ee->mumu forward-backward asymmetry at CEPC

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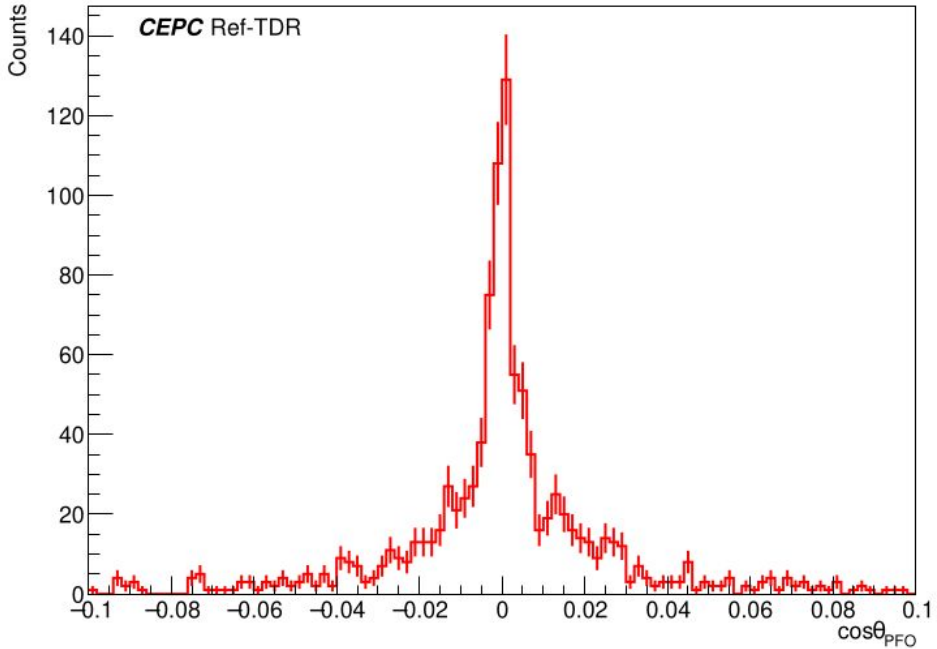
The section in TDR

- 增加了 |costheta_CM| > 0.05 cut，把forward-backward 误判的误差从5e-5降低到2e-6



原本1029个误判事例的costheta_CM分布

|costheta_CM| > 0.05，之后，仅剩53个误判事例

The section in TDR

- 按照上述两种情况更新了统计误差: Z pole run 2年的统计量是4.1x10^12 个 Z 玻色子。另外，在10年的ZH运行过程中，每年会安排1个月的low lumi Z，亮度大约是高亮度Z运行的20%，头一年运行1个月可以有大约0.4x10^11个Z玻色子

  - Extrapolating to 1.38×10^{11} muon pairs expected during 2 years of Z pole data taking, the statistical uncertainty of A_{FB}^{μ} in this case is 3×10^{-6}.
  - Extrapolating to 1.35×10^{9} muon pairs expected during the one-month low-luminosity Z running in the first year of ZH operation, the statistical uncertainty of A_{FB}^{μ} in this case is 3.1×10^{-5}.

The section in TDR

- 目前section中的图表
  - 5 figures：muon pT, costheta_CM, delta_theta, delta_theta_CM, AFB vs Ecm
  - 2 tables：cutflow, AFB calculation
- 结论

Conclusion: this analysis measures the forward-backward asymmetry with $Z \to \mu^+\mu^-$ events at Z pole (A_{FB}^{μ}). The result of measurement is 0.016572 ± 0.000003 (stat.) $\pm$ 0.000021 (syst.) based on the dataset corresponding to 2 years of Z pole running, or 0.016572 ± 0.000031 (stat.) $\pm$ 0.000021 (syst.) based on the dataset from the first year of ZH operation. In both cases, the CEPC result improves the precision of LEP result ($A_{FB}^{\mu} = 0.0163 \pm 0.0014$) by two magnitudes.

Response to Manqi’s comments

- Statistical error is not correct
  - Corrected
- 2D plot of theta and theta resolution?
  - Now added both 1D plots, will check 2D plots
- It’s hard to understand the figure of the costheta of the migrated events
  - This figure is a bit misleading and didn’t add more info., removed
- How well is the MC agrees with the SM? Is the interference included?
  - MC agrees well with SM around Z pole, it lacks of corrections with higher energy
  - Interference is included
- Other comments on texts
  - Mostly implemented

Todo list

- Some minor corrections due to the inconsistency in workflow: no change on conclusions
- Including muon detector hits in muon ID
  - Samples are ready, expect fewer mis-ID events, will update the results
- Check the contamination of Z->ee
  - Should be lower than Z->tautau and no impact on conclusion, will check
- Re-optimize selections
  - Now the selection eff is ~80%, need to be improved