OPTICAL SENSORS: ON-CHIP INTEGRATION FOR TELECOMMUNICATIONS & BIOSENSING

Project Master 1 : GAMIR

Simulation & fabrication of GaAs based waveguides for the Mid-InfraRed

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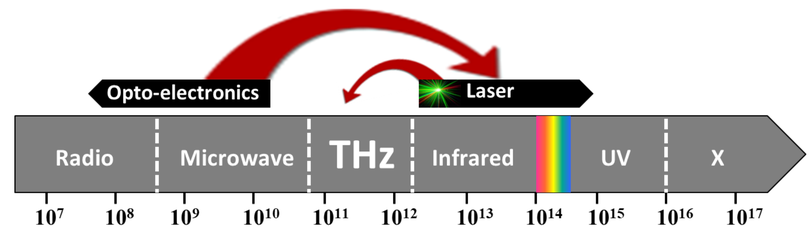
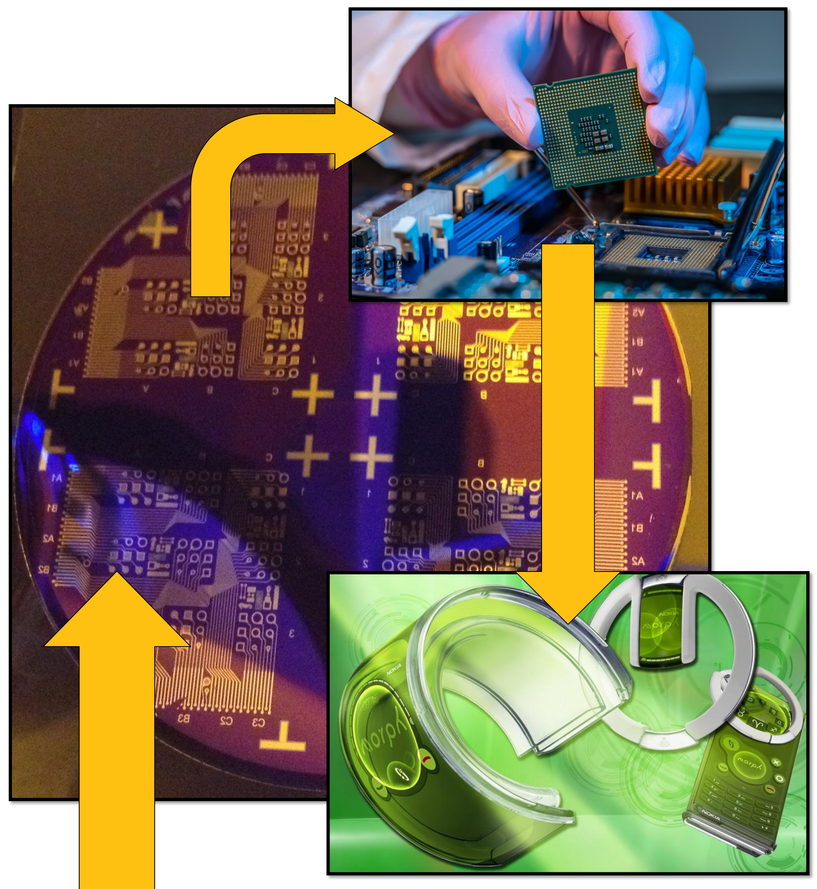


The integration of photonics offers a way to overcome purely electronic systems limitations by exploiting the unique properties of light for high-speed and low-energy signal processing. In this context, mid-infrared photonic circuits require compact and efficient waveguides capable of guiding and manipulating light at targeted wavelengths, while providing enhanced interaction with the surrounding environment for optical sensing applications.

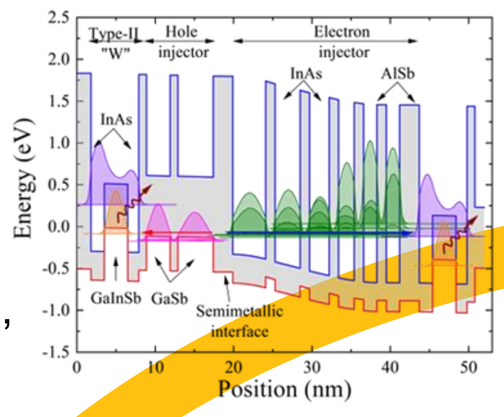
The **GAMIR** project aims to design, simulate, fabricate, and characterize **GaAs-based waveguides for the mid-infrared**, with a particular focus on their optical performance and potential for on-chip integration. By exploiting the strong interaction between mid-infrared light and molecular resonances, these waveguides will provide a platform for developing integrated optical sensors for applications ranging from telecommunications to biosensing.



