

# Finding the omega to ee?



Light pwg

R. Seto

July 10, 2003

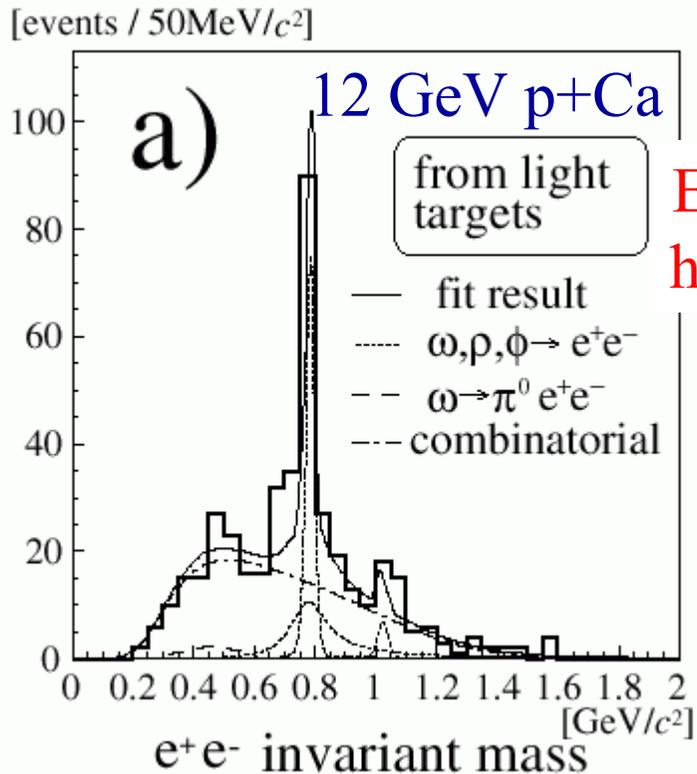
## Observation of $\rho/\omega$ Meson Modification in Nuclear Matter

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Excess from  
heavy targets

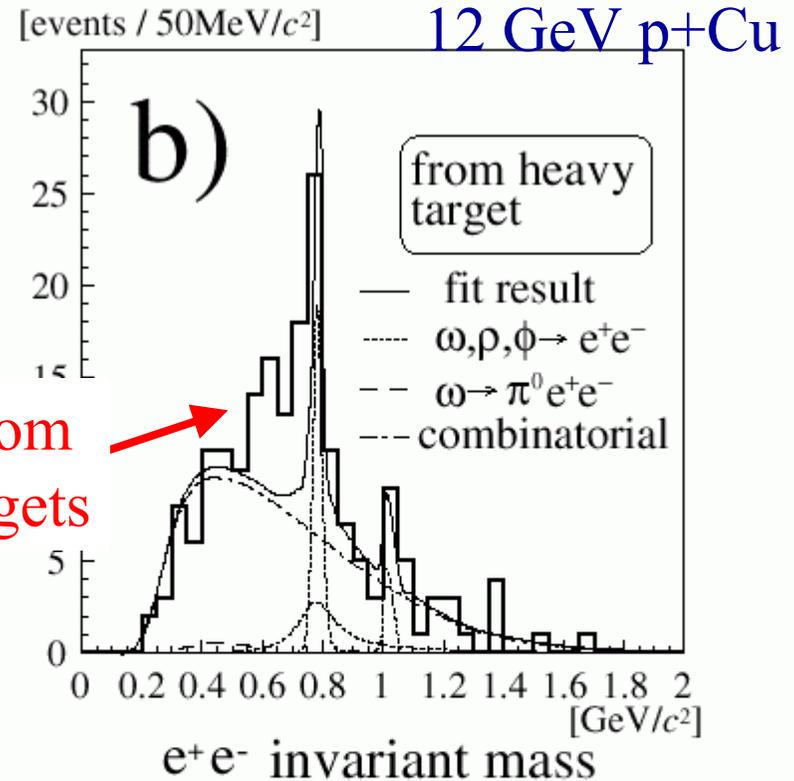


FIG. 3. Invariant mass spectrum of the  $e^+e^-$  pair: (a) for the carbon and polyethylene targets and (b) for the copper target. The solid lines show the best-fit results of the known hadronic sources with the combinatorial background. The dotted lines indicate the contributions from  $\rho$ ,  $\omega$ , and  $\phi$  decays. The dashed lines indicate  $\omega \rightarrow \pi^0 e^+e^-$  decays and the dot-dashed lines indicate the combinatorial background.

