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A Digital SiPM as 4D tracking prototype

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CMOS foundries have recently introduced Single Photon Avalanches Diodes SPADs into process design kits, allowing for easy implementation of monolithic SiPMs with custom designed ASIC. In CMOS SPAD arrays, many features typical of monolithic pixel detectors can be implemented, enriching the capabilities of widely used analog SiPMs. In-pixel digitization, masking, full hitmap readout, and large area sensors are some of the peculiar features of digital SiPMs. These qualities, typical for tracking detectors, combined with SPADs' intrinsic timing performance on the order of 10 ps, make monolithic SiPMs a good candidate for 4D-tracking in contexts where excellent spatial and temporal capabilities are required in the same detector.

A prototype of a digital SiPM was designed at DESY using LFoundry 150 nm CMOS technology. These dSiPMs have been tested at the DESY II test-beam facility, to investigate MIP detection efficiency, spatial and temporal resolution. This contribution will illustrate the test beam setup and analysis approach used to investigate the 4D-tracking performance of the DESY digital SiPM. The results of the latest measurements campaigns and future perspectives will be discussed.

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