



DEEP UNDERGROUND
NEUTRINO EXPERIMENT



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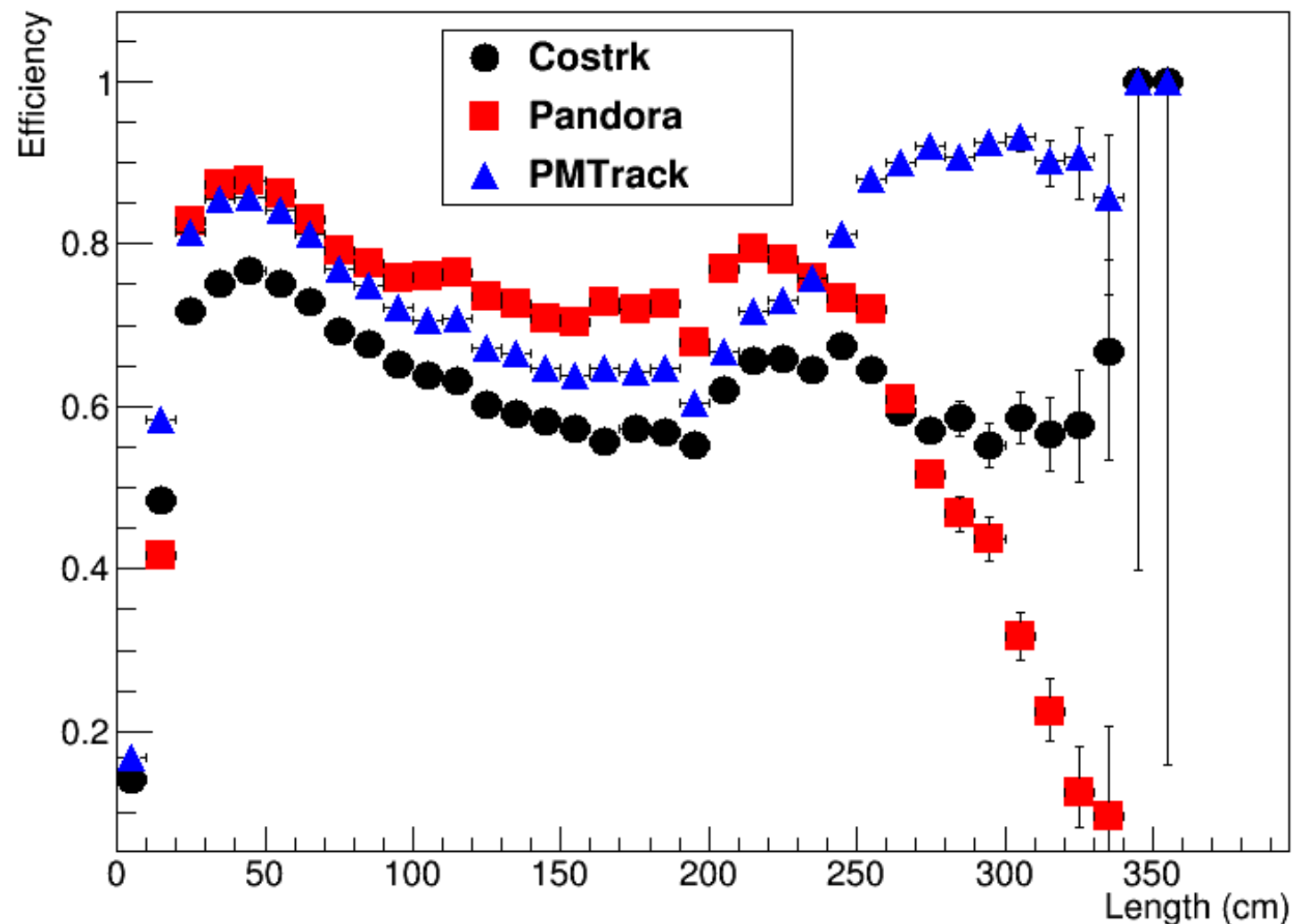
Stitching tracks in a milliblock sample

