

**PERSONAL DATA**

Name: **Federica Alberta VILLA**

Date and Place of birth:

Residence:

Nationality:

ORCID:

Researcher Identifier:

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Phone number:

**EDUCATION**

- 2011 – 2014**      **Ph.D. degree in Information Technology,**      *A cum Laude*  
 Dip. Elettronica, Informazione e Bioingegneria, Politecnico di Milano, Italy.  
 Thesis “*Time-of-Flight 3D Camera for Long-Distance 3D Ranging*”, discussed in March 2014, supervisor prof. F. ZAPPA.
- 2008 – 2010**      **MASTER degree in ELECTRONICS Engineering,**      *110/110 cum Laude*  
 Dip. Elettronica e Informazione, Politecnico di Milano, Italy.  
 Thesis “*Design of an Integrated Circuit for Fast-Gating and Active Quenching of a Single Photon Avalanche Diode*”, discussed in December 2010, supervisor prof. F. ZAPPA.
- 2005 – 2008**      **BACHELOR degree in BIOMEDICAL Engineering,**      *110/110 cum Laude*  
 Dip. Bioingegneria, Politecnico di Milano, Italy  
 Thesis “*Effects of pedaling on the high frequency components of Heart Rate Variability*”, discussed in September 2008, supervisor prof. R. RODANO.
- 2000 – 2005**      **High School Diploma,**      *100/100*  
 Liceo Scientifico “Vittorio Veneto”, Milano

## CURRENT AND PREVIOUS POSITIONS

### **Dec 2015 – ongoing Assistant Professor (Ricercatore Junior) in Electronic Engineering**

Dip. Elettronica, Informazione e Bioingegneria (DEIB), Politecnico di Milano (POLIMI), Italy.

Research topic: *Single photon detectors in CMOS technology, 2D and 3D cameras and their applications.*

### **Feb 2014 – Dec 2015 Research Assistant (Assegnista di Ricerca) in Electronic Engineering**

Dip. Elettronica, Informazione e Bioingegneria (DEIB), Politecnico di Milano (POLIMI), Italy.

## RESEARCH ACTIVITIES

My research mainly focuses on the design of microelectronic integrated sensors and circuits in CMOS technologies (STMicroelectronics, Fraunhofer IMS, AMS Austrian Micro System, and LFoundry) for Single Photon Detectors (like Single Photon Avalanche Diode, SPAD, and Silicon Photomultipliers, SiPMs) and array imagers (SPADAs) for 2D imaging and 3D depth-ranging with single-photon sensitivity, and high-resolution and linearity Time-to-Digital Converters (TDCs). The outcomes of these activities are 35 papers on peer-review international Journals plus 36 conference Proceedings, and the activation of many international collaborations and some research contracts. The main activities are listed in the followings:

1. SPAD – SINGLE PHOTON AVALANCHE DIODE design, front-end and characterizations
2. CMOS SPAD IMAGERS - chips and cameras for 2D IMAGING and 3D RANGING
3. PHYSIO-MONITOR - non-invasive monitoring of physiological parameters through 2D imagers
4. SiPM – SILICON PHOTOMULTIPLIERS modelling, design, and characterization
5. TDC - TIME-TO-DIGITAL CONVERTER for high-resolution and high-linearity
6. BIS – BIOELECTRIC IMPEDANCE SPECTROSCOPY electronics and tests

## OTHER RESEARCH/INDUSTRIAL ACTIVITIES AND CONTRACTS

### **2017 – ongoing General Motors (Torino, IT)**

Development of a physiological parameters (Heart Rate, Inter Beat Interval, Heart Rate Variability, Respiration Rate) monitoring system for automotive applications, under the Horizon 2020 European project “DEIS” (g.a. 732242).

### **2017 – ongoing OMRON Corporation (Kyoto, Japan)**

Design of a 3D single point detector for background rejection in industrial automation applications.

