- 1. Techtra did the MCV technology transfer from CERN into the Polish industry.
- 2. Techtra is the only European commercial producer of Gas Electron Multiplier (GEM) foils
- 3. Techtra is the only commercial producer of <u>GEM detectors</u>.

ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAII CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

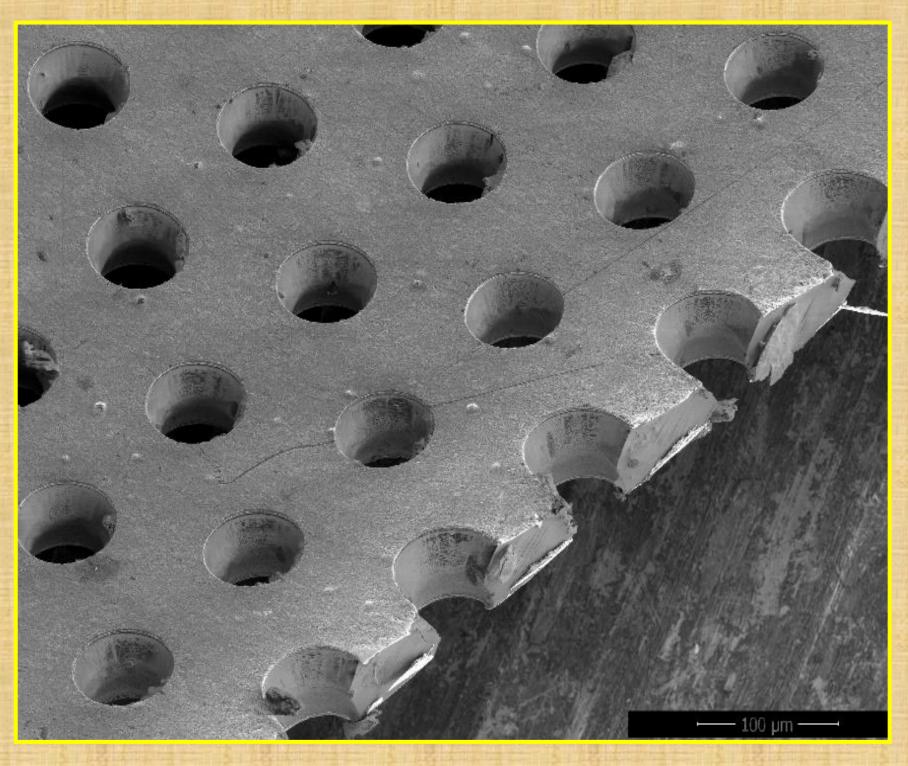
> ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIR CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

> > CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

AGREEMENT K 922/ETT

LICENCE AGREEMENT FOR MICROVIA TECHNOLOGY

License agreements between **Techtra and CERN**



Microscopic view of GEM

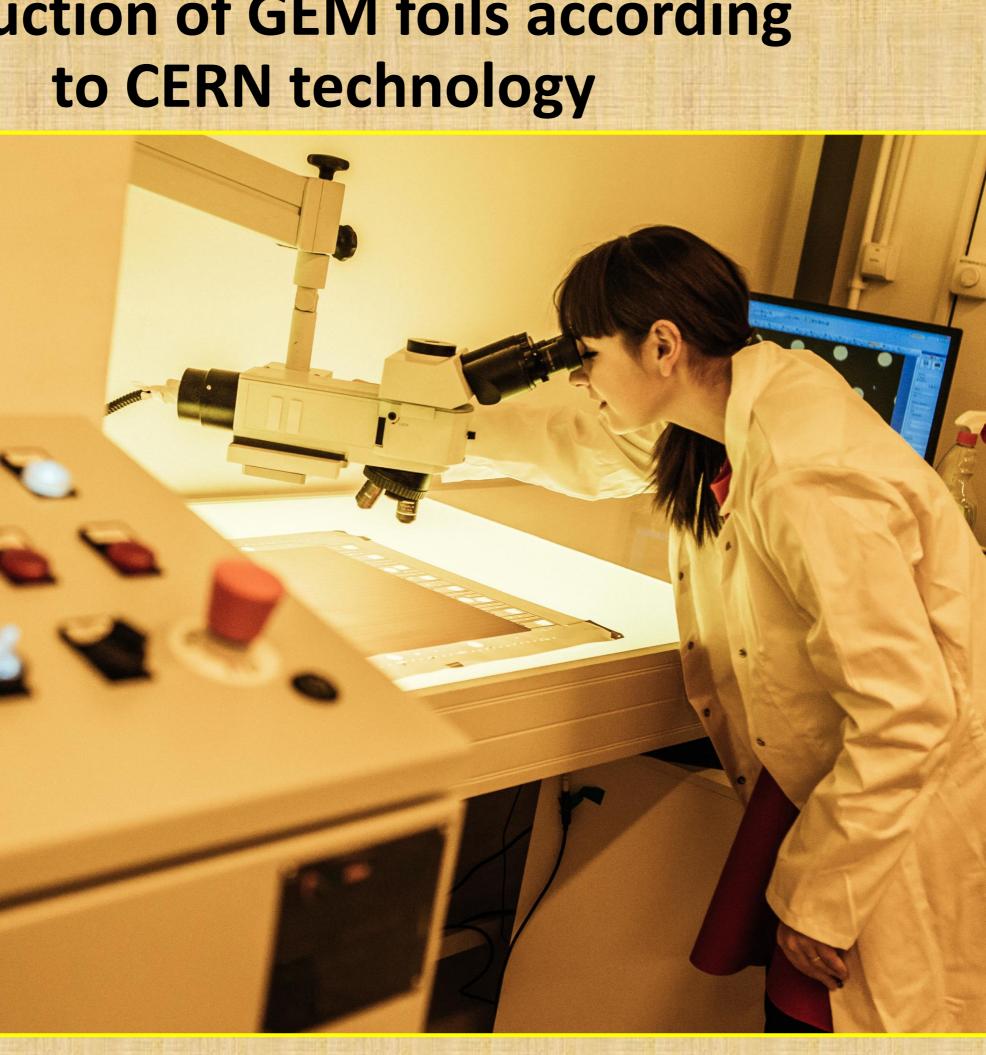


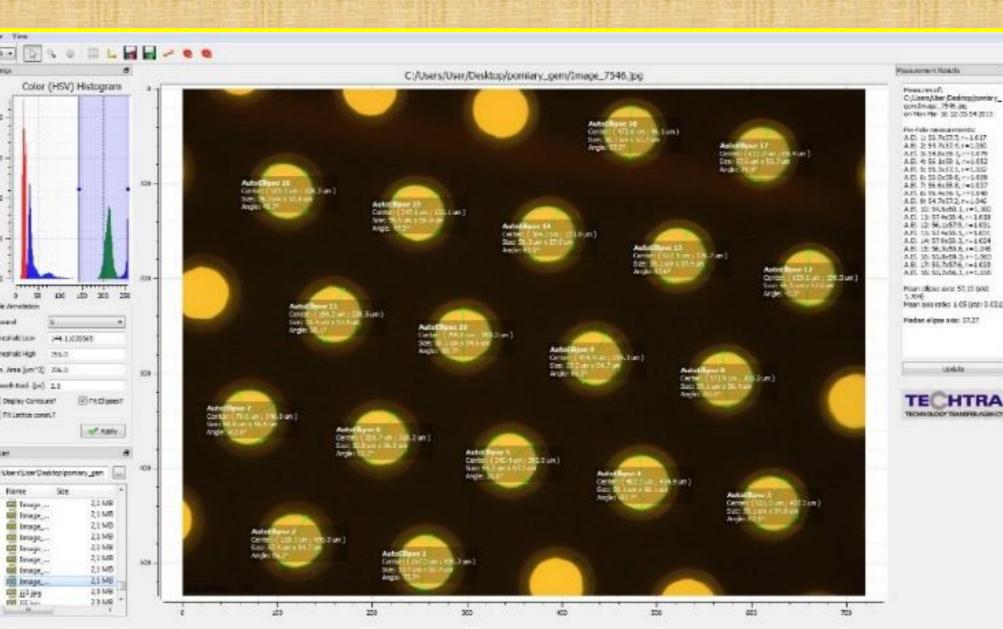


reshold High

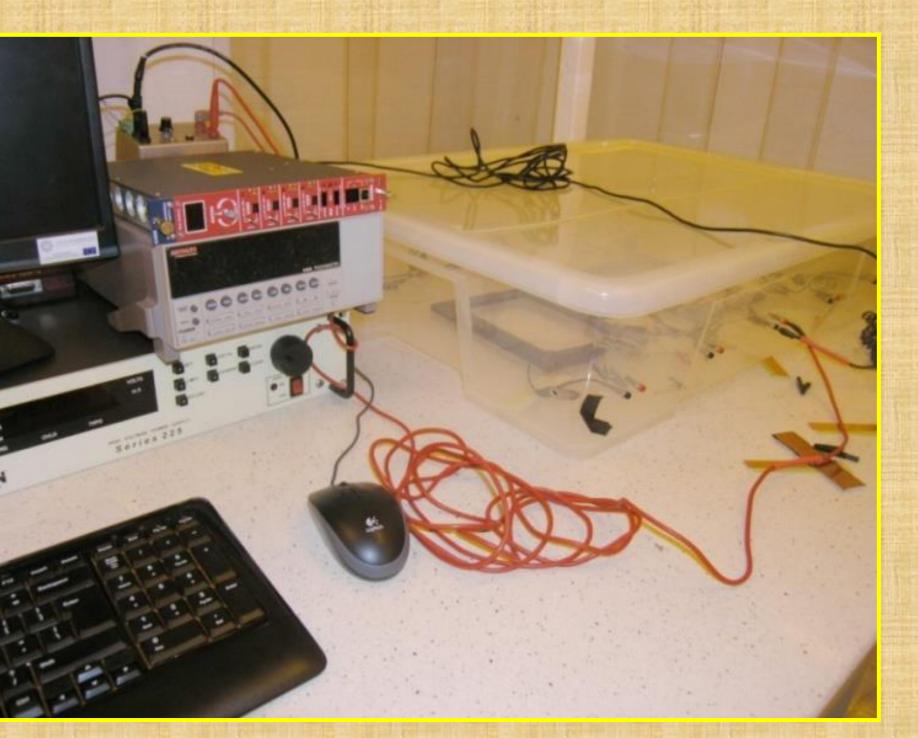
