

Tagger Microscope Commissioning Status Report

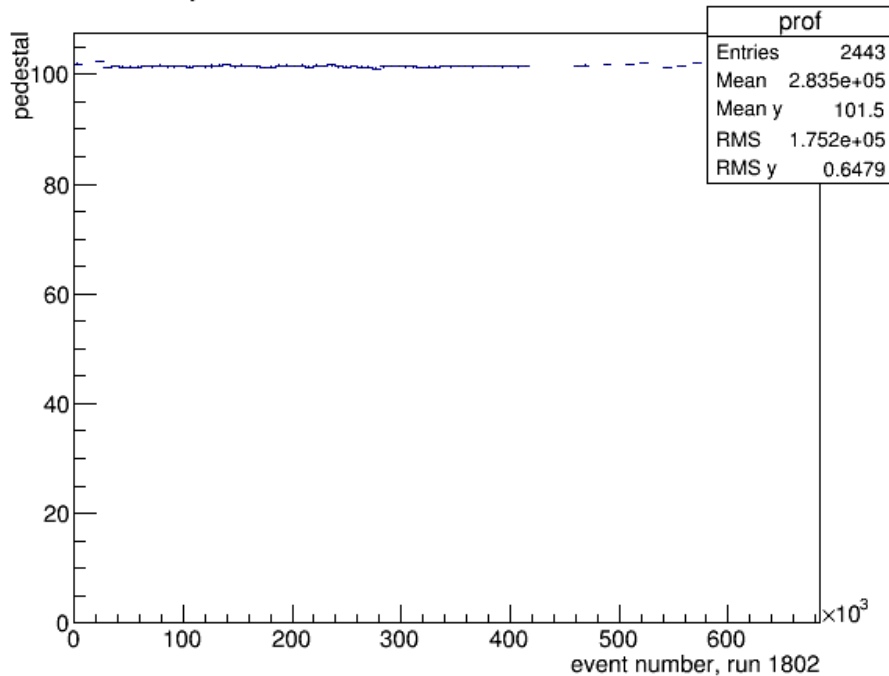
Richard Jones, Alex Barnes
University of Connecticut

Outline

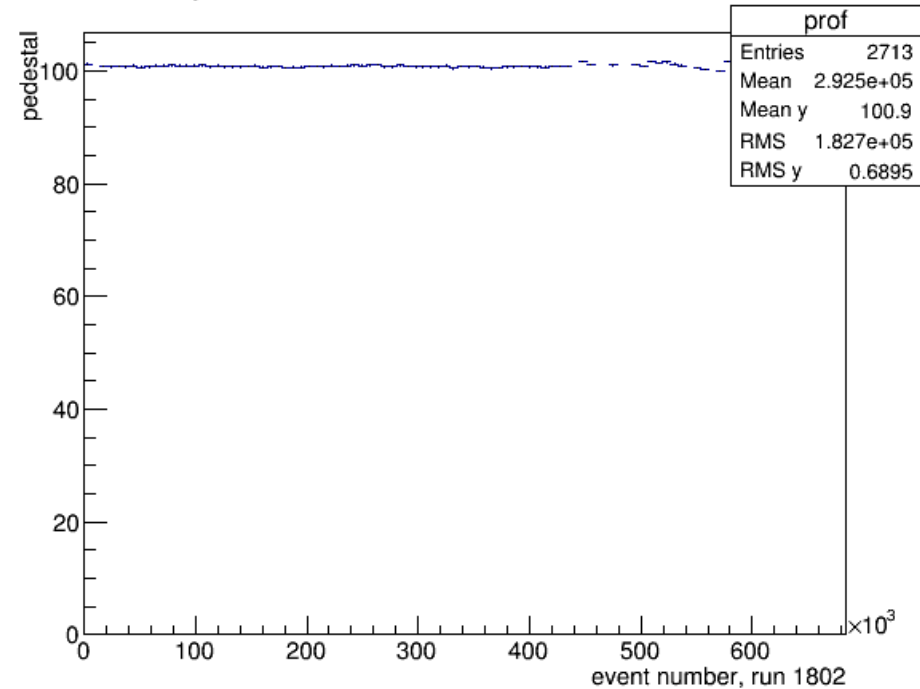
1. FADC signals
 - a. What is the variation of the pedestal with time, on a scale from seconds to days?
 - b. What is the pedestal width, instantaneous and long term?
 - c. How often the pedestal should be measured?
2. Typical FADC spectra for "hits": associated with tracks if possible.
3. What readout threshold should be used?
 - a. What would be the **detection** efficiency (energy cutoff)?
 - b. How often should be the threshold adjusted?
4. Signal rate above the threshold, without beam and at some beam conditions
5. If TDC readout exists: timing difference FADC-TDC, nhits(FADC) vs nhits(TDC) for given channels.

