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Large-area passive CMOS sensors for radiation tolerant hybrid pixel detectors

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CMOS process lines are an attractive option for the fabrication of hybrid pixel sensors for large-scale detectors like ATLAS and CMS. Besides the cost-effectiveness and high throughput of commercial CMOS lines, multiple features like poly-silicon layers, metal-insulator-metal capacitors and several metal layers are available to enhance the sensor design.

After an extensive R&D programme with several prototype sensors in 150 nm LFoundry technology, passive CMOS pixel sensors have been manufactured for the first time as large-area sensors using the reticle stitching technique. The sensors are compatible with the RD53 readout chips designed for the ATLAS and CMS tracking detector upgrades.

The sensors have been extensively studied in the lab and using a minimum ionising particle beam. In this talk, the performance of large-area passive CMOS sensors before and after irradiation to fluences of 2×10^{15} neq/cm² and 5×10^{15} neq/cm² is shown.

Author: DIETER, Yannick Manuel (University of Bonn (DE))

Co-authors: HUEGGING, Fabian (University of Bonn (DE)); KRUEGER, Hans (University of Bonn); DINGFELDER, Jochen Christian (University of Bonn (DE))

Presenter: DIETER, Yannick Manuel (University of Bonn (DE))

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