CURRICULUM VITAE

De Santi, Carlo

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Sex Male | *Date of birth* 30/12/1985 | *Nationality* italian

SHORT SUMMARY

I graduated (bachelor) in 2007 at the University of Padua. Subsequently, I graduated (masters) in 2010 with a thesis on the reliability of blue-ray emission devices. I hold a PhD in Information Engineering since 2014. I was a research fellow for five years. Since 02 Sep. 2019, I hold an assistant professor position at the University of Padova, since 01 Aug. 2022 a tenure-track assistant professor position and since 03 Mar. 2025 an associate professor position at the same affiliation.

My main research activities focus on the characterization, modeling and simulation of physical processes, degradation physics and reliability of electronic and optoelectronic devices based on elemental and compound semiconductors such as gallium nitride, gallium oxide, silicon carbide, gallium arsenide, indium phosphide, diamond, cadmium telluride and silicon, including various ternary and quaternary compounds. Tested structures include High Electron Mobility Transistors (HEMTs), Gate Injection Transistors (GITs), Natural SuperJunctions (NSJs), Metal-Insulator-Semiconductor transistors (MISs), Light Emitting Diodes (LEDs), Laser Diodes (LDs), Quantum Dot Laser diodes (QDLs), Schottky Diodes (SD), solar cells and photodetectors. The application fields of interest are traditional devices and innovative structures for power electronics and radiofrequency systems, including military applications, LEDs and lasers in the UV, visible monochromatic and white spectral range, devices for silicon photonics, solar cells and photodetectors, phosphors and systems for lighting applications (also based on laser sources). The activities are carried out in collaboration with various national and international research centers.

I am co-author of 194 journal papers, of 8 invited journal papers (three by personal invitation), of 244 publications in conference proceedings, of 57 invited conference presentations (9 by personal invitation) and six book chapters.

I have a strong background in the preparation of experimental setups and in the use of laboratory instrumentation, both manually and through computer-assisted programming (LabVIEW), obtained during my activity as a doctoral and post-doc student in the Microelectronics group of the University of Padova. Typical tests I am able to set-up and carry out include electrical techniques (current-voltage, output characteristics), optical techniques (optical power-current, spectral analysis, spectrally- and spatially-resolved electroluminescence and photoluminescence, photocurrent, differential lifetime, use of photomultiplier tubes for high sensitivity measurements), capacitive techniques (impedance-voltage, impedance-frequency, thermal admittance spectroscopy, photoassisted CV), time-dependent analysis (current DLTS, capacitance DLTS, optical DLTS, current transients, gate lag, drain lag , impulse response, gate frequency sweep, analysis of charge trapping phenomena), thermal (thermal resistance), degradation test (constant current, constant voltage, thermal storage, breakdown).

I was the guest editor of the special issue “Wide-Bandgap Materials and Applications” in the journal Materials, published by MDPI, of the special issue “Advances in InGaN/GaN-based LED” in the journal Crystals, published by MDPI, of the special issue “Challenges for wide bandgap semiconductors for RF, power and optoelectronics: a technical perspective” in the journal e-Prime, published by Elsevier, of the special issue “Future of GaN devices - Future and prospects of GaN Power, RF and optoelectronic devices: Proceedings of GaN Marathon 2022” in the journal Power Electronic Devices and Components, published by Elsevier, and of the special issue “Proceedings of GaN Marathon 2024”, in the journal Power Electronic Devices and Components, published by Elsevier. I was topic editor of the journal “Applied Sciences”, published by MDPI from 2020 to 2021, topical advisory panel member from 2021 to 2024, and

editorial board member since 2024. I am an early career board member of the journal e-Prime, published by Elsevier, since 2024.

I am affiliated to the following scientific societies: Materials Research Society (MRS) member, 01/07/2018 - 30/06/2019; Society of Photo-Optical Instrumentation Engineers (SPIE) member (ID: 3423616), from 16/01/2020; Institute of Electrical and Electronics Engineers (IEEE) member (ID: 93789519), from 01/01/2021.

I was a member of the organizing committee of the conferences: GaN Marathon 2.0, Padova, Italy, 18-19 April 2018; GaN Marathon 2022, Venice, Italy, 20-22 June 2022; GaN Marathon 2024, Verona, Italy, 10-12 June 2024.

I was task leader of the task T5.2.1 “Leakage current and breakdown of vertical stacks” for the european project UltimateGaN (H2020-ECSEL-2018-2-RIA, grant agreement ID: 826392) and I am deputy work package 5 leader of the project AGAMI_EURIGAMI (European Defense Agency, grant agreement ID: 101102983).

I am a reviewer for the following journals: ACS Journal of Physical Chemistry, AIP APL Electronic Devices, AIP Applied Physics Letters, AIP Journal of Applied Physics, AIP Journal of Vacuum Science and Technology B, Elsevier Current Applied Physics, Elsevier Microelectronic Engineering, Elsevier Microelectronics Reliability, Elsevier Optics and Laser Technology, Elsevier Solar Energy, IEEE Electron Device Letters, IEEE Electron Devices Magazine, IEEE Electronics Letters, IEEE Journal of the Electron Devices Society, IEEE Photonics Technology Letters, IEEE Transactions on Device and Materials Reliability, IEEE Transactions on Electron Devices, IEEE Transactions on Nuclear Science, IEEE Transactions on Power Electronics, IOP Japanese Journal of Applied Physics, IOP Journal of Physics D: Applied Physics, IOP Semiconductor Science and Technology, IOP Applied Physics Express, MDPI Condensed Matter, MDPI Electronics, MDPI Micromachines, MDPI Nanomaterials, MRS Advances, Nature Scientific Reports, Springer Journal of Electronic Materials, Wiley International Journal of Energy Research.

Since 2025, I am a reviewer for the Alexander von Humboldt Foundation.

From 2014 to 2024 I also carried out teaching activities (frontal lesson) during various bachelor, masters and Ph.D. courses for a total of 444 hours. The students' assessment of the quality of the teaching activity was very positive, as per the official survey by the department.

I achieved the Italian National Scientific qualification as associate university professor in 2020. Since 2024, I am a member of the Board of the Ph.D Program in Information Engineering, Department of Information Engineering, University of Padova.

Summary of scientific activity (when available, values taken from the Scopus database on 15/04/2025):

- Number of journal papers: 191
- Number of papers in conference proceedings: 244
- Number of book chapters: 6
- Number of invited journal papers: 8 (3 following a personal invitation)
- Number of invited conference presentations: 57 (9 following a personal invitation)
- Number of indexed documents: 323
- Number of indexed citations: 5438 (Google Scholar database: 6572, since 2020: 5432)
- Hirsch index: 30 (Google Scholar database: 33, since 2020: 30)
- i10 index (Google Scholar database): 116, since 2020: 104

WORK EXPERIENCE

03 Mar. 2025–now

Associate professor

University of Padova, department of Information Engineering

Field: microelectronics

01 Aug. 2022–03 Mar. 2025

Assistant professor – tenure track

University of Padova, department of Information Engineering

Field: microelectronics

02 Sep. 2019–01 Aug. 2022

Assistant professor

University of Padova, department of Information Engineering

Field: microelectronics

Feb. 19–Sep. 19

Post-doctoral research grant

University of Padova, department of Information Engineering

The activity carried out during the research grant consists in the characterization and reliability analysis of various GaN-based devices for power applications.

