NESCOFI@BTF

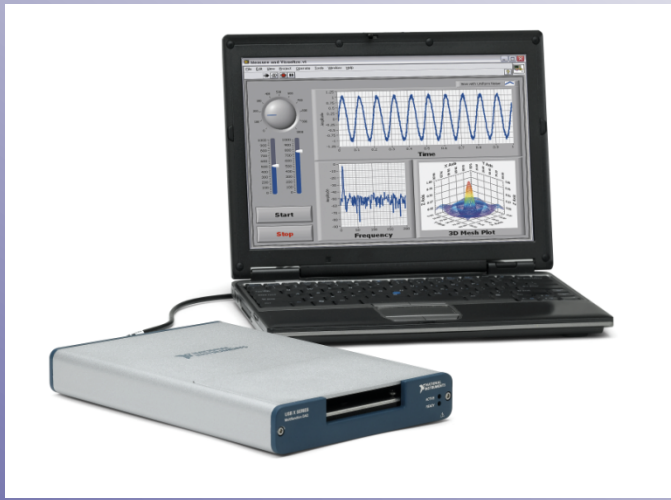
2011-2013

New detectors & DAQ systems

Davide Bortot

Politecnico di Milano

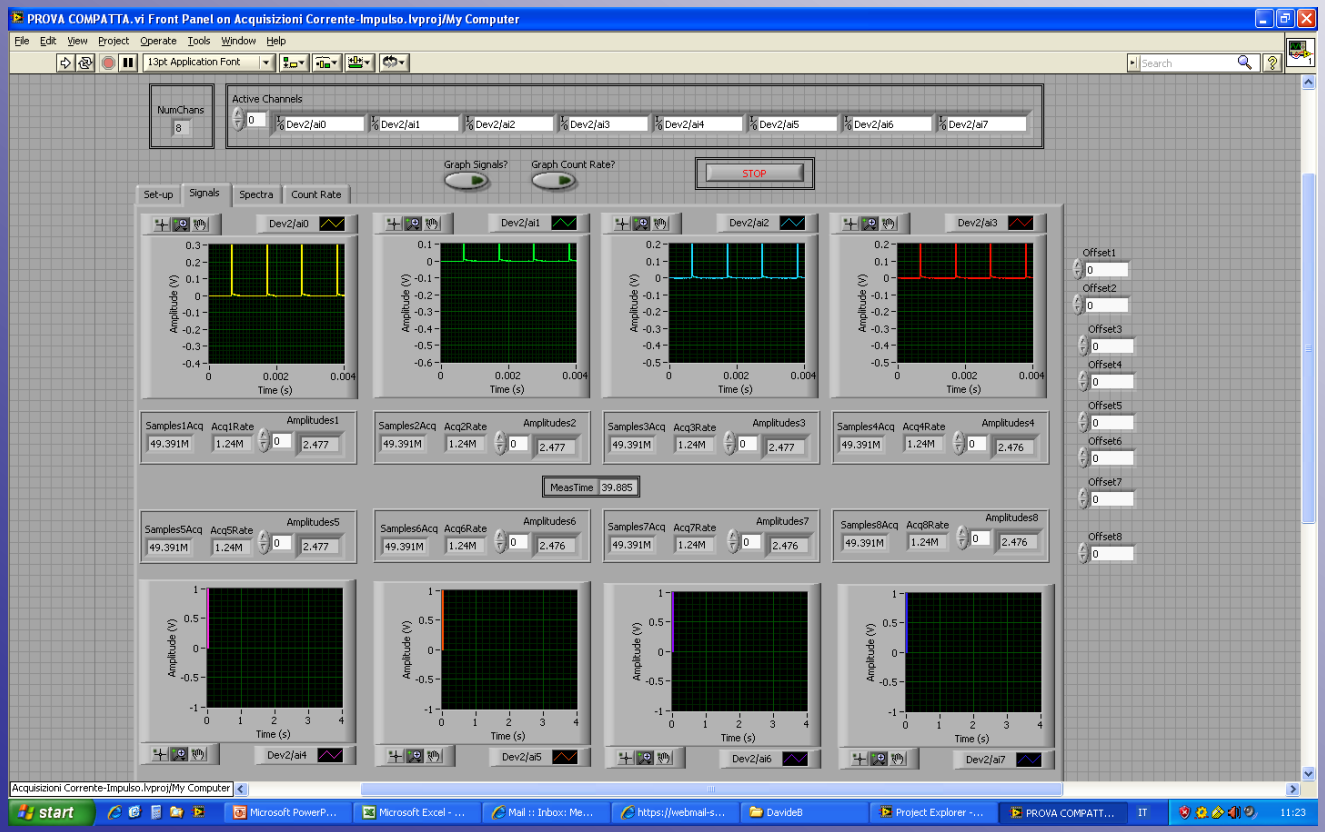
- Multidetector Acquisition

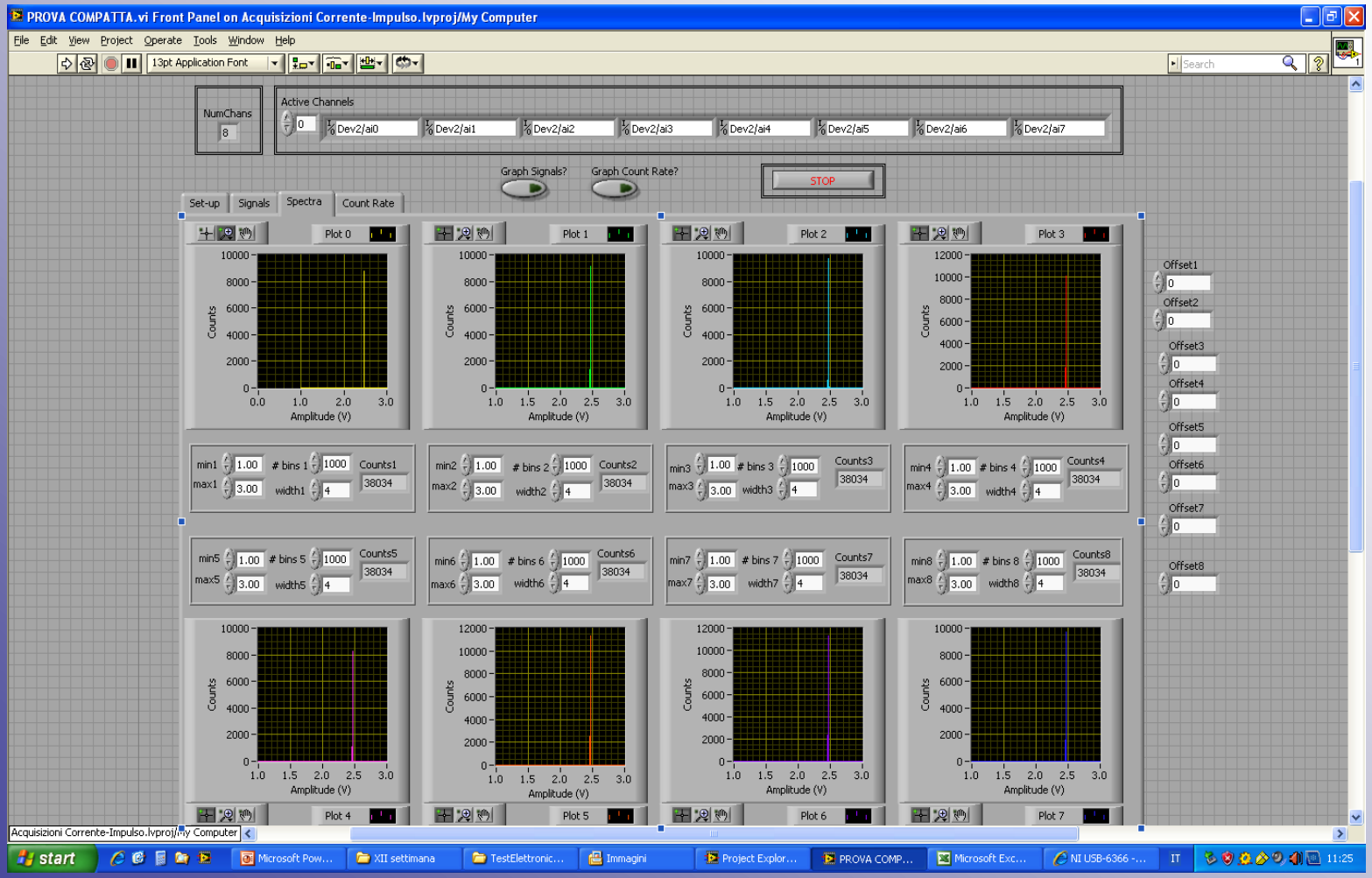


PULSE MODE

Multifunction Data Acquisition: NI USB 6366 X Series

8 simultaneous analog inputs at 2 MS/s/ch




PROVA COMPATTA.vi Front Panel on Acquisizioni Corrente-Impulso.lvproj/My Computer
File Edit View Project Operate Tools Window Help
13pt Application Font
Search
NumChans
8
Active Channels
Dev2/ai0
Dev2/ai1
Dev2/ai2
Dev2/ai3
Dev2/ai4
Dev2/ai5
Dev2/ai6
Dev2/ai7
Graph Signals?
Graph Count Rate?
STOP
Set-up
Signals
Spectra
Count Rate
Plot 0
Plot 1
Plot 2
Plot 3
Plot 4
Plot 5
Plot 6
Plot 7
