A First View to the Waveform-Correction Analysis

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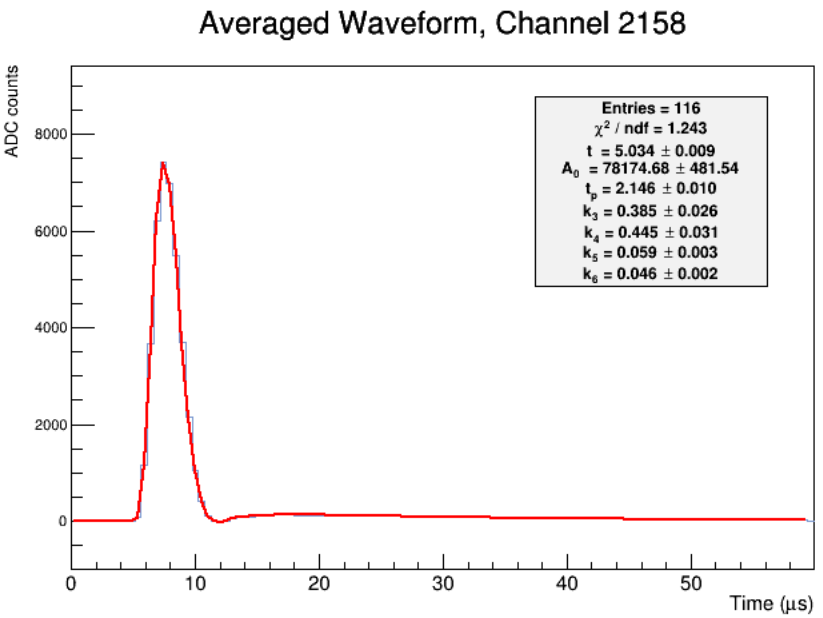
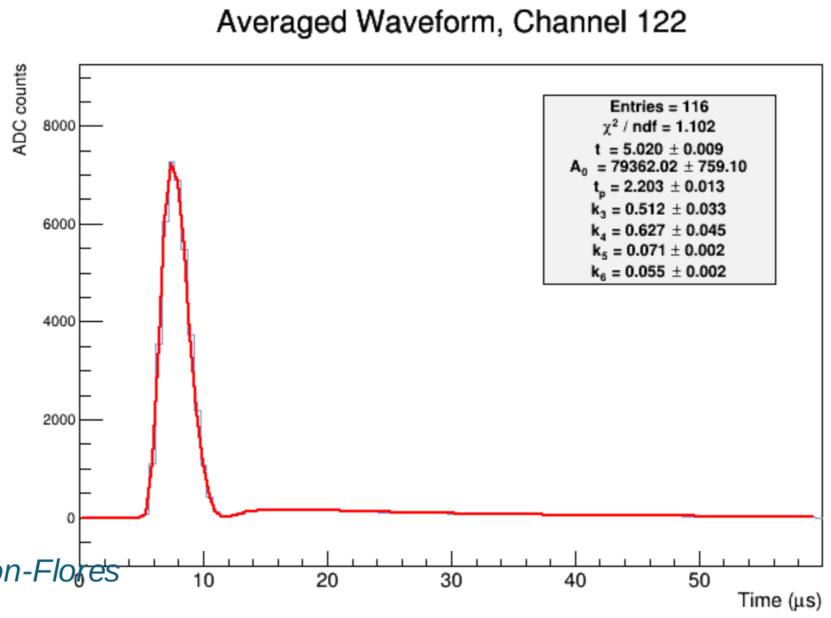
Dataset

- **NP04 TPC Electronics Studies Runs.**
- **Pulser Calibration Run 28286 from last 07/29 and 07/30.**
- **DAC = 30.**
- **7.8 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.
4. Fit corrected waveforms with Ideal Electronics Response Function.
5. Retrieve Amplitude and Shaping Time.
6. Convert Amplitude to Gain.





