A_{FB} and $\sin^2\theta_l^{eff}$ plans for CMS

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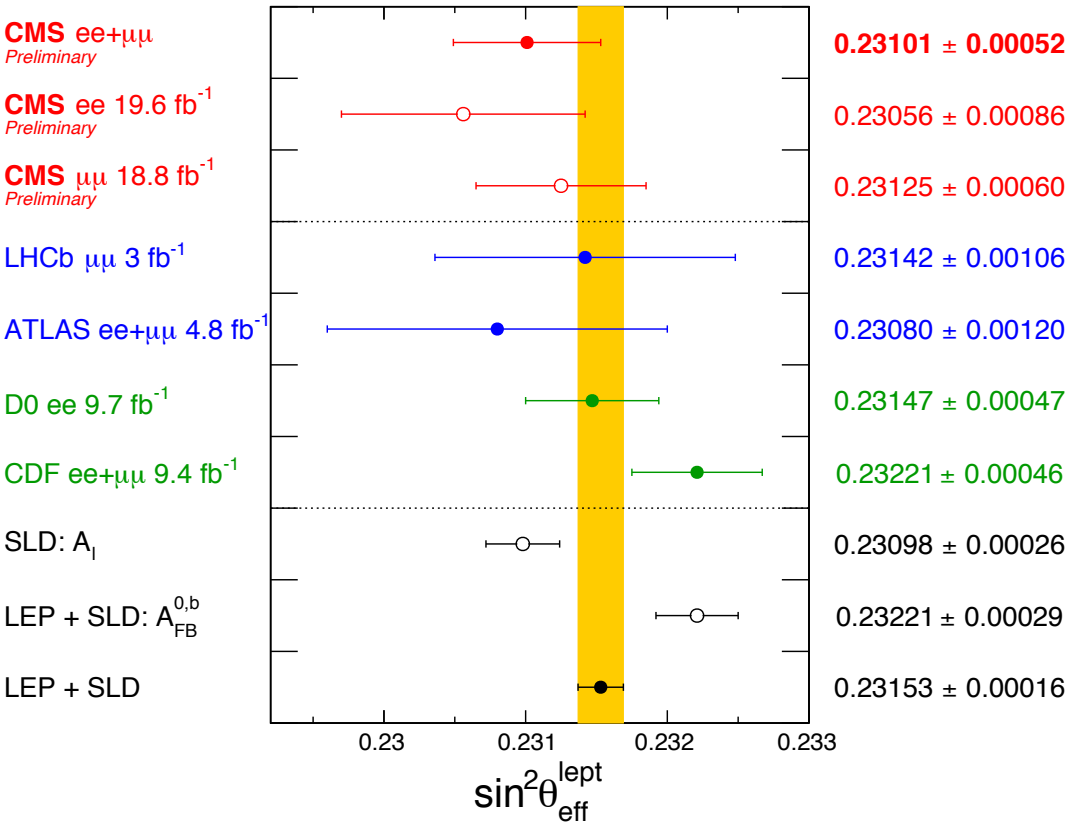
Introduction

- Goal: precision measurement of $\sin^2\theta_{eff} = (1 - m_W^2 / m_Z^2) \times k_{RAD}$

- indirect measurement of mW
- test of radiative corrections in SM
- probe new physics contributions

- Current precision dominated by LEP+ SLD (with ~3σ tensions between most precise results)

