



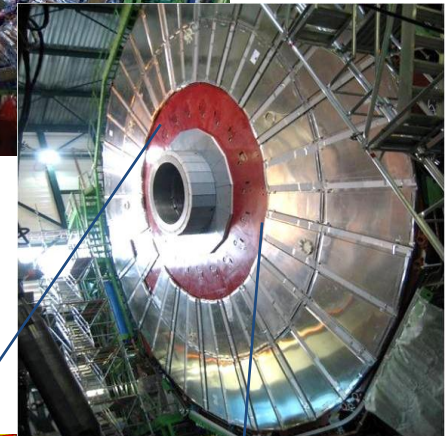
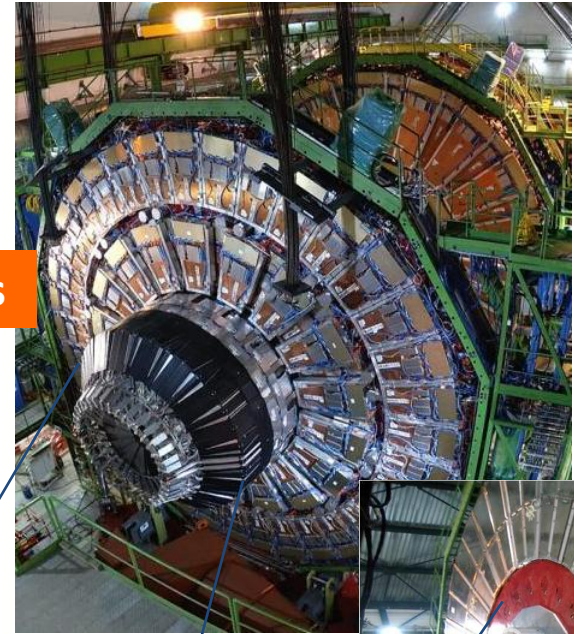
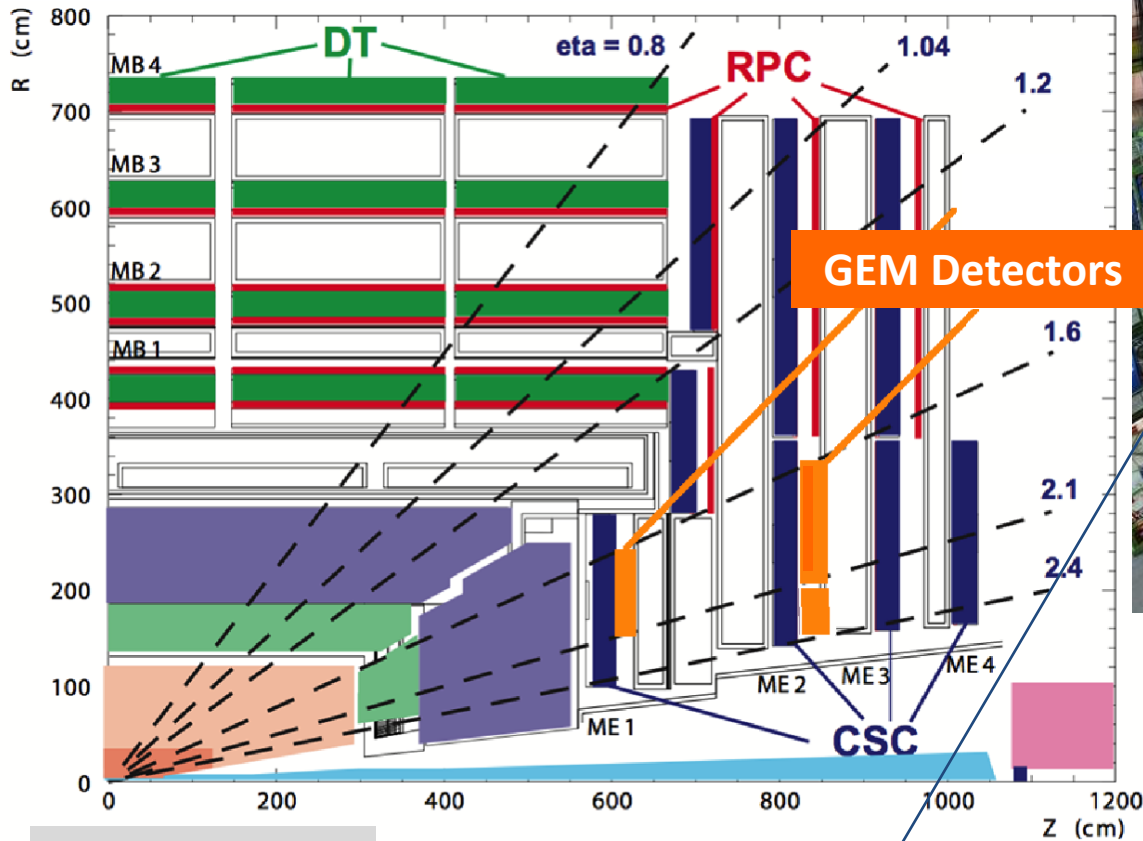
CONSTRUCTION AND TEST CMS NS2 GEMs (GE1/1)

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Lieselotte Moreels, Emmanuel Rohee, Hugo Buhours, Dylan Furic, Andrey
Marinov, Leszek Ropelewski, Eraldo Oliveri,
Rui De Oliveira, Archana Sharma

