

Forward-backward Asymmetry in $Z \rightarrow uu$ for CEPC

Mengran

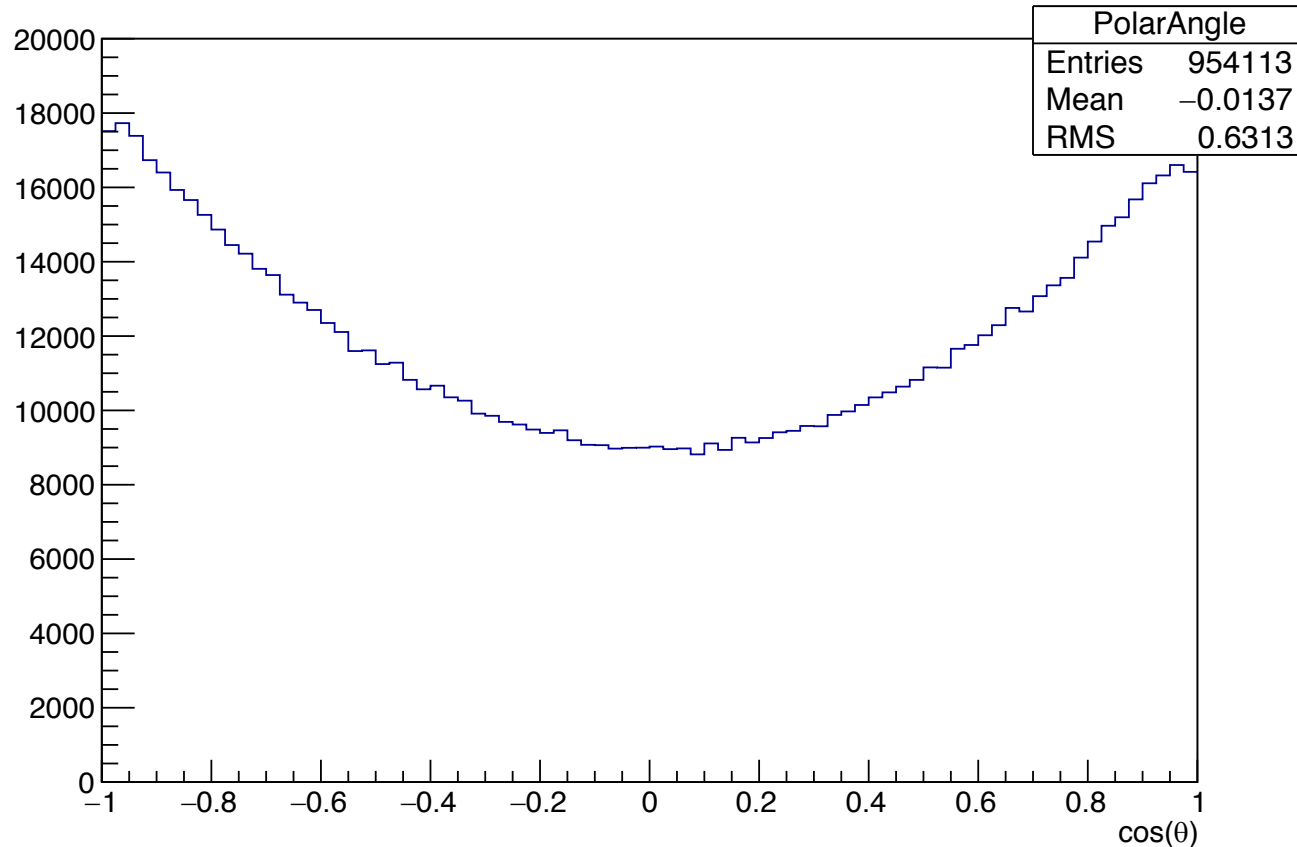
2018.5.7

A_{FB} Fit

(Fast-simulation)

$$\frac{d\sigma}{dP_T^Z dy^Z dm^Z d\cos\theta} = A \left(1 + \cos^2 \theta + \frac{1}{2} A_0 (1 - 3 \cos^2 \theta) + A_{fb} \cos\theta \right)$$

