ProtoDUNE Photon Detection Update
# February 2019

Chris Macias

Indiana University

ProtoDUNE PD Update, Feb 2019
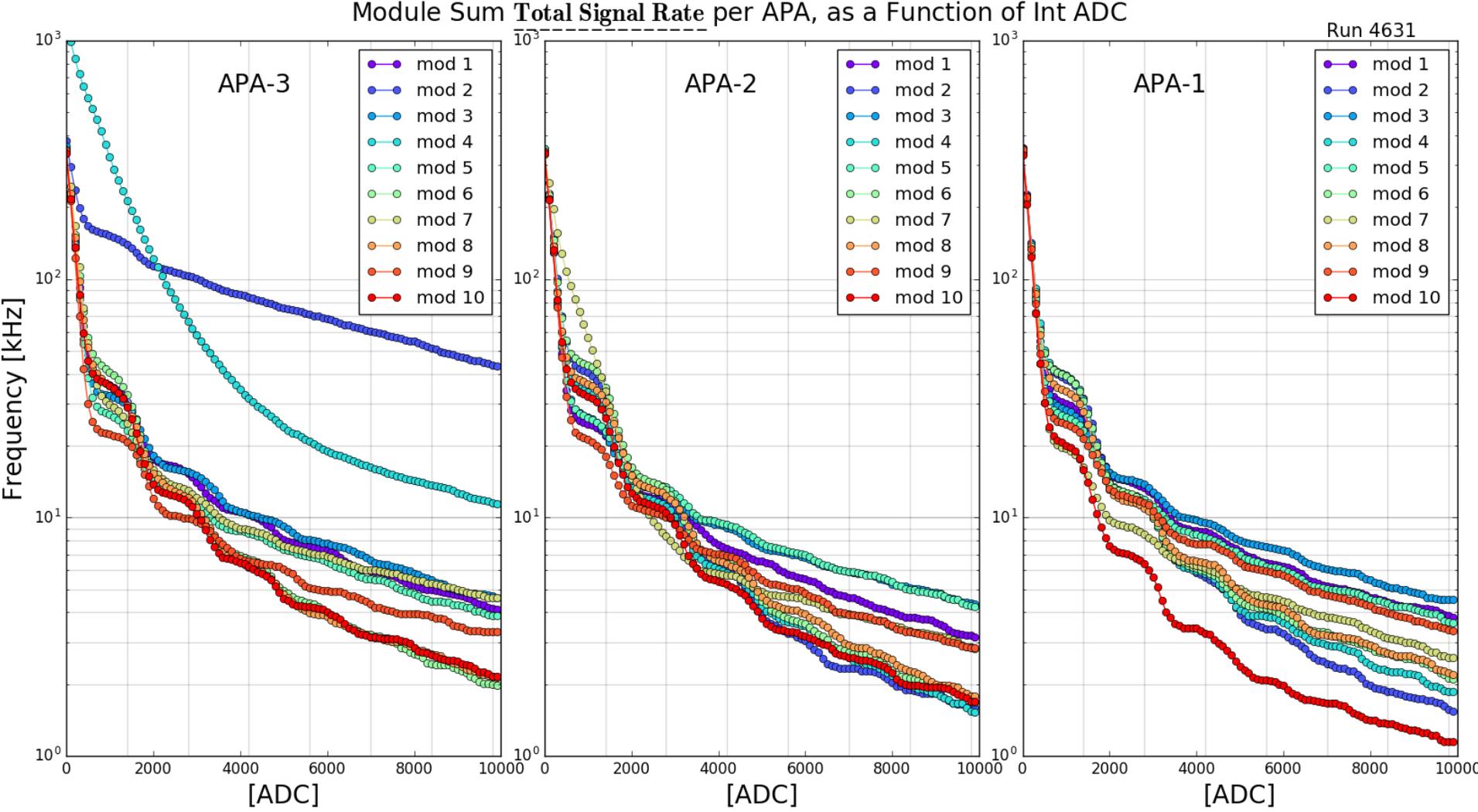
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DUNE

Module Sum Total Signal Rate per APA, as a Function of Int ADC

Module Sum Total Signal Rate per APA, as a Function of Int ADC

Note: Currently shows $\Sigma_{ch\_x}^{ch_x+3}(Rate)$
Need to update with $\Sigma_{ch\_x}^{ch_x+3}(PE)->Rate.$

# Module Sum Total Signal Rate per APA, as a Function of Int ADC Multiple Runs

Note: Currently shows
$\Sigma_{ch\_x}^{ch_x+3}$(Rate)
Need to update with
$\Sigma_{ch\_x}^{ch_x+3}$(PE)->Rate.

Module Sum Total Signal Rate per APA, as a Function of Int ADC
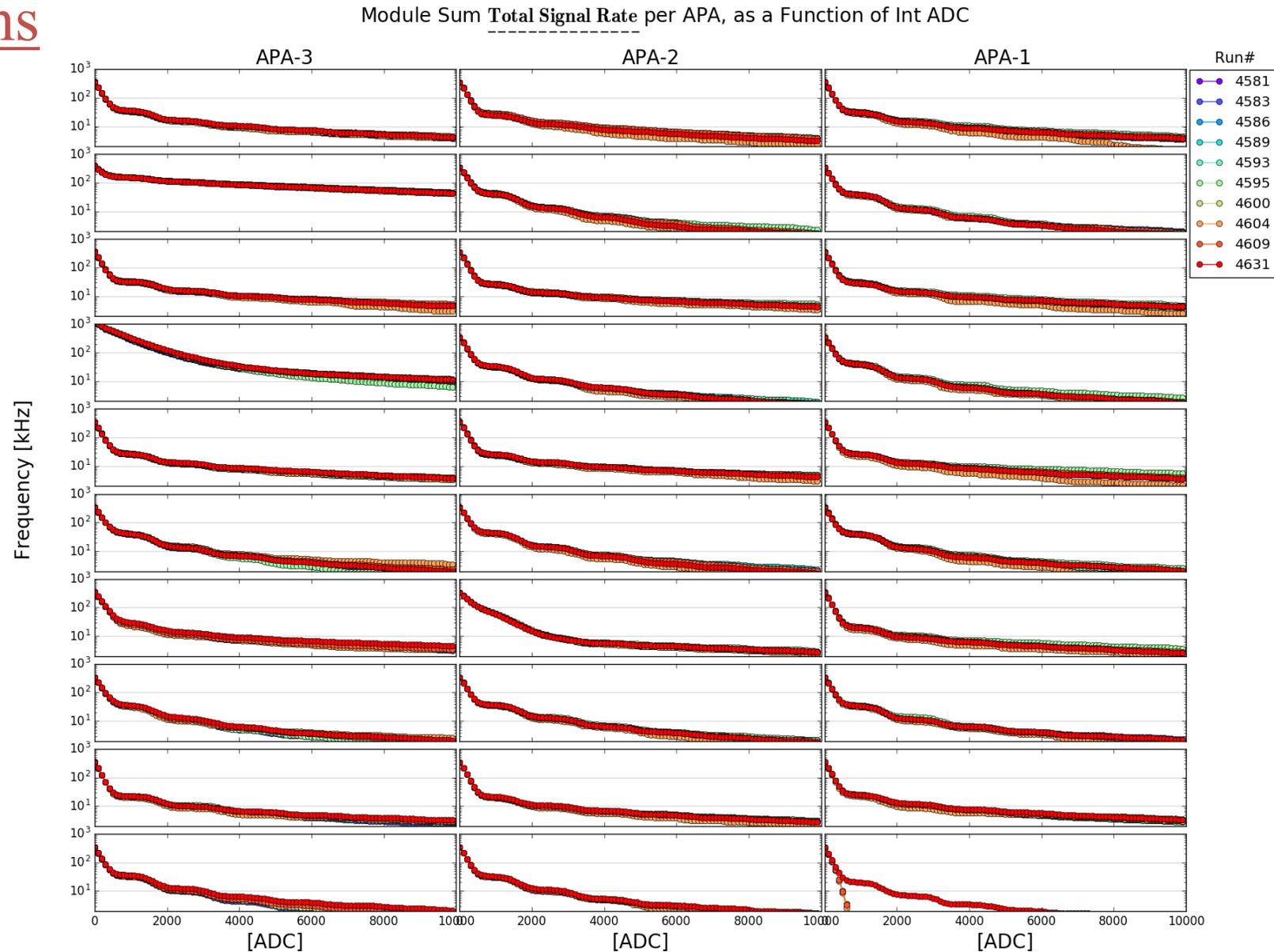
SensL Calibrations for APAs 1-3
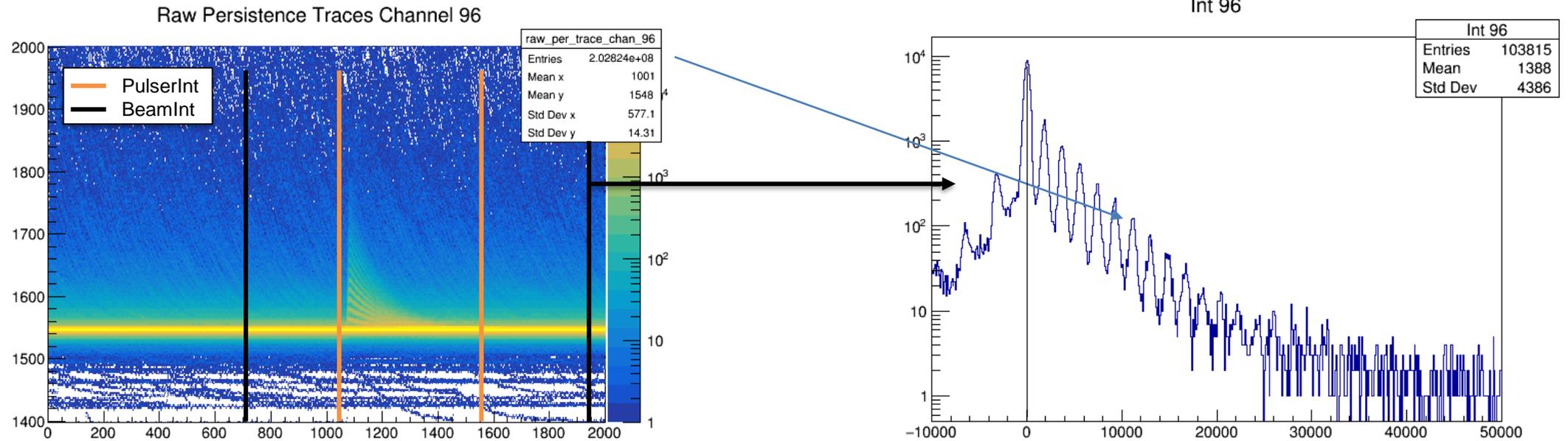
- Use Leon's Processed Runs, extracting Root Ttree information, such as:
  - Pedestal calculation (using 725 samples)
  - Integration, using fixed intervals
    - BeamInt - [700,1975] samples
    - PulserInt - [1050,1550] samples

# SensL Calibrations, using BeamInt Window
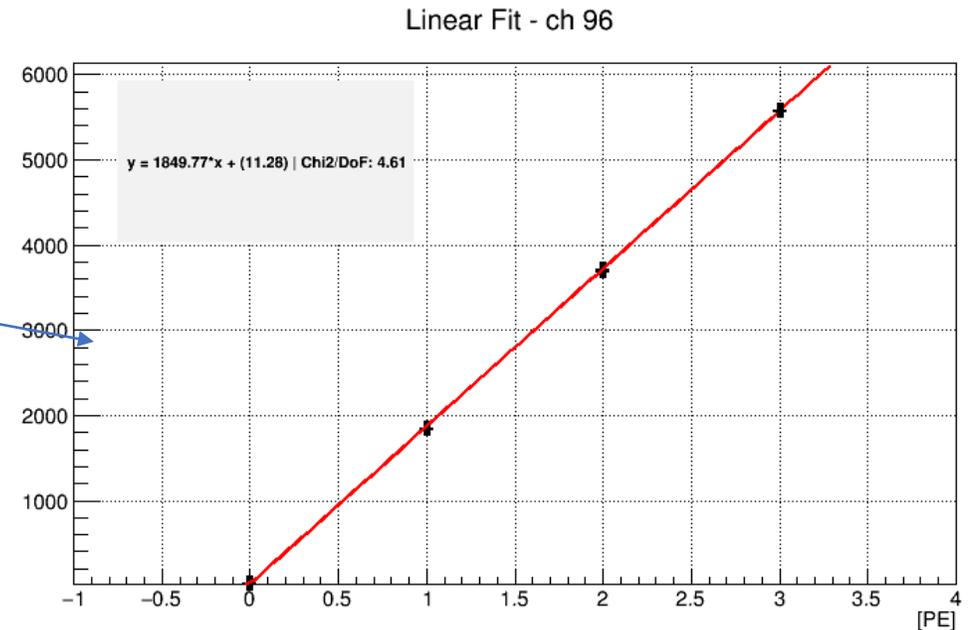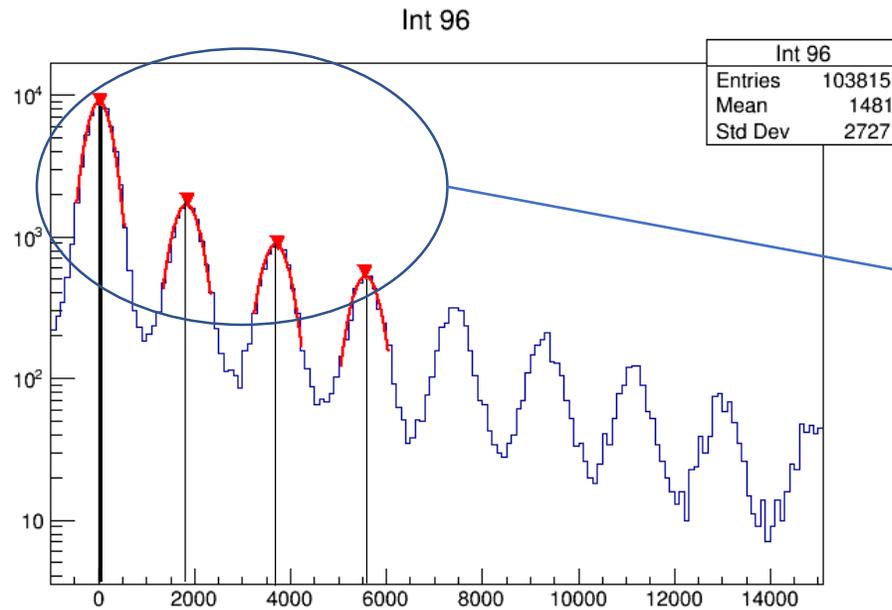
- Fit the first 4 PE peaks with a gaussian, using TF1 fit.
  - Fit range - [Peak-500, Peak+500]
- Linear Fit, via TF1 fit, using
 - mean of each peak
 - sigma as error

