

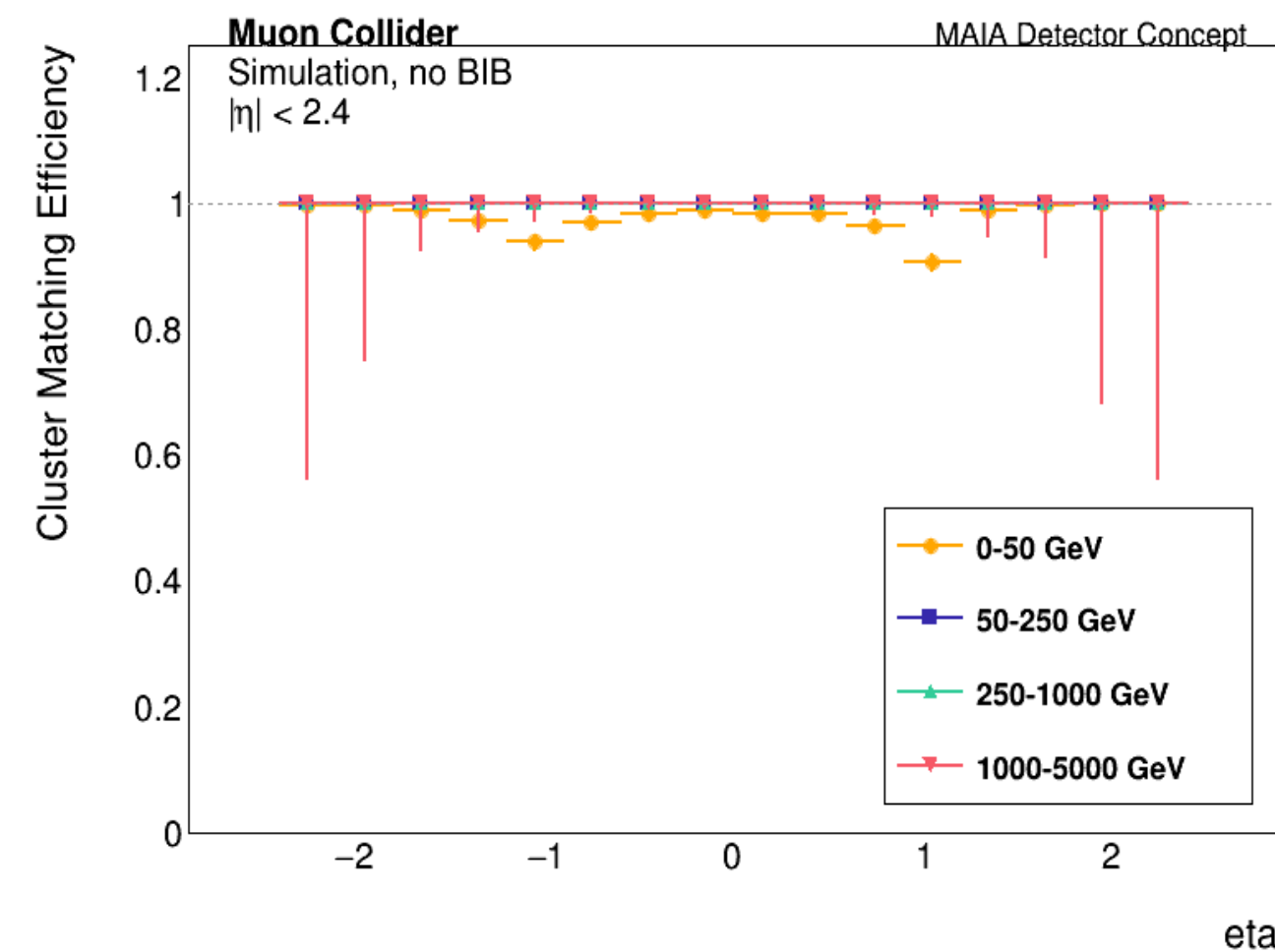
