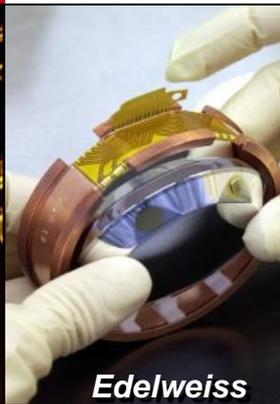


DE LA RECHERCHE À L'INDUSTRIE

cea

T2K Bulk



Déchiffrer les rayons de l'Univers

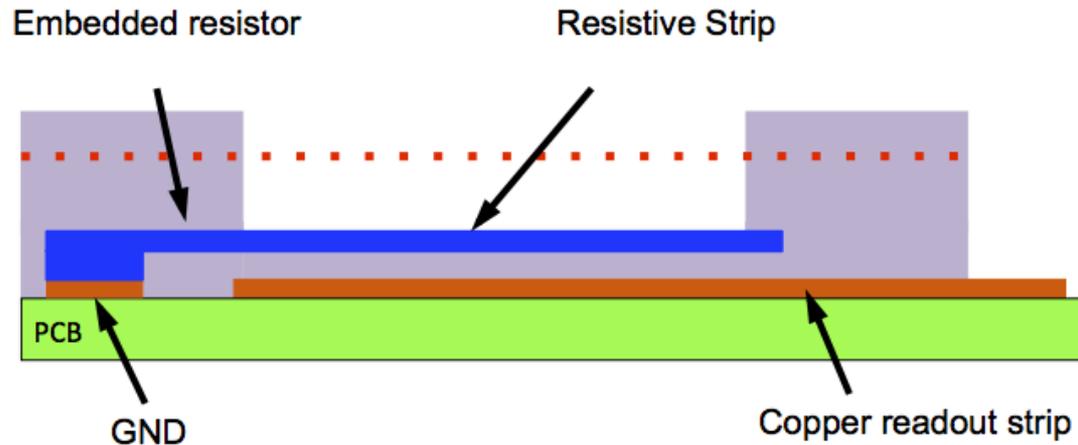


Stephan Aune

20 march 2017

- I. To resist or not to resist**
- II. Bulk at Saclay**
- III. Bulk prototype set up**

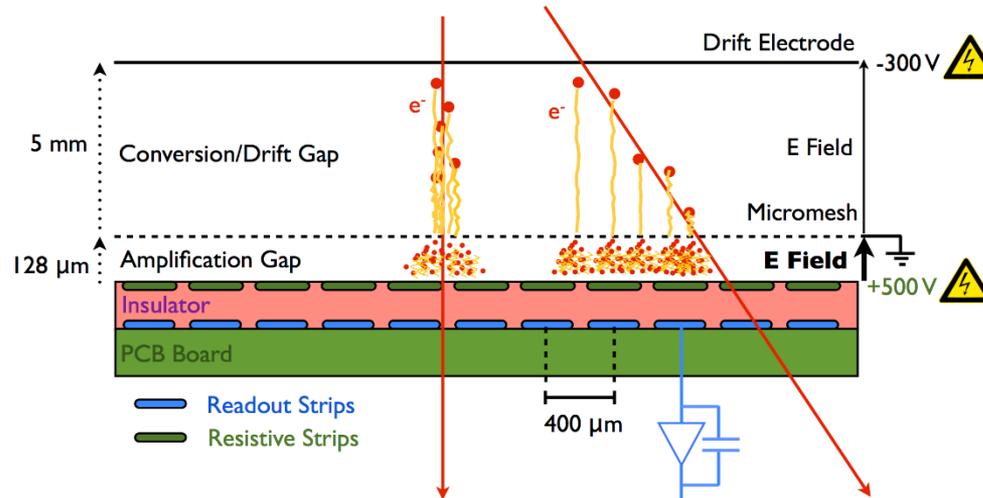
Resistive coating with micromegas detector



