Carlo Stefano Ragusa
Curriculum Vitae

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Politecnico di Torino
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TRAINING and ACADEMIC CAREER

Degree and training

Italian national habilitation to Full professorship, 09/E1 – Electrical Engineering, 2014.
PhD degree, 1997, Politecnico di Torino.
MS degree, 1993, Università degli Studi di Catania, Italy, Electrical Engineering (with honors).

Career advancement at Politecnico di Torino

Full Professor of Electrical Engineering (circuit theory and electromagnetism), 2019 – to present time.
Associate Professor of Electrical Engineering (circuit theory and electromagnetism), 2005 – to 2019.
Assistant Professor, 1998 – 2005.

International reputation and professional activity for the scientific community

Chair of the **IEC TC68 Magnetic alloys and steels** from October 2020 (term ending 2026).

Chair of the Italian National Committee **CEI\TC68/51** (Leghe e acciai magnetici, ferriti, polveri magnetiche, e componenti) since 10-12-2018.

Visiting professor at **École Normale Supériéure Paris-Saclay**, 61 avenue du Président Wilson 94235 Cachan in 2018 (2 months), 2014 (2 months), and 2010 (3 months). Visit at **Wolfson Centre for Magnetics**, Cardiff University, Cardiff (UK) (1 month).

Chairperson of the International Steering Committee of the conference "International Workshop on 1&2-Dimensional Magnetic Measurement and Testing", since September 2016.

Member of the International Steering Committee of the Conference "Soft Magnetic Materials (SMM)," since 2015.

Guest Editor for the International Conference *Soft Magnetic Materials* (SMM), years 2009, 2015, 2017, 2019; Guest Editor for the 13th International Workshop on 1&2-Dimensional Magnetic

Measurement and Testing, Torino, Italy, 2014; Guest Editor for the 6th International Workshop on Optimization and Inverse Problems in Electromagnetism, OIPE2000, Torino, Italy, 2000.

Reviewer for several leading international journals, including IEEE Transactions on Magnetics, IEEE Transactions on Industrial Electronics, Journal of Magnetism and Magnetic Materials, Physica B: Condensed Matter, AIP Advances, International Journal of Applied Electromagnetics and Mechanics.

Main responsibilities at Politecnico di Torino

- Teaching undergraduate, specializing master's, and doctoral courses in the field of electrical engineering, circuit theory, applied electromagnetism, materials for electrical energy, and numerical micromagnetics;
- Supervising Ph.D. students, Post-Docs research fellows, visiting researchers, undergraduate and master – level students;
- Guiding and setting up research directions and executing projects in the areas of (i) the analysis and optimization of electromagnetic devices for application in Electrical Engineering; (ii) the numerical techniques in the analysis of the electromagnetic fields; (iii) the theoretical and experimental analysis of magnetic materials for energy applications.
- Collaborating with leading international universities and technical bodies in joint research and technical projects.
- Participating to institutional offices in teaching and research structures of the Politecnico di Torino.

Career before enrolment at Politecnico di Torino

Post-doctoral Fellowship (l. 398/89), Politecnico di Torino, Torino from 15/12/1997 to 30/11/1998.

Career outside Politecnico di Torino

Fellowship at Istituto Elettrotecnico Nazionale Galileo Ferraris, Torino, from 01/11/1996 to 31/10/1997.
High-school teacher (grades 10-13), from 1984 to 1993.

Research Interests

My research activity, covering a period of 25 years, can be summarized as follows. My studies have mainly covered two complementary areas. A first one deals with the development of numerical techniques for the analysis of electromagnetic fields in the area of the Electrical Engineering. It is focused, in particular, on: 1) Numerical analysis of the electromagnetic fields in non-linear media, with scalar and vector hysteresis; 2) Theoretical and numerical issues regarding the Finite Formulation of micromagnetism coupled to the Maxwell's equations; 3) Computation of magnetostatic fields by application of FFT and parallel algorithms, and the modeling of spin waves in patterned nanostructures. This field also includes the study of scalar and multi-objective optimization algorithms and their coupling to Finite Elements methods codes, towards the automatic optimization of electromagnetic devices.

A second main area of research deals with theoretical and experimental analysis of the present-day landscape of magnetic materials for energy applications: non-oriented Fe-Si and Fe-Co, grain oriented steel sheets, soft magnetic composites, amorphous and nanocrystalline alloys, soft ferrites. Besides the measuring and metrological issues, the role of different physical parameters (thickness, resistivity, etc.), of different supply conditions (sinusoidal, triangular, distorted, PWM induction waveshapes) at high frequencies and high inductions, and of 1 & 2-dimensional flux loci have been investigated in theory and experiment. The main goal of this encompassing research activity is one of developing the experimental methods and the theoretical approaches by which a coherent assessment of the behavior of modern magnetic materials is worked out, to the benefit

of reliable and efficient design of electrical devices.

A persisting aim of my research work is to provide a *bridge* between the electrical engineering methods and the physical approach to the investigation of magnetic materials, eventually leading to improved and efficient solutions in applications. This implies, on the one hand, the development of refined numerical methods to describe non-linear materials with hysteresis and, on the other hand, the study of the physical properties of the materials and their measurement.