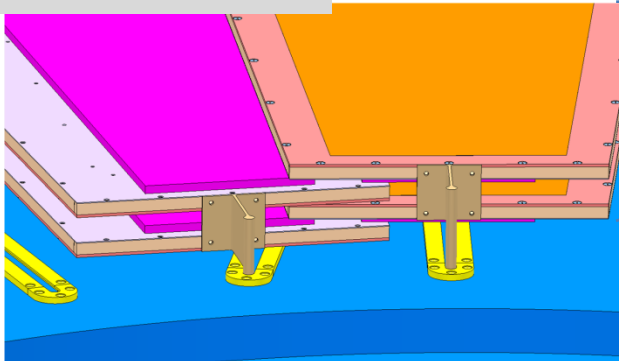
for
GEMs for CMS Collaboration
& RD51

RD51 Collaboration Meeting Stony Brook Oct 2012

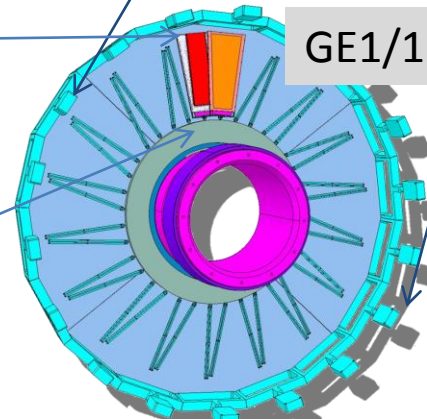
Introduction: the CMS GEM Endcap system



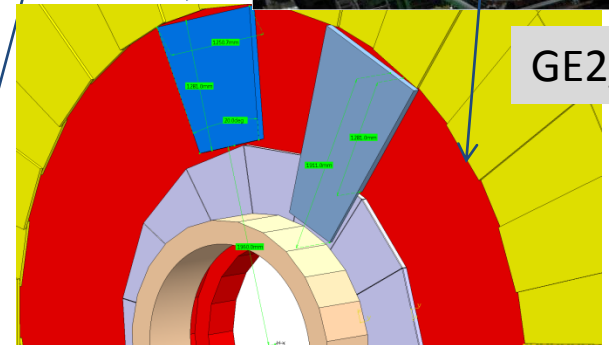
Superchambers



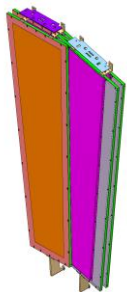
GE1/1



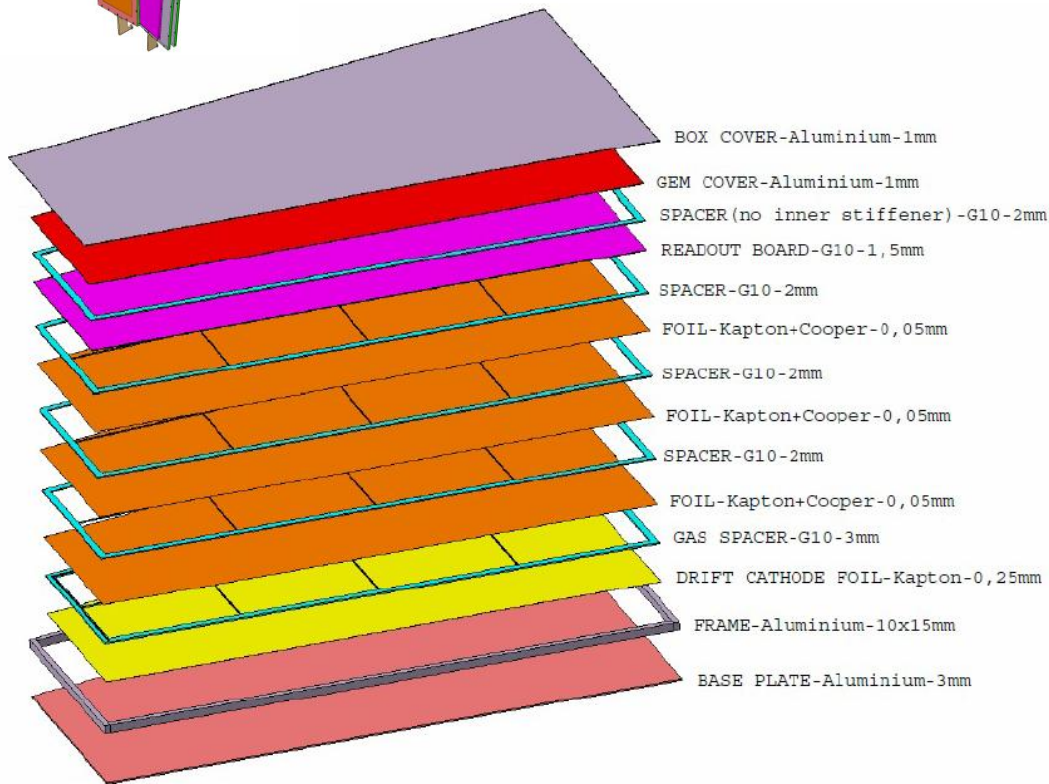
GE2/1



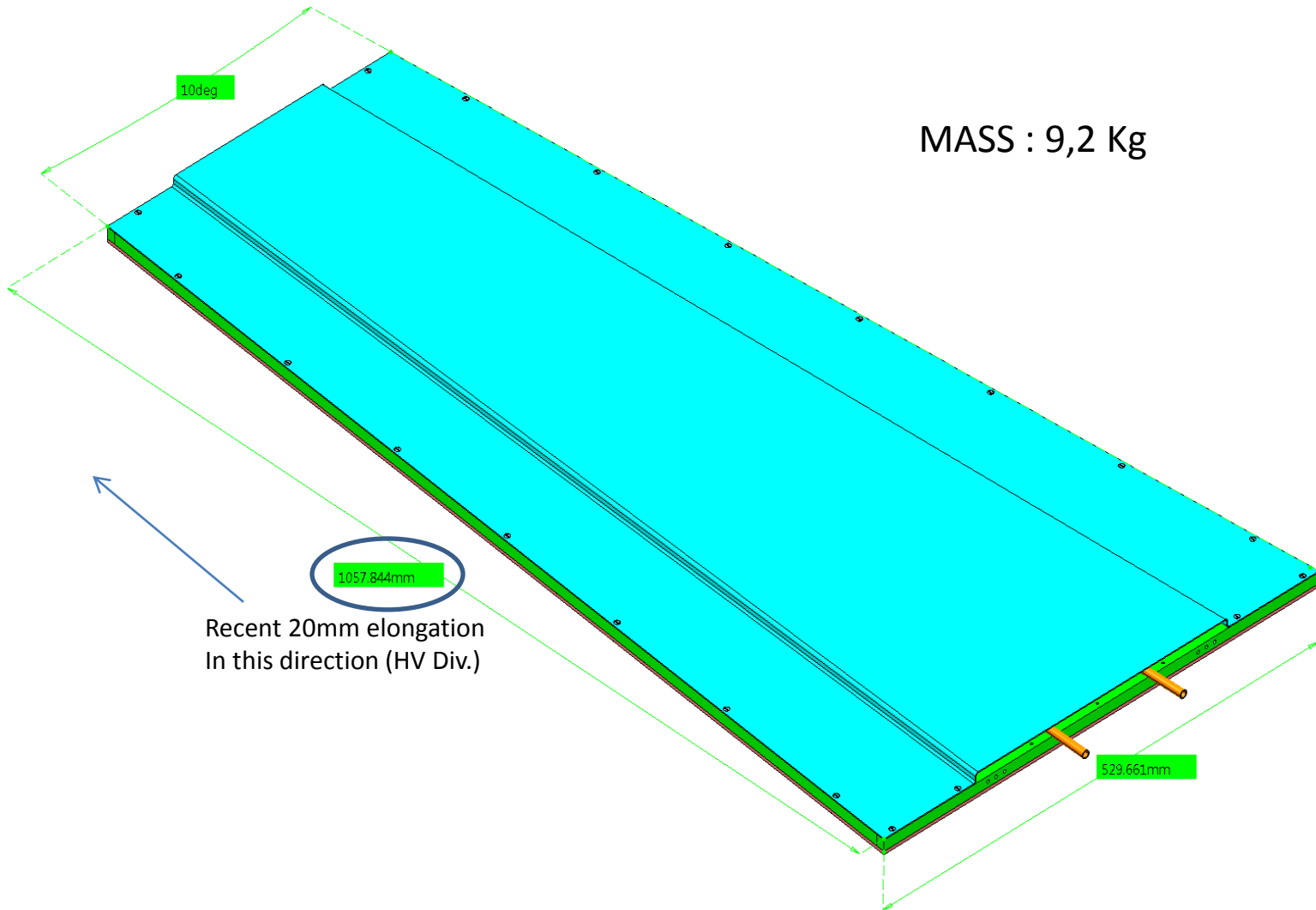
GE1/1 Detector Layout



LAYERS-Materials-Thicknesses



GE1/1 Proto1	GE1/1 Proto2
Drift, GEM1 = 3mm	Drift, GEM1 = 3mm
GEM1, GEM2 = 2mm	GEM1, GEM2 = 1mm
GEM2, GEM3 = 2mm	GEM2, GEM3 = 2mm
GEM3, Readout = 2mm	GEM3, Readout = 1mm



