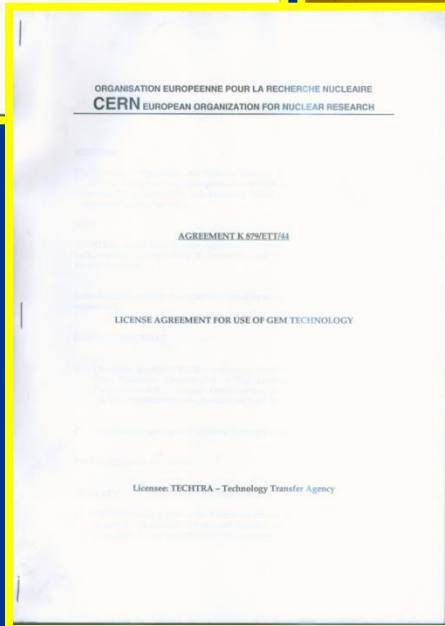
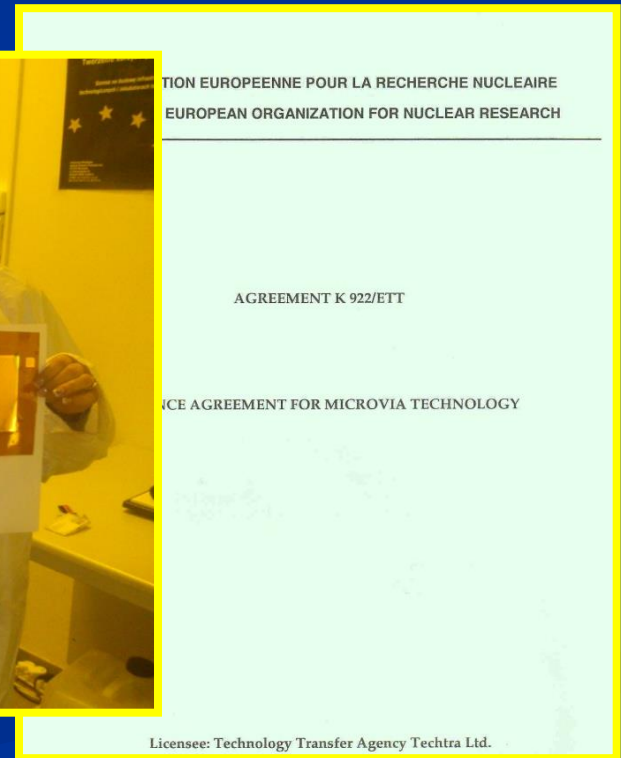
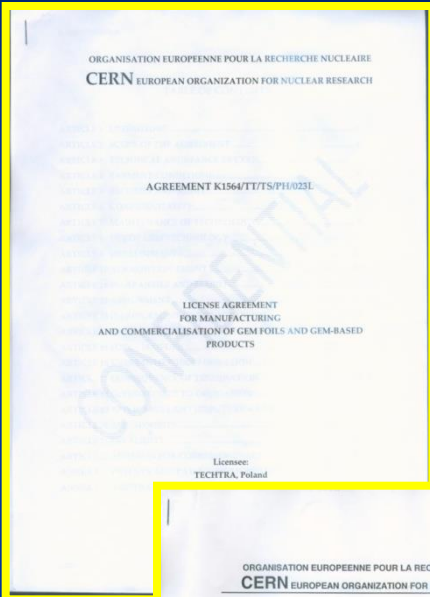




