Status report:
Electron trigger efficiencies from Z->ee events.

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Determining the trigger efficiency:

1.Monte Carlo:

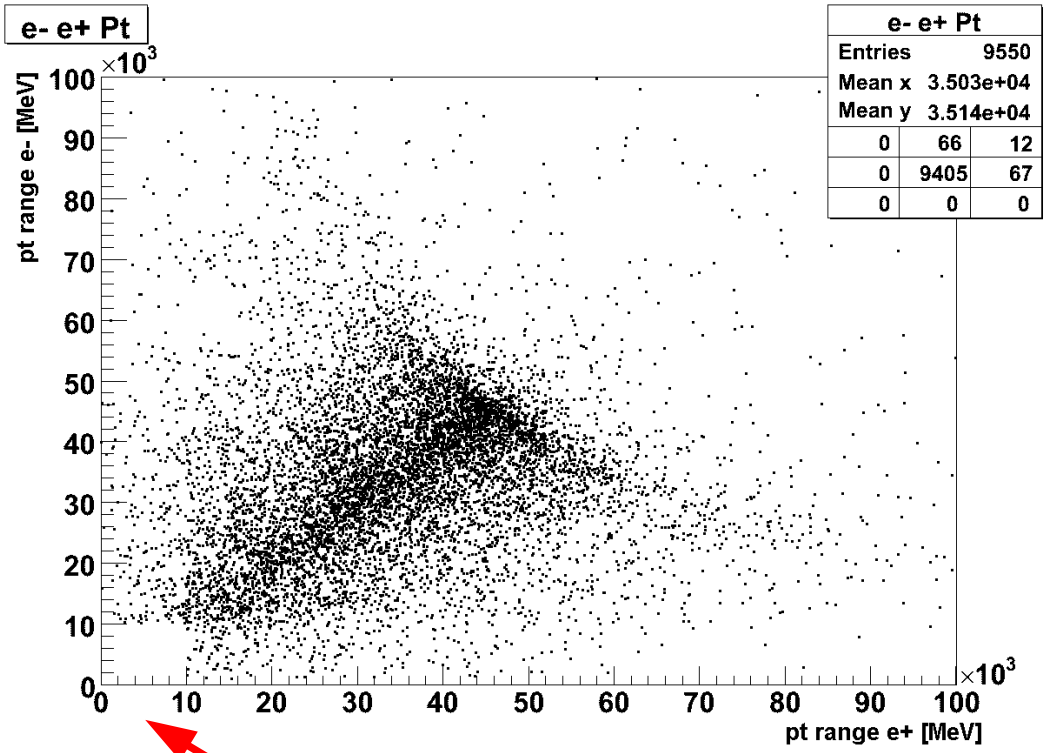
-Trigger simulation.
-Use truth information to estimate the efficiency.

