

Neuromorphic sensors for defence

Thales
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Thales at a glance: 2023 key figures



81,000
employees



68 countries
A global footprint



€4 bn*
* including €1,1 bn
in self-funded R&D

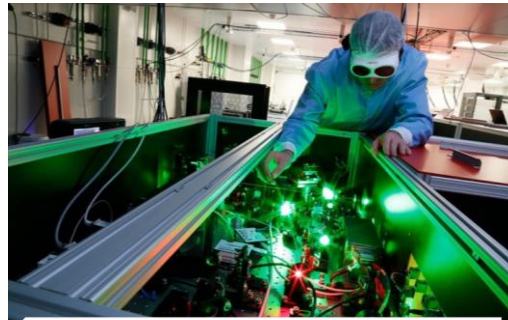


€18.4 bn
revenues

EMPOWER CUSTOMERS TO FACE THEIR DECISIVE MOMENTS WITH CONFIDENCE



We help air, naval and land forces perceive relevant information at the right time to help them make the right decision



OPTRONICS AND MISSILE ELECTRONICS

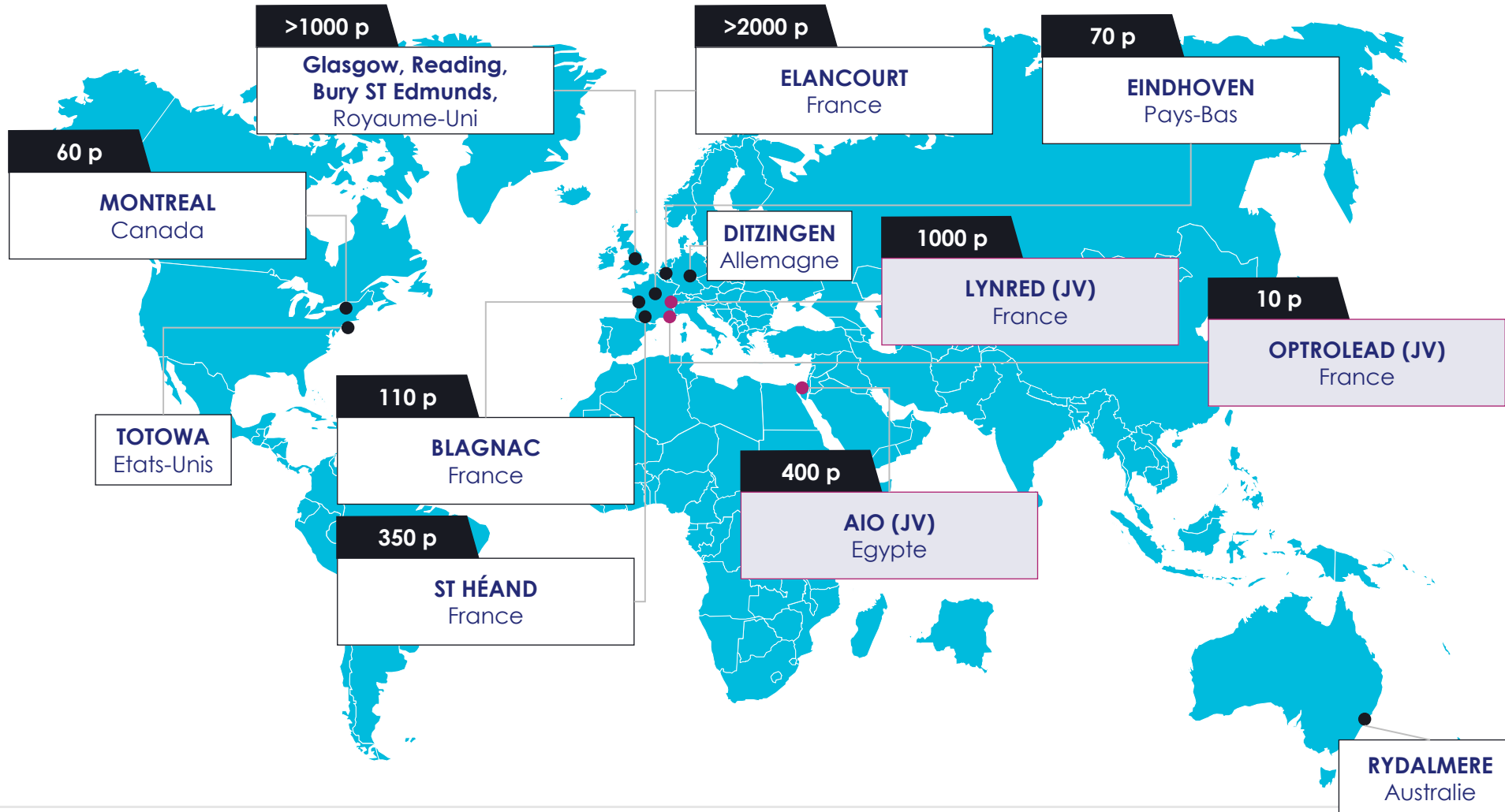
TALIOS new generation targeting pod is **300 times faster/more efficient** than a human operator for target detection and recognition.

We make the **world's most powerful laser systems**: 10 petawatts or 10,000 times the combined power of all the world's electricity grids.

The successful operational firing of the first EXOCET missile with our coherent anti-ship seeker confirms **our unique ability** to develop high-end radio frequency Ads.

Our lenses help art directors bring their wildest visions to life, and **have won three Oscars**.