- 2015 – ongoing**      **Austral University of Chile, UACH (Valdivia, Chile)**  
 Development of the time-resolved photon-counting acquisition system for imaging different proteins using fluorescent not natural aminoacids focusing on the activity of membrane proteins in native environments in living cells, with Dr. S. BRAUCHI.
- 2015 – ongoing**      **Istituto Italiano di Tecnologia (Genova, IT)**  
 Design of a small SPAD array, with 25 independent detectors, for high resolution microscopy.
- 2015 - ongoing**      **GNOTHIS (Stockholm, Sweden)**  
 Research contract “*SPAD imagers for DNA sequencing*” (Dr. R. RIGLER), with POLIMI-DEIB. Conceive and develop advanced CMOS SPAD imagers, tailored for multi-color excitation DNA sequencing, through a technique patented by GNOTHIS.
- 2015 – ongoing**      **ST Microelectronics (Cornaredo, IT)**  
 Design of fast laser-drivers in BCD (Bipolar/CMOS/DMOS) technology for Time-of-Flight 3D ranging.
- 2014 – ongoing**      **Istituto Nazionale di Ricerca Metrologica (Torino, IT)**  
 Design of a SPAD camera for quantum physics experiments.
- 2014 – ongoing**      **ST Microelectronics (Agrate Brianza, IT)**  
 Design of SPAD and frontend electronics in Ultra-Deep-Submicron BCD (Bipolar CMOS DMOS) technology.
- 2014 – ongoing**      **Charité Universitätsmedizin (Berlin, Germany)**  
 Assessment of body fluids shifts during accelerations between 1g and 3g, on a short arm human centrifuge at the German Aerospace Center (DLR).
- 2007 – ongoing**      **Fondazione Don Gnocchi Onlus (Milan, IT)**  
 Research collaborations with ing. P. CASTIGLIONI: (1) to study human body motion with optoelectronic devices and to analyze cardiovascular activity during physical exercises, and (2) to design and test compact and portable modules for continuous monitoring of biomedical parameters.
- 2016**                      **Jet Propulsion Laboratory - NASA (California, USA)**  
 Feasibility study of a LiDAR system for assisted landing on Europa (a Jupiter satellite).

- 2015 – 2016**            **Massachusetts Institute of Technology (Cambridge, Massachusetts - USA)**  
 Research collaborations for Photon-efficient computational 2D/3D imaging with a single-photon camera.
- March 2015**            **Aalto University (Helsinki, Finland)**  
 Experiments of chemiluminescence and photo-luminescence with prof. K. SAKARI, by means of SPAD imagers.
- 2014-2015**            **Heriot Watt University (Edinburgh, Scotland)**  
 Development of micro-lenses arrays with prof. G. BULLER and their characterization, under the European research contract “MiSPIA” (g.a. 257646), coordinated by POLIMI-DEIB, prof. F. ZAPPA.
- 2010**                    **UCLA University of California (Los Angeles, USA)**  
 Study of single-molecules with Dr. X. MICHALET at the University of California, Los Angeles (USA), by improving Single Molecules Spectroscopy throughput with novel multipixel approaches. I acquired expertise on fundamentals of biochemistry and optics, deeper experience in VHDL and Labview programming, and exhaustive knowledge of system integration of imagers into microscopes and spectrometers.

### FOUNDED PROJECTS

- 2017 - ongoing**            **European Horizon 2020 project, ICT-01-2016**  
 Research project “*Dependability Engineering Innovation for Cyber-Physical-Systems*” (DEIS), g.a. 732242, total founding € 415,336 to POLIMI. Duration 3 years (Jan 2017 – Dec 2019).
- 2015 - ongoing**            **NATO project under Science for Peace and Security Programme**  
 Research contract “*Microelectronic 3D Imaging and Neuromorphic Recognition for Autonomous UAVs*”, no. 984840, coordinated by POLIMI-DEIB (prof. F. ZAPPA), collaborating with three Australian partners. Total funding of € 380,000 (about € 150,000 for POLIMI-DEIB).
- 2010-2014**            **European Project under FP7-ICT-2009.3.7 framework**  
 Research contract “*Microelectronic Single-Photon Imaging Arrays for 3D low-light high-speed safety and security applications*”, grant agreement 257646, coordinated by POLIMI-DEIB. Total funding of € € 2,632,854 (about € 808,260 for POLIMI-DEIB).

- 2014 - ongoing**      **ESA project under (ITT AO 1-7483/13/NL/CP)**
- Research contract “*Advanced Laser Ranging Technologies for Altimetry*”, code ESA ITT AO 1-7483/13/NL/CP, as subcontractor of “COSINE Research bv”. Total funding of € 24,000 for POLIMI-DEIB.

