Monitoring rates of events selected for writing to tape.
Triggering on Σ^- beam particles.
RICH detector.
RICH significantly reduces combinatoric background.
Charm signal: $D^0 \rightarrow K^- \pi^+$ and $\Lambda_c^+ \rightarrow p^+ K^- \pi^+$ (anticharm included).
Beam and Vertex Silicon Strip Detectors. (and Prakash Mathew - graduate student from Carnegie Mellon)
Monitoring of events accepted by Filter.
WA89 and E781 (<u>proposal</u>) projected yields in selected modes from Σ^- beam.
E781 (<u>proposal</u>) efficiency factors and yields in selected modes from π^- beam
With recent improvements in experiment lifetime (1.3) and more beam (1.5) E781 expects to collect 20 billion interactions (proposal goal).
$\Lambda_c^+ \rightarrow pK^- \pi^+$ event in the RICH detector.
$\Lambda_c^+ \rightarrow pK^- \pi^+$ event in the target region.
$\Lambda_c^+ \rightarrow pK^- \pi^+$ event in Vertex Silicon.
$\Lambda_c^+ \rightarrow pK^- \pi^+$ event in the downstream PWC.

ONLINE Monitoring Plots

a) Primary vertex distribution for events that fit single vertex (background)

b) Missdistance for trigger tracks (signal) and for all tracks with respect to primary vertex.

E781 PRELIMINARY ANALYSIS

E781 Key detectors:

1. 74000 strip Silicon System.

2. 3000 phototube RICH.

3. Downstream PWC.

High Statistics Charm Baryon Physics with 650 GeV Σ^- and π^- beams.

Comprehensive Study of Weak Decay Systematics.

1. Precision comparision of lifetimes of all 4 stable states.
2. Semi-leptonic decay comparision for all stable states.
3. Uniform Dalitz plot analysis capability for most modes.
4. Excellent particle ID for Cabibbo-supressed modes.

Strong Interaction Characteristics.

1. Compare production by Σ^- and π^- beams:
   A-dependence vs x_F.
2. Measure excited state characteristics.
3. Search for polarization effects.

Primakoff Physics.

1. Search for hybrid meson states qqg.
2. Measure hadron EM structures (form factors, radiative width, polarizability).

Search for Exotic States.

1. Doubly-charmed baryons or pentaquarks.
2. Production of narrow, massive baryons from Σ^- beam.

E781 TRIGGER

Beam: Composition Σ^-/π^- = 0.85 at 650 GeV/c

Flux Now: 500KHz Request: 750 KHz

Trigger: Beam TRD cut enriches Σ^- fraction
Interaction Counter selects inelastic collisions
Hodoscopes enhance tracking likelihood

Now: Trigger rejects 50% of background σ_{inel}

Improvement: Trigger to reject >60% of background σ_{inel}

E781 DAQ: DART

- Build events in VME memories (holds entire spill)
- Reconstruct events to find secondary-vertex candidates (full tracking in beam, Vertex Silicon; M2)
- Write selected events to disk files
- Spool data to tape; copy 10% directly to mass store.

Online Monitoring

Use filter processor to monitor detectors

- Monitor alignment pulse by pulse
- Check tracking detectors
- Monitor calorimeters, RICH
- Check vertex resolution, filter rejection