Z->ee Analysis for Data Challenges 1 or 2

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Introduction

- $Z0 \rightarrow ee$ for EM calibration studies (see Physics Performance TDR and F. Djama presentation in Calibration Workshop).

- $Z0 \rightarrow ee$ provides electrons for Reconstruction and Identification.

- $Z0 \rightarrow ee$ provides electrons for Trigger LVL1 and HLT.

- $Z0 \rightarrow ee$ is proposed as a Luminosity measurement.
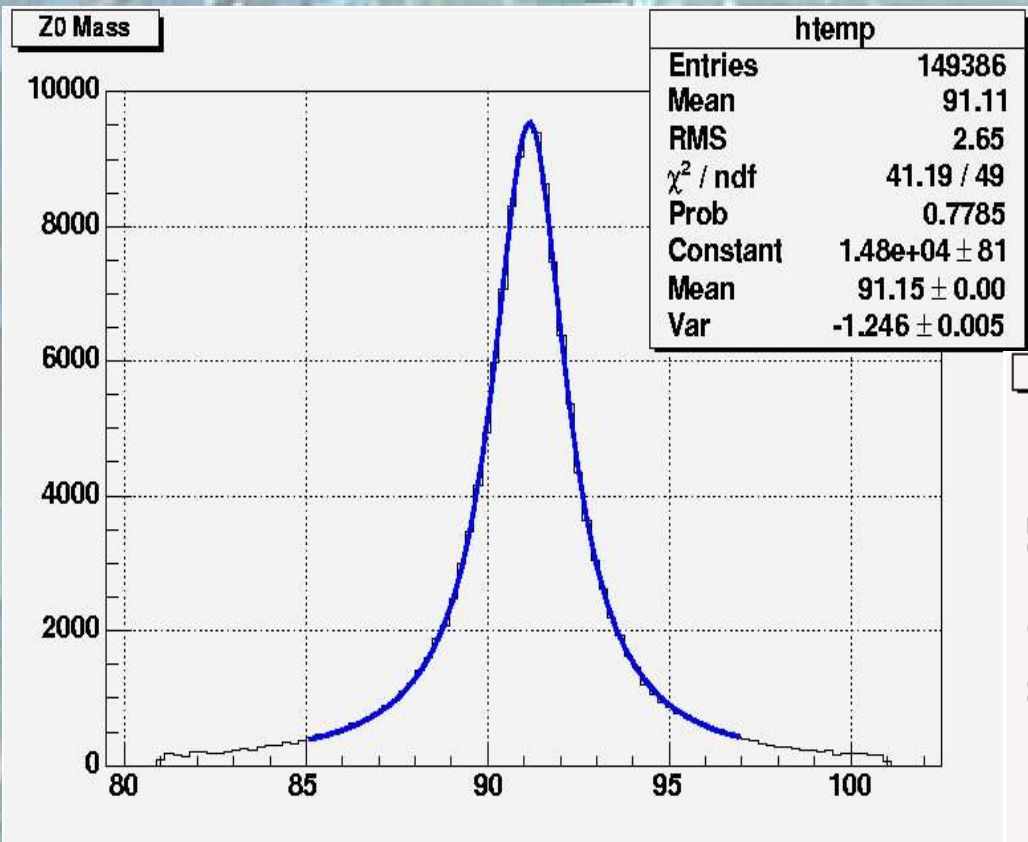
How our analysis is being done

- with Combined Ntuples from Data Challenges 1 and 2. Digitized samples.

- Offline software versions studied 7.2.0 (DC1 – Geant 3 simulation) and 9.0.1 (DC2 – Geant 4 simulation).

- with Analysis Object Data - AODs (see Ketevi's course) for DC2 data and software 9.0.1.
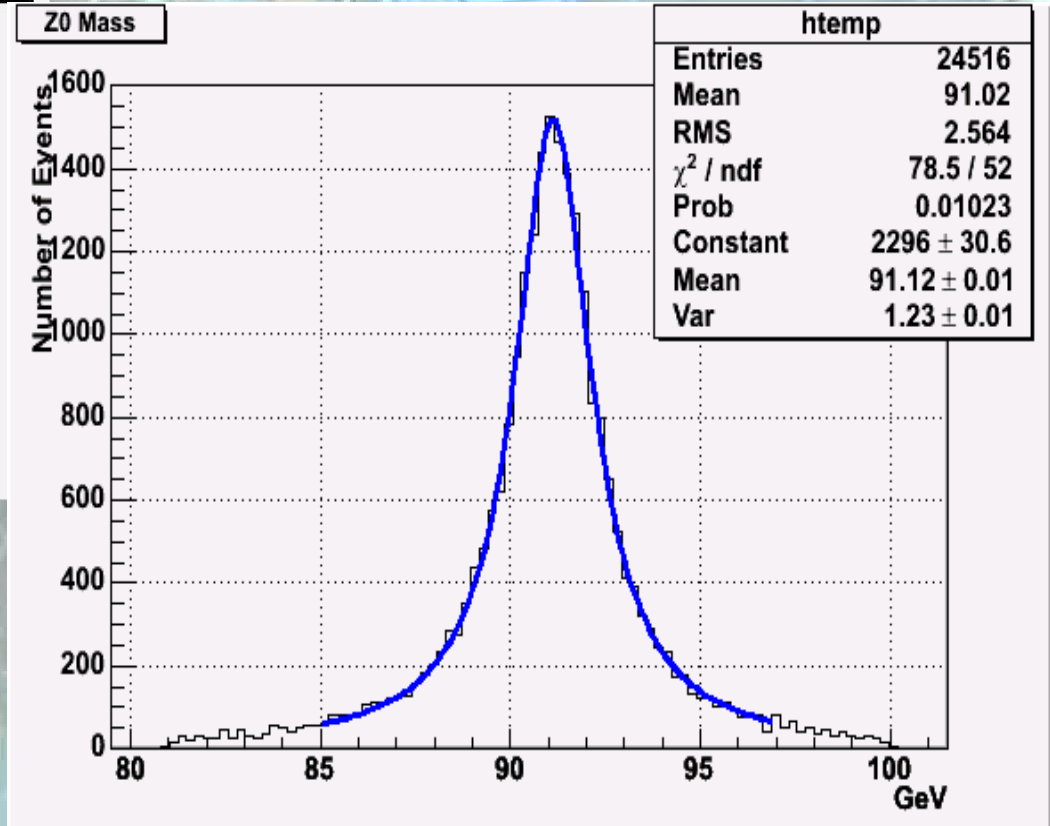
Datasets Used

- DC1 (run 2513) dataset using 7.2.0 (149386 Z0 events). No noise.

- DC2 dataset using 9.0.1 (36126 Z0 events). Noise added.

- DC2 dataset using 9.0.1 with AOD analysis (17427 Z0). Noise added.

- DC2 dataset using 9.0.1 with pile-up (# Z0). ?!?!?! Noise added.
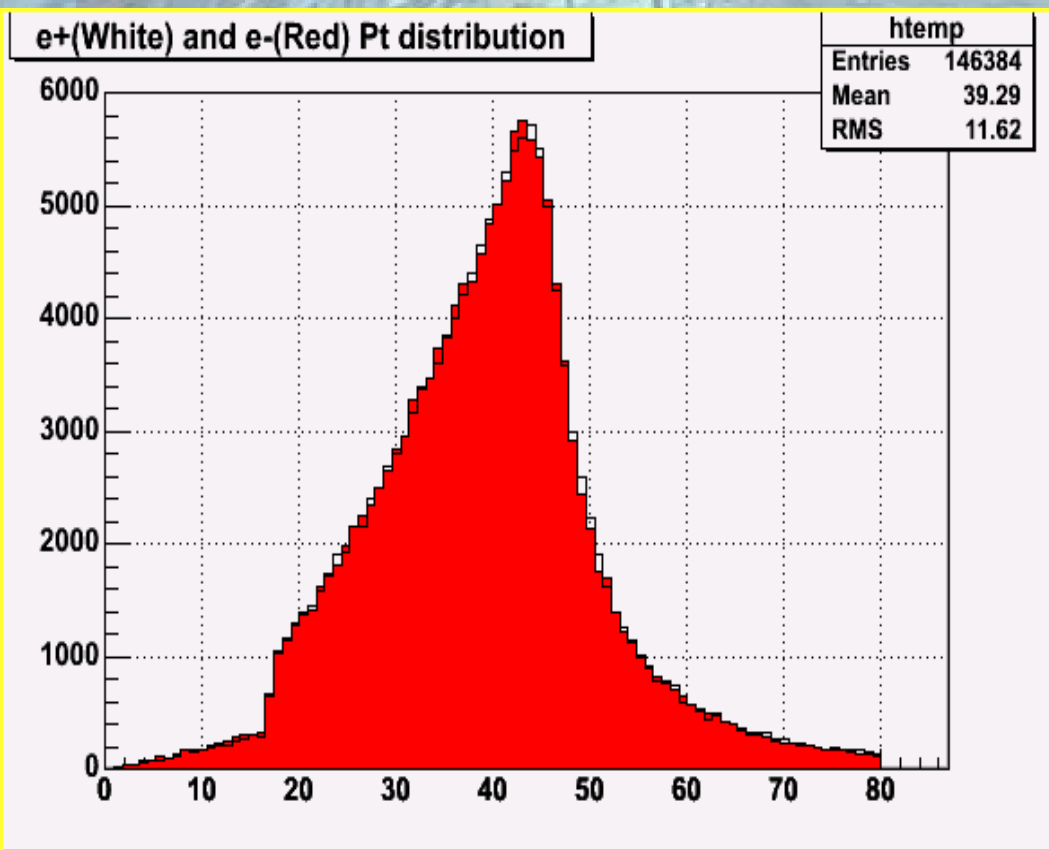
Z0 Mass truth
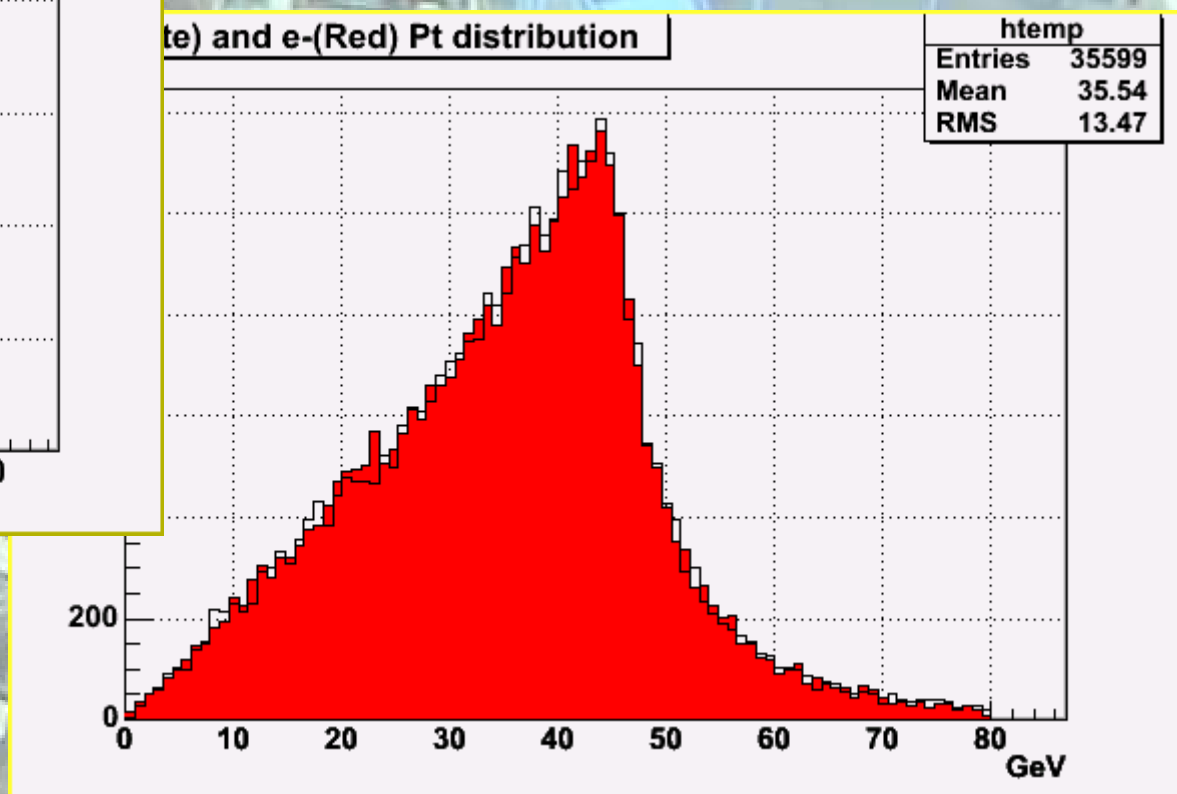

Run 3007 (DC2 - v. 9.0.1)

Run 2513 (DC1 - v 7.2.0)

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Electrons True Pt

Run 3007 (DC2 – v 9.0.1)

Run 2513 (DC1 – v 7.2.0)

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# Cuts to define EM elements (clusters)

- $|\eta| < 2.47$. Cut in η/ dispersion of the cluster (η dependent). Cut in leakage to TileCal (also η dependent). (IsEM=0).

- track match (for charge ID).

- Z0 reconstructed from clusters.

