
Elvia Micromegas activity

RD51 meeting – 06 February 2014

- Elvia PCB group: 8 plants in France and Tunisia
- Main activities: industrial (35%), aero (19%), auto (14%), military (13%), telecom (13%)
- Turnover: 80 M€
- French leader in mil, aero and telecom applications
- Micromegas technology transfer since 2010 (ANR funding since 2011)
- Main MM activity are centralized in Coutances plant (Normandie):
 - Large area PCB
 - Resistive screen printing
 - Bulk process

Roadmap (R&D axis)

- **Precise etching on large area PCBs** (Atlas/NSW, Compass, ...)
 - Strips and pitch accuracy over large length (>2m)
 - Metrology
 - PCB thickness
 - Mapping
- **Resistive layers** (Atlas/NSW, Compass, TD2DM2, ...)
 - Substrates quality
 - Masks alignment
 - Resistivity homogeneity
 - Large areas
 - Buried resistors
- **Multilayer stacking**
 - Large areas
 - Layers alignment
 - Gluing process
 - Pillars manufacturing
- **Bulk** (physics and imaging project, industrialization, ...)
- **Alternative read-out** (Gbar, large area tomo, ...)
 - 2D read-out
 - Multiplexing and mosaic
 - Connectics
 - New geometries

Roadmap (timeline)

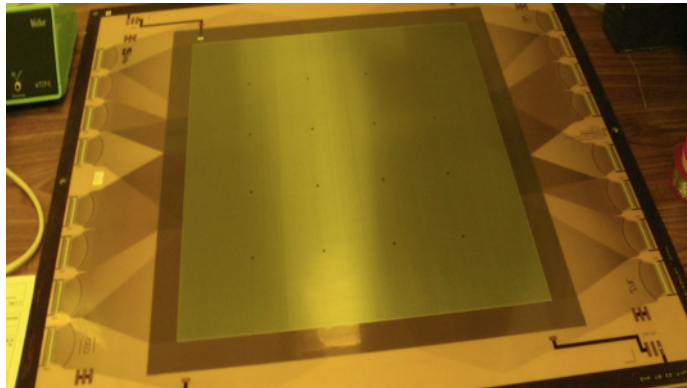
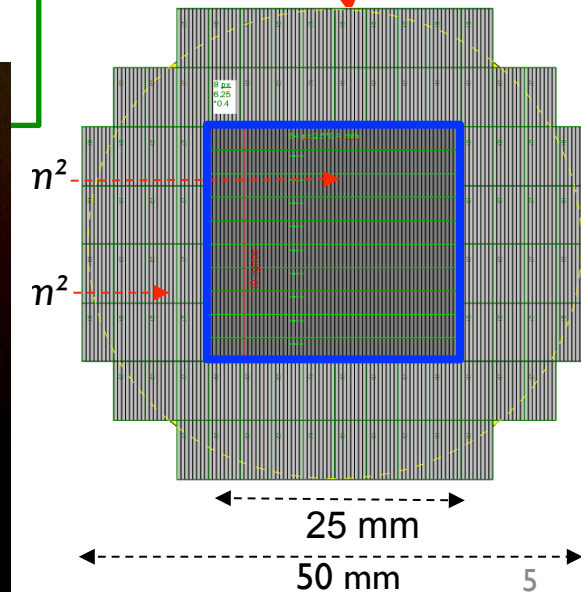
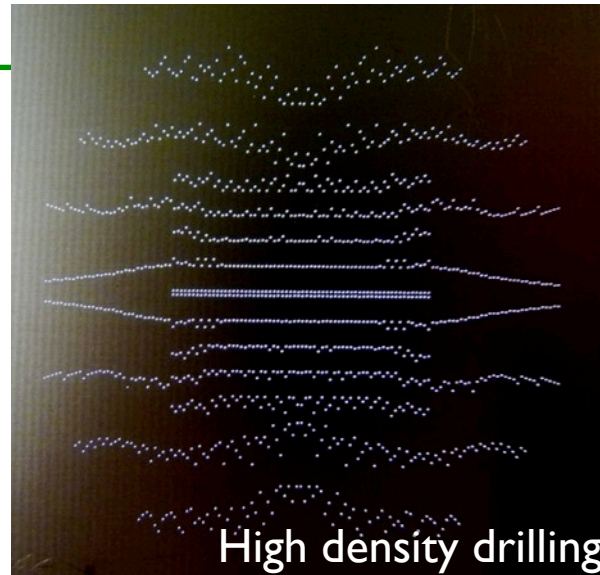
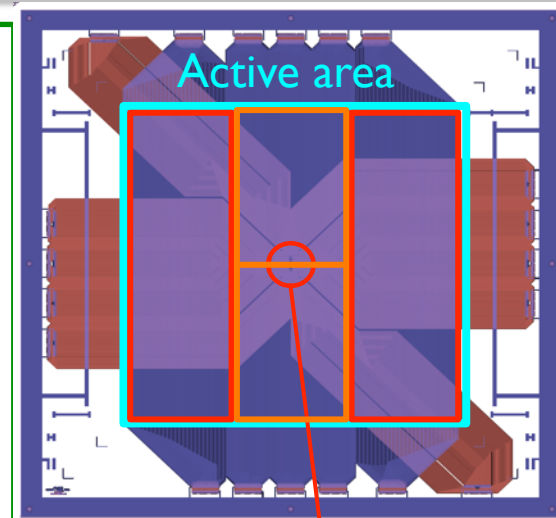
		2014		2015				2016				2017				2018				2019				
		T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	
				[Green bar]				[Green bar]				[Green bar]												
Physique	Atlas (LHC@Cern)			[Blue bar]				[Blue bar]				[Blue bar]												
	Compass (Cern)			[Orange bar]																				
	Gbar (Cern)			[Blue bar]				[Blue bar]				[Blue bar]												
	DVCS (Temple univ, J-Lab)			Etude de faisabilité				[Orange bar]				Réalisation				[Orange bar]								
R&D	Grandes longueurs			[Blue bar]																				
	Grandes largeurs																							
	Assemblage multi-couches			[Blue bar]				[Blue bar]				[Blue bar]				[Blue bar]								
	Nouveaux substrats (polyimides, LCP)																							
Valorisation	T2DM2 (hydrologie)			[Blue bar]				[Blue bar]																
	Densitométrie 3D (Areva)			[Orange bar]				[Orange bar]				[Orange bar]												
	Tomo2D NRBC			1 ans puis prolongation de 2 ans possible				[Light blue bar]																
	Stockage CO2 (Schlumberger)			prospectif: possibilité de contrat sur 3 années				[Light blue bar]				[Light blue bar]												
	Hydrocarbures (Schlumberger)							prospectif				[Light blue bar]												

