



## Luca Tomarchio

### ABOUT ME

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I am an experimental condensed matter physicist with a research interest in the light-matter interaction in quantum materials. I have studied topological crystals, like Weyl semimetals and topological insulators, vdW magnetic insulators, high-temperature superconductors, plasmonic and disordered materials. During my career, I have used THz and IR radiation in linear, nonlinear, and time-resolved spectroscopic experiments. I have studied and applied novel techniques for the generation and detection of THz waves in a time-domain setup. I have also worked on projects regarding the creation of superconductors-based Van der Waals heterostructures, acquiring the material science know-how to exfoliate, stack and measure 2D crystals.

### WORK EXPERIENCE

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#### Postdoctoral Researcher

*Sapienza University* [ 11/2022 – Current ]

City: Rome

Country: Italy

Research Topics: Frequency- and time-resolved spectroscopy of quantum materials (Topological materials, relaxor ferroelectric, high-temperature superconductors)

#### Guest Researcher

*Leibniz Institute for Solid State and Materials Research* [ 09/2021 – 07/2022 ]

City: Dresden

Country: Germany

Guest researcher in collaboration with IFW-Dresden for the project: "THz Spectroscopy of high-temperature superconductors-based Van der Waals heterostructures".

The project has been funded by the DAAD institution.

#### University Teaching Assitant

*Sapienza University* [ 03/2020 – 12/2020 ]

City: Rome

Country: Italy

Classical Physics (Mechanics, Thermodynamics, Electromagnetism)  
For the Information and Management Engineering bachelor's degree

### EDUCATION AND TRAINING

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#### Ph.D. in Physics

*Sapienza University* [ 10/2019 – 10/2022 ]

Address: Piazzale Aldo Moro, 00185 Roma (Italy)

Field(s) of study: Physics | Optical Spectroscopy | Material Science

Final grade: Full grades with Honourable mention – Level in EQF: EQF level 8

Thesis: Terahertz and optical response of novel quantum materials

Research in condensed matter physics and optical spectroscopy at the THz Sapienza Laboratory under the supervision of prof. Stefano Lupi.

### **Master's Degree in Physics**

**Sapienza University of Rome** [ 09/2017 – 10/2019 ]

Field(s) of study: Condensed Matter Physics

Final grade: 110/110 cum laude – Level in EQF: EQF level 7

Thesis: Terahertz Optical Response of a Type-II Weyl Semimetal: WTe<sub>2</sub>

### **Bachelor's Degree in Physics**

**Sapienza University of Rome** [ 09/2014 – 09/2017 ]

Field(s) of study: Physics

Final grade: 110/110 cum laude – Level in EQF: EQF level 6

Thesis: Utilizzo di Metalli Liquidi in Frascati Tokamak Upgrade (FTU)

### **Google Data Analytics Professional Certificate**

**COURSERA**

Website: [https://www.credly.com/badges/c9142294-a8c1-41ee-8917-2e8eee41faee?source=linked\\_in\\_profile](https://www.credly.com/badges/c9142294-a8c1-41ee-8917-2e8eee41faee?source=linked_in_profile)

### **Certified Personal Trainer (CPT)**

**Scuola Nazionale di Personal Trainer (SNPT)** [ 08/2020 – 10/2020 ]

## **HONOURS AND AWARDS**

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### **Scholarship for further Studying and Training in Germany**

DAAD - German Academic Exchange Service [ 06/2021 ]

Winner of a scholarship as a guest researcher at IFW-Dresden, defending the project: "THz Spectroscopy of high-temperature superconductors-based Van der Waals heterostructures".

### **Excellence Program for the Master's Degree in Physics**

Sapienza University of Rome [ 10/2019 ]

Admission and completion of the excellence program for the master's degree in physics, reserved only to the best 10 students of the associated academic year.

### **Excellence Program for the Bachelor's Degree in Physics**

Sapienza University of Rome [ 10/2017 ]

Admission and completion of the excellence program for the bachelor's degree in physics, reserved only to the best 30 students of the associated academic year.