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Motivation

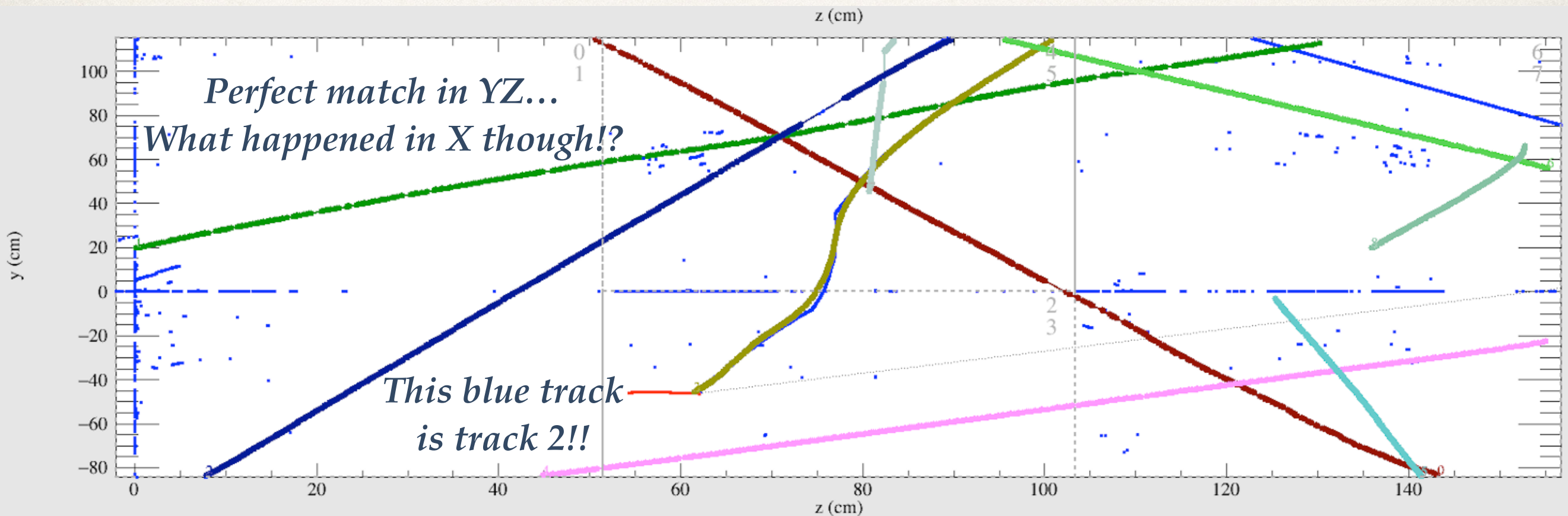
Length Efficiency for Normal Disambiguation



- ❖ Noticed sharp drop in pandora efficiency above 2.5 m!
- ❖ Want to find out why this is....

