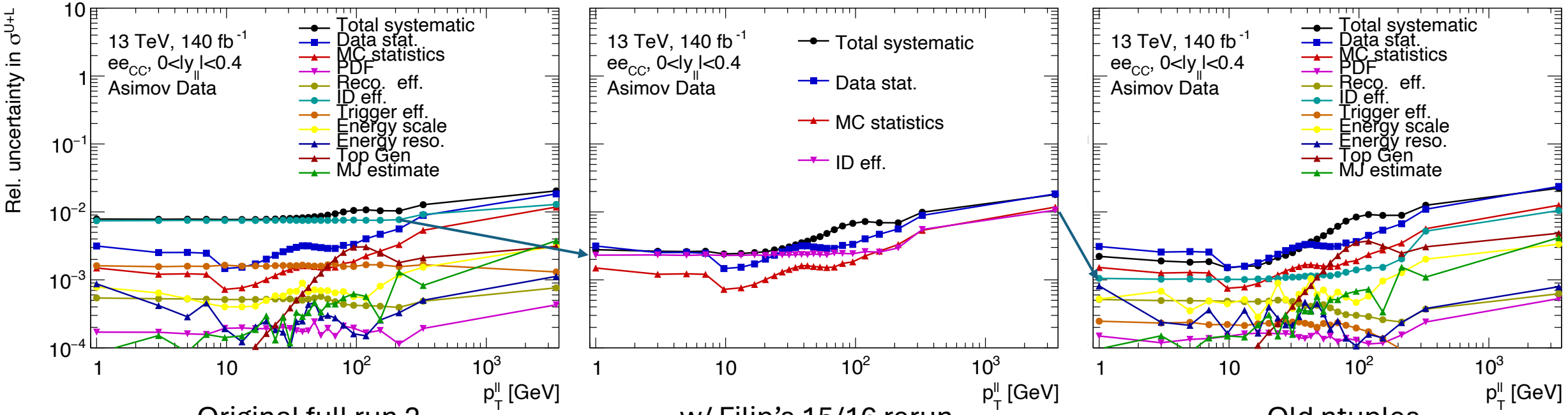


Original



Filip Rerun

CC – Problematic ID Efficiency Systematic



Original full run 2 | w/ Filip's 15/16 rerun | Old ntuples

- Is this improved 15/16 good enough when incorporated into full run 2? No…
- Xsec relative uncertainty improves from 0.0085 to 0.0015 which is good!
- However, with the old ntuples we achieved 0.001 so still 1.5 times larger than it should be.

CF Calibration

- Gave an (admittedly light on bulleted details…) update on the in situ last week at the roundtable
  - To summarise – 2017 looking good, 15/16 and 18 not so good

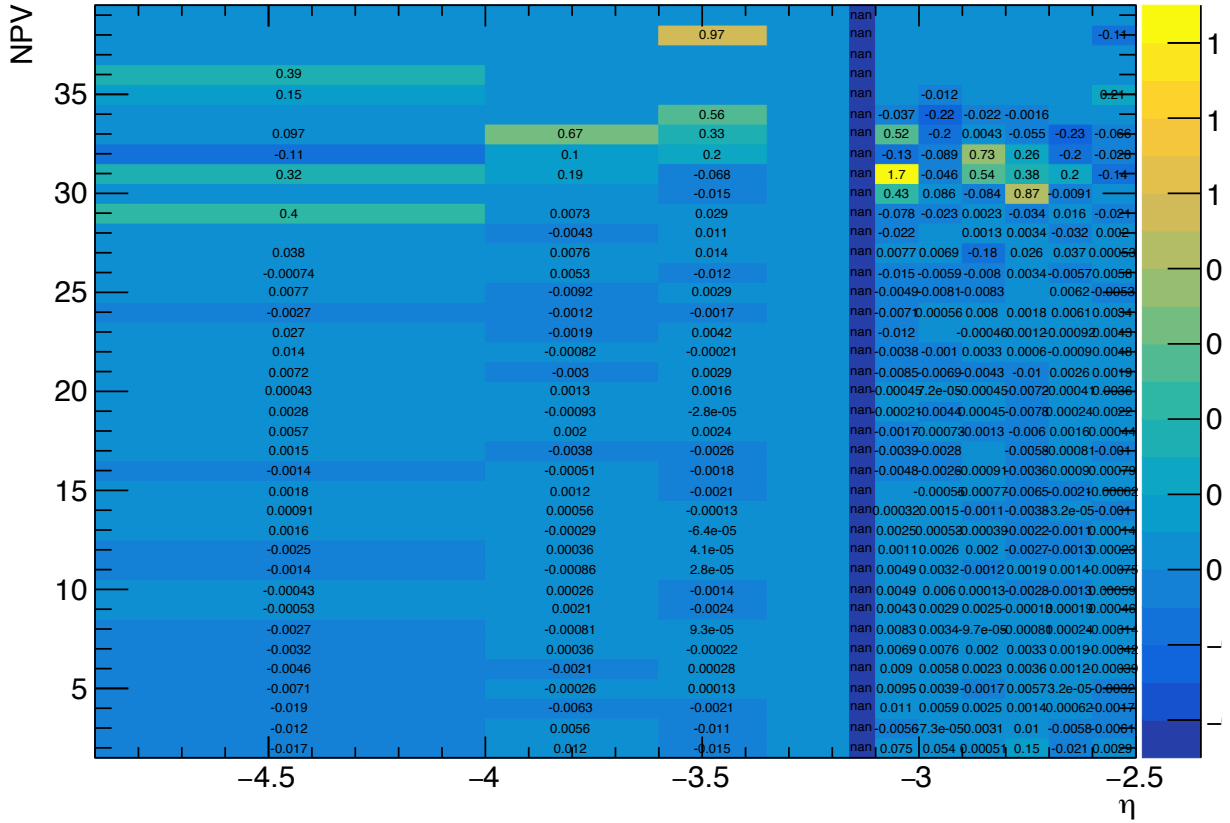
- New CF ntuples necessary, the hacked truth and reco weights disagree by 2-3%
  - Small update to the ntuplemaker, now using the latest fine binning SFs as recommended by e/gamma. CC uses the older version but I don't think it's worth reproducing these ntuples.
  - Lukas will run this production and manage the jobs but I'll talk him through it all.

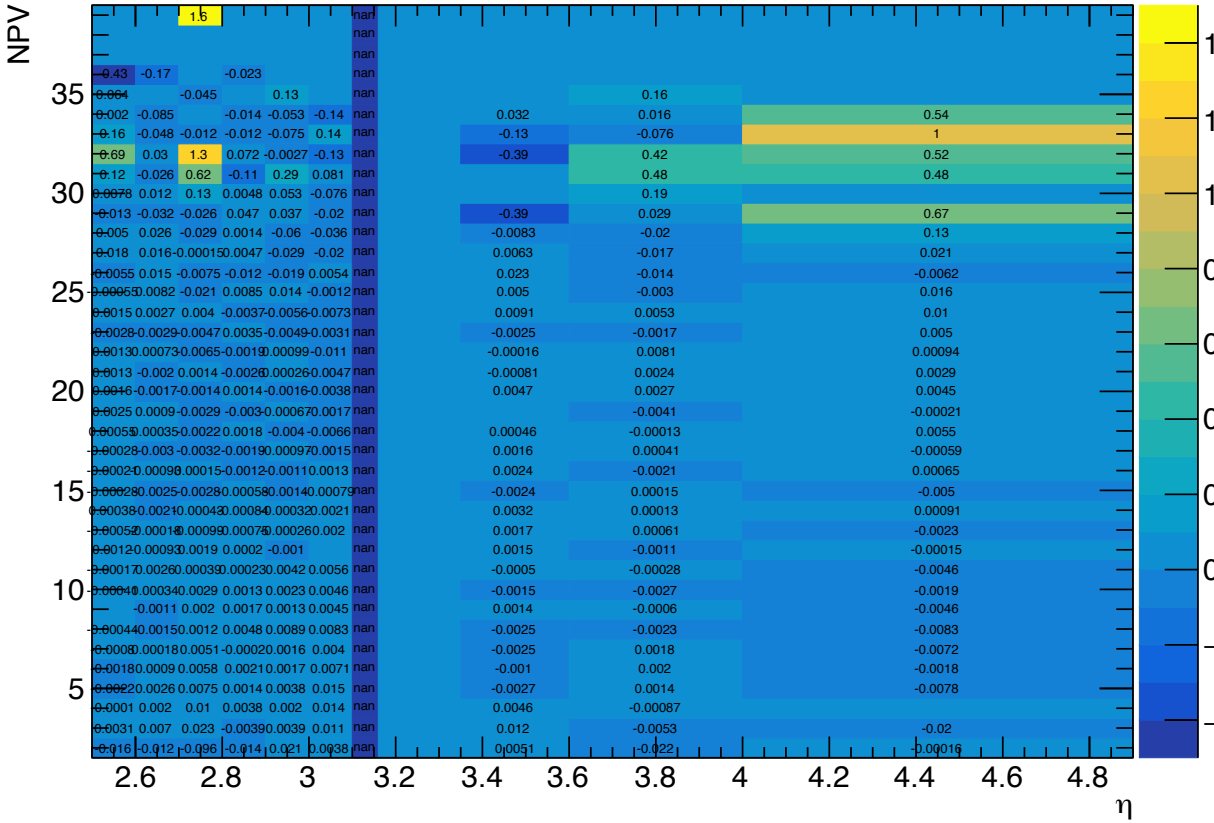
- Also looked at NPV correction and variance corrections for 15/16 and 18

