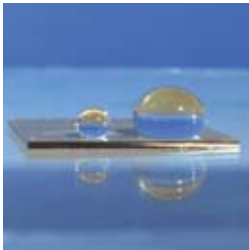
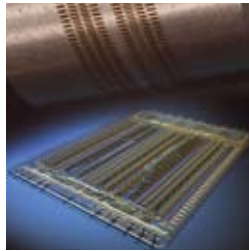
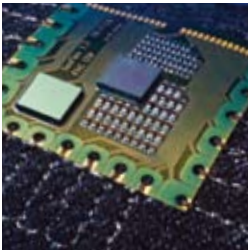
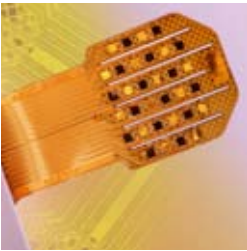
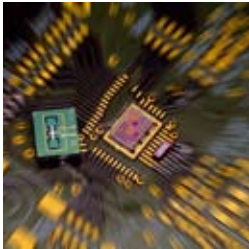


# Heterogeneous Technology Alliance

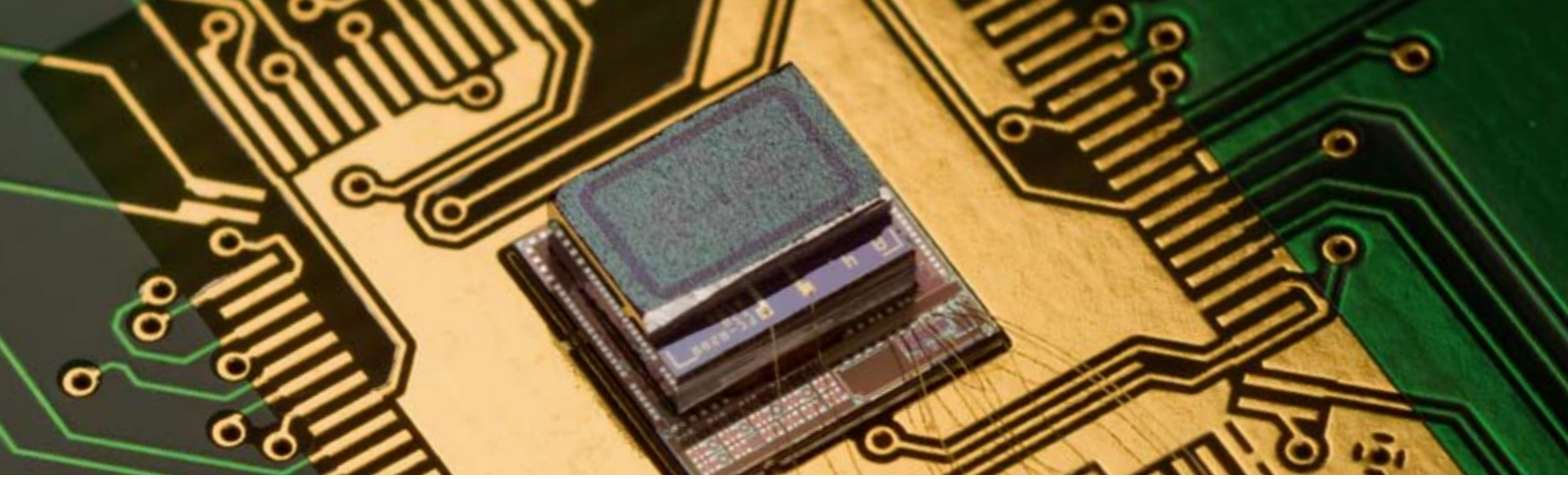


csem



 **Fraunhofer**  
MIKROELEKTRONIK

energie atomique • énergies alternatives  
**leti** **liten**



Europe is leading in the field of microsystem technologies both in research and industrial development. To strengthen this position four major European research institutes are linking their expertise and facilities. The objective is to meet the general trend of increasing complexity and multidisciplinary for a variety of different branches of the industry.

The HTA partners — CEA (France), FhG (Germany), CSEM (Switzerland) and VTT (Finland) — have concluded an agreement to join their competences. They will carry out joint research projects to create innovative solutions for the European industry.

Our scientific and technological skills as well as our infrastructure are devoted to the development of new products for the benefit of European economy.

