MARCO **LAMPERTI**

EDUCATION

APRIL 7TH, 2017

PHD IN PHYSICS, UNIVERSITY OF INSUBRIA

Cum laude. Thesis title: *Measuring the statistics of light – applications to quantum optics and biophysics*.
Supervisor: dr. M. Bondani.

MARCH 20TH, 2013

MS IN PHYSICS, UNIVERSITY OF INSUBRIA

110/110 cum laude. Thesis title: *On the properties of optical Twin-Beam States*.
Supervisors: dr. M. Bondani, prof. A. Allevi.

FEBRUARY 24TH, 2011

BS IN PHYSICS, UNIVERSITY OF INSUBRIA

110/110. Thesis title: *Determinazione dei canali di decadimento da S_1 del curcuminoide Ciclovalone attraverso tecniche di fluorescenza steady-state e time-resolved*.
Supervisors: prof. A. Andreoni, dr. L. Nardo.

RESEARCH EXPERIENCE

JUNE 1TH, 2022 – CURRENT

RESEARCHER, UNIVERSITY OF INSUBRIA

Ricercatore universitario a tempo determinato tipo A (Legge 240/2010). Title of the research program: *Nuovi protocolli di comunicazione quantistica per sistemi energetici e reti di trasmissione*.

JULY 6TH, 2020 – MAY 31ST 2022

RESEARCHER, POLITECNICO DI MILANO

Ricercatore universitario a tempo determinato tipo A (Legge 240/2010). Title of the research program: *Spettroscopia molecolare lineare e non lineare di elevata precisione per fisica fondamentale*.

FEBRUARY 16TH, 2019 – JULY 5TH, 2020

POSTDOC, POLITECNICO DI MILANO

Title of the research program: *Metrologia Raman dell'idrogeno molecolare. Misure di spettroscopia molecolare ad alta precisione – progetto CH2ROME ID R164WYYR8N finanziato dal programma nazionale della ricerca 2015-2016 Bando FARE 2016*.

DECEMBER 16TH, 2016 – DECEMBER 15TH, 2018

POSTDOC, POLITECNICO DI MILANO

Title of the research program: *Sviluppo di spettrometri di precisione per spettroscopia lineare (assorbimento) e non lineare (Raman coerente) di campioni gassosi*.

MAY 1ST – OCTOBER 31ST, 2013

RESEARCH FELLOW, UNIVERSITY OF INSUBRIA

Title of the research program: *Generation and characterization of nonclassical optical states for*
applications to quantum information.

JUNE 13TH – JULY 1ST 2011

LABORATORY ASSISTANT, UNIVERSITY OF INSUBRIA

Preparation and performance of fluorescence correlation spectroscopy experiments - Summer school: *School for Training in Experiments with Lasers and Laser Applications (STELLA).*

TEACHING

ACADEMIC YEAR 2023/24

TEACHER, UNIVERSITY OF INSUBRIA

Environmental Physics (graduate course in *Physics*, 6 credits).

ACADEMIC YEARS 2022/23, 2023/24

TEACHER, UNIVERSITY OF INSUBRIA

Introduction to Python (course for the *Corso di perfezionamento in Quantum Technologies*, 8 hours).

ACADEMIC YEARS 2022/23, 2023/24

TEACHER, UNIVERSITY OF INSUBRIA

Scripting and Programming Laboratory for Data Analysis (graduate course in *Physics*, 6 credits).

ACADEMIC YEARS 2020/21, 2021/22

TEACHER, POLITECNICO DI MILANO

Fisica Generale (course for the five-years degree in *Ingegneria Edile-Architettura*, Lecco campus, 6 credits).

ACADEMIC YEARS 2017/18, 2018/19, 2019/20

TEACHING ASSISTANT, POLITECNICO DI MILANO

Classroom exercises: *Fisica A+B* (undergraduate course in *Ingegneria della Produzione Industriale*, Lecco campus, 10 credits).

