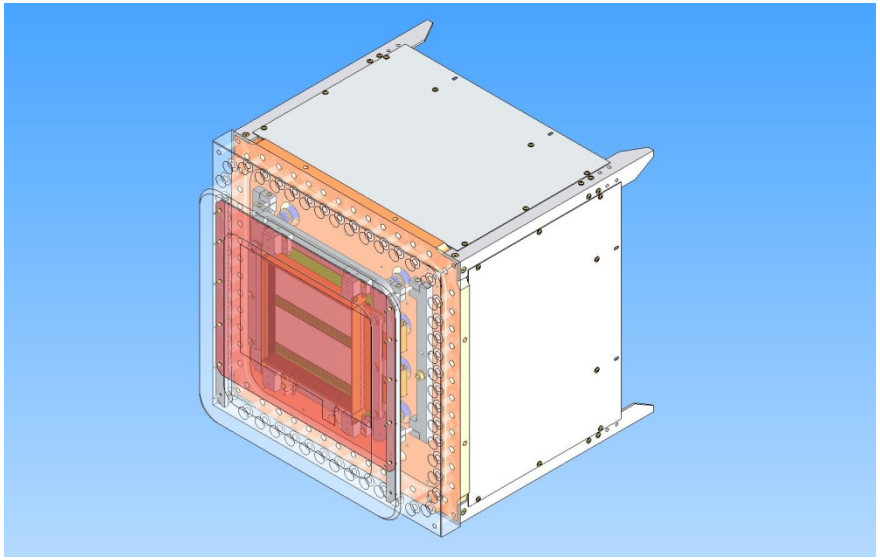
NEUTRONS FOR SCIENCE

First result of a new MSGC design based on Cr/Al electrodes readout by charge division



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Content

- Objective
- Plate information – what is “new” MSGC design
- Experiments – Count rate/Spatial resolution/Aging
- Future works

Objective of Bidim200

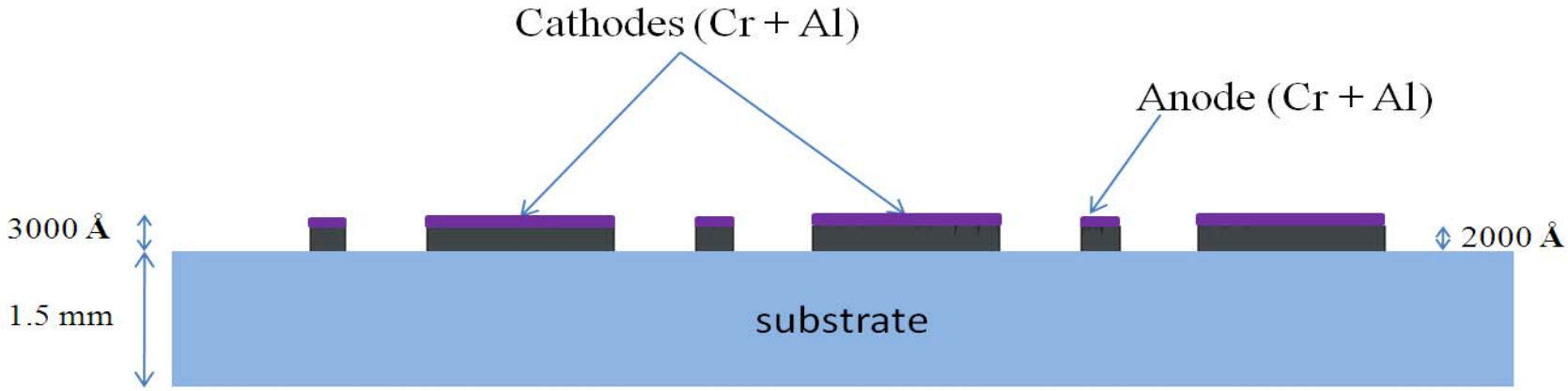
- 2-dimensional neutron detector dedicated to reflectometers

- Designed for high count rate and high spatial resolution

Plate design

Design:
64 individual anode strips,
2500µm pitch,
Anode width = 15µm,
Anode-Cathode gap = 300µm,
Anode length = 173.7mm

Material:
S8900 plate, Electrodes= 1000Å
Al on 2000Å Cr



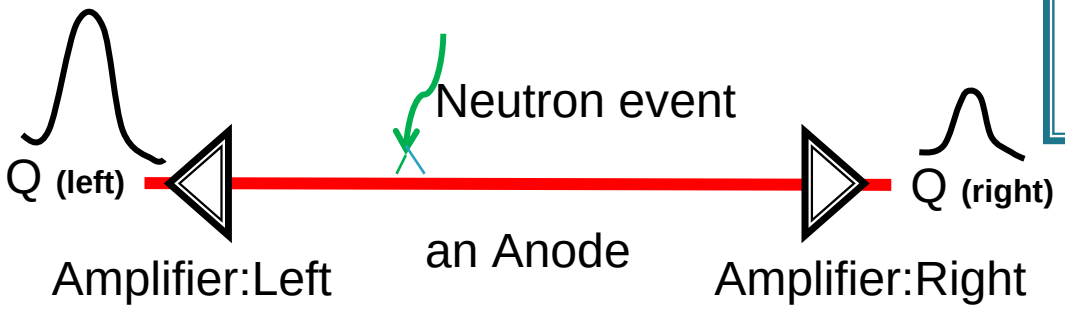
Side view

Principle of Bidim200

- Signals are read via 64 individual Anodes (0V)
- Negative voltage applied on Cathode

