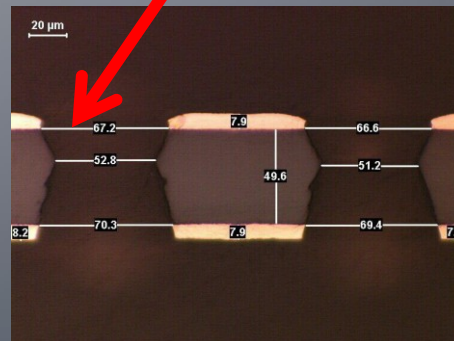
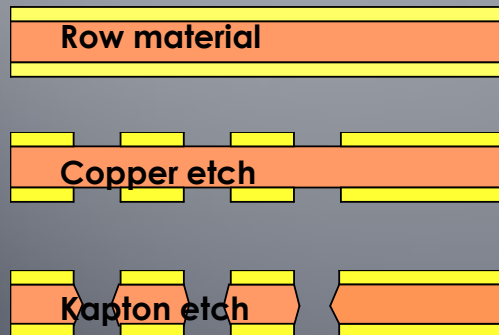
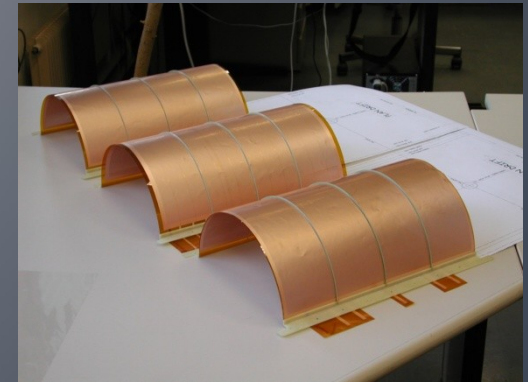
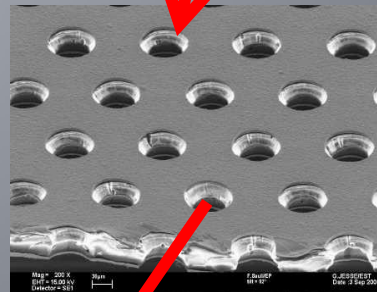