SensL Calibrations @ 27.5

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SensL Calibrations @ 27.0

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SensL Calibrations @ 26.5

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SensL Calibrations @ 26.0

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SensL Calibrations @ 25.5

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SensL Calibrations @ 25.0

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SensL Calibrations @ 24.5


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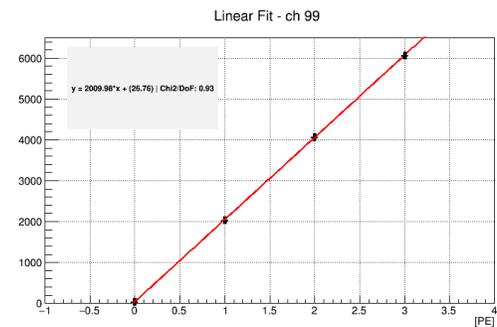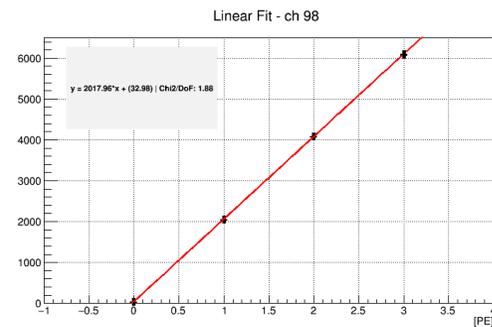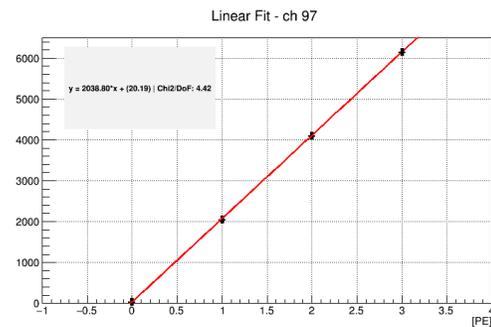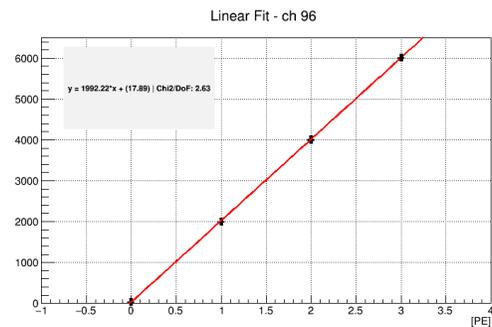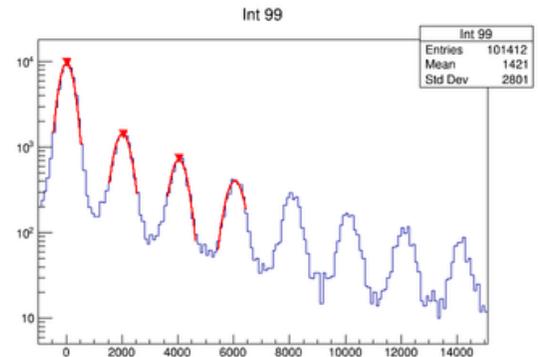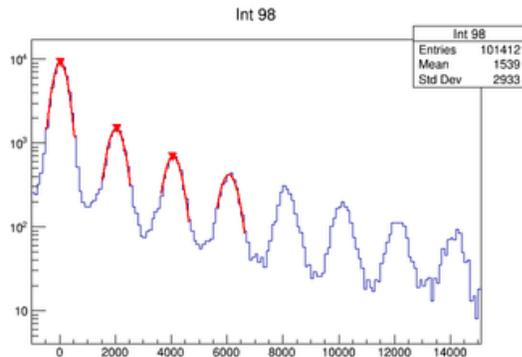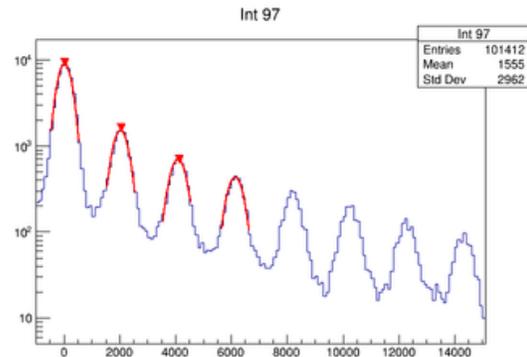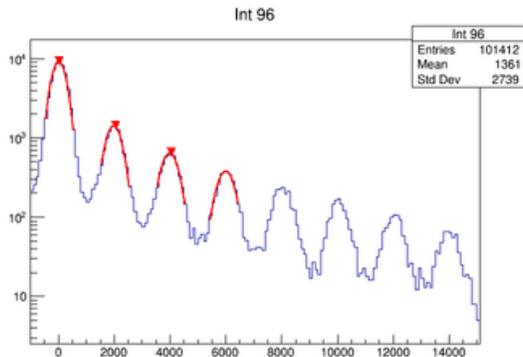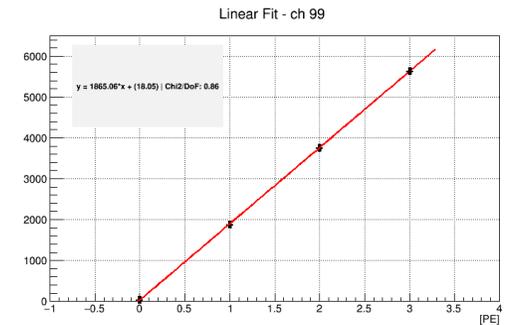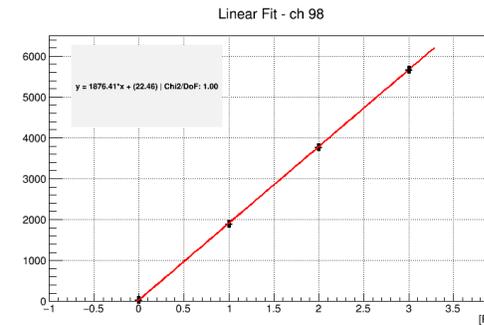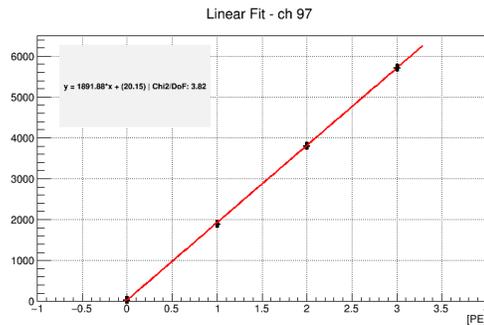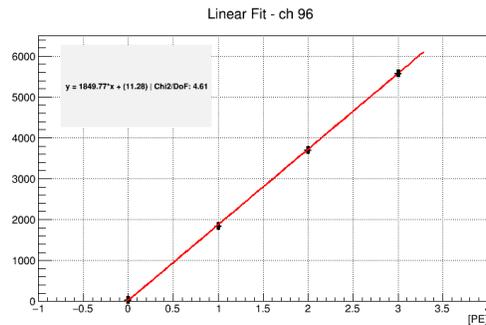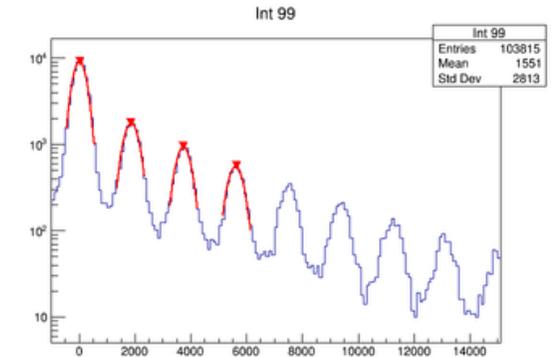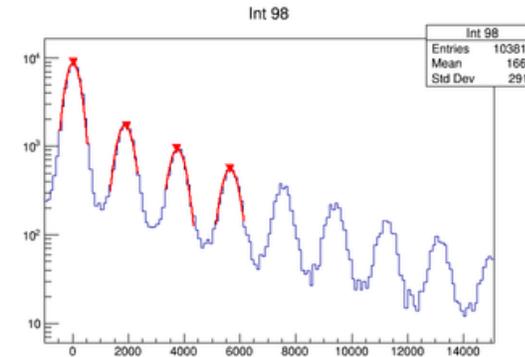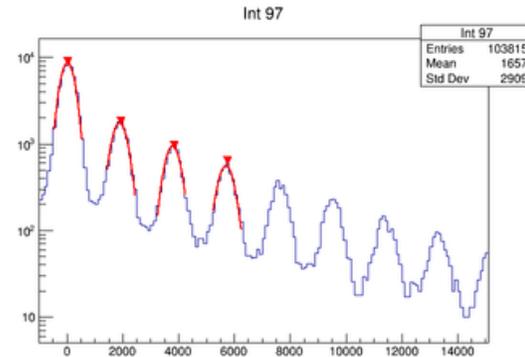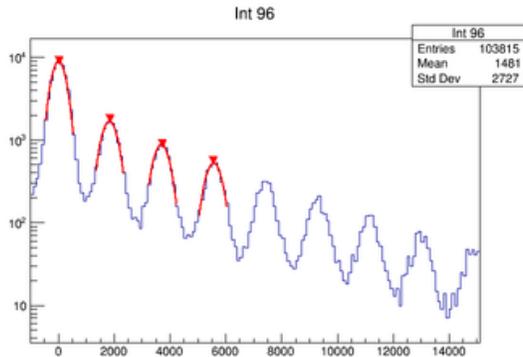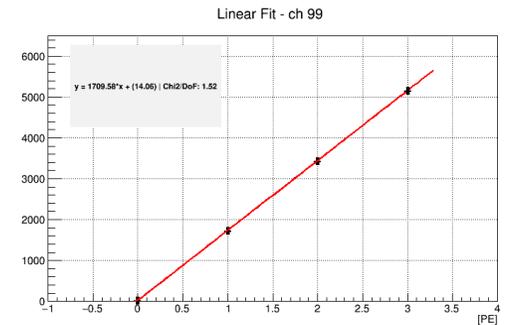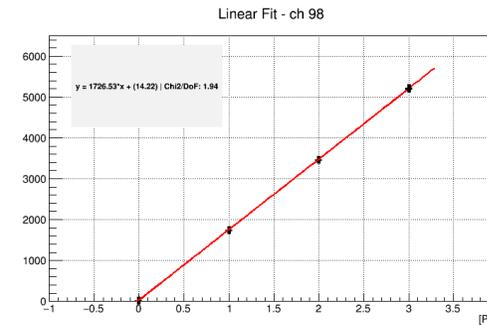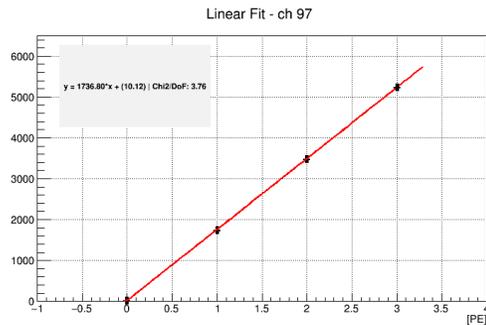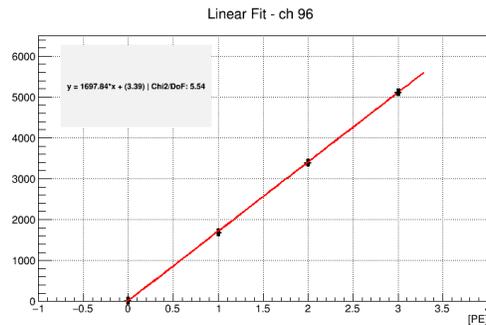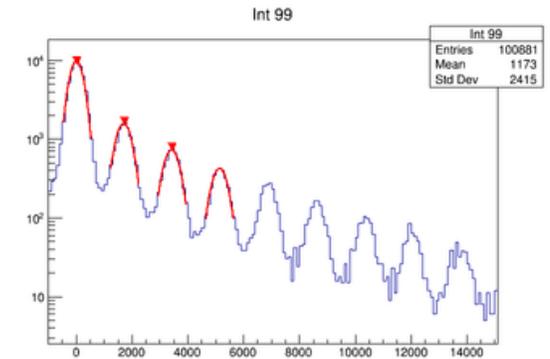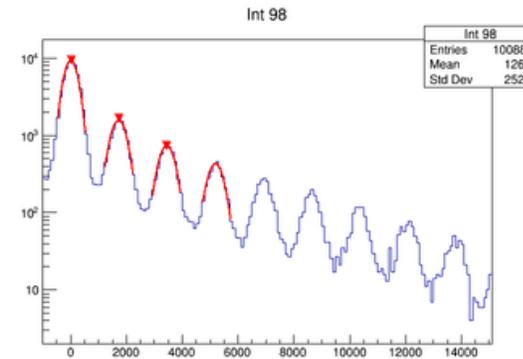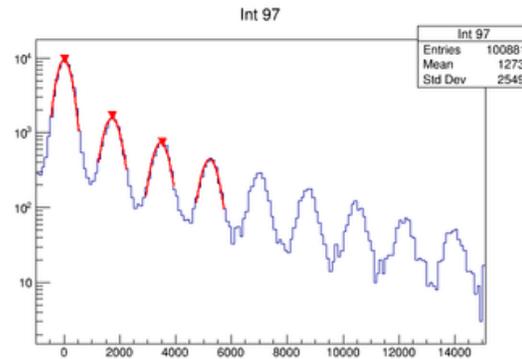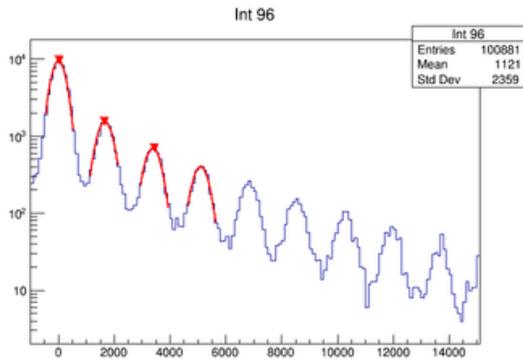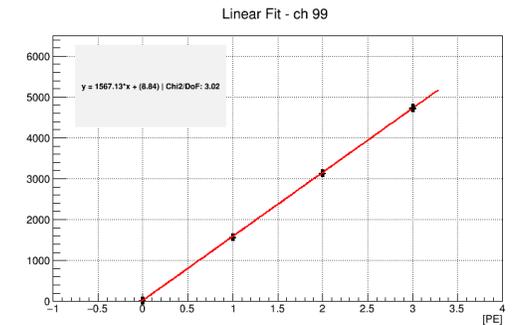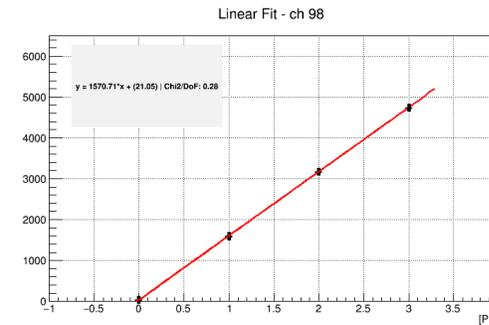