p14 Z(ee) + Jets

- Based on 219 pb^{-1} of delivered lumi (19 April 2002 - 7 Sept 2003 / run range: 151817 - 180956)
- CSG's 1EMloose skim: (ID=10 OR |ID|=11) AND (pT>15GeV)
- ✔ ATHENA root tuple
- ✔ Good event selection:
  - ✔ Jet/MET v5.0 list of bad LBNs
  - ✔ CAL, SMT, CFT based on runquality database
- ✔ Checking for event duplication
- ✔ DiEM triggers:
  - 2EM_HI = CEM(2,10) L3(loose, 1, 20) for triggerlist ≦ v11
  - E1_2L20 = CEM(1,11) L3(loose, 2, 20) for triggerlist v12
- ✔ Luminosity:

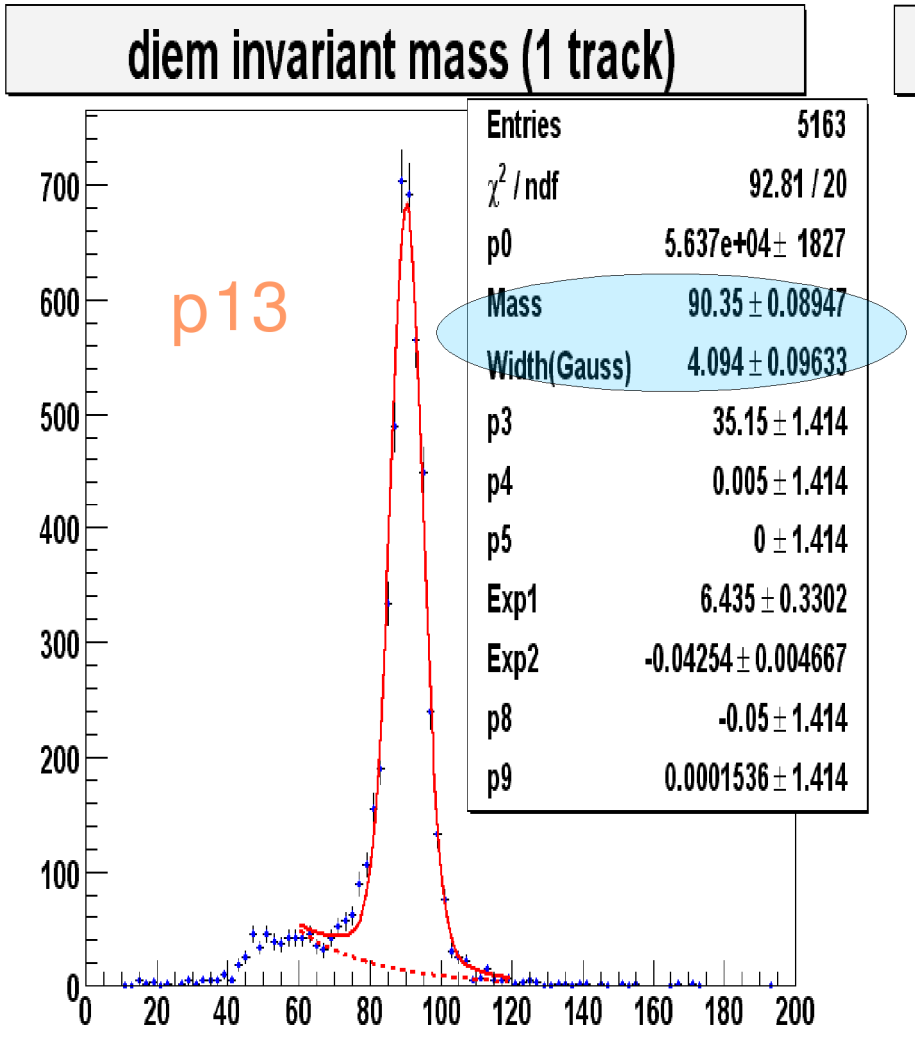
	2EM_HI	E1_2L20	Sum
delivered	172pb-1	47pb-1	219pb-1
recorded	143pb-1	44pb-1	187pb-1
recorded w/o bad LBNs	126.31pb-1	42.39pb-1	168.7pb-1
reco'd w/o bad LBNs	126.03pb-1	42.38pb-1	168.41pb-1

