ARAPUCA calibration

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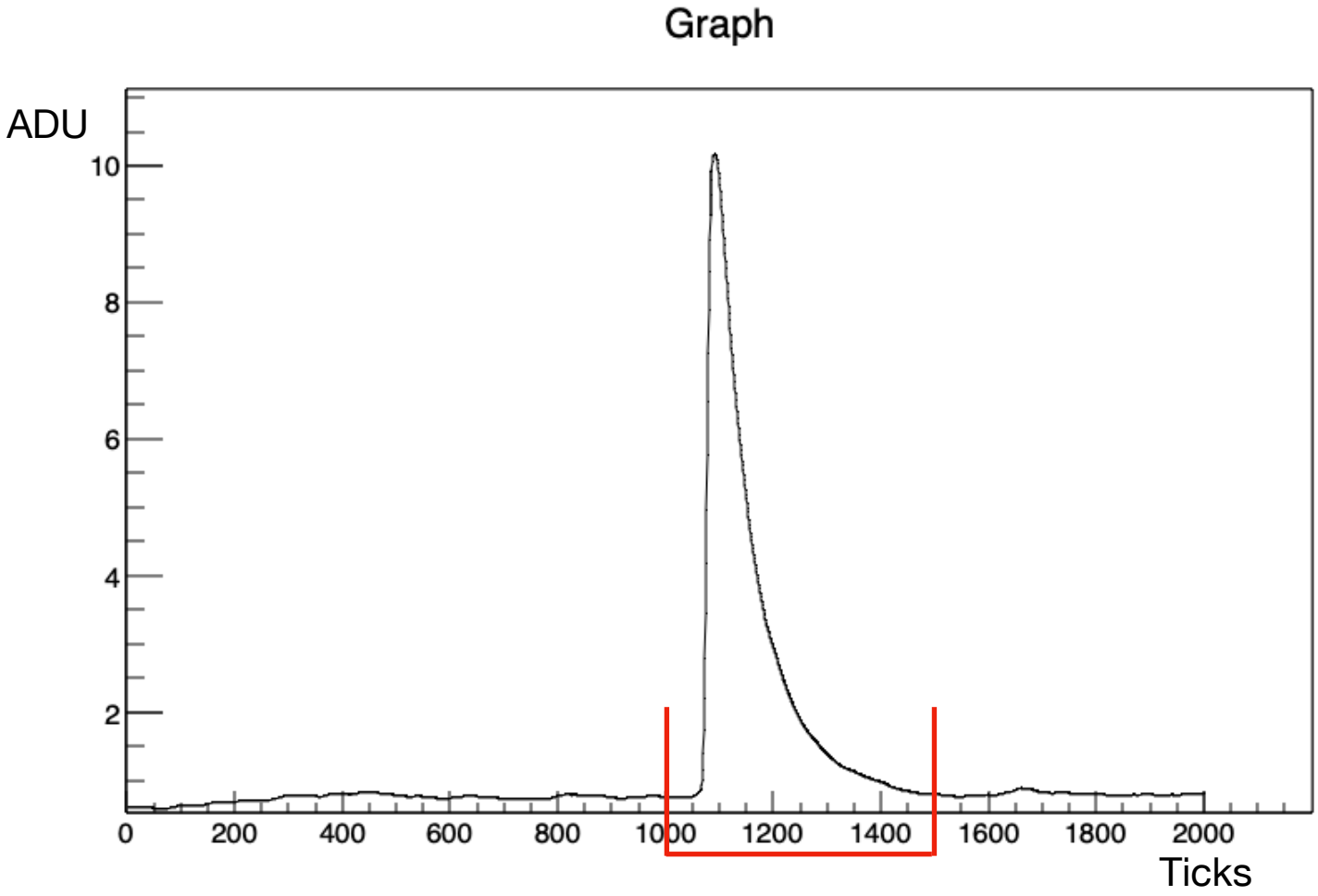
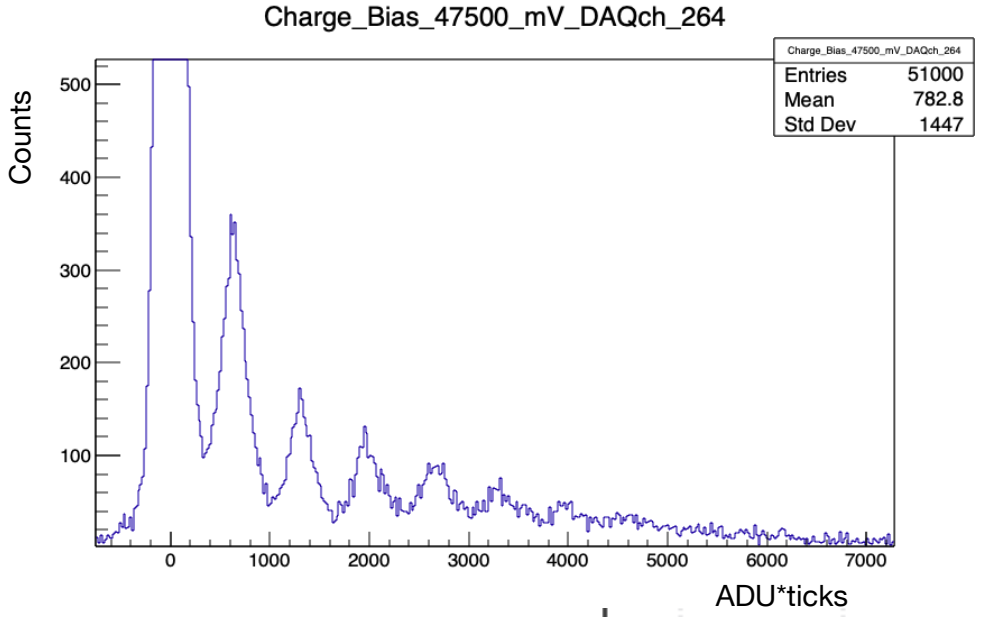
Average Waveform ch:264 V=47.5



