A Preliminary Look at Cosmic Ray Events

T. Wongjirad

ArgoNeuT Simulation Meeting

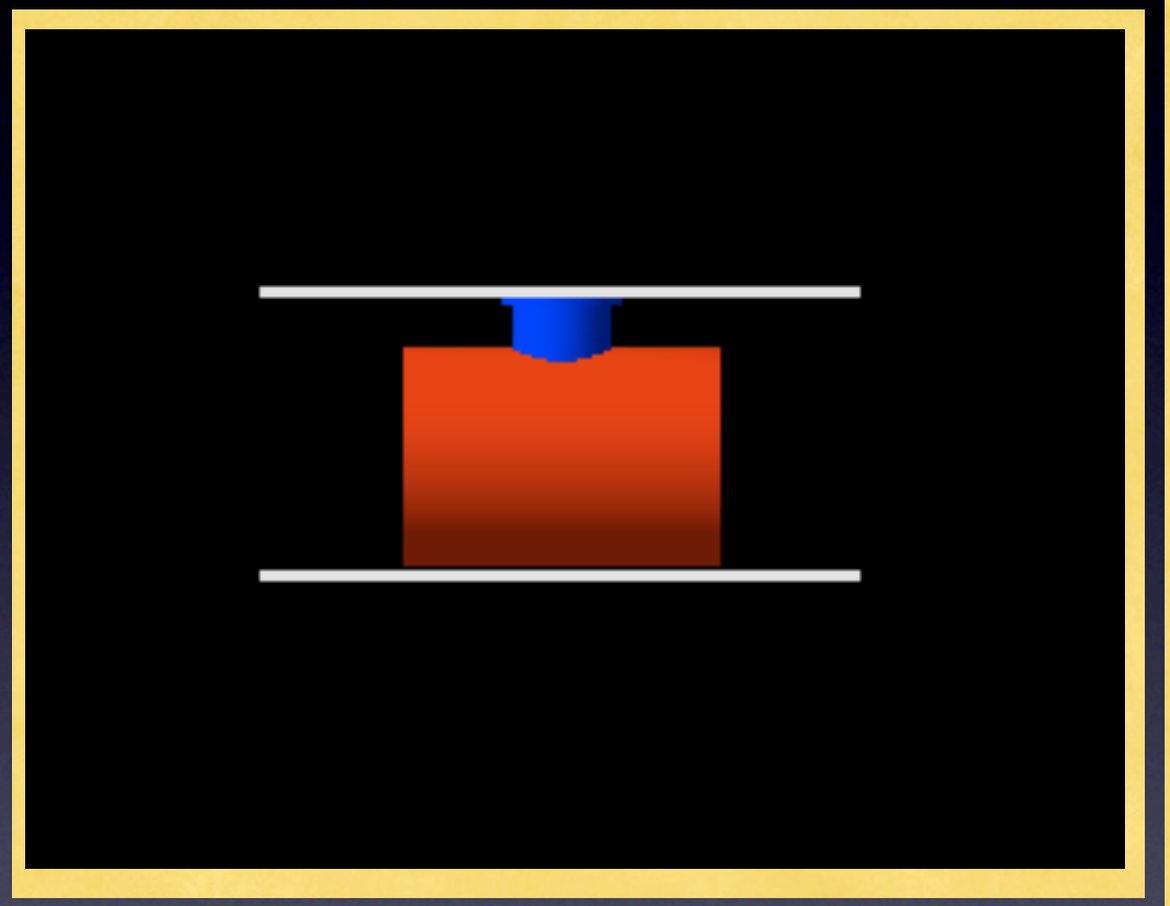
February 4th, 2008

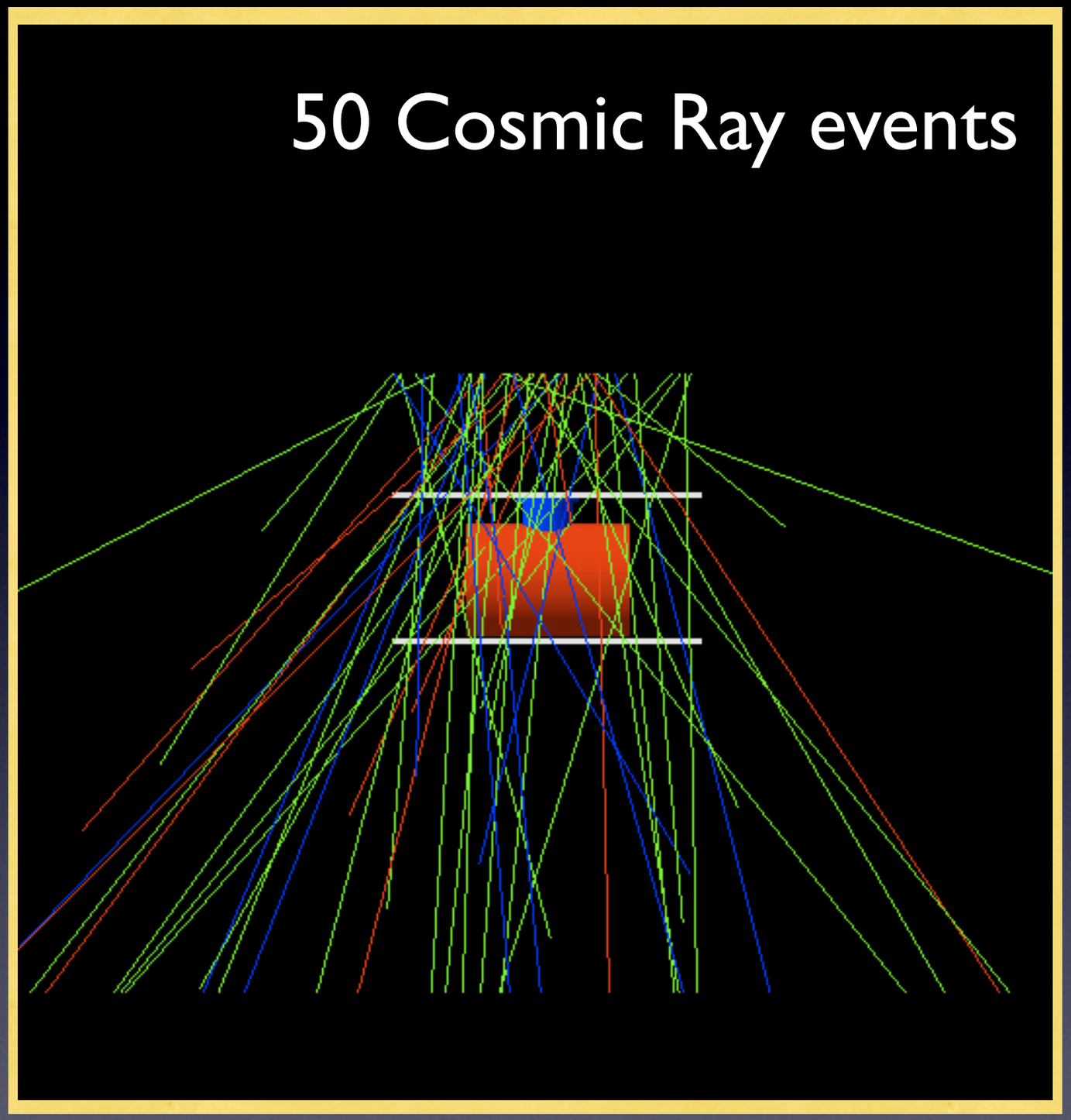
