Z(ee) + Jets update

- ATHENA ('A Technicolor Higgs Electron Neutrino Analysis')
- Using WZ em skim (p13.05/r13.06/p13.06) 120 pb^{-1}/50 million events
- Skim: one EM object, |ID|=10,11, pT>15GeV, no trigger cut
- Triggers: EM_HI_SH or EM_HI_2EM5_SH or EM_MX_SH or EM_MX
- Applying badrun list (SMT, CFT, CAL, JET, MET)
- Rejecting events with bad lumi blocks
- Removing duplicated events due to double processing with p13.05.00 and p13.06.01
- CAL fixes: Calorimeter energy sharing problem and N90 bug fixed

Selection criteria

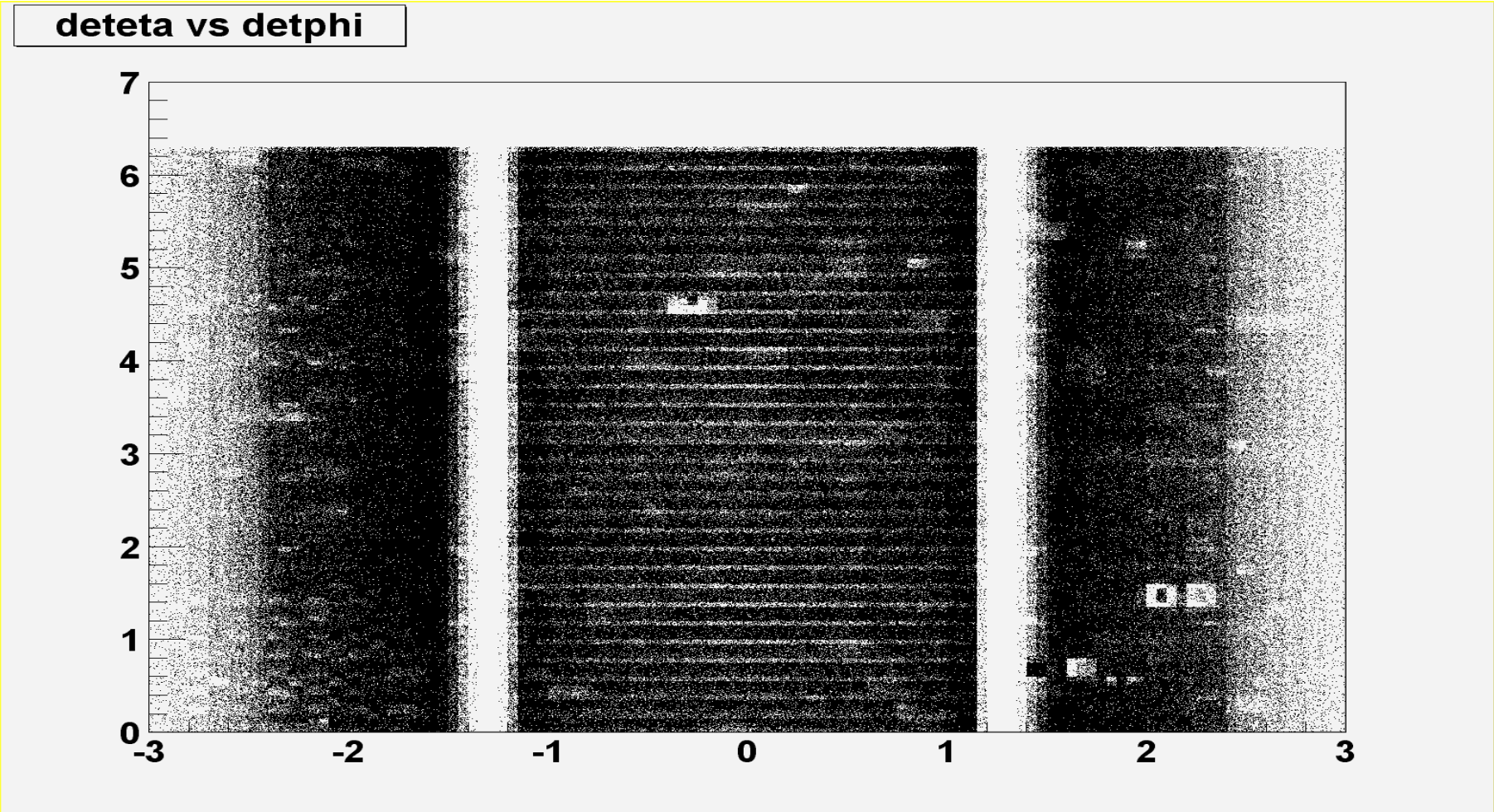
- EM:
  - Latest EM candidate
  - EMF>.9
  - Iso<.15
  - Hmx<20
  - Pt>20GeV
  - Fiducial:
    - |eta|< 2.5
    - ICR = 1.1 < |eta| < 1.6
    - No phi cuts
  - 80 GeV <= m_{ee} <= 100 GeV

- Jets (JCCB):
  - Jetcor v04-02-03
  - .05<EMfrac<.95
  - Chfrac<.4
  - Hotfrac<10.
  - N90>1
  - F90 cut
  - dR between jet and id'd EMobject > .45
  - Pt > 20 GeV
  - |eta|<2.5

Some numbers ...

