

EP-DT-EF section

# Section EP-DT-EF

## Mandate and Team

- To provide the CERN community with specific solutions combining mechanical design, small scale production and prototyping facilities and test benches for particle detectors' CERN-core technologies.

### Engineering Facilities (DT-EF)

Hans DANIELSSON  
Deputy: PA.GIUDICI

#### Thin Film & Glass

SCHNEIDER Thomas (PL)  
DAVID Claude  
VAN STENIS Miranda

#### Micro-Pattern Tech

DE OLIVEIRA Rui (PL)  
FERRY Serge  
GRIS Alexandra  
PIZZIRUSSO Olivier  
RANCHIN David  
RODRIGUES Alexis  
TEIXEIRA Antonio  
GRIS Alexandra  
MEHL Bertrand  
UGIDOS SEMAN Saray

#### Machine Shops

GIUDICI Pierre-Ange(PL)  
BODE Alain  
BRENDLEN Romain  
KEREKES Zoltan  
CANTIN Bernard  
GARNIER Francois  
SKOGEBY Richard

#### Magnets support

BERGSMA Felix (PL)  
1/11/16

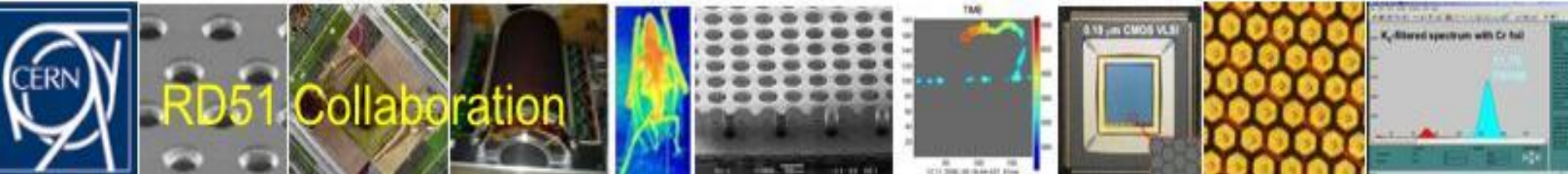
# Thin Film and Glass

Thomas Schneider

# Expertise and activities

## Overview of TFG-lab activities

	2010	2011	2012	2013	2014	2015	2016	2017
<b>Production</b>		NA_62 Mylar foil	NA_62 Mylar foil	NA62 mirrors	NA62 mirrors	US mirrors	Compass CSI ThGEM	LHCb RICH1 mirrors
		Cloud UV light tubes	ArDM TPB coatings		ArDM PM coating	Cloud UV light tubes	Cloud UV light tubes	Compass Spare
						WA 105 proto (PM coating and QC)		TPB WA105 Production
						PSI Fibercoating		Geom Spheres prod AWAKE Mirrors (BE)
<b>R+D</b>	Cloud UV light coating	Opt. of TPB coatings	ALICE HMPID	AIDA Optical Glue TRM	TDR LHCb	Micro Buse (MME)	CSI ThGEM coating	CSI ThGEM coating
	Indium AEgis	for ArDM	Saphire window	TiO2 Coatings	Tracker Upgrade	SciFi tooling for QC	Trans Edge Sensor (BE)	WLS study (Sphere)
	ALICE HMPID comp	ALICE HMPID comp	SciFi irradiation		SciFi Mirror solution	TiO2 coatings	Geom. spheres proto	Adherence study
	Mirror Coatings	Mirror Coatings	(test 3m module)		SciFi Kapton solution	CMS Calo Fibercoating	Fibre beam profile	with new ion source
	ALICE CSI coatings	Gluing stidy for	539nm Laser nirror		SciFi Att Lenght setup	CLOUD fibre study	monitor exp. area SPS	RD51 CSI Fast Detector
		optical coupling	NA62 Cedar windows		SciFi irr. test (AAA)		TPB study (Sphere)	Micro chanel cooling
							SciFi tooling for QC	
							SciFi Irradiation tests	
						LHCb RICH1 mir. study		
						RD51 CSI fast detector		