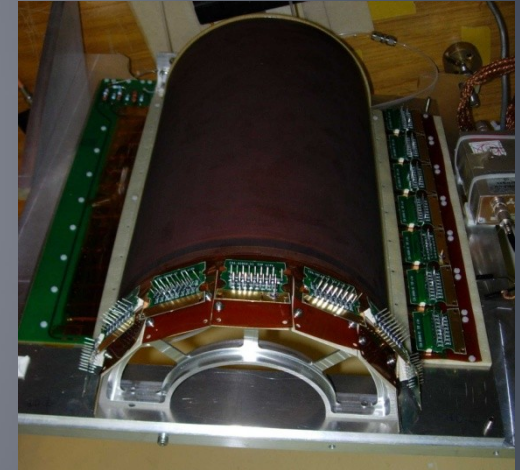
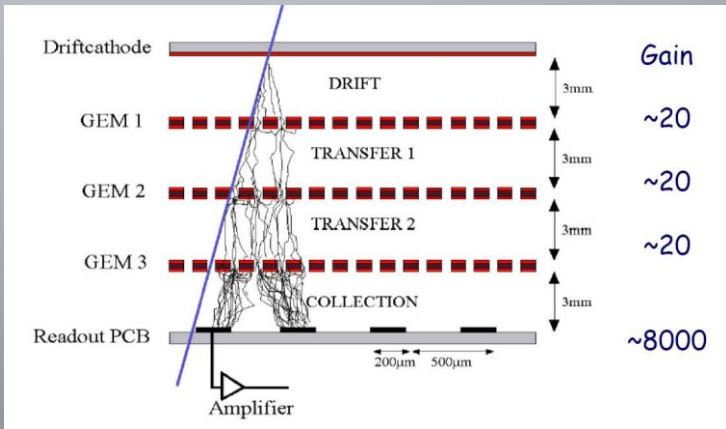
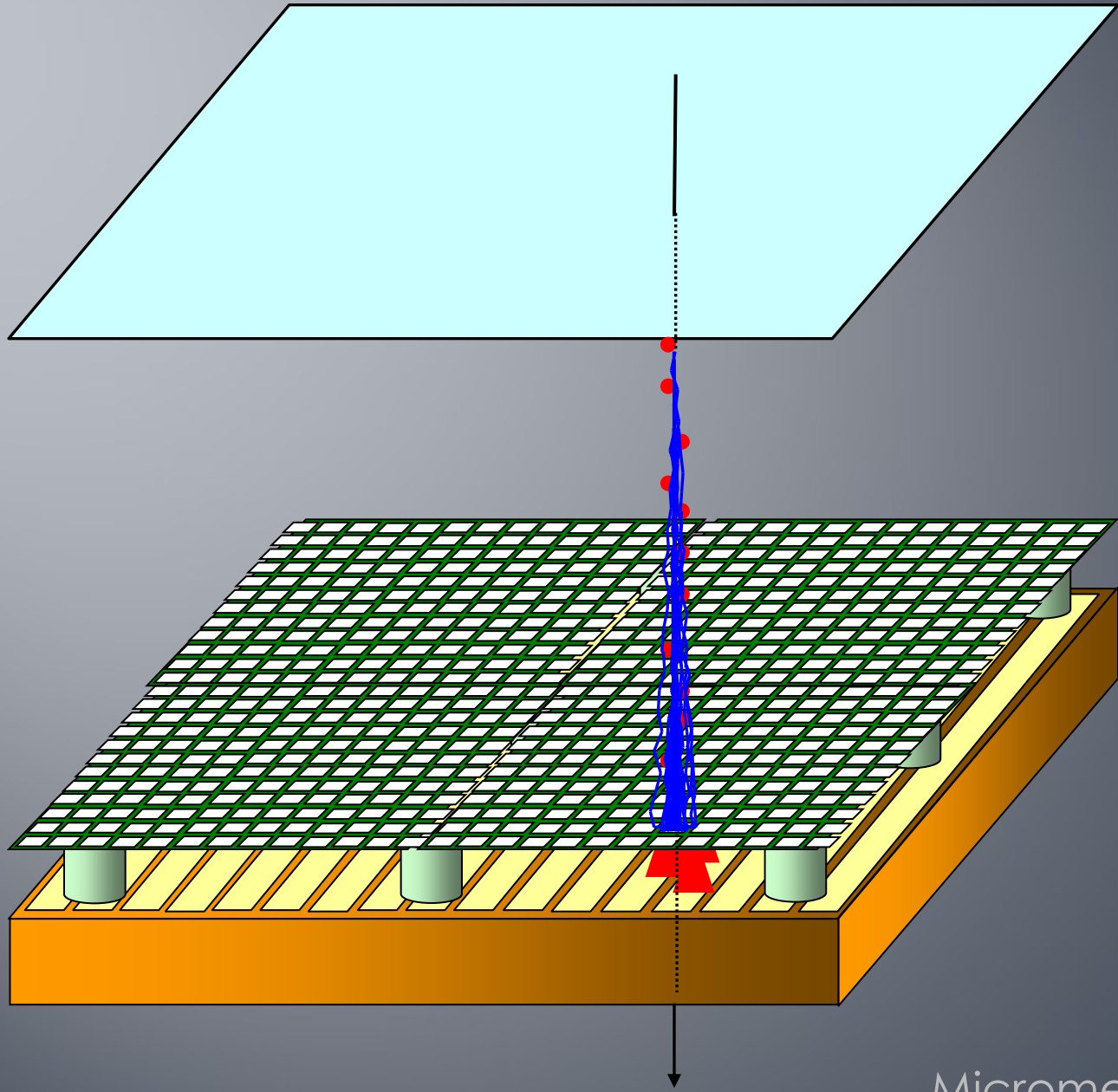


