

Infrared Imaging for improved Pharma processes

April 2024

AGENDA

- + Exosens Advanced Imaging
- + Don't limit to visible wavelength
- + Focus on Infrared
 - [▫] See through
 - [▫] See What
 - [▫] Analysis



EXOSENS AT A GLANCE

[□]

[□]

[□]

EXOSENS

LEADER IN DETECTION AND IMAGING

Exosens is specialized in innovation, development, production and sales of **high tech electro-optical detection and imaging solutions** used in Lifescience & Environnement, Industrial control, Nuclear and Defense & Surveillance.

+85

**YEARS
OF EXPERIENCE**



1 500
EMPLOYEES



319 M€
Revenue



+130
PROVEN
TECHNOLOGY PATENTS












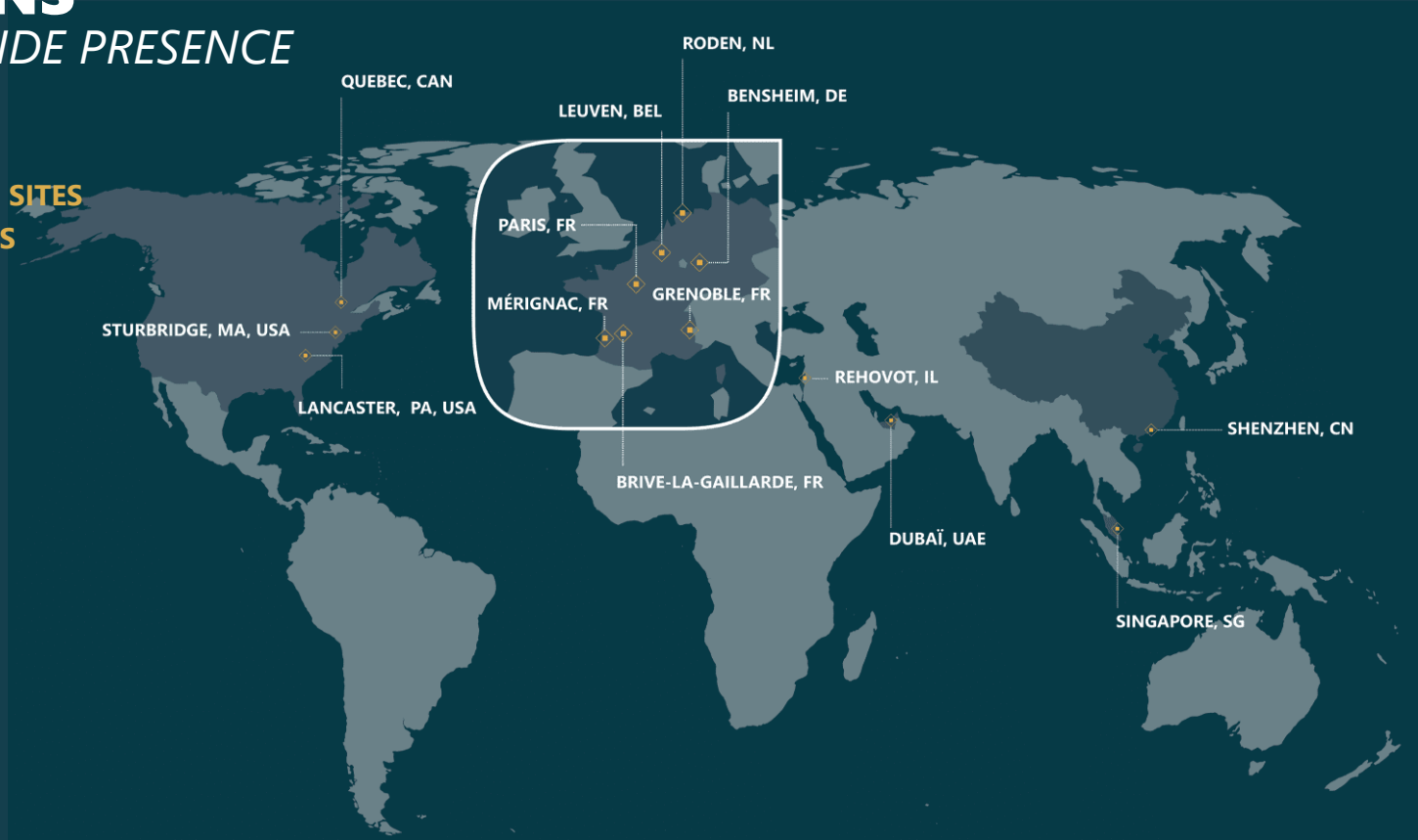
+50
COUNTRIES : 95%
OVERSEAS REVENUES

EXOSENS

WORLDWIDE PRESENCE

9 PRODUCTION SITES & R&D CENTERS

-  Brive
-  Grenoble
-  Roden
-  Leuven
-  Lancaster
-  Sturbridge
-  Bensheim
-  Quebec
-  Rehovot



EXOSENS MARKETS

A LARGE COVERAGE



DEFENSE/ SURVEILLANCE

- ◆ Portable sights (NVG)
- ◆ Armored vehicles & Platform Sights
- ◆ Electronic warfare
- ◆ Traffic management
- ◆ Security (Police)
- ◆ Border/infra. surv.
- ◆ Maritime surveillance
- ◆ Search & Rescue



LIFESCIENCE / ENVIRONMENT

- ◆ Cell analysis
- ◆ Ex-vivo
- ◆ Agriculture observation
- ◆ Gaz detection
- ◆ Aquaculture
- ◆ Firefighting
- ◆ Scientific instrumentation
- ◆ Space



INDUSTRIAL CONTROL

- ◆ Machine Vision
- ◆ Process monitoring
- ◆ Powergrid maintenance
- ◆ Material testing
- ◆ Beam profile analysis
- ◆ Train & Vehicles inspection
- ◆ Situation awareness



