



Status of no-stretch no-spacer GEM assembly.

The NS2 Technique Method and experimental results

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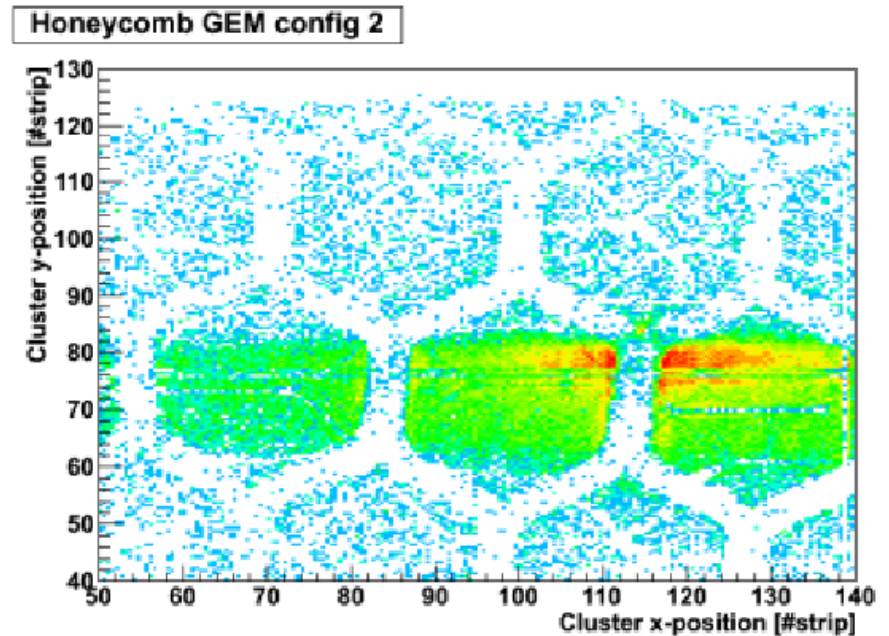
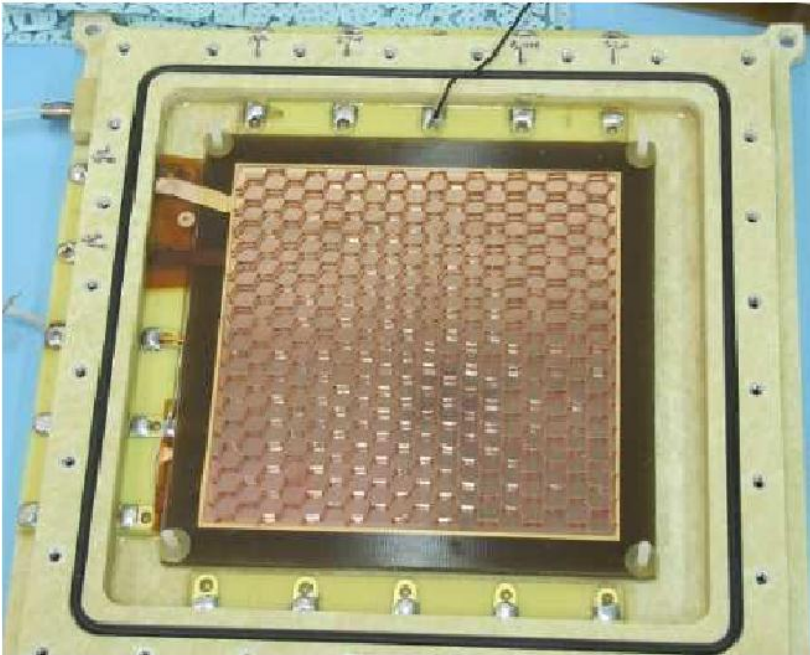
Andrey Marinov

Rui de Oliveira

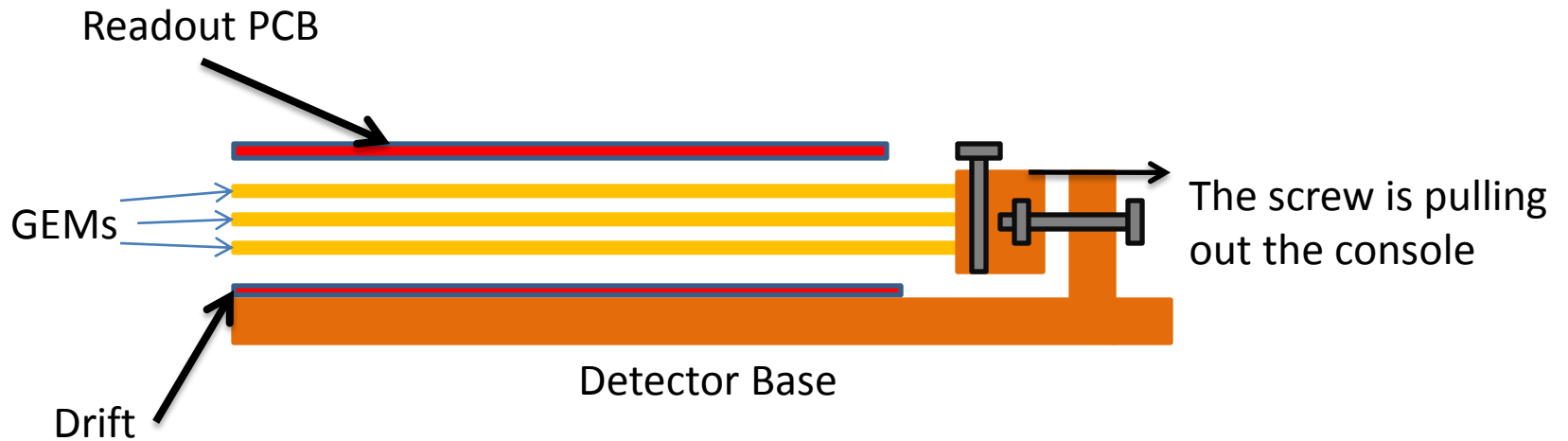
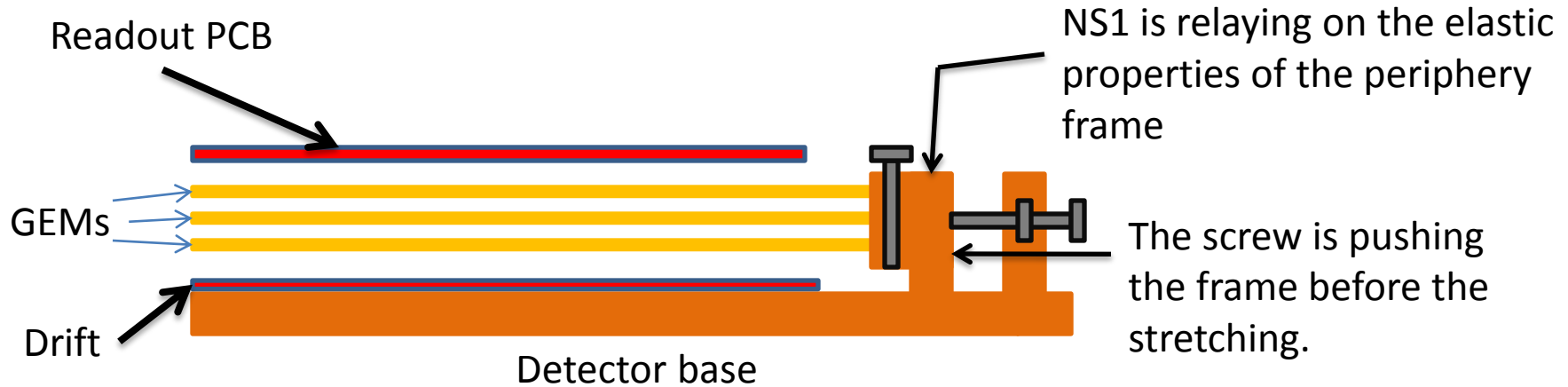
On behalf of the GEMs for CMS Collaboration

