

CURRICULUM VITAE

Part A. PERSONAL INFORMATION

CV date

24/09/2025

First name	Edoardo		
Family name	Vicentini		
Gender (*)	Male	Birth date (dd/mm/yyyy)	13/07/1992
Social Security, Passport, ID number	Y9202427A		
e-mail	e.vicentini@nanogune.eu	URL Web	
Open Researcher and Contributor ID (ORCID) (*)		0000-0003-1850-2327	

A.1. Current position

Position	MSCA post-doctoral researcher		
Initial date	18/03/2025		
Institution	CIC nanoGUNE		
Department/Center	Nanooptics		
Country	Spain	Teleph. number	+34 697913322
Key words	pump-probe nanospectroscopy, s-SNOM, nano-FTIR, optical frequency comb, dual-comb spectroscopy, ultrafast lasers		

A.2: Previous professional status

Period	Position	Institution/Country
01/01/2023-17/03/2025	Juan de la Cierva postdoctoral researcher	CIC nanoGUNE Spain
15/12/2021-31/12/2022	Post-doctoral researcher	CIC nanoGUNE Spain
01/11/2020-31/08/2021	Researcher	Institute for Photonics and Nanotechnology, National Research Council (CNR-IFN) Italy
	Interruption cause	
25/11/2022-05/01/2023	Paternity leave	
02/05/2023-10/07/2023	Paternity leave	

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD	Polytechnic University of Milan / Italy	2021
Master's degree	Polytechnic University of Milan / Italy	2017
Bachelor's degree	Polytechnic University of Milan / Italy	2015

Part B. CV SUMMARY

In 2011, I enrolled at the Polytechnic University of Milan in Italy, where I obtained a Bachelor's degree (2015) and a Master's degree (2017) in **Physics Engineering with a specialization in Optics and Photonics**. During these years, I gained a strong foundation in both theoretical and experimental aspects of physics, with a particular focus on electromagnetism, optics, and modern photonics technologies. This broad knowledge has been a key element in my research career, allowing me to easily shift between different areas and apply a wide-ranging perspective to complex problems.

In 2017, I was **awarded a doctoral grant from the Polytechnic University of Milan** to develop metrology-grade spectrometers based on optical frequency combs. From 2017 to 2021, I accumulated extensive expertise in engineering high-resolution spectrometers based on ultrafast lasers and developing precise models for spectroscopic analysis. In parallel to my PhD research activities, I contributed to several scientific and 1 industrial projects. In between, I developed of two different Fourier transform coherent Raman spectrometers for the detection of biological hazards in water and for stand-off detection of anthrax in a project funded by the UK Ministry of Defence. Additionally, I prototyped a FTIR spectrometer for wine analysis in collaboration with Gibertini, a world leader in wine and spirits analysis instrumentation. In parallel, I completed over 120 hours as a Teaching Assistant at Polytechnic University of Milan, delivering problem-solving lectures to final-year undergraduate students in Electronic Engennering. This experience enhanced my teaching and supervisory skills, fostering my ability to guide and support students in their learning process.

In 2020, I completed an **internship at the Max Planck Institute of Quantum Optics** (Garching, Germany) in the group led by Nobel laureate Prof. T.W. Hänsch (one of the pioneers of optical frequency combs), under the supervision of Dr. N. Picqué (now director of the Max Born Institute for Nonlinear Optics in Berlin). This invaluable experience resulted in the demonstration of the potential to apply optical frequency combs to new fields, such as dual-comb spectroscopy for digital holography (*Nature Photonics*, 2021). Thanks to this breakthrough, **I was recognized the Helmholtz Prize** (20'000 €), one of the most prestigious awards in metrology, for "outstanding scientific and technological research in the field of precision measurement in physics, chemistry, and medicine."

In March 2021, I completed my **European PhD in Physics**, graduating with summa cum laude. I then continued for six months as a researcher in Milan at the Institute for Photonics and Nanotechnology (CNR-IFN). As a final recognition of my research on optical frequency combs, in 2023, **I was honored with the Bernard J. Couillaud Prize in Ultrafast Lasers** (\$20,000), an award recognizing the excellence of early-stage professionals at the forefront of ultrafast laser research, presented by the Optica Foundation and Coherent Inc.

