

ELECTROWEAK MIXING AT CMS TODAY AND AFTER PHASE 2 UPGRADE

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- Conclusion

Introduction

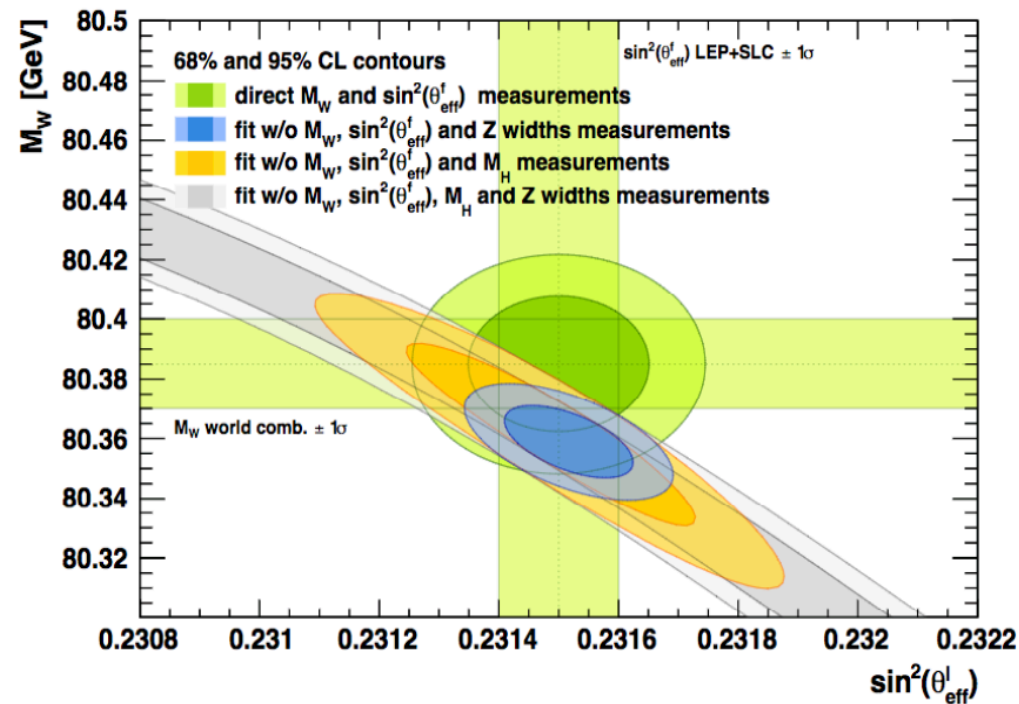
- Drell-Yan dilepton events feature unique combination of large production cross section and clean (\sim background-free) experimental signature

- Precise (multi-) differential measurements provide powerful test for high-order QCD/EW calculations and constraints to PDFs in global fits

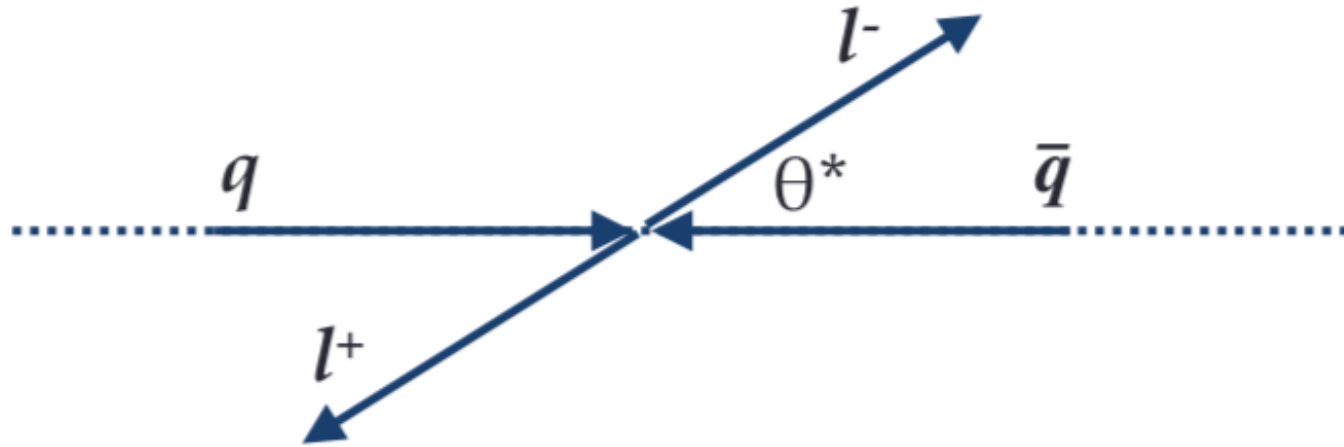
- Precise measurement of key EW parameters: m_W and $\sin^2\theta_{\text{eff}}$

- Probe for new physics

contributions to radiative corrections: $\sin^2\theta_{\text{eff}} = (1 - m_W^2/m_Z^2) \text{K}_{\text{RAD}}$



Forward-Backward Asymmetry

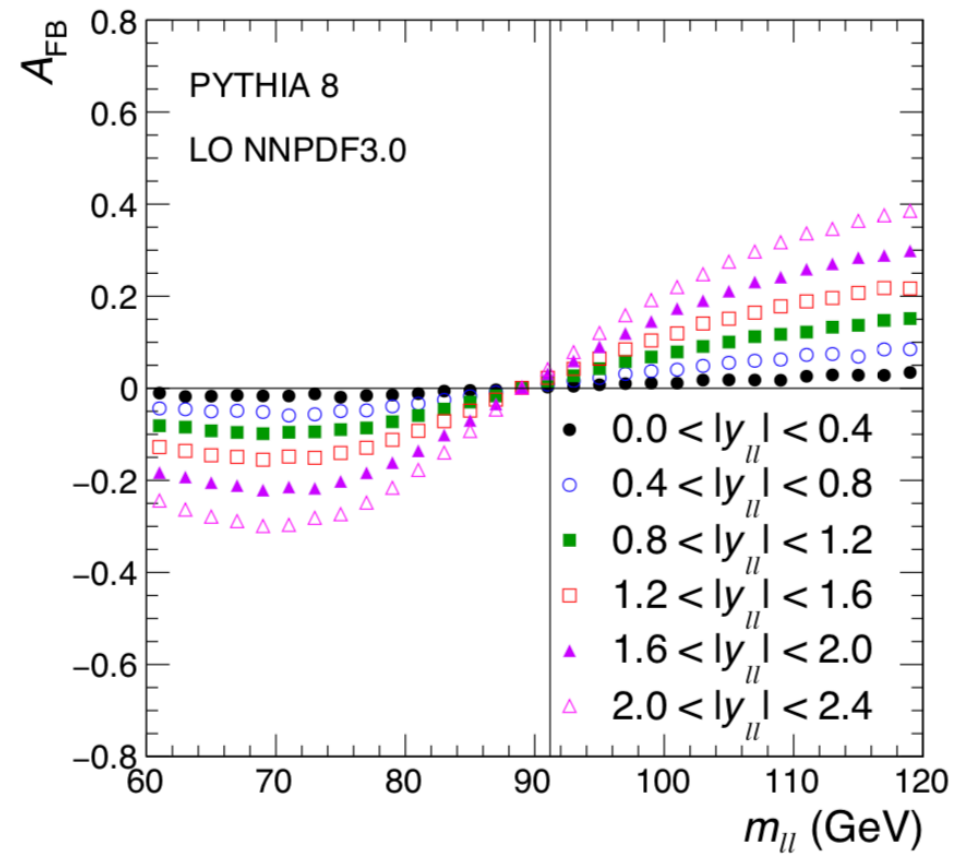
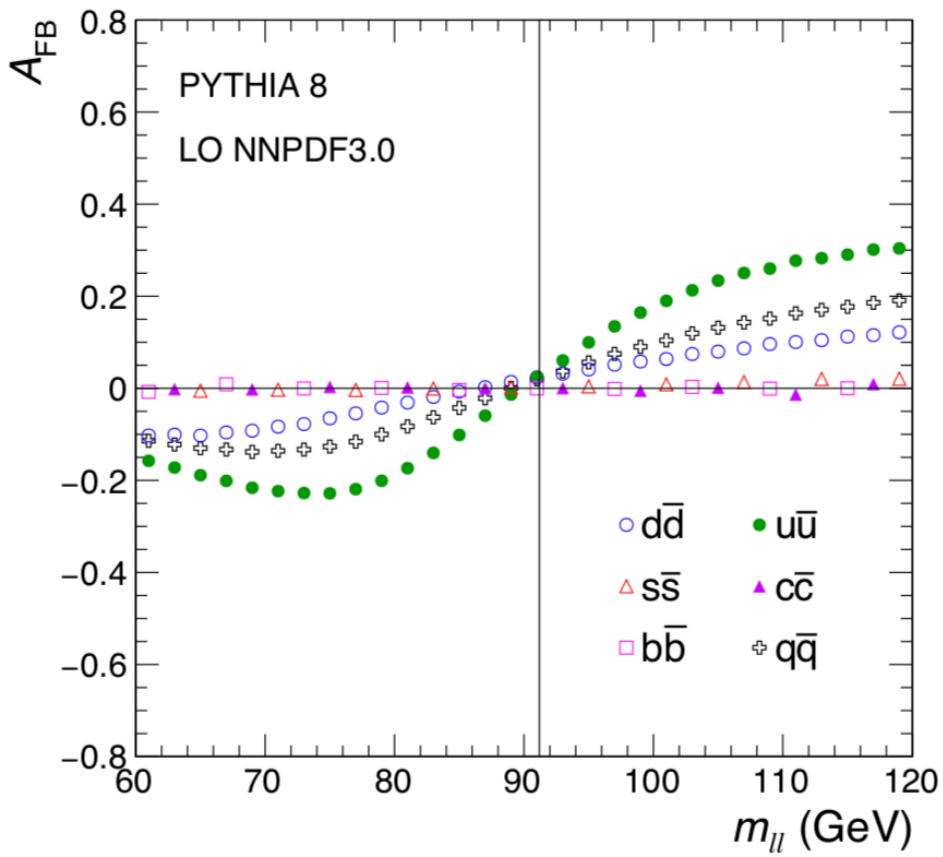


$$\frac{d\sigma}{d(\cos \theta^*)} \propto 1 + \cos^2 \theta^* + A_4 \cos \theta^*$$

$$A_{\text{FB}} = \frac{3}{8} A_4 = \frac{\sigma_{\text{F}} - \sigma_{\text{B}}}{\sigma_{\text{F}} + \sigma_{\text{B}}}$$