NUCLEAR

- ◆ Plant reactors
- ◆ Research reactors
- ◆ Defense
- ◆ SMR / XMR

EXOSENS ORGANISATION

PER BUSINESS UNIT



NIGHT VISION

Image Intensifier tubes for night vision devices



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



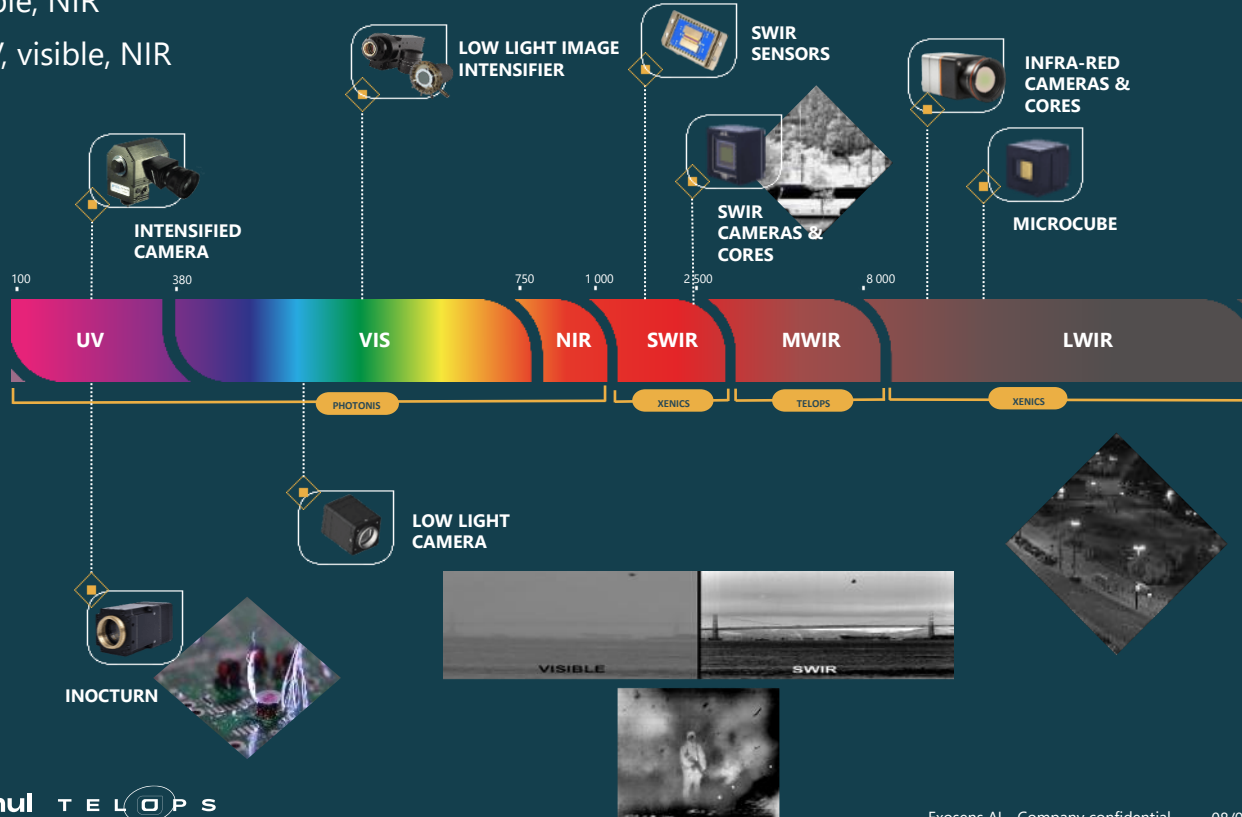
MICROWAVE AMPLIFIERS

Microwave sources for defense, communications and electronic warfare








EXOSENS Advanced Imaging Spectral Coverage

FROM UV TO LWIR

- ◆ Low light cameras in the visible, NIR
- ◆ Intensified cameras in the UV, visible, NIR
- ◆ SWIR cameras
- ◆ LWIR cameras



Don't limit to visible wavelength

						
X-Ray	UV	VIS	NIR	SWIR	MWIR	LWIR
X-Ray	Ultra Violet	Visible	Near IR	Short Wave	Mid Wave	Long Wave
0.01-10 nm	10-400 nm	400-750 nm	750-1100 nm	1.1-2.5 um	3.0-5.0 um	7.0-14 um

Pictures used with permission of Dr. Austin Richards



[□]



FOCUS on SWIR

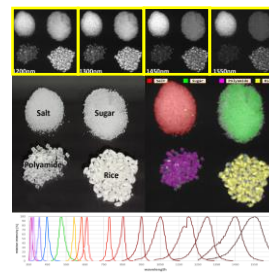
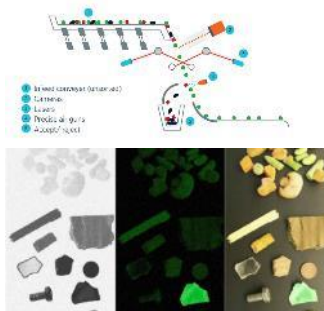
[□]

[□]



SWIR 1D Camera for process monitoring

	<p>SQ 25x25μ or 12,5x12,5μm 512-1024-2048 SQ 1700nm</p>	<p>R 12.5x250μm 512-1024-2048 R 1700nm</p>	
<p>Gen III <u>Manx</u> FC</p>	<p>High speed: 260kHz / Low noise / CXP</p>		
<p>Gen II <u>Lynx</u> / XSL WB</p>	<p>Compact, low power & cost</p>		
	<p>Optical sorting Quality inspection</p>	<p>Spectroscopy</p>	



