Update of L3 electron tool: L3 p11 certification, study of transversal shower shape cuts

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Status of L3E electron selection

◇ L3EM filter certfied for p11, now online

◇ Current filter:
- cluster: single cone, 0.4
- variables calculated in cone 0.4
  $\rightarrow$ test cone 0.25
- E_T, corresponding to L1,
- EM fraction (> 0.9)

background reduced by factor 5

◇ Improved L3 performance $\rightarrow$ additional cuts to obtain at least factor 10

◇
- No tracking information yet $\rightarrow$ only calorimeter information
- Efficiency loss for tight cuts on EM fraction and Isolation
- $\rightarrow$ Most promising discriminant for the near future is transversal shower shape.

Definition of Δ r:

$$\Delta r = \frac{\sum E_i \sqrt{(\phi_i - \phi)^2 + (\eta_i - \eta)^2}}{\sum E_i} \qquad (1)$$

of all cells in cone 0.2 from cluster axis.
ϕ, η : energy weighted cluster axis position (floor 3)

Samples

Z→ee Sample:

- ◇ 5600 events
- ◇ plate MC
- ◇ min.bias: 0.5

W-Higgs Sample:

- ◇ 1500 events
- ◇ plate MC
- ◇ min.bias: 0.5

data Sample:

- ◇ 25300 events
- ◇ run142871 to 142874
- ◇ no trigger selection

Di-EM Sample:

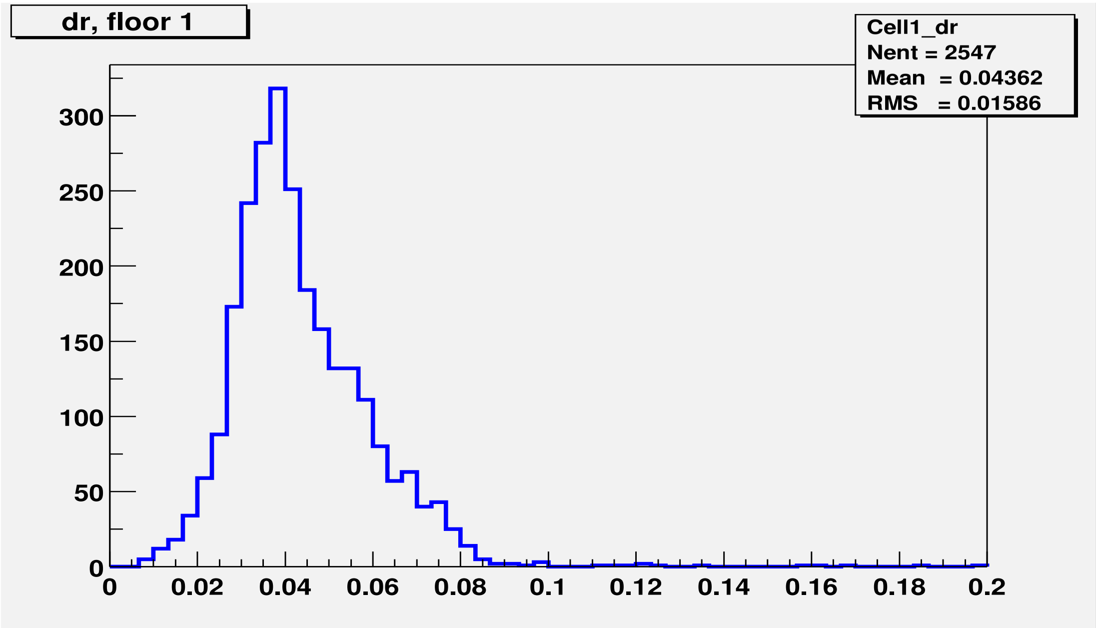
- ◇ 3930 Events,
- ◇ Di-EM Preselection

Precuts for the following plots:

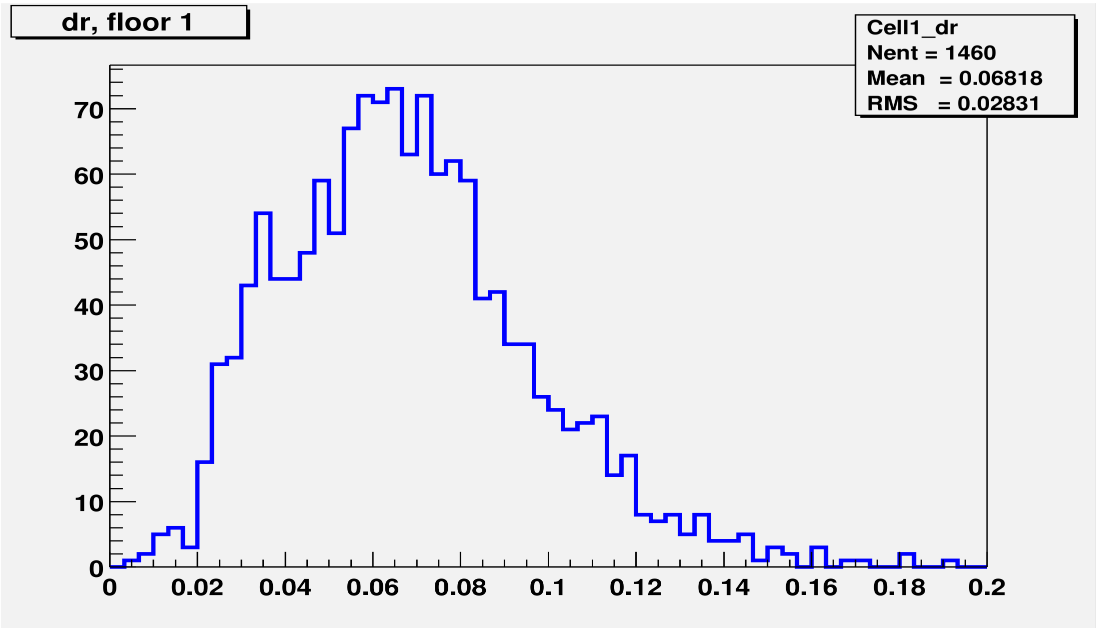
- ◇ MC Zee (WH) : Electron stemming from Z(W), fiducial region
- ◇ $|\eta| < 0.8$

Δr in Floor 1

Zee Sample:

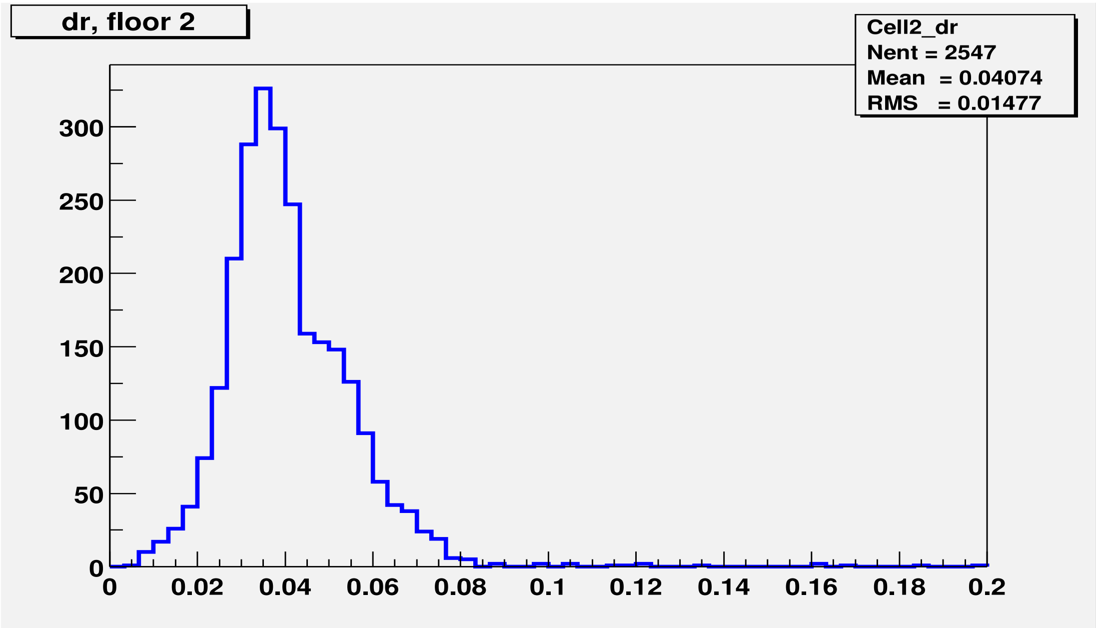


dataSample:

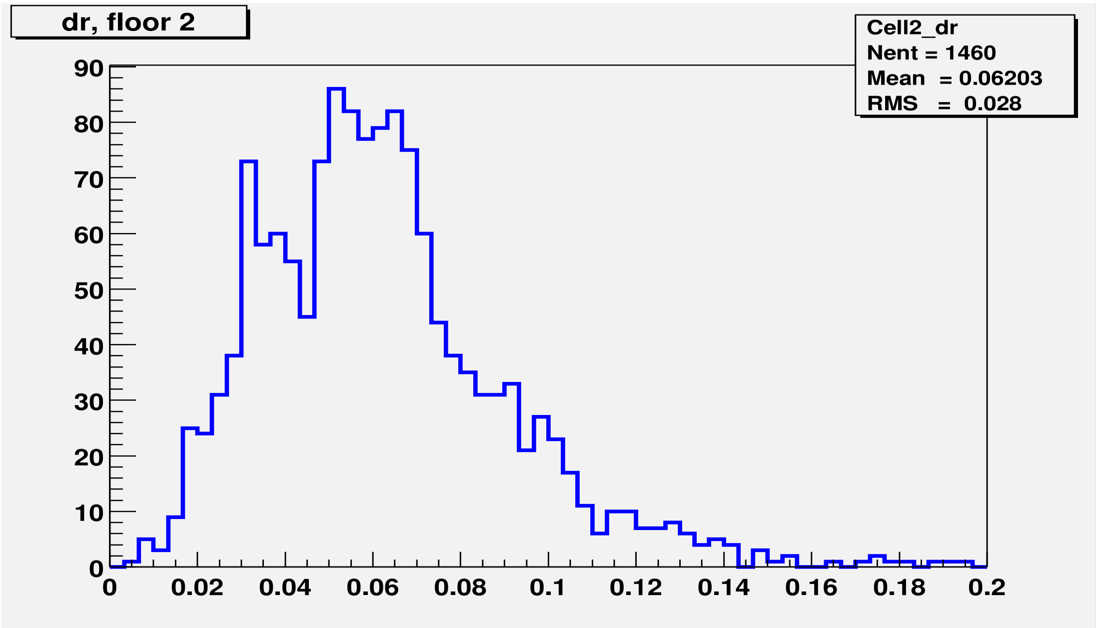


Δr in Floor 2

Zee Sample:

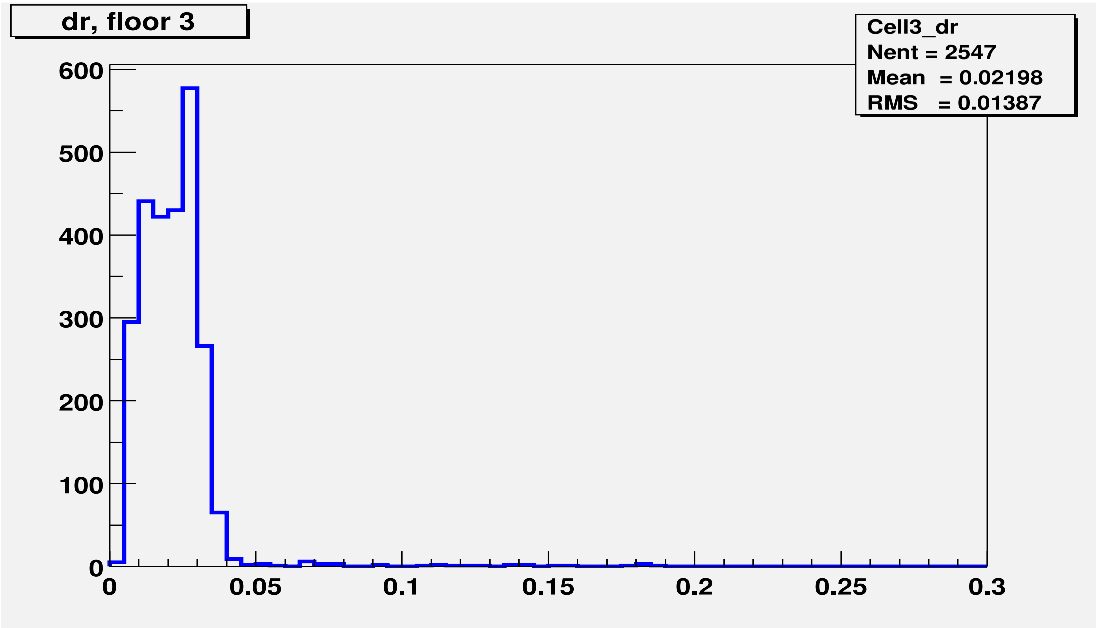


dataSample:

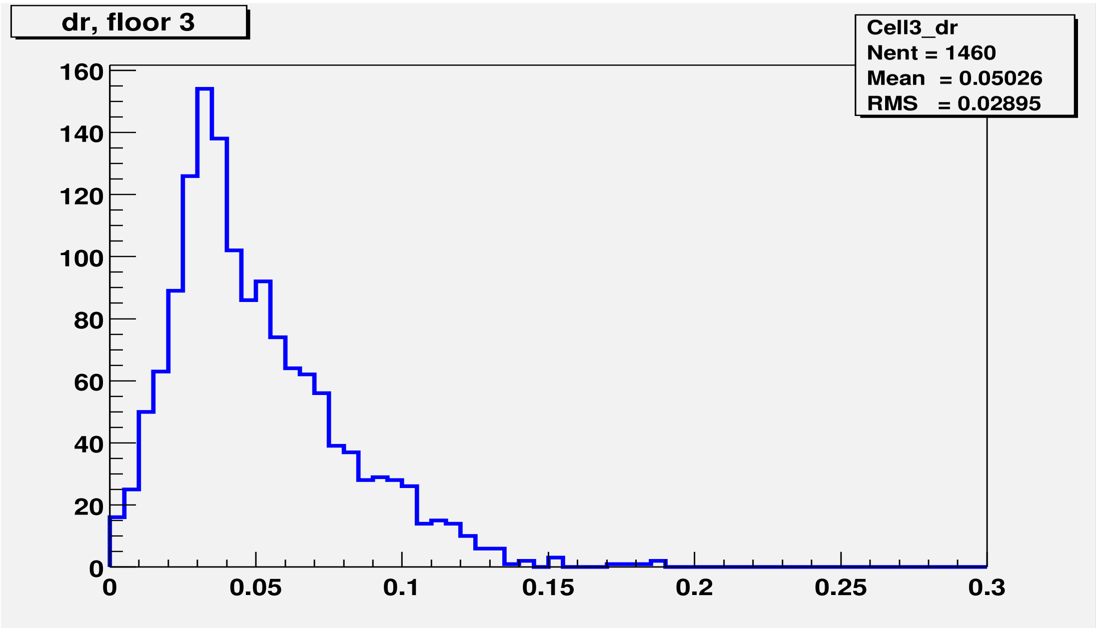


Δr in Floor 3

Zee Sample:



dataSample:

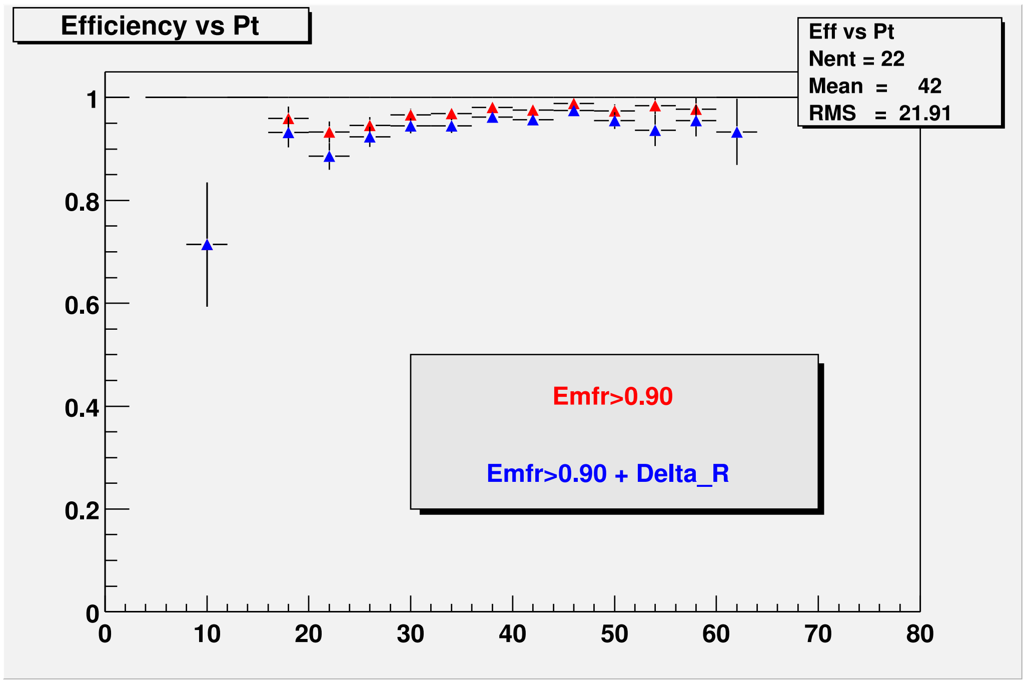


Certified L3 Cuts:
EM fraction > 0.9, $\mathrm{E_T} > 5.0\,\mathrm{GeV}$
Also studied: L3E variables calculated in cone 0.25

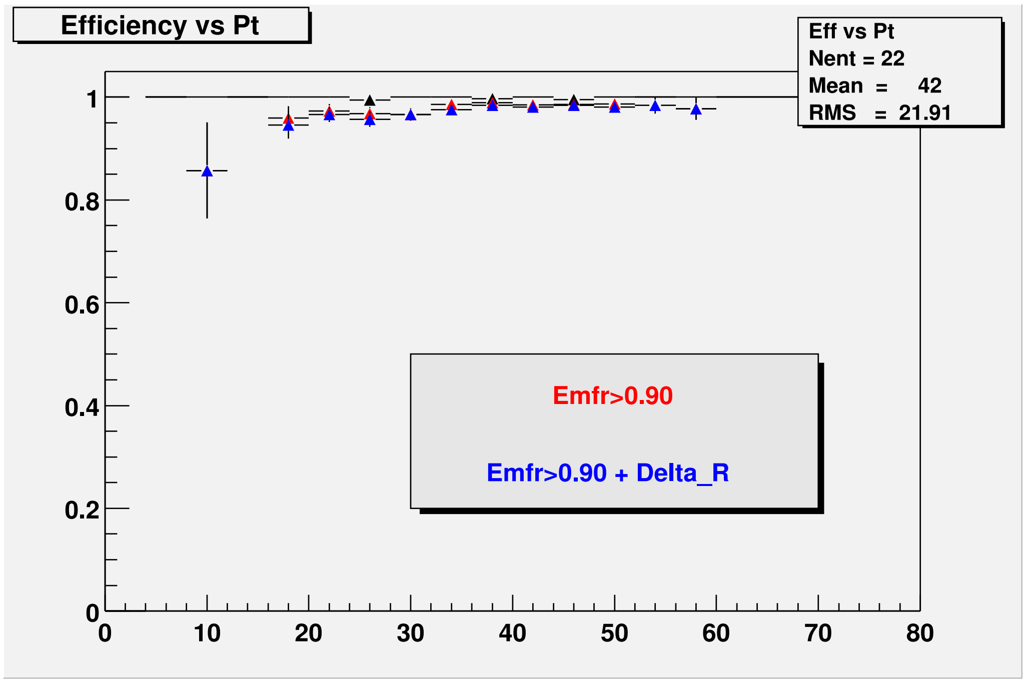
additional Δr Cut:
Δr(Floor1)< 0.085 + Δr(Floor2)< 0.085 +
Δr(Floor3)< 0.045

