H->2Photon with EventView

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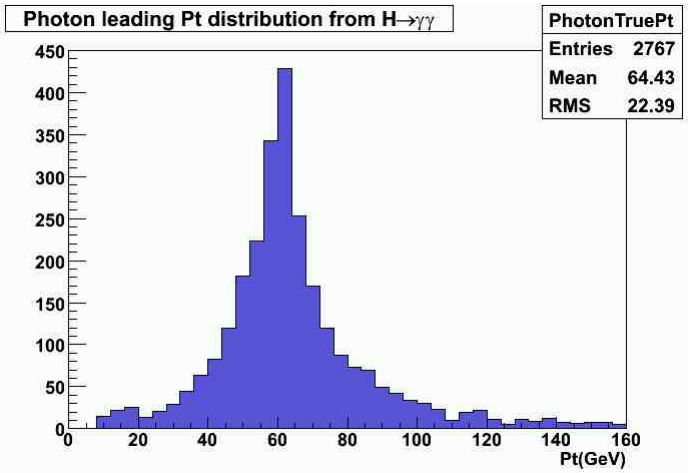
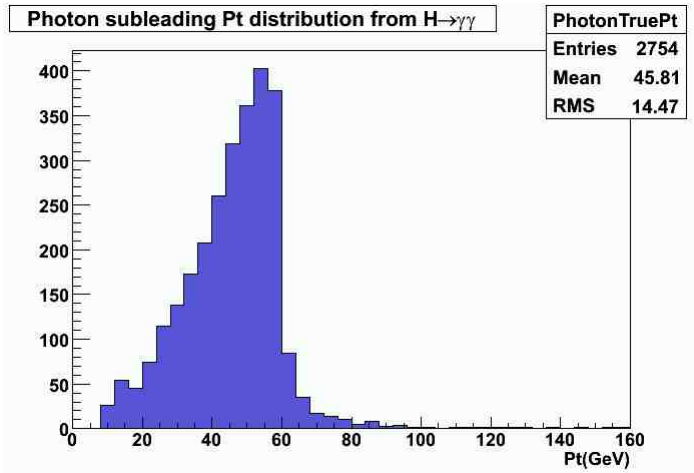
Particle Preselection with EventView

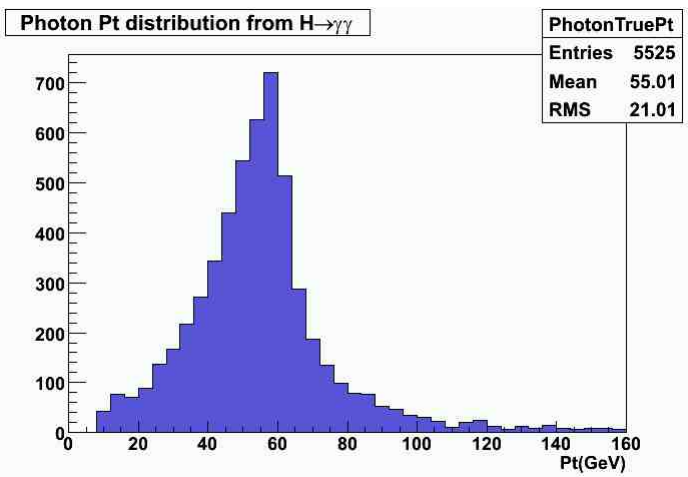
```
defaultEVAlg.EVElectronInserter.ContainerKey="ElectronCollection"
defaultEVAlg.EVElectronInserter.etCut=7*GeV
defaultEVAlg.EVElectronInserter.onlyEgamma=False
defaultEVAlg.EVElectronInserter.useIsEM=False
defaultEVAlg.EVElectronInserter.useTRT=False
defaultEVAlg.EVElectronInserter.useNN=False
defaultEVAlg.EVElectronInserter.nnCut=.7
defaultEVAlg.EVElectronInserter.useIsolation=False
defaultEVAlg.EVElectronInserter.isolationCone=0.45 # in deltaR
defaultEVAlg.EVElectronInserter.absoluteIsolationCut=15*GeV
defaultEVAlg.EVElectronInserter.deltaRCut=.1
defaultEVAlg.EVElectronInserter.OutputLevel=WARNING

defaultEVAlg.EVPhotonInserter.ContainerKey="PhotonCollection"
defaultEVAlg.EVPhotonInserter.etCut=7*GeV
defaultEVAlg.EVPhotonInserter.OutputLevel=WARNING
```

TruthParticleAssociator & ParticleToClusterAssociator are used to retrieve truth and cluster (5X5 by default) information.

