

# MX-10

PIXEL PARTICLE DETECTOR



## See a different world

V. Viswanathan, S. Martinek, M. Honig, P. Hubner, V. Stanislav

Tel: (+420) 483 559 811, e-mail: mx-10@jablotron.cz

JABLOTRON ALARMS a.s., 4567/33 Pod Skalkou, 46 601 Jablonec nad Nisou, Czech Republic

### Introduction

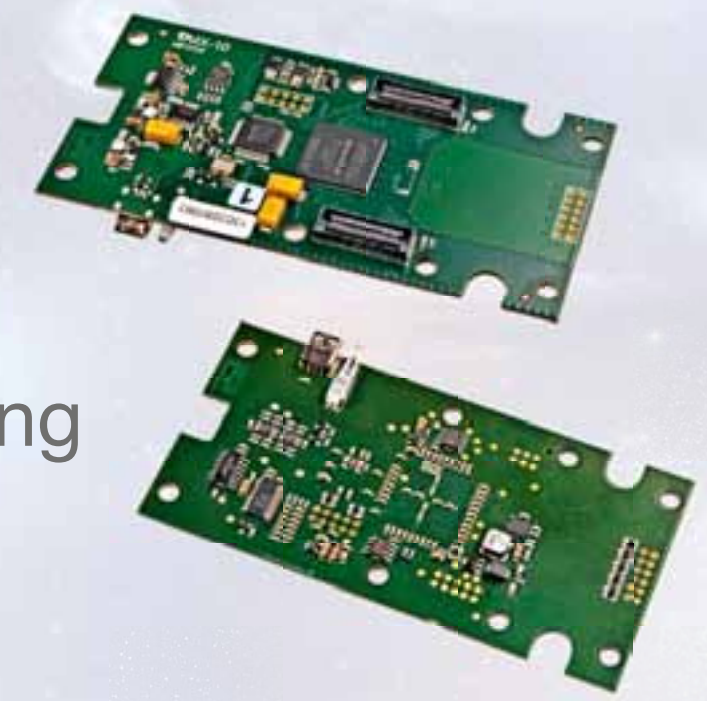
#### JABLOTRON MX-10:

- Portable educational kit for high schools and universities
- Developed at JABLOTRON ALARMS a.s. under the Medipix/IEAP CTU in Prague/ARDENT collaboration
- MX-10 comprises Timepix chip from the Medipix2 Collaboration (CERN technology transfer), read-out interface developed at Jablotron in cooperation with IEAP CTU in Prague, Pixelman software developed at IEAP CTU in Prague
- Experiment Guide for busy teachers
- Offered in two kits – basic or complete Edukit with a positioner, source and other demonstration components



### Baseboard

- FPGA, power supply circuitry, USB 2.0 hi-speed interface
- Altera FPGA – 150 FPS
- Possibility to upgrade firmware in the field
- Upgrading of power management
- Bias voltage configuration using software
- Current measurement from power rails – Testing
- Designed for 8 layer PCB
- Powered by Mini-USB connector



### Mechanical design

- Early design decisions in placing Mini-USB and LED
- Status indication (Green – Ready and Red – Busy)
- Sliding cover – protects the sensor chip, experiments with alpha particles possible
- Mount to fit standard tripod or M6 bolt
- Weight 160 g
- Tested and certified to EN61000-6-1 and EN 61000-6-3 standards

### Chip description

#### Timepix detectors:

- Developed in the Medipix2 Collaboration at CERN
- High energy physics for other fields

#### Top layer:

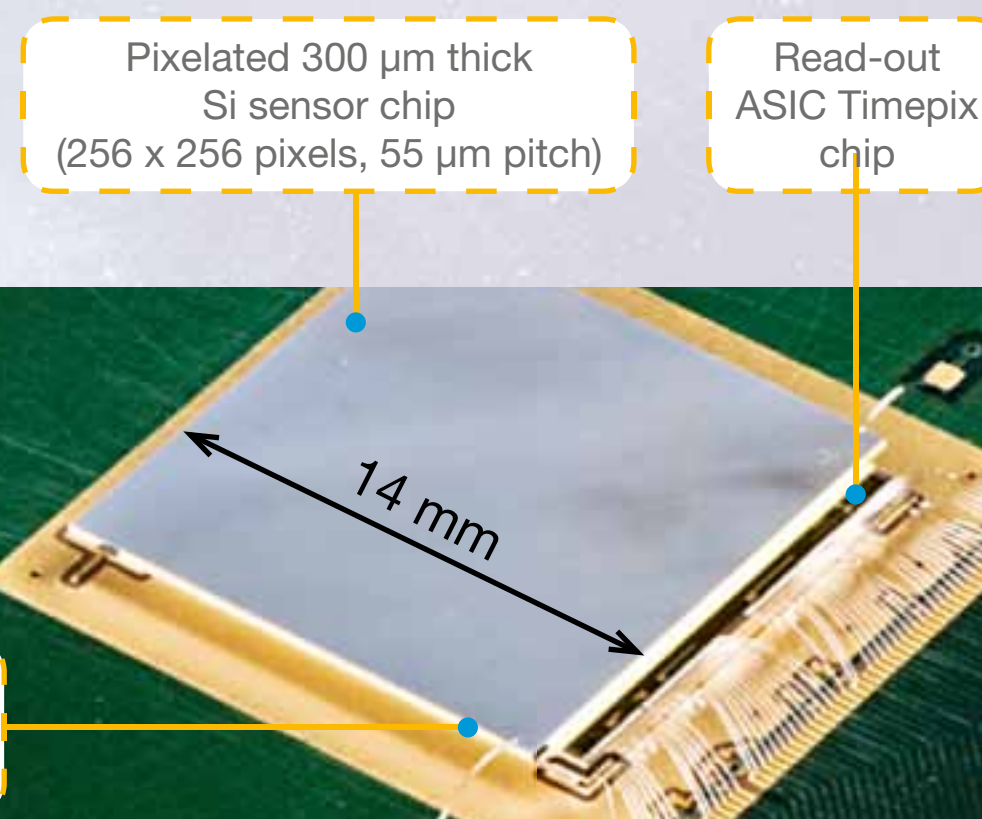
- Hybrid semiconductor pixelated detector
- 256 x 256 pixels
- Pixel size: 55 x 55  $\mu\text{m}^2$
- Silicon sensor layer thickness 300  $\mu\text{m}$
- Active area 14 x 14 mm

