TRIGGER-DEPENDENT VDC TIME OFFSET

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Hall A VDC single plane

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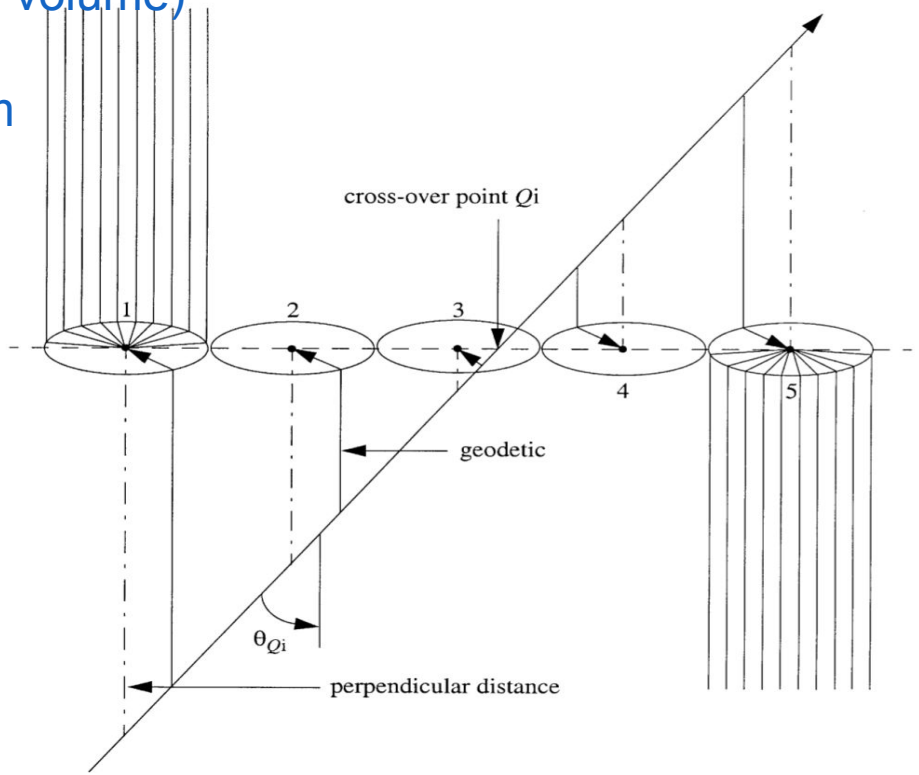
VDC gas: 50-50 Argon-Ethane (by volume)
VDC HV: -3.5 kV
VDC single plane thickness: 26mm



- 3 – 7 wires are fired
- TDC records hit time → subtract t0 to get drift time
- Convert drift time to drift distance (provided drift velocity)
- Fit drift distance to find intercepts