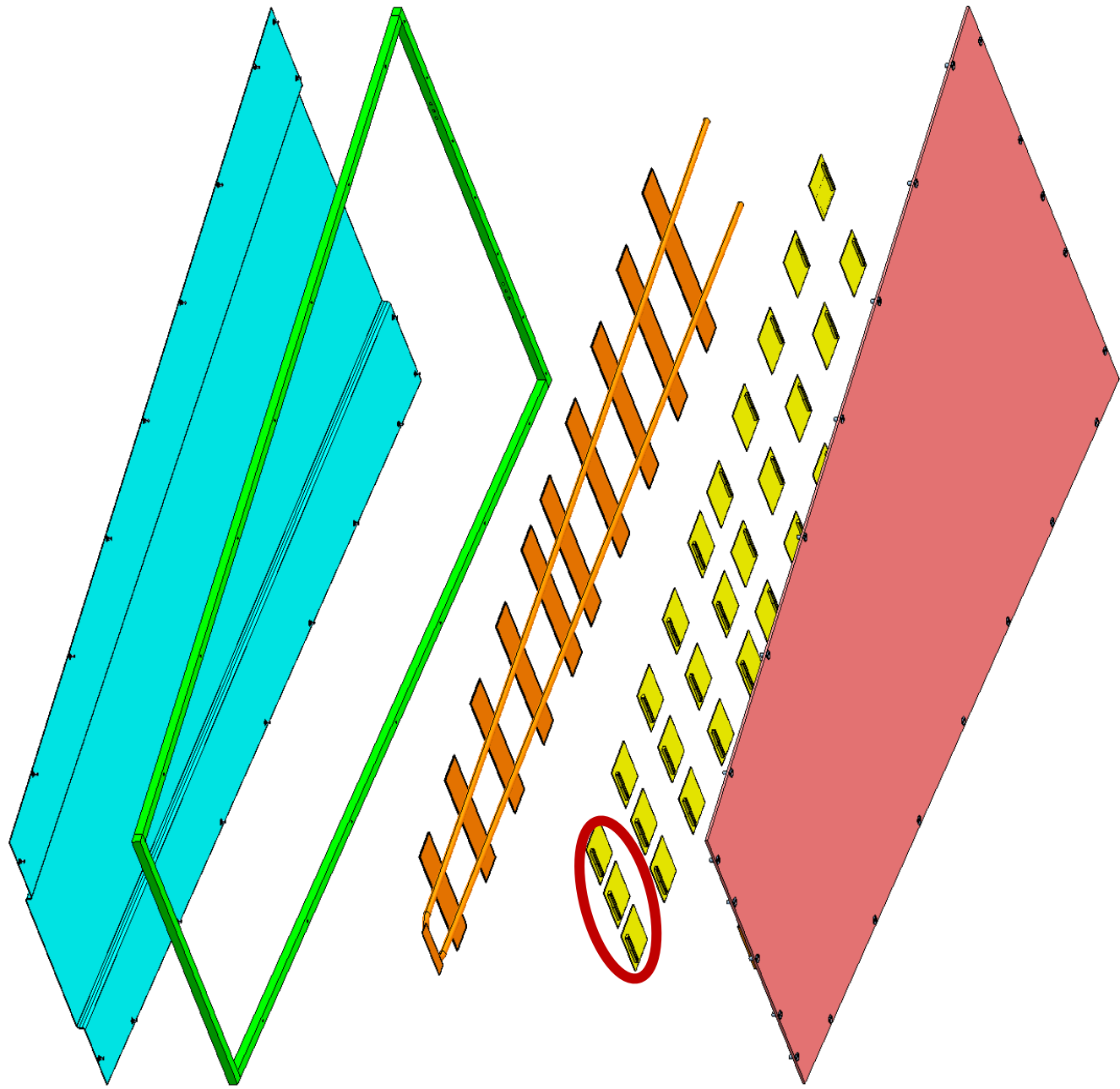
MASS : 9,2 Kg

10deg

1057.844mm

Recent 20mm elongation
In this direction (HV Div.)