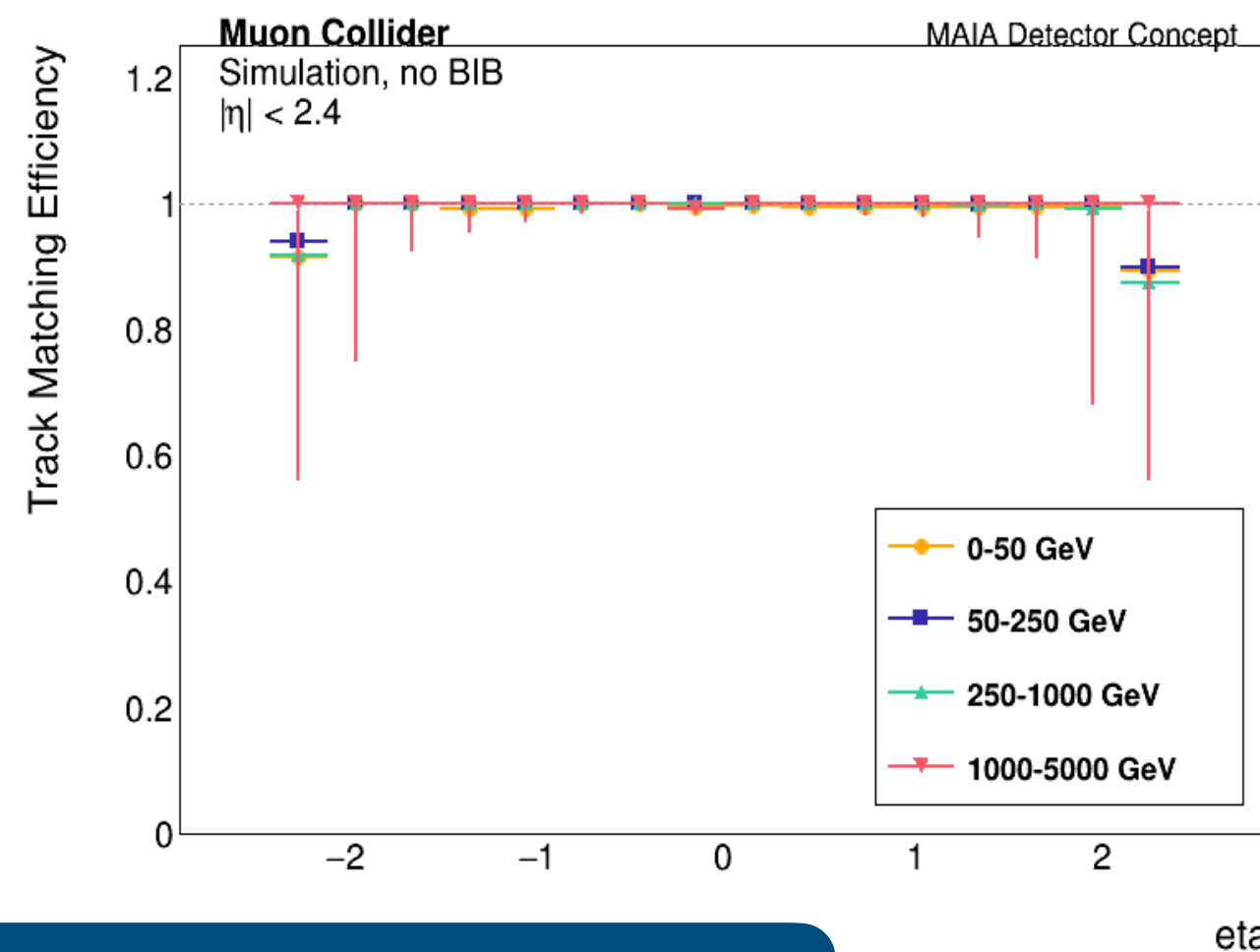
# Proposed Change to Electron ID

