ee->mumu forward-backward asymmetry at CEPC
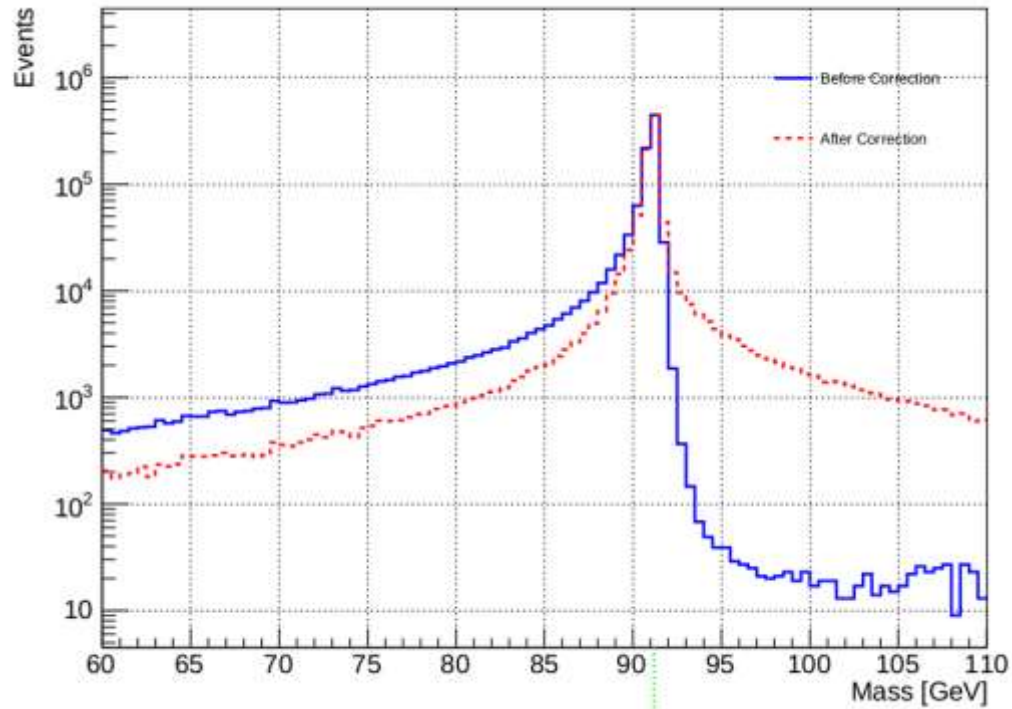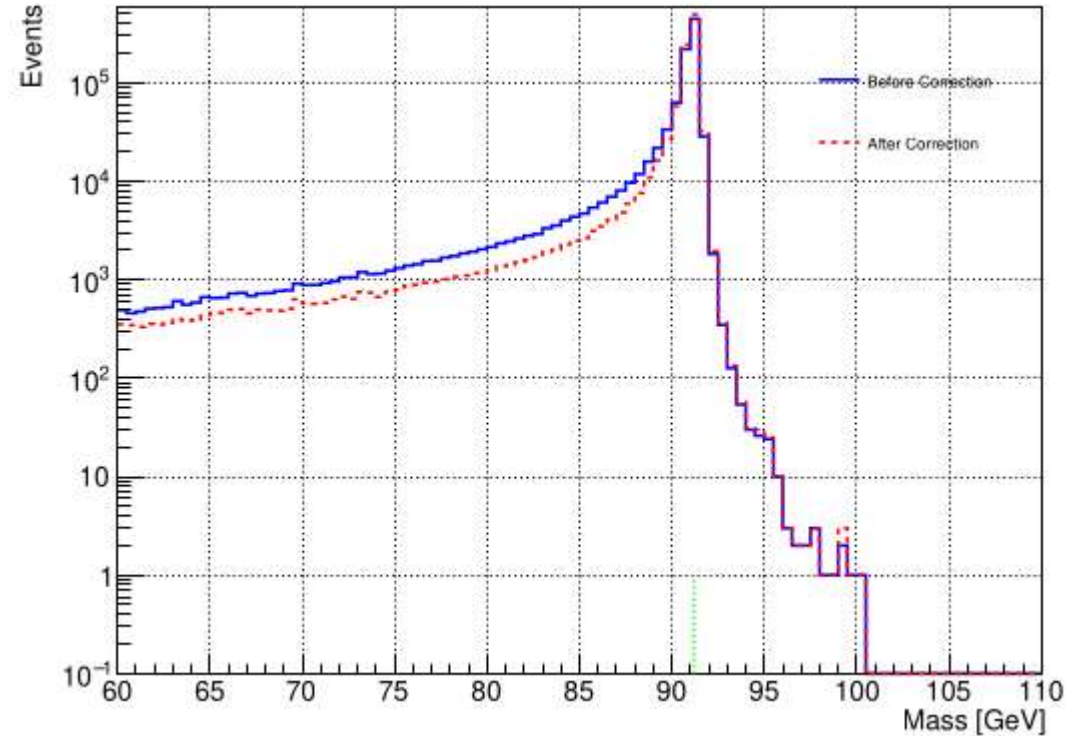
Jiawei wan , Shuo Han , Lei Zhang

- Directly searching for the closest neutral PFO near the muon in PFO leads to an abnormality on the right side of the Z peak.
- Using neutral particles near the muon in MCP to match neutral particles in PFO and then applying corrections results in a normal Z peak.