Older techniques

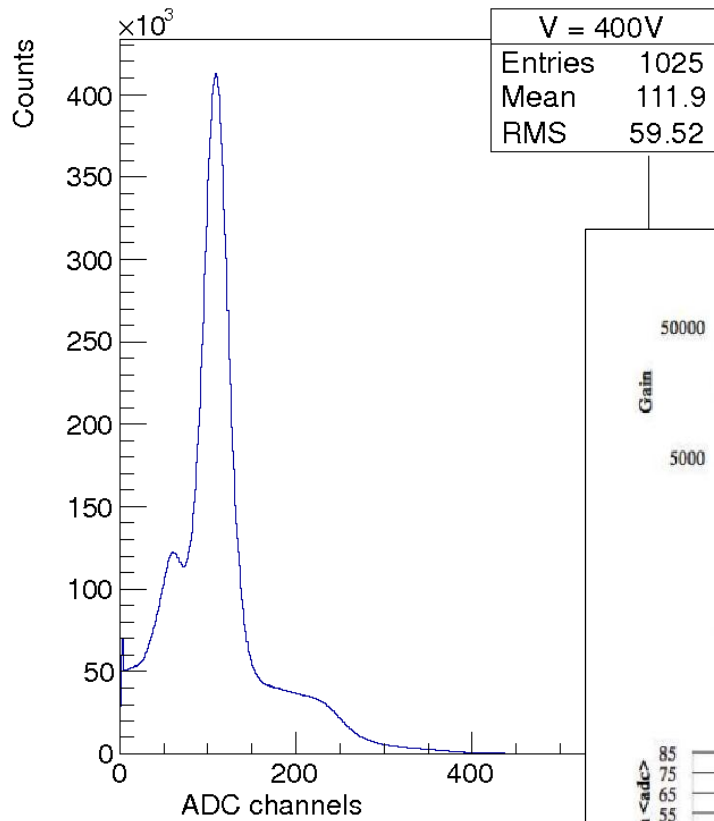
- Thermal stretching and gluing.
- Honeycomb method:



NS1 and NS2

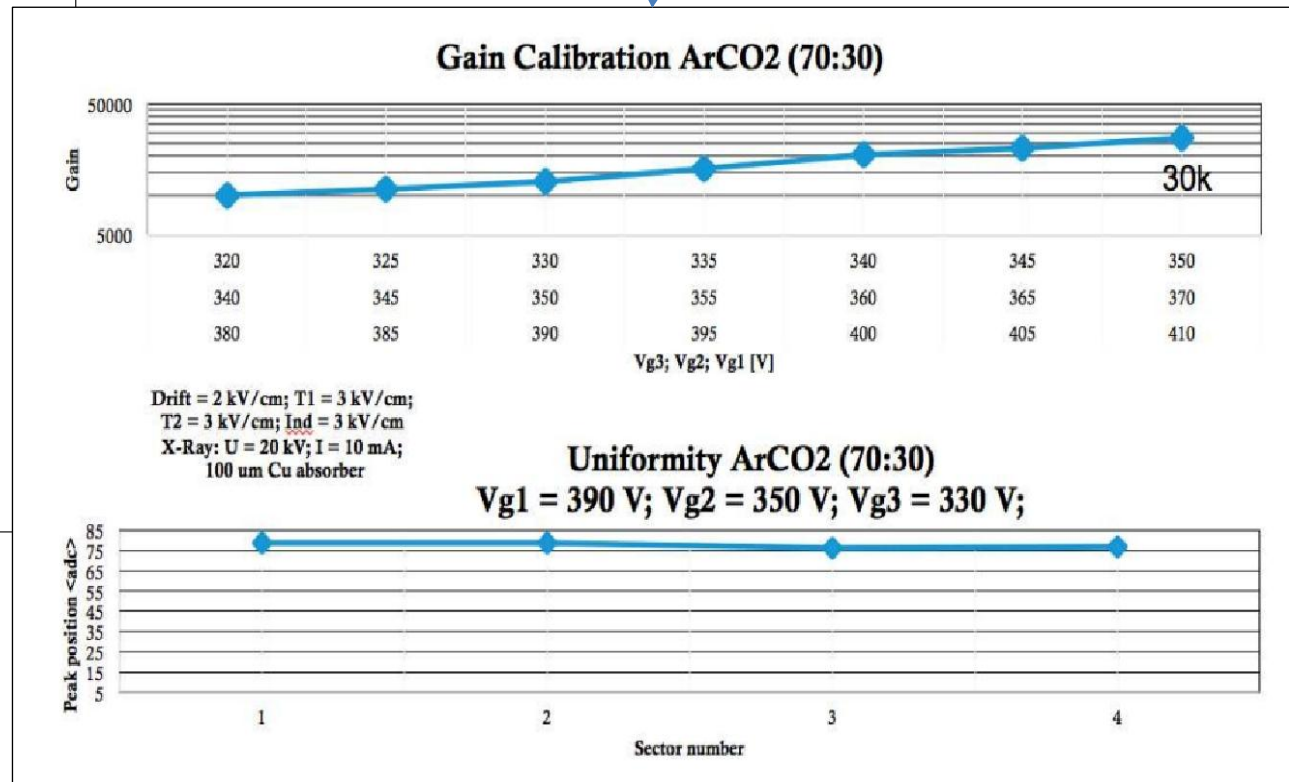


First prototype: the NS1 (10x10)cm²



Gain up to $3 \cdot 10^4$

Good uniformity across the entire surface



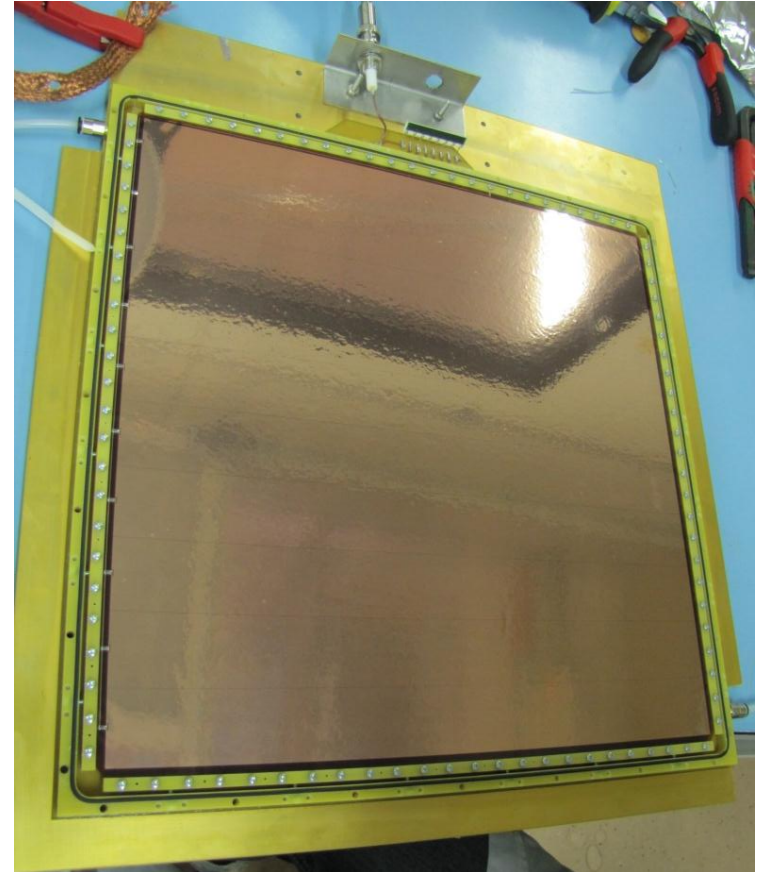
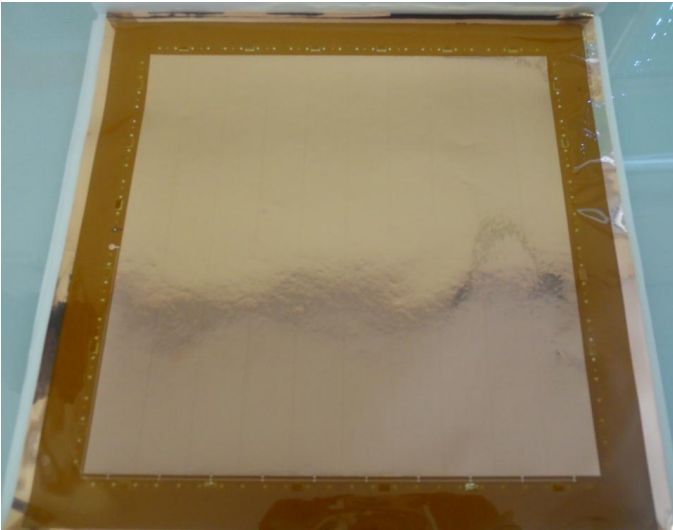
Good shape of the pulse height spectrum

NS2 (30x30) cm²

- The (10x10) cm² NS2 GEM detector gave excellent results in terms of
 - Gain
 - Uniformity across the chamber, indicating that the stretching is uniform on the whole surface
- These results encouraged us to build the (30x30) cm² triple GEM detector

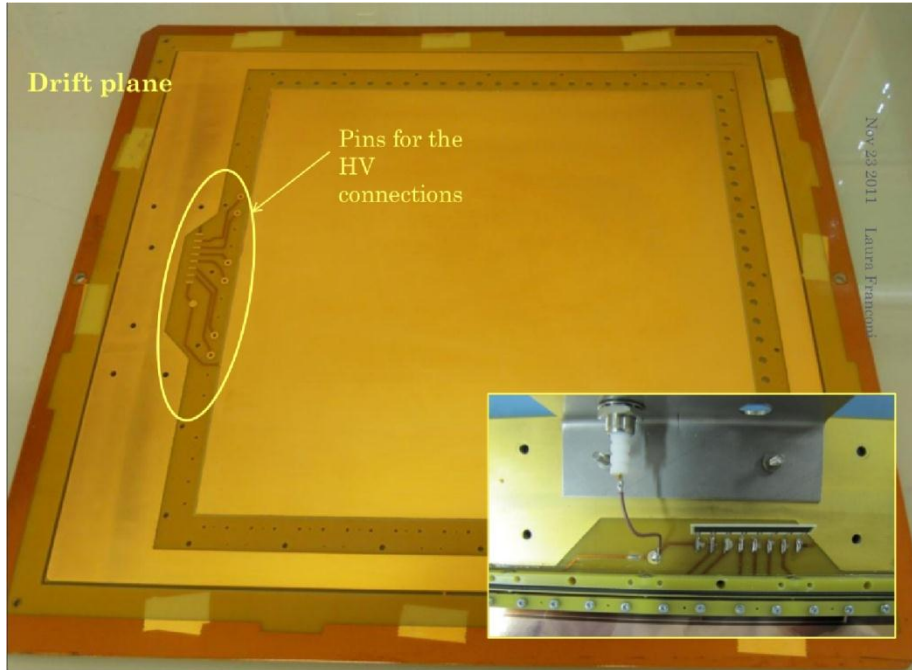
30x30cm GEM detector based on NS2 technique

A (30x30)cm² GEM foil before stretching.



The same foil after the stretching, already inserted in the detector's frame.

