W Production cross section with plug electrons (1.1<|η|<2.8) -status report-

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Original target/developments

- Demonstrate forward tracking capability
  - Use of ISL
- Perform a physics measurement
  - Measure efficiencies
    - ⇨ Establish confidence of the experiment
- First measurement based on O(70) pb-1
  - Spring 2004
    - ⇨ $\sigma = 2874 \pm 34(stat) \pm 167(syst) \pm 172(lum)$ pb
- Asked to go for a paper with full statistics
  - Physics interest (see for example MLM, Frixione 2004)
  - Implications: redo the analysis with 5.3.xx

Data samples

We use the plug electron dataset collected between March 02 and February 04, equivalent to about 175 pb^{-1} after applying goodrun (V.6) and 1.019 factor

- Require MET_PEM trigger fired
  - Require working plug and silicon ("Good silicon Run"
- Reconstructed using 5.3

In order to measure efficiencies (trigger, ID etc)

- $Z \rightarrow ee$ (Central plug)
- JETXX (XX=20,50,70)

Ingredients

The recipe for cross section is always the same:

- $(N_{cand}-N_{back})/(\epsilon \times Acc \times L)$
  - $\epsilon=\epsilon_{sele} \times \epsilon_{trigger}$

Measure efficiencies and background mostly using data

- $\epsilon_{sele}=\epsilon_{ID} \times \epsilon_{E/p} \times \epsilon_{Track}$
- $\epsilon_{Track-match} = \epsilon^{Z}_{Track} \times (\epsilon^{Wtt}_{rack}/\epsilon^{Z}_{Track})_{MC}$

Requirements

- calorimetric
  - EM clusters in plug region ($1.1<|\eta|<2.8$) with large E_T
  - Cluster to be consistent with being an electron *and* isolated (ID)
  - Large MET
- tracking
  - Require a match with a track extrapolated to the PES
  - Require track to have $E/p<2$

What you find in this talk

Will show:

- Number for candidates, backgrounds
- Efficiencies
- Preliminary result
- Open problem(s)

Selection

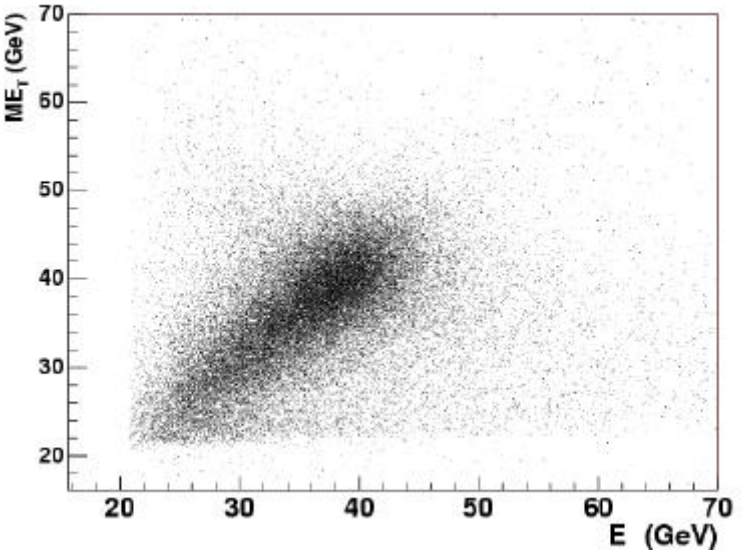
Trigger

- MET_PEM fired

Electron

- E_T>20 GeV
- 1.1<|h|<2.8
- Electron ID
  - ⇨ Had/Em <0.05
  - ⇨ Relative Isolation<0.1

MET(GeV)



ET(GeV)

MET> 20 GeV

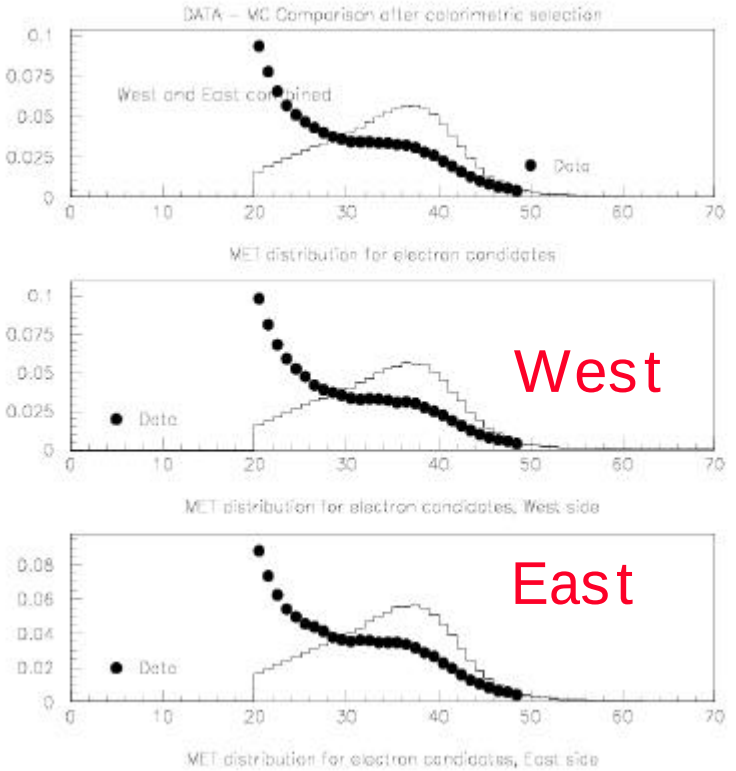
Require a track(P_T>1 GeV/c) to match:

- |DX|<3cm , |DY|<3 cm
  - ⇨ D indicates (PES-extrapolated track)
- Track $|Z_0|$<60 cm
- E/p < 2
  - ⇨ Final: 46555 events (23614 West , 22941 East)

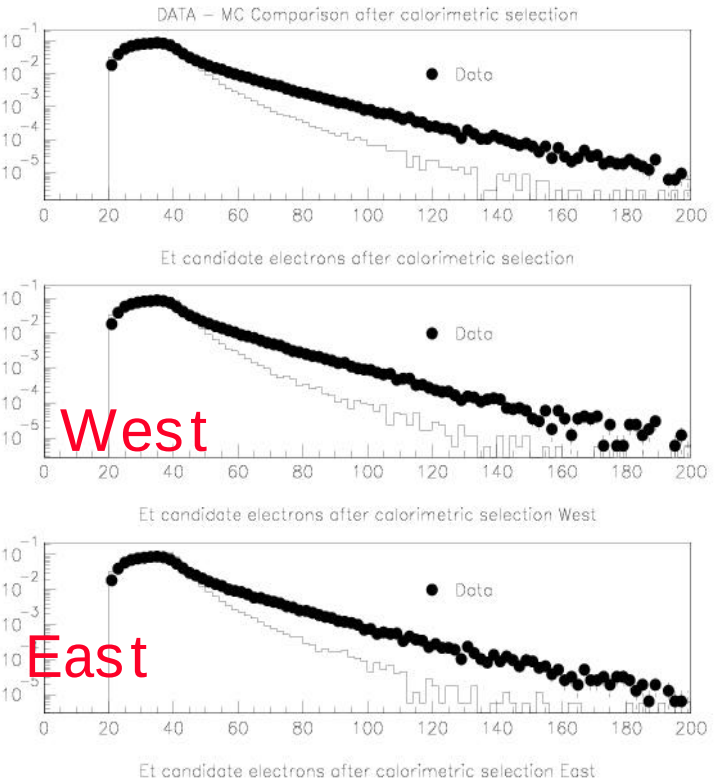
Data – MC comparison I

After calorimetric selection still large background contribution:

MET



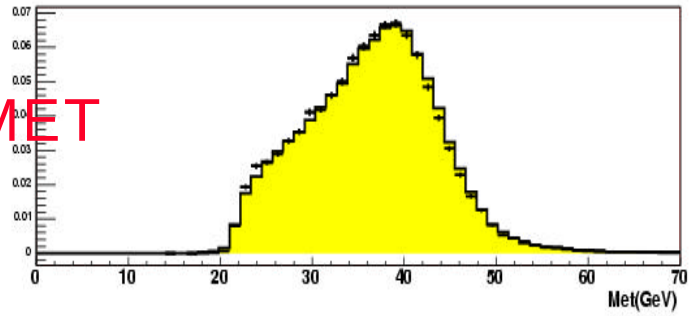
ET



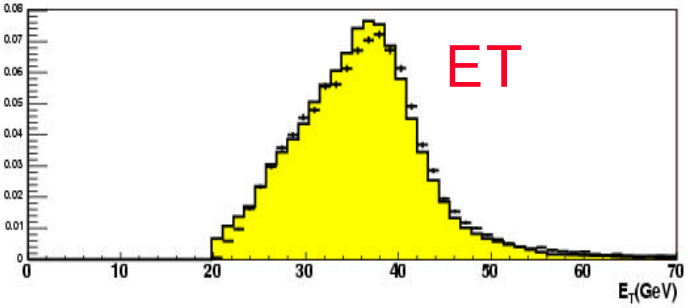
Data/MC comparison II

After final cuts:

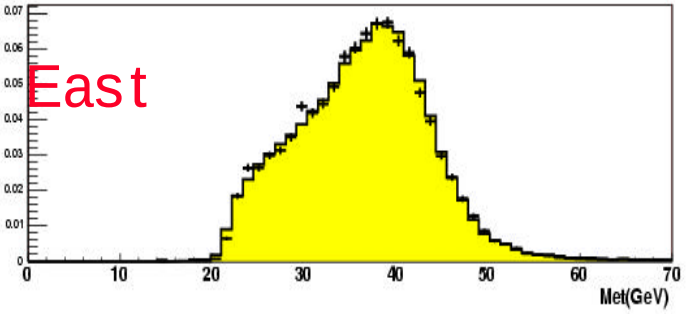
MET



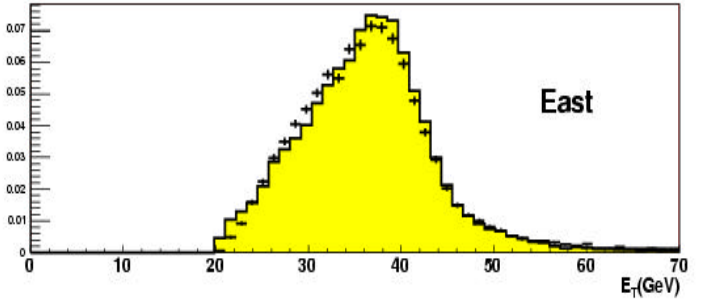
ET



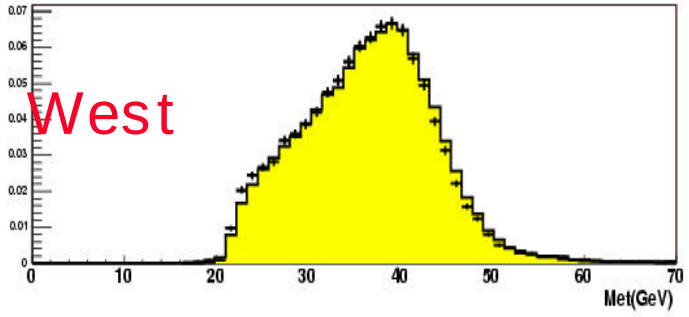
East



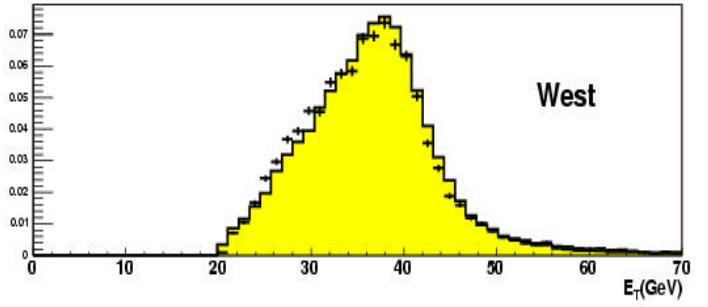
East



West

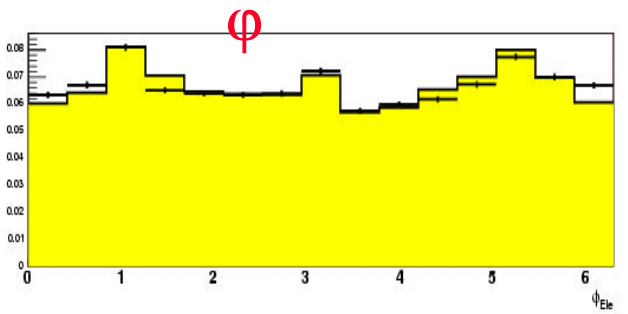


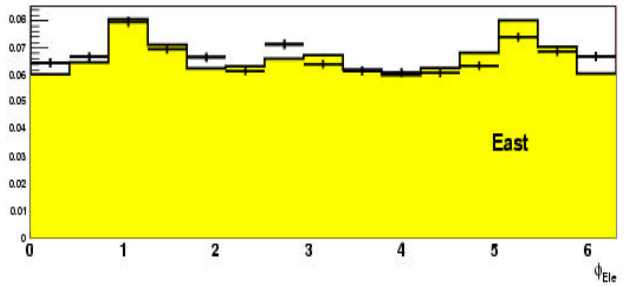
West

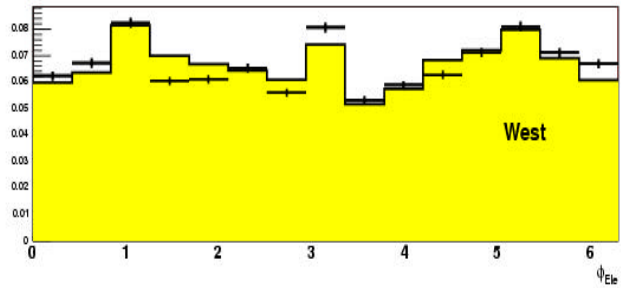


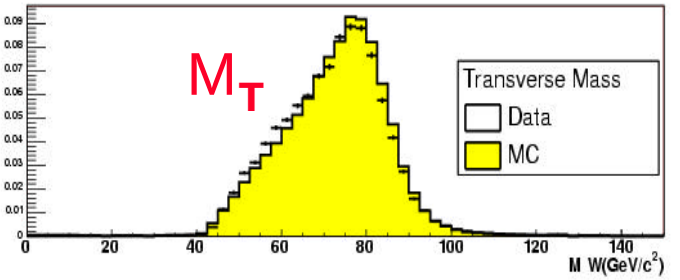
Data/MC comparison III

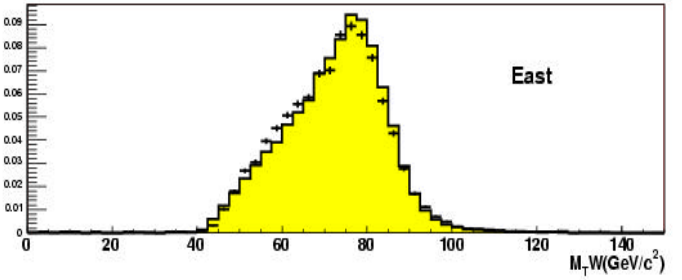
After full selection good agreement data-MC