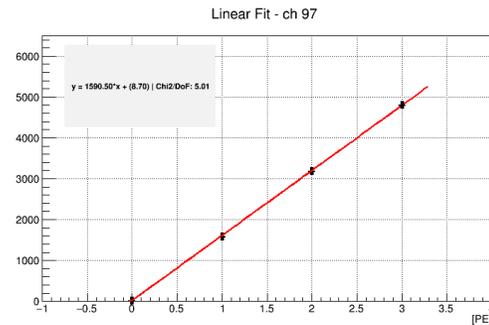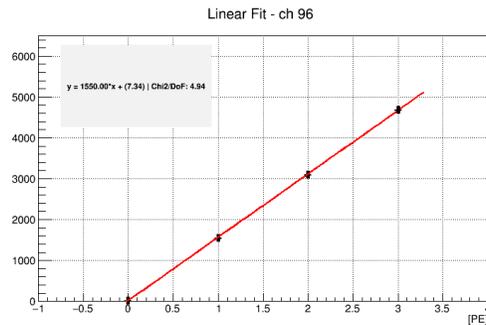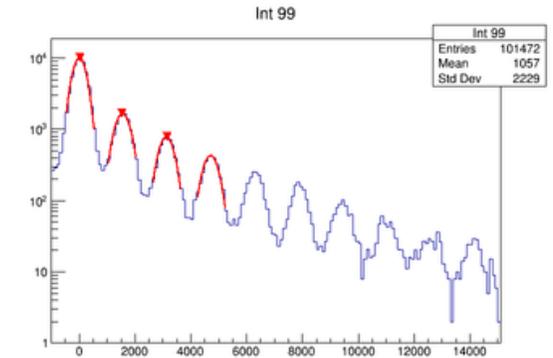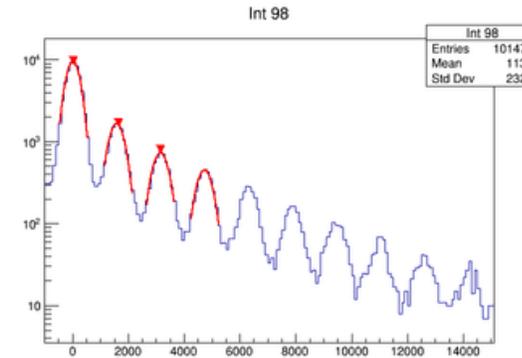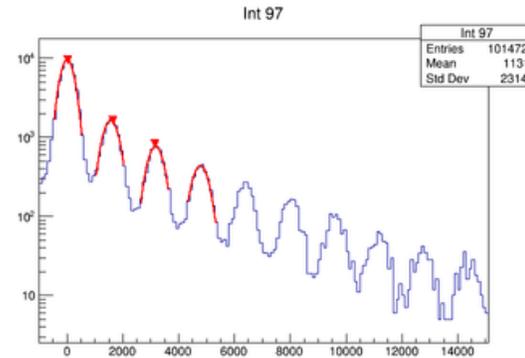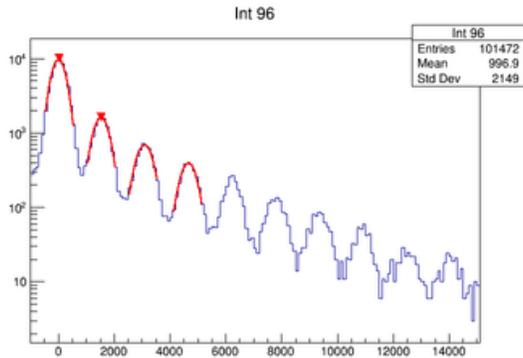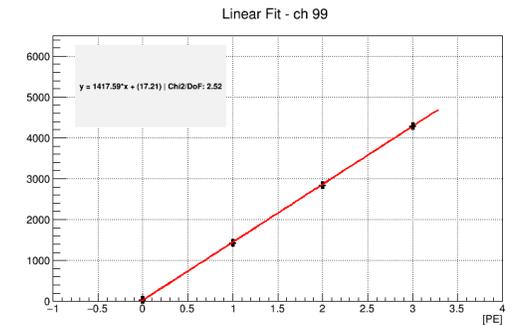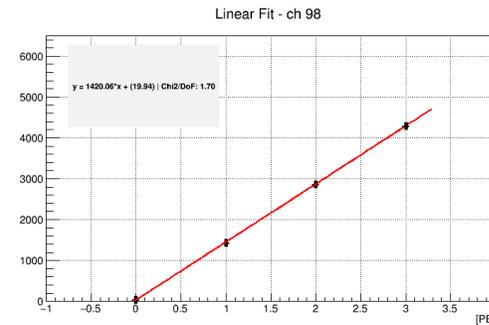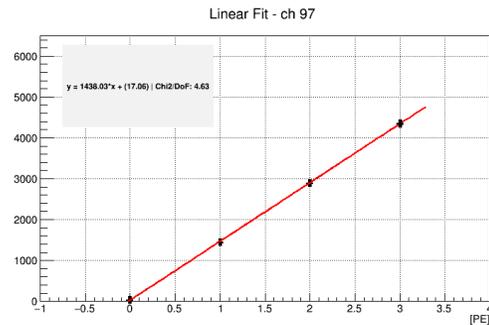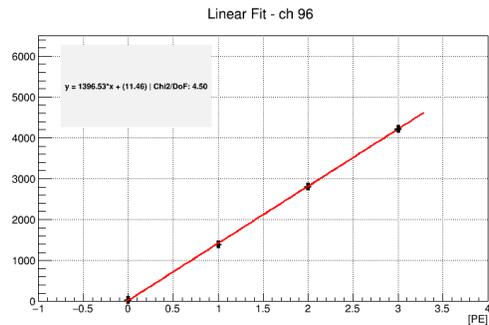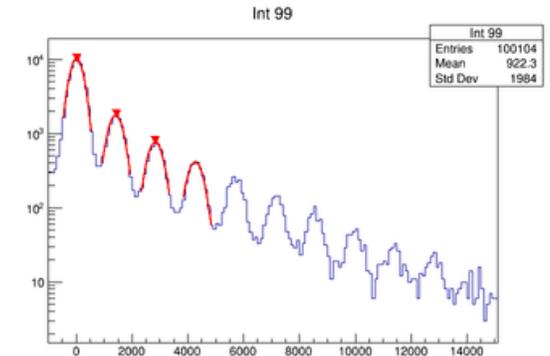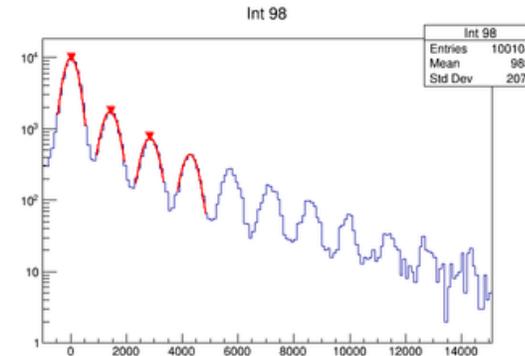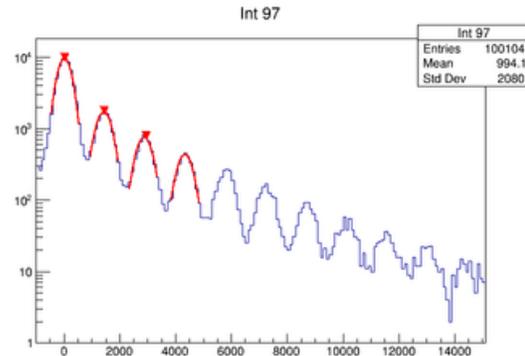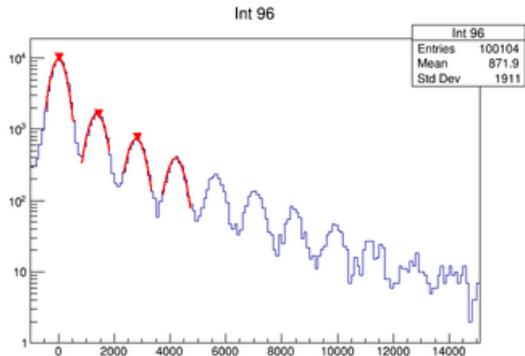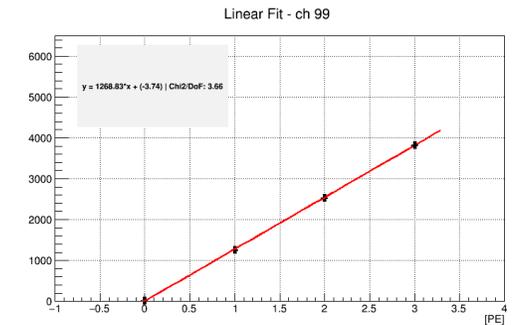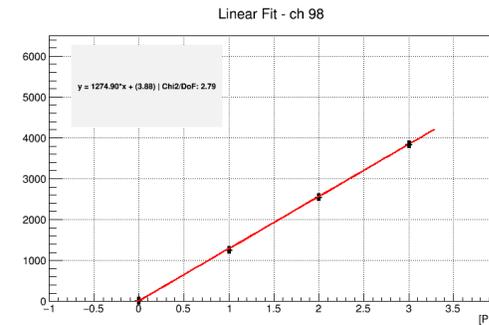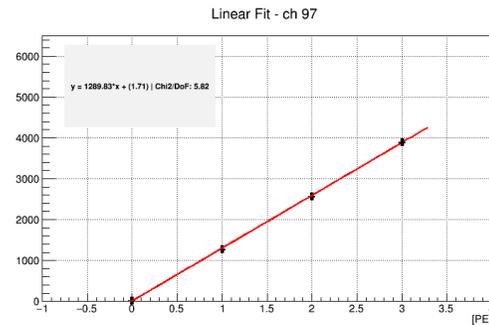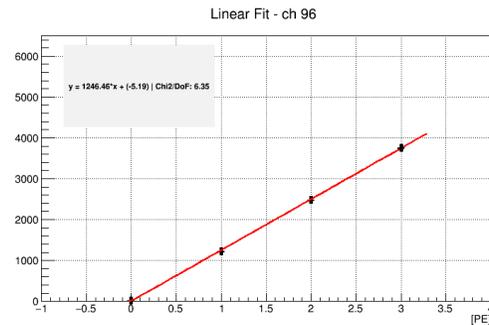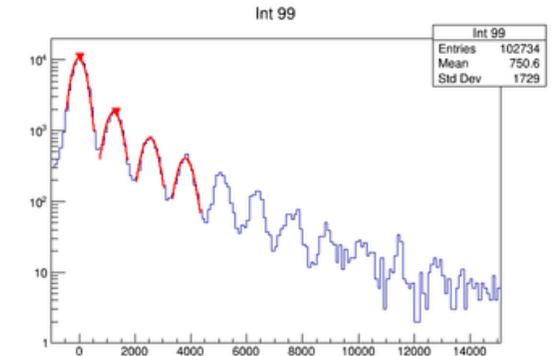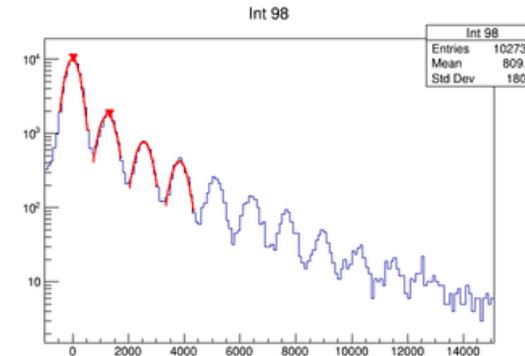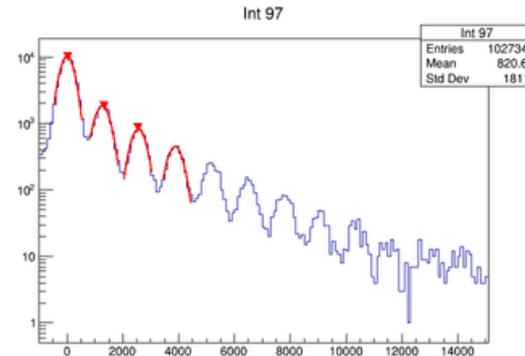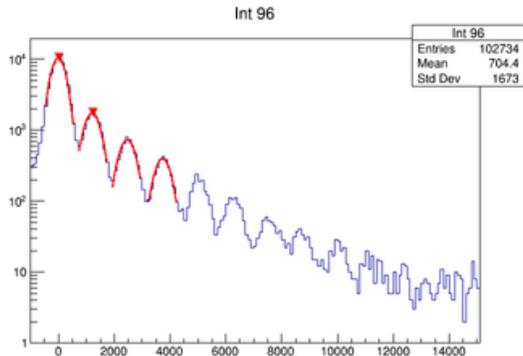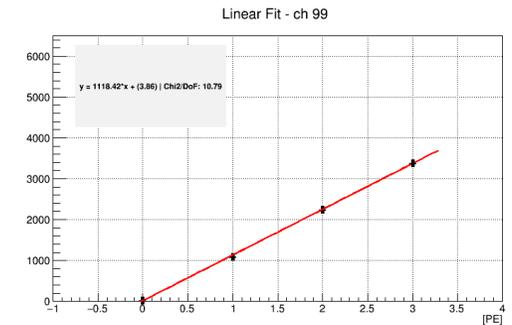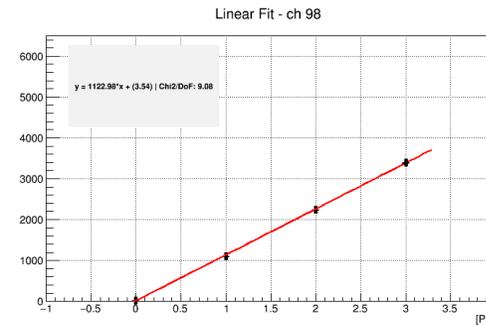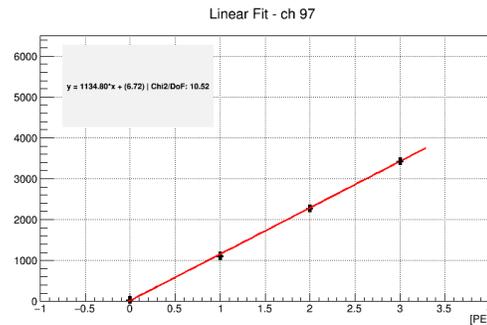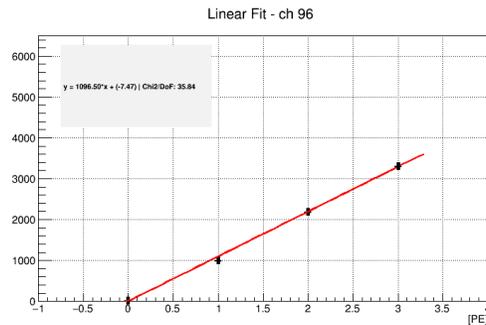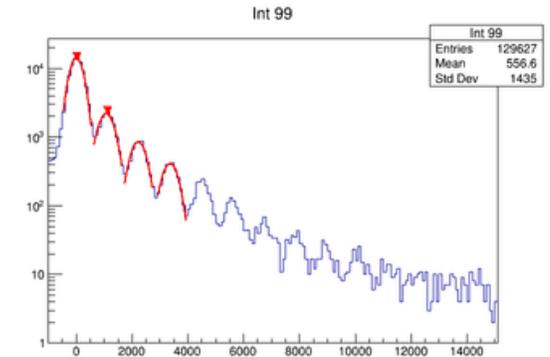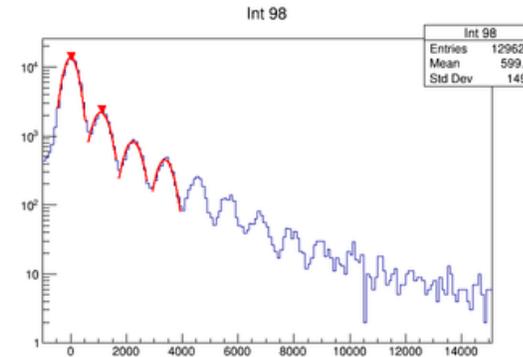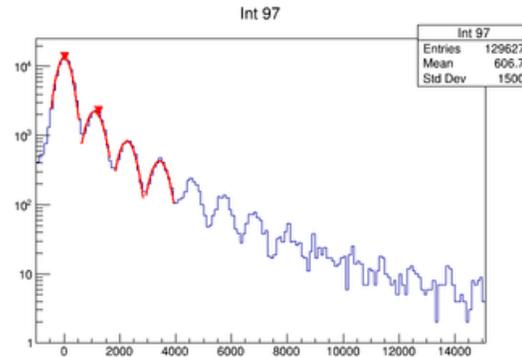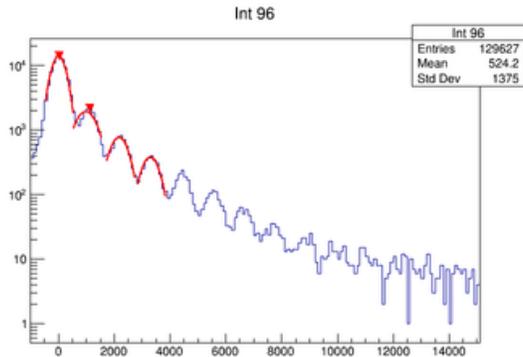
SensL Calibrations @ 24.0
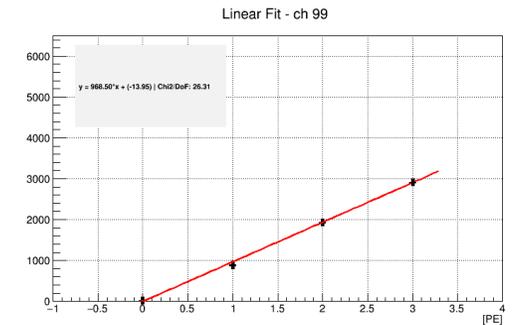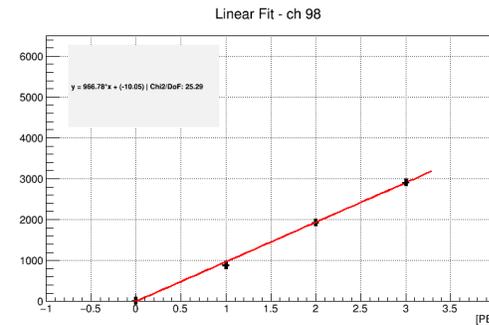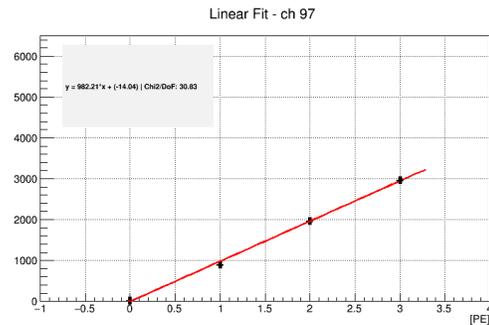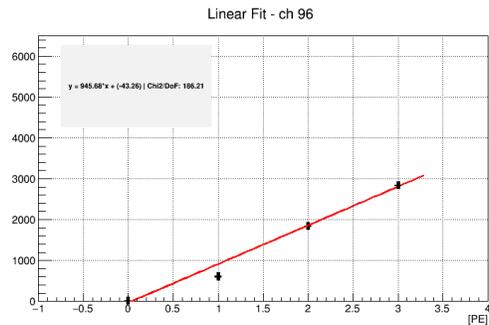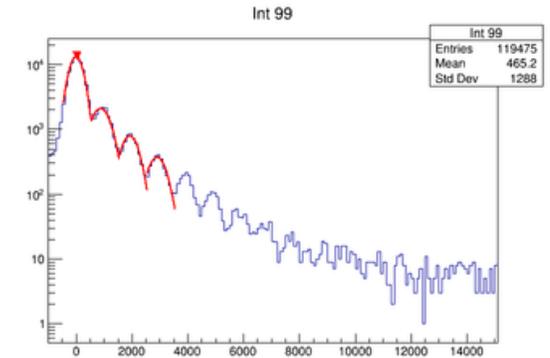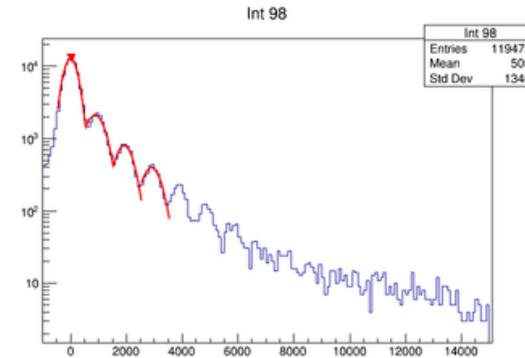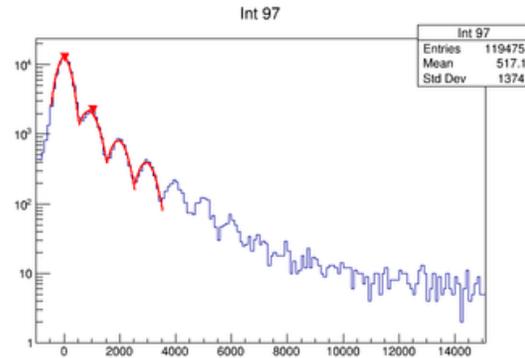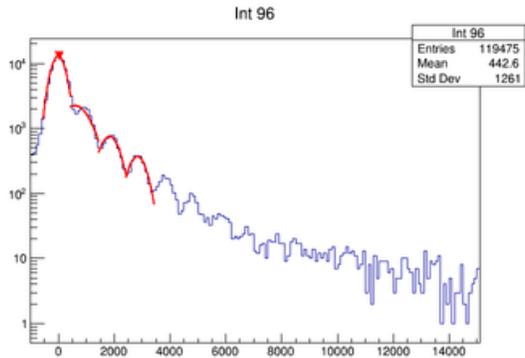
SensL Calibrations @ 23.5

