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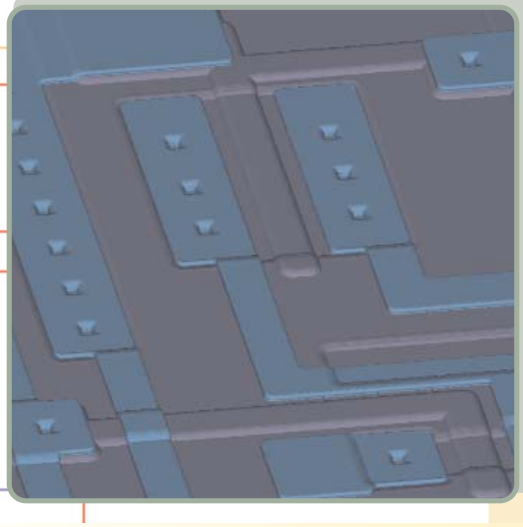
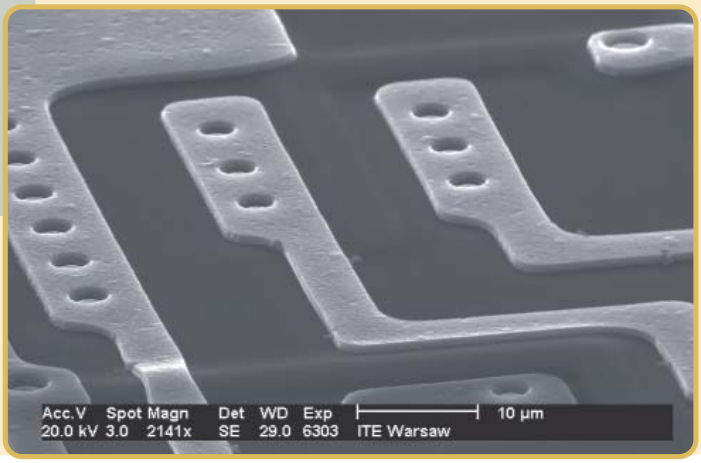
Topics in this issue:





Emulation of the ITE CMOS fabrication process *(left)* **and SEM image of the structure** *(right)*

Results obtained by Division of Silicon Microsystem and Nanostructure Technology, ITE, Warsaw, Poland

The process emulation approach at ITE uses 3D numerical simulation to produce highly accurate models of the effects of chemical reactions involved in fabrication.

More details on page 4.

Edited by:
National Institute for Research and Development in Microtechnologies
(IMT-Bucharest, www.imt.ro)
Ministry of Education and Research, Romania

Previous issues on web*: www.imt.ro/mnt*

Design for Micro & Nano Manufacture (DfMM) News

Coordinator:University of Lancaster (UK), Dr. A Richardson
(A.Richardson@Lancaster.ac.uk) **web page: http://www.patent-dfmm.org**

The NoE Patent-DfMM aims to establish a collaborative team to provide European industry with support in the field of "design for micro nano manufacture" to ensure that problems affecting the manufacture and reliability of products based on micro nano technologies (MNT) can be addressed before prototype and pre-production.

Presentations from DfMM-Micro&Nano Systems event

1-4 Oct 2007, Lancaster, UK

A "Big event" for "Small Systems" was the headline that appeared in the press release from UK journalists covering this event. In the context of the events diary across the globe, 84 delegates can hardly justify labelling this event as "Big" but for the delegates this was indeed a highly significant meeting as it formed the main showcase for the technical work carried out within the FP6 Network of Excellence in Design for Micro & Nano Manufacture (PATENT-DfMM).

This 3 day conference aimed to pull together the technical research work initiated by the PATENT-DfMM project. This included work fully supported by the project and activities stimulated by the NoE through both partial funding, feasibility projects and mobility.

The presentations delivered were clearly rich in terms of engineering research outputs associated with new concepts for embedded test and packaging technologies, reliability engineering and demonstrator focused activities. The majority of the presentations provided the audience with examples of how collaboration between conventionally isolated disciplines could deliver major benefits. Specific examples here where evident around new application focused work that have been launched by the NoE in the fields of Health and Usage Monitoring (HUMS) and Micro Electro Fluidics (MEF). In the case of HUMS, embedded test experts, sensor engineers and packaging specialists have come together to drive forward concepts around miniaturised devices able to monitor and test higher level systems. In the case of MEF, fluidic modellers, test engineers and system-on-chip designers have collaborated to deliver concepts around chip based digital fluidics that feature active devices operating across the electronics to Biology interface.

Presentations that the organisers have been given permission to distribute are available from the following web: **http://www.patent-dfmm.org/site/events/lancaster.htm**.
Contact: **Patric Salomon**, 4M2C/enablingMNT, Germany,
E-Mail: **patric.salomon@4m2c.com**

DfMM Service Cluster Update

Over the past 18 months the PATENT-DfMM NoE has been assessing the potential of six key areas of activity for commercial roll out. The final selection meeting took place in September 2007 and provided a mandate and budget for the development for the following two clusters:

Health and Usage Monitoring Microsystems (µHUMS)

A technical cluster led by the Institute for System Level Integration, Scotland, UK offering:

- Feasibility studies on embedded µHUMS solutions/systems where diagnostics, prognostics or condition monitoring are required.
- Access to extensive information databases and consultancy on methods to achieve on-line test, fault tolerance and diagnostic capabilities.
- Design services for µHUMS sensors using silicon and non-silicon based micro technology and both electrical stimulus generation and response processing.
- Prototyping facilities based on silicon, ceramic or flexible substrates as well board based solutions.

The cluster involves Heriot-Watt University, Lancaster University, Budapest University of Technology and Economics, and BCF Designs.

European Microsystems Reliability Service Cluster (EUMIREL)

A cluster of experts offering consultancy, training and reliability analysis services led by four key service hubs IMEC, IMT Bucharest, Polytechnic of Milan and Fraunhofer IMS, supported by 4M2C in marketing and coordination. Eumirel is offering the following services:

- Consultancy: Design for Reliability, Physics of failure, Test structures, FMEA studies, Reliability test strategies.
- Training: Failure Analysis techniques, Accelerated Life Testing, Reliability Assessment, Failure Modes and Physics of Failure.
- Reliability analysis: Accelerated Reliability Test, Qualitative Life Testing, Functional Test, Failure Analysis, Test Structure Design.

The cluster offers access to a wide range of equipment and facilities together with a database for matching the needs of clients to specific capabilities within partner facilities. In addition to the lead partners mentioned above, the team includes CSL Liege, Warsaw University Technology, Budapest University of Technology and Heriot-Watt University plus key industrial reliability service providers.

