Collection of projects posters

EURIPIDES²

European Smart Electronic Systems

EUREKA

Acknowledgments:

This booklet would not have been possible without the support of partners involved in EURIPIDES² projects.
Special thanks goes to all projects managers.

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Design, graphics and lay out : amm design - contact@amm-design.net

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Executive summary

Jean-Luc Maté - EURIPIDES² Chairman

> *"Electronics is an "enabling" technology and a "propulsive" sector directly contributing to at least 10% of the World GDP.*

Electronics is an "enabling" technology and a "propulsive" sector directly contributing to at least 10% of the World GDP. **The electronics industry today employs about 2.5 million people in Europe.** This very large industry will grow nearly twice as fast, during the coming years, as the total world GDP.

Europe has a strong position in professional "embedded" electronic systems. This position rests on European excellence in a number of industrial leaders, such as high performing technology for aerospace, defence, transport and high technology with best cost due to high volume in automotive, industrial engineering, machinery and energy. This is a two-way synergetic relationship ; **European excellence in embedded systems also consolidates the position of the downstream incorporating industries.**

Today European industry has the opportunity to acquire strong initial positions by targeting the new markets for heterogeneous electronic product integration, smart sensors and power electronics, **enmeshed and implanted systems.** This is where the value added by the positioning of European industry and its know-how are the greatest. Europe must from the start become a major player in these revolutionary new markets.

This virtuous innovation cycle and value chain must be maintained and developed. The EURIPIDES² cluster aims to support cooperative industrial research in Europe in the crucial domain of **smart electronic systems integration**. EURIPIDES² will focus on research and development close to actual applications and marketable products that could be manufactured in Europe with competitive prices. This involves exploiting the complementarities of all the different players in the electronics scene, such as academia, SMEs, large companies, integrating companies and end-users, as partners in cooperative projects.

The heterogeneous character of the EURIPIDES² ecosystem, and of the EURIPIDES² projects partners, echoes the concept of heterogeneous electronic integration and smart electronic system integration. Maintaining and developing the strength of European industry in the field of advanced technology and production, and as a consequence, to boost employment and growth in Europe is also the ultimate objective of EURIPIDES².

The EURIPIDES² ecosystem covers activities that range all the way up the electronic systems integration value chain, from materials, equipment and technologies, through components, modules, up to embedded, mechatronics, enmeshed and implanted systems. **In 2012, these activities involve about 1.7 million employees in Europe, out of the 2.5 million employed in all the European electronics industry.**

By the end of the current decade, in 2020, the players in the EURIPIDES² domain could provide about 700 000 new jobs. Naturally all these new jobs are not only the result of the action of EURIPIDES² and its members. But in an industry where technology and innovation play a key role, supporting research and development, international cooperation and harmonisation, and the position of SMEs is a crucial factor of growth. **In this way EURIPIDES² cooperative R&D projects have a direct impact on employment and economic growth in Europe.**

EURIPIDES² Vision: European Leadership in Smart Electronic Systems Integration design development and manufacturing

This is a global strategy to set up a virtuous cycle of R&D-innovation-manufacturing in Europe, focussed on the fields where European industry is powerful. A strong leading-edge European capability will have the greatest downstream impact on incorporating industries or in every new domain where market positions are still to be established.

EURIPIDES² Mission: Innovation hub for smart sensors, smart power modules and more generally heterogeneous electronic product integration for all leading industry sectors in Europe

EURIPIDES² Strategy:

- Focus on heterogeneous electronic products integration, advanced smart sensors and power electronics
- Increased participation of SMEs building on EURIPIDES2 "savoir faire" and network
- Involve European industrial leaders in supporting the definition of the innovative electronic hardware platforms
- Capitalize on its partnership with DG Connect (European Commission) to further cooperate with the EU Horizon 2020, the R&D&I framework and Key Enabling Technology areas (printed electronics, robotics, photonics, ...)
- Promote multi-sectorial projects through the EUREKA cluster co labelling
- Priority stress on following-up European innovation for manufacturing in Europe

Today the major challenge is to improve the competitiveness of European industry, and as a consequence to maintain and **create new manufacturing and employment opportunities in Europe.**

The prospects of employment evolution in the EURIPIDES² domain in Europe over the coming decade, where 700 000 new jobs can be created in Europe, show the major importance of the action of EURIPIDES², which can help make part of these new job prospects become real, through the power of the European Smart Electronic Systems technology, design and manufacturing.

[1] See Annexe 1 of *Vision, Mission and Strategy* : Methodology

[2] The words enmeshed and implanted systems are defined, hereunder.
The three categories we distinguish in electronic systems are :
- stand-alone electronic systems, such as TVs, mobile phones, PCs... ;
- embedded systems, such as automotive or aerospace electronics for instance, which are systems conventionally incorporated into larger pieces of equipment or platforms belonging to the electrical or mechanical engineering sectors ;
- enmeshed or implanted systems, which are a new and emergent domain, where electronic smart systems and devices are beginning to be used as inclusions in products, materials, or even living bodies, such as in textiles, clothing, building materials, animals, and the human body for health and bio applications.

[3] In particular, through the experience gained in COWIN, a support action (FP7) to strengthen the European competitiveness in miniaturized smart systems. This initiative is dedicated to commercial exploitation of advanced technologies coming from collaborative European research work. In particular, COWIN facilitates interaction between public and private investment in Europe.

Introduction

EURIPIDES² is industry driven and projects involve an increasing number of participants, large companies, SMEs but also European research organizations. To-day, more than 400 organizations are or have been involved in EURIPIDES² consortia, coming from 17 countries.

In terms of participation, SMEs counts for 40%, Large companies and research organizations for 30% each.

Projects are the core business of EURIPIDES². The EURIPIDES² Council is granting the label twice a year. Since its launch, around 50 projects worth 400 million Euros in R&D have been labeled.

This booklet provides an insight on a collection of EURIPIDES² projects.

EURIPIDES² launches two calls per year, in a two-step approach, in order to maximize the chances for success and avoid unnecessary time consuming efforts in setting up projects.

• • •

Participants may submit a project Outline (PO) or a Full project proposal (FPP) either at the PO deadline or the FPP deadline.

At both stages, the EURIPIDES² office will check whether public funding would be available for partners through the Public authorities' network.

At each step, the two EURIPIDES² experts selected by the Technical Committee will assess the proposal against 34 criteria and their conclusion will be delivered in full transparency to the consortium.

Step 1: Project outline

The Project Outline (PO) provides a short overview of the concept, the objectives of the project and the partnership even if they are not entirely settled. This document allows early advice and feedback from the Technical Committee (TEC) supported by the evaluations of two external experts. The PO will facilitate preliminary discussions with and feedback from the relevant public authorities.

This step is highly recommended, but participants may submit a Full Project Proposal straightforward.

Step 2: Full project proposal

The second step in the EURIPIDES² evaluation procedure is, for projects that have been accepted at PO (Project Outline) level, to submit a Full Project Proposal (FPP).

The FPP is an important document within EURIPIDES². It is used for the evaluation and labelling of new projects and it is also the basis for the reporting and monitoring procedure.

