19th RD50 Workshop (CERN)

Report of Contributions

https://indico.cern.ch/e/148833

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

Progress on the ”Slim Edges” Project

Tuesday, 22 November 2011 11:30 (20 minutes)

The UCSC-NRL “Slim Edges” Project made good progress.
The laser scribing+cleaving was replaced by XeF2 etching+cleaving leading to a much improved i-V curve.
The edge psssivation has also been finalized with Alumina for p-type sensors and Nitrogen PECVD for n-type.
Charge collection will be discussed ina second talk

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

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

Session Classification: Full detector systems

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

Update on charge collection annealing

Tuesday, 22 November 2011 12:30 (20 minutes)

The annealing is now being accepted as a tool for improving the signal and reducing the negative effects of the reverse current (on noise and power dissipation). An update of the measurements of the charge collection as a function of the bias voltage and the current is here presented.

Primary authors: CASSE, Gianluigi (University of Liverpool (GB)); FORSHAW, dean

Presenter: CASSE, Gianluigi (University of Liverpool (GB))

Session Classification: Full detector systems

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

First results with non-irradiated and heavily irradiated microstrip trenched detectors.

Tuesday, 22 November 2011 12:10 (20 minutes)

One of the RD50 approved projects (Fabrication of new p-type strip detectors with trench to enhance the charge multiplication effect in the n-type electrodes) aims to enhance charge multiplication by "trenching"the strip. Here we present the first results before and after neutron irradiation.

Primary authors: FORSHAW, Dean Charles (University of Liverpool-Unknown-Unknown); CASSE, Gianluigi (University of Liverpool (GB)); PELLEGRINI, Giulio (Universidad de Valencia (ES)); LOZANO FANTOBA, Manuel (Universidad de Valencia (ES))

Presenter: FORSHAW, Dean Charles (University of Liverpool-Unknown-Unknown)

Session Classification: Full detector systems

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

Edge-TCT characterization of 24 Gev/c proton irradiated p-type silicon detectors

Tuesday, 22 November 2011 09:00 (20 minutes)

Oxygen-enriched silicon, both DO Float Zone and Magnetic Czochralski has proved to be more radiation tolerant than standard silicon in harsh radiation environments. We are going to summarize the results obtained with the Edge-TCT technique on field development with annealing in FZ and MCz n-on-p detectors from the 2010 Micron production batch. The studied structures were exposed to high fluences (1e16 p/cmˆ2) of 24 GeV/c protons at the CERN PS and subsequently went through several annealing steps at 80℃. Clear evidence of charge multiplication mechanism at long annealing times will be provided as well as the presence of a bistable defect activated by moderate current injection, heavily affecting the observed neff.

Primary author: PACIFICO, Nicola (CERN)

Co-authors: DOLENC KITTELMANN, Irena (CERN); GABRYSCH, Markus (CERN); MOLL, Michael (CERN)

Presenter: PACIFICO, Nicola (CERN)

Session Classification: Detector characterisation

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

Annealing of CCE in HPK strip detectors irradiated with pions and neutrons

Tuesday, 22 November 2011 14:00 (20 minutes)

In this presentation an update of CCE annealing studies with HPK strip detectors irradiated with PSI pions and reactor neutrons will be shown. Measurements of collected charge were made with SCT128A chip after several annealing steps at 60C.

Primary author: MANDIĆ, Igor (Jožef Stefan Institute)

Presenter: MANDIĆ, Igor (Jožef Stefan Institute)

Session Classification: Full detector systems

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

Charge collection measurement on slim edge sensors with the ALiBaVa system.

Tuesday, 22 November 2011 11:50 (20 minutes)

We report the charge collection measurement on p-on-n micro strip
sensors with slim edges.
The sensors were “GLAST” style sensors manufactured by HPK with 228
micron pitch. The edge was produced by PECVD deposition of Nitride and was 50 micron from the outer edge of the guard ring, about 200 micron from the active area.
We find constant charge collection even in the last trip before and
after cutting the edge.

Primary author: MORI, Riccardo (University of Florence, INFN)

Co-authors: SADROZINSKI, Hartmut (SCIPP, UC santa Cruz); BRUZZI, Mara (Dipartimento di Fisica); FADEYEV, Vitaliy (University of California,Santa Cruz (US))

Presenter: MORI, Riccardo (University of Florence, INFN)

Session Classification: Full detector systems

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

First results from the online radiation dose monitoring system in ATLAS

Wednesday, 23 November 2011 11:10 (20 minutes)

Online radiation monitoring system measures ionizing dose in SiO2, fluences of 1-MeV(Si) equivalent neutrons and fluences of thermal neutrons at several locations in ATLAS detector. In this contribution measurements collected during two years of ATLAS data taking will be presented and compared to predictions from FLUKA simulation.