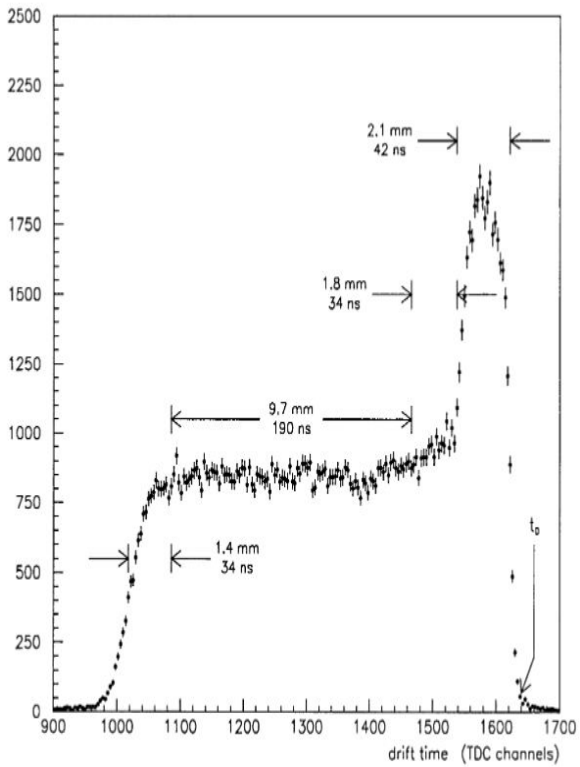
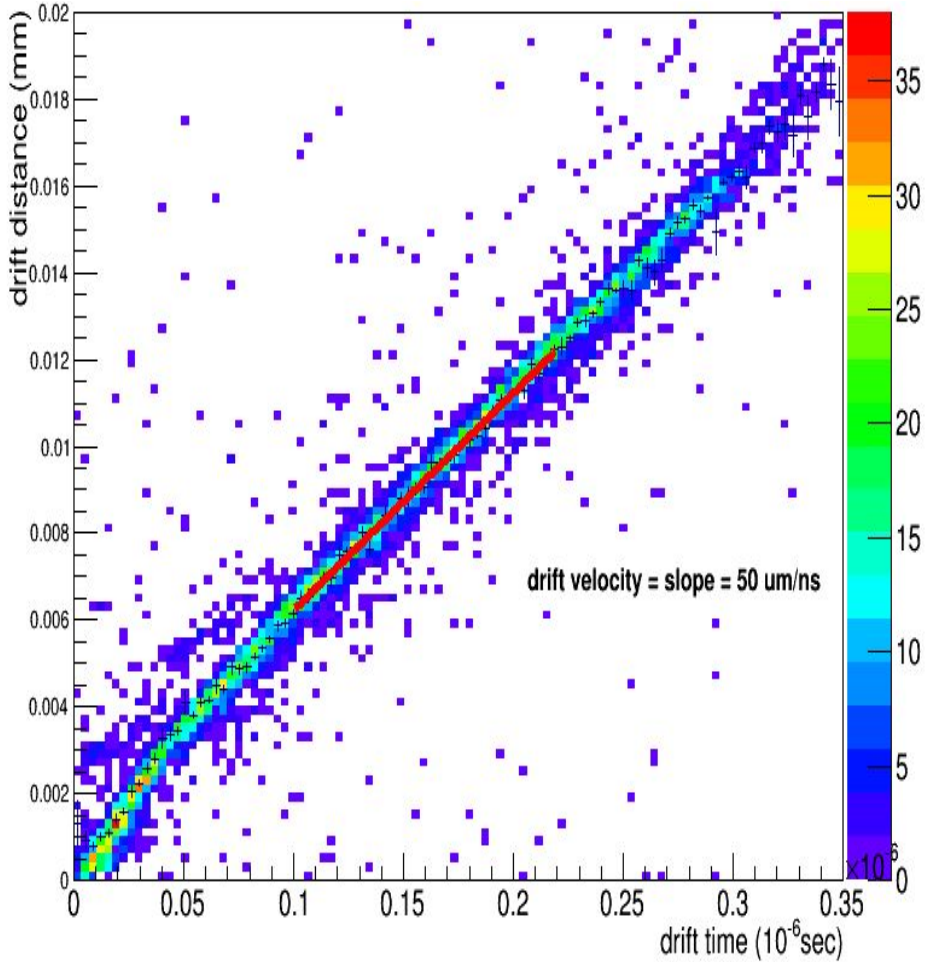


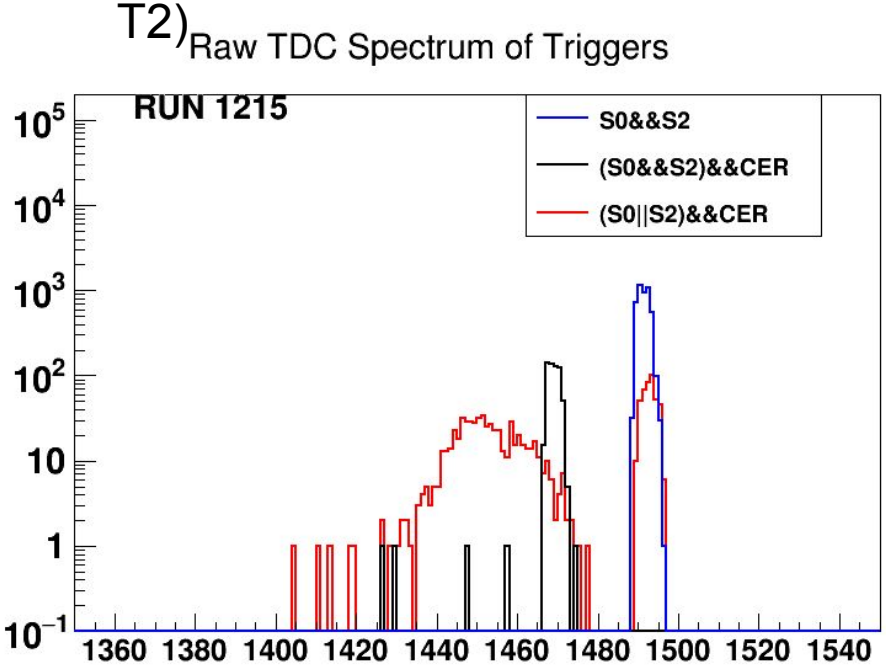
Fig. 17. A single-wire drift-time spectrum. The TDC is operated in common-stop mode, so that short drift times occur at large TDC values. A single time bin is 2.0 ns. The timing reference point t_0 is located at channel 1640.