- High flux possible with no spark (ATLAS-NSW, CLAS12,...) ☺
- Charge spreading on pads for less electronics channels (ILC,..) ☺
- More gain possible with $+ \sim 40$ V on the amplification mesh ☺
- Mesh grounded and resistive at positive potential for less noise ☺

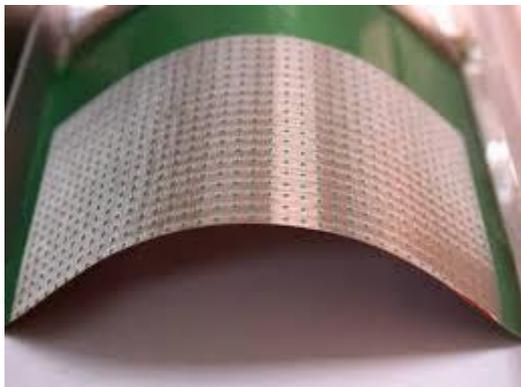
TO RESIST IF GOOD FOR YOU ☺

To resist if good for you but no dust allowed ☹️



- In standard micromegas the dust are eliminated by spark when detector high voltage mesh is first switch on
- No spark = no dust
 - Bulk need to be washed after bulk process
 - Bulk need to be integrated in clean room (1000 or better)
 - Bulk can have erratic functioning ($\sim 1 \mu\text{A}$ current on mesh)
 - Dust issue = surface² ☹️

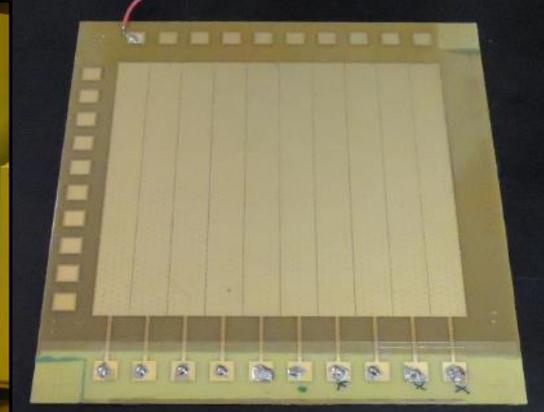
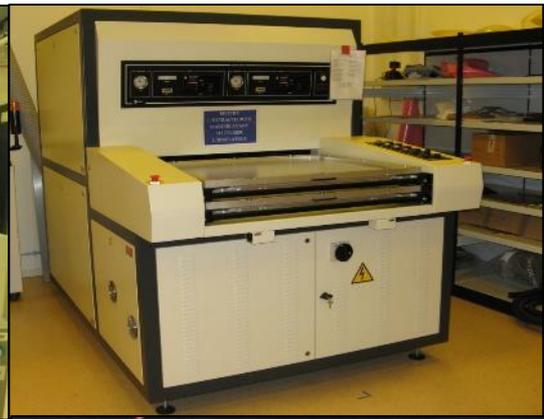
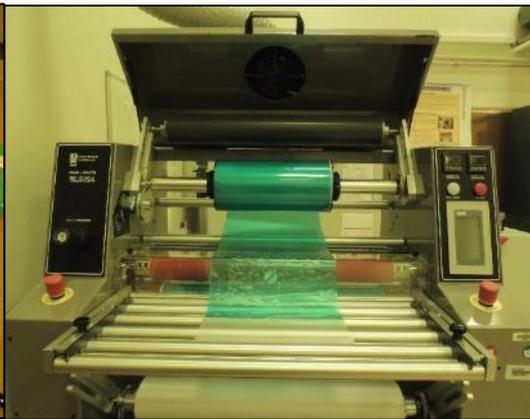
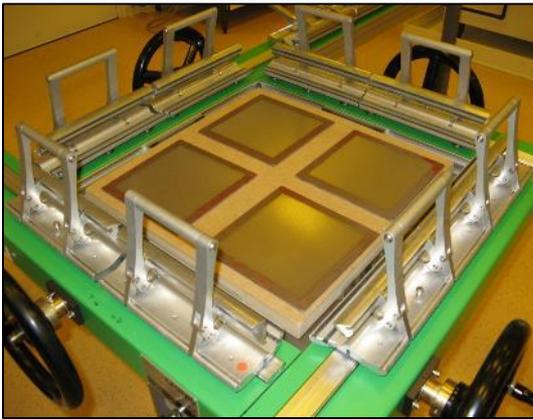
- Forward detector, $\sim 1\text{m}^2$ for six disk; thin PCB on nomex with resistive bulk
 - Washing with deionized water prior integration
 - Washing with caustic soda if current
 - Clean room with ultrasonic bath for all component
 - Filter on gas circulation
 - More spare
- Barrel detector, $\sim 4\text{ m}^2$ for 18 curved bulk sealed detector
 - WASH – CLEAN MECHANICS – VARNISH – FILTERS
 - Infrared search for hot spot
 - $\sim 40\%$ spare
- When possible use standard micromegas (removable mesh, NSW)



