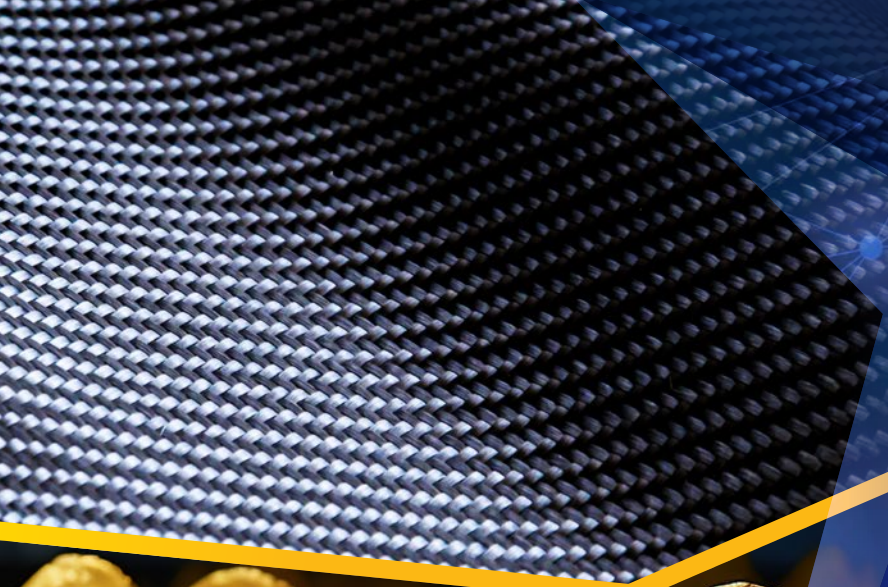


THE TamaTA PROGRAMME PRESENTS

WHY SMEs NEED LIGHT SOURCES

Advanced composites, food safety, recycled rubber and more.

LEAPS League of European Accelerator-based Photon Sources

Synchrotron computed tomography (CT) allows industry researchers to see deep inside their samples in 3D, in extremely high-resolution. Here, the TOMCAT beamline at the Swiss Light Source (SLS) has enabled researchers at Lument to study a new contrast agent for lower resolution, medical CT (p7).

TamaTA | tam’ata: |

noun
a programme that helps small- to medium-sized companies perform experiments at world-class synchrotrons and other light sources in Europe and in the Middle East, to make the companies more innovative and competitive.

ORIGIN
acronym from Tailor-made for SMEs Trans-national Access

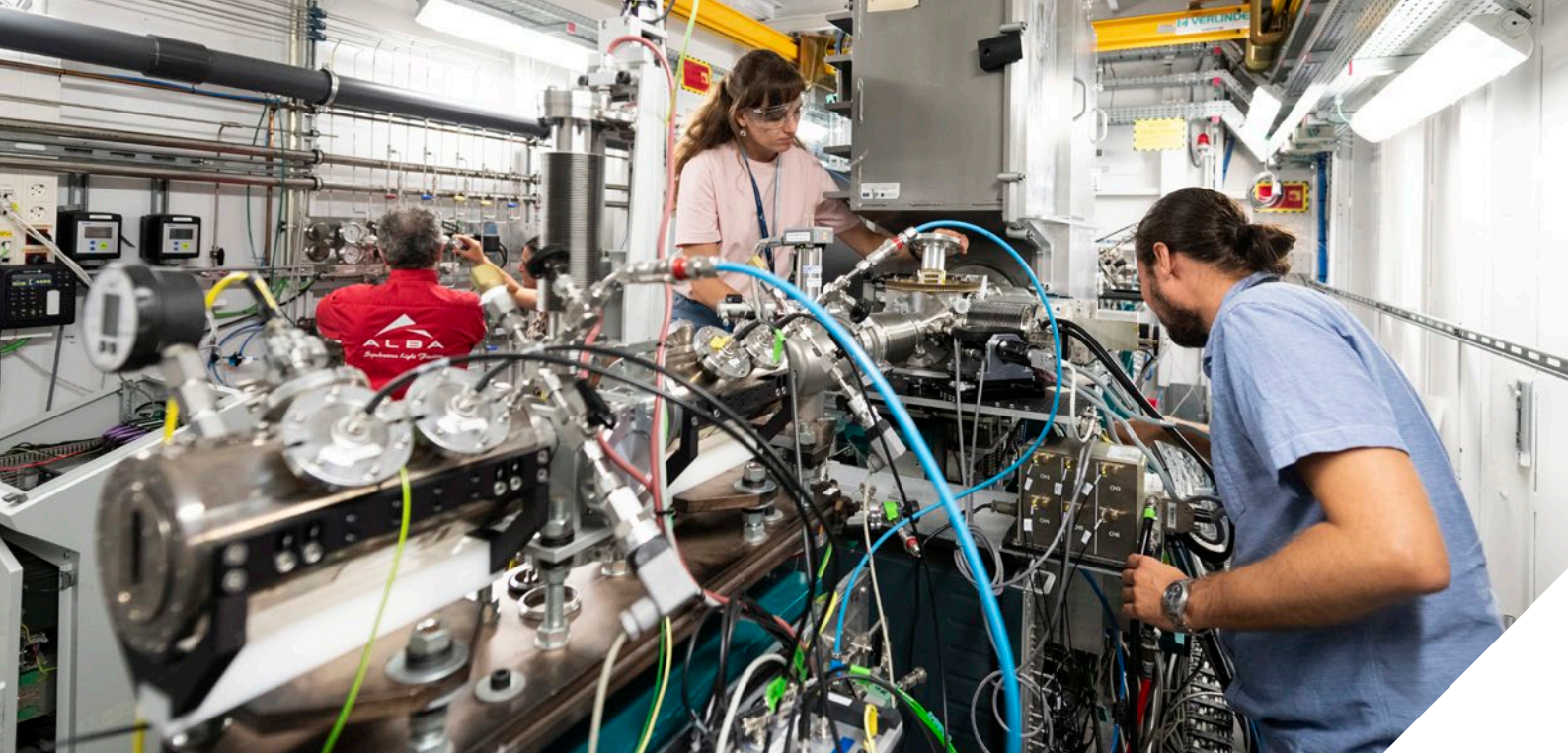
Synchrotron X-rays are billions of times brighter than those generated in a laboratory. As a result, they can expose material processes that are otherwise invisible to industry researchers.
Here, the ESRF–EBS has enabled researchers from FORCE Technology (p11), AmaDema (p15), Xnext (p16) and Takis Biotech (p21) to study a range of systems important for their businesses.

