Electron ID in Emulsion

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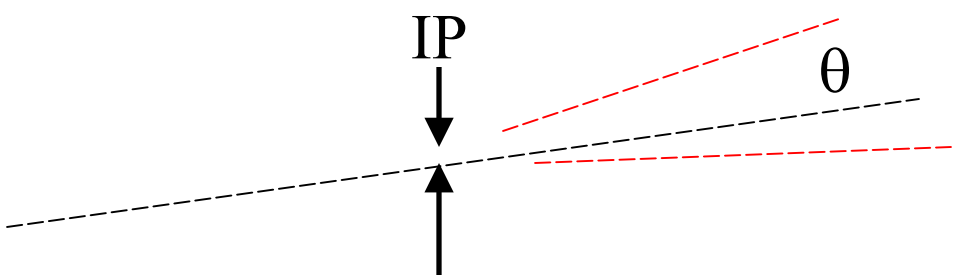
Method

- Identify brehmstrahlung tracks associated with primary vertex tracks in emulsion
- Nonaka producing a follow-down m-file for each long primary track
  - 815 follow-down m-files on fnbblx1
- Identify brehm tracks by making angle and IP cuts
  - Project brehm track (>2 seg) to each segment of the primary track
  - Find minimum IP
  - Cut on $\delta u * \delta\theta u,v$ for large θ, IP tracks
  - Require $\theta < 0.1 - 4000 * IP(min)$



