ND Plots

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ND Phone Meeting 07-27-05

Outline

- Events used & Details
- Cuts
- General Quantities
- CC-like Quantities
- NC-like Quantities

(ALL PLOTS HERE NORMALIZED TO THE SAME NUMBER OF EVENTS, THE SAME PLOTS EXIST NORMALIZED TO POTS)

- On going work

Events, releases,POTs e.t.c

- March LE data

  -Data POT : 5.29* E17(after imposing beam quality cuts)

  -MC POT : 19.80 E17 (150 MC FILES, 550 Snarls each,2.4 E13 PPP)

  -Release Data & MC : R1.16

- March pME data

  -Data POT : 5.13* E17(after imposing beam quality cuts)

  -MC POT : 9.90 E17 (150 MC FILES, 550 Snarls each,1.2 E13 PPP)

  -Release Data & MC : R1.16

- March pHE data

  -Data POT : 1.70* E17(after imposing beam quality cuts)

  -MC POT : 7.42** E17 (150 MC FILES, 550 Snarls each,0.9 E13 PPP)

  -Release Data & MC : R1.16

  * *Corrected for the known 4.8 % factor (decrease) on the measured POTs by TORTGT*

  ** *MC POTS in this presentation corresponding to 25 MC Files*

Known Features

•Known features of DATA & MC :

- ND Not calibrated

- DATA & MC have different Field Maps

- Rock Muons in Data ~ 50% more than in MC

- Intranuke OFF

-Flux Version used for MC generation v16

- Bug in Track Fitting (Brian talked about it last week, effect believed to be very small but needs to be checked)

Cuts Used: Timing

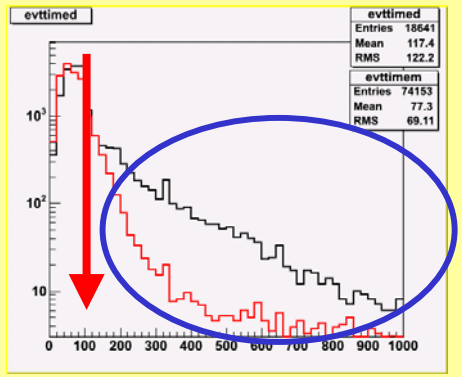
Cut to reduce events composed of Low PH activity due to PMT afterpulsing

- EVENT TIME WIDTH < 100 ns if NO TRACK PRESENT
- AVERAGE PH PER STRIP > 300 ADC counts

TIMING CUT :

Motivation : Low PH events have unphysically large time widths

- **Events with a track with trkpass == 1 OR**
- **Time Width of event < 100 nano second.**



- This cut rejects 4 % of MC CC events and 7% of MC NC events

Cuts Used: Fiducial Region& CC-like definition

FIDUCIAL REGION

Use a Cylinder of

- Event Vertex to be within 1 m radius of the beam centre. Beam centre taken by MC to be 1.4885m in X and 0.1397 m in Y

- Event Vertex to be greater than 1 m and less than 5 m in Z.

CC-Like DEFINITION

Use 2 CC Classifiers (for events with a track)

- David P. CC-NC Separation using PDFs (cut for clean CC sample at –0.4)

- N.S. CC-NC Separation using ANNs (cut for clean CC sample at 0.2)

(Details for both selections have been extensively discussed in previous presentations, comparison between the 2 to be presented soon since now both selection methods are available in MAD)

At the moment not all plots are made with both (can be easily done).

Energy Spectrum & Muon Momentum presented for both selections.

Total Events DATA/MC (pot normalization)

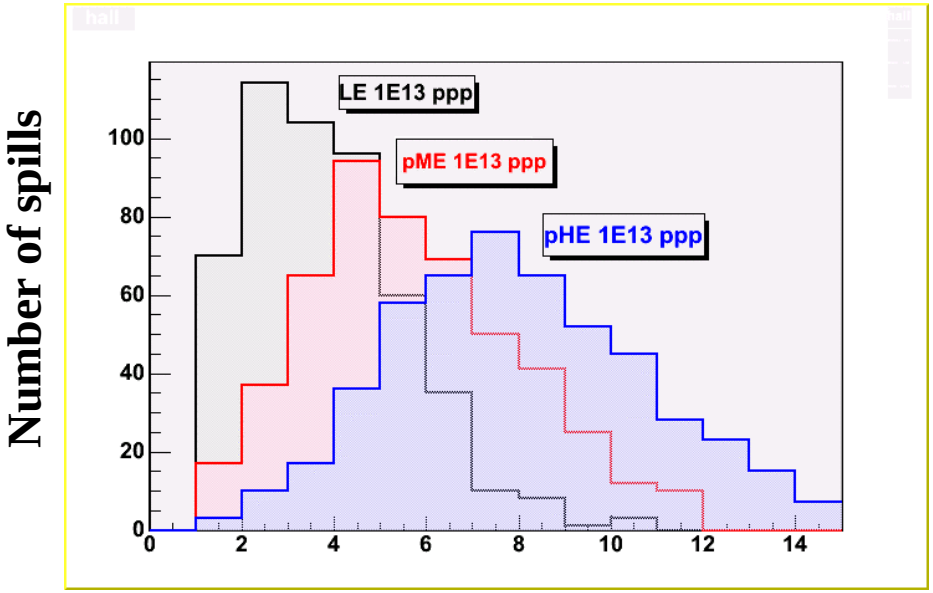
LE	EVENTS
DATA	20087
MC	19227
diff	+4%
pME	EVENTS
DATA	36357
MC	39365
diff	-7%
pHE	EVENTS
DATA	18804
MC	19486
diff	3.5 %

GENERAL PLOTS

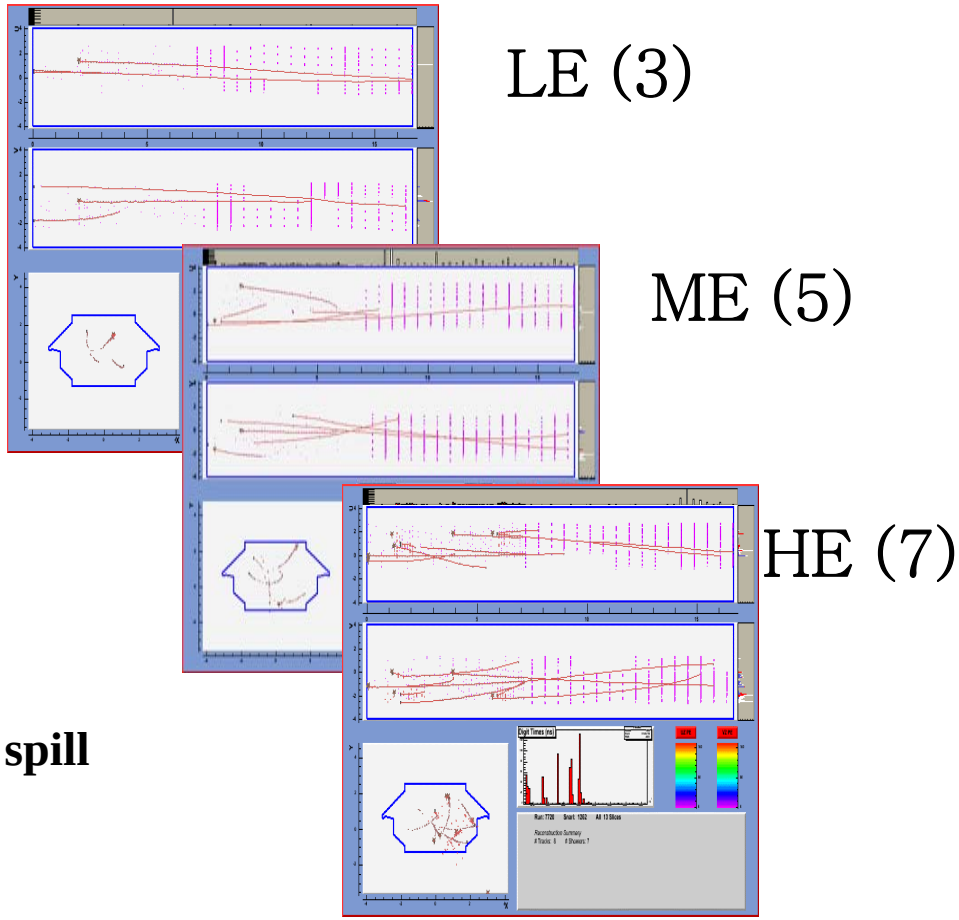
ALL EVENTS :

Satisfying timing cut always and CC-like & fiducial when denoted.

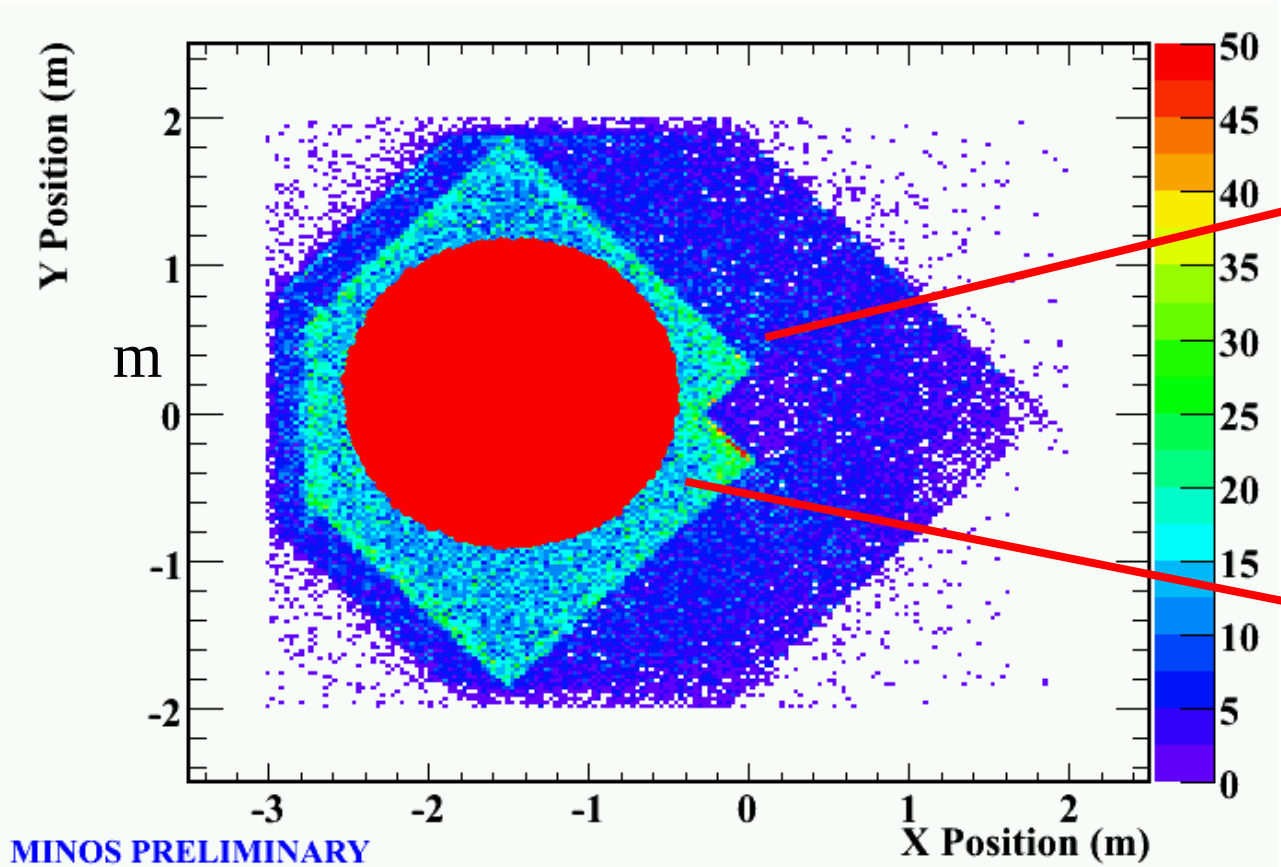
Neutrino Events per Spill (all events) *(not in "blessed" style yet…but soon)*

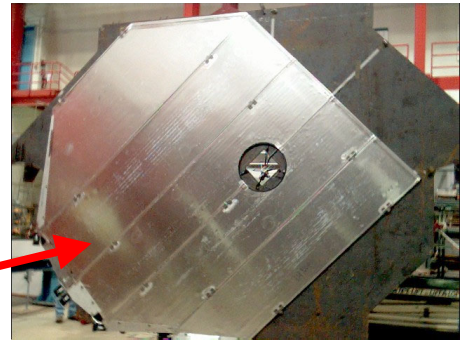


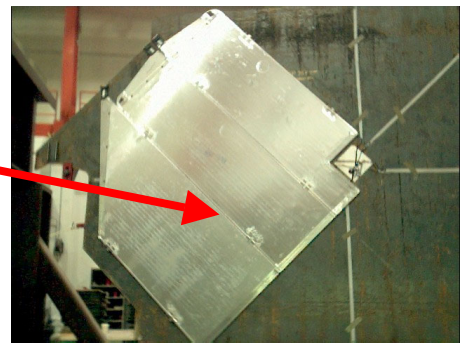
Number of reconstructed neutrino events per spill



Event Vertices (all events)

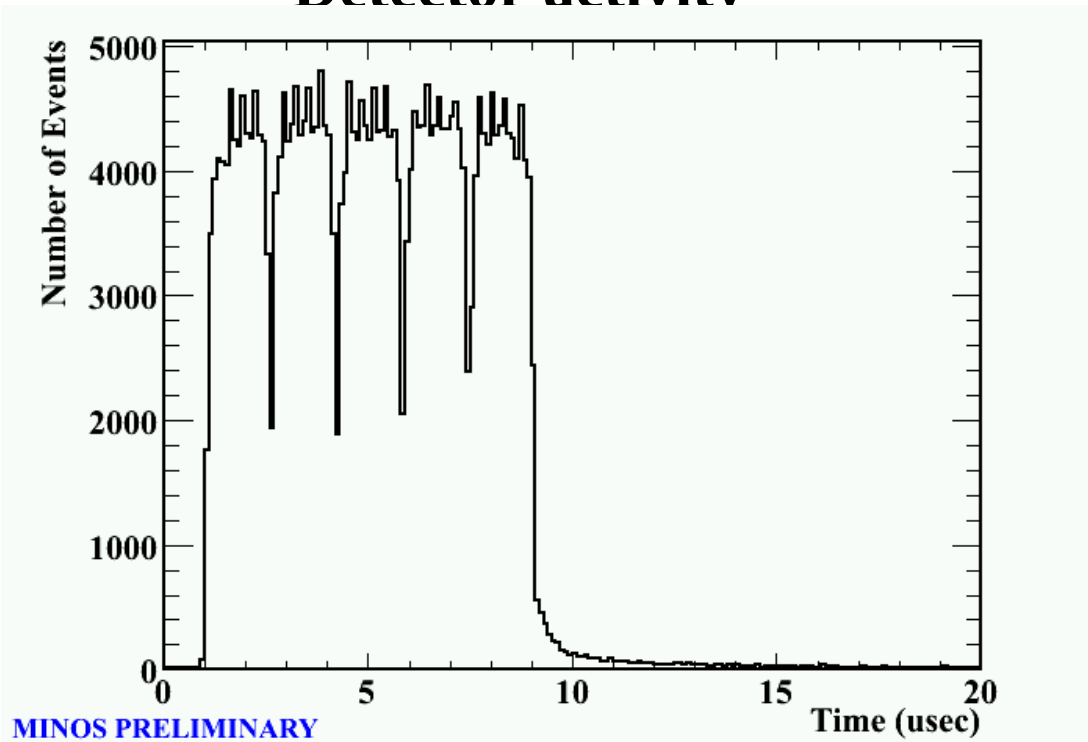




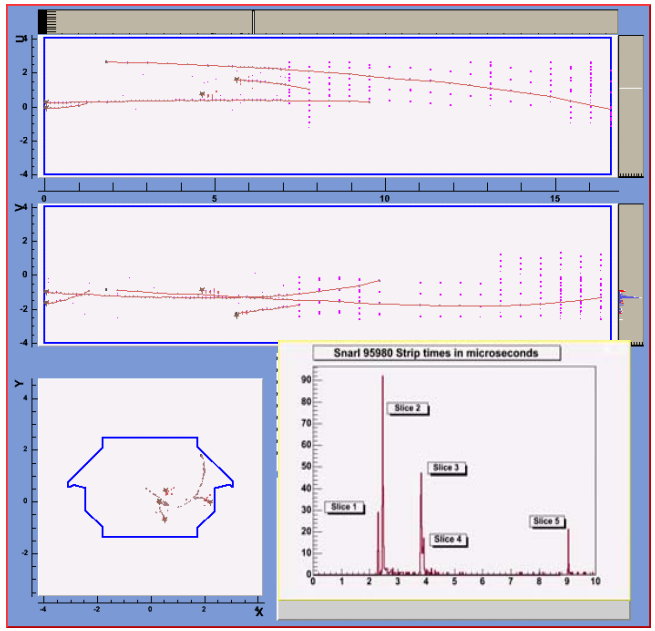


Near Detector Timing (all events)