inaje, inaje, inaje, inaje, inaje,

Production of GEM foils according

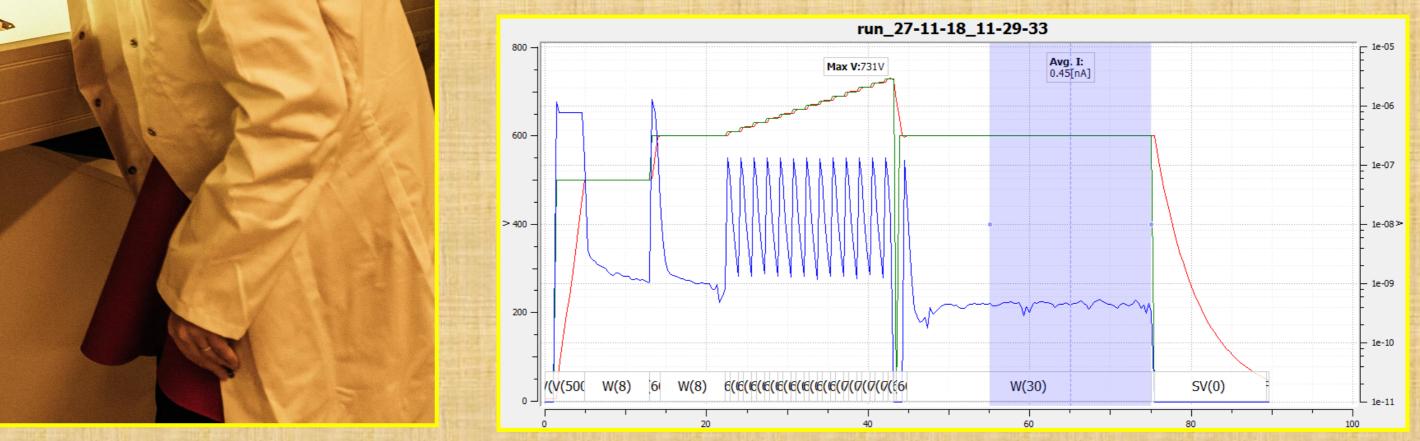




Automatic inspection of geometry uniformity



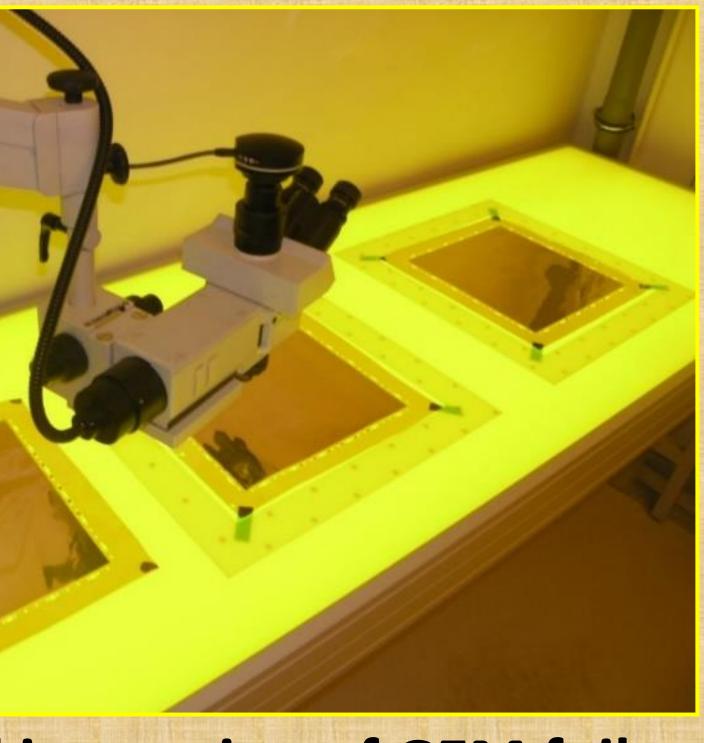
Electrical tests of GEM foils



GEM PRODUCTION

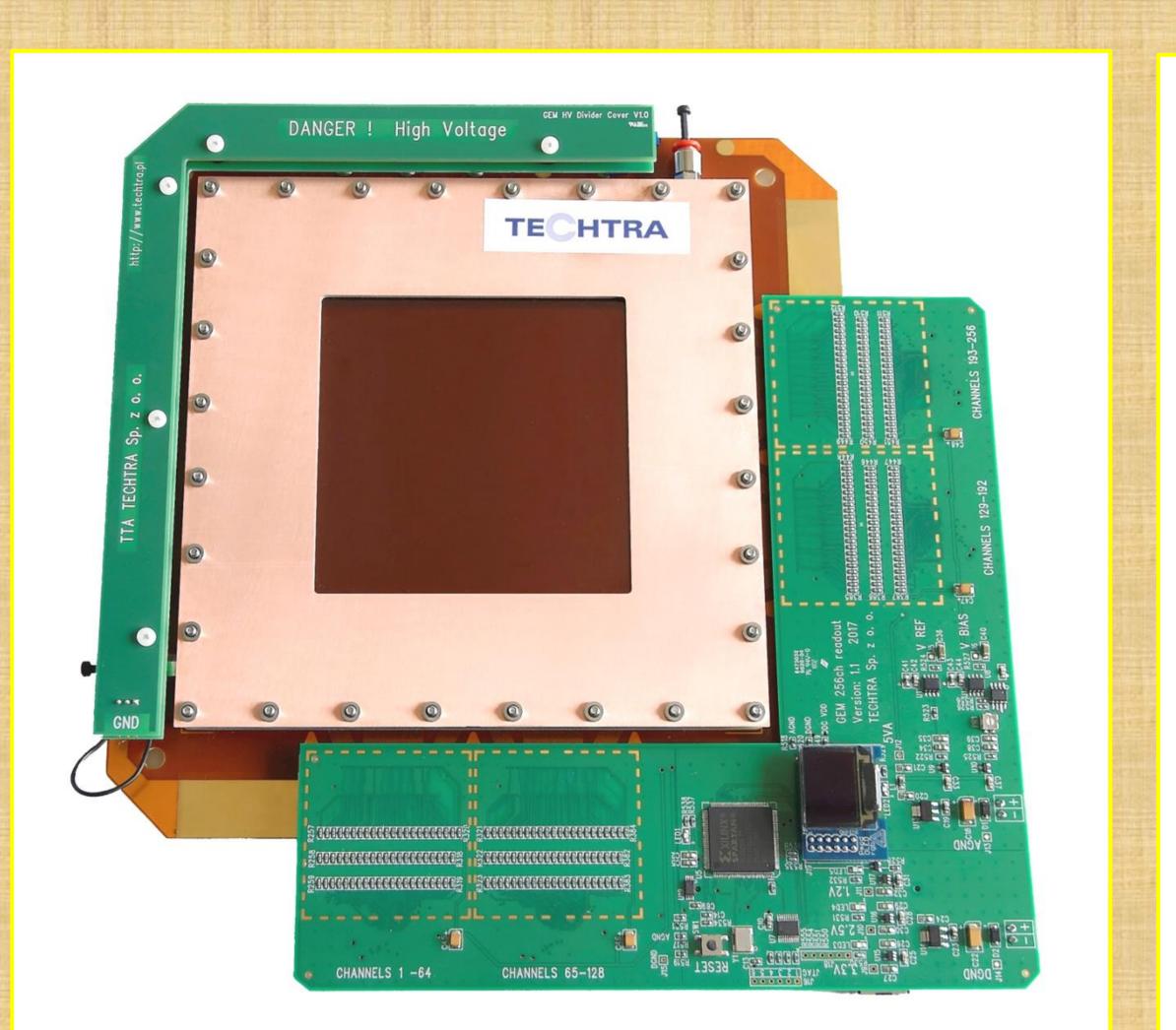


Production of GEM foils

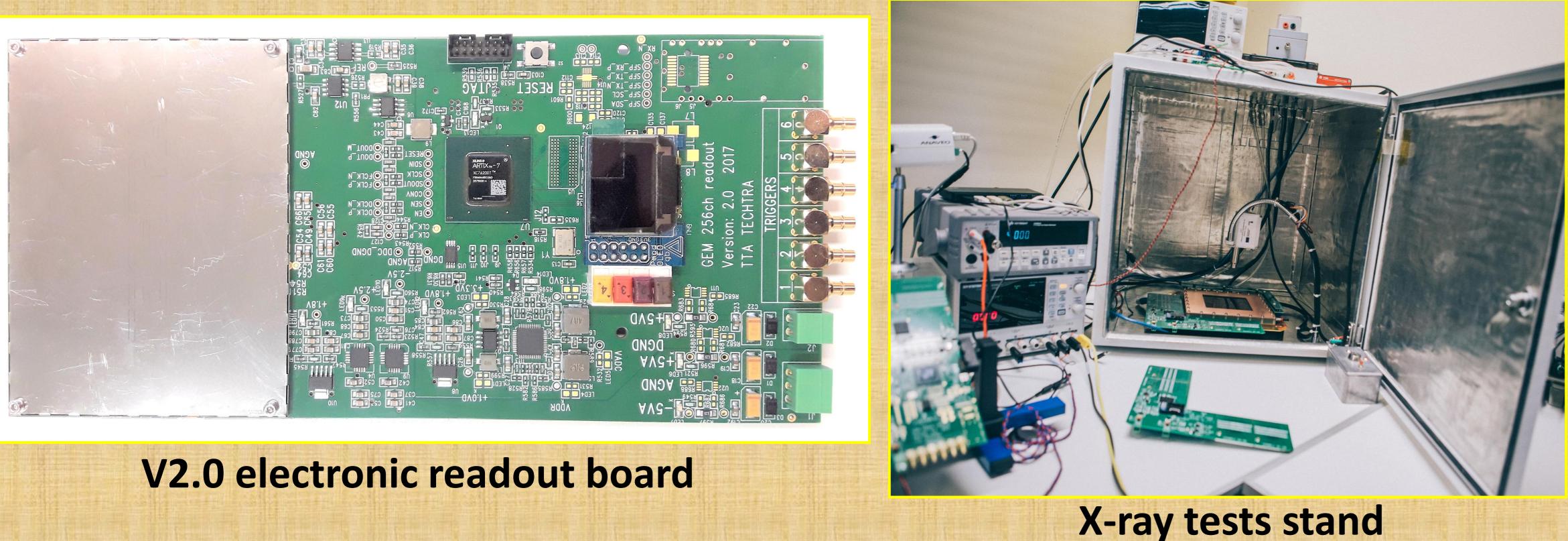