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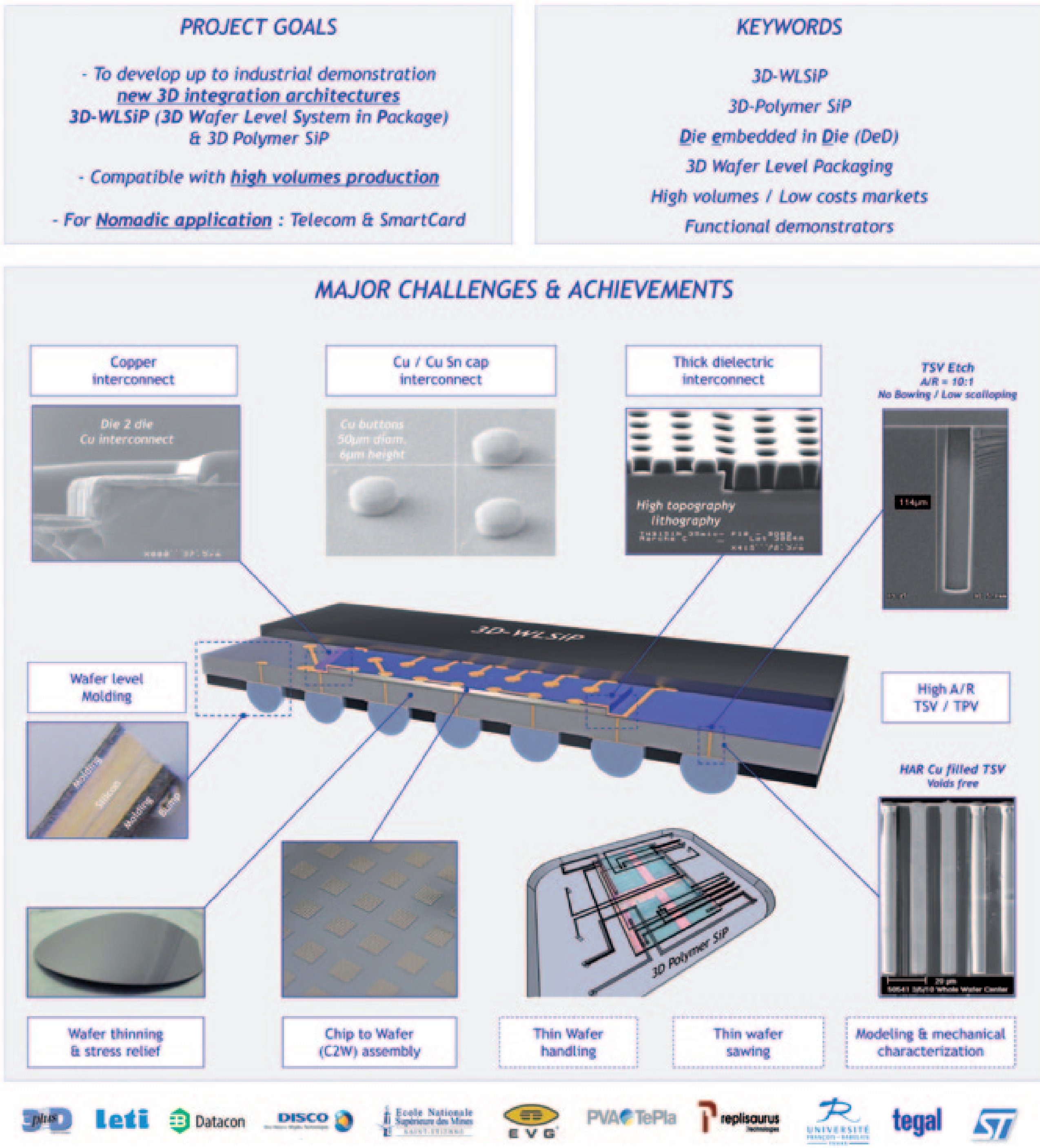
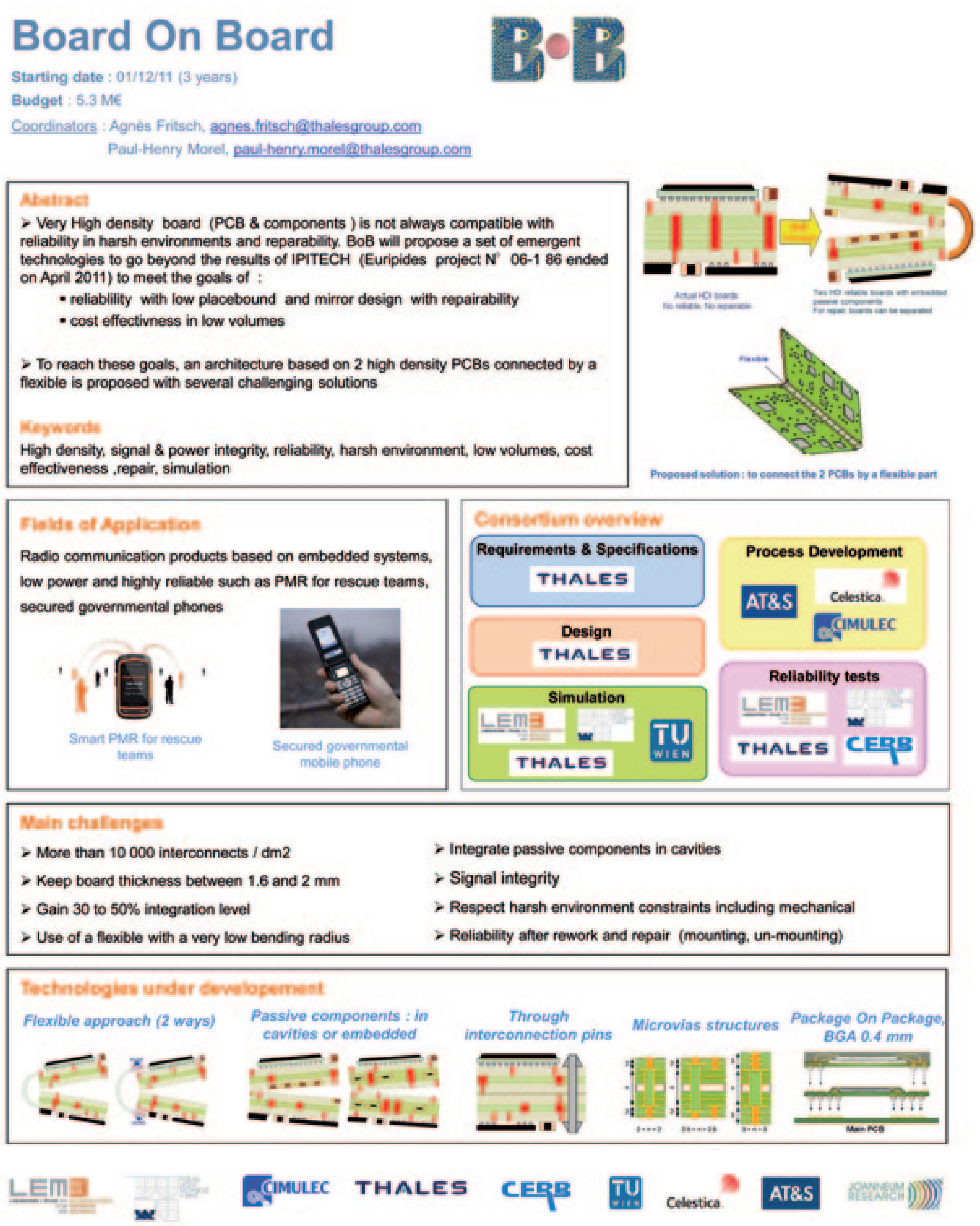
1. 3DICE

