

# 2022 HIGHLIGHTS



2022

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## HEALTH

## Clinatéc endowment fund hires new neuroillumination researchers

The Clinatéc team is growing and research on infrared illumination therapy is intensifying: Australian scientist John Mitrofanis, internationally renowned for his work on neurodegenerative diseases and infrared light, joined Clinatéc.

## HEALTH

## CEA-Leti helps farmers detect when cows are about to ovulate

Farmers typically use visual observation to determine the best time to breed their livestock. CEA-Leti developed a painless ear patch that detects hormone fluctuations in cows for better livestock management and animal wellness.



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## MANUFACTURING

## SET, from the French Alps to the world

SET Corporation, a CEA-Leti and IRT Nanoelec partner, is a true local success story. Based in the Alpine region of Savoie, SET sells its flip-chip bonders worldwide, and signed an agreement with SUSS MicroTec to develop their NEO HB flip-chip machine for die-to-wafer (D2W) hybrid bonding. A prototype of this SET machine was installed in CEA-Leti cleanrooms.



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## HEALTH

## Microfluidic chips test biomaterials for personalized implants

CEA-Leti helped design an instrumented microfluidic chip that tests several potential biomaterials on a cell sample from the patient.



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### > Leti Photonics Workshop 2022: Hardware-enabling Photonic Applications

Discover the photonic technologies that will enable the next generation of sensors, artificial intelligence circuits, augmented reality systems, and imagers. Download the slides here!



### > Cybersecurity & computing: the power of quantum photonics

CEA-Leti introduced its quantum photonics platform at Photonics West 2022. Watch the video.





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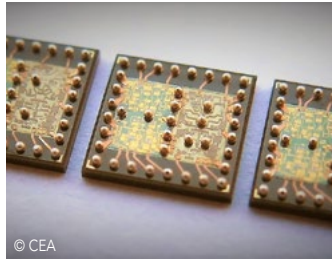
OCTOBER

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### > CES 2022: InjectPower rechargeable millimeter-sized microbatteries for implantable medical monitoring devices

The problem with implantable medical monitoring devices for organs like the eye or heart is that the power sources are often larger than the actual sensors! CEA-Leti's startup InjectPower is changing all that.



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#### SCIENTIFIC EXCELLENCE

### CEA-Leti develops competitive advanced packaging technology for heterogeneous SiPs

From design to fabrication down to UBM structures, CEA-Leti offers extensive expertise in fan-out wafer-level packaging to chip makers on the lookout for competitive heterogeneous system-in-package (SiP) solutions.

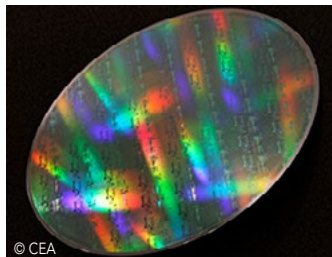


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#### HEALTH

### Odile Allard revolutionizes thyroid cancer surgery

After 25 years in IT, Odile Allard came to CEA-Leti to study the feasibility of a new imaging technology. She founded Fluoptics to take the solution to the market in 2009. Fluoptics is now the global leader in fluorescence imaging for thyroid cancer surgery.