Primary author: MANDIĆ, Igor (Jožef Stefan Institute)

Presenter: MANDIĆ, Igor (Jožef Stefan Institute)

Session Classification: New Structures

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

Electric field and space charge in neutron irradiated n+p sensors

Tuesday, 22 November 2011 09:40 (20 minutes)

ATLAS-HPK n+-p miniature strips sensors were irradiated in steps with neutrons up to the cumulative fluence of 1e16. At each step Edge-TCT measurements were performed immediately after irradiation and also during accelerated beneficial annealing. The drift velocity profiles were used to model the space charge in the detectors.

Primary author: KRAMBERGER, Gregor (Jozef Stefan Institute)

Co-authors: MANDIC, Igor (Jozef Stefan Institute); MIKUZ, Marko (Jozef Stefan Institute); MILOVANOVIC, Marko (Jozef Stefan Institute); ZAVRTANIK, Marko (Jozef Stefan Institute); CINDRO, Vladimir (Jozef Stefan Institute)

Presenter: KRAMBERGER, Gregor (Jozef Stefan Institute)

Session Classification: Detector characterisation

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

Edgeless detectors with CTS: the 1st year successful operation in TOTEM

Tuesday, 22 November 2011 17:10 (20 minutes)

The approach for edgeless detectors with current terminating structure (CTS) has been developed in collaboration between PTI and TOTEM in 2006. The idea was proved in several successful beam tests and then realized in the design of edgeless detectors for the Roman Pots TOTEM stations. 400 detectors have been processed in the consortium "Silicon detector laboratory"in Russia. The first year stable detectors operation on the LHC beam confirms the expectations and is discussed with a consideration of recent results on the edgeless detectors physics.

Primary author: Dr EREMIN, Vladimir (Ioffe Physical-Technical Institute of Russian Academy of Sciences)

Co-authors: Dr ERMOLAEV, Boris (Ioffe Physical-Technical Institute of Russian Academy of Sciences); Prof. KARSTEN, Eggert (CERN); Dr VERBITSKAYA, Elena (Ioffe Physical-Technical Institute of Russian Academy of Sciences); Dr RADERMACHER, Ernst (CERN); Dr RUGGIERO, Gennaro (CERN); EREMIN, Igor (Ioffe Physical-Technical Institute of Russian Academy of Sciences); Dr BAECHLER, Joachim (CERN); KONKOV, Konstantin (Research Institute of Material Science and Technology); FADEEVA, Nadezda (Ioffe Physical-Technical Institute of Russian Academy of Sciences); EGOROV, Nikolai (Research Institute of Material Science and Technology); GOLUBKOV, Sergei (Research Institute of Material Science and Technology); Dr TUBOLTSEV, Yuri (Ioffe Physical-Technical Institute of Russian Academy of Sciences)

Presenter: Dr EREMIN, Vladimir (Ioffe Physical-Technical Institute of Russian Academy of Sciences)

Session Classification: Full detector systems

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

New research activity “Silicon detectors modeling in RD50”: goals, tasks and the first steps forward

Tuesday, 22 November 2011 11:10 (20 minutes)

The new RD50 project “Silicon detectors modeling”is motivated by the numerous results on the application of the original and professional software for simulations of irradiated silicon detectors characteristics and performance. The goal of the project is establishing the common physical understanding of the approaches for the modeling and the results, and performing the comparative studies of the available tools for simulations of the silicon detectors properties.
The project will include several tasks important for the modeling and results interpretation.
1. Input data systematization;
2. Physical models for simulation of the main detector characteristics;
3. Evaluation and systematization of the results.

Please consider your participation in this RD50 new common activity.

Primary author: Dr EREMIN, Vladimir (Ioffe Physical-Technical institute of Russian Academy of Sciences)

Presenter: Dr EREMIN, Vladimir (Ioffe Physical-Technical institute of Russian Academy of Sciences)

Session Classification: Detector characterisation

Contribution ID: **10** Type: **not specified**

A low cost scanning TCT

Tuesday, 22 November 2011 10:50 (20 minutes)

Abstract: A low cost scanning TCT which enables Edge-TCT has been built. All components except the moving stages and optics are custom made and in many ways surpass that of the commercial products. The choice of lasers vary from 670, 950 and 1060 with possibility of having programmable light patterns and pulses of large dynamic range.

