Analysis of Short candidate 3356_17099

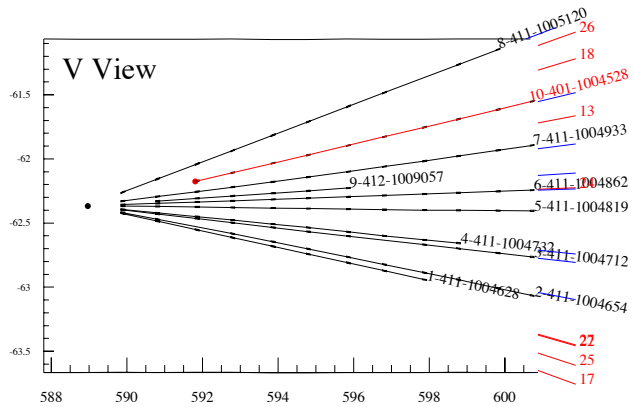
- **This event was not included as τ candidate in the 203 events set because a primary emulsion track was linked to 3 hits in the MuID system**
- **The short track found in the decay analysis *is* linked to SFT hits**
- **The main task is to determine the probability of a muon in the event**
- **Also estimate probability of hypotheses:**

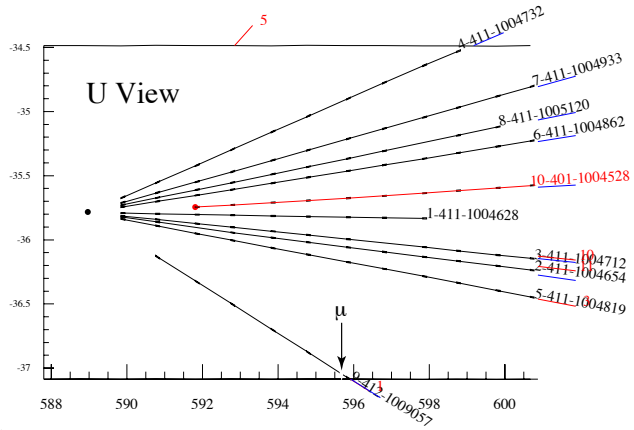
  A) ν_τ CC event .AND. (π decay .OR. random)

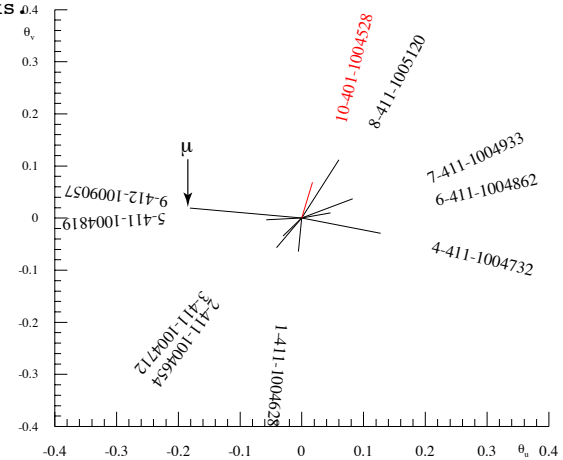
  B) ν_μ CC event .AND. (S background .OR. charm)