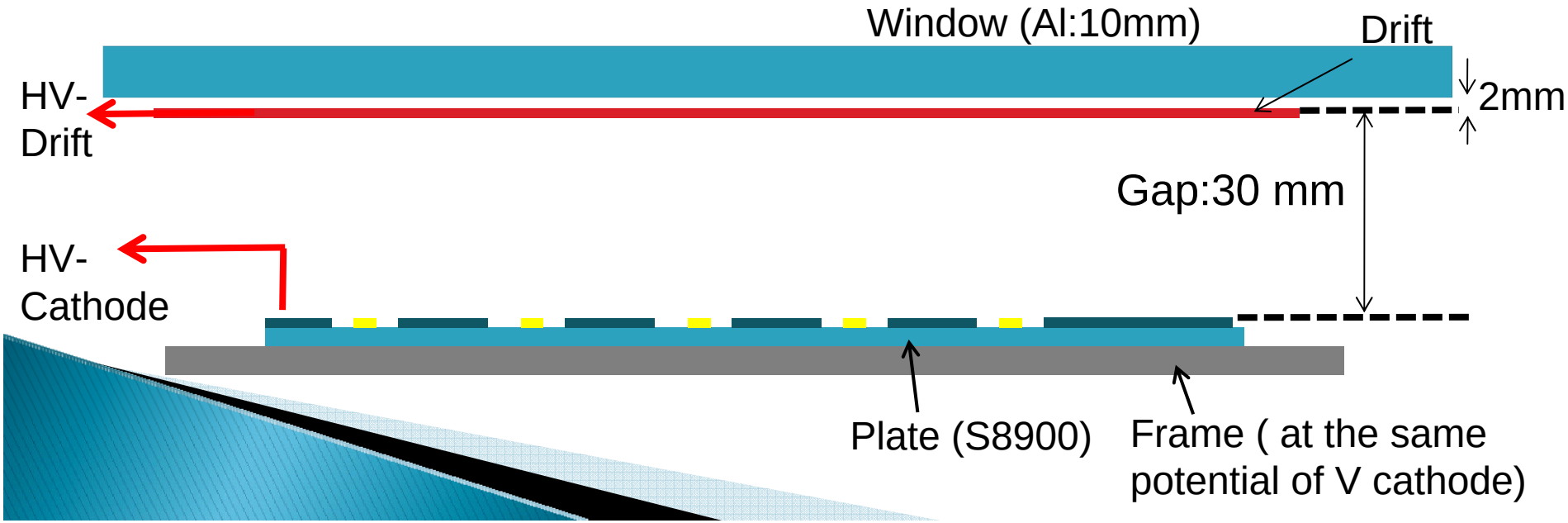
(-1.5kV to -1.8kV)

- Charge Division Method -> **Position** $= \dfrac{Q\ \textbf{(left)}}{(\ Q\ \textbf{(left)} + Q\ \textbf{(right)}\ )}$



Chamber inside set up

- Drift :-2.5kV
- Guard ring (to avoid edge electrical field distortion)
- Conversion Gap : 30mm
- Gas ^3He(2 bar) + CF_4 (3 bar)
  ~ 67.05% of efficiency (λ=2.5Å,10mm Al window +30cm Gap of ^3He)