Topic: Analysis of the degradation mechanisms of GaN power transistors

Supervisor: prof. Matteo Meneghini

Jun. 17–Jan. 19

Post-doctoral research grant

University of Padova, department of Information Engineering

The activity carried out during the research grant consists in the characterization and reliability analysis of innovative solar cells and photodetectors based on multiple quantum wells with high periodicity in InGaN. Part of the activity was dedicated to the analysis of other electronic and optoelectronic devices based on the same material, in order to extract useful information for the project. We have created innovative measurement setups and based on the results obtained, designed other devices with increased performance.

Topic: InGaN based solar cells for high efficiency photovoltaics and wireless energy transmission

Supervisor: prof. Matteo Meneghini

Mar. 17–May 17

Post-doctoral research grant

University of Padova, department of Information Engineering

The activity carried out during the research grant consists in the characterization and reliability analysis of various electronic devices based on gallium nitride for power applications.

Topic: HEMT power transistor: characterization and reliability

Supervisor: prof. Enrico Zanoni

Mar. 15–Feb. 17

Assegno di ricerca

University of Padova, department of Information Engineering

The activity carried out during the research grant consists in the characterization and reliability analysis of various optoelectronic devices based on gallium nitride and its ternary compounds. Particular attention was paid to the implementation of innovative measurement techniques and the modeling of physical phenomena.

Topic: Reliability limits of LED-based light sources submitted to harsh operating conditions: effect of high-temperature and electrical overstress

Supervisor: prof. Matteo Meneghini

Mar. 14–Feb. 15

Post-doctoral research grant

University of Padova, department of Information Engineering

The activity carried out during the research grant consists in the characterization and reliability analysis of various electronic devices based on gallium nitride for high frequency applications. A sub-part of the activity was dedicated to the analysis of devices for power electronics and optoelectronics, to extract

parameters useful for modeling.

Topic: Transistors on GaN for RF applications: characterization and reliability

Supervisor: prof. Enrico Zanoni

Jan. 14–Feb. 14

Research grant

University of Padova, department of Information Engineering

The activity consists in the realization of an innovative system of analysis of the dynamic performance of transients for power applications based on gallium nitride. The system allows to analyze the response of the tested device when the bias condition at rest and the selected operating frequency changes.

Topic: Development of gate-frequency sweep measurement setup for GaN HEMT

Supervisor: prof. Enrico Zanoni

Jan. 11–Dec. 13

PhD student position

University of Padova, department of Information Engineering

The activity carried out during the PhD consists in the characterization and reliability analysis of various electronic and optoelectronic devices. For power electronics applications, the electrical, dynamic and robustness performances of HEMT, GIT, natural superjunction and MIS devices were analyzed. For optoelectronic applications, the electrical, optical performance and robustness of LED and laser diodes were analyzed.

Thesis title: Degradation mechanisms of devices for optoelectronics and power electronics based on gallium nitride heterostructures

Supervisor: prof. Gaudenzio Meneghesso

Nov. 10–Dec. 10

Research grant

University of Padova, department of Information Engineering

The activity carried out consists in the characterization and reliability analysis of various optoelectronic devices based on gallium nitride and its ternary compounds.

Topic: Reliability of optoelectronic devices on GaN

Supervisor: prof. Enrico Zanoni

EDUCATION

11–13

Ph.D., Information Science and Technology

University of Padova, department of Information Engineering

The activity carried out during the doctorate consists in the characterization and reliability analysis of various electronic and optoelectronic devices. For power electronics applications, the electrical, dynamic and robustness performances of HEMT, GIT, natural superjunction and MIS devices were analyzed. For optoelectronic applications, the electrical, optical performance and robustness of LED and laser diodes were analyzed.

Thesis title: Degradation mechanisms of devices for optoelectronics and power electronics based on gallium nitride heterostructures

Supervisor: prof. Gaudenzio Meneghesso

08–10

Master degree in Electronic engineering

University of Padova, department of Information Engineering

The activity carried out during the master degree thesis consists in the characterization and reliability analysis of LED-like structures and blu-ray laser diodes. Furthermore, the variation of the UV LED emission spectrum as a function of temperature and current was analyzed.

Thesis title: Electrical and optical characterization of GaN devices with emission in blue and deep ultraviolet

Supervisor: prof. Enrico Zanoni

05–07 **Bachelor degree in Electronic engineering**

University of Padova, department of Information Engineering

The activity carried out during the three-year degree thesis consists in the programming of a FPGA Xilinx Spartan 3 through VHDL language and Xilinx ISE environment. The algorithm created is a Variable Length Coding for MPEG video compression.

Thesis title: Realization and verification of a VLC coding on FPGA

Supervisor: prof. Daniele Vogrig

99–04 **Classical high school degree**

ADDITIONAL INFORMATION

Research activities and Scientific collaborations

The following list summarizes the main research activities and corresponding collaborations, as testified by published papers and conference presentations. Confidential activities and collaborations are not included due to non-disclosure agreements. Partners are listed in no specific order.

GaN-based lateral and vertical transistors for power and RF applications (HEMT, MISHEMT, trench)

The activity consists in the characterization, also by custom measurement techniques, of normally-on and normally-off transistors with various structures, both lateral and vertical, for high voltage, high electron mobility and high frequency applications based on gallium nitride and its ternary compounds. The analysis was also extended to the dielectrics used in this type of structure, and to Ga-polar, N-polar and semi-polar structures. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and degradation of the devices in various operating conditions. Furthermore, studies have been conducted on the fundamental physical properties of the semiconductor (impact ionization, hot electrons). The activity included a part of computer-assisted physical simulations to model the behavior of the devices in various operating conditions.

List of collaborations:

- University of California at Santa Barbara, Department of Electrical and Computer Engineering, Mishra Research Group, Santa Barbara, USA
- United Monolithic Semiconductors GmbH (UMS), Ulm, Germany
- University of Modena and Reggio Emilia, Modena, Italy
- Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Power Electronics Department, Berlin, Germany
- SweGaN AB, Linköping, Sweden
- ON Semiconductor, Oudenaarde, Belgium
- Nexperia, Stockport, U.K.
- NXP Semiconductors, Eindhoven, The Netherlands
- NXP Semiconductors, Leuven, Belgium
- Nexperia, Stockport, United Kingdom
- Ghent University, Ghent, Belgium
- Katholieke Universiteit Leuven, Leuven, Belgium
- Infineon Technologies AG, Villach, Austria
- IAF Fraunhofer Institute for Applied Solid State Physics, Freiburg, Germany
- imec, Leuven, Belgium
- École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

▪ IEMN-CNRS, Villeneuve d'Ascq, France

▪ Nagoya University, Amano group, Nagoya, Japan

▪ Fraunhofer Institute for Microstructure of Materials and Systems IMWS, Halle, Germany

