



Antonio Macchiagodena

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Antonio-Macchiagodena • 0000-0002-6131-6581

Profile Summary

Experienced researcher specializing in applied superconductivity, with a strong background in electromagnetic modeling, circuit analysis, and high-temperature superconductors (HTS). Passionate about advancing energy-efficient technologies through innovative research and numerical modeling.

Education

Ph.D. in Biomedical, Electrical, and Systems Engineering

Alma Mater Studiorum - Università di Bologna

2024

Curriculum: Applied Superconductivity

Final evaluation: Excellent

Master's Degree in Electrical Engineering

Alma Mater Studiorum - Università di Bologna

2020

Final evaluation: 110/110 cum Laude

Bachelor's Degree in Electrical Engineering

Alma Mater Studiorum - Università di Bologna

2017

Final evaluation: 110/110 cum Laude

Courses and Training

- 24th stage of the Scuola Nazionale dei Dottorandi di Elettrotecnica "Ferdinando Gasparini" (Naples, Italy, 2022)
- 3rd International School on Numerical Modelling for Applied Superconductivity (Saas-Fee, Switzerland, 2022)
- 2nd Training School of the Hi-SCALE COST action (Fethiye, Turkiye, 2023)

Professional Experience

Post Doctoral Research Grant Holder

Alma Mater Studiorum - Università di Bologna

2025–2026

Project: Marine Reciprocating Superconducting Generator (RSG) Project acronym: MARES, funded by the EU

Post Doctoral Research Grant Holder

Alma Mater Studiorum - Università di Bologna

2024–2025

Project: Superconducting Energy Pipelines, funded by the PNRR

Post Doctoral Research Grant Holder

INFN (Italian National Institute for Nuclear Physics, Bologna)

2023–2024

Project: Electromagnetic design and optimization of resistive magnets for the Muon Collider. Research activities were performed with FEMM, Python, and LT Spice.

Local Organizing Committee Member

16th European Conference on Applied Superconductivity (EUCAS2023)

2023

Technical Editor

IEEE Transactions on Applied Superconductivity (Special Issue of EUCAS2023)

2023

Didactic Tutor

Alma Mater Studiorum - Università di Bologna

2022–Present

- Fundamentals of Electrical Engineering (Chemical and Biochemical Engineering)
- Applied Electromagnetism (Electrical Engineering)

Ph.D. Student

Alma Mater Studiorum - Università di Bologna

2020–2023

PhD activities carried out under the supervision of Prof. Marco Breschi

Research Focus:

- Development of analytical formulae for magnetization losses in high-temperature superconductors (HTS)
- Circuit models for current distribution in HTS tapes and devices
- Electromagnetic analysis using Ansys-Maxwell 3D, COMSOL, and FEMM

Intern

CERN (Geneva, Switzerland)

2019–2020

Activities supervised by Dr. Arnaud Devred

Key Responsibilities:

- Member of the quality team of the Large Magnet Facility (LMF)
- Quality analysis of the heat treatment for the 11T Nb₃Sn dipole and MQXF quadrupole for the HiLumi-LHC project

Collaborations

ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development)

Collaboration in the framework of the EUROFUSION project for the development of analytical formulae and numerical models for the analysis of AC losses in HTS twisted stacked cables.

PoliTo (Politecnico di Torino)

Engaged in joint research efforts on computational modeling and design of superconducting cables in the framework of PRIN2022. Collaboration for developing numerical models for HTS cables in the framework of the EUROFUSION activities.

CERN (European Organization for Nuclear Research)

Collaborated on optimized resistive dipole and quadrupole design for the MuCO project and development of HTS cable. Performed the electromagnetic design of the 20@20 modelcoil for the MuCo and analysis on AC losses.

F4E (Fusion for Energy)

Contributed to the development of circuitual and FEM-based models for the analysis of faults of the ITER reactor.

RSE spa (Ricerca sul Sistema Energetico)

Collaboration centered around the development of a numerical model for the characterization of the behavior of NI-HTS coils and validation via experimental measurements.

ENI spa (Ente Nazionale Idrocarburi)

Partnership in the electromagnetic design of the 20@20 model coil for the MuCo and analysis, and on experimental characterization of HTS tapes.

Political Activity

City Council Member

Montelongo (CB)

2022–Present

- Elected as a member of the city council, actively participating in local governance and decision-making.

Skills

🛠️: Software

Ansys-Maxwell 3D, COMSOL, MATLAB, LTSpice, FEMM, PSIM, MS Office

💻: Programming

Fortran, MATLAB, SIMULINK, Python, LaTeX

🗣️: Languages

Italian (Native), English (B2), French (Basic)