- For efficiency calculation, η/ matching with a true particle (electron/positron) is required.
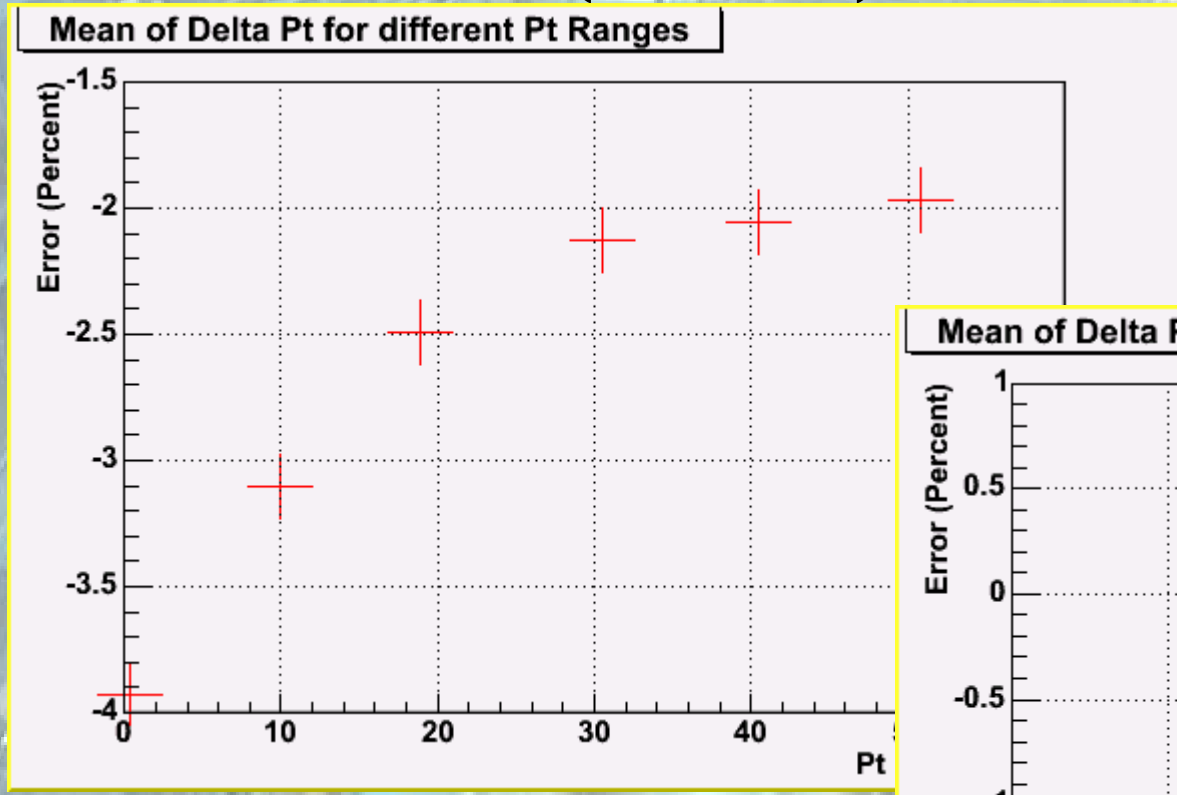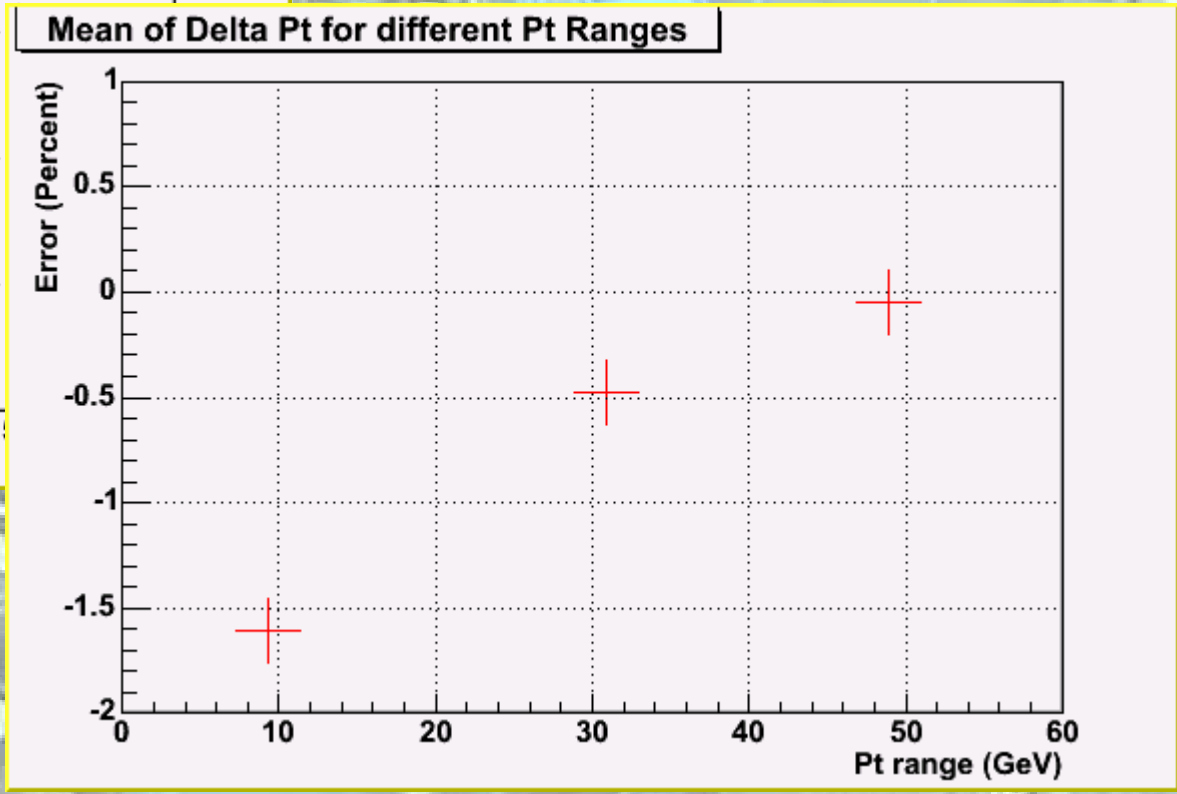
Electrons Pt reconstructed

Run 3007 (DC2 – v 9.0.1)

Run 2513 (DC1 – v 7.2.0)

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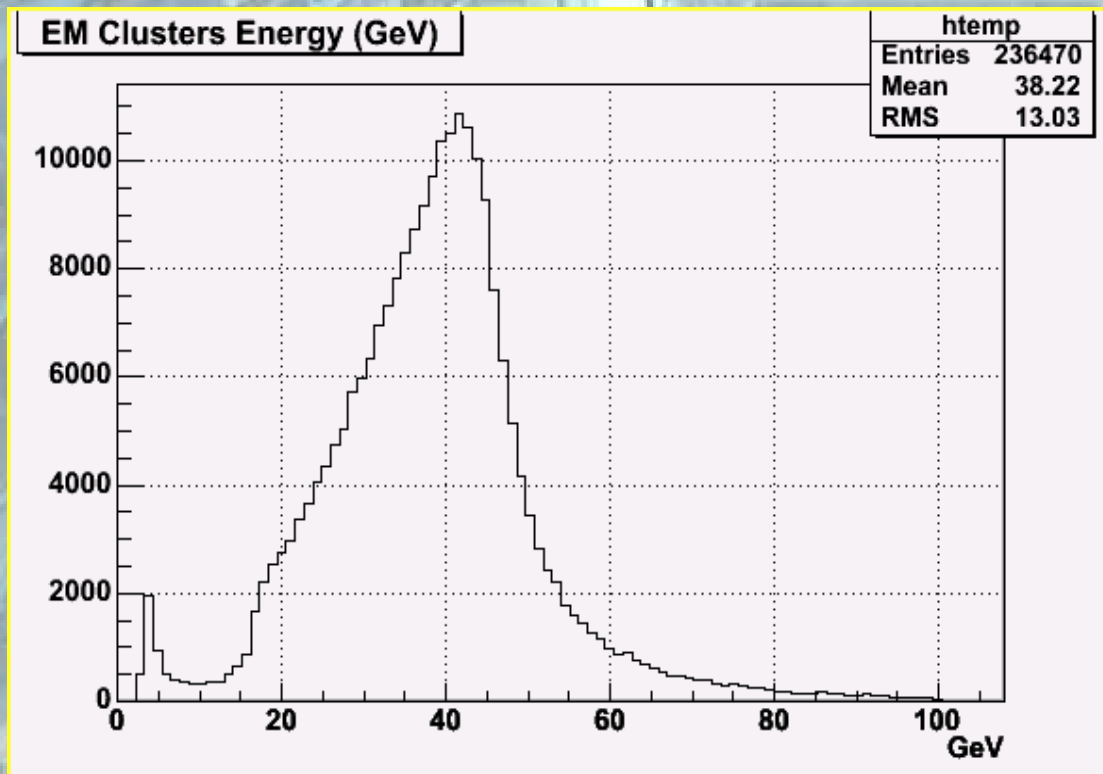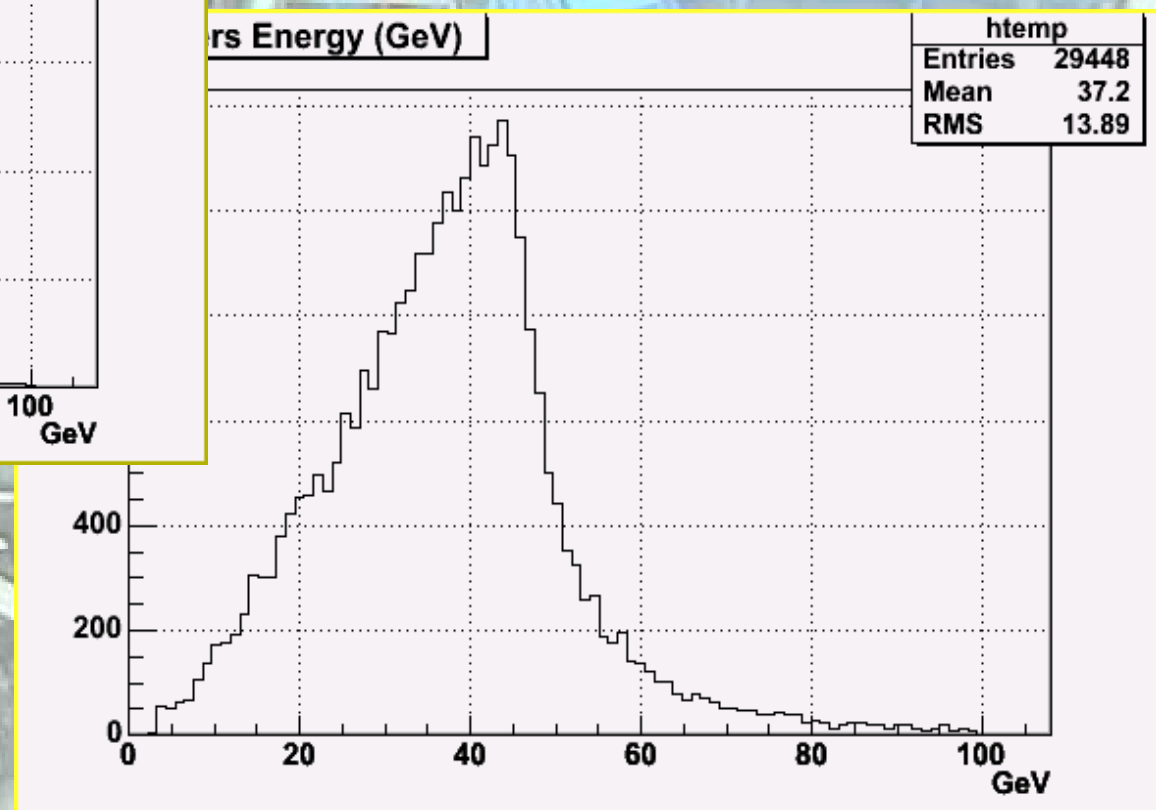
Electrons (Pt(true)-Pt(rec))/ Pt(true) - calibration

