

# STATE-OF-THE-ART IMAGING SOLUTIONS FOR PORTABLE & VEHICLE PLATFORMS

C.Robinet, AI BU Strategic Marketing  
for

EPIC Technology Meeting  
Kielce, PL on 06 Sept 23



# AGENDA

- ◆ Photonis Group at a glance
- ◆ State of the art solutions
  - [ ▫ ] with Intensification tubes
  - [ ▫ ] with digital cameras in VIS and IR
- ◆ What's ahead



# **PHOTONIS GROUP AT A GLANCE**

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[ □ ]

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# PHOTONIS GROUP

LEADER IN DETECTION AND IMAGING

Photonis is specialized in innovation, development, production and sales of **high tech electro-optical detection and imaging solutions** used in defense, industrial, lifescience and scientific applications.

**+85**  
**YEARS**  
**OF EXPERIENCE**



**1 200**  
EMPLOYEES



**217 M€**  
TURNOVER



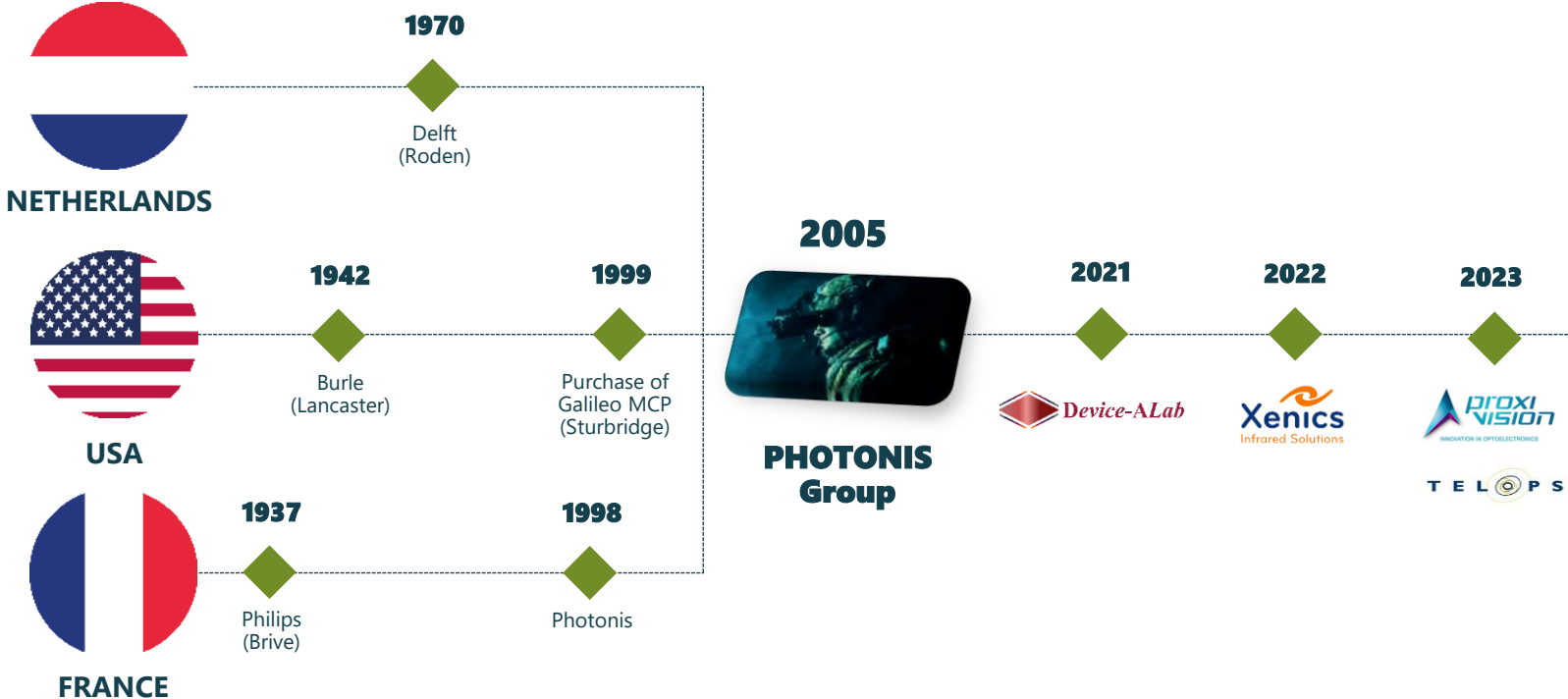
**+100**  
PROVEN  
TECHNOLOGY PATENTS



**+50**  
COUNTRIES : 90%  
OF EXPORT REVENUES

# PHOTONIS GROUP HISTORY

## ACROSS 3 COUNTRIES



# PHOTONIS GROUP ORGANISATION

## PER BUSINESS UNIT



### **NIGHT VISION**

Image Intensifier tubes for night vision goggles



### **ADVANCED IMAGING**

Digital cameras for defense, surveillance and industrial applications



### **ULTIMATE DETECTION**

Electron, ion, X-Ray and Image Intensifier tube based detectors for mass spectrometry, space, and scientific applications



