# Curriculum Vitae

# Stefano Bonaldo

**Postdoctoral researcher**
University of Padova
Department of Information Engineering
Via Gradenigo, 6/B
35131 Padova, Italy

**BRIEF CARRIER DESCRIPTION**

In February 2013, I obtained the **Bachelor's Degree in Information Engineering** at the University of Padova, Italy, with experimental thesis in the field of optics and photonics. In 2015, I worked at **CERN**, Switzerland, for 9 months for my Master's degree thesis, where I have developed and characterized a **sensor electronic system** based on FETs, pin-diodes, and memories for monitoring the radiation level at CHARM facility, currently used to test the reliability of electronics in radiation environments. In September 2016, I received the **Master's degree in Electronic Engineering** at the University of Padova, Italy. Subsequently, I started the PhD program at the University of Padova with major focus on **radiation effects on contemporary Si and III-V FETs**, where I explored the total ionizing dose effects up to ultra-high doses for space and high-energy physics experiments. In 2018, I was invited as a **visiting research scholar at Vanderbilt University**, USA, for 11 months, where I investigated the radiation mechanisms degrading the electrical response of **III-V transistors**. In February 2020, I got my **PhD degree in Information Engineering** and continued my research in the field of **radiation effects on electronics**, bringing important contributions that led me to win the **IEEE Paul Phelps Award** [A5], sponsored by IEEE Nuclear and Plasma Science Society – NPSS, for my outstanding research work as a young researcher in the field of nuclear and plasma science. Currently, in this research line, I am working in the field of **total-ionizing dose effects in contemporary CMOS technologies**, and I am actively contributing to the research in radiation effects on electronics within several international projects and collaborations.

In parallel, starting from 2019, I wanted to expand my research activity in the field of **biosensors**, keeping the focus on the electronics and hardware side of sensing devices. I won three consecutive "**Assegni di Ricerca**" at the Department of Information Engineering, University of Padova, including an "**Assegno Junior**" and an "**Assegno Senior**" with presented peer-reviewed projects on **developing rapid and cost-effective sensing devices for pathogens**. Since then, I have started building up my multidisciplinary **research experience in sensors and biosensors** with projects involving agri-food and medical applications. Currently, I am working on electrochemical sensors based on **screen-printed electrodes and on graphene-based FETs**.

Since 2020, I have carried out **teaching activities** (frontal lesson) in the **Biosensor** course and I have developed a completely new course organized by myself in **Biometrics**. Students' assessment of the quality of the teaching activity was very high, as demonstrated by the attached documentation.

Important contributions of my research are:
- Exploration of radiation-induced effects in transistors fabricated into several CMOS technologies, following their scaling down: 150 nm Si MOSFETs, 65 nm Si MOSFETs, 28 nm high-k oxide Si MOSFETs, 16 nm InGaAs FinFETs, 16 nm Si FinFETs, and Gate-All-Around Si nano-wire FETs (GAA-FETs).

- Analysis of the dominant microscopic mechanisms induced by total-ionizing-dose in contemporary CMOS transistors.
- Study of radiation-induced effects degrading the electrical response of devices working in extreme environments, i.e., at ultra-high dose levels.
- Proposal of guidelines on how to improve the radiation tolerance of integrated circuits by selecting proper radiation tolerant transistors.
- Development of electrochemical biosensors for the rapid and cost-effective detection of pathogens in medical and agri-food applications.
- Design and implementation of optical systems and instruments for biosensing applications.
- Development of multi-physics simulations of electrochemical screen-printed biosensors.

## EDURATION

**September 2019**

**Ph.D.** in **Information Engineering** (3 years)
University of Padova, Department of Information Engineering – DEI, Padova, Italy

*Supervisor (University of Padova, Italy):* Prof. Alessandro Paccagnella
*Co-supervisor (Vanderbilt University, USA):* Prof. Daniel Fleetwood

*Thesis Title:* Total ionizing dose degradation mechanism in nanometer-scale microelectronic technologies

My research explored the total ionizing dose degradation mechanisms of deeply scaled transistors at microscopical level. I have tested transistors and electronics devised for high energy physics experiment and space applications. Transistors from different technology nodes were tested in order to evaluate their radiation tolerance up to never-explored ultra-high doses. By dc characterizations, charge pumping and low frequency noise measurements, as well as Technology Computer-Aided Design simulations, I have studied and identified the location, density and energy levels of the radiation induced defects. I have demonstrated that the aggressive device downsizing has led to new TID-induced degradation mechanisms related to dielectrics and modern production processes. My PhD thesis was awarded with the *2020 IEEE Emilio Gatti and Franco Manfredi Best Ph.D. Thesis Award [A3].*

**September 2016**

**Master's Degree** in **Electronic Engineering** (2 years)
University of Padova, Department of Information Engineering – DEI, Padova, Italy

*Supervisor (University of Padova, Italy):* Prof. Alessandro Paccagnella
*Co-supervisor (CERN, Switzerland):* Dr. Salvatore Danzeca

*Final grade*: 108/110

*Thesis Title:* CHARM: a new mixed-field facility for radiation test on electronics

My research activity was focused on the development of the radiation monitoring system for measuring the radiation levels at the CERN high energy mixed field facility (CHARM). I have carried out extensive irradiation campaigns for the proper calibration of the radiation sensors, including RadFETs, SRAMs and pin diodes. Moreover, I coordinated the activities for the 2016 commissioning of the CHARM facility by characterizing the radiation levels in the irradiation chamber in terms of total ionizing dose, 1-MeV neutron equivalent fluence and high energy hadron fluence. The results provided the basis for future calibrations and improvements of the radiation instrumentation of the facility and are currently used as a reference for several users to test and qualify their electronic equipment.

**February 2013**

**Bachelor's Degree** in **Information Engineering** (3 years)
University of Padova, Department of Information Engineering – DEI, Padova, Italy

*Supervisor (INF - CNR, Italy):* Prof.ssa Maria Guglielmina Pelizzo
*Co-supervisor (INF - CNR, Italy):* Dr. Alain Jody Corso

*Thesis Title:* Optical interferometer for the fine control of the polarization status of a beam

I designed, built and tested an optical system for generating a beam with variable and controllable polarization status. In the first part, I developed and analyzed the optical interferometer from a theoretical point of view. An interferometric system, consisting of a division system, a phase delay system and a recombination system, modifies the polarization state of the electromagnetic wave by controlling the optical path. Therefore, I experimentally realized the optical interferometer using only reflective elements, allowing its application in a wide spectral band, from the near infrared to the extreme ultraviolet. The built system was able to generate different states of polarization: linear, elliptical and circular.

## RESEARCH EXPERIENCE

**November 2022 to present**

**Postdoctoral researcher with "Assegno di Ricerca Senior - Tipo B"** (2 years)

Department of Information Engineering, University of Padova, Padova, Italy

*Supervisor (University of Padova, Italy):* Prof. Alessandro Paccagnella

*Research topics*: screen-printed devices, electrochemical biosensors, reduced graphene, oxide FET sensors, and COMSOL Multiphysics simulations

My research is multidisciplinary and aims at designing, developing, characterizing, and validating innovative biosensors for the agri-food sector, mostly for detecting phages and bacteria, as phages of *Lactobacillus helveticus* and *Escherichia coli*, but with the possibility of extending the detection methods to other pathogens in the context of health safety. The concept of developing phage biosensors was boosted by the successful results I obtained with ideal-lab solutions during my previous "assegno di ricerca", having now the goal of validating the biosensor platform with biological samples. In parallel, I am also using biosensors based on field-effect transistors with several functionalization types, as single-strand DNA (ssDNA-FETs), in order to improve the relatively low sensitivity of previous impedimetric sensors. I am implementing different experimental tools, as DC, electrochemical impedance spectroscopy, cyclic voltammetry and low frequency noise measurements, to evaluate the sensitivity and performance of biosensors. I developed equivalent circuit models to extrapolate the most sensitive elements in the sensing process, and I use COMSOL Multiphysics to model the complex system and optimize the sensor layout.

**November 2020 to October 2022**

**Postdoctoral researcher with "Assegno di Ricerca Junior - Tipo B"** (2 years)

Department of Information Engineering, **University of Padova**, Padova, Italy

*Supervisor (University of Padova, Italy):* Prof. Alessandro Paccagnella

*Research topics*: screen-printed devices, electrochemical biosensors, genosensors, optical sensors, and COMSOL Multiphysics simulations

My research activity was mainly focused on two topics, namely: *i)* the development of a single-strand-DNA biosensor for the rapid detection of *Campylobacter*, which is the leading cause of acute human foodborne bacterial gastroenteritis; and *ii)* an electrochemical biosensor for the detection of *Lactococcus lactis* phage, which is a detrimental pathogen in the production of milk derivatives of dairy industry. I evaluated biosensors' performances before and after functionalization of the electrode surfaces, experimentally characterized through cyclic voltammetry, electrochemical impedance spectroscopy, differential double pulse voltammetry approaches, and optical techniques, as absorbance and surface plasmon resonance. In parallel, I developed simulations models able to reproduce the electrical responses of drop-based electrochemical biosensors through COMSOL software, allowing to understand the critical parameters and optimize the performances of devices.

