

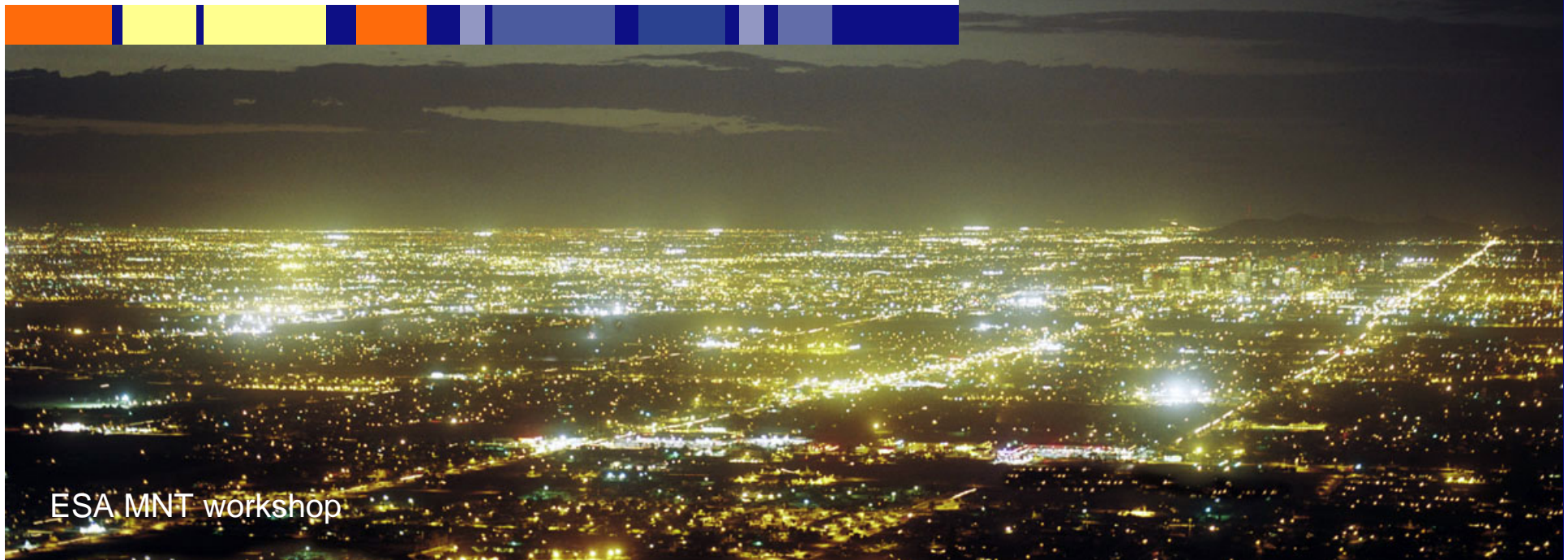
Micro Sensors

Autonomous sensors at their best

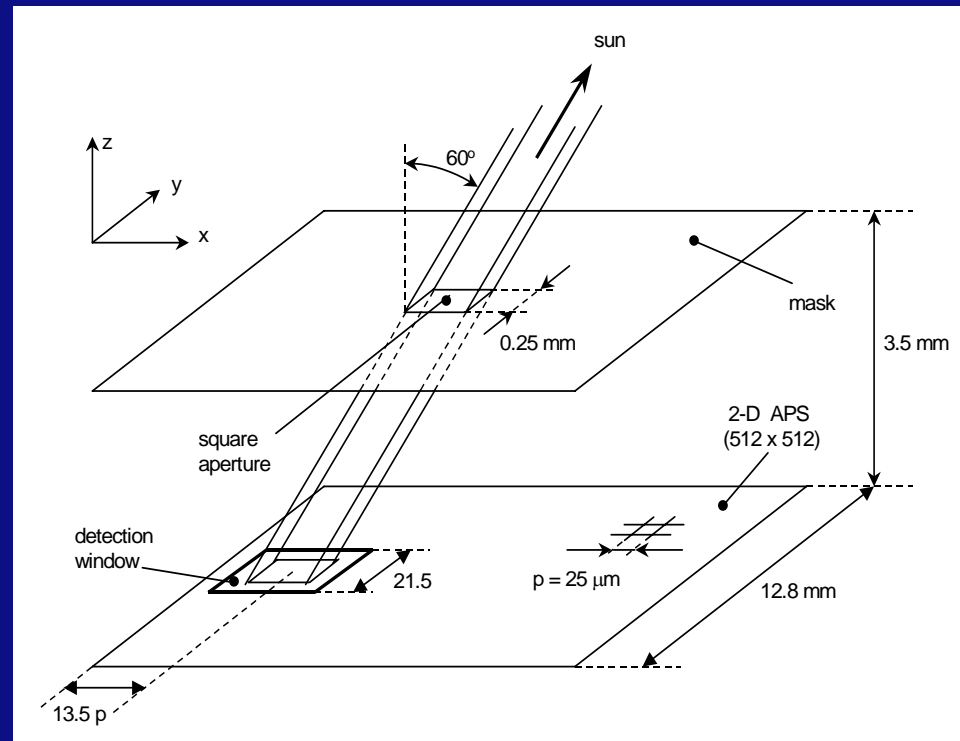
TNO | Knowledge for business



ESA MNT workshop

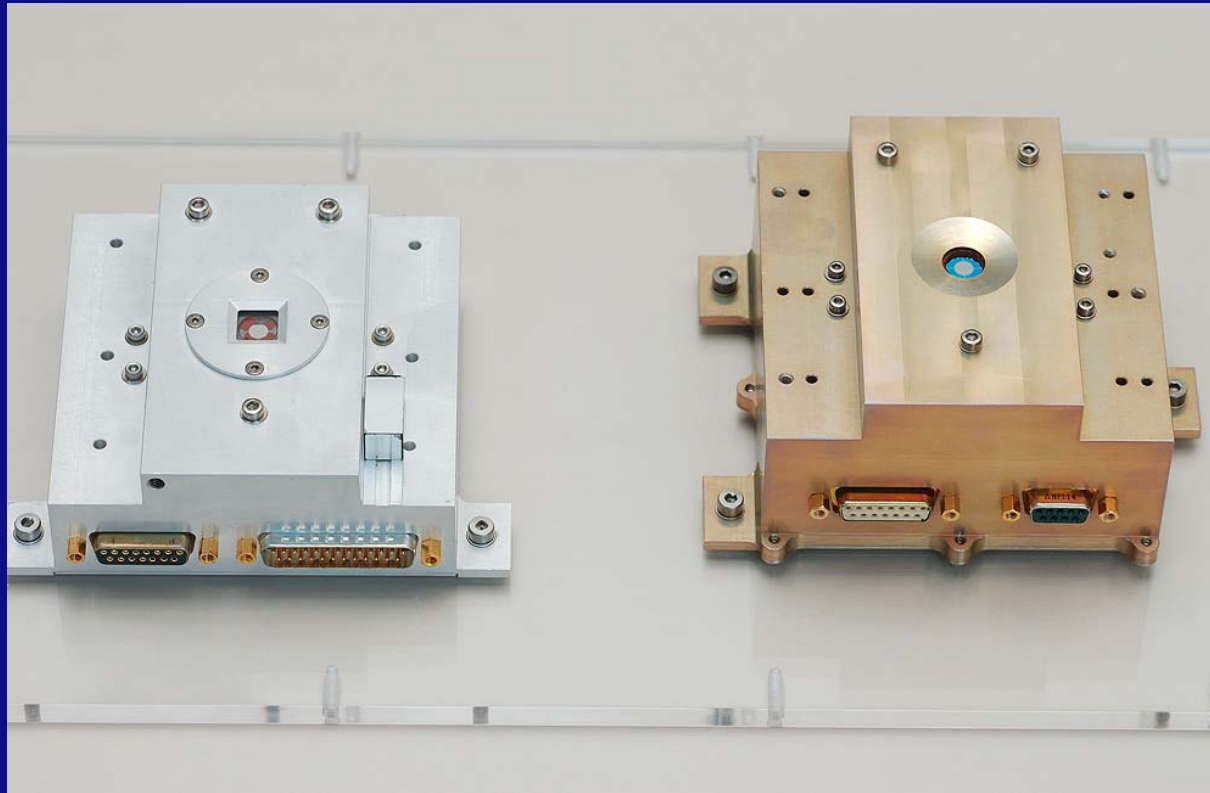