Synchrotrons and free-electron lasers are among the most powerful tools on Earth for illuminating the structure, composition and behaviour of materials.

Their insights can hugely accelerate industrial research and development in a wide range of sectors.

Over four years, within a broader “CALIPSOplus” project, TamaTA made use of European Commission Horizon 2020 funding to subsidise access to synchrotrons for dozens of small-to-medium sized enterprises (SMEs), with impressive results.

TamaTA’s work is now continuing within the Horizon 2020 “LEAPS–INNOV” project.



"What is TamaTA? It's a way of giving an SME like us the chance to access a synchrotron, a very powerful tool for the analysis of materials. Without TamaTA, we wouldn't have been able to do our study.

The study was part of our development of a nanoparticle-containing packaging adhesive for crisps and other foods. Made of selenium, the nanoparticles can react with free radicals, which cause food to oxidise and spoil in air. The synchrotron was the only tool we could find to study the oxidation states at such low concentrations of selenium, and allowed us to fine-tune our process.

We're now introducing our product to the market. We hope that it will increase the shelf life of food, reduce food waste, and avoid the need for packaging in expensive inert atmospheres."

Esteve Valls
Technical Manager
Samtack

SAMTACK

HQ	Barcelona, Spain
Sector	Adhesives
Synchrotrons used	ALBA

"At Lument, we're developing an entirely food-based contrast agent for abdominal examinations with computerised tomography (CT). Our product allows radiologists to generate CT images with quality comparable to that from magnetic resonance imaging, but cheaper, faster and more patient friendly. Our product consists of micro bubbles dispersed in an aqueous phase, and we wanted to study these bubbles in more detail than what lab-scale methods allow, to assess their properties and behaviour.

TamaTA opened a door. For a small company such as us, having access to this kind of facility, a synchrotron, can have a great impact."

Lucia Casal-Dujat
Chief Scientific Officer
Lument

LUMENT

HQ	Lund, Sweden
Sector	Medical imaging
Synchrotrons used	SLS, MAX IV

SMEs are the backbone of the European economy. They employ some 100 million people, and account for more than half of Europe's GDP.

TamaTA has made it as simple as possible for them to benefit from synchrotron analysis, with a single online portal (wayforlight.eu) for them to propose experiments. If an SME is successful, TamaTA delivers a tailored service: the best synchrotron, the best technique, the best support.

- 100% of SMEs agree that their application was quick and easy.
- 80% agree that their results were valuable.
- 100% would recommend TamaTA to other SMEs.*

*survey results from TamaTA under CALIPSOplus.