**November 2019 to October 2020**

**Postdoctoral researcher with "Assegno di Ricerca - Tipo A"** (1 year)

Department of Information Engineering, **University of Padova**, Padova, Italy

*Supervisor (University of Padova, Italy):* Prof. Alessandro Paccagnella

*Research topics*: screen-printed electrodes, electrochemical cells, and COMSOL Multiphysics simulations

After my return to Italy, my research moved toward the development of sensors and biosensors for agri-food and medical applications. I developed and validated a self-built laboratory electrochemical cell based on 3D-printed structure, whose design allows reliable electrochemical measurements in a rapid, simple and comfortable way. The electrochemical cells were tested using external and screen-printed electrodes of different layouts and electrode materials, and/or using a gold flat substrate obtained from DVDs. The sensors were experimentally characterized by cyclic voltammetry and electrochemical impedance spectroscopy measurements. By COMSOL simulations, I also evaluated the spatial distribution of equipotential lines, evidencing some criticalities in scaled electrodes. Finally, part of my research was also dedicated to radiation effects on scaled devices for ultra-high dose applications.

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| September 2018 to July 2019 | **Visiting research scholar** (11 months) |

Dept. of Electrical Engineering and Computer Science, **Vanderbilt University**, Nashville, USA

*Supervisor (Vanderbilt University, USA):* Prof. Daniel M. Fleetwood

*Research topics*: radiation effects on electronics, total ionizing dose mechanisms in III-V transistors, and low frequency noise response

My research was focused on the total ionizing dose mechanisms in III-V devices with high-k gate stacks. In collaboration with Imec (Leuven, Belgium), I organized and performed irradiation tests with X-rays. TID responses of transistors were characterized by DC, C-V, I-V hysteresis and low frequency noise measurements at several temperatures. By comparing the experimental data with density functional theory-based calculations, I identified the location, type and microscopical nature of the defects activated during irradiations and their relationships with irradiation bias conditions.

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| October 2016 to September 2019 | **PhD** (3 years) |

Department of Information Engineering, **University of Padova**, Padova, Italy; National Institute of Nuclear Physics – INFN, Padova, Italy

*Supervisor (University of Padova, Italy):* Prof. Alessandro Paccagnella

*Research topics*: radiation effects in ICs and microelectronic devices, total ionizing dose mechanisms in nanometer-scaled devices, effects at ultra-high doses, and TCAD Sentaurus simulations

My research work was focused on the exploration of total ionizing dose degradation mechanisms in nanometre-scaled FET technologies. I tested MOSFETs and FinFETs devised for high energy physics experiment and space applications. Devices from different technology nodes were tested in order to evaluate their radiation tolerance up to never-explored ultra-high doses. By DC static characterization, charge pumping and low frequency noise measurements, as well as Technology Computer-Aided Design simulations, I studied and identified the location, density and energy levels of the radiation induced defects. The results I obtained demonstrate that the aggressive device downsizing has led to new TID-induced degradation mechanisms related to dielectrics and modern production processes.

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| September 2015 to May 2016 | **Research contract as technical student** (9 months) |

Engineering Department; Source, Targets and Interactions Group; Equipment Controls & Electronics Section, **CERN**, Geneva, Switzerland

*Supervisor (CERN, Switzerland):* Dr. Salvatore Danzeca

*Research topics*: electronic devices and systems for sensing the radiation levels, radiation sensors, dosimetry, and radiation testing facilities

My research activity was focused on the development of radiation monitoring systems for measuring radiation levels at the CERN high energy mixed field facility (CHARM). I carried out extensive irradiation campaigns for the proper calibration of radiation sensors, including RadFETs, SRAMs and pin diodes. Moreover, I coordinated the activities for the 2016 commissioning of CHARM facility by characterizing the radiation levels in the irradiation chamber in terms of total ionizing dose, 1-MeV neutron equivalent fluence and high energy hadron fluence. The obtained results provided the basis for

future calibrations and improvements of the radiation equipment of the facility, and they are currently used as a reference for several users to test and qualify their electronic equipment. The results of my work at CERN are included in my Master's Degree thesis, entitled "*CHARM: A New Mixed-Field Facility for Radiation Test on Electronics*".

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| June 2012 to February 2013 | **Research experience** (9 months) |

Institute for Photonics and Nanotecnology, **National Research Council (IFN - CNR)**, Padova, Italy

*Supervisor (INF – CNR, Italy):* Prof. Maria Guglielmina Pelizzo

*Research topics*: optics and photonics

I designed, built and tested an optical system for the generation of a beam with a variable and controllable polarization. The results of my work are included in my Bachelor's Degree thesis, entitled "*Optical interferometer for the fine control of the polarization status of a beam*".

## TEACHING EXPERIENCES ■

Details about the evaluation of teaching by students are included in the attached documents of this application.

**A.Y. 2023-24**

**Insegnamento a contratto** in **Biosensori (ING-INF/01 – Elettronica)** for **Master's Degree in Bioengineering (LM-21)**

Department of Information Engineering, University of Padova, Padova, Italy

I held a course of 24 hours (3 CFU) of teaching in Biosensors during the first semester of academic year 2023-24. My teaching module was focused on the laboratory experiences and exercises on the electrical and optical methodologies in the field of biosensors, including measurements of voltammetry, electrochemical impedance spectroscopy, absorbance, and surface plasmon resonance. Lessons included frontal teaching and laboratory activities.

Evaluation of teaching by students (from UniPD website, scores 0-10):
- *"Satisfaction"*: average 8.2, median 8
- *"Teaching"*: average 8.4, median 8.5
- *"Organization"*: average 8.6, median 8.8

**A.Y. 2022-23**

**Insegnamento a contratto** in **Biometrics (ING-INF/01 – Elettronica)** for **Master's Degree in Cybersecurity (LM-66)** and **Master's Degree in ICT for Internet and Multimedia (LM-27)**

Department of Information Engineering, University of Padova, Padova, Italy

School of Science, University of Padova, Padova, Italy

I held a course of 16 hours (2 CFU) of teaching in Biometrics in English language during the second semester of academic year 2022-23. My teaching module was devoted to the hardware (electronics) of biometric sensors.

Evaluation of teaching by students (from UniPD website, scores 0-10):
- *"Satisfaction"*: average 8.4, median 9
- *"Teaching"*: average 8.9, median 9
- *"Organization"*: average 8.8, median 9

**A.Y. 2022-23**

**Didattica integrativa** in **Biosensori (ING-INF/01 – Elettronica)** for **Master's Degree in Bioengineering (LM-21)**

Department of Information Engineering, University of Padova, Padova, Italy

I held 18 hours of teaching classes and laboratory classes in Biosensors during the first semester of academic year 2022-23.

**A.Y. 2021-22**  **Insegnamento a contratto** in **Biometrics (ING-INF/01 – Elettronica)** for **Master's Degree in Cybersecurity (LM-66)** and **Master's Degree in ICT for Internet and Multimedia (LM-27)**

Department of Information Engineering, University of Padova, Padova, Italy

School of Science, University of Padova, Padova, Italy

I held a course of 24 hours (3 CFU) of teaching in Biometrics in English language during the second semester of academic year 2021-22. My teaching module was devoted to the hardware (electronics) of biometric sensors.

Evaluation of teaching by students (from UniPD website, scores 0-10):
- *"Satisfaction"*: average 8.4, median 9
- *"Teaching"*: average 8.5, median 8.5
- *"Organization"*: average 8.5, median 8.7

**A.Y. 2021-22**  **Didattica integrativa** in **Biosensori (ING-INF/01 – Elettronica)** for **Master's Degree in Bioengineering (LM-21)**

Department of Information Engineering, University of Padova, Padova, Italy

I held 18 hours of teaching classes and laboratory classes in Biosensors during the first semester of academic year 2021-22.

**A.Y. 2020-21**  **Insegnamento a contratto** in **Biometrics (ING-INF/01 – Elettronica)** for **Master's Degree in Cybersecurity (LM-66)** and **Master's Degree in ICT for Internet and Multimedia Engineering (LM-27)**

Department of Information Engineering, University of Padova, Padova, Italy

School of Science, University of Padova, Padova, Italy

I held a course of 24 hours (3 CFU) of teaching in Biometrics in English language during the second semester of academic year 2020-21. My teaching module was devoted to the hardware of biometric sensors. The Biometrics course was new and it was entirely organized and structured by myself.

Evaluation of teaching from students (from UniPD website, scores 0-10):
- *"Satisfaction"*: average 8.5, median 8
- *"Teaching"*: average 8.5, median 9
- *"Organization"*: average 9, median 9.5

**A.Y. 2020-21**  **Didattica integrativa** in **Biosensori (ING-INF/01 – Elettronica)** for **Master's Degree in Bioengineering (LM-21)**

Department of Information Engineering, University of Padova, Padova, Italy

I held 18 hours of teaching classes and laboratory classes in Biosensors during the first semester of A.Y. 2020-21.

