

Title

Evaluation of the charge collection properties on the silicon strip detector of the LHC-ATLAS experiment

Abstract

The LHC-ATLAS experiment have been operated since 2010, aiming for new particle searches, and precision measurements of the Higgs boson properties. The SemiConductor Tracker (SCT) is one of the most important subsystems in the ATLAS detector, which plays a key role in tracking and p_T measurement for charged particles. Since SCT is located 30-50 cm from the beam pipe, it has been exposed to a radiation fluence of $\sim 10^{13}$ n_eq/cm² during about 15 years of operation.

The charge collection efficiency is one of the most important parameters of the SCT detector, because it is directly connected to hit efficiency. The charge collection efficiency was supposed to be significantly reduced by the radiation damage. However, since SCT has a binary readout, we were not able to measure the charge collection efficiency directly. We therefore established a method to evaluate it from the median charge obtained by analyzing the threshold scan data. During the threshold scan, SCT modules were divided into several groups in ϕ , and each group was assigned to different HV setting. This method enabled us to evaluate the HV dependence of the charge collection efficiency of the SCT while minimising impacts on the quality of the physics data. In this poster, the first attempts of the charge collection efficiency evaluation of SCT using 2024 and 2025 datasets will be presented, in comparison with sensor irradiation experiments from the sensor R&D.