



## Company Overview Wafer Fab Introduction

*April 2017*  
Nozay, France



**3S**  
**PHOTONICS**

3S Photonics is a trademark of 3SP Technologies S.A.S.

- **Company Overview**
  - The Genesis
  - 3SPT within O-Net Group
  - 3SP Technologies Overview
  - 3SPT Product Portfolio
- **Nozay Wafer Fab Introduction**
  - Know-how
    - Process Flow: from Epitaxy to Chip-on-Submount
    - Core competencies: Mastering InP & GaAs Technologies
  - Organization and Facilities
    - People / Facilities
    - Equipment
    - Capacities



# Company Overview



**3SPTechnologies**  
Source of Smart Solutions

**1994**

**Creation of Alcatel Optronics by the Alcatel Group**

Investments and R&D => €480m // Alcatel Optronics owns 450 patents worldwide

**2003**

**Acquisition of Alcatel Optronics by Avanex Corp. Company was renamed Avanex France**

**April 2007**

**Creation of 3S Photonics**

Leading world supplier of laser chips, discrete modules and optical components, sole player for the 980nm submarine pump market

Management team raised €7.8m from Venture Capital, including the French's Strategic Investment Fund (FSI) in order to proceed with some acquisitions

**February 2010**

**Acquisition of Avensys for €7.5m (incl. ITF Labs)**

**October 2011**

**Eurazeo acquires 83% of 3S Photonics Group for €37m**

**November 2011**

**3S Photonics acquires 100% of Manlight**, company specialized in optical amplifiers, fiber lasers and LIDAR.

Manlight fully merged with 3S Photonics SA in March 2012




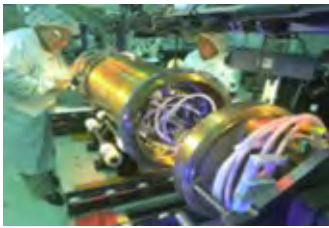



**October 2014**

**O-Net Communications (Group) Ltd acquires assets of 3S Photonics and creates 3SP Technologies**

**Global R&D, customer support and manufacturing footprint**



# 3SPT Market Segment Within O-Net

  	<b>Undersea</b> 	<b>Telecom/Datacom</b> 	<b>Fiber Laser</b> 	<b>Sensors</b> 
<b>Components</b>	<ul style="list-style-type: none"> <li>▪ 980nm Pumps</li> <li>▪ PIN Monitoring</li> <li>▪ GFF, slope filters</li> <li>▪ Undersea Gratings</li> <li>▪ TAP Couplers</li> <li>▪ WI &amp; WDM Couplers</li> </ul>	<ul style="list-style-type: none"> <li>▪ EA-laser modules</li> <li>▪ DML &amp; CW Lasers</li> <li>▪ 980nm pumps</li> <li>▪ DCF-based DCMs</li> <li>▪ VOA, Interleaver</li> <li>▪ GFF, Isolators, PD</li> <li>▪ Mux/Demux, TF</li> <li>▪ MPO/MTP</li> <li>▪ AOC &amp; Transceiver</li> </ul>	<ul style="list-style-type: none"> <li>▪ 1064nm Seed Lasers</li> <li>▪ N:1,N+1:1 combiner/splitter, PM and kW class devices</li> <li>▪ MFA, End cap, HR &amp; Output Coupler Gratings</li> </ul>	<ul style="list-style-type: none"> <li>▪ Unpackaged FBG</li> <li>▪ Temperature sensors</li> <li>▪ Strain sensors</li> </ul>
<b>Assemblies</b>		<ul style="list-style-type: none"> <li>▪ “Build to print” Amplifier modules</li> </ul>	<ul style="list-style-type: none"> <li>▪ Amplifiers</li> <li>▪ Customized Fiber lasers</li> </ul>	<ul style="list-style-type: none"> <li>▪ Packaged fiber-based sensors</li> </ul>
<b>Engineering services</b>	<ul style="list-style-type: none"> <li>▪ Custom GFF design</li> </ul>	<ul style="list-style-type: none"> <li>▪ Line card (Blade) - assembly &amp; test</li> <li>▪ Back-end wafer processing</li> </ul>	<ul style="list-style-type: none"> <li>▪ Fiber laser and amplifier module design</li> </ul>	

