

Chafic-Thomas SALAME,
Ph.D. Semiconductor Physics

Research Interests: Semiconductors Devices & Renewable Energy

Physics Department

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Born 15/03/1974 KLAYAA-LEBANON

Married, 2 childrens



UNIVERSITY EDUCATION

HDR, Research Director Diploma, Perpignan University, France (2005)

Health physics, Interfaculty Reactor Institute, Delft University of Technology, Netherlands (2001)

Ph.D. in Physics (Microelectronics), Supelec-Metz University and Perpignan University, France (2000)

Master's in Plasma and Opto-electronic, Supelec-Metz University, France (1997)

Bachelor's in Physics, Faculty of Sciences 2 - Lebanese University, Lebanon (1996)

PROFESIONEL EXPERIENCES

Since 2010: President of the Institution "MEDGREEN"

The Mediterranean Environment Durably Green using Rewarding Efficient Energy from Nature (www.themedgreen.org)

Since 2008: Professor at the Lebanese University

2006-2008: Individual Expert for the Tempus –Syria Project, CD_JEP-34064-2006 (SY) MEDA

Title: Curriculum Development in Science and Technology at Master and Doctorate level for Aleppo University

Project type: MEDA 2006 Curriculum Development

Subject area: T500 - Applied Sciences and Technologies

Partners: Cardiff (GB), Ilmenau (DE), Toulouse III (FR), UMII(FR), UPVD

Total awarded amount: 261,200.00 Euro

Since 2005: Member of the scientific committee of the Euro-Mediterranean Laboratory for Science and Technology

Since 2004: Research Group Leader "Semiconductors Devices & Renewable Energy (SDRE)"

(6 Professors, 4 Ph.D. students and 10 Master Thesis)

Since 2003: Founder and editor in chief for the Journal of Electron Devices. [http://: www.jeldev.org](http://www.jeldev.org)

1998-2000: European Program, ESA-ESTEC PH-126 at Cyclotron Research center Belgium

Research Activities and Scientific skills

• Renewable Energy:

➤ Evaluation and Review of the Characteristics of Photovoltaic Solar Cells

- ❖ *Encourage local scientific and experimental research on PV solar cells through furnishing equipment, software, and updated modern research results.*
- ❖ *Furnish a local and regional database on PV solar cells.*
- ❖ *Test the quality of imported and existing commercial solar cells and comparing its efficiency with internationally available PV solar cells.*
- ❖ *Furnish research and experimental results with the existing modest local potentials on an international level through publishing these results in recognized journal and conferences.*
- ❖ *Launch serious and scientific research on PV solar cells.*
- ❖ *Encourage the extensive use of PV solar cells as a source of alternative energy.*

➤ An Integrated and Optimized National Domestic Energy Saving System

- ❖ *Performing sufficient and extensive research on the applicable energy saving methods and procedures.*
- ❖ *Performing sufficient and extensive research on the renewable energy methods, technologies, and procedures.*
- ❖ *Classifying applicable energy saving methods and procedures.*
- ❖ *Classifying renewable energy methods, technologies, and procedures.*
- ❖ *Selecting adequate energy saving methods and procedures.*
- ❖ *Selecting adequate renewable energy methods, technologies, and procedures.*
- ❖ *Performing feasibility study on the domestic power system.*
- ❖ *Manufacturing and if not possible buying available energy saving and renewable energy technologies.*
- ❖ *Performing experimental tests on these technologies for the purpose of efficiency and durability.*
- ❖ *Integrating the selected technologies into the domestic power system.*
- ❖ *Testing the integrated system.*
- ❖ *Perform modifications on the domestic power system.*
- ❖ *Optimizing the domestic power system.*
- ❖ *Standardizing the domestic power system.*
- ❖ *Coordination with local manufacturers for mass production of hybrid renewable energy technologies.*
- ❖ *Coordination with local institutions to apply recommended and approved energy saving methods and procedures.*

• Quality and reliability of SC devices under extremes conditions:

➤ Silicon devices for space application

- ❖ *Characterization of electronic components and systems design with irradiation tolerance.*
- ❖ *Increase the understanding of radiations phenomena and their effects on semiconductor materials.*
- ❖ *Study and qualify under irradiations components generally COTS.*
- ❖ *From the knowledge gained on the behavior of silicon devices by characterizing these actions, the goal is to design complex electronic systems with high reliability in radiation environments.*
- ❖ *Possibility of using COTS devices for space application after a specific treatment.*
- ❖ *Study the effects of ionizing radiation environments on commercial electronic devices (Heavy Ion Irradiation, Proton, ...) and propose solutions to industrial manufacturers for the use of COTS components in systems subjected to ionizing radiation.*

➤ MOS circuits in fast switching for application in coupling with optical fiber

- ❖ *The main objective of this project is the development of telecommunications through the improvement of data transfer in fiber optics.*
- ❖ *The development of MOS circuit efficiency in connection with the optical fiber is the first step towards obtaining an additional speed transfer of digital data.*
- ❖ *This improvement is achieved by acting on changing the behaviour of MOS switching circuits, thus allowing development of CMOS technology and optical electrical interfaces necessary in communication field.*

- ❖ *Electrical treatments can act on the gate oxides of MOS structures to create charged defects.*
- ❖ *The action of these defects depends on their concentration and their location in the geometric structure.*
- ❖ *The good control of these defects allows an improvement of switching speed and hence the speed of response of these components.*
- ❖ *Circuits are treated in telecommunications devices connected to optical fibers. The speed of electrical response obtained transmitted to the transfer of digital data.*

➤ **Treatment and improvement of MOS silicon nanostructures by electrical stress**

- ❖ *This work leads to connect the size effect on the degradation of switching time.*
- ❖ *A new model is proposed for conducting the structures whose dimensions are close to the inter-atomic distances.*
- ❖ *The aim of this work is to show the possibility of acting on both reliability and speed of these components by changing the capacitance of silicon-oxide interface by hot carrier bombardment carried out under extreme polarization.*

➤ **Temperature dependence of a silicon power device switching parameters**

- ❖ *Switching characteristics of a commercial power MOSFET were investigated at different temperatures.*
- ❖ *The current decay time was found to decrease with temperature increase.*
- ❖ *The reverse drain-source leakage current showed a sudden increase above a threshold temperature of 300 °C.*
- ❖ *Measurements of the current voltage output characteristics indicated that the direct current increased with temperature. This was attributed to the activation of the creation process of interface defects and traps at high temperature causing a reduction in the threshold voltage and an increase of the channel current at saturation for the same gate voltage.*

➤ **Development of particles Detectors (X and Gamma Rays, Neutrons...):**

- ❖ *Study and development of X-ray detectors*
- ❖ *Reliability Test: Energy resolution, determination of noise and interference that can affect the detection efficiency, low temperature measurements, the effect of frequency, capacitance, leakage current, etc. ...*
- ❖ *Amplifiers: gain power, conversion, noise ...*

Computer skills:

Semiconductor Devices simulation: PIsces-Silvaco 3D, P-Spice.

Programming: LabView, PSpice

Numerical Analysis and simulation: MatLab, MathCad, Mathematica

Microsoft Office: Word, Excel, PowerPoint.

Languages

Fluent in French, English and Arabic

Teaching experience:

- Since 2008: Full professor position, **Lebanese University, Faculty of Sciences II, Department of Physics (Lebanon).**
Courses: Semiconductor Devices Technology, Electronic for Scientist, SC Devices and Aggressive environments.
Supervisor: PhD, MS and BS Thesis in physics materials science and renewable energy.
- 2003-2008: Assistant professor (Full-Time), **Lebanese International University, Faculty of Engineering, (Lebanon)**
Courses: Electric Circuits I, Electric Circuits II, Electronic Devices I, Electronic Devices II, Logic Design, Signal and Systems.
- 2001-2007: Assistant professor (Part-Time), **Lebanese University, Faculty of Sciences II, Physics Department (Lebanon)**
Courses: Modern Physics, Fundamental Physics
- 2002-2004: **Universite de Saint-Joseph (USJ), Faculty of Engineering - ESIB (Lebanon).**
Courses: Semiconductor Devices, Electronic Lab
Notre Dame University, Faculty of Engineering (Lebanon).
Courses: Logic Design, Electronic Devices
- 2000-2001: **Delft University of Technology, Faculty of Engineering - (The Netherlands)**
Courses: Silicon Drift Detectors
- 1999-2000: **Perpignan University, Faculty of Sciences (France)**
Courses: Electricity and Magnetism, thermodynamics