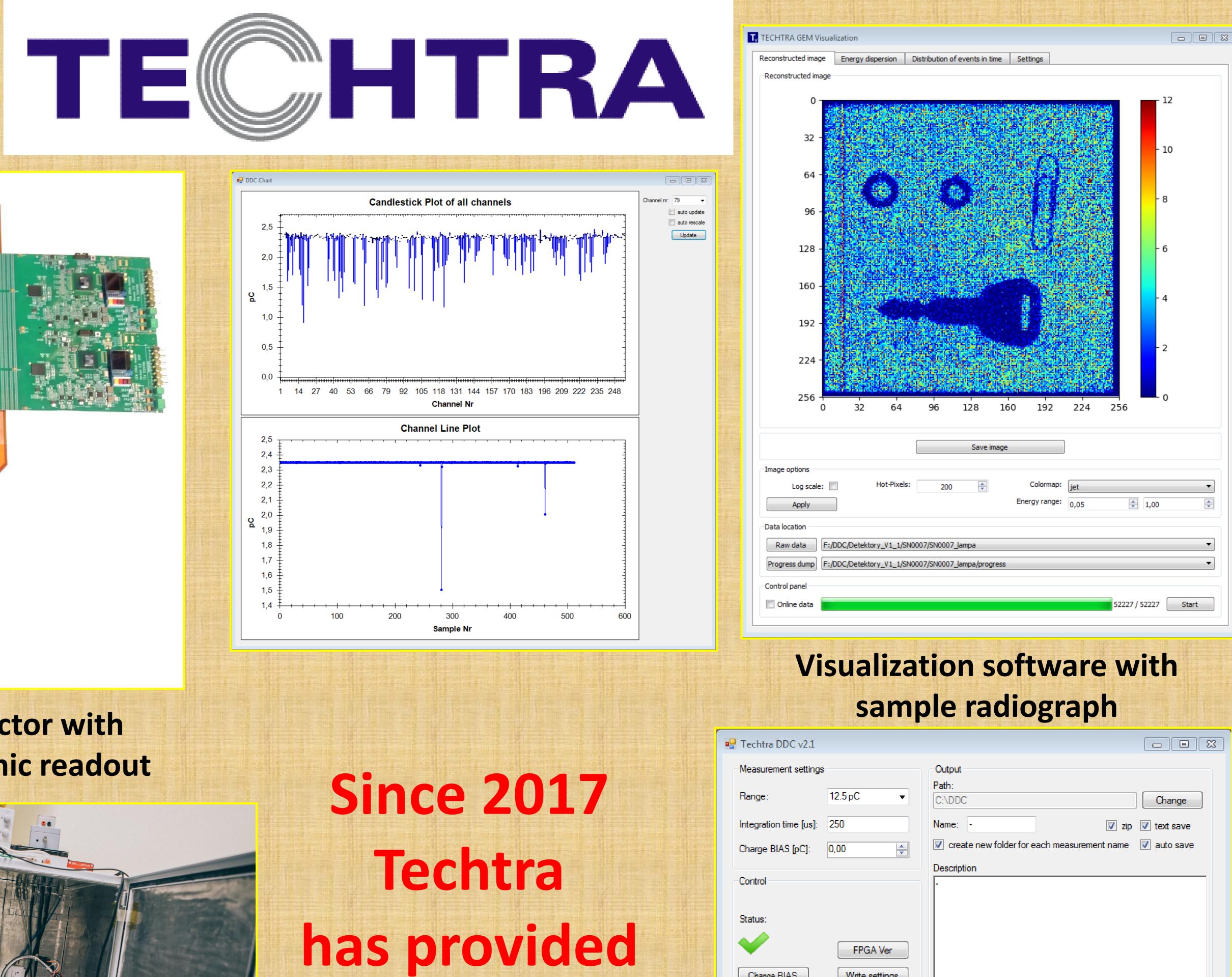
Optical inspection of GEM foils Since 2010 Techtra has provided over **3500 GEM foils**

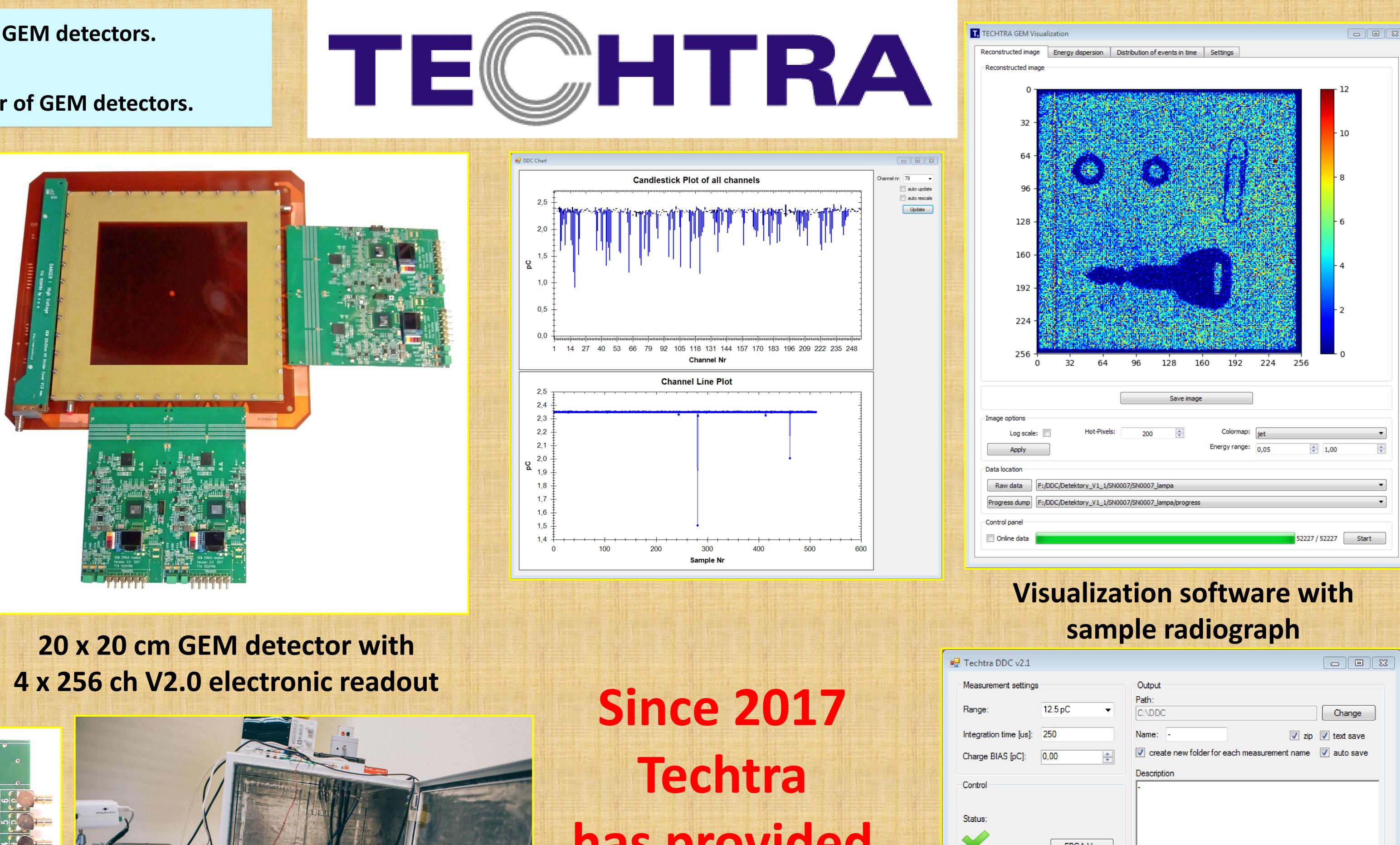
1. Techtra has developed universal DAQ systems for GEM detectors. 2. The system can be scaled-up for bigger detectors. 3. Techtra is the only European commercial producer of GEM detectors.