Peak Finder Starts to Fail

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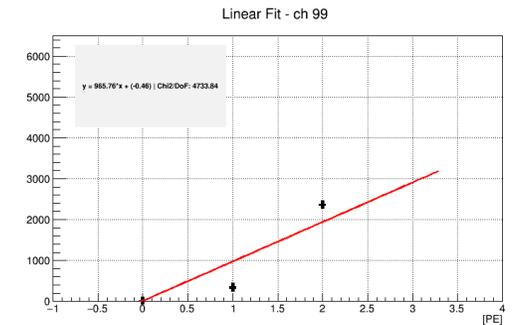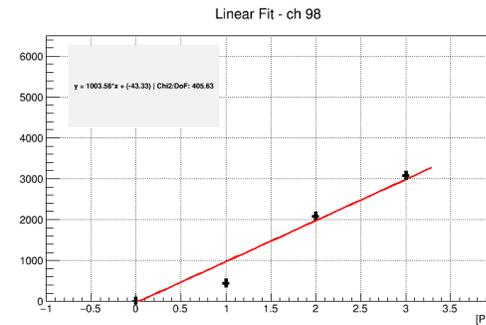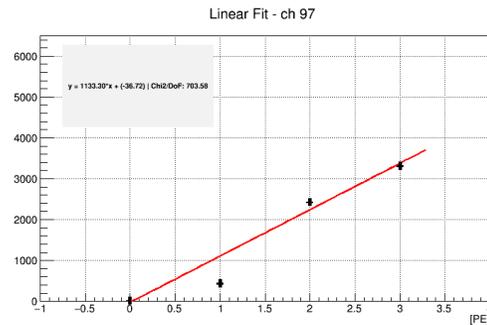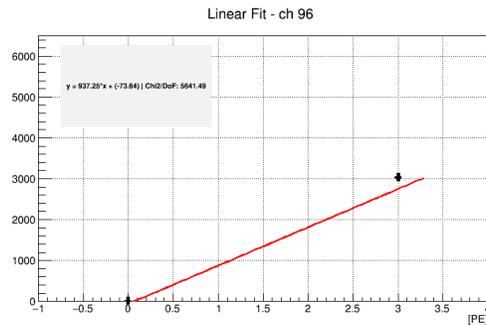
SensL Calibrations @ 23.0


