

Large Scale Collaborative Project

DOTSEVEN

Towards 0.7 Terahertz Silicon Germanium
Heterojunction Bipolar Technology

FP7 Contract Number: 316755



WP5 – Training and dissemination

Deliverable report

Due date of deliverable: M42
Actual Submission date: M42

Deliverable ID: **D5.5**
Deliverable Title: **DOTSEVEN workshop 4**
Responsible beneficiary: UB
Contributing beneficiaries: UB, RWTH, UN

Start Date of the Project: 1st October 2012 42 Months

Revision: Vf
Dissemination Level: PU

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Document Information

Document Name: DOTSEVEN-WP5-D5.5
Document ID: DOTSEVEN_D5.5_UB_vf
Version: V0
Version Date: 05/01/16
Authors:
Security: **Public**

Approvals

	Name	Organization	Date	Visa
<i>Coordinator</i>	Rudolf LACHNER	INFINEON	05/01/2016	RL
<i>Technical Manager</i>	Michael SCHROTER	TUD	05/01/2016	MS
<i>Work Package Leader 5</i>	Thomas ZIMMER	UB	05/01/2016	TZ
<i>Quality Manager</i>	Julie CHUPIN	ALMA	05/01/2016	JC

Document history

Revision	Date	Modification	Authors
V0	05/01/2016	Initial Version	TZ
Vf		Final	IFAG

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Section 1 - Executive summary

A Workshop entitled “SiGe-THz devices: Physics and reliability” was held in Bordeaux, France on December 17, 2015. In order to maximize the impact, this event was part of the Master’s degree program at the University of Bordeaux and INP, the Bordeaux engineering school.

The purpose of this full-day tutorial was to provide an insight in the physics of the SiGe-THz devices. In the first session, the fundamental equations of semiclassical transport (the Boltzmann equation) were discussed taking into account the SiGe HBTs structure where scattering by phonons, alloy fluctuations, impurities and impact ionization is of importance. The second session was dedicated to the exploration of the safe-operating-area (SOA) of SiGe-THz devices. The limiting factors such as impact ionization and self-heating were highlighted.

The afternoon sessions focused on reliability. The first one was dedicated to the presentation of degradation phenomena occurring inside SiGe-THz devices under extreme operation conditions. In the last session, the reliability aware circuit design concept was explained.

1.1 Description of the Workshop Program

Programme

Opening and Welcome (9h00), Thomas Zimmer, University of Bordeaux

Session 1: Physics based device simulation (9h15-10h45)

Christoph Jungemann, RWTH Aachen University

Coffee Break: 10h45-11h00

Session 2: Safe operating limits of SiGe-THz devices (11h00-12h30)

Anjan Chakravorty, IIT Madras, India, guest professor at the University of Bordeaux

Lunch Break: 12h30-14h00

Session 3: Reliability of SiGe-THz devices (14h00-15h30)

Grazia Sasso, University of Naples, Italy

Coffee Break: 15h30-15h45

Session 4: Reliability aware circuit design (15h45-17h15)

Cristell Maneux, University of Bordeaux, France

17h30: End of SiGe-THz device Tutorial

1.2 Brief description of announcement strategy

The announcement has been carried out through 4 information channels:

1. DOTSEVEN Webpage
<http://www.dotseven.eu/>
2. Use of the Mailing list of
 - a. the DOTSEVEN consortium
 - b. the Rf2THz consortium
 - c. the ESSDERC Technical Program Committee
 - d. the HiCuM Workshop community
 - e. the BipAk members

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Security: Public

3. Flyers have been distributed at the ESSDERC conference in Graz and at the BCTM conference in Boston.
4. Information was given to the managers of the Master's degree programs at the University of Bordeaux and INP - the Bordeaux engineering school as well as to the head of the PhD training program of the University of Bordeaux

1.3 Attendees

52 persons participated at the tutorial. The participation was mostly local: 8 PhD students from the University of Bordeaux, 16 Master students from INP - the Bordeaux engineering school, 16 Master students from the University of Bordeaux and 12 PostDocs, researchers, professors and assistant professor, mostly from the IMS lab, Bordeaux.

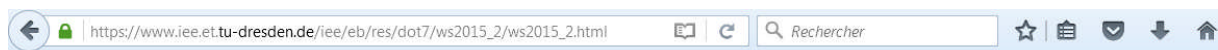
1.4 Webpage for downloading the presentations

The workshop presentations have been made publicly available on a website managed by a dedicated system administrator of TUD.

The URL is:

https://www.iee.et.tu-dresden.de/iee/eb/res/dot7/ws2015_2/ws2015_2.html

The following picture shows the screenshot of the webpage.



DOTSEVEN Workshop

Place: University of Bordeaux, France

351 cours de la Liberation, IMS, Bat A31, Amphitheatre Jean-Paul Dom

Date: December 17, 2015

Inscription fees: free of charge, just mail to: thomas.zimmer@ieee.org

Abstract: In Europe, a huge effort is actually undertaken to strengthen Europe's leading edge position in integrated THz devices, circuits and new applications. Cut-off frequencies (f_{max}) of up to 700 GHz will be possible thanks to the progress of SiGe HBT technology. The purpose of this full-day tutorial is to provide an insight in the physics of the SiGe-THz devices. In the first session, the fundamental equation of semiclassical transport (the Boltzmann equation) will be discussed taking into account the SiGe HBTs structure where scattering by phonons, alloy fluctuations, impurities and impact ionization is of importance. The second session is dedicated to the exploration of the save-operating-area (SOA) of SiGe-THz devices. The limiting factors such as impact ionization and self-heating will be highlighted. The afternoon sessions focus on reliability. The first one is dedicated to the presentation of degradation phenomena occurring inside SiGe-THz devices under extreme operation conditions. In the last, the reliability aware circuit design concept will be explained.



1.5 Feedback from the audience

The feedback from the audience was positive. The students were very impressed. The organizer received several requests from persons who could not manage to attend the tutorial but were very interested; so they asked for the URL for downloading the slides.

1.6 Impact

During the tutorial, 4 technical presentations were given. Since reliability is a very important topic, the last DOTSEVEN tutorial was dedicated to device physics and reliability of SiGe devices. A special attention was given to the audience, mostly Master students, the engineers of tomorrow, in order to prepare them for an efficient future work placement in the SiGe THz domain.

1.7 Publishable information

All information is public and the presentations are downloadable from a specific website (see above).

1.8 Conclusion

A tutorial was organized with special focus on device physics and reliability. This Workshop took place on December 17, 2015 in Bordeaux, France. 52 participants attended the tutorial, especially Master students from the University of Bordeaux and from INP - the Bordeaux engineering school. The audience's feedback was positive. The research activities and reported results within DOTSEVEN were met with great interest.