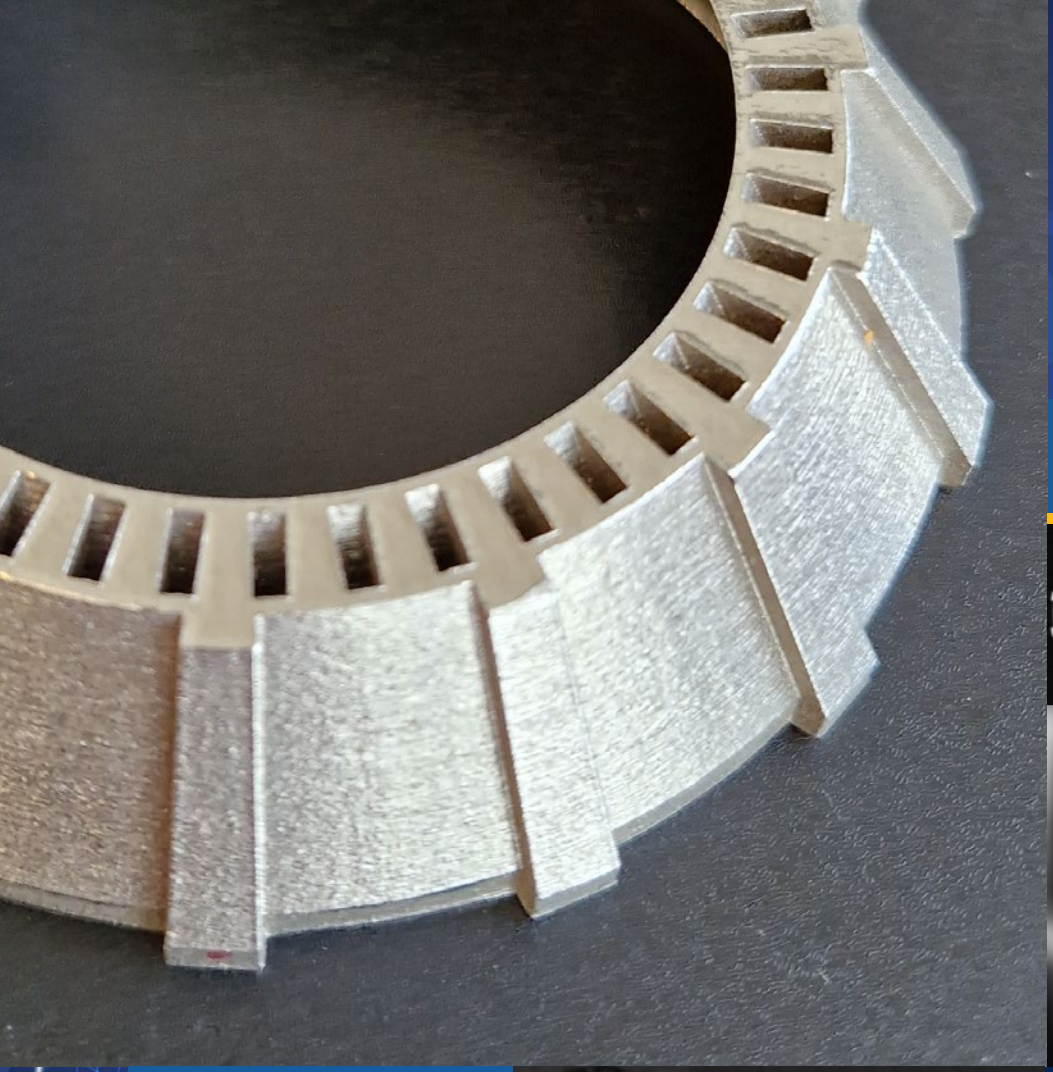
"We've been developing a copper-complex solution that can trigger the autumn leaf-fall of fruit trees in a short time, allowing farmers to plan the subsequent pruning process more efficiently. The synchrotron showed us which of many samples had the most copper complexed, and therefore which would be the most efficient. It also gave our company the characterization data that is vital to our obtaining the European REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) certificate.

This was our first time at a synchrotron, and it was very good! We had a technician who constantly helped us. We just defined the R&D project, prepared the proposal with them and sent it through the portal provided by TamaTA."

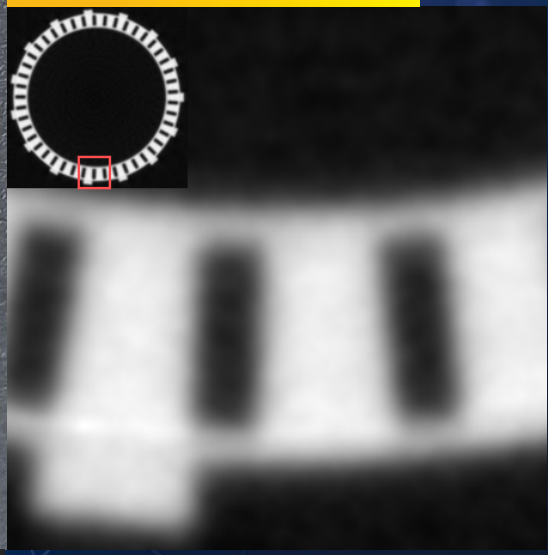
Joan Minguella Piqué
General Manager
Altinco

