BigBite Analysis

5.89 GeV S=0 Cut History and Pion Contamination

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Outline

Fluctuating Cut Histories (5.89 GeV, S=0)

Took a closer look at runs 1708 and 1710

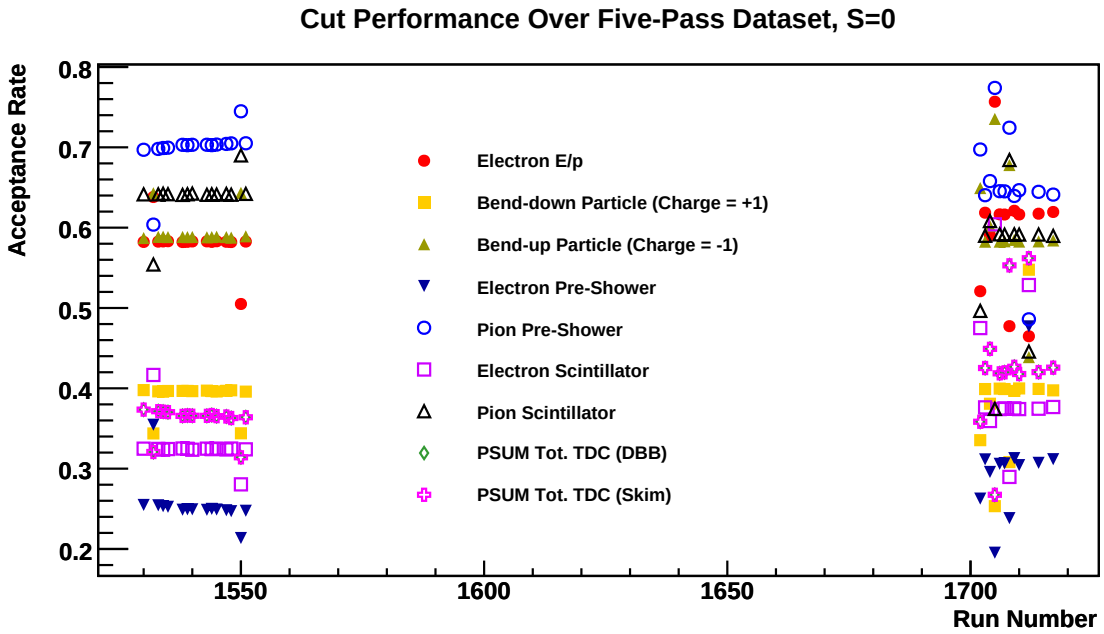

Figure: Percentage of tracks passing cuts vs run number for beam energy of 5.89 GeV and target spin of 0 degrees.

Run Comparison

1708

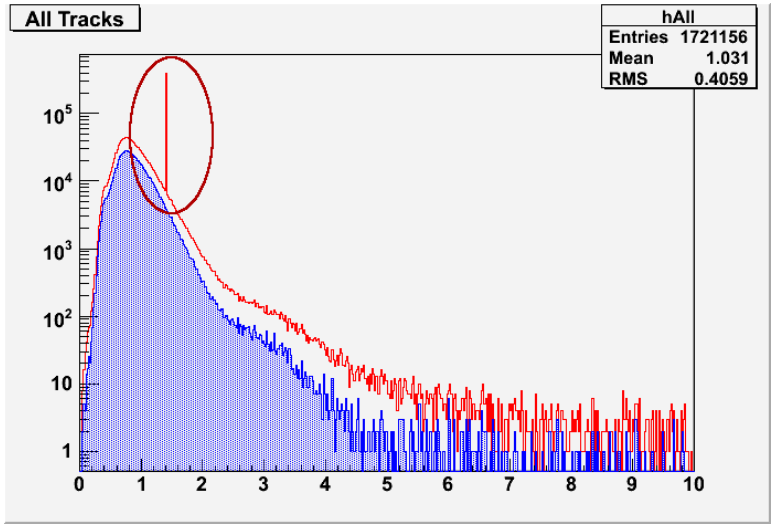

Figure: Run 1708: Shows the skim.p variable with no cuts applied in red. The skim.p variable with a cut on the z-vertex is shown in blue.

