

11th "Trento" Workshop on Advanced Silicon Radiation Detectors

Monday, 22 February 2016 - Wednesday, 24 February 2016

LPNHE

Book of Abstracts

Contents

Welcome 143	1
Progress in Ultra-Fast Silicon Detectors 144	1
Tracking in 4 dimensions 145	1
Electric field, mobility and trapping in Si detectors irradiated with neutrons and protons up to $1e17 \text{ n}_{\text{eq}}/\text{cm}^2$ 146	1
Recent results with hybrid pixel assemblies for the CLIC vertex detector 147	1
Silicon pixel tracking detector with ultra-precise time resolution 148	1
X-rays characterisation of pixelated silicon detectors 149	1
The Belle II SVD Origami Modules 150	2
Charge Collection Properties of depleted Monolithic Active Pixel Sensors 151	2
Development of passive pixel sensors using a commercial 150nm CMOS technology on high resistivity silicon 152	2
Monolithic CMOS ASIC Developments 153	2
The impact and persistence of static surface charges on differently passivated silicon strip sensors 154	2
New pixel technologies for HL-LHC 155	2
Detector development at the Paul-Scherrer-Institut (PSI) 156	3
Reverse bias current characterisation of silicon strip sensors and shallow radiation damage generation 157	3
TCT measurements of HV-CMOS test structures irradiated with neutrons 158	3
Investigation on the radiation resistance of HV-CMOS and pin diodes using a Transient Current Technique based on the Two-Photon-Absorption Process 159	3
SPS Test Beam characterisation results with CCPDv4 capacitively coupled to FEI4 160	4
Pixel Sensor Development for the LHCb VELO Upgrade 161	4
The Phase 1 upgrade of the CMS pixel detector 162	4
Results on thin n in p Planar Pixels from INFN R&D 163	4

Characterisation of thin irradiated epitaxial silicon sensors for the CMS phase II pixel upgrade 164	4
Latest development in HPK/KEK n ⁺ -in-p planar pixel sensors for very high radiation environments 165	4
Study of New ADVACAM Active Edge Sensor Technology for ATLAS Upgrade 166	5
Performance of Edgeless Silicon Pixel Sensors on p-type substrate for the ATLAS High-Luminosity Upgrade 167	5
Initial results from the electrical characterisation of planar p-on-n sensors with active/slim-edge for the next generation of FELs 168	5
Low Gain Avalanche Detectors TCAD Radiation Damage Analysis 169	5
First Inverted Low Gain Avalanche Detector fabrication at IMB-CNM 170	5
Low Gain Avalanche Diode gallium process flow simulation studies 171	6
Status of LGAD CNM fabrications 172	6
Status of 3D detector activities at CNM 173	6
Initial results from a new generation of 3D Sensors for HL-LHC 174	6
Beam test results of irradiated 3D pixel sensors for the CMS-TOTEM Precision Proton Spectrometer 175	6
TCAD simulations of High-Voltage-CMOS pixel structures for the CLIC vertex detector 177	6
Validation strategy for the simulation of highly irradiated silicon pixel sensors 178	7
TCAD simulations of LGAD devices using Silvaco software 179	7
Comprehensive radiation damage test and modelling of p-type silicon detectors for high-luminosity operations 180	7
Close-out 181	7
3D Sensors for the HL-LHC 182	7
The upgraded ATLAS Pixel detector and its performance during run-2 in 2015 184	7
Beam test results of highly irradiated planar and 3D pixel sensors for the Phase II Upgrade of the CMS pixel detector 186	7
The first reticle size HV-CMOS sensor demonstrator for ATLAS pixel layers 187	8
Charaterization of 3D module with micro-channel cooling 188	8
Practical information 189	8

Introduction / 143

Welcome

Corresponding Author: giovanni.calderini@cern.ch

Introduction / 144

Progress in Ultra-Fast Silicon Detectors

Corresponding Authors: hartmut@scipp.ucsc.edu, hartmut@ucsc.edu

Introduction / 145

Tracking in 4 dimensions

Corresponding Author: cartiglia@to.infn.it

Introduction / 146

Electric field, mobility and trapping in Si detectors irradiated with neutrons and protons up to $1e17$ n_{eq}/cm²

Corresponding Author: marko.mikuz@cern.ch

Planar 1 / 147

Recent results with hybrid pixel assemblies for the CLIC vertex detector

Corresponding Authors: andreas.nurnberg@cern.ch, andreas.matthias.nurnberg@cern.ch