**Centre Suisse d'Electronique et de Microtechnique SA**

CSEM, Centre Suisse d'Electronique et de Microtechnique (Swiss Center for Electronics and Microtechnology), founded in 1984, is a private research and development center, specialized in micro- and nanotechnologies, microelectronics, systems engineering and communications technologies. It offers its customers and industry partners tailor-made innovative solutions based on its technological expertise from applied research.

Approximately 400 highly qualified and specialized employees from various scientific and technical disciplines work for CSEM in Neuchâtel and the four regional centers in Zurich, Alpnach, Basel and Landquart.

**Commissariat à l'Energie Atomique et aux Energies Alternatives**

CEA (alternative energies and atomic energy commission) is a French government-funded technological research organisation with 15,000 professionals involved in research, development and innovation. CEA is active in three main fields: energy, information and health technologies, and defense and national security. In Grenoble CEA provides world-class R&D for both public and industrial clients through the activities of more than 1,600 researchers and engineers at Leti in micro and nanotechnologies and 700 at Liten in the fields of new and renewable energies.

**VTT Technical Research Centre of Finland**

VTT is a globally networked multitechnological contract research organization. VTT provides high-end technology solutions and innovation services. Our aim is to increase the competitiveness of our customers' position, promote the creation of new business, and improve and speed up the productivity of R&D.

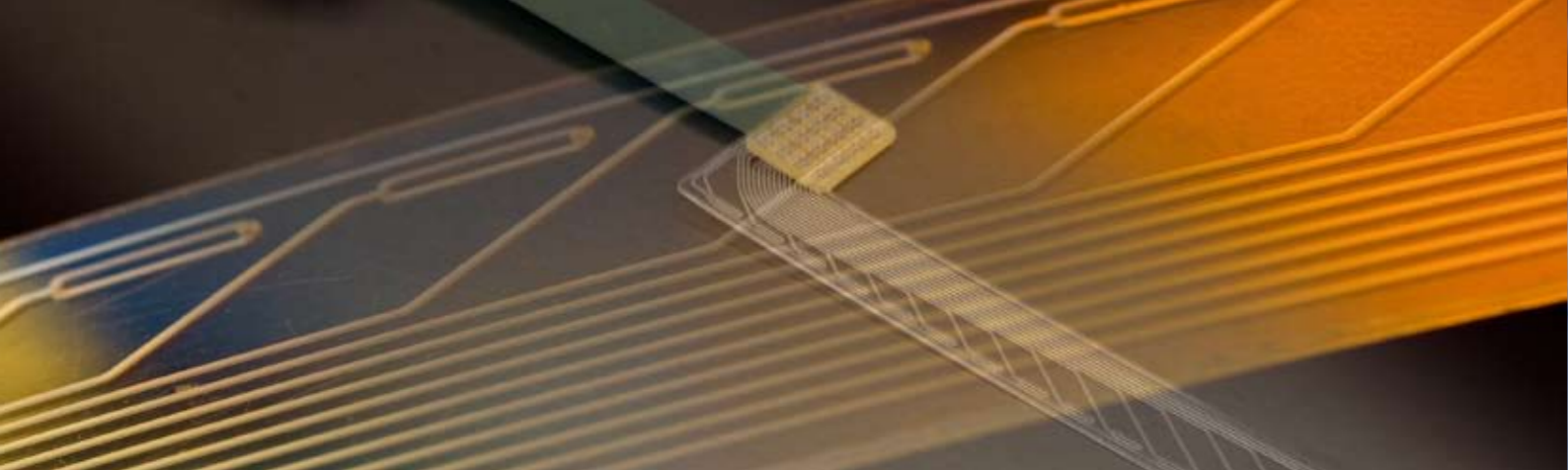
VTT offers access to the cross-disciplinary expertise of 2,900 professionals, unique research infrastructure, and comprehensive partnership networks. Approximately 300 VTT experts are specialized in microsystems and microelectronics. Our other technological focus areas are applied materials, bio- and chemical processes, energy, ICT, industrial systems, services and the built environment, and business research.

**Fraunhofer Group for Microelectronics**

The Fraunhofer-Gesellschaft with its approximately 17,000 employees is one of the leading European institutions for contract and advanced research. Its Fraunhofer Group for Microelectronics VμE brings together the activities of fifteen institutes working in the fields of micro- and nanoelectronics and microsystems. Strongly industry driven, more than 2,700 employees are working on the development and implementation of innovative concepts of miniaturized, highly integrated micro systems. Thus Fraunhofer VμE bridges the gap between semiconductor technologies and its applications. The focus is on creating new technical solutions for advanced systems integration, design and process technologies. Additionally, interdisciplinary research projects are prepared and coordinated, studies conducted and strategies identified.







