



LYNRED

BY SOFRADIR & ULIS

INFRARED IMAGING SOLUTIONS AND CHALLENGES

Patrick Abraham
EPIC World Photonics Technology Summit
Berlin 30/08/2019

1

WE ARE

- About LYNRED

2

WE MAKE

- LYNRED technologies

3

WE SERVE

- LYNRED target markets

4

CHALLENGES

- Overview of the future trends



1

WE ARE

About LYNRED

About LYNRED

KEY FIGURES AND SHAREHOLDERS



RESEARCH PARTNER
CEA LETI- ONERA- III-V LAB



80%
EXPORT



114 PATENT FAMILIES
410 PATENTS FILED



15% REVENUE
INVESTED in R&D



1 MILLION DETECTORS
SHIPPED SINCE 1986



FULL INFRARED
SPECTRUM



GLOBAL INDUSTRY LEADER IN INFRARED DETECTORS

offering the largest
product portfolio






1000
EMPLOYEES
2018 REVENUE:
€225 MILLION





LYNRED USA
BY SOFRADIR & ULIS


SOFRADIR-EC


Creation date : 2008
Cooled & Uncooled US distributor
Products engineering


LYNRED
BY SOFRADIR & ULIS

Creation date : 1986
Cooled


SOFRADIR
Sensing your future

Creation date : 2002
Uncooled


ULIS
