



xfab

From academic research to the industry

Valerio Pasquali

NVM 180nm leader (Staff engineer, XFAB France)

GDR Pulse - Porquerolles 08/07/2021

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Introducing my-self

Scientific background



Università di Roma Tor Vergata

09/2013 -05/2014

Internship on nanodiamond growth by CVD – Bachelor Material Science (S.Orlanducci/M.L. Terranova)

Fabrication by CVD and characterization by SEM and Raman of nano-diamond structures on silicon for application as field-effect emitters.



Università di Roma Tor Vergata

09/2013 -05/2014

Internship on semiconductor crystal growth by MBE – Master Material Science (E.Placidi/F. Arciprete)

Study of Indium surface diffusion on GaAs structured substrates. During this project I learned the fundamentals of the epitaxial growth of III-V semiconductor by MBE and the characterization by AFM.



Université Sorbonne (previous UPMC)

PhD : “Fabrication and characterization of strain-free GaAs/AlAs quantum dot devices” (P.Atkinson/M.Marangolo)

09/2014 -09/2017

Developing an optical read-out system for single electron quantum processing: The aim of this project was to create a device that can convert a “flying single electron” quantum bit to a single photon, to provide a rapid (GHz) optical read-out for single electron quantum computing. The device consisted of a 2D p-n junction containing embedded self-assembled quantum dots.