ALTINCO

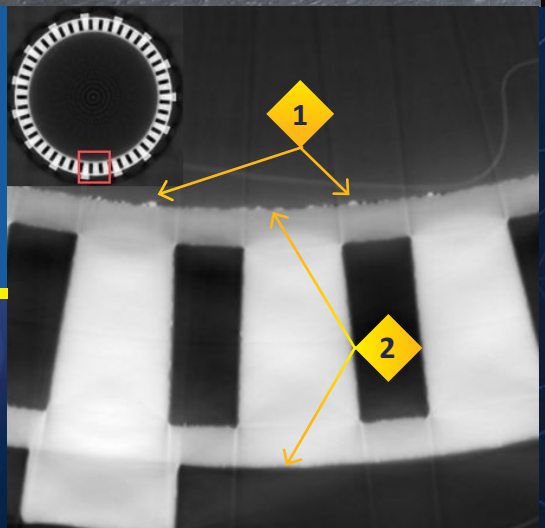
HQ	Lleida, Spain
Sector	Agrochemicals
Synchrotrons used	ALBA

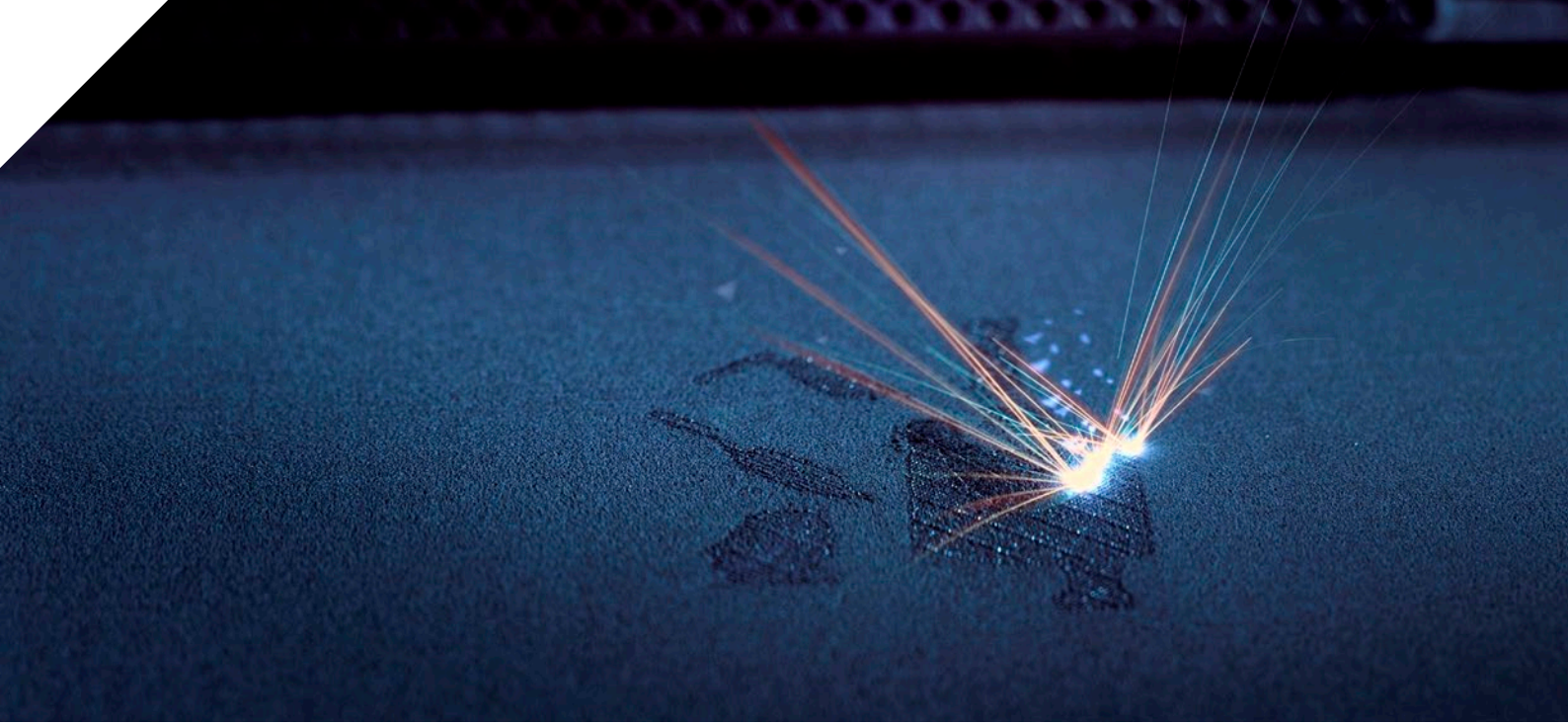


(a) Cross section of a 3D-printed spacecraft component, taken with lab X-rays. The resolution is poor; details are hard to identify.



(b) The same cross-section taken by X-rays at the European Synchrotron by FORCE Technology. With 10 times better resolution, one can identify (1) particles stuck to an inner surface, and (2) surfaces of different roughness. The high resolution images are used to evaluate whether all relevant flaws are detected by the newly developed lab based setup.





