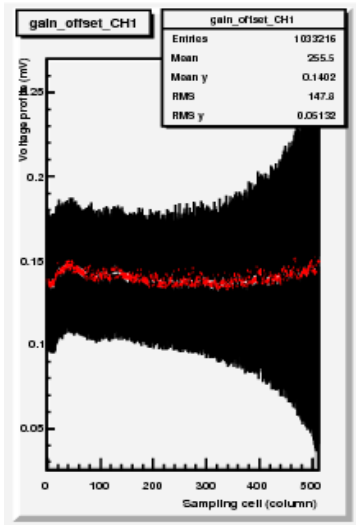
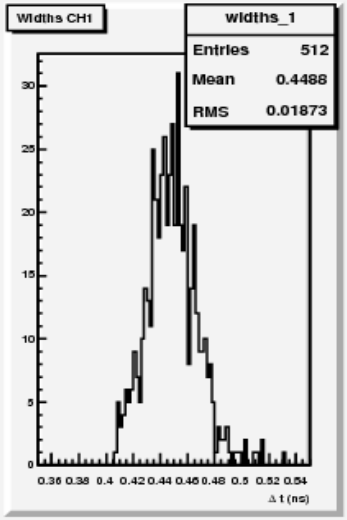
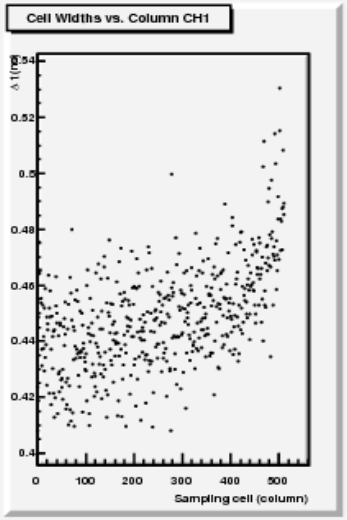
TARGET Calibration

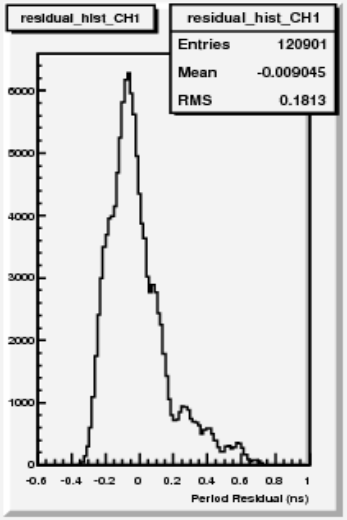
- Used (roughly) same method from code snippets of Jihane:
  - Find zero crossings of input sine wave (135 MHz).
  - Since near the zero crossings, sin x $\approx$ x, voltage difference is proportional to the Δt value.
  - Average time per bin: calculated from average number of bins between zero crossings and known input frequency.
  - Actual time per bin: average voltage difference for that bin / mean voltage difference for all bins * average time per bin.
- Added step:
  - Waveforms first must be corrected for mean offset and gain.
- To check performance:
  - After calibration, use the same data to determine the period of the input signal. Subtract from this the known period to calculate a residual.

