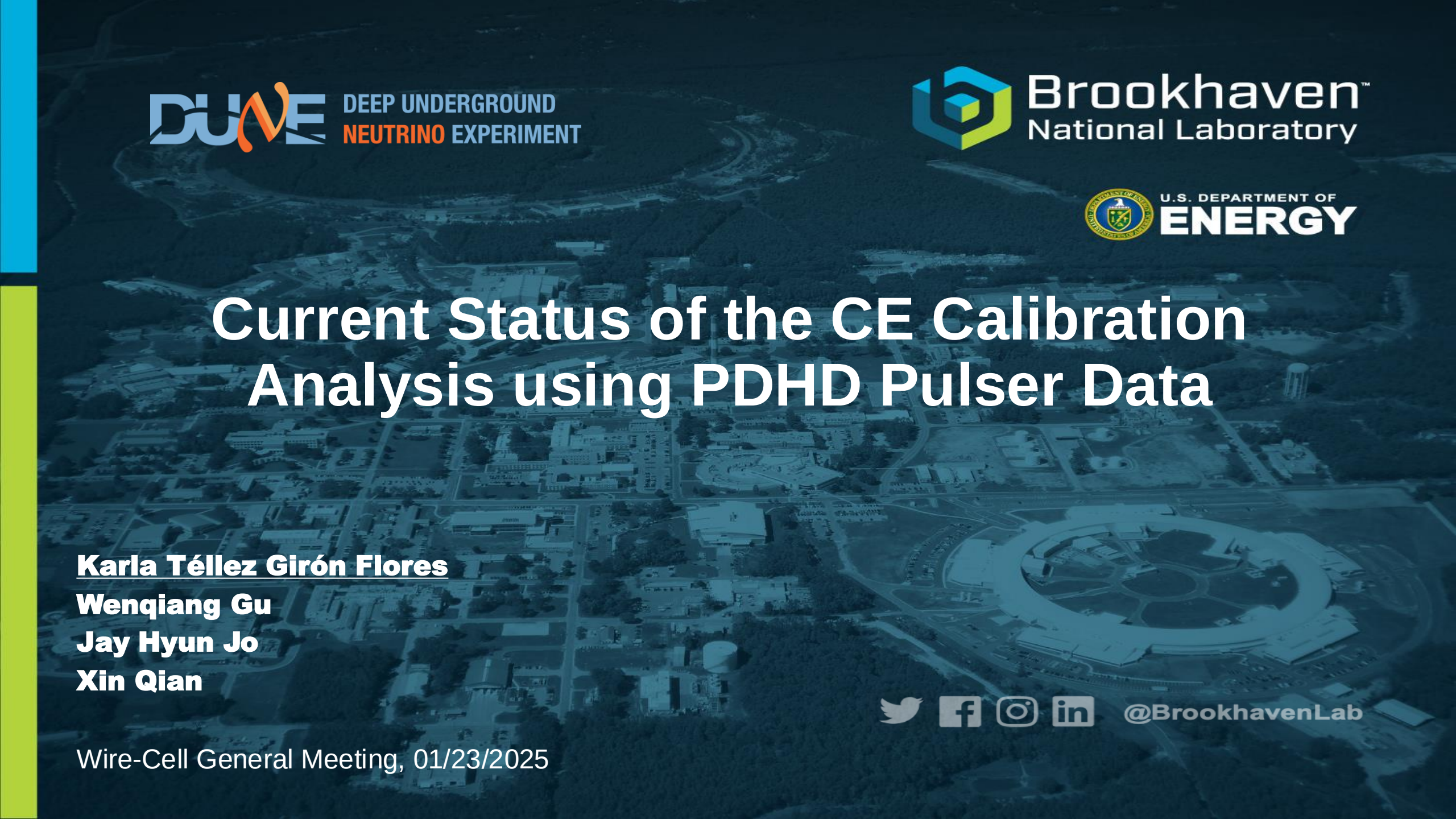

Current Status of the CE Calibration Analysis using PDHD Pulser Data

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Wenqiang Gu
Jay Hyun Jo
Xin Qian