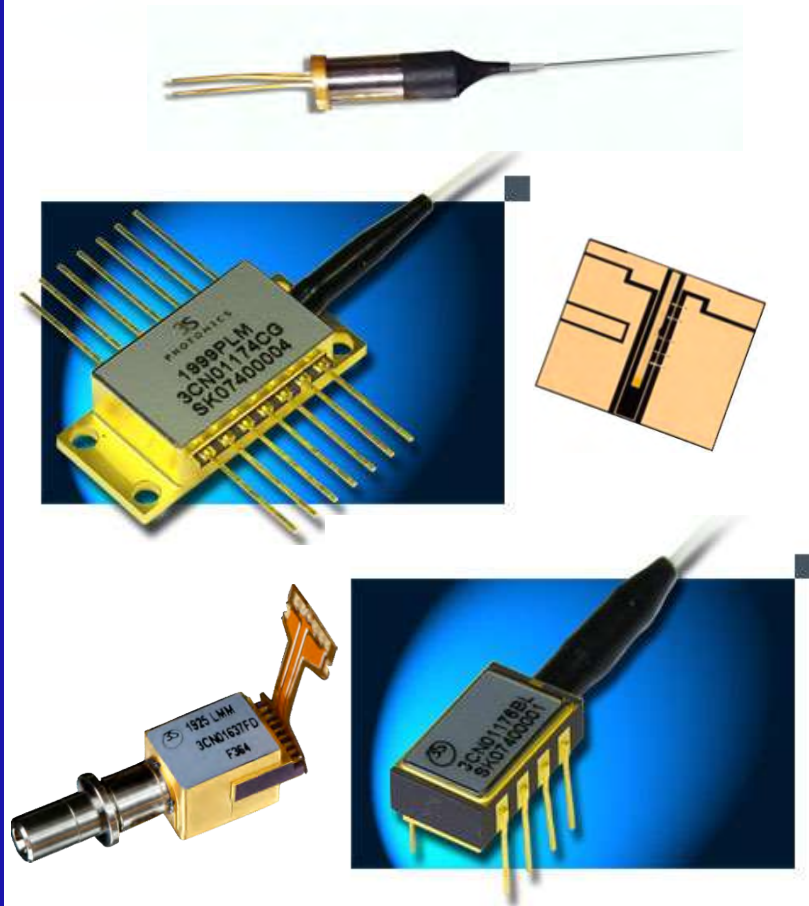
- **Founded in October 2014**
  - Share capital: 1,800,000 Euros
  - Shareholder: Advance Photonics Investments Ltd (Hong Kong)
  - Under management contract with O-Net Communications
    - President: Mr Austin NA
    - General Manager: Mr Yannick BAILLY
- **Location**
  - Nozay (France): Approx. 8,250 sqm facilities
- **Main activity**
  - Design & manufacturing of laser chips & modules
- **2 subcontractors for back-end & packaging activities**
  - Coset (Gwangju, Korea)
  - O-Net (Shenzhen, China)
- **95 employees**
- **Sales revenue: 13 M€ in 2015, 18 M€ in 2016**
  - 95% of turnover from exports



- **Multiple R&D sites**
  - Chip and CoS: 3SP Technologies (Nozay, France)
  - Packaging:
    - ✓ O-Net (San Jose, USA; Shenzhen, China): design / process development
    - ✓ Coset (South Korea): design / process development
    - ✓ 3SP Technologies (Nozay, France): technical support
- **Three production sites**
  - One site for chips and chip on submount (CoS)
    - ✓ Since 1994, production site in 3SP Technologies (France)
  - Two sites for Modules
    - ✓ Since 2007, production site in Coset (South Korea)
      - Mini-Dil, 14 pin Butterfly, 10 pin mini-Butterfly
    - ✓ Since 2016, production site in O-Net (Shenzhen, China)
      - TO can, 14 pin Butterfly



- 980nm uncooled 8-pin Mini-DIL – up to 300mW
- 980nm cooled 14-pin BTF – up to 950mW
- 14xxnm cooled 14-pin BTF – up to 500mW
- 1064nm cooled 14-pin BTF – up to 500mW
- 10-pin Mini-BTF 980nm cooled – 450 to 680 mW (Q317)
- 10-pin Mini-BTF 980nm semi-cooled – 440-540mW (Q317)
- 10-pin Mini-BTF 980nm cooled – 700 to 950 mW (Q417)
- 10-pin Mini-BTF 980nm semi-cooled – 600-750mW (Q118)
  
