

# **18th RD50 Workshop (Liverpool)**

## **Report of Contributions**

Contribution ID: 0

Type: **not specified**

## CCE Measurements on Irradiated HPK-ATLAS07 n-on-p Sensors

*Tuesday 24 May 2011 15:20 (20 minutes)*

A set of strip sensors has been irradiated with pions and protons in a mixed irradiation campaign. The results of CCE measurements after each irradiation step will be presented.

In another study three sensors were irradiated with protons in Karlsruhe with a fluence of  $1.1 \times 10^{15}$  n<sub>eq</sub>/cm<sup>2</sup>. The difference in charge collection measurements will be compared when sensors were annealed at room temperature, 40°C and 60°C.

**Primary author:** DRIEWER, Adrian (Freiburg University)

**Presenter:** DRIEWER, Adrian (Freiburg University)

**Session Classification:** Full Detector Systems

**Track Classification:** Full Detector Systems (Strip sensors)

Contribution ID: 1

Type: **not specified**

## **Update on Performance of Punch-through Protection structures**

*Tuesday 24 May 2011 14:00 (20 minutes)*

We present the results on characteristics and performance of different punch-through structures when the silicon sensors are flooded with IR radiation.

WE report dependence on p-spray vs. p-stop and doping density, radiation levels and types, gate effects, and IR intensity.

Punch-through protection depends on the ratio of two resistors, the bulk resistance and the asymptotic resistance of the punch-through channel.

**Primary author:** SADROZINSKI, Hartmut (SCIPP, UC santa Cruz)

**Presenter:** SADROZINSKI, Hartmut (SCIPP, UC santa Cruz)

**Session Classification:** Full Detector Systems

Contribution ID: 2

Type: **not specified**

## **Atomoc Layer Ddeposition (ALD) Treatment of cleaved SSD to achieve slim edges**

*Tuesday 24 May 2011 17:30 (20 minutes)*

We present the present status of our work on slim edges: using post-fabrication ALD treatment, we can reduce the width of non-active material at the edge considerably without breakdown. ALD is shown to work for both p-type and n-type sensors. We show the first results on charge collection.

**Primary author:** SADROZINSKI, Hartmut (SCIPP, UC santa Cruz)

**Presenter:** SADROZINSKI, Hartmut (SCIPP, UC santa Cruz)

**Session Classification:** Full Detector Systems

Contribution ID: 3

Type: **not specified**

## The CMS HPK campaign - An overview

*Tuesday 24 May 2011 09:00 (20 minutes)*

This contribution gives an overview on the campaign to evaluate the planar silicon sensor options for the CMS Tracker Upgrade. This evaluation is done with one industrial supplier, which is capable to provide the large quantity of sensors needed for the Tracker volume at very high quality. Wafers are processed on various materials (FZ, MCz, Epi), with several dopings (n-type, p-type with p-spray and p-stop strip isolation) and thicknesses (50 $\mu\text{m}$  – 320 $\mu\text{m}$ ). The different structures on the wafers are explained as well as the irradiation procedures and planned measurements.

**Primary author:** DIERLAMM, Alexander (Inst. fuer Experimentelle Kernphysik, KIT)

**Presenter:** DIERLAMM, Alexander (Inst. fuer Experimentelle Kernphysik, KIT)

**Session Classification:** Detector Characterization

**Track Classification:** Detector Characterization

Contribution ID: 4

Type: **not specified**

## First measurements on mixed-irradiated mini strip sensors and outlook to Lorentz angle studies as part of the CMS-HPK Campaign

*Tuesday 24 May 2011 15:00 (20 minutes)*

As part of the CMS-HPK Campaign, Lorentz angle measurements on irradiated mini strip sensors will be performed. For that, floatzone mini sensors of three different thicknesses and different doping type (p-in-n, n-in-p with p-stop and p-spray) were irradiated with neutrons and protons to several fluences up to  $1.4 \times 10^{16}$  neq/cm<sup>2</sup>. During the pre-qualification process, IV and CV measurements were done before and after each irradiation step. Development of leakage current and full depletion voltage will be shown, as well as an outlook to the Lorentz angle studies.