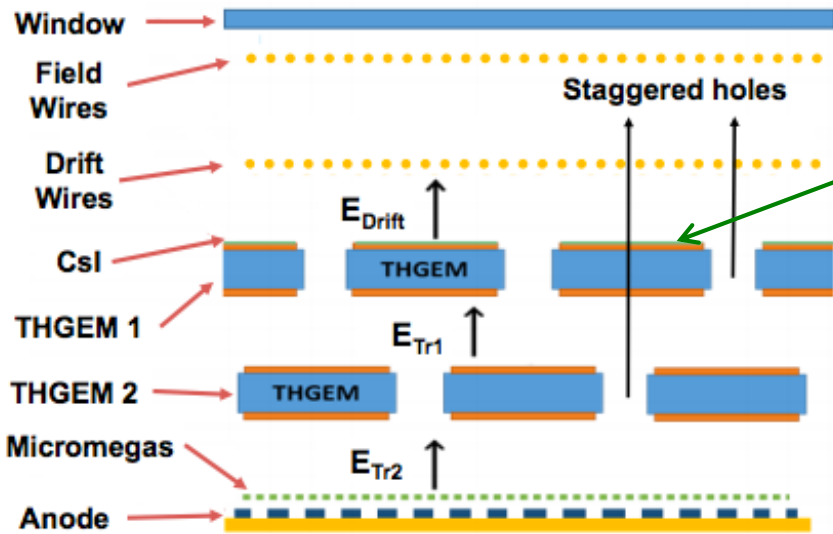


<b>Projects</b>	LHCb Muon	LHCb Muon	SciFi	SciFi	SciFi	SciFi	SciFi	SciFi (integration)
Ax-PET	Ax-PET	Ax-PET	Ax-PET					
ALFA	ALFA	ALFA	ALFA(heat problem)	ALFA(spare trigger /RF Fille	ALFA (RF-Filler instal.)	ALFA		

