

## Networks, roadmaps and other activities to support DfMM

Patric Salomon, 4M2C

May-06

«Design for Micro & Nano Manufacture (NoE PATENT-DfMM)»  
 Network of Excellence funded by the European Commission (EC FP6: IST, Unit C2, Contract 507255)



## NEXUS objectives

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NEXUS – the European Microsystems Association

User-supplier Clubs

Methodology Working Groups, e.g.:


- Design Modelling Simulation (DMS)
- Reliability and Test



Industry driven independent Roadmapping & Market studies

New:


- Moving to a subscription based membership
- Moving Headquarters to Neuchatel, Switzerland
- Reinforce links to European national and regional networks

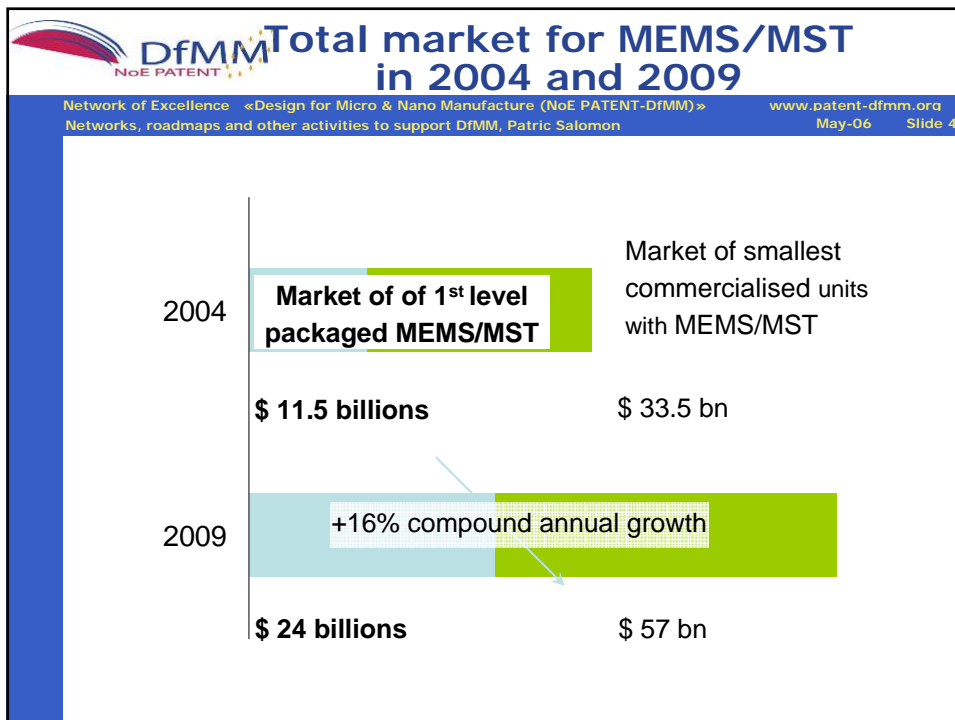


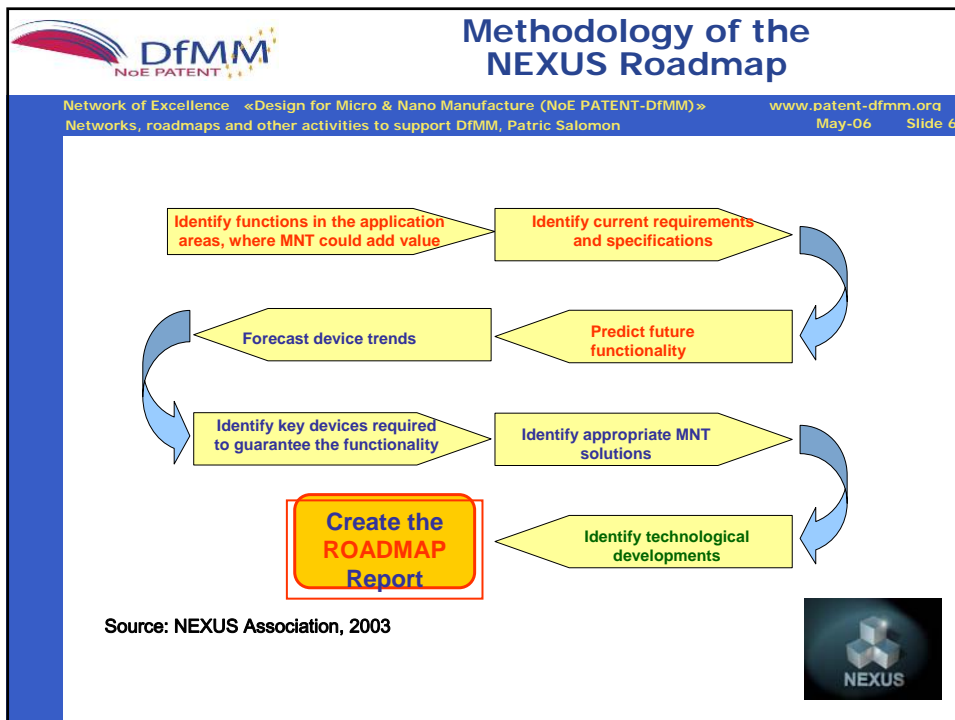
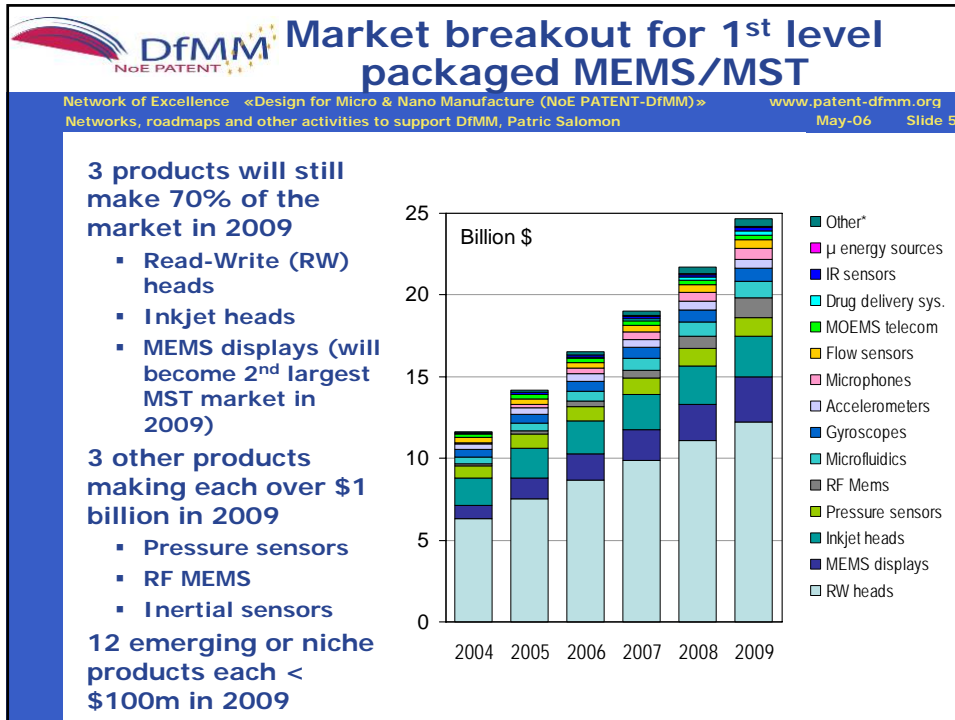
## The third NEXUS market report 2005

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- 7 new products
  - MEMS microphones – Micro energy sources
  - MEMS memories – Micro pumps
  - Wafer probes – Liquid lenses
  - Microreaction products
- 2 new application fields
  - Consumer electronics
  - Industrial process control
- Regional analysis
  - North America / Europe / Asia / ROW
- Detailed subcategories of application fields







**DfMM**  
NoE PATENT

## NoE Design for Micro & Nano Manufacture (PATENT-DfMM)

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To establish a new research community with critical mass in the field of Design for Micro & Nano - Manufacture through the integration of experts and infrastructure in Packaging, Reliability & Test Engineering, and Design to support the drive towards a predictable route from concept to product and dependability in application

**DfM** – yield enhancement, robustness, testability

**DfM** – part count, assembly process, design methodologies

Microelectronics

Manufacturing

MNT

**DfMM**  
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Objectives:

- Integrate European Research in DfMM
- Offer services to industry, especially to SMEs:
  - Research type services
  - Databases: Failure modes, packaging and test solutions, etc.
  - Consulting: Improvement of production processes, test, yield, reliability, etc.
  - Design services
  - Subsystem development
  - Training courses, education