Run 3007 (DC2 – v 9.0.1)

Run 2513 (DC1 – v 7.2.0)

Z0 Mass reconstructed

Run 3007 (DC2 – v 9.0.1)
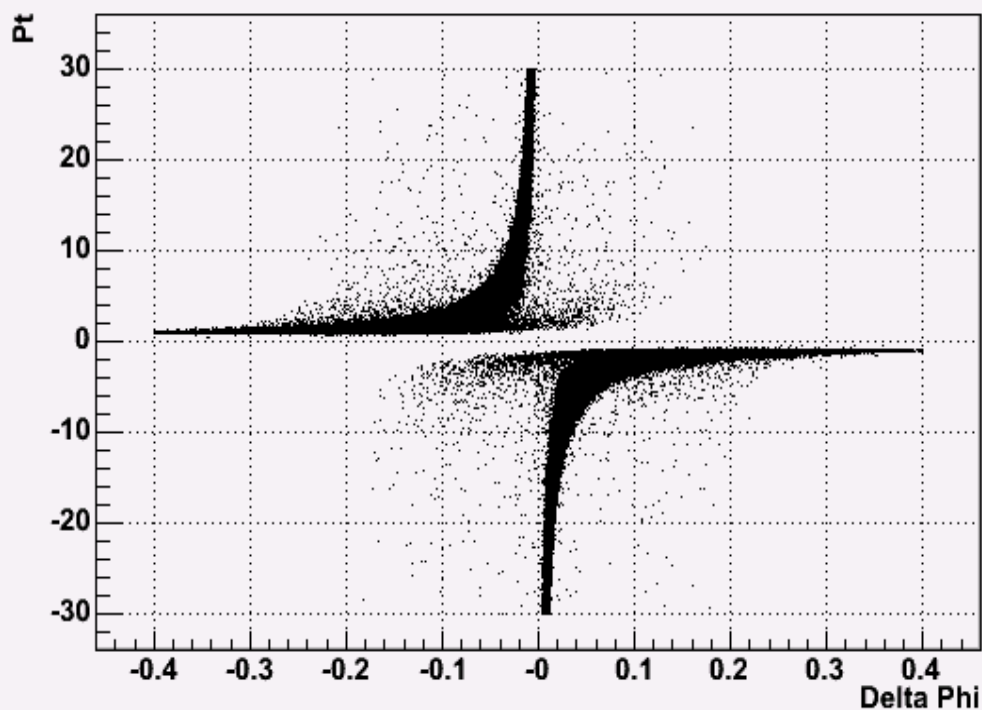
Run 2513 (DC1 – v 7.2.0)

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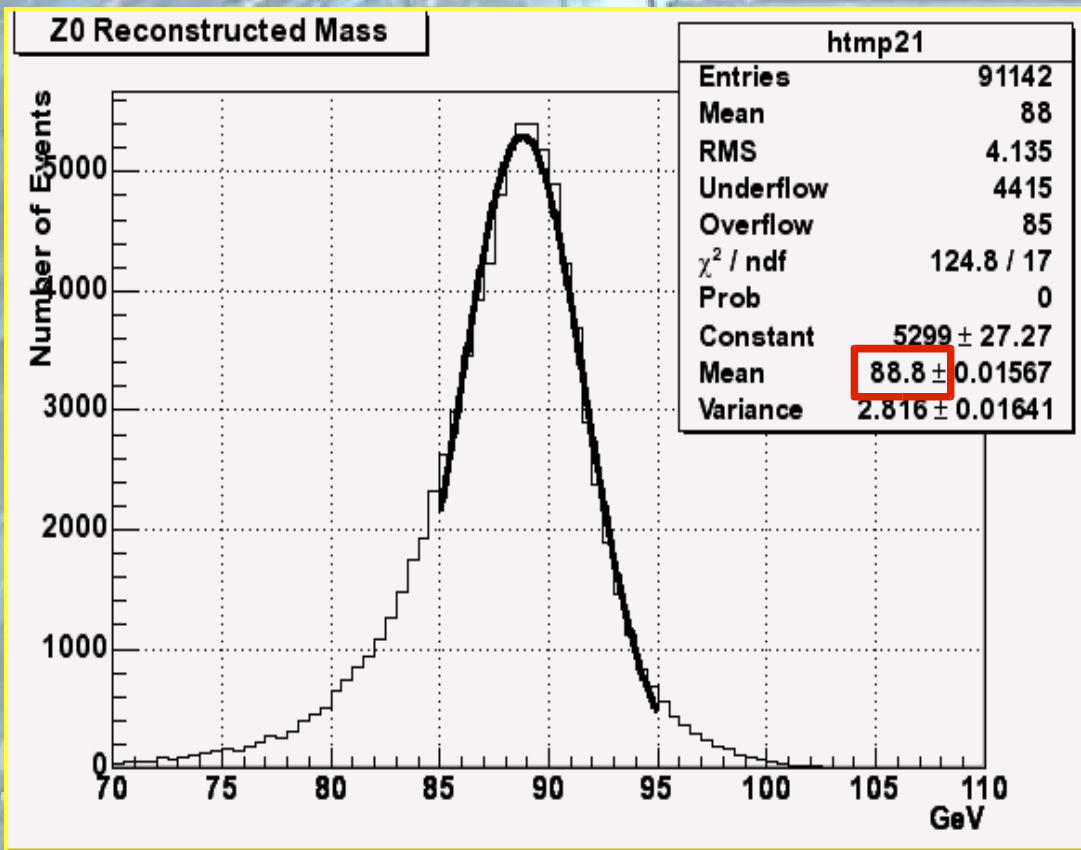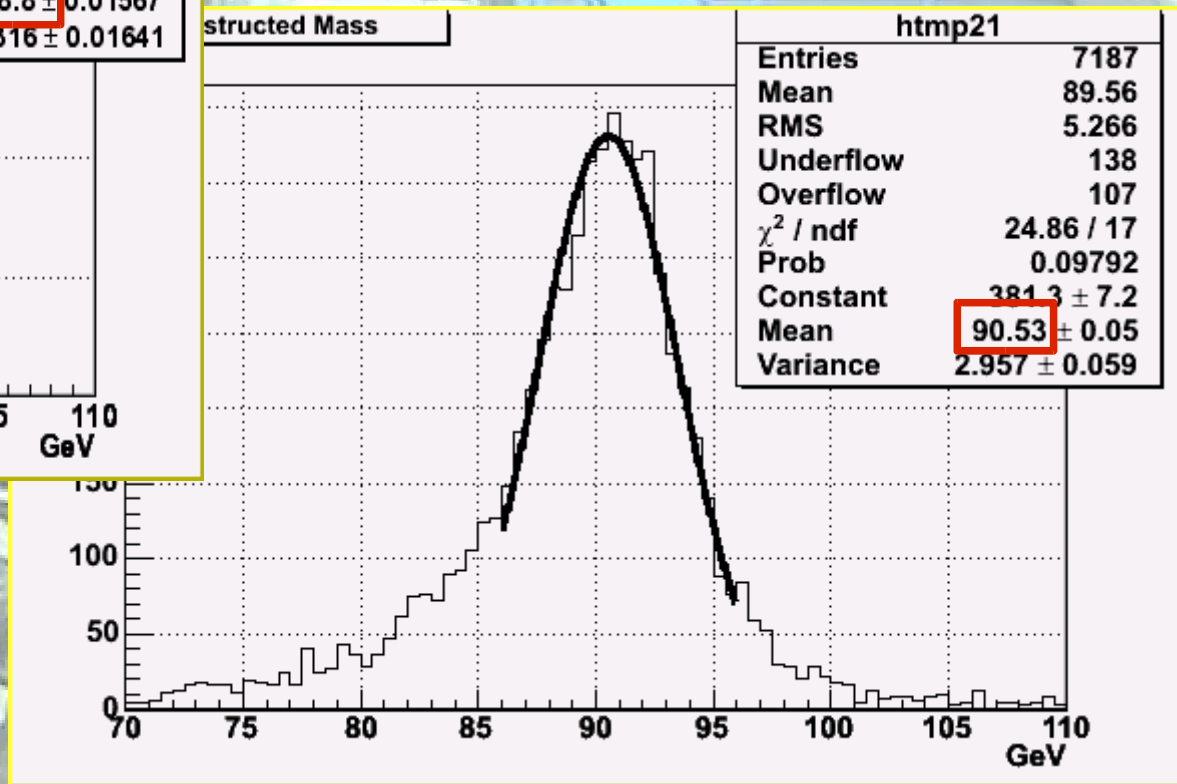
Tracks analysis

