Update on the Ar Capture Analysis: The recoil drift-plane pulse-length definition question;

Can strong longitudinal diffusion in the capture-recoil pulses be excluded with a cut on the muon stop track YZ-plane angle? Is it really established that there isn't a longitudinal drift effect for the muon stops alone?

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I have studied two definitions of the capture-recoil drift-plane pulse length…

• The first definition is the YminEH and YmaxEH of the capture-island, and using this to get the drift-plane pulse length with the drift-velocity.

• The second definition was to take the raw pixel information and count the number of continuous pixels in Y on the anode of the recoil pulse. **Not** expected to ever be greater than the length by the first definition.

    • The condition that all EH pixels of the recoil be on the same anode was applied in this case. **Not** that the stop anode of the muon stop had to be the same.

A comparison of the two definitions…

Most likely case for discrepancies: Three continuous pixels, and a 4th which is discontinuous; 1% level
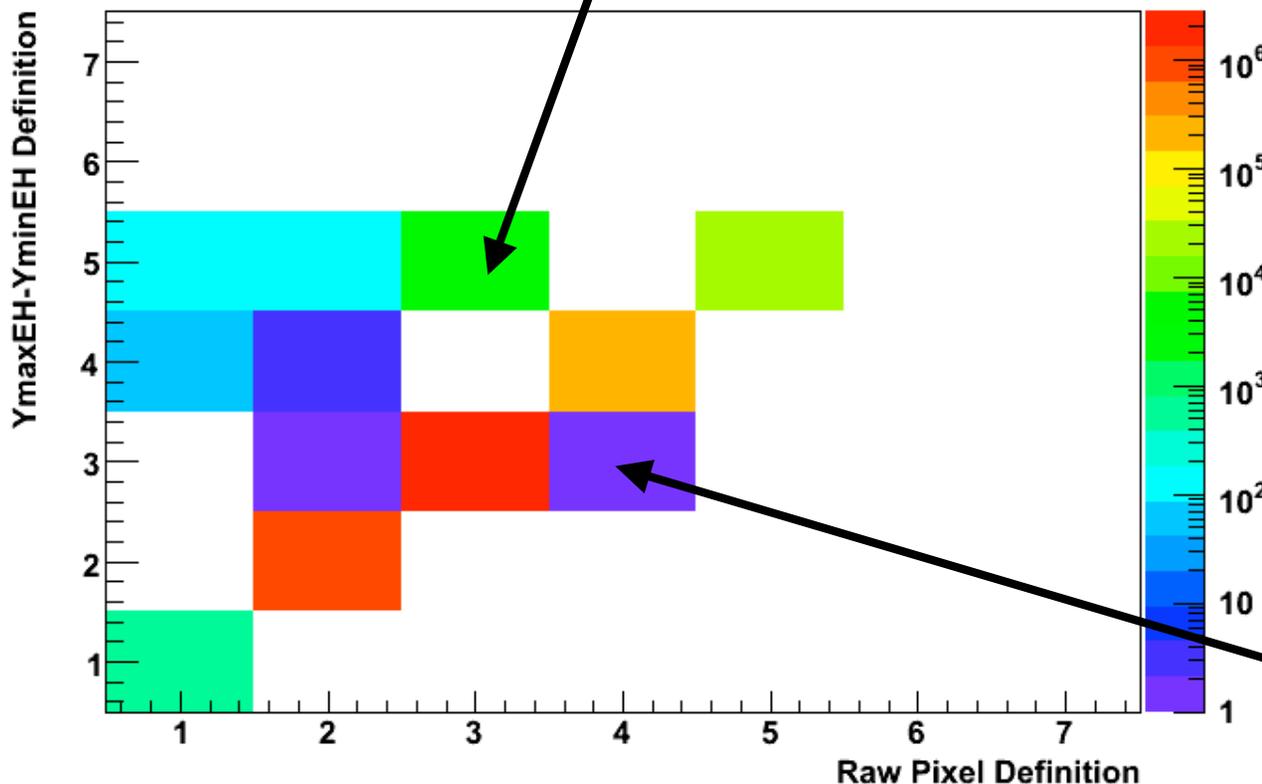
In general there is little disagreement between these two definitions