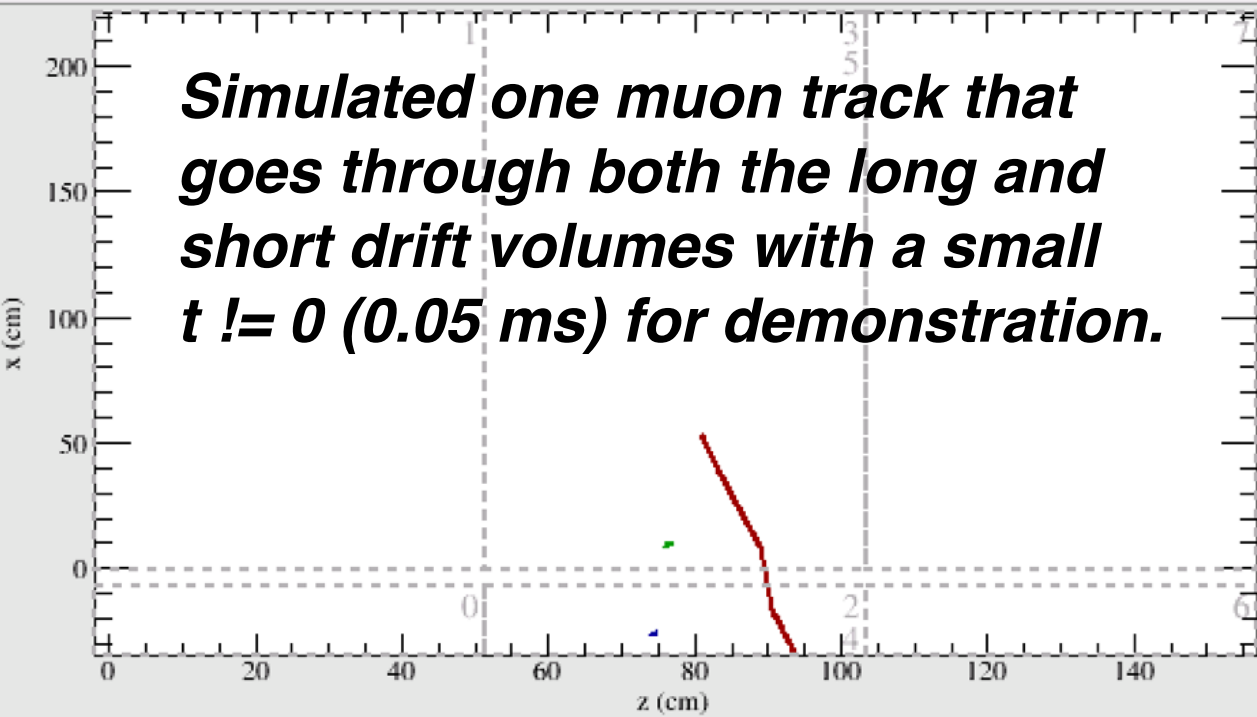
Looking through my matching code

```
Have a long particle, with PdgCode 13, in event 4238. Was it matched correctly? 0  
It had MCTPCLength 255.831  
Had a track reconstructed to this particle 2, it had length 658.883, and trkd2 -99999  
Start (x,y,z) -437.908, 114.326, 89.7499. End (x,y,z) 528.581, -83.4692, 7.87468  
Start (x,y,z) -99999, -99999, -99999. End (x,y,z) 0, 0, 0
```