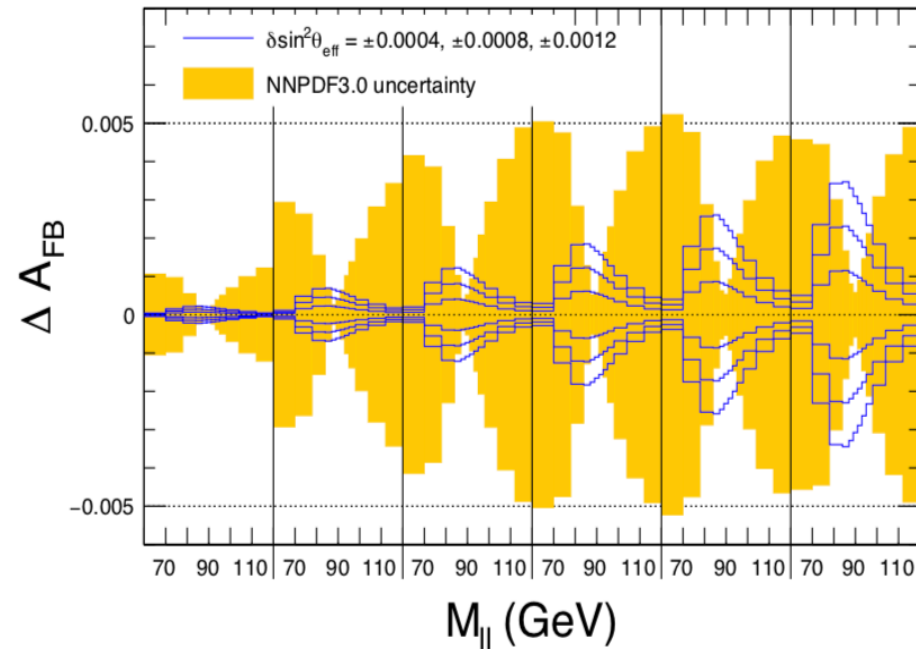
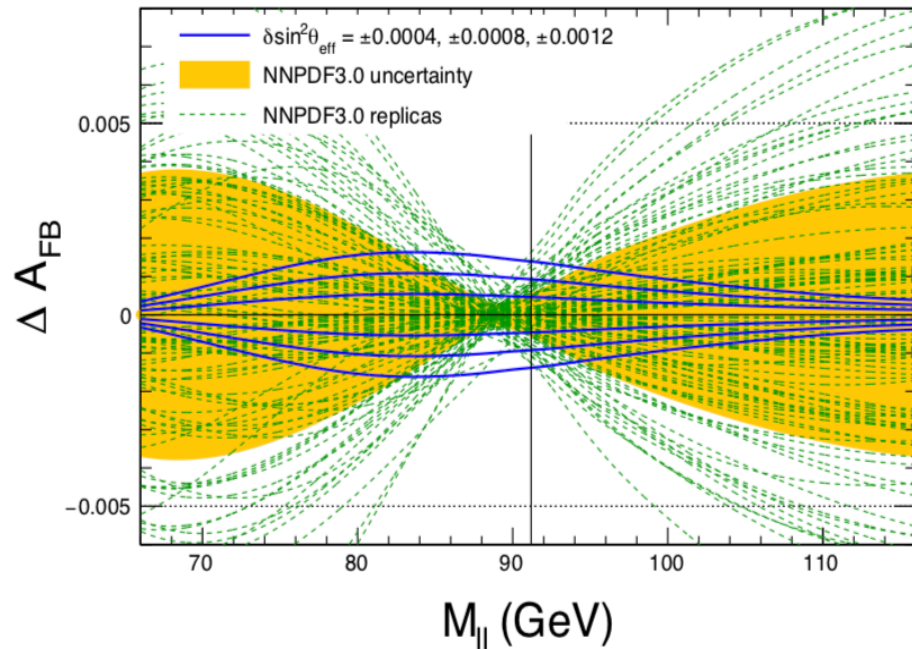
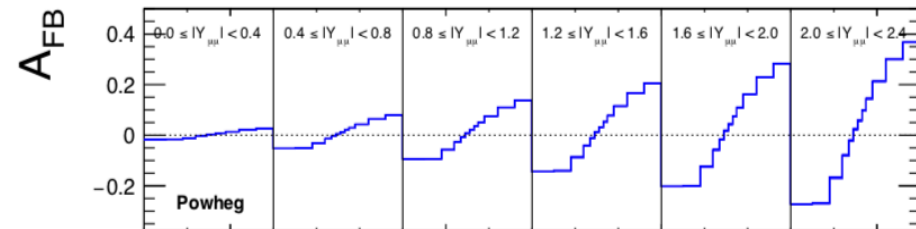
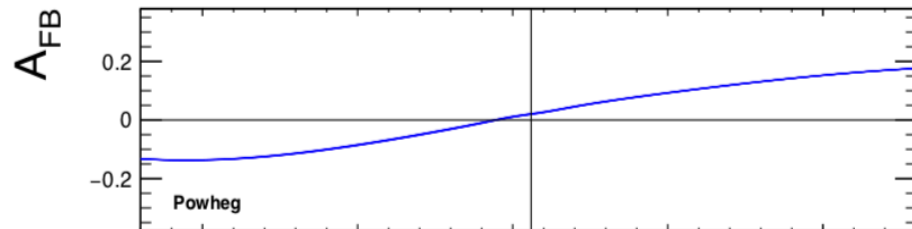
Forward-Backward Asymmetry

SM Predictions



PDF uncertainty

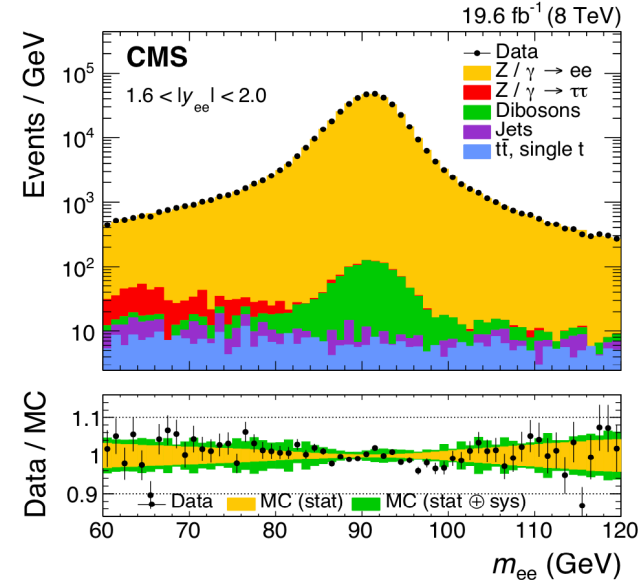
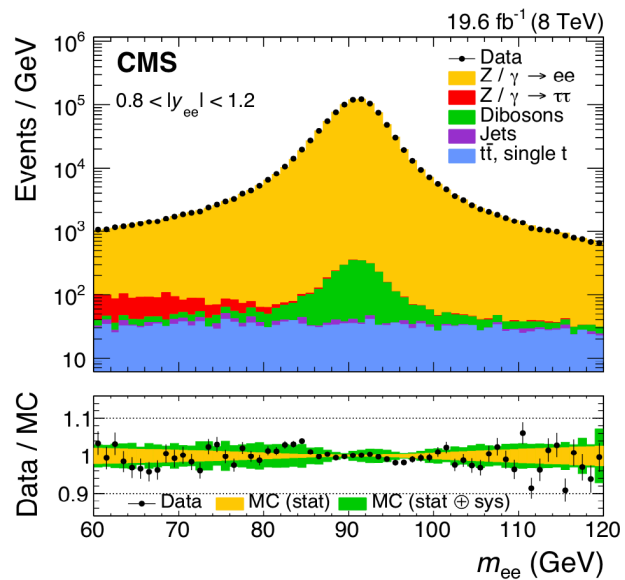
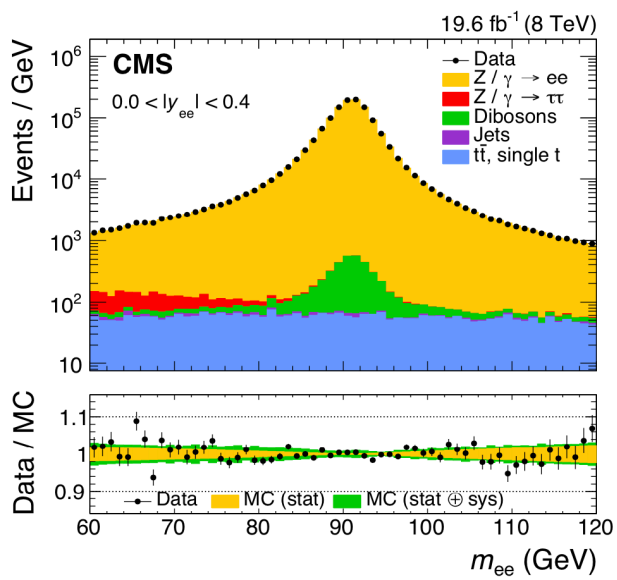
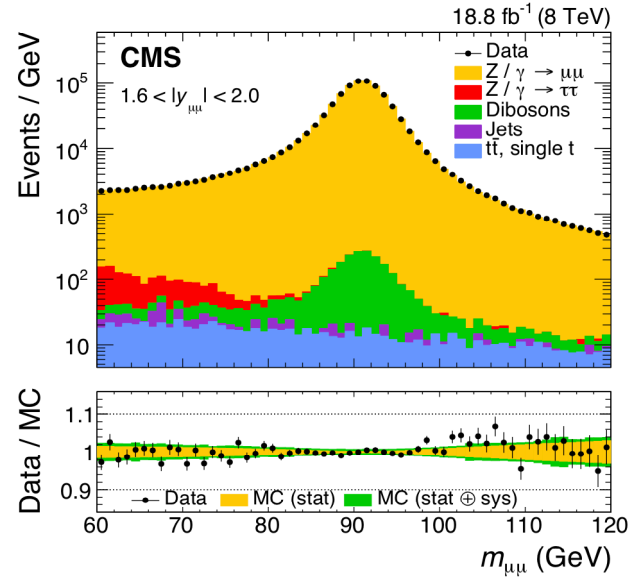
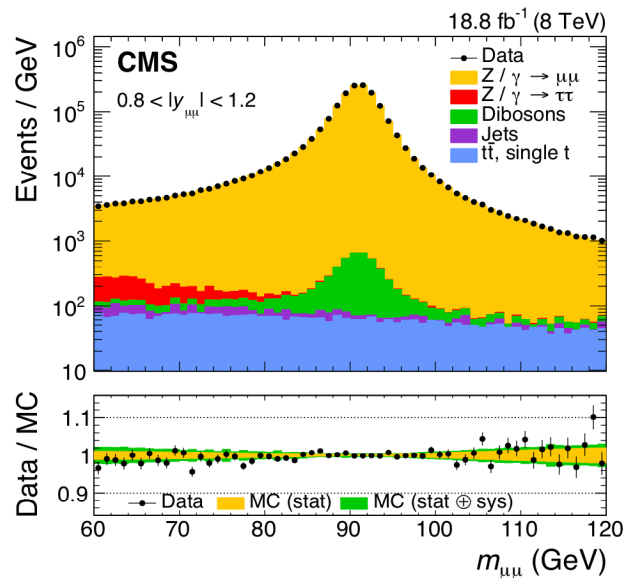
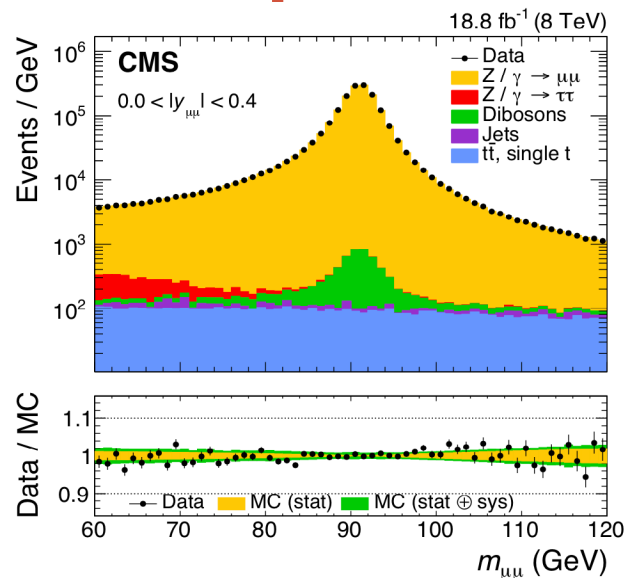
PDF unc. are small at ~ 90 GeV