$$\langle \cos\theta \rangle = \frac{1}{4} A_{fb}$$



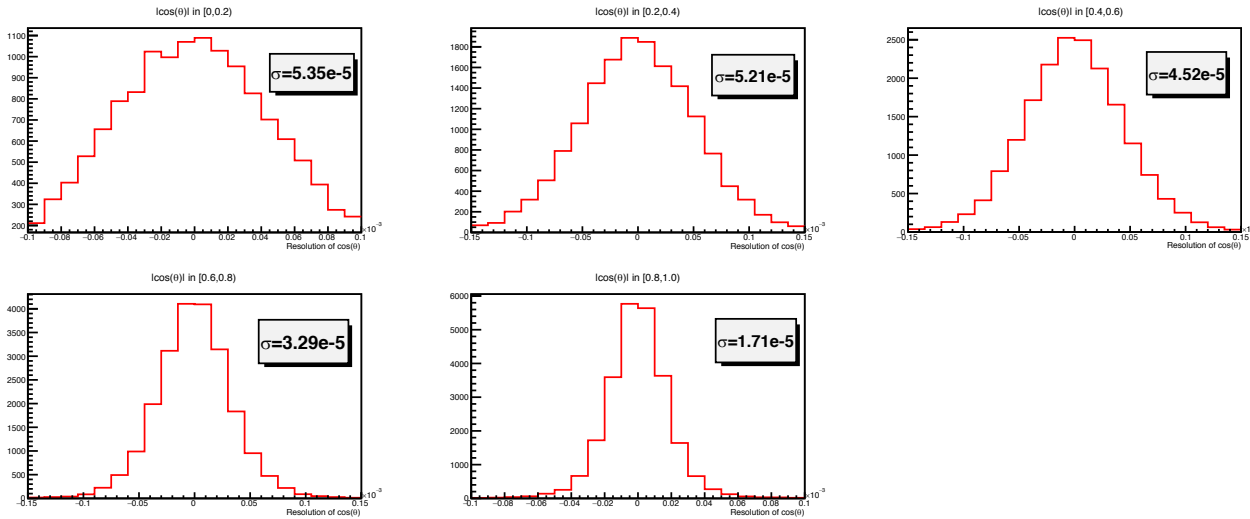
My calculation:

$$A_{FB} = 0.044$$

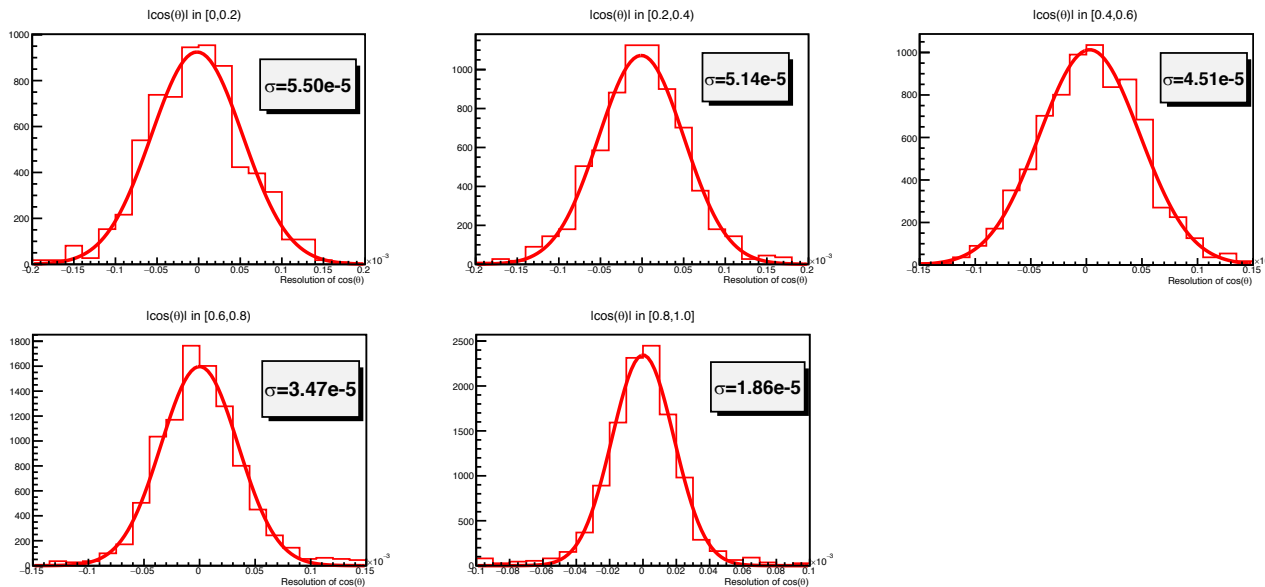
Far from World Average...

