Meeting on technological progress in semiconductors

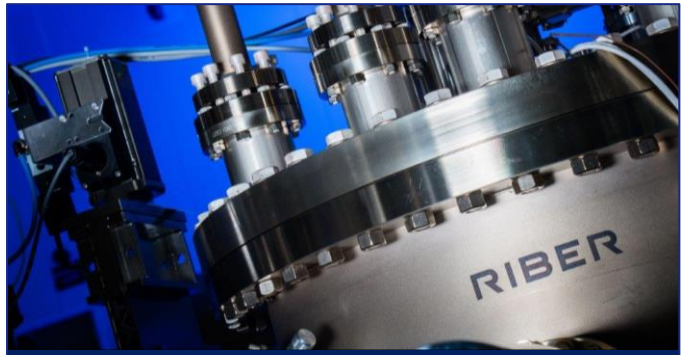
Philippe Ley, RIBER CEO

November 30, 2021

RIBER

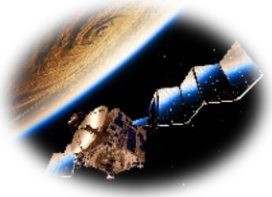
RIBER’s profile

- Global market leader for Molecular Beam Epitaxy (MBE) machines, used to manufacture compound semiconductors and complex materials under ultra-high vacuum.
- Thanks to its know-how, Riber has also diversified into the field of evaporators for the OLEDs (organic LEDs) and photovoltaic (PV) industry.
- Riber’s equipment enable to produce very high-performance electronic and photonic components.
- Technological expertise recognized worldwide.
- A company with the resources needed to ensure its development.

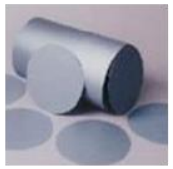


- Over 55 years of experience
- Around 750 MBE machines in operation
- Over 90% of revenues generated abroad
- 120 employees, including 80% engineers



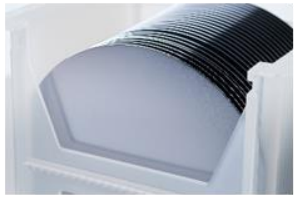

RIBER in the compound semiconductor value chain



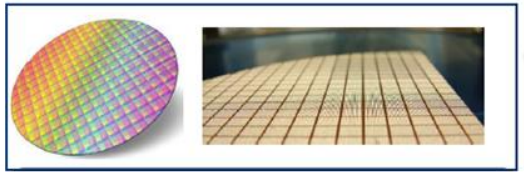
RAW wafer
With no
epitaxy

RIBER

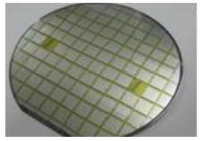
Equipment



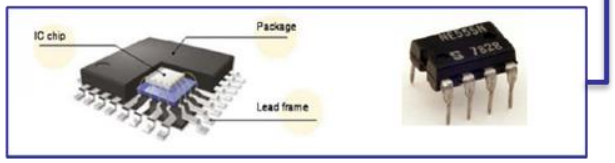
Epiwafer



Front end wafer
(litho, etching, metallization)



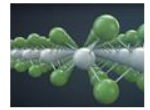
Chips: dies-on-wafer



Back-end assembly

- Fundamental research
- RF
- Sensing
- Data com
- MicroLED
- Beyond CMOS

End products






RIBER

Wafer → Epiwafer → Device → Module → End application

At the heart of today's applications ...

Sterilization and disinfection by UV LEDs

AsahiKASEI

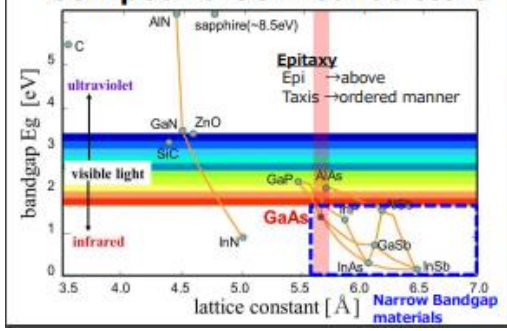
Materials: Growth capability

"Key technology"

High quality & thin film growth of antimonide materials

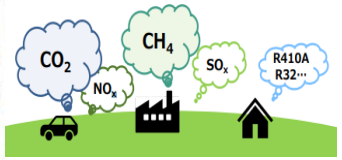
Antimonide on GaAs substrate ➧ Highly mismatched

Compound Semiconductors



MBE system

RIBER MBE49



RIBER delivers MBE system to Teledyne Imaging Sensors for the fabrication of high performance infrared imaging sensors.

