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Testing and characterization of the RD53 ATLAS pixel production readout ASIC (ITkPixV2) for HL-LHC

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The Phase-2 upgrades of ATLAS and CMS for the High-Luminosity LHC (HL-LHC), require a new tracker with robust readout electronics capable of withstanding extreme radiation (1 Grad), a high hit rate (3 GHz/cm²), and a high data rate readout (5 Gb/s). In a joint effort between ATLAS and CMS, pixel detector readout chips have been designed by the RD53 collaboration in 65 nm CMOS technology. Based on a half-sized demonstrator (RD53A), two chip variants were designed for ATLAS and CMS, respectively. The ATLAS pre-production readout chip, ITkPixV1, was characterized in detail, and informed by the results, the final ATLAS pixel readout chip, ITkPixV2, has been designed, submitted, and the first wafers were received in July 2023. This contribution provides an overview of the characterization measurements performed on the ITkPixV2 chip so far, focusing on bench-top testing of chip functionality, and first results of X-ray irradiation studies to assess the radiation tolerance of the chip.

Early Career

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