Noise; a single strange event

The events for which the two definitions are consistent show the same capture pulse-length effect in the muon stop Y distribution that was seen before. (Same order of magnitude.)
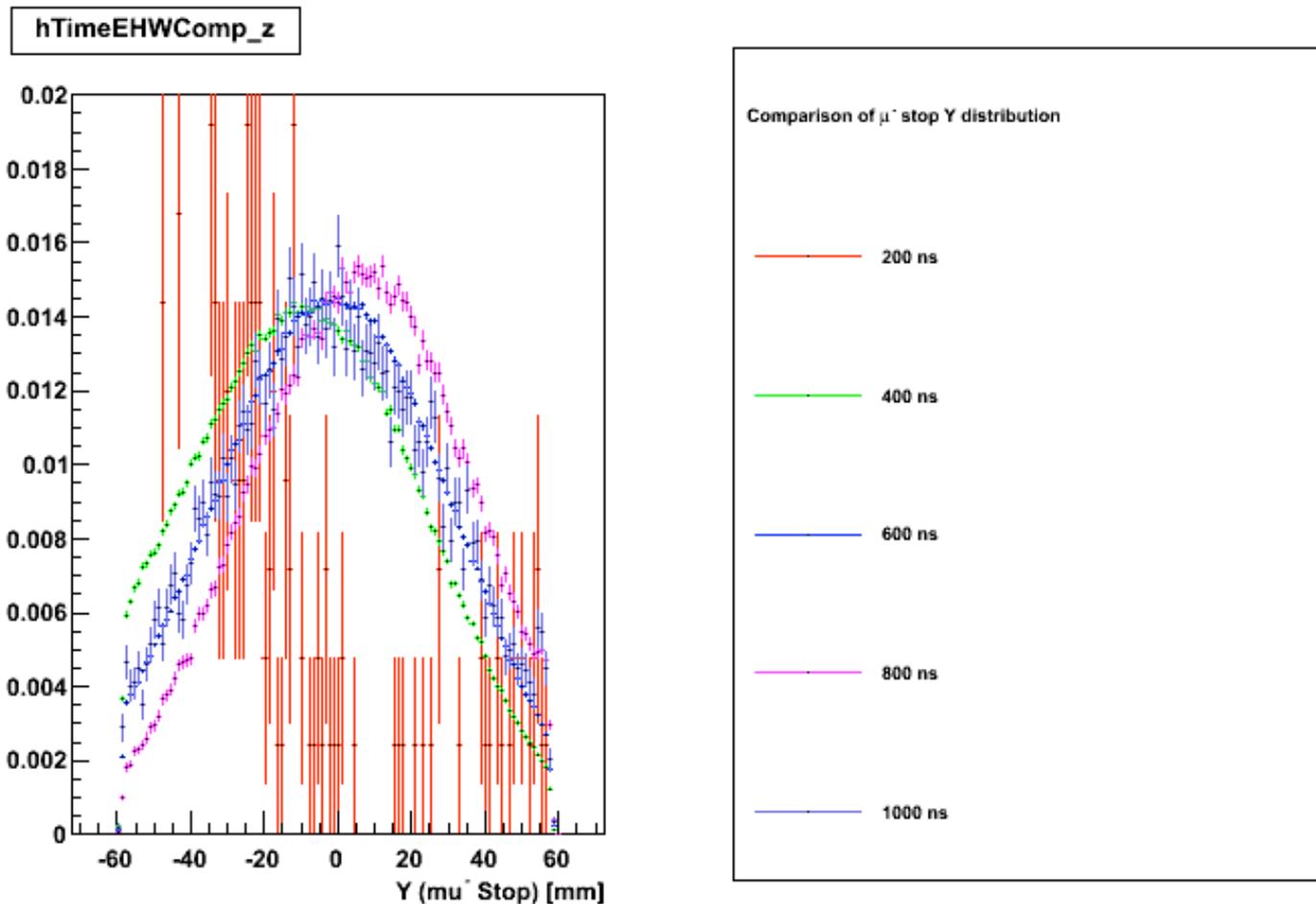
Previously the μ⁻ stop Y distribution effects were shown to be subject to the angle of the muon track entering the TPC in the vertical YZ plane.

Could this be a part of the effect still being observed in the capture events?