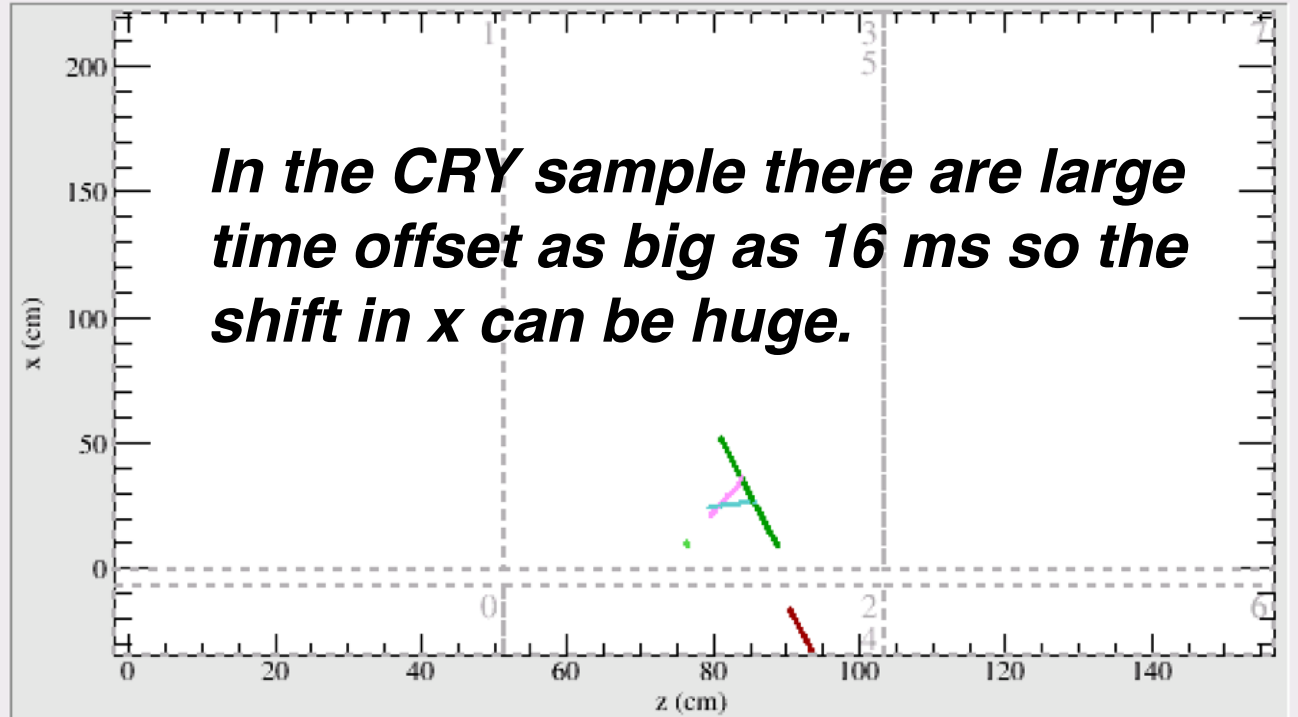


What is happening...

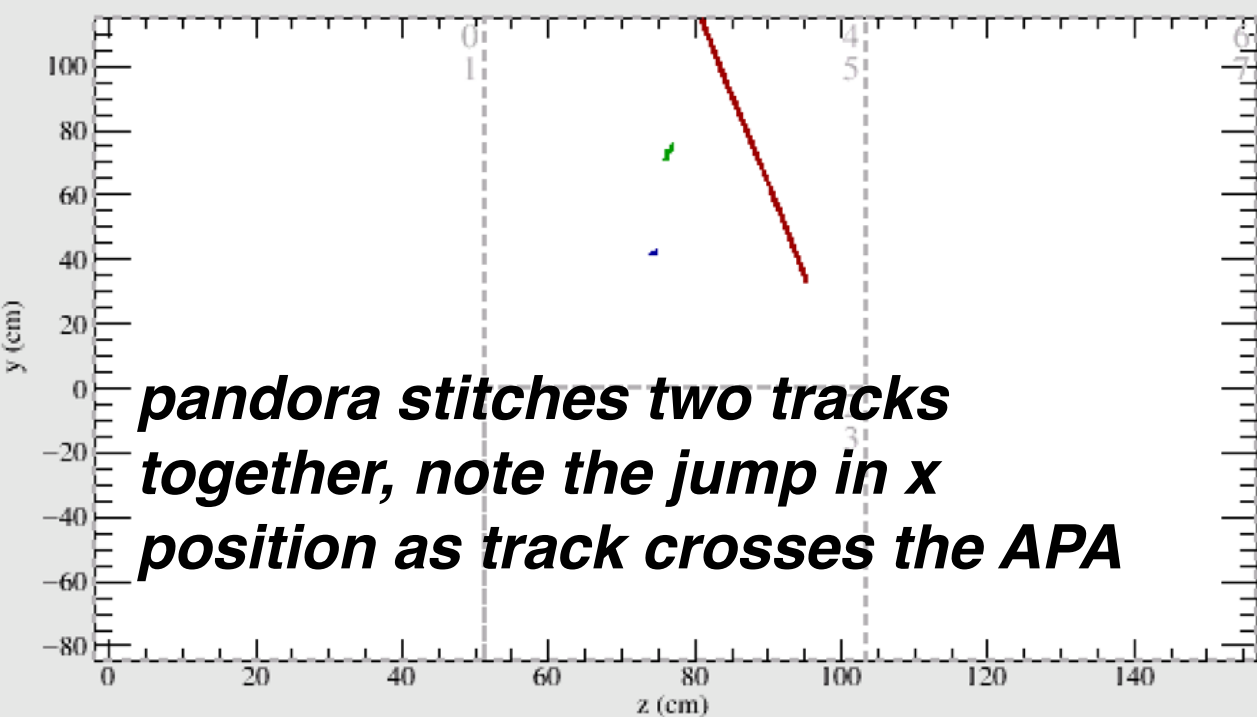
Simulated one muon track that goes through both the long and short drift volumes with a small $t \neq 0$ (0.05 ms) for demonstration.



