

# ProtoDUNE Photon Detection Update

## June 2019

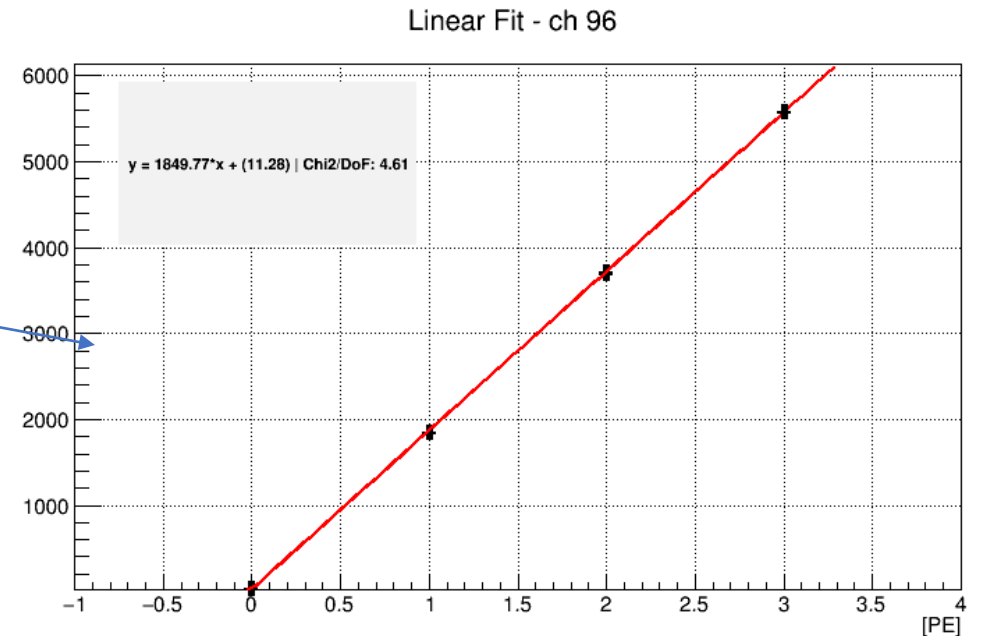
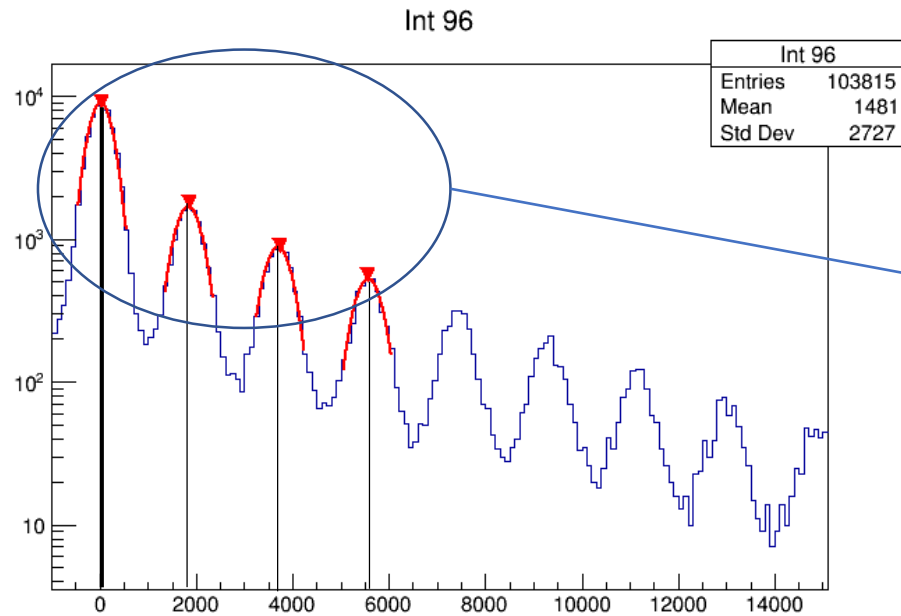
Chris Macias  
Indiana University

ProtoDUNE PD Update, June 2019

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# SensL Calibration Stability