fADC pedestal variation during a run

pedestal vs event no., channel 0

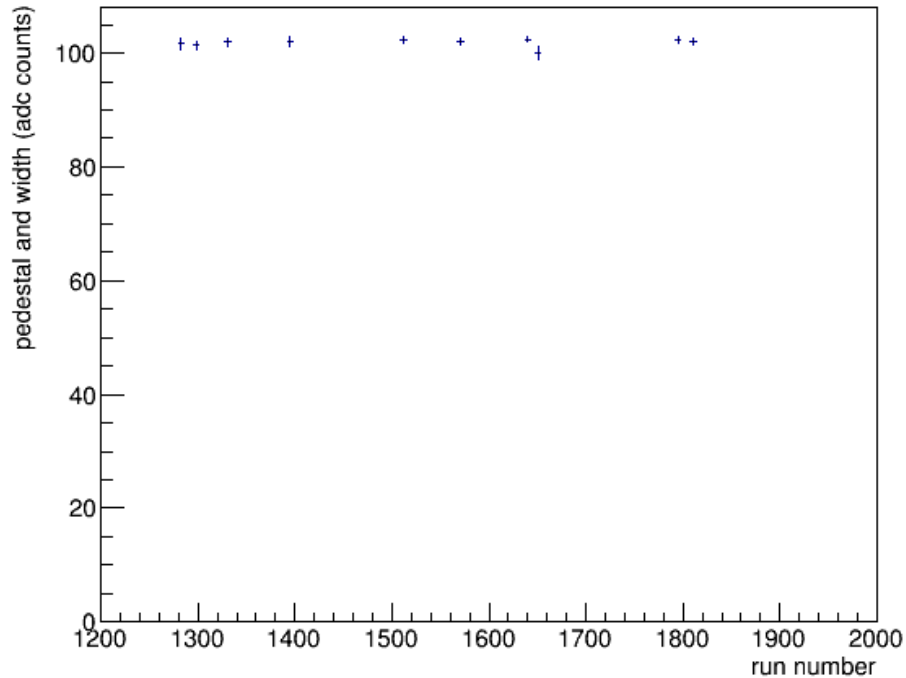


pedestal vs event no., channel 20

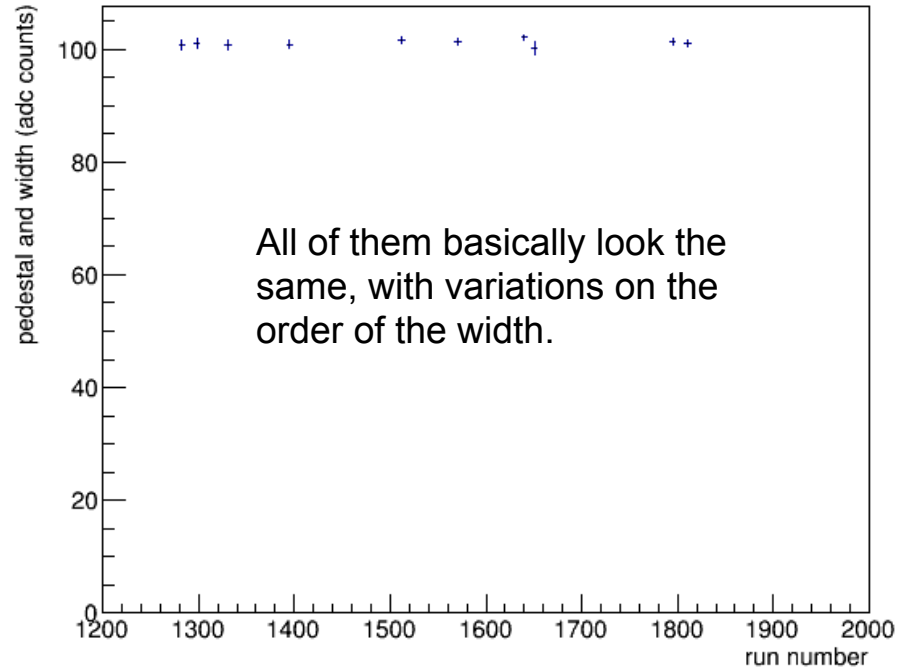


fADC pedestal variation over weeks

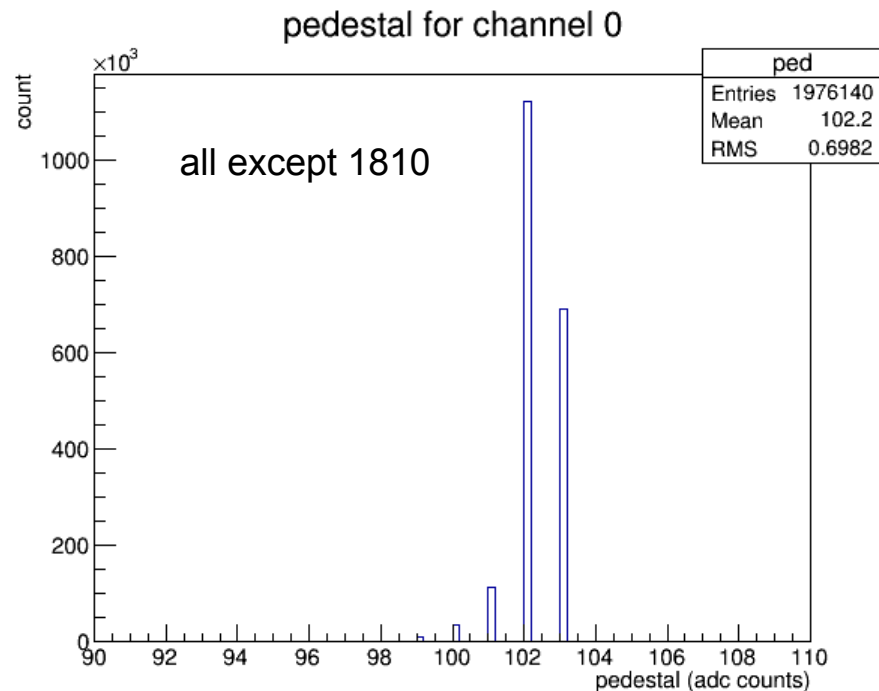
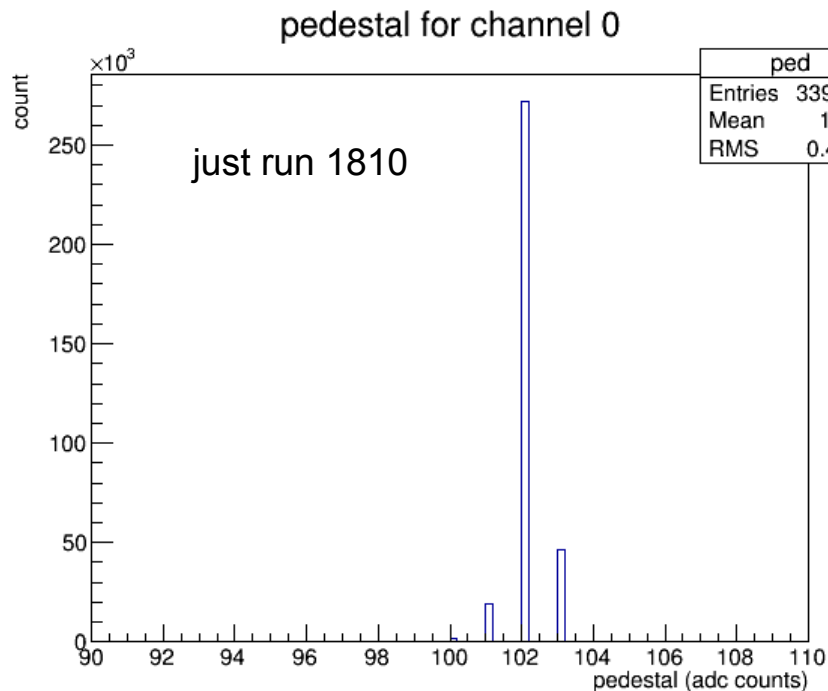
pedestal vs run number for channel 0



