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Characterization of a new HV/HR CMOS sensor in LF150nm technology for the ATLAS Inner Tracker Upgrade

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The Large Hadron Collider (LHC) upgrade planned for 2026, will allow to develop new type of sensor to replace the ATLAS Inner Tracker. For this upgrade, the HV/HR CMOS technology has been studied because of his low price, the limitation of the scattering (reduction of the material budget), the good tracking precision (pixels sizes) and the charge collection by drift allow a high radiation tolerance and a high time resolution. A HV/HR CMOS detector prototype called LFCPIX, has been developed with LFoundry 150nm technology and has been tested. In this sensor we have implemented, in the diode, with a pitch of $250\mu\text{m} \times 50\mu\text{m}$, the front-end (using NMOS and PMOS transistors. This demonstrator is an implementation of a matrix of smart pixels which the diode composed by a DNWell and Psubstrate is used as a depleted sensor. Three types of pixels has been developed: passive pixels, analog-digital pixels, analog pixels (connected to the FE-I4). The FE-I4 is the present readout IC of the innermost ATLAS pixel layer and the demonstrator is able to be connected to the demonstrator. In addition to present the different versions of the LFCPIX demonstrators, laboratory tests results like the characterization of the different pre-amplifiers with external injection signal first and source ^{55}Fe calibration then of the analog-digital pixels, results of the pixels connected to the FE-I4 and radiation hardness results will be presented.

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