CHARGE–FLOW POD RECONSTRUCTION APPROACH (TRACK ID - FIRST LOOK)

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Motivation

• Want to exercise charge-flow reconstruction
  • Tracks are a bit easier than showers
  • Can emulate Raj/Erez’s analysis for comparison

• Issues
  • Can’t easily match global interface in ND280 framework
  • Our recon can’t simply plug into framework in place of P0Drecon
  • Neither of these issues are obstacles that can’t be overcome

• Potential Payoffs and Advantages
  • More information available for analyses
  • Lower level information is needed for MVA PID
  • Possibly reduce the falloff in downstream track ID efficiency
  • Ultimately to be used for NC $\pi^0$ and CC $\nu_e$ P0D measurements
Full Approach

• Build fundamental cluster (qCluster) set for each event
  • group together adjacent hits
• Build “super” clusters for each event
  • involves combination of qClusters (and splitting if necessary)
  • tracks: group clusters within cylinder aligned with US or DS of qCluster
  • showers: group clusters within cone aligned with DS of qCluster
• Parameterize superClusters for each event
  • parameterized superClusters feed PID

500 MeV $\pi^0$ (particle gun) 500 MeV $\mu$ (particle gun)

6.0 p.e. threshold cut
So how can we do a quick and dirty track ID?

A track must have:

- mean $Q_{\text{layer}} < 60$ p.e. in each projection
- mean $|\Delta Q_{\text{layer}}| < 20$ p.e. in each projection
- mean $N_{\text{Hits}}_{\text{layer}} \leq 2$ hits in each projection

VERY crude but gives benchmark – improvements underway
500 MeV muon and electron

# qClusters/event

Blue = muon
Red = electron

# hits/qCluster

# hits/layer
100 MeV muon and electron

# qClusters/event

Blue = muon
Red = electron

# hits/qCluster

# hits/layer
500 MeV muon and electron

qCluster length

Blue = μ  Red = e⁻
Blue = $\mu$
Red = $e^-$

XZ

YZ

qCluster length
Summary

• Have foundations for charge-flow reconstruction in place

• Current focus is on track ID (muons)

• Studying many variables as function of particle type, particle energy, and particle angle

• Planning to have much more mature version of track ID by collaboration meeting

• Perhaps PID by end of current C.Y.

• Look for regular updates at P0D software meeting