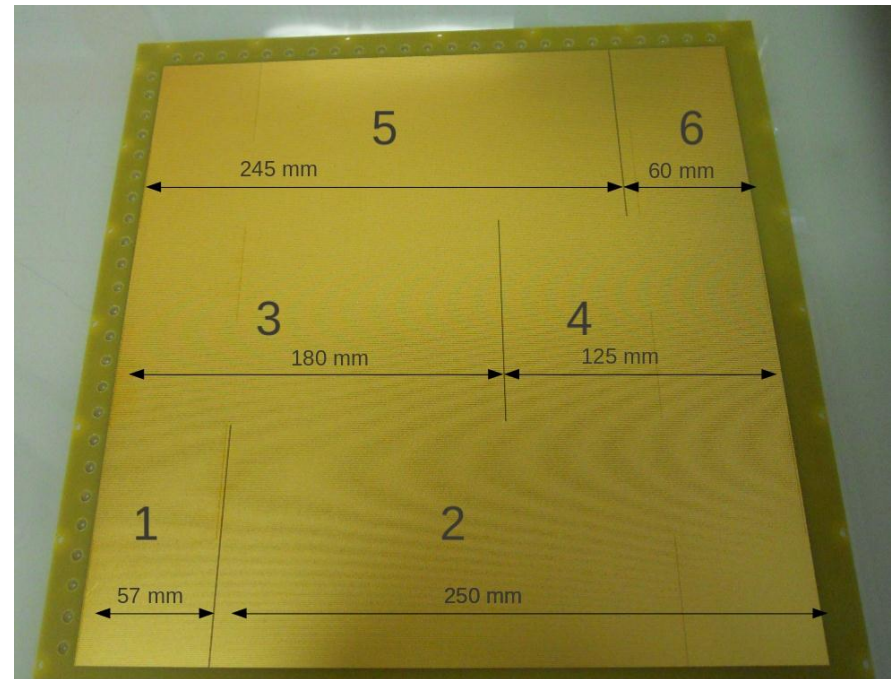
NS2 (30x30) cm² – The frame



Drift plane with the pins for the HV connections and a particular of the new Ceramic HV divider.

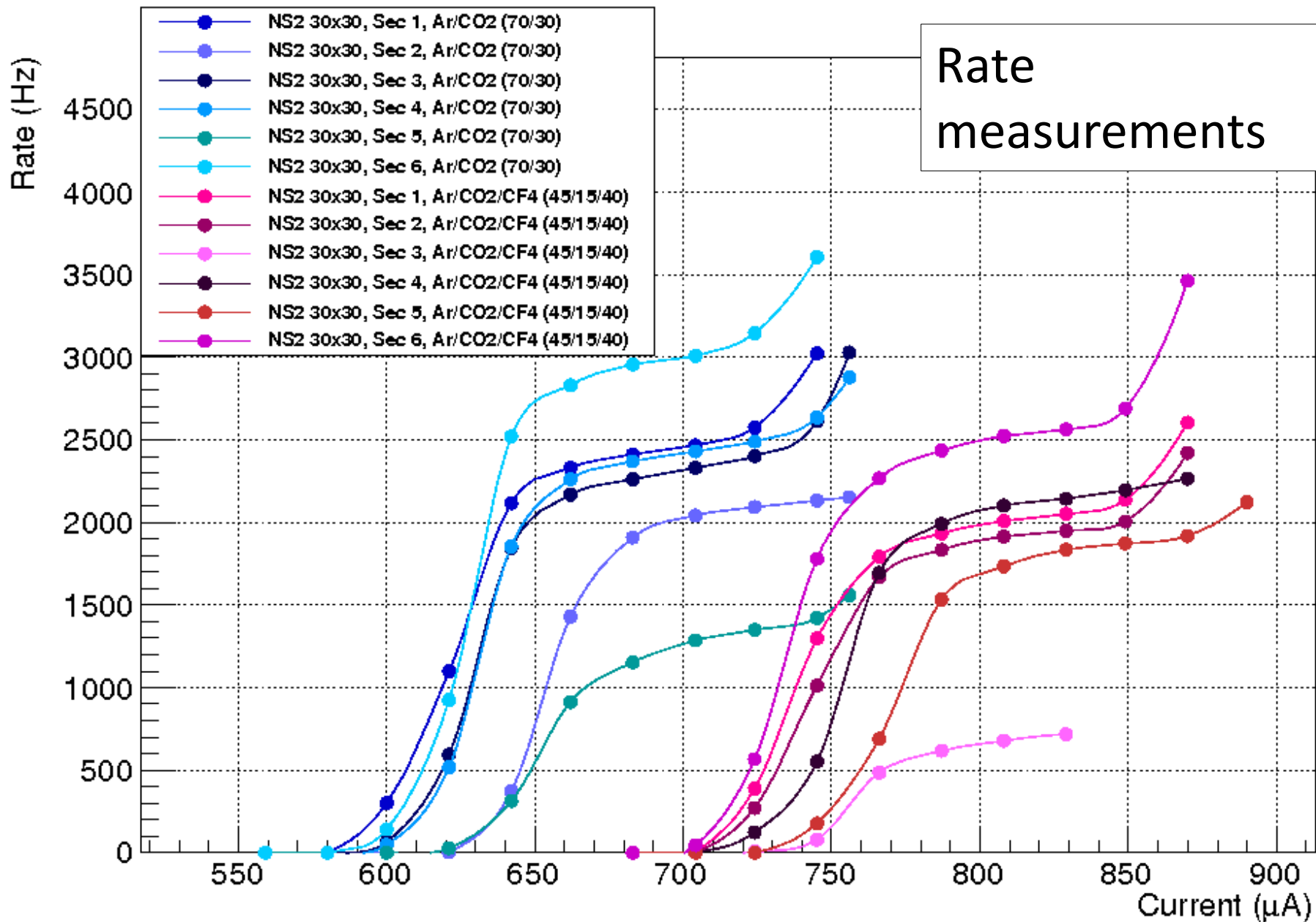
The Read-out board with labels of the different sectors. Lengths of the different strips are indicated.