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## NoE PATENT-DfMM Key Facts

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- Duration: 1 Jan 2004 – 31 Dec 2007
- EC Budget: 6.2 M€ (over 4 years)
- Partners: 24 (21 research, 3 commercial)
- People: 124 (99 researchers, 25 PhD)
- MB: 8 WP leaders + IAB chair
- IAB: 20 members

- Novel strategy for control of project financial allocations through an "internal call scheme"
- Focus on creating a new community and commercial services

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## Project Partners

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The slide displays a grid of logos for the project partners. The logos include:
 

- LANCASTER UNIVERSITY
- imec
- QinetiQ
- Tyndall National Institute
- LIRMM
- CCLRC
- LEUVEN
- Fraunhofer
- HERIOT WATT UNIVERSITY
- ITEM
- ENSERB
- ULg
- Leti
- Institute for System Level Integration
- WARSAW UNIVERSITY OF TECHNOLOGY
- DIPARTIMENTO DI INGEGNERIA STRUTTURALE
- Universiteit Twente de ondernemende universiteit
- Budapest University of Technology and Economics Department of Electron Devices
- Fraunhofer IMS



## Industry Advisory Board (IAB)

Network of Excellence «Design for Micro & Nano Manufacture (NoE PATENT-DfMM)»
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<p><b>Chairman:</b> Benedetto Vigna</p> <p><b>Members:</b>                  Gerold Schröpfer                  Jens Branebjerg                  Lars Voßkämper, Gilles Depeyrot                  Henne van Heeren                  Gert Anderson, Katrin Persson, Leif Bergstedt                  Ridha Hamza                  András Poppe                  Steve Riches                  Graham Peggs                  Kit Latham                  Markus Gabriel                  Christoph Gahn, Reinhard Neul                  Robert Aigner                  Andreas Menz                  Ayman El-Fatraty                  Felix Rudolf                  Job Elders                  Laurent Marchand                  Steve Prosser</p>	<p>ST Microelectronics</p> <p>Coventor</p> <p>DELTA</p> <p>Dolphin Integration</p> <p>EnablingM3</p> <p>IMEGO</p> <p>SoftMEMS</p> <p>MicRed</p> <p>MicroCircuit Engineering</p> <p>National Physical Laboratory</p> <p>Oxley Developments</p> <p>SUSS MicroTec</p> <p>Bosch</p> <p>Infineon</p> <p>Protron</p> <p>BAE Systems</p> <p>Colibrys</p> <p>C2V Concept to Volume</p> <p>European Space Agency</p> <p>TRW Automotive Electronics</p>
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The IAB is co-ordinated through Patric Salomon (WP7)



## Dissemination and Training

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Dissemination





Training



Design for Micro & Nano Manufacture (DfMM) Newsletter#2, 25 June 2004

In this edition:

- [News from the NoE Patent-DfMM](#)
- [Events/ Conferences, and Calls for Papers](#)
- [Other DfMM-related News](#)



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

Edited by: Patric Salomon, 4M2C PATRIC SALOMON GmbH, Germany





## Technology Roadmapping : Packaging of MEMS

20 April 2006

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May-06

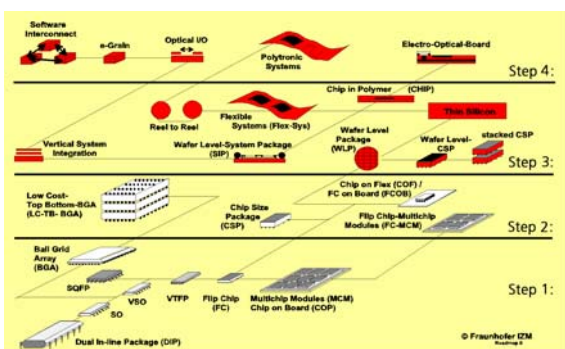
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## What has been done?