Peak Finder Starts to Fail
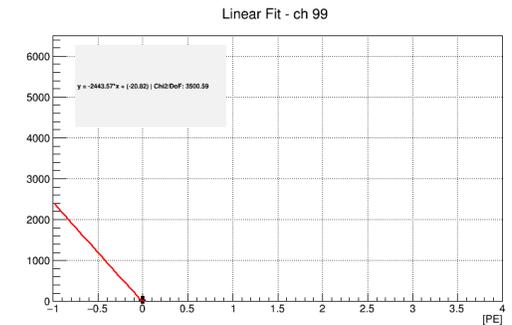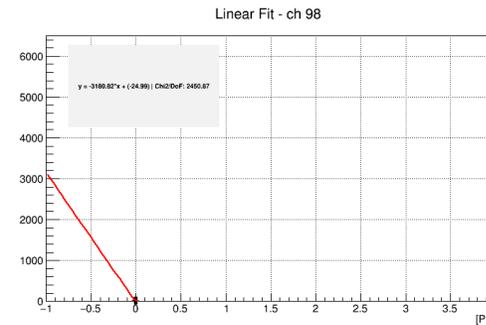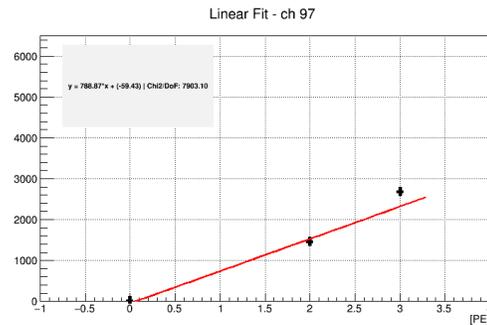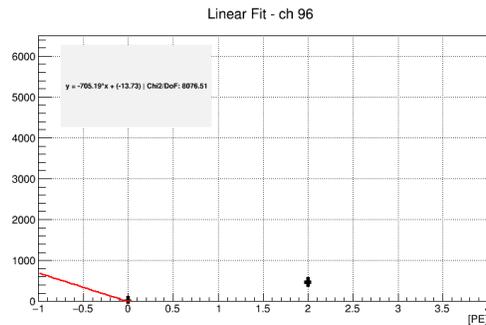
SensL Calibrations @ 22.5

Peak Finder Starts to Fail

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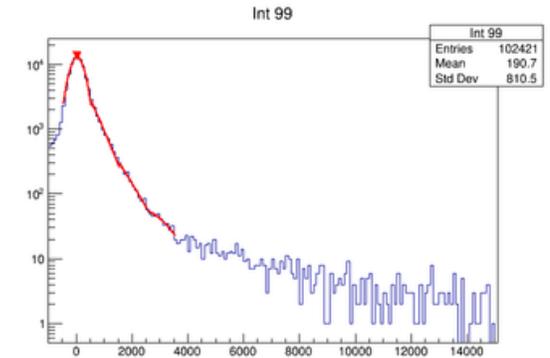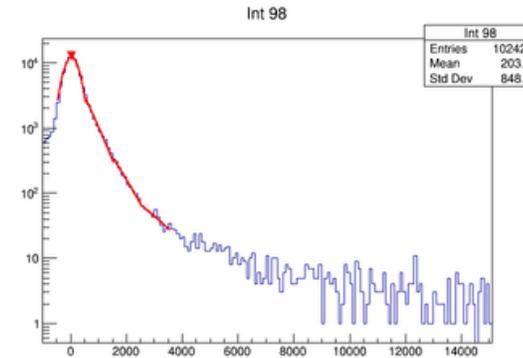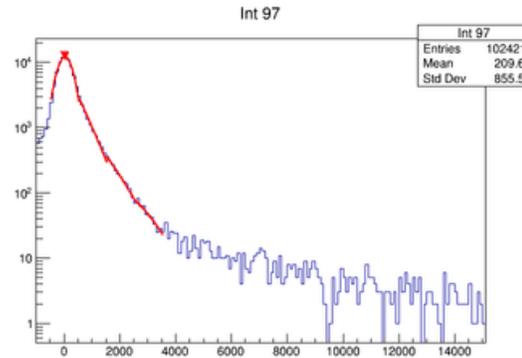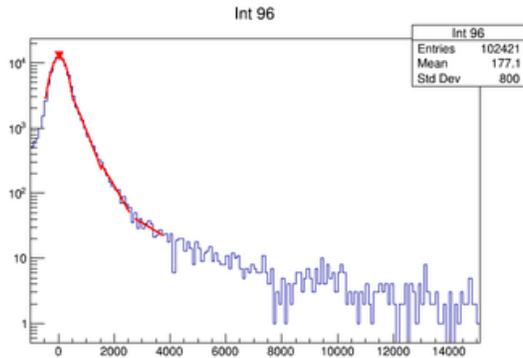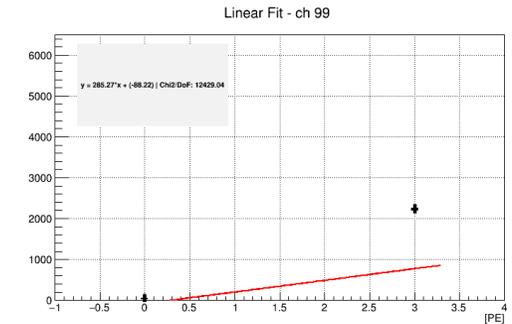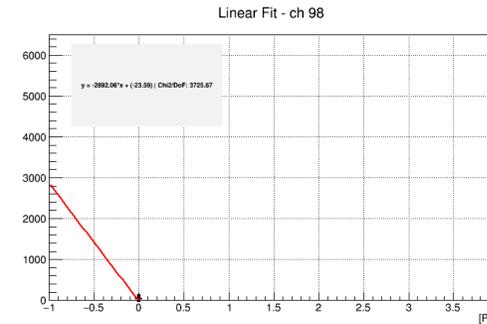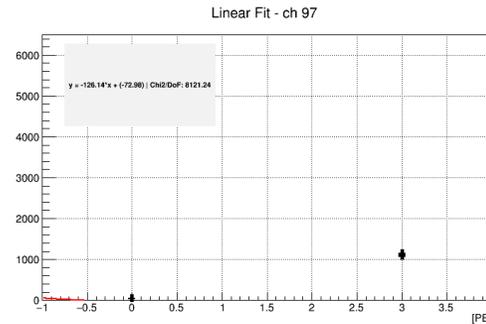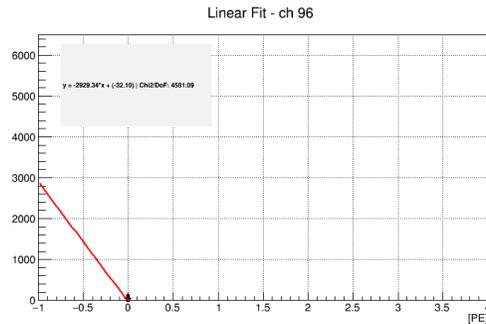
APA-3, Module 1 ADC/Avalanche vs. Voltage
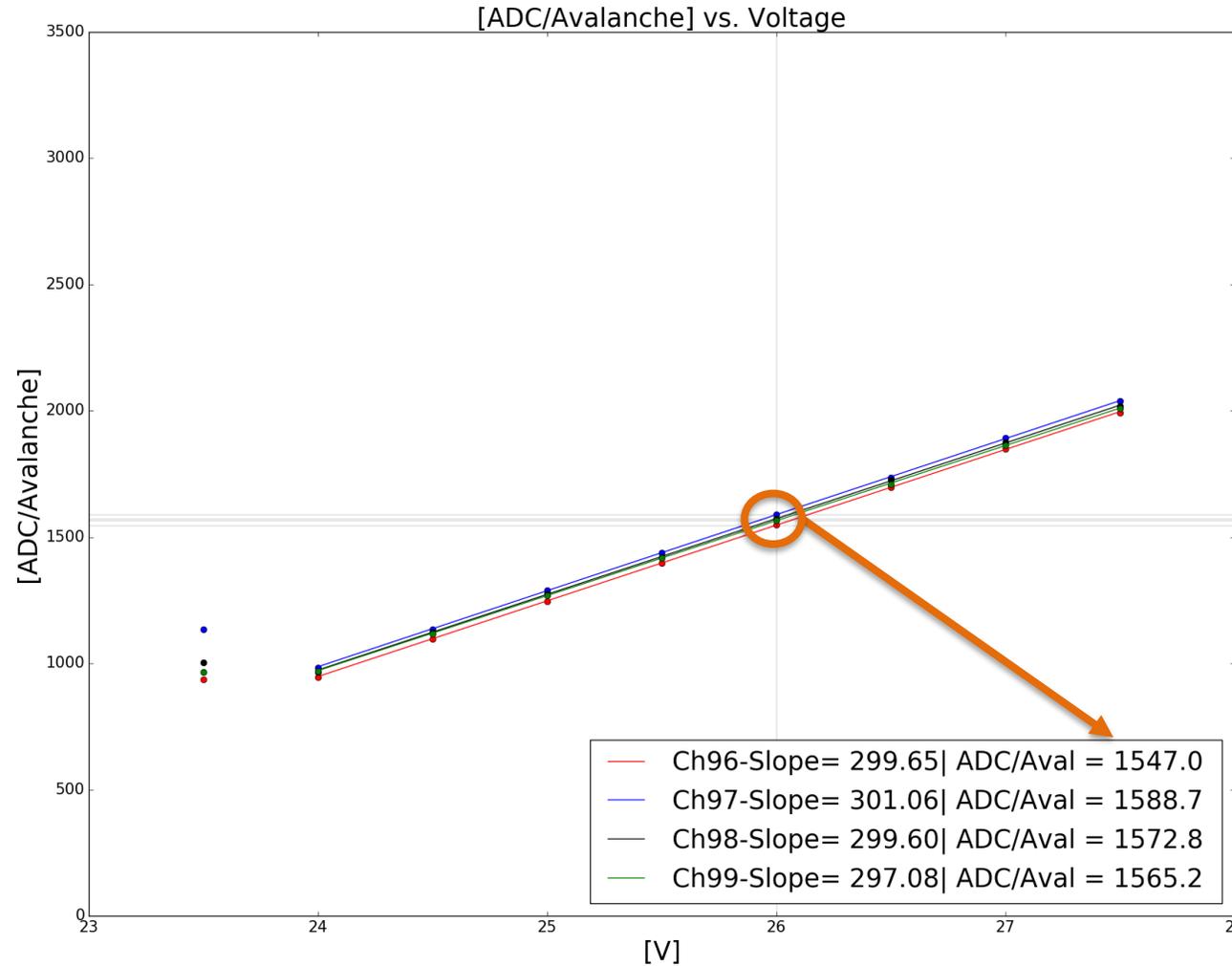
Consistent Slopes!

Determination of Calibration Constant @ Nominal Voltage

APA-3, Module 2 ADC/Avalanche vs. Voltage
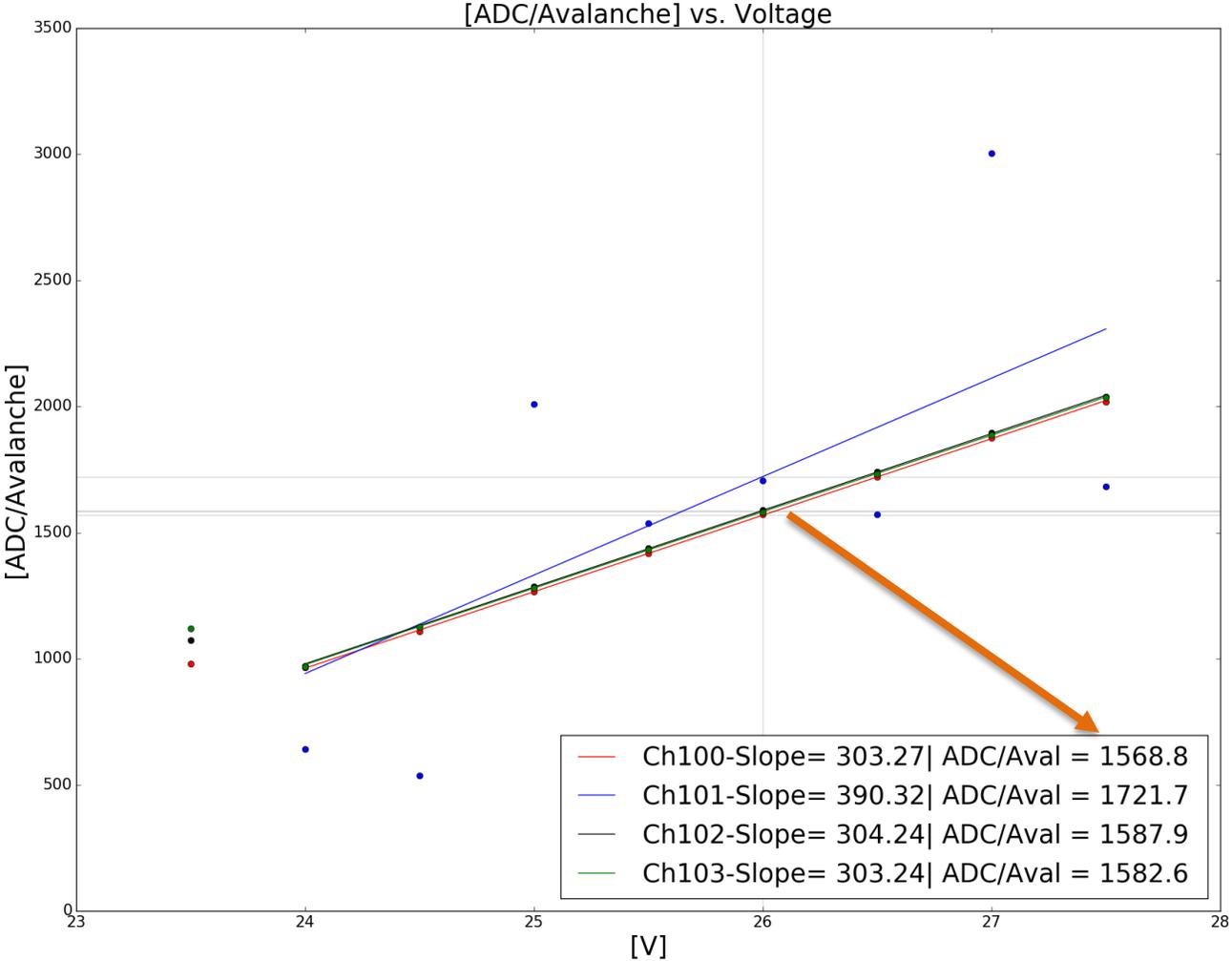
Consistent Slopes!

