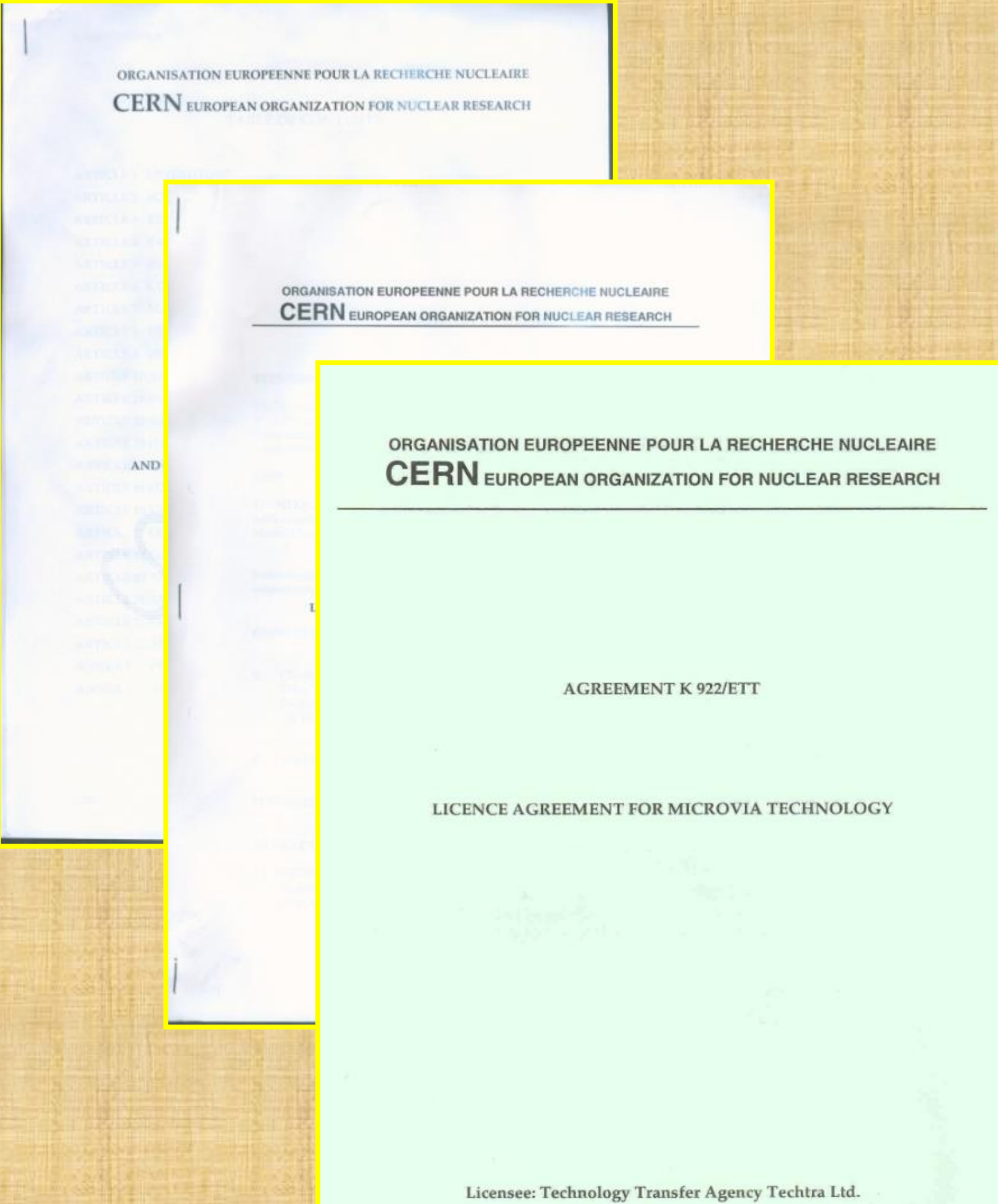


- 1. Techtra did the MCV technology transfer from CERN into the Polish industry.
- 2. Techtra is the only European commercial producer of Gas Electron Multiplier (GEM) foils
- 3. Techtra is the only commercial producer of GEM detectors.



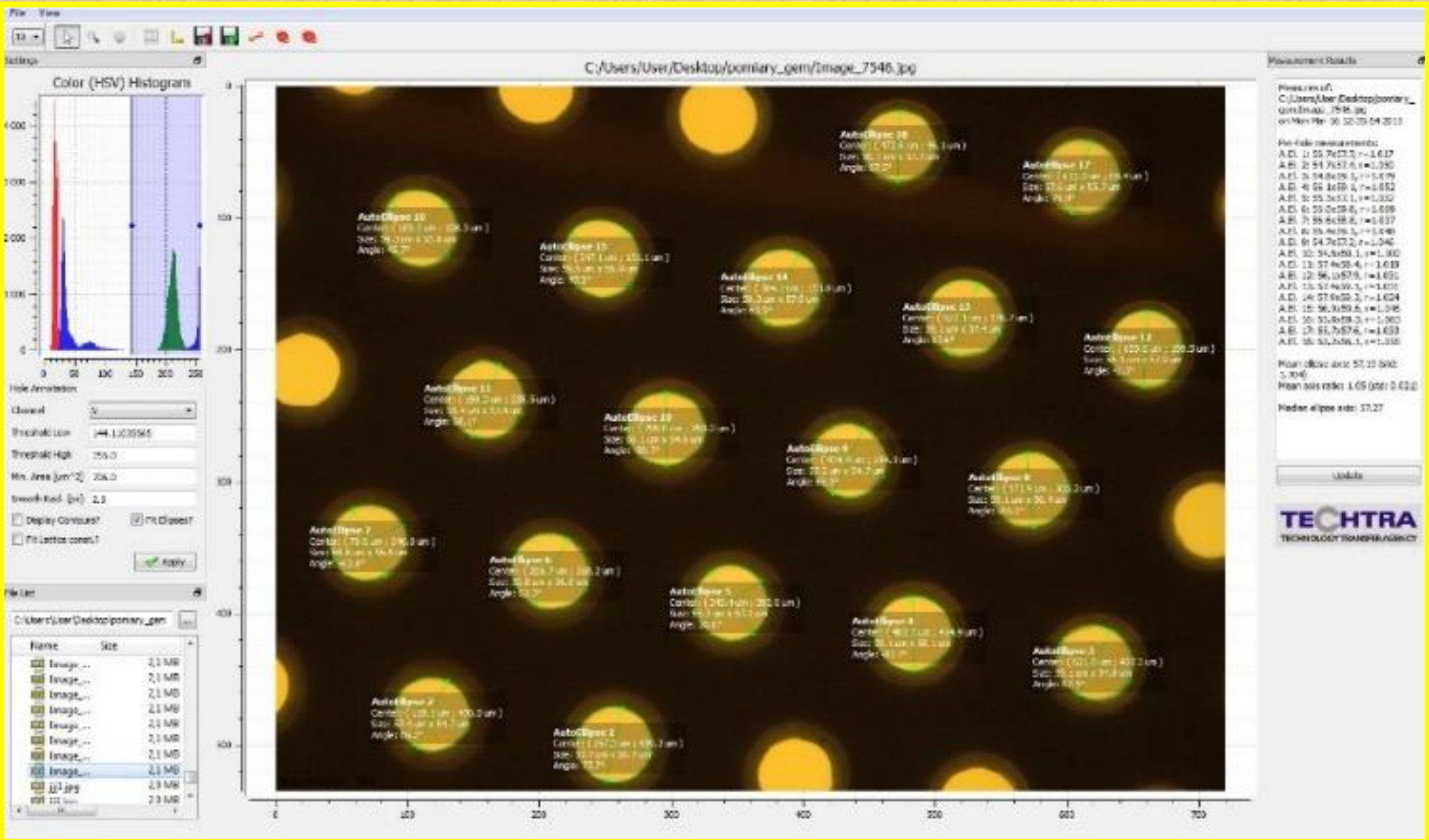
GEM PRODUCTION



License agreements between Techtra and CERN



Production of GEM foils according to CERN technology



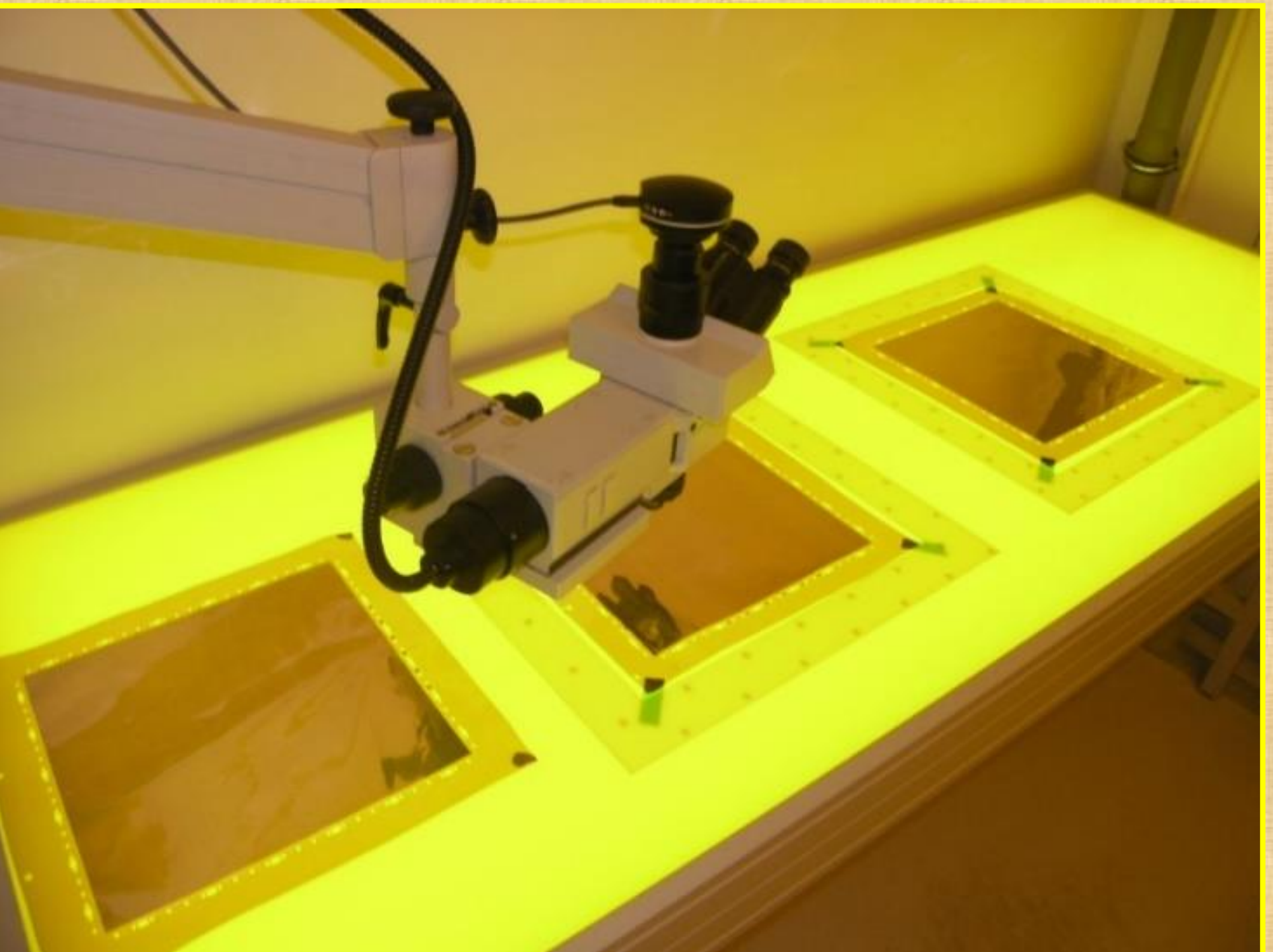
Automatic inspection of geometry uniformity



