

Alberto Tosi

Curriculum vitae

Alberto Tosi was born in 1975 in Borgomanero (Italy).

He graduated summa cum laude in Electronics Engineering in 2001 and he received the Ph.D. degree (summa cum laude) in Information Technology Engineering in 2005, both at Politecnico di Milano (Italy). The major topic of the Ph.D. was “Non-invasive testing of VLSI circuits” (with prof. Franco Zappa as advisor).

From April 2005 to April 2006 he was a research assistant at Politecnico di Milano and from April 2006 to December 2014 he was an Assistant Professor at Politecnico di Milano, working on the development of single-photon detectors for the near-infrared wavelength range.

Since December 2014 he has been Associate Professor at “Dipartimento di Elettronica, Informazione e Bioingegneria” of Politecnico di Milano.

Currently, he teaches the course "Electronics" (10 credits) for Biomedical Engineering since 2009.

During the 2006/2007 and 2007/2008 Academic Years, he taught “Fundamentals of Electronics” (10 credits) for Telecommunications Engineering at Politecnico di Milano.

During the Academic Years from 2002/2003 to 2008/2009, he was teacher assistant for the courses “Fundamentals of Electronics” (10 credits) for Physics Engineering, Mathematical Engineering, Engineering for Computer Systems, Telecommunications Engineering at Politecnico di Milano.

During the Academic Years from 2002/2003 to 2007/2008, he was teacher and assistant during the laboratory activities for the courses “Fundamentals of Electronics” at Politecnico di Milano.

In the 2002/2003 Academic Year, he was teacher assistant for the course “Electron Devices” at Politecnico di Milano, Faculty of Information Engineering.

During the Academic Year from 2002/2003 to 2007/2008, he gave seminars in the course “Sensors, signals and noise”, held prof. Sergio Cova, at Politecnico di Milano.

In 2013, he was lecturer in the Master course “The expert in Mechatronics” at “Centro di formazione permanente G. Veronesi”, Rovereto, Italy, for 32 hours.

In 2004 he was a summer student at IBM T. J. Watson Research Center, Yorktown Heights, NY, working on the experimental investigation and testing of VLSI CMOS circuits by means of single-photon detectors and imaging arrays, like SPAD, SSPD, CCD, HgCdTe camera.

Since 2007 he is IEEE member of the Electron Device Society and Photonics Society.

Since 2006 he is member of Associazione Società Italiana di Elettronica (SIE), formerly Associazione Gruppo Elettronica (GE).

In 2013 he was member of the Technical Committee of CLEO, the Conference on Lasers and Electro-Optics.

Since 2011 he is member of Technical Program Committee (TPC) for the conference Ph. D. Research in Microelectronics and Electronics (PRIME).

In 2014 he was member of the Organizing Committee of the conference “Quantum sensing and Nanophotonic Devices” at SPIE Photonics West.

Since 2014 he is member of the Technical Program Committee for the Single Photon Workshop (SPW).

He is the General Chair of the next Single Photon Workshop that will be organized in Milano (Italy) in October 2019.

In the group founded by prof. Sergio Cova, he is currently working on the design and development of Single-Photon Avalanche Diodes (SPADs), both for visible and near-infrared (up to 1700 nm) spectral ranges.

Detectors optimized for near-infrared (specifically for 1550 nm and 1064 nm) are manufactured in InGaAs/InP and InGaAsP/InP and are operated in gated mode with a short gate-ON interval (from ns to hundreds of nanoseconds) in order to keep noise low. After having characterized InGaAs/InP and Germanium SPADs, he designed and developed circuits and methods in order to optimize the performance of such SPADs for the various applications. He is currently working also on the design and development of new InGaAs/InP SPADs (both single pixels and arrays) in a current project. Recently, he also started a new activity for the development of Ge-on-Si single-photon detectors exploiting a new vertical growth of semiconductors.

