BB Analysis for d_2^n

Reconstructed Tracks, T2 Trigger

Matthew Posik

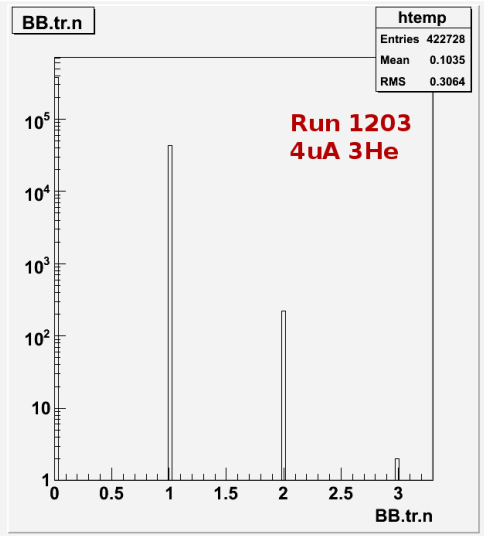
[1] Temple University
Philadelphia, PA 19122

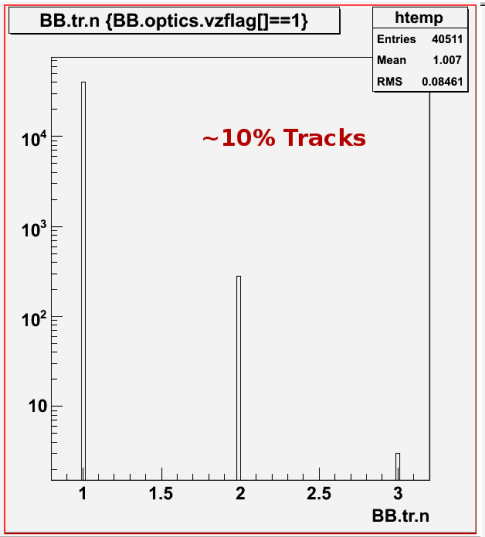
4/15/10

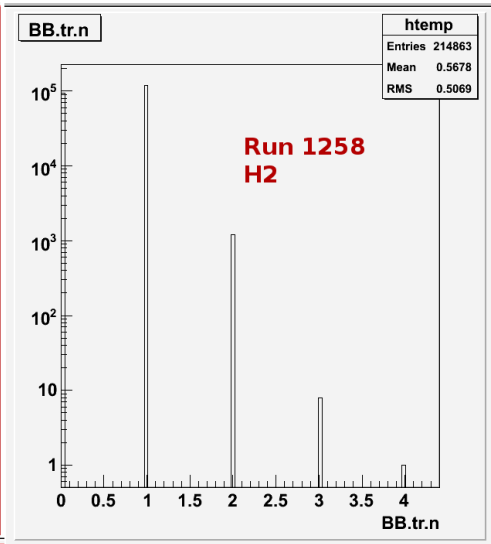
Outline

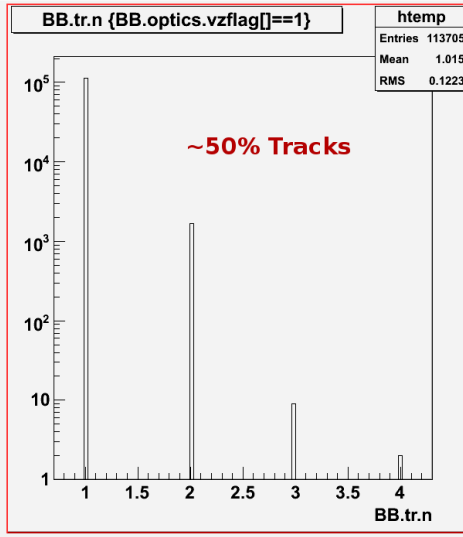
Reconstructed Tracks

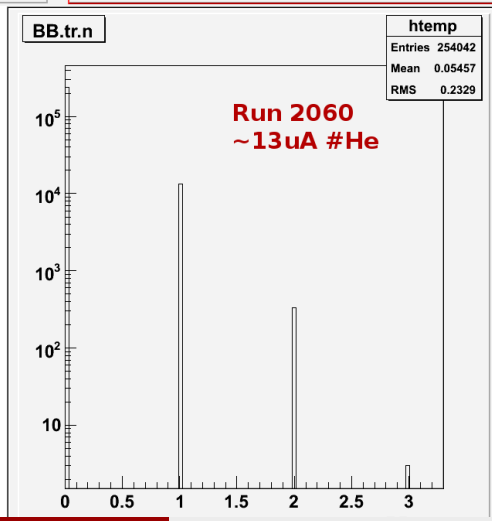
Plots of Reconstructed Track

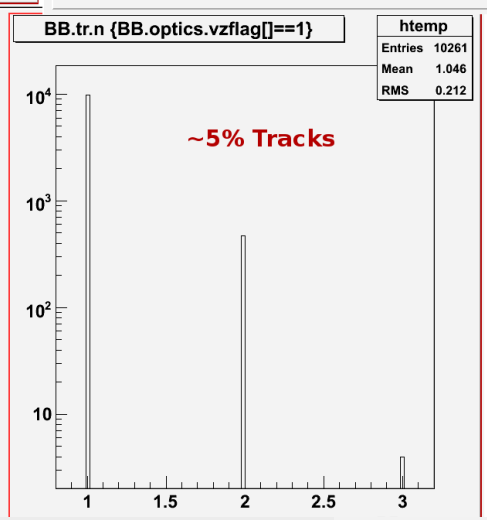












t_0 Offsets (1)

t_0 Check for various runs

- Plot the drift time for all planes in the 3 chambers and check the t_0 offset.
- This was done with three different runs:
  - 1203: 1-pass $4\mu A$ 3He
  - 1258: 1-pass H2
  - 2060: 4-pass $13\mu A$ 3He

t_0 Offsets (2)

