



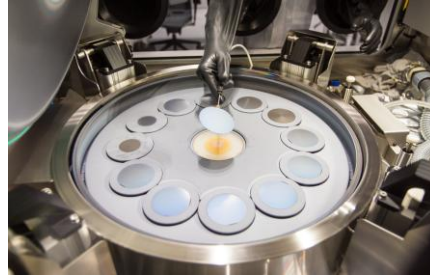
Enhancing security through IR detection

Jacek Kulakowski

About us

VIGO Photonics is a photonic semiconductor manufacturer from Poland.

We produce the high-quality epi-wafers and components for photonic and microelectronic applications based on advanced compound materials (III-V & II-VI).



Since 1987 on the market



6500 m² production area
Headquarters in **POLAND**,
office in the **USA**



UNIQUE TECHNOLOGY -
own proprietary
technology developed in
VIGO Photonics



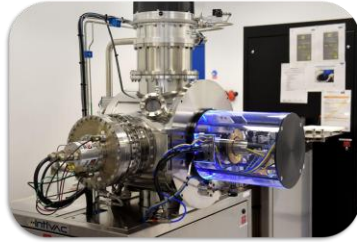
>220 employees

About us

OWN RESEARCH AND DEVELOPMENT FACILITIES



State-of-the-art laboratories and devices for the creation of semiconductor layers and photonic solutions.



Clean room laboratories (ISO 6 cleanliness class).



Constant investments in improving technology and developing new solutions.

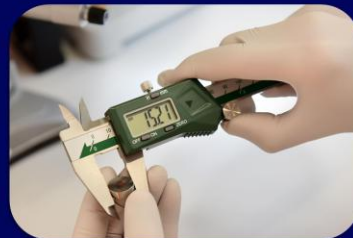


World-class experts and cooperation with the best research centers around the world.

MODERN AND AUTOMATED PRODUCTION LINE



Production independence and our own complete production line.



Control of product parameters at every stage of production.



Possibility to create a production station dedicated to a special, unique product.

Trusted partner in defense industry

Our experience in the defense industry manifests itself in real numbers and facts:

30+ YEARS

of military-grade deliveries

15,000+

detectors delivered for smart munitions

22,000+

detectors delivered for Laser Warning Systems

10+ YEARS

of continuous cooperation in anti-tank mine programs

10,000+

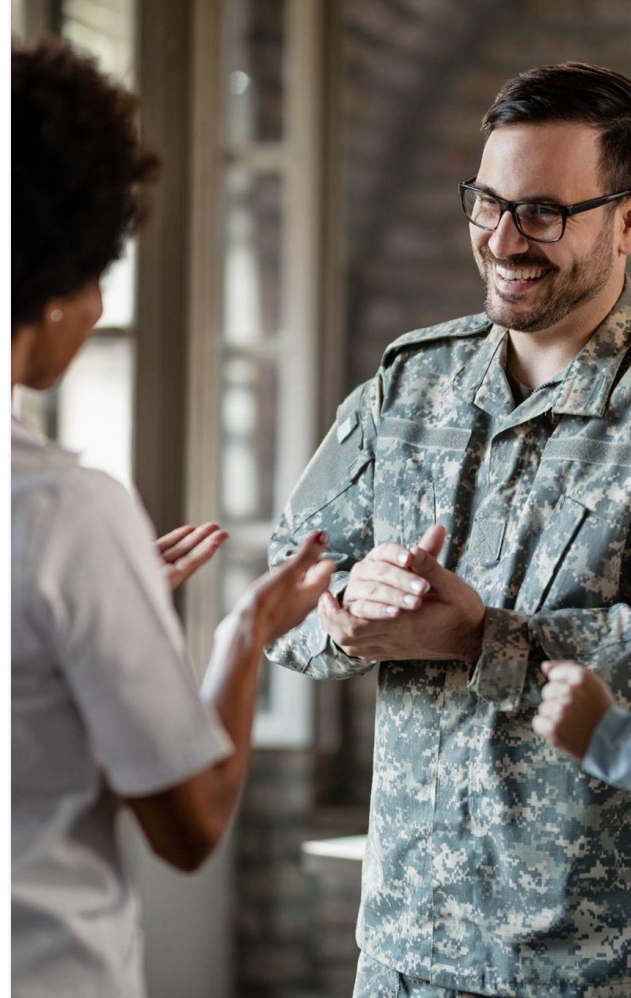
VIGO detectors in ultra-fast fire detection and suppression systems for military vehicles