### additional tasks

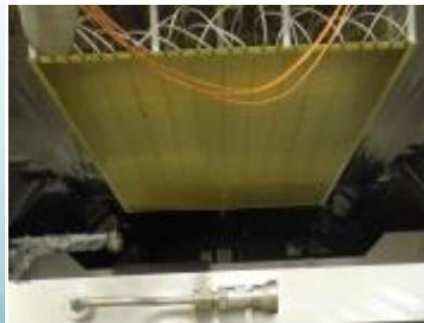
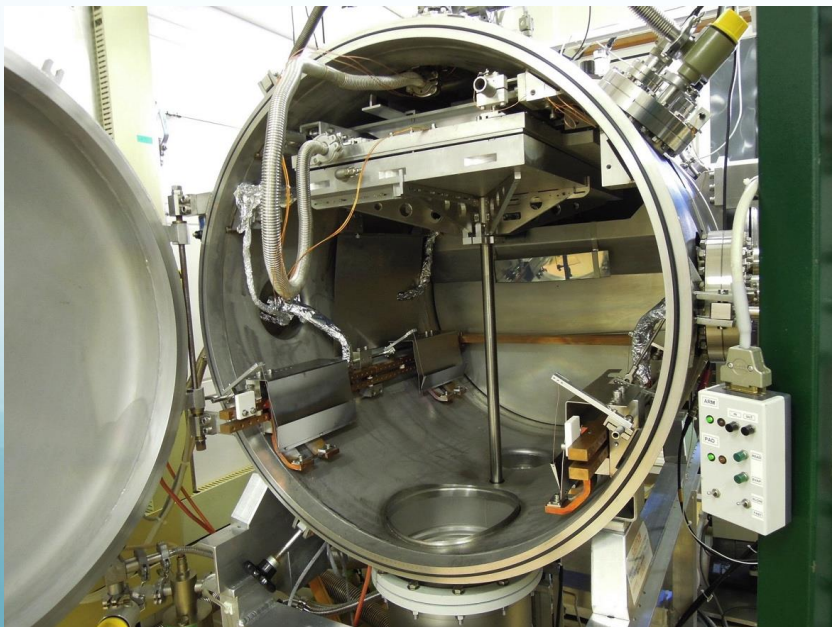
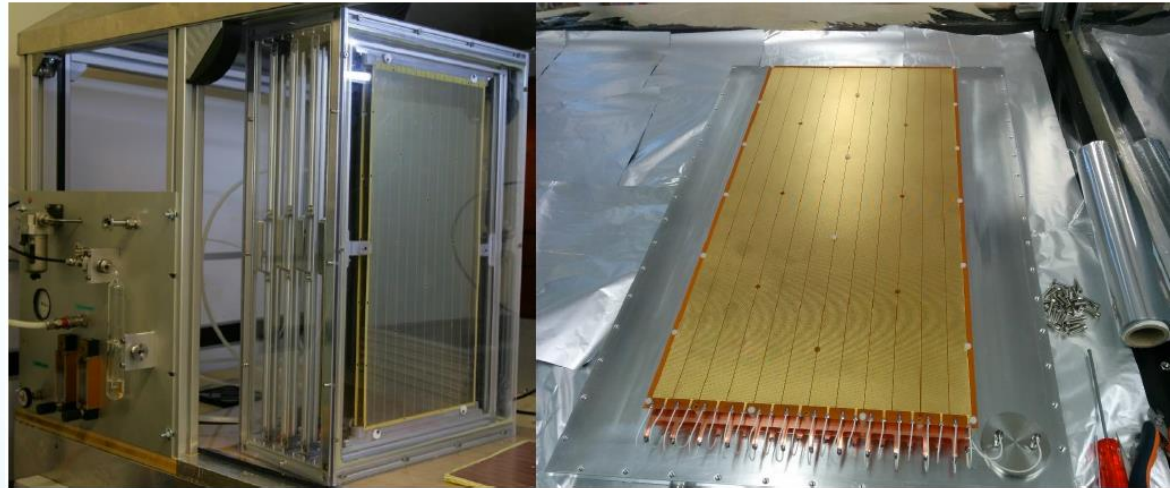
General mech. supp./ Gluing act./ Chemistry infrastr./ Spectroscopy  
 Hosting NA62 GIGA Tracker / Assembly clean room infrastr.  
 TSO act./ Apprentices/SIG /Open days/ summerstudent workshop  
 increasing safety activity (workshop, chemistry etc)

# Upgrade of the COMPASS RICH-1



CsI film on Thick GEM as photo cathode

THGEM storage, transport, gold coating and preparation for CsI deposition



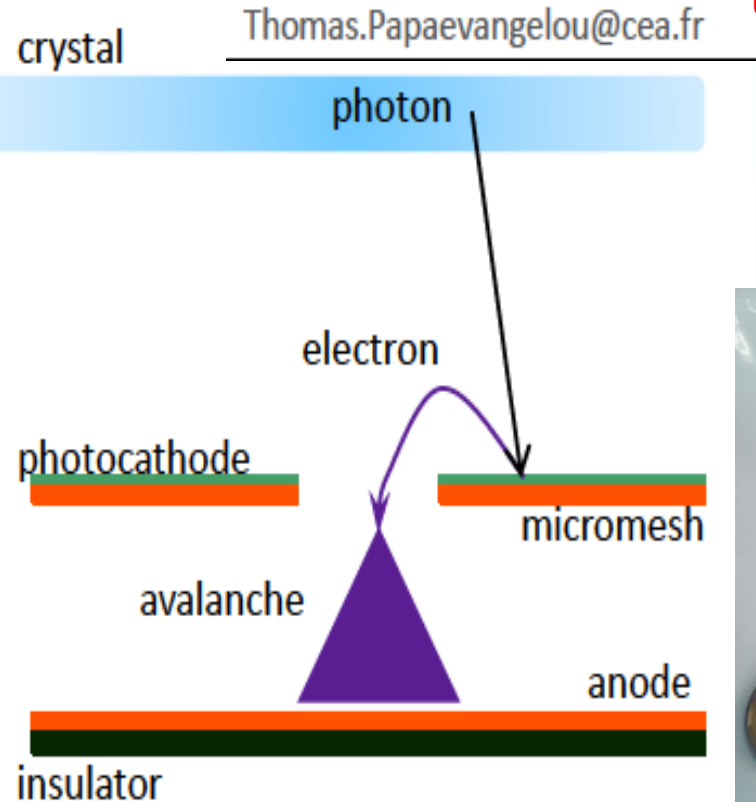
THGEM are coated at CERN and QE measurements indicate for our photocathodes *preliminary*