# Electron ID Proposal

## Steering file with electron id - PandoraSettings/PandoraSettingsDefault.xml

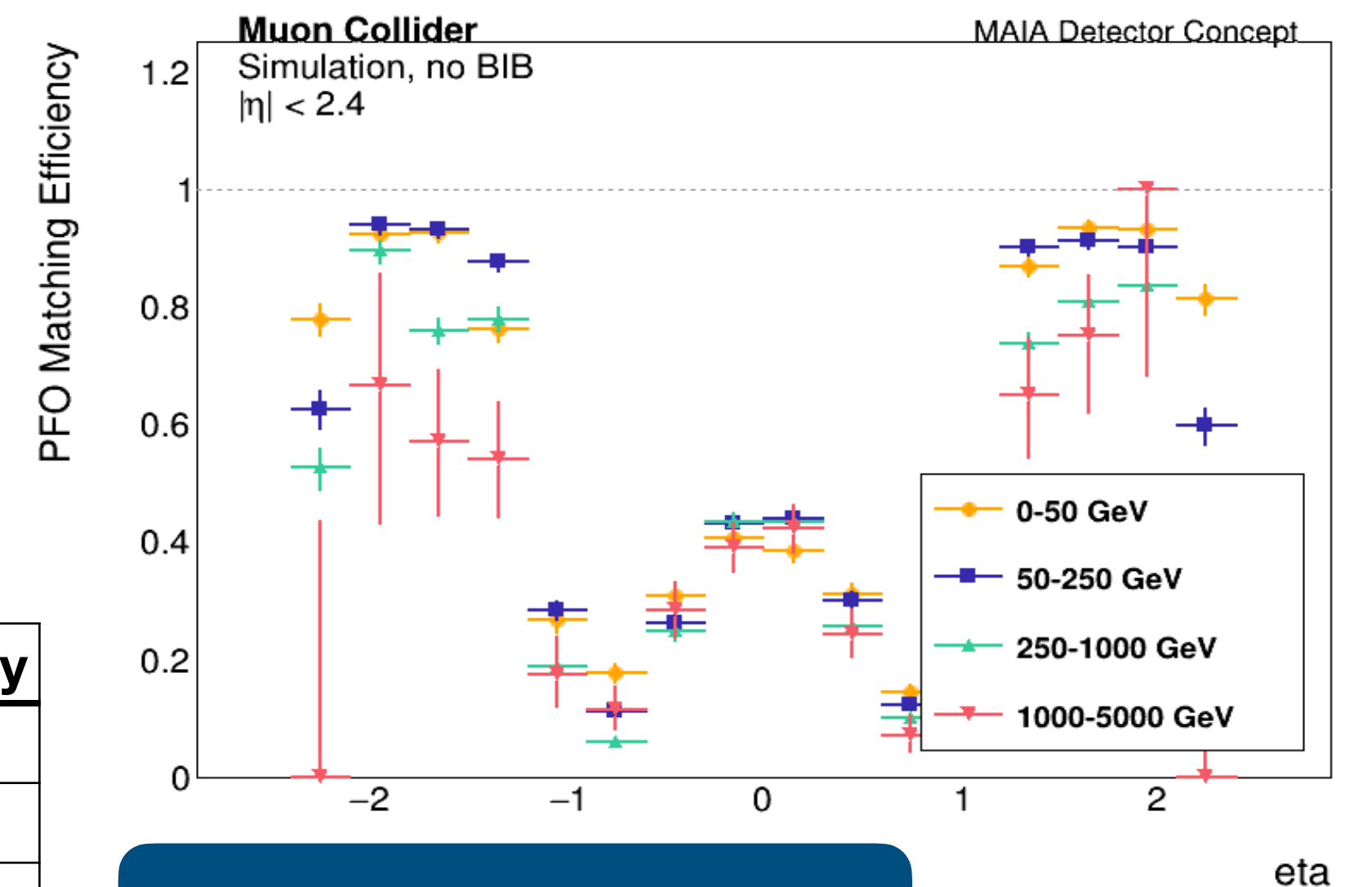
- Im proposing that we change the values in the electron id plugin due to low electron PFO efficiency
- We are currently using pandoras default values which are

```
LCParticleIdPlugins::LCElectronId::LCElectronId() :
    m_maxInnerLayer(4),
    m_maxEnergy(5.f),
    m_maxProfileStart(4.5f),
    m_maxProfileDiscrepancy(0.6f),
    m_profileDiscrepancyForAutoId(0.5f),
    m_maxResidualEOverP(0.2f)
{
}
```