Plots of Drift Time U1 Planes

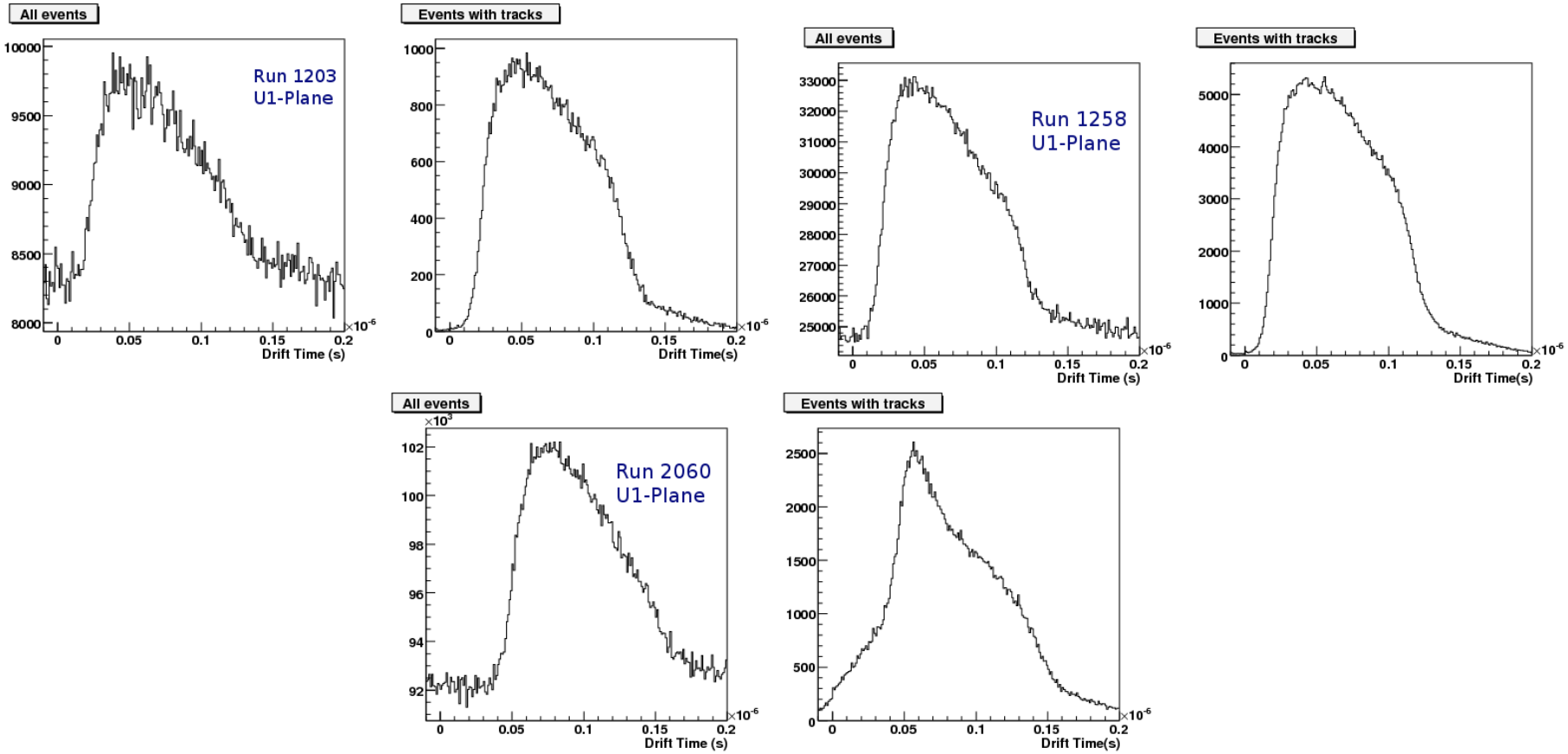


Figure: t_0 of u1 planes for runs 1203,1258 and 2060

t_0 Results

- The t_0 offsets for the low luminosity planes looks ok $\sim 10ns$ from 0
- The t_0 offsets for the high luminosity $\sim 13\mu A$ could use a little tweaking $\sim 40ns$ from 0
- I don't think this significantly affects the reconstructed tracks
- Run 1203 has similar t_0 as 1258 and sees much less tracks than 1258 [check this]

Residuals (1)

Residual Check for various runs

- Another important quantity other than t_0 is the track residual.
- The track residual is defined as the distance between the projection on the hit wire plane and the hit position(hit wire position).
- According to Xin residual resolution for each plane should be $\sim 200 - 250 \mu m$

Residuals (2)

