Non-prompt Component Study

1 - Use Nagoya ν_e CC analysis → Prompt ν_μ

2 - Patrick's momentum spectrum analysis

3 - Patrick's (+other) MC analysis

4 - E_{cal} integrated spectrum analysis

5 - Low p_μ

Non-prompt Component Study - 1

Using the Nagoya Electron Sample

1.1 The Event Set

The Nagoya electron ID procedure yields 54 primary $e^{\pm}$ in 400 events.

The background is negligible.

Their analysis is ~complete

There were no $e^{\pm}$ in the ν_{μ} CC events.

1.2 Analysis

1. Determine efficiency as a function of X / X_0

2. Correct number of events by total efficiency

3. Compare to number of ν_μ CC events

Efficiency vs. X_0

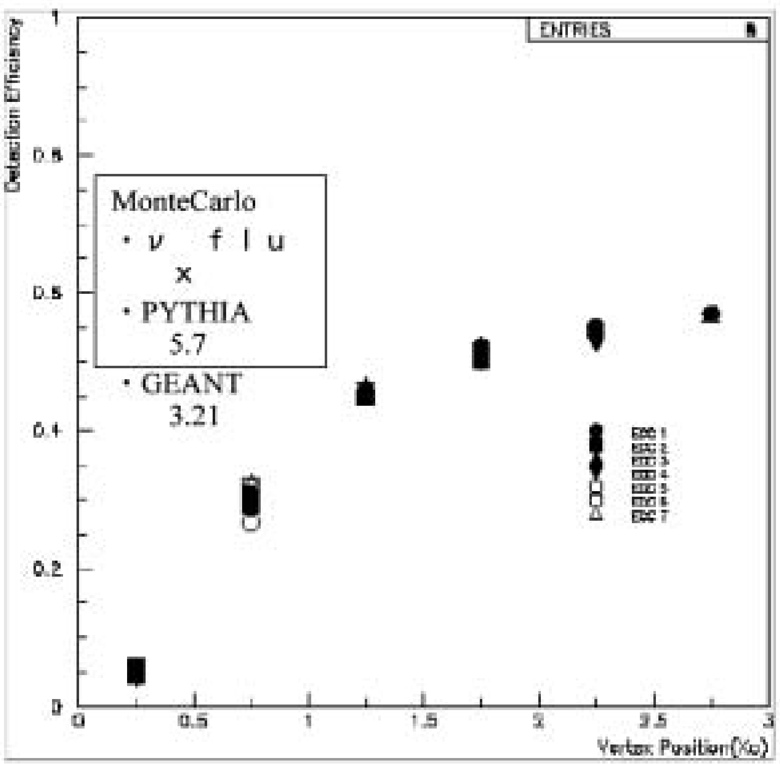
Assume two contributions:

a) efficiency of brem conversion in emulsion

b) efficiency of location

a) Efficiency of election ID in emulsion

From Nonaka's presentation 8 Aug 2003 (from MC study)



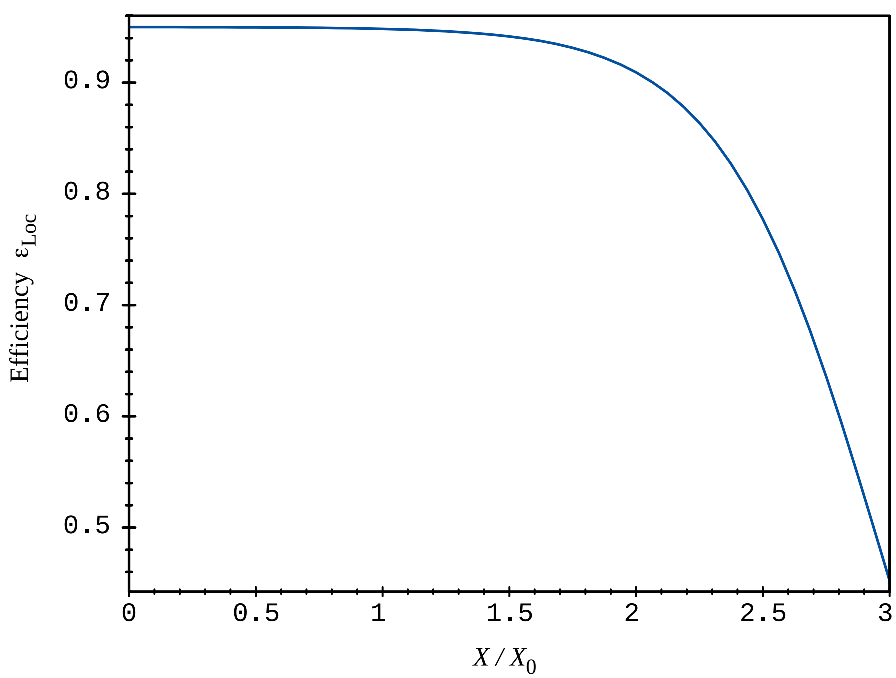
X/X_0	ε_{ID}
0.0	0.0
0.25	0.06
0.75	0.30
1.25	0.46
1.75	0.52
2.25	0.55
2.75	0.58