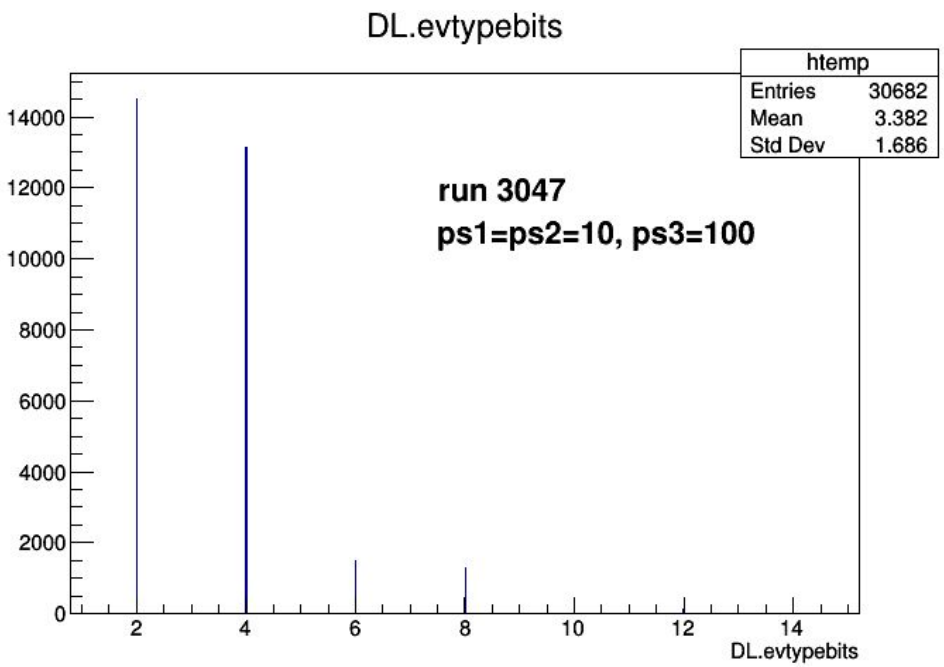


The t0 is fixed for a given wire. But the raw vdc time spectrum will have:

1. +-5ns jiggling due to the cable length to different s2 paddles

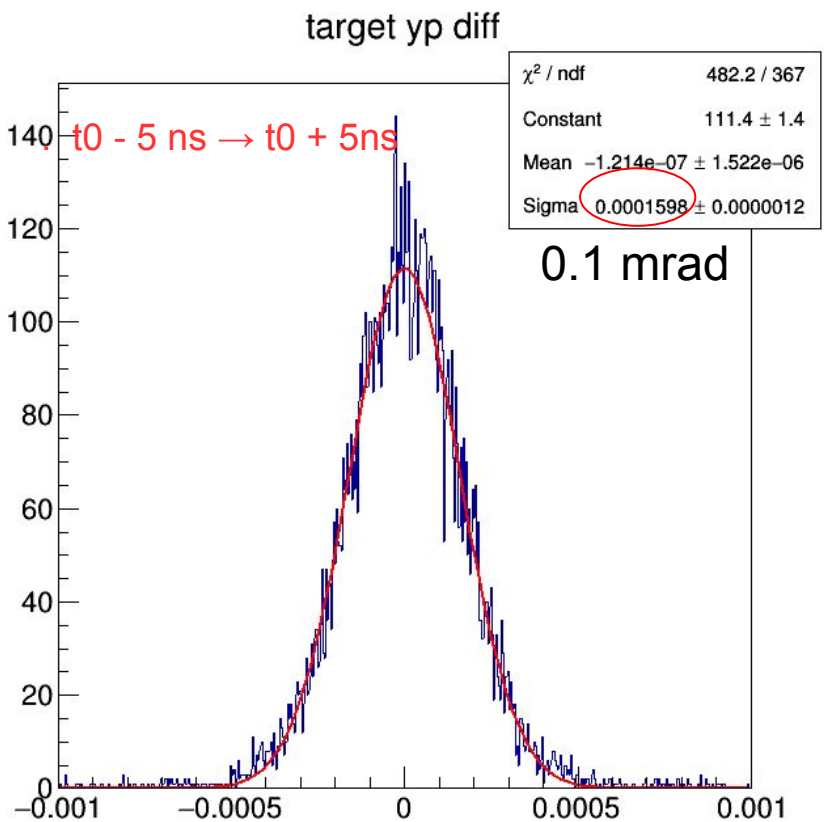
2. When triggers are prescaled, a time shift due to trigger type (10 ns b/w T1 and T2)

