

# International Workshop “Quantum THz Nanomaterials and Devices: Science, Technology and Applications”

Ettore Majorana Foundation and Center for Scientific Culture, Erice (IT) | July 5th-11th, 2026

**Venue: Aula Dirac, San Domenico – Majorana center**

## Programme

### Sunday July 5<sup>th</sup>

9.00 – 19.00: Arrival and Registration

12:30 - 14:30 Lunch

16:30: Opening of the industrial Exhibition at the top floor of San Domenico building



19:30 – 21:30: Dinner

From 21:30: **Welcome reception**

Sicilian cakes, marsala piano music in the “Marsala Room Cave”

### Monday July 6<sup>th</sup>

08:45-09:15 **Giorgio Benedek, Federico Capasso, Oleg Mitrofanov and Miriam S. Vitiello**

Opening remarks

#### **SESSION I: Photonics I**

Chair: Federico Capasso (Harvard University, USA)

9:15 – 10:15: **Andrea Alù** (City University of New York, USA), *tutorial*

“Polaritonic Metamaterials”

10:15 – 10:45: Coffee Break

#### **SESSION II: Photonics II**

Chair: Federico Capasso (CNR-NANO and Scuola Normale Superiore, Italy)

10:45 – 11:45 **Ileana Cristina Benea-Chelmus** (EPFL, Switzerland), *lecture*

“Photonic integrated devices for next-generation sensing and metrology in the terahertz”

11:45 – 12.00 O. Nagy (Ruth University Bochum, Germany)

“High-repetition-rate THz air photonics”

12:00 – 12.15: A. Martinez (Ruth University Bochum, Germany)

“Terahertz Generation in DAST Driven by a High-Repetition-Rate 2.1  $\mu\text{m}$  fs-Holmium Amplifier”

12:15 – 12:30 S. Schäffer (Ecole Normale Superieure, Paris France)  
"Mid-infrared Driven Nonlinear THz Response in the Topological Crystalline Insulator  $Pb_{1-x}Sn_xSe$ "  
12:30 – 12:45 M. E. Portnoi (University of Exeter, UK)  
"Tuneable Terahertz Transitions in Quasi-One-Dimensional Carbon-Based Nanostructures"  
12:45 – 13:00: G. Cywiński (CENTERA, Poland)  
"Integration of Active and Passive sub-THz Elements into a Single Monolithic Circuit Fabricated in Advanced Nitride Technology"  
  
13:00 – 16:00: Lunch Break and Free Time

### **SESSION III: Metasurfaces**

Chair: Miriam Serena Vitiello (CNR-NANO, Italy)

15:45 – 16:40: **Federico Capasso** (Harvard University, USA) *lecture*  
"From Classical to quantum metasurfaces"  
16:45 – 17:05: M.A. Belkin (University of Munich, Germany) *invited*  
"Generation of continuous-wave 1-12 THz radiation with intersubband polaritonic metasurfaces"  
17:05 – 17:20 D. Peeters (Eindhoven University of Technology, The Netherlands)  
"Near-Field Terahertz Time-Domain Microscopy of Metasurfaces"  
17.20 – 17:35 H. Liu (Cambridge University, UK)  
"Design of an Ultra-Thin Gallium Phosphide Metasurface for High-Resolution Terahertz Hyperspectral Imaging"

### **SESSION IV POSTER SESSION**

17:35-19:30 **POSTER SESSION & coffee break**  
Flash poster presentation (5 min/poster) & Poster session

19:30 - 21:30: Dinner

From 21:30: Sicilian cakes, marsala and piano music in the "Marsala Room Cave"

