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A position sensitive silicon sensor with sub-micron resolution working on entirely digital operation

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We have developed a novel design for a high pixel density position sensitive detector that avoids the use of the analogue circuit for amplification of the signal. The working principle of this novel silicon sensor is based on the change of a binary status when an ionising particle crosses the devices. This mode of operation has multiple advantages, from very high position resolution, low power consumption, simplified readout, portability of the design to different CMOS technologies. This concept can allow designing position sensitive detectors in very deep sub-micron CMOS technologies. The first prototype (PartiCam) of this new concept has been produced in standard 65nm UMC CMOS. The chip has a 1.8x1.8 mm2 footprint with various test arrays for comparing the efficiency of different layouts to sensing ionising radiation . The arrays have different pixel numbers (128x128 or 256x256) with pitches ranging from minimum 2 μm to maximum 6μm. The pixel size shows the ground-breaking position resolution achievable with this concept. We will present characterisation of this chip using test structures with internal charge injection circuits and response to laser and alpha particle illumination.

Collaboration

Role of Submitter

I am the presenter

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