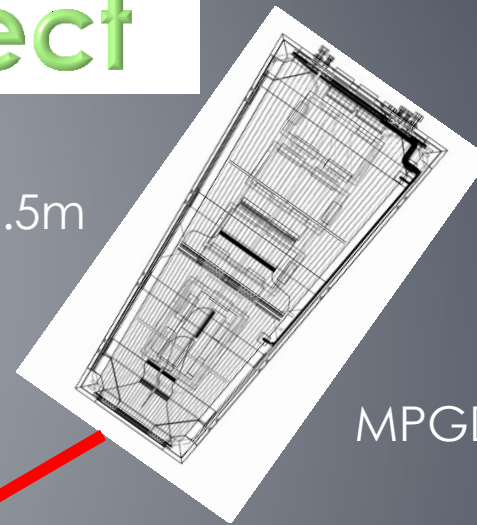


# Summary

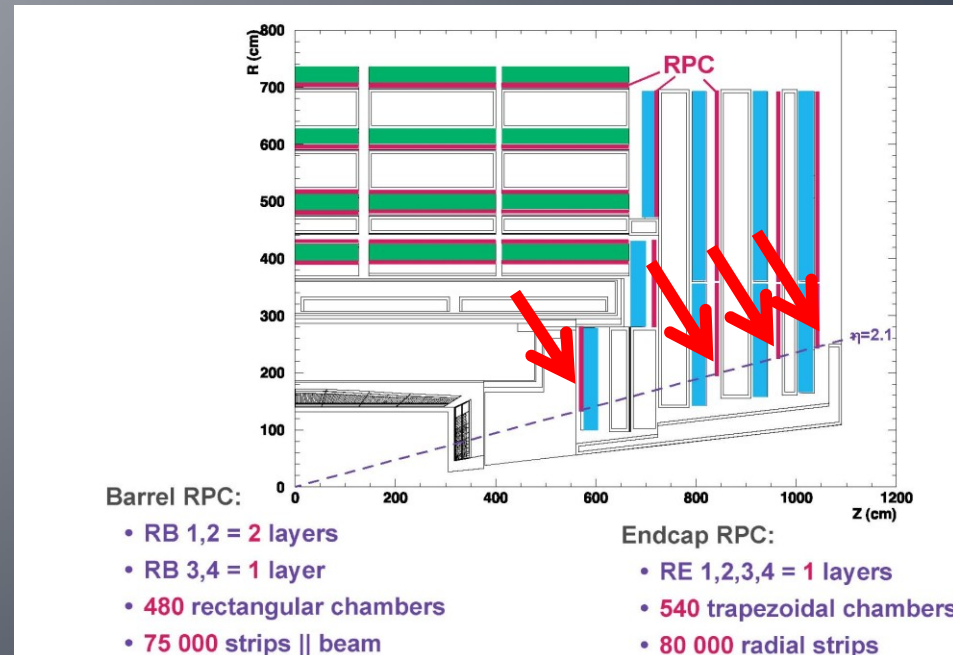
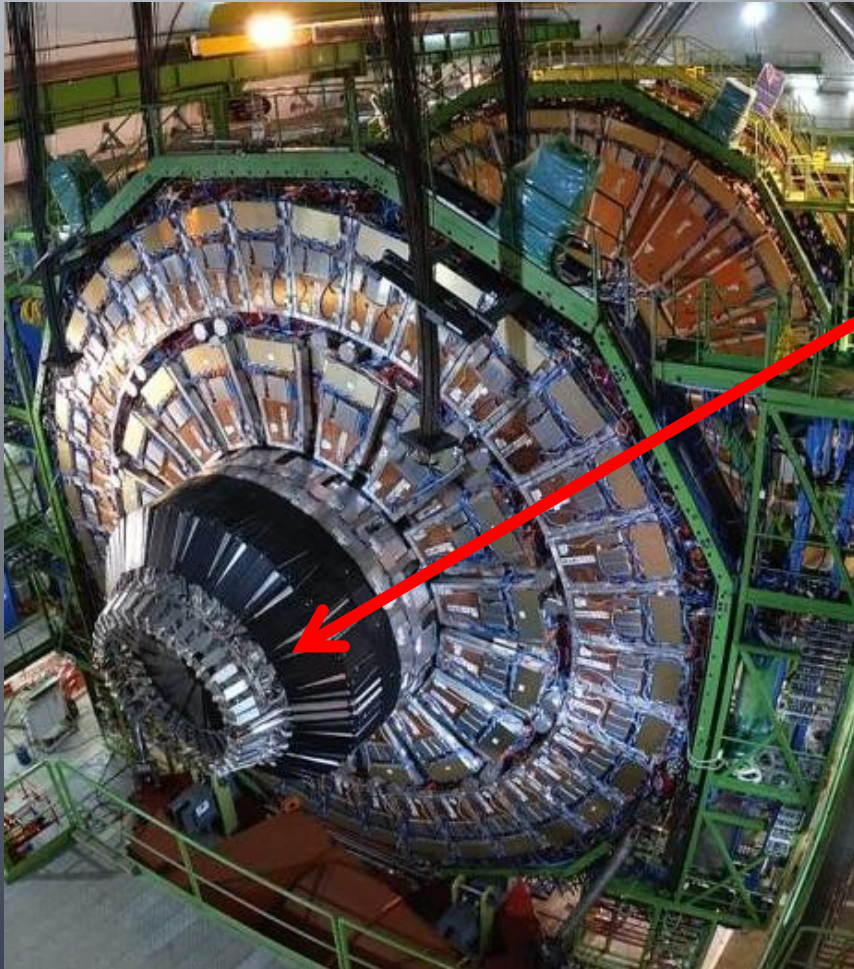
- ▣ **Large GEM**
  - CMS RE1-1
  - Kloe
  - Ns2 ( No stretch No stress)
- ▣ **Large Micromegas**
  - Atlas MAMA project
- ▣ **Large THGEM**
  - Double phase pure argon project
- ▣ **Equipment for large size detectors update**
- ▣ **Next workshop**