Counts
Amplitude (V)
Offset1
Offset2
Offset3
Offset4
Offset5
Offset6
Offset7
Offset8
min1 max1 # bins 1 width1 Counts1
min2 max2 # bins 2 width2 Counts2
min3 max3 # bins 3 width3 Counts3
min4 max4 # bins 4 width4 Counts4
min5 max5 # bins 5 width5 Counts5
min6 max6 # bins 6 width6 Counts6
min7 max7 # bins 7 width7 Counts7
min8 max8 # bins 8 width8 Counts8
Acquisizioni Corrente-Impulso.lvproj/My Computer
start
Microsoft Pow...
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TestElettronic...
Immagini
Project Explor...
PROVA COMP...
Microsoft Exc...
NI USB-6366 -...
IT
11:25

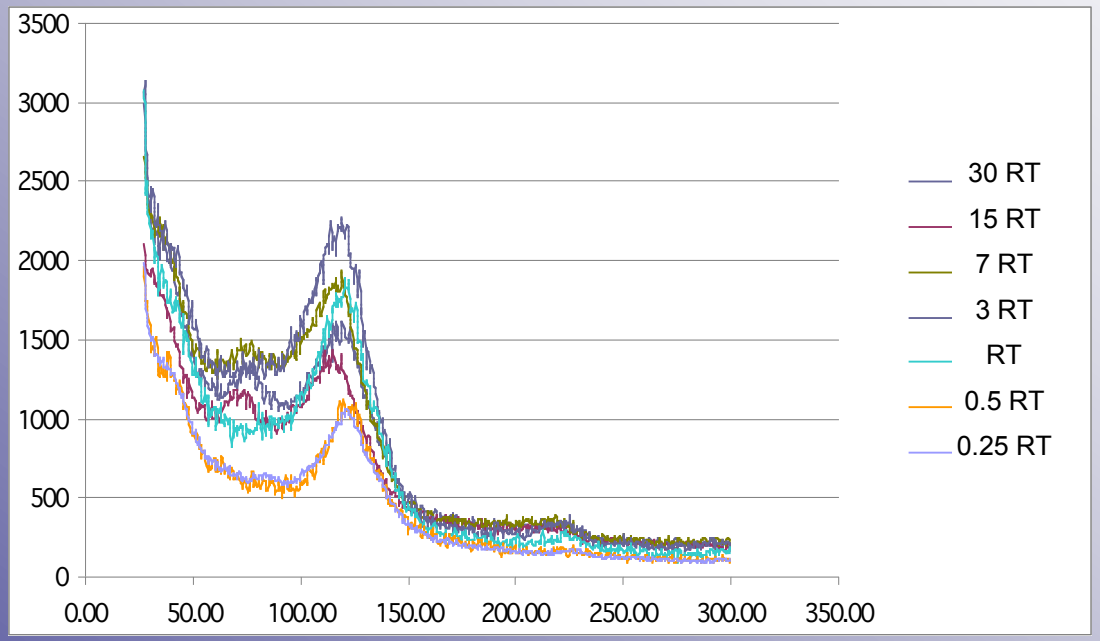
-ANTE - Experiment at NPL

(Probes preparation)

Disclaimer: constructive details on neutron detectors are reserved.

