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ATLAS ITk Pixel Detector Overview

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In the high-luminosity era of the Large Hadron Collider, the instantaneous luminosity is expected to reach unprecedented values, resulting in up to 200 proton-proton interactions in a typical bunch crossing. To cope with the resulting increase in occupancy, bandwidth and radiation damage, the ATLAS Inner Detector will be replaced by an all-silicon system, the Inner Tracker (ITk). The innermost part of the ITk will consist of a pixel detector, with an active area of about 13 m². To deal with the changing requirements in terms of radiation hardness, power dissipation and production yield, several silicon sensor technologies will be employed in the five barrel and endcap layers. Prototype modules assembled with RD53A readout chips have been built to evaluate their production rate. Irradiation campaigns were done to evaluate their thermal and electrical performance before and after irradiation. A new powering scheme – serial – will be employed in the ITk pixel detector, helping to reduce the material budget of the detector as well as power dissipation. This contribution presents the status of the ITk-pixel project focusing on the lessons learned and the biggest challenges towards production, from mechanics structures to sensors, and it will summarize the latest results on closest-to-real demonstrators built using module, electric and cooling services prototypes.

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