



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




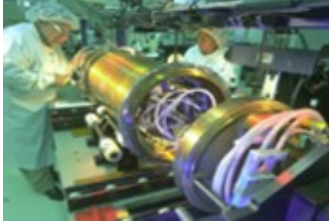



October 2014

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

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

- **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

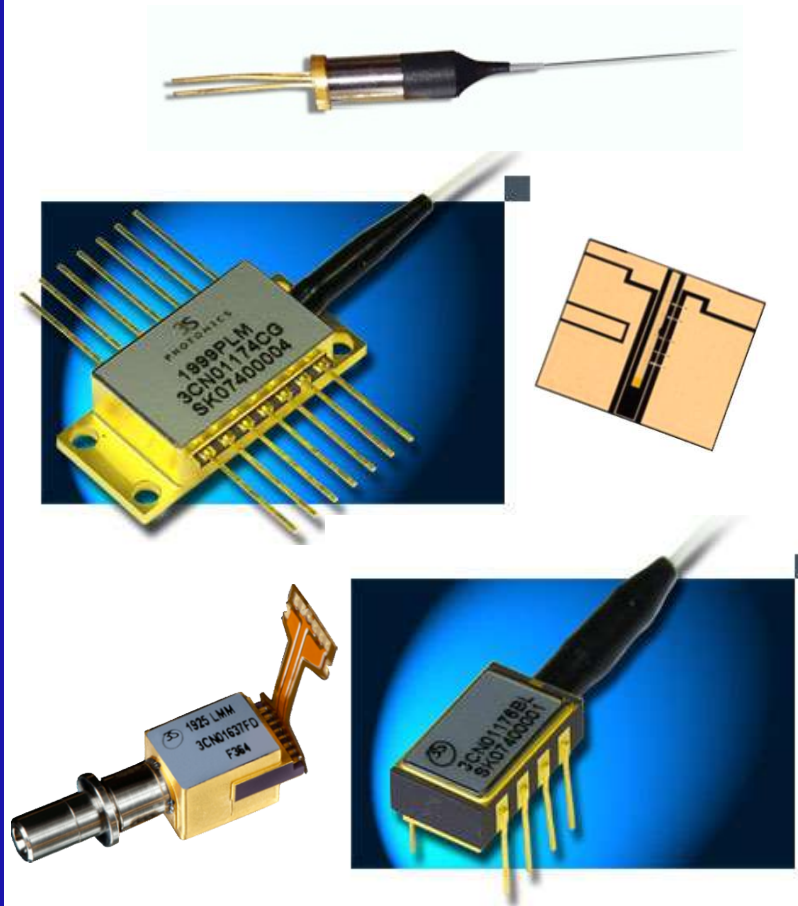


- **Multiple R&D sites**
 - Chip and CoS: 3SP Technologies (Nozay, France)
 - Packaging:
 - ✓ O-Net (San Jose, USA; Shenzhen, China): design / process development
 - ✓ Coset (South Korea): design / process development
 - ✓ 3SP Technologies (Nozay, France): technical support
- **Three production sites**
 - 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