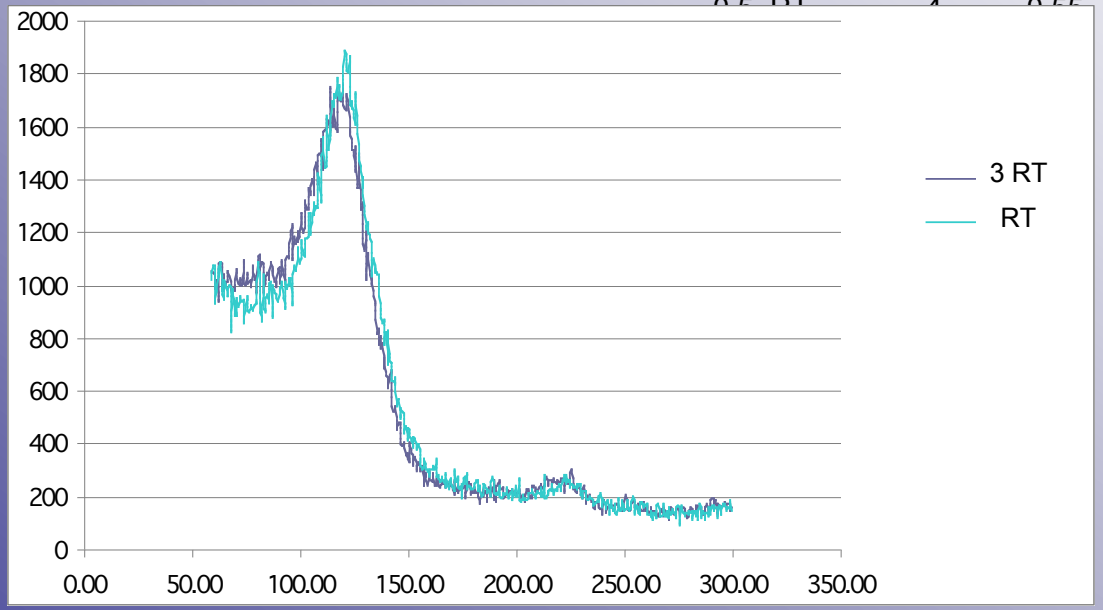
International patents under preparation

Converter thickness



ROI: 85-170mV

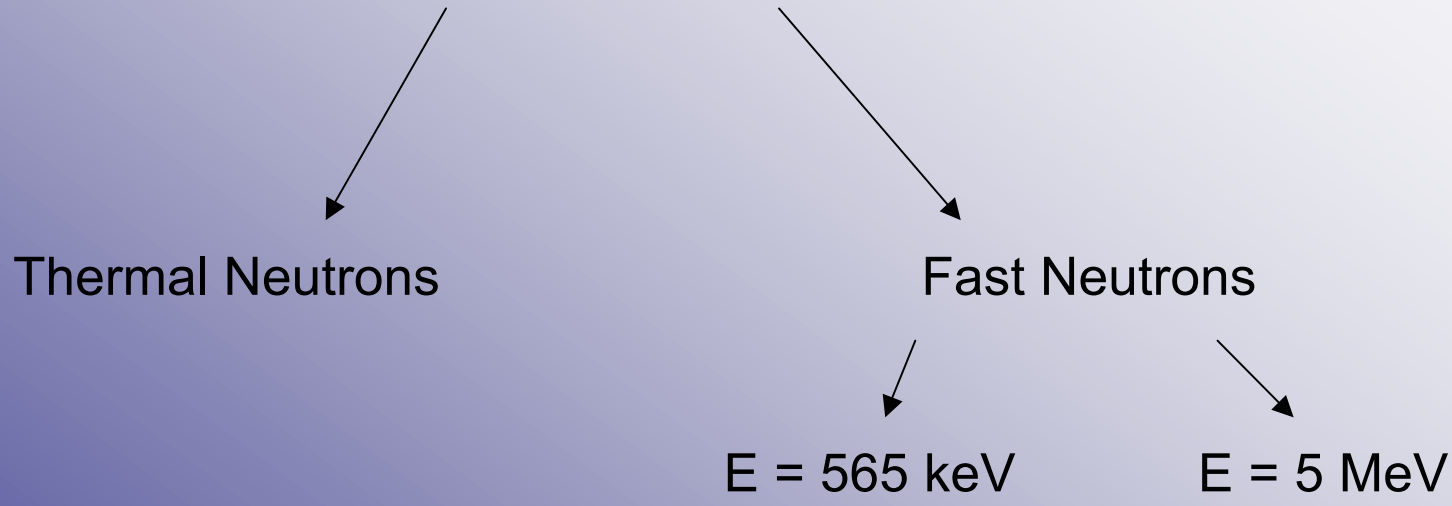
		peak	peak/RT
30	RT	35099	0.58
15	RT	26330	0.43
7	RT	41444	0.68
3	RT	67586	1.11
RT		60778	1.00
		3317	



Comparison 3 RT : RT

SAME INTEGRAL

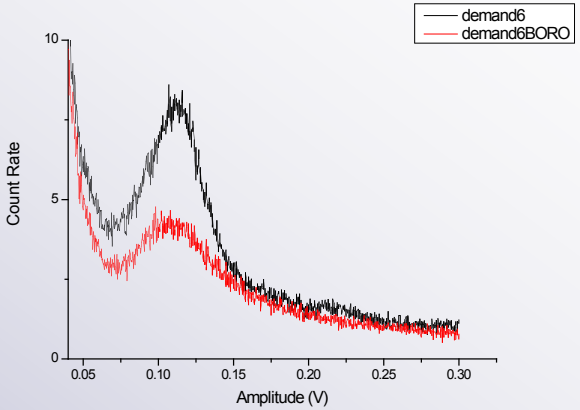
- Experiment at NPL (March 2012)



Thermal Neutrons

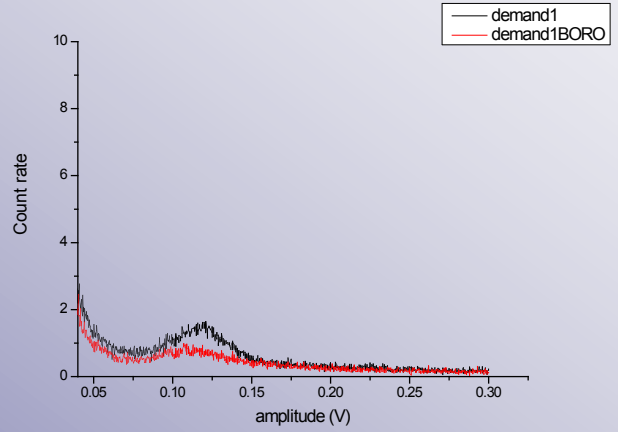
PULSE MODE

Demand 6



Demand 1

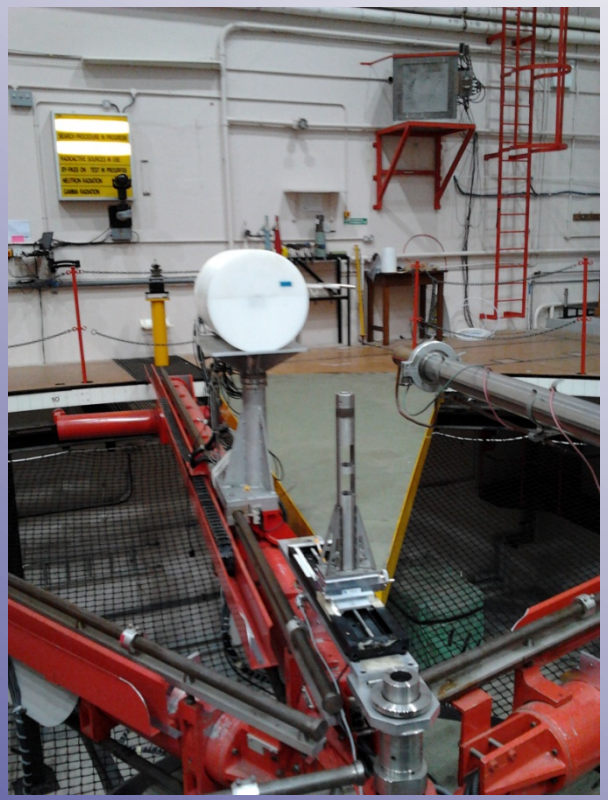
(1.5E+6 cm^{-2} s^{-1})



