CNNs FOR ELECTRON IDENTIFICATION

EHEP Group Meeting

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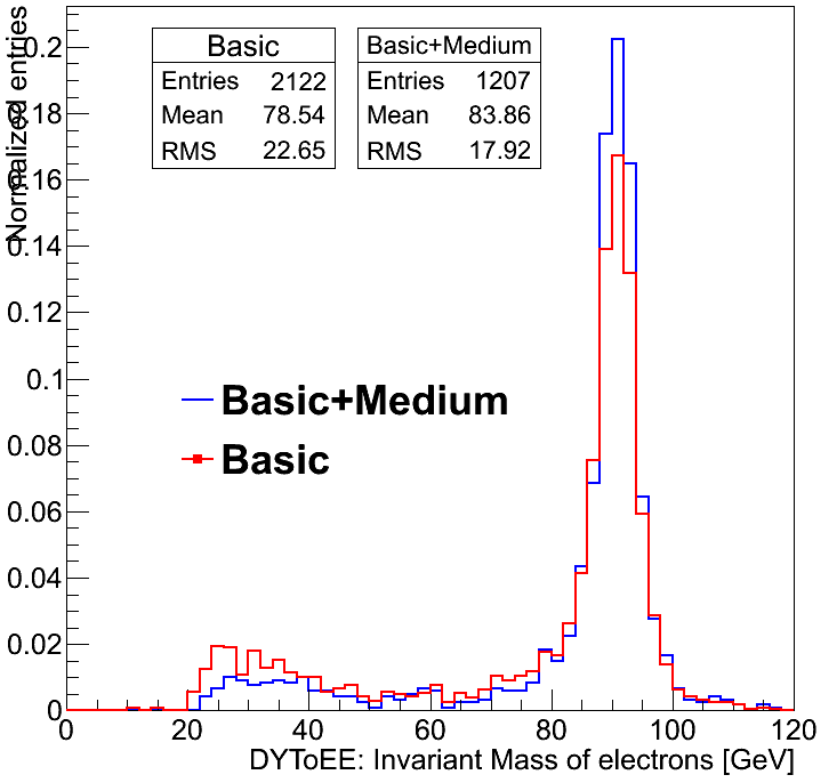
Objective

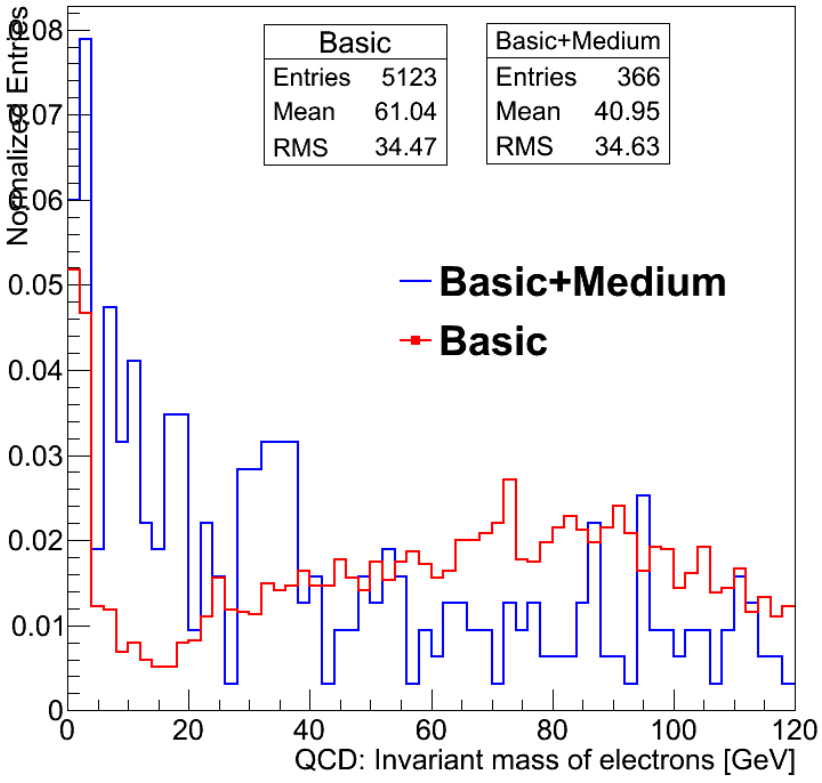
- **Aim:** To use CNN for classifying real and fake electrons.
- **Real:** Electrons from gauge boson decay (Z, W, new particles)
- **Fake:** Electrons from other sources such as jets.
- **Competitor:** Relative Isolation of electron
- **Input:** Image of calorimeter deposit around electron with dR<0.4
- **Samples used:**
  - Real: DYToEE at 8 TeV
  - Fake: QCD at 8 TeV
- **Selection:** Pt>10 GeV & |η|<2.4 & mediumID without isolation