## AWARDS ■

A1.  **Electronics 2023 Travel Award** by MDPI Electronics for presenting the first-authored work "*Radiation-induced charge trapping in shallow trench isolations of FinFETs*", selected for oral presentation [T3] at the IEEE Nuclear and Space Radiation Effects Conference (NSREC 2023), Kansas City, USA, July 24th-28th, 2023.

A2.  **Best Student Conference Abstract Award**, Radiation and its Effects on Components and Systems Conference 2020 - RADECS 2020, for the co-first authored paper "*TID degradation mechanisms in 16 nm bulk FinFETs irradiated to ultra-high doses*",

presented as oral talk [T15], and published [J18] on IEEE Transactions on Nuclear Science, vol. 68, no. 8, pp. 1571-1578, May 2021.

A3. **2020 IEEE Emilio Gatti and Franco Manfredi Best Ph.D Thesis Award** in Radiation Instrumentation, 2020, for my PhD thesis entitled "*Total ionizing dose degradation mechanisms in nanometer-scale microelectronic Technologies*". I was awarded by IEEE Nuclear Plasma Science Italy Chapter following a selection carried out by a committee of international experts. The award was announced on 17 December 2020 through a dedicated event, where I held an invited talk [I8], online due to the pandemic from COVID-19.

A4. **Conference Best Student Paper Award**, IEEE Nuclear and Space Radiation Effects Conference - NSREC 2019, for the first-authored paper "*Total-ionizing-effects and low-frequency noise in 16-nm InGaAs FinFETs with $HfO_2/Al_2O_3$ dielectrics*", presented as oral talk [T20], and published [J22] on IEEE Transactions on Nuclear Science, vol. 67, no. 1, pp. 210-220, January 2020.

A5. **2019 Paul Phelps Continuing Education Grant Award** by the IEEE Nuclear and Plasma Sciences Society (NPSS) for the exceptional research work carried out as a young researcher in the field of Nuclear and Plasma Science (NPS). The prize was awarded following a peer-reviewed selection and was announced during the IEEE international conference Nuclear and Space Radiation Effects Conference - NSREC 2019, San Antonio, USA, September 2019.

A6. **2nd Best Oral Presentation** at the 50th Annual Meeting of the Italian Electronic Society - SIE 2018, for the oral presentation [T26] "*Effects of LDD spacer dielectrics on 65 nm pMOSFETs irradiated to ultra-high doses*", Napoli, Italy, June 2018.

A7. **Conference Outstanding Paper Award** of IEEE Nuclear and Space Radiation Effects Conference - NSREC 2017, New Orleans, USA. I was awarded with the prize (plaque in wood and metal) after selection by the NSREC award committee for the work entitled "*Influence of LDD spacers and $H^+$ transport on the total-ionizing-dose response of 65-nm MOSFETs irradiated to ultrahigh doses*", presented as oral talk [T28], and published [J30] on IEEE Transactions on Nuclear Science, vol. 65, no. 1, pp. 164-174, January 2018.

## RESEARCH PROJECTS AND COLLABORATIONS

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### Project Responsibility

I am responsible, with the role of principal investigator, for the following ongoing or completed projects

2022-ongoing
*(2 years)*

**BiPAS - Biosensing Pathogens in the Agrifood Sector**

*Funder*: University of Padova, Italy

*Description*: I am PI of this project, funded by the Department of Engineering of Information of the University of Padua, for a senior research grant awarded following peer-reviewed evaluation of submitted research proposals. The research project focuses on the development of electronic, electrochemical devices and FET transistors for monitoring and quantifying pathogens in food products. Contract signed on 11/11/2022 and registered in the repertoire n. 298/2022, prot. No. 3599 of 11/11/2022 at University of Padova.

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| 2020-2022 *(2 years)* | **Development of biosensors for the rapid detection of contamination of pathogens in agri-food applications** |

*Funder*: University of Padova, Italy

*Description*: I was PI of this project, funded by the Department of Engineering of Information of the University of Padova, for a junior research grant awarded following peer-reviewed evaluation of submitted research proposals. The research project focused on the development and electrical characterization of capable electronic and biosensor devices to detect the presence of pathogens of interest in agri-food applications. Contract signed on 11/11/2020 and protocol in the repertoire n. 210, prot. No. 2665 of 11/11/2020 at University of Padova.

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| **Projects** | I actively participated or currently participate in the following research projects |
| 2021-ongoing *(3 years)* | **Miniaturised biosensors with high selectivity** |

*Funder*: Australian Research Council, Australia

*Objective*: Development of miniaturized wearable sensors capable of detecting analytes of interest through technologies based on multi-enzymatic reactions with high selectivity performance.

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| 2020-ongoing *(3 years)* | **FaLaPHEL – Fast links and RadHard front end with integrated photonics and electronics for physics** |

*Funder*: National Institute of Nuclear Physics – INFN, Italy

*Objective*: Development of readout electronics for pixel detector circuits for the high energy physics experiments at CERN.

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| 2018-2020 [Extended until 2022 due to COVID-19] *(2 years)* | **Sviluppo di un biosensore per l'identificazione rapida di partite di polli da carne positive per *Campylobacter* spp** |

*Funder*: Ministry of Health, Italy

*Objective*: Development and electrical characterization of a biosensor capable of detecting *Campylobacter* spp.

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| 2018-2020 *(3 years)* | **FinFET16v2 - Low-power rad-hard design in finFeT-16nm technology** |

*Funder*: National Institute of Nuclear Physics – INFN, Italy

*Objective*: Study of the 16 nm FINFET technology for the development of readout electronics for future upgrades of the detectors installed in the high energy physics experiments at CERN.

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| 2016-2018 *(3 years)* | **LF15A Evaluation** |

*Funder*: European Space Agency

*Objective*: Assessment of damage induced by ionizing radiation in electronic devices manufactured in LFoundy's LF15A semiconductor technology for ESA space applications.

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| 2015-2017 *(3 years)* | **SCALTECH28 – Low-power rad-hard design in 28nm** |

*Funder*: National Institute of Nuclear Physics – INFN, Italy

*Objective*: Study of the 28 nm MOSFET planar technology for the development of the readout electronics, aimed at future upgrades of the detectors installed in the high energy physics experiments at CERN.

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| 2014-2015 *(2 years)* | **Radiation to Electronics (R2E)** |

*Funder*: European Organization for Nuclear Research – CERN, Switzerland

*Objective*: Evaluation of electronic components for the correct functioning of CERN accelerators in highly radioactive environments.

**Collaborations**

I have collaborated or currently collaborate with the following institutions, organizations, universities, and companies

Continuative collaborations, attested by at least three joint publications:
- ARC – Applied Research Center s.r.l., Italy
- ARCADIA s.r.l., Italy
- CERN, Switzerland
- École Polytechnique Fédérale de Lausanne – EPFL, Switzerland
- Imec, Belgium
- INFN – National Institute of Nuclear Physics, Section of Milano, Padova and Legnaro, Italy
- Northwest Institute of Nuclear Technology, China
- University of Bergamo, Italy
- University of Milano-Bicocca, Italy
- University of Udine, Italy
- Vanderbilt University, USA

Collaborations attested by at least one joint publication:
- Catalan Institute of Nanoscience and Nanotechnology - ICN2, Spain
- Catalan Institution for Research and Advanced Studies – ICREA, Spain
- Centre National d'Etudes Spatiales – CNES, France
- CNR – National Research Council, Institute of Photonics and Nanotechnology, Italy
- CUAMM – Medici con l'Africa Non-Governmental Organization, Italy
- ETH Zurich, Switzerland
- IZSVe – Istituto Zooprofilattico delle Venezie, Italy
- ISIS Neutron and Muon Source, Science and Technology Facilities Council, UK
- KU Leuven – Katholieke Universiteit Leuven, Belgium
- Japan Atomic Energy agency, Japan
- LFoundry s.r.l., Italy
- Mackenzie Presbyterian University, Brazil
- MIT – Massachusetts Institute of Technology, USA
- UCSB – University of California Santa Barbara , USA
- University of Brescia, Italy
- University of Salento, Italy
- University of Trieste, Italy
- Up-Code s.r.l., Italy

**Research groups**

I joined the following international research groups:

November 2019-now

*Biodevices* research group at the Department of Information Engineering, **University of Padova**, Italy, in the context of the development, characterization and validation of sensors and biosensors for agri-food and medical applications.

September 2018-July 2019

*Radiation Effects and Electronics Reliability* research group at the Department of Electrical Engineering and Computer Science, **Vanderbilt University**, USA, within the study of the effects of ionizing radiation in semiconductor devices manufactured with modern technologies using materials of group III-V.