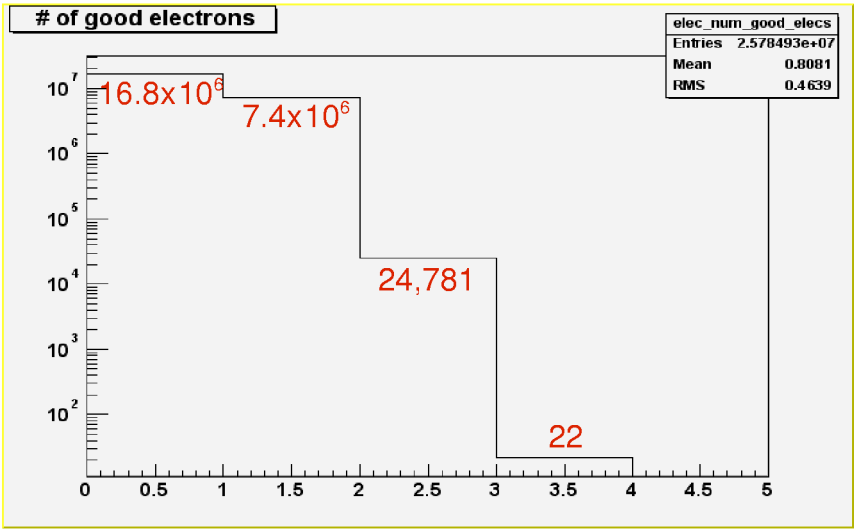
- Total number of events processed:
  52,008,740
- Number of events in which at least one of my triggers fired:
  31,623,261
- Number of events after trigger-, bad-run-, lumiblock-cuts:
  25,784,933
- Number of events with 2 (or more) good electrons:
  24,803
- ... add (at least) 1 trackmatch:
  10,095
- ... add di-em mass window cut (80GeV < m_{ee} < 100GeV):
  7,626
- ... want at least 2 good jets in the event:
  166

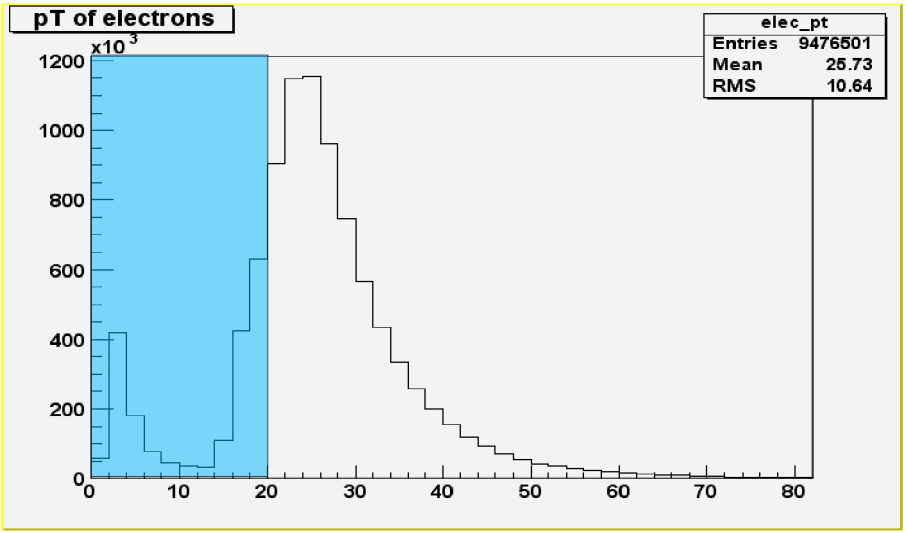
CAL

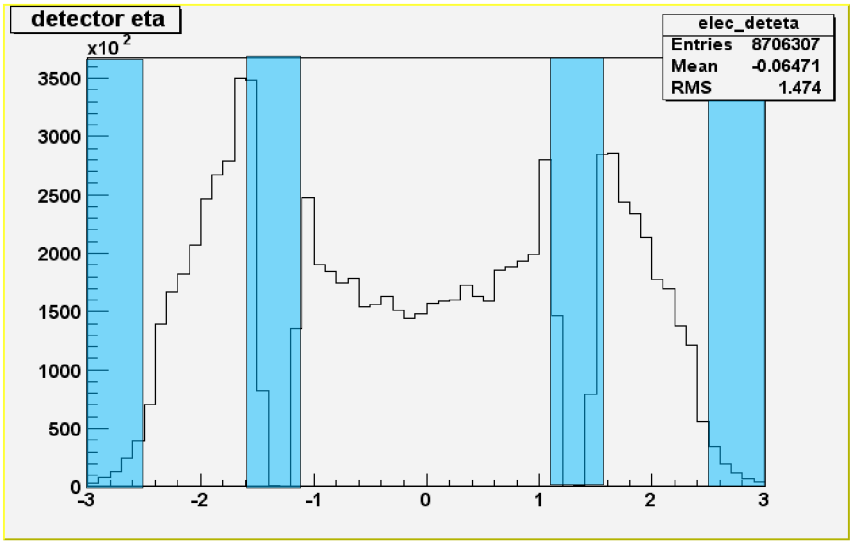


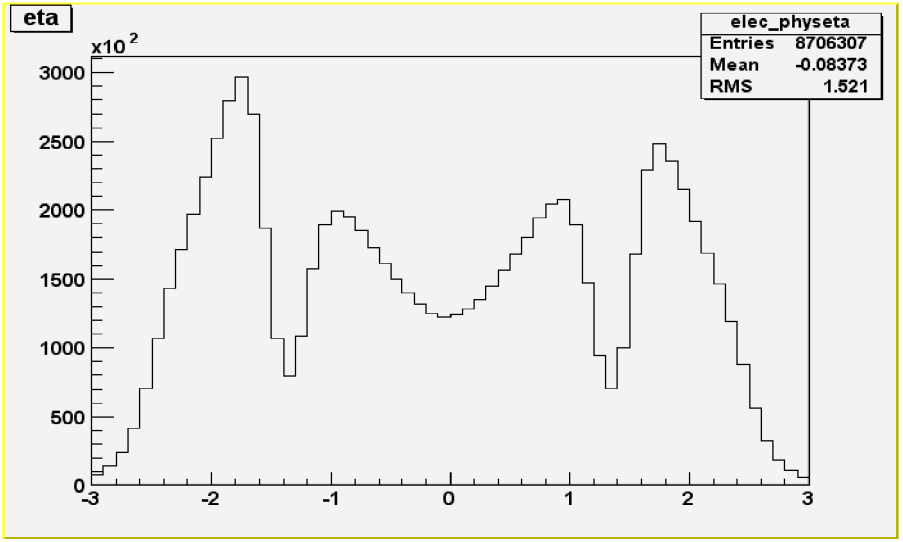
All electrons passing EMF, Iso, Hmx, pT cuts - no fiducial cuts

Basic electron plots ...

