

## ***PhD Position at IEMN Laboratory.***

### **Mid-infrared pumped photomixers for millimeter-wave generation**

So far photomixers for mm-, sub-mm and THz-wave generation have relied on difference frequency mixing of near-IR laser sources. This process is intrinsically inefficient owing to the large energy difference between near-IR and mm-wave photons. In this PhD project we seek to exploit mid-IR photons in the  $\sim 5$  to  $\sim 10$   $\mu\text{m}$  range, and intersubband transitions in quantum-well semiconductor heterostructures for a more efficient generation of mm-waves in the 30-300GHz range. Different types of photomixer concepts and geometries will be explored in order to maximize radiation in-coupling, conversion efficiency as well as widen the IF bandwidth.

The work will be carried out in the THz-Photonics group at IEMN Laboratory. The group has a long lasting experience in the conception and realization of THz optoelectronic devices, such as InGaAs and GaAs-based photomixers, and is fully equipped for the fabrication and characterization of the devices realized in this project. Equipment includes state of the art microwave and mm/sub-mm-wave electronic instrumentation, as well as MIR sources, optics and detectors. The Laboratory hosts a 1500m<sup>2</sup> clean-room with state of the art growth and fabrication facilities. IEMN is located in Lille, the capital of French Flanders, a vibrant city close to the Belgian border at 50min by train from Paris-CDG airport.

For this thesis we seek a motivated student interested in realizing this new family of mm-wave semiconductor sources, starting from their conception, modeling and simulation, to their fabrication in clean-room environment and characterization. The work will be mainly experimental, with a significant part dedicated to electromagnetic modeling . The ideal candidate should have a solid background in classical electrodynamics, quantum mechanics, semiconductor physics and optoelectronics. The envisaged start date of this thesis is between October and December 2017.

Applications including a CV should be sent to:

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