10 x 10 cm GEM detector with **256 ch V1.1 electronic readout**







several GEM

detectors

Data Acquisition software with on-line charts

Change BIAS

Measurement -

Nr of measurement: 40000

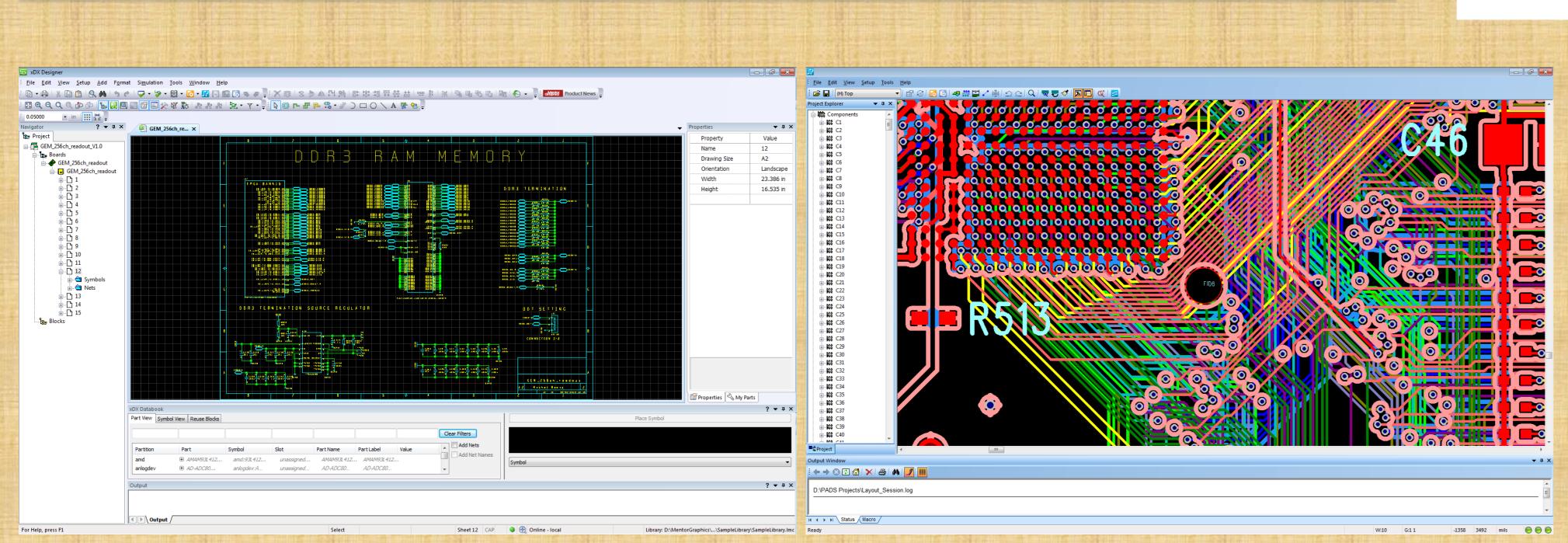
Server runs on IP: 172.24.0.1 pc

Memory limit: 1000

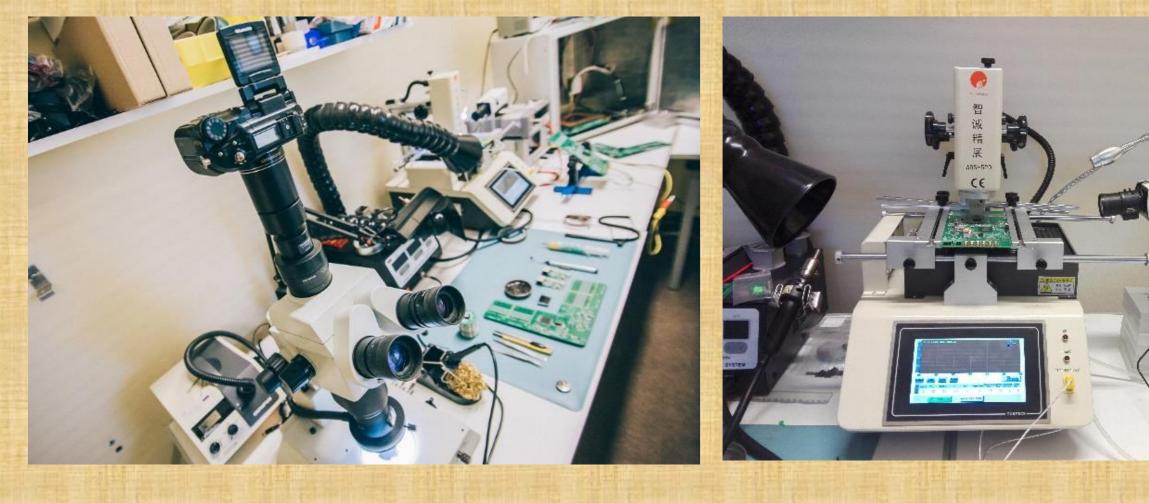
Write

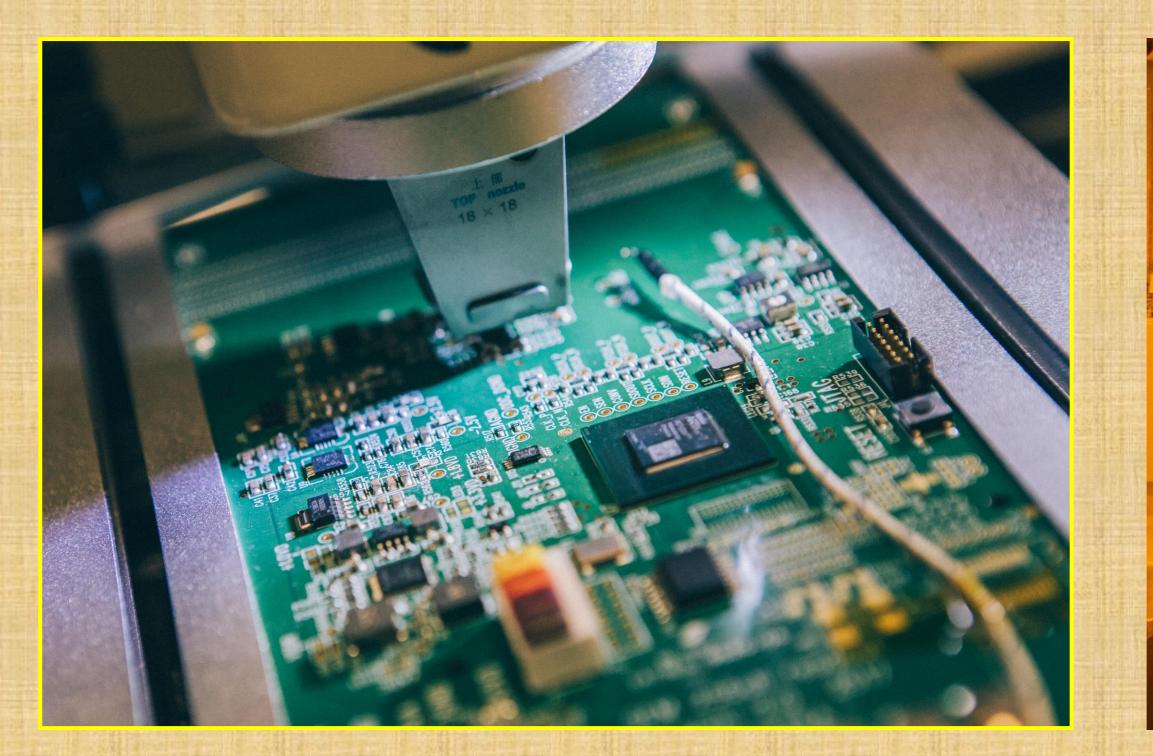
| | | | S |
|-------------------|---|-------------|---------|
| • | Output Path: C:\DDC Name: - | Change | |
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| | o with on line | -h-art- | THE CAL |

- **1.** Techtra prototype and produce dedicated electronic systems.
- 2. Techtra started the development of ceramic components for GEM detectors – XY strip readouts, hex pads readouts, and GEM foils.



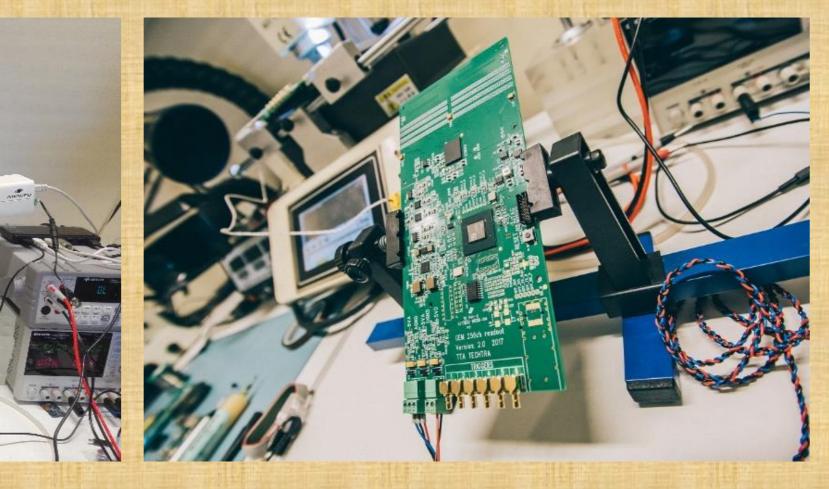
Equipment for the design and production of electronic circuits.