-Threshold: 28mV

-Vmax: 300mV

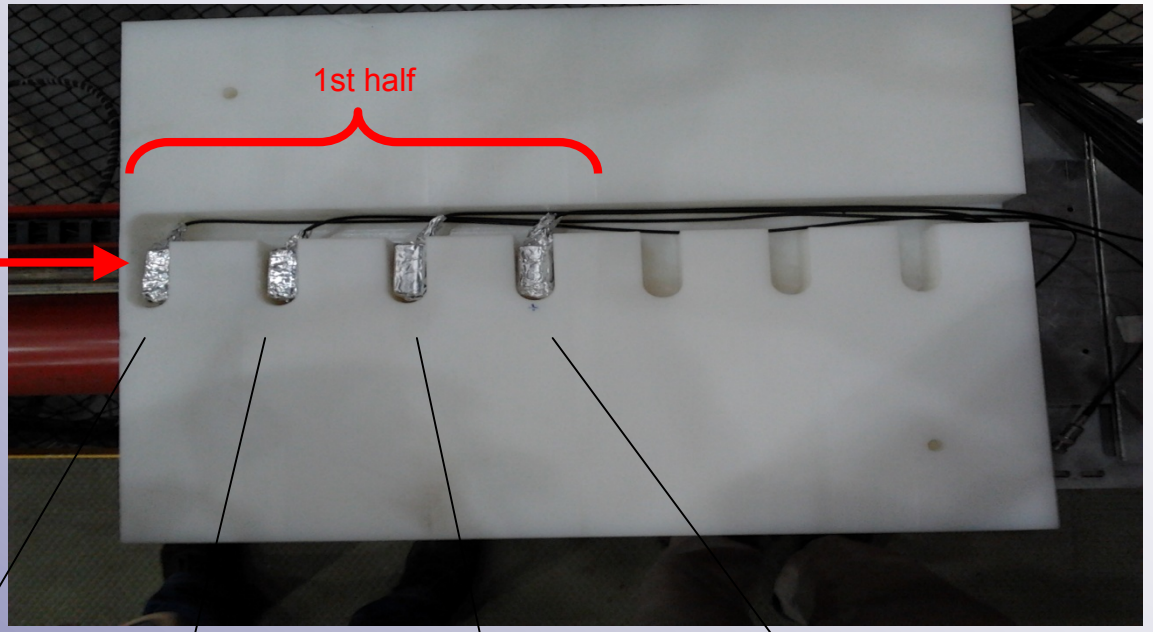
-Shaping Time: 2μs



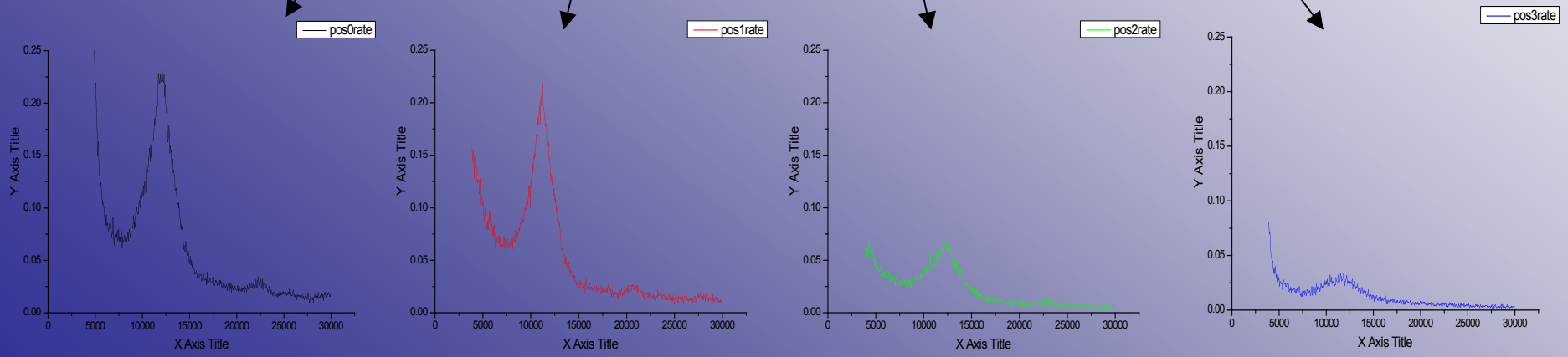
E_n = 565 keV and 5 MeV

n BEAM 565 keV

150.5 cm

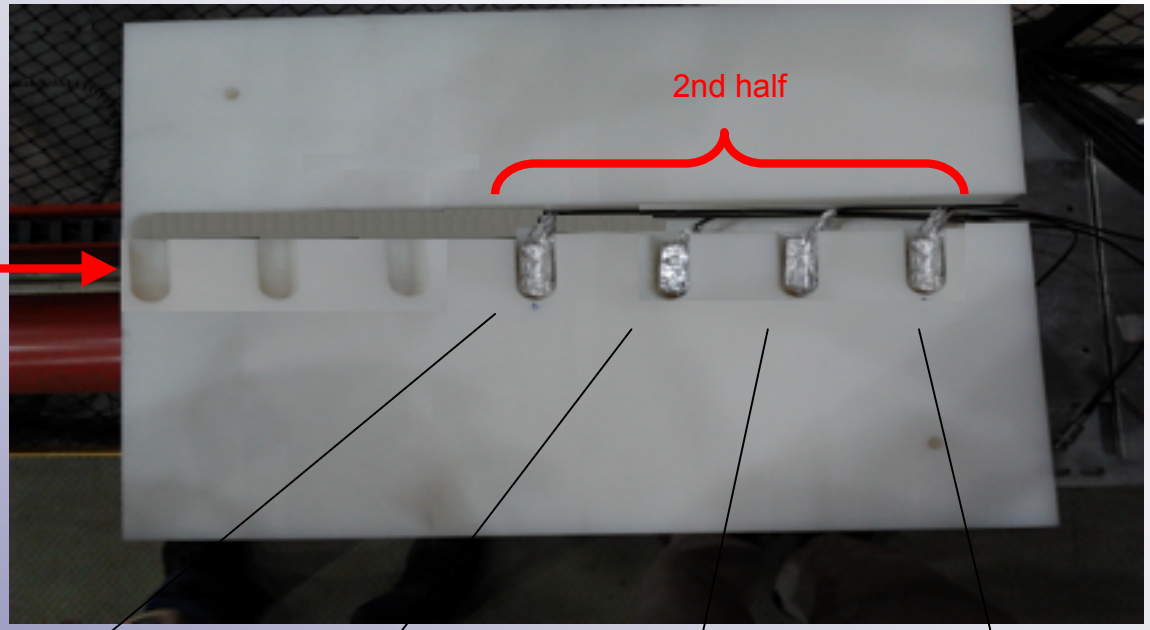


PULSE MODE

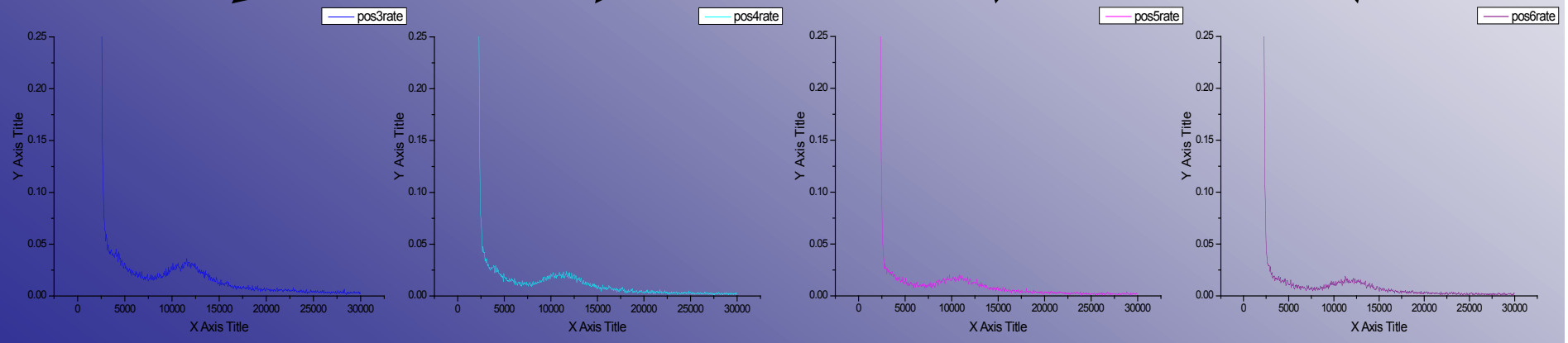


