13th RD50 Workshop

Report of Contributions

https://indico.cern.ch/e/42494

Contribution ID: **0** Type: **not specified**

Measurements of CCE/IV/annealing behaviour of microstrip detectors irradiated with reactor neutrons and protons to SLHC doses

Tuesday 11 November 2008 11:40 (20 minutes)

Measurements of micro-strip sensors made with the RD50 mask sets with various silicon substrates (n-type/p-type FZ/MCz/EPI) have been compared after high doses of neutron and protons comparable to those expected at the SLHC.

Issues of charge collection, sensor power, and annealing performance will be evaluated for both standard (˜300 um) and thin (140-200 um) detectors.

Primary author: Dr AFFOLDER, Anthony (University of Liverpool)

Co-authors: Dr CASSE, Gianluigi (University of Liverpool); Prof. ALLPORT, Phil (University of Liverpool)

Presenter: Dr AFFOLDER, Anthony (University of Liverpool)

Session Classification: Full Detector Systems

Contribution ID: **1** Type: **not specified**

3D stc Strip Detector Test Beam Results

Tuesday 11 November 2008 16:40 (20 minutes)

A 3D stc micro strip detector was placed in a beam of 180GeV pions at CERN in 2007. The detector was connected to analogue read-out electronics as used in the tracking system of the LHCb experiment. We present the results from the analyis of the test beam data, including signal/noise ratio measurements and efficiciency studies. This work has been done in close collaboration with Trento (FBK-irst and INFN/UNITN) and Glasgow.

Primary author: PARZEFALL, Ulrich (Fakultaet fuer Physik)

Presenter: PARZEFALL, Ulrich (Fakultaet fuer Physik)

Session Classification: 3D detectors & other new detector structures

Contribution ID: **2** Type: **not specified**

Questions about extrapolation at SLHC doses of silicon parameter measured after lower fluences

Tuesday 11 November 2008 11:20 (20 minutes)

Discussion of VFD, trapping and reverse currrent

Primary author: CASSE, Gianluigi (University of Liverpool)

Co-authors: AFFOLDER, Antoni (University of Liverpool); WORMALD, Mike (University of Liverpool)

Presenter: CASSE, Gianluigi (University of Liverpool)

Session Classification: Full Detector Systems

Contribution ID: **3** Type: **not specified**

Anneal dependent variations of lifetime and deep levels in neutron irradiated MCZ Si

Monday 10 November 2008 14:15 (20 minutes)

The photoconductivity spectra (PC) and lifetime measurement were used for control of transforms and competition of recombination and generation centres in neutron irradiated MCZ Si. In the as-irradiated material the recombination centres prevail and cause mono-exponential decay with nearly linear decrease of carrier lifetime from several microseconds to sub-nanoseconds with enhancement of fluence from 1012 to 3⊠1016 n/cm2. Isochronal 24 hours anneals in the range of temperatures from 80 to 420 C induce variation of the density of different deep levels, which depends on irradiation fluence. Appearance of two-exponential decays and the changes of the effective lifetimes of the initial and asymptotic decays imply the complicated transformations of radiation defects under heat treatments. Qualitatively these transforms can be understood when existence and dominance of cluster defects is assumed. The PC spectra allowed to identity the deep levels playing role in free carrie capture and generation.

Primary author: Prof. VAITKUS, Juozas (Vilnius University)

Co-authors: Dr ZASINAS, Ernestas (Vilnius University); Dr GAUBAS, Eugenijus (Vilnius University); Prof. KAZUKAUSKAS, Vaidotas (Vilnius University); Mr KALENDRA, Vidmantas (Vilnius University)

Presenter: Prof. VAITKUS, Juozas (Vilnius University)

Session Classification: Defect and Material Characterization

Contribution ID: **4** Type: **not specified**

Charge collection and trapping effects in 75 µm, 100 µm and 150 µm thick n-type epitaxial silicon diodes after proton irradiation

Tuesday 11 November 2008 09:40 (20 minutes)

Epitaxial silicon pad diodes of 75 µm, 100 µm and 150 µm thickness and both ST and DO n-type material have been investigated after 24 GeV/c proton irradiation (CERN PS) in an equivalent fluence range between 1e14 n/cm² and 1e16 n/cm². A new TCT setup with 670 nm laser light enabled the measurement of time-resolved electron current pulse shapes in 150 µm thick diodes. Thus the charge correction method could be used in order to extract the trapping time constant. Moreover CCE measurements with 5.8 MeV alpha-particles will be presented and compared to simulation.

