



VIGO INVESTOR DAY online
INVESTOR PRESENTATION

June 1, 2022

AGENDA

1. ABOUT VIGO
2. MARKET ENVIRONMENT
3. TECHNOLOGY
4. DEVELOPMENT STRATEGY
5. FINANCE
6. OUTLOOK

VIGO
PHOTONICS

ABOUT VIGO

VIGO IN A NUTSHELL



35 years of experience
and operations

Headquarters in Poland

and branch offices in USA and Taiwan

220 highly qualified
and experienced experts
(1 Professor, 14 PhDs and >60 engineers)

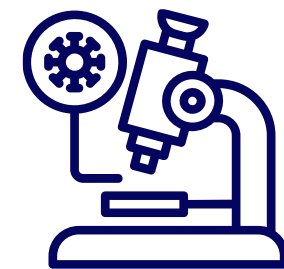
25 distributors in **18** countries
supporting sales of solutions

Listed on the WSE since **2014**

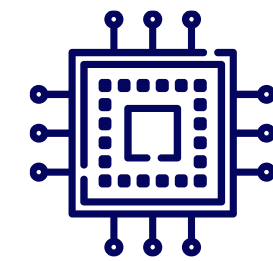
Approx. **PLN 500** million
capitalisation

Support for stable long-term
shareholders

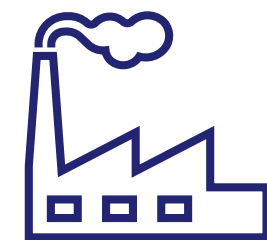
VIGO IS A WORLD LEADER IN HIGH-TECH SOLUTIONS – THE MOST ADVANCED MID-INFRARED PHOTONIC DETECTORS, DETECTION MODULES AND SEMICONDUCTOR MATERIALS



Operating in a fast-growing infrared market supported by demand and economic-technology trends



Unique, independently developed technology and innovative, high-end solutions, tailored to customer needs



6,500 m² of production space - complete production line for semiconductors



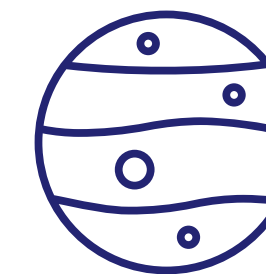
Ambitious development strategy to maintain a 20-30% annual growth rate



Business relationships with global corporations (Safran, Emerson, Caterpillar, TRUMPF, to name a few)



Over 2.5 times growth in revenue and EBITDA over the last 5 years (2017-2021)

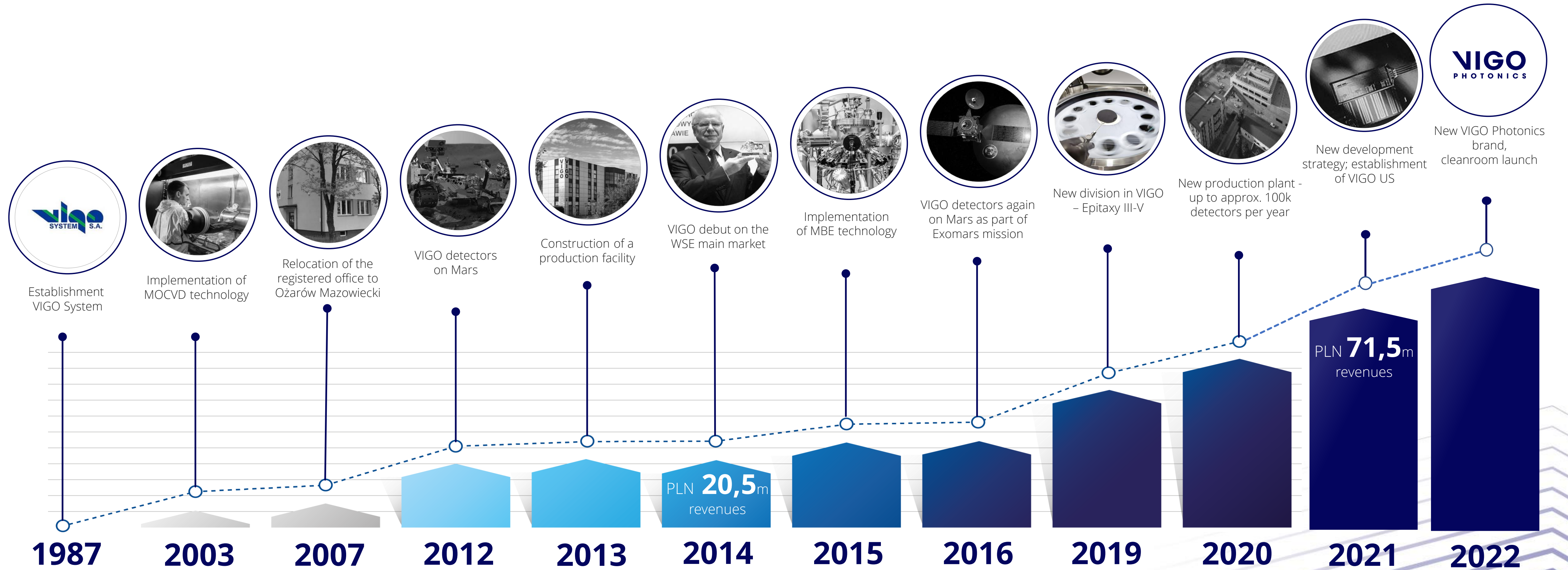


6 detectors successfully used in Mars missions

MILESTONES OF THE VIGO'S DEVELOPMENT



35 YEARS OF CONTINUOUS DEVELOPMENT AND EXPANSION ON THE MARKETS



MODERN BUSINESS APPROACH WITH PROFESSIONAL STAFF



220 highly qualified and experienced experts

Nearly **80%** of employees with university degree and academic title

1 person with a professorial title

14 persons with a PhD degree

>60 engineers

3 recognised international experts:
prof. dr hab. Józef Piotrowski
dr hab. inż. Włodzimierz Strupiński
dr hab. inż. Ryszard Piramidowicz, professor at Warsaw University of Technology

MANAGEMENT BOARD AND KEY PERSONNEL



Adam Piotrowski, CEO

Electronics engineer and scientist, doctor of engineering sciences.

Graduate of the Warsaw University of Technology and of the Military University of Technology.



President of the Management Board



Member of the Management Board



Łukasz Piekarski, CFO

Manager experienced in raising finance for businesses.

Graduate of the Warsaw School of Economics and the Institute d'Etudes Politiques in Paris.

RESEARCH PROJECTS AND TECHNOLOGY (STRUCTURE UNDER THE STRATEGY INITIATIVES)

MCT+ - Artur Kęłowski, Director of Technology Development Department

III-V Sb - Paweł Leszcz, Deputy Director of the Technology Development Department

III-V InGaAs - Francesco Ivaldi, Deputy Director of the Technology Development Department

Semiconductor materials and VCSEL - Włodzimierz Strupiński, Director of III-V Epitaxy Department

MIR, PIC - Ryszard Piramidowicz, Head of the Optoelectronic Systems Team

Matrices - Przemysław Kalinowski, Director of Matrix Technology Development Department

FOREIGN BRANCHES

VIGO PHOTONICS US:

Scott Riggi, CEO

VIGO PHOTONICS TAIWAN:

Harris Liao, CEO

COMMERCIALISATION OF SOLUTIONS AND PRODUCTS

Rafał Kiss, Sales Director

PROJECT MANAGEMENT, BUSINESS DEVELOPMENT

Piotr Warzybok, Head of Development Project Management

SUPERVISORY BOARD

Przemysław Danowski, Chairman of the Supervisory Board (SB), Mirosław Grudzień, SB Member, Krzysztof Kaczmarczyk, SB Member, Janusz Kubrak, SB Member, Piotr Nadolski, SB Member, Marek Wiechno, SB Member, Zbigniew Więclaw, SB Member

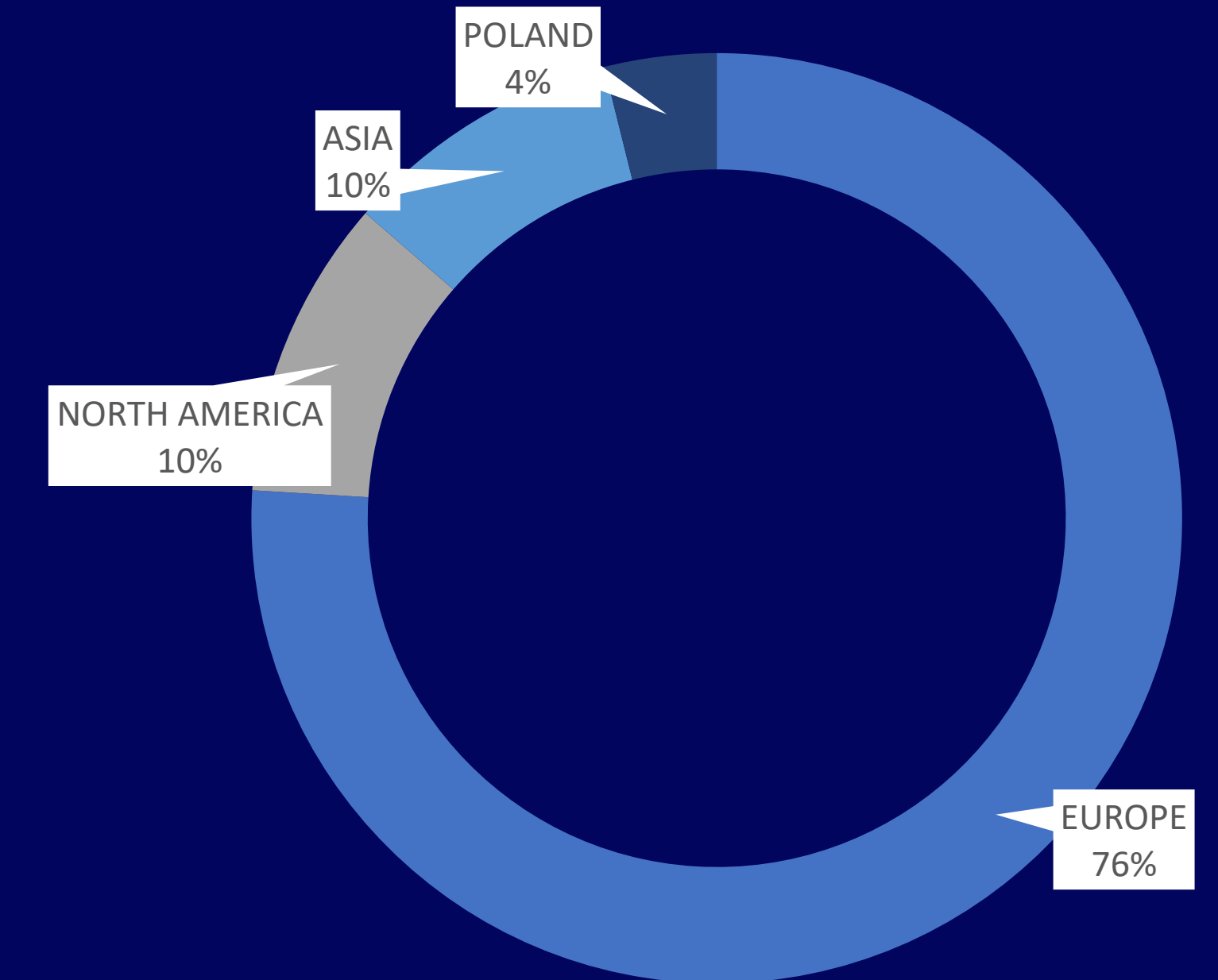
GLOBAL REACH AND EXPLORATION OF NEW MARKETS

INTERNATIONAL EXPANSION ALLOWS VIGO'S SOLUTIONS TO MATCH THE NEEDS OF EXISTING AND NEW GLOBAL PLAYERS

- VIGO is headquartered in Ożarów Mazowiecki, Poland
- VIGO is supported by subsidiaries in the **USA** (from 2021) and **Taiwan** (from 2020) - the most important technological global destinations - accelerating VIGO's growth in the US market and deeper exploration of the US public procurement market
- Cooperation with **25** distributors in **18** countries supporting commercialisation of VIGO solutions and products



MARKET SPLIT 2021



INITIATIVES TO EXPLORE NEW APPLICATION MARKETS

- Better identification of new mass markets for infrared sensors
- Gaining partners and key customers for new technology development
- Building a portfolio for new applications

VIGO's presence on the WSE



SELECTED INFORMATION

Ticker WSE	VGO
Sector, industry	Electromechanical industry, new technologies
ISIN	PLVIGOS00015
Reuters Code	VGOP.WA
Bloomberg Code	VGO PW
Indices	WIG-Poland, sWIG80, sWIG80 Total Return, WIG140, WIGtech, WIGtech Total Return, INNOVATOR, InvestorMS
Number of shares	729 000
Market cap.*	PLN 458 million
Other/ free float	52.5%
Free float*	PLN 240 million

25 November 2014

first day of trading
on WSE

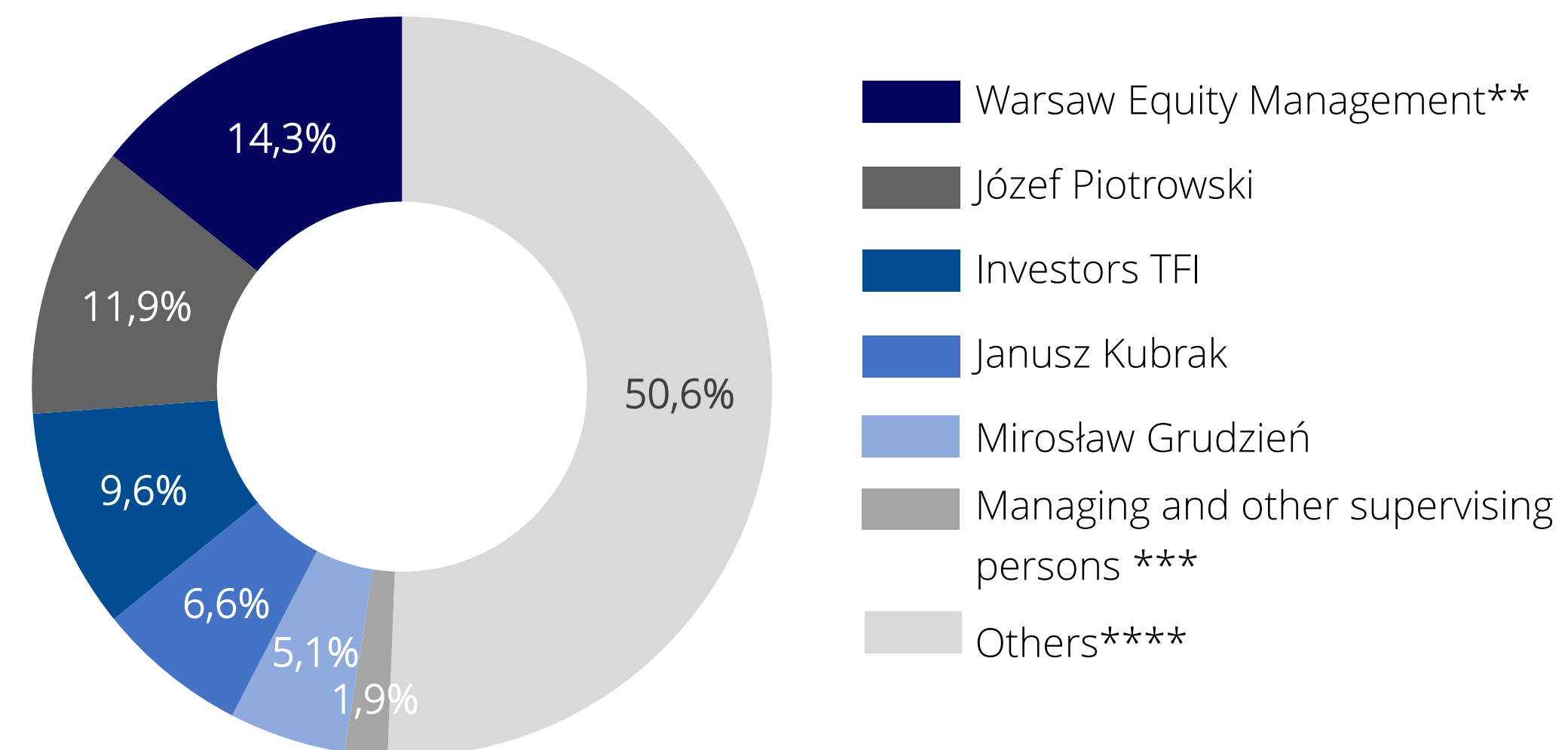
~PLN 500 million
market capitalisation

1.4%
share in WIGtech

**WSE Analytical Coverage
Support Programme**
(IPOPEMA Securities)



SHAREHOLDING STRUCTURE OF VIGO SYSTEM S.A. (AT THE END OF 2021)



INCENTIVE PROGRAMME

- Programme for the Management Board and selected key employees
- additional incentive mechanism to increase the value of the company
- implemented in the years 2021-2023
- granting to Programme participants, free of charge, registered subscription warrants of A and B series entitling to acquire not more than 29,160 ordinary bearer shares of E series with nominal value of 1 PLN each

*As of 16.05.2022; ** VIGO System S.A. shares are held by subsidiaries of Warsaw Equity Management S.A.: Xarus Holding Limited (9.9%) and WE ASI (4.4%); *** Adam Piotrowski, Łukasz Piekarski, Zbigniew Więclaw, Przemysław Danowski; **** Including (in 2021) i.a.: OFE Aegon, OFE PZU, TFI PZU, Norges Bank, TFI Santander, TFI Skarbiec, TFI Millennium, TFI Generali Investment, TFI MetLife, TFI Esaliens, TFI Credit Agricole, TFI NN

IMPLEMENTATION OF A NEW BRAND VIGO PHOTONICS



THE DYNAMIC DEVELOPMENT OF THE COMPANY, OPENING UP TO NEW TECHNOLOGIES AND THE ESTABLISHMENT OF THE FIRST VIGO SYSTEM BRANCHES IN ASIA AND NORTH AMERICA HAVE LED TO THE CREATION OF ONE GLOBAL BRAND - VIGO PHOTONICS

Steps taken:

- Creation of a new brand combining VIGO System, VIGO Photonics Taiwan, VIGO Photonics Corp.
- Creation of a new logotype and visual identity system
- Patenting the word mark and logo of VIGO Photonics
- Implementation of new visual identity in internal and external communication
- Planned change of company name from VIGO System S.A. to VIGO Photonics S.A. in June 2022

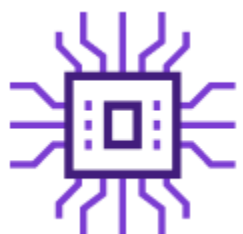
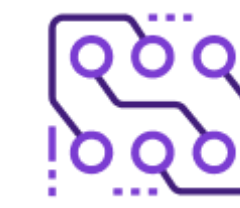
NEW
BRAND



PREVIOUS
BRAND



VIGO VENTURES



VIGO VENTURES - VIGO WE INNOVATION (VWI)

Investment incubator created by VIGO System and Warsaw Equity Group (50:50 joint venture) in 2017

MANAGEMENT BOARD

Wojciech Smoliński

Managing Partner, President of the Management Board

Marek Kotelnicki

Managing Partner, Member of the Management Board

SUPERVISORY BOARD

Adam Markiel, WEG Chief Investment Officer

Adam Piotrowski, President of VIGO Management Board

Łukasz Piekarski, Member of VIGO Management Board

INVESTMENT ASSUMPTIONS

- investments and development of technological projects (start-ups, spin-offs) with global potential in the production of high-tech devices and components
- areas: photonics, semiconductors, quantum technologies
- solutions already pre-verified and/or with a working prototype
- projects generating independent profits and/or potential support for VIGO Photonics
- single investment project up to EUR 1 million

PORTFOLIO



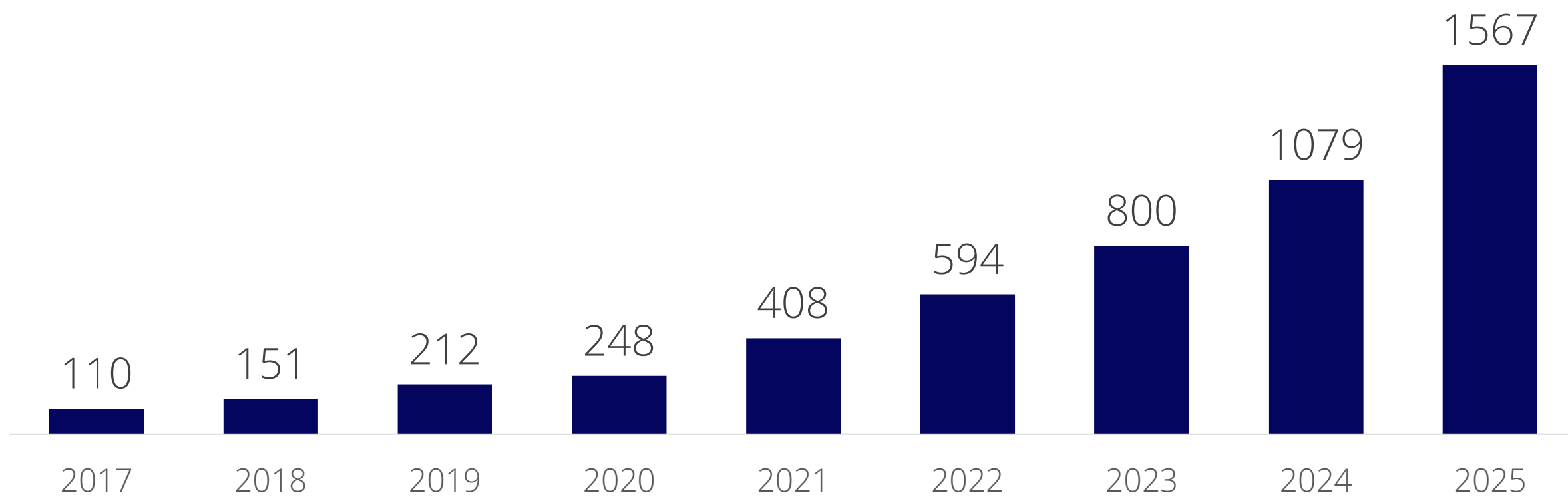


MARKET ENVIRONMENT

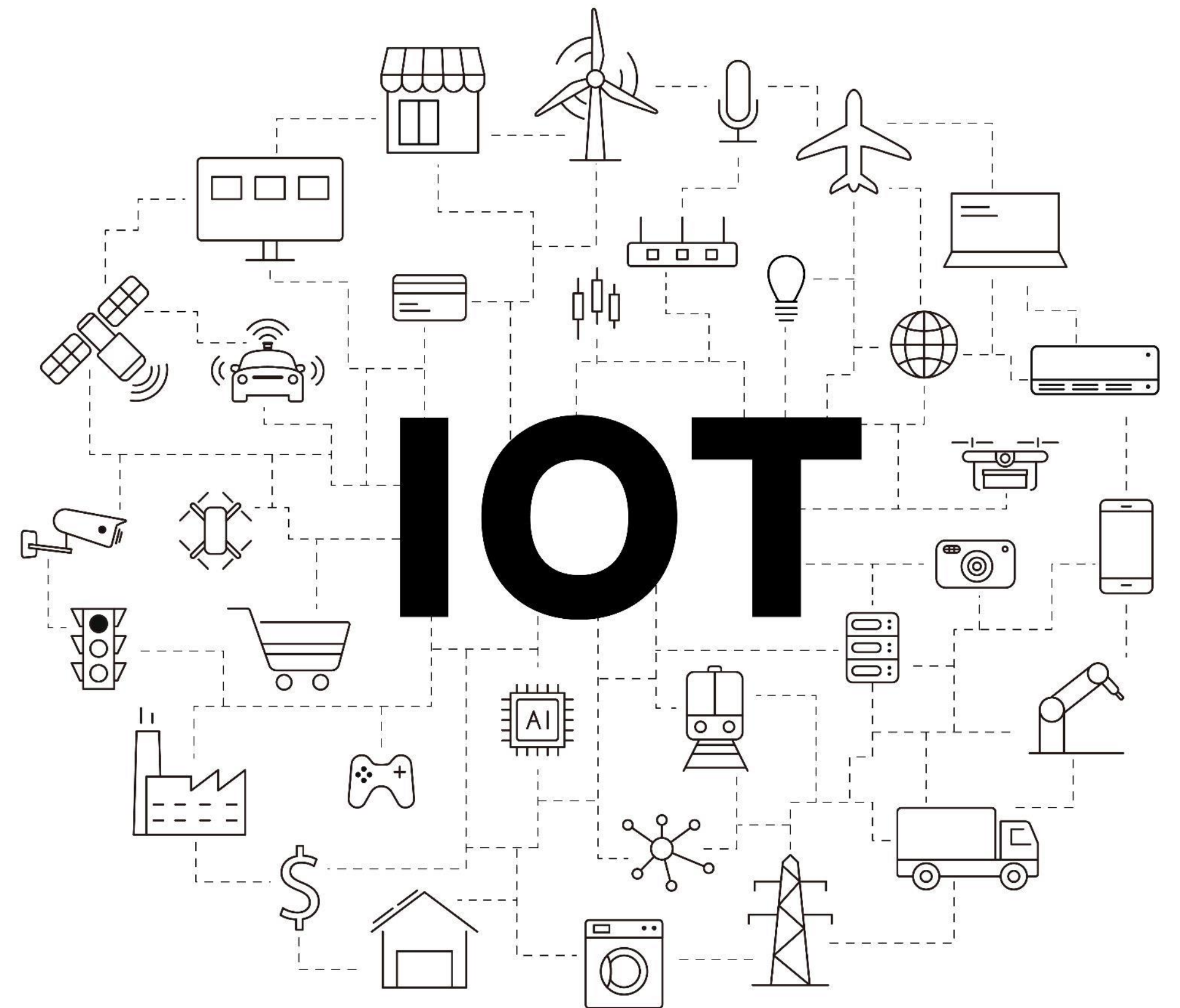
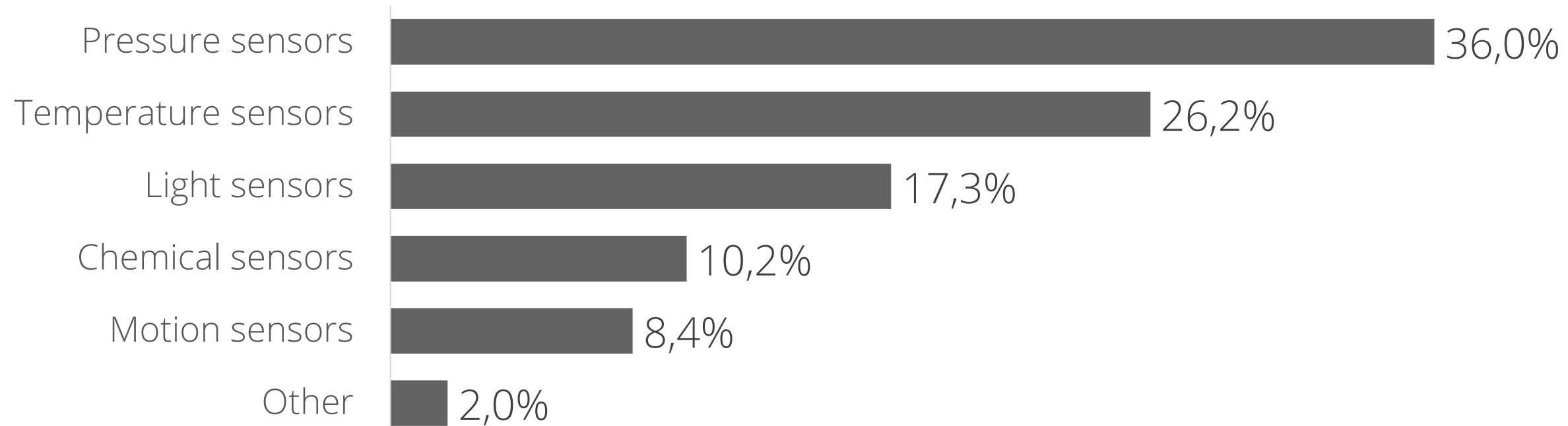
INFRARED SHARPENS THE SENSES OF THE INTERNET OF THINGS – MEGATRENDS

INTERNET OF THINGS - NEW REALITY, WHERE DEVICES **FEEL, ACT, MAKE DECISIONS** AND **COMMUNICATE** WITHOUT OUR INTERVENTION, TRANSFORMING THE MANNER IN WHICH SOCIETIES WORK!