▪ BelGaN BV, Oudenaarde, Belgium

▪ Robert Bosch GmbH, Renningen, Germany

▪ Graz University of Technology, Graz, Austria

▪ STMicroelectronics, Italy

▪ Leonardo Company, Rome, Italy

▪ Fraunhofer Institute for Integrated Systems and Device Technology IISB, Erlangen, Germany

▪ AIXTRON SE, Herzogenrath, Germany

▪ III-V Lab, Palaiseau, France

▪ Qorvo, Inc., Hillsboro, OR, USA

▪ EpiGaN, Hasselt, Belgium

▪ Transphorm Inc., Goleta, CA, United States

▪ Attolight AG, Lausanne, Switzerland

▪ International College of Semiconductor Technology, National Chiao Tung University, Hsinchu, Taiwan

▪ Institute for Applied Microelectronics, Universidad de Las Palmas de Gran Canaria, Las Palmas, Spain

▪ Department of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, MI, USA

Gate Injection Transistors (GIT)

The activity consists in the characterization, also by custom measurement techniques, of normally-off transistors for high voltage and high electron mobility applications based on gallium nitride and its ternary compounds. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and degradation of the devices in various operating conditions.

List of collaborations

▪ Panasonic Corporation, Nagaokakyio City, Kyoto, Japan

FinFET and nanowire FETs

The activity consists in the characterization, also by custom measurement techniques, of vertical transistors with innovative structure for high voltage and high electron mobility applications based on gallium nitride and its ternary compounds. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and degradation of the devices in various operating conditions. The activity included a part of computer-assisted physical simulations to model the behavior of the devices in various operating conditions.

List of collaborations:

▪ Massachusetts Institute of Technology (MIT), Cambridge, USA

▪ Technical University of Braunschweig, Braunschweig, Germany

▪ University of Kassel, Kassel, Germany

Vertical power diodes

The activity consists in the characterization, also by custom measurement techniques, of innovative p-n vertical junctions with polarization doping for high voltage and high electron mobility applications based on gallium nitride and its ternary compounds. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and degradation of the devices in various operating conditions. Furthermore, studies have been conducted on the fundamental physical properties of the semiconductor (impact ionization and avalanche conduction). The activity included a part of computer-assisted physical simulations to model the behavior of the devices in various operating conditions.

List of collaborations:

▪ Cornell University, Jena-Xing group, Ithaca, USA

▪ IQE RF LLC, Somerset, USA

▪ imec, Leuven, Belgium

▪ Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Power Electronics Department, Berlin, Germany

Silicon Carbide

The activity consists in the characterization, also by custom measurement techniques, of vertical transistors for power applications. A specific focus is given to charge trapping and reliability phenomena.

▪ Onsemi, Oudenaarde, Belgium

▪ Technischen Universität Wien, Institute of Microelectronics, Vienna, Austria

▪ University of Antwerp, Antwerp, Belgium

▪ Ghent University, Ghent, Belgium

▪ ON Semiconductor, Kista, Sweden

Gallium Oxide

The activity consists in the characterization, also by custom measurement techniques, of insulation structures and layers implanted with magnesium and nitrogen for high voltage and high electron mobility applications based on gallium oxide. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and stability of the structures in various operating conditions.

List of collaborations:

▪ Tamura Corporation, Saitama, Japan

▪ Tokyo University of Agriculture and Technology, Department of Applied Chemistry, Tokyo, Japan

▪ National Institute of Information and Communications Technology, Tokyo, Japan

▪ Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Power Electronics Department, Berlin, Germany

▪ Cornell University, Jena-Xing group, Ithaca, USA

▪ Novel Crystal Technology, Inc, Saitama, Japan

▪ LATMOS, CNRS, Guyancourt, France

▪ PIT, OVSQ, Guyancourt, France

▪ Nanovation, Châteaufort, France

Diamond

The activity consists in the characterization, also by custom measurement techniques, of hydrogen-terminated diamond FETs for high power and high frequency applications. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and degradation of the devices in various operating conditions.

▪ Department of Industrial Engineering, University of Rome “Tor Vergata,”, Rome, 00133, Italy

▪ Institute for Microelectronics and Microsystems (IMM)-CNR, Rome, 00133, Italy

Ring-gate normally-off transistors

The activity consists in the characterization, also by custom measurement techniques, of normally-off lateral transitors with innovative gate structure (ring-gate) for high voltage and high electron mobility applications based on gallium nitride and its ternary compounds. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and degradation of the devices in various operating conditions.

List of collaborations:

▪ Science and Technology on Monolithic Integrated Circuits and Modules Laboratory, Nanjing Electronic Devices Institute, Nanjing, China

▪ Nanjing University, Nanjing, China

Light Emitting Diodes (LEDs), visible spectral range

The activity consists in the characterization, also by custom measurement techniques, of diodes and complex light-emitting systems in the visible spectral range based on gallium nitride and its ternary compounds. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and degradation of the devices in various operating conditions. The analysis includes a variety of conditions, including electrostatic discharge (ESD), electrical overstress, radiation with protons, system-level tests, reverse bias tests. Furthermore, studies have been conducted on the fundamental physical properties of the semiconductor (recombination mechanisms, recombination coefficients, conduction mechanisms, time-dependent dielectric breakdown). The activity included a part of computer-assisted simulations to model the behavior of the devices in various operating conditions.

List of collaborations:

▪ OSRAM Opto Semiconductors, Regensburg, Germany

▪ University of Cagliari, Cagliari, Italy

▪ Polytechnic of Turin, Turin, Italy

▪ National Research Council, Institute for Microelectronics and Microsystems (IMM), Bologna, Italy

▪ University of Modena and Reggio Emilia, Modena, Italy

▪ École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

▪ IEIIT-CNR, Torino, Italy

▪ National Research Council, Institute of Photonics and Nanotechnologies, Padova, Italy

▪ LightCube SRL, Padova, Italy

▪ University of Palermo, Palermo, Italy

▪ Department of Electrical and Computer Engineering, Boston University, Boston, MA, USA

Light Emitting Diodes (LEDs), UV spectral range

The activity consists in the characterization, also by custom measurement techniques, of light emitting diodes in the UV spectral range based on gallium nitride and its ternary and quaternary compounds. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and degradation of the devices in various operating conditions. Furthermore, studies have been conducted on the fundamental physical properties of the semiconductor (recombination mechanisms, conduction mechanisms). The activity included a part of computer-assisted simulations to model the behavior of the devices in various operating conditions.

