

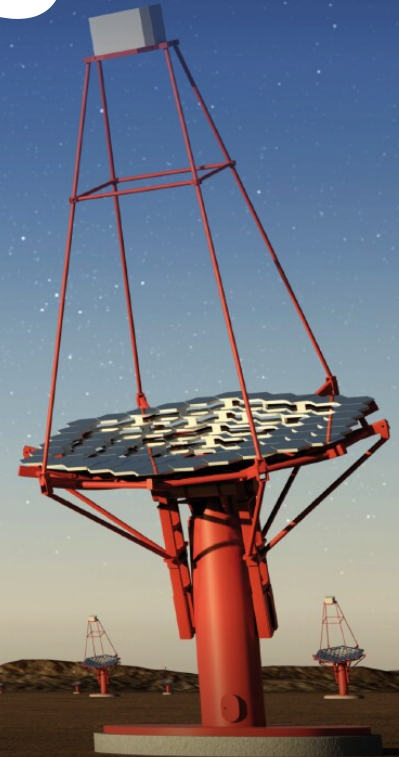
Initial SiPM Testing

Richard White

CTA-UK Meeting

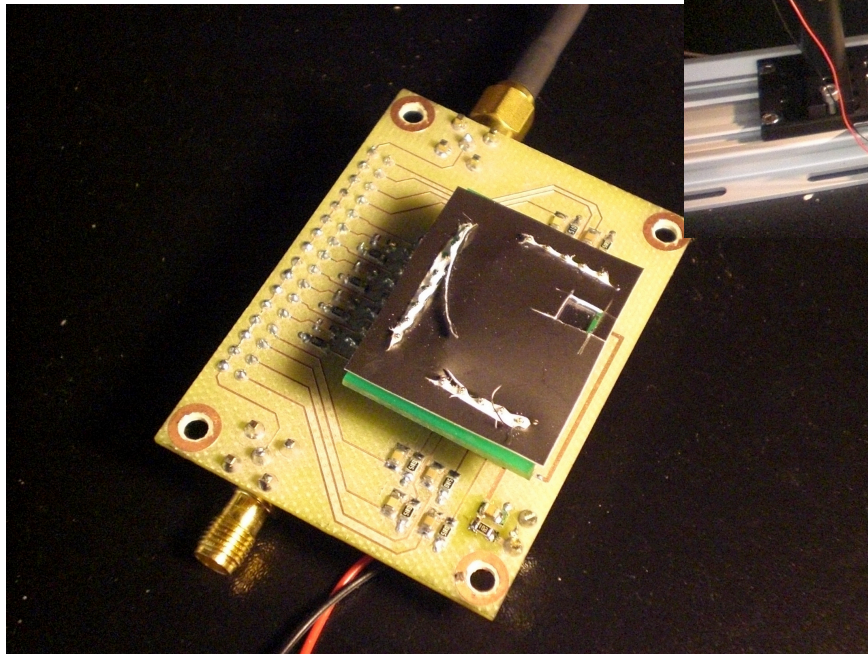
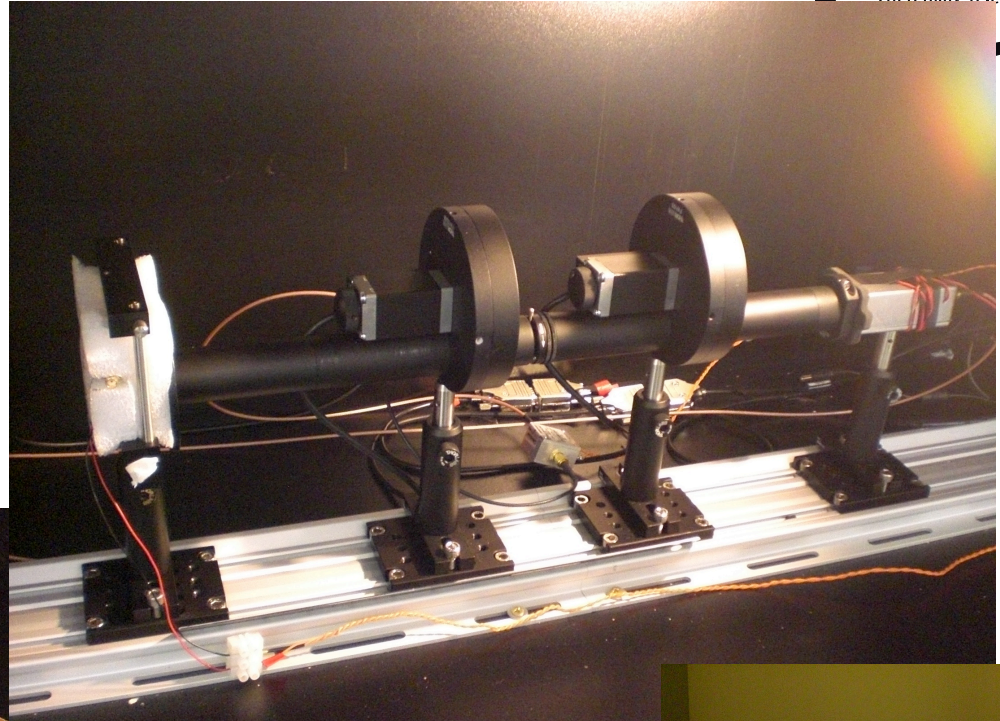
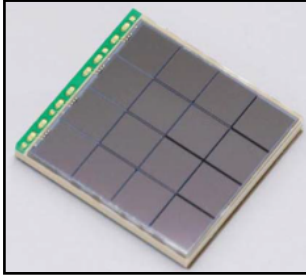
Liverpool