NPV Correction

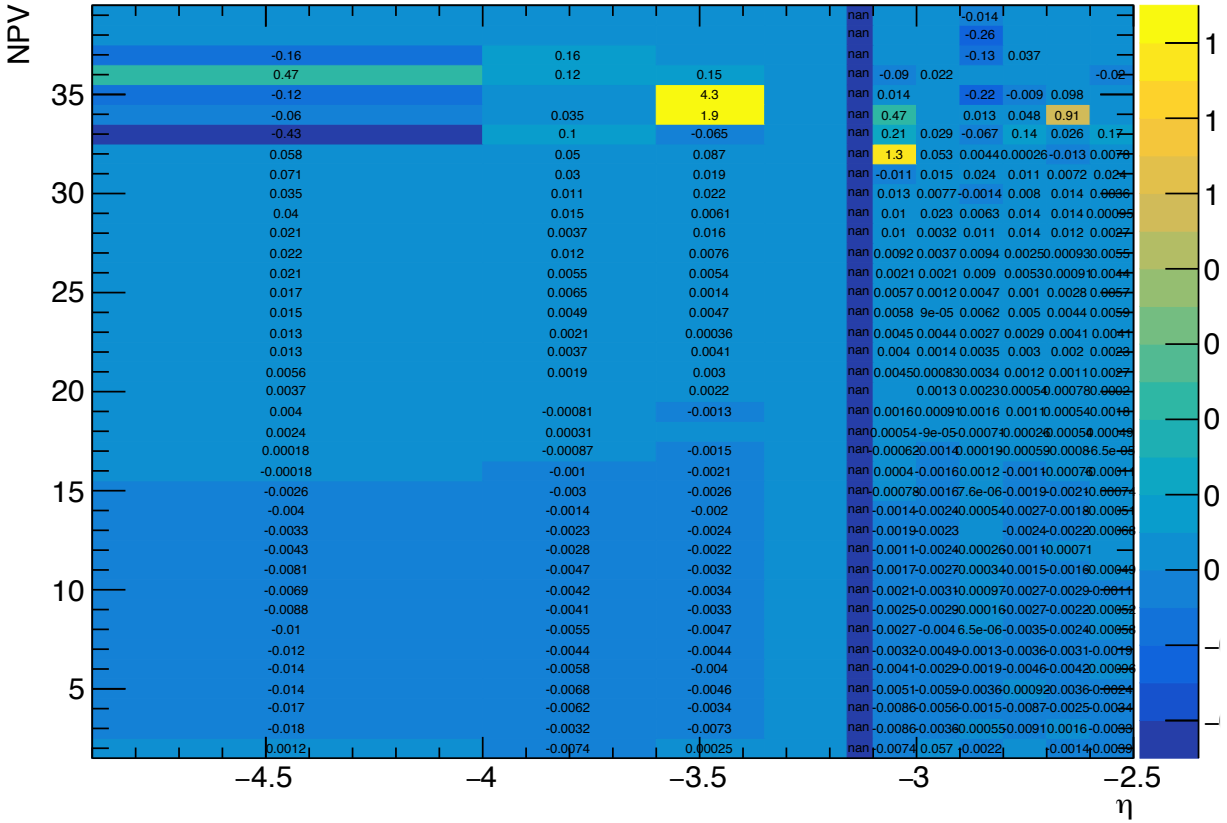
- Similar to the phi-uniformity correction, in a given eta region, correct the energy response of the forward electron so that it is flat vs NPV
- Fit a Gaussian to mll distribution in each NPV bin for an eta slice (1.5 sigma around histogram mean), record the median of the fitted means in each eta slice
- Alpha = (mu_data/median)^2 - 1
- E corr = E*1/(1+alpha)
- Alpha values mostly ~per mille level but at high eta and high pileup this can become a ~percent level variation
- Still small enough that this correction is not necessary

NPV: 15/16 – Data





NPV: 15/16 – MC


NPV
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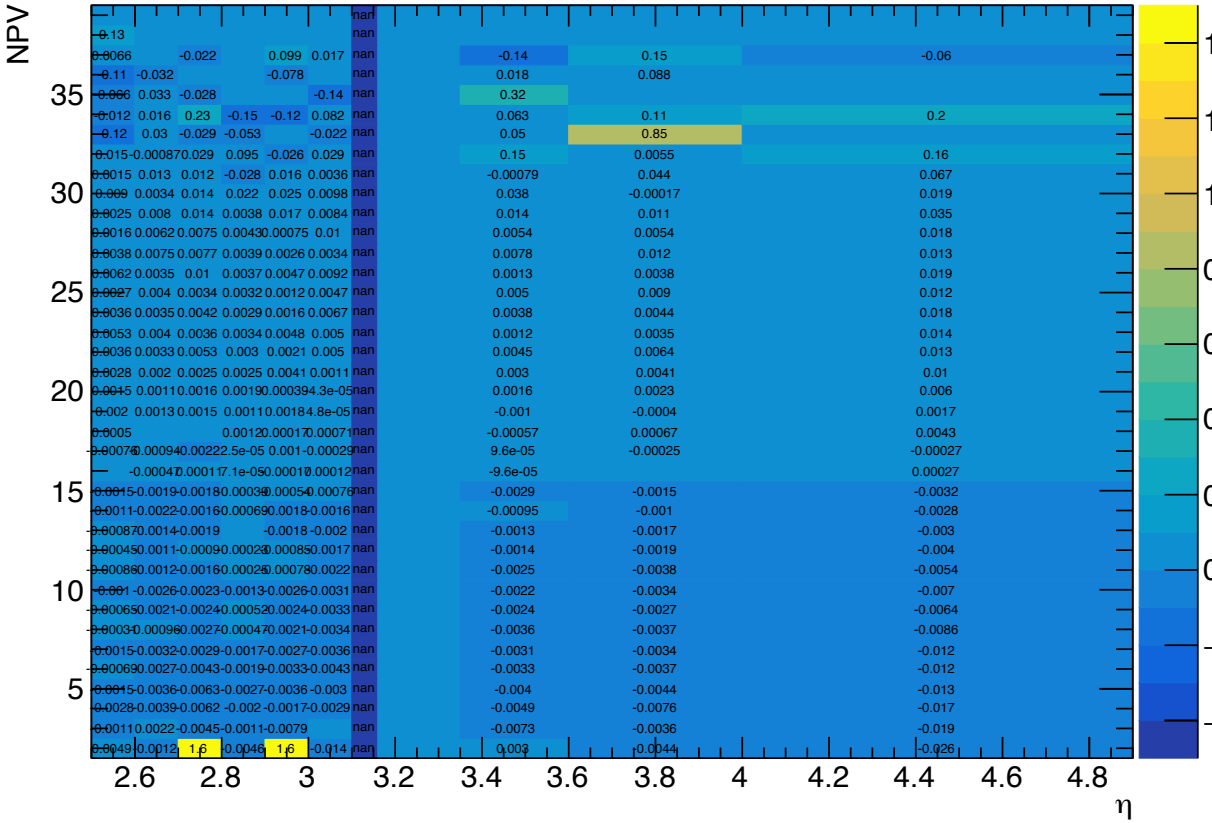
η


NPV
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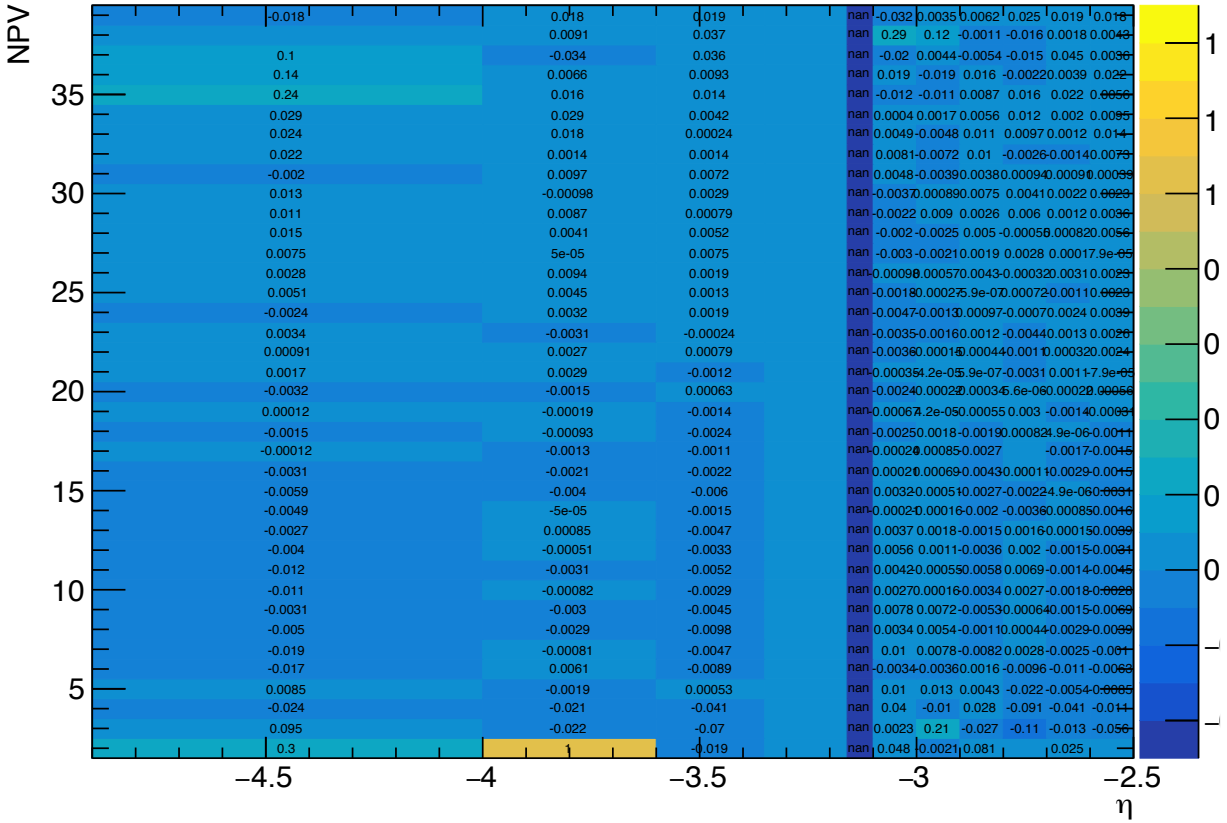
η