# Procedure

- Look at ~ 5000 files of for the EWG
  - pro.36 and pro.39
    - electrons require  $n_0 \geq 2$
- Used procedure outlined on EWG working page (Wei's eAna...)
- Redo momentum using “momentum\_changer”
- Looks like I see mostly ERT triggered events so
  - Require ERT giving consistent RICH and EMC sector ( $\text{bit}_{2 \times 2} == 1 \ \&\& \ \text{bit}_{\text{RICH}} == 1$ ) for one of the electrons in the event
  - $|\text{Bbcz}| < 30$
- Remember
  - Omega mass = 783 MeV width ~8 MeV
  - Phi mass ~1019 MeV width ~4 MeV
- All plots are raw. No background subtraction has been done

# ee spectrum 5MeV/bin

Events/5MeV

Events/5MeV

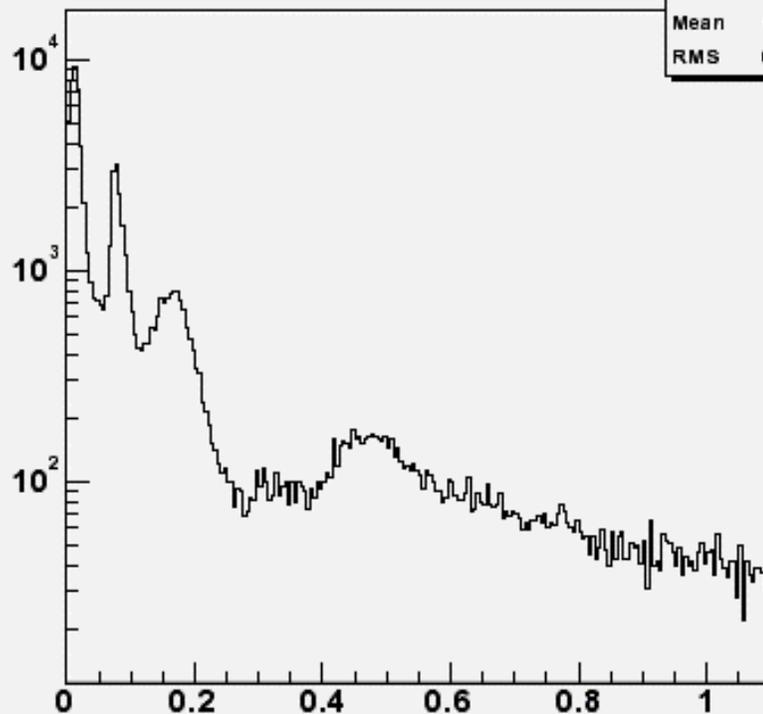
ee invariant Mass(GeV)

ee invariant Mass(GeV)

