14 MeV Neutron Track Recognition with Si Timepix Detector

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Abstract. The Timepix family of pixel detectors provides high spatial and spectral resolution, enabling event-by-event analysis of radiation interactions based on both deposited energy and track morphology. This work characterizes selected spectral and morphological track parameters, including their pairwise combinations, for particle recognition in mixed radiation fields generated by 14 MeV neutrons. [1] Measurements were performed with a Timepix3 (300µm sensor thickness) detector with silicon sensor exposed to fast neutron fields at the DANAIDES laboratories, CEA Cadarache. Two-dimensional parameter-space distributions were analysed to identify characteristic regions associated with different particle interaction types. Parameter-function-based filters were then used for manual class-domain definition and decomposition of the measured mixed field into its basic radiation components. The presented approach demonstrates the potential of manual parameter-space decomposition for particle recognition in Timepix detectors and provides classified datasets suitable for future supervised machine learning methods.

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