In December 2021, I decided to shift my research focus and joined CIC nanoGUNE (San Sebastián, Spain) as a post-doctoral researcher in the group led by Prof. Rainer Hillenbrand, widely recognized as one of the leading groups in nano-optics and plasmonics. **I secured a Juan de la Cierva Fellowship and subsequently a Marie Skłodowska-Curie Individual Fellowship**, ensuring over €240,000 in funding over four years to develop s-SNOM and nano-spectroscopy techniques for material science, with a particular focus on anisotropic materials. Over the past four years, I have worked on both the technical development of s-SNOM (scattering-type scanning near-field optical microscopy) and fundamental plasmonic research, leveraging my extensive background in lasers, optics, and spectroscopy.

In the past year, I applied my expertise in ultrafast lasers to **combine s-SNOM and pump-probe spectroscopy**, enabling the study and control of ultrastrong coupling between plasmonic and phononic materials. This research uncovered new coupling phenomena that has been accepted for publication in *Nature Materials*. The combination of these techniques promises to open new avenues in material science, offering insights into the behavior of complex materials at the nanoscale and providing a platform for future technological innovations.

From 2017 to the present, **I have published 19 peer-reviewed articles** (9 as first author), all in Q1 journals, including *Nature Materials* and *Nature Photonics*. My work has garnered an h-index of 11, with 430 citations (Google Scholar). I have presented my research at 6 conferences, including 6 oral presentations and 1 poster. Additionally, I have reviewed 15 articles for high-impact journals, including *Nature*, *Nature Photonics*, and *Optica*. I have also contributed to science prize committees and participated in national project evaluations. As leadership and mentoring experience, **I have co-supervised 9 undergraduate students** during their thesis/research activities and I have served as professor assistant for a total of 136 hours in the courses of electromagnetism and optics for undergraduate students at Polytechnic University of Milan.

Part C. RELEVANT MERITS

Awards & Fellowship

1. **Bernard J. Couillaud Prize in Ultrafast Lasers 2023**. Award recognizing excellence on the frontiers of ultrafast lasers given by the Optica Foundation and Coherent Inc.
2. **Marie Skłodowska-Curie Action Postdoctoral Fellowships 2022**. Two years fellowship for post-doctoral research from European Commission.
3. **Helmholtz Prize 2022** winner for “the outstanding scientific and technological research in the field of precision measurement in physics, chemistry and medicine” in the category of applied metrology.
4. **Juan de la Cierva formación 2021**. Two years fellowship for post-doctoral researcher from Spanish Ministry for Science and Innovation. First classified in the category of “Science and technology of materials”.
5. **Best scientific communication** in “Applied physics, accelerators and cultural heritage” section of 107° National congress from Italian physics society (2021).
6. **PhD scholarship (2017)**. Three years scholarship for a PhD in physics at Polytechnic University of Milan

