



PARTNER PRESENTATION AND INTEREST IN HORIZON EUROPE PARTICIPATION

Name of the organization	The National Institute for Research and Development in Microtechnologies (IMT)
Country	Romania
Type of organization	Research Institute
Short description	<p>IMT Bucharest is a non-budgetary public research unit, established in 1993 and supervised by the Romanian Ministry of Research, Innovation, and Digitalization since 1996 when it became the sole national institute in the micro/nanotechnologies domain in Romania. The institute is based on a strong experience in the field of device and integrated circuit manufacturing (former Platforma Baneasa - Microelectronica SA) and research in the field (Institute of Semiconductors Electronics (ICCE))</p> <p>Since 2004, there has been a period of strong investments and openness towards European cooperation in R&DI, being an internationally competitive organization, IMT has been involved in world-class research in the fields of micro- and nanoelectronic components, and systems, including smart sensors, micro-, and nanotechnology for societal applications, integrated devices, systems and platforms, and CAD of electromechanical microstructures. In terms of integrated systems, IMT has also seen success in implementing neural interfaces, Wi-Fi communication, and biocompatible materials.</p> <p>IMT employs 200 people with differing expertise in the fields of electronics, computer science, physics, chemistry, and biology. The institute is structured in 4 R&D centers, grouping 11 laboratories specialized in the following areas: Microsystems for biomedical and environmental applications; Nanobiotechnology; Molecular nanotechnology; Micro-nano photonics; Micromachined structures, microwave circuits, and devices; Societal technologies, Simulation, modeling, micro-and nano-fluidics; Reliability. More info at www.imt.ro.</p>
Laboratory/ Faculty Department	Research Centre for Integration of Technologies (CINTECH) – Ambiental Technologies Laboratory
Contact person	Ileana Cernica
Phone	+40723666939
E-mail	ileana.cernica@imt.ro

Short description of Laboratory/ Faculty Department involved

The Ambiental Technologies Laboratory (Head Dr. Ileana Cernica), has been working for over 25 years with the aim of monitoring environmental conditions and increasing individual and societal security and upgrading traditional industries in order to make them more efficient. In recent years, the Laboratory's activity has diversified with applications in the aerospace field (e.g., ESA, ROSA projects) and the hardness part for AI projects. Specific is the increased number of projects with completion in TRL greater than TRL 5 and collaboration with SMEs (up to technology transfer).

Our activity is focused on: (a) RDI for new micro/nanosensor technologies for societal, security, and environmental applications (Technological design, technological development up to prototype level) including the IoT part/ RDI for applications in space and security – special operating conditions and reliability (Technological design, technological development up to prototype level)/ RDI of new nanostructured materials (Synthesis of new materials; Development of devices/structures based on new materials) for applications in traditional industries and agriculture; (b) **Technological and characterization services:** Technological assistance and consultancy (design of technological flows, control gates, etc.)/ Analyze technological compatibilities and defects, on the technological flow/Technological assistance when moving from prototype to zero series (technology transfer)/Development of individual technological processes.

Expertise.

Our expertise involves Research-Development-Innovation Competences: Advanced technologies for making solar cells (including for space applications); Surface and volume microprocessing technologies; Integration technologies of signal electronics with sensors; Micro/nano sensor technologies (including sensor arrays); Technologies for optical elements (microlens arrays, thin lenses, thin mirrors); Technologies for advanced nanocomposite materials with antibacterial,

antifungal properties with applications in civil construction, agriculture, and health; Technologies for optical alignment systems with operation in special working conditions (e.g.: applications in space).

Services Characterization and Technological Processes Competences: Microsystem electrical characterization; Individual technological processes & technological flows design; Realization of test benches and signal electronics; IoT enabling technologies.