Contact: **services@patent-dfmm.org**

MINAM established industrial management board and starts new services

Following the establishment of their Industrial Management Board, the ***European Technology Platform for Micro- and Nanomanufacturing*** **(MINAM)** announce its official launch event to be held in January 2008. At MINAM more than 400 stakeholders today are contributing to orient the R&D excellence in Europe towards a fast transfer of results into industrial production technologies and applications. The secretariats are hosted by Fraunhofer IPA, VDMA and euspen. The platform is supported by the European Commission, its projects **µSapient, IPMMAN, 4M** and is linked to the umbrella of Manufuture **www.manufuture.org** . MINAM is an open community, established around research, industry and European funding programmes. *The goal is to speed up the successful implementation of new technologies, encourage the coordination of industrially focused R&D and the fast transfer from laboratory to industry in a socially acceptable manner.*

The official launch event will take place on Jan 23, 2008 in Brussels, Belgium, with high-level representatives from European Commission, industry and academia. On Jan 24, 2008, a brokerage event will offer partner search, technology information, and proposal assistance to all Micro-and Nano-stakeholders. Details on **www.minamwebportal.eu**.

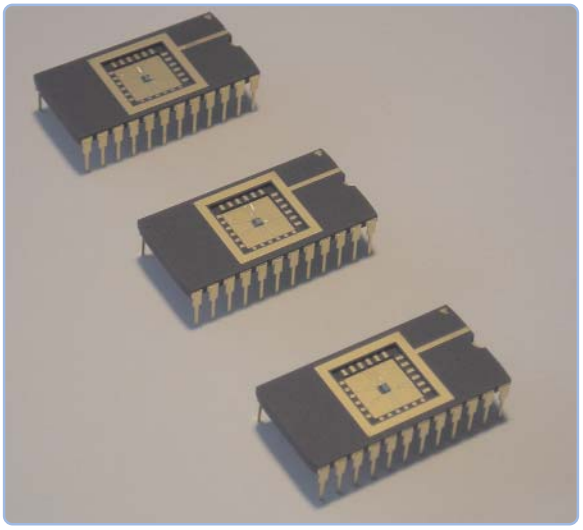
The publication of this page is supported by the *network of excellence PATENT - DfMM*

Cooperation between ON Semiconductor and the Slovak University of Technology

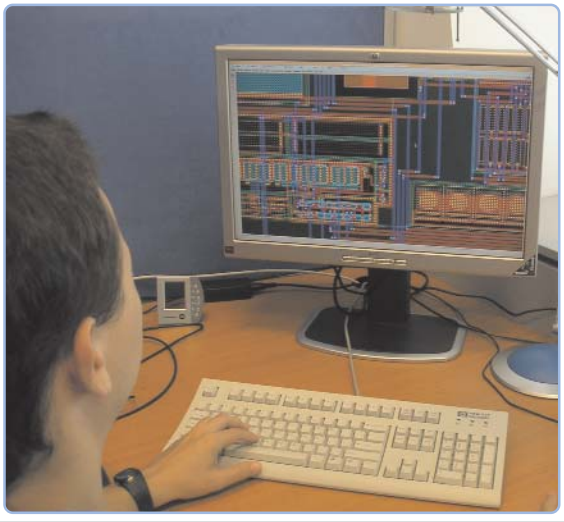
Department of Microelectronics, Slovak University of Technology, Bratislava, Slovakia
http://ec.elf.stuba.sk

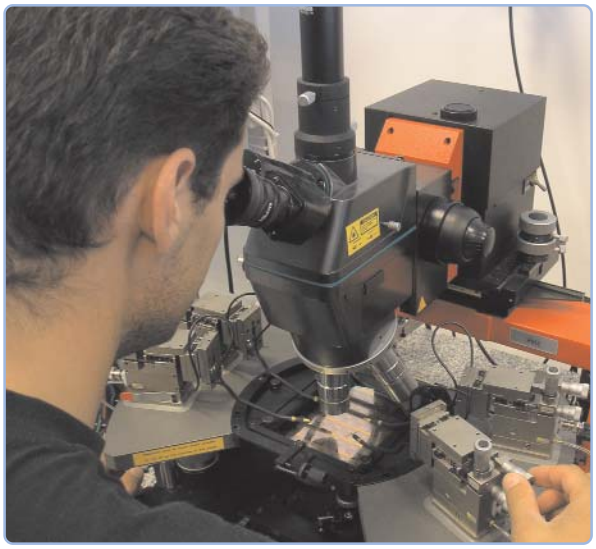
The Bratislava Development Center was established in September 2006. The Center develops integrated circuits for use in end products such as portable consumer electronics, gaming devices, and digital TVs.

The ***Bratislava Development Center of the ON Semiconductor Corporation*** very recently celebrated the 1st year from its foundation. The Bratislava Development Center ***(BDC)*** focuses on developing power management integrated circuit products. Currently the center has a staff of more than 20 engineers, most of them coming from the ***Department of Microelectronics of the Slovak University of Technology (STU)***, Bratislava, Slovakia with which ON Semiconductor has a longstanding cooperation.



The cooperation between ON Semiconductor and the Slovak University of Technology started through a program called ON Semiconductor Microelectronics Center at the Slovak University of Technology (ONMiST). ONMiST successfully worked with professors and students on longer-term projects in the fields of design, characterization and technology modeling. ***Professor Daniel Donoval,*** Head of the ***Department of Microelectronics***, has been the principal project advisor at the Slovak University of Technology. More than two dozen students have participated in the program working on student projects under the supervision of ON Semiconductor engineers. Most of these students got employed by the company after their graduation from the University. The ONMiST program also established a good environment for cooperation between the University and other ON Semiconductor sites, especially those within the region of Central Europe, particularly in the field of analysis of semiconductor devices and interpretation of results obtained on tools available at the University.





ON Semiconductor has a strong presence in Central Europe. In addition to the Bratislava Development Center, the company owns and operates a wafer fabrication facility, and a customer service and logistics center in Piestany, Slovakia. It also operates another silicon production facility, a wafer fabrication plant, and a product development center in Roznov pod Radhostem, Czech Republic.