These infrared sensors are used in major NASA missions such as the Hubble Space Telescope, James Webb Space Telescope, GOES weather satellites and the Mars Reconnaissance Orbiter. Teledyne also supplies infrared detectors to European Space Agency missions: Euclid dark energy mission and JUICE mission to Jupiter.

TELEDYNE IMAGING SENSORS Everywhereyoulook™

RIBER

… and those of tomorrow

AUTOMOTIVE SENSORS

imec
embracing a better life

IntelliEPI

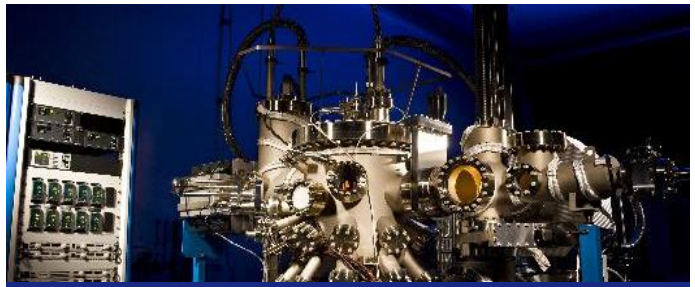
VCSEL FOR 3D SENSING

Superconducting materials for quantum computers

EpiCentre
LAAS CNRS - RIBER

RIBER

Value propositions - Equipment



Research laboratories: MBE

Client needs

Stability, process reproducibility, configuration flexibility

Riber's Solutions

Configurable, instrumented, automated platforms

The widest offer on the process market

Industrial company: MBE

Client needs

Yield, operational costs, reliability

Riber's Solutions

Automation, process optimization, traceability

Most capacitive equipment on the market - MBE8000

Industrial company: Evaporators

Client needs

Speed and uniformity of the deposit on large surfaces, yield

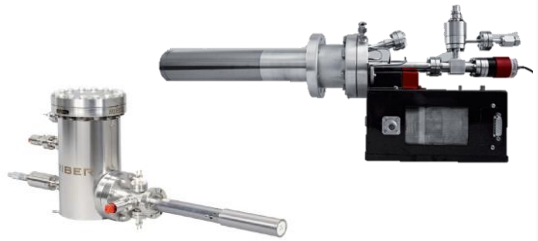
Riber's Solutions

Range of evaporators suitable for manufacturers' machines

Integration on OLEDs and PV production lines

Value propositions - Components and services

MBE components



Client needs

Improved performance (components) and ergonomics (automation and software)
Fitting of new components

Riber's Solutions

Catalog of spare parts, accessories and sources
Retrofit and upgrade of machines on customer site

Services

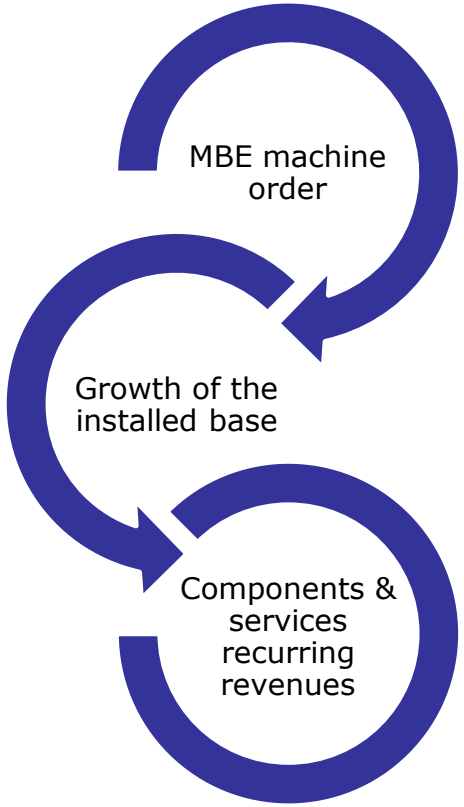
Client needs

Technical and scientific support
Replacement of obsolete components
Curative or preventive maintenance

