



Elektrotechnisches Kolloquium

der Bergischen Universität Wuppertal

Die Fakultät für Elektrotechnik, Informationstechnik und Medientechnik lädt zur Teilnahme an folgender Vortragsveranstaltung mit anschließender Diskussion ein:

Es spricht

Marcel Andree, M. Sc.

Lehrstuhl für Hochfrequenzsysteme in der Kommunikationstechnik

Prof. Dr. Ullrich Pfeiffer

Bergische Universität Wuppertal

über das Thema

A Broadband Dual-Polarized Terahertz Direct Detector in a 0.13 μm SiGe HBT Technology

Inhalt:

The first silicon based focal-plane array operating at room-temperature in the terahertz (THz) frequency range has been demonstrated in a 250 nm CMOS technology at 650 GHz over ten years ago. Since then, the research in integrated THz silicon receivers mainly focused on advancing the performance of THz direct power detectors for applications such as THz spectroscopy and active imaging in quality control or security screening. Over the past decade the sensitivity of THz integrated direct detectors in terms of noise-equivalent power has improved by nearly two orders of magnitude from 250 to 10 $\text{pW}/\sqrt{\text{Hz}}$, while the operation bandwidth usually stays narrowband. Considering future passive imaging applications, not only their sensitivity but especially the bandwidth has to be improved by another order of magnitude.

In this talk a dual-polarized terahertz (THz) direct detector with an integrated, differential wire-ring antenna, coupled to an external silicon lens is presented. It is implemented in an advanced 0.13- μm SiGe HBT technology with f_t/f_{max} of 350/550 GHz. It comprises two pairs of differentially driven HBT transistors in common-base (CB) configuration. Their voltage-mode readout is characterized in the forward-active and in the saturation region with an external load resistance of 1.83 k. In the forward-active region the detector's optical noise equivalent power (NEP) is lower than 38 $\text{pW}/\sqrt{\text{Hz}}$ in the measured 220 - 1000 GHz band. Best NEP values of 2.7 to 3.4 $\text{pW}/\sqrt{\text{Hz}}$ were measured in the frequency range of 430 to 476 GHz, corresponding to a voltage responsivity of 5-6 kV/W. In the saturation region the minimum NEP with no collector biasing is 8.2 $\text{pW}/\sqrt{\text{Hz}}$. This is the first reported silicon-integrated SiGe HBT THz direct detector, operating at room temperature, with an NEP below 10 $\text{pW}/\sqrt{\text{Hz}}$ in the frequency range between 300 GHz and 500 GHz.

Termin:

Mittwoch, 29.05.2019,

14:00 Uhr

Ort:

Bergische Universität Wuppertal
Campus Freudenberg

FE 00.01