## Enabling Technologies & Integration

## Market-oriented Research



### Creating economic value from research knowledge

In terms of technology, future microelectronics and microsystems are distinguished by extreme miniaturization and significant cost-reduction while addressing environmental concerns. In terms of implementation, assembly, interconnection and packaging technology will largely determine the functionality, quality and cost of future systems.

### The Heterogeneous Technology Alliance HTA

The HTA masters the entire value chain from applied research to production, including modeling, simulation, design and system engineering.

#### Silicon and related CMOS technologies

- ▶ Nanoelectronics down to sub 35 nm
- ▶ Low-power and low voltage SoC
- ▶ 300 mm CMOS facilities

#### Silicon and non-silicon microsystems technologies

- ▶ Functional thin films
- ▶ Optoelectronics
- ▶ MEMS and MOEMS, including magnetic RF and bio

#### Organic electronic technologies

- ▶ Organic CMOS
- ▶ OLED integration on CMOS
- ▶ Organic photovoltaics

#### Nanotechnology

- ▶ Nanomaterials and nanopowders
- ▶ Surface structuring and nanopatterning
- ▶ Nanophotonics
- ▶ Nanotools
- ▶ Nanocharacterization

#### Back-end, assembly and packaging

- ▶ System integration at wafer, chip and board level
- ▶ 3D-packaging, high density interconnects, embedded components
- ▶ MEMS assembly and packaging, including RF-packaging, photonics and flexible systems (SiP)
- ▶ Reliability analysis
- ▶ Thermomechanical simulation
- ▶ Thermal management

#### Photonics

- ▶ Optical elements, sensors and actuator devices and systems
- ▶ Lighting, high brightness LED
- ▶ Detectors
- ▶ Vision sensing, visible and IR

#### Mechatronics and robotics

- ▶ Flexible structures and mechanisms
- ▶ Microhandling
- ▶ Object-driven robotics
- ▶ Control algorithms

#### Bio and medical technologies

- ▶ Biosensors
- ▶ Biochips and lab-on-chip
- ▶ Microfluidic devices
- ▶ Monitoring systems

#### Smart power systems

- ▶ Microbatteries and supercapacitors, wafer level batteries
- ▶ Micro fuel cells technology
- ▶ Thermoelectricity
- ▶ Embedded micropower sources
- ▶ Converters for energy harvesting
- ▶ Power electronics management
- ▶ Ultra low power electronics design
- ▶ Signal processing

### Market & applications

The core competences are combined in the fields of automotive, healthcare & wellness, information & communication, building control & home automation, environment, security, consumer, aeronautics & space and industrial process control. Backed by a 200 mm MEMS production line at CEA-Leti in Grenoble, the CSEM-MEMS facilities in Neuchatel, a pilot line for organic devices and a MOEMS- production line at Fraunhofer IPMS in Dresden, and a packaging line at Fraunhofer IZM in Berlin, MEMS sensor and RF MEMS processes on 150 mm wafers at VTT, the HTA represents a comprehensive technology platform. It develops and produces all types of MEMS devices, including those using CMOS ICs as a backplane. It also integrates all these heterogeneous technologies into a single package or even a single chip. The combination of the technological infrastructure of all four institutions enables the HTA to act as a one-stop shop for complete system solutions:

#### Automotive

- ▶ Electronics (silicon, polymers)
- ▶ Fuel cells and batteries
- ▶ Lighting
- ▶ MEMS: pressure, acceleration, gyro, encoder
- ▶ Imagers and vision sensors
- ▶ Man machine interface
- ▶ Head up projection displays
- ▶ Power control

#### Healthcare

- ▶ Lab-on-chip, biosensing, dispensing and diagnosis
- ▶ Implantable devices
- ▶ Non-invasive monitoring
- ▶ Wearable electronics
- ▶ Vital data monitoring
- ▶ Medical imaging
- ▶ Brain-computer interface

#### Information & communication

- ▶ Optical communications (design, devices, etc.)
- ▶ Micropower sources
- ▶ Data storage
- ▶ Wireless (protocols, design, simulation, etc.)
- ▶ Portable electronics

#### Building control & home automation

- ▶ Solar cells
- ▶ Smart sensors
- ▶ RF links and sensor network
- ▶ Energy saving

#### Security

- ▶ Authentication and anti-forgery
- ▶ Smart RFID
- ▶ Vision sensors
- ▶ Terahertz imaging

