

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 a unique way to highly-integrated, vo-lume-manufacturable, cost- and energy-efficient, reconfigurable submillimeter-wave and THz systems.

The OBJECTIVES of M3TERA

The primary objective of M3TERA is to develop a heterogeneous micro-system 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 through 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.

The primary objective is accompanied by 3 further key aims:

- Primary technology prototype
- Developing a system-in-package concept
- Enabling a manufacturable and efficient technology transfer

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Message from the Coordinator

Since the beginning of the project several conference calls and events dedicated to the project development took place. The consortium met, beginning of October, for the Technical & 1st Advisory Board Meeting in Stockholm at KTH. Valuable feedback on the project progress has been received. The cooperation within the consortium is great and the project is very well on track.

M3TERA Technical & 1st Advisory Board Meeting

From **1st to 2nd October 2015** the M3TERA technical & 1st Advisory Board meeting took place in Stockholm, hosted by the scientific lead KTH. Both meeting days were full of revisions, discussions and further project planning, with all members of consortium participating. There were lively discussions with the **Advisory Board members**, professor Roberto Sorrentino (Università die Perugia) and professor Antti Räisänen (Aalto University), and they confirmed the excellent project progress.

The main focus of the meeting was the technical progress of the project, with intense discussions in WP4 "Sensor and Antenna Interfaces" and WP6 "Ubiquitous THz Sensor Prototype". Partner CSEM gave a presentation on deliverables focusing on sensing THz application, the flexible baseband processing unit description, IC to antenna interface and mmW antennas. The following talks were about different possibilities of antenna solutions (WP4). Besides that the consortium examined the dimension of the platform, which depends on the amount of components and coverall complexity as well as solutions of the ubiquitous THz sensor prototype. Depending of the success of the sub-circuits, the consortium expects to have the chip ready a few months before project end. In addition deep discussions about the technical progress in the other WPs, overall management issues and upcoming events (first technical Review Meeting) took place.

To sum up, the meeting was very successful and the consortium already agreed to execute the next technical meeting in spring (13th to 14th April 2016) at the premises of partner ANTERAL.



KEY Data:

Start Date: 1 February 2015
End Date: 31 January 2018
Duration: 36 months
Project Reference: 644039
Project Total Costs: € 4.255.743,75
EC Contribution: € 3.742.961,25

Consortium:
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Technical Work Progress

Since the last newsletter in August 2015, the M3TERA project experienced significant progress towards reaching its goals. **WP1 "Application and Technology Specifications"** has successfully ended by reaching milestones MS1 "Successful project kick-off" led by partner TEC, and MS2 "Final specifications completed" led by ERICSSON. Overall, system specifications for primary and secondary applications, as well as technology assessment were successfully delivered in this WP.

Within **WP2 "Heterogeneous Integration Platform"** there has been continuous work and progress on overall THz micro-system platform and KTH processes, including subcomponents, dimensional restrictions and geometrical implementation. Deliverable D2.1 focused on draft version of report on overall THz Microsystem and system packaging concept, was successfully submitted end of October 2015.

WP3 "Active Circuits and their Intra-Platform Interfaces" is well on track with designing generic MMIC demonstrator. Feasibility analyses and technology benchmarks for VCO, DCO and amplitude/delay control circuits have been executed. The mm-wave frequency generation has been investigated, as well as the verification and adjustment of models and parameters in the SiGe-PDK. As a result, the final version of PDK (Process Design Kit) for SiGe-BiCMOS MMIC technology has been adjusted to the circuit design focus in M3TERA project. The public deliverable D3.3 which is a report on overall MMIC Concept and Intra-Platform interfaces was submitted in due time in month 8.

In **WP4 "Sensor and Antenna Interfaces"**, which started in July, the first drafts of antenna designs have been obtained. In addition the work on the possible interface designs that could reach the primary application (telecommunication link) has started, including an overview of miniature mm-wave antenna solutions.

WP5 "Telecom Proof-of-Concept Prototype" progressed with concept development of the telecom radio link prototype and set up of a system simulation tool which will be further used for various assessments, as well as with description of primary application demonstrator. In addition, the build-up of the demonstrator radios and how they will be tested and measured are defined and outlined.

Within **WP6 "Ubiquitous THz Sensor Prototype"** there has been continuous research and testing of different platforms and applications. Investigations on sensor applications and evaluation regarding the availability of suited SiGe circuits for a first sensor prototype were performed. Multi-use THz sensor concept and architecture, as well as specifications of the demonstrator for the secondary application have been presented.

In **WP7 "Technology Transfer to High-Volume Manufacturer"** there have been multiple investigations of the suitable micromachining technologies and a preliminary overview to the design rules for micro-system platform which are to be used within the M3TERA project has been provided.

Submitted Deliverables

Altogether **eight deliverables** were submitted since the last newsletter in August.

The public deliverable **D3.3 "Report on Overall MMIC Concept and Intra-Platform Interfaces"** successfully defined the module architecture of the wireless millimeter wave communication demonstrator as well as a steerable antenna based on MEMS-phase-shifter. The initial simulation results are well aligned with the specifications and state-of-the-art, compared to the same technology node. The report is available on our project website:

<http://www.m3tera.eu/publications-deliverables>

The other submitted deliverables brought light into following areas – overall concept of the THz microsystem including subcomponents and various antenna designs, THz sensor architecture and specifications for the secondary application, and a description of primary application demonstrator and a proof-of concept telecom radio link.

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Participation in Conferences / Workshops

- **International Workshop on THz Engineering**
1st September 2015, Pamplona/SPAIN
- **Workshop WS07 at European Microwave Integrated Circuits Conference**
6th September 2015, Paris/France
- **ESSCIRC Conference**
14th - 16th September 2015, Graz/AUSTRIA

Upcoming Conferences / Meetings

- **1st technical review meeting**
28th January 2016, Brussels/BELGIUM
- **M3TERA technical meeting**
13th - 14th April 2016, Pamplona/SPAIN

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