Strip Pitch = 0.8 cm (in all the surface)

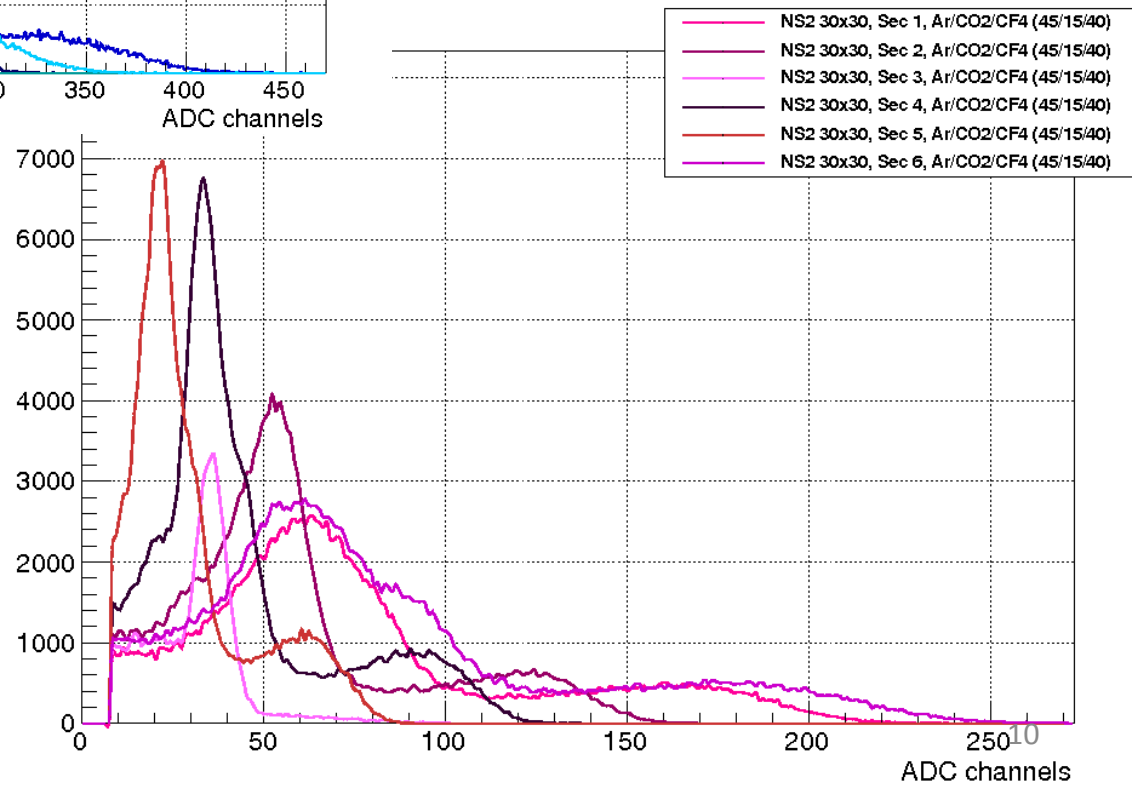
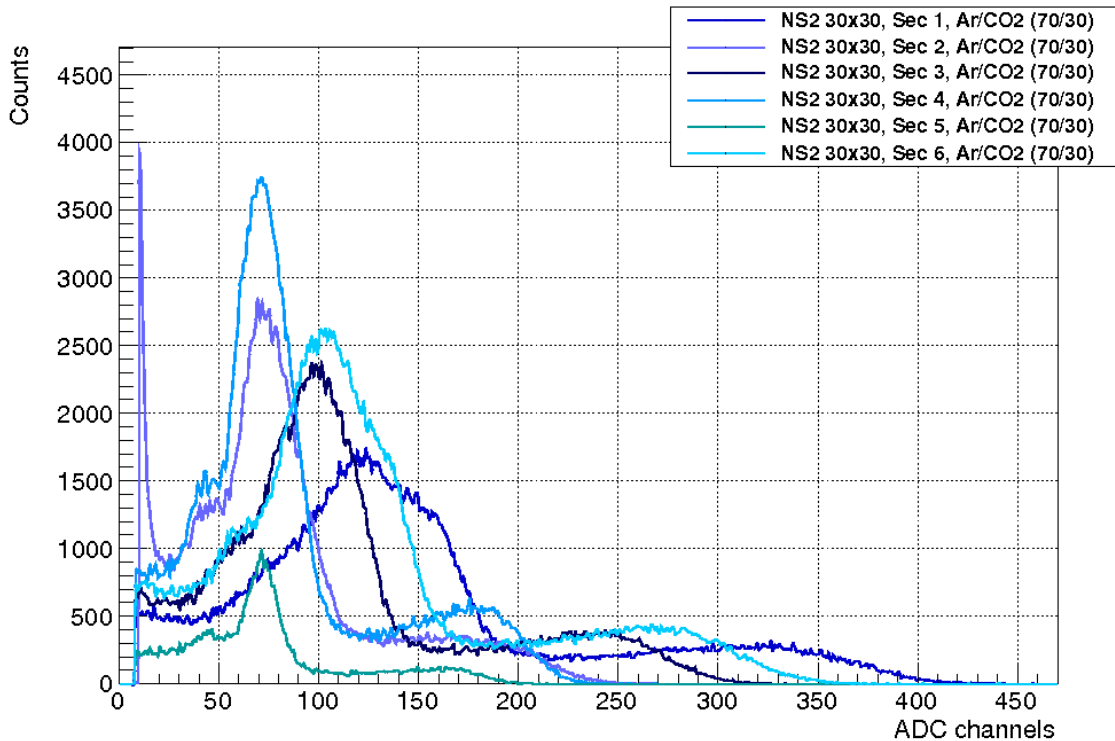


