

EUROPEAN
CURRICULUM VITAE
FORMAT



PERSONAL INFORMATION

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Nationality	Italian
Civil State	Married
Date of birth	22.02.1977
Place of birth	Valmontone (RM), Italy
Affiliation	Fondazione Bruno Kessler MT-Lab - Testing Via Sommarive 18, 38100 Povo (TN), Italy Tel.: +39-0461-314158

WORK EXPERIENCE

TECHNICAL COLLABORATIONS

1 January 2005 - 30 November 2006: Analog designer in 3DARCH Project at ITC-irst, SOI division. Team: ITC-irst SOI division, CNRC-NRC.

Activities: development of a novel 3D vision optical sensor with merged I-TOF and OT techniques for a 3D acquisition system.

1 February 2007 - 30 April 2007: Software developer in GasBench Project at FBK-irst (ex ITC-irst) MTLab division.

Activities: development of LabView control software for a customized test-bench for automated testing of gas sensors.

12 January 2007 - 3 May 2007: POST-DOC Scholarship at the Department of Information and Communication Technologies of the University of Trento for the project "Characterization of hydrogen sensors based on the Kelvin Probe principle". Team: DIT University of Trento, FBK-irst (ex ITC-irst) MTLab division, DIE University of Rome "Tor Vergata".

Activities: development of a customized test-bench for the dynamic electrical characterization of micro-machined RF-switches realized at MTLab laboratories; characterization of novel micro-machined "Kelvin-Probe" prototype devices realized at MTLab laboratories.

JOBS

From 4 May 2007: employed as Researcher at the Fondazione Bruno Kessler (ex ITC-irst), MT-Lab Testing group.

Activities: development of customized test-benches for T&QA applications.

EDUCATION

Dates	21 December 2006
Name and type of organization	University of Trento - Trento (Italy)
Principal subjects/occupational skills covered	Sensors and Microsystems. Dissertation on “3DJAM - A Linear CMOS Sensor for 3D Vision with merged I-TOF and OT Techniques” Advisor: Prof. G.-F. Dalla Betta
Title of qualification awarded	“Dottore di ricerca” Degree (Ph. D. equivalent) in Information and Communication Technologies
Dates	July 2003
Name and type of organization	University of Rome “Tor Vergata” - Rome (Italy)
Principal subjects/occupational skills covered	Public examination for engineers.
Title of qualification awarded	Enabled to operate as professional Electronic Engineer
Dates	May 2003
Name and type of organization	University of Rome “Tor Vergata” - Rome (Italy)
Principal subjects/occupational skills covered	Sensors and Microsystems. Dissertation on “Studio del comportamento di strutture tipo ‘cantilever’ sollecitate da fotoni” (Study on ‘cantilever’ structures energized by photons) Advisor: Prof. A. D’Amico
Title of qualification awarded	Laurea Degree (Master of Science equivalent) in Electronic Engineering with full marks “110/110 cum laude”

SCOLARSHIPS & AWARDS

Exemption for merit from university fees for the academic years 1996/1997, 1997/1998, 1998/1999, 1999/2000, 2000/2001 and 2001/2002

Scholarship given by A.D.I.S.U. (Association for the Rights to University Study) in the academic years 1997/1998, 1998/1999, 1999/2000, 2000/2001 and 2001/2002

Best Poster Award at the Conference AISEM 2004, the 9th Italian Conference on Sensors and Microsystems, Ferrara, Italy, February 8-11, 2004

TRAINING COURSES

CMOS Analog Integrated Circuit Design.

Phillip E. Allen (Georgia Institute of Technology)
ITC-irst and University of Trento - Trento (Italy)
Subject: Advanced methodologies in CMOS Analog IC Design

Organic Semiconductors Electronic: Principles, Devices, Applications

Elettronica a Semiconduttori Organici: Principi, Dispositivi ed Applicazioni
Politecnico di Milano - Milan (Italy)
Subject: Electronic Devices and Principles based on Organic Semiconductors

ADVanceMS Course. Diego Lasagna for Mentor Graphics

ITC-irst - Trento (Italy)
Subject: Analog simulation with ADVanceMS tool

Using Calibre DRC & LVS Course. Stefano Pettazzi for Mentor Graphics

ITC-irst - Trento (Italy)
Subject: Calibre DRC and LVS tools analysis in DESIGNrev