JUNE-AUGUST 2013, 2014, 2015, 2016

TEACHING ASSISTANT, UNIVERSITY OF INSUBRIA

Joint International Physics Summer School – Optics (for high school students).

ACADEMIC YEARS 2010/11, 2011/12, 2012/13, 2013/14, 2014/15, 2015/16

TEACHING ASSISTANT, UNIVERSITY OF INSUBRIA

Laboratory courses: *Laboratorio di Fisica I* (2 years, 6 credits); *Laboratorio di Fisica II* (3 years, 6 credits); *Laboratorio di Fisica III* (1 year, 6 credits) – undergraduate courses in Physics.

JULY 20TH – AUGUST 7TH, 2015

TUTOR, HUMANITAS UNIVERSITY

Physics and Maths teacher – Admission exam preparation course to the degree programme in Medicine and Surgery.

RESEARCH EXPERIENCE ABROAD

- 2 weeks at Palacky University, Olomouc (Czech Republic)
- 2 weeks at Heriot-Watt University, Edinburgh (UK)
- 1 week EMBO practical course *Single molecule and single cell fluorescence Å/nm/µm/mm-scopy* at EMBL Heidelberg (Germany)

OUTREACH

- 2023 – ongoing: supervisor and teacher for the activity *Game development in Python* in the context of the *PCTO* ministerial initiative for high schools, targeting 30 students/year
- 2022 – ongoing: participation to outreach activities targeting high-school students organized by colleagues or by the *Ufficio orientamento*, including activities related to physics and STEM subjects as well as general orientation activities for the conscious choice of the university career by high school students
- 2020 – 2022: assistant for the supervision of high school students during the *Alternanza scuola lavoro* programme. My role included the planning of activities for the students to be carried out at the Lecco pole of Politecnico di Milano and the supervision of students during their activity.
- 2013 – 2016: assistant for the *Joint International Physics Summer School – Optics* (for high school students). For the first week of the school, I participated in the decision and preparation of experimental activities for the students, in the supervision of the students and of other teaching assistants. For the second week of the school, I participated in the experimental activities realized in Olomouc, Czech Republic, and supervised the high school students involved in the experiments.
- 2010 – 2016: outreach activities for high school students (few times per year). I prepared and supervised the execution of modern physics experiments (measurement of the electron mass/charge ratio, electron diffraction, Franck-Hertz experiment, double-slit diffraction of single photons) and of experiments on light and color, including qualitative and quantitative determination of absorption and fluorescent spectra of molecular compounds in liquid solutions. Experiments were prepared and carried over either in high schools or at University of Insubria.
- 2010 – 2016: outreach activities during the Insubria open days. I participated in the decision of the experimental activities to be presented at the open days, collaborated to the organization of the performance, prepared the experimental apparatuses, participated in the open day activities.
- 2010 – 2011: co-founder and editor of an outreach journal (*il Quanto,* ilquanto.wordpress.com) targeted to high school students and to general public. I edited and wrote articles, and I was involved in fundraising and distribution (500 copies/issue).

STUDENTS SUPERVISION

- Co-supervisor of 1 PhD student (ongoing).
- Supervisor of 1 master thesis (discussed in 2021) and 2 bachelor theses (discussed in 2021 and 2022) in Engineering Physics at Politecnico di Milano.
- Supervisor of 1 bachelor thesis (discussed in 2024) in Physics at University of Insubria.

INSTITUTIONAL ROLES

- 19/12/2023 – ongoing: responsible for the physics area in the Orientation and outreach commission of the University.

