

MPGD Experience with Technology Transfer

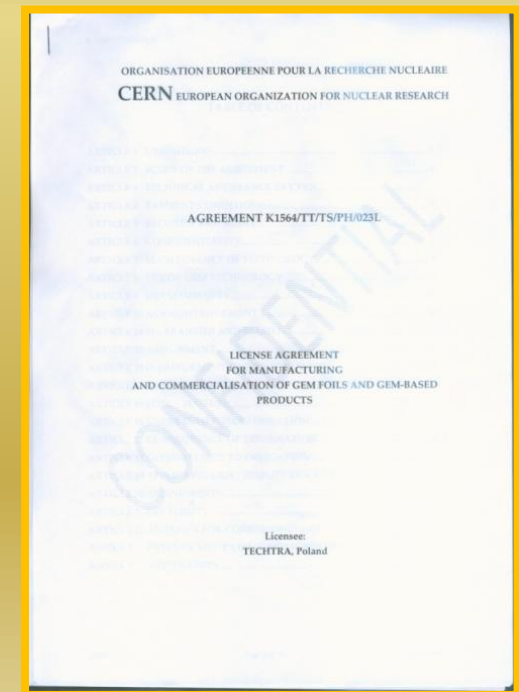
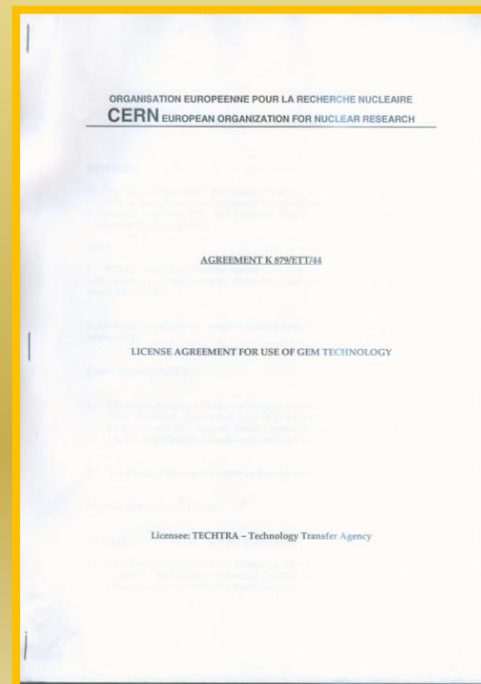




1. History

Technology Transfer Step 1: Legal issue

1. Licence for Micro-Chemical-Vias - for „kapton etching” technology in PCB
2. Licence for Microvia technology - for internal GEM R&D
3. License for Manufacturing and Commercialisation of Gem Foils and Gem-based products



Technology Transfer Step 2: Cooperation with **existing industry**

Eldos - PCB producer



Techtra was responsible for Kapton etching
Eldos was responsible for all the rest

Problems:

- it is hard to separate production steps especially during R&D!
- production regime of big PCB producer

Benefits for Techtra:

- „experience transfer” from Eldos to Techtra



Technology Transfer Step 3: Starting **the business**



Techtra decides to assemble whole GEM production line. The machinery was installed in Wrocław Technology Park. Techtra get UE support within „Intelligent Development” project. We had 2 rooms of about 50m².



Laboratory scale workshop to have everything under control.

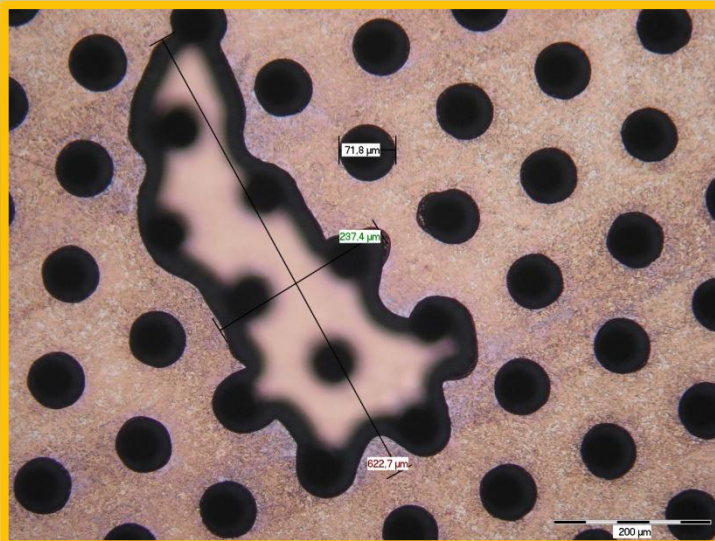


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Technology Transfer Step 3: Starting the business