DEVELOPMENT PERSPECTIVES FOR INTERNET OF THINGS DEVICES MARKET (USD BILLIONS)



SENSORS USED IN IoT DEVICES

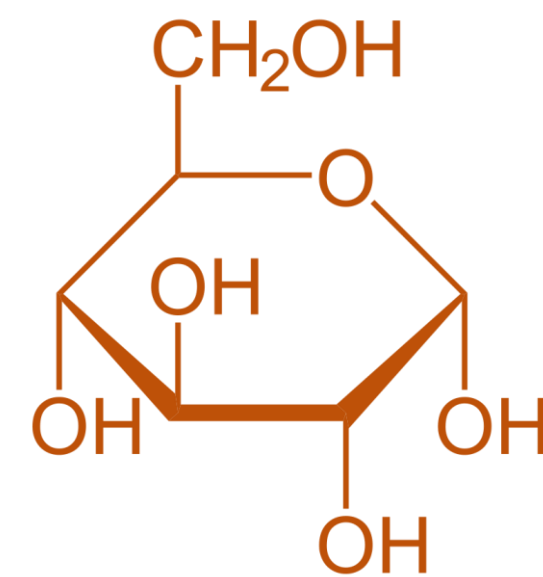


INFRARED AS THE CATALYST OF 'WEARABLE LAB-ON-CHIP' DEVELOPMENT - MEGATRENDS

MARKET 'WEARABLE LAB-ON-CHIP'

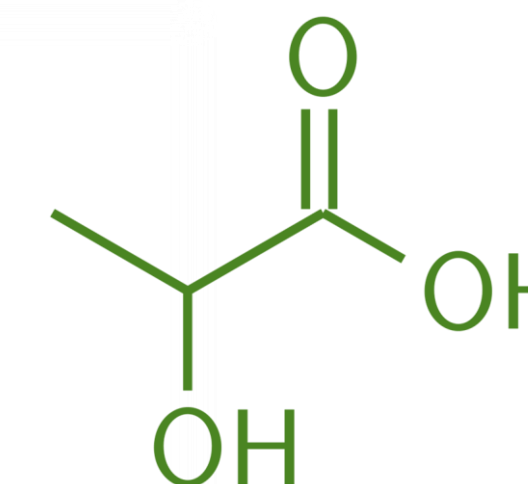
- First devices with 'lab-on-chip' based on IR will enter the market in the next 2-3 years.
- Current solutions are based on the visible spectrum and short infrared.
- Development of MIR PICs will significantly boost the possibilities of the devices.

SELECTED PLAYERS



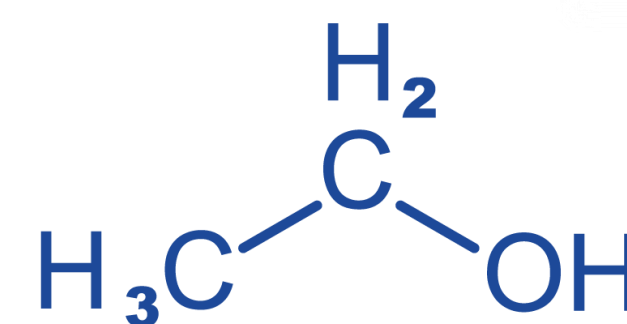
Glucose - uses:

- health – blood sugar level for diabetics
- sport – metabolism
- lifestyle – monitoring when on diet



Lactic acid – uses:

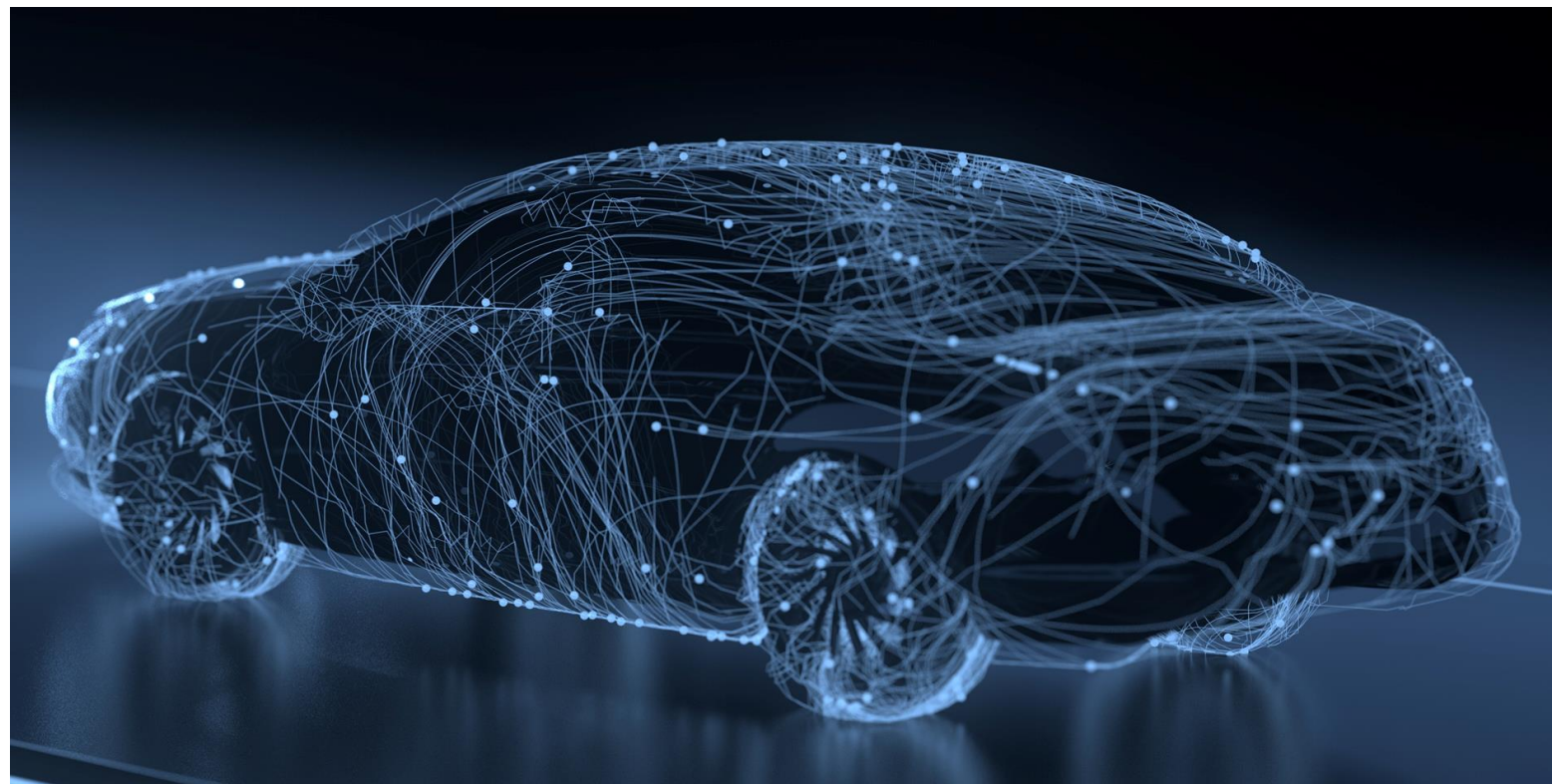
- sport – monitoring muscle fever
- health – disease diagnosis (e.g. sepsis)



Ethanol – uses:

- health – monitoring the blood alcohol concentration

DEMAND TRENDS



AUTOMOTIVE

Automotive bets on IR

The importance of modern solutions in the field of IR, i.e. new generation LIDAR sensors, thermographic cameras, in-cab sensors, is increasing in automotive companies.



SECURITY AND DEFENCE

IR in support of countries' security

The current geopolitical situation may influence the need for increased security in countries including those in Western Europe. - expected growing interest in detectors from the defence sector.

ECONOMIC AND TECHNOLOGICAL MEGATRENDS

SYSTEM MINIATURISATION

Miniaturisation and integration - the future of IR

The use of IR technology in mass-market applications made possible by the development of photonic integrated circuits (PICs) - miniaturised circuits containing a number of passive and active integrated components.

ROHS AND ECOLOGY

RoHS is changing the mid-infrared (MIR) market

The EU RoHS* Directive has, among other things, banned the use of mercury, cadmium and lead in industrial applications. Detectors based on HgCdTe will be available for use in military, space and large industrial infrastructures.

DEFICIT OF SEMICONDUCTORS IN THE EU

Crisis in the chip market spurs development of the semiconductor industry in the EU

Shortage of silicon-based chips: the crisis highlights the weakness of the model based on fabless manufacturing - outsourcing chip production to specialised players, mainly in East Asia.

*Restriction of Hazardous Substances

WIDESPREAD APPLICATION OF MEDIUM INFRARED IN A MULTI-SPECIAL INDUSTRY



EVERY OBJECT WITH A TEMPERATURE ABOVE ABSOLUTE ZERO EMITS INFRARED RADIATION. THE WAVES THAT ARE PRODUCED CAN BE READ AND PROCESSED BY SPECIAL DEVICES DESIGNED FOR THIS PURPOSE - INFRARED RADIATION DETECTORS ARE THEIR MOST IMPORTANT COMPONENT. THEY CAN BE USED IN MANY FIELDS AND INDUSTRIES.

INDUSTRY AND TRANSPORT



- Safety systems for alarming the detection of dangerous gases such as methane
- Production quality control
- Gas sensors, exhaust sensors, spectroscopy
- Automotive - driver support and monitoring systems
- Railway - control of the occurrence of rolling stock malfunctions while running
- Power control and laser calibration

SAFETY AND SECURITY



- Detection of explosive, toxic, chemical substances
- Intelligent munitions
- Tracking early warning systems

ENVIRONMENTAL PROTECTION



- Air quality monitoring
- Monitoring of water quality in waterworks, sewage treatment plants
- Gas analysis (e.g. CO₂ emission levels)

MEDICINE



- Non-invasive blood tests
- Respiratory analysers
- Air monitoring in medical facilities
- Early detection of cancer markers

SPACE INDUSTRY



- Astronomy
- Space missions - detection of gases and substances

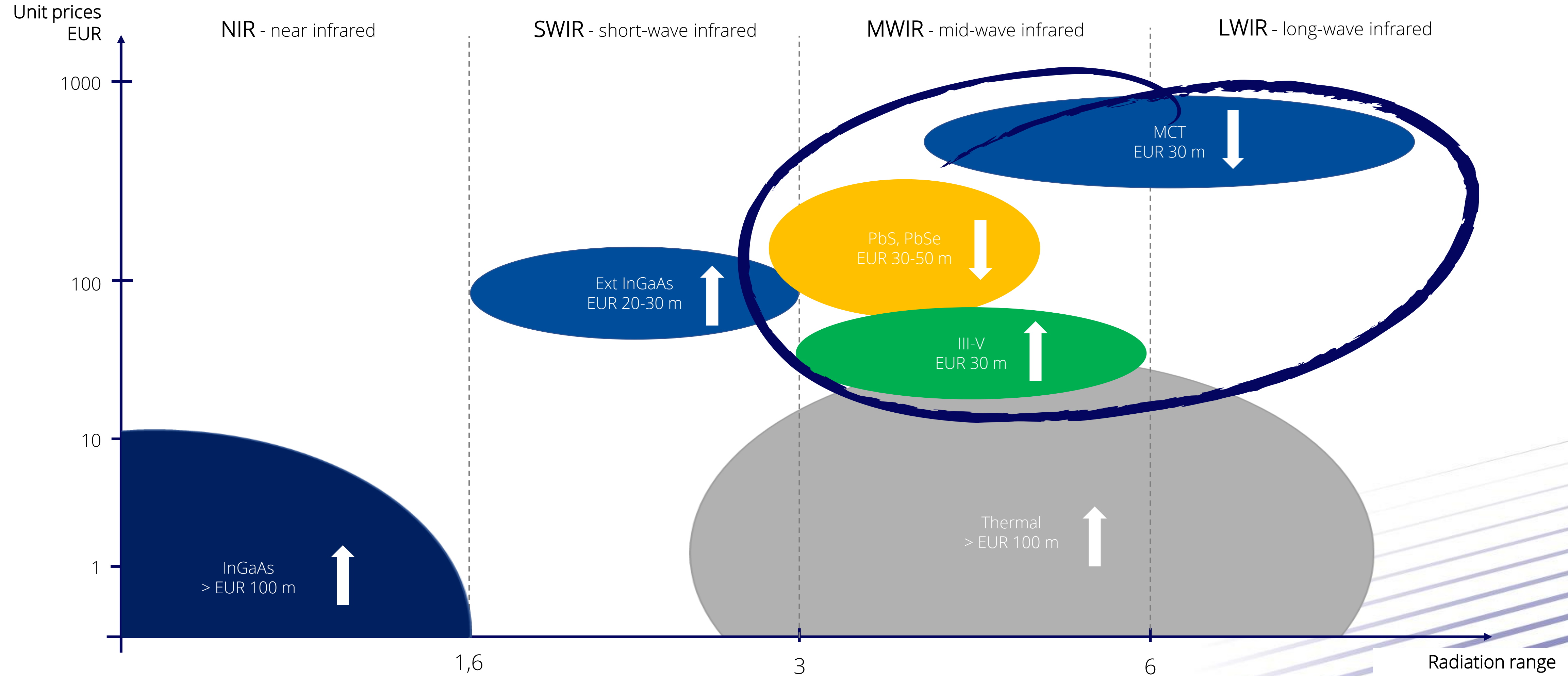
CONSUMERS AND FMCG



- Electronics and wearables e.g. smartwatches with heart rate sensors, iris or face scanners, fingerprint readers
- Internet of Things (IoT)
- Devices for home air quality testing
- Alcohol detection
- Analysis and testing of food products

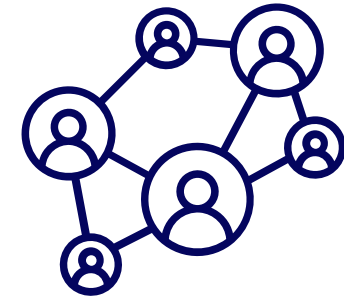
VALUE OF THE INFRARED DETECTORS MARKET

COMPETITIVE TECHNOLOGIES AND PROSPECTIVE MARKETS FOR INFRARED DETECTORS* (EXCLUDING OTHER VIGO MARKETS: LASERS AND SEMICONDUCTOR MATERIALS)



* photon detectors

ORGANISATION

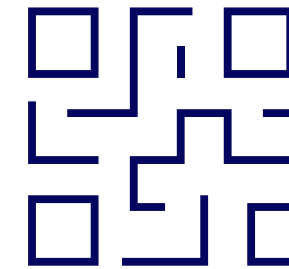


Expert staff - highly qualified in interdisciplinary fields of technical knowledge

Know-how and 35 years of experience in the sector

International brand recognition - positive company image in global markets

TECHNOLOGY

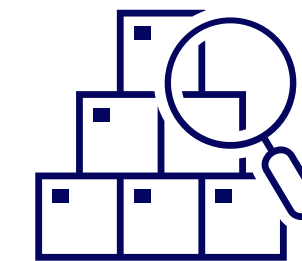


Unique technology (parameters, sensitivity, time) that cannot be copied - industry specific - solutions not achievable by other methods

Research facilities - solution flexibility through complete production line and faster time-to-market

Platform nature of technologies and solutions

COMMERCIALISATION



Product customisation - tailoring to individual customer needs

Delivering solutions that meet customers' requirements, so far unattainable by other methods

PARTNER FOR INTERNATIONAL ENTERPRISES



COOPERATION WITH GLOBAL CORPORATIONS AND THE SECURITY INDUSTRY – SELECTED CUSTOMERS

SUPPLIER OF HIGH-TECH COMPONENTS FOR THE MOST DEMANDING CUSTOMERS



Safran Aerotechnics
(smart munitions)



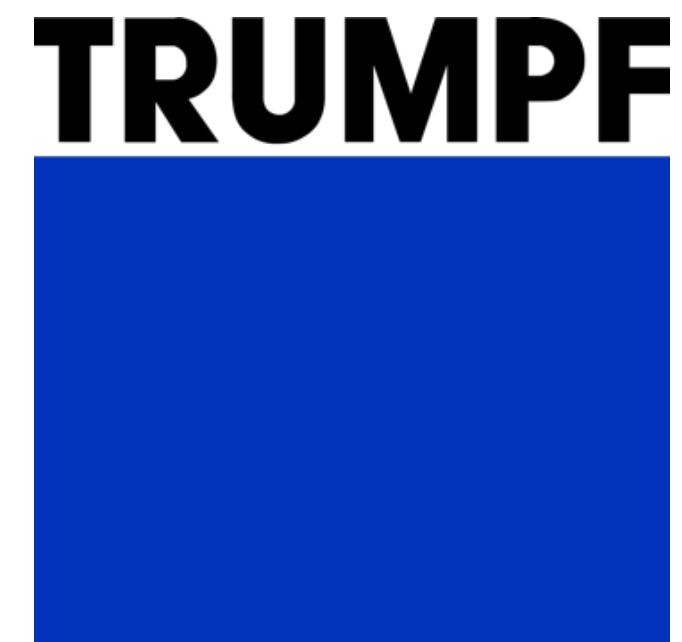
Emerson Electric Co.
(industrial gas analysers)



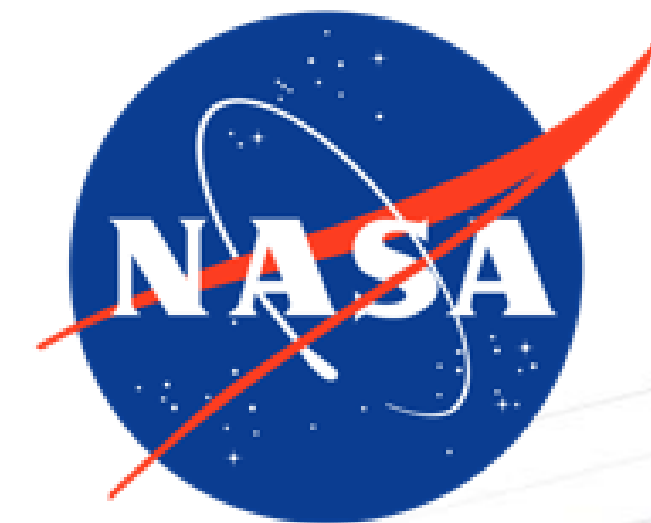
European Space Agency



Caterpillar
(railway safety systems)



TRUMPF
(industrial lasers)

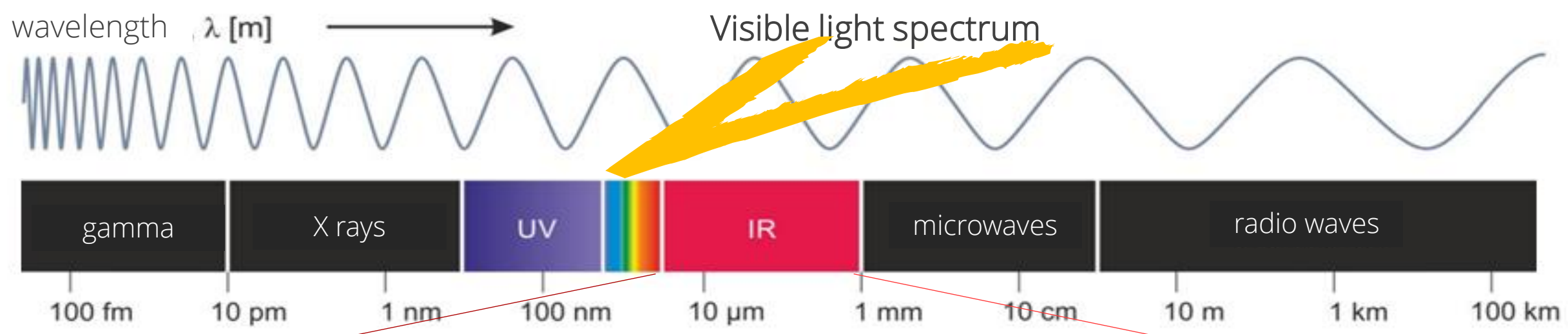


VIGO
PHOTONICS

TECHNOLOGY

WHAT IS INFRARED (IR)? WHAT IS A DETECTOR AND HOW DOES IT WORK?

OPTICAL RADIATION DIAGRAM



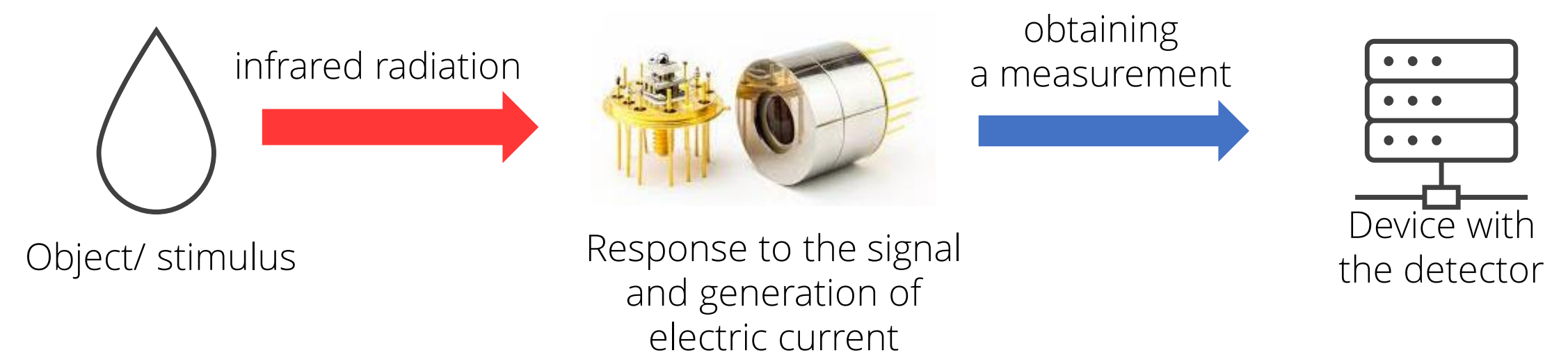
Infrared/IR (infrared) radiation is electromagnetic radiation invisible to the naked eye with wavelengths between visible light and radio waves.

- Any object with a temperature >0 absolute ($= -273.15^{\circ}\text{C}$) emits electromagnetic radiation.
- Bodies at room temperature emit most radiation with a wavelength of about $10\ \mu\text{m}$ (LWIR).
- Higher temperature objects emit more radiation and at shorter wavelengths (SWIR, MWIR).

HOW DOES A DETECTOR WORK?

Infrared sensors focus the emitted radiation on one or more detectors. In the detector, the energy of the infrared radiation is converted into an electrical signal after taking into account the emissivity of the object. Based on this evaluation, for example, the measured temperature can be presented on the display.

SIMPLIFIED GENERAL OPERATING DIAGRAM OF THE INFRARED (IR) DETECTOR



SIMPLIFIED DIVISION OF DETECTORS

Thermal	Photon
<ul style="list-style-type: none">• less sensitive - their operation does not depend on the infrared wavelength emitted by the tested object• they require more time to generate a measurement• example: motion detection, TV remote control	<ul style="list-style-type: none">• manufactured on the basis of complex semiconductor materials• their production requires very complex technologies and equipment• high performance: sensitivity and detection; fast measurement• example: gas detection

PHOTONIC PRODUCTS AND INFRARED (IR) MATERIALS

Semiconductor materials

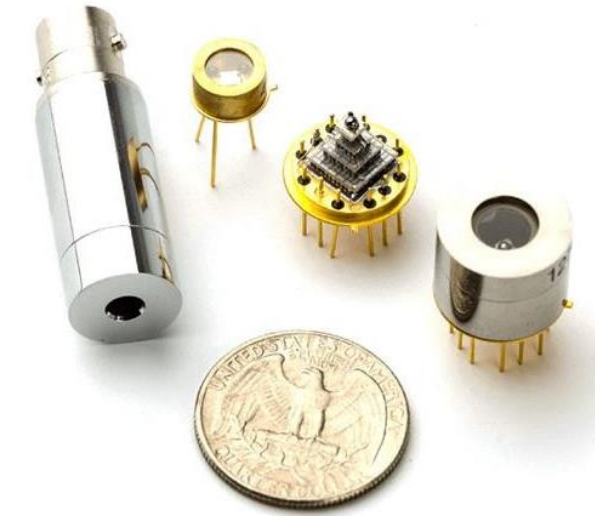


Materials of crystalline structure whose electrical conductivity is between conductors (usually metals) and insulators (most ceramic materials).

Elements for semiconductors: indium (In), gallium (Ga), aluminum (Al), arsenic (As).

Infrared detector

An electronic component made up of semiconductors that allows the conversion of infrared radiation energy into electrical signal.



Infrared module

An integrated system containing an infrared photodetector, signal processing electronics, optics, heat dissipation systems and other components.



VALUE CHAIN IN THE SEMICONDUCTOR INDUSTRY - VIGO'S COMPLETE LINE FOR SEMICONDUCTORS AND PHOTONIC DEVICES

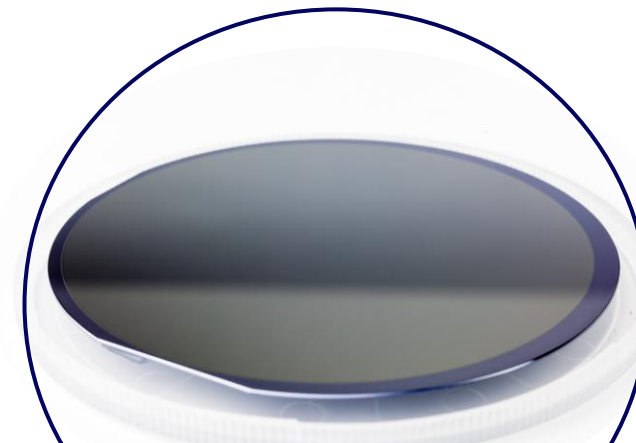
Complete production line allowing for flexibility and short time-to-market for new products



1

Growth of GaAs, InP substrates

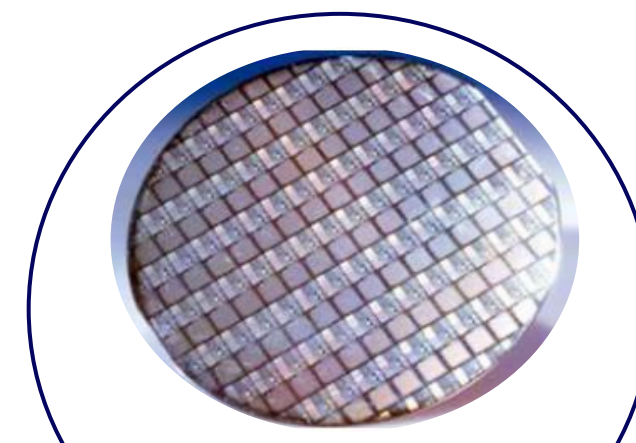
A suitable crystalline structure on which the proper layers are then grown. III-V compound semiconductors are grown on monocrystalline substrates of gallium arsenide (GaAs) or indium phosphide (InP).



2

Epitaxy

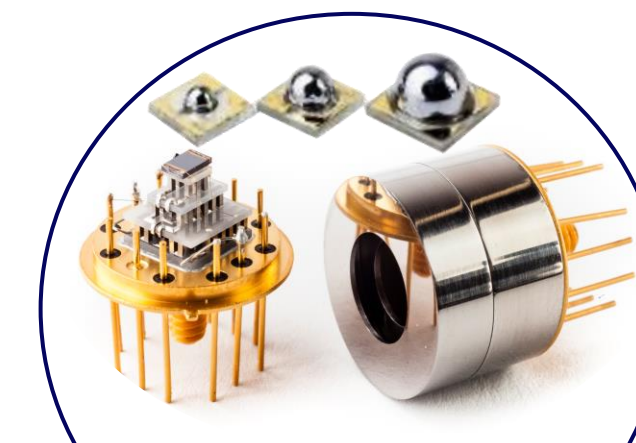
Deposition of the required semiconductor layers with the target parameters. The number of layers can be up to several hundred.



3

Processing

of epitaxial layers and fabrication of detector and laser chips through a range of physical and chemical processes.



4

Packaging

Automated assembly of chips on suitable substrates and in housings. Components (detector, laser) capable of processing an optical/electrical signal are created at the end of this stage.



5

Integration with electronics

Complete detection modules - Electronics integrated in the infrared detector. Production by specialised companies assembling electronic or optoelectronic modules..