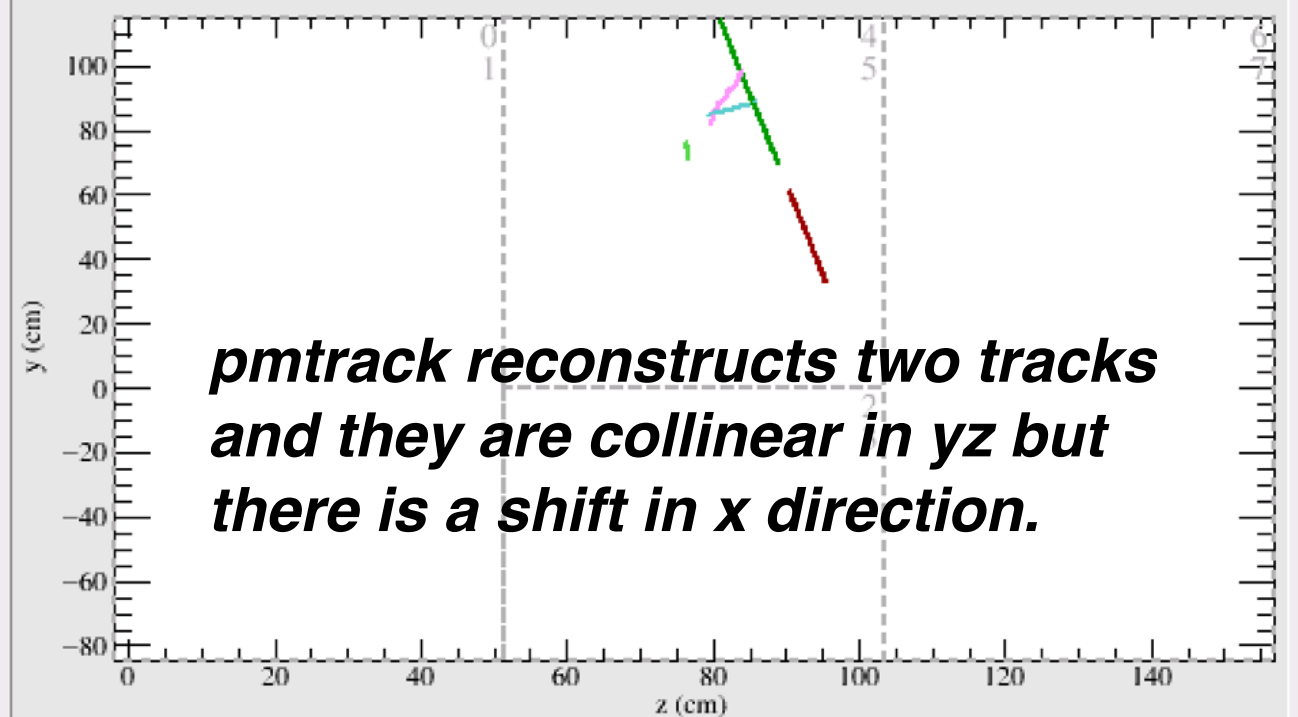
In the CRY sample there are large time offset as big as 16 ms so the shift in x can be huge.



pandora stitches two tracks together, note the jump in x position as track crosses the APA



pmtrack reconstructs two tracks and they are collinear in yz but there is a shift in x direction.



What is happening...

- ❖ If one of the two tracks reconstructed by pmtrack is at least 75% (50%) of MCLength then it will be considered matched.
- ❖ If this increase in X in the pandora track causes the length to be more than 125% (150%) of MCLength then it will not be considered matched.
- ❖ In milliblock will see a big increase in X \rightarrow many pandora tracks are not considered matched \rightarrow drop in efficiency for long tracks!

What do we want to do?

Taken from an email Tingjun sent to Robert....

- 1) We plan to run slicer on data/MC. The hope is to use PD/counter information to slice event so each track would happen at $t=0$. So one does not need to worry about the offset in drift direction. If this works, it is great since we do not need to do anything.
- 2) If we do not run slicer, or there are multiple tracks in one slice, we may have this shift in drift direction. Actually this is a feature we can use to determine t_0 . If we take half of the offset in x direction and divide it by drift velocity, we get t_0 . If we identified this offset and calculate t_0 , we can correct for it when we convert ticks to x and maybe save a t_0 object and associate it with the track. In the later module where Karl associate tracks with PD t_0 's he can ignore tracks that already have a t_0 associated with it.
- 3) One can save tracks in a PFParticle and do the stitching at a late stage when t_0 is determined.
- 4) Stitching both sides of APA should be done in a separate module, which is creating new tracks?