Plots of U1 Plane Residuals

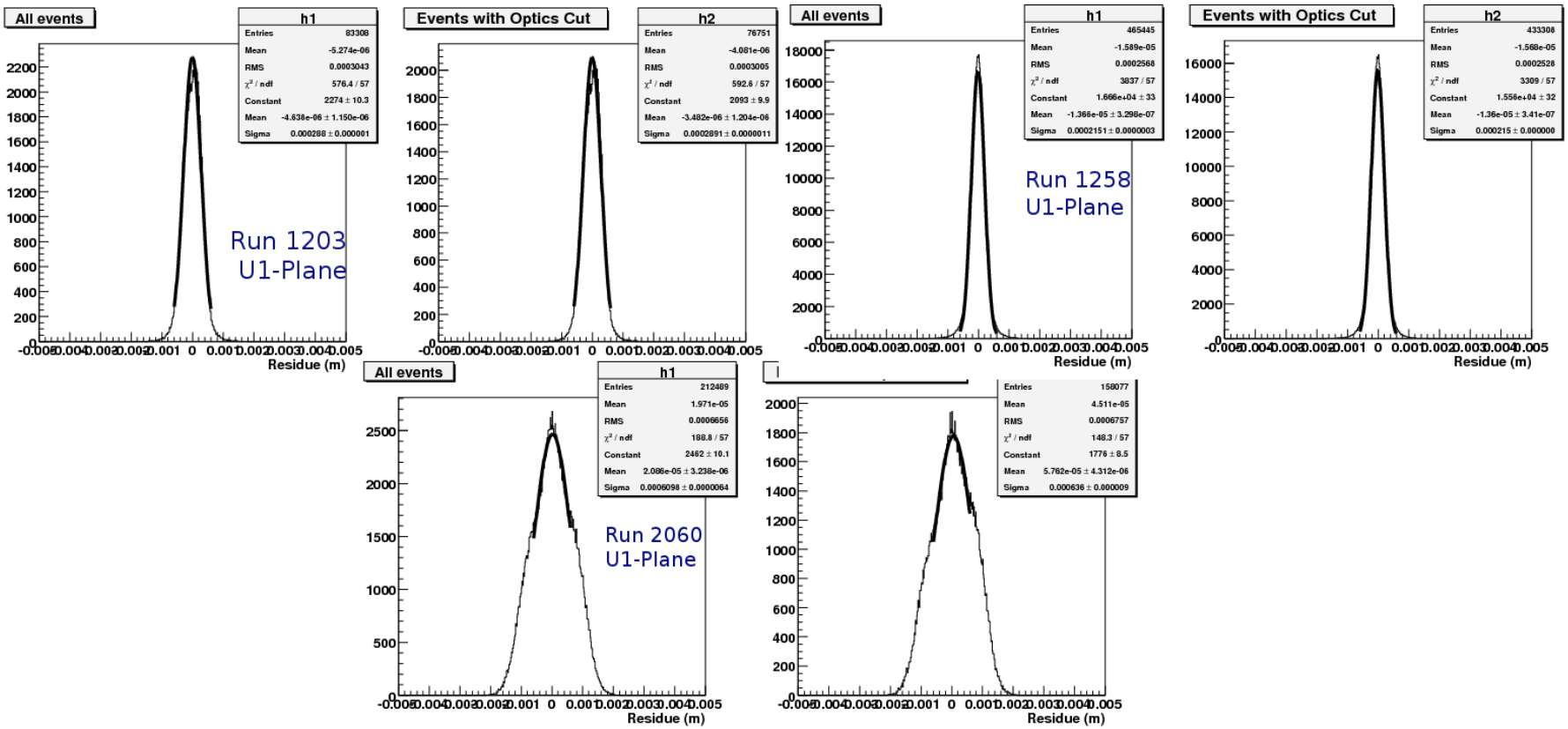


Figure: Residuals of u1 plane for runs 1203,1258 and 2060

Residuals (3)