SIGNIFICANT DIVERSIFICATION OF VIGO'S OFFER THANKS TO INVESTMENTS IN INFRASTRUCTURE BETWEEN 2014 AND 2020 (MBE LAB, EFFICIENT MOCVD IN THE III-V EPITAXY DEPARTMENT)

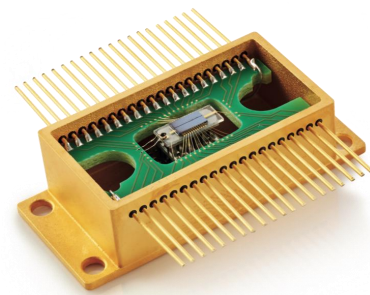
- Manufacture of MCT, InAs, InAsSb and InGaAs detectors, dedicated electronics, detection modules, accessories and semiconductor materials.
- Devices with high sensitivity over a wide spectral range from 1 to 16 μm and high speed in frequency bands up to 1 GHz.
- 90% customised* sales - approx. 10% are sales of standard products.

MCT

MCT Detector



Multi-element detector



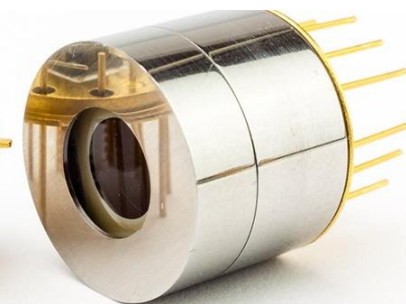
Detectors and detection modules with the semiconductor layer made of MCT/HgCdTe (mercury cadmium telluride) materials.

III-V InAsSb

InAs Detector



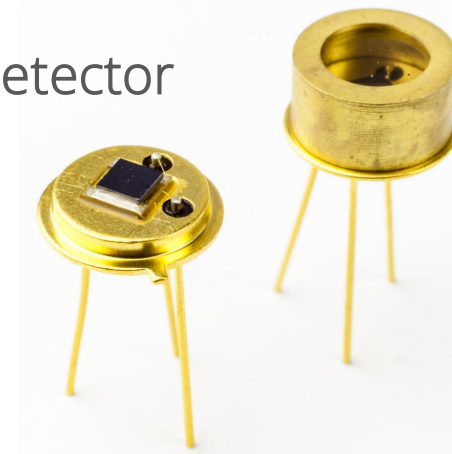
T2SL Detector



Detectors and detector modules with the semiconductor layer made of InAs (indium arsenide) or InAsSb (indium arsenide antimonide) materials.

III-V InGaAs

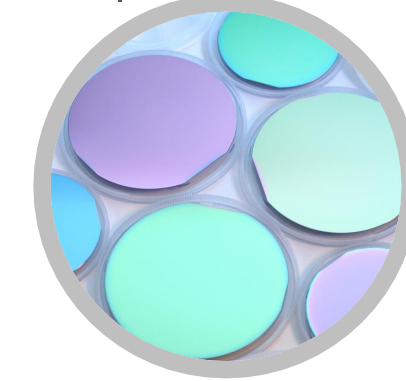
InGaAs Detector



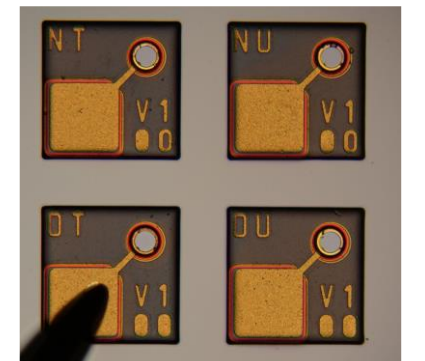
Detectors and detector modules with the semiconductor layer made of InGaAs (indium gallium arsenide) materials.

III-V* EPITAXY and VCSEL

III-V epitaxial wafers



VCSEL



High-quality epitaxial structures of III-V semiconductor materials (InGaAs, InAsSb) offered directly to clients for in-house production of detectors/chips and VCSEL lasers as well as production of SWIR (VCSEL), including VCSEL VIGO lasers.

*realisation of product projects with the client - projects tailored to users' needs

TECHNOLOGICAL AND PRODUCTION FACILITIES - INVESTMENTS

NEW PRODUCTION PLANT

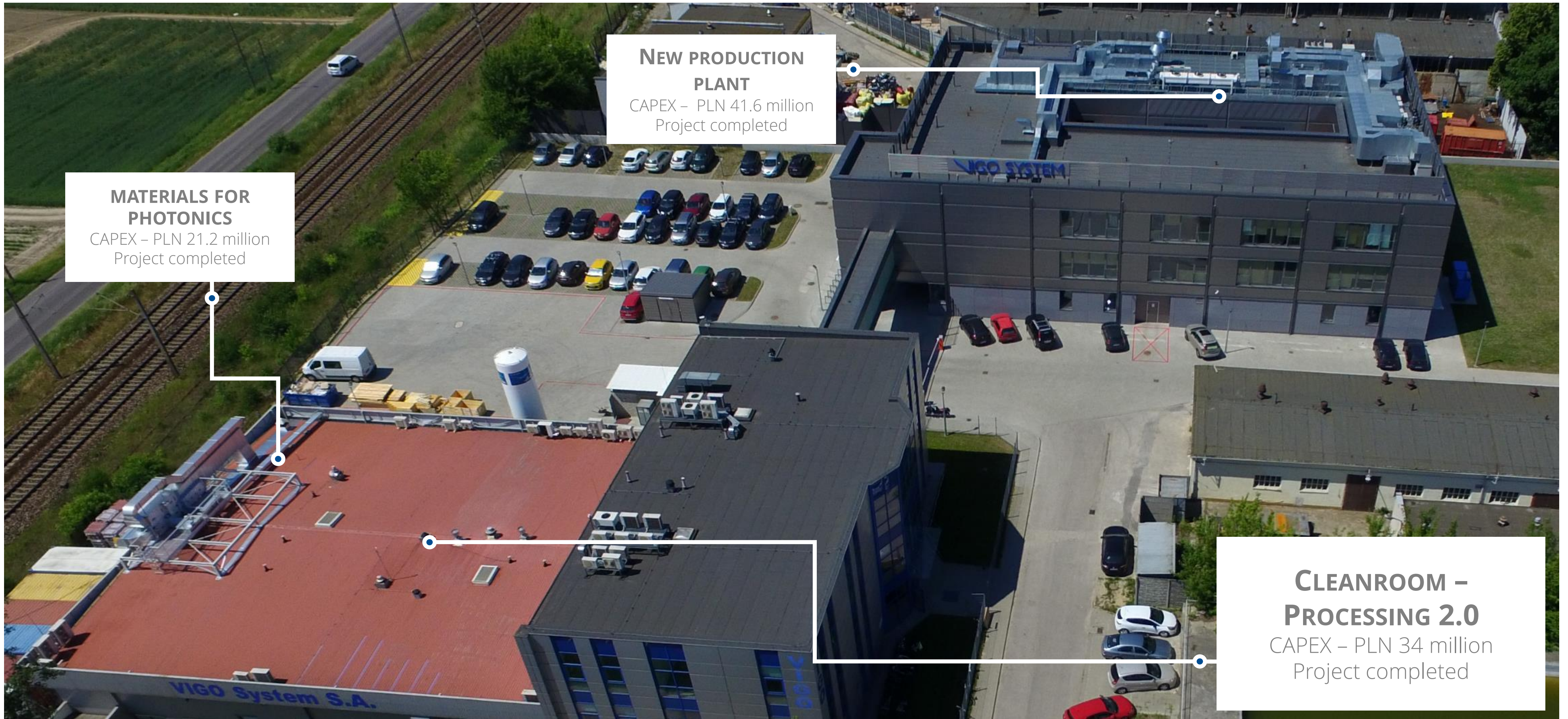
CAPEX – PLN 41.6 million
Project completed

MATERIALS FOR PHOTONICS

CAPEX – PLN 21.2 million
Project completed

CLEANROOM – PROCESSING 2.0

CAPEX – PLN 34 million
Project completed



CLEAN ROOM COMPLETED - SUPPORT FOR 2.0 PROCESSING

INVESTMENT OBJECTIVES

1. Increase in production repeatability
2. Detector chip manufacturing technology
3. Reduction of production costs
4. Meeting the highest quality requirements (military, space, semiconductor industries)

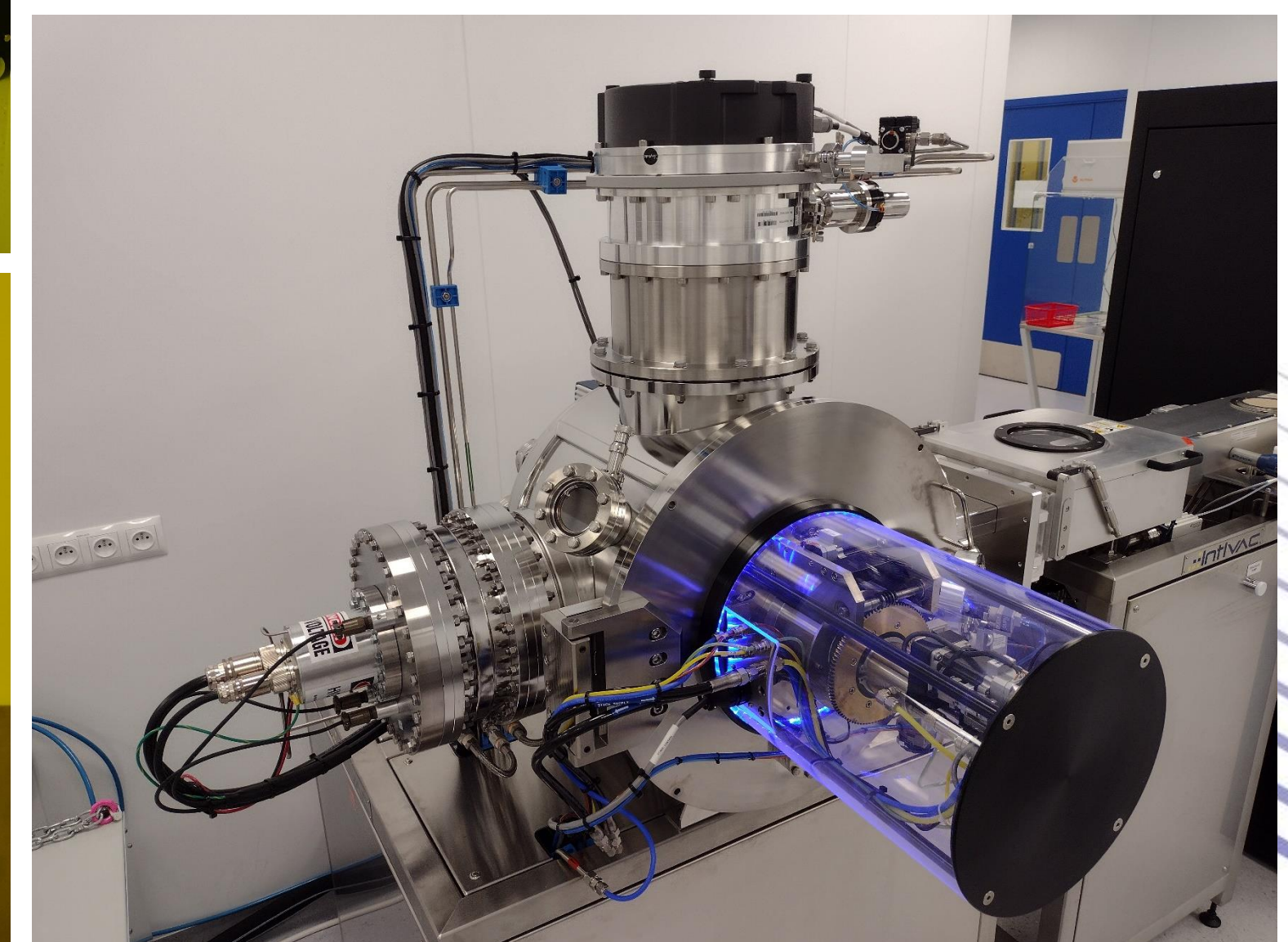
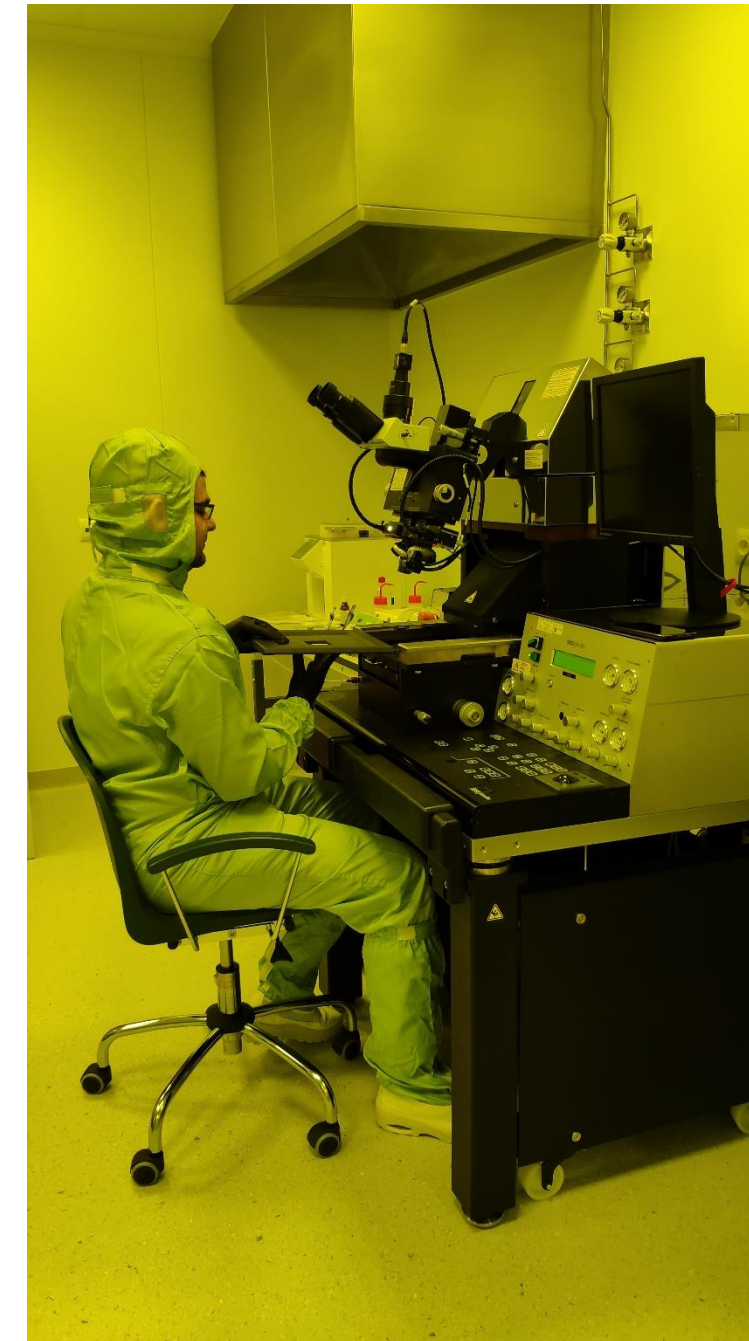
SCOPE: modernisation of the existing VIGO technology hall and construction of a cleanroom with additional production equipment

CAPEX: PLN 34 million

FINANCING: own funds, EUR 2 million credit and co-financing under POIR (PLN 6 million)

PROGRESS

- April 2021 - completion of technology hall expansion
- June 2021 - signing of the contract with the contractor for cleanroom facilities
- November 2021 - completion of the construction first phase and commissioning of the cleanroom
- December 2021 - production start-up in the cleanroom
- February 2022 - completion of the second phase of the redevelopment and full start-up of production
- March 2022 - settlement of the project



AUTOMATION AND THE INCREASE OF PRODUCTION CAPACITIES SUPPORT THE GROWTH



INVESTMENTS IN THE DEVELOPMENT OF PRODUCTION CAPACITY

In 2021, the production volume of detectors increased by 46% YOY to 12.2 thousand units.

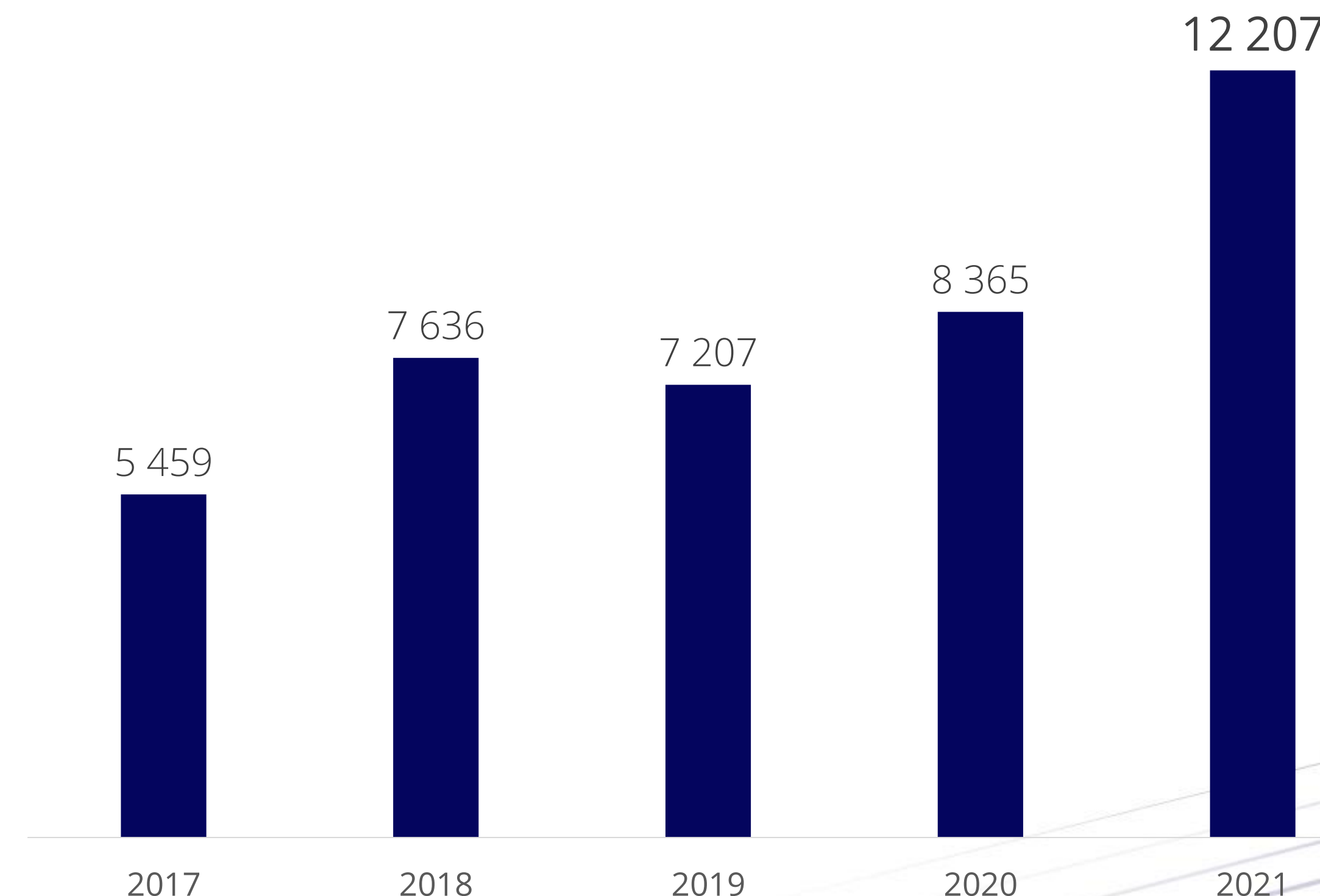
Throughout the last 5 years, VIGO System invested approx. PLN 90 million in the development of production capacity, new organisation, and processes automation, thus transforming from a manufacture of advanced detectors into a modern production plant.

The realised investments increased the capacities manifold at all major production stages:

- 7.5-fold increase of the lens production potential,
- 2-fold increase of the flip-chip assembly capacity,
- 4-fold increase of wire-bonding capacity,
- As huge as 16-fold increase in packaging capacity,
- 11-fold increase in encapsulation capacity.

A great emphasis placed on work organisation and processes automation resulted in the capacity increase exceeding significantly the increase of employment in production.

DETECTORS PRODUCTION STATISTICS (IN UNITS)

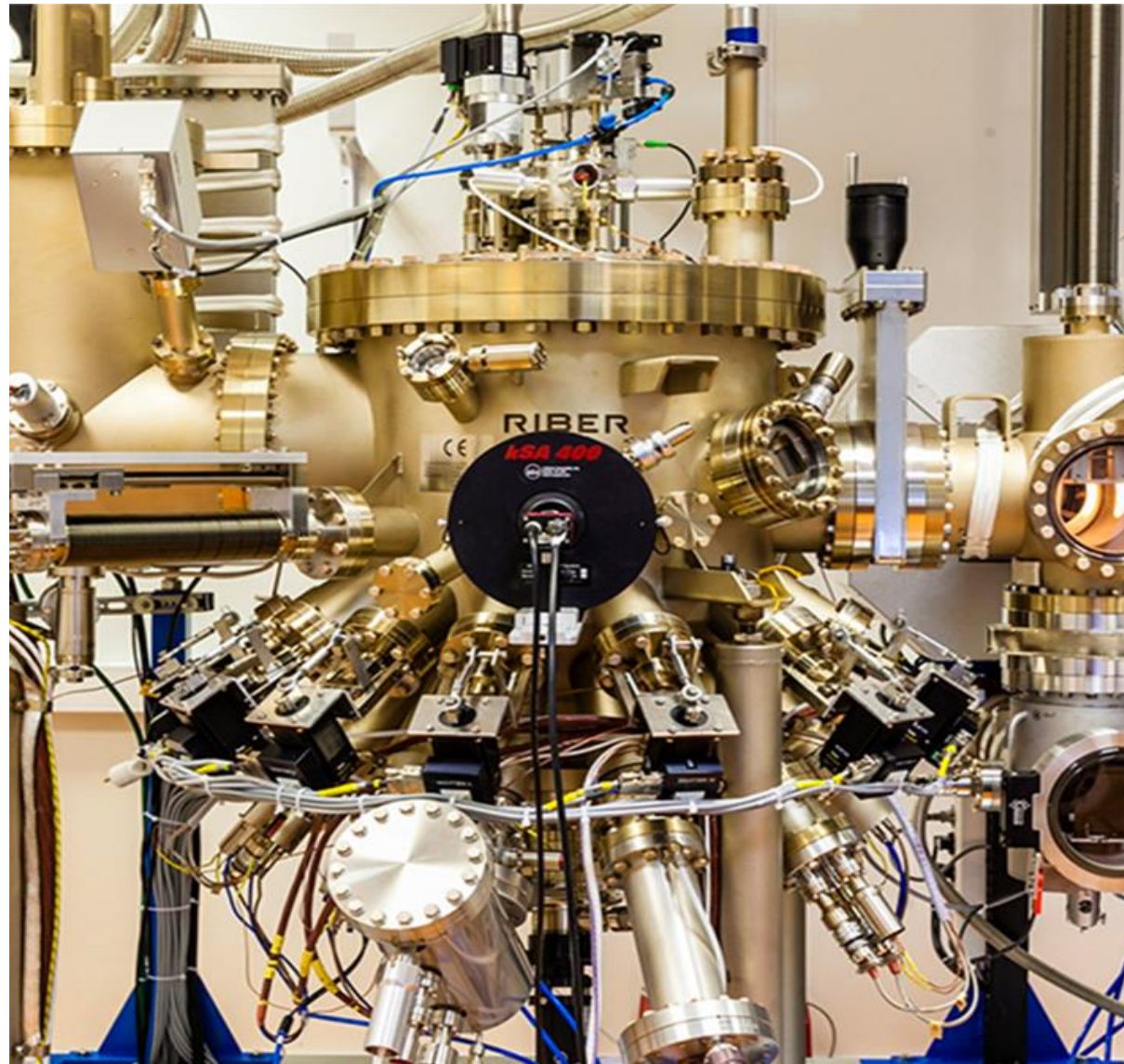


THE NEW REACTOR WILL ENABLE THE DOUBLING OF PRODUCTION CAPACITY



VIGO HAS 3 REACTORS FOR THE PRODUCTION OF SEMICONDUCTOR MATERIALS, THE LARGEST OF WHICH IS A REACTOR MANUFACTURED BY AIXTRON AND COMMISSIONED IN 2019.

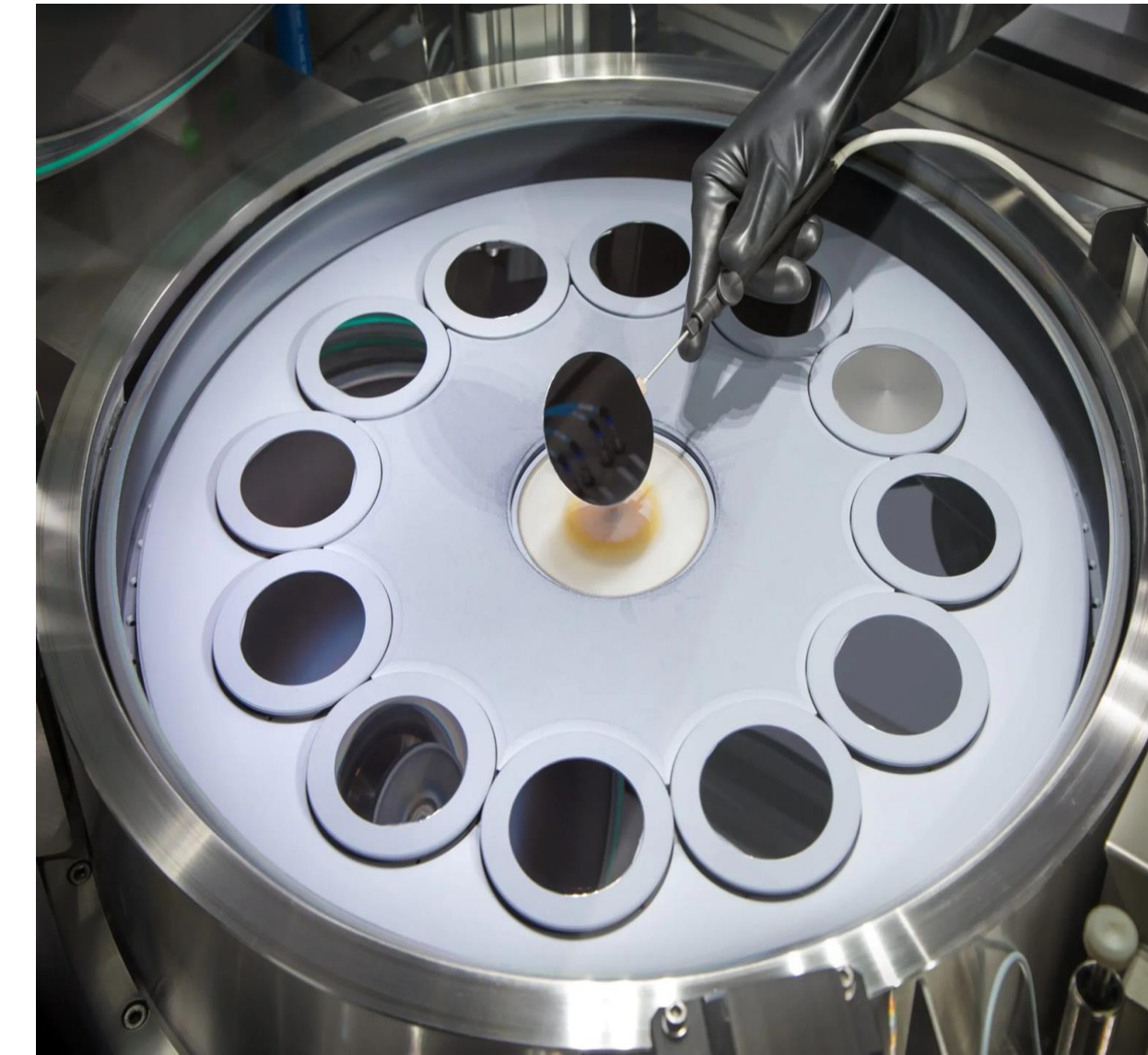
MBE (InAs, InAsSb)



MOCVD (HgCdTe/ MCT)



MOCVD (III-V)



NEW EPITAXIAL REACTOR

- Epitaxial reactor for the production of III-V semiconductor materials ordered
- Supply contract with a reliable company - AIXTRON: November 2021; order delivery: September 2022, system start-up: early 2023
- CAPEX: EUR 3.6 million, total EUR 5.4 million with investments required for the start-up



DEVELOPMENT STRATEGY

Sense what matters

We enable the detection of any substance in any conditions

What do we do?