My studies, carried out at the Department of Energy of Politecnico di Torino, have always been oriented towards collaborative activities, favored by the numerous connections I established with national and international laboratories and scientists. They have been presented in 70 peer-reviewed papers on international journals, more than 11 papers published in Conference proceedings, and a number of seminars, presentations and invited communications at international conferences/workshops.

Coordination of research and technology transfer groups and projects.

From the year 2006 I have coordinated, as academic supervisor, the research activity of **12** PhD students at Politecnico di Torino, **4** Post-Doc Research Fellowships, **3** Visiting Professors.

Partner of Euramet – EMPIR project HEFMAG - 19ENG06: "Metrology of magnetic losses in electrical steel sheets for high-efficiency energy conversion," 2020 – 2023.

I was partner of several National research projects, awarded through a peer-review process: "Non linear dynamics and relaxation in micromagnetic system: computational study," 2007-2009; "SAVE – Systems for UAV Advanced Alternative Energy", 2007-2011; "Control of Magnetization Dynamics in Magnetic Nanostructures for Information and Communication Technology Applications – DyNanoMag," 2013-2016; "TIVANO – Innovative Technologies for New Generation General Aviation Aircraft," National Technology cluster – Aerospace, 2014-2017.

I participated as a research staff member to EU Project BRITE-EURAM III "CHARLES" Characterisation of Losses in Electrical Steel, (1996-1998).

Teaching activity

During my career, since 2000, I have taught numerous courses regarding Electrical Circuits and Network Analysis, Fundamental of Industrial Electrical Systems, Circuit Theory II, Materials for Electrical Energy, Electromagnetism.

Publications

My list of publications, accounts 79 Journal papers, 11 Conference Proceedings, and 1 Editorial. 1094 citations in Scopus; h-index = 17 (Scopus).

List of publications

Journal papers

2021

[1] A. Napolitano, C. Ragusa and F. Laviano, "**Modeling stray field distribution generated by domain-walls in rare-earth substituted iron garnets**," in *IEEE Transactions on Magnetics*, doi: 10.1109/TMAG.2021.3083589.

[2] A. Magni, A. Sola, O. de la Barrière, E. Ferrara, L. Martino, C. Ragusa, C. Appino, F. Fiorillo, "**Domain structure and energy losses up to 10 kHz in grain-oriented Fe-Si sheets**," AIP Advances 11, 015220 (2021), doi: 10.1063/9.0000184.

2020

[3] A. Napolitano, C. Ragusa, S. Guastella, S. Musumeci, P. Rivolo, Francesco Laviano, "**Visualization of stray-field distribution by charged domain-walls in rare-earth substituted iron garnets**,"Journal of Magnetism and Magnetic Materials, Volume 504, 2020, 166556, doi: 10.1016/j.jmmm.2020.166556.

[4] Carlo Ragusa, Luigi Solimene, Salvatore Musumeci, Olivier de la Barriere, Fausto Fiorillo, Giulia Di Capua, Nicola Femia, "**Computation of current waveform in ferrite power inductors for application in buck-type converters**," Journal of Magnetism and Magnetic Materials, Volume 502, 2020, 166458, doi:10.1016/j.jmmm.2020.166458.

[5] F.J.G. Landgraf, C. Ragusa, D. Luiz Rodrigues, M.B.S. Dias, O. de la Barrière, F. Mazaleyrat, F. Fiorillo, C. Appino, L. Martino, "**Loss decomposition in plastically deformed and partially annealed steel sheets**," Journal of Magnetism and Magnetic Materials, Volume 502, 2020, 166452, doi: 10.1016/j.jmmm.2020.166452.

[6] Carlo Appino, Enzo Ferrara, Fausto Fiorillo, Carlo Ragusa, Olivier de la Barrière, "**Static and dynamic energy losses along different directions in GO steel sheets**," Journal of Magnetism and Magnetic Materials, Volume 500, 2020, 166281, doi: 10.1016/j.jmmm.2019.166281.

2019

[7] M. Filippini, P. Alotto, V. Cirimele, M. Repetto, C. Ragusa, L. Dimauro, and E. Bonisoli, "**Magnetic Loss Analysis in Coaxial Magnetic Gears**," *Electronics*, vol. 8, no. 11, p. 1320, Nov. 2019, doi: 10.3390/electronics8111320.

[8] Cinzia Beatrice, Samuel Dobák, Vasiliki Tsakaloudi, Carlo Ragusa, Fausto Fiorillo, "**The temperature dependence of magnetic losses in CoO-doped Mn-Zn ferrites**,"Journal of Applied Physics 126, 143902 (2019), doi: 10.1063/1.5118824.

[9] O. de la Barrière, C. Ragusa, C. Appino and F. Fiorillo, "**Loss Prediction in DC-Biased Magnetic Sheets**," in *IEEE Transactions on Magnetics*, pp. 1-14, published online June 2019. doi: 10.1109/TMAG.2019.2921000.