Real vs Fake: Invariant Mass

Basic: Pt>10 GeV & |η|<2.4

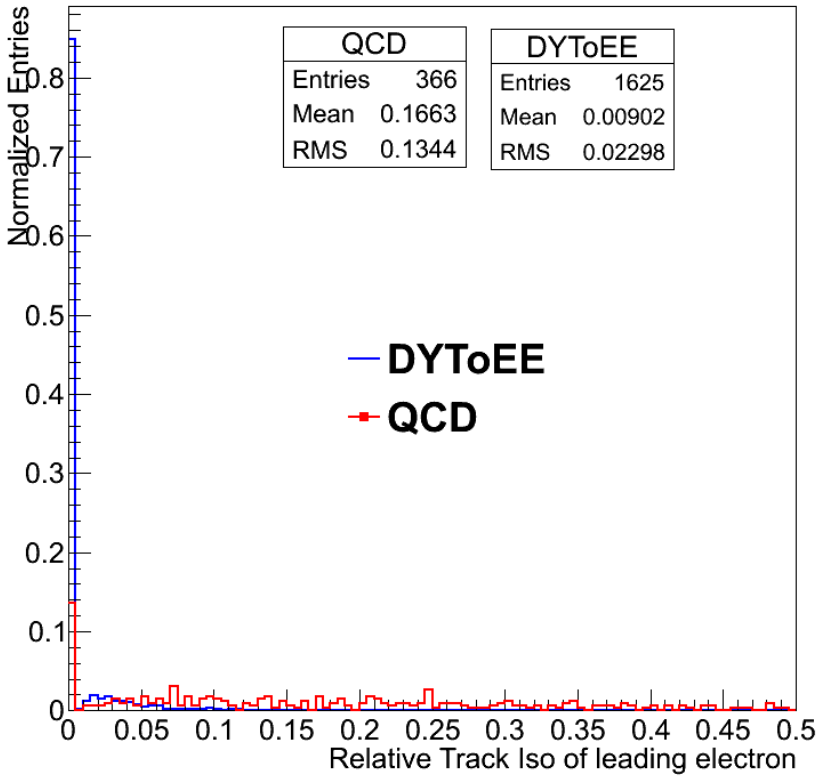
In DYToEE, electrons have Z as mother and so, the invariant mass of leading and subleading electron peaks about 91 GeV. This is not true in case of QCD.

