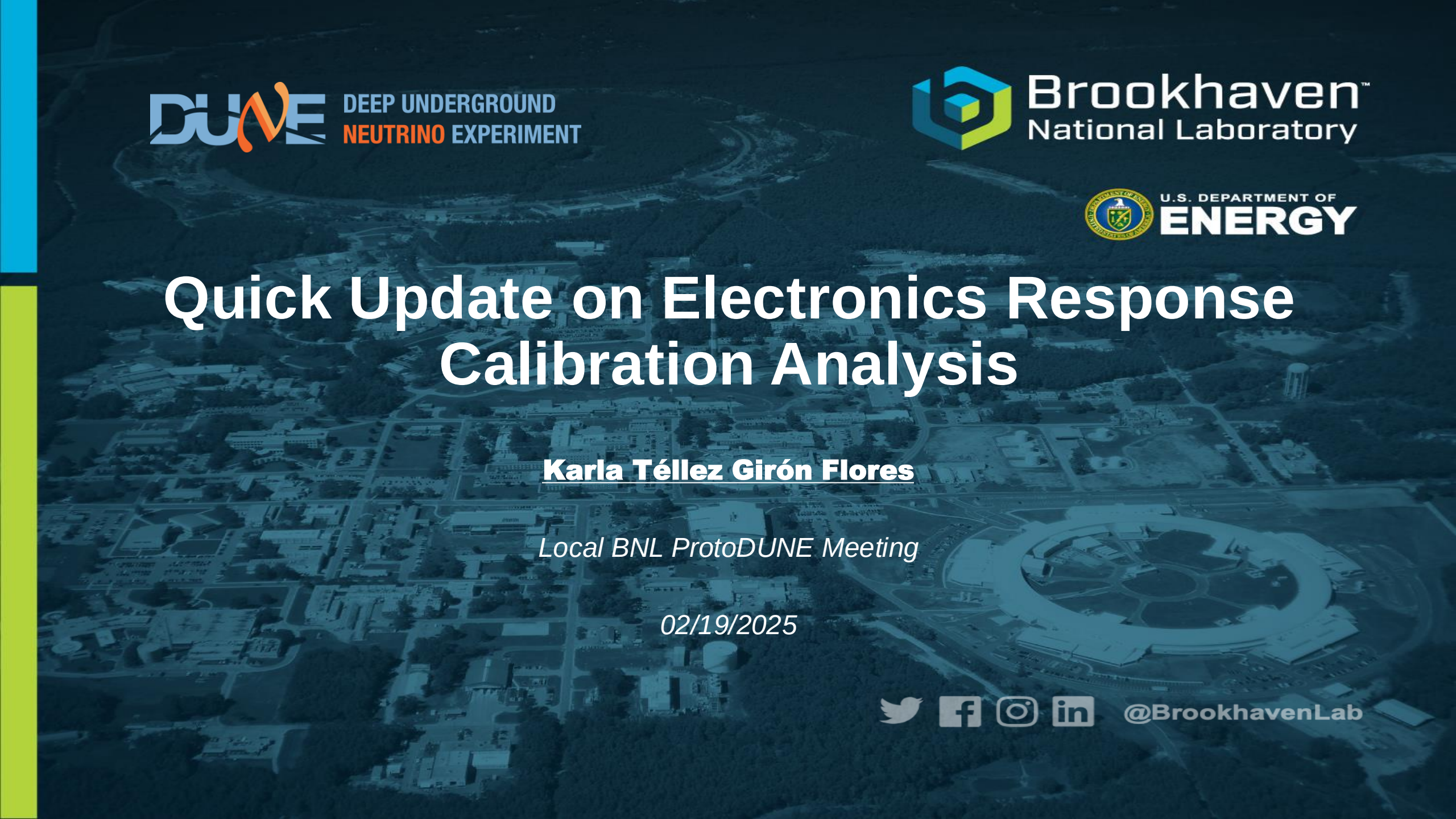


Quick Update on Electronics Response Calibration Analysis

Karla Téllez Girón Flores

Local BNL ProtoDUNE Meeting

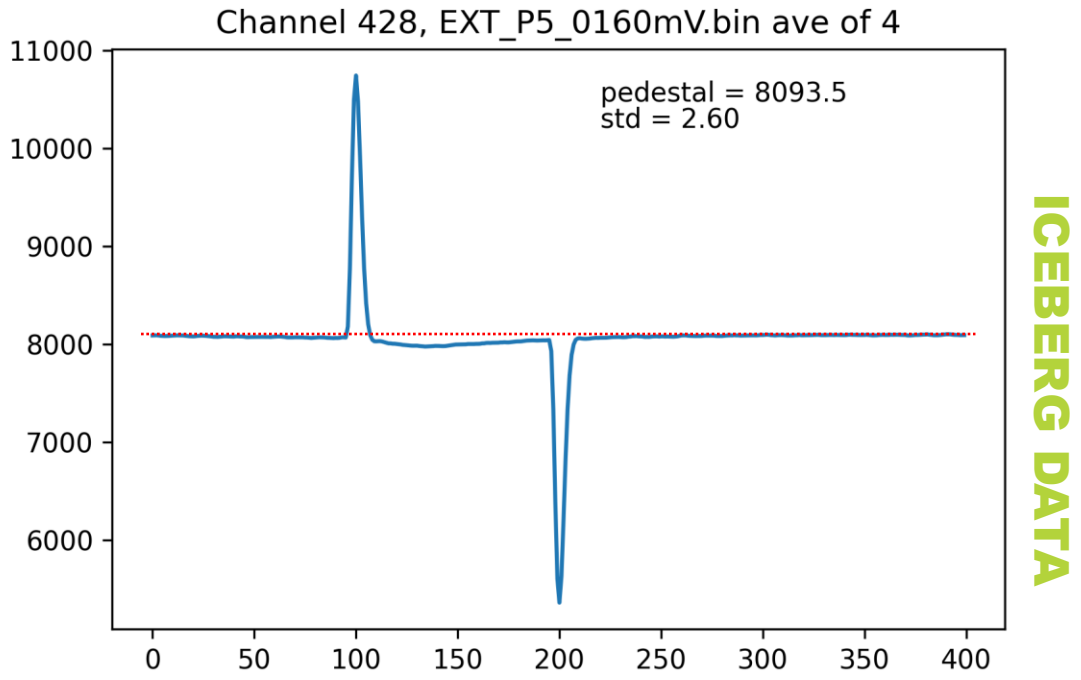
02/19/2025