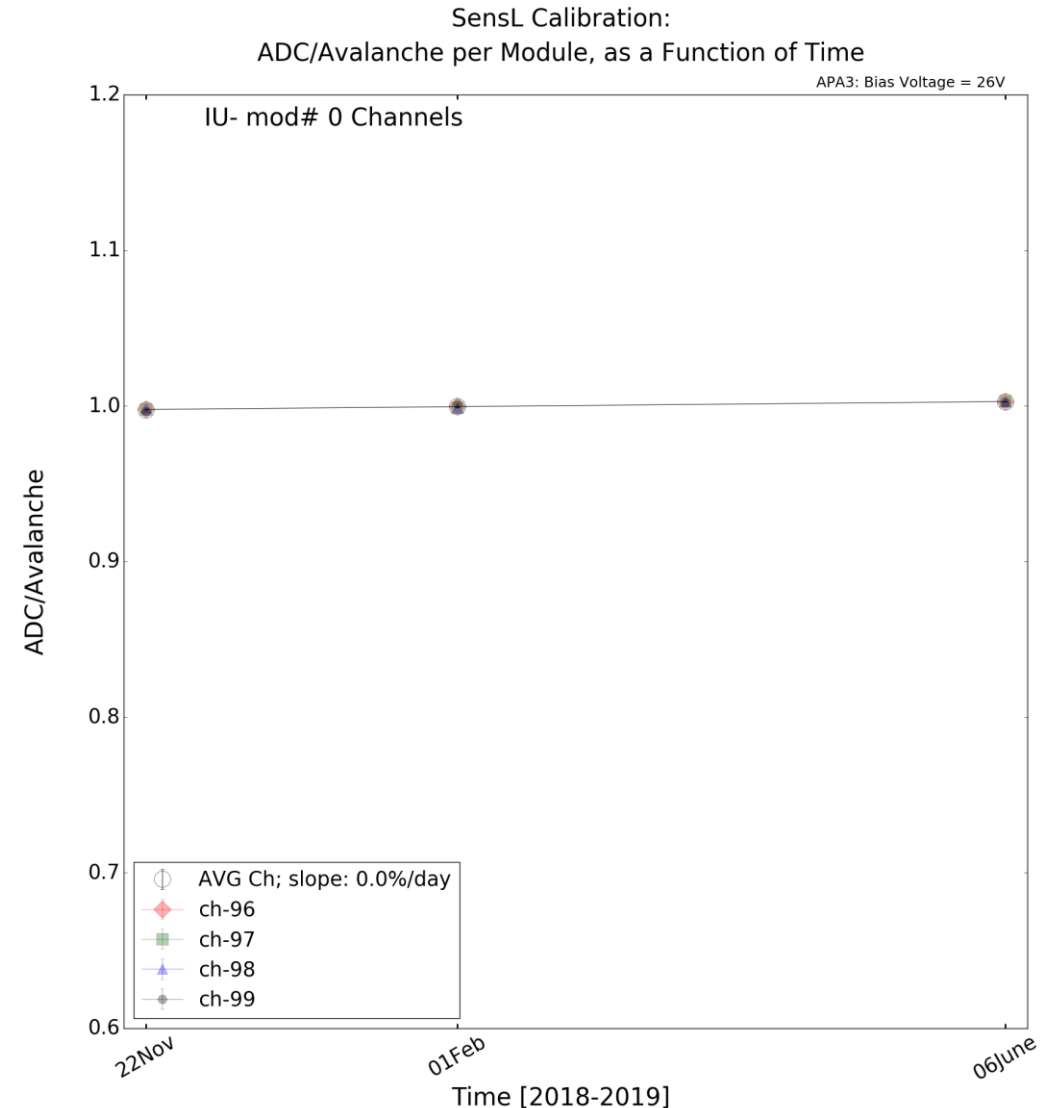
# APA3 SensL ADC/Avalanche - Example



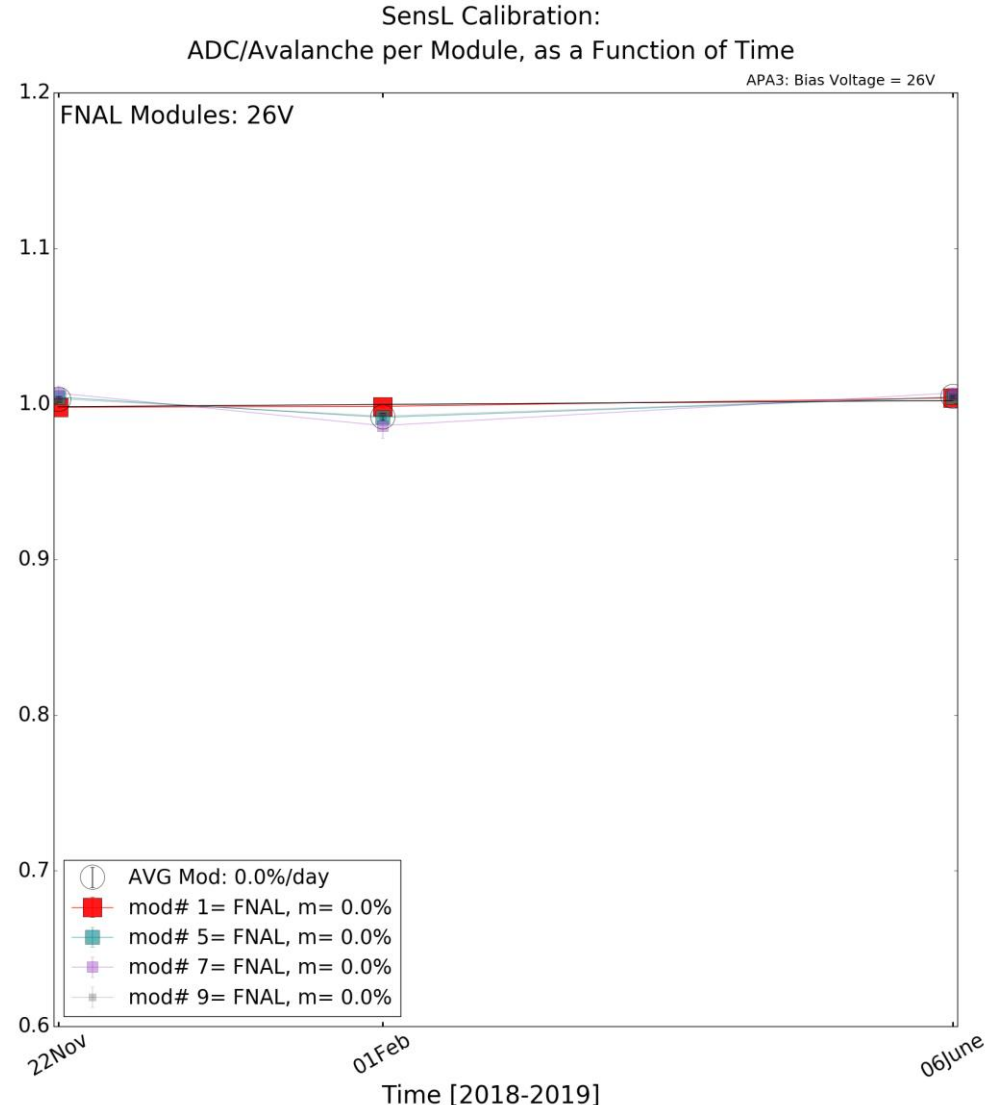
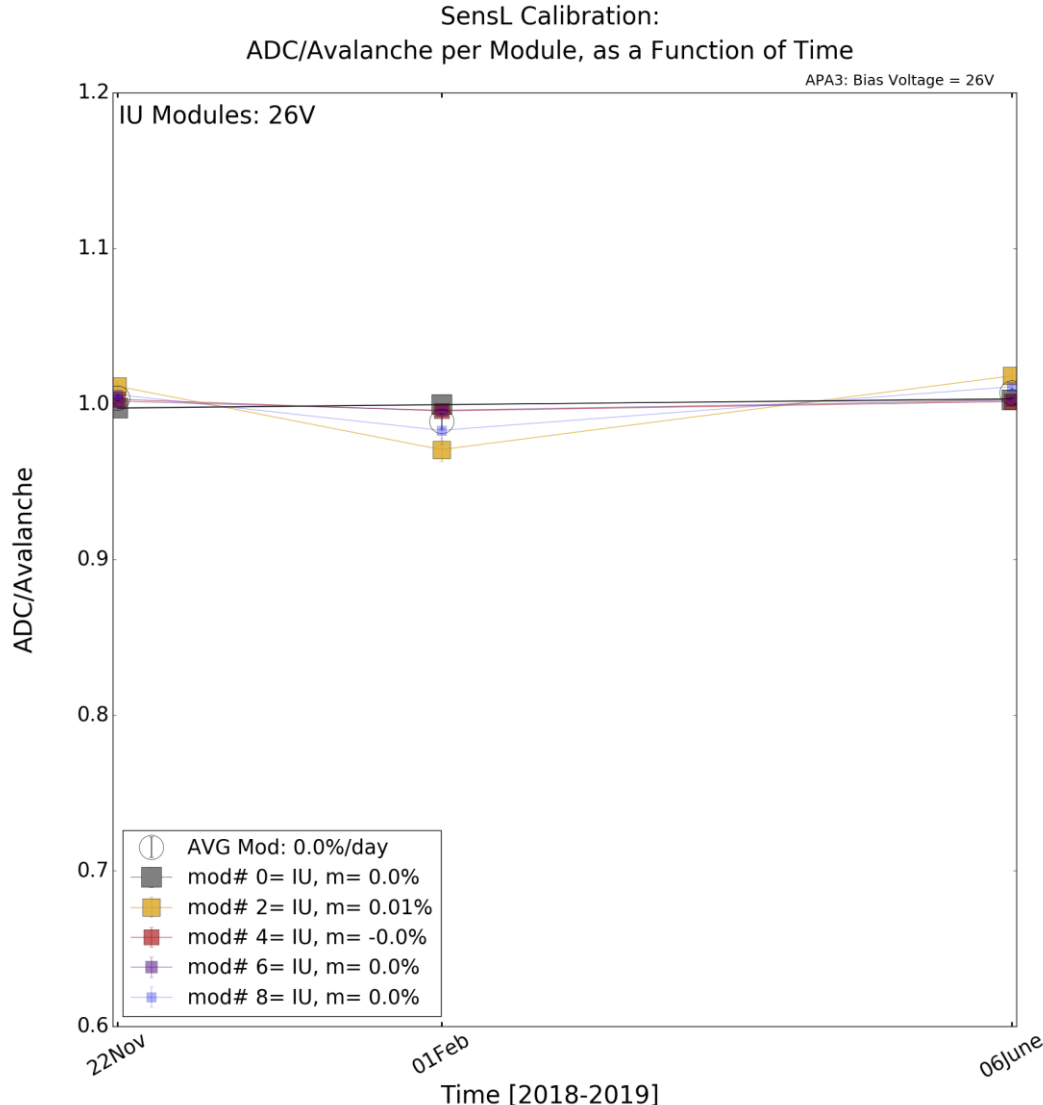
- Fit the first 4 Avalanche peaks with a gaussian, using TF1 fit.
  - Fit range - [Peak-500, Peak+500]
- Linear Fit, via TF1 fit, using
  - mean of each peak
  - sigma as error