To be improved...

Angle ($\cos\theta$) Resolution Comparison between Old and New CEPC geometry (Full-simulation)



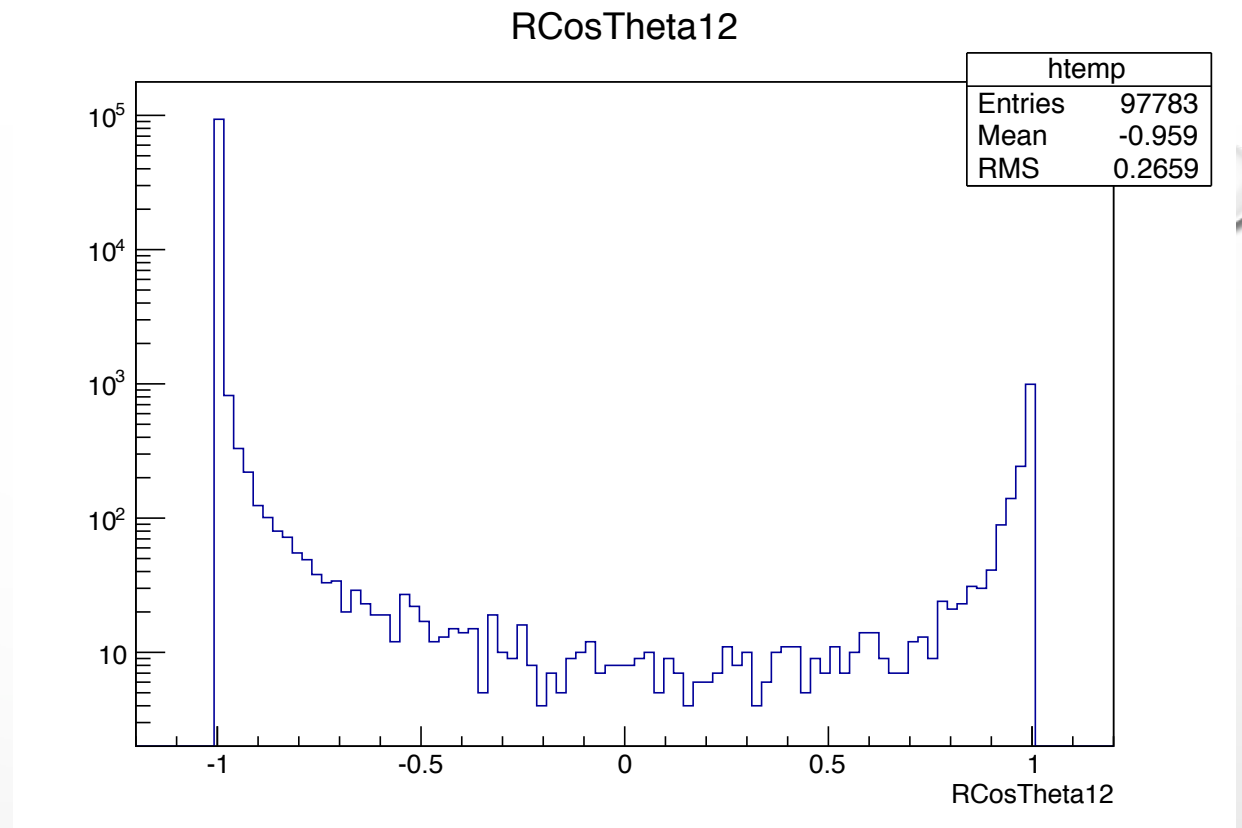
CEPC.v4 new geometry
and 3T magnetic field