Optronics and Missile Electronics : international footprint



11 sites Thales
+3 Joint ventures



7 countries



>4 500
employees

Introduction

- > Belongs to Thales Optronics and Missile Electronics of Thales
- > Optronics Equipment for defence
 - Land
 - Airborne
 - Naval
- > The applications for which we identified potential interest of the neuromorphic technology is very diverse
- > Last Year, we leaded a EDA OB-Study called NEDA with a large European consortium to select some potential applications

Motivation for studying Neuromorphic Cameras (NCs)

Main characteristics of NCs according to NEDA results are

- **high temporal resolution** as NCs can capture fast-moving objects and obtain greater detail of the evolution of the motion without having to interpolate between frames,
- **low latency** meaning that NCs can respond quickly to environmental changes,
- **high dynamic range** since NCs can capture bright and dark scenes without losing detail,
- **low power** as NCs consume much less energy than traditional cameras, and
- **data sparsity** since NCs provide data only when there is a change in the scene.

Some Defence applications identified in the NEDA project

> Detection and tracking, including trajectory determination of fast moving objects

- ▶ High velocity missiles, hypersonic missiles,
- ▶ Bullets in projectile warning systems,
- ▶ swarms of UAVs flying at low altitude...

> UAV detection for counter UAV systems

- ▶ In a complex environment with a strong background
 - Even if the UAV is coming in front of the sun

> Situational awareness, behavior detection and recognition for threat assessment, alert generation.

- ▶ incl. detection of expanding dust, recognition of firing weapons

> Autonomous systems

- ▶ Fast detection of obstacles, pedestrians
- ▶ With High dynamic range constraints: entering or leaving a tunnel

> Laser warnings and glare robust systems

Observation of a small UAV

- ▶ UAV in front of complex background with multiple cameras in parallel.
- ▶ The image of the event based camera was used for the tracking of the object





Laser Pulse detection application

Laser Pulse detection

- > **Asynchronous Laser Pulse Detection (ALPD) can be done with an event based sensor**
- > **Was done by changing the settings of the event based sensor**
 - By tuning outside the qualified domain of the sensor
 - With an important increase of the power consumption of the sensor
- > **But it is not the only way to design a sensor with ALPD function**

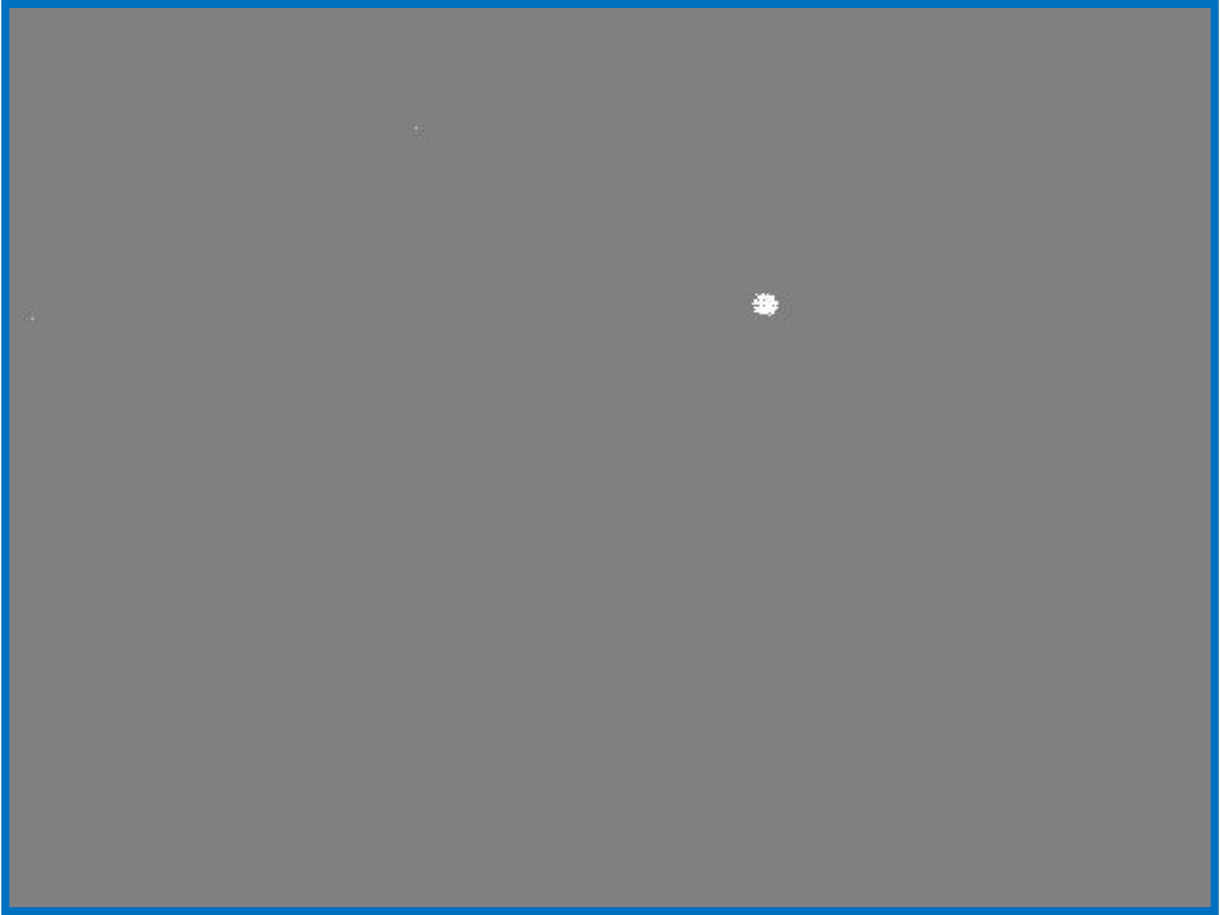
Pixel with standard Prophesee settings



The man holds a
golf rangefinder



Pixel and algorithm tuned with THALES settings to detect the laser pulses only





Contact

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Thank you

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