Determination of Calibration Constant @ Nominal Voltage

APA-3, Module 3 ADC/Avalanche vs. Voltage

Consistent Slopes!

[ADC/Avalanche] vs. Voltage

Ch104-Slope= 319.27| ADC/Aval = 1718.1
Ch105-Slope= 299.94| ADC/Aval = 1580.4
Ch106-Slope= 322.43| ADC/Aval = 1710.0
Ch107-Slope= 322.22| ADC/Aval = 1710.1
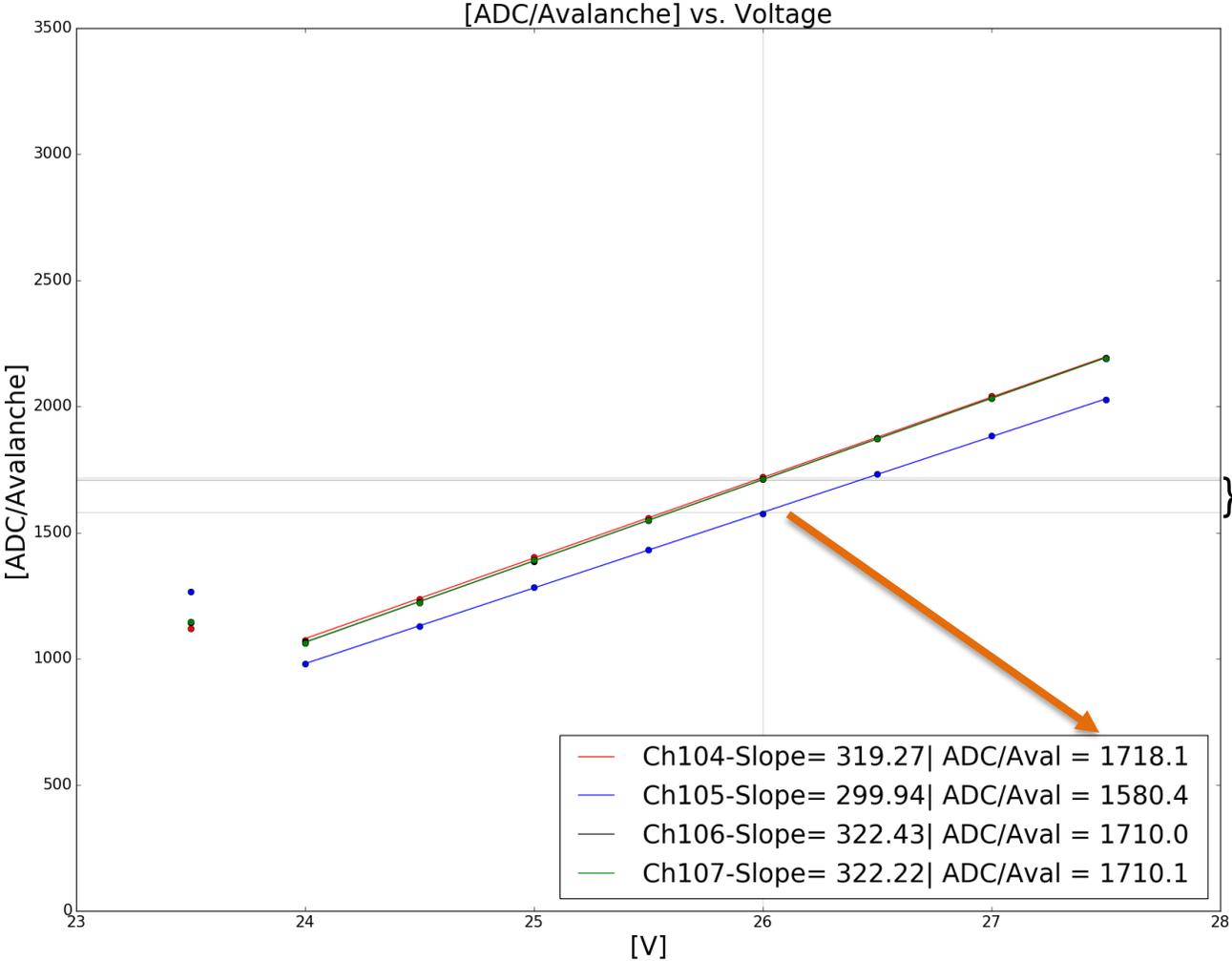
Can use to Match Gains in the future

Determination of Calibration Constant @ Nominal Voltage

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APA-3, Module 5 ADC/Avalanche vs. Voltage
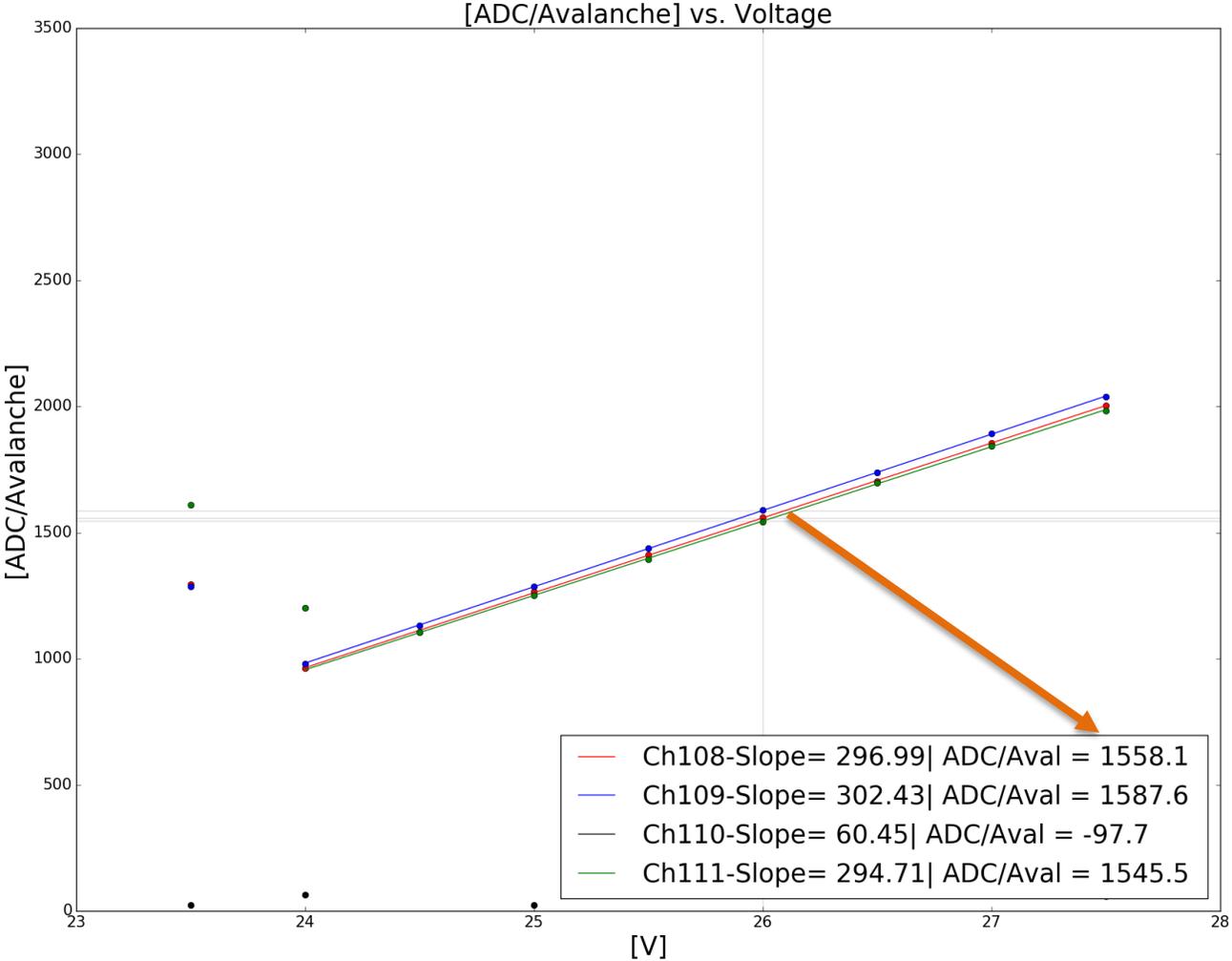
Consistent Slopes!

[ADC/Avalanche] vs. Voltage

Known Problematic Channel: 110

Ch108-Slope= 296.99| ADC/Aval = 1558.1
Ch109-Slope= 302.43| ADC/Aval = 1587.6
Ch110-Slope= 60.45| ADC/Aval = -97.7
Ch111-Slope= 294.71| ADC/Aval = 1545.5

Determination of Calibration Constant @ Nominal Voltage

APA-3, Module 6 ADC/Avalanche vs. Voltage

Consistent Slopes!

[ADC/Avalanche] vs. Voltage

	Ch112-Slope= 303.97| ADC/Aval = 1569.6
	Ch113-Slope= 300.98| ADC/Aval = 1566.3
	Ch114-Slope= 303.54| ADC/Aval = 1559.1
	Ch115-Slope= 301.10| ADC/Aval = 1574.8
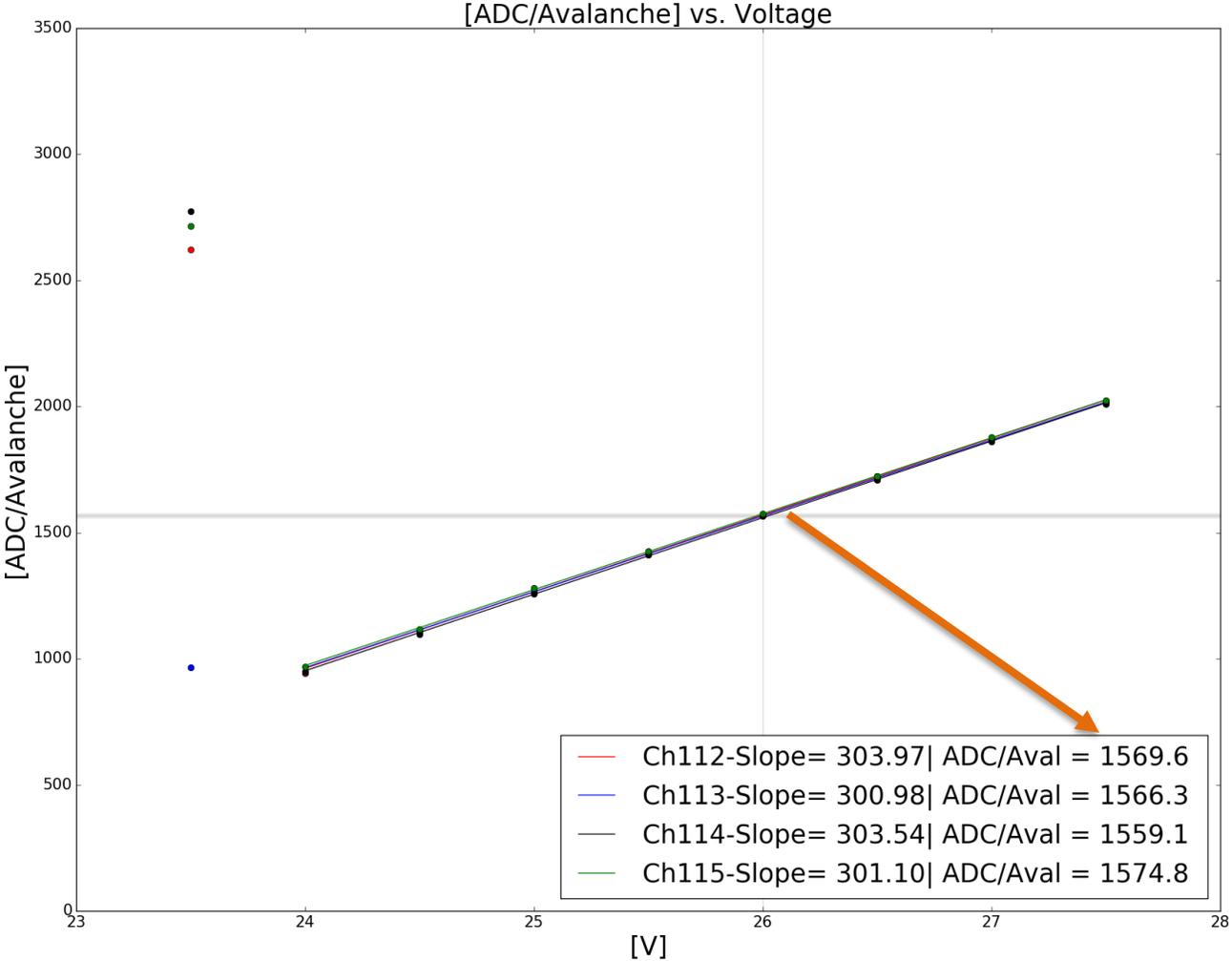
Determination of Calibration Constant @ Nominal Voltage

APA-3, Module 7 ADC/Avalanche vs. Voltage

Consistent Slopes!