Last Time: Positive and Negative Pulse Tails in Induction Channels are very different

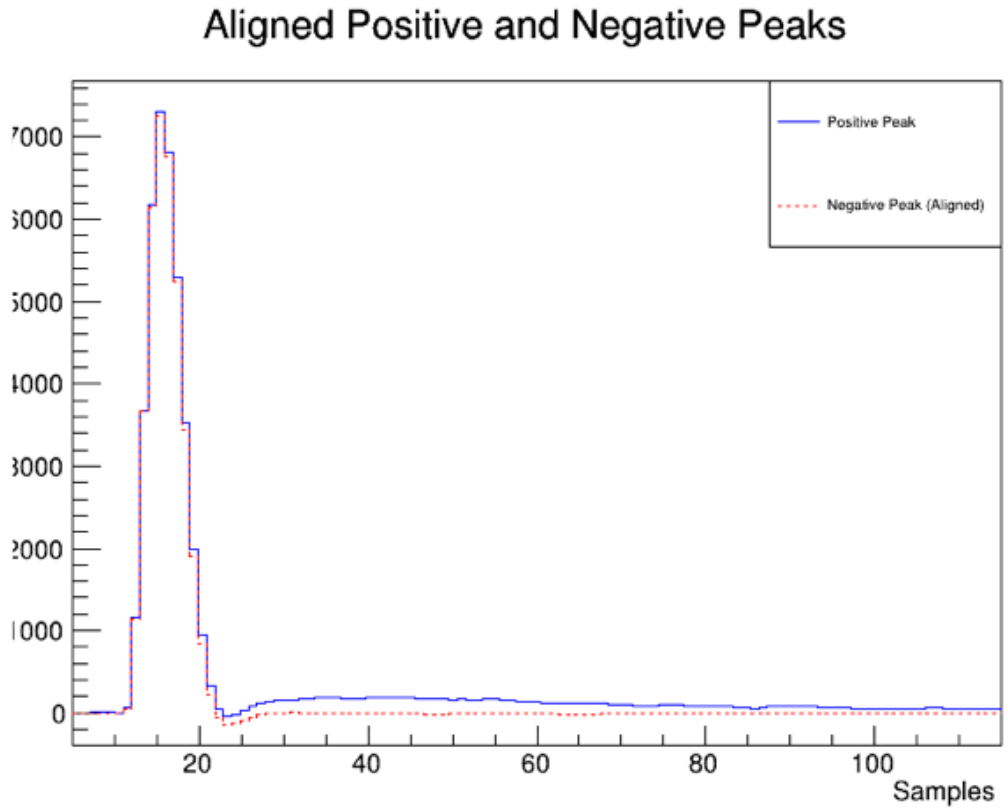
Dave took (ICEBERG) waveforms with the longest undershoot/overshoot effects and realized that + and – pulses are very different.