FTIR OEM

detectors powering CBRN detection and identification systems

CUSTOM R&D

deep product customization for mission-specific requirements



IR Homing Beam Riding
& Laser Terminal Guidance

IR Free Space Optical
Communication

Loitering and artillery
munitions IR homing

IR Imaging

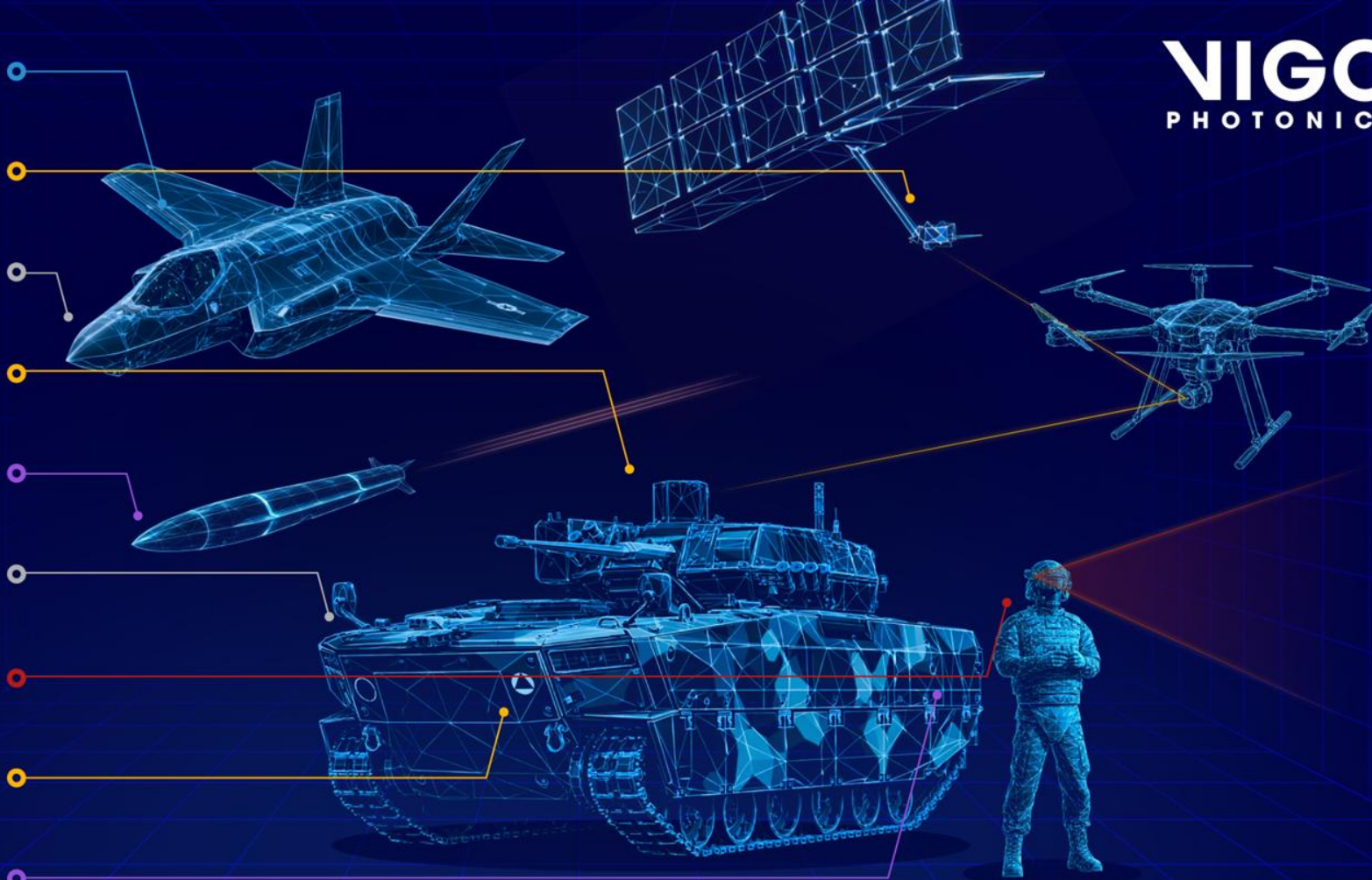
Intelligent munition

IR Fire Detection
& Suppression

IR Laser
Warning System

IR CBRN detection

IR HVAC
Air Quality Control



Products

Multielement IR Detectors and Modules

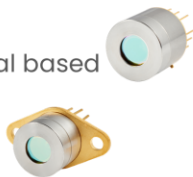
EPITAXIAL WAFERS

- III-V epitaxial structures
 - GaAs based products
 - InP based products



INFRARED DETECTORS

- InGaAs, InAs/InAsSb and HgCdTe material based
- 1 – 20 μm spectral range
- Uncooled and TE cooled
- Unique immersion lens technology



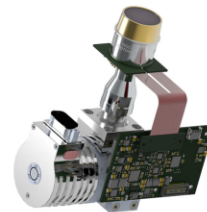
INFRARED DETECTION MODULES

- InGaAs, InAs/InAsSb and HgCdTe material based
- 1 – 16 μm spectral range
- High S/N
- Bandwidth > 1 GHz available



FOCAL PLANE ARRAYS

- Spectral range: 3.7 to 4.8 μm
- Custom-made robust design
- Assembly of various types of windows available
- Easy mechanical and thermal integration with the target device
- III-V material compliant with the RoHS Directive
- Readout integrated circuit (ROIC)

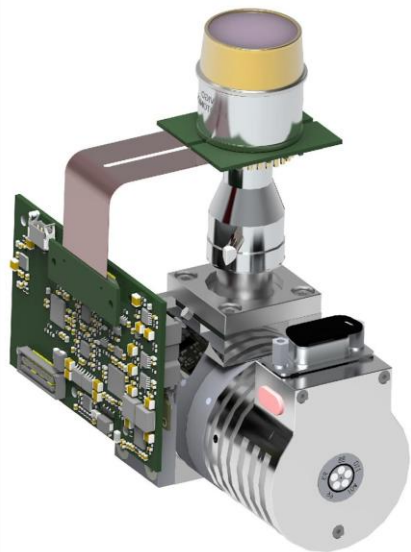


ACCESSORIES

- Amplifiers
- Power supplies
- Thermoelectric cooler controllers
- Mechanical accessories
- AC adaptor and cables



