

## Message from the Coordinator

M3TERA is now in project month 30 out of 42, and the consortium is proud to present the first promising results. We are excited about the THz sensor Prototype, which has also triggered external interest and many of the project partners submitted articles which were accepted to distinguished international conferences.

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## Intermediate Review Meeting in Neuchâtel / Switzerland

From 27<sup>th</sup> - 28<sup>th</sup> of June 2017, the 3<sup>rd</sup> M3TERA review meeting took place in Neuchâtel, Switzerland with its focus on the **demonstration of the Secondary Application "Ubiquitous THz Sensor Prototype"**.

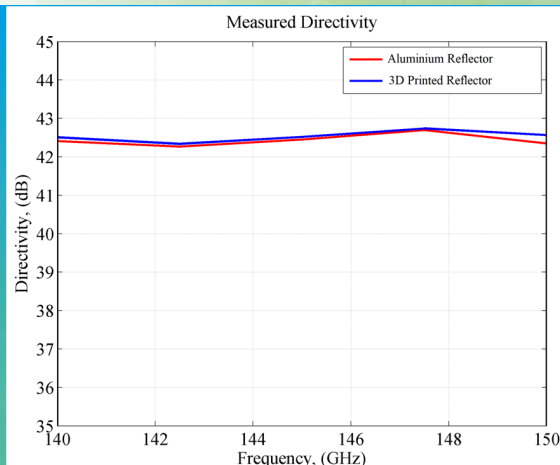
The 3<sup>rd</sup> meeting hosted by CSEM started with presentations of the Integrated and Wireless Systems division. The tours through CSEM's show room and biomedical labs supported the former input. The main aim of the meeting was the secondary application measurement setup of the "Ubiquitous THz Sensor Prototype" which was discussed in the afternoon of the first day. The demonstration was considered as **very successful** (convincing and converging) and has triggered external interest.

On the second day of the meeting the consortium planned the upcoming deliverables as well as ongoing and future work within the other work packages.



## Some research highlights of the previous months

The antenna system for the primary application has been tested obtaining the expected performance in terms of directivity and radiation pattern and fulfilling the project requirements. The 3D printed antenna prototype has also been characterized resulting in a comparable performance to the aluminum system, becoming this way in an optimal low cost solution for the M3tera project. Furthermore, the public version of [D4.3 "Prototype of Antenna System"](#) has been submitted and published on the project website.



### Key Data:

**Start Date:** 1<sup>st</sup> of February 2015  
**End Date:** 31<sup>st</sup> of July 2018  
**Duration:** 42 months  
**Project Reference:** 644039  
**Project Total Costs:** € 4.255.743,75  
**EC Contribution:** € 3.742.961,25

**Consortium:**  
**Project Coordinator:**

**Technical Leader:**

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 644039.

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This work is supported (also) by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract number 15.0059. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the Swiss Government.





## Summary of Results and Progress in the 2<sup>nd</sup> Project Period

### Context and overall objectives of the project

The main objective of the M3TERA project is to **develop a novel microsystem platform which provides a new way for fabricating complex systems working at terahertz (THz) frequencies**. This technology envisions a true break-through in THz technology, which could finally enable a wide-spread utilization of THz technology in society. As implementation demonstrators, the project focuses primarily on a telecom demonstrator for a beyond-100 GHz high speed communication link, and secondary on sensing applications.

### Work performed and main results

The main technical achievements in the second period are: **first prototype of the microsystem platform** in this project, generic MMIC front-end circuits were fabricated and tested which include low noise amplifiers, power amplifiers, mixers, multipliers and co-integrated circuits. Moreover, the **aluminium antenna** has been fabricated and tested along with the characterisation of the plastic antennas for secondary applications. Mechanical fixture for the diplexer measurements was designed and manufactured. The **CMOS readout circuit for the THz sensor prototype** was finalized and the fabricated circuit was received. For the technology transfer, the process flow has been identified and process steps are being optimized.

### Progress beyond the state of the art and expected potential impact

The concepts of a **microsystem technology platform for THz systems** developed in M3TERA clearly go beyond the state of the art, including micro-electromechanical reconfigurable sub-systems. A major step beyond state of the art is also the **interfaces between active circuits and the waveguides** developed in this project.

In summary, the main impact of the disruptive THz technology developed in M3TERA is still given as follows: **highly-miniaturized, volume-manufacturable, low cost** (as compared to state-of-the-art THz technology), **low-weight, highly integrated THz with high product uniformity**, enabling the large-scale exploitation of the THz frequency spectrum and thus a **wide-spread use of THz technology in many applications in society**.

### Accepted Papers

(visit also: <https://m3tera.eu/publications-deliverables>)

- “3D Printed Antennas for mm-Wave Sensing Applications”, A. Vorobyov, J. Farserotu, J-D. Decotignie
- “A Non-galvanic D-band MMIC-to-Waveguide Transition Using eWLB Packaging Technology”, A. Hassona, Z. He, C. Mariotti, F. Dielacher, V. Vassilev, Y. Li, J. Oberhammer, H. Zirath
- “Elliptical Alignment Holes Enabling Accurate Direct Assembly of Microchips to Standard Waveguide Flanges at sub-THz Frequencies”, J. Campion, U. Shah, J. Oberhammer
- “High Gain Reflector Antenna for M3Tera H2020 project”, I. Maestrojuan, M. Goñi, A. Martinez
- “A 100-145 GHz Area-Efficient Power Amplifier in a 130 nm SiGe Technology”, M. Bao, Z. S. He, H. Zirath
- “A Direct Carrier I/Q Modulator for High-Speed Communication at D-Band Using 130 nm SiGe BiCMOS Technology”, S. Carpenter, Z. S. He, H. Zirath
- “A 100-140 GHz SiGe-BiCMOS Sub-Harmonic Down-Converter Mixer”, N. Seyedhosseinzadeh, A. Nabavi, S. Carpenter, Z. S. He, M. Bao, H. Zirath

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