Techtra gained production capacity in 2009, with following restrictions:

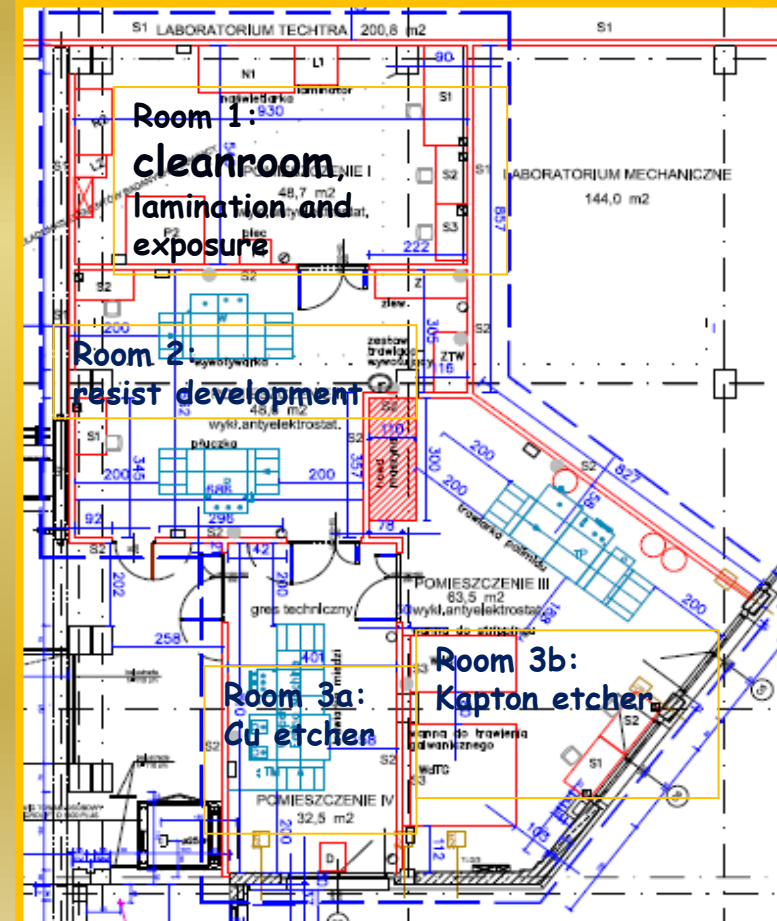
- Uniformity limited to about 10x10cm²
- Max yield of around 70% due to lack of cleanroom, others?



Technology Transfer Step 4: Full scale technology implementation with **dedicated** infrastructure for GEMs



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

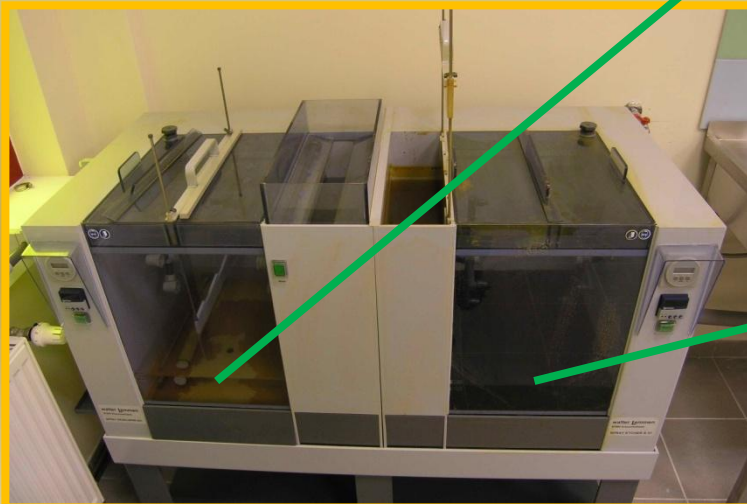


Technology Transfer Step 4: Dedicated infrastructure for GEMs were based on CERN experience.

The choice of machines and workshop layout were consulted with Rui.
Machines were produced by „Wise“ company, Parma.



New developer



Old developing and etching set



New Cu etcher

Machinery „dedicated“ for GEM production Techtra

Techtra is focused on GEM foils and GEM detector manufacturing.

All machines have been tuned for GEM production.