$QE = 0.7 \pm 1 \times$  (max CsI QE)

with an increasing trend during the production

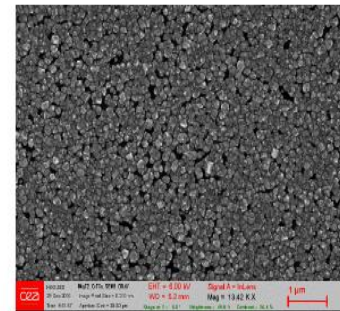
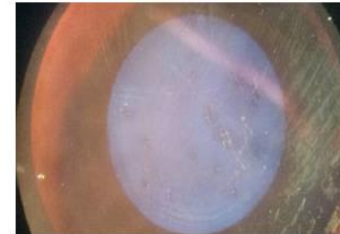
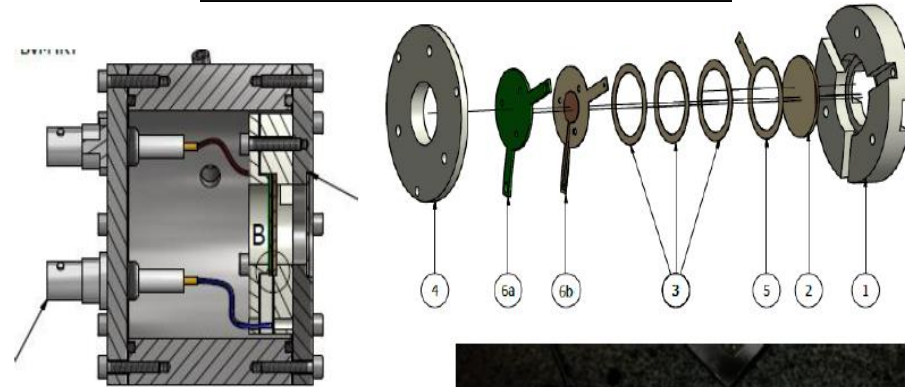
# Fast Timing for High-Rate Environments

- Is time resolution of a few tens of picoseconds possible?
- What type of photocathode?



**Beam test in the fall 2016**

[Thomas.Papaevangelou@cea.fr](mailto:Thomas.Papaevangelou@cea.fr)



