Ndlar_flow: update

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From last discussion

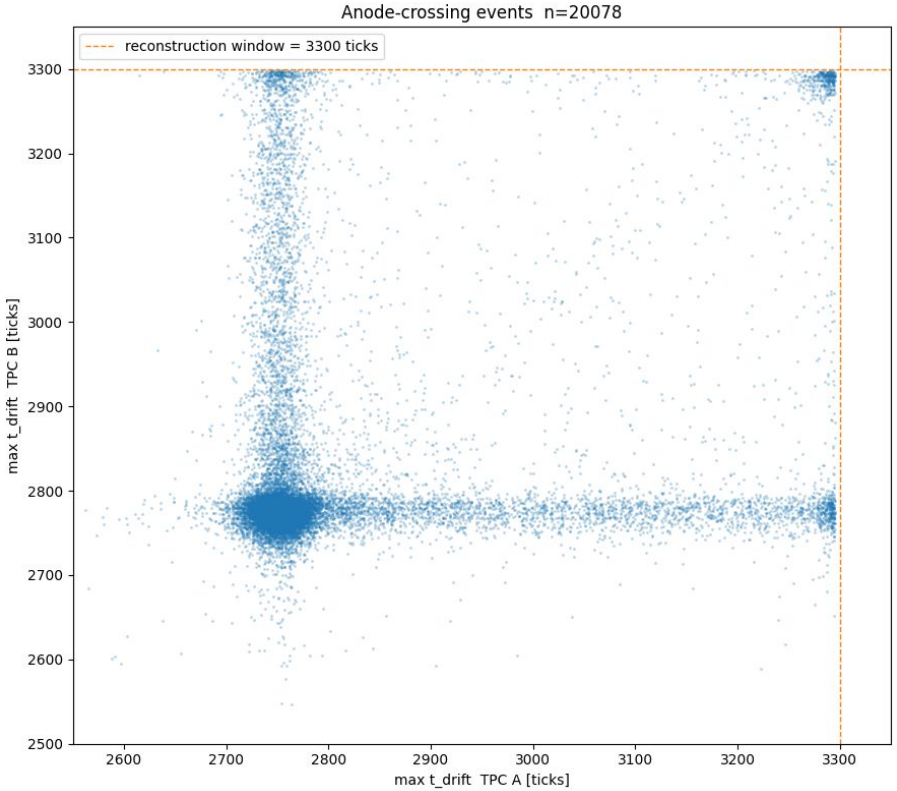
Very strange event times/x-position reconstructions of F18 data are due to event window staying open too long

- Hard coded the event window to 3300 ticks (3.3 us) in the event builder
- Found option in yaml to set event window manually and toggle extensions of event window on/off…

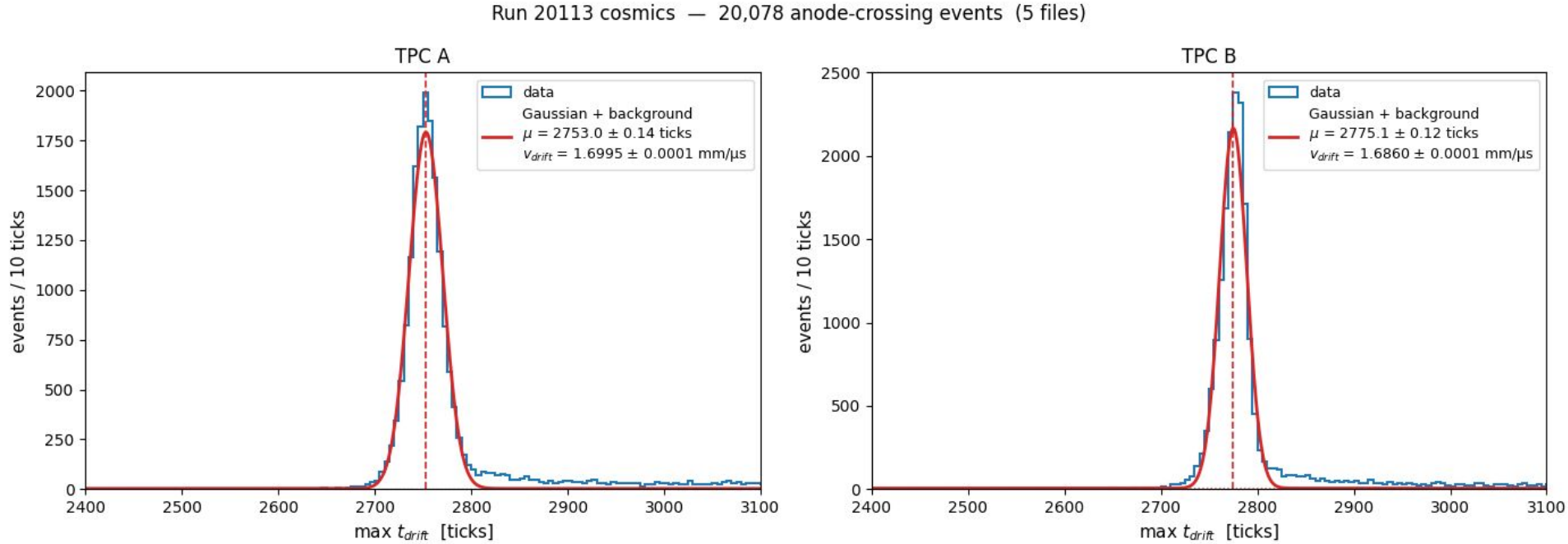
Problem: Now that the event window is fixed, are we sure that the x position is correct? V_drift could still be wrong!