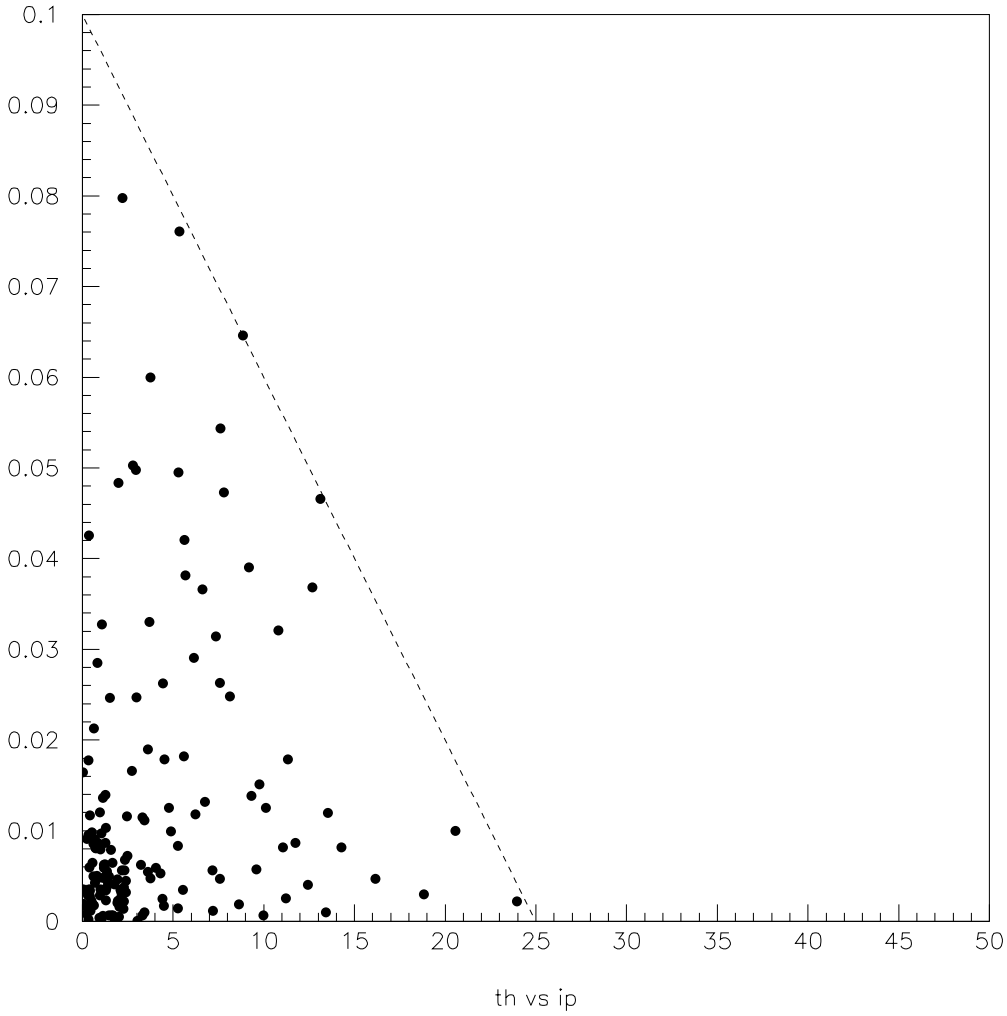
Monte Carlo

- Generated 500 electron CC events in most upstream plate of bulk module 8
- Generated 500 electron CC events in most upstream plate of ECC module 1
- Geant electron/photon tracking threshold 20 MeV
  - Produced another set with 1 MeV threshold
- MC emulsion resolution 0.3 μm, 3 mr

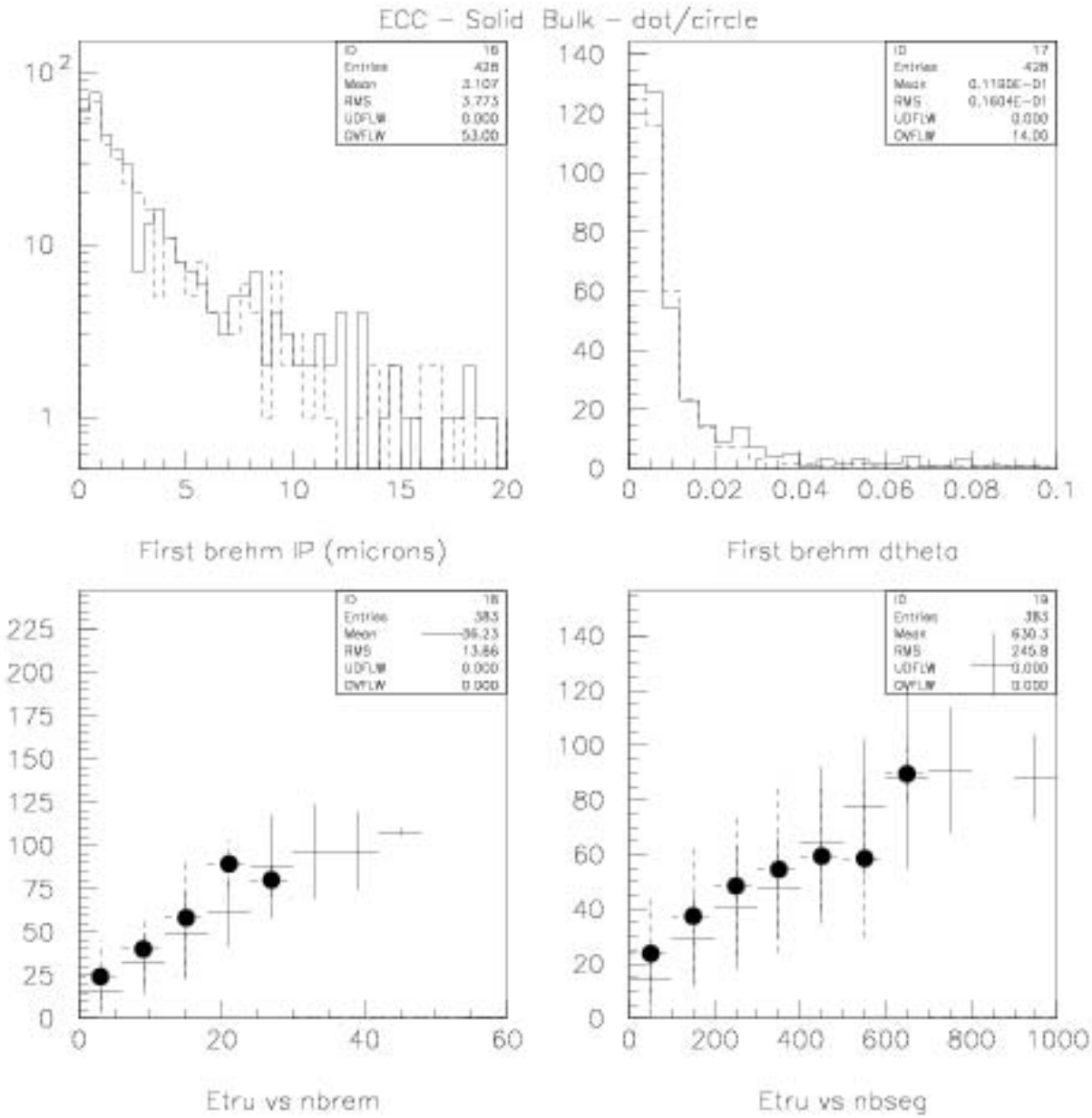
- Use to define θ/IP cut
- No significant differences between bulk and ECC brehm tracks
  - Radiation length is all that is important