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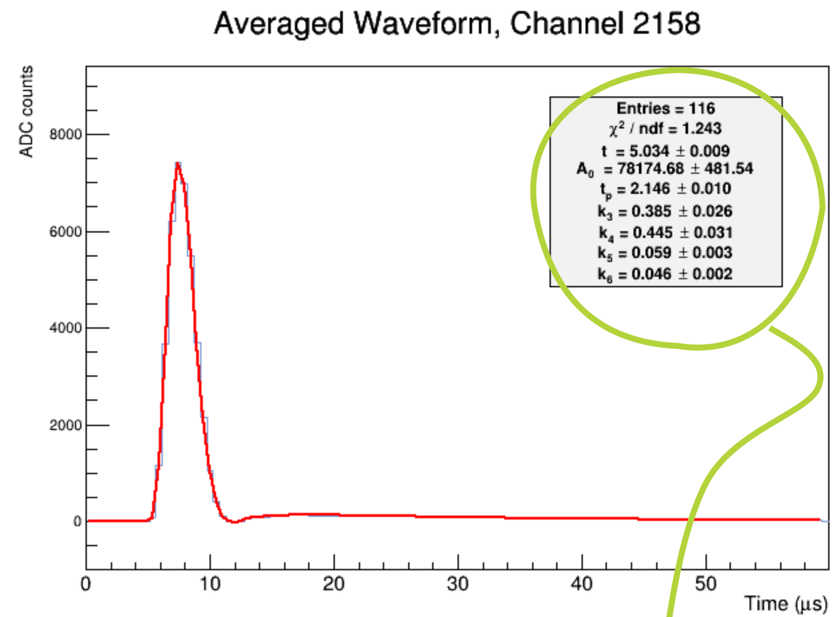


```
"channels": [
        2158
    ],
    "gain": 1.345697e-12,
    "shaping": 2146.0,
    "k3": 0.3846,
    "k4": 0.4447,
    "k5": 0.05915,
    "k6": 0.04606
},
```

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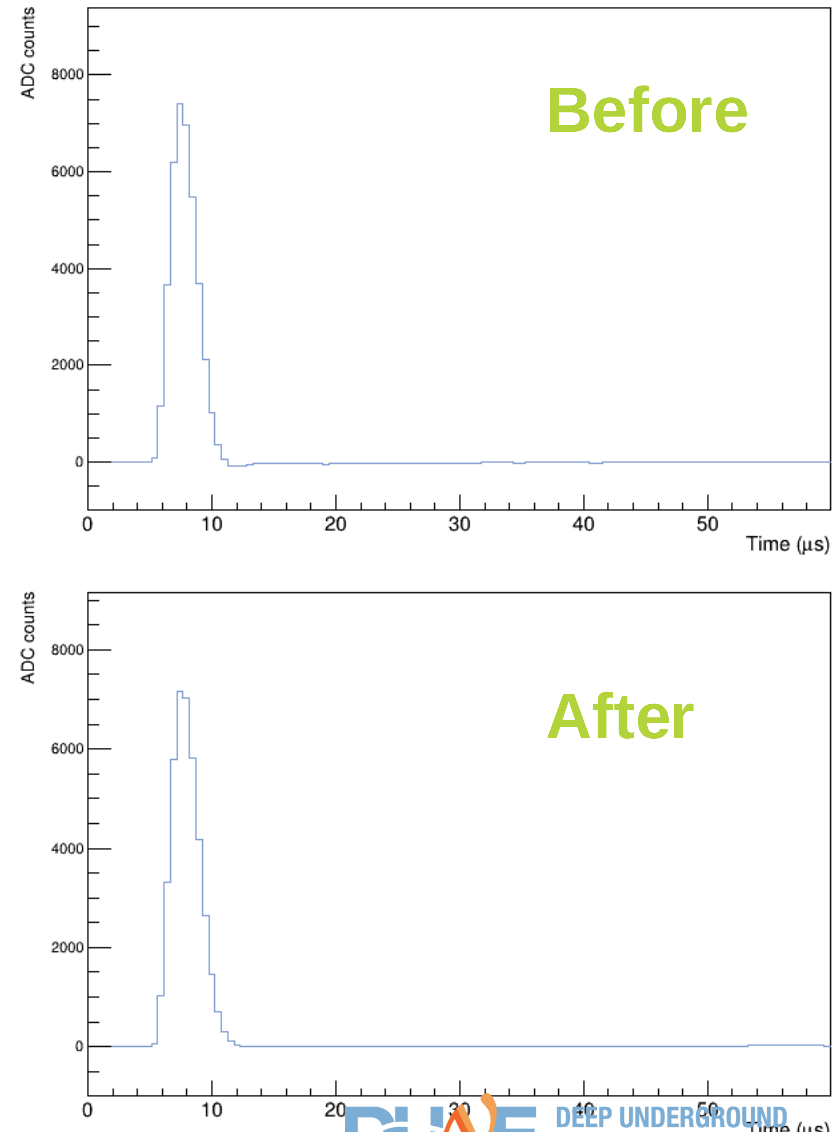

