



PARTNER PRESENTATION AND INTEREST IN HORIZON EUROPE PARTICIPATION

Name of the organisation	National Institute for R&D in Microtechnologies, IMT Bucharest
Country	Romania
Type of organisation	Research
Short description	R&D in micro-nanoelectronics, photonics, micro-nano-systems (MEMS, NEMS, MOEMS, RF-MEMS, MNBS), micro and nano-fabrication technologies and new materials
Laboratory	Micro and Nano-Photonics Laboratory
Contact person	Rebeca Tudor
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Short description of Laboratory/ Faculty Department involved

Mission: Research, development and education in micro and nanophotonics

Research domains:

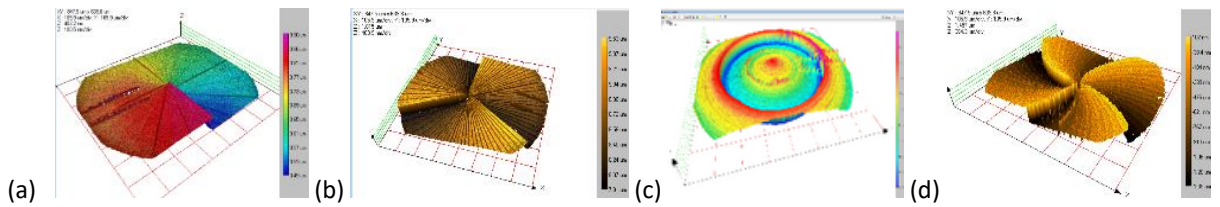
- **Modelling, simulation and CAD of micro and nano-photonic structures** (optoelectronic devices and photonic integrated circuits; plasmonics; OMEMS).
- **Optical and electrical characterization of materials and devices**
- **New materials for micro-nanophotonics** (hybrid nano-composites with controlled optical properties, transparent semiconducting oxides, Graphene, quantum dots) **and new processes and devices.**
- **Micro-nano photonics components** (photodetectors, photonic integrated circuits, metasurfaces, plasmonic structures, DOE, optical components);
- **Organic optoelectronics** (devices based on graphene-polymer nanocomposites)
- Microtechnologies for the fabrication of photonic circuits, optical and optoelectronic components for **quantum technologies**

Applications:

- ✓ **Optical sensors** (gas sensors based on composite nanomaterials/metasurfaces, fluorescent biosensors)
- ✓ **Security elements for anti-counterfeit protection and logistic monitoring** (holographic labels with extra security nanoelements, RFID elements and temperature sensor);
- ✓ **Free space optical communications, Beam shaping.**

Expertise in the specific field of the selected call: Significant R&D projects: (i) Project HOLOCOMM investigated optical vortices for optical free space communications (FSOC); (ii) National project PCCDI QUTECH-RO "Developing quantum information and quantum technologies in Romania" component project Q-Vortex "Quantum information with optical vortices" where the use of vortices in an optical system for encoding classical and quantum information in invariant rotational states was investigated, with applications in FSOC, and in quantum keys distribution systems that do not require rotation alignment along their optical axis for inter – satellites scenarios; (iii) Partnership for using Key Enabling Technologies on a platform for interaction with companies" TGE-PLAT POC-G – Operational Competitiveness Program 2014-2021, a project financed by Structural Funding dedicated to knowledge transfer from IMT to high tech Romanian companies; - High quality forming image optical system with diffractive optical elements in LWIR spectral range for multisensory systems-SOFID.

Diffractive optical elements (spiral phase plates, axicons, spiral axicons) working in the reflection and transmission mode were fabricated with standard microfabrication techniques where the spiral geometry was patterned in using successive photolithographical processes followed by plasma or chemical etching. By increasing the number of levels, a continuous profile of the optical component is well approximated. This fabrication process was reproducible for different topological orders.



Images obtain by white light interferometry of the optical components fabricated in IMT.



(a) Optical vortices with OAM =1, 2, 3, 4, b) Interference pattern - optical vortex OAM=1 and plane <https://granit.imt.ro/email/wave>, in an interferometrical set-up (Michelson or Mach -Zehnder)

Involved persons. Short CV

Dr. Rebeca Tudor: PhD in Physics from University of Bucharest. RT is Senior Researcher III in IMT Bucharest. Expertise: simulation, design, fabrication, characterization of diffractive optical elements for beam shaping especially with optical vortices and nondiffractive Bessel beams, fabrication and characterization of the micro and nano photonic components

Dr. Cristian Kusko: PhD in Physics from Northeastern University, Boston, USA. CK is Senior Researcher I in IMT Bucharest. Expertise: theoretical calculations, numerical and modeling / simulation / design and functional characterization of photonic and optical components (optical vortices, metamaterials, nonlinear plasmonic systems). CK participated in the following European projects: WAPITI, MIMOMEMS and FlexPAET

Dr. Mihai Kusko: PhD in electronic and telecommunications engineering from University Politehnica of Bucharest in 2009. MK is Senior Researcher II IMT-Bucharest. Expertise: simulation and modeling micro and nano photonic components, photonic integrated circuits, diffractive optical elements, optical multilayers systems and surface plasmon resonance sensors, fabrication and characterization of the micro and nano photonic components. MK participated in the following European projects: WAPITI, MIMOMEMS and FlexPAET.

If you are interested in a particular call, please indicate the Reference of the call/ Topic of interest.

HORIZON-CL4-2023-TWIN-TRANSITION-01-02: High-precision OR complex product manufacturing – potentially including the use of photonics (Made in Europe and Photonics Partnerships) (IA)

Potential contribution.

Design and fabrication of optical/micro-optical components with free form surfaces with different diameters using standard photo-lithographic techniques. Functional characterization of the components.

Have you already participated in an EU funded project? If so, provide some references/ results.

- **MIMOMEMS-** European Centre of Excellence in Microwave, Millimetre Wave and Optical Devices, based on Micro-Electro-Mechanical Systems for Advanced Communication Systems and Sensors, REGPOT -Contract no. 202897- **design, fabrication and characterization of plasmonic nanostructures.**
- **FlexPAET-** Flexible Patterning of Complex Micro Structures using Adaptive Embossing Technology, IP, NMP- algorithms for the optimization **high volume production of large-area masters micro structured surfaces for diffractive optical elements.**
- **WAPITI -** Waferbonding and active passive integration technology and implementation - STREP FP 6 /IST - **design and 3D simulation of microring resonator, all-optical wavelength converters, multifunctional devices.**