GEM production facility @ Techrta

Piotr Bielówka

The beginning: December 2002



GEM manufacturing upon CERN licence

RD51, Kalkota, Oct. 2014

2004: the Demonstrator for Mico-Chemical-Vias

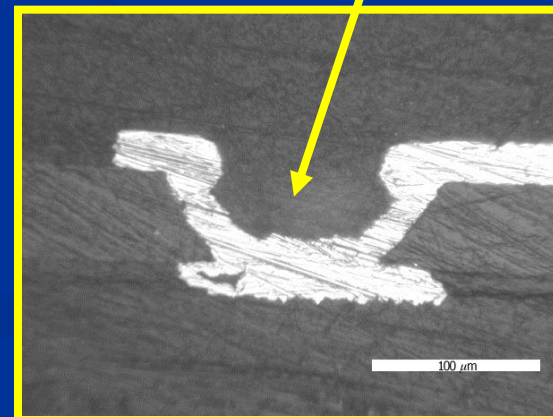
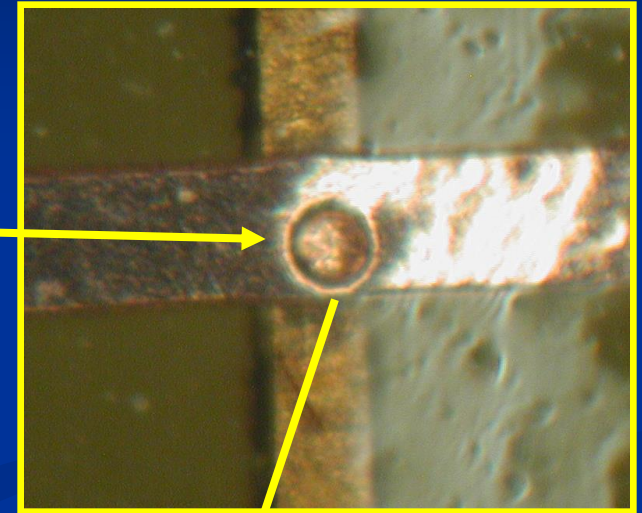
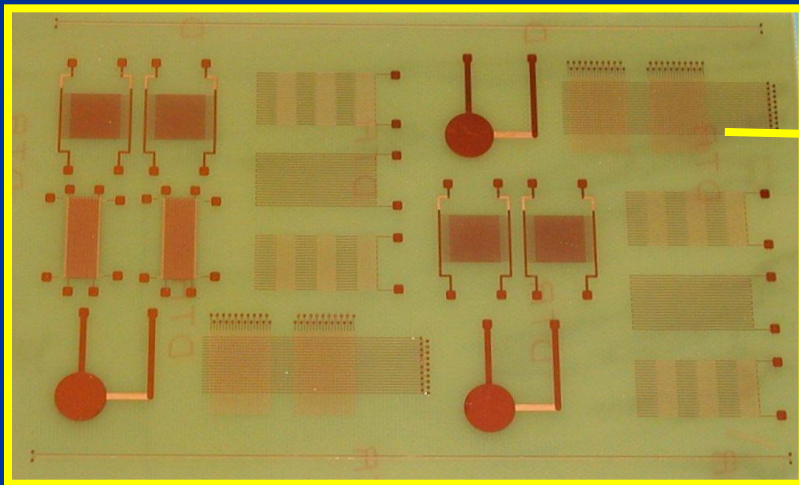


the Demonstrator



PCB laboratory equipment

Mico-Chemical-Vias

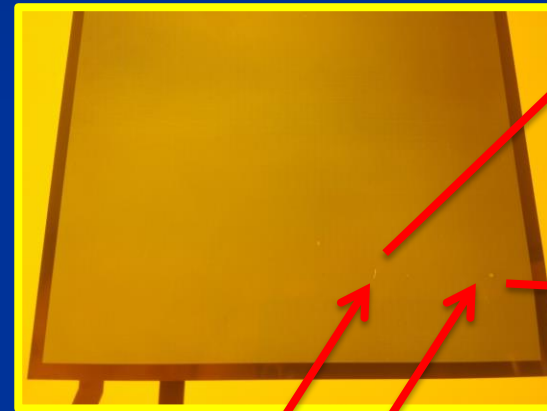
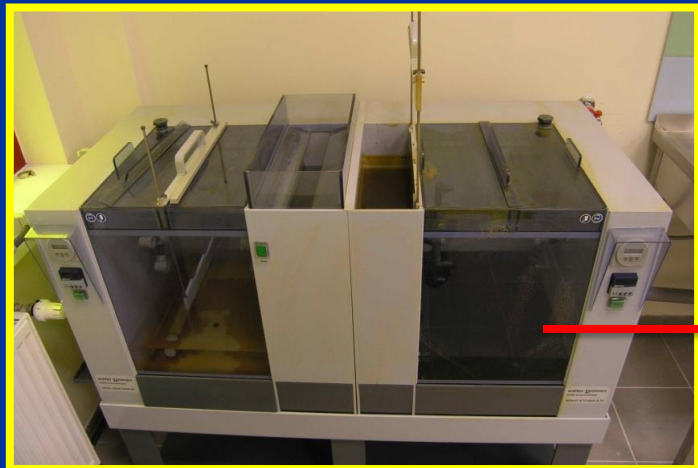