Infrared for you

TRIXELL
X-Ray imaging excellence

MULTIX
X-ray Spectrometric Imaging

pyxalis
X-ray Image Sensor Solutions

Device-A-Lab

cea tech

LYNRED
BY SOFRADIR & ULIS

cea leti

isorg

Aledia

resolution
spectra systems

GAENLAPS

SteadXP

TELEDYNE e2v
Everywhere you look™

teem
compositing with light
photonics

STI
life.augmentec

Soitec

kolor

Xenocs
BRIGHTER SOLUTIONS

microoled

irlynx
SMART DETECTION

ProbaYes
Smart Data

INSIDIX
NON-DESTRUCTIVE TESTING

About LYNRED

**A PRIME
LOCATION IN
EUROPE'S
IMAGING VALLEY**

**IMAGING
VALLEY**





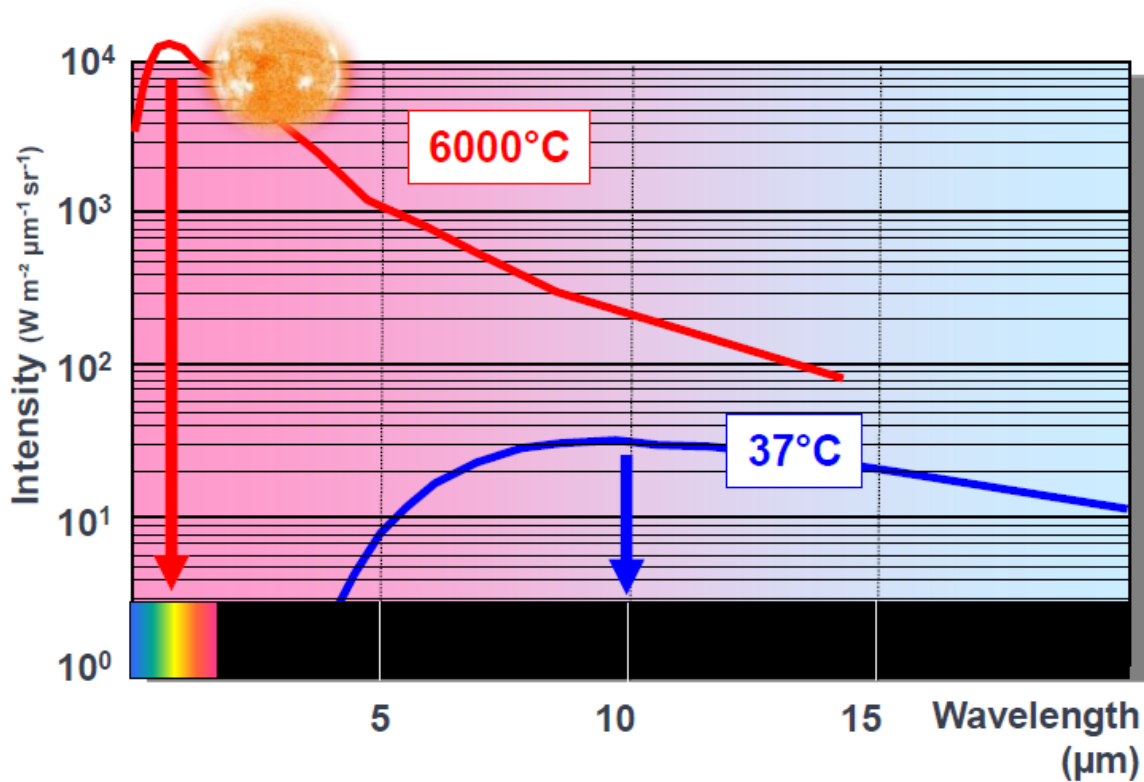
2

WE MAKE

LYNRED technologies

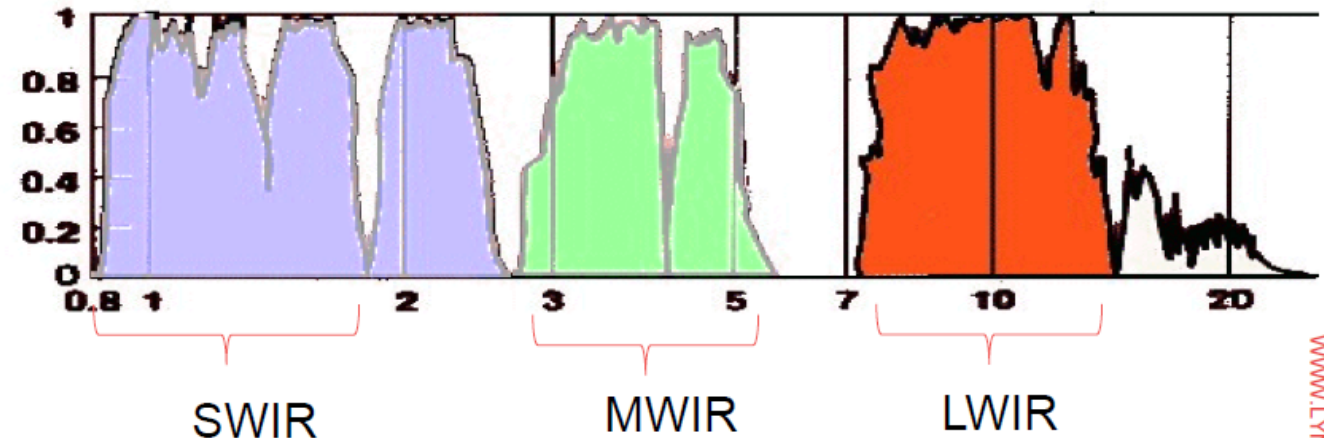
BACK TO BASICS, INFRARED DETECTION

Planck

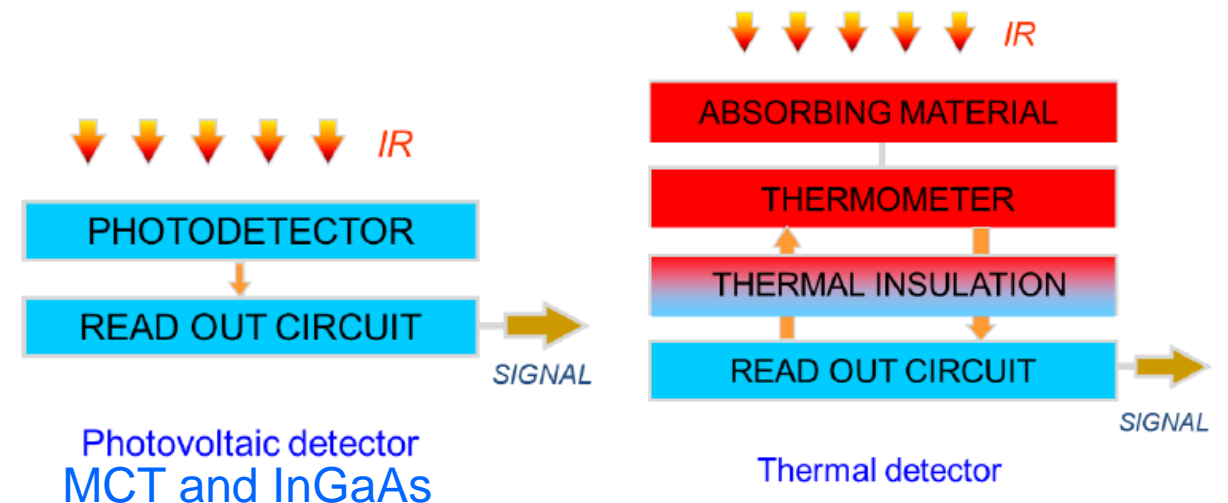


**Human peak
emission**
 $\lambda = 10\mu\text{m}$

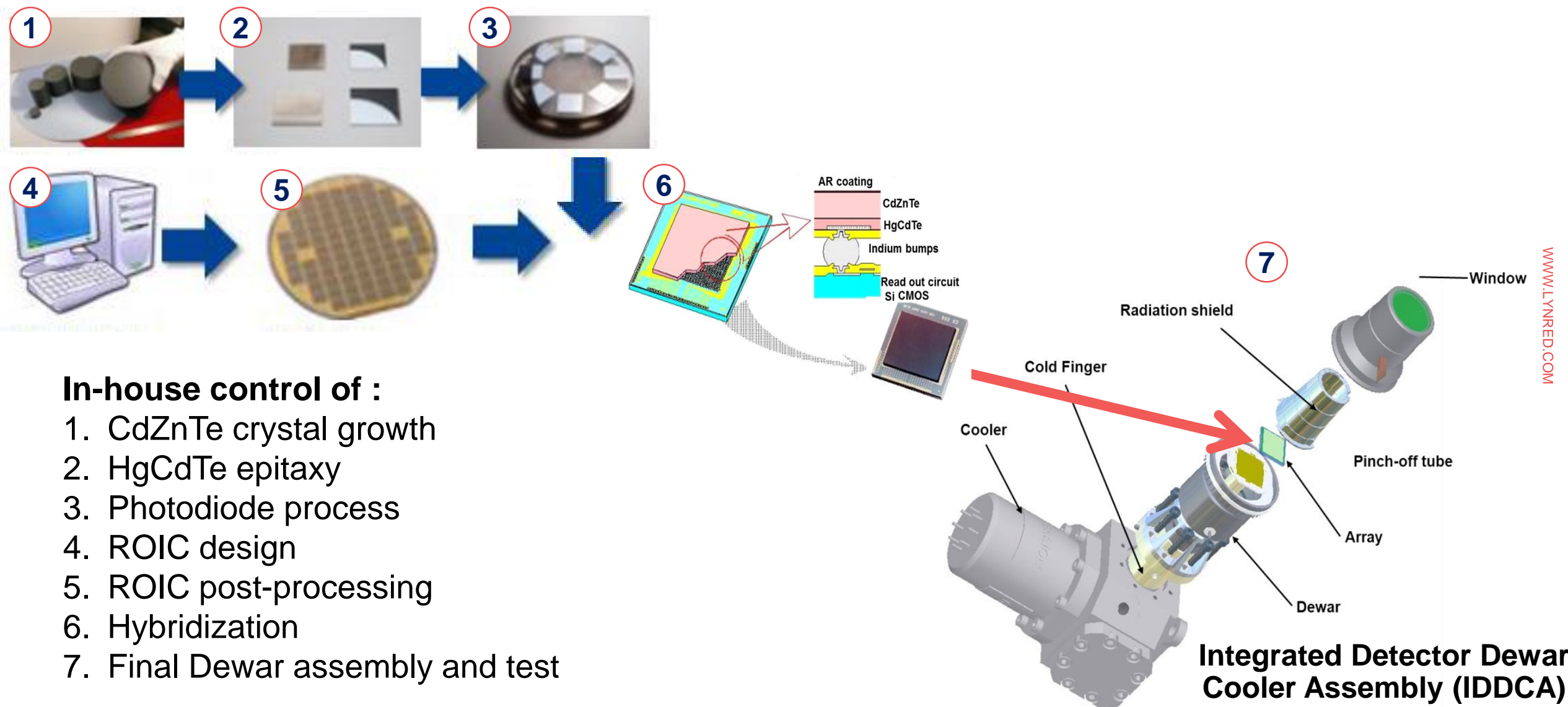
Atmosphère



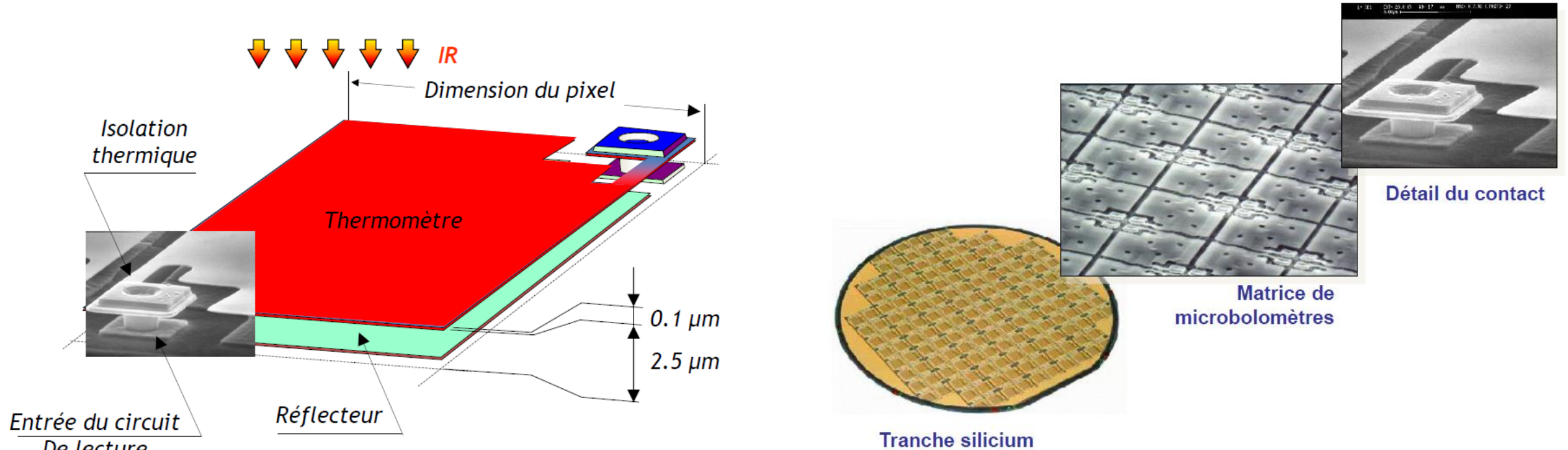
3 infrared windows possible in the atmosphere



