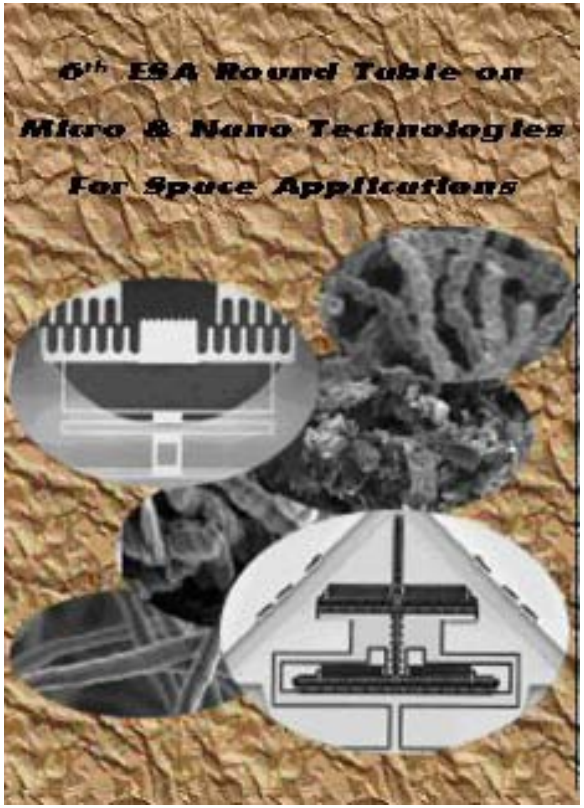
6th ESA Micro & Nano Technologies Round Table
ESTEC, Noordwijk, The Netherlands
8-12 October 2007



Conclusion
&
Closure

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The 6th ESA MNT in figures

- 1st Round Table in March 1995
- 2nd Round Table in October 1997
- 3rd Round Table in May 2000
- 4th Round Table in May 2003
- 5th Round Table in October 2005
- *6th ESA MNR Round Table 8-12 October 2007:*
  - More than 100 Abstracts submitted (70 in 2005)
  - 20 countries participating (Netherlands, Switzerland, France, Denmark, Italy, Spain, Germany, Portugal, UK, China, USA, Belgium, Sweden, Greece, Norway, Finland, Austria, Canada, Poland, US) (16 in 2005)
  - 4 complete days, 15 sessions including two complete session for Nano-Technologies (3 days and 11 sessions, only 1 for nano in 2005)
  - 220 registrations (10% increase from 2005)

Main Technological Feed-Backs

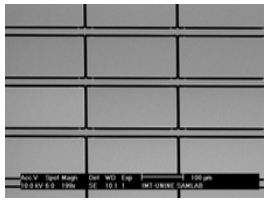
Micro-Propulsion:

- Technology is “matured” (TNO, Nanospace, Pressens,..)
- Mission Enabler for formation flying and accurate pointing (Prisma, GAIA,…)
- Flight opportunities identified for demonstration (Prisma, Delfi C3, Nano Rubin,…) even for mission

RF MEMS:

- Better understanding of RF MEMS reliability issues (ENDORFINS, LAAS & CNES presentations…)
- Innovative solutions presented for longer lifetime (dielectricless switches)
- Demonstrator are being prepared and tested on ground

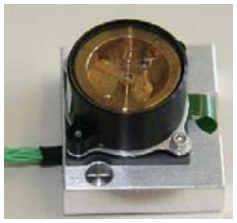
MOEMS:



- Trend toward a certain level of European non dependence, development of technologies in Europe for micro-shutters, micro mirrors and diffraction gratings (LAM, Sercalo, IMT, CSEM)

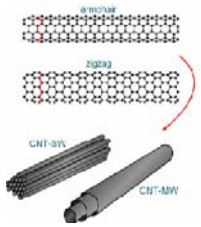
Main Technological Feed-Backs

AOCS:



- New potential players declared interest in the space market especially for MEMS accelerometers (Colybris, ST Microelectronics)
- Items referenced in the dossier but not yet covered by ESA programmes were presented (i.e reaction wheels)

Nanotechnologies:



- Rapidly emerging especially for CNTs and CNFs where SMEs are already active and can make business
- Cooperation ESA-EC to be re-inforced in this domain

General observations

- New trend for micro-systems integration, basic component ready and merging several MEMS functions on a single chip is now reported (was not the case in 2005)
- SMEs are now taking over from academic development (spining off has taken place)
- Technology is here (hardware, small series available) but not yet TRL (present TRL is 2-3 in general) and qualification effort are still required
- Main concern today is lack of qualification procedures and methodologies (In 2005 was still reliability and packaging)

General observations

- **Support from Space Agencies for " transfer & industrialisation" of the MEMS technologies is limited**
- **A number of national initiatives for technology demonstrator were reported as failed.**
- **Number of national initiatives is increasing which would definitively benefit from increased european synergy**

Conclusion & perspectives

- **Spin off companies are being started but there is still a lack of spin-in, clustering with non-space domains (automotive, military…) has to improve**
- **Awareness of Space Agencies Technical Officers is key to success, exchange of information between MNT and space communities has to be permanent**
- **Immersion of space actors specialists in European MNT Technical Network (ENIAC, EUFANET, etc) and European national Initiatives is essential**
- **The ESA MNT Conference should be complemented with regular " Info-days" 2 to 3 times a year with specific topics and targeted audience**
- **Networking needs to be intensified within Europe**

Conclusion & perspectives

- **Previous session shows that MNT confirm their role as Mission Enablers for scientific missions**
- **The MNT dossier is a first step for ESA MNT policy and strategy**
- **Next stage is to consolidate the roadmaps into MNT strategy paper for ESA member states approval**
- **NEOMEX is a first initiative but not the last one, brainstorming is already taking place for defining follow on projects**
- **NEWPRO with IOD, Spin-In, Technology Ruptureand non-dependence initiatives will be the Agency tools to turn strategy into flight hardware and mission enablers**

ESA Missions Timeline

MEMS rate sensor

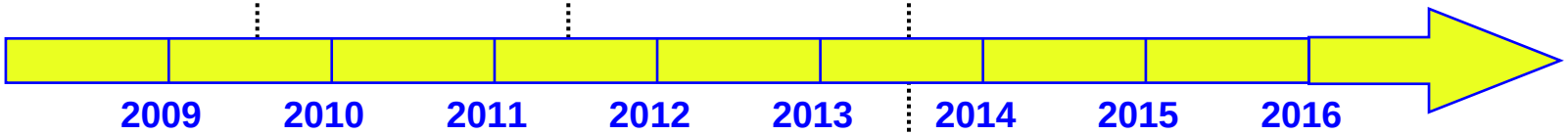
Cryosat 2

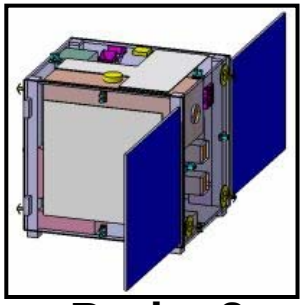
Cold gas µ-propulsion and MEMS flow sensor

Gaia

MEMS µ-shutter array on NIRSpec

James Web Space Telescope



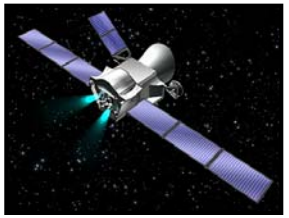


Proba 3

MEMS-based µ-propulsion

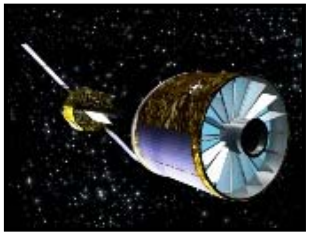
Exomars

MEMS accelerometer



Bepi-Colombo

MEMS bolometer



XEUS

Cooled µ-calorimeter array