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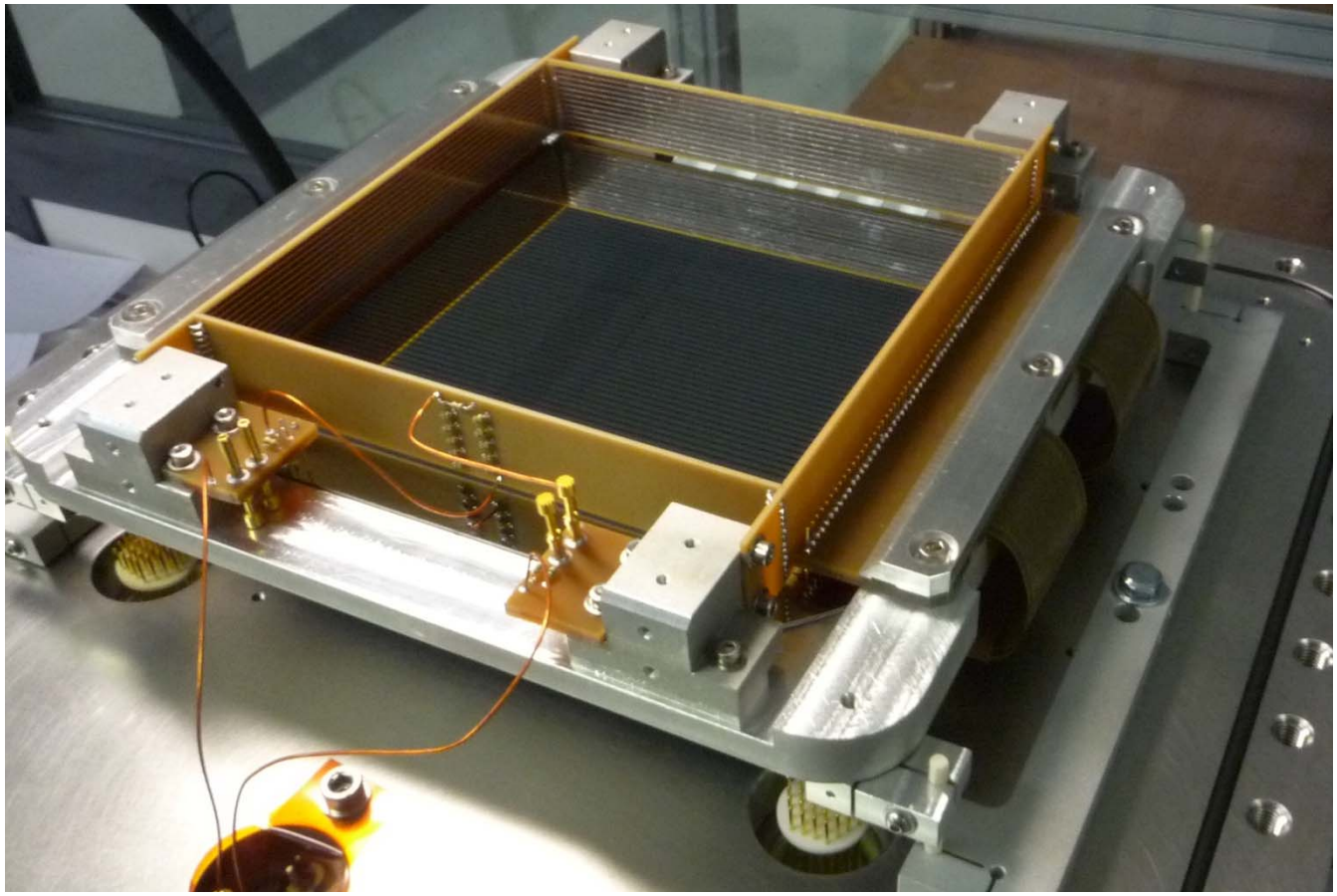
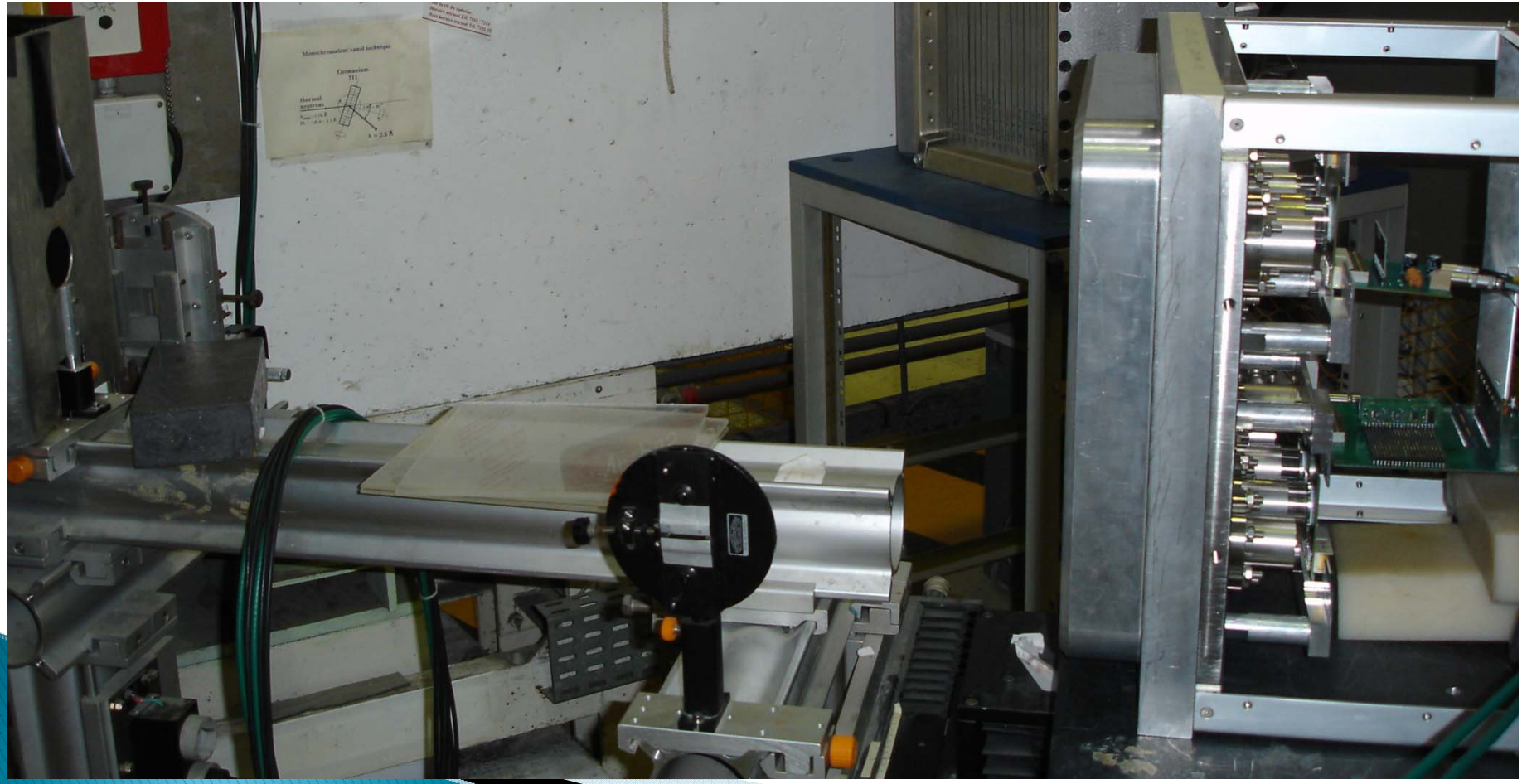
Chamber inside set up