Cooled Infrared detector based on hybridized sensors



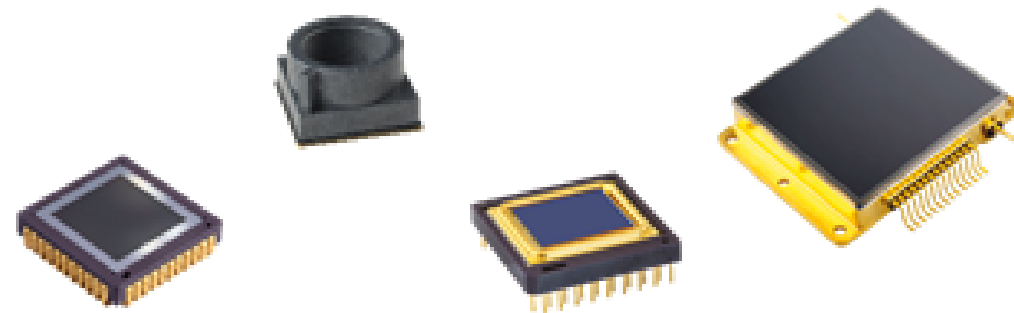
IR detectors based on microbolometers



Above IC MEMS technology performed at LYNRED on CMOS ROIC designed by LYNRED

MEMS technology followed by

- Dicing
- Packaging (integration, pumping)
- Test



About LYNRED

Business Model





3

WE SERVE

LYNRED target markets

Target markets

Designed to deliver what your
markets demand

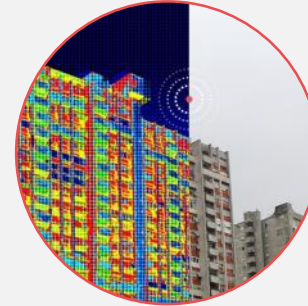
DEFENSE



SPACE



INDUSTRY



SECURITY &
SURVEILLANCE



LEISURE &
OUTDOOR



SMART
BUILDINGS



AUTOMOTIVE

Thermal Imaging Applications

LYNRED