# APA3 SensL ADC/Avalanche Stability @ Nom. - Example

- ADC/Avalanche per Channel
- Runs 5933, 6626, 8185
  - Bias Voltage= 26 V
  - All viable LEDs
    - Scanning Pulse Heights within run
- Normalization
  - Mean(ADC/Avalanche) per channel
- $\langle$ Channel $\rangle$  value
  - Mean(channels)
  - Statistical error =  $\text{RMS}(\text{chs})/\text{sqrt}(N)$
- Linear regression
  - Measure any channel degradation [ % / day]

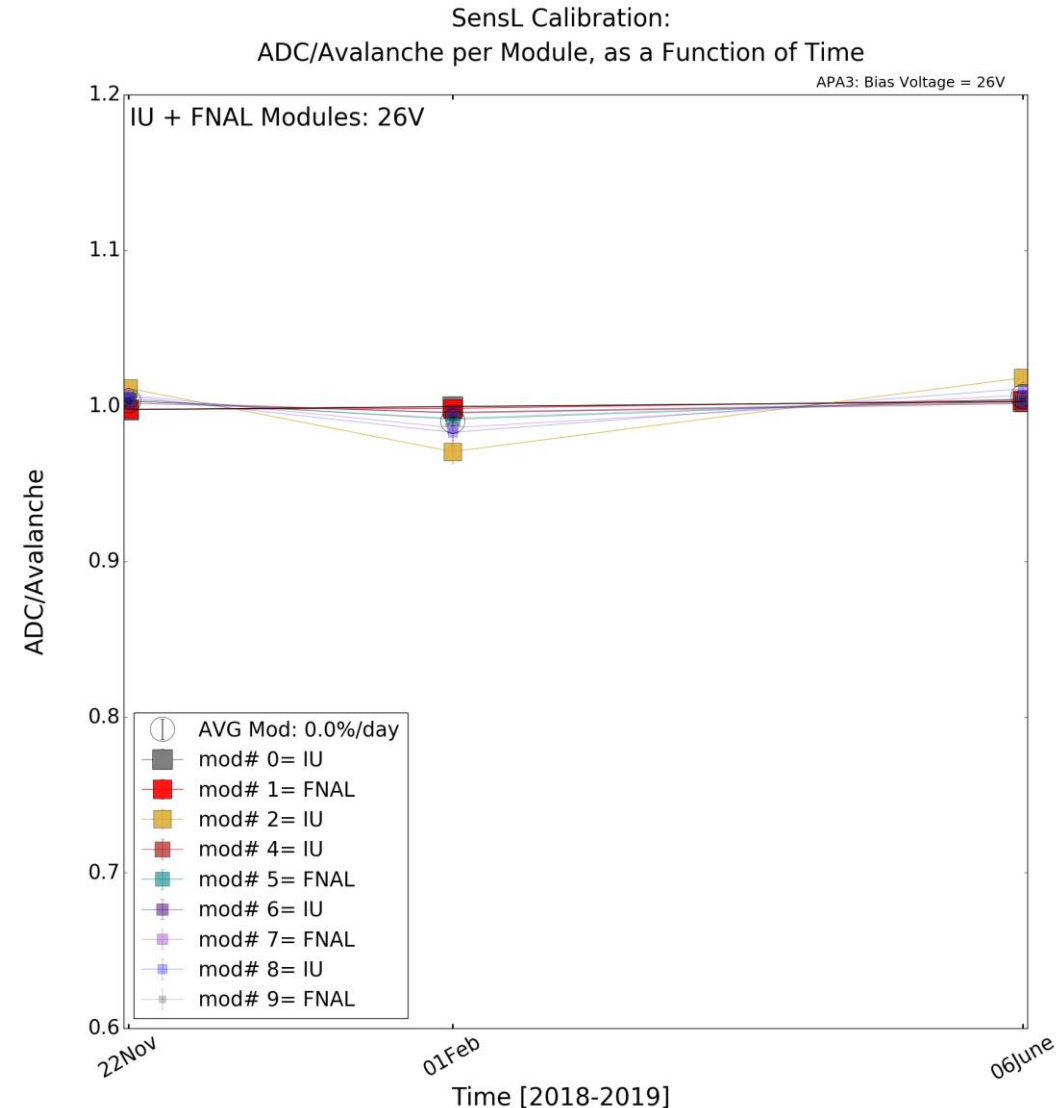


# APA3 SensL ADC/Avalanche Stability @ Nom. - Module Comparison



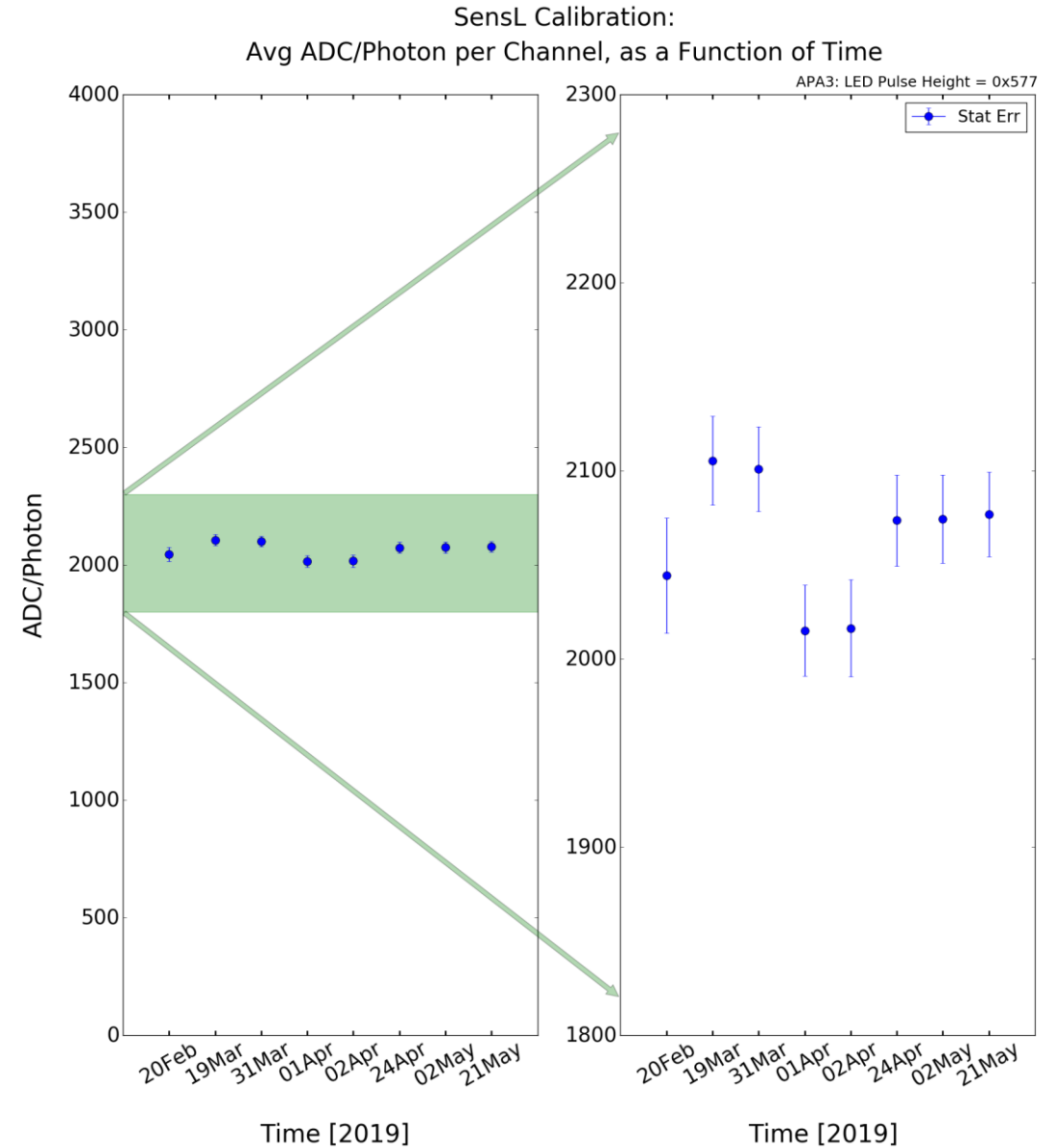
# APA3 SensL ADC/Avalanche Stability @ Nom. - Summary