Primary authors: MARGAN, Erik (Jozef Stefan Institute); KRAMBERGER, Gregor (Jozef Stefan Institute); MANDIC, Igor (Jozes Stefan Institute); MIKUZ, Marko (Marko.Mikuz@ijs.si); ZAVRTANIK, Marko (Jozef Stefan Institute); CINDRO, Vladimir (Jozef Stefan Institute)

Presenter: KRAMBERGER, Gregor (Jozef Stefan Institute)

Session Classification: Detector characterisation

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

Characterization of the new Stripixel detectors

Wednesday, 23 November 2011 10:30 (20 minutes)

The Centro Nacional de Microelectrónica (IMB-CNM-CSIC) of Barcelona in collaboration with the Brookhaven National Laboratory (BNL) of New York have developed a new design and technology for the novel prototypes generation of stripixel detectors, 2D position sensitive detectors manufactured using a true single-sided processing.
The new device is a dual-column 3D detector in which the p+ and n+ columns are arranged in squared active area in a quincunx pattern (with the p+ columns as the central elements) .
Double metal layer technology has been used to allow a projective X-Y read out with the use of two different multichannel chips.
The new prototypes have been characterized with the use of Transient Current Technique measurements performed with different laser of different wavelength. Charge Collection Efficiency and detection sensibility have been measured with the use of a radioactive 90Sr source. Two-dimensional position sensitivity has been tested using a collimated laser set up and the ALIBAVA readout system. The experimental results will be presented.

Primary author: Ms BASSIGNANA, Daniela (IMB-CNM, CSIC)

Co-authors: Dr FLETA, Celeste (IMB-CNM, CSIC); Dr QUIRION, David (IMB-CNM, CSIC); Dr PELLEGRINI, Giulio (IMB-CNM, CSIC); Dr LOZANO, Manuel (IMB-CNM, CSIC); Dr TUUVA, Tuure (Lappeenranta University); Dr LI, Zheng (BNL)

Presenter: Ms BASSIGNANA, Daniela (IMB-CNM, CSIC)

Session Classification: New Structures

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

Performance and Aging of the Run-II CDF Silicon Detector

Tuesday, 22 November 2011 14:20 (20 minutes)

The CDF Run-II silicon microstrip detector has witnessed 12 fb-1
of proton-antiproton collisions over the last 10 years.
It has shown remarkable performance, with 90% of its channels
functional, 80% error-free, and only one of its eight layers
near the operational limits for full depletion.
The measured bias currents, depletion voltage and
signal-to-noise ratio of
these sensors provide unique information about the behavior of
sensors irradiated slowly over a long period of time.
Charge collection measurements from irradiated, double-sided sensors
reveal a doubly-peaked electric field inside the sensors
that is weaker in the center and stronger at the edges.

Primary author: STANCARI, Michelle (Fermilab)

Presenter: STANCARI, Michelle (Fermilab)

Session Classification: Full detector systems

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

Performance of Thin Irradiated SOI Detectors

Tuesday, 22 November 2011 14:40 (20 minutes)

Single chip pixel modules were built from an MPP-HLL production of 75µm thin sensors and ATLAS read-out chips exploiting the novel Solid Liquid Interdiffusion technology (SLID). We will present laboratory and testbeam measurements for these devices before and after irradiation with neutrons in Ljubljana and with protons in Karlsruhe. Additionally, first results from edgeTCT measurements on strip sensors with thicknesses of 75µm and 150µm from the same production irradiated to a fluence of 1e16 neq will be shown.

Primary author: WEIGELL, Philipp (Max-Planck-Institut fuer Physik (Werner-Heisenberg-Institut) (D)

Presenter: WEIGELL, Philipp (Max-Planck-Institut fuer Physik (Werner-Heisenberg-Institut) (D)

Session Classification: Full detector systems

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

Effect of oxygen on annealing induced defects transformations in epitaxial silicon irradiated with high energy protons

Monday, 21 November 2011 13:40 (20 minutes)