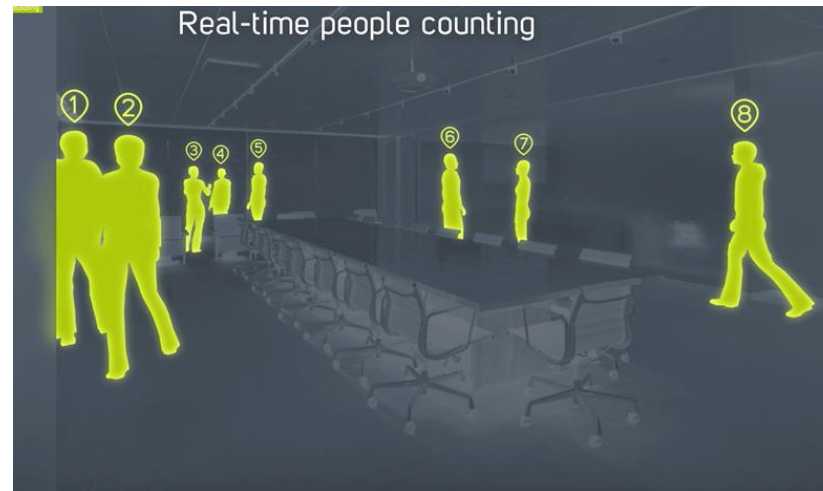
Security



Automotive



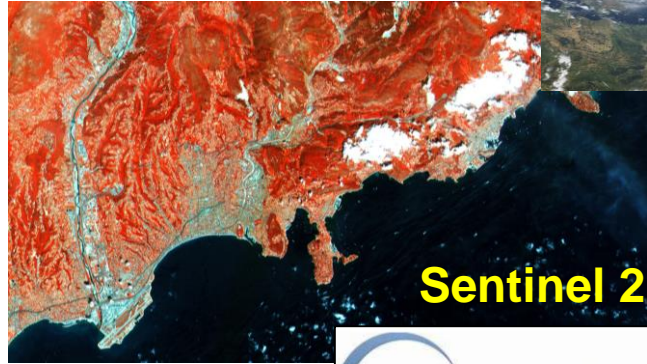
Smart building



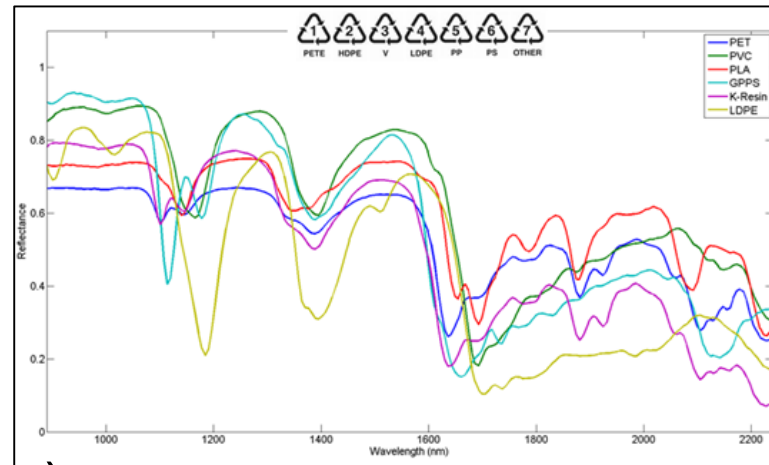
Multi/Hyper Spectral Imaging Applications

LYNRED

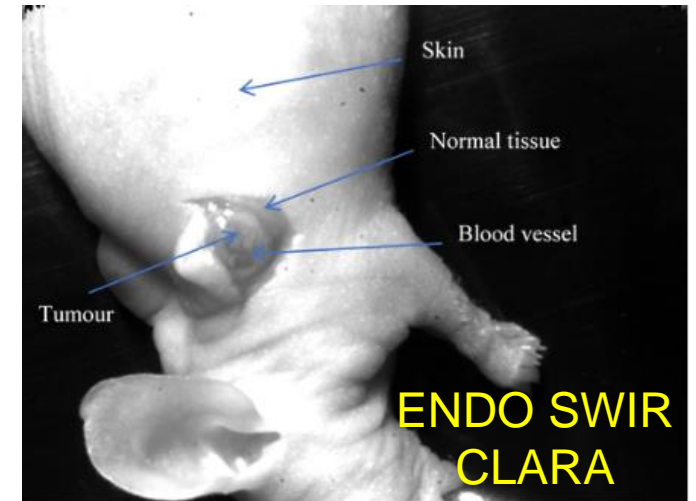
Hyperspectral Earth Observation



Machine Vision

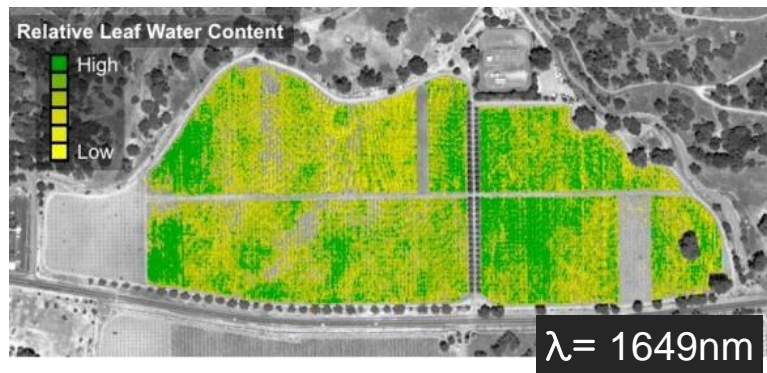


Medical Diagnostic



WWW.LYNRED.COM

Smart Farming (hydric stress)



EPIC Summit – Berlin – 30/08/2019

Gas Detection



A large, bold, white number '4' is centered on the left side of the slide. The background is a solid red color with a white dot grid pattern.