List of collaborations:

▪ Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, GaN Optoelectronics Lab, Berlin, Germany

▪ Technische Universität Berlin, Institut für Festkörperphysik, Berlin, Germany

▪ University of Modena and Reggio Emilia, Modena, Italy

▪ Polytechnic of Turin, Turin, Italy

▪ LightCube SRL, Padova, Italy

▪ Nagoya University, Amano group, Nagoya, Japan

▪ Nikkiso Giken Co. Ltd., Ishikawa, Japan

▪ University of Padua, Department of Industrial Engineering, Padua, Italy

▪ Department of Biotechnology and Life Sciences, University of Insubria, Varese, Italy

Innovative light-emitting structures: nanowire

The activity consists in the characterization, also by custom measurement techniques, of light emitting diodes in the visible spectral range with an innovative nanowire structure based on gallium nitride and

its ternary compounds. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and degradation of the devices in various operating conditions. Furthermore, studies have been conducted on the fundamental physical properties of the semiconductor (conduction mechanisms, strain effect). The activity included a part of computer-assisted physical simulations to model the behavior of the devices in various operating conditions.

List of collaborations:

- Paul-Drude-Institut für Festkörperelektronik, Berlin, Germany
- TiberLAB s.r.l., Rome, Italy

Laser diodes, visible spectral range

The activity consists in the characterization, also by custom measurement techniques, of laser diodes in the visible spectral range based on gallium nitride and its ternary compounds. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and degradation of the devices in various operating conditions. Furthermore, studies have been conducted on the fundamental physical properties of the semiconductor (diffusion phenomena, influence of dislocations, influence of the yellow band).

List of collaborations:

- Panasonic Corporation, Nagaokakyio City, Kyoto, Japan
- Institute of High Pressure Physics "Unipress", Warsaw, Poland
- TopGaN Limited, Sokolowska 19/37 01-142, Warsaw, Poland
- National Research Council, Institute of materials for electronics and magnetism (IMEM), Parma, Italy
- IMTEK, University of Freiburg, Freiburg, Germany
- IAF Fraunhofer Institute for Applied Solid State Physics, Freiburg, Germany
- École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland
- University of Cagliari, Cagliari, Italy

Laser diodes, IR spectral range, for silicon photonics

The activity consists in the characterization, also by custom measurement techniques, of laser diodes in the infrared spectral range with innovative hybrid structure for silicon photonics applications based on gallium arsenide, indium phosphide and their ternary and quaternary compounds. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and degradation of the devices in various operating conditions. The activity included a part of computer-assisted simulations to model the behavior of the devices in various operating conditions.

List of collaborations:

- University of California at Santa Barbara, Department of Electrical and Computer Engineering, John Bowers Optoelectronics Research Group Santa Barbara, USA
- Intel Corporation, Santa Clara, USA
- Korea Institute of Science and Technology, Seoul, South Korea
- imec, Leuven, Belgium
- Ghent University, Ghent, Belgium
- Polytechnic of Turin, Turin, Italy
- National Research Council, Institute of materials for electronics and magnetism (IMEM), Parma, Italy
- Chalmers University of Technology, Photonics Laboratory, Department of Microtechnology and Nanoscience, Goteborg, Sweden
- LIGENTEC SA, Ecublens, Switzerland
- Quintessent Inc., Santa Barbara, CA, USA
- Robert Herrick Consulting, San Jose, CA, USA

Solar cells and photodetector

The activity consists in the characterization, also by custom measurement techniques, of light receiver structures in the visible spectral range with an innovative structure with multiple quantum wells based

on gallium nitride and its ternary compounds. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and degradation of the devices in various operating conditions. Innovative systems based on these devices have also been developed, including a wireless power transfer system based on optical transfer with laser diodes. The activity involved the design of new structures with better performance and reliability. Furthermore, studies have been conducted on the fundamental physical properties of the semiconductor, identifying a new mode of degradation (optical degradation).

List of collaborations:

- IEMN-CNRS, Villeneuve d'Ascq, France
- University of Padua, Department of Physics and Astronomy, Padua, Italy
- University of Padua, Department of Industrial Engineering, Padua, Italy
- Polytechnic of Turin, Turin, Italy
- Arizona State University, Tempe, AZ, USA
- Rice University, Department of Electrical and Computer Engineering, Houston, TX, USA
- National Research Council, Rome, Italy
- IEIIT-CNR, Torino, Italy
- University of Rome “Tor Vergata”, Rome, Italy
- National Research Council, Institute of materials for electronics and magnetism (IMEM), Parma, Italy
- University of Cagliari, Cagliari, Italy
- LATMOS, CNRS, Guyancourt, France
- Iowa State University, Ames, IA, USA
- Kyoto Institute of Technology, Kyoto, Japan
- Ecoprogetti S.r.l., Carmignano di Brenta, Italy
- Institute of Physics, Chemnitz University of Technology, Chemnitz, Germany
- Universidade Federal do Rio de Janeiro, RJ, Duque de Caxias, Brazil

Hyperspectral cathodoluminescence

The activity consists in the analysis of an innovative measurement technique, hyperspectral cathodoluminescence, and its possible use to obtain useful information on the mechanisms responsible for the loss of performance and the degradation of optoelectronic devices based on gallium nitride and its ternary compounds. Starting from the experimental data, physical models have been developed that are able to represent and predict the performance and degradation of the devices in various operating conditions. Furthermore, studies have been conducted on the fundamental physical properties of the semiconductor (fluctuation of the composition).

List of collaborations:

- Attolight AG, Lausanne, Switzerland
- University of Cagliari

Phosphors for lighting

The activity consists in the characterization, also by custom measurement techniques, of phosphors for wavelength conversion in general lighting applications based on europium. Starting from the experimental data, physical models have been developed capable of representing and predicting the performance and degradation of phosphors in various operating conditions. Furthermore, studies have been conducted on the fundamental physical properties of the material (EPR spectra, XPS spectra), and on new sintering methods.

List of collaborations:

- University of Padua, Department of Chemical Sciences, Padua, Italy
- University of Padua, Department of Industrial Engineering, Padua, Italy
- School of Science, RMIT University, Melbourne, Australia

Space applications of electronic and optoelectronic devices

The activity consists in the analysis of reliability and performance of electronic and optoelectronic devices in the extreme environmental conditions typical of space applications. Areas of study are irradiation tests with protons and recovery, characterization of device parameters and reliability tests at high temperature.

List of collaborations:

▪ European Space Agency, European Center for Space Applications and Telecommunications (ECSAT), Didcot, UK

▪ National Research Council, Institute of Photonics and Nanotechnology (IFN), Padua, Italy

▪ University of Firenze, Florence, Italy

▪ National Institute of Astrophysics (INAF), Rome, Italy

▪ LATMOS, CNRS, Guyancourt, France

▪ PIT, OVSQ, Guyancourt, France

▪ Nanovation, Châteaufort, France

Awards

- Poster Award at the conference "16th International Symposium on the Science and Technology of Lighting", with the article N. Trivellin, M. Buffolo, L. Bogo, C. De Santi, A. Longato, A. Martucci, G. Meneghesso , E. Zanoni, M. Meneghini, "Phosphors for laser baser lighting systems: quantitative investigation of performance and degradation processes", 16th International Symposium on the Science and Technology of Lighting (LS-16), Sheffield, UK, 17-22 June 2018

- Second award for the best contribution to the "Brains meet digital enterprises", Padua, Italy, 25 Oct. 2018