NPV: 17 – Data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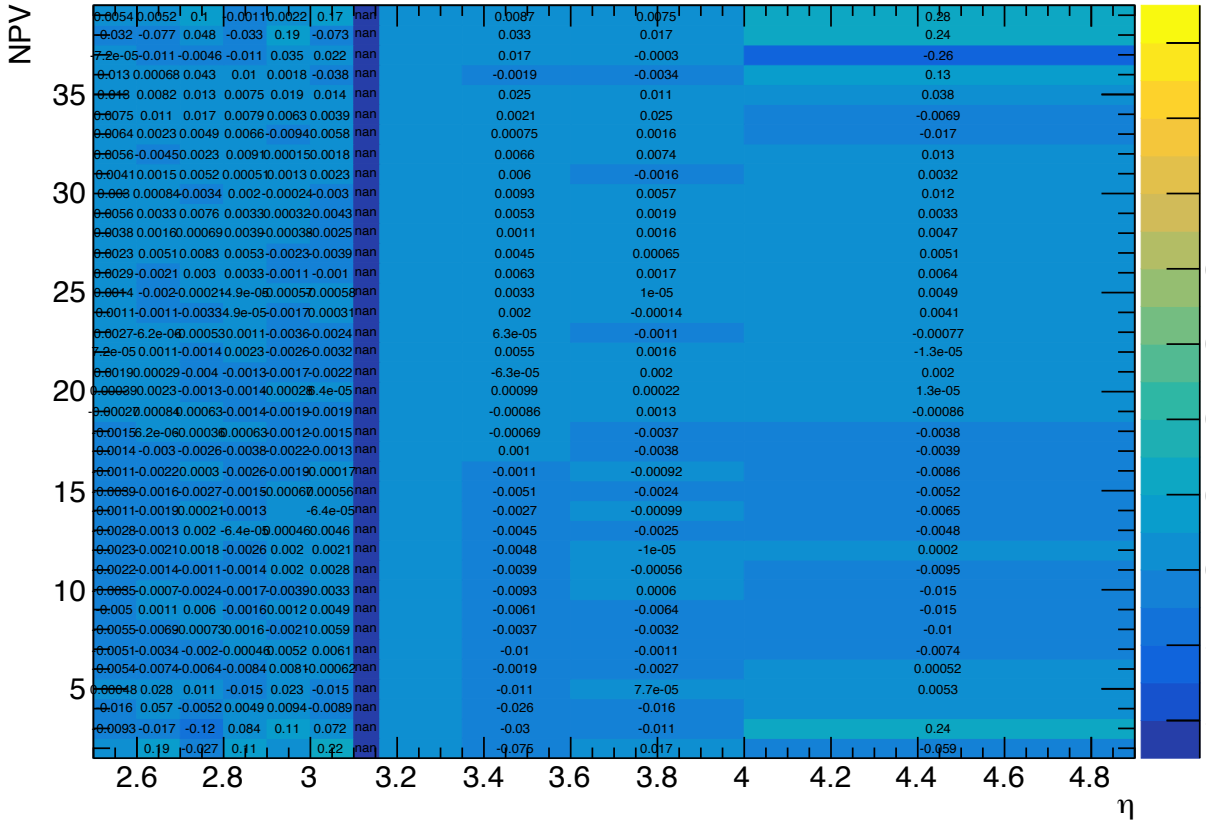
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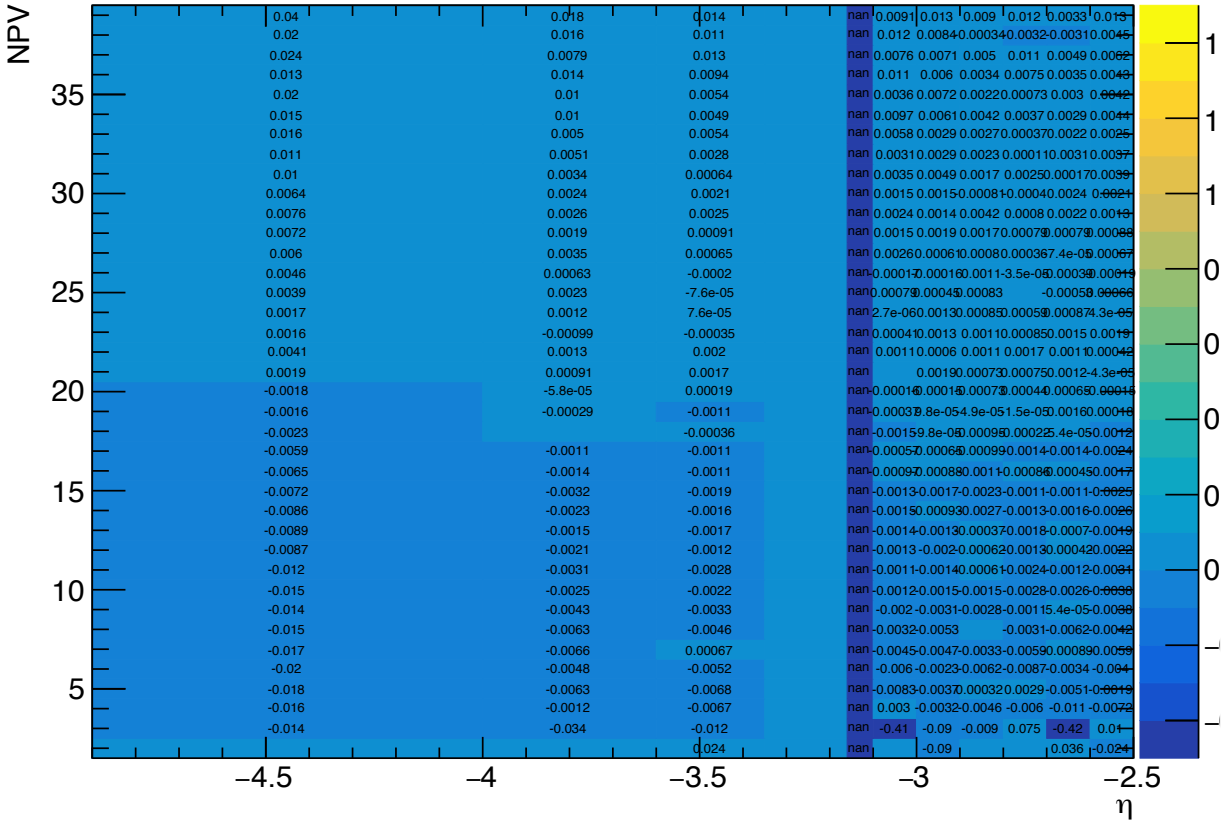
NPV: 17 – MC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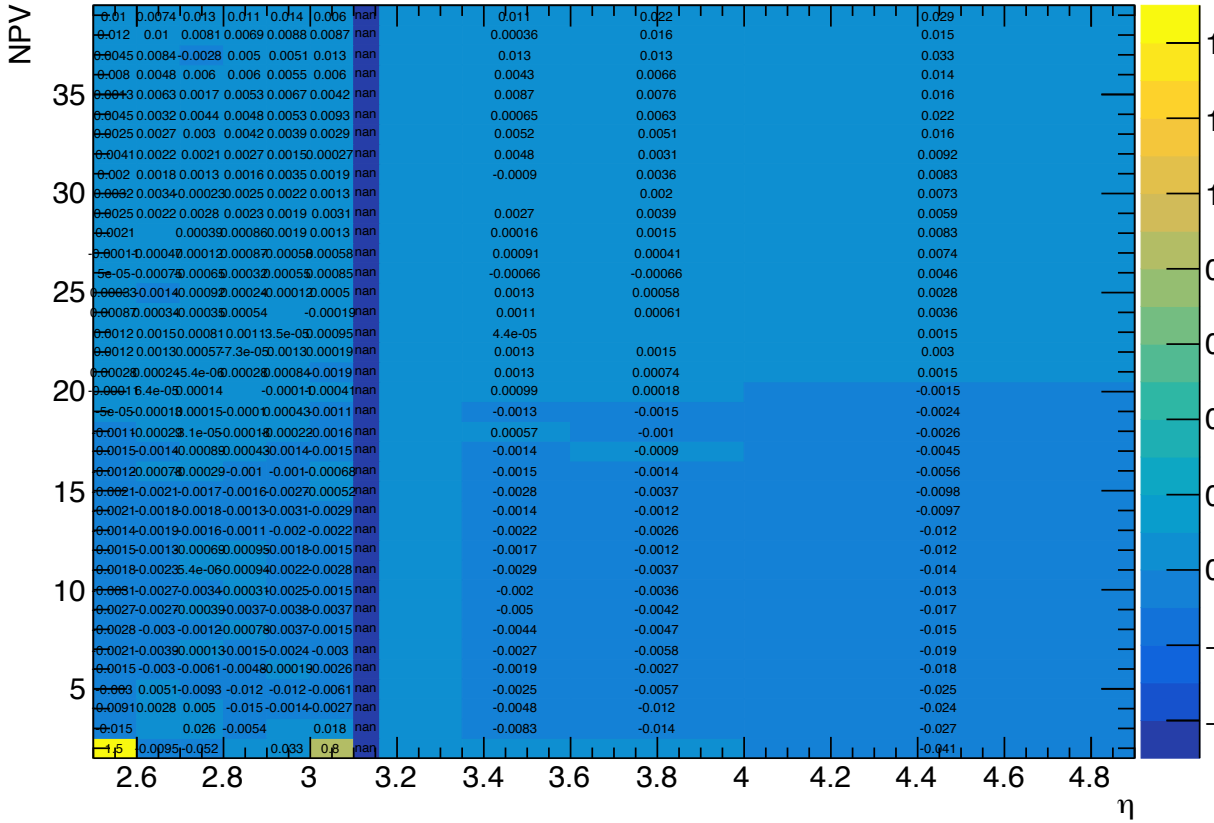
NPV
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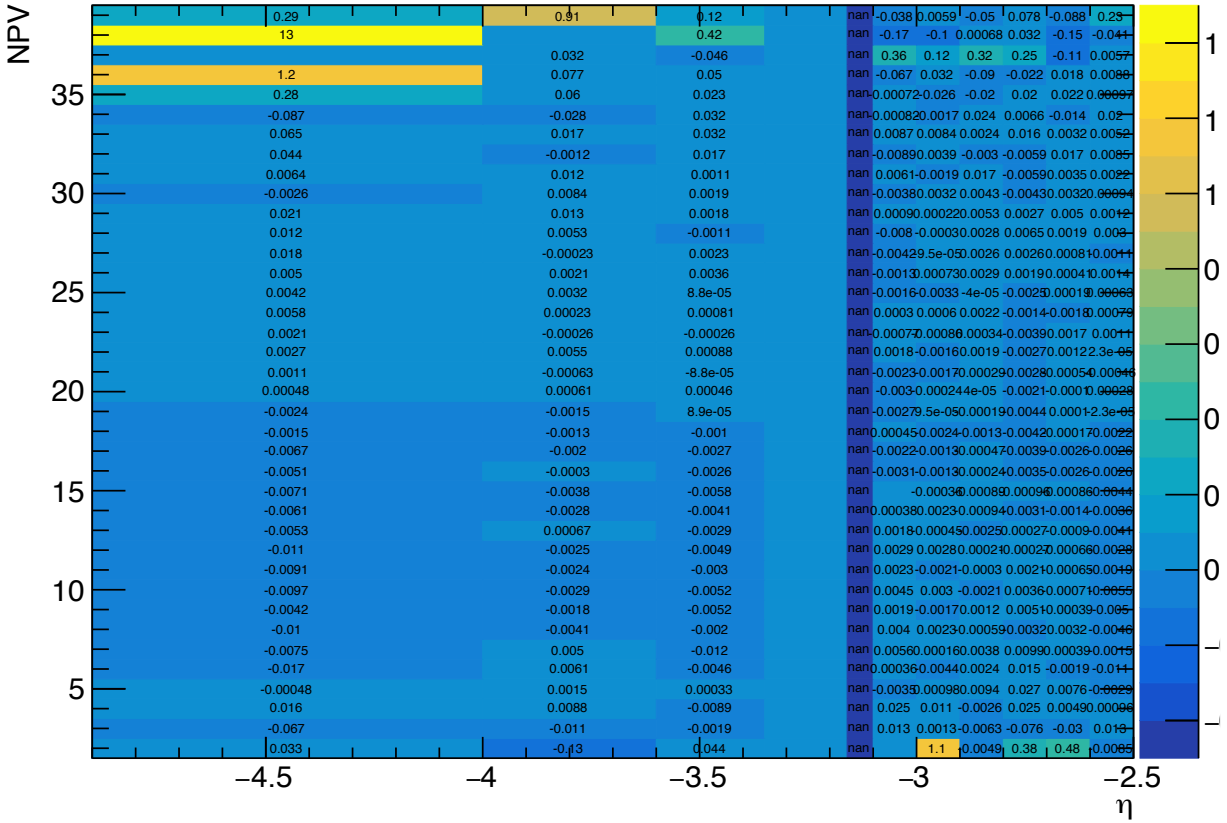
η