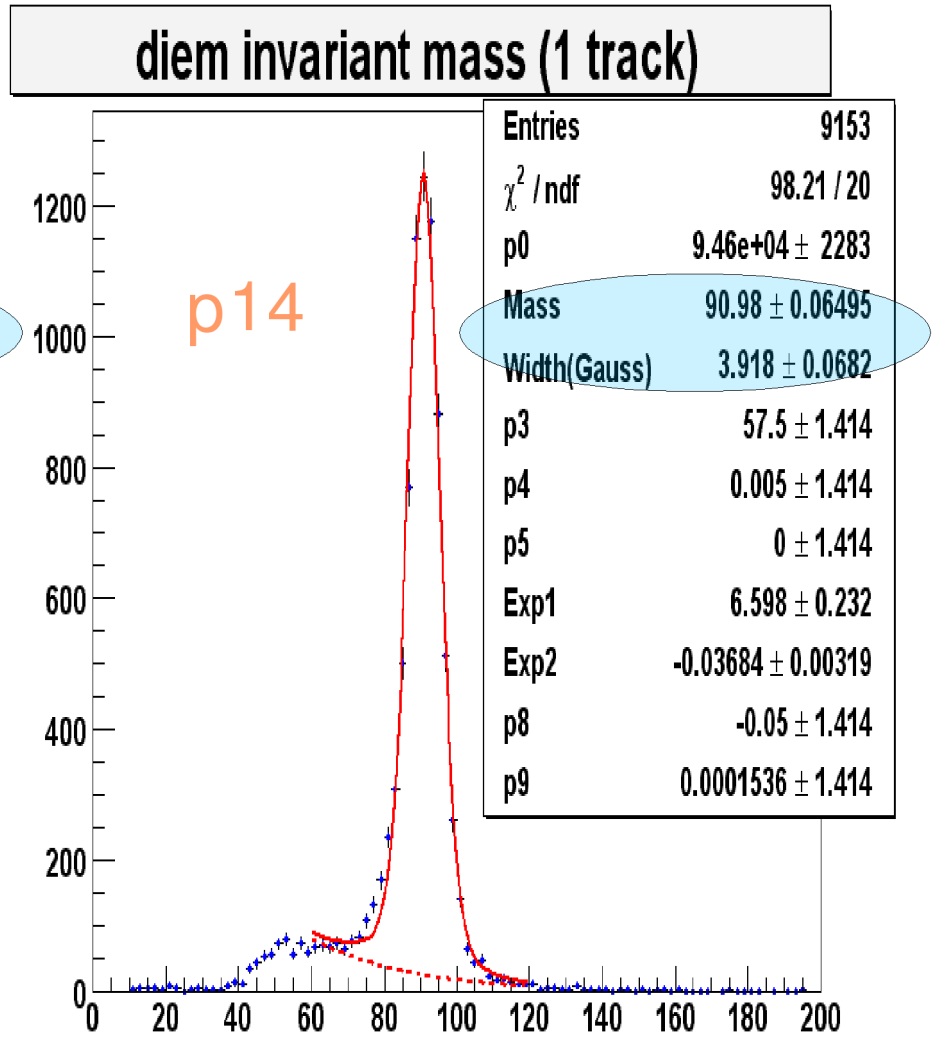
Electron and Jet selection

- Electron selection:
- EMF>.9
- Iso<.15
- HMx8<20.
- pT>20GeV
- Including phi cracks
- CC-CC: |eta|<1.1
- Requiring at least one trackmatched electron