We come up with ideas, conduct research, design and produce high quality complex detectors of exorbitant parameters

How do we do that?

By listening to and understanding the needs as well as cooperating with our technological partners, we learn together with our clients

For whom do we do this?

For pioneering technological companies, designers and system integrators searching for new solutions

What value do we bring along?

We enable the clients to detect phenomena, acquire data, and transform it into useful information

VIGO DEVELOPMENT STRATEGY UP TO 2023 AND 2026



VIGO 2026 STRATEGY - A RANGE OF BUSINESS OPPORTUNITIES TO MEET GROWTH AMBITIONS BY 2026

- New VIGO Strategy for 2021-2026 announced on 16 June 2021
- New business directions based on new technologies (infrared sources, optoelectronic systems and integrated circuits): Phase I and Phase II

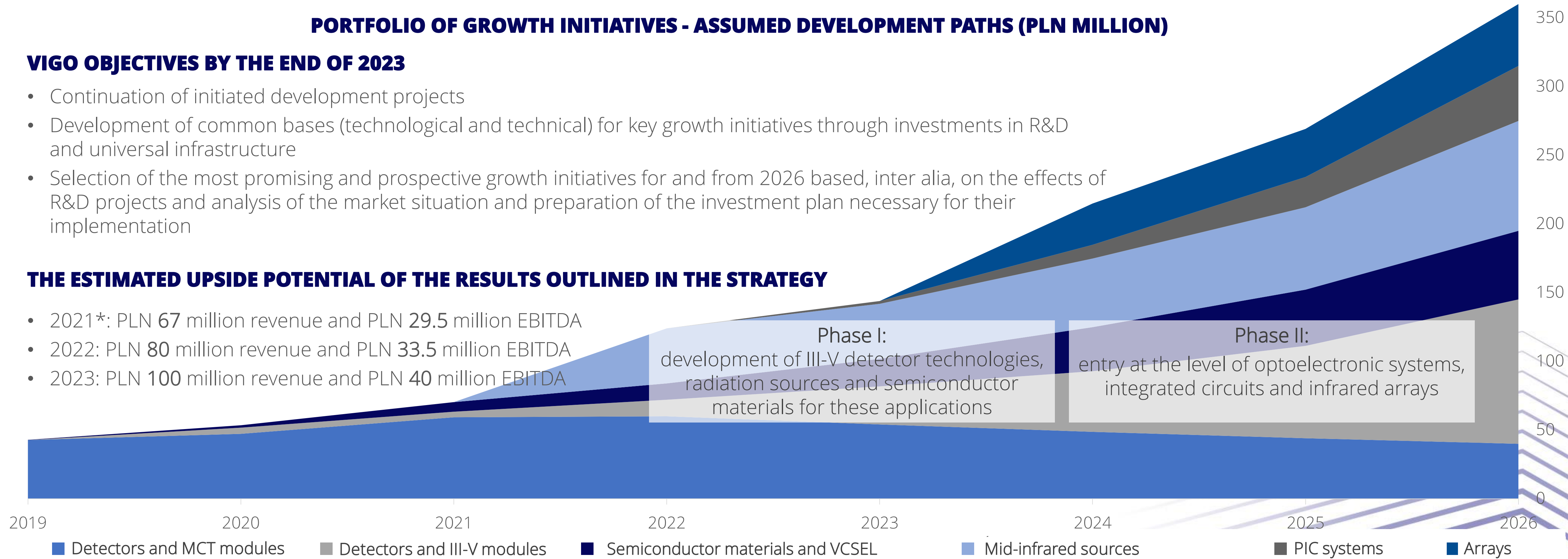
PORTFOLIO OF GROWTH INITIATIVES - ASSUMED DEVELOPMENT PATHS (PLN MILLION)

VIGO OBJECTIVES BY THE END OF 2023

- Continuation of initiated development projects
- Development of common bases (technological and technical) for key growth initiatives through investments in R&D and universal infrastructure
- Selection of the most promising and prospective growth initiatives for and from 2026 based, inter alia, on the effects of R&D projects and analysis of the market situation and preparation of the investment plan necessary for their implementation

THE ESTIMATED UPSIDE POTENTIAL OF THE RESULTS OUTLINED IN THE STRATEGY

- 2021*: PLN 67 million revenue and PLN 29.5 million EBITDA
- 2022: PLN 80 million revenue and PLN 33.5 million EBITDA
- 2023: PLN 100 million revenue and PLN 40 million EBITDA



*In 2021, the Company achieved sales revenues of PLN 71.5 million, up by PLN 4.5 million compared to the assumptions in the strategy for that year.

MCT DETECTORS AND DETECTION MODULES (MCT+)

MCT DETECTORS AND DETECTION MODULES (MCT+) - GENERAL INFORMATION

VIGO MCT SOLUTIONS

Detectors and detector modules with a semiconductor layer made of MCT/ HgCdTe (mercury cadmium telluride) materials.

Natural phasing out of the MCT market due to RoHS.

A range of photoconductive (PC) and photovoltaic (PV) detectors used in many market sectors, tailored to specific customer requirements.

Radiation range: MWIR, LWIR.

Reactor/production method: MOCVD (Metalorganic Chemical Vapour Deposition).

Annual volume/production capacity: 20,000 detectors and modules.

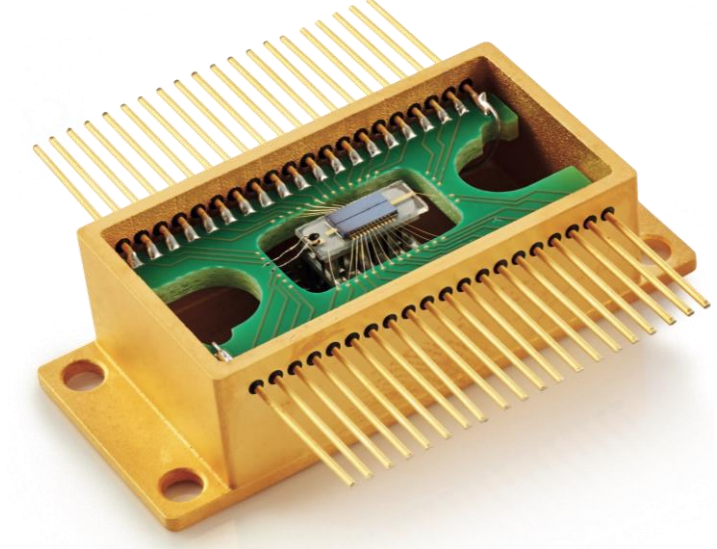
Price: relatively more expensive products sold in smaller volumes compared to other VIGO solutions - average price approx. EUR 500-1000 / module, average volume - 200 pcs./order.

PRODUCTS

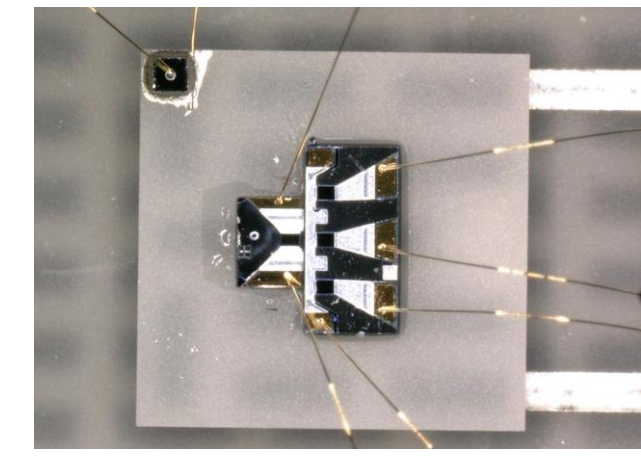
MCT detector



Multi-element detector



Complex detection modules



MARKET - VALUE AND POTENTIAL*

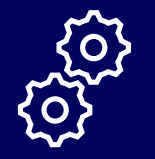
USD 40 million, 9% CAGR

COMPETITION

Teledyne Judson, Infrared Associates, Hamamatsu

APPLICATIONS - EXAMPLES

Sectors



Industrial applications



Military and space technologies



Markets not covered by RoHS exclusions (use of cadmium and mercury)

Applications

- ✓ gas analysis
- ✓ examination of the spatial distribution of temperature
- ✓ precise determination of the direction of the infrared radiation source
- ✓ scanning of larger areas for the detection of substances, gases and temperature changes
- ✓ sorters on production lines

Products



systems for monitoring emissions from power plant stacks



failure detection system for high-speed trains



detectors for gas leakage detection in the gas network

Clients

manufacturers of monitoring and measurement equipment
manufacturers of high-performance sensory systems

*Mid-Infrared Photodetectors and Systems: Market Study, 2018

MCT DETECTORS AND DETECTION MODULES (MCT+) INITIATIVE



THE MCT DETECTORS AND DETECTION MODULES INITIATIVE - KEY POINTS

Conditions

Natural extinction of the MCT market due to ROHS.

Objective of the initiative

Exploitation of the market in a phase of gradual reduction by 2024 by improving the customisation process and exploration of uncovered market niches.

Market objective

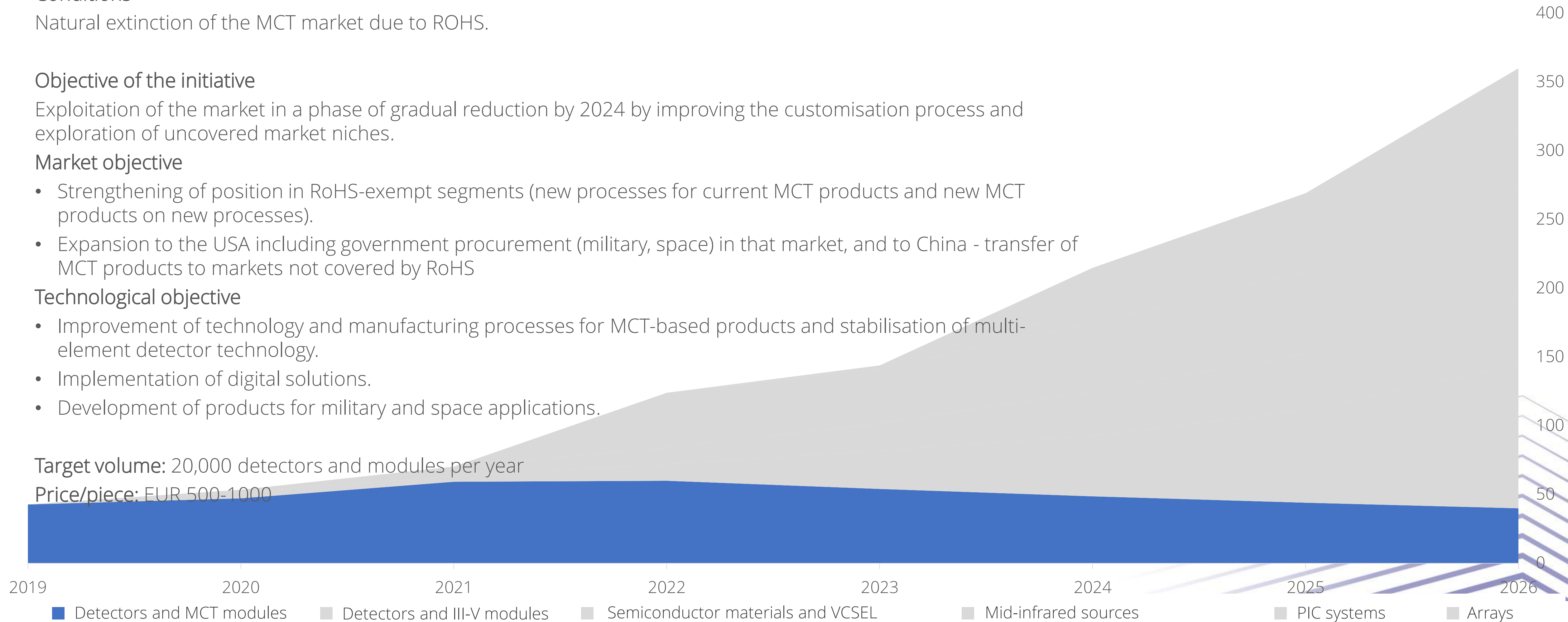
- Strengthening of position in RoHS-exempt segments (new processes for current MCT products and new MCT products on new processes).
- Expansion to the USA including government procurement (military, space) in that market, and to China - transfer of MCT products to markets not covered by RoHS

Technological objective

- Improvement of technology and manufacturing processes for MCT-based products and stabilisation of multi-element detector technology.
- Implementation of digital solutions.
- Development of products for military and space applications.

Target volume: 20,000 detectors and modules per year

Price/piece: EUR 500-1000



MCT DETECTORS AND DETECTION MODULES (MCT+) INITIATIVE – TECHNOLOGY AND COMMERCIALISATION

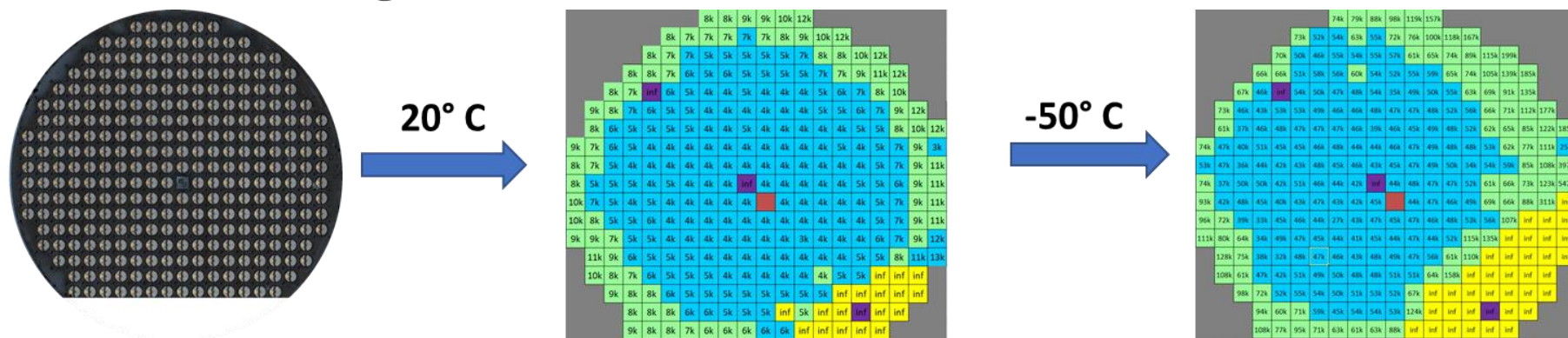
TECHNOLOGY DEVELOPMENT

Achievements in 2021

- The first products based on new technologies applied in a single production line were obtained. The following were used: an automatic measuring station, an automatic flip-chip, a new robotic station for gluing windows and casings.
- Vacuum encapsulation technology was developed, which enables the use of detectors at elevated ambient temperatures while increasing performance.

Achievements in Q1 2022

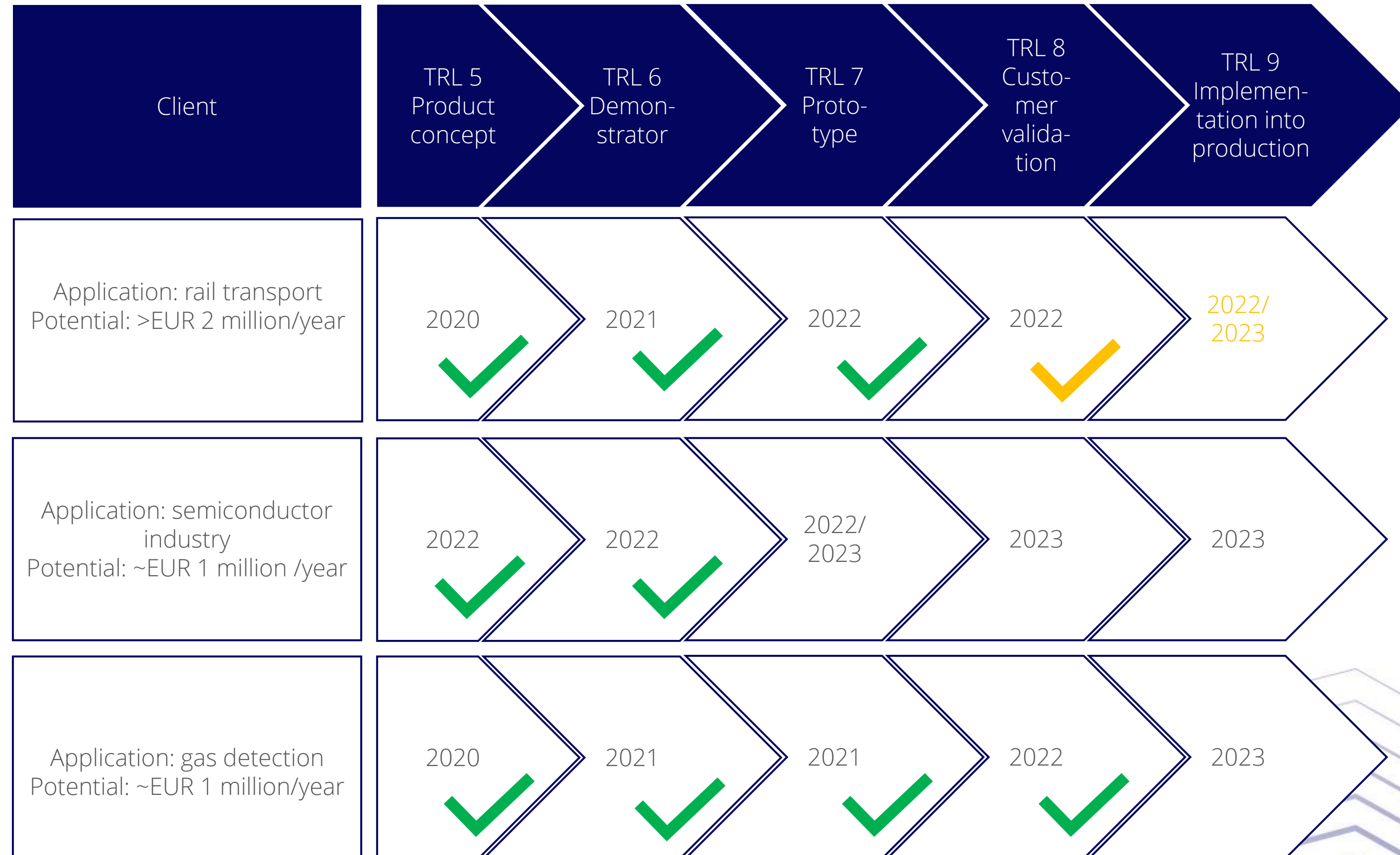
- Implementation of new technologies for characterisation of whole semiconductor layers (probestation), which will reduce unit manufacturing costs.



Plans for 2022

- Optimisation of the existing product range on new processing and assembly technologies.
- Implementation of a new product series based on vacuum sealed detectors.

COMMERCIALISATION - SAMPLE PROJECTS



III-V InAsSb DETECTORS AND DETECTION MODULES

III-V InAsSb DETECTORS AND DETECTION MODULES - GENERAL INFORMATION

VIGO InAsSb SOLUTIONS

Detectors and detector modules, chips with a semiconductor layer made of the following materials: **InAs (indium arsenide) or InAsSb (indium arsenide antimonide).**

RoHS compliant, no mercury or cadmium.

A range of photoconductive (PC) and photovoltaic (PV) MWIR and LWIR type II super lattice (T2SL) detectors, operating at room temperature or thermoelectrically cooled, prepared to specific customer requirements.

Radiation range: MWIR and LWIR.

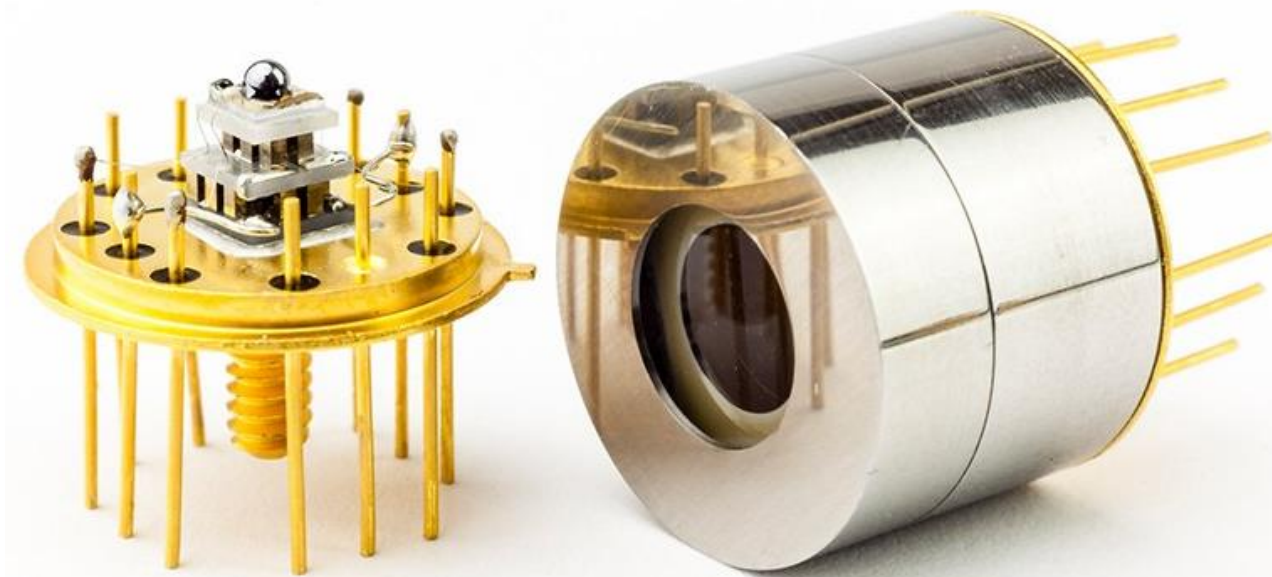
Reactor/production method: MBE (Molecular Beam Epitaxy).

Annual volume/production capacity: 100,000 detectors and modules, 1 million chips.

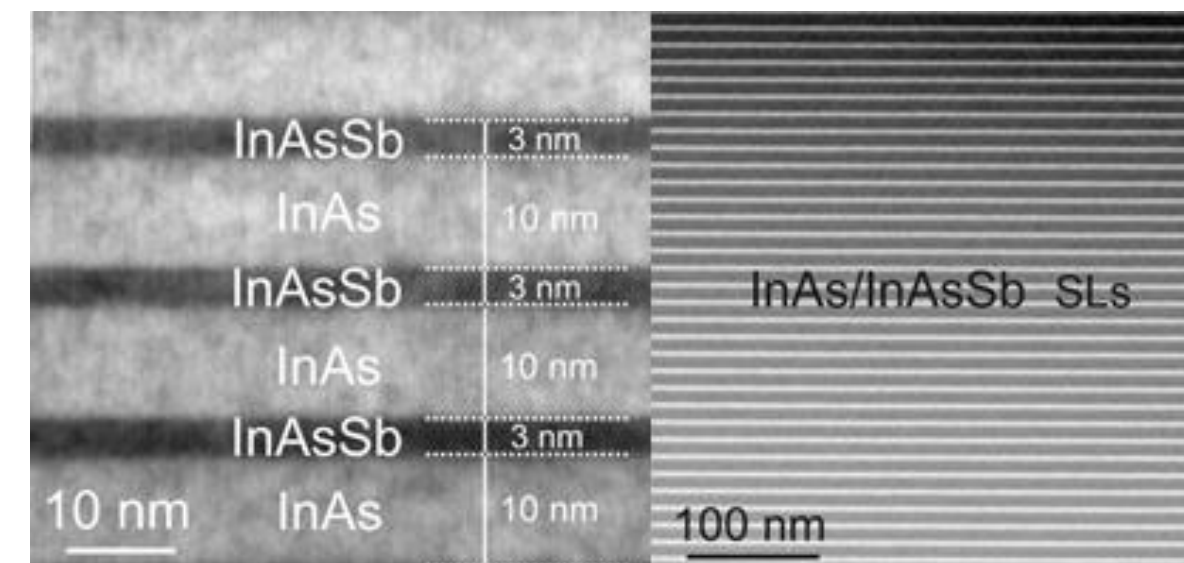
Price: EUR 100-500/ module, EUR 20-30/ detection chip (average volume - 5-10,000 units/order).

PRODUCTS

InAs/InAsSb detectors



T2SL structure



MARKET - VALUE AND POTENTIAL*

USD 30 million, >20% CAGR

COMPETITION

Hamamatsu, Teledyne Judson, Asahi Kasei

APPLICATIONS - EXAMPLES

Sectors

areas for the use of low-cost detection modules

- Environment protection
- Medicine
- Robotics
- Military industry
- Property protection
- Industry (automotive, manufacturing)

Applications

- ✓ gas analysis
- ✓ examination of the spatial distribution of temperature
- ✓ precise determination of the direction of the infrared radiation source
- ✓ scanning of larger areas for the detection of substances, gases and temperature changes
- ✓ sorters on production lines

Products

- NOx level sensor in the air pollution monitoring sensor network
- LIDAR for scanning the environment in reduced visibility conditions

Clients

manufacturers of monitoring and measurement equipment
manufacturers of high-performance sensory systems

III-V InAsSb DETECTORS AND DETECTION MODULES INITIATIVE



III-V InAsSb DETECTOR AND DETECTION MODULE INITIATIVE - KEY POINTS

Conditions

- Divided into 3 main areas: (1) specialised detectors and modules (continued), (2) integration of mass-produced detectors with electronics (integrated circuits, electronic schematic licensing, customer assembly management), (3) mass-produced chips.

Objective of the initiative

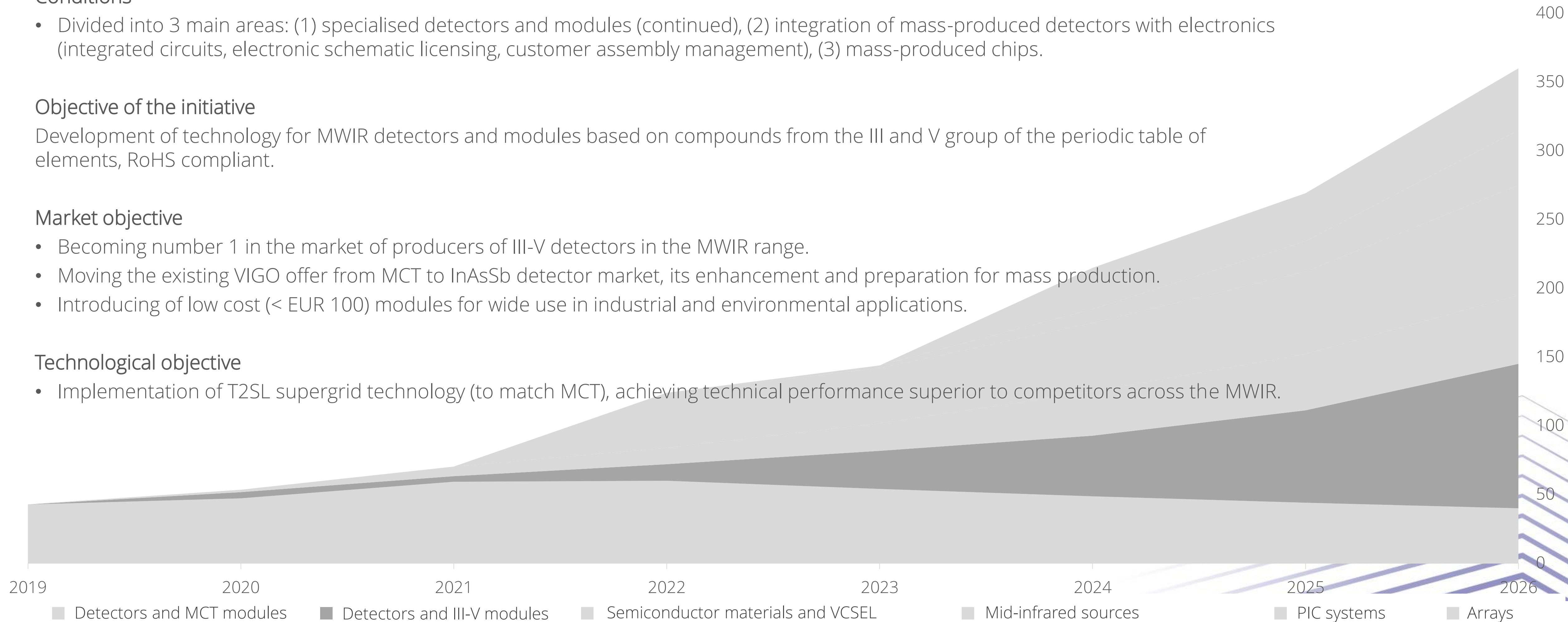
Development of technology for MWIR detectors and modules based on compounds from the III and V group of the periodic table of elements, RoHS compliant.