Detector activity



One Spill



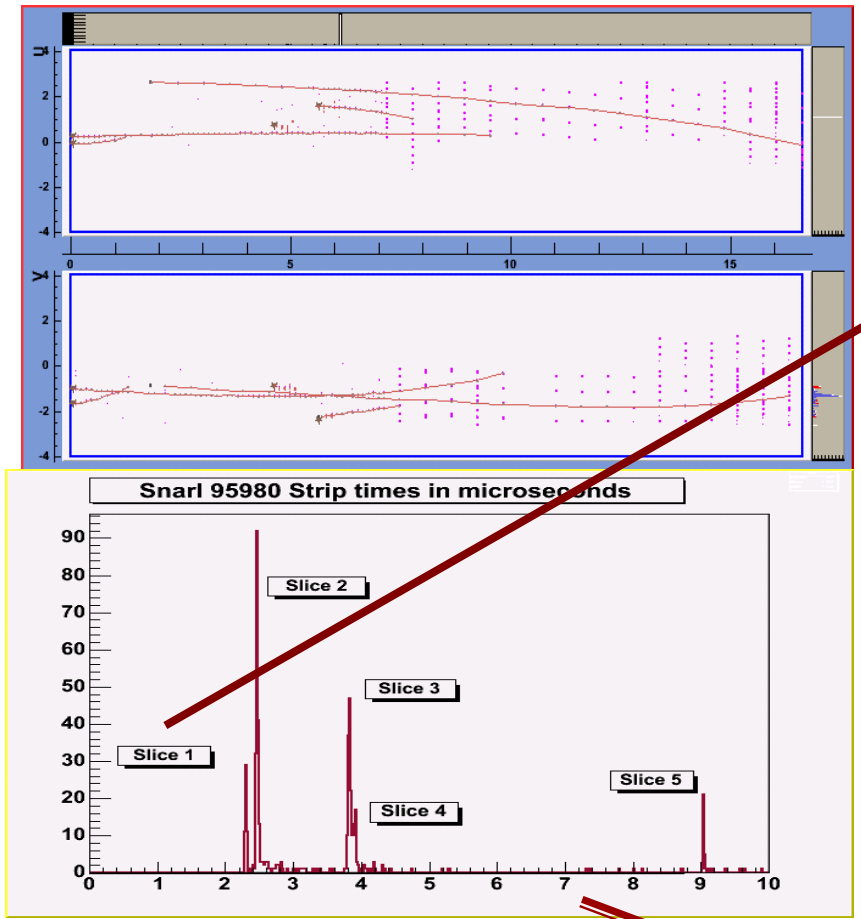
8 –10 usec spill of 5-6 "batches" each of ~ 1.6 usec length.

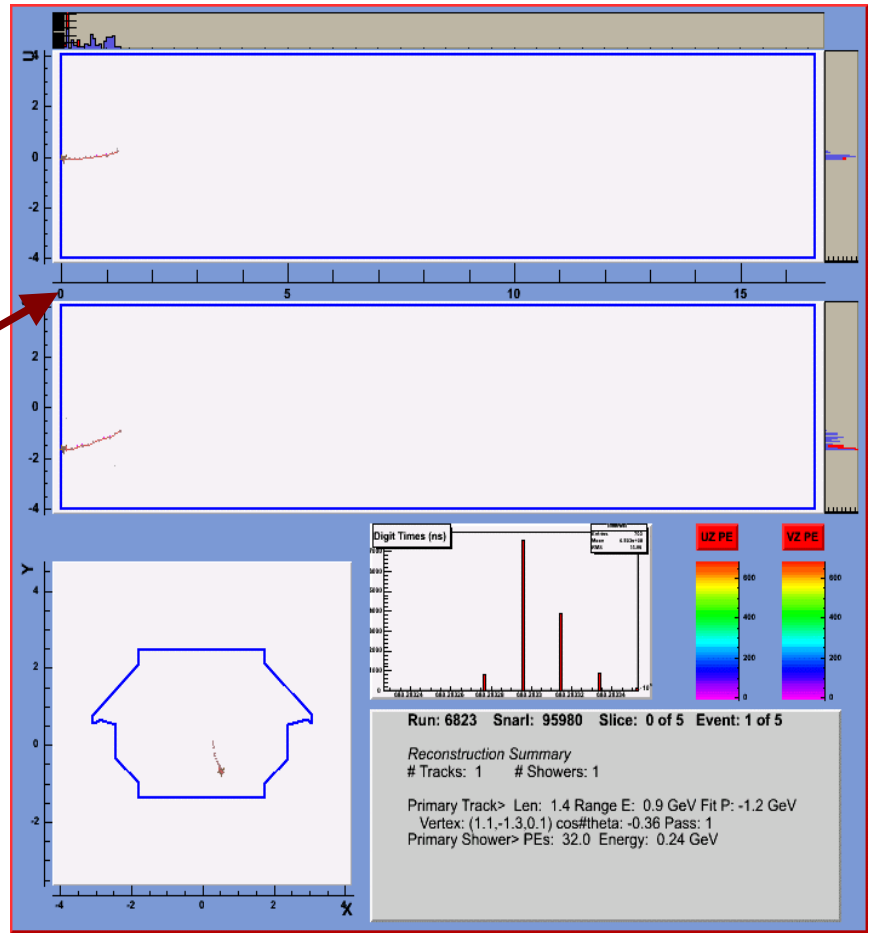
Events recorded within a 18 micro sec window.

Event Timing

One Spill

"Rock muon"