n BEAM 565 keV

150.5 cm

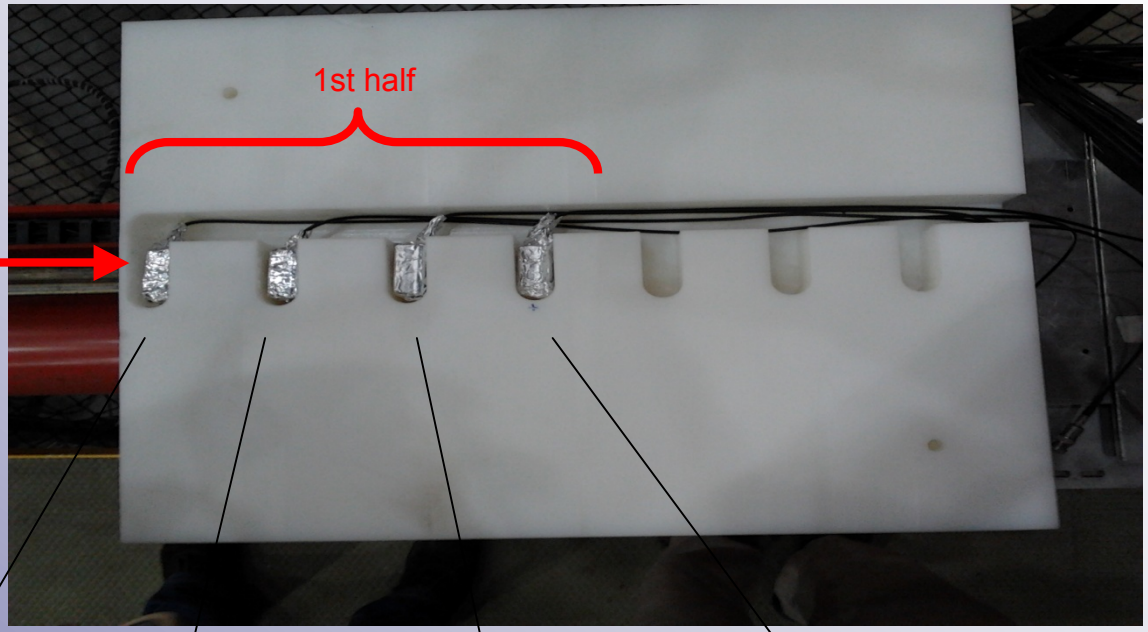


PULSE MODE

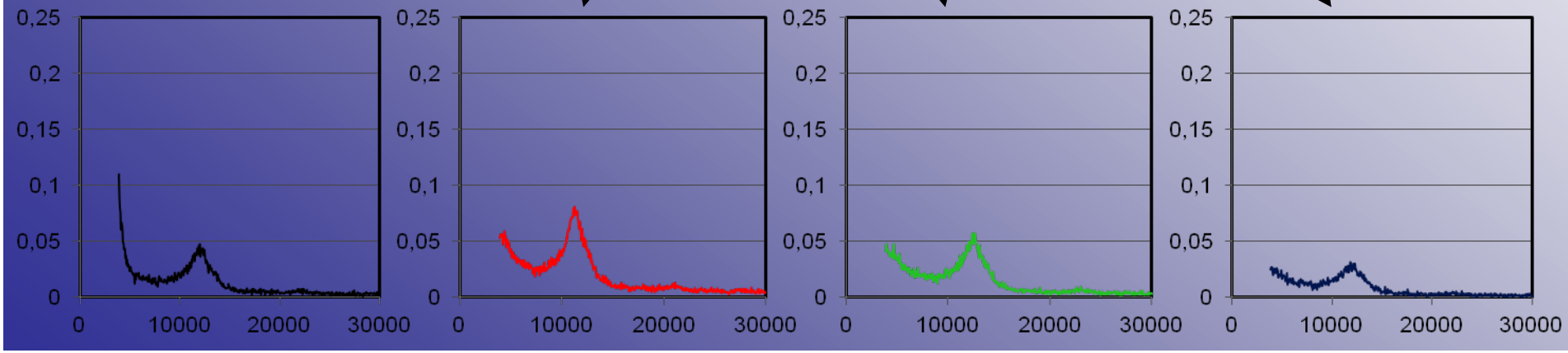


n BEAM 5 MeV

150.5 cm

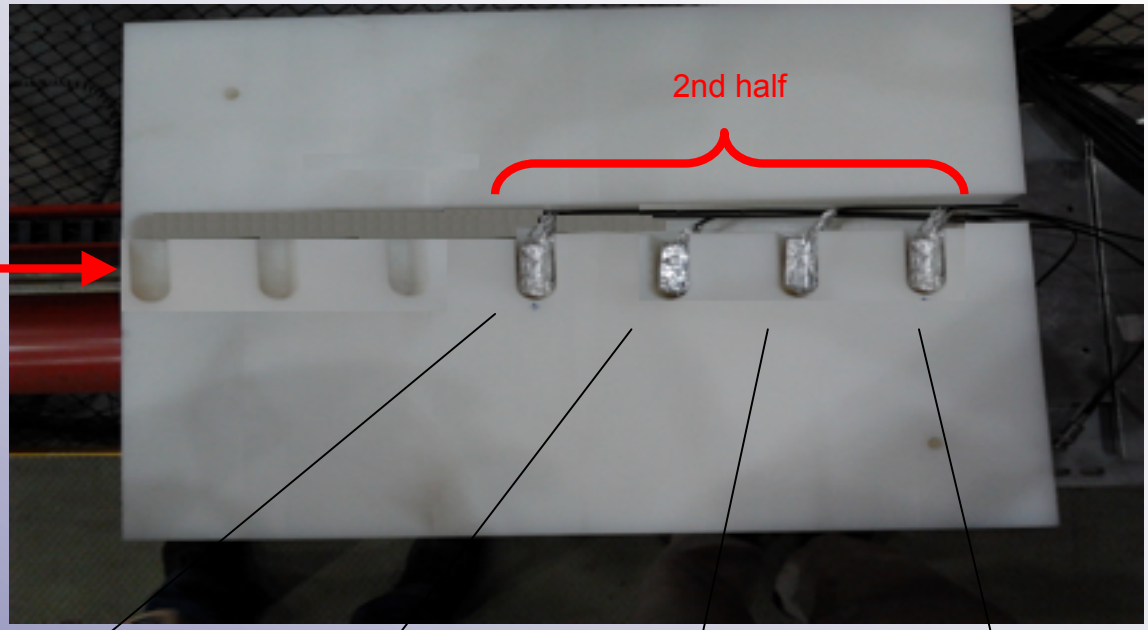


PULSE MODE

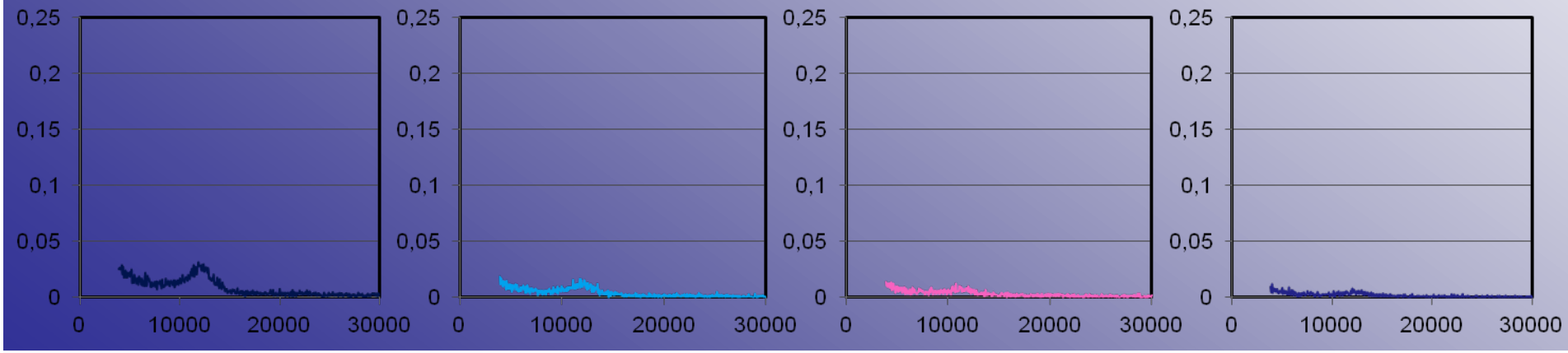


n BEAM 5 MeV

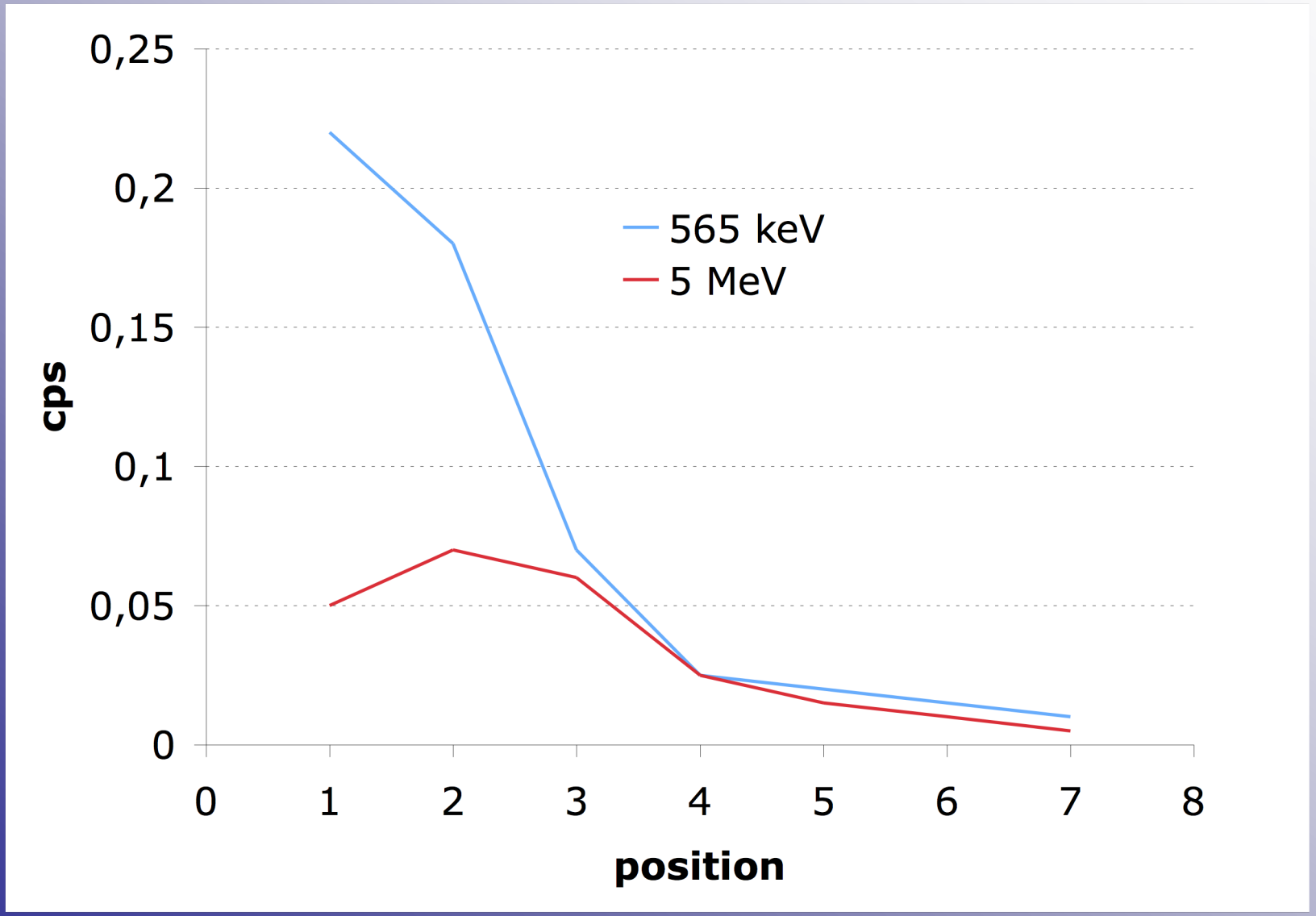
