

# An excellence centre...

...within an institute of micro- and nanotechnologies in Bucharest, Romania...

**I**MT-Bucharest (National Institute for Research and Development in Microtechnologies, [www.imt.ro](http://www.imt.ro)) was the first R&D organisation in this field to be set up (1993) in Eastern Europe. In 2004–2008, IMT is active in about 20 European projects. At the national level, IMT is the co-ordinator of a few technological networks, and a science and technology park in micro- and nanotechnologies, MINATECH-RO ([www.minatech.ro](http://www.minatech.ro)).

IMT is developing an existing centre of Radio Frequency (RF) and Optical-MEMS into a 'European Centre of Excellence in Microwave, Millimetre Wave and Optical Devices, based on Micro-Electro-Mechanical Systems for Advanced Communication Systems and Sensors' (MIMOMEMS), according to a project financed (2008–2010) through the Regional Potential part (REGPOT call 2007-1) of the European Framework Programme (FP7).

The overall aim of the MIMOMEMS project is to bring the research activity in Radio Frequency (RF) and Optical-MEMS at the National Institute for R&D in Microtechnologies (IMT-Bucharest) to the highest European level and create a European Centre of Excellence in Microwave, Millimetre Wave and Optical Devices, based on Micro-Electro-Mechanical Systems (MEMS) for Advanced Communication Systems and Sensors.

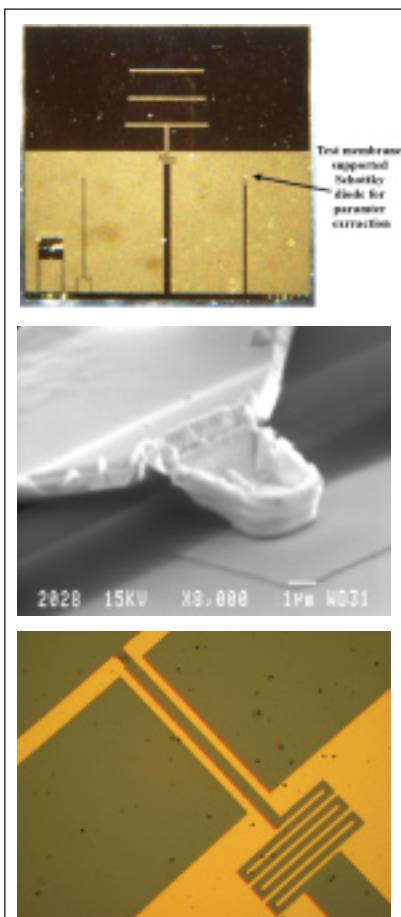
The main concept of MIMOMEMS is to develop a European Centre of Excellence in RF and Optical-MEMS by increasing the competitiveness of our research in the most advanced topics of microsystems technology. Consequently, we have selected new niche research topics from the areas of RF-MEMS and Optical-MEMS, taking into account the latest trends in microsystems technology and priorities for long-term

research that have been identified by the two EU technology platforms, ENIAC, Photonics21, and EPOSS, and included in FP7 ICT Work Programme.

Two IMT laboratories, for RF-MEMS and Microphotonics, respectively, already active in previous European programmes, have joined their efforts to achieve this centre of excellence. The research activities of IMT's two laboratories have been developed in the last years through strong co-operation with many European partners. The most important research partnerships are with FORTH-IESL-MRG (Greece), LAAS-CNRS in Toulouse (France), Tor Vergata University Rome (Italy), VTT Helsinki (Finland), ITC Trento (Italy), TU Darmstadt (Germany), University of Athens (Greece), Cambridge University (the UK), Fraunhofer Institute for Telecommunications-Heinrich-Hertz Institute, Berlin (Germany), and IMT-FZK Karlsruhe (Germany). These co-operations have been developed in the context of EC founded projects and bilateral agreements for working on circuit manufacturing in technological labs, and characterising millimetre wave and photonic circuits.

The Laboratory of RF-MEMS has co-ordinated 'Micromachined Circuits for Microwave and Millimetre Wave Applications' (MEMSWAVE, 1998–2001, FP4-INCO). In 2002, MEMSWAVE was nominated among the top 10 European projects for the Descartes Prize (the best European co-operative research project). This laboratory was a key partner in the FP6 network of excellence 'Advanced MEMS for RF and Millimetre Wave Communications' (AMICOM, 2004–2007), and is also involved in the recently approved FP7 STREP 'MEMS 4 MMIC' (2008–2011), ICT-2007-2. The Laboratory of Microphotonics (Dr Dana Cristea, [dana.cristea@imt.ro](mailto:dana.cristea@imt.ro))

was also participating in several FP6 projects: the network of excellence 4M (Multi-Material Micro Manufacture: Technologies and Applications); NoE, FP6-NMP; WAPITI, STREP, 2004–2007, FP6-IST; ASSEMIC, Marie Curie Network, (FP6-Mobility), and it is now involved in the FP 7 Integrated Project FlexPAET (2008–2010), NMP-2007-1.