"We've been helping an SME develop a quality control system for 3D-printed parts for the European Space Agency. Quality control is essential to ensure success when building for space applications. The challenge is that the parts are heavy and dense, and if they're bigger than a few centimetres lab X-ray sources have a hard time penetrating them.

If we want to look at samples that are industrially relevant, we need to go to high energy and high resolution – we need a synchrotron. The ESRF gave us 'gold standard' images that we could use to benchmark the in-house lab X-ray quality-control setup.

TamaTA gave us these first synchrotron images for free. It de-risked our project. It's much easier to persuade a client to continue using a synchrotron when they have seen what's possible. Based on the TamaTA results we have decided to return to the ESRF for more measurements."

Torben Haugaard Jensen
Specialist, Materials Test & Analysis
FORCE Technology

FORCE TECHNOLOGY

HQ	Brøndby, Denmark
Sector	Research and technology organisation
Synchrotrons used	ESRF

“Our goal is to make tyres and other rubber products more sustainable, by replacing virgin rubber with recycled, devulcanised rubber. TamaTA saved us two years of development, because the synchrotron could show us how to better predict what is going on in our reactions. Now we’re already supplying our products to premium tyre manufacturers.”

Francesco di Pierro
Chief Business Development Officer
Rubber Conversion

RUBBER CONVERSION

HQ	Verona, Italy
Sector	Sustainable rubber
Synchrotrons used	ELETTRA

The technology readiness level (TRL) is an estimate of how close a product or technology is for implementation, from stage 1 (beginning of basic research) to stage 9 (proven in an operational environment). Completing each step can often take several years.

- In 95% of TamaTA projects, the TRL of products increased by at least 1 stage.
- In 47% of TamaTA projects, the TRL increased by 2 stages.*

*survey results from TamaTA-Innov


European XFEL
ISA
MAX IV
HZB Helmholtz Zentrum Berlin
DESY.
PTB
FELIX
HZDR
HELMHOLTZ ZENTRUM DRESDEN
diamond
SOLARIS
SOLEIL SYNCHROTRON
Elettra Sincrotrone Trieste
ALBA
ESRF
PAUL SCHERRER INSTITUT PSI
INFN
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Light sources
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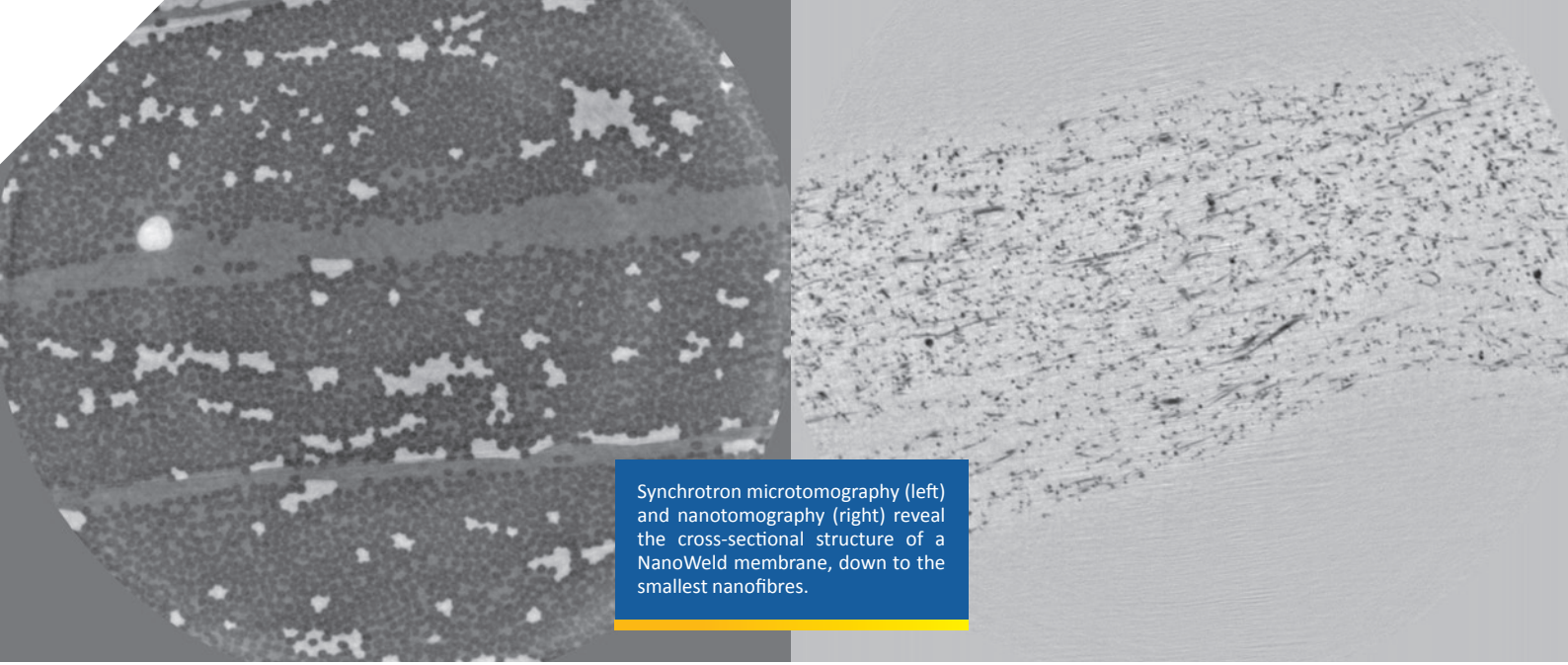
Proposals



