DEEP UNDERGROUND NEUTRINO EXPERIMENT

Brookhaven National Laboratory

U.S. DEPARTMENT OF ENERGY

Current Status of the CE Calibration Analysis using PDHD Pulser Data

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Wire-Cell General Meeting, 10/24/2024

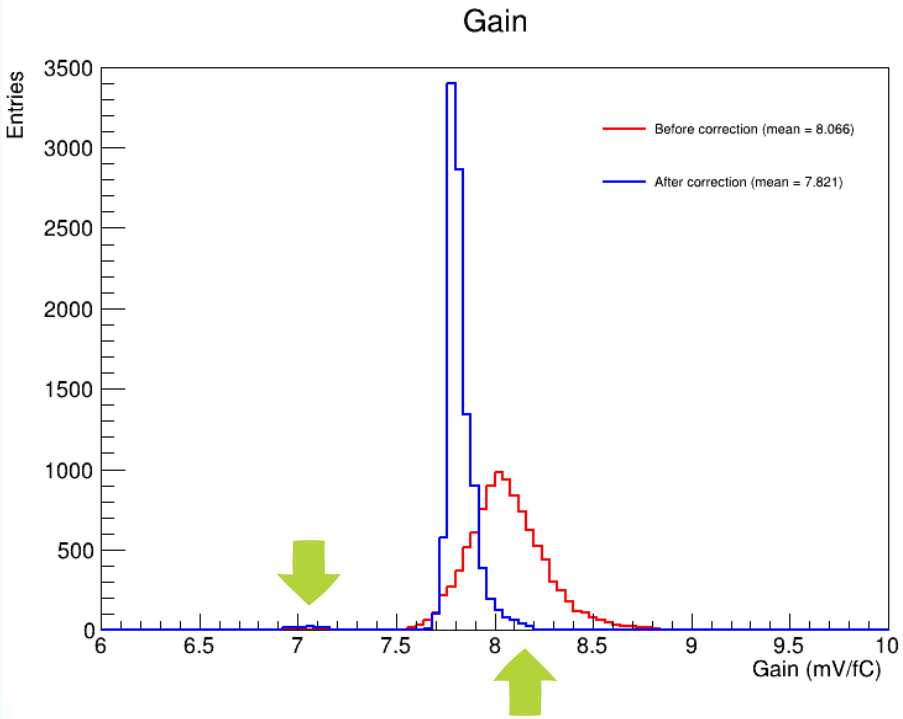
Datasets

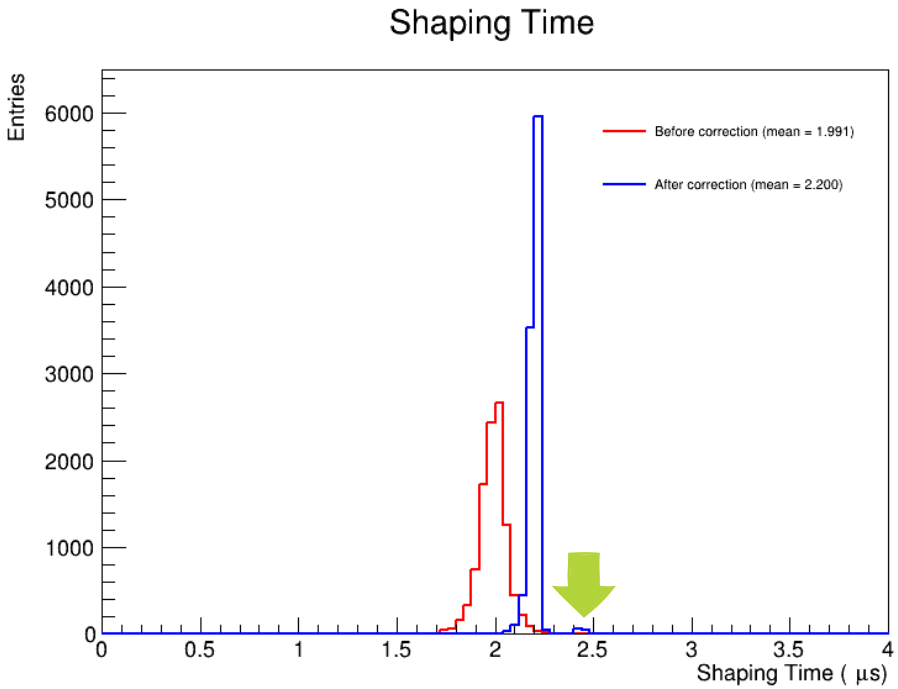
- **NP04 TPC Electronics Studies Runs**.
- Pulser Calibration **Runs 28286 & 28329** from July of 2024.
- **DAC = 30**.
- **7.8 & 14 mV/fC** LArASIC gain.
- 2 μs CE Shaping Time.
- LArASIC Output Mode: Single-ended.