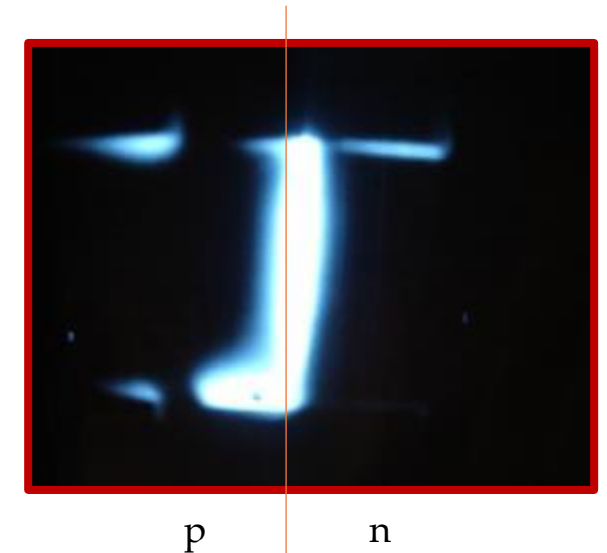
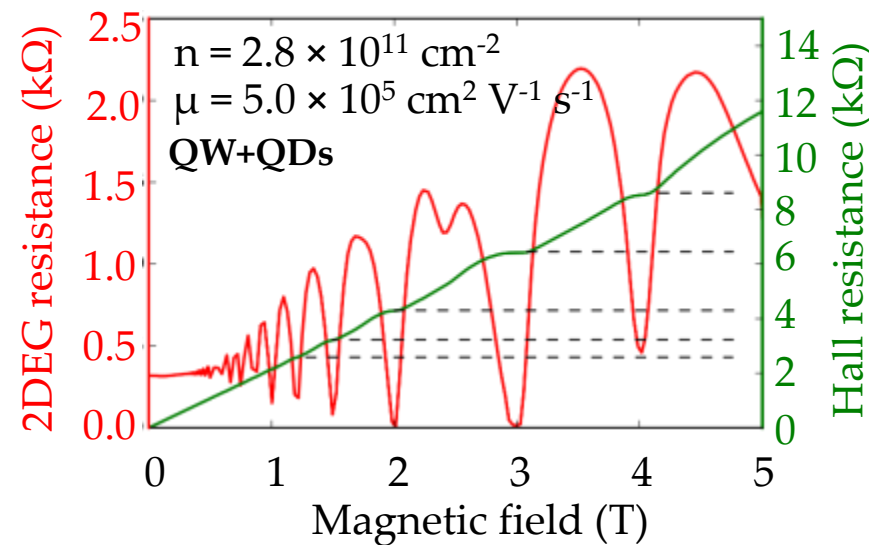
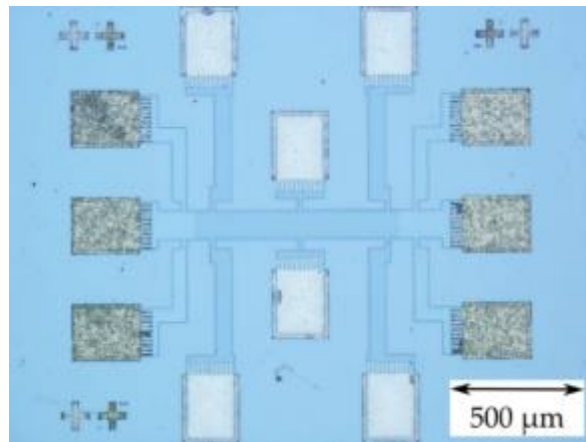
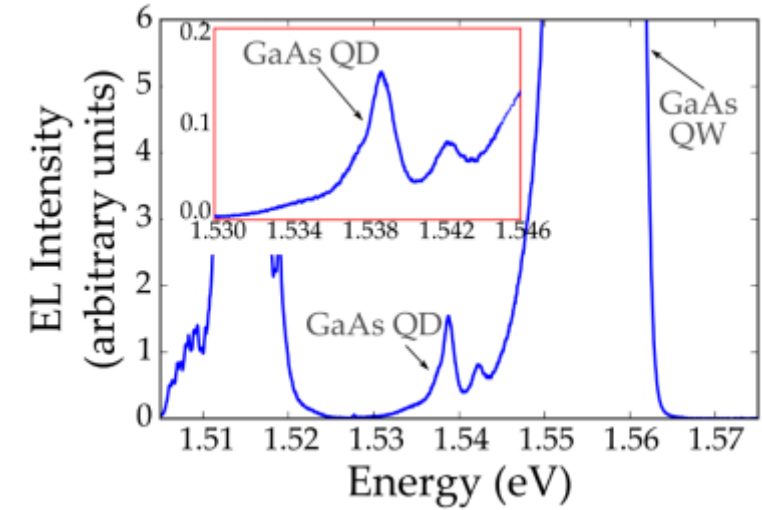
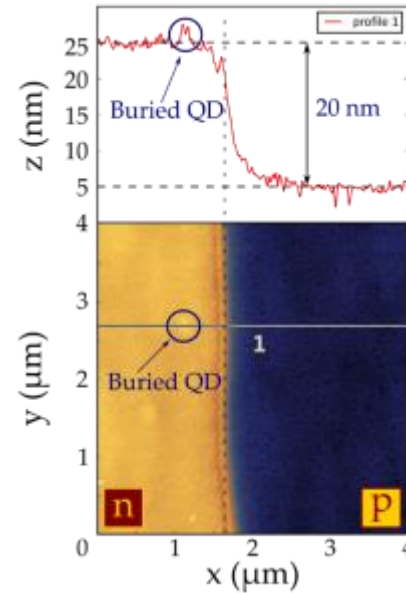
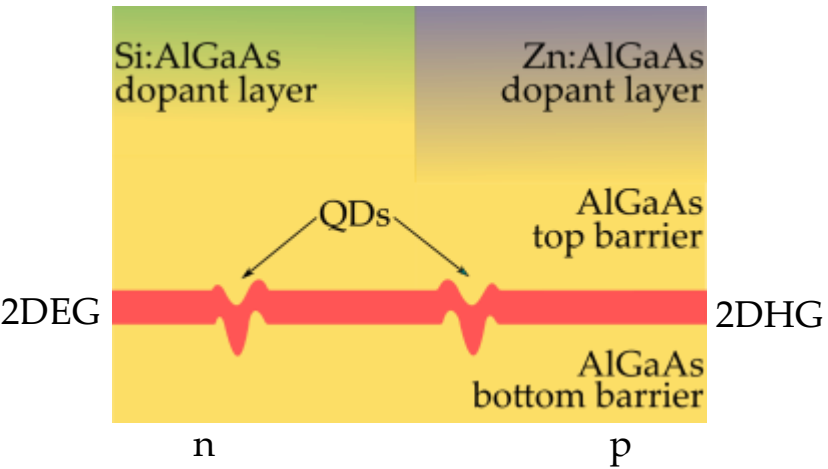
University of Cambridge and NPL Teddington

01/2017 -09/2017

Visiting and scientific collaboration (A. Naseer/M. Kataoka)

Modelling, fabrication and characterization of a 2D LED based on 2DEG GaAs/AlGaAs heterostructures grown by MBE where a 2DHG locally replaced the 2DEG by using a proximity doping technique.