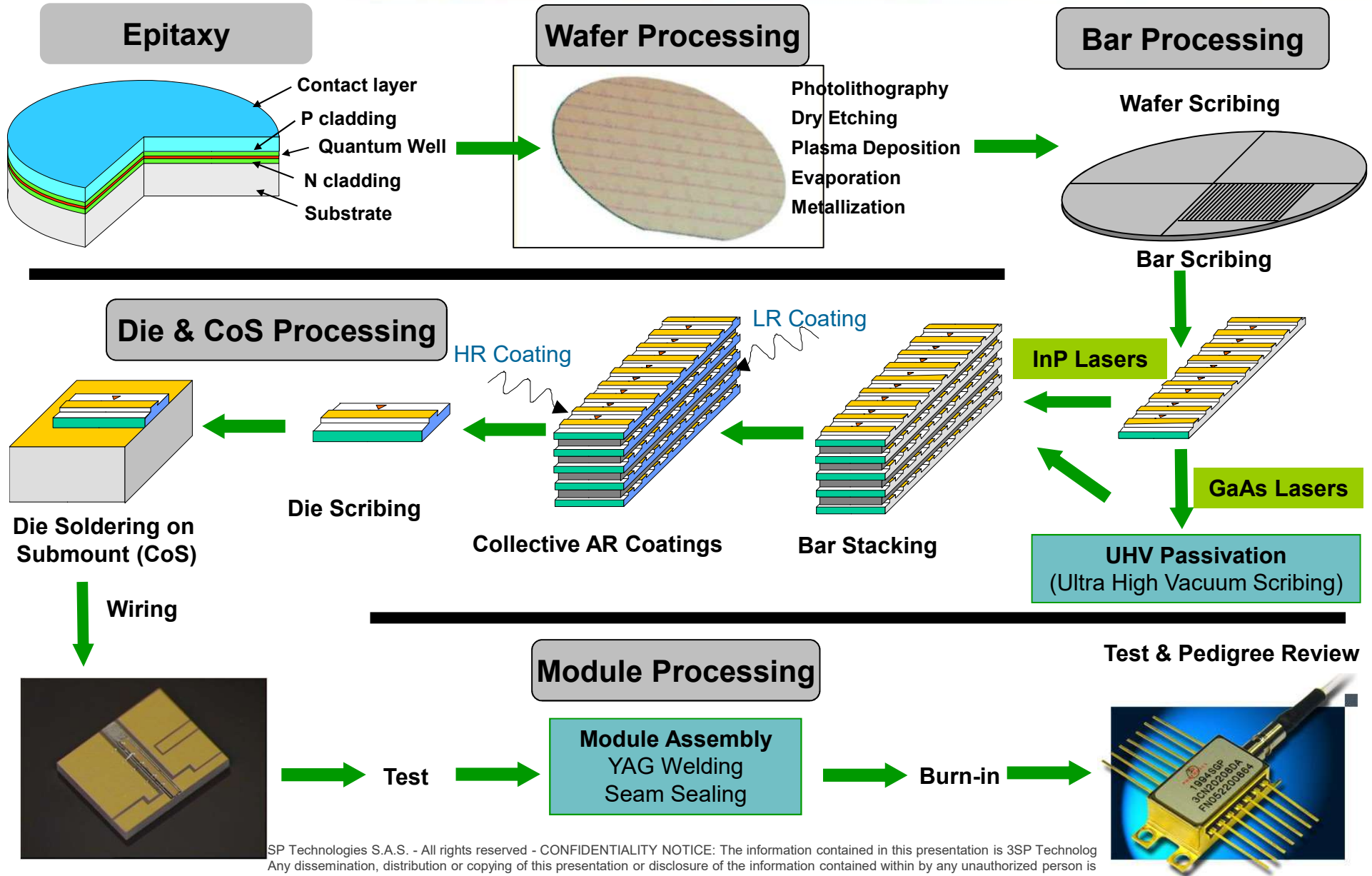


Wafer Fab Introduction



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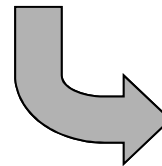
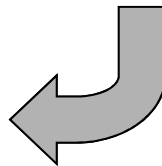
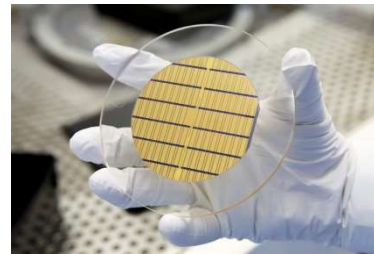
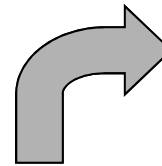
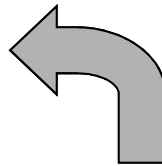
Process Flow From Epitaxy to Chips on Submount