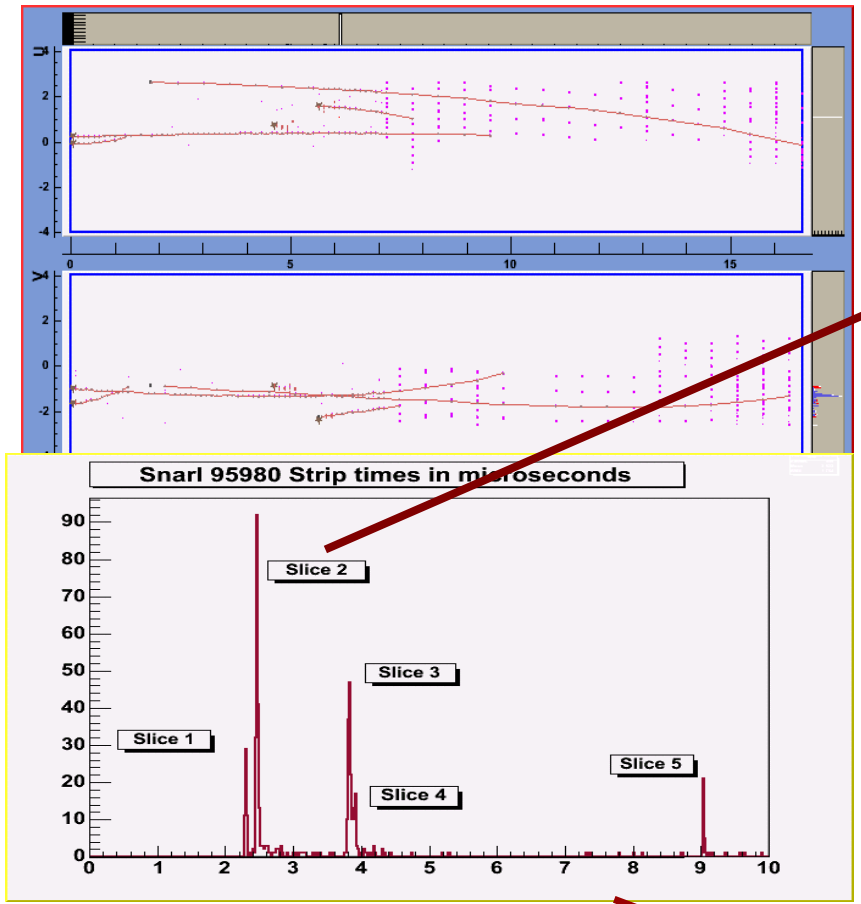




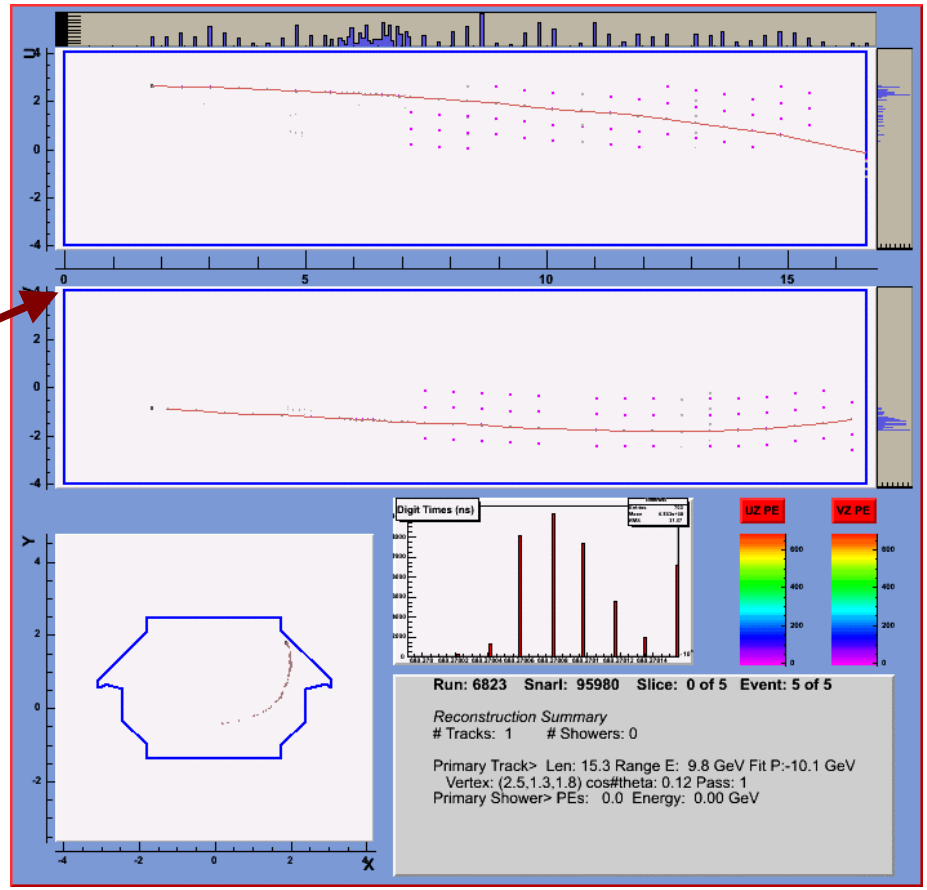
5 time slices -> 5 events

Event Timing

One Spill



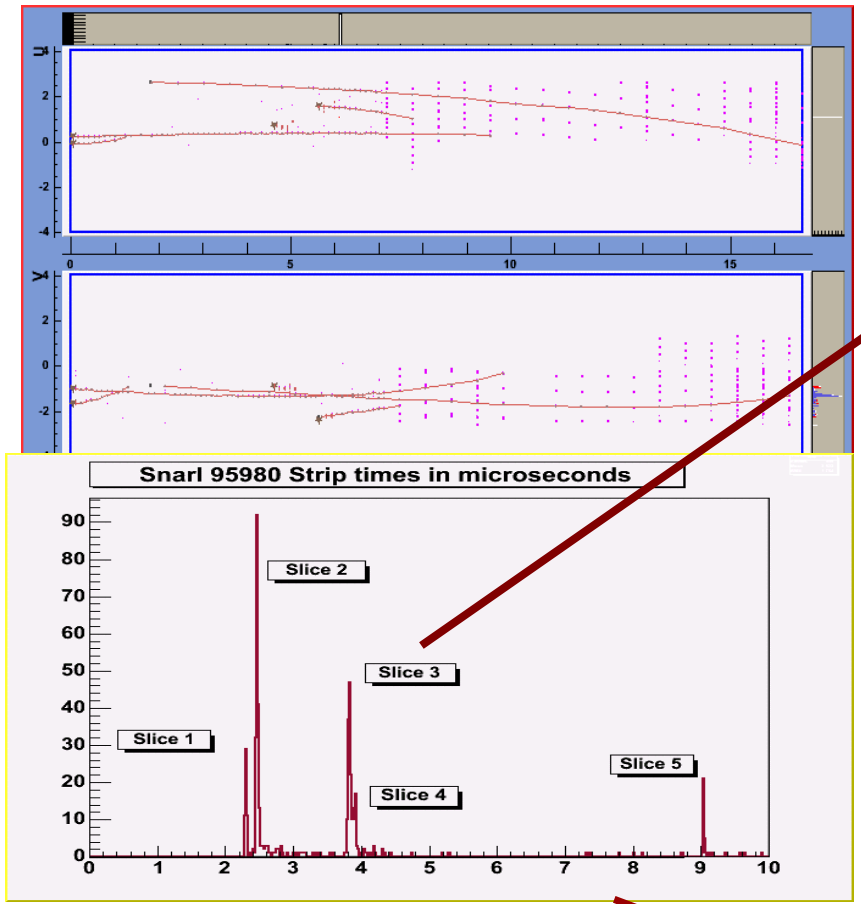
Rock Muon



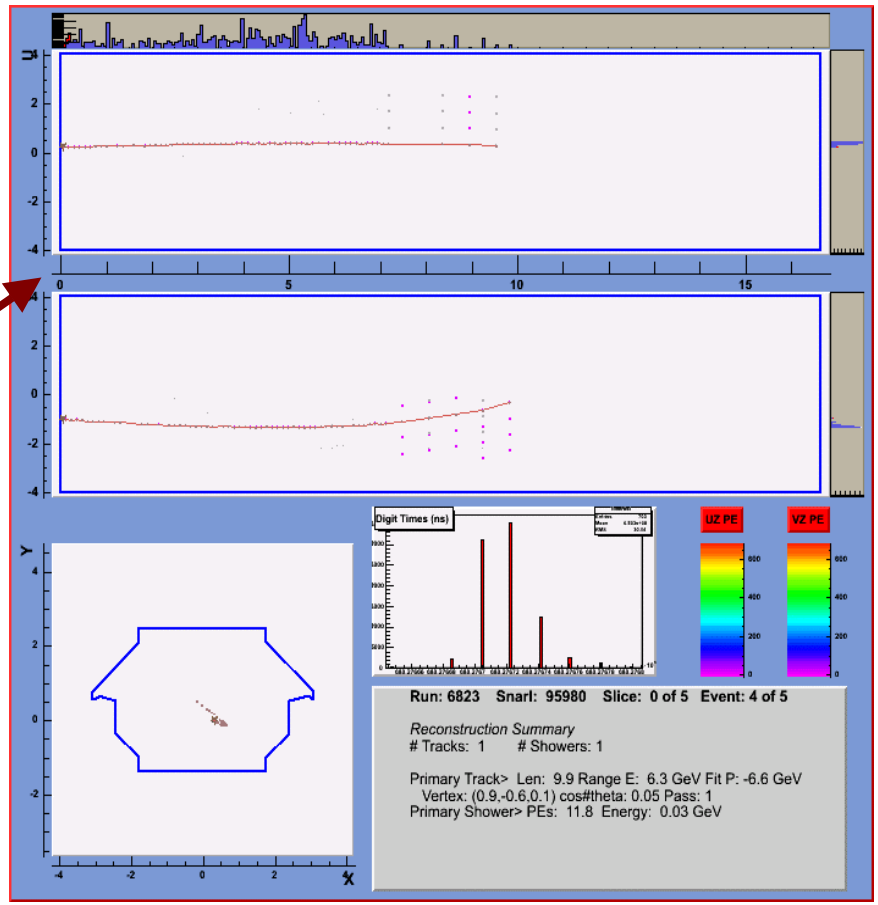
5 time slices -> 5 events

Event Timing

One Spill



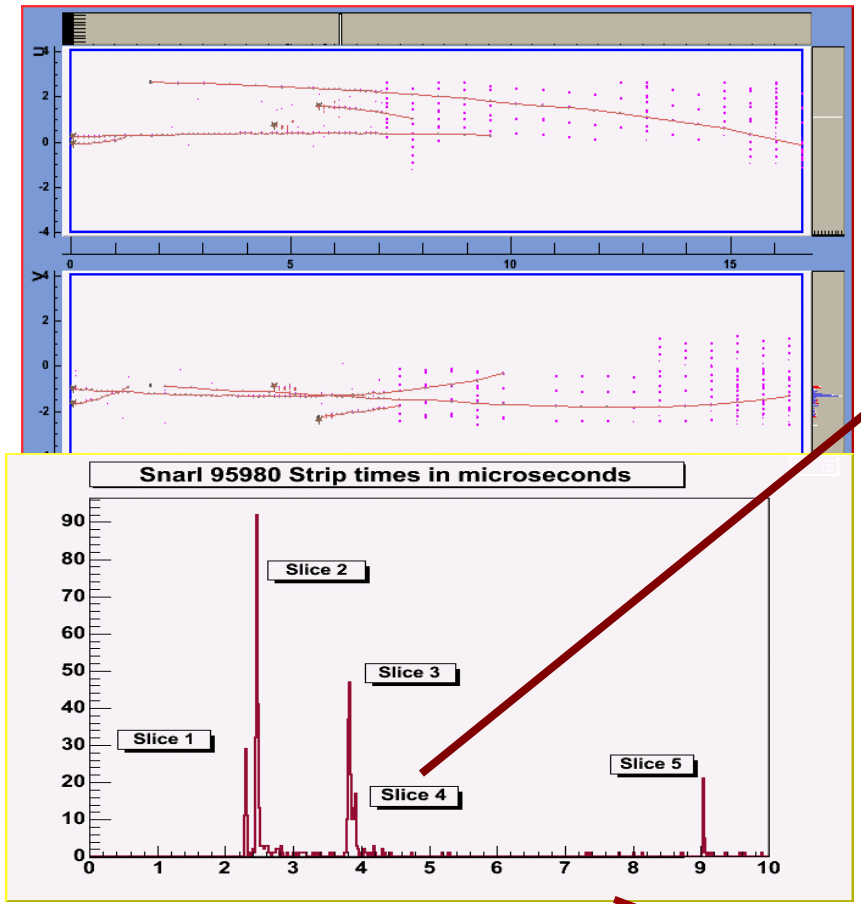
Rock Muon



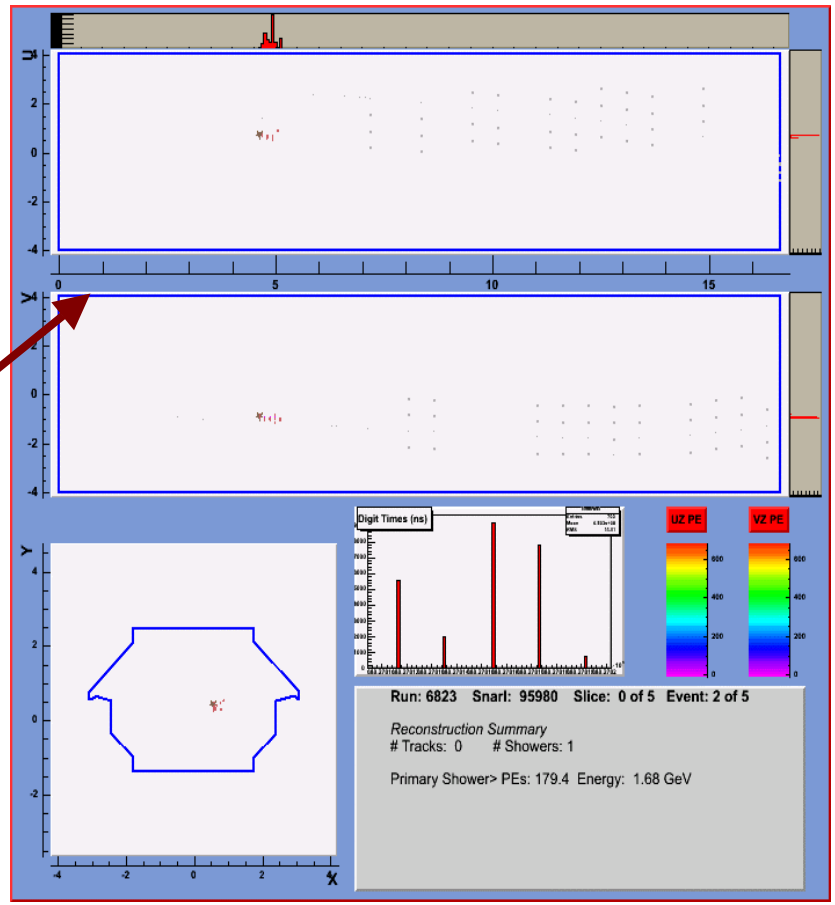
5 time slices -> 5 events

Event Timing

One Spill



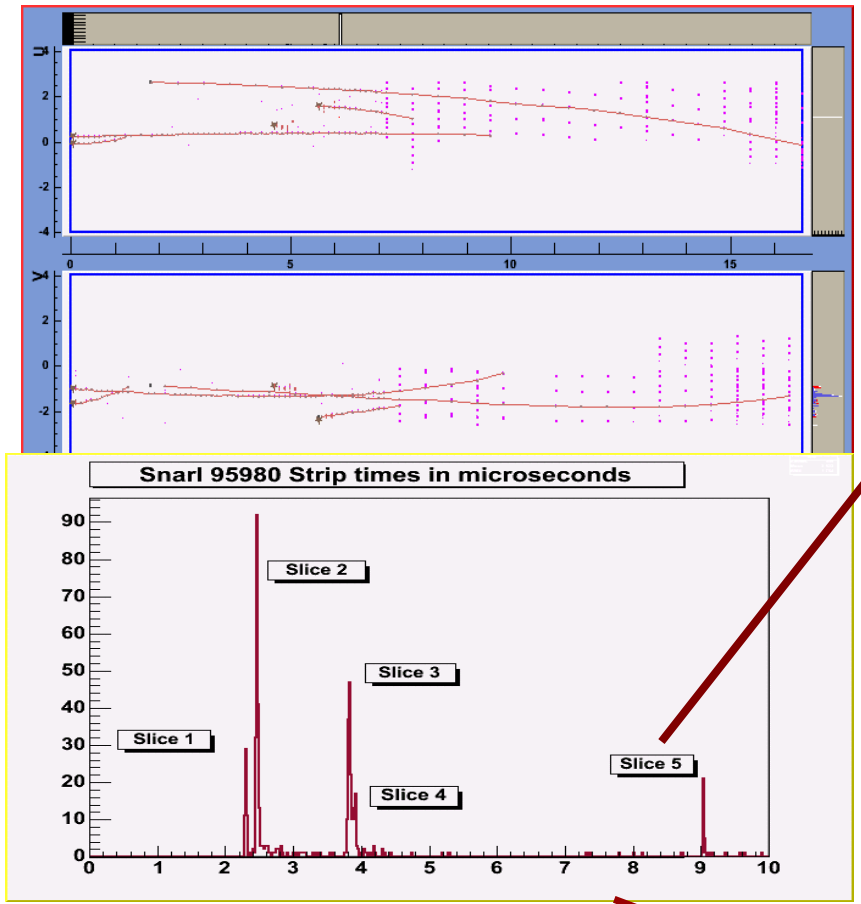
Contained event



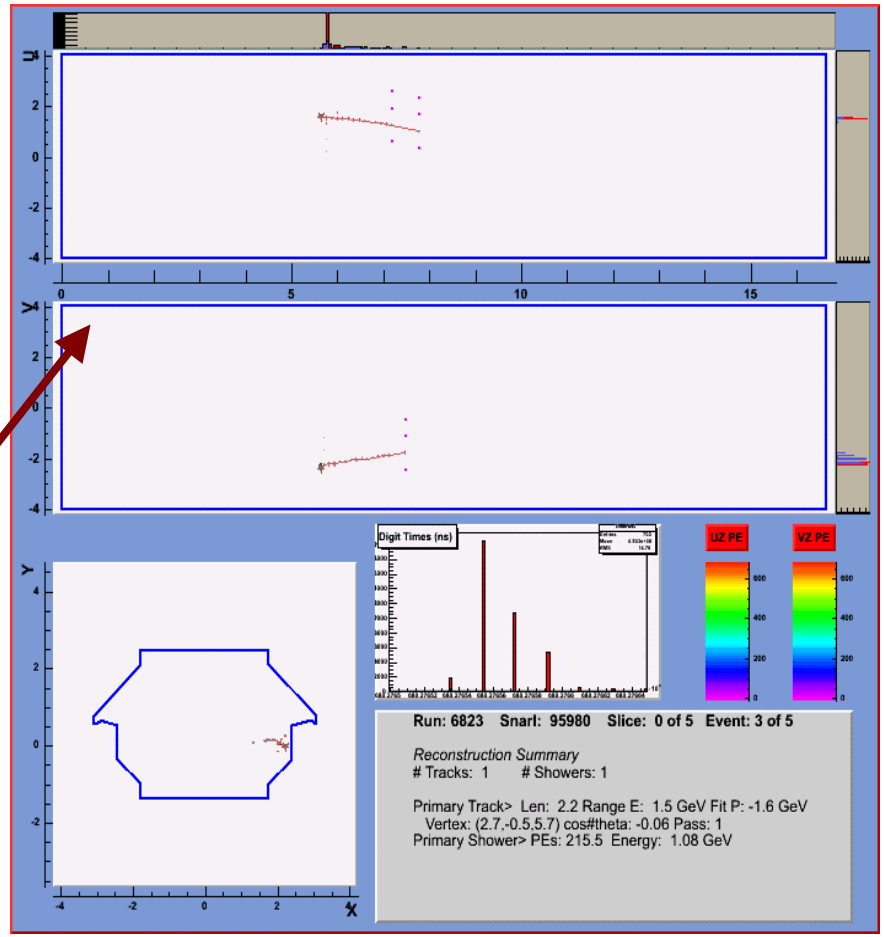
5 time slices -> 5 events

Event Timing

One Spill



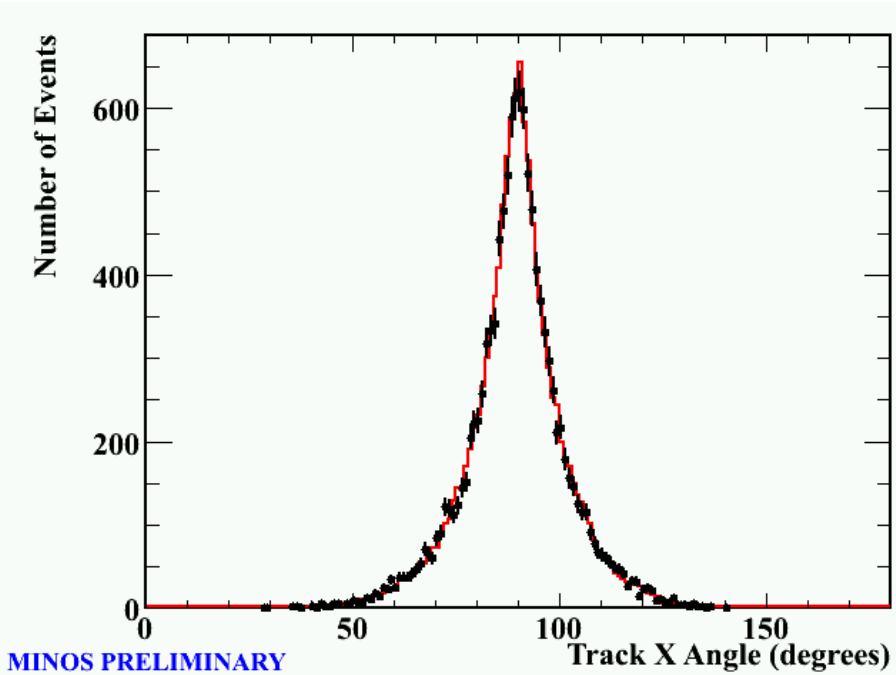
Contained event

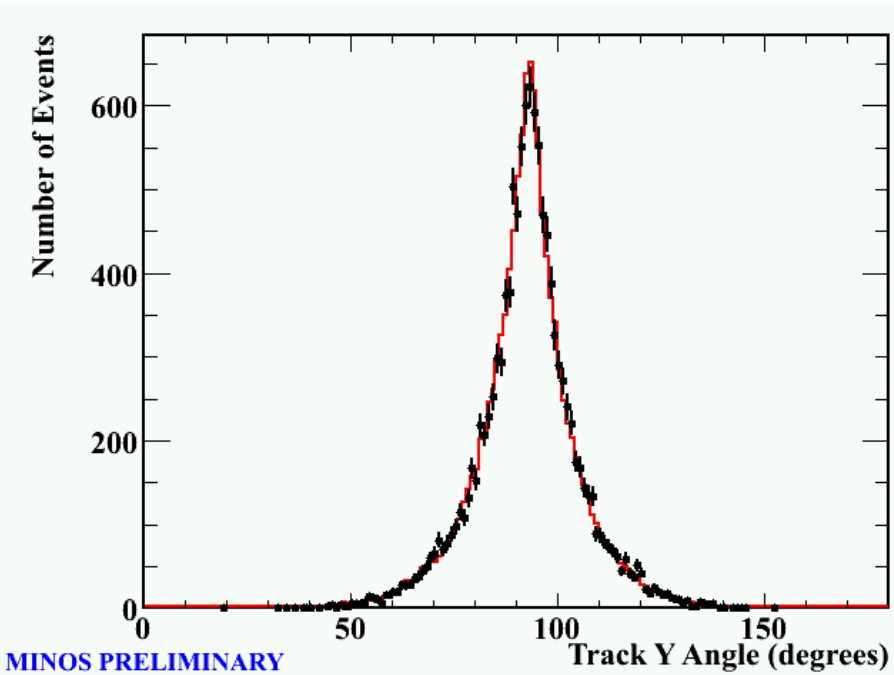


5 time slices -> 5 events

ANGLES (Events in fiducial region)

CC – LIKE EVENTS (ANN PID CUT <0.2) : LE

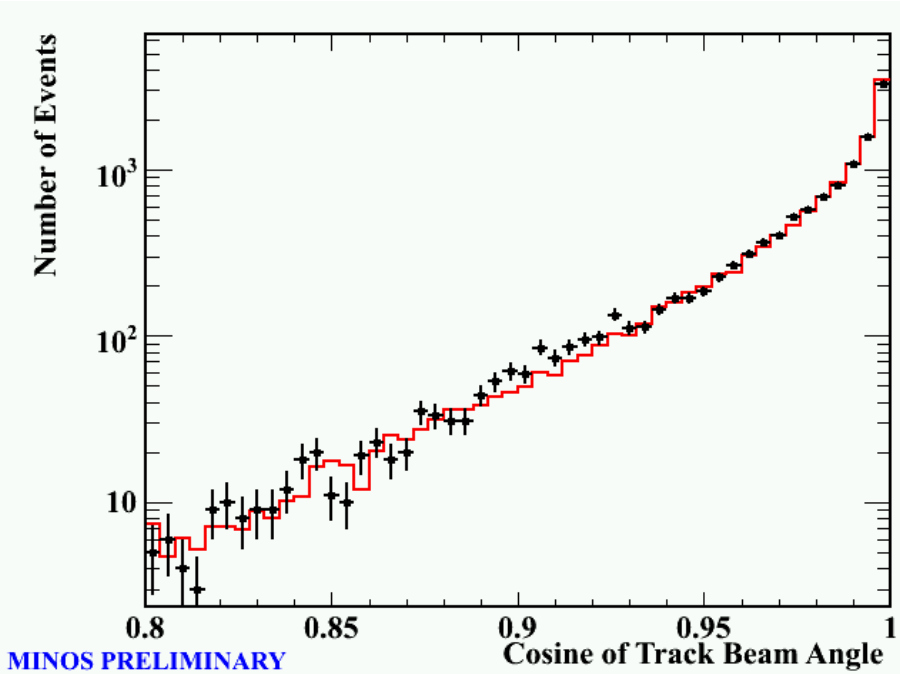


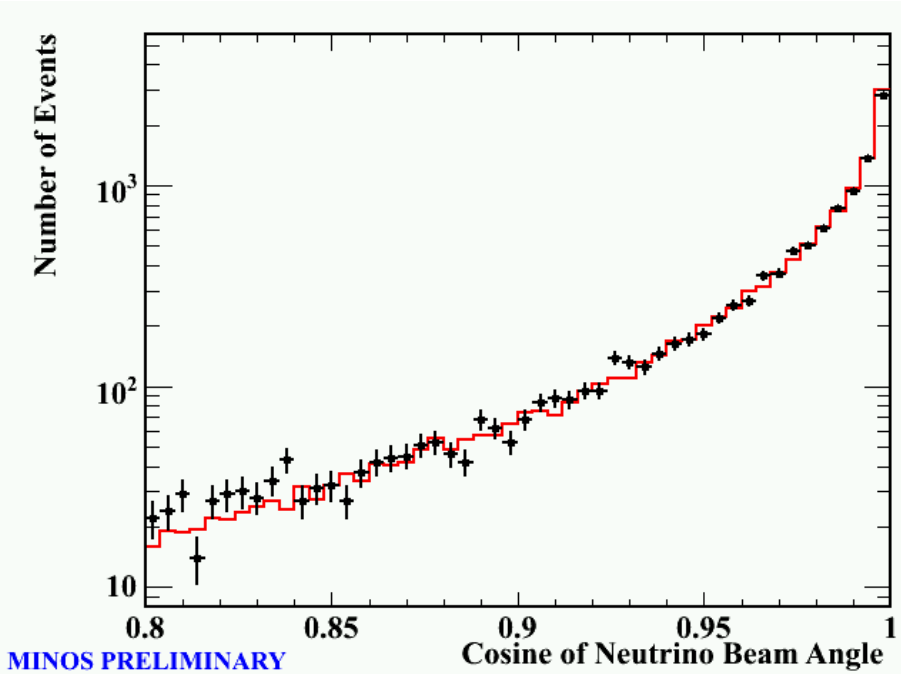


Track X and Y angles (these plots exist for PME & PHE as well)

ANGLES (Events in fiducial region)

CC – LIKE EVENTS (ANN PID CUT <0.2) : LE





Track & Neutrino angle (cosine) with respect to the beam axis.

