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CMOS SPAD Sensor Chip for the Readout of Scintillating Fibers

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The detection of light from optical fibers is required in a variety of detector concepts like fiber trackers or sampling calorimeters. Instead of using photo detectors like PMTs or SiPMs and associated readout electronics, we propose to combine Single Photon Sensitive Avalanche Diodes (SPADs) and CMOS readout electronics on the same silicon die. We have developed, fabricated and initially characterized such a 'Digital SiPM' solution. In order to provide a high flexibility in fiber diameters and positions, our architecture allows for assigning the individual SPADs to 'groups' which are routed to chip pins. The purely digital output signals provide the timing by the rising edge and an amplitude information by the pulse width. The first available chip has been successfully used to detect light of individual fibers from a fiber bundle. The proposed concept could significantly reduce the mechanical and electronic complexity as well as the cost of fiber readouts and possibly improve their performance.

Primary experiment

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