MCV test board

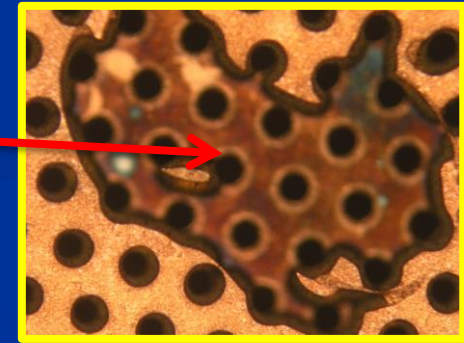
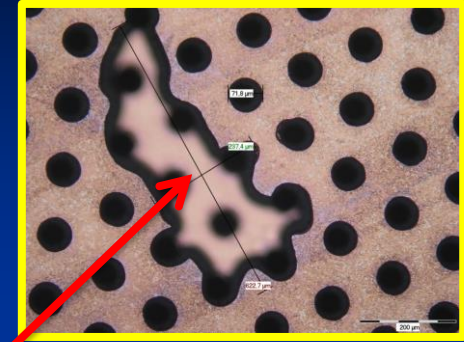
Boards made by Techtra to check if technology transfer were made properly.

Laboratory scale:

1. Low yield
2. PCB dimensions limit
3. Quality problems



Dust defects



Developing & Etching set:
Volume: 15 liters
Max width - 40cm



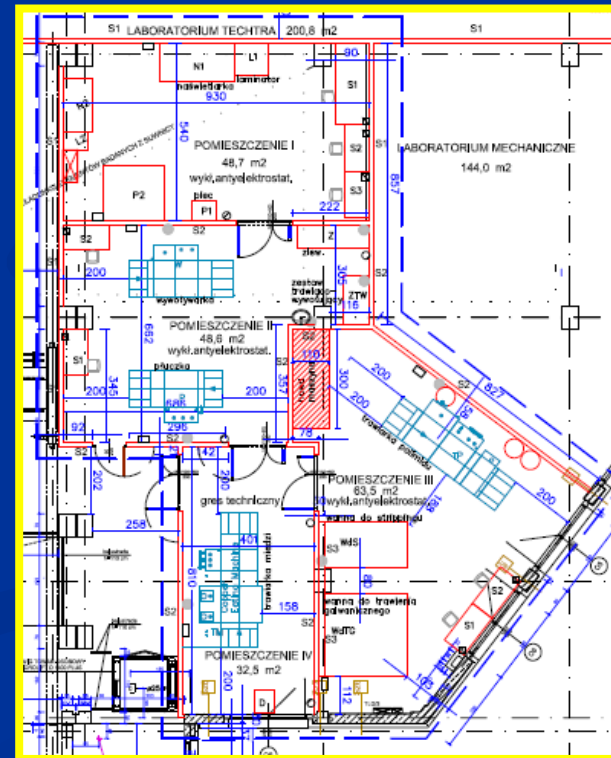
Problem 1
„Low yield” - solved



2013: New workshop dedicated to GEMs production



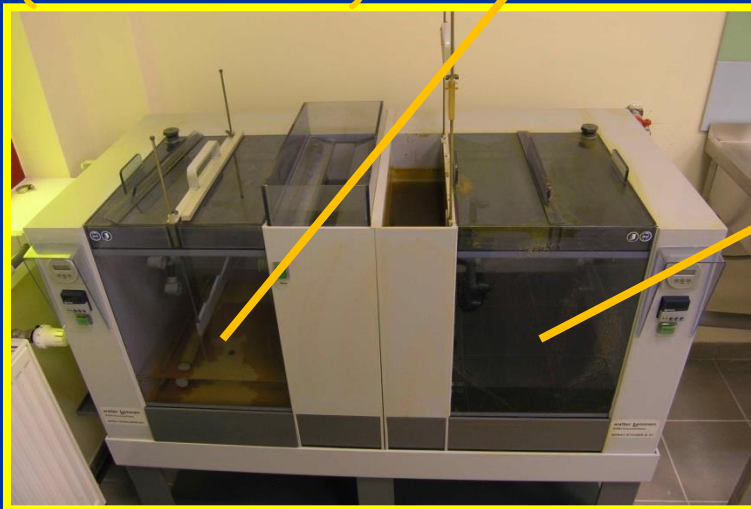
Room 1 - 48 m²
Room 2 - 48 m²
Room 3 - 96 m²
Total - 192 m²



Problems:

- low yield
- GEM dimensions limit

Old developing
and etching set
(2x15liters)



New developer (350l main chamber)



New Cu etcher (350l main chamber)

