The University Of Sheffield.

H->γγ with EventView

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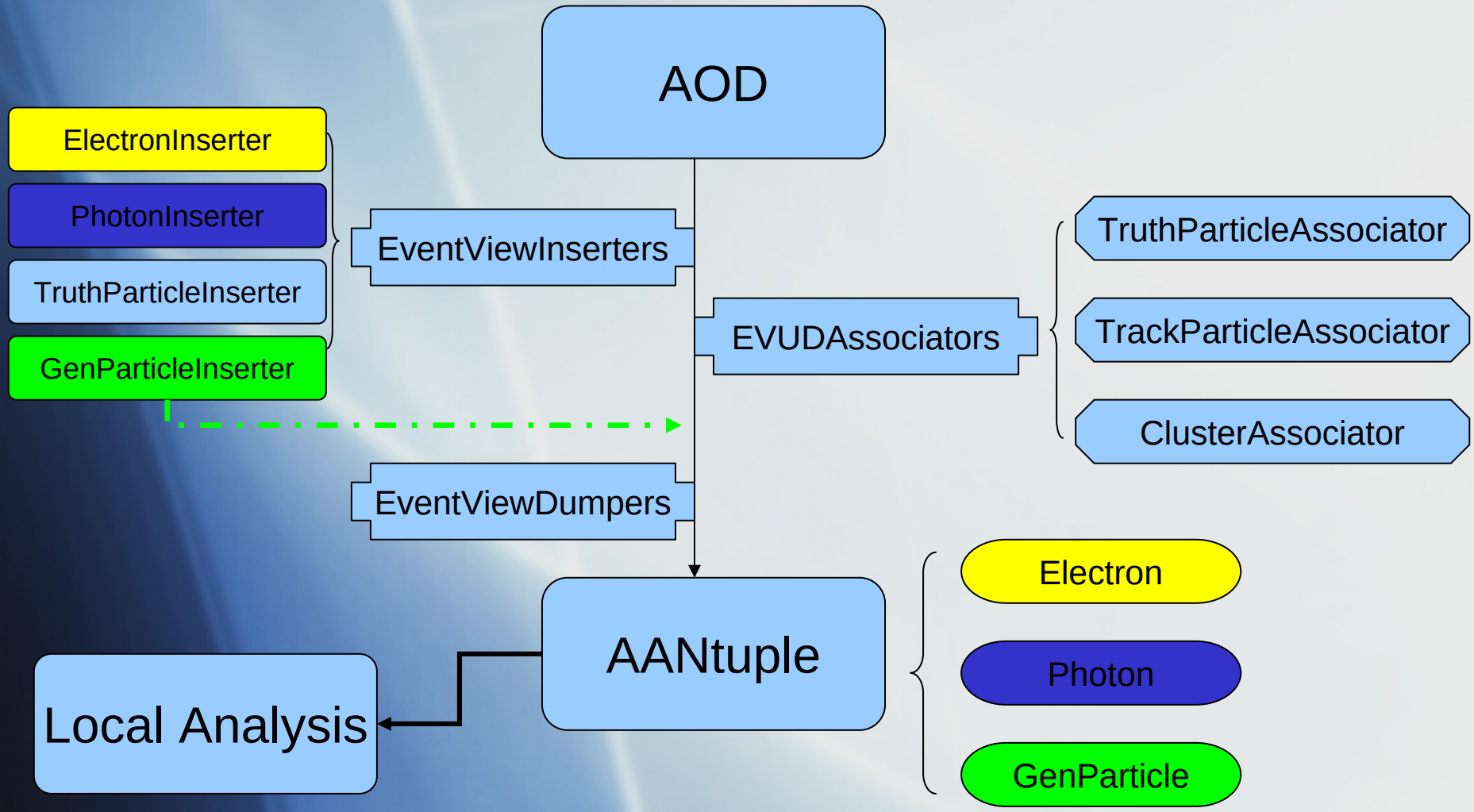
Outline:

- Very first attempt to perform a Higgs->γγ analysis in EventView
  - Experience using the tools
  - Studying “Electron” and “Photon” objects, the info inserted in the EventView and identifying the parts that are currently missing.
  - Giving feedback to developers
- Currently we are only looking at photons, electrons, conversions and shower-shape variables
  - Comparison with CTB whenever possible (not shown here)

EventView


AOD
ElectronInserter
PhotonInserter
TruthParticleInserter
GenParticleInserter
EventViewInserters
EVUDAssociators
TruthParticleAssociator
TrackParticleAssociator
ClusterAssociator
EventViewDumpers
AANtuple
Electron
Photon
GenParticle
Local Analysis

MC Samples and e/γ definitions

- Samples: CSC 11.0.41 mc11.003047.H3_120_gamgam.recon.AOD.v11004101
- Detector Geometry Description: DC3-02
- Filter: 2Photons, p_T >20GeV, |η|<2.7

Electron:

- Egamma 5x5 cluster
- A track matched
- E/P>0.7

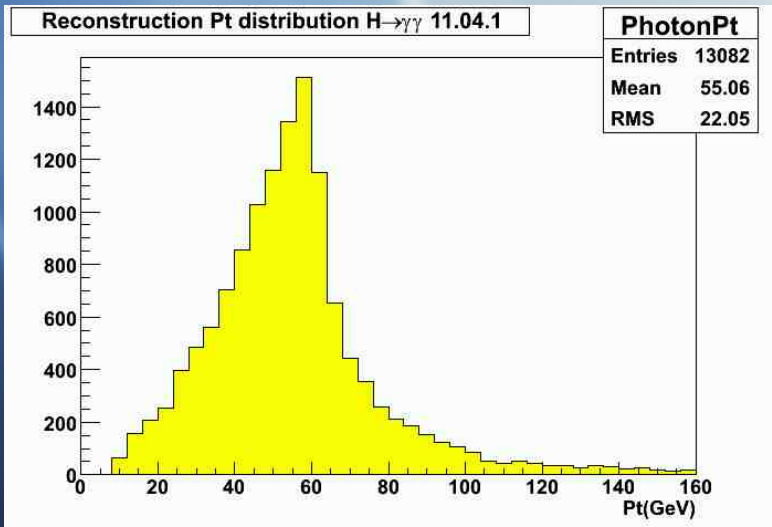
Photon:

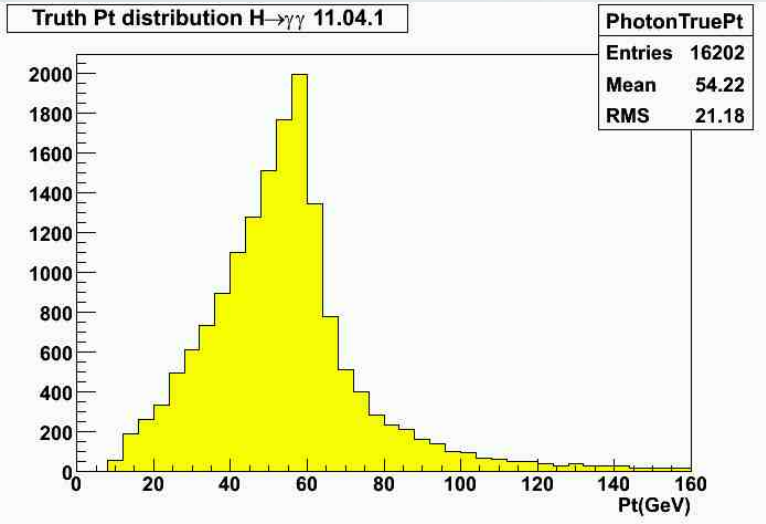
- Egamma 5x5 cluster
- No track matched
- Hadronic leakage < 0.2