Primary author: LANGE, Jörn (Hamburg University)

Co-authors: Dr FRETWURST, Eckhart (Hamburg University); Prof. LINDSTRÖM, Gunnar (Hamburg University); Mr BECKER, Julian (Hamburg University)

Presenter: LANGE, Jörn (Hamburg University)

Session Classification: Pad Detector Characterization and Defect Engineering

Contribution ID: **5** Type: **not specified**

Analysis of the 2008 Testbeam with 3D ddtc Detectors (Status Report)

Tuesday 11 November 2008 17:00 (20 minutes)

In July 2008, a testbeam with double-sided double type column (ddtc) 3D detectors was performed at the CERN SPS. It was provided by the Helsinki group in the framework of CMS. This talk presents the testbeam setup and a detector under test, produced by FBK-irst. The current status of the analysis, which is done in collaboration with the groups from Glasgow and Helsinki, and first (preliminary) results will be shown.

Primary author: KOEHLER, Michael (Universitaet Freiburg)

Presenter: KOEHLER, Michael (Universitaet Freiburg)

Session Classification: 3D detectors & other new detector structures

Contribution ID: **6** Type: **not specified**

Recent results on bistable cluster related defects

Monday 10 November 2008 14:35 (20 minutes)

It was previously shown, *that the bistable cluster defect levels E4aand E4b** anneal out at the same temperature like the divacancy in neutron and proton irradiated oxygen rich material (MCz and oxygen enriched Epi). Defect concentrations were obtained by means of Deep Level Transient Spectroscopy (DLTS) and Thermally Stimulated Current technique (TSC). In addition oxygen lean Epi and FZ material was investigated in the same way, in order to exclude an impurity dependence of those defects. First results of our study support the former observation. Furthermore, we observe that the DLTS and TSC signals of point defects, like the vacancy-oxygen complex and the divacancy, are strongly influenced by the presence of disordered regions (clusters).

- Work presented at the RADECS08 and RESMDD08 conference ** M. Moll et al., Nucl. Instr. & Meth. in Phys.Res. B 186 (2002) 100-110, also known as E4 and E5

Primary author: JUNKES, Alexandra (Hamburg University)

Co-authors: FRETWURST, Eckhart (Hamburg University); PINTILIE, Ioana (NIMP Bucharest)

Presenter: JUNKES, Alexandra (Hamburg University)

Session Classification: Defect and Material Characterization

Contribution ID: **7** Type: **not specified**

Status of the ALIBAVA readout system

Tuesday 11 November 2008 13:40 (20 minutes)

A readout system for microstrip silicon sensors has been developed as a result of a collaboration among the University of Liverpool, the CNM of Barcelona and the IFIC of Valencia. The name of this collaboration is ALIBAVA and it is integrated in the RD50 Collaboration. This system is able to measure the collected charge in one or two microstrip silicon sensors by reading out all the channels of the sensor(s), up to 256, as an analogue measurement. The system uses two Beetle chips to read out the detector(s) . The Beetle chip is an analogue pipelined readout chip used in the LHCb experiment. The system can operate either with non-irradiated and irradiated sensors as well as with n-type and p-type microstrip silicon sensors. Heavily irradiated sensors will be used at the SLHC, so this system can be used to research the performance of microstrip silicon sensors in conditions as similar as possible to the SLHC operating conditions.

The system has two main parts: a hardware part and a software part. The hardware part acquires the sensor signals either from external trigger inputs, in case of a radioactive source setup is used, or from a synchronised trigger output generated by the system, if a laser setup is used. This acquired data is sent by USB to be stored in a PC for a further processing. The hardware is a dual board based system. The daughterboard is a small board intended for containing two Beetle readout chips as well as fan-ins and detector support to interface the sensors. The motherboard is intended to process the data, to control the whole hardware and to communicate with the software by USB. The software controls the system and processes the data acquired from the sensors in order to store it in an adequate format file.