Analisis Details

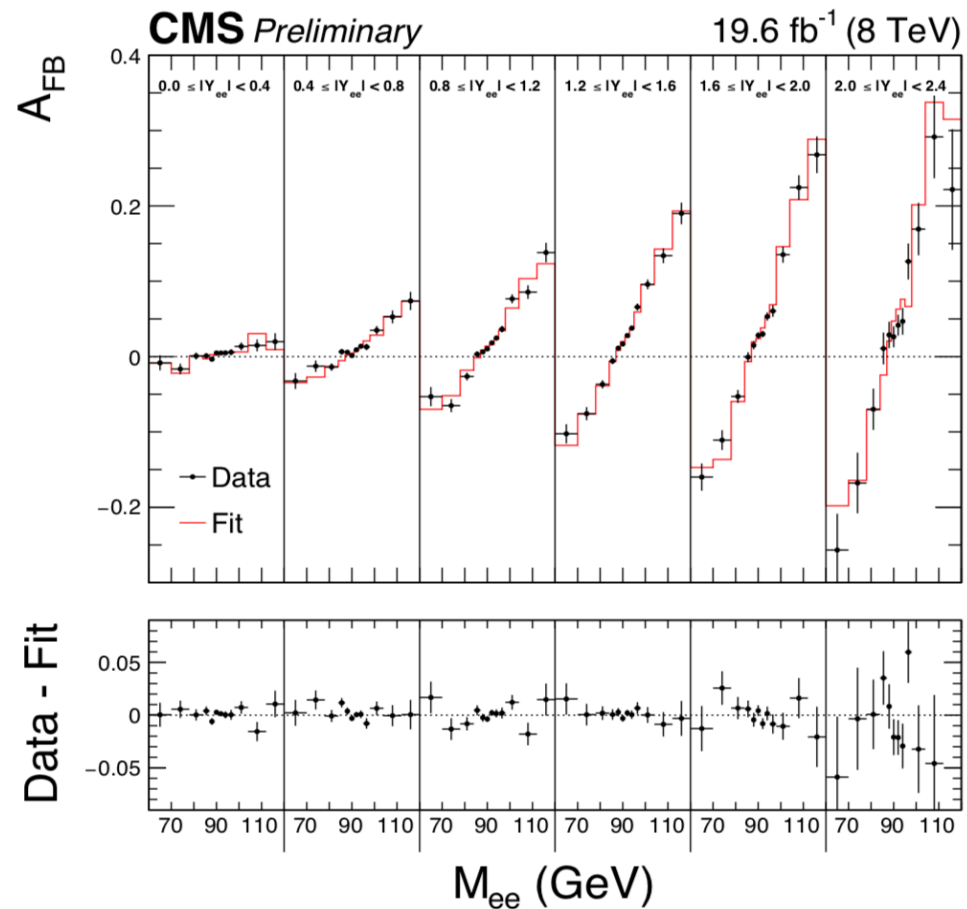
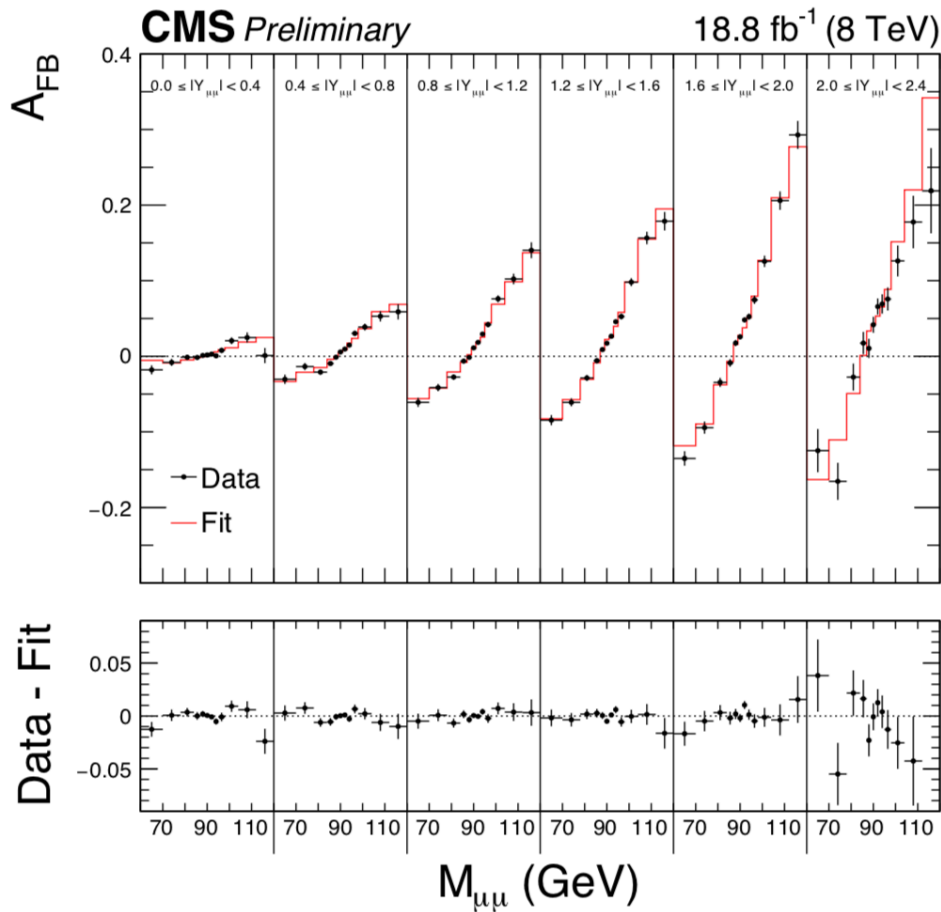
- 8 TeV CMS Paper: *Sirunyan, A.M., Tumasyan, A., Adam, W. et al. Eur. Phys. J. C (2018) 78: 701.*
<https://doi.org/10.1140/epjc/s10052-018-6148-7>
- Cadi 8 TeV:
<http://cms.cern.ch/iCMS/analysisadmin/cadilines?line=SMP-16-007>
- Cadi Phase 2:
<http://cms.cern.ch/iCMS/analysisadmin/cadilines?line=FTR-17-001>

Z peak for 8TeV Data



Forward-Backward Asymmetry

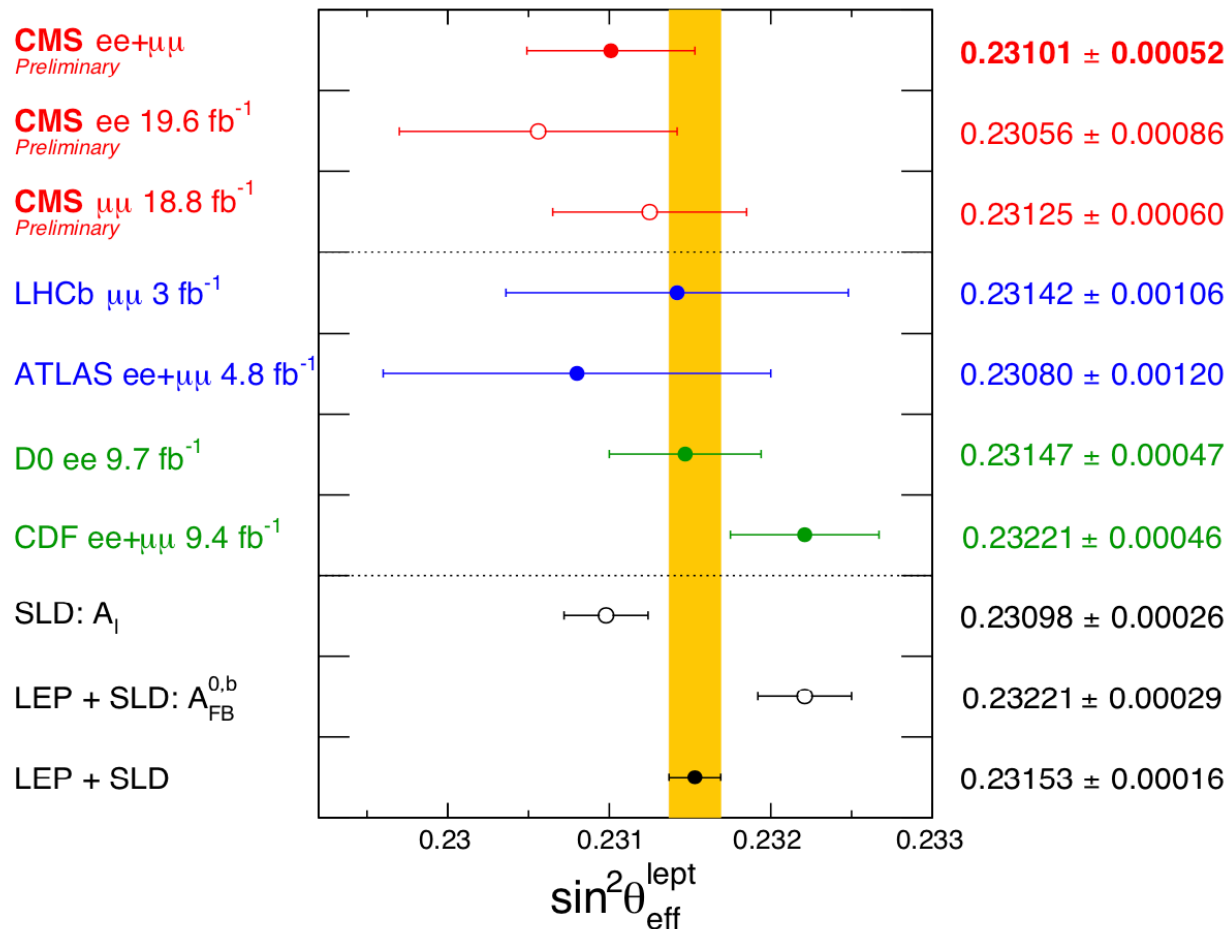
A_{FB} in 6 dilepton rapidities x 12 mass measurement bins