MOTHER TONGUE

ITALIAN

OTHER LANGUAGES

Reading skills
Writing skills
Verbal skills

ENGLISH
Excellent
Good
Good

SCIENTIFIC ACTIVITY

RESEARCH ACTIVITIES

Development of LabView control software for a customized test-bench for automated testing of gas sensors. Testing of gas sensors is a time-cost intensive task due to their slow response dynamic: sequences of gas mixtures have to be fluxed into the Device Under Test chamber, collecting the electrical data from the sensor, and then sequentially repeating the measurement to produce statistical data. With the aim to reduce the human interaction with the system during the testing process, a custom LabView control-software has been developed: on one hand it is responsible of the gas mixtures generation through a mass-flow controller (MKS 647C with 8 channels), on the other hand it collects the electrical data from a Semiconductor Parameter Analyzer (HP 4145B) connected to the DUT, then writing together the acquired data into a single output spreadsheet file for post-measurement statistical analysis.

Development of a customized test-bench for the dynamic electrical characterization of micro-machined RF-switches. An innovative electrical test-bench has been assembled at the DIT Electronics Laboratory. Employing an RF generator (Agilent 8648C), two directional couplers (Rohde & Schwarz ZPV-Z3), a multi-channel oscilloscope (Tektronix TDS3052B), an ad-hoc LabView software (named Dynacor) has been developed to dynamically estimate the reflection coefficient from a Device Under Test, with a temporal scale of tens of nanoseconds. With the use of an adequate electrical model for the RF-Switch, it is possible to obtain dynamic information related to time-variation of its electrical parameters (like its capacitance).

Characterization of novel micro-machined “Kelvin-Probe” devices. Novel “Kelvin Probe” devices have been developed for hydrogen detection. They consist of micro-machined capacitors with a mobile plate, which can be actuated by an external voltage. These devices are under testing (dynamic performances evaluation) with the aim of an employment in a Kelvin Probe compact measurement system developed at the Department Electronic Engineering (DIE) of the University of Rome “Tor Vergata”.

Development and testing of a novel CMOS sensor for 3D vision with

merged I-TOF and OT techniques. An innovative sensor has been developed and tested, as the main research activity during the last two years at the International Graduate School on ICT of the University of Trento, in collaboration with the ITC-irst of Trento. This novel CMOS image sensor merges, as one of the first prototype in the world, two different techniques for range acquisition, Optical Triangulation (OT) and Indirect-time-Of-Flight (ITOF), employing a single laser source. The sensor has been fabricated with a $0.35\mu\text{m}$, 4 metal and 2 poly layers, 3.3V CMOS technology (C35B4) from Austria Micro Systems, embedding on the same die an OT array (60 pixels) and 2 I-TOF pixels, their readout channels and an analog output buffer (which can drive an external ADC), as well as the bias circuitry (based on band-gap generators, both voltage and current) and the digital control logic, thus achieving a complete “system on chip”. The pixels have been designed with an Automatic Gain Control and an Ambient Light Removal features, while the system architecture has been divided into a two stage pipeline to improve the data throughput (up to 52000 frame acquisition per second). At the same time, a further enhancement in the data throughput has been achieved reading only a portion of the OT array, called Region Of Interest (ROI). The ROI extraction is performed inside the sensor, by its main logic, using a dedicated circuitry called Winner Take All. The I-TOF pixels are used to enhance the depth view of the sensor up to 20 meters, while the OT array can be used to achieve a range resolution better than $150\mu\text{m}$ in the first 2 meters range.

Characterization of fingered photodiodes and phototransistors as gas sensors. An electro-optical test-bench has been equipped in the Sensor Laboratory of the ICT Department of the University of Trento, including the design and realization of an *ad-hoc* sensor front-end circuitry, based on a low noise amplifier stage. The measurements have been performed employing an automated mass-flow controller to test the responsivity of the devices to ethanol, with the aim to introduce them in a complex gas sensing system (electronic nose), based on the variation of the optical properties of metal-porphyrins in the blue spectral region.