## **Tuesday July 7<sup>th</sup>**

### **SESSION V: Quantum Matters and ultra-strong coupling**

Chair: Alfred Leitenstorfer (University of Konstanz, Germany),

9:00 – 10:00: **Junichiro Kono** (Rice University, USA) *lecture*  
"Cavity-Dressed Quantum Matter"  
10:00 – 10:15: F. Velli (TU Dortmund University, Germany)  
"Ultrastrong coupling of cavity-less THz magneto plasmon polaritons"  
10:15 – 10:30: M Białek (CENTERA and Technical University of Warsaw, Poland)  
"From Weak to Strong Magnon-Photon coupling in the THz range"  
10:30 – 10:45: P. Sai (CENTERA and Technical University of Warsaw, Poland)  
"Magneto-Plasmonic Terahertz Crystals with Multiple Bernstein Modes contributed"  
10:45 – 11:00 D. Yavorskiy (CENTERA and Technical University of Warsaw, Poland)  
"Deep-Strong Light-Matter Coupling of Kane Fermions Beyond Room Temperature"

11:00: 11:20: Coffee Break

### **SESSION VI: Time-domain and near-field**

Chair: Rupert Huber (University of Regensburg, Germany)

11:20 – 12:20: **Alfred Leitenstorfer** (University of Konstanz, Germany) *lecture*  
"Studying Electromagnetic Quantum Fluctuations in the Time Domain"  
12:20 – 12:35: E. Mironova (EPFL)  
"Quantifying thermal THz-field-induced modulation in on-chip two-color correlation measurements"  
12:35 – 12:50 L. Viti (CNR-NANO)  
"Engineering Dirac Plasmon Dispersion in Topological Insulator Meta-Resonators via THz Near-Field Nanoscopy"  
12:50 – 13:05 S. Anglhuber (University of Regensburg, Germany)  
"Direct spatio-temporal mapping and manipulation of THz surface plasmon polariton propagation"  
13:05 – 13:20 R. Rouzegar (Zurich Instruments)  
"From Noise to Signal with the Right Measurement Technique"

13:20 – 15:30: Lunch Break and Free Time

### **SESSION VI Quantum Cascade Lasers I**

Chair: Jerome Faist (ETHz, Switzerland)

15:30 – 16:30: **Edmund Linfield** (University of Leeds, UK) *lecture*  
"Molecular Beam Epitaxial Growth of quantum cascade lasers – The Challenges and the Rewards"  
16:30 – 16:45 Q. Wang (University of Singapore)  
"Terahertz Semiconductor Multi-bound States-Assisted Flat-Band Lasers"  
16:45 – 17:00 T. Letsou (Harvard University)  
"Active integrated photonics using quantum cascade lasers"

17:00 -17:20 coffee break

### **SESSION VII Quantum Cascade Lasers II**

Chair: Mikhail Belkin (Technical University of Munich, Germany)

17:20 – 17:35 Q. Qin (Nanjing University, China)  
"Surface-Emitting THz Quantum Cascade Lasers via Valley-Edge Topological Cavities"  
17:35 – 17:50 A. De Vetter (Ecole Normale Supérieure, Paris)  
"Time-resolved emission dynamics in ring-shaped THz QCLs driven by a bus laser"  
17:50 – 18:05 F. Wang (Quantum Science Center, Shenzhen, China)  
"Extended Combined Resonant Tunneling and Rate Equation Model for Group-IV Room-Temperature THz Quantum Cascade Lasers"  
18:05 – 18:20 D. Piciocchi (ETH Zurich, Switzerland)  
"Shaping of Frequency Combs from Fast-Gain Lasers"  
18:20 – 18:35 M.A. Justo Guerrero (CNR-NANO, Italy)  
"Engineering Frequency Comb Regimes in Elliptical THz Quantum Cascade Lasers with integrated graphene"

19:30 - 21:30: Dinner

21:30: Sicilian cakes, marsala and piano music in the "Marsala Room Cave"

## **Wednesday July 8<sup>th</sup>**

### **SESSION VIII Special Session Women in Terahertz I**

Chair: Miriam S. Vitiello (CNR-NANO, Italy)

Special session Women in Optics

9:00 – 10:00: **Manijeh Razeghi** (Northwestern University, USA), **keynote**  
"Breaking the *Reststrahlen* Barrier with III-V semiconductors: RT, THz Laser Diodes and frequency combs world record power and quantum device technology"

