

DEEP DATA FOR FACTORY 4.0



AUGMENTED INDUSTRIAL PERFORMANCE
FOR THE MANUFACTURE OF NON-METALLIC
MATERIALS

BY SYSTEMATIC CONTINUOUS MEASUREMENT
OF THE INNER QUALITY OF THE PRODUCTS



Thierry ANTONINI

CEO

- Profit center management: 20 years
- Creation of companies: 3
- International : 8 years (Russia, Kazakhstan)
- B2B in the field of industrial control equipment



Christophe ARCHIER

CTO

- Management of R&D-Industrial centers: 20 years
- Creation of companies: 2
- International: 4 years (USA)
- B2B in the field of opto-electronic equipment



Antoine GUILLE

Manager

Applications Center

- R&D in measurement, materials science: 10 years
- International : 2 years (Belgium)

STRATEGIC PARTNERSHIPS



+ 10 Laboratories
& Technological
platforms

BOARD

Supernova Invest
Aster

C. Archier

T. Antonini

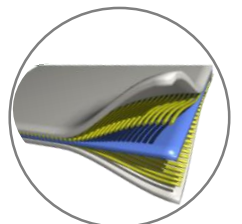
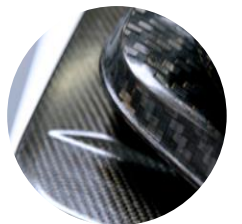
JC. Lenain (*former
president of Mistras France.
Top 10 worldwide NDT
service companies*)

In **non metallic materials** world (polymers, elastomers, ceramics...), innovation follows an accelerated pace :

- they ensure **more and more critical functions** in sensitive sectors such as aerospace, automotive, energy and defense...,
- they are gradually **replacing metals**,
- they must match new requirements in terms of **durability and recyclability**,
- their nature are **increasingly heterogeneous**,
- their manufacturing processes become **more and more complex**,

MASTERING THEIR MANUFACTURING PROCESSES BECOMES A MAJOR STAKE TO :

- GUARANTEE THEIR PERFORMANCES
- QUICKLY DEPLOY THEIR INNOVATIONS



Manufacturers of these materials collect a great quantity of data on a continuous basis on the parameters of the manufacturing process, but practically no usable information on the inner quality of the manufactured product.

Data Type (*)		Qty
Process		3 000

Product		
	surface	10
	inner volume	0

**"BLIND" MONITORING
ON KEY MATERIAL PROPERTIES**

(*) Source: major global automotive equipment supplier

THIS SITUATION HAS A **STRONG IMPACT ON PERFORMANCE:**

QUALITY

- poor control (only by sampling)
- late detection of non quality
- unstable process

PRODUCTIVITY & ECO-EFFICIENCY

by increasing the :

- consumption of raw materials
- production cycle time
- energy consumption
- scrap rate ...



LOSS : 50 K€ to 1 M€ / line / year

ON A LARGE SCALE:

86% of the top 100 European Industrials concerned



TOTAL LOSS: + 500 M€ / year

LACK OF INSTRUMENTATION TO ACCESS DATA ON THE INNER PROPERTIES OF PRODUCTS DURING MANUFACTURE



ONLY ONE TECHNOLOGY AVAILABLE :

X-RAYS



Owning **strong limitations** :

- High cost
- Low detection sensitivity
- Low portability
- Harmful to operators
- ...

Leaving many control problems unsolved

SOLUTION

- Terakalis offers **new solutions** for non-destructive and non-contact testing based on new electromagnetic waves
- including software for **automatic decision making**

APPLICATION FRAMEWORK

- **Inner volume of** non-metallic materials

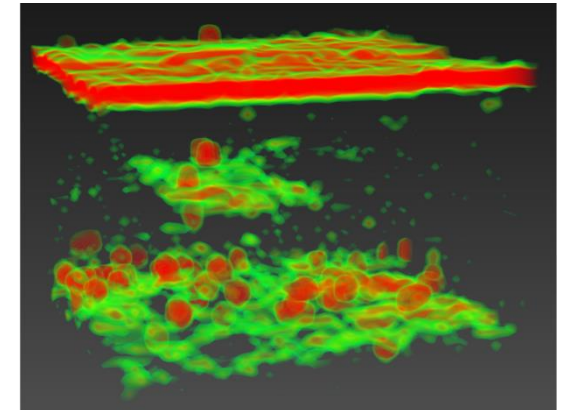
CUSTOMER VALUE

- For the first time, **during manufacture**, "learn" and control inner defects:

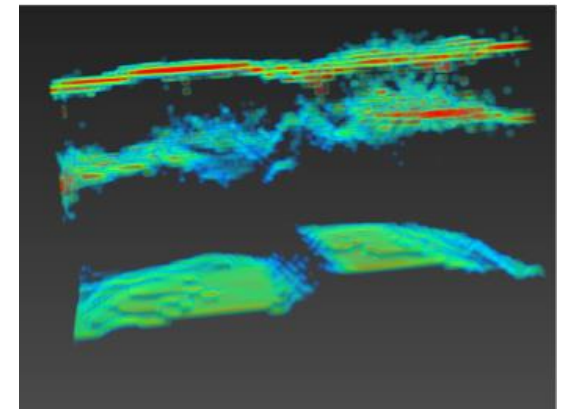
- for some, **undetectable until now**
- at high speed on 100% of the products

Gains : quality, productivity, eco-efficiency but also acceleration of new materials development

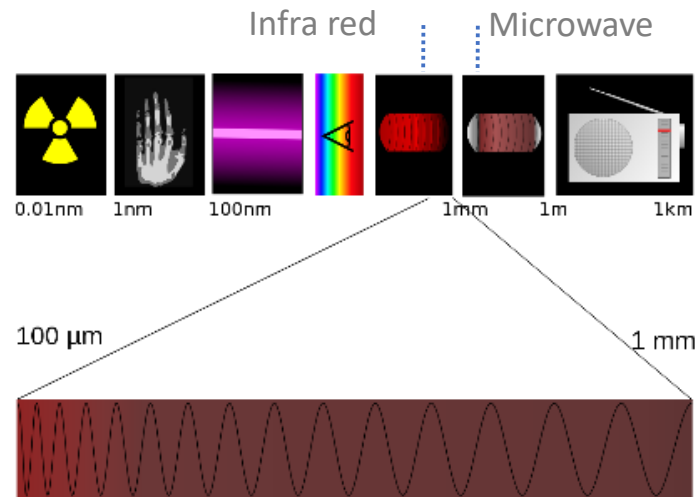
3D Defects Imaging



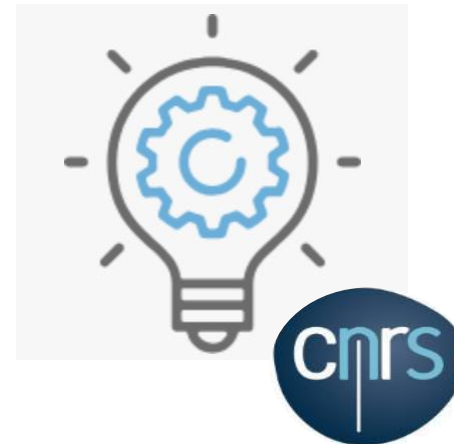
Multilayer thickness measurement



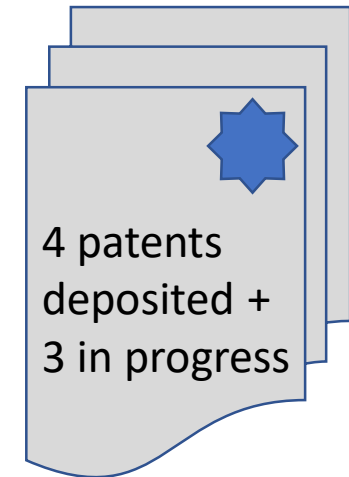
RELIES ON 3 PILLARS →



New Waves, TeraHertz [THz]
New technologies



5 years of research in
collaboration partly with a CNRS
laboratory, leader in the field



Unique global offer
worldwide

Business line	Use Case	Referent with contract	TAM (*)	Techno Bricks
Gluing	Windshield Gluing Control	Renault	+ 50 M€	I1
	Automotive safety devices gluing inspection	Plastic Omnium	+ 12 M€	I1
	Foam thermal barriers gluing control	Air Liquide	+ 10 M€	I2
Polymeric Transformation	Polymeric Coextrusion Control	Michelin	+ 60 M€	DM1
	Polymeric Tank Inspection (Fuel, Hydrogen)	Plastic Omnium	+ 60 M€	DM2
Composites	Composites materials manufacturing control including recycled ones	IPC, ICAM, CETIM	transverse	I1
	UD Carbon tapes manufacturing and assembly control	CNES	evaluation in progress	I2
Multilayers	Multilayer Coating Control for Aero	Airbus	+ 80 M€	DM2
	Multilayer Coating Control for Auto	PSA / PO	+ 60 M€	DM2
	TOTAL		+ 352 M€	