October 2016-now

*Reliability and Radiation Effects on Advanced CMOS Technologies (RREACT)* research group at the Department of Information Engineering, **University of Padova**, Italy, in the

context of the study of CMOS technology reliability and the effects of ionizing radiation on electronic components.

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| September 2015-<br>May 2016 | ***Equipment Controls & Electronics Section*** at the Department of Engineering, **CERN**, Switzerland, with contract of association. My research activity at CERN was focused on the development, testing and calibration of electronic radiation level monitoring systems at the CHARM facility, using RadFETs, SRAM memories and pin diodes as radiation sensors. |

## MENTORING ■

**Ph.D. students**  I co-supervised 2 Ph.D. students in Information Engineering:

1. Lara Franchin, currently pursuing her Ph.D. in Information Engineering on electrochemical and FET-based biosensors for the rapid and low-cost detection of pathogens in agrifood applications; expected PhD defence in February 2026.
2. Teng Ma, "*Total Ionizing Dose Effects in Nanometer Scale CMOS Technologies Irradiated to Ultra-High Doses*", Ph.D. in Information Engineering, February 2022.

**Master's students**  I co-supervised 26 graduated students pursuing the Master's Degree in Electronic Engineering or in Bioengineering:

1. Alessandro Castellaro, currently pursuing the Master's Degree in Bioengineering, developing and characterizing an innovative graphene-based FET platform for sensing applications; expected thesis defence in October 2024.
2. Alice Norina Angela Ghislandi, currently pursuing the Master's Degree in Bioengineering, developing an ion-sensitive platform for the detection of $K^+$ and $Na^+$ ions in patients suffering from water retention; expected thesis defence in October 2024.
3. Federico Muraro, currently pursuing the Master's Degree in Bioengineering, studying the influence of porous surfaces in the electrochemical sensors by COMSOL simulations; expected thesis defence in October 2024.
4. Lorena Gallizioli, currently pursuing the Master's Degree in Bioengineering, developing COMSOL models capable of simulating the electrochemical response of screen-printed electrodes; expected thesis defence in October 2024.
5. Gabriele Andreetta, currently pursuing the Master's Degree in Electronic Engineering through internship at CERN, Switzerland, developing sensors and electronic systems for monitoring the radiation levels in high-energy physics experiments; expected thesis defence in September 2024.
6. Emanuele Ferriani, currently pursuing the Master's Degree in Bioengineering, developing reduced graphene oxide rGO FET sensors for food security applications; expected thesis defence in March 2024.
7. Thomas Cogo, currently pursuing the Master's Degree in Bioengineering, designing and developing an electronic bracelet for detecting the children malnutrition in low-income countries; expected thesis defence in March 2024.
8. Mara Meni, currently pursuing the Master's Degree in Bioengineering, developing COMSOL Multiphysics simulations for screen-printed electrochemical devices; expected thesis defence in September 2023.
9. Teresa Bertozzi, currently pursuing the Master's Degree in Bioengineering, working on screen-printed biosensors for detecting phages of diary industry; expected thesis defence in September 2023.
10. Alessio Lerede, currently pursuing the Master's Degree in Bioengineering, modelling and developing COMSOL simulations of electrochemical impedance spectroscopy of electrochemical sensors; expected thesis defence in September 2023.

11. Fabio Bartolucci, currently pursuing the Master's Degree in Bioengineering, working on FET-based biosensors capable of detecting pathogens in the field of agri-food; expected thesis defence in September 2023.

12. Riccardo Vernile, "*Electrochemical biosensors for the detection of bacteriophages of Lactococcus lactis in milk samples*", Master's Degree in Bioengineering, April 2023.

13. Sara Poggi, "*Detection of Lactococcus lactis bacteriophages in milk samples by using electrochemical biosensors*", Master's Degree in Electronic Engineering, October 2022.

14. Stefano Contini, "*Development and fabrication of a bio-sensor system for the detection of chemo-therapeutic agents in plasma sample",* Master's Degree in Bioengineering, October 2022.

15. Silvia Pontara, "*Multiphysics simulations of commercial biosensors*", Master's Degree in Bioengineering, March 2022.

16. Federico Magalini, "*Detection of L. lactis bacteriophages in milk samples by an electrochemical biosensor*", Master's Degree in Bioengineering, March 2022.

17. Lara Franchin, "*Development of an impedimetric genosensor for Campylobacter detection in agri-food sector*", Master's Degree in Bioengineering, March 2022.

18. Omar Zanini, "*Modelling of electrochemical biosensors through multiphysics simulations*", Master's Degree in Bioengineering, September 2021.

19. Angela Iurlo, "*Electrochemical biosensing of L. lactis Phage for the dairy industry*", Master's Degree in Bioengineering, September 2021.

20. Luca Rocatello, "*Development of an electrochemical genosensor for the detection of Campylobacter*", Master's Degree in Bioengineering, September 2021.

21. Federico Dal Lago, "*Portable digital stadiometer for assessing the malnutrition degree of children in low-income countries*", Master's Degree in Electronic Engineering, March 2021.

22. Matteo Rossato, "*Electrochemical impedance spectroscopy of biosensors analyzed through multiphysics simulation*", Master's Degree in Bioengineering, July 2021.

23. Nicolò Valle, "*An electrochemical biosensor for the detection of Lactococcus lactis bacteriophages for the dairy sector*", Master's Degree in Bioengineering, July 2021.

24. Deborah Verri, "*Biosensors for SARS-CoV detection*", Master's Degree in Bioengineering, November 2020.

25. Daniele Gambaletta, "*Influence of the transistor layout on the TID effects of 28 nm MOSFETs irradiated at ultra-high doses*", Master's Degree in Electronic Engineering, 2018.

**Bachelor's students**

I co-supervised 1 undergraduate student pursuing the Bachelor's Degree in Electronic Engineering:

1. Sara Chemello, "*Development of an Arduino based low-cost system for impedance spectroscopy*", Bachelor's Degree in Electronic Engineering, 2021.

# PUBLICATIONS ■

The following sections include a complete list of all publications. Additional information for the 12 selected papers submitted for the evaluation by the committee is provided in a specific document attached to this application.

**Bibliometric indicators**

Overall, I am co-author of **31 journal publications (19 as first-author and/or corresponding author)**, including 4 journal publications currently under revision, and **8 conference proceedings (3 as first-author and/or corresponding author)**.

**International peer-reviewed journals**

The symbol (§) identifies co-first authorship and the symbol (*) identifies corresponding authorship.

J1. **S. Bonaldo\***, T. Wallace, H. Barnaby, G. Borghello, G. Termo, F. Faccio, D. Fleetwood, A. Baschirotto, S. Mattiazzo, M. Bagatin, A. Paccagnella, S. Gerardin. "Radiation-induced charge trapping in shallow trench isolations of FinFET". *IEEE Trans. Nucl. Sci.*, early access, **2024**. (Winner of the **Electronics 2023 Travel Award)**

J2. D. Fleetwood, E. Zhang, R. Schrimpf, S. Pantelides, **S. Bonaldo**. "Effects of interface traps on the low-frequency noise of irradiated MOS devices". *IEEE Trans. Nucl. Sci.*, early access, **2024**.

J3. **S. Bonaldo**, C. Martinella, S. Race, N. Fuer, S. Mattiazzo, M. Bagatin, S. Gerardin, A. Paccagnella, U. Grossner. "Radiation-induced effects in SiC vertical power MOSFETs irradiated at ultra-high doses". *IEEE Trans. Nucl. Sci.*, early access, **2024**.

J4. L. Franchin, **S. Bonaldo**. "Multiphysics modeling of electrochemical impedance spectroscopy responses of SAM-modified screen-printed electrodes". *Sensors*, vol. 24, no. 3, article no. 858, January **2024**.

J5. **S. Bonaldo\***, L. Franchin, E. Cretaio, E. Pasqualotto, M. Scaramuzza, A. Paccagnella. "Electrochemical biosensor for the monitoring of phages of Lactococcus lactis in milk-based samples". *IEEE Sens. J.*, vol. 24, no. 1, January **2024**.

J6. C. Y. Chain, L. Franchin, J. S. Cisneros, A. P. M. Villagra, C. A. Labriola, A. Paccagnella, **S. Bonaldo**. "Impedimetric Screen-Printed Immunosensor for the Rapid Detection of Chagas Disease". *IEEE Sens.*, vol. 24, no. 2, pp. 1167-1174, January **2024**.

J7. **S. Bonaldo\***, E. X. Zhang, S. Mattiazzo, A. Paccagnella, S. Gerardin, R. D. Schrimpf, D. M. Fleetwood. "Total-ionizing-dose effects at ultra-high doses in AlGaN/GaN HEMTs". *IEEE Trans. Nucl. Sci.*, vol. 70, no. 8, pp. 2042-2050, August **2023**.

J8. E. Pasqualotto, E. Cretaio, L. Franchin, A. De Toni, A. Paccagnella, **S. Bonaldo\***, M. Scaramuzza. "SPECTRA: a novel compact system for surface plasmon resonance measurements". *MDPI Sensors,* vol. 23, no. 9, article no. 4309, April **2023**.