- 80 GeV < M_{ee} < 100 GeV

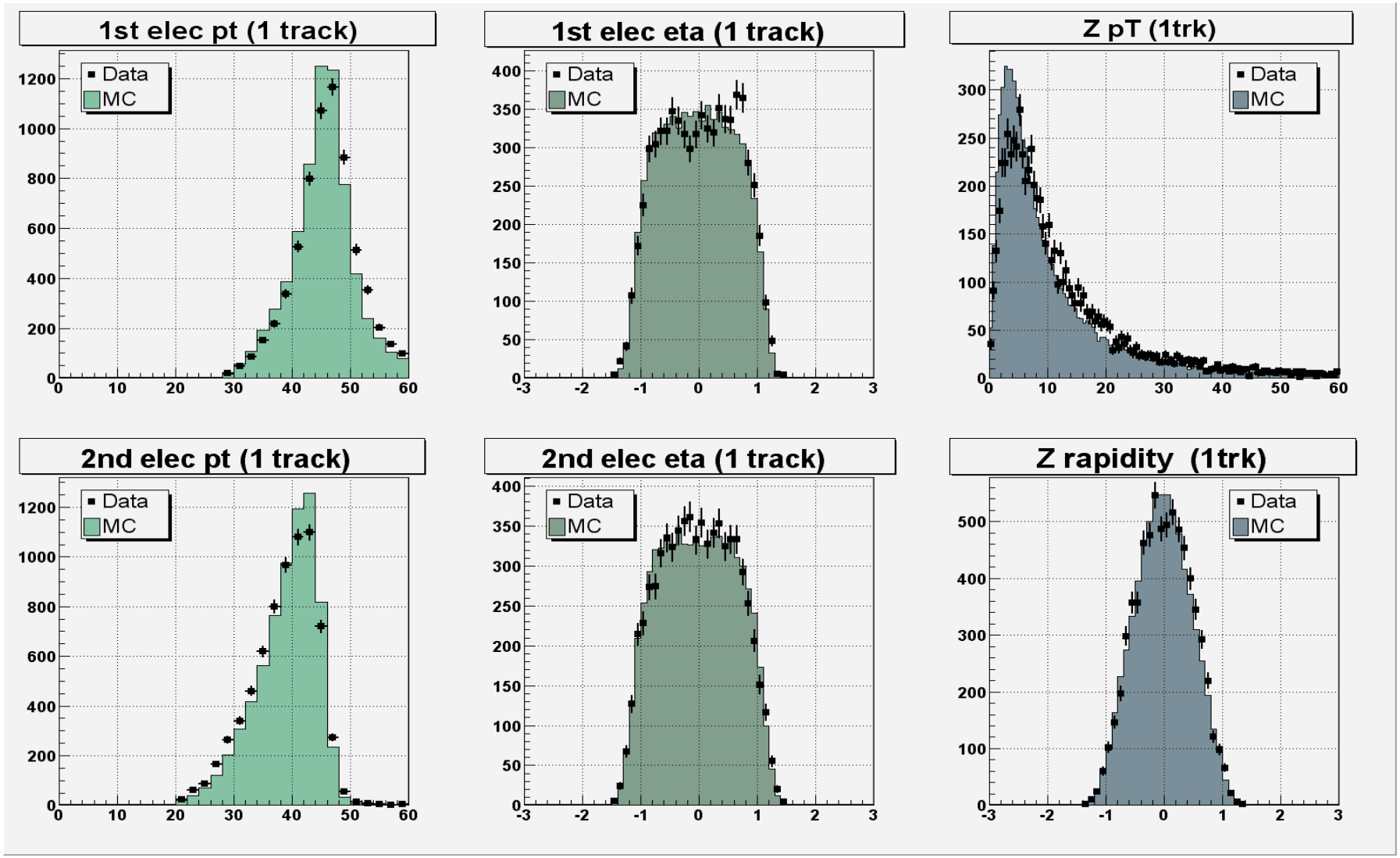
- Jet selection:
- .05<EMF<.95
- Chfrac<.4
- HotFrac<10.
- N90>1
- L1confirmation
- dR(Jet-EM)>.45
- pT>20GeV