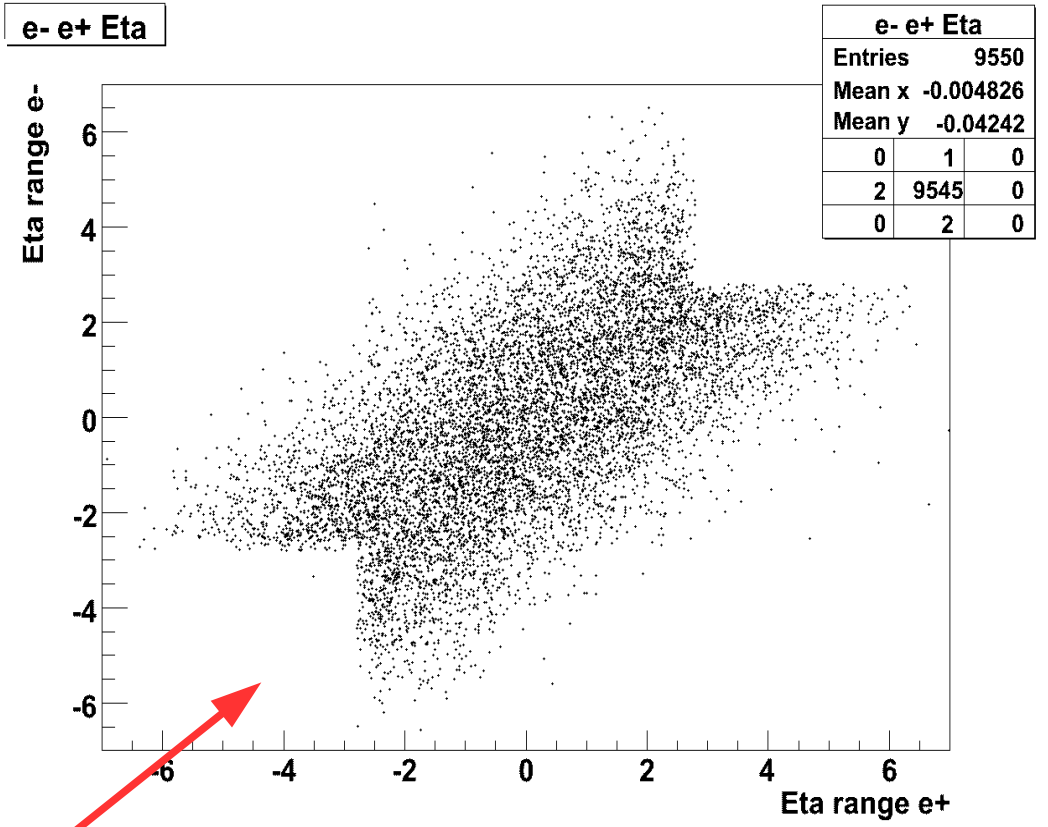
2.Tag and Probe:

-Use process with two known electrons
-> Z decays:
-Select events with two good reconstructed electrons.
-Look at the invariant mass and select Z´s.
-Tag one electron for which the trigger has fired.
-Estimate the trigger efficiency by probing if the second electron has been triggered too.
-not bias free!

CBNT 9550 events. pp collision with one Z->ee.

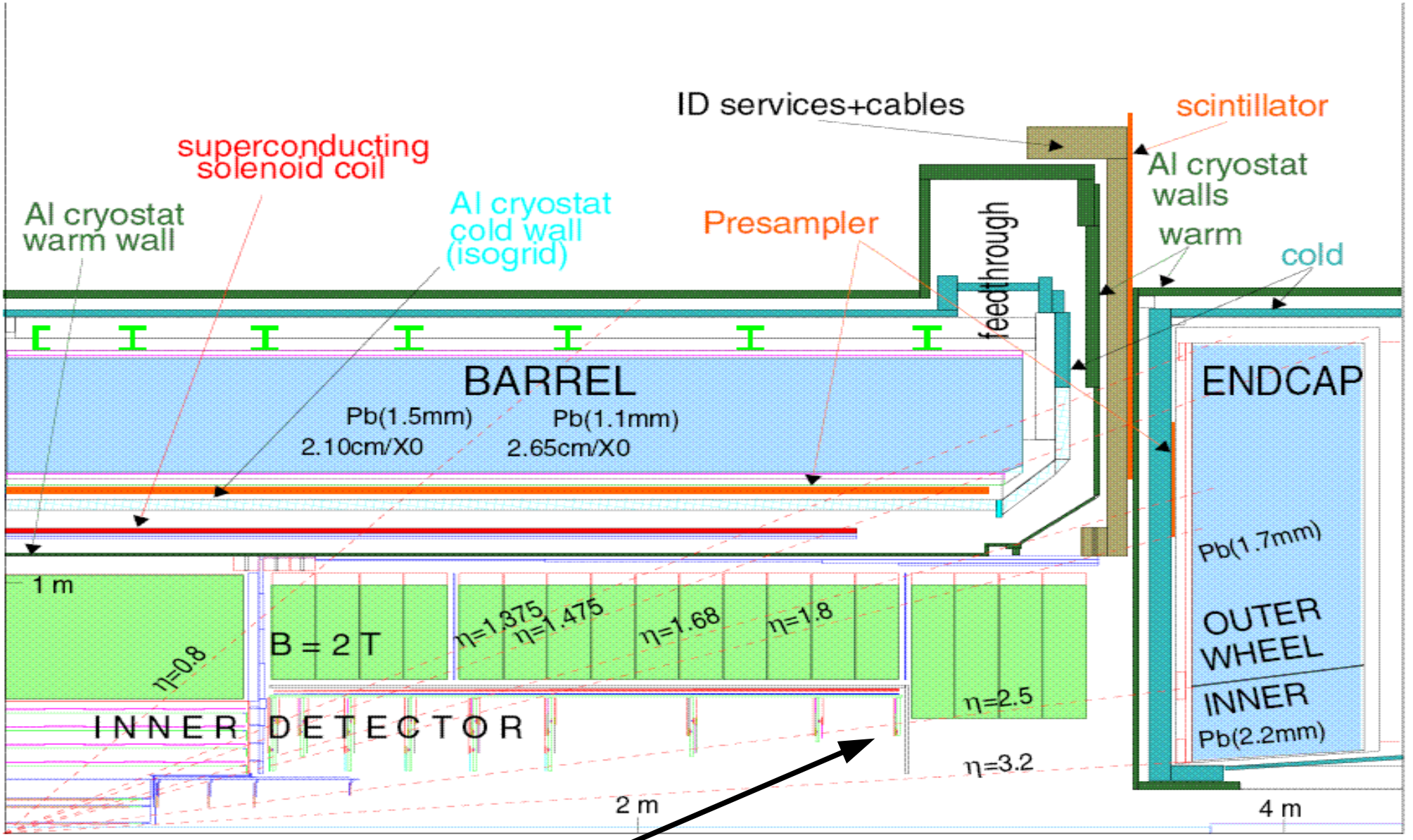
GENERATOR level:





PRECUTS (for at least one electron)

pt >10GeV, |η|<2,7

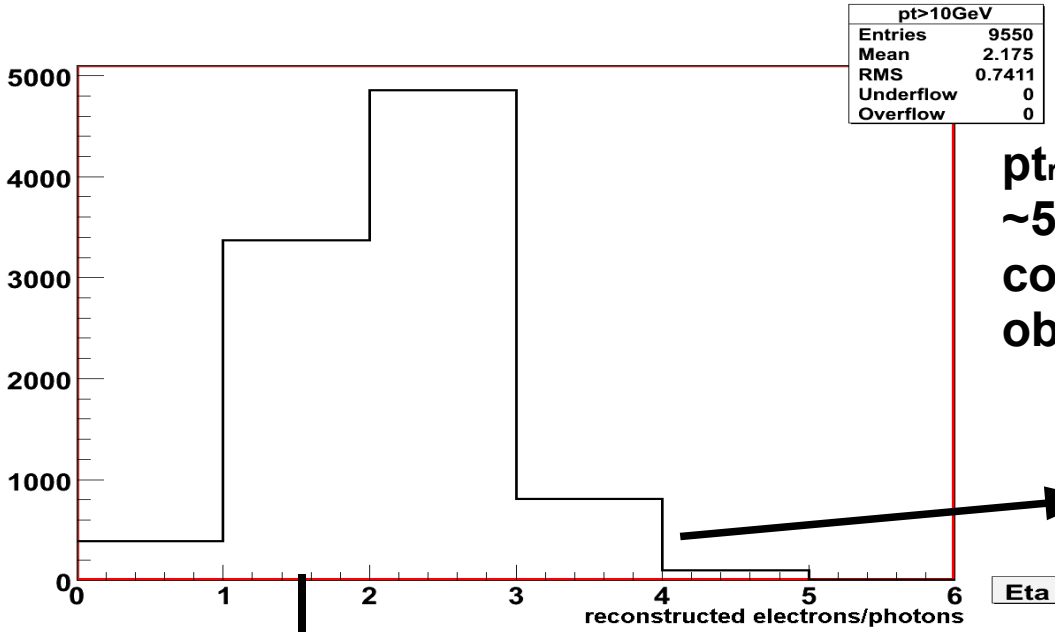


End of tracking |η|=2,5

No electron identification possible, pile up.

RECONSTRUCTION: Egamma container

-Contains energy, φ,η of electromagnetic cluster.
-Contains information to seperate electrons from jets (IsEM-flag).
-Via trackmatch identification of electrons possible.