Problem

„PCB dimensions limit“ - solved:
new machines & new technology



Exposure Unit
Type: **doublesided**
Maximum panel size: **600x600mm**
Status: **operational since 2012**

Exposure Unit
Type: **singlesided**
Maximum panel size: **650x2000mm**
Status: **operational**



Kapton etching machine

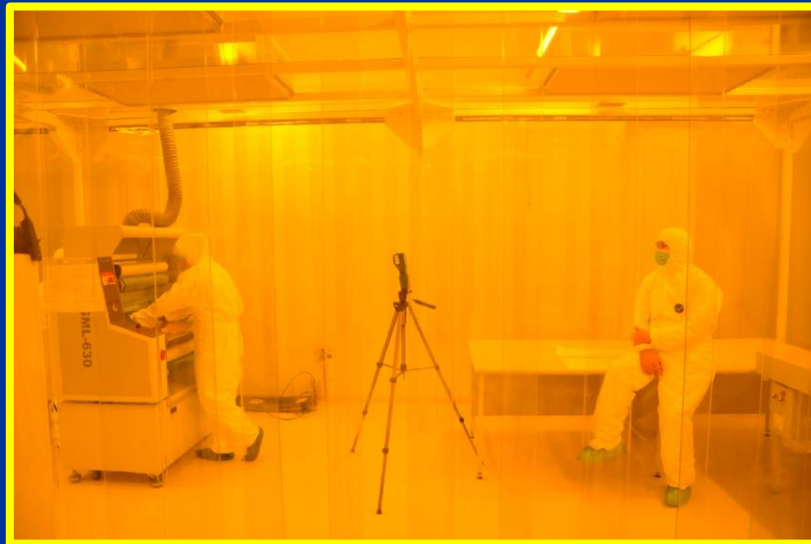


Type: **doublesided**
Maximum panel width: **650mm**
Status: **under commissioning**



RD51, Kalkota, Oct. 2014

Cleanroom



Problem 3:
Quality - solved
Cleanroom, Procedures &
Software

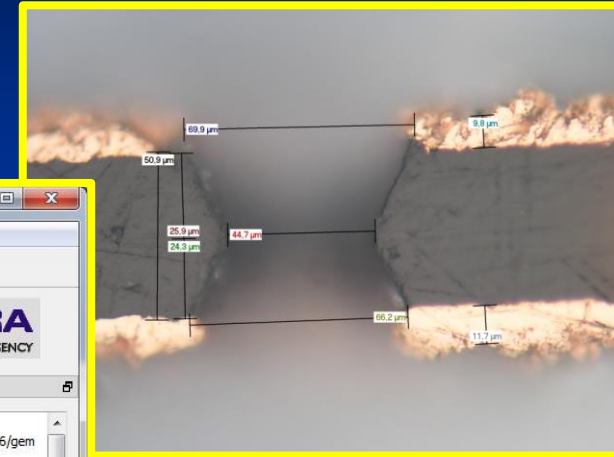
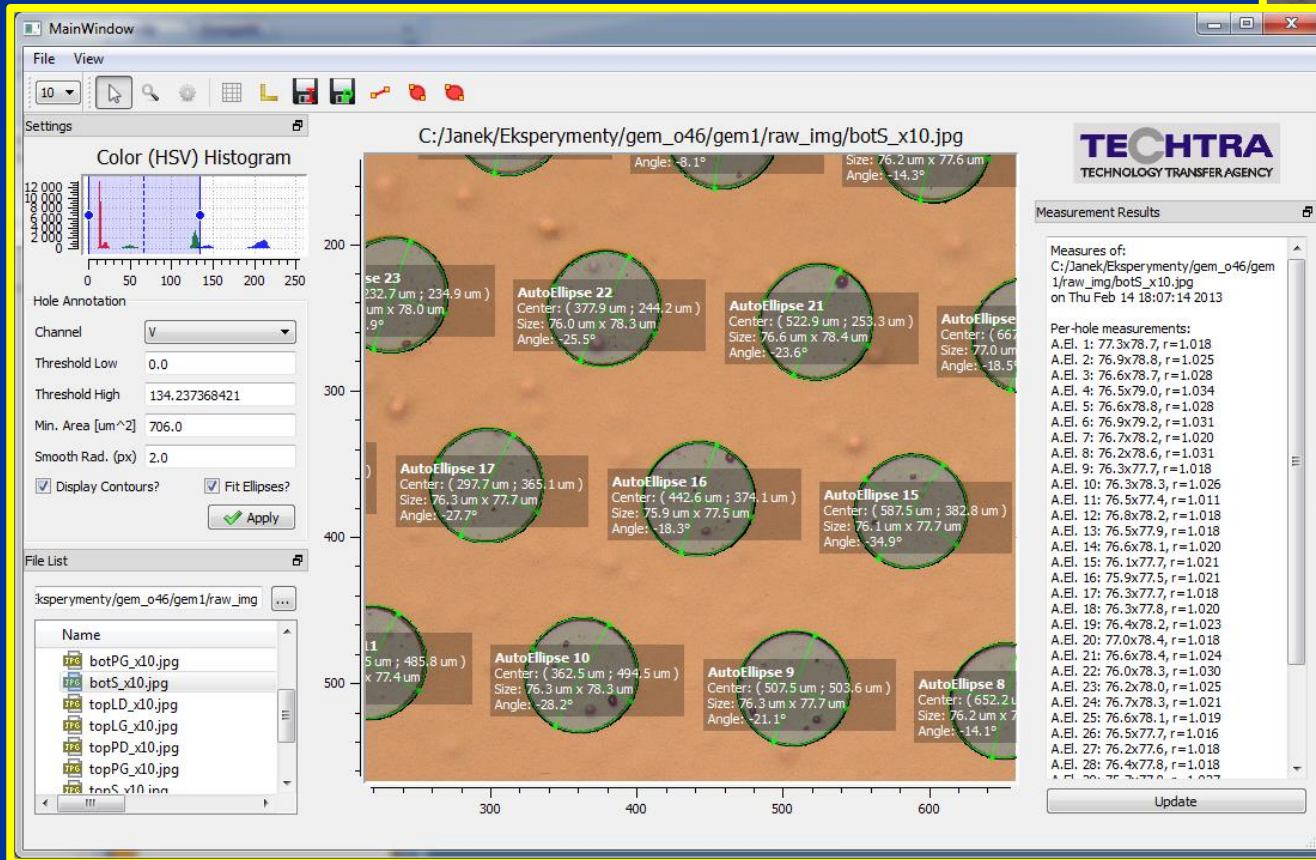


