iemn
Institut d'Electronique, de Microélectronique et de Nanotechnologie
UMR CNRS 8520

M2 Internship Offer

Proposed by Emilien Peytavit/S. Barbieri Tel. Number: 0320197871

E-mail : Emilien.peytavit@iemn.fr Research Group: THz Photonics

Title : Modeling and THz characterization of quantum-well infrared photoconductor arrays coupled to plasmonic antennas

Context: For several years now, the THz photonics group has been developing quantum-well infrared photoconductors (QWIP) operating in Mid-Infrared-Range (MIR) with electrical bandwidths in excess of 100 GHz. These fast MIR detectors are suitable for a wide range of applications, including IR spectroscopy, telecommunications, frequency comb characterization and THz wave generation by photomixing two MIR lasers. These components consit of arrays of quantum-well photoconductors coupled to plasmonic patch antennas and linked by metal air bridges[1].

Task : The aim of this project/internship is firstly to model the electrical response of these antenna arrays using 3D electromagnetic simulation software (HFFS, CST microwave). Secondly, the trainee will characterize the electrical response of these structures using vector network analyzers up to 320 GHz, and develop an equivalent electrical schematic.

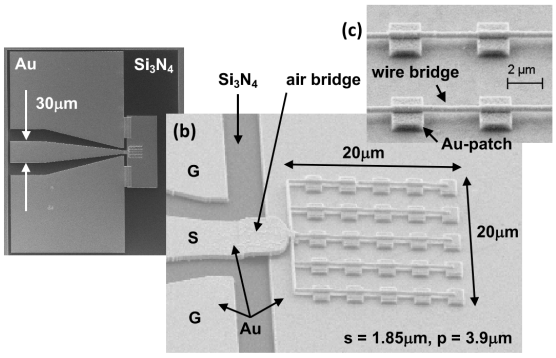

Figure 1. (a) SEM image of the 5 × 5 PAR array with an integrated coplanar waveguide. (b) Close-up on panel (a) showing the full 5 × 5 PAR array used in the experiment (s = 1.85 μm; p = 3.9 μm) and the air bridge connecting the coplanar waveguide to the array. (c) Individual resonators incorporating the multi-QW structure are connected by suspended Au wires of ~150 nm diameter (an array with p = 5 μm is shown in the panel).

Candidate Profile: For this multidisciplinary internship, we're looking for a student with a university degree in at least one of the following areas: microelectronics/microtechnology, microwaves, semiconductor device physics, or optoelectronics, and who is motivated by research in applied physics.

Salary: ~600€/month. **Duration : between 4 et 6 months** **Starting date : ~March 2024**

IMPORTANT: This internship may lead to a doctoral contract (funding already secured) as part of an ANR-funded project.

[1] M. Hakl *et al.*, "Ultrafast Quantum-Well Photodetectors Operating at 10 μm with a Flat Frequency Response up to 70 GHz at Room Temperature," *ACS Photonics*, 2021, doi: 10.1021/acsphotonics.0c01299.