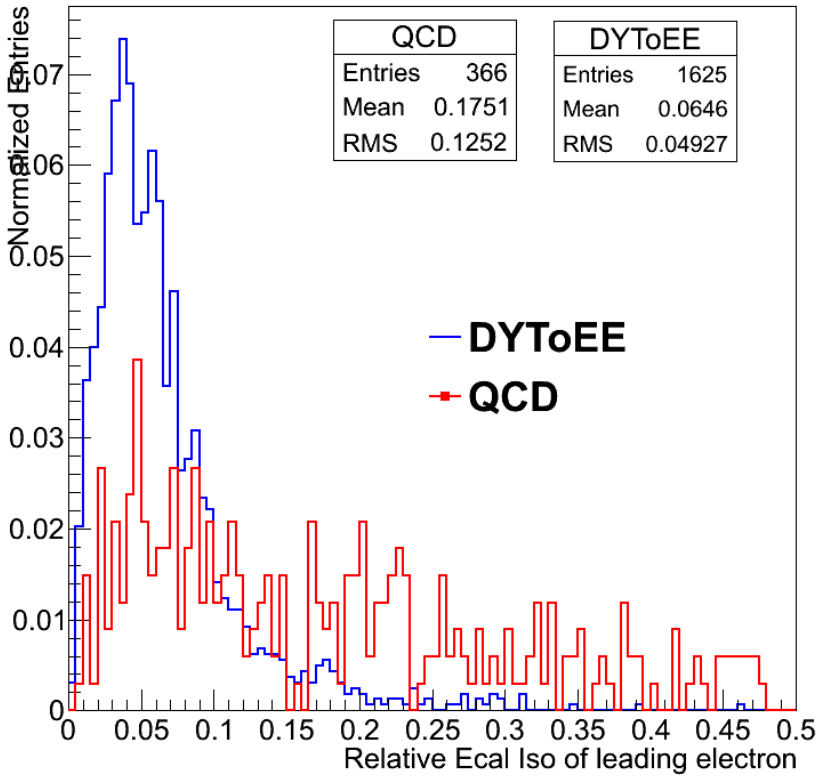




Real vs Fake: Relative Isolation

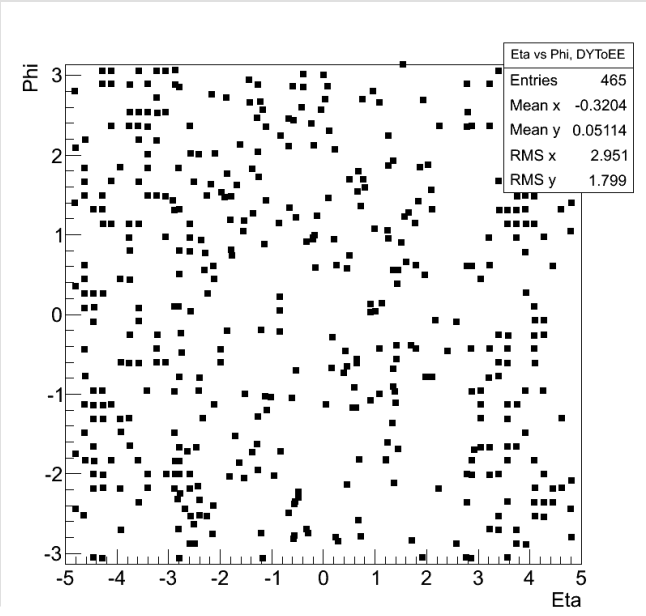
Track Iso: Isolation calculated at the vertex
Ecal Iso: Isolation calculated at the Ecal

