MNT measurement network
Winter 2006 Newsletter

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NPL acquires dynamic measurement capability

To support the metrology and dynamic characterisation of MEMS and other micro-structure devices as part of the CEMMNT project, NPL has added a Polytec MSA-400 micro systems analyser to its armoury of tools working in the micro and nano domain. NPL's new Polytec MSA-400 covers frequencies to 1 MHz and measures dynamic motion in both the out-of-plane (Z axis) and inplane (X-Y axes) directions. It is capable of measuring the frequency response of resonant devices (such as cantilevers, membranes, accelerometers, etc), as well as the time domain response of switches, actuators and other structures, displaying that response as still or animated deflection shapes for out of plane vibrations, or Bode plots with motion amplitude for lateral measurements. Data are easily taken, giving a fast indication of the overall frequency response of a structure, with deflection shapes quantifying the motion at the resonant and other frequencies. Such information is essential to check if design, manufacture and operation are correct for the device. The MSA-400 will also ensure that existing characterisation work on PZT and other active materials will also be enhanced and extended. The purchase of such a system shows NPL's commitment to supporting the emerging field of Microsystems and Nanotechnology and it is hoped that further work will ensure the development of calibration and certification techniques for the measurement of these challenging devices.

Please contact Markys Cain (markys.cain@npl.co.uk) for further information.

Nanometrology report published on Nanoforum.org

The Nanoforum.org project co-funded by the European Commission has recently published a summary report on the current developments in nanometrology. This interesting and informative document reviews the main European organisations that conduct metrology research and development. In later sections it also describes in some technical depth the analytical techniques and some of their

limitations and problems in analysis at the nanoscale. If you would like a copy of this report then please go to www.nanoforum.org

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Instrumentation and metrology for nanotechnology report published by NIST

In early 2004 NIST ran a 3 day workshop "Instrumentation and Metrology for Nanotechnology" under the US National Nanotechnology Initiative. Towards the end of last year NIST published the final version of the report details of which can be found at.

http://www.nano.gov/NNI_Instrumentation_Metrology_rpt.pdf

NPL addresses the metrology requirements of MEMS manufacturing

The MEMS sensor market is growing rapidly. However, the metrology that supports the fabrication of MEMS sensors is struggling to keep pace with the expanding limits of MEMS technology. With this in mind, Simon Reilly and Richard Leach of NPL's Length Group, aided by other teams across NPL, have compiled a report detailing the MEMS sensor industry's metrology needs and likely future requirements. Their report entitled 'Overview of MEMS sensors and the measurement requirements for their manufacture' gauges the metrological requirements of the MEMS sensor industry, reviews current MEMS manufacturing and metrology techniques, and highlights how metrology plays a role when manufacturing some of the key types of MEMS sensor (pressure, RF and microfluidic sensors, accelerometers and gyroscopes). The report details current measurement techniques used in MEMS manufacture such as profilometry, micro co-ordinate measuring machines, electron microscopy, optical microscopy, white light interferometry and laser Doppler velocimetry, and discusses their inherent limitations. Companies that contributed to the report included BAE Systems, Epigem, ETB, GE Sensing, Memsstar, QinetiQ, Rutherford Appleton Laboratory, STS and Tecan. Areas highlighted for future research include the measurement of · high aspect ratio microstructures, · sidewall roughness, form and parallelism, · wafer thickness, · hermeticity · development of a traceable infrastructure for vibrometry. NPL is now embarking on research and development projects that address the measurement areas highlighted by the report. The report has led to secondments, collaborative research projects and a new direction for the current National Measurement System Engineering Programme.

For further information and a copy of the report (NPL Report DEPC-EM-008) please contact Richard Leach (richard.leach@npl.co.uk).