1710

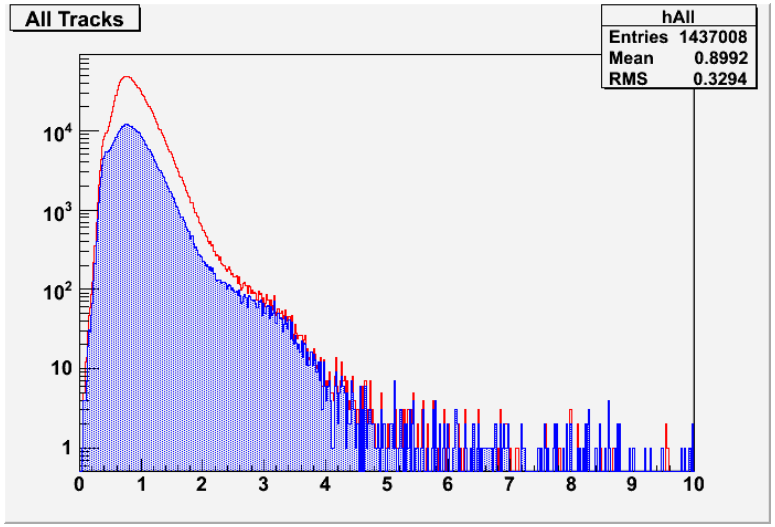

Figure: Run 1710: Shows the skim.p variable with no cuts applied in red. The skim.p variable with a cut on the z-vertex is shown in blue.

Raw - Skim ROOT File Comparison

Raw ROOT File

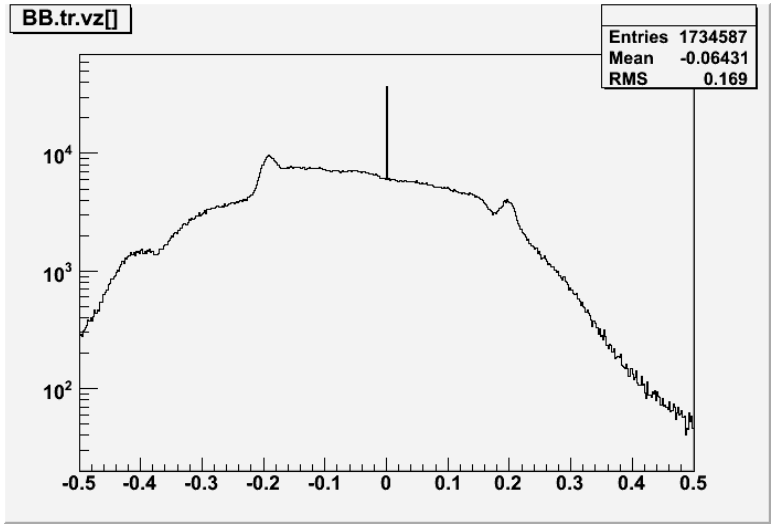

Figure: Raw ROOT file: Shows the z-vertex variable with no cuts for run 1708.

Skim ROOT File

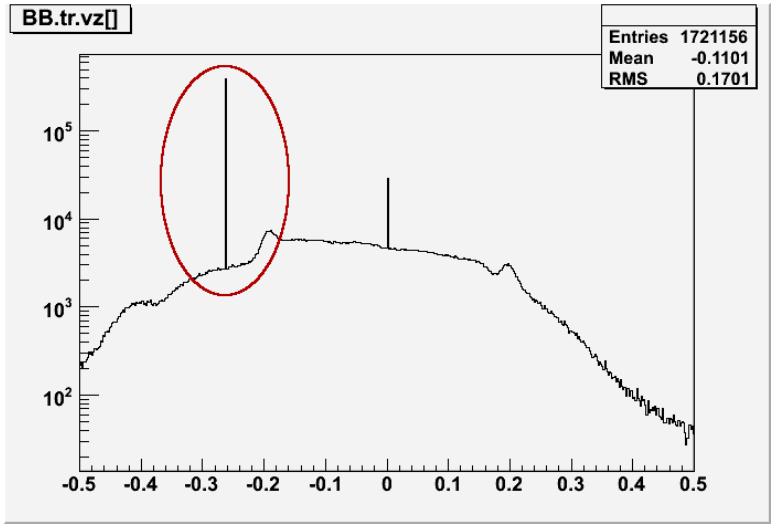

Figure: Skim ROOT file: Shows the z-vertex variable with no cuts for run 1708.