#### Bottom layer:

- Each pixel connected to an amplifier, comparator and counter
- Connection – Bump bonding technology

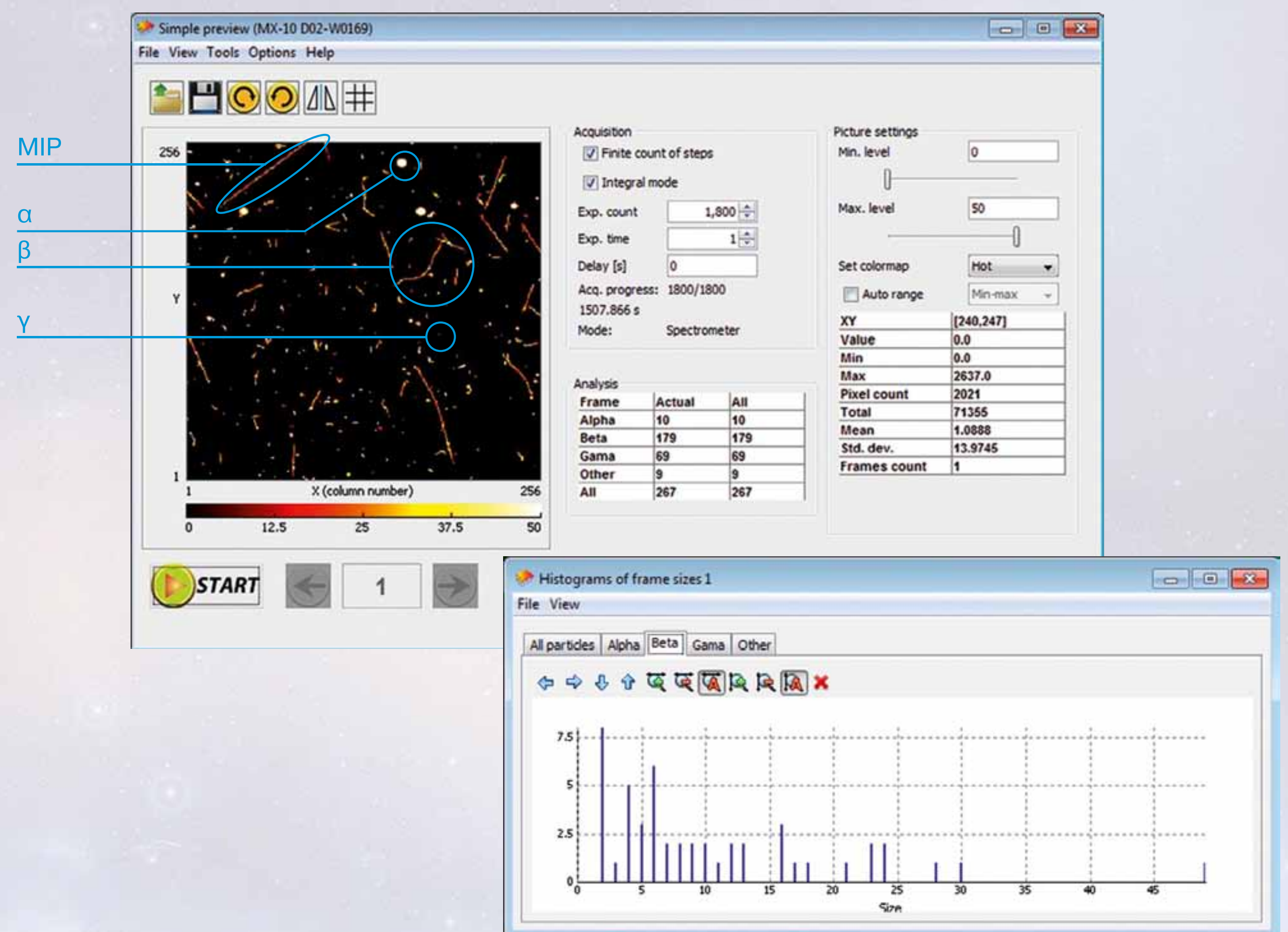
#### Operation:

- Ionizing particle entering a pixel creates a charge
- Charge converts to an electric current
- Amplified and registered by a digital counter



### Results

Basic Pixelman interface (image of natural background, 30 min.)



### Chipboard

- Redesigned and improved from FITPIX developed at IEAP
- ~28 % reduction in area
- Elimination of wide-connector coaxial cable
- Adjustable voltage setting enabling connection to any baseboard
- Parallel readout from base board – read-out speed improvement
- Portability, manufacturability and reliability



### References

- [www.jablotron.com/mx-10](http://www.jablotron.com/mx-10)
- [www.utef.cvut.cz/en/](http://www.utef.cvut.cz/en/)
- [medipix.web.cern.ch/medipix/](http://medipix.web.cern.ch/medipix/)

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