[ADC/Avalanche] vs. Voltage

Legend
Ch116-Slope= 305.09| ADC/Aval = 1583.7
Ch117-Slope= 299.65| ADC/Aval = 1573.7
Ch118-Slope= 296.78| ADC/Aval = 1587.6
Ch119-Slope= -9.95| ADC/Aval = 61.7
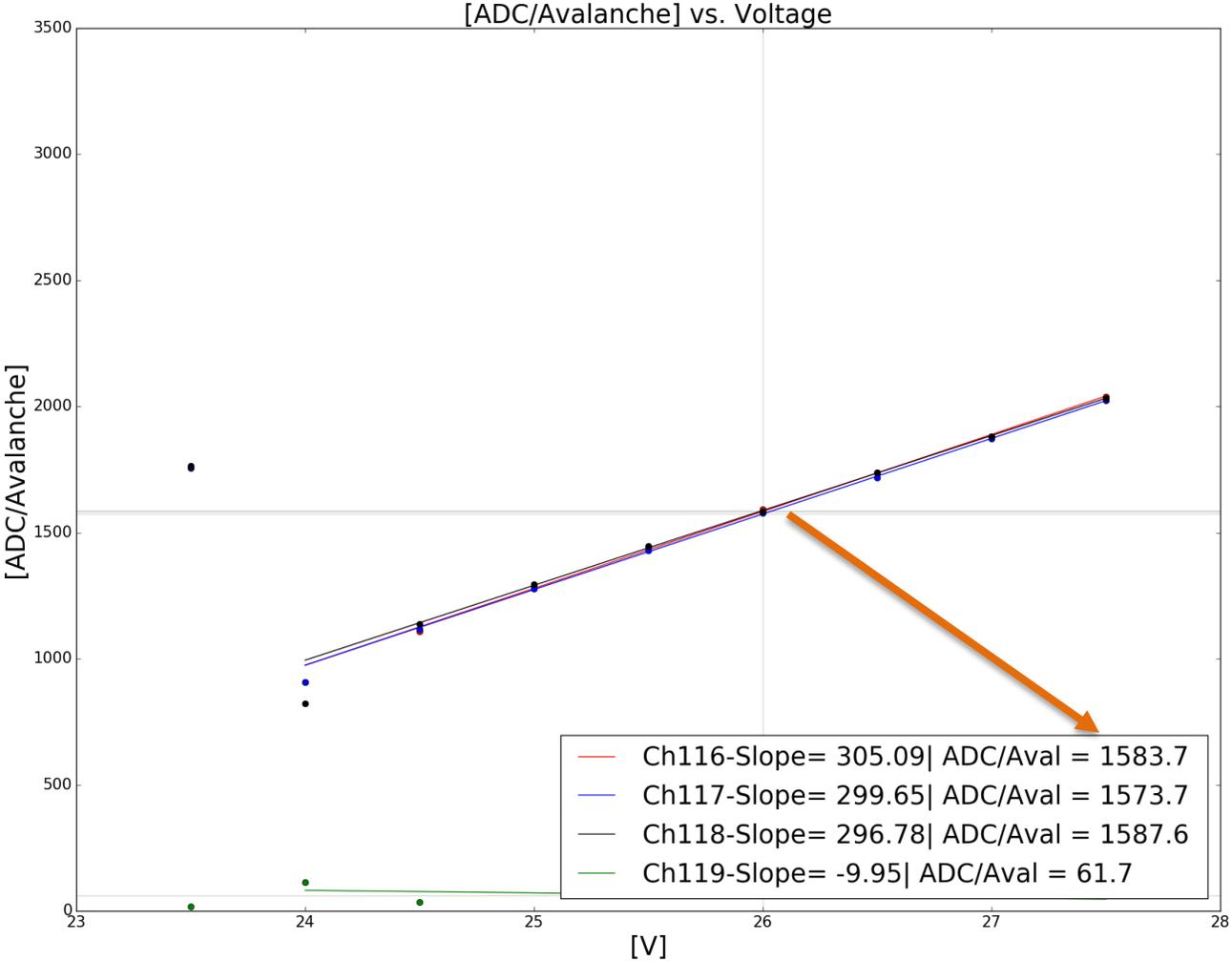
Known Problematic Channel: 119

Determination of Calibration Constant @ Nominal Voltage

APA-3, Module 8 ADC/Avalanche vs. Voltage

Consistent Slopes!

[ADC/Avalanche] vs. Voltage

	Slope	ADC/Aval
Ch120	323.27	1707.2
Ch121	300.07	1545.8
Ch122	301.48	1585.3
Ch123	302.62	1569.5

Determination of Calibration Constant @ Nominal Voltage

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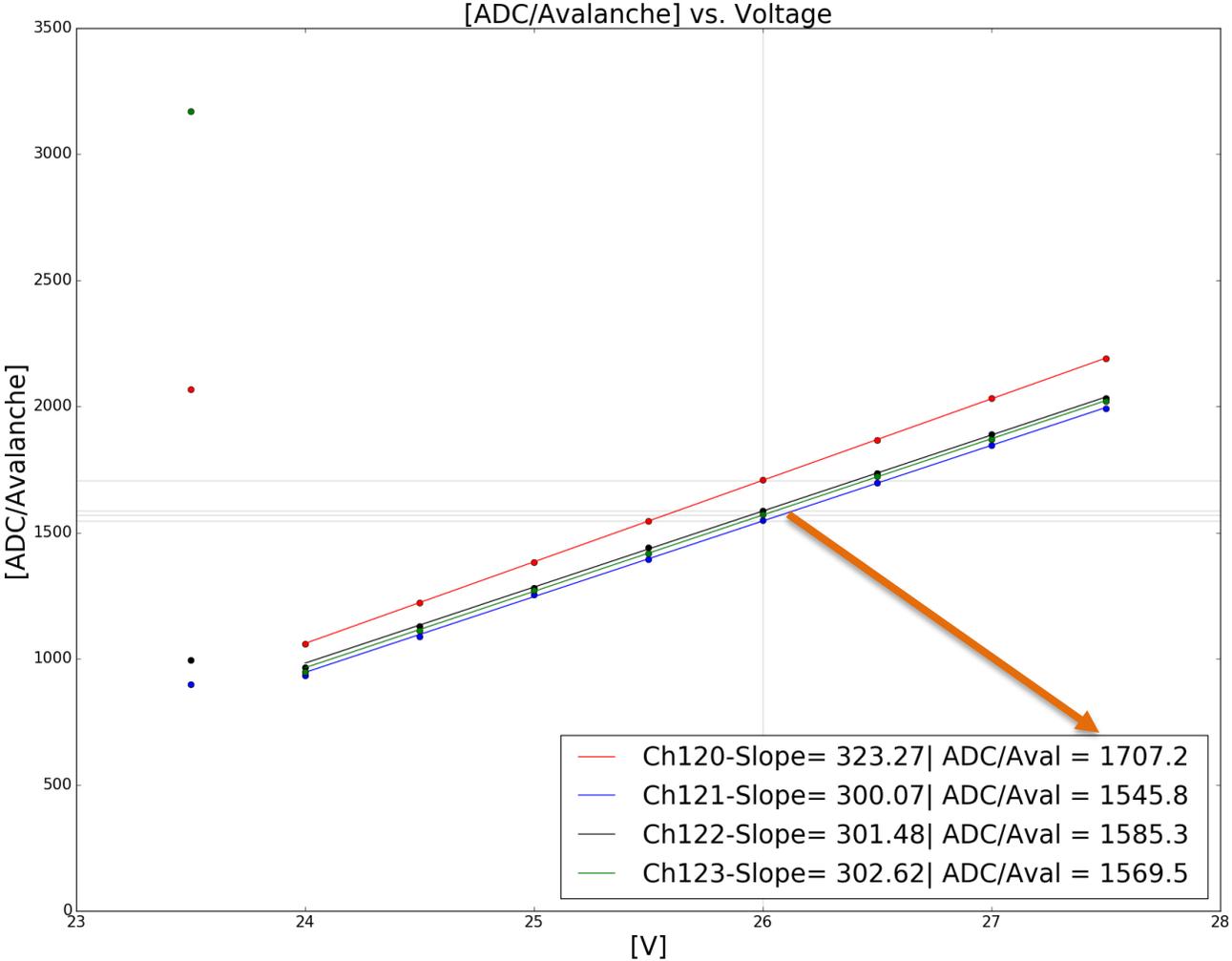
APA-3, Module 9 ADC/Avalanche vs. Voltage

Consistent Slopes!

[ADC/Avalanche] vs. Voltage

—	Ch124-Slope= 318.08| ADC/Aval = 1684.9
—	Ch125-Slope= 349.18| ADC/Aval = 1859.7
—	Ch126-Slope= 323.37| ADC/Aval = 1727.8
—	Ch127-Slope= 317.33| ADC/Aval = 1703.9
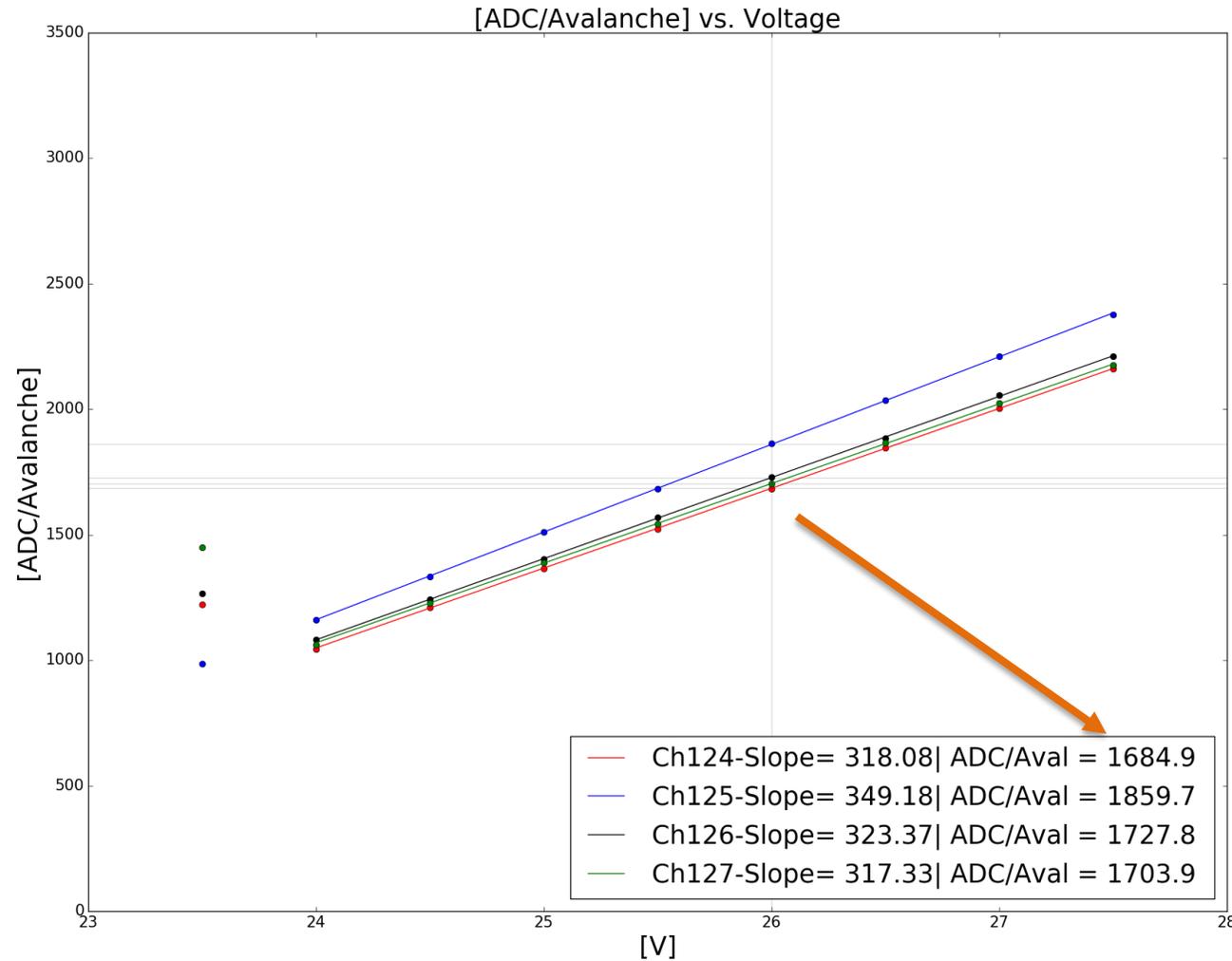
Determination of Calibration Constant @ Nominal Voltage