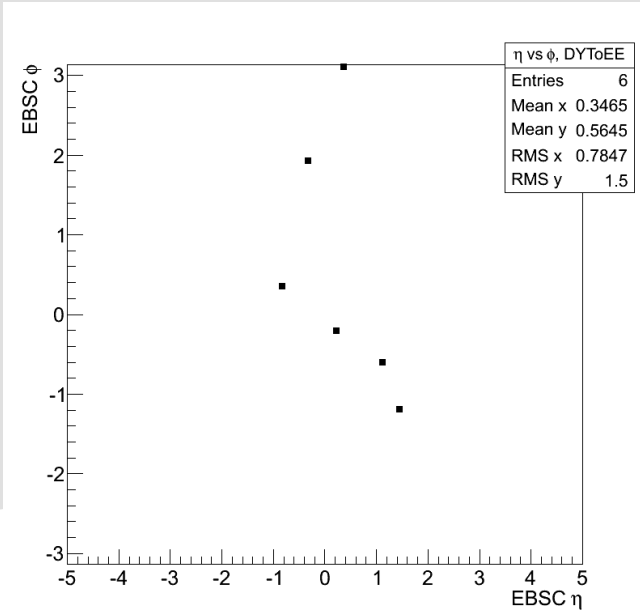


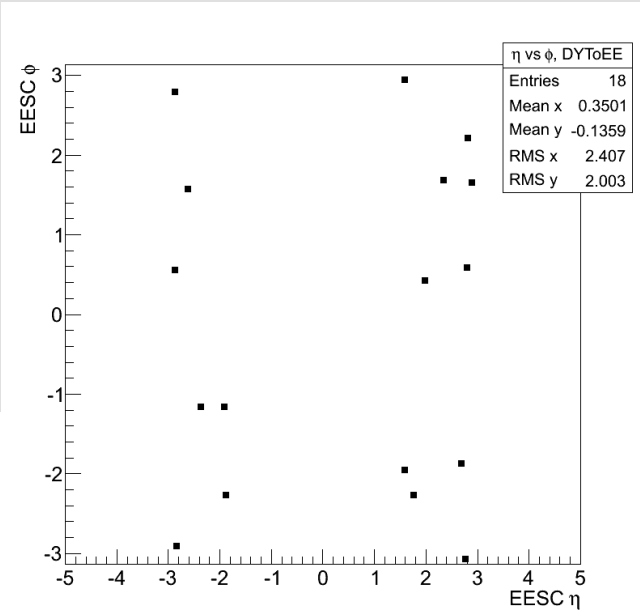


CaloTowers & SuperClusters

CaloTowers are the individual energy deposits recorded by calorimeters.
SuperClusters are formed by combination of CaloTowers.