Goals

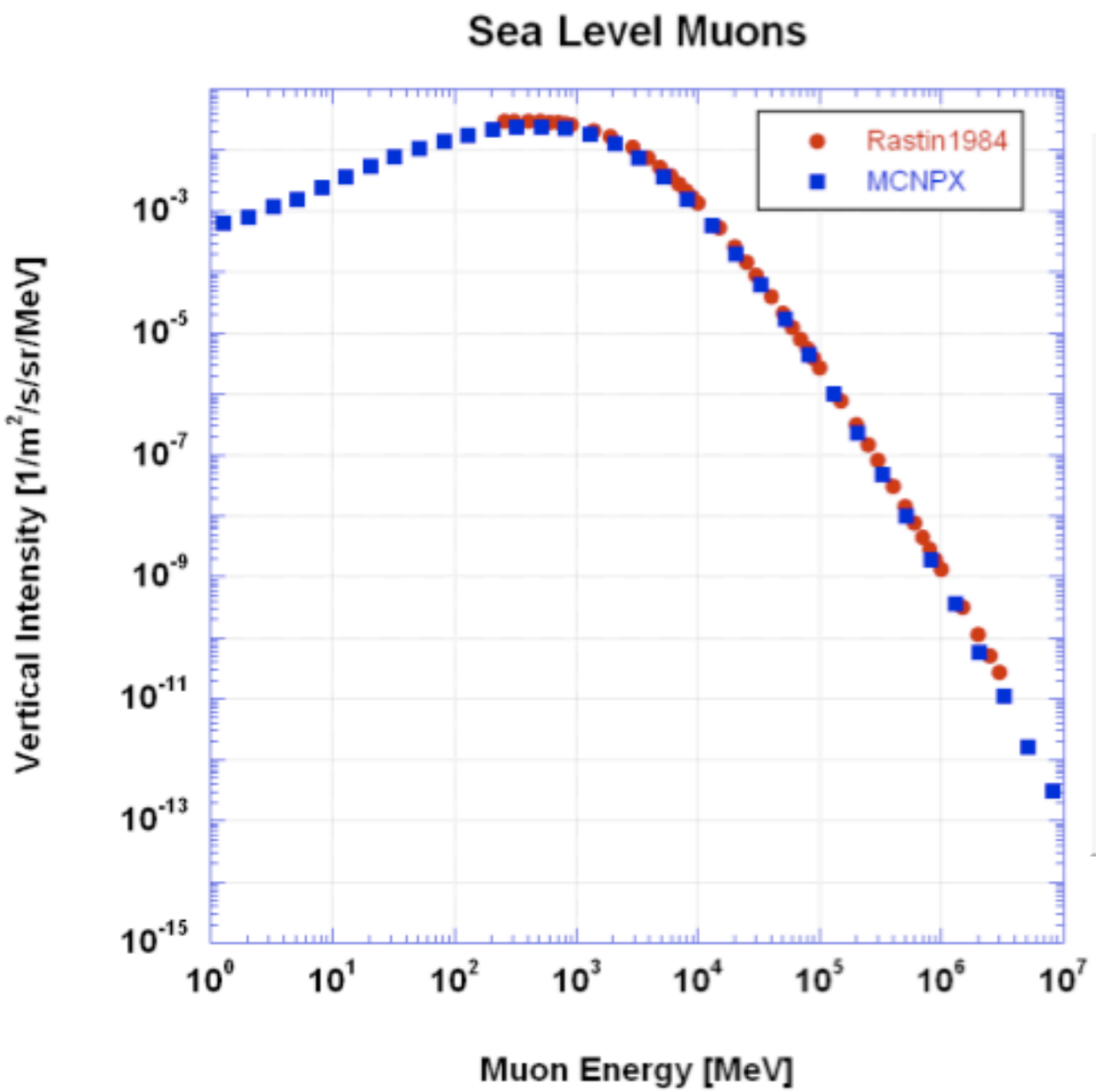
- Use Geant4-CRY to investigate
  - Through-going muons
  - Stopping muons with Michel Electrons