- **Do we see it in PD data?**

Yes, we do!



ICEBERG DATA

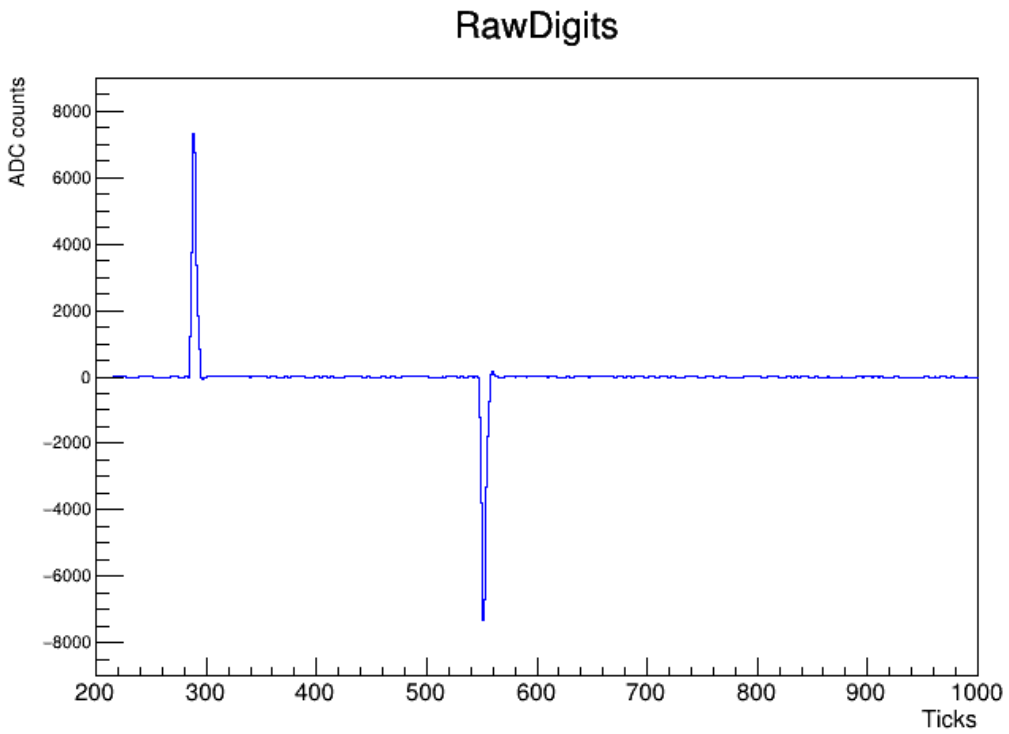


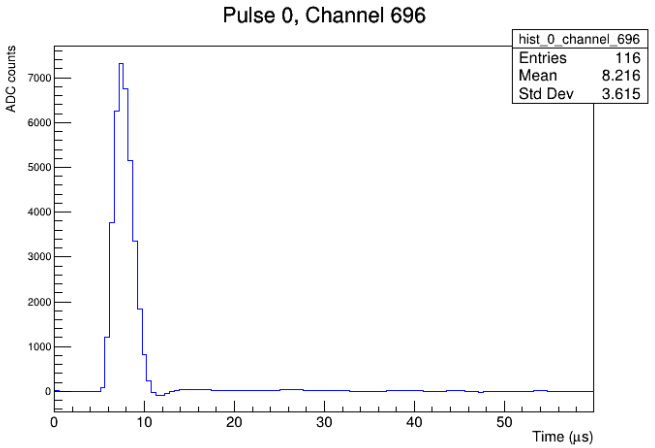
PDHD DATA

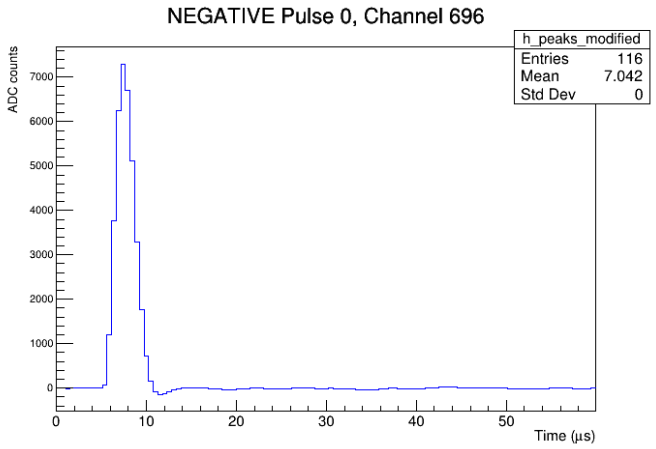
How to quantify this difference?

- We don’t have an Electronics Response (ER) function for each (+) and (-) pulses.