NPV: 18 – Data


NPV
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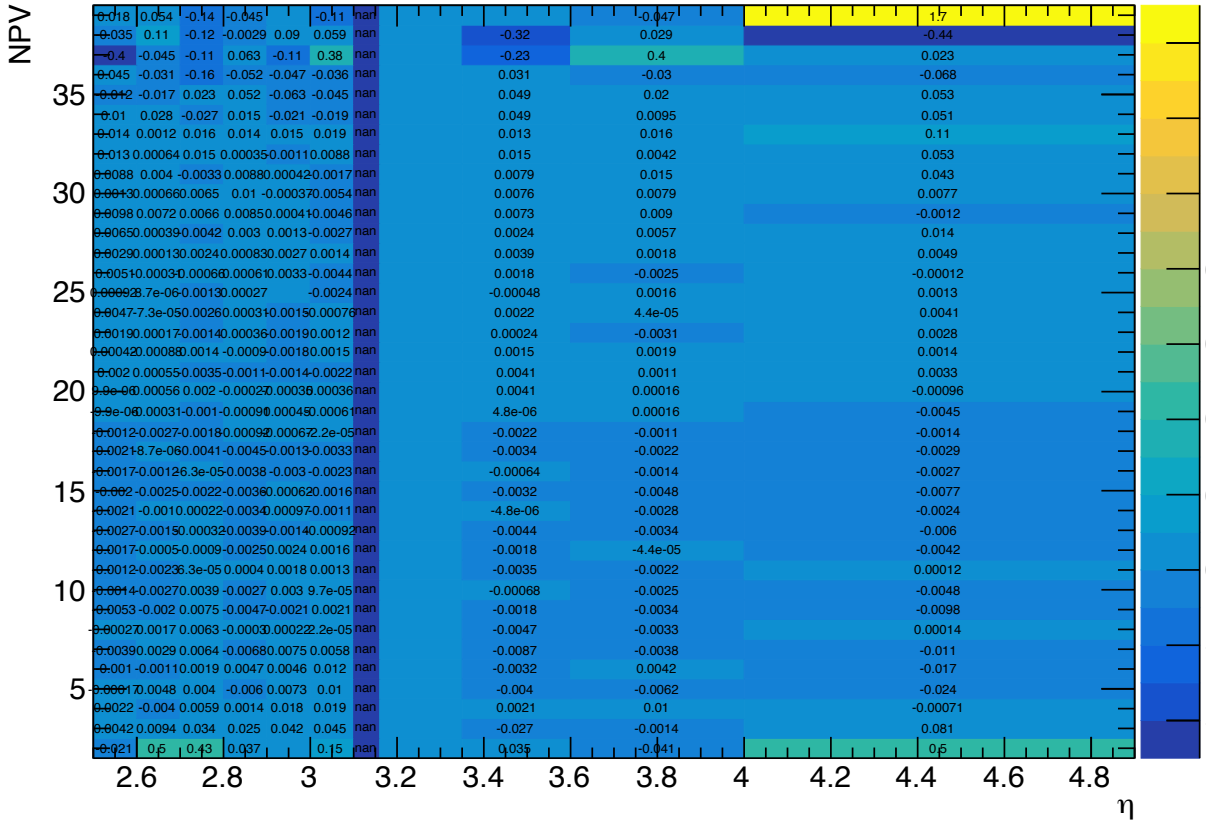
−2.5
η


NPV
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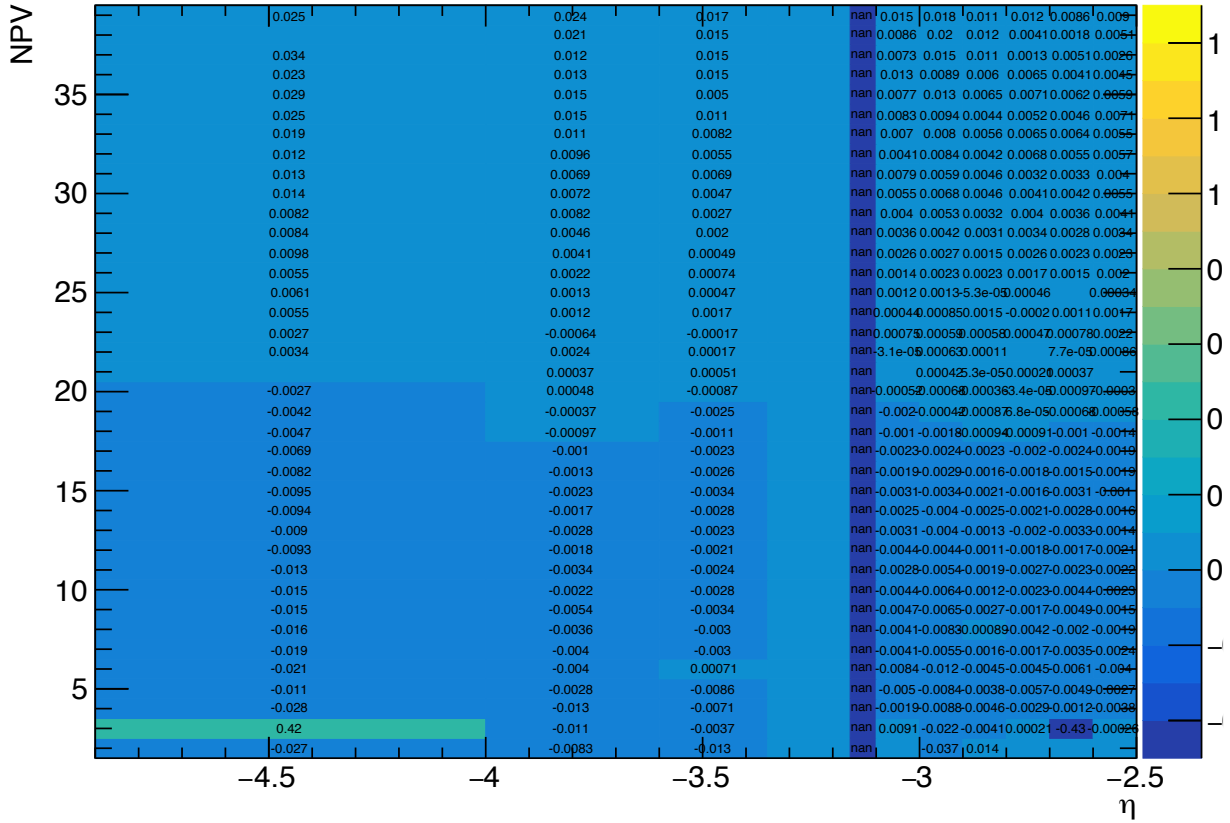
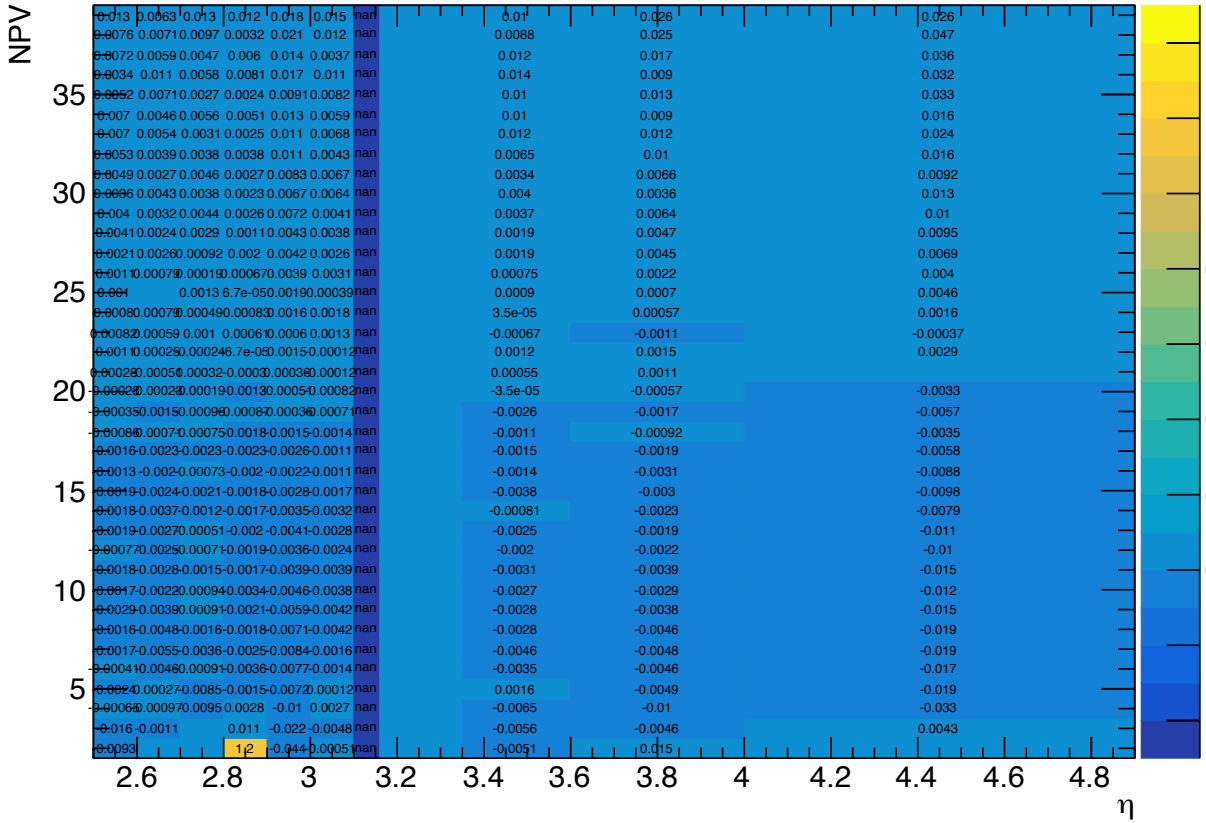
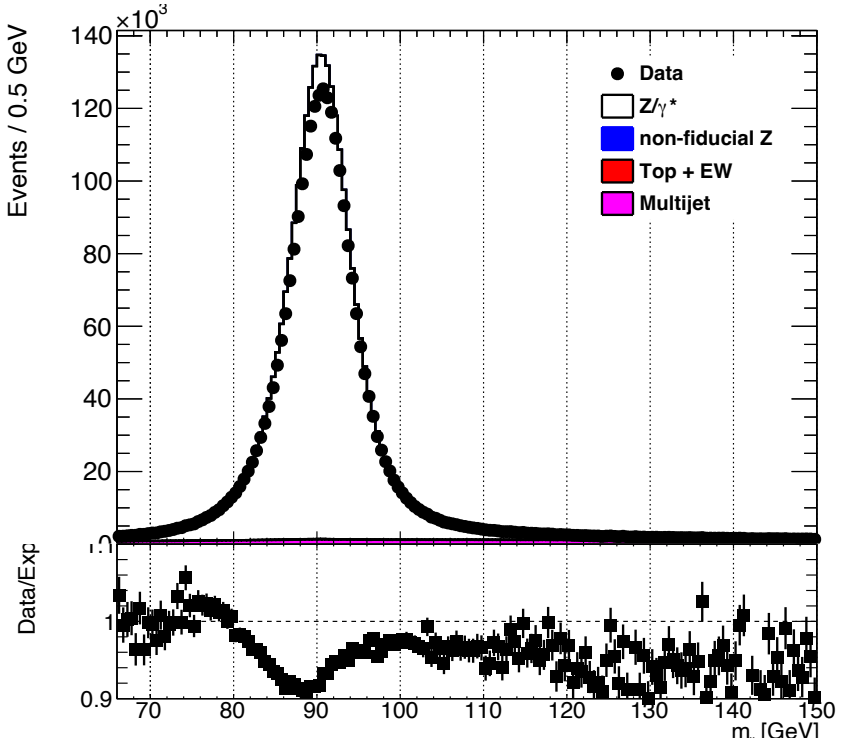
η