Compass

- 40 x 40 cm² active area
- 2560 readout channels
- Thin board glued on Rohacell
- 15 detectors for 2015
- Buried resistance in progress
- Layers ready for stacking
- Issues with large format optical control (too high density)

To do:

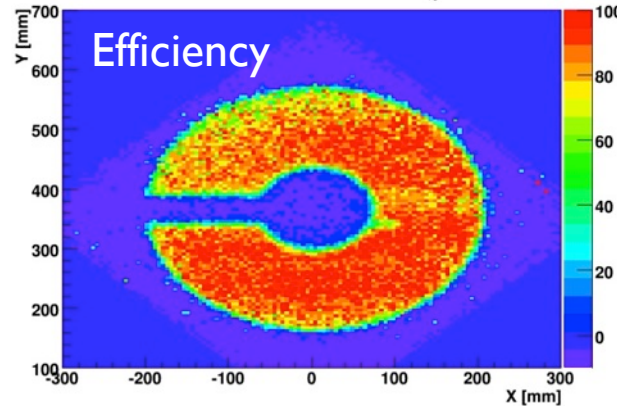
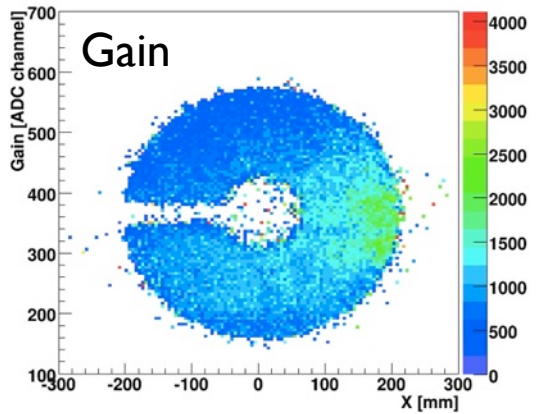
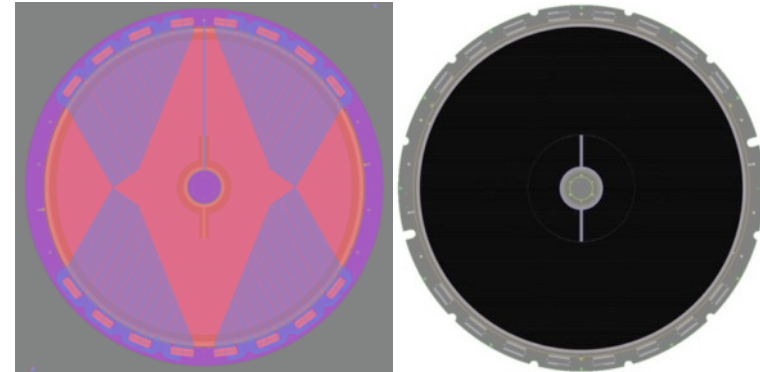
- Optical test in 2 steps
- Stacking on rohacell foam at low pressure in autoclave (2kg/cm²) to avoid glue flowing through μ -holes
- Bulk process next week