We show the results of both qualitative and quantitative analysis of defect levels in standard and oxygen-rich epitaxial silicon subjected to 24 GeV/c proton irradiation with a fluence of 1.7x10ˆ16 cm-2 and annealing at temperatures of 20, 80, 160 and 240 oC. The radiation defect levels in the bandgap have been scanned by High-Resolution Photoinduced Transient Spectroscopy. In the standard epilayer annealed at 240 oC, the concentration of the predominant shallow trap with the activation energy of 130 meV, assigned to the silicon tetra-interstitial (I4),was 1.2x10ˆ15 cm-3. The concentrations of the very deep traps with activation energies of 565 and 575 meV assigned to tri-vacancy(V3) and tetra- vacancy(V4), were 5.0x10ˆ15 and 7.1x10ˆ15 cm-3, respectively.
In the oxygen-rich epilayer annealed at this temperature,the
concentration of the predominant 130-meV trap was 2.2x10ˆ15cm-3.The concentrations of the 565-meV and 575-meV traps,were ˜1x10ˆ15 and ˜1.5x10ˆ15 cm-3,respectively.

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

Co-authors: FRETWURST, Eckhart (Institute for Experimental Physics, University of Hamburg, Germany); ZELAZKO, Jaroslaw (Institute of Electronic Materials Technology, Warsaw, Poland); LANGE, Joern (Institute for Experimental Physics, University of Hamburg, Germany); KOZLOWSKI, Roman (Institute of Electronic Materials Technology, Warsaw Poland)

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

Session Classification: Defect/Material characterisation

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

A comparative study of mixed irradiated sensors made of different silicon base material

Monday, 21 November 2011 14:00 (20 minutes)

Mini strip sensors of n-in-p and p-in-n Float-zone and Magnetic Czochralski material have been irradiated to fluences ranging from 10ˆ14neq/cm2 to 2*10ˆ16neq/cm2 according to five different radii in the CMS tracker.
An annealing study with signal and signal to noise ratio along with leakage current measurements has been performed with the ALiBaVa setup. The charge collection as function of annealing time has been parameterised.
A summary and comparison of the different materials will be presented.

Primary authors: PETRY, Florian (Karlsruhe Institute of Technology); EBER, Robert (KIT - Karlsruhe Institute of Technology (DE))

Co-authors: DIERLAMM, Alexander (KIT - Karlsruhe Institute of Technology (DE)); KORNMAYER, Andreas (KIT - Karlsruhe Institute of Technology (DE)); BÖGELSPACHER, Felix (Karlsruhe Institute of Technology); STECK, Pia (Karlsruhe Institute of Technology); MUELLER, Thomas (Institut fuer Experimentelle Kernphysik); BARVICH, Tobias (Inst. fuer Experimentelle Kernphys.-Universitaet Karlsruhe-KIT); DE BOER, Wim (KIT - Karlsruhe Institute of Technology (DE))

Presenter: EBER, Robert (KIT - Karlsruhe Institute of Technology (DE))

Session Classification: Defect/Material characterisation

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

Depletion Voltage and Effective Doping Concentration of Float Zone and Magnetic Czochralski Silicon Diodes Irradiated by Protons to Conditions Relevant to the High Luminosity LHC

Monday, 21 November 2011 14:20 (20 minutes)

We describe our measurements of the depletion voltage and change in effective doping concentration obtained from capacitance measurements after irradiation and annealing of four types of silicon diodes: n- and p-type in both Float Zone (Fz) and Magnetic Czochralski (MCz) silicon. The samples were irradiated with 800 MeV protons to fluences reaching 1.1x10^{15} n_{eq}/cm^2 and then annealed in several time steps at 60˜°C. The results were then fit using the Hamburg Model to extract annealing behavior constants.

Primary authors: METCALFE, Jessica (UNM); HOEFERKAMP, Martin (UNM); SEIDEL, Sally (University of New Mexico)

Presenter: SEIDEL, Sally (University of New Mexico)

Session Classification: Defect/Material characterisation

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

Charge collection in silicon strips sensors close to the accumulation layer

Tuesday, 22 November 2011 15:00 (20 minutes)

The collection of charge carriers injected close to the Si Si02 interface of p on n silicon strip sensors was investigated using a red laser TCT setup. The sensors were investigated non-irradiated and after 1 MGy 12 keV photon irradiation. The relation between charge collection and accumulation layer was studied as well as the dependence on humidity and biasing history. A model of charge collection and charge carrier losses at the interface was developed. Results will be presented and discussed.