- 980nm cooled 14-pin BTF Gen2 – 450-680mW
- 980nm semi-cooled 14-pin BTF Gen2 – 440-540mW
- 980nm cooled 14-pin BTF Gen2 – 700-950mW (Q4 17)
- 980nm semi-cooled 14-pin BTF Gen2 – 600-750mW (Q1 18)
- 980nm uncooled TO can – 50-200mW (Q1 18)
  
- ◆ C-Band Cooled 10G DWDM EML Laser
- ◆ C-Band Cooled CW & 2.5G DWDM DFB Laser
- ◆ Wide Band PIN Photodiode
- ◆ 25G 850nm VCSEL and PIN-PD



- Korea
- Shenzhen
- ◆ France

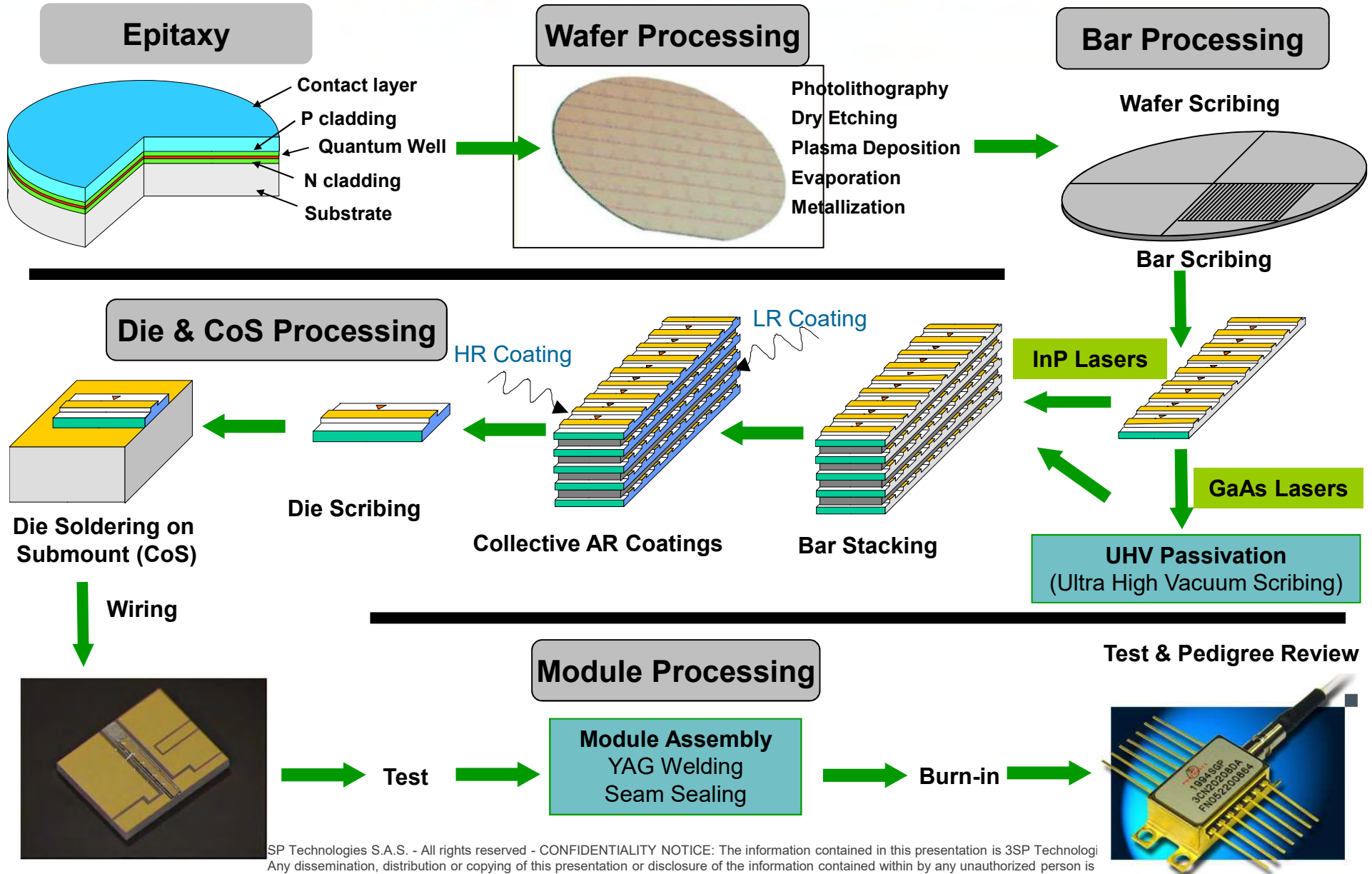


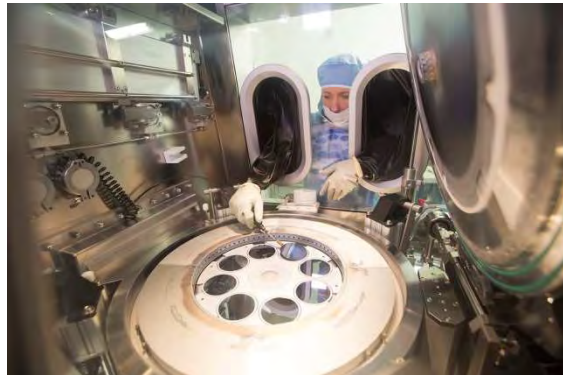
# Wafer Fab Introduction



**3SPTechnologies**  
Source of Smart Solutions