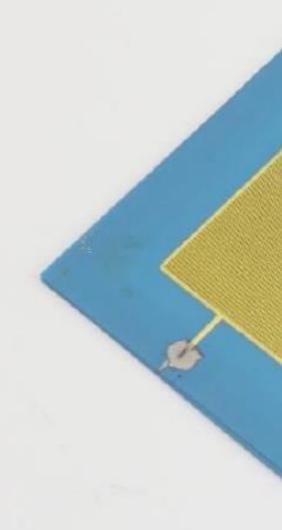
In-house manufacturing and prototyping







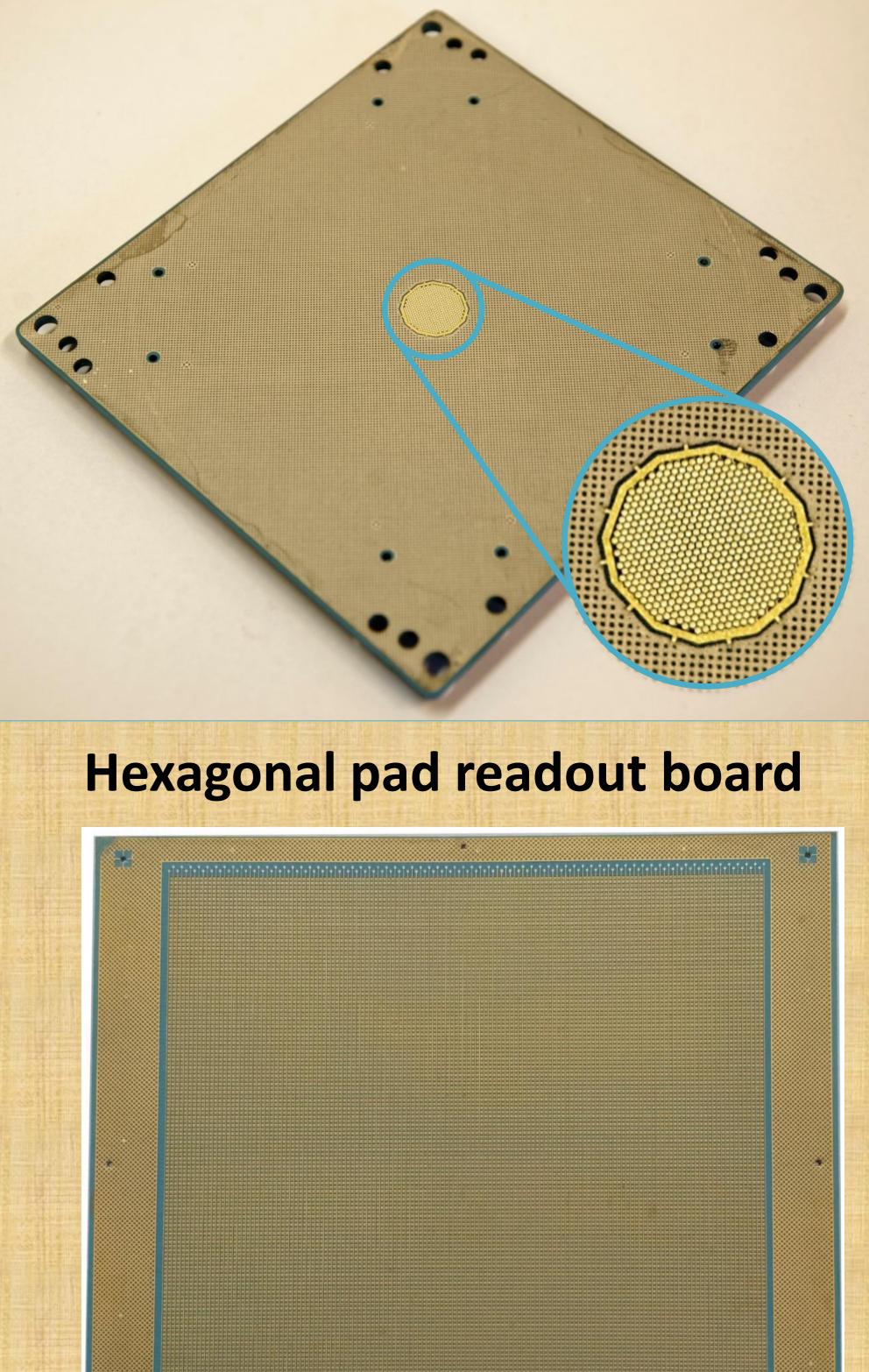
Techtra core team!