- Best Student Paper Award at the conference "IEEE International Reliability Physics Symposium" (IRPS2018), with the article in collaboration with MIT of Boston: Ruzzarin, M., Meneghini, M., De Santi, C., Meneghesso, G., Zanoni , E., Sun, M., Palacios, T. "Degradation of vertical GaN FETs under gate and drain stress", In: IEEE International Reliability Physics Symposium Proceedings 2018, p. 4B.11-4B.15, Institute of Electrical and Electronics Engineers Inc., ISBN: 9781538654798, usa, 2018, doi: 10.1109 / IRPS.2018.8353579

- Best Paper Award at the conference “30th European Symposium on Reliability of Electron Devices, Failure Physics and Analysis” (ESREF 2019) with the paper “Stability and degradation of isolation and surface in Ga_2O_3 devices”, De Santi, C., Nardo, A., Wong, M.H., Goto, K., Kuramata, A., Yamakoshi, S., Murakami, H., Kumagai, Y., Higashiwaki, M., Meneghesso, G., Zanoni, E., Meneghini, M., (2019) Microelectronics Reliability, 100-101, art. no. 113453, DOI: 10.1016/j.microrel.2019.113453

- Highly Commended Presentation Award at the conference “WOCSDICE - Workshop on Compound Semiconductor Devices and Integrated Circuits held in Europe & EXMATEC - Expert Evaluation and Control of Compound Semiconductor Materials and Technologies” (WOCSDICE/EXMATEC2021) with the paper: M. Ruzzarin, K. Geens, M. Borga, H. Liang, S. You, B. Bakeroot, S. Decoutere, C. De Santi, M. Meneghini, G. Meneghesso, E. Zanoni, “Gate Module Study for Performance Improvement in Vertical GaN Devices” 14-17 June, Bristol, UK (2021).

- SPIE Community Champion appointment, by the Society of Photo-Optical Instrumentation Engineers (SPIE) in 2021.

- Best Paper Award at the conference “34th European Symposium on Reliability of Electron Devices, Failure Physics and Analysis” (ESREF 2023) with the paper “Bias-dependent degradation of single quantum well on InGaN-based light emitting diode”, C. Casu, M. Buffolo, A. Caria, F. Piva, C. De Santi, G. Meneghesso, E. Zanoni, M. Meneghini, (2023) Microelectronics Reliability, 160, art. no. 115132, DOI: 10.1016/j.microrel.2023.115132.

- Best Paper Award at the conference "35th European Symposium on Reliability of Electron Devices, Failure Physics and Analysis" (ESREF 2024) with the paper "OFF-state Breakdown and Threshold Voltage Stability of Vertical GaN-on-Si Trench MOSFETs", M. Fregolent, F. Bergamin, D. Favero, C. De Santi, C. Huber, G. Meneghesso, E. Zanoni, M. Meneghini, (2024) to be published in Microelectronics Reliability.

Conference organization

Organizing commitee:

O1) GaN Marathon 2.0, Padova, Italy, 18-19 April 2018

O2) GaN Marathon 2022, Venice, Italy, 20-22 June 2022

O3) GaN Marathon 2024, Verona, Italy, 10-12 June 2024

Editorial activity

Guest editor:

G1) Guest editor for the special issue "Wide-Bandgap Materials and Applications" of the journal Materials, published by MDPI, 2019-2020.

G2) Guest editor for the special issue "Advances in InGaN/GaN-based LED" of the journal Crystals, published by MDPI, 2021-2022.

G3) Guest editor for the special issue "Challenges for wide bandgap semiconductors for RF, power and optoelectronics: a technical perspective" of the journal e-Prime, published by Elsevier, 2022-2023.

G4) Guest editor for the special issue "Future of GaN devices - Future and prospects of GaN Power, RF and optoelectronic devices: Proceedings of GaN Marathon 2022" of the journal Power Electronic Devices and Components, published by Elsevier, 2022-2023.

G5) Guest editor for the special issue "Proceedings of GaN Marathon 2024" of the journal Power Electronic Devices and Components, published by Elsevier, 2024.

Board editor:

E1) Topic editor for the journal "Applied Sciences", published by MDPI, 2020-2021.

E2) Topical advisory panel member for the journal "Applied Sciences", published by MDPI, 2021-2024.

E3) Editorial board member for the journal "Applied Sciences", published by MDPI, since 2024.

E4) Early career board member for the journal "e-Prime", published by Elsevier, since 2024.

Scientific appointments

A1) Task leader of the task T5.2.1 "Leakage current and breakdown of vertical stacks" of the project UltimateGaN (H2020-ECSEL-2018-2-RIA, grant agreement ID: 826392).

A2) Deputy work package 5 leader of the project AGAMI_EURIGAMI (European Defense Agency, grant agreement ID: 101102983).

Project participation

Only the participation to projects with source information is listed. Additional projects with supporting papers but no source information are not listed.

R1) MANGA, 2010-2012, funding scheme: European Defense Agency, source: https://eda.europa.eu/news-and-events/news/2014/06/30/eda-helps-establish-an-independent-european-supply-chain-for-advanced-gallium-nitride-technologies, https://ieeexplore.ieee.org/document/6102828, funding: not disclosed, role: member of the local research team, supporting papers: 10.1016/j.mee.2013.03.017, 10.1109/IRPS.2013.6531983, 10.1109/TED.2013.2279021.

R2) HiPoSwitch, 2011-2015, funding scheme: FP7-ICT, grant agreement ID: 287602, source: https://cordis.europa.eu/project/id/287602, total funding: ≈ 5.6 M€, local funding: ≈ 312 k€, role: member of the local research team, supporting papers: 10.1109/IRPS.2013.6531983, 10.1109/TED.2016.2553721.

R3) E2COGAN, 2013-2016, funding scheme: JTI-CP-ENIAC ENIAC-2012-1, grant agreement ID: 324280, https://cordis.europa.eu/project/id/324280, total funding: ≈ 26.3 M€, local funding: ≈ 112.5 k€, role: member of the local research team, supporting papers: 10.1109/IRPS.2017.7936282.

R4) PowerBase, 2015-2018, funding scheme: ECSEL-2014-2-IA, grant agreement ID: 662133, DOI: 10.3030/662133, source: https://cordis.europa.eu/project/id/662133, total funding: ≈ 90.3 M€, local funding: ≈ 349 k€, role: member of the local research team, supporting papers: 10.1109/IRPS.2017.7936311, 10.1088/1361-6463/aaaf9d, 10.1109/IEDM.2018.8614605, 10.1109/TED.2020.2964060.

R5) Support towards validation of European GaN foundry processes, 2016, funding scheme: European Space Agency, grant agreement ID: 4000106310, source: https://escies.org/webdocument/showArticle?id=1002, funding: not disclosed, role: member of the local research team, supporting papers: 10.1109/MIKON.2016.7492013.

