



iWoRiD 2022

23rd International Workshop on Radiation Imaging Detectors

26 – 30 June 2022

Riva del Garda, Italy

Contribution ID: 66

Type: **Poster**

A dE/dx -E position sensitive charged particle spectrometer

Wednesday 29 June 2022 17:16 (1 minute)

Hybrid pixel detectors- Timepix are very promising detectors considering their advantages getting simultaneously information about the position, energy, and time of arrival of a particle hitting the detector. These types of multi-parameter detectors can be effectively used to study and/or reinvestigate some fission processes such as the rare fission modes (ternary, quaternary, quinary), which are planned. In studying nuclear reactions, it is necessary to consider the following features: the energy resolution of the detecting system, angular distribution information, coincident timing, discrimination of different particles, background problem etc. Silicon solid-state detectors are commonly used for measuring the specific ionization (dE/dx), in instruments designed for identifying energetic nuclei using the dE/dx versus total energy technique. Using Timepix detector as E detector in this method gives the possibility to get simultaneous measurement of energy, coordinate, interaction time and the type of charged particles. This work is devoted to application of multi-parameter detectors- Timepix in dE/dx -E particle identification measurements. In constructing tailor-made dE/dx -E spectrometers, our requirement is the measurement of angular distributions, energy spectra, coincident time, yield of rare fission mode products. In order to test the spectrometers, a spontaneous fission source ^{252}Cf was used as a light particle source, since LCPs (mainly alpha particles) are formed along with the heavy fragments in ternary fission. The tailor-made dE/dx -E spectrometers consist of transmission type ΔE detectors and the Timepix detector. The particles (^1H , ^2H , ^3H , ^4He , ^7Li , and ^8Be et.c) have been identified by the method dE/dx -E, since the dE/dx -E value is unique to the type of particle. The specific energy loss (dE/dx) is measured using the transmission type ΔE detector (16 or 150 μm thicknesses) ordered from the company Micron Semiconductors, while the residual energy (E) is measured by a Timepix detector with thicknesses of 300 and 600 μm .

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Session Classification: Poster