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Development of SOI Monolithic Pixel Detector for Fine Measurement of Space and Time

SOFIST is an SOI pixel sensor in development to achieve fine measurement of both space and time, adopting the performance specifications of the International Linear Collider (ILC) vertex detector for the sensor design. The SOFIST is to consist of multiple-stage hit-charge and hit-time memories in each of 20 μm x 20 μm pixels with 3D integration technology. The SOFIST1 and SOFITS2 chips have been beam-tested to verify the space and time measurement performance, respectively. Spatial resolution of 1.3 to 1.4 μm was obtained for 200-500 μm depletion thicknesses by means of a simple charge-weighting method and 2.0 μs by measuring the ramp voltage height. Status of SOFIST3 (both functions integrated in 30 μm x 30 μm pixels) and SOFIST4 (3D integrated in 20 μm x 20 μm pixels) development is reported.

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