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Performance of the FASTPIX sub-nanosecond CMOS pixel sensor demonstrator

Within the ATTRACT FASTpix project, a monolithic pixel sensor demonstrator chip has been developed in a modified 180 nm imaging CMOS process technology, targeting sub-nanosecond timing measurements for single ionising particles. It features a small collection-electrode design on a 30 micron deep epitaxial layer and contains 32 mini matrices of 68 hexagonal pixels each, 4 transmitting an analog output signal and 64 transmitting binary hit information, with pixel pitches ranging from 8.66 to 20 micron. Various process- and design variations are explored, aiming at accelerating the charge collection and making it uniform over the pixel area. Signal treatment of the analog waveforms as well as reconstruction of Time-of-Arrival and Time-over-Threshold information is carried out off-chip. This contribution introduces the design of the sensor and readout system, and presents first performance results achieved in measurements with radioactive sources, laser-light injection and particle beams.

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