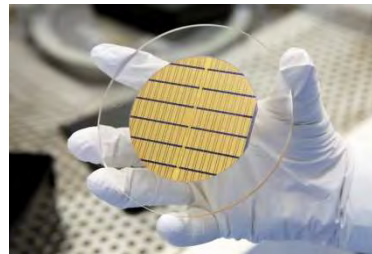
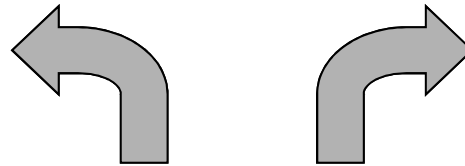
# Process Flow From Epitaxy to Chips on Submount





**Material Growth**

**Masking**

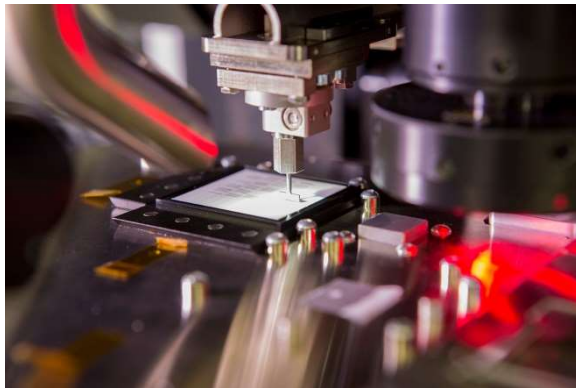


**Process Control**

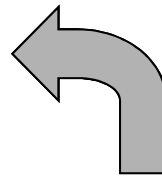
**Thin Films**



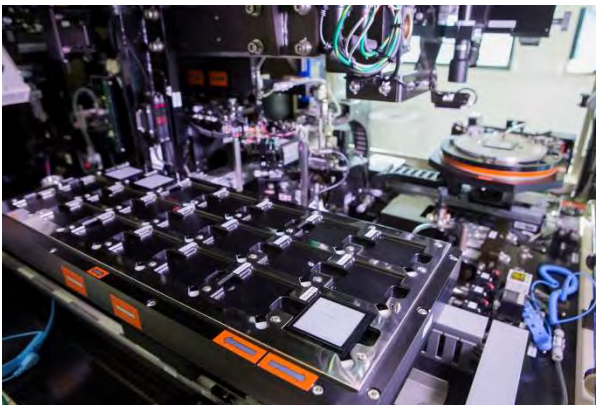
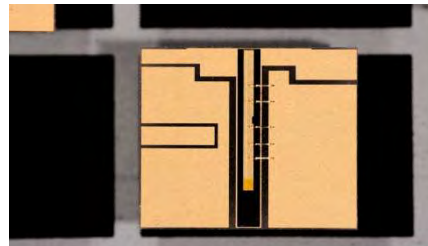
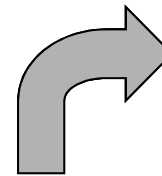
**Strong Technical & Industrial Experience in Optoelectronic Wafer Processing**  
**Unique « Building Block » Approach - Scalable Production Capacity**