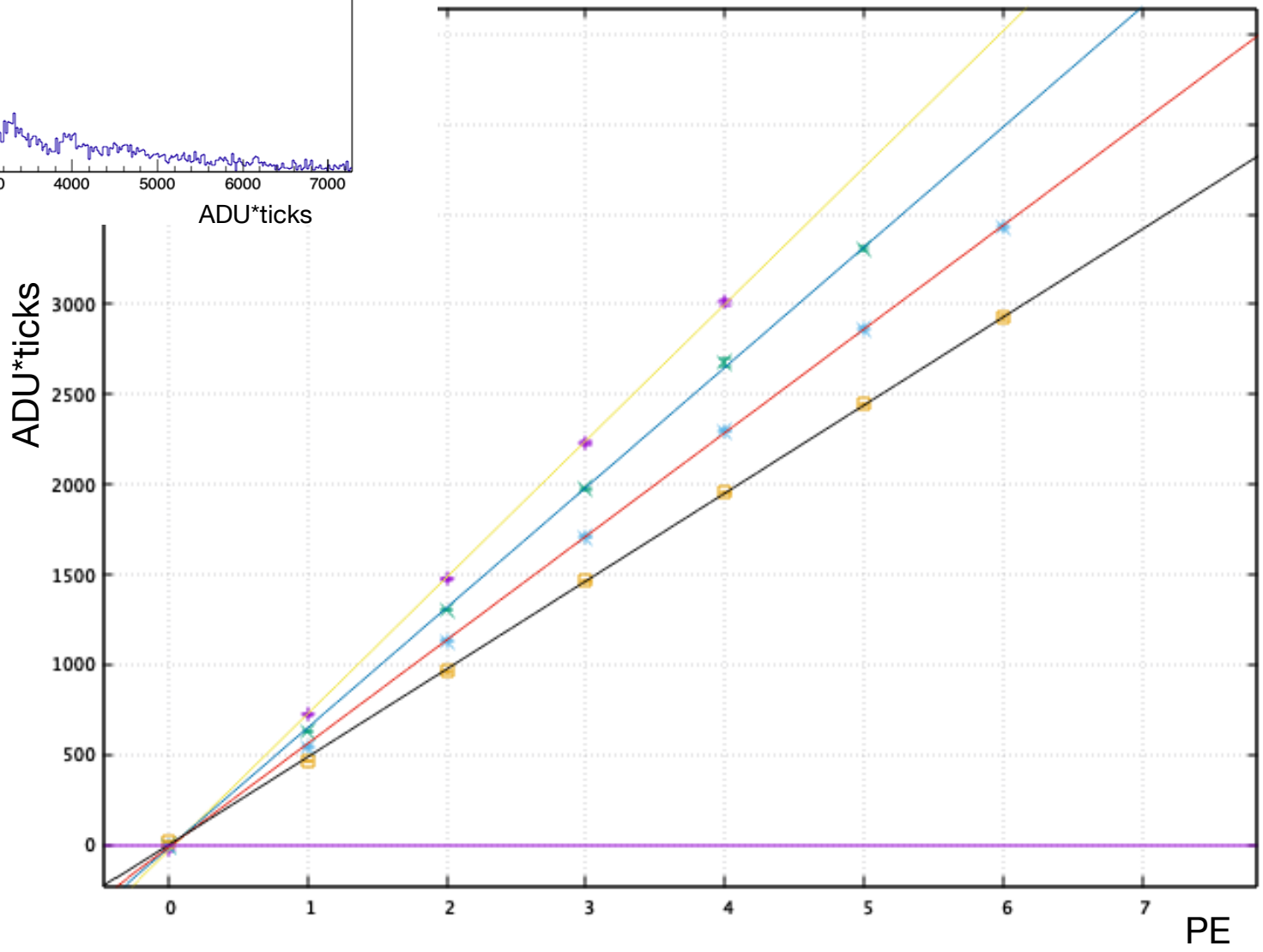
Window used [1000:1500] ticks $\simeq 3.3\,\mu s$