Your tasks: **Numerical simulation, device design, clean-room fabrication, and optical characterization.**

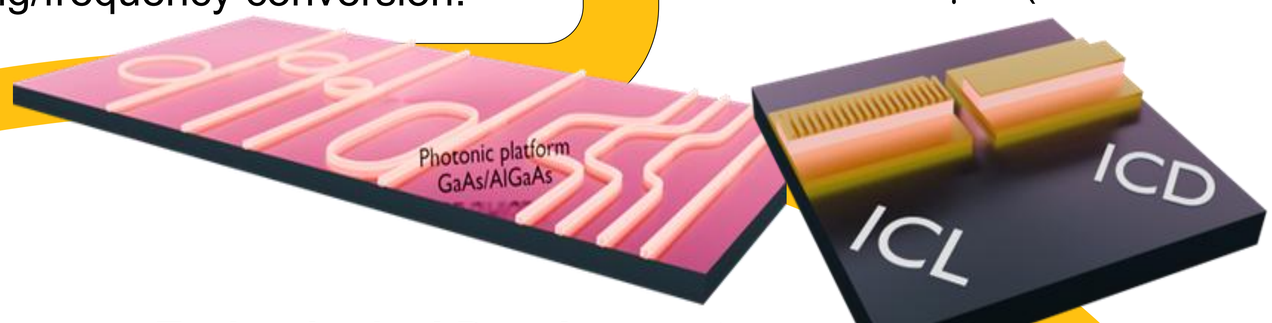
Your gains: **Hands-on experience in the complete development cycle of an integrated photonic device, from simulation to experimental validation.**

Project outcomes: **The resulting GaAs-based waveguides will serve as building blocks for compact on-chip optical sensors targeting telecommunications and biosensing applications.**

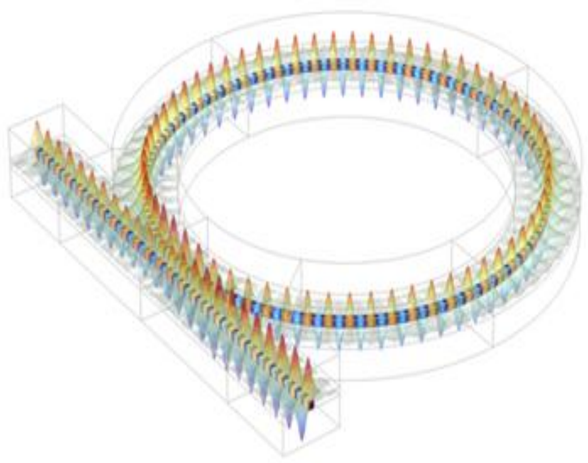


Waveguides : guiding, coupling, filtering, sensing, and nonlinear mixing/frequency conversion.

Interband Cascade Lasers (ICL) & Detectors (ICD) :
from 1 to 20 μm (300 – 15 THz).



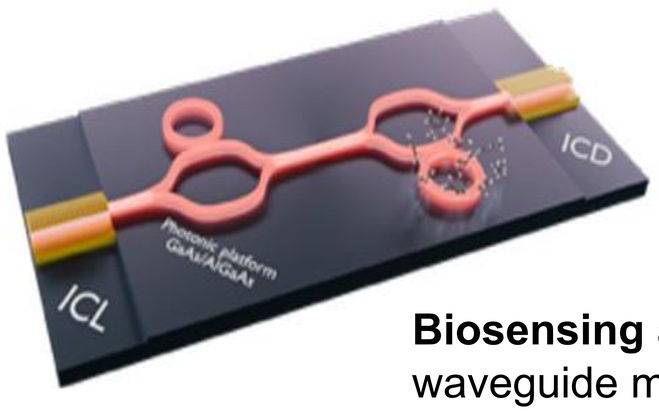
Simulations : mode analysis, effective index, propagation loss, confinement factor.



Design and Epitaxy : Material growth.

Technological Development: photolithography/e-beam lithography + dry etching in the clean room.

Ultimate integration on GaAs and Si platforms



Characterization: FTIR transmission, near-/mid-IR coupling, propagation losses.

Biosensing applications based on waveguide molecular interactions.

Free space telecommunications applications with high power laser sources and waveguides.