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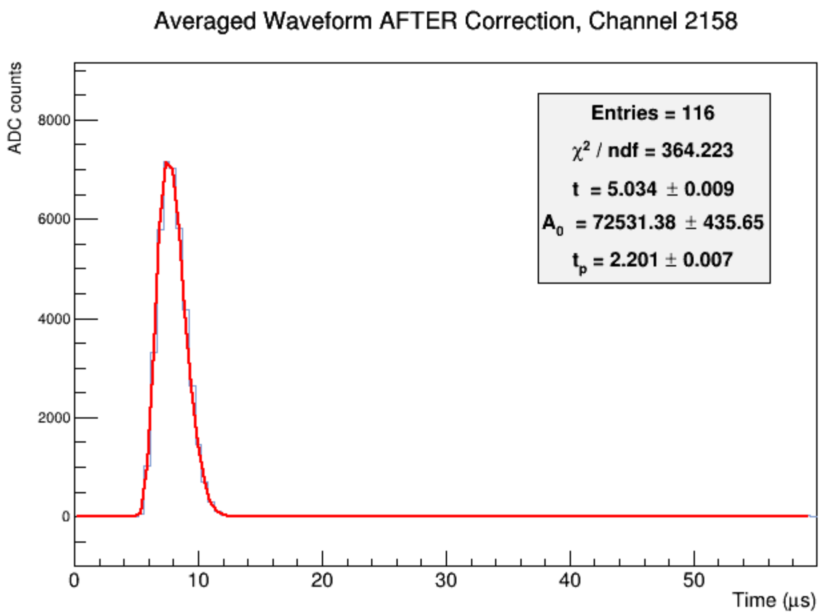

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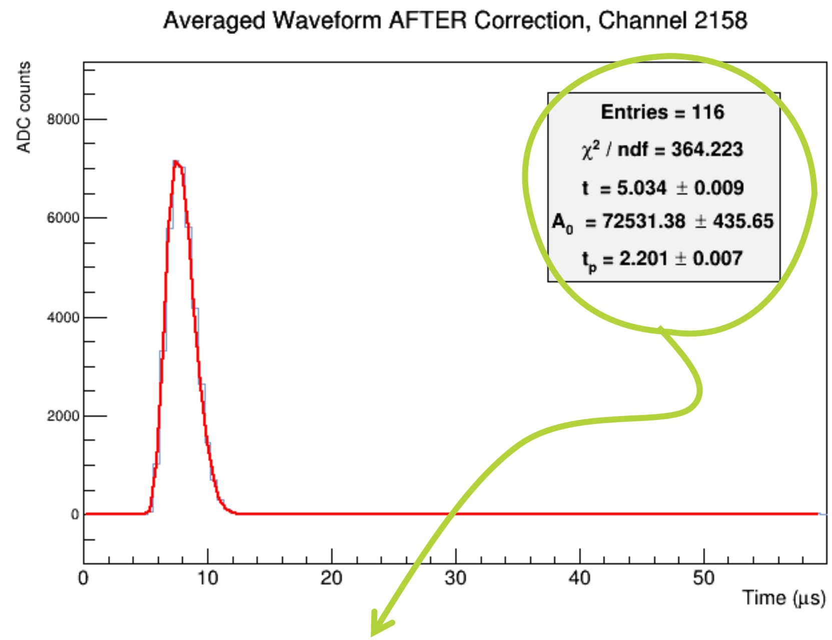

