

A Simple Approach to MeV Proton Track Filtration and Analysis in Timepix3 Hybrid Pixel Detector with Si, CdTe and GaAs Sensor

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Abstract. The Medipix3 and Timepix3 family of hybrid pixel detectors are detectors with high granularity provided by the 256×256 pixel matrix. They are capable of detecting events of a broad energy spectrum and a wide spatial and directional distribution [1]. Based on both spectral and morphological parameters, it is possible to process the acquired data on a per-cluster level and perform filtering of the events to achieve the filtration of a specific type of radiation particle [2]. The characteristic behavior of the selected radiation type is based on multiple parameters that include the particle energy, its direction, and also sensor-related parameters such as the sensor material and the sensor bias voltage that is applied [3, 4]. This work aims to process data acquired at the U120-M cyclotron at the NPI CAS Rez near Prague with collimated mono-energetic protons with energy of 31 MeV, perform analysis to filter proton clusters using a simple approach based on the cluster energy, size, and its skeleton with the Timepix3 detector with different semiconductor sensors (Si, GaAs:Cr, CdTe) and their thicknesses [5]. Using the cluster skeleton, the simple linear cluster length is calculated that can be subsequently used in the calculation of the linear energy transfer. We demonstrate filtration of proton based on three parameters only, cluster size, cluster energy, and number of end-points of particle cluster skeleton.