Primary author: POEHLSEN, Thomas (University of Hamburg)

Co-authors: FRETWURST, Eckhart (II. Institut fuer Experimentalphysik); ZHANG, Jiaguo (Institute of Experimental Physics, University of Hamburg); SCHWANDT, Joern (Uni Hamburg); KLANNER, Robert (Hamburg University (DE))

Presenter: POEHLSEN, Thomas (University of Hamburg)

Session Classification: Full detector systems

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

Lorentz angle measurements on irradiated strip sensors

Tuesday, 22 November 2011 15:50 (20 minutes)

Lorentz angle measurements on mixed-irradiated mini strip-sensors have been performed as part of the CMS HPK Campaign. Up to now, the study covers 320µm and 200µm thick n- and p-bulk floatzone sensors at a magnetic field of up to 8T at different temperatures and after two annealing steps. In addition to that, proton irradiated magnetic-czochralski and floatzone n-on-p sensors produced by Micron were examined. This talk gives an overview of the obtained results.

Primary author: NUERNBERG, Andreas (KIT - Karlsruhe Institute of Technology (DE))

Presenter: NUERNBERG, Andreas (KIT - Karlsruhe Institute of Technology (DE))

Session Classification: Full detector systems

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

Effects of long-term annealing in p-type strip detectors irradiated with neutrons to 1x10e16 investigated by Edge-TCT

Tuesday, 22 November 2011 10:00 (20 minutes)

Charge collection properties of a Hamamatsu n+-p micro-strip detector, irradiated to 1x10e16 1/cm2 with reactor neutrons, were measured using Edge-TCT. After several annealing steps, up to total time of 10240min. charge multiplication can be clearly seen for voltages even as low as a few hundred volts, as well as the influence of both short and long term annealing in high and low electric field detector region. The effect of charge multiplication also shows strong correlation with the increase of the leakage current.

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

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

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

Session Classification: Detector characterisation

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

Annealing Studies with Irradiated p-Type Strip sensors

Tuesday, 22 November 2011 17:30 (20 minutes)

A number of miniature strip detectors were irradiated to HL-LHC fluences, and then subjected to annealing in different batches at different temperatures. Using a 90Sr beta-source and the ALIBAVA system, signal measurements where performed on these detectors for a number of bias voltages. The measurements were repeated with increasing annealing time in order to study the time evolution.

Primary authors: DRIEWER, Adrian (Albert-Ludwigs-Universitaet Freiburg (DE)); PARZEFALL, Ulrich (Albert-Ludwigs-Universitaet Freiburg (DE))

Presenters: DRIEWER, Adrian (Albert-Ludwigs-Universitaet Freiburg (DE)); PARZEFALL, Ulrich (Albert-Ludwigs-Universitaet Freiburg (DE))

Session Classification: Full detector systems

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

measurements of radiation damage in the CMS Pixel detector with the first few invers femptobarns

Wednesday, 23 November 2011 14:40 (20 minutes)

Studies of radiation damage to the CMS Pixel Detector during LHC running are presented. Leakage current and depletion voltage are monitored with increasing fluence. Methods for addressing the challenges of these measurements in the context of ongoing detector operations are discussed. These include the derivation of depletion voltage from hit efficiencies, the measurement of silicon temperature and extrapolation of current as a function thereof, and determination of the total fluence from LHC luminosity. The results allow for validation of existing radiation damage models of radiation damage and an improved understanding of the anticipated lifetime of the Pixel Detector.

Primary authors: ZENZ, Seth (Princeton University (US)); ROHE, Tilman (Paul Scherrer Institut (CH))

Presenters: ZENZ, Seth (Princeton University (US)); ROHE, Tilman (Paul Scherrer Institut (CH))

Session Classification: Special Session on Radiation Damage in LHC Silicon Detectors

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

Radiation Damage in the CMS Strips Tracker

Wednesday, 23 November 2011 15:00 (20 minutes)

In this talk I give an overview of the radiation damage the strips tracker has suffered so far. These results are compared to the established model predictions. Finally an outlook is given for the future evolution of the detector properties within the next ten years.

Primary author: BARTH, Christian (KIT - Karlsruhe Institute of Technology (DE))

Presenter: BARTH, Christian (KIT - Karlsruhe Institute of Technology (DE))

Session Classification: Special Session on Radiation Damage in LHC Silicon Detectors

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

Nitrogen-doped silicon as a potentially radiation-hard material

Monday, 21 November 2011 14:40 (20 minutes)

Defect engineering technology based on nitrogen doping is known to be capable of controlling both the voids and the oxygen precipitates in Czochralski silicon wafers and completely suppressing D and A defects produced by aggregates of vacancies and self-interstitials, respectively, in FZ single crystals. A review of defect reactions resulting from interactions of nitrogen atoms with intrinsic defects and oxygen atoms is presented. It is suggested that these interactions may also occur in the material irradiated with high hadron fluences leading to an improvement of radiation hardness.