150.5 cm



PULSE MODE

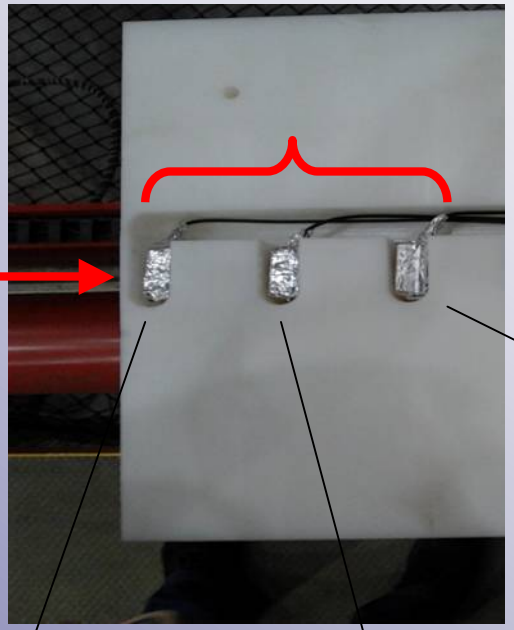


MODULATION PROFILE
within Mini-CYSP

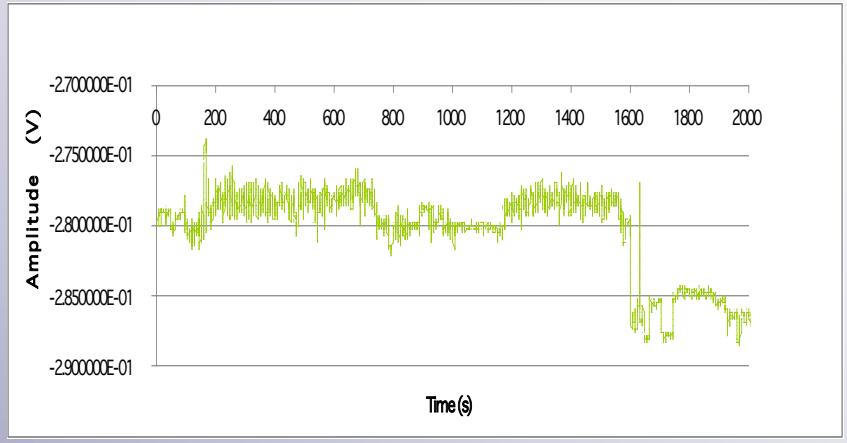


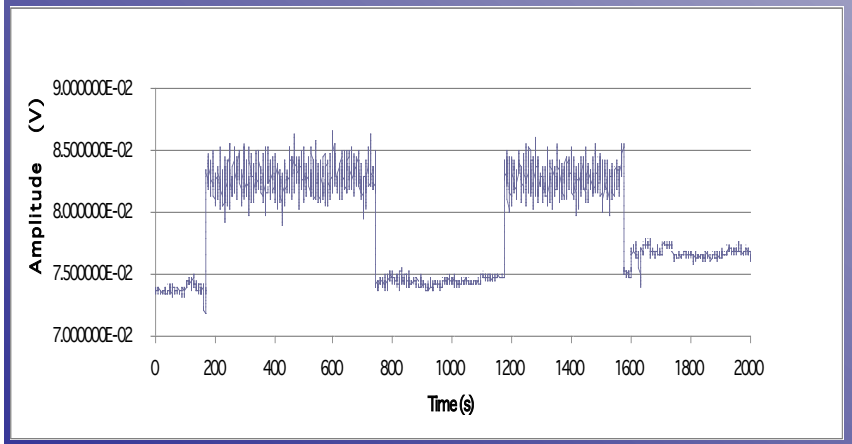
n BEAM 565 keV

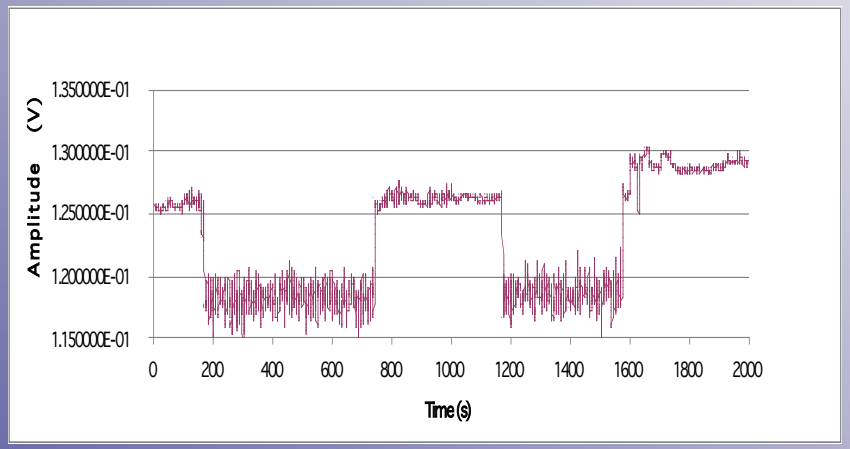
60.6cm



CURRENT MODE