Visit ON Semiconductor wafer fabrication plants and new product development centers in Europe:
http://www.onsemi.com/PowerSolutions/content.do?id=1074

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Design, modeling and simulations of the micro and nanostructures MEMS/MOEMS

Institute of Electron Technology, Warsaw, Poland
Division of Silicon Microsystem and Nanostructure Technology

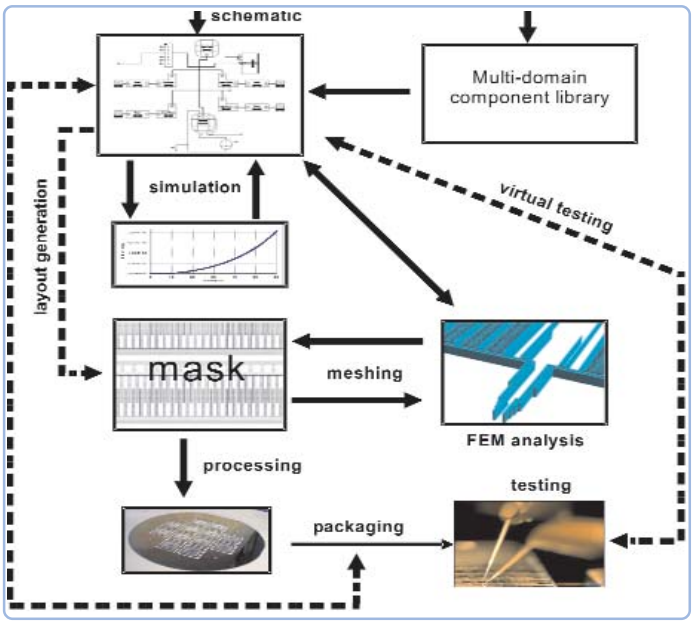

Fig.1 Flow chart describing modern MEMS design, modeling and analysis.

Modern methodology of MEMS design being extensively used at ITE is based on a system-level, top-down MEMS design process. The objectives of this method are to optimize the function of the devices and to minimize development time and cost by avoiding unnecessary design cycles and foundry runs (Fig.1).

Behavioural modelling of MEMS structures.
Instead of using a layout-drawing tool to create a 2D model, high-level design techniques use a graphical schematic capture tool to position and connect the model symbols that represent functional blocks (masses, plates, electrodes or micro fluidic parts) with underlying analytical formula.

Advanced techniques for MEMS/MOEMS/CMOS modeling. Very important issue is a possibility of simultaneously co-simulation of MEMS and IC unit. For MEMS structures integrated with integrated circuit controls the unit idea of Hardware-In-The-Loop basing on co-simulation using signal flow simulators is particularly promising. The goal is to verify whether the hardware and control algorithms work together without failure. In ITE we are using for co-simulation Architect module from CoventorWare and Simulink.

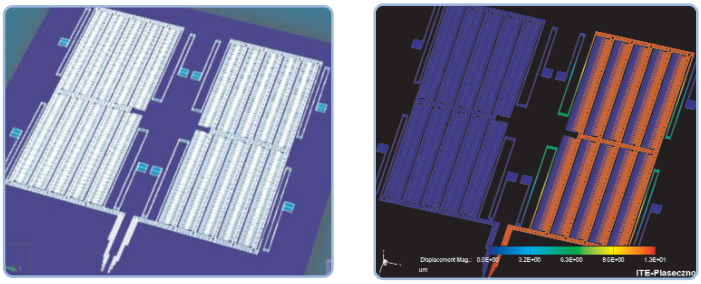

Fig.2 3D-model of silicon microgripper with comb-drive and simulation results.

Finite Element Method for MEMS/MOEMS modeling and simulation.
Analyzer (module of CoventorWare) allows to use FEM analysis for multi domain simulation (electrical, mechanical, thermal, electrostatic, piezoresistance, microfluidic etc. and it's combination e.g. thermo-mechanical) of the micro and nanostructures. Example based on electrostatic driven microgripper with comb-drive modelling shown on Fig. 2.

Virtual manufacturing of MEMS structures.

Designers developing MEMS and other IC devices quickly and cost effectively need detailed 3D models to help visualize each step of the fabrication process. Visualization allows designers to see what happens during material deposition and etching and catch errors before building an actual mask or prototype.

The process emulation approach at ITE uses 3D numerical simulation to produce highly accurate models of the effects of chemical reactions involved in fabrication. SEMulator3D-Memulator/Etch3D™ environment uses voxel (3D-pixel) algorithms to furnish the accuracy of physical process simulation and the speed and capacity of process emulation techniques (PECVD, LPCVD, deposition, etch wet, anisotropic, KOH/TMAH, CMP, oxidation, diffusion etc…).

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Division of Silicon Microsystem and Nanostructure Technology, ITE, Warsaw, Poland.
Web page: http://www.ite.waw.pl/en/Z02.php

Authors of this paper: "T. Bieniek, P. Janus"

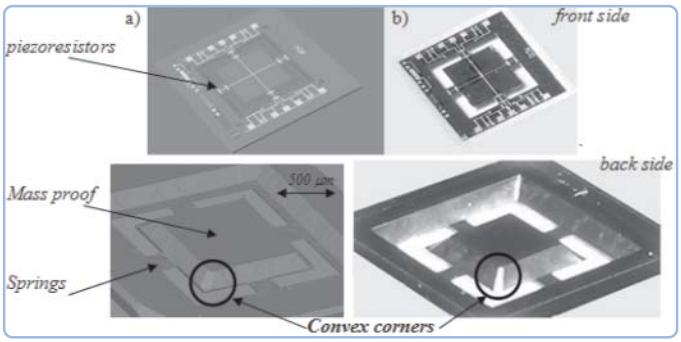


Fig. 3 Bulk-micromachined silicon piezoresistive accelerometer a) simulated, b) manufactured.

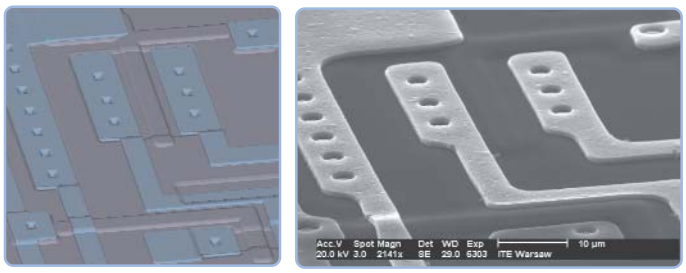


Fig. 4 Emulation of the ITE CMOS fabrication process (left) and SEM image of the structure (right).

The publication of this page is supported by the ***MINOS-EURONET*** project (EC Contract No 015704)

"Bio-medical applications of micro- and nanotechnologies"

Bucharest, Romanian Academy, 4th of December, 2007

PRO-BIOSYS project promote the Romanian competences, by intensifying the cooperation of the Romanian research organisations and private companies in the micro-nano-biosystems domain ("bio-chips") with the European research and industry area, stimulate the formation of new collaborations and partnerships and is open to cooperate with other networks or projects in the field.

Prof. Dan Dascalu

The workshop organized by the National Institute for R&D in Microtechnologies IMT-Bucharest, with the support of Pro-Biosys project **"PROmotion of Romanian competences for the European co-operation in micro-nano-BIOSYStems",** followed the developing of relationships between scientific networks and consortium existent in Romania with the European networks.

30 people attended the event: representatives from the Romanian scientific community, including young researchers, but also participants from private industrial sectors. National Research institutes also manifested their interest to participate, institutes of Romanian Academy, commercial companies with research activities and also Public Health institutes (University Hospital of Bucharest and Oncology Institute of Bucharest).