Bias Scan ch:264



MPPC
Bias :

46.5 V ->Black
47.0 V ->Red
47.5 V ->Blue
48.0 V ->Yellow



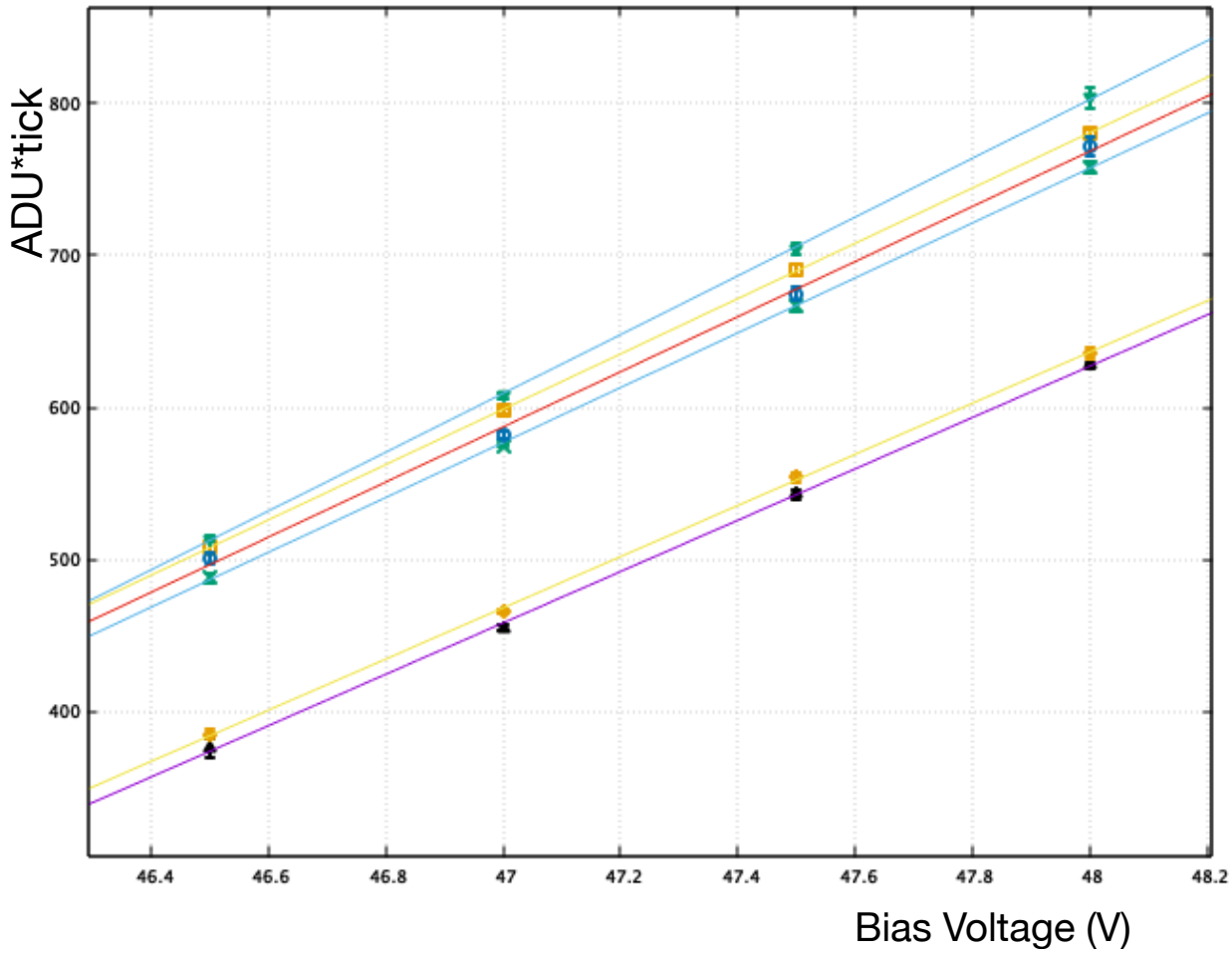
For each channel I got a set of 4 values for the 4 bias voltage.