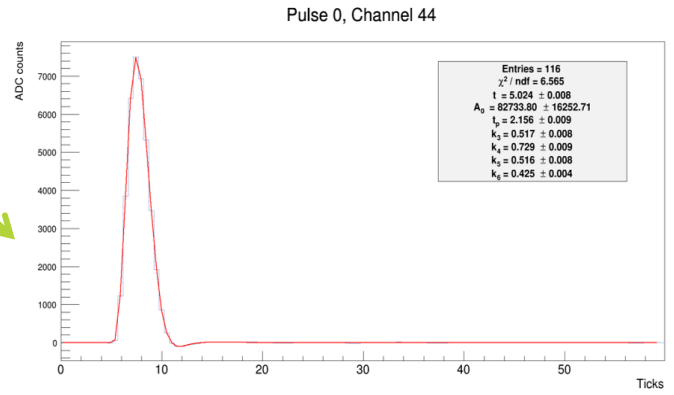
Wire-Cell General Meeting, 01/23/2025

Dataset

- **NP04 TPC Electronics Studies Runs.**
- **Pulser Calibration Runs 3036 — 30428** from October of 2024.
- **DAC = 0-39.**
- **7.8 mV/fC** LArASIC gain.
- 2 µs CE Shaping Time.
- LArASIC Output Mode: Single-ended.

Workflow

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 and run other studies!