Phi(End) - Phi(Vertex) versus Vertex Pt

Run 3007 (DC2 – v 9.0.1)

Run 2513 (DC1 – v 7.2.0)
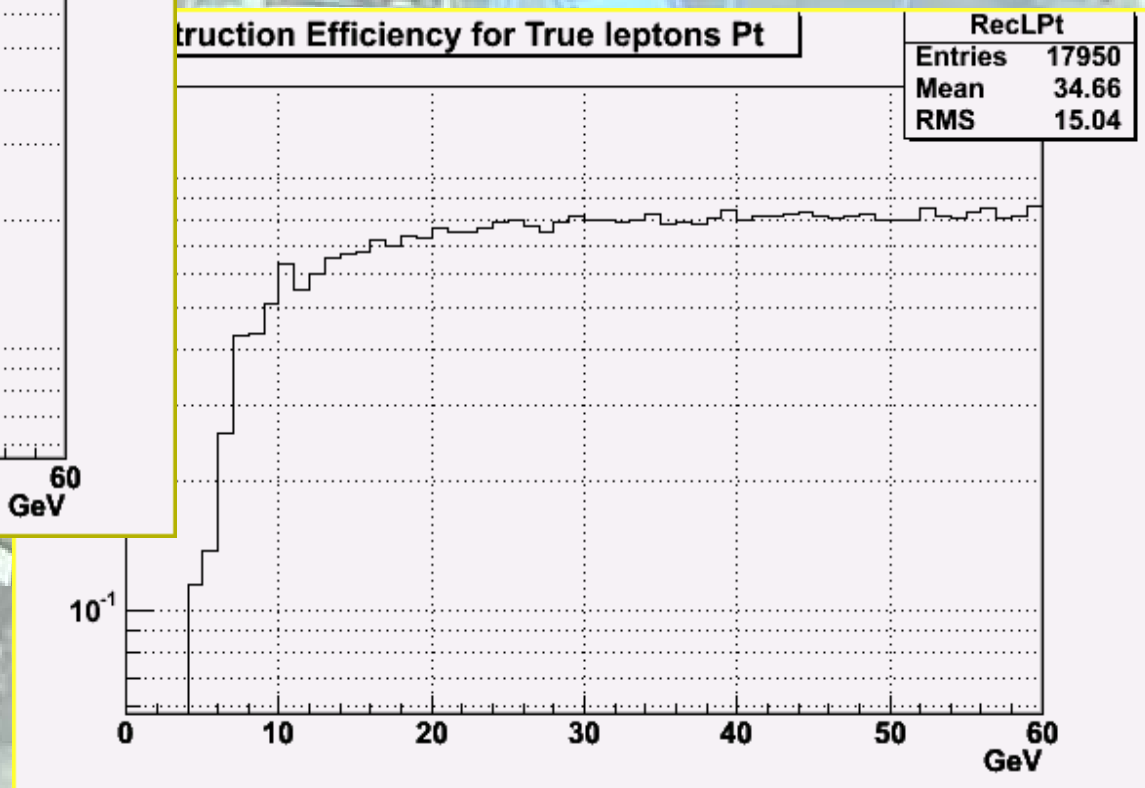
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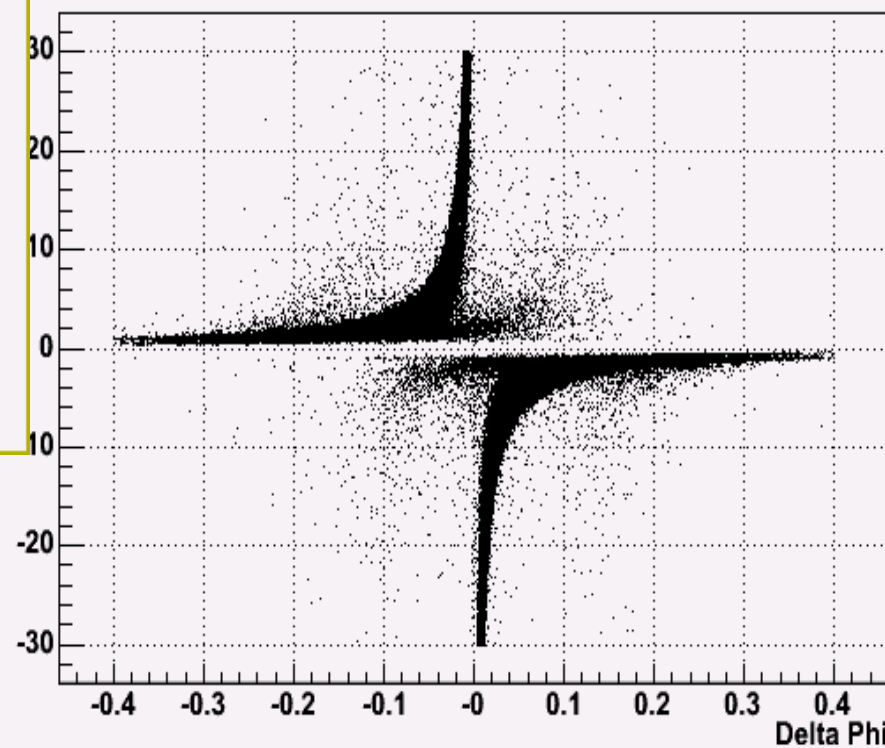
