

Timing resolution performance of the $\bar{\text{P}}\text{ANDA}$ SciTil detector using Silicon Photomultiplier (SiPM)

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The $\bar{\text{P}}\text{ANDA}$ experiment at FAIR situated in Darmstadt, Germany will use proton-antiproton annihilation with a momentum range from 1.5 GeV/c to 15 GeV/c for strong interaction studies. The detector is currently under construction. It will be in operation in 2022-. In order to identify the charged particles accurately and differentiate between subsequent events the detector will need several advanced particle identification systems.

We are working on the development of a SciTil (Scintillator Tile Hodoscope) detector, which is located in the central region (20° - 140°) and covers $\sim 5.7 \text{ m}^2$ area. It is constituted of 1920 scintillator tiles, each of which has a dimension of $90 \times 30 \times 5 \text{ mm}^3$, readout by Silicon Photomultipliers (SiPM). The SciTil detector will be capable of providing a fast and highly accurate event timing. The requirements for this detector are an intrinsic time resolution below $\sigma = 100 \text{ ps}$ and a geometry which fits along 2 cm in radial direction.

Development of a single tile is in a final phase. After optimizing scintillator material, sensor, wrapping etc., we achieved the best time resolution of $\sigma \sim 50 \text{ ps}$ with 4 Hamamatsu SiPMs S13360-3050-PE connected in series. In this presentation, the final design and its performance of a single tile will be presented.