MX-10

DIGITAL PARTICLE CAMERA

A unique educational aid for the research and analysis of ionizing radiation. It utilizes technologies developed by the world's best physicists.

See a different world

- real-time display
- clear recognition of particles (α, β, γ, MIP)
- top-level physics experiments

JABLOTRON
CREATING ALARMS

MX-10

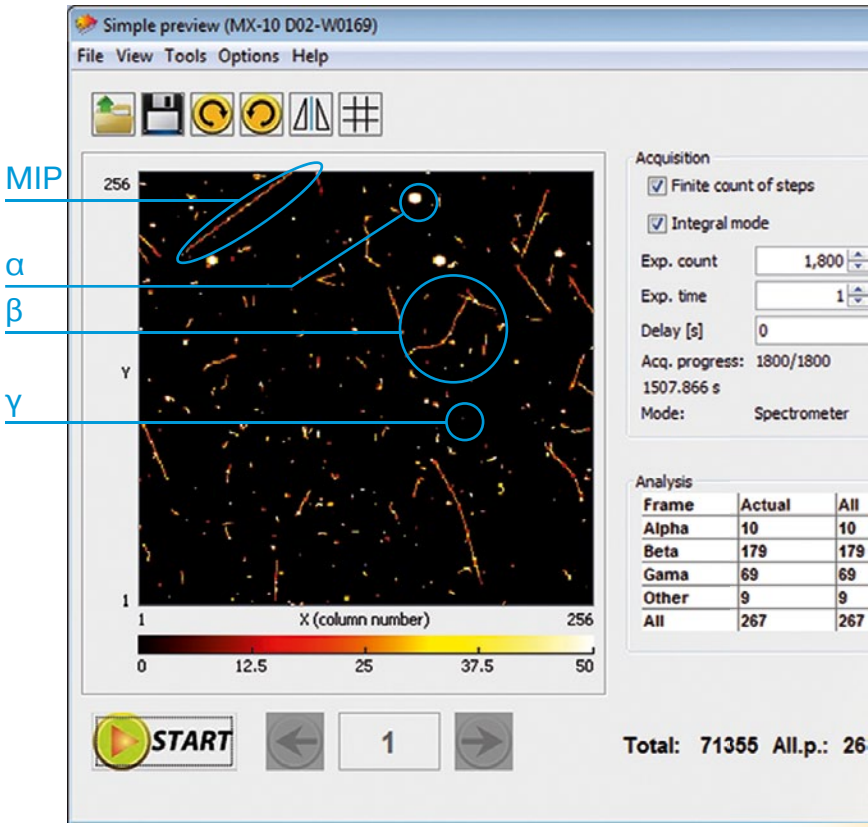
UNSEEN RADIATION WITH YOUR OWN EYES!

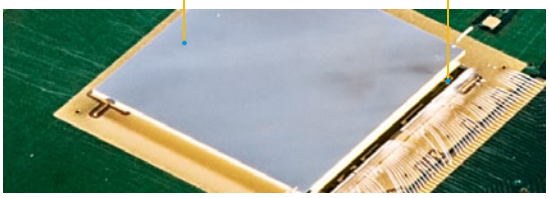
Using the JABLOTRON MX-10 digital camera you will see the spectacular theatre of nature and realise the incredible amount of various particles passing through our lives every second. You will see particles which originate from the natural decay of matter around us, artificially generated particles, but also mysterious messengers from remote space with your own eyes.

Main advantages

- Contains a Medipix/Timepix advanced detection chip and unique Pixelman software developed by the Institute of Experimental and Applied Physics CTU in Prague
- **Offers a real-time display** – unlike traditional quantum detectors (GM tubes, scintillators, etc.) MX-10 works as a digital particle camera
- Shows individual particles on the screen with a characteristic trace
- Recognises different types of particles – α, β, γ, MIP (e.g. muons) and others
- Covers a wide energetic spectrum
- Enables students to work with state-of-the-art technology which is quickly spreading in the fields of medicine, space programs or material analysis
- It brings yet unseen experiments into physics education and research
- Simple installation and intuitive software control (you can easily adjust it according to the level of your experiments)
- An affordable product employing a unique technology

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





technology

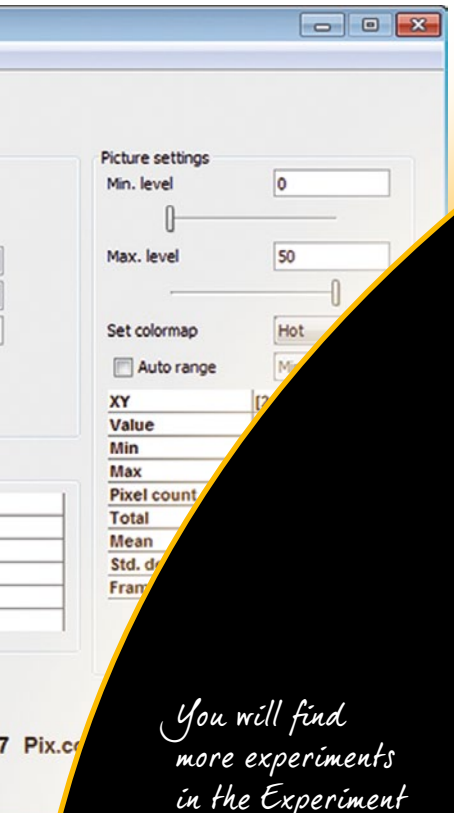
The MX-10 is a result of successful collaboration between JABLOTRON, the European Centre for Nuclear Research (CERN) and the Institute of Experimental and Applied Physics CTU in Prague.