Synchrotron microtomography (left) and nanotomography (right) reveal the cross-sectional structure of a NanoWeld membrane, down to the smallest nanofibres.

"We're a small company based in Cyprus. We're developing a product, NanoWeld, that makes fibre-reinforced polymer composites even stronger.

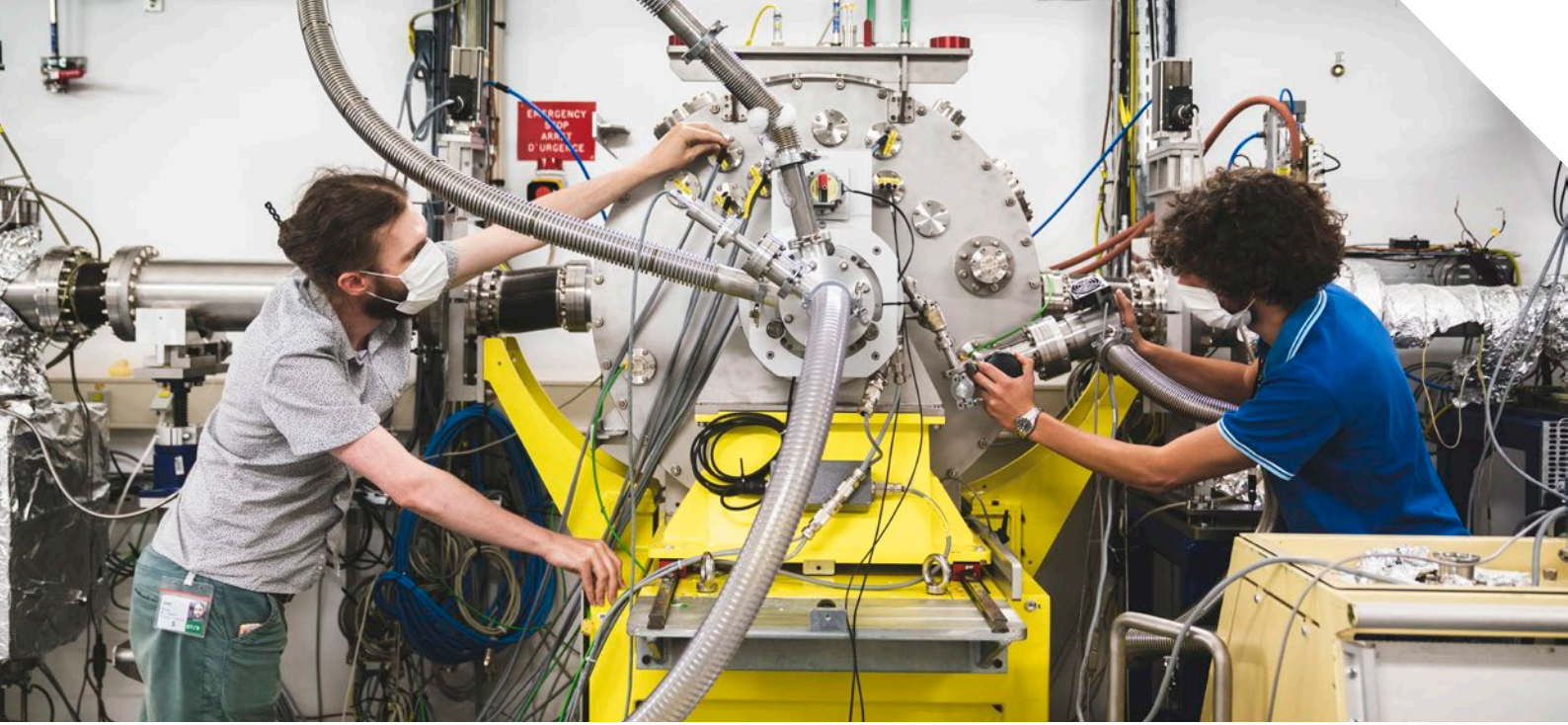
It's based on a dry membrane, several micrometres thick, that sandwiches between existing technical fibres before they are embedded into a polymer matrix. Consisting of spaghetti-like polymeric nanofibres, it can increase the toughness of composites by 100%, eventually allowing the use of less material and therefore reducing their weight—a boon for the aerospace industry. We wanted to study it in more detail to see if we could improve it, but lab techniques only gave us fuzzy, 2D images. That's why we approached the ESRF through TamaTA.