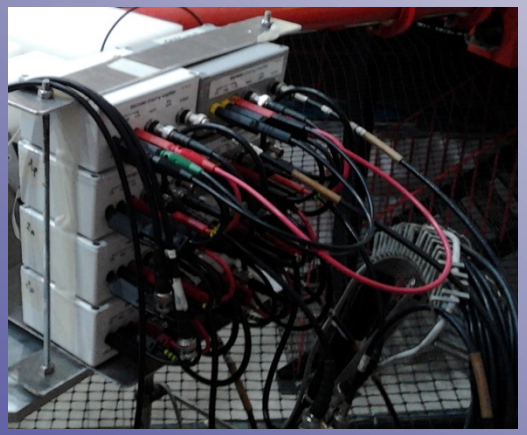


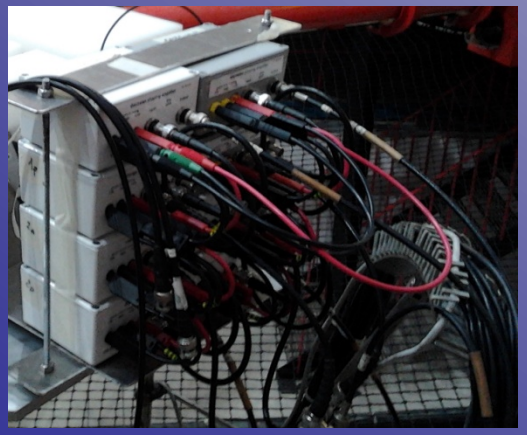


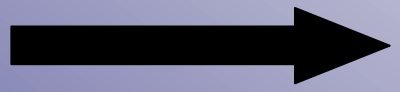


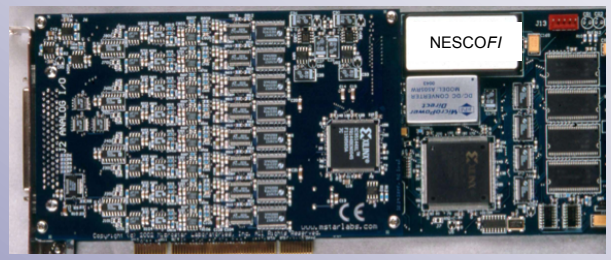
-DEVELOPED MULTICHANNEL BOARDS

From discrete components to integrated board









Noise FWHM (keV) - Shaping Time (μs)