OTHER ROLES AND ACTIVITIES

- Awarded the Italian *Abilitazione Scientifica Nazionale* for the sector 02/D1 as *professore di seconda fascia*, valid from 11/01/2023 to 11/01/2034
- Awarded the Italian *Abilitazione Scientifica Nazionale* for the sectors 02/B1 as *professore di seconda fascia*, valid from 06/02/2023 to 06/02/2034
- Reviewer for Optics Express, Advanced Quantum Technologies, Journal of Raman Spectroscopy, The Journal of Physical Chemistry, IEEE Sensors Letters, Optical Materials, Physics Letters A.
- 16/10/2020 – 31/5/2022: laser safety officer for the CNR building in Lecco, part of the campus of Politecnico di Milano in Lecco
- Project evaluator for the Polish National Science Center (2020, 2021 and 2022) and for the Latvian Science Center (2021)
- Guest editor for the research topic *Cavity-enhanced optical spectroscopy* of Frontiers in Physics, Frontiers Media, and for the special issue *Recent Developments in Novel Solid State Lasers* of Optics, MDPI

RESEARCH PROJECTS

Junior assistant professor (RTDA) position funded by:

- Collaborative project with KAUST (Saudi Arabia) and Université de Laval (Canada): *Dual-Comb Spectroscopy in the Mid-IR for Chemical Kinetic Studies*

Post-Doc fellowships from the following projects:

- Collaborative project with KAUST (Saudi Arabia) and Université de Laval (Canada): *Dual-Comb Spectroscopy in the Mid-IR for Chemical Kinetic Studies*
- Progetto FARE ricerca in Italia: *Coherent H2 Raman Metrology (CH2ROME)*
- Collaborative project with KAUST (Saudi Arabia): *Frequency-comb-calibrated cavity-Enhanced Absorption Spectroscopy at high Temperatures for combustion-relevant gases (FEAST)*
- ERC project at Politecnico di Milano (PI: prof. Dario Polli): *Very fast Imaging by Broadband coherent RAman (VIBRA)*

Team member in the following projects:

- Collaborative project with KAUST (Saudi Arabia): *Comb-calibrated cavity-ring-down spectroscopy around 7.8 micron*
- Collaborative project with KAUST (Saudi Arabia): *Development of two new sensors for industry*
- Progetto Emblematico, Regione Lombardia – Fondazione Cariplo: *EMpowerment del PAzienTe in cAsa (EMPATIA)*
- Accordo quadro Regione Lombardia – CNR: *Future Home for Future Communities (FHfFC)*
- Progetto FIRB – Futuro in Ricerca: *Light Correlations for High-precision Innovative Sensing (LiCHIS)*

PATENTS

Co-inventor in two patents:

- *Optical amplifier and amplified pulsed laser*, patent pending (Italy), request n° 102020000006208
- *Tunable mid-infrared laser source and method*, U.S. Application No. 17/307087. Published on November 11th, 2021. Publication number US-2021-0349371-A1

INVITED PRESENTATIONS

- Invited talk at Cavity Enhanced Spectroscopy 2022 in Lecco: *Cavity-enhanced vs Coherent Raman metrology of H_2*
- 21/10/21: Invited seminar c/o Institute de Physique de Rennes, France: *Vibrational spectroscopy with frequency combs: from hydrogen to hydrocarbons*

