"Workshop" Session/ Demonstration session at the GIREP22 Conference

Making elementary particles visible and study their properties.

In collaboration with the European Physical Society EPS, the Medipix Collaborations and CERN

Daniel PARCERISAS (3); Rafael BALLABRIGA (1); Michael CAMPBELL (1); Ana DORDA (1);
Stanislav POSPISIL (2*); Benedikt BERGMANN (2); Erik HEIJNE (1, 2); Michael HOLIK (2);
Vladimir VICHA (2); Becky PARKER (4)
(1) CERN, Esplanade des Particules 1, CH1211 Genève. Switzerland
(2) Institute of Experimental and Applied Physics of Czech Technical University, CZ Prague
*(3) Sagrada Familia School, Gava, Spain ; * Presenter*
(4) School of Physics and Astronomy, Queen Mary, University of London UK

We organize a 'Workshop' session at the GIREP conference with 4-5 Minipix instruments, a projector, and some materials such as a 1-page flyer, the detailed manual-handbook from IEAP CTU, reprints of articles, examples of students' work,etc. We show posters and live measurements on screen as well as on laptops.
Besides the basic demonstration of the 'Minipix-Edu' instrument operation visualizing different kinds of radiation (which is rather a focus of our second workshop "Particle camera based on the pixel detector Timepix…") we present examples of advanced experiments and application, performed by the same Timepix detectors on which the Minipix instrument is based on.

Moreover, we bring a variety of common and innocuous radiation emitting objects, such as a glass vessel of green 'uralite', a historic timewatch with radium-containing phosphor paint on the dial, a steel welding rod with a tiny concentration of thorium, some potassium-containing fertilizer, sand from the Copacabana beach, etc.
The purpose of the Workshop is, to show to teachers visiting the exhibit, which simple notions about ionizing radiation can easily be demonstrated in their schools, with the Minipix instrument.
Probably it is beyond the practical situation to enlarge the show to longer, and more complex measurements, which could be undertaken by students who could do this for a special report or work, such as sometimes is required at the end of their school years. These are described in some detail in the documentations available.

We would like to point out the multidisciplinary potential of the particle camera employment in the education process. Enhancement in teaching of physics is not the only evident benefit, but there are also other studies of problems involved (e.g. image processing techniques, complex data analysis, etc.) associated with application of pixel detectors and the Minipix instrument.

Some of the existing, practical experience in the ADMIRA project in Barcelone, and the Czech project in Prague, can be communicated by the presenters at the GIREP conference.

Workshop as a fore-runner for the proposal
towards wider use of radiation visualization in education -see submitted paper

While over the last 15 years, several efforts progressively have been developed to use Minipix instruments for educational purpose, in universities and in secondary schools, now it could be a good time to discuss a proposal for Europe-wide use of the mature Minipix-Edu. Initially, a fair number of 'Minipix' educational kits could be provided to interested entities by the Medipix team at CERN, at no charge for the users. The instrument could be on loan, or later even given as a donation to a local educational organization, a (secondary) school or university. The authors, after consultations with the European Physical Society, Medipix collaboration members, and national physics Societies and Institutes, intend to begin discussions about the setting up of locally organized volunteer organizations in many European countries. During the Workshop, interested parties or individuals will be welcome to sign up for further information and support.

Medium term plan in the proposal

We see the initiation of activities in different countries as a stepping stone towards more widespread adoption of pixel detector technology for teaching of radiation physics. We aim that at least all students leaving high school have 'experienced' or 'seen' radioactivity (either natural background as it is normal all around us, or from sources) during their science lessons giving them an intuitive understanding of the particle nature of radiation. Of course, we expect students studying to a higher level to perform experiments themselves with the existing devices much as we have seen with the existing projects. It should be noted that the Timepix devices are in a constant state of evolution as microelectronics technology evolves allowing more and more functionality to be integrated on a pixel. For example, in various studies already published, the Timepix3 ASIC, which is the chip in the 'Minipix', provided simultaneous measurements of detected energy and timestamp with a precision of 1.6ns. This opens the possibility of making 3D images of tracks in the semiconductor sensor much like an electronic

bubble chamber. How can this be funded? CERN has a new instrument called the CERN Impact Fund which aims to authorise approved projects which fall outside of CERN's core activities to raise private funding. We believe that the provision of Minipix (or other equivalent) hardware for use in teaching in publicly funded schools would have a high chance of falling within the remit of the Impact Fund.

Reference Medipix website. https://medipix.web.cern.ch/medipix2-collaboration-members