Dust diameter	Class 7 (10000)	Validation
0,5 µm	max. 352 000	2 784
1 µm	max. 83 200	1 892
5 µm	max. 2 930	320



Type: **ISO7** (Federal Class 10.000)
Total area: **40m²**
Status: **operational**

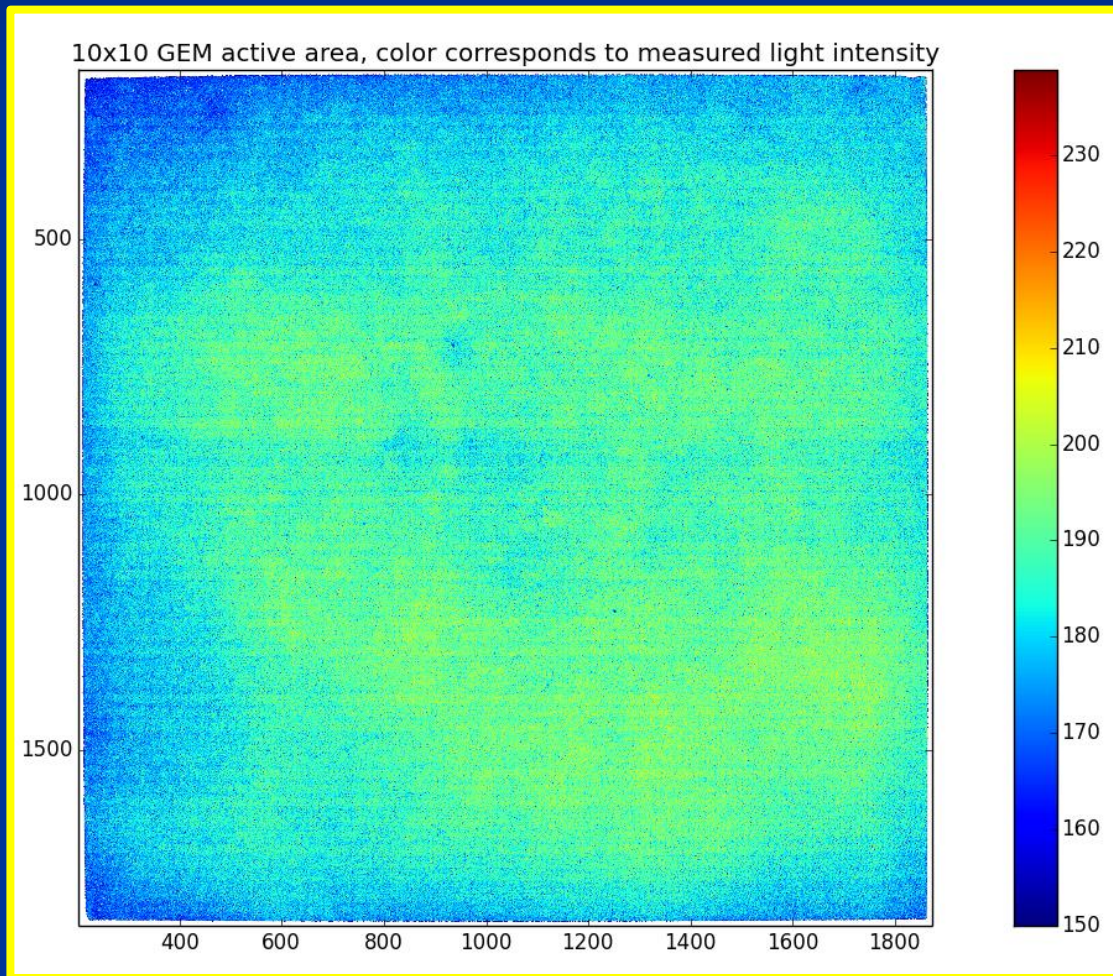
Quality: Procedures & Software



Cross section of double mask GEM.



Quick measurements of large GEMs.