3D Integrated Of Chips Using Embedding Technologies



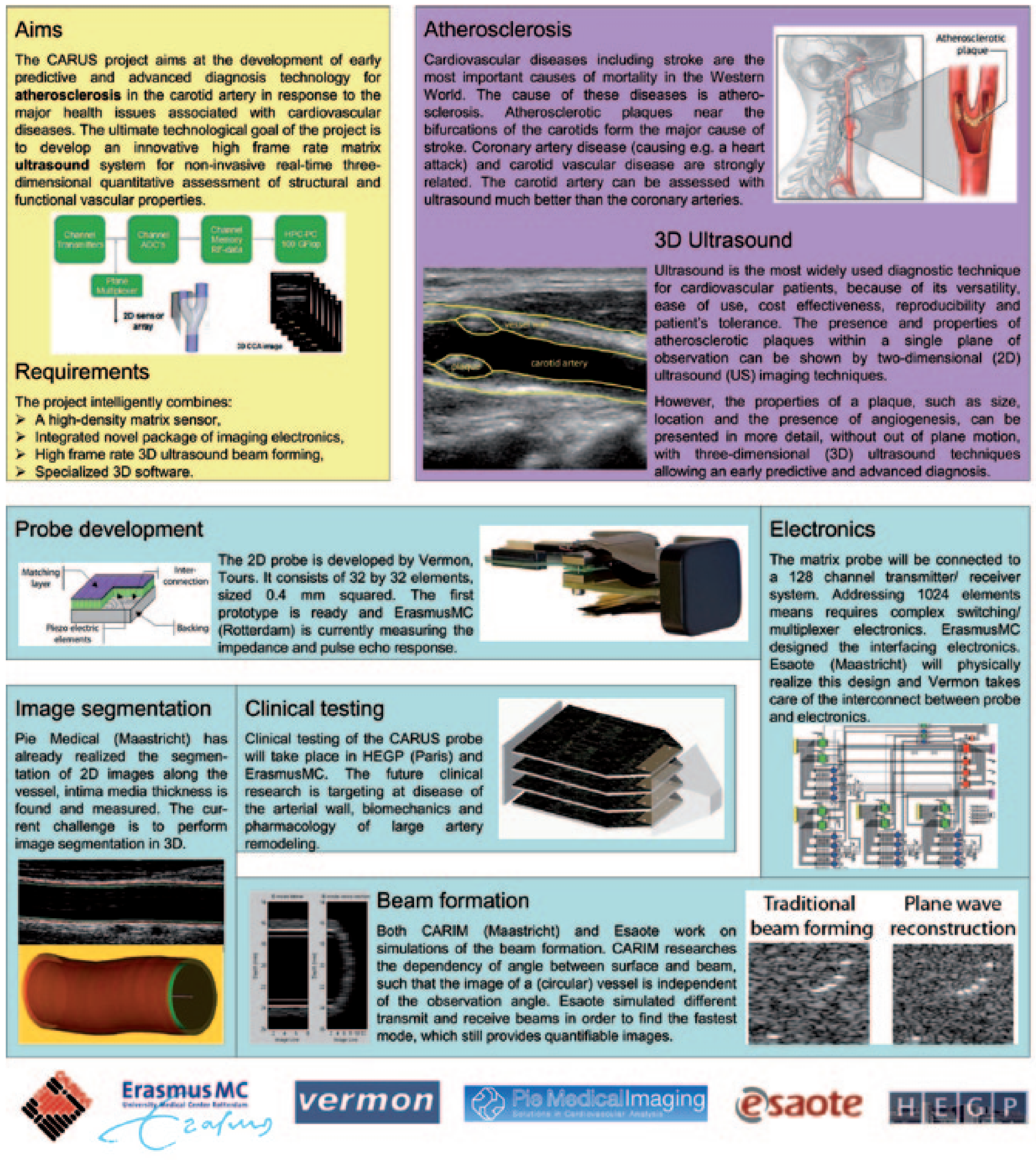
2. BoB

Board on Board



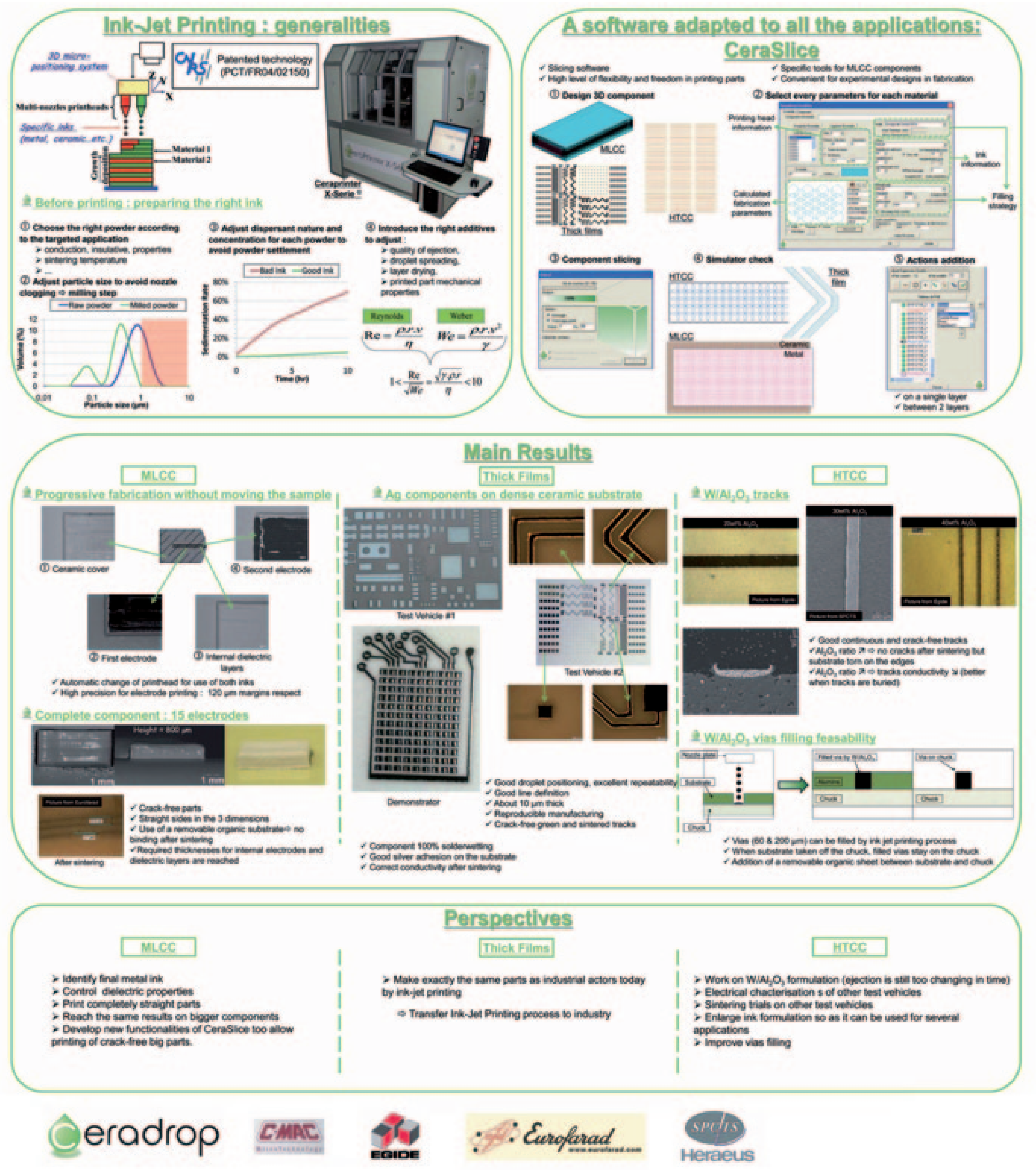
3. CARUS

Carotid 3D High Frame Rate Ultrasound Scanner For Advanced Diagnosis Of Cardiovascular Disease



4. CERAMJET

Ceramic Electronic Components By Inkjet Printing



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5. COSY3D

COmpact Secure SYstem in 3D

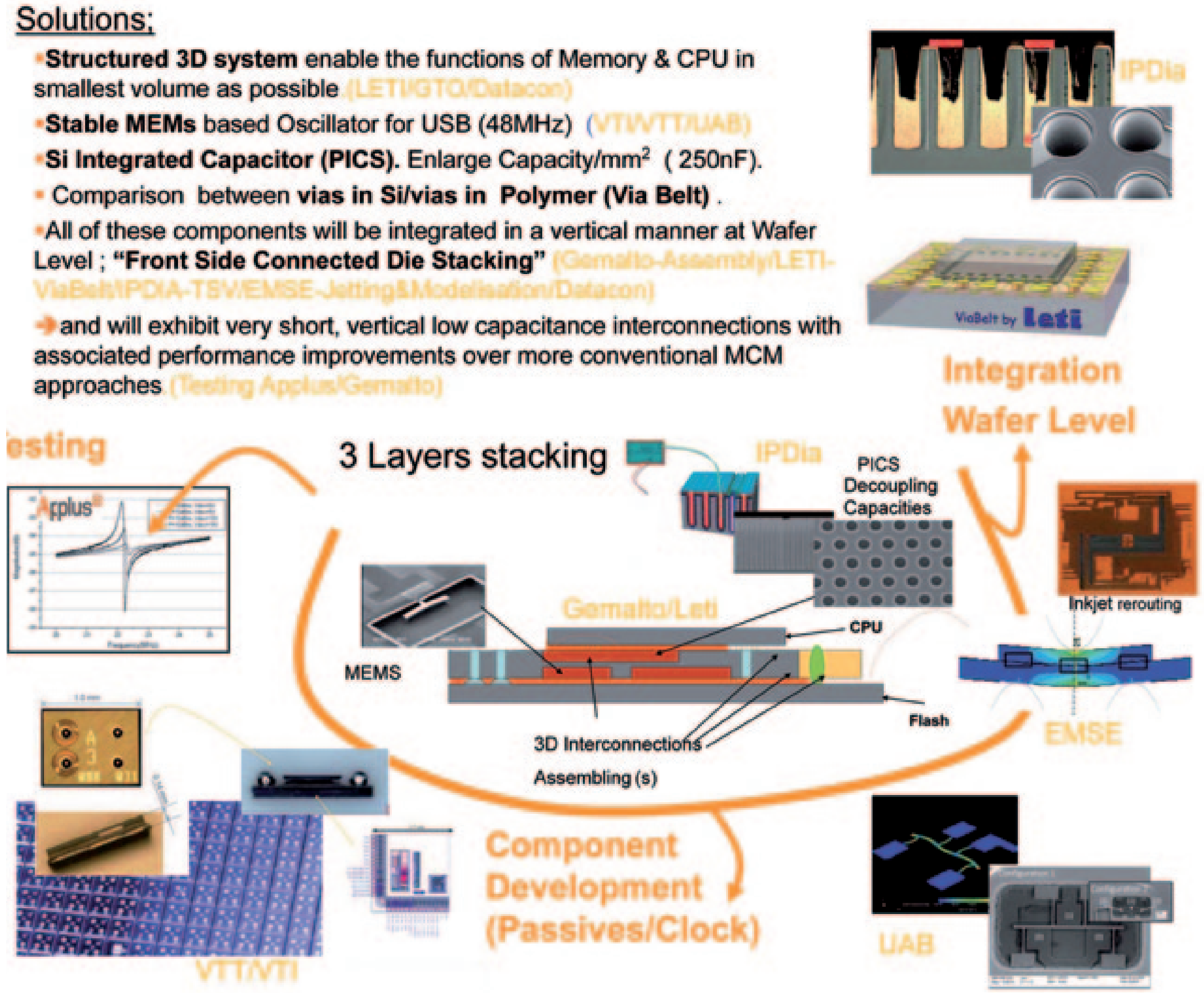
Objectives :

Collaboration with industrial, research centres and academia to create an innovative, **highly secure and portable intelligent system**, for:

- **advanced telephony,**
- **multimedia,**
- **secure transactions,**
- **enterprise access (digital & physical).**

Solutions:

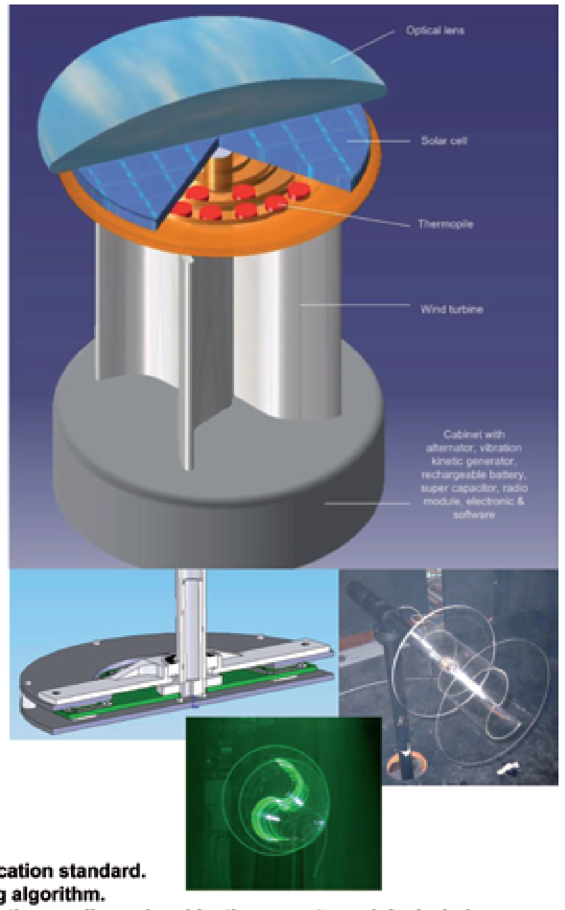
- **Structured 3D system** enable the functions of Memory & CPU in smallest volume as possible (LETI/GTO/Datacon)
- **Stable MEMs** based Oscillator for USB (48MHz) (VTI/VTT/UAB)
- **Si Integrated Capacitor (PICS).** Enlarge Capacity/mm² (250nF).
- Comparison between **vias in Si/vias in Polymer (Via Belt)** .
- All of these components will be integrated in a vertical manner at Wafer Level ; **"Front Side Connected Die Stacking"** (Gemalto-Assembly/LETI-ViaBelt/IPDIA-TSV/EMSE-Jetting&Modelisation/Datacon)
- → and will exhibit very short, vertical low capacitance interconnections with associated performance improvements over more conventional MCM approaches (Testing Applus/Gemalto)



gemalto ipdia ARMINES cea leti Datacon Applus LGAI UAB muRata VTT

6. ENERPACK

Multi Low Power Energy Source Packaging



Main objective

Packaging a new multi low-power energy source system with :

- High integration scale of multiple technologies : optic, silicon, mechanic, piezoelectricity, thermo engineering.
- Use of renewable energies : sun, wind, t°, mechanical vibrations and pulses.
- Improvement of the global efficiency by closed association of the different micro sources.
- Electrical energy production : up to 20Wh per day.
- Wireless control.
- Substantive cost cuts in regard with the usual hardwired solutions.
- Low cost and free maintenance.

Challenge

- Getting a smart and low cost package.
- Integration of all the necessary micro renewable energy transducers.
- Outdoor environmental constraint consideration.
- Regular energy production everywhere in the world.
- Multi function component and circuit interconnection.
- Embedded processing architecture.
- Research for efficient association of the micro sources.
- Research for efficient energy storage architecture.
- Use of low-power circuits and components.
- Use of CMOS technology.

Solution

- Electronic core : low-power processor and wireless communication standard.
- Embedded software: Absolute Maximum Power Point Tracking algorithm.
- Complementary micro renewable energy sources : solar cells, thermopiles, micro kinetic generator, original wind turbine, fuel cells.
- Energy storage components: complementary components like lead or lithium battery, super capacitor.
- Standard wireless communication for sensor data and meteorological forecast data to and from the supervisor.
- Thermal integration and interconnection for increasing the temperature delta inside the package.