GRANTS AND SCIENTIFIC STAYS

June 2009: Invited professor to Perpignan University – France, scientific mobility funded by AUF.

30 Jan-6 Feb 2009: European expertise for Tempus JEP 34064-2006, Aleppo University - Syria

31 Oct-07 Nov 2008: European expertise for Tempus JEP 34064-2006, Aleppo University - Syria

June 2008: Invited professor to Perpignan University – France, scientific mobility funded by AUF.

2005 - 2006: Post-Doctoral Grant from the AUF, Montpellier – France

Domain: Science, Information and Communication Technology

Purpose: Development of Francophone research Partnership in high technology.

Sept/Oct 2004: Tempus - Individual Mobility Grants (N°: IMG-LB1004-2004)

Type: MEDA IMG 2004 Type 3 - Retraining period, study period, collaboration on a specific academic subject, dissemination of good practice

Sept 2003: Tempus - Individual Mobility Grants (N°: IMG-2003-LB1018)

Type: MEDA IMG 2003 Type 1 - Preparation of a JEP proposal

2000-2001: Post-Doctoral Researcher Follow at Delft University of Technology, The Netherlands

Research and Development for Silicon Drift Detector for low X-ray detection

1999-2000: Post-Doctoral for Research & Teaching at Perpignan University

Research and Development for silicon hardened devices used in space application

Delegated by the Lebanese government to represent Lebanon in the following scientific events:

E2C10 international Conference, 21 – 23 April 2010, Bercalona - Spain

WASET09 international Conference, 24-26 June 2009, Paris - France

AMCTM08 international Conference, 23 – 25 June 2008, Paris - France

EUROSIM2006 international Conference, May 2006, Como - Italy

NASA-MAPLD2005 international Conference, 1-5 September 2005, Washington Dc - USA

PUBLICATIONS

- Evaluation of the electrical properties under extreme stress in photovoltaic solar modules
J. Sidawi, N. Abboud, R. Habchi and C. Salame
Accepted for publication in *Microelectronics International* (2010)
- The effect of induced reverse current on the dark properties of photovoltaic solar modules
J. Sidawi, R. Habchi and C. Salame
Accepted for publication in *Solar Energy* (2010)
- Electrical parameters evolution of an N-VDMOSFET transistor under high temperature conditions
N. Abboud, C. Salame, Y. Cuminal, A. Foucaran, A. Hoffmann
Accepted for publication in *Microelectronics International* (2010)
- Study for the electrical quality degradation of N-VDMOSFET transistor induced by electrical stress
N. Abboud, C. Salame, A. Khoury, A. Foucaran, A. Hoffmann, P. Mialhe
IEEE, ACTEA, 10.1109, 142-145 (2009)
- VDMOSFET reliability dependence on the integrated drain-source junction
R. El Bitar, R. Habchi, C. Salame, A. Khoury, P. Mialhe, B. Nsouli
Microelectronics International, 26, 1, (2009)
- Switching times variation of MOSFET devices with temperature and high-field stress
R. Habchi, C. Salame
Microelectronics Journal, 39, 5, 828-831 (2008)
- Silicon MOSFET devices electrical parameters evolution at high temperatures
C. Salame, R. Habchi
Microelectronics International, 25, 1, (2008)
- Hot carrier injection in VDMOSFETs for improvement of commutation process
R. El Bitar, C. Salame, Pierre Mialhe
Microelectronics International, 24, 3, (2007).
- Switching times variation of power MOSFET devices after electrical stress
R. Habchi, C. Salame, P. Mialhe, A. Khoury
Microelectronics Reliability 47, 8, 1296–1299 (2007)
- Temperature dependence of silicon power MOSFETs switching parameters
C. Salame, R. Habchi, P. Mialhe
Applied Physics Letters 88, 153503 (2006)
- Oxide thickness effect on MOSFET switching time evolution with electrical stress
C. Salame, R. Habchi, A. Khoury, P. Mialhe
NASA office of Logic design, MAPLD 2005 review.
- A faster power MOSFET device with electrical stress treatment
C. Salame, R. Habchi, B. Nsouli, A. Khoury, P. Mialhe
Microelectronics International, 22, 3, (2005).
- Junction parameter extraction for electronic device characterization.
S. Dib, C. Salame, N. Toufik, A. Khoury, F. Pelanchan and P. Mialhe
Active and Passive Electronic Components, 27, 61–67, (2004)
- N-Channel Power MOSFET for Fast Neutron Detection.
C. Salame, P. Mialhe
Microelectronics International, 19, 19-22, (2002).
- Effects of the Pre-neutron Irradiation on VDMOSFET Sensitivity to Heavy Ions
C. Salame, P. Mialhe and J-P. Charles
Microelectronics International, 18, 16-20 (2001).