Electron track and cluster reconstruction efficiency looks good

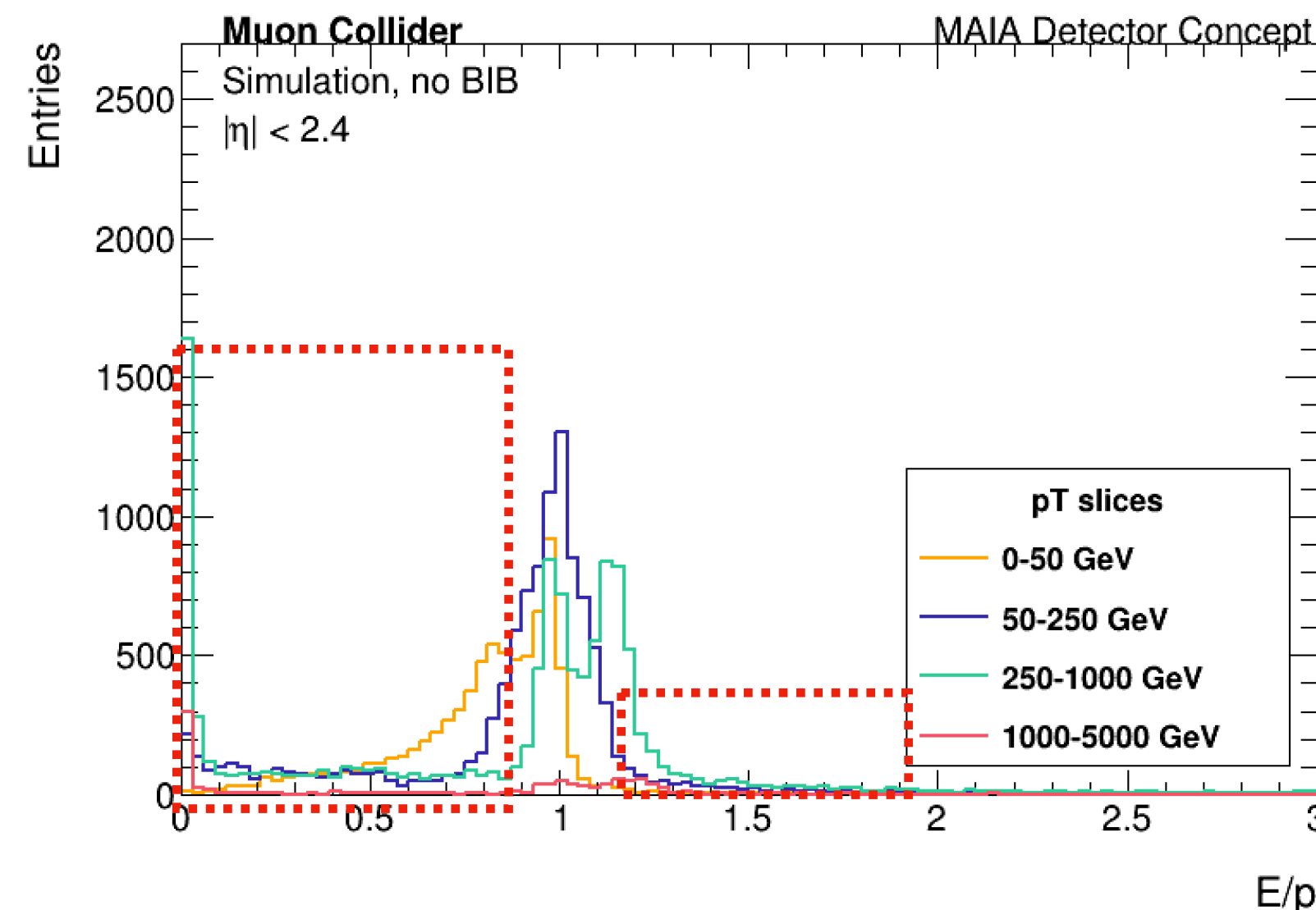
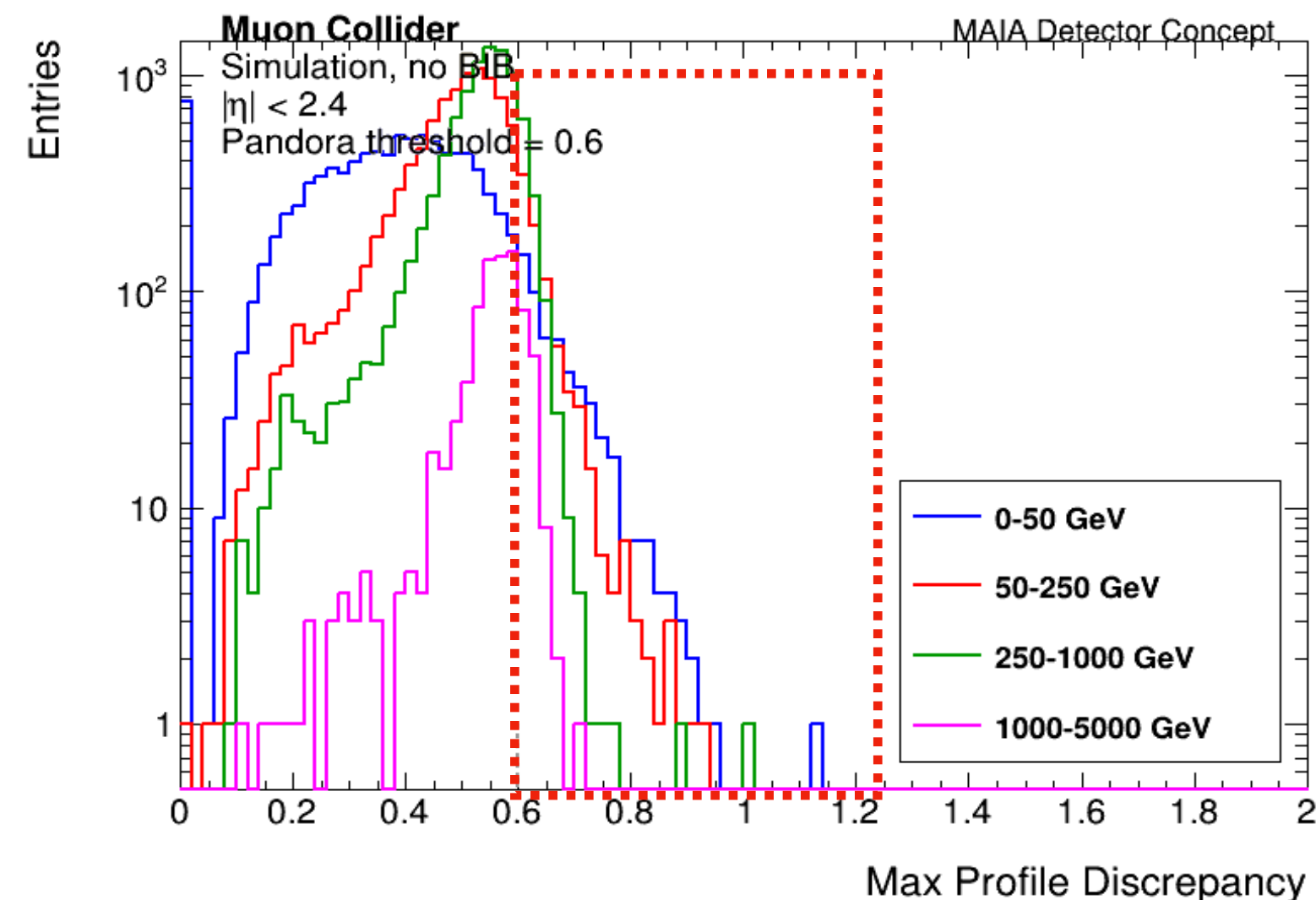
	# of PFOs id as electron	Total # of MC electrons	Reco efficiency
<b>0-50 GeV</b>	3472	7002	49.6%
<b>50-250 GeV</b>	4368	9708	45.4%
<b>250-1000 GeV</b>	3465	8807	39.3%
<b>1000-5000 GeV</b>	239	799	29.9%