R6) InRel-NPower, 2017-2020, funding scheme: H2020-NMBP-2016-2017, grant agreement ID: 720527, DOI: 10.3030/720527, source: https://cordis.europa.eu/project/id/720527, total funding: ≈ 7.7 M€, local funding: ≈ 650 k€, role: member of the local research team, supporting papers: 10.1109/TED.2017.2728785, 10.1088/1361-6463/aaaf9d, 10.1109/EDTM.2019.8731064, 10.1063/1.5109301, 10.3390/mi11010101, 10.1109/IRPS45951.2020.9129116, 10.1016/j.microrel.2020.113841

R7) NoveGaN, 2017, funding scheme: STARS-CoG, source: https://www.unipd.it/sites/unipd.it/files/2018/FINAL_EVALUATION_REPORT_WEB.pdf, funding: ≈ 140 k€, role: member of the local research team, supporting papers: 10.1109/IEDM.2018.8614568, 10.1016/j.microrel.2018.06.044, 10.1016/j.microrel.2018.06.041, 10.1109/EDTM.2019.8731064, 10.1109/TED.2019.2904851, 10.1016/j.microrel.2019.113488, 10.1109/TED.2019.2943014, 10.35848/1882-0786/ab6ef8, 10.35848/1882-0786/ab6ddd, 10.1109/IRPS45951.2020.9129098, 10.1002/pssa.201900750, 10.1109/LED.2020.3009649, 10.1109/TED.2020.3013242, 10.1109/TED.2020.2993192, 10.3390/ma13214740, 10.1063/5.0027922, 10.3390/mi12040445, 10.3390/ma14092316.

R8) EUGaNIC, 2018, funding scheme: European Defense Agency, source: https://eda.europa.eu/docs/default-source/brochures/eda-r-t-2016-a4---v09.pdf, funding: not disclosed, role: member of the local research team, supporting papers: 10.1016/j.microrel.2018.07.122, 10.1016/j.microrel.2019.06.080, 10.1109/IPFA49335.2020.9260793, 10.1016/j.microrel.2020.113905, 10.1016/j.microrel.2021.114199, 10.1002/pssa.202100722, 10.23919/EOS/ESD52038.2021.9574733, 10.1016/j.microrel.2021.114318, 10.1109/IRPS48227.2022.9764531, 10.1109/IRPS48203.2023.10118131.

R9) MAGYGAN, 2018-2019, funding scheme: Italy-Japan cooperation programme in the field of science and technology, source: https://www.esteri.it/mae/resource/doc/2016/12/pe_itjp_2017_2019.pdf, total funding: not disclosed, local funding: 46 k€, role: member of the local research team, supporting papers: 10.7567/1347-4065/ab1393, 10.1016/j.microrel.2019.113418, 10.1088/1361-6463/aaaf9d, 10.1109/TED.2018.2877905, 10.1109/EDTM.2019.8731064, 10.1109/IRPS.2019.8720472.

R10) 5G_GaN2, 2018-2022, funding scheme: H2020-ECSEL-2017-2-RIA, grant agreement ID: 783274, DOI: 10.3030/783274, source: https://cordis.europa.eu/project/id/783274, total funding: ≈ 20.6 M€, local funding: ≈ 337 k€, role: member of the local research team, supporting papers: 10.1109/TED.2023.3326781, 10.1109/TED.2023.3318564, 10.1109/IPFA49335.2020.9260793, 10.1016/j.microrel.2020.113905, 10.1002/pssa.202100722, 10.23919/EOS/ESD52038.2021.9574733, 10.1016/j.microrel.2021.114318, 10.1109/TED.2023.3270134, 10.1109/IRPS48227.2022.9764531, 10.1109/IRPS48203.2023.10118131.

R11) UltimateGaN, 2019-2022, funding scheme: H2020-ECSEL-2018-2-RIA, grant agreement ID: 826392, DOI: 10.3030/826392, source: https://cordis.europa.eu/project/id/826392, total funding: ≈ 48.4 M€, local funding: ≈ 238 k€, role: member of the local research team and task leader, supporting papers: 10.35848/1882-0786/ab6ef8, 10.35848/1882-0786/ab6ddd, 10.1109/IRPS45951.2020.9129098, 10.1109/ASDAM50306.2020.9393835, 10.3390/ma13214740, 10.1016/j.microrel.2020.113828, 10.1109/BCICTS50416.2021.9682455, 10.3390/mi12040445, 10.3390/ma14092316, 10.1016/j.microrel.2021.114218, 10.1016/j.microrel.2021.114255, 10.1063/5.0061354, 10.1109/IRPS48227.2022.9764600, 10.1063/5.0087245, 10.1088/1361-6463/ac4f0c, 10.1016/j.microrel.2022.114620, 10.1109/IRPS48203.2023.10117667.

R12) iRel40, 2020-2023, funding scheme: H2020-ECSEL-2019-1-IA, grant agreement ID: 876659, DOI: 10.3030/101007229, source: https://cordis.europa.eu/project/id/876659, total funding: ≈ 102.5 M€, local funding: ≈ 226 k€, role: member of the local research team, supporting papers: 10.1016/j.microrel.2023.115131, 10.1109/WiPDA49284.2021.9645151, 10.1063/5.0061354, 10.1109/IRPS48227.2022.9764510, 10.1109/TED.2022.3184622, 10.1016/j.microrel.2022.114735, 10.1016/j.microrel.2023.115133.

R13) GANAPP, 2020-2023, funding scheme: PRIN 2017, grant ID: 2017FL8C9N, source: https://prin.mur.gov.it/Ricerca?Filtro.Anno=2017&Filtro.Ateneo=%25&Filtro.Argomento=ganapp&Filtro.

Cognome=, total funding: ≈ 552 k€, local funding: 132 k€, role: member of the local research team, supporting papers: 10.1109/TED.2023.3326781, 10.1109/TED.2023.3318564, 10.1016/j.prime.2021.100018, 10.1016/j.microrel.2021.114199, 10.1109/WiPDA49284.2021.9645107, 10.1016/j.microrel.2021.114259, 10.3390/cryst11091037, 10.23919/EOS/ESD52038.2021.9574733, 10.1109/IRPS46558.2021.9405111, 10.1002/pssa.202100722, 10.1016/j.microrel.2021.114318, 10.1109/IRPS48227.2022.9764531, 10.1109/IRPS48203.2023.10118131, 10.1109/TED.2023.3270134, 10.1109/TDMR.2023.3305033.

R14) YESvGaN, 2021-2024, funding scheme: H2020-ECSEL-2020-2-RIA, grant agreement ID: 101007229, DOI: 10.3030/101007229, source: https://cordis.europa.eu/project/id/101007229, total funding: ≈ 27 M€, local funding: ≈ 114 k€, role: member of the local research team, supporting papers: 10.1109/TED.2023.3346369, 10.1109/TED.2023.3335032, 10.1109/IRPS48203.2023.10117719, 10.1016/j.microrel.2022.114644, 10.1088/1361-6463/ad5b6c, 10.1016/j.microrel.2023.115130, 10.1088/1674-4926/45/3/032501, 10.1109/tpel.2024.3441712, 10.1063/5.0061354, 10.1109/IRPS48203.2023.10117719.

