Contribution ID: **121** Type: **Oral**

Test beam characterization of irradiated SINTEF 3D pixel sensors

Wednesday 27 February 2019 10:00 (20 minutes)

The upcoming High Luminosity LHC (HL-LHC) puts stringent requirements on the tracking detectors situated closest to the interaction point in the planned Inner Tracker (ITk) of the ATLAS experiment. 3D pixel detectors have been proposed as a candidate for the innermost layers of the ITk since these detectors decouple the sensor thickness and the inter-electrode spacing, effectively increasing the radiation hardness.

The SINTEF prototyping R&D run (run 4) for radiation hard 3D silicon pixel detectors features ultra thin device layouts down to 100 and 50um active thicknesses, with a variety of compatibility. The layouts discussed here are compatible with the ATLAS pixel readout ASIC RD53A, allowing nominal signal thresholds below 1ke-.
The flip-chip and UBM processing steps was done by Fraunhofer IZM in Berlin, and these hybrids were mounted on Single Chip Cards (SCC) and bonded at the University of Oslo.

Noise vs. thickness scans demonstrates that the capacitance is dominated by device thickness, inferring less intrinsic noise in thinner devices.

Pre-irradiation tests, performed at the SPS testbeam facility at CERN shows an efficiency loss that is consistent with the non-active column geometry of the 50x50 1E pixel matrix, giving an overall efficiency > 97%. While devices irradiated to a fluence of 5x1015 neqcm-2 have an efficiency within optimistic expectations for such thin devices.

Authors: Mr HEGGELUND, Andreas Lokken (University of Oslo (NO)); STUGU, Bjarne (University of Bergen (NO)); ROHNE, Ole (University of Oslo (NO)); SANDAKER, Heidi (University of Oslo (NO)); READ, Alexander Lincoln (University of Oslo (NO)); DORHOLT, Ole (University of Oslo (NO))

Co-authors: KOYBASI, Ozhan (SINTEF); Dr POVOLI, Marco (SINTEF MiNaLab, Oslo, Norway); Dr KOK, Angela (SINTEF MiNaLab, Oslo, Norway); Mr LAURITZEN, Magne Eik (University of Bergen (NO)); Mr SUMMANWAR, Anand (SINTEF MiNaLab)

Presenter: Mr HEGGELUND, Andreas Lokken (University of Oslo (NO))

Session Classification: Session 8: 3D Sensors

Track Classification: 3D Sensors