Contribution ID: **107** Type: **Oral Presentation**

Results in the characterization of SiC-based devices for radioactive ion beams detection

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This contribution discusses the characterization of new-generation Silicon Carbide (SiC) detectors, which are increasingly recognized as an excellent choice for charged particle detection in both medical applications and nuclear physics research [1-7]. Leveraging the SAMOTHRACE ecosystem [8], a SiC detector array is currently being developed for the detection of Radioactive Ion Beams (RIBs) - a cutting-edge tool in both medical and nuclear physics fields [3,6,7]. The array in development, integrated with a fast front end electronics [9-10], is designed to be compact, versatile, and capable of delivering detailed information on RIBs, specifically those produced via the in-flight technique [3]. An important feature of this detection system is its high timing performance, which enhances experimental studies involving RIBs. The results focus on evaluating the energy resolution and timing performances of SiC detectors, composed of 2x2 pixels, with a total surface of 1 cm2 and a thickness of 100 μm. Measurements have been conducted using radioactive α sources as well as accelerated proton and α beams. Furthermore, a new method based on the crossing time and signal-sharing analyses has been employed to determine the time resolution of individual SiC pixels. Additionally, a comparative analysis of the timing resolution achieved using a micro-channel plate detector in coincidence with the SiC will be presented.

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Session Classification: Parallel session

Track Classification: Accelerators and Instrumentation