MC Zee Efficiencies

◇ Efficiency vs P_T (cone 0.4)

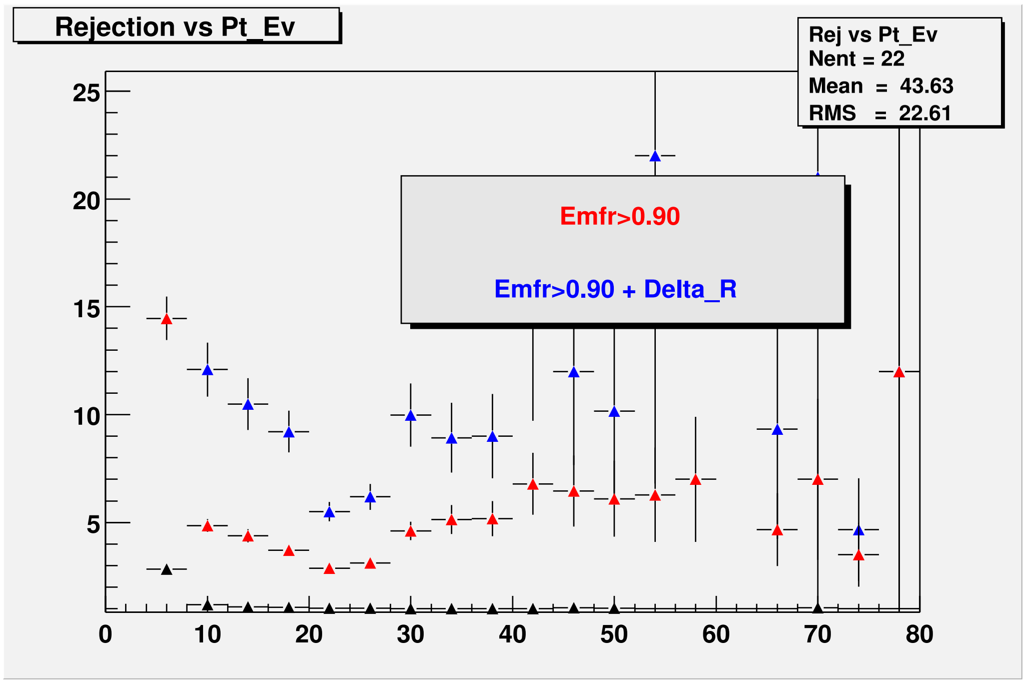


◇ Efficiency vs P_T (cone 0.25)