Z peaks (p13 vs p14)

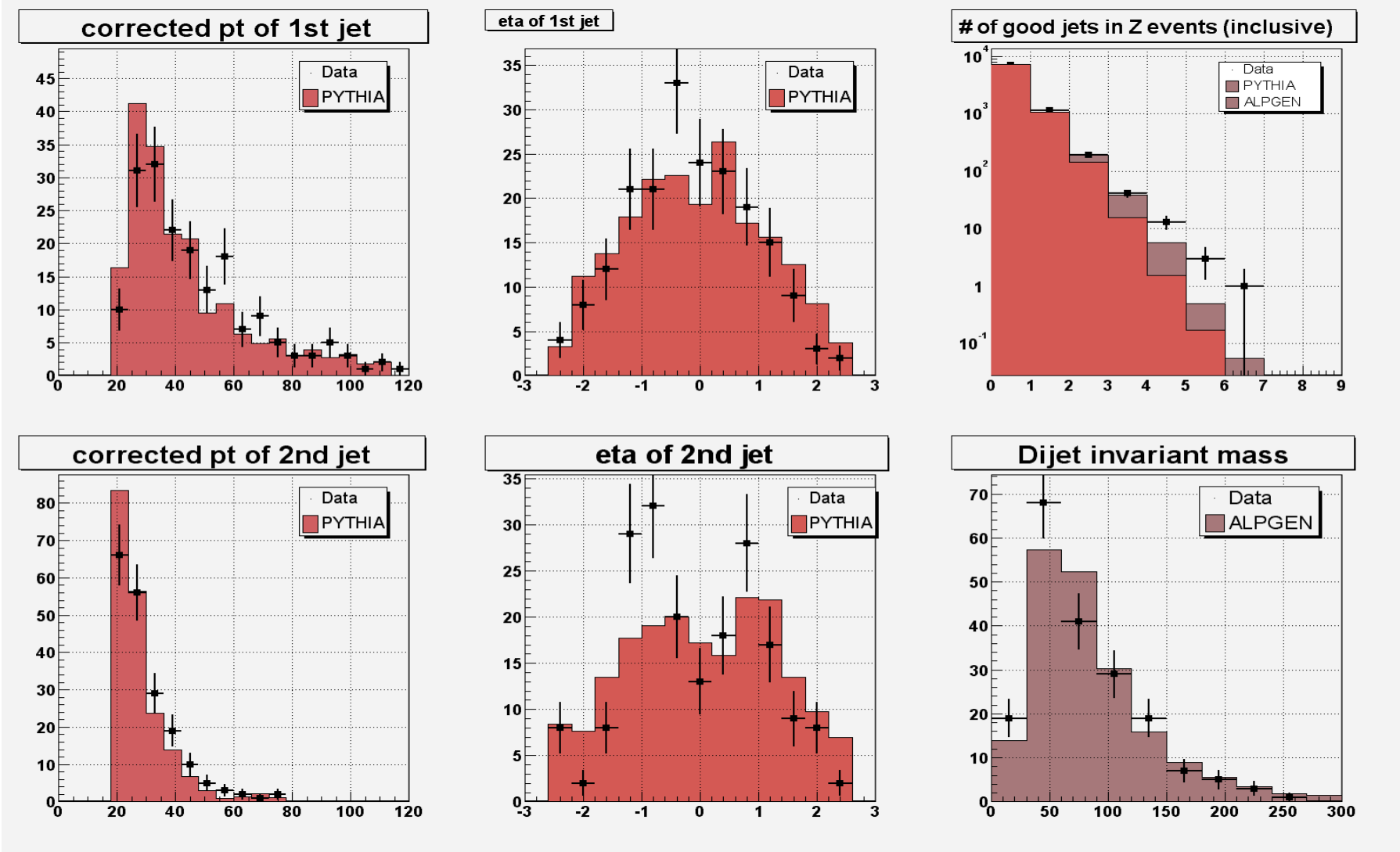




Electrons in Z candidate events (p14 data vs PYTHIA MC)

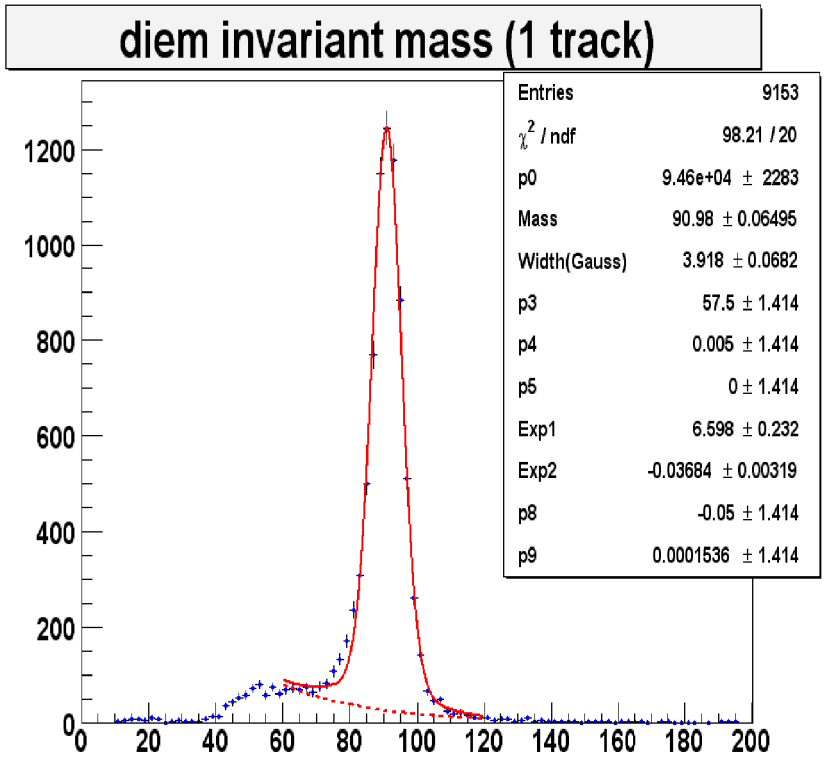


Jets in Z candidate events (p14 data vs PYTHIA/ALPGEN MC)



QCD background

- Using MC to dertermine fraction of DY in Z/Gamma*-> ee: **2.3%**
- Fitting exponential and convolution of Gaussian & BW to diem invariant mass plot to separate pure Z->ee from DY+QCD