# Micro Pattern Technology

Rui De Oliveira

# Micro Pattern Workshop activities

## MPGD

-GEM/thinGEM/THGEM/RETHGEM

-MSHP/Cobra

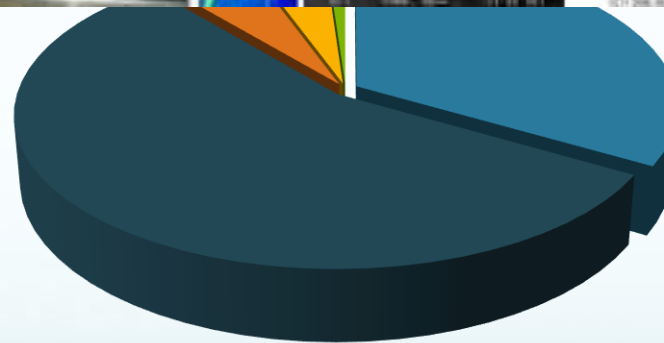
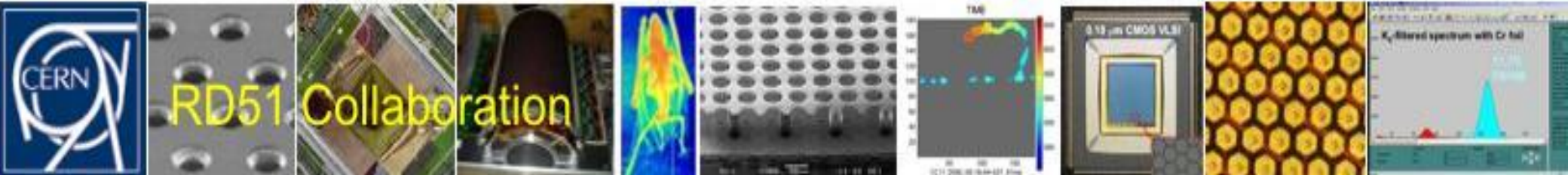
25 persons

Building 102 : 1000 sqr meters

Making PCBs since 1965

## PCB

- Rigid
- Flex
- Flex-rigid
- Micro-vias
- fine line (10um)



- PCB 30%
- MPGD 50%
- C-milling 5%
- Low-mass 4%
- embedded 1%

## Low mass circuits

- Multilayer flexes with aluminum strips
- embedded heat sinks (carbon, graphite, metals, diamond)

## Chemical milling

Cu, Fe, Al, Au, Ag, W, Mb, Ti, Cr, Ni etc...

## Embedded components

- passive
- Active



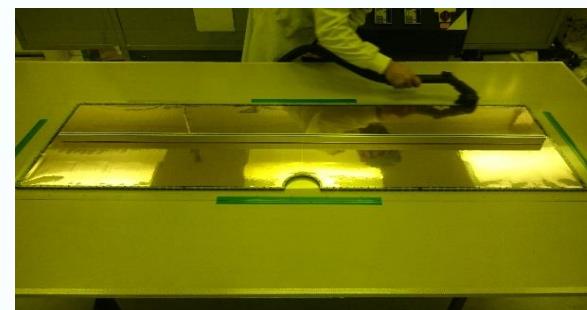
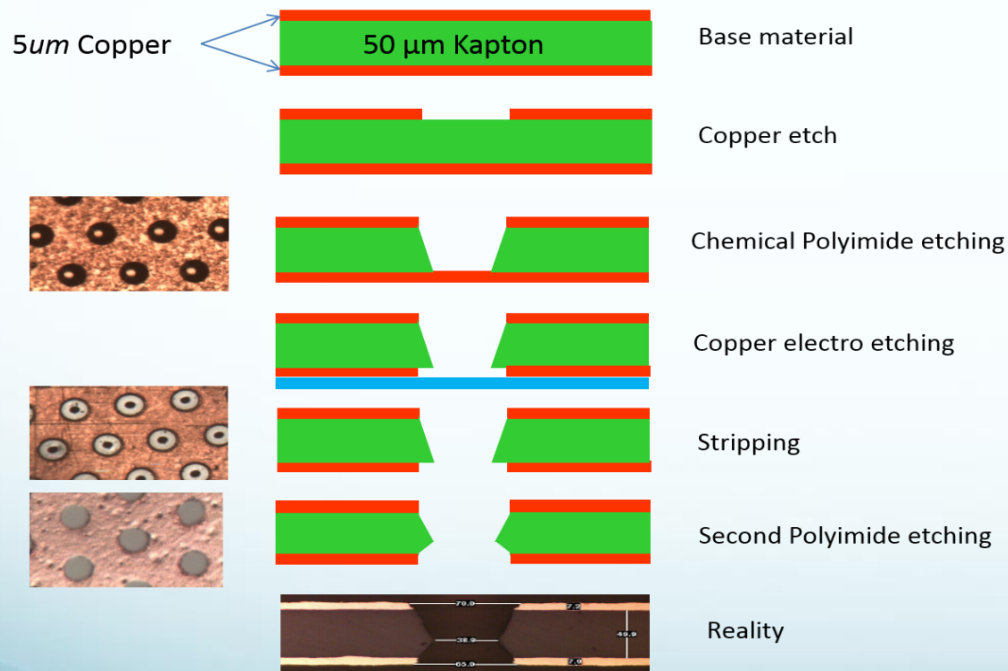
# GEM Detectors