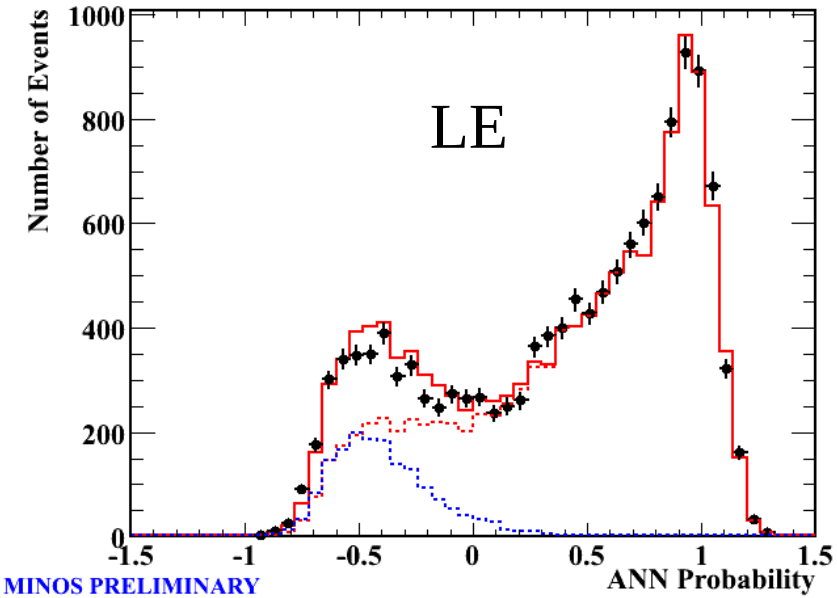
(these plots exist for PME & PHE as well)

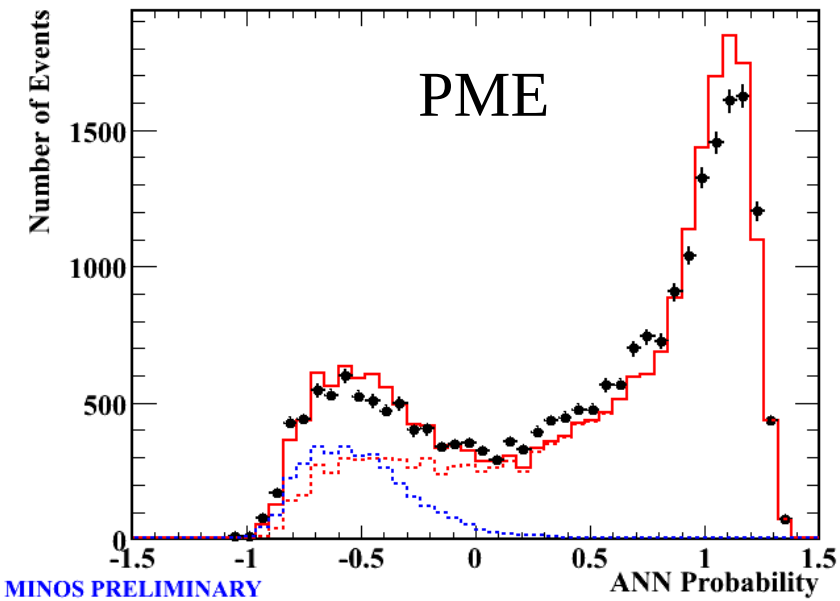
CC-Like Plots

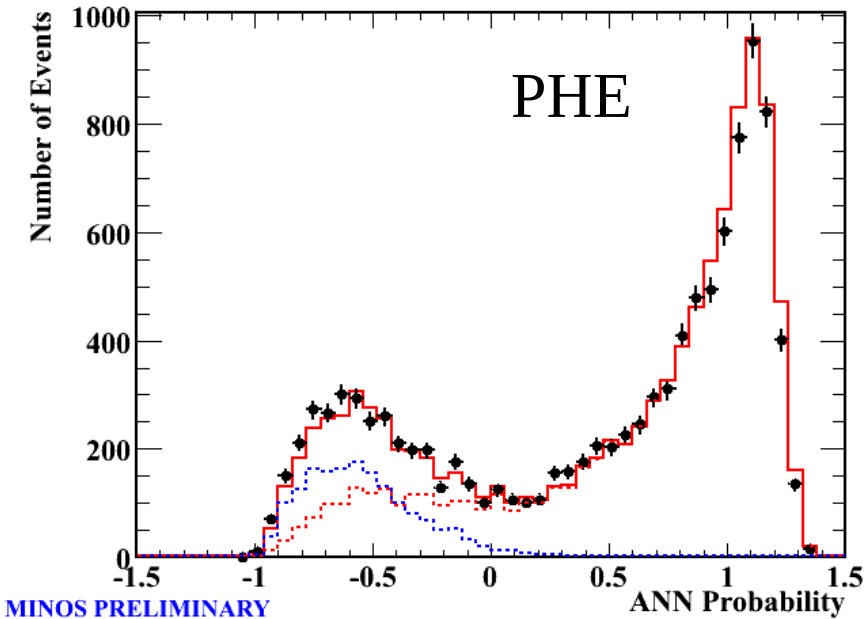
- ALL EVENTS :
- Satisfying timing cut , fiducial cut and CC-Like cut when denoted.

PIDs : (David P.)

ALL EVENTS : LE PME PHE



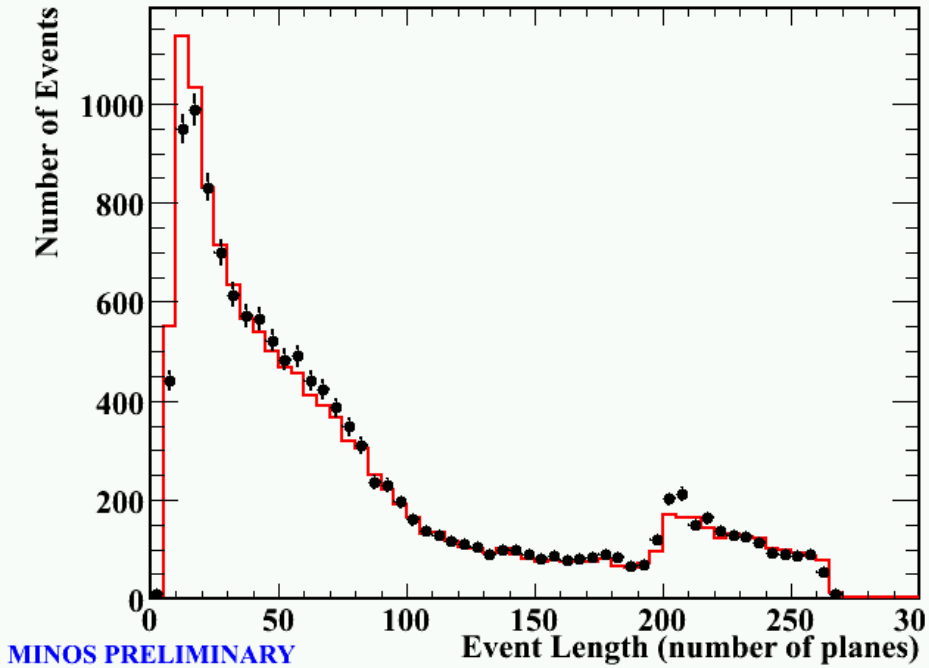


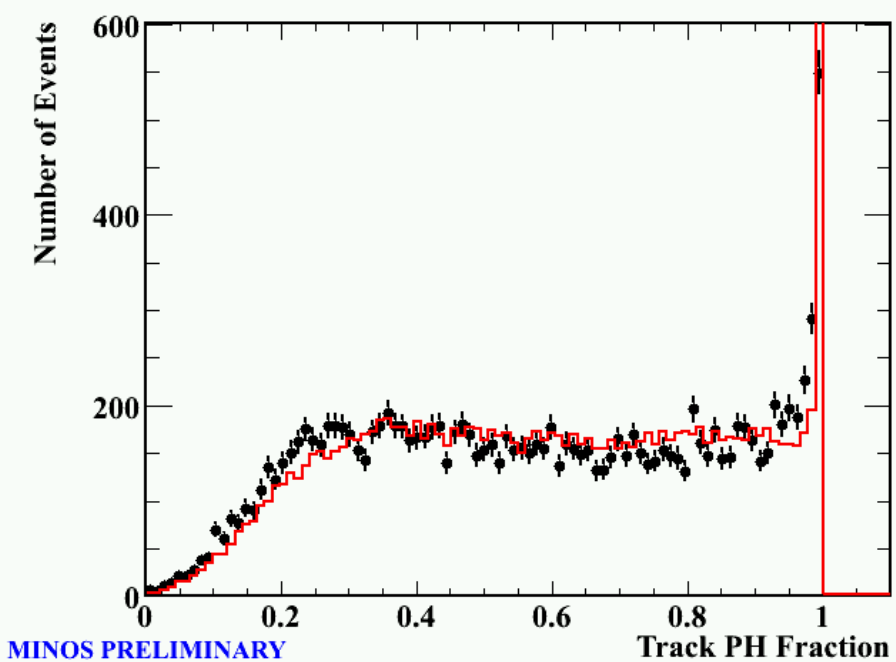


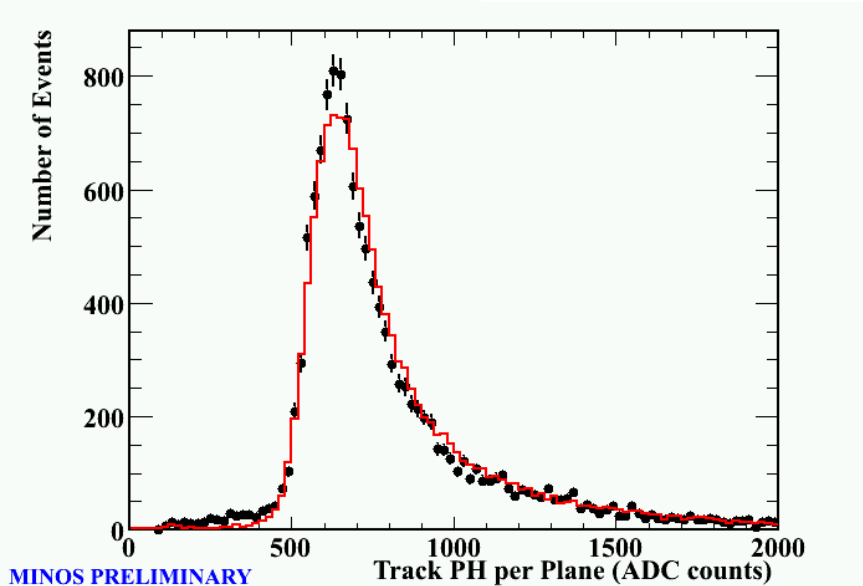
WRONG TITLE
(Sorry David!)

PIDs : PDFs (David P.)

ALL EVENTS : LE (the plots for PME & PHE exist as well)

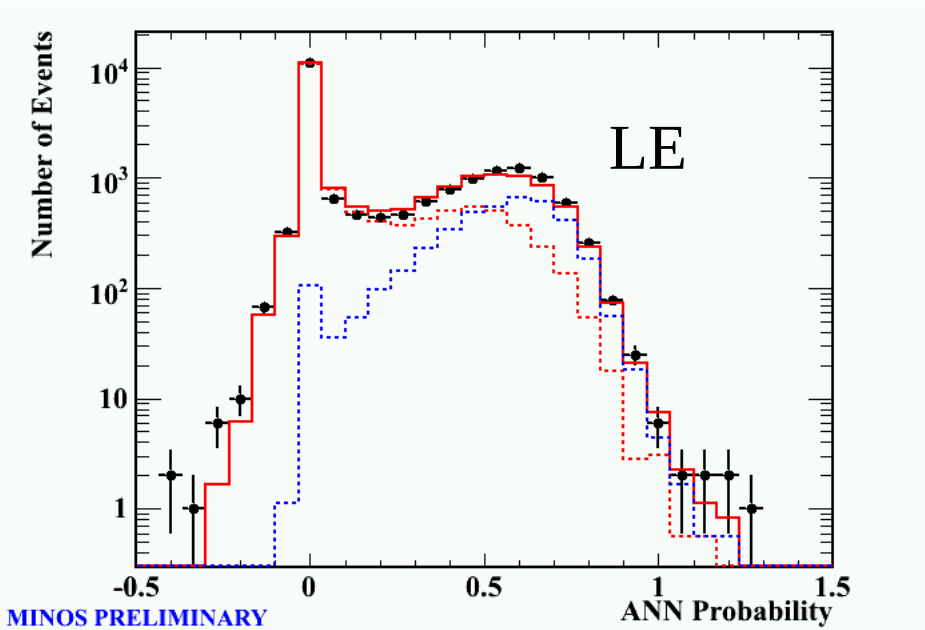


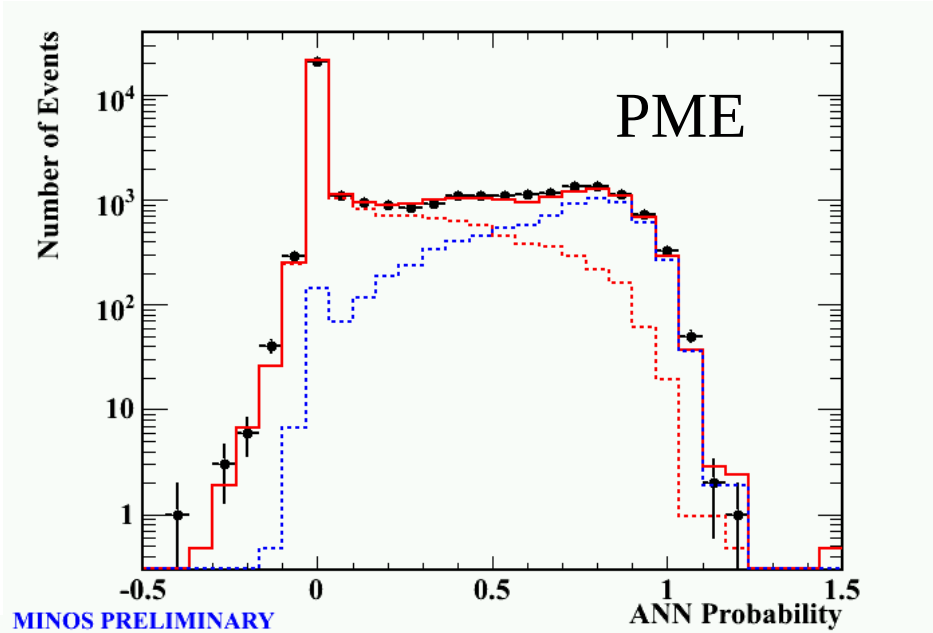


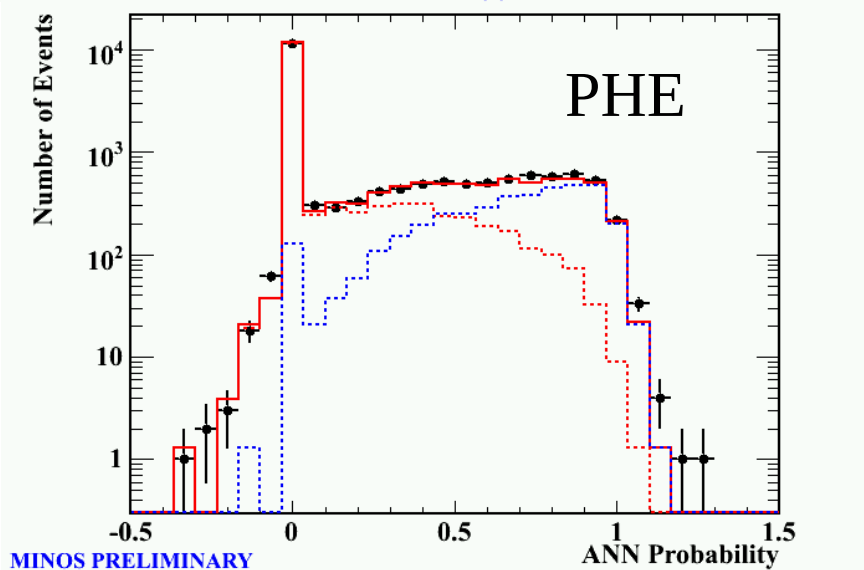


PIDs : ANN (N.S)