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

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

Session Classification: Defect/Material characterisation

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

Progress on the Low Resistance Strip Sensors Project

Wednesday, 23 November 2011 09:40 (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 project aims to fabricate low-resistance strips by means of the deposition of a conducting material in contact with the implants, assuring the effectiveness of the PT structures.

Summary

The Low Resistance Strip Sensors Project was approved in June 2011, since then the working group has been working on the technological and layout definition of the structures. With respect to the technological feasibility and variations several wafers have been fabricated in the CNM clean room trying a variety of technological options. The measurement performed so far have demonstrated the feasibility of the project and have given indication on the best options for the processing. With respect to the layout definition, a design of experiments have been planed to assure the functionality of the PT structures in order to be able to check their effectiveness optimization subject of the project. Miniature barrel-type strip sensors have been designed with the experiment variations, and some specifically designed test structures have also been created. At this point the final mask designs and the full process steps are being defined.

Primary author: Dr ULLAN COMES, Miguel (Universidad de Valencia (ES))

Co-authors: Dr GRILLO, Alex (University of California,Santa Cruz (US)); LACASTA LLACER, Carlos (Universidad de Valencia (ES)); PELLEGRINI, Giulio (Universidad de Valencia (ES)); SADROZINSKI, Hartmut (SCIPP, UC santa Cruz); LOZANO FANTOBA, Manuel (Universidad de Valencia (ES)); Mr BENITEZ, Victor (IMB-CNM (CSIC)); FADEYEV, Vitaliy (University of California,Santa Cruz (US))

Presenter: Dr ULLAN COMES, Miguel (Universidad de Valencia (ES))

Session Classification: New Structures

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

Extraction of physical quantities from edge-TCT measurements

Tuesday, 22 November 2011 09:20 (20 minutes)

A method to extract trapping times from edge-TCT measurements is proposed. It is based on extraction of point charge drift velocity profile with corresponding electric field and determination of transfer function of the electronics used in edge-TCT measurements. The method is currently under the development however some preliminary results will be presented in this talk.

Primary authors: DOLENC KITTELMANN, Irena (CERN); MOLL, Michael (CERN); PACIFICO, Nicola (CERN)

Presenter: DOLENC KITTELMANN, Irena (CERN)

Session Classification: Detector characterisation

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

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

Signals of heavily irradiated Si particle detectors

Monday, 21 November 2011 15:50 (20 minutes)

A role of moving carriers electric charge role was analyzed using the static and dynamic approches. The conditions, when the Ramo approximation is valid and invalid, are presented. The influence of generation current on the characteristics of heavily irradiated Si detector is demonstrated. It is shown the heavily irradiated diode behaves like a slow capacitor or un-stable resistor. It is proposed an increase of charge collection efficiency can be caused by the photo-electrical gain effect ir the static approach is valid, and the gain is dependent on the lifetime and the drift time ratio. The impact ionization avalanche caused gain is possible also within electrode edge region if a virtual photo-electrode is formed by high density of photo-generated excess carriers.

Primary author: Dr GAUBAS, Eugenijus (Vilnius University, Institute of Applied Research)

Co-authors: Prof. KALADE, Julijonas (Vilnius University, Dept. Theroretical Physics); Dr BUCINSKAS, Juozas (Vilnius University, Dept. Theoretical Physics); Prof. VAITKUS, Juozas (Vilnius University, Dept. Semiconductor Physics & Institute of Applied Research); Prof. SHUGUROV, Viktor (Vilnius University, Dept. Theroetical Physics)

Presenter: Prof. VAITKUS, Juozas (Vilnius University, Dept. Semiconductor Physics & Institute of Applied Research)

Session Classification: Defect/Material characterisation

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

Summary of measurements after first irradiation of HPK samples for CMS

Tuesday, 22 November 2011 16:30 (20 minutes)

The aim of the CMS-HPK-campaign is to find a new sensor material for the HL-LHC Upgrade of the CMS-tracker. Different test structures and sensors were implemented on a variety of silicon materials by HPK, Japan. The first planned irradiation step (protons 3*10^14neq/cm2 and neutrons 4*10^14neq/cm2) was done and the results concerning dark current, effective doping concentration and CCE will be presented.

