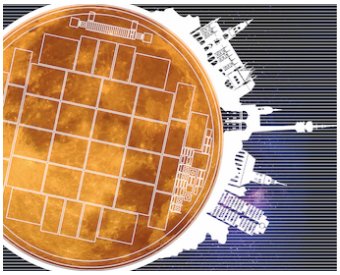

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Characterization of H35 HV-CMOS Sensors before and after Proton Irradiation

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ABSTRACT

In view of applications at the High Luminosity LHC (HL-LHC) upgrade, we developed a new generation of radiation tolerant High Voltage CMOS (HV-CMOS) sensors, that was fabricated at AMS Foundry (Austria) in 350 nm Technology. To evaluate their performance and operational stability within HL-LHC environment, four different substrate resistivity spanning from 20 to 1000 Ω×cm were considered in an aim to optimize the charge collection efficiency through the compromise between smaller dead areas at the pixel array periphery and a larger depleted volume. High resistivity substrate creates a larger depletion volume when biased, as a result, charge multiplication effects but also increased leakage current and premature electrical breakdown could be noticed after irradiation. A thorough experimental study is thence necessary to assess the device intrinsic behavior before and after irradiation campaigns. To this purpose, we have used standalone pixels, single pitch diode, and diode arrays. A dedicated campaign has been carried out that included Proton irradiations at different facilities: i) 24 GeV/c Proton in CERN Proton Synchrotron (PS) beam and (ii) 18 MeV Proton Cyclotron at University of Bern (Switzerland). The electrical characterization of the sensors was made before and after irradiation using a precise environmental chamber, Cascade Microtech 300 probing system. We report here the selected results retrieved from these investigations that give a greater insight of sensor's inherent behavior as well as their good compatibility to ATLAS ITk compliance.

Corresponding email: dms.sultan@unige.ch

Primary author: SULTAN, D M S (Universite de Geneve (CH))

Co-authors: BENOIT, Mathieu (UNIGE); FERRERE, Didier (Universite de Geneve (CH)); GONZALEZ SEVILLA, Sergio (Universite de Geneve (CH)); KIEHN, Moritz (Universite de Geneve (CH)); VICENTE BARRETO PINTO, Mateus (Universite de Geneve (CH)); ZAFFARONI, Ettore (Universite de Geneve (CH)); PERIC, Ivan (KIT - Karlsruhe Institute of Technology (DE)); IACOBUCCI, Giuseppe (Universite de Geneve (CH))

Presenter: SULTAN, D M S (Universite de Geneve (CH))