**Primary author:** Mr NUERNBERG, Andreas (Institut fuer Experimentelle Kernphysik, KIT)

**Presenter:** Mr NUERNBERG, Andreas (Institut fuer Experimentelle Kernphysik, KIT)

**Session Classification:** Full Detector Systems

Contribution ID: 5

Type: **not specified**

## CMS tracker upgrade test beam activities

*Tuesday 24 May 2011 14:40 (20 minutes)*

In the SLHC experiments the performance of the tracking detectors after high radiation fluencies will be an important issue. For example the CMS strip tracker will receive fluencies up to  $10^{15}$  MeV neq, and the pixel detector factor of ten higher than that. Thus, in addition to characterizing the electrical parameters of the new radiation-hard sensors, it is very important to test their performance in the realistic conditions like in a test beam.

Since 2007 a collaboration of several CMS institutes has been operating a silicon micro-strip beam telescope based on the CMS Tracker readout. So far there have been 6 test beam campaigns, the latest one including 14 FZ and 4 Epi-Si sensors from the official CMS R&D processing run from Hamamatsu. This latest test beam was performed at Fermilab with 120 GeV protons, and will serve as the baseline to which the future test beam results will be compared to. The samples were unirradiated and had two different layouts (multi-strip and multi-pixel). In addition, there were several different thicknesses for each material and sensor type.

**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: 6

Type: **not specified**

## Measurement of detrapping times in irradiated silicon detectors

*Monday 23 May 2011 15:00 (20 minutes)*

The TCT was exploited in a new way for measuring de-trapping times in irradiated silicon detectors. The method is based on measurements of the collected charge as a function of integration time on time scale much longer than drift times, which required acquisition of current waveforms on the time scale of few micro-seconds. The analysis of the data and first results will be presented. The preliminary measurements with irradiated n-type MCz diodes revealed that de-trapping times of holes are of order few micro-seconds and much shorter than those of electrons. The temperature dependence of de-trapping times can be exploited for estimation of energy levels responsible for trapping.

**Primary author:** KRAMBERGER, Gregor (Jozef Stefan Institute)

**Co-authors:** MANDIĆ, Igor (Jožef Stefan Institute); MIKUŽ, Marko (Jožef Stefan Institute); MILOVANOVIĆ, Marko (Jožef Stefan Institute); ZAVRTANIK, Marko (Jožef Stefan Institute)

**Presenter:** KRAMBERGER, Gregor (Jozef Stefan Institute)

**Session Classification:** Defect and Material Characterization



Contribution ID: 7

Type: **not specified**

## Deep level system Gaussian approximation according the extrinsic photoconductivity in irradiated Si diodes.

*Monday 23 May 2011 14:00 (20 minutes)*

The WODEAN Si samples photoconductivity spectra were measured keeping the constant intensity of light at different wavelengths at low and medium temperatures. The deep level contribution was analysed by Lučovský model proposing the Gaussian distribution of local level energies that followed from the preliminary results presented in the previous RD50 workshops. The time dependencies of photo-response at different excitation wavelength and TSC are presented and analyzed.

**Primary author:** Prof. VAITKUS, Juozas (Inst. of Appl. Res. (IAR) - Vilnius University)

**Co-authors:** Mr VAINORIUS, Neimantas (Vilnius University); Prof. KAZUKAUSKAS, Vaidotas (Vilnius University)

**Presenter:** Prof. VAITKUS, Juozas (Inst. of Appl. Res. (IAR) - Vilnius University)

**Session Classification:** Defect and Material Characterization

Contribution ID: 8

Type: **not specified**

## Gamma irradiation induced suppression of reverse annealing in neutron irradiated MCZ Si detectors

*Tuesday 24 May 2011 11:30 (20 minutes)*

For the development of radiation hard Si detectors for the SiD BeamCal program for International Linear Collider (ILC), n-type MCZ Si detectors were irradiated first by fast neutrons to fluences of  $1.5 \times 10^{14}$  and  $3 \times 10^{14}$  neq/cm<sup>2</sup>, and then by gamma. It is found that gamma radiation has suppressed reverse annealing in neutron irradiated detectors which were subject to gamma radiation during the 5.5 month room temperature annealing (RTA). The impressive effect is that in this mixed irradiation reverse annealing is totally suppressed by the same dose of gamma (500 Mrad) regardless of the neutron fluence. The following RTA of six months showed that suppression occurs only during gamma radiation that suggests some nonlinear effect, or interaction of radiation induced acceptor-type and donor-type defects.