Measured light intensity taken from an 8-bit jpeg photo of a GEM. The spread is about $3\mu\text{m}$ between measurements made in the lighter and darker regions in the plot.



„GEM-View” detector



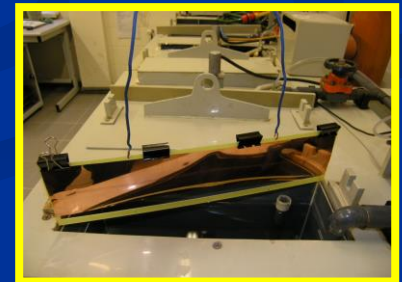
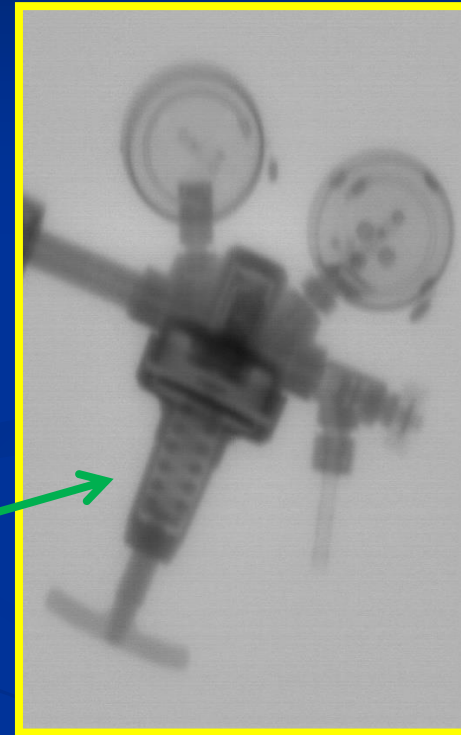
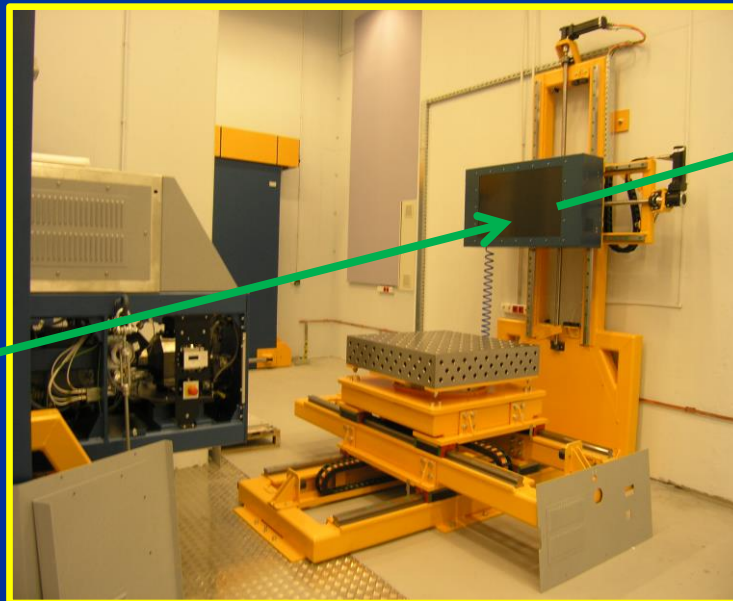
The very first prototype