Most sunsensors use the same principle



Typical measures for digital sunsensor

Conventional technology leads to robust and flexible systems



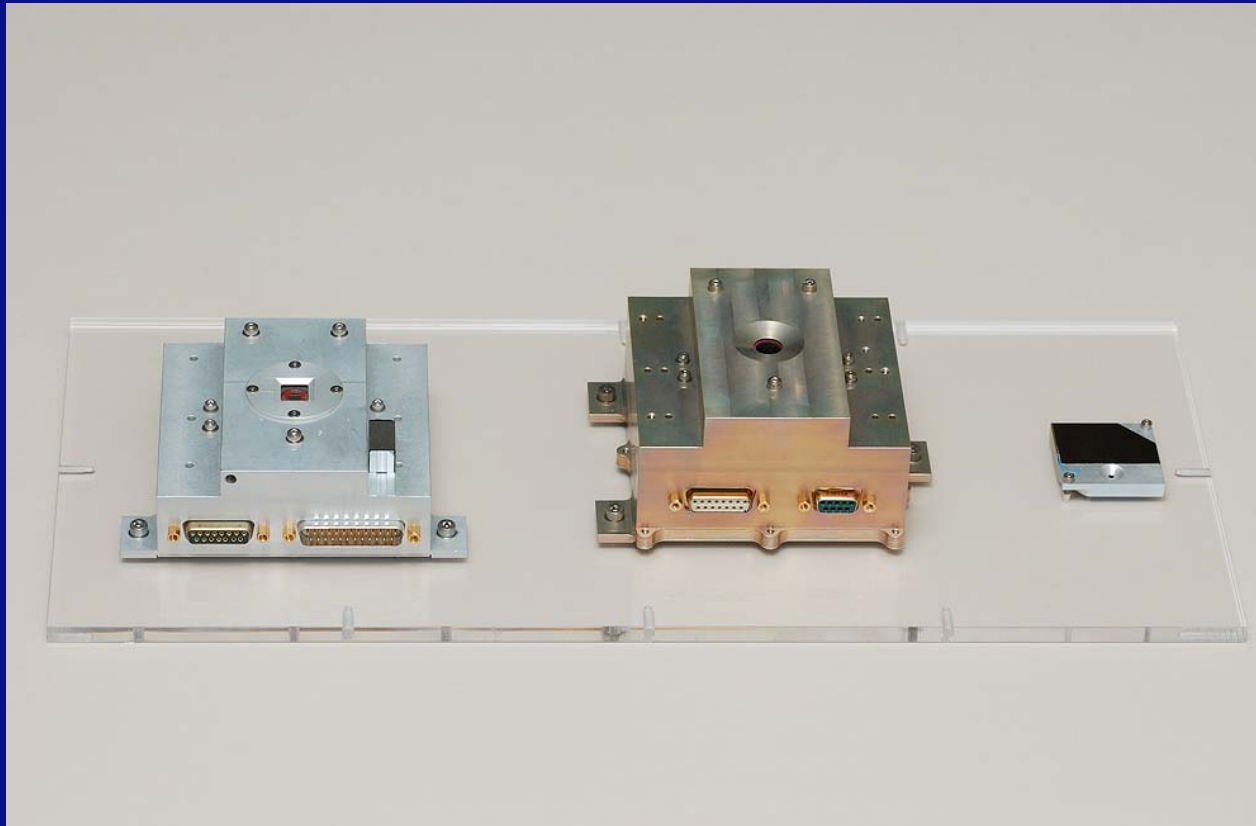
DSS-EQM

DSS-PFM

Many stringent requirements

- Vacuum compatibility
- Mechanical loads during transportation and launch
- Thermal cycling
- Cosmic radiation
- Electro Magnetic Compatibility (EMC)
- Power consumption
- Reliability
- Stability
- Accuracy