Here is plotted the photo-electron peaks separation (Calibration) for 4 values of bias voltage

Each line is relative to a channel:

Ch in the plot: 264, 265, 266, 267, 268 and 269

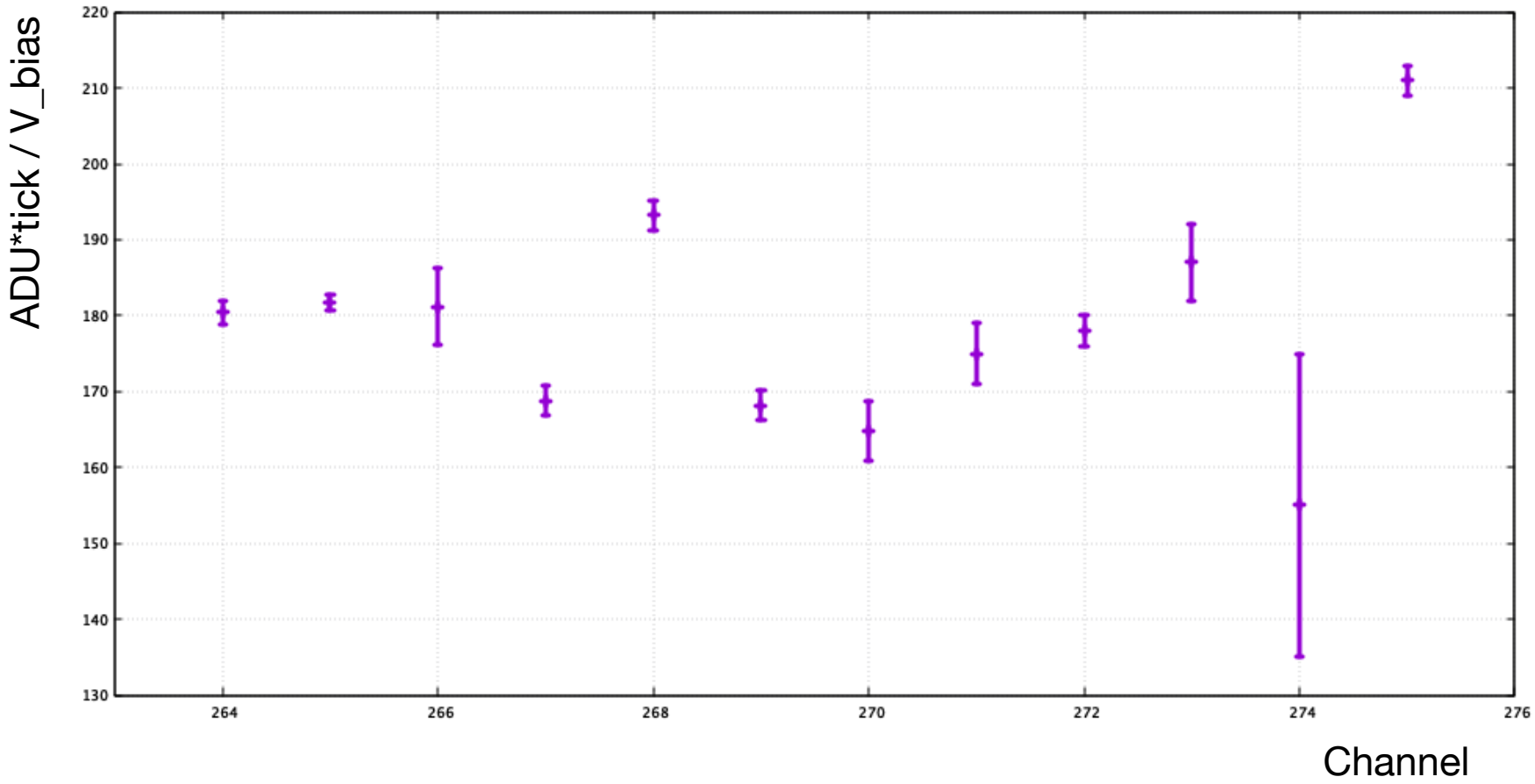
The gains are very similar but there is a clear substantial difference in the break down voltage