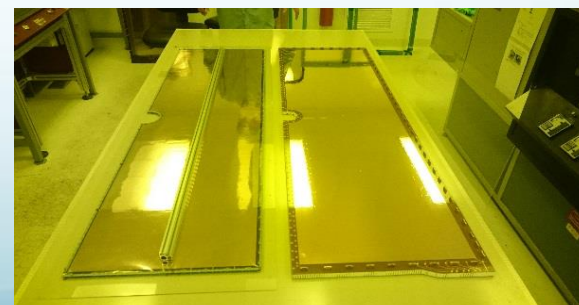
CMS GE1/1



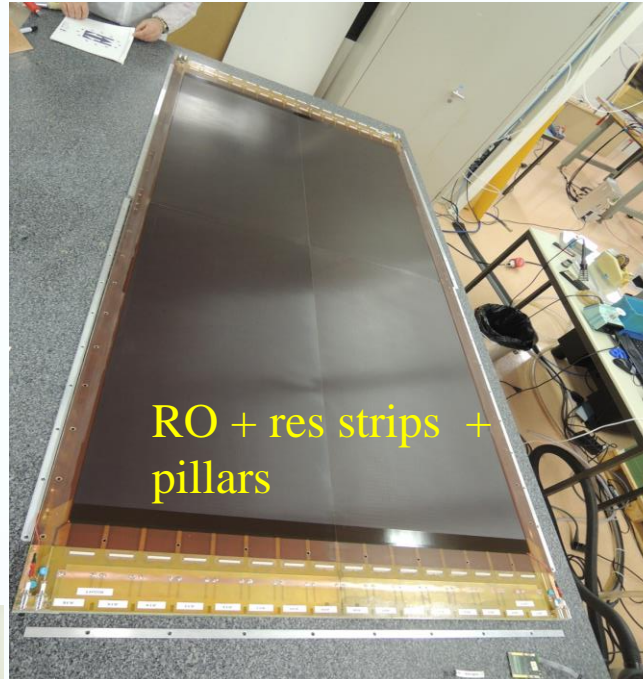
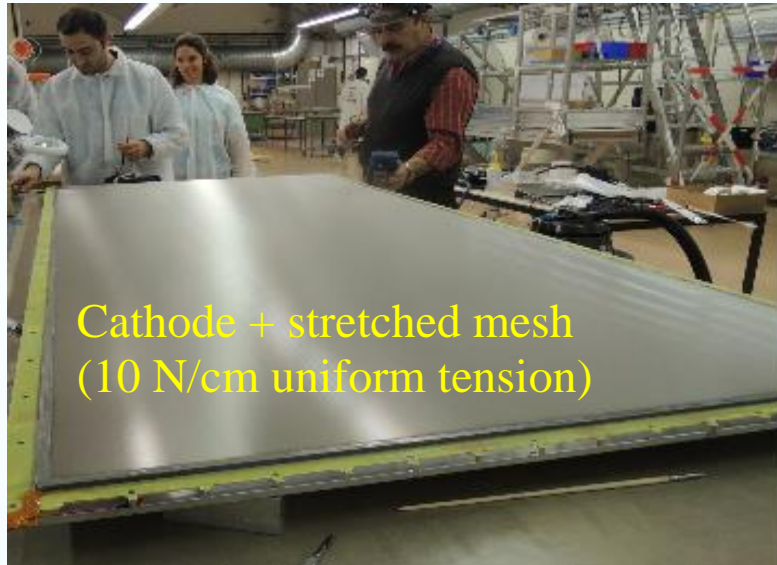
ALICE TPC