Electron PFO ID is failing

# Main Cause of Efficiency Loss

- The values for the max profile discrepancy variable and residual E/p variable are the **main cause of mis-identification**
- **I recommend loosening both of these variables**
- Any particle flow object plotted in the red dotted lines is not considered an electron PFO
- Perhaps **change residual E/p to 0.4** and **change max profile discrepancy to 0.8**



```
electronGun_pT_0_50:
  Total matches: 7690
  E/p entries with 0.8 < E/p < 1.2: 56.5%

electronGun_pT_50_250:
  Total matches: 10841
  E/p entries with 0.8 < E/p < 1.2: 72.3%

electronGun_pT_250_1000:
  Total matches: 11882
  E/p entries with 0.8 < E/p < 1.2: 50.6%

electronGun_pT_1000_5000:
  Total matches: 1182
  E/p entries with 0.8 < E/p < 1.2: 32.8%
```

For the PFOs in each pT slice, which percent of them pass the max residual E/p cut?

# How to implement this

This is in PandoraSettingsDefault.xml, specifically **where the electron plugin is called in the steering files**

```
9      <!-- PLUGIN REGISTRATION -->
10     <!--ElectromagneticEnergyCorrectionPlugins>ECALClusterCorrection</ElectromagneticEnergyCorrectionPlugins-->
11     <!--HadronicEnergyCorrectionPlugins>NonLinearity</HadronicEnergyCorrectionPlugin-->
12     <HadronicEnergyCorrectionPlugins>SoftwareCompensation</HadronicEnergyCorrectionPlugins>
13     <EmShowerPlugin>LCEmShowerId</EmShowerPlugin>
14     <PhotonPlugin>LCPhotonId</PhotonPlugin>
15     <ElectronPlugin>LCElectronId</ElectronPlugin>
16     <MuonPlugin>LCMuonId</MuonPlugin>
17
18     <!-- PLUGIN SETTINGS -->
19     <LCMuonId>
20         <MinMuonTrackSegmentHitsCut>5</MinMuonTrackSegmentHitsCut>
21         <MuonRmsCut>15.625</MuonRmsCut>
22     </LCMuonId>
23
```

I suggest we add code like this under where we call **LCElectronID**:

```
<!-- PLUGIN SETTINGS -->

<LCElectronId>

    <MaxInnerLayer>4</MaxInnerLayer>

    <MaxEnergy>5.0</MaxEnergy>

    <MaxProfileStart>4.5</MaxProfileStart>

    <MaxProfileDiscrepancy>0.6</
MaxProfileDiscrepancy>

    <ProfileDiscrepancyForAutold>0.5</
ProfileDiscrepancyForAutold>

    <MaxResidualEOverP>0.2</MaxResidualEOverP>

</LCElectronId>
```

- I recommend **changing residual E/p to 0.4** and **change max profile discrepancy to 0.8**
- That could be done in the plugin settings if we add this under LCElectron ID