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Silicon Photo Multiplier Design Using Silicon on Insulator Technology

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A 6 × 6 silicon photomultiplier (SiPM) array aimed at one-to-one coupling to a finely separated scintillator array was fabricated and characterized. All SiPMs were formed in the bulk substrate layer of a silicon on insulator (SOI) wafer for enabling future SiPMs which consists of 3-D integrated electronics without mechanical bump bonding. Each channel had a size of 250 × 250 μm² and was arranged for satisfying the counting-rate requirements of over 2 Mcps/mm² in energy-resolvable X-ray photon counting computed tomography (PCCT). In this study, the basic performance of SOI-SiPM prototype was characterized. Several features, such as a fast recovery time around 16 ns and a gain of 1 × 10⁵ were within requirements to realize Photon counting computed tomography.

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