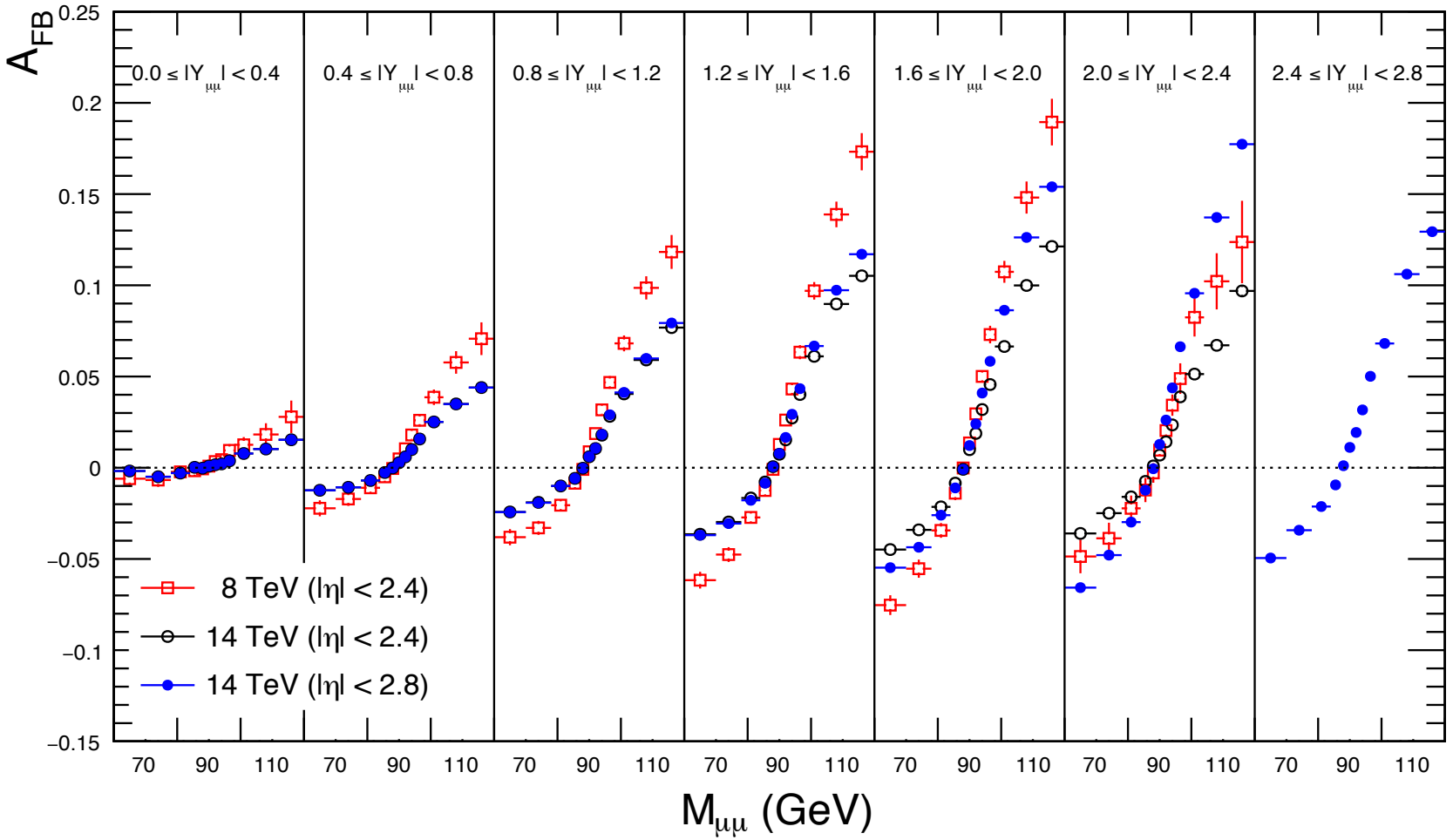


- Current-best hadron-collider measurements are limited by stat. and PDF errors

- Lot of ~background-free $Z/\gamma \to ll$ events produced at the HL-LHC that can be used to precisely measure $\sin^2\theta_{eff}$