- ADC/Avalanche per Module
- Runs 5933, 6626, 8185
  - Bias Voltage= 26 V
  - All viable LEDs
    - Scanning Pulse Heights within run
- Normalization
  - Mean(ADC/Avalanche) per channel
- $\langle \text{Module} \rangle$  value
  - Mean(modules)
  - Statistical error =  $\text{RMS}(\text{mods})/\sqrt{N}$
- Linear regression
  - Measure any module degradation [ % / day]



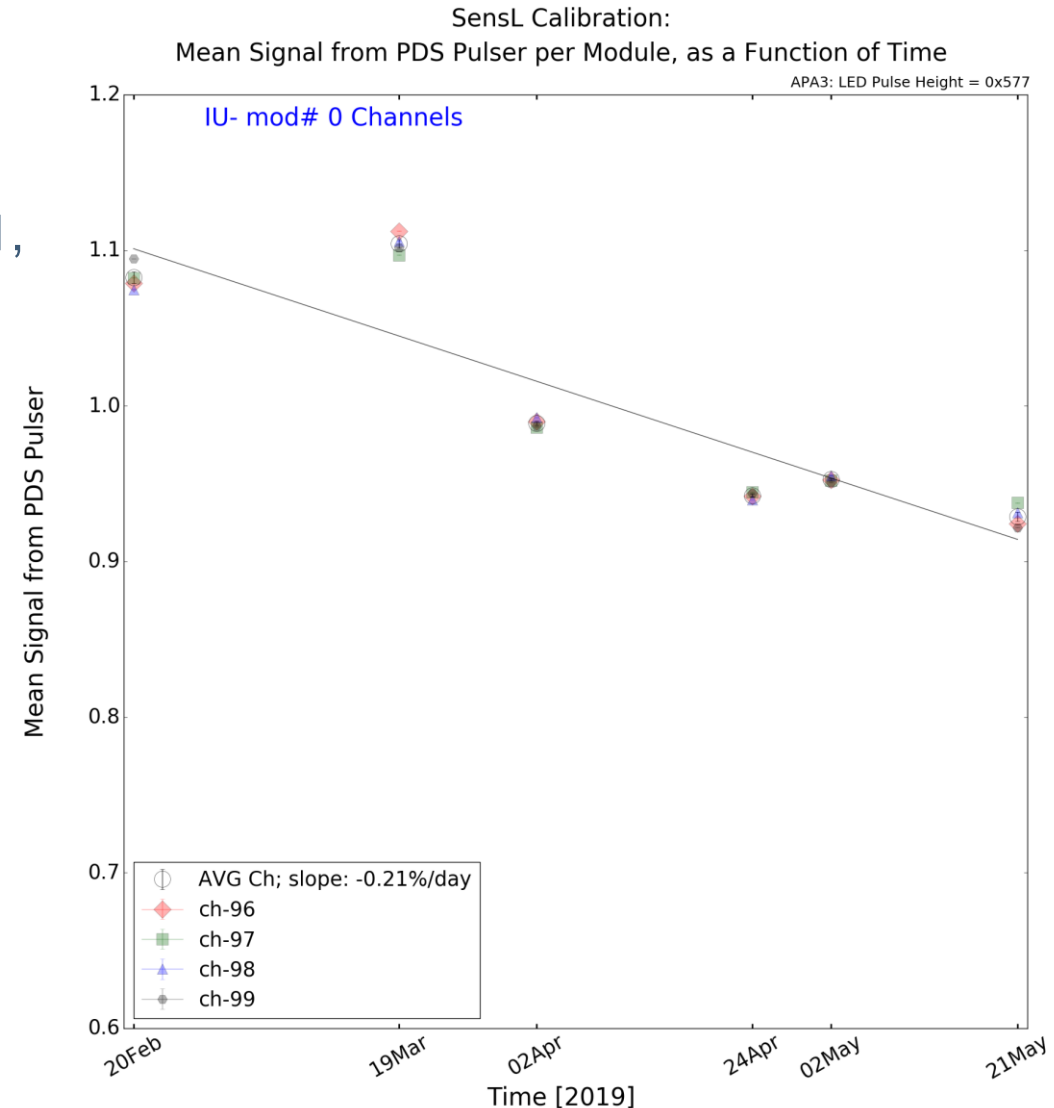
# APA3 SensL ADC/Photon Stability

- $\langle \text{ADC/Photon} \rangle$  per Channel
  - IU + FNAL modules
- Runs 6848, 7224, 7447, 7461, 7475, 7651, 7726, 7944
  - Stability Run
  - Pulse Peak Height = '0x577'
  - All viable LEDs on
- ADC/Photon value
  - Mean(channels)
- Statistical error
  - $\text{RMS}(\text{channels})/\text{sqrt}(N)$