Sep. 2012



University of
Leicester

Test Setup

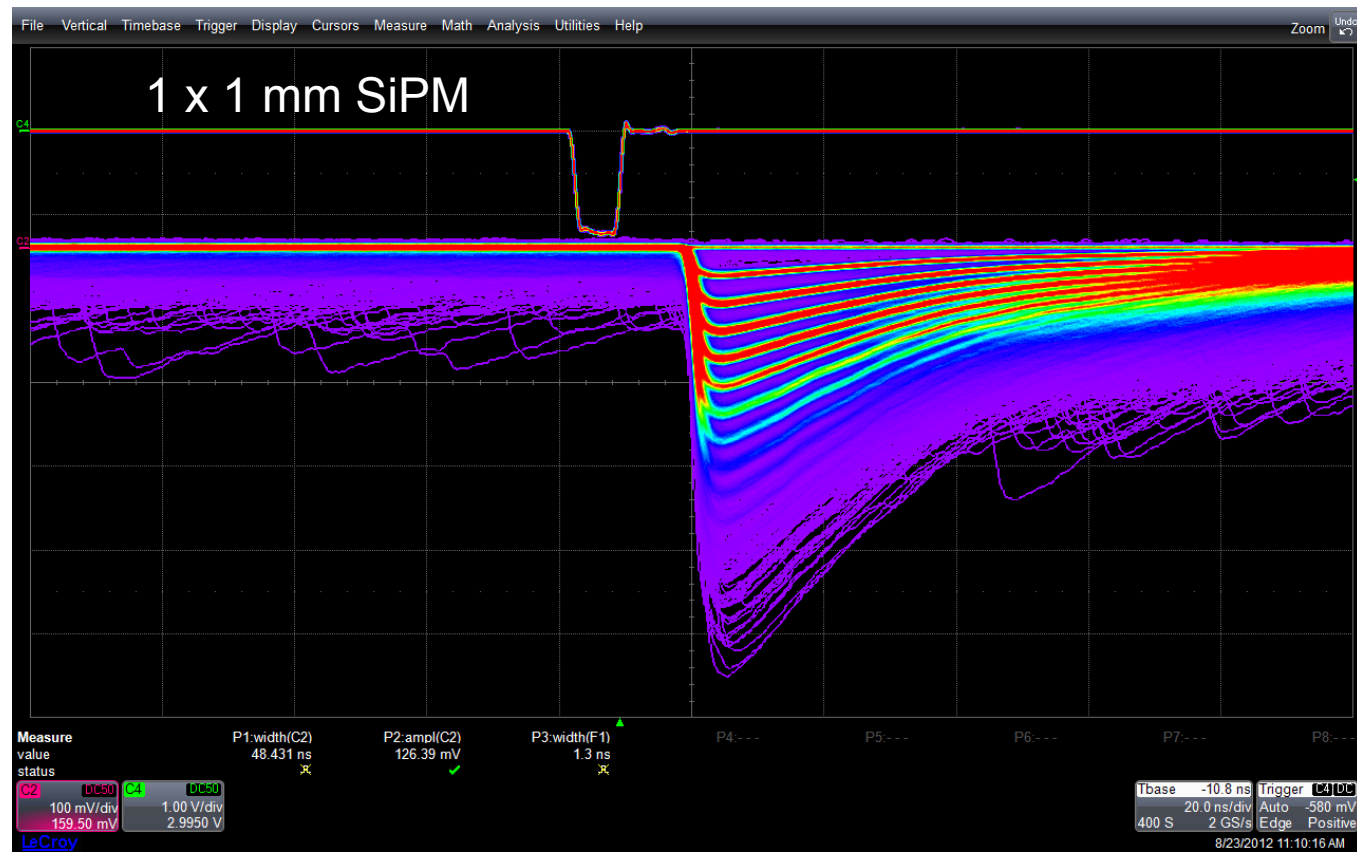


Initial Attempts



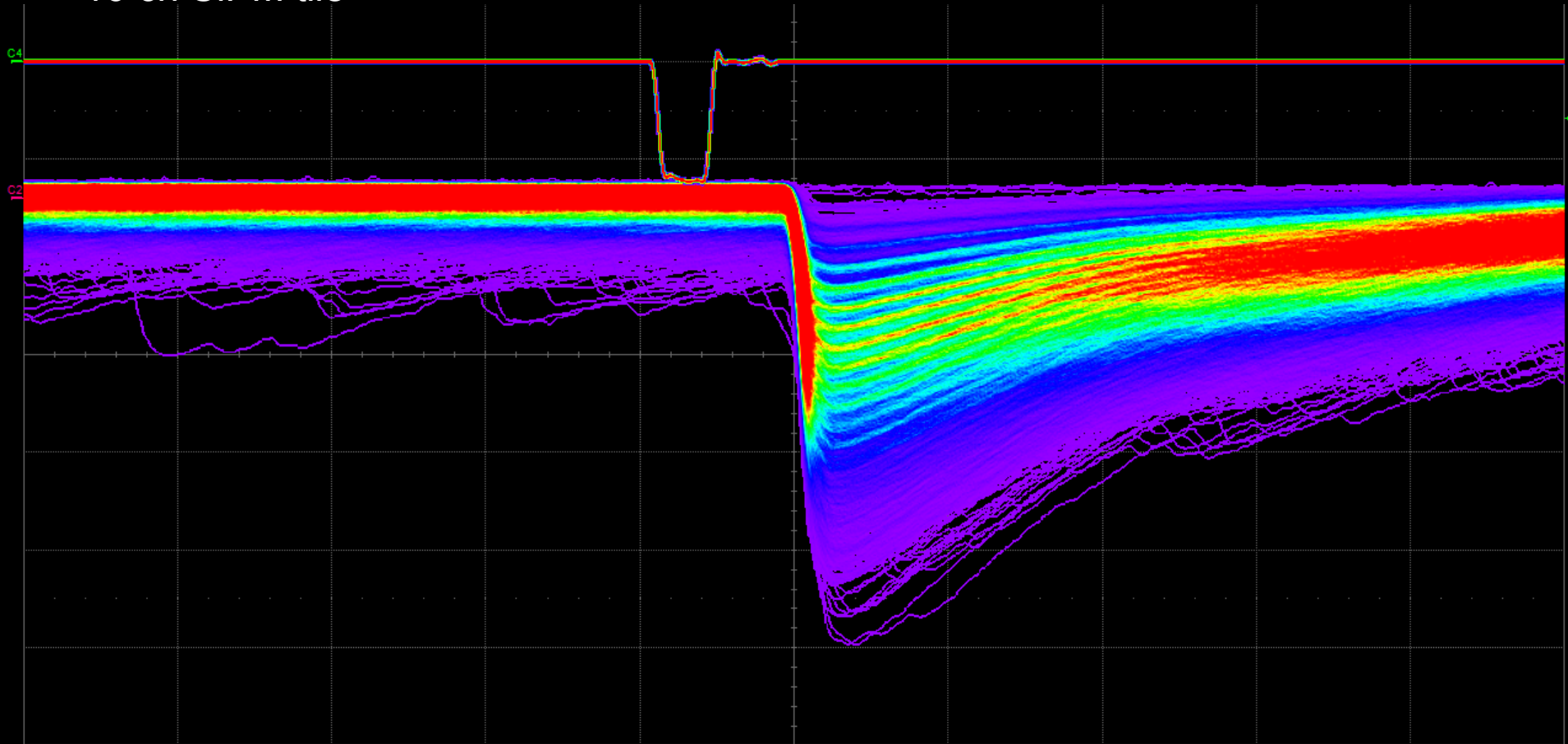
Tim's Caen Kit

...everything works apart from the digitiser



Initial Attempts

16 ch SiPM tile



Measure	P1:width(C2)	P2:ampl(C2)	P3:width(F1)	P4:---	P5:---	P6:---	P7:---	P8:---
value	15.254 ns	127.56 mV	1.1 ns					
status		✓						

C2	DC50	C4	DC50
100 mV/div	1.00 V/div		
159.50 mV	2.9950 V		

LeCroy

Tbase	-10.8 ns	Trigger	C4 DC
	20.0 ns/div	Auto	-580 mV
400 S	2 GS/s	Edge	Positive

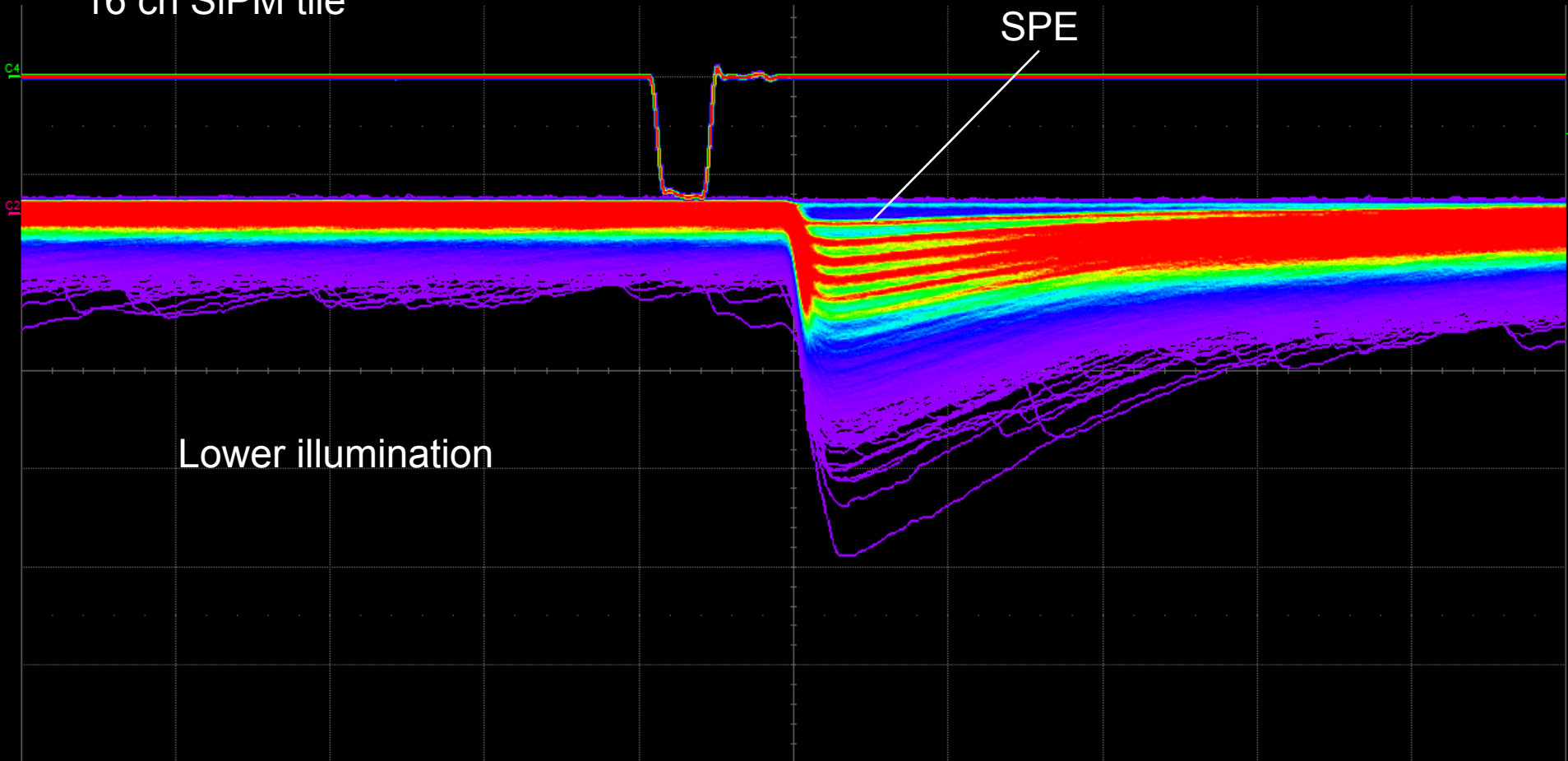
8/23/2012 11:53:38 AM

Initial Attempts

16 ch SiPM tile

SPE

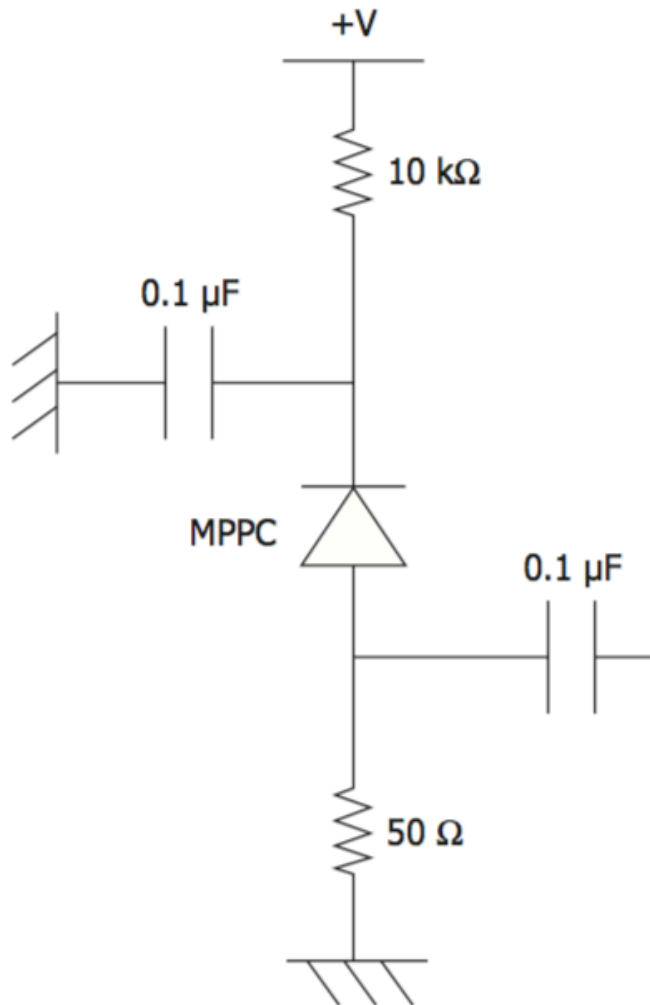
Lower illumination



Measure value status	P1:width(C2) 49.461 ns	P2:ampl(C2) 11.92 mV	P3:width(F1) 4.4 ns	P4:---	P5:---	P6:---	P7:---	P8:---
C2 DC50 100 mV/div 159.50 mV	C4 DC50 1.00 V/div 2.9950 V							
Tbase -10.8 ns		Trigger C4 DC						
20.0 ns/div		Auto -580 mV						
400 S		2 GS/s		Edge Positive				
8/23/2012 11:49:07 AM								