- $0.6 < p/E < 1.5$
- $N_0 \geq 2$

- $0.8 < p/E < 1.5$
- $N_0 \geq 3$

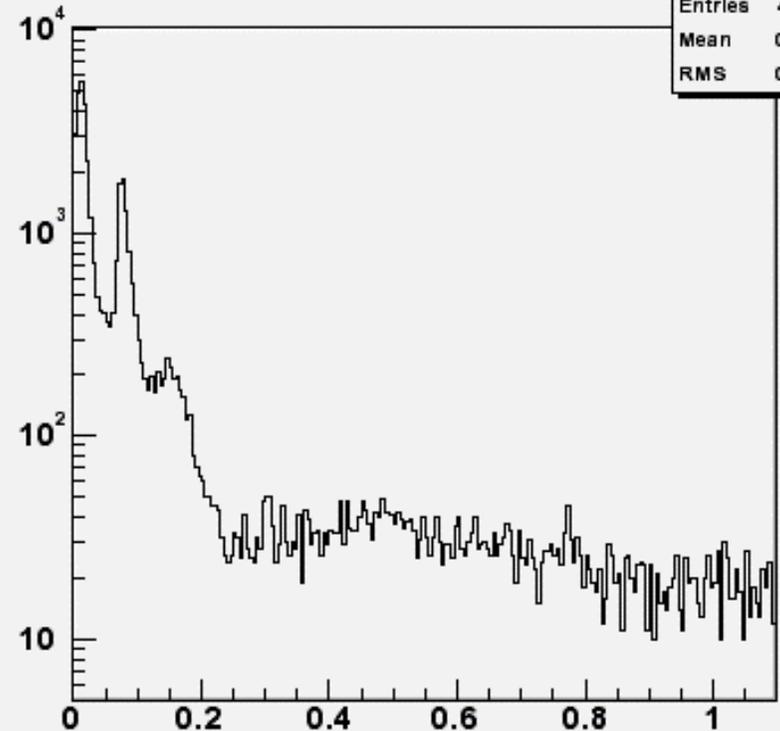
loose cuts



hu

Entries	83742
Mean	0.1473
RMS	0.2239

hard cuts



hl

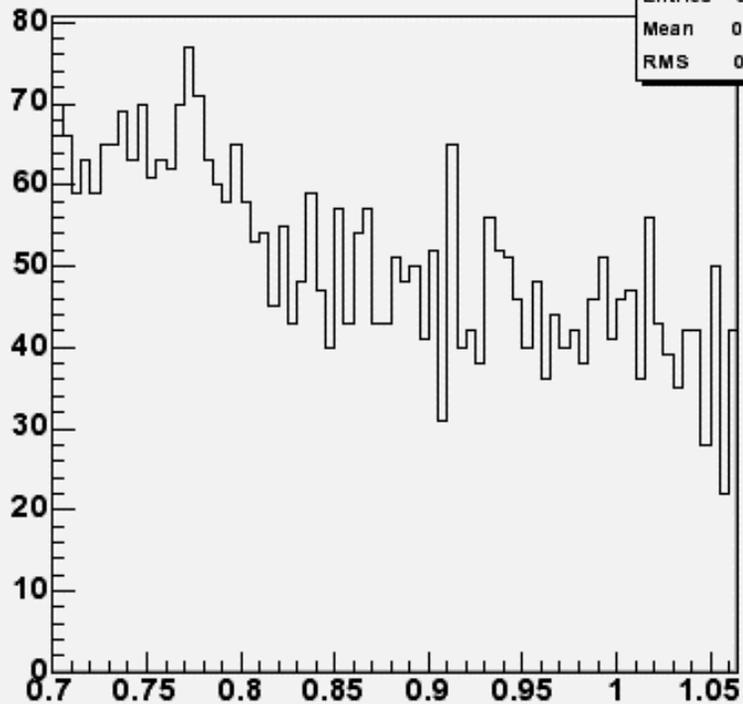
Entries	41688
Mean	0.1111