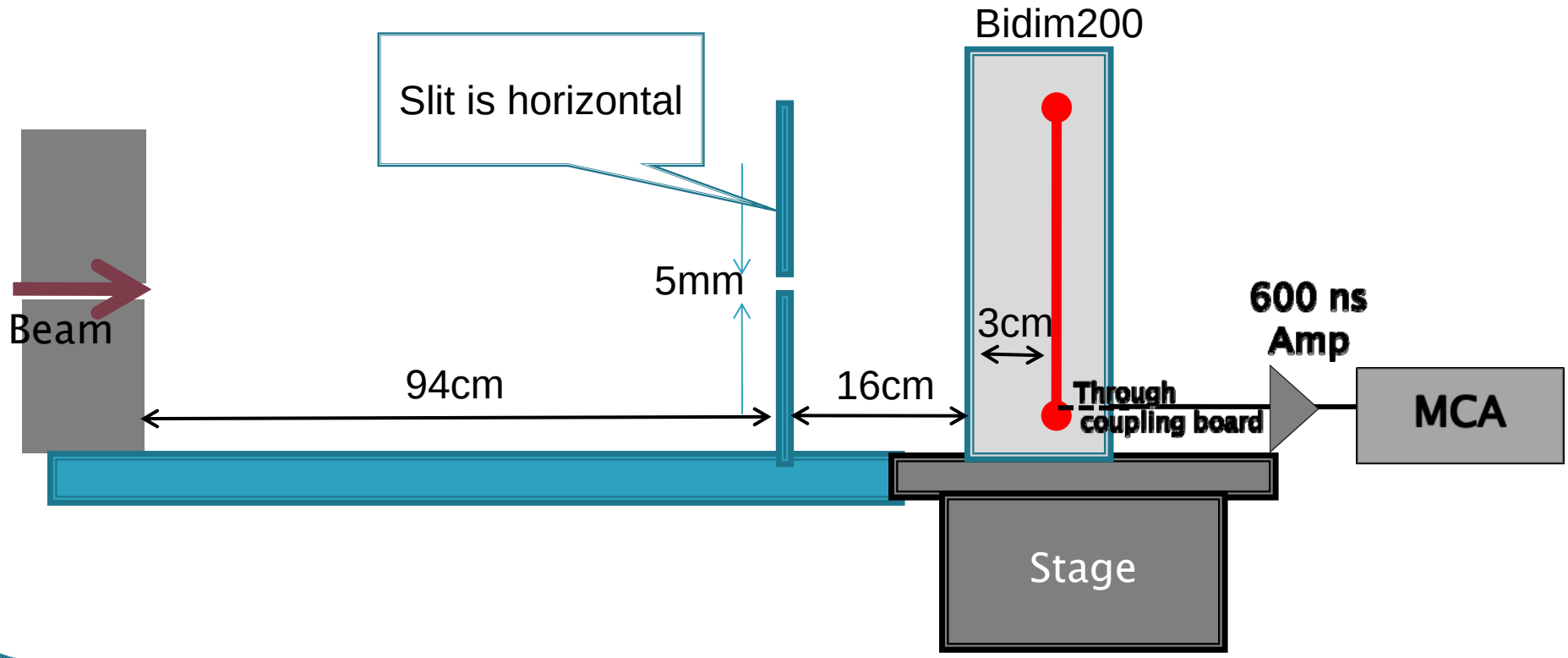
Experimental Set up

- CT1 at ILL wave length =2.5 Å



Experiments-1

- Basic operation: An Anode Strip is measured



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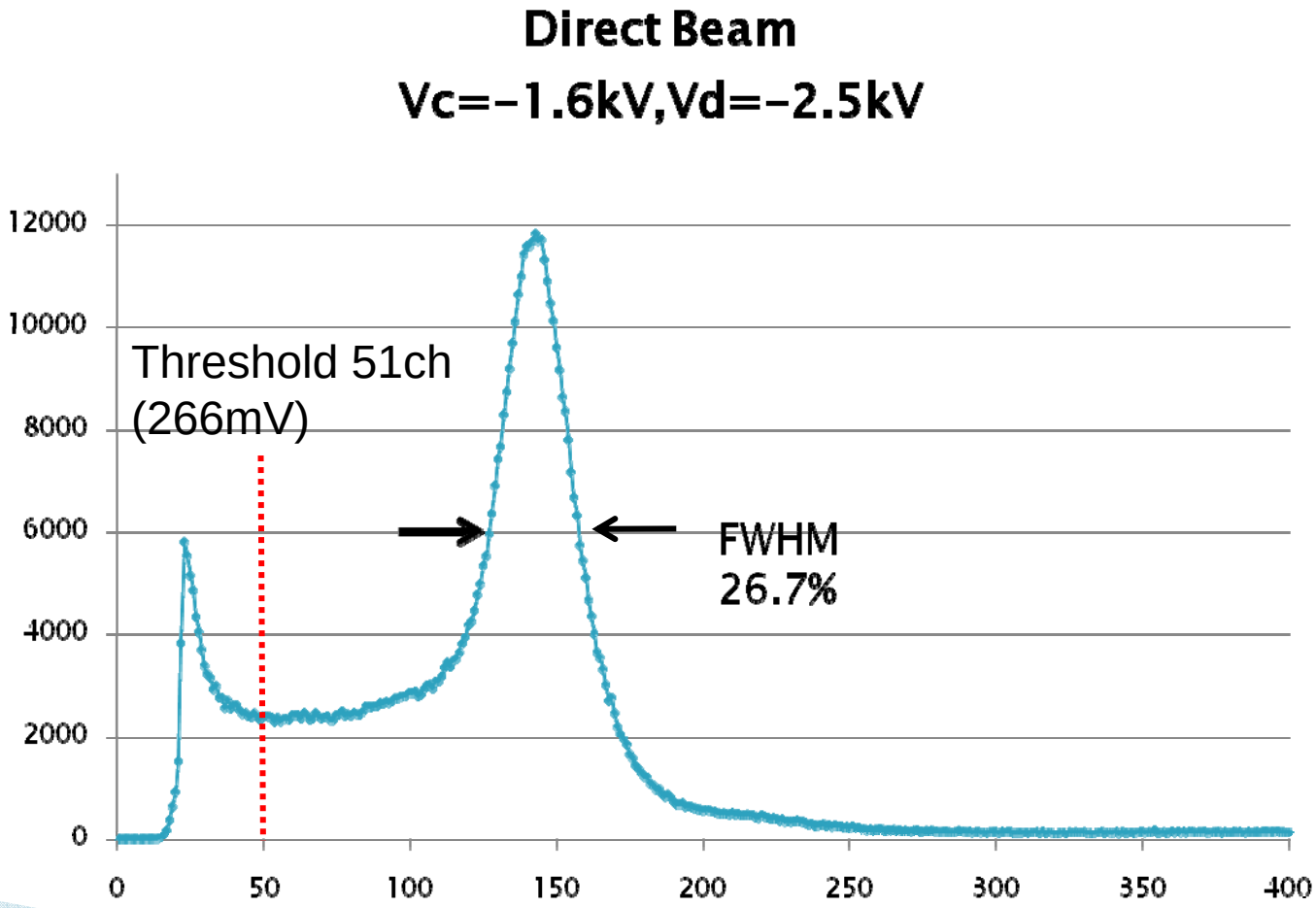
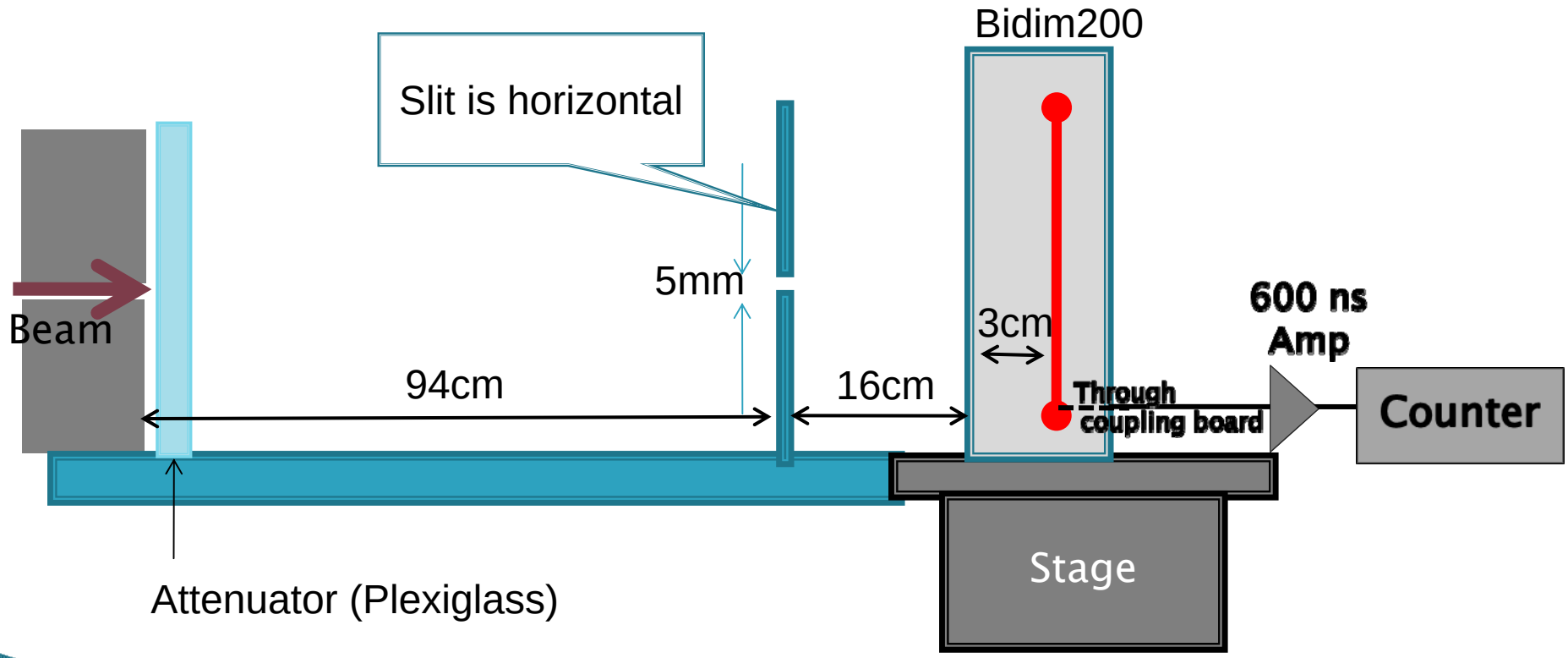
First Operation