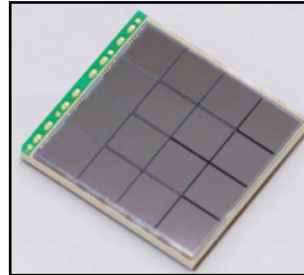
Test Setup

Bias Circuit

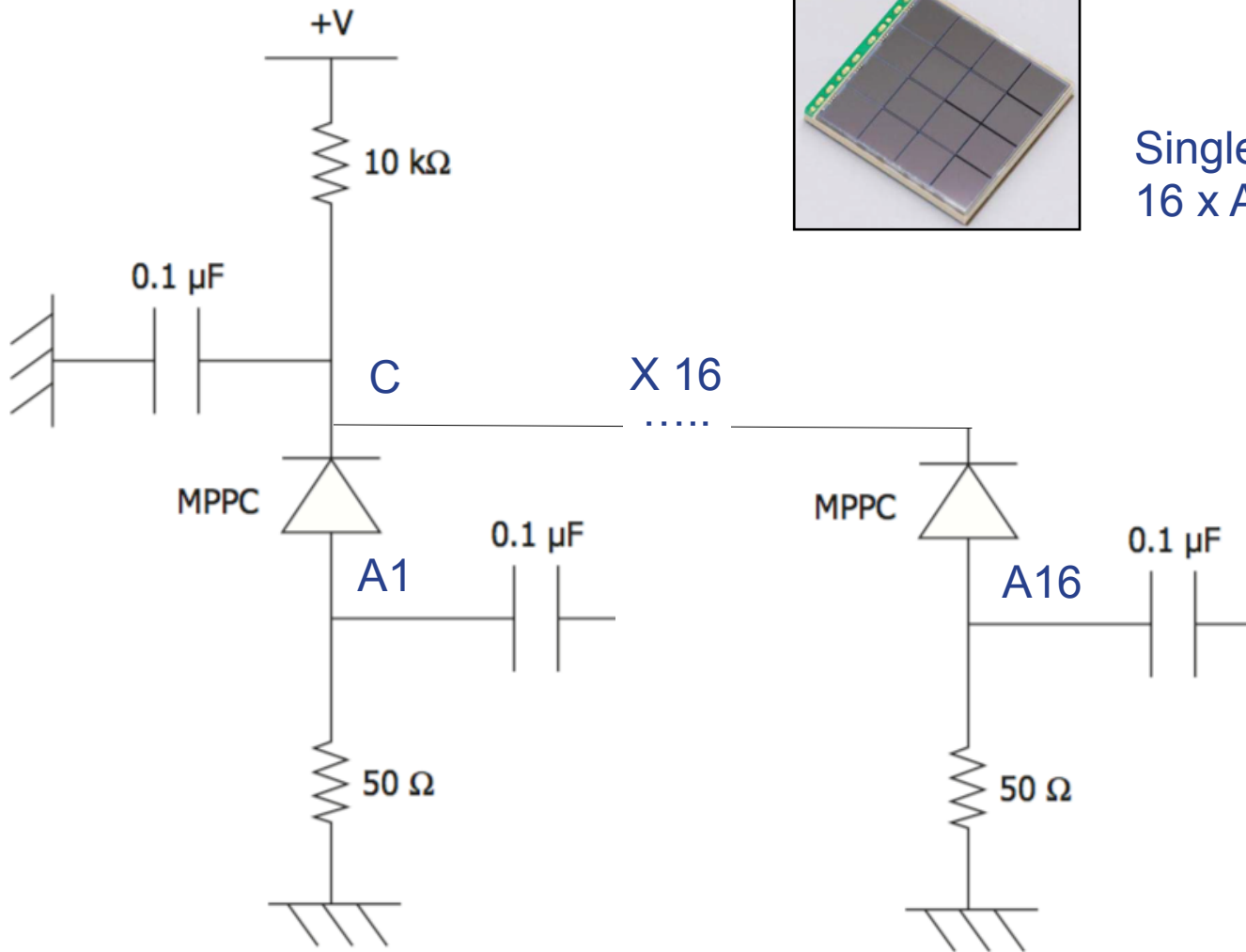


Test Setup

Bias Circuit

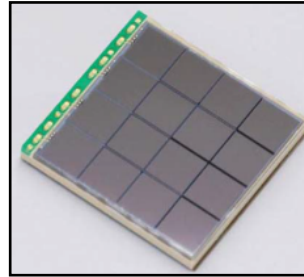


Single Cathode
16 x Anode

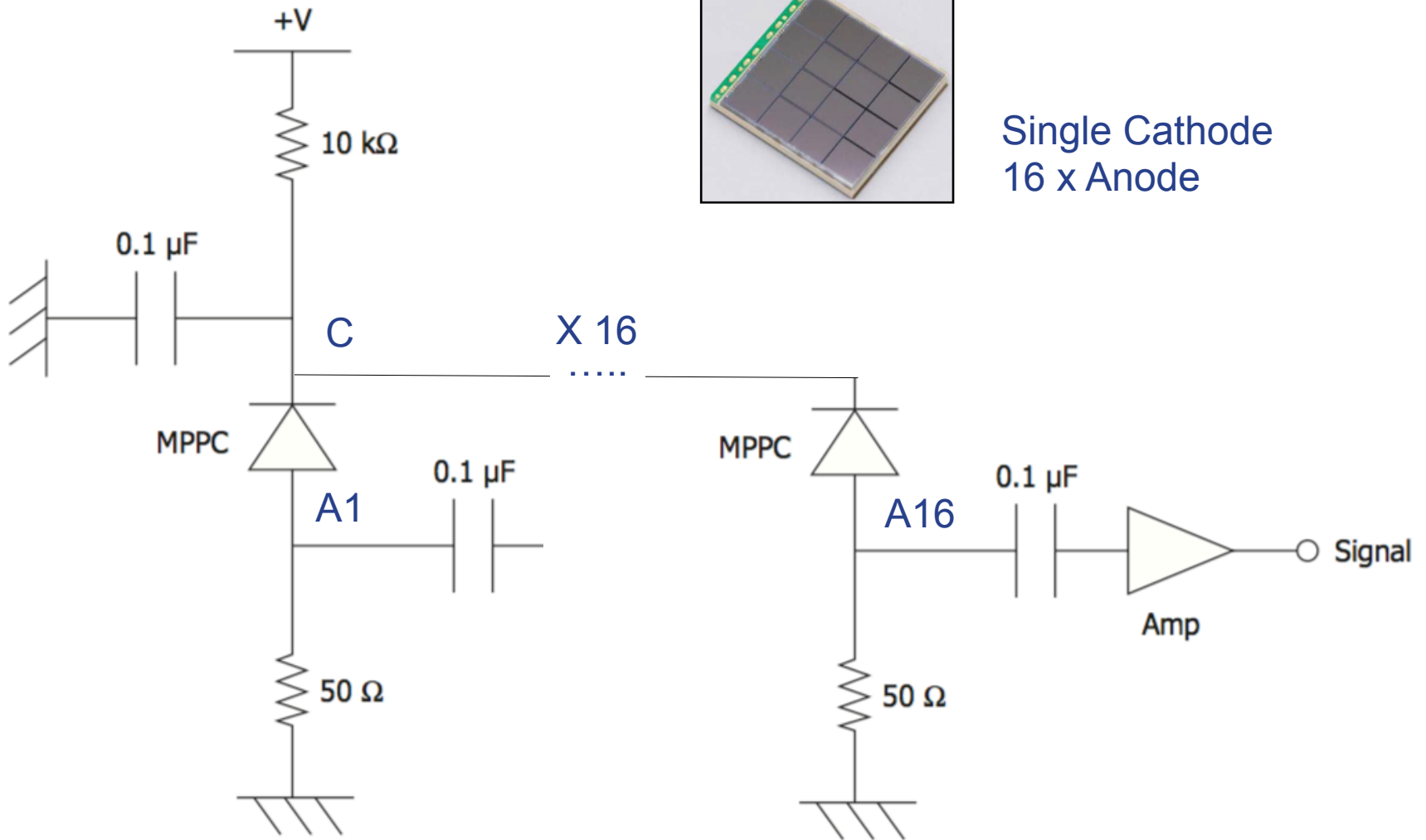


Test Setup

Bias Circuit