- VDMOSFET Model Parameter Extraction Based on Electrical and Optical Measurements.
C. Salame, P. Mialhe and J-P. Charles
Microelectronics Journal, 32, 7, 599-603 (2001).
- Degradation Of VDMOSFETs By Heavy Ions Irradiations.
C. Salame, F. Pelanchon, P. Mialhe
Active and Passive. Elec. Comp, 22, 265-282 (2000).
- Effect of Charge Distribution on Burnout Threshold of Hardened Power MOSFET".
C. Salame, L. Adams, S. Kerns, D. V. Kerns, F. Pelanchon, P. Mialhe and J.-P. Charles.
European Space Agency -publications- esa sp, 439, 25-30 (2000)
- Extraction of $R_{DS(ON)}$ of n-Channel Power MOSFET by Numerical Simulation Model
C. Salame.
Active and Passive. Elec. Comp, 24, 1-9 (2000).
- Geometry Parameter Extraction Method for MOSFET Devices
C. Salame, P. Mialhe, and J-P. Charles.
Active and Passive. Elec. Comp, 24, 11-18 (2000).
- Size Effect on SEB Cross-Section of VDMOSFETs".
C. Salame, A. Hoffmann, P. Mialhe, J.P. Charles, D.V Kerns Jr , and S.E.Kerns.
Radiation Effects & Defects in Solids, 152, 191-200 (1999).
- Junction Parameters for Silicon Devices Characterization.
M. de la Bardonnie, N. Toufik, C. Salame, S. Dib, P. Mialhe, A. Hoffmann and J-P. Charles.
Microelectron. Reliab. 39, 751-753 (1999).

CONFERENCES

- Photovoltaic Solar Modules Dark Characteristics Evolution with Electrical Reverse Current Stress
C. Salame, J. Sidawi
E2C 2010, European Energy Conference, 21- 23 April 2010, Bercalona - spain
- Evaluation of the Effect of Thermal Conditions on the Electrical Properties of Photovoltaic Solar Cells
C. Salame, J. Sidawi
E2C 2010, European Energy Conference, 21- 23 April 2010, Bercalona - spain
- Study for the electrical quality degradation of N-VDMOSFET transistor induced by electrical stress
N. Abdoud, C. Salame, A. Khoury, A. Foucaran, A. Hoffmann, P. Mialhe
CESSE 2009, International conference on computer, Electrical, and Systems Sciences, and Engineering", 24-26 June 2009, Paris - France
- Hot carrier injection from the intergrated drain-source junction in VDMOSFET
R. El Bitar, R. Habchi, N. Abboud, C. Salame, A. Khoury and P. Mialhe
IESC'08 , Aleppo First International Engineering Sciences Conference, 2-4 November 2008, Aleppo University - Syria
- Mathematical Software Tools for Silicon Devices parameters extraction at high temperatures
C. Salame, R. Habchi , Pierre Mialhe
Conference on Advanced Mathematical and Computational Tools in Metrology and Testing, 23 – 25 June 2008, Paris – France
- Variations du temps de transit du MOSFET en fonction de la température et soumis a un champ électrique élevé.
Chafic Salame, Pierre Mialhe
12ièmes JOURNEES NANO, MICRO ET OTOELECTRONIQUE, 3-6 Juin 2008, l'île d'Oléron France