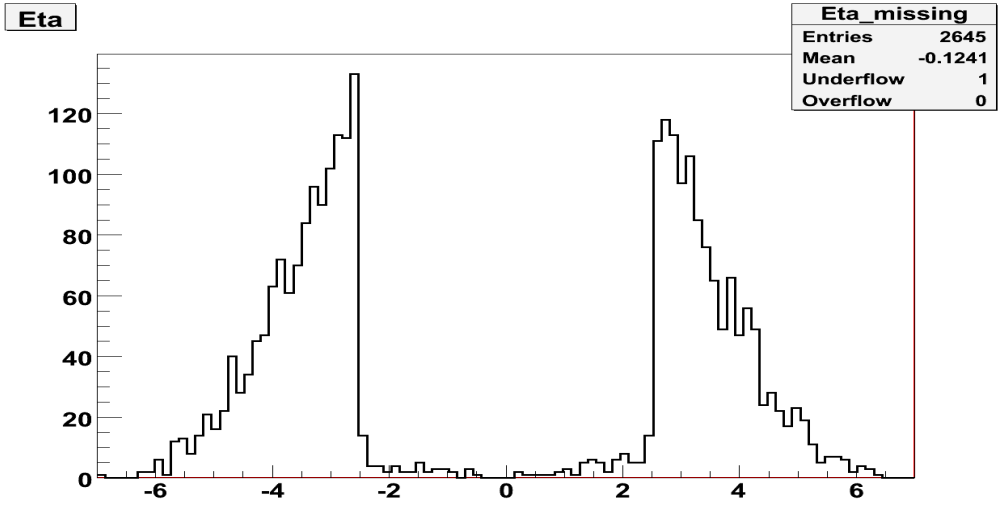


$pt_{rec.}$ >10GeV:
~50% of the events contain 2 Egamma objects.

Additional EM-cluster by radiated photon?

$$\Delta R = \sqrt{\Delta \eta^2 + \Delta \varphi^2}$$ truth matching

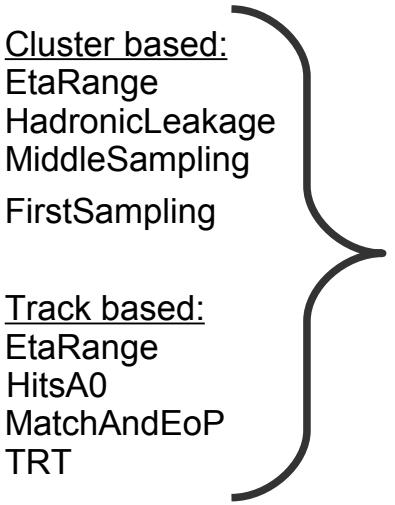
„lost“ electron in region |η|>2,7



selection of good reconstructed electrons:

-IsEM-flag: bit field, marks whether the candidate passed cuts or not (based on calorimeter and inner tracking system).

See: https://twiki.cern.ch/twiki/bin/view/Atlas/ElectronGammaIsEM



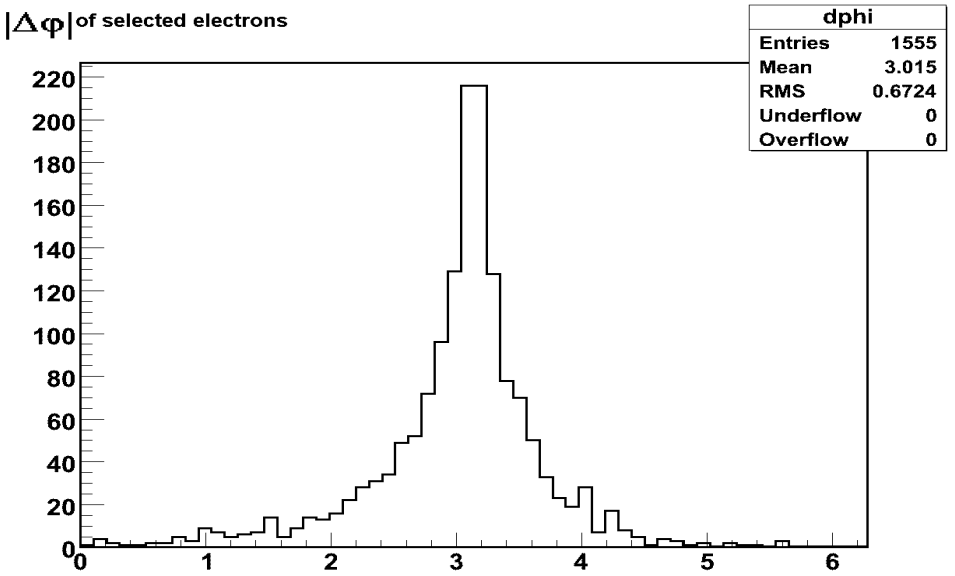
IsEM==0
good electron/photon

-selected items should have a track.