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- Existing relevant roadmaps: IZM, ITRS, NEXUS, MANCEF, MEMSTAND and various others from the internet
  - Few elements of technology roadmap for packaging of MEMS
  - But, some very good table formats (ITRS Roadmap)



© Fraunhofer IZM

Source: IZM



## Our approach

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### 1 - Constitution of High Level Challenges and Related Issues Table

- Questionnaires + PATENT deliverables
- 1<sup>st</sup> workshop (30 experts, half industrialists) at Heriot-Watt in February


Summary of issues	5 Years/More than 5 years	Priority (H / L)	RF / MEMS / Both
Reducing costs of packaging	M/L	H	Both
Integrating active and passive components	M	H	Both
Development/integration of new materials for higher resonant frequencies	M	H	Both
Techniques that allow in package tuning of RF devices	M	H	RF
Surface treatment of structures to prevent molecular absorption	SM	H	RF

### 2 – Constitution of Technology Requirements for selected Challenges

- Choice of a High-Level Challenges by WP4 experts
- 2<sup>nd</sup> workshop at Fraunhofer IZM on Thursday 08/06/2005

Requirement	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Low cost WLP	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Improvements in CAD/Modelling	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Improved reliability	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Future packages	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

### 3 – Write - up Roadmap



## Our approach: deliverable

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	Short term			Middle term				Long term		
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Market drivers										
Challenges metrics										
Package challenges										
R&D projects to tackle issues										
Enablers										

PATENT paper studies / Other Roadmapping session

Patterning capabilities for getters

standard for hermetic packaging for micro-cavities

Definitions of safety margins

Low cost WLP

Improvements in CAD/Modelling

Improved reliability

Future packages

Access to toe-dipping finance

Interviews IAB members

Access to commercial WLP service





## MEMS Industry Group, USA

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### METRIC, Pittsburgh, 12-14 Sept 2006

Topic: MEMS Integration into Systems

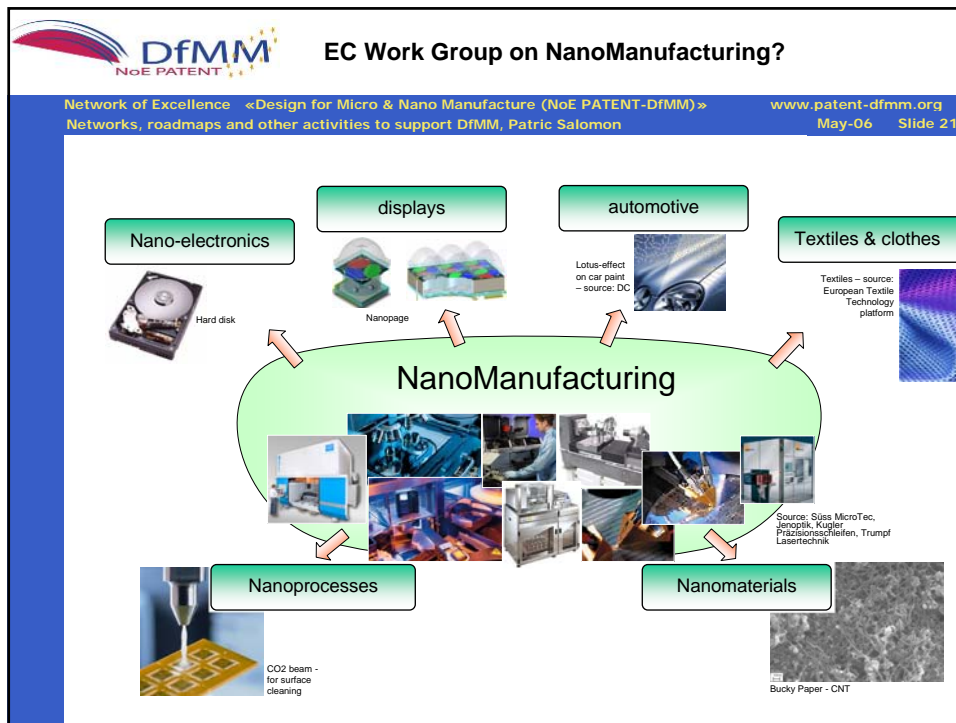
- includes a lot of „Design for Manufacture“ issues
- PATENT-DfMM is involved in work groups



## Events

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- DTIP Panel on „Design for Manufacture, Stresa, 27 Apr 2006
- Packaging Roadmapping Workshop, IZM Berlin, 8 June 2006
- International Mixed-Signals Testing Workshop - IMSTW, Edinburgh, 21-23 June 2006
- METRIC, Pittsburgh, 12-14 Sept 2006
- DfMM Summer School, Milan, 13-15 Sept 2006



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**Results of the Working Group NanoManufacturing**

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**Basis for “Vision and Strategic Research Agenda” of NanoManufacturing forum**