Publications

1. M. Breschi, **A. Macchiagodena**, P. L. Ribani, et al., "Experimental and numerical investigation on losses in electrodynamic transients in a Nb₃Sn prototype racetrack coil," in *IEEE Transactions on Applied Superconductivity*, vol. 28, no. 3, pp. 1–5, 2017.
2. **A. Macchiagodena**, M. Breschi, D. Buonafine, G. De Marzi, and L. Savoldi, "Analytical modeling of magnetization losses in twisted stacked HTS conductors," in *IEEE Transactions on Applied Superconductivity*, vol. 33, no. 5, pp. 1–5, 2023.
3. **A. Macchiagodena**, M. Breschi, G. De Marzi, F. Grilli, and L. Savoldi, "Analytical formulae for hysteresis power loss in twisted stacked HTS cables," in *IEEE Transactions on Applied Superconductivity*, vol. 34, no. 3, pp. 1–5, 2024.
4. M. Breschi, **A. Macchiagodena**, P. L. Ribani, A. Musso, G. Angeli, and M. Bocchi, "Circuit Model of Interlayer and Screening Currents in Layer-Wound NI HTS Coils," in *IEEE Transactions on Applied Superconductivity*, vol. 34, no. 3, pp. 1–5, 2024.
5. A. Musso, G. Angeli, M. Ascade, M. Breschi, **A. Macchiagodena**, et al., "Comparison between insulated and NI layer-wound ReBCO coils during transients," in *IEEE Transactions on Applied Superconductivity*, vol. 34, no. 5, pp. 1–6, 2024.
6. L. Cavallucci, A. Musso, G. Angeli, L. Martini, M. Bocchi, **A. Macchiagodena**, and M. Breschi, "Optimization Procedure to Design a DC Transmission Line with MgB₂ Wires in Liquid Hydrogen," in *IEEE Transactions on Applied Superconductivity*, vol. 35, no. 5, pp. 1–5, 2025.
7. M. Bracco, A. Balbo, C.-E. Bruzek, M. Breschi, L. Cavallucci, S. Farinon, **A. Macchiagodena**, et al., "Design of a Submarine 30-km MgB₂ Cable for the Combined Transfer of 0.3 GW_e and LH₂ from Offshore Plants to the Ravenna Port," in *IEEE Transactions on Applied Superconductivity*, vol. 35, no. 5, pp. 1–6, 2025.
8. M. Breschi, **A. Macchiagodena**, P. L. Ribani, A. Musso, G. Angeli, and M. Bocchi, "Improvement of the Circuit Analyzer Problem Solver CALYPSO," in *IEEE Transactions on Applied Superconductivity*, vol. 35, no. 5, pp. 1–5, 2025.
9. G. Mangiulli, M. Bracco, M. Breschi, L. Cavallucci, S. Farinon, **A. Macchiagodena** et al. , "Sizing and Economic Assessment for Auxiliar Components and Grid Connection of a MgB₂-LH₂ Hybrid Power Cable," in *IEEE Transactions on Applied Superconductivity*, vol. 36, no. 5, pp. 1-6, Aug. 2026,
10. L. Savoldi, M. Bracco, M. Breschi, L. Cavallucci, S. Farinon, **A. Macchiagodena**, et al. , "Analysis of the Evolution of Accidental Transients in the Cooling of a MgB₂-LH₂ Hybrid Power Cable," in *IEEE Transactions on Applied Superconductivity*, vol. 36, no. 5, pp. 1-6, Aug. 2026,
11. L. Cavallucci, M. Breschi, **A. Macchiagodena**, et al. "Analysis of Electric Fault in a MV DC MgB₂ Transmission Line Cooled by Liquid Hydrogen," in *IEEE Transactions on Applied Superconductivity*, vol. 36, no. 5, pp. 1-5, Aug. 2026,
12. **A. Macchiagodena**, M. Breschi, G. De Marzi, L. Savoldi and F. Grilli, "Circuit Model for Hysteresis Losses in Twisted Stacked HTS Cables," in *IEEE Transactions on Applied Superconductivity*, vol. 36, no. 5, pp. 1-5, Aug. 2026,
13. M. Cais, M. Nicoli, M. Gandiglio, M. Bracco, M. Breschi, L. Cavallucci, S. Farinon, **A. Macchiagodena**, G. Mangiulli, R. Musenich, and L. Savoldi, "Hybrid superconducting energy pipelines: key cost thresholds and system implications for Italy," *International Journal of Hydrogen Energy*, vol. 210, p. 153627, 2026.
14. L. Cavallucci, L. Soldati, S. M. Cutore, T. Spina, M. Tropeano, R. Tebano, L. G. Tabarez Rodriguez, **A. Macchiagodena**, and M. Breschi, "Optimization procedure to design a low-losses MgB₂ wire," in *IEEE Transactions on Applied Superconductivity*, vol. 36, no. 5, pp. 1-5, Aug. 2026,
15. L. Bottura, B. Bordini, M. Catellani, R. Losito, A. Trotta, M. De Bastiani, D. Indrigo, E. De Marchi, E. Gallo, A. Spagnuolo, F. Beggio, C. Luongo, L. Giannini, G. Federici, M. Casciello, M. De Stasio, L. Savoldi, M. Breschi, **A. Macchiagodena**, L. Cavallucci, A. Portone, and M. Statera "A "20 T at 20 K" Model Coil for the Muon Collider Target Solenoid and Fusion Applications" in *IEEE Transactions on*

- Applied Superconductivity*, vol. 36, no. 3, pp. 1-7, May. 2026,
16. M. Breschi, M. Fabbri, **A. Macchiagodena** and L. Bottura, "Analytical Study of Current Distribution in a 2-Turn Non-Insulated HTS Coil", in *IEEE Transactions on Applied Superconductivity*, vol. 36, no. 5, pp. 1-5, Aug. 2026,

According to law 679/2016 of the Regulation of the European Parliament of 27th April 2016, I hereby express my consent to process and use my data provided in this CV and application for recruiting purposes.