### SPEAKER TO INTERNATIONAL CONFERENCES

- 13-Jul-2015**      *Single photon workshop* – Genève (Switzerland), 1 paper presented.
- 9-Feb-2015**      *SPIE Photonics West* – San Francisco (USA), 3 papers presented.
- 24-Feb-2012**      *SPIE Security and Defense* – Edinburgh (Scotland), 2 papers presented.
- 12-Jun-2012**      *Conference on Ph.D. Research in Microelectronics and Electronics, PRIME* – Aachen (Germany), 1 paper presented.
- 23-Apr-2012**      *SPIE Defense, Security and Sensing* – Baltimore (USA), 1 paper presented.
- 5-Jun-2011**      *Intelligent Vehicles Symposium* – Baden-Baden (Germany), 1 paper presented.
- 14-Sept-2008**      *Computers in Cardiology* – Bologna (Italy), 1 paper presented.

### BIBLIOMETRIC INDICATORS

I’m co-author of 35 papers on peer-review international Journals plus 36 conference Proceedings and my present h-index is 12 (source: Scopus).

### REVIEWER AND COMMISSION OF TRUST ACTIVITIES

- 2011 - ongoing**      **Reviewer**
- I acted as official reviewer of 25 papers for several peer-reviewed journals (IEEE Transaction on Biomedical Engineering, IEEE Photonics Journal, Photonics Technology Letters, Optics Express, Review of Scientific Instruments, etc.).

### TEACHING ACTIVITIES

- 2016/17 – ongoing**      **(2 academic years, 50h per year)**
- “*Sensor Systems*”, Master Degree in Information Technology Engineering, lessons given in English, about 20 students per year.
- 2016/17 – ongoing**      **(1 academic years, 60h per year)**
- “*Elettronica*”, Bachelor Degree in Biomedical Engineering, about 190 students per year.

**2012/13 – 2015/16 (4 academic years, 40h per year)**

Exercise classes of “*Electronics Systems*”, Master Degree in Electronics Engineering, prof. F. ZAPPA, lessons given in English, about 110 students per year.

**2014/15 (1 academic year, 32h per year)**

Exercise classes of “*Analog Circuit Design*”, Master Degree in Electronics Engineering, prof. A. LACAITA, lessons given in English, about 90 students per year.

**2010/11 – 2014/15 (5 academic years, 40h per year)**

Exercise classes of “*Elettronica*”, Bachelor Degree in Biomedical Engineering, prof. F. ZAPPA, about 150 students per year.

**2011/12 (1 academic year, 40h per year, 40h in total)**

Exercise classes of “*Sistemi Elettronici*”, Master Degree in Electronics Engineering, prof. F. ZAPPA, about 100 students per year.

**2012/13 – 2015/16 (3 academic years, 90h per year, 270h in total)**

Tutoring for “*Support to foreign students*” of the English track of the Master in Electronics Engineering at POLIMI, about 40 students per year.

### SUPERVISION ACTIVITIES

**2014 - ongoing Co-advisor of 4 Ph.D. students**

**2010 - ongoing Co-advisor of 15 Master Students**

### ISTITUTIONAL RESPONSIBILITIES

**2010 - ongoing POLIMI-DEIB Open Days**

**2013 - ongoing High-School students seminars**

### AWARDS

**1. “Innovation Design Contest 2013” award**

Awarded on 26<sup>th</sup> of September 2013, by “Il Gruppo 24 Ore”. Ranking: 1° classified.

For the research: “*With a handful of photons trough safety, biomedical imaging and beyond*”, by F. Villa and D. Bronzi.

**2. Best graduated student “Premiazione dei migliori laureati in Ingegneria Elettronica” award**

Awarded on 21<sup>st</sup> of March 2012, by Politecnico di Milano. Ranking: 1° classified.

**3. Mathematics games competition, “Olimpiadi della Matematica”**

Awarded in May 2004, by Università di Pisa. Ranking: Bronze Medal.

**SKILLS AND COMPETENCES**

**Engineering tools**

Cadence Virtuoso; OrCAD; Mentor Graphics; Matlab; Eclipse; Xilinx ISE.

**Programming Languages and Development Environments**

C; VHDL; LabVIEW; Unix; DSP and FPGA tools.

**FOREIGN LANGUAGE**

**English: B2 level**

*Myself Federica Alberta VILLA declares to be informed, as Italian legislative decree 196/2003, that all the declared information written above will be used for the evaluation commission. Moreover, myself Federica Alberta VILLA declares to know, as point 76 of D.P.R. 445/2000 law, that any kind of false information may be object of penal code punishment.*

Date and Place:

23/10/2017 - Milano

Signature:

