



Dear Patric Salomon,

The Network of Excellence (NoE) Patent-DfMM aims to establish a collaborative team to provide European industry with support in the field of "Design for Micro & Nano Manufacture (DfMM)" to ensure that problems affecting the manufacturing and reliability of products based on micro & nano technologies (MNT) can be addressed before prototyping and production. For more information: [www.patent-dfmm.org](http://www.patent-dfmm.org)

Welcome to our third edition of the bi-monthly E-Newsletter, which will keep you updated on project related activities, but also on other DfMM activities that run outside of the project.

We apologise in case you have been added to our database in error: if so, please reply by e-mail with "UNSUBSCRIBE" in the subject field.

We welcome your comments and contributions.

Happy reading!

Patric Salomon  
*NoE Patent-DfMM News Editor*

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[www.patent-dfmm.org](http://www.patent-dfmm.org)

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## News from the NoE Patent-DfMM

### DfMM R&D Projects launched

Being an FP6 Network of Excellence, PATENT-DfMM has a very flexible approach to distribute budgets within the project. In an annual (internal) review, which is supported by the Industry Advisory

Board (IAB), priorities for the next period will be set. Internal calls for project proposals will then be launched throughout the year.

The following internal projects have been launched recently as part of the PATENT-DfMM research and integration activities:

- Design for Test (DfT) for Biosensor and for Biosensor Interface
- Design for Testability of Micro-Electronic Fluidic Arrays
- Quality Factor measurement and reliability for MEMS resonators
- MEMS Testing through Bias Superposition
- Benchmarks for MEMS testing
- Modelling and testing of microengineered cooler for microelectronics packaging
- Mechanisms of formation of preferential flow paths in microcirculation vessels for BIOMEMS
- Review of optical simulation and modelling techniques for MOEMS
- Simulation of the stiction effect in the metal-to-metal resistive contact occurring in MEMS switches
- Fault Modelling and System Simulation of Flow-FETs
- Methodology to assess the impact of packaging on MEMS components
- Reliability of M(O)EMS in harsh conditions
- Reliability of MEMS basic movable structures
- Methodology and high level design of failure modes of MEMS
- Input for materials data bases
- Failure mode database
- MEMS testing by electro-thermal excitation
- Scoping study for future programme to “Demonstrate a methodology for reliable, packaged of Micro and Nanosystems”
- MOEMS Packaging in harsh environment, Phase 1 Study
- FEA and modelling of IMS packaging structures using ANSYS
- Packaging Failure Mode Database
- Investigation of Laser Based Processes for MEMS Assembly and Packaging
- Packaging Material Parameter database

More information is available from the [PATENT-DfMM website](#).

Andrew Richardson  
Patric Salomon

### **First DfMM Summer School attracts industry participants**

The first training event for the PATENT-DfMM network of excellence was held at ISLI, Livingston, Scotland, 13-15 September. Over the 3-day programme, 30 delegates from around Europe were presented with a variety of interesting MEMS-related tutorials and presentations from research partners involved in the network. The themes covered MEMS fundamentals, failure modes, modelling and test techniques, through to packaging effects, and included an opportunity to try various CAD tools and talk to some of the experts in the DfMM field. In addition to academics and research students, the audience included industrial delegates; many of these expressed interest in the topics, which are being developed into longer training courses.

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E-mail: [george.bell@sl-i-institute.ac.uk](mailto:george.bell@sl-i-institute.ac.uk)

### **PATENT-DfMM Participation in METRIC, 29-30 Sep, Pittsburgh, USA**

METRIC (MEMS Technology Roadmap and Industry Congress) is the annual meeting for the members of the MEMS Industry Group (MIG). Andrew Richardson and Patric Salomon were invited to

this year's event that focussed on [MEMS accelerated lifetime test \(ALT\)](#). In advance of the conference, MIG organized topic-specific working groups, made up of MEMS industry professionals, to break down issues affecting the commercialization of MEMS technology. At METRIC, these working groups met in person with other invited attendees to formulate recommendations and conclusions based upon primary and secondary research conducted by MIG earlier. The working groups discussed and recommended specific action items and recommendations for the industry to better understand, extend and improve MEMS ALT, especially as MEMS expands into new applications (RF, acoustics, biomedical, etc.).

Andrew represented PATENT-DfMM in a panel on "Innovation in Design and Manufacturing", while Patric was involved in the panel on "Defining the MEMS market". During a follow-up meeting, further cooperation between MIG and PATENT-DfMM was envisaged for the areas of:

- Reliability Databases
- Test Structures
- MIG initiative on the development of a MEMS Cost Assessment Tool (CAT)
- Handbook on "Best Practices in Design ..."

These topics will be discussed further in upcoming weeks.

In January 2005 MIG plans to release the results of the working groups as an [online annual Industry Report](#).

Andrew Richardson  
Patric Salomon

#### **Job Offer: Post-doc position at IMEC**

IMEC is looking for a Post-doc to work on FEM and reliability of MEMS  
Start date: January 2005.

