

## Competence Centre for Biomedical Microdevices

The Centre of Competence for Biomedical Microdevices, which in recent years was formed by the Fraunhofer Institute for Biomedical Engineering (IBMT) in Germany and the Centro Nacional de Microelectrónica (CNM) in Spain, will continue its work in co-operation with the new industrial partners I2M-Design and Zarlink Semiconductors and will also offer new services.

**Fraunhofer IBMT**, the project co-ordinator, stands for industry-oriented R&D in biomedical engineering. Microimplants, biohybrid systems, miniaturised ultrasonic devices, biocompatible packaging & interconnection and biological testing represent only part of its expertise.

**I2M-Design**, located in Barcelona (E), is a joint venture of D+T in Spain, CCC in Uruguay and AGR-AIMS in Colombia. I2M-Design has strong links with CNM and other reputed research institutes in Spain and Latin America. Their main objective is to support the development of high-tech biomedical products based on micro- and nanotechnologies.

**Zarlink Semiconductors**, the new identity of the Mitel Corporation (NYSE/TSE: MLT), is specialised in the design and manufacturing of medical ASICs. Over one million pacemakers rely on Zarlink's integrated circuits. Zarlink's Medical Design Centre is located in Järfälla (S).

Being spread all over Europe, the Competence Centre is in an excellent position to reach the European biomedical community, even with the possibility to extend its services to Latin America.

### Services & Applications:

The Competence Centre aims at supporting companies wanting to use microtechnologies either for the development of completely new types of biomedical devices or the technical improvement of existing devices. The Competence Centre will also assist customers in assessing a possible benefit from microtechnologies for their specific applications. Envisaged biomedical products and applications are hearing aids, implants for the stimulation of nerves & muscles, nerve regeneration and pain treatment, biosensors, implantable diagnostic systems, catheter systems, telemetry units and portable systems.

The Competence Centre offers:

- information material that will be delivered on the occasion of fairs, conferences and workshops
- customer visits (when mutually agreed to be appropriate)
- feasibility assessments of micro- & nanotechnologies for biomedical applications
- access to silicon- & polymer-based key components and other basic modules necessary for the devel-

opment of biomedical devices (electrodes, sensor & telemetry units, leads, connectors, etc.)

- biocompatible packaging and interconnection solutions
- CAD of biomedical microcomponents
- internet information for the biomedical community (newsletter, database, search engine)
- organisation of application-specific workshops and training courses
- networking with Latin American biomedical groups
- access to design and manufacturing capacities within the European community for requests that are not within the scope of the Competence Centre.

The Competence Centre will be presented at the European Medical Manufacturing Suppliers Show, MEDTEC, in Stuttgart (D), March 5-7, 2002, at the booth of Fraunhofer IBMT (hall 8, booth 1317).

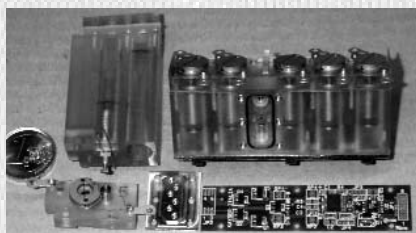
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## Medical Micro Instrument Competence Centre (MMICC)

MMICC team has developed two different microfluidic devices for biological tests in microgravity conditions. The systems have been fabricated in a small series (around 50) and consist of a variable number of different reservoirs and a culture cell with dedicated channels and the activation system. The biological culture is fed sequentially by the content of each reservoir. The activation system is based on a shape memory alloy (SMA) and allows the user to program the activation sequence, as he likes. In the first system we have one culture cell and one reservoir, so the system is activated once. In the

second device we have five different reservoirs sequentially activated every 1-2 days. The five reservoirs apparatus comprehends a controller board that addresses the activation signal (given by an external trigger) to each SMA based activation system (one for each reservoir).