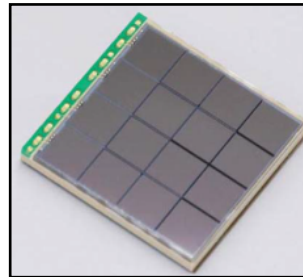


Single Cathode
16 x Anode

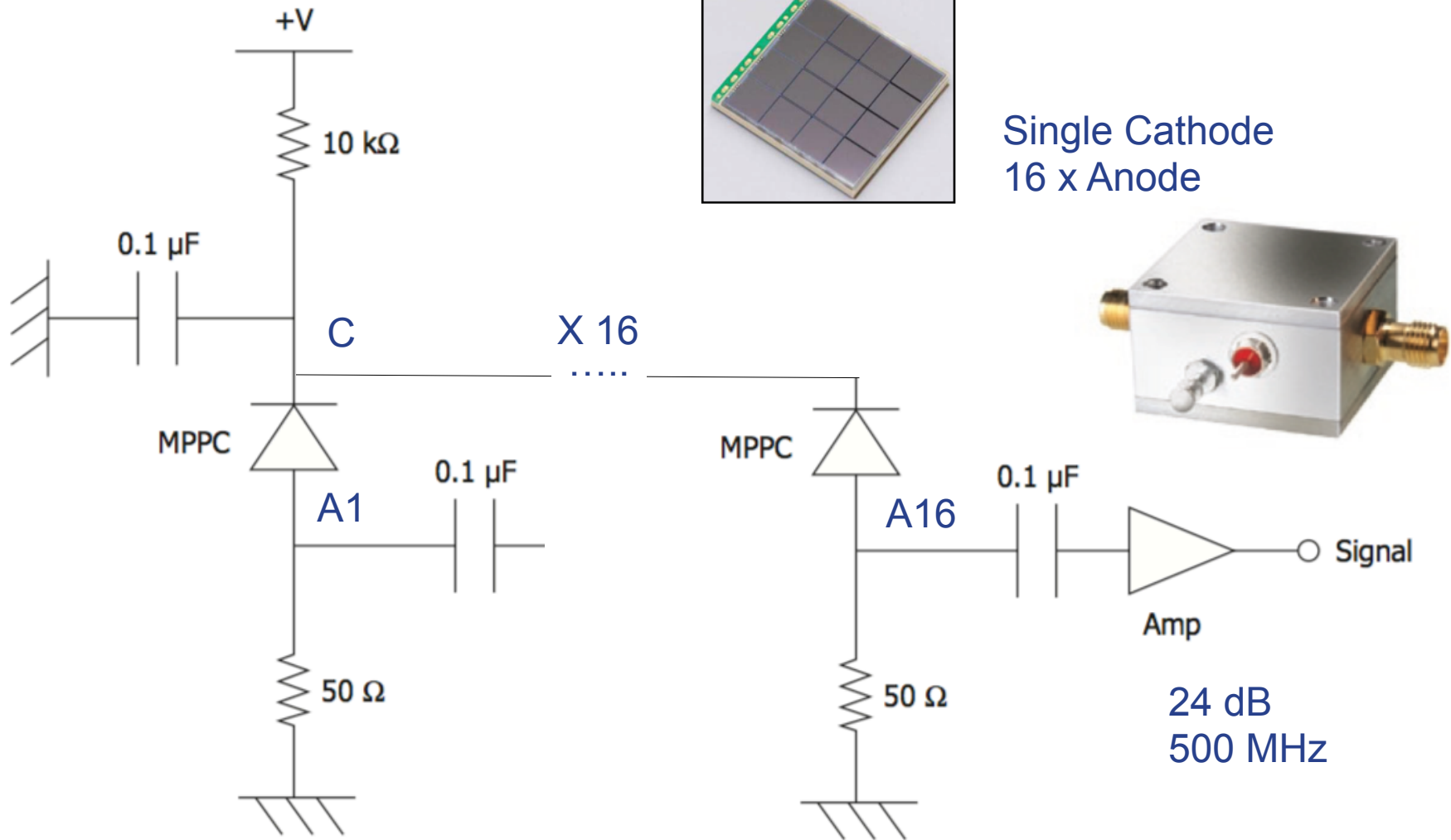


Test Setup

Bias Circuit



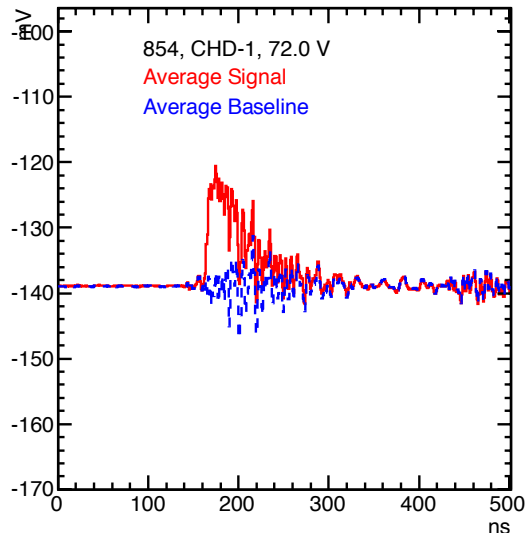
Single Cathode
16 x Anode



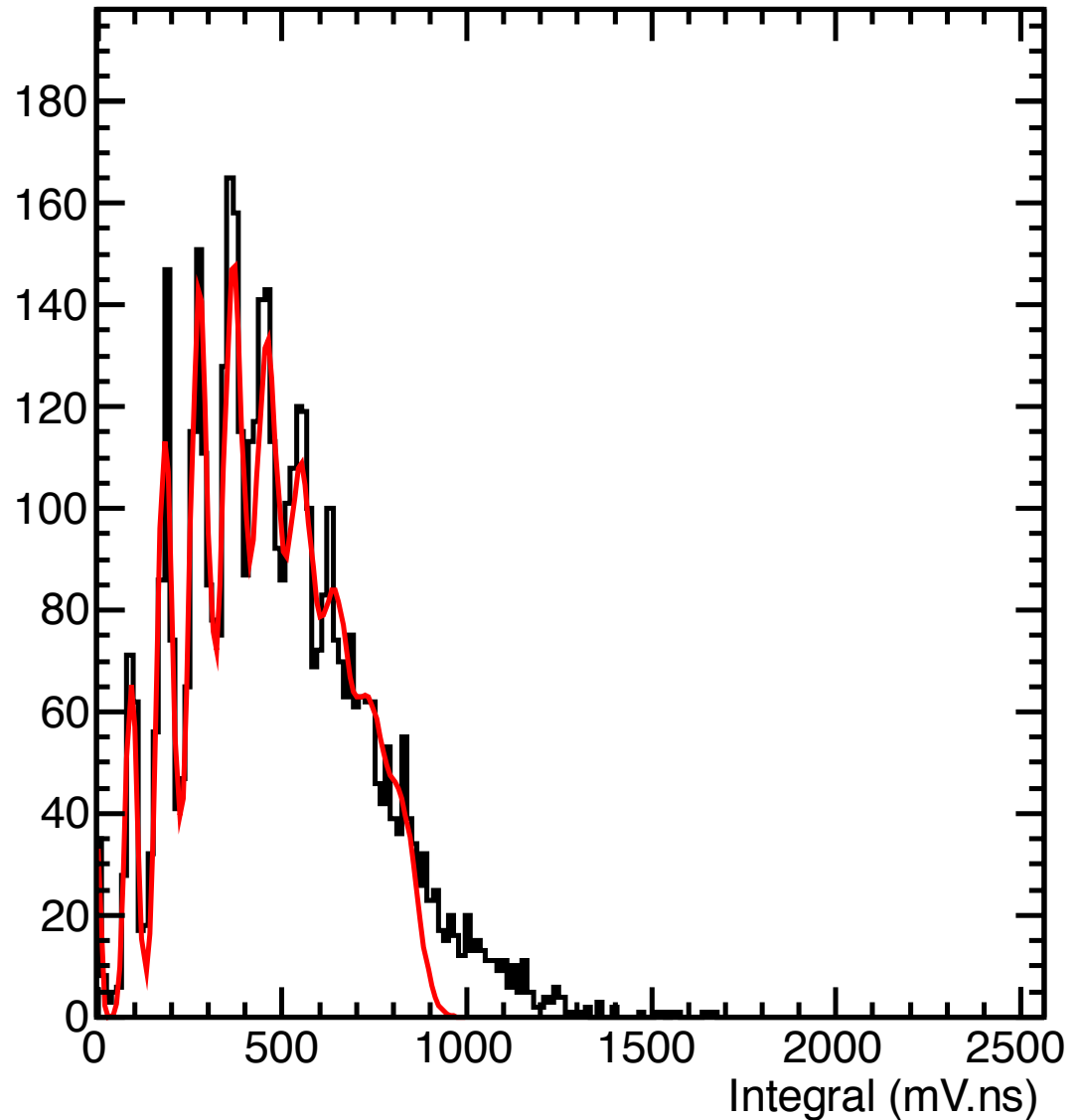
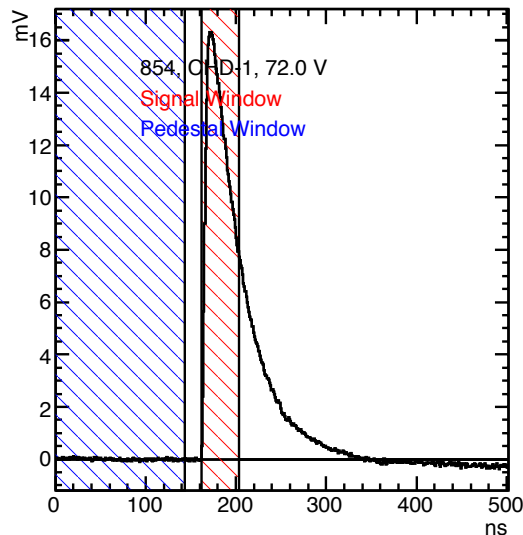
Pulse Height Spectrum