Production of GEM foils

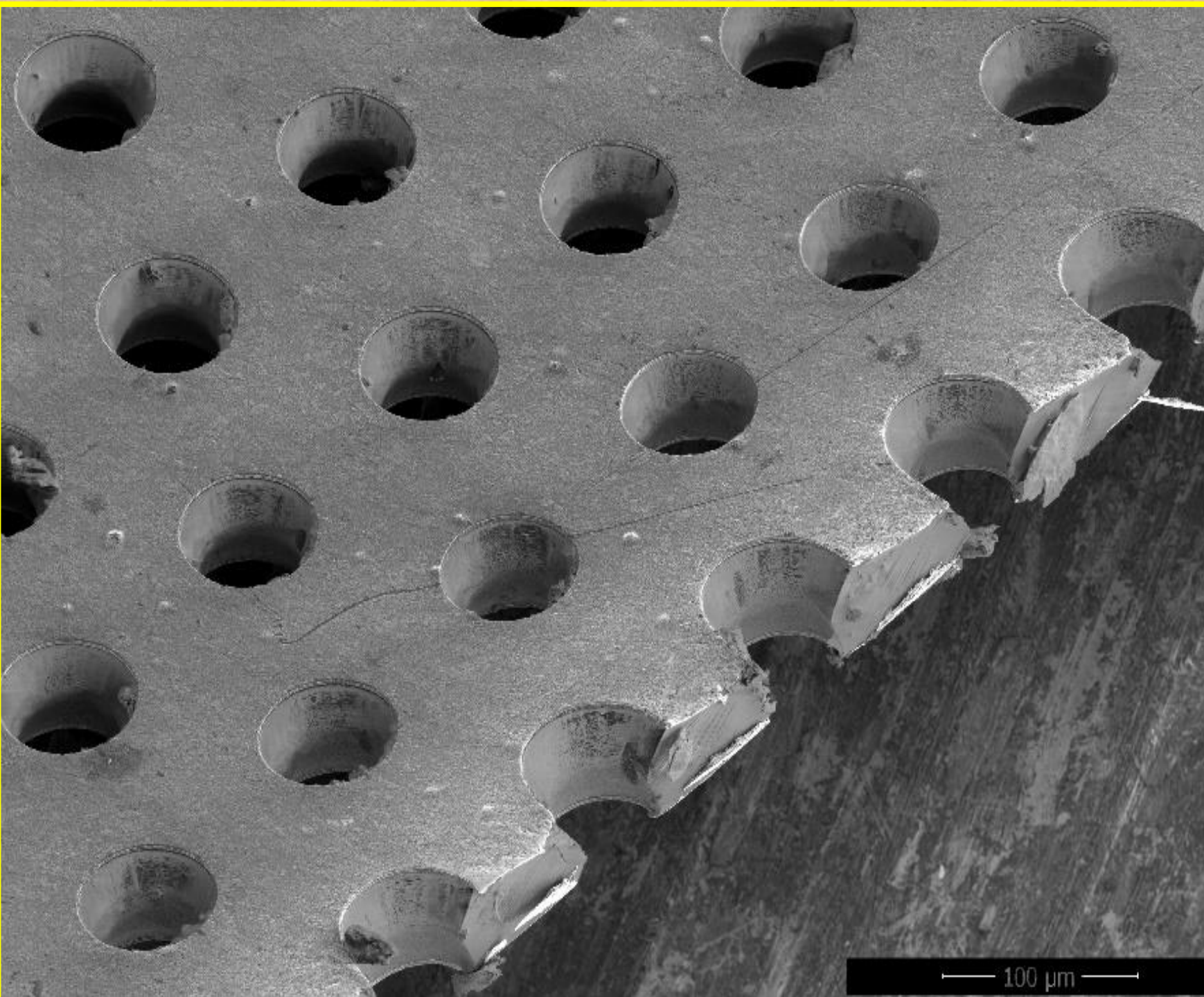


Electrical tests of GEM foils

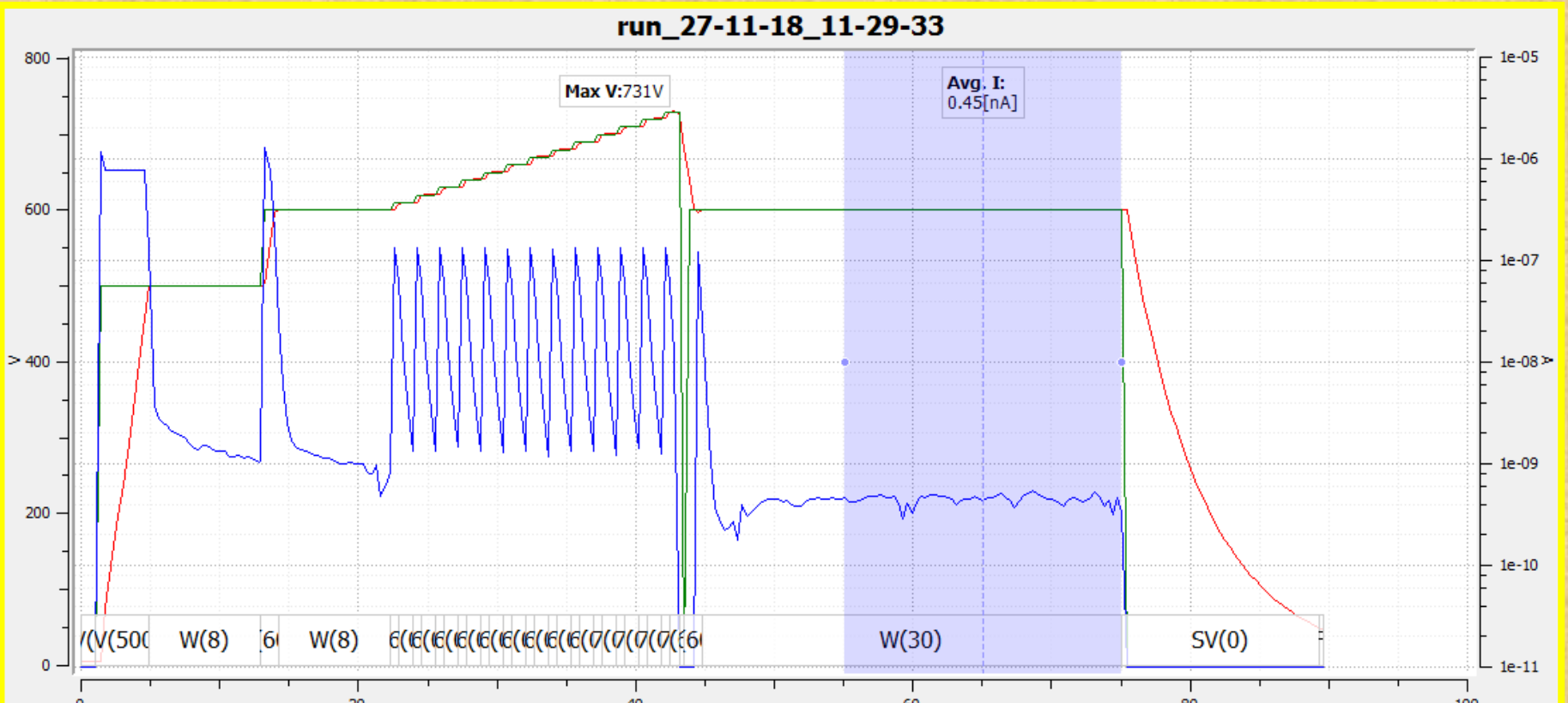


Optical inspection of GEM foils

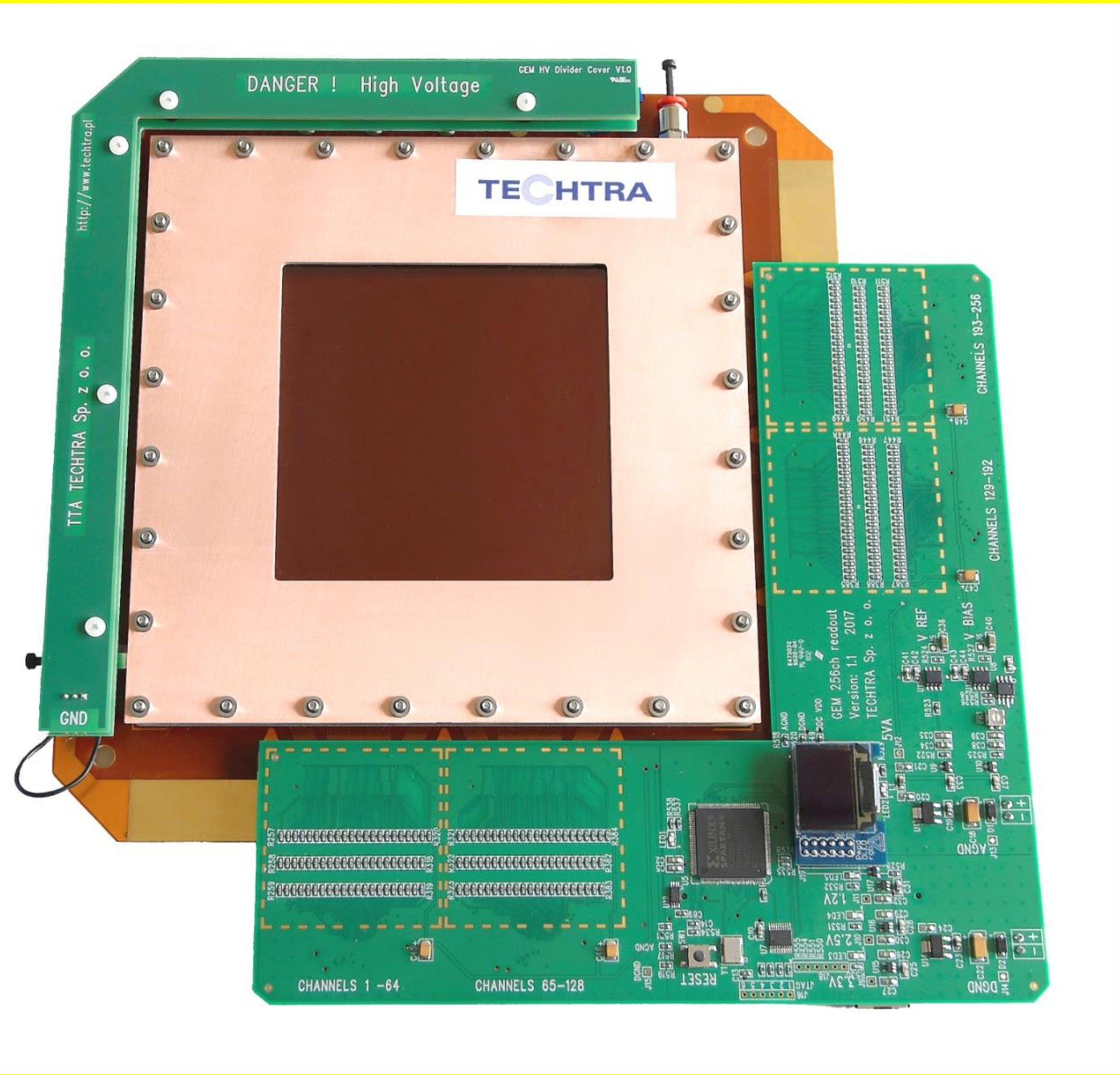
Since 2010 Techtra has provided over 3500 GEM foils



