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Monolithic CMOS sensors for high energy physics

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Monolithic pixel detectors integrating sensor matrix and readout in one silicon die are making their way into high energy physics as they potentially offer lower material budget and cost, and better performance. For the most extreme radiation levels, signal charge has to be collected by drift from a depletion layer onto a designated collection electrode without losing the signal charge elsewhere in the in-pixel circuit. Low power consumption requires optimization of Q/C , the ratio of the collected signal charge over the input capacitance. Progress is being made both in the area of radiation tolerance and low power consumption. Further challenges come from the extreme hit rates and system requirements and require careful choice of architecture to fully take advantage of present CMOS technologies. This paper tries to give an overview.

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