

Resonance Production Studies

Status: Aug 14, 2004

Run Minerva Sim with muon ranger off.

Generated 25K+ events for each of following:

No nuclear pion rescattering:

LE

COMBO

With nuclear pion rescattering:

LE

COMBO

Run tracker with 7.5PE/MeV on all ntuples.

How to analyze resonance data

- Inclusive:
 - Identify only muon tracks
 - Use Minerva only as calorimeter for $E_h \rightarrow Q^2, W$
- Exclusive:
 - Identify one or two π^{+-}/π^0 tracks
 - Energy, Angle, Charge distributions vs A.
 - Identify golden 3 particle final states:
 - Muon, Nucleon, pion
 - Little untracked energy

Tracking efficiency

- 40,000 events, combo beam, nuclear rescattering
- Select events where tracker finds muon
 - Truth: 2713 with single charged primary pion
 - Recon: 2836 with one charged primary pion tracked
 - 1385 from > 1 charged pi truth

Efficiency with energy cut

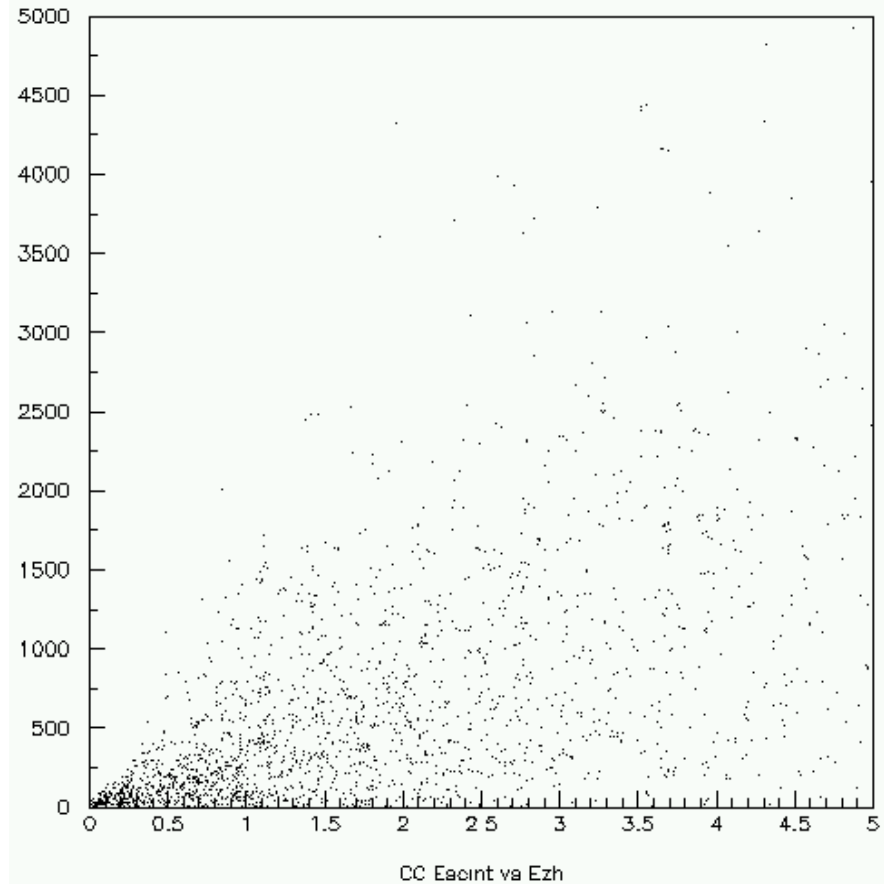
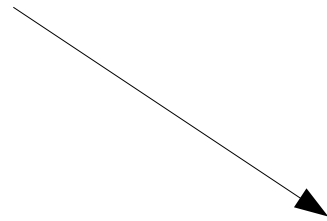
- From RAWHIT arrays in ntuple, compute
 - “E_h”: Sum of energy deposited in scintillators, excluding hits connected to muon (and descendants)
 - “E_other”: Energy sum excluding muon hits and hits from reconstructed pion (and descendants).
- Select events with $E_{\text{other}}/E_{\text{h}} < 0.20$
 - 282 events with one fit pion (10% of no cut)
 - 45 events from > 1 charged pi truth

Using tracked pion in E_h computation

- Add up all scintillator hit energy not associated with muon or tracked pion.