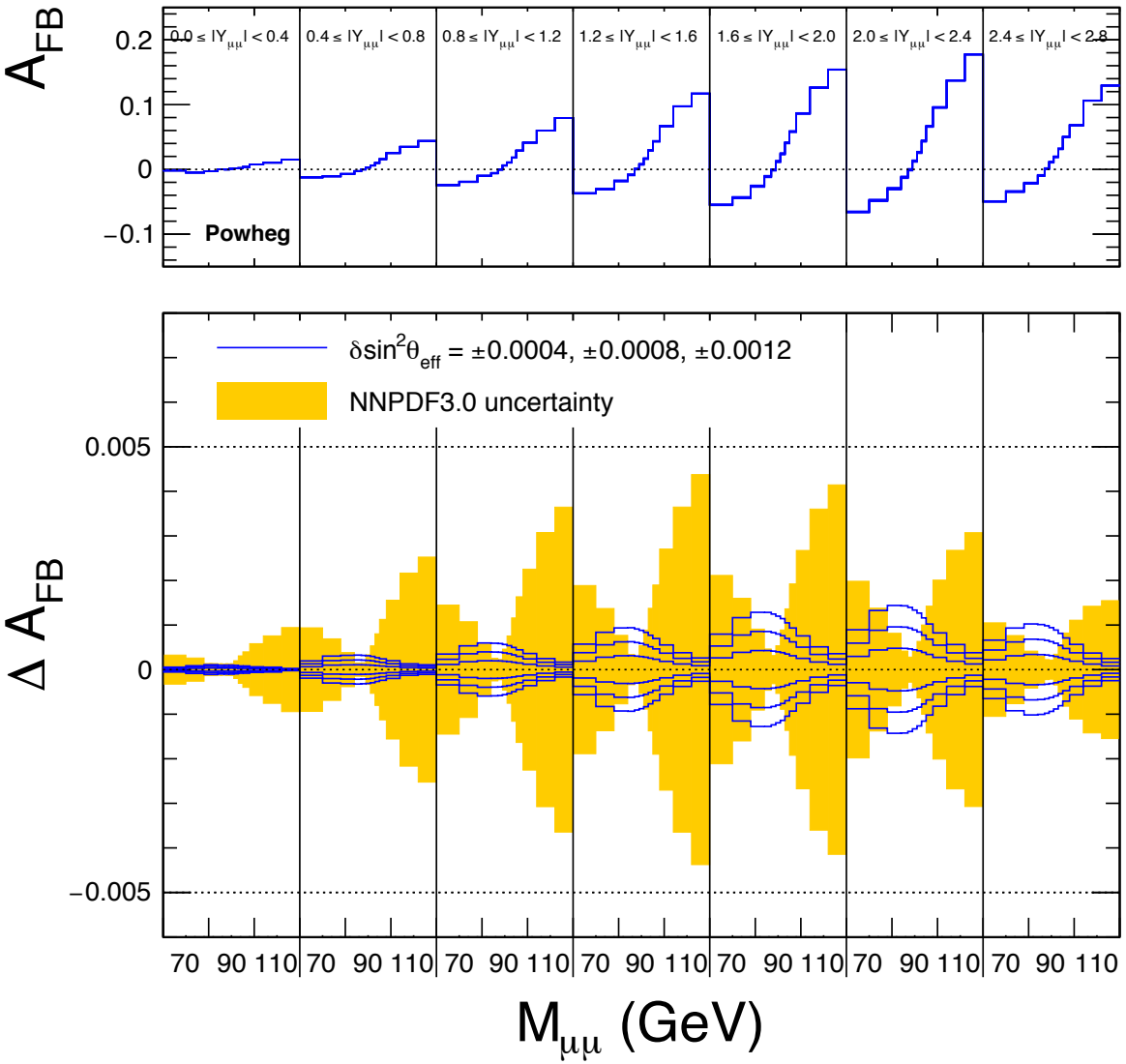
AFB in bins of mass and rapidity

- At 14 TeV less contribution from valence quarks — smaller observable $|A_{FB}|$



- Stat. and PDF errors will be significantly reduced with large amount of data and extended pseudorapidity coverage