(Same events selected in the previous plots, the capture recoil in on a single anode and the pixel list is present.)
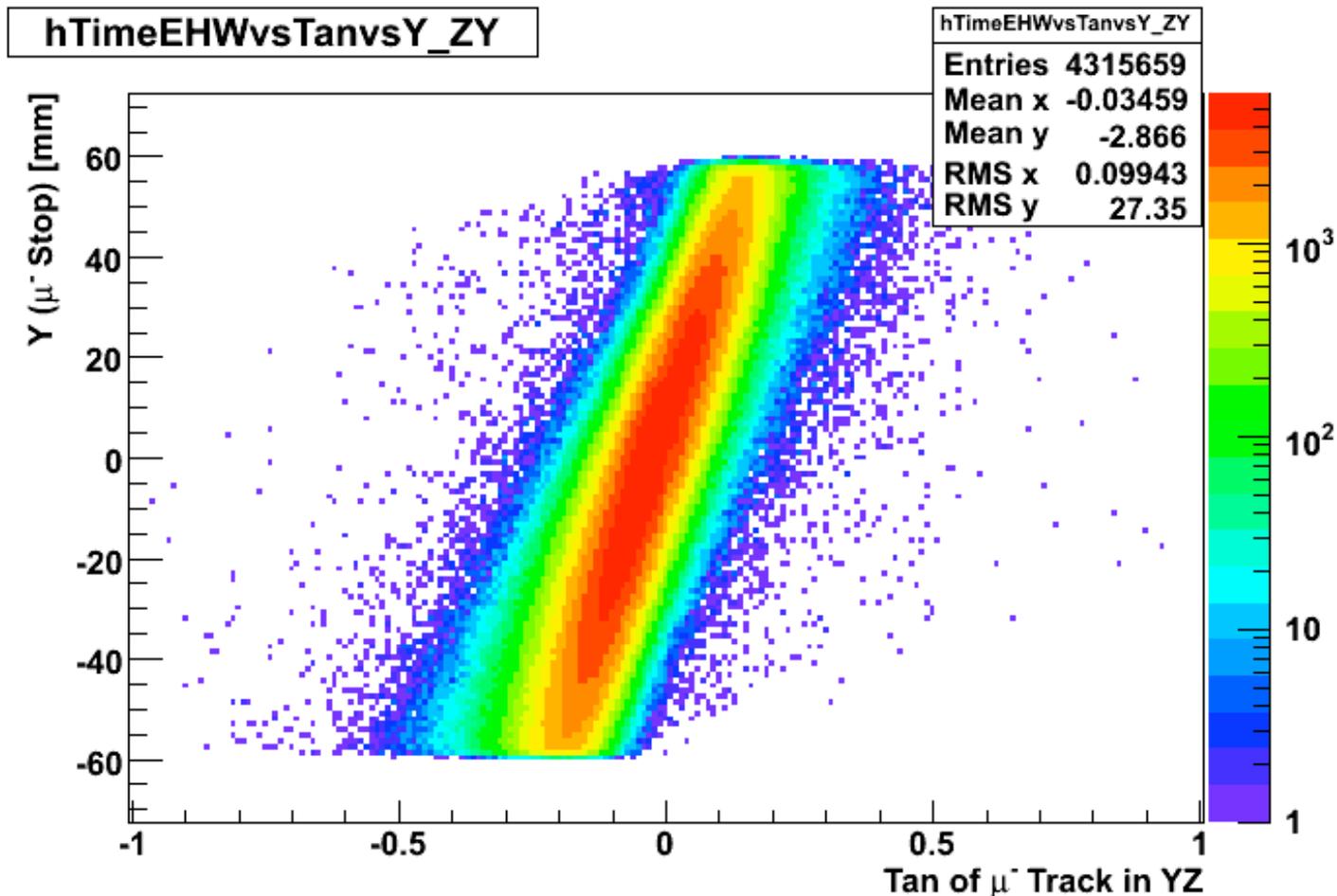
There is a correlation between the EH drift-plane pulse width of the capture recoil and the tan