IRFU/Sedi

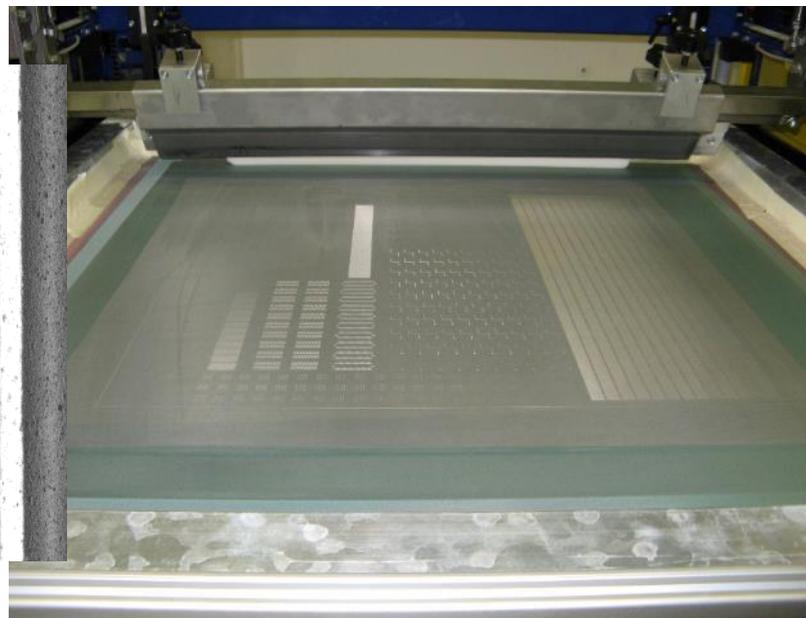
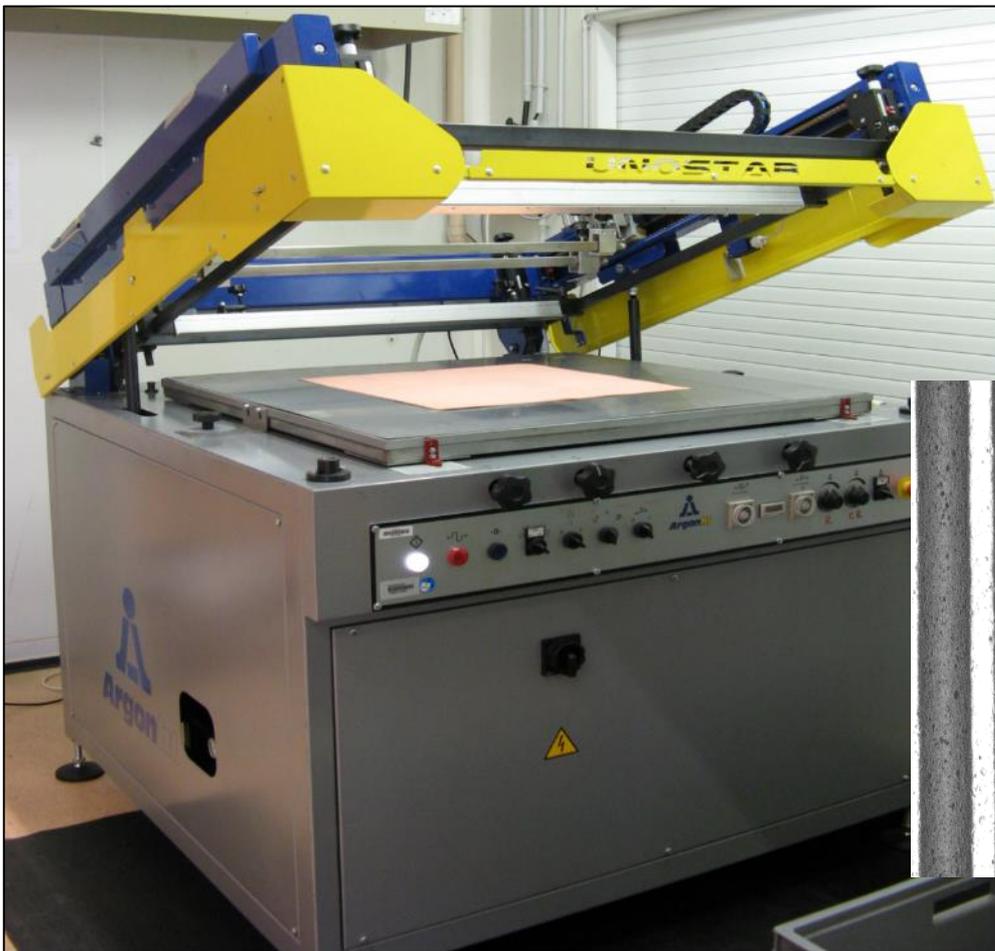