RMS	0.2051

# Blow up to omega/phi region

Events/5MeV

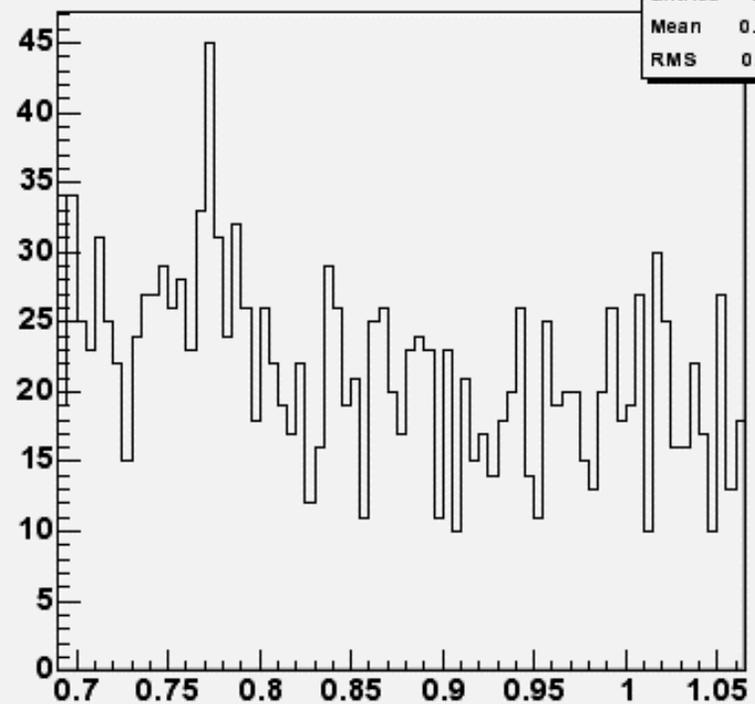
Events/5MeV

loose cuts



ee invariant Mass(GeV)

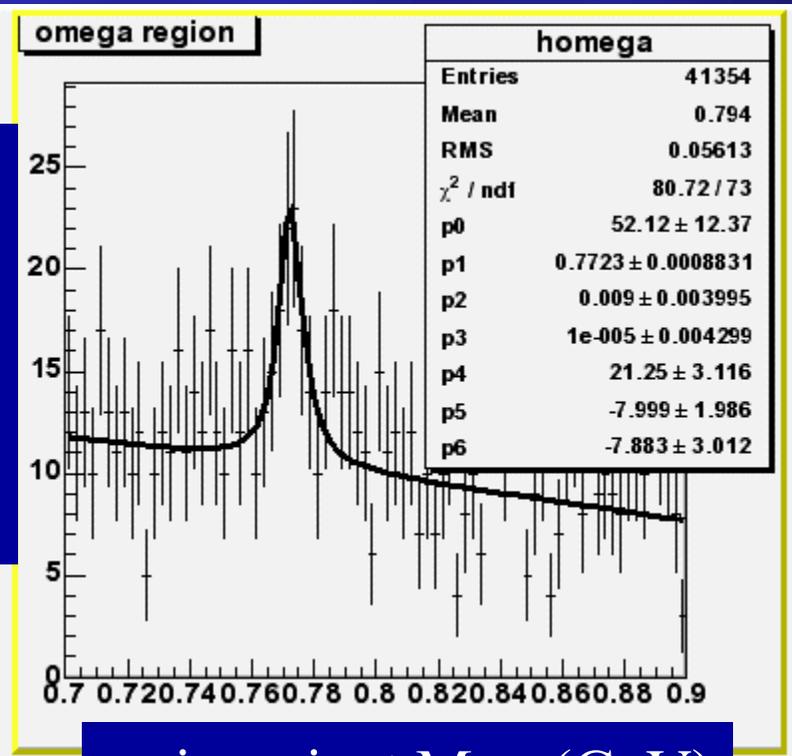
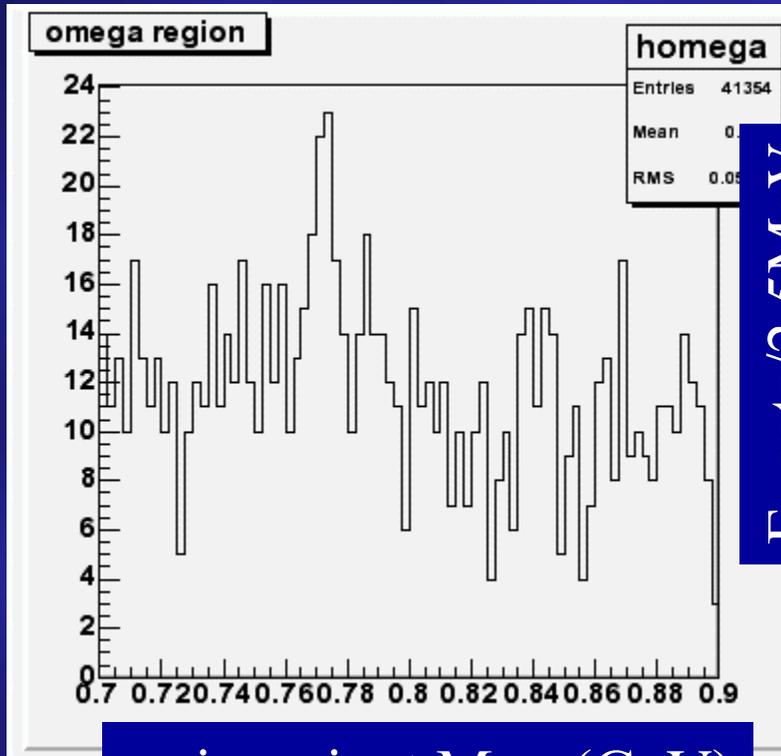
hard cuts