The experience acquired with this project allows MMICC to design customised microfluidic systems for automatic biological test for space applications and also for other fields. MMICC offers consulting, system definition, feasibility studies and prototyping in the field of medical and environmental devices. MMICC can also organise and manage medium- and large-scale production.

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## MEMSOI - Multi-Project Wafer Services for MEMS and Optical MEMS on SOI

Through MEMSOI, the Europractice consortium dedicated to the design and production of MEMS on SOI, TRONIC'S Microsystems, for the last three years has been offering an MPW service on its Epi-SOI surface micromachining process. This technology features the Deep RIE of structures on a 20µm thick single

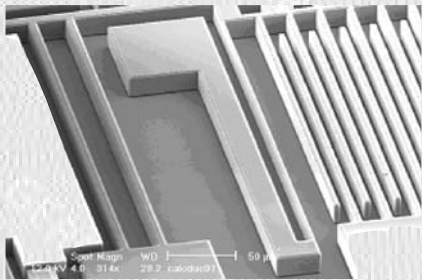


Figure 1: Example of a structure tested on the MPW

crystal silicon active layer epitaxied on a SOI wafer. Institutes and companies can benefit from this low-cost service to test structures or prototype MEMS devices, such as highly sensitive inertial sensors, optical switches, resonators... Design services are also proposed by 8 Design Houses in Europe: AML, ACREO, CEA-LETI, CNM, CNRS-LAAS, FhG ISiT, NMRC, SINTEF, and a Design Kit specific to this technology is proposed by MEMSCAP on its MemsXplorer platform.

The schedule of the 2002 runs is the following:

Run	Design Submission	20 Chips Delivery
10	1 Mar 2002	28 Jun 2002
11	1 Jun 2002	27 Sep 2002
12	1 Oct 2002	31 Jan 2003
13	20 Dec 2002	30 Apr 2003

In mid-2002, TRONIC'S Microsystems will be introducing a new Multi-Project Wafer service dedicated to the low-cost prototyping of Optical MEMS components on SOI through MEMSOI. Based on its core technology of Epi-SOI surface micromachining, the process will feature the High Aspect Ratio Micromachining of SOI wafers on both sides.

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## MAGFAB: New Schedule for Magneto-resistive MPW Service

MAGFAB is a manufacturing cluster which helps industrial companies to conduct their microsystem project on magneto-resistive technologies.

Advantages of MR - technology, an example:

In the field of current sensing, the basic requirements are galvanic insulation, a high accuracy over a wide measurement range, and a high bandwidth up to at least 100 kHz. In thin film magneto-resistors, the field sensitivity is about 50 times larger than in silicon based Hall-effect sensors, eliminating the need of flux concentrators and leading to low-cost, compact microsystems.

Figure 1 shows an example of a MR current sensing device, integrated in a straight slotted bus bar. The integrated ASIC sensor system, which was realised as a +5V, single supply solution, reaches an accuracy better 2% over a temperature range from -40 to +125°C. The new slotted bus bar and sensor design principle guarantees a linear response (deviations < 1%) up to 100 kHz for currents up to 1000 A. The chip is mounted together with the electronic interface on a 13.5mm x 35 mm ceramic substrate, leading to a very compact design. Main application areas are battery management (automotive), as well as frequency inverters and ser-

vo-regulators. Analogous, competitive low-cost, high precision applications could be realised in position sensing (2 µm) and angle measurement (0.1°). MagFab of-

fers, on a global service from design to magneto-resistive microsystem mass production, two complementary technologies for a wide range of microsensors and applications: AMR (Anisotropic Magneto-resistance), manufactured by Sensitec, and GMR (Giant Magneto-resistance), manufactured by PHSMEMS.

