PARTNER PRESENTATION AND INTEREST IN HORIZON EUROPE PARTICIPATION

Name of the organisation	**National Institue for R&D in Microtechnologies- IMT Bucharest**
Country	**Romania**
Type of organisation	**Research Organization**
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 **IMT infrastructure IMT-MINAFAB** is a facility for design, simulation, **Mi**cro- **na**no**fab**rication of electronic devices, sensors and systems, nanotechnologies, and Carbon-based nanomaterials). IMT-MINAFAB addresses the whole value chain starting with design and simulation to micro-nanofabrication, microphysical characterization, and reliability tests, with relevance to ICT, Space, Health, Environment and Energy areas.
Laboratory	**Simulation, Modelling and Computer-Aided Design Laboratory**
Contact person	Raluca Müller; Gabriel Moagar Poladian
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Short description of Laboratory involved

The lab is involved in research, development and applications of simulation, modelling and design techniques of micro-electro-mechanical MEMS and microfluidic systems focused to collaborative research projects, education (labs, PhD/MSc/BSc thesis coordination), services (specific design solutions, models, enabling access to hardware and software tools, rapid manufacturing) and consultancy (design/ optimization) in micro-nanobio/info technologies. Moreover, the laboratory is developing techniques for additive manufacturing from micro- to macro scale, micro-sensors and MOEMS and MEMS actuators and investigate new classes of advanced materials with applications in nanodevices (thin films and nanostructures of oxide semiconductor materials). The lab covers the whole production chain from concept development to design, simulation and fabrication.

Main software facilities: ANSYS Multiphysics 2022 R2., COMSOL M 6.1, COVENTOR 2014, Materialise Magics 26.0; Quantum ESPRESSO, SIESTA, FPLO

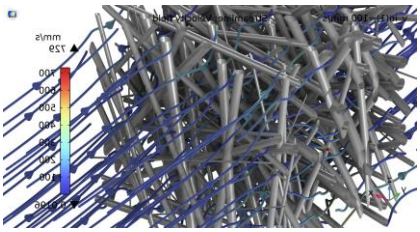
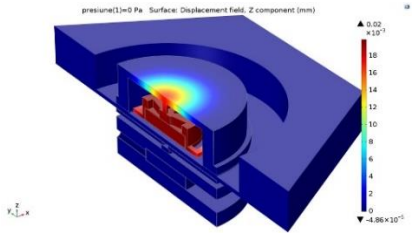
Main computing facility: High Performance Computing cluster consisting of one Windows node with two Intel(R) Xeon(R) E5-2670 v3 processors, 24 cores, 256 GB RAM, and 10 Linux nodes 10 x 2 CPUs Intel(R) Xeon(R) CPU E5-2670 v3, 240 cores, 256 GB RAM/node).

Main technological infrastructure: Formiga P100 Selective Laser Sintering system for polymers (EOS, Germany); MiniMultiLens single photon photopolymerization (stereolithography) system (EnvisionTEC, Germany); High energy ball milling system Emax (Retsch, Germany)

In-House access to: * Silicon-based microtechnology infrastructure for MEMS fabrication (including photomask workshop); * advanced micro-nanocharacterization facilities; * reliability and testing lab; * FDM 3D printers; * inkjet printing system for material deposition; * bioplotter; * general purpose chemistry lab; * computer controlled electrochemical deposition system Autolab; * optical lab; * microwave characterization lab; * electrical characterization systems; * e-beam nanolithography; * graphene deposition; * MBE of A III – B V compounds; * manual wire bonding system

Expertise:

- **Design, simulation and development/optimization of MEMS/MOEMS** devices and components and **microfluidics** (microchannels, mixers, filters, handling and monitoring systems) for biologic, microelectronics, environmental, security and biomedical applications;
- **Modelling and simulation for multiphysics phenomena;** mechanical, thermal, electrical, electromagnetic, piezoelectric, **coupled field analysis** (static and transient); **microfluidic analyses: CFD, diffusion, mixing, electrokinetics, fluid-structure interaction, particle dynamics.**
- **Rapid manufacturing & prototyping**: 3D Printing (Selective Laser Sintering on polymers, single-photon photopolymerization), development of novel additive manufacturing technologies (have 2 international patents in the filed);
- **Design and manufacturing** of MOEMS and MEMS microsystems/actuators and microsensors, microfluidic and micro-electro-fluidic systems, electrical and contact profilometry characterization;
- **Realization of heterostructures** with (ultra)thin layers by advanced technological processes for devices with controlled functionality.
- **Analysis of the physical phenomena at surfaces and interfaces** in metal-oxide-semiconductor heterostructures. **Modeling** their properties for multifunctional devices.