pedestal vs run number for channel 20

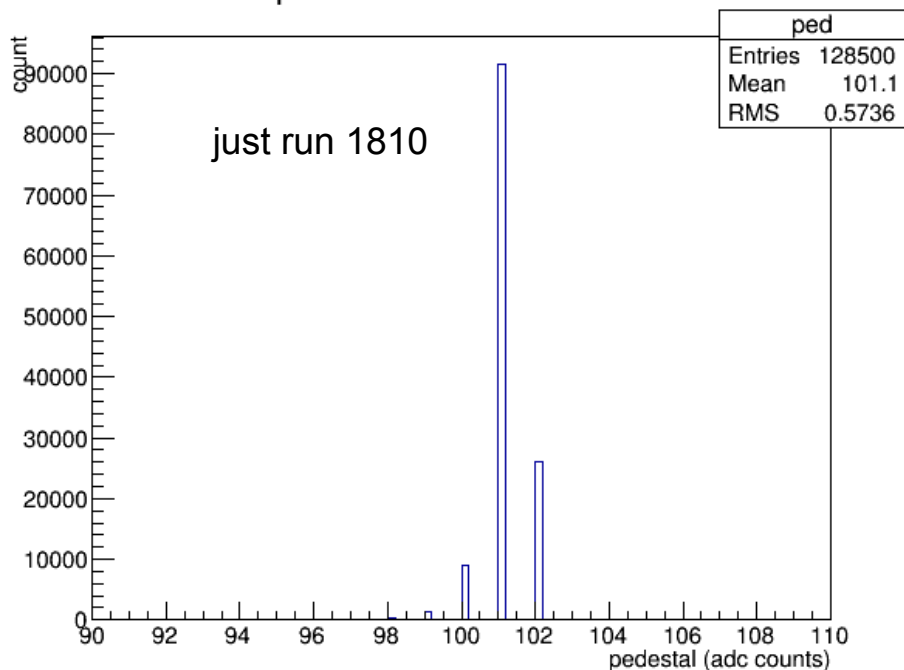


fADC pedestal width

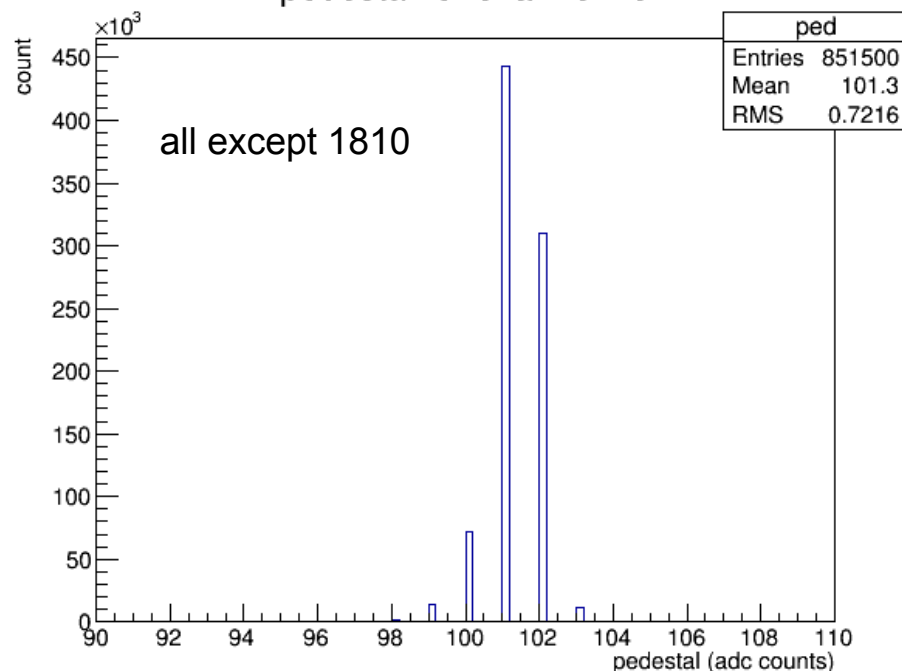


fADC pedestal width

pedestal for channel 20



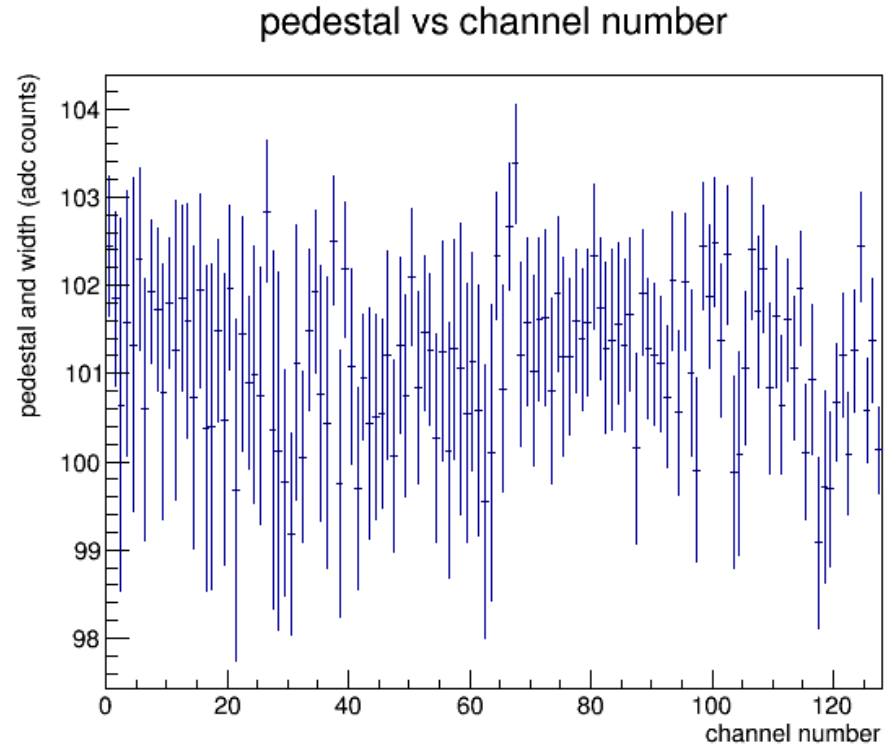
pedestal for channel 20



fADC pedestal positions and widths

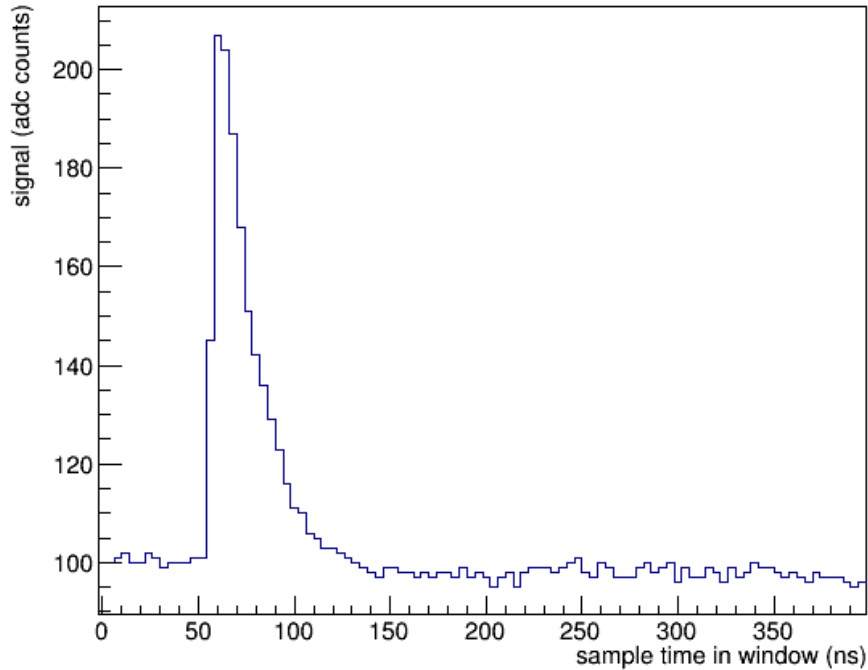
measurements in low gain mode

- readout threshold should be $>5\sigma$ over pedestal.
- pedestals vary over range 99 - 104
- $\sigma \sim 1\text{-}2$ channels
- readout threshold ~ 115 channels
- 1 week pedestal update interval is more than adequate.

