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

Master and Engineer Internship: 2020-2021

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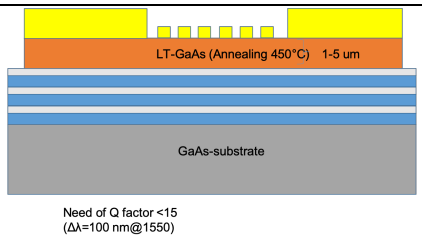
Research group : THz photonics

Title : 1550nm/1060nm wavelength THz photoconductors based on optical microcavity

Abstract :

The potential of terahertz (THz) spectroscopy for industrial non-destructive testing, medical imaging, and spectroscopy of biological macromolecules has long been recognized. However, the lack of low cost, compact and reliable sources prevented the use of the THz range for a long time. In the last decade, the exploitation of telecom technology around 1550nm has stimulated the development of optoelectronic systems, which have become well-established tools in science and industrial R&D today. However, the output power and the bandwidth of these systems are still relatively low. In this Master Internship**,** we aim to address these shortcomings by developing a new generation of optoelectronics THz emitters and detector working with 1550-nm and 1060 nm light based on Low-temperature-grown GaAs layers embedded in a metallic/dielectric optical cavity. The Internship candidate will be responsible of the design of the optical cavity by using home-made RCWA software and fdtd commercial software. She/he would be also in charge of the development of an optical reflectance testbench allowing for optimization of the cavity.

Fiber-coupled optoelectronics THz Emitter (courtesy HHI Berlin)



Schematic of the Optical Cavity THz emitter

Bibliography:

[1] C. Tannoury, M. Billet, C. Coinon, J. Lampin, and E. Peytavit, "Low-temperature-grown gallium arsenide photoconductors with subpicosecond carrier lifetime and photoresponse reaching 25 mA / W under 1550 nm CW excitation," pp. 4–5, doi: 10.1049/el.2020.1116.

[2] L. Liebermeister, S. Nellen, R. Kohlhaas, S. Breuer, M. Schell, and B. Globisch, "Ultra-fast, High-Bandwidth Coherent cw THz Spectrometer for Non-destructive Testing," *J. Infrared, Millimeter, Terahertz Waves*, pp. 1–9, Jan. 2019, doi: 10.1007/s10762-018-0563-6.

[3] M. Billet *et al.*, "InAlAs/InGaAs-MSM photodetectors based on optical cavity using metallic mirrors: THz frequency operation, high quantum efficiency and high saturation current," *Appl. Phys. Lett.*, vol. 114, no. 16, p. 161104, Apr. 2019, doi: 10.1063/1.5092283.