of the angle of the muon entrance track in YZ. (Old YmaxEH-YminEH definition of the pulse width used here.)
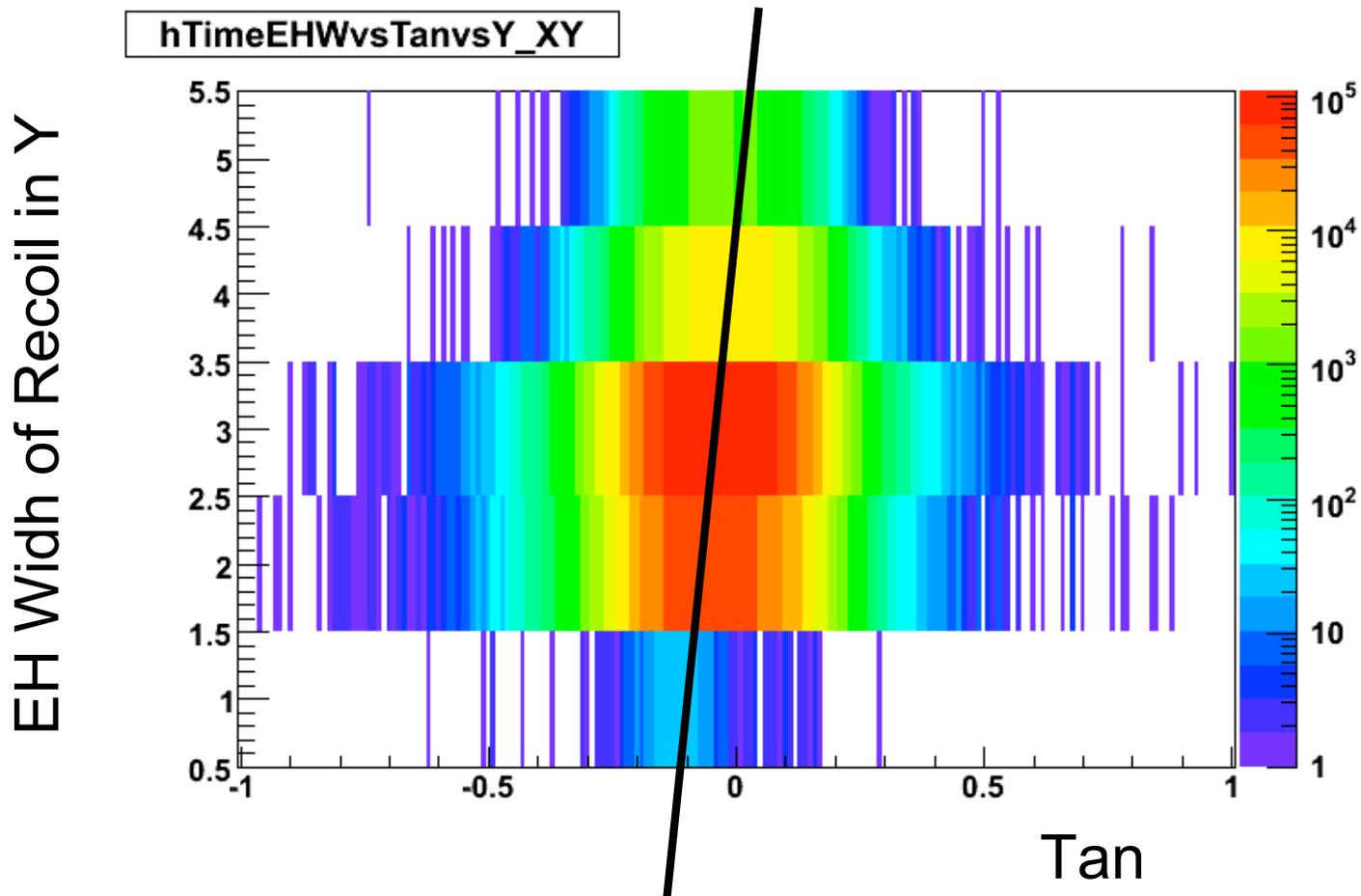
So, yes, the capture-recoil pulse-width effect could be connected to the angle of the muon entrance.