Plots of V3 Plane Residuals

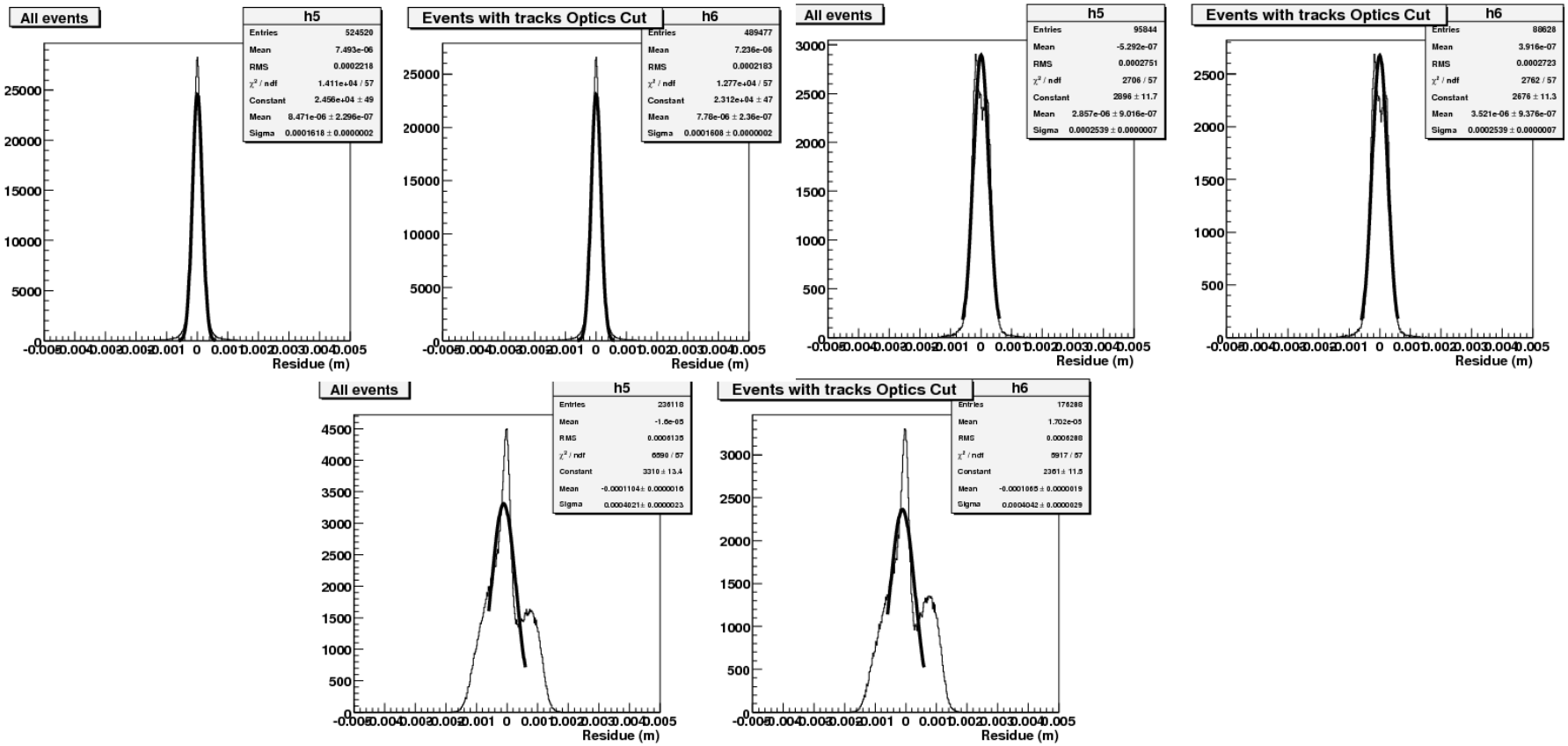


Figure: Residuals of v3 plane for runs 1203,1258 and 2060

Residuals Results

- Seems there may be a problem with the residuals during production runs (1203,2060)
- Xin only did d2n calibration for 1-pass H2.
- Will need to do a mwdc calibration for production runs.
- Also found Xin's event display code, which consists of the 3 wire chambers, scintillation plane, preshower and shower calorimeters. Will spend some time understanding his code to look at these three runs.
- Xin also suggested looking at the chi2/ndof of the tracks