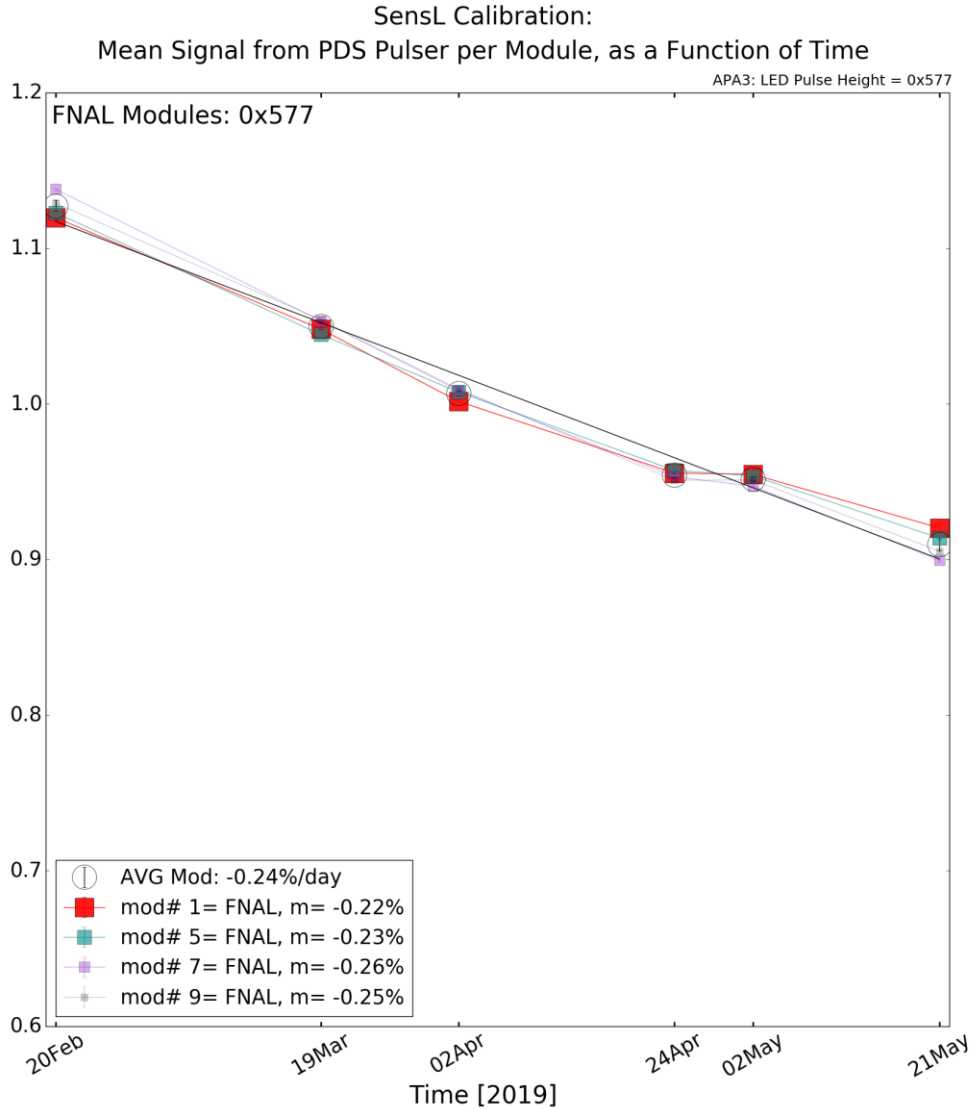
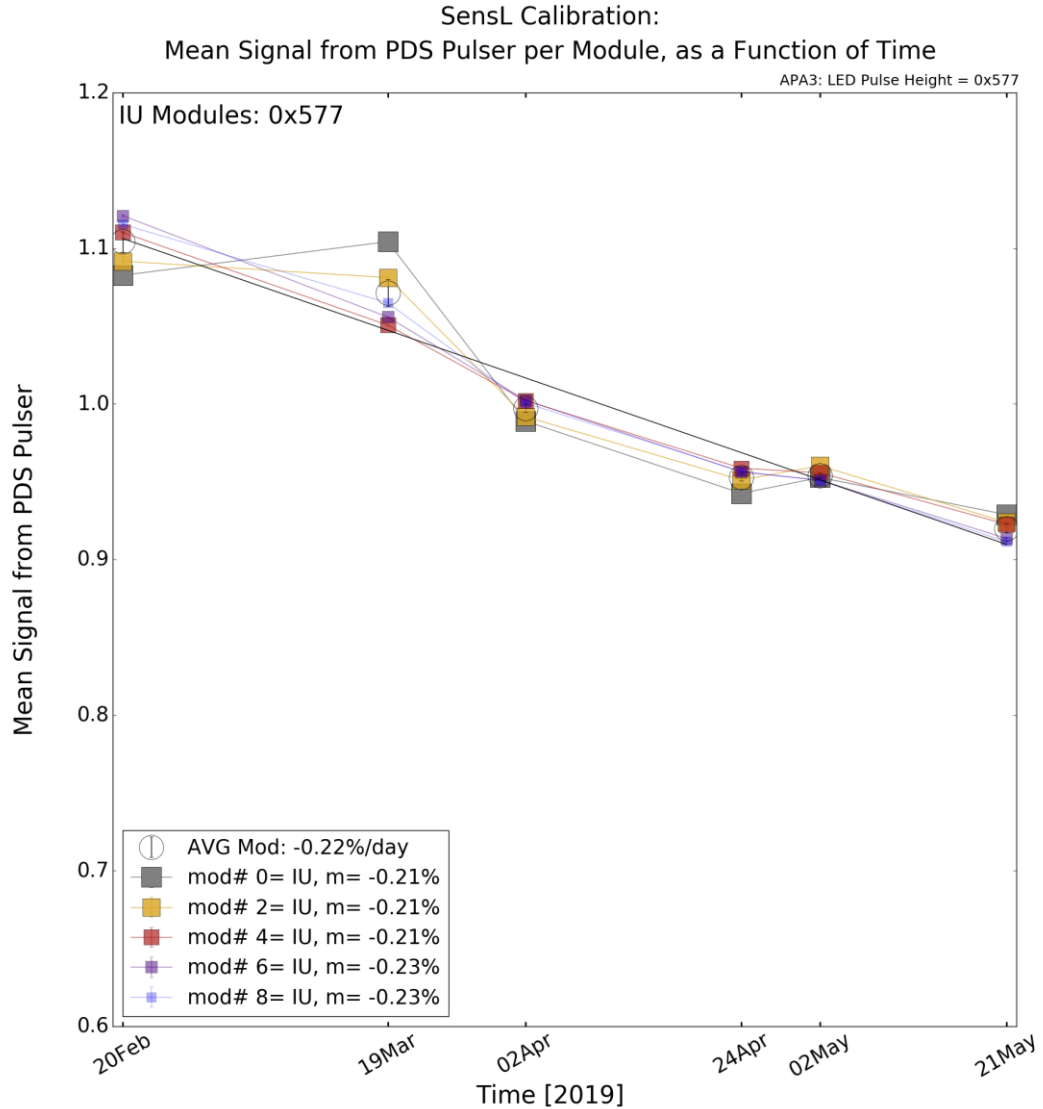
# APA3 SensL Mean Signal Stability- Example

