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Radiation-Hard Silicon Strip Sensors for the ATLAS Phase-2 Upgrade

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The ATLAS upgrade for HL-LHC operation includes the installation of an entirely new all-silicon Inner Tracker (ITk). The silicon strip region comprises 165m^2 of instrumented area, made possible by the mass production of silicon strip sensors. This area is covered in a nearly hermetic way. Multiple sensor shapes are utilized: square sensors in the barrel part and skewed trapezoidal sensors with curved edges to provide continuous coverage of the disc surface in the endcap part of a detector. As a result, there are 8 different strip sensor types in the system. They all feature AC-coupled n+-in-p strips with polysilicon biasing, developed to withstand the total fluence of $1.6 \times 10^{15} \text{n}_{\text{eq}}/\text{cm}^2$ and the total ionizing dose of 66 Mrad. Following many years of R&D and 4 prototype submissions and evaluations, in 2020 the project transitioned into pre-production, where 5% of the total volume was produced in all 8 designs. In this contribution, we will summarize the evaluation program, test results, and experience with the pre-production sensors.

In-person participation

Yes

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