PRESENTATIONS AT CONFERENCES

- (accepted) Poster at the IFN Congress 2024 – Como, IT: *Characterization of a plane-convex metallic microresonator*
- Oral presentation at FISMAT 2023 – Milan, IT: *High-accuracy Raman Spectroscopy of Molecular Hydrogen*
- Poster at FISMAT 2023 – Milan, IT: *Testing mesoscopic twin-beam states for underwater quantum communication*
- Oral presentation at CLEO EU 2023 – Munich, DE: *Comb-calibrated Raman Spectroscopy of Molecular Hydrogen* (ED-1.2 MON)
- Posters at CLEO EU 2023 – Munich, DE: *A Comb-calibrated Raman Spectrometer for High-accuracy Measurements of Quadrupole Transitions in Gases* (ED-P.2 MON)*, Underwater transmission of mesoscopic twin-beam states for applications in Quantum Communication* (EB-P.28 THU)
- Oral presentations at OSA Optical Sensors and Sensing Congress 2021 – Washington DC, USA: *Comb-calibrated Spectroscopy in the 12-15 µm Region* (JW4E.2), *Multispectrum Rotational States Distribution Thermometer* (SF1A.3)
- Oral presentation at ISMS 2021 – Urbana-Champaign, Illinois, USA: *Comb-calibrated nonlinear spectroscopy of the Q(1) 1-0 line of molecular hydrogen*
- Oral presentations at CLEO USA 2021 – San Jose, California, USA: *Multispectrum Rotational States Distribution Thermometry* (SM1C.2), *Bending Modes Metrology in the 12-15 µm Region* (SM1C.7), *Comb-Referenced Stimulated Raman Spectrometer: Application to the Collisional Physics of H_2* (SM1C.6)
- Oral presentation at CLEO Europe 2019 – Munich, Germany: *Stimulated Raman Spectroscopy of H_2 with absolute frequency calibration*
- Oral presentation at ISMS 2018 – Urbana-Champaign, Illinois, USA: *Comb-referenced coherent Raman spectroscopy on pure H_2*
- Poster at Aston Year of Light Conference 2015 – Birmingham, UK: *Investigating the early stages of Amyloid β oligomerization and its inhibition by pharmacologically active nanoparticles by fluorimetric assays*
- Oral presentation at SPIE Optics+Optoelectronics 2015 – Prague, Czech Repulic: *Superiorities of time-correlated single-photon counting against standard fluorimetry in exploiting the potential of fluorochromized oligonucleotide probes for biomedical investigation*
- Poster at Young Researcher Meeting 2015 – L'Aquila: *A fluorimetry-based assay for the investigation of early-stages Amyloid β oligomerization*
- Oral presentation at the SIF Congress 2014 – Pisa: *Effect of cytosine methylation on DNA thermal stability: a fluorescence study*
- Oral presentation at IQIS 2013 – Como: *Efficient selection of mesoscopic twin-beam states for the optimal production of sub-Poissonian light*
- Poster at the CNISM FisMat congress 2013 – Milano: *Detecting fluorescence in β-barium borate crystals*

PUBLICATIONS

From Scopus on March 23rd, 2024

- Peer-reviewed articles on international journals: 35
- Conference proceedings: 31
- First author in 22 publications, last author in 2 publications, corresponding author in 5 publications
- H index: 13
- Total citations: 438