Nanotechnology Standards update

There are currently many activities occurring at the National, European and International levels of standardisation. Discussions are ongoing for prospective new work items that can be developed to support industry and the regulatory aspects of nanotechnology. The main issue is to coordinate efforts globally to avoid confusion and duplication. There are already several committees whose work overlaps with ISO TC 229, CEN TC 352 and NTI/1 that deal with particulate standardisation. The UK also convened an important working group meeting for WG of ISO TC 229, Terminology and nomenclature. The UK is leading efforts in

this area with the introduction of a new ISO PAS work item proposal for ‘nanomaterial – terminologies’. Alongside these documents BSI will be producing rapidly developed UK Publicly Available Specifications (PAS) in the following areas; 1. Terminology for Medical and consumer applications of nanotechnologies 2. Terminology for The bio-nano interface 3. Terminology for Common Nanoscale Measurement Terms Including Instrumentation 4. Terminology for Carbon nanostructures 5. Terminology for Nanofabrication 6. Terminology for Nanomaterials

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NPL Involved with Nanostrand project to support EU policy

The National Physical Laboratory is involved in a Framework 6 Specific support action to develop a roadmap for nanostandardisation requirements across Europe. The consortium of 6 European organisations is led by Laboratoire National de Métrologie et d`Essais, LNE (FR). It is intended that the outputs of this work will contribute significantly to the workings of CEN TC 352 and inform the EC of important research needs for nanometrology in many areas including nanomaterials, bio and manufacturing. It is anticipated that the outputs will be delivered in the next 12 months.

Funding for Micro and Nanotechnology measurement technologies European Union Framework 7 Programme.

The European Commission in conjunction with the Members states are working towards the implementation of the Framework 7 Programme which started on the 1st January. The Framework programme is split into 4 specific programmes, cooperation, people, ideas and capacities with the majority of the money going to the cooperation programme. Within this programme there are 10 themes including ICT, Health and Nanotechnologies, Materials and Production processes. It has long been understood that metrology plays an important role in the development of new products and processes as recognised by the SMT programme in Framework 3 & 4. This work is now embedded into the main thematic areas and metrology and standardisation are mentioned many times in the European Union’s Nanosciences and nanotechnologies action plan. It is forecast that instrumentation and metrology RTD will be required to support the development of new nanofabrication lines, nano(eco)toxicology and the expansion of nanoparticulate industrialisation.

For further announcements and the latest information on EC funding please check the UK FP7 website. on - http://fp6uk.ost.gov.uk/fp7/Default.aspx and the EC Cordis website for all the documents and procedures required (http://www.cordis.lu/fp7)

Joint UKSAF/MNT Measurement club meeting, Newcastle

The joint meeting between the UK Suface Analysis Forum and the MNT Measurement club was held on the 9th and 10th of January. The first day was a workshop on new software developments for analytical software which was very well recieved by the audience. On the second day, more in depth talks were given on the latest developments including XPS, ToF-SIMS and nanoindentation. For a full report of the meeting please visit the MNT Measurement Club website.

Please follow the link

The 11th International Conference on Metrology and Properties of Engineering Surfaces, Huddersfield

This conference will focus on the progress in surface metrology, surface characterisation instrumentation and properties of engineering surfaces. It will provide an international forum for academics, industrialists and engineers from different disciplines to meet and exchange their ideas, results and latest research. The scientific themes include:- Surface Micro and Nano Metrology Measurement and Instrumentation Metrology for MST Devices Free Form Surface Measurement and Characterisation Uncertainty, Traceability and Calibration AFM / SPM Metrology Tribology and Wear Phenomena Functional Applications including Biotechnology Data Storage Automotive Surfaces Keynote speeches by Prof. T. R. Thomas (Chalmers University, Sweden) Prof. D. J. Whitehouse (University of Warwick, UK) 40 papers from worldwide researchers together with exhibition and workshops.

For further information please click here

International Events

- 7th International euspen Conference 20 - 24 May 2007, Bremen, Germany
- Transducers 07 & Eurosensors XXI 10 - 14 June 2007, Lyon , France
- EuroNanoforum 2007, June 19 - 21, 2007, CCD Düsseldorf, Germany
- 8th International Symposium on Measurement Technology and Intelligent Instruments, September 25-27, Sendai, Japan
- IMEKO2, Centro Nacional de Metrología (CENAM), Mexico

We value your feedback and are happy to talk to members individually about specific MNT related issues. If you have any suggestions, or if you would like to submit an article for the next newsletter please get in touch with the Club Manager, James Johnstone (james.johnstone@npl.co.uk).