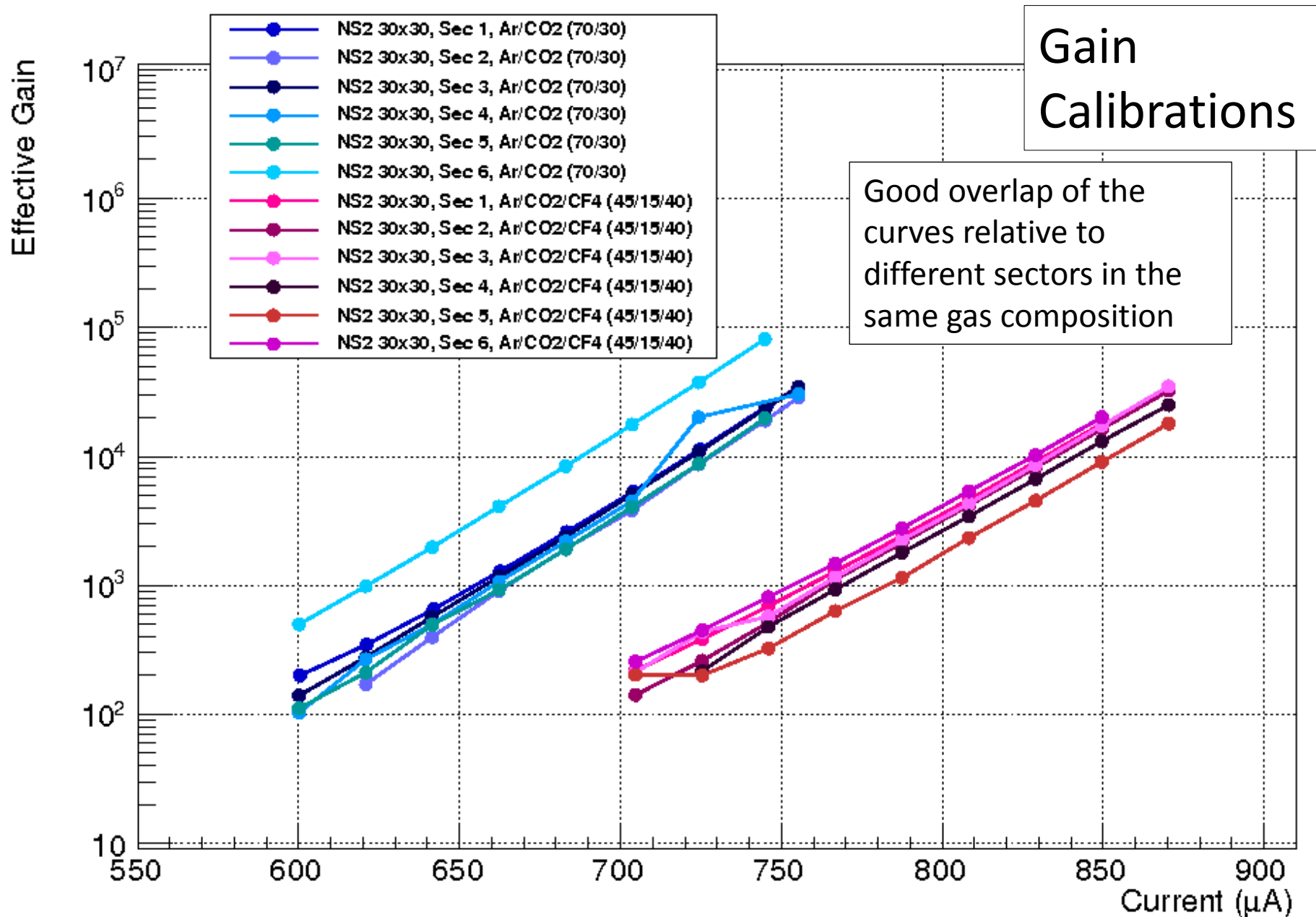
NS2 (30x30) cm² – Tests

- Measurements of the (30x30) cm² performed in all the sectors with 2 gas compositions:
 - Ar/CO₂ (70/30)
 - Ar/CO₂/CF₄ (45/15/40)
- Chamber irradiated with 8 keV X-rays gun
 - X-rays generator's settings: 2mA, 20kV
 - Collimator diameter
 - 2 mm for counts, pulse height spectra, gain calibration and rate capability
 - 6 mm for gain stability

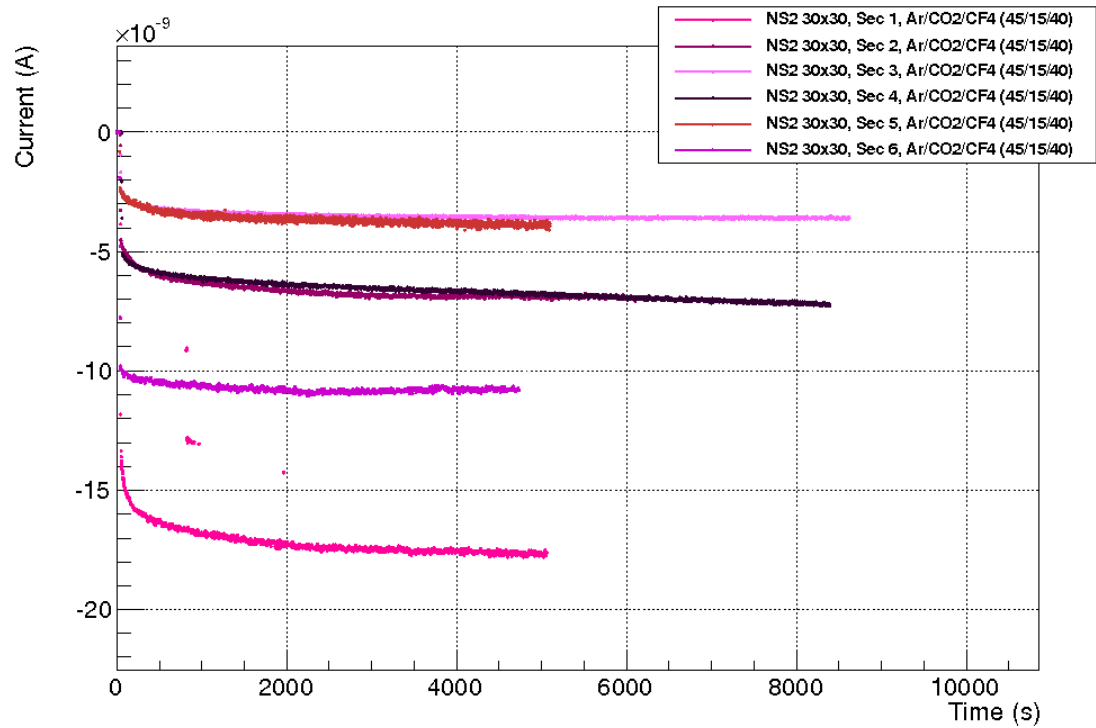
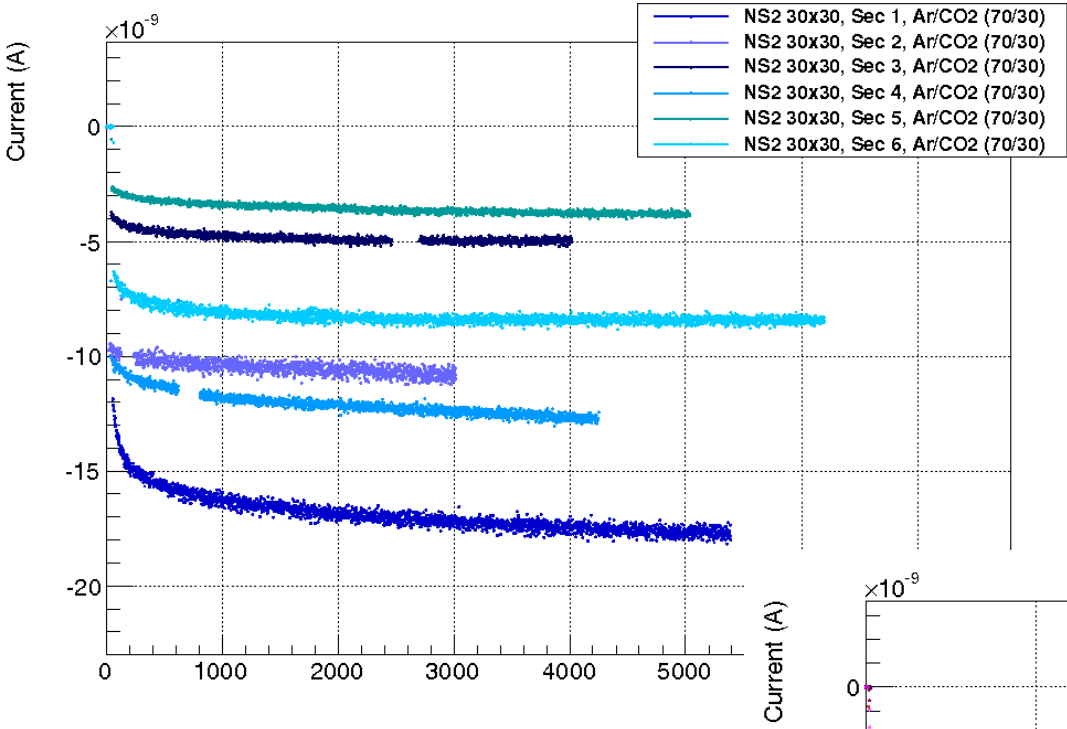