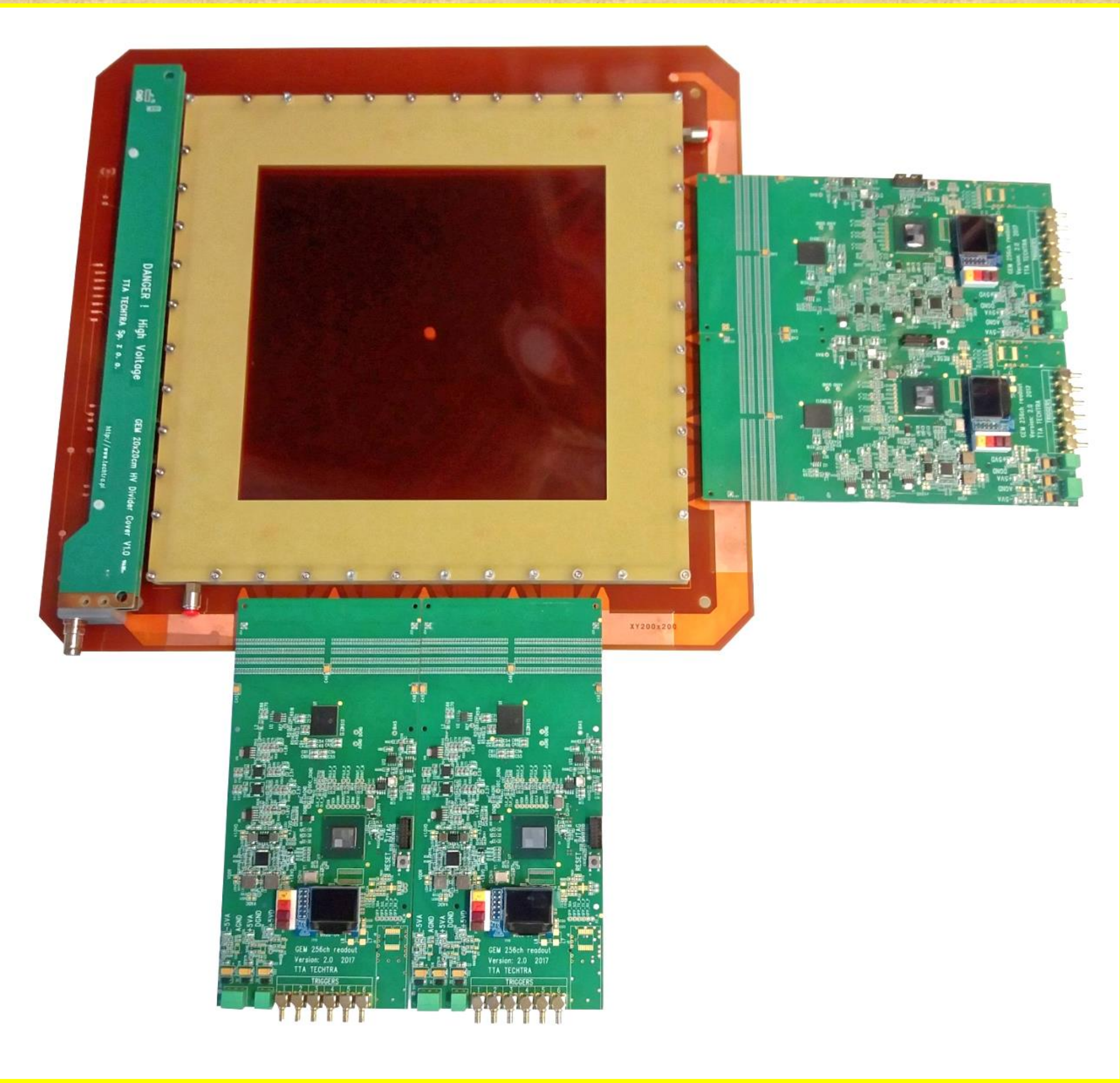
Microscopic view of GEM



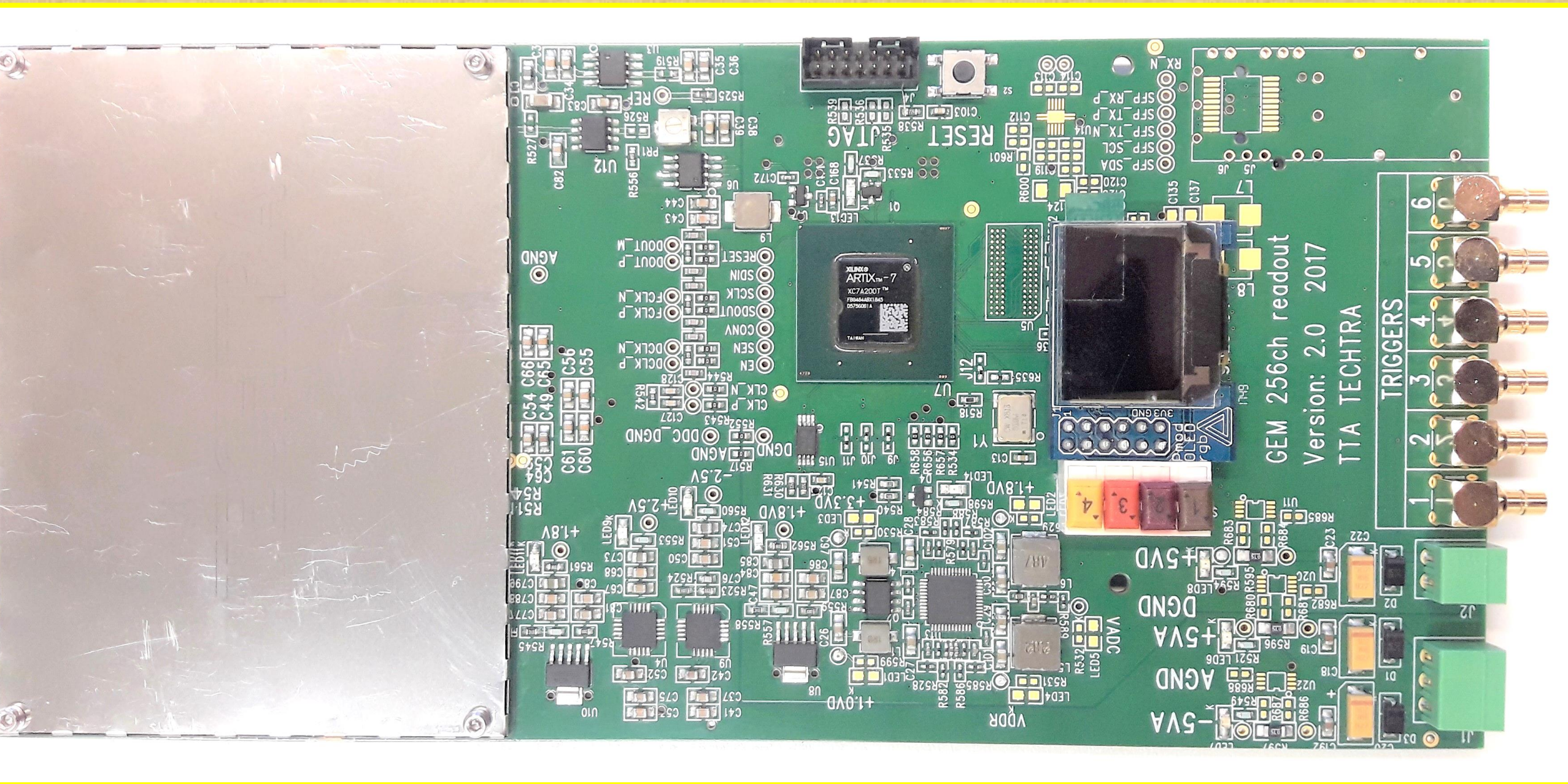
- 1. Techtra has developed universal DAQ systems for GEM detectors.
- 2. The system can be scaled-up for bigger detectors.
- 3. Techtra is the only European commercial producer of GEM detectors.