J9. **S. Bonaldo\***, D. M. Fleetwood. "Random telegraph noise in nanometer-scale CMOS transistors exposed to ionizing radiation". *Appl. Phys. Lett.*, vol. 122, article no. 173508, April **2023**.

J10. **S. Bonaldo\***, E. Cretaio, E. Pasqualotto, M. Scaramuzza, L. Franchin, S. Poggi, A. Paccagnella. "Screen-printed electrochemical biosensor for the detection of bacteriophage of *Lactococcus lactis* for dairy production". *IEEE Sens. J.*, vol. 23, no. 6, pp. 5552-5560, March **2023**.

J11. **S. Bonaldo\***, L. Franchin, E. Pasqualotto, E. Cretaio, C. Losasso, A. Peruzzo, A. Paccagnella. "Influence of BSA protein on electrochemical response of genosensors". *IEEE Sens. J.*, vol. 23, no. 3, pp. 1786-1794, February **2023**.

J12. **S. Bonaldo**\*, S. Mattiazzo, M. Bagatin, A. Paccagnella, G. Margutti, S. Gerardin. "Influence of bulk doping and halos on the TID response of I/O and core 150 nm nMOSFETs". *Electronics*, vol. 12, no. 3, article no. 543, February **2023**.

J13. E. Pasqualotto, E. Cretaio, M. Scaramuzza, A. De Toni, L. Franchin, A. Paccagnella, **S. Bonaldo\***. "Optical system based on Nafion membrane for the detection of ammonia in blood serum samples". *Biosensors*, vol. 12, no. 12, article no. 1079, December **2022**.

J14. S. Tonello, T. Fapanni, **S. Bonaldo**, G. Giorgi, N. Claudio, A. Paccagnella, M. Serpelloni, E. Sardini, S. Carrara, "Amperometric measurements by a novel aerosol jet printed flexible sensor for wearable applications". *IEEE Trans. Instrum. Meas.*, vol. 72, article no. 7500512, November **2022**.

J15. T. Ma, **S. Bonaldo**, S. Mattiazzo, A. Baschirotto, C. Enz, A. Paccagnella, S. Gerardin. "Increased device variability induced by total ionizing dose in 16-nm bulk nFinFETs". *IEEE Trans. Nucl. Sci.*, vol. 69, no. 7, pp. 1437-1443, July **2022**.

J16. **S. Bonaldo\***, M. Gorchichko, E. X. Zhang, T. Ma, S. Mattiazzo, M. Bagatin, A. Paccagnella, S. Gerardin, R. D. Schrimpf, R. A. Reed, D. Linten, J. Mitard, D. M. Fleetwood. "TID effects in highly scaled gate-all-around Si nanowire CMOS transistors irradiated to ultrahigh doses". *IEEE Trans. Nucl. Sci.*, vol. 69, no. 7, pp. 1444-1452, July **2022**.

J17. **S. Bonaldo\***, T. Ma, S. Mattiazzo, A. Baschirotto, C. Enz, A. Paccagnella, D. M. Fleetwood, S. Gerardin. "DC response, low-frequency noise, and TID-induced mechanisms in 16-nm FinFETs for high-energy physics experiments". *Nucl. Instrum. Methods Phys. Res. A: Accel. Spectrom. Detect. Assoc. Equip.,* vol. 1033, article no. 166727, June **2022**.

J18. T. Ma, **S. Bonaldo[§],** S. Mattiazzo, A. Baschirotto, C. Enz, A. Paccagnella, S. Gerardin. "Influence of fin- and finger-number on TID degradation of 16 nm bulk FinFETs irradiated to ultra-high doses". *IEEE Trans. Nucl. Sci.*, vol. 69, no. 1, January **2022**.

J19. G. Rosati, M. Urban, L. Zhao, Q. Yang, C. C. Castro e Silva, **S. Bonaldo**, C. Parolo, E. P. Nguyen, G. Ortega, P. Fornasiero, A. Paccagnella, A. Merkoçi. "A plug, print & play inkjet printing and impedance-based biosensing technology operating through a smartphone for clinical diagnostics". *Biosens. Bioelectron.*, vol. 196, article no. 113737, January **2022**.

J20. T. Ma, **S. Bonaldo[§]**, S. Mattiazzo, A. Baschirotto, C. Enz, A. Paccagnella, S. Gerardin. "TID degradation mechanisms in 16-nm bulk FinFETs irradiated to ultrahigh doses". *IEEE Trans. Nucl. Sci.*, vol. 68, no. 8, pp. 1571-1578, May **2021**. (Winner of the **Best Student Conference Abstract Award** at Radiation and its Effects on Components and Systems Conference 2020 - RADECS 2020)

J21. M. Gorchichko, E. X. Zhang, P. Wang, **S. Bonaldo**, R. D. Schrimpf, R. A. Reed, D. Linten, J. Mitard, D. M. Fleetwood. "Total-ionizing-dose response of highly scaled gate-all-around Si nanowire CMOS transistors". *IEEE Trans. Nucl. Sci.*, vol. 68, no. 5, pp. 687-696, March **2021**.

J22. **S. Bonaldo\***, S. Mattiazzo, C. Enz, A. Baschirotto, A. Paccagnella, D. M. Fleetwood, and S. Gerardin. "Ionizing-radiation response and low-frequency noise of 28-nm MOSFETs at ultra-high doses". *IEEE Trans. Nucl. Sci.*, vol. 67, no. 7, pp. 1302-1311, March **2020**.

J23. **S. Bonaldo\***, E. X. Zhang, S. E. Zhao, V. Putcha, B. Parvais, D. Linten, S. Gerardin, A. Paccagnella, R. A. Reed, R. D. Schrimpf, D. M. Fleetwood. "Total-ionizing-dose effects in InGaAs MOSFETs with high-k gate dielectrics and InP substrates". *IEEE Trans. Nucl. Sci.,* vol. 67, no. 7, pp. 1312-1319, March **2020**.

J24. **S. Bonaldo\***, S. E. Zhao, A. O'Hara, M. Gorchichko, E. X. Zhang, S. Gerardin, A. Paccagnella, N. Waldron, N. Collaert, V. Putcha, D. Linten, S. T. Pantelides, R. A. Reed, R. D. Schrimpf, D. M. Fleetwood. "Total-ionizing-effects and low-frequency noise in 16-nm InGaAs FinFETs with $HfO_2/Al_2O_3$ dielectrics". *IEEE Trans. Nucl. Sci.*, vol. 67, no. 1, pp. 210-220, January **2020**. (Winner of the **Best Student Paper Award** at IEEE Nuclear and Space Radiation Effects Conference – NSREC 2019)

J25. S. E. Zhao, **S. Bonaldo**, P. Wang, E. X. Zhang, N. Waldron, N. Collaert, D. Linten, S. Gerardin, A. Paccagnella, R. D. Schrimpf, R. A. Reed, D. M. Fleetwood. "Total ionizing dose effects on InGaAs FinFETs with modified gate stack". *IEEE Trans. Nucl. Sci.*, vol. 67, no. 1, pp. 253-259, January **2020**.

J26. **<u>S. Bonaldo</u>\***, S. Gerardin, X. Jin, A. Paccagnella, F. Faccio, G. Borghello, D. M. Fleetwood. "Charge buildup and spatial distribution of interface traps in 65-nm pMOSFETs irradiated to ultrahigh doses". *IEEE Trans. Nucl. Sci.*, vol. 66, no. 7, pp. 1574-1583, July **2019**.

J27. S. E. Zhao, **<u>S. Bonaldo</u>**, P. Wang, R. Jiang, H. Gong, E. Zhang, N. Waldron, B. Kunert, J. Mitard, N. Collaert, S. Sioncke, D. Linten, R. D. Schrimpf, R. Reed, S. Gerardin, A. Paccagnella, D. M. Fleetwood. "Gate bias and length dependences of total-ionizing-dose effects in InGaAs FinFETs on bulk Si". *IEEE Trans. Nucl. Sci.*, vol. 66, no. 7, pp. 1599-1605, July **2019**.

J28. D. M. Fleetwood, S. Beyne, R. Jiang, S.E. Zhao, P. Wang, **<u>S. Bonaldo</u>**, M. W. McCurdy, Z. Tőkei, I. De Wolf, K. Croes, E. X. Zhang, M. L. Alles, R. D. Schrimpf, R. A. Reed, D. Linten. "Low-frequency noise and defects in copper and ruthenium resistors". *Appl. Phys. Lett.,* vol. 114, article no. 203501, May **2019**.

J29. **<u>S. Bonaldo</u>\***, S. Mattiazzo, C. Enz, A. Baschirotto, A. Paccagnella, X. Jin, S. Gerardin. "Influence of halo implantations on the total ionizing dose response of 28 nm p-MOSFETs irradiated to ultra-high doses". *IEEE Trans. Nucl. Sci.*, vol. 66, no. 1, pp. 82-90, January **2019**.