CEPC.v1 old geometry
and 3.5T magnetic field

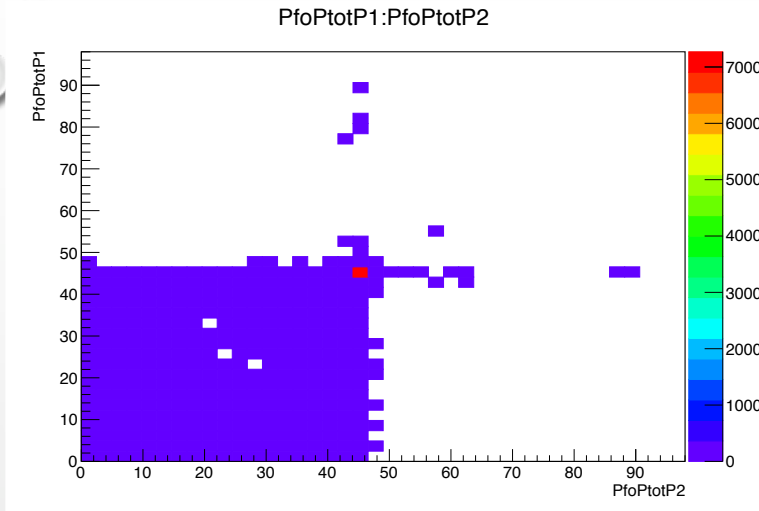
Efficiency for CEPCv4 (Full-simulation)

- Thinking about cuts:
- CutFlow:

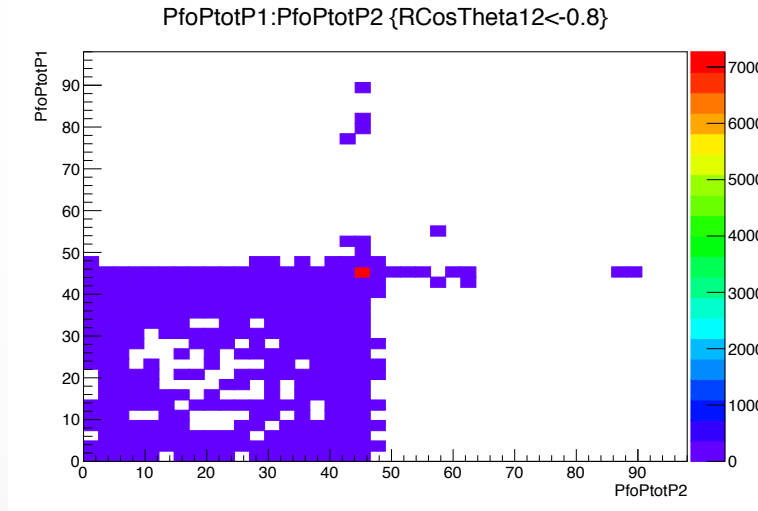


No cut	2 muons	$\Delta\cos\theta < -0.8$	$E_{11} + E_{12} < 95$	$\text{Max}(E_{11}, E_{12}) > 30$ GeV	$\text{Min}(E_{11}, E_{12}) > 30$ GeV
100000	97783 ± 313	95302 ± 309	95283 ± 309	94667 ± 308	85479 ± 292
Efficiency	$(97.78 \pm 0.05)\%$	$(97.46 \pm 0.05)\%$	$(99.980 \pm 0.005)\%$	$(99.35 \pm 0.03)\%$	$(90.3 \pm 0.1)\%$