ARTICLES

1. L. Moretti *et al.*, "Fast rate dual-comb spectrometer in the water-transparent 7.5–11.5 µm region," *Optics Letters*, Mar. 2024, doi: 10.1364/OL.515199.
2. S. Cassina, G. Cenedese, M. Lamperti, M. Bondani, and A. Allevi, "On the use of superthermal light for imaging applications," *Physics Letters, Section A: General, Atomic and Solid State Physics*, vol. 495, 2024, doi: 10.1016/j.physleta.2023.129300.
3. M. Moroni *et al.*, "Mercury clathration-driven phase transition in a luminescent bipyrazolate metal-organic framework: A multitechnique investigation," *Chemistry of Materials*, vol. 35, no. 7, pp. 2892–2903, 2023, doi: 10.1021/acs.chemmater.2c03801.
4. M. Lamperti *et al.*, "Stimulated Raman scattering metrology of molecular hydrogen," *Communications Physics*, vol. 6, no. 1, 2023, doi: 10.1038/s42005-023-01187-z.
5. M. Lamperti *et al.*, "A stimulated Raman loss spectrometer for metrological studies of quadrupole lines of hydrogen isotopologues," *Molecular Physics*, vol. 121, no. 17–18, 2023, doi: 10.1080/00268976.2023.2196353.
6. Elkhazraji *et al.*, "High-resolution molecular fingerprinting in the 11.6-15 µm range by a quasi-CW difference-frequency-generation laser source," *Optics Express*, vol. 31, no. 3, pp. 4164–4178, 2023, doi: 10.1364/OE.480107.
7. D. Gatti *et al.*, "Standoff CARS spectroscopy and imaging using an ytterbium-based laser system," *Optics Express*, vol. 30, no. 9, pp. 15376–15387, 2022, doi: 10.1364/OE.457373.
8. Villa *et al.*, "Broadly tunable mid-infrared femtosecond pulses directly generated by an optical parametric amplifier," *OSA Continuum*, vol. 4, no. 11, pp. 2837–2844, 2021, doi: 10.1364/OSAC.439298.
9. G. Vesco *et al.*, "Double-stranded flanking ends affect the folding kinetics and conformational equilibrium of G-quadruplexes forming sequences within the promoter of KIT oncogene," *Nucleic Acids Research*, vol. 49, no. 17, pp. 9724–9737, 2021, doi: 10.1093/nar/gkab674.
10. R. Gotti, M. Lamperti, D. Gatti, and M. Marangoni, "Laser-based primary thermometry: A review," *Journal of Physical and Chemical Reference Data*, vol. 50, no. 3, 2021, doi: 10.1063/5.0055297.
11. S. Wójtewicz *et al.*, "Accurate deuterium spectroscopy and comparison with ab initio calculations," *Physical Review A*, vol. 101, no. 5, 2020, doi: 10.1103/PhysRevA.101.052504.
12. M. Lamperti *et al.*, "Optical frequency metrology in the bending modes region," *Communications Physics*, vol. 3, no. 1, 2020, doi: 10.1038/s42005-020-00441-y.
13. R. Gotti *et al.*, "Comb-locked frequency-swept synthesizer for high precision broadband spectroscopy," *Scientific Reports*, vol. 10, no. 1, 2020, doi: 10.1038/s41598-020-59398-1.
14. R. Gotti *et al.*, "Multispectrum rotational states distribution thermometry: Application to the 3v 1+ v 3band of carbon dioxide," *New Journal of Physics*, vol. 22, no. 8, 2020, doi: 10.1088/1367-2630/aba85d.
15. M. Lamperti and A. M. Perego, "Collective dynamics of evanescently coupled excitable lasers with saturable absorber," *European Physical Journal B*, vol. 92, no. 6, 2019, doi: 10.1140/epjb/e2019-90634-8.