Contact person Short CV

Dr. Ileana Cernica, MSC Electronics Engineering, Ph.D. in microelectronics from POLITEHNICA University Bucharest, Senior Researcher (cat. A), Associate Professor at POLITEHNICA University, Electronic, IT and Tc Engineering Faculty, head of Laboratory for Ambiental Technologies and former head of Technologies Integration Dpt. She has a strong background in the industry (at Microelectronica company as an industrial researcher and technological integration engineer in CMOS IC chips). She has a strong experience in MST and advanced materials (nanomaterials included) and sensors/sensors array. Also, she has expertise in technological transfer (as Manager of the Technological Transfer Center for Microengineering Bucharest). Her scientific activity consists of more than 100 papers in journals/conferences, 16 patents (some of them awarded with medals at the International Conference of Innovation at Geneva, Nuremberg, Bruxelles), and 3 books as author/co-author. She was/is involved in 7 international projects (to be mentioned ESA PROBA 3 Mission in development), 38 national RDI projects as Project Manager/IMT responsible (she graduated courses as Project Manager and Manager of Innovation and a Master in Management from Economic Science Academy, Bucharest).

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

HORIZON-MISS-2023-SOIL-01-04: Innovations to prevent and combat desertification; HORIZON-MISS-2023-SOIL-01-03: Onsite digital technologies to monitor in soil nutritional compounds of food and possible applications for food safety and HORIZON-MISS-2023-SOIL-01-05: Soil-friendly practices in horticulture including alternatives to peat

IMT will use its team experience in nano materials, advanced nanocomposite materials with antibacterial and antifungal properties, new materials and technologies for advanced fertilizers and technological solutions in fighting against soil desertification, soil nutritional compounds monitoring and development of soil -friendly practices in horticulture.

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

SMART IMMERSIVE CLOUD-EDGE CBRN-E CRISIS TOOL FOR FIRST RESPONDERS, SIROCCO TRL 2-TRL 7

Project proposed in Call: HORIZON-CL3-2022-DRS-01,(Disaster-Resilient Society 2022), Topic: HORIZON-CL3-2022-DRS-01-08, Type of Action: HORIZON-IA

SIROCCO will provide EU first responders with a unique, global, end-to-end crisis decision support suite to solve real problems in the increasing complexity required for the management of CBRN-E events, be they either accidental or terrorist in nature. SIROCCO is a multidisciplinary project engaging 19 partners from 9 countries (including South Korea) including IMT Bucharest (with a core team from Ambiental Technologies Laboratory).

In a nutshell, the main SIROCCO innovation items are:

- (1) a new generation of virtual, immersive crisis center relying on real-time decision support accommodating multiple customizable control rooms in which the decision can be made by various types of first responders (and stakeholders);
- (2) a new collection of CBRN-E specific AI tools of various types (collaborative/aggregated decision support, abnormality detection on data streams, open databases, models for unmanned vehicles deployment, models for victim triage, and for toxic substances propagation);
- (3) new wearable sensors and sensing solutions integrated with legacy sensors and embedded into multiple aerial/ground unmanned vehicles;
- (4) new studies on the human reactions and interactions with IT tools in crisis situations;
- (5) a novel open ICT backbone for resilient and secure cloud-edge AI computing and communication in case of CBRN-E events;
- (6) new wearable solutions for in-situ first responders guidance and protection.

PROBA 3 Coronagraph System/ ESA Space Mission/ ESA FQ/3-13899/13/NL/GLC

Prime contractor: Centre Spatial de Liege; Subcontractor for OPSE" Occulter Position Sensor EmittersHeaders", TRL 2-TRL 9 (space mission)

The PROBA 3 mission aims to create two satellites that fly in formation for the space study of the solar corona. The first is equipped with a shutter of the solar corona. The second satellite carries a telescope studying the solar corona. To be able to do the study, the formation flight of the two satellites must be synchronized so that the telescope can only "see" the crown and not the sun. An essential element of the alignment are the 3 Occulter Position Sensor Emitter (OPSE) systems developed by the IMT-Bucharest PARTNER. The process begins with an optimized redesign. Then there are the

DM, STM, EM, QEM models, and ultimately the Flying Model. This was the first device of its kind, and it was made in Romania.