T2SL Focal Plane Array EAGLE



SPECIFICATIONS

detector technology: **HOT MWIR T2SL**

spectral range: **3,7-4,8 μm (optics limited)**

operating temperature: **110-150K**

resolution: **640x512 (15 μm pixel pitch)**

frame rate: **50 Hz/120 Hz**

NE Δ T (at 293K): **≤ 22 mK (avg), ≤ 50 mK (max), F/4**

operability: **$\geq 99,5\%$**

cool-down time: **$< 7,5$ min. (target $< 3,5$ min.)**

environment temperature: **from -40°C to $+71^{\circ}\text{C}$**

communication: **CameraLink, USB**

weight: **< 570 g**



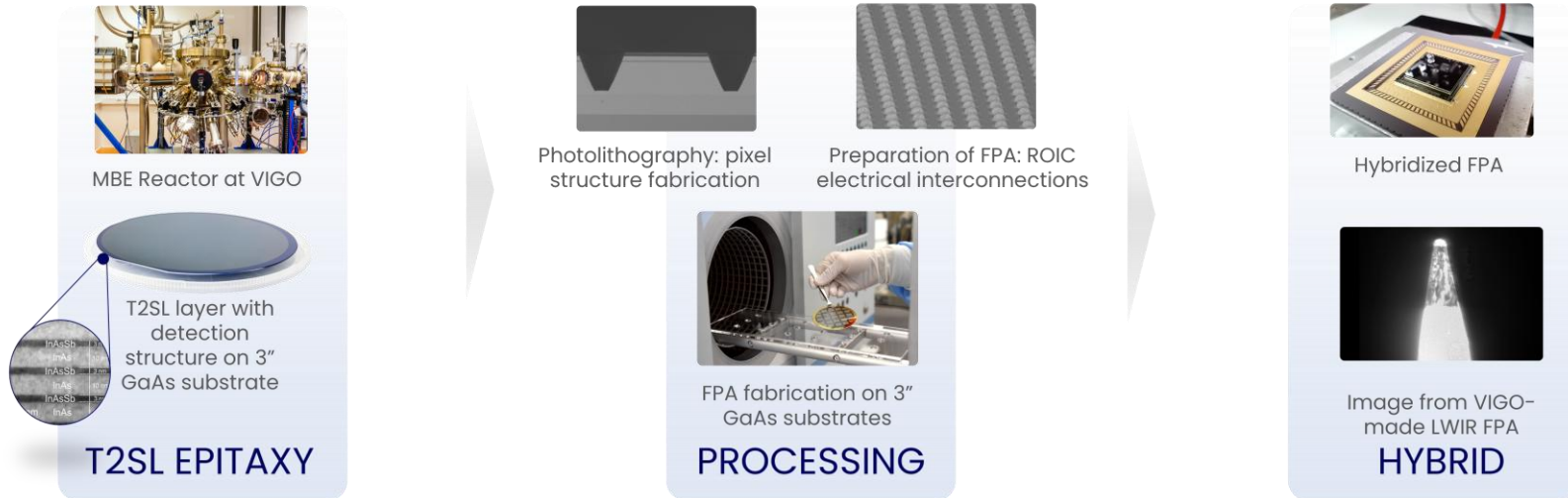
Exemplary video frame

T2SL Supply chain sovereignty

Very few companies can support full vertical integration without which European space and defense programs may be subject to ITAR export controls and geopolitical risks, creating strategic bottlenecks for fully autonomous European systems.

VIGO as sole European manufacturer possesses the capability for **end-to-end IR FPA manufacturing** from T2SL epitaxy, through processing until final hybridization and IDDCA integration.

In **2026**, VIGO is launching its own **hybridization and hermetization** line in Poland. This strategic move aims to provide Europe with **technological sovereignty** and independence from non-European suppliers.

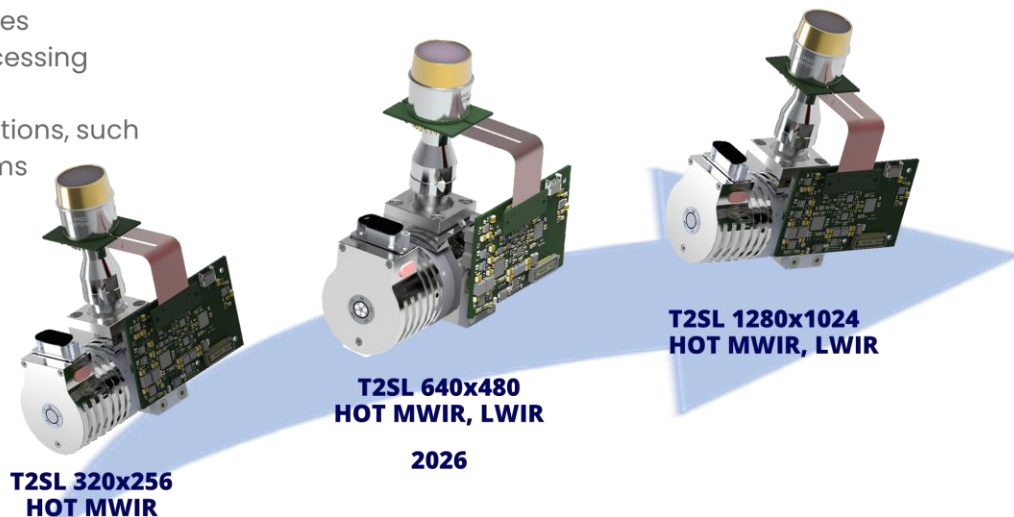


FPA value proposition

- HOT T2SL detector technology
- Exceptional long-term stability with no thermal drift eliminates costly recalibration over the system's lifetime
- Lower power budget, lower cooling times and longer cooler lifespan thanks to 110-150K FPA operating temperature
- 3.7 to 4.8 μm and 7.7 to 9.4 μm
- Sub 22 mK average thermal sensitivity (NEDT \leq 22 mK) for ultra-high fidelity in defense IR imaging
- The Hybridized Readout Integrated Circuit (ROIC) enables seamless integration and streamlined digital data processing
- The dynamic range of the ROIC used is \sim 81 dB
- The FPA could integrate with all standard cryocooler options, such as Stirling, SWaP-optimized, and Joule-Thomson systems