True Photon Pt Distribution (Association)

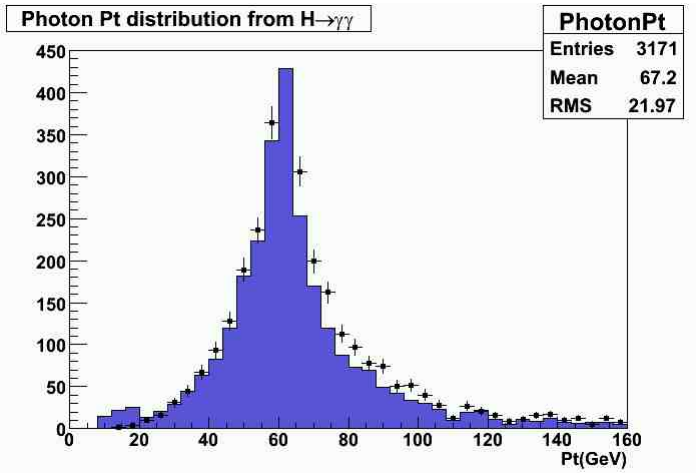


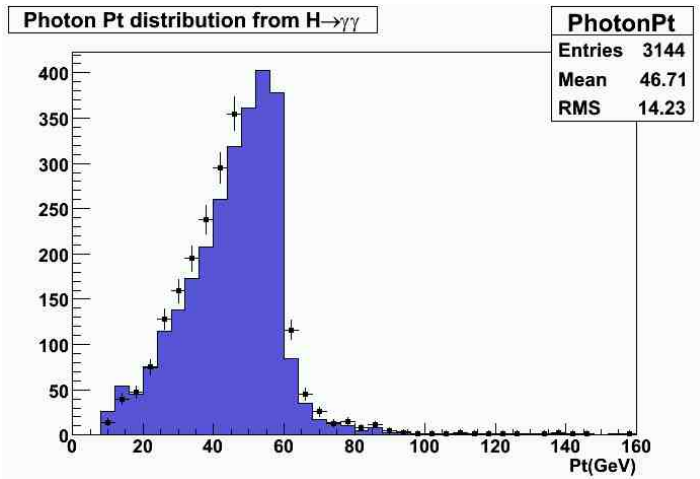


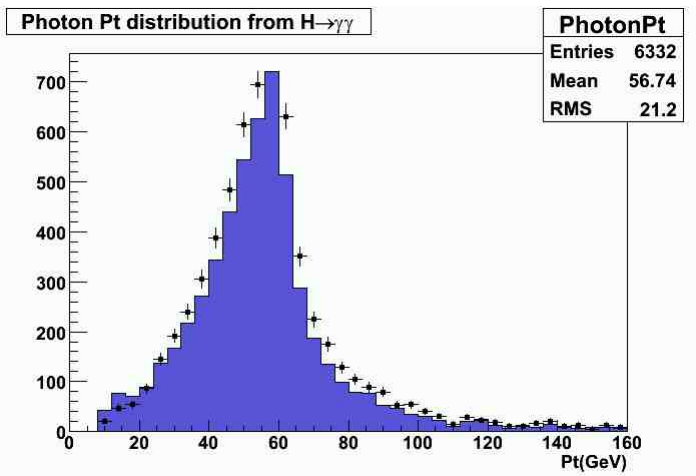


*In simulation, PtCut=20*GeV was applied on photons from H->gg events.