The operational demonstrator

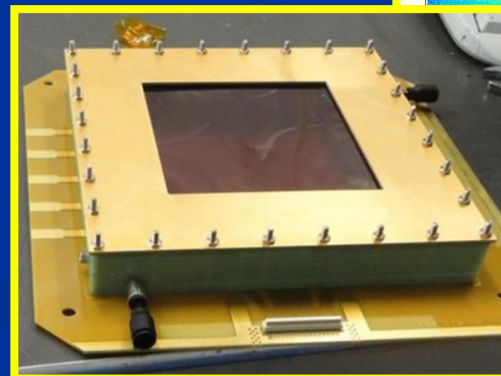
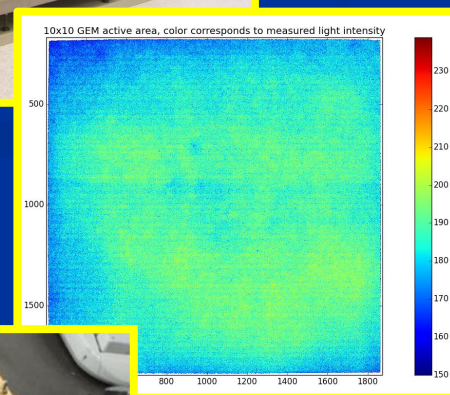
GEM-View industrial detector for NDT

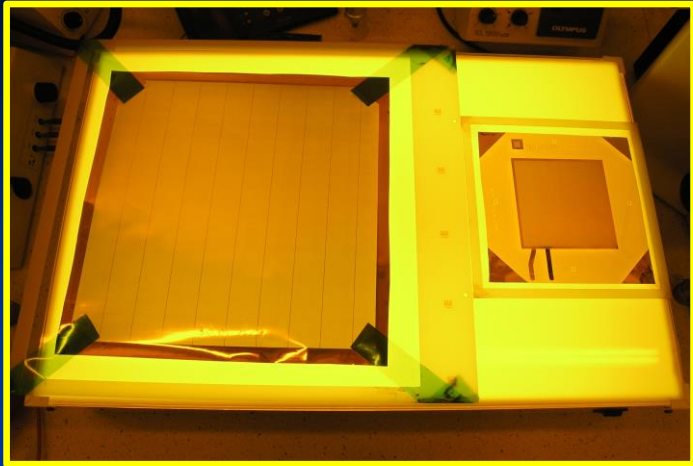
- GEM-View is a GEM-based detector for industrial Non-Destructive Testing
- It was developed by Techtra in collaboration with the National Center for Nuclear Research.
- It is employed at the NDT facility of the Wroclaw Technology Park



Task for future:

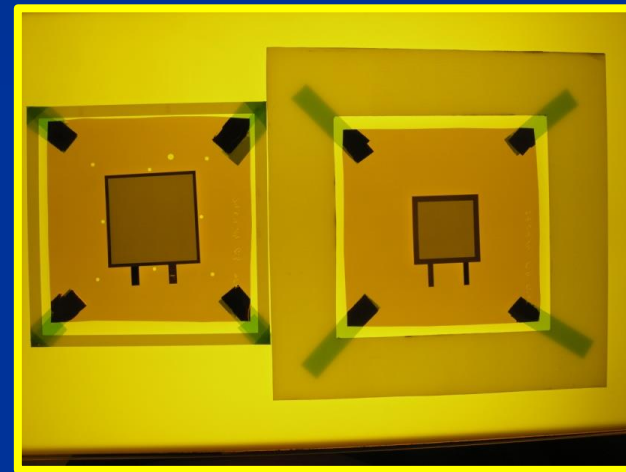
1. Increase GEMs production
2. Master big GEMs production
3. Optimize fast optical inspection system - uniformity map
3. Build X-ray testing stand - CERN GEM kit



