M3TERA

MICROMACHINED TERAHERTZ SYSTEMS

A new heterogeneous integration platform enabling the commercialization of the THz frequency spectrum

Project number: **644039**
Project website: **www.m3tera.eu**
Project start: **1st February, 2015**
Project duration: **3 years**
Total costs: **EUR 4.255.743,75**
EC contribution: **EUR 3.742.961,25**

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M3TERA

The mission of M3TERA:

The mission of the M3TERA project is to provide a wide-spread use of low cost-THz technology in our society, enabled by a micromachined heterogeneous integration platform, which provides an unique way to highly-integrated, volume – manufacturable, cost- and energy-efficient, reconfigurable submillimeter-wave and THz systems.

Motivation:

In line with technology convergence of advancing microwave semiconductor technology, according to internal and external roadmaps, the proposed THz microsystem platform is envisioned to accommodate multiple generations of future THz products in different application fields. The concrete business and lead application case is THz microsystems enabling compact, low-cost point-to-point high-speed communication links in the frequency space between 100 GHz and 500 GHz, to be deployed in a scenario of a high-density small-cell base-station network providing ubiquitous high-speed internet access to mobile communication devices in urban environment.
The potential for success and high impact of this project is given by industrially-driven objectives, application-driven prototype implementation for different key applications and an excellent industry-driven consortium.

Objectives:

The primary objective of M3TERA is to develop a heterogeneous microsystem integration platform which facilitates high volume manufacturing of compact, reliable, energy-efficient and advanced-performance millimetre-wave and THz systems at drastically reduced costs. For this purpose the suggested THz platform goes substantially beyond the state of the art trough innovative concepts in multiple domains of the system such as silicon-micromachined THz integration platform, wafer-scale integrated micromechanically-tuneable THz front-end components, heterogeneously-integrated millimetre-wave active circuits, novel low-loss signal and sensor interfaces tailor-made for THz frequencies.

This primary objective is accompanied by 3 further key aims:

Primary technology prototype

The M3TERA project provides the source for a primary technology prototype, based on real business case acting as a lead application that constitutes a complete high speed THz point-to-point communication link based on the proposed THz microsystem platform which will be tested in an-end-user test environment.

Developing a system-in-package concept

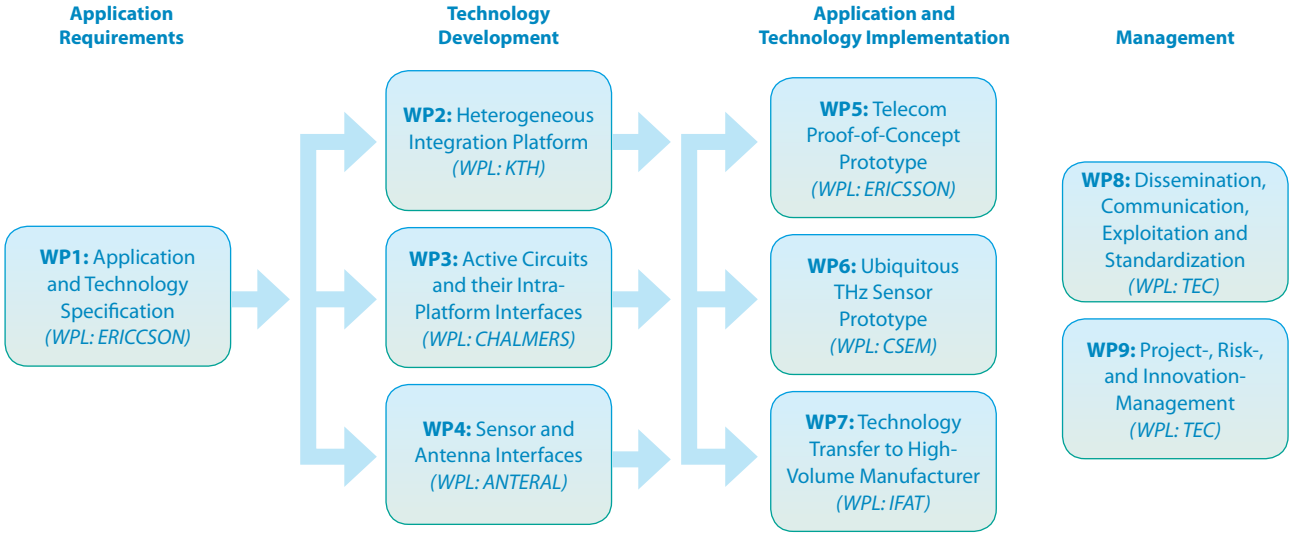
A further key aim is the development of a system-in-package concept pacing the way towards a complete solution for the purpose to integrate control circuits, base-band signal processing, and sensor interfaces together with THz microsystem platform on a compact module.

Enabling a manufacturable and efficient technology transfer

The THz microsystem platform technology is intended to enhance the manufacturability and efficient technology transfer from the technology developers to high volume semiconductor manufacturing facilities.

The high-volume manufacturable THz microsystem platform is envisioned as a secondary objective of M3TERA. The goal is to enable the ubiquitous usage of low-cost THz sensors in various applications in society. Possible target areas are millimeter-wave food quality control and food safety. Other sensor application could include medical diagnosis, industrial sensors and radar. Also, aspects, such as end-of-life management, recyclability, and bill of materials will be investigated within this project.

