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#11-297 A miniaturized reading interface Timepix2 Lite developed for use in a new generation of the educational kit SEST2RA applicable for real time demonstration of microcosmos experiments

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Timepix2 Lite is a new highly miniaturized readout interface applicable for particle physics experiments. The main part of the readout device is the hybrid pixel radiation detector Timepix2, developed by the CERN Medipix Collaboration, a successful successor of the former Timepix pixel detector. Dimensions of the entire Timepix2 Lite device are 73.4 x 22 x 13.5 mm (i.e. size comparable to a regular USB memory stick). The read-out interface is composed of two functional parts, two boards stacked on each other, in order to keep dimension small and form the device flexible. The first board is a chipboard integrating Timepix2 detector, bias source (allowing variant assembly to support different sensor layer materials and thicknesses). The second is a mainboard containing a microcontroller, power converters and communication interface. The device is equipped with USB type C connectivity serving for data transfer as well as for its powering.

Timepix2 Lite device is fully supported by the acquisition control software TrackLab. The advanced software tool which is capable of online clustering and particle track classification, smart configurable event filtering, continuous data recording as well as real time visualization via various kinds of plots as histograms, dependency charts, integral pixel matrix images, etc.

The combination of Timepix2 Lite and TrackLab represents high potential in the field of education. Both these well made tools were successfully exploited in the creation of a new generation of educational kit SEST²RA (School Educational Set with Timepix2 for Radiation Analysis). The kit highly benefits from the advanced data processing and real-time visualization features allowing to perform more impressive demonstrations of particle physics experiments and results become even more comprehensible for students. Moreover, Timepix2 detector (in comparison to its predecessor Timepix) provides extended functionalities. Timepix2 pixels can be programmed in various digital operation modes selecting a type of information recorded in pixel counters. It is possible to simultaneously record ToA value (corresponding to time of particle interaction) and also ToT value (corresponding to energy deposited by particle) with a precision up to 10ns. Further, the analog part of the pixel structure supports the adaptive gain avoiding pixel saturation when high energy is deposited in a sensor. Accessibility of these features opens a way in designing a new kind of progressive exercises practicable with the new generation SEST²RA kit.

Primary author: PAVLAS, Ondrej (IEAP CTU in Prague)

Co-authors: HOLIK, Michael (IEAP CTU Prague; UWB-FEE); MALICH, Milan (IEAP CTU in Prague); SMOLYAN-SKIY, Petr (IEAP CTU in Prague); VICHA, Vladimir (IEAP CTU in Prague)

Presenter: PAVLAS, Ondrej (IEAP CTU in Prague)

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