MST enables massive shrinkage with minimum loss of performance



Three generations of digital sunsensors

Some typical MST technologies are needed to achieve this:

- Bulk micromachining
 - Isotropic etching
 - Anisotropic etching
- Surface micromachining
- Wafer to wafer bonding

Even more general technologies are required:

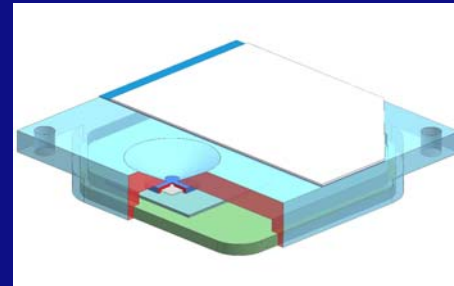
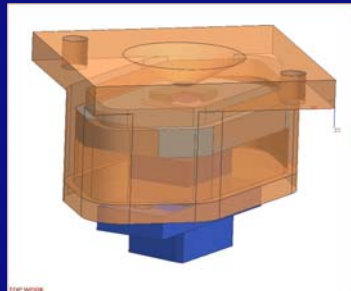
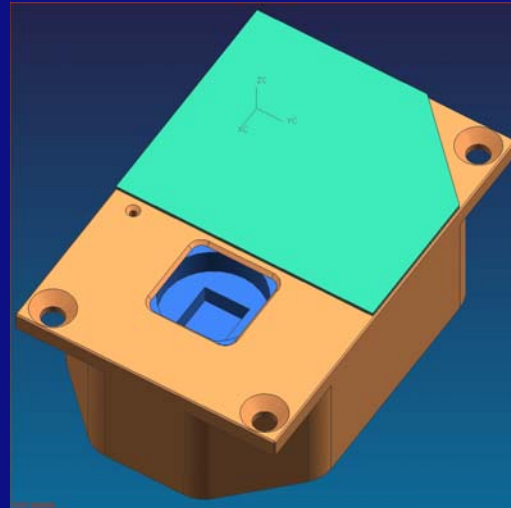
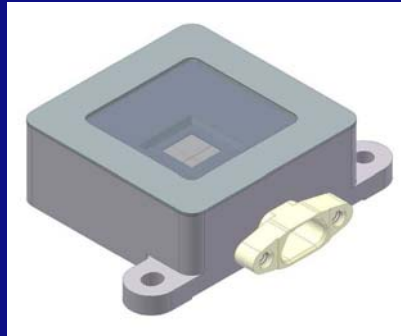
- Low power mixed signal ASIC
- Energy scavenging
- Mitigation of CTE mismatch effects
- Low temperature co-fired ceramics (LTCC)
- System in a package
- Low power RF communications

- Power over data
- Micro power generation

Some system drivers:

- Power consumption
 - Size of power generator
 - Cooling requirements/temperature rise
- Autonomy
- Performance required
- Minimum required flexibility