10:00 – 10:30: **Mona Jarrahi** (UCLA, USA), **invited**  
"Spatiotemporally Encoded Time-Domain Terahertz Imaging"

10:30 – 10:50: Coffee Break

### **SESSION IX Special Session Women in Terahertz II**

Chair: Margherita Maiuri (Politecnico di Milano, Italy)

10:50 – 11:20: **Clara Saraceno** (Ruth University Bochum, Germany), **invited**  
"Average power scaling in Terahertz time-domain spectroscopy"

11:20 – 11:50: **Juliette Mangeney** (CNRS and Ecole Normale Supérieure, France), **invited**  
"An on-chip THz two-level system based on a graphene double quantum dot"

11:50 – 12:20: **Hannah J. Joyce** (University of Cambridge, UK), **invited**  
"Advancing Terahertz Functionality through III–V Nanostructures"

12:20 – 12:35 L. Di Virgilio (Politecnico di Milano, Italy)

"Directional charge–phonon coupling in mixed exciton–charge-transfer states in DNTT single crystals"

12:35 – 12:50 X.L. Liu (University of Manchester (UK)

"Mapping the crystal damage in silicon carbide (SiC) introduced by ion implantation with scattering type-scanning near-field optical microscopy (s-SNOM)"

12:50 – 14:30 Lunch Break

14:45 – 23:00: **Excursion & Dinner**

## **Thursday July 9<sup>th</sup>**

### **SESSION X Ultrafast spectroscopy**

Chair: J. Kono (Rice University, USA),

9:00 – 10:00: **Rupert Huber** (University of Regensburg, Germany) **tutorial**

"Sub-cycle videography of strong-field controlled electrons"

10:00 – 10:15 A. Valladares (Politecnico di Milano, Italy)

"Tracking the ultrafast broadband chiro-optical nonlinearities of plasmonic nano-helicoids"

10:15 – 10:30 V. Bergbauer (University of Regensburg, Germany)

"All-optical atomic-scale microscopy with continuous-wave mid-infrared radiation"

10:30 – 10:45 A. Reich (Neaspec/Attocube)

"Integrating nanoscale spatial resolution with ultrafast spectroscopy"

10:45: 11:15: Coffee Break

### **SESSION XI Spectroscopy and imaging**

Chair: M. Jarrahi (UCLA, USA)

11:15 – 11:30: M. Khalili (Ruhr-University Bochum, Germany)

"Sub-diffraction spatially-resolved THz-TDS at high speeds enabled by high-average power large-area emitter"

11:30 – 11:45: A. Paul (Loughborough University, UK)

"Beyond the Mask Approximation in Terahertz Ghost Imaging"

11:45 – 12:00: X. Cao (EPFL, Switzerland)

"Monolithically Integrated Broadband Terahertz Transceiver for On-chip Spectroscopy on Thin-film Lithium Niobate"

12:00 – 12:15: M. Yessenov (Harvard University)

"Observation of Spatially Structured Montgomery Effect in Free Space"

12:15 – 12:30: A. Shkurinov (Moscow State University, Russia)

"Dielectric and nonlinear properties in the terahertz frequency range of heterostructures with ultrathin films of phase-changing and magnetic material"

12:30 – 12:45 J. Lee (Teraview, UK)

"Temperature-Dependent Optical Properties of NMC811 Battery Electrode Probed by Terahertz Spectroscopy"

12:45 – 13:00 M. Shalaby (Swiss Terahertz)

"Opportunities and Challenges in THz devices and Systems"

13:00 – 15:45: Lunch Break and Free Time

## **SESSION XII Cavity QED and non-linear optics**

Chair: F. Capasso (Harvard University, USA)

15:45 – 16:45: **Jerome Faist** (ETHz, Switzerland) *tutorial*

"Controlling solid state phases through vacuum fields"

16:45 – 17:00: Cormac McDonnell (Tel-Aviv University, 69978 Tel-Aviv, Israel)