# CMS RE1-1 project

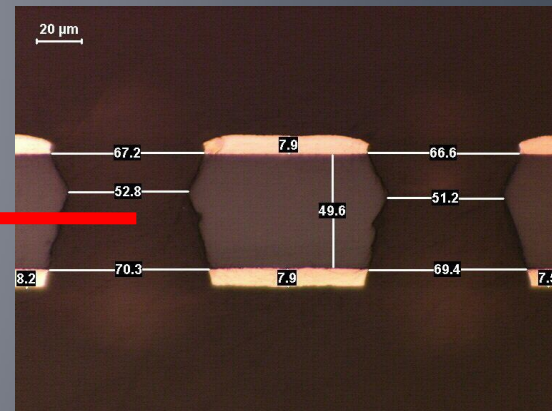
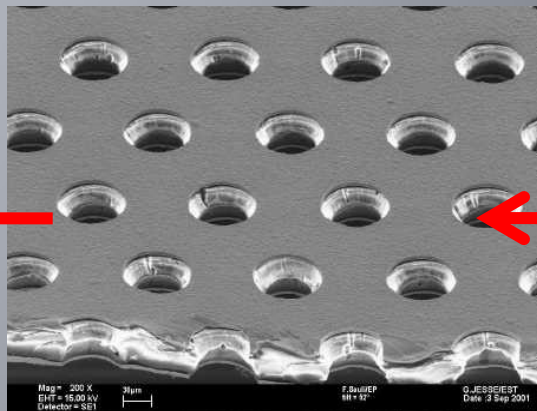
1m x 0.5m



MPGD Vs RPC



# CMS RE1-1 project



- 6 GEMs produced
- 1m x 0.4m Single Mask
- Yield : 8 GEMs for 6 Good (process tuning)
- No problems due to GEMs in the final detector