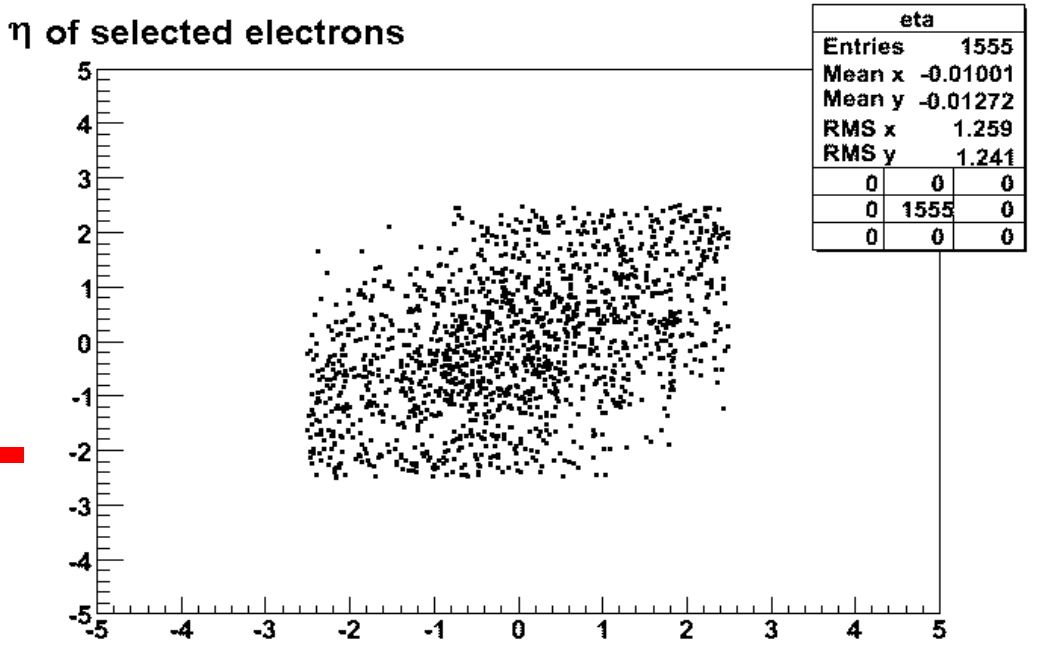
cut flow table:

	EVENTS
generator level:	**9550**
$\|\eta\|_{truth}$ <2,5 for both electrons:	**5412**
reconstruction:	
Pt>10GeV; IsEM==0,	**4476**
Pt>10GeV; IsEM==0; matched tracks=2:	**1555** ?

Distributions of the selected electrons:

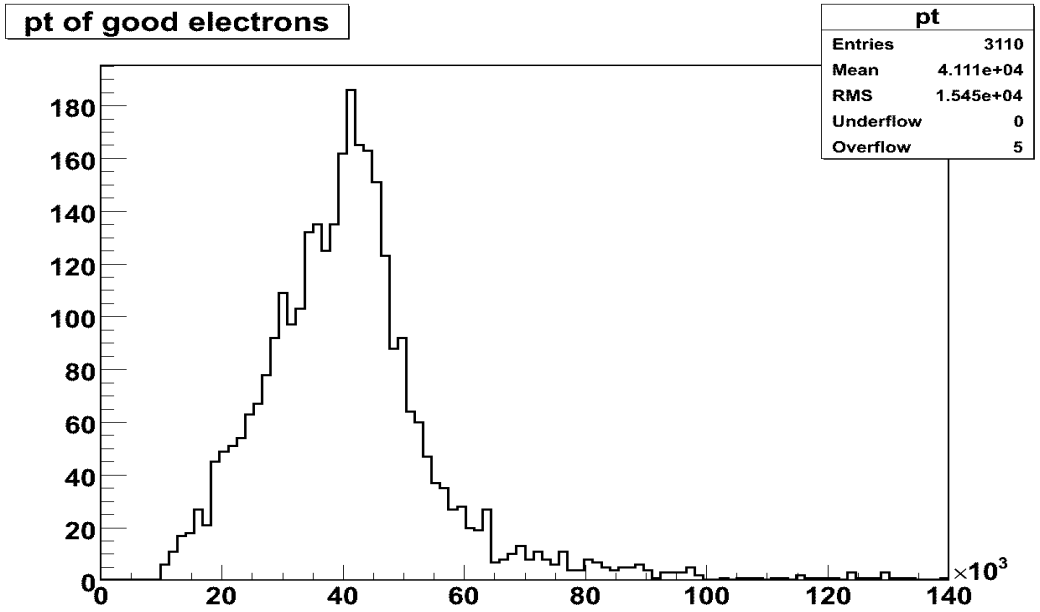


e+ e- back to back.

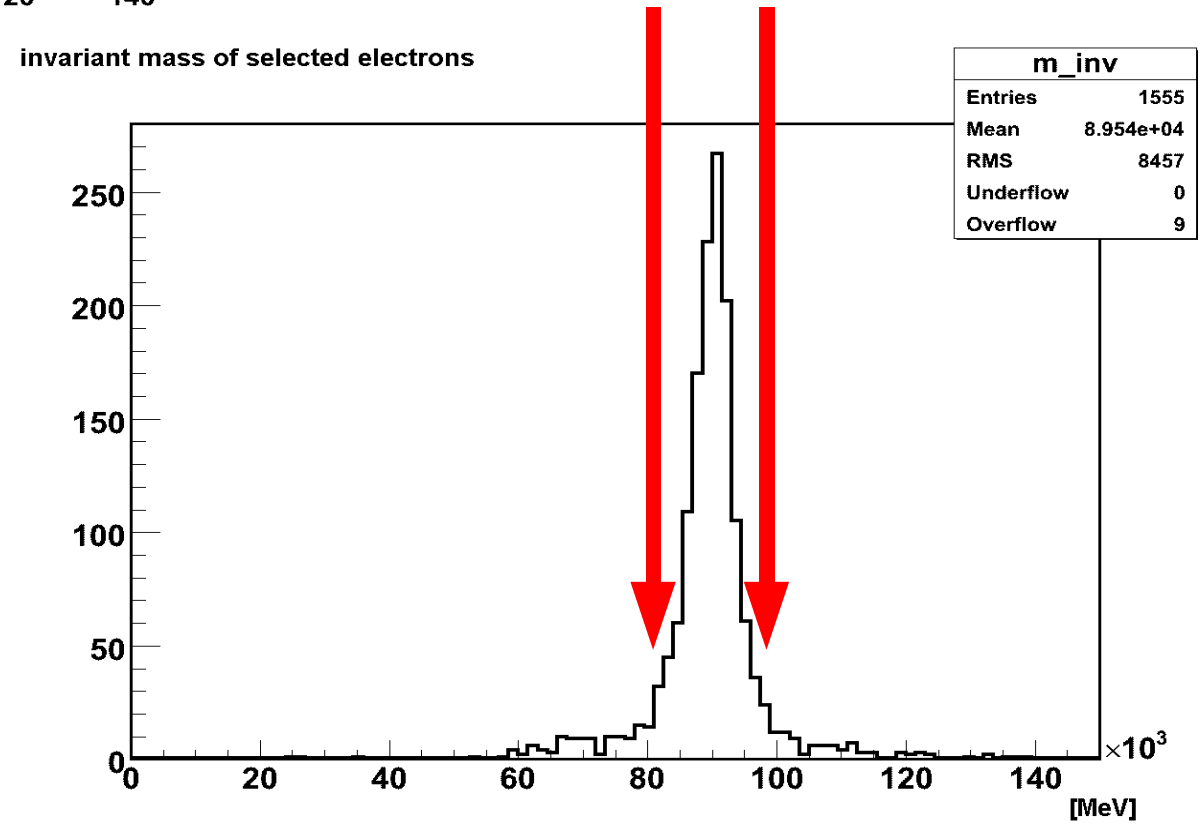


Electrons in inner detector.