J30. G. Borghello, F. Faccio, E. Lerario, S. Michielis, S. Kulis, D. M. Fleetwood, R. D. Shrimpf, S. Gerardin, A. Paccagnella, **<u>S. Bonaldo</u>**. "Dose rate sensitivity of 65 nm MOSFETs exposed to ultra-high doses". *IEEE Trans. Nucl. Sci.*, vol. 65, no. 8, pp. 1482-1487, August **2018**.

J31. R. G. Alía, **<u>S. Bonaldo</u>**, M. Brugger, S. Danzeca, A. Ferrari, C. Frost, A. Infantino, Y. Iwamoto, J. Mekki, C. Theis, A. Thornton. "Single event effect cross section calibration and application to quasi-monoenergetic and spallation facilities". *EPJ Nuclear Sci. Technol.*, vol. 4, February **2018**.

J32. F. Faccio, G. Borghello, E. Lerario, D. M. Fleetwood, R. D. Schrimpf, H. Gong, E. Xi. Zhang, P. Wang, S. Michelis, S. Gerardin, A. Paccagnella, **<u>S. Bonaldo</u>**. "Influence of LDD spacers and H$^+$ transport on the total-ionizing-dose response of 65-nm MOSFETs irradiated to ultrahigh doses". *IEEE Trans. Nucl. Sci.*, vol. 65, no. 1, pp. 164-174, January **2018**. (Winner of the **Conference Outstanding Paper Award** at IEEE Nuclear and Space Radiation Effects Conference - NSREC 2017).

J33. M. Marzo, **<u>S. Bonaldo</u>**, M. Brugger, S. Danzeca, R. G. Alia, A. Infantino, A. Thornton, "RadFET dose response in the CHARM mixed-field: FLUKA MC simulations". *EPJ Nuclear Sci. Technol.*, vol. 3, July **2017**.

**Conference proceedings**

C1. **<u>S. Bonaldo</u>\***, L. Franchin, E. Cretaio, E. Pasqualotto, M. Scaramuzza, A. Paccagnella. "Electrochemical biosensor for timely detection of Lactococcus lactis bacteriophage in milk samples". 2023 IEEE Sensors Conference, Vienna, Austria, December **2023**.

C2. **<u>S. Bonaldo</u>\***, S. Tonello, L. Franchin, A. Merkoci, G. Rosati, A. Paccagnella, "Multiphysics simulations of screen-printed electrodes for electrochemical biosensing". *2023 IEEE International Workshop on Metrology for Industry 4.0 & IoT (MetroInd4.0&IoT),* Brescia, Italy, June **2023**.

C3. **<u>S. Bonaldo</u>\***, E. Cretaio, E. Pasqualotto, M. Scaramuzza, L. Franchin, S. Poggi, A. Paccagnella. "An electrochemical biosensor for the detection of bacteriophage of *Lactococcus lactis*". *Proceedings of Società Italiana Elettronica – SIE 2022, in Lecture Notes in Electrical Engineering*, vol. 1005, pp. 98-103. Pizzo, Italy, September **2022**.

C4. **<u>S. Bonaldo</u>\***, F. Dal Lago, G. Putoto, L. Dal Lago, E. Griggio, A. Paccagnella. "Portable digital stadiometer for assessing the degree of childhood malnutrition in low-income countries". *Proceedings of International Humanitarian Technology – IHTC 2021.* Virtual conference, December **2021**.

C5. M. Marconi and RD53 Collaboration (including **<u>S. Bonaldo</u>**). "Design implementation and test results of the RD53A, a 65 nm large scale chip for next generation pixel detectors

at the HL-LHC". *2018 IEEE Nuclear Science Symposium and Medical Imaging Conference Proceedings (NSS/MIC).* Sydney, Australia, November **2018**.

C6.  E. Monteil and RD53 Collaboration (including **<u>S. Bonaldo</u>**). "RD53A: a large scale prototype for HL-LHC silicon pixel detector phase 2 upgrades". *Proceedings of Topical Workshop on Electronics for Particle Physics - PoS(TWEPP2018),* Zurich, Switzerland, vol. 343, May **2019**.

C7.  X. Jin, C. Wang, X. Guo, C. Qi, S. Yang, Y. Liu, W. Chen, S. Gerardin, M. Bagatin, **<u>S. Bonaldo</u>**, A. Paccagnella. "Simulation and experiment in neutron induced single event effects in SRAM". *17th European Conference on Radiation and Its Effects on Components and Systems (RADECS).* Geneva, Switzerland, October **2017**.

C8.  E. Conti and RD53 Collaboration (including **<u>S. Bonaldo</u>**). "Development of a large pixel chip demonstrator in RD53 for Atlas and CMS upgrades". *PoS(TWEPP-17). Proceedings of Science,* Santa Cruz, California, September **2017**.

C9.  E. Tessarolo, A. J. Corso, **<u>S. Bonaldo</u>**, P. Zuppella, M. G. Pelizzo. "A Mach-Zehnder interferometer for the fine control of the polarization status of a beam". *Proceeding SPIE vol. 9205, Optical Engineering+ Applications.* San Diego, USA, September **2014**.

**Patents**

P1.  E. Tessarolo, A. J. Corso, **<u>S. Bonaldo</u>**, P. Zuppella, M. G. Pelizzo. *"Metodo ed apparecchiatura interferometrici per la generazione di un fascio con controllo fine del suo stato di polarizzazione".* Italian Patent Application TO2013A000369, requested on May 8th, **2013** by CNR – National Research Council.

# EDITORING ∎

**Editor in peer-review journals**

- Guest Editor of the Special Issue on "*New Insights in Radiation-Tolerant Electronics*" published in *MDPI Electronics* journal, 2023.

- Guest Editor of the Special Issue on "*Semiconductor-Based Biosensors*" published in *MDPI Biosensors* journal, 2020.

**Conference chairing and committees**

- Organizing conference committee member as Poster Session chair at Radiations Effects on Components and Systems Conference – RADECS 2025, Antwerp, Belgium, October 29st-3rd, 2025.
- Technical session chair of the "Basic Mechanism of Radiation Effects" session at Radiations Effects on Components and Systems Conference – RADECS 2023, Toulouse, France, September 25th-29th, 2023.
- Award committee member of Radiations Effects on Components and Systems Conference – RADECS 2023, Toulouse, France, September 25th-29th, 2023.
- Award committee member of IEEE Nuclear & Space Radiation Effects Conference – NSREC 2023, Kansas City, US, September 24th-28th, 2023.
- Organizing conference committee member as A/V chair at Radiations Effects on Components and Systems Conference – RADECS 2022, Venice, Italy, October 3rd-7th, 2022.

**Conference Reviewer**

- Reviewer for the technical program of Radiation and Its Effects on Components and Systems Conference – RADECS 2024, Canary Islands, Spain, September 16rd-20th, 2024.
- Reviewer for the technical program of IEEE Nuclear & Space Radiation Effects Conference – NSREC 2024, Ottawa, Canada, July 22nd-26th, 2024.
- Reviewer for the technical program of IEEE Nuclear & Space Radiation Effects Conference – NSREC 2023, Kansas City, USA, July 24th-28rd, 2023.
- Reviewer for the technical program of Radiation and Its Effects on Components and Systems Conference – RADECS 2022, Venice, Italy October 3rd-7th, 2022.
- Reviewer for the technical program of IEEE Nuclear & Space Radiation Effects Conference – NSREC 2022, Provo, USA, July 18th-22nd, 2022.

- Reviewer for the technical program of IEEE Nuclear & Space Radiation Effects Conference – NSREC 2021, online, July 16th-23rd, 2021.
- Reviewer for the technical program of Radiation and Its Effects on Components and Systems Conference – RADECS 2020, online, October 19th-20th, 2020.

## TALKS ∎

**Invited talks**

I1. **S. Bonaldo**. "*Evolution of TID Effects with the Scaling Down of Microelectronic CMOS Technologies*". Invited lecture at the 19th International School on the Effects of Radiation on Embedded Systems for Space Applications – SERESSA 2023, University of Torino, Torino, Italy, December 4th-7th 2023.

I2. **S. Bonaldo**. "*Radiation effects and TID mechanisms at ultra-high doses*". Invited lecture at ETH Zürich, Zurich, Switzerland, October 23rd, 2023.

I3. **S. Bonaldo**. "*DRDT7.4. TID and challenges at ultra-high doses in modern CMOS technologies*". Invited talk at the workshop 'Implementing DRD7: an R&D Collaboration on Electronics and On-detector Processing', CERN, Geneva, Switzerland, March 14th-15th, 2023.

I4. **S. Bonaldo**. "*TID mechanisms in nanometer-scale microelectronic technologies*". Invited lecture at the 18th International School on the Effects of Radiation on Embedded Systems for Space Applications – SERESSA 2022, CERN, Geneva, Switzerland, December 5th-9th 2022.