The presentations were especially focused on the results of the researches from micro-nano-biosystems domain, results obtained from European projects. Romanian researchers delivered oral presentations, researchers with activities in nano-bio medical field recognized on national and international field (National R&D Institute for Microtechnologies, Institute of Biochemistry of the Romanian Academy and National R&D Institute for nonferrous and rare metals) and also from Europe (VTT

Prof. Shimshon Belkin

Technical Research Centre of Finland, Microelectronics Laboratory Université catholique de Louvain, Politecnico di Milano Dip. Elettronica e Informazione si Institute of Life Sciences The Hebrew University of Jerusalem).

The workshop was open by Prof. Dan Dascalu, National Institute for R&D in Microtechnologies IMT-Bucharest, Pro-Biosys project coordinator.

The **first section** of presentations delivered by the foreign guests, was started by **Prof. Shimshon Belkin**, from Institute of Life Sciences, The Hebrew University of Jerusalem, ***"Whole-cell biochips for toxicity detection"***, followed by **Prof. Inger Vikholm-Lundin**, VTT Technical Research Centre of Finland with the presentation ***"Resonator based bio-sensor system for DNA and protein detection in medical applications: Concept, state of development and future aspects"***. Also from the bio-sensor domain for DNA was the presentation of Dr. **Luis Moreno Hagelsieb**, from Microelectronics Laboratory, Université catholique de Louvain, Louvain, Belgium, ***"Al/Al_2O_3 Biosensors for DNA and Medical Applications: Materials and Design Concepts, Methodology and Perspectives"***. The first section was

Prof. Inger Vikholm-Lundin

Dr. Luis Moreno Hagelsieb

closed with the presentation ***"Single photon avalanche diode for genetic diagnostics"*** of **Dr. Ivan Rech** from Politecnico di Milano, Milano, Italy.

The **second part** of the event was dominated by presentations of Romanian researchers: Dr. Irina Kleps, National Institute for R&D in Microtechnologies, Bucharest, Romania ***„Micro/nano-fabrication of Si-based drug delivery systems"***; Math. Oana Nedelcu, National Institute for R&D in Microtechnologies, Bucharest, Romania, ***"Lab-on-chip for medical diagnosis"***; Dr. Mihaela Trif, Institute of Biochemistry, Romanian Academy, Bucharest, ***"Liposome-based anti-inflammatory molecules: new strategy for a local therapy"***; Dr. Roxana M. Piticescu, National Institute for Non-Ferrous and Rare Metals, Bucharest, Romania, ***"Hybrid Materials with potential use in biosensors"*** and Dr. Eng. Carmen Moldovan, National Institute for R&D in Microtechnologies, Bucharest, Romania, ***"Sensors and implantable devices for biomedical applications"***.

All the presentations from this workshop can be found on the page **www.imt.ro/probiosys**.

Dr. Ivan Rech

The discussions during the event resulted in establishing of new contracts and cooperation at international level in the nano-bio medical field and also possible new proposals of projects for FP7.

Contact: **Future information on web http://www.imt.ro/probiosys/eng/**

An excellence centre within an institute of micro- and nanotechnologies in Bucharest, Romania (I)

IMT-Bucharest (National Institute for Research and Development in Microtechologies, www.imt.ro) was the first R&D organization in this field to be set-up (1993) in Eastern Europe. In 2004-2008 is active in about 20 European projects. At the national level, IMT is the coordinator of a few technological networks, and a science and technology park in micro- and nanotechnologies, MINATECH-RO (**www.minatech.ro**)

Contact: General manager **Professor Dan Dascalu**, E-mail: **dan.dascalu@imt.ro; IMT-Bucharest, Romania**

IMT is developing an existing "centre" of RF and Opto 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 Pogramme (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 **M**icrowave, **M**illimetre Wave and **O**ptical Devices, based on **M**icro-Electro-**M**echanical **S**ystems (**MEMS**) for Advanced Communication Systems and Sensors.

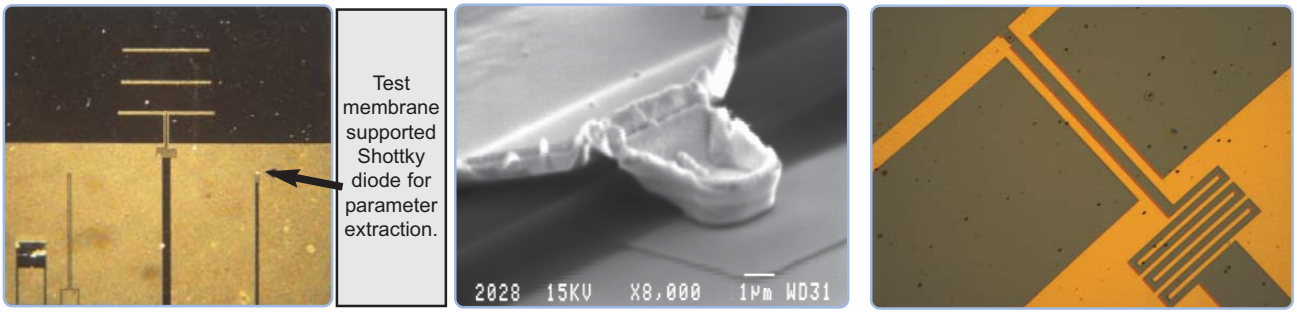


Fig. 1 Circuits are developed for advanced communication systems in the millimetre wave range. 60GHz receiver structure based on a membrane supported Yagi-Uda antenna monolithic integrated with a substrateless Schottky diode regions – common work of IMT (design, modelling, technological processes) FORTH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

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 Program.

Two IMT laboratories, for **RF-MEMS and Microphotonics**, respectively, ***already active in previous European programmes, have joint their efforts to achieve this excellence centre.*** The research activities of IMT's two Laboratories have been developed in the last years through strong cooperation with many European partners. **The most important research partnerships** are with ***FORTH-IESL-MRG (Greece), LAAS-CNRS in Toulouse (France), Tor Vergata Univ. Rome (Italy), VTT Helsinki (Finland), ITC Trento (Italy), TU Darmstadt (Germany), Univ. of Athens (Greece), Cambridge University (U.K.), Fraunhofer Institute for Telecommunications-Heinrich-Hertz Institut, Berlin (Germany), and IMT-FZK Karlsruhe (Germany).***

These co-operations have developed in the context of EC founded projects and bilateral agreements for working on circuits manufacturing in technological labs, and characterising millimetre wave and photonic circuits.