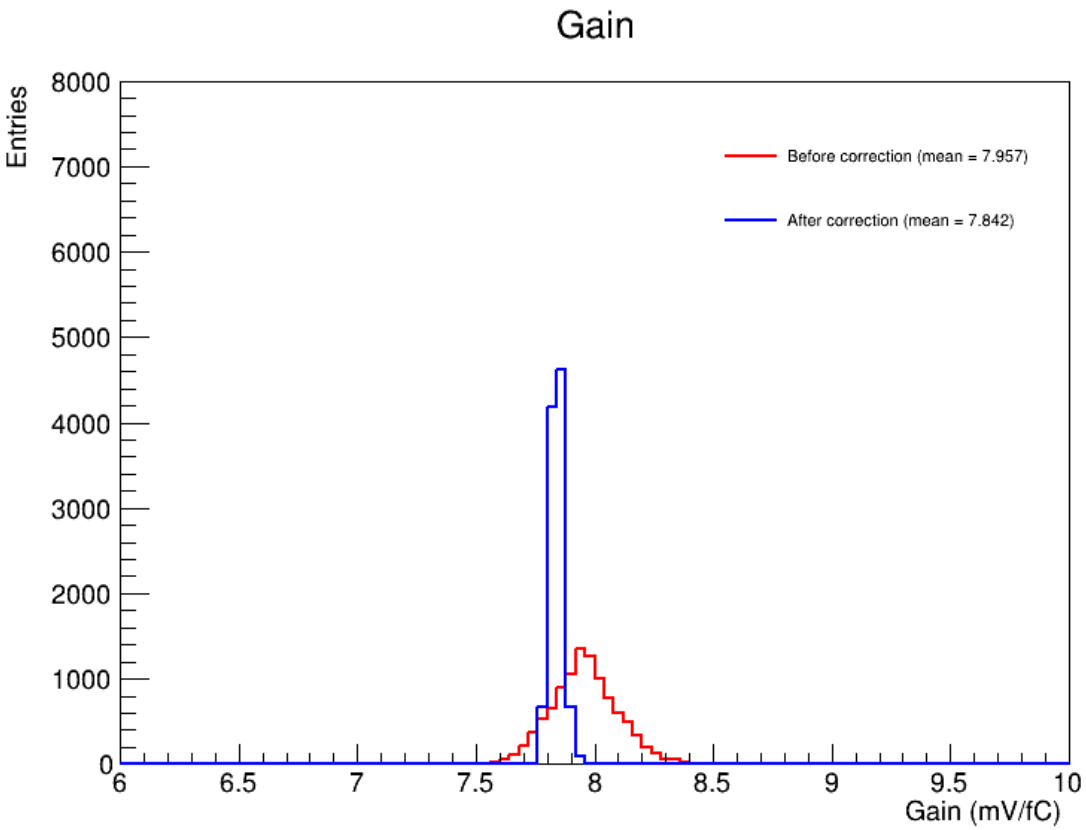


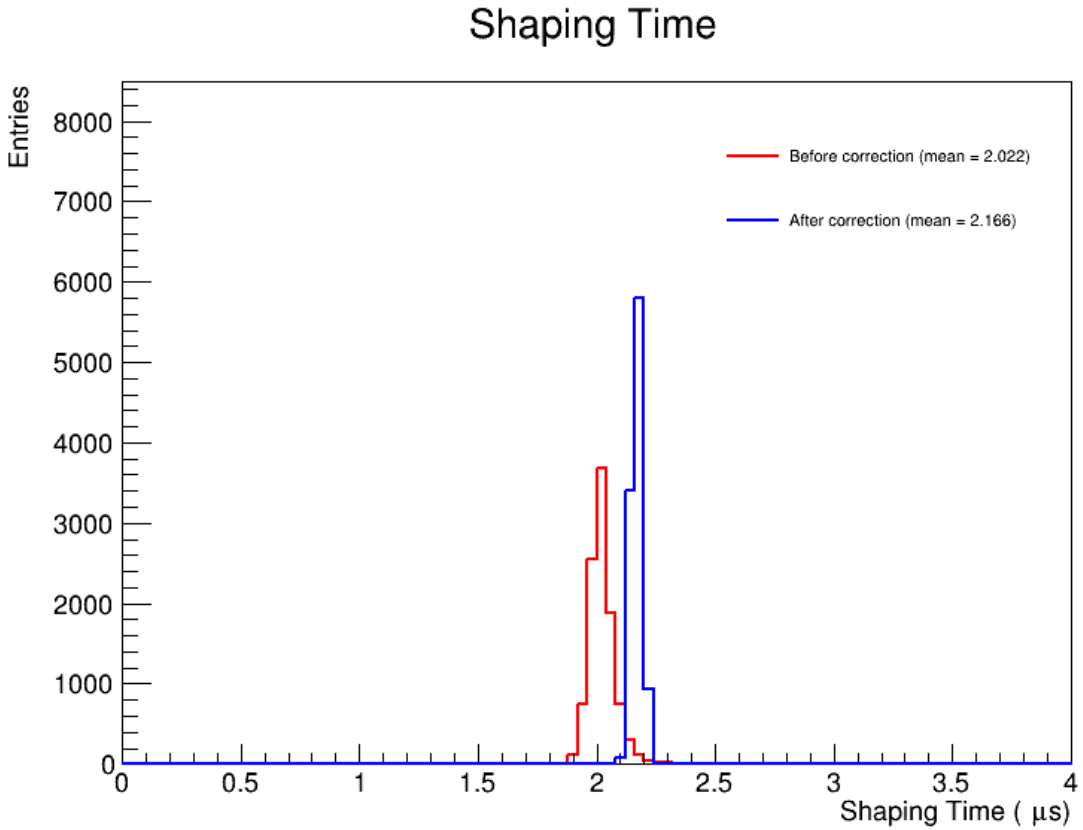
NEW:

Incorporated uncertainties in datapoints

Fitted Gain and Shaping Time Distributions