I5. **S. Bonaldo**. "*TID effects vs. scaling-down of CMOS technologies*". Invited lecture at Arizona State University, Phoenix, USA, July 14th, 2022.

I6. **S. Bonaldo**. "*Total-ionizing-dose degradation mechanisms in nanometer-scale microelectronic technologies*". Invited lecture at Vanderbilt University, Nashville, USA, February 16th, 2022, online due to COVID-19.

I7. **S. Bonaldo**. "*Total ionizing dose degradation mechanisms in nanometer-scale microelectronic technologies*". Invited lecture at the 2nd CERN 28 nm technology forum, Geneva, Switzerland, May 30th, 2021.

I8. **S. Bonaldo**. "*TID degradation mechanisms of 28 nm MOSFETs irradiated to ultra-high doses*". Invited lecture at the 1st CERN 28 nm technology forum, Geneva, Switzerland, March 10th, 2021.

I9. **S. Bonaldo**. "*Total ionizing dose degradation mechanisms in nanometer-scale microelectronic technologies*". Invited talk in honour of the 2020 Emilio Gatti and Franco Manfredi Best Ph.D. Thesis Award in Radiation Instrumentation, organized by University of Pavia, Italy, December 17th, 2020.

I10. **S. Bonaldo**. "*CHARM: A new mixed-field facility for radiation test on electronics*". Invited talk for presenting the CHARM facility at CERN 38th Coffee Seminar EN-STI-ECE, CERN, Geneva, Switzerland, May 3rd, 2016.

I11. **S. Bonaldo**. "*The CERN high energy accelerator mixed-field*". Invited talk for presenting the CHARM facility at the CERN 2nd Coffee Seminar EN-EA, CERN, Geneva, Switzerland, April 1st, 2016.

**Conference presentations**

The asterisk (*) identifies contributions where I was the presenting author.

T1. **S. Bonaldo\***, L. Franchin, E. Cretaio, E. Pasqualotto, M. Scaramuzza, A. Paccagnella. "Electrochemical biosensor for the monitoring of phages of Lactococcus lactis in milk-based samples". *Biodevices 2024 – 17th International Conference on Biomedical Electronics and Devices*, Rome, Italy, February 21st-23rd, 2024.

T2. C. Y. Chain, L. Franchin, J. S. Cisneros, A. P. M. Villagra, C. A. Labriola, A. Paccagnella, **S. Bonaldo**. "Impedimetric Screen-Printed Immunosensor for the Rapid Detection of Chagas Disease". *Biodevices 2024 – 17th International Conference on Biomedical Electronics and Devices*, Rome, Italy, February 21st-23rd, 2024.

T3. **S. Bonaldo\***, L. Franchin, E. Cretaio, E. Pasqualotto, M. Scaramuzza, A. Paccagnella. "*Electrochemical biosensor for the monitoring of phages of Lactococcus lactis in milk-based samples*". IEEE Sensor Conference 2023, Vienna, Austria, October 29th-November 1st, 2023.

T4. J. Neuendank, F. Al-Mamum, H. J. Barnaby, **S. Bonaldo**, M. Spear, T. Wallace, D. Loveless, J. Pew, M. Nour, P. Manos, Z. Giorno, U. Surino, M. Chambers, S. Kosier. "*TID effects on random telegraph signals in bulk 90 nm MOSFET devices*". IEEE International Integrated Reliability Workshop, Fallen Leaf Lake, USA, October 8th-12th, 2023.

T5. **S. Bonaldo\***, T. Wallace, H. Barnaby, G. Borghello, G. Termo, F. Faccio, D. Fleetwood, A. Baschirotto, S. Mattiazzo, M. Bagatin, A. Paccagnella, S. Gerardin. "*Radiation-induced charge trapping in shallow trench isolations of FinFET*". NSREC 2023, Kansas City, USA, July 24th-28th, 2023.

T6. D. Fleetwood, E. Zhang, R. Schrimpf, S. Pantelides, **S. Bonaldo**. "*Effects of interface traps on the low-frequency noise of irradiated MOS devices*". NSREC 2023, Kansas City, USA, July 24th-28th, 2023.

T7. C. Martinella, **S. Bonaldo**, S. Race, N. Fuer, S. Mattiazzo, M. Bagatin, S. Gerardin, A. Paccagnella, U. Grossner. "*Radiation-induced effects in SiC vertical power MOSFETs irradiated at ultra-high doses*". NSREC 2023, Kansas City, USA, July 24th-28th, 2023.

T8. **S. Bonaldo**, L. Franchin, G. Rosati, S. Tonello, A. Merkoci, A. Paccagnella. "*Multiphysics simulations of screen-printed electrodes for electrochemical biosensing*". IEEE International Workshop on Metrology for Industry 4.0 and IoT, Brescia, Italy, April 16th-18th, 2023.

T9. **S. Bonaldo\***, E. X. Zhang, S. Mattiazzo, A. Paccagnella, S. Gerardin, R. D. Schrimpf, D. M. Fleetwood. "*Total-ionizing-dose effects at ultra-high doses in AlGaN/GaN HEMTs*". RADECS 2022, Venice, Italy, October 3rd-7th, 2022.

T10. **S. Bonaldo\***, E. Cretaio, E. Pasqualotto, M. Scaramuzza, L. Franchin, S. Poggi, A. Paccagnella. "*An electrochemical biosensor for the detection of bacteriophage of Lactococcus lactis*". 53rd Meeting of Italian Electronic Society – SIE 2022, Pizzo, Italy, September 7th-9th, 2022.

T11. **S. Bonaldo\***, F. Dal Lago, G. Putoto, L. Dal Lago, E. Griggio, A. Paccagnella. "*Portable digital stadiometer for assessing the degree of childhood malnutrition in low-income countries*". International Humanitarian Technology Conference – IHTC 2021, online, December 2nd-4th, 2021.

T12. M. Urban, G. Rosati, L. Zhao, Q. Yang, C. Silva, **S. Bonaldo**, C. Parolo, E. P. Nguyen, G. Ortega, P. Fornasiero, A. Paccagnella, A. Merkoçi. "*Detection of a protein biomarker with an inkjet-printed nanobiosensor*". Trends in Nanotechnology International Conference – TNT2021, Tirana, Albania, October 4th-8th, 2021.

T13. T. Ma, **S. Bonaldo**, S. Mattiazzo, A. Baschirotto, C. Enz, A. Paccagnella, S. Gerardin. "*Enhancement of sample-to-sample variability induced by total ionizing dose in 16 nm bulk nFinFETs*". RADECS 2021, Vienna, Austria, September 13th-17th, 2021.

T14. **S. Bonaldo\***, M. Gorchichko, E. X. Zhang, T. Ma, S. Mattiazzo, M. Bagatin, A. Paccagnella, S. Gerardin, R. D. Schrimpf, R. A. Reed, D. Linten, J. Mitard, D. M. Fleetwood. "*TID effects in highly scaled gate-all-around Si nanowire CMOS transistors irradiated to ultra-high doses*". RADECS 2021, Vienna, Austria, September 13th-17th, 2021.

T15. **S. Bonaldo\***, T. Ma, S. Mattiazzo, A. Baschirotto, C. Enz, A. Paccagnella, D. M. Fleetwood, S. Gerardin. "*TID degradation and low frequency noise in 16 nm bulk*

*FinFETs irradiated to ultra-high doses*". RADECS 2021, Vienna, Austria, September 13$^{th}$-17$^{th}$, 2021.

T16. T. Ma, **S. Bonaldo**, S. Mattiazzo, A. Baschirotto, C. Enz, A. Paccagnella, S. Gerardin. "*Influence of fin- and finger-number on TID degradation of 16 nm bulk FinFETs irradiated to ultra-high doses*". NSREC 2021, online conference, July 16$^{th}$-23$^{rd}$, 2021.

T17. **S. Bonaldo**, T. Ma, S. Mattiazzo, A. Baschirotto, C. Enz, A. Paccagnella, S. Gerardin. "*TID degradation mechanisms in 16-nm bulk FinFETs irradiated to ultrahigh doses*". RADECS 2020, online conference, October 19$^{th}$-20$^{th}$, 2020. (Winner of the **Best Student Conference Abstract Award**, Radiation and its Effects on Components and Systems Conference 2020 - RADECS 2020)

T18. M. Gorchichko, E. X. Zhang, P. Wang, **S. Bonaldo**, R. D. Schrimpf, R. A. Reed, D. Linten, J. Mitard, D. M. Fleetwood. "*Total-ionizing-dose response of highly scaled gate-all-around Si nanowire CMOS transistors*". NSREC 2020, Santa Fe, USA, December 1$^{st}$-8$^{th}$, 2020.

T19. **S. Bonaldo\***, E. X. Zhang, S. E. Zhao, V. Putcha, B. Parvais, D. Linten, S. Gerardin, A. Paccagnella, R. A. Reed, R. D. Schrimpf, D. M. Fleetwood. "*Total-ionizing-dose effects in InGaAs MOSFETs with high-k gate dielectrics and InP substrates*". RADECS 2019, Montpellier, France, September 16$^{th}$-20$^{th}$, 2019.