# Summary

- ▣ **MPGD principle ( Micro Pattern Gas Detector)**
  - GEM
  - Micromegas
- ▣ **Large detector projects**
  - CMS
  - Atlas
- ▣ **Timing/equipment/ man power**

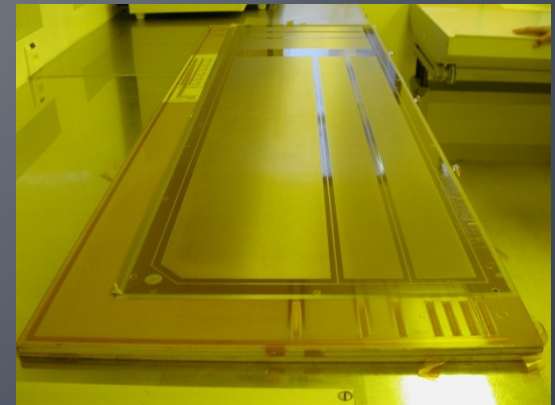
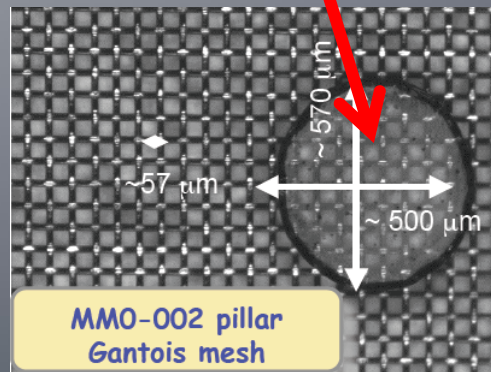
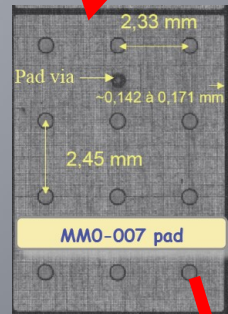
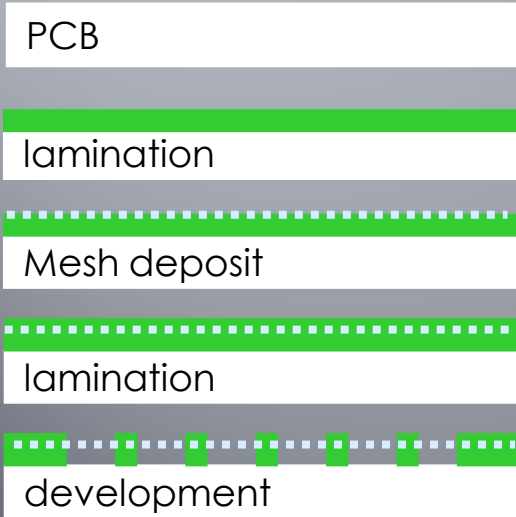
# GEM detector principle