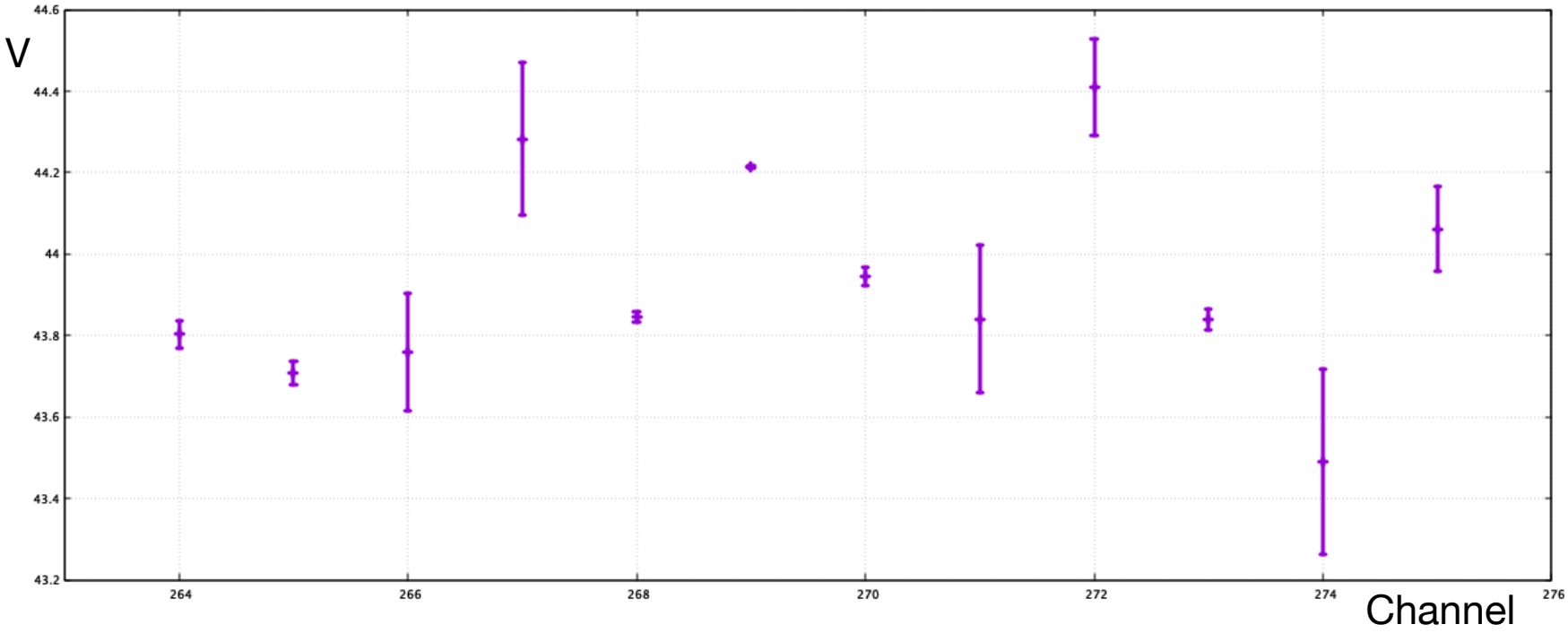
$$f(x) = a + b \cdot x \;\rightarrow\; G = b\ (\Delta G = \Delta b)\ \ and\ V_{bd} = -\frac{a}{b}\left(\Delta V_{bd} = \left[\frac{\Delta a}{a} + \frac{\Delta b}{b}\right] \cdot V_{bd}\right)$$

Gain for the 12 ARAPUCA channels in APA 6

Gain is measured in $\frac{ADU \cdot ticks}{V_{bias}} \left(= 0.244 \cdot 6.67 \frac{mV \cdot ns}{V_{bias}} \right)$



Break Down Voltage for the 12 ARAPUCA channels in APA 6



The MPPCs working point is the over voltage respect the break down: $V_{ov} = V_{bias} - V_{bd}$

In the standard situation MPPCs work at $V_{bias} = 48V$.

$$\frac{\Delta V_{ov}}{< V_{ov} >} = \frac{4.5 - 3.6}{4} \simeq 25\,\%$$

Ch.264:	4.2 V	Ch.268:	4.1 V	Ch.272:	3.6 V
Ch.265:	4.3 V	Ch.269:	3.8 V	Ch.273:	4.2 V
Ch.266:	4.2 V	Ch.270:	4.0 V	Ch.274:	4.5 V
Ch.267:	3.7 V	Ch.271:	4.2 V	Ch.275:	3.9 V