T20. **S. Bonaldo\***, S. Mattiazzo, C. Enz, A. Baschirotto, A. Paccagnella, D. M. Fleetwood, S. Gerardin. "*Ionizing-radiation response and low-frequency noise of 28-nm MOSFETs at ultra-high doses*". RADECS 2019, Montpellier, France, September 16$^{th}$-20$^{th}$, 2019.

T21. K. Li, E. X. Zhang, **S. Bonaldo**, A. L. Sternberg, J. A. Kozub, A. M. Tonigan, M. Reaz, L. D. Ryder, K. L. Ryder, H. Gong, S. M. Weiss, R. A. Weller A. Vardi, J. A. del Alamo, R. A. Reed, D. M. Fleetwood, R. D. Schrimpf. "*Pulsed laser-induced single-event transients in InGaAs FinFETs with sub-10 nm fin widths*". RADECS 2019, Montpellier, France, September 16$^{th}$-20$^{th}$, 2019.

T22. **S. Bonaldo\***, S. E. Zhao, A. O'Hara, M. Gorchichko, E. X. Zhang, S. Gerardin, A. Paccagnella, N. Waldron, N. Collaert, V. Putcha, D. Linten, S. T. Pantelides, R. A. Reed, R. D. Schrimpf, D. M. Fleetwood. "*Total-ionizing-effects and low-frequency noise in 16-nm InGaAs FinFETs with HfO$_2$/Al$_2$O$_3$ dielectrics*". NSREC 2019, San Antonio, USA, September 8$^{th}$ – 12$^{th}$, 2019. (Winner of the **Conference Best Student Paper Award**, IEEE Nuclear and Space Radiation Effects Conference - NSREC 2019).

T23. S. E. Zhao, **S. Bonaldo**, P. Wang, E. X. Zhang, N. Waldron, N. Collaert, D. Linten, S. Gerardin, A. Paccagnella, R. D. Schrimpf, R. A. Reed, D. M. Fleetwood. "*Total ionizing dose effects on InGaAs FinFETs with modified gate stack*". NSREC 2019, San Antonio, USA, September 8$^{th}$-12$^{th}$, 2019.

T24. S. Danzeca, C. Cangialosi, **S. Bonaldo**, R. Castellotti, A. Infantino, R. G. Alia, M. Brugger, A. Masi, S. Gilardoni. "*Challenges in dosimetry and testing in the CERN CHARM mixed radiation field facility*". NSS 2018 - IEEE Nuclear Science Symposium, Sydney, Australia, November 10$^{th}$-17$^{th}$, 2018.

T25. S. Mattiazzo, **S. Bonaldo**, M. De Matteis, F. Fary, S. Gerardin, A. Paccagnella, A. Pipino, F. Resta, A. Baschirotto. "*28 nm high-k bulk digital circuit performance after heavy ion exposure*". Topical Workshop on Electronics for Particle Physics – TWEEP 2018, Antwerpen, Belgium, September 17$^{th}$-21$^{st}$, 2018.

T26. **S. Bonaldo**, S. Gerardin, X. Jin, A. Paccagnella, F. Faccio, G. Borghello, D. M. Fleetwood. "*Spatial distribution of interface traps in 65 nm pMOSFETs irradiated to ultra-high doses*". RADECS 2018, Göteborg, Sweden, September 16$^{th}$-21$^{st}$, 2018. *(I was appointed as the presenting author, but the conference schedule was overlapping with the beginning of my research activity at the Vanderbilt University in Nashville)*

T27. **S. Bonaldo\***, S. Matiazzo, C. Enz, A. Paccagnella, X. Jin, S. Gerardin. "*Influence of halo implantations on the total ionizing dose response of 28 nm p-mosfets irradiated to ultra-high doses*". NSREC 2018, Kona, Hawaii, USA, July 16$^{th}$-20$^{th}$, 2018.

T28. **S. Bonaldo\***, S. Gerardin, A. Paccagnella, F. Faccio, G. Borghello. "*Effects of LDD spacer dielectrics on 65 nm pMOSFETs irradiated to ultra-high doses*". 50th Annual Meeting of Italian Electronic Society – SIE 2018, Napoli, Italy, June 20th-22nd, 2018. (Winner of the **2nd Best Oral Presentation** at the 50th Annual Meeting of the Italian Electronic Society - SIE 2018)

T29. G. Borghello, F. Faccio, E. Lerario, S. Michielis, S. Kulis, D. M. Fleetwood, R. D. Shrimpf, S. Gerardin, A. Paccagnella, **S. Bonaldo**. "*Dose rate sensitivity of 65 nm MOSFETs exposed to ultra-high doses*". RADECS 2017, Geneva, Switzerland, October 2nd-6th, 2017.

T30. F. Faccio, G. Borghello, E. Lerario, D. M. Fleetwood, R. D. Schrimpf, H. Gong, E. Xi. Zhang, P. Wang, S. Michelis, S. Gerardin, A. Paccagnella, **S. Bonaldo**. "*Influence of LDD spacers and H+ transport on the total-ionizing-dose response of 65-nm MOSFETs irradiated to ultrahigh doses*". NSREC 2017, New Orleans, USA, July 17th-21st, 2017.

T31. **S. Bonaldo\***, A. Paccagnella, S. Danzeca. "*CHARM – A new mixed-field facility for ionizing radiation test on electronics at CERN*". RADFAC 2017, Universidad de Sevilla, Sevilla, Spain, March 30th, 2017.

T32. **S. Bonaldo\***, A. Paccagnella, S. Danzeca. "*A new mixed-field facility for ionizing radiation test on electronics at CERN*". 49th Annual Meeting of Italian Electronic Society – SIE 2017, Palermo, Italy, June 21st-23rd, 2017.

T33. M. Marzo, M. Brugger, R. G. Alia, A. Thornton, S. Danzeca, **S. Bonaldo**. "*RadFET dose response in the CHARM mixed-field: FLUKA MC simulations*". ICRS-13 & RPSD-2016 – 13th International Conference on Radiation Shielding & 19th Topical Meeting of the Radiation Protection & Shielding Division of the American Nuclear Society 2016, Paris, France, October 3rd-6th, 2016.

T34. E. Tessarolo, A.J. Corso, **S. Bonaldo**, P. Zuppella, M. G. Pelizzo. "*A Mach-Zehnder interferometer for the fine control of the polarization status of a beam*". SPIE Optical Engineering + Applications, San Diego, USA, August 17th-21st, 2014.

**OTHER ACTIVITIES AND THIRD MISSION**

- I **reviewed more than 100 papers in peer-reviewed journals** (source: Web Of Science), including:
    - *IEEE Transactions on Nuclear Science*
    - *IEEE Journal of the Electron Devices Society*
    - *IEEE Transactions on Device and Materials Reliability*
    - *Microelectronics Reliability*
    - *Nuclear Instruments and Methods in Physics Research Section B*
    - *Biosensors and Bioelectronics*
    - *Biosensors*
    - *Sensors*
    - *Electronics*

- Since 2020, I am actively involved in **research activities on humanitarian technologies** in collaboration with the Non-Governmental Organization "**CUAMM Medici con l'Africa**". Within these research activities, I also involved students from Master's and Bachelor's Degrees at the Department of Information Engineering at University of Padova. In 2021, we **developed a prototype of digital stadiometer** capable of rapidly assessing the status of chronic malnutrition in African children. This work was presented in my first-authored paper entitled "P*ortable digital stadiometer for assessing the degree of childhood malnutrition in low-income countries*", which I presented as oral talk [T9] at the International Humanitarian

Technology Conference – IHTC 2021, and published in the conference proceedings [C3]. Currently, I am also working on the development of digital bracelet for the rapid detection of severe malnourished children.

- Due to the increasing interest of my research for local applications, I was **invited to disseminate my work about biosensing technologies in several local institutions, organizations and companies**, including:
  - Telea Medical s.r.l., Sandrigo
  - Centro Ricerche Applicate - ARC, Padova
  - Istituto Zooprofilattico Sperimentale delle Venezie – IZSVe, Legnaro
  - Veneto Agricoltura, Thiene

- In 2022, I applied for a **tenure-track position as assistant professor at Vanderbilt University**, USA. The initial selection had more than 50 candidates from several countries. The last step was restricted to 3 candidates, and I was short listed, even though I was the youngest applicant. Eventually I was not selected, as I was not familiar with the US funding system. After careful evaluation of this experience, considering my enthusiasm and motivation with the newly started research experience in the biosensing field, I decided to continue my research in the Italian academia at University of Padova.

- I was enrolled in the "**RADECS student team**", which aimed to support the organization of RADECS 2017 Conference, Geneva, Switzerland.

- During my PhD, I actively participated to the "**Orientation program for students**", organized by University of Padova, for presenting the university degree courses of the Department of Information Engineering to young high-school students.