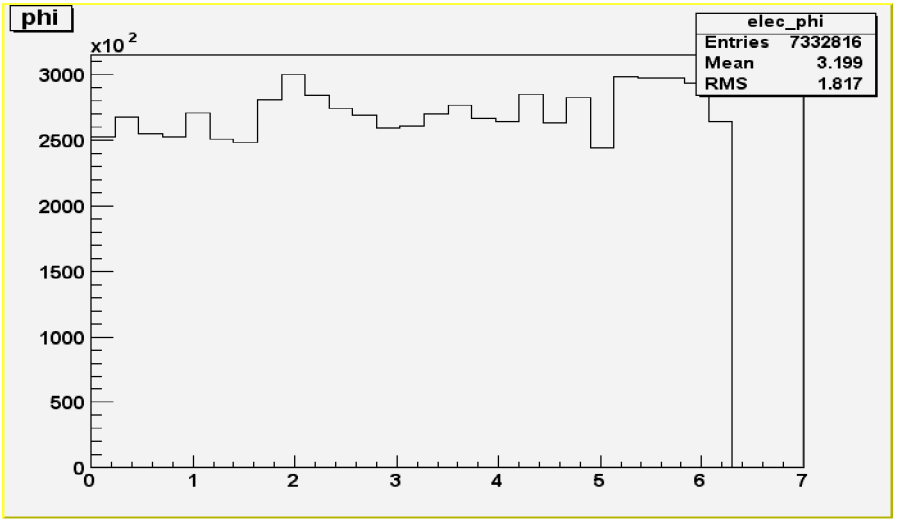


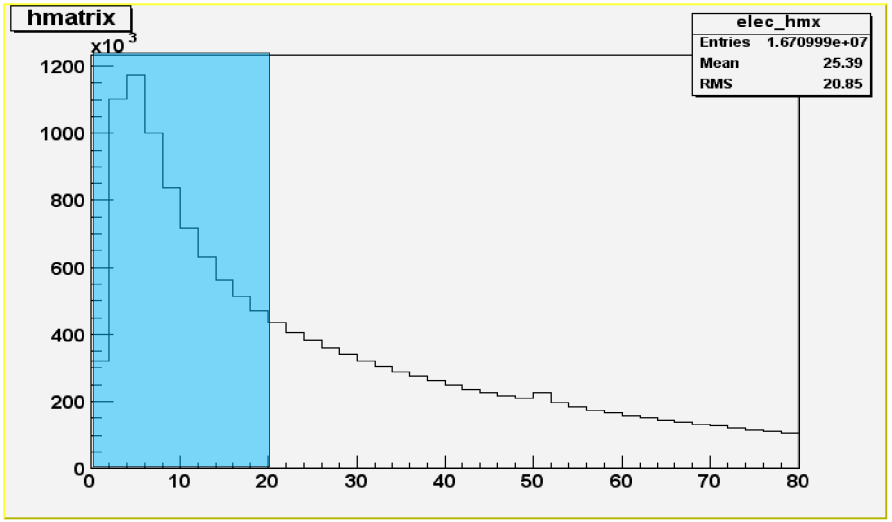


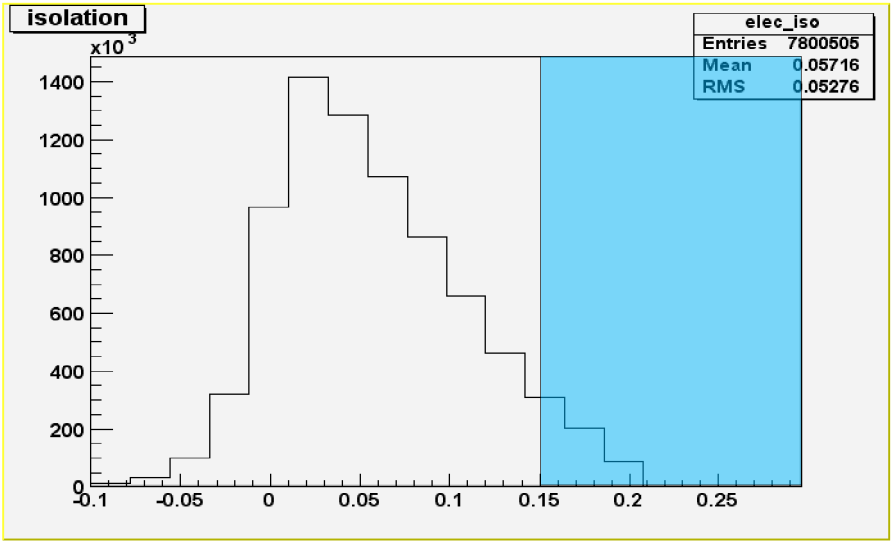


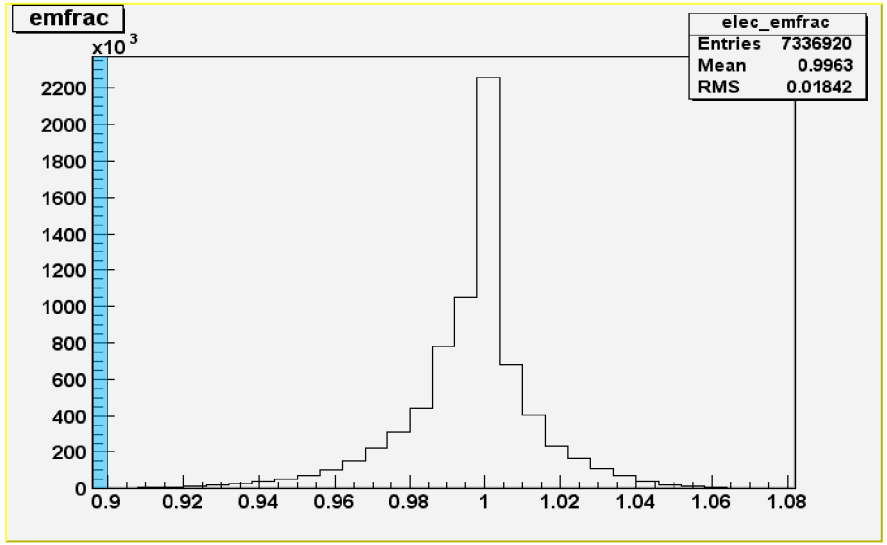


... basic electron plots



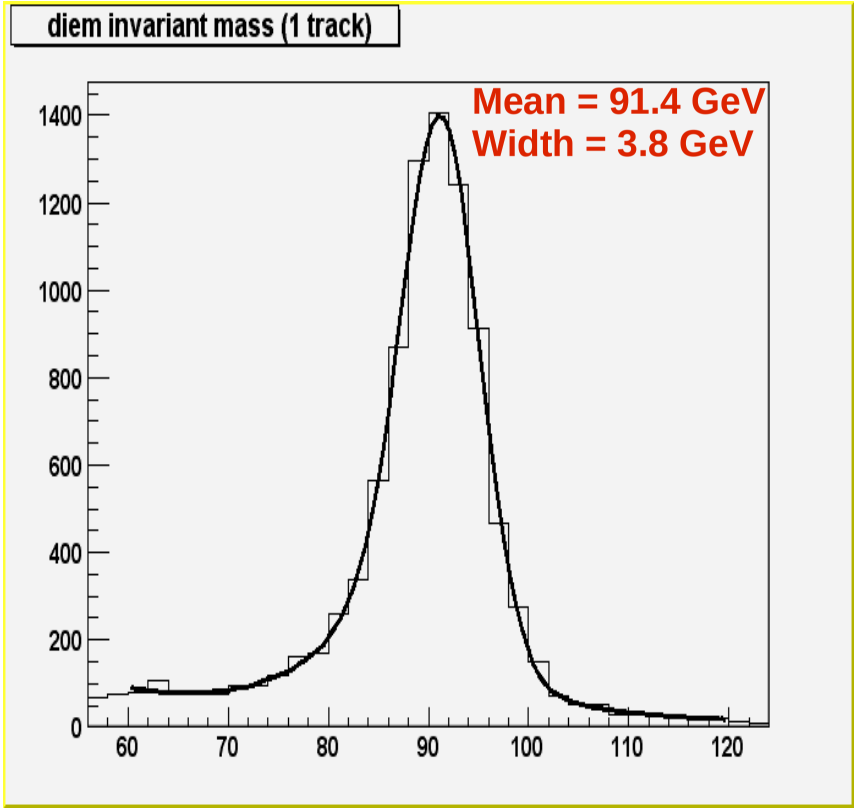