- Focus 2/3 of our commercial activity
- Based upon 4 technological system bricks
- **Asset** : better commercial efficiency and reduction of commercial cycle (12-24 ⇒ 6-12 months)




For
Laboratories



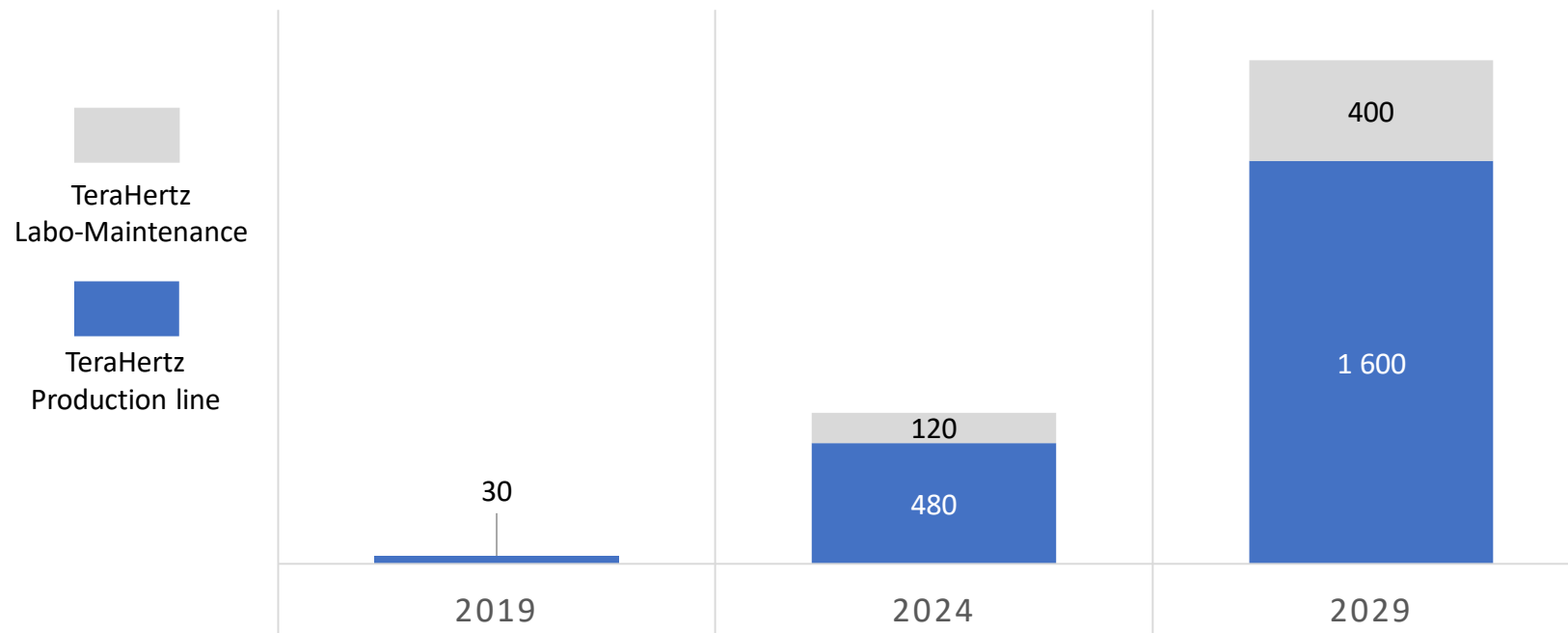
For
Lines of
production

Our first Customers :



- 
- 3 customers represent a potential of 120 plants for a turnover of 12 M€ (spread over 4 years)
 - 50 leads in the pipe linked to 9 validated use cases
 - Turnover :
 - 500 K€ for 2020
 - 1300 K€ for 2021incl. 500 K€ secured to date

- **BOOSTED** FOR THOSE WHO CAN **DEPLOY ITS SOLUTIONS ON PRODUCTION LINES**
- **OF SEVERAL BILLION EUROS IN THE LONG TERM**