A_0 = 72531.38 ± 435.65 ADCs

t_p = 2.201 ± 0.007 μs

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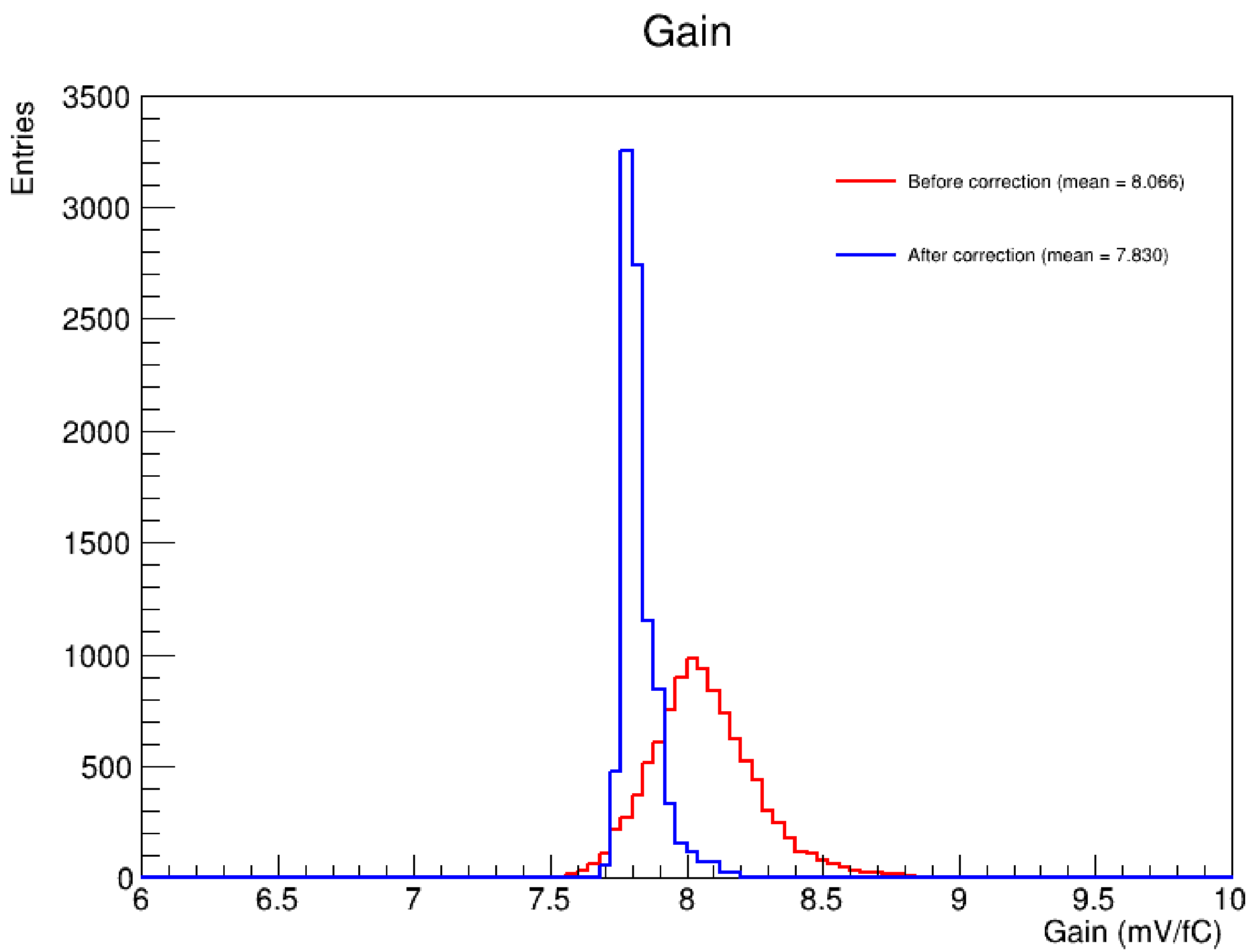
$$\text{gain} = \frac{1400\ mV * A_0}{79.5315\ \text{fC} * 16384 * 10}$$

- **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 gain setting.**
  - **30 DAC: DAC setting.**
- **16384 : 14-bit ADC resolution (2^{14})**

