

THALES

Building a future we can all trust



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Palaiseau

 EPIC

 *European Photonics
Industry Consortium*

EPIC online Technology Meeting on New
Developments for Microwave Photonics

www.thalesgroup.com

OPEN



Over **81,000**
employees 

68 
Countries
Global presence

1 bn € 
Self-funded R&D*
* Does not include externally financed R&D

Sales in 2020 
17 bn €

Thales's markets and mission

**Sensing
& data gathering**



**Data transmission
& storage**



**Data processing
& decision making**



Digital Identity and Security



Defence and Security



Aerospace



Space

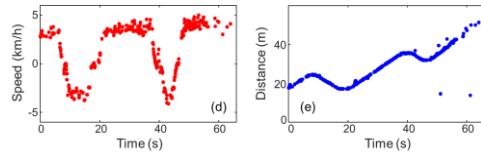


Ground Transportation

**We help customers master decisive moments by providing
the right information at the right moment**

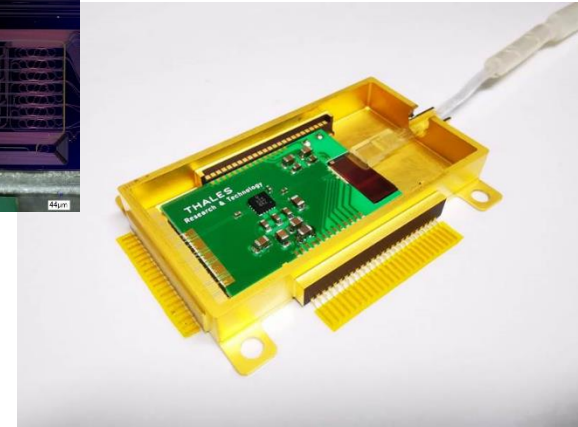
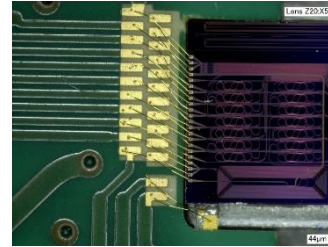
Photonic integrated circuits for Thales needs

Sensing
& data gathering



Multichannel FMCW LiDAR
SOI technology

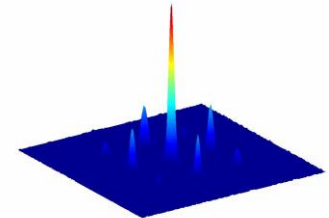
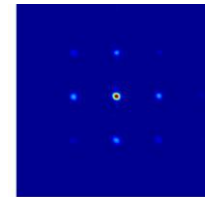
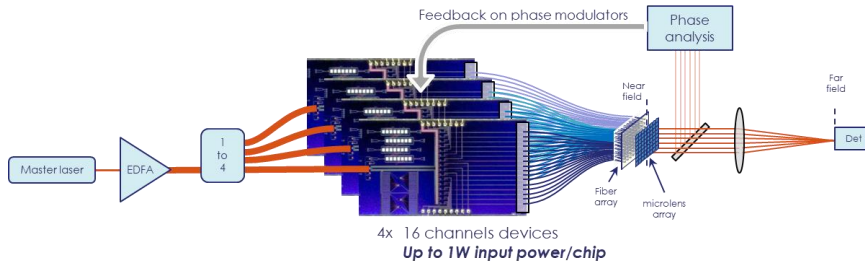
A. Martin et al, *JLT*, 36(19), 4640-4645 (2018).