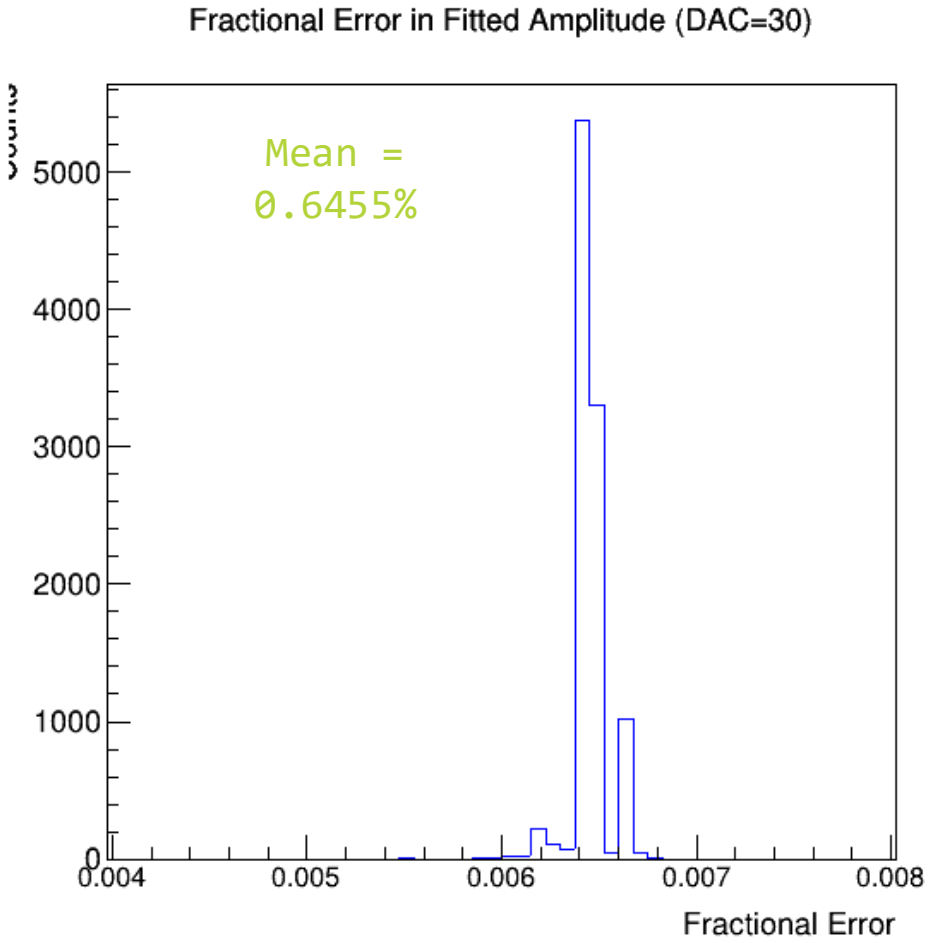
** Both (before/after) datasets are obtained by fitting waveforms with Ideal Electronics Response Function*

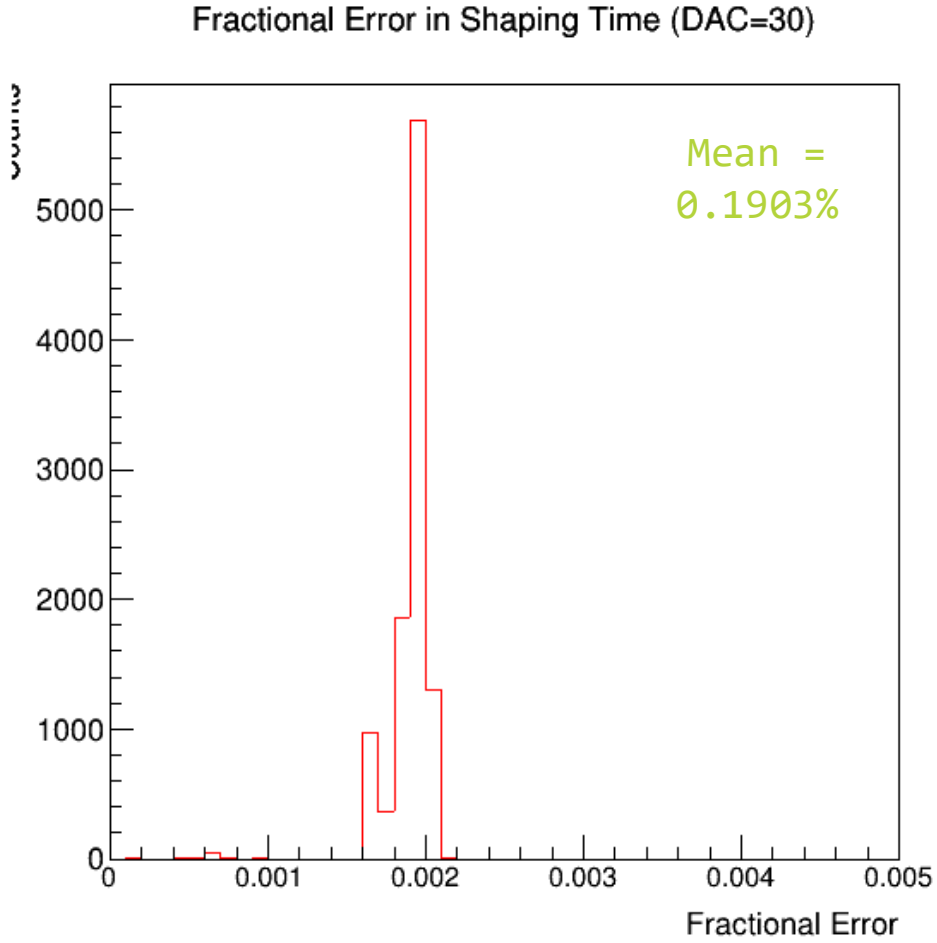




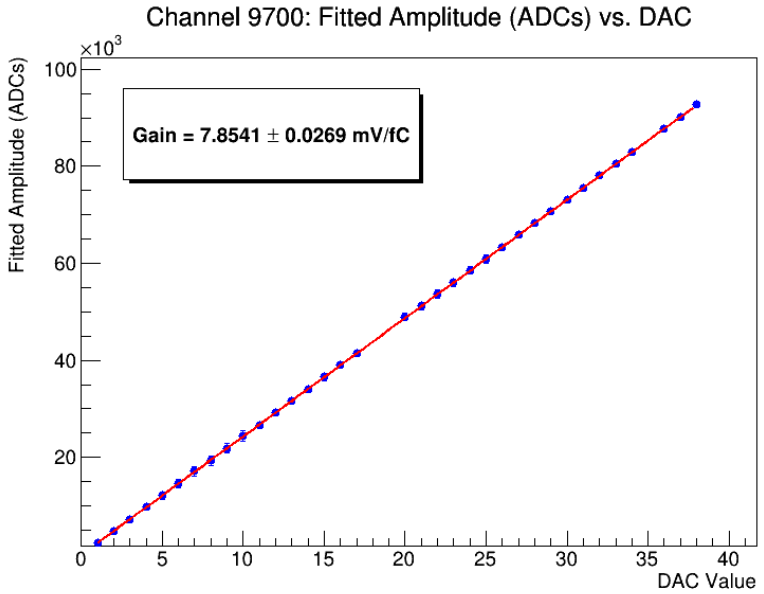
Run 30413 DAC = 30

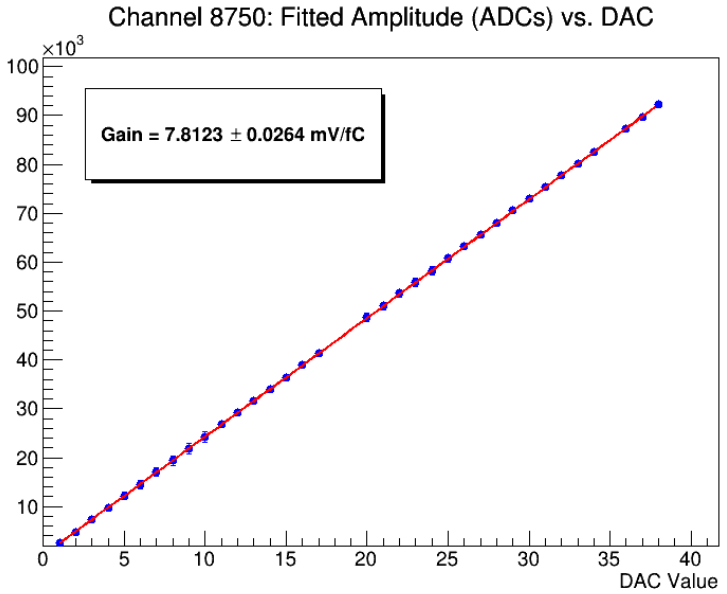
Fitted Amplitude and Shaping Time Uncertainty Distributions

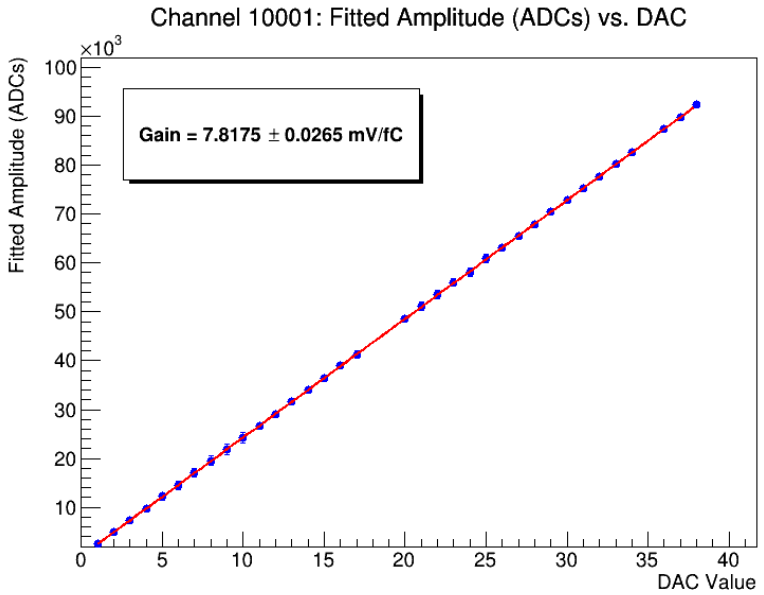


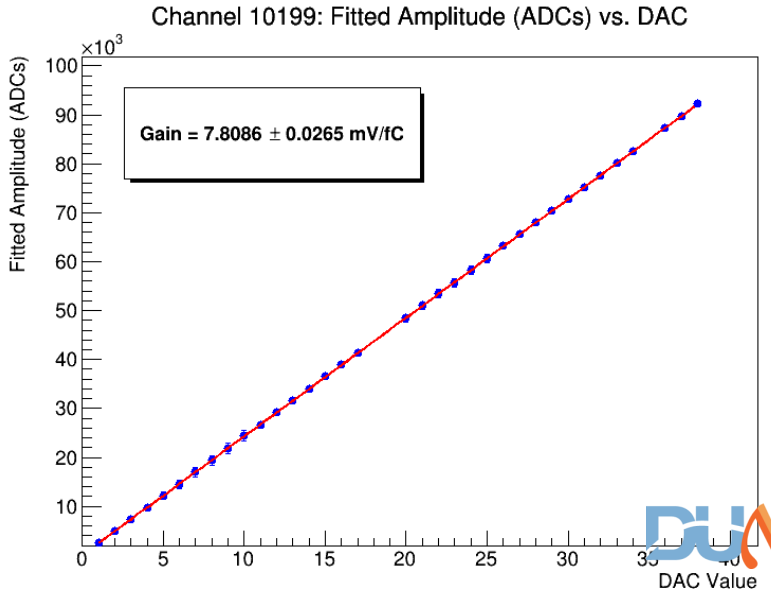


Fitted Amplitude vs. DAC Value

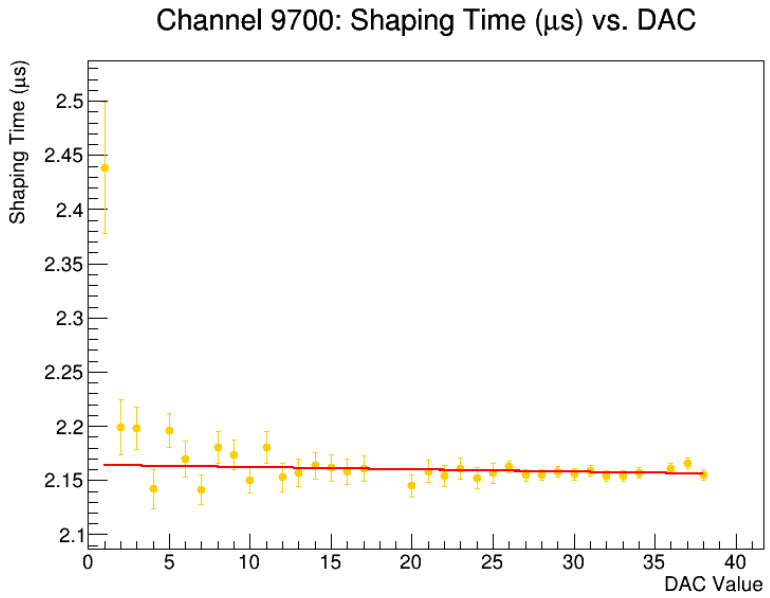


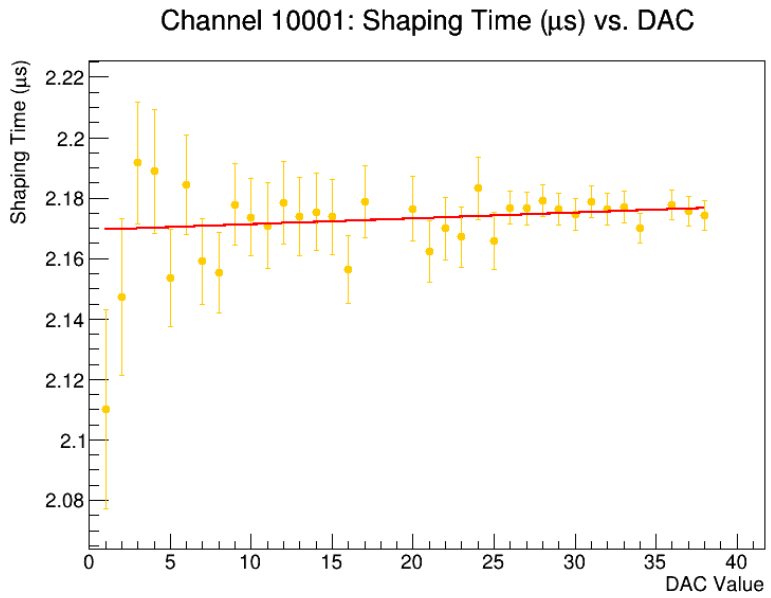


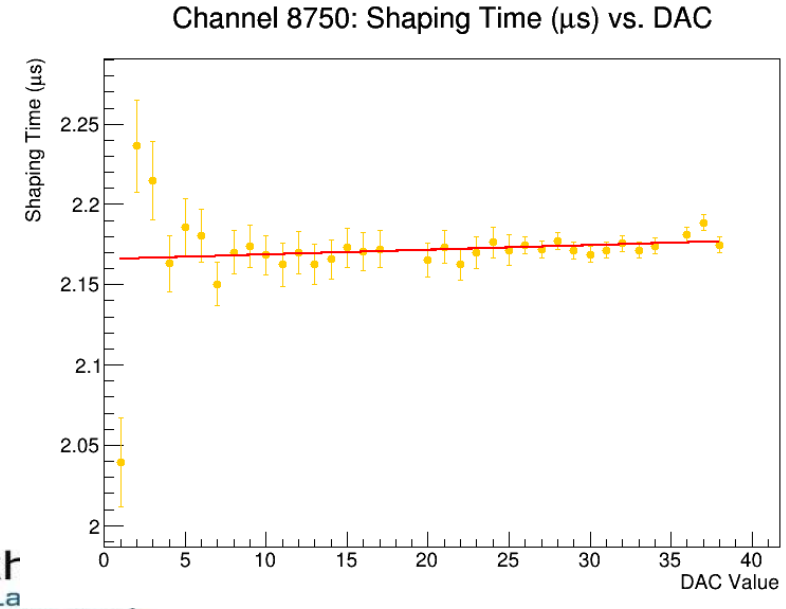


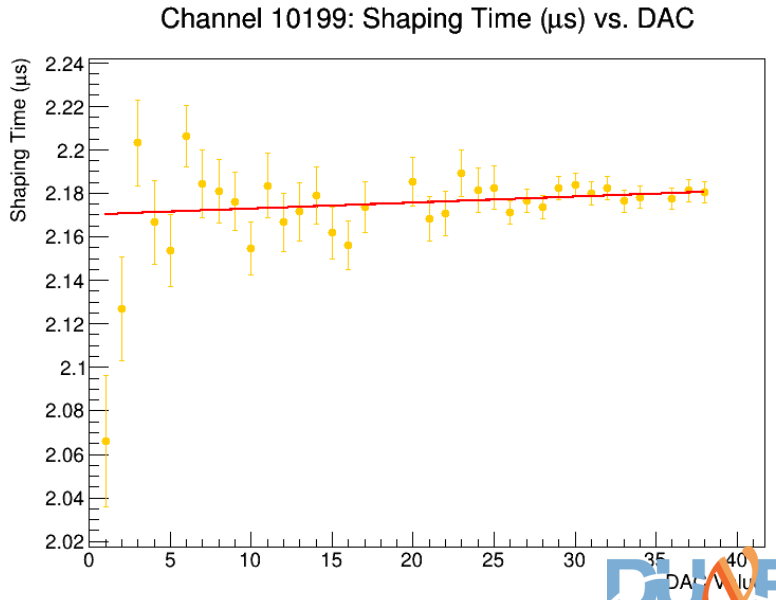


Shaping Time vs. DAC Value









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Takeaways and Future Plans

1. We have more reliable results now with the incorporation of datapoint uncertainties.
2. Repeat for the higher gain (14 mV/fC)
3. Apply the same principles for PDVD Data
4. Incorporate this calibration into the data production chain.
5. Look at the possibility of doing something similar for the top electronics?


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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.**

$$\text{gain} = \frac{14\,00\ \text{mV} * \text{Slope}}{79.5315\ \text{fC} * 16384 * 10}$$

- **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})**