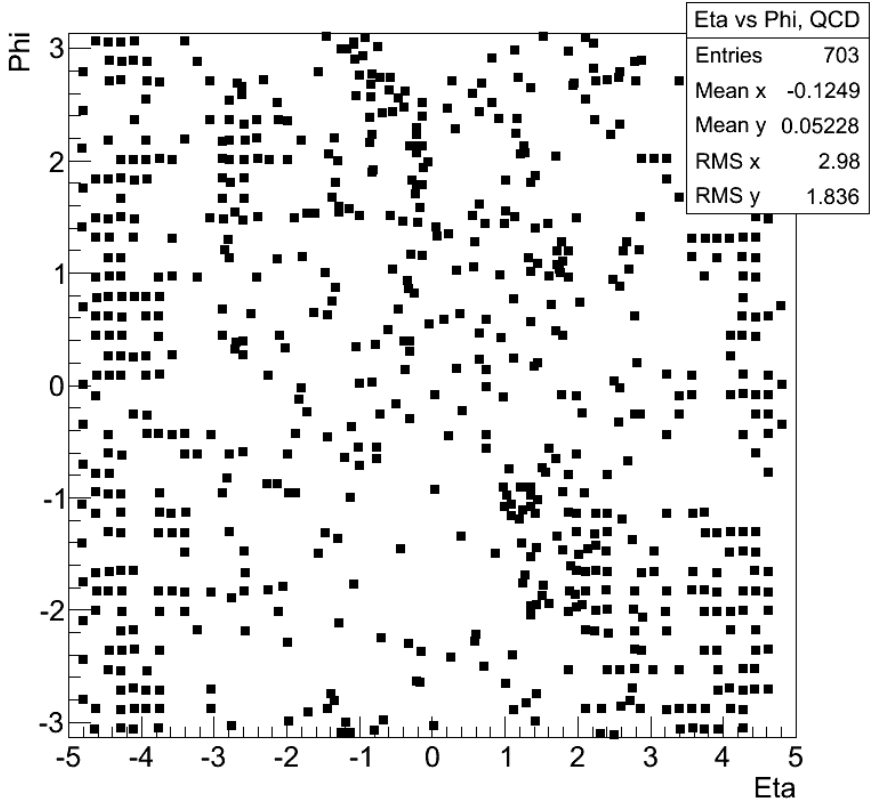


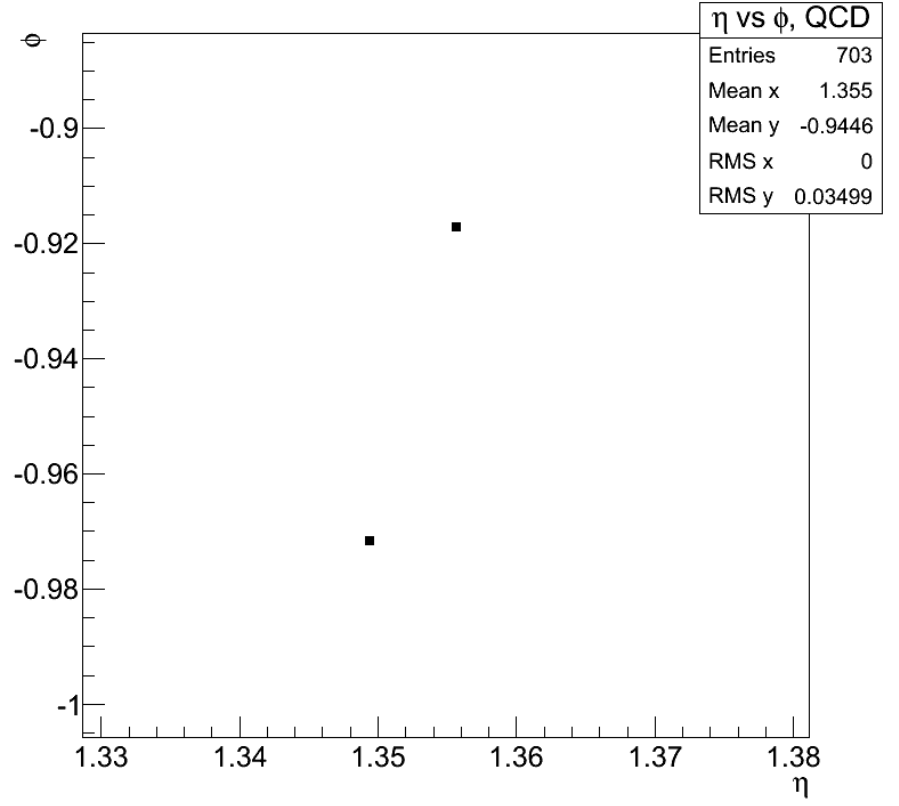




QCD & Zoomed CaloTowers