Riber's Solutions

Repair of equipment and components in the factory
Curative or preventive intervention on customer site

A virtuous leveraged model



A sustainable growth base for RIBER

An ecosystem of partnerships

R&D on new materials, instrumentation

New processes, pre-production

Passivation

Mass production

Photovoltaic

RIBER

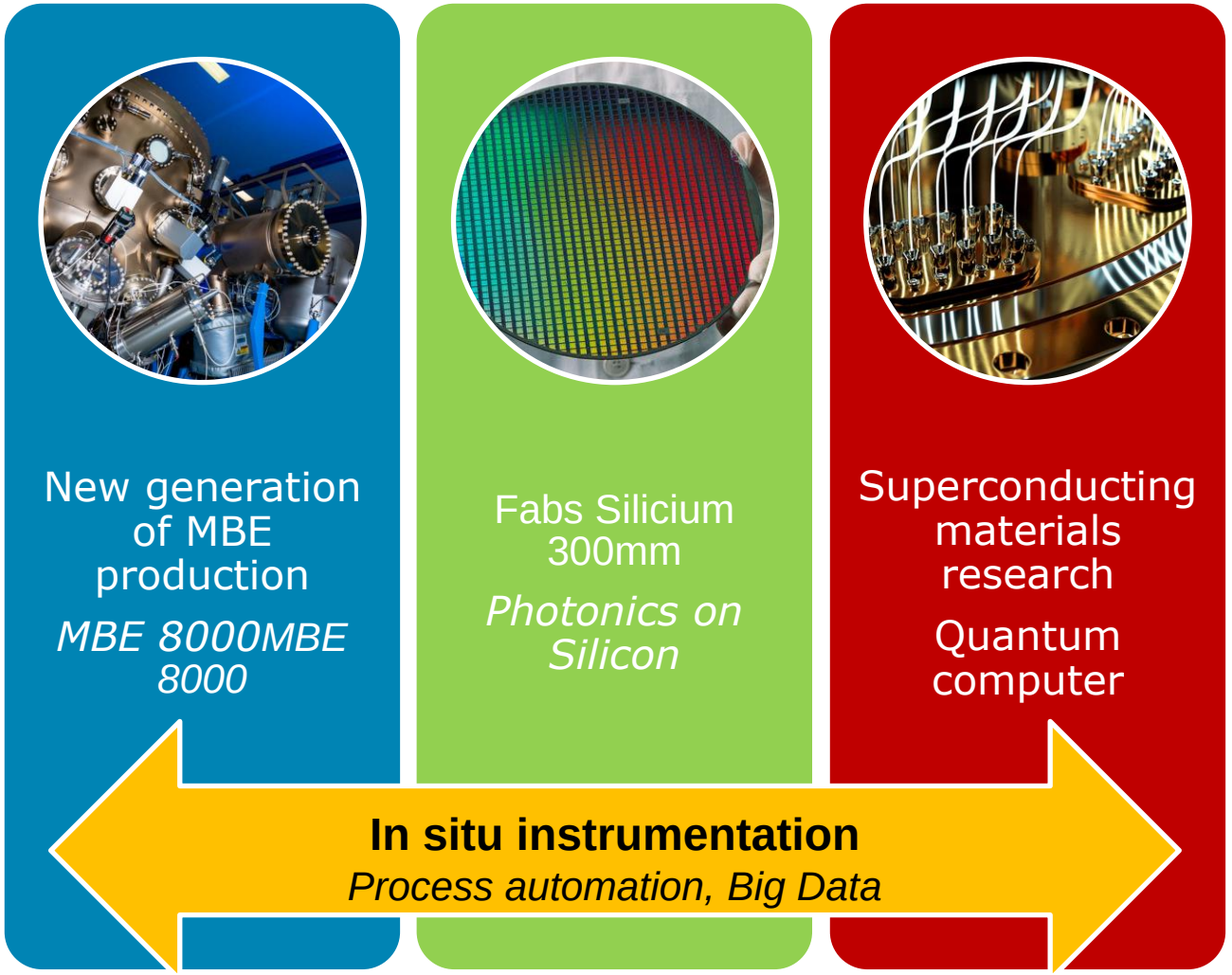
Major strategic axes

In situ instrumentation.