- Extraction of MOSFET Devices Electrical Parameters Evolution at High Temperatures
Chafic Salame, Roland Habchi
TMS 137th Annual Meeting & Exhibition, 9-13 March 2008, New Orleans, Louisiana, USA.
- Electrical and Thermal Stress Effect on Switching Process of VDMOSFETs
Chafic Salame, Pierre Mialhe
TMS, 137th Annual Meeting & Exhibition, 9-13 March 2008, New Orleans, Louisiana - USA.
- Switching times of stressed MOSFETs at high temperatures
C. Salame, R. Habchi, A. Khoury, P. Mialhe
International PCIM Conference 2007, Power Electronics, Intelligent Motion, Power Quality / Energy Management, May 22 – 24, 2007, Nürnberg - Germany
- Numerical Simulation for Temperature Effects on MOSFET Electrical Parameters
C. Salame, R. Habchi, B. Nsouli, A. Khoury, P. Mialhe
Eurosim2006, Thermal, mechanical and multi-physics simulation and experiments in micro-electronics and micro-systems, April 23-26, 2006, Milano (Como) - Italy.
- Temperature Dependence of Silicon Power MOSFETs Switching Parameters
C. Salame, R. Habchi, B. Nsouli, A. Khoury, P. Mialhe
International PCIM Conference 2006, Power Electronics, Intelligent Motion, Power Quality / Energy Management, May 30 – June 1, 2006, Nürnberg - Germany
- MOSFET switching time variation with respect to total electrical dose effect
C. Salame, R. Habchi, B. Nsouli, A. Khoury, P. Mialhe
MAPLD 2005, Military and aerospace programmable logic devices international conference, 6-9 September 2005, NASA office of Logic design, Washington DC – USA
- R. Habchi, W. Tazibt, C. Salame, B. Nsouli, A. Khoury, P. Mialhe
Effects of electrical stress on switching behaviour of VDMOSFETs
7th European CMSE Conference, Commercialization of Military and Space Electronics, 14 - 16 September 2004, Glasgow-Scotland
- VDMOSFET Degradation with electrical Stress dose
C. Salame, P. Mialhe, W. Tazibt, R. Habchi, C. Salame, B. Nsouli, A. Khoury, P. Mialhe
Mediterranean Conferences on Environment and Solar use, 19-20 October 2003, Aleppo - Syria
- La résistance du canal d'un MOSFET de puissance s'identifie a la résistance shunt d'une jonction pn.
C. Salame, A. Khoury, P. Mialhe
Mediterranean Conferences on Environment and Solar use, Complex 2002, Beirut-Lebanon
- Role of the Total Amount of Charge Deposited by Heavy-Ion on SEB Threshold of Hardened MOSFETs.
C. Salamé, P. Mialhe, A. Khoury, A. Hoffmann, and J.-P. Charles.
5th European CMSE, Commercialisation Military and Space Electronics Conference, 2001 Nice - France
- La jonction, élément de caractérisation en microélectronique.
Jean-Pierre Charles, Pierre Mialhe, **Hazri Bakhtiar**, Sidi Aboujja, Chafic Salamé et Nezha Toufik
Euro-Mediterranean Conference of Condensed Matter, 4 – 6 Jun 2001, Tlemcen - Algeria,
- MOSFET as dosimeter for high energetic neutrons
C. Salame, P. Mialhe
IRI00 "Radiation and health Symposium", 10-11 March 2000 TUDelft, Delft- The Netherlands.
- Effect of Charge Distribution on Burnout Threshold of Hardened Power MOSFET".
C. Salame, S. Kerns, D.V. Kerns, F. Pélançon, P. Mialhe, A. Hoffmann, J.P. Charles
ESCCON2000 " Europ. Space Comp. Conf., March 20-24 2000, ESA, Noordwijk – Netherlands