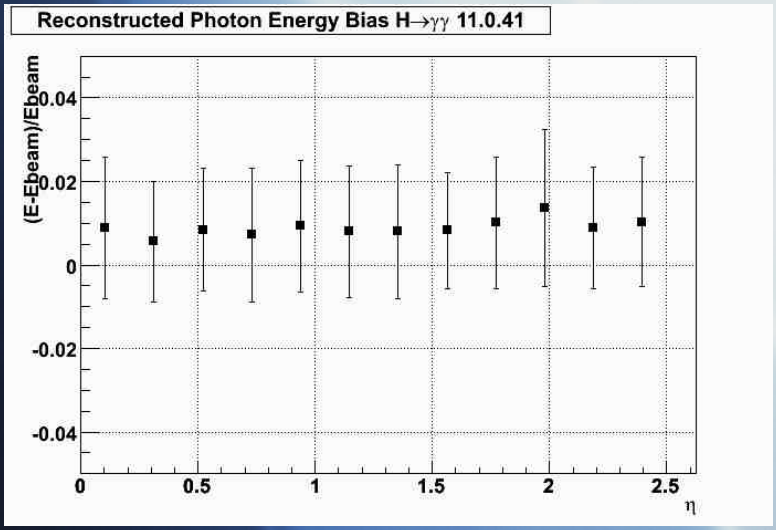
Photon	Total	Two Photon Events	Single Photon Events	No Photons Events	One Photon |η|>2.5	Photon reconstructed as Electron
Events	9700	4620	3806	1274	2610	2116

Electron	Total	Two Electron Events	Single Electron Events	No Electron Events
Events	9700	346	2689	7011