The heart of the MX-10 camera is an advanced chip developed by a group of research institutes called the Medipix2 Collaboration based at CERN. The chip consists of the incredible number of 65 thousand individual micro-detectors able to catch and record hitting particles.

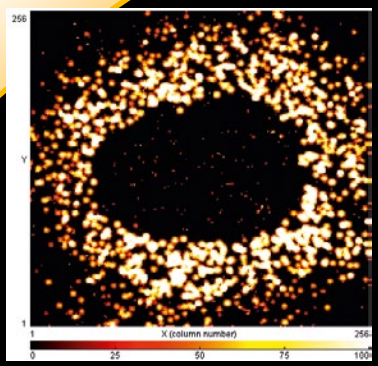
The Institute of Experimental and Applied Physics CTU in Prague developed the Pixelman control and display software and participated substantially in the preparation of the Experiment Guide.

Thanks to their long-term experience in the development and manufacturing of electronics, JABLOTRON contributed to improvements in the technical solution and in bringing the project from the academic environment to a final product.

To find out more about the technology used, its inventors, patents and its possible utilization in research please go to www.particlecamera.com.



You will find more experiments in the Experiment Guide.



The droplet of water is shown as a black spot not containing alpha particle traces. A layer of water only 45 µm thick is enough to absorb alpha particles emitted by americium. The drop of water has shielded alpha particles. Gamma photons pass through the droplet of water as the layer of water is not very thick. However, a layer of water several meters thick can also contribute to the shielding of gamma radiation, which takes place in nuclear power plants. When they are taken out of the reactor, spent fuel rods are stored in a pool of water which serves for cooling the fuel, shielding the neutron flow and also partially shielding the gamma radiation.

ABSORPTION OF alpha particles in water

(example from the Experiment Guide)

Although clear water is transparent for both gamma photons and visible light photons, it absorbs alpha radiation very well.

Aids:

MX-10 with a computer, adjustable positioner, School source of alpha particles (SSαP), food packaging or microtene foil, water, dropper.

SW setting (selected):

Mode: spectrometer, Exp. count 500, Exp. time 0.1 s, Integral mode.

Procedure:

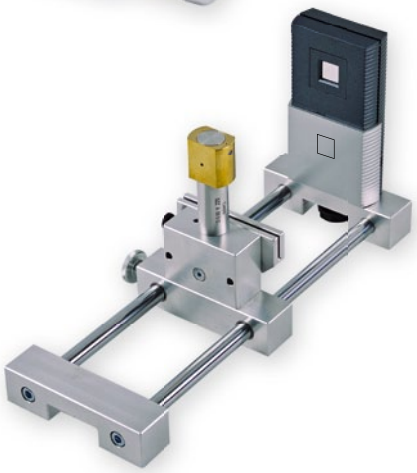
Fix the MX-10 into the adjustable positioner and tilt the whole kit so that the chip is in a horizontal position. The brass cap is in position 3 (“short” hole). Position the emitter so that there is 5–7 mm distance between the prisms on the positioner. Put a standard food packaging foil on the chip. Take a snapshot and save it using the Tools – Snapshot function. Move the emitter further away, drop a tiny droplet of water onto the foil using a dropper or some other aid and move the emitter back to the original position. Save the snapshot again.

The MX-10 Basic set contains:

- MX-10 camera
- Pixelman software on a memory stick
- USB connecting cable
- Robust hard case
- Experiment Guide

The complete MX-10 Edukit set contains:

- MX-10 camera
- Pixelman software on a memory stick
- 241 Am (9.5 kBq) low-emitting source of alpha and gamma radiation
- Adjustable experimental positioner
- Uranium glass sample
- Thoriated tungsten electrode WT40
- Shield samples (Al, Pb, Fe, brass)
- USB connecting cable
- Robust hard case
- Experiment Guide



MX-10 specifications

Chip	Pixelated 300 µm Si detector chip (256 × 256 pixels, 55 µm pitch) by the Medipix2 Collaboration
Software	Pixelman version 2.2.1 or higher – licensed by **IEAP CTU in Prague**
System requirements	• PC CPU 1.6 GHz (2 GHz or higher recommended), 1 GB RAM (2 GB recommended) • USB 2.0 Hi-Speed port • Java Runtime Edition v1.6 or higher • Microsoft Windows XP / Vista / 7
Maximum frame rate	80 frames per second (note: the given frame rate applies for the recommended system requirements)
Read-out interface	USB 2.0 (developed in cooperation with **IEAP CTU in Prague**)
Power requirements	Supplied via USB port
Power consumption	Max. 2.5 Watts
Dimensions	128 × 72 × 30 mm (h × w × l)
Weight	Approx. 160 g
Complies with	EN 61000-6-1, EN 61000-6-3

Detection ability

Particle Type	Energy Level	Efficiency	Comment
Heavy charged particles	> 1 MeV	~100 %	alpha, etc.
Electrons (beta)	> 10 keV	~100 %	
MIP particles	> 1 MeV	~100 %	under specific angle
X-rays	5 keV -10 keV	~100 %	
X-rays	20 keV	~25 %	
X-rays	60 keV	~1 %	
Gamma-rays	> 1 MeV	~0.1 %	
Thermal (slow) neutrons	0.5 eV	~1 %	using an 6LiF converter
Fast neutrons	~ MeV	~0.1 %	using a PE converter

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