The main characteristics of the system will be summarized. Results of measurements acquired with n-type and p-type non-irradiated and irradiated detectors, using both the laser and the radioactive source setup, will be also presented and discussed. Finally, the production status of the system will be presented.

Primary author: Mr MARCO, Ricardo (IFIC-Instituto de Física Corpuscular)

Presenter: Mr MARCO, Ricardo (IFIC-Instituto de Física Corpuscular)

Session Classification: Full Detector Systems

Contribution ID: **8** Type: **not specified**

Introduction

Monday 10 November 2008 13:30 (15 minutes)

Primary authors: BRUZZI, Mara (INFN and University of Florence); MOLL, Michael (CERN)

Presenters: BRUZZI, Mara (INFN and University of Florence); MOLL, Michael (CERN)

Session Classification: Welcome

Contribution ID: **9** Type: **not specified**

Radiation induced point- and cluster-related defects with strong impact to damage properties of silicon detectors

Monday 10 November 2008 13:45 (30 minutes)

I. Pintilie (a), *E. Fretwurst* (b), A. Junkes (b), G. Lindstroem (b) /(a)/ /National Institute of Materials Physics, Bucharest, Romania
(b) Institute for Experimental Physics, University of Hamburg, Germany

This work is focusing on the investigation of those radiation induced defects causing degradation effects of Silicon detector performance.
Comparative studies of the defects induced by irradiation with Coˆ60 - γ rays, 23 GeV protons and 1 MeV equivalent reactor neutrons revealed the existence of some point defects and cluster related centers having a strong impact to damage properties of Si diodes. The detailed relation between the “microscopic”reasons as based on defect analysis and their “macroscopic”consequences for detector performance are presented and discussed.

Primary authors: JUNKES, Alexandra (University of Hamburg); FRETWURST, Eckhart (University of Hamburg); LINDSTROEM, Gunnar (University of Hamburg); PINTILIE, Ioana (IMP Bucharest)

Presenter: FRETWURST, Eckhart (University of Hamburg)

Session Classification: Defect and Material Characterization

Contribution ID: **11** Type: **not specified**

New fabrication of 3D detectors, np and pn devices

Tuesday 11 November 2008 16:20 (20 minutes)

I will report on the fabrication of new 3D detectors and the future plan for bump bonding Atlas pixels and Medipix2 chips.

Primary author: Dr PELLEGRINI, Giulio (Centro Nacional de Microelectronica CNM-IMB-CSIC)

Presenter: Dr PELLEGRINI, Giulio (Centro Nacional de Microelectronica CNM-IMB-CSIC)

Session Classification: 3D detectors & other new detector structures

Contribution ID: **12** Type: **not specified**

Radiation damage of video device in a fusion stellarator

Monday 10 November 2008 16:40 (20 minutes)

The EDICAM (Event Detection Intelligent Camera) will be used for video diagnostic in the Endelstein 7X. The camera consists of three modules, the Sensor Module (SM) the Image Processing and Control Unit module and the Image Readout Card module. The sensor module of the camera will be located at the plasma facing end of the selected tangential ports. Because of this the SM should operate in harsh environment under neutron and gamma radiation. The gamma and neutron radiation levels and spectrums were calculated by MCNP code. The calculated neutron fluence 3.5•10ˆ13 n/cmˆ2 (16.7Gy in Si target) for one year operation. The neutron spektrum is rather hard, half of it consists of fast neutrons (2.45MeV) the other half epithermal energy neutrons (0.2 eV-1 MeV). The neutron irradiation was carried out in the BIO testing site of Budapest Neutron Centre where we had good gamma shielding, which allowed to reach the desired yearly neutron fluence and spectrum estimated by MCNP at low gamma background. The SM's dark current was in the centre of interest. Statistical methods were used for the evaluation of the dark current's behavior with different camera exposure times. The measurement showed that SM endures the estimated neutron dose although it will lose a big fraction of it's dynamics.