Photon energy bias

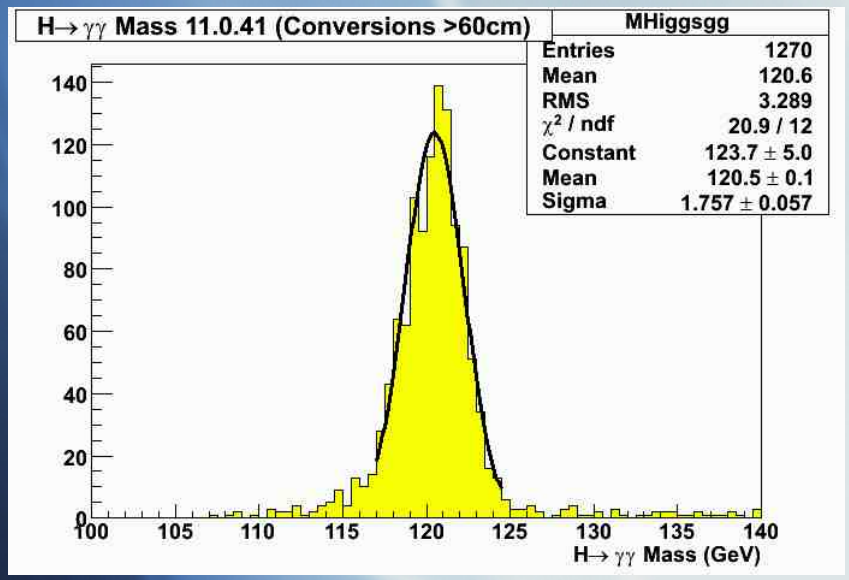


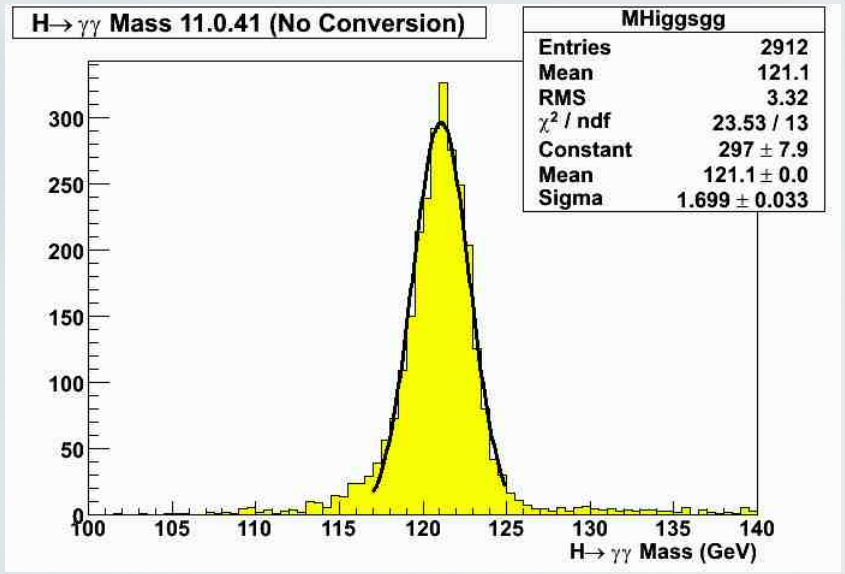




* Reconstructed photon energy is approximately 1% higher than true photon energy.

Higgs mass reconstruction



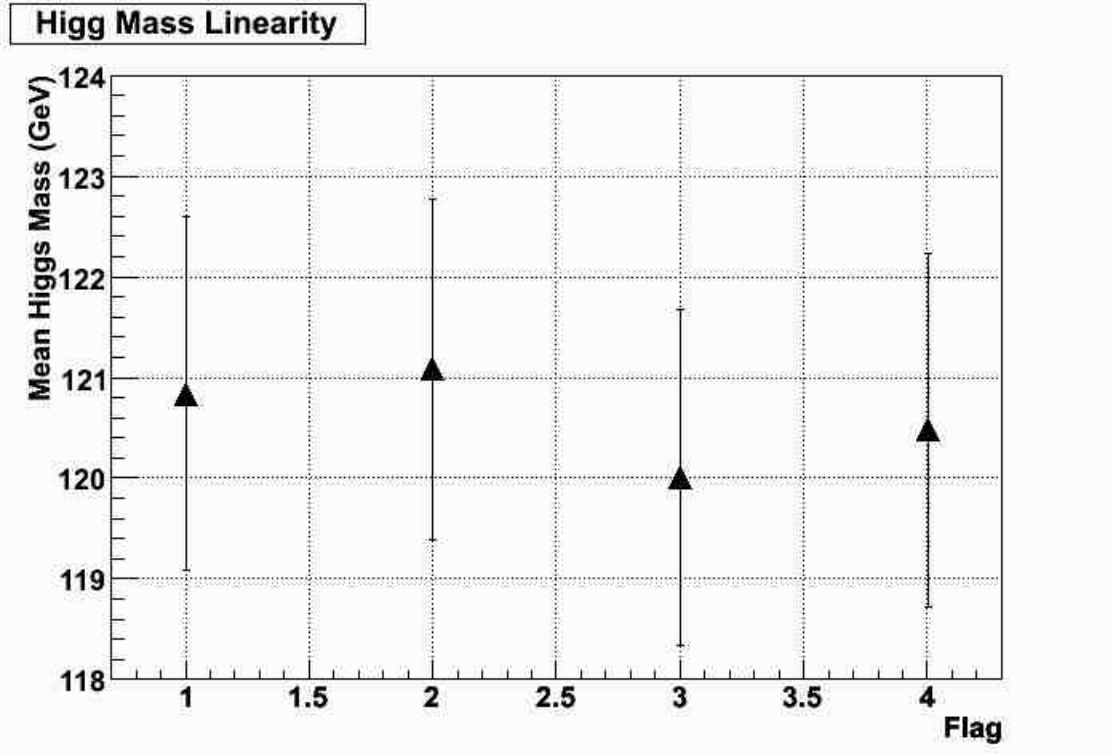


- Only photon pairs are used to reconstruct the Higgs mass.
- Only if an associated photon decays, its decay vertex is retrieved (conversion radius).

