Characterization of Silicon-Strip Sensors for the PANDA MVD

Hans-Georg Zaunick, Dariusch Deermann, Tommaso Quagli, Robert Schnell and Juraphan Tummo

DPG 2012, Mainz, poster session, HK 53.4

Supported by BMBF, GSI FEE and JCHP, Jülich

Rationale

For the future PANDA experiment at the FAIR facility, a silicon tracker (Micro-Vertex-Detector MVD) will be built. It features a large number of rectangular silicon strip sensors for which quality assurance procedures and parameter classification must be developed systematically. Based on a batch of first full-size prototype sensors, some of these procedures have been developed.



Wafer mask of the full size PANDA-MVD sensor prototypes (left) and photograph of wafer from 2010/2011 prototype run produced by CiS GmbH (Erfurt/Germany)

Probe Station setup for sensor characterization. The contacts to the sensor pads are realized by micro-adjustable needles.







Connections for single strip measurement (left), full equivalent circuit of the participating capacitances and simplified equivalent circuit.



 I_{Leak}

Schematic of the probing connections for characterization of global sensor properties.

Measurement Setup

- Probe-Needles, LCR-Meter and controllable voltage source
- Measurement of global I/V and C/V-curves as well as single strip p-side C/V-characteristics • Frequency dependent analysis possible



60 80 100 120 140 160 20 0 40 Bias Voltage (V)

Single Strip C/V-Characteristics demonstrating the extraction of the full depletion voltage V

Results

- Classification of a set of produced prototype sensors done
- Extraction of depletion voltages and capacitances understood \rightarrow Input for noise analysis









CiS-PANDA 2011 Wafers slope = $4 \ 10^{-17}$ A/cm (RD48)

varying equivalent neutron fluence



Irradiation setup at the Cyclotron facility in Bonn. The sensor is shrouded by a charged fieldcage to prevent discharge.

Characterization of S4-Sensors (global parameters only) in dependence of various radiation levels

 Consistent annealing intervals of 80min @ 60°C

1MeV neutron equivalent fluence (cm⁻²)



- Contact: H.G. Zaunick
 - zaunick@hiskp.uni-bonn.de Email:
 - +49 228 73 2229 Phone:
 - Nussallee 14-16, D-53115 Bonn Mail:

Helmholtz-Institut für Strahlen- und Kernphysik, Rheinische Friedrich-Wilhelms-Universität Bonn, Germany