Market objective

- Becoming number 1 in the market of producers of III-V detectors in the MWIR range.
- Moving the existing VIGO offer from MCT to InAsSb detector market, its enhancement and preparation for mass production.
- Introducing of low cost (< EUR 100) modules for wide use in industrial and environmental applications.

Technological objective

- Implementation of T2SL supergrid technology (to match MCT), achieving technical performance superior to competitors across the MWIR.



III-V InAsSb DETECTORS AND DETECTION MODULES INITIATIVE – TECHNOLOGY AND COMMERCIALISATION

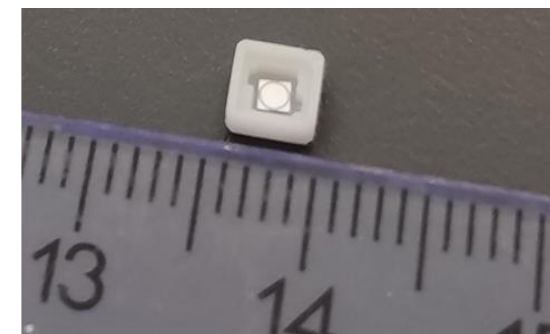
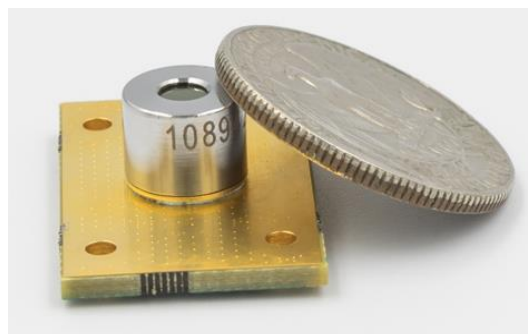
TECHNOLOGY DEVELOPMENT

Achievements in 2021

- Demonstrators based on photoresistors and super grid photodiodes.
- Integrated modules (detector with preamplifier) with 32-element detectors dedicated for spectroscopy and scanning systems.
- Four-channel module with filters for NDIR gas detection.

Achievements in Q1 2022

- Development of new versions of the Low-Cost Detection Module - detector adapted to be soldered with electronics developed. Completion of components for the first batch of prototypes started.

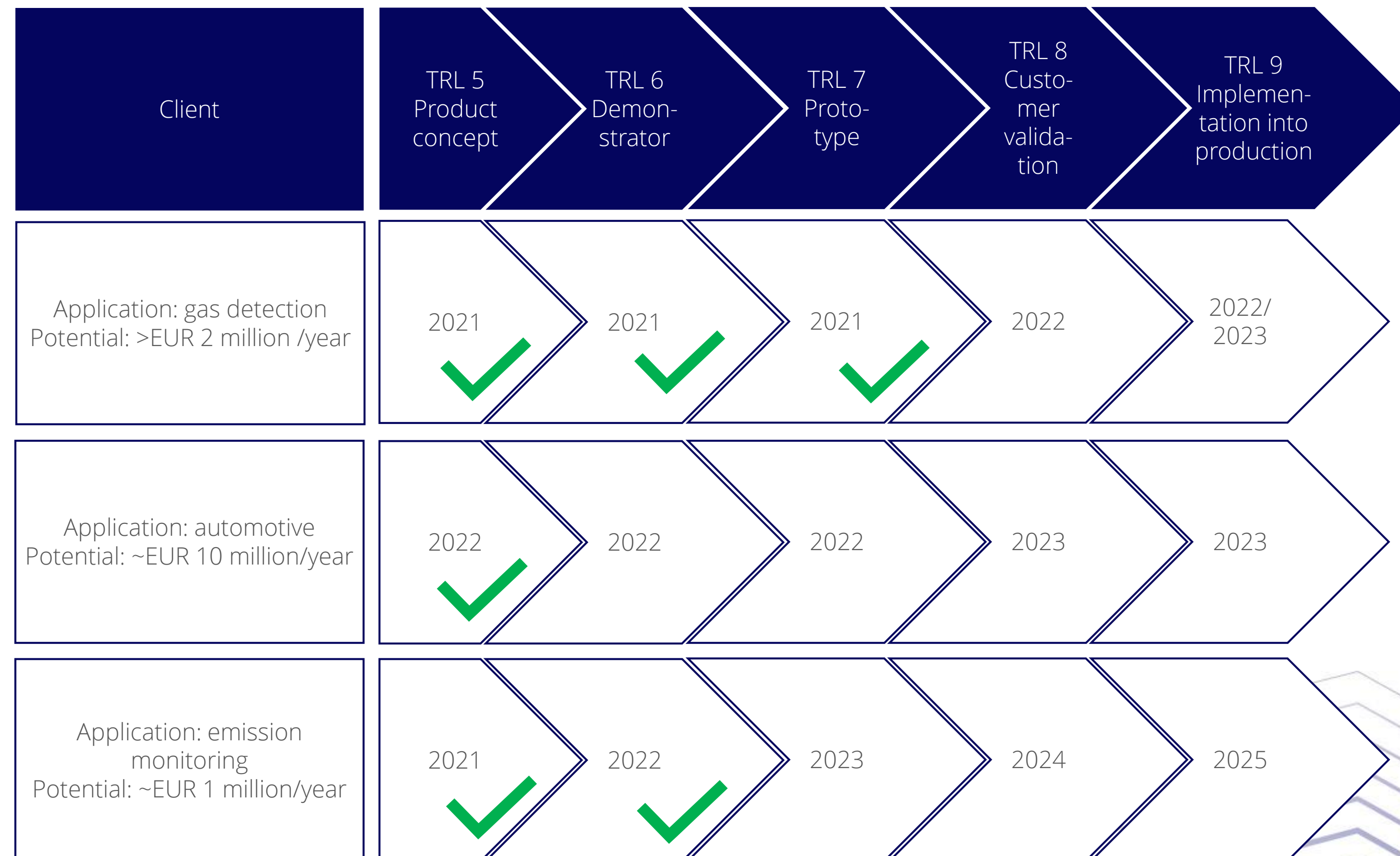


- First orders for TMD (500 units) from the Chinese market.

Plans for 2022

- Expansion of the TMD offer to include more wavelengths and the addition of digital solutions.
- Development of long-wavelength supergrid detectors and anti-fringing solutions.
- Cost optimisation of NDIR gas detection solutions.

COMMERCIALISATION - SAMPLE PROJECTS



III-V InGaAs DETECTORS AND DETECTION MODULES

III-V InGaAs DETECTORS AND DETECTION MODULES - GENERAL INFORMATION

VIGO InGaAs SOLUTIONS

Detectors and detector modules, chips in which the semiconductor layer is made of InGaAs (indium gallium arsenide) materials.

RoHS compliant, no mercury or cadmium.

A range of detectors, chips addressed to mass applications, detecting IR radiation and converting it into an electrical signal (resistance - photoconductive detectors - PC, voltage - photovoltaic - PV), prepared according to specific customer orders.

Radiation range: SWIR.

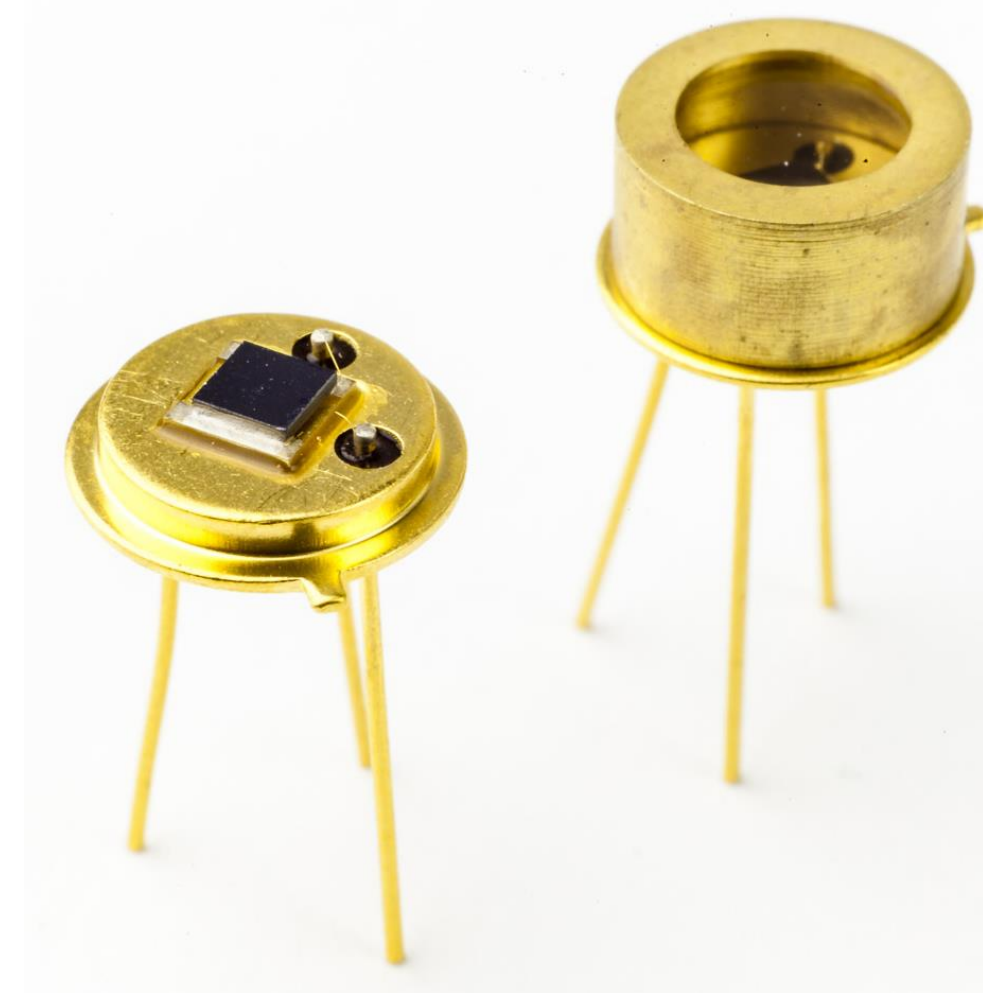
Reactor/production method: MOCVD (Metalorganic Chemical Vapour Deposition) Aixtron G4.

Annual volume/production capacity:
1 million chips.

Price: the cheapest products in VIGO's offer and sold in very high volumes compared to the company's other solutions, EUR 30-50/chip.

PRODUCTS

InGaAs detectors



MARKET - VALUE AND POTENTIAL*

USD 150 million whole market, USD 30 million extended InGaAs market, >10% CAGR (2021-2025)

COMPETITION

Hamamatsu, Teledyne Judson, Laser Components, Thorlabs, OSI Optoelectronics




APPLICATIONS - EXAMPLES

Sectors

Current

-  Industry (gas analysis)
-  Environmental protection (emissions monitoring)
-  Military and space industries



Target

-  Health
-  Consumer market (wearable devices)
-  Quantum cryptography
-  Internet of Things (IoT)

Applications

- ✓ measurement of key parameters - glucose, lactic acid, alcohol
- ✓ gas analysis, humidity measurement, leakage and emission control
- ✓ breath analysis, applications in surgery and medical procedures
- ✓ plastics analysis
- ✓ food product analysis
- ✓ health monitoring
- ✓ next-gen lidar (especially automotive)
- ✓ direct optical communication; industry - non-invasive verification of product quality

Products

-  currently - a sensor to measure the concentration of e.g. CO₂
-  target - blood glucose monitoring sensor installed in a smartwatch

Clients

manufacturers of monitoring and measurement equipment
manufacturers of high-end sensor systems
target - consumer electronics manufacturers, automotive component suppliers

III-V InGaAs DETECTORS AND DETECTION MODULES INITIATIVE



III-V InGaAs DETECTOR AND DETECTION MODULE INITIATIVE - KEY POINTS

Conditions

- Leveraging megatrends related to IoT and consumer devices (measuring glucose, lactic acid, alcohol).
- Exploiting synergies with the new III-V epitaxy business (MOCVD).

Objective of the initiative

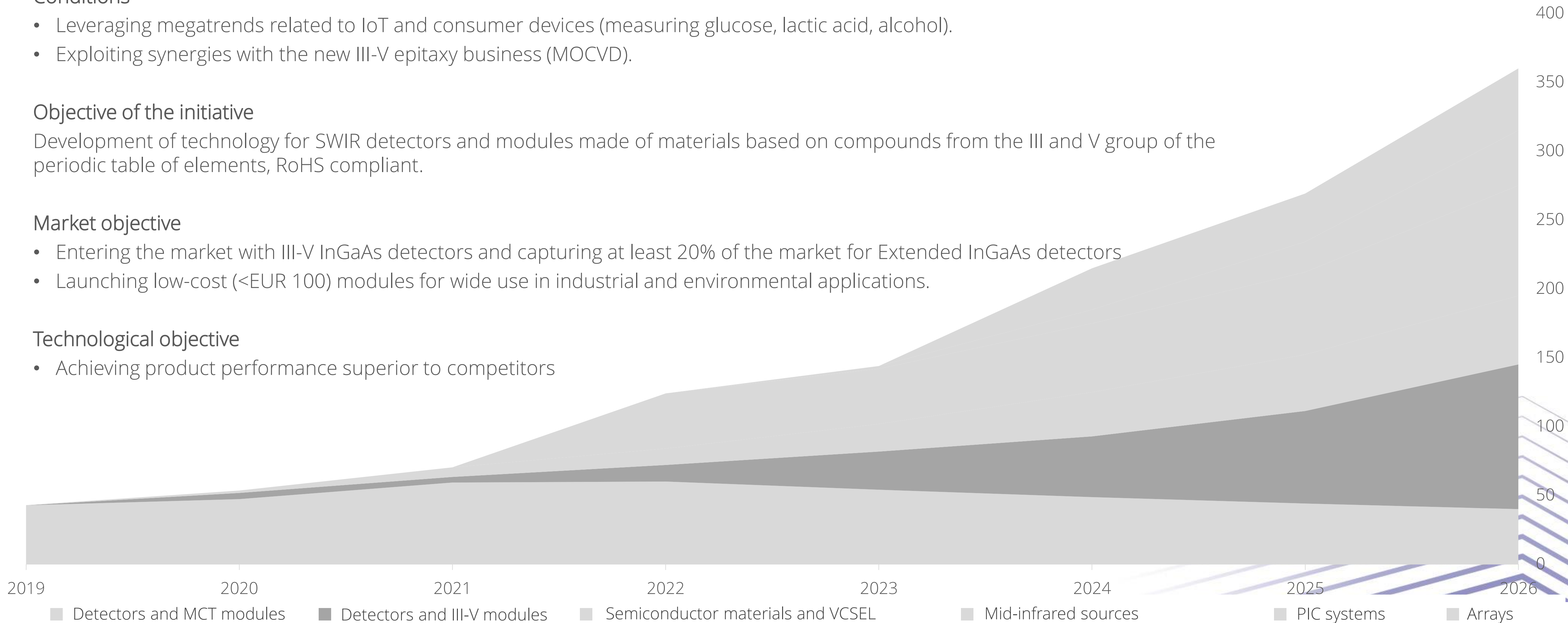
Development of technology for SWIR detectors and modules made of materials based on compounds from the III and V group of the periodic table of elements, RoHS compliant.

Market objective

- Entering the market with III-V InGaAs detectors and capturing at least 20% of the market for Extended InGaAs detectors
- Launching low-cost (<EUR 100) modules for wide use in industrial and environmental applications.

Technological objective

- Achieving product performance superior to competitors



III-V InGaAs DETECTORS AND DETECTION MODULES INITIATIVE – TECHNOLOGY AND COMMERCIALISATION



TECHNOLOGY DEVELOPMENT

Achievements in 2021

- First prototype of VIGO 1.7um InGaAs detector shipped to customer.
- Funding has been received and work has begun on a POIR project to fabricate InGaAs sensors with integrated ASIC electronics for the 1.7-2.6um range.



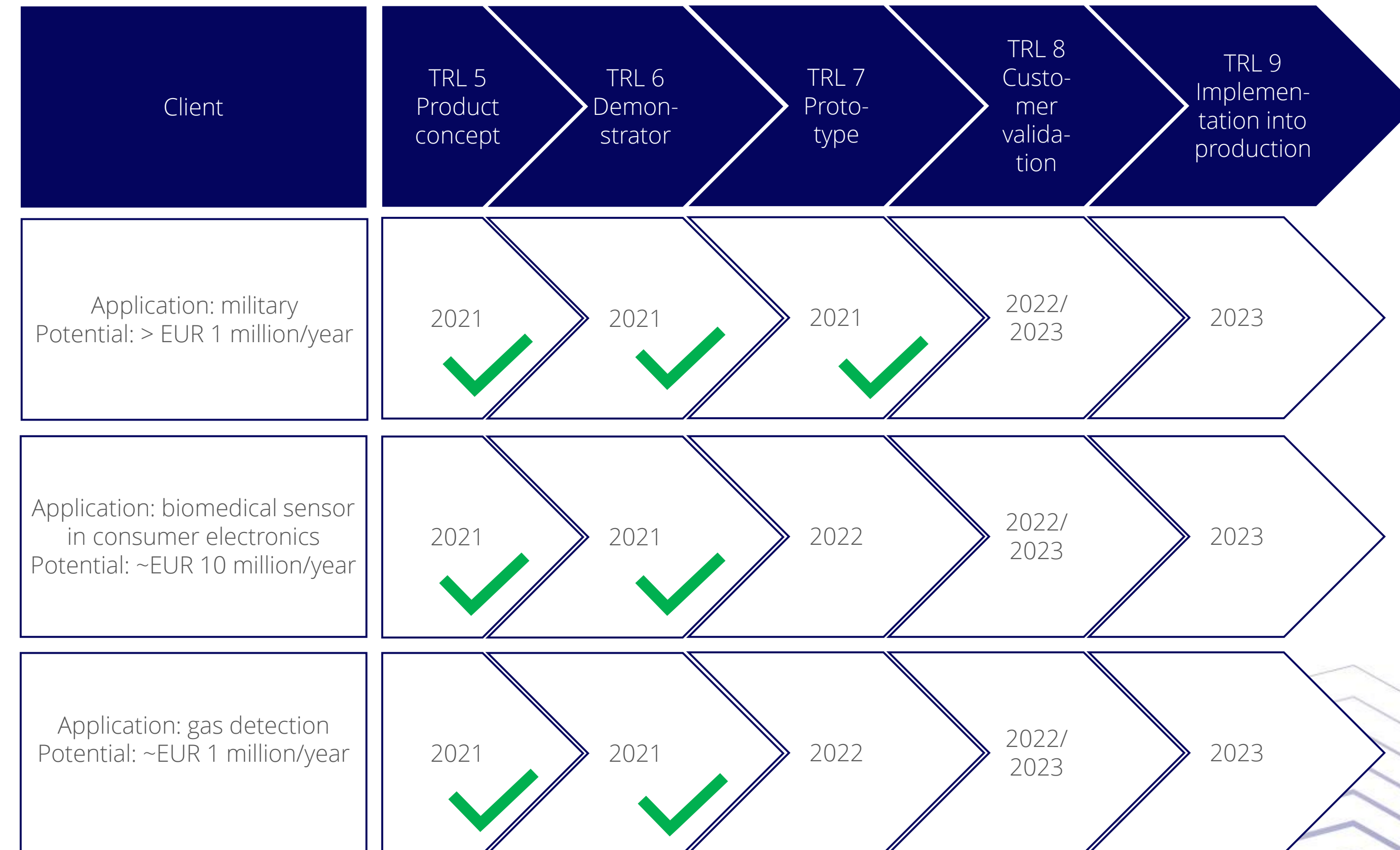
Achievements in Q1 2022

- Contract has been signed to develop planar technology for InGaAs detectors.
- Application has been submitted to the prestigious M2Tech project (240kEUR) for funding eInGaAs (multi Messenger astrophysics) work.
- Execution of the first order for InGaAs/InGaAsP/InP chips.
- Optimization of InGaAs 1.7 um technology for military applications.

Plans for 2022

- Implementation of planar technology (which will enable entry into the large telecommunications market).
- Validation of eInGaAs and 1.7um prototypes with clients.

COMMERCIALISATION - SAMPLE PROJECTS





III-V EPITAXY:
SEMICONDUCTOR MATERIALS
AND NEAR-INFRARED SOURCES (VCSEL)

III-V EPITAXY: SEMICONDUCTOR MATERIALS AND NEAR-INFRARED (VCSEL) - GENERAL INFORMATION

VIGO III-V EPITAXY SOLUTIONS

High-quality epitaxial structures of III-V semiconductor materials (InGaAs, InAsSb) offered directly to customers for in-house production of detectors/chips and VCSEL lasers, as well as production of SWIR (VCSEL) including VIGO VCSEL lasers.

RoHS compliant, no mercury or cadmium.

Wide range of highest quality products: laser layers, detectors, quantum dots, Bragg reflectors. First VCSEL laser chips in Poland.

Radiation range: NIR, SWIR.

Reactor/production method: MOCVD (Metalorganic Chemical Vapour Deposition), Aixtron G4.

A foundation for all future activity and potentially a technological springboard for future growth.

Annual volume/capacity: currently 9,000 wafers, from 2023 18,000 wafers per year.

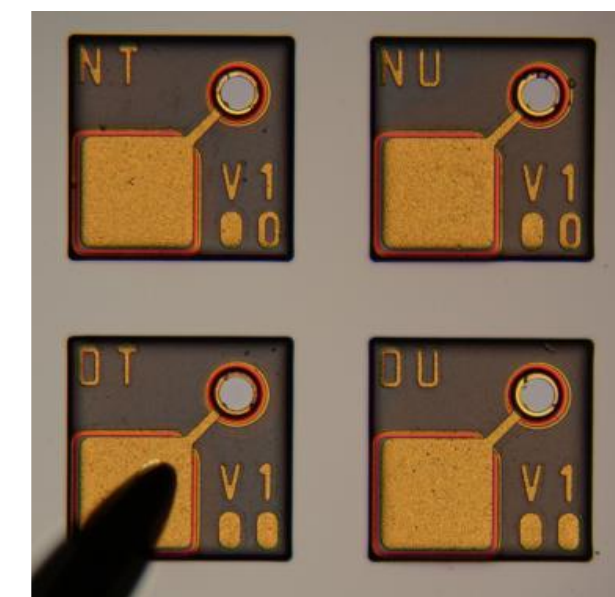
Price: EUR 800-4500

PRODUCTS

III-V epitaxial wafers



VCSEL



MARKET - VALUE AND POTENTIAL*

> USD 2.6 billion, 13% CAGR (2020-2027)

COMPETITION

IQE, AMS, II-VI Inc., Intelli Epi

APPLICATIONS - EXAMPLES

Sectors

 Data transfer

 3D detection

 Microelectronics

 Imaging

 Telecommunications

 Automotive (LIDAR)

 Medicine

 Quantum photonics

Applications

- ✓ increasing data transmission efficiency, throughput in optical communications
- ✓ gas detection
- ✓ 3D scanning
- ✓ access to energy sources without energy infrastructure
- ✓ reduction of battery consumption in computer mice
- ✓ elimination of microwave limitations for automotive radars
- ✓ control of autonomous vehicles
- ✓ electrical powering of satellites and strategic drones

Products

- data transmission systems, optical communication systems
- gas detection systems
- spatial imaging systems
- computer mice, laser printers, 3D printer heads
- infrared cameras, optical radars
- renewable energy sources
- semiconductor light sources

Clients

manufacturers of chips and electronic devices using VCSEL, EEL, QCL lasers, InGaAs detectors, photovoltaic cells, transistors, microwave diodes

III-V EPITAXY INITIATIVE: SEMICONDUCTOR MATERIALS AND NEAR-INFRARED SOURCES (VCSEL)



III-V EPITAXY INITIATIVE - KEY POINTS

Conditions

- The foundation for all future activity.
- Access to consumer markets where our production throughput is too low.
- A potential technological springboard for future growth.

Objective of the initiative

Development of epitaxy of III-V semiconductor materials and production of SWIR sources (VCSEL lasers) as well as continuous improvement in the production of epitaxial heterostructures of semiconductor compounds based on GaAs and InP by the MOCVD method.

Market objective

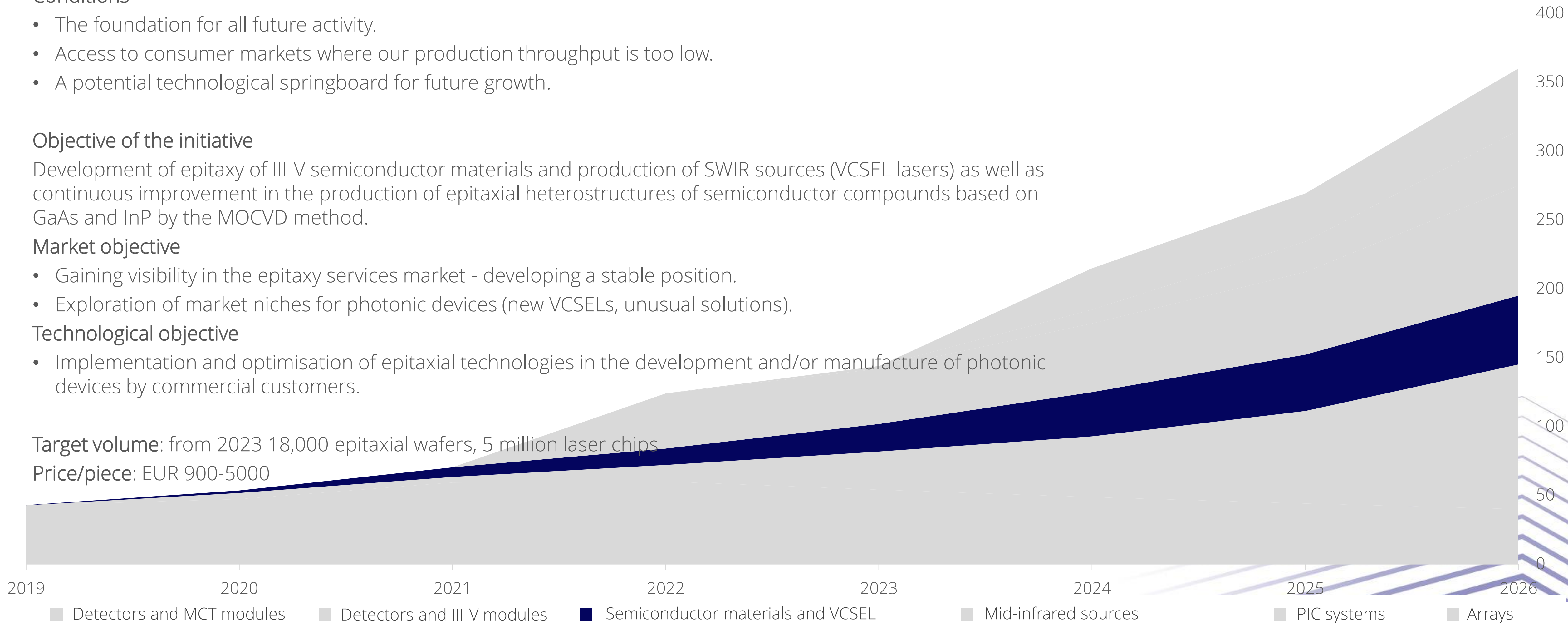
- Gaining visibility in the epitaxy services market - developing a stable position.
- Exploration of market niches for photonic devices (new VCSELS, unusual solutions).

Technological objective

- Implementation and optimisation of epitaxial technologies in the development and/or manufacture of photonic devices by commercial customers.

Target volume: from 2023 18,000 epitaxial wafers, 5 million laser chips

Price/piece: EUR 900-5000



III-V EPITAXY INITIATIVE: SEMICONDUCTOR MATERIALS AND NEAR-INFRARED SOURCES (VCSEL) – TECHNOLOGY AND COMMERCIALISATION



TECHNOLOGY DEVELOPMENT

Achievements in 2021

- Long-Wave (LW) structure technology -VCSEL for telecommunication applications (intranet).
- Technology of epitaxial structures of high frequency communication detector.
- Technology of high performance solar cell (TJSC) structures.

