Contribution ID: **26** Type: **not specified**

# Measurements of highly irradiated ATLAS n+-in-n planar pixel sensors with unirradiated readout electronics

*Tuesday 22 November 2011 16:10 (20 minutes)*

ATLAS plans two major upgrades of its pixel detector on the path to HLLHC: First, the insertion of a 4th pixel layer (Insertable B-Layer, IBL) is currently being prepared for 2013. This will enable the ATLAS tracker to cope with an increase of LHC's peak luminosity to about 3E34 cmˆ-2 sˆ-1 which requires a radiation hardness of the sensors of up to 5E15 n_eq cmˆ-2. Towards the end of this decade, a full replacement of the inner tracker is foreseen to cope with luminosities of up to 10E35 cmˆ-2 sˆ-1 at HLLHC. Here, the innermost pixel layer will have to withstand a radiation damage of 2E16 n_eq cmˆ-2.

The general challenge in studying highly irradiated pixel sensors is that usually the permanent connection of sensor and readout electronics by bump bonding has to be done before irradiation as the flipchipping is often a high temperature step which would deteriorate the sensor's properties vastly. On the other side operating highly irradiated readout electronics can be difficult and also raises the question whether the gained data is completely reliable. Therefore it is desirable to crosscheck these results with unirradiated readout electronics.

We have irradiated sensors in Karlsruhe with low energy protons up to a fluence of 1.4E16 n_eq cmˆ-2 and had them flipchipped afterwards to the unirradiated readout electronics FE-I3 using indium stubs. This is possible as indium thermo compression is done at a relatively low temperature which is not harmful to the irradiated sensor. Data from lab characterization as well as testbeam measurements at CERN SPS will be presented and a comparison to results gained with wholly irradiated assemblies given.

**Primary author:** Mr RUMMLER, Andre (Technische Universitaet Dortmund (DE))

**Presenter:** Mr RUMMLER, Andre (Technische Universitaet Dortmund (DE))

**Session Classification:** Full detector systems