

MONOLITH – pico-second time-stamping in fully monolithic highly-granular pixel sensors

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The MONOLITH H2020 ERC project aims at the development of fully monolithic highly granular pixel sensors with pico-second time-stamping capabilities. Using high-resistivity epitaxial layer material in combination with a continuous deep and thin gain layer, a pico-second fast detector response is achieved over the full pixel cell. The placement of the gain layer away from the pixel junctions additionally allows for a small pixel pitch of down to 50 micrometers, resulting in a high spatial precision. Making use of silicon-germanium BiCMOS technology, a ultra-fast and low noise front end has been implemented inside a large collection electrode design.

Various prototypes of this technology have been produced with different variations, including various doping levels and different complexity of in-pixel circuitry. The prototypes have been investigated in laboratory and test-beam measurements, with a focus on the sensor gain, time-stamping capability and detection efficiency. This contribution will introduce the novel sensor concept and discuss the front-end that has been implemented in the SiGe BiCMOS technology. Results of laboratory measurements with radioactive sources will be presented, including measurements of the sensor gain with an iron source and timing measurements that have been performed with a strontium source.

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