We wanted a proof of concept, to see whether we could actually see anything in 3D. In fact, the quality of the synchrotron results surpassed our expectations. It was an exceptional experience."

Vassilis Drakonakis
Managing Director
AmaDema

AMADEMA

HQ	Nicosia, Cyprus
Sector	Aerospace materials
Synchrotrons used	ESRF



"The discovery of just a single contaminated food item often means an entire production run must be recalled and destroyed. This is a huge cost to the environment, not to mention the manufacturer's reputation and business – in the US, for example, recalls are believed to cost food producers more than $50bn every year. But most industry X-ray detectors can only spot dense contaminants, such as metal, stones and glass.

We designed a detector, XSpectra, that performs multiple scans to identify low-density foreign objects, such as wood, plastic and insects. But we needed a standard against which it could be compared – that's why we sought help through TamaTA.

We had never been to a synchrotron before, but with help from the ESRF staff we quickly learned what was possible. The data were crucial in getting XSpectra to market. It's now been adopted by major food companies across Europe, as well as in Japan, Israel, the US and Canada."

Emanuele Rappa
Communication Specialist
Xnext

XNEXT

HQ	Milan, Italy
Sector	Food inspection technology
Synchrotrons used	ESRF

"These are high risk, high reward experiments. Companies need to see the benefits of using light sources. TamaTA makes this happen.

We're a start-up developing software and services for synchrotron and neutron facilities. We wanted to validate a part of our software working with the European steel manufacturer Ovako, which is looking to improve the lifetime of steels for ball bearings.

Synchrotrons X-rays are brighter and focused; you can see defects smaller than micrometers and penetrate deep into the steel. Combined with our software, the X-rays revealed the evolution of defects in ball bearings. This can support knowledge-driven innovation – not trial and error."

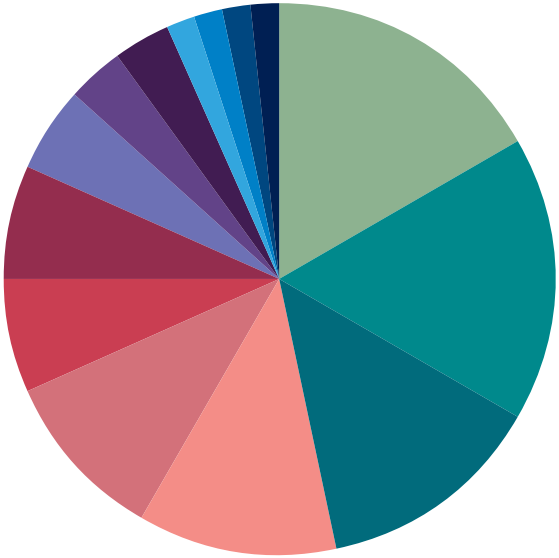
Ahmet Bahadir Yildiz
Chief Executive Officer
Scatterin