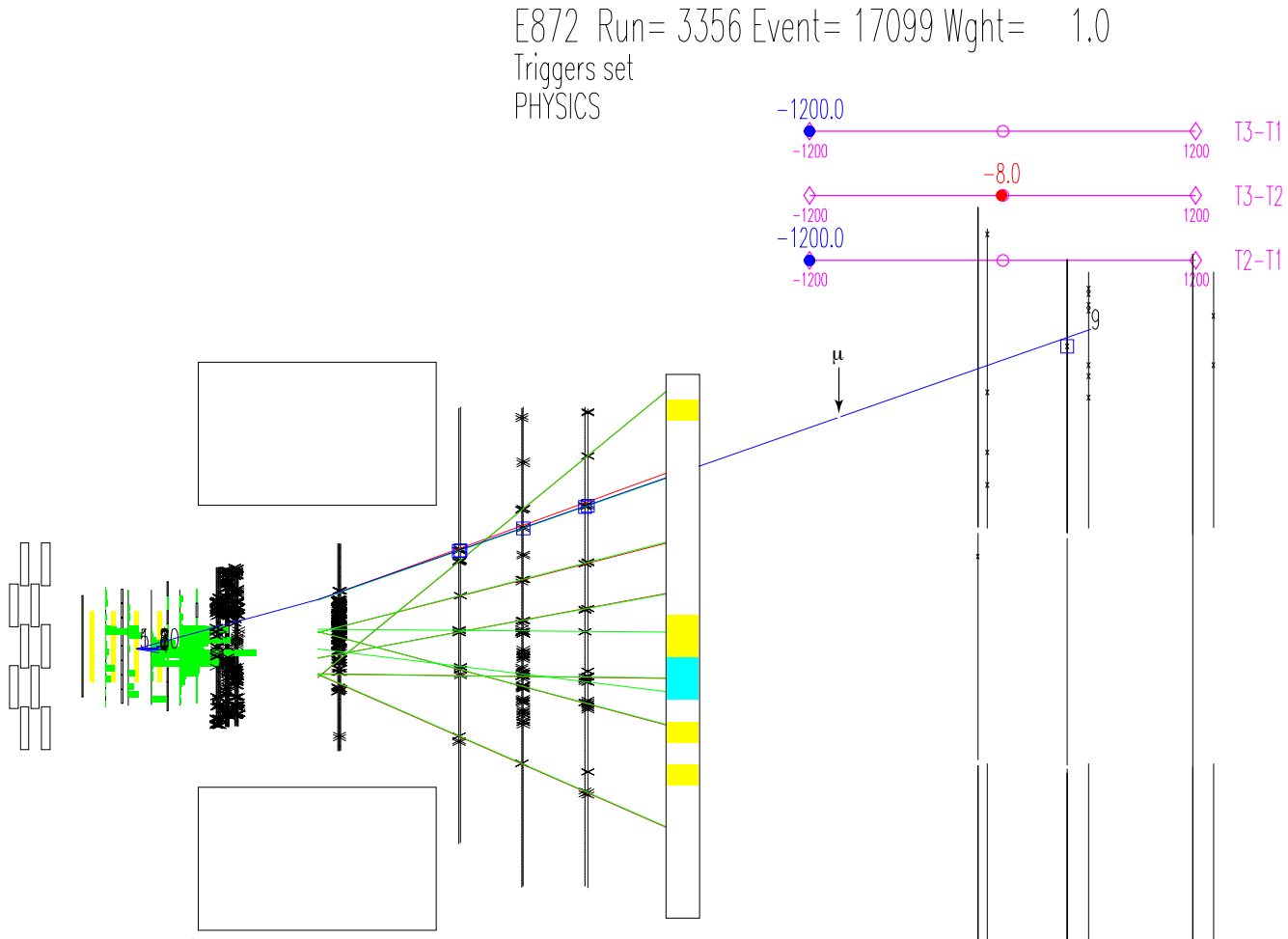
  C) (S background) .AND. (π decay .OR. random)

```
>>>>>>>>>>>> RDTDECAY results 3356_17099<<<<<<<<<<<<<<
Run period 4 Module type E/B3. Vtx in SFT station 3, emulsion module 7
Primary vertex @   -35783.5  -62366.5  588965.2 micron
       primary trk      nseg  eplt  flag     ip   theta   mom
       1-411-1004628     9   371     0    3.08  0.065   0.0
       2-411-1004654    11   362     1    2.27  0.070   0.0
       3-411-1004712    11   362     1    2.84  0.046   0.0
       4-411-1004732    10   372     2    3.46  0.131   0.0
       5-411-1004819    12   362     1    2.97  0.058   0.0
       6-411-1004862    12   362     1    2.68  0.048   0.0
       7-411-1004933    12   362     1    4.05  0.090   0.0
       8-411-1005120    10   361     2    3.47  0.127   0.0
       9-412-1009057     6   381     2    6.47  0.187   0.0
Short decay (code=1) IP cut= 200. microns. Angle cut= 0.200
Long decay  (code=2) IP cut=   5. microns. Angle cut= 0.250
 Code + 10 -> track in SFT. Min seg cut= 2
 code ptk  2ndry trk     nseg  eplt  flag   flght     ip    theta   mom   Gnt ID
   1   0   0-411-1004844    12   401     1    875.    20.0   0.023   0.0