Planar 1 / 148

Silicon pixel tracking detector with ultra-precise time resolution

Corresponding Author: massimiliano.fiorini@cern.ch

Planar 1 / 149

X-rays characterisation of pixelated silicon detectors

Corresponding Author: dzmitry.maneuski@cern.ch

Planar 1 / 150

The Belle II SVD Origami Modules

Corresponding Author: antonio.paladino@pi.infn.it

HVCMOS 1 / 151

Charge Collection Properties of depleted Monolithic Active Pixel Sensors

Corresponding Author: malte.backhaus@cern.ch

HVCMOS 1 / 152

Development of passive pixel sensors using a commercial 150nm CMOS technology on high resistivity silicon

Corresponding Authors: fabian.huegging@cern.ch, huegging@physik.uni-bonn.de

HVCMOS 1 / 153

Monolithic CMOS ASIC Developments

Corresponding Author: pietroc@slac.stanford.edu

Technology / 154

The impact and persistence of static surface charges on differently passivated silicon strip sensors

Corresponding Author: axel.koenig@oeaw.ac.at

Technology / 155

New pixel technologies for HL-LHC

Corresponding Author: andrea.gaudiello@cern.ch

Technology / 156

Detector development at the Paul-Scherrer-Institut (PSI)

Corresponding Author: dominic.greiffenberg@psi.ch

Technology / 157

Reverse bias current characterisation of silicon strip sensors and shallow radiation damage generation

Corresponding Author: sven.wonsak@cern.ch

HVCMOS 2 / 158

TCT measurements of HV-CMOS test structures irradiated with neutrons

Corresponding Author: igor.mandic@ijs.si

HVCMOS 2 / 159

Investigation on the radiation resistance of HV-CMOS and pin diodes using a Transient Current Technique based on the Two-Photon-Absorption Process

Author: Ivan Vila Alvarez¹

Co-authors: David Moya Martin ¹; Francisco Rogelio Palomo Pinto ¹; Gregor Kramberger ²; Javier Gonzalez Sanchez ¹; Marcos Fernandez Garcia ¹; Michael Moll ³; Richard Jaramillo ⁴; Salvador Hidalgo Villena ⁵

¹ Universidad de Cantabria (ES)

² Jozef Stefan Institute (SI)

³ CERN

⁴ IFCA

⁵ Instituto de Microelectronica de Barcelona (ES)

Corresponding Authors: ivan.vila@cern.ch, marcos.fernandez@cern.ch, francisco.rogelio.palomo.pinto@cern.ch, michael.moll@cern.ch, jaramilo@ifca.unican.es, javier.gonzalez.sanchez@cern.ch, gregor.kramberger@ijs.si, hidalgo.salvador@cern.ch, david.moya.martin@cern.ch

Transient Current Techniques (TCT) based on laser-induced photo-currents produced by Single Photon Absorption (SPA) processes have been extensively used during the last two decades as a powerful tool to study many of the properties relevant to operation of semiconductor detectors.

Very recently, an innovative Transient Current Technique was introduced where the free charge carriers are created in a Two-Photon-Absorption (TPA) process induced by a focused femto-second laser pulse with a wavelength of 1300nm. The fact that in a TPA process the absorption of the light depends on the square of the intensity of the light beam used for the current generation allows a localized TPA-induced electron-hole pair creation in a micrometric scale voxel centered on the laser

waist. As a consequence, this new technique opens the possibility to carry out a 3D mapping of the sensor's space-charge properties with micrometric resolution.

Due to its intrinsic spatial resolution, the TPA-TCT technique should be a very appropriate choice for the characterization of the alterations of the sensor's active (charge collecting) volume induced by radiation damage and especially for the case of partially depleted sensors as it is the case of the carrier collecting n-well implemented in HV-CMOS sensors.