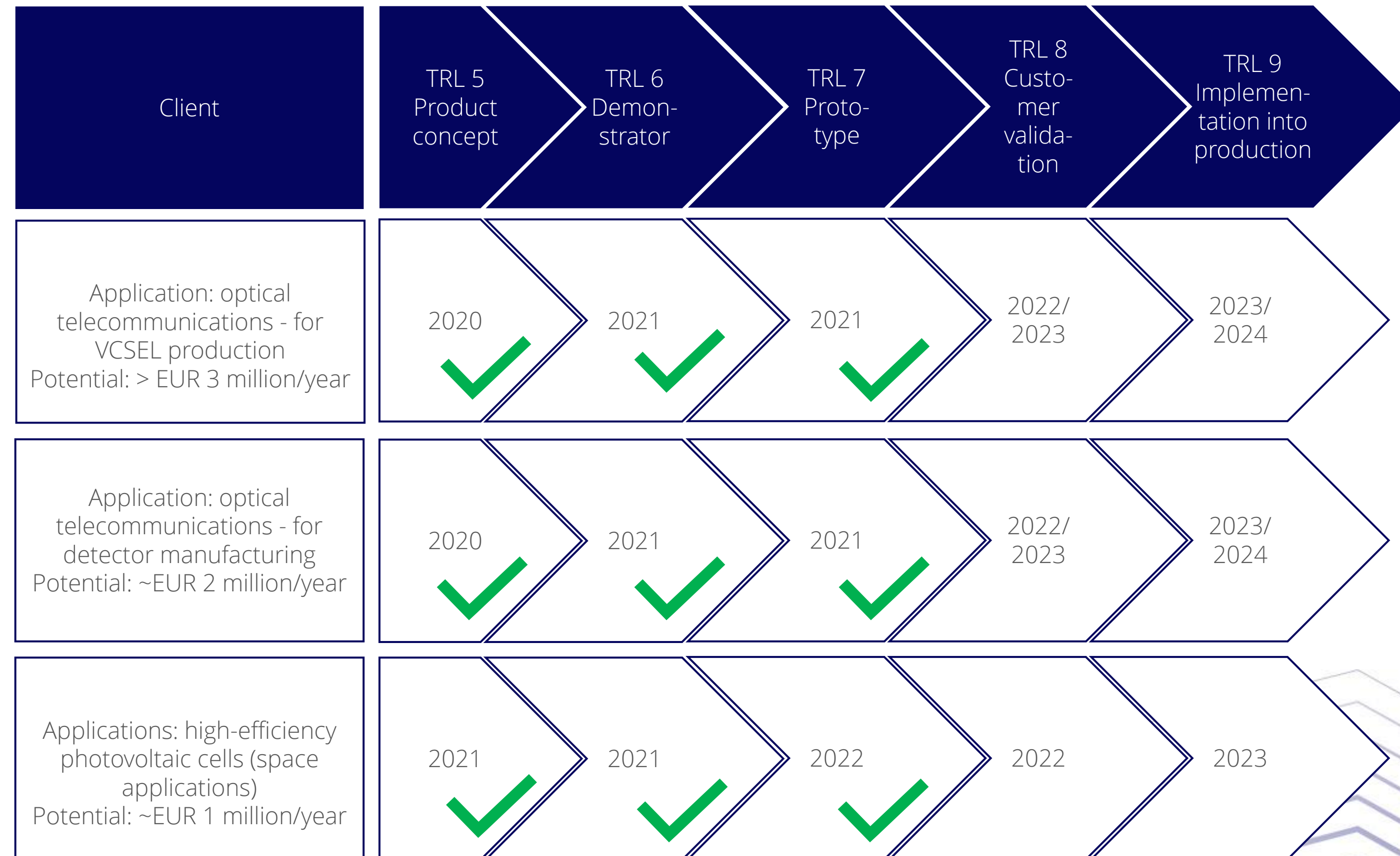
Achievements in Q1 2022

- *Quantum Cascade Lasers (QCLs)* - first confirmation of high power lasers obtained in collaboration with a client.
- *Optical Wireless Power Transmitters (OPWTs)* - delivery of first test batch of wafers with final structures.
- *Solar Cells (SCs)* - delivery of first batch of wafers with final structures with confirmed parameters.
- *Laser Diodes (LDs)* - first delivery of standard product (off-the-shelf).

Plans for 2022

- Initiate commercial technology collaboration for bringing QCLs into mass production.
- Finalise the development of OPWTs technology and commence implementation into production.
- Commence strategic project to develop PDs PIN technology with a key foreign client.

COMMERCIALISATION - SAMPLE PROJECTS



MID-INFRARED SOURCES (ICL, QCL, MIRL)

MID-INFRARED SOURCES (ICL, QCL, MIRL) - GENERAL INFORMATION

ICL, QCL, MIRLED SOLUTIONS

Laser or diode chips and modules that provide infrared radiation sources, manufactured from III-V semiconductor materials.

RoHS compliant, no mercury or cadmium.

Lasers or light emitting diodes that convert electrical energy into infrared radiation.

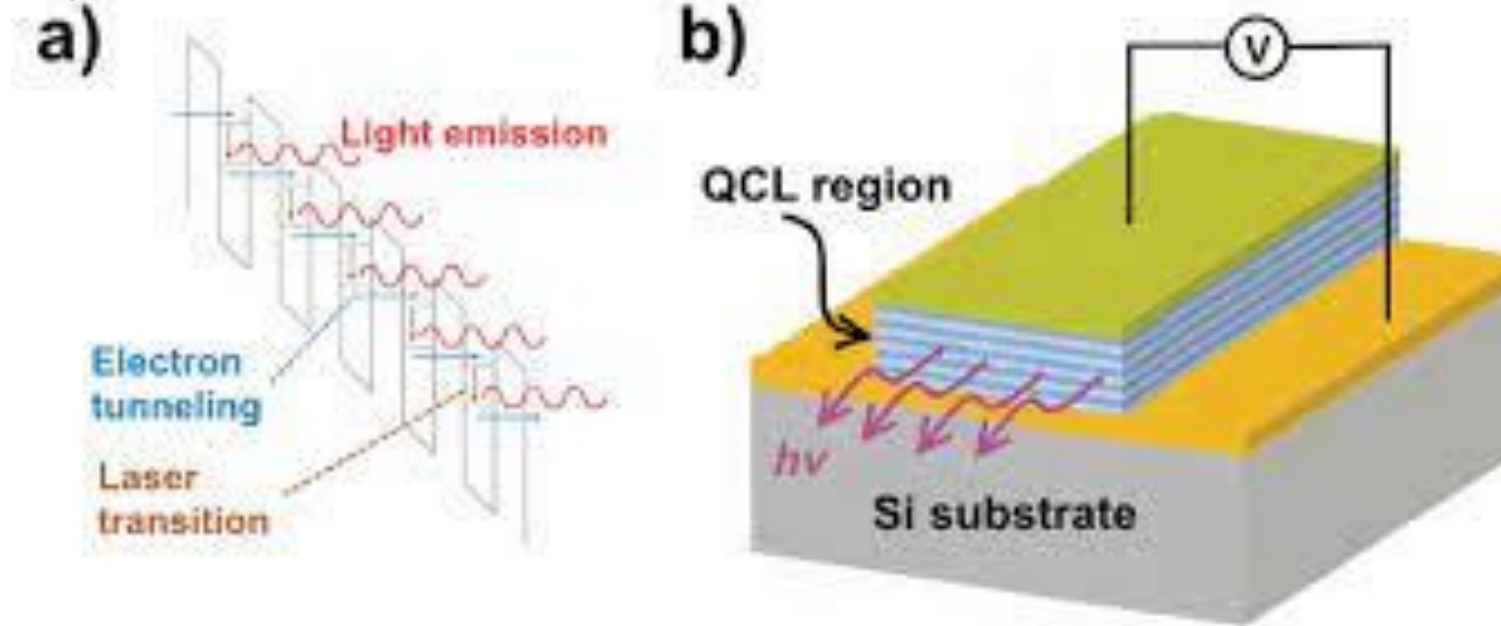
Radiation range : SWIR, MWIR, LWIR.

Reactor/production method : MOCVD lub MBE.

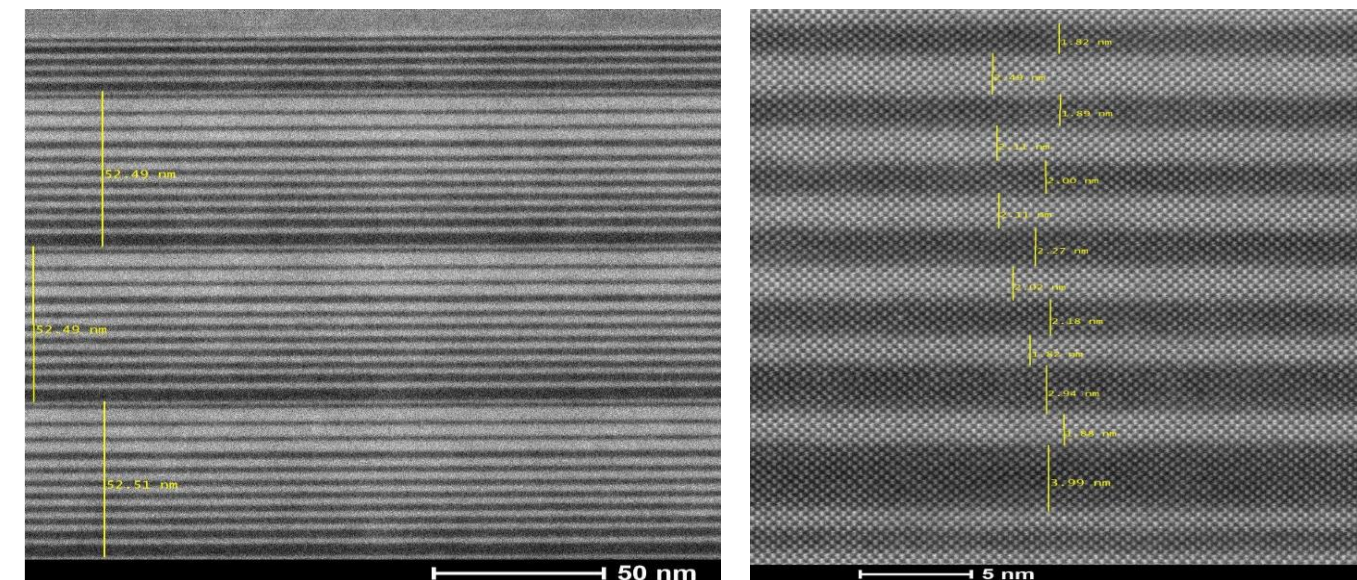
Price: approx. USD 6000 - 9000/unit.

PRODUCTS

QCL structures



QCL structures manufactured in VIGO



MARKET - VALUE AND POTENTIAL*

USD 61 million, 10% CAGR (2020-2026)

PRODUCERS

Hamamatsu, Thorlabs, Nanoplus, Daylight Solutions, Mirsense, Alpes Laser

APPLICATIONS - EXAMPLES

Sectors:

areas for the use of low-cost detection modules

- Environment protection
- Medicine
- Robotics
- Military industry
- Property protection
- Industry (automotive, manufacturing)
- Consumer market (wearable devices) - target

Applications:

- ✓ gas analysis
- ✓ examination of the spatial distribution of temperature
- ✓ precise determination of the direction of the infrared radiation source
- ✓ scanning of larger areas for the detection of substances, gases and temperature changes
- ✓ sorters on production lines

Products:

- systems for monitoring emissions from power plant stacks
- failure detection system for high-speed trains
- detectors for gas leakage detection in the gas network

Clients:

manufacturers of monitoring and measurement equipment
manufacturers of high-performance sensory systems

MID-INFRARED SOURCE (ICL, QCL, MIRLED) INITIATIVE



MID-INFRARED SOURCE INITIATIVE - KEY POINTS

Conditions

- Securing the availability of complementary components is a prerequisite for the long-term strategy.
- Possible rapid growth through M&A and high synergy potential.
- Alternative scenario - development of proprietary technology (demonstrated in-house laser structures, available patent licenses for laser manufacturing, technological capabilities at the institute in Warsaw).

Market objective

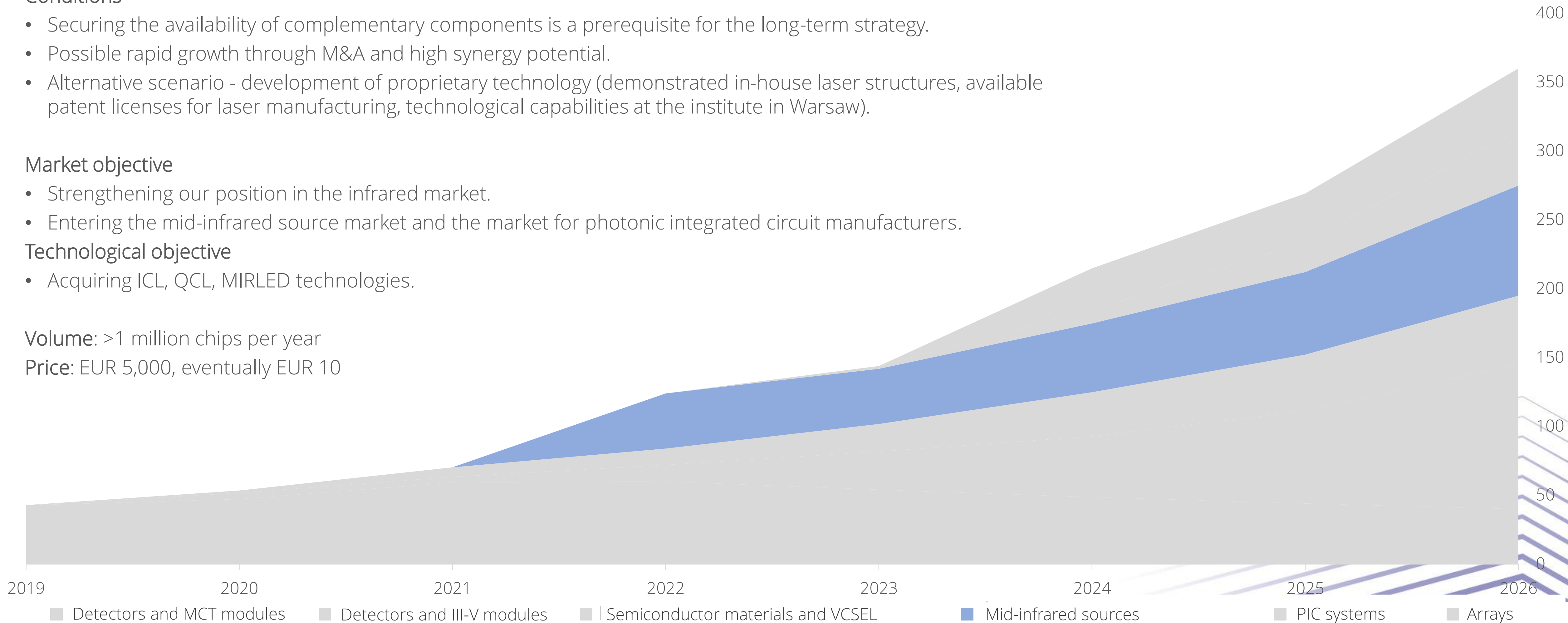
- Strengthening our position in the infrared market.
- Entering the mid-infrared source market and the market for photonic integrated circuit manufacturers.

Technological objective

- Acquiring ICL, QCL, MIRLED technologies.

Volume: >1 million chips per year

Price: EUR 5,000, eventually EUR 10





OPTOELECTRONIC SYSTEMS AND PHOTONIC INTEGRATED CIRCUITS (PIC)

OPTOELECTRONIC SYSTEMS AND PHOTONIC INTEGRATED CIRCUITS (PIC) - GENERAL INFORMATION

VIGO PIC SOLUTIONS

A miniaturised system consisting of multiple optical and electronic components with different functionalities integrated on a common substrate (usually semiconductor) - on a single chip.

Moving up the value stream - developing off-the-shelf sensory systems that can be integrated into everyday consumer devices.

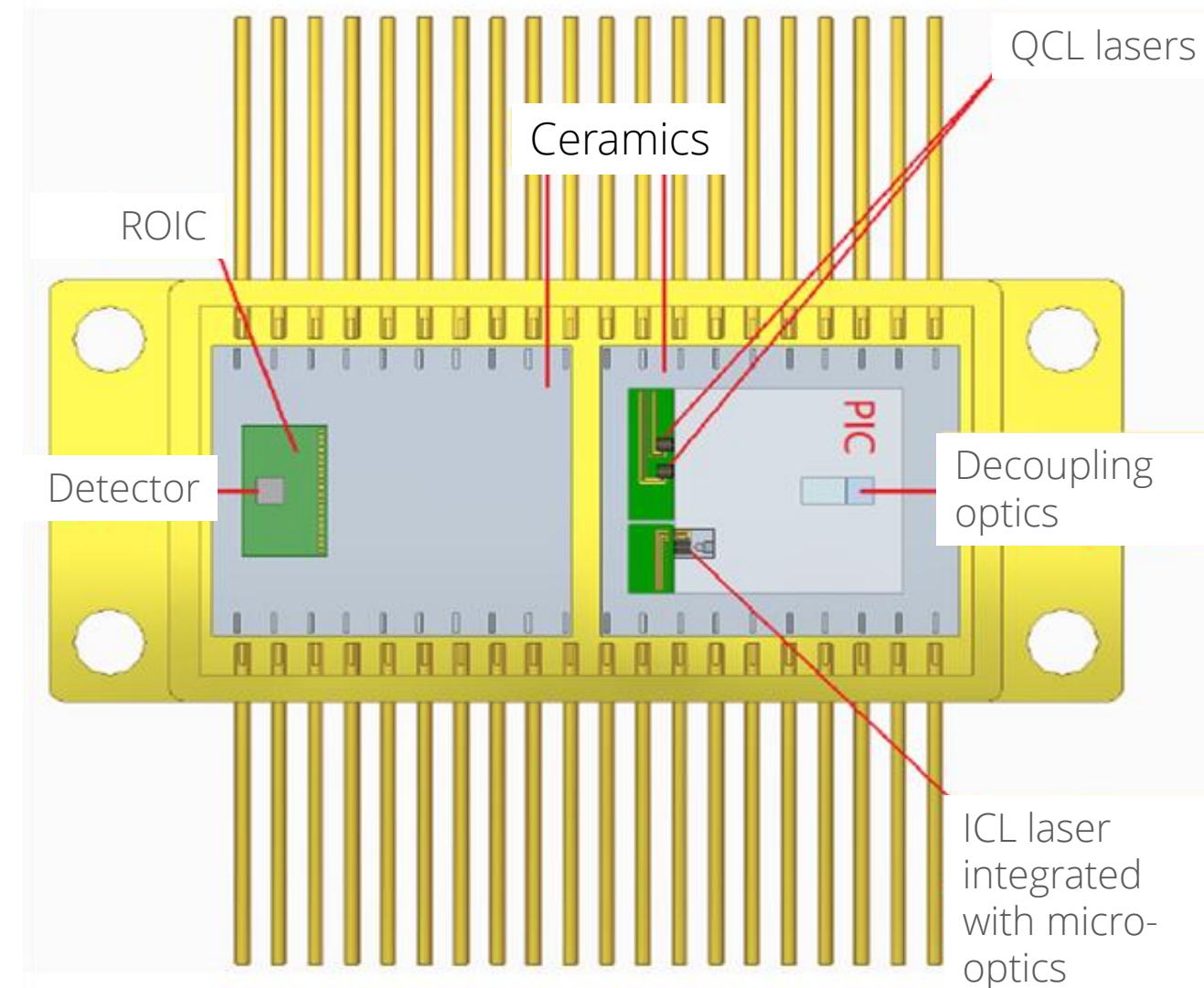
RoHS compliant, no mercury or cadmium.

Radiation range : SWIR, MWIR, LWIR.

Reactor/manufacturing method: Different components will be made using different technologies.

PRODUCTS

PIC scheme for MIR



MARKET - VALUE AND POTENTIAL*


USD 1.5 billion (current market for non-PIC based sensor systems), 12% CAGR

COMPETITION

Redfinch, CEA-LETI, Picpair, Rockley, Brolis, NeoSpectra, Hamamatsu

APPLICATIONS - EXAMPLES

Sectors

- | | |
|--|---|
|  Industry and transport |  Protection and security |
|  Environment protection |  Medicine |
|  Food industry |  Automotive |
|  Biomedicine |  IoT/ICT |
|  Telecom (free space) |  Space |

Applications

- ✓ analyses of the chemical composition of gases
- ✓ analysis of impurities in liquids
- ✓ gas detection
- ✓ FSO (free space communication)
- ✓ analyses related to medicine and telemedicine: blood analysis

Products

-  smart sensors installed in wearable devices, home appliances, monitoring pollution levels, detecting spoiled food

Clients:

- consumer electronics manufacturers
- domestic appliance manufacturers
- car manufacturers

OPTOELECTRONIC SYSTEMS AND PHOTONIC INTEGRATED CIRCUITS (PIC) INITIATIVES



OPTOELECTRONIC SYSTEMS AND PICs INITIATIVE - KEY POINTS

Conditions :

- Moving up the value stream - development of off-the-shelf sensory systems that can be integrated into mainstream devices.
- The lever for development is photonic integrated circuits (PICs) - miniaturised arrangements of passive and active components on a single chip.

Objective of the initiative

First manufacturer in the world to introduce mid-infrared integrated circuits. Complete production line (world's first) for PICs for the MIR range (MIRPIC), complete supply chain for MIRPICs.

Market objective

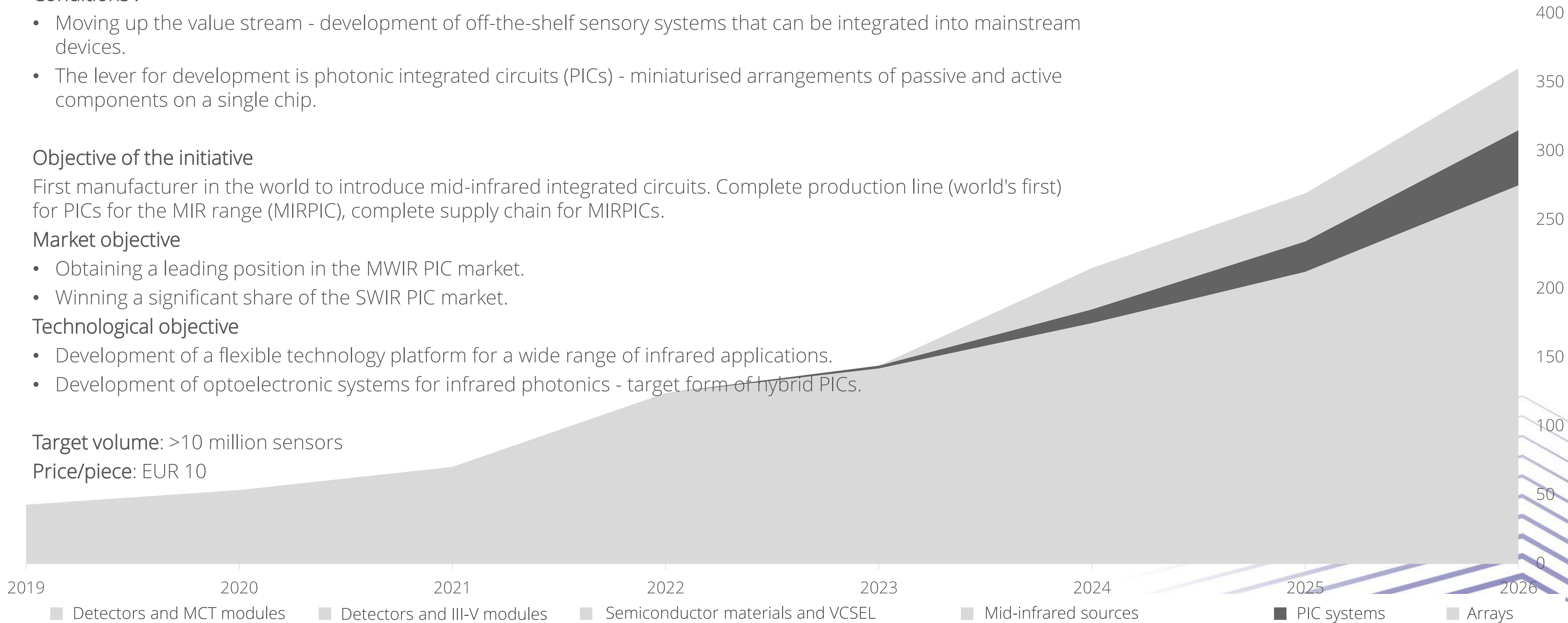
- Obtaining a leading position in the MWIR PIC market.
- Winning a significant share of the SWIR PIC market.

Technological objective

- Development of a flexible technology platform for a wide range of infrared applications.
- Development of optoelectronic systems for infrared photonics - target form of hybrid PICs.