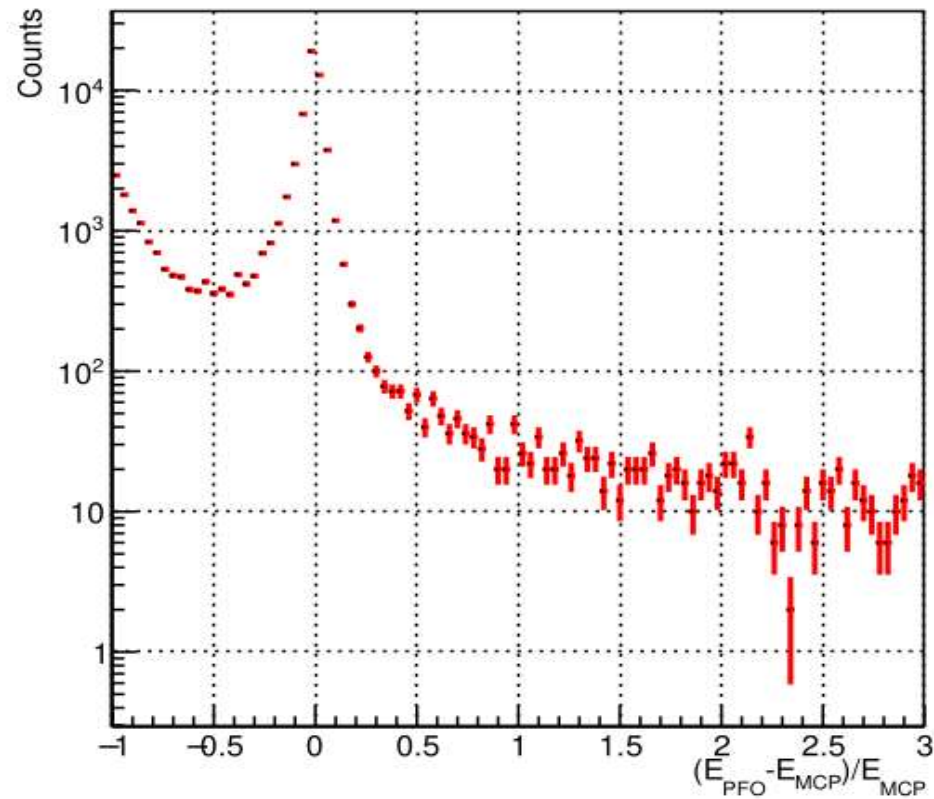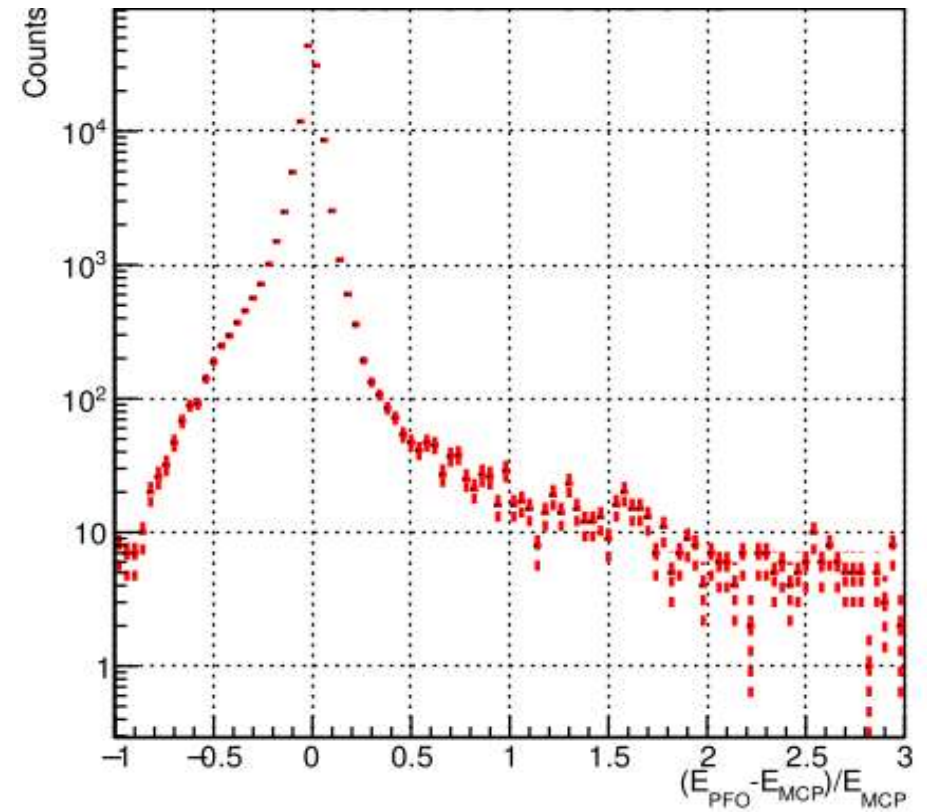
PFO direct correction