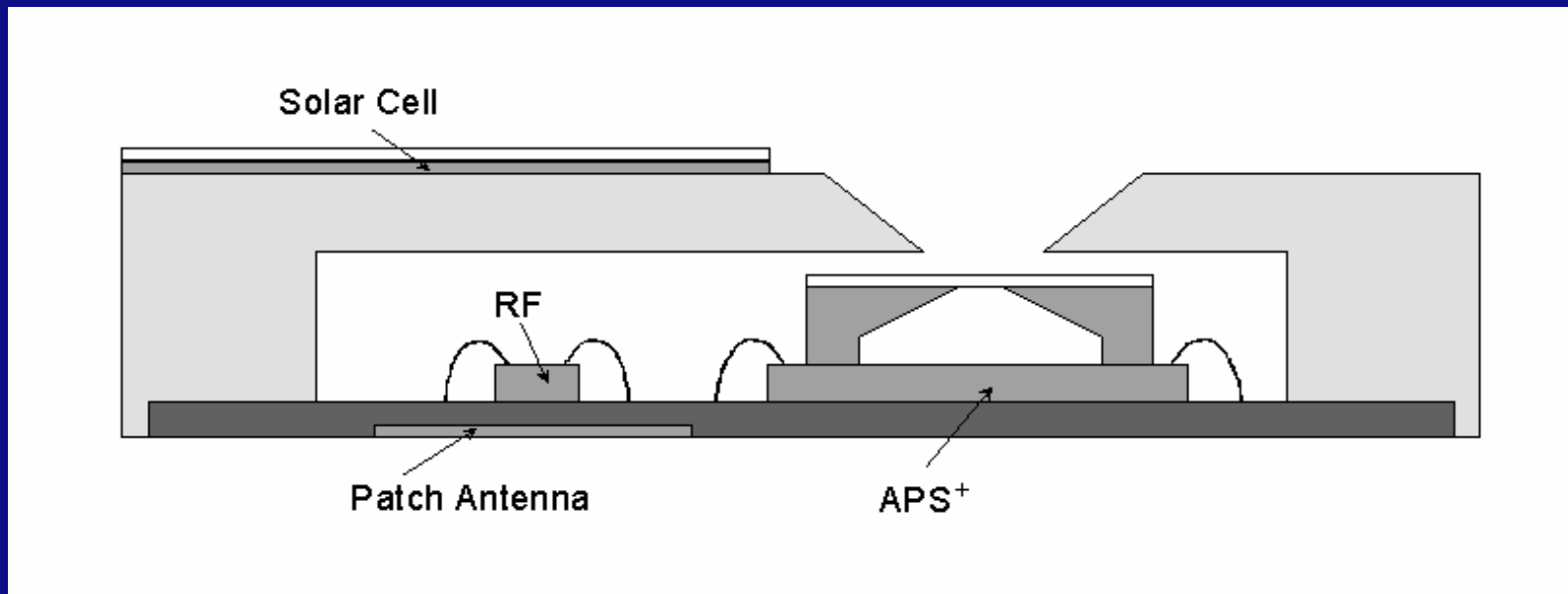
Final systems small and robust with or without connector



Systems will have some core properties.

- Multi chip approach
 - High costs for ASIC developments
 - Minimum changes will always be required to adapt to different systems
- Power supply most crucial
- Single base material sensor core
- Low mass
- Small size
- Mechanically robust
- Semi COTS

Size determined by relative spacing and I/O



Autonomous wireless sunsensor (AWSS) will be flown on Delfi-C3

- Cubesat mission from Technical University of Delft.
- Educational goals
- Amateur radio relay
- Demonstrator for flexible solarcells and wireless sunsensor in cooperation with Dutch Space and TNO
- Scheduled to fly end of 2006



Micro digital sunsensor will be developed in frame of microned

- Dutch technology development program.
- Demonstration of applicability for micro systems technology
- Educational goals but in close cooperation with industrial partners
- Scheduled to fly 2010



Conclusions

- Micro systems technology enables the design and production of small sensor systems. (not only sensors)
- Large up front costs for ASIC design are required
- Flexibility of application for the sensor core should be considered.
- Delfi-C3 is a welcome precursor mission to qualify autonomous operation and some manufacturing aspects
- Microned is main sponsor for the micro digital sunsensor development activities.
- Once the base technologies are mastered, several other products can be developed.(not limited to sunsensors)



Thank you for your
attention.

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