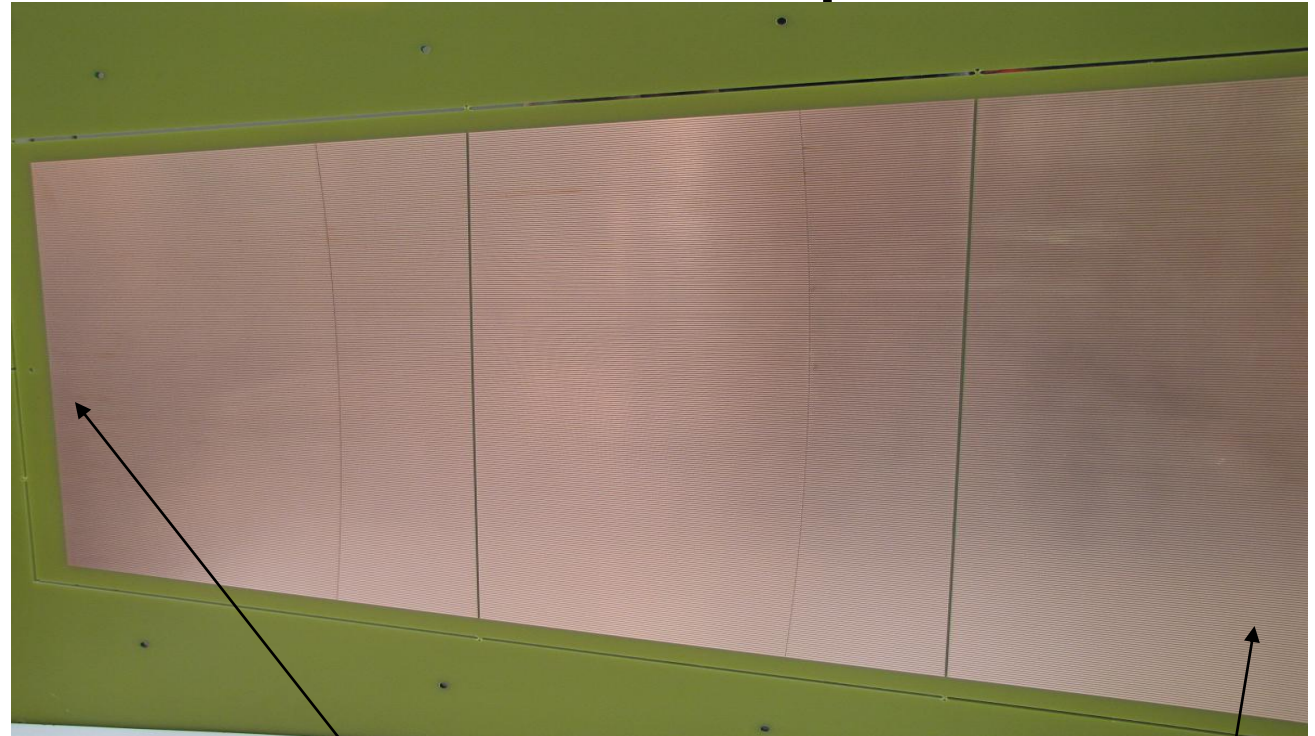
529.661mm



GE1/1 Prototypes – Proto1 Readout PCB with strips



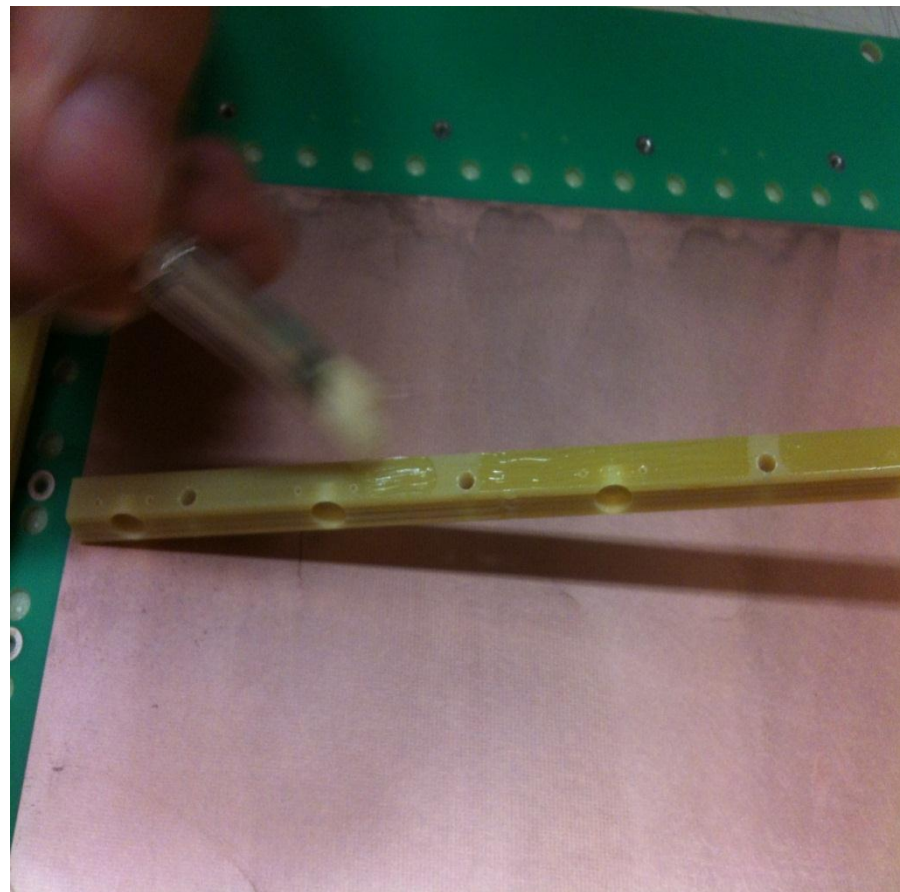
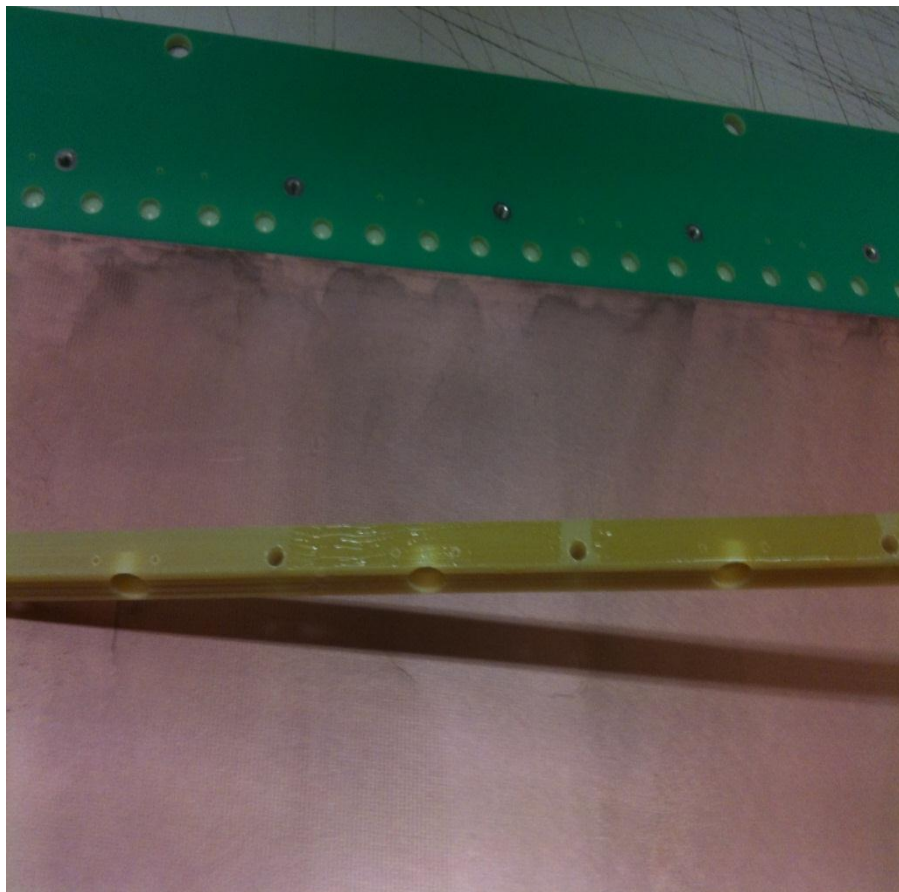
128 channels per VFAT connector
256 strips for each eta partition
1024 channels