Result for 8 Tev Data

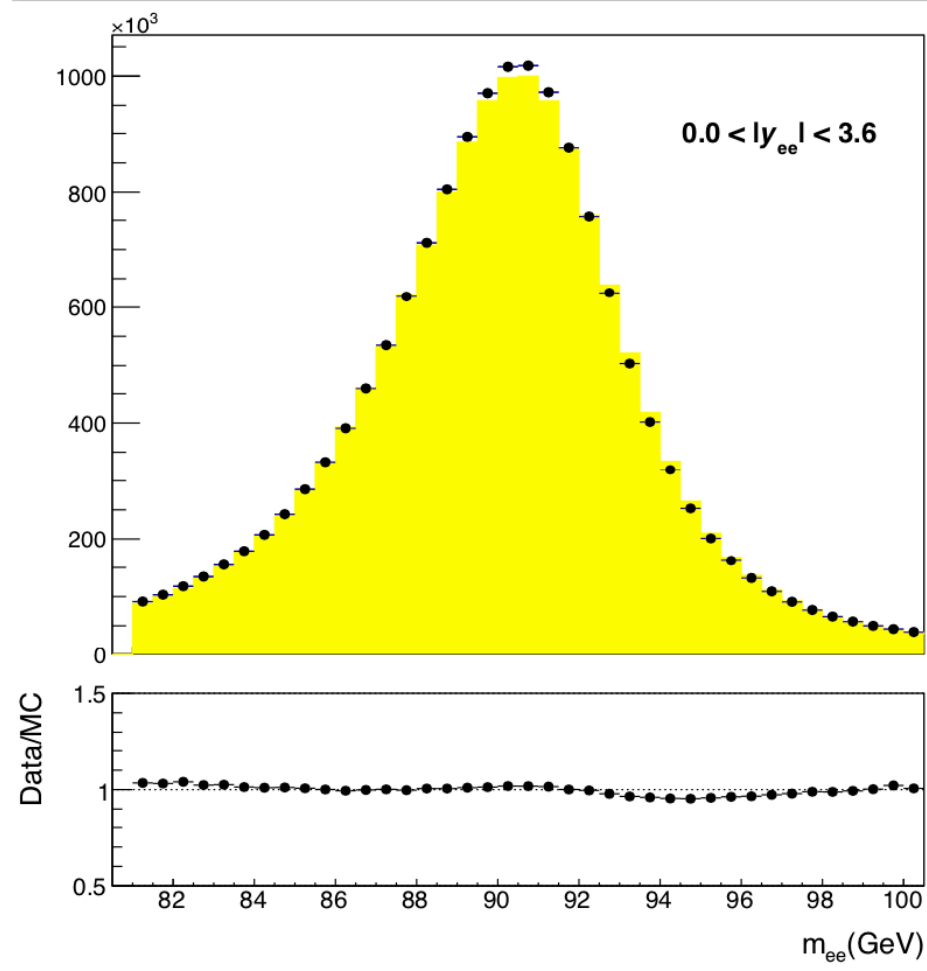
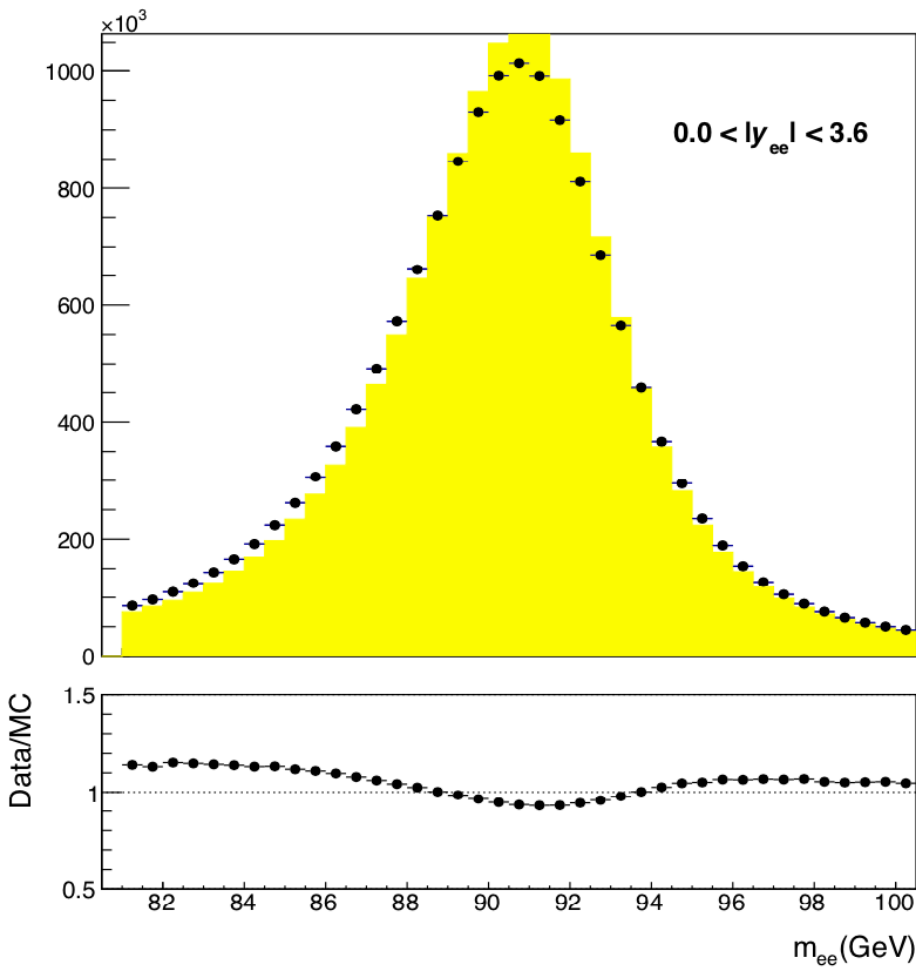
$$\sin^2 \theta_{\text{eff}}^{\text{lept}} = 0.23101 \pm 0.00036(\text{stat}) \pm 0.00018(\text{syst}) \pm 0.00016(\text{theory}) \pm 0.00030(\text{pdf})$$

$$\sin^2 \theta_{\text{eff}}^{\text{lept}} = 0.23101 \pm 0.00052.$$



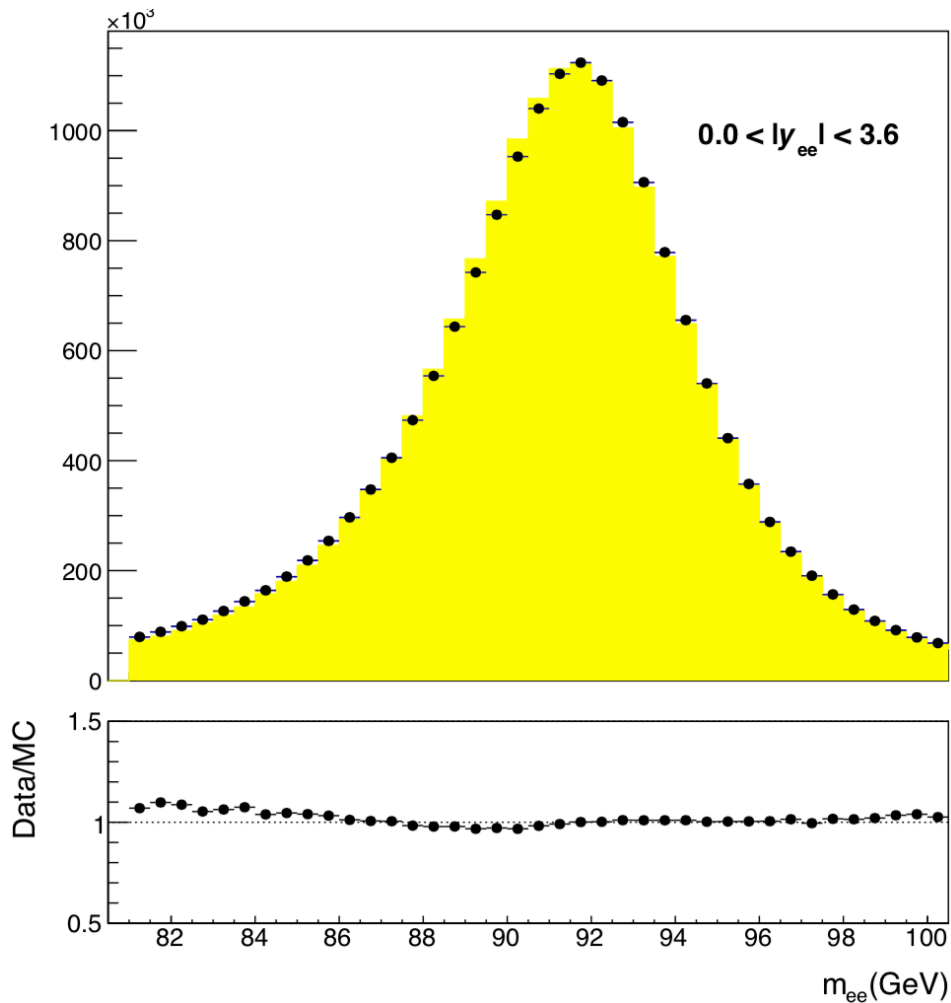
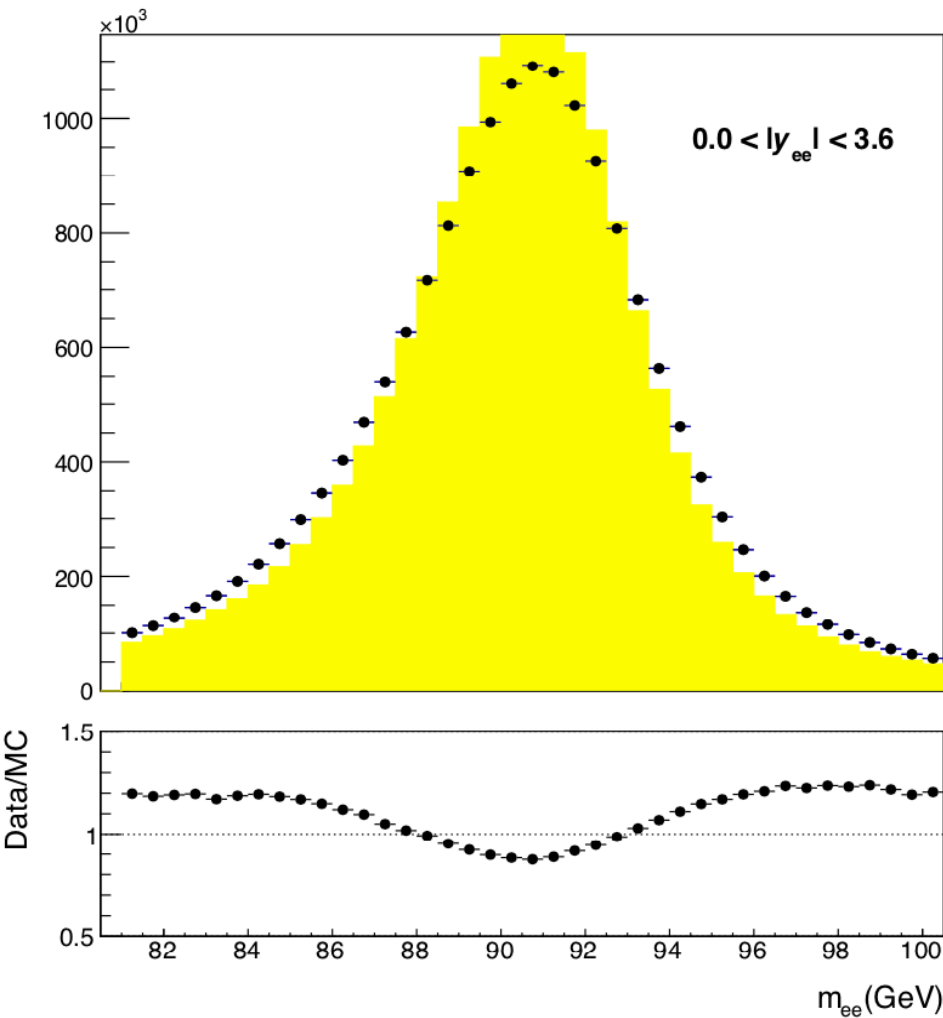
Z peak for 13TeV Data 2016