- Use this ER to quantify any significant differences between pulses.

1. Isolate both pulses:



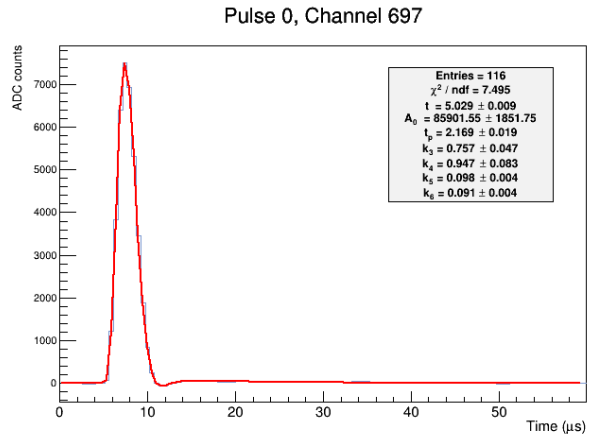


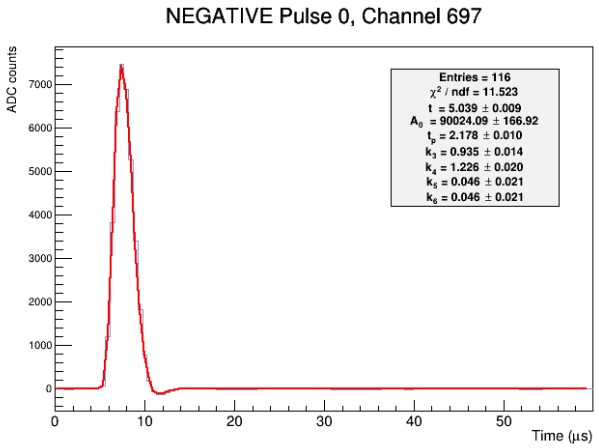


Brookhaven National Laboratory

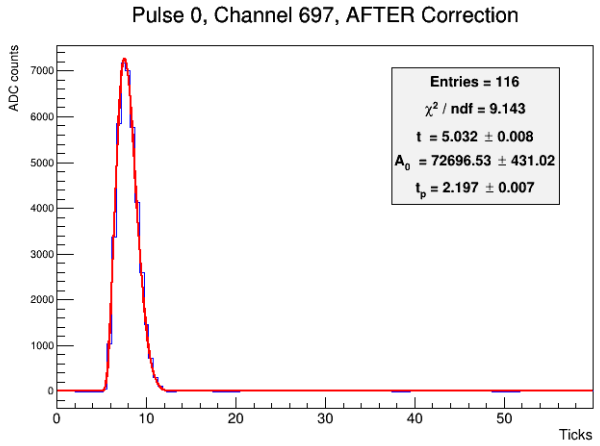
How to quantify this difference?