World record, largest GEM detector  
BM@N Dubna project 1.7m x 0.55 active area

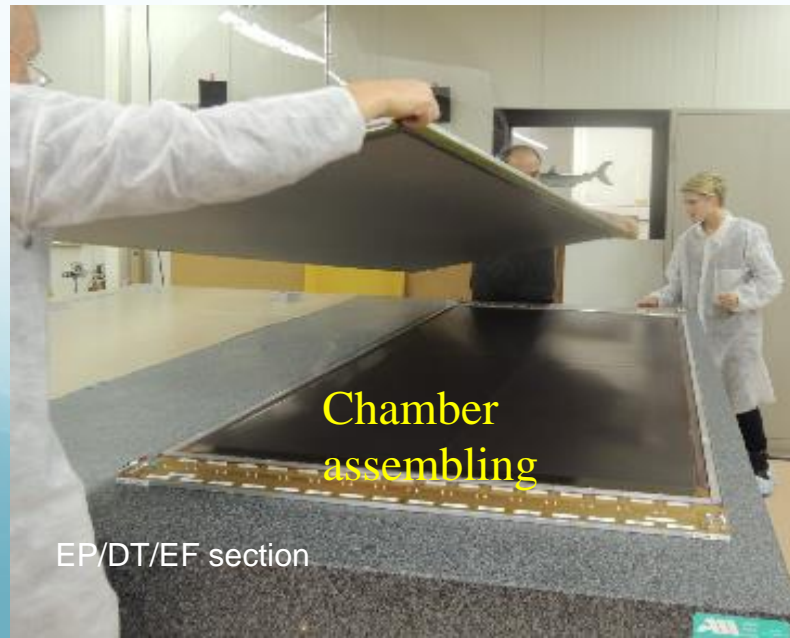


# Micromegas: A TLAS Muon upgrade NSW



EP-DT activity!

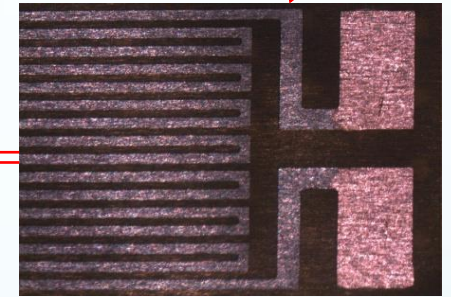
➔ Technical Transfer and series production in industry



# For the machine



Stainless steel Quench Heaters for magnet MQXC(+2m long)



140  $\mu\text{m}$

-NbTi superconductor quench detector response allows 200 times faster than the previous version, means 5ms.



Mix Stainless steel /Copper  
9 m Long  
No company found today  
for the plating step

Others:  
-Cryogenic temp sensors  
-Heating foils  
-High power resistors  
-and many special PCBs