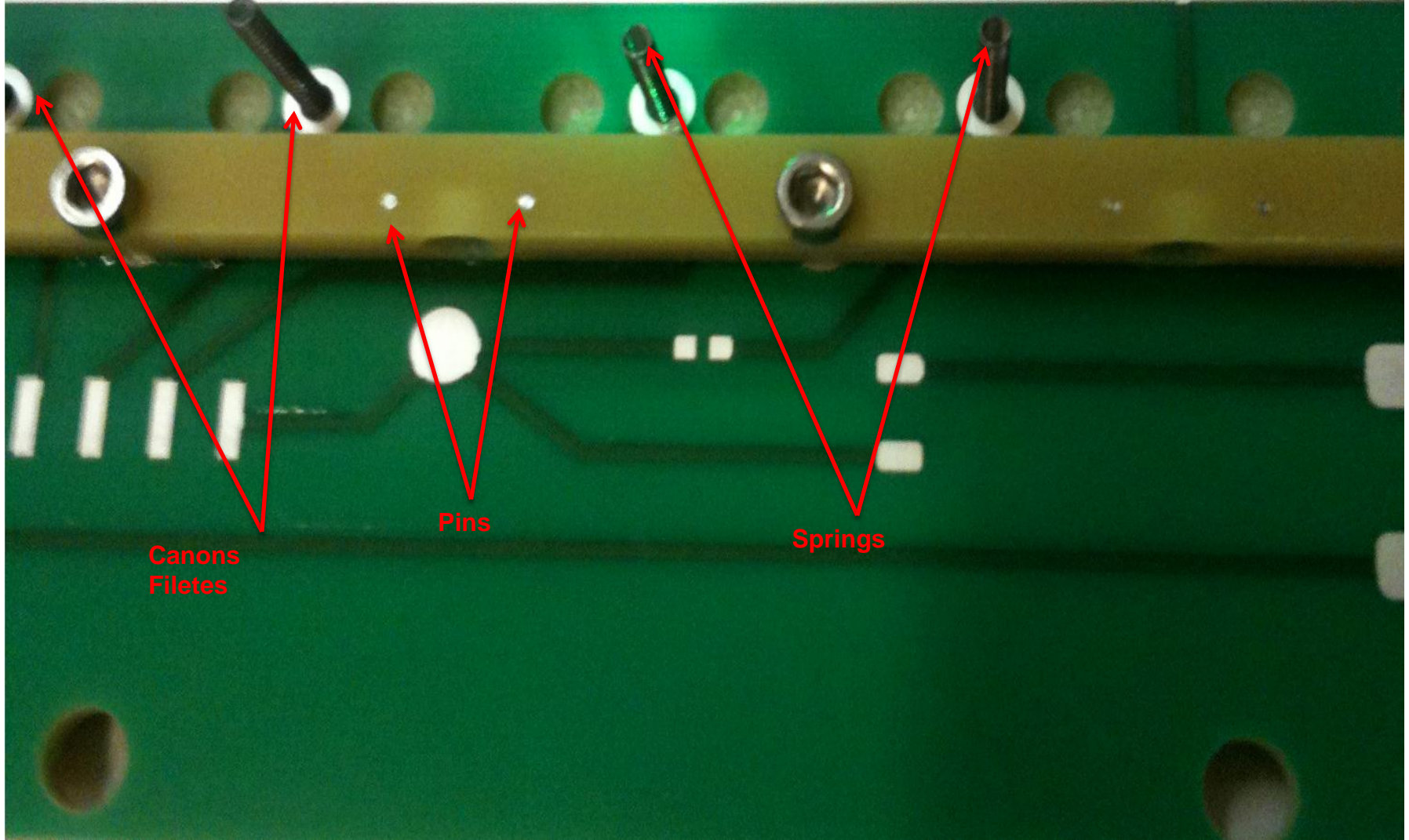


0.8mm pitch

1.6mm pitch

PCB thickness = 3mm

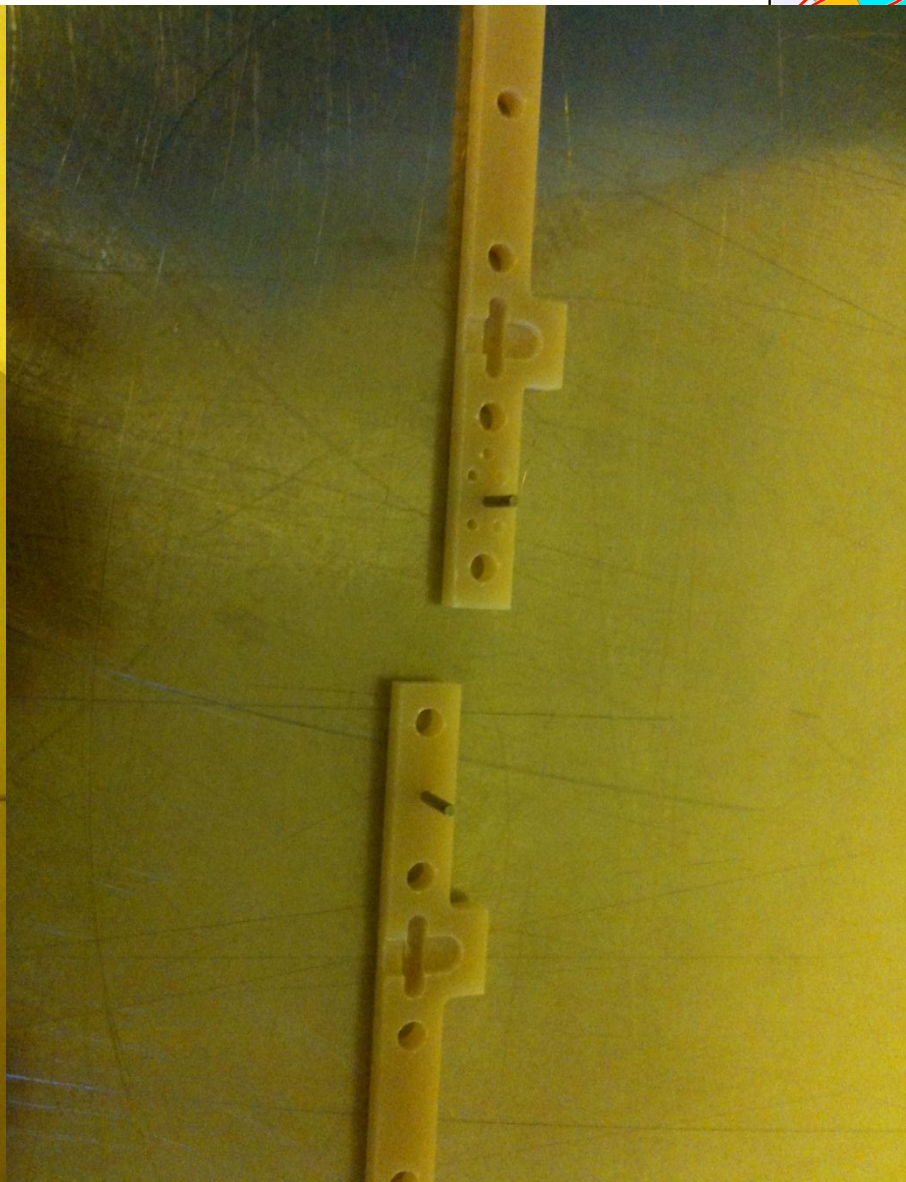
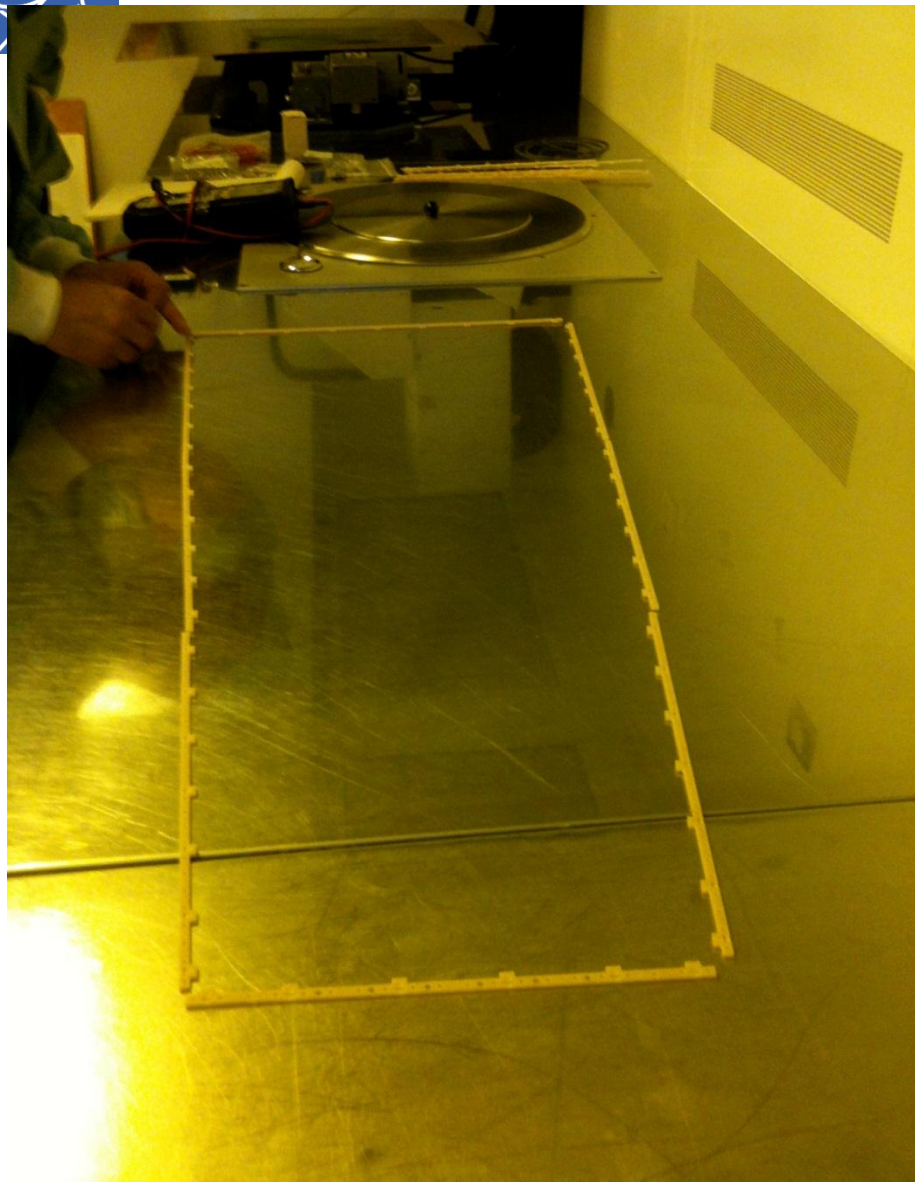


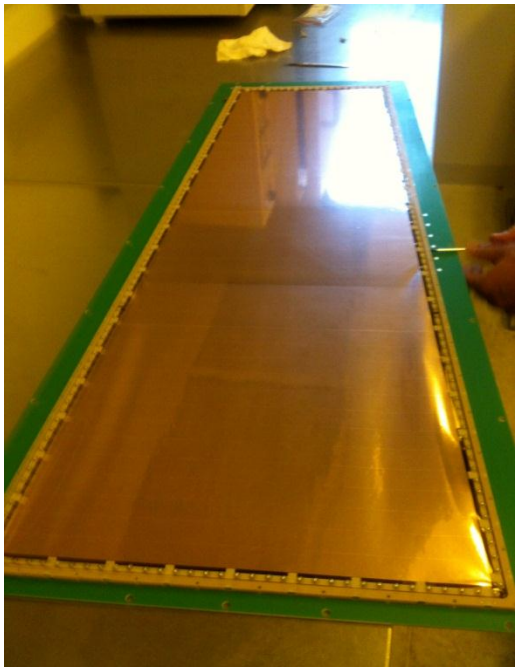
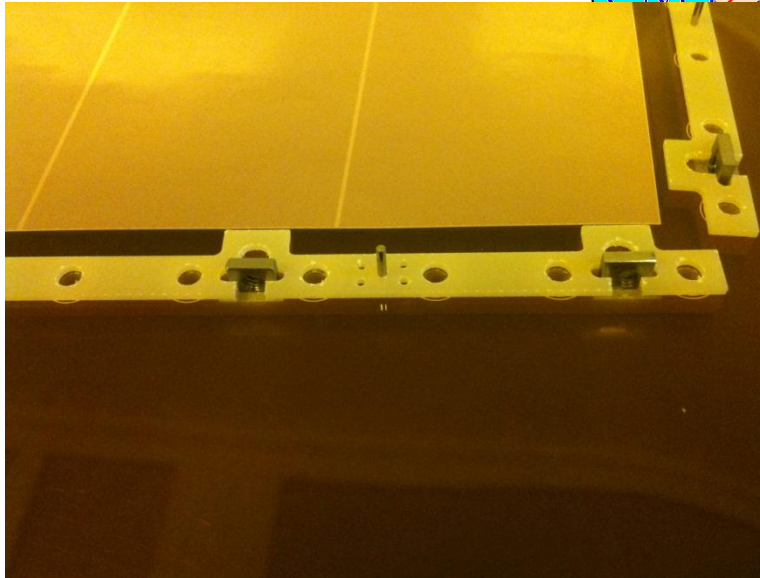