New Cut Histories (5.89 GeV, S=0)

Remove sharp peak by applying $|z - vertex| < 0.25m$ as a base cut

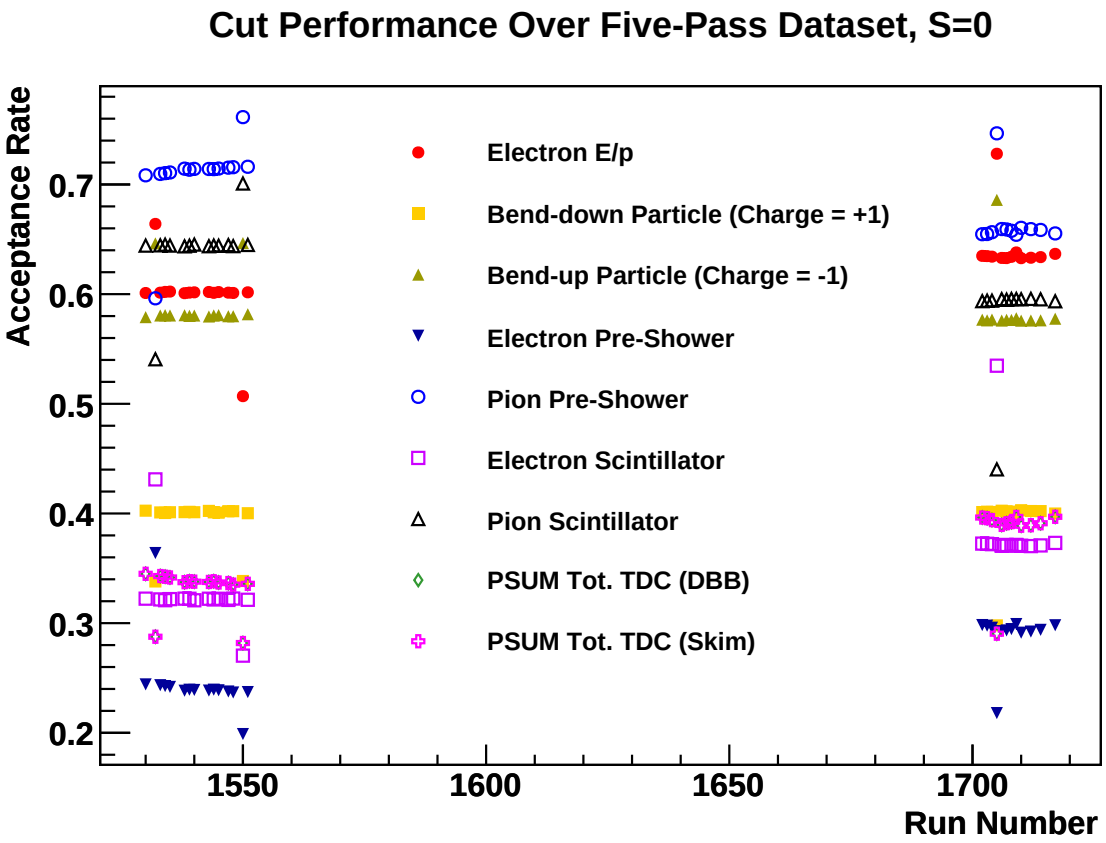

Figure: Percentage of tracks passing cuts vs run number for beam energy of 5.89 GeV and target spin of 0 degrees w/ z-vertex cut of +/- 0.25 m to remove sharp peak.

Cut History Summary

- Most fluctuations in percentage of tracks passing cuts are due to a sharp peak in the data
- This sharp peak seems to be being caused during skim ROOT file replays
- Since the peak shows up at z-vertex = -0.26 m, The peak can be cut out by applying a base cut of $TMath :: Abs(BB.tr.vz[]) < 0.25$
- With the z-vertex base cut, percentage of tracks passing the cuts are more stable
- Remaining 3 major fluctuations due to sharp peak moving within the z-vertex base cut

Defining Cuts

- All Cuts:
  - Pre-shower sum TDC cut was applied to pion and electron events: $TMath :: Abs(skim.psumRT_c[]) < 50$
- Pion Cuts:
  - Scintillator Cut: $BB.s.MaxADCHit < 450$
  - E/p Cut: $E/p < 0.8$
  - Čerenkov Cut: $MirCut[pmt]\&\&Ndata.DBB.BBcerT[pmt] == 0$
- Electron Cuts:
  - Scintillator Cut: $BB.s.MaxADCHit > 500$
  - E/p Cut: $TMath :: Abs(E/p - 0.983) < 0.182$
  - Čerenkov Cut: $MirCut[pmt]\&\&TMath :: Abs(skim.BBcerT_c[pmt]) < 50\&\&Ndata.DBB.BBcerT[pmt] > 0$