θ/IP cut – Monte Carlo

Most upstream brehmstrahlung track



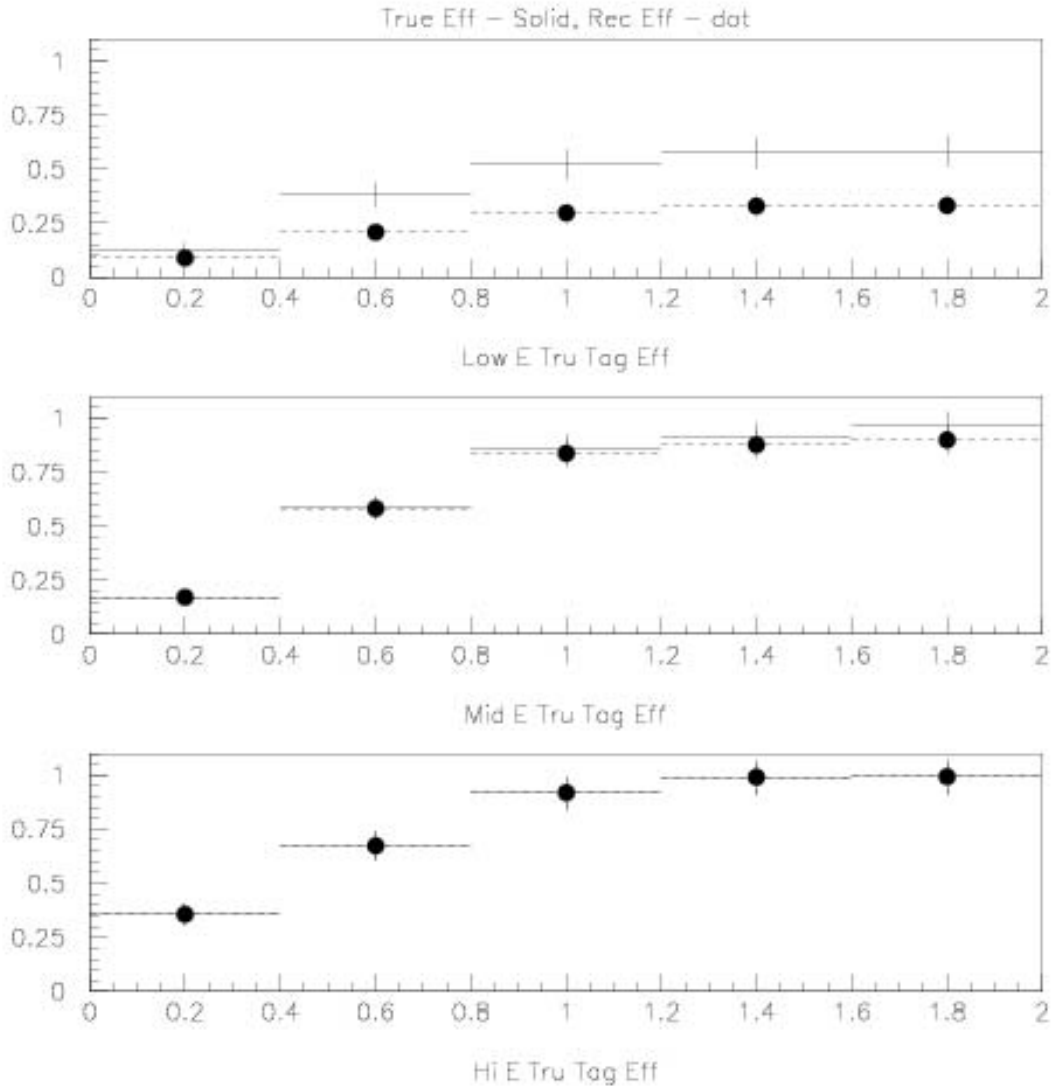
ECC/Bulk Comparison



~50% energy estimate w 3 Xo

True/Rec Tagging Efficiency vs Electron Energy

True = track STID >0 (Solid)
Rec = θ/IP cut (Dots)
Tag = Num brehm trk> 2



E<10 Gev

E>10 GeV
E<30 GeV