First Results



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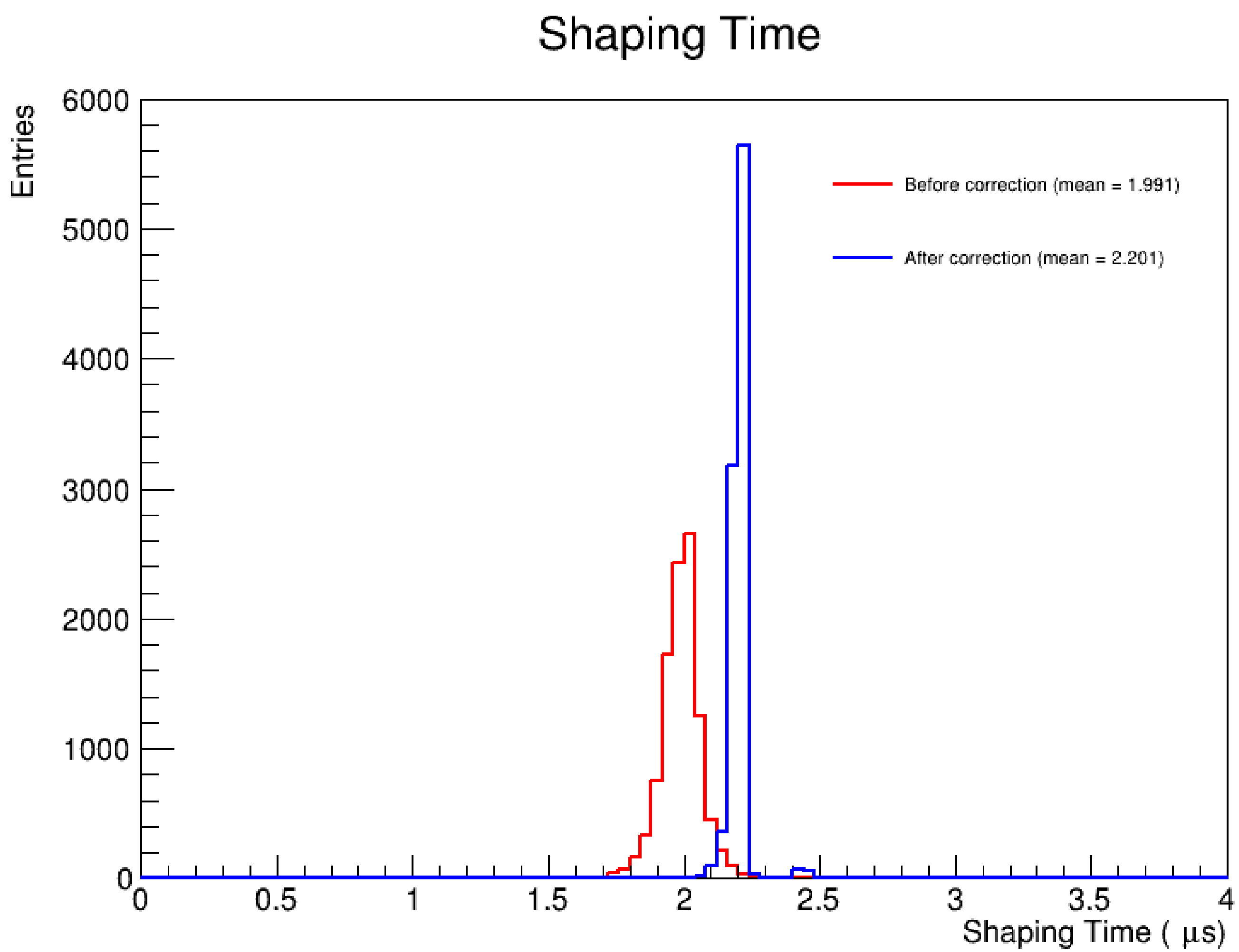

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Electronics Response in Waveform Data

$$M_i(t_0) = \int_{-\infty}^{\infty} R_i(t - t_0) \cdot I(t) \cdot dt$$

$M_i(t_0)$: Digitized Waveform
$R_i(t - t_0)$: Channel "i" Elec. Response
$I(t)$: Induced Current

Frequency Domain

$$M_i(\omega) = R_i(\omega) \cdot I(\omega)$$

Electronics Response Correction

$$M_i^{Corr}(\omega) = M_i(\omega) \cdot \frac{R_{nominal}(\omega)}{R_i(\omega)}$$

$R_i(\omega)$: Channel "i" measured response FFT

https://arxiv.org/pdf/1804.02583