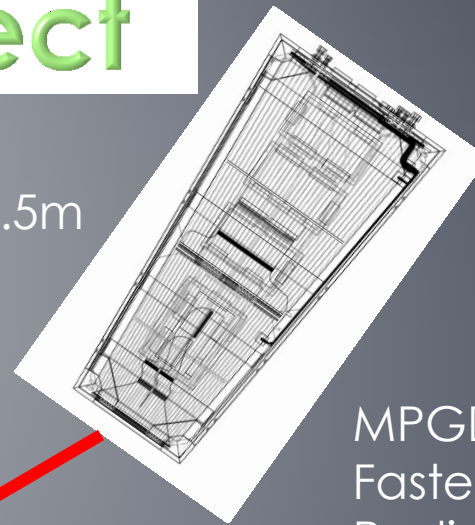
Micromegas principle

# Micromegas

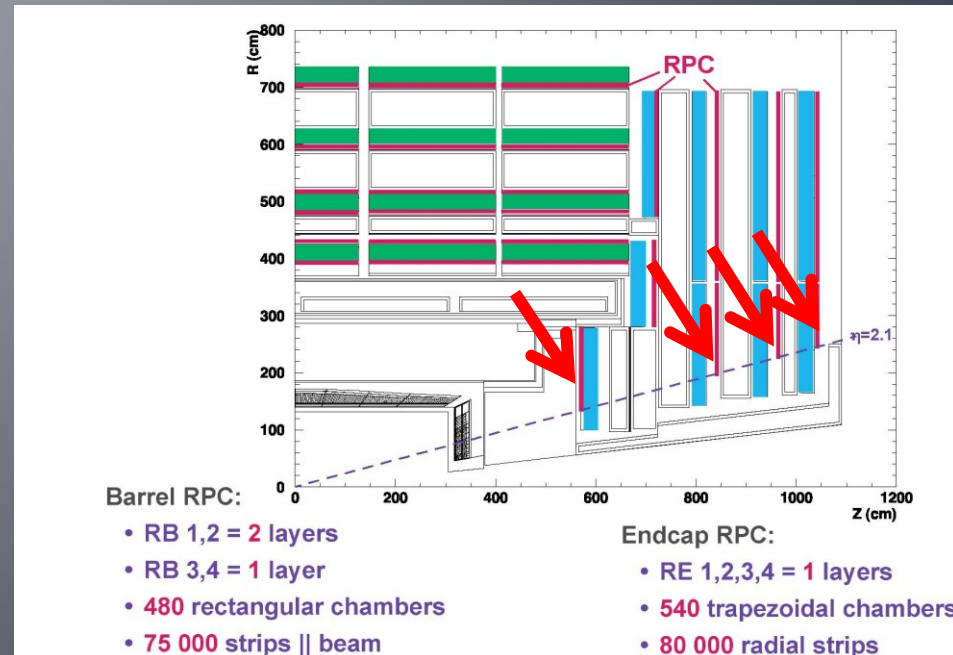
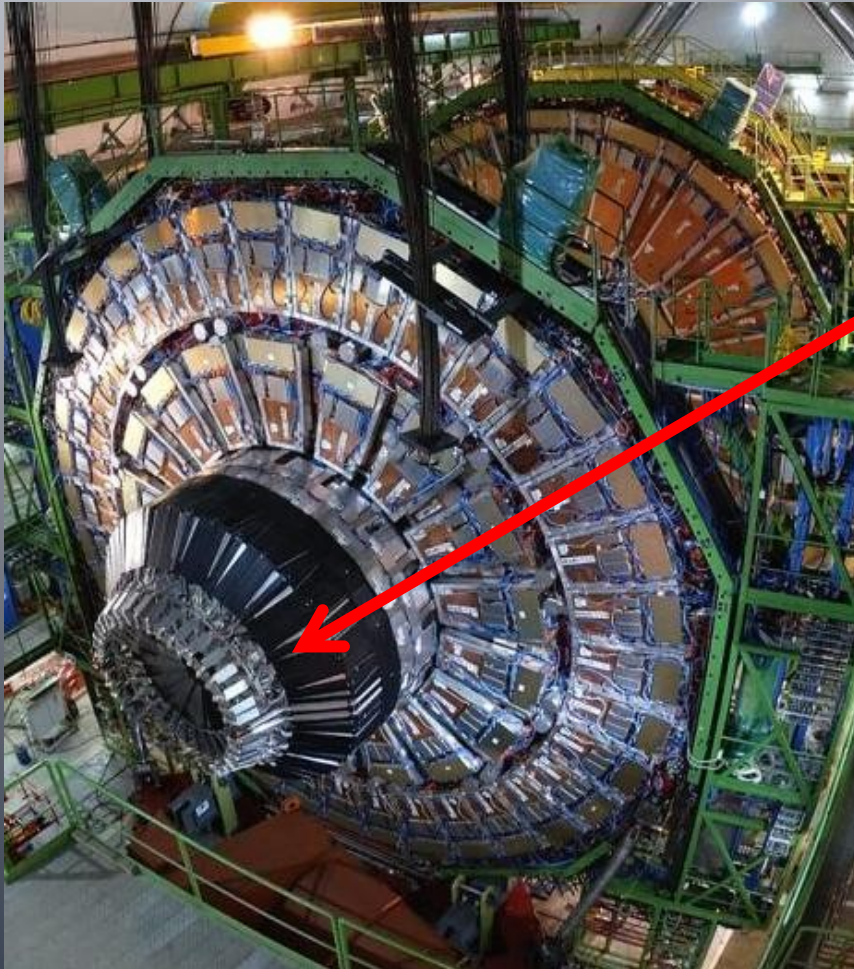