Reconstruction Efficiencies for electrons (Pt)
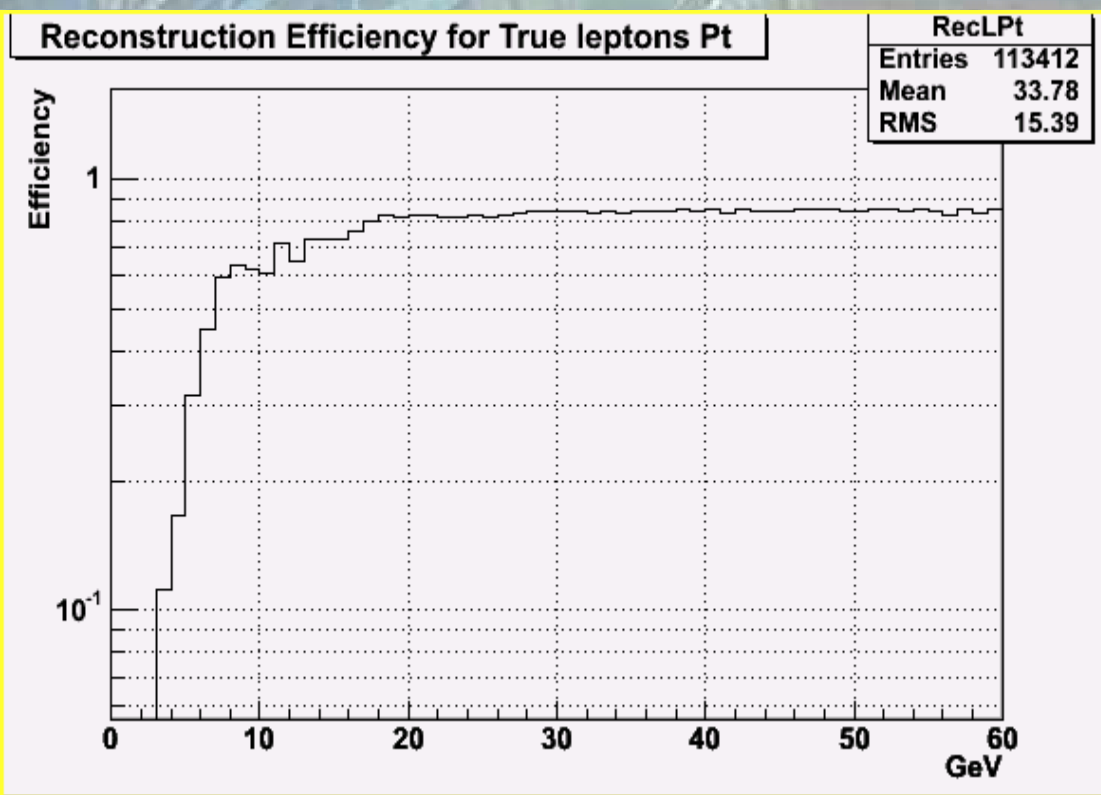
Run 3007 (DC2 – v 9.0.1)
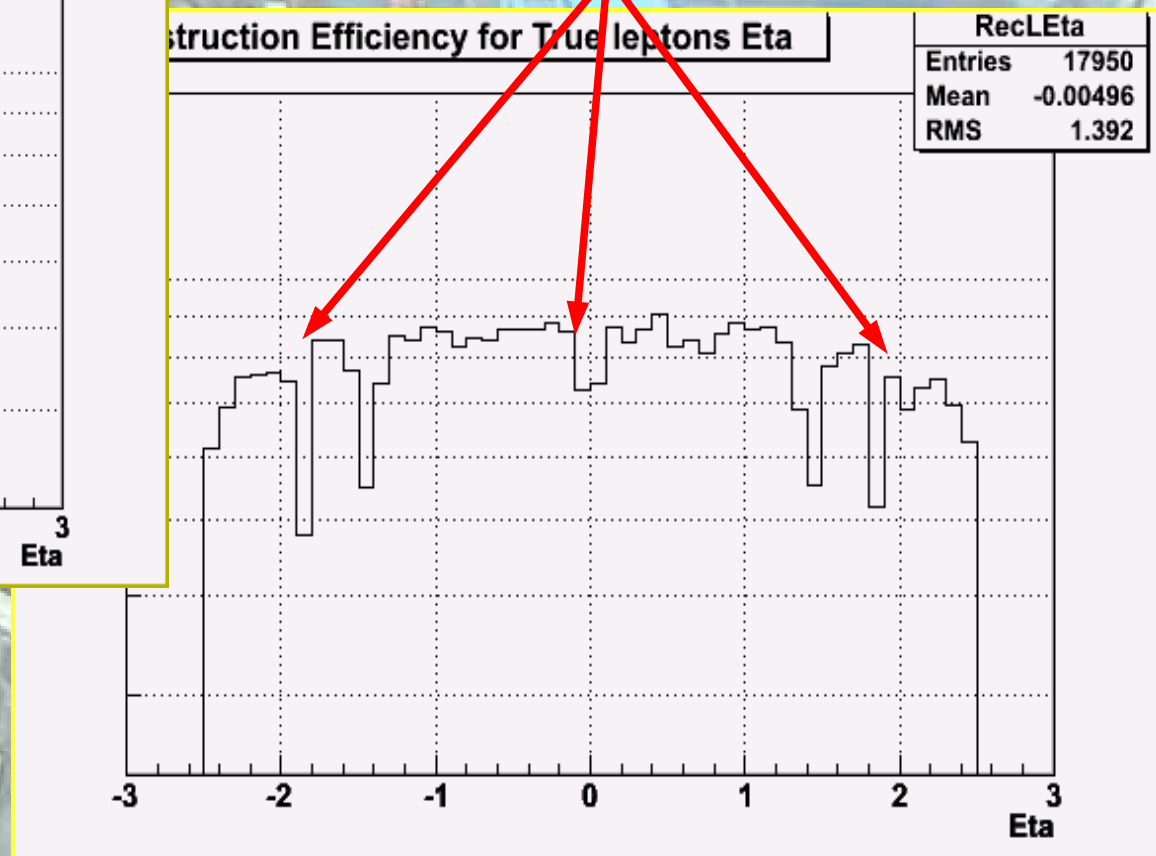
Run 2513 (DC1 – v 7.2.0)
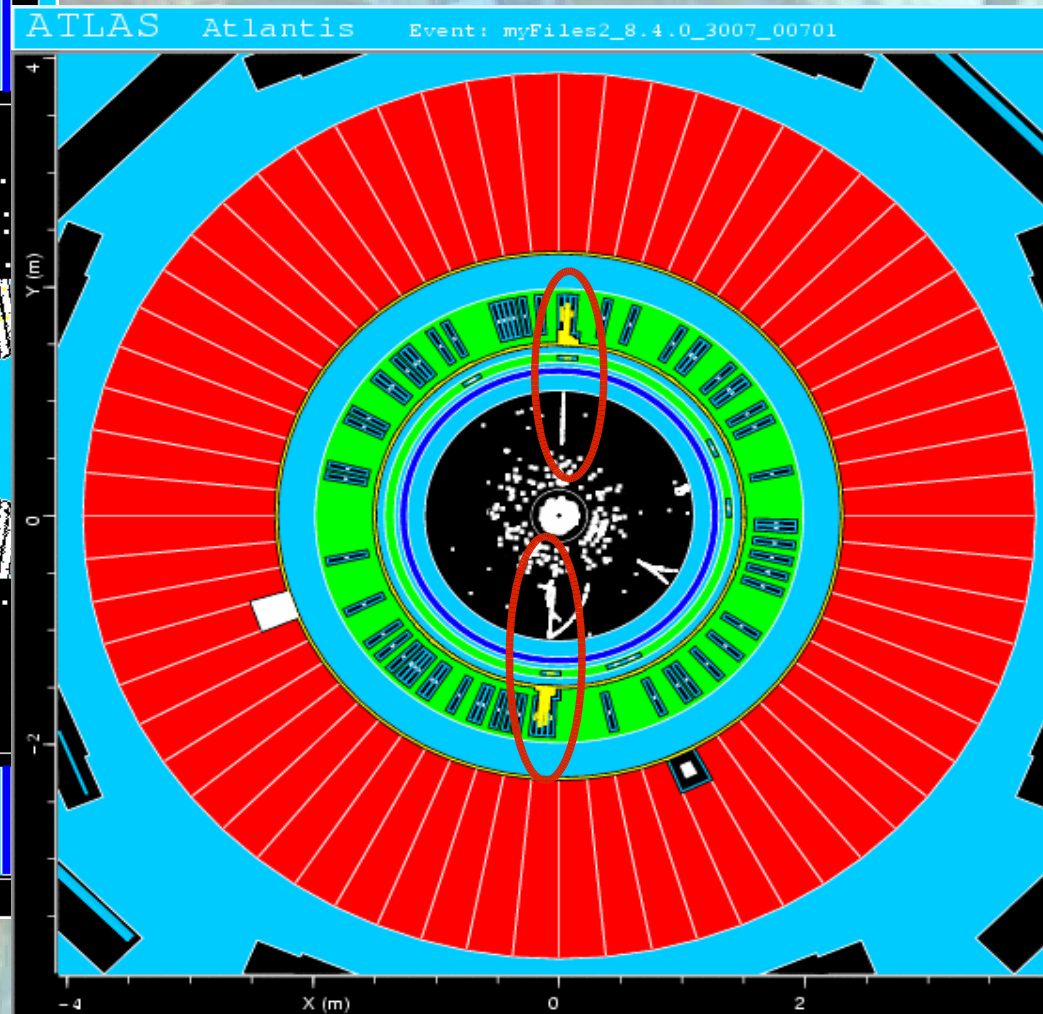
Reconstruction Efficiencies for electrons (η)