CHALLENGES

Overview of the future trends

NEXT CHALLENGES

❑ **No matter the technology, products need to be :**

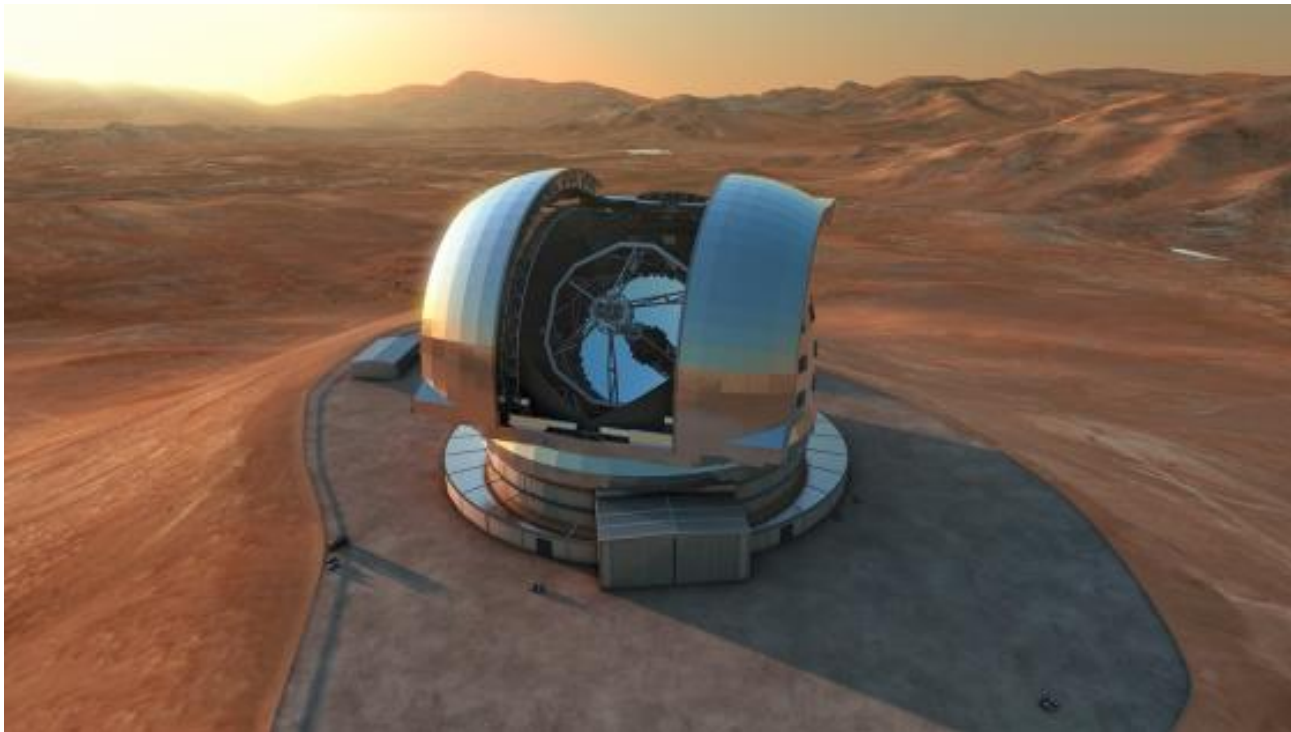
- More compact (SWAP)
- Less expensive
- Higher performance
 - More pixels and resolution
 - Higher sensitivity
 - Less cross talk between pixels (better MTF)
 - Less noise
 - Faster frame rate
 - Multispectral or Hyperspectral capability
 - Integrated image pre-treatment



- Very large high performance detectors for Astronomy and Space applications
- High operating temperature MWIR sensors for SWAP applications
- Low cost small pitch modules for Automotive and Smart building applications

High performance large focal plane arrays (2k² : 2048 x 2048)