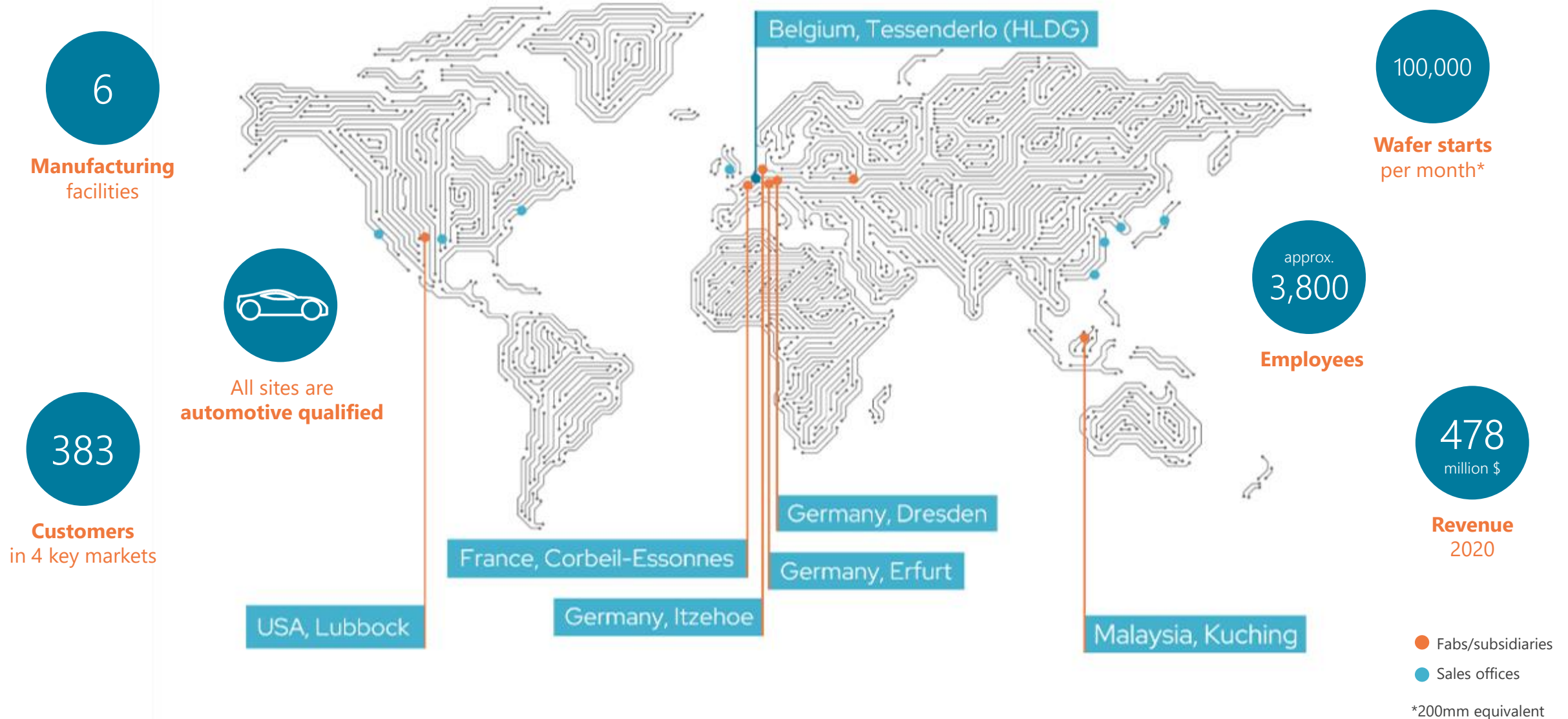
PhD project: QD baded devices





About XFAB

X-FAB at a glance





Kuching, Malaysia

Process focus:
CMOS, HV-SOI

Capacity:
30,000 wafer
starts per month

Wafer size:
8"

Main nodes:
350 nm, 250 nm,
180 nm



Erfurt, Germany

Process focus:
CMOS, MEMS,
BiCMOS, SOI

Capacity:
21,000 wafer
starts per month

Wafer size:
6" for CMOS,
6" + 8" for MEMS

Main nodes:
1.0 μm , 0.8 μm ,
0.6 μm



Dresden, Germany

Process focus:
CMOS, GaN-on-Si,
MEMS

Capacity:
8,000 wafer
starts per month

Wafer size:
8"

Main nodes:
0.6 μm , 350 nm



Itzehoe, Germany

Process focus:
MEMS

Capacity:
n/a

Wafer size:
8"