Applications

- Environment monitoring: quality and toxicity surveillance of the air and water, seismic surveillance, flood sensors, great infrastructure surveillance (bridge, ...).
- Surveillance and protection of sensitive sites : nuclear plants, atomic research centers, energy distribution networks, water tanks, Seveso industrial factories, pipelines, borders, containers.
- Outdoor public area surveillance and control : crossroad, highway, airport, harbor, train station.
- Nomad smart device supplying (smart phones, laptops, play stations, GPS, ...).

Project started in December 2009

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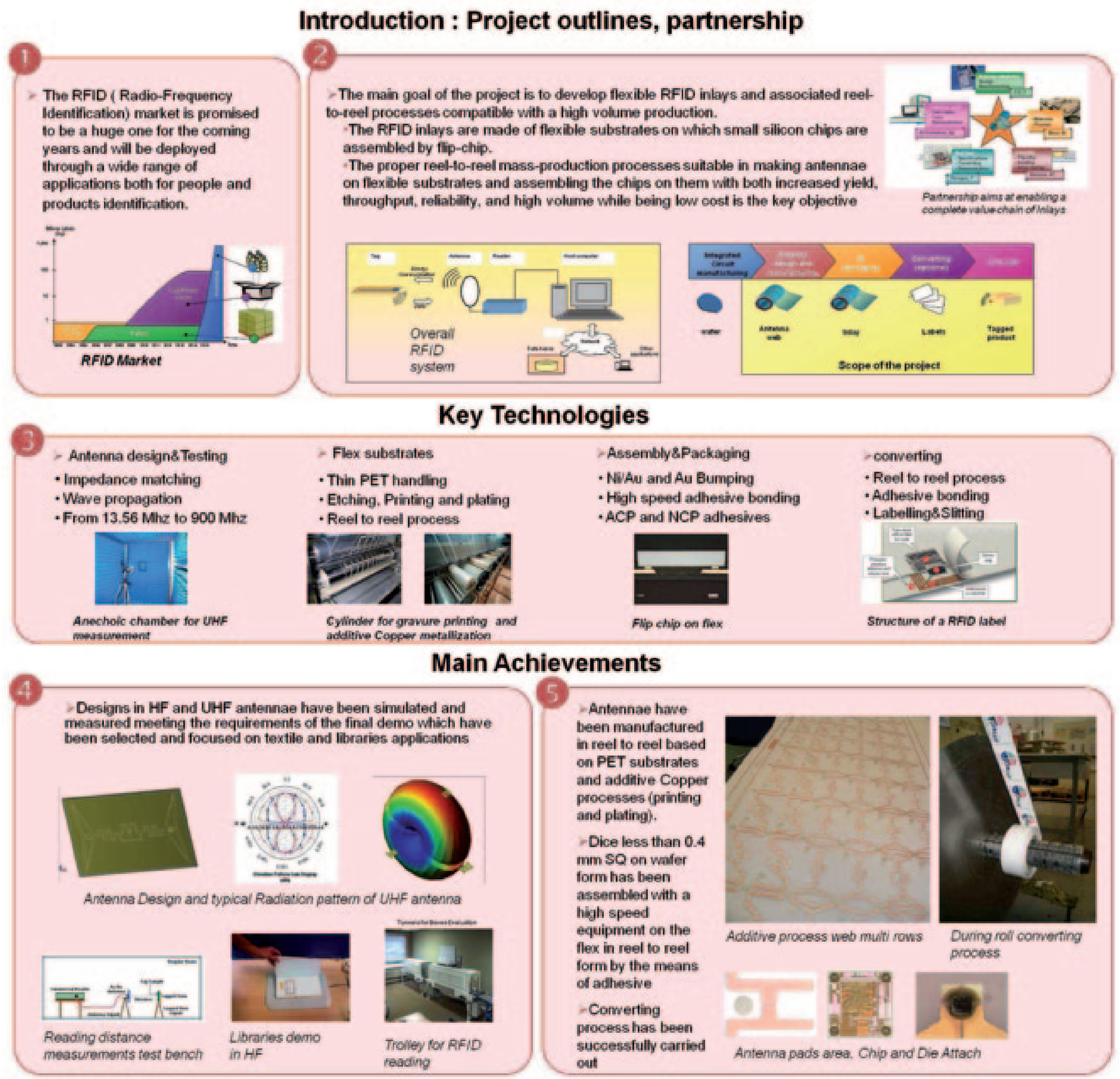
7. FLEXILVIA

Flexible Inlays In Large Volume For Identification Application



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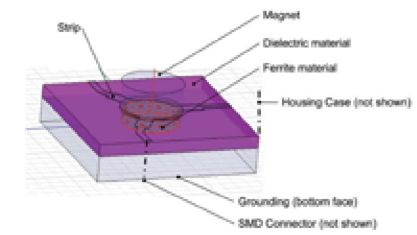
8. IMICIMO

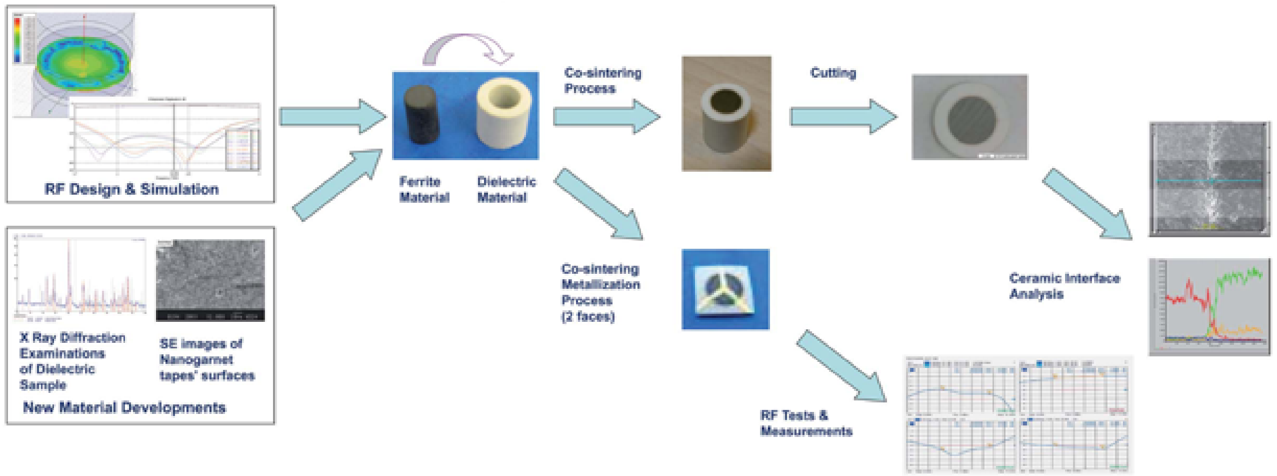
Integrated Miniature Circulators For Microwave Modules



Circulator Design Simulation with Co-sintered Materials

Targets:

- New materials and manufacturing technologies for microwave ferrite circulators and isolators
  - Reduction of the device size, weight and cost
  - Facilitate integration and packaging in mobile telecommunication equipment of new generation
  - Low cost and high volume reproducibility
- Low temperature co-fired systems (LTCC) for low cost, multi-layer ferrite device structures, integration of ferrite devices with active semiconductor and/or advanced microwave interconnection and packaging techniques for future large volume mm-wave applications.
- Set up an high-efficiency European supply chain of microwave ferrite components



Fields of Application: *Microwave Transmit/Receive modules for Radars and Telecom applications*

Duration: *36 months*

Partners:

Cobham Microwave	France
Thales Research & Technologies	France
Thales Systèmes Aéroportés	France
LABoratory of Sciences and Technologies for Information, Communication and knowledge (Lab-STICC UMR CNRS 3192)	France
Temex Ceramics	France
TKI-Ferrit Development and Manufacturing Ltd.	Hungary
Budapest University of Technology and Economics	Hungary
Pro Patria Electronics	Hungary
Jožef Stefan Institute	Slovenia
Keko Equipment	Slovenia
Telecommunication Research Institute (PIT)	Poland

9. INTEX

Intelligent Sensing And Communicating Textile

Abstract

Kick off meeting: 17. - 19. 05. 2010
2nd Progress meeting: 25. - 26. 05. 2011
Project start: 01. 05. 2010
Project duration: 4 years

Keywords

Intelligent textile, advanced screen printing, gas sensors, vapour sensors.

Fields of application

Personalised health and safety care, integrated sensor modules for textile products and intelligent beds.

Key project achievements

- Very fine line prints obtained using innovative screens.
- Non-conventional stainless steel meshes and new emulsions.
- Integrated low cost sensor elements on organic and inorganic basis for smart textile.
- Technological platform for industrial exploitation in place.

Consortium overview

TESLA BLATNA, a. s. Czech Republic – project leader
G.BOPP + CO. AG, Switzerland
BVK Hradec Kralove, s. r. o. Czech Republic
CEA Leti, France
Kissel + Wolf GmbH, Germany
Microcircuit International, France
University of West Bohemia, Czech Republic

Project objectives

- Development of a new generation of printing process: ultra thin film deposition below 1 µm, printing on alumina, silicon and textile substrates.
- Development of functional building blocks of the smart micro system for intelligent working clothing, beds, and similar applications including system communication.
- Smart system application in firemen clothing and other working clothing.

Project results

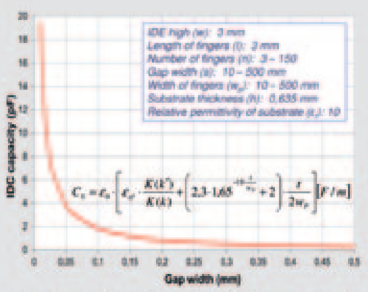


Fig. 1: UWB sensor structure design based on the conformal mapping method.

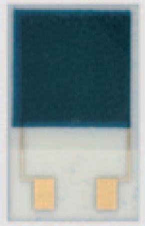


Fig. 2: UWB printed organic sensing film on the TESLA interdigital electrodes structure.

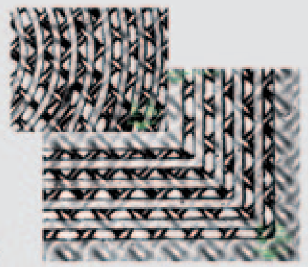


Fig. 3: 25 µm circle lines and lines with sharp corners - KIWO emulsion.