Data transmission
& storage

2D Optical Phased Array
SOI technology

Data processing
& decision making



C. Scarcella et al, *Photonics* 3(1) MDPI (2016).

Photonic integrated circuits for Thales needs

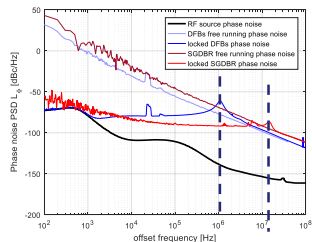
Sensing & data gathering



Data transmission & storage



Data processing & decision making



RF signal generation : on-chip OPLL
InP technology

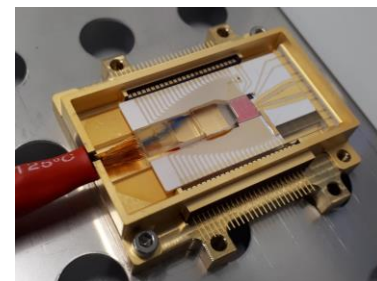
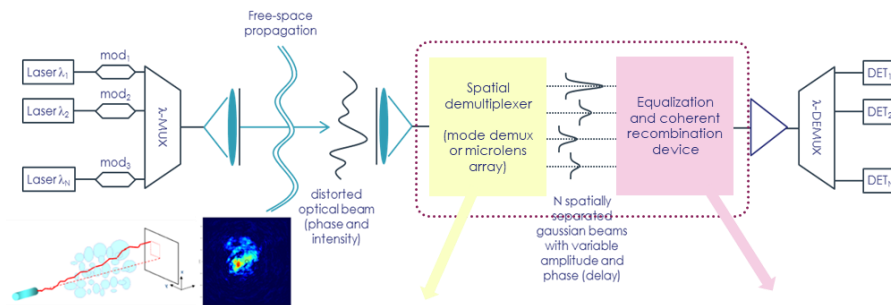
H2020 BLUESPACE