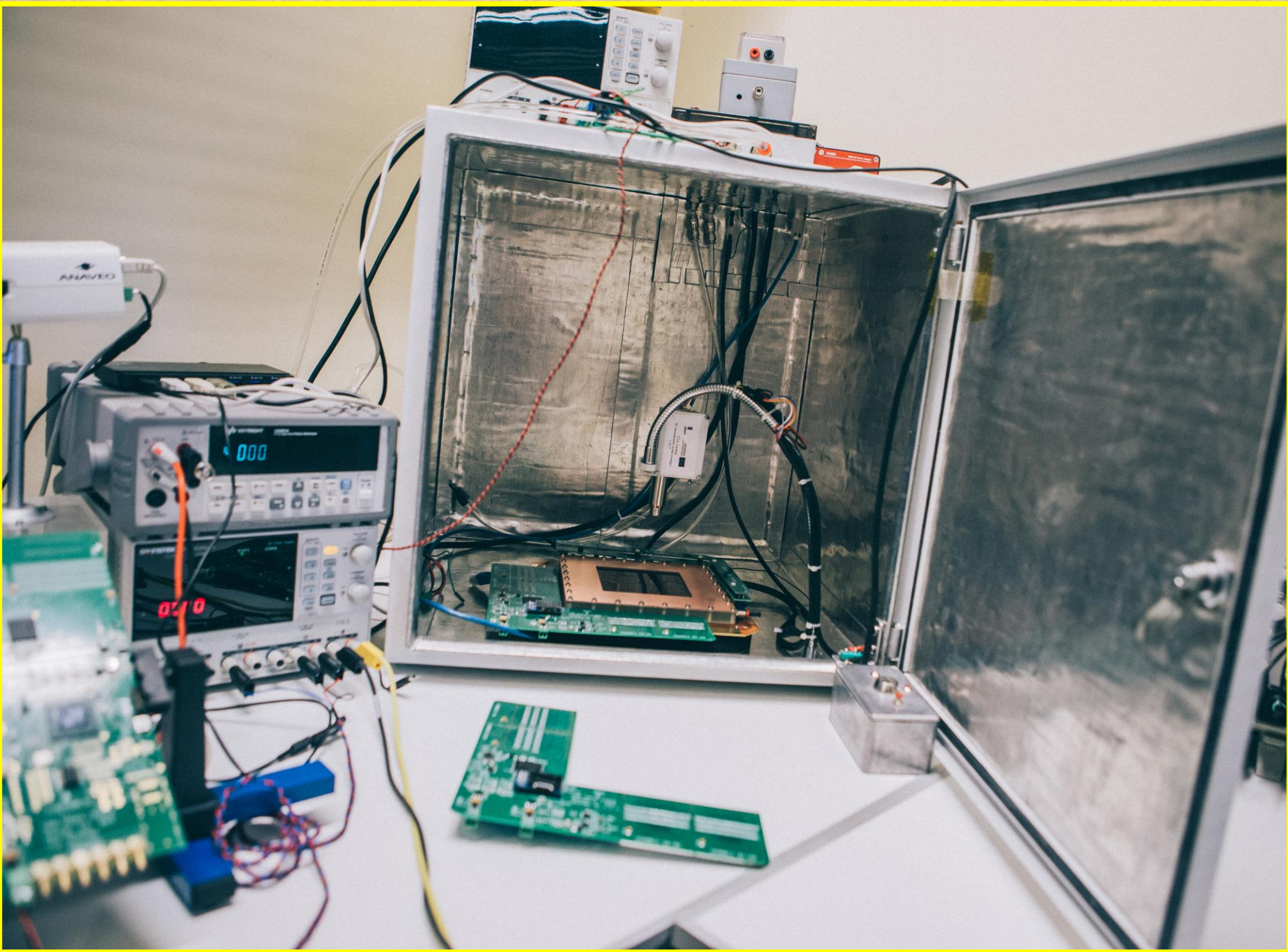
10 x 10 cm GEM detector with 256 ch V1.1 electronic readout



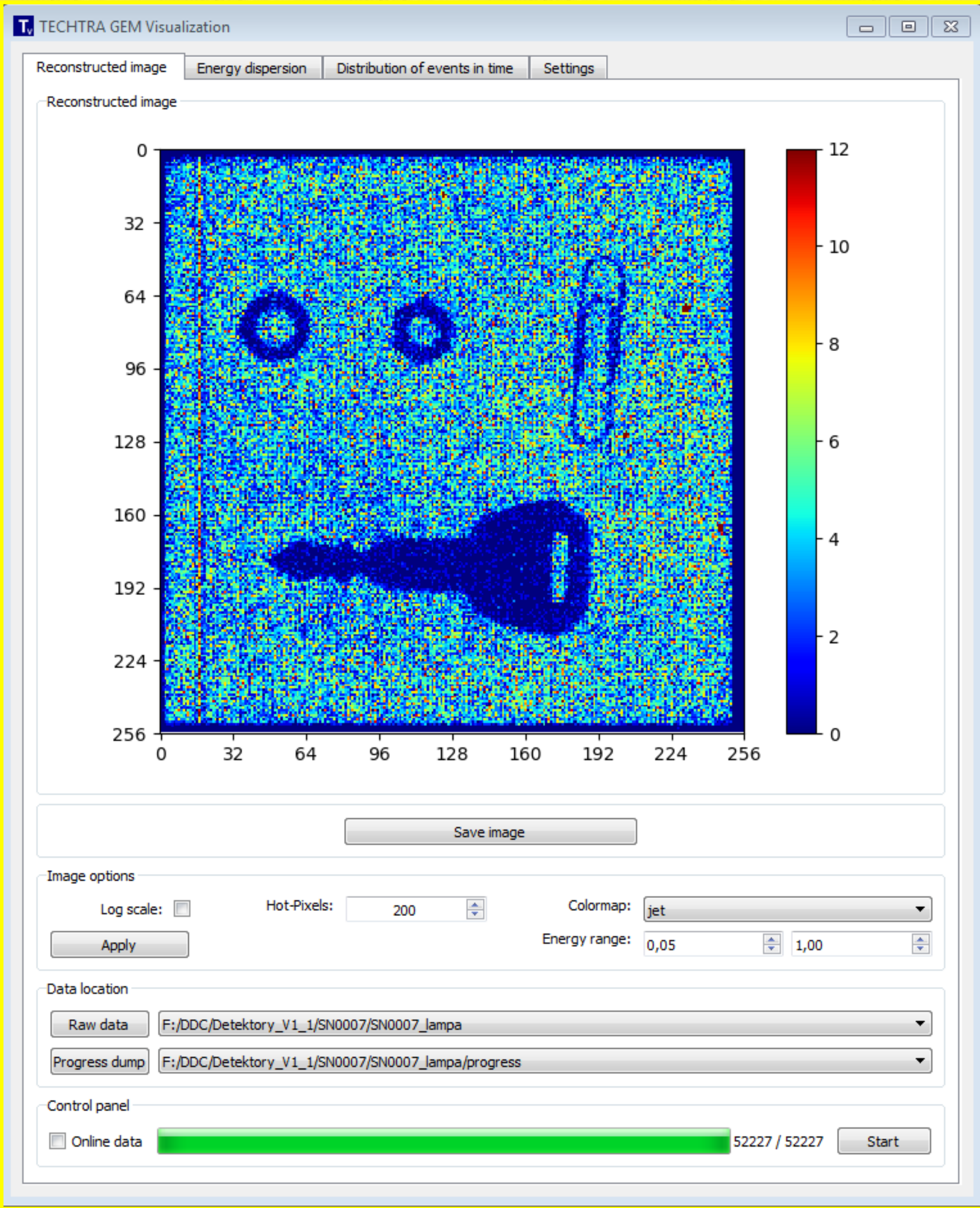
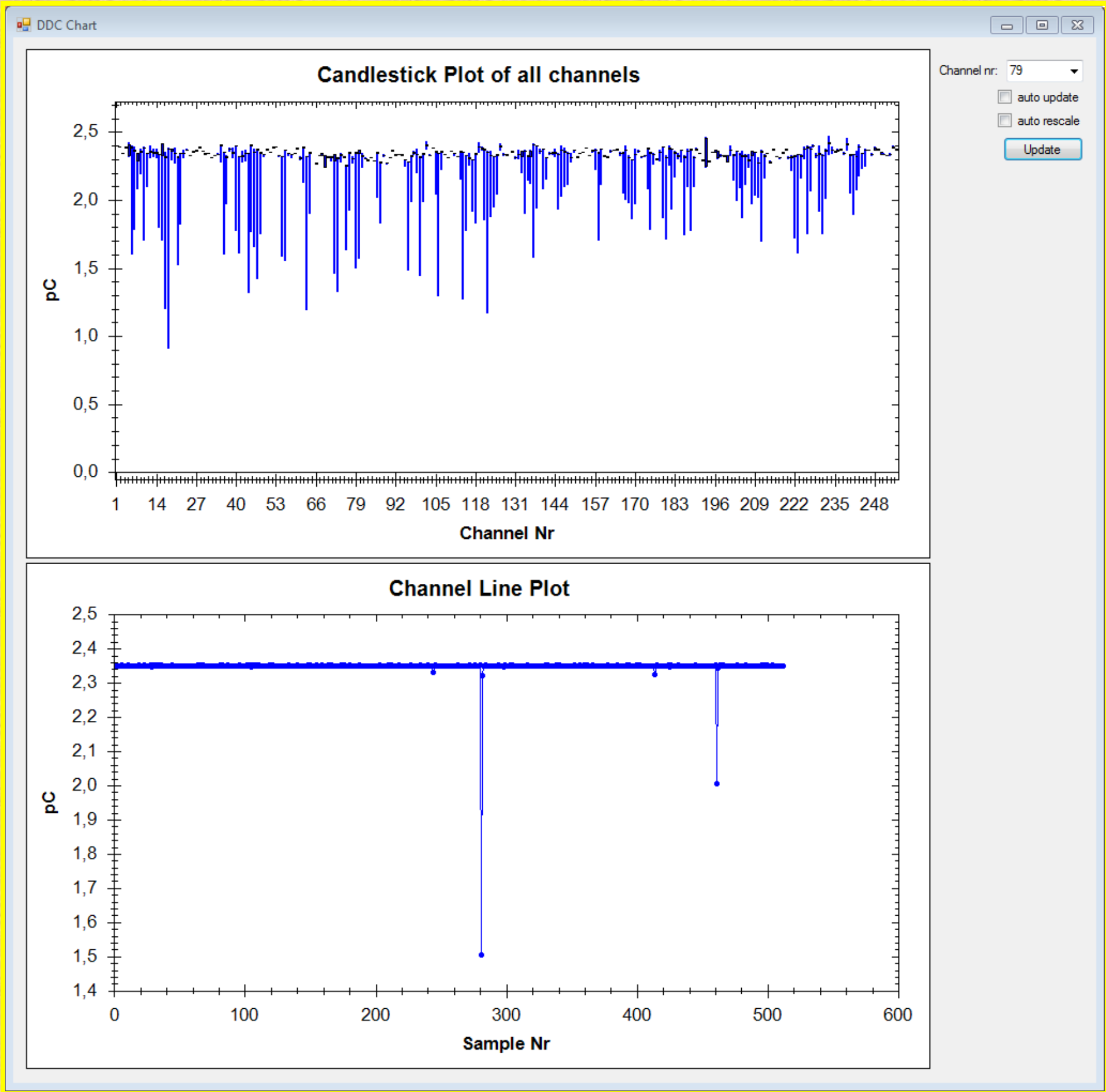
20 x 20 cm GEM detector with 4 x 256 ch V2.0 electronic readout



