


## PERSONAL INFORMATION

## Gianluca De Marzi

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## PROFESSIONAL PROFILE

Experimental physicist and senior research scientist at ENEA with expertise in superconducting magnet systems, spanning LTS and HTS technologies for fusion energy and high-field applications. Associated Scientist at CERN (2018–2020) and INFN Associate (since 2021).

Extensive experience in the design, modelling, and experimental characterization of superconducting conductors and magnet systems for large-scale fusion devices (ITER, DEMO, DTT, JT-60SA) and high-energy physics applications.

## RESEARCH DOMAINS

- Superconducting magnet systems for fusion and accelerators
- HTS and LTS cable-in-conduit conductors (CICC)
- AC loss modelling and numerical simulation
- Quench physics and stability analysis
- Electromechanical strain effects in superconductors
- Multiphysics modelling (FEM + analytical approaches)

## WORK EXPERIENCE

02 Oct 2006–Present

**ENEA - Senior Research Scientist**

ENEA - Via Enrico Fermi 45, 00044 Frascati (Italy)  
Nuclear Department, Applied Superconductivity Laboratory

## Leadership &amp; Engineering Roles

- Project Leader, *Magnet Shared Components* project, Divertor Tokamak Test (DTT)
- Responsible for procurement, QA/QC of Nb<sub>3</sub>Sn superconducting strands
- Engineering design lead for cryogenic interfaces: cold terminal boxes, current leads, and superconducting Feeders and joints

## Fusion Magnet R&amp;D

- Advanced modelling and characterization of LTS/HTS conductors for fusion magnets
- Design and analysis of CICC systems under mechanical, thermal, and electromagnetic loads
- Development of performance models for AC losses, quench detection, and stability in superconducting cables

## Modelling &amp; Simulation Expertise

- Electromagnetic modelling of superconducting systems (FEM + analytical frameworks)
- AC loss modelling in HTS and CICC conductors
- Development of hybrid and reduced-order models for large-scale magnet systems

## Selected Technical Contributions

- HTS sector-shaped conductors for fusion coils (DEMO/DTT concepts)
- Quench detection methodologies for HTS cable systems
- Mechanical degradation modelling in Nb<sub>3</sub>Sn under transverse stress
- Design optimization of superconducting feeder systems

01 Feb 2018–31 Jan 2020

### CERN - Associated Scientist

CERN, Esplanade des Particules 1,1211 Meyrin (Switzerland)  
Technological Department, Magnets, Superconductors, and Cryostats (TE-MSC)

- Electromechanical characterization of Nb<sub>3</sub>Sn superconducting Rutherford cables.

## VISITING & INTERNATIONAL RESEARCH APPOINTMENTS

27 Jun–26 Jul 2016  
29 Jan–28 Feb 2015  
22 Sep–31 Oct 2014

### Visiting Scientist

Massachusetts Institute of Technology (MIT), Plasma Science and Fusion Center, NW16-288, 167 Albany Street, Cambridge, MA 02139-4213 – United States

Bending tests of HTS cable-in-conduit conductors for high-field magnets applications.

22 Sep–31 Oct 2014

### Guest Lecturer

School of Engineering, TUFTS University, 200 College Avenue, Medford, MA 02155 – United States

Lectures on Superconductivity: Phenomenological Theories of Superconductivity (London Equations, Ginzburg-Landau theory), and Critical State Models.

01 Mar–30 May 2010

### Visiting Scientist

Lawrence Berkeley National Lab, 1 Cyclotron Road, Berkeley CA 94720 – United States

Electrical characterization of Nb<sub>3</sub>Sn multifilamentary strands subjected to uniaxial loads.

## EDUCATION AND TRAINING

1997–2000

### Doctor of Philosophy (Ph.D.), Material Science

*Infrared Optical Properties of La<sub>1-x</sub>Ca<sub>x</sub>MnO<sub>3</sub> Manganites*

Università degli Studi di Roma "Sapienza", Piazzale Aldo Moro 5, 00185 Rome (Italy)

1989–1996

### M. Sc. Physics, 110/110 *cum laude*

*Optical Properties of CuO<sub>2</sub> "infinite-layers" films*

Università degli Studi di Roma "Sapienza", Piazzale Aldo Moro 5, 00185 Rome (Italy)

## LANGUAGE SKILLS

Mother tongue

Italian

Other languages

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	B2	B2	B2
French	B2	B2	B2	B2	A2
Spanish	C1	C1	C1	C1	C1

Levels: A1 and A2: Basic user - B1 and B2: Independent user - C1 and C2: Proficient user  
Common European Framework of Reference for Languages