- Essential technological brick for advanced process control, machine learning and industry 4.0

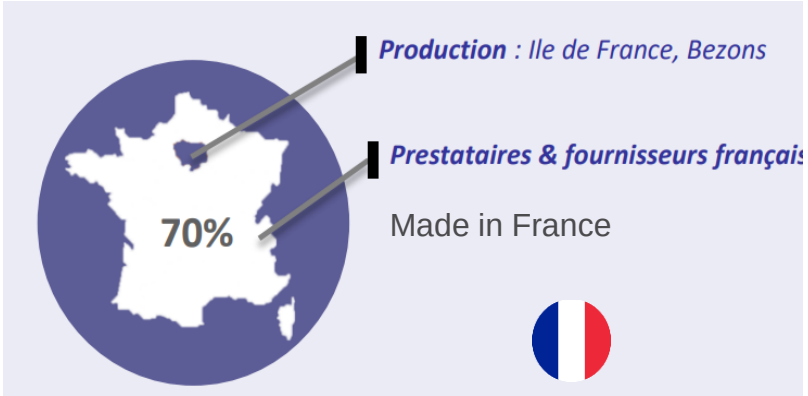
New generations of MBE R&D and production systems.

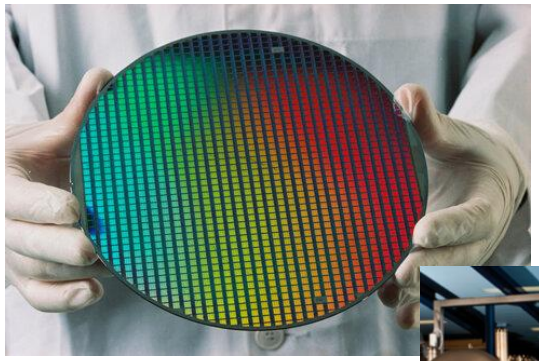
- **MBE 8000**: production capacity adapted to “Megatrends”
- **300 mm – ROSIE project**: convergence of compound semiconductors and silicon to overcome the current limits of silicon (5nm, 3nm)
  - Changing material is becoming a major focus in relation to process optimization → paradigm shift
- **Superconducting materials**: future developments for the quantum computer



Conclusion

- RIBER, a major player in the compound semiconductor
- Manufacturer of high-tech equipment, world leader in the MBE market
- Performance accelerator for electronic and photonic components
- Promising technological prospects: versatility of MBE, convergence with Silicon lines
- Favorable context: the public authorities' desire to develop the European sector





Questions / answers

RIBER's know-how

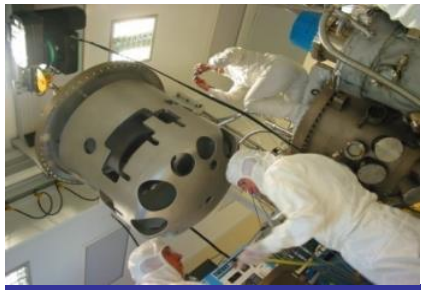
Assembly platform

R&D department

Mechanical workshop

Surface treatment

Application laboratory



Customer service

Think Design Build

RIBER

TECHNOLOGY EXPERTISE: TECHNICAL EXPERTISE

Preventive maintenance

GOAL

Customer Satisfaction

- **2 on site permanent service engineer**
  - Riber / VG system
- **7 qualified service technicians**
- **5 sales managers**
- **1 product manager**

3 locations of inventory for spare parts delivery

Repairing

Upgrade

Components rebuild

Cleaning & refurbishment

RIBER