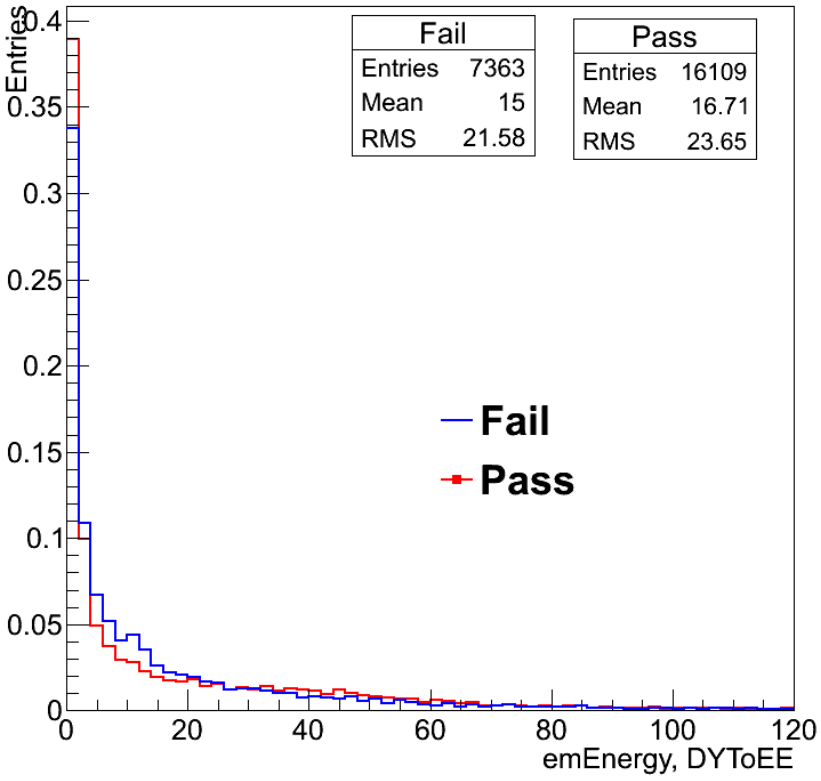
Size: 0.0174x0.0174. In the figure on the right hand, we have zoomed into the cluster at (η,ϕ) ~ (1,-1)