Limitations:

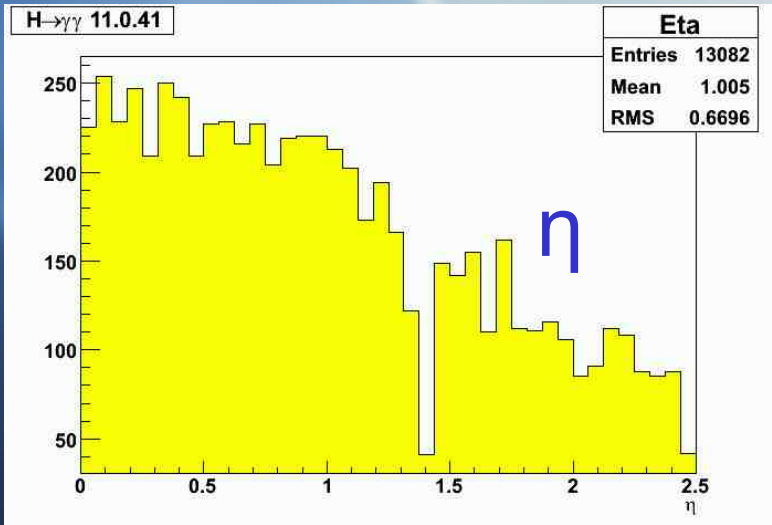
1. Some converted photons may be reconstructed as electrons and their contributions are not included (to be studied)
2. TruthPaticleAssociator only checks the deltaR match (0.1) so sometimes it fails