**Primary author:** Dr VERBITSKAYA, Elena (Ioffe Physical Technical Institute RAS)

**Co-authors:** Dr HÄRKÖNEN, Jaakko (Helsinki Institute of Physics); METCALFE, Jessica (University of New Mexico); Dr KIERSTEAD, Jim (Brookhaven National laboratory); Dr HOEFERKAMP, Martin (University of New Mexico); Dr GUL, Rubie (Brookhaven National laboratory); SEIDEL, Sally (University of New Mexico); Dr EREMIN, Vladimir (Ioffe Physical Technical Institute RAS); Dr LI, Zheng (Brookhaven National laboratory)

**Presenter:** Dr LI, Zheng (Brookhaven National laboratory)

**Session Classification:** Detector Characterization

Contribution ID: 9

Type: **not specified**

## Recent results on I-V characteristics study for TOTEM edgeless detectors

Presentation is done on behalf of Ioffe PTI and RIMST groups, and CERN-TOTEM collaboration. The control of I-V characteristic of planar edgeless detectors with current terminating structure which are produced by PTI for TOTEM collaboration is a crucial issue for the proper detector operation. Recent results on the edge properties exhibit that different areas of the edge produce specific contributions to the edge current. With this observation, the data on I-V characteristics measured for irradiated planar edgeless n-on-p detectors are presented and discussed.

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

**Co-authors:** Dr VERBITSKAYA, Elena (Ioffe Physical Technical Institute RAS); Dr RUGGIERO, Gennaro (CERN)

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

Contribution ID: 10

Type: **not specified**

## First CCE and TCT measurements on irradiated diodes of the CMS-HPK-Campaign

*Tuesday 24 May 2011 09:40 (20 minutes)*

In a large campaign started by the CMS collaboration to identify the future silicon sensor technology baseline for a new tracker for the high-luminosity phase of LHC, a first set of floatzone diodes was irradiated to a fluence of  $10^{14}$  neq/cm<sup>2</sup> with protons, neutrons and mixed exposure. Measurements of leakage current, depletion voltage and charge collection efficiency with an infrared Laser on some of the irradiated diodes were made in order to get good understanding of the ordered material and to get a first impression of the material performance after irradiation. In addition, trapping times calculated with the charge correction method were gathered from TCT measurements with a red Laser for 320µm thick diodes.

**Primary author:** EBER, Robert (Institut für Experimentelle Kernphysik, KIT)

**Co-authors:** DIERLAMM, A. (Institut für Experimentelle Kernphysik, KIT); SCHARF, Ch. (Universität Hamburg, Institut für Experimentalphysik); STECK, Pia (Institut für Experimentelle Kernphysik, KIT); MÜLLER, Th. (Institut für Experimentelle Kernphysik, KIT); PÖHLSSEN, Th. (Universität Hamburg, Institut für Experimentalphysik); DE BOER, W. (Institut für Experimentelle Kernphysik, KIT)

**Presenter:** EBER, Robert (Institut für Experimentelle Kernphysik, KIT)

**Session Classification:** Detector Characterization

Contribution ID: 11

Type: **not specified**

## **CCE measurements with SCT128A chip on strip detectors irradiated with pions**

*Tuesday 24 May 2011 16:10 (20 minutes)*

Recent charge collection measurements with SCT128A chip on Hamamatsu mini strip detectors will be presented. The detectors were irradiated with pions at PSI in 2010. Measurements were made after several annealing steps at 60C.

**Primary author:** MANDIC, Igor (University of Ljubljana)

**Presenter:** MANDIC, Igor (University of Ljubljana)

**Session Classification:** Full Detector Systems

Contribution ID: 12

Type: **not specified**

## Study of Surface Radiation Damage in Silicon Sensors

*Monday 23 May 2011 16:00 (20 minutes)*

The surface radiation damage of 12 keV X-rays on silicon test structures fabricated on high-ohmic n-type silicon and on strip sensors is investigated. At these X-ray energies no bulk damage in silicon is expected. However fixed oxide charges in the SiO<sub>2</sub>/Si<sub>3</sub>N<sub>4</sub> layer and interface traps at the Si-SiO<sub>2</sub> interface build up.