# CMS RE1-1 project

1m x 0.5m



MPGD Vs RPC  
Faster  
Radiation hardness



# Atlas CSC replacement project

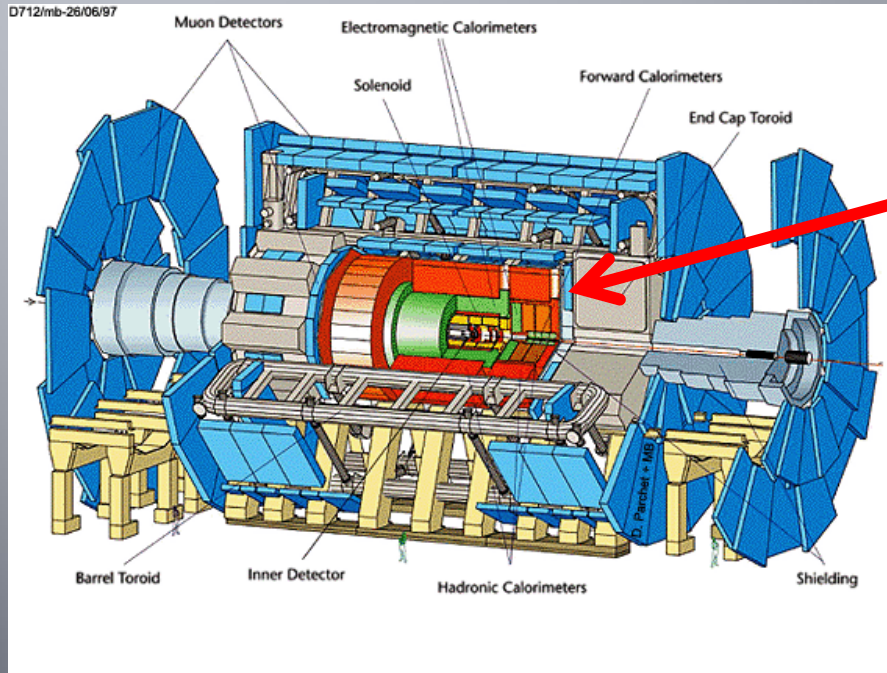
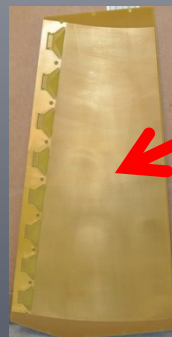
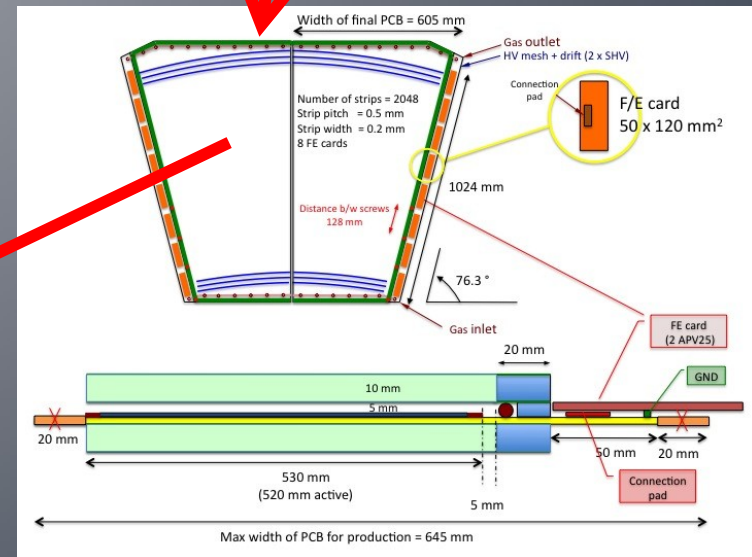
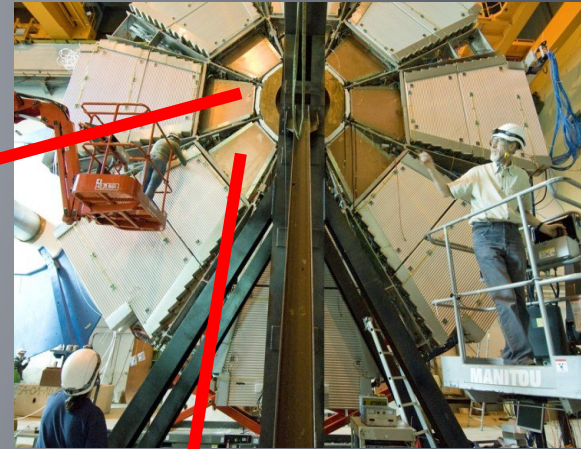