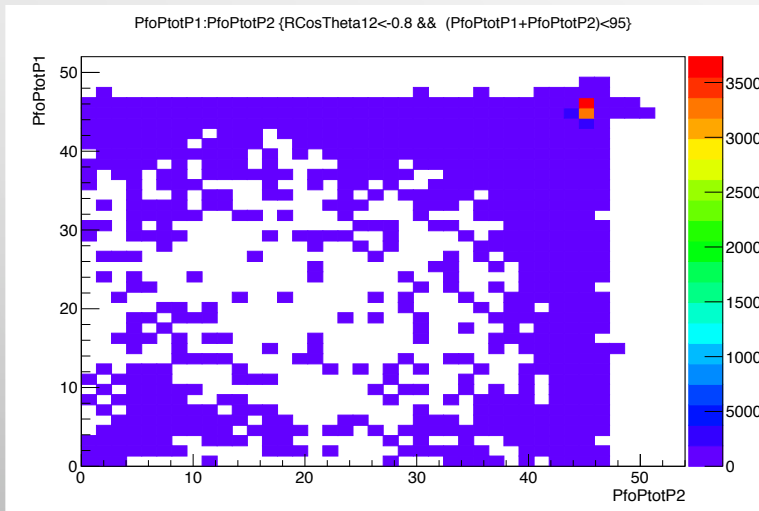
PI1 : PI2 for all cuts for CEPCv4



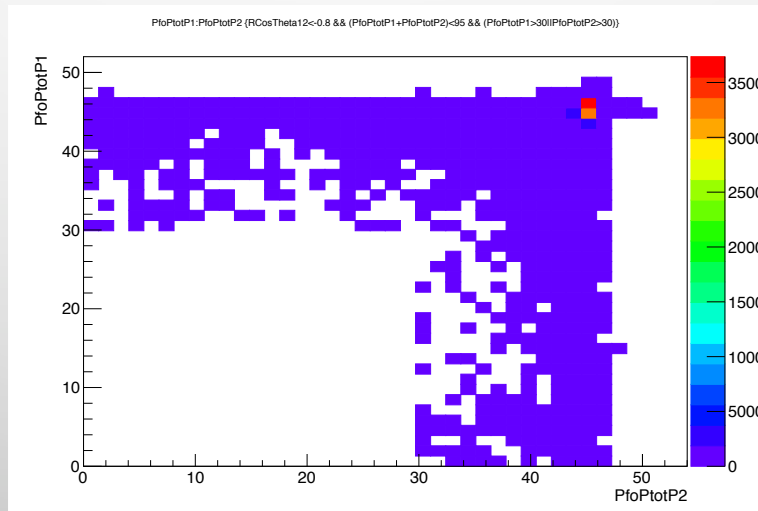
2 muons



$\Delta\cos\theta < -0.8$



$E_{11} + E_{12} < 95$

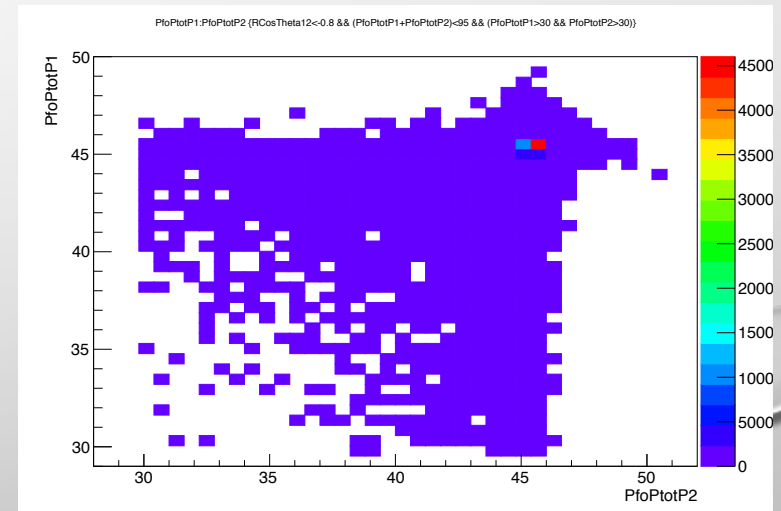


$\text{Max}(E_{11}, E_{12}) > 30\text{GeV}$

Generator: Whizard-1.95

Compromise between efficiency:

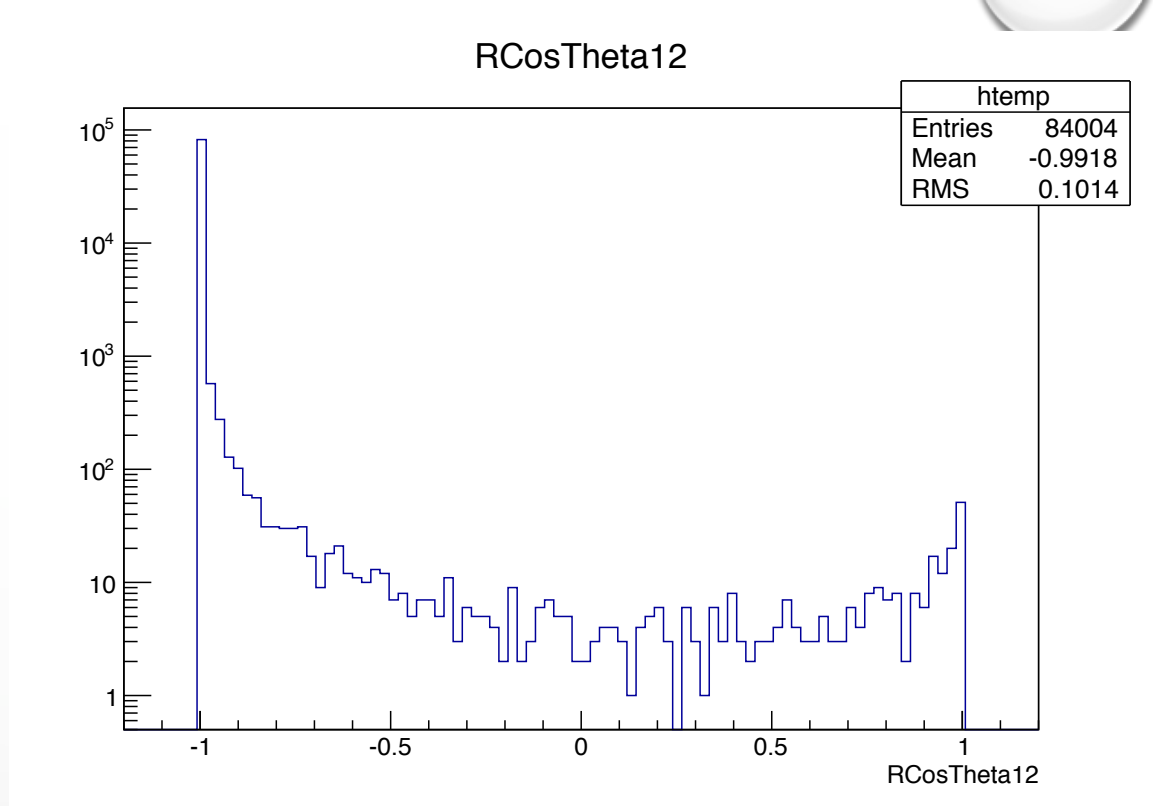
- Strict cuts for better momentum performance. Or
- Loose cuts for higher efficiency ?
- $10^{10}Z * 3.37\%(Z \rightarrow uu) \sim 3 \cdot 10^8$ Zuu events