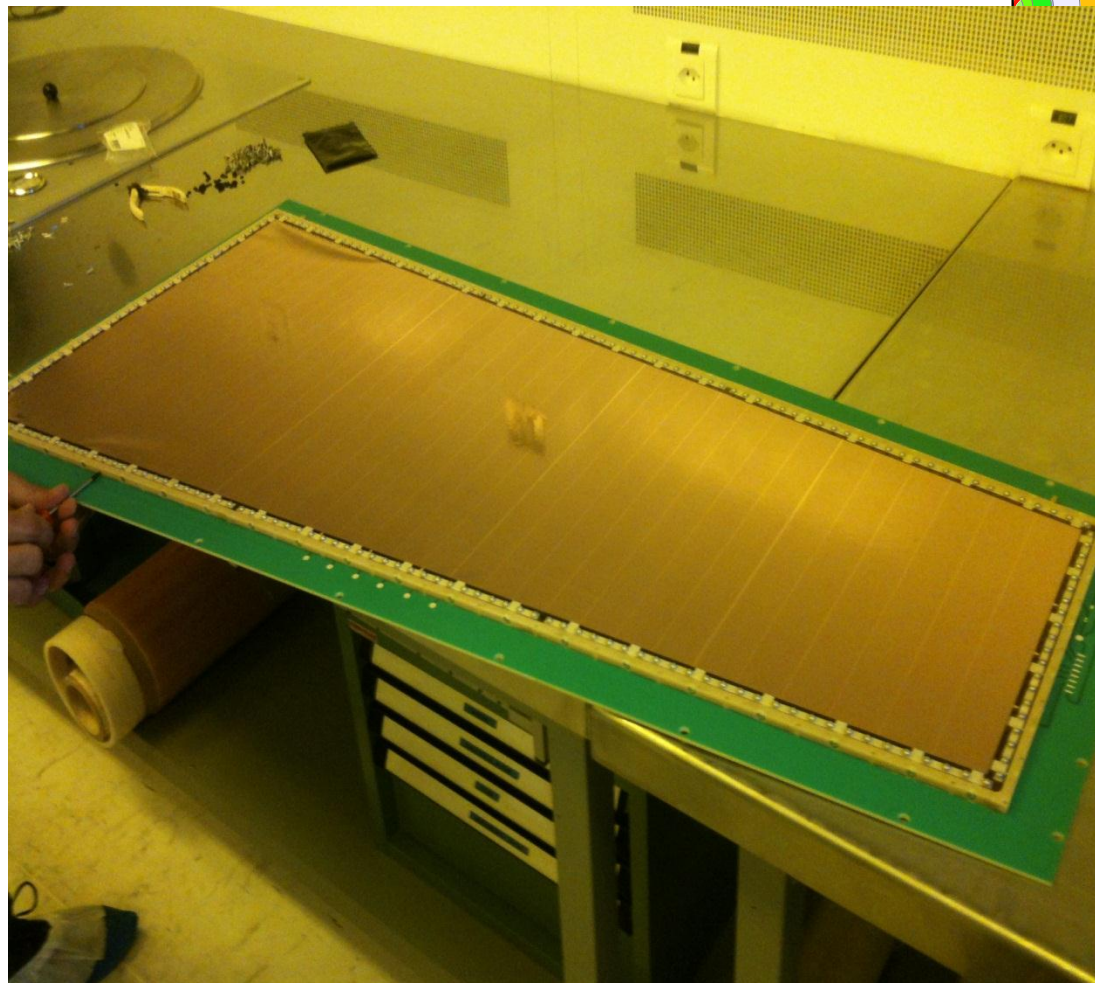
Canons
Filetes

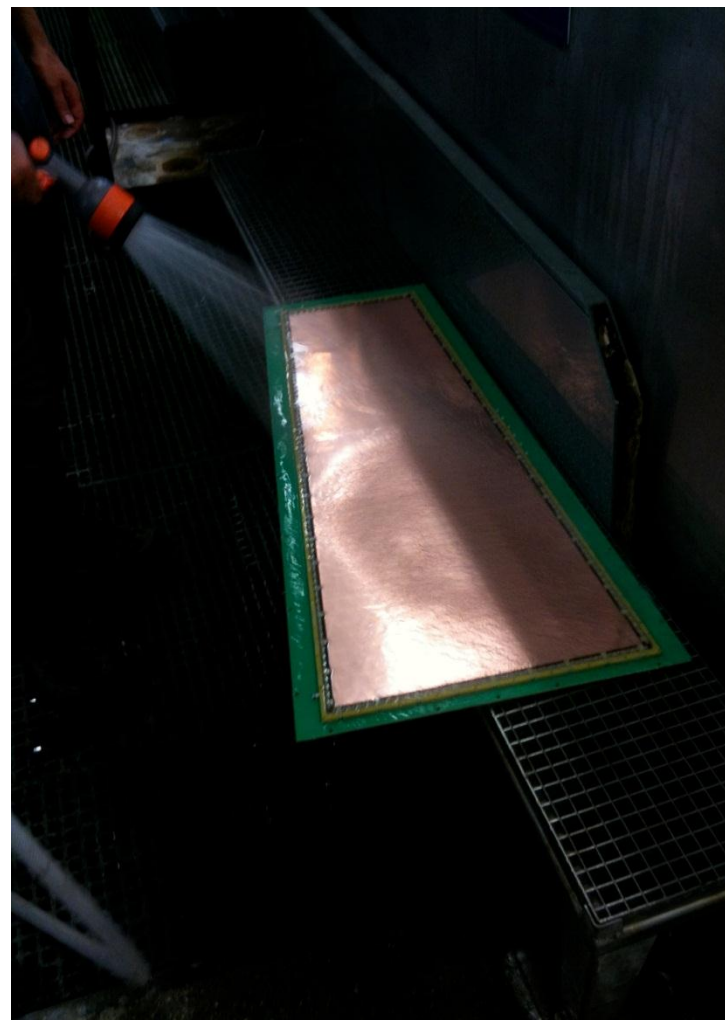
Pins

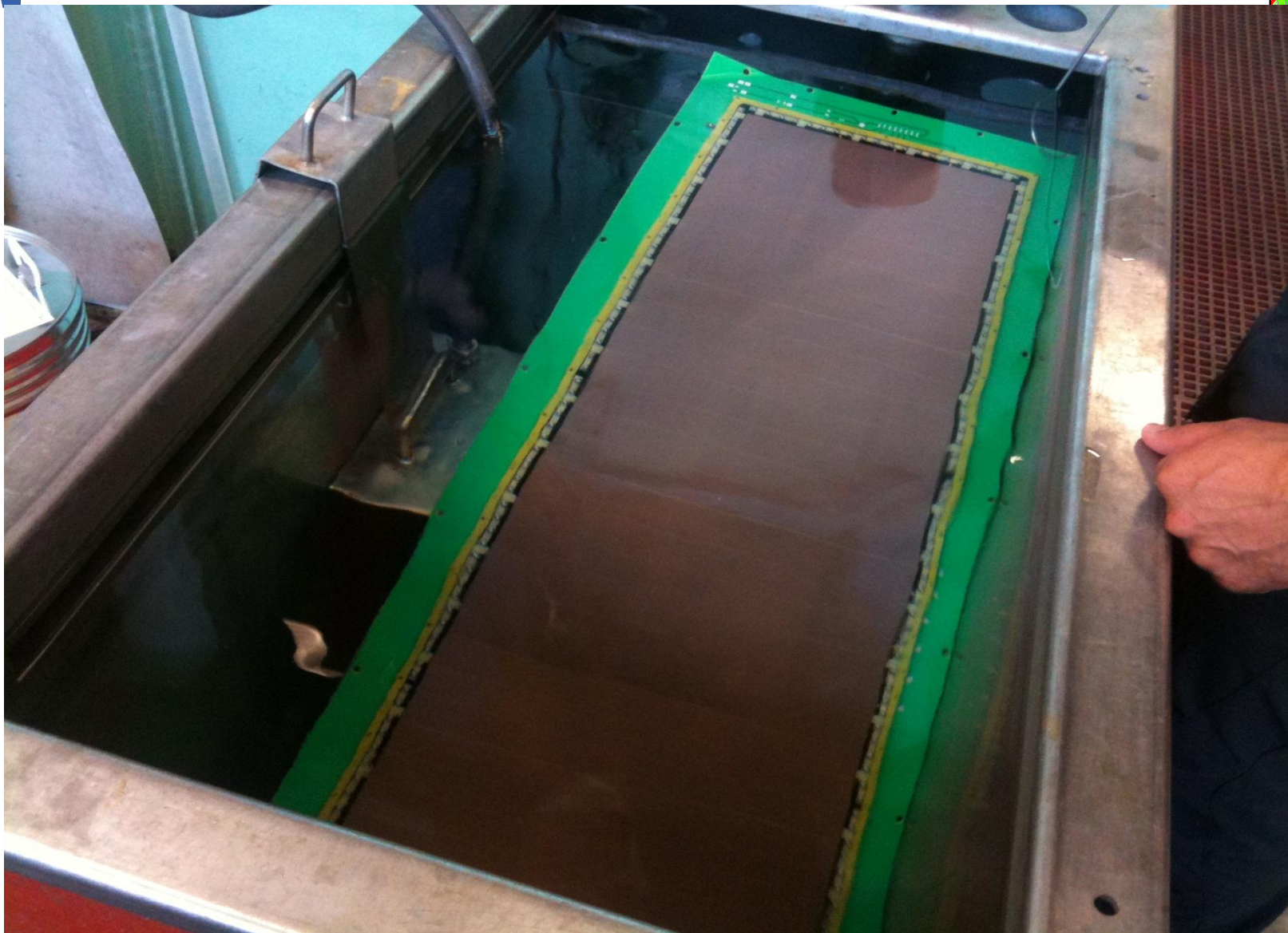
Springs