Reconstructed Photon Pt Distribution

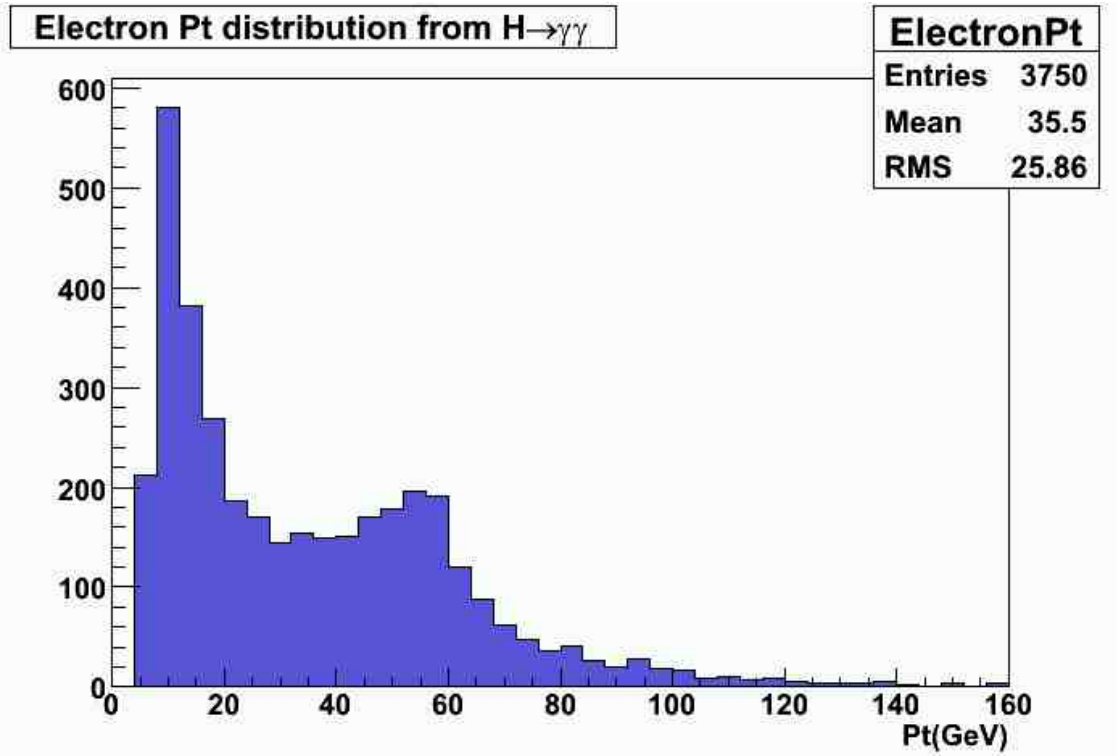






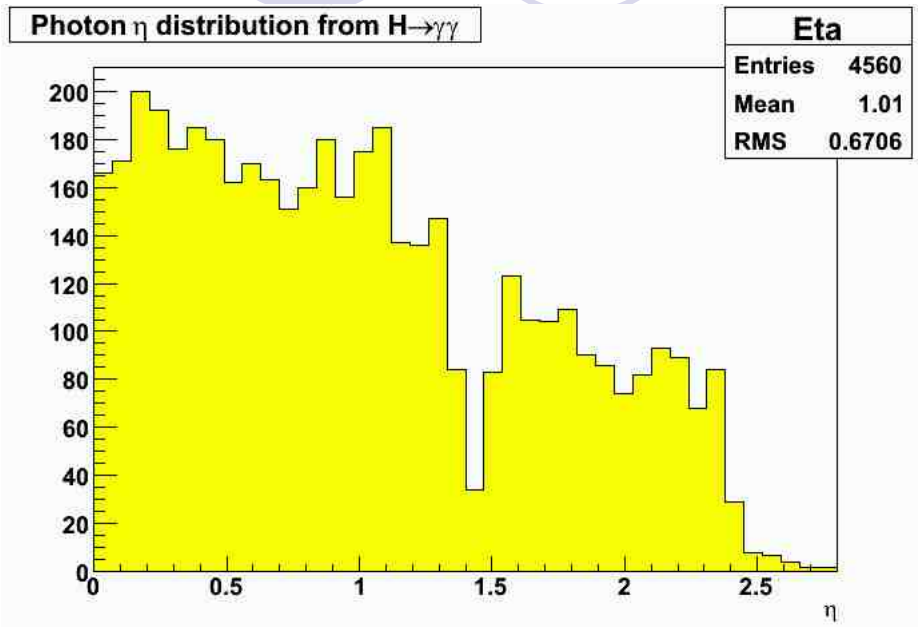
1. TruthParticleAssociator may return wrong particle because of the simple DeltR match.
2. TruthParticleAssociator some times failed.