# Kloe

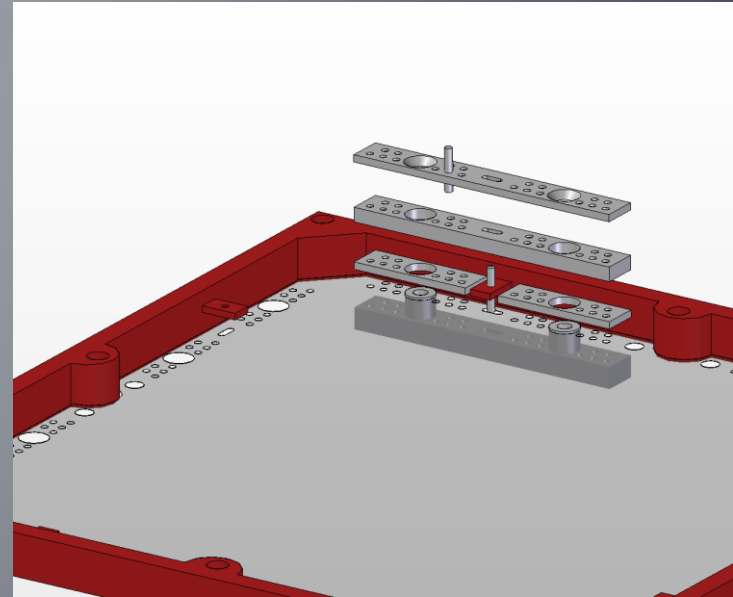
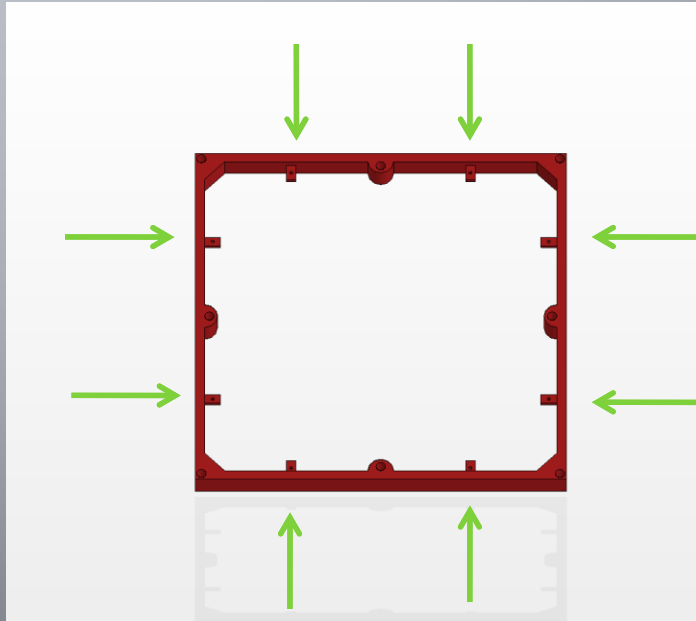


- Single mask process
- 1 m x 400mm
- Std hole pattern
- Gem segmented (100cm<sup>2</sup>)

15 GEMs already produced and tested

New batch of 15 GEMs in production  
-delivery end of January

# Ns2 project



- Triple GEM detector without spacers in active area
- No tool for stretching
- No gluing
- Detachable
- 7 to 8mm Complex frame
- Goal :1h assembly for a 100mm x 100mm detector

