The RF SOI Group of the Louvain School of Engineering performs research on the modelling, design and characterization of RF Silicon-on-Insulator (RF SOI) devices for applications such as advanced communication circuits, radar and imaging systems, miniaturized RFID chips, … In this field, recent transistor downscaling down to a few tens of nm has enabled the operation of RF SOI circuits well above 100 GHz. The design and characterization of devices and circuits at those frequencies require dedicated measurement techniques and on-wafer measurement setups. The RF SOI Group is therefore seeking an **RF and mm-waves Device engineering PhD student** to work on advanced techniques for on-wafer characterization of microwave Silicon-on-Insulator (SOI) devices at microwave and mmWave frequencies.

With the continuous downscaling of semiconductor technologies cut-off frequencies of advanced silicon (Si)-based transistors are now well into the THz (0.1-10 THz) range. This enables the fabrication of integrated circuits operating at several hundreds of GHz for applications such as short-range automotive or gesture sensing radars, high speed communications (6G) or imagery. However, on-wafer measurements and characterization of THz devices present many challenges. Some of the fundamental difficulties are to deal with direct probe-to-probe coupling as well as with undesired electromagnetic modes that are excited inside and in periphery of on-wafer test structures. Both can severely impact measurement accuracy and induce errors in the extracted parameters of materials, devices and circuits, hence impairing model accuracy and our physical understanding of tested structures. Published literature indicates that the probe geometry plays a central role in exciting parasitic modes by inducing direct probe-to-substrate coupling. We therefore propose in this work to further characterize the physical mechanisms of probe coupling and correlate them to specific probe geometrical features. We also propose to study, design, fabricate and characterize new, Si-based, probe geometries with improved performance for on-wafer THz measurements. The outcomes of this project should benefit the entire (and growing) community of scientists and engineers involved in the study and development of integrated millimeter-wave and THz circuits and systems.

Position Requirements

Master in Physics or Electrical Engineering with Si device and microwave analysis experience;
Experience in using EM simulation software;
Familiarity with vector-network analyzer on-wafer measurement techniques;
Understanding of broadband high-frequency and analog device figures of merit;
Good communication skills and ability to work across functional teams of device, electrical characterization, reliability and layout.

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Hosting lab information

The student will be hosted by the RF SOI Group of the Louvain School of Engineering. Under the guidance of Prof. J.-P. Raskin, the group has pioneered the widespread use of SOI for RF and microwave applications by establishing a clear path to transform lossy SOI substrates into quasi-lossless material. Thanks to those developments SOITEC's eSI™ RF-SOI substrate has been able to displace III-V on the mobile handset RF switch market and at present almost all new smartphones have RF-SOI inside.

Prof. D. Lederer joined the **Louvain School of Engineering** in September 2020 to work on THz technologies. He joined the RF SOI Group to explore how the boundaries of RF SOI can be pushed towards > 100 GHz applications.

Contact us:

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