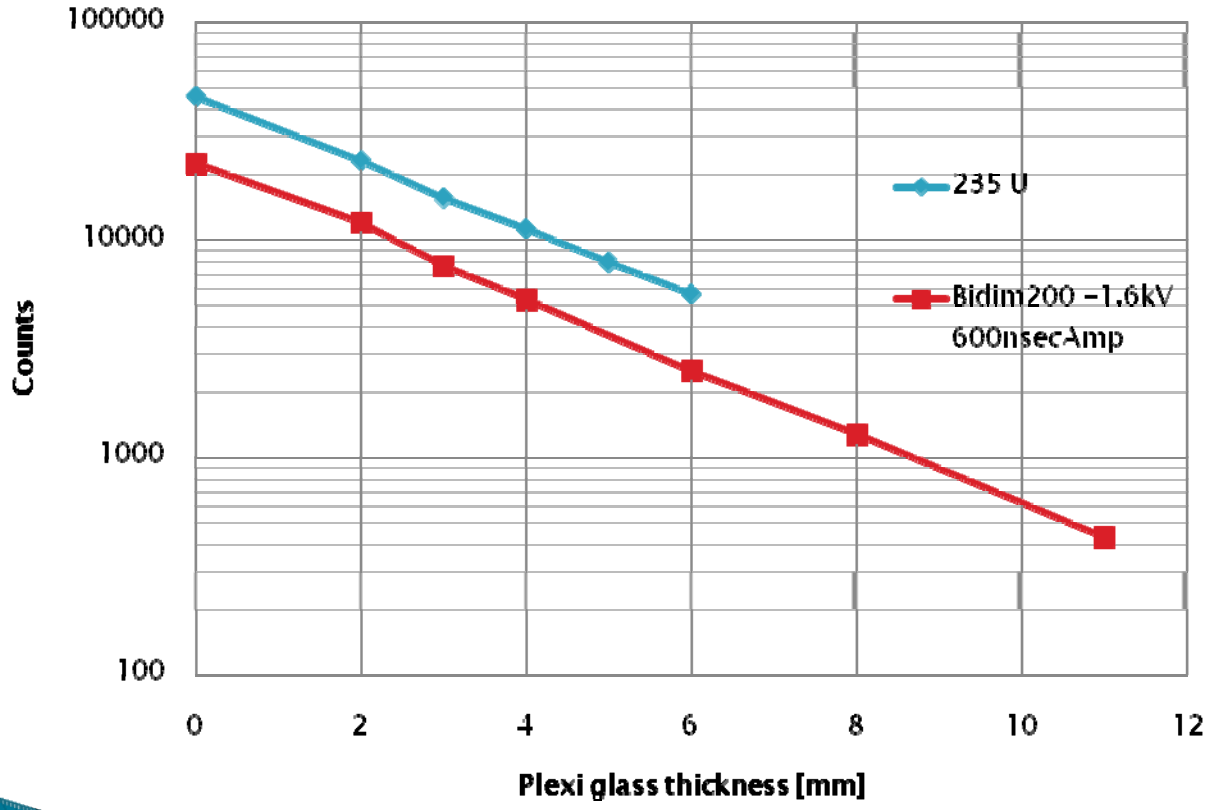
Data acquired by MCA (600nsec shaping time Amp)