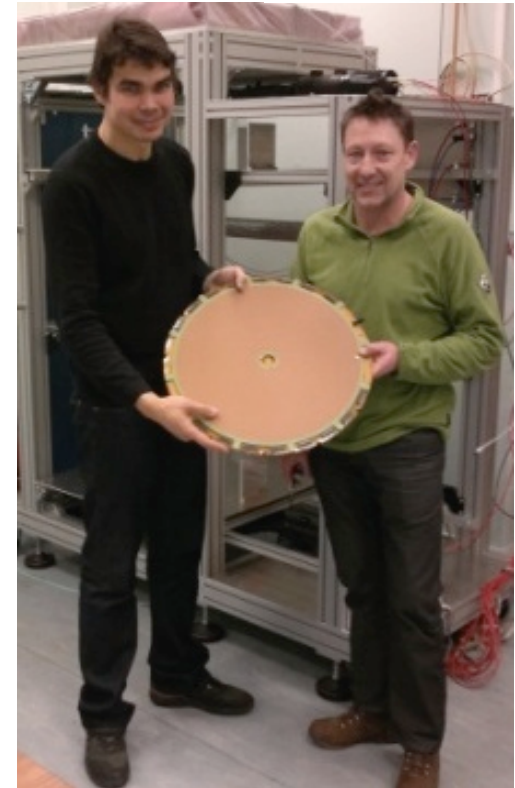
Clas 12

Specifications :

- active area : 430 mm diameter disk with a 50 mm diameter hole at the center
- 100 μm PCB glued on ROHACELL (4mm)
- 500 μm pitch, 100 μm strip gap
- resistive strips



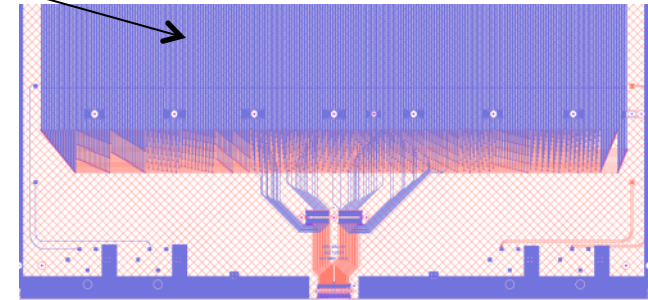
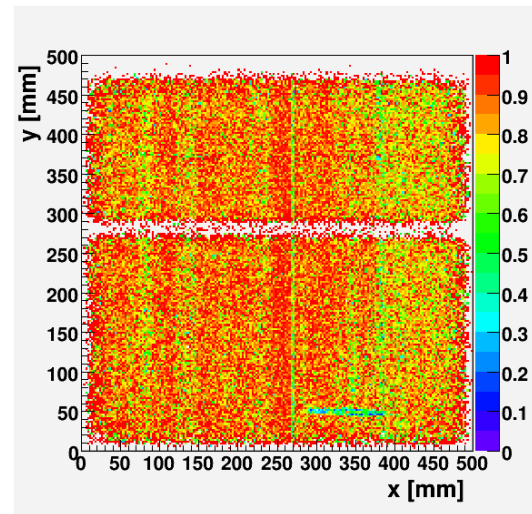
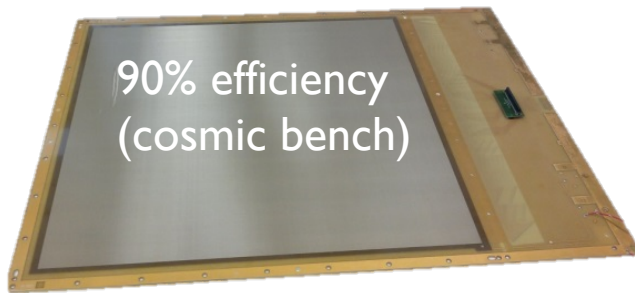
- Production @ Cern:
 - 8 detectors: 6 + 2 spares
 - layout adjustments
 - copper layers: 5 μm