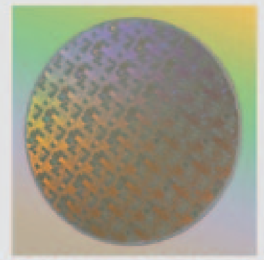


Fig. 4: CEA-Leti silicon wafer with Bulk Acoustic Waves (BAW) resonators using screen printing procedures for gas sensitive polymers deposition.

Fig. 5: MCI advanced screen with BOPP precision mesh and KIWO emulsion.

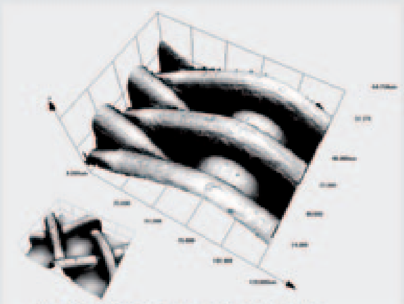


Fig. 6: BOPP non-conventional stainless steel precision mesh in comparison to square mesh.

Fig. 7: Screen printing on alumina substrate in TESLA.

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10. IPITECH

Innovative Pcb (Printed Circuit Board) Integration Technologie For Hdi Board In Harsh Environment

Objectives

- ❑ Assess, adapt and validate new High Density PCB technologies in HARSH ENVIRONMENTS
  - ➢ Copper filled microvias
  - ➢ Stacked-microvias
  - ➢ Microvias-in-pad
- ❑ Assess the impact of these new technologies on Signal Integrity
  - ➢ Define by an experimental approach the contributions of the IPITECH technology on Signal Integrity
  - ➢ Establish new design rules to ensure reliable multi-gigahertz data transmissions

Microvia Technology

Standard microvias technology

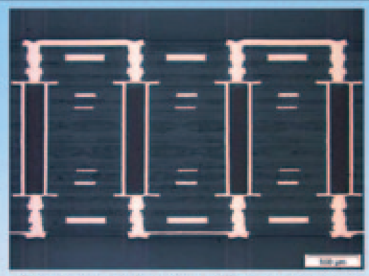
Standard 'stair' route

Standard microvias-in-pad weakness

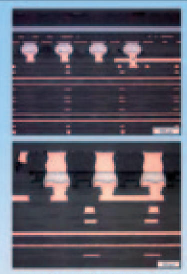
New High Density PCB technologies

Filled microvia

Dimple definition



Stacked and copper filled microvias



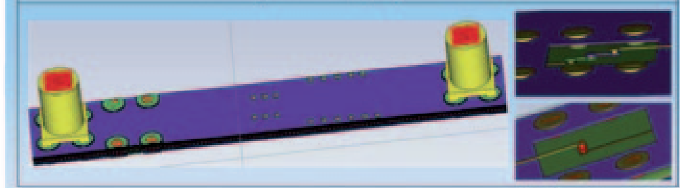
Microvias-in-pad

Technical Advantages

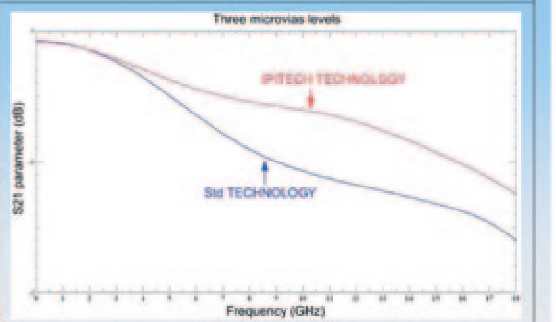
- ❑ Route BGA with a pitch as small as 0.4 or 0.5 mm
- ❑ Allow densification of routing and surface components
- ❑ Improve the thermal impedance of vias

Signal and Power Integrity

3D Signal Integrity models



S21: Transmission coefficients



Technical Advantages

- ❑ Reduce line impedance discontinuities
- ❑ Improve the integrity of powers planes

11. IQFUEL

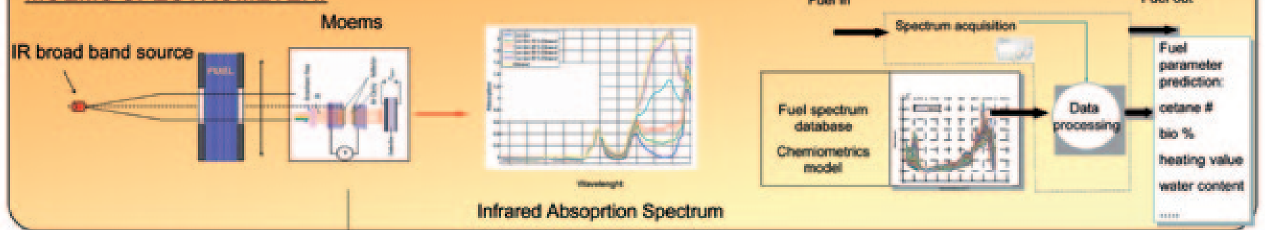
Integrated Sensor For Determining Quality Of Fuel

INTRODUCTION:

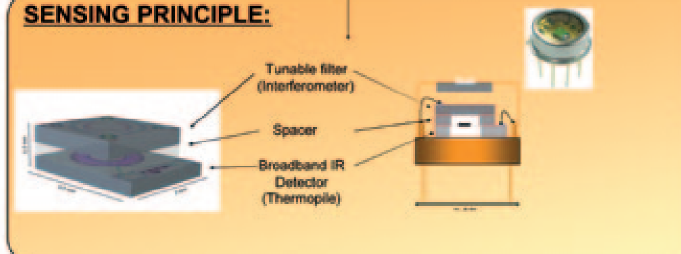
"IQF sensor project" is devoted to development of one automotive embedded sensor (MOEMS based) for real time measurement of used fuel composition together with related engine and exhaust gas aftertreatment control function. Fuel type can be either diesel or gasoline.

The sensor is using Near Infrared Absorption spectroscopy together with mathematical model (chemiometry) to predict the fuel parameters relevant for engine combustion and exhaust gas aftertreatment efficiency. The spectrometer and detection units are based on 2 MOEMS components integrated within one single package.

MOEMS SPECTROMETER:



SENSING PRINCIPLE:



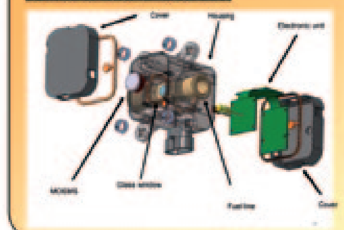
Interferometer chip:

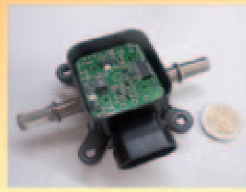
- silicon based
- dielectric mirrors ($Al_2O_3 – TiO_2$)

Thermopile chip:

- thermocouple array
- absorber material (Al_2O_3 film)

SENSOR DESIGN:

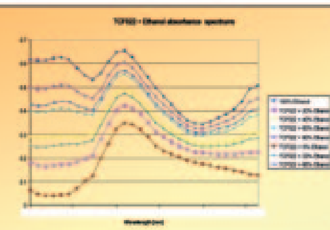




A2 sample

LAB RESULTS:

- from A2 samples
- good linearity
- good repeatability



TARGET SPECIFICATION:

Measurement location: in fuel line

Pressure Range: <10bar

Temperature range: -40°C to +85°C

Sensor Signal: CAN, SENT

No field calibration

	Measurement Range	Accuracy
[illegible]	0-100% vol	±5 %
Density	[illegible]	[illegible]
[illegible]	40 – 75	±4
[illegible]	[illegible]	±2%
[illegible]	[illegible]	[illegible]
[illegible]	0-100% vol	±5 %
[illegible]	80-100	±2
[illegible]	[illegible]	[illegible]

BENEFITS:

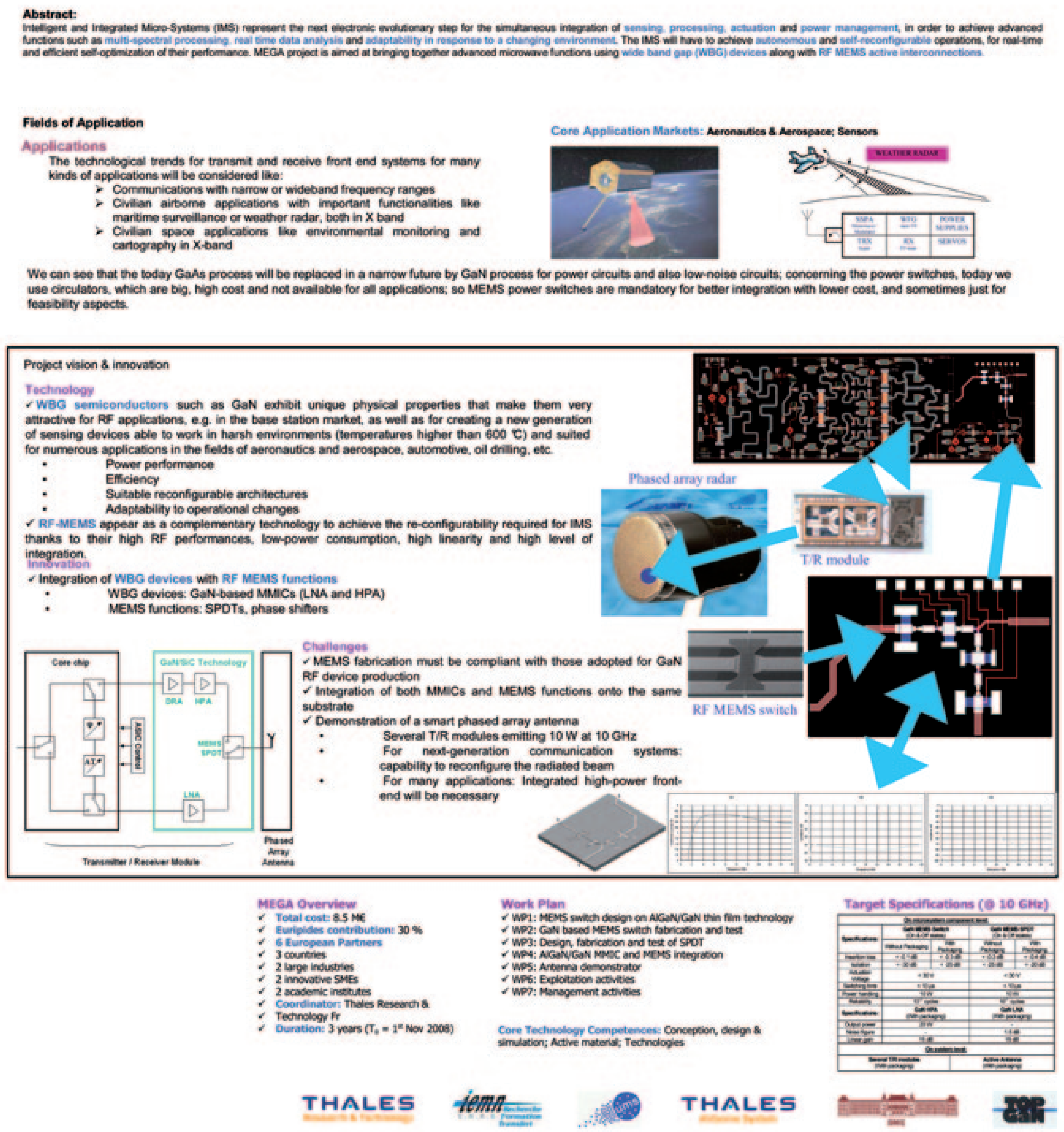
- Optimization of engine and after treatment units efficiency (DPF, SCR, CO): reduction of C02, NOx, particle emission and fuel economy
- Improvement of drivability (e.g.: engine knocking, cold start)
- Engine component reliability improvment
- Same concept can be used for Oil and AdBlue diagnostic