Pulse Height Spectra

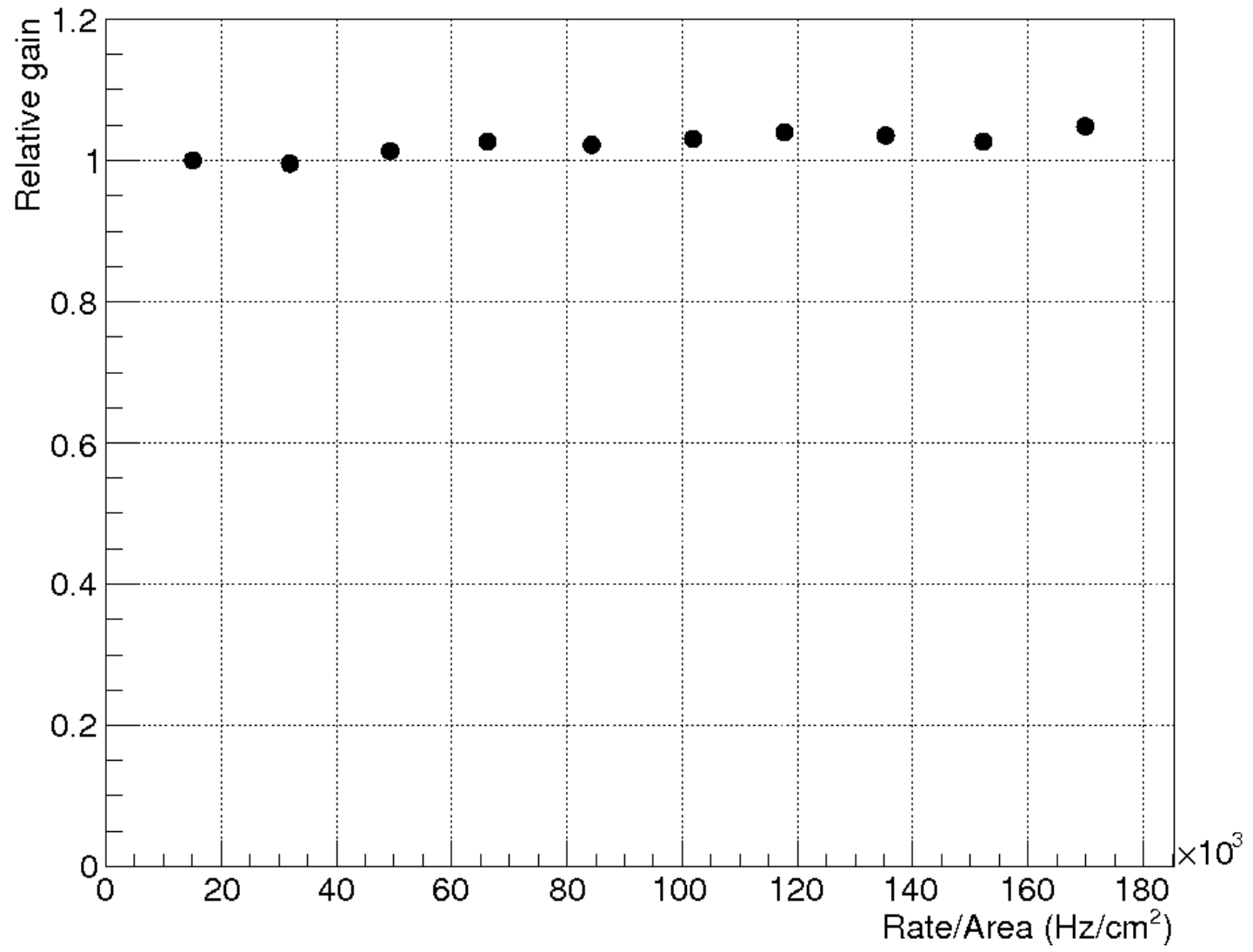




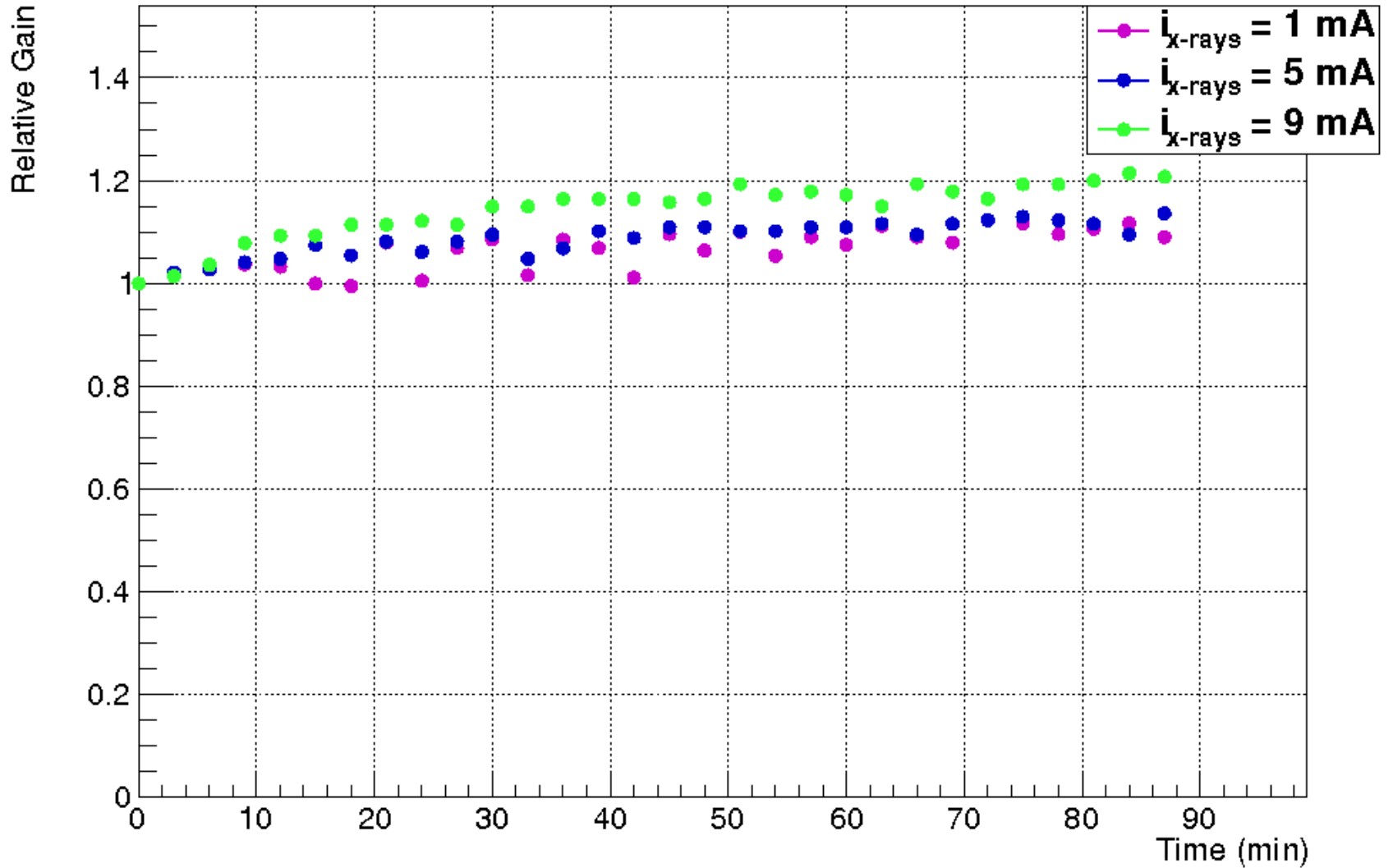
Gain Stabilities



Rate Capability