Fluid flow through a fibrous material (H2020) *Displacement map of a pressure sensor (ECSEL-H2020)* *Photo of a torque sensor for automotive (ENIAC)*

Involved persons. Short CV

Dr. Gabriel MOAGĂR-POLADIAN (senior researcher) - PhD in Solid state physics and optoelectronics, Bucharest University, co-founder and coordinator of the Experimental lab of integrated technologies for micro- and nanosystems (additive manufacturing); main area of expertise: additive manufacturing, optoelectronics, sensors (concept development, design, fabrication and evaluation); coordinator of more than 10 international and national projects (ENIAC, H2020, MANUNET) in the area of optoelectronics, sensors and application of additive manufacturing technologies; extensive cooperation with SMEs.

Interested in the calls and **potential contribution**:

- **HORIZON-CL4-2023-RESILIENCE-01-33:** ***Smart sensors for the Electronic Appliances market (RIA)***
  Potential contribution: development of low-cost disposable sensors and of (green) technologies used for fabricating them (e.g., temperature, infrared detection), development of integrated refractometers

- **HORIZON-CL4-2023-HUMAN-01-54:** ***Green and digital skills and training needs for a just transition (CSA)***
  Potential contribution: elaboration of a curricula for training in green digital manufacturing technologies such as additive manufacturing (including micro-nanoscale additive manufacturing)

- **HORIZON-CL4-2023-DIGITAL-EMERGING-01-57:** ***Advanced imaging and sensing technologies (IA)(Photonics Partnership)*****Potential contribution**: development of sensors using light for detection purposes, novel detection schemes, design and development integrated spectrometers and refractometers for bio-medical applications

- **HORIZON-CL4-2023-RESILIENCE-01-42:** ***Boosting generation and diffusion of advanced technologies in SMEs based on a supply chain model (CSA)*** **Potential contribution**: establishing the ways additive manufacturing could be up-taken by SMEs, design of the associated supply chain, assessment of risks, disruption and possible solutions

- **HORIZON-CL4-2023-TWIN-TRANSITION-01-08:** ***Foresight and technology transfer for Manufacturing as a Service (Made in Europe Partnership) (CSA)*** **Potential contribution:** (a) analysis of the best practices for additive manufacturing (including at micro-nanoscale) to advance circularity and sustainability of industrial production in the context of "Manufacturing as a Service" approach; (b) analysis of foreseeable developments and trends in additive manufacturing (including at micro-nanoscale), including the potential advantages and disadvantages; (c) roadmapping for EU industry to transform and anticipate these changes.

- **HORIZON-CL4-2023-TWIN-TRANSITION-01-07:** ***Achieving resiliency in value networks through modelling and Manufacturing as a Service (Made in Europe Partnership) (RIA)*** **Potential contribution:** additive manufacturing service provider for testing the concepts / models / algorithms / practices developed within the project (including participation in a potential test network)

Have you already participated in an EU funded project? If so, provide some references/results (most recent ones).

- **H2020:** *Open innovation test bed for developing safe nano-enabled bio-based materials and polymer bionanocomposites for multifunctional and new advanced applications*, 2021–2024, coordinator ITENE (Spain); IMT project responsible: Dr. Oana Tatiana NEDELCU
- **MANUNET:** *Tool kit for robotics for manufacturing electronic components and Nodes using Digital Fabrication Technologies*, 2021-2023, coordinator Fraunhofer Institute (Germany); IMT project responsible: dr. Gabriel MOAGĂR-POLADIAN;
- **ECSEL-H2020**: *Integrated components for complexity control in affordable electrified cars*, 2015-2018, coordinator Infineon Technologies AG (Germany), IMT project responsible: dr. Gabriel MOAGĂR-POLADIAN
- **ENIAC**: *Nanoelectronics for electric vehicle intelligent failsafe powertrain*, 2011-2014, coordinator Infineon Technologies AG (Germany), IMT project responsible: dr. Gabriel MOAGĂR-POLADIAN

International collaborations - Scientific services contracts:

- **Research Service contract for CEA Saclay, France**: *Design and fabrication of microfluidic chips, consultancey for experimnetal set-ip for microscopy without lenses,* IMT PM: Dr. Oana Tatiana Nedelcu:
- **Services for company City Technology, Portsmouth, UK**: *Development of environmental compensation methods for gas electrochemical sensors*; IMT PM: Dr. Mihai Gologanu
- **Project with industrial partner Garrett Transportation Inc., USA**: *Experimental and modelling support for gas sensors based on solid electrolytes*; IMT PM: Viorel Avramescu, Dr. Mihai Gologanu