ee invariant Mass(GeV)

# Fit in 2.5 Mev bins

## RBW\*Gaussian+2 deg polynomial

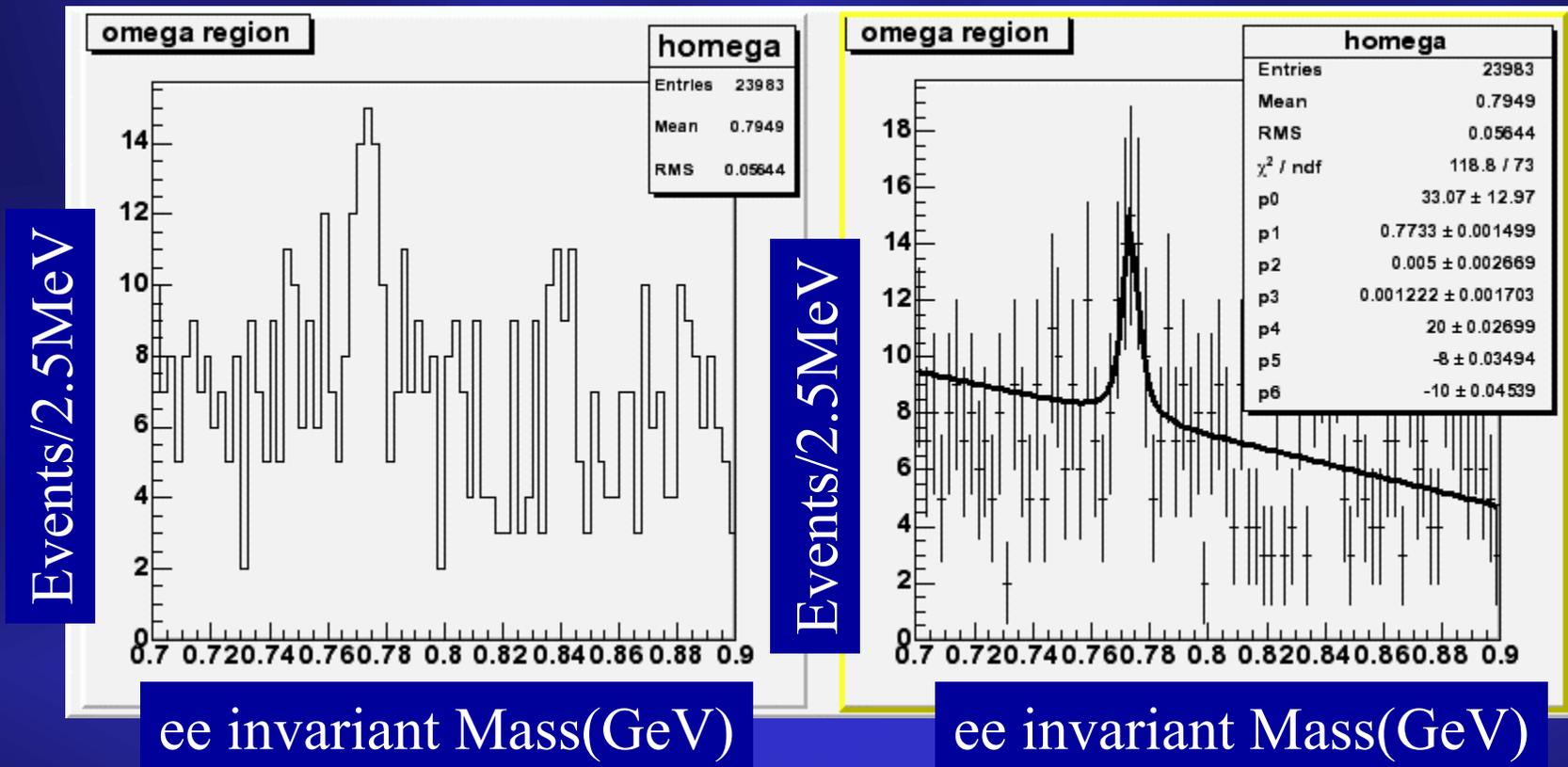


ee invariant Mass(GeV)

ee invariant Mass(GeV)

- ~43 events  $\chi^2=81/73$
- $M=772.3 \pm 0.9$   $\Gamma=9 \pm 4$   $\sigma=0 \pm 4$  (all in MeV)

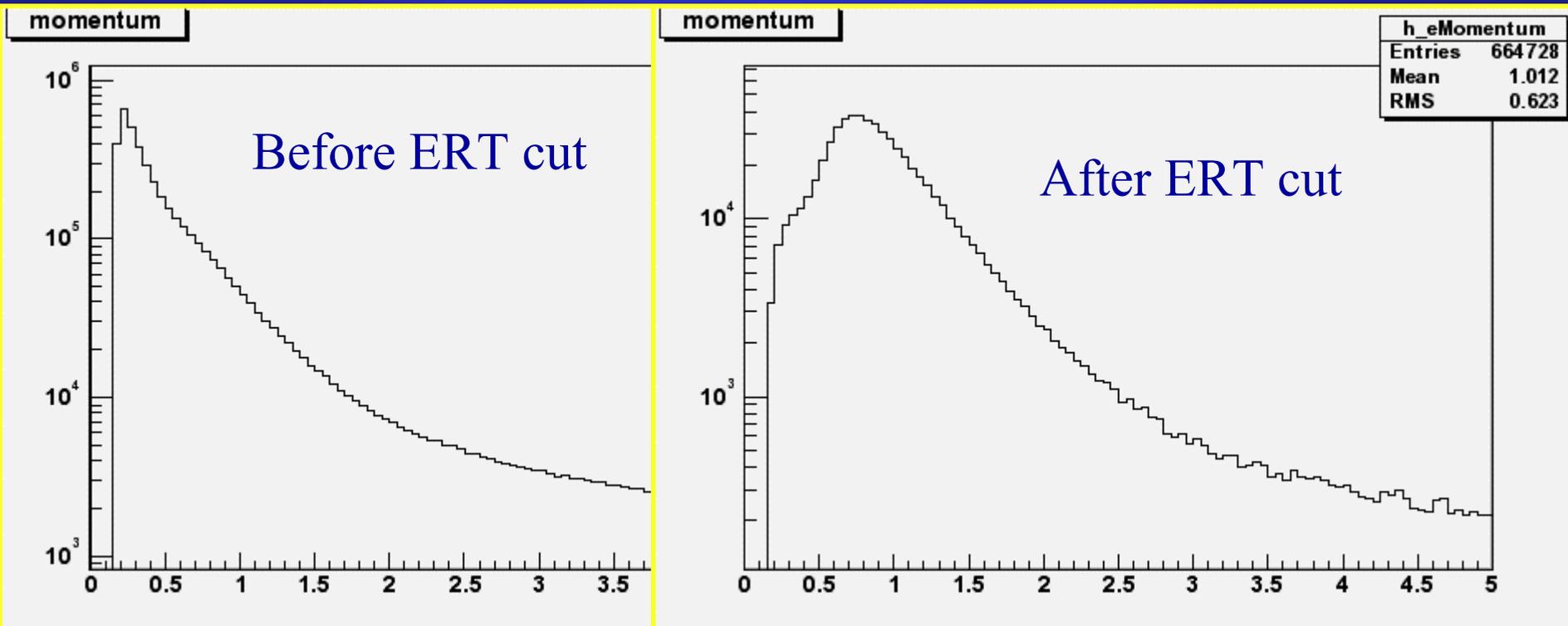
# Track quality 31/63



- TKH comment – momchanger only accurate for track types 31/63
- $\sim 37$  events  $\text{chisq}=119/73$
- $M=772.3 \pm 1.5$   $\Gamma= 5 \pm 3$   $\sigma= 1 \pm 2$  (all in MeV)