Distributions of the selected electrons:

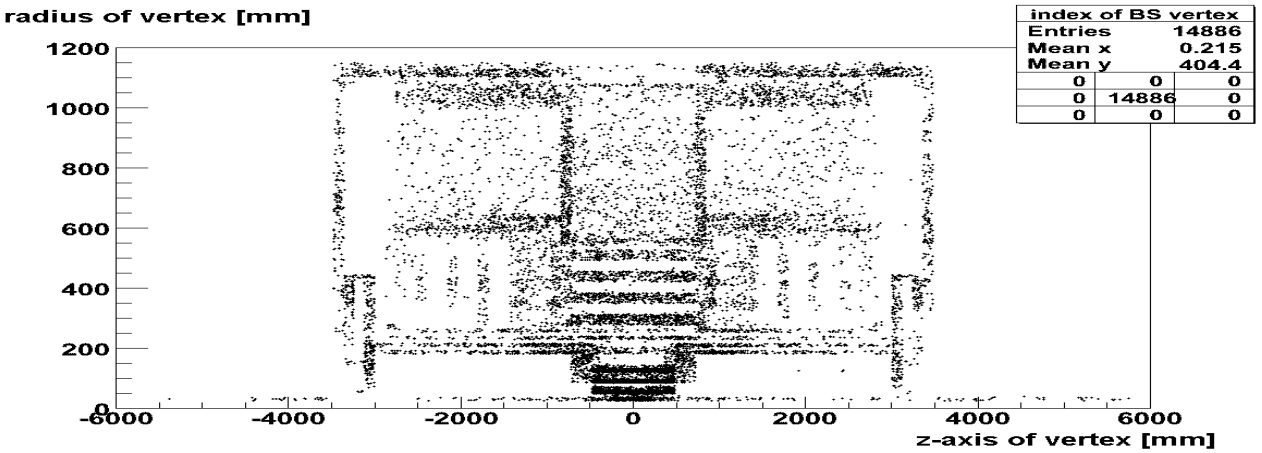


Tag and Probe method in region Mz +/- 10GeV.



Summary & Outlook:

- We took a look at the electrons. Compared reconstructed and generated distributions.
- For the tag & probe method, we selected events with the required two good electrons and reconstructed the invariant mass to get a clean sample.
- *We even discovered the detector in the sample:*



NEXT STEPS:

- CBNT contains LVL1, LVL2 and EF information, algorithms for trigger decision need to be implemented.
- Estimate the electron trigger efficiency with the MC and the Tag & Probe method for the different trigger levels.
- Compare the results.

Em/Tau Trigger Block

L1Em_nRoI - Number of e/gamma/tau RoIs in the event
L1Em_RoIWord(L1Em_nRoI) - Raw RoI word (32 bits) encoding position and thresholds passed
L1Em_Core(L1Em_nRoI) - Central 2x2 "RoI core" ET (em+had)
L1Em_EmClus(L1Em_nRoI) - Em Cluster ET
L1Em_TauClus(L1Em_nRoI) - Tau Cluster ET
L1Em_EmIsol(L1Em_nRoI) - Em Isolation ET sum
L1Em_HdIsol(L1Em_nRoI) - Outer Had Isolation ET sum
L1Em_HdCore(L1Em_nRoI) - Inner Had Isolation ET sum
L1Em_EmThresh(L1Em_nRoI) - Set of e/gamma thresholds passed (bitmask)
L1Em_TauThresh(L1Em_nRoI) - Set of tau/hadron threshold passed (bitmask)
L1Em_eta(L1Em_nRoI) - eta coordinate of RoI
L1Em_phi(L1Em_nRoI) - phi coordinate of RoI

example:
LVL1 trigger isolation cuts for a 25GeV electron:
L1Em_EmIsol <= 3000
L1Em_HdIsol <= 2000
L1Em_HdCore <= 2000

L1Em_EmClus > 19000