Access to the Service - Planned MPW Runs:

	Design Deadline	Prototypes Delivery
AMR	8 Jan 2002	5 Mar 2002
GMR	4 Jan 2002	8 Mar 2002
AMR	0 Jul 2002	5 Sep 2002
GMR	1 Jul 2002	9 Sep 2002

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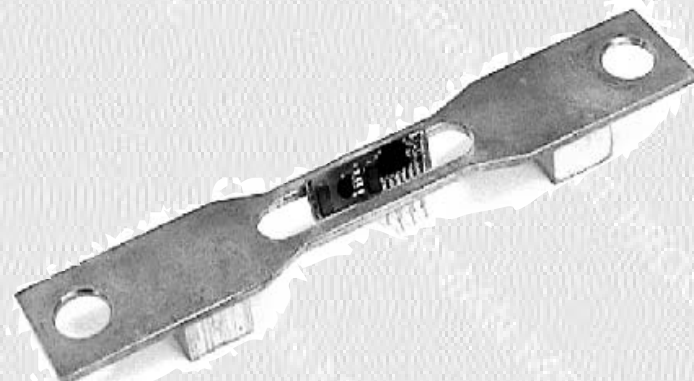


Figure 1: MR current sensor in a slotted bus bar

## Colibrys' Digital Imaging for Medical Applications

Within the framework of EURO-PRACTICE, Manufacturing Cluster 4, Colibrys has developed several radiation detectors for biomedical applications as Application Specific Standard Microsystems (ASSM). For over 15 years, CSEM/Colibrys has been active in the field of silicon radiation detectors and recent developments in the field of intra-oral dental imaging clearly demonstrated the potential of its technology. Simage Oy (SF), a partner active in the field of dental imaging and a wholly owned subsidiary of iX Imaging plc (GB), has further developed the concept of a hybrid pixel detector fabricated on Silicon, bump-bonded to a proprietary CMOS single photon counting electronics allowing a dramatic reduction of image blur and delivering



Figure 1: Standard teeth phantom image, 150ms exposure with 60keV X-ray energy

a very good S/N Ratio. The detector features 850,000 pixels in an extremely compact volume (0.05 x 3.7 x 3 cm<sup>3</sup>) and excels in meeting all technical requirements for a dental intra-oral sensor solution. With X-rays exposure of 150 ms at 60 keV, the mea-

sured image resolution shows an excellent MTF (Modulation Transfer Function) surpassing 40% at 8 lp/mm.

These results, coupled with a dynamic range limited only by photon statistics and unprecedented linearity, notably enhance contrast sensitivity, enabling the realisation of a powerful sensor outperforming existing solutions based on film or coated CCDs. The performance of this product enables the kick-off of the pre-industrialisation phase for the sensors developed and produced by Colibrys.

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## MC 4 Commitment to Total Quality

The Manufacturing Cluster 4 (MC 4) offers custom and semi-custom products for different applications. The principle of MC 4 is teamwork between a network of design houses - each one having know-how in specific industrial sectors - and Colibrys as a flexible foundry. It offers advanced design, medium-scale volume production of custom MEMS and standard products as well as related manufacturing services like assembly packaging and reliability testing. This implies the ability to manage the complexity resulting from the combination of numerous technological platforms, while bringing value

to customers and insuring fast time to market for MEMS products. Recently, Colibrys has obtained: ISO 9001 (version 2000) certificate for quality system management and ISO 14001 for environmental system management by the TÜV organism of certification. These certificates guarantee the best services for customers targeted by MC4.

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## MC1 - Bosch Foundry Runs in 2002

Robert Bosch GmbH has announced three MPW runs in its silicon surface micromachining foundry for 2002. The users can rely on a low-volume production in a high-volume environment as the employed process is identical to the one used for millions of Bosch sensors each year. This foundry service provides a clear path for low-cost development of new MEMS products from prototyping to high volume production. The time schedule for the silicon surface MPW runs in 2002 is as follows:

Run	Layout	Start	Completion	Chip Delivery
Run 1	15 Mar	2002		Jul 2002
Run 2	15 Jul	2002		Oct 2002
Run 3	15 Nov	2002		Feb 2003

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