Primary authors: NAFRADI, Gabor (BUTE-INT); POR, Gabor (BUTE-INT)

Co-authors: SZAPPANOS, Andras (KFKI RMKI); BODIZS, Denes (BUTE-INT); KOCSIS, Gabor (KFKI RMKI); PÁLFALVI, Jozsef (KFKI AEKI); ZOLETNIK, Sandor (KFKI RMKI); CZIFRUS, Szabolcs (BUTE-INT); PÁZMÁNDI, Tamas (KFKI AEKI)

Presenter: NAFRADI, Gabor (BUTE-INT)

Session Classification: New developments and Non-LHC applications

Contribution ID: **13** Type: **not specified**

Annealing studies of mixed irradiated MICRON diodes

Tuesday 11 November 2008 09:00 (20 minutes)

A set of MICRON diodes was irradiated with different fluences of protons and pions up to 1.1e15 p/cm2 followed by additional 2e14 n/cm2. The compensation of the stable damage due to neutron and charged hadron irradiation was observed for the MCz-n samples, while for FZ detectors the damage scales with equivalent fluence. The diodes were annealed up to 10000 min at 60C in steps, during which CV-IV and CCE measurements were performed.

Primary author: KRAMBERGER, Gregor (Jozef Stefan Institute)

Co-authors: Dr MANDIC, Igor (Jozef Stefan Institute); Dr DOLENC, Irena (Jozef Stefan Institute); Prof. MIKUZ, Marko (Jozef Stefan Institute); Prof. CINDRO, Vladimir (Jozef Stefan Institute)

Presenter: KRAMBERGER, Gregor (Jozef Stefan Institute)

Session Classification: Pad Detector Characterization and Defect Engineering

Contribution ID: **14** Type: **not specified**

Discussion Session: Defect and Material Characterization

Monday 10 November 2008 15:45 (35 minutes)

Session Classification: Defect and Material Characterization

Contribution ID: **15** Type: **not specified**

Discussion: Full Detector Systems

Tuesday 11 November 2008 15:00 (30 minutes)

Session Classification: Full Detector Systems

Contribution ID: **16** Type: **not specified**

Production of n-in-n and n-in-p pixels on Fz and MCz silicon with CiS

Tuesday 11 November 2008 14:40 (20 minutes)

We present a production of n-in-n and n-in-p planar pixel sensors on Fz and MCz silicon that we intend to perform with CiS. We aim to investigate the performances
of these detectors at SLHC fluences comparing different bulk materials and to study
the feasibility of operating planar pixel sensors with slimmed or active edges.

Primary author: MACCHIOLO, Anna (Max-Planck-Institut fur Physik)

Presenter: MACCHIOLO, Anna (Max-Planck-Institut fur Physik)

Session Classification: Full Detector Systems

Contribution ID: **17** Type: **not specified**

Infrared transparent detectors

Monday 10 November 2008 16:20 (20 minutes)

In large systems, as ATLAS, the detectors are aligned using mechanical systems and laser beams. Another option, implemented in CMS, is to use the signal generated by the laser beam in the detector to measure its position. Unfortunately, standard detectors present a high light absorption, and therefore it is almost impossible to generate signal in many detector layers using one single laser beam. In collaboration with Institute of Physics in Cantabria, Spain (IFCA) we are developing detectors optimized to present infrared transmission coefficient over 50%, in this way it will possible to detect signal in 5 detectors simultaneously.

Primary author: Prof. LOZANO FANTOBA, Manuel (CNM Instituto de Microelectronica de Barcelona)

Co-authors: Mrs BASSIGNANA, Daniela (IFCA, Spain); Dr CABRUJA, Enric (CNM Instituto de Microelectronica de Barcelona); Dr PELLEGRINI, Giulio (CNM Instituto de Microelectronica de Barcelona); Dr VILA, Ivan (IFCA, Spain); Dr FERNÁNDEZ, Marcos (IFCA, Spain)

Presenter: Prof. LOZANO FANTOBA, Manuel (CNM Instituto de Microelectronica de Barcelona)