R15) MOST, 2022-now, funding scheme: NextGenerationEU, source: https://www.centronazionalemost.it/eg/, total funding: ≈ 320 M€, local funding: not disclosed, role: member of the local research team, supporting papers: 10.1016/j.microrel.2023.115199, 10.1109/TED.2023.3346369, 10.1063/5.0154878, 10.1088/1361-6463/ad5b6c, 10.23919/AEITAUTOMOTIVE58986.2023.10217233, 10.23919/AEITAUTOMOTIVE58986.2023.10217245.

R16) NEST, 2022-now, funding scheme: NextGenerationEU, source: https://fondazionenest.it/, total funding: ≈ 118 M€, local funding: not disclosed, role: member of the local research team, supporting papers: 10.3390/photonics11090880, 10.1109/TED.2023.3272297, 10.1109/TED.2023.3236915, 10.1109/SAS60918.2024.10636656, 10.1109/JPHOTOV.2024.3366710, 10.1109/TED.2024.3353711, 10.1109/metrosea62823.2024.10765668, 10.1109/JPHOTOV.2023.3311891.

R17) Empowering UV Led technologies for high-efficiency disinfection: from semiconductor-level research to SARs-Cov-2 inactivation, 2022-now, funding scheme: PRIN 2022 PNRR, grant ID: 20225YYLEP, source: https://prin.mur.gov.it/Ricerca?Filtro.Anno=%25&Filtro.Ateneo=%25&Filtro.Argomento=UV+LED&Filtro.Cognome=, total funding: ≈ 198 k€, local funding: 103 k€, role: member of the local research team, supporting papers: 10.1088/1361-6641/ad54e9, 10.1088/1361-6463/ad5b6c, 10.1088/1361-6463/ad7039, 10.1109/JPHOT.2024.3355553, 10.1109/IPFA61654.2024.10691243.

R18) AI-Twilight, 2021-2025, funding scheme: H2020-ECSEL-2020-2-RIA, grant agreement ID: 101007319, DOI: 10.3030/101007319, source: https://cordis.europa.eu/project/id/101007319, total funding: ≈ 18.1 M€, local funding: ≈ 201 k€, role: member of the local research team, supporting papers: 10.3390/mi13081266, 10.1016/j.microrel.2023.115142, 10.1109/THERMINIC62015.2024.10732033, 10.1002/pssa.202200900, 10.1109/THERMINIC60375.2023.10325894, 10.1002/pssa.202100727, 10.1109/LS1858153.2023.10170252, 10.1016/j.microrel.2022.114724, 10.1109/ted.2024.3393448, 10.1117/12.2651787.

R19) GaN4AP, 2021-2025, funding scheme: H2020-ECSEL-2020-1-IA, grant agreement ID: 101007310, DOI: 10.3030/101007310, source: https://cordis.europa.eu/project/id/101007310, total funding: ≈ 62.2 M€, local funding: ≈ 352 k€, role: member of the local research team, supporting papers: 10.1109/TED.2023.3346369, 10.1088/1361-6463/ad5b6c.

R20) Progetto Integrato Fotovoltaico ad alta efficienza, 2022-2024, funding scheme: RDS, source: https://www.ricercasistemaelettrico.enea.it/accordo-di-programma-mase-enea-2022-2024/decarbonizzazione/fotovoltaico-ad-alta-efficienza.html, total funding: ≈ 17 M€, local funding: not disclosed, role: member of the local research team, supporting papers: 10.1109/JPHOTOV.2024.3492281.

R21) U.S. Office of Naval Research, grant agreement ID: various, role: member of the local research team, supporting papers: 10.1016/j.mee.2013.03.017, 10.1109/MIKON.2016.7492013, 10.1088/1361-6463/aaaf9d, 10.1109/LED.2018.2835517, 10.1109/TED.2023.3326781, 10.1109/TED.2023.3318564, 10.1109/IRPS48228.2024.10529479, 10.1016/j.prime.2021.100018, 10.1109/TED.2013.2279021, 10.1109/LED.2020.2968875, 10.3390/cryst11091037, 10.1109/WiPDA49284.2021.9645107, 10.1109/IRPS46558.2021.9405111, 10.23919/EOS/ESD52038.2021.9574733, 10.1002/pssa.202100722, 10.1109/IRPS48203.2023.10118131, 10.1109/TED.2023.3270134, 10.1109/TDMR.2023.3305033.

R22) AGAMI_EURIGAMI, 2022-2026, funding scheme: European Defense Agency, grant agreement ID: 101102983, source: https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/projects-details/44181033/101102983/EDF, total funding: ≈ 24.7 M€, local funding: ≈ 597 k€, role: member of the local research team and deputy work

package 5 leader.

R23) MoWiLife, 2024-2027, funding scheme: HORIZON-CL5-2024-D3-01, grant agreement ID: 101172657, DOI: 10.3030/101172657, source: https://cordis.europa.eu/project/id/101172657, total funding: ≈ 4 M€, local funding: ≈ 192 k€, role: member of the local research team.

Scientific society memberships

M1) Materials Research Society (MRS) member, 01/07/2018 - 30/06/2019.

M2) Society of Photo-Optical Instrumentation Engineers (SPIE) member (ID: 3423616), since 16 Jan. 2020

M3) Institute of Electrical and Electronics Engineers (IEEE) member (ID: 93789519), since 01 Jan. 2021

Fundraising activities

F1) Research contract with non-disclosable company, 100 800 €, 2023-2024.

Full list of publications (up to 20/11/2024)

Journal papers:

J1) Trivellin, Nicola; Meneghini, Matteo; DE SANTI, Carlo; Vaccari, Simone; Meneghesso, Gaudenzio; Zanoni, Enrico; Orita, K; Takigawa, S; Tanaka, T; Ueda, D., 'Degradation of InGaN lasers: Role of non-radiative recombination and injection efficiency', MICROELECTRONICS RELIABILITY, Vol. 51, pp. 1747-1751, 2011, DOI: 10.1016/j.microrel.2011.07.038.

J2) Meneghini, Matteo; DE SANTI, Carlo; Trivellin, Nicola; Orita, K; Takigawa, S; Tanaka, T; Ueda, D; Meneghesso, Gaudenzio; Zanoni, Enrico, 'Investigation of the deep level involved in InGaN laser degradation by deep level transient spectroscopy', APPLIED PHYSICS LETTERS, Vol. 99, pp. 093506-1-093506-3, 2011, DOI: 10.1063/1.3626280.

J3) Meneghini, Matteo; Santi, C. d.; T., Ueda; T., Tanaka; D., Ueda; Zanoni, Enrico; Meneghesso, Gaudenzio, 'Time- and Field-Dependent Trapping in GaN-Based Enhancement-Mode Transistors With p-Gate', IEEE ELECTRON DEVICE LETTERS, Vol. 33, pp. 375-377, 2012, DOI: 10.1109/LED.2011.2181815.