E>30 Gev

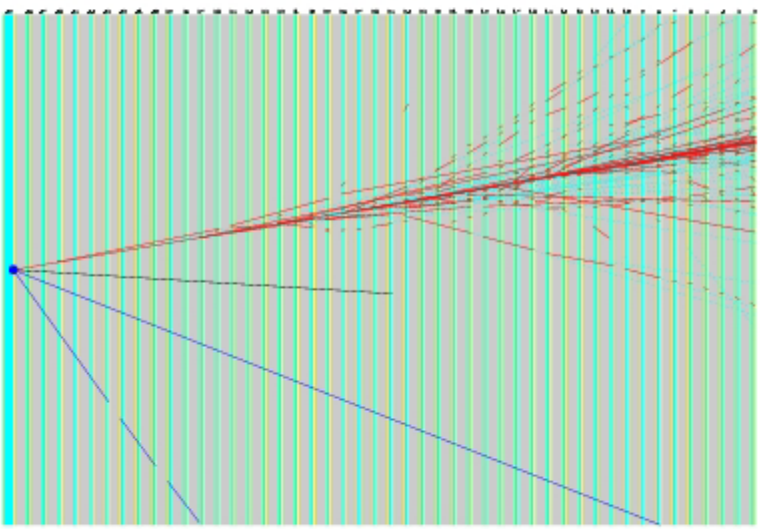
Good efficiency for electrons > 10 GeV and > 1 Xo

MC - 58 GeV electron, 3Xo

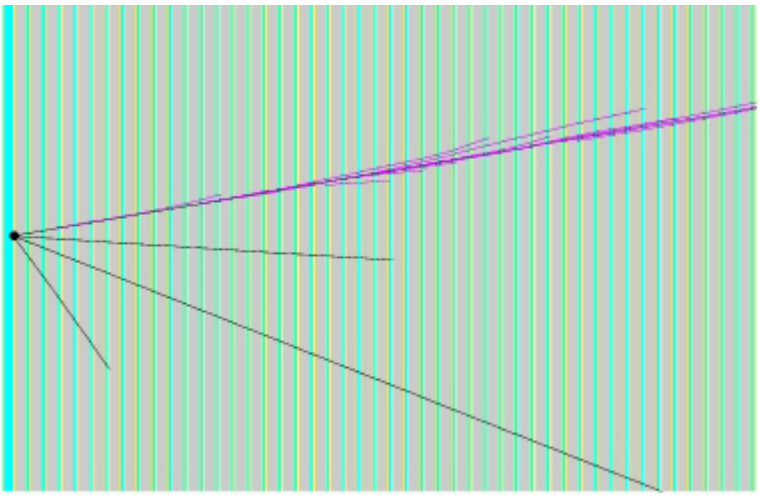
E872 Run= 2879 Event= 7 Wght= 159.3

U View

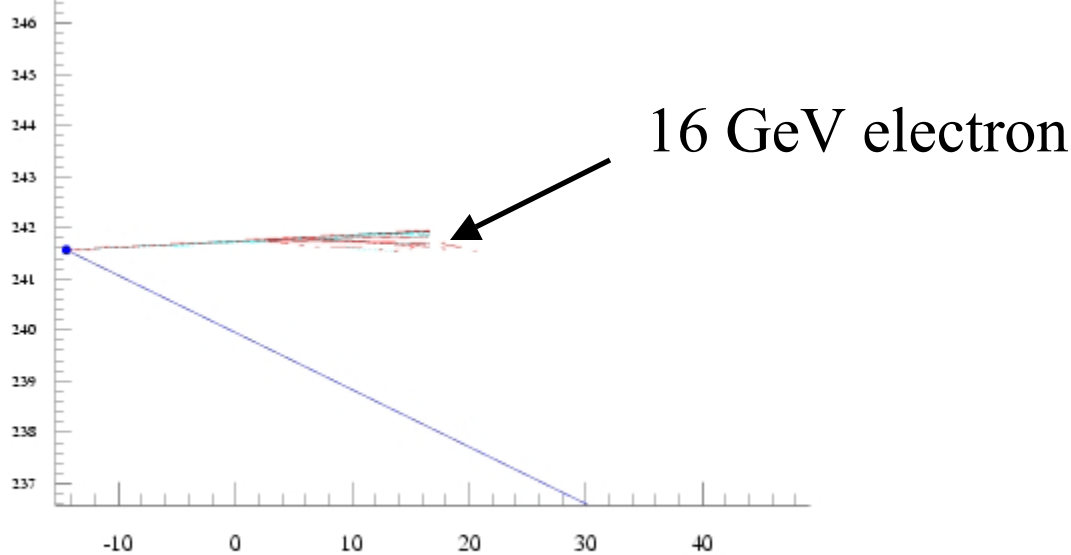
gamma
e+/e-
mu+/mu-
pi+/pi-
K+/K-
K0
Tau
proton