- Mean Signal per Channel
- Runs 6848, 7224, 7447, 7461, 7475, 7651, 7726, 7944
  - Stability Run
  - Pulse Peak Height = '0x577'
  - All viable LEDs on
- Normalization
  - Mean(mean signal) per channel
- $\langle \text{Channel} \rangle$  value
  - Mean(channels)
  - Statistical error =  $\text{RMS}(\text{chs})/\text{sqrt}(N)$
- Linear regression
  - Measure any channel degradation [ % / day]



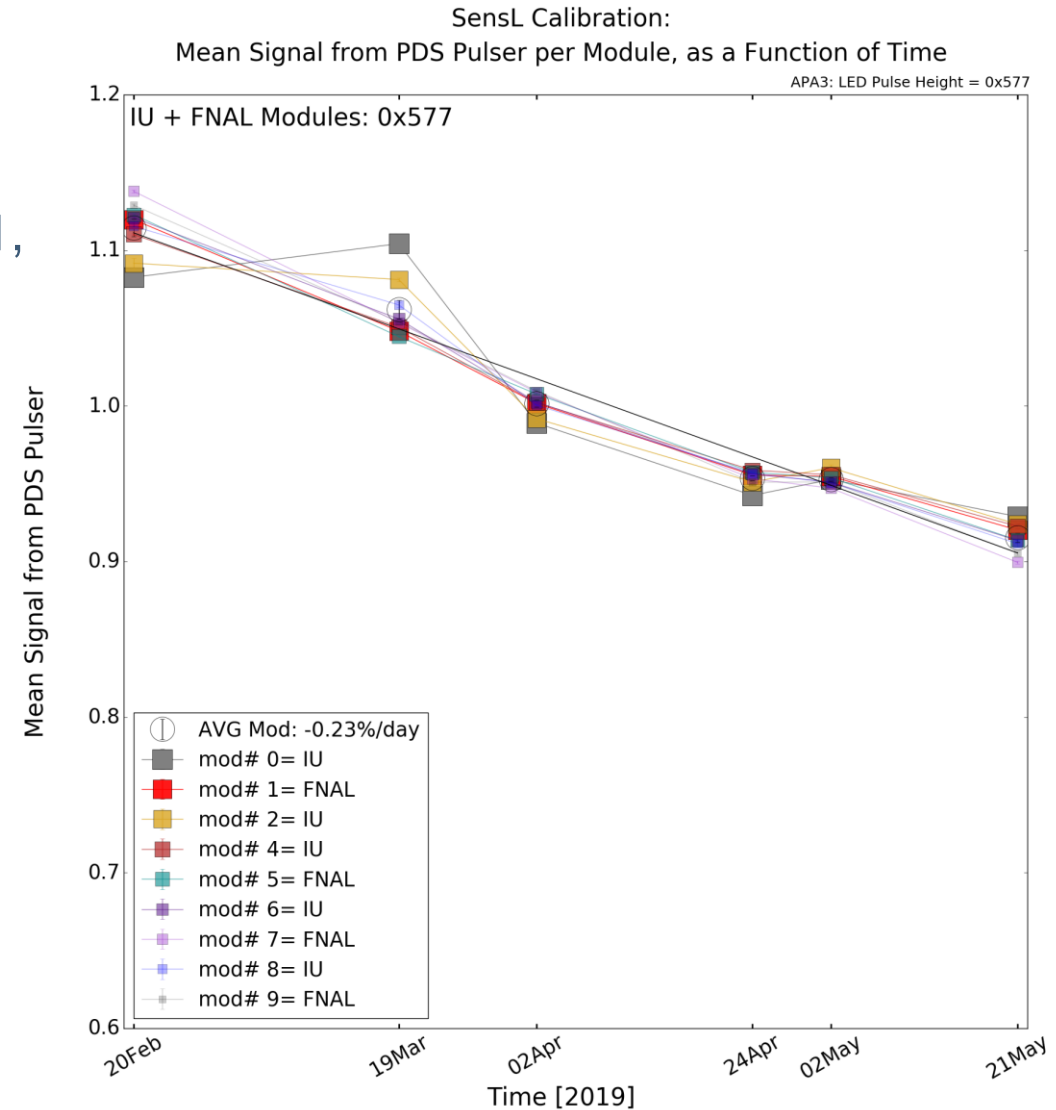


# APA3 SensL Mean Signal Stability- Module Comparison

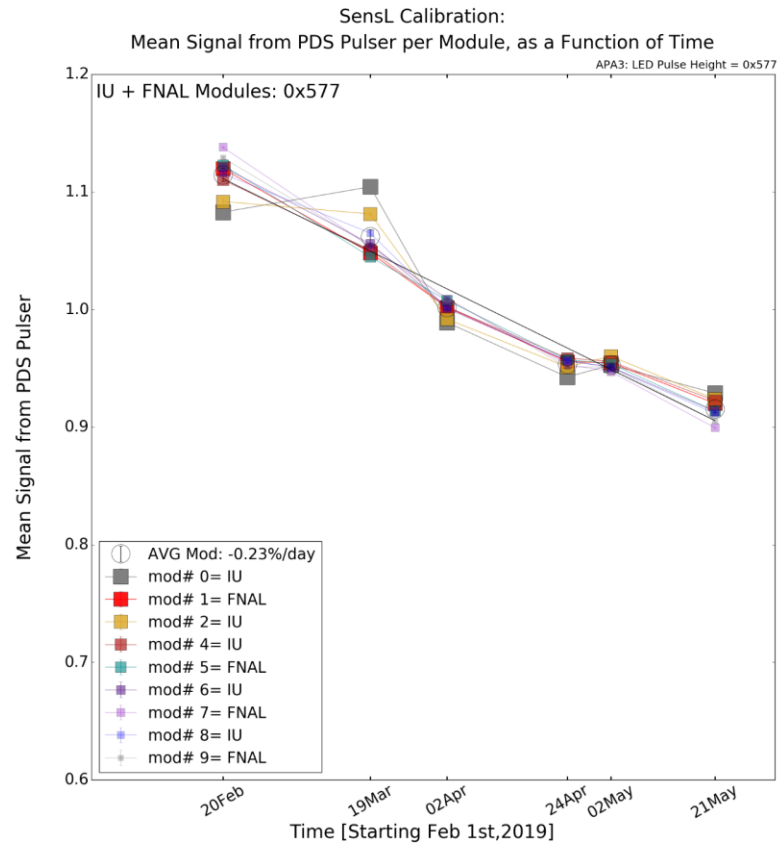
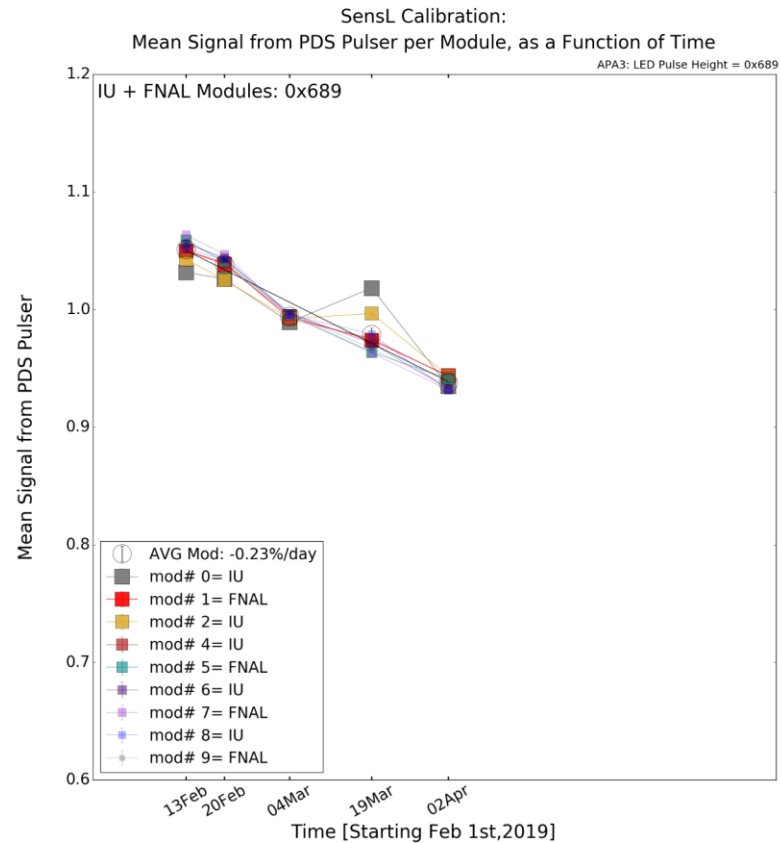
