Contribution ID: **69** Type: **Talk**

Characterization of Novel Thin N-in-P Planar Pixel Modules for the ATLAS Inner Tracker Upgrade

Friday 8 September 2017 10:20 (20 minutes)

Facing the high luminosity phase of the LHC (HL-LHC) to start operation around 2026, a major upgrade of the tracker system for the ATLAS experiment is in preparation. The expected neutron equivalent fluence of up to 3×10^{16} n_{eq}/cm^2 at the innermost layer of the pixel detector poses the most severe challenge. Thanks to their low material budget and high charge collection efficiency after irradiation, modules made from thin planar pixel sensors are promising candidates to instrument these layers.
To optimize the sensor layout for the decreased pixel cell size of 50×50 μm^2, TCAD device simulations are being performed to investigate the electronic noise as well as the charge collection efficiency before and after irradiation.
In addition, sensors of $100 - 150$ μm thickness, interconnected to FE-I4 read-out chips featuring the previous generation pixel cell size of 50×250 μm^2, are characterized with radioactive sources as well as test beams at the CERN-SPS and DESY. The performance of sensors with various designs, irradiated up to a fluence of 1×10^{16} n_{eq}/cm^2, is compared in terms of charge collection and hit efficiency.
It is foreseen to exchange once the two innermost pixel layers during the lifetime of HL-LHC. The exchange will require several months of intervention, during which the remaining detector modules cannot be cooled. They are kept at room temperature, thus inducing an annealing. The expected performance of these modules will be investigated using modules irradiated to the respective fluences, and the method of accelerated annealing at higher temperatures.

Author: BEYER, Julien-Christopher (Max-Planck-Institut fur Physik (DE))

Co-authors: LA ROSA, Alessandro (Max-Planck-Institute for Physics (D)); MACCHIOLO, Anna (Max-Planck--Institut fur Physik (DE)); NISIUS, Richard (Max-Planck-Institut fur Physik (DE)); SAVIC, Natascha (Max-Planck--Institut fur Physik (DE))

Presenter: BEYER, Julien-Christopher (Max-Planck-Institut fur Physik (DE))

Session Classification: Detectors for high energy physics and astrophysics (IV)