Find the actual v_drift in FSD

- Calculate the max drift time for anode-to-anode crossing cosmic events
- Use 5 cosmic runs and not F18 runs (F18 data triggered on a gamma from the decay and not on t_0 form the cosmic event)
- Compare the max t_drift time per TPC and compare



Find the actual v_drift in FSD



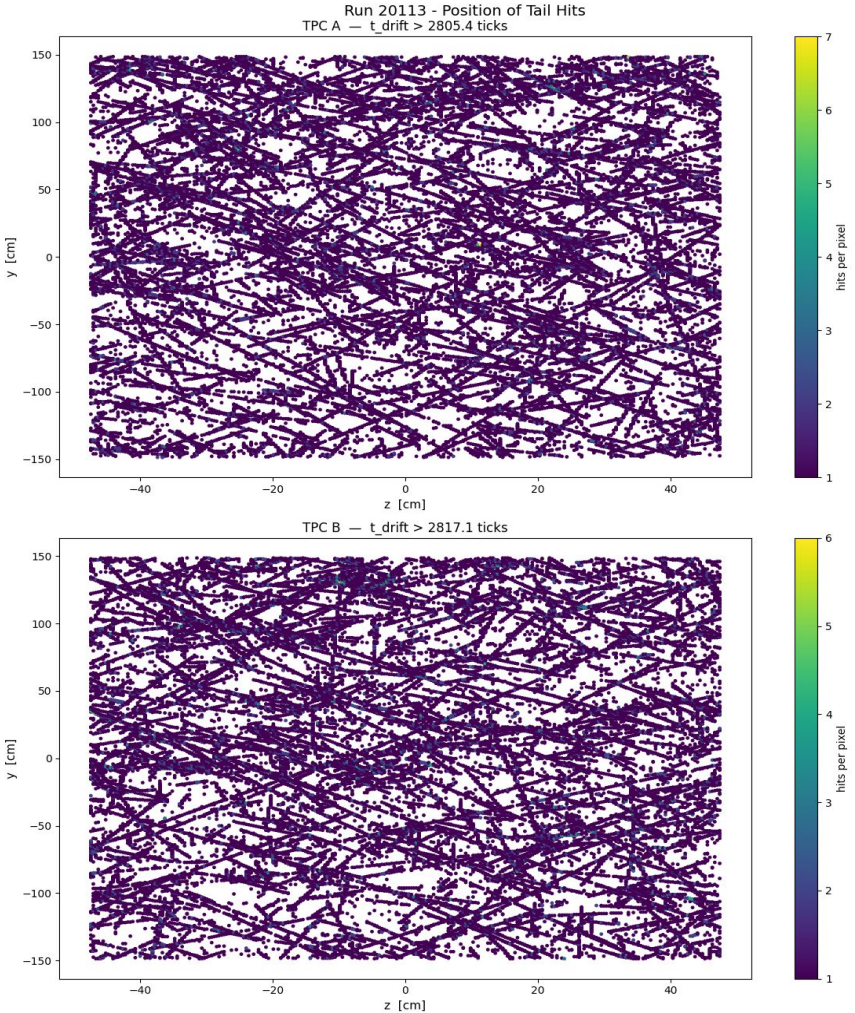
Both differ from nominal v_drift [1.680, 1.683] mm/us

Analysis of right tail

Looked at events that were beyond 3σ from mean μ in each TPC.