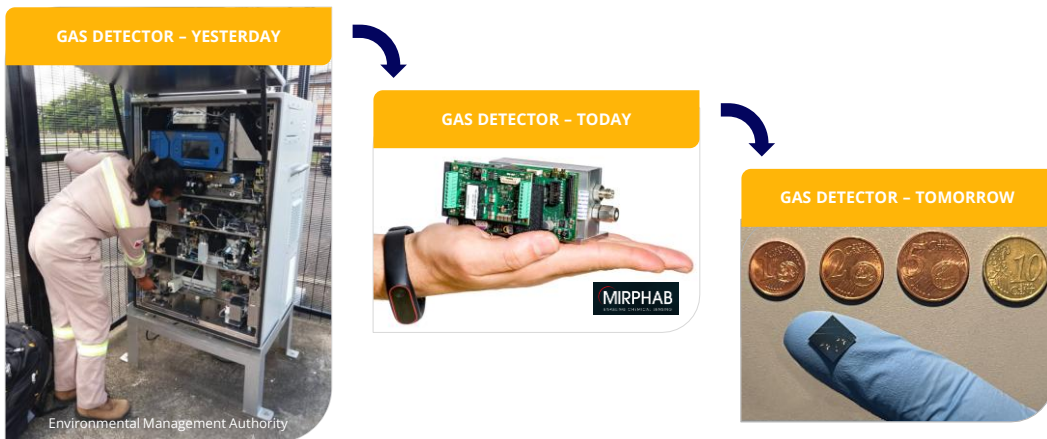
APPLICATIONS

- Intelligence, Surveillance, and Reconnaissance (ISR)
- IRST (Infrared Search and Track)
- Counter-Unmanned Aerial Vehicles (C-UAV)
- Imaging Infrared (IIR) seeker
- Digital Scene-Matching Area Correlator (DSMAC)



New developments – PICs

Our idea is combining MIR light sources, waveguiding elements and best in class detectors into a groundbreaking product – a fully functional **Photonic Integrated Circuit** operating in the **MIR** spectral range.



Within **HyperPIC**, VIGO's semiconductor fab and PDK will be used to offer custom, application-driven MIR Photonic Integrated platforms for integrators

Features

01

Compact size

02

Energy efficiency

03

High reliability

04

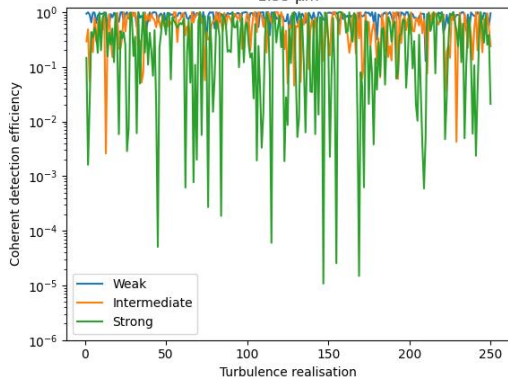
Reduced manufacturing, packaging and maintenance costs