MCP match PFO

- After matching, calculate ΔE/E for neutral particles.
- In the range of -1 to 0.5, PFO misidentifies neutral particles, typically such photons have very low energy.

PFO direct correction

MCP match PFO

- Identical neutral particles appear in PFO.
- A single event in PFO contains three muons.

```
PFO Muons (2):
Index | Charge |      Px       |      Py       |      Pz       |      E        |
------|--------|---------------|---------------|---------------|---------------|
   0  |   +1   |   -43.9425    |    -9.5798    |     6.6587    |    45.4651    |
   1  |   -1   |    24.7940    |     5.3336    |    -3.6999    |    25.6296    |

Neutral particles near PFO Muon [0]:
Neutrals in ΔR < 0.3 cone:
No neutral particles found within ΔR < 0.3

Neutral particles near PFO Muon [1]:
Neutrals in ΔR < 0.3 cone:
IDX |  PID  |      Px       |      Py       |      Pz       |      E        |     ΔR     |
----|-------|---------------|---------------|---------------|---------------|------------|
  2 |   22  |    19.0837    |     4.2488    |    -2.8246    |    19.7539    |   0.0073   |
  3 |   22  |    19.0837    |     4.2488    |    -2.8246    |    19.7539    |   0.0073   |
```
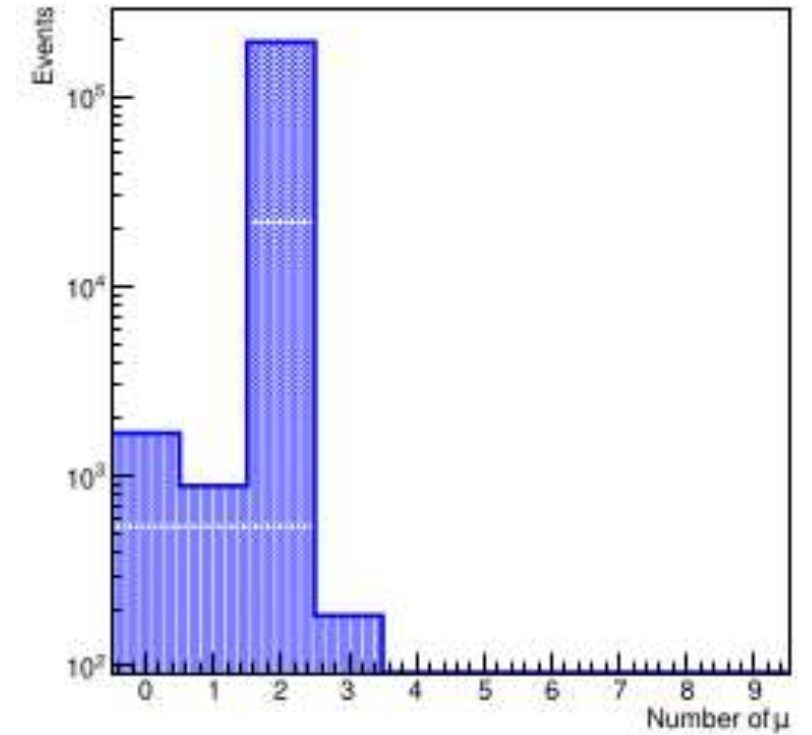
```
Neutral particles near PFO Muon [1]:
Neutrals in ΔR < 0.3 cone:
IDX |  PID  |      Px       |      Py       |      Pz       |      E        |     ΔR     |
----|-------|---------------|---------------|---------------|---------------|------------|
  4 |   22  |     8.9255    |    -6.9005    |     5.4801    |    12.5424    |   0.0787   |
  5 |   22  |     8.9255    |    -6.9005    |     5.4801    |    12.5424    |   0.0787   |
  6 |   22  |     0.1019    |    -0.0792    |     0.0653    |     0.1447    |   0.0967   |
  7 |   22  |     0.1019    |    -0.0792    |     0.0653    |     0.1447    |   0.0967   |
```