M3TERA structure of the work plan



Technical Approach:

The M3TERA project envisions the wide-spread use of low-cost THz technology in our society, enabled by the proposed micromachined heterogeneous integration platform, which provides an unprecedented way to highly-integrated, volume-manufacturable, reliable, reconfigurable, cost- and energy-efficient submillimeter-wave and THz systems. The work performed in the framework of this project is organized in nine different work packages tailor-made to achieve the maximum of efficiency and output quality:

WP1: Application and Technology Specification

WP1 intends to analyze system requirements for the applications, on the one hand from a technology and on the other hand from an economical perspective, and further to derive the technology specifications for the technical implementation in the project.

WP2: Heterogeneous Integration Platform

The second work package deals with the development of the micromachined heterogeneous integration platform with integrated MEMS - tunable components as well as designing a systems integration packaging concept.

WP3: Active Circuits and their Intra-Platform Interfaces

WP3 aims to develop monolithic microwave active circuits (MMIC) front-end circuits for the telecom and the sensor prototype, and novel interface concepts to the micro-machined integration platform.

WP4: Sensor and Antenna Interfaces

WP4 includes a further development step by composing a platform sensor and antenna interface for primary (telecommunication) and secondary applications (medical, food science, and industrial sensor) prototypes.

WP5: Telecom Proof-of-Concept Prototype

WP5 targets to develop a proof-of-concept prototype for millimeter-wave wireless link based on the microsystem platform. The goal is to test a 145 GHz frequency and investigate how compact the system can be made using the heterogeneously integrated micro-machined platform and what kind of flexibility the platform may offer using MEMS-based tuneable devices.

WP6: Ubiquitous THz Sensor Prototype

WP6 was defined to form a basis for the investigation of secondary applications of the THz microsystem platform spreading over a wide range of sensors: medical microwave sensors, industrial sensors, radar- and food quality sensors.

WP7: Technology Transfer to High-Volume Manufacturer

WP7 involves further key steps in the M3TERA project starting with the technology transfer, accompanied by the design for manufacturability, process documentation and the preparation of the microsystem platform to the high-volume manufacturer in the consortium.

WP8: Dissemination, Communication, Exploitation and Standardisation

The penultimate work package focuses on the dissemination, communication, exploitations and standardization that obtain inputs from all other preceding work packages. WP8 ensures the communication and dissemination of results to be achieved in a single work package to the outside parties as well as to participating entities.

WP9: Project-, Risk-, and Innovation- Management

In the final work package the Project- Risk-, and Innovation- Management will draw from the input of all other WPs in order to guarantee a successful project lifetime with respect to Risk- and Innovation-Management.

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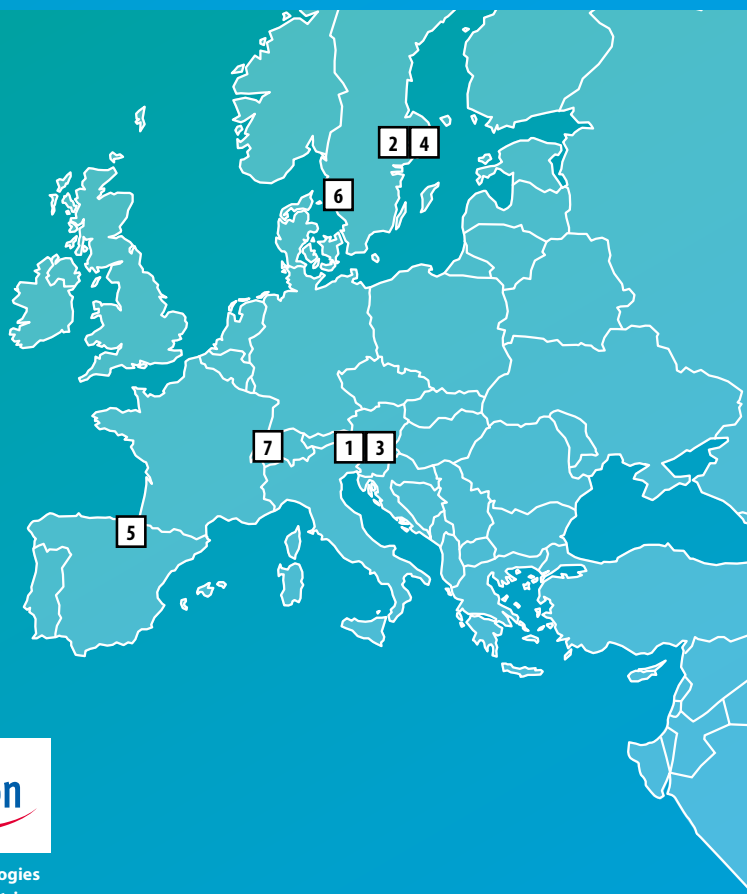
Consortium:

The M3TERA consortium is well-positioned to achieve its objectives by bringing together a European team of leading industrial and research companies. These 7 project partners from 4 different countries form a complete chain stretching from basic research and service design, via applied research, up to end-user oriented service providers.



Project Partners:

1 **Technikon Forschungs- und Planungsgesellschaft mbH, Austria**

2 **Kungliga Tekniska Hoegskolan, Sweden**

3 **Infineon Technologies Austria AG, Austria**

4 **Ericsson AB, Sweden**

5 **Anteral SL, Spain**

6 **Chalmers Tekniska Hoegskola AB, Sweden**

7 **CSEM Centre Suisse D'Electronique et de micro-technique SA – recherche et developpment, Switzerland**