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## First studies on AMS H35 CMOS devices for application in the ATLAS tracker upgrade

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H35Demo chips are HV-CMOS devices produced in the 350nm AMS technology with the purpose of inquiring the opportunity to introduce this technology in the next ATLAS tracker upgrade. Each chip includes four different pixel matrices and three test structures. The results of TCT (Transient Current Technique) and edge-TCT analysis on the test structures from with different substrate resistivity before and after irradiation will be shown. Also the first results from the stand alone readout of the monolithic matrices will be shown.

### Summary

The High-Voltage CMOS (HV-CMOS) technology has recently been introduced in the high energy physics community. The opportunity to include the pixel electronics within the sensor substrate brings major advantages to particle tracking detectors. Sensors produced in the HV-CMOS technology can be thinner, faster and cheaper with respect to the silicon detectors currently in use.

H35Demo chips have been produced in order to study the radiation hardness of such detectors and verify the possibility to introduce this technology in the next ATLAS tracker upgrade for the high luminosity LHC. These chips are HV-CMOS devices produced in the 350nm AMS technology (H35). They have been produced on wafers with different substrate resistivity ranging from the standard value of  $20 \Omega \cdot \text{cm}$  to  $1000 \Omega \cdot \text{cm}$  to increase the depletion region of the sensor.

Each chip includes four different pixel matrices, two of them are fully monolithic and can be read out stand-alone while the others two require to be bonded to a readout chip. All the four matrices are suitable to be read out via the FE-I4 readout chip through gluing or bump bonding. In addition the chip includes three test structures to characterize the sensor properties. The first includes the electronics for measuring the pixel intrinsic capacitance, the second is a matrix of nine pixels with a source follower output buffer, the third one is a single diode with eight neighbours that do not include additional electronics allowing to directly sample the signal waveform. This last structure has been used to characterize the samples with the Transient Current Technique (TCT).

The TCT allows to trigger the waveform readout on the injection of a laser pulse. The light crossing the sensor generates the electron-hole pairs inducing the signal. Illuminating the sensors from the side, a technique known as edge-TCT, it is possible to study the signal generation at different depths and measure the depletion depth of the substrate.

The results of TCT and edge-TCT studies performed on the test structures with different substrate resistivity before and after irradiation will be presented together with the first results of the stand alone readout of the monolithic matrices through the set-up developed at IFAE.

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