NPV: 18 – MC



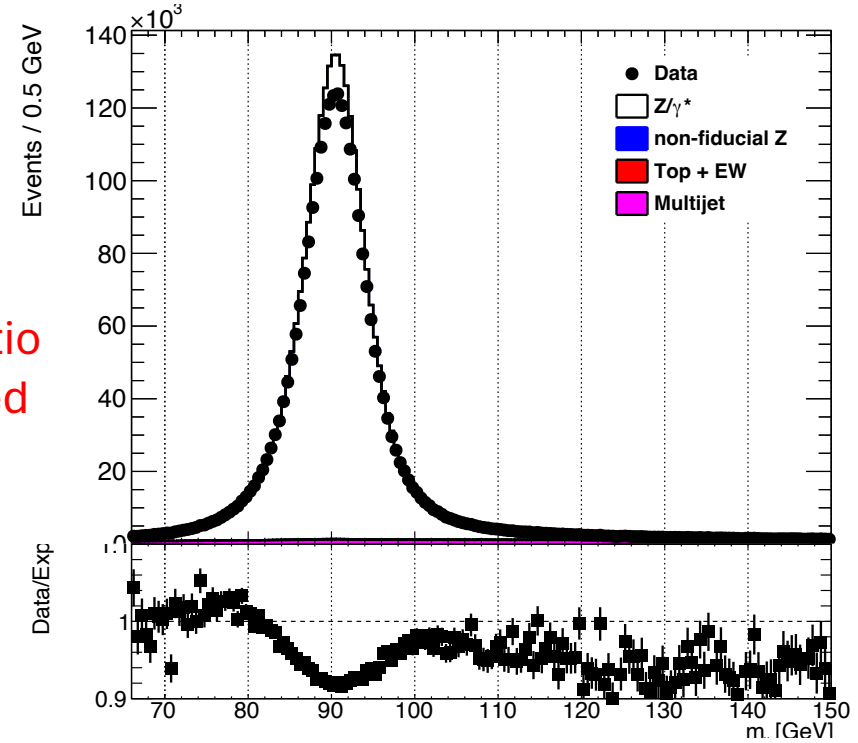


In Situ 15/16 - Inclusive



Last iteration of primary calibration

(Almost) all plots have ratio range changed to 0.9 – 1.1

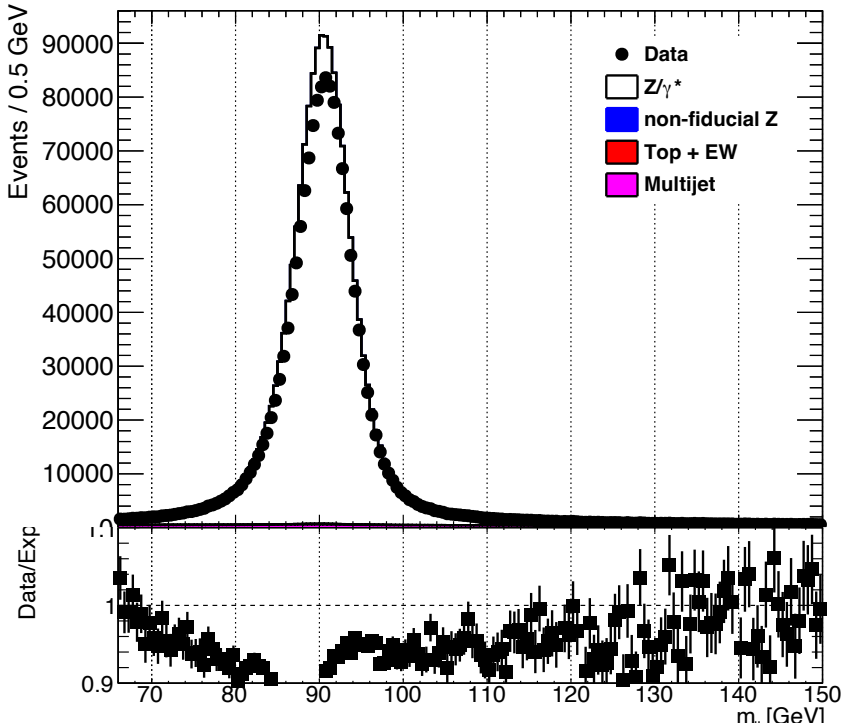


One round of variance correction

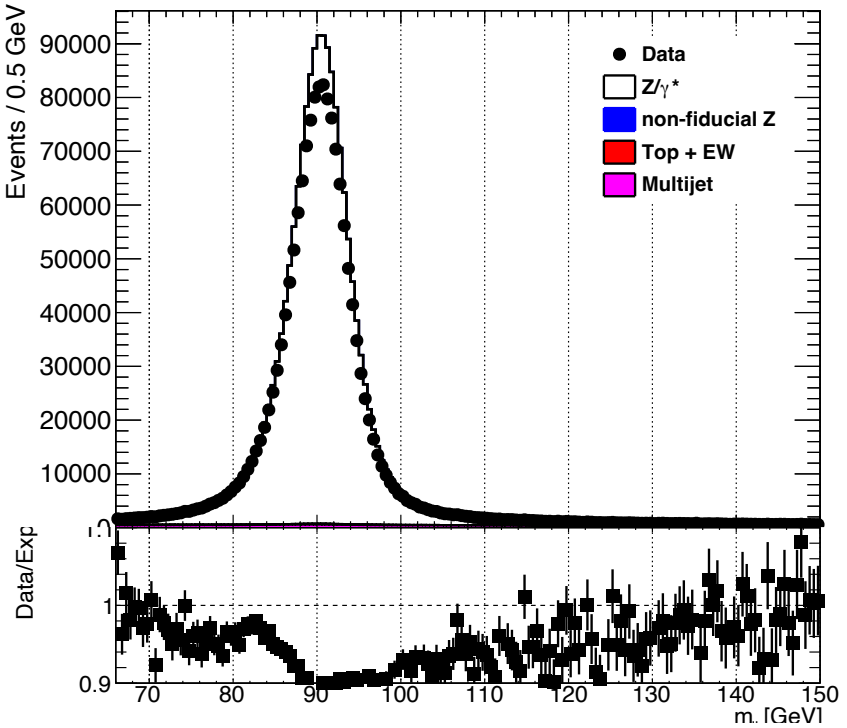
- Performing the variance correction does move some MC events to the tails but not enough to significantly improve the data/MC agreement under the pole

- Second round of the variance correction resulted in oversmearing ⇒ don't apply this correction!

In Situ 15/16 - EMEC



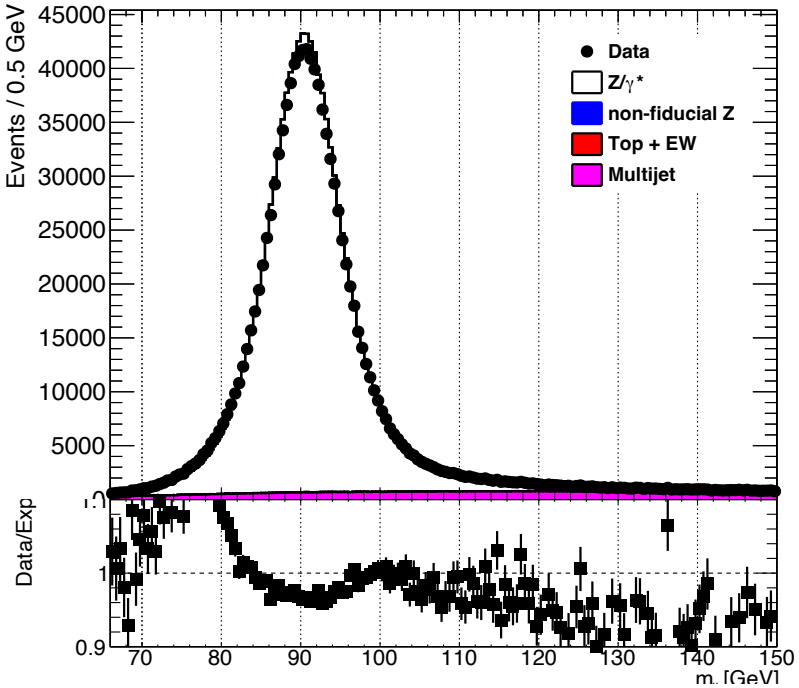
Last iteration of primary calibration



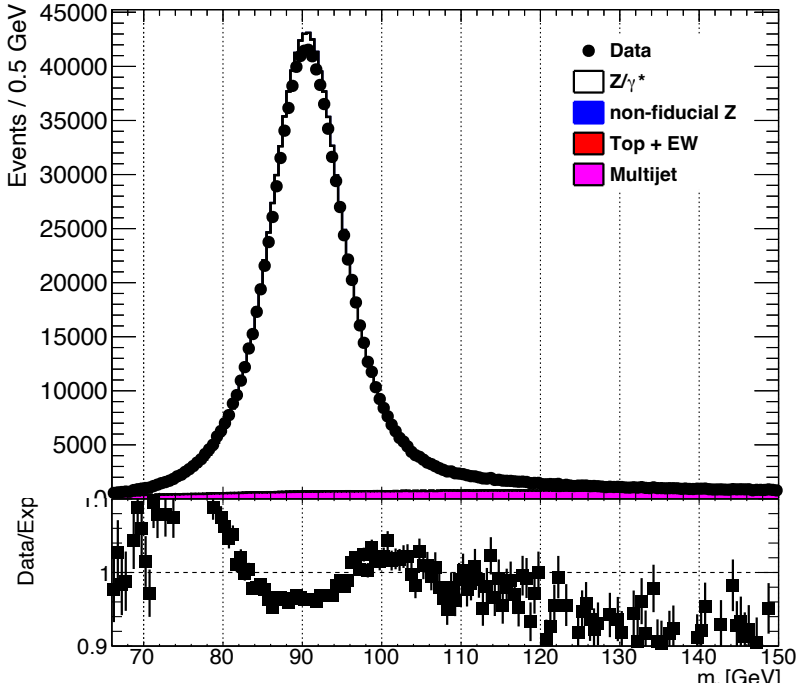
One round of variance correction

- Non-optimal data/MC agreement is clearly driven by the performance in the EMEC (worse than 0.9 data/MC in pole region!)
- Variance correction smooths this out a bit but doesn't improve performance significantly