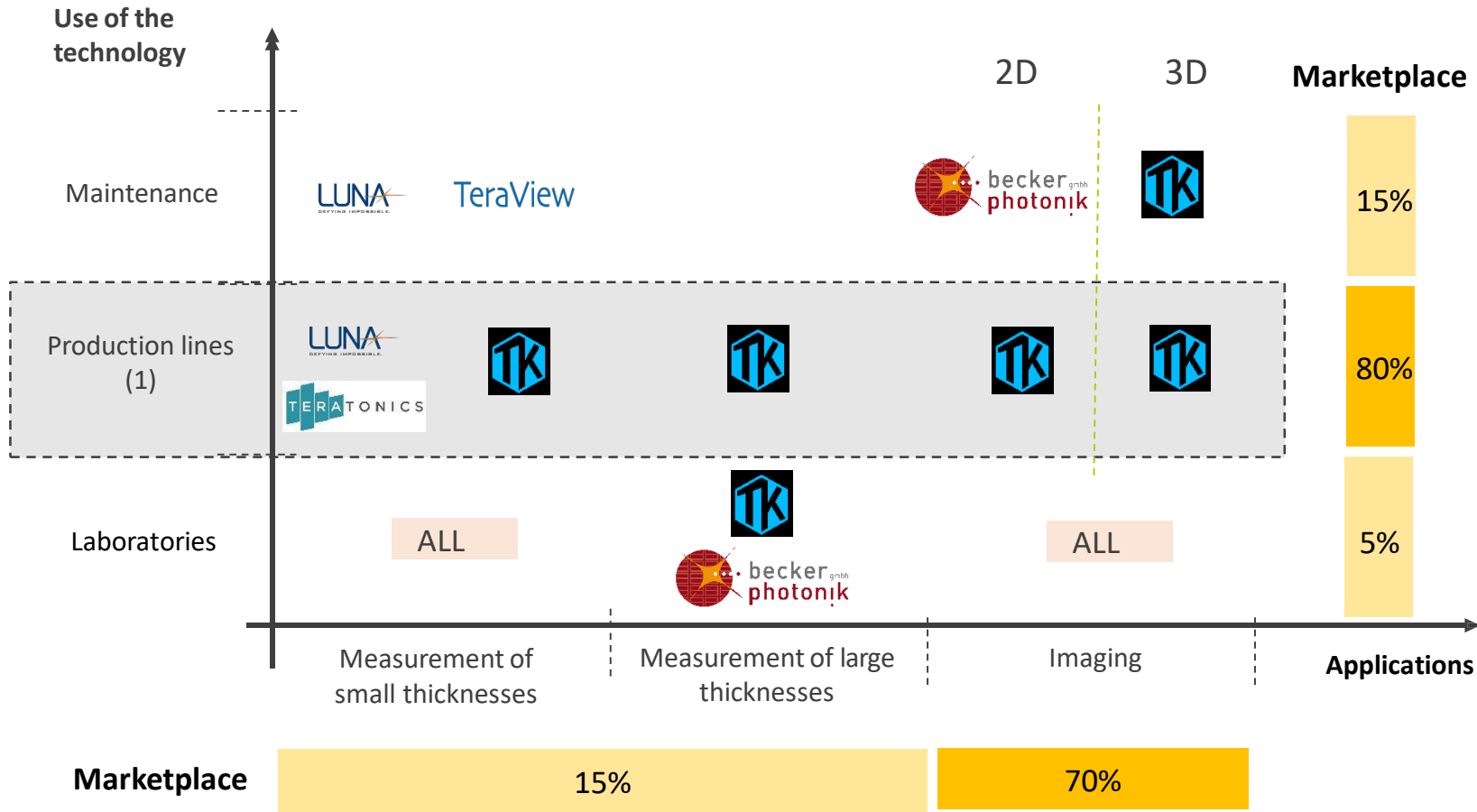


- Growth: 45% per year
- Exceeding the market of X-ray equipment in 2029 estimated at €1,800 million

TeraHertz Digital Volumetric Inspection Equipment
in M€ - World (1)

Source : (1)Terahertz Radiation Systems
Technologies and Global Markets-BCC Research Aug 2019

A UNIQUE POSITION AT THE GLOBAL LEVEL



**STRONG DIFFERENTIATION
HIGH SPEED**

TERAKALIS, THE ONLY HIGH-SPEED
IMAGING SOLUTION (3 PATENTS+ 2 TO COME)

