Session 9 - Microwave, Millimeter Wave and Analog Technology - Compound Semiconductors and Novel Materials for RF and mmWave
Monday, December 9, 1:30 p.m.
Imperial Ballroom A
Co-Chairs: M. Urteaga, Teledyne Science
F. Gianesello, STMicroelectronics

1:35 PM **9.1** First Demonstration of III-V HBTs on 300 mm Si Substrates Using Nano-Ridge Engineering
A.Vais, L. Witters, Y. Mols, A.S.-Hernandez, A. Walke, H. Yu, M. Baryshnikova, G. Mannaert, V. Deshpande, R. Alcotte, M. Ingels, P. Wambacq, B. Parvais, R. Langer, B. Kunert, N. Waldron, and N. Collaert, imec, KU Leuven, VUB

In this paper, we demonstrate GaAs/InGaP HBTs grown on a 300 mm Si substrate. A DC current gain of ~112 and breakdown voltage, BV_{CBO} of 10 V is achieved. The emitter-base and base-collector diodes show an ideality factor of ~1.2 and ~1.4, respectively.

2:00 PM **9.2** Millimeter-wave InP Device Technologies for Ultra-high Speed Wireless Communications toward Beyond 5G
H. Hamada, T. Tsutsumi, H. Sugiyama, H. Matsuzaki, H-J. Song, G. Itami, T. Fujimura, I. Abdo, K. Okada, and H. Nosaka, NTT Corporation, Tokyo Institute of Technology

300 GHz, 100 Gb/s InP-HEMT wireless transceiver (TRx) is presented. Fabricated TRx can handle the data rate of 100 Gb/s at the link distance of 2.2 meter. Furthermore, 120 Gb/s, 9.8 meter wireless data transmission was achieved by applying the newly designed high-linearity PAs to our TRx.

2:25 PM **9.3** Impact Ionization Control in 50 nm Low-Noise High-Speed InP HEMTs with InAs Channel Insets
Diego Calvo Ruiz, Tamara Saranovac, Daxin Han, Olivier Ostinelli, Colombo Bolognesi, ETH-Zurich

Composite InAs/GaInAs channels with thin InP subchannels can suppress impact ionization in 50 nm HEMTs and improve noise properties while outperforming similar devices in f_T/f_{MAX} These are the first HEMTs combining InAs insets with InP subchannels. Ionization is mapped/quantified over the I_{DS}/V_{DS} domain, and correlated to NF_{MIN} for different designs.

2:50 PM **9.4** Weyl Semi-Metal-Based High-Frequency Amplifiers
Alessandra Toniato, Bernd Gotsmann, Erik Lind, Cezar Zota, IBM Research – Zurich, Lund University

In this work, we propose and simulate a novel amplifier based on Weyl semi-metals. Results show the device provides high gain with extremely low power dissipation. This device is promising to replace HEMTs in quantum computers, where low power dissipation enables it to be integrated at lower cryostat temperature stages.

3:15 PM *COFFEE BREAK*

3:40 PM **9.5** Non-volatile RF and mm-wave Switches Based on Monolayer hBN
Myungsoo Kim, Emiliano Pallecchi, Ruijing Ge, Xiaohan Wu, Vanessa Avramovic, Etienne Okada, Jack Lee, Henri Happy, Deji Akinwande, The University of Texas at Austin, University of Lille

Non-volatile RF switches based on hBN is realized for the first time with low insertion loss (≤ 0.2 dB) and high isolation (≥ 15 dB) up to 110 GHz. It offers a promising combination of non-volatility, nanosecond switching, power handling, high cutoff frequency (43 THz), and heater-less ambient integration.

4:05 PM **9.6** Non-Reciprocal Acoustoelectric Amplification in Germanium-Based Lamb Wave Delay Lines

Faysal Hakim, Mehrdad Ramezani, Sushant Rassay, Roozbeh Tabrizian, University of Florida

This paper reports on the use of acoustoelectric effect in single crystal germanium for non-reciprocal amplification of Lamb waves in RF delay lines. Waves are electromechanically excited using thin-film aluminum nitride transducers and amplified by the application of a DC electric field across the Ge waveguide through the deformation-potential coupling.