Using TDRC (Thermally Dielectric Relaxation Current) and C-V and G-V (Capacitance-Voltage, Conductance-Voltage) measurements we investigate as function of X-ray dose the microscopic defects in test structures with different crystal orientations and compare the results to the macroscopic properties of strip sensors as obtained from C-V and I-V measurements. Due to the irradiation the density of positive oxide charges increases and three dominant interface traps build up. The TDRC and the C/G-V results allow us to determine the energy levels and capture cross sections of the traps and the dose dependence of the trap and oxide charge densities. We find that both saturate (and even decrease) for doses above a few MGy. The annealing of the defects is studied at 70C and 80C and the activation energies for the annealing of the interface traps and the oxide charges determined. We find that the annealing times of the different trap levels are very different.

For the strip sensors the radiation induced oxide charges and the interface traps increase the full depletion voltage, the surface leakage current and the inter-strip capacitances. In addition an electron accumulation layer forms at the Si-SiO<sub>2</sub> interface whose extension increases with dose and decreases with applied voltage. This accumulation layer has a significant impact on the performance of the sensors.

**Primary authors:** Mrs PINTILIE, Ioana (National Institute of Materials Physics, Romania); Mr ZHANG, Jianguo (Institute of Experimental Physics, University of Hamburg, Germany)

**Co-authors:** Mr FRETWURST, Eckhart (Institute of Experimental Physics, University of Hamburg, Germany); Mr SCHWANDT, Joern (Institute of Experimental Physics, University of Hamburg, Germany)

**Presenter:** Mr ZHANG, Jianguo (Institute of Experimental Physics, University of Hamburg, Germany)

**Session Classification:** Defect and Material Characterization

Contribution ID: 13

Type: **not specified**

## Update of 3D Simulations and Processing of New BNL 3D-Trench-Electrode Detectors

*Wednesday 25 May 2011 11:10 (20 minutes)*

Update of 3D Simulations and Processing of New BNL 3D-Trench-Electrode Detectors

Z. Li<sup>1</sup>, D. Bassignana<sup>2</sup>, G. Pellegrini<sup>2</sup>, M. Lozano<sup>2</sup> and D. Quirion<sup>2</sup><sup>1</sup> Brookhaven National Laboratory, Bldg. 535B, Upton, NY 11973-5000, USA<sup>2</sup> Centro Nacional de Microelectrónica IMB-CNM-CSIC, Campus Universitat Autònoma de Barcelona, 08193 Bellaterra, Barcelona (Spain)

More full 3D simulations on the new BNL 3D-Trench-Electrode detectors have been performed. In addition to the square geometry, hexangular and near-circular geometry single cells with boundary conditions on both top (oxide, oxide charges) and bottom (oxide, oxide charges, and spray ion implant) surfaces were simulated. Large cells with a diameter up to 300  $\mu\text{m}$  need a bias voltage as small as 5 volts to fully deplete for a 400  $\mu\text{m}$  thickness high resistivity (non-irradiated) detector. Some small effects of slightly lower electric field (about 25-30% less) in the corners of square, hexangular geometry cells have been found by simulation. These effects are not significant since the fields are high enough for carriers to drift out before significant diffusion effect can take place. The fabrication of the first prototype detectors has already begun at CNM in Spain. The etch process of trenches up to 250  $\mu\text{m}$  in depth with various geometries and cell sizes went extremely well. Some photos of etched trenches will be shown.

**Primary author:** LI, Zheng (BNL)**Presenter:** LI, Zheng (BNL)**Session Classification:** Pixel and 3D sensors

Contribution ID: 15

Type: **not specified**

## **Carrier recombination and emission lifetimes in heavily irradiated pad–detectors and their impact on operational characteristics of pin diodes.**

*Monday 23 May 2011 14:20 (20 minutes)*

**Primary author:** GAUBAS, Eugenijus

**Co-authors:** VAITKUS, Juozas; CEPONIS, T.

**Presenter:** GAUBAS, Eugenijus

**Session Classification:** Defect and Material Characterization



Contribution ID: 16

Type: **not specified**

## Recent results from Atlas 3d collaboration

*Wednesday 25 May 2011 10:50 (20 minutes)*

I will report on the last fabrications and measurements of 3D detectors for the IBL project.