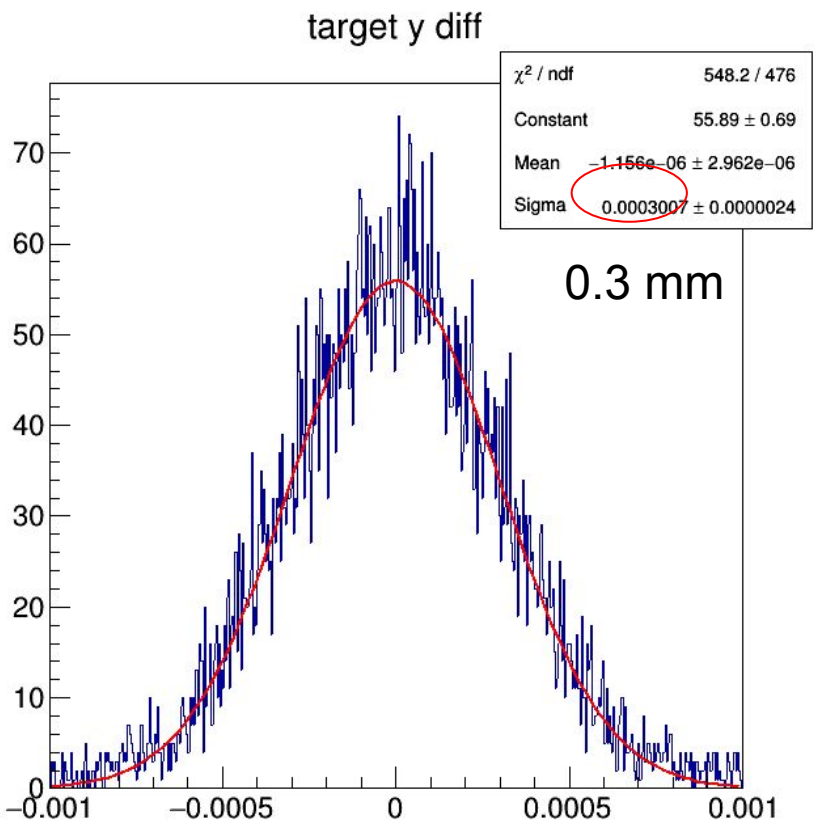




Q: Will the trigger time change affect VDC tracking?

– No obvious change in reconstructed target variables





Q: Will the trigger time change affect VDC tracking?