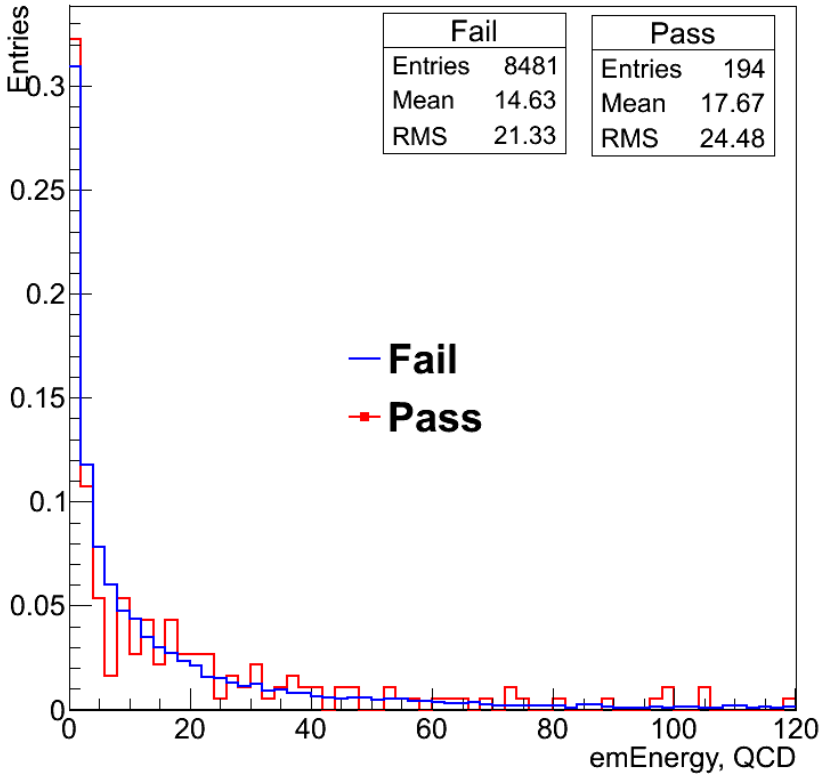




CaloTowers' emEnergy

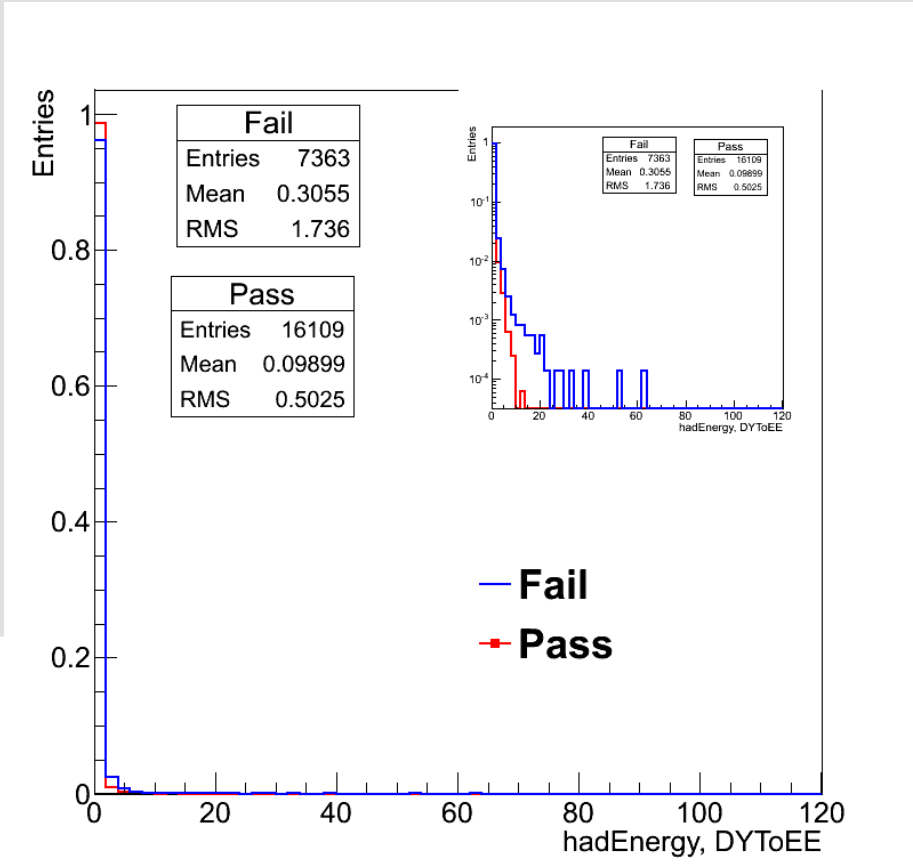
Energy deposited by Calotowers in Ecal
Pass in QCD has some entries at higher energy as well