Waveform Correction

1. Run the full fitter on our dataset.
2. Extract fit parameters.
3. Run the waveform correction (Wire-Cell).
4. Fit corrected waveforms with Ideal Electronics Response Function.
5. Retrieve Amplitude and Shaping Time.
6. Convert Amplitude to Gain.

First Results as seen last time (Run 28286, 7.8 mV/fC, DAC=30)





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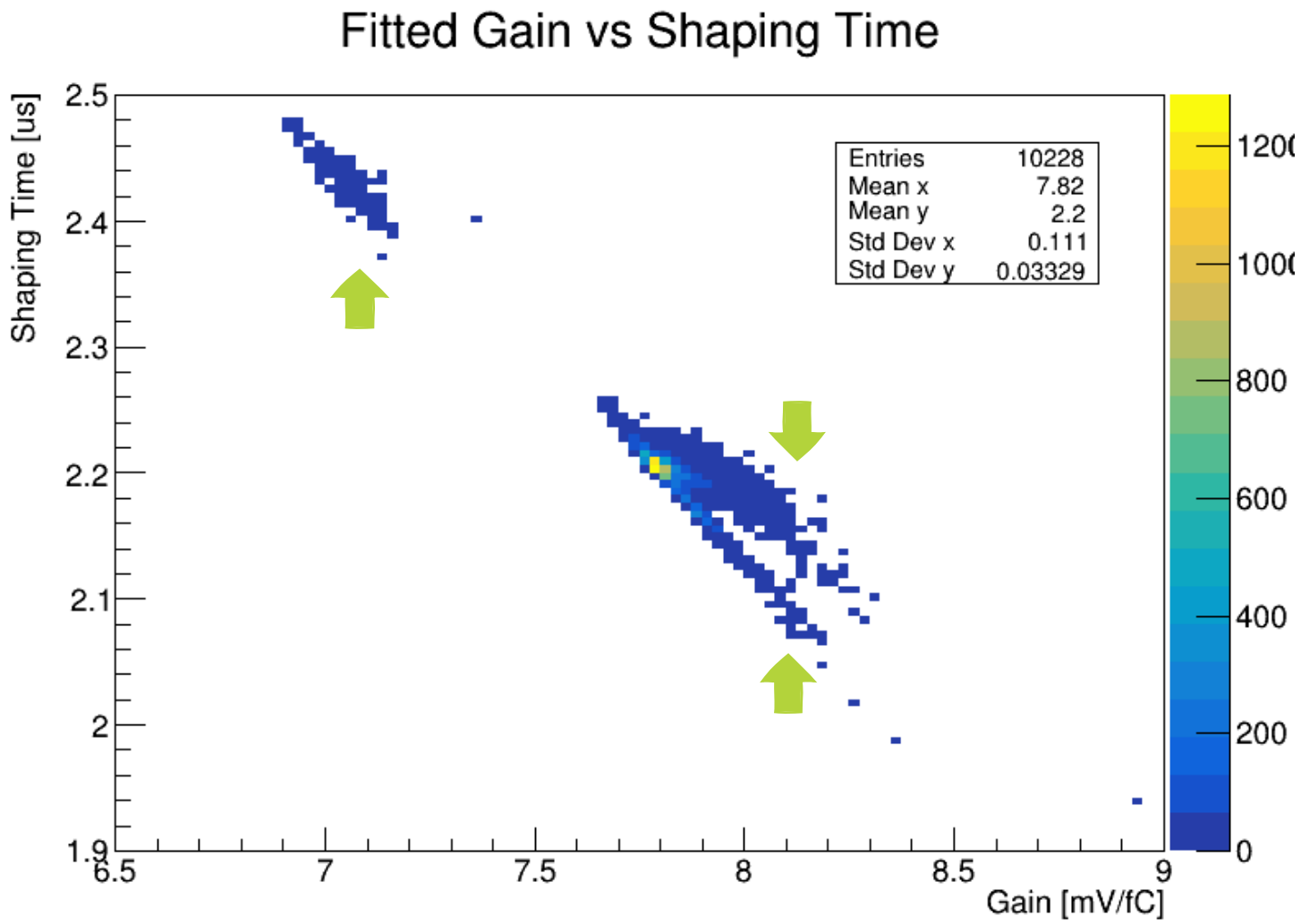
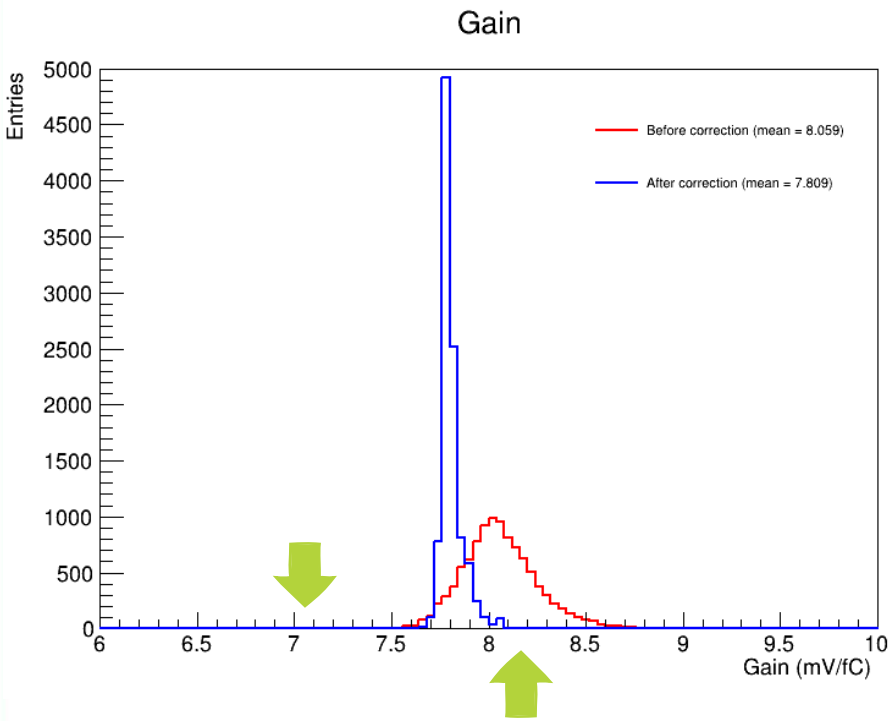
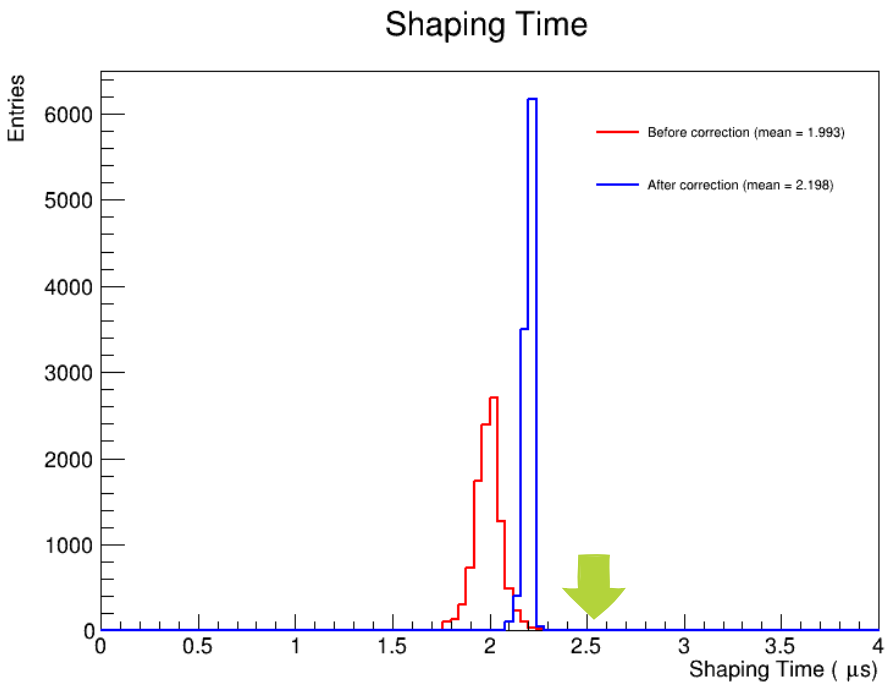