Electron Channel before and after corr.

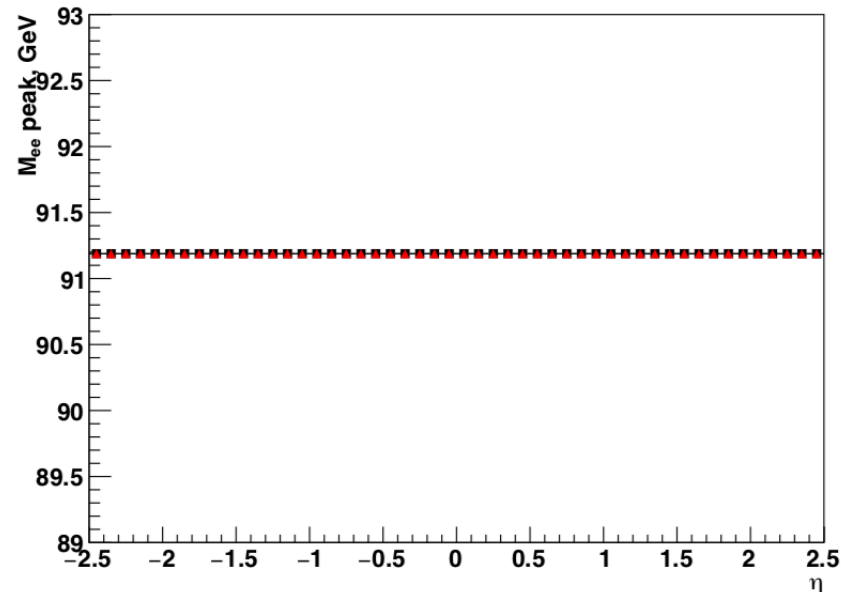
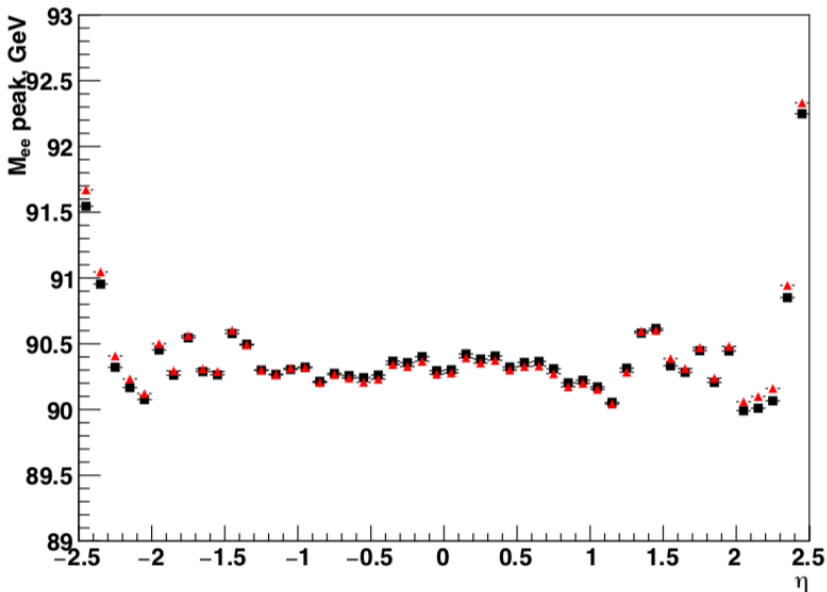
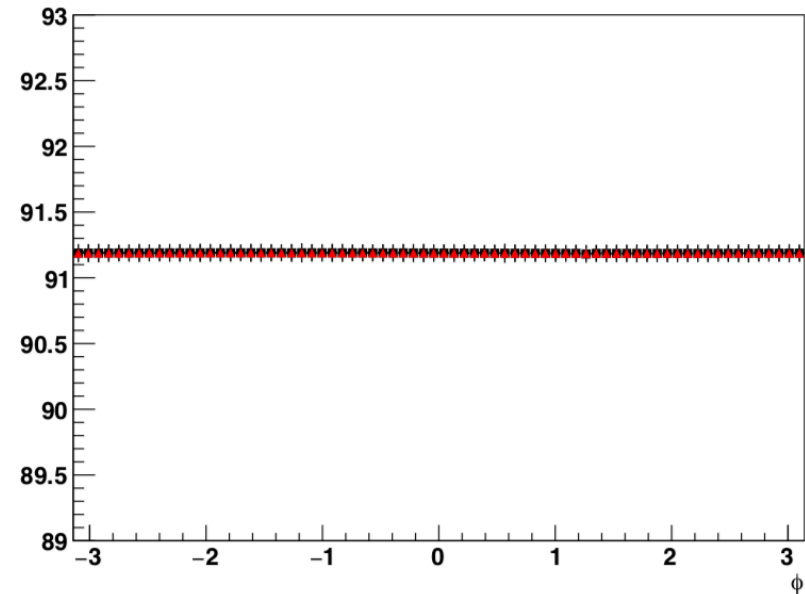
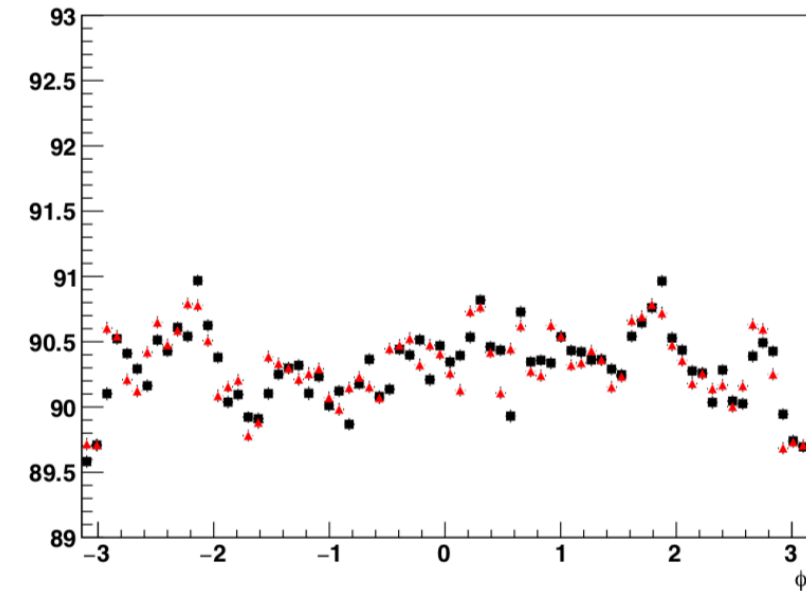


Z peak for 13TeV Data 2017

Electron Channel before and after corr.