**Fig. 1:** Circuits are developed for advanced communication systems in the millimetre wave range. 60GHz receiver structure based on a membrane supported Yagi-Uda antenna monolithic integrated with a substrateless Schottky diode regions – common work of IMT (design, modelling, technological processes), FORTH Heraklion (processing) and LAAS/CNRS Toulouse (measurements) in the frame of FP6 NoE – AMICOM (the structure and details of the Schottky diode region)



Fig. 2: Dr Alexandru Müller (IMT, Bucharest ) and Dr Tauno Vähä-Heikilä (VTT, Helsinki), testing the 60GHz receiver, used in the first millimetre wave identification (MMID) tag developed in Europe.

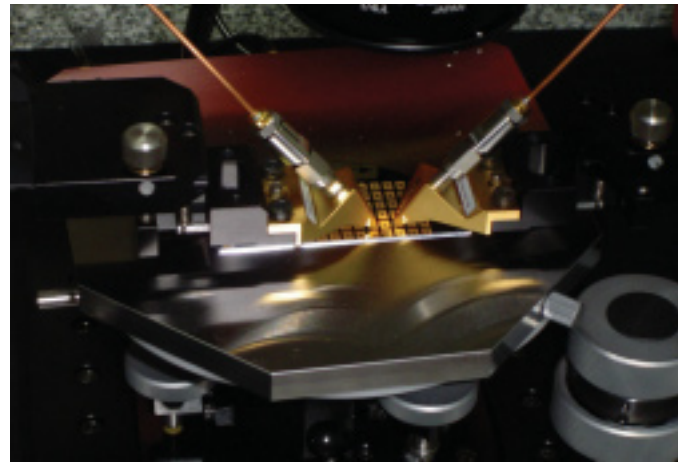
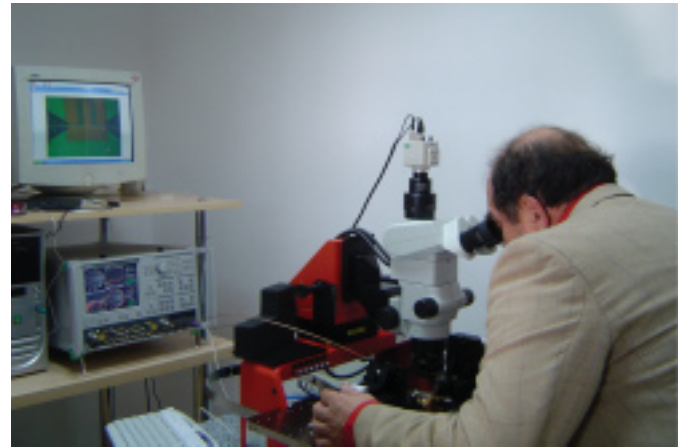


Fig. 4: The new 'on wafer' microwave measurement equipment to 65GHz purchased by IMT-Bucharest in 2007 in the frame of the National Programme CEEEX (Module 4). The corresponding MICROLAB will also provide services for companies

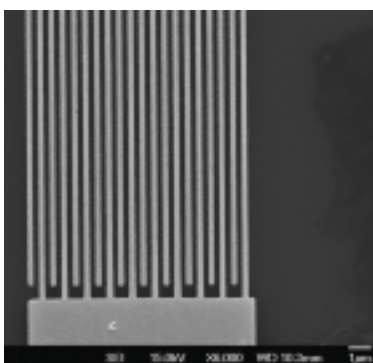
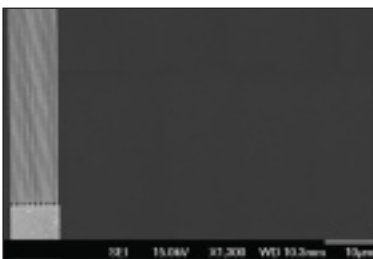


Fig. 3: New experimental AlN SAW structure for GHz applications manufactured and measured at IMT-Bucharest. Fingers and pitches with a width of 250nm have been obtained with the newly purchased nanolithographic equipment (Vega-SEM and Elphy Plus EBL). Envisaged applications in the new generation of mobile phones

The main objectives of the MIMOMES project are described below:

- Exchange of know-how and experience – this activity will be done by joining two research centres: LAAS-CNRS in Toulouse, France, and FORTH-IESL-MRG in Heraklion, Greece;
- Recruitment of experienced researchers – will allow IMT to hire postdoctoral researchers with expertise in nanophotonics and microwave millimetre wave devices, and MEMS for advanced communication systems and sensors. The researchers will be initially hired for 24 month fellowships. At the end of the period, the researchers have the option to become full-time IMT employees;

Acquisition, development or upgrading of research equipment – will provide IMT with a Scanning Near field Optical Microscope (SNOM) and an upgrade to 110GHz of the existing 65GHz set-up for 'on wafer' millimetre wave characterisation;

Organisation of workshops and conferences – will support knowledge

transfer at national and international levels through organisation of scientific international sessions and seminars; while

Dissemination and promotional activities – will consist in the publication of research results in peer reviewed journals and presentations at international conferences.



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