Contact:

Ingrid de Wolf, PATENT-DfMM Co-ordinator of WP3  
IMEC, Leuven, Belgium  
E-mail: [dewolfi@imec.be](mailto:dewolfi@imec.be)

#### **Second annual PATENT-DfMM Project Meeting 29-30 Nov, Leuven**

The second annual PATENT-DfMM project meeting will take place at IMEC facilities in Leuven from 29-30 Nov 2004. This will combine meetings of the workpackages, Industry Advisory Board (IAB), the Assembly of all partners representatives, and a Management Board meeting.  
The meeting **is open to project partners and IAB members only!**

Further information will be send to partners and IAB later.

Patric Salomon

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## **Events/ Conferences, and Calls for Papers**

**RF-MEMS course at IMEC, 24-26 November**

On 24-26 November, 2004 there will be an RF-MEMS course held at IMEC, co-organized by NanoMEMS Research LCC from the US (Hector De Los Santos) and IMEC.

This course aims at getting interested parties informed on:

- RF MEMS fabrication processes, devices, circuits, systems, packaging, reliability and CAD
- How to apply RF MEMS technology to create superior wireless systems
- How to evaluate competing RF MEMS devices and technologies in light of your capabilities, applications and budget.
- How to identify opportunities for RF MEMS insertion in wireless applications.

Contact:

Bart de Mey, IMEC, Leuven, Belgium

E-mail: [Bart.DeMey@imec.be](mailto:Bart.DeMey@imec.be)

### **Call for Papers: International Reliability Physics Symposium (IRPS), 17-21 Apr 2005, San Jose, USA**

IRPS, the IEEE International Reliability Physics Symposium, scheduled for April 17-21, San Jose, California, is unique in covering state-of-the-art developments in electronic and optoelectronic reliability.

It has also a session especially dedicated to Reliability of Micro-Electro Mechanical Systems (MEMS). We solicit original, previously unpublished papers on a wide range of reliability analysis topics. This covers all kinds of MEMS from bio- and fluidic-, to optical- or RF-MEMS and their packaging. It includes new instrumentation or test methodology, reliability simulation, failure analysis, reliability related design issues, processing issues, standards, etc.

Abstract Deadline: 8 October 2004

[www.irps.org](http://www.irps.org)

### **Call for Papers: European Microelectronics and Packaging Conference & Exhibition (EMPC 2005); 12-15 June 2005, Brugge, Belgium**

The IMAPS EMPC is Europe's premier conference related to microelectronic packaging and interconnection technologies. Planned every two years in a different European country, for the past 28 years, it brings together specialists from industry and academia. The EMPC conference addresses „everything in electronics between the chip and the system“. The Technical Programme Committee of the EMPC 2005 invites abstracts of original work describing recent developments in the fields of microelectronic interconnections and packaging.

Abstract Deadline: 31 October 2004

[www.imapsbrugge.be](http://www.imapsbrugge.be)

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## **Other DfMM-related News**

### **MACROS project to provide behavioural models including non-linear effects**

University of Lancaster - partner in PATENT-DfMM - is involved with Dolphin Integration and ST Milan in a European project called MACROS. In this project, behavioural models including non-linear effects are developed, validated against measurements and integrated into a library. All the models of the library will be available with an EDA environment extended to support advanced VHDL-AMS language features. The designer will not only be able to model and simulate the ideal (fault-free) MEMS behaviour, but also the influence of package induced effects, pre-stress, mode coupling and failure modes of MEMS structures within the complete MEMS in Dolphin's Mixed Signal, Multi Level and Multi Domain simulator SMASH.

For more information about MACROS project, please visit:  
<http://www.dolphin.fr/projects/macros/index.php>

Contact: Lars M. Vosskaemper, Dolphin Integration GmbH, Germany, Email: [mems@dolphin-integration.com](mailto:mems@dolphin-integration.com)  
Andrew Richardson, University of Lancaster, UK, Email : [A.Richardson@Lancaster.ac.uk](mailto:A.Richardson@Lancaster.ac.uk)

### **Coventor Awards Five MEMS Design Scholarships**

Coventor, along with the Micro and Nanotechnology Commercialization Education Foundation (MANCEF), awarded five MEMS design scholarships to students and their professors during the COMS 2004 conference in Edmonton, Alberta in August. The scholarships were granted based on proposals submitted by students working in micro systems research around the world. Each student will receive a free 1-year license to Coventor's ANALYZER and DESIGNER CoventorWare software tools to be used in the University setting. Universities were required to be current MANCEF members to be eligible to submit proposals. Coventor plans to offer similar scholarship opportunities at COMS 2005.

Contact: E-mail [Benjamin.Blackwell@coventor.com](mailto:Benjamin.Blackwell@coventor.com), [www.coventor.com](http://www.coventor.com)

### **C2V releases Yield Module for OlympIOs software**

C2V has added a new module to its planar waveguide design and simulation platform OlympIOs. This module allows for the calculation of device yields for specified performance criteria and statistical process data. At the core of the yield simulation engine are C2V's existing proprietary numerical (optical) simulation engines, combined with Monte Carlo methods and clever fitting procedures to minimize the simulation time required.