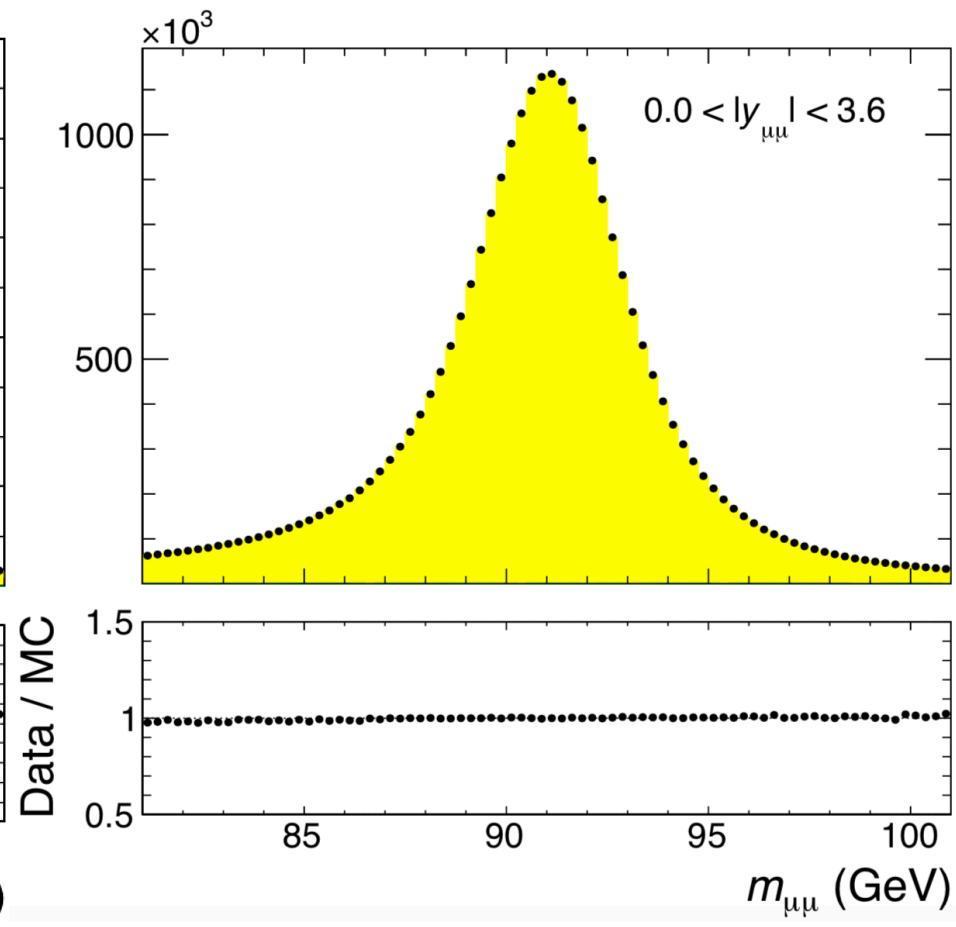
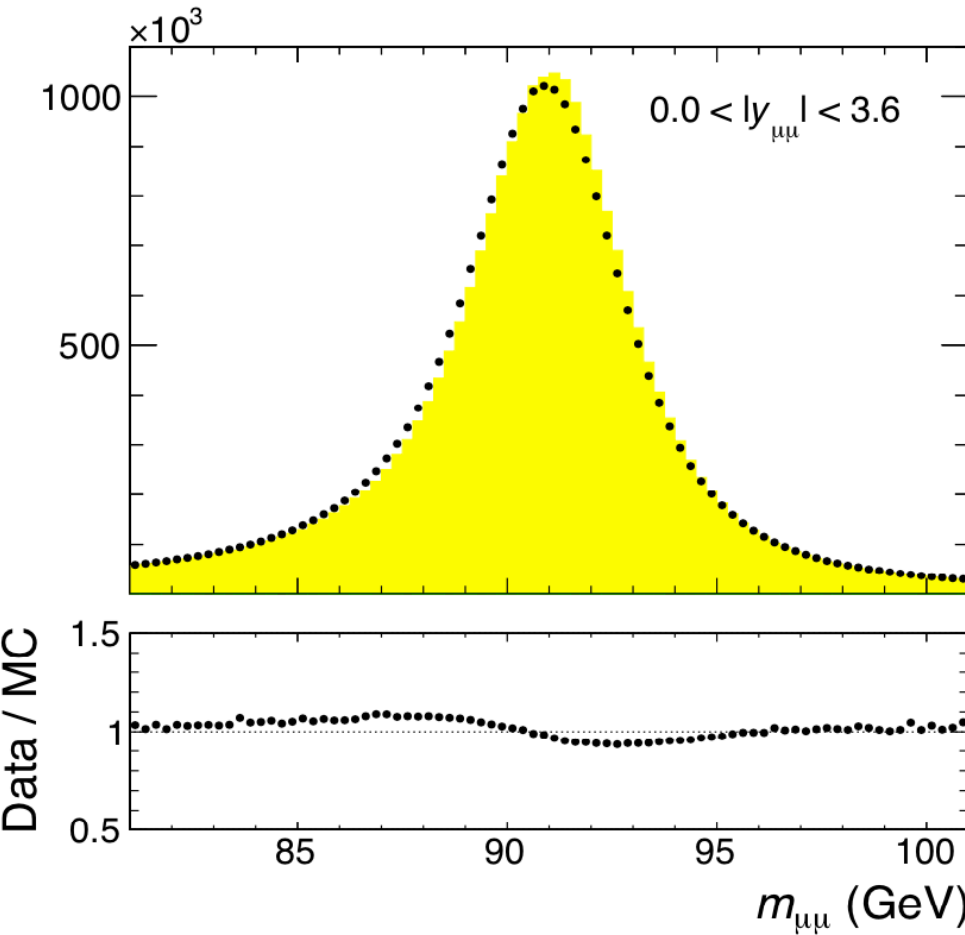


Z peak for 13TeV Data 2017



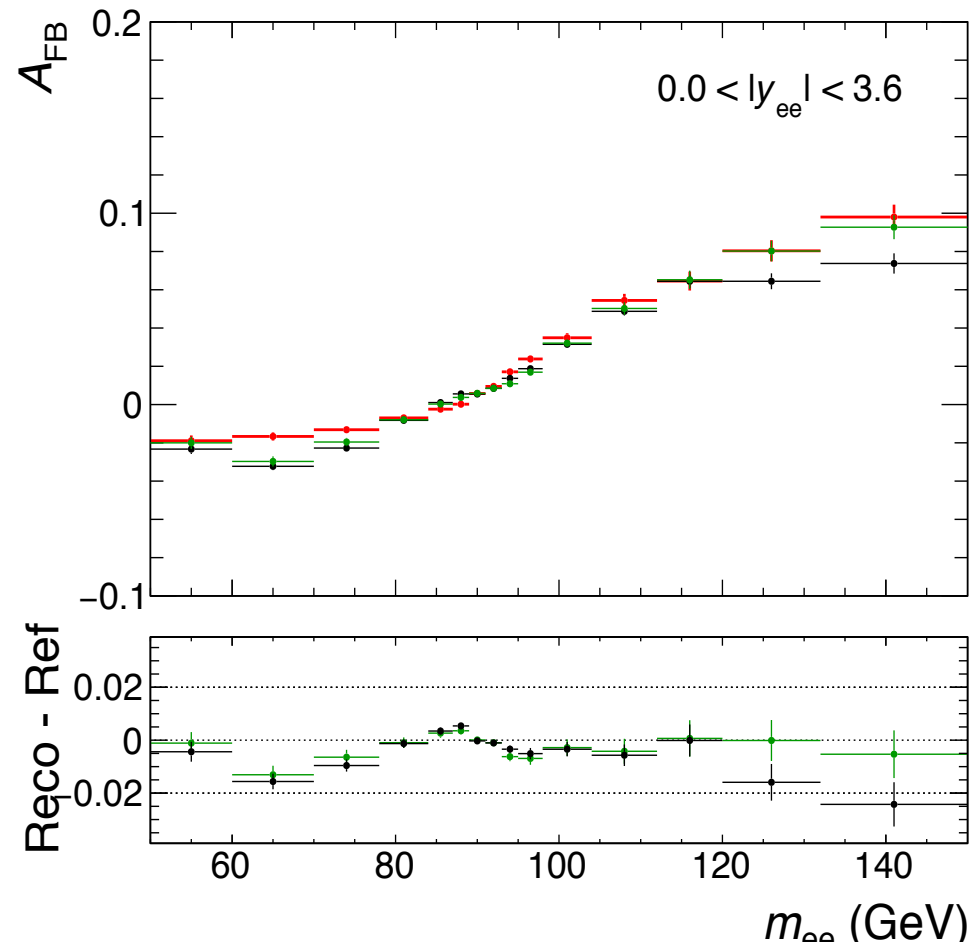
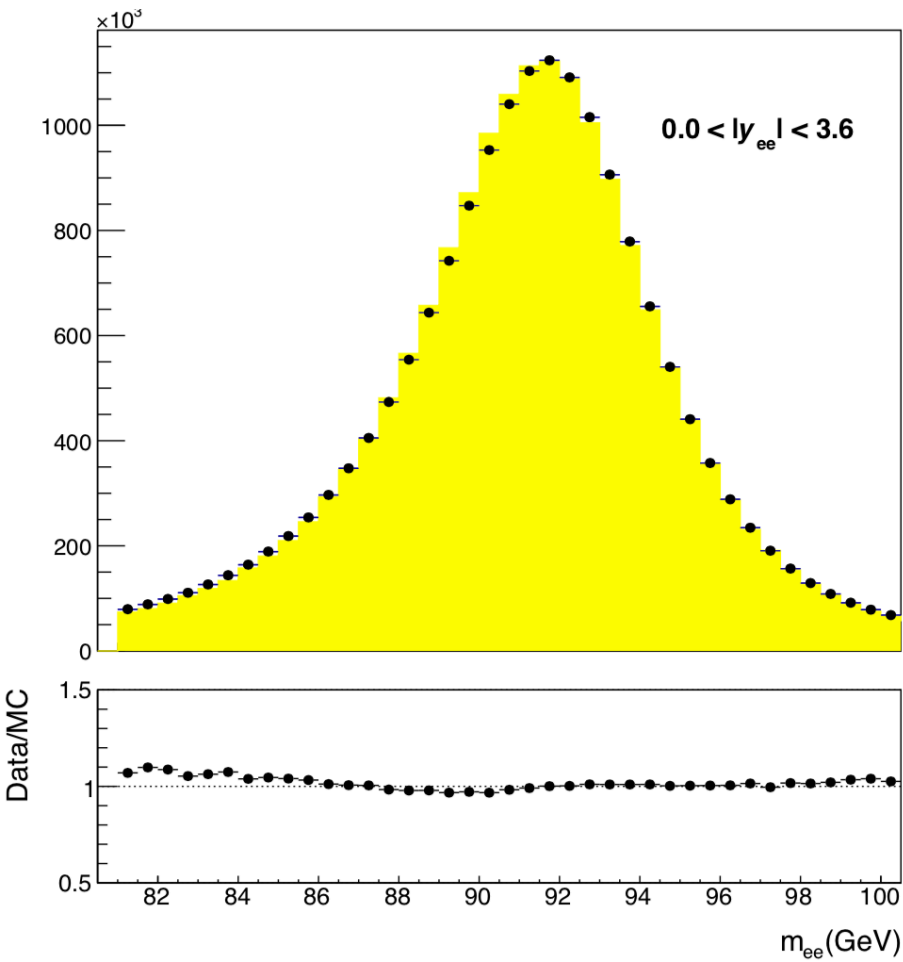
Z peak for 13TeV Data 2017

Muon Channel before and after corr.