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

An excellence centre within an institute of micro- and nanotechnologies in Bucharest, Romania (II)

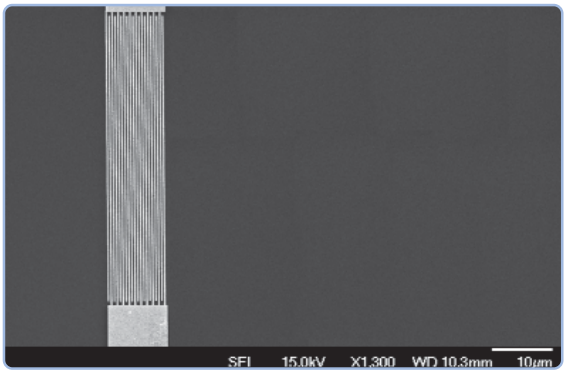
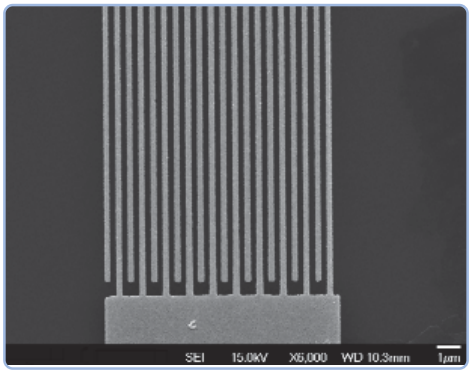


Fig. 3 New experimental AlN SAW structure for GHz applications manufactured and measured at IMT-Bucharest. Fingers and pitches with a width on 250 nm have been obtained with the new purchased nanolithographic equipment (Vega-SEM and Elphy Plus EBL). ***Envisaged applications in the new generation of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



Previous record of European cooperation of the two IMT laboratories (see also the figures, below). **The Laboratory of RF-MEMS** has coordinated "Micromachined Circuits for Microwave and Millimetre Wave Applications" (MEMSWAVE, 1998-2001, FP4-INCO). MEMSWAVE was nominated in 2002 among the top ten European projects for the Descartes Prize (the best European co-operative research project). This lab 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) call ICT-2007-2.

The Laboratory of Microphotonics (***Dr. Dana Cristea, 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), call NMP-2007-1.

The main objectives of the MIMOMES project are described below:

"Exchange of know-how and experience". This activity will be done **by twinning with two research centres: LAAS-CNRS** in Toulouse, France, and **FORTH-IESL-MRG** in Heraklion, Greece.

"Recruitment of incoming experienced researchers" will allow IMT to **hire Post-Doctoral 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 will have the possibility to become full time IMT employees.

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

"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 publication of research results in peer reviewed journal and presentation at international conferences.

Contact: Dr. Alexandru Müller, **alexandru.muller@imt.ro;**
http://www.imt.ro/organisation/research%20labs/L4/index.htm
IMT-Bucharest, Romania

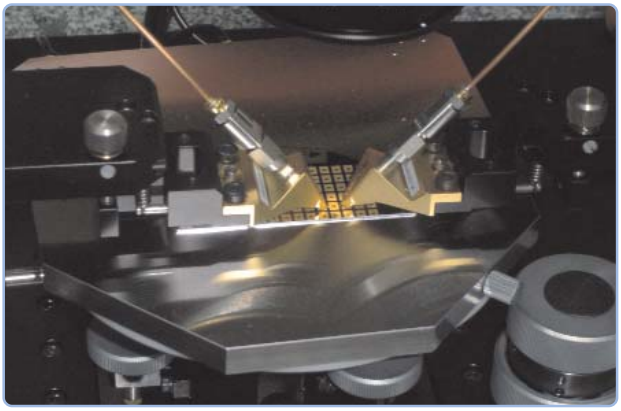
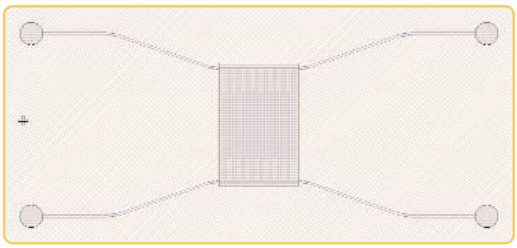


Fig. 4. The new "on wafer" microwave measurement equipment till 65 GHz purchased by IMT-Bucharest in 2007 in the frame of the National Programme CEEX (Module 4). The corresponding MICROLAB will also provide ***services for companies.***

INTEGRAMplus Recent results

A new enzymatic sensor was developed under the INTEGRAMplus FP6 project, with support from EPIGEM Ltd. (UK). The sensor is based on a deposited enzymatic layer (AChE enzyme), developed (concentration, enzymatic activity measuring, deposition protocol) for demonstration.



The enzymatic sensor layout

The acethylcholinesterase (AChE) immobilization was performed by ionic adsorption on chitosane or poly-ethilenglicol (PEG) bio-polymeric substrate, by including in the gel. The method for enzyme complexation to this support is simple, being based mainly on the potential interactions between the rests of amino acids from the enzyme molecule, the cationic character and the non-solubility of chitosane at high pH values. The membrane was obtained by drying the gel in air flow and loosing of water molecules facilitates the enzyme accessibility to the support linking sites, by the interactions between the rest of polar and non-polar amino

The main advantage of this method is that the enzyme immobilization is performed at room temperature, in aqueous environment, assuring an adequate homogeneity of the sample and reducing the possibility for enzyme inactivation. The sensor substrate is Si with gold interdigitated electrodes on top. The plasma treatment in O_2+Surface functionalization with APTS (3 aminopropiltrietoxisilan), 0.1μL have been performed. This way, the accurately deposition and immobilization only on the surface of the working electrodes has been achieved. The plasma treatment in O_2+Surface functionalization with APTS (3 amino-propiltrietoxisilan), 0.1μL have been performed. The sensor substrate is Si with gold interdigitated electrodes on top.

The microelectrodes fabrication was based on a Si substrate, p type, 16Ωm, oxidation, Ti/Au deposition, patterning, PSG 4% deposition leaving openings for the pads connections and biomaterial deposition. The functionalized electrodes deposited with biomaterial have been inserted into the microfluidic channels and tested from electrical and microfluidic point of view, achieving the micro/nano bio integration. Insertion of electrolyte plus choline into the channels is leading to activate the enzyme and the measurements have been done under the strict control of temperature and pH and will be presented. The sensitivity and selectivity of the sensor have been measured and calculated, using a LabView-based environment.

INTERGRAMplus, IP, Priority 2 -IST, FP 6, Contract no.: 027540; 2005-2007. Coordinator: QinetiQ Ltd, UK. http://www.integramplus.com;
***Contact from* IMT-Bucharest: Dr Carmen Moldovan, E-mail: carmen.moldovan@imt.ro**

Molecular Imaging Lab-on-a-Chip

MI-lab on chip-Lab-On-A-Chip Implementation of Production Processes for New Molecular Imaging Agents. **Acronym**: **MI-lab-on-chip**, STREP-FP6, NMP, 2005-2008, Contract No.516984 **Coordinator: Liege University,** Belgium;

The purpose of this project is to develop multiple steps radio-pharmaceutical chemistry processes at the micro molar scale in disposable, automated and miniaturized systems to be used at the time the products are injected to the patients.