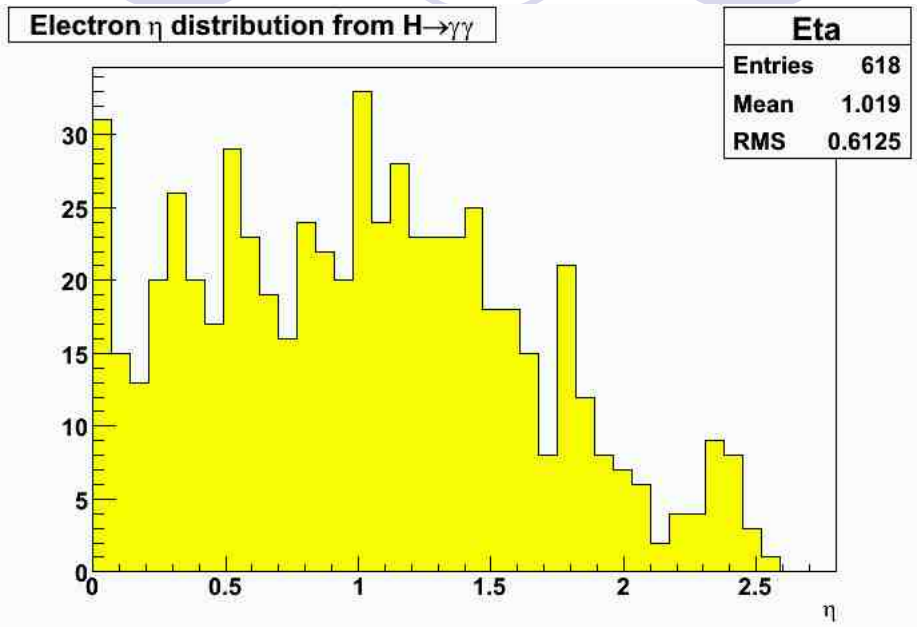
Reconstructed Electron Pt Distribution



1. No true electron Pt distributions to show
2. Details of the reconstructed “Electron” require further research.

Eta Distribution





The electron eta distribution is confusing!

Table I (Events type)