Multiple PE

Average Waveforms



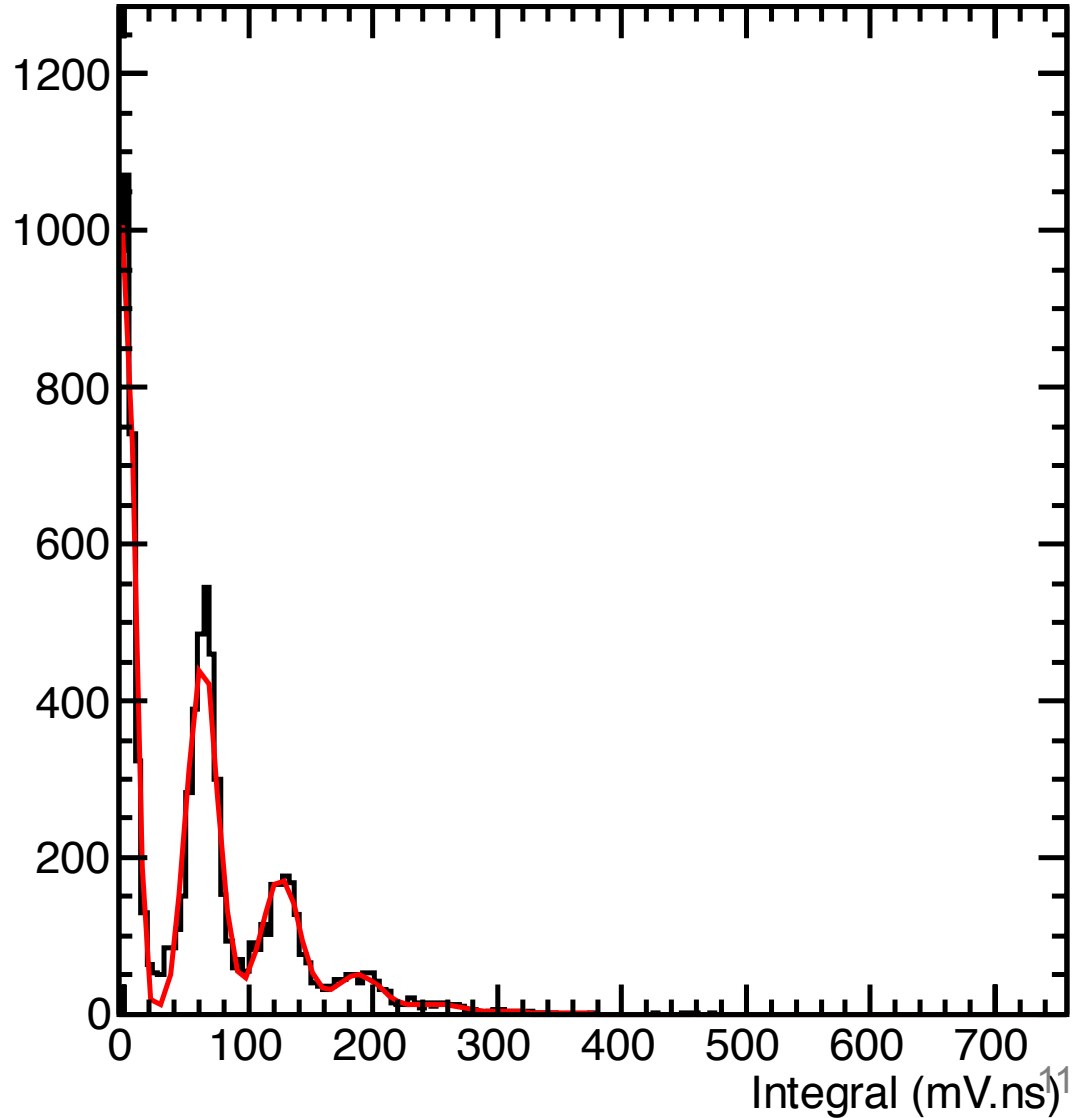
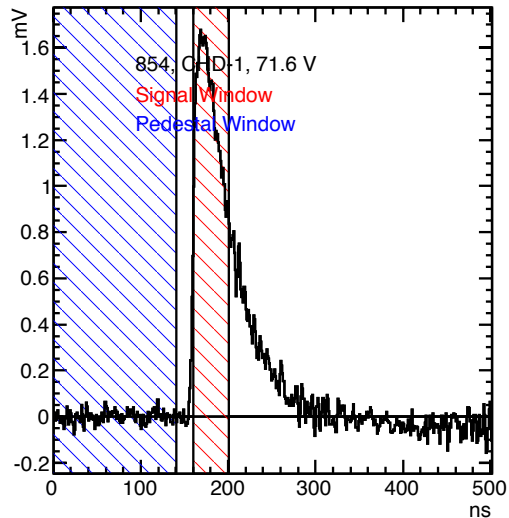
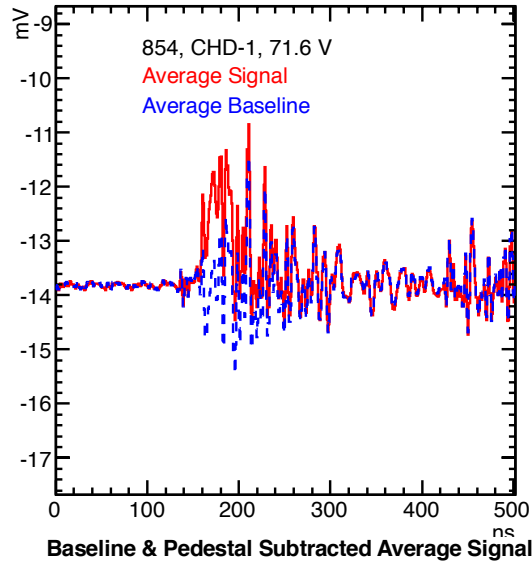
Baseline & Pedestal Subtracted Average Signal



Pulse Height Spectrum

SPE

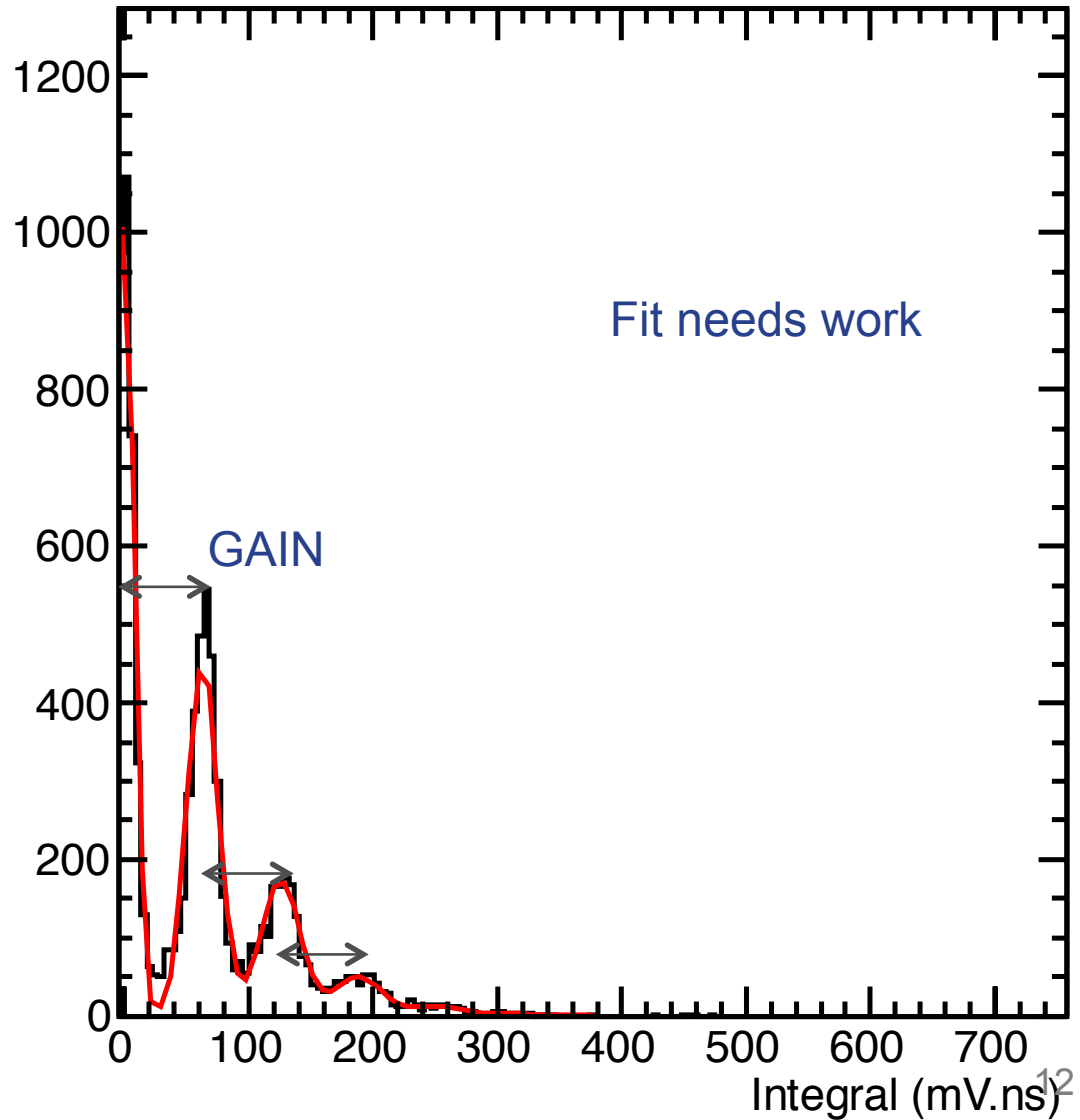
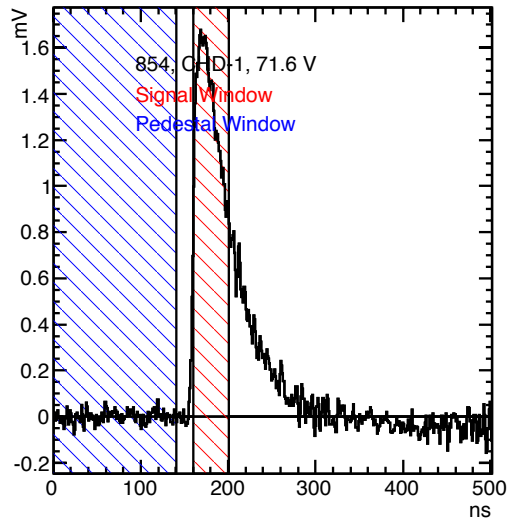
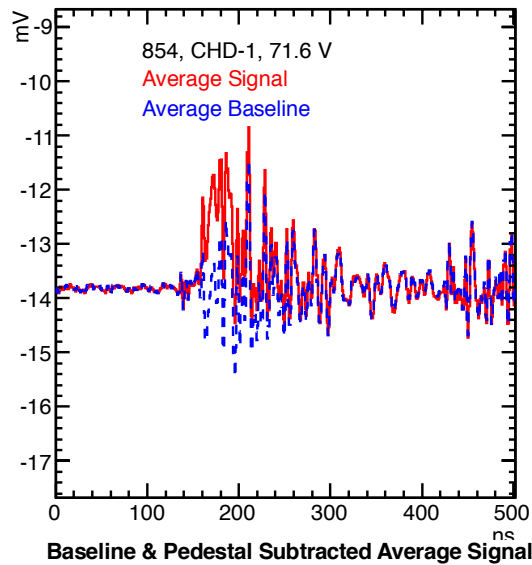
Average Waveforms