Session Classification: New developments and Non-LHC applications

Contribution ID: **18** Type: **not specified**

Characterisation of defect centres in epitaxial silicon irradiated with high proton fluences

Monday 10 November 2008 14:55 (20 minutes)

Systematic studies of defect centres in epitaxial silicon irradiated with high fluences of 24 GeV/c protons, ranging from 1.6e15 to 1.6e16 cmˆ-2, have been performed using High-Resolution Photoinduced Transient Spectroscopy (HRPITS). The studies were correlated with the measurements of the leakage current of the epitaxial detectors and the estimations of the electron mobility and lifetime product. The comparison of the defect structure of the oxygenated and standard n-type epitaxial layers is shown.

Primary author: KAMINSKI, Pawel (Institute of Electronic Materials Technology)

Co-authors: FRETWURST, Eckhart (Institute for Experimental Physics, Unversity of Hamburg); ZELAZKO, Jaroslaw (Institute of Electronic Materials Technology); KOZLOWSKI, Roman (Institute of Electronic Materials Technology)

Presenter: KAMINSKI, Pawel (Institute of Electronic Materials Technology)

Session Classification: Defect and Material Characterization

Contribution ID: **19** Type: **not specified**

TCT measurements on MCz

Tuesday 11 November 2008 09:20 (20 minutes)

TCT measurements on a series of proton and neutron irradiated MCz p- and n-type detectors.

Primary author: KASKA, Katharina (CERN)

Presenter: KASKA, Katharina (CERN)

Session Classification: Pad Detector Characterization and Defect Engineering

Contribution ID: **20** Type: **not specified**

X-Ray irradiation on p-type micro-strip detectors with p-spray and moderated p-spray isolations

Tuesday 11 November 2008 11:00 (20 minutes)

Two micro-strip sensors were irradiated with X-ray irradiation facility in Karlsruhe to investigate the change of the inter-strip resistance and capacitance as a function of the recieved dose. For one of the structures a p-spray isolation was chosen, for the other one a moderated p-spray.

Primary author: BEIMFORDE, Michael (Werner-Heisenberg-Institut - Max-Planck-Institut fuer Physik)

Presenter: BEIMFORDE, Michael (Werner-Heisenberg-Institut - Max-Planck-Institut fuer Physik)

Session Classification: Full Detector Systems

Contribution ID: **21** Type: **not specified**

Discussion: Pad Detector Characterization and Defect Engineering

Tuesday 11 November 2008 10:00 (30 minutes)

Session Classification: Pad Detector Characterization and Defect Engineering

Contribution ID: **22** Type: **not specified**

Discussion on 3D detectors

Tuesday 11 November 2008 17:40 (30 minutes)

Session Classification: 3D detectors & other new detector structures

Contribution ID: **23** Type: **not specified**

Dinner

Tuesday 11 November 2008 19:10 (3 hours)

Public Bus Leaving CERN Bus stop at 19:21 sharp‼

Restaurant Home Page

Apéro : Kir

Entrée : Terrine aux poivres verts garnie

Plat : Médaillon de chevreuil, garniture de chasse

Dessert : Glaces/Sorbets

Café

Boissons : 1 bouteille Pinot Noir « Les Faunes » pour trois personnes, Bouteilles d'eau.

Session Classification: Workshop Dinner

Contribution ID: **24** Type: **not specified**

Progress in R & D on silicon edgeless strip detectors with Current Terminating Structure

Tuesday 11 November 2008 16:00 (20 minutes)

The overview on silicon edgeless strip detectors developed for close-to-beam experiments at CERN will be presented. The recent progress of these detectors is related to the elaboration of the specific design - edgeless detectors with current terminating structure that was successfully realized in p-on-n Si edgeless detectors for the TOTEM experiment. The potential and electric field distributions at the detector sensitive diced edge which control the detector operation are simulated and studied experimentally using two methods –MicroProbe Technique and Scanning Transient Current Technique. The model of edgeless detector operation is developed and applied for predictions on radiation hardness of edgeless detectors.

Primary author: VERBITSKAYA, Elena (A.F. Ioffe Physical Technical Inst.)