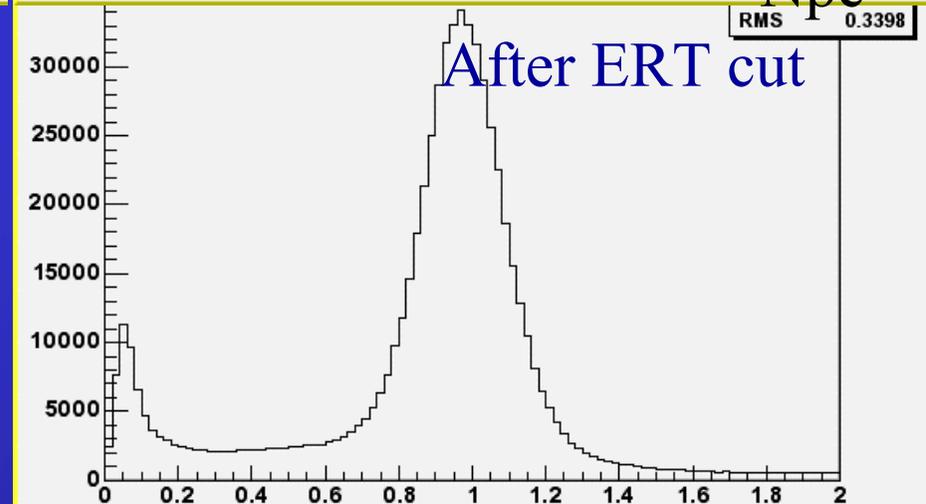
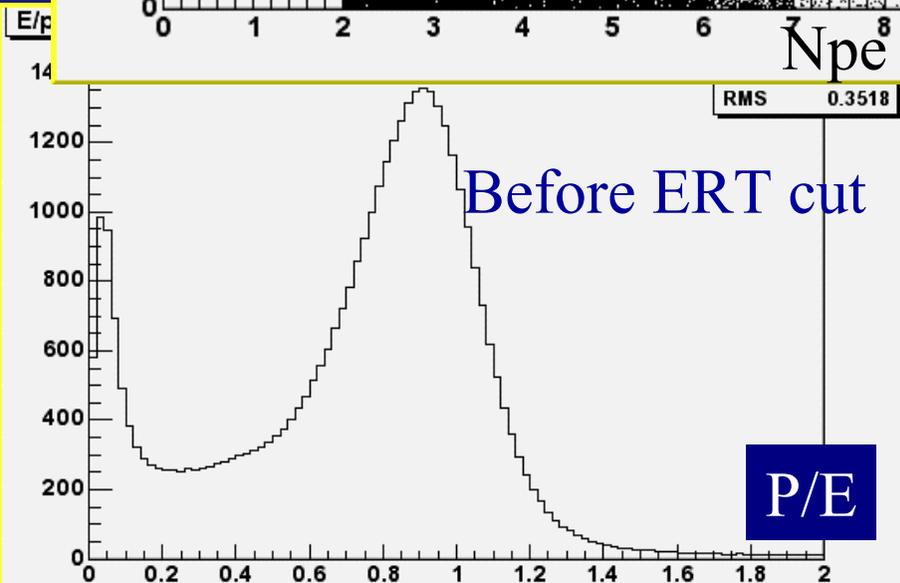
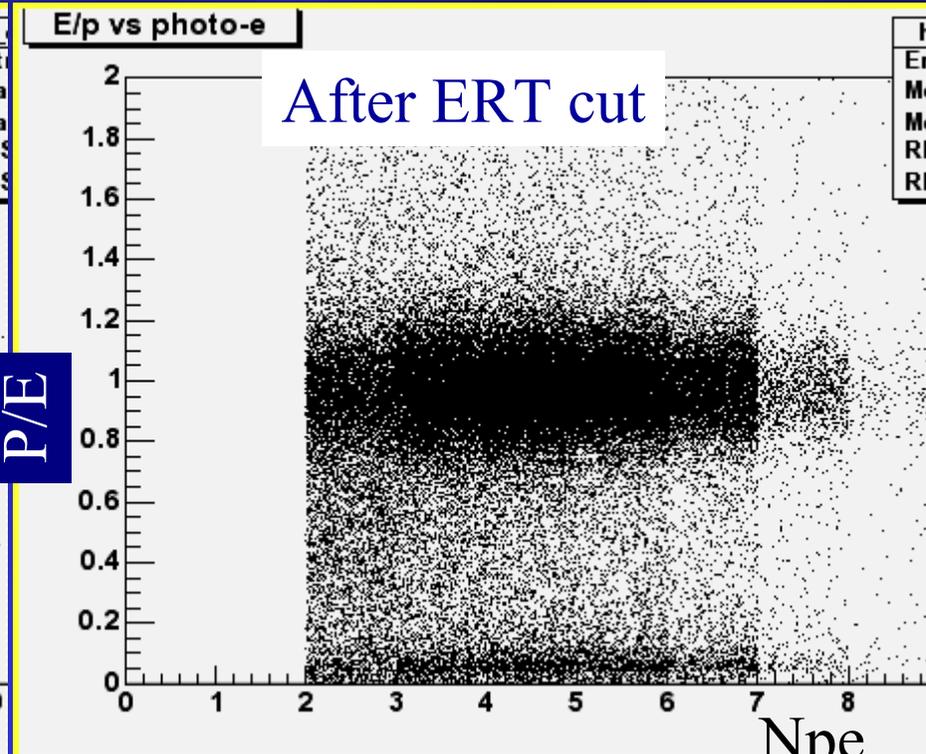
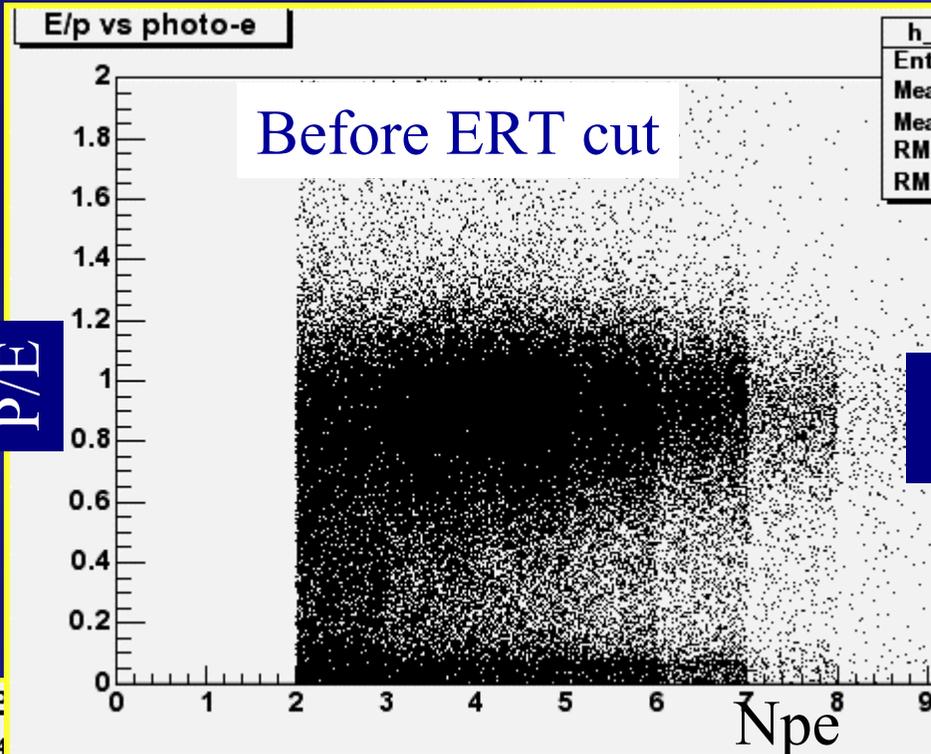
# What does this ERT cut do?