ALL EVENTS : LE PME PHE

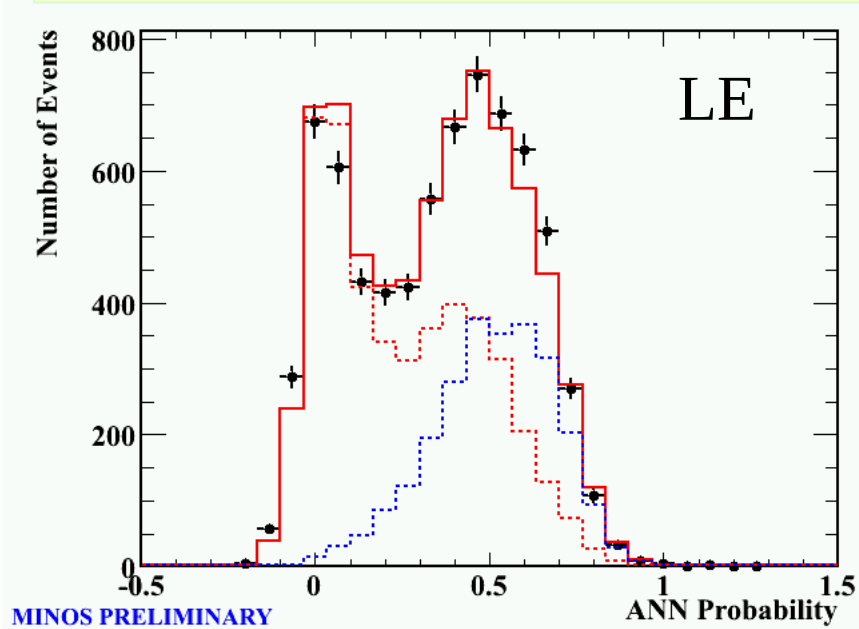


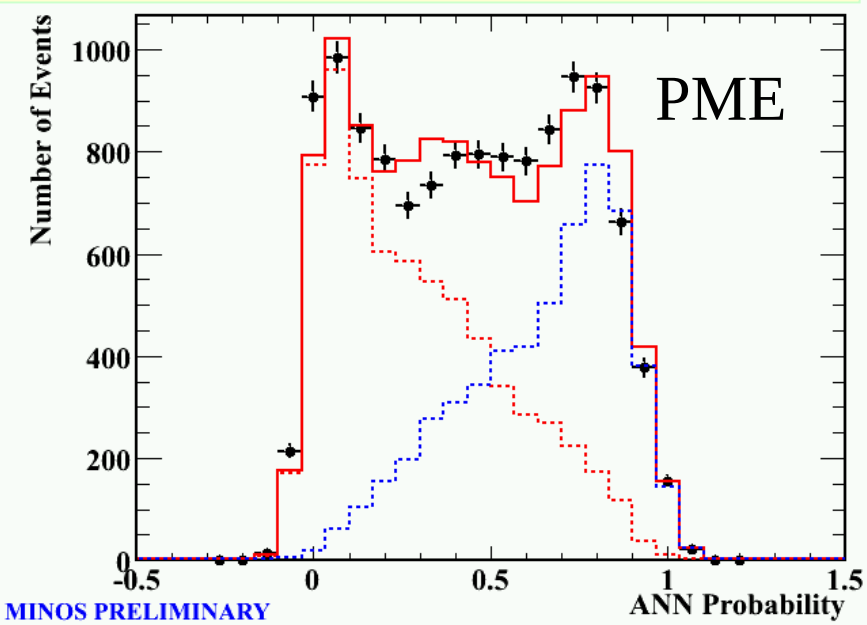


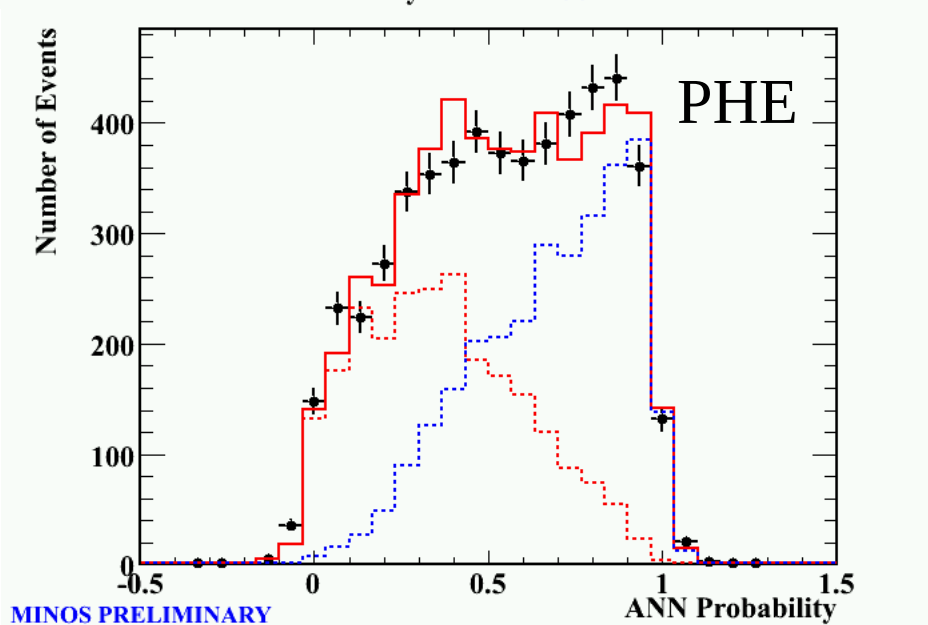


PIDs : ANN (N.S)

ALL SHORT EVENTS (# PLANES < 40) : LE PME PHE

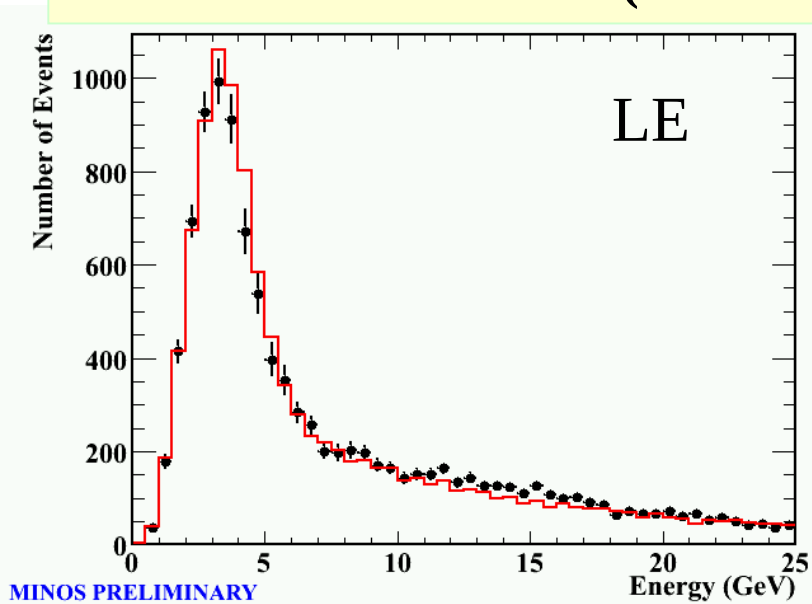


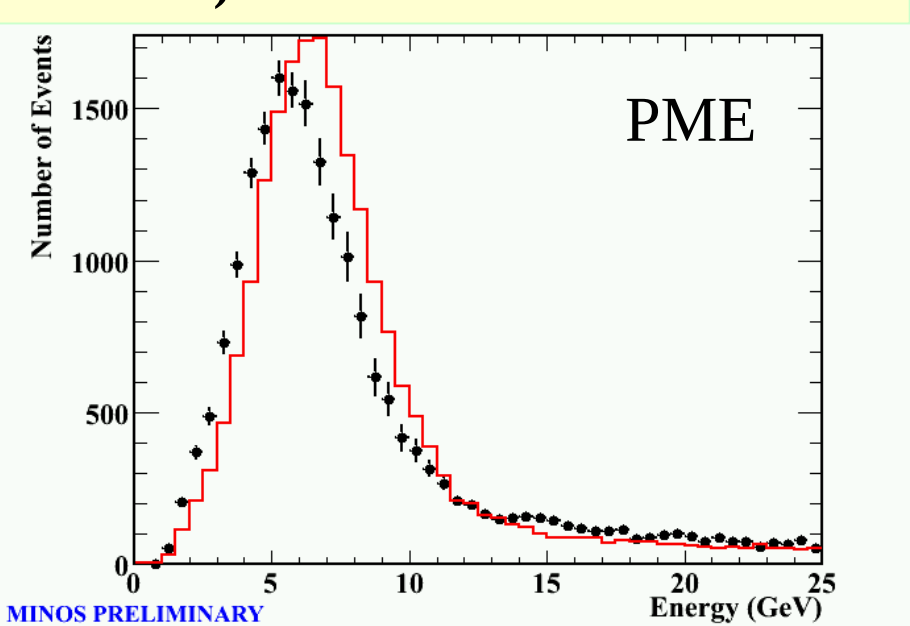


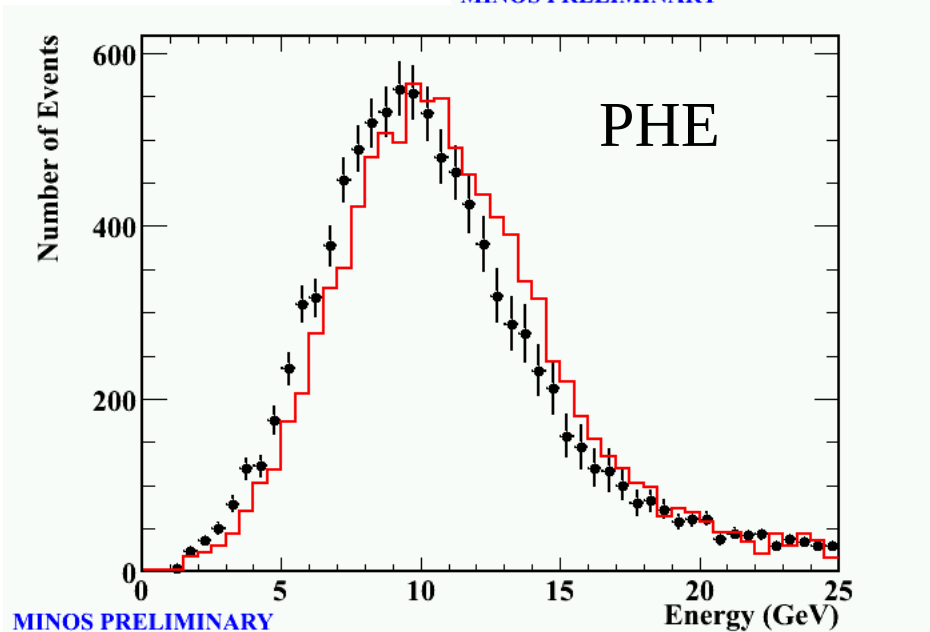


Energy Spectra : LE PME PHE

CC – LIKE EVENTS (ANN PID CUT <0.2) : LE PME PHE

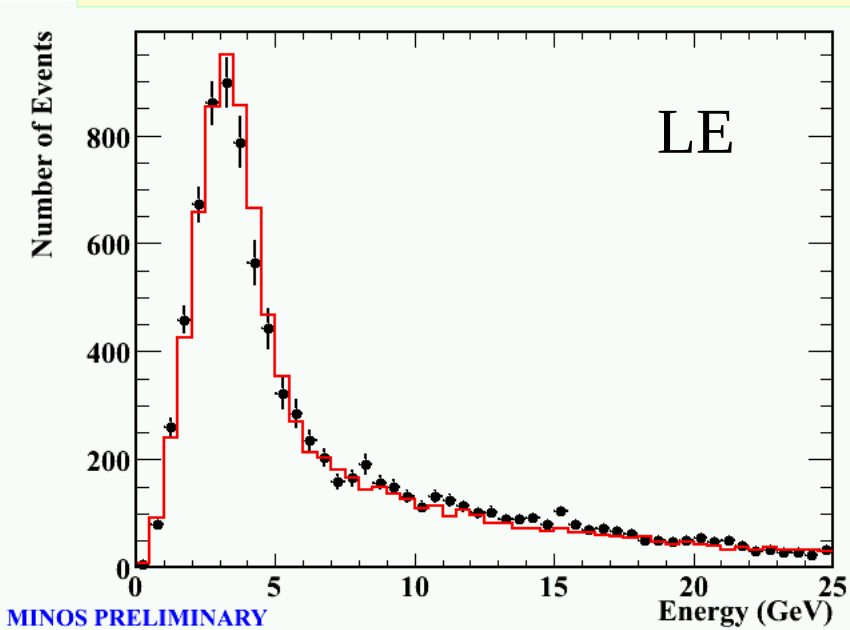


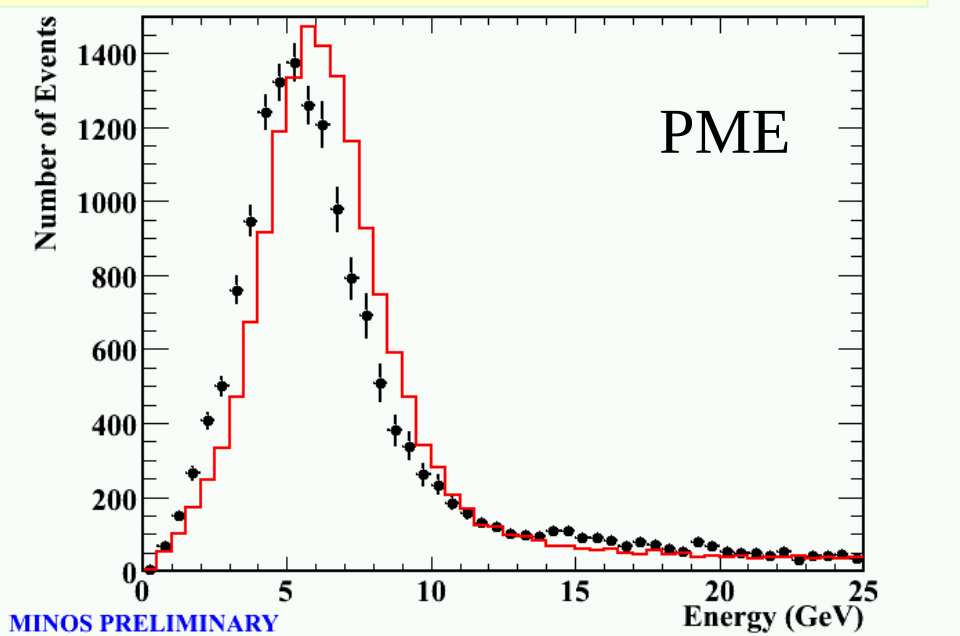


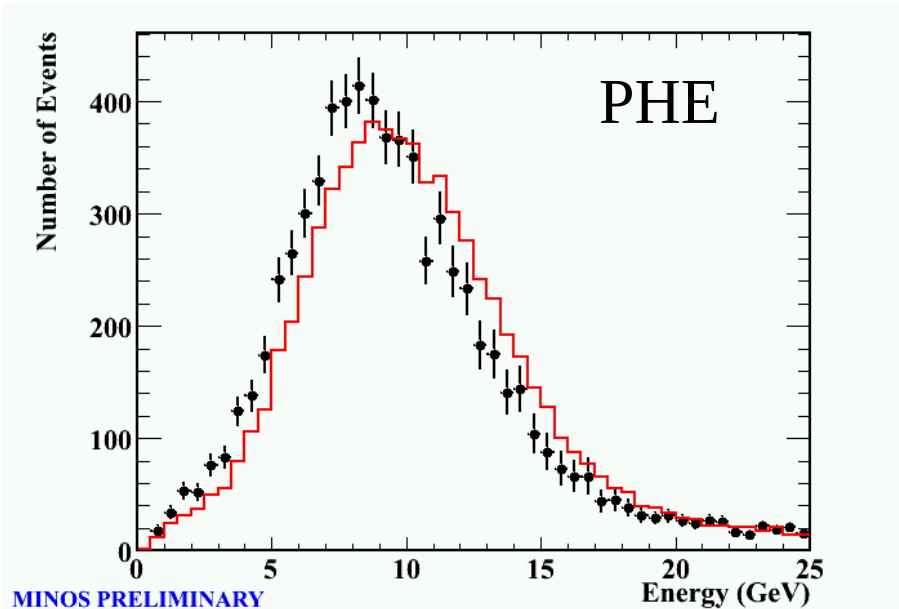


Energy Spectra : LE PME PHE

CC – LIKE EVENTS (David P. PID CUT > -0.4)