**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:** Pixel and 3D sensors

Contribution ID: 17

Type: **not specified**

## **Influence of material defects on the electrical properties of test-diodes for future cms tracking detectors**

*Monday 23 May 2011 14:40 (20 minutes)*

A large number of silicon sensors was ordered for a comprehensive study of the radiation hardness of test structures for future CMS detectors. Of those materials the unirradiated Float Zone sensors exhibit unexpected electrical properties studied by capacitance-voltage and current-voltage characteristics (CV-IV). The properties observed in this material can be explained by material defects introduced during the production process. A characterisation of the crystal defects was carried out by means of Deep Level Transient Spectroscopy (DLTS).

**Primary author:** JUNKES, alexandra (Hamburg University)

**Co-authors:** ECKSTEIN, Doris (DESY); FRETWURST, Eckhart (Hamburg University); STEINBRÜCK, Georg (Hamburg University); ERFLE, Joachim (Hamburg University); PÖHLESEN, Thomas (Hamburg University)

**Presenter:** JUNKES, alexandra (Hamburg University)

**Session Classification:** Defect and Material Characterization

Contribution ID: 18

Type: **not specified**

## Characterization and Testbeam Analysis of irradiated Silicon n-in-p Pixel Detectors for the ATLAS Upgrade

*Wednesday 25 May 2011 09:20 (20 minutes)*

FE-I3 compatible, n-in-p single chip modules, produced in the framework of a joint RD50-ATLAS planar pixel group production have been irradiated up to  $5 \times 10^{15} \text{ n}_{\text{eq}}/\text{cm}^2$  with protons (KIT and CERN PS) and reactor neutrons (JSI). They were characterized in the laboratory as well as under beam-test conditions at the CERN SPS.

New results on the charge collection performance as well on the high voltage stability will be presented. Additionally, an update on the results from beam-test studies is given.

**Primary author:** WEIGELL, Philipp (MPI für Physik)

**Presenter:** WEIGELL, Philipp (MPI für Physik)

**Session Classification:** Pixel and 3D sensors

Contribution ID: 19

Type: **not specified**

## CMS-HPK-Campaign: IV/CV-characteristics of the first sample of irradiated Diodes

*Tuesday 24 May 2011 09:20 (20 minutes)*

The aim of the CMS-HPK-Campaign is to find a new Material for the HL-LHC Upgrade of the CMS-Tracker. Therefore a lot of different structures and materials is produced by HPK. A first sample of FZ Diodes of n- and p-type has been neutron and proton irradiated with  $10^{14}$  neq. Their IV/CV-characteristics will be presented.

**Primary author:** Mr ERFLE, Joachim (UHH - Institut fuer Experimental Physik (UHH)-Universitaet Ham)

**Co-authors:** Mr SCHARF, Christian (UHH - Institut fuer Experimental Physik (UHH)-Universitaet Ham); Mr EBERT, Robert (Institut für Experimentelle Kernphysik, KIT)

**Presenter:** Mr ERFLE, Joachim (UHH - Institut fuer Experimental Physik (UHH)-Universitaet Ham)

**Session Classification:** Detector Characterization

**Track Classification:** Detector Characterization

Contribution ID: 20

Type: **not specified**

## Some aspects of proton implantation and subsequent thermal annealing

*Monday 23 May 2011 13:30 (30 minutes)*

In contrast to the well known physics of conventional ion doping the situation for hydrogen seems to be quite different. The implantation of hydrogen induces crystal damage into the Si matrix. These defects are decorated by the hydrogen itself after a soft anneal and thereby a donor complex is build. We investigated those defects and complexes with the aim of acquiring a better physical understanding of them and their changes under certain variable parameters. In particular, the impact of implantation dose variations, annealing temperature and annealing time on crystal defects and doping concentration mainly in FZ material were examined.