Publications

1. **Scientific paper:** E. Vicentini, X. Arrieta, M. Schnell, M. Barra Burillo, A. Bylinkin, R. Esteban, J. Aizpurua, R. Hillenbrand, “Real-space observation of flat-band ultrastrong coupling between optical phonons and surface plasmon polaritons”, accepted for publication in *Nature Materials*.
2. **Scientific paper:** E. Vicentini, W. Nuansing, I. Niehues, I. Amenabar, A. M. Bittner, R. Hillenbrand, and M. Schnell, “Pseudoheterodyne interferometry for multicolor near-field imaging,” *Optics Express* 31, 22308-22322 (2023). <https://doi.org/10.1364/OE.492213>
3. **Scientific paper:** Chen, S., Leng, P.L., Konečná, ..., and R. Hillenbrand, 19/6 “Real-space observation of ultraconfined in-plane anisotropic acoustic terahertz plasmon polaritons” *Nature Materials* 22, 860–866 (2023). <https://doi.org/10.1038/s41563-023-01547-8>
4. **Scientific paper:** E. Vicentini, A. Gambetta, F. Canella, N. Coluccelli, P. Laporta, and G. Galzerano, “High-resolution mid-infrared spectroscopy based on ultrafast Cr:ZnSe laser,” *Optics Express* 31, 21482-21492 (2023). <https://doi.org/10.1364/OE.491397>
5. **Scientific paper:** E. Vicentini, Z. Wang, K. van Gasse, T. W. Hänsch and N. Picqué, “Dual-Comb Hyperspectral Digital Holography”, *Nature Photonics* 15, 890–894 (2021). <https://doi.org/10.1038/s41566-021-00892-x>
6. **Scientific paper:** E. Vicentini, A. Gambetta, G. Galzerano, P. Laporta, K. Curtis, K. McEwan, C. R. Howle, and N. Coluccelli, “Fiber laser system for standoff coherent Raman spectroscopy”, *Optics Letters* 45, 5925-5928 (2020) <https://doi.org/10.1364/OL.404832>
7. **Scientific paper:** E. Vicentini, A. Gambetta, N. Coluccelli, Y. Wang, P. Laporta and G. Galzerano, “Direct-frequency-comb spectroscopy by a scanning Fabry-Pérot microcavity resonator”, *Physical Review A* 102(3), 033510 (2020). <https://doi.org/10.1103/PhysRevA.102.033510>
8. **Scientific paper:** E. Vicentini, A. Gambetta, N. Coluccelli, ..., and G. Galzerano, 10/1 “Absolute frequency stabilization of a QCL at 8.6 μm by modulation transfer spectroscopy”, *Optics Letters* 45, 4948-4951 (2020) <https://doi.org/10.1364/OL.401265>
9. **Scientific paper:** E. Vicentini, P. Maddaloni, R. Aiello, ..., and G. Galzerano, 11/1 “Absolute frequency metrology of the CHF₃ 8.6- μm ro-vibrational spectrum at 10– 11 level”, *Journal of Quantitative Spectroscopy and Radiative Transfer* 248, 106963 (2020). <https://doi.org/10.1016/j.jqsrt.2020.106963>
10. **Scientific paper:** E. Vicentini, Y. Wang, D. Gatti, ..., N. Coluccelli, 10/1, “Nonlinear pulse compression to 22 fs at 15.6 μJ by an all-solid-state multipass approach”, *Optics Express* 28, 4541-4549 (2020). <https://doi.org/10.1364/OE.385583>

Congress

1. **Oral presentation:** “Real-Space Observation of Ultrastrong Coupling Between Optical Phonons and Surface Plasmon Polaritons”
E. Vicentini, X. Arrieta, M. Schnell, M. Barra Burillo, A. Bylinkin, R. Esteban, J. Aizpurua, R. Hillenbrand
The 11th International Conference on Surface Plasmon Photonics, Tokyo/Japan (May 19-23 2025)
2. **Poster:** “Multi-wavelength pseudoheterodyne interferometry for near-field imaging”
E. Vicentini, W. Nuansing, I. Niehues, I. Amenabar, A. M. Bittner, R. Hillenbrand, and M. Schnell
Nanolight 2024, Benasque/Spain (25/02-02/03 2024).
3. **Invited:** “Dual-comb hyperspectral digital holography”
E. Vicentini, N. Picqué
Seminar: High-Precision Measurements and Searches for New Physics, 766. WE-Heraeus-Seminar, Bad Honnef/Germany (09-13/05/2022).
4. **Oral presentation:** “High-resolution direct-comb spectrometer at 2.4 μm ”
E. Vicentini, A. Rosina, M. Nobis, F. Canella, Y. Wang, P. Laporta and G. Galzerano
107° National congress from Italian physics society, Italian physics society, Virtual meeting (13-17 September 2021).
5. **Oral presentation:** “Dual-comb digital holography with high spectral resolution”
E. Vicentini, Z. Wang, K. van Gasse, T. W. Hänsch, and N. Picqué
Conference on Lasers and Electro-Optics, OSA Technical Digest, Optical Society of America, Virtual meeting (9-14 May 2021).
6. **Oral presentation:** “High-Spectral-Resolution Imaging Spectroscopy with a Dual-Comb Interferometer”
E. Vicentini, Z. Chen, J. H. Huh, G. Galzerano, T. W. Hänsch, and N. Picqué
Frontiers in Optics / Laser Science, OSA Technical Digest, Optical Society of America, Virtual meeting (14-17 September 2020).