J4) Bisi, Davide; Meneghini, Matteo; DE SANTI, Carlo; Alessandro, Chini; Michael, Dammann; Peter, Bruckner; Michael, Mikulla; Meneghesso, Gaudenzio; Zanoni, Enrico, 'Deep-Level Characterization in GaN HEMTs-Part I: Advantages and Limitations of Drain Current Transient Measurements', IEEE TRANSACTIONS ON ELECTRON DEVICES, Vol. 60, pp. 3166-3175, 2013, DOI: 10.1109/TED.2013.2279021.

J5) Meneghesso, Gaudenzio; Meneghini, Matteo; Stocco, Antonio; Bisi, Davide; DE SANTI, Carlo; Rossetto, Isabella; Zanandrea, Alberto; Rampazzo, Fabiana; Zanoni, Enrico, 'Degradation of AlGaN/GaN HEMT devices: Role of reverse-bias and hot electron stress', MICROELECTRONIC ENGINEERING, Vol. 109, pp. 257-261, 2013, DOI: 10.1016/j.mee.2013.03.017.

J6) DE SANTI, Carlo; Meneghini, Matteo; Carraro, Simone; Vaccari, Simone; Trivellin, Nicola; S., Marconi; M., Marioli; Meneghesso, Gaudenzio; Zanoni, Enrico, 'Variations in junction capacitance and doping activation associated with electrical stress of InGaN/GaN laser diodes', MICROELECTRONICS RELIABILITY, Vol. 53, No. 9-11, pp. 1534-1537, 2013, DOI: 10.1016/j.microrel.2013.07.053.

J7) DAL LAGO, Matteo; Meneghini, Matteo; DE SANTI, Carlo; Barbato, Marco; Trivellin, Nicola; Meneghesso, Gaudenzio; Zanoni, Enrico, 'ESD on GaN-based LEDs: An analysis based on dynamic electroluminescence measurements and current waveforms', MICROELECTRONICS RELIABILITY, Vol. 54, No. 9-10, pp. 2138-2141, 2014, DOI: 10.1016/j.microrel.2014.07.122.

J8) DE SANTI, Carlo; Meneghini, Matteo; H., Ishida; T., Ueda; Meneghesso, Gaudenzio; Zanoni, Enrico, 'Gate frequency sweep: An effective method to evaluate the dynamic performance of AlGaN/GaN power heterojunction field effect transistors', APPLIED PHYSICS LETTERS, Vol. 105, pp. 073507-1-073507-3, 2014, DOI: 10.1063/1.4893607.

J9) DE SANTI, Carlo; Meneghini, Matteo; Trivellin, Nicola; Gerardin, Simone; Bagatin, Marta; Paccagnella, Alessandro; Meneghesso, Gaudenzio; Zanoni, Enrico, 'Recoverable degradation

of blue InGaN-based light emitting diodes submitted to 3MeV proton irradiation', APPLIED PHYSICS LETTERS, Vol. 105, pp. 13506-13506, 2014, DOI: 10.1063/1.4902870.

J10) DE SANTI, Carlo; Meneghini, Matteo; Marioli, MICHAEL SIMONE; Buffolo, Matteo; Trivellin, Nicola; T., Weig; K., Holc; K., Koehler; J., Wagner; U. T., Schwarz; Meneghesso, Gaudenzio; Zanoni, Enrico, 'Thermally-activated degradation of InGaN-based laser diodes: Effect on threshold current and forward voltage', MICROELECTRONICS RELIABILITY, Vol. 54, No. 9-10, pp. 2147-2150, 2014, DOI: 10.1016/j.microrel.2014.07.073.

J11) LA GRASSA, Marco; Meneghini, Matteo; DE SANTI, Carlo; Mandurrino, Marco; Goano, Michele; Bertazzi, Francesco; Zeisel, Roland; Galler, Bastian; Meneghesso, Gaudenzio; Zanoni, Enrico, 'Ageing of InGaN-based LEDs: Effects on internal quantum efficiency and role of defects', MICROELECTRONICS RELIABILITY, Vol. 55, No. 9-10, pp. 1775-1778, 2015, DOI: 10.1016/j.microrel.2015.06.103.

J12) Marioli, MICHAEL SIMONE; Meneghini, Matteo; Rossi, F.; Salviati, G.; DE SANTI, Carlo; Mura, G.; Meneghesso, Gaudenzio; Zanoni, Enrico, 'Degradation mechanisms and lifetime of state-of-the-art green laser diodes', PHYSICA STATUS SOLIDI. A, APPLICATIONS AND MATERIALS SCIENCE, Vol. 212, No. 5, pp. 974-979, 2015, DOI: 10.1002/pssa.201431714.

J13) DE SANTI, Carlo; DAL LAGO, Matteo; Buffolo, Matteo; Monti, Desiree; Meneghini, Matteo; Meneghesso, Gaudenzio; Zanoni, Enrico, 'Failure causes and mechanisms of retrofit LED lamps', MICROELECTRONICS RELIABILITY, Vol. 55, No. 9-10, pp. 1765-1769, 2015, DOI: 10.1016/j.microrel.2015.06.080.

J14) Buffolo, Matteo; DE SANTI, Carlo; Meneghini, Matteo; Rigon, D.; Meneghesso, Gaudenzio; Zanoni, Enrico, 'Long-term degradation mechanisms of mid-power LEDs for lighting applications', MICROELECTRONICS RELIABILITY, Vol. 55, No. 9-10, pp. 1754-1758, 2015, DOI: 10.1016/j.microrel.2015.06.098.

J15) Musolino, M.; Van Treeck, D; Tahraoui, A.; Scarparo, L.; DE SANTI, Carlo; Meneghini, Matteo; Zanoni, Enrico; Geelhaar, L.; Riechert, H., 'A physical model for the reverse leakage current in (In,Ga)N/GaN light-emitting diodes based on nanowires', JOURNAL OF APPLIED PHYSICS, Vol. 119, No. 4, pp. 044502-, 2016, DOI: 10.1063/1.4940949.

J16) DE SANTI, Carlo; Meneghini, Matteo; Meneghesso, Gaudenzio; Zanoni, Enrico, 'Degradation of InGaN laser diodes caused by temperature- and current-driven diffusion processes', MICROELECTRONICS RELIABILITY, Vol. 64, pp. 623-626, 2016, DOI: 10.1016/j.microrel.2016.07.118.

J17) LA GRASSA, Marco; Meneghini, Matteo; DE SANTI, Carlo; Zanoni, Enrico; Meneghesso, Gaudenzio, 'Degradation of InGaN-based LEDs related to charge diffusion and build-up', MICROELECTRONICS RELIABILITY, Vol. 64, pp. 614-616, 2016, DOI: 10.1016/j.microrel.2016.07.131.

J18) Monti, Desiree; Meneghini, Matteo; DE SANTI, Carlo; Meneghesso, Gaudenzio; Zanoni, Enrico, 'Degradation of UV-A LEDs: Physical Origin and Dependence on Stress Conditions', IEEE TRANSACTIONS ON DEVICE AND MATERIALS RELIABILITY, Vol. 16, No. 2, pp. 213-219, 2016, DOI: 10.1109/TDMR.2016.2558473.

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Invited book chapters:

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