16. M. Lamperti *et al.*, “Synthesis and spectroscopic characterization of 2-(het)Aryl perimidine derivatives with enhanced fluorescence quantum yields,” *Journal of Fluorescence*, 2019, doi: 10.1007/s10895-019-02361-9.
17. B. Alsaif, D. Gatti, M. Lamperti, P. Laporta, A. Farooq, and M. Marangoni, “Comb-calibrated sub-Doppler spectroscopy with an external-cavity quantum cascade laser at 7.7 µm,” *Optics Express*, vol. 27, no. 17, pp. 23785–23790, 2019, doi: 10.1364/OE.27.023785.
18. M. Lamperti *et al.*, “Invited Article: Filamentary deposition of laser energy in glasses with Bessel beams,” *APL Photonics*, vol. 3, no. 12, 2018, doi: 10.1063/1.5053085.
19. M. Lamperti *et al.*, “Absolute spectroscopy near 7.8 µm with a comb-locked extended-cavity quantum-cascade-laser,” *Scientific Reports*, vol. 8, no. 1, 2018, doi: 10.1038/s41598-018-19188-2.
20. B. AlSaif *et al.*, “High accuracy line positions of the v1 fundamental band of 14N2 16O,” *Journal of Quantitative Spectroscopy and Radiative Transfer*, vol. 211, pp. 172–178, 2018, doi: 10.1016/j.jqsrt.2018.03.005.
21. M. Lamperti and A. M. Perego, “Disorder-induced localization of excitability in an array of coupled lasers,” *Physical Review A*, vol. 96, no. 4, 2017, doi: 10.1103/PhysRevA.96.041803.
22. R. Gotti *et al.*, “Conjugating precision and acquisition time in a Doppler broadening regime by interleaved frequency-agile rapid-scanning cavity ring-down spectroscopy,” *Journal of Chemical Physics*, vol. 147, no. 13, 2017, doi: 10.1063/1.4999056.
23. A. M. Perego and M. Lamperti, “Collective excitability, synchronization, and array-enhanced coherence resonance in a population of lasers with a saturable absorber,” *Physical Review A*, vol. 94, no. 3, 2016, doi: 10.1103/PhysRevA.94.033839.
24. L. Nardo *et al.*, “Fluorimetric detection of the earliest events in amyloid β oligomerization and its inhibition by pharmacologically active liposomes,” *Biochimica et Biophysica Acta - General Subjects*, vol. 1860, no. 4, pp. 746–756, 2016, doi: 10.1016/j.bbagen.2016.01.003.
25. E. Lavigna *et al.*, “Investigating the structural features and spectroscopic properties of bis(tetrazolato)-based coordination polymers,” *Crystal Growth and Design*, vol. 16, no. 11, pp. 6390–6404, 2016, doi: 10.1021/acs.cgd.6b01056.
26. M. Giani *et al.*, “Fluorescence studies on 2-(het)aryl perimidine derivatives,” *Journal of Luminescence*, vol. 179, pp. 384–392, 2016, doi: 10.1016/j.jlumin.2016.07.033.
27. L. Nardo *et al.*, “Effects of non-CpG site methylation on DNA thermal stability: A fluorescence study,” *Nucleic Acids Research*, vol. 43, no. 22, pp. 10722–10733, 2015, doi: 10.1093/nar/gkv884.
28. E. Totè, M. Lamperti, M. Bondani, D. Salerno, V. Cassina, and L. Nardo, “Full genotyping of a highly polymorphic human gene trait by time-resolved fluorescence resonance energy transfer,” *PLoS ONE*, vol. 9, no. 9, 2014, doi: 10.1371/journal.pone.0107310.
29. R. Machulka, K. Lemr, O. Haderka, M. Lamperti, A. Allevi, and M. Bondani, “Luminescence-induced noise in single photon sources based on BBO crystals,” *Journal of Physics B: Atomic, Molecular and Optical Physics*, vol. 47, no. 21, 2014, doi: 10.1088/0953-4075/47/21/215501.
30. R. Machulka, O. Haderka, J. Perina, M. Lamperti, A. Allevi, and M. Bondani, “Spatial properties of twin-beam correlations at low-to high-intensity transition,” *Optics Express*, vol. 22, no. 11, pp. 13374–13379, 2014, doi: 10.1364/OE.22.013374.
31. M. Lamperti, A. Maspero, H. H. Tønnesen, M. Bondani, and L. Nardo, “Elucidation of the relationships between H-bonding patterns and excited state dynamics in cyclovalone,” *Molecules*, vol. 19, no. 9, pp. 13282–13304, 2014, doi: 10.3390/molecules190913282.

32. M. Lamperti *et al.*, “Optimal sub-Poissonian light generation from twin beams by photon-number resolving detectors,” *Journal of the Optical Society of America B: Optical Physics*, vol. 31, no. 1, pp. 20–25, 2014, doi: 10.1364/JOSAB.31.000020.
33. Andreoni, M. Bondani, M. Lamperti, and L. Nardo, “Typing of polymorphic human genes by picosecond-resolved förster energy transfer,” *IEEE Journal on Selected Topics in Quantum Electronics*, vol. 20, no. 2, 2014, doi: 10.1109/JSTQE.2013.2278216.
34. Allevi *et al.*, “Characterizing the nonclassicality of mesoscopic optical twin-beam states,” *Physical Review A - Atomic, Molecular, and Optical Physics*, vol. 88, no. 6, 2013, doi: 10.1103/PhysRevA.88.063807.
35. D. Faccio, T. Arane, M. Lamperti, and U. Leonhardt, “Optical black hole lasers,” *Classical and Quantum Gravity*, vol. 29, no. 22, 2012, doi: 10.1088/0264-9381/29/22/224009.

Autorizzo il trattamento dei dati personali presenti nel presente curriculum vitae ai sensi del Decreto Legislativo 30 giugno 2003, n. 196 e del GDPR (Regolamento UE 2016/679)