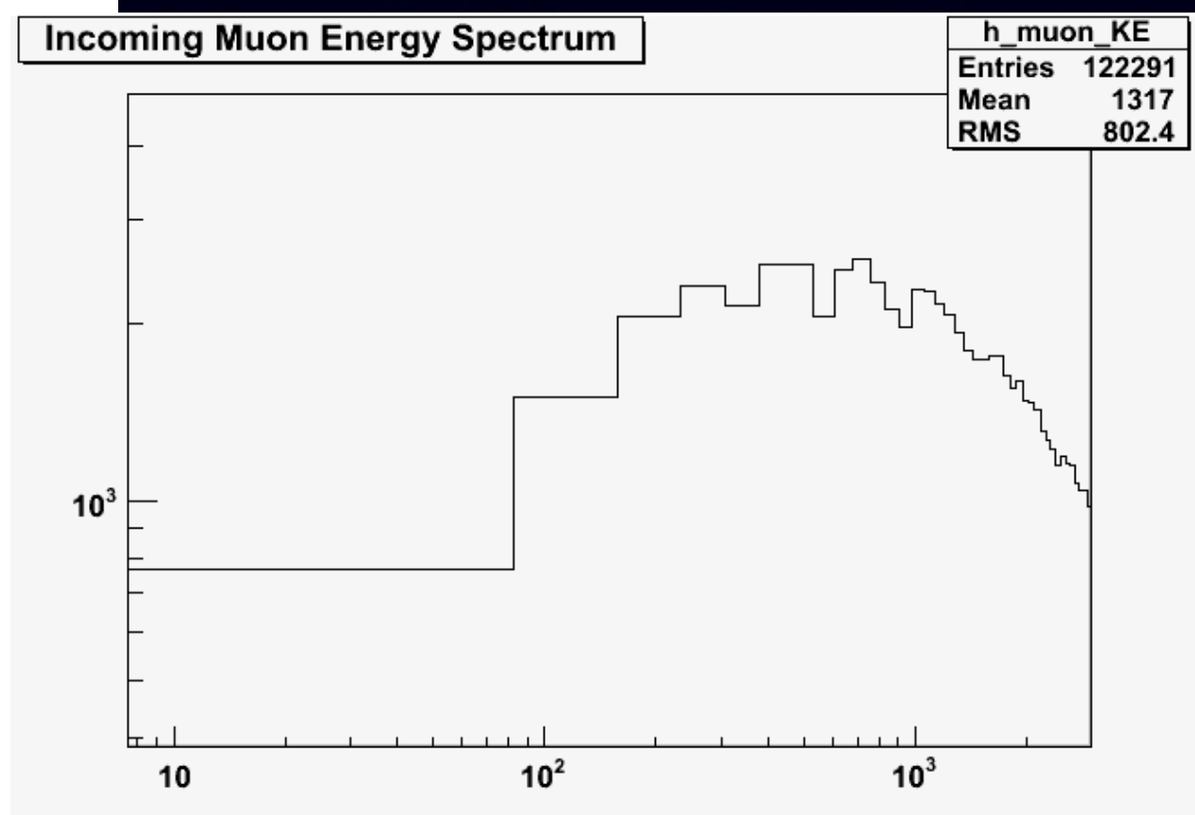
MC

- Cosmic Ray vertices generated on a 3 m plane above detector
- Cherenkov and Scintillation Processes Turned off for Preliminary study to reduce computing time
- Sctintillator Panels 3 m x 3m defined above and below detector
- Analysis ignores non-muon particles