### **NUCLEAR INSTRUMENTATION**

Neutron and gamma detectors for nuclear power plants reactors

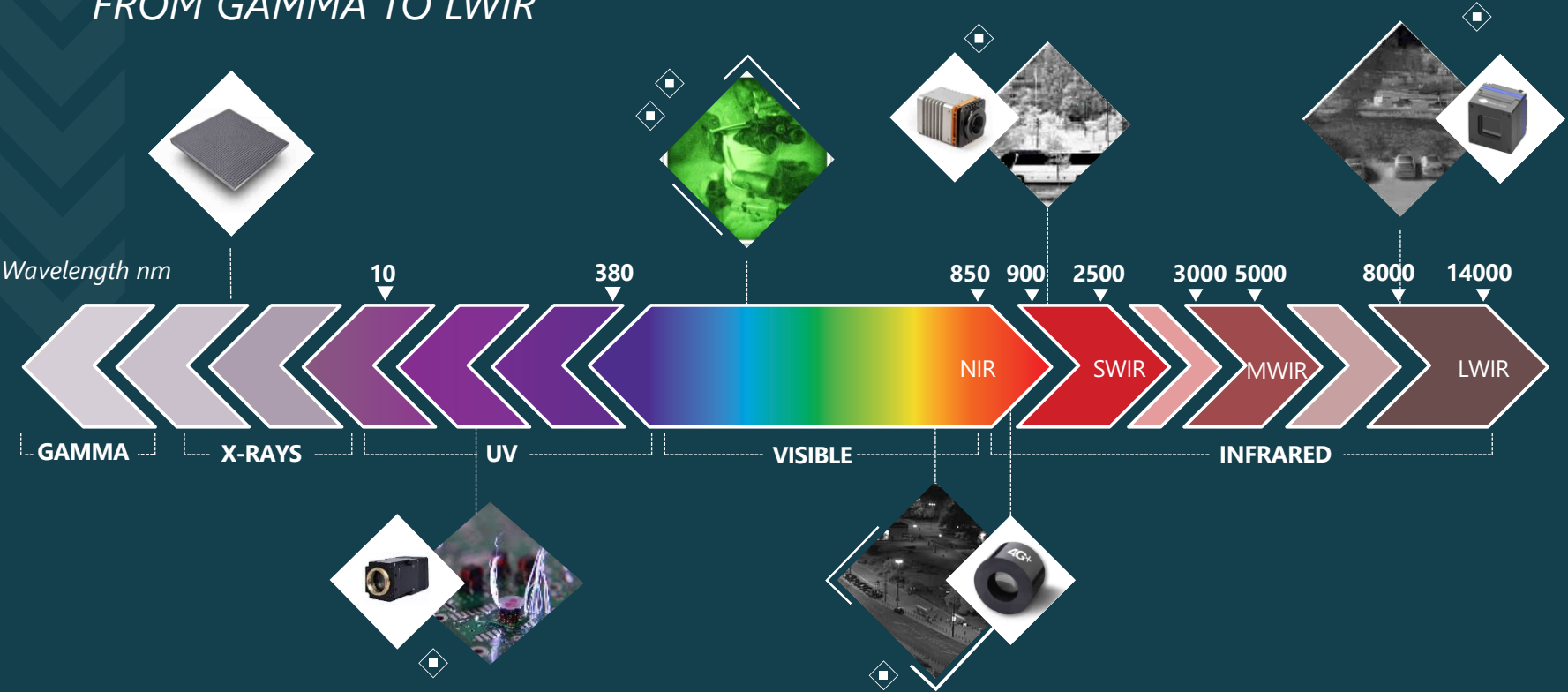



### **MICROWAVE AMPLIFIERS**

Microwave sources for defense, communications and electronic warfare

# PHOTONIS TECHNOLOGICAL PLAY FIELD

FROM GAMMA TO LWIR





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# State-of-the-art Imaging solutions for Portable Equipment

[ □ ]

[ □ ]



# CHALLENGES

## *DISMOUNTED SOLDIER \_ NIGHT*

### Objectives

- ◆ Material weight / size  
... Stealthiness / Agility
- ◆ E/O performances ... Perception
- ◆ Autonomy

### Typically in

- ◆ Helmet mounted device
- ◆ Monocular / Binocular
- ◆ Weapon sight



# SOLUTIONS

## *INTENSIFIED IMAGING*

# CHALLENGES

*DISMOUNTED SOLDIER \_ NIGHT*



# SOLUTIONS

*INTENSIFIED IMAGING*



- ◆ 4G+ **16mm** tubes 45g enables lighter equipment
- ◆ 72 lp/mm & SNR>31 resolution / factor of merit / **DRI**
- ◆ Fast auto-gating ops in **dynamic lighting** conditions
- ◆ Extended bandwidth compliant to **JTAC 1064 nm**

# CHALLENGES

## PORTABLE DEVICES \_ DAY & NIGHT

### Objectives

- ◆ Passive imaging
- ◆ Material weight & size, autonomy
- ◆ Performances vs harsh environment  
... shocks & temperature range