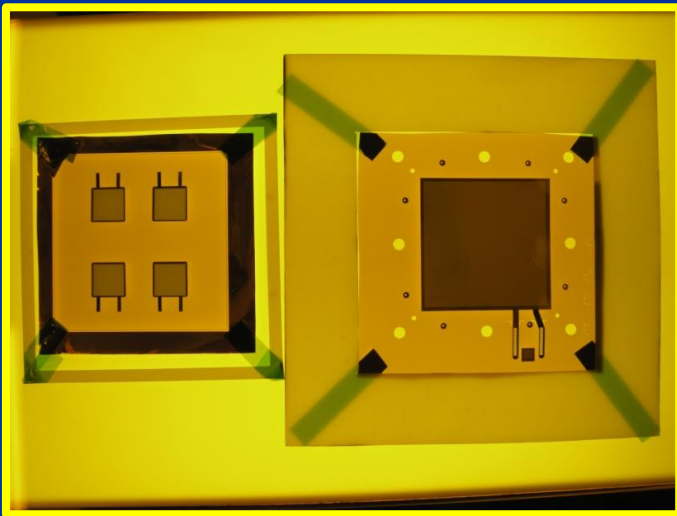


30x30cm² 10x10cm²
Single Mask

Typical GEMs offered by Techtra



5x5cm² 7.5x7.5cm²



2.5x2.5cm² 10x10cm²
280um pitch

Possible modifications:

- Different sizes, shapes,
- Different openings diameters
- Different layouts, pitches

Offer:

Singla and double mask GEMs

- GEM boards size: up to: 40x40cm²
- GEM active area: up to: 30x30cm²
- Holes diameter in copper: 70μm +/-5μm
- Holes diameter in kapton: 50μm +/-5μm
- Leakage currents: below 3nA @ 600V @ 30% HR @ 10x10cm²



Cooperation with:

RD51



Our Core GEM Team

- MSc Piotr Bielówka
piotr.bielowka@techtra.pl
physicist
- Dr Jan Chorowski
jan.chorowski@techtra.pl
electrical engineer
- MSc Katarzyna Gut
katarzyna.gut@techtra.pl
chemist
- MSc Alicja Sapiszczuk
- MSc Michał Babij
- Mr Jakub Nowicki



**We do welcome you
(and your orders) at our
facility in Techtra, Wrocław**

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ul. Dunska 13

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Fax: +48 71 798 58 86

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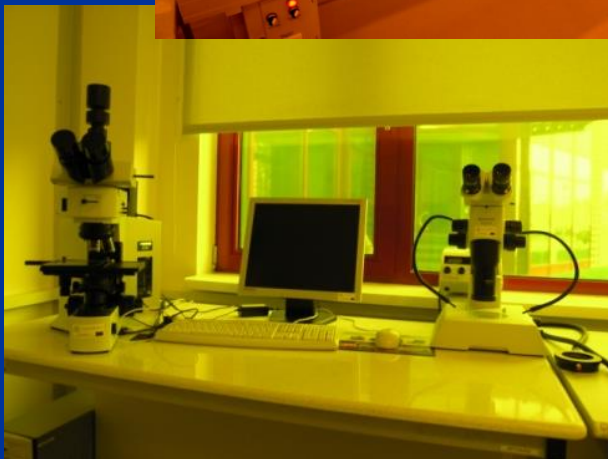
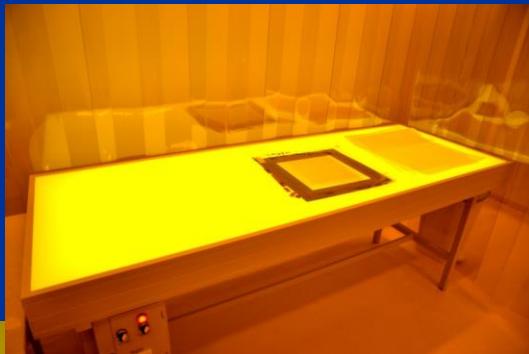
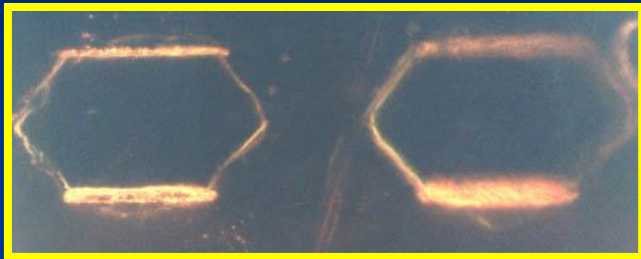
Steps towards big GEMs:

- to implement „single mask“ technique - CERN
- to acquire dedicated set of PCB machines - WPT



Access to EU funds through Wrocław Technology Park (WPT) - non profit organization.

Backup line



Rinser



Type: **doublesided**

Maximum panel width: **650mm**

Status: **operational since 2014**