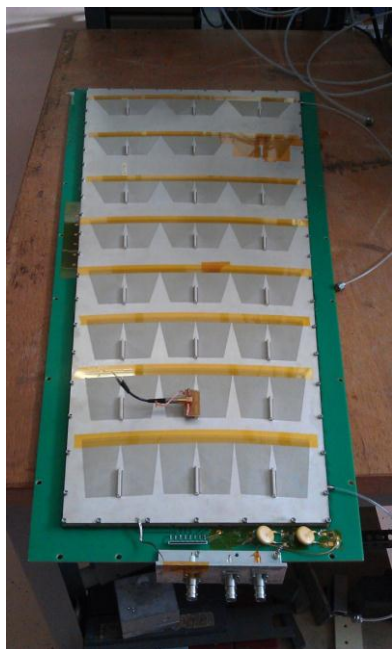






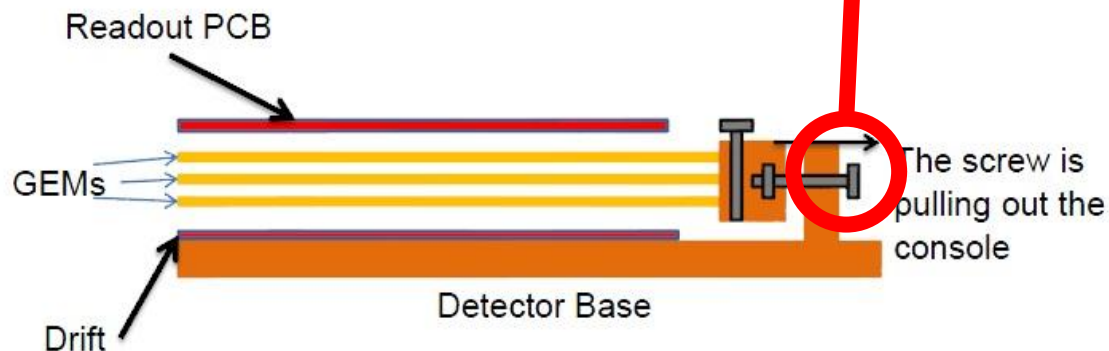


4 detectors completed

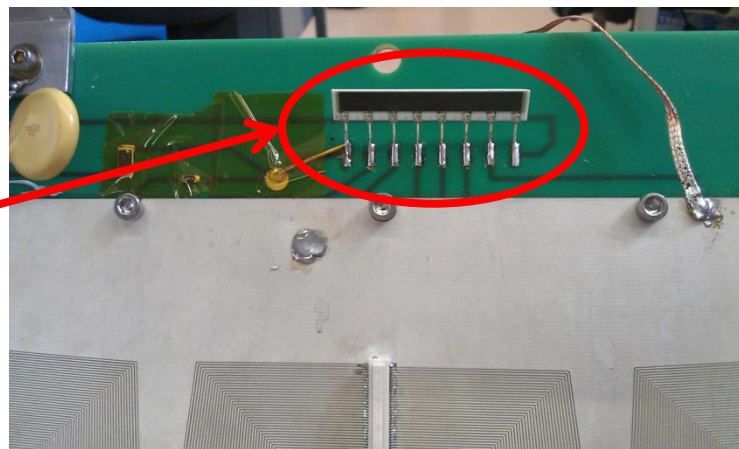
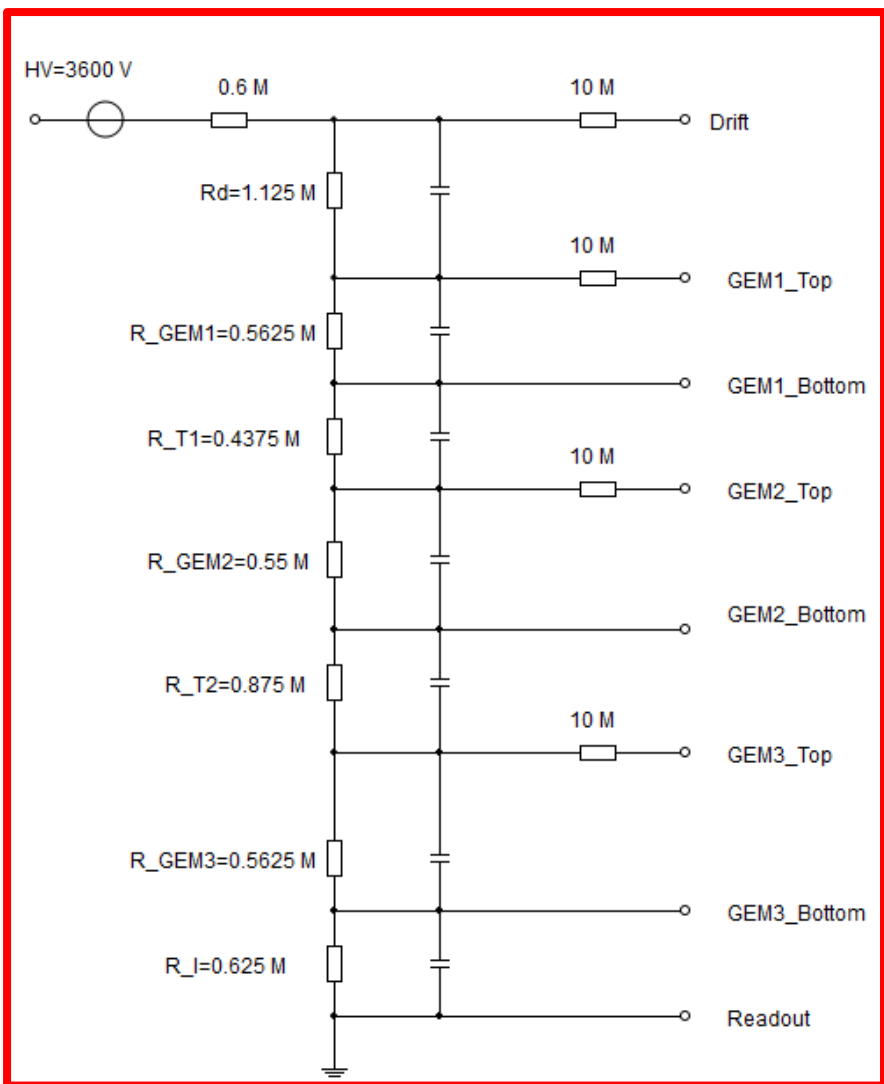