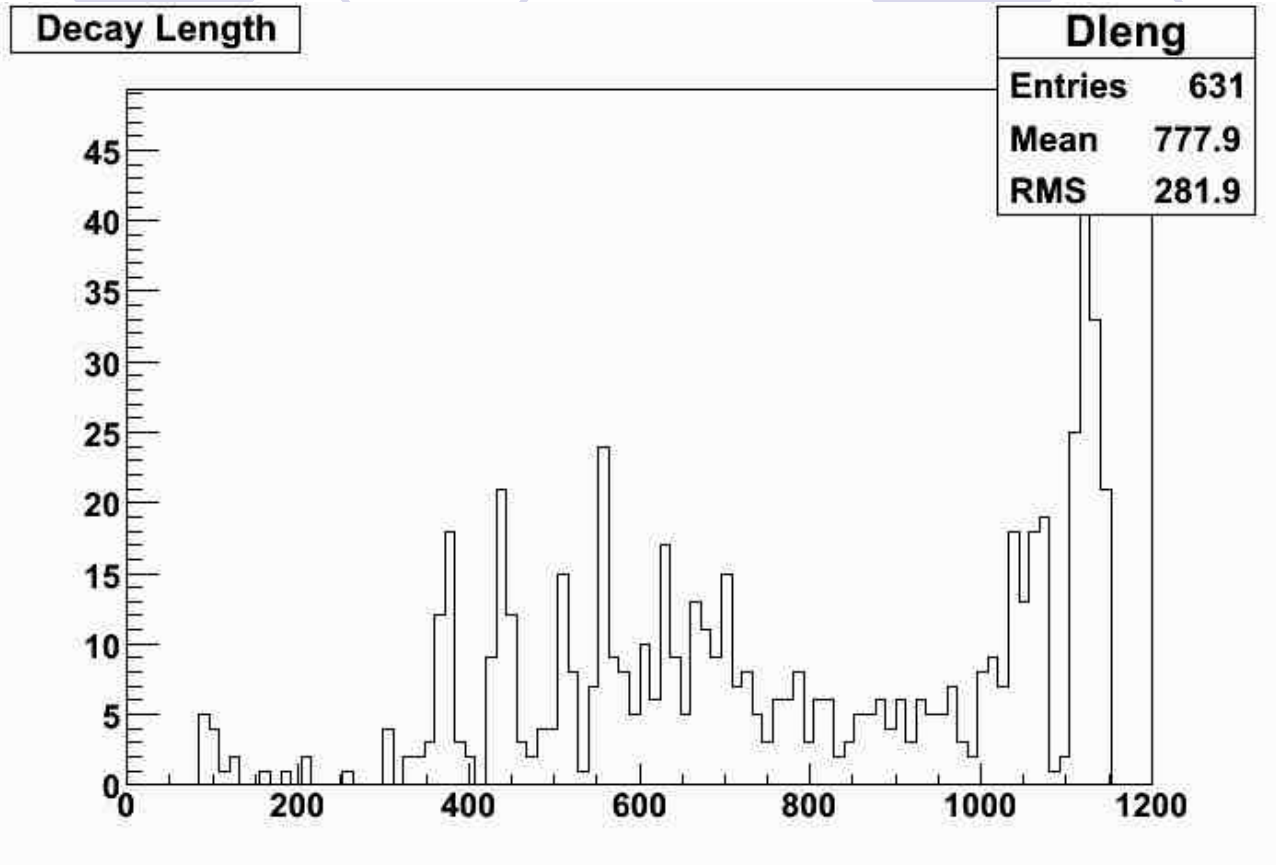
	No Photons	No Electrons	Photons (≥1)	Electrons (≥ 1)	Photons (≥ 2)	Electrons (≥2)	Photons(≥1)& Electrons(≥1)
Events	892	4222	5808	2478	3171	769	1586