Co-authors: CAVALLINI, Anna (Bologna University); RUGGIERO, Gennaro (CERN); PELLEGRINI, Giulio (Centro Nacional de Microelectrónica, CNM-IMB, Barcelona); TUUVA, Tuure (Lappenranta University of Technology); EREMIN, Vladimir (Ioffe Physico-Technical Institute RAS)

Presenter: VERBITSKAYA, Elena (A.F. Ioffe Physical Technical Inst.)

Session Classification: 3D detectors & other new detector structures

Contribution ID: **25** Type: **not specified**

Predictions for 3D detector operation in SuperLHC environment

Tuesday 11 November 2008 17:20 (20 minutes)

The different constructions of silicon 3D detectors are analyzed and tabulated in terms of combinations of two simple elements: the p-n junction and the ohmic columns. In the p-n junction column two parts are recognized: a cylindrical one which radius increases with the bias, and a semi-spherical "dead"tip with a maximal electric field due to the focusing effect. This consideration allows analytical extrapolation of the detector critical parameters to its operation in the upgraded LHC facility.

Primary author: EREMIN, Vladimir (Ioffe Physical Technical Institute RAS)

Co-author: VERBITSKAYA, Elena (Ioffe Physical Technical Institute RAS)

Presenter: EREMIN, Vladimir (Ioffe Physical Technical Institute RAS)

Session Classification: 3D detectors & other new detector structures

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

Test beam results of heavily irradiated magnetic Czochralski silicon (MCz-Si) strip detectors

Tuesday 11 November 2008 12:00 (20 minutes)

N-type MCz-Si strip detectors with an area of 16 cmˆ2 were irradiated to several different fluences up to 3x10ˆ15 1 MeV neq/cmˆ2 with protons or with neutrons and protons depending on the detector. The beam test was carried out at CERN H2 area using a reference beam telescope and an efficient cooling system.

Primary author: LUUKKA, Panja-Riina (Helsinki Institute of Physics HIP)

Presenter: LUUKKA, Panja-Riina (Helsinki Institute of Physics HIP)

Session Classification: Full Detector Systems

Contribution ID: **27** Type: **not specified**

Pixel Sensor Measurements at CERN

Tuesday 11 November 2008 14:00 (20 minutes)

Presenter: PERNEGGER, Heinz (CERN)

Session Classification: Full Detector Systems

Contribution ID: **28** Type: **not specified**

Discussions

Wednesday 12 November 2008 09:00 (1h 30m)

Session Classification: Discussion: Statusreport 2008 - Workplan 2009

Contribution ID: **29** Type: **not specified**

Signal height in irradiated Silicon Pixel Detectors

Tuesday 11 November 2008 14:20 (20 minutes)

In order to establish a fluence limit for the radiation hardness of the CMS barrel pixel detector and for conventional n-on-n sensors in general, pixel sensors of the size of one CMS pixel readout (PSI46V2.1) have been bumpbonded and irradiated with positive pions up to 6E14 Neq/cm2 and with protons up to 4E15 Neq/cm2. The sensors were taken from production wafers of the CMS barrel pixel detector. They use n-type DOFZ material with a resistance of about 3.7 k Ohm cm and an n-side read out. As the performance of silicon sensors is limited by trapping, the response to a Sr-90 source was investigated. The highly energetic beta-particles represent an approximation to minimum ionizing particles. The bias dependence of the signal for a wide range of fluences will be presented.

Primary author: ACOSTA, Jhon (Univ. of Puerto Rico - Mayaguez)

Co-authors: BEAN, Alice (Univ. of Kansas); MEIER, Beat (PSI); MARTIN, Christopher (Univ. of Kansas); SIBILLE, Jennifer (Univ. of Kansas); TRUEB, Peter (PSI, ETH Zuerich); ROHE, Tilman (PSI); LANGENEGGER, Urs (ETH Zuerich); RADICCI, Valeria (PSI, Univ. of Kansas); ERDMANN, Wolfram (PSI)

Presenter: ACOSTA, Jhon (Univ. of Puerto Rico - Mayaguez)

Session Classification: Full Detector Systems