SWIR CAMERAS for process monitoring

SWIR 2D PRODUCT RANGE for imagery and hyperspectral

Laser related

Industrial / Security Defense

Scientific

High speed

SXGA



WILDCAT+ 1280

VGA



WILDCAT+ 640 WL



BOBCAT 640



XSW 640



WILDCAT 640
WILDCAT+ 640 TE0



WILDCAT+ 640 300Hz



AION



CHEETAH+

QVGA



BOBCAT 320 WL



BOBCAT 320
BOBCAT 320 TE0
BOBCAT+ 320



XSW 320



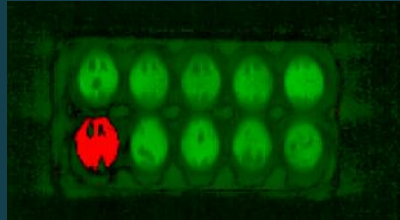
XEVA 320

Performance 

Use of SWIR in Pharma

SWIR enable to see inside

❖ Inside a blister



Courtesy of EVK

❖ Inside a bottle

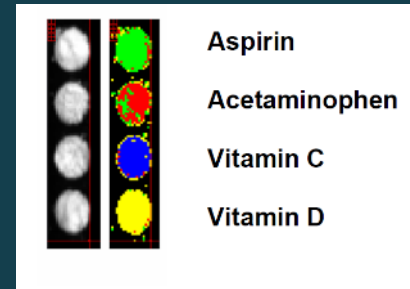


Use of SWIR in Pharma

SWIR and hyperspectral to check the content



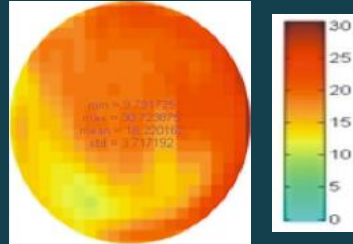
Courtesy of Resonon



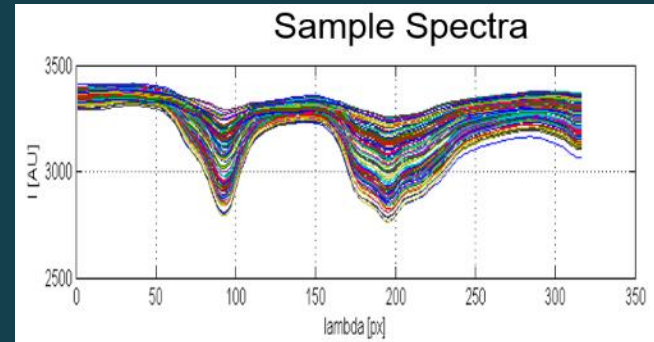
Courtesy of Headwall Photonics

Use of SWIR in Pharma

Uses SWIR to quantify and check homogeneity



Courtesy of EVK





FOCUS on LWIR

[•]

[•]

[•]



LWIR CAMERAS and CORES

SMARTIR, CRIUS, DIONE & CERES

SWaP

SWaP & Shuttered

Thermography

SXGA



Dione 1280 CRIUS 1280



CRIUS S 1280 Dione S 1280



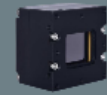
Ceres 1280



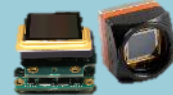
50 mK
40 mK

60Hz
9Hz

XGA



SmartIR



Dione 1024



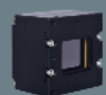
Dione S 1024



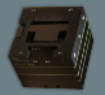
50 mK

60 Hz

VGA



SmartIR



XTM+



Gobi+



Dione 640 CRIUS 640 µcube



Dione S 640



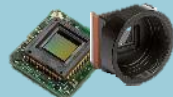
Ceres 640



50 mK
40 mK

60Hz
9Hz

QVGA



Dione 320



50 mK

60Hz
9Hz

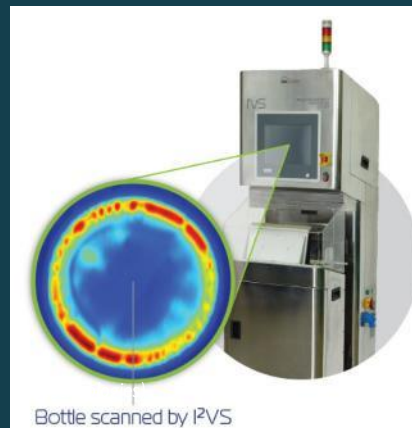
17µm

12µm

Use of LWIR in Pharma

Typical use: sealing inspection

- ◆ Induction-sealed bottles



EXOSENS ADVANCED IMAGING

VALUE PROPOSITION

- ◆ European leader in detection and imaging for high-end markets
- ◆ Leader in high-speed IR imagery
- ◆ Broad product offering from UV to LWIR
 - ◆ One-stop-shop – with agility and flexibility to meet specific needs
- ◆ European supplier and supply chain (No Chinese, no ITAR)
- ◆ Installed process control in operation
 - ◆ Product performance repeatability
 - ◆ Operational excellence
 - ◆ Customer support focused
- ◆ Financial stability
 - ◆ Ensuring a long-term commitment for supply and support
- ◆ Independent supplier, manufacturer agnostic
 - ◆ Building unconstrained and transparent relationships



THANK YOU !