IRFU MPGD workshop; bulk process and screen printing for resistive coating



Sérigraphie: Bat 546 (30 m²) Réalisation de plancher résistif (pistes,...) = principe du pochoir

- Ecran mesh = motif à imprimer
- Pâte résistive (conductrice, isolante)
- Substrat (Mylar, Kapton, verre,...)
- Etuve (polymérisation de l'impression)



Make a set up vessel to test different prototypes (2017-2018)

- Gas vessel without TPC mode ?
 - Smaller vessel for characterization with ^{55}Fe ?
 - TPC vessel with cosmic tracks ?

- Use on the shelf electronics (AFTER, Aget,...)

- Test several possible prototypes
 - Bulk seize of maximum $\sim 50 \times 50 \text{ cm}^2$ (full scale)
 - Normal bulk and resistive bulk
 - Resistive bulk
 - Full or strip screen printing (test several resistivity ?)
 - Bulk with resistive film
 - Multiplex bulk (no resistive but multiplex pads)

MULTIPLEXING PIXELS

3

Number of channels (el.) and pixels (physical pads) :

Multiplexing in 2D = Neighboring pixels are direct neighbors *only one time*

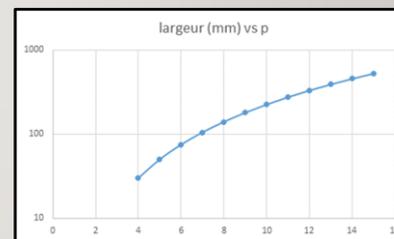
1	2	3
4	5	6
7	8	2

ok

1	2	3
4	5	6
7	1	2

Not ok

$N_{pixels_max}(q,p) = [q(q-1)/2 + 1] * [p(p-1)/2 + 1]$
So 1 DREAM = 64ch = 8x8 => 29x29 pixels (841)



