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ANALYSIS OF THE QUALITY ASSURANCE RESULTS FROM THE INITIAL PART OF PRODUCTION OF THE ATLAS18 ITK STRIP SENSORS

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The production of strip sensors for the ATLAS Inner Tracker (ITk) started in 2021. During this time, a Quality Assurance (QA) program is being carried out continuously, by using specific test structures, in parallel to the Quality Control (QC) inspection of the sensors. The QA program consists of monitoring sensor-specific characteristics and the technological wafer process variability, as produced and after the irradiation with gammas, neutrons, and protons. After two years, half of the full production volume has been delivered and we present statistical and time-evolution information of the parameters measured as part of the QA performance.
The main devices used for QA purposes are miniature strip sensors, monitor diodes and the ATLAS test chip, which contains several test structures (e.g., bias resistors, interdigitated structures or field oxide capacitors). Such devices are tested by several sites across the collaboration depending on the type of samples (non-irradiated components or irradiated with protons, neutrons, or gammas).
All the parameters extracted from the tests are uploaded to a database, from which they are selected in the analysis process by the use of newly developed python scripts which interrogate the database, filter the data, and perform analysis, statistics and representation. These parameters are summarized in the form of histograms, time-evolution plots and correlation plots to get parameter distributions, trends, and meaningful parameter-to-parameter correlations. The purpose is to identify possible deviations in the fabrication, the sensor quality, or alternatively, changes in the behaviour of the test equipment or possible variability in the irradiation processes.
The results from these two years of production of the strip sensors of the ITk are presented. They have allowed the optimization of the measurements, setting soft limits, and analysis, and a better understanding of the device properties and fabrication trends. Those abnormal results are fed back to the vendor promptly.

Submission declaration

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Primary author: BACH MARQUÈS, Eric (Consejo Superior de Investigaciones Cientificas (CSIC) (ES))

Presenter: BACH MARQUÈS, Eric (Consejo Superior de Investigaciones Cientificas (CSIC) (ES))

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