Research projects

1. Project: 101106434. *Advanced nanospectroscopy for mapping local conductivity in conductive metal-organic framework* - NAPOLEON. Marie Skłodowska-Curie Actions - Postdoctoral Fellowships 2022 (Grant ID: 101106434). Edoardo Vicentini. (CIC NANOGUNE). 01/09/2024 - 31/08/2026. 181'152,96 €. Role: Principal investigator
2. Project: FJC2021-046779-I. *Nanospectroscopy for mapping local conduction and chemical properties in polymeric conductor*. Ministerio de Ciencia e Innovación – Juan de la Cierva - formación. Edoardo Vicentini. (CIC NANOGUNE). 01/01/2023 al 31/12/2024. 64.800 €. Role: Principal investigator
3. Project: PID2020-115221GA-C44. *Microscopia de campo cercano para la patología ultraestructural sin marcadores*. Ministerio de Ciencia e Innovación, Programa I+D Generación de Conocimiento. Martin Schnell (CIC NANOGUNE). 01/09/2021 - 31/08/2024. 70'000 €. Role: Researcher
4. Project: PID2021-123949OB-I00, *Advanced near-field optical nanospectroscopy and novel applications in material sciences and nanophotonics* - NANOSPEC. Spanish Ministry for Science, Innovation & Universities (MCIU), Retos & Generación de conocimiento

Proyectos I+D+i 2021". Prof. R. Hillenbrand (CIC NANOGUNE). 01/01/2022 - 31/12/2024. 314'600 €

Role: Researcher

5. Project: ACC6003996, *A compact fiber-laser-based system for detection of hazardous biological agents via coherent Raman spectroscopy*. Defence Science and Technology Laboratory (DSTL), Ministry of Defence, United Kingdom. Prof. N. Coluccelli (Polytechnic University of Milan). 01/10/2018 - 28/06/2019. 150'000 £

Role: Researcher

6. Project: 140952, *EEM- Ecoenometer*. Regione Lombardia (POR FESR 2014-2020 ASSE I - AZIONE I.1.B.1.3 BANDO "LINEA R&S PER AGGREGAZIONI"), Italy. Prof. N. Coluccelli (Polytechnic University of Milan). 01/11/2017 - 31/05/2019. 430'000 €

Role: Researcher

Student supervision

01/02/2025 - now

Student: Nicolas Pajusco. PhD students at Le Mans University.

Project: pump-probe nanospectroscopy of hyperbolic surface phonon polariton.

Role: internship supervisor.

01/09/2022 – now

Student: Jan Krpenský. PhD students at CIC nanogune.

Project: THz nanoplasmonics based on Ag₂Te.

Role: PhD co-supervisor.

01/09/2020 –31/08/2021

Students: Andrea Rosina and Mauro Nobis. Master students of Physics Engineering at Polytechnic University of Milan.

Project: High-resolution direct comb spectrometer at 2.4µm.

Role: Master thesis co-supervisor.

14/01/2019 –18/12/2019

Student: Martino Crippa. Master students from Polytechnic University of Milan.

Project: A compact FTIR spectrometer for wine analysis.

Role: Master thesis co-supervisor.

21/05/2018 –01/06/2018

Students: Andrea Comi, Carlo Alfisi, Barbara Menno di Bucchianico, Giorgio Consonni. Bachelor students of Physics Engineering at Polytechnic University of Milan.

Project: High-resolution and ultra-broadband direct-comb absolute-spectroscopy by means of the scanning micro-cavity resonator (SMART) technique.

Role: Bachelor thesis co-supervisor.

Teaching experience

- 40 hours conducting problem-solving lectures as a teaching assistant in the course "Fundamentals of Electromagnetism and Optics" imparted to bachelor students in Biomedical Engineering at Polytechnic University of Milan (academic year 2017-2018).
- 120 hours conducting experimental practice lectures as a teaching assistant in the course "Electromagnetism and Optics" imparted to bachelor students in Electronic Engineering at Polytechnic University of Milan (academic years 2018-2019, 2019-2020, 2020-2021).