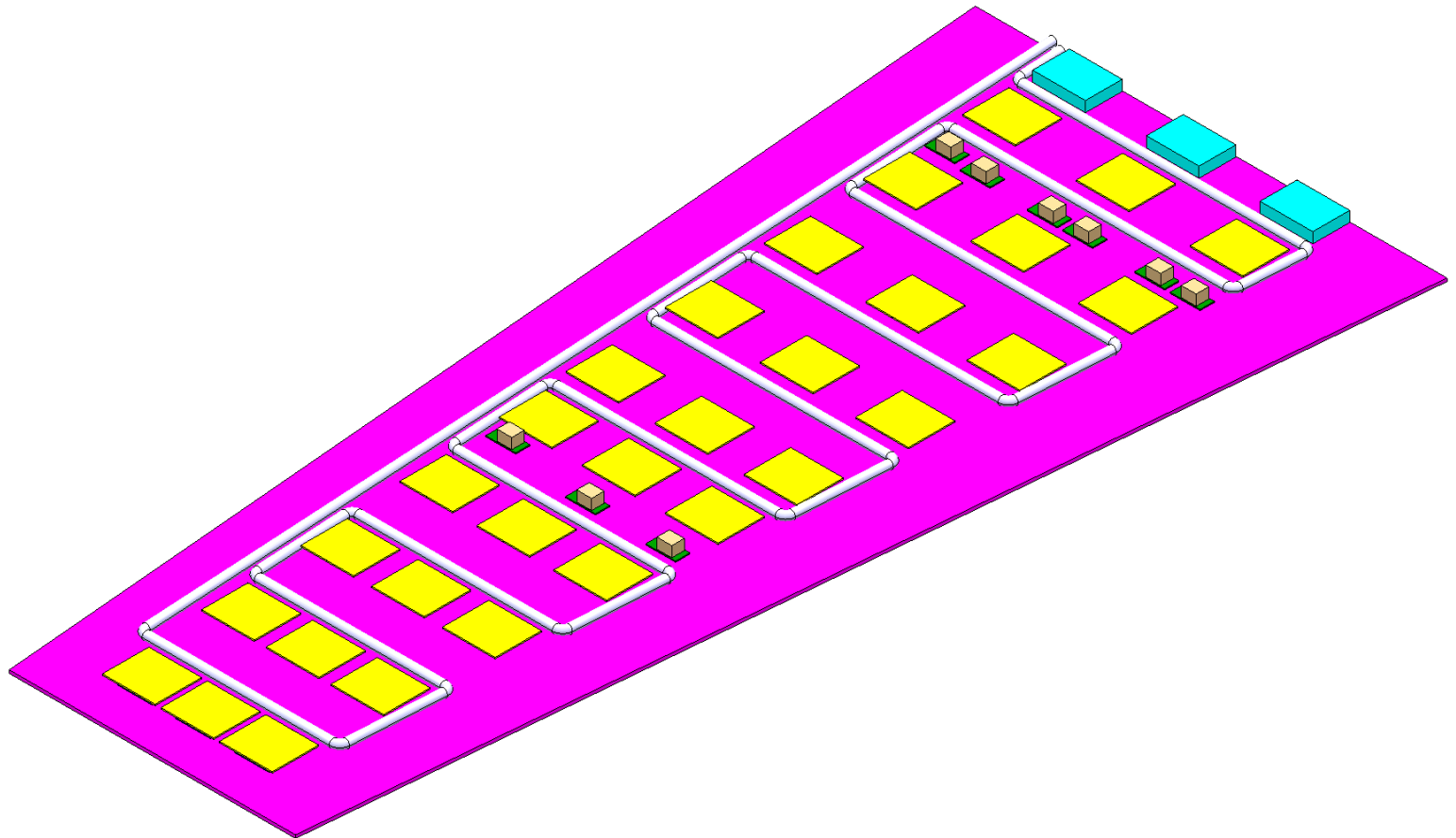


Rate Capability in Time



Future Plan

Producing NS2 GE1/1 CMS baseline detector



Thank you