For applications where single-photon detection up to 1000 nm is required, he focused the research activity on the development of methods and techniques for ultra-fast time-gating SPAD detectors (rise-time of few hundreds of ps) with low timing jitter (few tens of ps) for high resolution waveform reconstruction. He has introduced and developed the technique for ultra-fast gating (rise-time < 200 ps) silicon SPAD for time-resolved diffuse optical spectroscopy, which guarantees waveform reconstruction with high linearity and wide dynamic range (up to 8 decades). Such technique was successfully exploited in European projects for biomedical applications (e.g. brain functional imaging, muscle oximetry, mammography, etc.).

He is working also on linear and two-dimensional SPAD arrays for high frame-rate acquisitions. He developed arrays with up to 2048 SPAD, based on “smart pixels” where processing electronics for counting and timing is integrated in each pixel. Specifically, time-to-digital converters (TDCs) have been integrated in the pixels and SPAD arrays with time-tagging capability have been developed.

His research activity includes also the development of single-photon counting applications, such as the non-invasive optical testing of integrated circuits (he has developed methods and techniques for investigating signals propagating inside VLSI CMOS circuits), time-resolved diffuse optical spectroscopy, LIDAR (Light Detection and Ranging), plasmonics, nanoscopy, etc. All such applications have been developed in collaboration with international partners, like IBM, NIST, PTB, INRIM, Lund University, University of California – Irvine, Heriot-Watt University, University of Waterloo – Institute for Quantum Computing, École Polytechnique de Montréal, Queen’s University, University of California – San Diego, National Research Council – Canadian Photonics Fabrication Centre, Micro Photon Devices S.r.l., Istituto Italiano di Tecnologia (IIT), etc.

He is the principal investigator for POLIMI-DEIB in the projects “DARPA REVEAL: Scene Recovery using an extended Plenoptic Function” (University of Wisconsin subcontract PRJ 144 AAA8584), “micro-crystals Single Photon InfraREd detectors (microSPIRE)” (H2020 FETOPEN-

RIA-2017-1 g.a. 766955), “Smart optical and ultrasound diagnostics of breast cancer (SOLUS)” (H2020 ICT-29-2016-RIA, g.a. 731877) and “Laser and Ultrasound Co-Analyzer for thyroid nodules” (ICT-28-2015, Cross-cutting ICT KETs, g.a. 688303). He was also the principal investigator for POLIMI of the projects “Optical metrology for quantum-enhanced secure telecommunication” (EURANET EMPIR 14IND05 MIQC2), “Advanced Laser Ranging Technologies for Altimetry” (ESA ITT AO 1-7483/13/NL/CP) and "Development of high-performance single-photon detectors", European Metrology Research Programme (EMRP) Grant IND06-REG2 – Researcher Excellence Grant in reference to JRP: IND06 MIQC. He is a participant of the project “Dependability Engineering Innovation for CPS (DEIS)” (H2020 ICT-01-2016, g.a. 732242) and he was a participant of the project "Microelectronic Single-Photon 3D Imaging Arrays for low-light high-speed Safety and Security Applications (MiSPIA)" (FP7-ICT-2009.3.7, g.a. 257646) and of the project "Quantum Interfaces, Sensors, and Communication based on Entanglement (Q ESSENCE)" (FP7-ICT-2009.8.2, g.a. 248095), besides actively working in other projects funded either by the European Commission or by the Italian Ministry.

He is co-author of more than 240 papers on peer-reviewed journals and conference proceedings, and he is the co-inventor of 3 patents for improving the optical testing of integrated circuits.

His H-index is 34 (according to Scopus, author ID 35499994500).

Milano, May 9th, 2019

Alberto Tosi
Associate Professor

Politecnico di Milano
Dipartimento di Elettronica, Informazione e Bioingegneria
P.za Leonardo da Vinci 32 - 20133 Milan - Italy
Phone: +39 02 2399 6174
E-mail: alberto.tosi@polimi.it