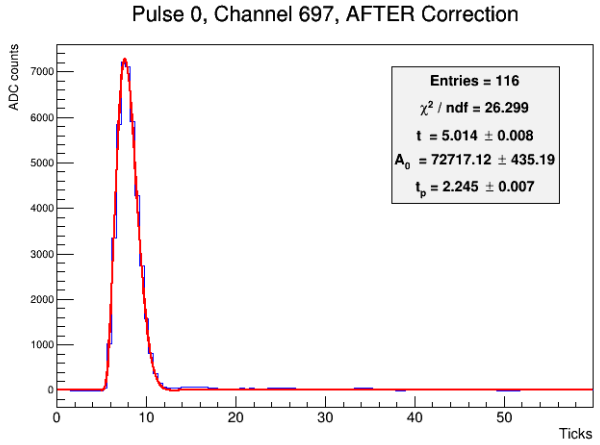
2. Run the same fitter with ER function





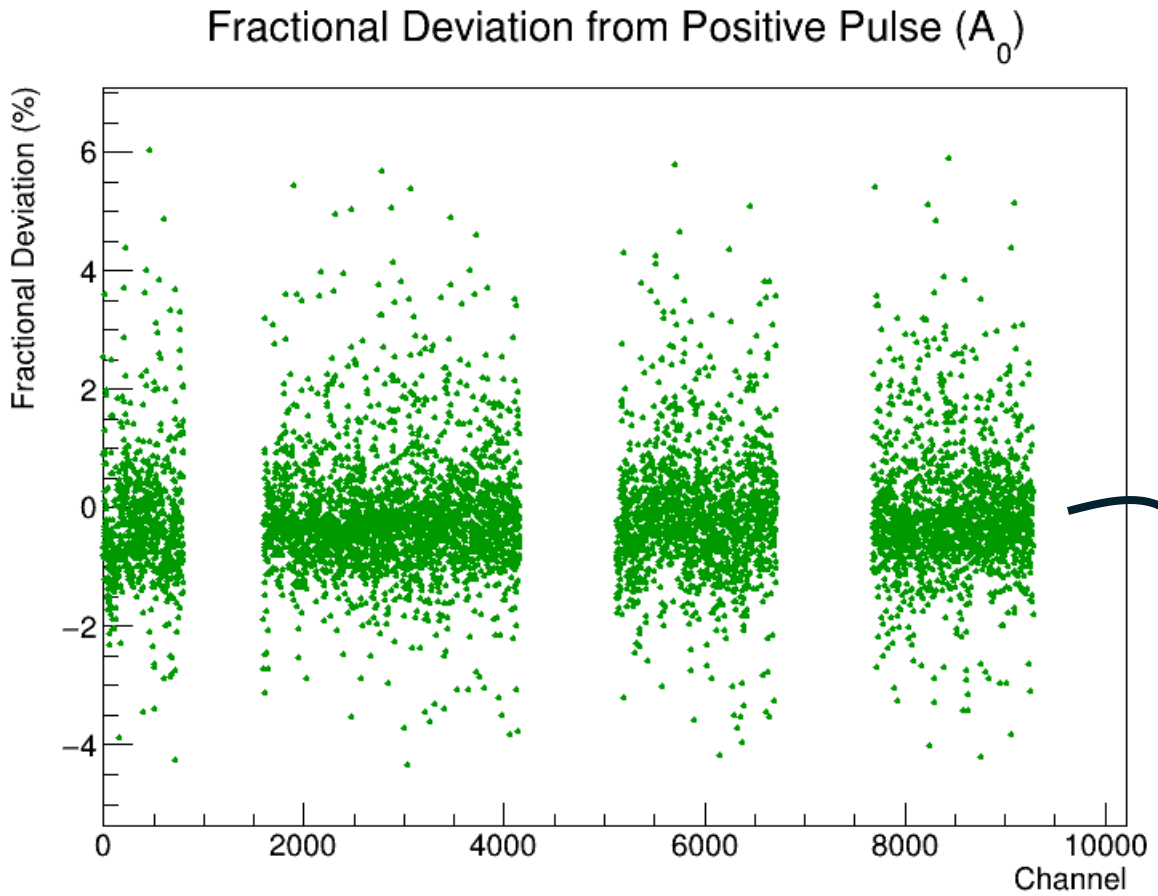
3. Run the waveform correction





How do we quantify this difference?