- Effets d'une irradiation par neutrons sur la sensibilité aux ions lourds d'un VDMOSFET.
C. Salamé, F. Pelanchon, P. Mialhe, A. Hoffmann, J.-P. Charles.
CSM2-Second colloque Franco-Libanais sur les sciences des matériaux, 25- 26 Mai 2000, Beirut - Lebanon
- Extraction des paramètres géométriques et du niveau du dopage d'un transistor VDMOSFET.
C. Salamé, P. Mialhe, A. Hoffmann, A. Khoury, M. Zoaeter, J.-P. Charles.
13th Science Meeting, NCSR, 2-4 Nov. 1999, Beirut - Lebanon
- Junction electrical properties evolution after electrical stress
C. Salame, P. Mialhe, A. Hoffmann, J-P. Charles.
ESREF'99, 10th European Symposium Reliability of Electron Devices, 1999, Bordeaux - France
- Heavy ions charge deposition effects on SEB occurrence in MOSFET devices
C. Salame, P. Mialhe, A. Hoffmann, J-P. Charles
5th European Conference, RADECS99, 13-17 september 1999, Abbaye de Fontevraud- France
- Détection de neutrons de 30MeV à partir de VDMOSFETs.
C. Salame, Pierre Mialhe, A. Hoffmann, J.-P. Charles.
OPTORAD, CEA Saclay - INSTN, 10 déc. 1998, Gif-sur-Yvette-France.

Ph.D SUBJECT SUPERVISING

- Wahiba TAZIBT: Thesis was realized at the University of Perpignan
Entitled: "reliability and quality study of Microelectronics structures"
(Defence date 25 October 2007)
- Roland HABCHI
Entitled: "Power devices: switching and reliability"
(Defence date 25 mai 2007)
The work involved the study of the switching phenomena of power devices and its degradation with time. A novel experiment was set up to measure the switching speed, witch allowed us to publish the first results that studies the switching behavior as a reliability parameter. Defects resulting from long time operation and from temperature differences were characterized through a whole set of measurements such as, $I(V)$, $C(V)$, $G(V)$, T_{on} , T_{off} , ... Degradation of the oxide, the interface, and the package were considered.
- Rony EL BITAR
Entitled: "VDMOSFETs switching: improving, Hardening"
(Defence date 16 june 2008)
- Nadine ABBOUD
Entitled: "Characterization of defect induced by aggressive environment in SiC Photovoltaic Cells"
(Starting date 01 October 2008)

Research Projects (Funding)

- An Integrated and Optimized National Domestic Energy Saving System
Duration: 2 years, Starting 2011 (Lebanese National Council for Scientific Research).
- Evaluation and Review of the Characteristics of Photovoltaic Solar Cells
Duration: 2 years, Starting 2010 (Lebanese National Council for Scientific Research).
- *Duration: 2 years, Starting 2010 (Lebanese University Research Fund)*
- Treatment and improvement of MOS silicon nanostructures by electrical stress (**Ref 030209**)
Duration: 2 years, Starting 2009 (Lebanese National Council for Scientific Research).
- Hardening silicon MOS nanostructures by electrical stress
Duration: 2 years, Starting 2007 (Lebanese University Research Fund)
- MOS circuits in fast switching for application in coupling with optic fibre (**Ref 030707**)
Duration: 2 years, Starting 2007 (Lebanese National Council for Scientific Research).
- Effect of electrical stress on power MOSFETs avalanche threshold (**Ref 030705**)
Duration: 3 years, Starting 2005 (Lebanese National Council for Scientific Research).