

Studying signal collection in the punch-through protection area of a silicon micro-strip sensor using a micro-focused X-ray beam

Sunday, 10 December 2017 20:22 (1 minute)

on behalf of the ATLAS ITk strip sensor working group.

For the Phase-II Upgrade of the ATLAS detector, a new, all-silicon tracker will be constructed in order to cope with the increased track density and radiation level of the High Luminosity Large Hadron Collider. While silicon strip sensors are designed to minimise the fraction of dead material and maximise the active area of a sensor, concessions must be made to the requirements of operating a sensor in a particle physics detector. Sensor geometry features like the punch-through protection deviate from the standard sensor architecture and thereby affect the charge collection in that area.

In order to study the signal collection of silicon strip sensors over their punch-through-protection area, ATLAS silicon strip sensors were scanned with a micro-focused X-ray beam at the Diamond Light Source. Due to the highly focused X-ray beam ($2 \times 3 \mu\text{m}$) and the short average path length of an electron after interaction with an X-ray photon ($\leq 2 \mu\text{m}$), local signal collection in different sensor areas can be studied with high resolution.

This study presents results of highly detailed 2D-scans of the punch-through protection region of ATLAS silicon micro-strip sensors, showing how far the strip signal collection area extends toward the bias ring and how the region is affected by radiation damage.

Primary author: POLEY, Luise (Deutsches Elektronen-Synchrotron (DE))

Co-authors: BLUE, Andrew (University of Glasgow (GB)); REHNISCH, Laura (Humboldt University of Berlin (DE)); STEGLER, Martin (Deutsches Elektronen-Synchrotron (DE))

Presenter: POLEY, Luise (Deutsches Elektronen-Synchrotron (DE))

Session Classification: POSTER

Track Classification: Strip sensors