#### Consumer

- ▶ Nomadic devices
- ▶ Multimedia
- ▶ OLED displays and highly miniaturized mobile displays
- ▶ Sport and wellness

#### Aeronautics & space

- ▶ Mechatronics
- ▶ Scientific instrumentation
- ▶ Communication

#### Industrial process control

- ▶ Sensor systems solutions
- ▶ Chemical sensors
- ▶ Process analytical tools

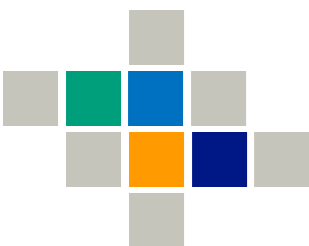
#### Environmental control and monitoring

- ▶ Autonomous sensor network (ASN)
- ▶ Clean processing : sustainable electronics, ecological and economical analysis of processes



## Cooperation

## Contact



Cooperation is generally done by defining joint focal areas of research and through joint projects. This method of working enables the cooperating institutes to offer their customers, in particular innovative small and medium-sized firms, access to cutting-edge research and developments in applications at an extremely early stage, thus giving them a distinct competitive advantage.

The HTA-partners act as key partners for the world of industry, large groups as well as SMEs, with several hundred contracts in progress. They have launched a variety of start-up companies.

A main goal of HTA is to develop partnerships with the European and global industry using powerful working tools such as technological platforms intended to facilitate the transfer of technologies towards the industry.

The format of cooperation ranges from feasibility studies or training courses to technology and process development, the solution to questions related to environment and reliability or the special manufacturing of demonstrators and prototypes.

The HTA platform will fulfill the pre-industrial research requirements but it will also be able to produce prototypes and small series, to optimize designs and processes in an iterative way by technology mixing.

The HTA-partners appreciate the support from local and federal authorities as well as from the European Commission.



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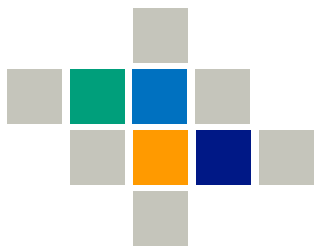
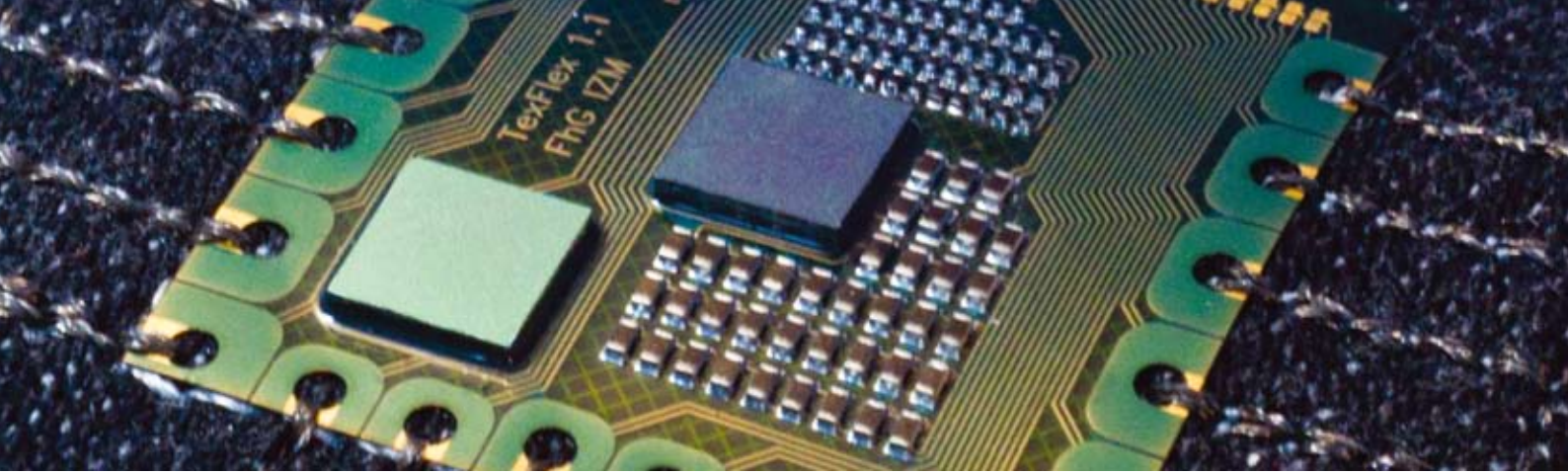
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