Total # of events (80-100GeV) = **7041**

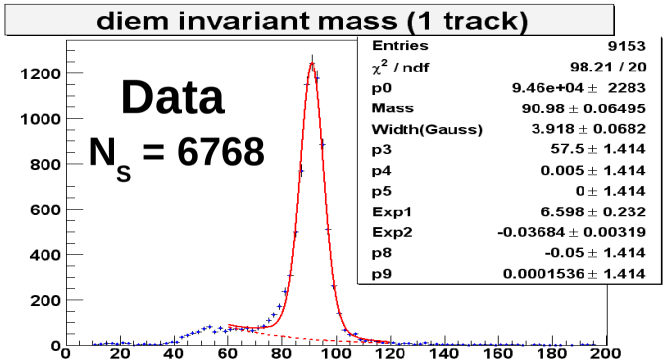
from QCD and DY (80-100GeV)= 273

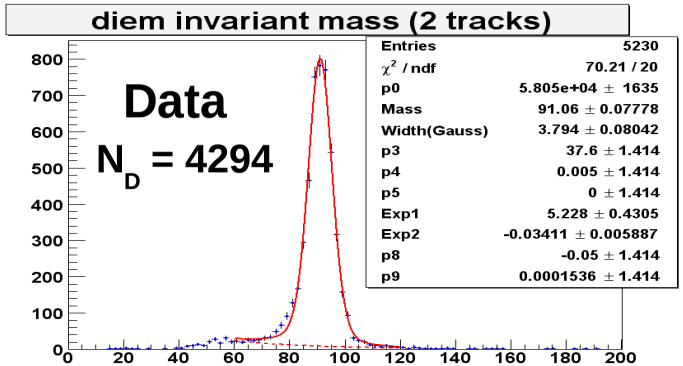
=> Signal = Z + DY = 6927 +-86

Background = QCD = 114 +-21

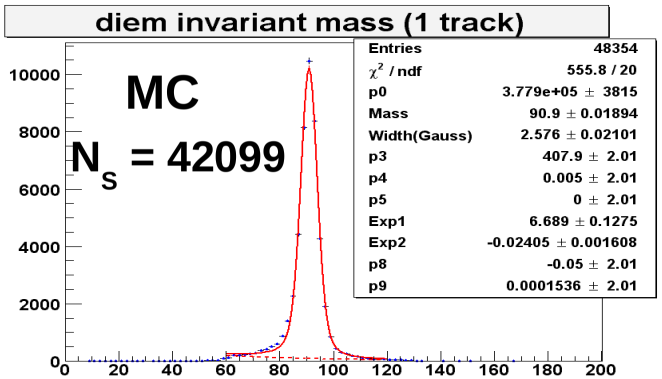
Track efficiency in data and MC

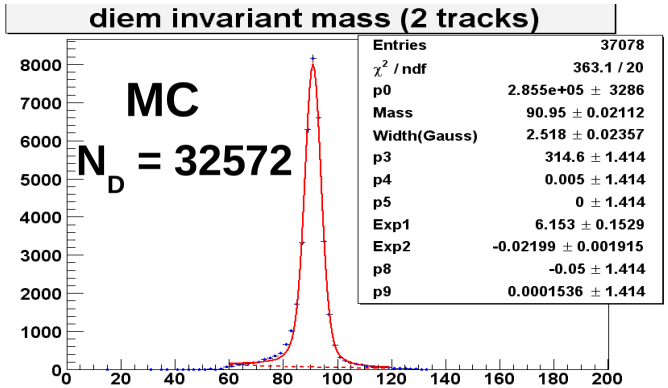
- N_S = # of events with 2 trk matches
- N_D = # of events with at least 1 trk match
- Efficiency = $2N_D/N_D + N_S$
- Fit: Gaussian+BW for signal and exponential(data)/linear function (MC) for background





ε_{trk}^{data} = 77.6%+.45%

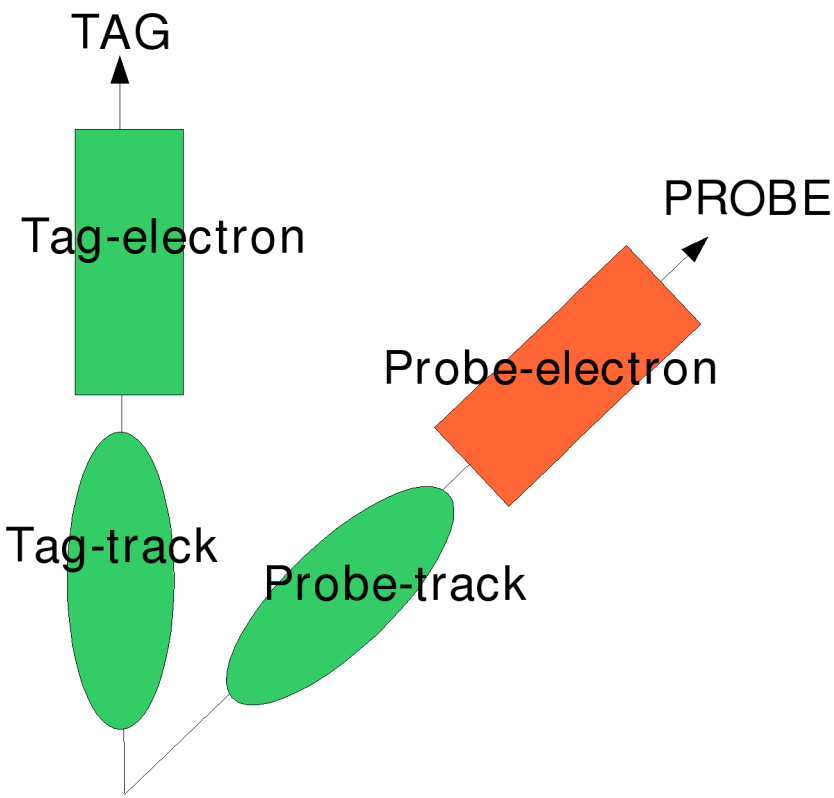




ε_{trk}^{MC} = 87.2%+-.12%

EM efficiency in data and MC

Tag and probe method:



Tag electron:
EMF>.9, Iso<.15, HMx8<20.,
pT>20GeV, |det_eta|<1.1

Tag/Probe tracks:
20GeV<pT<80GeV, |eta|<1.1,
Chi^2<8., DCA wrt r-phi <.3,
DCA wrt best vtx<4.cm,
del_phi<2.