S. Procureur HDR, 2015

(^--- Actually not exactly true, only for square)

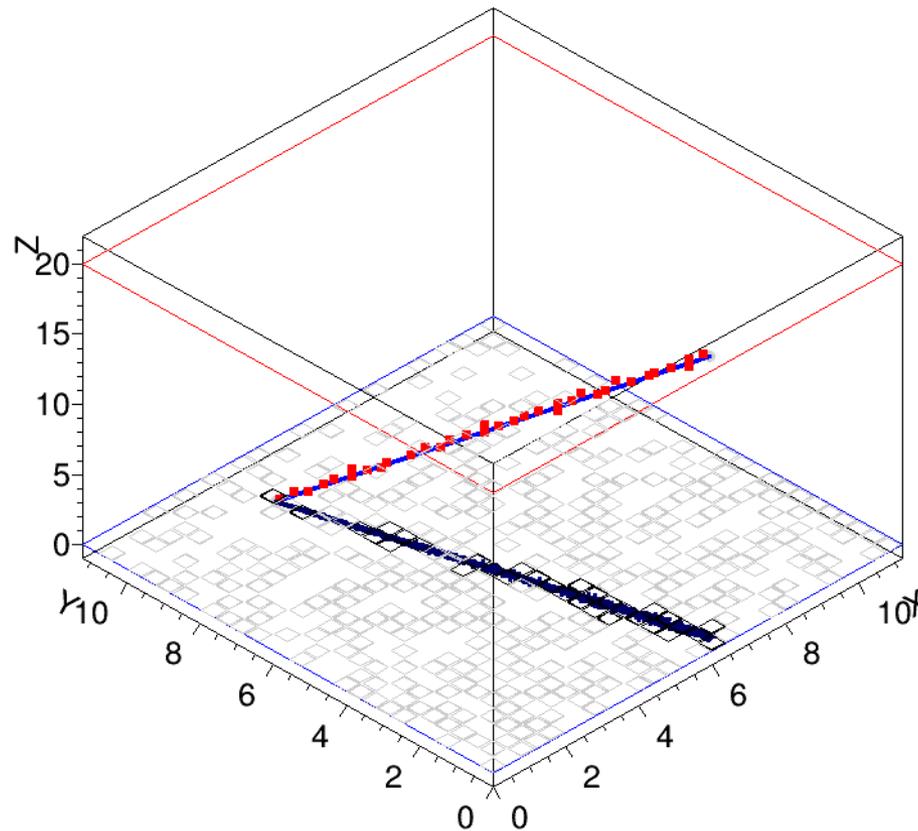
Q*P	NB OF EL. CHANNELS	MAX. PIXELS	SIZE (4mm pads)	SIZE (5mm pads)	SIZE (3mm pads)
8x8	64 ch. (1 ASIC)	29x29=841	11.6x11.6 cm ²	14.5x14.5 cm ²	8.7x8.7 cm ²
11x11	121 ch. (2 ASICs)	56x56=3136	22.4x22.4 cm ²	28x28 cm ²	16.8x16.8 cm ²
16x16	256 ch. (4 ASICs, 1/2 FEU)	121x121=14641	48.4x48.4 cm ²	60.5x60.5 cm ²	36.3x36.3 cm ²
22x22	484 ch. (8 ASICs, 1 FEU)	232x232=53824	92.8x92.8 cm ²	116x116 cm ²	69.6x69.6 cm ²

CEA/IRFU - Maxence Vandembroucke - RD51 - 12/2016

https://indico.cern.ch/event/588409/contributions/2387696/attachments/1387555/2112226/TPCMG2D_RD51_2016.pptx

CLUSTERING (2)

- Artificial time division creates bad events when too much channels are in one time bin (horizontal tracks):



=> Limitation on track angle + refit to remove bg.