V2.0 electronic readout board

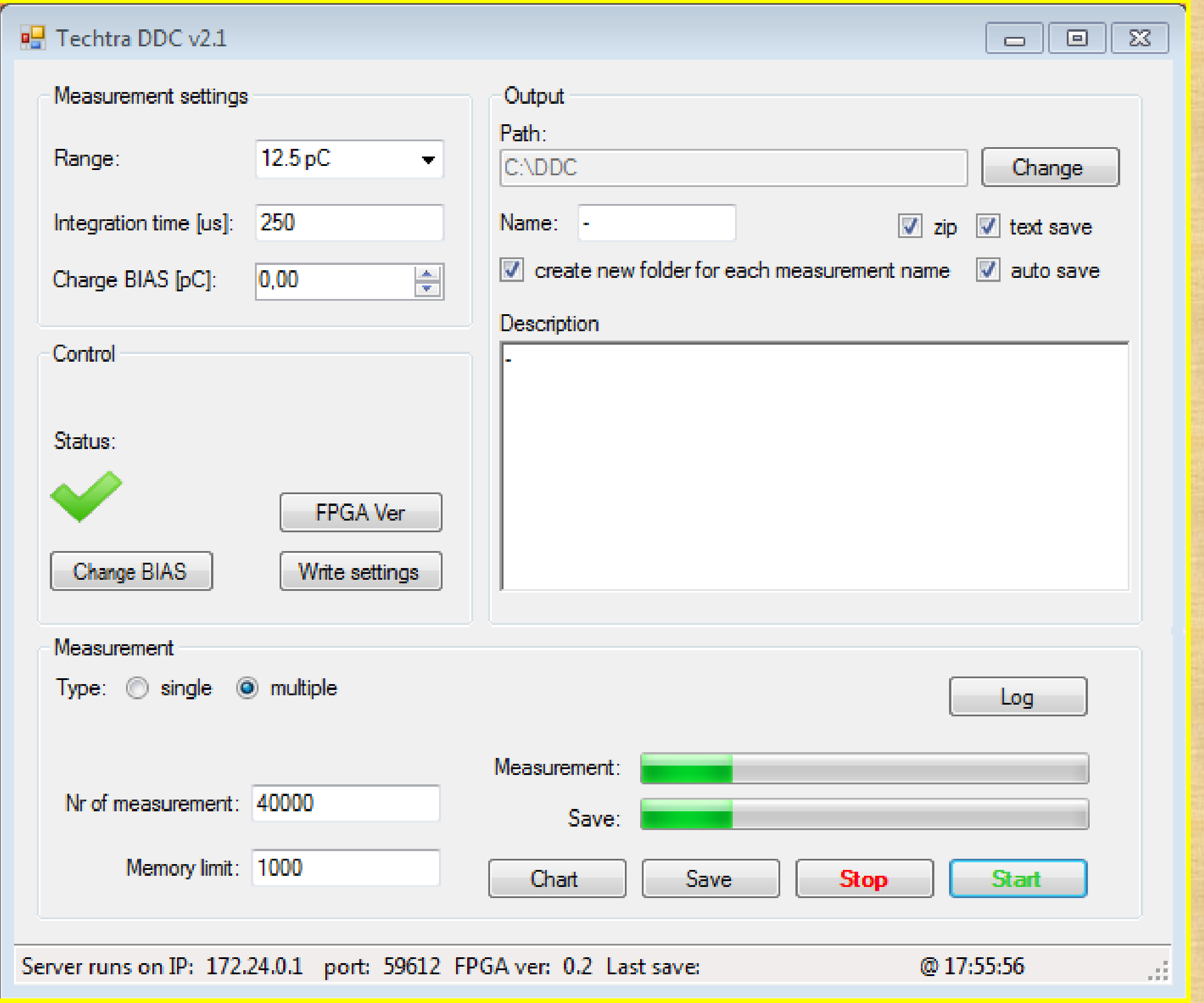


X-ray tests stand



Visualization software with sample radiograph

Since 2017
Techtra
has provided
several GEM
detectors

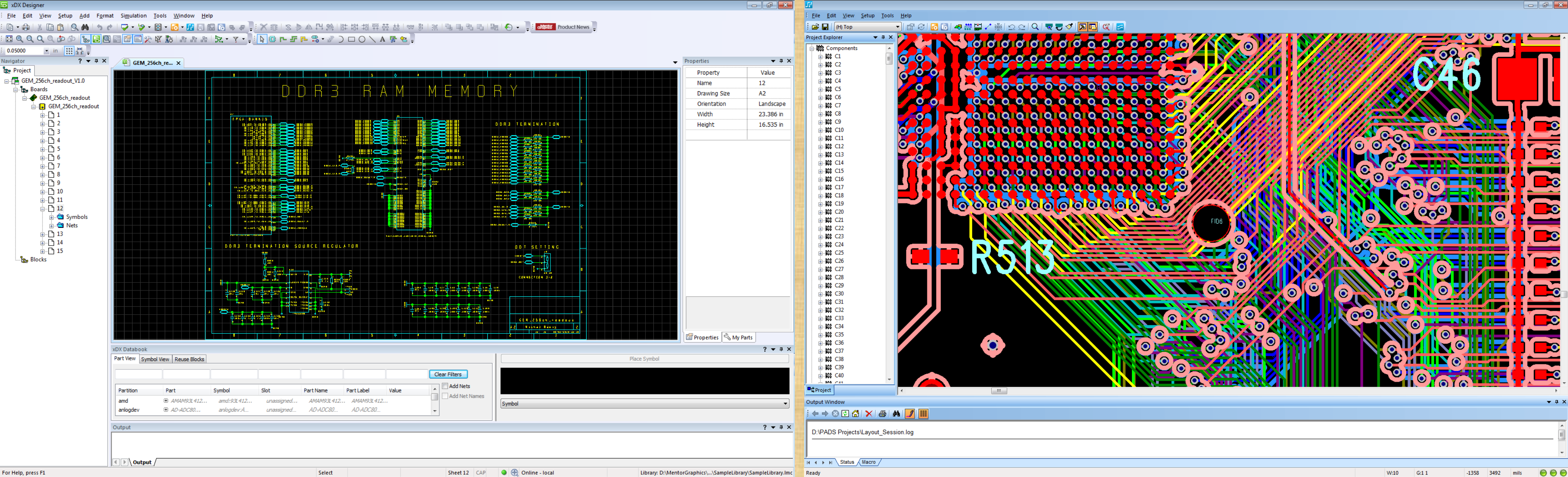


Data Acquisition software with on-line charts

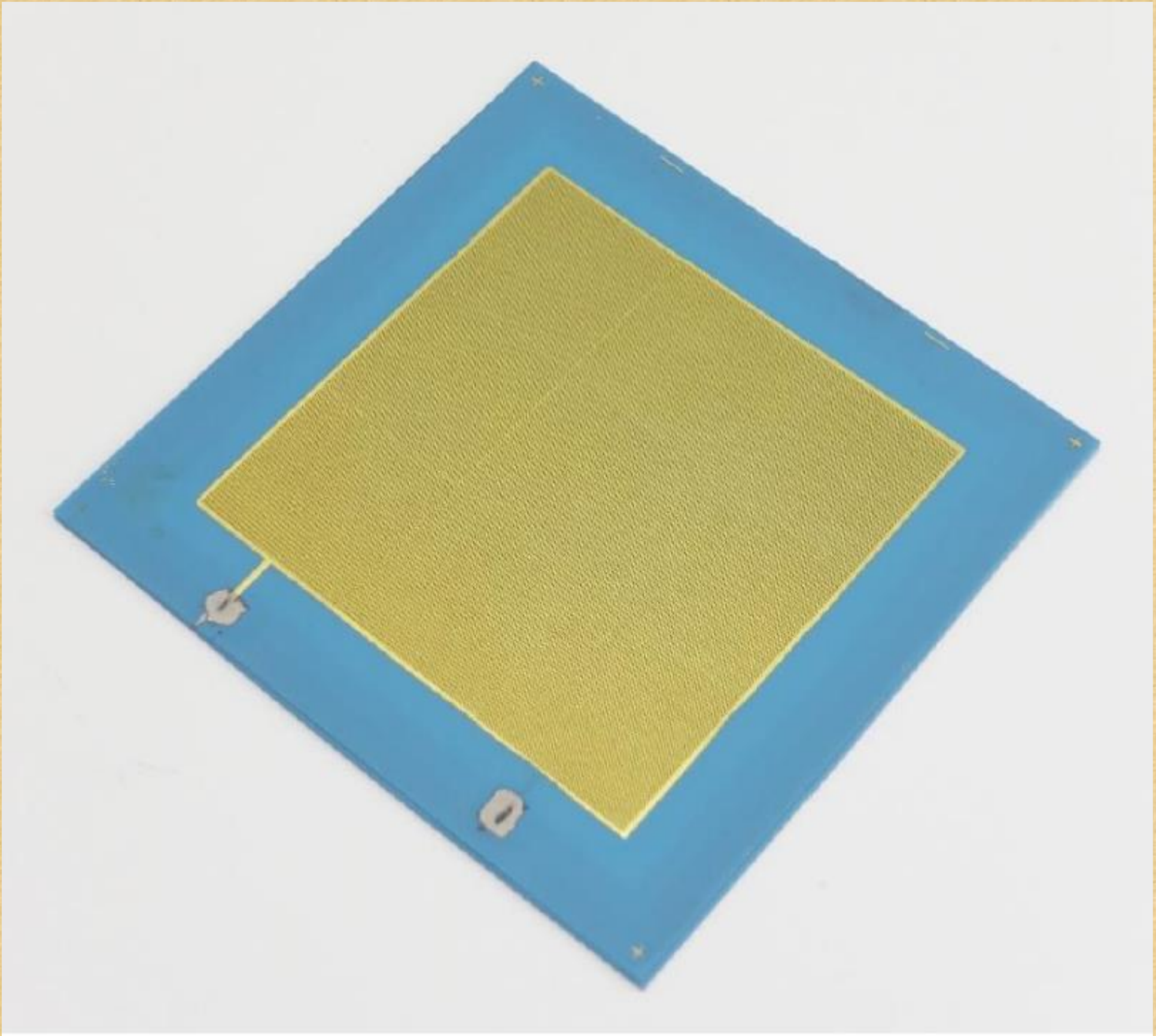
- 1. Techtra prototype and produce dedicated electronic systems.
- 2. Techtra started the development of ceramic components for GEM detectors – XY strip readouts, hex pads readouts, and GEM foils.