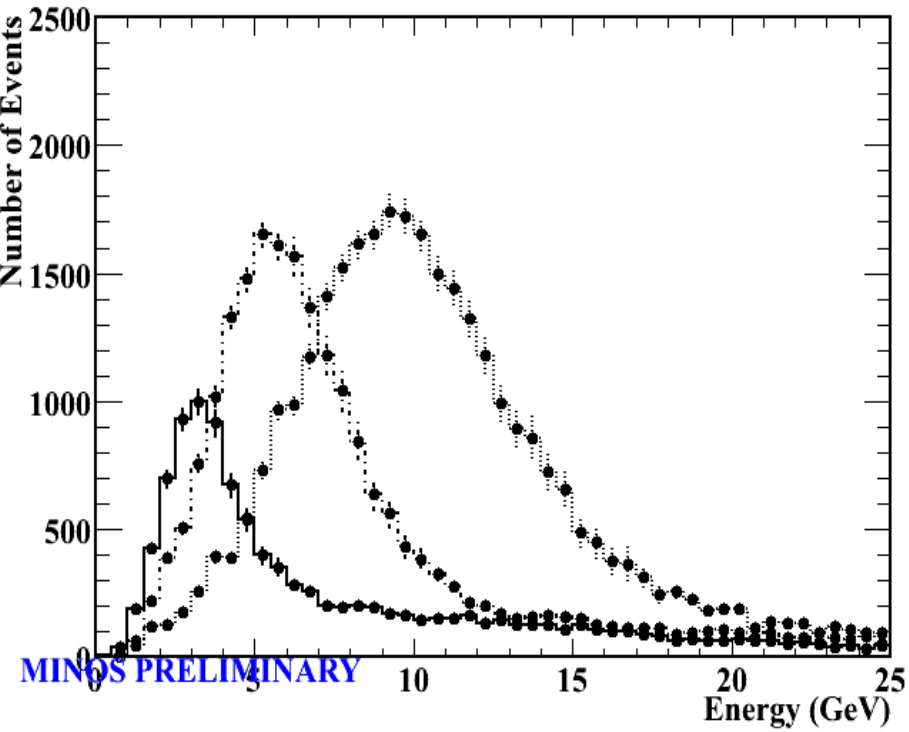


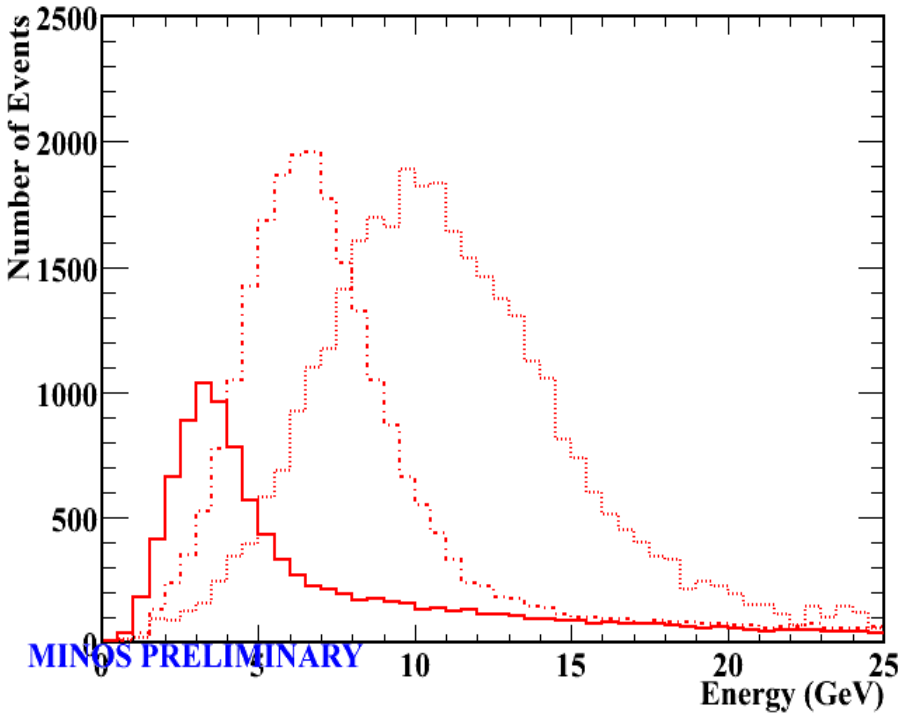




Energy Spectra : LE PME PHE (Normalized to same POTs)

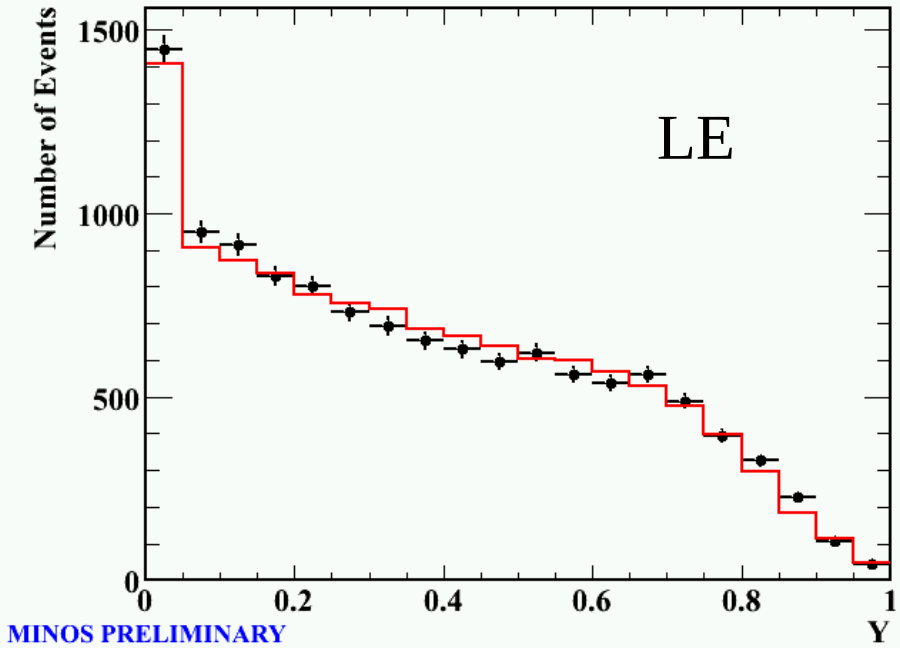
CC – LIKE EVENTS (ANN PID CUT <0.2) : LE PME PHE

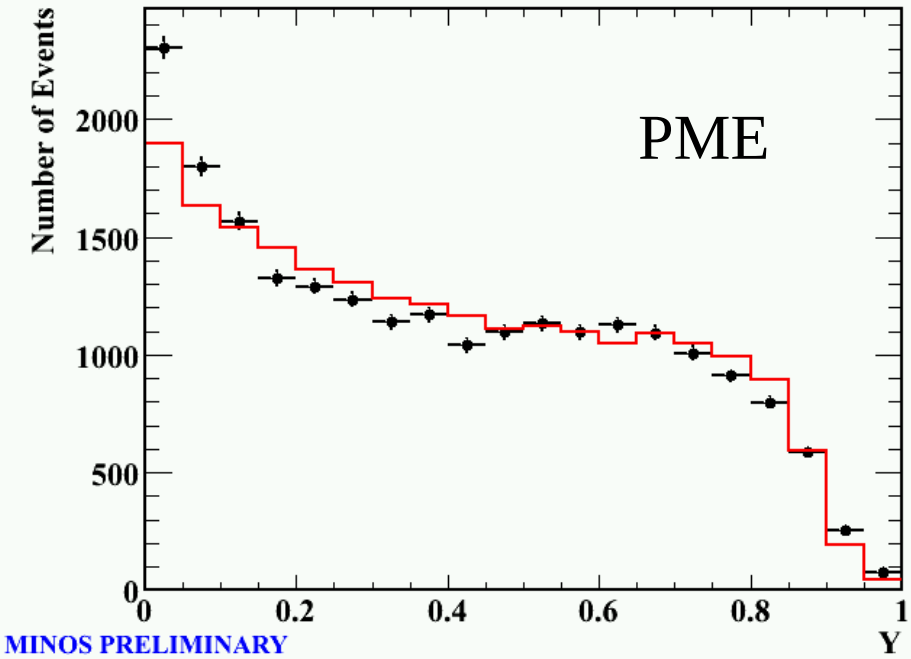


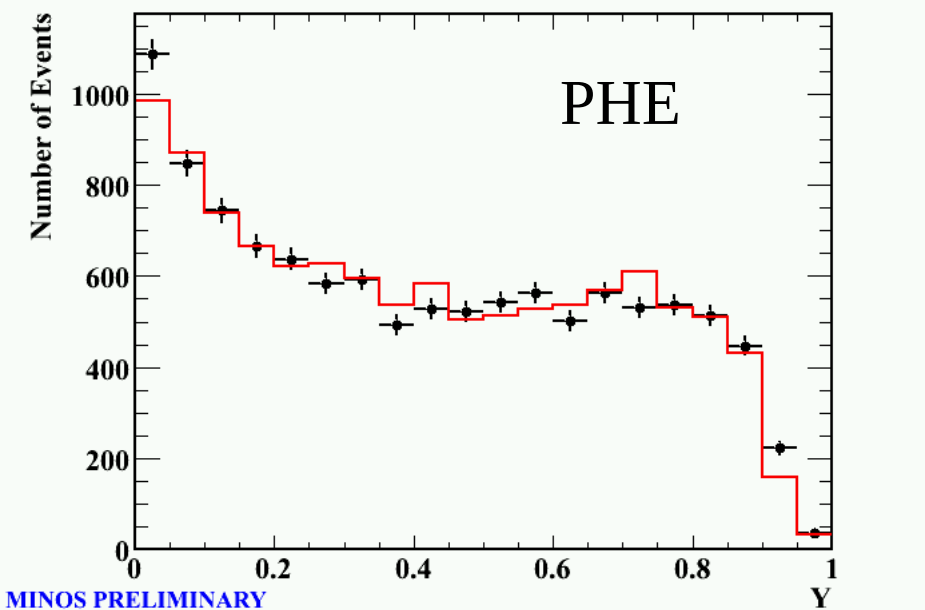


Y : LE PME PME

CC – LIKE EVENTS (ANN PID CUT <0.2) : LE PME PHE

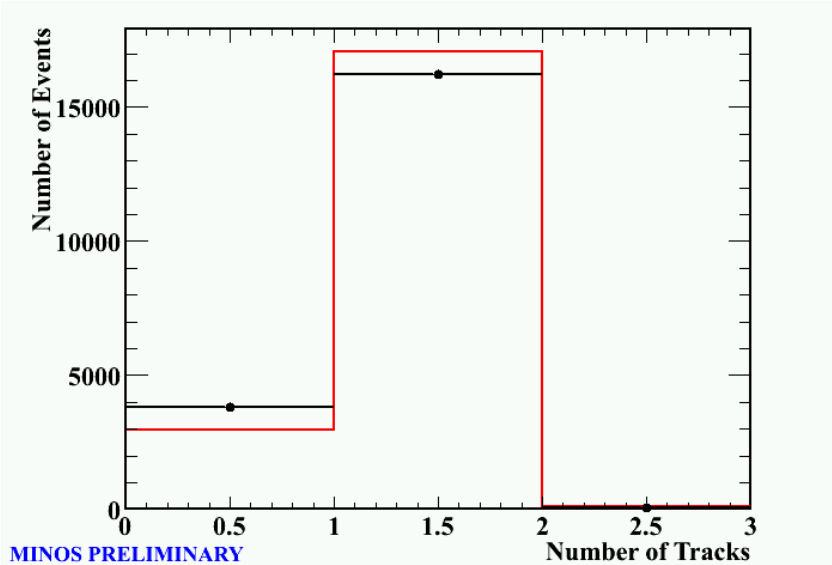


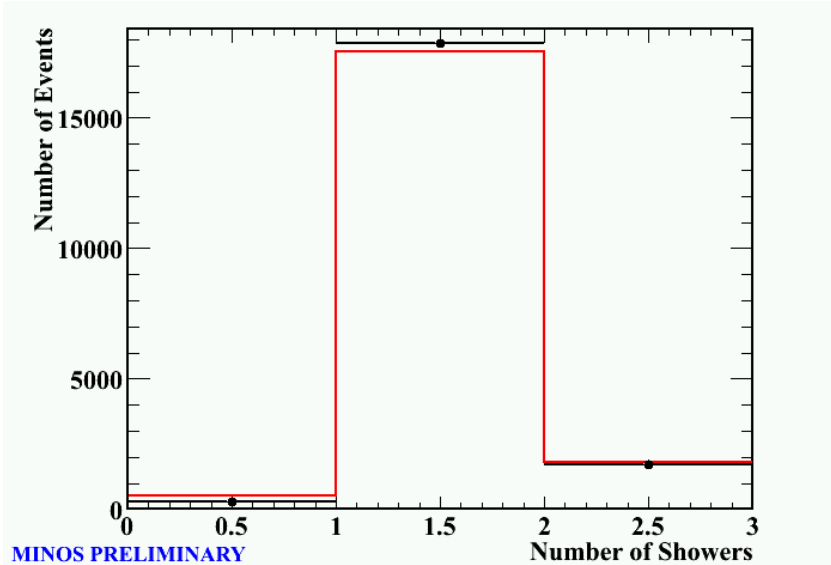


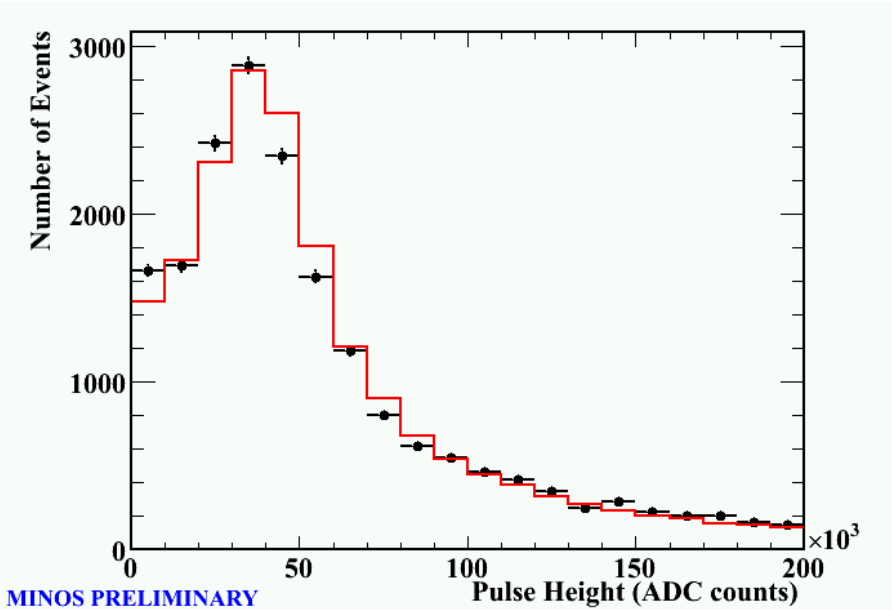


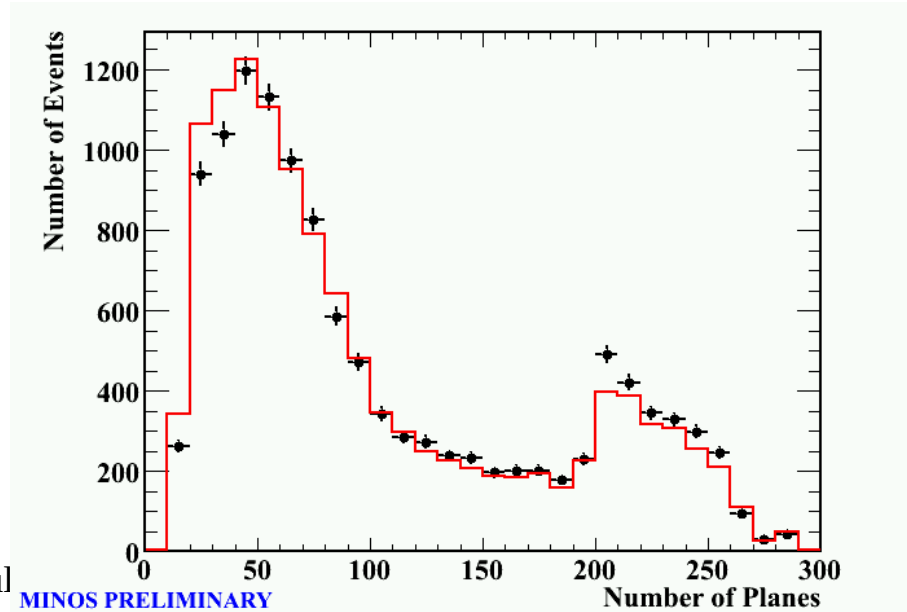
Low Level Plots : LE (The same plots exist for PME PHE)