Experiments-1

- Counting rate : Measured by An Anode Strip



Counting rate [counts/mm/anode]



Direct Beam
~ 22.19k Hz/mm

Cf. Monitor(235U)
~ 22.9k Hz/mm

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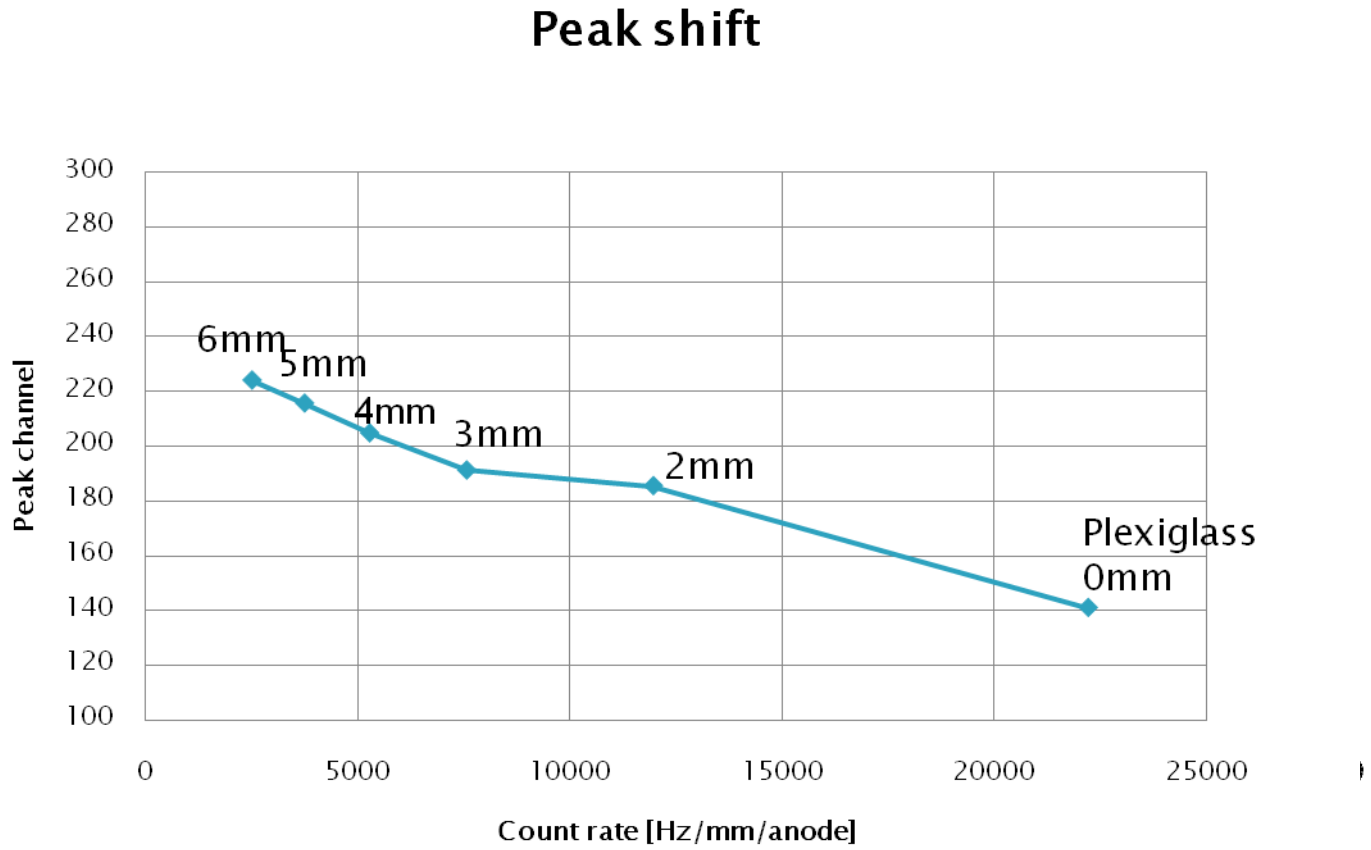
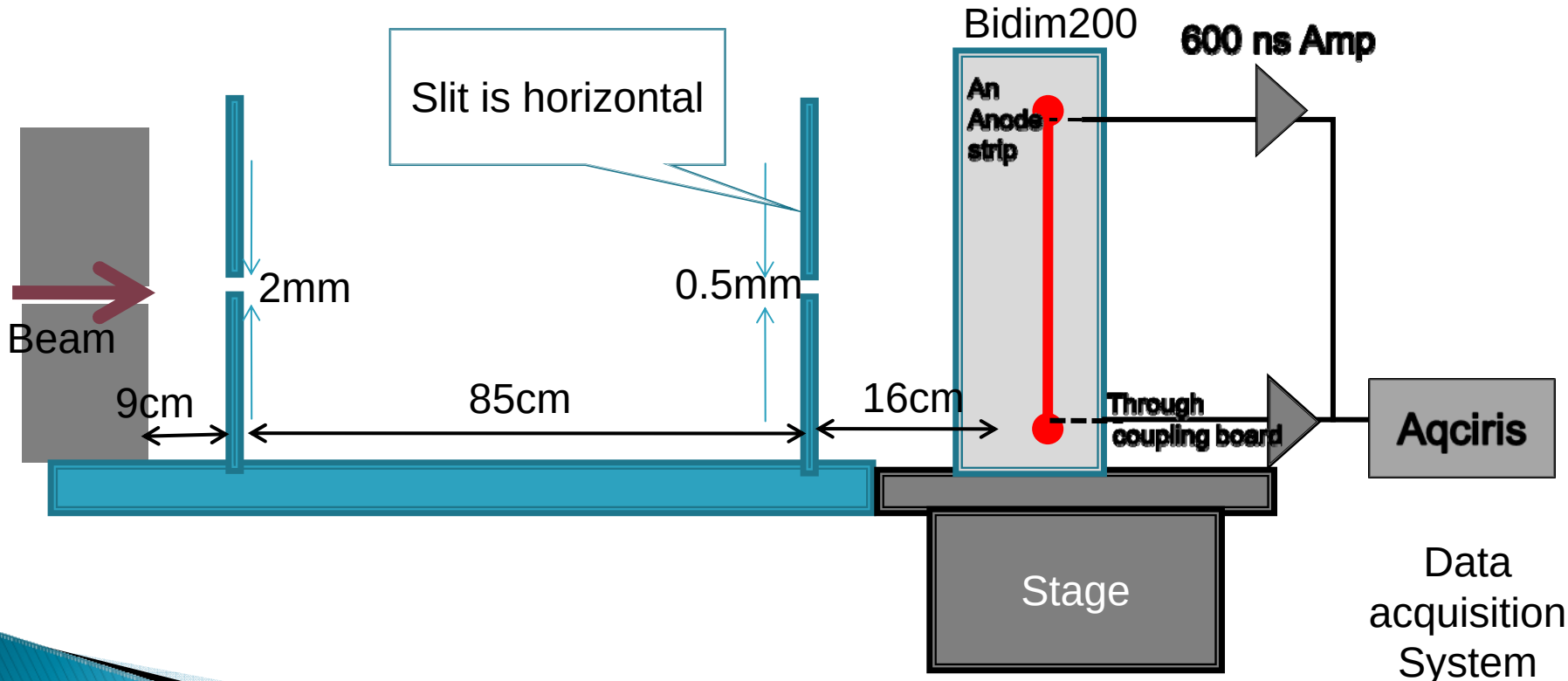
Counting rate
Space charge effect