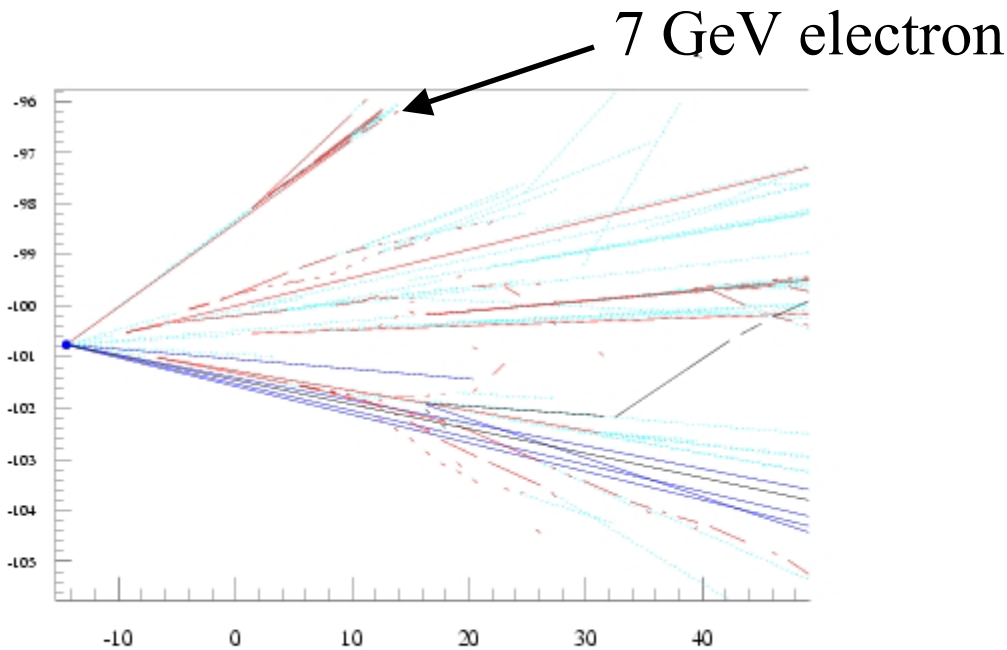


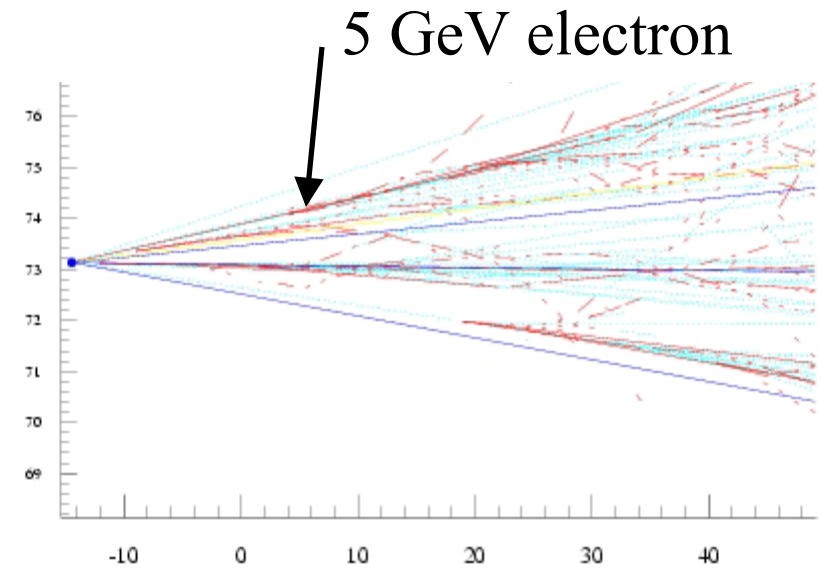
Truth



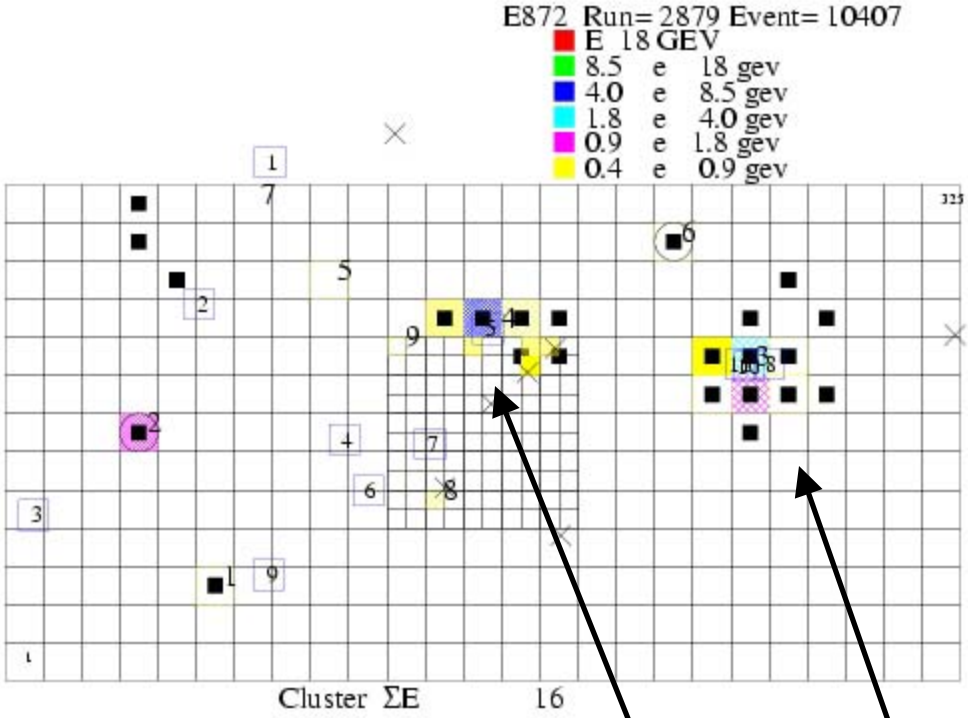
23 brehm tracks
1st brehm after 0.2 Xo


16 GeV electron
246
245
244
243
242
241
240
239
238
237
-10
0
10
20
30
40


7 GeV electron
-96
-97
-98
-99
-100
-101
-102
-103
-104
-105
-10
0
10
20