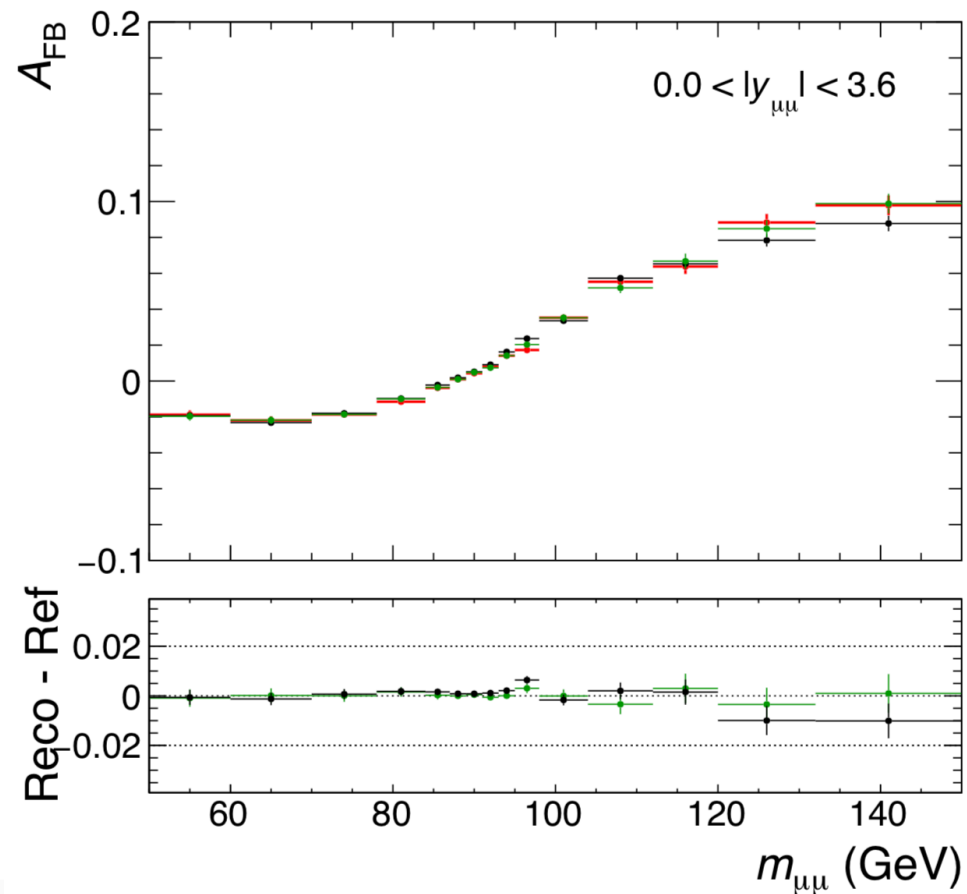
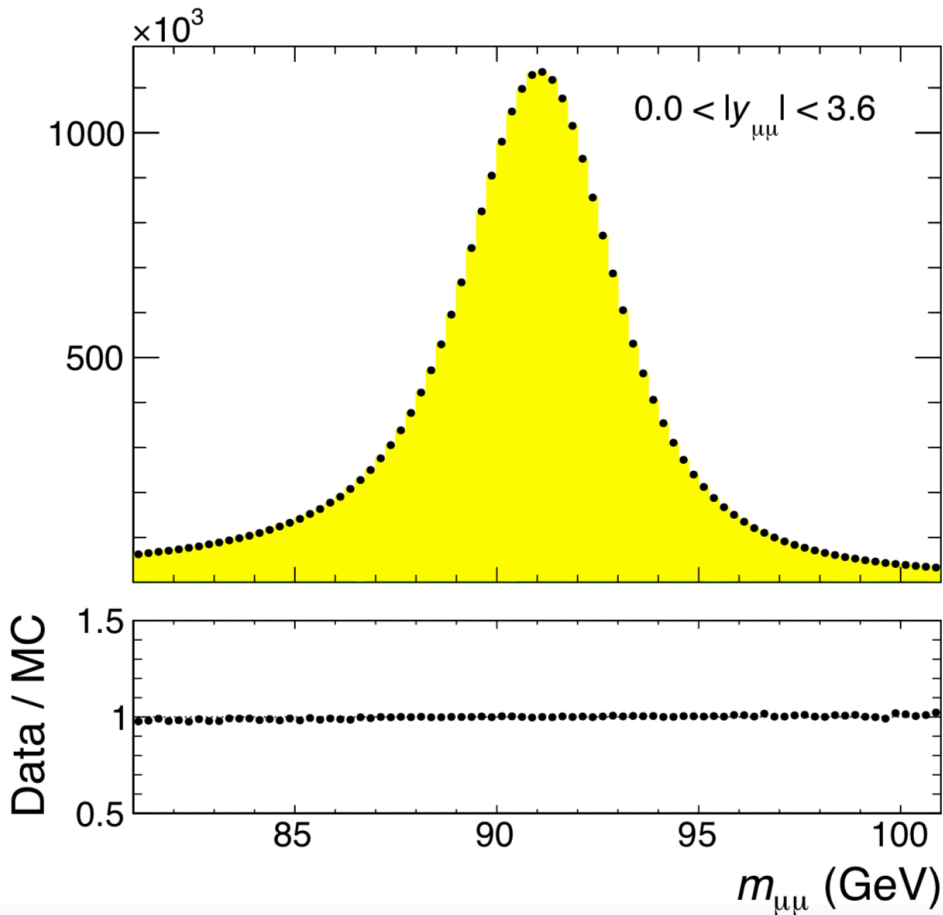
A_{FB} for 13TeV Data 2017