- Threshold is at 600 MeV
- Turn on by  $\sim 800$  MeV



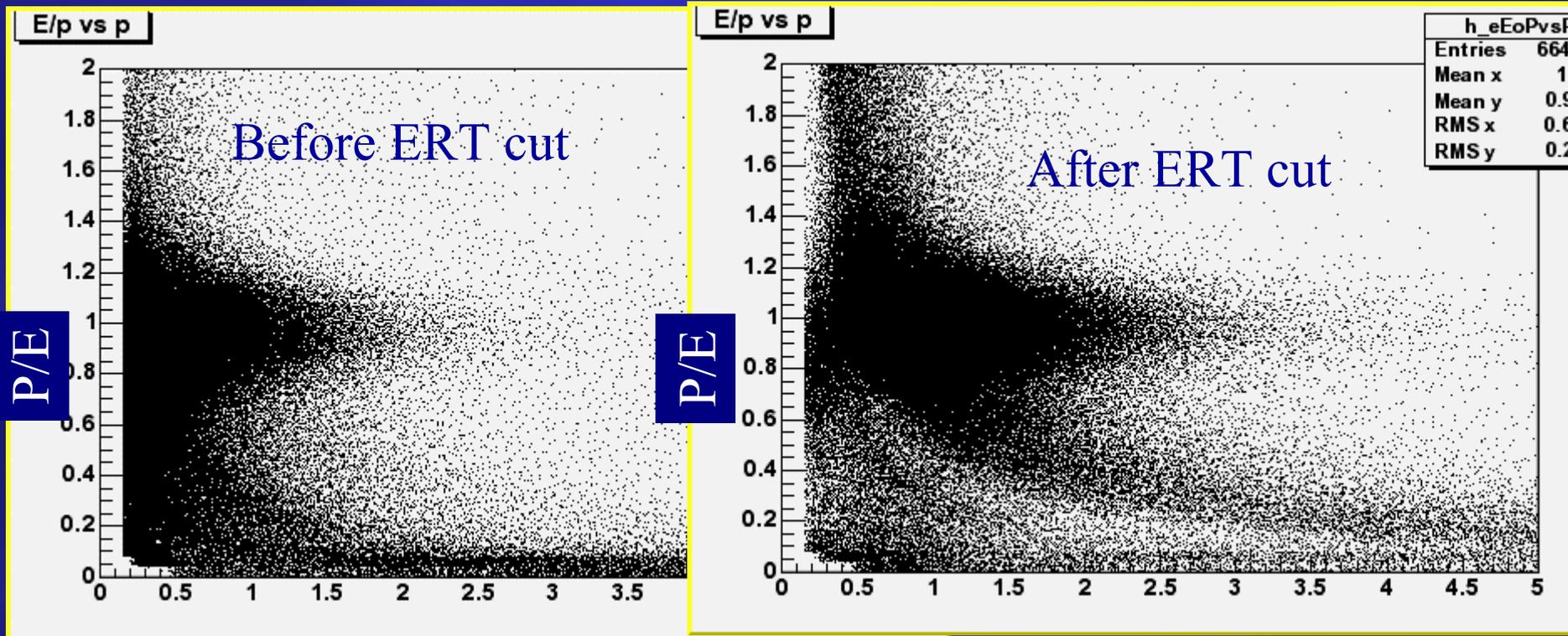
Electron(positron) momentum (GeV)