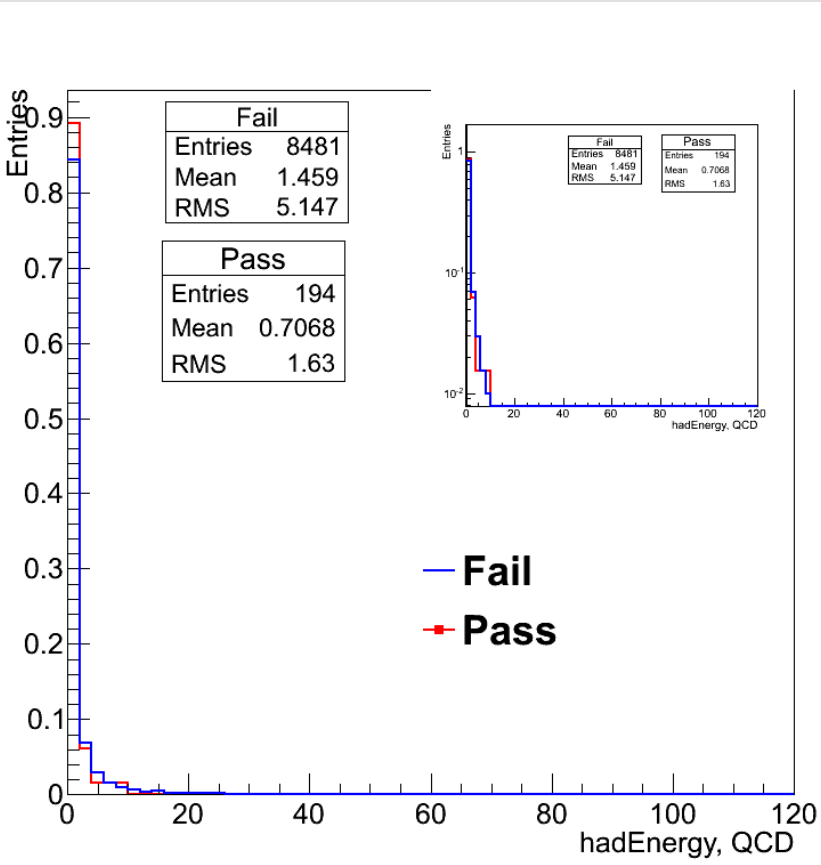




CaloTowers' hadEnergy

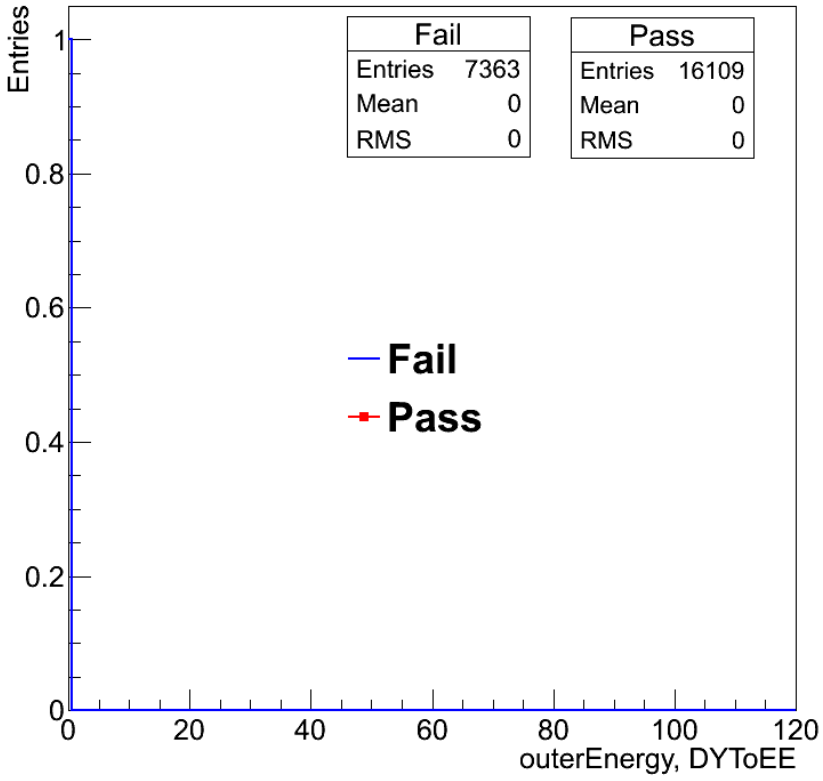
Energy deposited by Calotowers in Hcal
Again, pass in QCD has entries at higher energy than that of pass in DYToEE

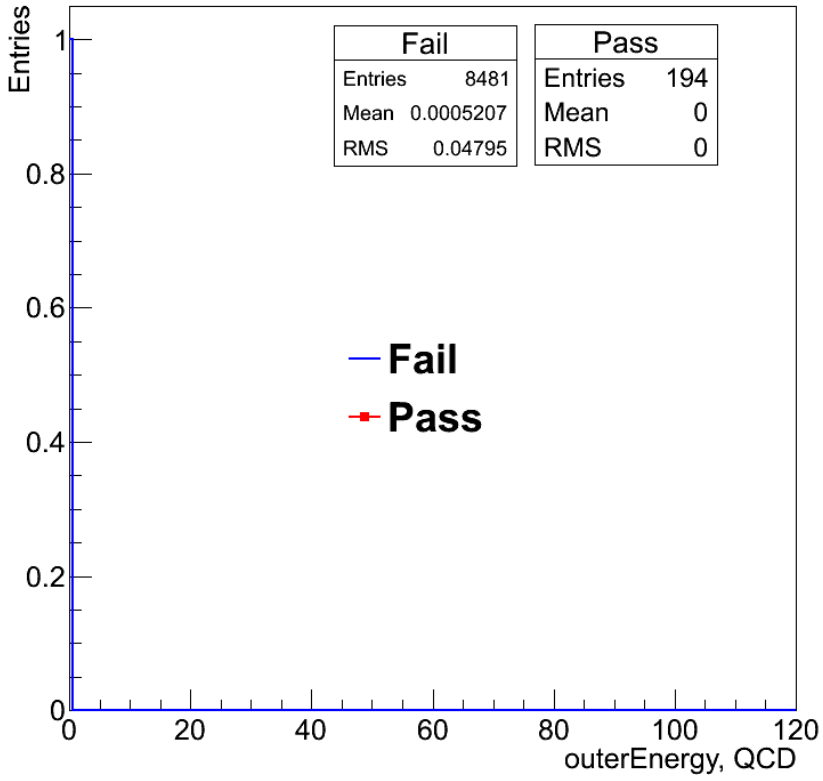




CaloTowers' outerEnergy

Energy deposited by Calotowers in Outercal
Outercal is located just behind the Hcal





Total Energy One Channel Image