

# High-performance long-wavelength Quantum-Cascade-Laser sources for high-sensitivity mid-MIR medical diagnostics

Humboldt University of Berlin, Newton Str. 15, 12489 Berlin, Germany

**Objectives:** 10-25  $\mu\text{m}$  QCL for LWIR applications.

## Long term goals

The goal of this PhD Project is to investigate the long-wavelength **QCL active region design** approaches towards a **high performance** at room temperature and above.

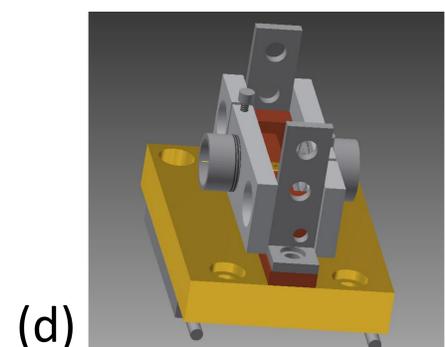
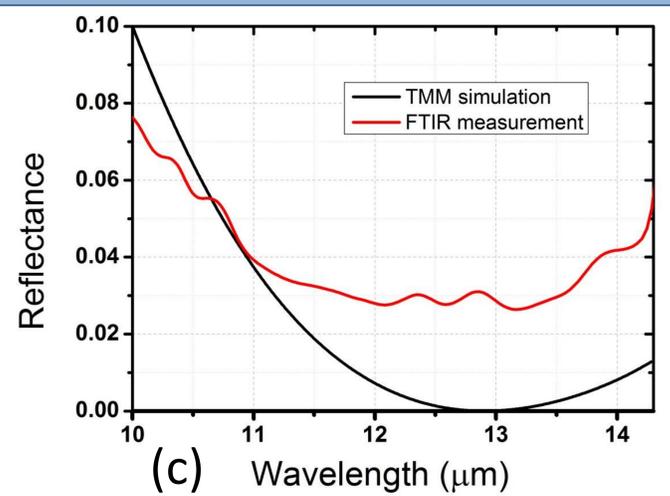
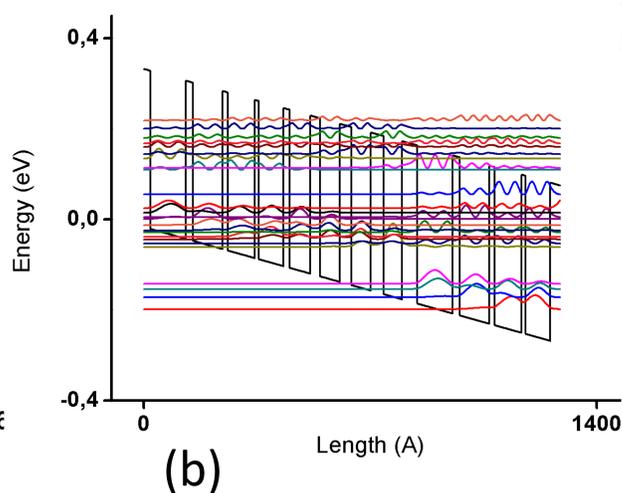
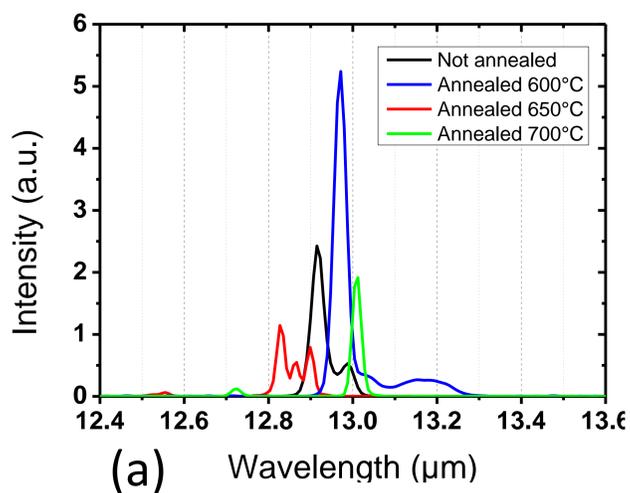
- New **material system** experimentation for LW QCL.
- Investigation of various QCL design approaches towards **low-threshold and high operating temperature** in 10–25  $\mu\text{m}$  spectral range.
- Investigation of **beam quality, threshold current, slope efficiency, power, and thermal management** of QCLs emitting in 10–25  $\mu\text{m}$  spectral range.
- Work with partner groups on detectors and applications for 10–25  $\mu\text{m}$
- New **long-wavelength tunable QCL** for hazardous compounds detection (June 2017)

## Planned secondments

- **DTU** – **M 27** – 2 months for long wavelength up conversion experiments
- **Rambøll** – **M 39** – 2 weeks for detection of hazardous compounds

## Achieved Results

- Annealing experiment on QCL **(a)**
- Design of new active region for QCL **(b)**
- Design of an AR coating suitable for long wavelength QCL **(c)**
- New Inventor design for ease of alignment of EC-QCL **(d)**



## Publications currently under review

*“Thermal Annealing of Lattice-Matched InGaAs/InAlAs Quantum Cascade Laser”*

S. Mathonnière, M. P. Semtsiv, W. Ted Masselink. Special issue of Journal of crystal growth. Proceeding of MBE 2016 conference.