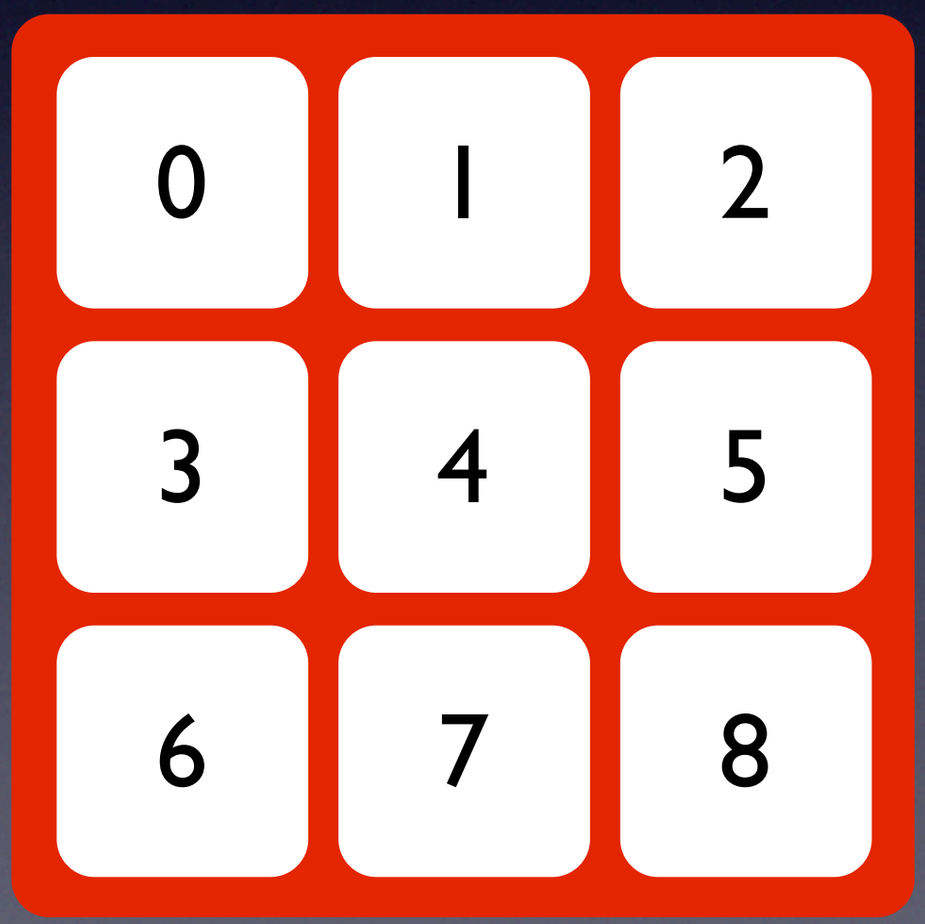

50 Cosmic Ray events

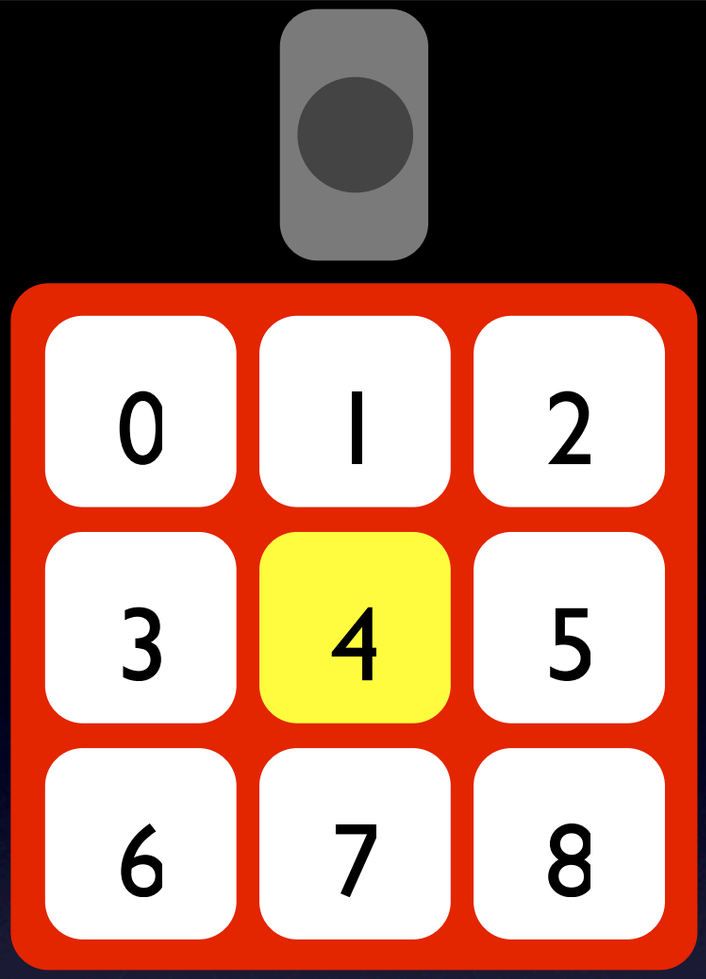

Sea Level Muons
Rastin1984
MCNPX
Vertical Intensity [1/m²/s/sr/MeV]
Muon Energy [MeV]
10^-3
10^-5
10^-7
10^-9
10^-11
10^-13
10^-15
10^0
10^1
10^2
10^3
10^4
10^5
10^6
10^7


Incoming Muon Energy Spectrum
h_muon_KE
Entries 122291
Mean 1317
RMS 802.4
10^3
10
10^2
10^3