- >Space observation
- >Astronomy



FPA dimension > 30 x 30 mm²

→ Larger substrates & epitaxy

Dark current < 1 e⁻ / sec

→ Very low defect material and process

Read Out Noise ~ 10 e⁻

ROIC cross talk < 3 %

→ High performance CMOS design

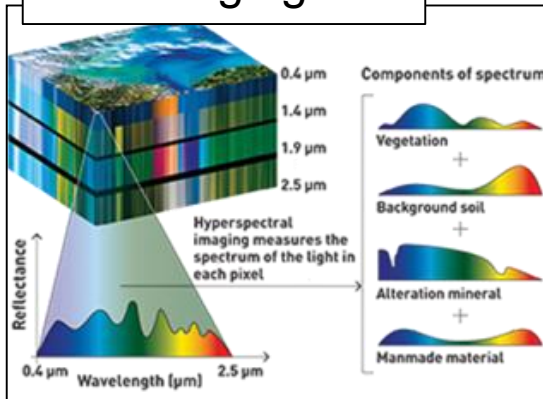
Quantum efficiency > 75 %

→ Device design optimisation



High operating temperature MWIR sensors for SWAP applications

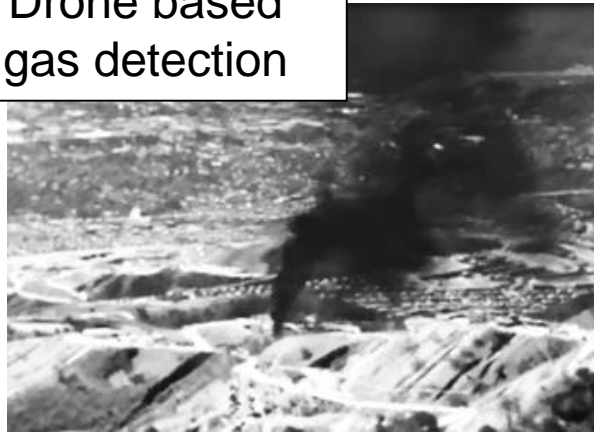
Drone based
hyperspectral
imaging



Hand held
devices



Drone based
gas detection



High operating temperature $\sim \geq 140 \text{ K}$

Very low dark current

- New detection configuration (long minority carrier life time)
- Very low defect material and process

Compact cryostat

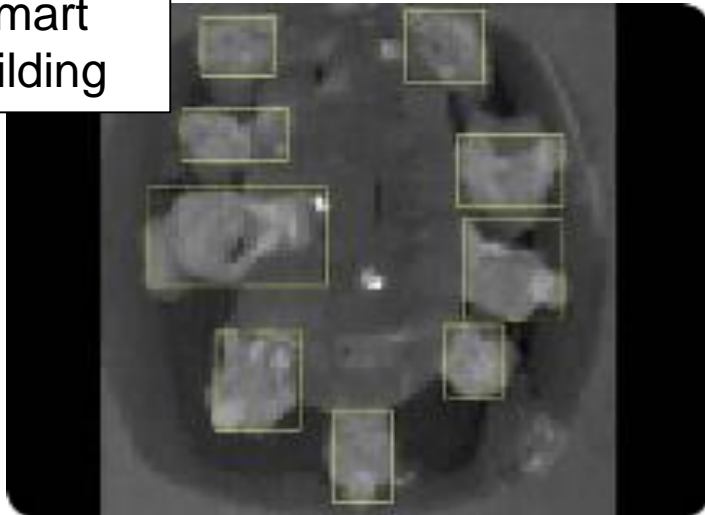
- New materials and designs
- New and more compact cooler adapted to the new operating temperature

Next generation microbolometer sensors

Automotive



Smart building



Low cost systems

→ Small pitch

→ New volume packaging solutions

Faster frame rate

→ Design optimization

Compact

→ New volume packaging solutions

Wrap-up

Product development:

- Many technology fields involved
 - Being expert in every single field is complicated
- ➔ We are paying attention to potential new solutions

Application development:

- Many potential applications for IR sensing
 - Identifying all of them is complicated
- ➔ We are paying attention to your needs in IR sensing and imaging

THANK YOU
FOR YOUR ATTENTION



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