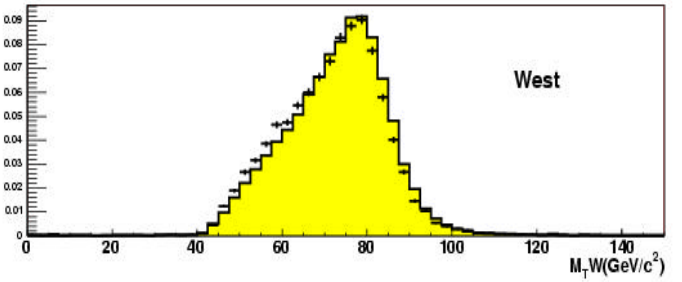






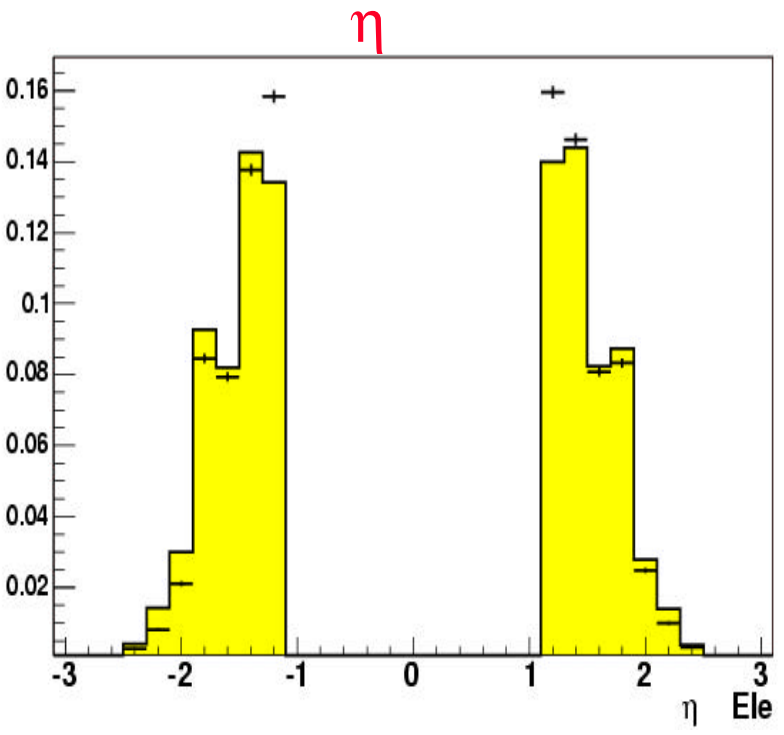


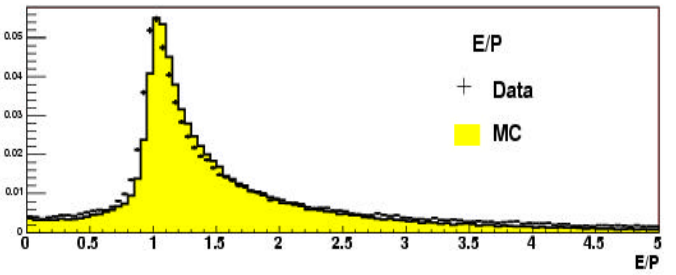


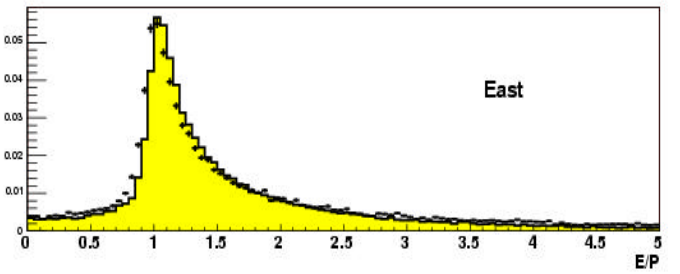


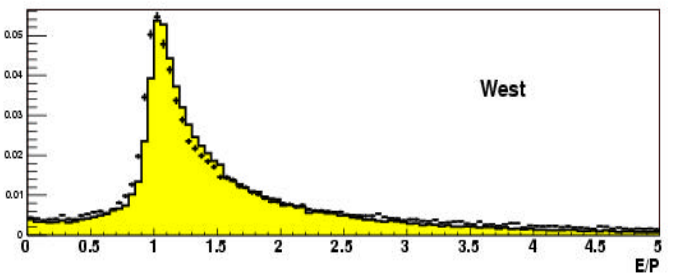
Data/MC comparison IV

In 5.3 better tracking understanding and material description in MC