## **PUBLICATIONS**

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### **[Terahertz Resonators Based on YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> High-Tc Superconductor](#)**

[2022]

Salvatore Macis, Maria Chiara Paolozzi, Annalisa D'Arco, Luca Tomarchio, Alessandra Di Gaspare, Stefano Lupi

*Appl. Sci.* **2022**, 12(20), 10242

### **[Electrodynamics of MnBi<sub>2</sub>Te<sub>4</sub> intrinsic magnetic topological insulators](#)**

[2022]

Luca Tomarchio, Lorenzo Mosesso, Salvatore Macis, Antonio Grilli, Martina Romani, Mariangela Cestelli Guidi, Kejing Zhu, Xiao Feng, Michele Zacchigna, Massimo Petrarca, Ke He & Stefano Lupi

*NPG Asia Materials* **14**, 82 (2022)

### **[Infrared plasmons in ultrahigh conductive PdCoO<sub>2</sub> metallic oxide](#)**

[2022]

Salvatore Macis, Luca Tomarchio, Silvia Tofani, Federica Piccirilli, Michele Zacchigna, Vincenzo Aglieri, Andrea Toma, Gaurab Rimal, Seongshik Oh, Stefano Lupi

*Commun Phys* **5**, 145 (2022)

### [Low energy electrodynamics of CrI3 layered ferromagnet](#)

[2021]

Luca Tomarchio, Salvatore Macis, Lorenzo Mosesso, Loi T. Nguyen, Antonio Grilli, Mariangela Cestelli Guidi, Robert J. Cava & Stefano Lupi

*Scientific Reports* **11**, 23405

### [Disordered photonics behavior from terahertz to ultraviolet of a three-dimensional graphene network](#)

[2021]

Luca Tomarchio, Salvatore Macis, Annalisa D'Arco, Sen Mou, Antonio Grilli, Martina Romani, Mariangela Cestelli Guidi, Kailong Hu, Suresh Kukunuri, Samuel Jeong, Augusto Marcelli, Yoshikazu Ito & Stefano Lupi

*NPG Asia Materials* **13**, 73 (2021)

### [Simultaneous elliptically and radially polarized THz from one-colour laser-induced plasma filament](#)

[2021]

Mou Sen, Annalisa D'Arco, Luca Tomarchio, Marta Di Fabrizio, Alessandro Curcio, Stefano Lupi, Massimo Petrarca

*New Journal of Physics* **23** (6), 063048

### [Angular Dependence of Copper Surface Damage Induced by an Intense Coherent THz Radiation Beam](#)

[2020]

Salvatore Macis, Luca Tomarchio, Silvia Tofani, S Javad Rezvani, Luigi Faillace, Stefano Lupi, Akinori Irizawa, Augusto Marcelli

*Condens. Matter* **5**(1), 16

### [Spatially Resolved Spectral Imaging by A THz-FEL](#)

[2020]

Akinori Irizawa, Masaki Fujimoto, Keigo Kawase, Ryukou Kato, Hidenori Fujiwara, Atsushi Higashiya, Salvatore Macis, Luca Tomarchio, Stefano Lupi, Augusto Marcelli, Shigemasa Suga

*Condens. Matter* **5**(2), 38

### [Broadband Anisotropic Optical Properties of the Terahertz Generator HMQ-TMS Organic Crystal](#)

[2020]

Annalisa D'Arco, Luca Tomarchio, Valerio Dolci, Paola Di Pietro, Andrea Perucchi, Sen Mou, Massimo

*Condens. Matter* **5**(3), 47

### [Generation of terahertz vector beam bearing tailored topological charge](#)

[2023]

S. Mou, A. D'Arco, L. Tomarchio, S. Macis, A. Curcio, S. Lupi, M. Petrarca

APL Photonics (in press)

## **PROJECTS**

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### **Time-resolved spectroscopy of relaxor ferroelectrics**

[ 11/2022 – Current ]

Sapienza research grant: Progetto per avvio alla ricerca - Tipo 2

### **THz Spectroscopy of high temperature superconductors-based Van der Waals heterostructures**

[ 08/2021 – 08/2022 ]