Molecular Imaging Lab-on-a-Chip - *Year II of the project*

An overview of the activities carried out by IMT in 2007, including a description of the progress in relation with project's objectives during period. Besides "basic" functionalities required by the lab-on-chip concept such as valves, pumps, reservoirs, mixers, filters, heaters, for which successful concepts have been demonstrated, other specific functionalities needed to be developed. Main design options were identified to allow such different functions, and consequently different manufacturing techniques to be merged onto a single component. As being the only one partner in the project responsible for modeling and simulation, IMT specific activities included:

• Optimisation of pumping cycle as function of geometry, dimensions and pressure

• Simulation of fluids flow in specific channel geometry of actuating system

• Simulation of heating of the liquid enclosed in a cavity by means of different methods (electro-thermal and absorption of laser radiation)

• Filter simulation (for retaining solid phase resins having grain diameter larger that 20 μm, into cavity)

The 2nd year meeting of the MI-lab-on-Chip project was organized by IMT on October 19, 2007, Sinaia, bringing together the involved researchers in this European project.

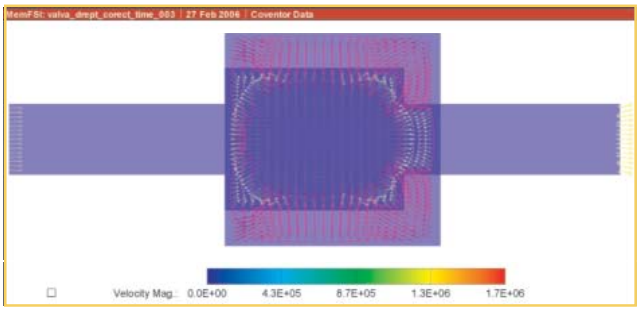


Figure 1. Transient simulation of a rectangular valve opening at p=0.01 MPa; velocity field distribution at t=0.2 seconds

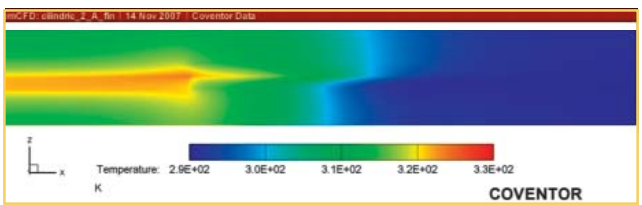


Figure 2. Heating of the flowing fluid through the chamber. The temperature distribution in the chip at thermal equilibrium (cross-section view along the channels; inlet on right side)

***Contact:* Mat. Oana Tatiana Nedelcu, IMT-Bucharest. E-mail: oana.nedelcu@imt.ro**

IntegramPlus and µBuilder joint training event

December 2007, IMT, Bucharest, Romania

In the period 3rd to 5th of December 2007, a course presenting two EC funded projects on microfluidics was offered at IMT-Bucharest (partner in INTEGRAM Plus). The two projects have set out to increase knowledge in microfluidcs and provide scientists and engineers with little or no knowledge in microfluidics and microsystem technology, an introduction and kick start. For details about the projects see µBuilder web page **http://www.sintef.no/content/page12____11691.aspx** and INTEGRAM Plus web page **http://www.integramplus.com.**

During the course the participants learned about potential applications, the technologies offered by the project partners and how to design in these technologies. By the end of the course, the people were able to make simple designs in the technologies presented and make use of the dedicated software that were used in two separate hands-on sessions offering introduction to design and simulation using state-of-the-art software.

21 participants (from research institutes, universities and industry) attended the joint course. The course format and content were appreciated as suitable for the audience, as resulted from the feed-back forms filled by the participants, which could lead to more such joint events.

Target Groups:

The course was primarily aimed at students, PhD students, postgraduates engineers and physicians from European universities and research institutes interested in developing MEMS design skills and accessing low-cost fabrication services, who participated free of charge. In addition, engineers and researchers from industry and other organisations were invited to participate.

Each of the projects introduced their specific technologies

MICROBUILDER:

Design your own microsystem

The MicroBuilder part of the event (3rd – 4th of December) was mainly focused on MultiMEMS technologies (Silicon/Glass Multi Project Wafer and Polymer manufacturing and mixed technologies).

Christopher Grinde (Vestfold University College, Norway) and **Danilo Demarchi** (Politecnico di Torino, Italy) presented the MicroBuilder project, the **ThinXXS, Tronics and MultiMems** technologies in the first day, and **CoventorWare-based** examples and exercises (hands-on) in the second day of the course.

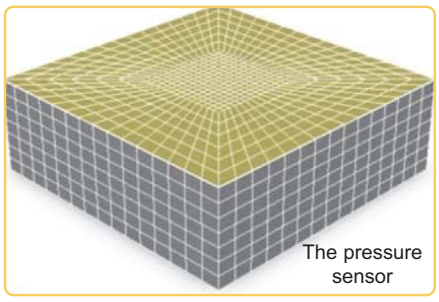
Day 1 (3rd December):

MicroBuilder project presentation; Thinxxs technology+add-on processes; Tronics technology; MultiMEMS technology;

Day 2 (4th December)

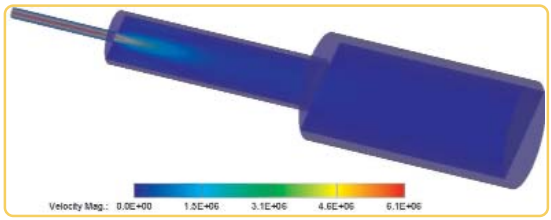
Device examples; Coventor software; Hands-on with Coventor/MultiMEMS;

During the hands-on training, the example was based on a pressure sensor, designed using the MicroBuilder MultiMEMS technology. The sensor was first designed and simulated using the Coventor Designer and Analyzer modules, before the same sensor was designed and simulated using the Coventor Architect module. The course target was that, at the ebd of the training event, the participants to be able to design and simulate MultiMEMS structures using the different CoventorWare packages.



The pressure sensor

INTEGRAMplus: Design, Technology and Simulation of Microfluidic Structures: The INTEGRAMplus part (on the 5th of December) was focused on microfluidics technologies and applications. **Dr. Carmen Moldovan**, **Oana Nedelcu** and **Bogdan Firtat** (IMT-Bucharest) gave a presentation on the INTEGRAMplus project and its technologies and provided several examples and exercises using the microfluidics module of CoventorWare. Some basic microfluidic structures were designed and simulated, in order to provide the participants the initial knowledge in using the specific CAD tools.