M³

(Muon tomography with Multiplexed Micromegas)

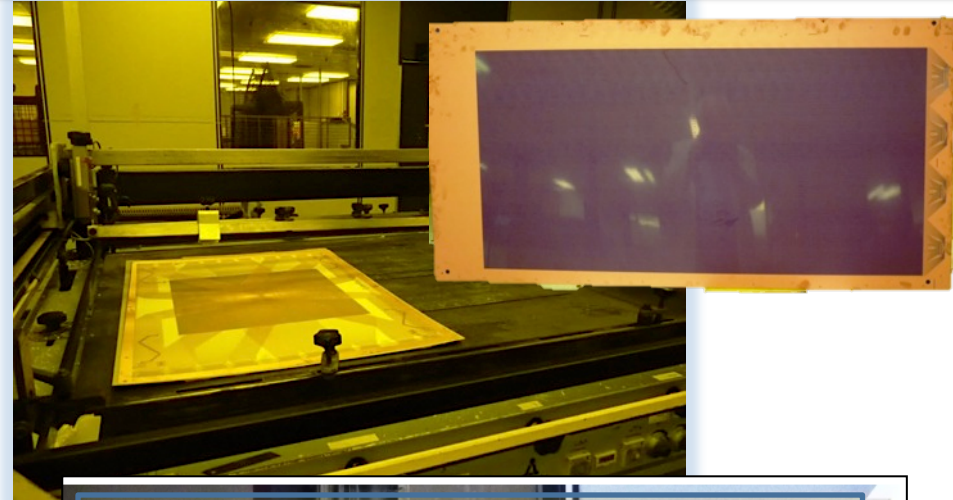
- Multiplexed R/O plane:
 - Aim: reduce the number of electronic channels without spatial resolution degradation
 - 1024 strips can be read out by 61 elx channels



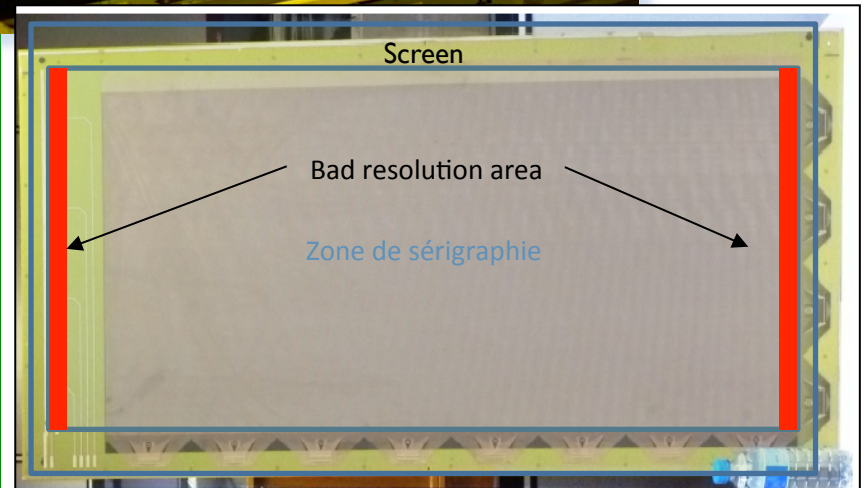
- Towards a tomography system of 2x2x2 m³
 - 2014 → 8 scale-1 prototypes (50x50 cm²), bulk / 2D / resistive / multiplexed
 - 2015 → technology transfer to Elvia (8 detectors)
 - 2016 → production of 48 detectors by Elvia
- Elvia prototype in progress (mid-March)

Geoazur (TD2DM2)

- Muon tomography project (LSBB)
 - Measure of the rock density using the muons from the cosmic rays as a source
- Others applications
 - Survey of tunnels
 - Dynamics of reservoir (aquifer, oil, ...)
 - Homeland security
 - Natural risks (volcan, cliffs, ...)