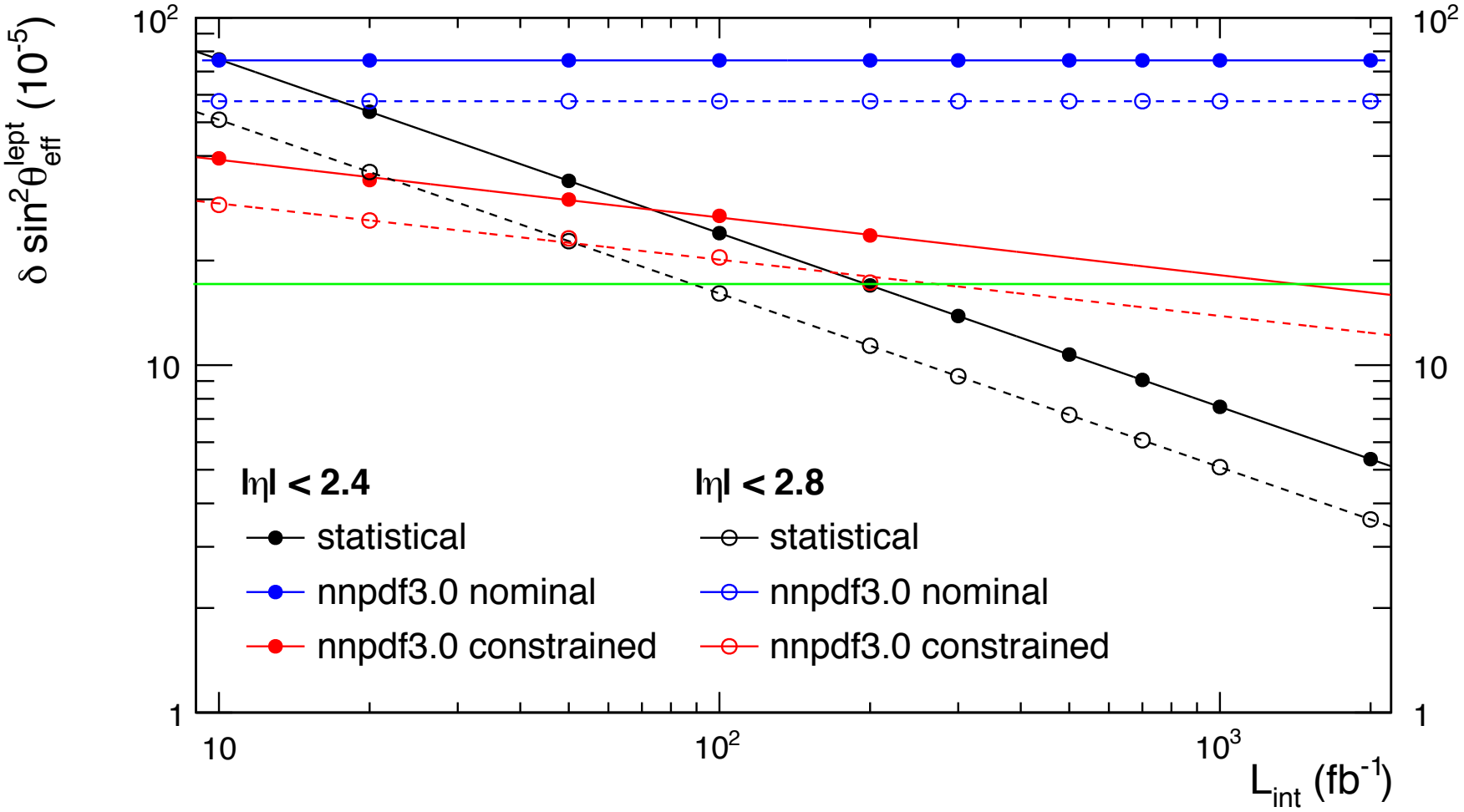
PDF Errors



- PDF uncertainties are (will be) limiting the precision
- Can be significantly constrained in-situ using A_{FB} at low and high dilepton masses

Projected uncertainties

- Projected statistical and PDF uncertainties from MC study



- A single-channel measurement will have negligible stat. error and PDFs can be constrained to less than current world-average uncertainty

Summary

- Performed MC Study to estimate projected statistical and PDF uncertainties at the HL-LHC

- With large amount of data (1000's of /fb) and extended pseudorapidity coverage (up-to 2.8) statistical uncertainties will be negligible and PDF errors can be constrained to improve current knowledge of $\sin^2\theta_{eff}$