Characterization of Mesoscopic Silicon Wires. An *ad-hoc* measurement system (including the sensor front-end circuitry) has been designed and equipped in the Sensor Laboratory of the ICT Department of the University of Trento (DIT). The measurements have been performed employing an automated mass-flow controller to test the characteristics of the *wires* as hydrogen sensors.

Design, realization and characterization of micro-machined cantilevers. The devices have been fabricated and tested in the Rome CNR-IMM institute, as a research activity for the Laurea Degree. The study has been based on optical stimulation of the tip of the structures through a laser source, and on the analysis of their deflection through a position measurement system, which has been *ad-hoc* designed for this purpose.

TEACHING ACTIVITIES

Academic Years 2005/2006, 2006/2007, 2007/2008, 2008/2009.

Teaching assistant for the course of “Elettronica 1” (Prof. G.-F. Dalla Betta) that is part of the Telecommunication Engineering program at the University of Trento - Trento (Italy)

Academic Years 2008/2009, 2009/2010, 2010/2011, 2011/2012, 2012/2013.

Teaching assistant for the course of “Elettronica” (Prof. G.-F. Dalla Betta) that is part of the Telecommunication Engineering program at the University of Trento - Trento (Italy)

Academic Year 2006/2007.

Teaching assistant for the course of “Elettronica Analogica” (Prof. G. Soncini) that is part of the Mechatronics Engineering program at the University of Trento - Trento (Italy)

PUBLICATIONS

Book Chapters

1. A. Tibuzzi, **F. Ficarella**, G. Soncini, C. Di Natale, A. D'Amico, "*Silicon nanowires for Hydrogen detection*", AISEM 2004, Proceedings of the 9th Italian Conference on Sensors and Microsystems, Ferrara, Italy, February, 8-11, 2004, World Scientific Publishing, Singapore 2005
2. A. Tibuzzi, **F. Ficarella**, G.-F. Dalla Betta, G. Soncini, "*Junction photodetectors for optical gas sensing*", AISEM 2005, Proceedings of the 10th Italian Conference on Sensors and Microsystems, Firenze, Italy, February, 15-17, 2005, World Scientific Publishing, Singapore 2006
3. V. Mulloni, F. Solazzi, **F. Ficarella**, A. Collini, B. Margesin, "*Influence of temperature on the actuation voltage of RF-MEMS switches*", in "MICROELECTRONICS RELIABILITY", vol. 53, n. 4, 2013, pp. 706-711.

Journals

4. A. D'Amico, C. Di Natale, E. Martinelli, A. Tibuzzi, B. Marghesin, F. Giacomozzi, G. Soncini, C. Calaza, **F. Ficarella**, S. Iarossi, "*A micromachined gold palladium Kelvin probe for hydrogen sensing*", Sensors and Actuators. B, Chemical 2009, v. 142, n.2, pp. 418-424
5. A. Tibuzzi, **F. Ficarella**, R. Paolesse, G.-F. Dalla Betta, M. Boscardin, A. Macagnano, C. Di Natale, G. Soncini, A. D'Amico, "*Gas sensors based on high blue spectral responsivity photodiodes*", Sensors and Actuators. B, Chemical 2005, v. 111, pp. 242-245