$$\varepsilon_{ID} = 0.607\left[1 - e^{-1.196(X-0.15)}\right]$$

b) Location efficiency

Use data from Vittorio's presentation (Fig 2) with asymptotic efficiency from Emulsion NIM paper (Fig. 21)

$\varepsilon_{ID} \rightarrow 0.95$ for $X/X_0 \rightarrow 0$

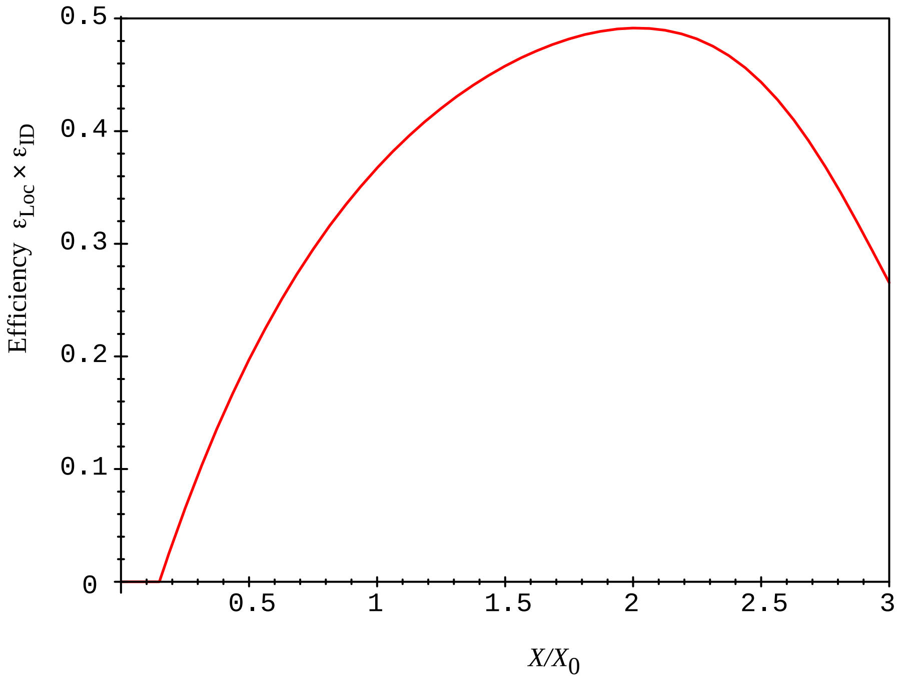


X/X_0	N	ε_{Loc}
0.0	43	0.95
0.25	39	0.95
0.75	43	0.95
1.25	44	0.95
1.75	51	0.93
2.25	36	0.86
2.75	30	0.64

$$\varepsilon_{Loc} = \frac{0.95}{1 + e^{\left[3.2(X-2.97)\right]}}$$

Total Efficiency is the mean of the product:

$$\varepsilon_{Tot} = \frac{1}{3}\int_0^3 \varepsilon_{ID} \cdot \varepsilon_{Loc}\, dX \quad = 0.35$$



The corrected number of ν_e CC events is therefore:

54/0.35 = **153**

Comparison to ν_μ CC

There are 163 identified muon events

Assume location efficiency of 0.84

Assume acceptance of 0.72

$\Rightarrow$ corrected number of events 163/(0.84×0.72) = 270

Therefore the ratio of total ν_μ CC to prompt events:

$$r = \frac{\mu}{e} = \frac{p+n}{p} \Rightarrow \frac{n}{p}(r-1) = 0.77$$