

# Detection Response and Spectral-Composition Characterization of SiC Timepix3 Detector to 14 MeV Neutrons

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**Abstract.** Silicon carbide is a valuable semiconductor material for radiation detection, in particular neutrons. Operated with the pixel detector Timepix, it combines imaging and per-pixel spectrometry for detailed measurements. In this work we investigate and evaluate the spectral track imaging response of a SiC Timepix3 detector to monoenergetic 14 MeV neutrons. For the decomposition of accompanying mixed-radiation fields with high particle-type discrimination, we elaborated a new classification of particle-type events. The high-granularity (65.536 pixels of 55  $\mu\text{m}$  pitch size) and noiseless photon-counting response per-pixel of the Timepix3 detector enables to visualize and examine the individual particle tracks at the pixel scale. We analysed the single particle tracks with high-resolution pattern recognition algorithms. Track morphology parameters of spectral and tracking response and their ratios are used for event type filtering. Three broad event type classes are derived and applied to experimental neutron data acquired from a D-T neutron generator at CEA Cadarache. Results are presented in terms of field decomposition, particle flux and dose rate of total (all particles) and partial (event-type classes) radiation data as well as wide-range deposited energy spectra and linear-energy-transfer (LET) distributions.