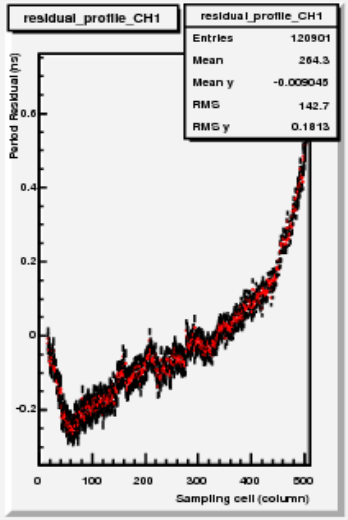
Calibration Results

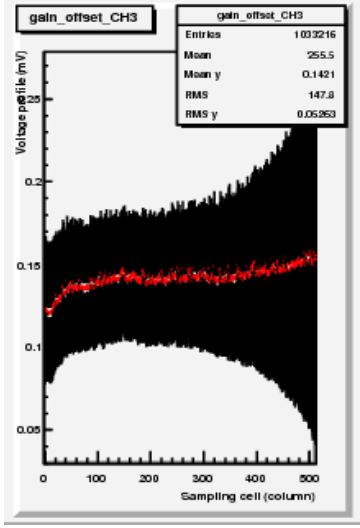


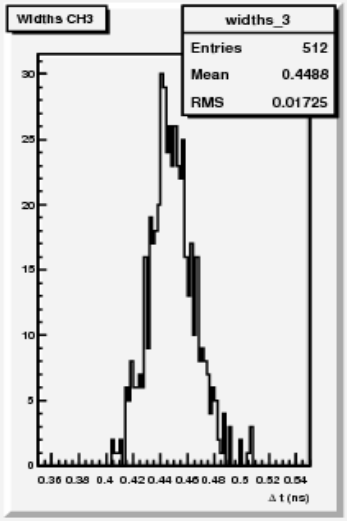


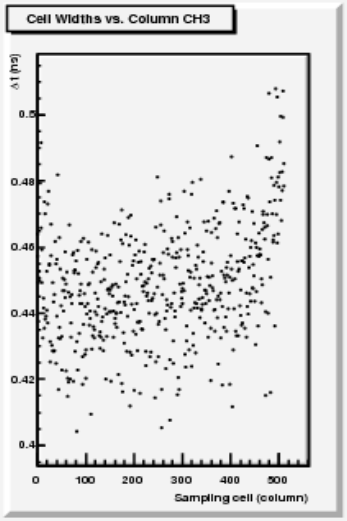


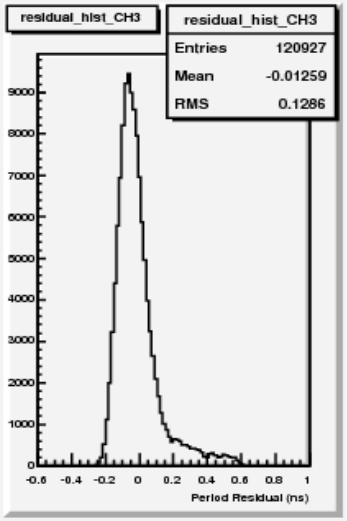


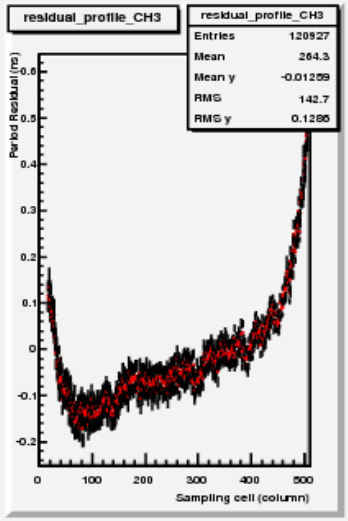












V profile v. sampl. cell

Significant offset from 0. Significant gain variation!

Δt histogram

~17 ps RMS

Δt v. sampl. cell

Some structure still appears… correlated w/ gain & offset.