4. Focus on fitted amplitudes for simplicity. Look at the fractional deviation relative to (+) pulse.

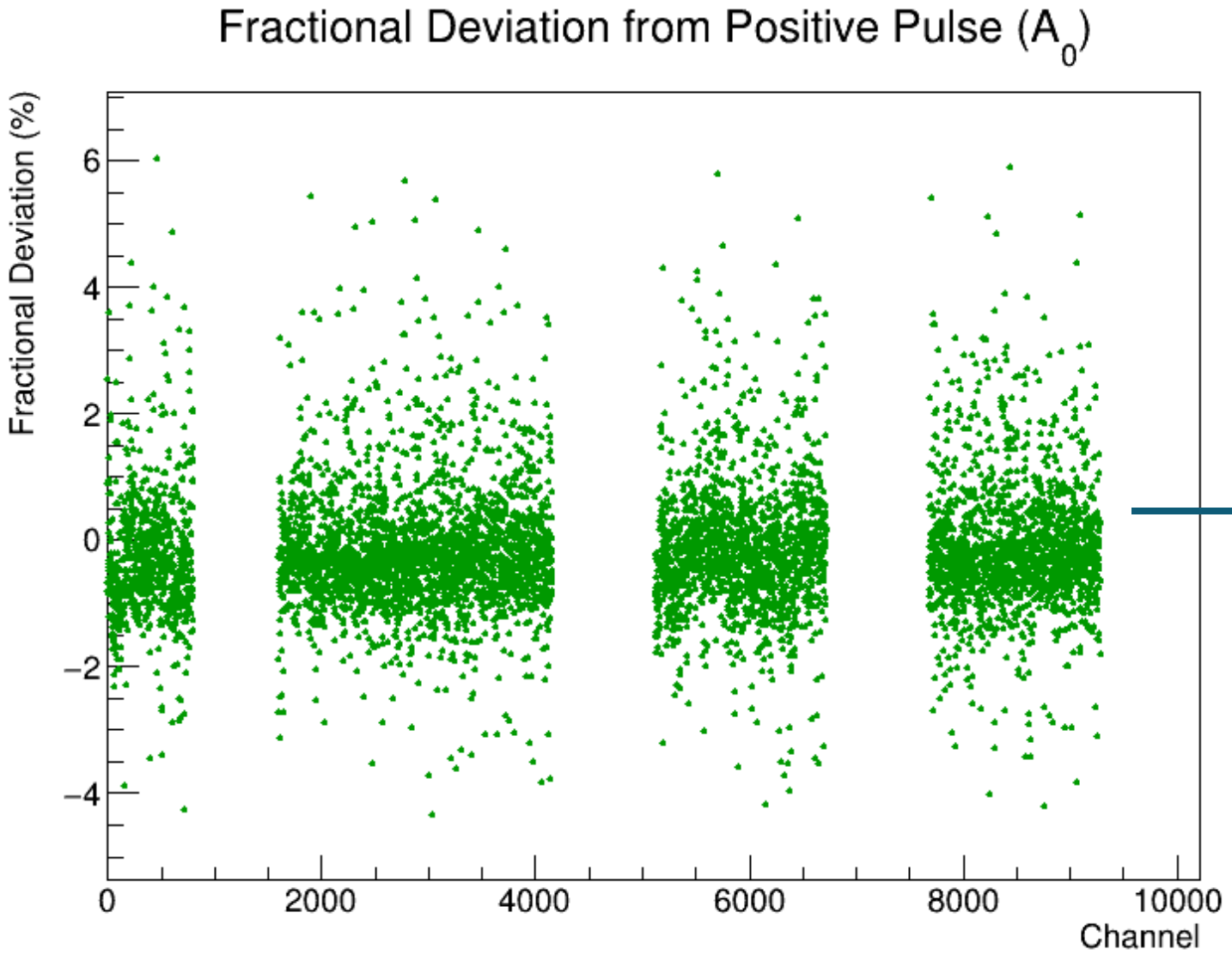


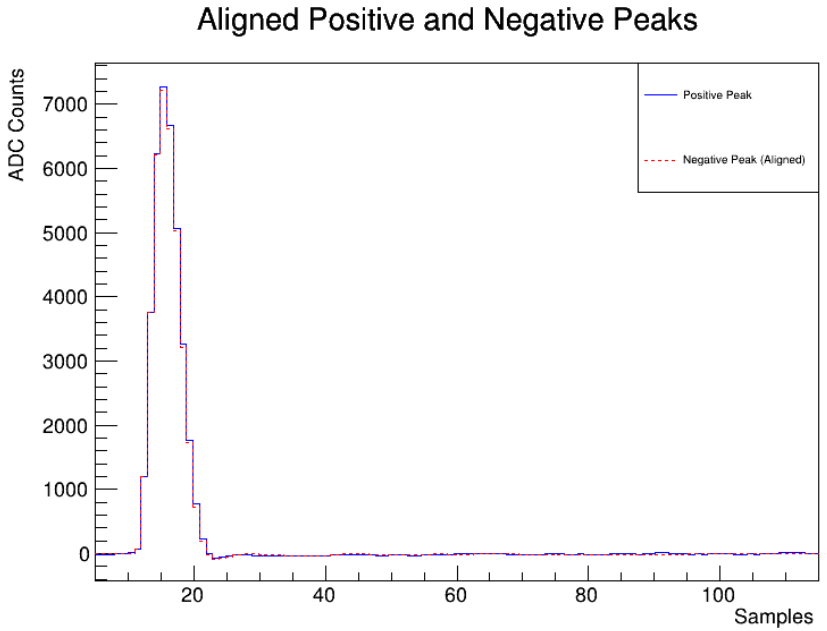
$$\text{Fractional Deviation} = \frac{A_- - A_+}{A_+} \times 100$$

- If (–) pulse is the same as the (+): 0%
- If (–) pulse is larger than the (+): > 0%
- If (–) pulse is smaller than the (+): < 0%