### Typically in

- ◆ Clip-on / Weapon sight
- ◆ Handheld device

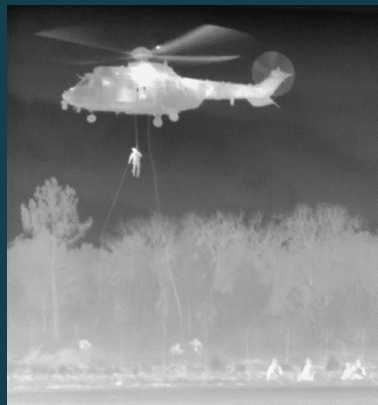


# SOLUTIONS

## DIGITAL IMAGING – LWIR CORES

# CHALLENGES

PORTABLE DEVICES \_ DAY & NIGHT



# SOLUTIONS

DIGITAL IMAGING – LWIR CORES



- ◆ Uncooled thermal to enable **SWaP cameras <30g**  
**core consumption <1W**
- ◆ up to 1Mpix resolution 12 $\mu$ m pixel  
NETD <25 mK NETD ... **DRI perf.**
- ◆ Shutterless implementation
- ◆ Time to **first image** ~1 sec
- ◆ Local AGC / Overlays / add on



[ □ ]

# State-of-the-art Imaging solutions [ □ ] for [ □ ] Vehicles & Platforms

# CHALLENGES

*SITUAT. AWARENESS \_ DAY & NIGHT*

## Objectives

- ◆ Perimetric or unidirectional
- ◆ Reliability / latency-free
- ◆ System cost

## Typically in

- ◆ Guimbal
- ◆ Multi camera systems
- ◆ Sea / Air / Land



# SOLUTIONS

*DIGITAL IMAGING – VIS+LWIR CORES*

# CHALLENGES

SITUAT. AWARENESS \_ DAY & NIGHT



# SOLUTIONS

DIGITAL IMAGING – VIS+LWIR CORES



- + VIS and LWIR **SWaP cameras**  
**Reliability** / 24/7 operations  
**No latency** / triggered
- + **VIS** typ 2Mpix in night level 1  
up to 1.3 Mpix in night level 3  
coupled to zoom lenses x30
- + **LWIR** up to 2Mpix 10µm pixel  
typ NETD <50 mK ; shuttered  
Alternatives shutterless with  
1.3Mpix and >30 mK

# CHALLENGES

*MID. RANGE OBSERVATION*  
*\_ HAZE*

## Objectives

- ◆ Passive acquisition
- ◆ Harsh environment  
... shocks & temperature range

## Typically in

- ◆ Pan Tilt Zoom
- ◆ Remote Weapon Station
- ◆ UAV Payloads / Aircraft Pods



# SOLUTIONS

*DIGITAL IMAGING MULTI SPECTRAL*  
*- SWIR CORES*



# CHALLENGES

MID. RANGE OBSERVATION

— HAZE



# SOLUTIONS

DIGITAL IMAGING MULTI SPECTRAL

— SWIR CORES



- ◆ Each modality VIS NIR SWIR MWIR LWIR provides information
- ◆ SWIR enables sight through Smoke / Dust / Fog / Rain
- ◆ **Uncooled** or TEC stabilized cores
- ◆ Resolution **1.3Mpix** / 10µm pitch
- ◆ Read Out **Noise** <30 electrons
- ◆ Frame rate **120 Hz**

# CHALLENGES

*OTHER CASES*

**Active Protection Systems**

**Loitering Amunitions**

**Enhanced Vision Systems**

# SOLUTIONS

*DIGITAL IMAGING \_ SWAP IR CORES*

- ◆ Sensitivity // Frame rate ... **NETD at 100+Hz**
- ◆ **No latency**
  
- ◆ Time to first image **<1 sec**
- ◆ **Calibration**
  
- ◆ **Reliability**
- ◆ Sync / No latency
- ◆ Frame rate >60Hz



# Preparing tomorrow

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# FUTURE IMAGING SOLUTIONS

## SENSOR / IMAGE CAPTURE



- ◆ **Sensor technology / performance across the spectrum**  
 higher resolution / smaller pixels / increased sensitivity (SNR)  
 e.g. low light VIS camera ... down to photon detection  
 e.g. SWIR with extended QE  $\sim 2\mu\text{m}$   
 e.g. LWIR  $8\mu$  pitch // 2 Mpix
- ◆ **Multispectral / Hyperspectral**  
 to enable fusion or decamouflage...
- ◆ **Beyond innovation, technology ecosystem**  
 strengthen European based supply chain for the most technology sensitive bricks

# FUTURE IMAGING SOLUTIONS

## INTERFACE / FUNCTIONS / INTEGRATION



- ◆ **Integration via...**  
smaller and smarter sensors... SWaP become commodity
- ◆ **Artificial Intelligence**  
enable generic products compliant to AI bricks
- ◆ **Interfaces / Interoperability**  
Fit to secured communication / data processing standard
- ◆ **Technology cost ... system user price point**  
Optimal design save Sensor BOM  
Embedded functions save System cost



**Thanks for your  
attention**

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