

National Institute for Research and Development in Microtechnologies (IMT-Bucharest)

The National Institute for R&D in Microtechnologies (the first with this profile in Eastern Europe) is the main actor in microtechnologies in Romania (with microsystems promoted by national programmes since 1993, also including nanotechnologies since 2000). The back-bone of IMT is provided by three centres of excellence: in RF MEMS, in microoptoelectronics and microphotonics and in nanotechnology: their activity is briefly presented below. The excellence at European standards is proved nomination for the Descartes Prize 2002 of MEMSWAVE (this is a European project in IT, coordinated by IMT-Bucharest, the only one with partners from associate countries). IMT has an up-to-date electronic communication infrastructure and has experience in international cooperation. To enhance its capabilities, IMT is promoting both a "horizontal integration" (multidisciplinary research in consortia), and "vertical integration", by grouping in the "Centre of Microfabrication" (to be developed as a technological park) activities from training to production. This institute is the promoter and the main actor of a number of pilot activities, developed for the first time in Romania using the European model, such as: scientific networks, centres of services, virtual centres of excellence. Further details are available on www.int.ro.

General Manager: Prof. Dan Dascalu (dascalu@imt.ro)

MICROMACHINED STRUCTURES, MICROWAVE CIRCUITS AND DEVICES LABORATORY

Center of Excellence in RF MEMS in the National Matnantech Programme

Coordinator: Dr A Müller - IMT-Bucharest (alexm@imt.ro); <http://www.int.ro>

Mission:

- 1 to develop a new design approach for micromachined millimeter wave circuits, using high performance electromagnetic 3D software simulations and enhanced circuit modeling
- 1 to develop novel micromachining technologies for millimeter and submillimeter wave circuits manufacturing
- 1 to develop new type of membranes as support for millimeter wave circuits
- 1 to organize workshops and conferences
- 1 to organize training by research of master and Ph.D. students.

Expertise in:

Advanced modelling and simulation of micromachined millimeter wave circuits (inductors, filters, antennae, receivers);

Manufacturing of micromachined circuits for millimeter wave applications based on silicon micromachining;

Manufacturing of micromachined circuits for millimeter wave applications based on GaAs micromachining.

Main partners:

- 1 FORTH Heraklion, Greece,
- 1 LAAS Toulouse, France
- 1 ITC Trento, Italy,
- 1 CNR Rome, Italy,
- 1 HAS Budapest, Hungary
- 1 IRCOM Limoges, France
- 1 Univ. Tor-Vergata, Rome

Facilities

- v IED and Fidelity software for circuit design and modelling
- v LEDIT and CADENCE software for mask manufacturing
- v Mask manufacturing shop
- v Technological facilities for non-standard processes

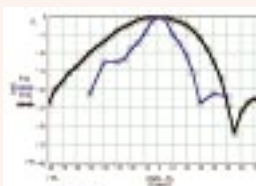
RESULTS

Silicon based micromachined receiver module and GaAs membrane supported millimeter wave receiver module in the frame of the MEMSWAVE project 1998-2001.

The Project was nominated in 2002 between the 10 finalists of the DESCARTES Prize 2002



38GHz GaAs membrane supported receiver module and detail of the monolithically integrated Schottky diode region (design: IMT-Bucharest; manufacturing: FORTH Heraklion together with IMT-Bucharest; microwave measurements CNR-Rome, Univ. Rome, IMT-Bucharest)

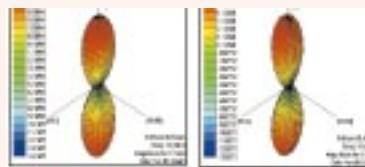


Radiation pattern for the 38 GHz hybrid micromachined receiver module - simulation (IMT-Bucharest) and measurements (CNR-Rome, IMT-Bucharest)



77 GHz hybrid receiver based on silicon micromachining (design: IMT-Bucharest; manufacturing: ITC-Trento)

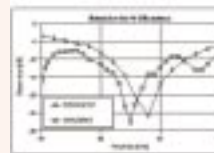
Micromachined filters and antennae for 77GHz and 94 GHz manufactured in the frame of the IMPACT Project (FP 5) coordinated by LAAS Toulouse



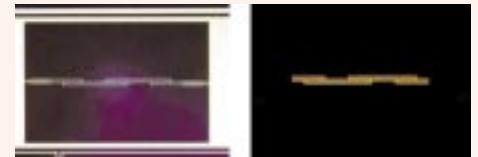
Simulated radiation pattern for the 77 and 94 GHz membrane supported antennae (IMT-Bucharest)



White light interferometric analysis (Uppsala Univ.) of the 94 GHz membrane supported antenna designed at IMT-Bucharest and manufactured at LAAS Toulouse



S11 parameter of the 94 GHz antenna comparison between simulations (IMT-Bucharest) and measurements (IRCOM Limoges)



Top and bottom view of the 77 GHz membrane supported filters (design: IMT-Bucharest; manufacturing: LAAS Toulouse)

Future plans in the frame of FP6

- 1 Participation in the Network of Excellence (AMICON - "Advanced MEMS for RF and Millimeter Wave Communications"), coordinated by LAAS Toulouse.
- 1 Participation in a FET proposal ("Micromachined Transmitter-Receiver Modules for THz Environmental Monitors"), coordinated by FORTH-IESL Heraklion.

The team is open in another proposals for FP6.

Main Publications (2000-2002):

- 1 Polyimide based GaAs micromachined millimeter wave structures, J. of Micromech. and Microeng. (JMM) 10(2000), pp.130-135.
- 1 Resistive pressure sensing structures on polyimide membranes on GaAs substrate, JMM 10(2000), pp. 218-222.
- 1 Micromachined filters for 38 and 77 GHz supported on thin membranes", JMM 11(2001) pp 1-5
- 1 Micromachined Microwave Devices and Circuits, Ed. Academiei Romane, 2002, ISBN 973-27-0908-1, editors: D.Dascalu, H.Hartnagel, R.Plana, A.Müller.