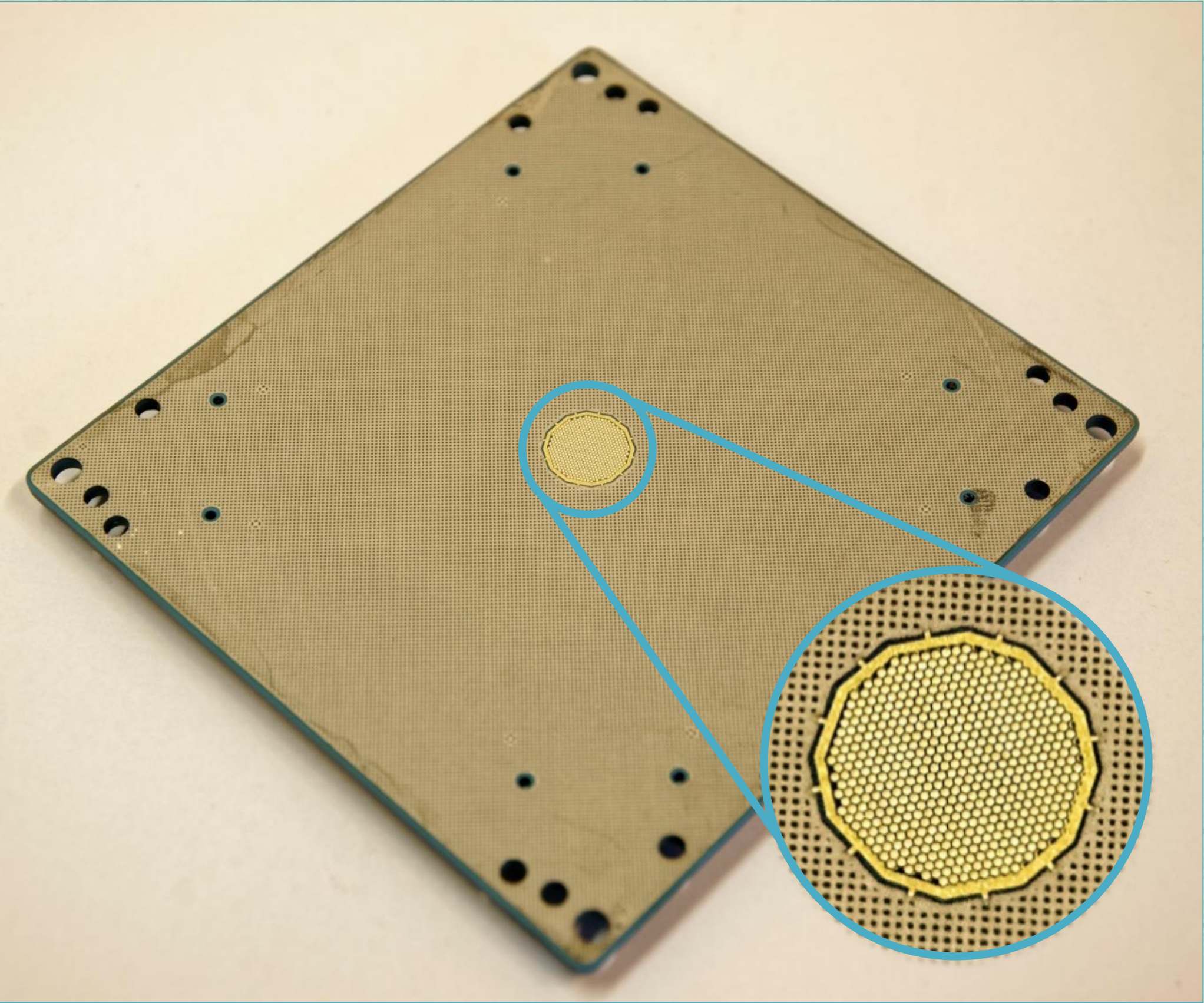
LTCC ceramic GEM foils and readouts



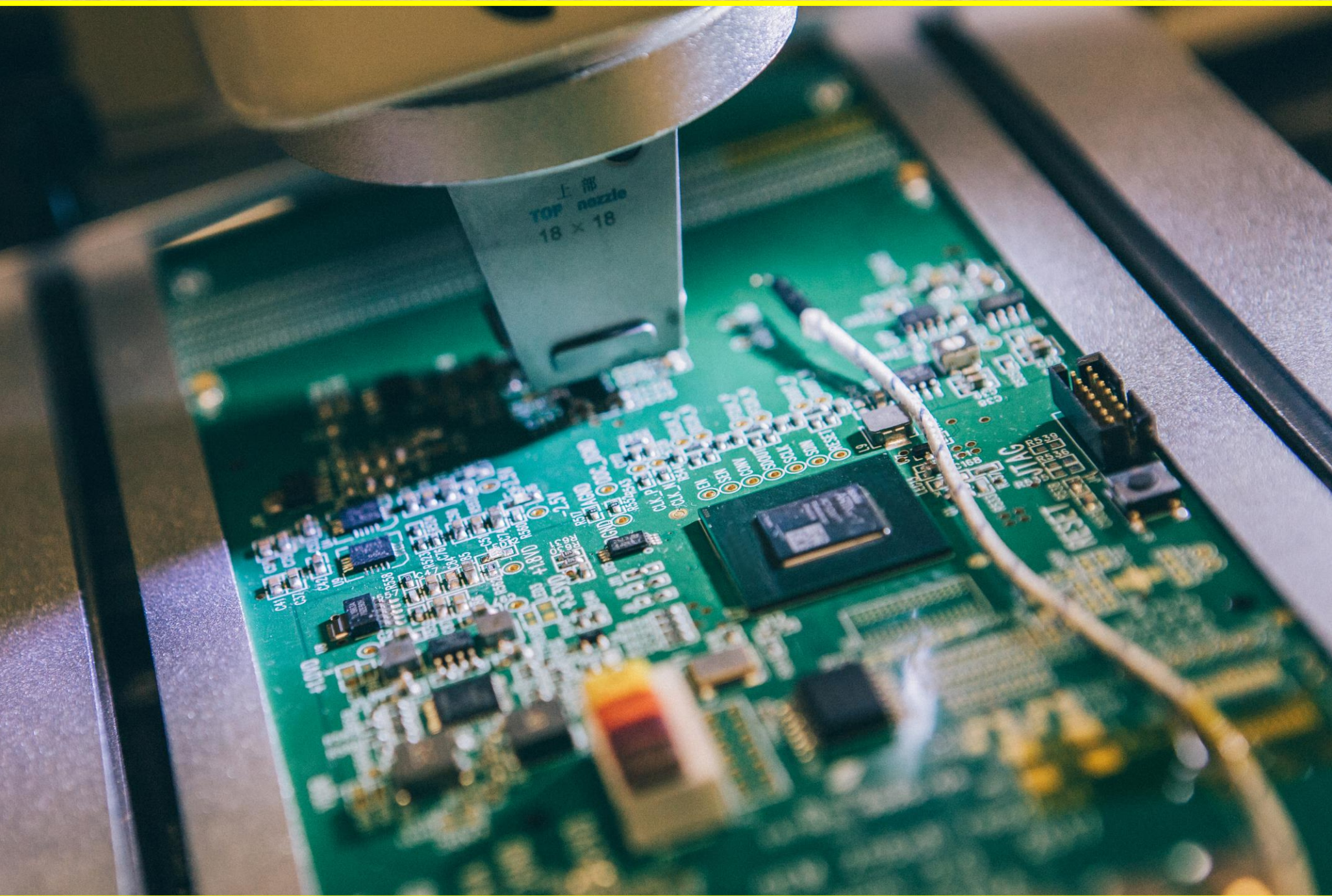
Equipment for the design and production of electronic circuits.



70 x70 mm ceramic GEM foil



Hexagonal pad readout board

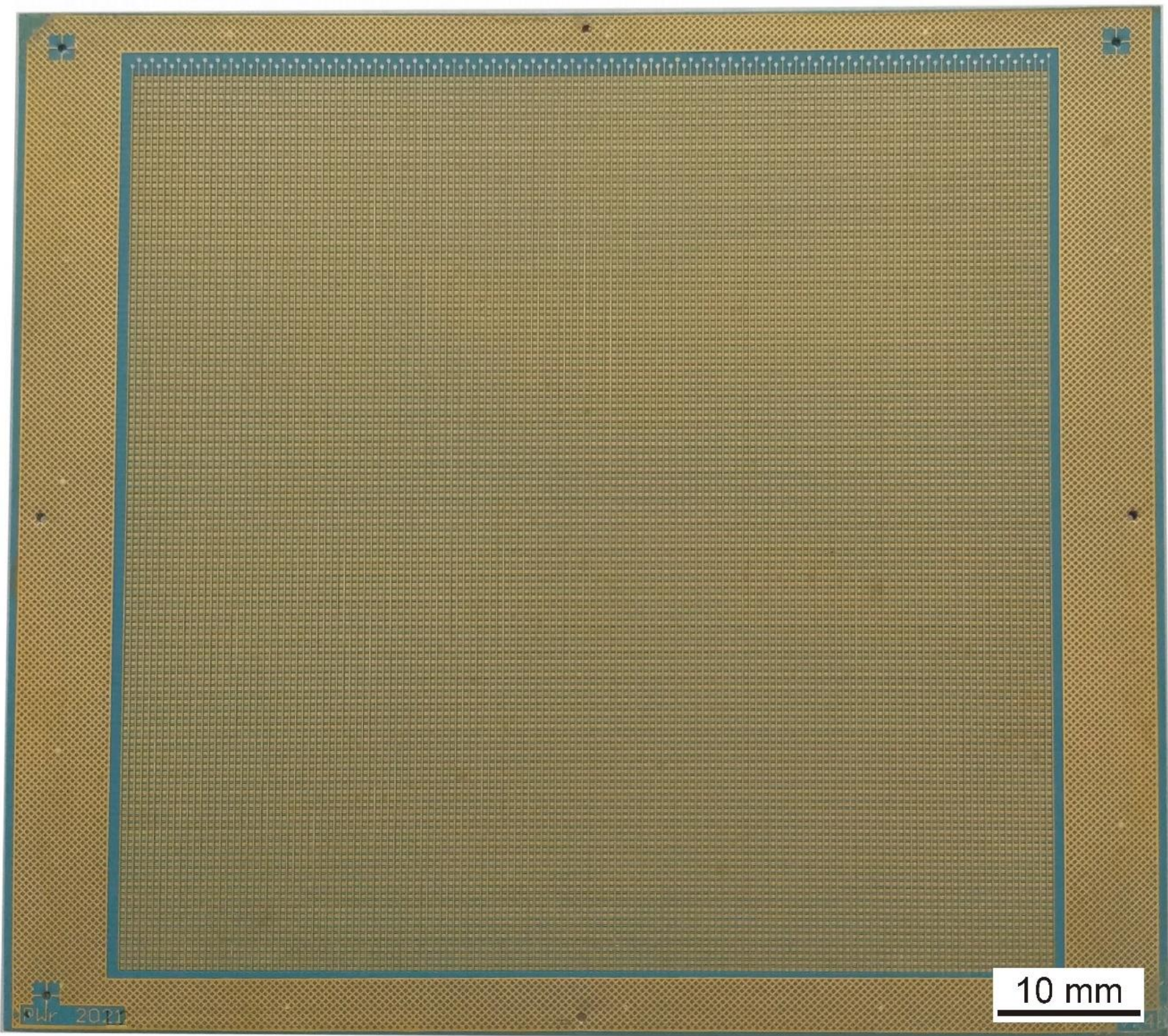


In-house manufacturing and prototyping

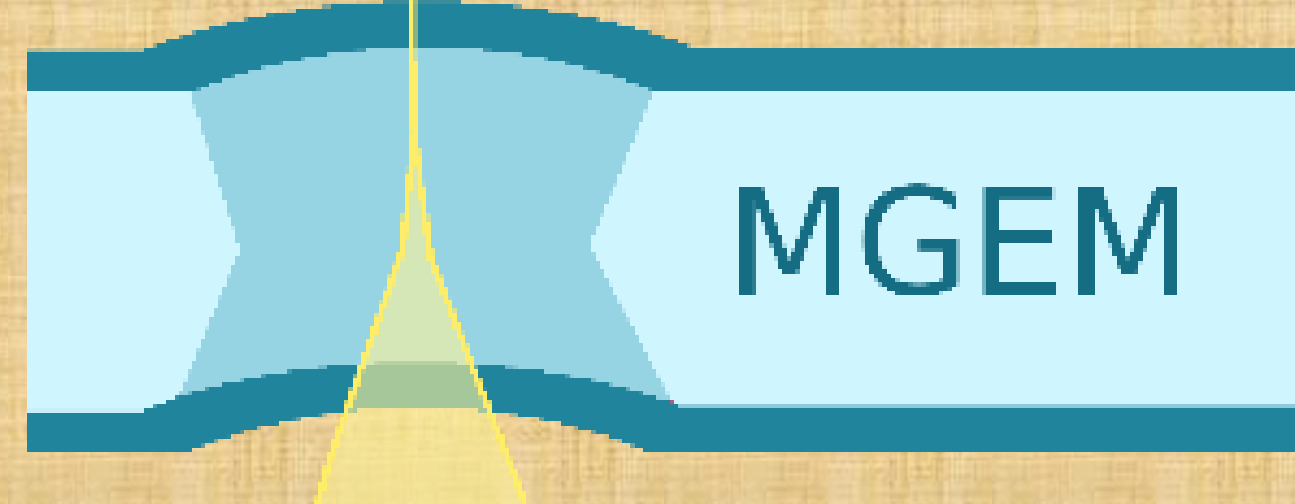


Techtra core team!