Target volume: >10 million sensors

Price/piece: EUR 10



INICJATYWA SYSTEMY OPTOELEKTRONICZNE I FOTONICZNE UKŁADY SCALONE (PIC) – TECHNOLOGIA I KOMERCJALIZACJA

TECHNOLOGY DEVELOPMENT

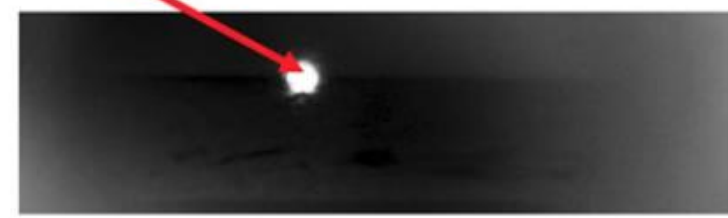
Achievements in Q1 2022

- The first successful experiments have been carried out confirming the successful insertion and radiation propagation of QCL lasers (4.5 μm , 5.2 μm) in germanium waveguides fabricated under the MIRPIC funded project

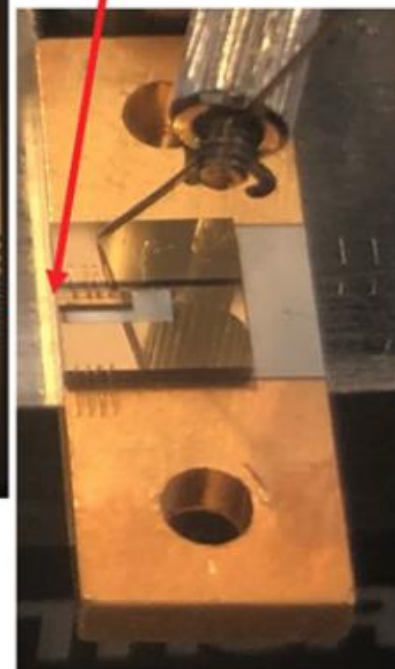
Plans for 2022

- Preparation of first prototypes of the device
- Finding partners for technology development

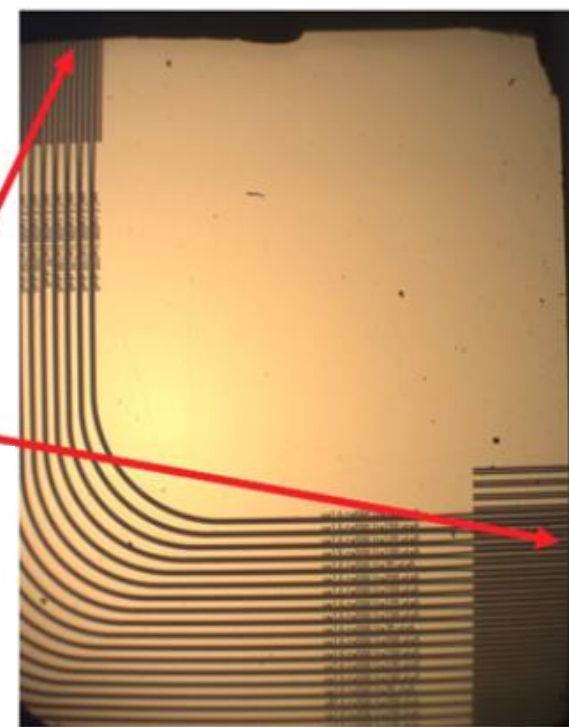
Image from thermal imaging camera



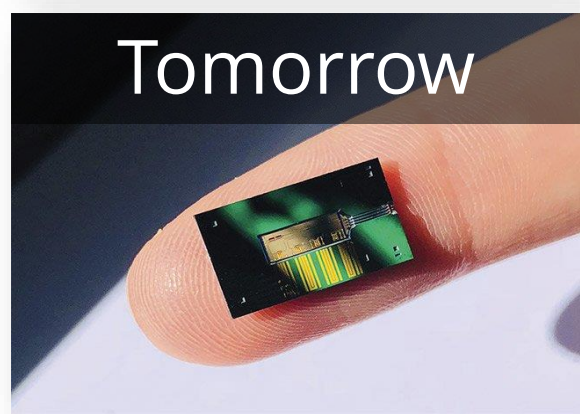
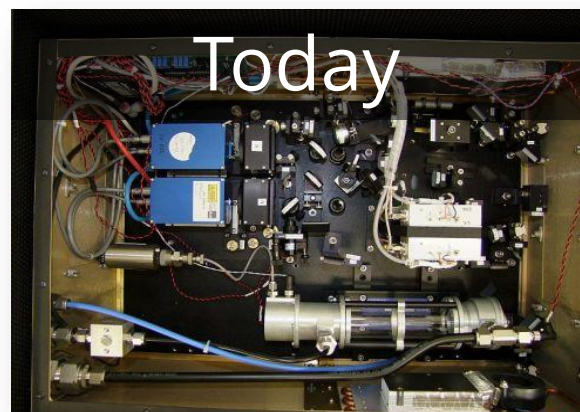
QCLs



Examined waveguide



Gas detectors

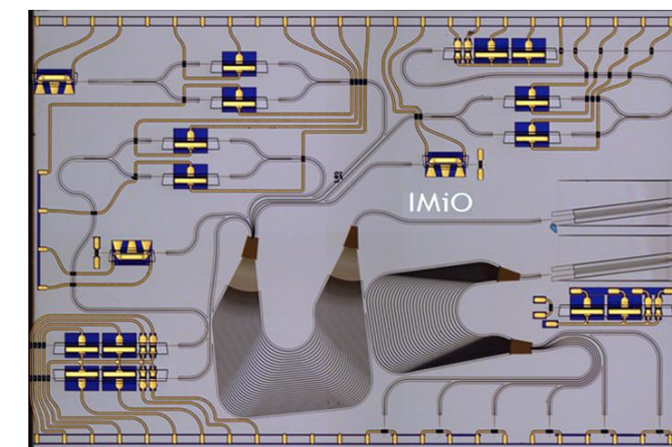


R&D MIRPIC PROJECT

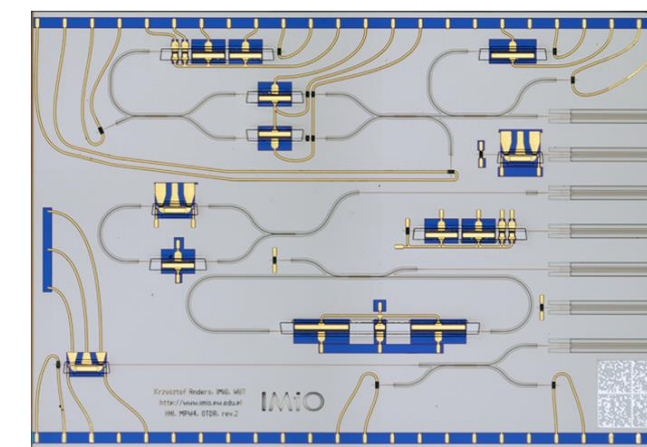
- Goal: Development of the first mid-infrared photonic integrated circuit (MIRPIC) on the market
- Cooperation: technology project carried out with Warsaw University of Technology and the Institute of Microelectronics and Photonics,
- Launch: April 2021, lead time: 3 years
- Budget: PLN 29.3 million, Co-financing: PLN 26.6 million.
- Potential applications: miniature gas sensors (smart cities, intelligent household appliances, automotive); advanced medical devices; wearables (high end)



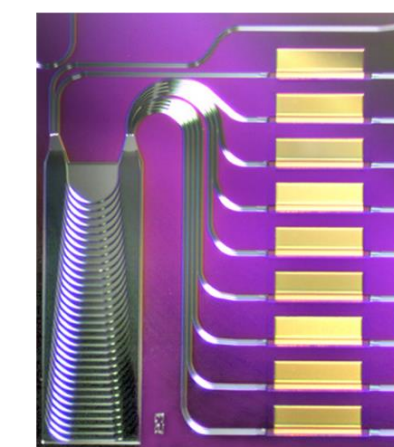
Over **10** years experience of the new Vigo team in photonic integrated circuit design – over **80** completed PIC projects



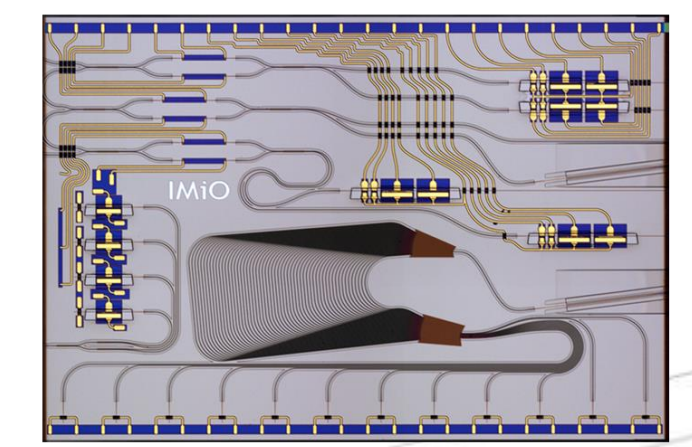
Multi-channel transceiver for free space optics



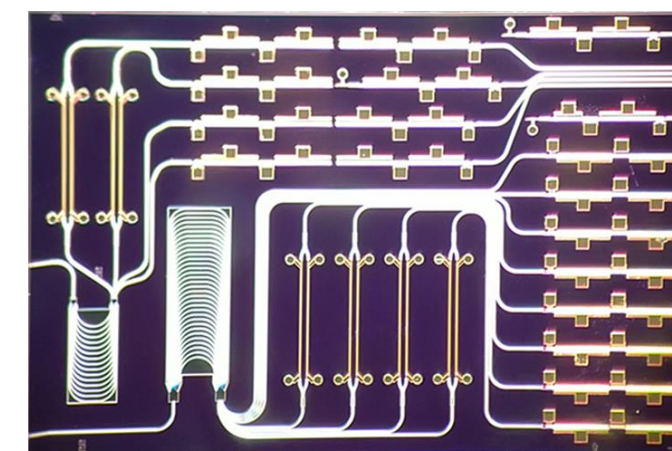
Optical time domain reflectometer



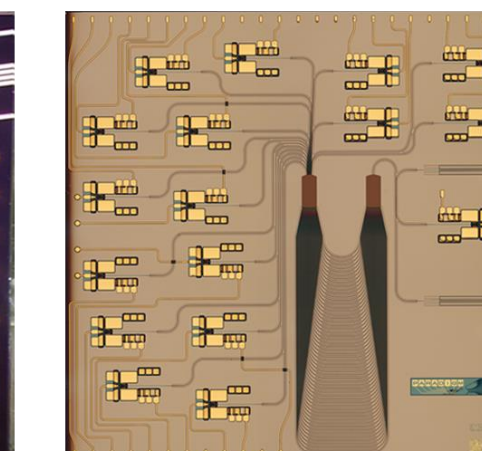
Multi-wavelength laser



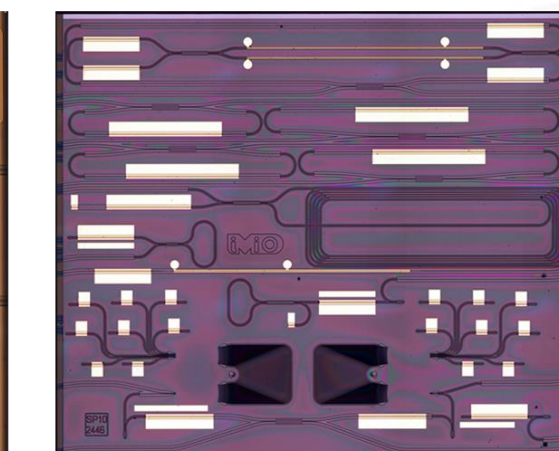
FBG interrogator unit



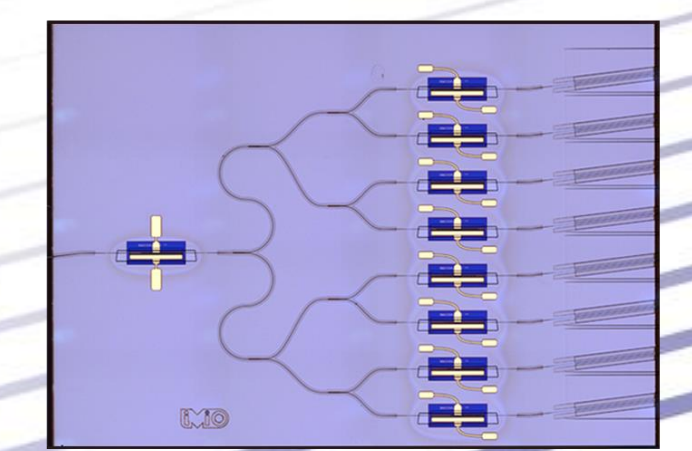
Multi-channel transmitter for FTTH networks



Spectrometer for FBG sensor interrogator

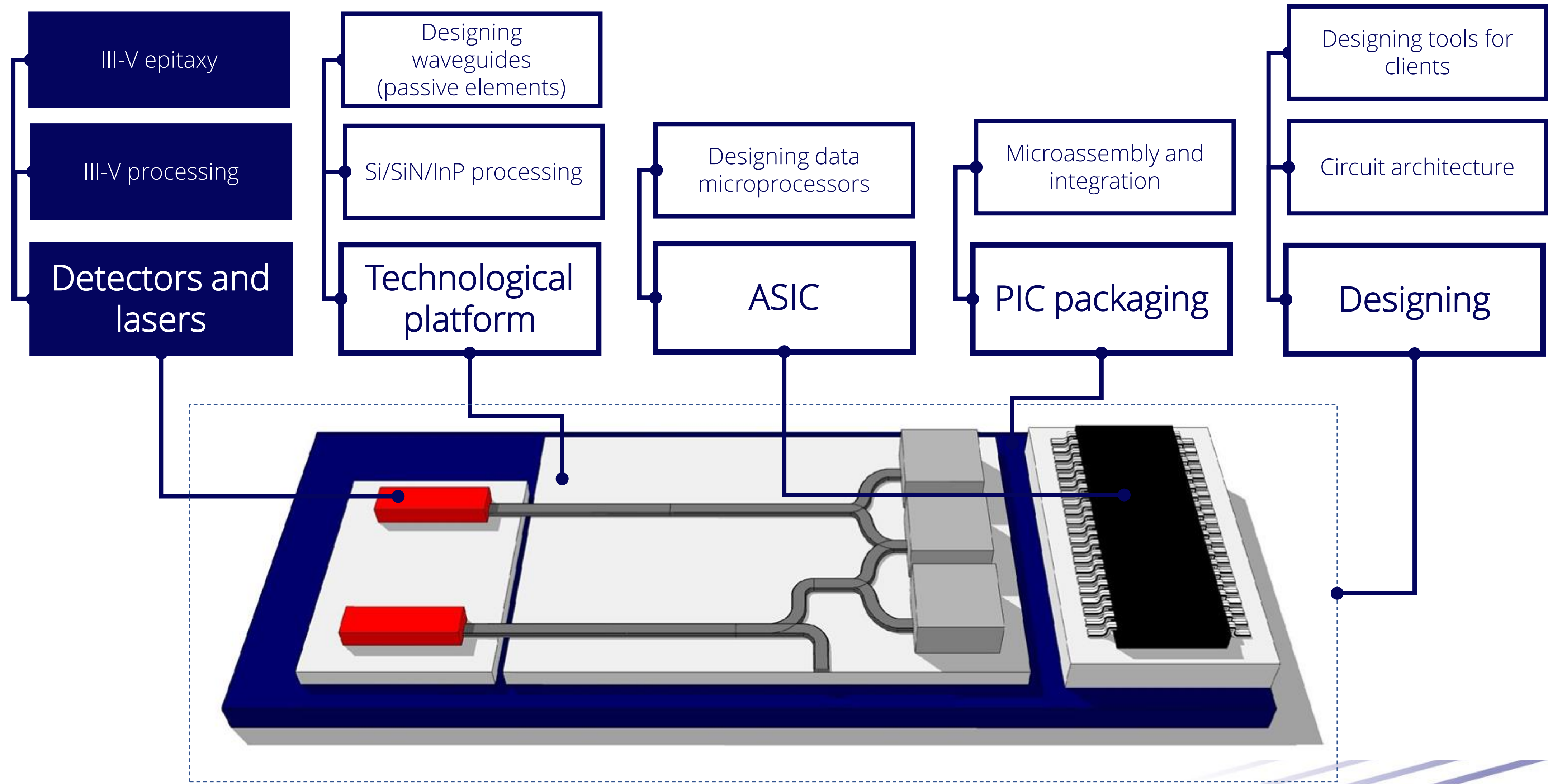


Discretely tunable laser

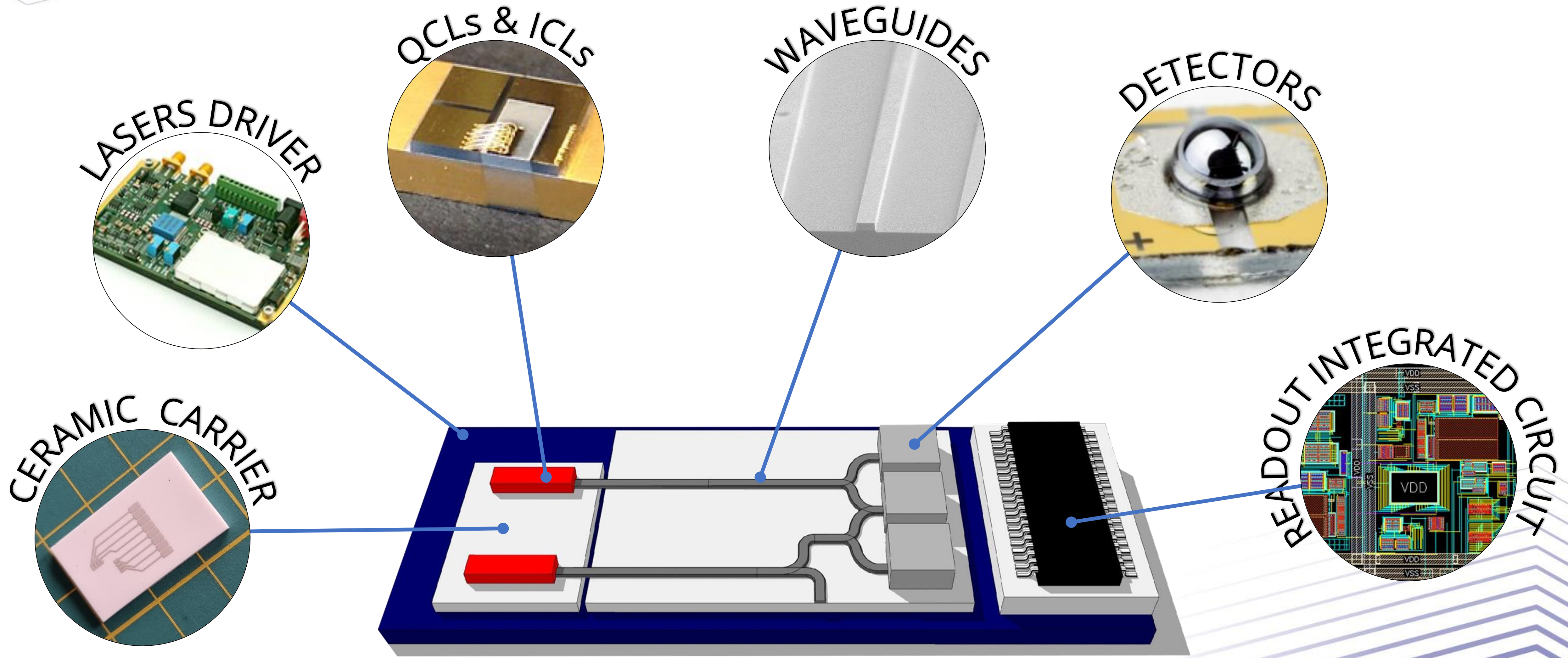


Lossless power splitter

PHOTONICS INTEGRATED CIRCUIT (PIC) SERVICE STACK - VIGO 2026



PHOTONIC INTEGRATED CIRCUITS (PIC) – CURRENT STATUS



INFRARED ARRAY

INFRARED ARRAY - GENERAL INFORMATION

ABOUT VIGO INFRARED MATRICES

Infrared detector arrays containing hundreds of thousands or millions of active pixels used in the construction of thermal imaging cameras for space and military applications and having a semiconductor layer made of III-V materials (InAsSb - MWIR, LWIR, or InGaAs - SWIR).

RoHS compliant, no mercury or cadmium.

Products based on the same technologies used to manufacture single-element detectors, products tailored to specific customer needs.

Radiation range : SWIR, MWIR, LWIR.

Reactor/production method : MBE (InAsSb) lub MOCVD (InGaAs).

Annual volume/production capacity: 500 units.

Price: EUR 30,000/unit.

PRODUCTS



MARKET - VALUE AND POTENTIAL



EUR 15 million (Polish market)

COMPETITION

Lynred, Irnova, Hamamatsu, large armaments companies

APPLICATIONS - EXAMPLES

Sectors

-  Military industry, the army
-  Space industry

Applications

- ✓ polonisation of technology
- ✓ increasing the potential of the Polish army
- ✓ enabling export of Polish optoelectronic solutions

Products

-  Detectors for thermal imaging cameras

Clients

manufacturers of thermal imaging cameras for military and space applications

INFRARED ARRAY INITIATIVE - KEY POINTS

Conditions

- An area linked to trends in cybersecurity, technology Polonisation and increasing the potential of the Polish army.
- Programme requiring a strong public partner (PGZ or PFR).

Objective of the initiative

Developing technology and building competence in the field of manufacturing matrix detectors both cooled (thermal) and uncooled (SWIR InGaAs), epitaxy, high-density processing, ROIC, hybridization, encapsulation.

Market objective

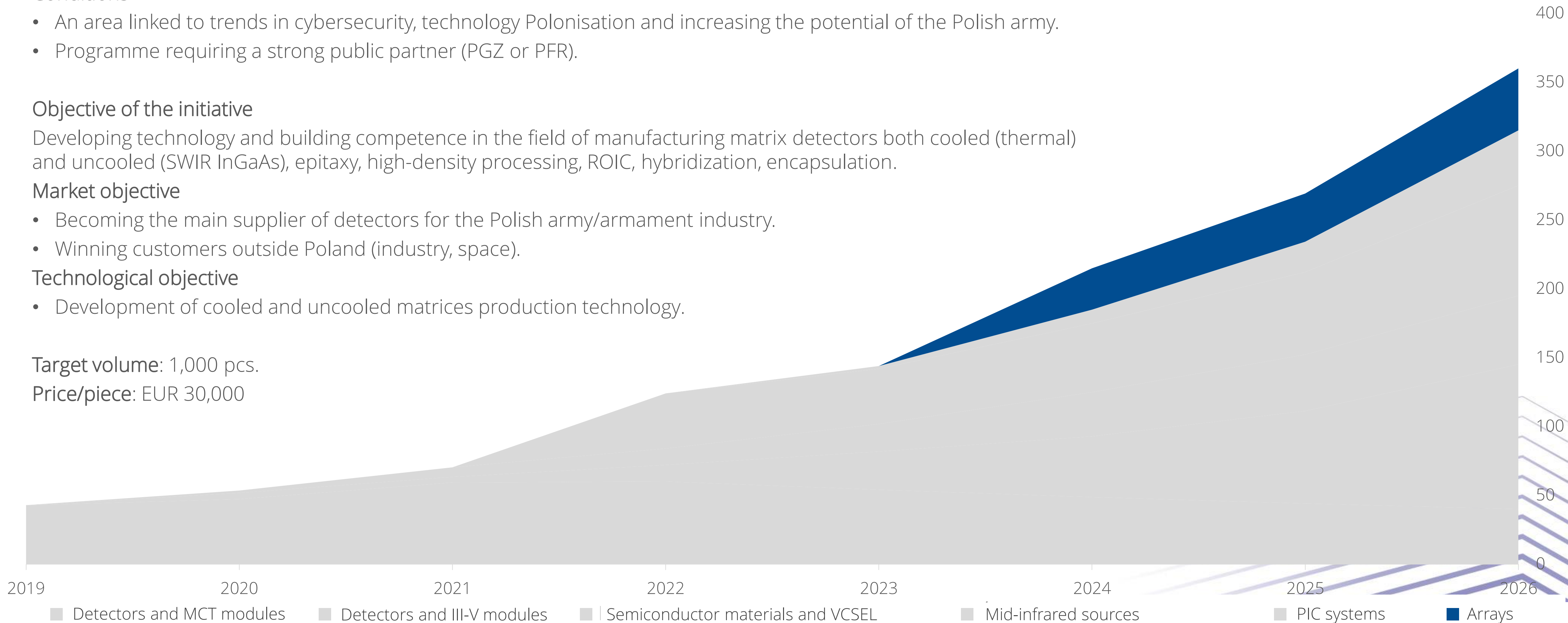
- Becoming the main supplier of detectors for the Polish army/armament industry.
- Winning customers outside Poland (industry, space).

Technological objective

- Development of cooled and uncooled matrices production technology.

Target volume: 1,000 pcs.

Price/piece: EUR 30,000



INFRARED ARRAY INITIATIVE – TECHNOLOGY AND COMMERCIALISATION



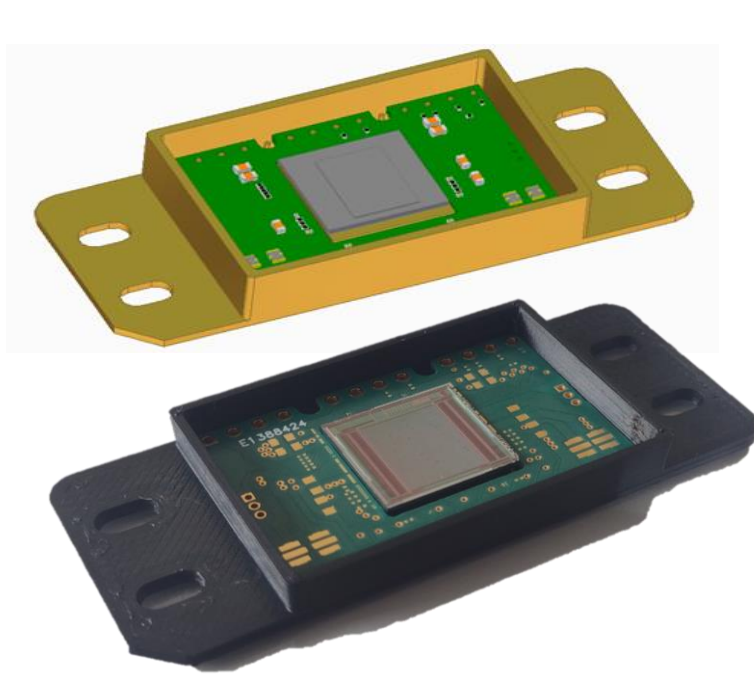
TECHNOLOGY DEVELOPMENT

Objective of the initiative

- Becoming a major supplier of detectors for the Polish army/armament industry, winning customers outside Poland (industry, space).
- Development of the technology for manufacturing cooled matrices.

Achievements in Q1 2022

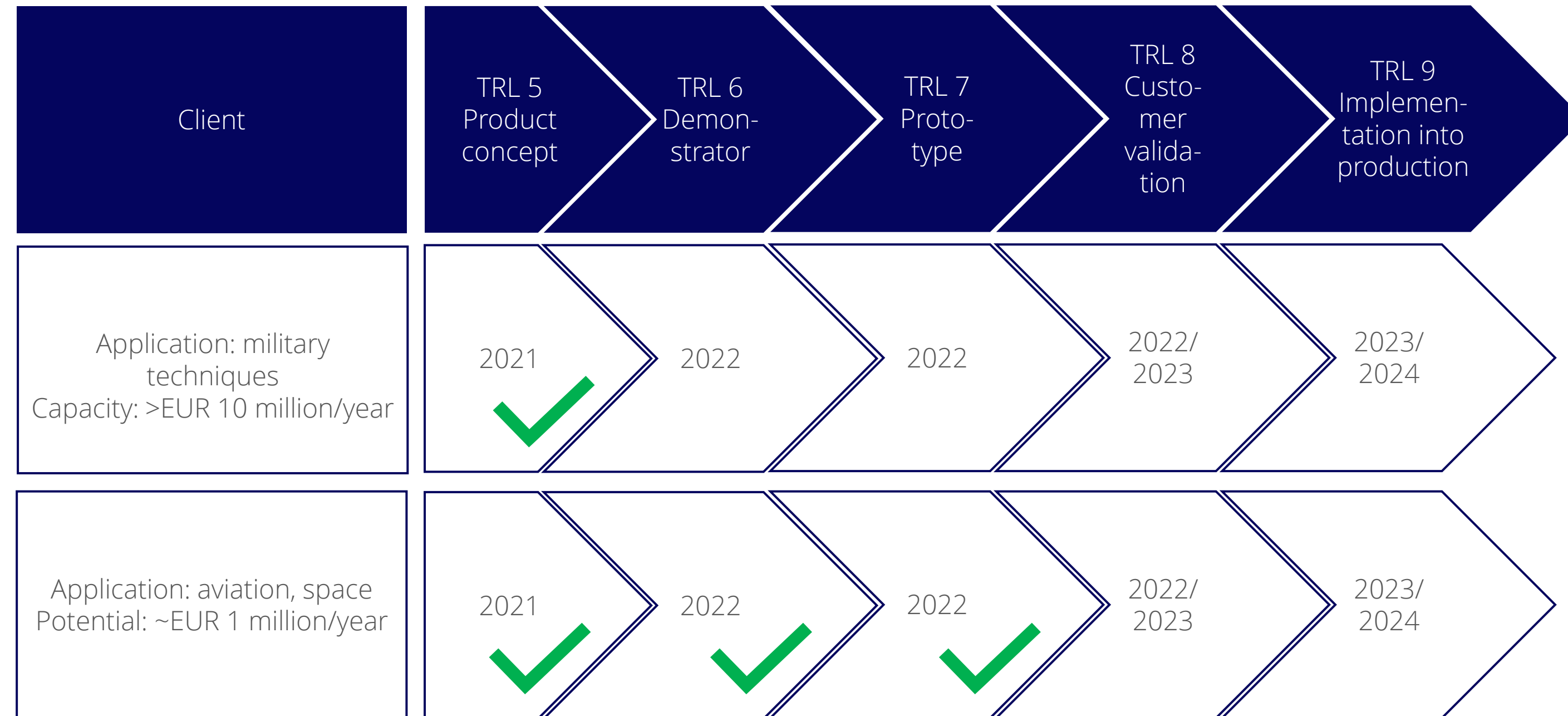
- Optimisation of the architecture of T2SL structures for array applications, work on process stabilisation.
- Design and prototype of housing for commercial InGaAs array



Plans for 2022

- Development and implementation of InGaAs matrix packaging and encapsulation technology
- T2SL cooled die demonstrator