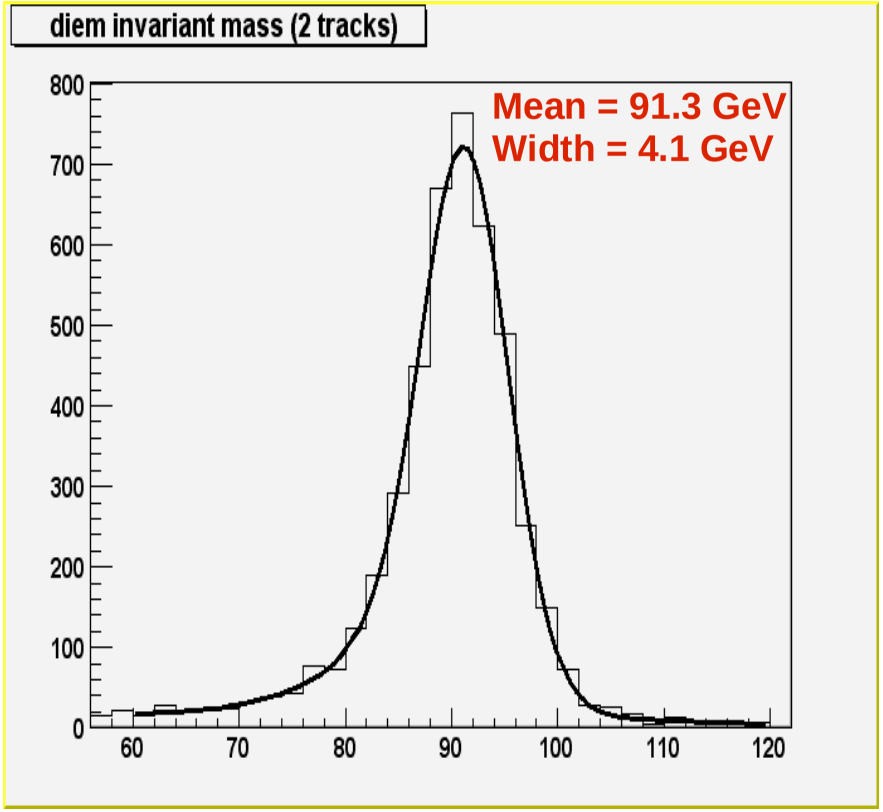




m(ee) for 1 and 2 trkmatch

Applying all quality cuts to electrons and calculating di-em invariant mass for the two lead pt electrons (1 trkmtch & 2 trkmtch sample).