# Atlas MAMA project

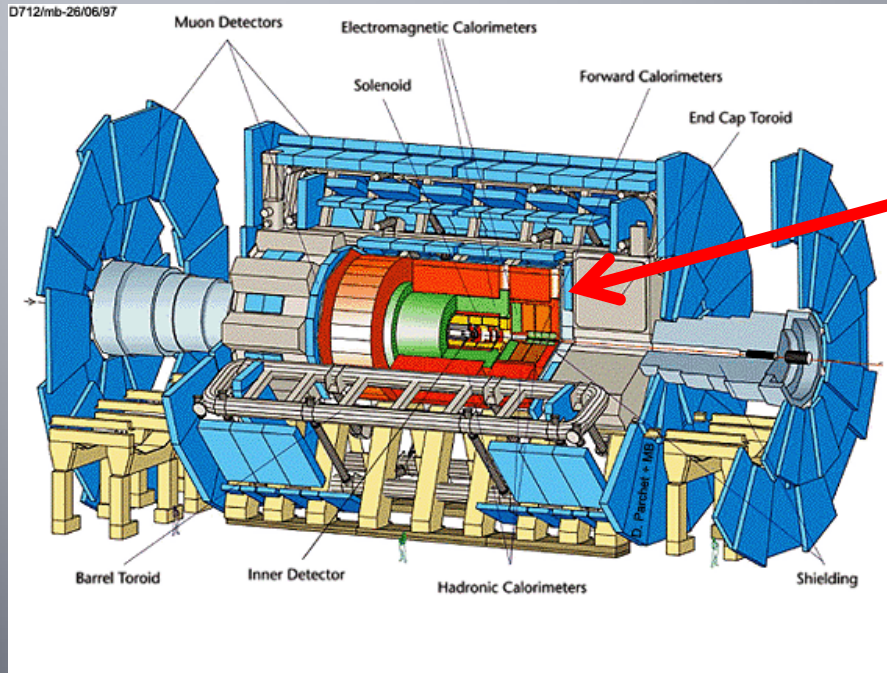
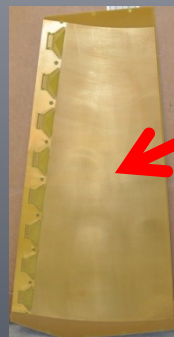
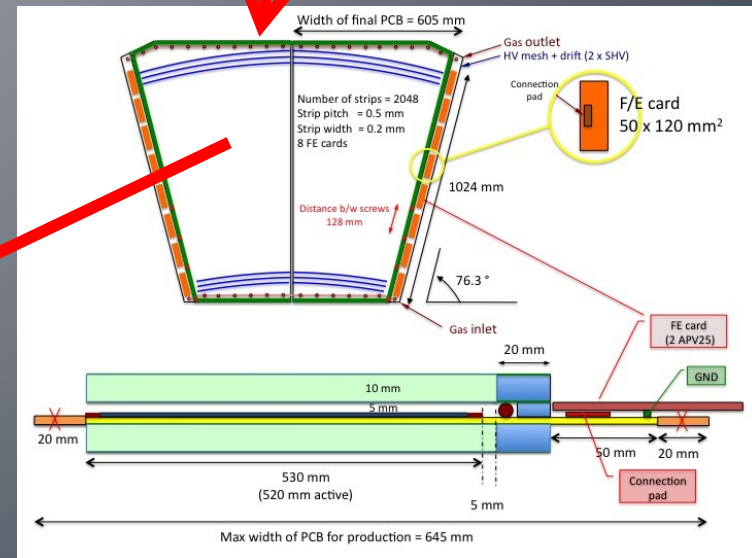
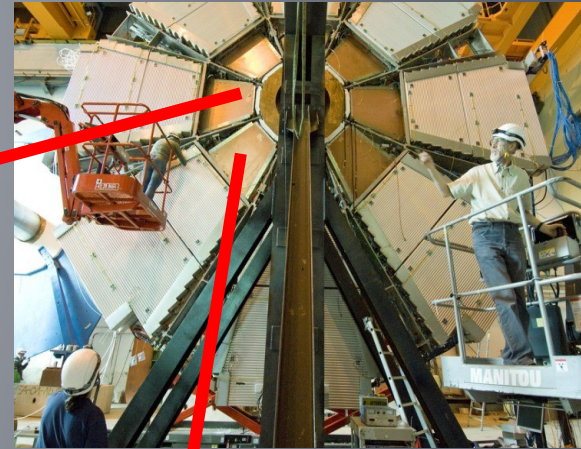


FIG. 1: Lay-out of the ATLAS detector with its major sub-system components. The diameter is about 25m, the total length about 46m, and the weight 7000 Tons.



1.1m x 600

# Atlas MAMA project



2 Bulks have been produced

-1 Standard Bulk (S1)

- No production problems
- Detector works

-1 Resistive Bulk (R1)

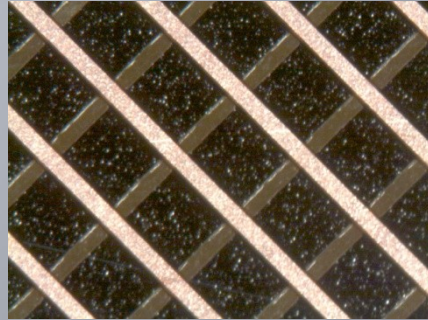
- Leakage current  $\rightarrow 2\mu\text{A}$  @ 500V?
- Development problem?
- One line connected to mesh?



