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Test Beam Studies of Barrel and End-Cap Modules for the ATLAS ITk Strip Detector before and after Irradiation

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ATLAS is preparing for the HL-LHC. In order to cope with occupancy and radiation doses expected, we will replace our Inner Detector with an all-silicon Inner Tracker (ITk). The strip system will be built from modules, consisting of one n+-in-p sensor, and one or two PCB hybrids containing the front-end electronics glued directly on the active sensor surface.
Several prototypes have been tested at DESY-II and CERN SPS, built from rectangular ATLAS17LS barrel sensors and annular ATLAS12EC sensors, designed for the innermost ring (R0) of the ECs.
A carbon-fibre based support, with two R0 modules positioned back-to-back has been measured, as well as two separate irradiated R0s. We present results of the module performance, incl. charge collection, noise occupancy, detection efficiency, and tracking performance. The good tracking resolution allows for detailed studies of various sensor features. The results give confidence that the ITk strip detector will meet the HL-LHC requirements.

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