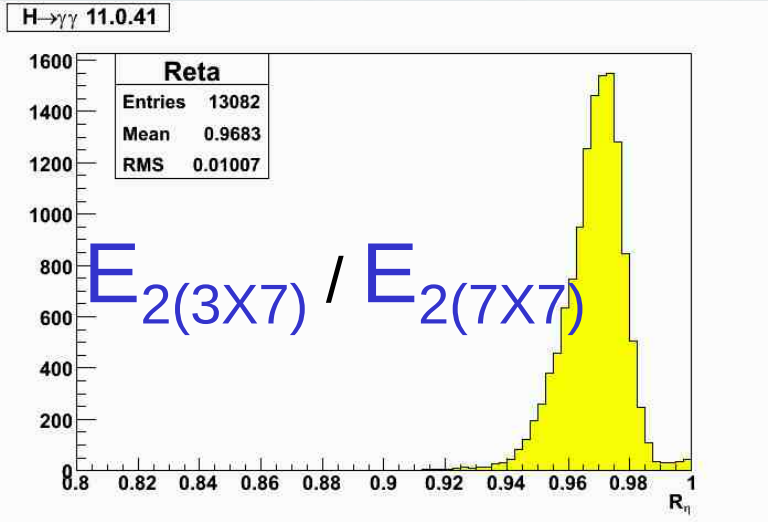
Higgs Mass Resolution/Scale

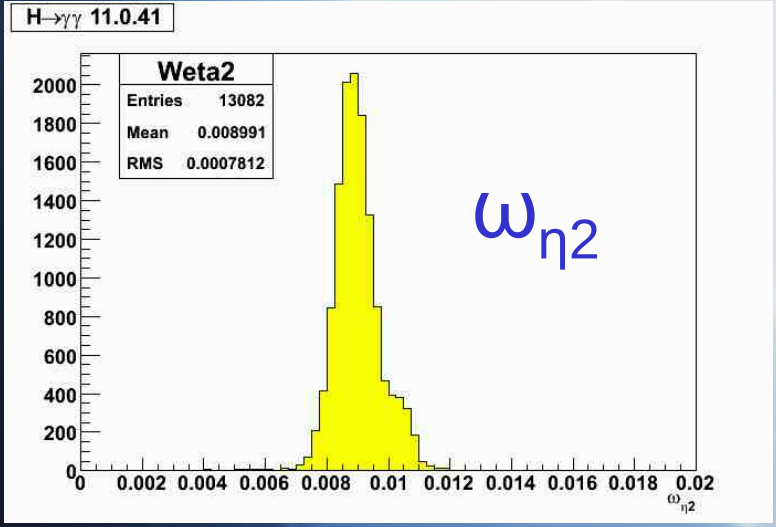


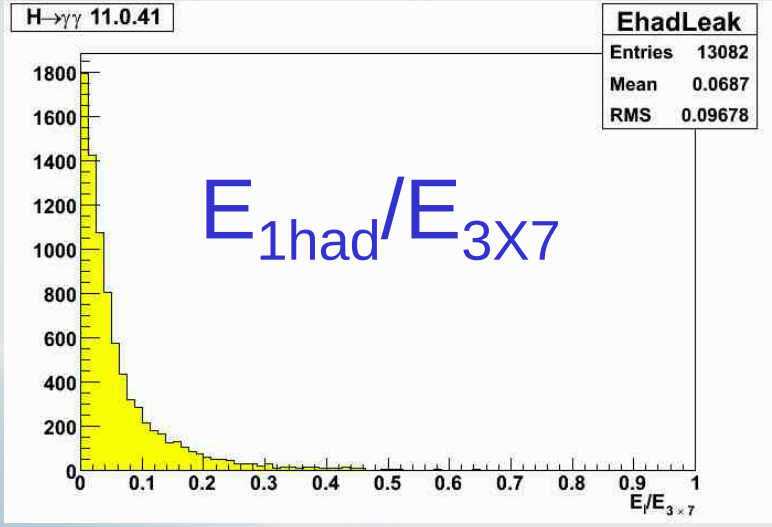
1. All events
2. Non-converted photon events
3. Events with at least one “early” converted (Rcon<60cm) photon
4. Events with at least one “late” converted (Rcon>60cm) photon