$\text{Min}(E_{11}, E_{12}) > 30\text{GeV}$

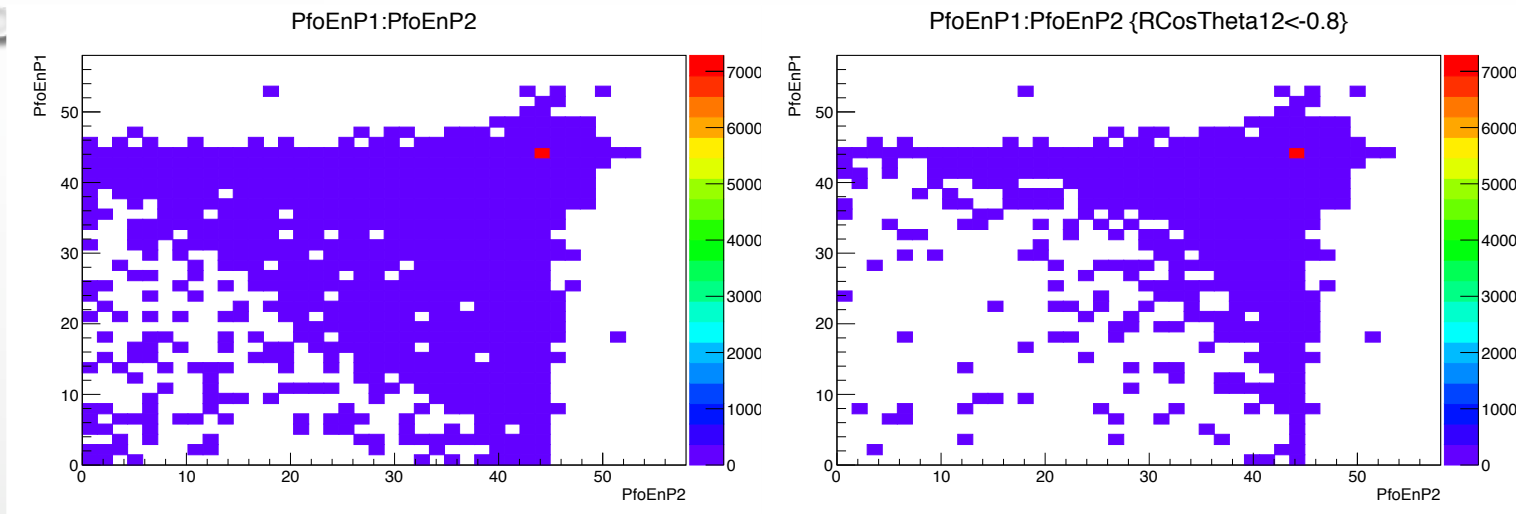
Efficiency for CEP Cv1

- CutFlow:



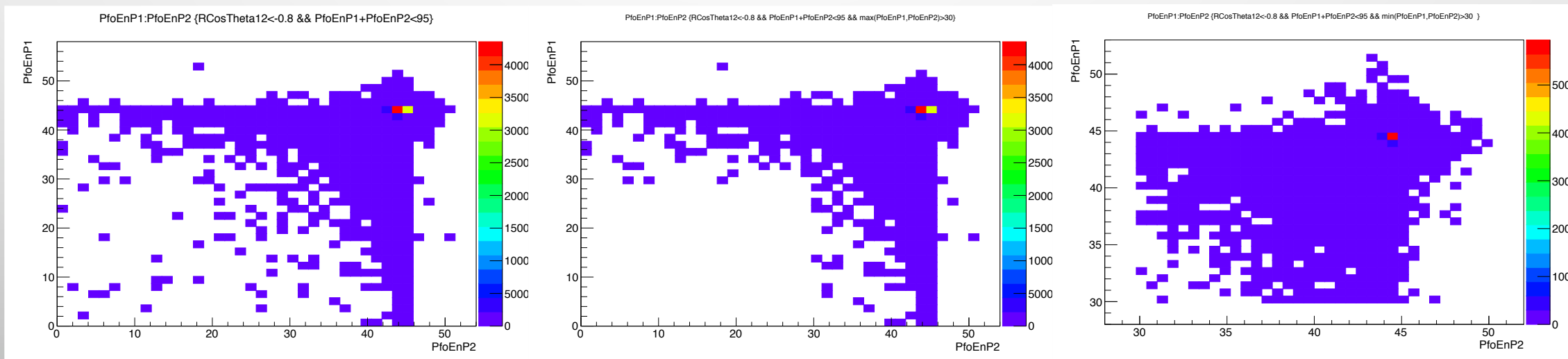
No cut	2 muons	$\Delta\cos\theta < -0.8$	$E_{11}+E_{12}<95$	$\text{Max}(E_{11},E_{12})>30$ GeV	$\text{Min}(E_{11},E_{12})>30$ GeV
100000	96601 ± 311	95277 ± 309	95260 ± 309	95213 ± 309	92121 ± 304
Efficiency	$(96.60 \pm 0.06)\%$	$(98.63 \pm 0.04)\%$	$(99.982 \pm 0.004)\%$	$(99.982 \pm 0.004)\%$	$(96.75 \pm 0.06)\%$
Efficiency in v4	$(97.78 \pm 0.05)\%$	$(97.46 \pm 0.05)\%$	$(99.980 \pm 0.005)\%$	$(99.35 \pm 0.03)\%$	$(90.3 \pm 0.1)\%$

PI1 : PI2 for all cuts for CEPCv1



2 muons

$\Delta\cos\theta < -0.8$



$E_{11} + E_{12} < 95$

$\text{Max}(E_{11}, E_{12}) > 30\text{GeV}$

$\text{Min}(E_{11}, E_{12}) > 30\text{GeV}$