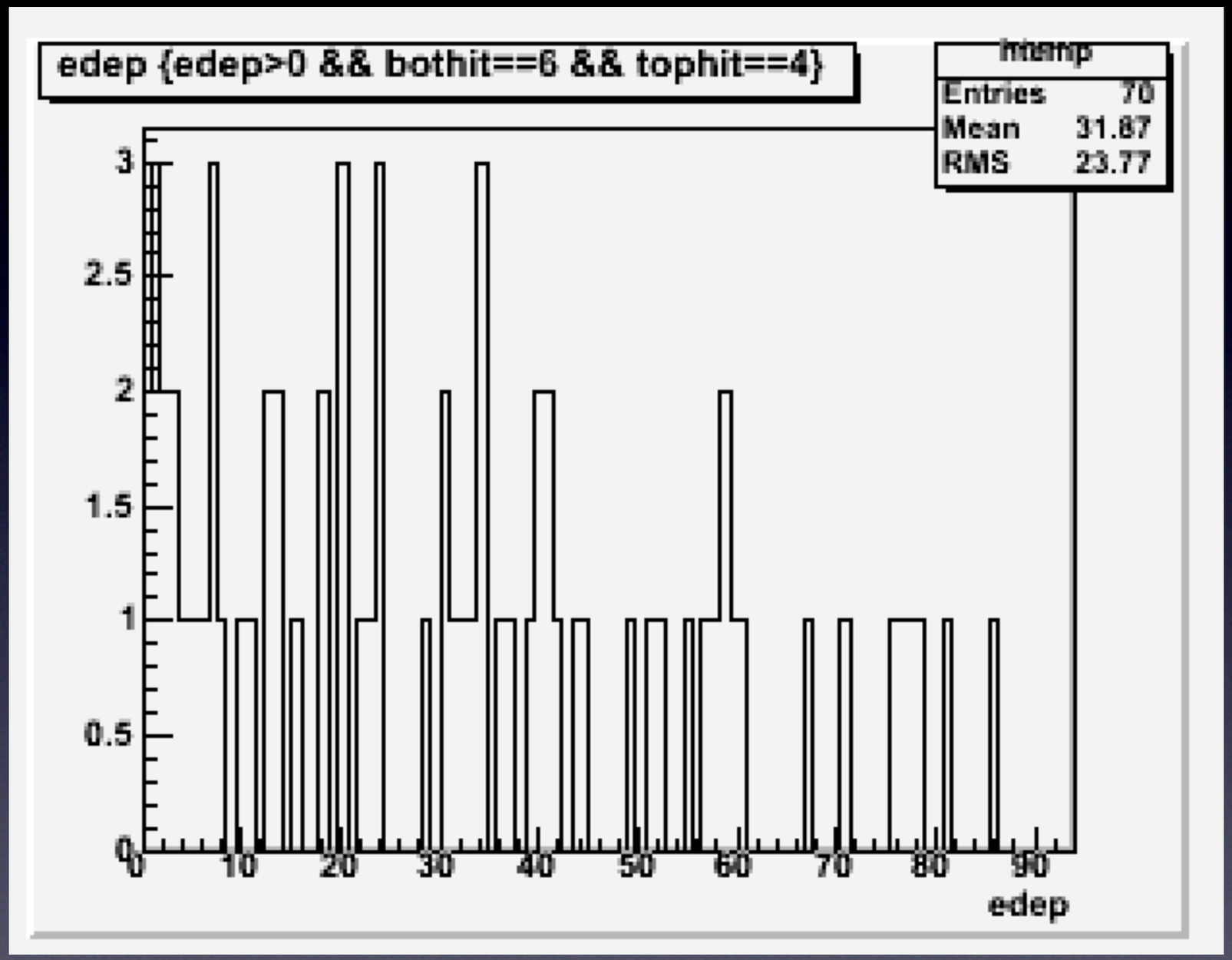
Scintillator Pads

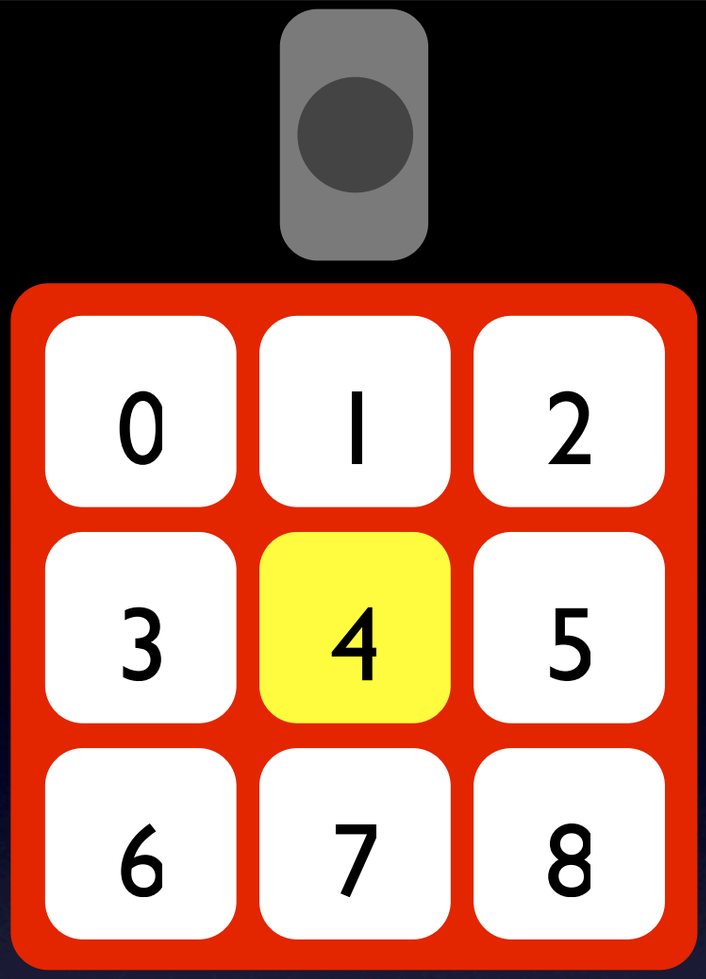
- Pads divided into 9 1 m x 1 m sections
- To investigate optimum configuration




0
1
2
3
4
5
6
7
8

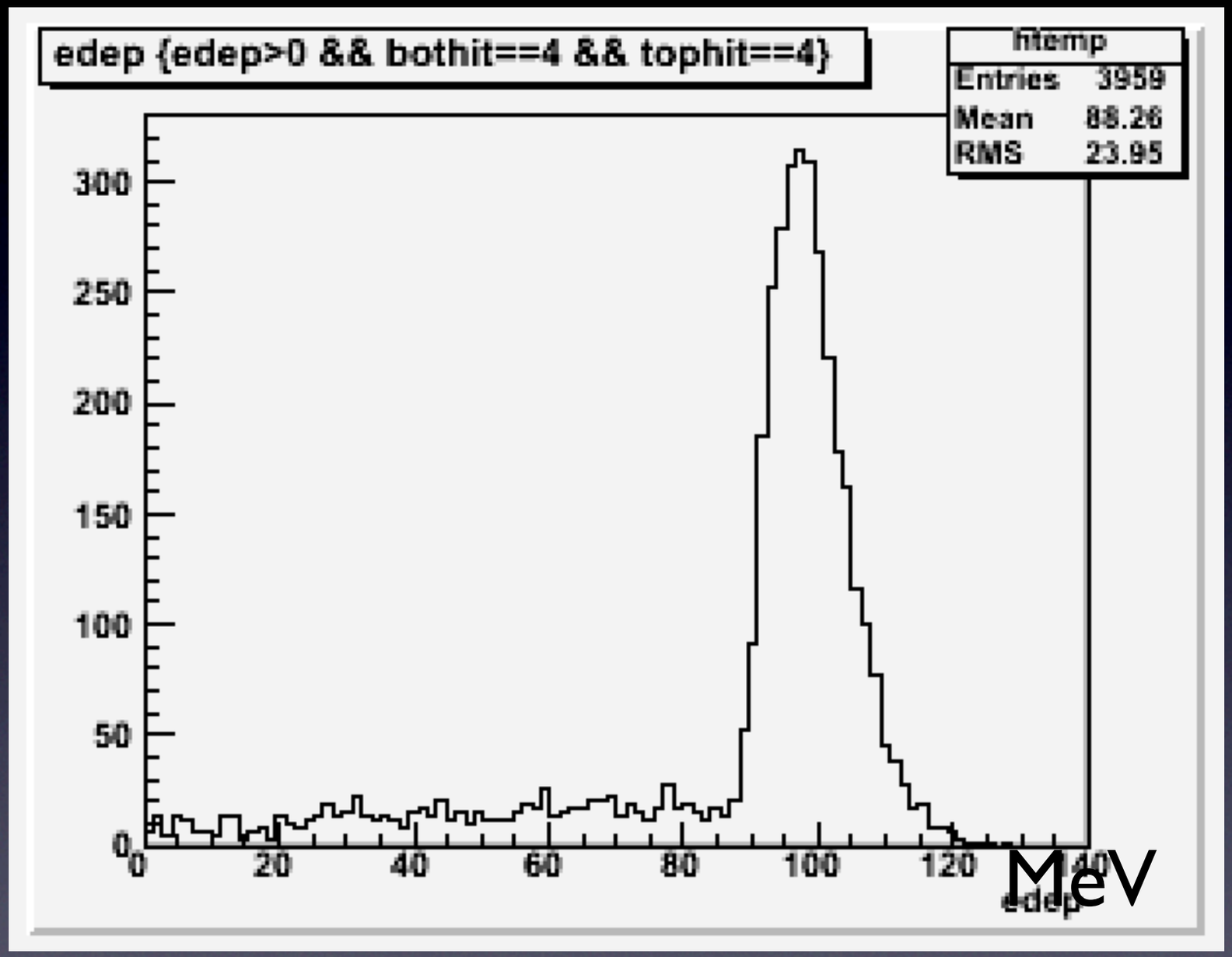
0
1
2
3
4
5
6
7
8


edep {edep>0 && bothit==6 && tophit==4}
htemp
Entries 70
Mean 31.87
RMS 23.77
3
2.5
2
1.5
1
0.5
0
0
10
20
30
40
50
60
70
80
90
edep