Total Events: 6700

Total Reconstructed Photons: 9909

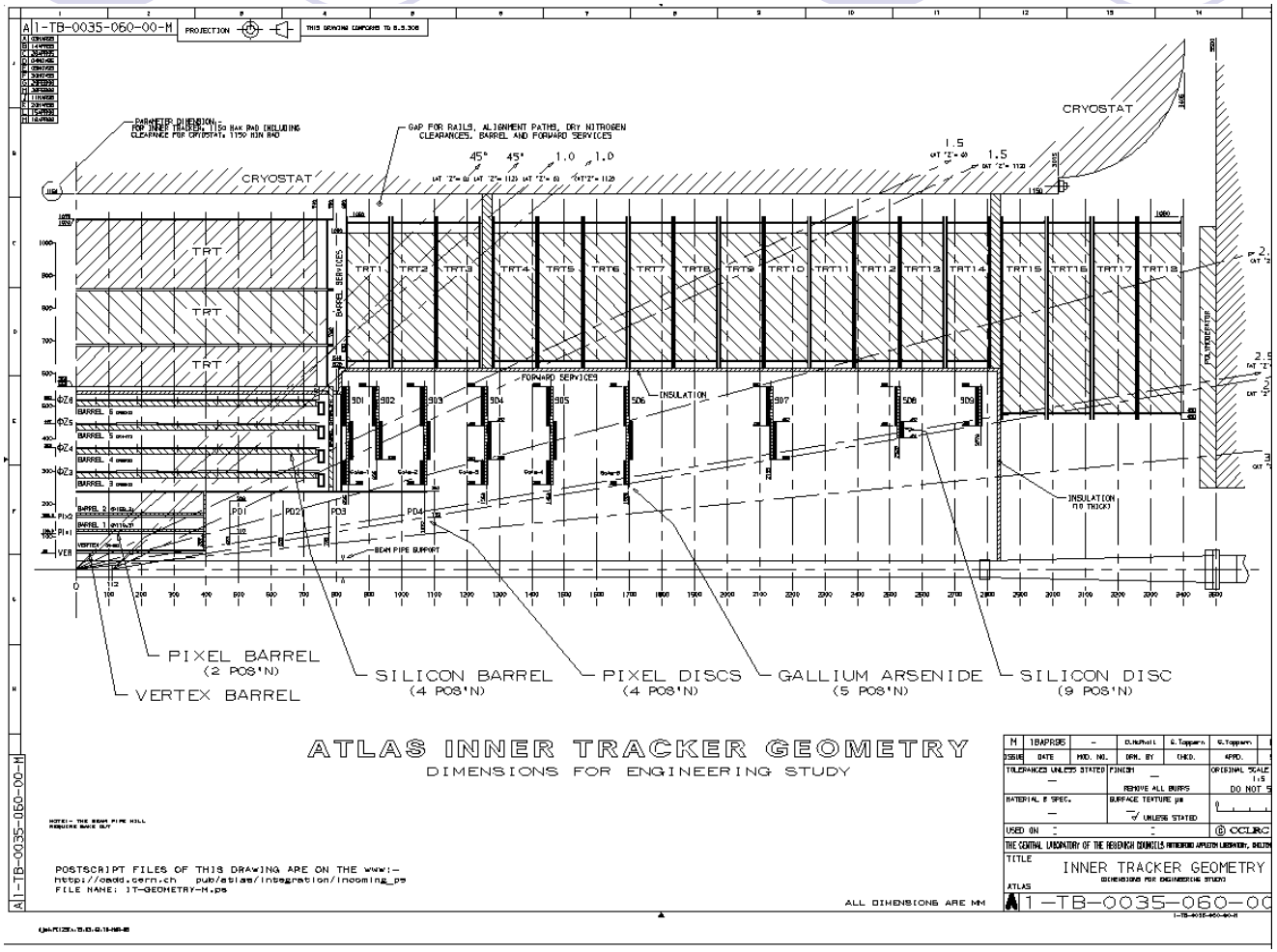
Total Reconstructed Electrons: 7972

Conversion Radius

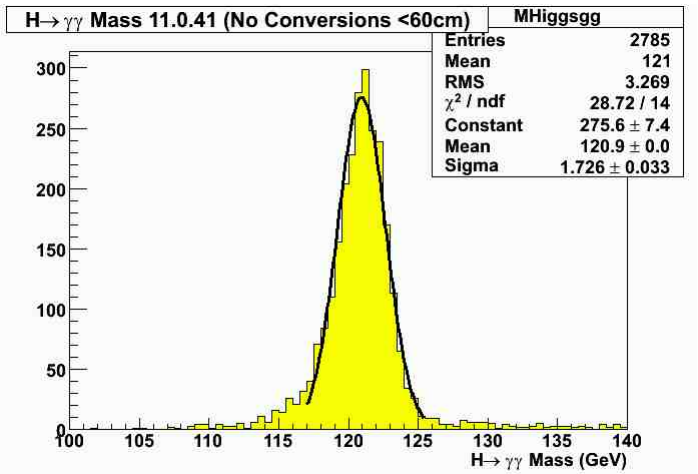


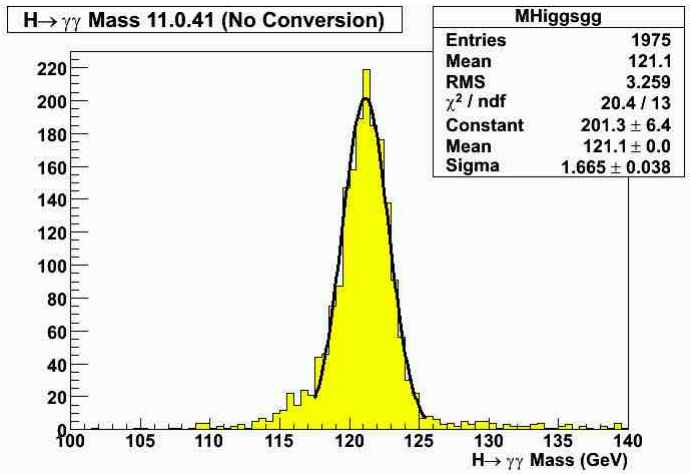
Conversion radius is retrieved based on TruthParitcleAssociator.