Primary author: ERFLE, Joachim (Hamburg University (DE))

Presenter: ERFLE, Joachim (Hamburg University (DE))

Session Classification: Full detector systems

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

The peculiarities of photoconductivity in the irradiated Si.

Monday, 21 November 2011 15:30 (20 minutes)

The irradiated Si pad structures were investigated. The details of conductivity and photoconductivity mechanisms are analyzed by investigation of free carrier concentration and mobility temperature dependence, and by thermally stimulated current using different excitation by light conditions. The effects of microinhomogeneities were observed by an existence of the persistent current and by the dependence of TSC activavtion energy on the applied bias. The analyze of photoconductivity decay in a presence of a few levels was analyzed and discussed in a frame of earlier proposed model of clusters.

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

Co-authors: Dr MEKYS, Algirdas (Vilnius University, Institute of Applied Research); Prof. FRETWURST, Eckhart (Hamburh University); Mr DVINELIS, Edgaras (Vilnius University, Institute of Applied Research); Dr ZASINAS, Ernestas (Vilnius University, Institute of Applied Research); Mr MOCKEVICIUS, Giedrius (Vilnius University, Institute of Applied Research); Dr STORASTA, Jurgis (Vilnius University, Dept. Semiconductor Physics); Mr VAINORIUS, Neimantas (Vilnius University, Institute of Applied Research); Mr RUMBAUSKAS, Vytautas (Vilnius University, Dept. Semiconductor Physics)

Presenter: Prof. VAITKUS, Juozas (Vilnius University)

Session Classification: Defect/Material characterisation

Contribution ID: **30** Type: **not specified**

Testbeam results of CNM 3D FE-I4 devices

Wednesday, 23 November 2011 09:20 (20 minutes)

Data analysis results for CNM 3D FE-I4 devices from June and September IBL testbeams at CERN.

Summary

CNM 3D FE-I4 devices perform according to IBL requirements.

Primary author: TSISKARIDZE, Shota (Universitat Autònoma de Barcelona (ES))

Presenter: TSISKARIDZE, Shota (Universitat Autònoma de Barcelona (ES))

Session Classification: New Structures

Contribution ID: **31** Type: **not specified**

Characterization of CNM FE-I4 3D Double-Sided Sensors

Wednesday, 23 November 2011 09:00 (20 minutes)

The ATLAS Pixel Detector is the innermost part of the ATLAS tracking system and is critical for track and vertex reconstruction. In order to preserve the tracking performance in the face of the increasing instantaneous luminosity delivered by the LHC, ATLAS plans to introduce a new pixel layer (IBL) mounted directly on a reduced diameter beam pipe. To cope with the high data rate at a radius of ˜33mm a new readout chip (FE-I4) has been designed. Furthermore the IBL will have to sustain an estimated radiation dose, including safety factors, of 5E15 neq/cm2. Two sensor technologies are currently being considered for the IBL, the planar n-on-n slim edge and the 3D double sided designs. Results of the characterisation and irradiation of CNM 3D double sided FE-I4 pixel devices will be presented.

Primary author: Mr HARB, Ali (Institut de Fisica d'Altes Energies (IFAE), Barcelona)

Presenter: Mr HARB, Ali (Institut de Fisica d'Altes Energies (IFAE), Barcelona)

Session Classification: New Structures

Contribution ID: **32** Type: **not specified**

Development of radiation-hard active sensors in 180 nm HV CMOS technology

Tuesday, 22 November 2011 16:50 (20 minutes)

While CMOS processes are cost-efficient and commercially available, they have not yet been used to produce radiation-hard sensors. So-called HV CMOS processes combine a slightly higher resistivity p-type substrate with deep n-wells and allow the combination of a drift-based electron-collecting sensor with active cuircit components while keeping a fill factor of 100%. Achievable depletion depths are in the order of 10-20 um.

The presentation will introduce the concept, present preliminary results obtained with first test chips and outline the planned submission of a combined active strip/pixel sensor chip.

Summary

While CMOS processes are cost-efficient and commercially available, they have not yet been used to produce radiation-hard sensors. So-called HV CMOS processes combine a slightly higher resistivity p-type substrate with deep n-wells and allow the combination of a drift-based electron-collecting sensor with active cuircit components. Achievable depletion depths are in the order of 10-20 um.