In Situ 15/16 - FCal



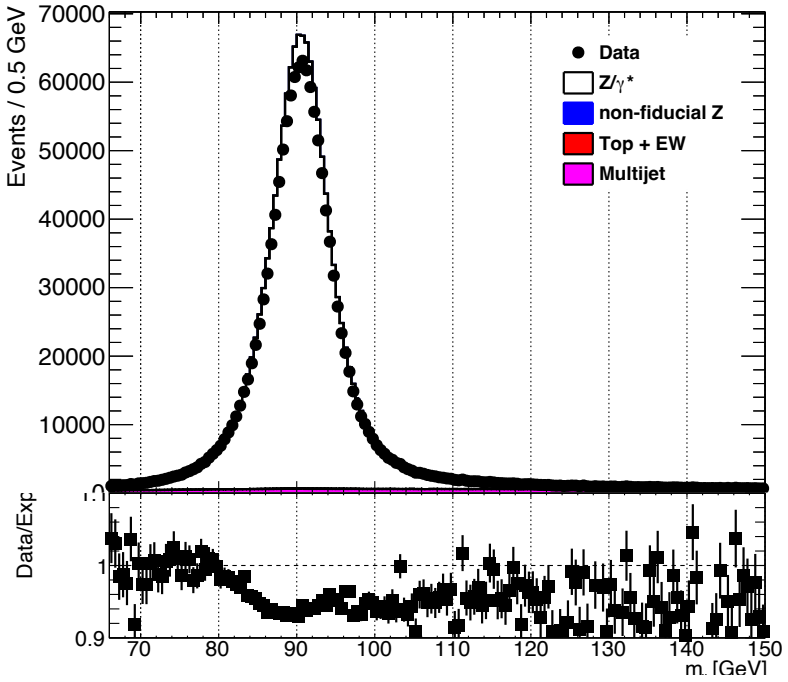
Last iteration of primary calibration



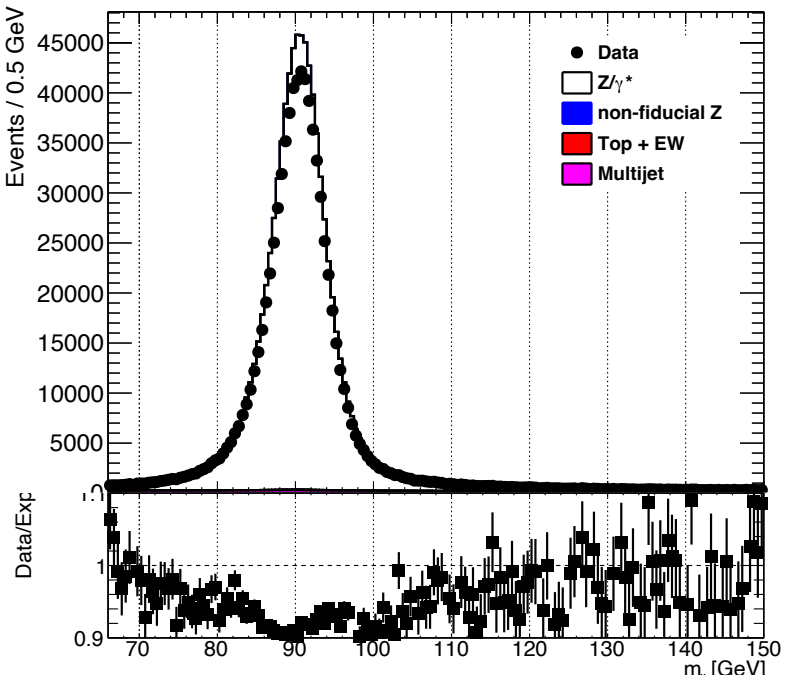
One round of variance correction

- FCal actually looks quite good!
- Good agreement in the signal region and upper tail (could be improved by rerunning MJ estimate)
- Agreement in the lower tail is worse but this has been observed previously
- Again VC is not necessary.

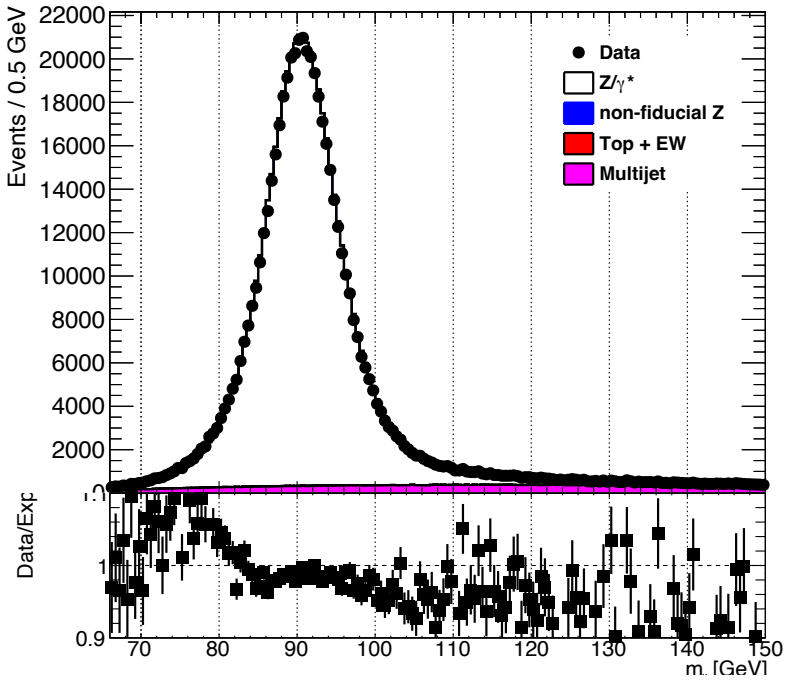
In Situ 15/16 – Primary Calibration Negative Eta



Inclusive



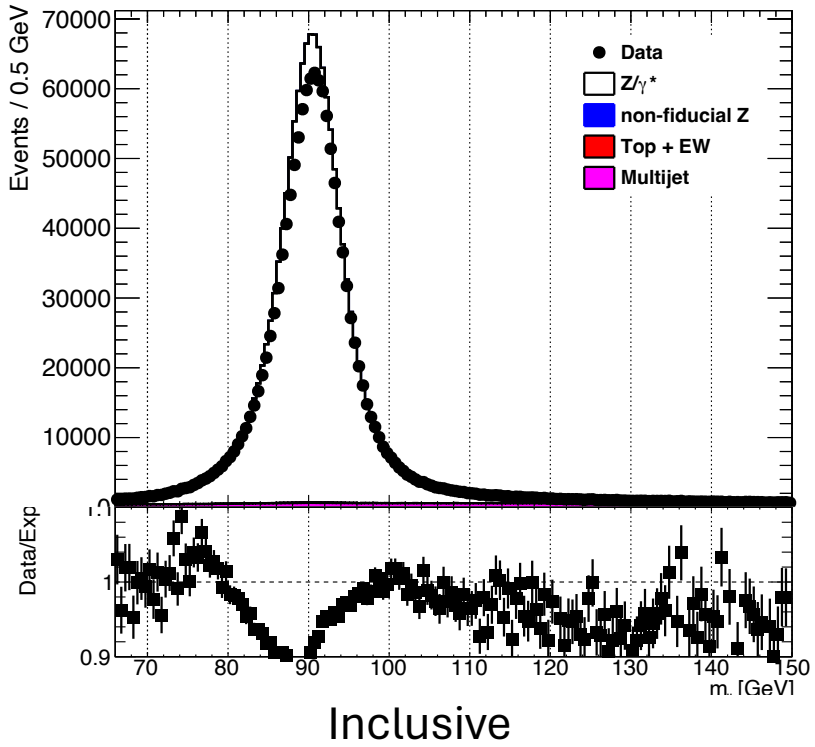
EMEC



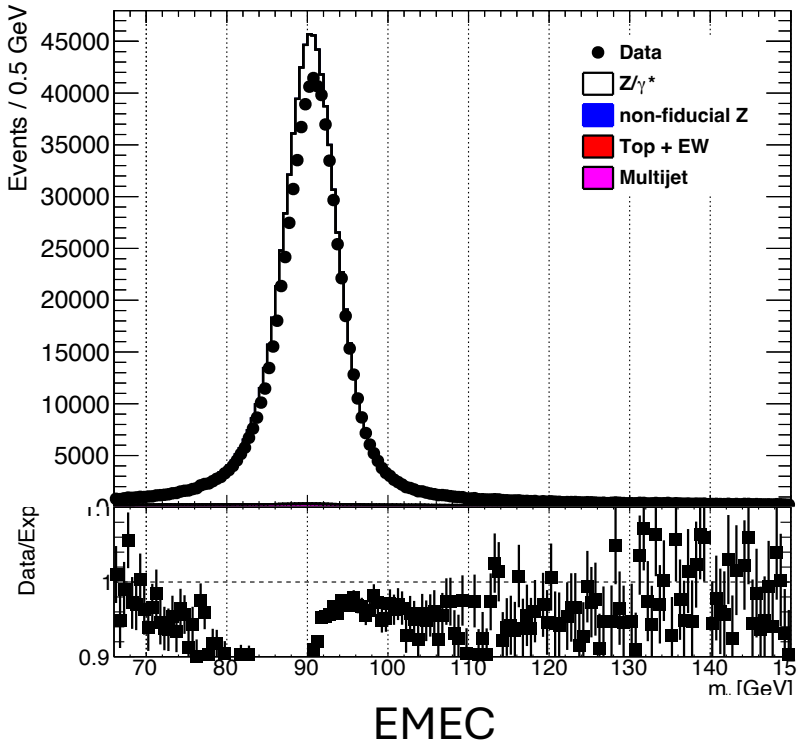
FCal

- Looking at positive/negative eta seems to tell a (slightly) different story.
- Shape of the data/MC agreement looks good both inclusively and for both calorimeters
- Agreement in the EMEC is still suboptimal

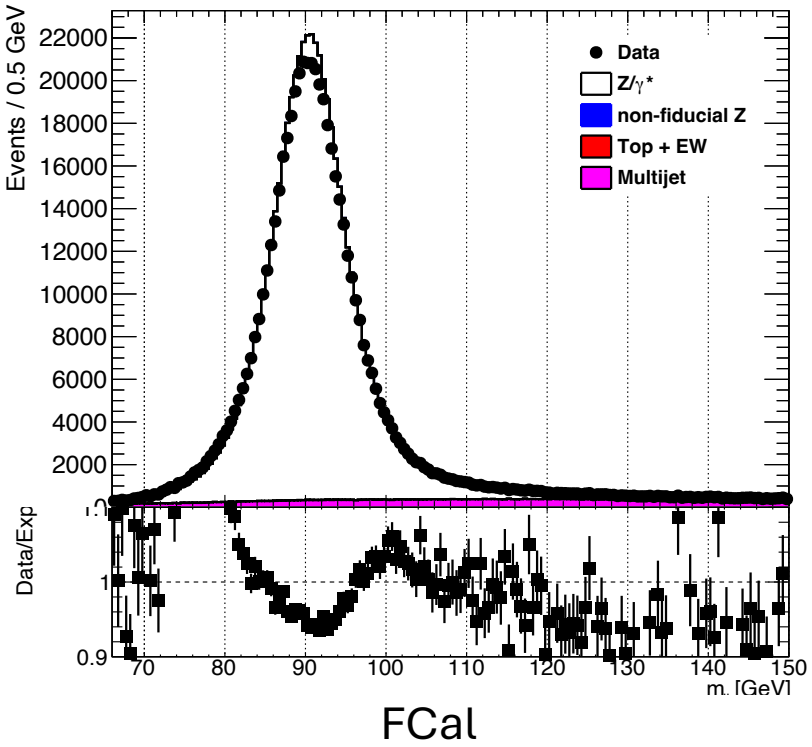
In Situ 15/16 – Primary Calibration Positive Eta