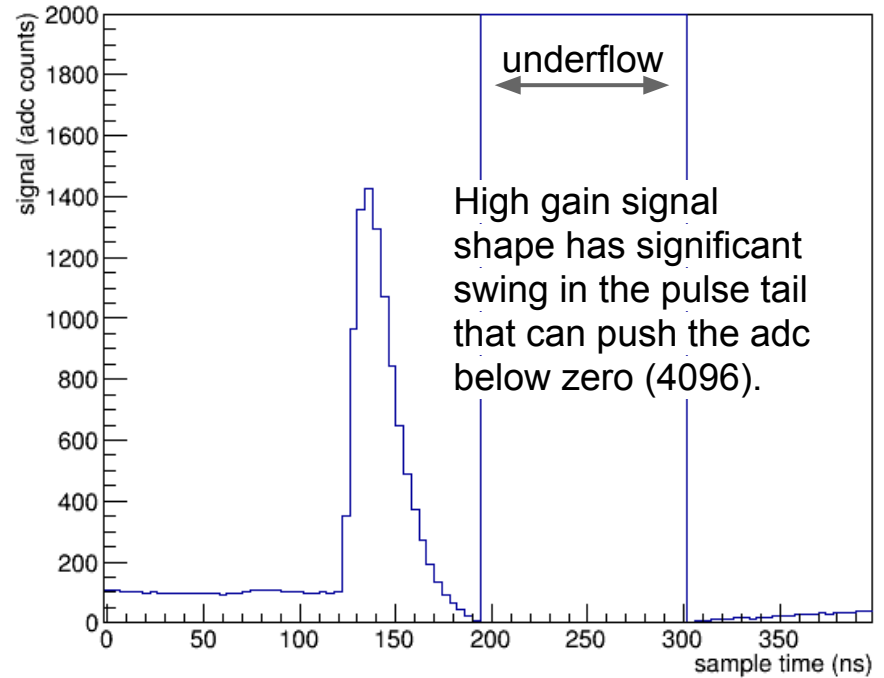


Typical fADC “hits” pulse shape

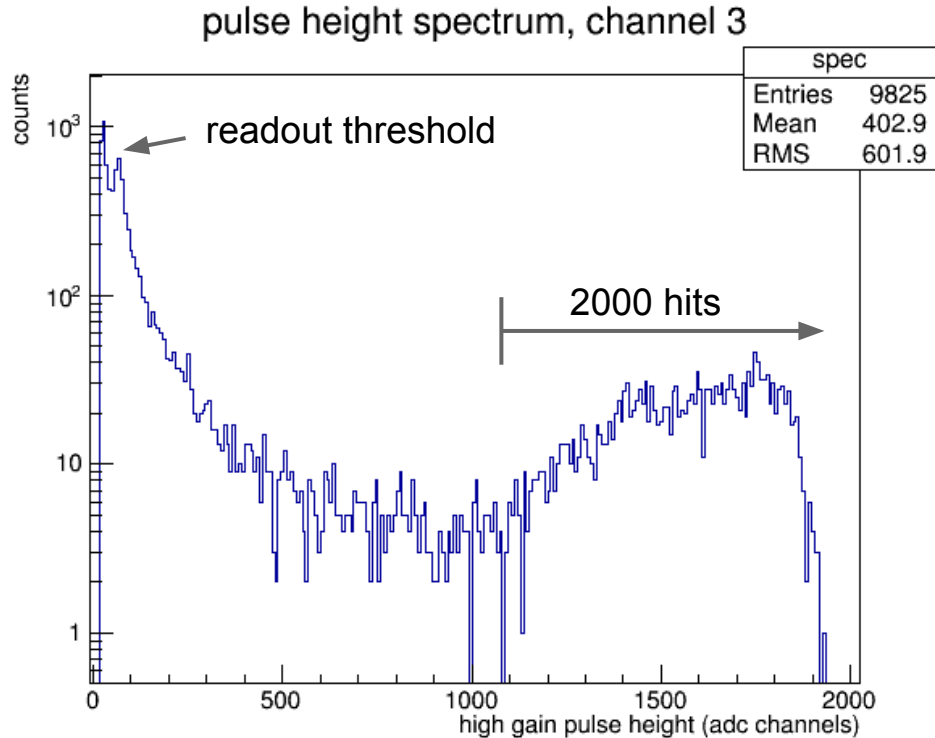
typical hit in low gain



typical hit in high gain



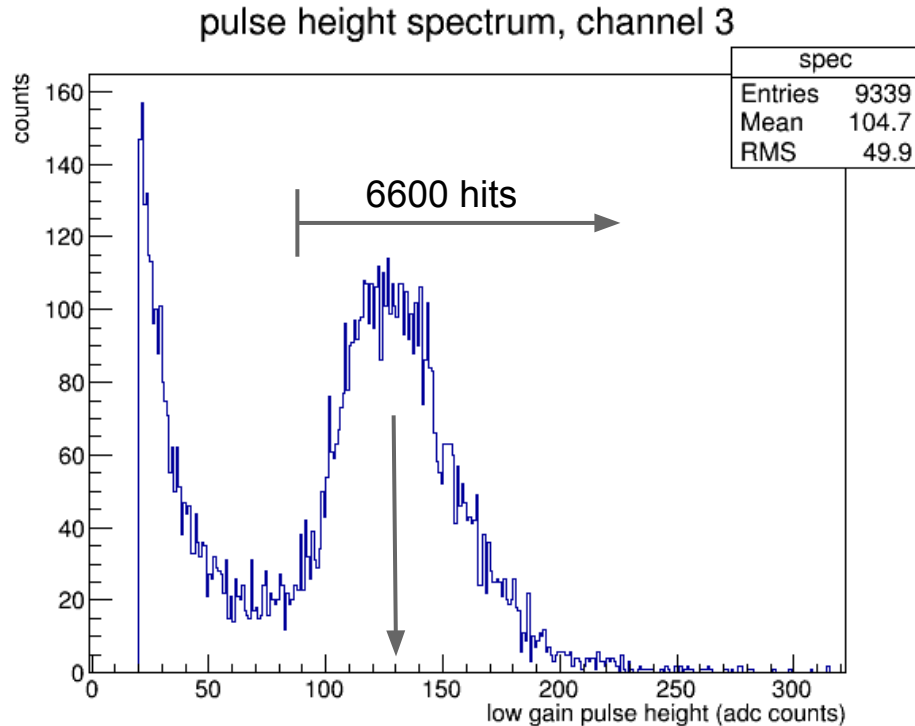
fADC “hits” pulse spectrum



measurements in high gain mode
(run 8998)

- amplifier output saturates at $\sim 1.8V$
- after 50:50 splitter, becomes $0.9V$
- **hits are saturating the preamplifier**
- **total hit count agrees well with expectations ~ 1800 hits over bg.**
- difficult to count pixels in pulses that are saturating the amplifier, **look next at low gain**

fADC “hits” pulse spectrum



measurements in low gain mode
(run 1807)

- amplifier far from saturation
- very clean scintillation signal
- **width dominated by Landau fluctuations, not photon statistics**
- **total hit count agrees well with expectations ~5800 hits over bg.**
- difficult to count pixels in low gain, cannot see individual pixels
- rough guess: $\langle N_{\text{pix}} \rangle \sim 200$

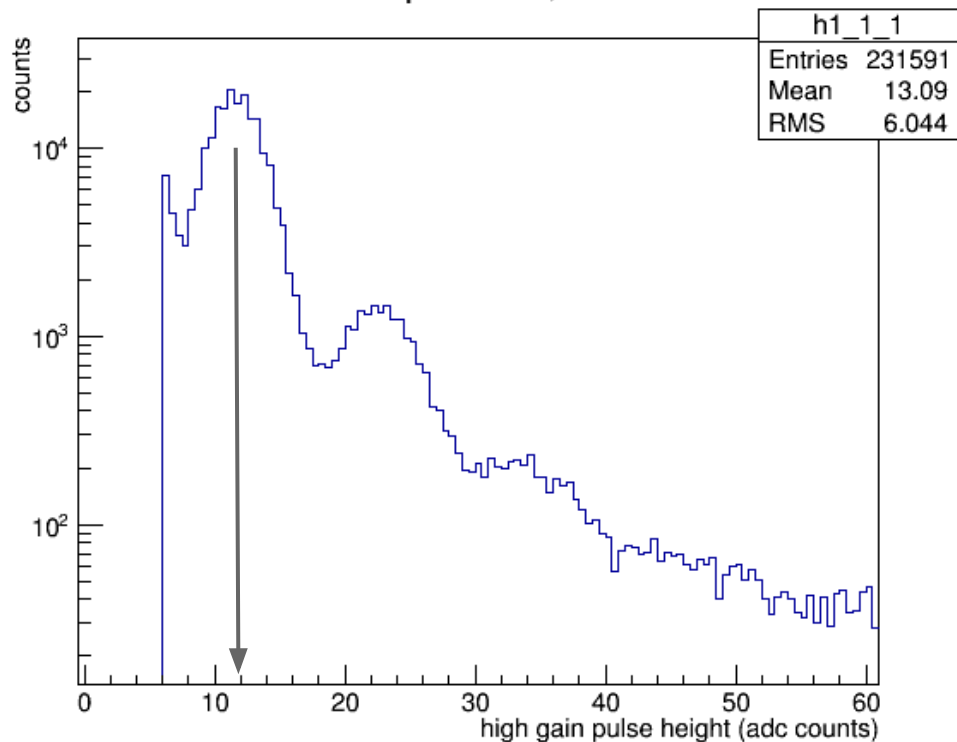
fADC pulse normalization

two-step procedure:

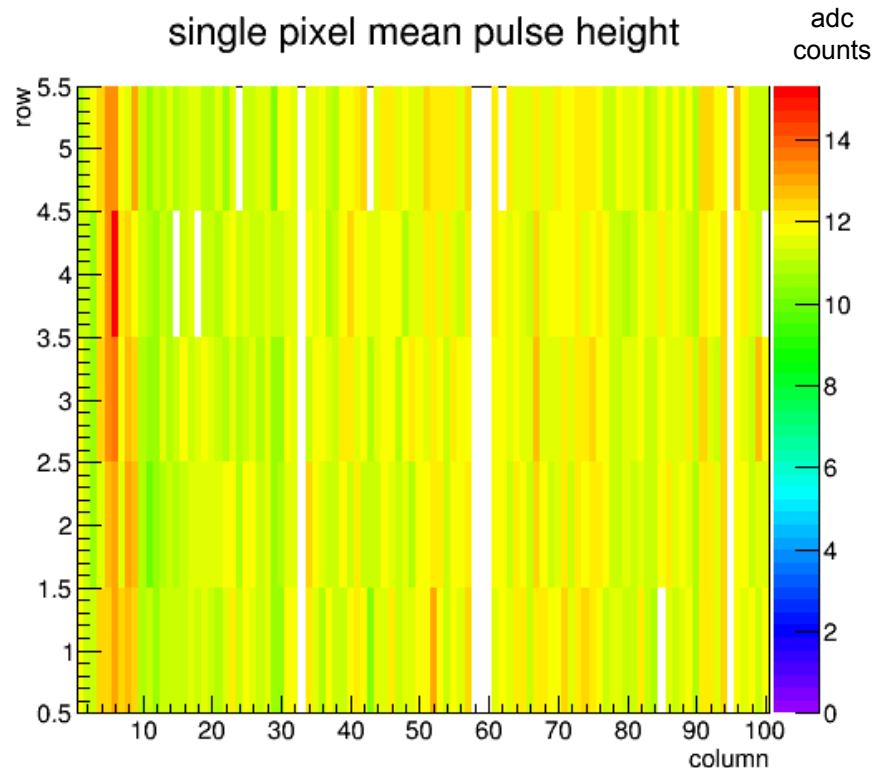
1. Determine the single-pixel pulse height in high gain mode.
2. Use columns with both individual fiber (low gain) and summed (high gain) readout and to transfer the absolute gain calibration from high gain to low gain signals.

1) single pixels in high gain

dark noise spectrum, all channels

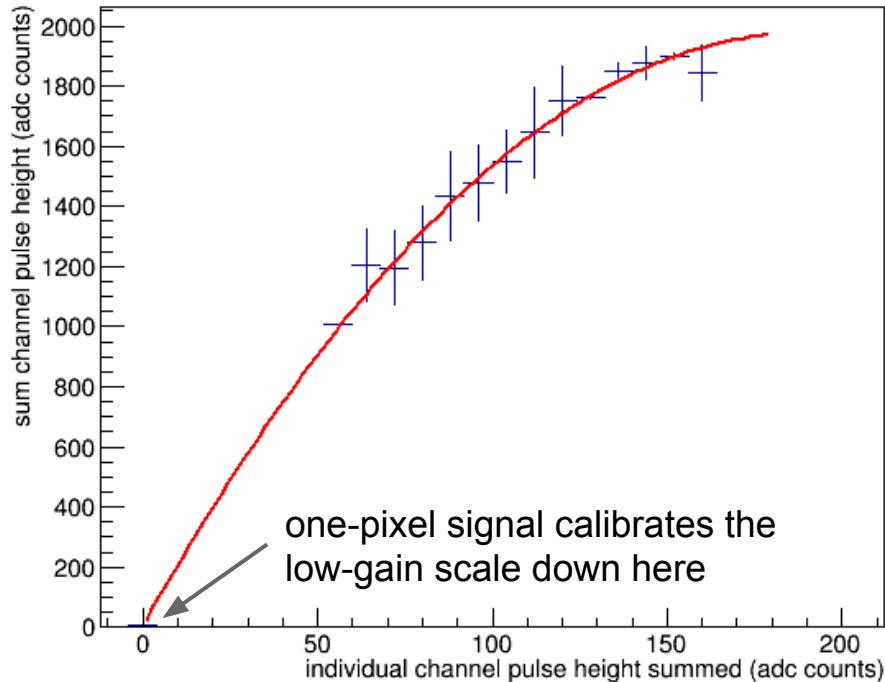


single pixel mean pulse height



2) low gain -- high gain matching

sum vs individual pulse heights



fit to second order polynomial

Chi2 = 3.63713

Ndf = 11

p0 = 5.01006 +/- 4.08208

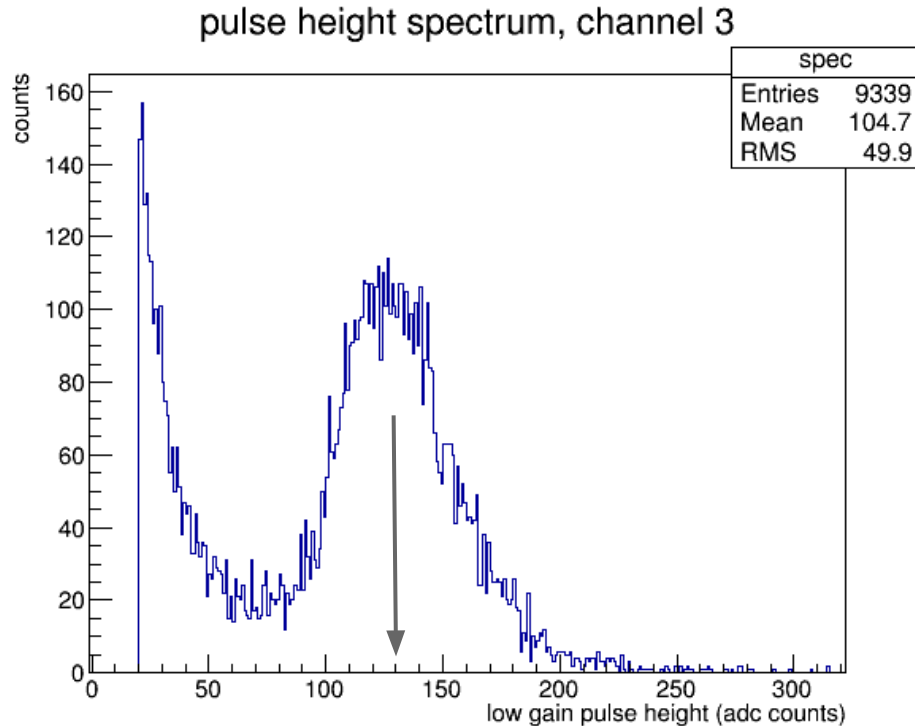
p1 = 20.7665 +/- 0.542004

p2 = -0.05465 +/- 0.003883

low-gain calibration:

high-gain linear scale / 20

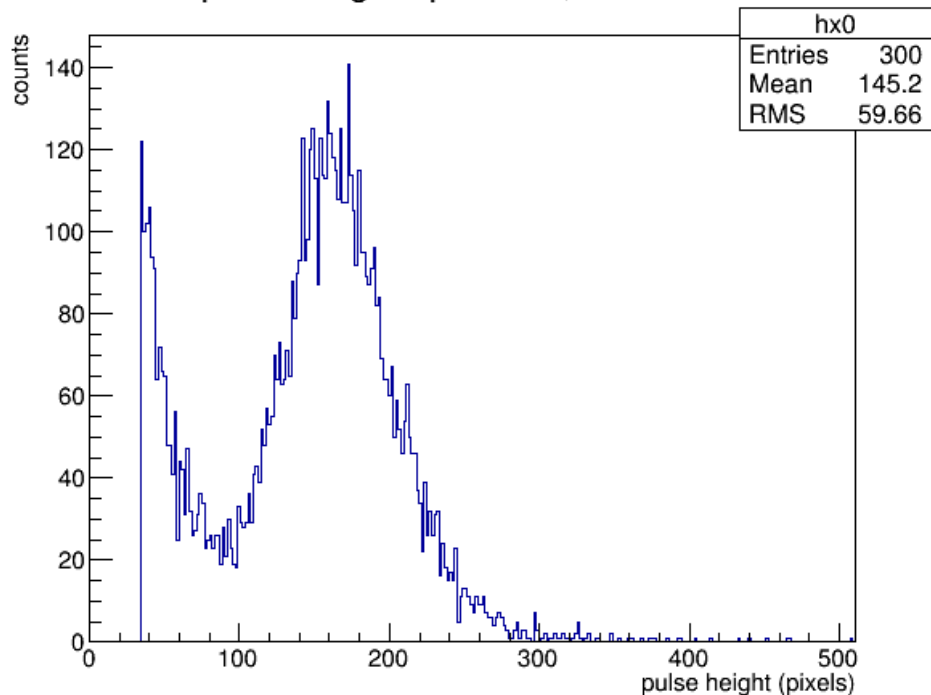
fADC “hits” pulse spectrum



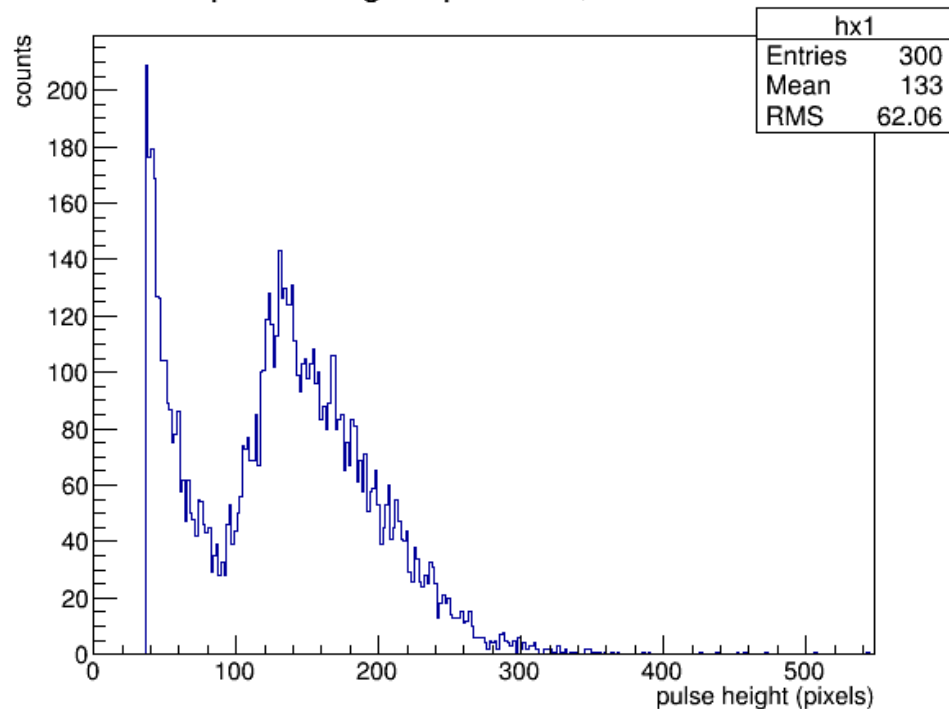
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fADC “hits” pulse spectrum

