

Curriculum Vitae

General data

Family Name CARPENTIERI
First Name MARIO
Job Title FULL PROFESSOR
Institution TECHNICAL UNIVERSITY OF BARI
Address VIA ORABONA 4, I-70125 BARI, ITALY
Telephone/Fax +39.0805963254/3410
Email mario.carpentieri@poliba.it
Nationality ITALIAN

Education

February 2005 – University of Messina, Italy. Ph.D. degree “Advanced Technologies in OptoElectronic, Photonic and Electromagnetic Modeling”. Thesis’s title: “Micromagnetic study of magnetic multilayers for spintronic applications”.

2004 – ERASMUS for PhD student at the Department of Applied Physics (University of Salamanca).

August 2001 – Comillas University of Madrid, Spain. Specialization School in “Analogical and Digital Electronic Design”. The research activity has been developed at the ICAI center of the University of Madrid – Spain.

December 1999 – University of Messina, Italy. Master’s degree in Electronic Engineering. Thesis’s title: “Suppression of shot noise in thin oxide MOS devices”.

Employment and professional experience

From May 2019 – Full Professor of Electrical Engineering (09/E1) at the Department of Electrical and Information Engineering of the Technical University of Bari, Bari (Italy).

From January 2016 – Scientific Head of the Research Unit of Electrical Engineering of Bari inside the national group. <http://www.gruppoelettrotecnica.it/index.php?who=dettunita&id=2>

From October 2015 to May 2019 – Associate Professor of Electrical Engineering (09/E1) at the Department of Electrical and Information Engineering of the Technical University of Bari, Bari (Italy).

From May 2012 to October 2015 – Assistant Professor of Electrical Engineering (09/E1) at the Department of Electrical and Information Engineering of the Technical University of Bari, Bari (Italy).

From 2009 – Visiting researcher for several times at the Department of Applied Physics – Laboratory of Atomic and Solid State Physics of the Cornell University, Ithaca, NY, USA.

From February 2008 to April 2012 – Assistant Research at the Department of Electronics, Computer and System Sciences of the University of Calabria (Italy). Title of the research activity: “Micromagnetic modeling of magnetization dynamics in nanostructures for Spintronic applications”.

From November 2005 to October 2007 – Assistant Research at the Department of Industrial Engineering of the University of Perugia (Italy). The research activity is carried out at the “Center for Electric and Magnetic Applied Research”, Scientific Pole of Terni (Italy).

From 2003 – Visiting Researcher for several times at the Department of Applied Physics, University of Salamanca (Spain).

Research

The main research interests are related to the thematic of the nanoscale science and nanotechnology, with particular focus on nanoscale magnetism and spintronics. In particular, it has been developed a full micromagnetic code (GPU parallel code) to perform fast numerical simulations of magnetic nanodevice taking

into account spin torque and spin transfer effects. The research involves studying electron spin dynamics in thin film magnetic nanostructures. Much of the work focuses on the spin transfer torque (STT), STT-induced magnetization domain reversal and high frequency (GHz) magnetization dynamics of these nanomagnets. STT-induced magnetic dynamics have immense applicability in both the evolution of memory technology as well as in the development of highly tunable microwave oscillators. In the last years, the study and the application of spin currents generated by the giant spin Hall effect have been also considered. Particular interest is devoted to the spin-dependent electron and pure spin transport in thin film electronic structures, magnetic tunnel junctions and point contact geometries. Currently, the theoretical study and numerical simulations of a new topological object called skyrmion is investigated for advanced device research and applications, like racetrack memory, diode and nano-oscillator. The high interest in skyrmions arises from the fact that they can be manipulated very efficiently with electric currents with ultra-low threshold. By adding an additional layer with strong spin-orbit coupling to the ferromagnet, it is possible to generate an interfacial chiral Dzyaloshinskii Moriya interaction, which stabilizes the skyrmion spin structure in the magnetic bubble domain wall. Using spin Hall effects these magnetic skyrmion bubbles can then be electrically manipulated.