CC – LIKE EVENTS (ANN PID CUT <0.2) : LE



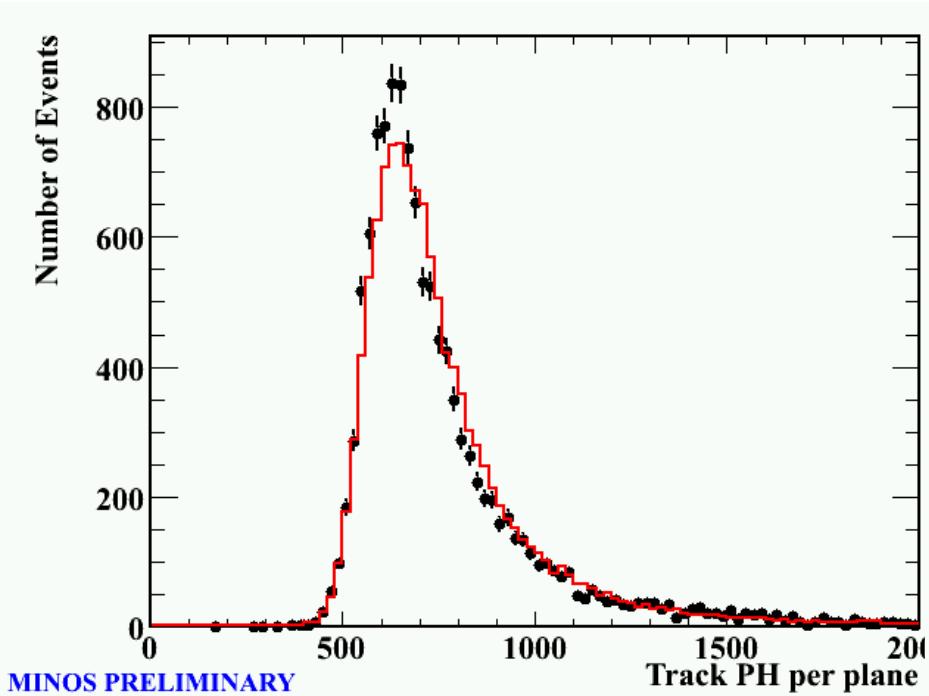


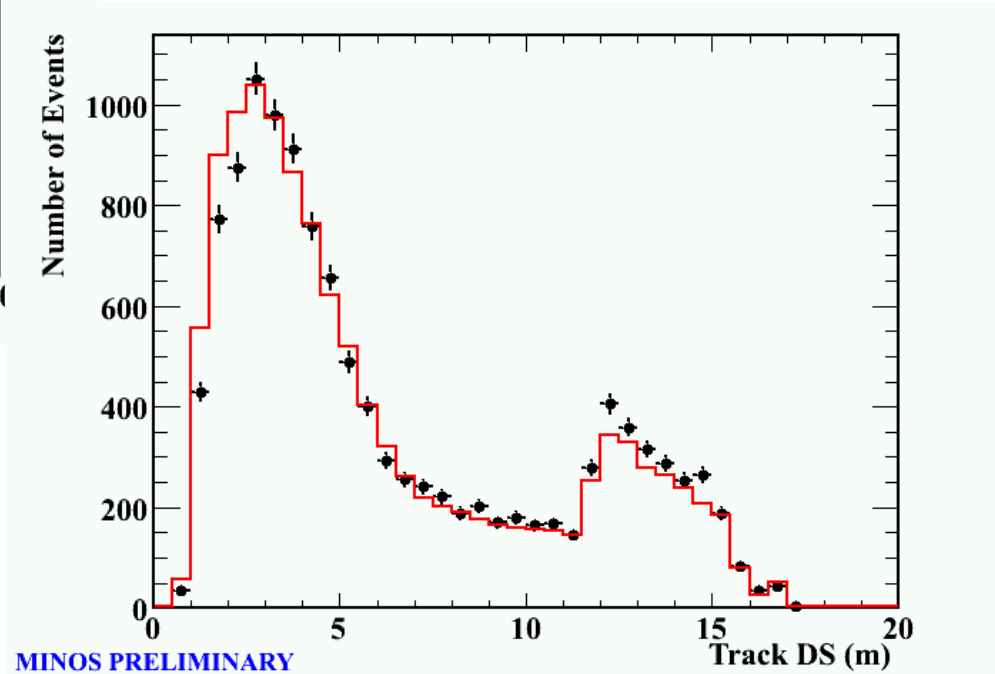




Low Level Plots : LE (The same plots exist for PME PHE)

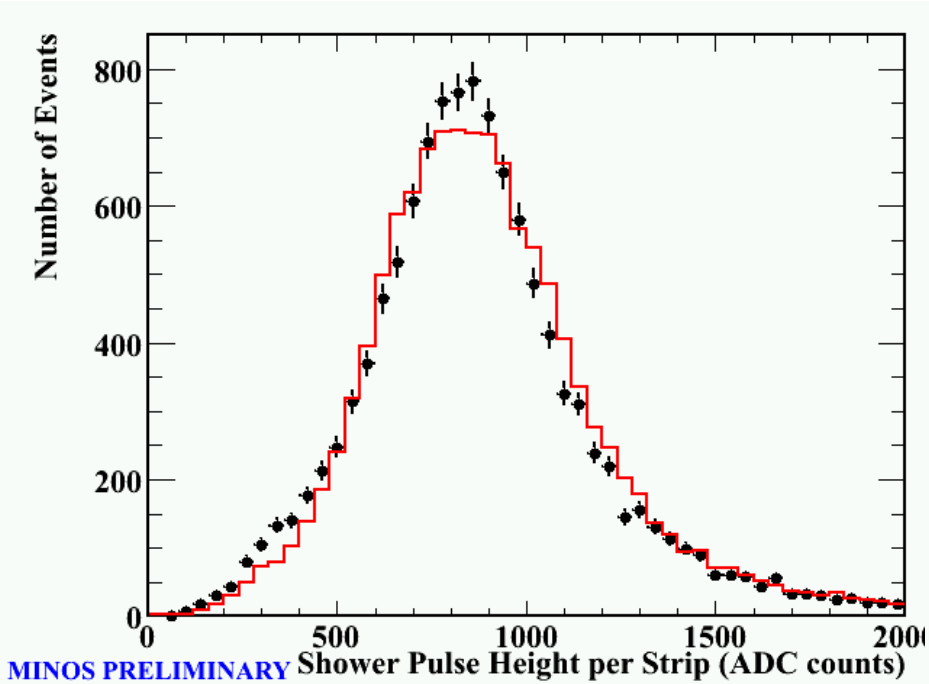
CC – LIKE EVENTS (ANN PID CUT <0.2) : LE

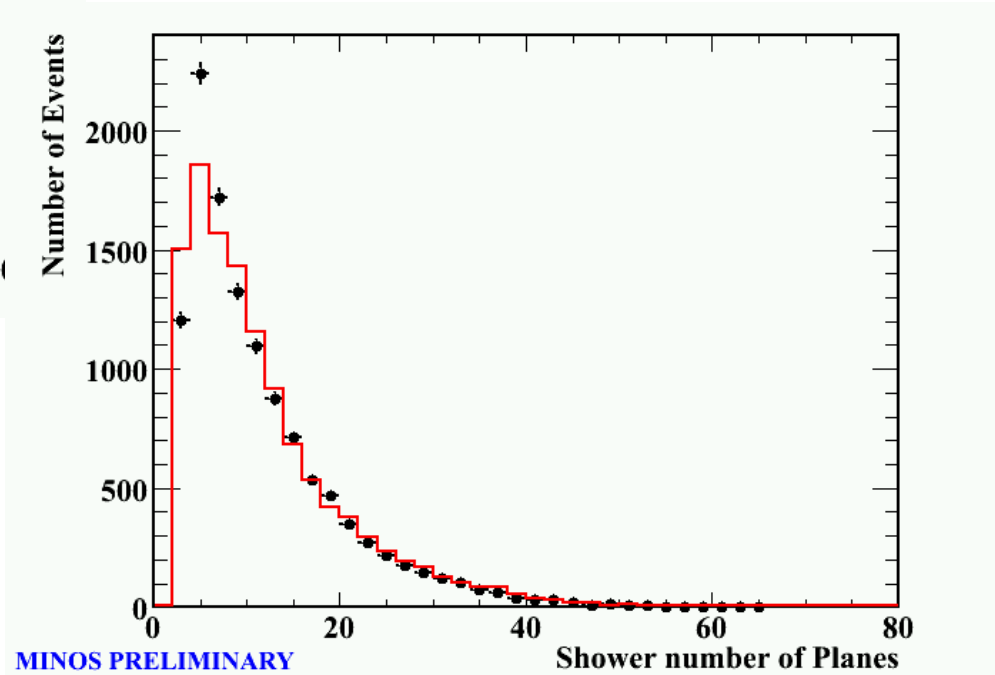




Low Level Plots : LE (The same plots exist for PME PHE)

CC – LIKE EVENTS (ANN PID CUT <0.2) : LE

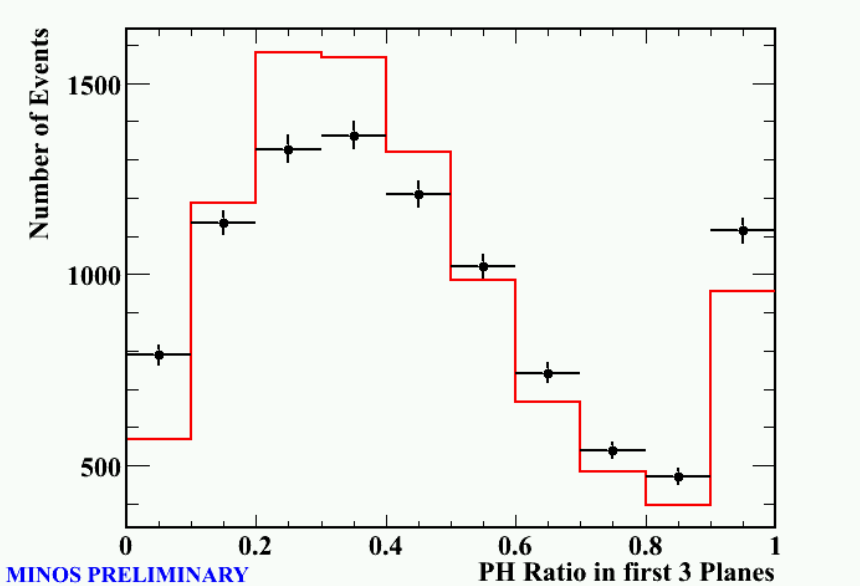


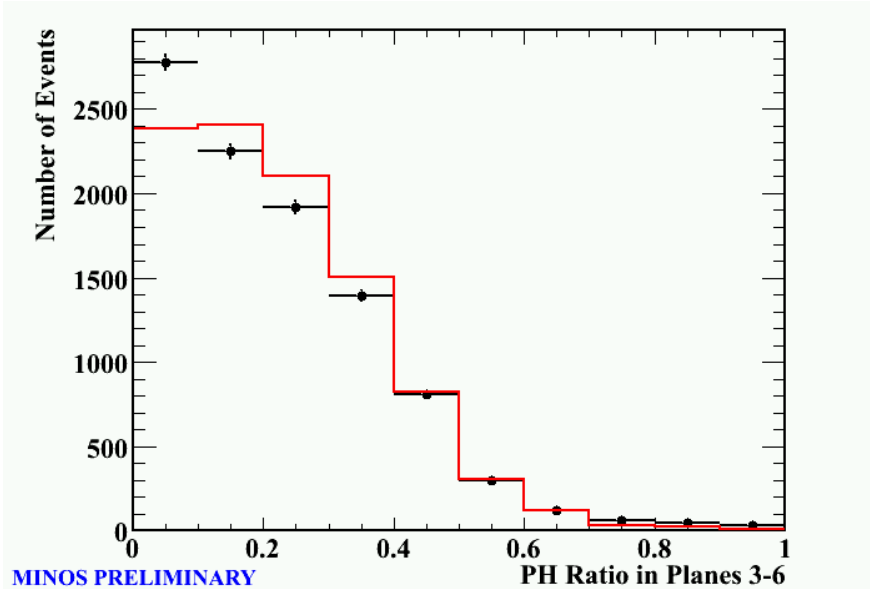


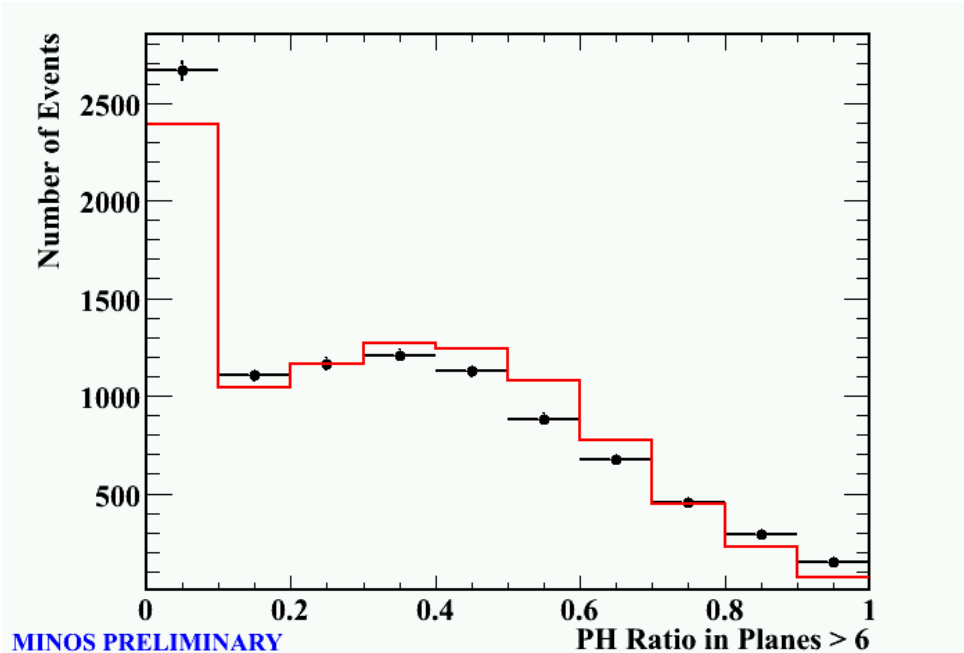
NC-Like Plots

- ALL EVENTS :
- Satisfying timing cut , fiducial cut and Length < 40 Planes (everything above is considered as CC).