PROJECT DATA:

Starting: April 2008 — SP1: specification/added value - completed
Closure: October 2011 — SP2/SP3: sensor/MOEMS design – 50%
Budget: 8.1 Meuros — SP4: engine control function – 10%
Man Power: 519 MenMonths — SP5: test/validation – 0%

12. MEGA

Next Generation Intelligent Microsystems Based On Wide Band Gap Materials



13. MIDASS

Moulded Interconnect Device Applied To Smart Systems

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14. MIDIMU-HD

Mixed Microwave & Digital Multiplayer Pcb For High Density Applications

Abstract

The **MIDIMU-HD** project is aimed at the development of a new technology making possible the design and manufacture of high density mixed microwave and digital **printed circuit boards** made of multilayer dielectric material. The major innovations include **integrated frequency filters** and other microwave functions coupled with stacked copper-filled microvia and HDI technologies. This new approach will enable significant improvement of the long-term reliability of printed circuit boards, which is a strong demand of end users in professional electronics.

The project will offer an opportunity to develop a highly integrated transceiver module operating in a target bandwidth of **40.5 – 43.5 GHz**, which with allow a major advance in WLAN networks, satellite communications, point-to-point and point-to-multipoint networks, **mobile network (3G, 4G**) applications.

Keywords

Radio Frequency
Printed Circuit Board
40-45 GHz Bandwidth / Wireless Access
Embedded Pass Band Filter / Transmitter
Fine Pitch Components / High Density Interconnect
Dielectric Substrate
Industrial Manufacturing

Fields of Application

The MIDIMU-HD project is dedicated to the development of transmitter modules for microwave Point-to-Multipoint Backhaul applications. The target Wireless Access Networks are designed to provide connection between NTE (Network Terminal Equipment) and Operators Core Networks for the mobile or stationary telecommunication services such as voice, data, or video transmission.

Consortium overview / Complementarities / R&D chain

A consortium has been formed to take benefit of the partners' best complementary skills. The project objective can be fully reached due to the highest competences, background, and complementary skills of the team of partners. All partners have been carefully chosen for the consortium in order to guarantee high synergy level and high probability of success in terms of matching market requirements.
AT&S (Austria) is the largest PCB manufacturer in EUROPE ranking among the largest manufacturers worldwide. PROTECNO GTID (France), a partner of Thales for the concept and manufacturing of microwave PCB, is the best complement to AT&S. PANASONIC (Austria) has established the production facilities for PCB substrates in the world's key market locations and capitalizes on leading technology to research, develop, and manufacture substrates for multilayer PCBs. SWEREA IVF (Sweden) offers support having many years of experience and using well-established test methods for electronics. LABSTICC (France) is a modern laboratory dedicated to establishing a standard for developments in the communication field, it has been selected for is background and great experience in frequency filters design. FLEXTRONICS (Sweden) is involved in this project to make sure that the assembly and repair of the assembled boards are done in the best possible way to guarantee that the processes are commercially feasible. THALES Global Services (France) provides competitive advantages to the consortium by transferring leading edge ideas & skills to the partners; it is involved in MIDIMU-HD project particularly due to the expertize in torsion tests and thermal shock tests with continuous monitoring. THALES Communication & Security (France) is in charge of electrical tests, compiling specifications, coordination and links with the operator and equipment suppliers.

Project Objectives

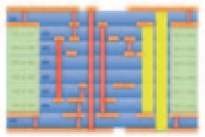
- Development and validation of a substrate material matching the dielectric and loss properties for high frequency application, available in a large range of laminates and prepregs in order to be compatible with multilayer structures.
- Conception and design of a pass band filter for Q-Band (40-44 GHz) on an organic substrate using industrial manufacturing rules.
- Build-up and integration of multilayer PCB for high frequency applications (board integration concept, HDI, fine pitch BGA).
- Combining RF functions (including pass band filter, power amplifier and up-converter), and HDI design on a same organic multilayer PCB.
- Validation of the structure; assembly and repair process development; electrical tests; reliability estimation.
- Cost-effective production and testing of a Tx/Rx test vehicle for LTE node equipment.

Project Solutions / Results

The MIDIMU-HD project has been started in January 2012. The first step of the project, substrate selection, is completed with the recommendation of a resin-based material suitable for upgrading to meet specific electrical requirements.

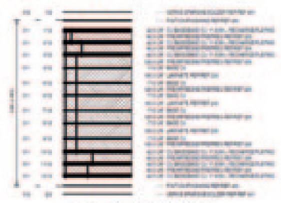
Specifications are reaching the approval point; the work packages 3 and 4 have been started to specify the frequency filter build-up, HDI interconnection, and integration technologies. The pictures below present the first concepts of filter build-up, filter integration, and HDI interconnection concept.

The first test vehicles have been manufactured. They are aimed at the substrate and conductive material validation and production process development.

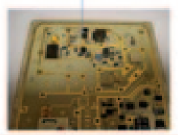


Frequency filter build-up

Filter integration into multilayer structure



HDI interconnection

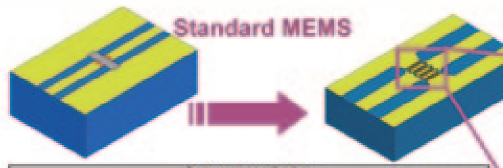


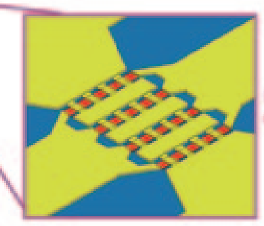
THALES GTID Lab-STICC swerea IVF FLEXTRONICS AT&S Panasonic

15. MINIMEMS

High-Reliability, High-Power & High Speed Rf Tuning Applications Based On Miniaturised Mems. Switched Capacitors

TECHNOLOGY & INNOVATION





Component specifications	Standard MEMS	MiniMEMS Goals
Beam size	250x100 µm²	20x10 µm²
Gap	2 µm	0.25 µm
Capacitance ratio	30-150	3-30
Switching time	> 1 µs	200 ns
Reliability	< 10[illegible]	> 10[illegible]
Power handling	< 5 W	5 W

[illegible] for fixed-fixed beam devices

- Miniaturization of RF-MEMS allows:
  - ✓ Faster switching time at standard actuation voltage
  - ✓ Improved mechanical/thermal stability
  - ✓ Improved repeatability of fabrication process and relaxed packaging conditions
  - ✓ Improved reliability
- MiniMEMS will develop two routes for the miniaturised MEMS fabrication process :
  - ✓ A secure and low-risk fabrication process using standard MEMS with Si technologies, compliant with short time-to-market transfer to foundry;
  - ✓ The challenging but very promising miniaturization route

PROJECT OBJECTIVES & WORK PLAN

Adaptive Receiver (TRS) (Working frequency: 11 GHz)		
Function level:	Tunable Filter	
Tuning range	200-500 MHz (5 bits resolution)	
Losses	3-5 dB	
BW (3dB)	10 MHz (high-Q filter), 100-1000 MHz (medium-Q filter)	
Selectivity	20 dB @ 25 MHz from f0 (high-Q), 20 dB @ 0.3-1 GHz from f0 (medium-Q)	
Size	2 x 4 x 1 cm³	
Power consumption	< 20 mW	
System level:	Adaptive receiver	
Integration	Hybrid	Monolithic
Substrate	-	GaN
Tuning range	200-500 MHz (5 bits resolution)	200-500 MHz (5 bits resolution)
Gain	13-15 dB	13-15 dB
Noise Figure	3-4 dB	3-4 dB
Limiter	Power handling: 2W; Loss: 1 dB; VSWR > 15dB; Flat leakage: 20dBm	Depends on the robustness of the GaN LNA
LNA	Gain: 19 dB; Flatness 2 dB; Noise figure: 2 dB; Power consumption < 50 mW (5V)	Gain: 19 dB; Flatness 2 dB; Noise figure: 2 dB

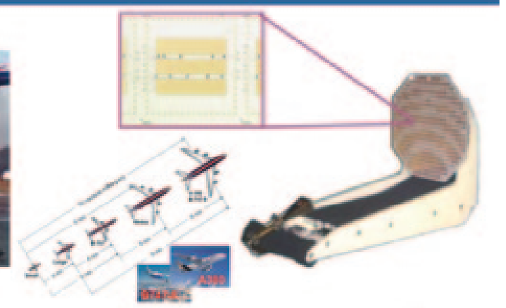
- Component level: MiniMEMS switched capacitors
- Functional level:
  - ✓ Tunable (multi-bits) matching/ filtering circuits on Si / GaN substrates for frequency-agile (multi-band) LNA
  - ✓ Phase-shifting cells (3-/6-bit) for X-Band reflect array antennas
- System level: Demonstrators
  - ✓ Partial reflect array antenna for weather Radar Replacing mechanically scanned parabolic reflector antennas for reliability, agility and low cost
  - ✓ Partial reflect array antenna for wake vortex detection
  - ✓ Adaptive receiver for ATM applications
    - Hybrid integration (external limiter and LNA)
    - Monolithic integration of tunable filter and the LNA on the same GaN substrate