Run 3007 (DC2 – v 9.0.1)

Cracks not here before
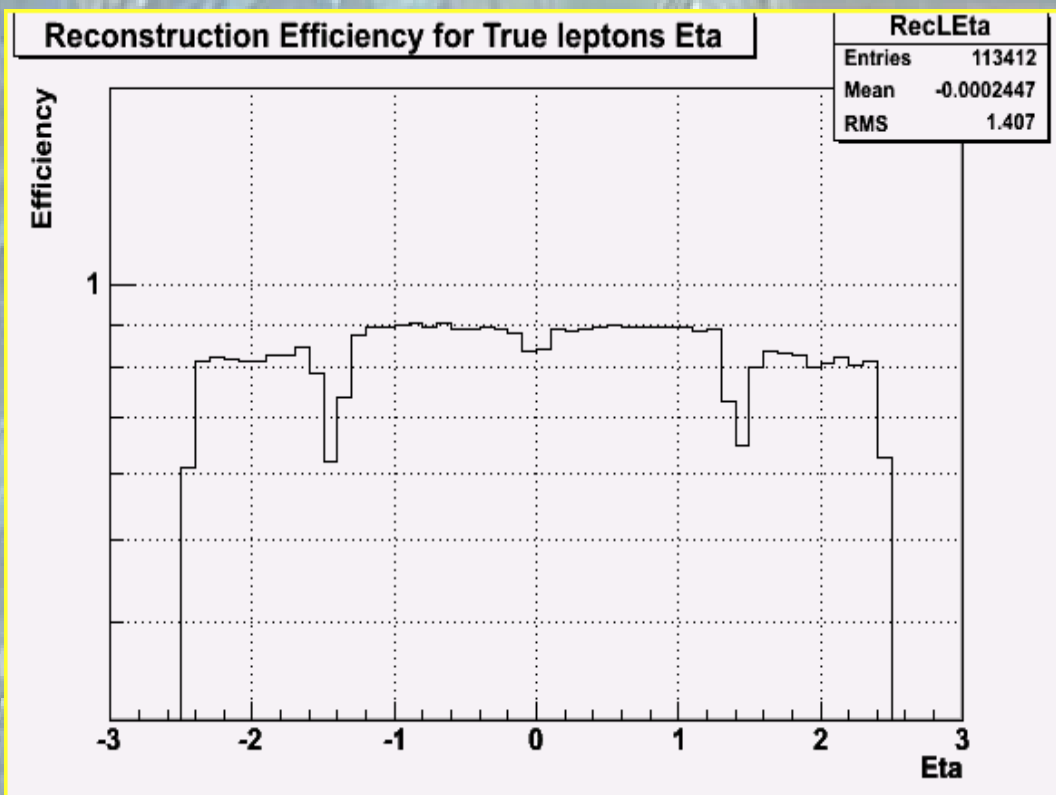
Run 2513 (DC1 – v 7.2.0)

Some Nice pictures of a Z->ee event

Event from the Z0 3007 (DC2) run

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AOD Analysis

Z0 Mass Distribution

m_h_Z0_m	
Entries	23914
Mean	89.47
RMS	5.151
χ^2 / ndf	109.9 / 6
Prob	0
Constant	7712 ± 163.7
Mean	90.79 ± 0.02
Var	-1.451 ± 0.022

Event from the Z0 3007 (DC2) run

Electron (white) and Positron (Red) Pt Distribution

m_h_elec_pt	
Entries	36744
Mean	37.13
RMS	13.03

Pt (GeV)