  11   0  10-401-1004528    10   372     1   2851.    10.9   0.004   0.0
   1   0   0-412-1011650     3   401     2   1909.   131.2   0.076   0.0
   1   0   0-401-1005170     2   412     0   2935.   188.1   0.068   0.0
   1   0   0-401-1004026     2   412     0   2852.   101.9   0.036   0.0
   1   0   0-412-1007924     2   401     2   1864.   127.7   0.071   0.0
   1   0   0-401-1003492     2   401     0   2919.    66.8   0.023   0.0
   1   0   0-401-1005092     2   401     0   2902.   157.1   0.056   0.0
   1   0   0-401-1004190     2   411     2   2955.   128.7   0.046   0.0
   1   0   0-411-1005479     2   411     0    911.    42.4   0.049   0.0
   1   0   0-411-1004837     2   411     0    877.   125.6   0.146   0.0
   1   0   0-411-1005215     2     0     0    891.    72.9   0.084   0.0
  >>>>>>>>>>>>>>>>>>>>> CHK2NDRY <<<<<<<<<<<<<<<<<<<<<
Emul tracks within   6. microns and  10. mrad which stop upstream of 2ndry tracks
     trk      nseg   dplt    dr      dsl     U/S trk
                           [um]    [mrad]
 CHK2NDRY: Search for more 2ndry vertex tracks
******** Vtx  2 -35744.9 -62175.1 591810.0 microns **************
  emtrk    nseg     IP      dplt to vtx
```