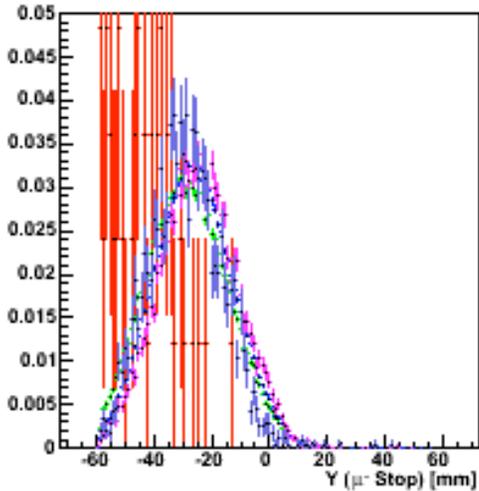The capture-island width effect in Y disappears with a cut on the entrance angle.
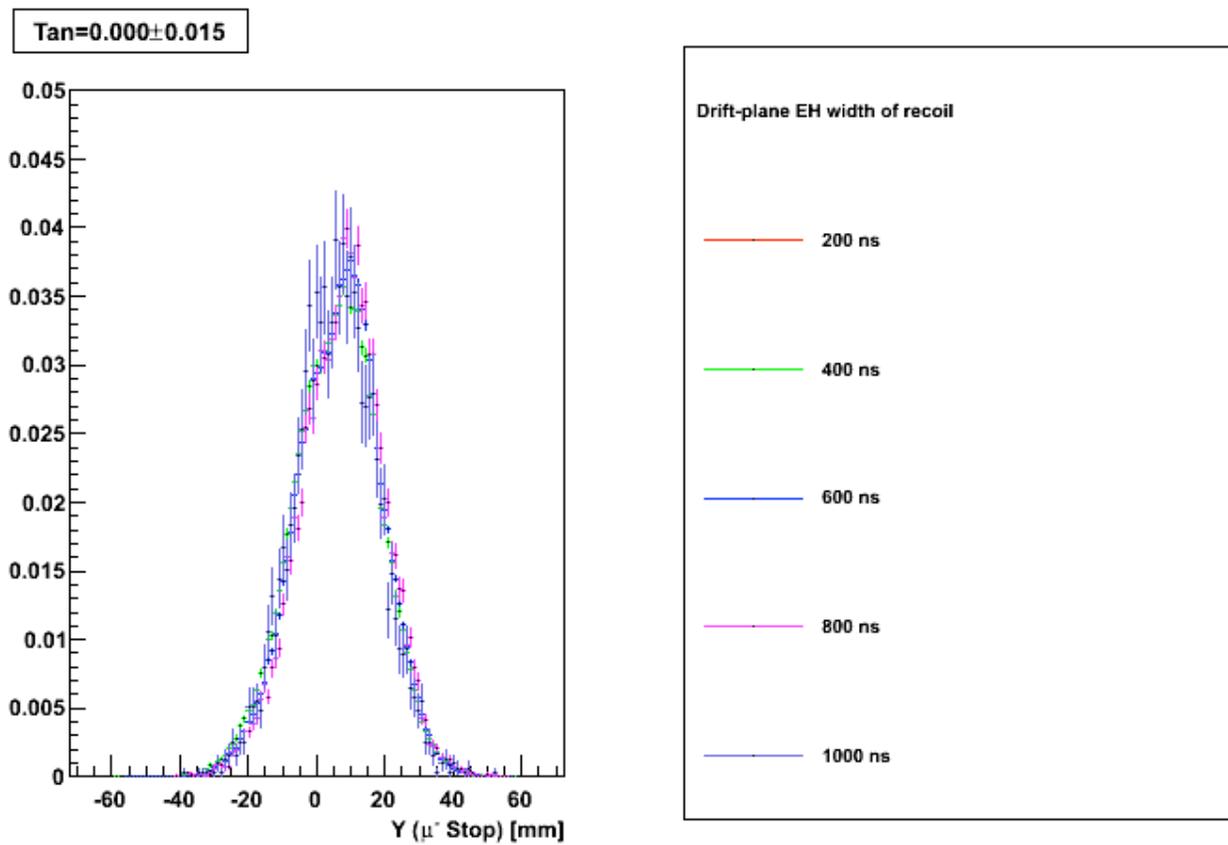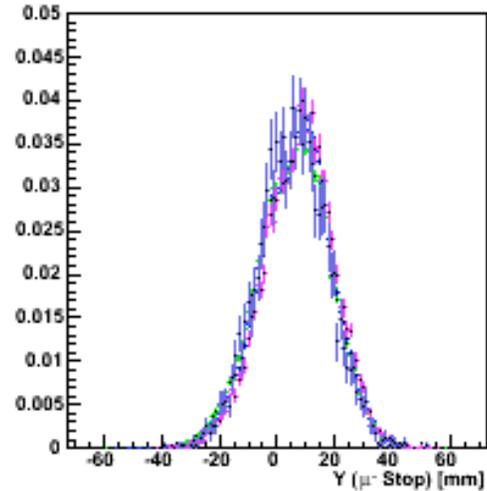
… Over a range of angles.
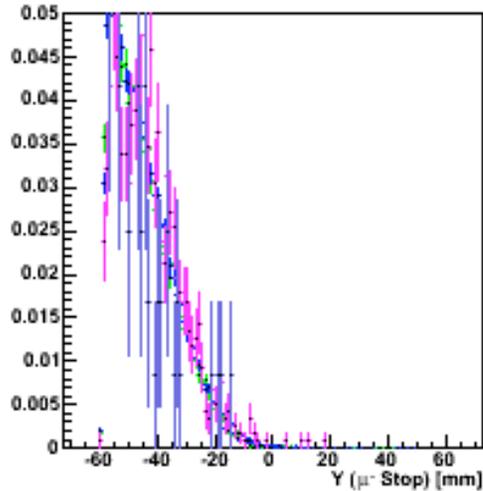