Counting

- $N_{\pi-}$: Number of events that pass pion cuts
- N_{e-}: Number of events that pass electron cuts
- R_{tot}: $\frac{N_{\pi-}}{N_{e-}}$ (pion to electron ratio)
- R_{cont}: Ratio of pions with pre-shower ADC $>$ 200 MeV to electrons with pre-shower ADC $>$ 200 MeV

Pion Contamination

R_{tot} = 0.107, R_{cont} = 0.66%

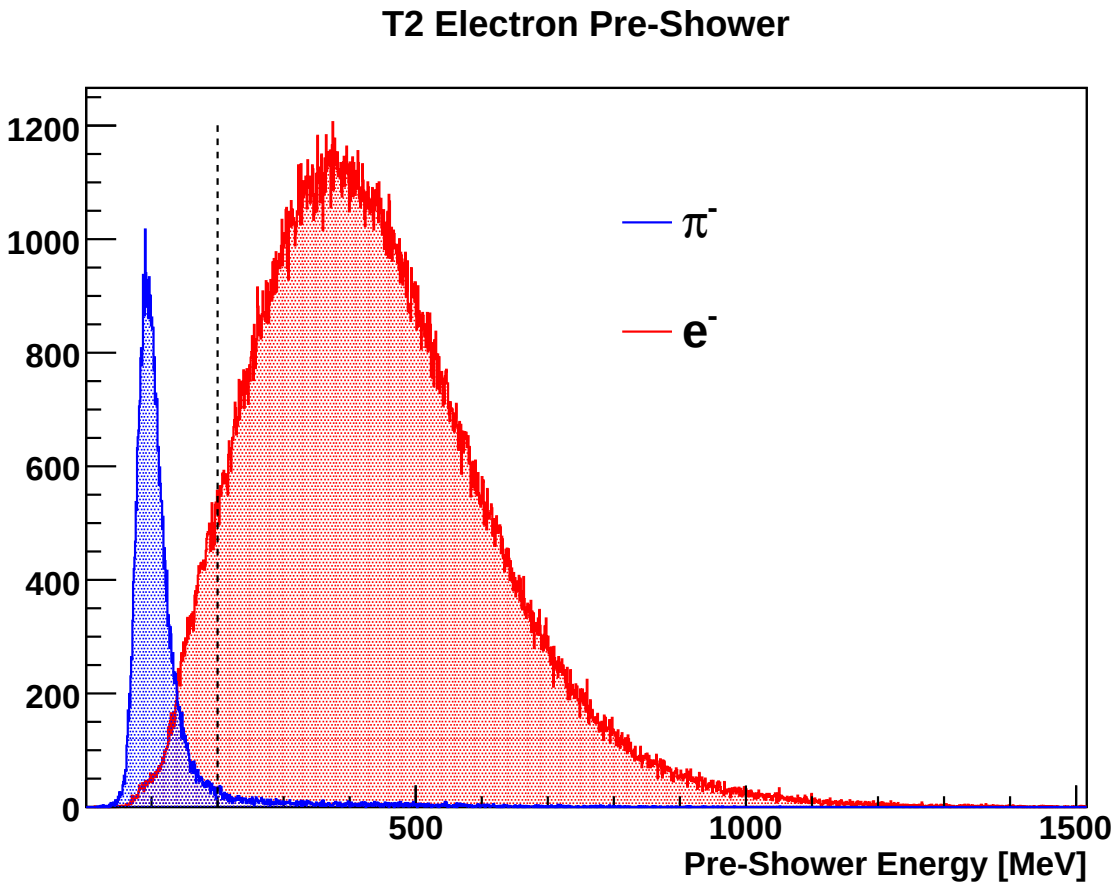

Figure: Pre-shower ADC for pions (blue histogram) and electrons (red histogram) for runs 1530-1552. The black dashed line is at pre-shower energy of 200 MeV, which is the current electron pre-shower cut energy.

What's Next

- Look more into in-plane angle shift
- Look at π contamination in x bins
- Get chamber density uncertainties
- Get EPR Polarizations

Moving Peak

Can't remove sharp peak by applying $|z - vertex| < 0.25m$ as a base cut