Cleanroom



Old exposure unit

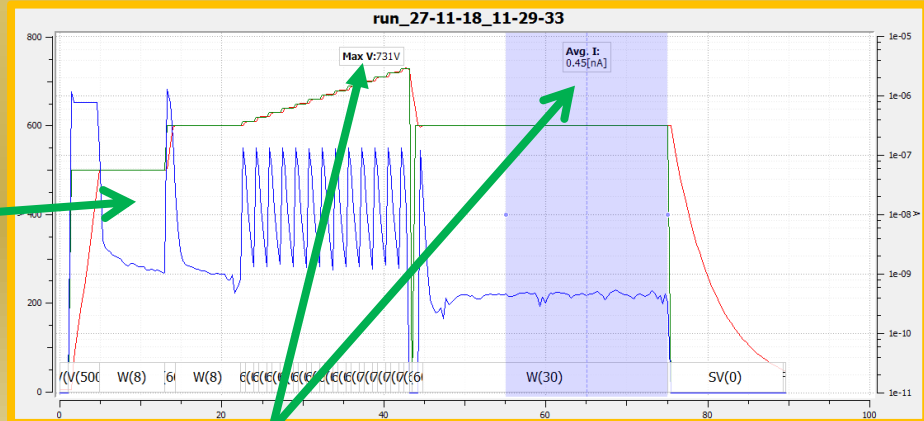
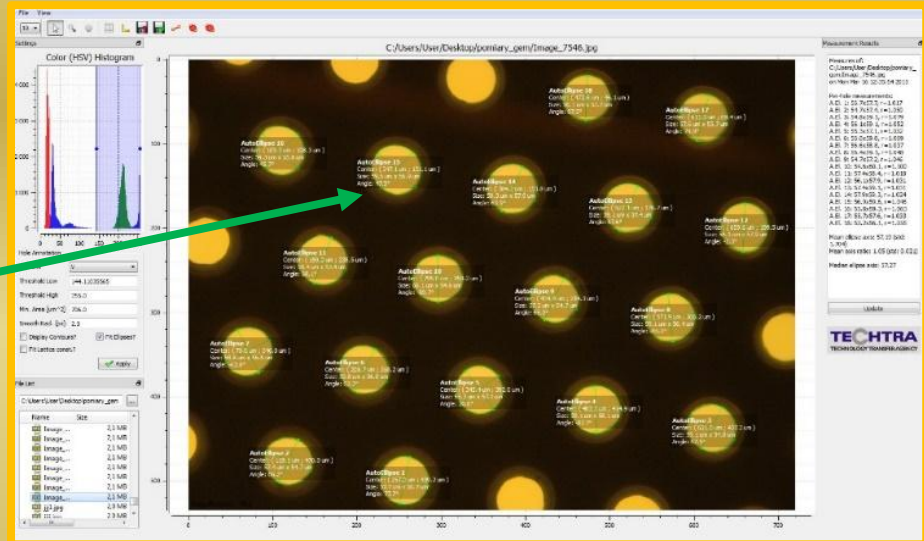
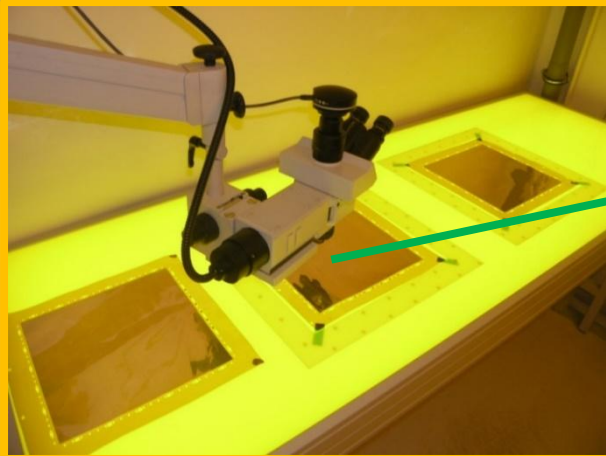


New exposure unit



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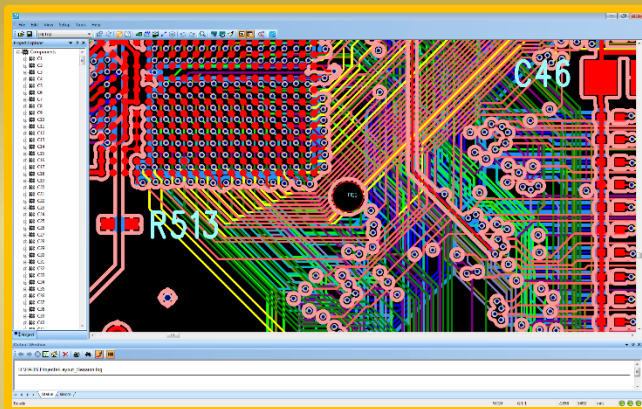
Technology Transfer Step 5: Quality control: **define parameters!**



Leakage current below 1nA@100cm² @600V @30 %HR

HV testing stand

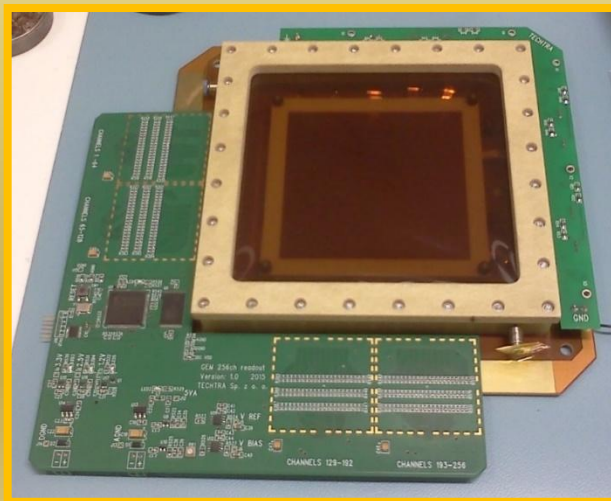
Technology Transfer Step 6: Look for **new applications**:



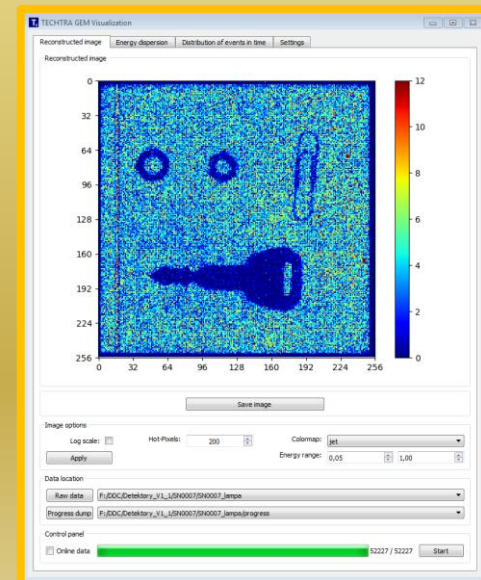
Techtra is the only commercial producer of GEM detectors



Design and prototyping



Commercially available product

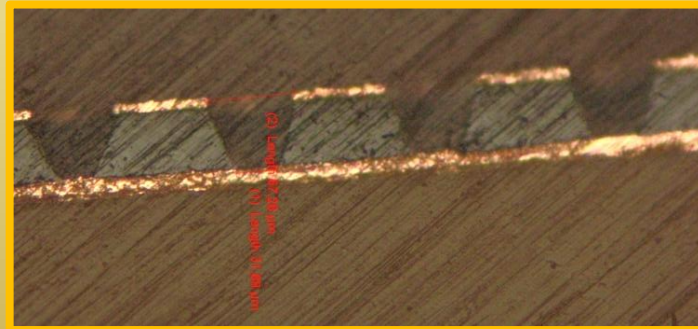
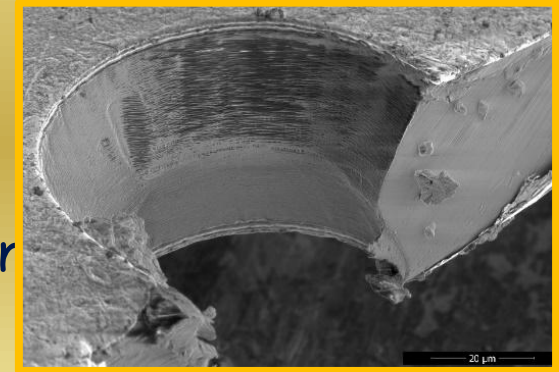


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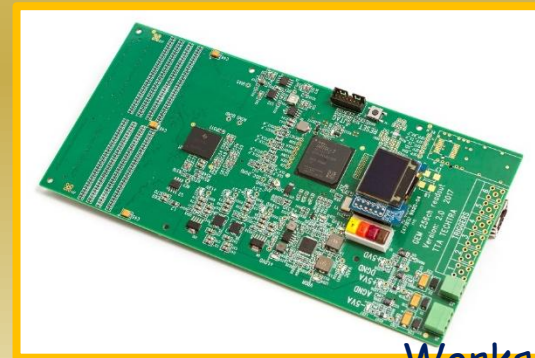
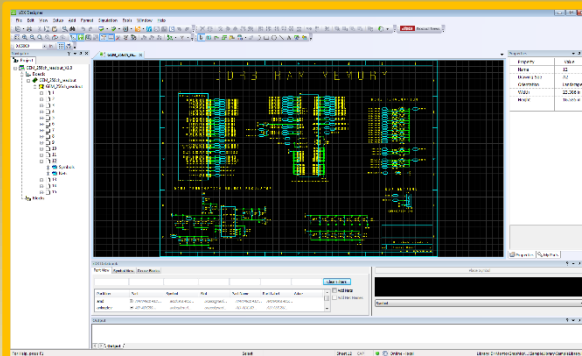
2. Techtra's competences

1. Techtra has mastered all techniques for GEMs production:

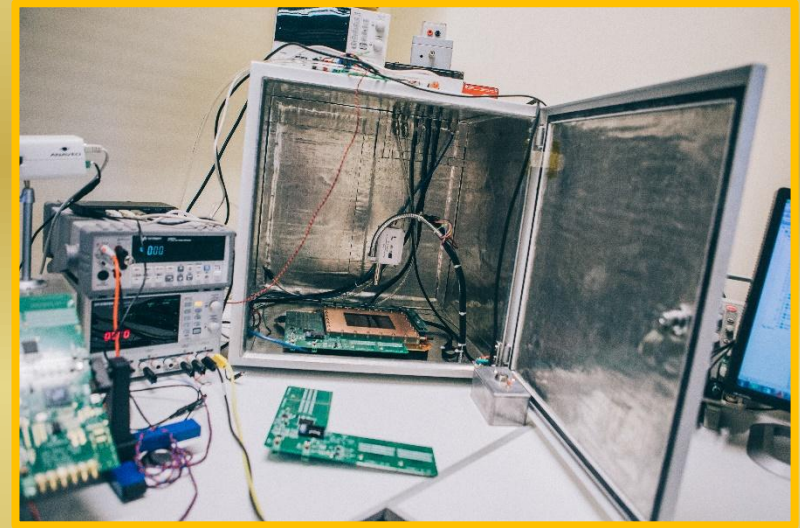
1. Copper etching on thin copper layers with precision of $\pm 2\mu\text{m}$
2. Kapton etching in kapton layer with precision of $\pm 2\mu\text{m}$ at „double“ and „single mask technique:“



3. Dedicated electronic readout for detectors:



4. Validation detectors with small X-ray tube:



5. We are participating in few UE projects.

We are very willing to cooperate in R&D and commercialization for **Resistive Coatings for Gaseous Detectors.**

Summary:

Technology Transfer issues:

1. Legal issues are critical for companies . That needs time !
2. Production chain: techniques (MCV....), consumables (Kapton, DLC coating...), transport, validation and installation.
3. Tuning a collaboration with PCB Industry needs time, if you need kapton etching technology you can:
 - do a technology transfer
 - start a cooperation with: CERN, Techtra, Mecaro, TechEtch, Micropack ...
4. Find an additional applications of your device
5. Look for external funding..... everything costs more than you expect

Our Core GEM-team



European
Funds
Smart Growth

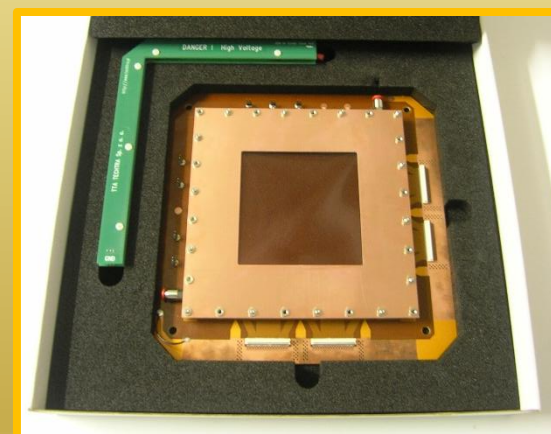
EUROPEAN UNION
EUROPEAN REGIONAL
DEVELOPMENT FUND



Project numer: POIR.01.01.01-00-0192/16



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