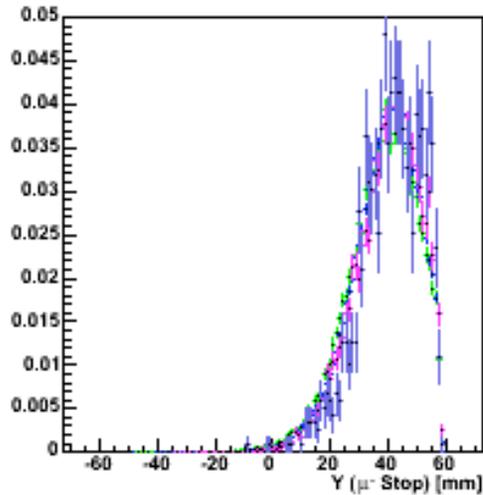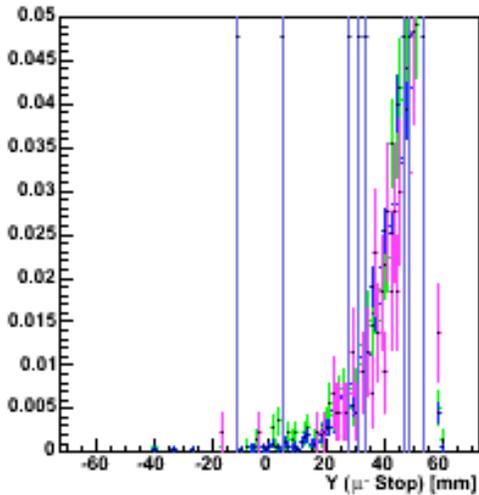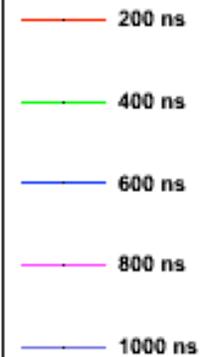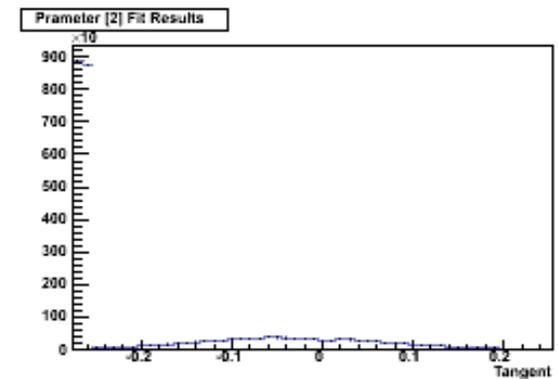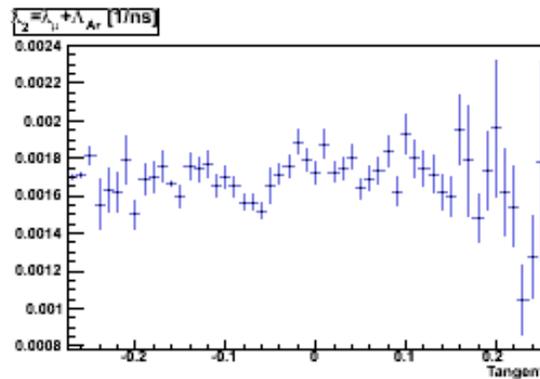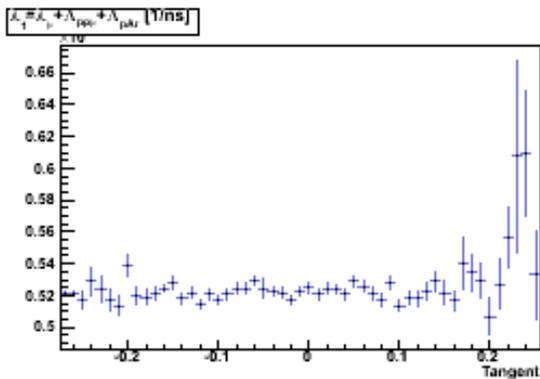# Capture time-spectrum fit scan vs. tangent: Not a significant level of discrepancy at the level of statistics available.

