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Characterization of thin n-in-p planar pixel sensors with active edges before and after irradiation

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We report about the characterization of silicon pixel modules employing n-in-p planar sensors with an active thickness of 150μm, produced at MPI/HLL, and 100μm with active edges, produced at VTT in Finland.
The thinned sensors are designed to reduce the signal degradation and ensure radiation hardness even after high fluences. Moreover the n-in-p technology only requires a single side processing and is a cost-effective alternative to the n-in-n pixel technology presently employed in LHC experiments.
High precision beam test measurements of the hit efficiency have been performed with high energy pions at the SpS CERN with different bias voltages and beam incidences.
Results obtained on 150μm thick sensors, assembled with the new ATLAS FE-I4 chip and irradiated up to a fluence of 4e15 n_eq cmˆ-2, show that they are excellent candidates for larger radii of the silicon pixel tracker in the ATLAS Phase II. In addition, the active edge technology maximises the active area of the sensor and therefore suits the requirements for the innermost layers.
The edge pixel perfomance of VTT modules has been compared to the central region and a first analysis of the charge collection of these devices after irradiation was performed in the laboratory using radioactive sources.

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