Sensing requires extended spectral range

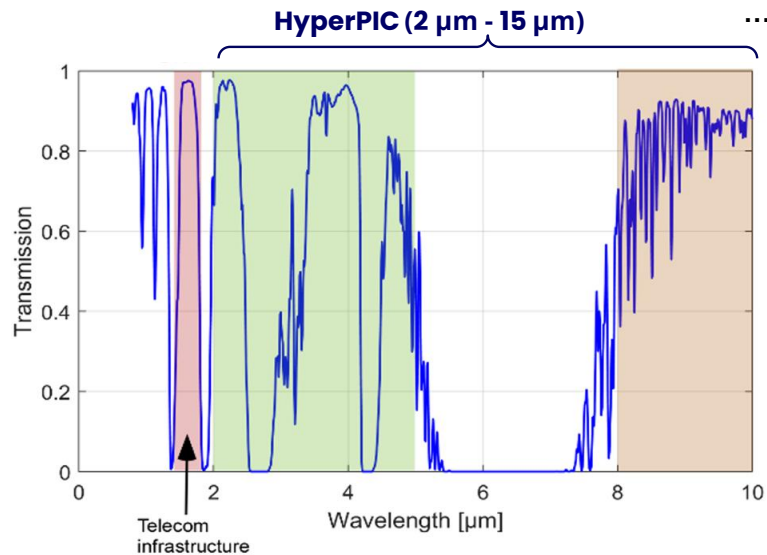
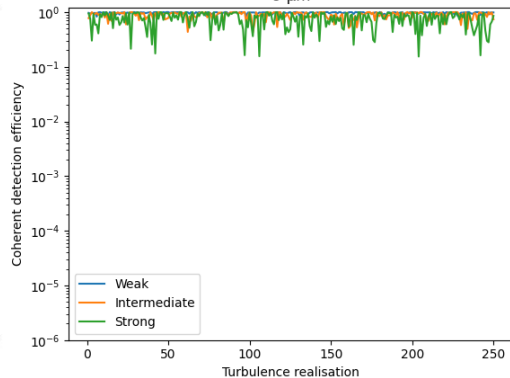
MIR is also superior due to:

- Low atmosphere absorption
- Reduced impact of air turbulence on the transmitted signal