Sapienza research grant: Progetto per avvio alla ricerca - Tipo 1

### **THz Spectroscopy of high temperature superconductors-based Van der Waals heterostructures**

[ 30/09/2021 – 30/07/2022 ]

DAAD research grant: One-Year Grants for Doctoral Candidates, concerning an active collaboration with the Superpuddles lab of Dr. Nicola Poccia at the Leibniz Institute of Solid State and Materials Research in Dresden

## **Spectroscopic Study of new Topological Semimetals in the THz Frequency Gap**

[ 08/2020 – 08/2021 ]

Sapienza research grant: Progetto per avvio alla ricerca - Tipo 1

### **CREATIVE WORKS**

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#### **Il Metallo, L'Isolante e il Superconduttore**

[ 01/2023 ]

Author of the book "Il Metallo, L'Isolante e il Superconduttore", published through the editor Youcanprint.

ISBN: 9791221457223

### **CONFERENCES AND SEMINARS**

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#### **The 2nd 3D Graphene workshop: from fundamentals properties to applications**

[ University of Science and Technology of China, Hefei, Anhui, 09/10/2019 – 10/10/2019 ]

Invited speaker

#### **Spectroscopy and Imaging with THz Radiation using Ultimate Radiation Sources**

[ University of Rome La Sapienza, Rome, Italy, 09/12/2019 – 10/12/2019 ]

Co-chair and speaker

#### **SuperFOx2020 Conference on Superconductivity and Functional Oxides**

[ Santa Margherita Ligure, Italy, 09/02/2020 – 11/02/2020 ]

Oral Contributor

#### **11th NGSCES 2021 Conference**

[ Zoom Conference, 06/06/2021 – 09/06/2021 ]

Poster Contributor

#### **LEES 2021 Conference (28/06-01/07/2021)**

[ Zoom Conference, 27/06/2021 – 30/06/2021 ]

Poster contributor

#### **Bilateral 3D Graphene workshop**

[ University of Rome La Sapienza, Rome, Italy., 25/11/2021 ]

Invited Speaker

#### **Quantum Materials for Quantum Technologies workshop**

[ Laboratori Nazionali di Frascati (LNF), Frascati, Rome, Italy., 14/02/2022 – 15/02/2022 ]

Invited Speaker

#### **GEMCMP22 Conference**

[ Rome, Italy, 16/06/2022 – 18/06/2022 ]

Invited Speaker

#### **Superstripes 2022 Conference (20-24/06/2022),**

[ Laboratori Nazionali di Frascati (LNF), Frascati, Italy., 20/06/2022 – 24/06/2022 ]

Oral Contributor

### **LANGUAGE SKILLS**

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Mother tongue(s): **Italian**

#### **Other language(s):**

##### **English**

**LISTENING C2 READING C2 WRITING C1**

**SPOKEN PRODUCTION C1 SPOKEN INTERACTION C1**

##### **German**

**LISTENING A1 READING A1 WRITING A1**

**SPOKEN PRODUCTION A1 SPOKEN INTERACTION A1**

## **DIGITAL SKILLS**

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### **Statistical Data Analysis Skills**

Microsoft Excel / MATLAB&Simulink / R Language and R Studio / Relational Databases: SQL / Data Science, Data Analytics, Data Visualization / LabVIEW programming

### **Oral and Written Presentation Skills**

Microsoft Powerpoint / Microsoft Word / Latex Software

### **Management Skills**

Analytical skills / Organizational and planning skills / Team-work oriented / Problem Analysis & Problem Solving

### **Physics Related Skills**

Ultrafast spectroscopy / Material Characterization (Confocal, Optical and UV-Vis Spectroscopy, SEM, Raman Spectroscopy) / nonlinear optics / Topological Materials / Material Science / Superconductivity / Quantum Materials / Terahertz spectroscopy

## **DRIVING LICENCE**

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**Driving Licence:** B

## **VOLUNTEERING**

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### **Blood donor**

[ Lipari, 01/2011 – Current ]

AVIS - Associazione Volontari Italiani del Sangue