Events over 328 seconds realtime

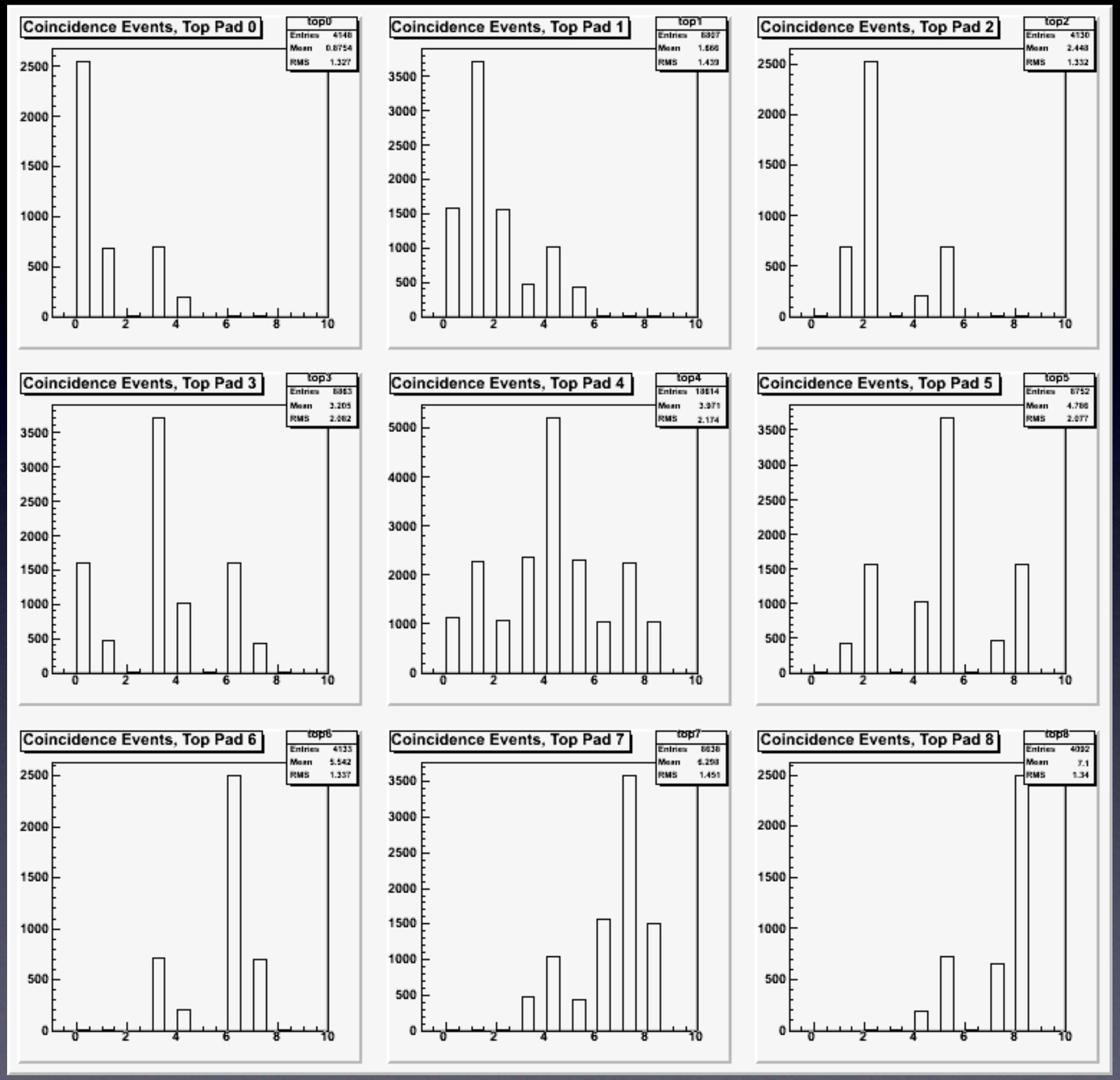
Rate ~12 Hz



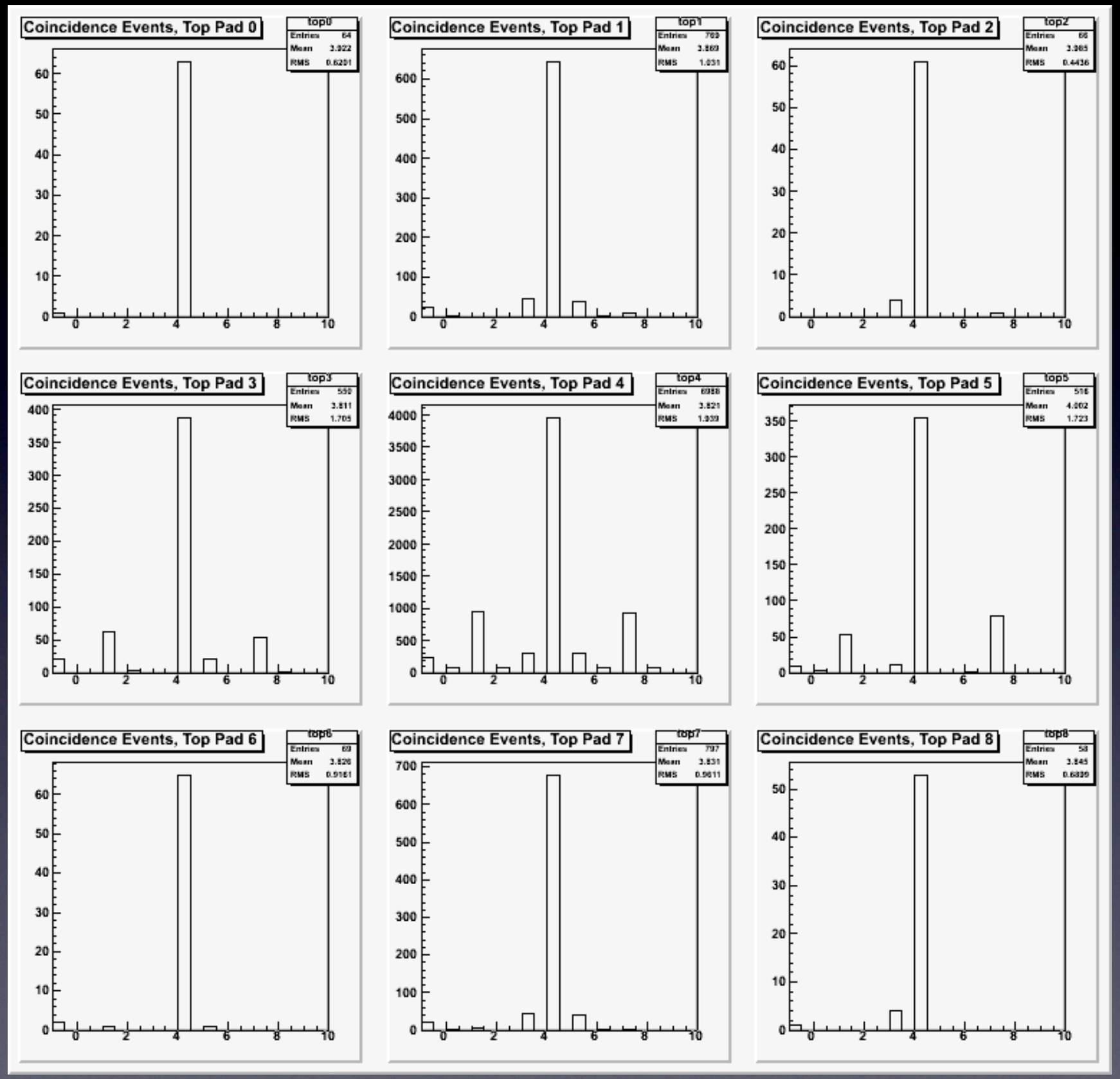
Use to establish:

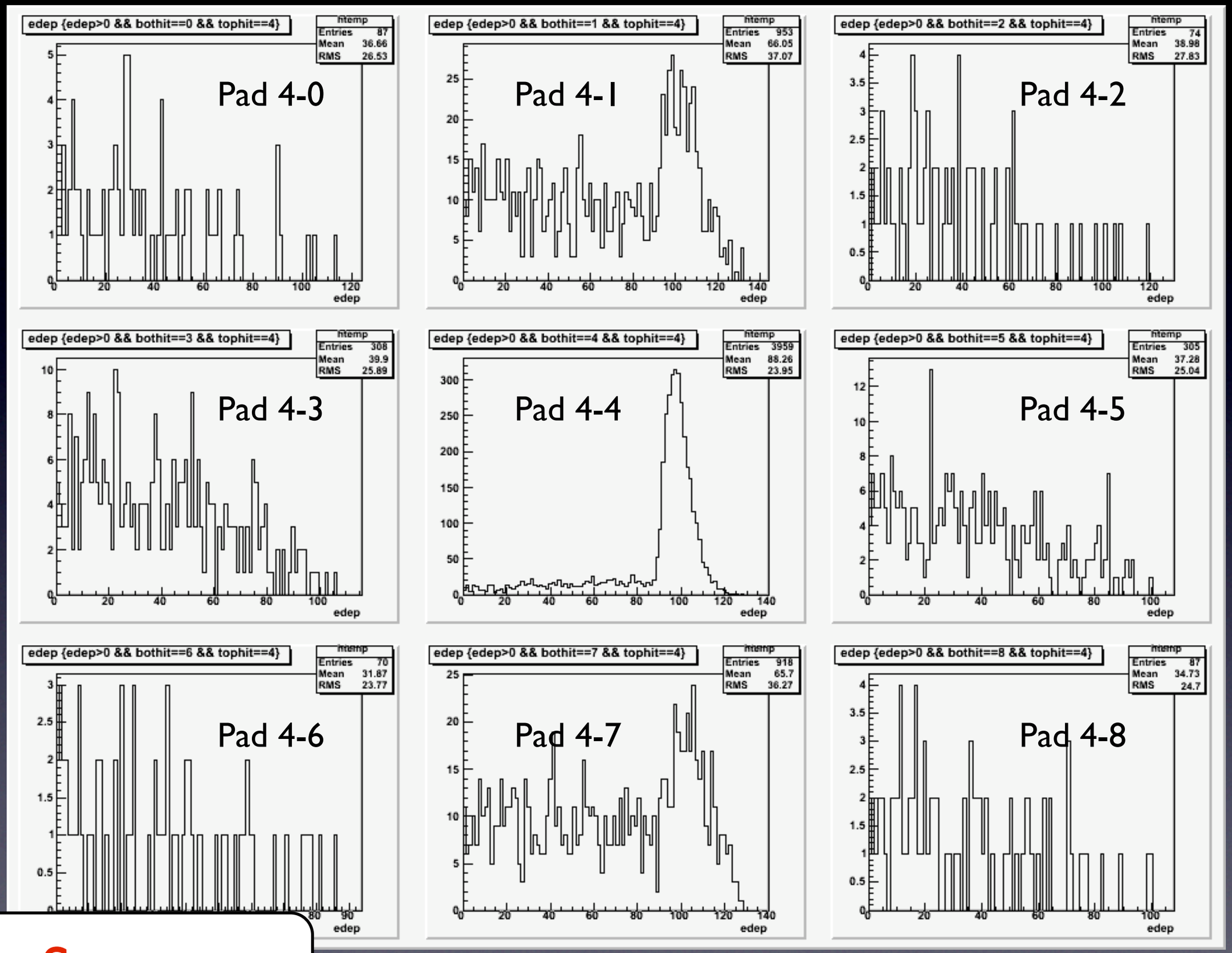
(1) dE/dx muon (2) Resolution (3) Threshold