NS2 Technique

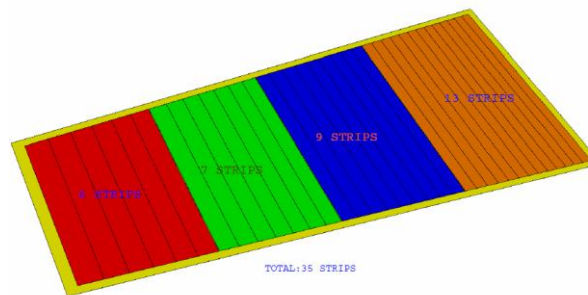
- No spacers in active area
- Assembly time : 2 hours
- No gluing, no soldering
- Re-opening possible
- GEM exchange possible
- No stretch degradation with time
- Stretching more intense



Power supply



Ceramic divider distributing the High Voltage among the 3 GEMs



Gain calibration

CMS – GE1/1 – NS2 prototype

1-8	1-7	1-6	1-5	1-4	1-3	1-2	1-1
2-8	2-7	2-6	2-5	2-4	2-3	2-2	2-1
3-8	3-7	3-6	3-5	3-4	3-3	3-2	3-1





Gain calibration



- For each sector (24 readout sectors) :
 - Counts VS chamber HV supply
 - Output current
 - Position of the X-ray peak
- } Gain VS chamber HV supply
- We want to see if :
 - The **gain** is **uniform** for all the readout sectors
 - All the sectors are working
 - The GEM stretching system is suitable

Gain calibration

Experimental Setup



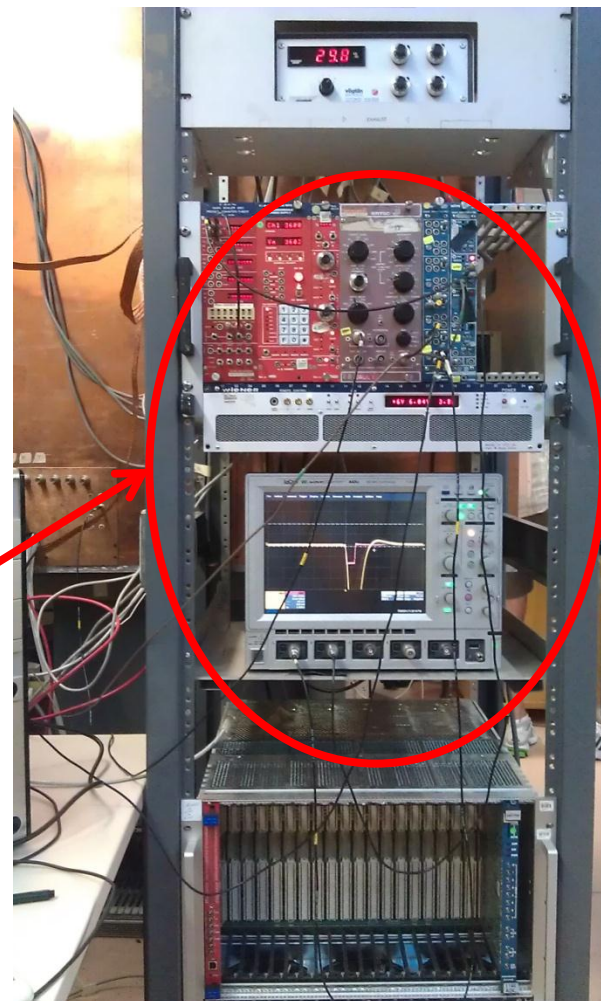
Prototype 1

Copper X – ray
(8KeV)

Holes

Electronic
modules

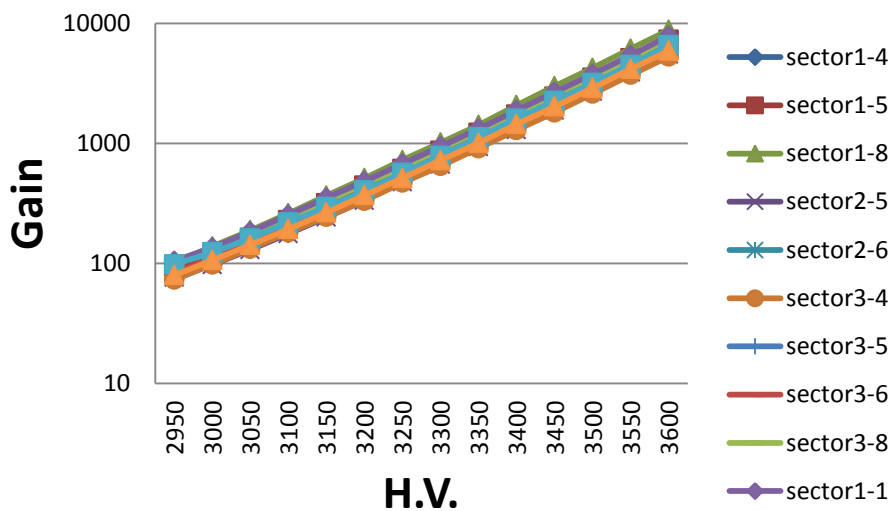
- Gas mixture Ar - CO₂
(70%/30%)
- Gas flow : 5L/hour



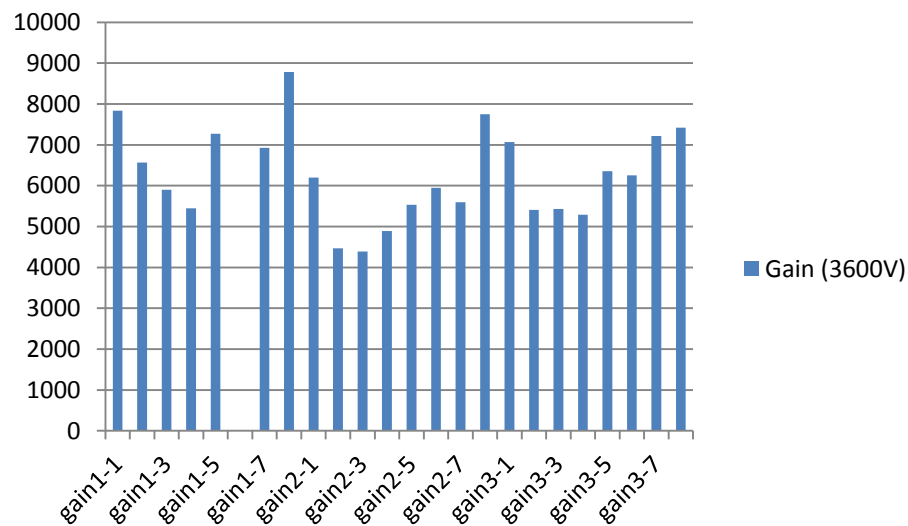
Gain calibration

Chamber 1

Gain VS high voltage applied



Gain (3600V)



Gain calibration

