

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/ Faculty Department	Micro and Nano-Photonics Laboratory
Contact person	Dr. Cristian Kusko
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Short description of Laboratory/ Faculty Department involved

Mission: Research, development and education in micro and nanophotonics

Research domains:

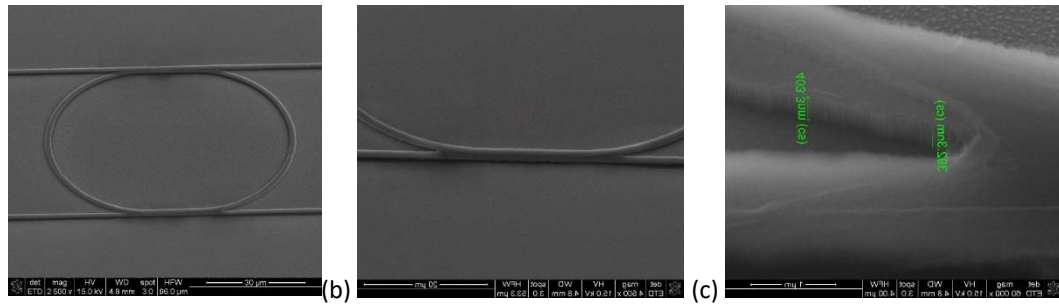
- **Modelling, simulation and CAD of micro and nano-photonic structures** (optoelectronic devices and photonic integrated circuits; plasmonics; OMEMS).
- **Optical and electrical characterization of materials and devices**
- **New materials for micro-nanophotonics** (hybrid nano-composites with controlled 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-Chip "*Developing the integrated quantum photonics platform*" where the use of optical integrated circuits was investigated for applications in quantum technologies such as quantum keys distribution systems; (iii) STREP FP 6 - priority 2, IST Waferbonding and Active Passive Integration Technology and Implementation (WAPITI) where waferbonding was used for the realization of optical microcircuits integrating passive photonic / active optoelectronic and active photonic driven building blocks for novel functionalities and microsystems such as: ring resonators, compact bus integrated ring WDM-lasers, high efficiency all-optical wavelength converters.

Optical integrated components and circuits based on waveguides realized from silicon nitride were modeled, simulated, designed and fabricated using standard photolithographic techniques .



Scanning electron microscopy images of microring resonator structures fabricated in IMT Bucharest.. (a) top view (b) image of the coupling region; (c) detailed image of the waveguides 45°.

Involved persons. Short CV

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. 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. 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.

Dr. Dana Cristea: PhD in Optoelectronics and Material for Electronics, head of Microphotonics Laboratory; expertise: optoelectronic devices; photonic integrated circuits (PICs)- design, fabrication in monolithic, hybrid or heterogeneous integration techniques, PICs, chemo-bio-sensors with optical read-out (design, processing and characterization); coordinator of more than 25 national and international projects (FP6, FP7, H 2020) in the area of photonic devices and sensors.

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

HORIZON-CL4-2023-DIGITAL-EMERGING-01-40: Quantum Photonic Integrated Circuit technologies (RIA)

Potential contribution.

Design, fabrication and characterization of integrated optical circuits (waveguides, couplers, interferometers, circular resonators) based on silicon nitride with applications in the processing of optical signal at classical and quantum level.

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 .***