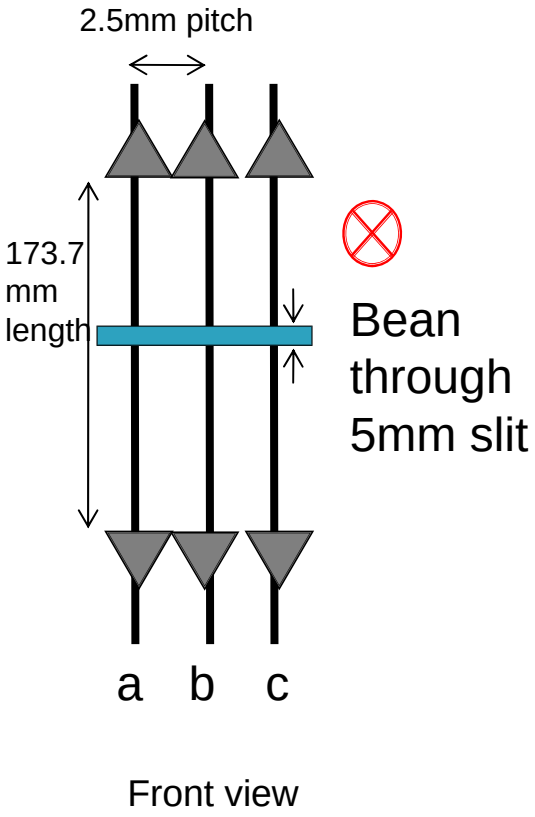


Experiments-2

- Spatial resolution



Spatial resolution
Data acquisition

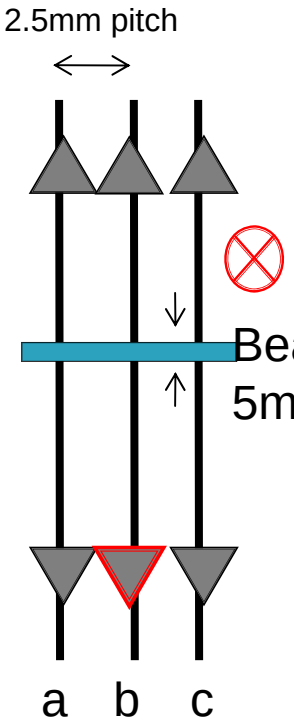


- 3 neighbouring channels data are acquired
- Middle channel (b) is triggerd

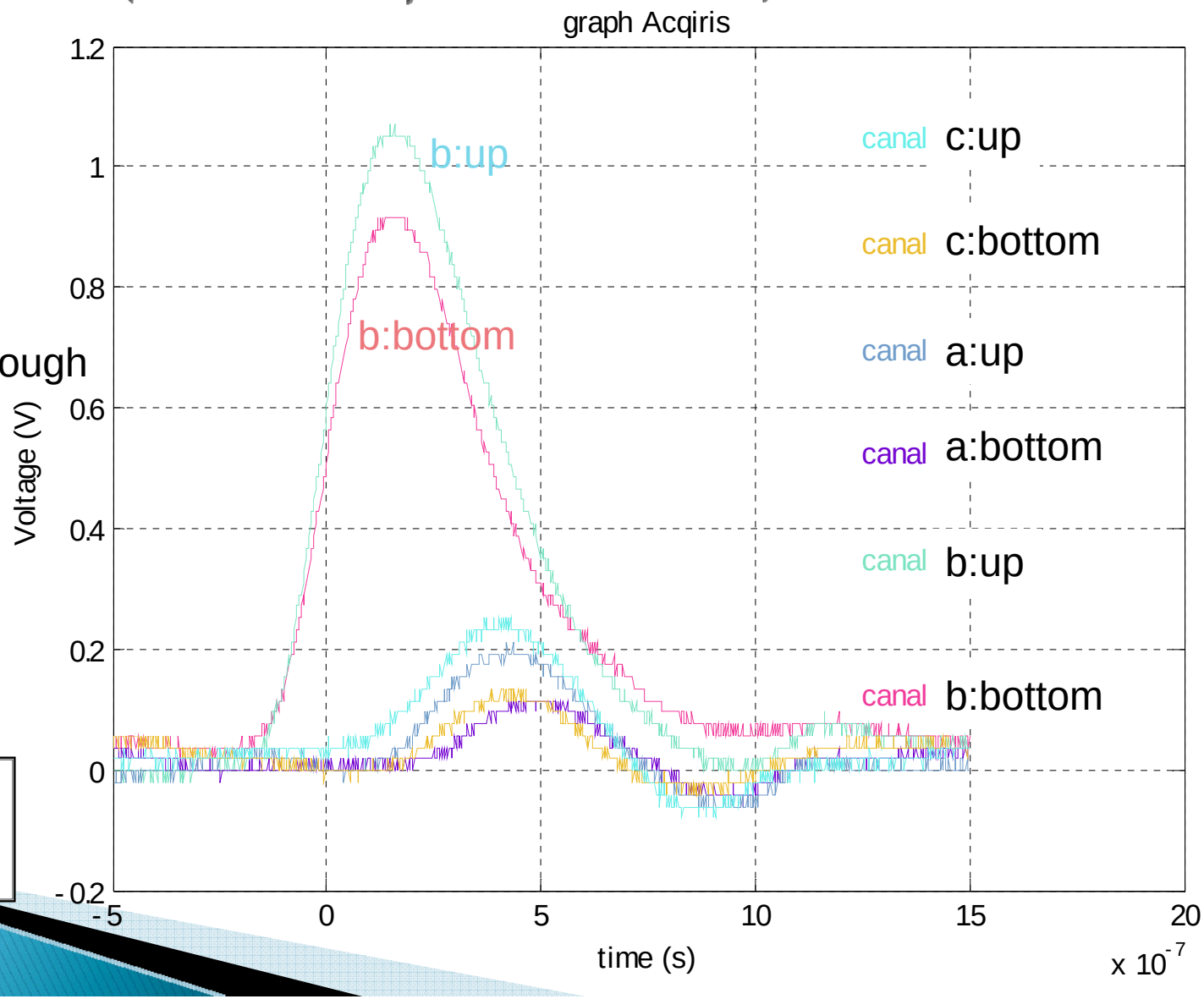
- Less Coincident event on neighbouring channels (a&c)