This allows for novel sensor concepts such as having the first amplifier (and more electronics if desired) directly in a (very small) pixel sensor cell. Due to the low input capacitance of the small pixel, the noise contribution is very small and the signal-to-noise ratio is superb in spite of the rather shallow depletion zone and signal. These small pixel cells can then combined to form virtual strips or larger pixels which match already existing readout electronics chips, e.g. Beetle or FE-I4. Analogue hit encoding can yield improved resolution compared to the readout-chip pitch.

The presentation will introduce the concept, present preliminary results obtained with first test chips and outline a planned submission of a combined active strip/pixel sensor chip.

Primary authors: MUENSTERMANN, Daniel (CERN); Dr PERIC, Ivan (Ruprecht-Karls-Universitaet Heidelberg (DE))

Presenter: MUENSTERMANN, Daniel (CERN)

Session Classification: Full detector systems

Contribution ID: **33** Type: **not specified**

Welcome

Monday, 21 November 2011 13:30 (10 minutes)

Presenters: CASSE, Gianluigi (Liverpool University); MOLL, Michael (CERN)

Session Classification: Defect/Material characterisation

Contribution ID: **65** Type: **not specified**

Measurements of rad damage at Tevatron

Wednesday, 23 November 2011 14:20 (20 minutes)

Presenter: STANCARI, Michelle (Fermi National Accelerator Laboratory)

Session Classification: Special Session on Radiation Damage in LHC Silicon Detectors

Contribution ID: **68** Type: **not specified**

Measurement of rad damage in ATLAS pixels

Wednesday, 23 November 2011 15:20 (20 minutes)

Presenter: KEIL, Markus (Georg-August-Universitaet Goettingen (DE))

Session Classification: Special Session on Radiation Damage in LHC Silicon Detectors

Contribution ID: **69** Type: **not specified**

Measurement of rad damage in ATLAS strips

Wednesday, 23 November 2011 15:40 (20 minutes)

Presenter: MCMAHON, steve

Session Classification: Special Session on Radiation Damage in LHC Silicon Detectors

Contribution ID: **70** Type: **not specified**

Measurement of rad damage of LHCb silicon

Wednesday, 23 November 2011 16:30 (30 minutes)

Presenter: Dr PARKES, Chris (Glasgow)

Session Classification: Special Session on Radiation Damage in LHC Silicon Detectors

Contribution ID: **71** Type: **not specified**

Measurement of rad damage of Alice silicon

Presenter: RIEDLER, Petra (CERN)

Contribution ID: **72** Type: **not specified**

Summary of RD50 results

Wednesday, 23 November 2011 17:00 (20 minutes)

Presenter: CASSE, Gianluigi (University of Liverpool (GB))

Session Classification: Special Session on Radiation Damage in LHC Silicon Detectors

Contribution ID: **73** Type: **not specified**

Welcome

Welcome

Primary author: MOLL, Michael (CERN)

Contribution ID: **74** Type: **not specified**

Discussion

Tuesday, 22 November 2011 17:50 (20 minutes)

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

Session Classification: Full detector systems

Contribution ID: **75** Type: **not specified**

Discussion

Monday, 21 November 2011 16:10 (50 minutes)

Discussion

Session Classification: Defect/Material characterisation

Contribution ID: **76** Type: **not specified**

Results with a non-homogenously irradiated Medipix sensor

to be completed

Contribution ID: **77** Type: **not specified**

Progress with 2D microstrip detectors with polysilicon electrodes

Wednesday, 23 November 2011 10:50 (20 minutes)

to be completed

Primary author: Dr VILA ALVAREZ, Ivan (Instituto de Fisica de Cantabria, Grupo de Altas Energias)

Presenter: VILA ALVAREZ, Ivan (Universidad de Cantabria (ES))

Session Classification: New Structures

Contribution ID: **78** Type: **not specified**

Discussion

Wednesday, 23 November 2011 11:30 (30 minutes)

Session Classification: New Structures

Contribution ID: **80** Type: **not specified**

Introduction

Wednesday, 23 November 2011 14:00 (20 minutes)

Presenter: GIBSON, Stephen (CERN)

Session Classification: Special Session on Radiation Damage in LHC Silicon Detectors

Contribution ID: **81** Type: **not specified**

Discussion

Wednesday, 23 November 2011 17:20 (20 minutes)

Presenter: GIBSON, Stephen (CERN)

Session Classification: Special Session on Radiation Damage in LHC Silicon Detectors

Contribution ID: **83** Type: **not specified**

”Development of radiation-hard active sensors in 180 nm HV CMOS technology

Presenter: Dr MUENSTERMANN, Daniel (CERN)