200 times faster than competition

AND WIDEST RANGE FOR HIGH SPEED

THICKNESS MEASUREMENT (1 PATENT+ 1 TO COME)

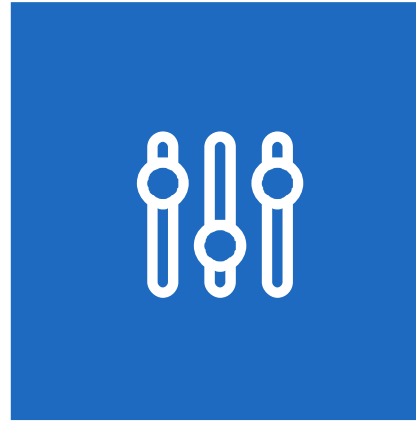
7 companies in the world operate
TeraHertz waves for volume control of
materials. None of them achieve the
performance of Terakalis.



Short business cycle
6-12 months
Focus on ROI

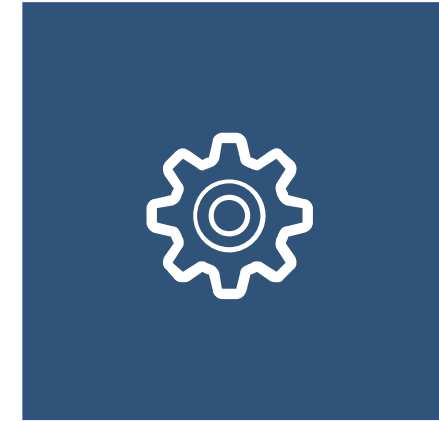
Structured commercial approach

Demonstrators available
developed on
9 validated use cases



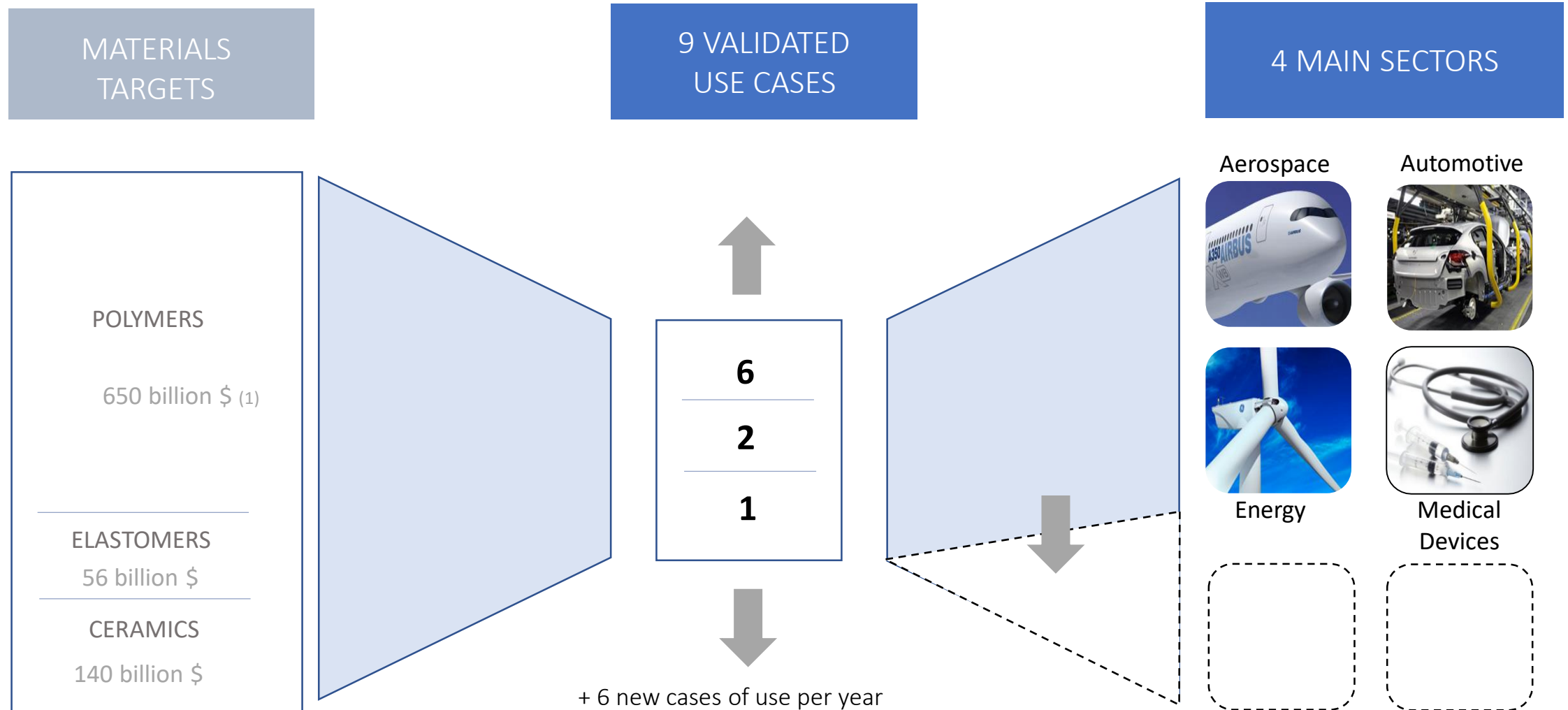
Advanced knowledge
materials, processes
& applications

