

# mirSense lasers



Supplier of Industrial Quantum Cascade Lasers (QCL) and QCL-based spectrometer modules for Industrial & Defense applications



- A French Company, Specializing in Quantum Cascade Laser Solutions
- Founded in 2015
- Headquarters in Palaiseau, Essonne
- Over 15 Years of R&D Turned Into Innovative Products
- Focus on Defense and Industrial Markets

## QCL Series



### uniMir

Industrial Single mode DFB Quantum Cascade Lasers (QCL) for high performance gas analysis



### multiSense

Multi-gas Quantum Cascade Laser (QCL) based spectrometer module



### powerMir

High power Quantum Cascade Lasers (QCL) for DIRCM and Standoff applications

- Proprietary technology incorporates high-powered diodes (typically watt-level) emitting in the main transmission bands of the atmosphere ( $4.0\mu\text{m}$ ,  $4.6\mu\text{m}$ ,  $4.8\mu\text{m}$ ,  $9.x\mu\text{m}$ ).
- ITAR-free technology exhibits outstanding performance in terms of power and wall-plug efficiency.

# Our Products – uniMir

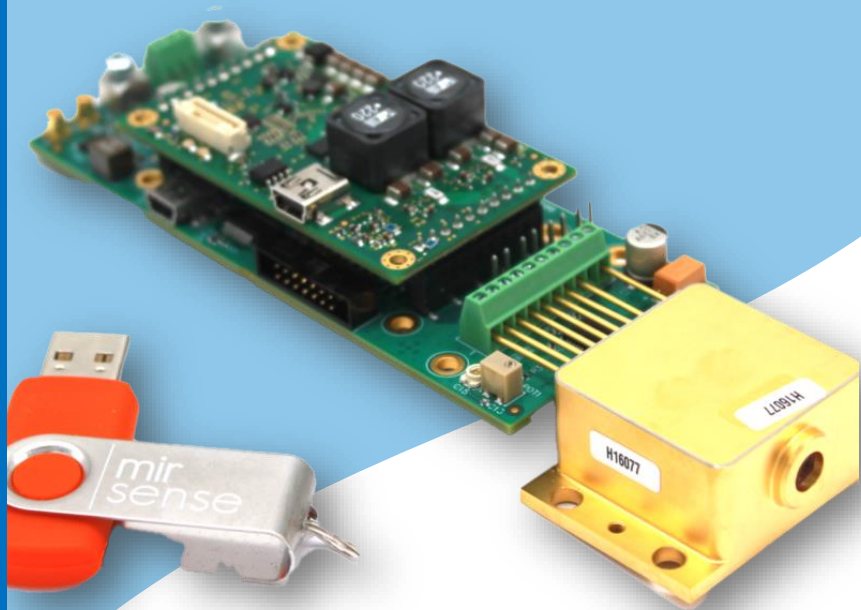


Single Mode DFB Quantum Cascade Lasers

## Why uniMir?

- Fabry-Perot laser sources operating in the quasi CW regime (pulsed operation down to few tens of nanoseconds and high frequency above MHz) at room temperature.
- High average power, wall-plug efficiency, and beam quality
- Ideally suited for counter-measures and other defense applications
- Based on proprietary technology
- Incorporates high-powered diodes (typically watt-level) emitting in the main transmission bands of the atmosphere (4.0 $\mu$ m, 4.6 $\mu$ m, 4.8 $\mu$ m, 9.x  $\mu$ m)
- ITAR free mirSense technology
- Outstanding performance in terms of power and wall-plug efficiency
- High-performance QCL assembly takes full advantage of mirSense's state of the art technologies

# Our Products – powerMir



## powerMir: High-Power Quantum Cascade Lasers (QCLs)

- Maximum Average Optical Power: Above 1W @4.0 $\mu$ m, 1W @4.6 $\mu$ m, 1.5W @4.8 $\mu$ m, 0.3W @9.X $\mu$ m.
- Mode of operation: Quasi-CW, high duty cycled pulsed
- Central wavelength: 4.0, 4.6, 4.8, 9.X $\mu$ m +/- 0.15  $\mu$ m
- Pulse frequency: > 500 kHz
- Divergence: Horizontal < 8 mrad (typically 6mrad), Vertical < 6 mrad (typically 4mrad)
- Beam quality: TM00 Gaussian beam,  $M^2 < 1.5$
- Output beam dimension (window output): 2 mm x 3 mm
- Polarization: Linear vertically polarized

## Packaged Chips

- Standard high heat loads package (9-pins HHL) or custom package on request
- Integrated Peltier TEC cooler
- Integrated collimating lens (High beam quality,  $M^2 < 1.5$ )
- Possibility of chips on sub-mount delivery