MWDC Calibration Layout

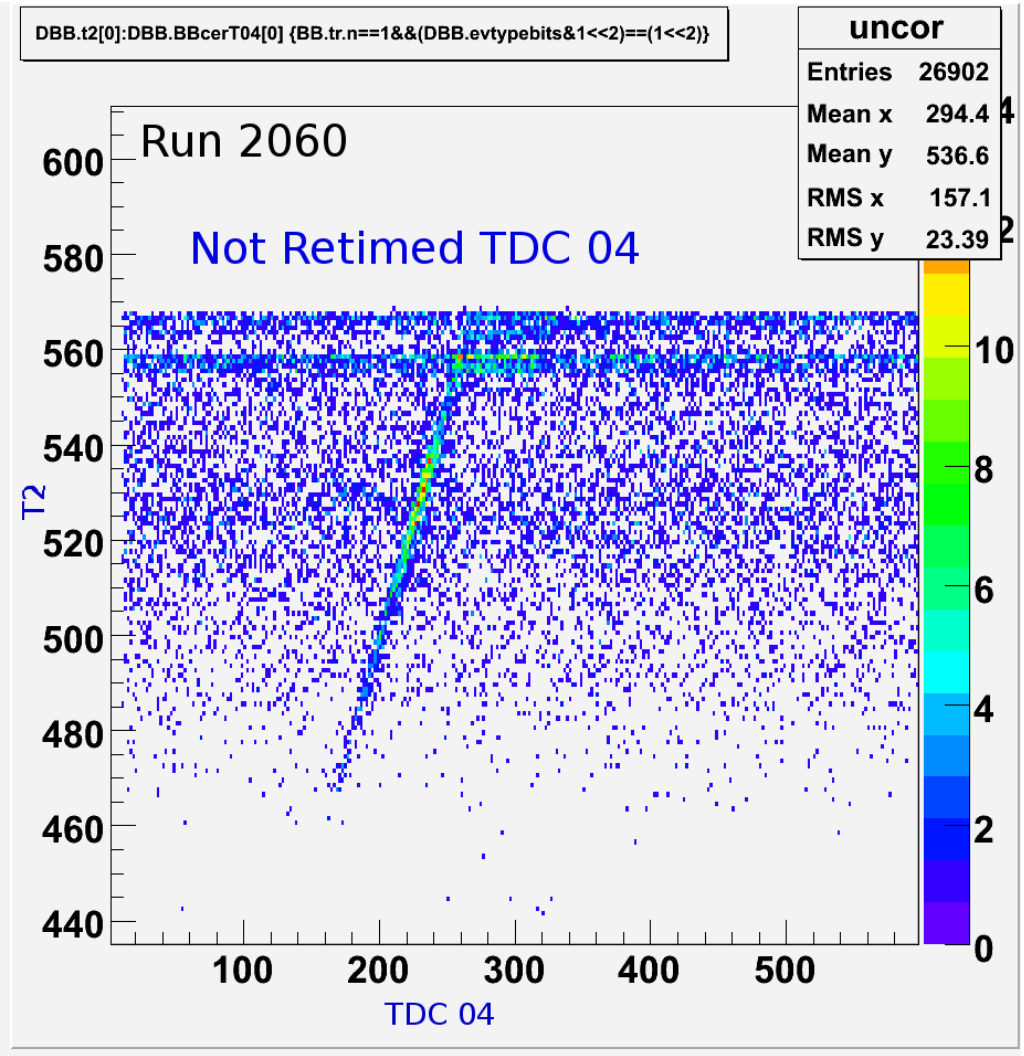
- Check for MWDC hardware changes and determine how many db files will be needed.
- Replay best tracks, with no missing hits ($\sim$100 runs)
- Drift distance to drift time conversion
- Fine tune wire positions
- Fine tune t_0 for each wire
- Check residuals, if good then finished. Otherwise redo calibration (iterative process).

T2 Trigger (1)