FIG. 1: Lay-out of the ATLAS detector with its major sub-system components. The diameter is about 25m, the total length about 46m, and the weight 7000 Tons.



1.1m x 600

# Timing

- ▣ CMS
  - 2010 → 2 prototypes OK
  - 2011 → build 2 new prototype for test beams
  - 2012 → large production of 80 detectors at CERN
  - 2013 → large volume production with industry
- ▣ Atlas
  - 2010 → prototype Normal Bulk OK
  - 2011 → build large protected Bulk
  - 2012 → install few detectors in ATLAS
    - ▣ Start large volume production with industry (100pieces)

# 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 (ordered)
  - Large exposure machine(OK)
  - Continuous Kapton etching machine(ordered)
  - Electro-chemical copper etching line(study)
- ▣ All the machine should be running by mid 2011



# Man power

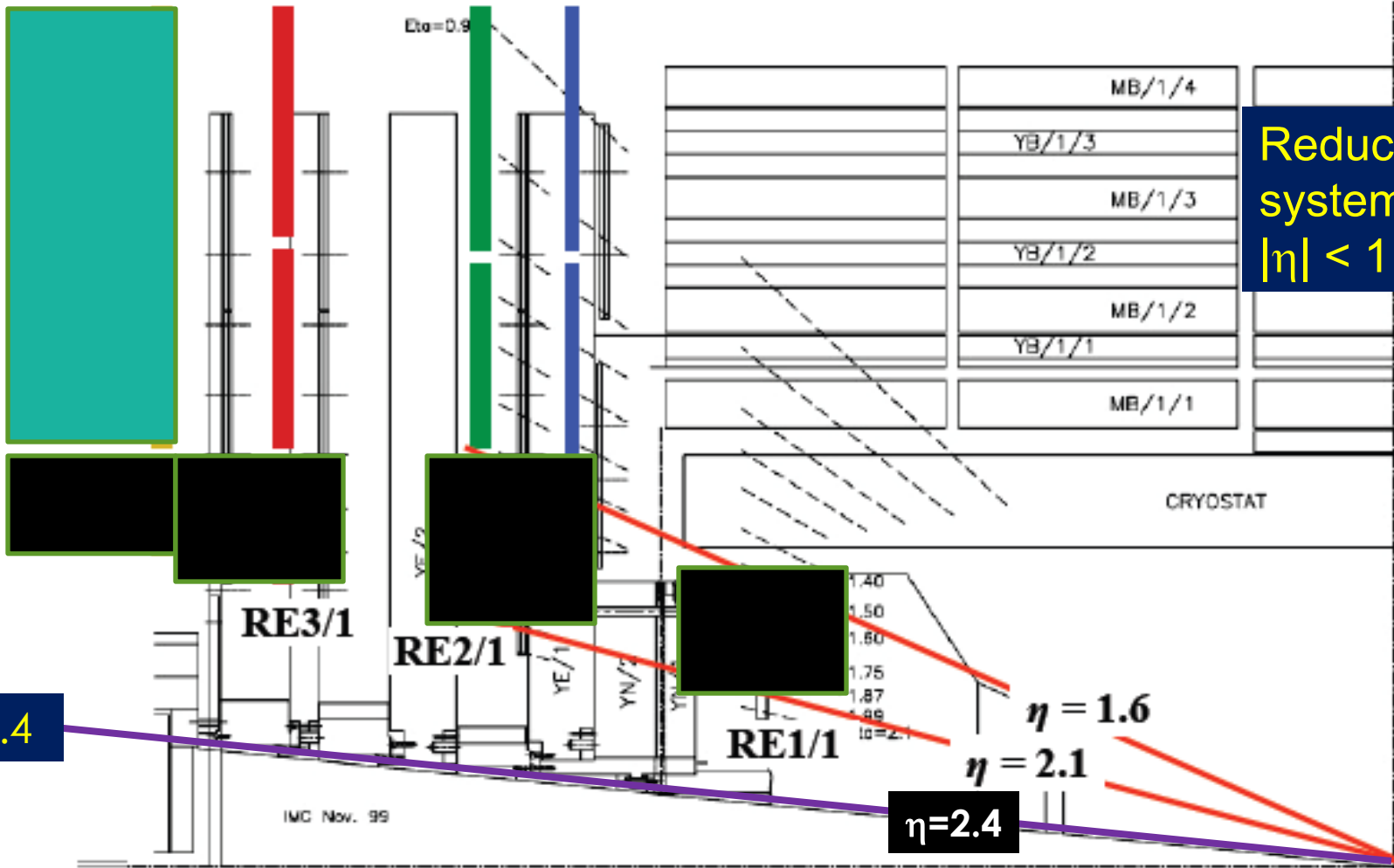
- ▣ No problem for 2011
  - 1 staff + 1 FSU affected to CMS project
  - 1 staff + 1 fellow affected to Atlas project
- ▣ 2012
  - CMS → 2 FSU for large production (100 detectors)
    - ▣ +1 staff for technology transfer with industry
  - Atlas → 1 staff affected to technology transfer with industry
- ▣ 2013
  - CMS+Atlas → 2 staff to follow the subcontracted productions

Thank you

Questions?

# Back up slides

# Initial RE system –tailored to budget



Reduced RE system  
 $|\eta| < 1.6$

$\eta = 2.4$

$\eta = 2.4$

$\eta = 1.6$   
 $\eta = 2.1$

## STAGED

	RE	RE	RE	RE	RE	RE
	1/2	1/3	2/2	2/3	3/2	3/3
No. of chambers	36*2	36*2	36*2	36*2	36*2	36*2