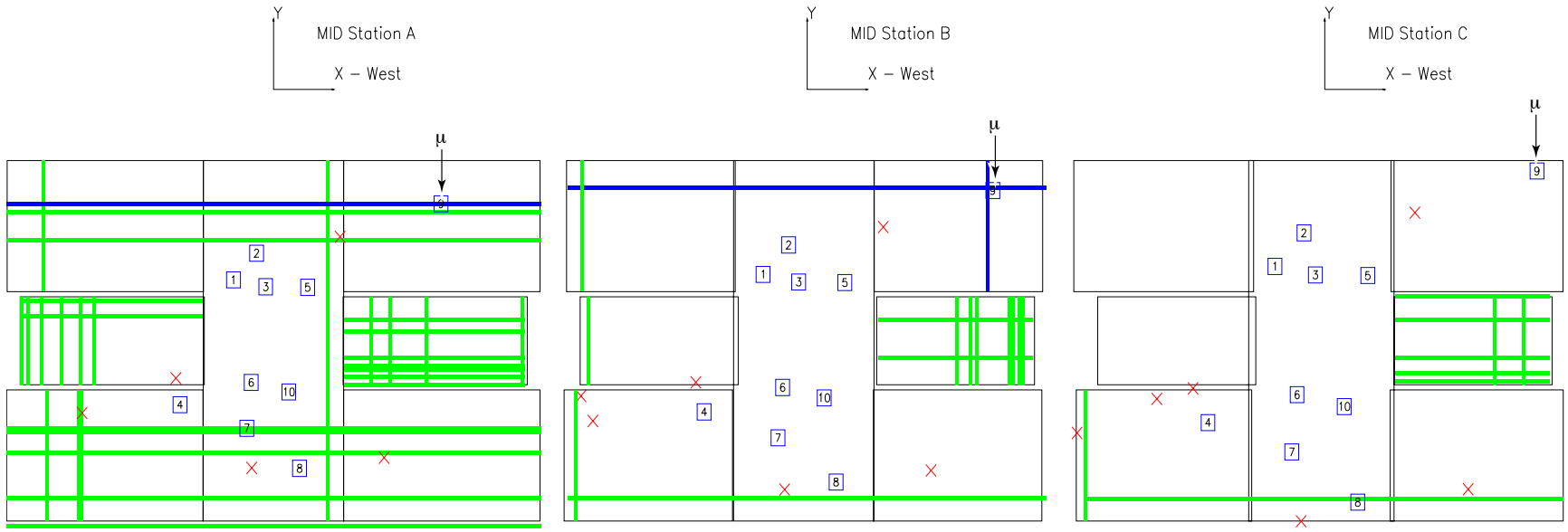


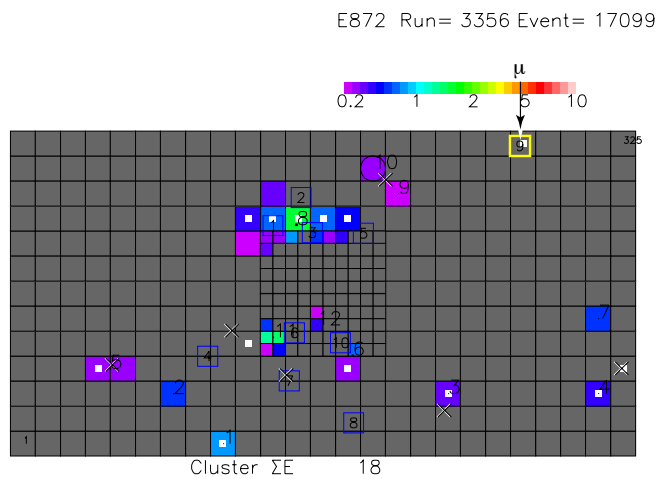






Trk	Mom	Chi	nht	Emul	Vtx
1	0.0	0.0	0	4111004628	1
2	0.0	0.7	9	4111004654	1
3	0.0	0.6	9	4111004712	1
4	0.0	0.2	9	4111004732	1
5	0.0	0.0	0	4111004819	1
6	0.0	0.8	9	4111004862	1
7	0.0	0.8	8	4111004933	1
8	0.0	2.2	8	4111005120	1
9	-5.0	0.9	8	4121009057	1
10	0.0	2.7	8	4011004528	2





1	0.8	9	0.2
2	0.6	10	0.3
3	0.3	11	5.0
4	0.4	12	0.4
5	0.5		
6	0.9		
7	0.5		
8	7.6		

y View

Reasonable hypothesis:

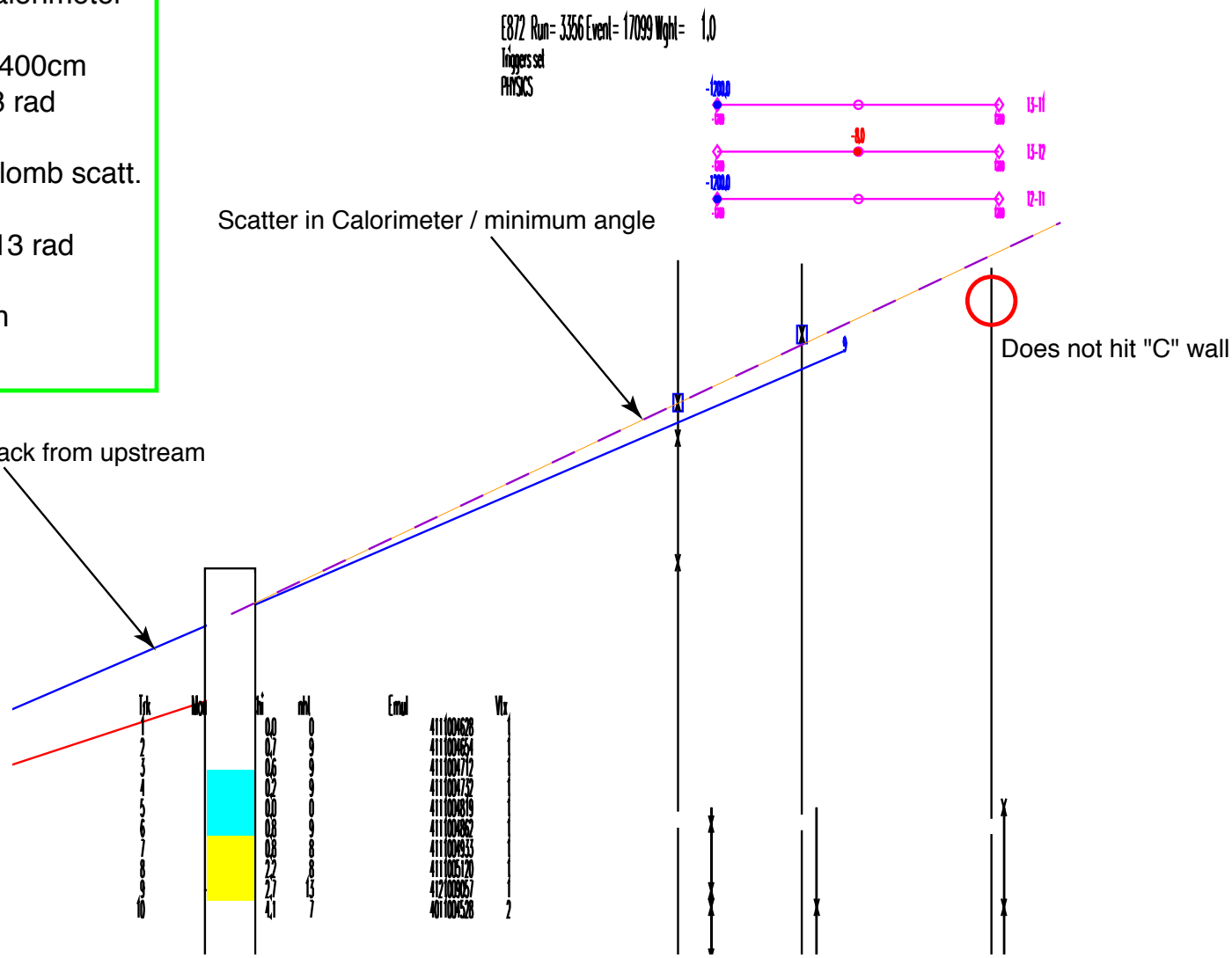
Scatter in $20X_0$ calorimeter

Min angle ~ 3cm/400cm
= 0.008 rad

Est *rms* mult. coulomb scatt.

~ 0.013 rad

Good match



Summary of 3356_17099

- Short candidate track SFT match $(\Delta u, \Delta v) = (0.008, -0.018)$
- Emulsion momentum estimate 3.2 GeV/c
  $\Rightarrow$ scattering consistent with match

- Track 9 ("muon") matches hits in KSx,y / DC / Ecal
- Spectrometer momentum -5.0 GeV/c
- Range through A wall : 0.9 GeV
  B wall : 2.0 GeV
  C wall : 3.0 GeV
  $\Rightarrow$ expect penetration to C wall

- random hits in 20cm window ~ $(\overline{Ax})(Ay)(Bx)(By)$
  $(0.4)(0.9)(0.03)(0.09)$
  $= 1.0\times10^{-3}$

- There are 2.5 $\pi^{\pm}$ / event ; avg. energy ~ 6 GeV
  $\gamma c\tau \sim 280$m ; decay space ~7.5m $\Rightarrow$ 0.027 $\pi^{\pm}$ decay probability

Hypotheses for 3356_17099 "muon track":

A) Random coincidence of hits in MuID system

Prob ~ 0.001

B) π decay-in-flight; scatters out of C-wall

Prob ~ (0.027)(6)(0.06) = 0.010

π decay no. π 3 of 4 hits

Event Probability Analysis

from Emily's report 10 Mar 2003

- Assume tau track and daughter meet before daughter segment
- Assume muon exists for charm/interaction hypothesis A
- or... assume muon does not exist for interaction hypoth B

	A	B
$P(\tau)$	0.00	0.02
$P(c)$	0.82	0.85
$P(int)$	0.18	0.13