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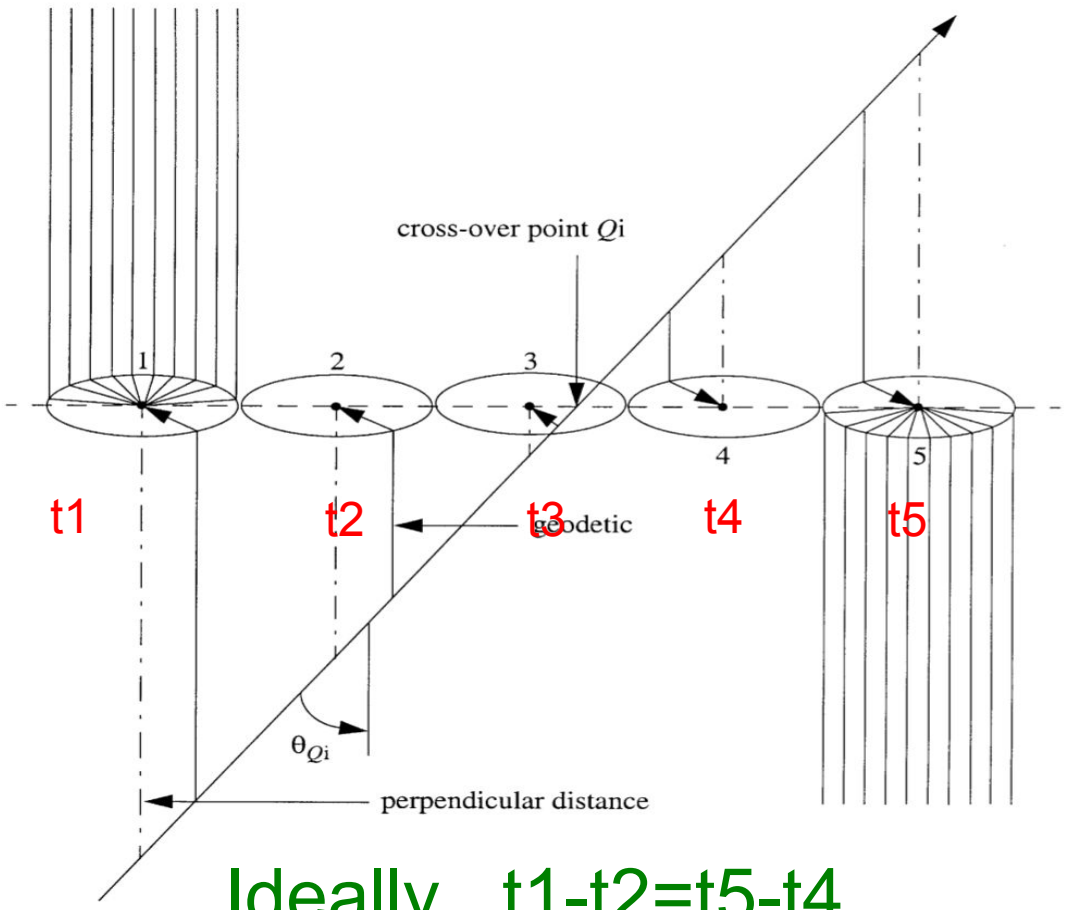
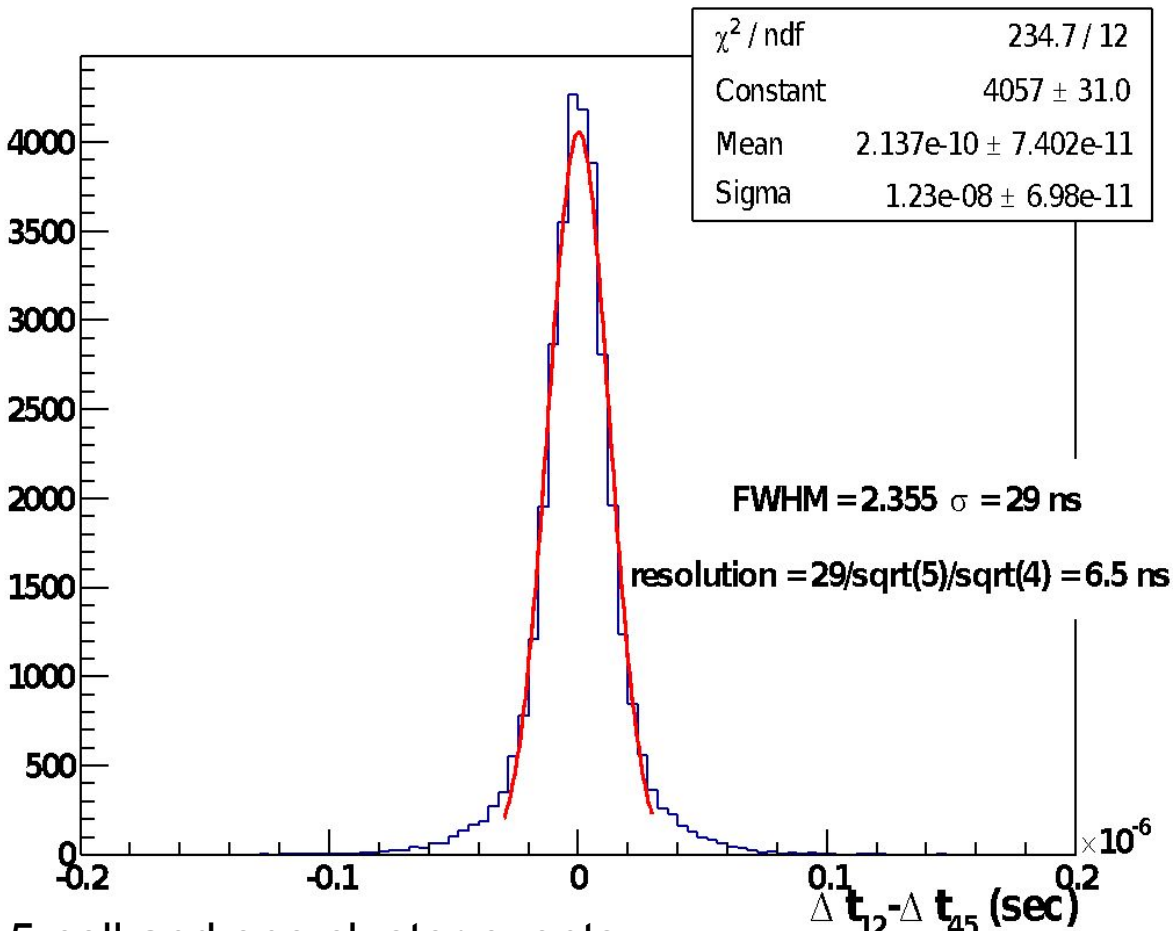