Main nodes:
n/a



Corbeil, France

Process focus:
CMOS, RF-SOI

Capacity:
35,000 wafer
starts per month

Wafer size:
8"

Main nodes:
180 nm, 130 nm



Lubbock, TX, USA

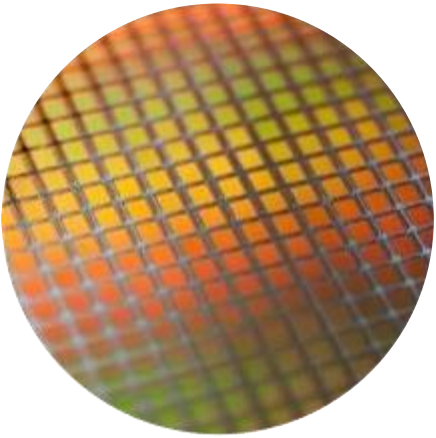
Process focus:
SiC, CMOS,
BiCMOS, SOI

Capacity:
26,000 wafer
starts per month

Wafer size:
6"

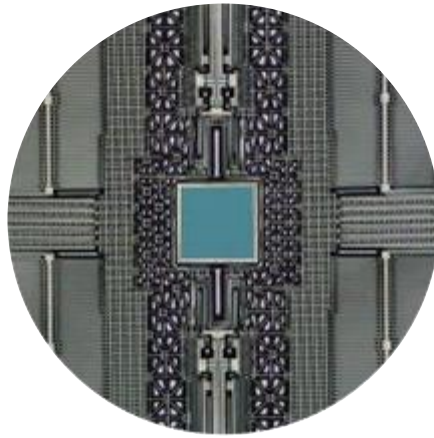
Main nodes:
1.0 μm , 0.8 μm ,
0.6 μm

All quoted capacity numbers exclude MEMS



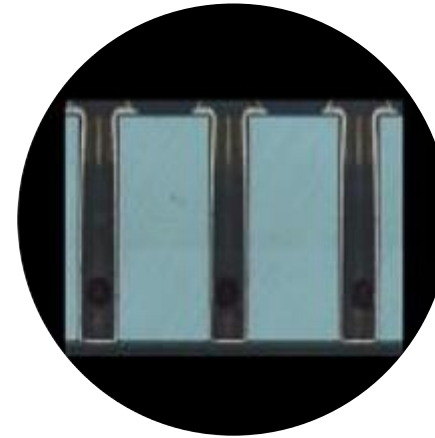
CMOS & SOI

13 process families with over 450 options



MEMS

MEMS with or without integrated CMOS



Heterogeneous integration

3D integration and wafer level package solutions

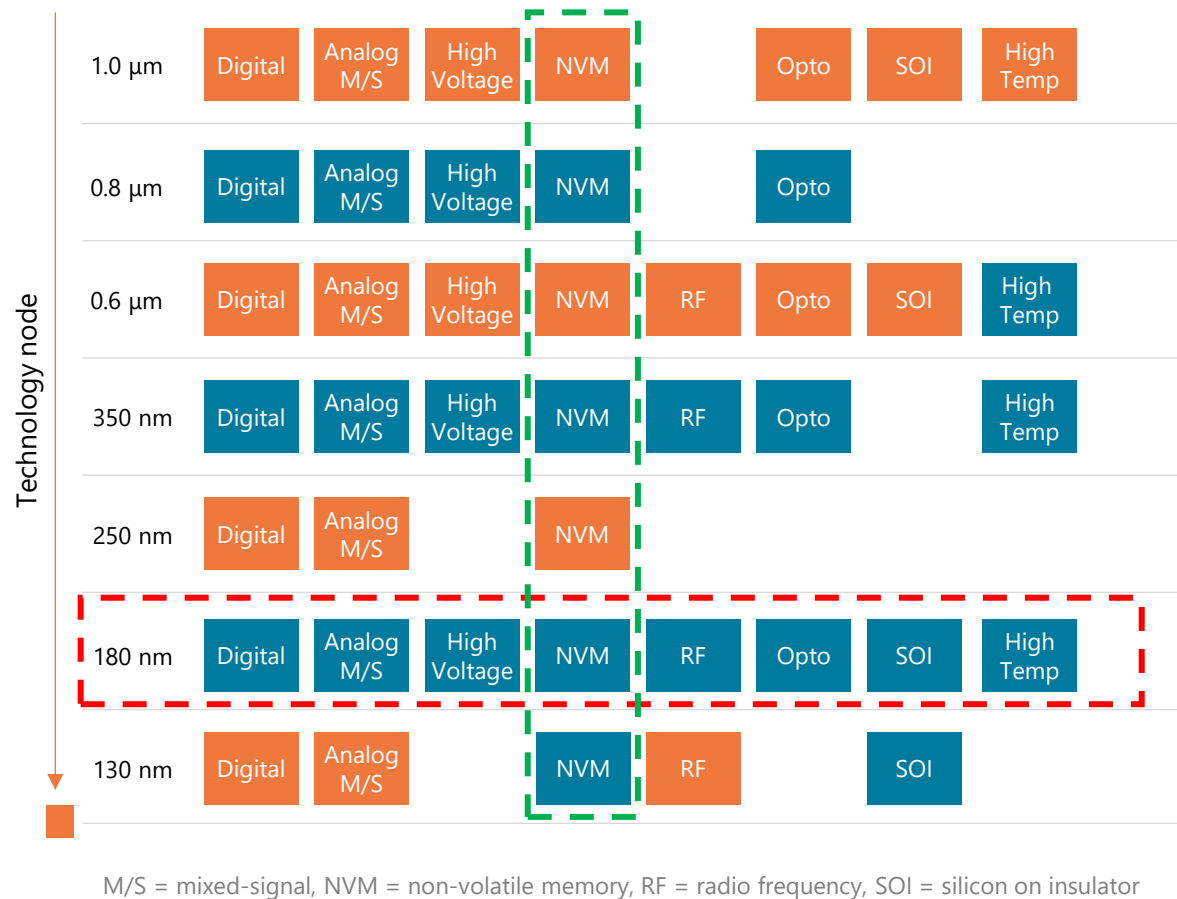


SiC & GaN

First 6-inch SiC foundry offering worldwide

CMOS & SOI offering

Large portfolio of CMOS/SOI process technologies



- **Coordinate the process transfer from production/R&D to production for the NVM option:**
 - Define the process flow in strict collaboration with the transfer source and the internal process team
 - Design experiments to study the electrical and physical properties of the NVM devices and assess their behaviour by varying process parameters
 - Analyse electrical and physical parameters
 - Choose with the team the most appropriate investigation approach to address electrical/physical failures: e.g. SEM, TEM, AFM, SIMS, μ -probing and so on.
 - Follow the reliability tests for the qualification of the automotive products including the NVM option
- **Support the Yield Enhancement team on the NVM topics:**
 - Collaborate with the YE team to identify the root cause behind customer issues: e.g. process defectivity and equipment issues
 - Define experiments to address customer issues and yield improvement
- **Interface between the R&D NVM team (based in Germany and Malaysia) and the process team in France**
 - Bring NVM knowledge/expertise from R&D team to process/production team
 - Coordinate process improvements for the NVM devices

From the academia to the industry

Some information about my choice

> **Why did I decide to leave the university for the industry ?**