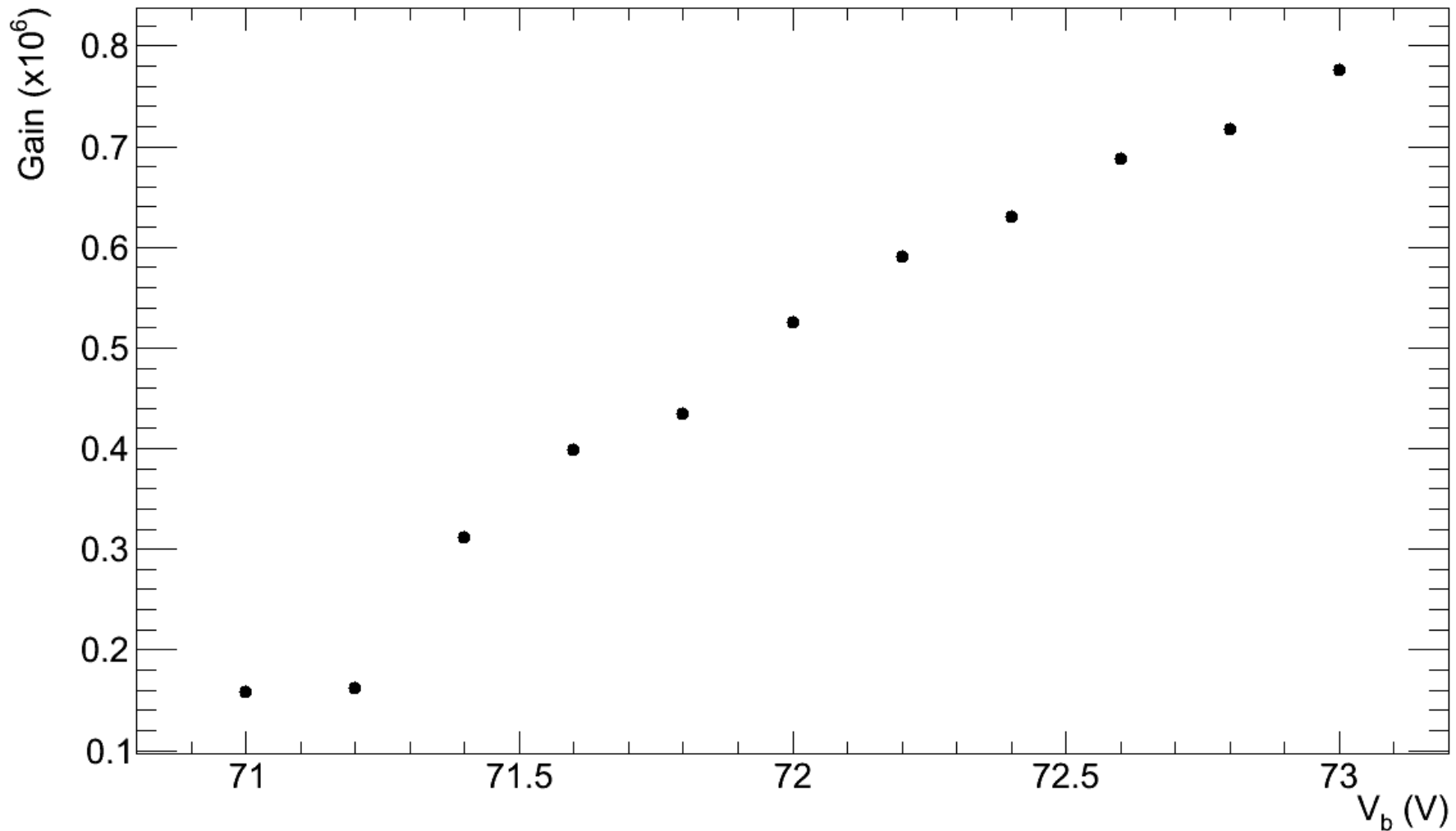
Pulse Height Spectrum

SPE

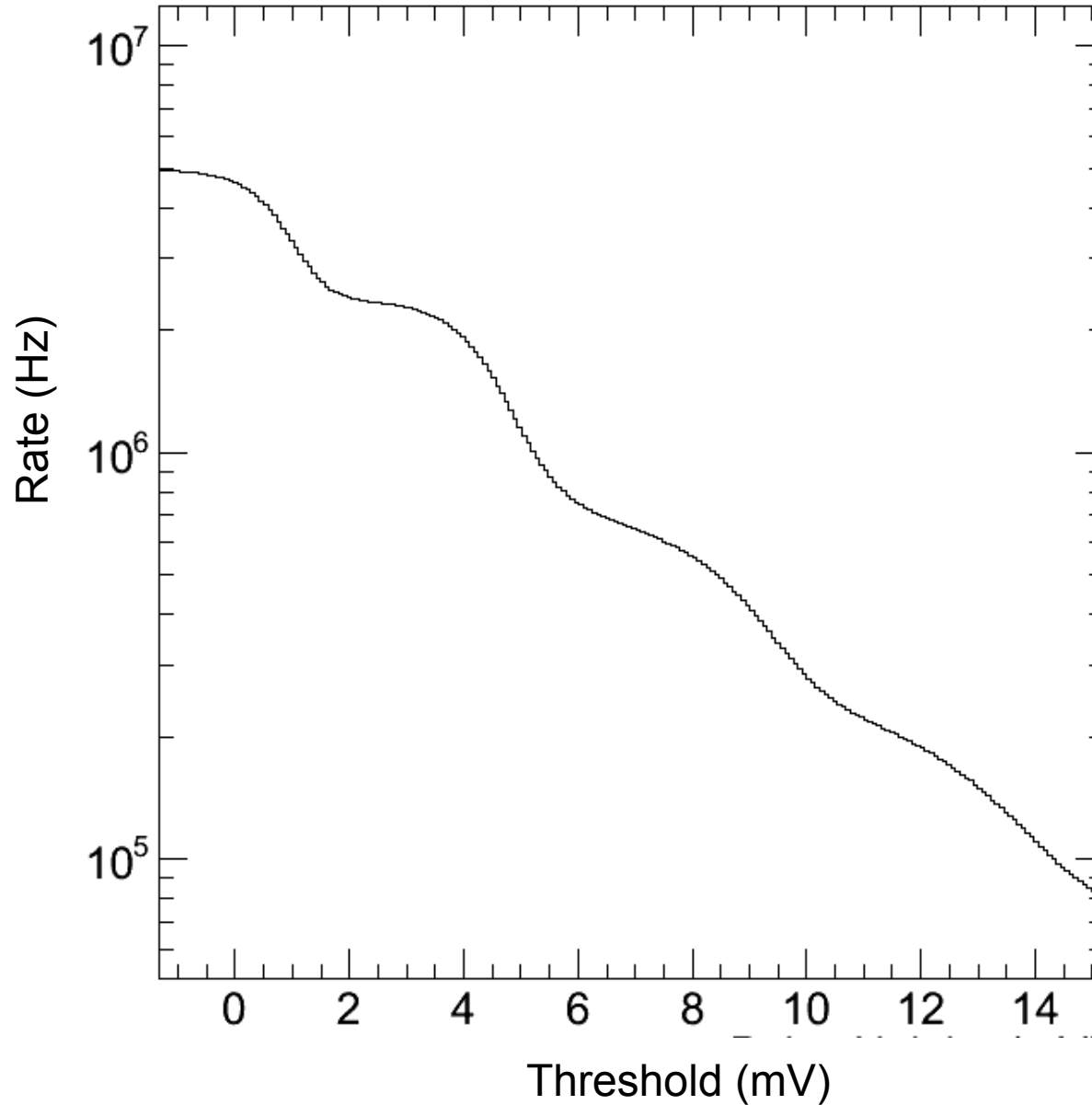
Average Waveforms



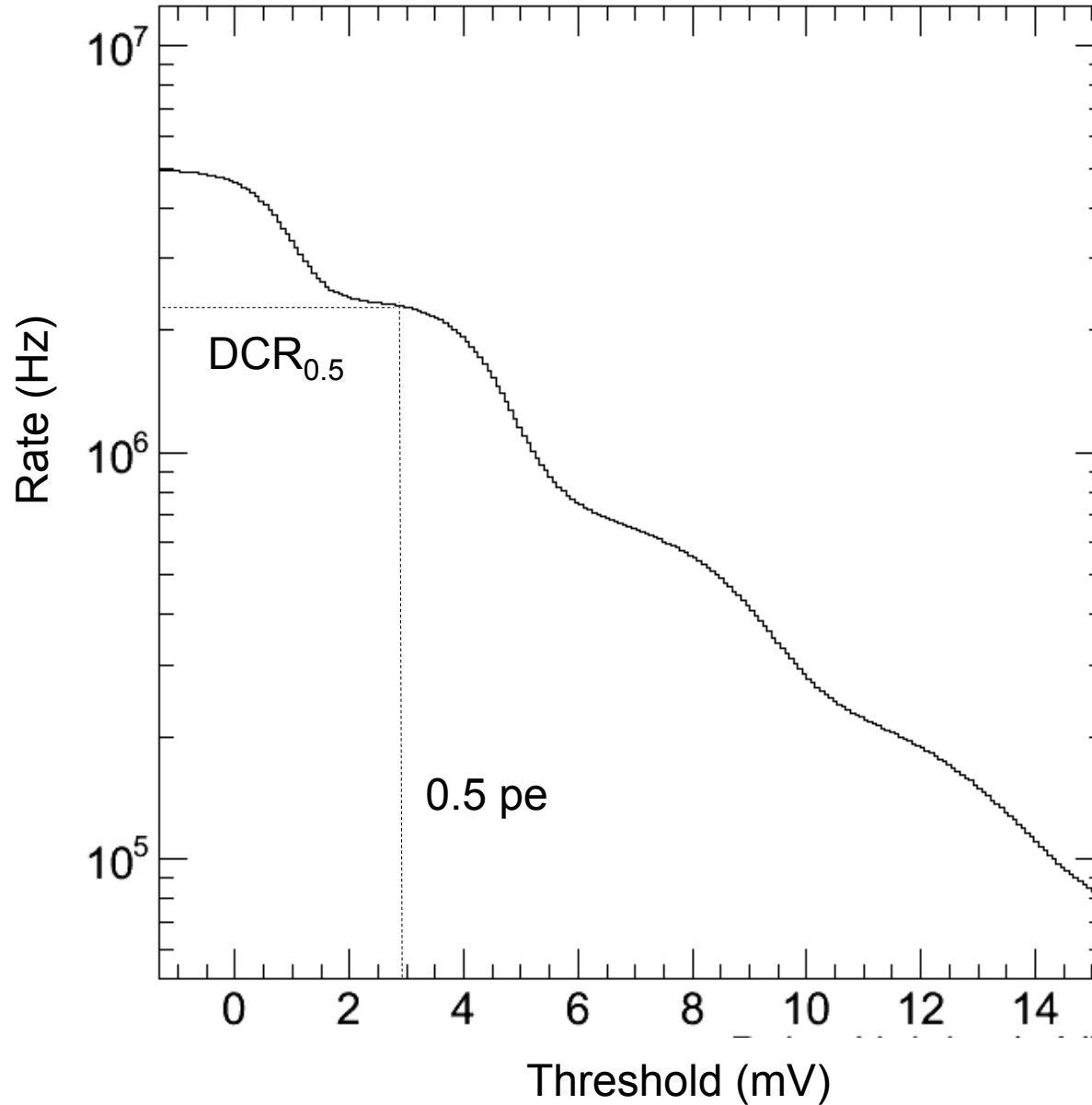
Gain vs. V_b



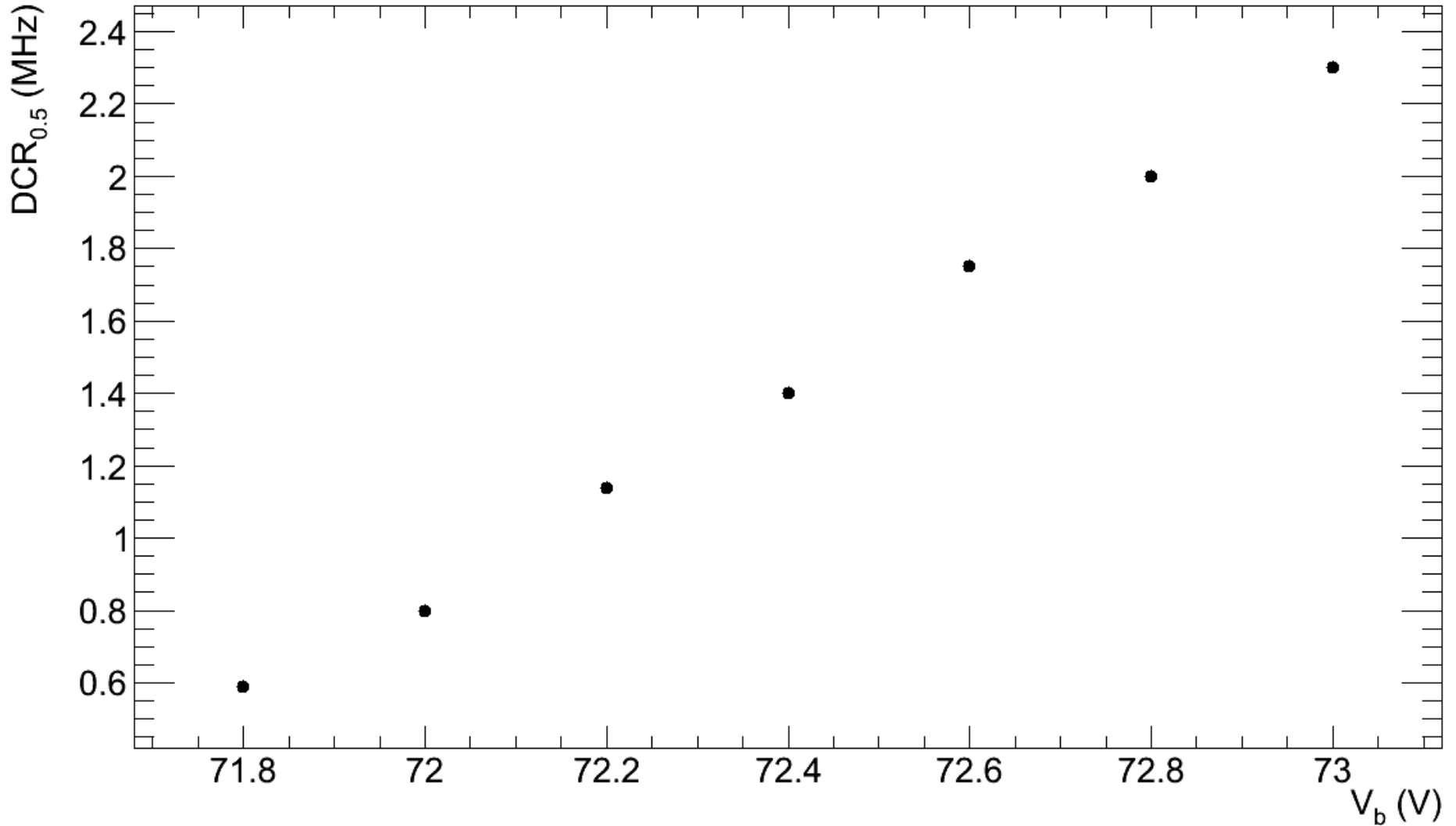
Dark Count Rate



Dark Count Rate



DCR vs. V_b