A wide variation of techniques including Doppler broadening, the highly sensitive positron annihilation spectroscopy and low temperature lifetime spectroscopy measurements down to 10 K were used along with electrical methods like spreading resistance profiling. In order to de-couple crystal defects originating directly from proton implantation also experiments utilizing co-implantation with He followed by hydrogen treatment were carried out.

The proton irradiation induced defects perform a gettering function for impurities, strongly influence the diffusion of oxygen and hydrogen itself and serve as thermal donor formation-centers. A major finding is that different donor states are build predominantly as function of the annealing temperature. The complexes are stable within certain annealing temperature ranges and populate different energy levels in the Si band gap. Ultimately, about  $10^{-4}$  donors are created for every radiation-induced Frenkel defect.

One main focus of the investigation is the dependency of the donor introduction efficiency on the ion dose and the annealing temperature. The position and shape of the damage profile will be discussed in view of the different preparation methods.

We were also able to detect shallow traps in Czochralski silicon after specific annealing processes, and its corresponding temperature dependence of the trapping rate. The latter was found to be positron de-trapping from extended Rydberg states.

**Primary author:** Dr SCHUSTEREDER, Werner (Infineon Austria)

**Presenter:** Dr SCHUSTEREDER, Werner (Infineon Austria)

**Session Classification:** Defect and Material Characterization

Contribution ID: 21

Type: **not specified**

## Low Temperature Electrical Characteristics of Irradiated Sensors

*Tuesday 24 May 2011 16:30 (20 minutes)*

Three groups of ATLAS07 miniature sensors have been irradiated on the reactor in Rez near Prague up to fluences  $4E14$ ,  $2E15$  and  $1E16$  neq/cm<sup>2</sup>. The basic electrical characteristics IV, CV, an interstrip capacitance, a coupling capacitance and the DC PTP have been measured at temperature  $-30$  deg C and compared to ones of the non-irradiated sensors.

**Primary author:** Dr BOHM, Jan (Institute of Physics AS CR)

**Co-authors:** Dr SOLAR, Michal (Czech Technical University); Mr MASEK, Petr (Czech Technical University); Dr DOLEZAL, Zdenek (Charles University)

**Presenter:** Dr BOHM, Jan (Institute of Physics AS CR)

**Session Classification:** Full Detector Systems

**Track Classification:** Full Detector Systems (Strip sensors)

Contribution ID: 22

Type: **not specified**

## Micron n-in-p analogue SCA pixel detector fine neutron radiation characterization

*Wednesday 25 May 2011 09:40 (20 minutes)*

The charge sharing between adjacent segmented electrodes is an important parameter for the spatial resolution of tracking silicon sensors. Hadron irradiation is though known to decrease charge sharing by mean of trapping of the signal charge carriers

generated by the ionising event, to eventually reduce the resolution of the sensor to binary. The study of the degradation of charge collection and charge sharing of pixel detectors as a function of hadron irradiation is presented. These pixel sensors were specially conceived for analogue readout with electronics designed for microstrip sensors. This approach allows measuring the detector properties with much higher sensitivity with respect to the electronics currently used for reading out pixilated sensors thanks to the analogue output signal digitised by a 12 bit ADC.

**Primary author:** Mr FORSHAW, Dean Charles (Department of Physics-Oliver Lodge Laboratory-University of Liv)

**Presenter:** Mr FORSHAW, Dean Charles (Department of Physics-Oliver Lodge Laboratory-University of Liv)

**Session Classification:** Pixel and 3D sensors

Contribution ID: 23

Type: **not specified**

## Characterization and test beam studies for FE-I3 planar n-in-p and 3D double-sided pixel sensors for the ATLAS upgrade

*Wednesday 25 May 2011 10:00 (20 minutes)*

Solid state detectors provide very high precision tracking in particle physics experiments. However, their tracking performance starts to degrade at fluxes of radiation around  $\sim 10^{14}$ - $10^{15}$  hadrons/cm<sup>2</sup>. Research on new radiation-hard pixel sensor technologies is being done at IFAE, in collaboration with CNM. Results of the characterisation and beam test studies of n-in-p planar and 3D double-sided devices bump bonded to the current ATLAS pixel front-end chip (FE-I3) will be presented. An overview of this work is given in this talk.

