SFT hit generator for Decoder 1

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Problem & Study

- The SFT hit generator for the standard decoder is crude
  - All hits have PH of 2000
- Studied 200 muon T1 • T3 events with cuts:
  - Hits in SFT plane 1 and plane 44
  - 30 cm fiducial cut in plane 1 & 44
  - Forgot to remove multi-muon events…
- Histogram hits within 2 mm of the track in U,V and X planes
  - Hits are sorted by pulse height
  - See phfit.ps

phfit.ps Comments

- Page 1 shows the probability of n hits/plane/MIP for X and U,V planes
- Page 2(3) shows pulse height distribution of the 4 highest pulse X (U,V) height hits/muon
  - Distributions fitted to $x^a \exp(b*x)$
- Page 4(5) show distance from track projection for sorted hits
  - Gaussian fit
- Parameters extracted from these plots were encoded in mcaddsfht.sf in the decoder 1 section

Evaluate w CCmu events

- Select Phase 1,2 CCmu events with muon momentum < 80 GeV
- Generate similar number of MC events
  - Use new mcaddsfht
- Data have a background of low pulse height hits not present in T1•T3 events and not modeled by MC
  - Lowered GEANT threshold to 2 keV
  - Data/MC comparison in muons_mc3.ps
  - Page 1 show good agreement w mu momentum. Not so good with # emulsion tracks
  - Page 2 shows plots for ALL hits/plane
  - Page 3 shows plots for the muon pulse height (<2 mm)

Other checks

- Changing the GEANT threshold from 2 MeV to 2 keV has only minor effect on these distributions
- Assumed low pulse height hits due to soft electrons
  - Generated $1 < n < 6$ low pulse height hits with several mm width around each true electron hit
  - Get a tail of large number of SFT hits./plane in histogram 103
  - *Wrong assumption*

One solution

- Ignore low pulse height hits for data/MC analyses (i.e. ANN)
  - Apply PH > 500 cut
- Histograms in ccmu_phcut.ps
  - Also changed histograms 2 and 102
    - Npri = # of prim trks matched in SFT
  - Good agreement can be made better with a few iterations on the hit generator

Another "Solution"

- Generate random low pulse height hits to model the data
- Histogram $U_{hit} - U_{vtx}$ for CCmu data and MC (same number of events)
  - Compare low PH hits (<300)
  - Compare high PH hits (>600)
  - See ccmu_phdist.ps
  - Solid histogram = data
  - Dotted histograms = MC
  - Bottom histograms = data – MC
  - Good agreement with high PH cut
  - Add random low PH hits
    - σ = 0.13 m