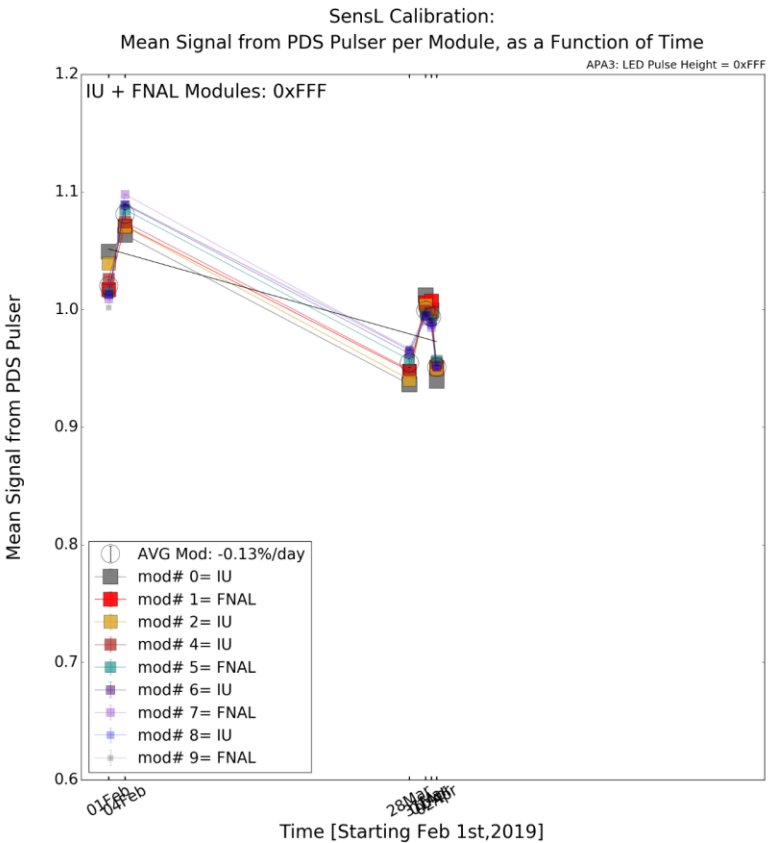


# APA3 SensL Mean Signal Stability- Summary

- Mean Signal per Module
- Runs 6848, 7224, 7447, 7461, 7475, 7651, 7726, 7944
  - Stability Run
  - Pulse Peak Height = '0x577'
  - All viable LEDs on
- Normalization
  - Mean(mean signal) per channel
- <Module> value
  - Mean(modules)
  - Statistical error =  $\text{RMS}(\text{mods})/\text{sqrt}(N)$
- Linear regression
  - Measure any module degradation [ % / day]



# APA3 SensL Mean Signal Stability- LED Peak Height Comparison



# APA3 SensL Mean Signal Stability- LED Peak Height Comparison

## Zoomed