Eyeball Fit

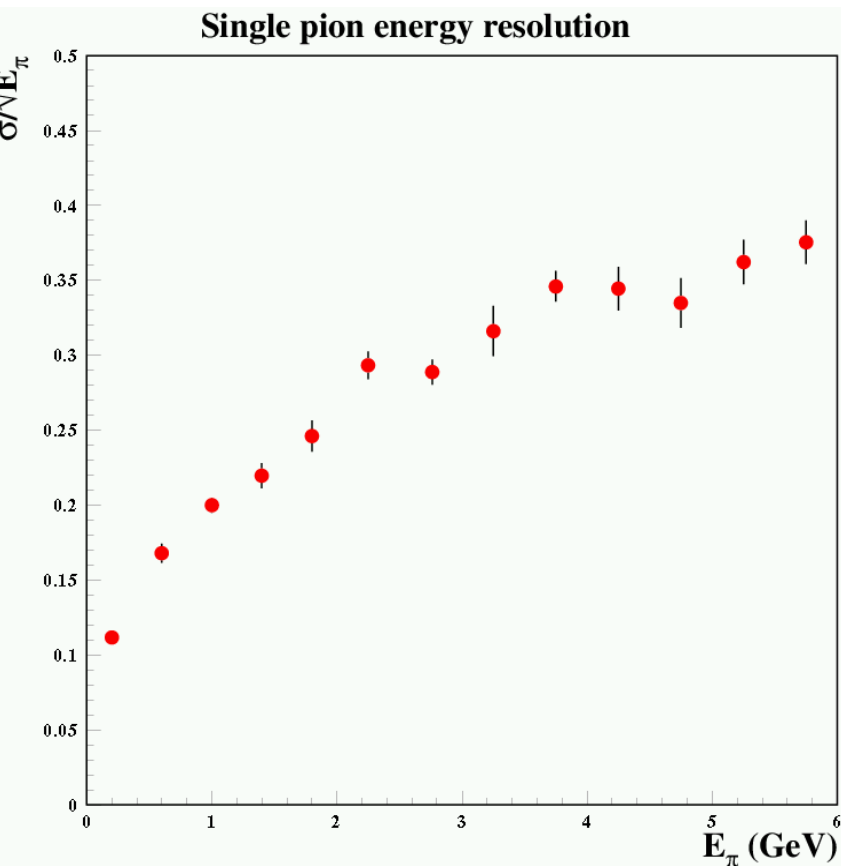
$$E_{\text{scint}} = 750\text{MeV}/2\text{Gev} * E_{\text{true}}$$



$E_h - E_{\pi}$

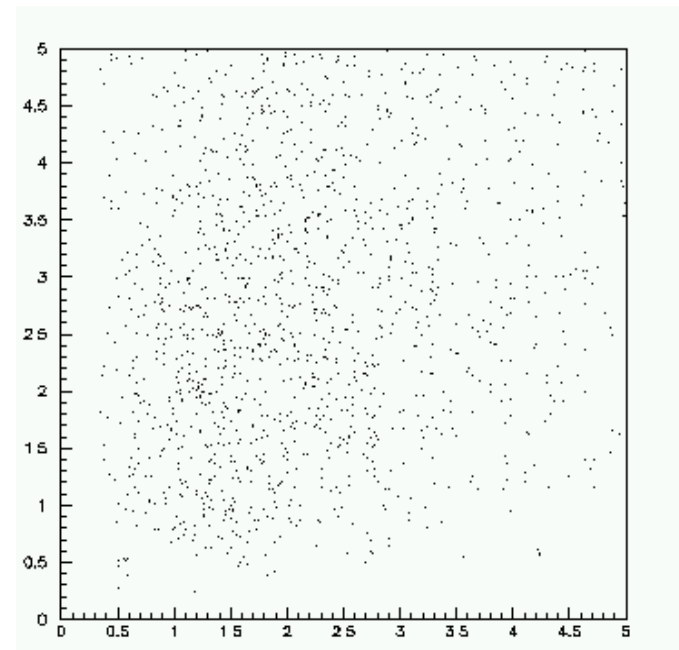
Reconstructed E_h

- Use core plot pion resolution to fuzz true energy
- Add to “reconstructed” non pi/mu scint energy