## ADDITIONAL INFORMATION

Technical Editor IEEE Transaction on Applied Superconductivity, Cryo

Conference Committee Member Applied Superconductivity Conference 2016, 4-9 September, Denver (USA)  
Applied Superconductivity Conference 2022, 23-28 October, Honolulu (USA)  
Applied Superconductivity Conference 2026, 6-11 September, Pittsburgh (USA)

Refereeing Regular referee for the following international journals on applied physics and superconductivity:

- Journal of Applied Physics (AIP Publishing)
- Superconductor Science and Technology (IOP)
- IEEE Transaction on Applied Superconductivity and IEEE Access
- Fusion and Energy Design
- Annals of Nuclear Energy
- Cryogenics

Selected Conferences  
Contributions (2021-2026)

**CHATS-AS 2026** – Saariselkä, Ivalo (Finland) 09-12 March 2026 “*Instantaneous Power-Loss Modelling in HTS Conductors for Fusion Applications*” (oral)

**MT29** – International Conference on Magnet Technology – Boston (USA) 1-6 July 2025 “*AC Loss Experiments at the SULTAN Facility on Aluminum Slotted-Core HTS REBCO Conductors for Fusion Applications*” (poster)

**SPAS24** – Superconductivity & Particle AcceleratorS – Kraków (Poland) 21-24 October 2024 “*An Analytical Framework for Computing AC Losses in the HTS Insert of the EU-DEMO Central Solenoid*” (poster)

**ASC24** – Applied Superconductivity Conference – Salt Lake City, UT (USA) 1-6 September 2024 “*Evaluation of the AC Losses of DTT Poloidal-Field Conductors*” (oral); “*AC Losses in HTS Sector-Shaped, High-Current Conductors for Fusion Coils*” (poster)

**EUCAS 2023** – The 16<sup>th</sup> European Conference on Applied Superconductivity – Bologna (Italy) 3-7 September 2023 “*Test Results of the DTT Poloidal Field Conductor Samples in SULTAN*” (oral)

**ASC22** – Applied Superconductivity Conference – Honolulu, HI (USA) 23-28 October 2022 “*Electromechanical Characterization of Advanced Internal-Tin Nb<sub>3</sub>Sn Wires for the DTT Magnet System*” (oral)

**MT24** – International Conference on Magnet Technology – Fukuoka (Japan) 15-19 November 2021 “*Magnetic and Electromechanical Characterization of a High-JC RRP Wire for the HL-LHC MQXF Cable*” (poster)

**CHATS-AS 2021** – St. Paul Lez Durance (France) 20-24 September 2021 “*High Field-Rate Losses in Cable-In-Conduit-Conductors Carrying Transport Current*” (oral)

Selected Publications (2021-  
2026)

Citations: 2283; *h*-index = 25 (source: *scopus*, May 2026).

Book chapters and Reference collections:

G. De Marzi, and L. Muzzi, "Low-Temperature Superconductors", in "*Handbook of Superconductivity - Theory, Materials, Processing, Characterization and Applications*, 2nd Edition (3-Volume Set)", by CRB Press, **ISBN 9781439817308**, Edited By David A. Cardwell, David C. Larbalestier, Aleksander Braginski (2021).