Invariant tag-electron probe-track
mass m: 70GeV < m < 110GeV

Probe electron:
EMF>.9, Iso<.15, HMx8<20.

$\varepsilon_{EM}^{data} = \varepsilon_{EMreco}^{data} \times \varepsilon_{EMF,Iso}^{data} \times \varepsilon_{HMx8}^{data}$ = 95.7%+-0.4% x 99.3%+-0.6% x 90.3%+-0.8% = 86.3%+0.7%

$\varepsilon_{EM}^{MC} = \varepsilon_{EMreco}^{MC} \times \varepsilon_{EMF,Iso}^{MC} \times \varepsilon_{HMx8}^{MC}$ = 96.6%+-0.1% x 99.2%+-0.2% x 97.2%+-0.2% = 93.7%+-0.2%

Z(ee) + X Cross Section

$$XSection \cdot BR = \frac{N - B}{Lumi \cdot Trigger \cdot Accept \cdot Trk \cdot EM}$$

$$Accept = \frac{N_{pass}}{N_{total}} * \frac{1}{\epsilon^{MC}_{EMreco}}$$

$$Trk = 2 * \epsilon^{data}_{trk} - \epsilon^{data\ 2}_{trk}$$

$$EM = \epsilon^{data\ 2}_{EM}$$

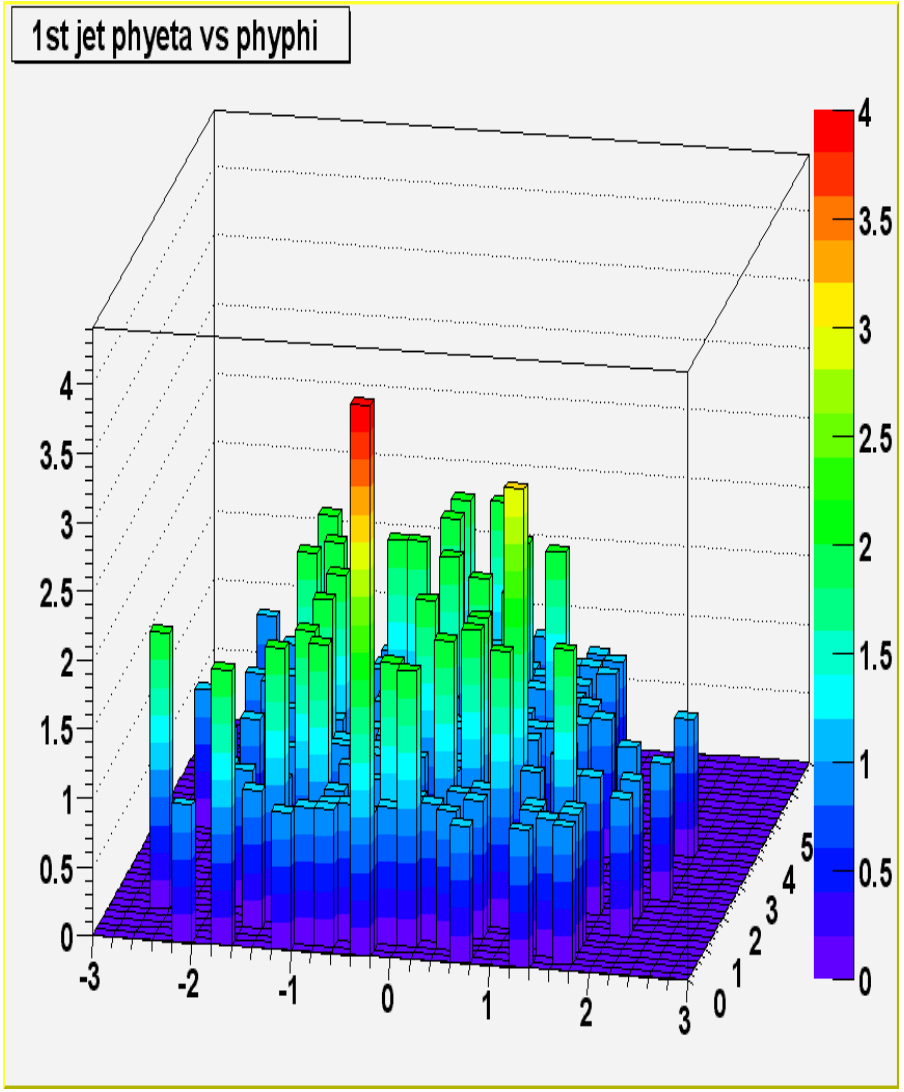
	Value	Uncertainty
N-B	6927	86
Lumi	168.41pb-1	10.09pb-1
$A=N_{pass}/N_{total}$	22.1%	0.1%
$\varepsilon^{MC}_{EMreco}$	96.6%	0.1%
ε^{data}_{trk}	77.6%	0.5%
ε^{data}_{EM}	86.3%	0.7%
$\sigma \times$ BR	254.2pb	4.6pb