5

E_h
recon

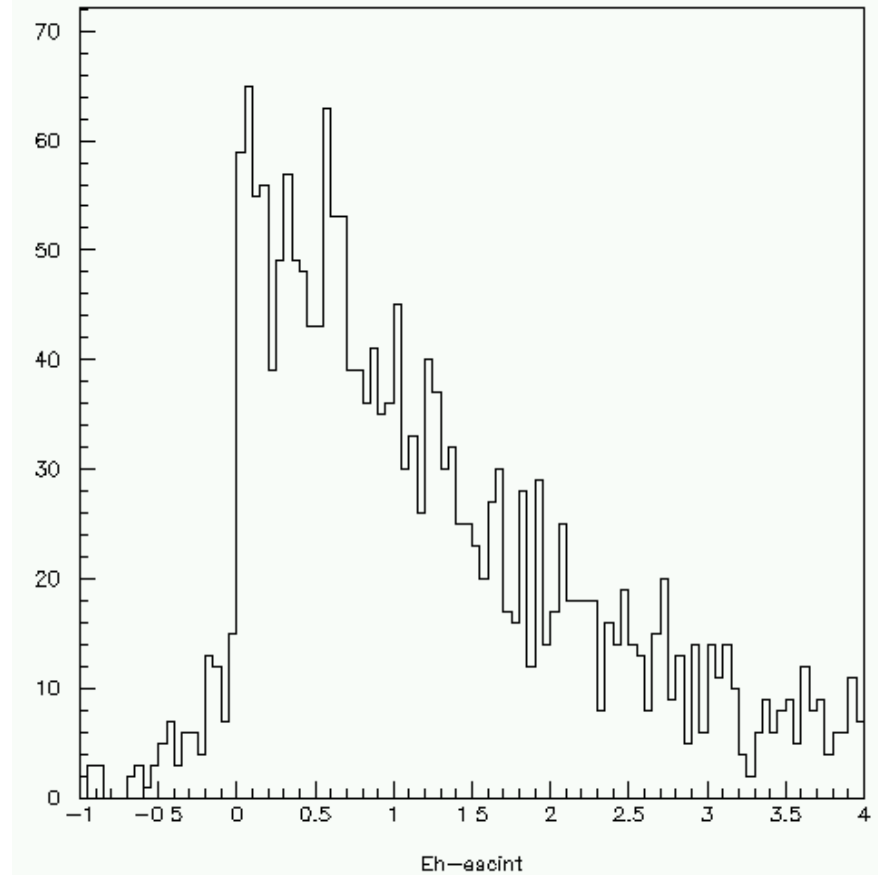
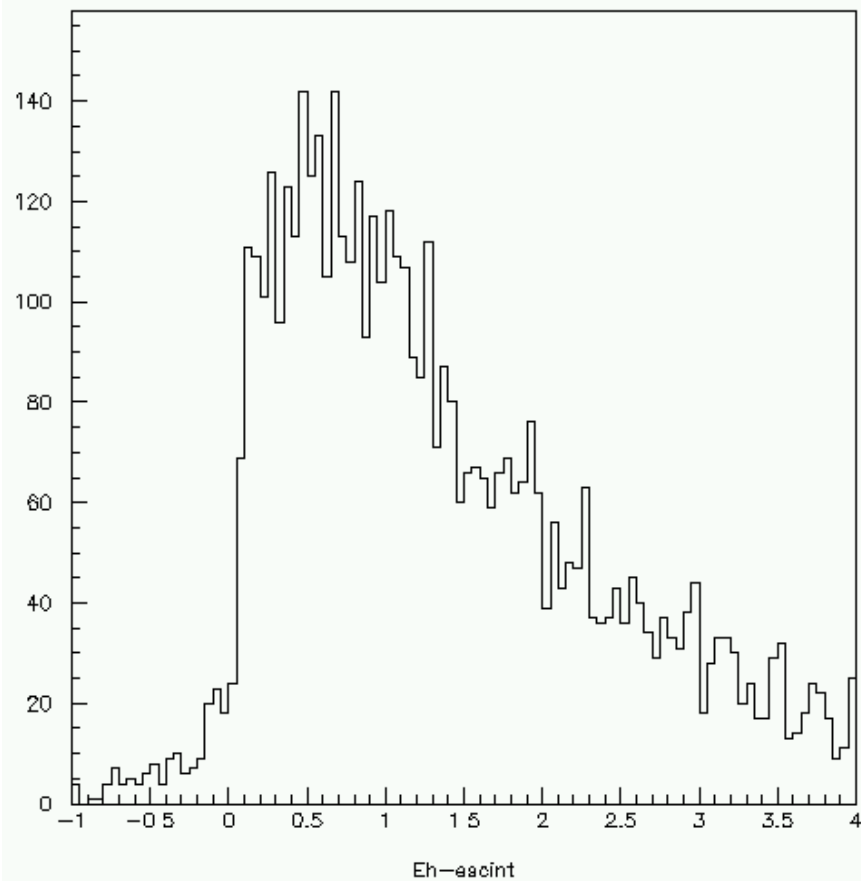


E_h true

5 GeV

Free Energy

- True E_h – Scintillator rawhit esum sometimes < 0 . What am I doing wrong or misunderstand?



Todo

- Do current results make sense?
- Compare spectra of tracked pions vs A
- Compare $Y(W, Q^2)$ analysis vs. truth
- Efficiency for golden events
- Efficiency of pion tracking vs E_{pi}
- Explore ID of non-stopping pions
- π^0 identification from tracker