pulse height spectrum, channel 0

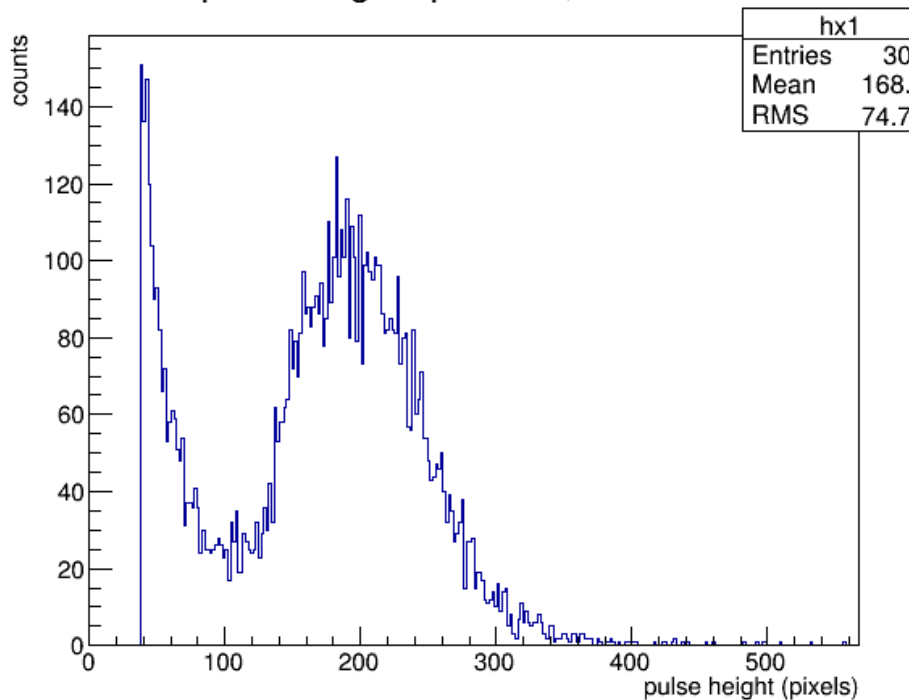


pulse height spectrum, channel 1

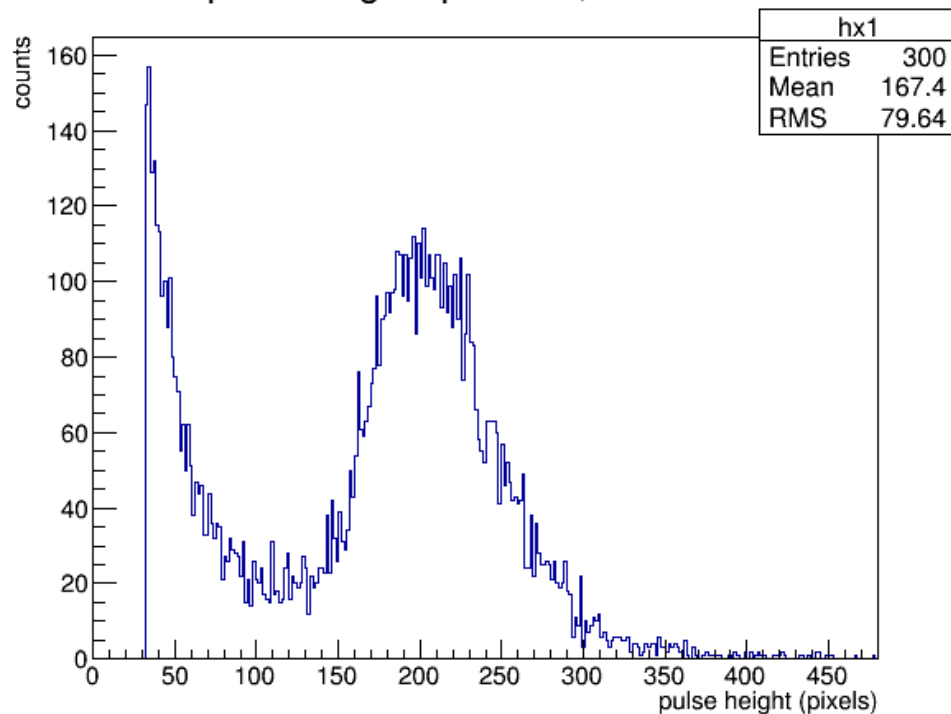


fADC “hits” pulse spectrum

pulse height spectrum, channel 2

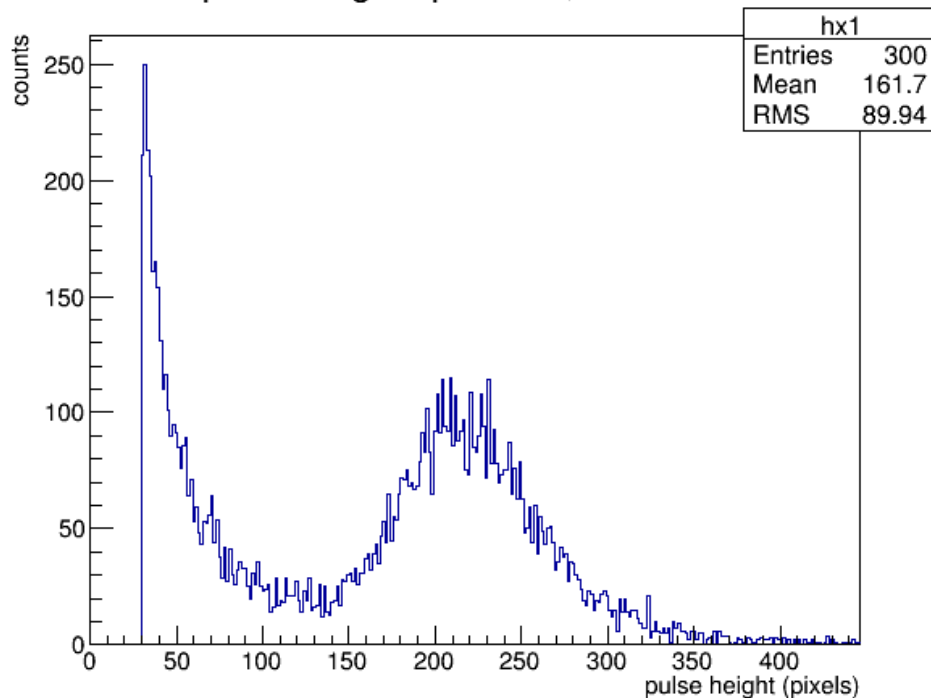


pulse height spectrum, channel 3

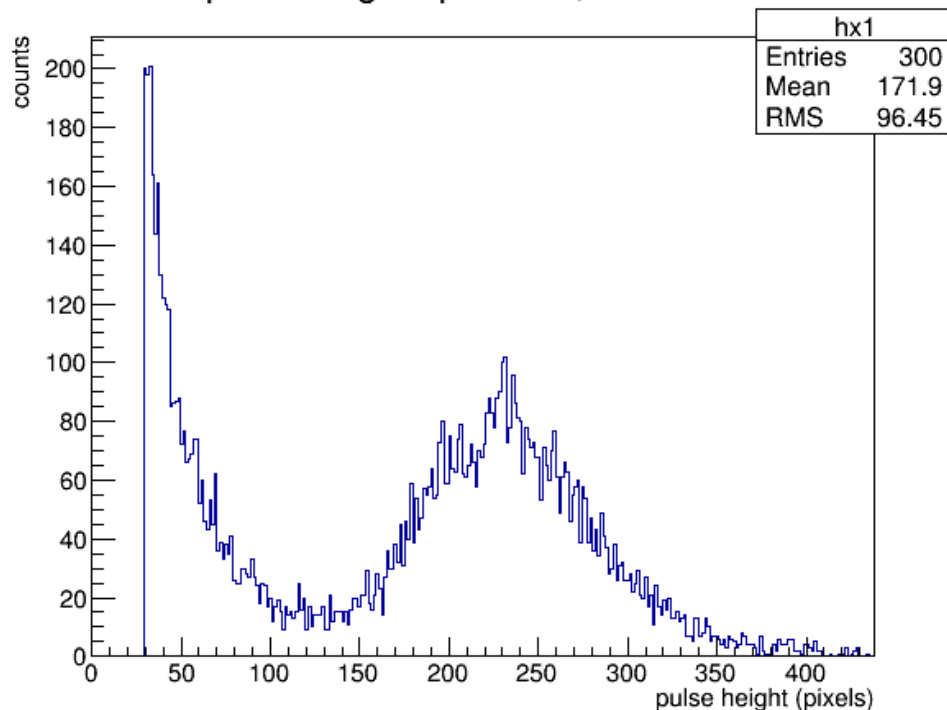


fADC “hits” pulse spectrum