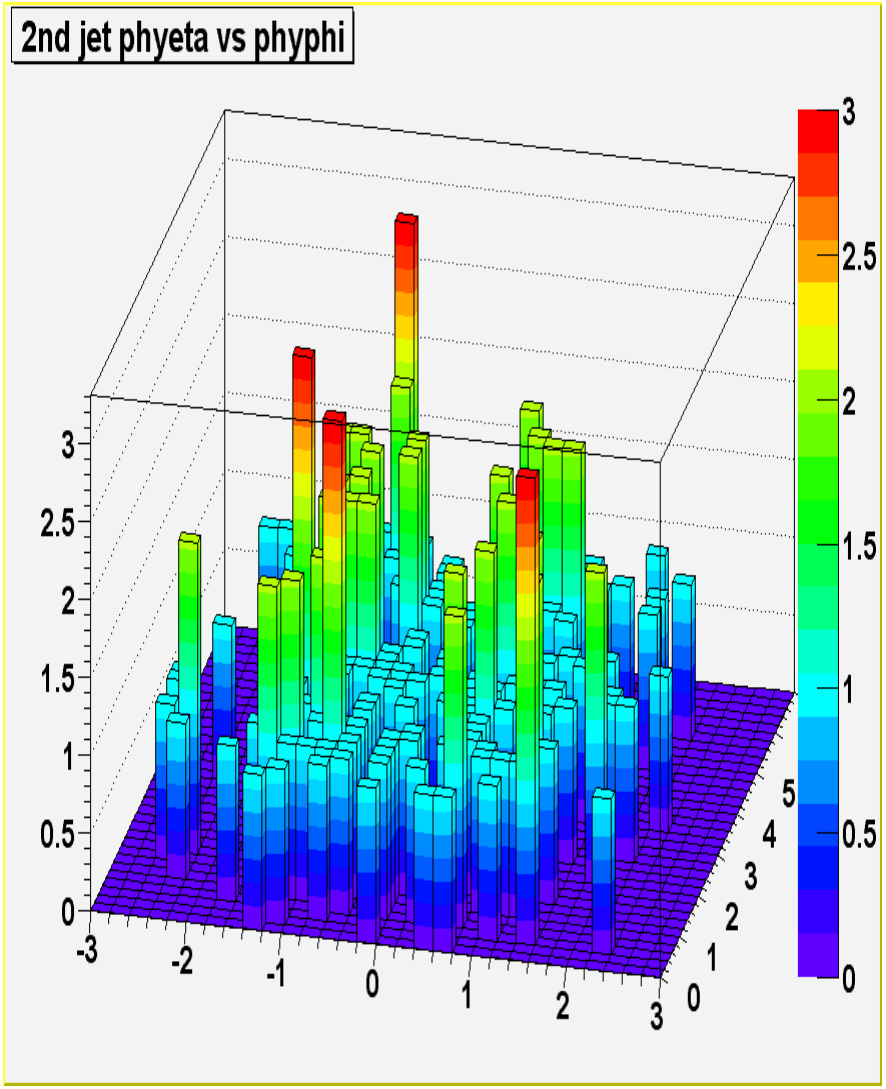
Signal Efficiency = Accept x Trk x EM
= 16.2%

Todo

- MC electron smearing
- Trigger efficiency
- Jet Reco/ID efficiency
- Recalculate efficiencies with jets