Inclusive



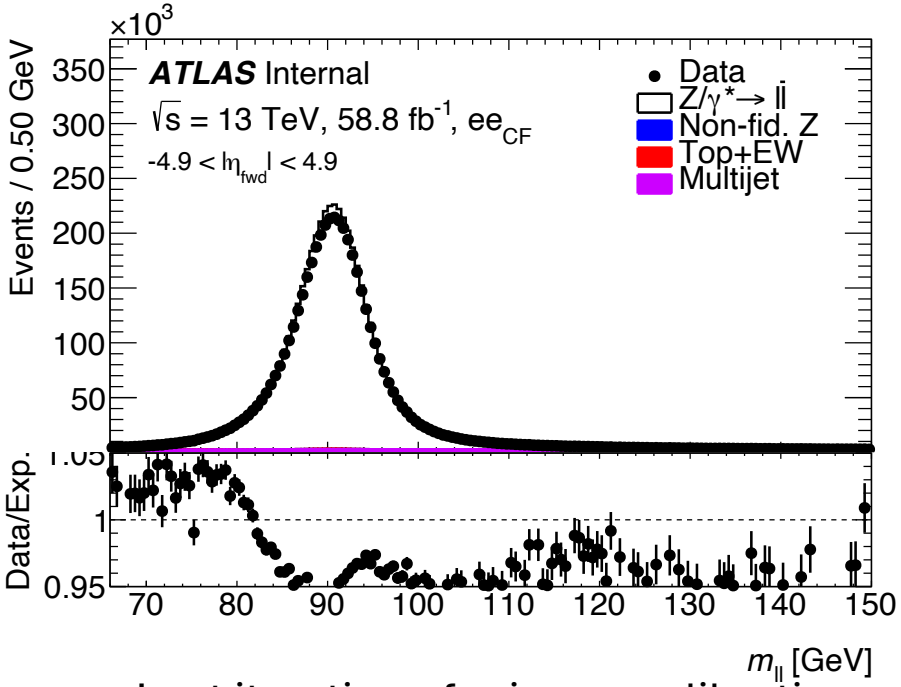
EMEC



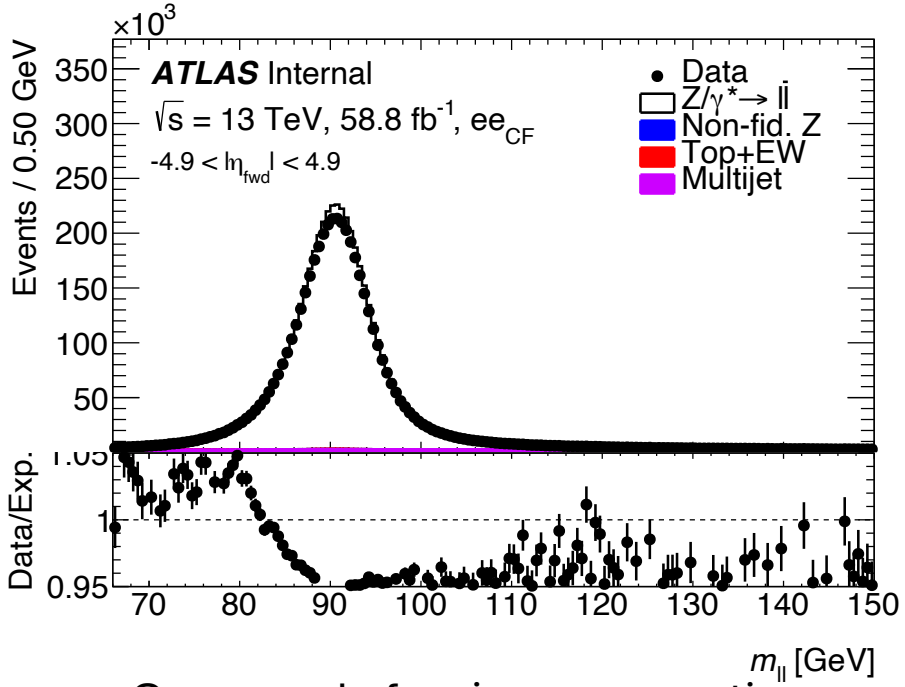
FCal

- Performance of positive eta is completely different to negative eta
- Some bug with the new binning implementation?
- Did I put a wrong binning mode in a config file?

In Situ -18 Inclusive



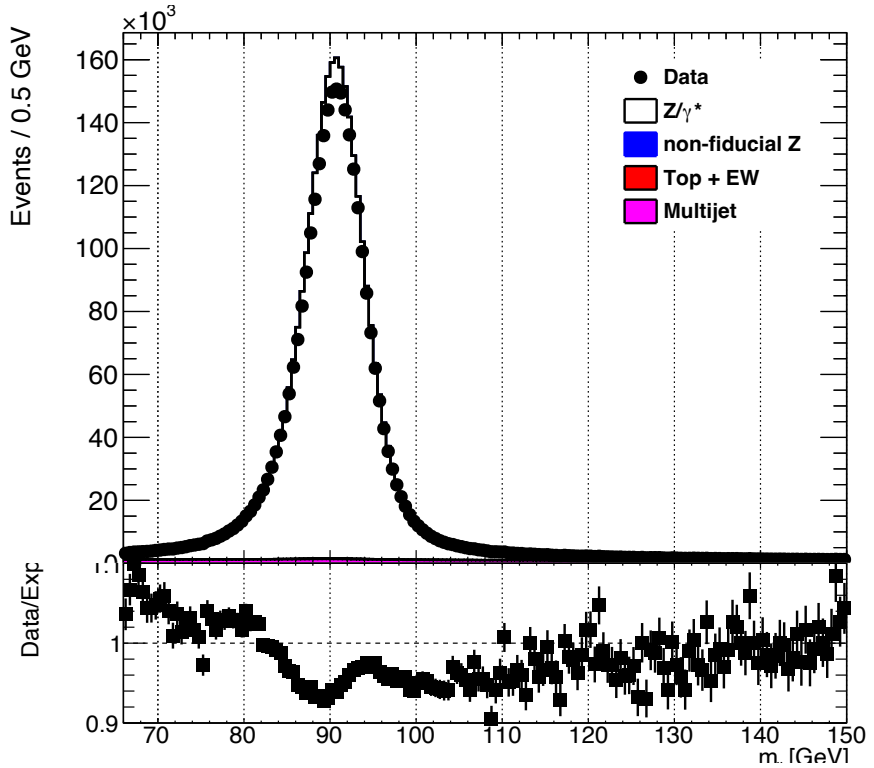
Last iteration of primary calibration



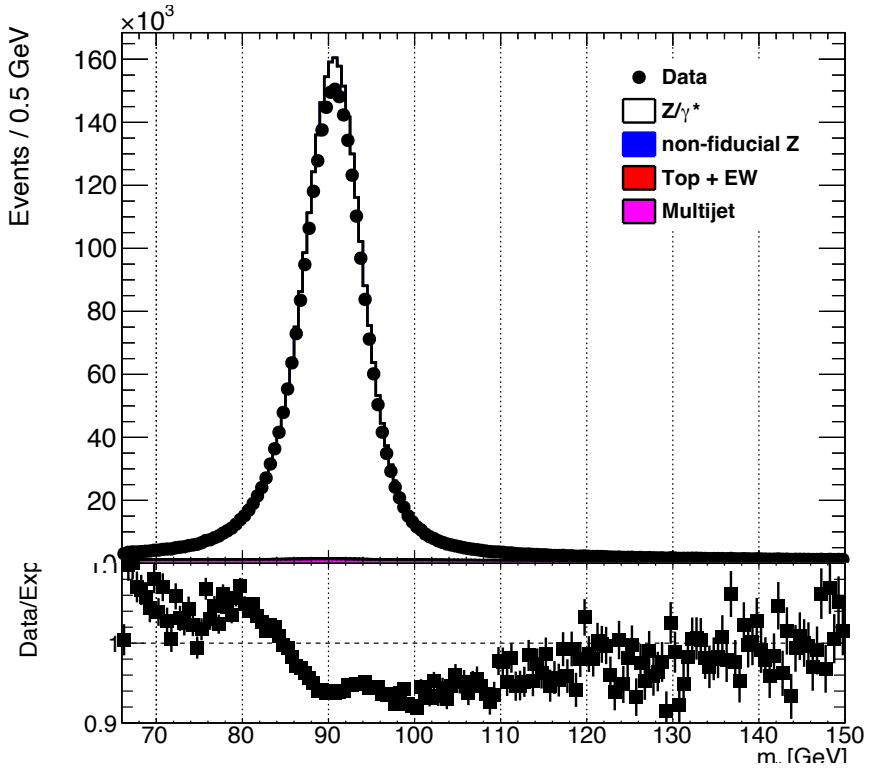
One round of variance correction

- For 2018, similar behaviour to 2015/16 is observed but the data/MC agreement is improved
- Again, the variance correction flattens out the data/MC agreement but does little to improve the value of the agreement.

In Situ 18 - EMEC



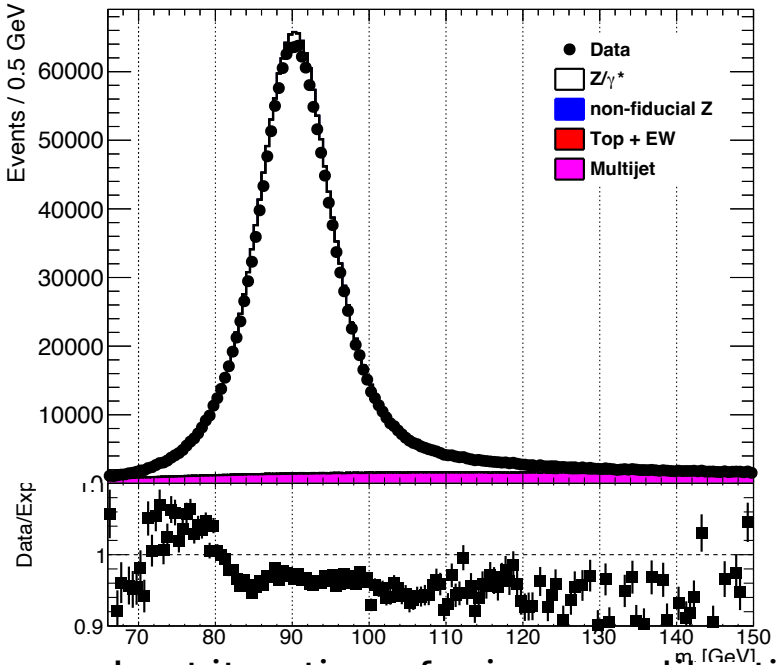
Last iteration of primary calibration



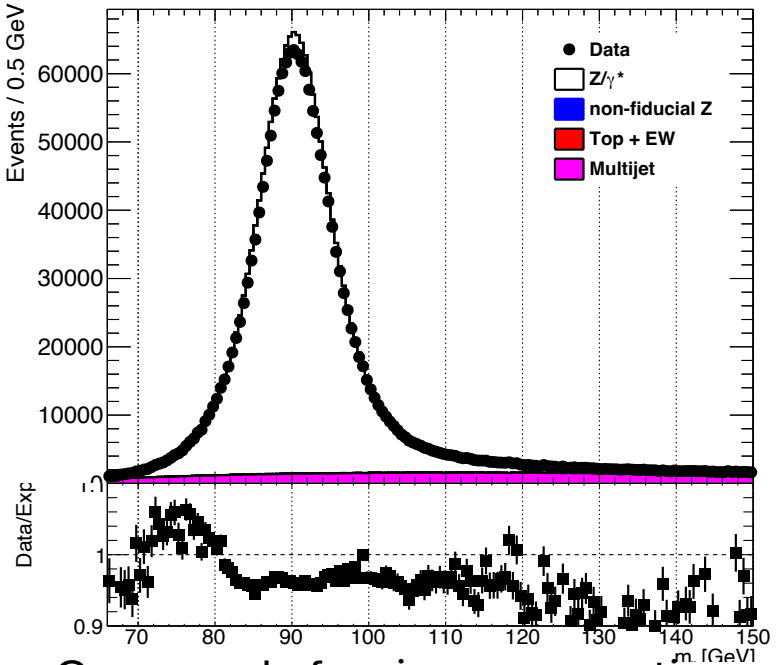
One round of variance correction

- Similar behaviour to 15/16 is observed, with the EMEC having a worse data/MC than the FCal
- Variance correction is again not helpful here

