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Characterization of the planar pixel modules of the active and slim edge design for ATLAS Inner Detector Upgrade

In the frame of the second phase of LHC (CERN) accelerator complex upgrade, during the long shutdown in ~ 2023, it's planned to increase the beam luminosity up to $5 \times 10^{34} cm^{-2} s^{-1}$ and collision energy up to 14 TeV in the center of mass to achieve the high-precision results in the project tasks. These conditions will lead to additional demands especially on an inner part of the ATLAS detector system. The resulting increase in occupancy levels and integrated radiation doses go beyond the design values for the current tracker. Due to this fact the replacement of the ATLAS tracker system is foreseen with using of advanced sensor and readout electronics technologies.
This work is dedicated to the characterization of the new n-in-p sensor (active edge and slim edge) designs, which are the promising candidates for the ATLAS pixel detector upgrade to be operated at the HL-LHC, thanks to their radiation hardness, cost-effectiveness, increased active area fraction and low material budget. The results on a test beam characterization of the samples of these designs are presented and discussed in the present work.

Auteur principal: M. HOHOV, Dmytro (LAL Université Paris-Sud)

Co-auteurs: Dr LOUNIS, ABDENOUR (LAL-CNRS); Mme RASHID, Tasneem (LAL)

Orateur: M. HOHOV, Dmytro (LAL Université Paris-Sud)