# P/E vs number of photo-electrons



# P/E vs momentum

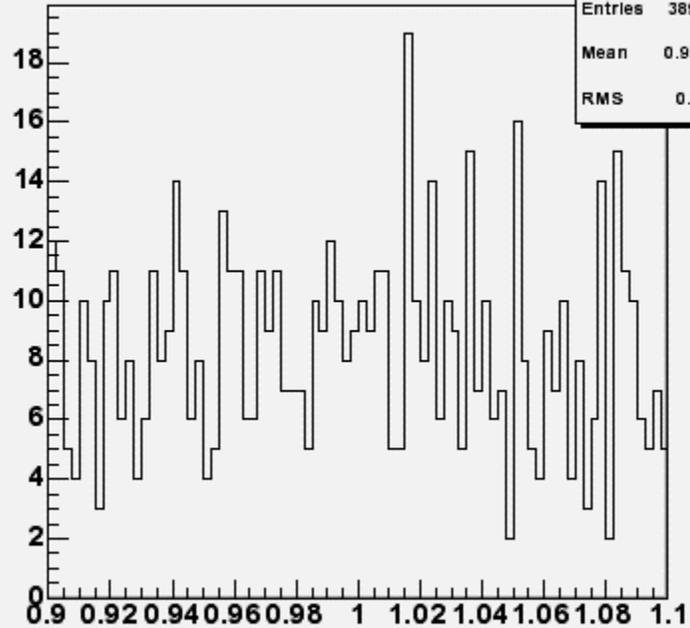
- Leaves some electrons  $\sim 600$  MeV



# Summary

- Omega shows up to ee
- Where is the phi(?) – inconsistent?
- Mass (measured)  $\sim 773$ , pdg  $\sim 783$ 
  - Consistent with  $\sim 1\%$  problem found by Charlie, TKH etc
- Mass resolution seems to be pretty good
  - We expected it to be  $\sim 4$  MeV I think
- Can we understand the trigger eff at turn on?
- Next steps
  - Look at mixed background
  - Study cuts/electron selection
  - Phi(?)
  - PT distribution/centrality etc
  - Figure out mass resolution

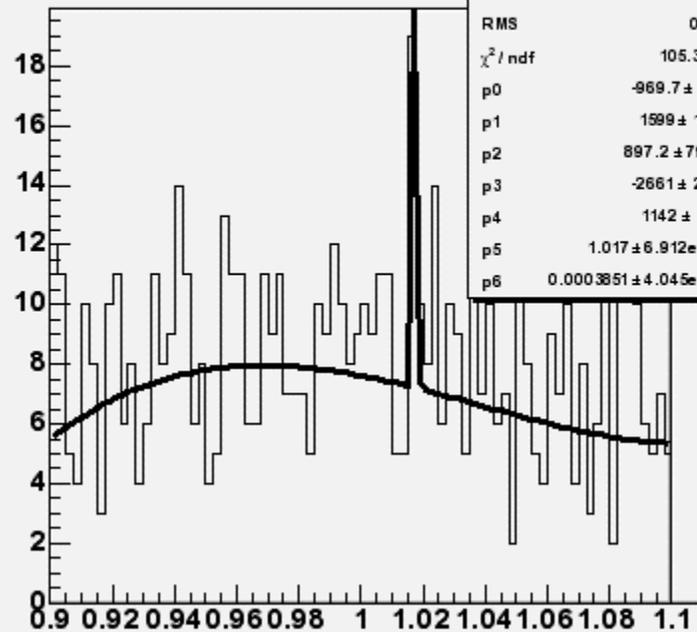
phi region



**hphi**

Entries	38925
Mean	0.9988
RMS	0.056

phi region



**hphi**

Entries	38925
Mean	0.9988
RMS	0.056
$\chi^2 / \text{ndf}$	105.3 / 73
p0	-969.7 ± 861
p1	1599 ± 1462
p2	897.2 ± 796.5
p3	-2661 ± 2523
p4	1142 ± 1126
p5	1.017 ± 6.912e-005
p6	0.0003851 ± 4.045e-005