[10] H. Zhao, C. Ragusa, C. Appino, O. de la Barrière, Y. Wang and F. Fiorillo, "**Energy Losses in Soft Magnetic Materials Under Symmetric and Asymmetric Induction Waveforms**," in *IEEE Transactions on Power Electronics*, vol. 34, no. 3, pp. 2655-2665, March 2019. doi: 10.1109/TPEL.2018.2837657

[11] S. Dobák, C. Beatrice, F. Fiorillo, V. Tsakaloudi and C. Ragusa, "**Magnetic Loss Decomposition in Co-Doped Mn-Zn Ferrites,**" in *IEEE Magnetics Letters*, vol. 10, pp. 1-5, 2019, Art. no.7100205.
doi: 10.1109/LMAG.2018.2881108.

2018

[12] Enzo Ferrara, Fausto Fiorillo, Cinzia Beatrice, Samuel Dobák, Carlo Ragusa, Alessandro Magni, Carlo Appino, "**Characterization and assessment of the wideband magnetic properties of nanocrystalline alloys and soft ferrites**," Journal of Material Research, Vol. 33, No. 15, pp. 2120-2137, Aug 13, 2018, doi: 10.1557/jmr.2018.275, https://doi.org/10.1557/jmr.2018.275.

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[14] Cinzia Beatrice, Samuel Dobák, Vasiliki Tsakaloudi, Carlo Ragusa, Fausto Fiorillo, Luca Martino, and Vassilis Zaspalis, "**Magnetic loss, permeability, and anisotropy compensation in CoO-doped Mn-Zn ferrites**," AIP Advances 8, 047803 (April 2018), doi:10.1063/1.4993718.

2017

[15] Hanyu Zhao (赵洽宇), Carlo Ragusa, Carlo Appino, Olivier de la Barrière, Mahmood Khan, Carlo Appino, and Fausto Fiorillo, "**Magnetic loss versus frequency in non-oriented steel sheets and its prediction: minor loops, PWM, and the limits of the analytical approach**", IEEE Transactions on Magnetics, vol. 53, no. 11, Article Number 2003804, November 2017, ISSN: 0018-9464, doi: 10.1109/TMAG.2017.2701299.

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[17] Luca Boggero, Marco Fioriti, Carlo Ragusa, Sabrina Corpino, "**Trade off studies of hybrid-electric aircraft by fuzzy logic methodology**," International Journal of Applied Electromagnetics and Mechanics, Vol. 56, 2018, pp. S143–S152, doi: 10.3233/JAE-172293.

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[19] O. de la Barrière, Carlo Ragusa, C. Appino, F. Fiorillo, "**Prediction of energy losses in soft magnetic materials under arbitrary induction waveforms and DC bias**," IEEE Transactions on Industrial Electronics, vol. 64, no 3, March 2017, ISSN: 0278-0046, doi: 10.1109/TIE.2016.2608886.

2016

[20] C. Beatrice, S. Dobák, E. Ferrara, F. Fiorillo, Carlo Ragusa, J. Füzer, P. Kollár, "**Broadband magnetic losses of nanocrystalline ribbons and powder cores**," Journal of Magnetism and Magnetic Materials, vol. 420, December 2016, pp. 317-323, ISSN: 0304-8853, doi: 10.1016/j.jmmm.2016.07.045.

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2015

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Electromagnetics and Mechanics, vol. 48, 2015, pp. 247-254, ISSN: 1383-5416, doi: 10.3233/JAE-151995.

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2014

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[32] C. Appino, O. de la Barrière, C. Beatrice, F. Fiorillo, Carlo Ragusa, "**Rotational magnetic losses in nonoriented Fe-Si and Fe-Co laminations up to the kilohertz range**," IEEE Transactions on Magnetics, vol. 50, no. 11, Article Number 6971426, Nov. 2014, ISSN: 0018-9464, doi: 10.1109/TMAG.2014.2325968.

[33] A. Rahim, Carlo Ragusa, B. Jan, O. U. Khan, "**A mixed Mid-point Runge-Kutta like scheme for the integration of Landau-Lifshitz equation**," Journal of Applied Physics, vol. 115, 17D101, 2014, ISSN: 0021-8979, doi: 10.1063/1.4852118.

[34] O. de la Barrière, C. Appino, Carlo Ragusa, F. Fiorillo, F. Mazaleyrat, M. LoBue, "**High-frequency rotational losses in different Soft Magnetic Composites (SMC)**," Journal of Applied Physics, vol. 115, 17A331,2014, ISSN: 0021-8979, doi: 10.1063/1.4865974.

[35] C. Beatrice, C. Appino, O. de la Barrière, F. Fiorillo, and Carlo Ragusa, "**Broadband magnetic losses in Fe-Si and Fe-Co laminations**," IEEE Transactions on Magnetics, vol. 50, no. 4, Article number 6300504*,* April 2014, ISSN: 0018-9464, doi:10.1109/TMAG.2013.2286923.

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2013

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2012

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2011

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2009

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2008

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2007

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2006

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2005

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