-PreAMP: CREMAT CR-110

-AMP: SILENA – ORTEC – CREMAT CR-200

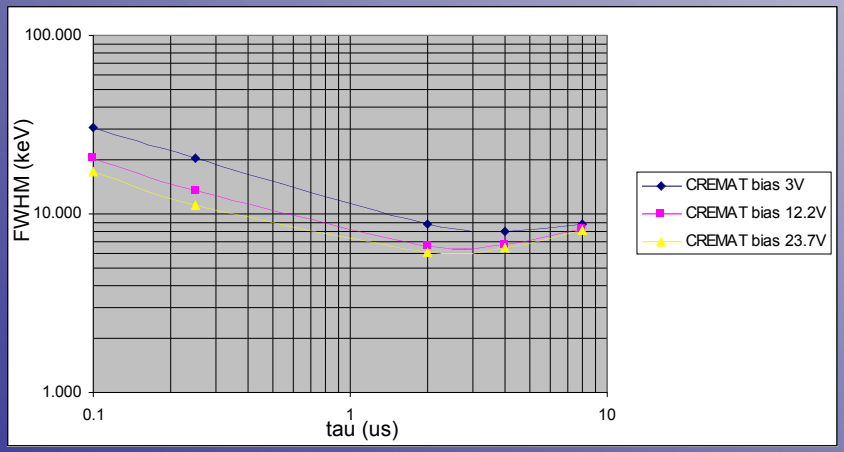
-V_{test}: 2.5 mV

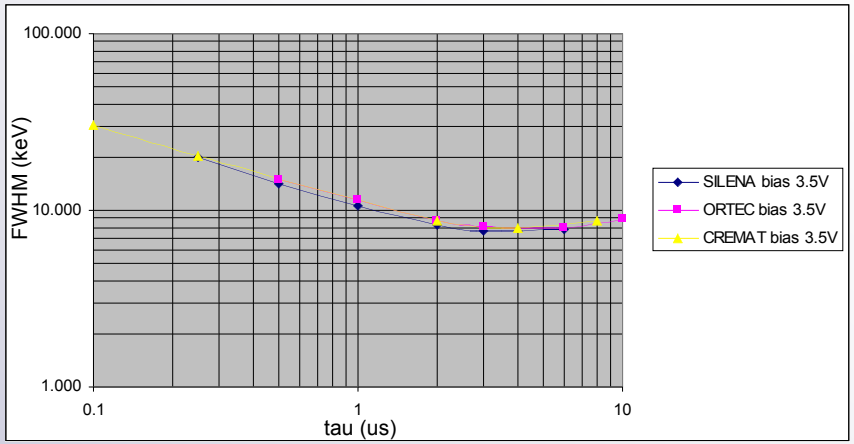
-C_{inj} (ch.1): 4.91 pF

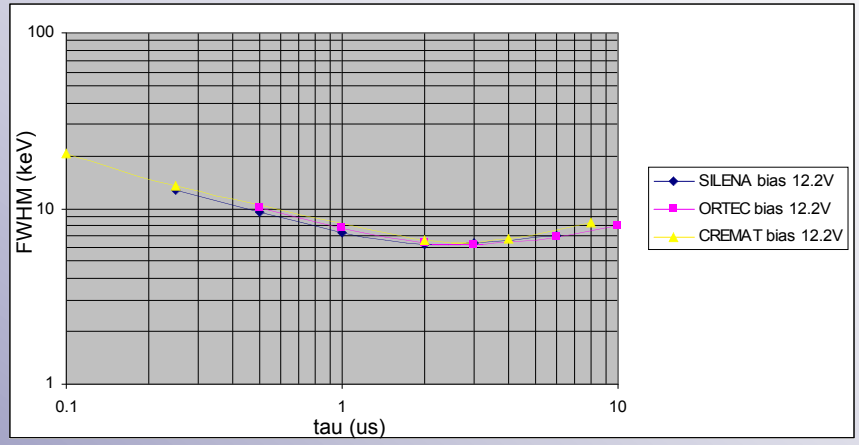
-V_{bias}: 3.5V – 12.2V – 23.7V

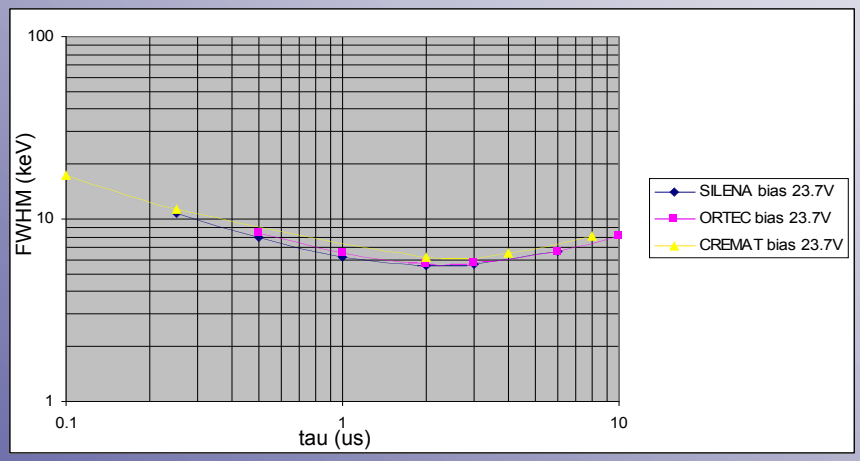
$$E_{inj} = C_{inj} * V_{test} * \varepsilon_{Si} * 1/q$$

$$\text{Noise FWHM} = 2.35 * E_{inj} * V_{rms}/V_{sign}$$





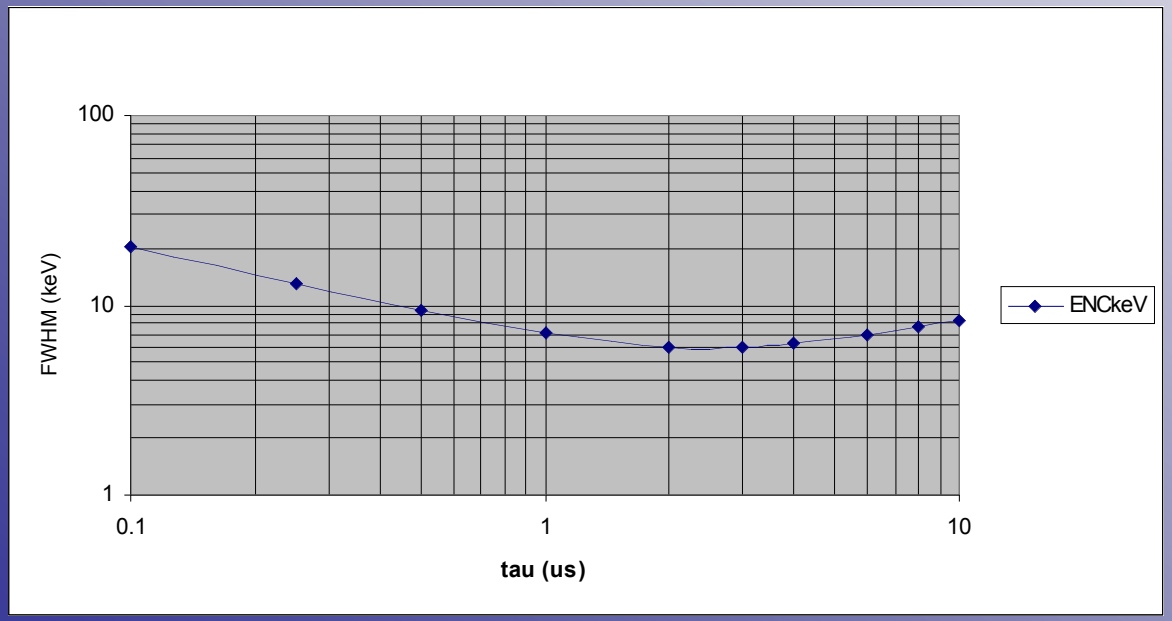




THEORETICAL MODEL

$$ENCel(\tau, Cin, Id) := \sqrt{\frac{43\cdot(Cin + 15)^2}{\tau} + 8\cdot\tau\cdot(Id + 800) + 50000}$$

$$ENCkeV(\tau, Cin, Id) := ENCel(\tau, Cin, Id)\cdot 3.62\cdot 2.355\cdot 10^{-3}$$



-Cin: **100 pF**

-Id: **10nA**

-Shaping Time: **0.1us – 10 us**

Tau (us)	FWHM (keV) TEORICO	FWHM (keV) CREMAT CR-200
0.1	20.43	20.52
0.25	13.06	13.49
2	6.07	6.64
4	6.02	6.69
8	7.68	8.25