Electron Channel



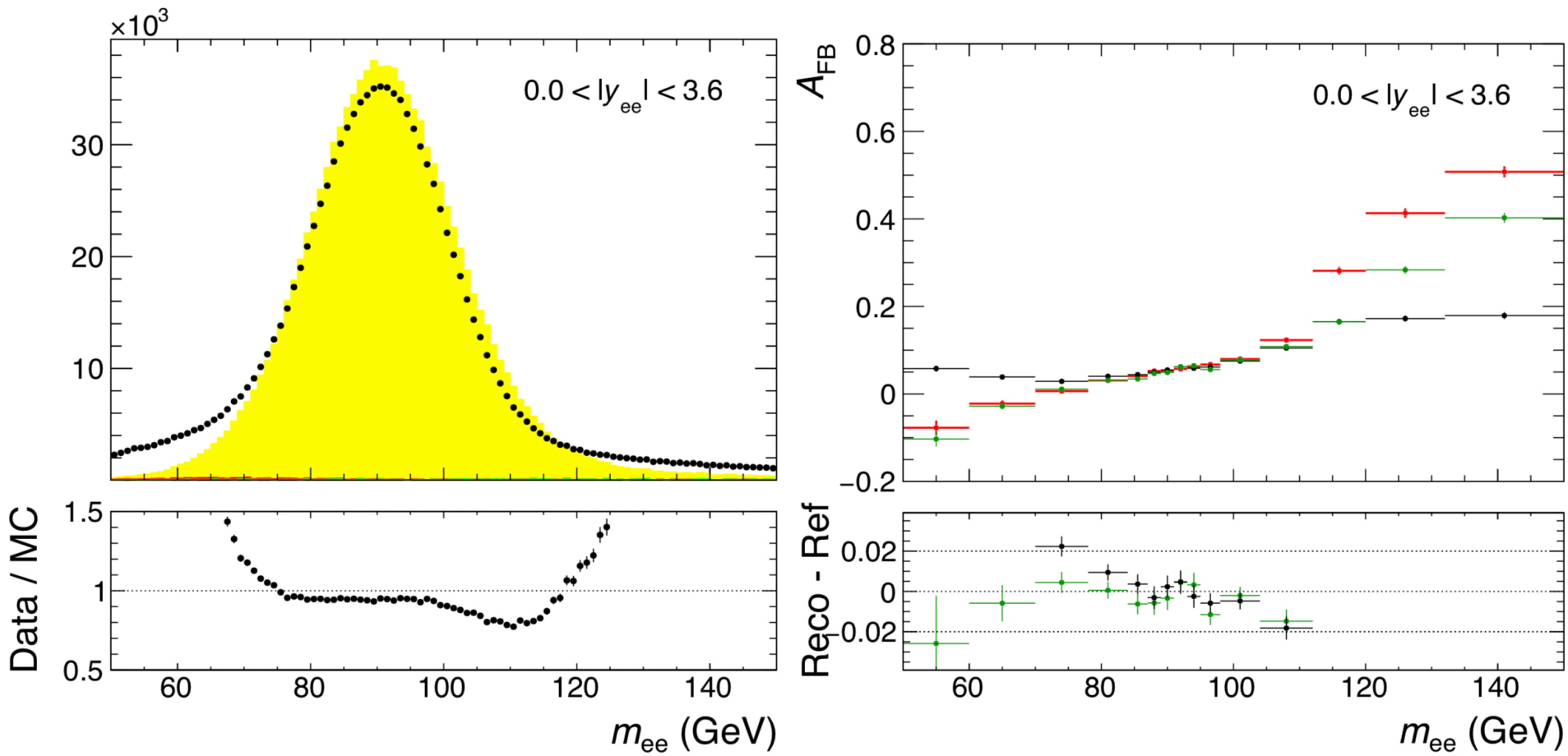
A_{FB} for 13TeV Data 2017

Muon Channel

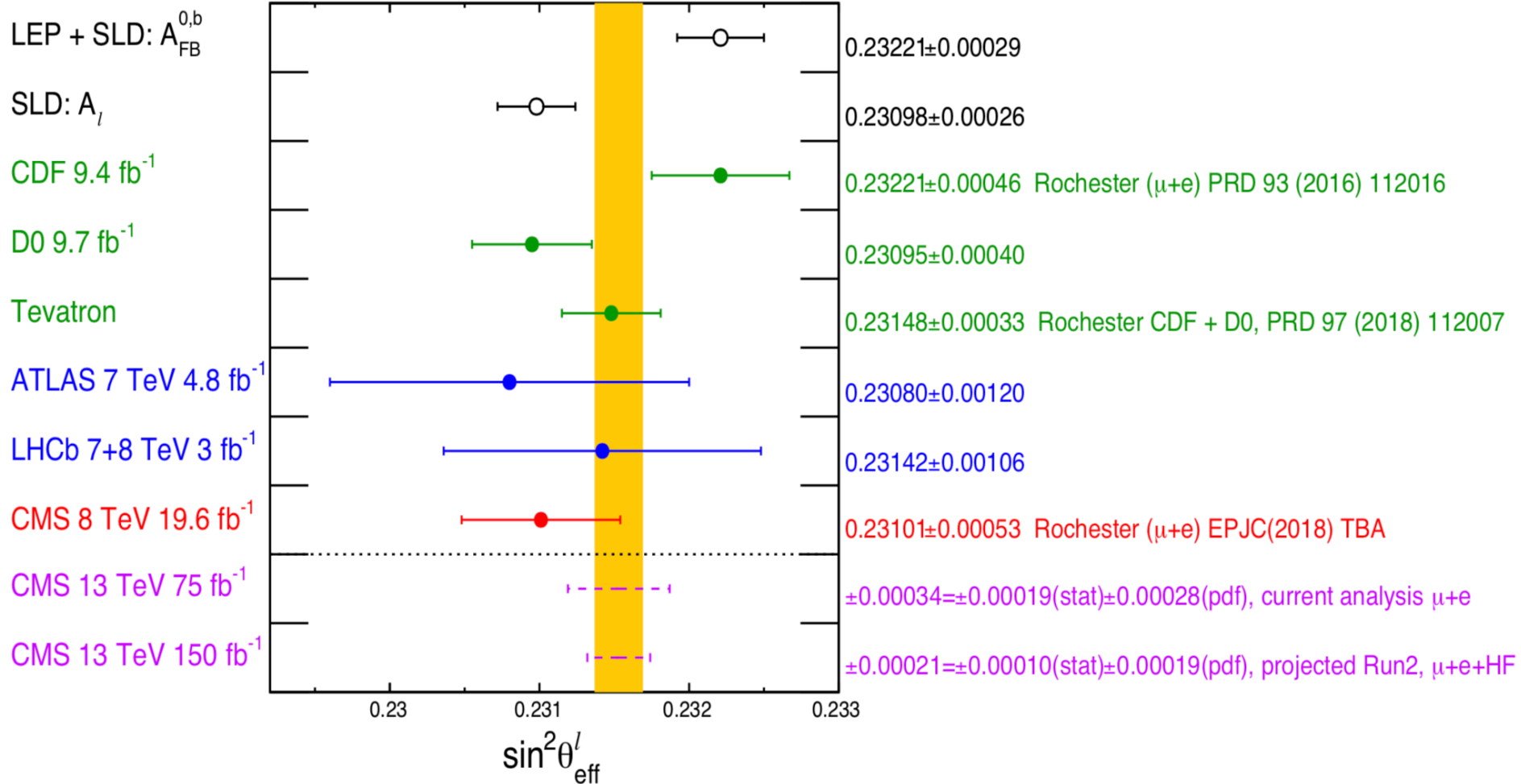


A_{FB} for 13TeV Data 2017

HF Channel without eta-phi corrections

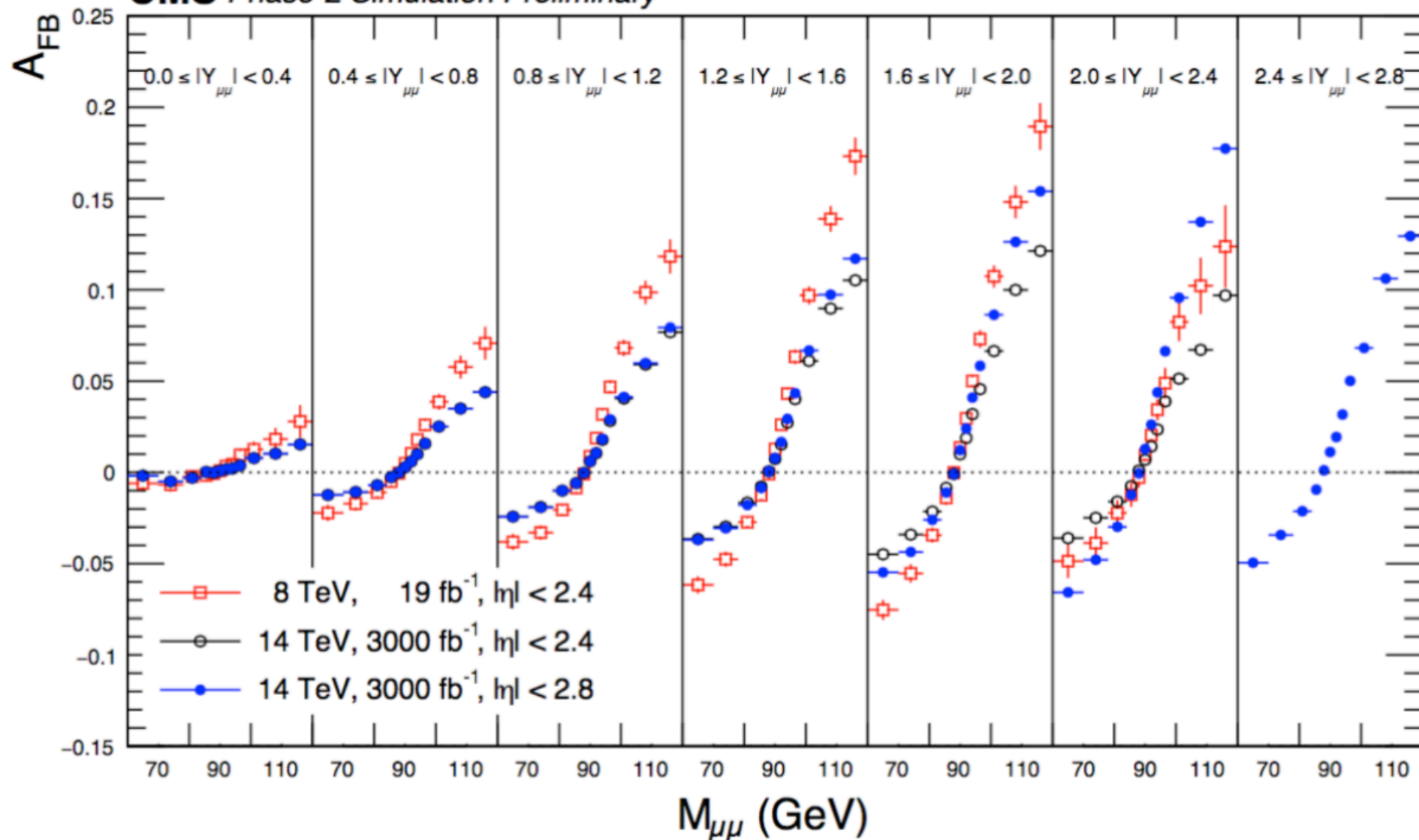


Result estimation for 13TeV Data

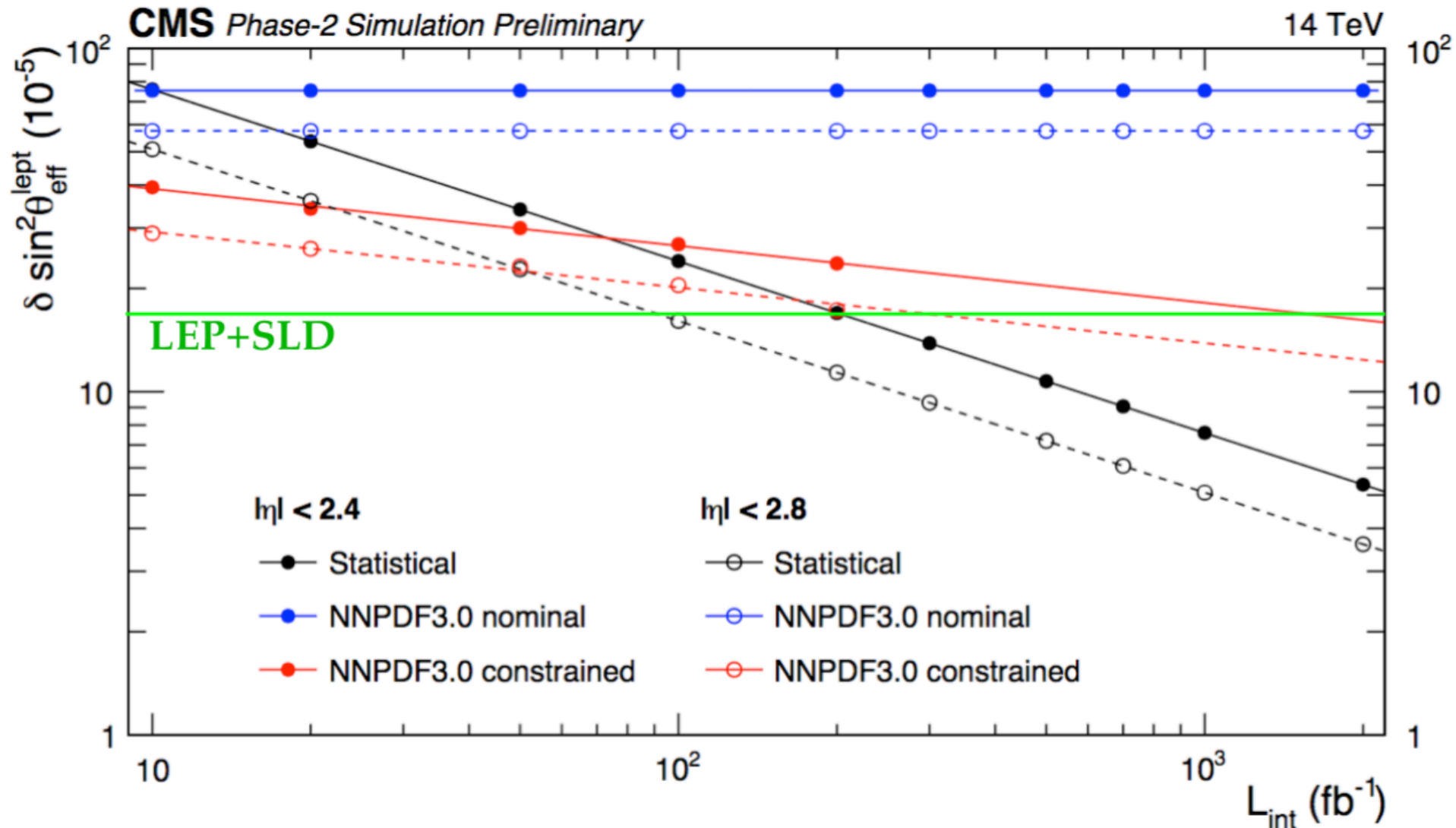


A_{FB} after Phase2

CMS Phase-2 Simulation Preliminary



Uncertainty vs L_{int}



Conclusion

- EW Mixing angle is important SM parameter, sensitive to high order QCD/EW and possible new physics
- 8 TeV Data Analysis is done
- 13 TeV Data Analysis is ongoing
- Mixing angle measurement is very sensitive in high eta regions
- It is important during LS2 to upgrade endcaps both calorimeters and muon system