In Situ 18 - FCal

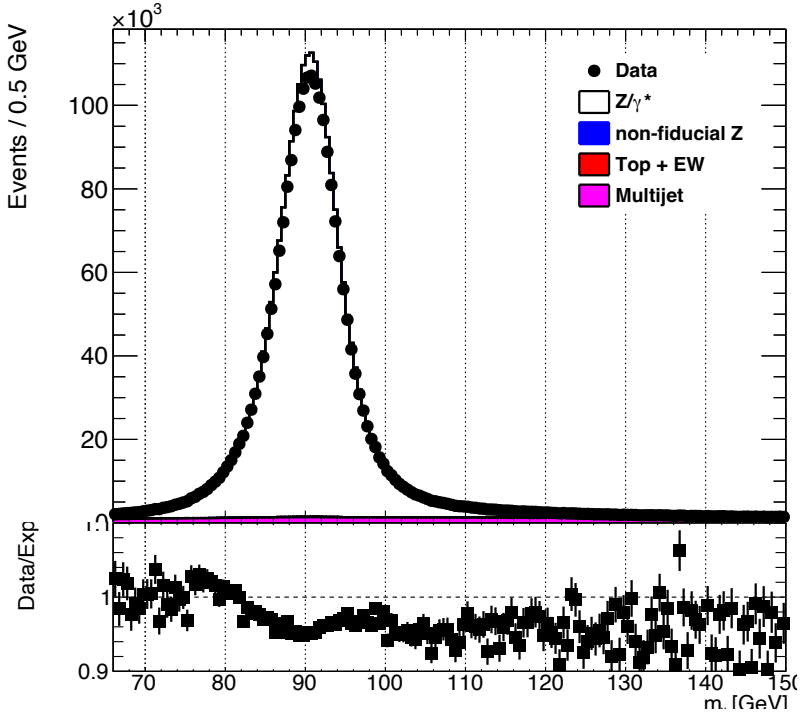


Last iteration of primary calibration

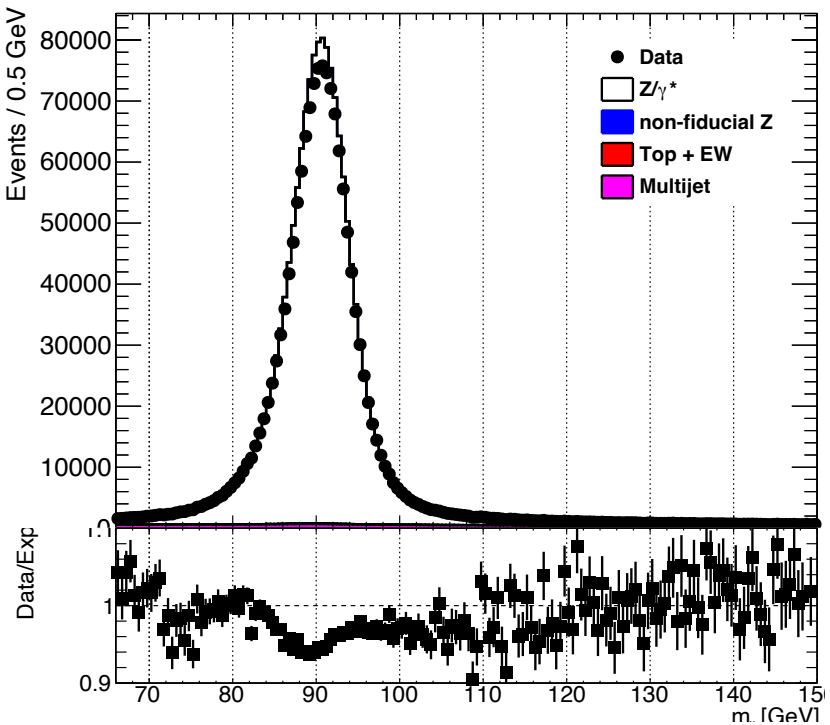


One round of variance correction

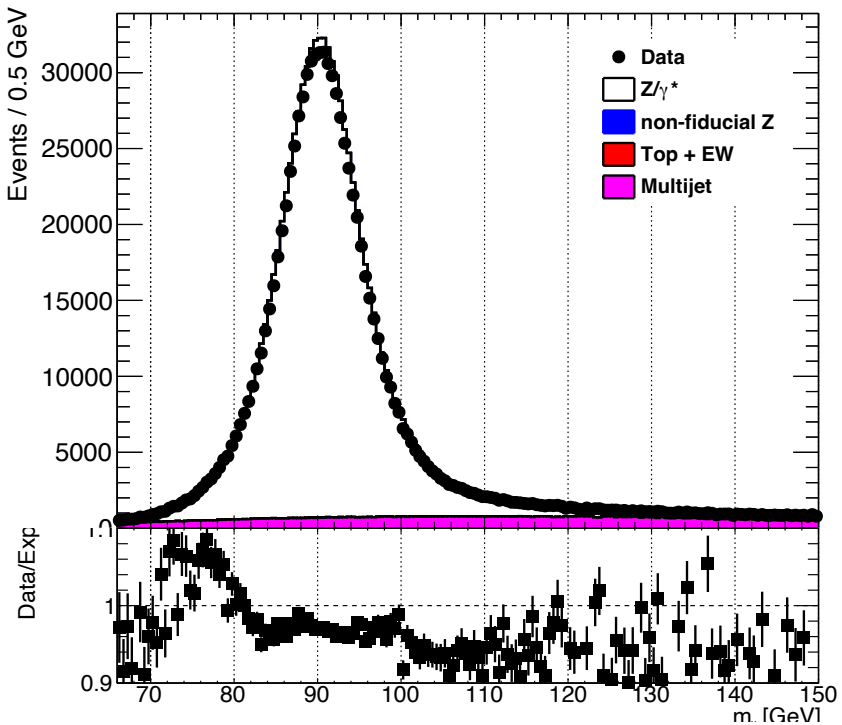
In Situ 18 – Negative Eta



Inclusive

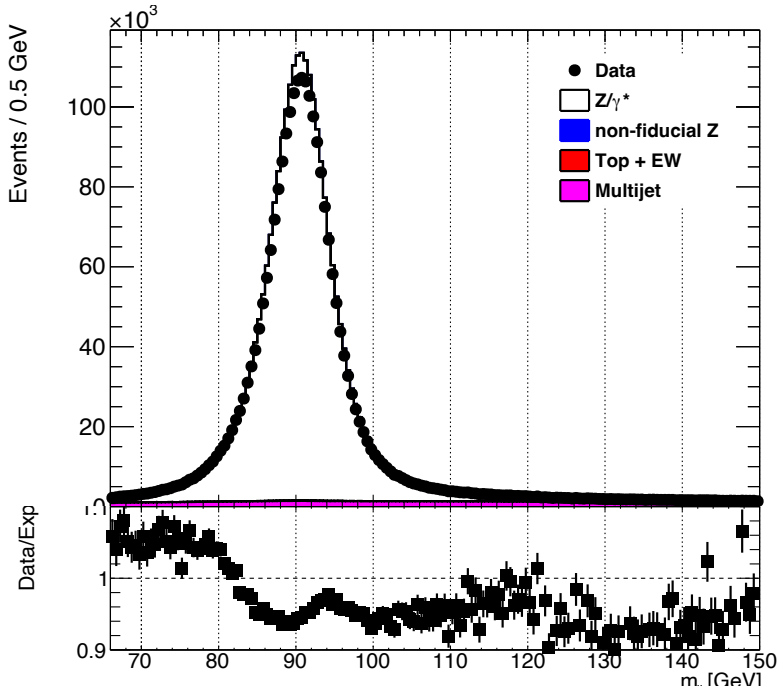


EMEC

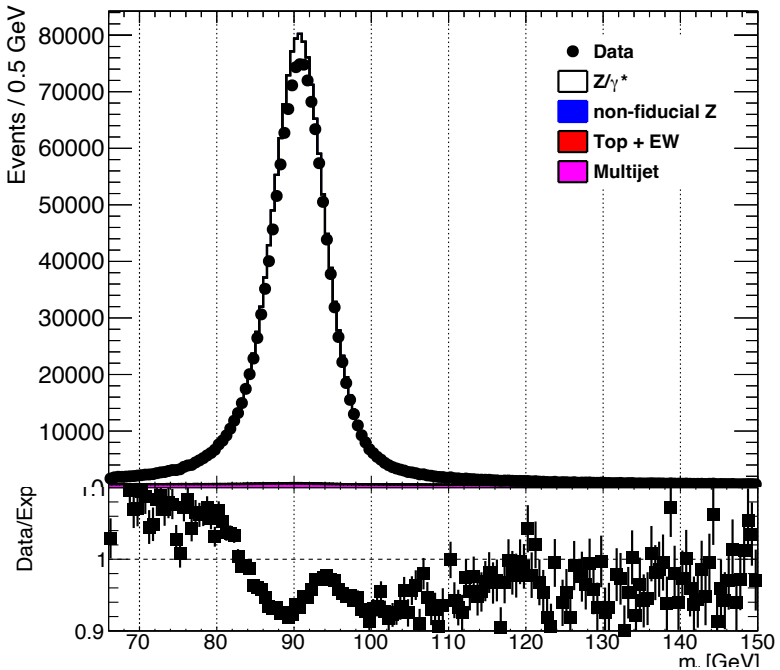


FCal

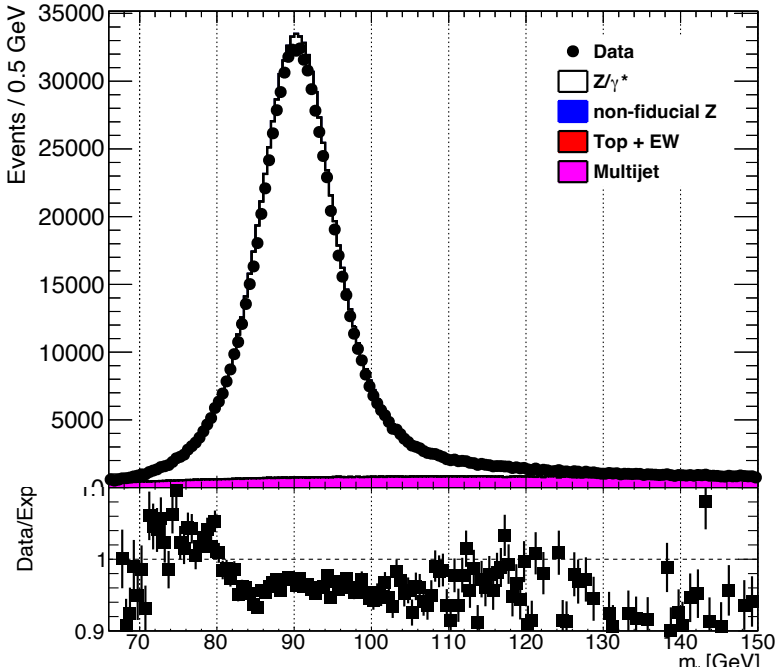
In Situ 18 – Positive Eta



Inclusive



EMEC



FCal

Analysis Plans

CC channel

- Fix ID efficiency systematic issue
- Perform compatibility studies with the muon channel

CF channel

- Finalise calibration versions to be used
- New ntuple production (latest version of fine binning SFs)
- Perform an Asimov study on the extraction of $\sin^2 \theta_W$ in this channel (hopefully better than CMS!)

All analysis ntuples can be found on the naf, explicit locations are here. This will be updated once we have the new CF ntuples