(Gaussian + Breit-Wigner for signal - exponential for background)

Trackmatching- and EMID Efficiencies

ε = track matching efficiency

both EM objects with trackmatch → number of Z events $N_D \propto \varepsilon^2$

at least one EM object with trackmatch → number of Z events $N_S \propto 2\varepsilon - \varepsilon^2$

$$\Rightarrow \quad \varepsilon = 2N_D / (N_D + N_S)$$

$$\boxed{\varepsilon_{TRK} = 72\%}$$

→ Using sample where both EM objects have a trackmatch

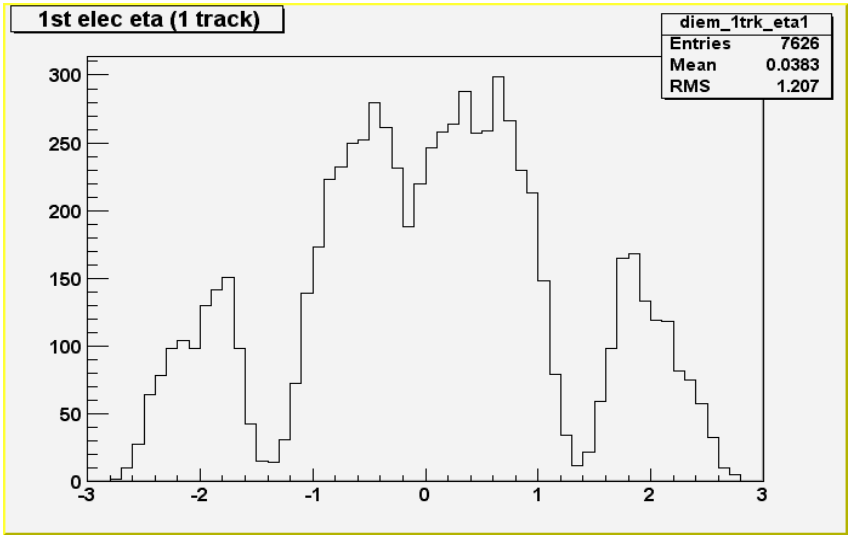
→ N_S^{EM} = from fit of M_{ee} distribution for events with at least one EM object passing the EMID cuts (EMF, Iso, Hmx)

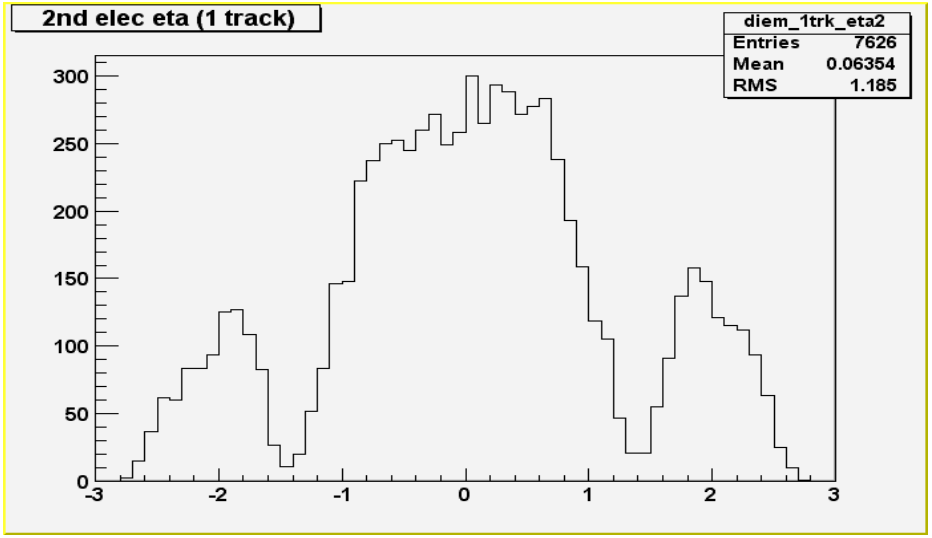
→ N_D^{EM} = from fit of M_{ee} distribution for events with both EM objects passing the EMID cuts

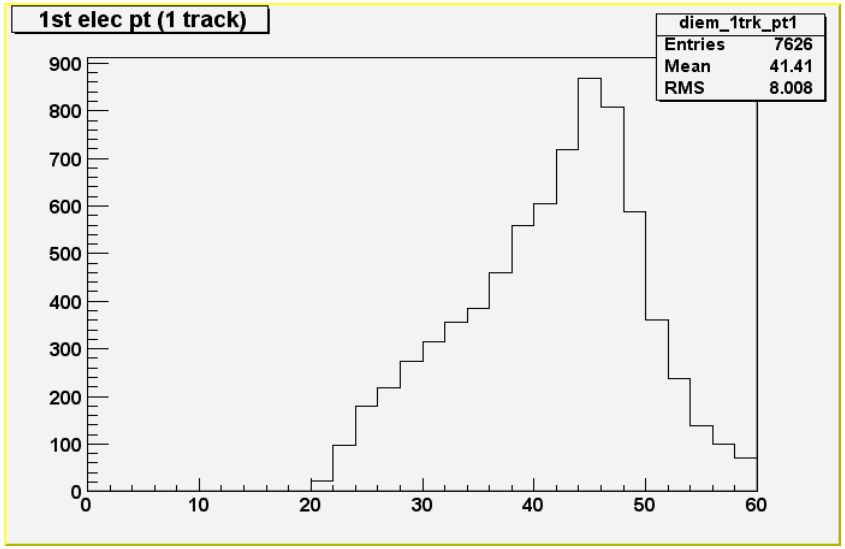
$$\Rightarrow \quad \varepsilon = 2N_D^{EM} / (N_D^{EM} + N_S^{EM})$$

