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Performance of CMOS pixel sensor prototypes in AMS H35 and aH18 technology for the ATLAS ITk upgrade

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Pixel sensors 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 as sensor diodes with the depleted region extending into the silicon bulk. Both analog and digital readout electronics can be added to achieve different levels of integration up to a fully monolithic sensor. Small scale prototypes using the AMS technology have previously demonstrated that it can in-principle achieve the required radiation tolerance above 10^{15} neq/cm^2 and detection efficiencies above 99%. Recently, large area prototypes, comparable in size to a full sensor, have been produced that include most features required towards a final design: the H35demo prototype produced in AMS H35 technology that supports both external and integrated readout and the monolithic pATLASPix1 pre-production design produced in AMS aH18 technology. Both chips are based on large fill-factor pixel designs, but differ in readout structure. We will show systematic performance results for H35demo with capacitively-coupled external readout using TCT and testbeam measurements as well as first results for the monolithic pATLASPix1.

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