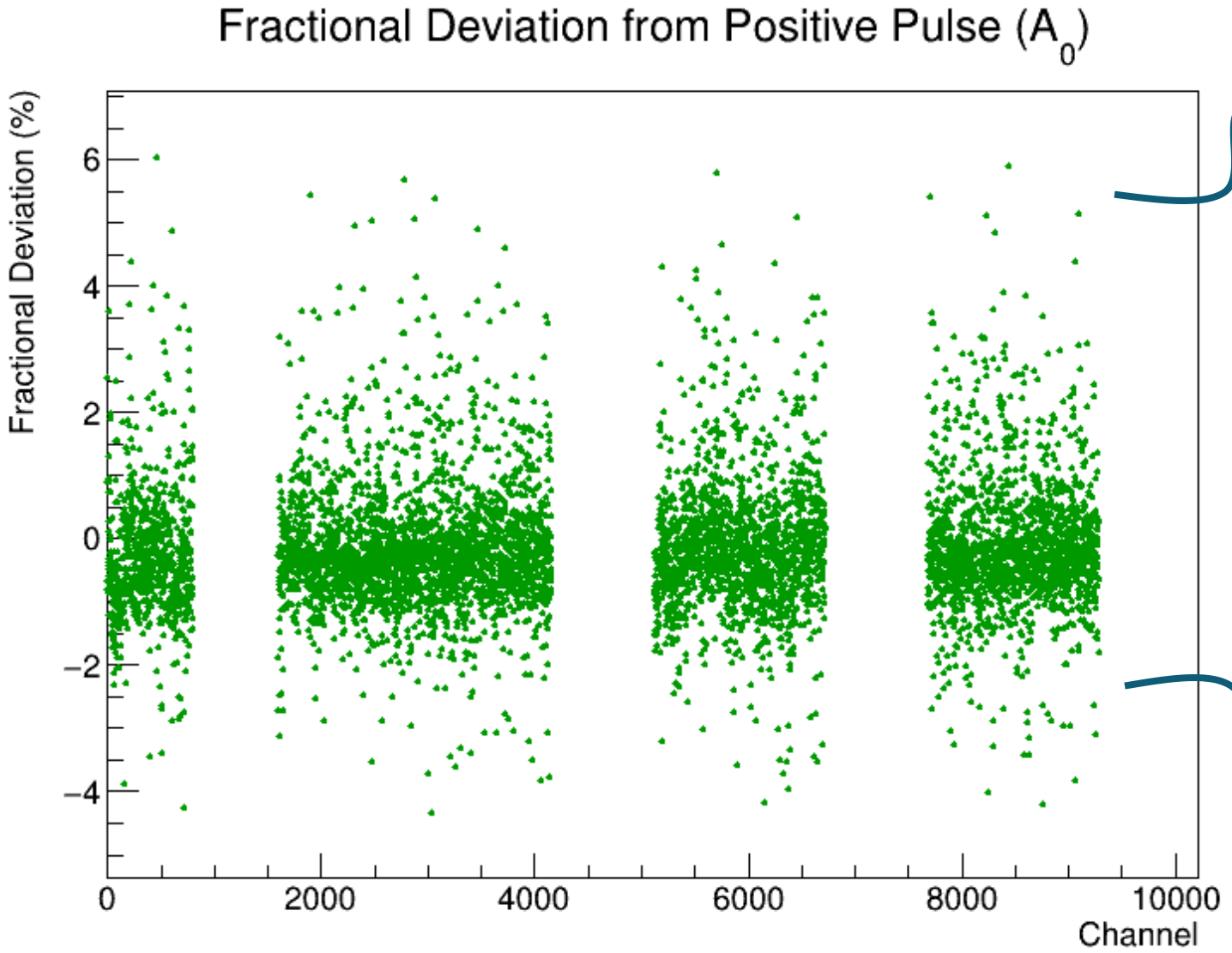
Mean: ~ -0.15%

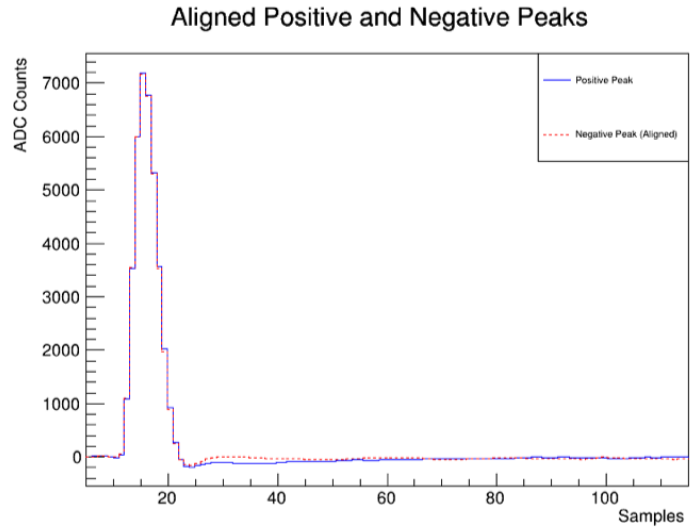
How do we quantify this difference?

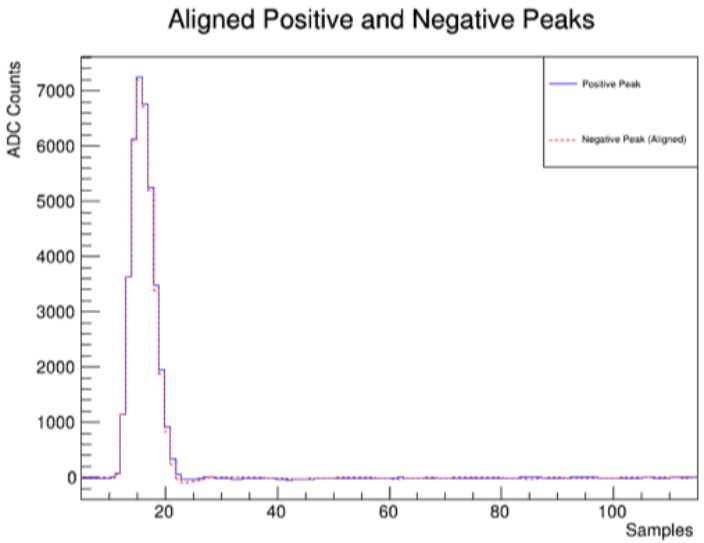




How do we quantify this difference?







Takeaways

Pending conversation with CE experts

1. (+) and (-) pulses are often different from each other. Is this behavior expected?
2. Are these differences considered *small*?
3. What are the implications of having such differences in positive and negative pulses?
4. Do we need to modify the Electronics Response function for negative pulses or are we okay with the current form?

ON A SIDE NOTE: *Design of the DUNE Far Detector TPC Electronics and Performance in the ProtoDUNE-HD Demonstrator* paper in preparation. We need to coordinate with Roger.