NOW: Debugging

✓ Removed WF averaging (Run 28286, 7.8 mV/fC, DAC=30)

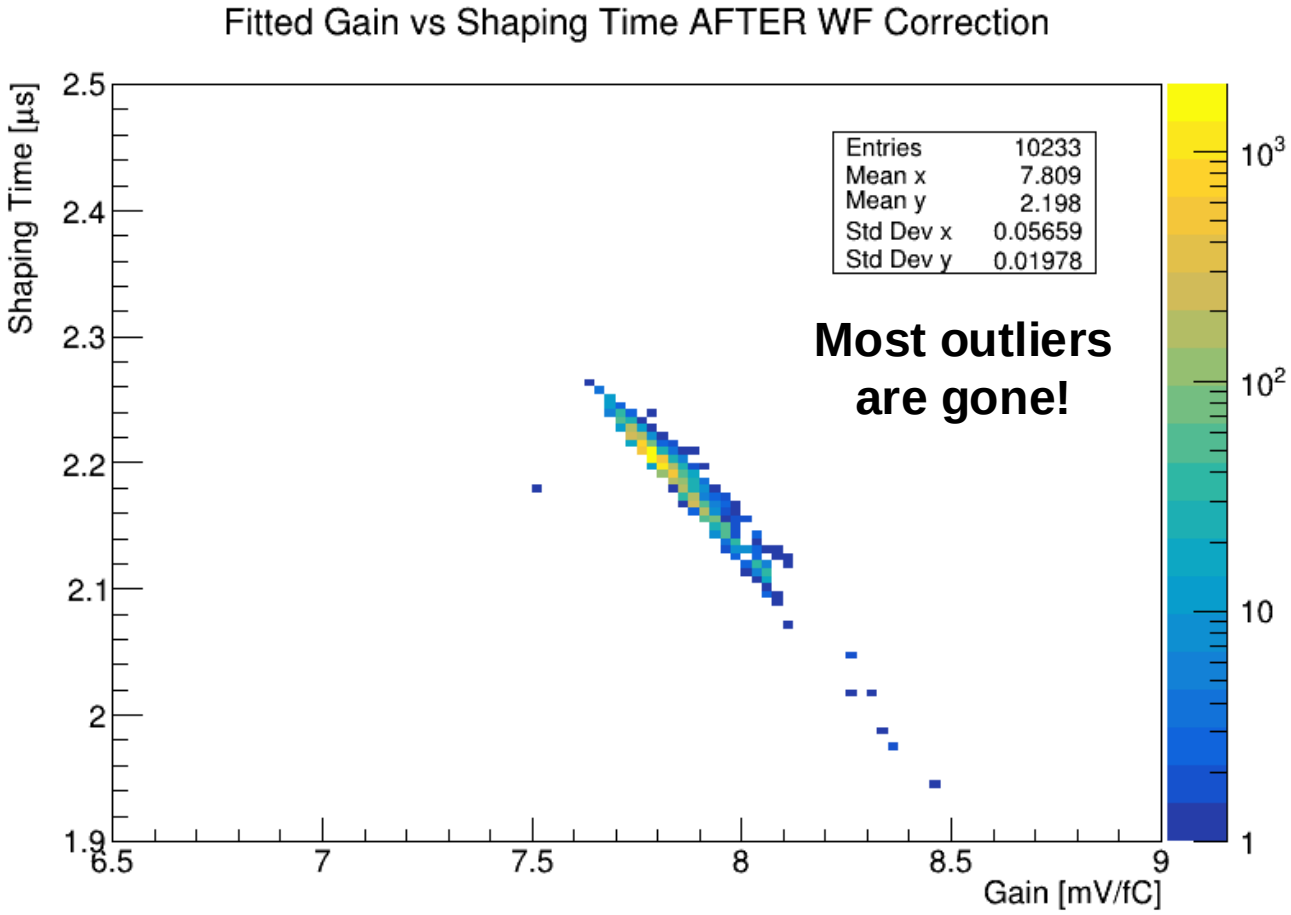




- **Random bumps are not here if we don't average waveforms.**
- **Small tail in Fitted Gain distribution prevails.**

NOW: Debugging

✓ Removed WF averaging (Run 28286, 7.8 mV/fC, DAC=30)