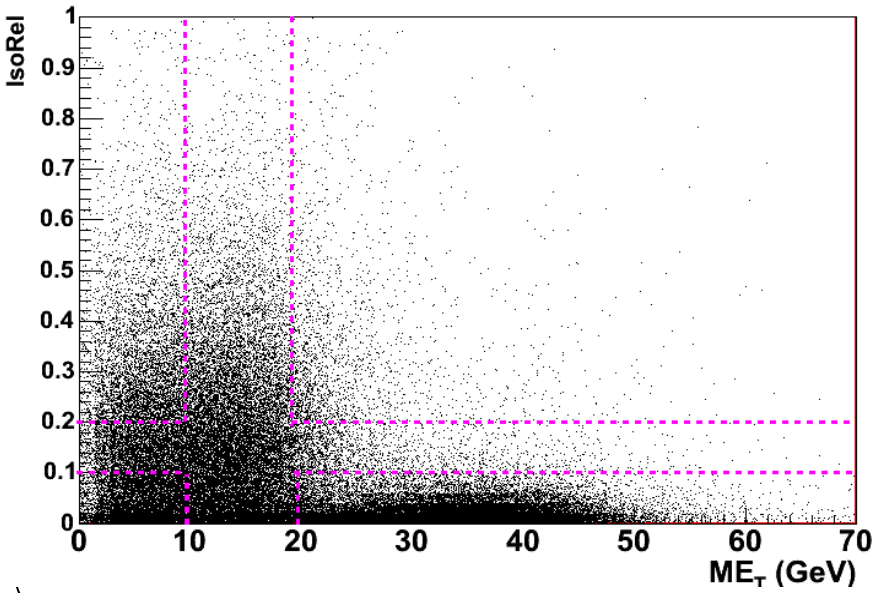




Background

QCD background is calculated using the MET vs ISO method.

EWK contributions to ctrl. regions subtracted



$W \rightarrow \tau\nu$ and $Z \rightarrow ee$ background are estimated using MC 5.3.2 and normalized to candidates

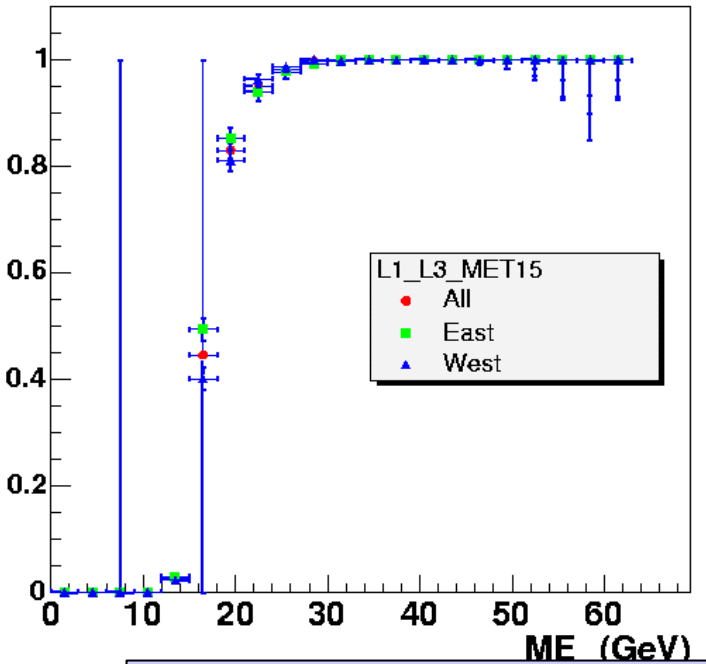
Results:

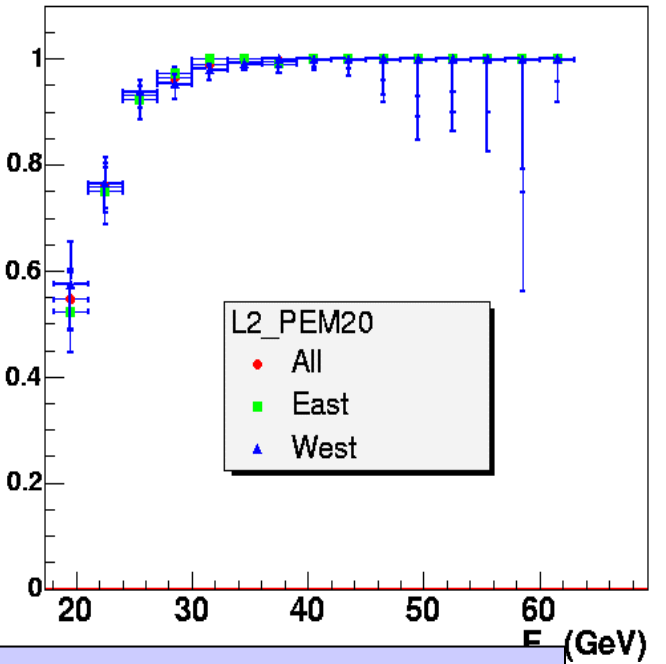
- QCD background:
  - Raw: 7.7%
  - After EWK corr:6.5%
- Nqcd≅3000±1500
- NZ=411
- Ntau=1510

~10 % background

Trigger Efficiencies

Measured from (data) backup triggers

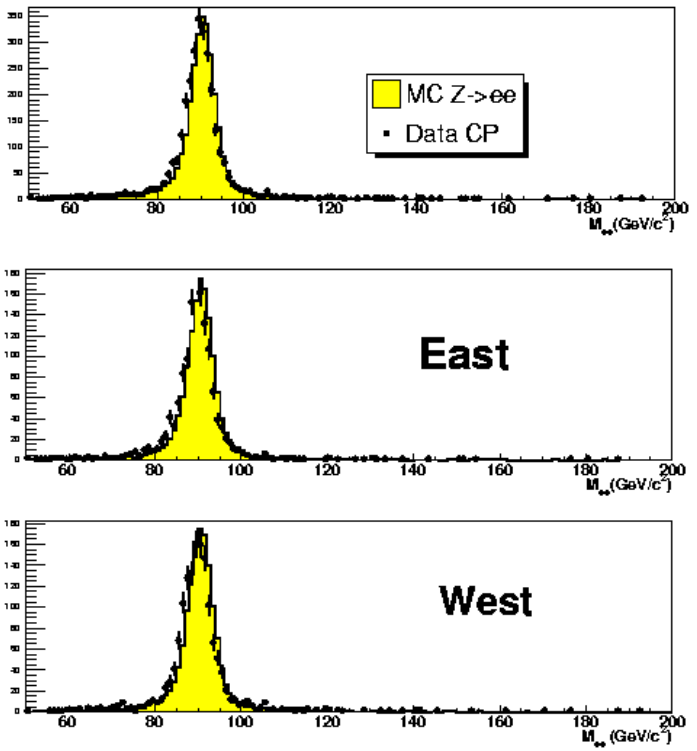




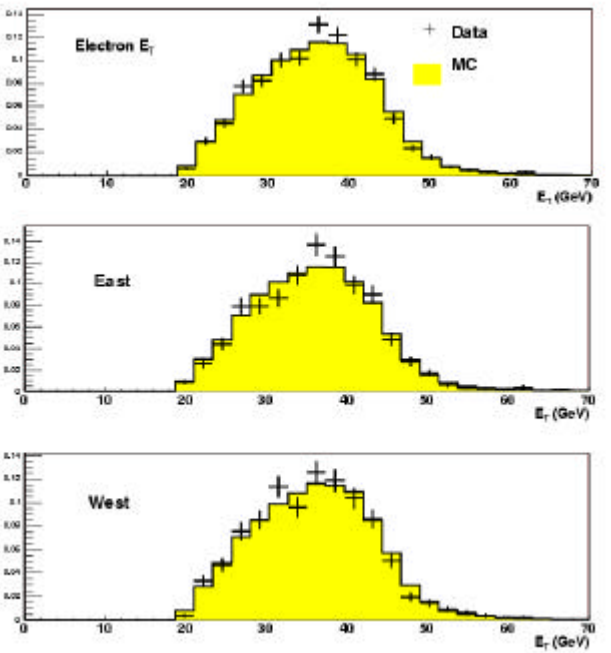
Preshut	Tot	East	West
L1_&_L3_MET15	99.3+/-0.2	99.2+/-0.2	99.4+/-0.2
L2_PEM20	96.4+/-0.5	96.2+/-0.8	96.6+/-0.8
Overall	95.7+/-0.6	95.5+/-0.8	95.9+/-0.8