→ No outlying pixels can be seen!

→ Likely some random blip or another cosmic event entering TPC after the primary muon's trigger and adding a δt to the original event (as long as it happened inside of the event window)



What this means

- V_drift has to be changed for the next flow of F18 or else:

  $\Delta\mu$ = 22.1 ticks $\rightarrow$ Δt = 2.21 us $\rightarrow$ Δx = 2.21us * 1.69mm/us = 3.76 mm

  $\Rightarrow$ Displacement of x position in TPC A larger than a pixel

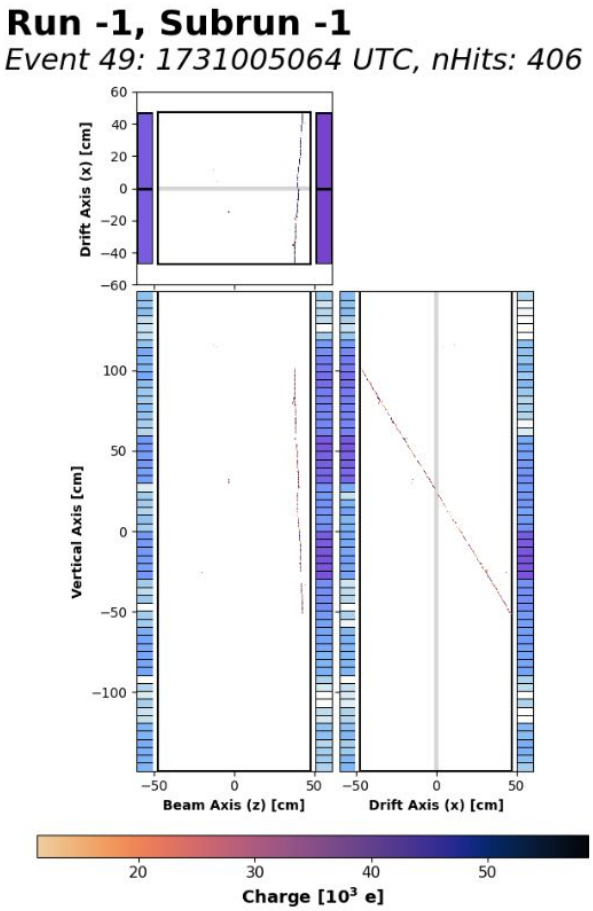
- Is this difference in v_drift between the TPCs a sign of electric field inhomogeneities?

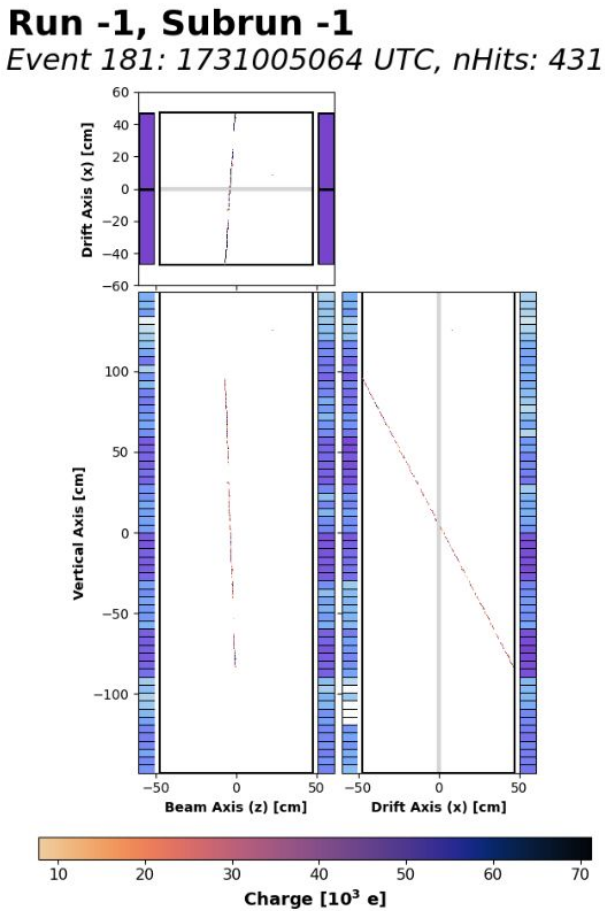
- Next steps (after my exams): reflow F18, exclude all cosmic events