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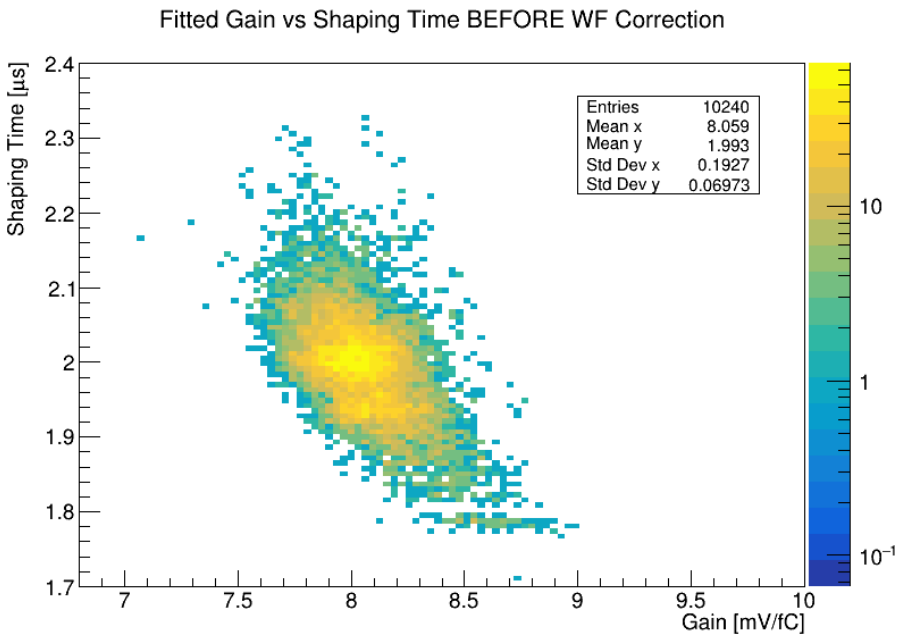
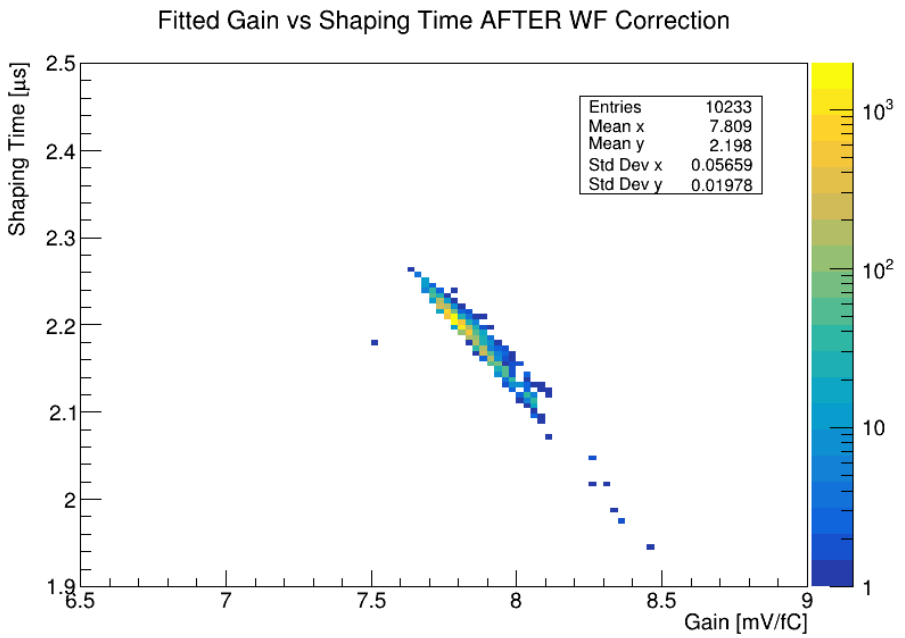
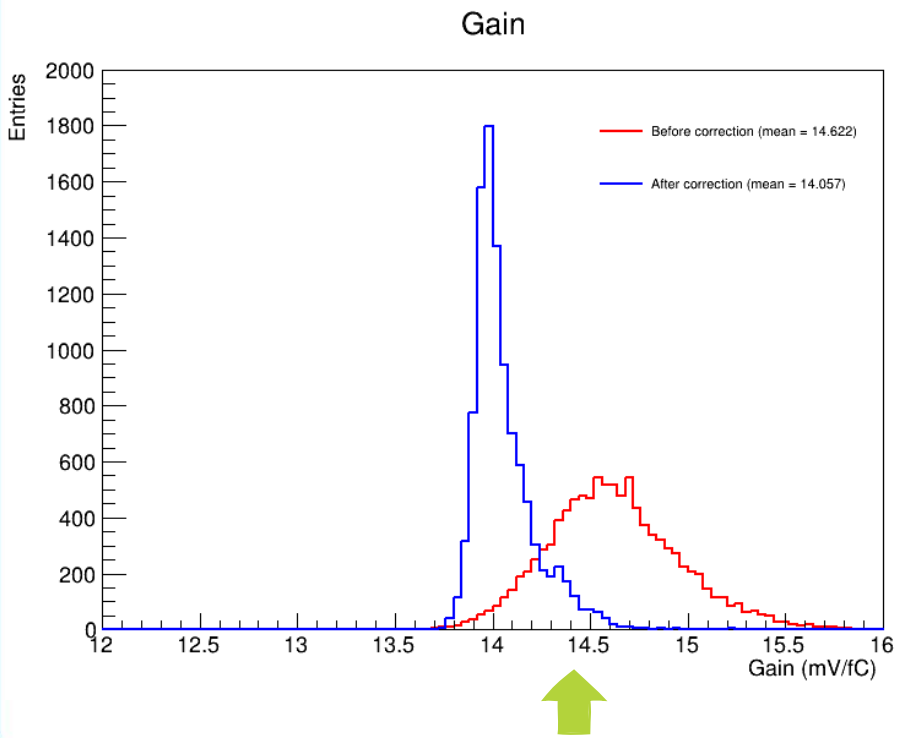