Variables used for NC-CC ANN PID : LE (The same plots exist for PME PHE)

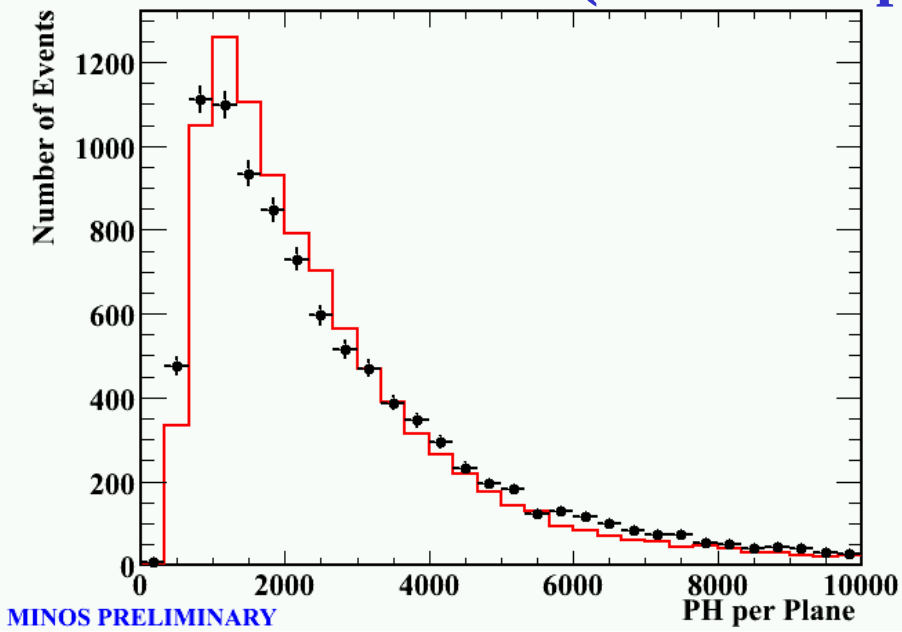


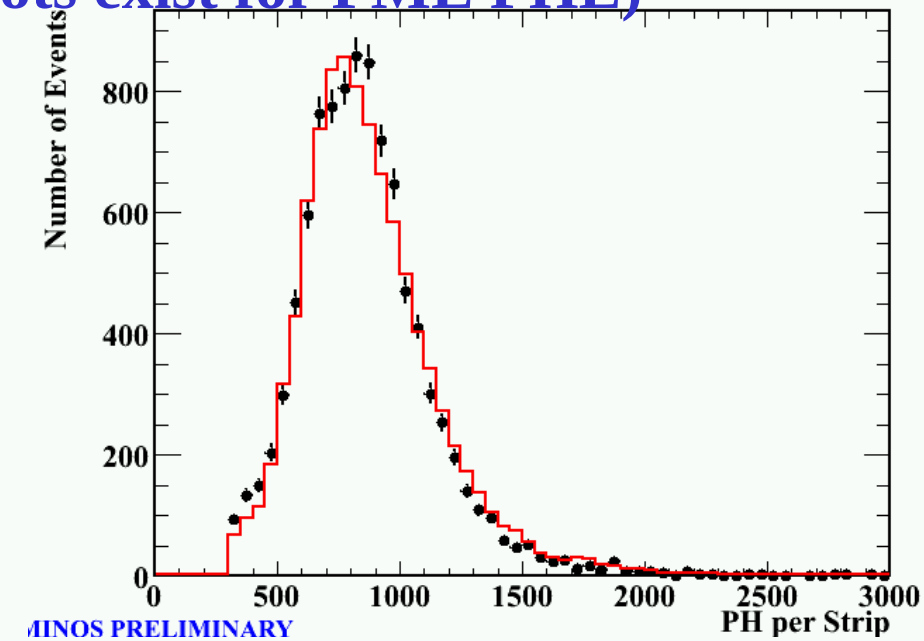


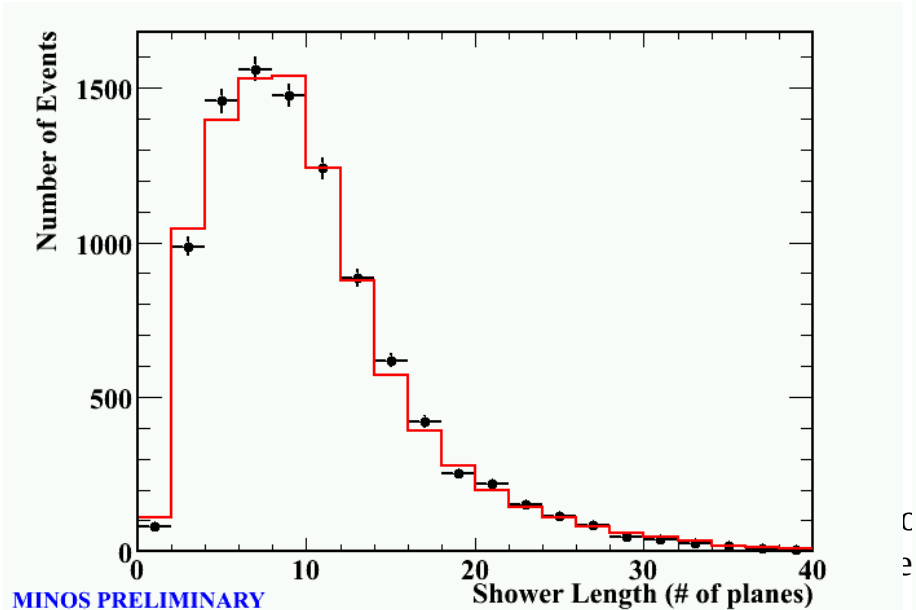


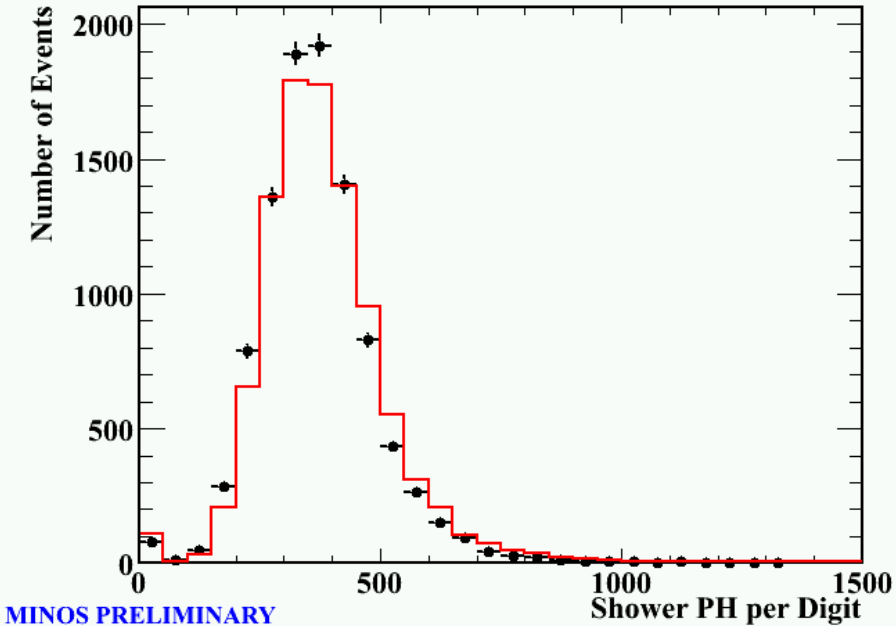
PH Fractions

Variables used for NC-CC ANN PID
: LE (The same plots exist for PME PHE)

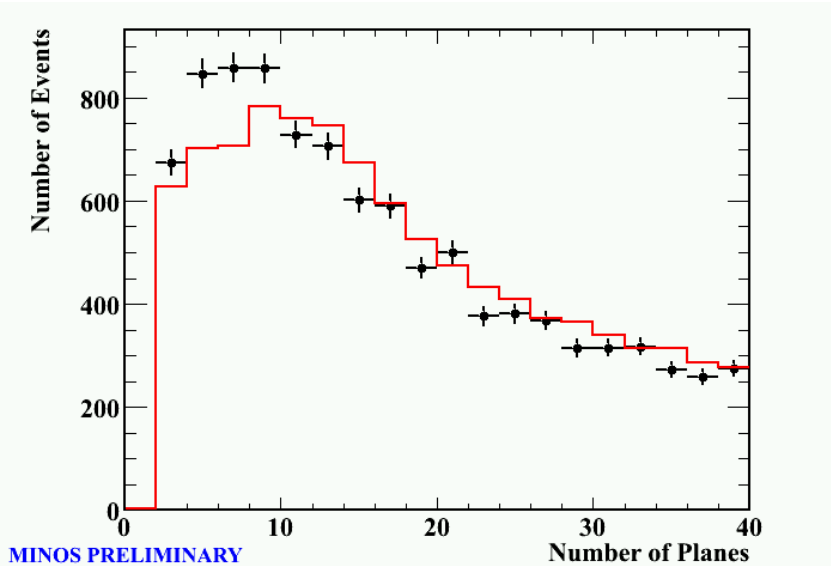


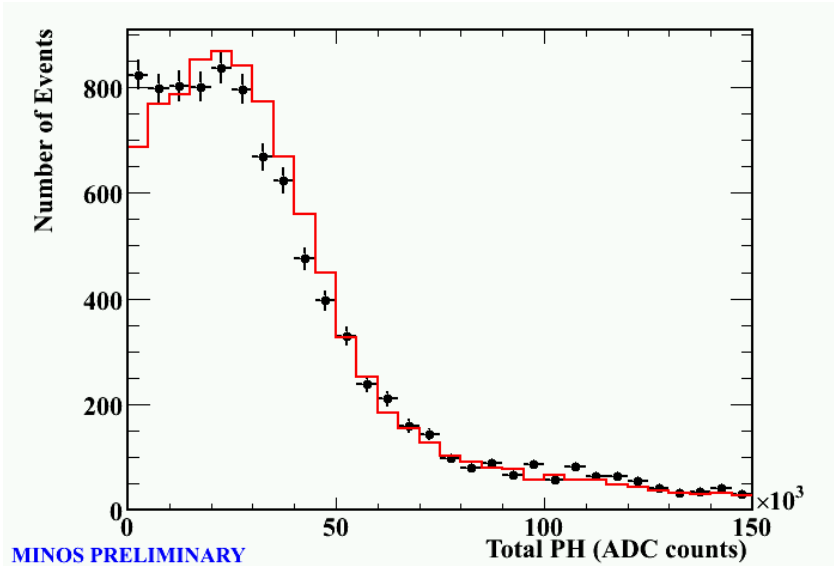


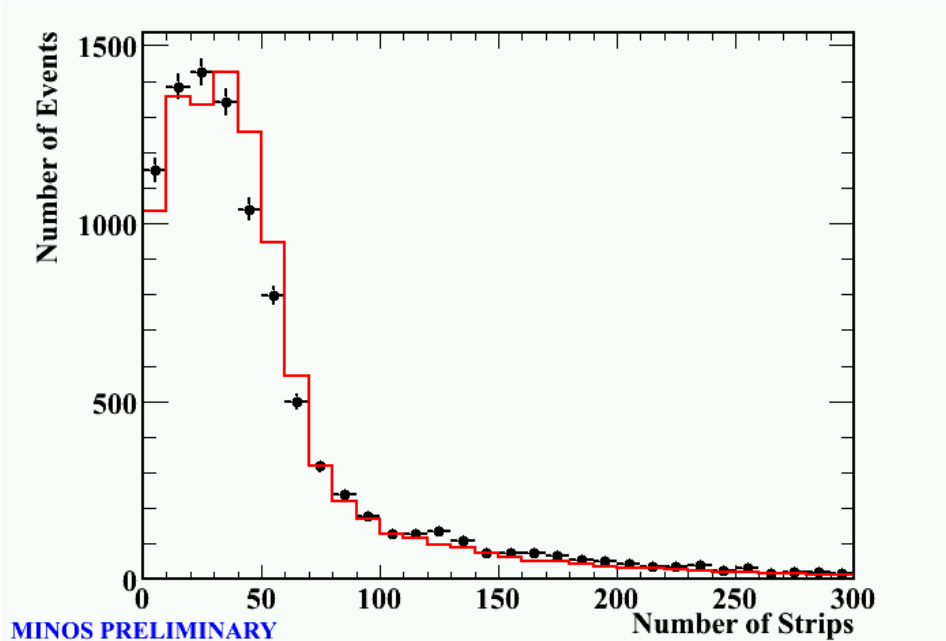




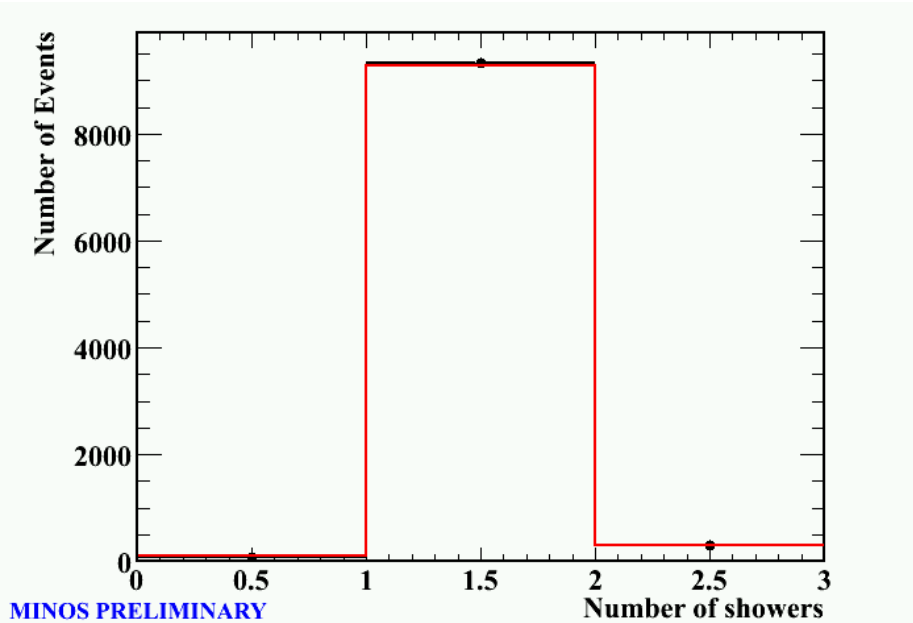
Variables used for NC-CC ANN PID
: LE (The same plots exist for PME PHE)

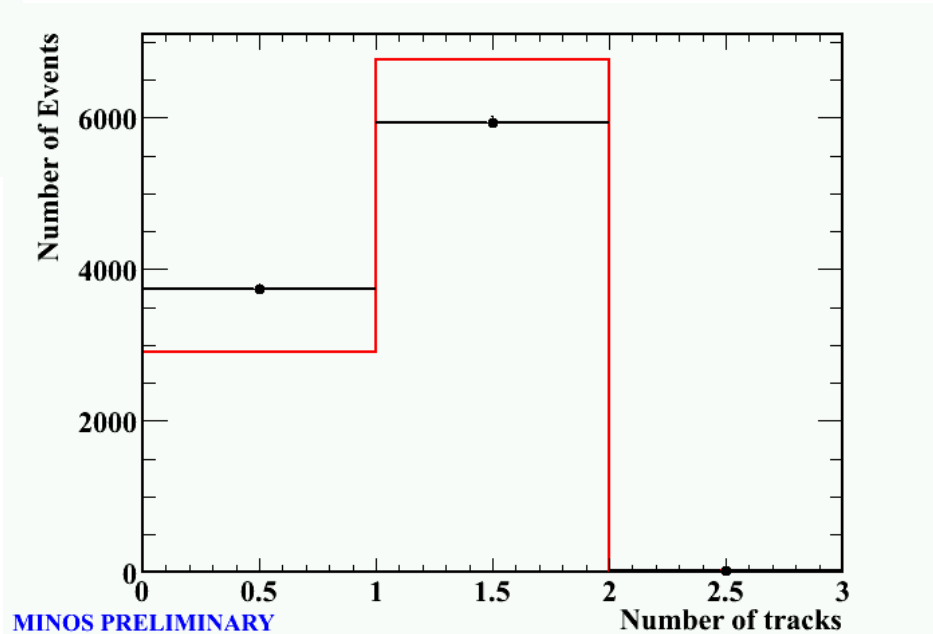






Variables used for NC-CC ANN PID : LE (The same plots exist for PME PHE)





Summary & Conclusions

- **I organized the production of these plots according to the blessed plot style in order to be available & well documented for everyone (So far people where asking me questions about details for the plots and where using some of these plots from the ppt version of my Users Meeting presentation which was certainly not easy for them).**
- **The energy plots now have the systematic uncertainties discussed in the previous ND meeting by Zarko and Sacha.**
- **All the .root files & plots that I showed exist in afs space and soon (within this week) I will organize them in a MINOS web page. This info will be updated as we change releases, MCs e.t.c but all folders will always remain there.**
- **This presentation is going to be there as well to serve mainly as documentation.**
- **The Plots normalized to POTs will be available as well.**
- **The Far Detector plots from the Users meeting talk that people are using so far in their talks are going to be placed there as well, after they are presented in a similar manner in the next ND meeting.**
- **Suggestion/comments/requests are welcome.**