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Analog signal from common electrode of pixelated detector for triggering and spectroscopy

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The Medipix/Timepix device consists of a semiconductor detector chip (usually silicon) bonded to a readout chip. The detector chip is equipped with a single common backside electrode and a front side matrix of electrodes (256 x 256 square pixels with pitch of 55 μm) bump bonded to Medipix/Timepix read-out chip.
A significant advantage of these pixel detectors is the possibility of direct observation of traces of single particles. In many cases, however, these particles are accompanied with background of other unwanted particles overlapping traces of the desired radiation. The selectivity of the detector can be increased using a self-triggering approach especially if combined with an external trigger from other detecting devices such as ionization chambers, scintillating or semiconductor detectors. Unfortunately the Medipix/Timepix devices are not equipped with self-trigger feature.
A solution which is proposed in this contribution uses the analog signal from the common electrode of the pixelated sensor. This signal called back-side-pulse is amplified by a charge sensitive preamplifier and, after shaping, it can be used as fast trigger and as independent spectroscopic signal. The stability and energy resolution of this analog signal is, however, strongly affected by interference from the digital read-out interface. In this contribution we present the solutions of suppression of electromagnetic. The result allows to select a particular particle in a mixed radiation field. The technique is demonstrated on measurements with heavy charged particles from radioactive α-sources 241Am, 239Pu as well as spontaneous and neutron induced fission sources 252Cf and 235U, respectively.

Primary author: Mr PLATKEVIC, Michal (IEAP CTU in Prague)

Co-authors: Mr GRANJA, Carlos (IEAP CTU in Prague); Mr JAKUBEK, Jan (IEAP CTU in Prague); Mr VYKYDAL, Zdenek (IEAP CTU in Prague)

Presenter: Mr PLATKEVIC, Michal (IEAP CTU in Prague)

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