Further information of the yield module and other OlympIOs modules can be found at:  
<http://www.c2v.nl/software/olympios/modules/index.shtml>

Trial versions of the new yield module (as well as all other modules) can be obtained at:  
[http://www.c2v.nl/software/trial\\_request\\_form.pdf](http://www.c2v.nl/software/trial_request_form.pdf)

For further inquiries please contact: Martin Amersfoort, VP Integrated Optics, C2V, Tel: +31-53-4889889, E-mail: [software@c2v.nl](mailto:software@c2v.nl)  
<http://www.c2v.nl>

### **Infotonics and IntelliSense Announce Strategic Alliance at COMS 2004**

Infotonics Technology Center and IntelliSense Software announced a strategic alliance aimed at lowering the barriers to entry in the MEMS market. The alliance will offer a "total MEMS solution" including market research services, design kits, CAD/EDA tools for MEMS based on IntelliSense's market leading IntelliSuite product, design services, chip prototyping services, MEMS and optical packaging services, and pilot production facilities. Both companies will combine resources to develop MEMS and nanotechnology prototypes and move technologies into high yield and low cost commercial markets quickly and efficiently. [www.intellisense.com](http://www.intellisense.com), [www.infotonics.org](http://www.infotonics.org)

### **Job Offer: MEMS/Microsystems Modelling Engineer at Coventor Europe**

Contribute to Coventor's industry-leading library of components for system-level design and simulation of MEMS (Mirco-Electro-Mechanical System). Responsibilities will include deriving and enhancing mathematical models of electromechanical design elements (such as beams, plates and electrodes), implementing the models in an HDL (Hardware Description Language), troubleshooting customer problems, and other tasks related to delivering a high-quality software product. Requires a Ph.D., M.S. or Ecole d'ingénieur degree in mechanical or control engineering, with strong theoretical background in solid/structural mechanics, FEM, model-order reduction and/or control engineering. Also must have

substantial experience programming in Matlab, C++ or an HDL. Must be able to read and understand technical articles and documentation written in English. Recent graduates will be considered. This position is located in a Coventor office near Paris, France. Must have authorization to work in France.

If you are interested in this opportunity, please e-mail your resume to [job1738@coventor.com](mailto:job1738@coventor.com).

### Phoenix introduces FlowDesigner

Designing a process for fabricating micro and nano-structures, requires substantial knowledge of process technologies such as deposition, etching and lithography. The number and types of materials and processes used in a typical device, combined with the fact that for every material/process, the exact response depends on the individual machines, makes the design and validation of a process a complex activity. Process design is therefore commonly referred to as being an art. FlowDesigner turns process design into a craft !

Schematic cross section pictures are typically used during process design to retain an overview of the process. FlowDesigner is a powerful tool to do this work automatically. You can analyze your first order flow based on geometrical simulation. This enables advanced features like tolerance analysis and yield optimization. It uses a material database which you can extend and modify. Free trial versions are available! [www.phoenixbv.com](http://www.phoenixbv.com)

### New report: Suppliers of Materials for MST/MEMS Production

Although still considered to be the smallest of MST/MEMS markets, the demand for specific materials (substrates, resist, etc) is growing. Equally relevant is the fact that users are operating in a fast changing and diverse environment, forcing the suppliers to develop and sustain a range of application specific products.

The enablingMNT Review on Suppliers of Materials for MST/MEMS Production shows that a multitude of companies ranging from small start-ups to the chemical and plastics giants are supplying the MST/MEMS community. Having noted the neglect by the suppliers of large quantities for the high volume electronic industries, small companies started to develop customised material solutions for the MST/MEMS market. Their role in the supply chain and the description of further business opportunities make up the analysis in the report, supplemented with detailed material supplier information and profiles. The enablingMNT industry review on Suppliers of Materials for MST/MEMS Production has more than 100 pages, which includes 16 tables, 10 figures and 58 company profiles. The report is available at □ 280. [www.enablingmnt.com](http://www.enablingmnt.com)

### Innovative Multi-Site Wafer Level Reliability Test System is Introduced by SUSS

With integrated devices becoming increasingly complex, the need to ensure that every transistor will last over the IC's lifetime has become almost as important as testing the functionality of the device itself. Reliability tests stress the device over several hours or even days in order to simulate how the device would act under normal conditions throughout its expected lifetime.

[http://www.suss.com/main.php?rad\\_id=708](http://www.suss.com/main.php?rad_id=708)

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Next issue: **03 Dec 2004** (deadline for contributions: **01 Dec 2004**)

Please feel free to send us any DfMM-related news that might be of interest for our readership.

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This e-mail newsletter contains public information, only. Please feel free to distribute it to anyone who might be interested in the topics.

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