The fluid velocity through a rounded, variable area, channel

This part of the course aimed at:

- Introducing the INTEGRAMplus project and services offer;
- Introducing MEMS and the key-concepts of microfluidics;
- Providing familiarity with CoventorWare tools for microfluidics (design, modeling and simulations)
- Explaining methods to help students design and analyse MEMS microfluidic devices;
- Reinforcing learning through practical case studies and worked examples based on simple devices, using hands-on training for microfluidics simulations;
- Supporting participants to develop heir own design ideas and practical implementations in INTEGRAMplus processes.

Image from course hall.

Contact: **Dr. Carmen Moldovan, IMT-Bucharest. E-mail: carmen.moldovan@imt.ro**

4M Summer School

August 2007, Denmark

The 4M Network of Excellence held its first Summer School in 2007. Sixteen international students made the trip to IPL, at the Technical University of Denmark, during the two first weeks of August 2007, to work hard and learn about micro technologies.

They were treated to a **combination of lectures, practical work** and a whole-school project. **The lectures covered the following subjects: tooling technologies** (Micro cutting, Micro EDM, Laser ablation, Electrochemical deposition processes ...), **replication techniques adapted to micro scale** (Micro injection moulding, Micro metal forming...), **micro products functionalities** (Microfluidic devices, Micro products overview, Micro optical devices), **methodology of design** (Delta Design engineering role-playing experience, life cycle assessment, toolbox for design...), **metrology, micro handling and assembly** (Laser welding, Joining...). They were given by staff from DTU, with invited guest lecturers from other 4M partners (for a **ceramic processing overview and a sensors and actuators lecture**) as well as from the industry.

Regarding the project work, the student's task was the design and manufacturing of two fluidic mixing devices with a common optically-functional lid. The lecture on microfluidics gave ideas in terms of mixing principles based on geometry and it was decided to try them, albeit with different technologies. Indeed the examples were taken from the silicon area whereas the course was focusing on non-silicon manufacturing processes. An innovative (and risky) process chain was chosen for the embedding of the optics in the lid: commercially available lenses were mounted on a master, rendered conductive through a PVD step and electroplated in order to obtain an insert for injection moulding.

Not everything went according to plan, but the students were able to pursue the complete product development of their three parts: collaborative design, manufacturing of masters and inserts, injection moulding and joining. Though the devices were not functional, the learning objectives were achieved and potential solutions and/or improvements were identified.

The evaluation consisted of technical reports for each part (2 fluidic devices and 1 lid) which were presented in front of an examination board (DTU summerschool staff and an external censor from the 4M network). It should be added that the students produced a "paper-like" description of their PhD subject which was included in the material given to them (using the same format as the proceedings of the 4M conferences) that they handed-in before coming to the summerschool. They also held a 15 minute presentation about their work and their lab.

All in all it was a great experience. Everyone worked hard, learned a lot (both students and teachers alike) and had a very good time. Social activities were not forgotten and the team spirit was great. And it is important to mention that Denmark was kind enough to deliver the good weather promised by the organisation staff, for at least half of the time!

The good news is that plans for a 4M Summer School are already underway so keep an eye out for details on the 4M website (**www.4m-net.org**) early in 2008.

4M 2007 Conference

Borovets, Bulgaria

Our third conference, 4M2007, attracted some 140 delegates to the stunning mountain resort of Borovets in Bulgaria. Six fascinating addresses were delivered by the invited speakers to an interested and knowledgeable audience. These were complemented by the papers selected for oral presentation in the thematic sessions. Meanwhile a well-presented poster session gave everyone further opportunity to network and discuss each other's work. Finally, a superb banquet dinner offered by our Bulgarian hosts gave all delegates an insight to the culture and music of the

country. The organising committee would like to take this opportunity to thank all those who made the event a success: the Samokov Hotel; Prof. Yuli Toshev and the team from BAS; Technical University Sofia; our sponsors; all attendees, authors and speakers; theme chairs and reviewers; the 4M Industrial Advisory Board; Whittles publishing; the 4M office in Cardiff; and last, but not least, Juliane Sandner from FZK.

4M2008 - Our fourth annual conference on multi-material micro manufacture, 4M2008, will be held in Cardiff, UK on 9th - 11th September 2008. The First Call for Papers is available now at:
http://www.4m-net.org/conference

The publication of this page is supported by the ***MINOS-EURONET*** project (EC Contract No 015704)

New activity in MINOS-EURONET: The MINOS Roadshow

Make the western institutes aware of the capabilities existing in the East

A number of questions have been received from MINOS partners about the proposed roadshow. This document will help provide some answers. Tim Harper, CEO of Cientifica UK, one of the project partners will be responsible for this activity.

Introduction

One of the criticisms of the Commission in the MINOS second year review was that were two few contacts between the eastern and western partners. In fact this represents a wider concern within the Commission that institutions from the new member states are still under represented across the Framework programs.

There are two reasons for this, lack of contacts and lack of experience and MINOS will attempt to address both of these.

a. Lack of Contacts

It became clear to the Commission that while many of the eastern partners in MINOS know each other very well, and had a clear idea of their capabilities, there was little contact with institutions in Western Europe. In fact awareness of the eastern partners was very low in the West due to the lack of contact with the major research institutes. A key objective of the roadshow is to address this lack of awareness in the West.

b. Lack of Experience

Many of the major institutes in the west have been accessing Commission funding since the inception of the Framework programs. As a result, there are many academics who are highly networked and experienced in putting together successful proposals. However, in the East, many institutes have little experience of working with the Commission in Framework proposals, and are therefore at a disadvantage to their more experienced western colleagues. The roadshow aims to forge strong partnerships between east and west in order to utilise the western expertise and improve the chances of eastern partners successfully receiving Commission funding.

What is a Roadshow?

The roadshow will consist of a series of presentations given by eastern partners at key western institutions. The aim is to select the key eastern expertise that the institutes may find useful, and present this in an internal seminar. This differs from the usual brokerage events and conferences in that it is a closed internal event, open only to staff of the western institute.

Cientifica will assist in the preparation of PowerPoint presentations and other marketing materials, ensuring that the Eastern partners can present a unified and professional image during the roadshows.

It is anticipated that a number of institutes across Western Europe will be visited in two or three separate roadshows (depending on budget and number of participants).

What are the objectives?

The objective of the roadshow is to make the western institutes aware of the capabilities existing in the East. Many FP7 proposals require the addition of eastern partners in order to achieve a geographic balance, and man western institutes have trouble identifying who to include in their applications. Roadshow participants have the ability to promote their expertise and be top of the list when eastern partners are required.

Furthermore, the nature of the roadshow will allow the eastern partners to gain a good understanding of the capabilities of the western institutes, allowing them to prepare better future proposals.

By developing face-to-face contacts with researchers at leading western institutions, eastern partners will have the ability to widen their scientific network, giving them enhanced scientific and commercial opportunities in the future.

How Will The Western Institutes Be Chosen?

The western institutes will be chosen on the basis of

a. Scientific excellence
b. Success in attracting FP6 & FP7 funding
c. Compatibility with the expertise of the eastern partners

How Will The Eastern Participants Be Chosen?

