Contribution ID: **149**   Type: **ORAL**

HVCMOS Sensors - Progress towards final tracking sensor designs for Mu3e and ATLAS experiments

Tuesday, 12 December 2017 15:00 (20 minutes)

Commercial HVCMOS technologies allow design of monolithic particle pixel sensors in the form of systems on a chip. Readout electronics is embedded in charge collection electrodes and particle detection occurs in depleted silicon region. The sensors have excellent efficiency in detection of ionizing radiation. In the past ten years, various smaller and reticle size particle detector prototypes have been designed in several commercial semiconductor processes. HVCMOS sensors will be used in Mu3e experiment and are one of the options for ATLAS upgrade and CLIC. The prototypes have successfully met the radiation tolerance, detection efficiency and time resolution requirements for these high particle rate experiments. The next step in our development is the design of large area sensors with all the required features. MUpix and ATLASpix, which are pre-production sensor designs for Mu3e and ATLAS experiments will be presented. The sensors have been produced within an engineering run in AMS 180nm high voltage process. Various novel features have been developed for these final designs. They include the new isolated PMOS structure, the novel high data-rate readout architecture with trigger and data sorting possibility, circuits for amplitude measurements and a special powering scheme. The readout architecture have been optimised using a dedicated simulation environment. Design details, simulation- and measurement results will be presented.

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Session Classification: Session7

Track Classification: Pixel sensors for tracking