Drift time: t1 t2 t3 t4 t5

Ideally, t1-t2=t5-t4

Q: Will the trigger time change affect VDC tracking?

– *10 ns change is the same order as VDC time resolution*



With 5-cell and one cluster events

Q: Will the trigger time change affect VDC tracking?

-Analyzer tracking algorithm is robust ?

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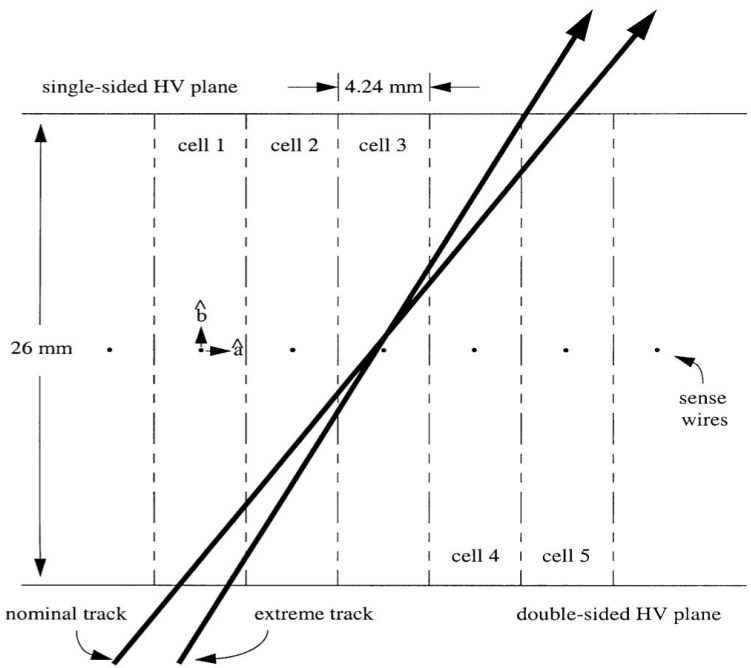
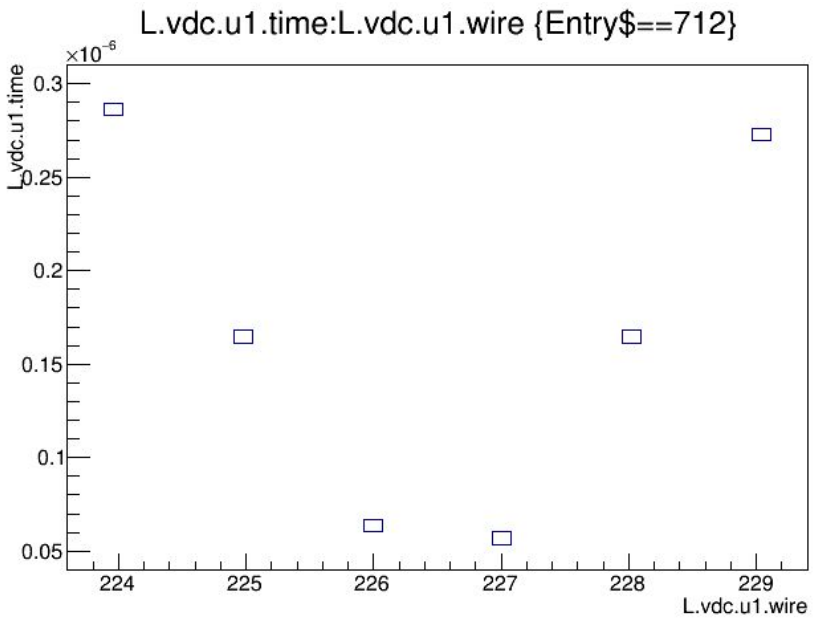


step 1: For each fired wire, find drift time



step 2: For each plane, find V shape cluster, fit good cluster to get intercept point and drift distance

Q: Will the trigger time change affect VDC tracking?