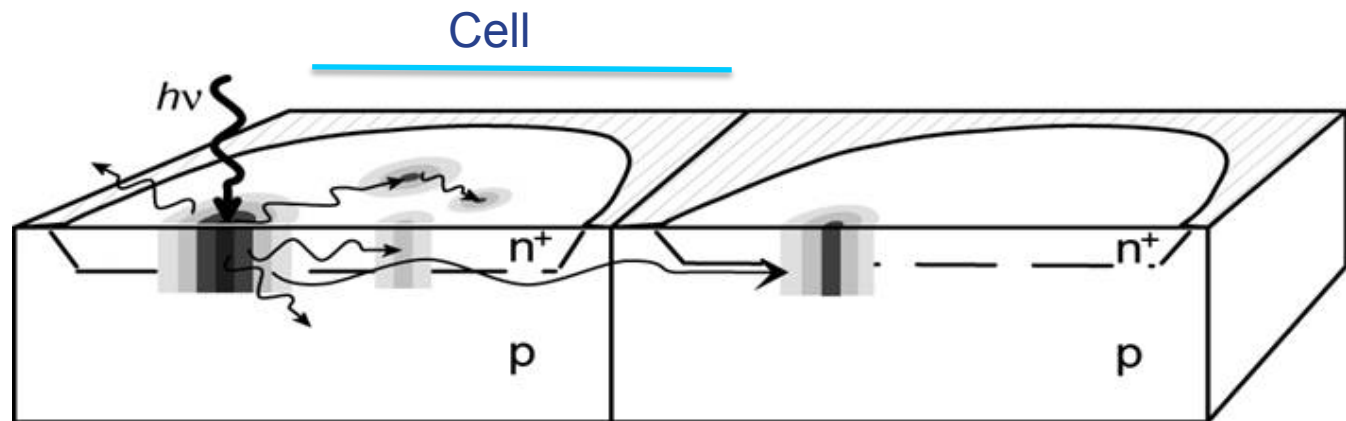


Optical Cross Talk

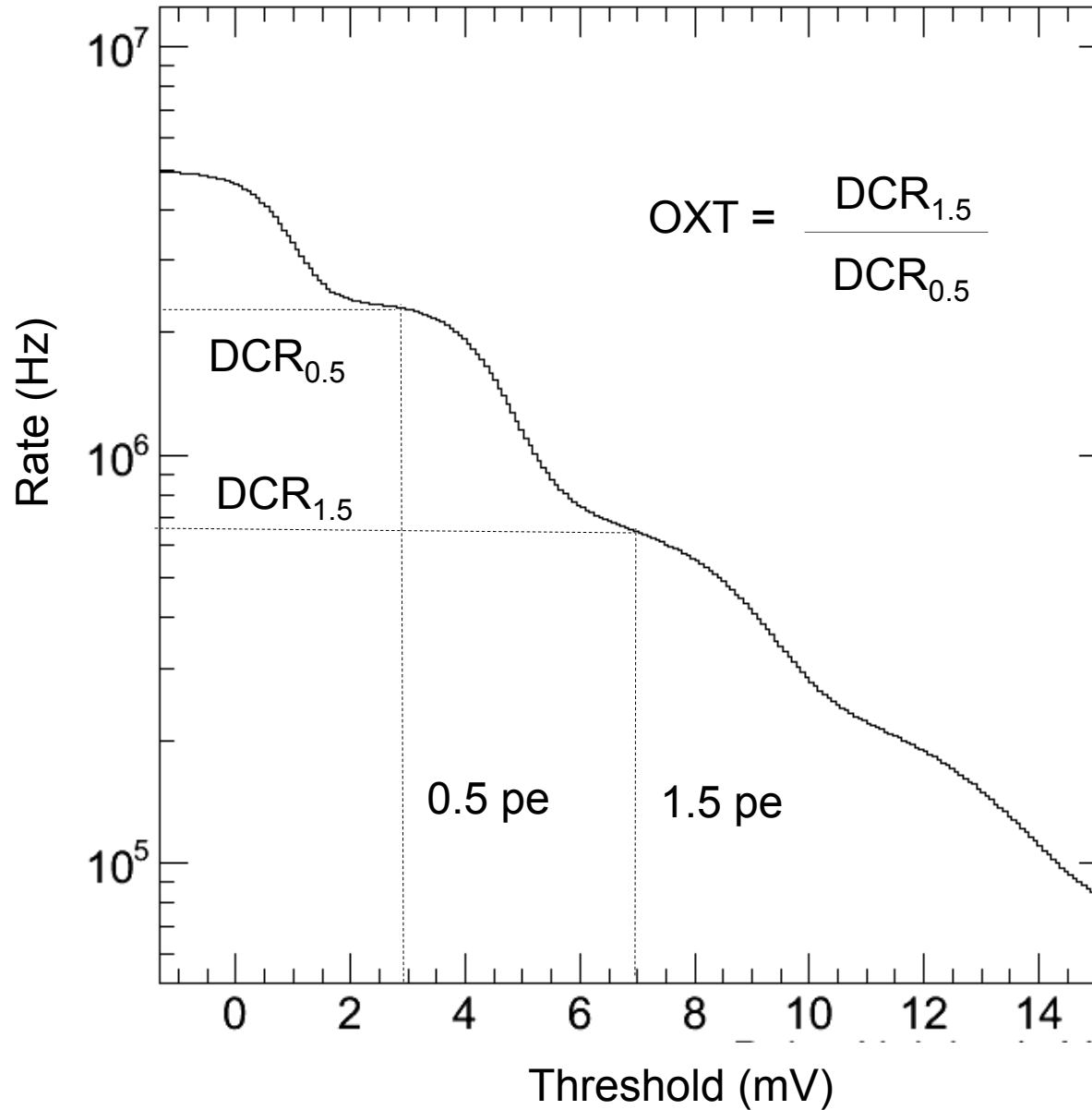
10^5 carriers in an avalanche breakdown emit on average 3 photons with an energy higher than 1.14 eV.

A. Lacaita et al, IEEE TED (1993)

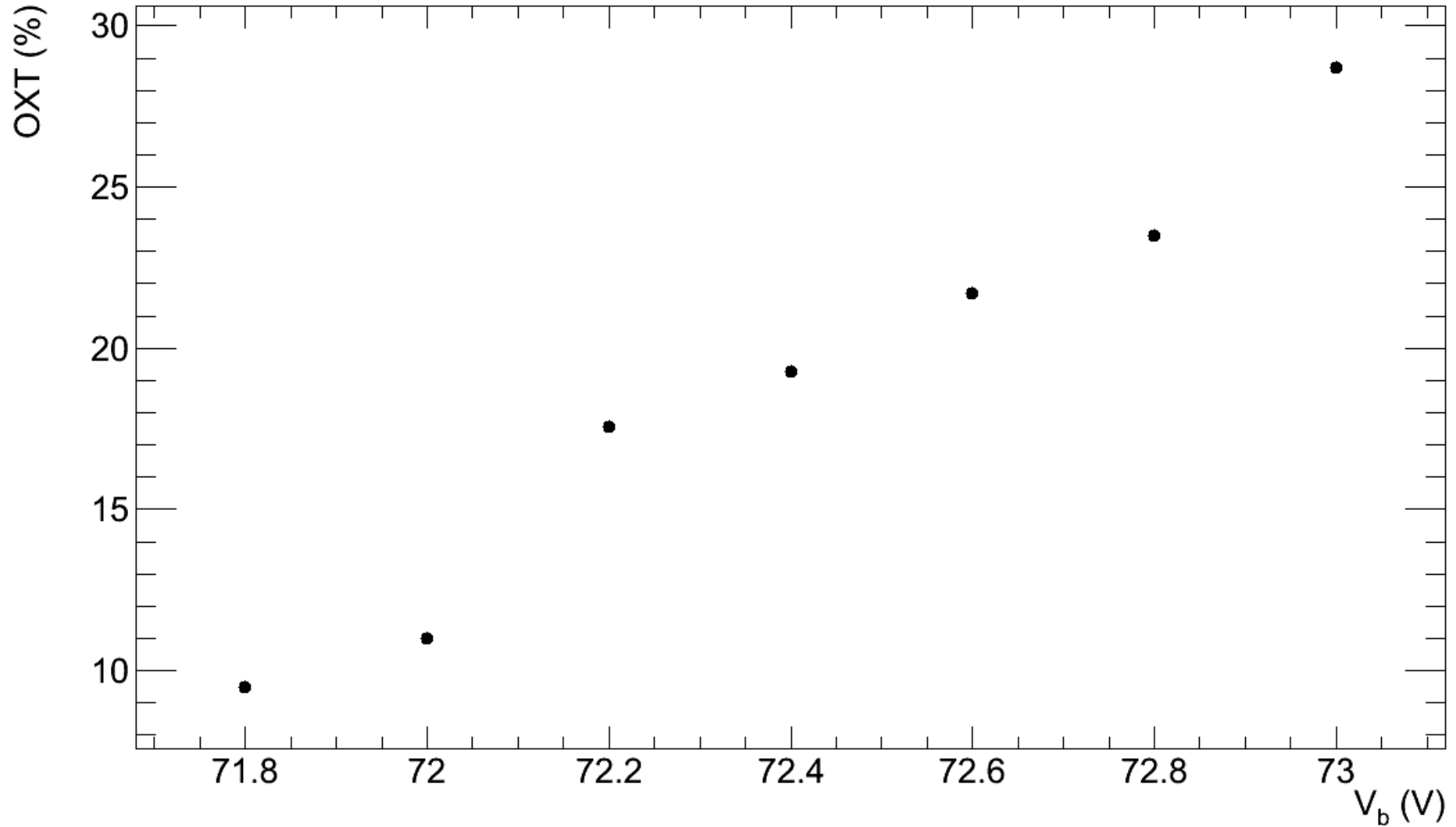
When these photons travel to a neighbouring cell they can trigger a breakdown there.



Optical Cross Talk



OXT vs. V_b



What's next?

- Automate V_b steps
- Temperature ramps
- New bias circuit
- Combine 4 pixels to form 6 x 6 mm pixel
- Shaping circuit