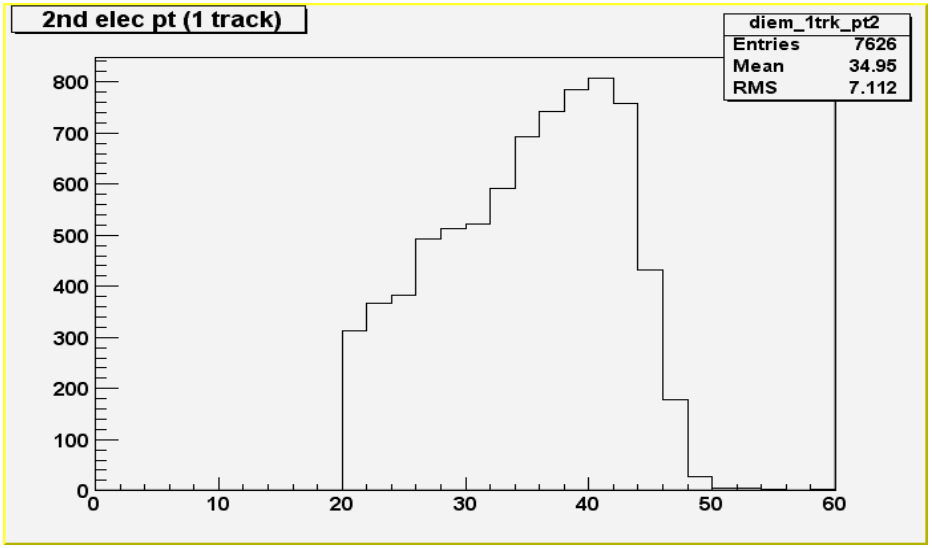
$$\boxed{\varepsilon_{EMID} = 92\%}$$

eta and pT of the Z electrons (requiring at least 1 trkmatch)