Efficiencies from Z (CP)

Select a clean sample of Z (CP), to compute ε_{id}, ε_{trk}, $\varepsilon_{E/p}$

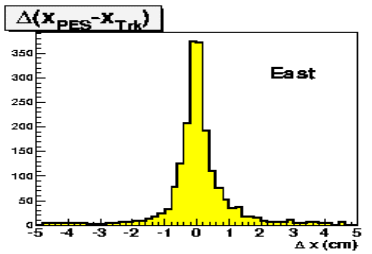


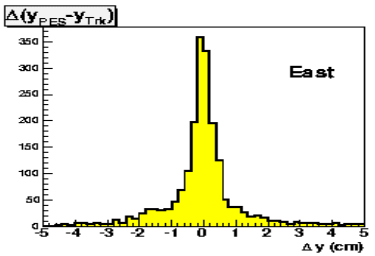
Background contribution at each step in selection is measured using jet samples and subtracted

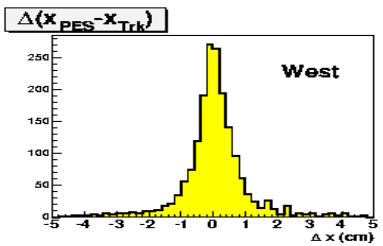


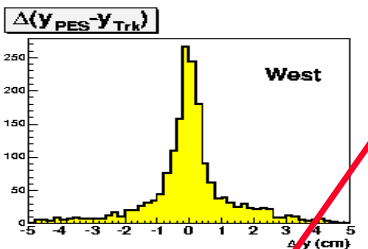
Z(CP) tracking...

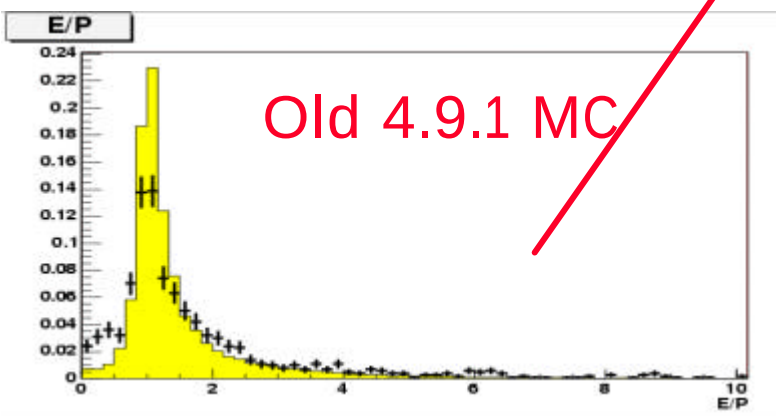
Good agreement data/MC is visible:

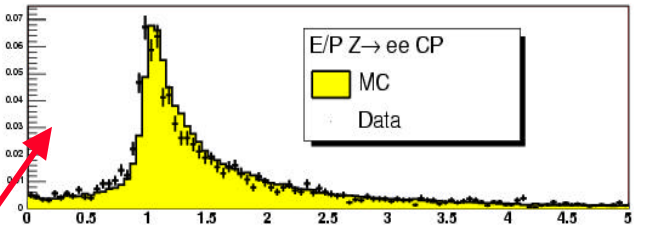


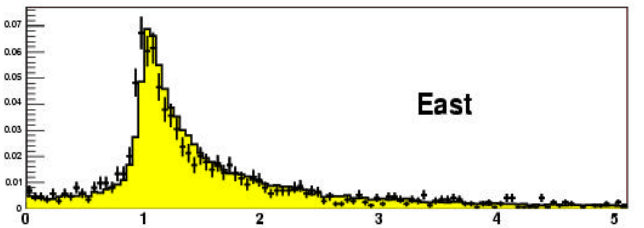


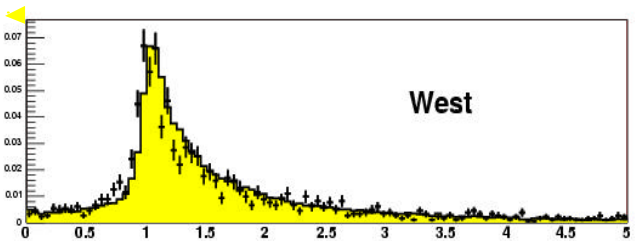








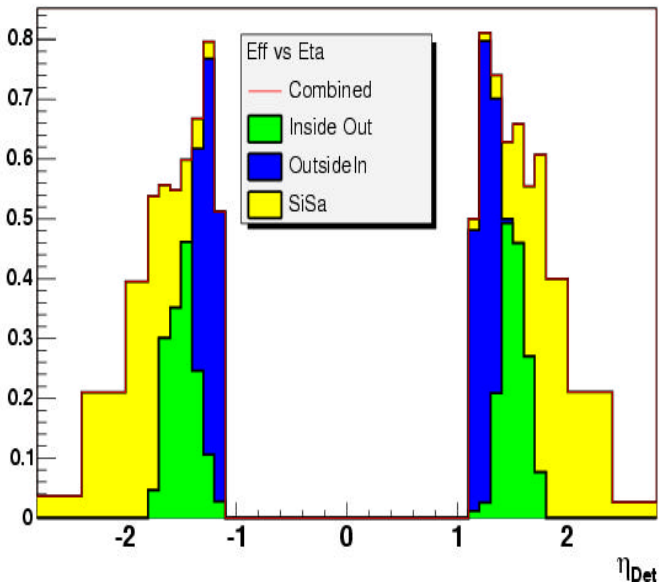


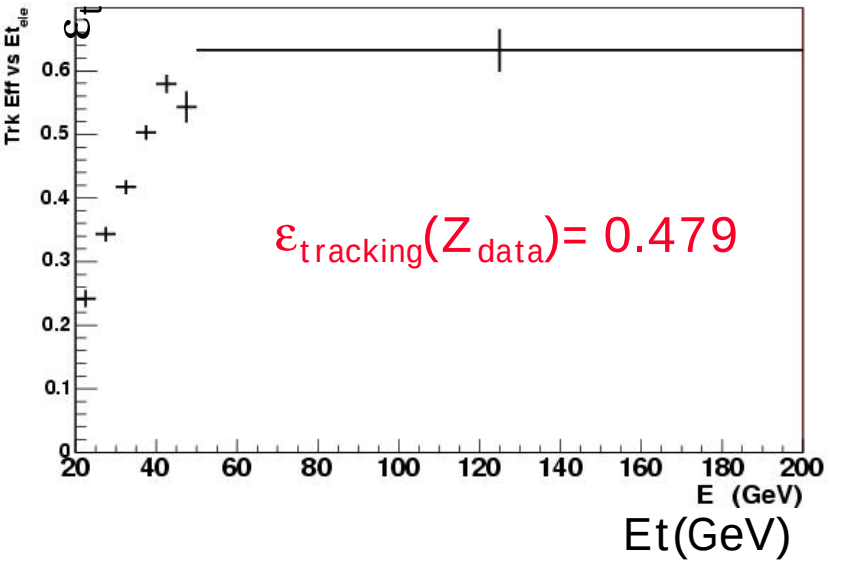


Tracking efficiency

We do not want to rely on MC for $\varepsilon_{tracking}$

- Use $Z \rightarrow ee$ sample, measure how many plug *e* are matched ($\Delta X, \Delta Y < 3$ cm) by a track and define
- $\varepsilon_{tracking}(W_{data}) = \varepsilon_{tracking}(Z_{data}) \times \{\varepsilon_{tracking}(W_{MC}) / \varepsilon_{tracking}(Z_{MC})\}$





Old vs New

	Old	New
Accept.	0.311	0.3125
Pvz	0.92	N/A
e_{id}	0.961	0.951
Track match	0.32	0.4574
E/p*	0.64	0.7358
Lum.region	0.951	0.948
Trigger	0.958	0.957
Overall	0.051185	0.090742

* E/p cut changed from [0.5-2] to [0,2]

Results –preliminary

Systematics still in progress

- L= 172.5x1.019=(175.8±10.5)pb^{-1}
- Acc=0.3125±0.00044(stat)
- Trigger efficiency=0.957±0.006(stat)
- Lumin. region (lum.weighted)=0.948±0.001±0.003
- This presentation:
  - ε_{ID}=0.9511±0.01963 (stat+syst)
  - ε_{track}=0.48x(ε^{W}_{tr} / ε^{Z}_{tr})=0.46±0.006(stat)
  - $\varepsilon_{E/P}$ =0.7358±0.0054
- ε = 0.090742±0.002412
- σ = 2610 pb±12(stat) ±>100(syst)±156(lum)pb

Very preliminary!

Questions

Why the cross section is lower than central?

- Little/none apparent time dependency of various quantities (systematic study done for trigger)
- Check new code on runs used for blessed result:
  - → σ=2550 pb
- Effect due to lower probability to reconstruct a track in W wrt Z events not accounted for by MC?
  - ⇨ Under investigation
- Looking for mistakes (always!...)

Could it be real ?

- Investigating Pythia/Herwig differences: $D\text{Acc} \cong 4\%$
  - → (did anybody ever look at the differences between Pythia and Herwig)?

Last but not least:

- ⇨ NNLO cross section is 2687 nb