Backup: Anode-to-anode selection

- Only select events with hardware trigger (t_0 from light)
- Mask some pixels that fired randomly
- > 200 hits in an event, > 20 hits per TPC
- Both TPCs must have hits close to anode
  - min hits = 5 during min t_drift < 200 ticks → ~ 3 cm from anode
- Both TPCs must have hits close to cathode
  - min hits = 5 during max t_drift > 2500 ticks → ~ 42 cm from anode (out of 46.8 cm)

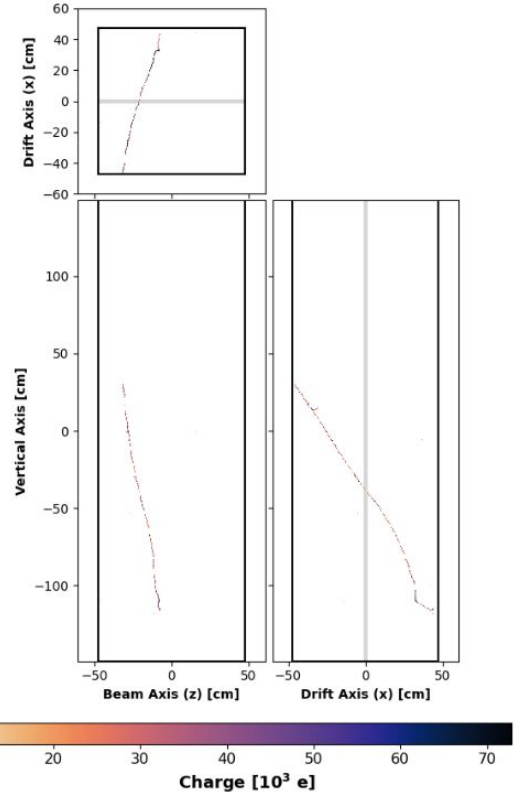
Backup: Example of “good” events



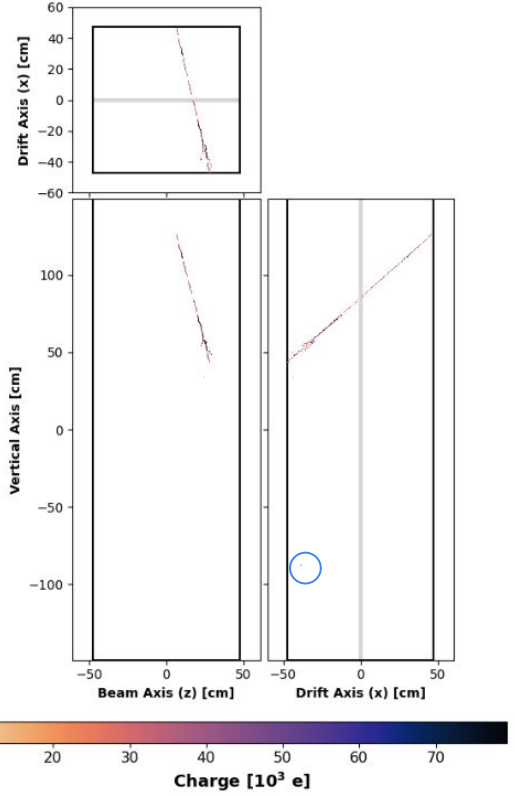


Backup: Example of “bad” events

Run -1, Subrun -1
Event 714: 1731005066 UTC, nHits: 413



Run -1, Subrun -1
Event 1226: 1731005067 UTC, nHits: 367



Run -1, Subrun -1
Event 1785: 1731005068 UTC, nHits: 300