**Primary author:** Mr CAMINAL ARMADANS, Roger (IFAE - Institut de Física d'Altes Energies-Universitat Autònoma)

**Presenter:** Mr CAMINAL ARMADANS, Roger (IFAE - Institut de Física d'Altes Energies-Universitat Autònoma)

**Session Classification:** Pixel and 3D sensors



Contribution ID: 24

Type: **not specified**

## Generation current temperature scaling

*Tuesday 24 May 2011 11:50 (20 minutes)*

Temperature dependence of the generation current is analysed using the experimental and theoretical data for intrinsic carrier concentration. It is recommended that the current is scaled with temperature by the following formula:  $T^2 \exp(-1.21 \text{ eV}/2kT)$  both for non-irradiated and irradiated Si detectors.

**Primary author:** Dr CHILINGAROV, Alexandre (Lancaster University)

**Presenter:** Dr CHILINGAROV, Alexandre (Lancaster University)

**Session Classification:** Detector Characterization

Contribution ID: 25

Type: **not specified**

## Edge-TCT and Alibava measurements with neutron and pion irradiated micro-strip detectors

*Tuesday 24 May 2011 11:10 (20 minutes)*

Charge collection measurements with both Edge-TCT and Alibava on neutron and pion irradiated micro-strip detectors will be presented. Edge-TCT measurements were made in reverse and forward bias and include several annealing steps at 60C (according to the standard CERN scenario), as well as different temperature and laser frequency steps.

**Primary author:** MILOVANOVIC, Marko (Jozef Stefan Institute, Ljubljana)

**Co-authors:** KRAMBERGER, Gregor (Jozef Stefan Institute, Ljubljana); MANDIC, Igor (Jozef Stefan Institute, Ljubljana); MIKUZ, Marko (Jozef Stefan Institute, Ljubljana); ZAVRTANIK, Marko (Jozef Stefan Institute, Ljubljana); CINDRO, Vladimir (Jozef Stefan Institute, Ljubljana)

**Presenter:** MILOVANOVIC, Marko (Jozef Stefan Institute, Ljubljana)

**Session Classification:** Detector Characterization

Contribution ID: 26

Type: **not specified**

## Edge TCT and Charge Collection Efficiency study on pion irradiated n-on-p strips

*Tuesday 24 May 2011 10:50 (20 minutes)*

Silicon n-on-p strip detectors produced by CIS, have been irradiated with pions in a fluence range  $2 \times 10^{14} \text{pi/cm}^2$  -  $1 \times 10^{15} \text{pi/cm}^2$ . The irradiated detectors have been measured by means of the Edge-TCT and Alibava CCE setup, as well as standard CV/IV characterization. The detectors have shown a fairly low gc value. Investigation went in the direction of looking for correlation between the different techniques, looking for a consistency, as well as determining whether measurement temperature plays a role in the obtained results.

**Primary authors:** Dr DOLENC KITTELMANN, Irena (CERN); Dr GABRYSH, Markus (CERN); Dr MOLL, Michael (CERN); PACIFICO, Nicola (CERN & Università degli Studi di Bari)

**Presenter:** PACIFICO, Nicola (CERN & Università degli Studi di Bari)

**Session Classification:** Detector Characterization

Contribution ID: 27

Type: **not specified**

## Custom made components for Transient Current Technique

*Tuesday 24 May 2011 10:00 (20 minutes)*

Current amplifiers with and without integrated Bias-T and laser drivers (with heads) were developed for the dedicated use in TCT. The results from the first tests will be shown.

