

Curriculum vitae of Marco Piccardo

Primary ERC sub-sectors (max 3): PE2_14 Lasers, ultra-short lasers and laser physics; PE11_13 Metamaterials engineering; PE2_12 Optics, non-linear optics and nano-optics

PERSONAL DETAILS

Family name, First name: Piccardo, Marco
Birthdate: October 7, 1989
Researcher unique identifier(s): ORCID: 0000-0001-8851-1638; Web of Science ResearcherID: AAJ-9240-2020; Google Scholar profile: kOhkK5sAAAAJ
URL for web site: <https://mplab.tecnico.ulisboa.pt/> ; <https://inesc-mn.pt/team-member/marco-piccardo/>

Education and key qualifications

2025 Habilitation, Instituto Superior Técnico, University of Lisbon, Portugal
2016 Ph.D., Physics, Highest Honors, École Polytechnique, Palaiseau, France. PhD supervisor: Claude Weisbuch
2013 M.Sc., Applied Physics, Highest Honors, École Polytechnique, Palaiseau, France. Quantum Electronics and Photonics, Class MX2013
2012 M.Sc., Physics, École Normale Supérieure, Paris, France. Fundamental Concepts in Physics
2011 Erasmus studies, Physics Department, Umeå University, Umeå, Sweden
2011 B.Sc., Physics, Summa cum laude, Università degli Studi di Torino, Turin, Italy

Current positions

2023-present Assistant Professor with Habilitation, Department of Physics, Instituto Superior Técnico, University of Lisbon, Portugal
2023-present Principal Investigator, Engineering Institute for Microsystems and Nanotechnologies, INESC MN, Lisbon, Portugal
2020-present Visiting Professor, Harvard University, Cambridge, MA, USA

Previous positions

2020-2023 Researcher and Team Leader, Vectorial Nano-Imaging Group, Istituto Italiano di Tecnologia, Milan, Italy
2016-2020 Postdoctoral Research Fellow, Federico Capasso Group, John A. Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, MA, USA

RESEARCH ACHIEVEMENTS AND PEER RECOGNITION

Research achievements

Marco Piccardo is a physicist and photonics researcher working at the interface of laser physics, structured light, nanophotonics, meta-optics, and high-intensity laser-matter interaction. His work has advanced two connected areas: semiconductor and integrated laser frequency combs, especially fast-gain and mid-infrared comb systems; and structured light/meta-optics for ultrafast, high-power, plasma, and aerospace photonics.

Bibliometric and activity indicators are: h-index 30, i10-index 44, and more than 3,000 citations according to the Google Scholar database; around 60 peer-reviewed publications, including more than 20 first/co-first-author papers; publications include 4 Nature, 2 Science, 3 Nature Photonics, 1 PNAS, 3 Nature Communications, 4 Physical Review Letters, and 6 patent applications. Since 2024, he has raised around EUR 2.8M for his research group.

Selected research outputs:

1. **M. Piccardo et al., “Frequency combs induced by phase turbulence,” Nature 582, 360-364 (2020).** First-author work identifying phase turbulence as a mechanism for frequency-comb formation in semiconductor lasers, establishing a new physical route to comb generation in fast-gain active resonators.
2. **M. Piccardo et al., “Frequency-modulated combs obey a variational principle,” Physical Review Letters 122, 253901 (2019).** First-author theoretical and experimental contribution showing that frequency-modulated laser combs can be understood through an extremal principle, clarifying the organization of quantum-cascade-laser combs.
3. **M. Piccardo et al., “Radio frequency transmitter based on a laser frequency comb,” PNAS 116, 9181-9185 (2019).** First-author demonstration of a laser-frequency-comb-based radio-frequency transmitter, translating mid-infrared comb physics into a communication-relevant photonic architecture.

4. V. Ginis, M. Piccardo et al., “Remote structuring of near-field landscapes,” *Science* **369**, 436-440 (2020). Contribution to a method for remote control of near-field optical landscapes through cascaded mode conversion, expanding the toolbox for structured optical fields.
5. M. Piccardo, M. de Oliveira et al., “Vortex laser arrays with topological charge control and self-healing of defects,” *Nature Photonics* **16**, 359-365 (2022). First-author work combining laser arrays and metasurfaces to generate vortex laser states with controlled topological charge and defect self-healing.
6. M. Piccardo et al., “Broadband control of topological-spectral correlations in space-time beams,” *Nature Photonics* **17**, 822 (2023). First-author work introducing broadband control over correlations between topology and spectrum in spatiotemporal light fields.
7. B. Oliveira et al., “High-aspect-ratio, ultratall silica meta-optics for high-intensity structured light,” *Optica* **12**, 713-719 (2025). PI work establishing an all-glass meta-optics platform for shaping high-intensity laser beams, addressing the fluence bottleneck of metasurface beam shaping.
8. M. Piccardo et al., “Trends in relativistic laser-matter interaction: the promises of structured light,” *Optica* **12**, 732-752 (2025). Lead-author field-setting article connecting structured light with relativistic laser-matter interaction, plasma acceleration, and ultrafast high-field science.
9. D. Kazakov, T. P. Letsou, M. Piccardo et al., “Driven bright solitons on a mid-infrared laser chip,” *Nature* **641**, 83 (2025). Contribution to the demonstration of driven bright solitons in an active mid-infrared laser platform, advancing integrated nonlinear mid-infrared photonics.
10. M. Tamagnone, M. Piccardo, D. Kazakov, C. M. Spaegele, F. Capasso, “Wavelength tuneable metasurface based external cavity laser,” WO2021226544A1, licensed to Metalenz. Patent output translating metasurface and laser physics into an industrially relevant device concept.