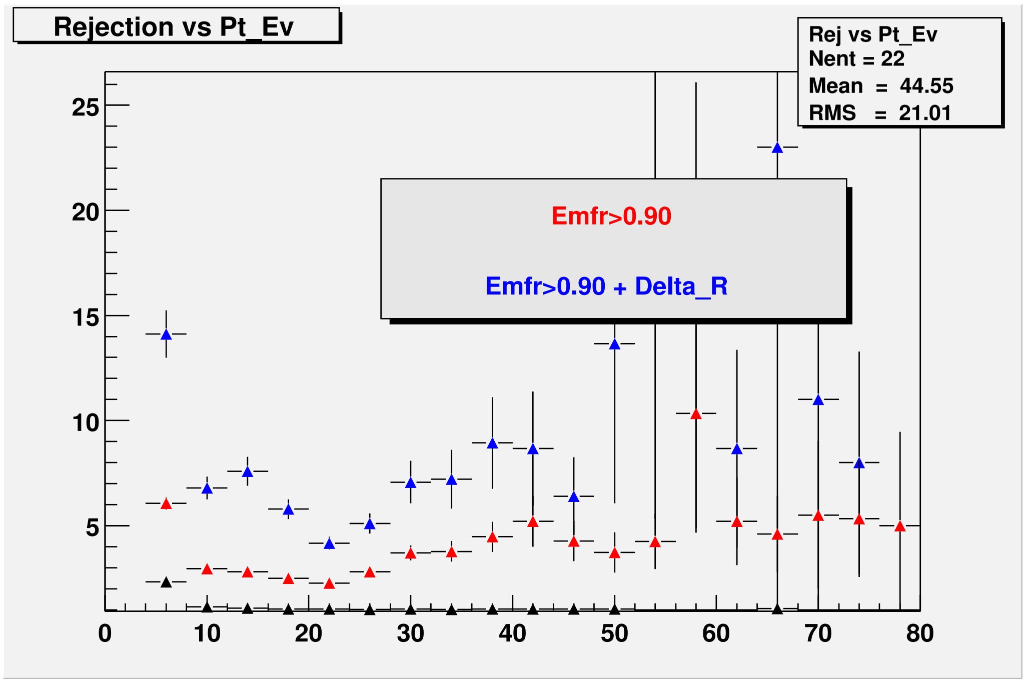


Data Rejection

◇ Rejection vs P_T, cone 0.4

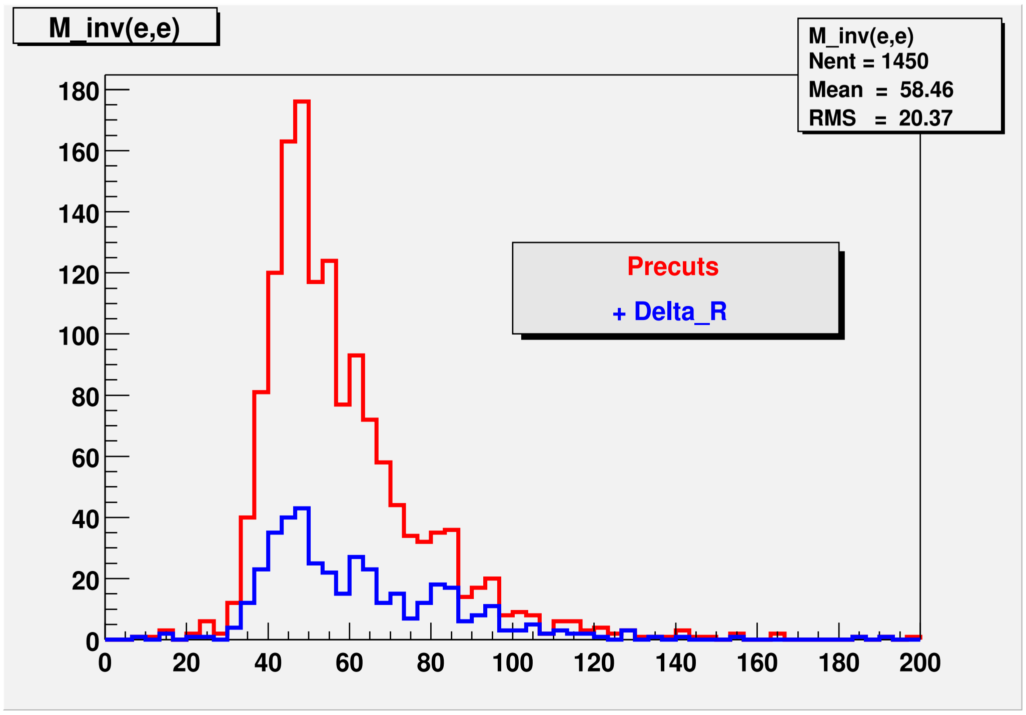


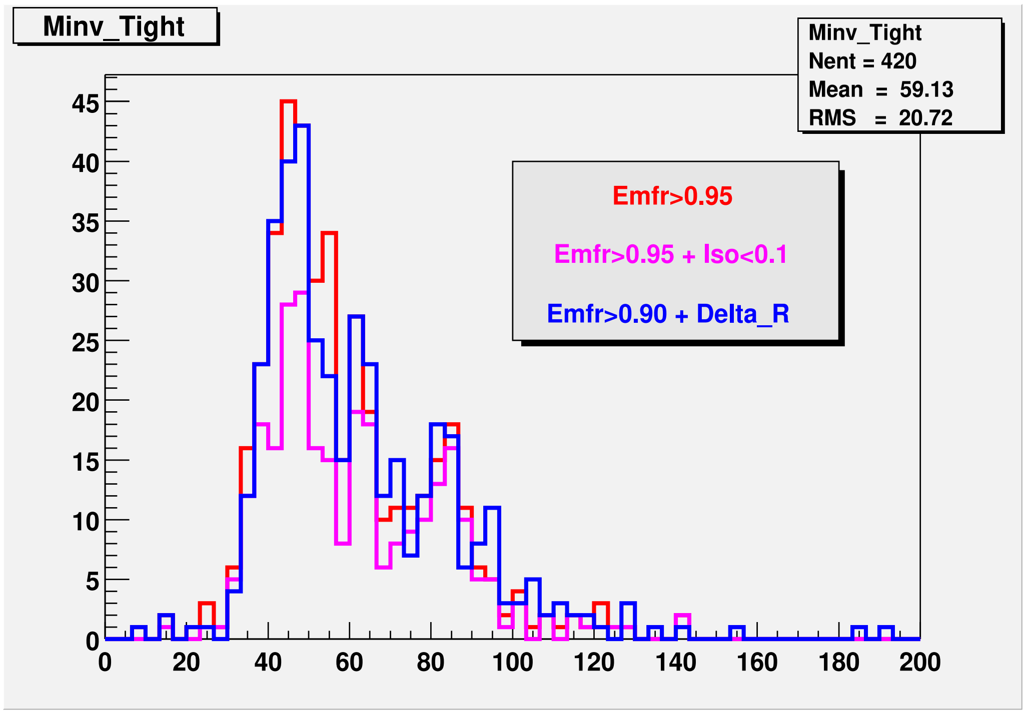
◇ Rejection vs P_T, cone 0.25



Di-EM Data Sample: Invariant Mass Distribution

Preselction: Two offline EM-objects, $P_T > 15\,\mathrm{GeV}$





Summary

- ◇ L3 EM filter certified for p11, now online
- ◇ Set of transversal shower shape cuts tested in MC studies
  Cuts on E weighted average Δr (cone 0.2) proved to be most efficient
- ◇ Impact of Δr cuts comparable with tight EM fraction and Isolation cuts
- ◇ Study of L3EM variables that are calculated in cone 0.25

...Yet to do:

- ◇ further studies of cone 0.25 variables
- ◇ test Δr cuts with tight offline electron candidates
- ◇ study rejection of data with selected L1 triggers