-Analyzer tracking algorithm is robust ?

step 3: For each VDC chamber (1 u plane and 1 v plane), pair the intercept point to get a local track. Project local track to s2 position to get rid of extreme track.

step 4: Pair local tracks from upper and lower chamber, fit to get global tracks. Check the track quality by projecting the local track from one chamber to another and compare the projection to the global track point. Tracks are ranked by the sum of differences.

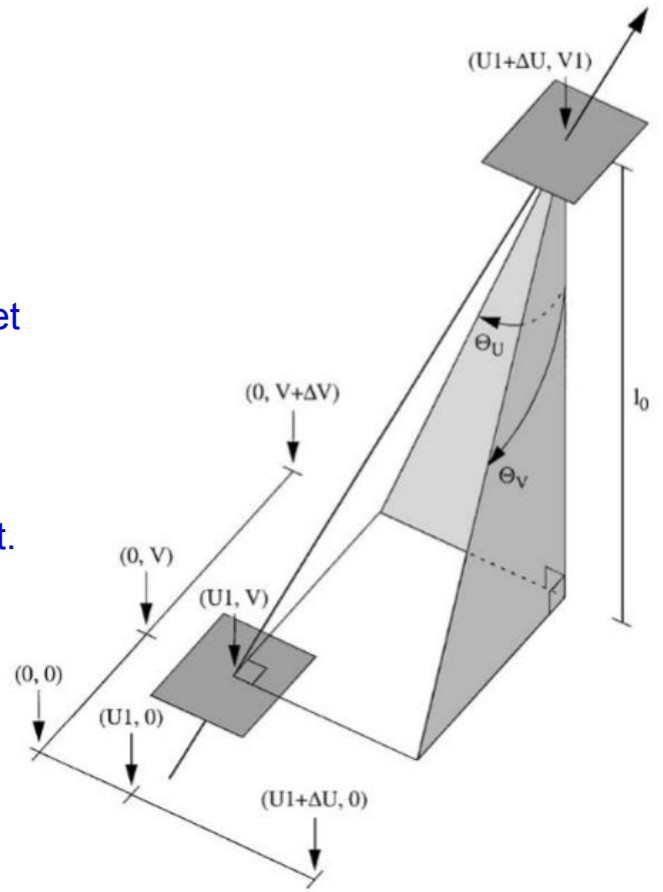


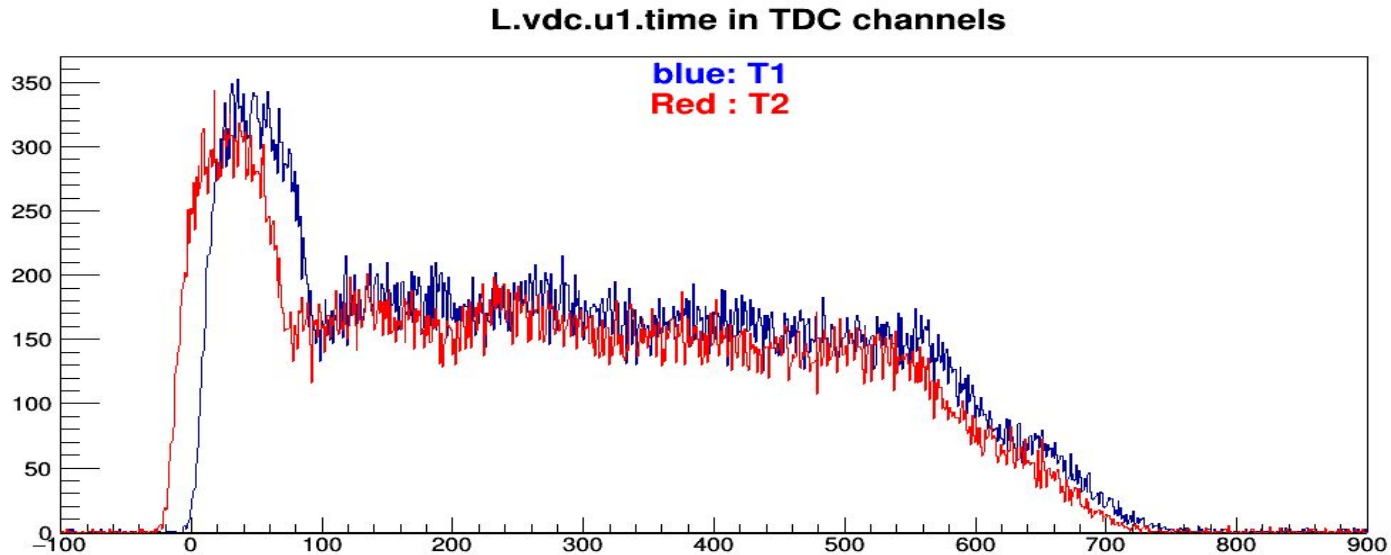
Fig. 16. Geometrical projection of the trajectory coordinates measured by the $V1$ plane into the $U1$ plane using the global angles Θ_U and Θ_V.