Partial reflect array (VAI) (Working frequency: 9.3-9.8 GHz)	
Function level: Phase Shifter	
Phase range	0-360°
Phase increment	[illegible]°
Insertion loss	<1 dB
Switching time	<500 ns
Power handling	20 W (peak), 2 W (average)
Reliability	>10[illegible] cyc.
System level: Partial Reflect Array	
Size	~250 mm x 250 mm (corresponding approx. to 400 radiating elements and 15 phase shifters)
Element	TBD
Polarization	Two orthogonal polarizations with matching main lobes
Side lobes	<-30 dB
Cross-pol	<-35 dB

Partial reflect array (TRS) (Working frequency: 11 GHz)	
Specifications: Phase Shifter	
Size	12 x 12 mm²
Phase range	0-180°
Phase increment	3 bits
Dispersions	Phase: 5° (rms); Amplitude: 0.6 dB (rms)
Insertion loss	<0.5 dB
Switching time	<500 ns
Power handling	0.2 W average (4 W peak)
Reliability	>10[illegible] cyc.
Specifications: Partial Reflect Array	
Size	Diam ~ 60mm for a hexagonal sub-array of 19 phase-shifters; Total Diam ~ 200 mm (7-9 sub-arrays)
T° range	-40°C/+60°C (storage: -55°C/+70°C)
Polarization	Linear
Cross-pol	-20dB

APPLICATIONS & MARKET FIELDS

- Targeted applications and markets
  - ✓ Weather radars
  - ✓ Wake vortex detection radars
  - ✓ Air Traffic Management
  - ✓ RF wireless communication systems, consumer electronics



MiniMEMS

THALES Research & Technology THALES Air Systems VAISALA AAC Microtec iemn UPPSALA UNIVERSITET

16. RESTLES

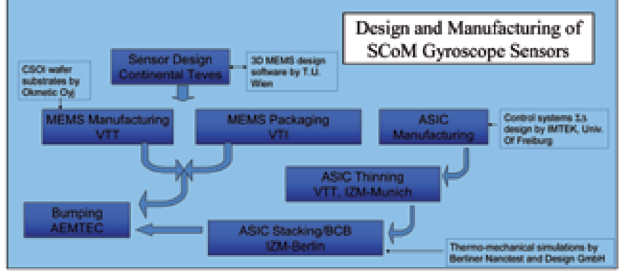
Reliable System Level Integration Of Stackes Chips On Mems

RESTLES is a project with partners from Finland and Germany. Partners: Continental Teves, coordinator (Germany), VTI Technologies (Finland), Sensitec (Germany), Okmetic (Finland), AEMtec (Germany), Berliner Nanotest and Design (Germany), FhG IZM (Germany), Saarland University, LSR (Germany), University of Freiburg, IMTEK (Germany), VTT Technical Research Centre of Finland (Finland).

Targets for the project:

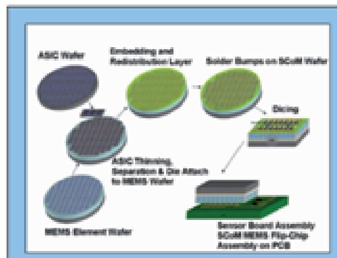
Developing a reliable Stacked Chip on MEMS (SCoM) technology to reduce the size and profile and increase the functionality of MEMS sensors, including 2-axes gyroscopes, 3-axes accelerometers, AMR Wheelspeed sensors as well as 3-axes MEMS magnetometers

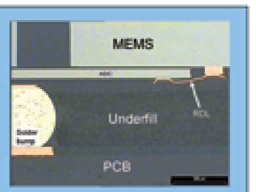
The production, testing, and stacking of the dual axes-Gyro devices illustrates the route to reaching just one of these targets.



Along the way to achieving these goals. Restles requires advancing a number of technologies:

1) Thinning and stacking of thinned chips on MEMS (IZM and VTT)
2) Demanding deep trench specifications for the MEMS designs
3) Magnetic foils and screen printing for Sensitecs compact AMR wheelspeed sensor
4) Sophisticated ΣΔ control systems for the dual axis gyro (IMTEK)





Stacking sequence of the Scom process and cross-section of the final SCOM after bumping and fixing on its PCB

SCoM Milestones achieved to date:

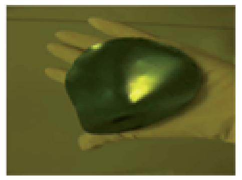
1) AMR sensors in the SCoM package are fully functional. Reliability testing of the stacked chip is underway
2) Gyro designs have been optimised for the SCoM package
3) Succesful production and testing of 2-axes accelerometers. Excellent temperature stability has already been demonstrated. SCoM preparation is underway
4) First "production" CSOI wafers delivered to customers.

Final tasks

In the final phase of the project, the SCOM concept nears realization with all the optimised MEMS elements to be combined

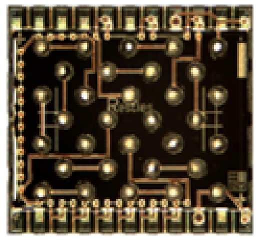
1) ASIC for stacking in the design phase
2) Optimization of SCoM embedding and flip chip assembly
3) Optimized gyro element redesign for SCoM finished
4) Stacking of 3-axes accelerometers in the SCoM package is now underway

Combining the Key Elements of SCoM

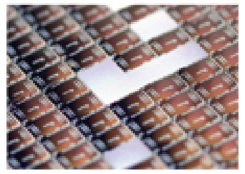


(Left) A thinned AMR wafer from Sensitec for the wheelspeed sensor application. Photo courtesy Joachim Hölzl, Sensitec

(Right) After stacking (IZM) and Bumping at AEMTEC. The ASIC dummy contains all its redistribution in a compact footprint. The stacked MEMS sits beneath the ASIC. Photo courtesy R.Schachler, AEMTec



Mems wafer + asic chips = SCoM

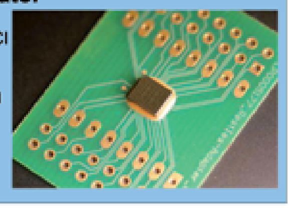


(Left) 25 um thick ASIC dummy chips, ready for stacking on the MEMS wafer. Photo courtesy James Dekker, VTT

A Technology Demonstrator

RESTLES SCoM-device after full TCI process mounted on PCB.

Photo courtesy T. Baumgartner, FhG IZM



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17. SEAMOVES

Sensor Enabling Autonomous Motion By Optimized Visual Environment Sensing

Abstract

Navigation of small unmanned vehicles equipped with bulky laser scanners or visual sensors, demands computationally intensive algorithms.

A key to the development of autonomous systems market (cars, care or assistant robots, security agents ....) is the availability of compact, low cost smart sensors for navigation.

Consortium overview / Complementaries / R&D chain

Around an innovative chip designer (AIT) , the consortium is composed of partners involved in sensors and subsystems design for imaging and robotics (Thales R&T, TOSA, LASMEA) and end users in the field of automation of vehicles (LASMEA, ECA, TOSA), or personal robotics and assisted living (Aldebaran)

Keywords

Smart sensor, neuromorphic chip, visual navigation, embedded processing, panoramic vision

Fields of Application

The main fields of application are autonomous systems (cars, automatic vehicles for factory automation...), assisted living (awareness, home robotic platforms ..), security and safety (area surveillance, anti-intrusion ...)

The functionality and performances will be tested on various robotic platforms

The system will also be evaluated for security applications on stationary and non-stationary platforms.

Project objectives

Develop an innovative smart sensor for autonomous visual navigation

based on a neuromorphic vision chip, 360° fast panoramic scanning

Embed low-level processing, and intelligent navigation functions

Technical challenges

Optimize the linear detector : resolution, sensitivity, pixel rate

Re-visit the processing for this innovative, event driven imager

Develop a small-size, low consumption scanning system

Optimize the processing architecture

Project Solutions / Results

Specifications

-the base sensor requirements have been derivated from use cases analysis, and from sensor market situation

-the neuromorphic chip specifications have been defined

-The sensor architecture has been settled

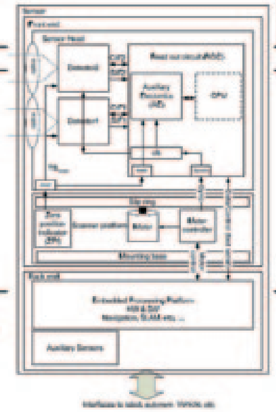
Next steps

-design of the opto-mechanical scanner

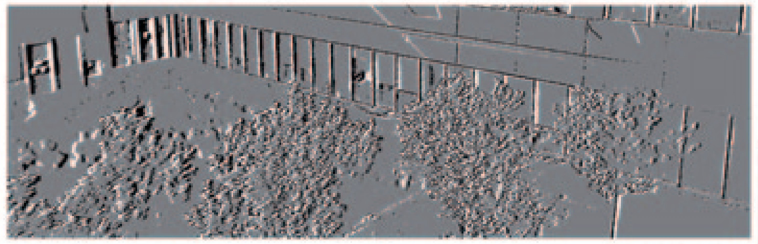
-chip design

-architecture of the processing electronics

Website : http://www.seamoves-eureka.eu/

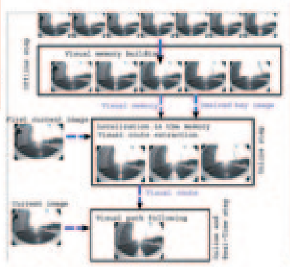


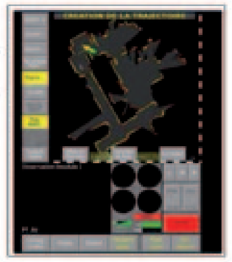
Sensor architecture



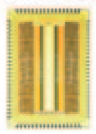
Gradient image

Visual navigation





Neuromorphic chip



Panoramic scanner

Test platform

18. SINETRA

Smart Integration For Rescue Teams

The SINETRA System is dedicated to PS organizations (First responder, fireman, policeman, rescuer) operating outdoor and indoor

The first responder is equipped with sensors which measure information such as his location (indoor and outdoor), his health parameters and his environment parameters

After local processing, data are:
- processed before transmission and stored for after crisis management
- displayed to the First Responder himself
- uploaded to the Mobile Command Centre

The SINETRA System is embedded in the suit of the user, it is an industrial proof of the so-called wearable PMR concept

Consortium overview

CASSIDIAN (FR - FI) - SOFILETA (F) - FRANCITAL (F) - FhG IZM (Ge) CETEMMSA (Sp) - HYPERTAC (F) - TWINLINX (F) - ADTEL (Sp) - VARTA µB (Ge) Interactive-WEAR (Ge) - ESYS (Ge) -TRADIA (Sp) – FICOSA (Sp) - MICROOLED (F) MOVEA (F) – VTI (Fi) - TTY-SÄÄTIÖ (Fi) - IRIS (Ge) – HEIMANN (Ge)

Project objectives

The SINETRA system aims at providing Public Safety users with dedicated services (location, cartography and navigation, user monitoring and environment monitoring…) provided by sensors and technologies to be embedded in the user's suit : the main innovation is therefore the integration of wearable computing and electronics into personal protective equipment and work wear combined with professional communication system : Integration of microelectronic components into textiles still means typically independent units which are attached to the textile or concealed in the textile structure

=> The SINETRA program will transform this research activity into product vision for professional markets with wide spread technology acceptance by end users and integration into sophisticated communication system.

