

The European funded project DOTFIVE (Framework Program FP 7) provides details of their latest high-speed circuits at ISSCC conference this week. DOTFIVE design teams make use of cutting-edge Silicon-Germanium process technologies developed in Europe. The technology is suitable for future THz imaging, radar, or communication applications.



Over the last 3 years, the DOTFIVE consortium has established a leadership position for the European semiconductor industry in the area of SiGe HBTs (Silicon-Germanium Heterojunction Bipolar Transistors) for millimeter wave applications, with contributions from semiconductor manufacturers like STMicroelectronics, Infineon Technologies and IHP GmbH. Chips based on SiGe feature faster NPN transistors and target integration levels unseen in any other high-frequency Silicon bipolar technology.

At the International Solid State Circuit Conference (ISSCC), held in San Francisco February 20-24, 2011, University of Wuppertal and IHP discuss circuit results of the DOTFIVE-Consortium's next-generation Silicon-Germanium BiCMOS technology, an imaging chip-set for applications at 0.82THz. The chips-set, a transmitter and receiver, include all required circuitry such as frequency multipliers, harmonic mixers, power amplifiers, on-chip antennas, and run from a 18GHz frequency reference. The circuits operate their transistors sub-harmonically and expand their application beyond their cut-off frequency. Overall, this demonstrates the "highest frequency of operation in the SiGe history."

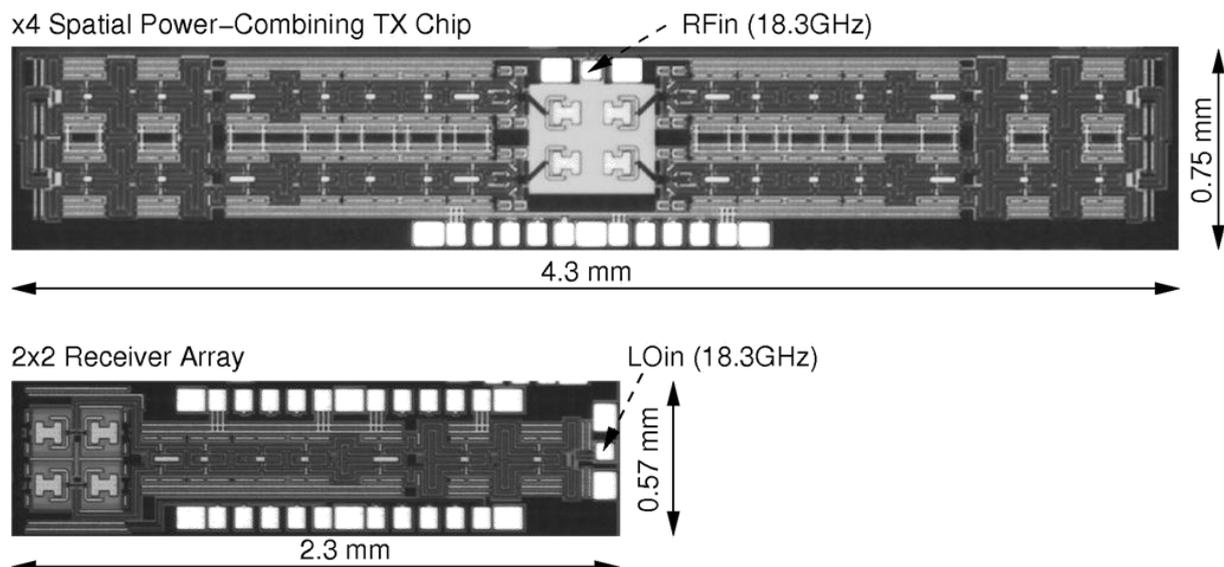


Fig. 1 Chip micrographs of a fully-integrated SiGe chip-set for THz imaging applications, to be presented at the 2011 ISSCC.

The chips include some of the latest cutting-edge process technologies and focus on novel applications for Silicon technologies, said Dr. Erik Öjefors, circuit designer at the University of

Wuppertal, Germany. The DOTFIVE Project's transistors are not only designed for high-frequency applications, but also enable lower power applications and better noise performance at lower frequencies. The technology could also be a key driver for novel applications in a variety of emerging applications in the security, medical and scientific area.



Fig. 2 Visual images (top) and THz images (below) of objects screened at 0.82 THz. The images were captured with an integrated Silicon solution; no expensive THz equipment was required.

Prior to ISSCC the latest DOTFIVE technology achievements were presented by IHP at the IEDM meeting in San Francisco, California, in December 2010. The technology feature $f_{max}=500\text{GHz}$ hetero-junction bipolar (HBT) transistors and has reached ring-oscillator gate delays as low as **2.0ps**, a new world record for SiGe said Dr. Bernd Heinemann, IHP GmbH, Germany.

Designers and technologists of STMicroelectronics and the University of Wuppertal were recognized when being **awarded the 40th EuMC Microwave Prize**, in Paris in September 2010, a prize given since 1977 for the best contributed paper to the European Microwave Conference. The paper was presented by E. Öjefors, F. Pourchon, P. Chevalier, and U.R. Pfeiffer, for their work "A 160-GHz Low-Noise Downconverter in a SiGe HBT Technology".

Leading edge DOTFIVE circuits, fabricated by Infineon, were also presented at the 2010 BiPolar/BiCMOS Circuits and Technology Meeting (BCTM) in Austin Texas, (4-6 October 2010). The static frequency dividers presented by Infineon, showed record operation at 133-GHz and such circuits play a key role in any communication and radar system.

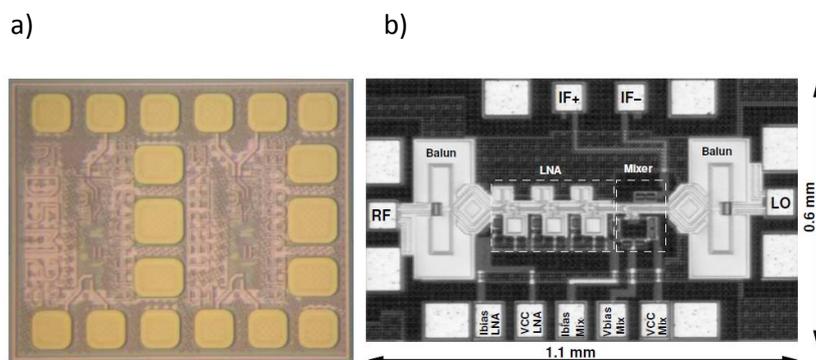


Fig. 3 Further DOTFIVE record circuits include 133GHz static frequency divider (a), and 160GHz communication receiver (b). The circuits were presented by Infineon and STMicroelectronics at the BCTM 2010 and the EuMC 2010 conference respectively.

Further information about the project, publications and seminars are available at the project public web site: <http://www.dotfive.eu>

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