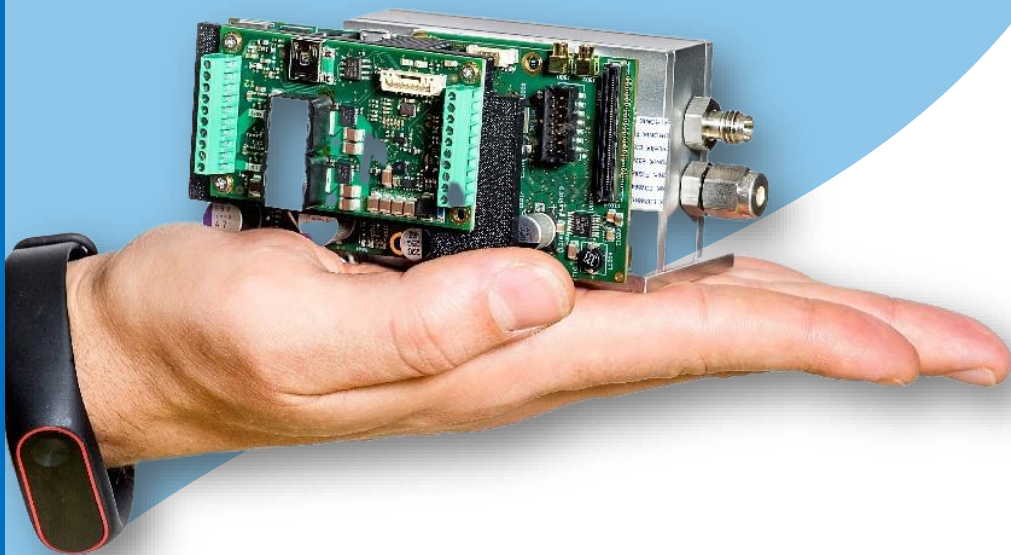
## POEM system (HHL packaged laser + PCB electronics)

- Compact stand-alone OEM product for system integration
- Powerful FPGA-based architecture
- MODBUS communication for system integration and user-friendly PC software for configuration and tests
- External TTL for synchronization
- Cost effective for series-productions

## Turnkey System

- Plug-and-play system perfect to use inside a lab
- Stand alone system including: laser head, driver, heat exchanger
- External TTL for synchronization
- Red laser beam to facilitate alignment
- User-friendly PC software allows users to:
  - Turn ON/OFF the laser
  - Easily change the operating mode (power, modulation)

# Our Products – multiSense



## QCL Based Spectrometer Module for Gas Analyzers

- Components Measured: CH<sub>4</sub>/H<sub>2</sub>CO/H<sub>2</sub>O — Or— CO/CO<sub>2</sub>
- Analysis principle: mid-IR (QCL) + PhotoAcoustic
- Size: 7cm (W) x 7cm (D) x 3cm (H) housing for easy integration
- Detection limits: Gas dependent – Typically, from ppb to ppm level (e.g: CH<sub>4</sub> – 10 ppb)
- Sample Gas Flow Rate: < 40 ml/min
- Sample Gas Conditions: Temperature: Less than 40°C, Pressure: 1 bar ± 10%

## multiSense

is a QCL based spectrometer module for gas analyzers manufacturers. It combines the unique properties of mid-infrared lasers together with the compactness and affordability of photoacoustic detection. In 1 dL, our offer can detect up to 10 gases, such as: CO, CO<sub>2</sub>, NO, NO<sub>2</sub>, NO, SO<sub>2</sub>, SO<sub>3</sub>, HS, NH<sub>3</sub>, CH<sub>4</sub>... as well as more complex molecules such as hydro-carbides or blood constituents.

## mirSense

has reached an unprecedented level of co-integration of quantum cascade lasers and photoacoustic detection in order to deliver such an innovative module. Working together with CEA-Léti, we also benefit from the best of the silicon industry to provide this cost-effective approach..

## Off-the-Shelf

components are available and mirSense provides “design to cost” components for large volume (>100 000) applications when both performance and cost matter!

# Applications and Markets



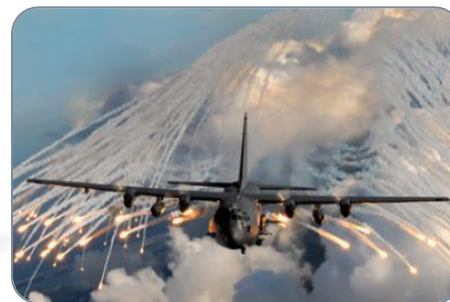
## Gas Sensing

- Automotive Gas Exhaust Analysis
- In-Situ Gas Analyzers
- Leak Detectors
- Air Quality Analyzers
- Continuous Emission Monitoring (CEM)



## Instrumentation & Measurements

- R&D
- Sensing of Complex Mixture
- Optical Metrology
- Inline Process Gas Monitoring
- Leaks Detection
- Liquid Detection/Water in Oil Detection



## DIRCM & Standoff Detection

- Directional InfraRed Counter Measures (DIRCM)
- Standoff detection
- Rugged Systems
- Not Subject to ITAR Constraints
- Detect Hazardous or Forbidden Substances such as Drugs or Explosives



## Bio & Healthcare

- Glucose Monitoring
- Breath Analysis

# Why mirSense?

Your OEM source for the best  
laser modules at a fair price

Over 15 years of R&D in III-V lab, a common laboratory between Alcatel, Thales and the CEA-Léti. Combining nanotechnology and photonics, the strong miniaturization of the mirSense technology offers unique solutions.





The Lasers You Need  
From The People You Trust  
Our Experience, Your Advantage

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North American Source for mirSense.

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THANK YOU!