# Estimated Particle rates in Forward CMS



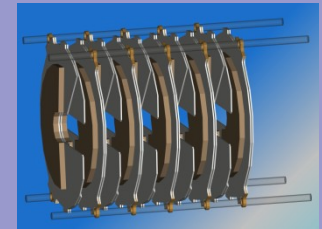
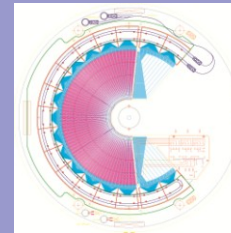
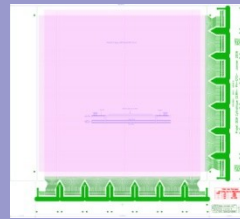
RPC Region	Rates Hz/cm <sup>2</sup> LHC (10 <sup>34</sup> cm <sup>2</sup> /s)	High Luminosity LHC 2.3 x LHC	(10 <sup>35</sup> cm <sup>2</sup> /s) Phase II SLHC ??
RB	30	Few 100	kHz (tbc)
RE 1, 2, 3,4 $\eta < 1.6$	30	Few 100	<b>kHz (tbc)</b>
Expected Charge in 10 years	0.05 C/cm <sup>2</sup>	0.15 C/cm <sup>2</sup>	~ C/cm <sup>2</sup>
<b>RE 1,2,3,4 <math>\eta &gt; 1.6</math></b>	<b>500Hz ~ kHz</b>	<b>Few kHz</b>	<b>Few 10s kHz</b>
Total Expected Charge in 10 years	(0.05- <b>1</b> ) C/cm <sup>2</sup>	few C/cm <sup>2</sup>	Few 10s C/cm <sup>2</sup>



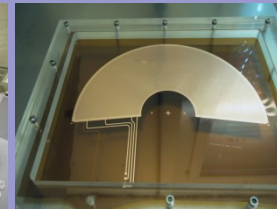
# GEM Detectors at CERN

CERN is involved in all aspects of GEM detectors design, production and applications.

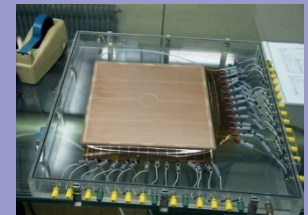
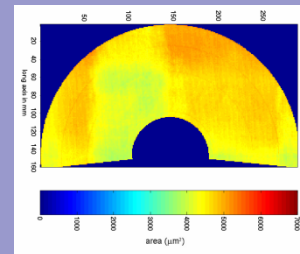
## Detector Design



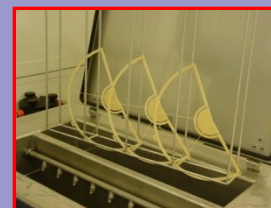
## Component Production



## Component Quality Control



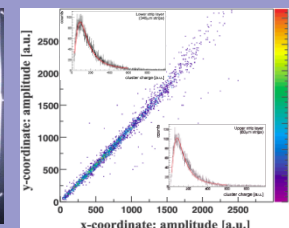
## Detector Assembly



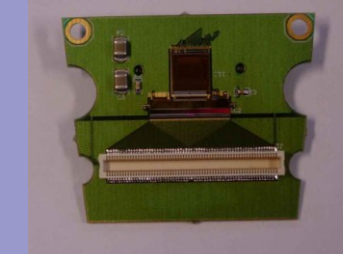
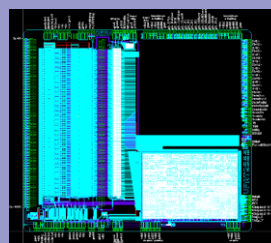


# GEM Detectors at CERN

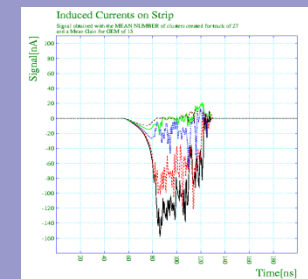
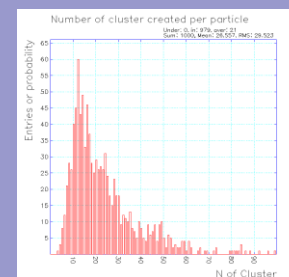
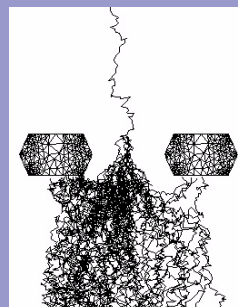
Detector Test



Readout Electronics



Detector Simulations



Technology Dissemination

