Technology Transfer
by Techtra
Techtra did the first and only technology transfer from CERN to Polish industry.

On the basis of signed license agreements, Techtra is the only European company producing Gas Electron Multipliers (GEM).
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 the whole GEM production line. The machinery was installed in Wrocław Technology Park. Techtra got UE support within the „Intelligent Development” project. We had two rooms of about 50m2.

Laboratory scale workshop to have everything under control.
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.
Technology Transfer Step 5: Quality control: define parameters!

Leakage current below 1nA@100cm² @ 600V @ 30 %HR
Since 2010, Techtra has supplied over 3,500 GEMs for High Energy Physics laboratories.

- Typical 30x30 and 10x10cm GEM foils
- Round GEMs Ø 5cm
- Round Ø 12cm
- Chromium GEMs
- Different shapes and sizes
- GEM prototype for the CMS experiment, CERN
- Ø70µm, pitch 280µm
- Ø90µm, pitch 140µm
- Ø50µm, pitch 80µm
Techtra’s clients for GEM foils

- **Experiment KLOE-2**, INFN, Italy
- **Experiment PANDA**, Germany
- **Experiment CMS**, CERN, Switzerland
- **Electron Ion Colider detector**, USA
- **Experiment BESIII**, Chiny
Techtra cooperates with European research centers as part of research projects and deliveries.

- Istituto Nazionale di Fisica Nucleare (Italy)
- Johannes Gutenberg-Universität Mainz (Germany)
- Ruhr-Universität Bochum (Germany)
- University of Sussex (UK)
- Uppsala University (Sweden)
- Westfälische Wilhelms-Universität Münster (Germany)
- CERN - European Organization for Nuclear Research (Switzerland)
- CAEN - Costruzioni Apparecchiature Elettroniche Nucleari Caen-S.p.A (Italy)
- ELTOS S.p.A (Italy)
- Institute of High Energy Physics (China)
Technology Transfer Step 6: Look for **new applications**:

Techtra is the only commercial producer of GEM detectors.

**Design and prototyping**

**Commerically available product**
Cosmic rays for industrial radiography

Cosmic rays (muons) can be used for radiography.

Nuclear Reactor in Fukushima - muon tomography showed that nuclear fuel was released from the reactor into an external tank.

Scanning the Great Pyramids in Giza.

Scanning a volcano in Italy.
R&D project aims to build a microsatellite for forecasting solar weather.

Project is cofinanced state budget

The POIR.04.01.02-00-0080/17 project is co-financed by the National Centre for Research and Development selected under the Smart Growth Operational Programme in Competition No. 1 - 4.1.2/2017_RANB
Summary:

Technology Transfer issues:

Pros:

1. Support of Industrial Liaison Officer for Poland
2. Great support of CERN ETT
3. Excellent support from engineers and technicians – interpersonal contacts are crucial.

Cons:

1. Legal issues are critical for companies. That needs time!
2. The technology was not ready for transfer.
3. One needs to ask good questions.
4. Look for external funding …… everything costs more than you expect.
5. Competitors:
   1. CERN itself !!!!
   2. „In-kind” contributing partners
Our Core GEM-team

TTA TECHTRA Sp. z o.o.
ul. Dunska 13
54-427 Wroclaw
Poland

phone: +48 71 798 58 85
www.techtra.pl
e-mail: techtra@techtra.pl