



## Design for Micro & Nano Manufacture (DfMM) News

web page: <http://www.patent-dfmm.org>

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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.

### Common RF MEMS Lab THALES/LETI - PATENT-DfMM work transferred to CEA-LETI

THALES and the French Atomic Energy Commission (CEA) have created last year a common research laboratory in the field of RF-MEMS. The objective of this co-operation is to achieve more critical mass through the merging of so far parallel efforts on this particular subject. Another objective is to optimise the use of expensive clean-room facilities required for this application field. CEA LETI presents an excellent partnership opportunity for THALES, in particular through the MINATEC technology platform in Grenoble which gathers more than 3000 people in the fields of micro-electronics, microsystems and nanotechnologies. The MINATEC program includes facilitating technology transfers to industry through various channels such as joint laboratories.

The Common Lab research staff is now entirely located at the CEA-Grenoble. For this reason, the Thales participation to the PATENT-DfMM project has been transferred to CEA-LETI. The main contact person for PATENT is now Didier Bloch, head of the MEMS Reliability Laboratory within LETI. Jean-Philippe Polizzi, previous representative for THALES and now personal of the common lab in Grenoble will remain active in the project.

The 9-member team of the Reliability Lab assists the specialists in design, process development, and packaging in order to develop reliable components. Electrical, Magnetic, and Surface Analysis specific test benches are designed and developed. Tests are performed by the experts of the lab, which allow determining the origin of the failure mechanisms in Microsystems (RF switches, FBARs, memories, magnetic MEMS...); and propose reliability models.

The complete press release is available at [www.leti.cea.fr](http://www.leti.cea.fr).

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### Support Project to SME Sandvik Osprey in use of Controlled Expansion Silicon / Aluminium Alloys for MEMS packaging

This work has been carried out by Lancaster University's Product Development Unit with a specific objective of assisting Sandvik Osprey enter the MEMS packaging market. Computational models capable of predicting the stresses involved in producing multiple layer assemblies from CE (Controlled expansion) Aluminium/Silicon alloys have been realised.

CE alloys are a product of Sandvik Osprey, and are manufactured by rapid solidification spray forming of Aluminium and Silicon. The effort required to produce these materials is considerable, however the properties of light weight, low Coefficient of Thermal Expansion (CTE) and good thermal conductivity are ideal for packaging of a range of high power electronics and MEMS technologies where heat dissipation and low expansion are required to protect components. However the brittleness and low CTE of the CE alloys becomes a problem when it is a requirement that they be joined to other materials.

Although at present steps have been taken, and progress has been made the analysis models produce results that conflict with the result of physical prototype manufacture. Before the extent of the disparity can be ascertained it will be necessary to compare the material properties used with a more complete set of values from the manufacturer.

All the tools developed to date are equally applicable to the new models that are needed. As a result progress can be made without time being spent reproducing existing work. Further progress will now rely heavily on the ability to characterise the as yet undefined, non linear, material properties such as thermal creep.

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### NEXUS Methodology Working Group "Reliability & Test" in co-operation with NoE PATENT-DfMM:

*Brainstorming/factfinding meeting on 6 Dec 2005, Paris*

The NEXUS Reliability & Test Methodology Working Group will be re-launched through PATENT-DfMM. Prior to a kick-off meeting (planned for Q1/2006) a brainstorming/factfinding workshop is planned in conjunction with the NEXUS meeting of EC-funded IP/NoE projects in Paris, 5-6 Dec 2005. The objectives of this meeting will be to gather recommendations and interest from the NEXUS members and EC-funded IP/NoE projects on how this MWG should run over the next years.

Main objectives proposed for the MWG:

- Create a venue where industry can share knowledge in reliability and test problems
- Create a venue where industry can discuss future trends and priorities
- Create an environment where industry can interact with the PATENT-DfMM database developments through requests for content and contributions to the content
- Provide an environment where industry can network and understand the reliability and test requirements of PATENT-DfMM services in particular
- Provide a central contact point for international links in the area of MNT reliability and test (MIG, MANCEF, SEMI, etc.)
- Provide a central point for the development and co-ordination of major new European initiatives in MEMS reliability and test

And possibly:

- Drive a roadmapping activity
  - Contribute to standardisation activities
  - Provide a central point for accessing training in reliability and test
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### Electrical only testing of MNT based systems

MNT based systems contain in most cases a transducer that interacts with a non-electrical quantity such as pressure, chemical, temperature, motion and electronics for processing. Testing of these devices hence requires the application of this "physical quantity" that is normally expensive and slow hence not practical for mass produced low cost devices. This project is investigating the potential for testing these devices using electrical only stimuli applied by either superimposing test stimuli onto the bias signal or modulating the biasing of the device. The work is being carried out by Lancaster University, LIRMM, Montpellier and Qinetiq. To date the technique has been applied to an electro-chemical sensor, a silicon accelerometer and a magnetosensor for embedded compass applications.

The initial phase of this work has now been published at European Test Symposium 2005, International Mixed Signal Test Workshop 2005. The next phase of the work will focus on accelerometers in collaboration with ST Microelectronics.

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