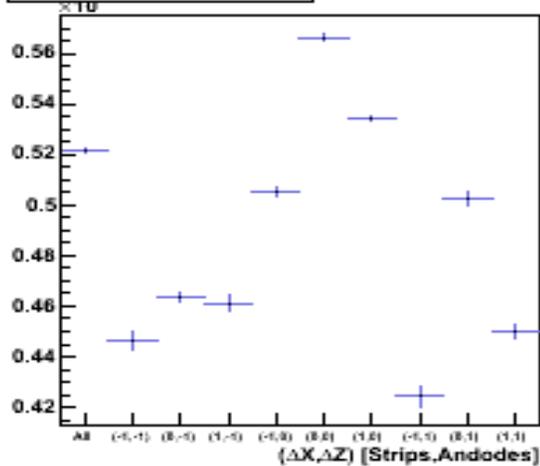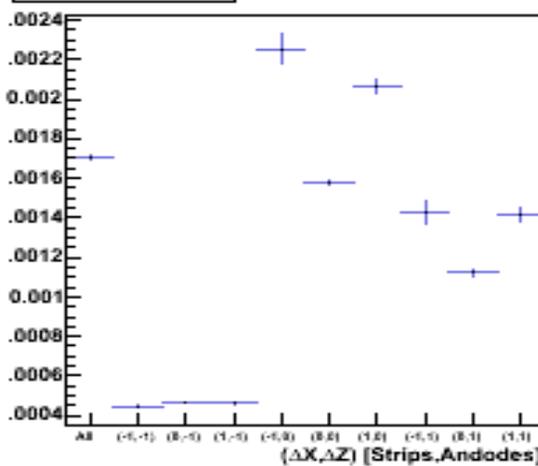## (Bin Ordering: All, tan = ± 0.25, tan = # ± 0.005)
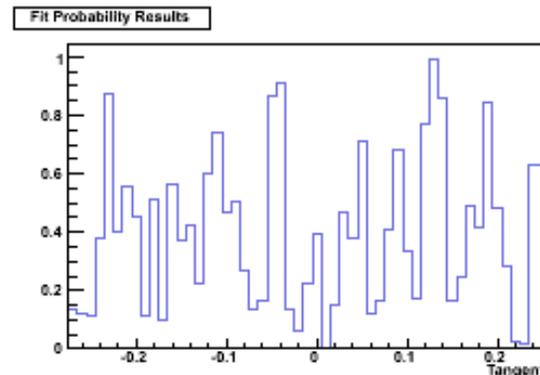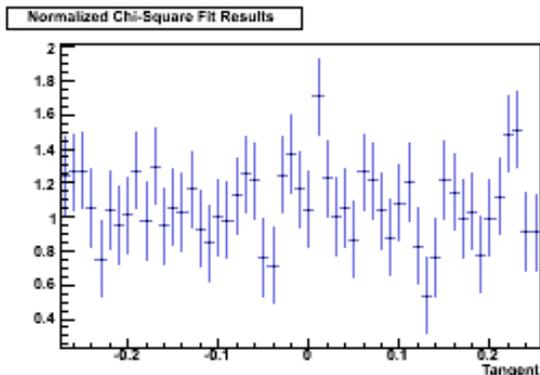
Conclusions