130 Articles in peer-reviewed international journals

## Selected List of Publications

- 19) G. Messina, **G. De Marzi**, F. Maierna, and L. Muzzi, "Superconducting Stator Winding for Axial Flux Electrical Machines Applications", IEEE Trans. Appl. Supercond. **36** (5), 5202905 (2026).
- 18) A. Macchiagodena, M. Breschi, **G. De Marzi**, L. Savoldi, and F. Grilli, "Circuit Model for Hysteresis Losses in Twisted Stacked HTS Cables", IEEE Trans. Appl. Supercond. **36** (5), 4701305 (2026).
- 17) G. dos Santos, B. M. Oliveira Santos, F. Jorge Monteiro Dias, N. Riva, G. De Marzi, and F. Grilli, "J-A- $\phi$  Formulation With Homogenizing Technique Used to Efficiently Model HTS Cable-in-Conduit Conductors", IEEE Trans. Appl. Supercond. **36** (3), 4800604 (2026).
- 16) M. Lewandowska, A. Dembkowska, R. Ortwein, A. Nijhuis, G. Anniballi, L. Giannini, D. C. van der Laan, J. Weiss, **G. De Marzi**, and D. Uglietti, "Thermal-hydraulic analysis of the CORC® conductor for the DEMO CS coil", Fus. Eng. Des. **220**, 115368 (2025)
- 15) G. Messina, D. Buonafine, **G. De Marzi**, and F. Maierna, "Assessment of hysteresis losses in HTS coils designed for a rotating electrical machine", IEEE Trans. Appl. Supercond. **35** (8), 5204310 (2025)
- 14) **G. De Marzi**, V. Corato, and M. Lewandowska, "An analytical framework for computing AC losses in the HTS insert of the EU-DEMO central solenoid", Cryogenics **149**, 104078 (2025)
- 13) L. Cavallucci, G. Colombo, **G. De Marzi**, A. Trotta, F. Zanon, and M. Breschi, "Modeling of quench in a slotted core HTS cable for compact fusion reactors", IEEE Trans. Appl. Supercond. **35** (5), 4200705 (2025).
- 12) **G. De Marzi**, L. Muzzi, and F. Grilli, "An analytical model for predicting the magnetization loss in HTS sector-shaped conductors for fusion", Supercond. Sci. Technol. **37** (12), 125007 (2024).
- 11) S. Burioli, G. Iannone, **G. De Marzi**, D. D'Agostino, G. Avallone, A. Gagno, M. Bracco, A. Leveratto, A. Traverso, D. Pedrini, R. Valente, M. Prioli, P. Piccardo, A. Malagoli, S. Farinon, and R. Musenich, "A novel numerical approach for analyzing experimental data on critical current degradation in Nb<sub>3</sub>Sn wires caused by transverse deformations preceding heat treatment", Supercond. Sci. Technol. **37** (9), 095007 (2024).
- 10) A. Zappatore, N. Bykovskiy, and **G. De Marzi**, "Validation and application of hysteresis loss model for HTS stacks and conductors for fusion applications", IEEE Trans. Appl. Supercond. **34** (5), 4704105 (2024).
- 9) A. Macchiagodena, M. Breschi, **G. De Marzi**, F. Grilli, L. Savoldi, "Analytical formulae for hysteresis power loss in twisted stacked HTS cables", IEEE Tran. Appl. Supercond. **34** (3), 8200305 (2024).
- 8) A. Zappatore, **G. De Marzi**, and D. Uglietti, "Impact of hysteresis losses in hybrid (HTS-LTS) coils for fusion applications", IEEE Access **11**, 1004655 (2023).
- 7) H. Ding, **G. De Marzi**, and Y. Gao, "Numerical simulation of mechanical behaviors and intergranular fracture of polycrystalline Nb<sub>3</sub>Sn and superconducting filaments", Supercond. Sci. Technol. **36** (9), 095001 (2023).
- 6) **G. De Marzi**, L. Muzzi, B. Bordini, A. Di Zenobio, F. Fabbri, C. Fiamozzi Zignani, A. Formichetti, R. Freda, L. Merli, G. Ramogida, S. Turtù, and A. della Corte, "Electromechanical characterization of advanced internal-tin Nb<sub>3</sub>Sn strands for the DTT magnet system", IEEE Trans. Appl. Supercond. **33** (5), 8400205 (2023).
- 5) A. Zappatore, **G. De Marzi**, and D. Uglietti, "Modelling of hysteresis losses in HTS Cable-in-Conduit Conductors for large scale applications", 8th International Workshop on Numerical Modelling of High Temperature Superconductors (HTS 2022), Kevin Berger (Université de Lorraine - GREEN), Jun 2022, Nancy, France.
- 4) **G. De Marzi**, B. Bordini, L. Muzzi, A. Affinito, A. Angrisani Armenio, D. Baffari, A. Formichetti, R. Freda, L. Merli, A. Rufoloni, and A. della Corte, "Magnetic and electromechanical characterization of a high-J<sub>c</sub> RRP wire for the HL-LHC MQXF cable", IEEE Trans. Appl. Supercond. **32** (6), 6001505 (2022).
- 3) G. Tomassetti, **G. De Marzi**, C. Fiamozzi Zignani, F. Giorgetti, and A. della Corte, "A methodological approach for the optimal design of the toroidal field coils of a tokamak device using artificial intelligence", Supercond. Sci. Technol. **35** (1), 014002 (2022).
- 2) **G. De Marzi**, B. Bordini, and D. Baffari, "On the mechanisms governing the critical current reduction in Nb<sub>3</sub>Sn Rutherford cables under transverse stress", Sci. Rep. **11** (1), 7369 (2021).
- 1) **G. De Marzi**, G. Celentano, A. Augieri, M. Marchetti, and A. Vannozi, "Experimental and numerical studies on current distribution in stacks of HTS tapes for cable-in-conduit-conductors", Supercond. Sci. Technol. **34** (3), 035016 (2021).