Documentation at: **http://heplab2.phy.uic.edu/physics/Zee_jets.html**

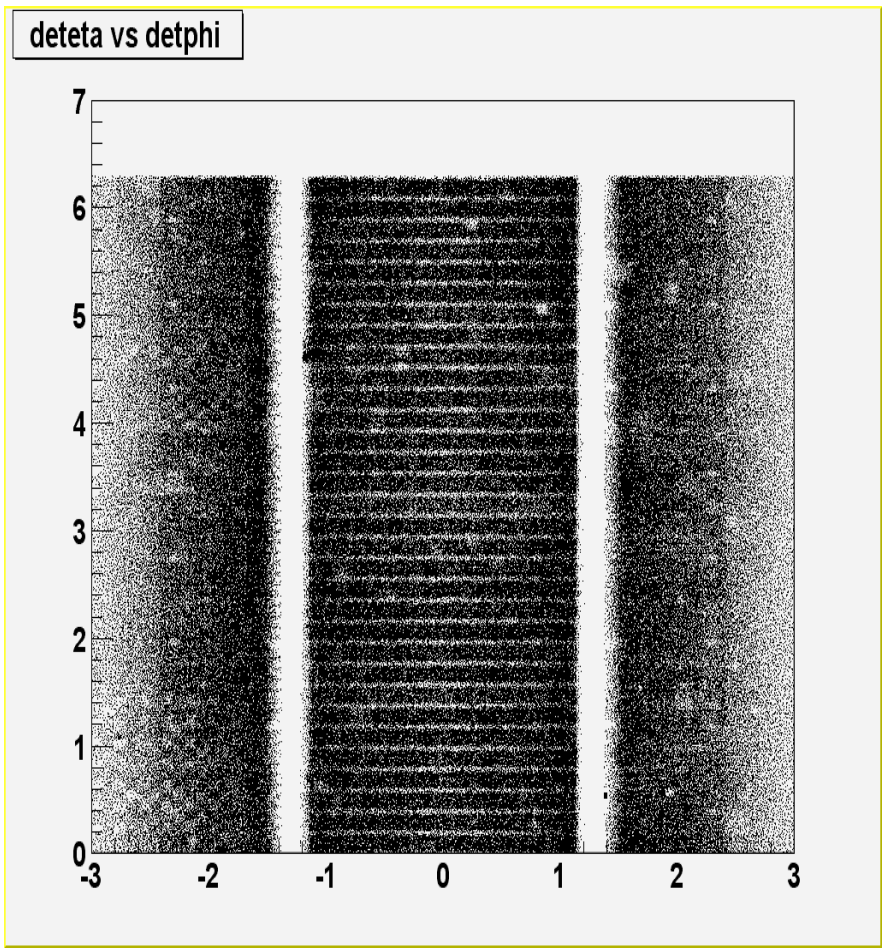

1st jet phyeta vs phyphi

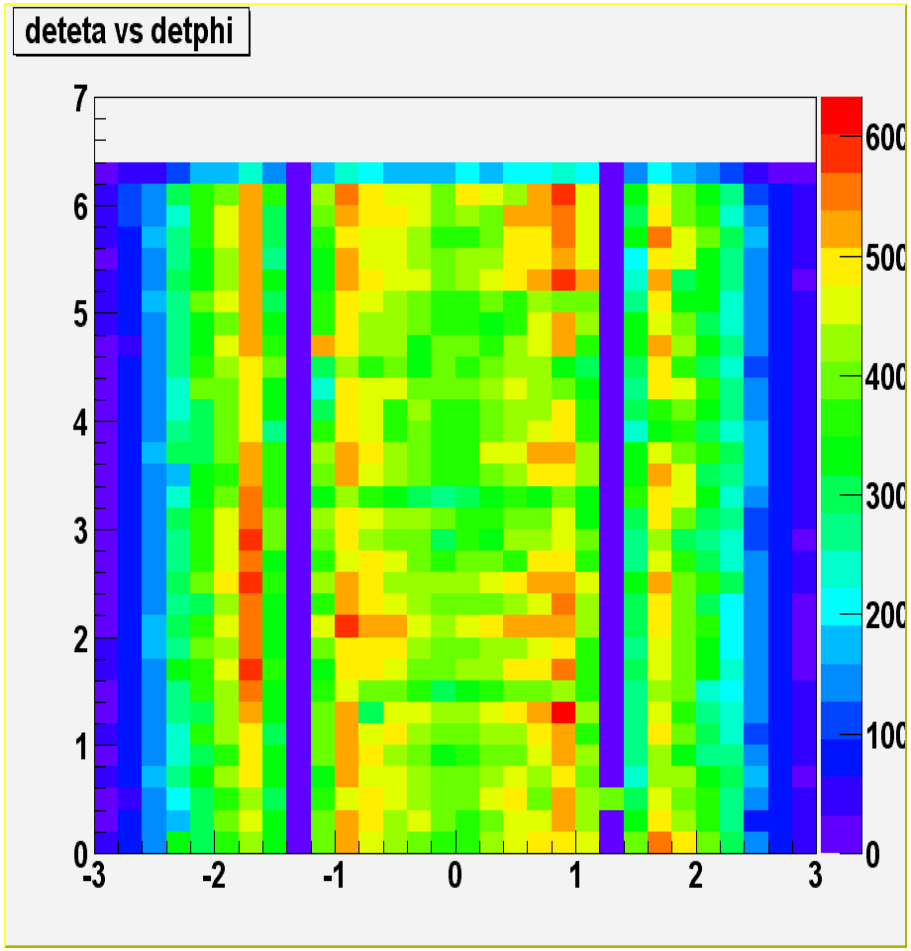

2nd jet phyeta vs phyphi

Bookkeeping information

- 520 million events to tape
- 74 million in 1EMloose skim
- 8.793.039 events in ATHENA root tuple format
- Duplicate events = 340.144
- Events rejected due to Jet/MET bad LBNs list = 321.803
- Events rejected due to bad CAL run = 674.717
- Events rejected due to bad SMT run = 345.903
- Events rejected due to bad CFT run = 13.385
- Events passing trigger selection = 1.545.441
- Events selected for analysis = 1.312.303
- Events with Z candidates = 7.041
- Z candidate events with dijets (inclusive) = 194

CAL





All electrons passing EMF, Iso, HMx, pT cuts - no fiducial cuts - rejecting bad events (Jet/MET, CAL, SMT, CFT)