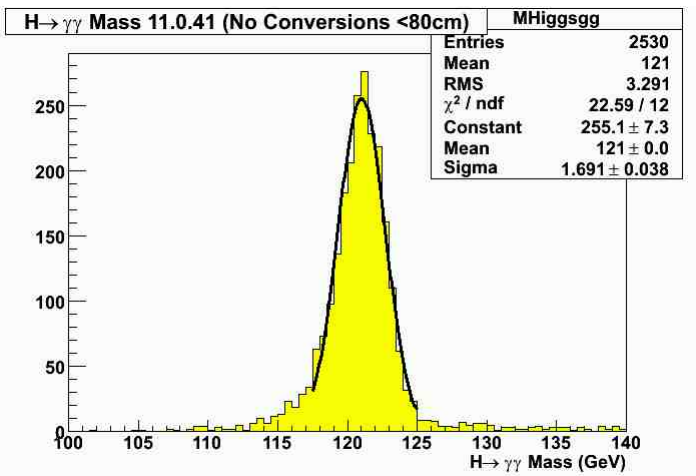
Geometry of Inner Detector



Higgs Mass (No-Conversion)

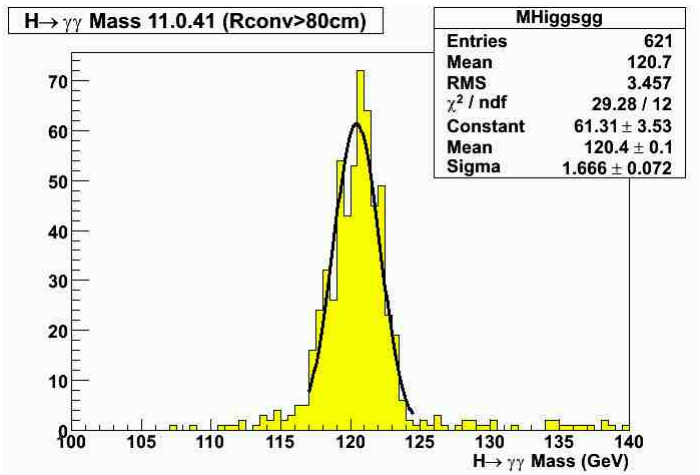


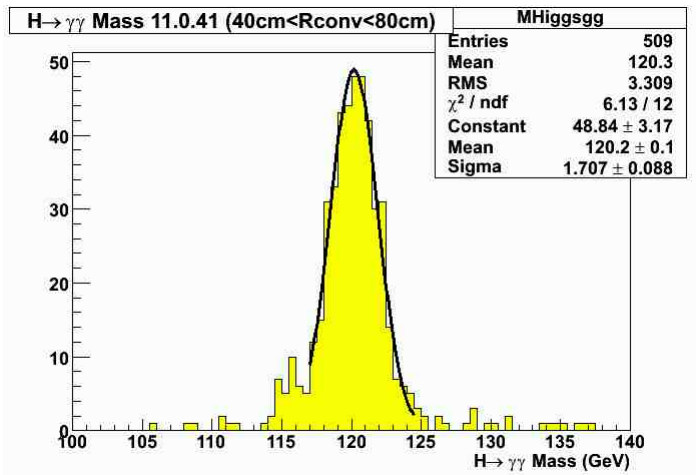


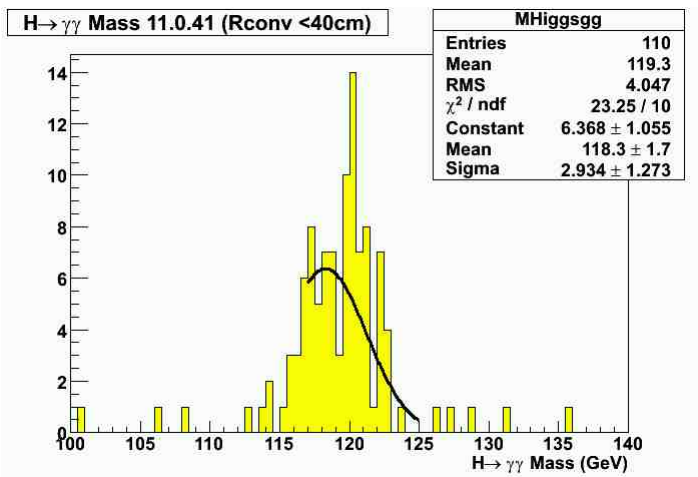


Higgs mass are reconstructed only with photon pair.