30
40


5 GeV electron
76
75
74
73
72
71
70
69
-10
0
10
20
30
40

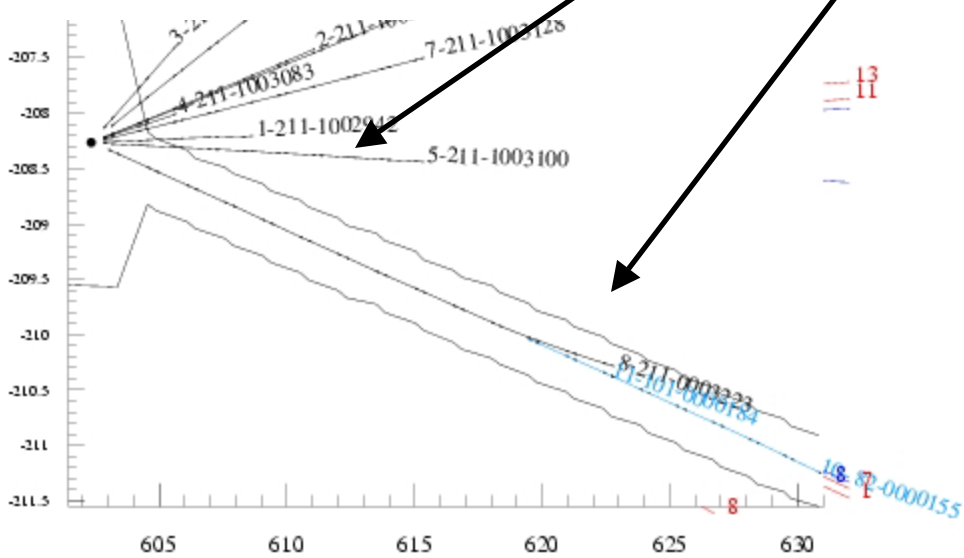
Data Event 1.2Xo



1	0.4	9	0.4
2	1.0		
3	6.0		
4	7.7		
5	0.2		
6	0.3		
7	0.1		
8	0.5		

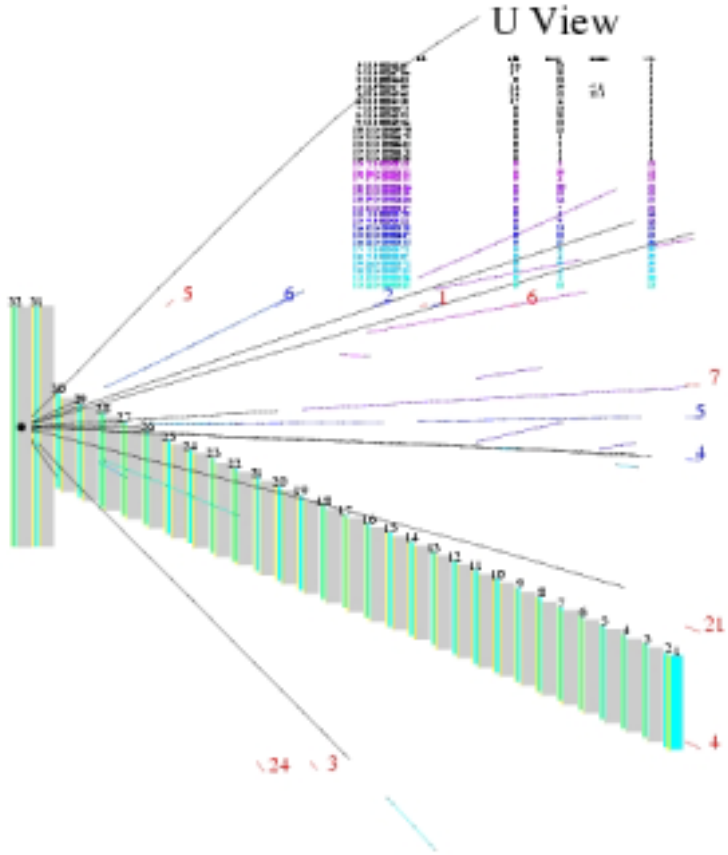
Trk 5
no tag

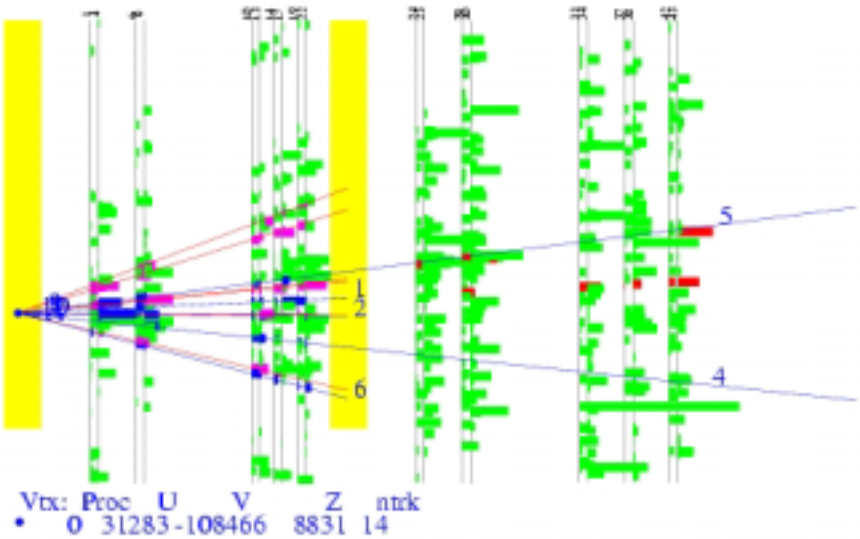
Trk 8
tagged



Tagging Failure – 6 e's

E872 Run= 2884 Event= 10377 Wght= 1.0





Summary

- Tagging inefficiency due to “short” radiation length targets
- Method is inadequate as a stand-alone electron tagger
  - ~90% efficiency for tracks with > 1 Xo and E > 10 GeV
  - Rate of false positives is not negligible

- Could improve efficiency with SFT & EMCal