The EDUSAFE first prototype will consist of the following independent systems:

- The Supervision System will be placed on the helmet.
- The Augmented Reality (AR) Prototype will be a hand-held device and a server for computer vision algorithms.
- A camera will be a standalone device which connects wirelessly to the AR prototype

Localization of radioactive sources is a major issue for radiological safety of operators in radiation facilities. For this issue, a gamma radiation imaging system capable of superimposing a gamma image with a visible image is a powerful technique, especially for 3D mapping and radioactive source localization – as is desired for the ATLAS environment. With this system, "fast" dose rate algorithms will need to be developed using the latest technologies of ray-tracing and radiation shielding codes to calculate the volumetric dose rates over the entire ATLAS environment, along with the 3D localization of all hotspots and dose rates of concern.

The next-generation gamma imaging system, the gamma camera (See Figure), utilizes a Timepix sensor and coded mask to localize gamma radiation within its field-of-view without the use of heavy shielding or bulky detectors. The

Figure: the camera head unit

platform is based on a prototype system developed by the CEA in 2011, along with a CANBERRA prototype developed in 2012. Unlike CANBERRA's previous CARTOGAM system, it is a compact, lightweight (~2.5kg) system with a rapid plug-and-play design. The system utilizes a single cable for power and communication and has more than five (5) hours of autonomy if the internal battery-pack is used. Specialized software has been developed with the iPIX system to process the raw data from the iPIX head unit, delivering an all-in-one solution for the measurement and localization of hotspots.

Timepix sensor

The Timepix is a unique CMOS pixel read-out sensor capable of direct gamma photon conversion with specialized counting modes for the counting of individual particle events and incident gamma energies. The CMOS sensor is 256x256 pixels, with the x-ray conversion functionality provided by the deposition of a thin (1mm) cadmium telluride (CdTe) substrate layer above the sensor. Each pixel of the sensor has its own analog processing electronics, including analog-to-digital (ADC) converters for gamma intensity determination.

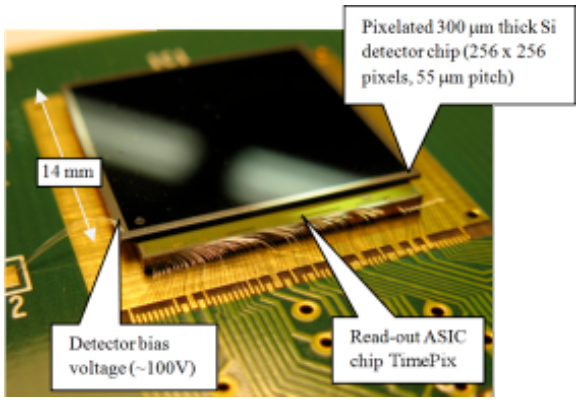

Figure: Timepix sensor (Jakůbek, n.d.)

Coded mask

The coded mask design in the iPIX is based on MURA patterns, which are square-shaped patterns that can be inverted by a 90° rotation. By using such masks with a stream of incident photons from a remote source within the field-of-view of the iPIX, a shadow is cast onto the Timepix sensor. Through deconvolution of the resulting raw image collected with the Timepix sensor, the location of the remote source(s) can be localized.

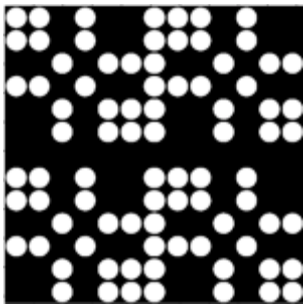

Figure: MURA mask