Material Growth

Masking

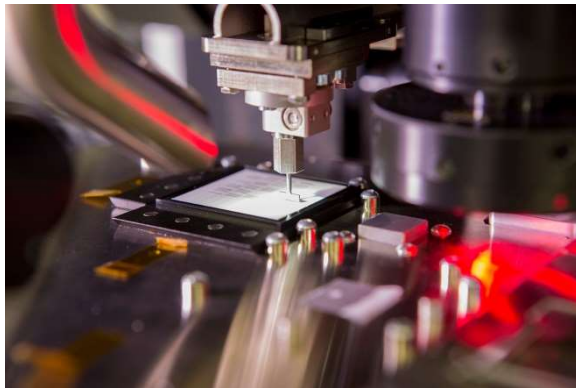


Process Control

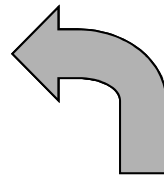
Thin Films



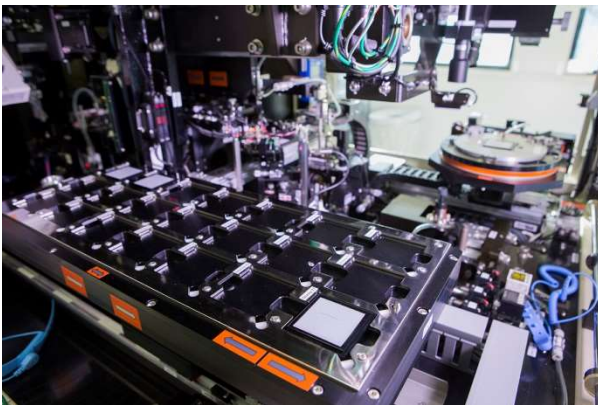
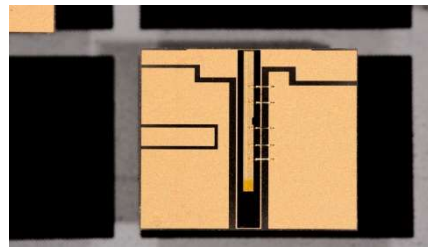
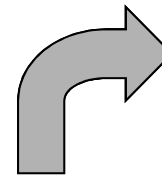
Strong Technical & Industrial Experience in Optoelectronic Wafer Processing
Unique « Building Block » Approach - Scalable Production Capacity



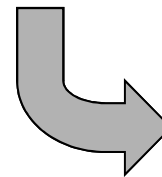
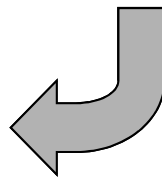
CoS Assembly



Bonding



Pick and Place



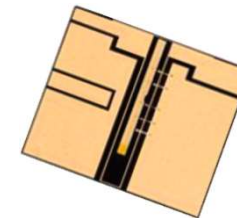
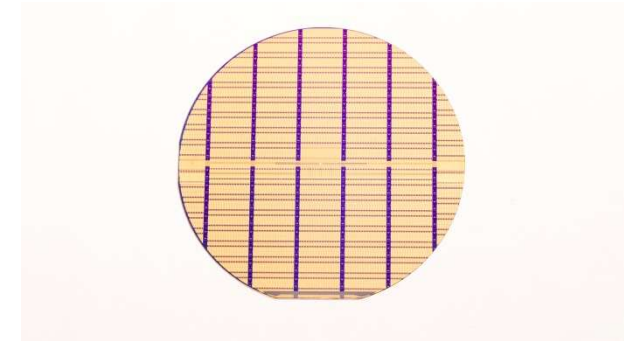
Burn-in



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

▪ **PRODUCTION Nozay**

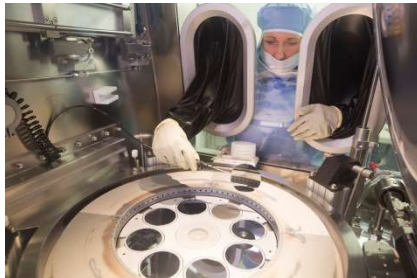
- **Manufacturing => 5 workshops**
 - Epitaxy – Wafer Processing – Bar – Die - CoS
 - 3 engineers and 26 workers
- **Process and Products Engineering**
 - 6 engineers and 2 technicians
- **Facilities and Maintenance**
 - 2 engineers and 2 technicians



▪ **Nozay Factory => Total facilities = 8,250 m²**

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

- **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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