➡ Only triggered channel (b) is used for position calculation

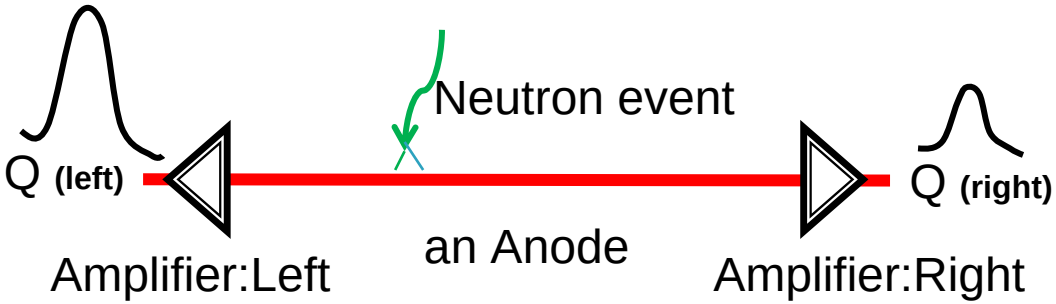
Typical signal
(600nsec,Vc=-1.6kV)

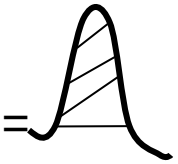


b:bottom
Triggerd @500mV



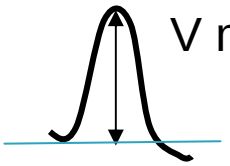
- Position calculation $= \dfrac{Q\ \textbf{(left)}}{(\ Q\ \textbf{(left)} + Q\ \textbf{(right)}\ )}$



Amount of Charge Q = $= \int \Delta V\, dt =$ 

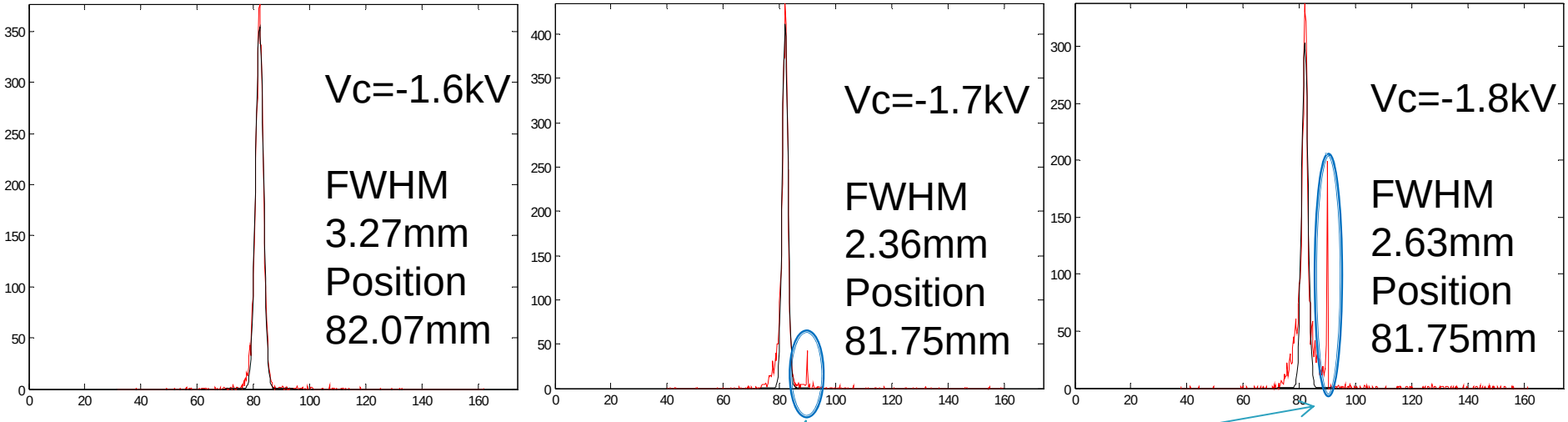
! Poor S/N ratio ➡ Q integrated signals gave worse resolution

Instead of integration, pick up the Max value of the signal



Spatial resolution

Beam collimated with 0.5mm slit



Saturated signal is taken for the analysis

Even emitted these saturated signals, spatial resolution is not improved.

Vc=-1.7kV -> 2.35
Vc=-1.8kV -> 2.63