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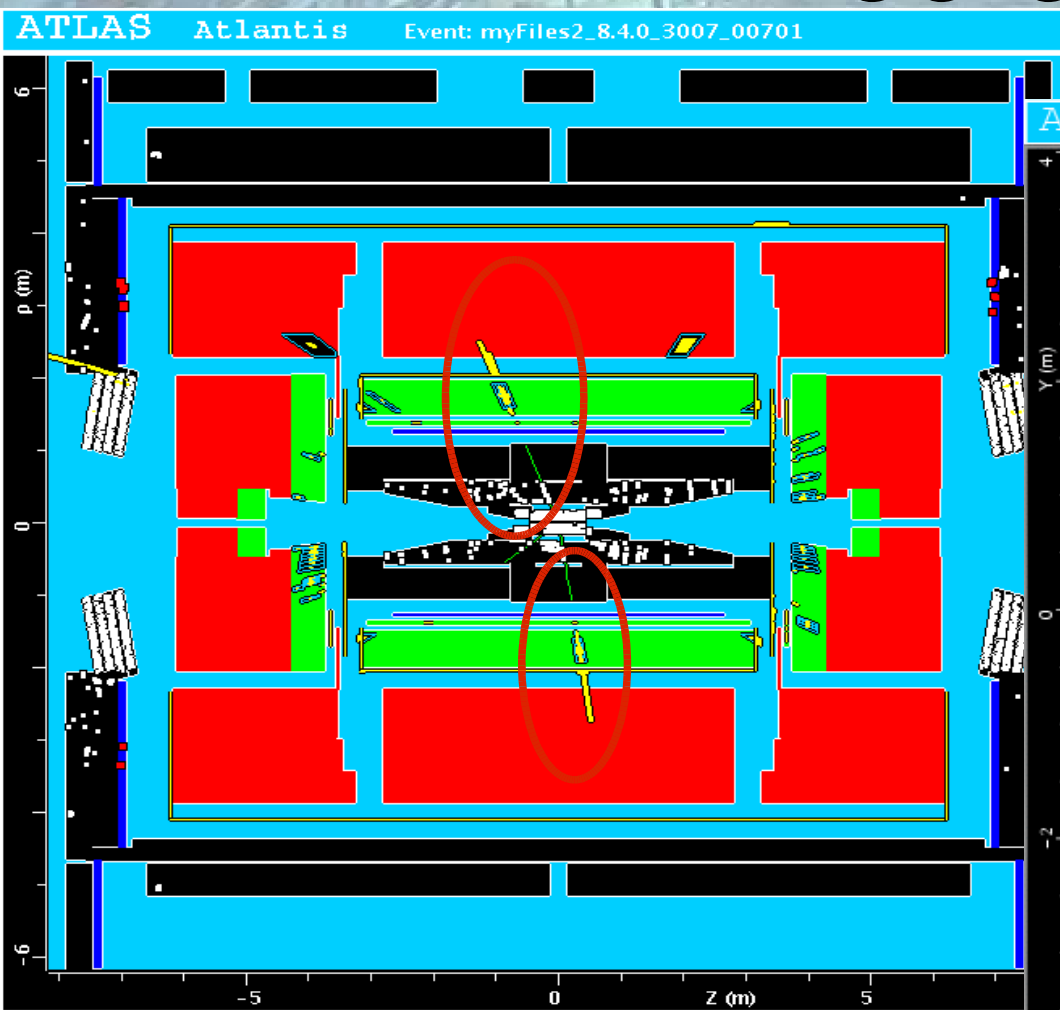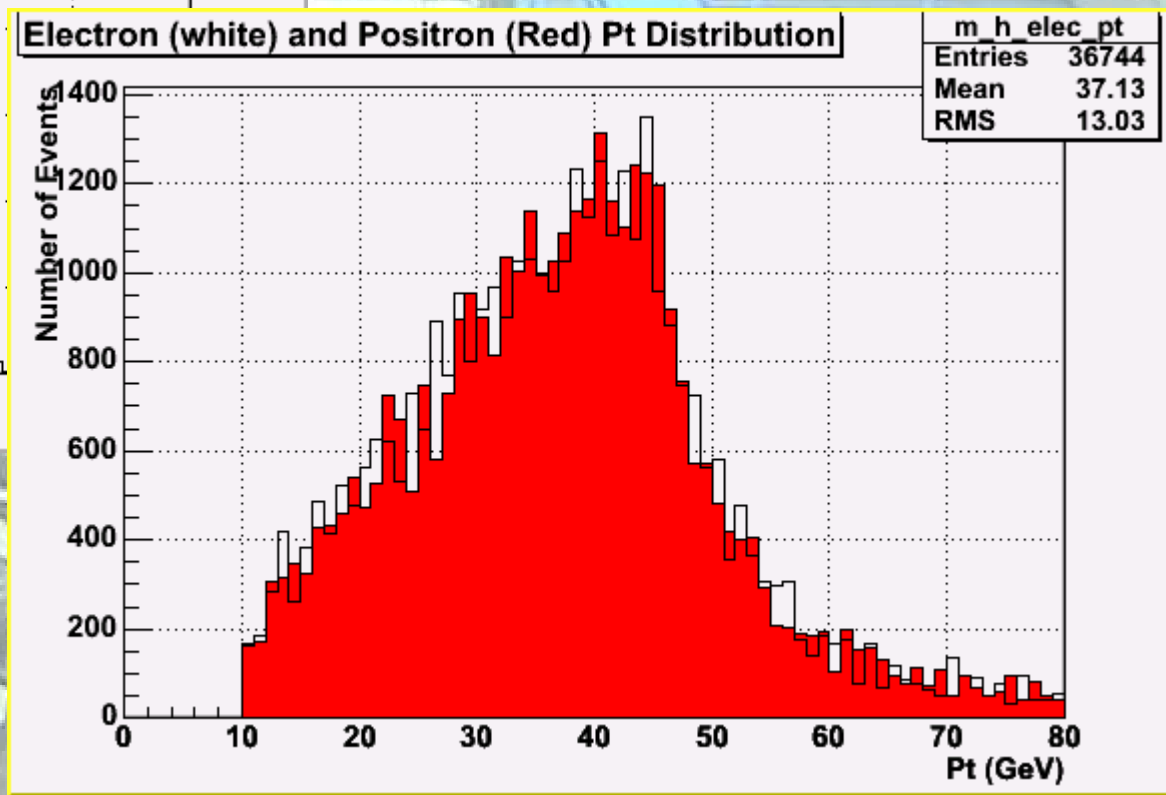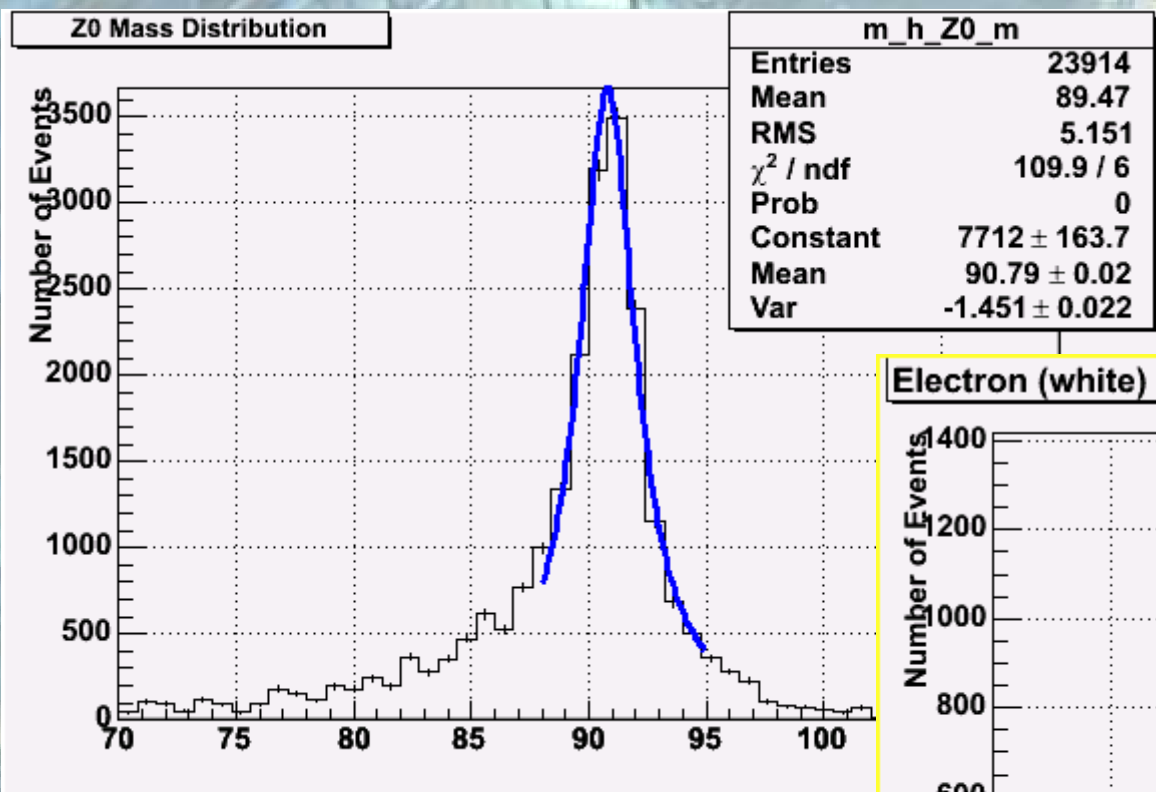
Conclusions

- It is possible to perform a group of different analysis (calorimeter performance, software validation, calibration strategy).

- Data challenges can be used as important sources for data.

- Reconstruction parameters are under study. Calibration still varying.

- Flexibility in the study through CBNT and/or AOD/ESDs.

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Next Analysis Steps

- Increase the amount of DC2 events analyzed (up to 1M events).

- Expand the analysis using AODs.

- Coordinate with other analysis (eg: H->ZZ->4e or H->ZZ->2e2μ).

- Digitized and Event Sumary Data ESD files are available on BNL dCache for the usatlas community. More files to come.

- Much more info can be found at : http://www.usatlas.bnl.gov/~damazio/log

Next Analysis steps

- The theoretical error for Z->ee is becoming increasingly smaller (NNLO).

- Z->ee can be used as a luminosity measurement.

- It is important to fully understand the Trigger (Level 1 and High Level Trigger) and Reconstruction efficiencies.

Plots for possible extra Discussion