

Verification of Monolithic CMOS Pixel Sensor Chip with Ion Beams for Application in proton Computed Tomography

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proton Computed Tomography (pCT) is an emerging imaging modality useful in treatment of cancer using protons and heavy ions. The pCT collaboration in Bergen is building a prototype Digital Tracking Calorimeter (DTC) for proton therapy application. The DTC is a 41 layers of Si-Al sandwich structure where CMOS pixel sensors are used as the active element and aluminum is the absorbing material. The pixel sensor used was developed for upgrade of the ALICE Inner Tracking System at the Large Hadron Collider, CERN. The pixel sensor is a CMOS Monolithic Active Pixel Sensor (MAPS) consisting of almost half-million pixels each of the size of $29.24 \times 26.88 \mu\text{m}^2$.

In the pCT context two ion-beam test experiments were performed. The first experiment was carried out to test dependence of the cluster size on the beam position. For this a micro-beam of 10 MeV Helium-4 was used and a few pixels of the chip were scanned. The test results show that the cluster size changes with the beam position. The second experiment was carried out to study the cluster sizes for different beam energies and to obtain the tracking efficiency for Proton and He4 ions going through a stack of three chips. In the presentation, early results of both the ion-beam test experiment of MAPS will be reported.

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