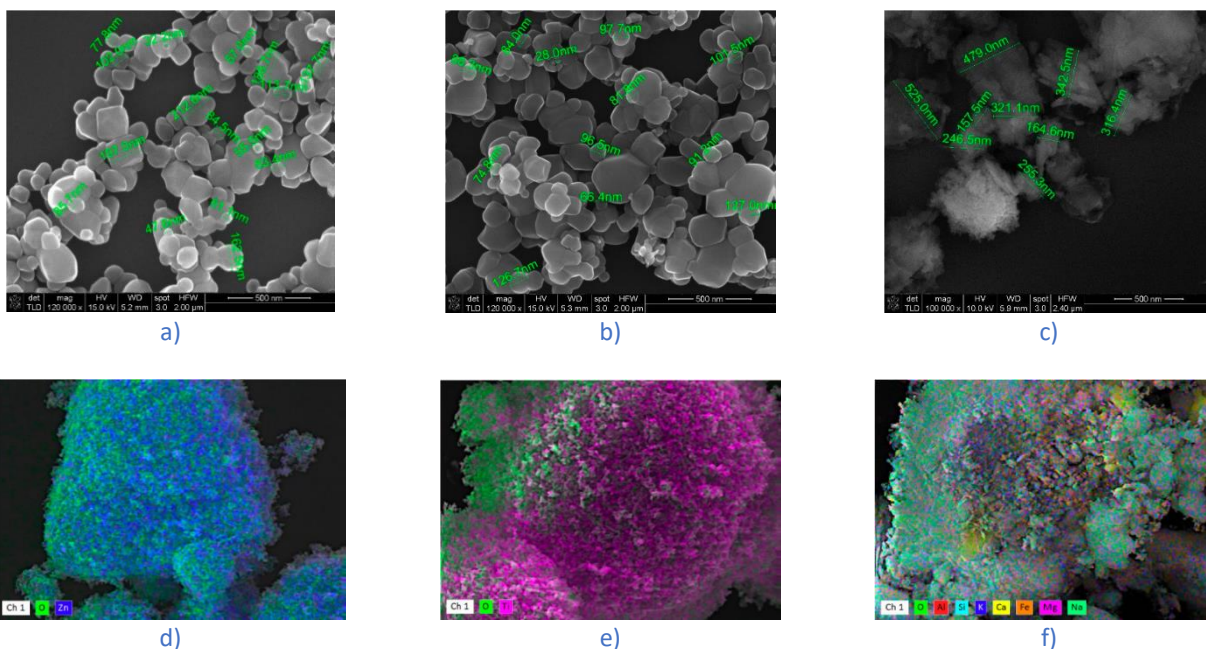
DEMONSTRATION VALIDATION – The PROBA 3 Mission will be launched in the 3/2023 quarter of the French Guyana polygon.

Adaptive mobile mixing and dispersing system using nanoparticles into innovative colloidal solutions for chemical, biological and radiological agents' mitigation/**NANODEC, PN-III-P2-2.1-PED- 2020-2022 TRL 2-TRL4**

It is a national project that aims to obtain a new innovative colloidal solution, based on an organic decontamination matrix combined with several types of nanoparticles and a new adaptive system for dispersing the prepared solution.

RESULTS:

- Organic decontamination solution as a dispersive medium for adsorbents for nanoparticles, Fig. 1. The concentrations of ZnO, TiO₂ anatase, and zeolite were (wt. %) – 0.1; 0.5; 1; 2 zinc oxide, titanium dioxide, and zeolites;
- The testing and evaluation of the decontamination efficiency for two chemical agents (toxic mustard gas/HD and soman/GD) and a biological agent (Bacillus anthracis), Fig. 2, was carried out on the specific equipment and procedures by the project partners – CCIACBRNE /P1 and TM/P2.



SEM images and EDX mapping of nanoparticle clusters: (a,b) ZnO, (c,d) TiO₂, and (e,f) zeolites/Z

High efficiency microtextured photovoltaic cell system integrated in the wing of an unmanned aircraft (UAV) with applications in social security – UAVPHOTO, TRL 2-TRL 6 (flying prototype)/ TGE-PLAT 77.7D 2020-2021



The UAV is adapted for data collection from sensors and satellites and benchmarking for streamlined monitoring in agriculture or CBRN surveillance. Highly efficient micro-structured solar cells can also be used in space applications. Two samples made of the same material as the prototype was made and covered with photovoltaic cells, for testing using the small-size equipment from IMT-Bucharest. Based on the regulations used for UAVs, they were mechano-climatically tested (vibrations, repeated bends, temperatures +/-). The results showed that the technology used to make them meets the requirements of using the prototype made for UAVs. The prototype allows the increase of the flight autonomy by approximately 20 minutes, the increase depending on the meteorological conditions. The initial autonomy of the model is 180 minutes.