Coherent Detection Efficiency
1.55 μm



Coherent Detection Efficiency
9 μm



Main use cases

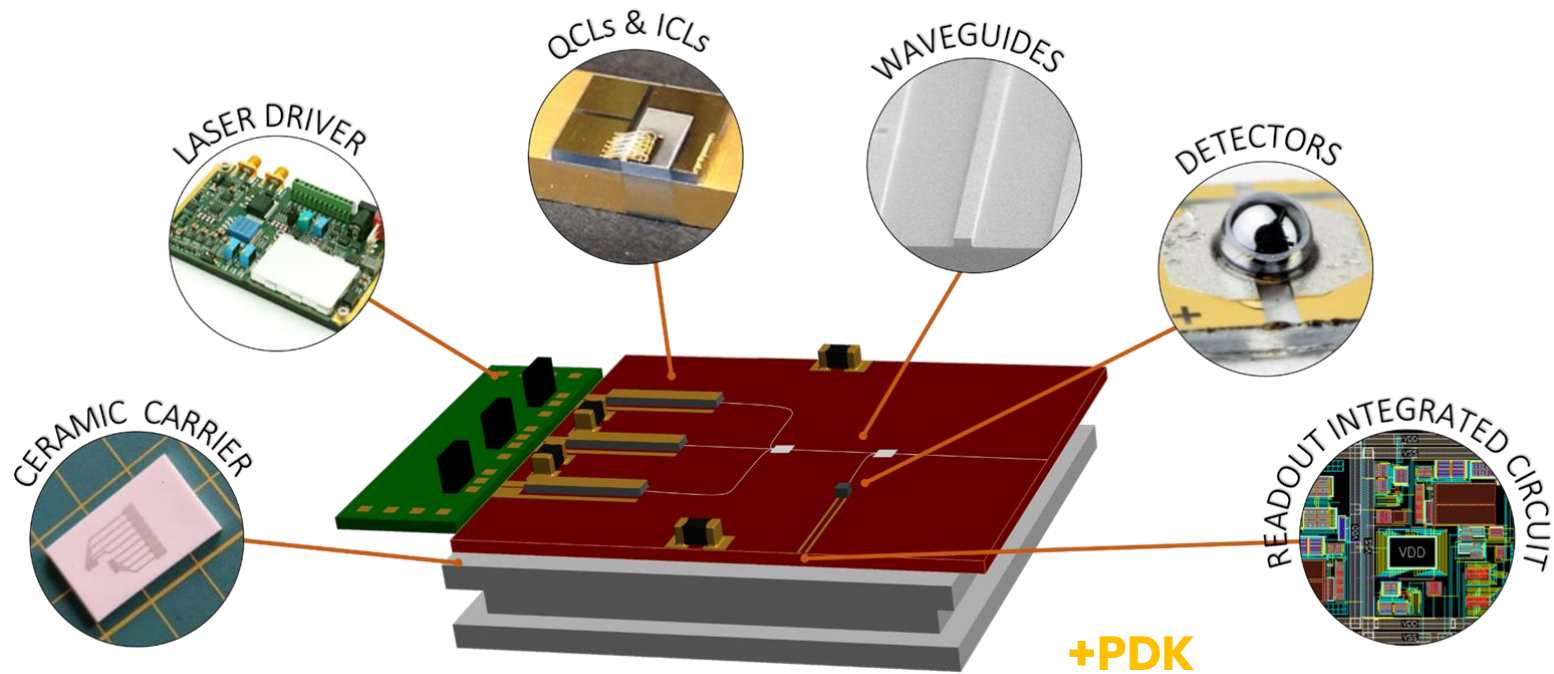


Free Space
Optical links



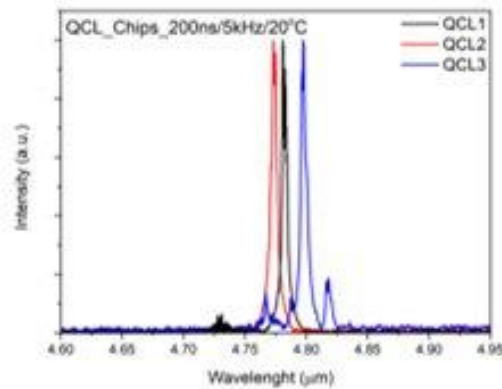
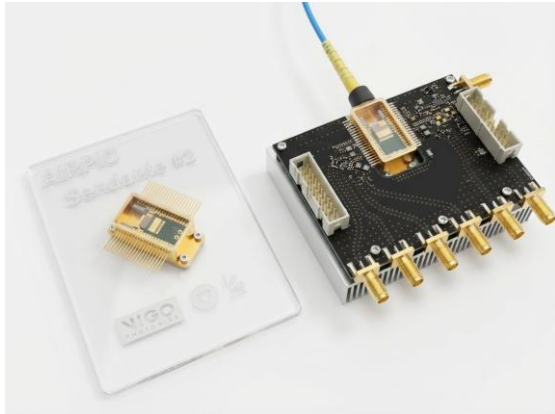
LIDARS

MIR PIC platform

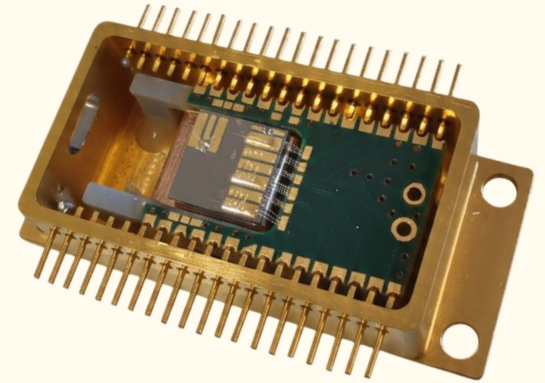


Demonstrator #1

Presented at CLEO Europe 2025



- 3×QCL ($3 \times \text{ca. } 4.8 \mu\text{m}$)
- 3×3 MMI multiplexer
- PIC size: $7 \times 7 \text{ mm}^2$
- Goldenbox package



Defence applications fields of interest



Integrated Optoelectronic Head

Infrared imaging for detection and tracking of ground and air targets



Precision-Guided Munitions

Infrared-guided intelligent munitions and air-dropped bombs, laser proximity fuses



Electro-optical seeker

Infrared homing, beam-riding and terminal laser guidance, laser proximity fuses



Laser Warning System

Detection and indication of hostile laser targeting



UAV Gimbal

Infrared imaging for night vision and low-visibility conditions such as fog and smoke



Passive Barrier

Multidirectional and long-range detection of IR signatures across multiple zones



Fire Detection & Suppression

Ultra-fast fire detection for immediate suppression in military vehicles



CBRN Detection and Identification

Optical spectroscopy solutions for the detection of chemical and biological agents



Mine and IED Detection

Accurate threat detection ensuring precision in high-risk environments



Muzzle Flash

Detection and localization of gunfire flashes in the infrared spectrum



LiDAR System

High-precision 3D mapping for enhanced situational awareness and laser range finding



Soldier Equipment

Alerts for laser events caused by LRFs, UAV LiDAR systems or IR illuminators



Thank you for your attention

Jacek Kulakowski