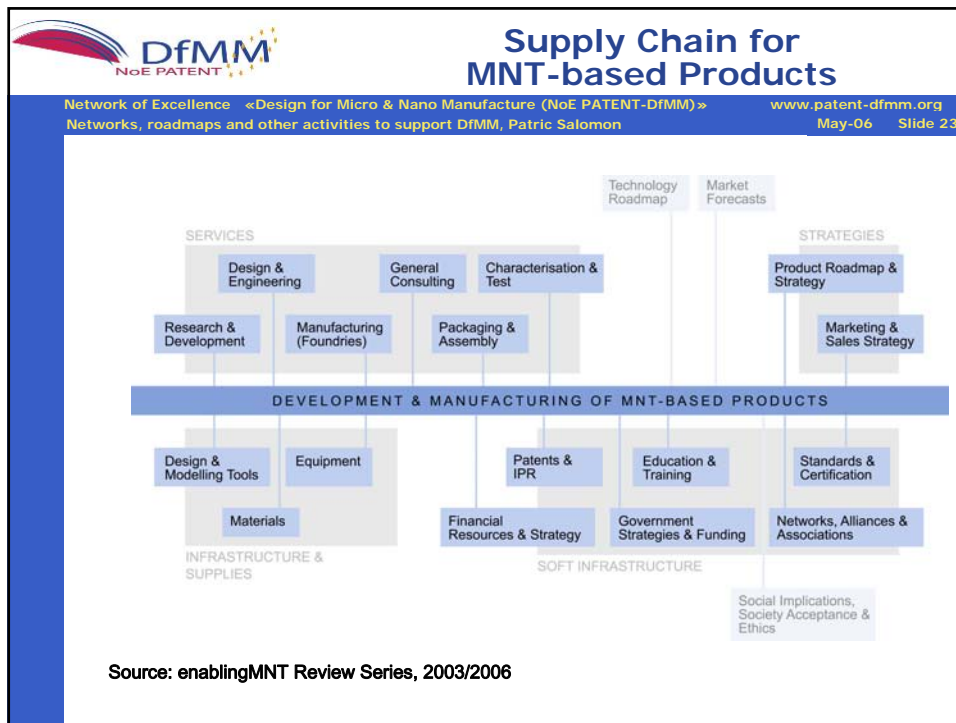
- Strategic paper Version 17th January (and working group documents)
- 1st Questionnaire and first evaluation Meeting 30th January 2006
- expert groups with 49 active and passive experts and 6 Coordinators
- statements to develop a vision and mission of the WG NanoManufacturing
- Draft for 1st Input 7th framework
- Thesis-paper (first draft)

**Members of the working group**

- 150 Persons (mailing list / member list)
- about 70 Companies, Organizations, Institutes
- networks and Projects are involved
- about 40 participants on every Meeting

**WEB:** [www.nanomanufacturing.eu](http://www.nanomanufacturing.eu)

**Work: ongoing! Contact: Patric Salomon, 4M2C/enablingMNT**



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- EC Technology Platforms**
- Network of Excellence «Design for Micro & Nano Manufacture (NoE PATENT-DfMM)» www.patent-dfmm.org  
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- Towards Framework Programme (FP) 7
- Smart Systems Integration – EPOSS
  - Manufacturing of the Future - Manufuture
  - Design for Manufacture?
    - Role of PATENT-DfMM, NEXUS
    - International/overseas links/networks: MEMS IG, MANCEF

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## International Networks

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**USER-SUPPLIER CLUBS**

USC Pharmaceutical	USC Instrumentation & Process Control	USC Medical devices
USC Peripherals & Multimedia	USC Aerospace & Geophysics	USC Automotive
USC Telecom.	USC Household & Appliances	USC NEMS Nanotechnology

**METHODOLOGY WORKING GROUPS**

MWG DMS Design & simulation	MWG Packaging Assembly & test	MWG Reliability
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**Strategic Role**

THE NEXUS Product-technology Roadmap for Microsystems

ROADMAP

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## Further Information

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**enablingMNT Industry Reviews:**

- MST/MEMS Foundries
- MST/MEMS Design & Engineering Companies
- MST/MEMS Packaging & Assembly Providers
- Manufacturing Equipment for MST/MEMS (front-end and back-end)
- Nanomanufacturing Equipment
- Test & Measurement Services & Equipment
- Processing Services
- Design and Modelling Tools

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