Data base from
of + 100 Customer Analysis,
Applications center,
Demonstrative and agile
Technological platform

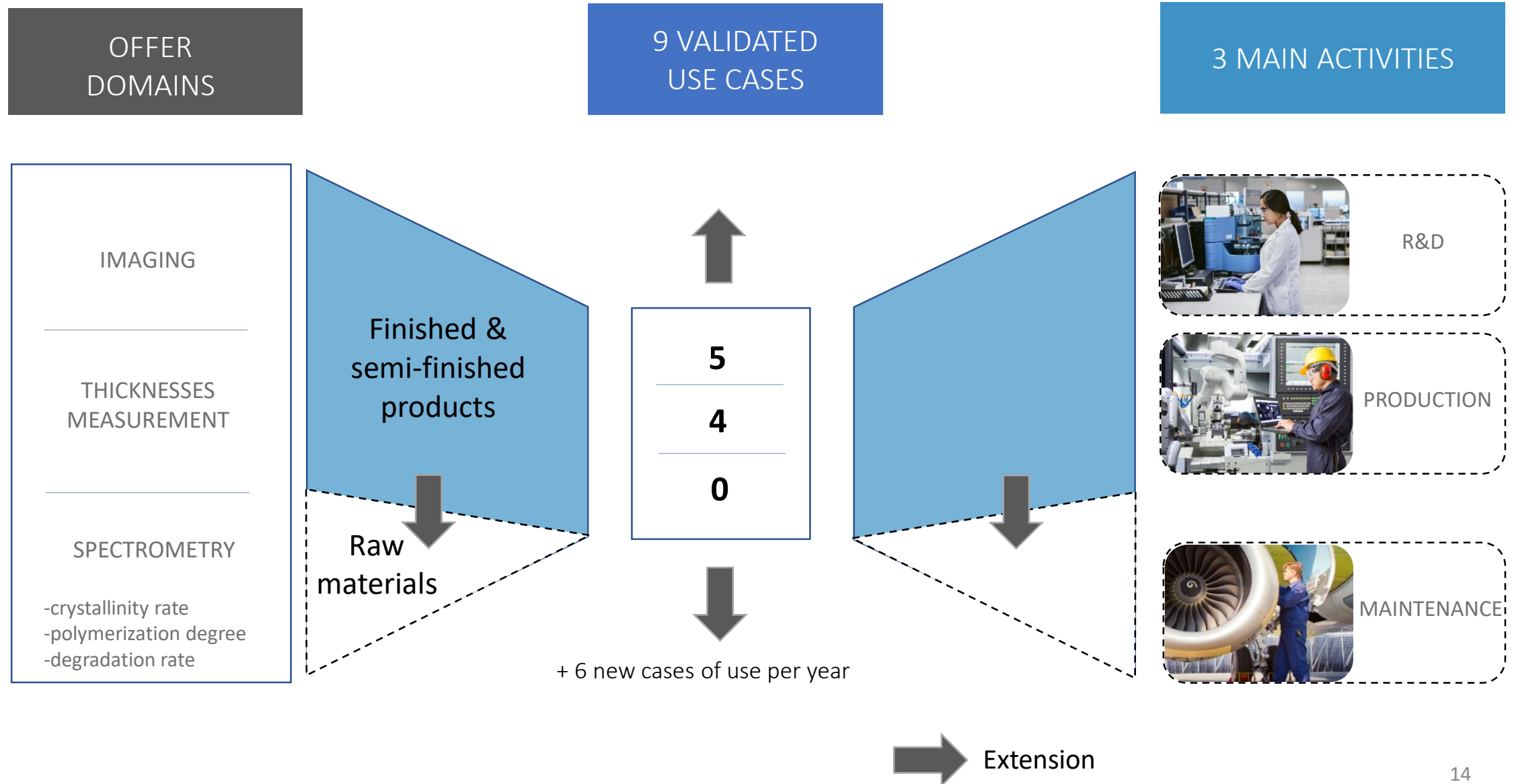


Ability to create independently
new and differentiated
product lines

Multicompetent Design-R&D
(electronics, semiconductor,
hyper frequency, optical,
signal processing...),
Network of qualified subcontractors