T2 Correction

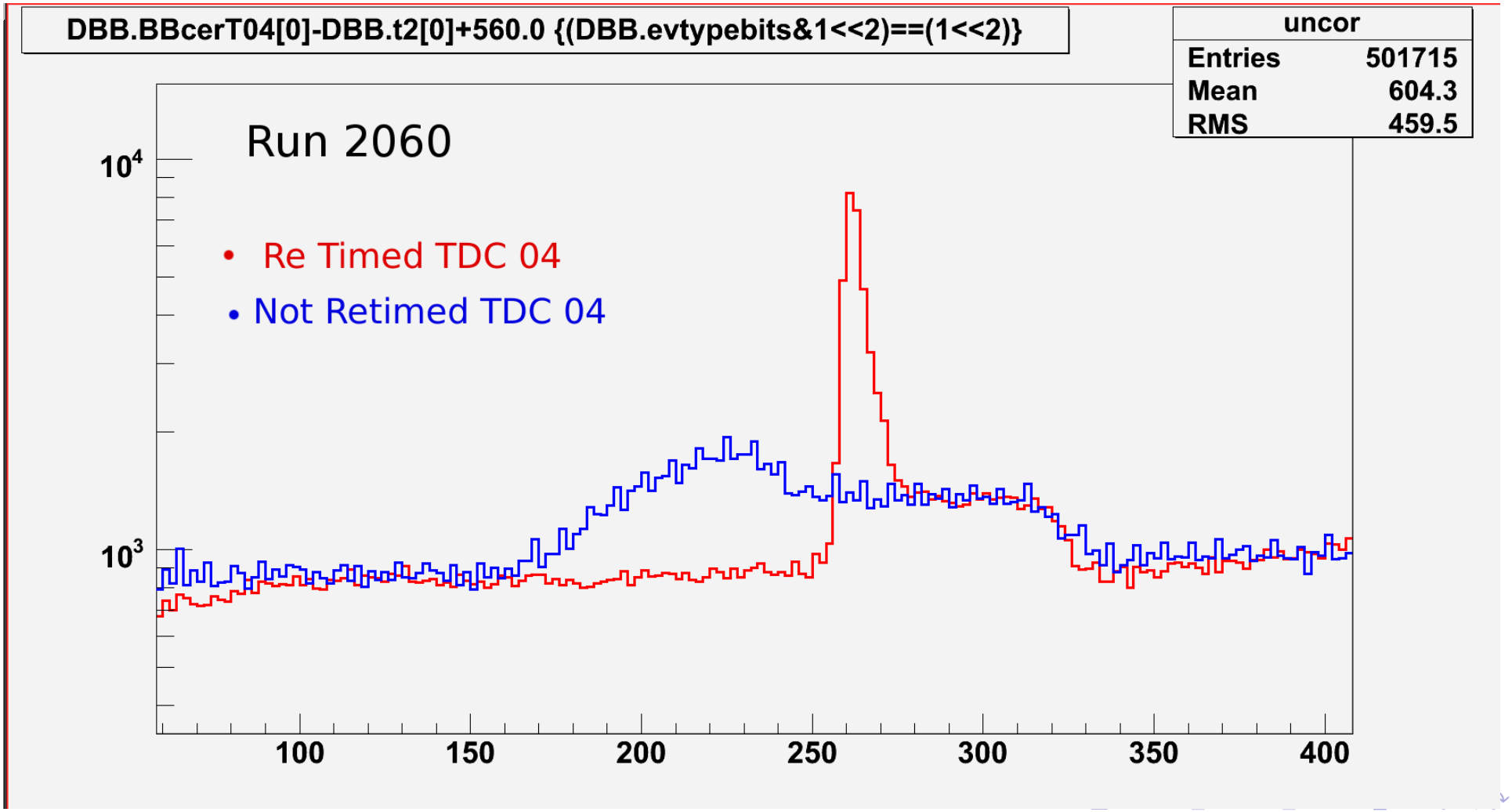
- Hardware retimes the T2 generated L1A with the T6 after the trigger supervisor,($L1A_{T6}$)
- This allows all of the TDC common stops and ADC gates to be timed of the Shower signal(T6)
- The walk in the T2 vs TDC plot shown last time just means that the T2 and TDC are moving together vs the $L1A_{T6}$, the TDC is generating a T2 for those events.
- We do not want to subtract the T2 timing off of those events.

T2 vs TDC


DBB.t2[0]:DBB.BBcerT04[0] {BB.tr.n==1&&(DBB.evtypebits&1<<2)==(1<<2)}
uncor
Entries 26902
Mean x 294.4
Mean y 536.6
RMS x 157.1
RMS y 23.39
Run 2060
Not Retimed TDC 04
T2
TDC 04
600
580
560
540
520
500
480
460
440
100
200
300
400
500
10
8
6
4
2
0

TDC

Remember the shoulder structure seen in the TDCs...



T2 Trigger (2)

T2 Shoulder

- So what is the shoulder structure that shows up in the TDC? Thanks to Brad we can finally answer that...
  - The shoulder events come in when the T2 has a fixed time relative to the $L1A_{T6}$,(T2 being timed off of the T6 part of the $Sh_{group} + Cer_{group}$ overlap)
  - These are random background events in the TDC arriving early at the $Sh_{group} + Cer_{group}$ overlap, timing of the overlap is carried by Sh_{group} (makes a T6)
  - The width of the shoulder should be the width of the Cer_{group} logic pulse at that overlap
  - Shoulder width is $\sim$30ns and the overlap is $\sim$35ns This matches!

T2 Trigger (3)

T2 Structure

- T2 does not have simple self timing peak because of the T6 retiming
- Still don't understand:
  - Horizontal band at T2=565 (T1/T7?)
  - Slight slope between two horizontal bands
- Not sure where to go next with the T2

Summary

- Reconstructed Tracks
  - Found that MWDC needs to be calibrated for production runs
- T2 trigger
  - T2 trigger does not have to be retimed with the T6, as previously thought

What's Next?

- Look at chi2/ndof for tracks
- Calibrate MWDC
- Use Xin's event display to look at runs
- T2?