Optical / RF filtering
SiN technology



Beamforming network
SiN technology

Multimode receiver for free space communications
SOI technology

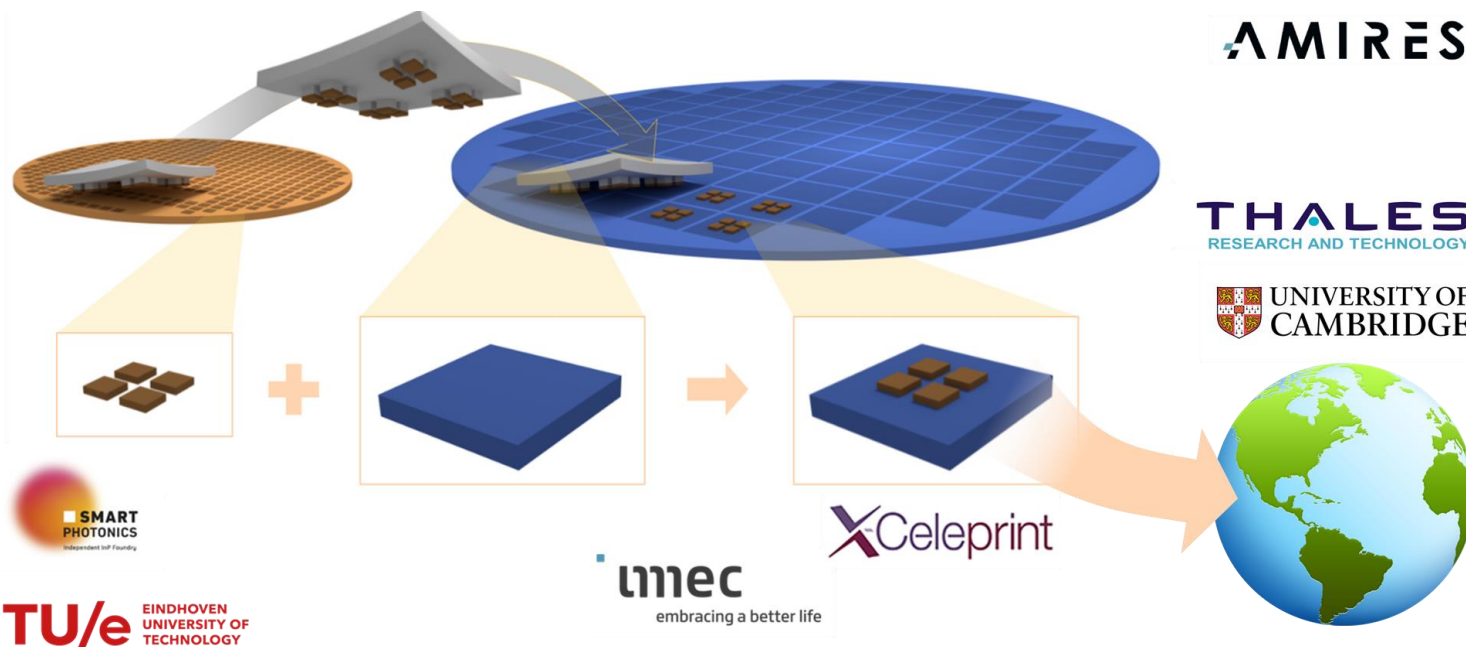


C. Scarcella et al, *Photonics* 3(1) MDPI (2016).

The INSPIRE project



Combining technologies by micro-transfer printing



AMIRES

THALES
RESEARCH AND TECHNOLOGY

UNIVERSITY OF
CAMBRIDGE

SMART
PHOTONICS
Independent IFF Foundry

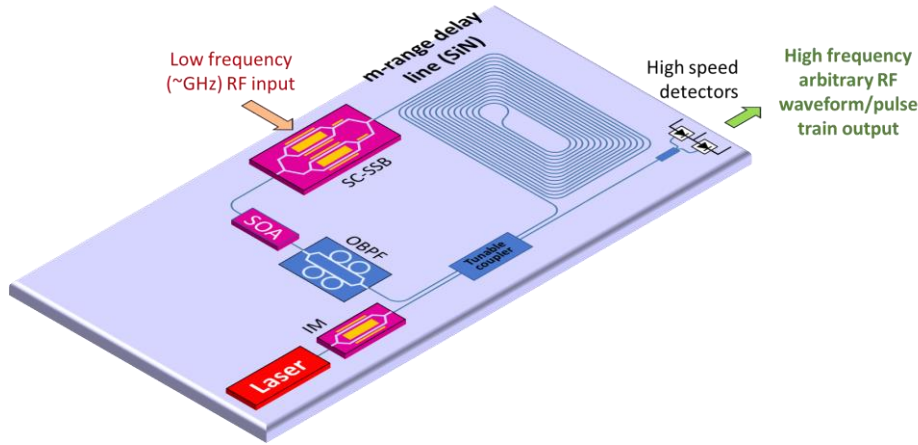
TU/e
EINDHOVEN
UNIVERSITY OF
TECHNOLOGY

imec
embracing a better life

X-Celeprint



PIC platform attributes	Indium phosphide	Silicon Nitride	Silicon (CMOS) photonics	INSPIRE
Light sources and amplifiers	✓✓✓	X	X	✓✓✓
Electrical energy efficiency	✓✓	X	✓✓	✓✓
Electro-optic speed	✓✓	X	✓✓	✓✓✓
Optical connect efficiency	✓	✓✓✓	✓	✓✓✓
Optical signal integrity	✓✓	✓✓✓	✓	✓✓✓
Robustness	X	✓✓	✓✓	✓✓
Production scalability	✓	✓✓	✓✓✓	✓✓✓
Active device scaling	✓	X	X	✓✓
Passive device scaling	✓	✓	✓✓✓	✓✓
Hosting exotic materials	✓	✓✓✓	X	✓✓✓
Route to 3D integration	✓	✓✓	✓✓✓	✓✓✓



Frequency shifting loop RF generator

Requires on-chip :

- Ultralow loss m-range delay line
- EO frequency shifter & modulator
- Optical amplifier
- Optical filter
- Narrow linewidth laser

Monolithic intergration mandatory for optical phase stability

Thank you !