COMMERCIALISATION - SAMPLE PROJECTS

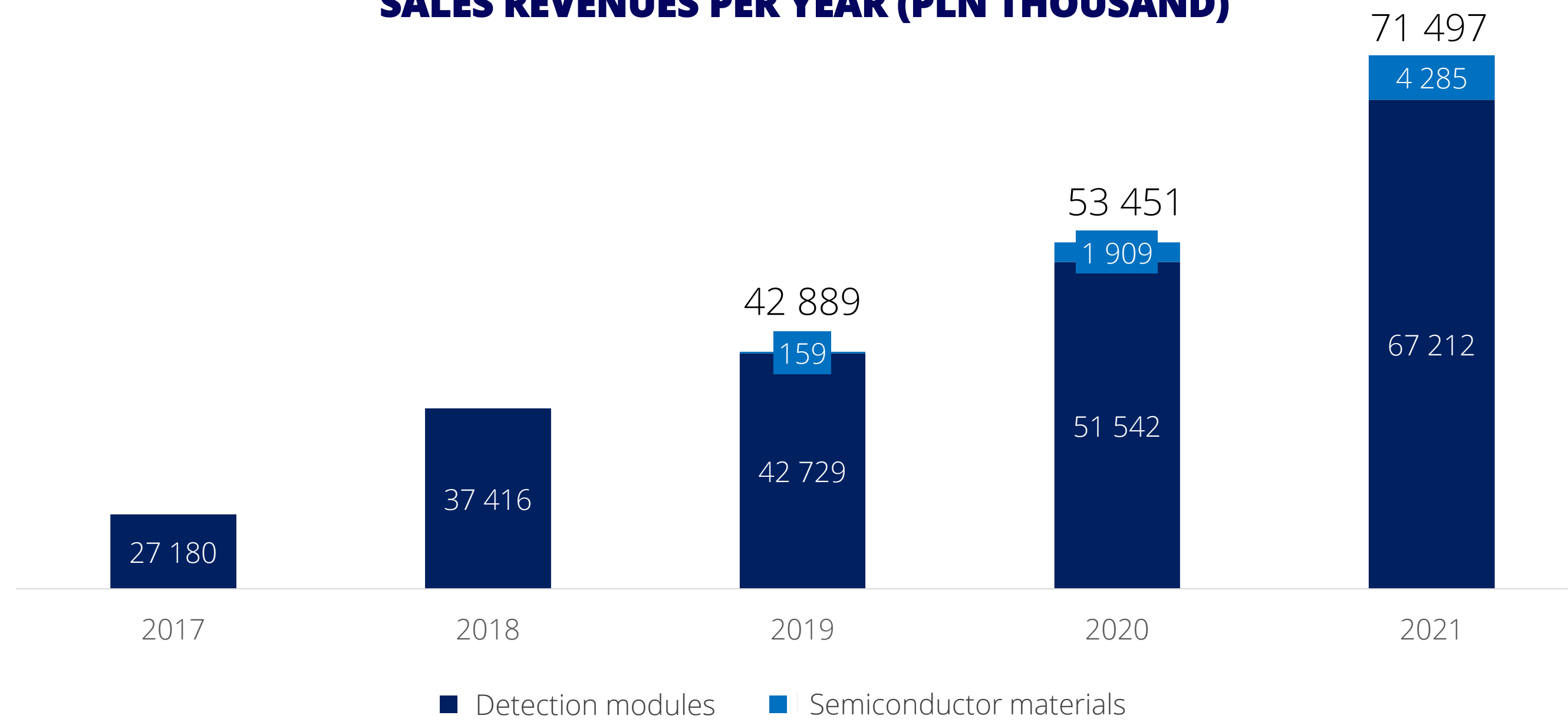


VIGO
PHOTONICS

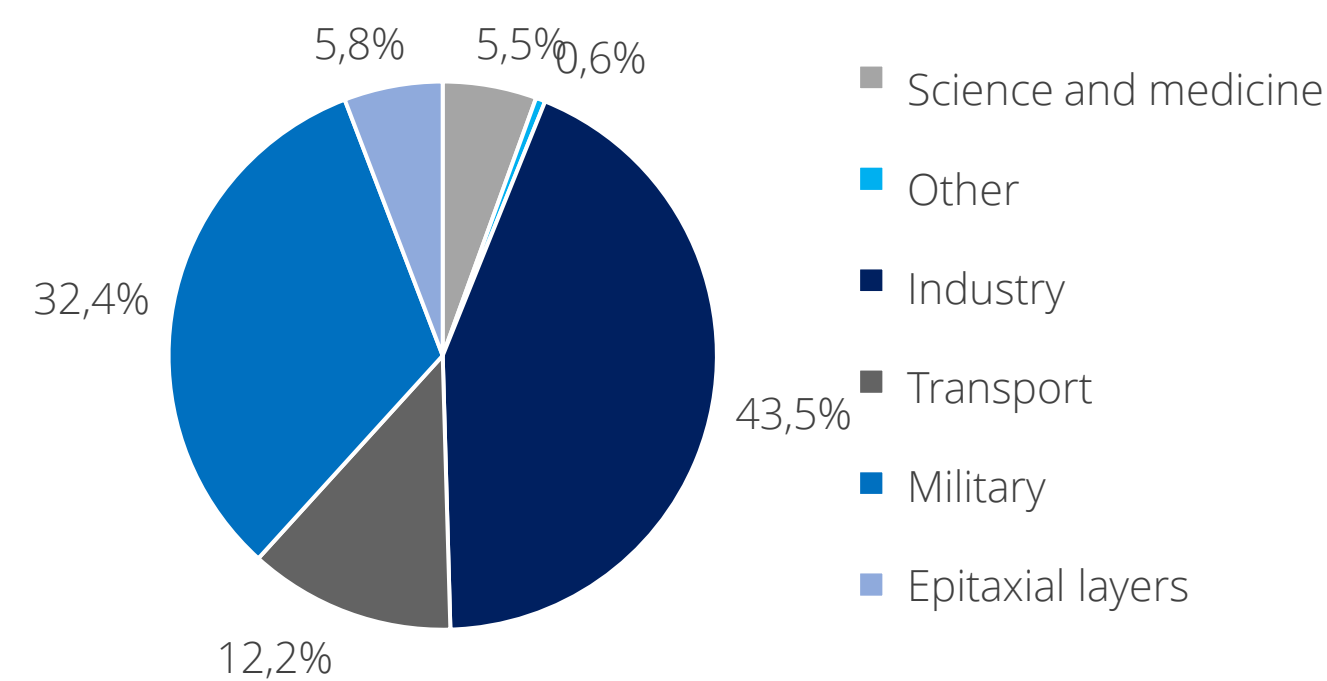
FINANCE

DYNAMIC GROWTH OF RESULTS WHILE MAINTAINING HIGH MARGINS

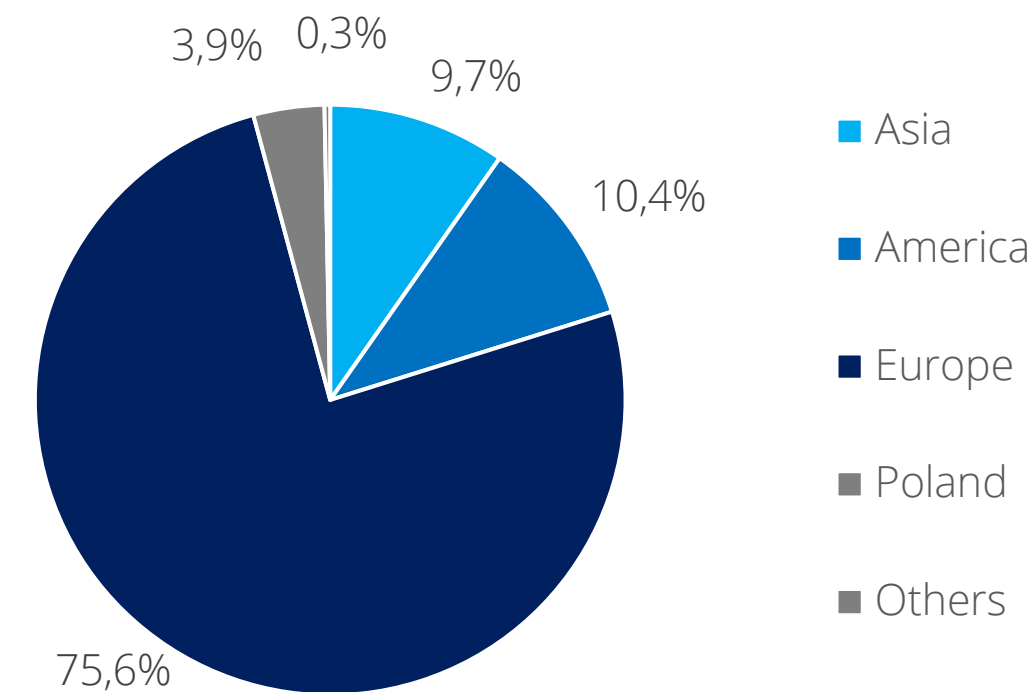
SALES REVENUES PER YEAR (PLN THOUSAND)



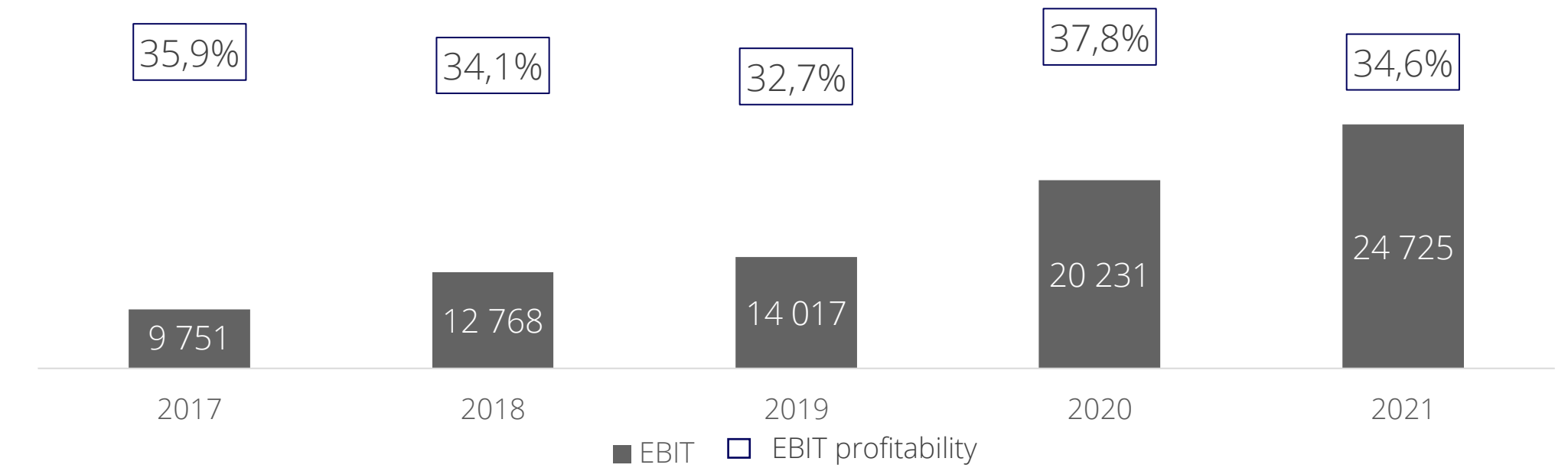
SALES REVENUES BY APPLICATION IN 2021 (%)



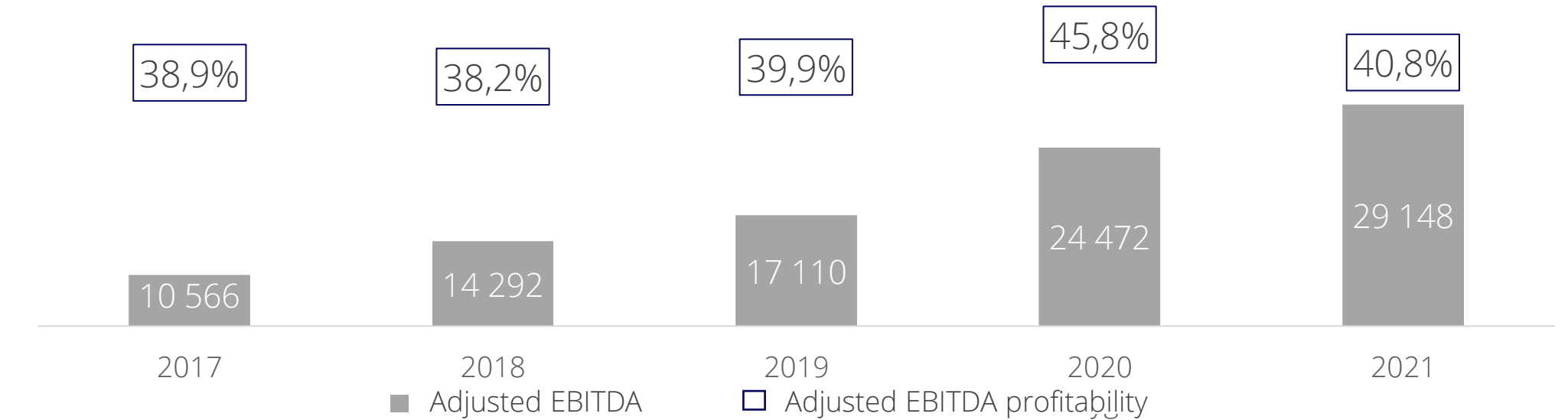
SALES REVENUES BY REGION IN 2021 [%]



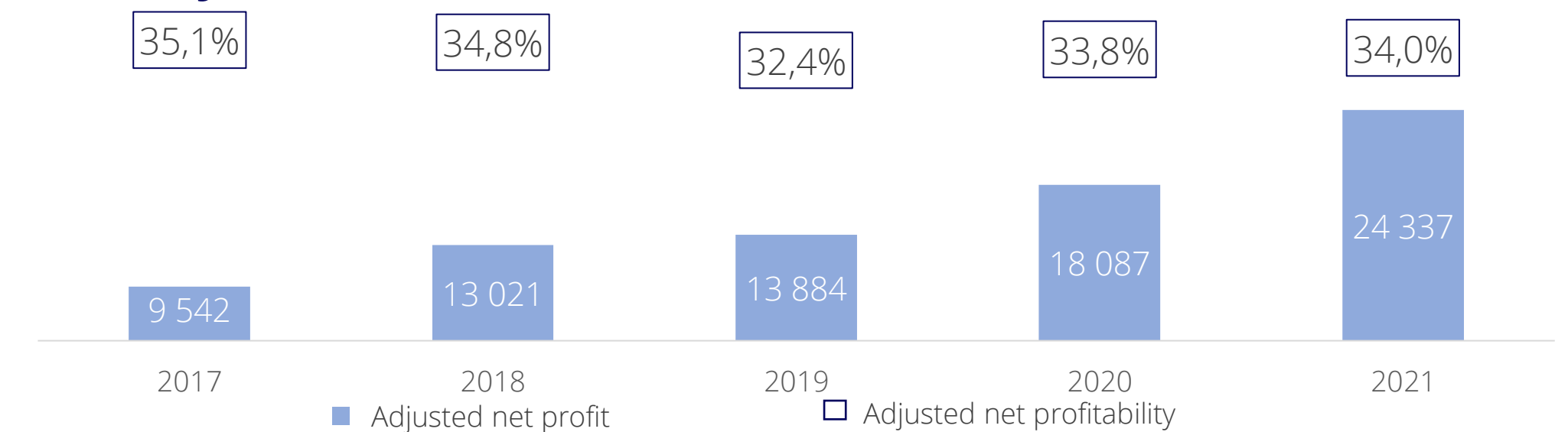
EBIT AND EBIT PROFITABILITY OVER 2017-2021



ADJUSTED EBITDA AND EBITDA PROFITABILITY OVER 2017-2021



ADJUSTED NET PROFIT AND NET PROFITABILITY OVER 2017-2021



OUTLOOK

SHORT-TERM OUTLOOK

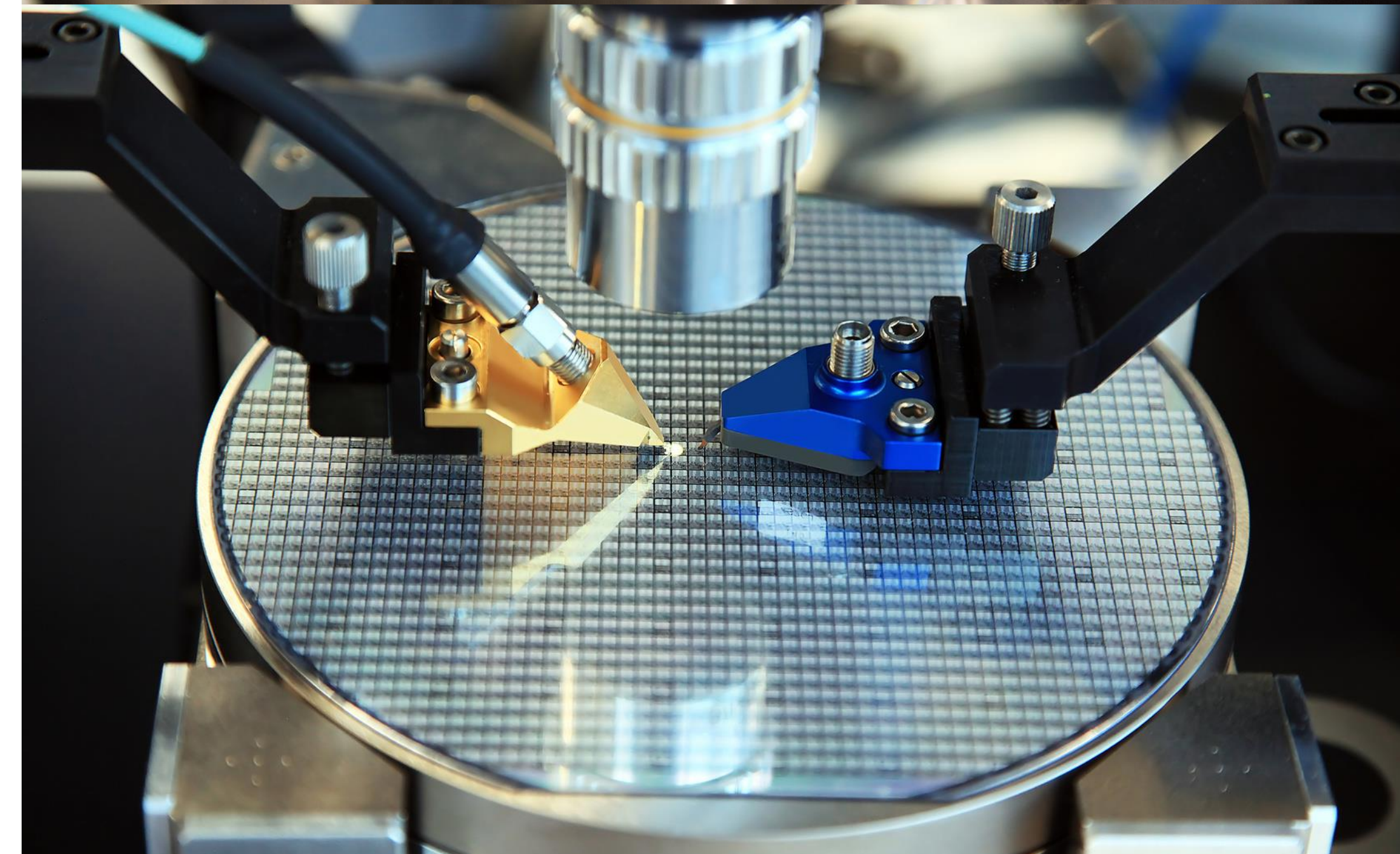
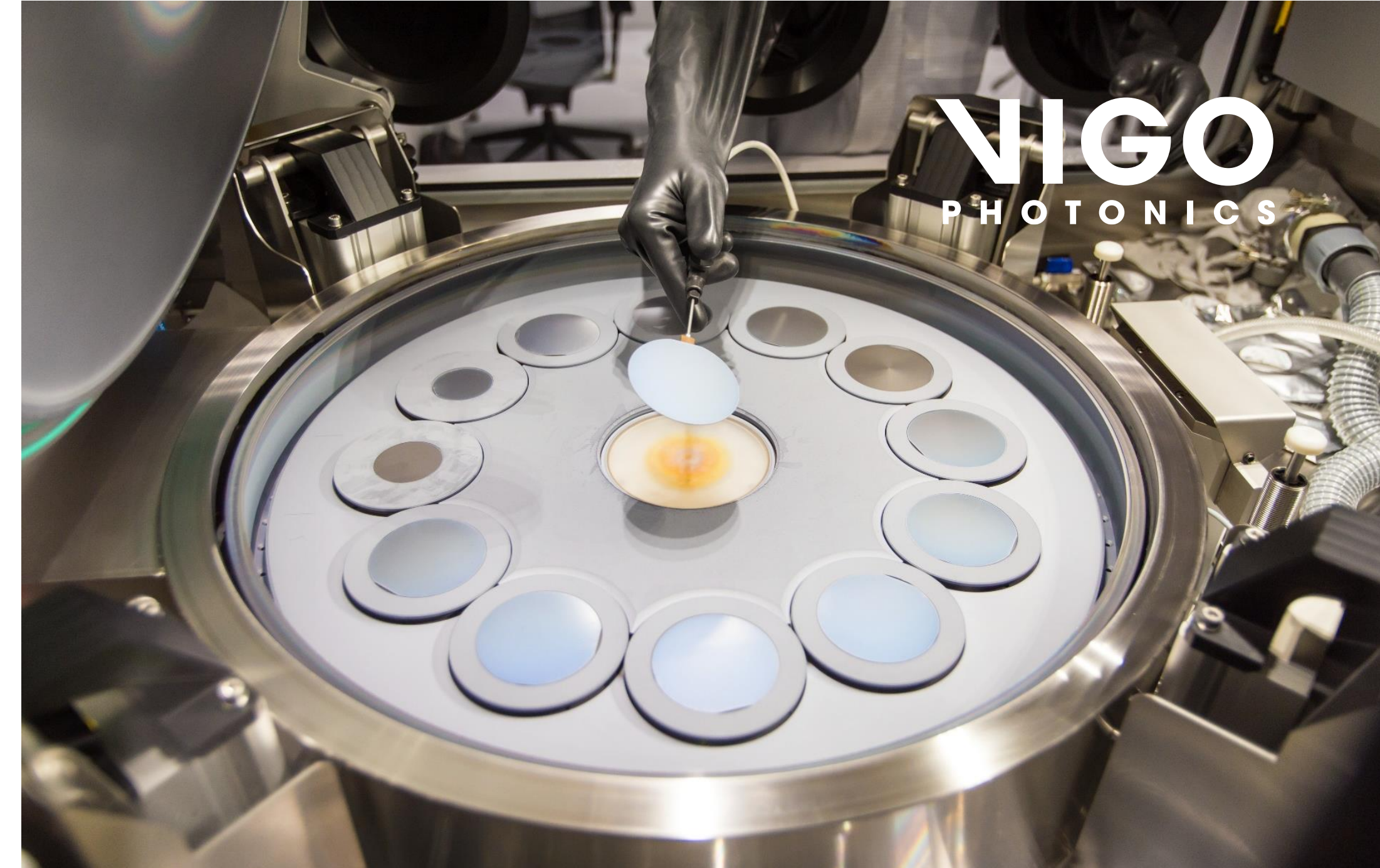
Plan for 2022

PLN 80 million revenue, including:

- **Industry** - growth by 20-30%, especially on the US market, in environmental applications, semiconductor industry, possible higher growth in case of positive validation of new products by customers
- **Transportation** - growth of approx. 10% (Caterpillar + Chinese market)
- **Military technologies** - in 2022 smaller orders expected from Safran; total revenue approx. PLN 10 million
- **Science and medicine** - revenues at a similar level as in 2021
- **Materials for photonics** - EUR 1.5-2 million (awaiting the delivery of the purchased epitaxial reactor to significantly increase contract execution in this segment)

RoHS Directive* (Restriction of Hazardous Substances)

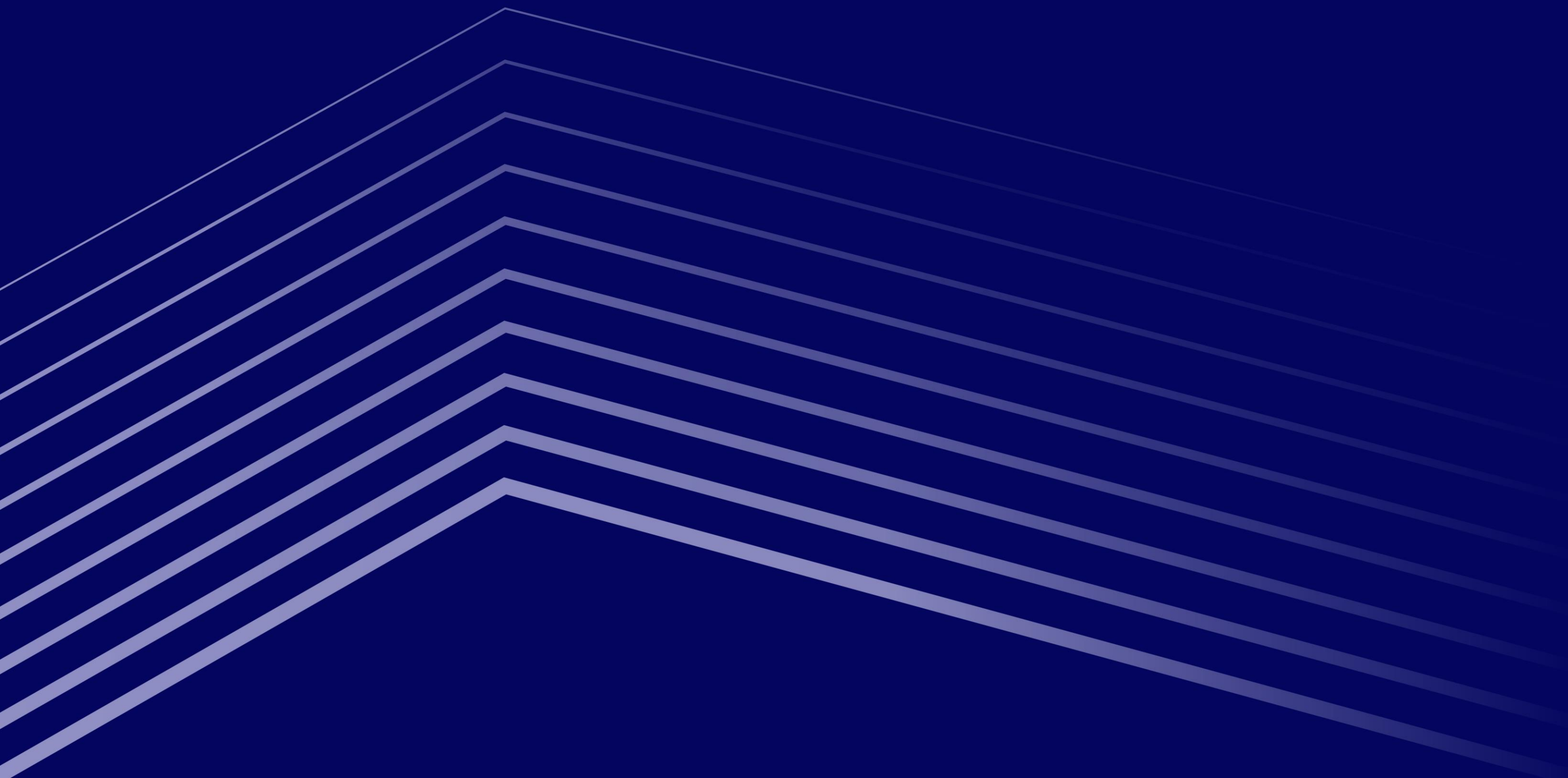
- Pending decision on early 2020 application (together with other MCT manufacturers) to extend transition periods
- Report** of EC advisor published recommending extension of transition periods and possibility to use MCT solutions until 21 July 2028



CONTINUE TO EXECUTE THE 2023 AND 2026 STRATEGY WITH A FOCUS ON PRODUCTION EFFICIENCY AND STRATEGIC INITIATIVES BASED ON VIGO'S UNIQUE TECHNOLOGIES AND ACCELERATE COMMERCIALISATION OF NEW SOLUTIONS IN A FAST-GROWING AND FORWARD-LOOKING MARKET

MARKET ENVIRONMENT	<ul style="list-style-type: none">• Operating in the fast-growing mid-infrared market• Market megatrends: miniaturisation of devices, RoHS directive and ecology, semiconductor deficit in EU• New industries gaining importance: internet of things, wearable-lab-on-chip consumer electronics, environmental protection, automotive, defence and security
INVESTMENTS	<ul style="list-style-type: none">• Development of common bases (technological and technical) for key pro-growth initiatives by 2023 through investments in R&D and universal infrastructure• Preparation of the investment plan necessary for the implementation of the 2026 strategy plans
TECHNOLOGY	<ul style="list-style-type: none">• Continuation of development work on initiatives from the Company's strategy• Implementation of new initiatives from the 2026 strategy - entering the level of optoelectronic systems, integrated circuits and infrared matrices• Continued work with and for global partners on new VIGO solutions
COMMERCIALISATION	<ul style="list-style-type: none">• Focus on commercialisation of current and new VIGO products with emphasis on semiconductor materials• Continuation of sales to customers with the potential for the highest growth in industrial, security and military applications as well as transportation - about 20-30% growth in 2022• Active development of sales and acquisition of new customers for solutions - priority market in Asia, active operations in the European and American markets, pilot programs in the Polish market
FINANCIAL RESULTS	<ul style="list-style-type: none">• Maintain annual growth rate in the range of 20-30%• Sales revenues - 2022: ~PLN 80.0 million, 2023: ~ PLN 100.0 million• Adjusted EBITDA - 2022: ~ PLN 33.5 million, 2023: ~ PLN 40 million• Maintain high i.e. over 40% normalised EBITDA margin

Q&A SESSION



THANK YOU FOR YOUR ATTENTION

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