• Changing the definition of the capture-recoil pulse-width in Y will not resolve the variations observed in the μ^- stop Y distribution.

• A selection cut on the angle of the μ^- entrance in the vertical YZ plane "resolves" the discrepancy in the μ^- stop Y distributions. Can the TPC now be fully exonerated from strong longitudinal-diffusion effects? This is the question. Is there another way to look at this Y/YZ-plane-tangent space?

• Might we require an improvement to the μ^- stop Y definition to establish better capture-time definition consistency?

The fit scan over the nine center most bins shows a large amount of inconsistency. (Does not change with a small angle cut, or changing to an EH-EH coincidence condition.)
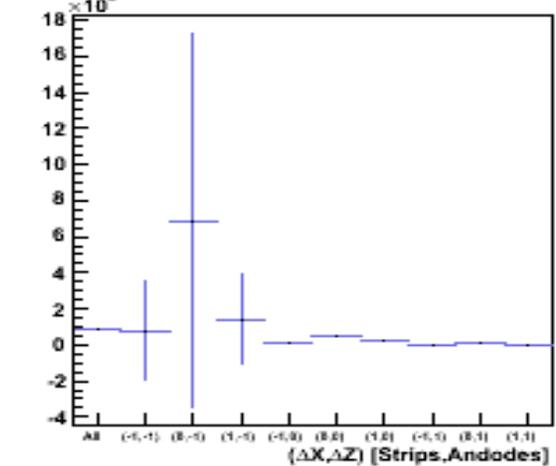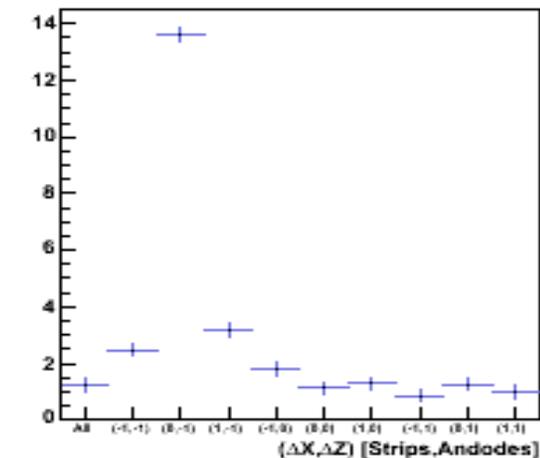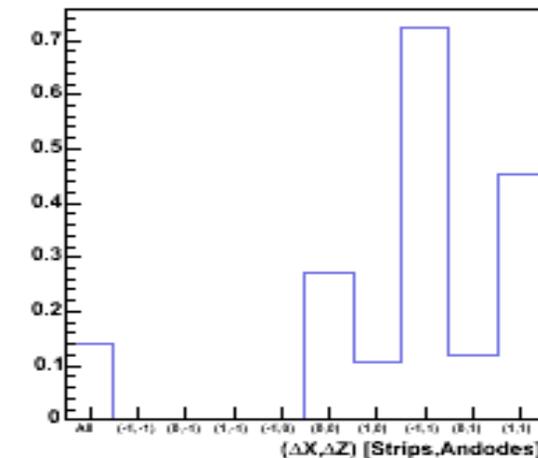
A more significant anomaly is found with the displacement of the capture recoil relative to the muon stop.
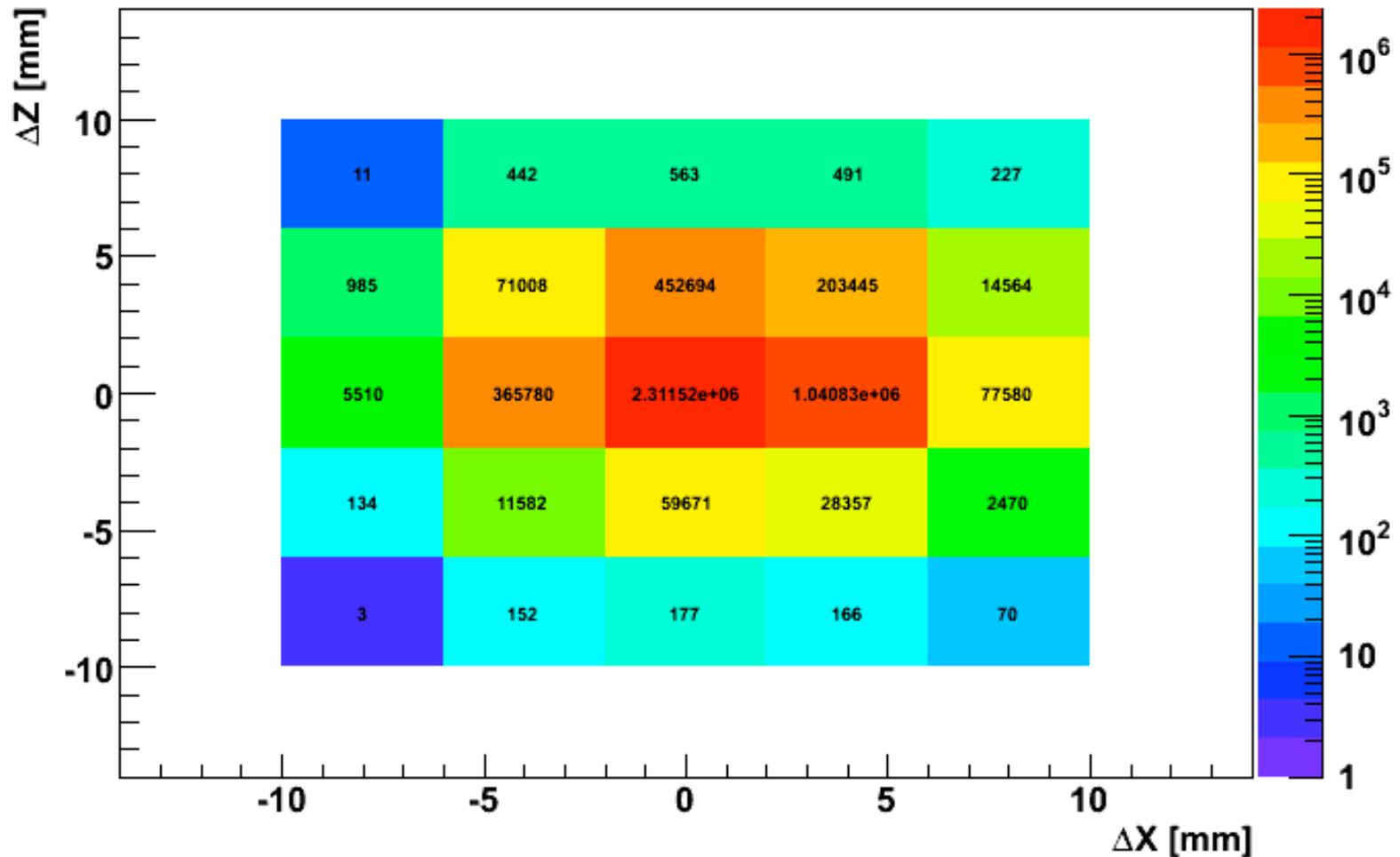
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• The X and Z displacement inconsistencies are far more significant than any seen vs Y, YZ plane tangent or the drift-plane EH threshold width of the capture-island.