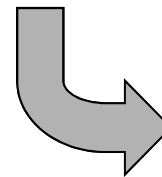
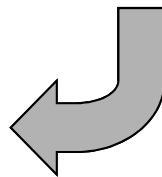
**CoS Assembly**



**Bonding**



**Pick and Place**



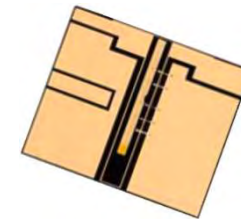
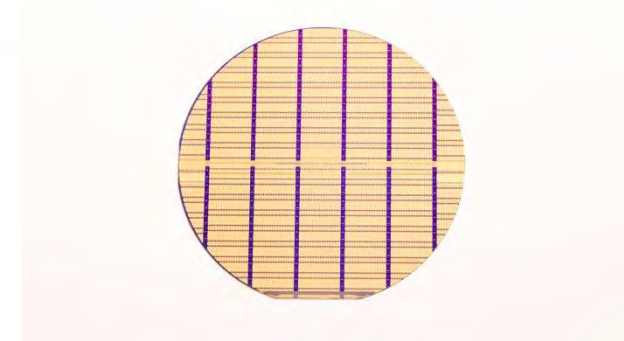
**Burn-in**



**Strong Technical & Industrial Experience in Optoelectronic Die Assembly**  
**Scalable Production Capacity**

## ▪ **PRODUCTION Nozay**

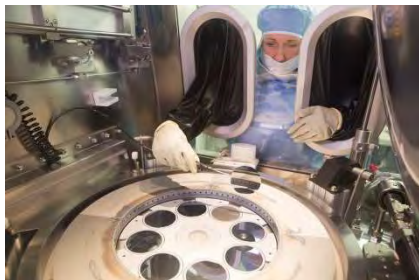
- **Manufacturing => 5 workshops**
  - Epitaxy – Wafer Processing – Bar – Die - CoS
  - 3 engineers and 26 workers
- **Process and Products Engineering**
  - 6 engineers and 2 technicians
- **Facilities and Maintenance**
  - 2 engineers and 2 technicians



## ▪ **Nozay Factory => Total facilities = 8,250 m<sup>2</sup>**

- |               |                      |   |
|---------------|----------------------|---|
| – Offices     | 900 m <sup>2</sup>   |   |
| – Workshops   | 650 m <sup>2</sup>   |   |
| – Clean Rooms | 2,100 m <sup>2</sup> | (ISO 6 and ISO 7)                                 |
| – Technical   | 4,200 m <sup>2</sup> | (Vacuum/Exhaust – Gas distribution – Air control) |
| – Others      | 400 m <sup>2</sup>   |   |

- **Epitaxy**
  - 1x MBE (InP), 2x MOVPE, X-Ray, PL map, C(V) Profiler
- **Wafer Processing**
  - 1x DFB grating holographic bench, 2x Mask aligners, 2x PECVDs, 2x RIE, 1x RIE-ICP, 1x Evaporator, 2x Sputters, 2x IBE, 1x Lapping/polish, 2x Alloying Ovens, Profilers
- **Bars & Dies**
  - 2x home-made UHV passivation (GaAs), bar stacking, IB coater, Evaporator, Ellipsometer, Reflectometer, 2x Probe-testers, 1x auto & 4x manual Die scribing (Loomis)
- **Chips on Submount**
  - 1x auto & 3x manual Die-bonders, 2x Wire-bonders, 6x CoS Testers, BI CoC-2A with approx. 4,000 slots



## ■ GaAs-based Technologies

- 980 Pump Dies 500k dies
- VCSEL Dies 2 000k dies

## ■ InP-based Technologies

- 14XX Pump Dies 250k dies
- DFB LASER Dies 2 000k dies
- 10G EML Dies 500k dies
- Detectors 2 000k dies





**Thank You !**



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