- Production of 60 telescopes:
 - XY resistif readout
 - 0,5 m²
 - 5 cm drift TPC
- 6 prototypes (end of 2013):
 - 2 protos at Elvia (4 at Cern)
 - Large areas screen printing
- PCB are finished
- Issues with large area serigraphy (decision next week)



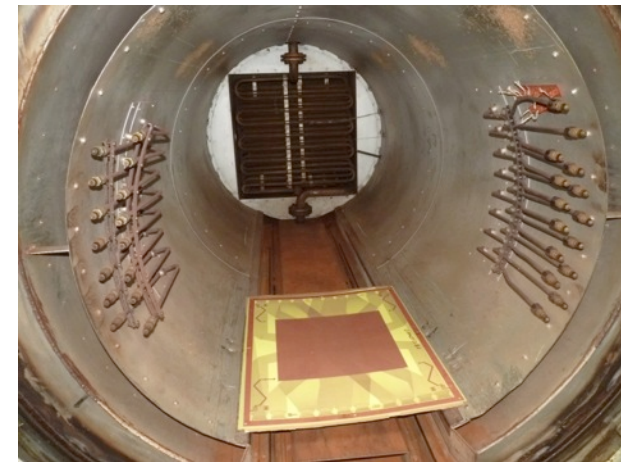
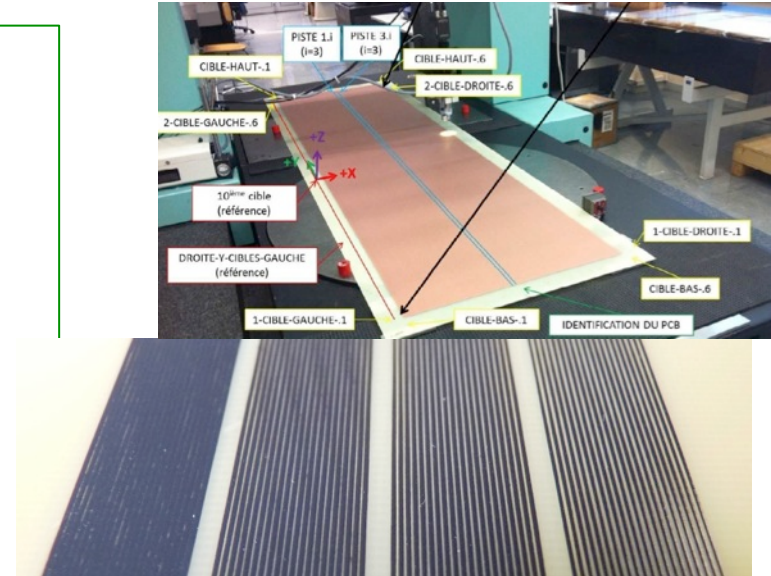
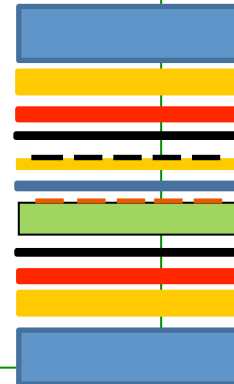
Preg I06 FR4 Htg

Preg I080 FR4 HTtg

Rigide I,6 mm FR

Atlas/NSW

- Large precise PCB
 - 6 PCBs manufactured by Elvia (1x0.6 and 2x0.6 m²)
 - Optical control at Cern metrology lab
 - Very good accuracy:
 - strip pitch (400 / 399±3.5 μm)
 - strip width (270 / 262±5.8 μm)
 - inter-strip gap (130 / 138±5.8 μm)
- Resistive ink screen printing
 - Manufacturing process is ok for 30 cm
 - Homogenous resistance and resistivity
 - Geometry ok taking into account the spreading of the ink
 - Test for longer strip are on-going
- Stacking test
 - Max length 2186 mm (2156 mm)
 - Tooling upgrade needed to achieve 2400 (2370)
 - Max pressure 12 bars
 - Quotation already sent for 4 PCBs



Summary

- Accurate etching on large PCB (up to 2 meters long and 400 μ m pitch)
- Accurate drilling process
- Bulk capability (up to medium size – 0.5 m² – and X/Y r/o)
- Different types of substrates (thin PCB, rohacell, ...), geometries (Clas I 2 forward) and mapping (multiplexed r/o)
- Resistive strips screen printing for small surface (on-going tests for medium size)
- Test of stacking for the Atlas/NSW PCB foreseen for march 2014 (qualification process for Atlas/NSW – first boards expected beginning of 2015)

Thank you for your attention !!



