PROJECT PERIODIC REPORT

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[1] Usually the contact person of the coordinator as specified in Art. 8.1. of the Grant Agreement.

[2] The home page of the website should contain the generic European flag and the FP7 logo which are available in electronic format at the Europa website (logo of the European flag: http://europa.eu/abc/symbols/emblem/index_en.htm logo of the 7th FP: http://ec.europa.eu/research/fp7/index_en.cfm?pg=logos). The area of activity of the project should also be mentioned.

1. Publishable summary

DOTSEVEN is a very ambitious 3.5 year R&D project targeting the development of silicon germanium (SiGe) heterojunction bipolar transistor (HBT) technologies with cut-off frequencies (fmax) up to 700 GHz. Special attention will be paid to clearly demonstrate the manufacturability and integration with CMOS as well as the capabilities and benefits of 0.7 THz SiGe HBT technology by benchmark circuits and system applications in the 0.1 to 1 THz range.

The main objective of the DOTSEVEN consortium is therefore to reinforce and further strengthen Europe's leading edge position in SiGe HBT technology and modelling as well as SiGe enabled mm-wave applications so as to stay significantly ahead of non-European competition.

THz technology is an emerging field which has demonstrated a wide ranging potential. Extensive research during the last years has identified many attractive application areas, and paved the technological paths towards broadly usable THz systems.

THz technology is currently in a pivotal phase and will soon be in a position to radically expand our analytical capabilities via its intrinsic benefits.

One of the most pressing challenges of THz applications is the development of cost effective, compact & efficient THz signal sources and receivers for everyday applications.

In this context, DOTSEVEN is planned to continue the push for fully integrated cost efficient electronic THz solutions. The deployment of the associated high-performance circuits and systems in commercial and other non-military markets is driven mainly by cost, form-factor and energy-efficiency.

The DOTSEVEN project is motivated by the increasing interest in utilizing the mm-wave frequency spectrum within the so-called THz gap, which ranges from 0.3 to 30 THz, for a wide variety of applications.

Examples for these applications are:

- >120GHz industrial sensors including mm-wave scanning and radar,
- extremely broadband ADCs with 50

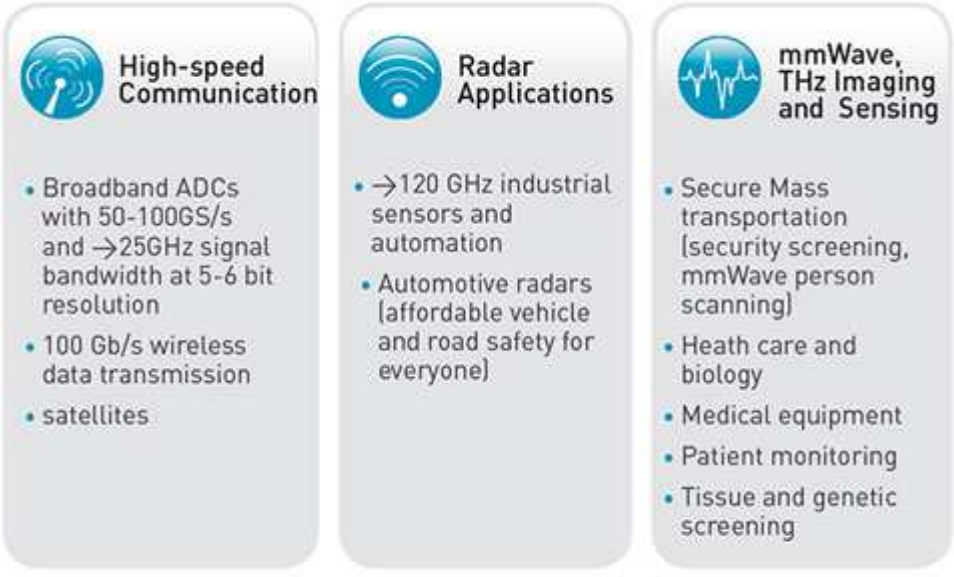

Illustration of mm-Wave and THz applications

to 100GS/s and >25GHz signal bandwidth at 5 to 6 bit resolution,
- 400Gb/s optical (backbone) transmission, as well as highly linear amplifiers, e.g., for 4G mobile communications.

These circuits and systems serve a large variety of markets such as:
- Health care and biology (e.g., medical equipment, patient monitoring, tissue, genetic screening)
- Infrastructure and construction (e.g., structural safety),
- Mass transportation (e.g., security screening, automotive radar, in-seat entertainment)
- Industrial automation (e.g., sensors)
- Communications (e.g., high-bandwidth terrestrial point-to-point wireless, satellites).

The rapidly increasing interest in THz-applications has most recently even spawned the start of a new IEEE Journal, namely the “Transactions on Terahertz Science and Technology”.

Moreover, as discussed in a first business report, applications operating in the mm- and sub-mm-wave range constitute a diverse but quite sizeable future market

The design and implementation of high-speed circuits such as those mentioned above requires individual transistors to be able to operate, i.e. maintain power gain, at 3 to 10 times higher frequencies. This puts their characteristic operating frequencies well into the spectrum of the (low-end) THz gap.
The main objectives of the DOTSEVEN project are therefore:
- The realization of SiGeC Heterojunction Bipolar Transistors (HBTs) operating at a maximum frequency up to 0.7 THz (i.e. 700 GHz) at room temperature.
- The design and demonstration of working integrated mm- and sub-mm-wave circuits using such HBTs for specific applications
- The evaluation, understanding, and modelling of the relevant physical effects occurring in such high-speed devices and circuits.

The results of this project are expected to be the last stepping stone before realizing a SiGeC HBT with THz performance.

A highly qualified and success-proven consortium of 14 partners, from industry and academia in 6 European countries, has been set-up to achieve these goals.

In the first period of the project, covering the first 14 months, already good progress towards all these three main objectives has been made. With respect to the technology not only investigations towards higher performance by e.g. reducing the thermal process budget have been done. In addition also first good results have been achieved for utilizing the shown Dotfive SiGe HBT performance levels in an industrial BiCMOS technology environment. The circuit design activities have led to about 185 mm² of silicon area

designed towards the challenging integrated mm- and sub-mm-wave demonstrators. This activities were supported by advanced characterization and modeling, for which the hardware of the previous Dotfive project could have been advantageously used as a starting point.

DOTSEVEN is also accessible on www.dotseven.eu

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SEVENTH FRAMEWORK PROGRAMME