Techtra has
conducted several
R&D projects in last
years



XY strip readout board



Michał, Babij³; Jarosław, Bakała¹; Piotr, Bielowka³; Małgorzata, Chojnicka-Oleszko³; Mateusz, Czok²; Arkadiusz, Dąbrowski²; Szymon, Gburek¹; Jacek, Głowinkowski⁴; Laura, Jaisńska²; Michał, Jędzierowski³; Mariusz, Kasprzyk³; Katarzyna, Kijewska³; Milena, Kiliszkieicz²; Mirosław, Kowaliński¹; Karol, Malecha²; Katarzyna, Mikuta¹; Witold, Nawrot²; Piotr, Podgórski¹; Marek, Siarkowski¹; Bogusz, Stępak⁴; Marek, Stęślicki¹; Daniel, Ścisłowski¹; Piotr, Wilk⁴; Tomasz, Witwicki³.

¹ Space Research Centre Polish Academy of Sciences Solar Physics Division

²Wrocław University of Science and Technology

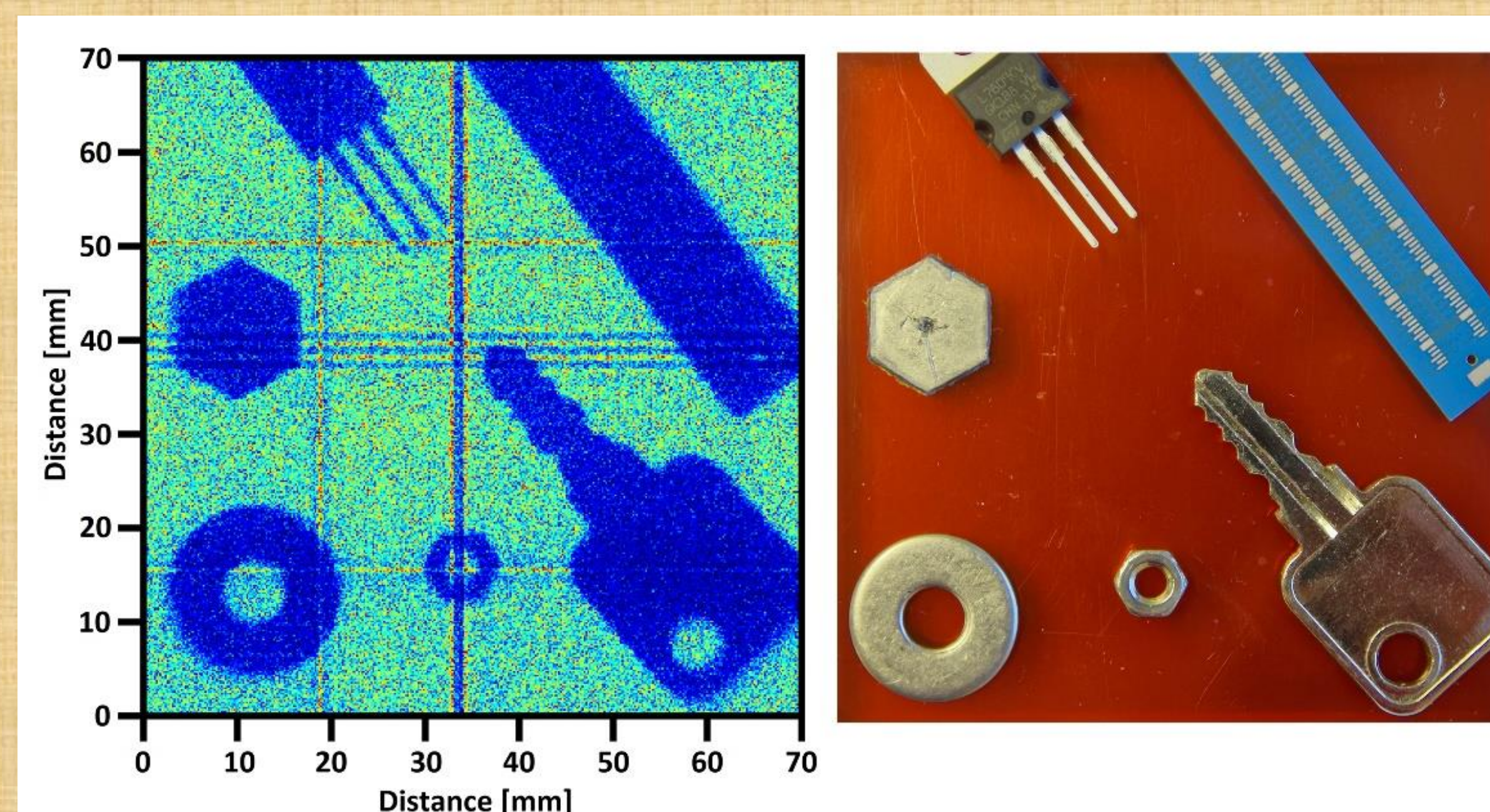
³Technology Transfer Agency Techtra Sp. z o.o.

⁴Wrocław Technology Park S.A.

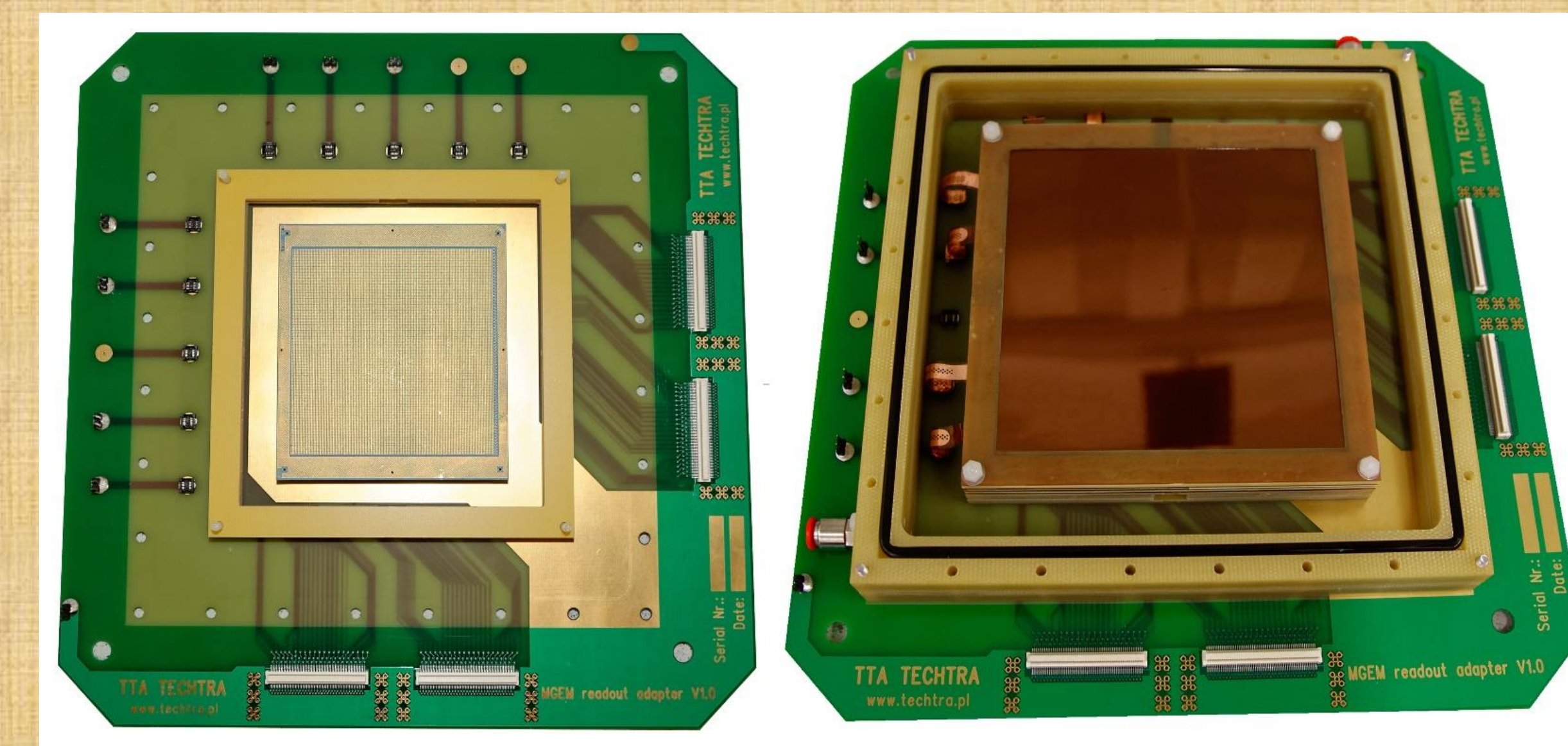
Project supported by The National Centre for Research and Development.

Project number POIR.04.01.02-00-0080/17.