Keywords

Smart clothes, textile, wearable computing & electronics, embedded sensors, Interconnection & Packaging, Heterogeneous Integration

Fields of Application

SINETRA is missions oriented for Fire Brigades operating outdoor (forest fires, water flood, earthquakes…) and/or indoor (underground, parking, critical infrastructures…), police forces in typical mission (ID control) or urban guerrilla, rescue teams, lonely worker (power plant, seamen…)

Project Solutions / Results

The services to be provided to the end-user are E2E emergency & location, cartography (navigation, POI…), user monitoring (dead man alarm, heart rate, T°…) , environment monitoring (C, T°, explosive…), vision capability improvement (visible, IR), SW services (database, automatic report).

These services lead to huge technical requirements: hands free (easy to wear, discreet), autonomy (reduced consumption + chargers), MMI (displays, keyboards, helmets), RF perfs (antennas, power) and connectivity (ad-hoc, gateways, DRM).

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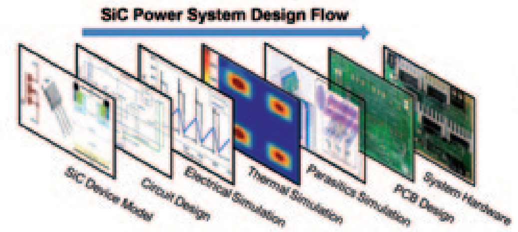
19. THOR

Striking Technologies For Power

Project Objectives
- Develop 20% more energy efficient power technologies
- Demonstrate high performance power electronics systems with SiC, GaN and SOI components
- Develop thermal management systems, embracing components and packaging

Unique Selling Points / Business Value
- Three application domains
- Economy of scale
- Wide applicability due to reduced weight and reduced volume

Expected Results
- 20% efficiency increase
- Innovative thermal solutions
- Improved EMC performance
- Enhanced reliability

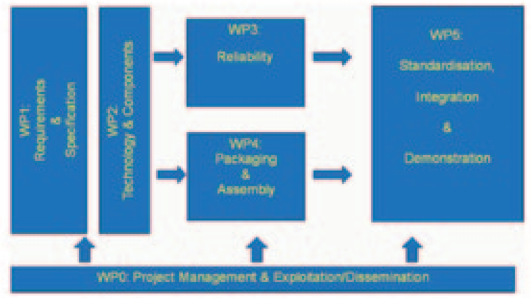


Towards a 'hot' power unit !

The problem:
Wide band-gap technologies are promising, but wide-scale industrial application is hampered by limited missing elements in the value chain. Fragmented market has prevented sufficiently deep investments so far.
The approach:
Bring three application domains together so as to create economy of scale and apply the resulting leverage for the design of common power technology.
The solution:
Novel power technology based on wide band-gap materials which is more heat resistant and hence more compact, leading to increased applicability and integral lower cost.

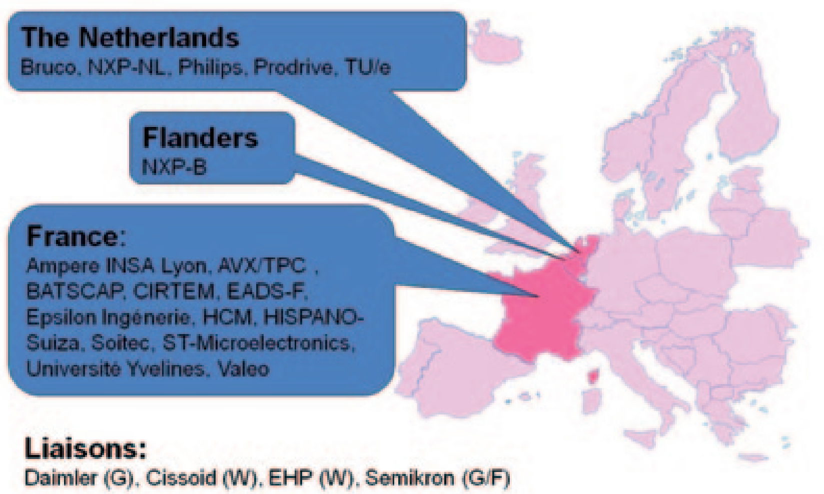
Value chain

THOR levels	Automotive	Aeronautics	Healthcare
power system			
module			
component	Common power devices		
process technology	Common process technology		



THOR Consortium:
18 partners , 3 countries

THOR partners
- Large companies (9)
- Small companies (7)
- Universities (2)



Liaisons:
Daimler (G), Cissoid (W), EHP (W), Semikron (G/F)

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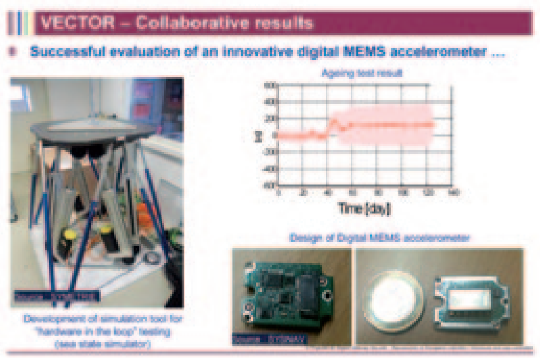
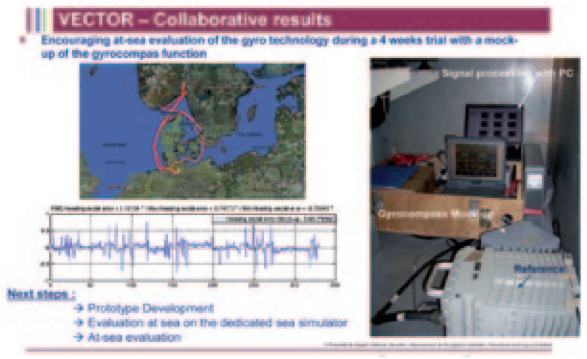
20. VECTOR

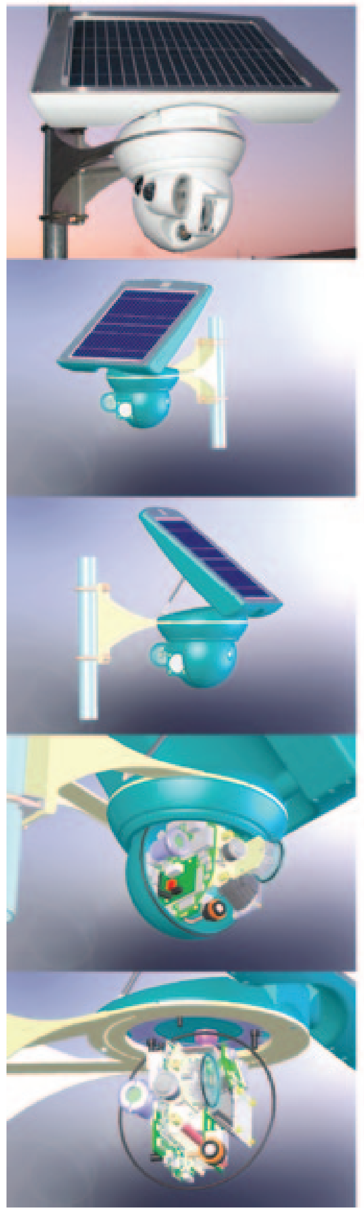
Vibrating European Compass





21. VISIOPACK

Vision System in One Package



Main objective

Packaging a new intelligent and autonomous vision system with :

- High integration scale.
- Low energy consumption.
- Autonomy for energy and processing.
- Low cost.
- Multi application availability.
- Public private life consideration.
- Free maintenance.

Challenge

- Getting a smart and low cost package.
- Integration of all the necessary functionalities.
- Outdoor environmental constraint consideration.
- Multi function circuit interconnection.
- Embedded processing architecture.
- Research for efficient built-in autonomous supply system.
- Use of low-power circuits and components.
- Use of new video optical technology.
- Use of new video human detection algorithm.
- Use of CMOS imager.

Solution

- Electronic core : ARM11 processor with ten layer 400 micro PCB.
- Self-powered: solar panel with patented charger and temperature compensation.
- Wireless transmission of the only relevant data after processing (image transmission is optional): bluetooth vector.
- Auto focus : controlled liquid lens.
- Wake up system : passive infra red sensor.
- Night operation : led lighting with day/night sensor.
- Interconnection : extremely low profile connectors.

Applications

- Sensitive site perimeter surveillance.
- Border control.
- On board surveillance for public transport.
- Indoor and outdoor public area surveillance (crossroad, highway, airport, train station, metro).
- Human detection, pedestrian counting, object surveillance.

Up to date results (project completed late 2008)

- Industrialization in progress from the operational demonstrator.
- A new product in catalog.
- Market research confirmation.
- Commercial proposals in progress (1500 pieces for the end of 2009).

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