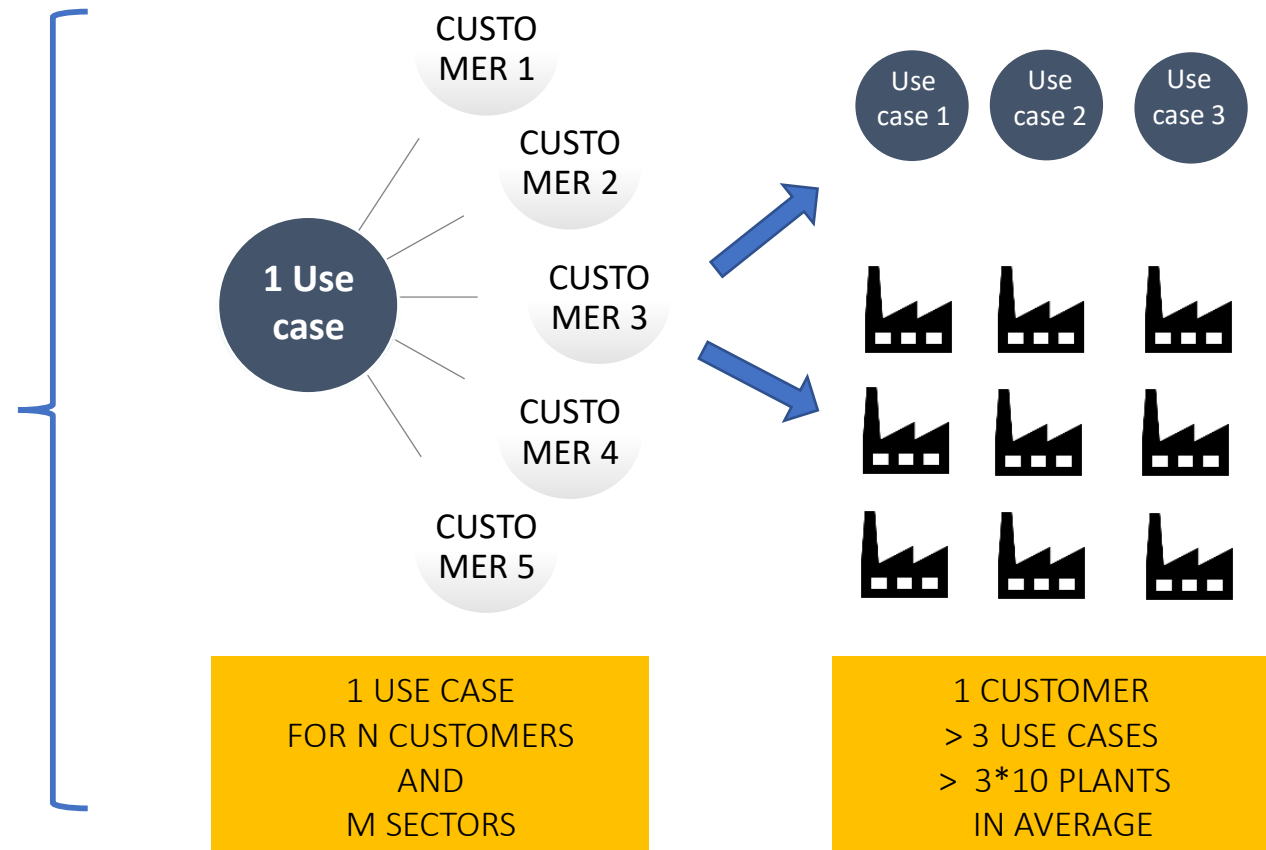
(1) : Volume of materials production



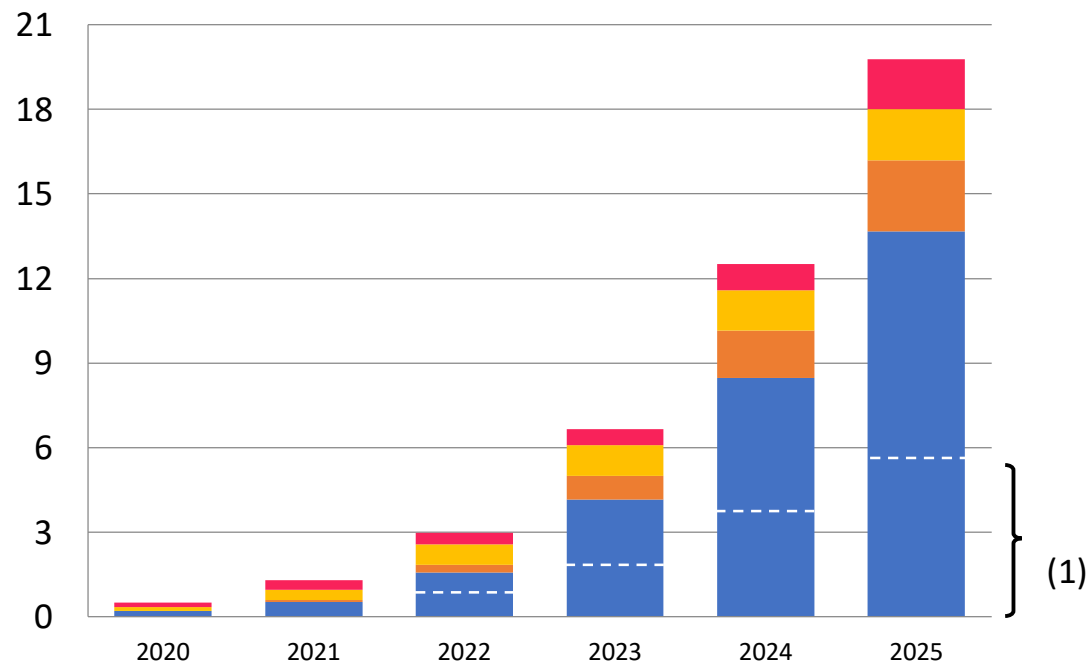
EQUIPMENTS	Modular, Evolutive , Common software base
SERVICES	with recurrence (*) & AI driven advanced

(*) forecast 10-15% of turnover / equipment /year

HIGH SCALABILITY AT 2 LEVELS



TURNOVER IN €M




■ Rev. Services ■ Rev. At Lab ■ Rev. On Field ■ Rev. On Line

(1) Potential represented by today's top 3 customers, €12M spread over 4 years

ROADMAP FOR 2021-24

2018, **€1.6 M** raised with Supernova Capital, Aster Capital and Badge

2021, Need **€4 M** to finance (*):

- 40% {
 - Sales duplication process
 - Creation of 3 subsidiaries 
- 40% {
 - Extension of the product range for new markets
 - Plan to reduce production costs by 30%
- 20% {
 - Industrial infrastructure development

(*) Historical investors contribution : **€1,5 M**

2021 MAIN MILESTONES TO DATE



Order booking / Use case	INRA Water stress monitoring in vegetal leafs & Stems	Plastic Omnium Fuel tank inspection		
Main Revenue	€ 130 K – TK Line € 40 K – R&D Services	€ 130 K – TK Line	€ 40 K – R&D services	Total : € 450-500 K (*)
Strategic agreement signature / Use case	CNES R&T program Thermoplastics crystallinity	Michelin / deployment Polymeric coextrusion control	Air liquide / R&D Tank liquid-gas level measurement	
Technology Offer development		High speed coating thickness measurement	On field range	High speed 3D imaging
Demonstrative tests on site	Plastic Omnium Fuel tank inspection			Airbus Helicopter DGA - Cuers

2021 S1 order Booking ≈ 2020 order Booking

(*) including € 120 K of 2020 Backlog

OUR NEXT STEP 2021-25 :

- SALES ACCELERATION
KEEPING OUR TECHNOLOGICAL LEADERSHIP
- GEOGRAPHICAL AND MARKETS EXTENSION



Disposal opportunities from major market players who do not have yet the TeraHertz offer



HEXAGON



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