Contribution ID: **37** Type: **Poster**

Development of radiation hard CMOS Active Pixel Sensors for HL-LHC

Thursday, 28 May 2015 09:15 (0 minutes)

The luminosity of the Large Hadron Collider (LHC) will increase nearly by an order of magnitude over its design luminosity during the HL-LHC upgrade with the goal to substantially enhance the sensitivity of its experiments to rare processes. The present ATLAS tracker, called Inner Detector, will be replaced with a newly developed tracker, which can cope with the expected high radiation damage, the high hit rates, stringent tracking requirements and the pile-up of >140 collisions per bunch crossing of LHC beams.
Newly developed pixel detectors, based on commercial high voltage and/or high resistivity full CMOS processes, hold promise as next-generation active pixel sensors for inner and intermediate layers of the upgraded ATLAS tracker. The presentation will summarize recent development and tests on CMOS sensors produced as charge-coupled pixel detectors ("CCPD") in the AMS 180nm process as well as recent tests of monolithic XFAB SOI sensor test structures. Our development focuses on high granularity and radiation hard pixel sensors, which can be employed as hybrid-pixel detectors as well as monolithic pixel sensors. The sensors also include in pixel signal amplification, shaping, digitisation and position encoding to achieve an optimal spatial resolution for the chosen readout granularity.
The use of commercial CMOS processes furthermore allows cost-effective detector construction and simpler hybridisation techniques. The presentation will give an overview of the results obtained on AMS-produced CMOS sensors coupled to the ATLAS Pixel FE-I4 readout chips. The test results include pre-/post-irradiation comparison, measurements of charge collection regions as well as test beam results. The SOI produced sensors by XFAB hold great promise as radiation hard SOI-CMOS sensors due to their combination of partially depleted SOI transistors which reduces back-gate effects, high voltages (up to 200V) and the possibility to use higher resistivity substrates. The presentation will summarise initial radiation measurements up to 700 MRad on transistors and test beam results of pixel sensors.

Collaboration

ATLAS CMOS pixel collaboration

Primary author: Dr PERNEGGER, Heinz (CERN Physics Department)

Presenter: Dr PERNEGGER, Heinz (CERN Physics Department)

Session Classification: Solid State Detectors - Poster Session

Track Classification: S6 - Solid State Detectors