
# Electronics Response Calibration Update

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**Local BNL ProtoDUNE Meeting**

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# TPC Electronics & Performance Paper Plots

## What we need for this subsection:

a. ***16 x 16 cross-talk table, showing with a large injection to channel X, how much response does channel Y show.***

b. ***Possibly do this for both single-ended and differential mode. But maybe not needed if it's already very low for the single-ended data.***

## Pulser-Based Calibration Plots

1. ✅ **Pulse shape studies/fits.**
2. ✅ **Gain/calibration plots using internal LArASIC pulser data.**
3. ✅* **Linearity plots using the same pulser scans.**
4. **Cross-talk plots, using the single-ASIC-channel pulser data.**
5. **Cross-checks on gain calibration using the WIB-DAC and internal gain-matching-off data.**

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## The itemized procedure:

**1. For a given DAC setting (start with highest):**

**For each injecting channel N from 0 to 15:**
- **Record the Amplitude of the response in:**
- **The injected channel N (signal).**
- **The other 15 channels (potential crosstalk).**

**2. Normalize crosstalk:**

**For each channel M ≠ N:**

$$X_{N \to M} = \frac{Amp_M}{Amp_N}$$

**This represents how much of channel N's signal appears in channel M.**

**3. Repeat for multiple DAC values**

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## The itemized procedure:

### 4. Linear fit:

**For each pair (N, M ≠ N):**

- **For all available DAC settings, plot $Amp_M$ vs. $Amp_N$**
- **Fit a line through the origin (or with a small intercept if needed).**

**The slope of this line is the crosstalk coefficient.**

### 5. Build the Crosstalk Matrix:

**A 16×16 matrix, where**

- **Entry (N, M) is the crosstalk ratio from channel N to M.**
- **The diagonal entries (N=N) are 1 by definition (self-response).**
- **Average across ASICs if multiple FEMBs/ASICs are tested to get a representative matrix.**

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## Started by looking at the data:

- Looking at NP04 Pulser Scan runs 31578 - 31710 from last October.
  - 5 different DAC settings (20, 25, 30, 35, 40)
  - Injecting into one channel X at the time in each LArASIC (X: 0-15)
  - Done both for Single-Ended and Differential LArASIC Output modes.
- Single channel gets a pulse -> we observe the remaining channels.
- Goal: to see if the pulse in channel X leaks into any other channels.

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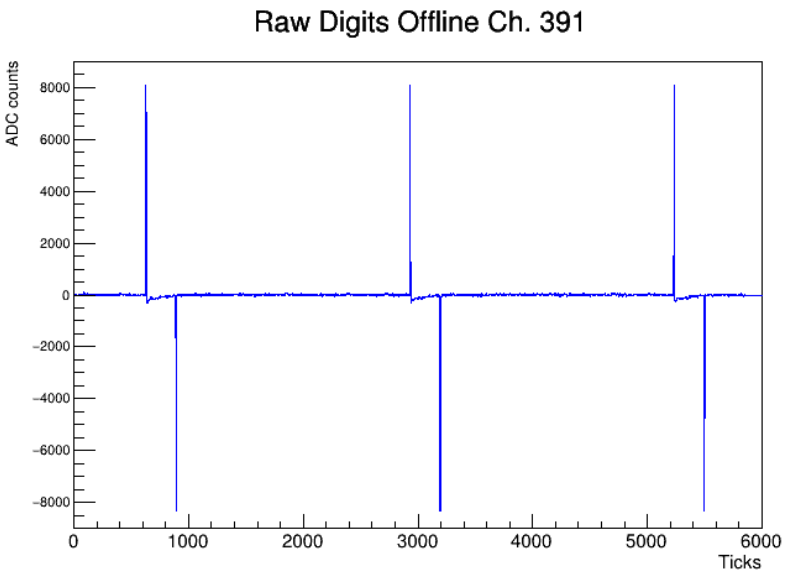
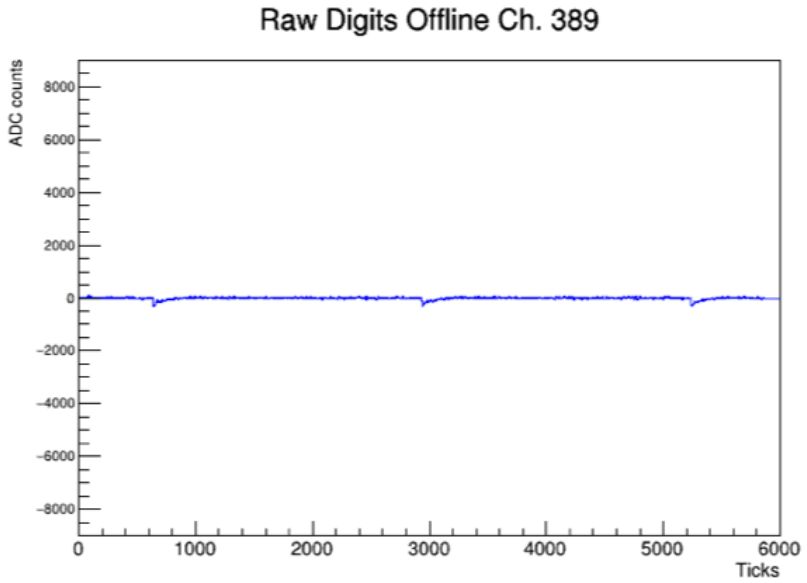
## Where we are at:

*An example: APA_P02SU, FEMB =1 and ASIC = 1. DAC=40*




*Pulsed Channel*




*Remaining channels of the ASIC*

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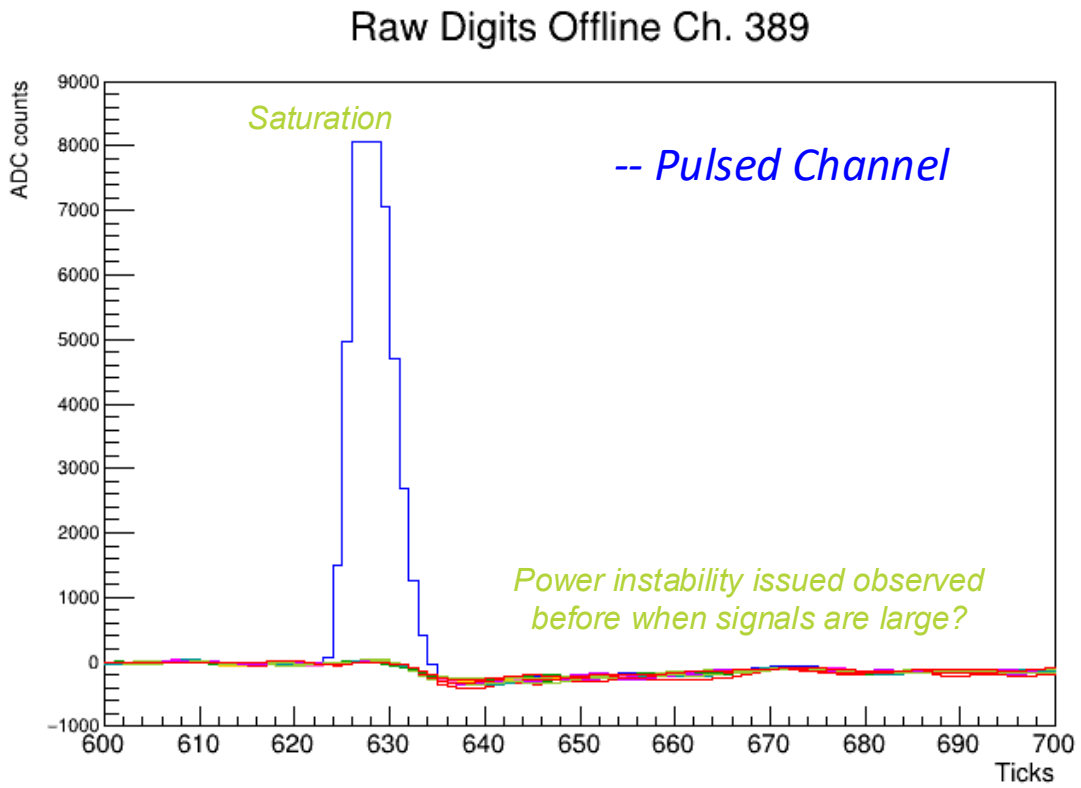


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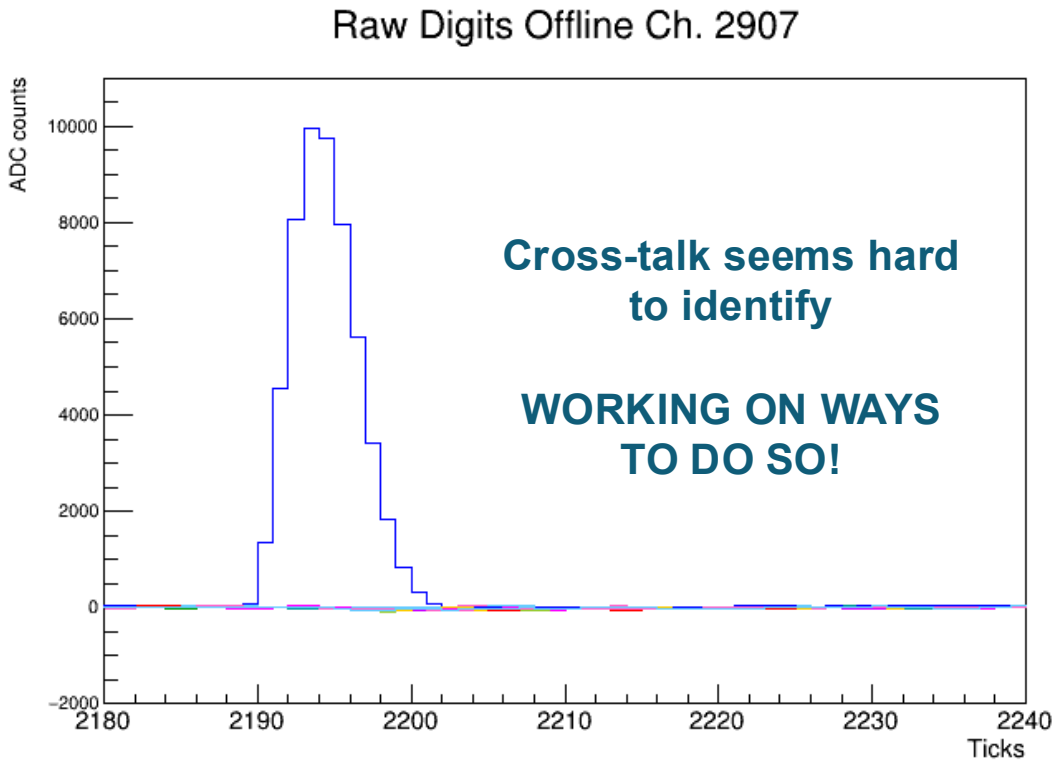
## Where we are at:

*Another example: APA_P02NL, FEMB =5 and ASIC = 7. DAC=40*

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