Car2TERA

Issue 02
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Eyes and Ears for the Car of the Future

Terahertz sensors and networks for next generation smart automotive electronic systems

Message from the Scientific Lead

Making terahertz frequencies available for car safety applications – that's what Car2TERA is doing. We moved on to the implementation of an advanced car radar prototype, and have some interesting new concepts to be tested.

Joachim Oberhammer

In This Issue

- First project year – 2019
- Highlights about ongoing work
- Beyond 5G Cluster
- First Winter School
- Upcoming Events

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Budget

€ 3.9 Million
100% EU-funded

Consortium

9 Partners
5 countries

Duration

39 Months
01/2019 - 03/2022

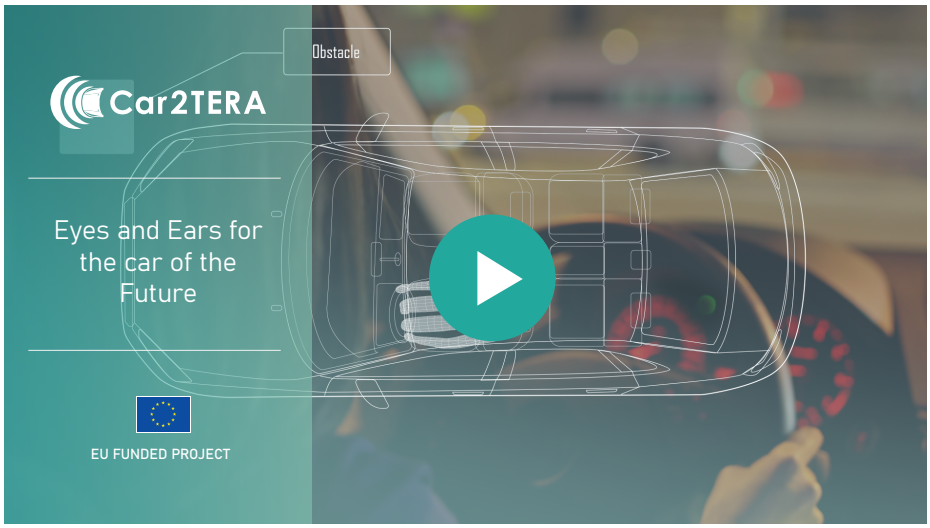
About

From Advanced Driver Assistance Systems (ADAS) to fully Automated Vehicles, Car2TERA combines the results of recent achievements in semiconductor, micro- and nanoelectronics scientific projects. Car2TERA emerging technology and innovation will take next generation cars to the next level.

First project year – 2019

The focus of the first project year in Car2TERA was (1) to exchange technology information between the partners, including design kits, technology capability; (2) to discuss the applications and delivery of specifications to the specific applications and (3) to explore possible concepts for implementation of prototype solutions. Here is a summary of the main achievements:

- Design Kit for B12HFC prepared (first version) and system specifications for primary and secondary demonstrator defined
- The radar beam steering strategy finalized
- Tape out in B11 completed
- Graphene single layer and bi-layer tests on large SiC substrates carried out and promising results on other substrates (e.g. copper, silicon and sapphire) gained
- Preliminary MMICs design and antenna concepts developed
- Measurements of a micromachined test antenna with beam-steering capability performed
- Plastic microwave fiber (PMF) topologies investigated and extensive EM simulations carried out
- System simulation on baseband hardware started



In an effort to explain the fundamentals of Car2TERA, a video was designed which offers a quick glance into the objectives of the Project. This video was intended to be shared on social media to raise awareness of Car2TERA. Please have a look and share with colleagues who are interested in your work.

The Car2TERA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 824962.

Highlights about ongoing work

In January 2020 the consortium finalized a couple of technical reports: about the eWLB Process Design Kit for the B12 process, on the requirements for in-cabin radar sensor tests and one about modulation waveforms and the radar beam steering concept.

The advanced eWLB package technology represents an attractive solution for Si integrated um and mm-Wave designs. The eWLB package is successfully integrated in the B11HFC Process Design Kit while it is currently being ported to the B12HFC SiGe technology to be used for the needs of the Car2TERA designs.

In another report, which describes the development of the Car2TERA radar prototype, partner Veoneer states that the tests for basic performance will be compared to the theoretical values based on electromagnetic field calculations, while the tests designed for the in-cabin application will be used to do an assessment of how a full radar system must be designed to be able to handle all vehicle safety defined in-cabin scenarios.

Another report explored different 240 GHz carrier frequency modulation waveforms that might be used for the Car2TERA radar. The chosen waveforms will have an impact on the range, speed and angular resolution as well as the radar update rate of the radar.

Furthermore, a report as a result of the investigation of beam steering and beam shape strategies was completed. The criteria was to develop a concept, which, at affordable hardware complexity and for the given bandwidth limitation, achieves high performance to separate objects in distance, angle, and speed.

BEYOND5G

Eight H2020 projects funded under call ICT-09-2017 form the Beyond5G Cluster, which aim is to offer a response to new challenges of future networks with above state of the art technologies covering all the major communication area from Gb/s to Tb/s. Car2TERA is proud to be part of this international initiative starting in 2020.

The Winter School was a great success for all three H2020 projects, with excellent collaboration among organizers and speakers and with high interest among the participants, who joined the event either directly in Gothenburg or through an online live stream webinar. (*more on next page*)

First Winter School co-organized by H2020 projects Car2TERA, SERENA & Grace

The three H2020 projects SERENA, car-2TERA and GRACE recently organized a winter school entitled "Technology and Integration Platforms for Future mm-wave Communication and Radar Applications", which took place from 15th – 17th January 2020 at Chalmers University in Gothenburg, Sweden. The event was particularly targeted towards PhD students and young researchers from various countries. Renowned international experts from academia and leading industries gave tutorial talks on up-to-date research trends for future wireless technology – from semiconductors to millimetre wave systems.

The first day was dedicated to trends and requirements in emerging wireless systems including insights in 5G and beyond mobile communications, sensor technologies for automotive industry and short-range mm-wave radar sensors for airbone applications.

On the second day industry experts, as well as university professors, talked about technology and circuits for mm-wave communication and sensing and about emerging mm-wave technologies and system integration. To conclude, basic principles and research trends regarding mm-wave communication and radar sensing, as well as multi-physics simulation of mm-wave systems were presented.

Dissemination material

Podcast

In our second podcast episode, we speak with Olof Eriksson from Veoneer about the progress of the project.

Project video

Car2TERA explained in under 2 minutes – see what makes this project so important for the advancement of driver safety in Europe

Publications

Explore and download all Car2TERA publications on Zenodo.

Consortium

The Car2TERA consortium consists of eight highly qualified industrial and academic partners from various backgrounds and five different countries (Austria, Sweden, Poland, Italy and Spain), making it well positioned to achieve its objectives.

Past Events

Asia-Pacific Microwave Conference
10th-13th of December
@Singapore
Ericsson presented results of parent project M3TERA and introduced follow-up project Car2TERA to the community

CES
7th - 10th of January
@Las Vegas, (USA)
Veoneer had its own booth at the world's leading event for consumer electronics.

Upcoming Events

International Solid-State Circuit Conference
16th - 20th February
@San Francisco (USA)

2nd International Workshop on Polymer Microwave Fiber Technology
3rd - 4th March
@Leuven (Belgium)

3rd Towards TeraHertz Communication Workshop
12th - 13th March
@Leuven (Belgium)
(free admission)

All events can be found on the Car2TERA webpage:
car2tera.eu/events