Higgs Mass (Conversion)

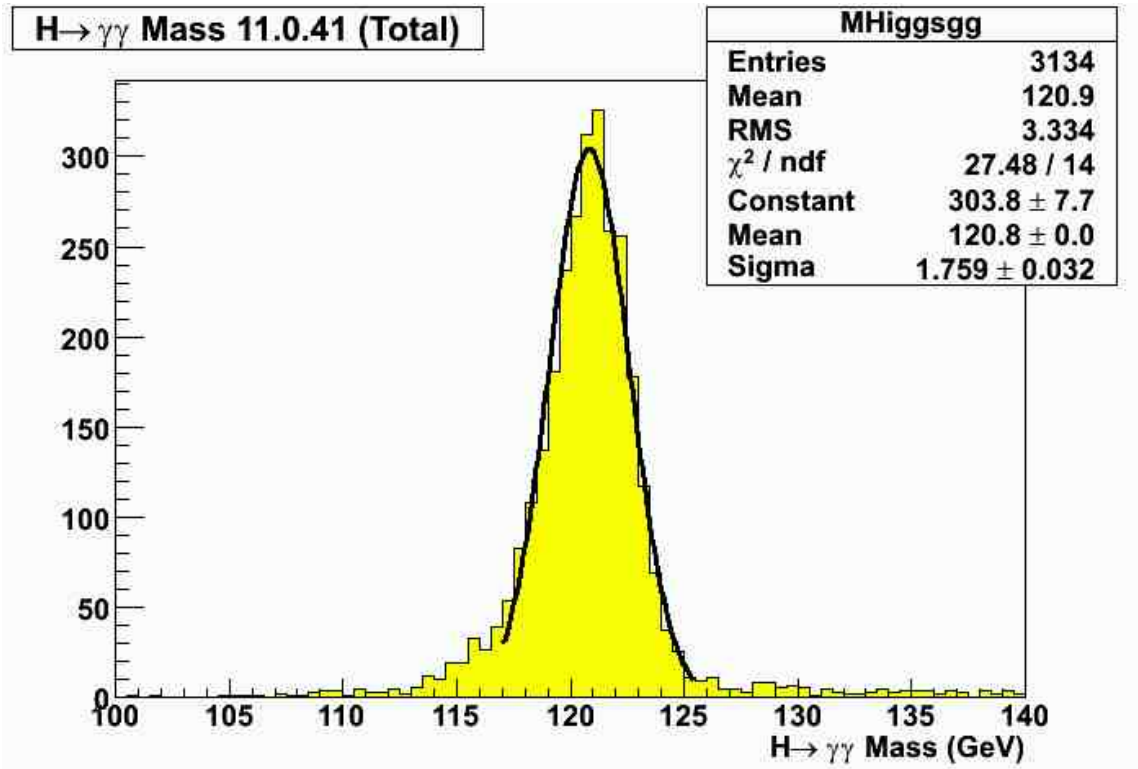






More events are required to compare Higgs mass resolution at different conversion radius.

Higgs Mass (Total)



The reconstructed Higgs mass slightly shifted from 120GeV.

Table II (Higgs Mass Resolution)

	No Rconv < 60cm	No Rconv < 80cm	No Rconv	*Rconv < 40cm	40cm < Rconv < 80cm	Rconv > 80cm	Total
Mean (GeV)	121	121	121.1	119.3	120.3	120.7	120.9
RMS	3.269	3.291	3.259	4.047	3.309	3.457	3.334
Sigma	1.726	1.691	1.665	2.937	1.707	1.666	1.759

*Not enough statistics

Conclusion

- EventView makes the preslection and overlap removal of particles much easier.
- Reconstructed Higgs mass is slightly higher than the truth due to the shifted reconstructed photon energy.
- Conversions in the inner detector don’t obviously affect the Higgs mass resolution.

Future Plan

- Further research on the reconstructed “Electron” using the new GenParticleInserter
- Higgs mass resolution at different conversion radius in detail (more events)
- Check the photon/Higgs efficiencies of different cuts based on shower shape
- Check the photon efficiencies of different cuts based on shower shape using CTB data