Shower Shape Variables I

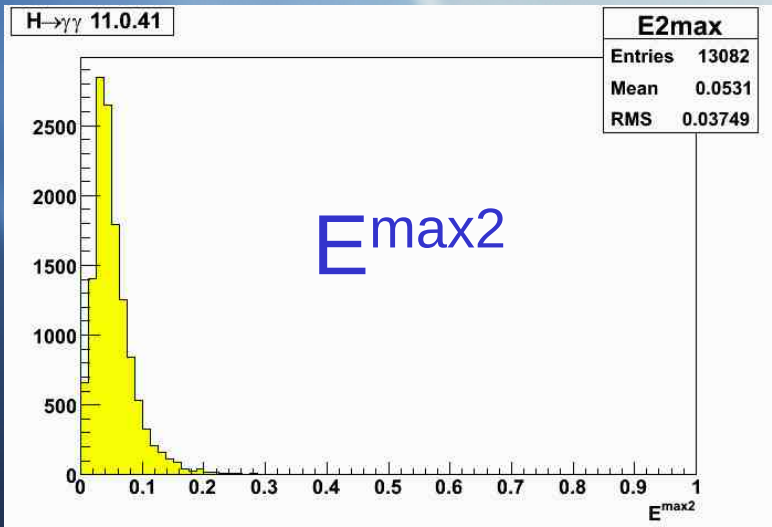


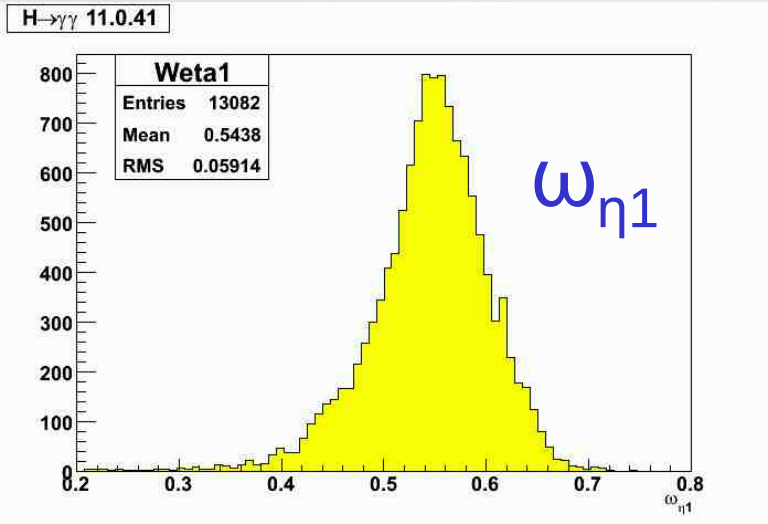


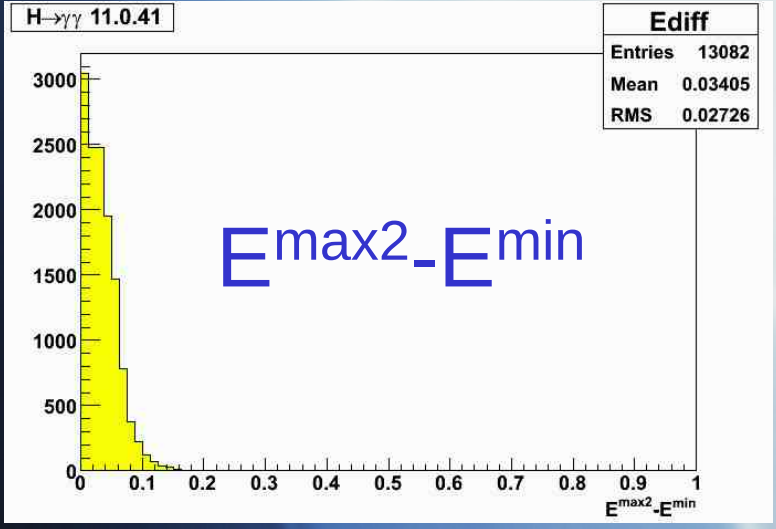


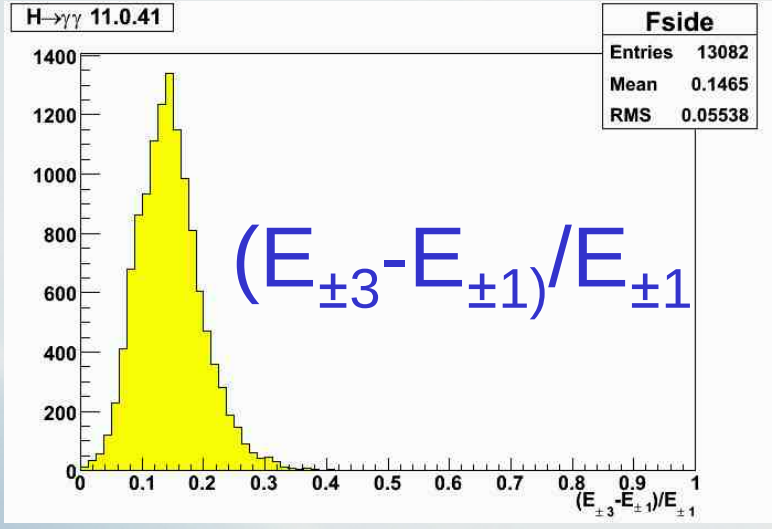


Shower Shape Variables II









Summary:

- First steps towards an EventView based analysis.
  - Electron (soft/egamma), Photon insterters are being improved in 12.0.x.
  - New tools are being introduced that ease the analysis.
  - Certain variables are still inserted “by hand” from the AODs and it is important to try to perform the analysis to see what is missing.
- Performed a study of Higgs resolution vs conversion radius using calorimeter only (preliminary):
  - Late conversions give similar resolution to Higgs from non-converted photons
- Will continue studying conversions and photon calibration