Eastern partners will be chosen on the basis of

a. Scientific excellence
b. Visibility within the MINOS program
c. Compatibility with the expertise of the western partners

The databases already compiled by MINOS will be used in this evaluation, as well as contributions to newsletters, conferences and brokerage events. In addition calls for participation will be circulated in order that MINOS can present the best possible institutes to the west.

When Will This Take Place

The roadshows will be scheduled in the first half of 2008. This will be subject to the availability of the western institutes

Details on web page
www.minos-euro.net

Tim Harper Summary: Tim Harper is a serial technology entrepreneur, founding London based Cientifica Ltd (**www.cientifica.eu**), the world's leading source of global business intelligence about nanotechnologies, co-founder of Salisbury based nanoparticle visualisation and sizing company Nanosight Ltd., and is one of the worlds foremost experts on commercialisation of technologies, with experience gained in both venture capital and the laboratory.

Tim has given over 100 invited talks and keynote lectures on nanotechnologies ranging from economic implications to toxicology. He has been published in journals ranging from 'Nanotechnology' and 'Nature' to 'Microscopy and Analysis,' in addition to being extensively quoted in media ranging from the Financial Times and The Economist to Time and Business Week.

He is also the Founder and former Executive Director of European NanoBusiness Association and is an advisor to many organizations around the globe including top tier Universities, the European Commission, many of the world's largest companies and national governments from Austria to Singapore. He is the co-author of the Nanotechnology Opportunity Report™, described by NASA as "the defining report in the field of nanotechnology."

The publication of this page is supported by the ***MINOS-EURONET*** project (EC Contract No 015704)

The 4th conference on Ph.D. Research in Microelectronics and Electronics (PRIME'08), 22-25 June 2008.

(PRIME'08) will be held at Beta Lab, Boðaziçi University, Turkey, 22-25 June 2008. All the papers at PRIME 2008 will be presented by Ph.D. students, experienced people from academia and industry are warmly invited to attend, in order to create a stimulating environment for favoring exchange of knowledge and mentoring of young researchers.

A half-day (23 June 2008) will be dedicated to a Company Fair, for allowing Ph.D. students to get in touch with companies and other institutions.

The topics for the conference include, but are not limited to: Design and use of MEMS in ICs; Analog and Digital Signal Processing; VLSI and SoC Applications; Visual Signal Processing; Computer Aided Design; Analog and Digital ICs; Integrated Power ICs; Sensor Systems. Details on **http://www.prime.boun.edu.tr/**.

IEEE Workshop on Design and Diagnostics of Electronic Circuits and Systems

April 16 – 18, 2008, Bratislava, Slovakia

The IEEE Workshop on DDECS provides a forum for exchanging ideas, discussing research results and presenting practical applications in the areas of design, test and diagnosis of microelectronic circuits and systems.

Topics of interest include but are not limited to: • ASIC/FPGA Design; • System-on-a-Chip (SoC); • Bio-inspired Hardware; • Analog, Mixed-Signal, RF Design and Test; • Design Verification/Validation; • ATE Hardware and Software; • Formal Methods in System Design; • Built-in Self-Test (BIST); • Hardware/Software Co-Design; • Design for Testability and Diagnosis; • IP-based Design; • Defect/Fault Tolerance and Reliability; • Logic Synthesis; • Embedded Test; • Physical Design; • Memory and Processor Test; • Reconfigurable Computing; • MEMS Testing; Details on: **http://ui.sav.sk/DDECS2008, http://www.ddecs.org**

Nano2Life network presents main achievements, 26 February in Brussels

Nano2Life (N2L), the EU-funded Network of Excellence on nanobiotechnology, will present its principal achievements to stakeholders, the scientific committee and representatives from the European Commission on 26 February in Brussels.

A poster show and keynote speakers will present all facets of the network's work, including that on joint research collaborations, technology transfer, gender and intellectual property rights.

For further information, please visit: **http://www.nano2life.org**

Nanosciences, Nanotechnologies, Materials and New Production Technologies, 4th February 2008.

The Seminar will be held at the BUT Rectorate, Antonínská 548/1, 60190, Brno, Czech Republic.

The Brno University of Technology, Masaryk University and The South Moravian Innovation Centre is pleased to invite you to attend a seminar aimed at the current calls of FP7 Cooperation Wor Programme: Nanosciences, Nanotechnologies, Materials and New Production Technologies. All details can be found on: **http://www.jic.cz/en/news/seminar-nanosciences-nanotechnologies-materials-and-new-production-technologies/strana-1.html**

EC Call now opens for "Infrastructures" under the "CAPACITIES" Programme

The overall objective of the Research Infrastructures part of the "Capacities" specific programme is to optimise the use and development of the best research infrastructures existing in Europe, and to help to create in all fields of science and technology new research infrastructures of pan-European interest needed by the European scientific community to remain at the forefront of the advancement of research, and able to help industry to strengthen its base of knowledge and its technological know how.

This call has been published *30 Nov 2007 and is closing 29 Feb 2008*. All details can be found on the "Capacities" programme homepage - see: **http://cordis.europa.eu/fp7/capacities/research-infrastructures-highlights_en.html**

FINAL CALL FOR PAPERS MIXDES 2008 - th 15 International Conference Mixed Design of Integrated Circuits and Systems. Poznan, Poland, 19-21 June, 2008. Details on: **http://www.mixdes.org**

COE 2008 - X Conference Optoelectronics and electronics sensors, Poznañ, Poland 22-25 June 2008. Details on: **http://coe2008.et.put.poznan.pl/**

Micro and NanoTechnology Bulletin is published quarterly by IMT-Bucharest, Romania (**www.imt.ro**). This Bulletin, originally intended to publish **results of Romanian researchers in the micro and nanotechnology (MNT) field,** is extending its coverage since 2004 to Eastern Europe. The purpose is to contribute to a *better communication of MNT scientific communities from Eastern Europe to the rest of the world*. MNT Bulletin is distributed free of charge to interested organisations and individuals.

Editor-in-Chief: ***Dan Dascalu (IMT-Bucharest)***.

The Bulletin is also available on the web page: **www.imt.ro/mnt.**

IMT-Bucharest it is also the coordinator of three SSA projects (***MINOS-EURONET***) with *support and dissemination activities* through *web pages, e-newsletter, flash news and online databases:*

- **E-newsletters:** ***MINOS-EURONET project*** (common issue): **http://www.minos-euro.net**
- **Flash news:** ***MINOS-EURONET project***(common issue): **http://www.minos-euro.net**
- **Online Databases: http://www.minos-euro.net**

MINOS-EURONET **Coordinator :** Prof. Dan Dascalu **(dascalu@imt.ro).** ***MINOS-EURONET Team*** **(minos@nano-link.net)**

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