- Willing to see an immediate impact of my work
- Curious to discover new topics: bring products from R&D to mass production and project management
- Geographic and economic stability
- Work in future as an interface between the industry and the academic research

> **How did I find the position in XFAB ?**

- I started to send CVs around ~6 months before the end of my PhD
- I mainly used two on-line platforms: APEC (French platform) and LinkedIn

> **What did help me to get the position ?**

- Knowledge on semiconductor devices and experience on charge trapping systems
- Direct experience in clean room fabrication and device characterization
- Experience on a multidisciplinary project
- A class organized by Sorbonne university to help PhD students to get a job in the private sector
- Experience working in international environments

The benefits of a PhD for the industry

> **Strong technical skills and experience on multidisciplinary projects:**

- Developing a deep knowledge in a specific domain
- Capability to transpose this knowledge to different type of systems: e.g. materials, devices, simulation, theory
- The student directly works on several topics: theory, simulation, programming, fabrication, characterization
- The student interacts with a different background (scientist, engineers, technicians, other students)
- Mentoring students → training new colleagues

> **Acquisition of a set of transferable skills**

- Capability to communicate to different type of audiences
- Create project timelines and adapt them depending on unexpected events
- Developing a critical reasoning
- Capability to navigate the scientific literature
- Manage budget : e.g. to buy software, hardware, lab equipment, to participate to conferences
- Work in a multicultural environment

What opportunities in the industry after a PhD

Post-doc

Design

Big data

R&D

Modelling

Consulting

Characterization
and test

Project
management

Process

Programming

Create your
own start-up



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Thank you.



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