# Machine shops and Magnetic Support

Pierre-Ange Giudici, Felix Bergsma

# Magnetic Field mapping

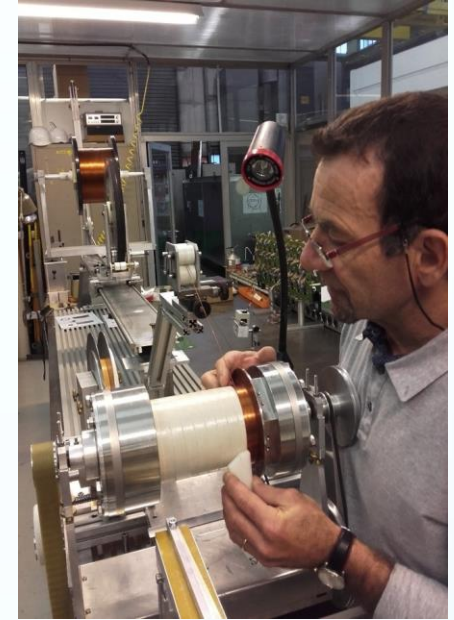
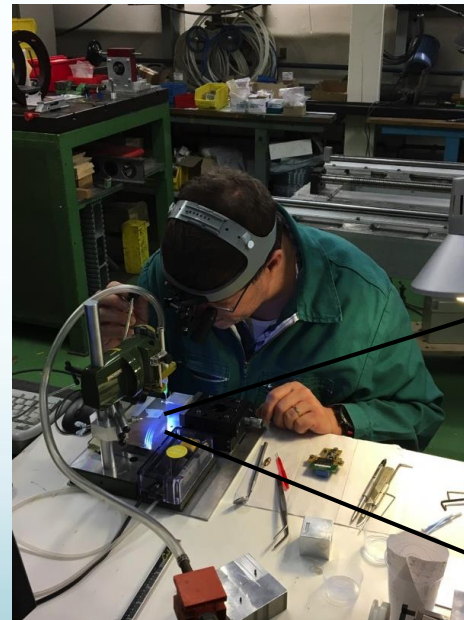
LHC super conducting coil construction

BELLE II, 2016 (KEK,Japan)



EP/DT/EF section

Hall probe construction



# Project support

New staff: Zoltan KEREKES on 1/9/2016

Opening of ATLAS during winter shutdown



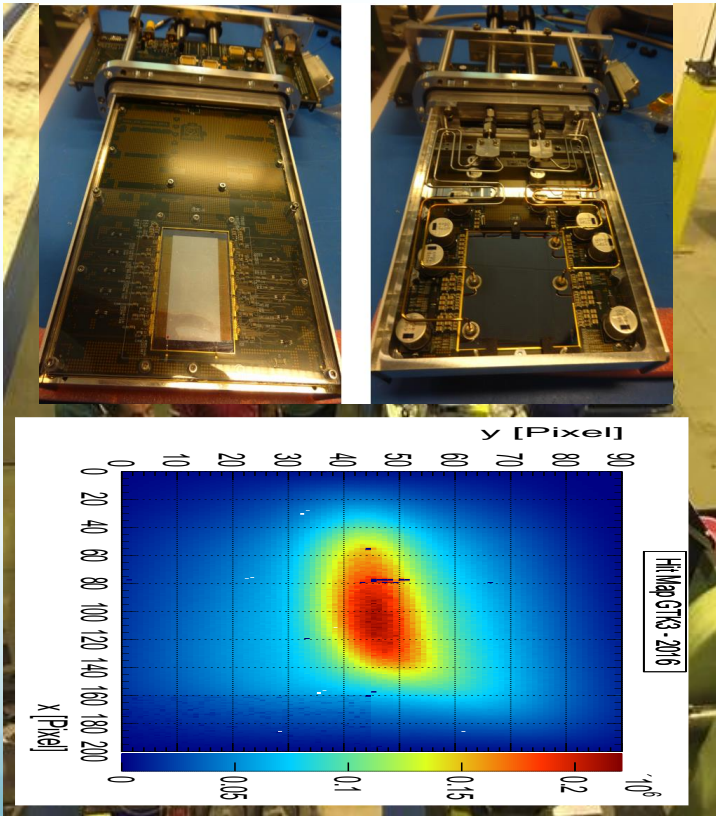
LHCb: Optical Fiber Tracker  
Quality control of 12000  
km fiber



# Project support

GTK installation NA62  
All chips working! (1/9/2016)

Detector construction and  
installation, technical  
coordination



# Summary EP/DT/EF

- Unique expertise and world leading in many fields
- Participates and lead the work towards the next generation of MPGDs, e.g. large size and ultrafast detectors
- Participates in numerous detector projects at different levels (R&D, development, construction, installation, maintenance)
- Collaboration and support to the high energy physics community inside and outside CERN