SCATTERIN

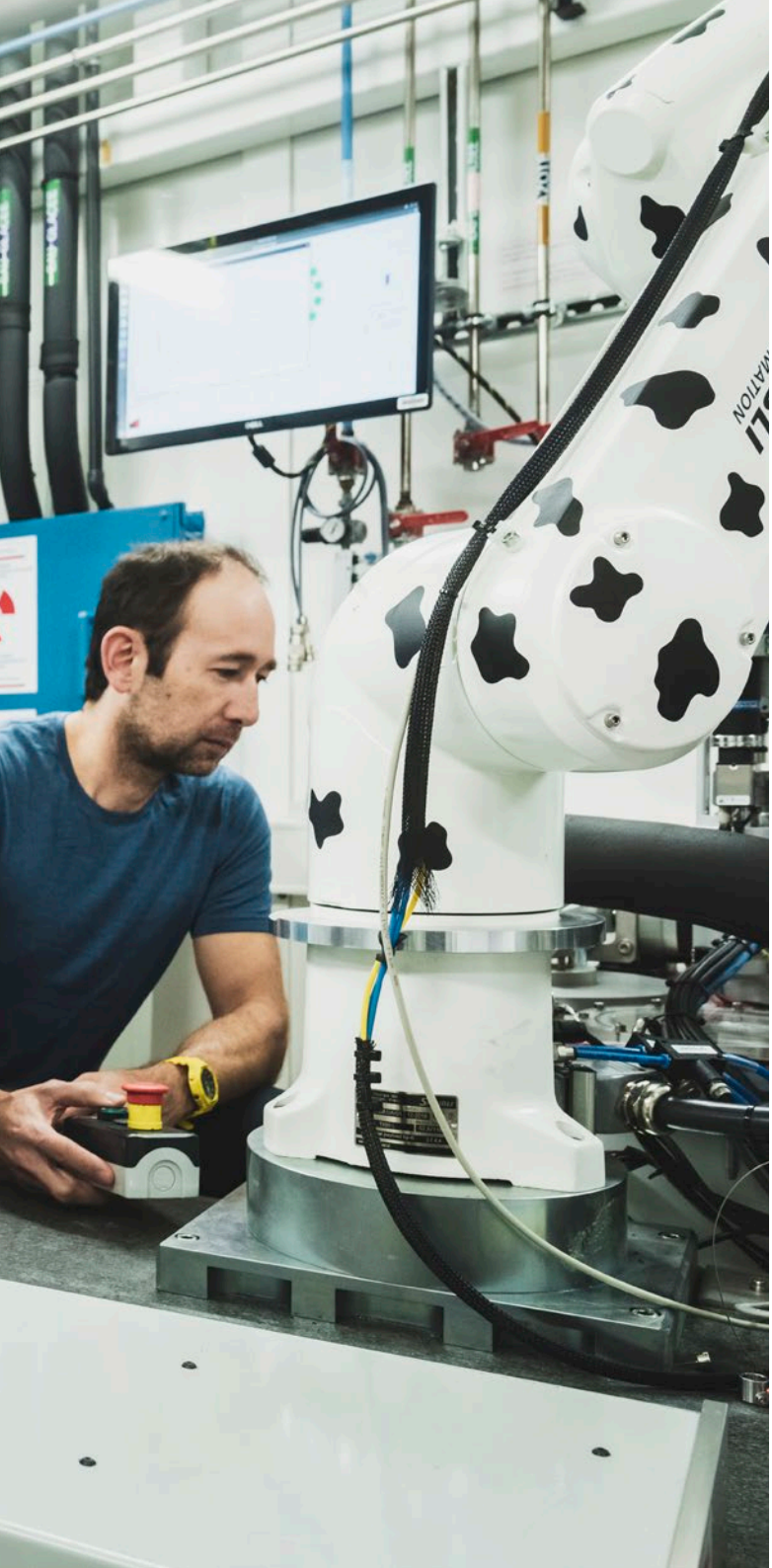
HQ	Stockholm, Sweden
Sector	Research and technology organisation
Synchrotrons used	DESY

TamaTA proposals come from a wide range of industrial sectors.

Health and pharmaceutics are the most popular, as they are for industrial access at synchrotrons generally. Additive manufacturing, aerospace and nanotechnology are also well represented.



- Agriculture
- Energy storage and generation
- Environment
- Metallurgy
- Chemistry
- Textile
- Instrumentation
- Food & Packaging
- Nanotechnology and high tech materials
- Aerospace
- Engineering & Technology
- Additive manufacturing
- Health & Cosmetics
- Pharmaceutics



Most TamaTA proposals concern the development of new products, or product improvements.

"I think people are interested in whether synchrotrons can have applications besides scientific research. If you can also use them for inexpensive, reliable manufacturing, why not?

We use synchrotron X-rays and micro-electroplating to manufacture custom and standardised components by lithography. We started out 15 years ago, making watch parts for the luxury Swiss watch maker IWC Schaffhausen; now we're focused on instrumentation for X-rays themselves – gratings and interferometers.

Synchrotron X-rays often involve expensive installations. In our TamaTA proposal, we wanted to know whether simpler and cheaper installations, using broad wavelength 'white beams', could work as well. They did – the quality was just the same."

Joachim Schulz
Managing Director
Microworks

MICROWORKS

HQ	KIT campus, Eggenstein-Leopoldshafen, Germany
Sector	X-ray instrumentation
Synchrotrons used	KIT Light Source

A Takis scientist uses a specialised laboratory module to handle pathogens that are dangerous to humans.

"When the COVID-19 pandemic emerged in 2020, we turned our expertise in oncology to research vaccines and antibody treatments for the respiratory disease. We collaborated with a lab at 'La Sapienza' University of Rome, which grew thousands of crystals of COVID-19 antibodies and, with TamaTA support, took them to the ESRF for crystallographic structure analysis. The data were useful to design better conditions for crystal formation.

The opportunity to collaborate with a world-leading synchrotron is extremely important for an SME, especially if it's in the frame of a grant. In our sector, internal research is mostly funded by grants – we wouldn't have been able to come to the synchrotron if it weren't for TamaTA."

Giuseppe Roscilli
Director
Takis Biotech

TAKIS BIOTECH

HQ	Rome, Italy
Sector	Pharmaceutics
Synchrotrons used	ESRF

For more information about the LEAPS–INNOV project, visit www.leaps-innov.eu.

For more information about the LEAPS consortium of light sources, visit leaps-initiative.eu.

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This booklet was produced with funding from the European Union´s Horizon 2020 research and innovation programme under the LEAPS Innov grant agreement no. 101004728.

European Commission