HVCMOS 2 / 160

SPS Test Beam characterisation results with CCPDv4 capacitively coupled to FEI4

Corresponding Author: francesco.armando.di.bello@cern.ch

Planar 2 / 161

Pixel Sensor Development for the LHCb VELO Upgrade

Corresponding Authors: asmund.schiager.folkestad@cern.ch, asmund_sf@hotmail.com

Planar 2 / 162

The Phase 1 upgrade of the CMS pixel detector

Corresponding Author: viktor.veszpremi@cern.ch

Planar 2 / 163

Results on thin n in p Planar Pixels from INFN R&D

Corresponding Author: marco.meschini@cern.ch

Planar 2 / 164

Characterisation of thin irradiated epitaxial silicon sensors for the CMS phase II pixel upgrade

Corresponding Author: matteo.centis.vignali@cern.ch

Planar 3 / 165

Latest development in HPK/KEK n⁺-in-p planar pixel sensors for very high radiation environments

Corresponding Author: yoshinobu.unno@kek.jp

Planar 3 / 166

Study of New ADVACAM Active Edge Sensor Technology for ATLAS Upgrade

Corresponding Author: tasneem.rashid@cern.ch

Planar 3 / 167

Performance of Edgeless Silicon Pixel Sensors on p-type substrate for the ATLAS High-Luminosity Upgrade

Corresponding Author: audrey.ducourthial@cern.ch

Planar 3 / 168

Initial results from the electrical characterisation of planar p-on-n sensors with active/slim-edge for the next generation of FELs

Corresponding Authors: gianfranco.dallabetta@unitn.it, gian.franco.dalla.betta@cern.ch

LGAD / 169

Low Gain Avalanche Detectors TCAD Radiation Damage Analysis

Co-authors: Ivan Vila Alvarez ¹; Salvador Hidalgo Villena ²

¹ Universidad de Cantabria (ES)

² Instituto de Microelectronica de Barcelona (ES)

Corresponding Authors: francisco.rogelio.palomo.pinto@cern.ch, rpalomop@cern.ch, ivan.vila@cern.ch, hidalgo.salvador@cern.ch

Where we present our last results on radiation damage analysis of Low Gain Avalanche Detectors using the Synopsys TCAD suite and different well established radiation damage models. Our main conclusions point to this device could work reasonably well up to $\sim 1e14$ n_{eq}/cm².

LGAD / 170

First Inverted Low Gain Avalanche Detector fabrication at IMB-CNM

Corresponding Author: mar.carulla@imb-cnm.csic.es

LGAD / 171

Low Gain Avalanche Diode gallium process flow simulation studies

Corresponding Author: vagelis.gkougkousis@cern.ch

LGAD / 172

Status of LGAD CNM fabrications

Corresponding Authors: giulio.pellegrini@cnm.es, giulio.pellegrini@csic.es

3D / 173

Status of 3D detector activities at CNM

Corresponding Authors: giulio.pellegrini@cnm.es, giulio.pellegrini@csic.es

3D / 174

Initial results from a new generation of 3D Sensors for HL-LHC

Corresponding Authors: boscardi@fbk.eu, maurizio.boscardin@cern.ch

3D / 175

Beam test results of irradiated 3D pixel sensors for the CMS-TOTEM Precision Proton Spectrometer

Corresponding Author: fabio.ravera@cern.ch

TCAD / 177

TCAD simulations of High-Voltage-CMOS pixel structures for the CLIC vertex detector

Corresponding Author: matthew.daniel.buckland@cern.ch

TCAD / 178

Validation strategy for the simulation of highly irradiated silicon pixel sensors

Corresponding Author: joern.schwandt@cern.ch

TCAD / 179

TCAD simulations of LGAD devices using Silvaco software

Corresponding Author: marco.bomben@cern.ch

TCAD / 180

Comprehensive radiation damage test and modelling of p-type silicon detectors for high-luminosity operations

Corresponding Author: arianna.morozzi@gmail.com

Conference closing / 181

Close-out

Introduction / 182

3D Sensors for the HL-LHC

Corresponding Author: sgrinstein@ifae.es

Planar 2 / 184

The upgraded ATLAS Pixel detector and its performance during run-2 in 2015

Corresponding Author: didier.ferrere@cern.ch

Planar 1 / 186

Beam test results of highly irradiated planar and 3D pixel sensors for the Phase II Upgrade of the CMS pixel detector

Corresponding Author: daniel.schell@cern.ch

HVCMOS 1 / 187

The first reticle size HV-CMOS sensor demonstrator for ATLAS pixel layers

Corresponding Author: ivan.peric@kit.edu

3D / 188

Charaterization of 3D module with micro-channel cooling

Corresponding Author: cinzia.da.via@cern.ch

Introduction / 189

Practical information

Corresponding Authors: marco.bomben@cern.ch, giovanni.marchiori@cern.ch