Current research is partially carried out together with some research group of the same consortium. In particular, he is involved with Prof. Finocchio (Unime, Italy) in the micromagnetic modelling of magnetic skyrmion applied to MRAM, nano-oscillator and diode devices. In collaboration with Prof. Z. Zeng from the Suzhou Institute of Nanotech and Nanobionics – Suzhou (China), he theoretically studied by micromagnetic simulations the giant spin-torque diode sensitivity. Actually, he collaborates with the group of Prof. Slavin (Oakland University, USA) for the theoretical study of the excitation of propagating spin waves in ferromagnetic nanowires.

Honours and invited

From March 2022 – Member of the board of the National Electrotechnics Group (<http://www.gruppoelettrotecnica.it/index.php?who=organizzazione>).

From July 2021 – President of the Patent Commission of the Polytechnic of Bari for the four-year period 2019-2022.

June 2021 – General Chair of the international conference IEEE Advances in Magnetism AIM 2020 (www.aim2020.poliba.it).

From March 2021 – Coordinator of the PhD Program in “Electrical and Information Engineering” (DRIEI) of the Politecnico di Bari.

November 2019 – Chair of the session ET “Micromagnetics and hysteresis modeling I” of the international conference MMM 2019 Las Vegas, Nevada, USA, November 04-08, 2019.

July 2019 – General Chair of the international conference Magnonics 2019 (www.magnonics2019.poliba.it).

September 2018 – Member of the commitment European doctorate at the University of Valladolid (Spain) for the thesis “Magnetic nanodevices modelization focused on spin-orbit coupling phenomena”.

July 2018 – Chair of the session U16 “Vortex and skyrmion dynamics II” of the international conference ICM 2018 San Francisco, USA, July 15-20, 2018.

From February 2018 – Associate Editor of the international journal “IEEE Transactions on Magnetism”.

From June 2017 to March 2021 – Member of the PhD Committee in “Electrical and Information Engineering”. Politecnico di Bari.

June 2017 – Visiting professor for the Mobility for Teaching (SMT) Erasmus+ KA103 - Higher education student and staff mobility within the Programme Countries at the University of Salamanca (SPAIN).

From May 2017 to December 2020 – Component of the “Presidio della Qualità di Ateneo del Politecnico di Bari”. <http://www.poliba.it/it/Q%26S/presidio-della-qualit%C3%A0-di-ateneo>.

May 2017 – Chair of the session MoA2 “Hysteresis modeling” of the international conference HMM 2017 Barcellona, SPAIN, May 29-31, 2017.

April 2017 – Chair of the session CN “Spin currents, switching and Spin Seebeck Effect II” of the international conference INTERMAG 2017 Dublin, IRLANDA, April 25-29, 2017.

From February 2017 – Associate Editor of the international journal “SCIENTIFIC REPORTS”, Nature Publishing Group, (www.nature.com/srep/about/editorial-board).

September 2016 – Invited paper: topical review “Magnetic skyrmions: from fundamental to applications” for Journal of Physics D: Applied Physics (IOP).

March 2016 – Chair of the session “Nanomagnetism and Spintronics” of the international conference AIM 2016 Bormio, ITALY, March 14-16, 2016.

November 2014 – Chair of the session CW “Skyrmion I” of the international conference MMM 2014 Honolulu, Hawaii - USA, November 3-7, 2014.

From 2014 to May 2017 – Member of the PhD Committee in “Information and Communication Technologies”. University of Calabria.

September 2013 – Lecturer of the course for PhD students “Micromagnetism and spintronics for MRAM and nano-oscillator applications”, for the PhD in “Systems and Information Science Engineering” of the University of Calabria.

July 2013 – Member of the Committee of European doctorate at the University of Salamanca (Spain) for the doctoral thesis “Spintronic Micromagnetic Simulations Using Parallel Computations” presented by the PhD student David Aurelio.

2013 – Member of the PhD Committee in “Ingegneria Elettrica e dell’Informazione”. Technical University of Bari.

November 2012 – Leader of the ANASSILAOS 2012 award.

From 2012 – Member of the Editorial Board of the IEEE Transactions on Magnetics.

August 2012 – Invited paper: topical review “Micromagnetic simulations using Graphics Processing Units” for the international Journal of Physics D: Applied Physics (IOP).

July 2011 – Leader of a post-doc research fellowship at the University of Calabria.