"THz Field Induced Second Harmonic Generation in Semiconductor Thin Films"

17:00 – 17:15: P. Undrum Fathi (Harvard University)

"Metasurface Enhanced Nonlinear Polarization Using Multi Quantum Wells"

17:15 – 17:30: S. Mukherjee (Ecole Normale Supérieure, Paris, France)

"Tailoring Terahertz Spin-Charge Conversion in 2D transition metal dichalcogenide Heterobilayers"

17:30 – 17:45: Z. Wang (TU Dortmund University, Germany)

"Ultrafast terahertz high-harmonic generation in Dirac/Weyl semimetals and semiconductors"

17:45 -18:00: A.D. Thomas (Loughborough University, UK)

"Enhanced Terahertz Emission in a Hybrid Spintronic Emitter/ZnTe Structure"

20:00 – 22:30: **Conference Banquet**

## **Friday July 10<sup>th</sup>**

### **SESSION XIII Electronics, transceivers and applications**

Chair: X.J. Zhang (Rochester University, USA)

9:00 – 10:00: **Tadao Nagatsuma** (University of Tokyo, Japan) *lecture*

"Engineering the Terahertz Era: Heterogeneous Integration of Photonics and Electronics"

10:00 – 10:15 R. De La Bastida (Catalan Institute of Nanoscience and Nanotechnology, Spain)

"Enabling thin film thickness determination and data transfer using a sub-THz coherent graphene detector"

10:15 – 10:30 K. Delfanazari (University of Glasgow, UK)

"Terahertz quantum communication with superconducting circuits"

10:30 – 10:45 J. Elumalai (University of Leeds)

"Spectrally Efficient 16-QAM OFDM Transmission in a Terahertz laser Free-Space Link"

10:45 – 11:00 V. Pushkarev (CNR-NANO, Italy)

"Graphene-Based Terahertz Photodetectors on integrated Photonic Platforms"

11:00-11:30: Coffee Break

### **SESSION XIV Metasurfaces and light-matter interaction**

Chair: Miriam Vitiello (CNR-NANO, Italy)

11:30 – 12:30: **Margherita Maiuri** (Politecnico di Milano, Italy) *tutorial*

"Ultrafast all-optical metasurfaces: controlling light and manipulating matter"

12:30 – 12:45: Y. Pang (Queen Mary, London UK)

"Thermolytic and Auxetic Miniaturization for Nano-architected 3D Metamaterial"

12:45 – 13:00: D. Cassara (Harvard University)

“Experimental Demonstration of Near-Zero-Reflection Bilayer Dielectric Metasurfaces”

13:00 – 13:15 A. Schirato (Politecnico di Milano, Italy)

“All-optical manipulation of the spatio-temporal response of dynamic metasurfaces”

13:15 – 15:15 Traditional Sicilian Lunch

### **SESSION XV Quantum Cascade Lasers III**

Chair: Edmund Linfield (University of Leeds, UK)

15:15 – 16:15: **Paul Chevalier** (Harvard University, USA), *tutorial*

“The quantum cascade laser pumped molecular laser: from design to applications”

16:15 – 16:30: R.E. Vass (ETH, Zurich)

“Miniature, Low-Dissipation Quantum Cascade Ring Lasers”

16:30 – 16:45: Q. Yang (Fraunhofer Institute for Applied Solid State Physics (IAF), Freiburg)

“Rate equations approach for optically pumped CH<sub>3</sub>F terahertz gas lasers”

16:45 – 17:00: A. Sorgi (CNR-INO Florence)

“Design and Characterization of a THz Diffraction Grating for Quantum Correlation Measurements”

17:00: **Federico Capasso, Oleg Mitrofanov** and **Miriam S. Vitiello**

Closing remarks

19:30 - 21:30 Closing Banquet Dinner

21:30: Sicilian cakes, marsala and piano music in the “Marsala Room Cave”

## **Saturday July 11th**

Departures