R&D activities

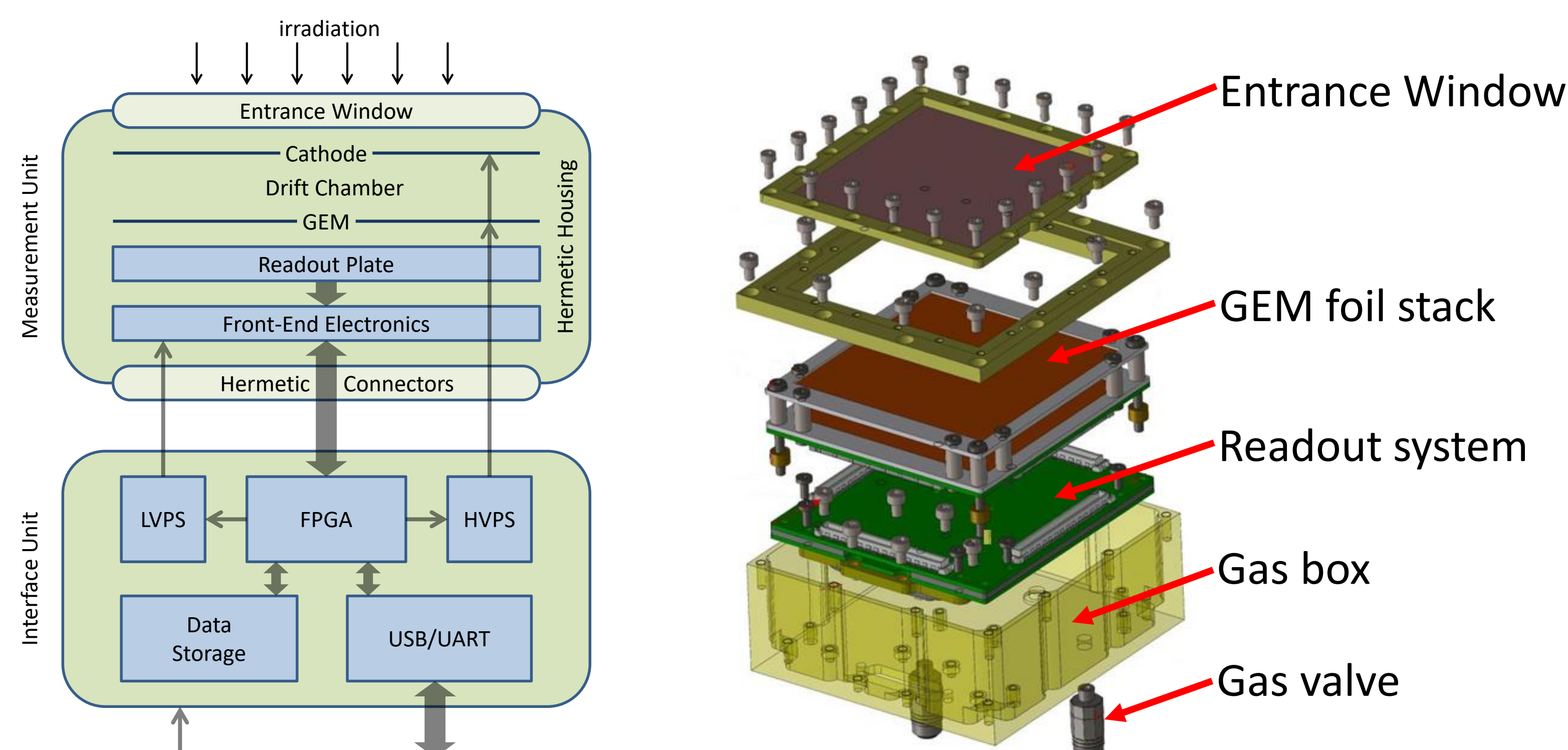


The test radiographs measured on the LTCC readouts:

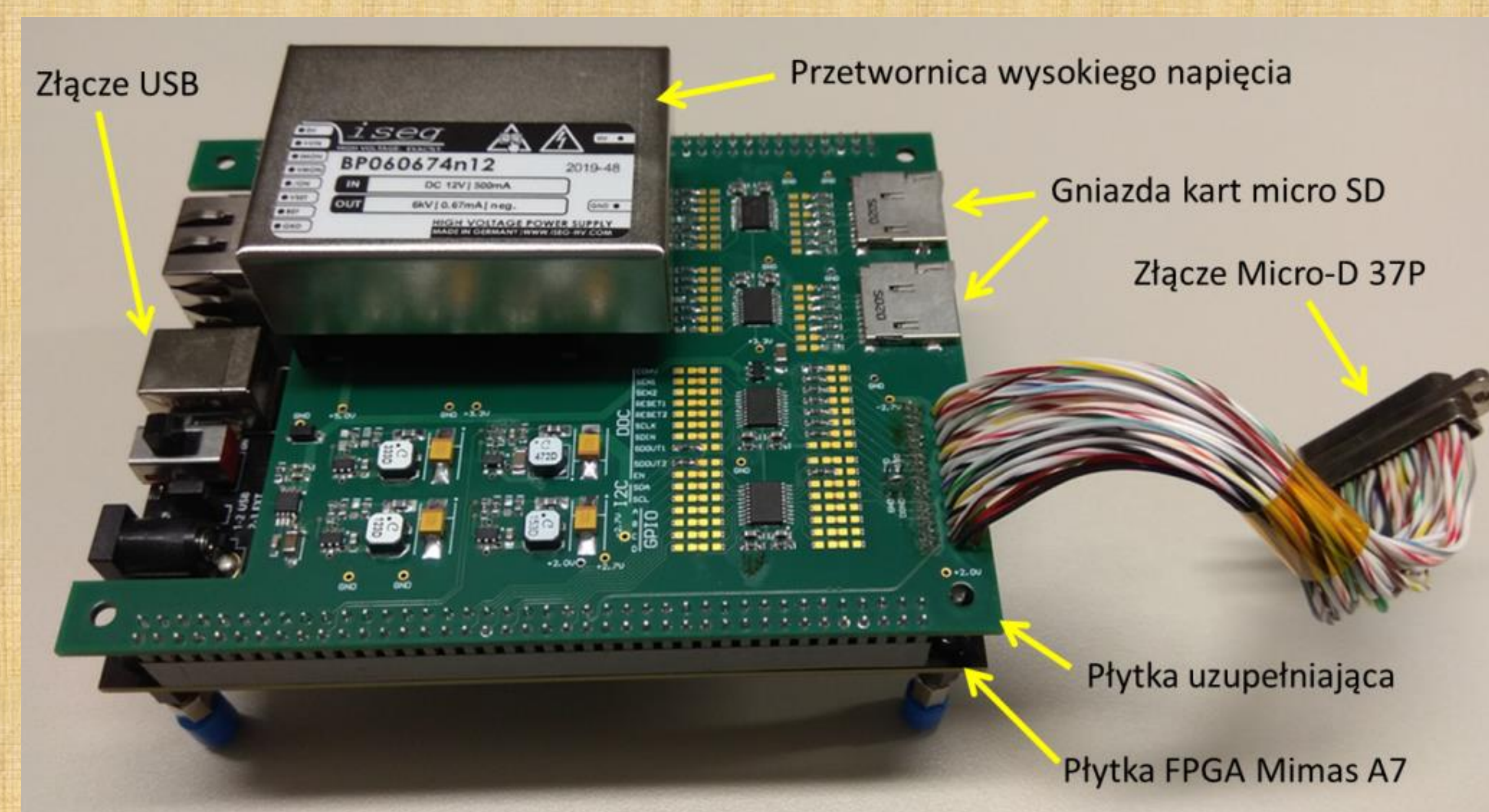


The prototype LTCC readout is placed on the testing board

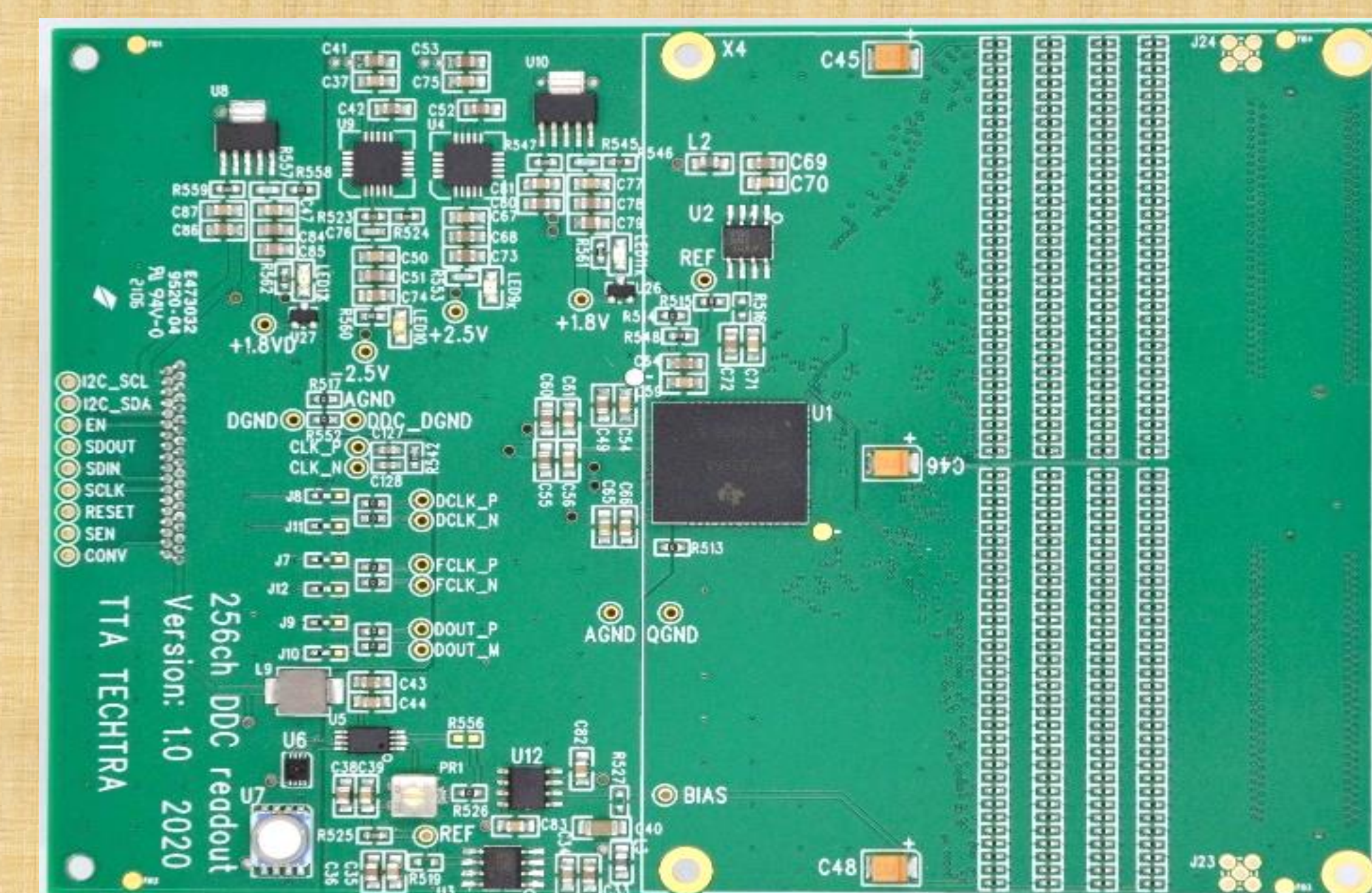
The prototype LTCC readout is placed on the testing board, covered by GEM and drift foils



Block diagram of MGEM detector.



Control and powering system - demonstration version made



The DAQ system dedicated to the MGEM project