Residual on meas. T

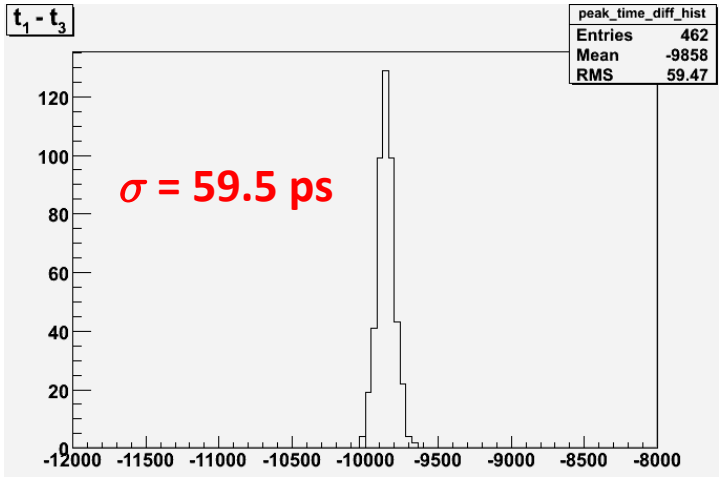
129 ps RMS residual

Residual v. sampl. cell

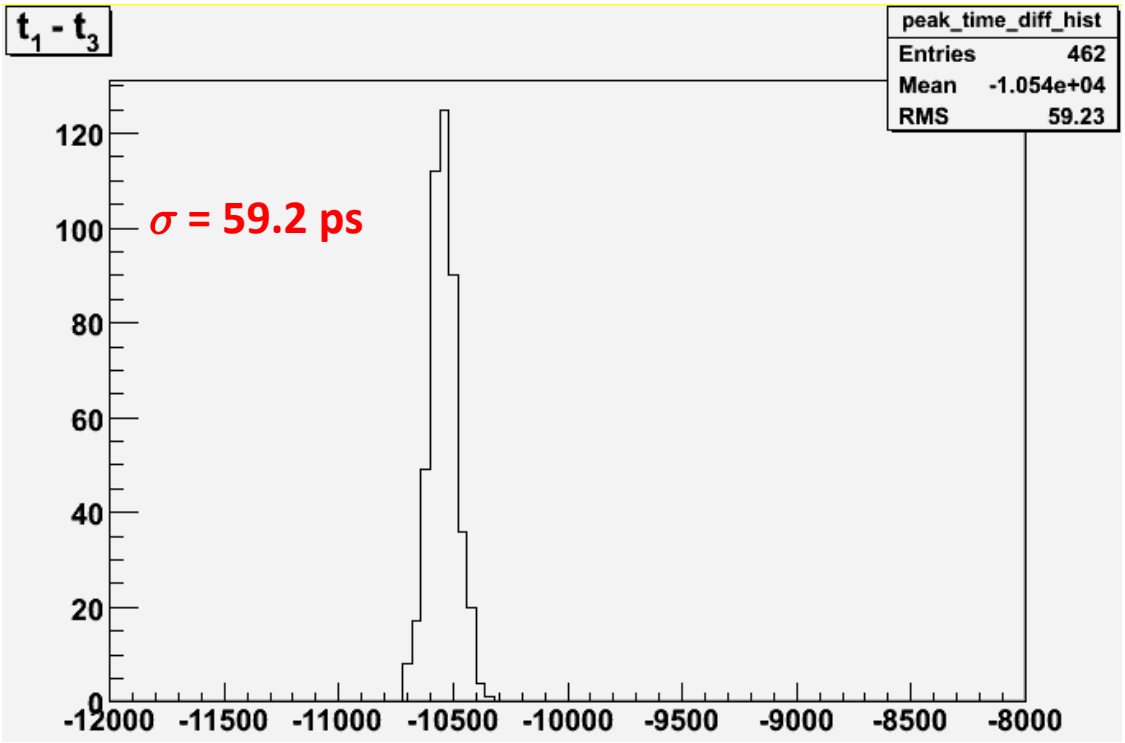
Residual shows structure correlated to gain & offset.

CFD Timing

- Quick checks to see if this helped w/ software CFD (22%):



Uncalibrated (450 ps width for all cells)



Calibrated

➔Basically no change.
I also considered doing a baseline correction waveform-by-waveform and a gain correction pixel by pixel… still no change ➔ also no change.

- Calibrations appeared to make little to no difference, probably because the waveform is always at the same place in the window.
  - Also happens to be in a fairly stable region of gain.
  - Best performance with CFD method, ~60 ps resolution.
- Calibration file is available at:
  - http://www.phys.hawaii.edu/~kurtisn/lib/exe/fetch.php?media=target:target.voltage.cal.2010-02-18.txt
  - Format: CHANNEL SAMPLING_CELL Δt GAIN