**Primary author:** KRAMBERGER, Gregor (Jozef Stefan Institute)

**Presenter:** KRAMBERGER, Gregor (Jozef Stefan Institute)

**Session Classification:** Detector Characterization

Contribution ID: 28

Type: **not specified**

## Welcome to the 18th RD50 Workshop

*Monday 23 May 2011 13:00 (20 minutes)*

**Presenter:** Prof. ALLPORT, Philip Patrick (University of Liverpool)

**Session Classification:** Workshop Welcome

Contribution ID: 29

Type: **not specified**

## **DMC - Discussion Session**

*Monday 23 May 2011 16:20 (30 minutes)*

**Presenter:** BRUZZI, Mara (Dipartimento di Fisica)

**Session Classification:** Defect and Material Characterization

Contribution ID: 30

Type: **not specified**

## **Discussion Session: Detector Characterization**

*Tuesday 24 May 2011 12:10 (30 minutes)*

**Presenter:** FRETWURST, Eckhart (II. Institut fuer Experimentalphysik)

**Session Classification:** Detector Characterization

Contribution ID: **31**

Type: **not specified**

## **Discussion Session: FDS**

*Tuesday 24 May 2011 17:50 (30 minutes)*

**Presenter:** KRAMBERGER, Gregor (Jozef Stefan Institute)

**Session Classification:** Full Detector Systems



Contribution ID: **32**

Type: **not specified**

## **Discussions on Pixel and 3D**

*Wednesday 25 May 2011 11:30 (30 minutes)*

**Presenter:** BATES, Richard (Department of Physics and Astronomy)

**Session Classification:** Pixel and 3D sensors

Contribution ID: **33**

Type: **not specified**

## **Lunch Break**

Contribution ID: 34

Type: **not specified**

## Some practical issues

*Monday 23 May 2011 13:20 (10 minutes)*

**Presenters:** CASSE, Gianluigi (Department of Physics); MOLL, Michael (CERN)

**Session Classification:** Workshop Welcome

Contribution ID: 35

Type: **not specified**

## **Accelerated and room temperature annealing of the CC(V)**

*Tuesday 24 May 2011 17:10 (20 minutes)*

**Presenter:** CASSE, Gianluigi (Department of Physics)

**Session Classification:** Full Detector Systems

Contribution ID: 36

Type: **not specified**

## Low Resistance Strip Sensors

*Tuesday 24 May 2011 14:20 (20 minutes)*

AC-coupled silicon strip sensors can get damaged in case of a beam loss due to the possibility of a large charge accumulation in the bulk, developing very high voltages across the coupling capacitors which can destroy them. Punch-through structures are currently used to avoid this problem helping to evacuate the accumulated charge as large voltages are developing. Nevertheless, previous experiments, performed with laser pulses, have shown that these structures can become ineffective in relatively long strips. The large value of the implant resistance can effectively isolate the “far” end of the strip from the PT structure leading to large voltages. The proposal aims to fabricating low-resistance strips by means of the deposition of a conducting material in contact with the implants, assuring the effectiveness of the PT structures.

**Primary author:** Dr ULLÁN, Miguel (CNM-IMB (CSIC), Barcelona)

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**Presenter:** Dr ULLÁN, Miguel (CNM-IMB (CSIC), Barcelona)

**Session Classification:** Full Detector Systems

**Track Classification:** Full Detector Systems (Strip sensors)

Contribution ID: 37

Type: **not specified**

## Lab measurements and testbeam results of irradiated $n^+$ -in-n planar pixel sensors for IBL and beyond

*Wednesday 25 May 2011 09:00 (20 minutes)*

We have irradiated  $n^+$ -in-n sensor assemblies based on the current ATLAS readout chip FE-I3 up to the required IBL end of life fluence  $5 \times 10^{15} \text{ n}_{\text{eq}}/\text{cm}^2$  (and further up to  $2 \times 10^{16} \text{ n}_{\text{eq}}/\text{cm}^2$  for HLLHC) using thermal neutrons in Ljubljana as well as low energy protons in Karlsruhe. Promising results, particularly hit efficiencies, from the analysis of testbeam data will be shown. Furthermore an update on the overall charge collection gained from lab measurements will be presented. An outlook on first results obtained in the lab with similarly irradiated FE-I4 based SingleChip assemblies and their general behaviour will be given as well.

**Primary author:** Mr RUMMLER, André (TU Dortmund)

**Presenter:** Mr RUMMLER, André (TU Dortmund)

**Session Classification:** Pixel and 3D sensors

**Track Classification:** Full Detector Systems (Pixel Sensors)

Contribution ID: 38

Type: **not specified**

## **Overview of charge collection measurements after hadron irradiation - Trying to summarize all the CC(V) data we have to date.**

*Tuesday 24 May 2011 16:50 (20 minutes)*

**Presenter:** Dr AFFOLDER, Anthony (University of Liverpool)

**Session Classification:** Full Detector Systems