-Many cleaning procedure have been performed:

- Potassium Permanganate
- Concentrated Sulfuric acid
- Karsher cleaning
- Extremely robust structure

# THGEM and read-out for Double phase pure argon LEM-TPC with 2D anode



THGEM description:

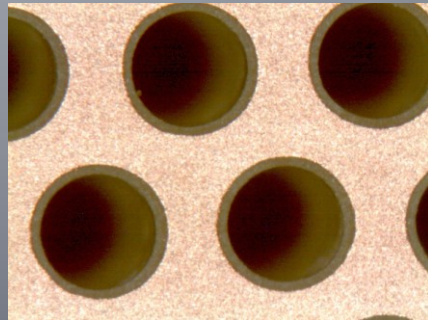
- 800mm x 400mm Halogen Free
- 1mm & 2mm thick
- RIM 40um (differential etching)
- 0.8mm pitch
- 0.5mm hole diameter

@ ELTOS:

- Drilling
- Photolithography
- Differential etching

@ CERN:

- Thermal treatment
- Passivation
- Cleaning
- Electrical Test



@ CERN : full Read-out 2D production



# THGEM test

Tested in air

1 mm  $\rightarrow$  4kV

2 mm  $\rightarrow$  7kV

Results are consistent with  
Paschen law in air

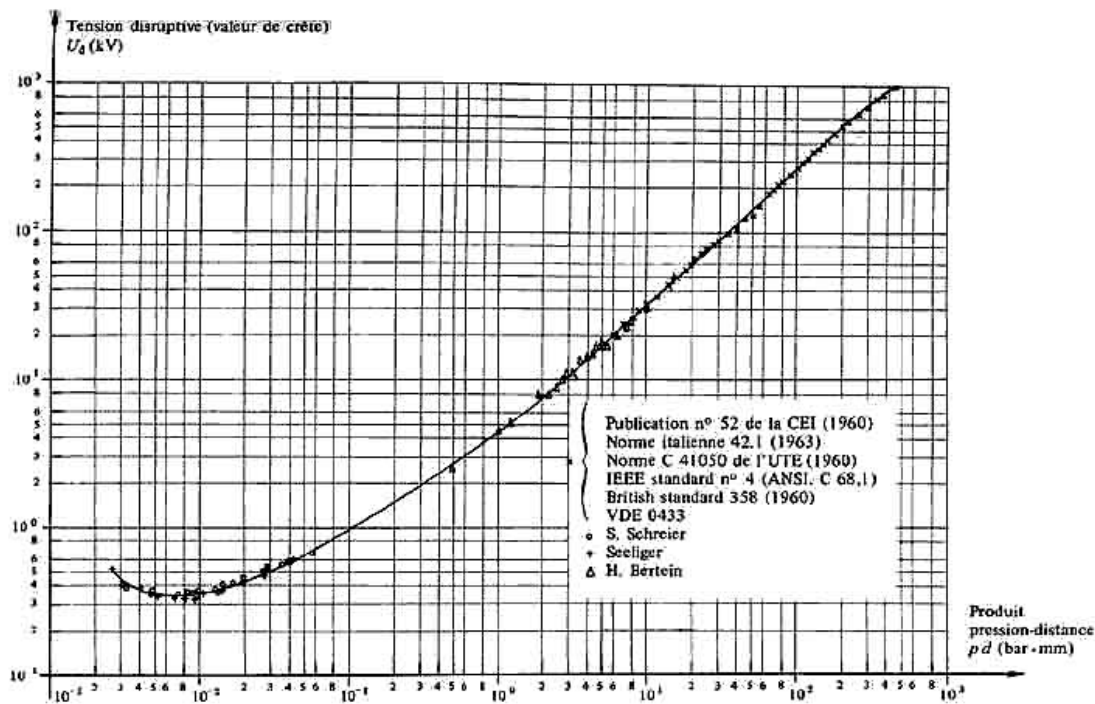


Fig. 9.11 Courbe de Paschen pour l'air en échelles logarithmiques. Température 20°C [262]

# Equipment

- ▣ Investment of 785 KChf 2010-2011
  - Large developing machine (DR)
  - Large copper etching machine (DR)
  - Large stripping machine (DR)
  - Large laminator (ordered)
  - Large dryer (ordered)
  - Large oven (OK)
  - Large exposure machine(OK)
  - Continuous Kapton etching machine(OK)
  - Electro-chemical copper etching line(study)
- ▣ All the machine should be running by mid 2011

# For the Next workshop

- Re Production of a large resistive BULK for MAMA
- Introduce the first 2 D Micromegas Read-out with only capacitive coupling and Resistive protection (R16)
- Ns2 project → detector 100mm x 100mm