pulse height spectrum, channel 4

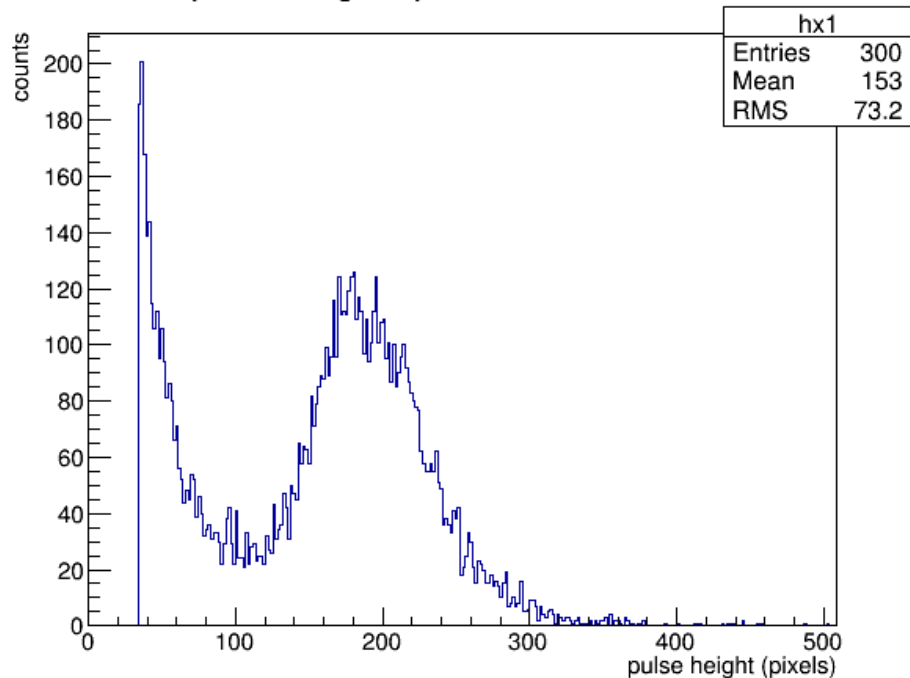


pulse height spectrum, channel 5

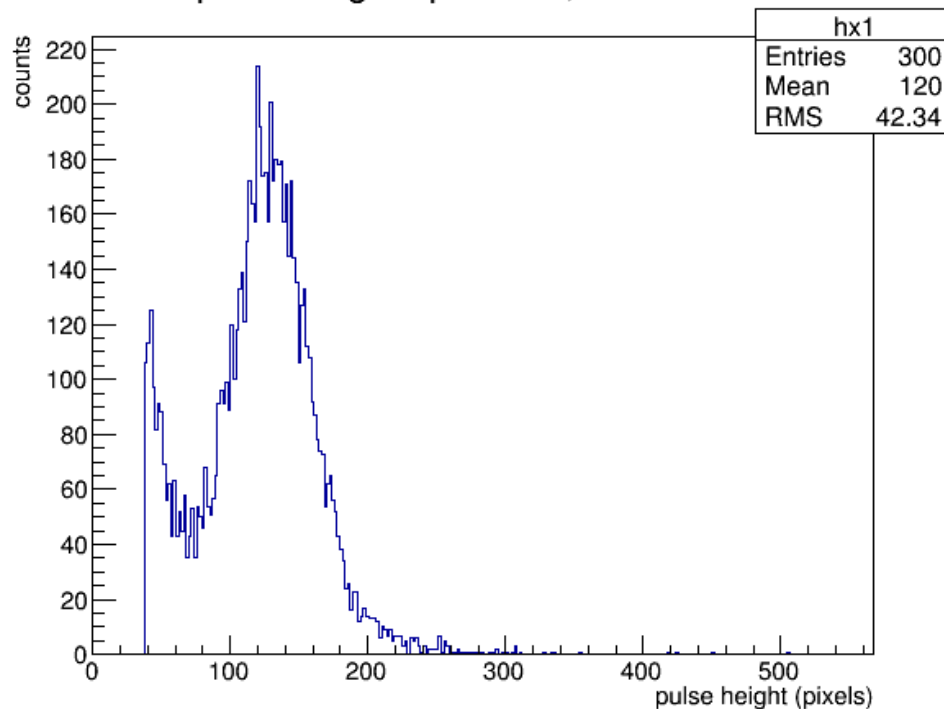


fADC “hits” pulse spectrum

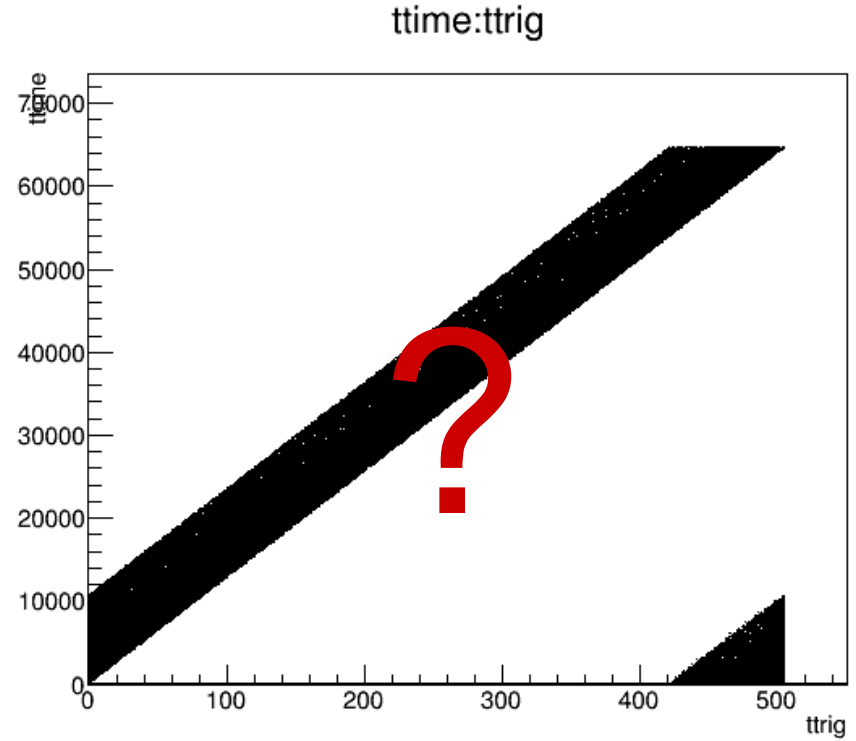
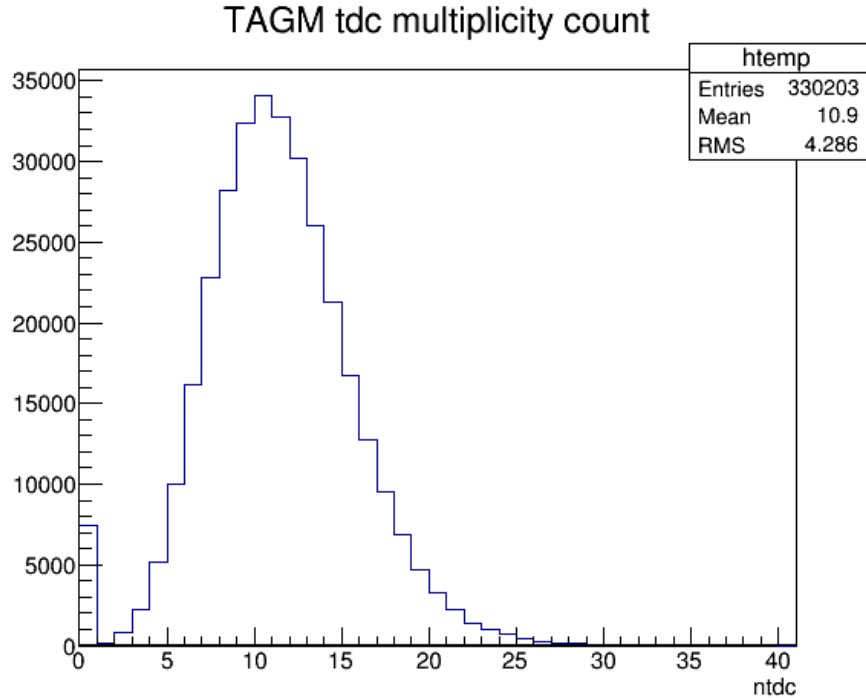
pulse height spectrum, channel 11



pulse height spectrum, channel 15



TDC hits



TDC hits

yet to come...