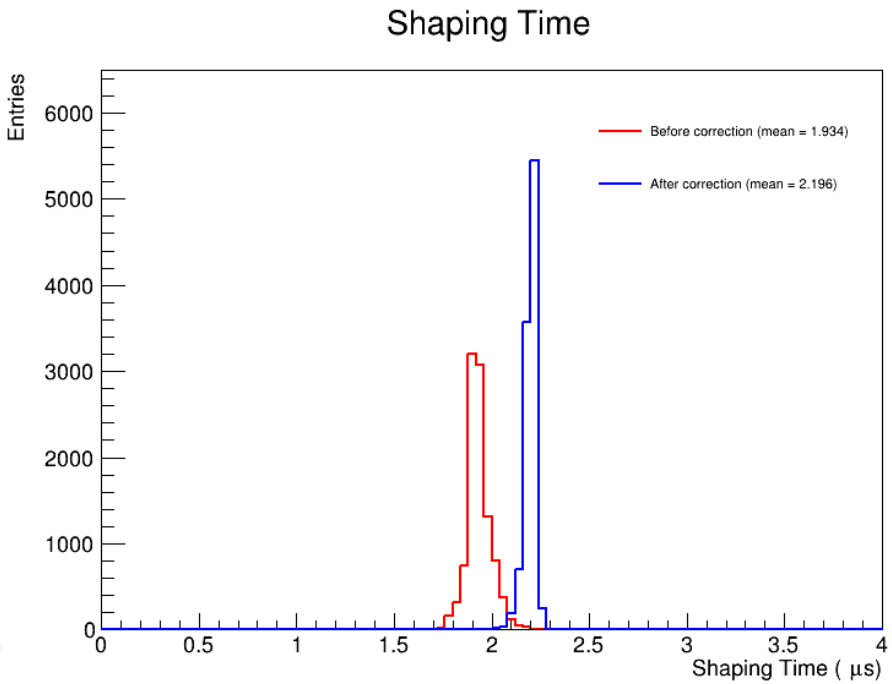


- **Correlation is still here even without averaging waveforms.**

NOW: Debugging

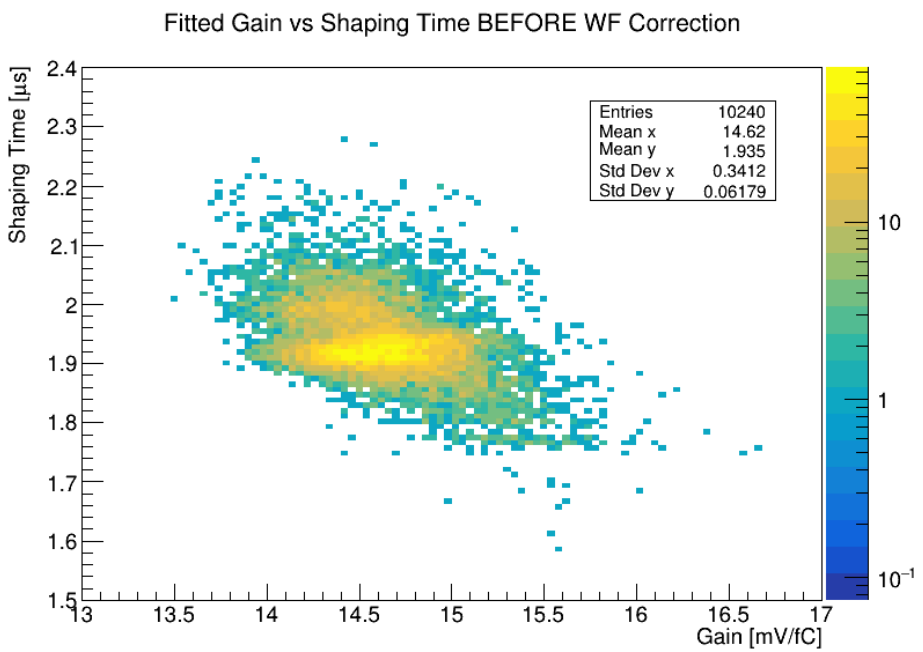
- ✓ Tried a different run (Run 28329, 14 mV/fC, DAC=30)
- ✓ Still no waveform averaging.

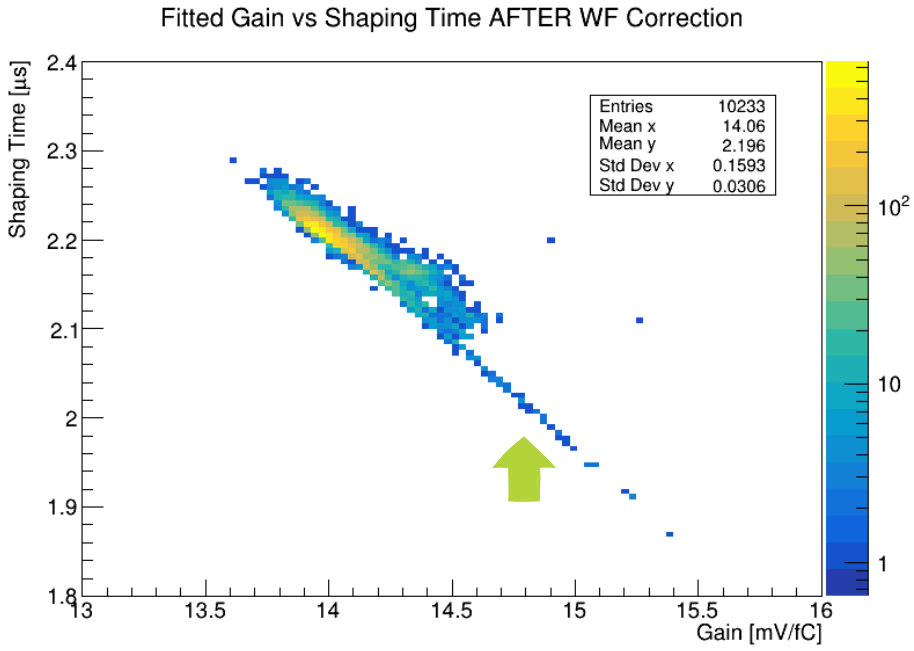




NOW: Debugging

- ✓ **Tried a different run (Run 28329, 14 mV/fC, DAC=30)**
- ✓ **Still no waveform averaging.**





- **Even without the high gain tail, we still see correlation.**
- **Where is this coming from? (WORK IN PROGRESS)**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$$\text{gain} = \frac{1400\ \text{mV} * A_0}{79.5315\ \text{fC} * 16384 * 10}$$

- **1400 mV is the maximum voltage in our voltage range.**
- **79.5315 fC is the injected charge**
  - **0.185 pF: test capacitance**
  - **14.33 mV/bit : DAC-to-voltage conversion factor for our LArASIC gain setting.**
  - **30 DAC: DAC setting.**
- **16384 : 14-bit ADC resolution (2^{14})**