Peer recognition

- ERC Starting Grant, European Research Council, 2024, for “Space-time and vectorial meta-optics for high-power structured laser-matter interactions.”
- ERC Proof of Concept Grant, 2026-2027, for “Metasurface beam shapers for aerospace high-power laser links.”
- EIC Pathfinder Open project, 2026-2029: PI for the INESC MN contribution to a EUR 3M consortium on holographic surface morphing for planar photonic components, with EUR 0.5M to his group.
- MSCA Doctoral Network, 2027-2030: PI in a EUR 4.5M consortium on spatiotemporal photonic technologies, with EUR 560k to his group.
- ULisboa/LaCaixa Scientific Prize for top researcher in the area of Physics and Materials, 2026.
- Young Scientist of the Portuguese National Academy of Sciences, 2024-2027.
- COMITES Award Top Researcher, Italian Excellence in Portugal, 2025.
- Stanford-Elsevier World’s Top 2% Scientists Ranking, 2024 and 2025.
- Finalist, 2018 World Technology Award, The World Technology Network.
- PhD Award “Innovative Materials and Applications,” University of Paris-Saclay, 2017
- Young Physicist Award “G. F. Bassani,” Italian Physical Society, 2016.
- More than 40 invited talks, workshops, seminars, and webinars, including keynotes at EuPRAXIA 2025 and AOP 2024 and invited talks at ELI ALPS, META, CLEO, Photonics Europe, Photonics West, Yale, Harvard, ETH Zurich, EPFL, MIT, Columbia, and UC Berkeley.

ADDITIONAL INFORMATION

Other contributions to the research community

Research leadership and funding: Since taking up his faculty position, Marco Piccardo has built an independent research group at the intersection of structured light, meta-optics, high-power laser-matter interaction, nanophotonics, and photonics-based AI. He has raised around EUR 2.8M for his research group since 2024, including ERC Starting Grant, ERC Proof of Concept, EIC Pathfinder Open, MSCA Doctoral Network, ELI ERIC access, Deucalion HPC time, LaserLab Europe access, FCT exploratory funding, and other support.

Teaching and pedagogy: At Instituto Superior Técnico he teaches Laboratory of Advanced Experimental Physics and coordinates Nanotechnology and Nanoelectronics. He was recognized as Excellent Faculty (“Docente Excelente”) in 2024-25 and received an E.Awards “Entrepreneurial faculty” distinction in 2025.

Knowledge transfer: His research has led to 6 patent applications in integrated nonlinear mid-infrared photonics, cascaded-mode resonators and waveguides, metasurface-based external-cavity lasers, optically pumped terahertz molecular lasers, and microwave/terahertz communication based on quantum-cascade-laser frequency-comb generators.

Scientific service and research management: He is Vice-President of the Scientific Council of INESC MN from 2025 onward and Pedagogical Director of the Técnico Lisboa Undergraduate Physics Labs since 2026. He has served on departmental commissions at Instituto Superior Técnico, including a commission for new undergraduate laboratories with a EUR 1.6M budget.

Editorial and conference organization: He has served as Guest Editor for Journal of Optics special issues and roadmaps, received an Outstanding Reviewer Award from Journal of Optics, and organized/co-organized events including the CLEO 2023 Special Symposium “Enabling Highly Multimode Nonlinear and Quantum Photonics,” the CLEO 2024 Topical Review on structured light for laser-plasma applications, and the EPS CMD 31 mini-colloquium “Optical materials for structured light.”

Outreach, diversity, and public engagement: He has contributed to Ciência Viva high-school training on structured light, Physics Coffee at Técnico Lisboa, articles for Revista Técnica, and public communication through interviews and media coverage. Earlier outreach includes LED demonstrations at the Fête de la Science at École Polytechnique and mentoring through the NSF Research Experiences for Undergraduates programme.

Career breaks, diverse career paths and major life events

30/12/2022–16/4/2023 Parental leave, 108 days. Ensured consistent care for my baby during a critical developmental phase, coinciding with our family’s relocation from Italy to Portugal.