Double Coincidence



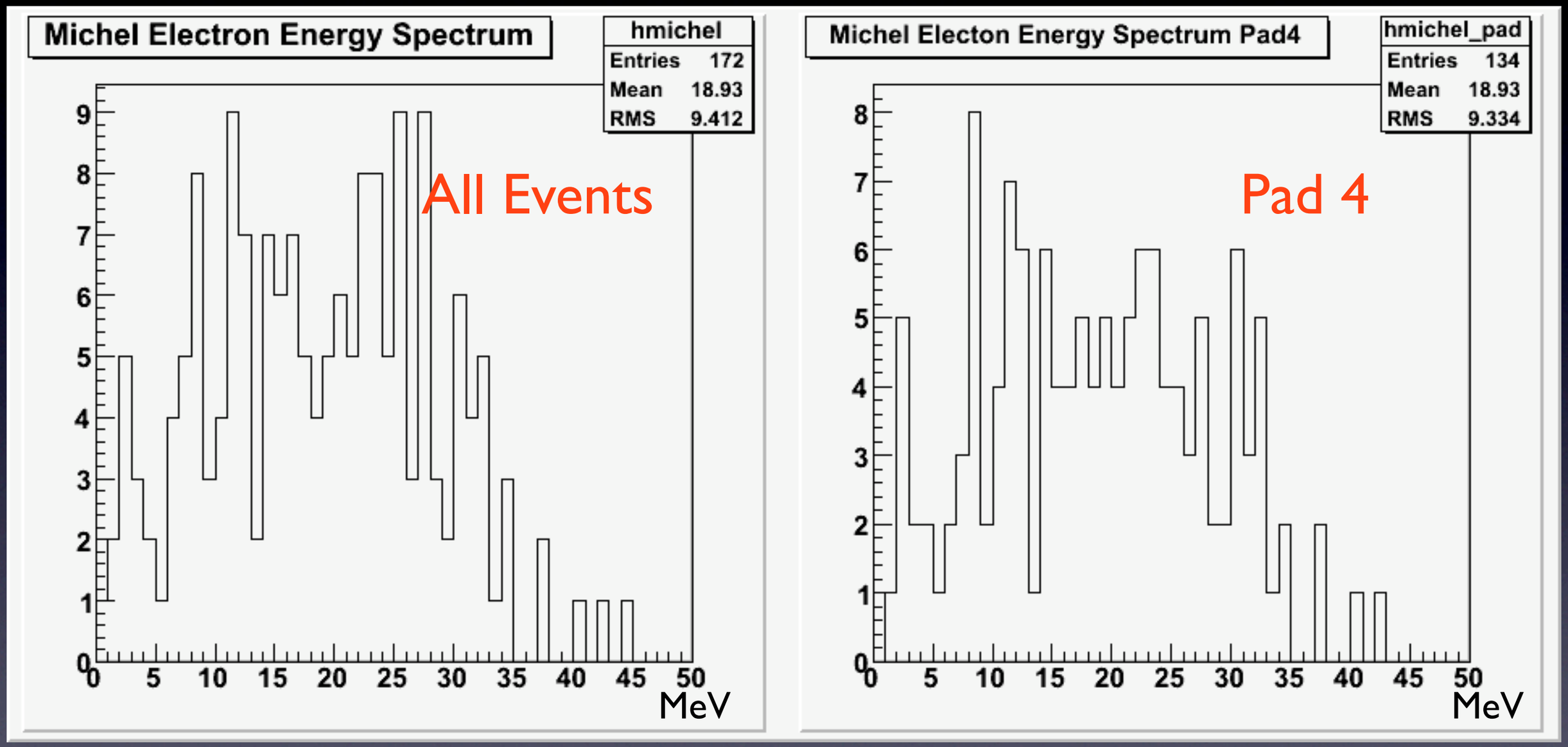
Triple Coincidence





Muon Spectrum

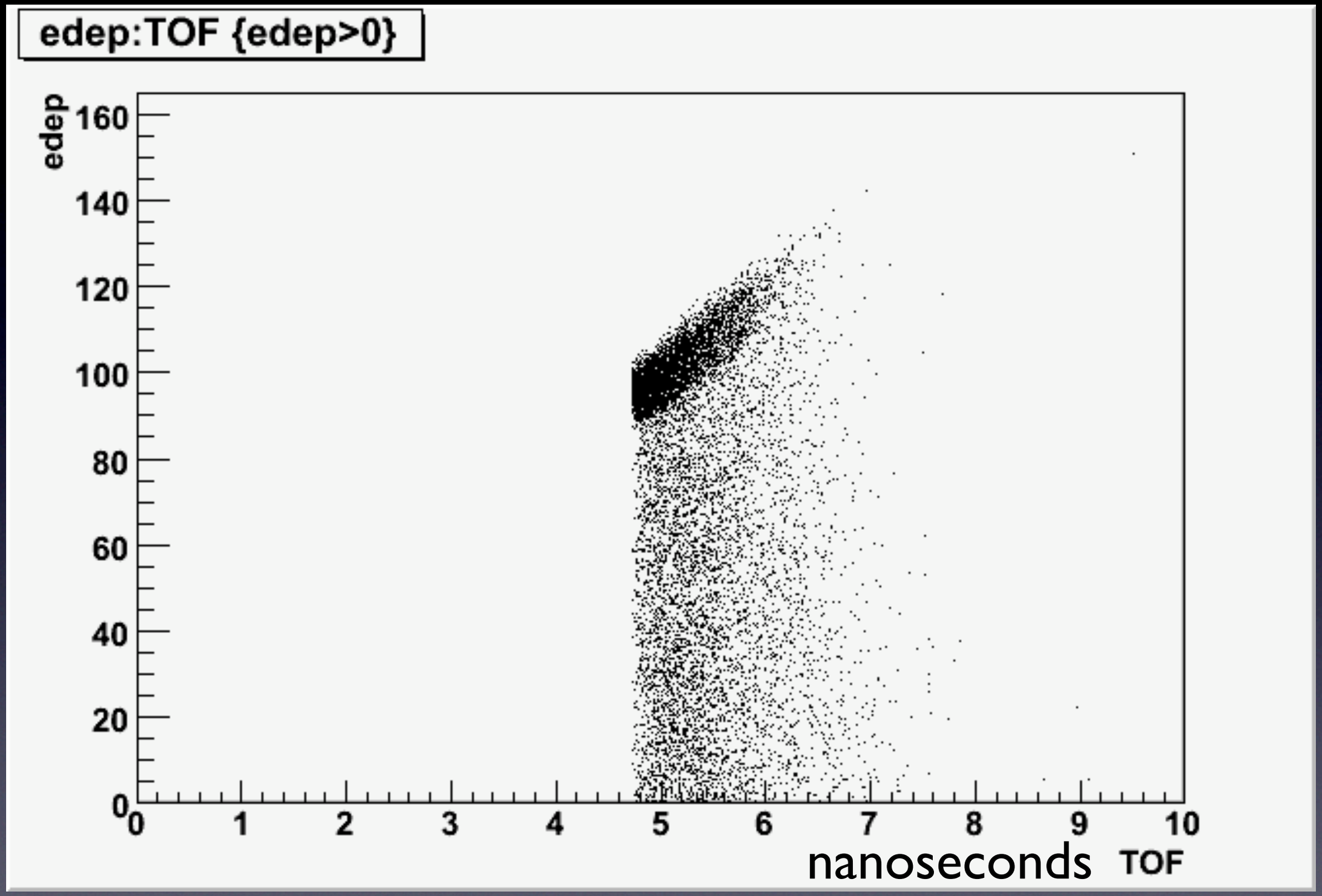
Michel Electron Spectrum



Events occur over 328 seconds of real time

Rate of ~0.5 Hz Total
Pad 4 events ~0.41 Hz

Future Work

- Re-run simulation-analysis with Cherenkov/ Scintillation Processes
- Translate Events into Wire Readout Signals
- Background from Other Cosmic Particles
- Use CRY to create background for simulated neutrino events
- Large Angle Rate
- Systematics in Michel Parameters

Time of Flight