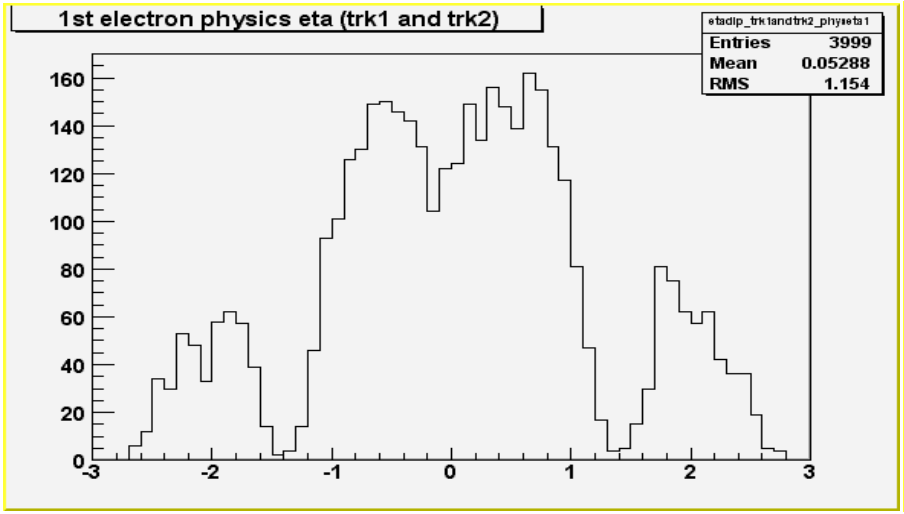


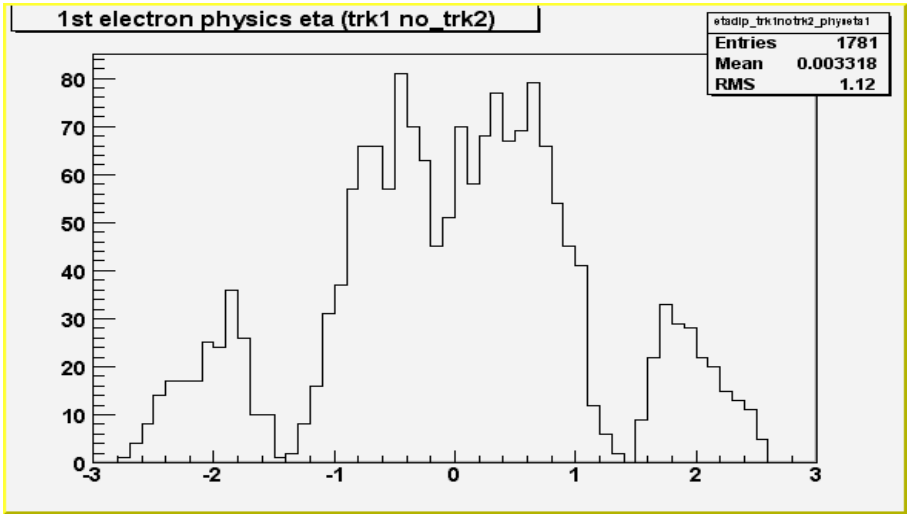


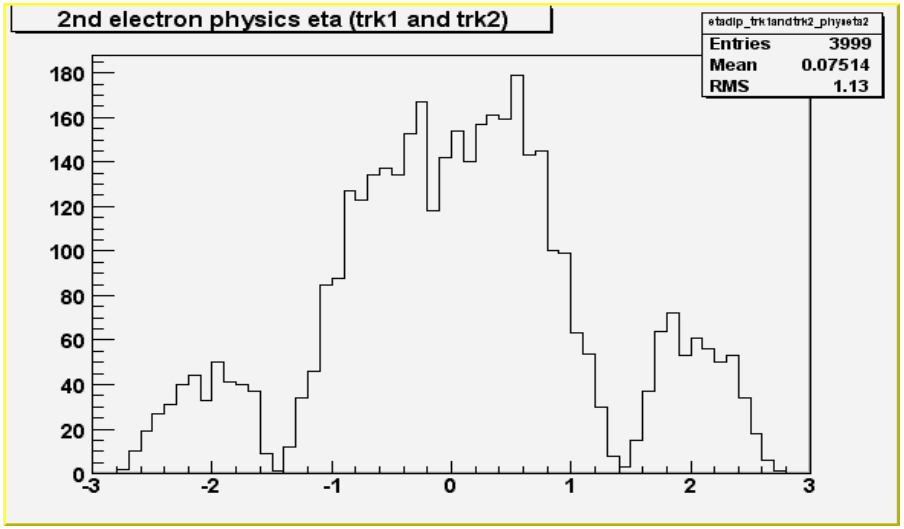


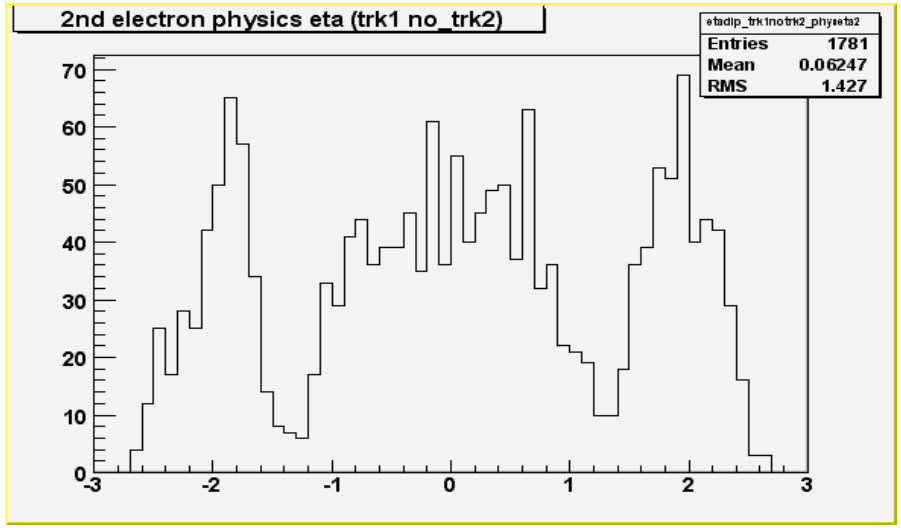
Eta-dip

Turning 2nd electron trk match on/off (physics eta)



