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Performance of the ATLASPix1 pixel sensor prototype in ams aH18 CMOS technology for the ATLAS ITk upgrade

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Monolithic active pixel sensors (MAPS) based on commercial high-voltage CMOS processes are an exciting technology that is considered as an option for the ATLAS inner tracker upgrade. Here, particles are detected using deep n-wells on a p-type substrate as sensor diodes with the depleted region extending into the silicon bulk. With readout electronics and sensor integrated on the same device, the detector complexity and the material budget are greatly reduced. The ATLASPix1 pixel sensor prototype is a large-scale pre-production monolithic prototype that implements the full readout chain on a single physical chip. It is based on a large sensor electrode and is produced using the ams aH18 high voltage technology. Three pixel matrices with different readout architectures, triggered and untriggered, and pixel designs are implemented. We will show a systematic performance evaluation of this prototype for unirradiated and irradiated samples of up to $10^{15} n_{eq}/cm^2$, discuss its applicability as an option for the ATLAS inner tracker upgrade, and outline the future plans.

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