Just to be careful… Work with ThaTriggerTime.h

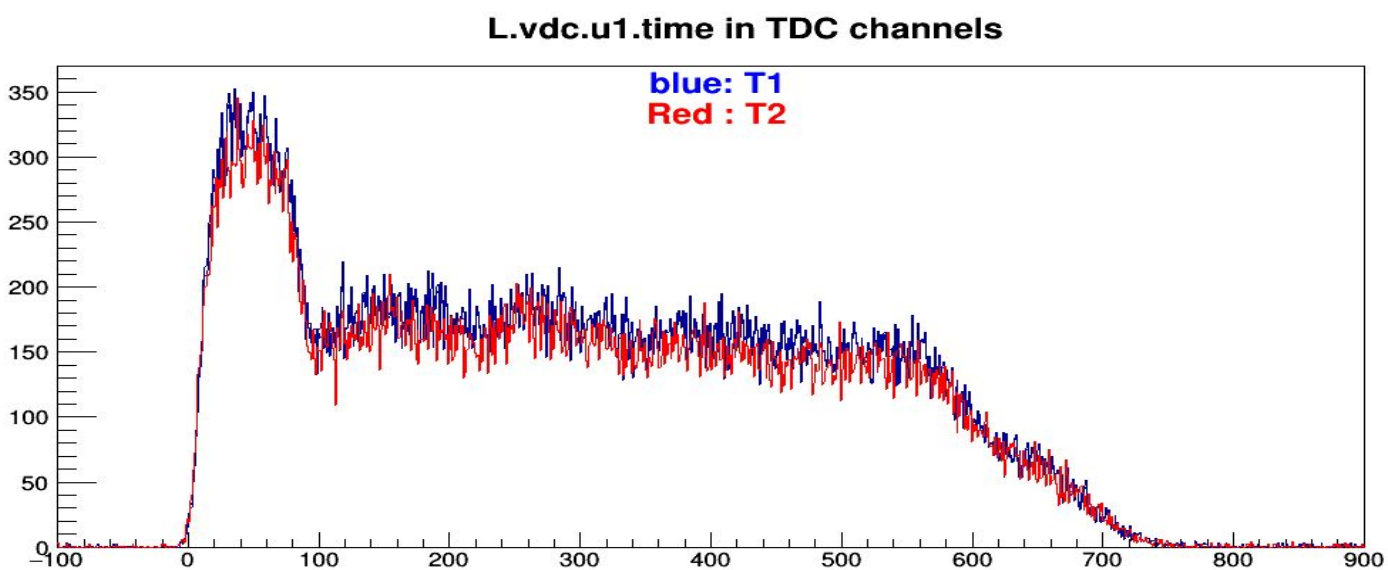
Drift time = (rawtime – t_0) * TDCresolution - triger_shift

```
db_L.trg.dat:

# TDC resolution (s/channel)
L.trg.tdc_res = 0.5e9
L.trg.common_stop = 1

# Global offset (s), shared by all triggers (optional, zero if not given)
L.trg.glob_off = 0

# 5-tuples of trigger numbers, time offsets, TDC channels.
# Trigger numbers not specified are assumed to have offsets of zero.
# trigger number, offset (s), crate, slot, chan
L.trg.trigdef =
  1   0e-9       5      16      0
  2   -10e-9     5      16      1
  3   0e-9       5      16      2
```

Before Trigger Correction



After Trigger Correction



Bottom Line:

1. Trigger jiggling from s2 shows very small (if any) impact on tracking
2. For runs with prescaled T1 and T2 (e.g. Boiling runs in December), we can use the triggertime class to adjust the VDC timing offset

TO DO:

1. Better understanding of tracking - timing relation.
2. how to deal with trigger 3 time jiggling?

Thank you