Conference Proceedings

6. R. Peloso, C. Fiorini, L. Bombelli, P. Busca, R. Quaglia, A. Geraci, P. Bellutti, M. Boscardin, **F. Ficarella**, G. Giacomini, A. Picciotto, C. Piemonte, N. Zorzi, S. Incorvaia, N. Nelms, B. Shortt, "*Development of a Detector Based on Silicon Drift Detectors for Gamma-Ray Spectroscopy for Astronomy Applications*", Conference Record of NSS/MIC 2012, IEEE, 2012, pp. 918-921, 2012 IEEE Nuclear Science Symposium and Medical Imaging Conference, Anaheim (CA), USA, 10/29/2012 – 11/03/2012.
7. C. Fiorini, L. Bombelli, P. Busca, R. Peloso, R. Quaglia, P. Bellutti, M. Boscardin, **F. Ficarella**, G. Giacomini, A. Picciotto, C. Piemonte, N. Zorzi, "*New Development of Silicon Drift Detectors for Gamma-Ray Spectroscopy*", Conference Record of NSS/MIC 2012, IEEE, 2012, pp. 2068-2074, 2012 IEEE Nuclear Science Symposium and Medical Imaging Conference, Anaheim (CA), USA, 10/29/2012 – 11/03/2012.
8. M. Bregoli, C. Ressa, A. Collini, **F. Ficarella**, G. Giacomini, F. Mattedi, A. Costantino, S. Hernandez, M. Zahir, "*Development and ESCC evaluation of an European Optocoupler for Space Applications*", 2012 ICSO Proceedings, 2012, pp. 1-4, International Conference on Space Optics, Ajaccio (Corse) France, 9th - 12th October 2012.
9. G. Paternoster, P. Magnone, P. Bellutti, A. Collini, R. De Rose, L. Ferrario, **F. Ficarella**, C. Fiegna, F. Mattedi, E. Sangiorgi, M. Zanucoli, "*Silicon concentrator solar cells: fabrication, characterization and modeling for future Improvements*", Proceedings of the 27th European Photovoltaic Conference, Munchen, WIP Wirtschaft und Infrastruktur GmbH & Co Planungs KG, 2012, pp. 181-184, European Photovoltaic conference and Exhibition, Frankfurt, 09/24/2012.
10. A. Tibuzzi, **F. Ficarella**, C. Di Natale, A. D'Amico, G. Soncini, "*Gas sensors based on photodiodes and phototransistors in the blue spectral range*", Proceedings of the Annual Meeting of the Electronic Group GE, Courmayeur, Italy, June 24-26, 2004.
11. A. Tibuzzi, **F. Ficarella**, G. Soncini, A. D'Amico, M. Zen, "*Mesoscopic Sili-*

con Wires for Hydrogen Detection", Proceedings of the Annual Meeting of the Electronic Group GE , Courmayeur, Italy, June 24-26, 2004.

12. Tibuzzi, G.-F. Dalla Betta, C. Piemonte, **F. Ficarella**, C. Di Natale, A. D'Amico, G. Soncini, "*Finger emitter/base bipolar junction phototransistors for optical gas sensing in the blue spectral region*", Proceedings of IEEE Sensors 2004, 3rd IEEE Conference on Sensors, Vienna, Austria, October 24-27, 2004
13. A. Tibuzzi, G.-F. Dalla Betta, C. Piemonte, **F. Ficarella**, C. Di Natale, A. D'Amico, G. Soncini, "*NPN finger-BJT's with improved current gain for a high sensitivity optical gas sensor matrix*", Proceedings of "Eurosensors XIX", Barcellona, 11-14 September 2005
14. **F. Ficarella**, G.-F. Dalla Betta, L. Viarani, M. Perenzioni, D. Stoppa, L. Gonzo, "A Linear CMOS Sensor for 3D Vision with Merged I-TOF and OT Techniques", Proceedings of "PRIME 2006", Otranto, Italia, 12-15 Giugno 2006, pp. 261-264

OTHER SKILLS

TECHNICAL SKILLS AND COMPETENCES

Software Tools

Advanced skills on IC Analogue Design (design, simulation and layout) with Cadence ICFB software (AMS C35B4 and AMI Semiconductor C05M-D Technologies)

Advanced skills on IC Analogue Design (verification) with Calibre in Mentor Graphics software

Good skills on control-software development with LabView software

Good skills on device layout editing with Tanner Tools software

Good skills on PCB design and route with Cadence OrCAD software

Good skills on math analysis with Origin and Matlab software

Good skills on C/C++ programming

Good skills on Microsoft Office applications

Test and Measurements Instrumentation

Good skills with general purpose laboratory equipment (waveform and function generators, digital oscilloscopes, digital multimeters, etc...)

Good skills with electro-optical test equipment (LED, laser and related driving circuits, photodetectors, etc...)

Good skills with semiconductor test equipments (HP4145, HP4284A, etc...) and their programming through GPIB interface both in C and LabView environments.

ADDITIONAL INFORMATIONS

I hereby **authorize** for the treatment of my personal data in compliance with the D.Lgs 196/2003.

Francesco Ficarella