LTCC ceramic GEM foils and readouts



Techtra has conducted several **R&D** projects in last years





XY strip readout board

<u>10 mm</u>

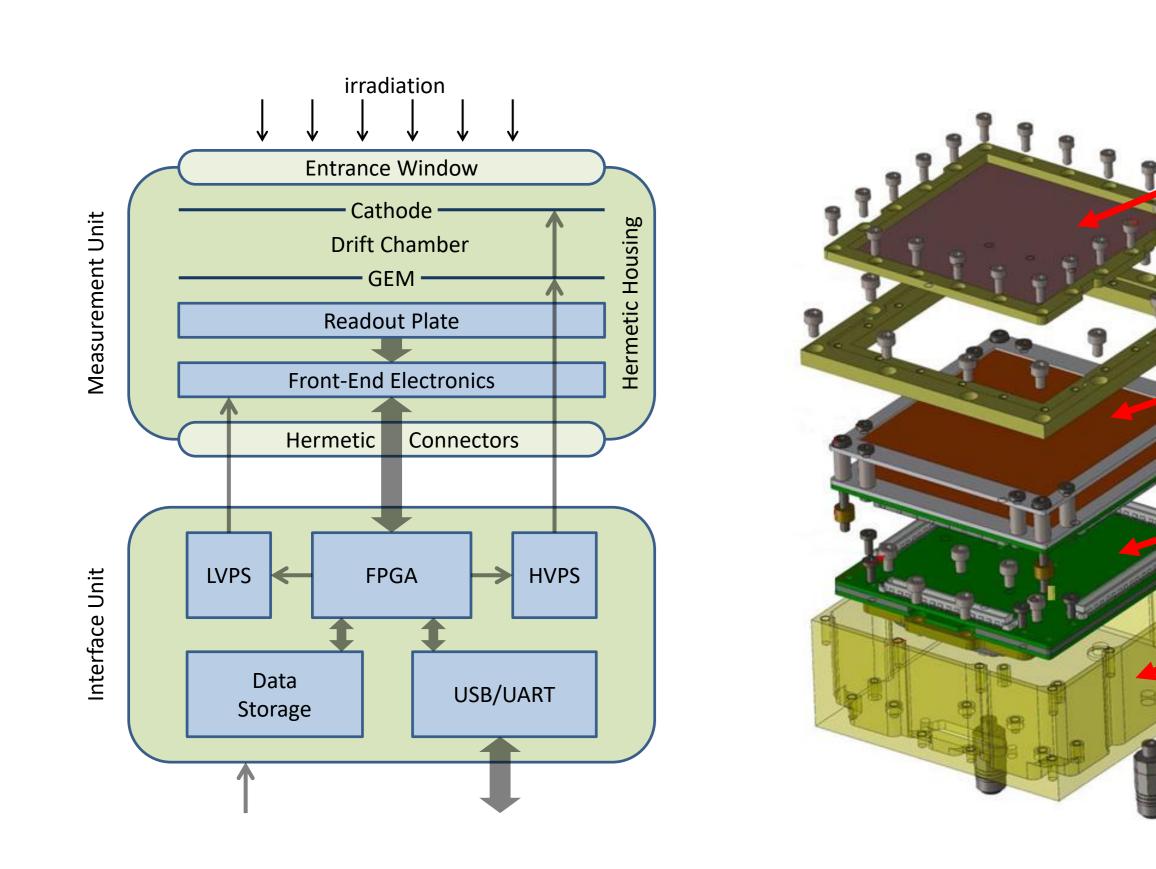
MGEM



Modular GEM Detectors (MGEM) Subtitle: GEM detector for CubeSat Ścisłowski¹; Piotr, Wilk⁴; Tomasz, Witwicki³. technology. Design, construction and tests.

Summary

linnovative GEM detectors are under development in Wrocław, Poland within a framework of MGEM Project supported by the Polish National Centre for Research and Development. Each detector module will be compatible with CubeSat technology and thus can be implemented even in small satellites. The detector will be a component suitable for ballooning, rocket and space mission instrumentations. Detector will be commercially available. Some elements of the detector can be customized. It is expected that the detector will be finally assembled in the end of 2022. For more information on the detector components, their construction and test procedures see the parallel poster.

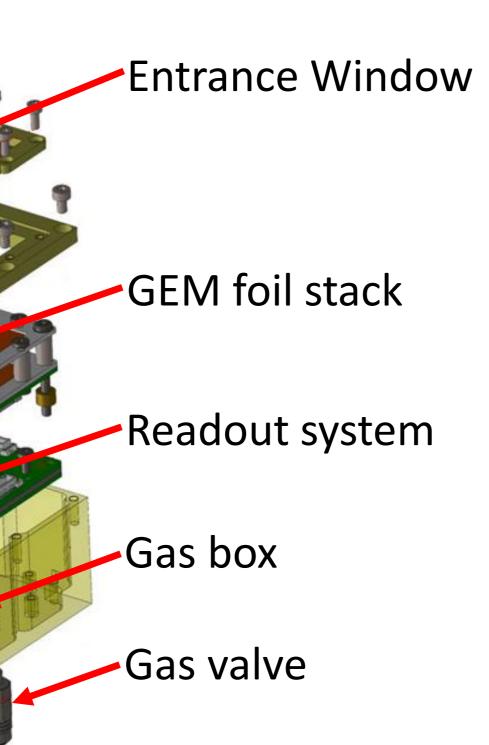


Block diagram of MGEM detector.

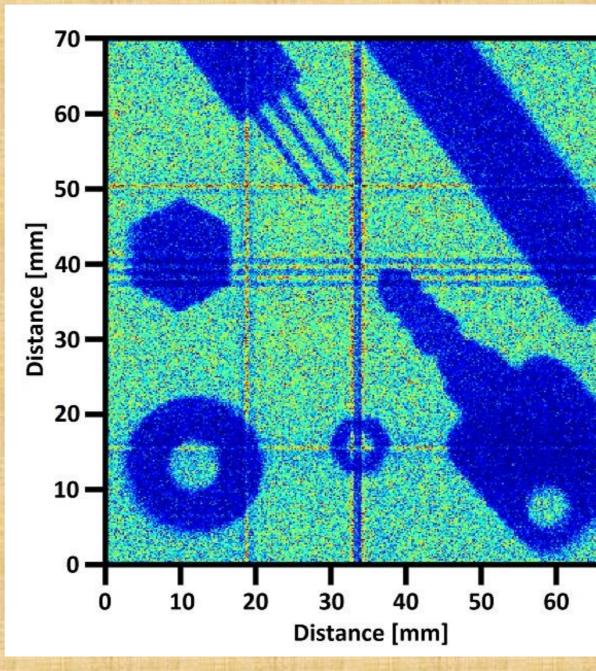
Narodowe Centrum Badań i Rozwoju



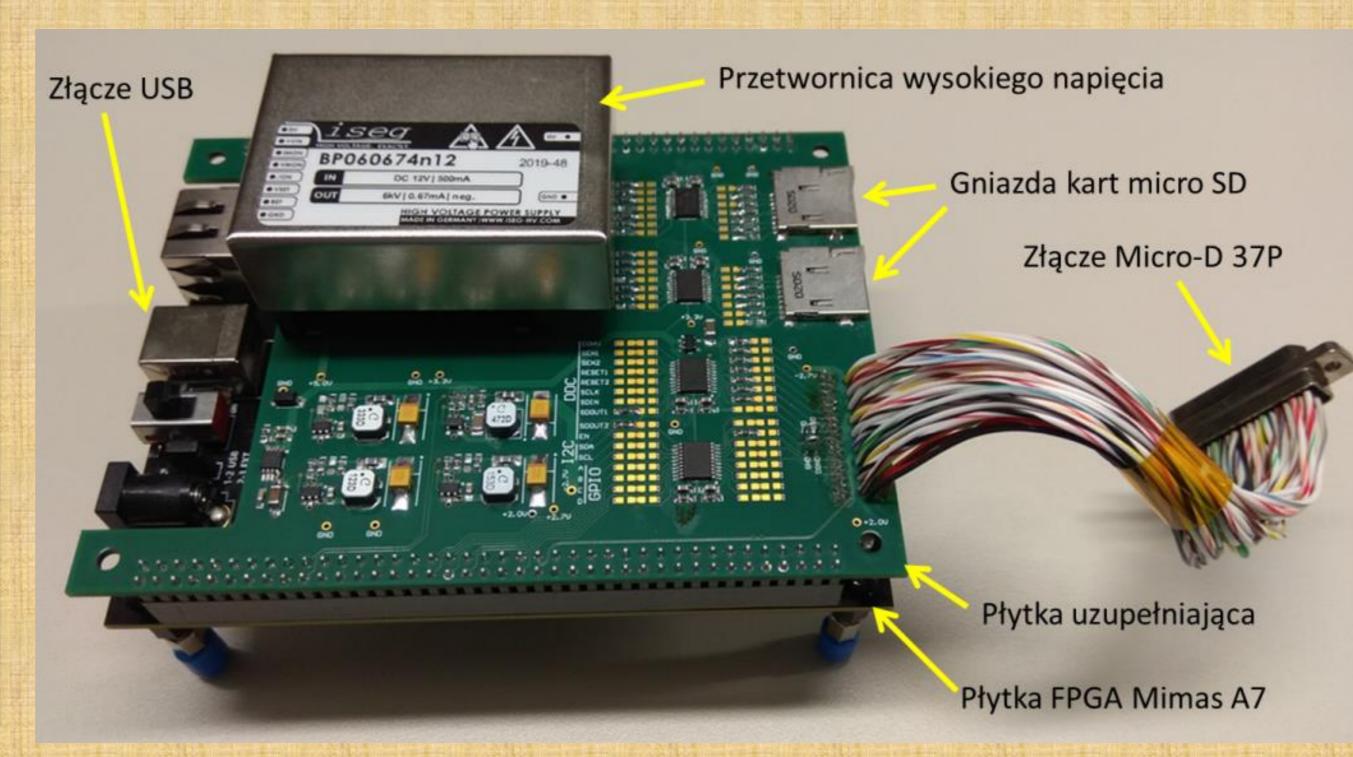




R&D accivities



The test radiographs measured on the LTCC readouts:



Control and powering system - demonstration version made

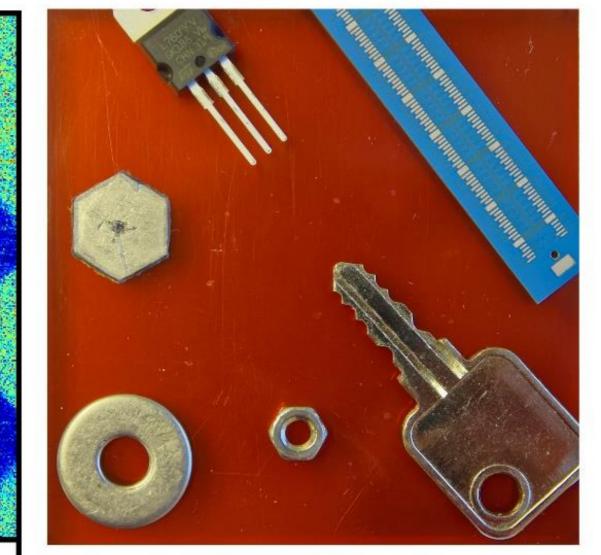




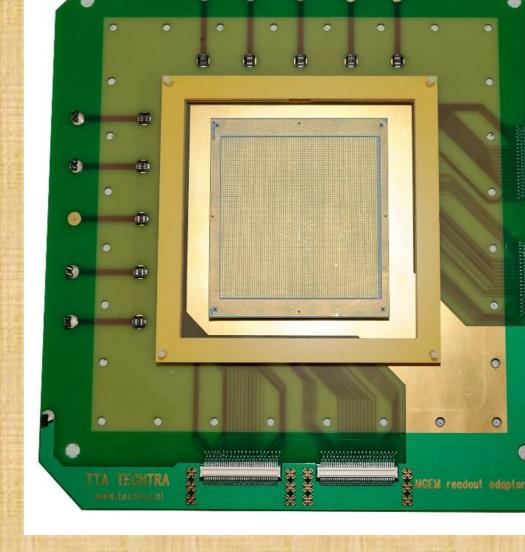
Michał, Babij³; Jarosław, Bąkała¹; Piotr, Bielowka³; Małgorzata, Chojnicka-Oleszko³; Mateusz, Czok²; Arkadiusz, Dąbrowski²; Szymon, Gburek¹; Jacek, Głowinkowski⁴; Laura, Jaisńska²; Michał, Jędzierowski³; Mariusz, Kasprzyk³; Katarzyna, Kijewska³; Milena, Kiliszkiewicz²; Mirosław, Kowaliński¹; Karol, Malecha²; Katarzyna, Mikuła¹; Witold, Nawrot²; Piotr, Podgórski¹; Marek, Siarkowski¹; Bogusz, Stępak⁴; Marek, Stęślicki¹; Daniel,

> ²Wrocław University of Science and Technology ³Technology Transfer Agency Techtra Sp. z o.o. ⁴Wroclaw Technology Park S.A. Project number POIR.04.01.02-00-0080/17.

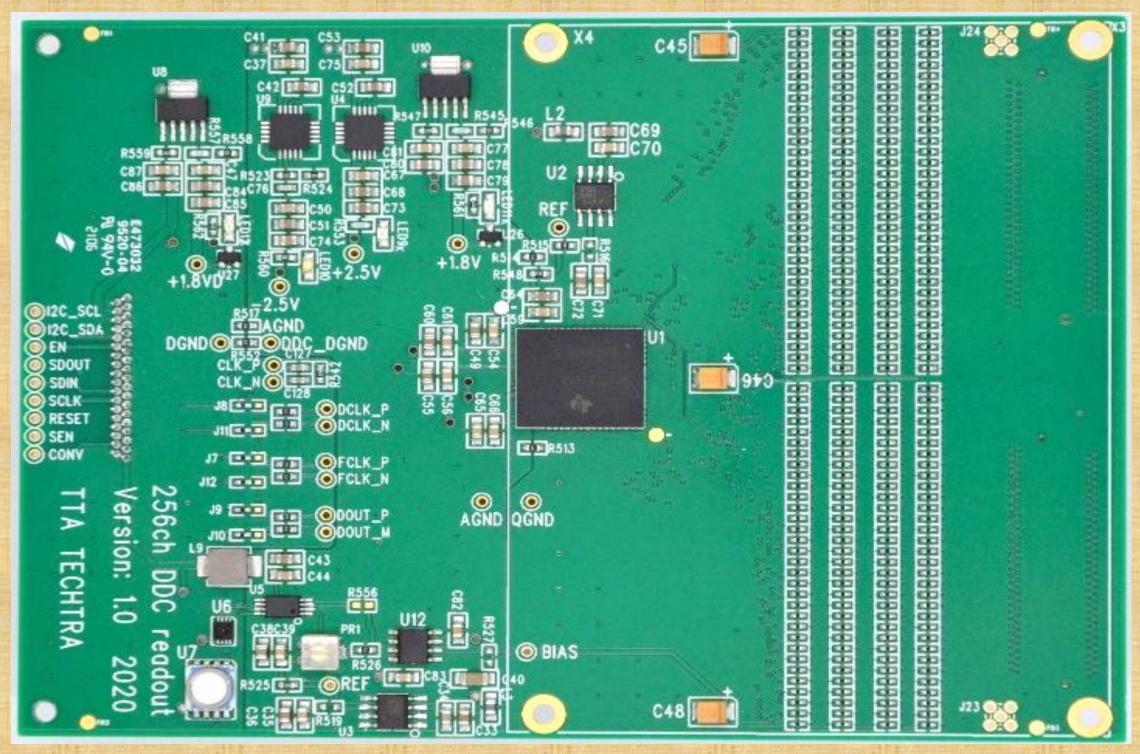
¹ Space Research Centre Polish Academy of Sciences Solar Physics Division Project supported by The National Centre for Research and Development.





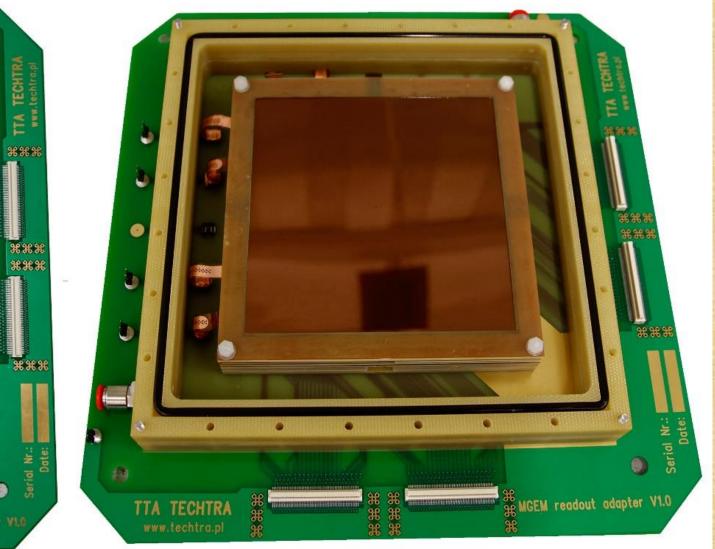


The prototype LTCC readout is placed on the testing board



The DAQ system dedicated to the MGEM project

Rzeczpospolita Polska



The prototype LTCC readout is placed on the testing board, covered by GEM and drift foils