APA-3, Module 10 ADC/Avalanche vs. Voltage
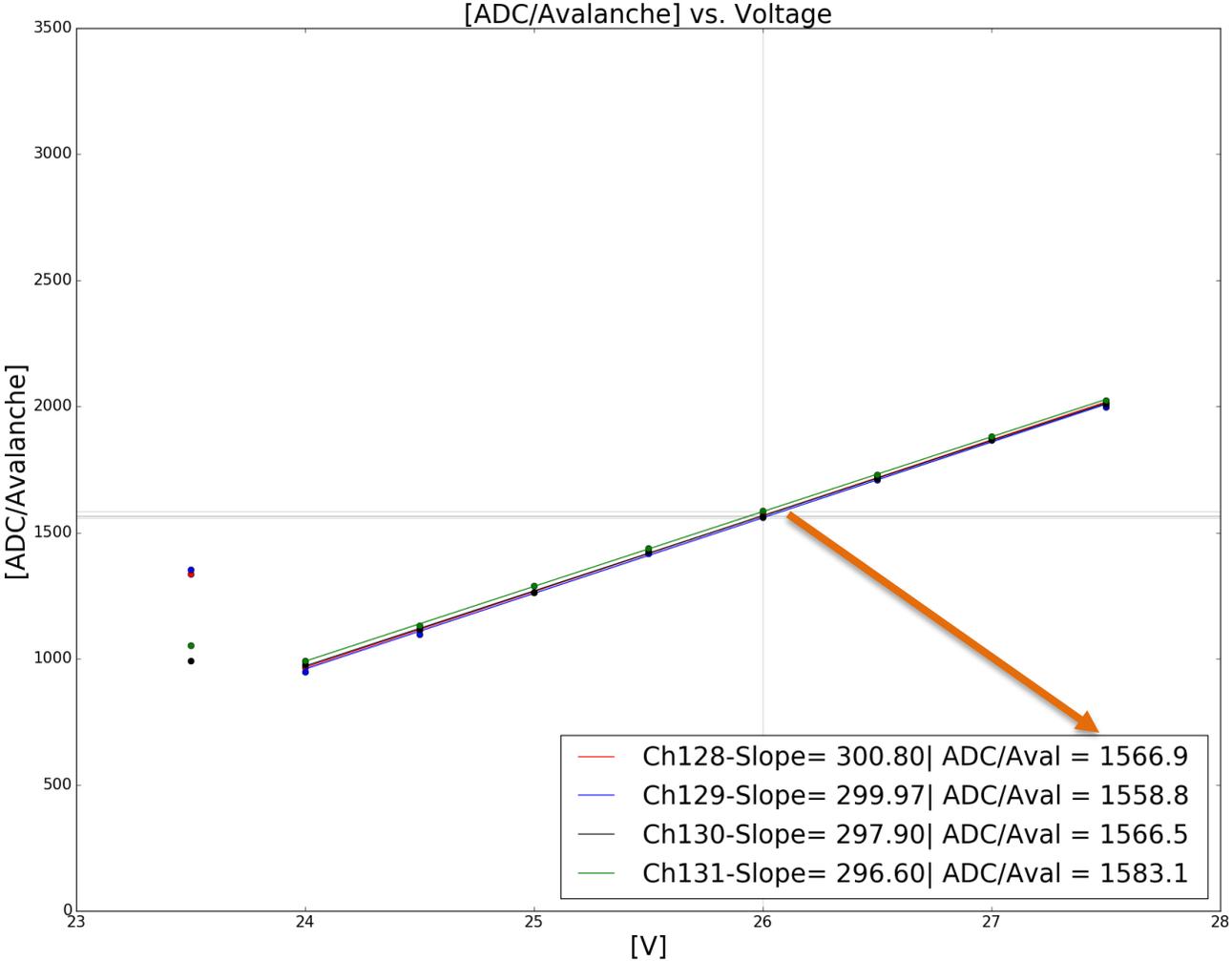
Consistent Slopes!

[ADC/Avalanche] vs. Voltage

Ch128-Slope= 300.80| ADC/Aval = 1566.9
Ch129-Slope= 299.97| ADC/Aval = 1558.8
Ch130-Slope= 297.90| ADC/Aval = 1566.5
Ch131-Slope= 296.60| ADC/Aval = 1583.1

Determination of Calibration Constant @ Nominal Voltage

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SensL Calibrations, BeamInt vs PulserInt
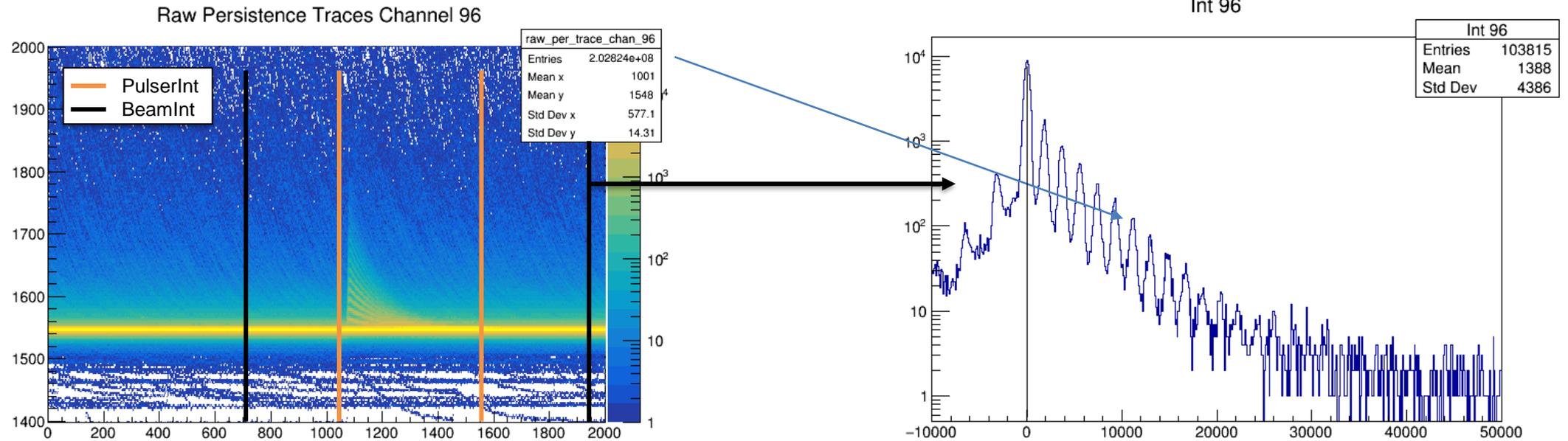
- Use Leon's Processed Runs, extracting Root Ttree information, such as:
  - Pedestal calculation (using 725 samples)
  - Integration, using fixed intervals
    - BeamInt - [700,1975] samples
    - PulserInt - [1050,1550] samples

SensL Calibrations, BeamInt vs PulserInt
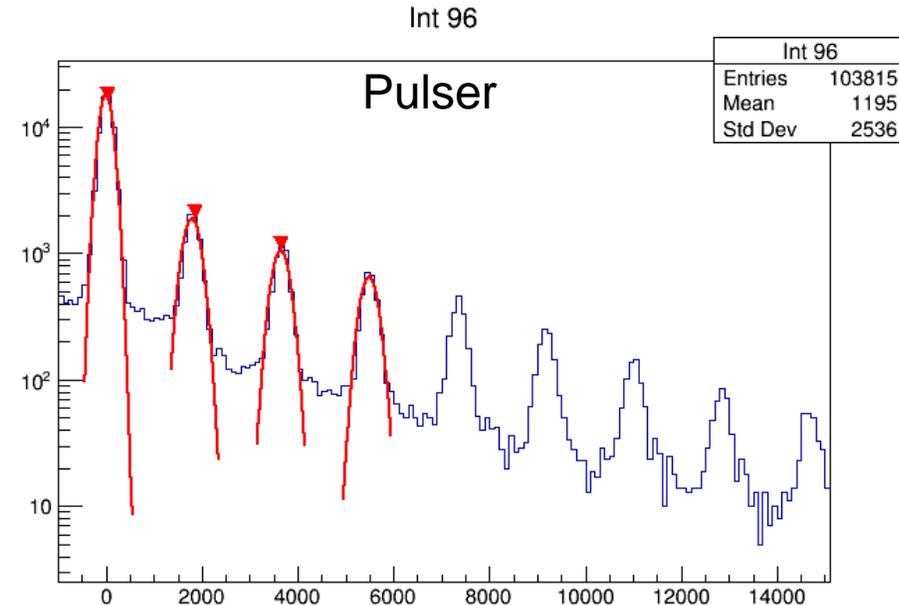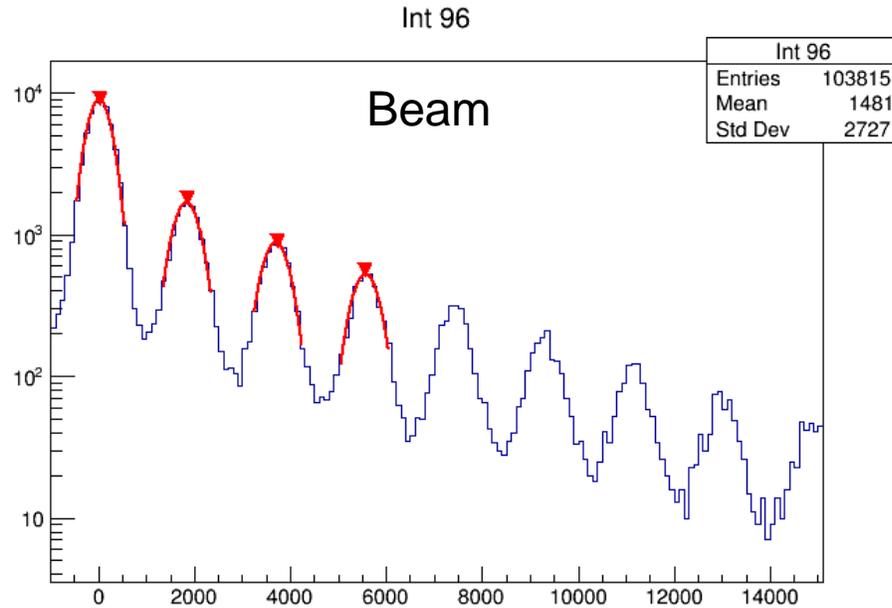
- Fit the first 4 PE peaks with a gaussian, using TF1 fit.
  - Same fit range - [Peak-500, Peak+500]
- Linear Fit, via TF1 fit, using
  - mean of each peak
  - sigma as error

ADC/Avalanche - BeamInt vs PulserInt

ADC/Avalanche (m) - BeamInt vs. PulserInt Comparison @ 27.5 V

ADC/Avalanche - BeamInt vs PulserInt

ADC/Avalanche (m) - BeamInt vs. PulserInt Comparison @ 27.0 V

ADC/Avalanche - BeamInt vs PulserInt

ADC/Avalanche (m) - BeamInt vs. PulserInt Comparison @ 26.5 V

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ADC/Avalanche - BeamInt vs PulserInt

ADC/Avalanche (m) - BeamInt vs. PulserInt Comparison @ 26.0 V

ADC/Avalanche - BeamInt vs PulserInt

ADC/Avalanche (m) - BeamInt vs. PulserInt Comparison @ 25.5 V

ADC/Avalanche - BeamInt vs PulserInt

ADC/Avalanche (m) - BeamInt vs. PulserInt Comparison @ 25.0 V

ADC/Avalanche - BeamInt vs PulserInt

ADC/Avalanche (m) - BeamInt vs. PulserInt Comparison @ 24.5 V

ADC/Avalanche - BeamInt vs PulserInt

ADC/Avalanche (m) - BeamInt vs. PulserInt Comparison @ 24.0 V

ADC/Avalanche - BeamInt vs PulserInt

ADC/Avalanche (m) - BeamInt vs. PulserInt Comparison @ 23.0 V

# ADC/Avalanche - BeamInt vs PulserInt

ADC/Avalanche (m) - BeamInt vs. PulserInt Comparison @ 22.5 V

ADC/Avalanche - BeamInt vs Puls

Taking a Closer Look

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ADC/Avalanche - BeamInt vs Puls[...]

Taking a Closer Look

Int 0

Int 0	
Entries	101412
Mean	3062
Std Dev	4209

Beam

ADC/Avalanche (m) - Be[...]

Zero'd ➡ 103/116 Channels [...]
13/116 Channels > [...]

$(m_{BeamInt} - m_{PulserInt}) / <m_{BeamInt}, m_{PulserInt}>$

0.038

Channel

Int 0

| Int 0	
Entries	101412
Mean	2480
Std Dev	3862

Pulser

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ADC/Avalanche - BeamInt vs Puls

Taking a Closer Look

Zero'd →

-0.005

# ADC/Avalanche - BeamInt vs Puls

Taking a Closer Look

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ADC/Avalanche - BeamInt vs Puls...

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