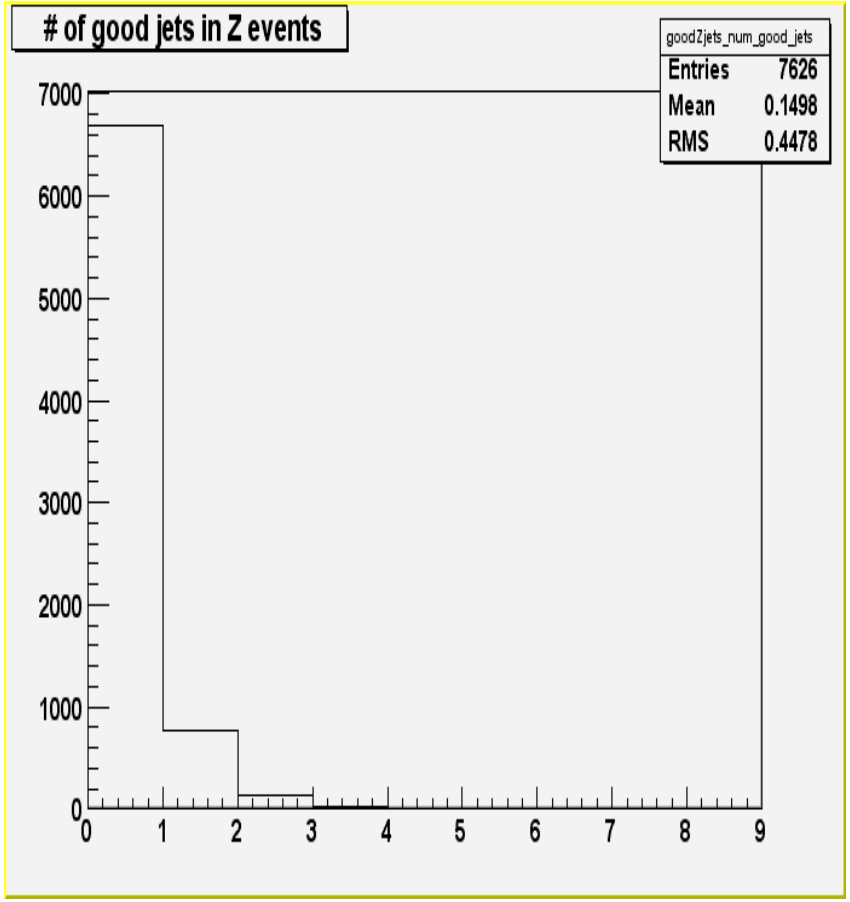


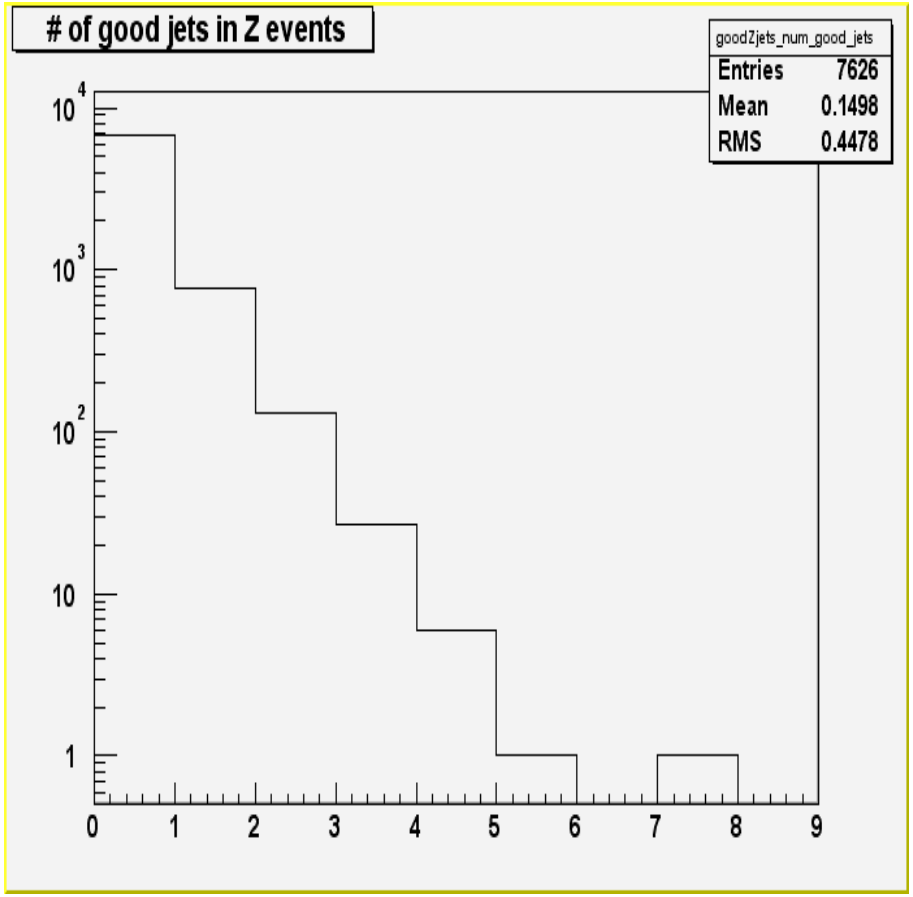




Jet multiplicities

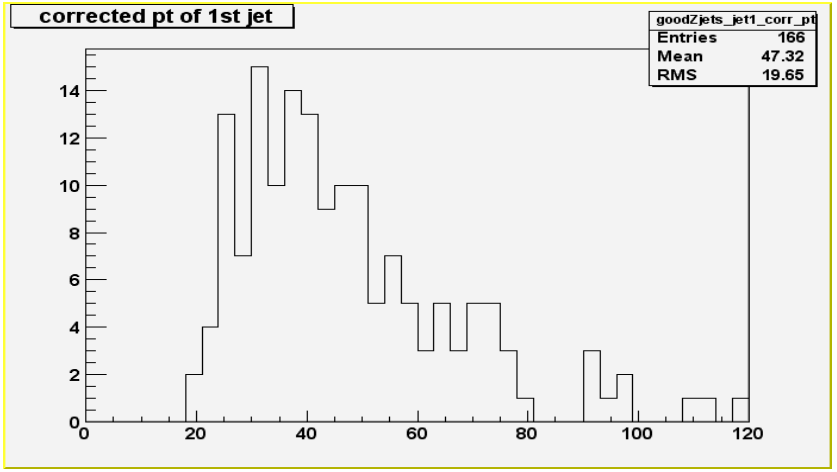
→ **taking the two highest pT good electrons → calculate di-em invariant mass → 80GeV≤M_{ee}≤100GeV → plot good jet multiplicities**

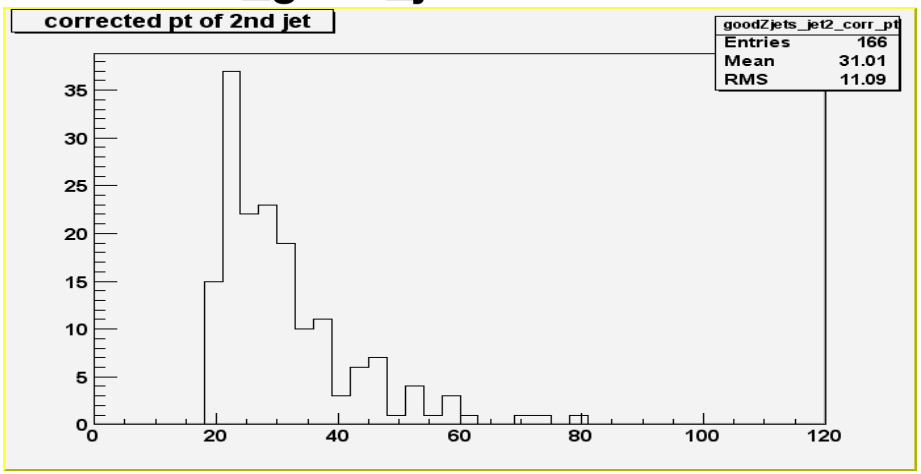


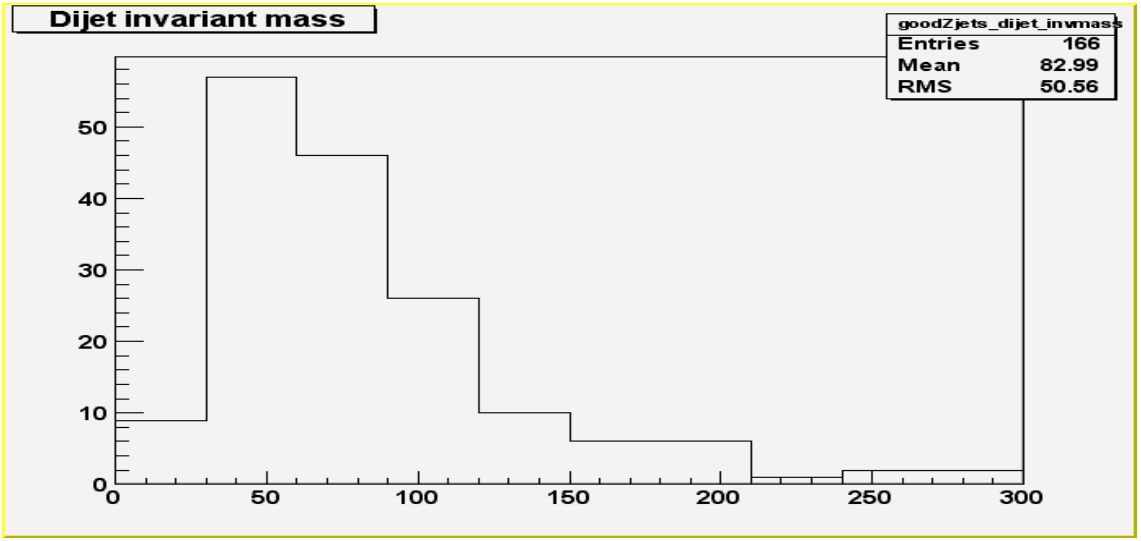


Dijet events

Events with Z candidates and num_good_jet >1







To do

- Spacial trackmatching instead of Chi2 cut
- Optimize quality cuts
- Missing ET cut (W veto)
- MC (signal & background)
- Correction factors: Trigger, Acceptance, Jets