From 2011 – Senior Member of IEEE and IEEE Magnetic Society # 90557910.

From 2010 – Promoting partner of the SpinOff Society “GoParallell S.R.L.”. Environment Park of University of Salamanca, Spain.

May 2009 – Chair of the session PB of the international conference HMM 2009 Gaithersburg, Maryland - USA, May 11-14, 2009.

July 2006 – Lecturer of the NATO-ASI School in “Magnetic nanostructures for micro-electromechanical systems and spintronic applications” Catona, Calabria (Italy), July 2-15, 2006.

January 2006 – Member of the Local Organizing Committee of the NATO-ASI School in “Magnetic nanostructures for micro-electromechanical systems and spintronic applications” Catona, Calabria (Italy), July 2-15, 2006.

Reviewer for international journals: Scientific Reports (NATURE), IEEE Transactions on Magnetics (IEEE), IEEE Transactions on Nanotechnology (IEEE), Physical Review Letters (APS), Physical Review B (APS), Applied Physics Letters (AIP), Journal of Applied Physics (AIP), Electric Power Systems Research (Elsevier), Journal of Magnetism and Magnetic Materials (Elsevier), Physica B (Elsevier), Journal of Physics D: Applied Physics (IOP), Journal of Physics (IOP), New Journal of Physics (IOP).

Reviewer for scientific projects: Prin and Furb of the Italian Ministry of the Istruzione, Università e Ricerca; Projects of the Romania government (CNCS – <http://www.cncs-uefiscdi.ro/home/>).

Member of the EDITORIAL BOARD of the COMPUMAG – “International Conference on the Computation of Electromagnetic Fields” and of the CEFC – “Conference on Electromagnetic Field Computation”.

Advisor di 1 PhD student in “Information and Communication Engineering for Pervasive Intelligent Environments”, XXVIII cycle, University of Calabria.

Projects and activities

1. Coordinator of the Poliba unit of the PRIN 2020 project “The Italian factory of micromagnetic modeling and spintronics” Prot. 2020LWPKH7. Total project budget: 796 kEuro.
2. PON project “NSG – New Satellite Generation Components”. OR4 – Task 4.1 e 4.2: “Innovative Power Generation and Storage”. Activity budget: 300 kEuro.
3. PON project “CLOSE to the Earth”. OR3 – Task 3.2: “Studio di sistemi innovativi per generazione e accumulo di energia e recupero di calore in orbite very LEO”. Activity budget: 220 kEuro.
4. Italian Coordinator of the project “Rad-hard spintronics diodes with giant sensitivity (DIOSPIN), funded by the Agenzia Spaziale Italiana (ASI). The project aims to realize a detector rad-hard device for space applications based on a Magnetic Tunnel Junction (MTJ) cell. 3 research groups from different academia are involved in the project. Total project budget: 220 kEuro.
5. FFABR project for the last 5 years evaluation of the scientific activity. Total budget: 3 kEuro.
6. Coordinator of the project FRA – Study and simulations of magnetization dynamics for spintronics nano-oscillator applications, founded by the Technical University of Bari, 2012-2017. Total project budget: 20 kEuro.
7. PON Res Novae, Reti Edifici Strade, Nuovi Obiettivi Virtuosi per l’Ambiente e l’Energia”. Research unit of Politecnico di Bari, 2012-2105.
8. Research project of the Ministerio de ciencia e innovacion de Espana. Research unit of University of Salamanca, 2008-2011.

Patents

1. P. Burrascano, M. Carpentieri, M. Ricci. Patent number: TR2011A000001 of 18.02.2011, Ministry of the Sviluppo Economico, patent N. 0001406955 of the 14.03.2014. “Method for increasing the writing efficiency in MRAM nanodevices”.
2. P. Burrascano, M. Carpentieri, M. Ricci. Patent number: MI2007A000381 of the 27.02.2007. “Method and related apparatus to the non-destructive test of conductor materials”.

Bibliometric indicators

- *International journals*: **134**
- *Citations number (from ISI Web of Science, Journals)*: **3200**
- *h-index (from ISI Web of Science, Journals)*: **31**
- *Book chapters*: **9**
- *International conferences*: **213**