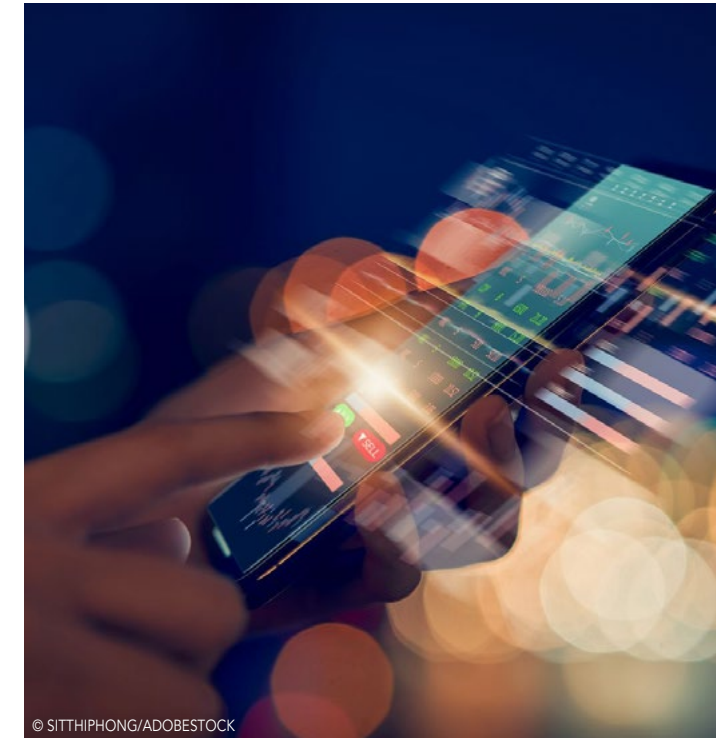


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#### MANUFACTURING

### Advance in high-performance photonic chips

CEA-Leti has been developing photonics on silicon nitride for several years now. Today, the technology is mature enough to address growing demand for high-performance chips.



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#### TELECOMMUNICATIONS

### FD-SOI inside the next generation of smartphones

Google recently started using France's very own FD-SOI wafers in its brand-new Pixel 6 smartphones. The substrate was first developed at CEA-Leti in the 1980s. Read what CEA-Leti experts have to say about the advantages of FD-SOI for smartphones and telecommunications networks.

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**REPORT**

## CEA-Leti publishes its 2021 Scientific Report and looks ahead to 2022

The chip shortage has provided an extraordinary boost to semiconductor R&D. Download CEA-Leti's 2021 Scientific Report to learn about the latest R&D in chips and other exciting fields!

**HEALTH**

### CEA-Leti PhD sheds new light on acute stress with off-the-shelf sensors

A CEA-Leti PhD candidate investigated whether acute stress can be detected and assessed using an explainable, interpretable “white box” method or not. The resulting method, leveraging more robust algorithms than those used in “black box” methods and off-the-shelf sensors performs at the state of the art!



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**HEALTH**

### European research helps Covid-19 patients

Did you have Covid-19 and lose your sense of smell? The EU-funded Rose project will help restore patients' ability to smell with a one-square-centimeter artificial nose that can detect 16 or 64 families of smells.



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**OPTICS**

### Sylvie Menezo pioneers high-speed transmission for data centers with Scintil Photonics

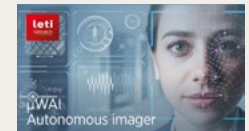
With a career that has taken her from research to business and—now—entrepreneurship as founder of a new venture based on an optical communication technology she discovered while at CEA-Leti, Sylvie Menezo is on a mission to speed up data transmission inside data centers.



© LIDIJA/ADOBESTOCK

### › Smartphone face recognition for just a few additional microwatts

CEA-Leti's new autonomous imager,  $\mu$ WAI, activates any device upon recognition of a specific pattern—like a face—making it ideal for applications like smartphones. Watch the video!



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### > Diabeloop shifts into high gear in France and around the globe

Diabeloop obtained French national health insurance approval for its DBLG1 closed-loop automated insulin therapy device (DBLG1), in September.



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#### HEALTH

### One step closer to human organs-on-chips

The ability to maintain human cells and organoids (which replicate the functioning of *in vivo* organs) in culture could help advance personalized medicine and provide an alternative to animal testing.



© BLUE PLANET STUDIO/ADOBESTOCK

#### TELECOMMUNICATIONS

### CEA-Leti and Spectronite achieve record-breaking spectral efficiency

CEA-Leti successfully transferred a highly spectrally efficient waveform technology to France-based startup Spectronite, supporting Europe's sovereignty in telecommunications.



© CEA

#### HEALTH

### Sylvain Trigueros wins the SFM 2021 best poster award

The award-winning research at CEA-Leti focused on using detection devices to improve pathogenic bacteria viability testing in the food industry.



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#### EDGE AI

### CEA-Leti's Elisa Vianello receives a €3 M EU grant to build insect-inspired memory

What do crickets and memory devices have in common? Elisa Vianello discovered that different functions of the insect's nervous system closely resemble functions performed by deterministic, probabilistic, volatile, and non-volatile memories.



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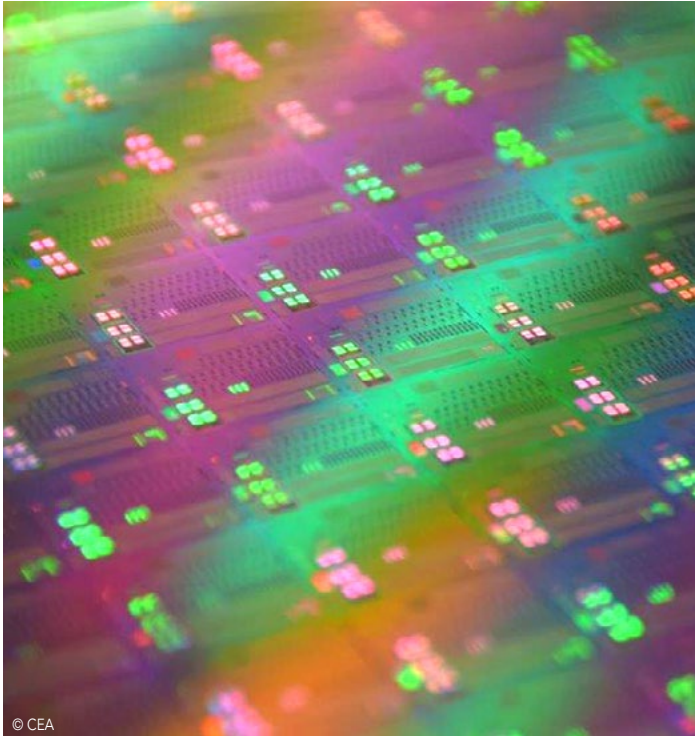
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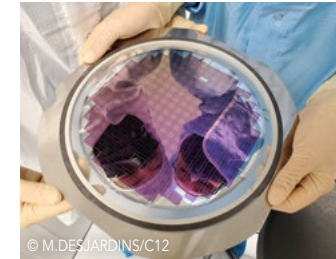
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**MEMORY****CEA-Leti engineers are working to make ReRAM memories more robust**

CEA-Leti scientists utilized Mott insulators to achieve a tenfold reduction in ReRAM cell variability. These unusual materials conduct electricity in theory but turn out to be insulators. The research could pave the way toward new solutions for data storage and other demanding applications.

**QUANTUM****CEA and C12 Quantum Electronics announce partnership**

Leveraging advances in 200 mm silicon CMOS processes to fabricate quantum chips, the partners will produce the first multi-qubit chips at wafer scale. C12 focuses on using carbon nanotubes to build quantum bits—the next leap forward in materials for quantum computing.



© M.DESJARDINS/C12

**ECO-INNOVATION****Discover SELF-e, a standalone, wireless, batteryless switch**

SELF-e brings energy harvesting to switches. The mechanical energy produced when someone flips a switch is harvested and used to power the switch. The innovation is now inside Legrand brand switches.



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**QUANTUM****Quantum sensors measure with unrivaled precision**

While much quantum research focuses on computing, CEA-Leti is also working on a lesser-known and much more advanced field, quantum sensing. Quantum sensors utilize the same properties as quantum computers to provide precision measurements.



© SAKKMESTERKE/ADOBESTOCK

**> Apparel: Say goodbye to bulky RFID tags**

CEA-Leti startup Primo1D integrates RFID capabilities into a single textile thread. The company is currently scaling up its E-Thread technology.

> **Leti Healthcare Workshop 2022: Innovation in Microtechnology for Bioproduction & In Vitro Diagnostics**

Biochips, integrated biosensors, automated systems, and photonic technologies will drive advances in drug development, bioprocess optimization, and medical diagnostics. Watch the recordings!

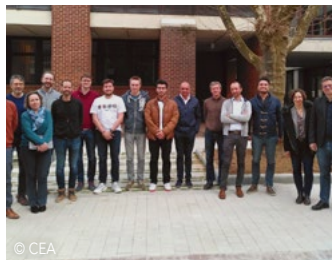


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## HEALTH

### Greenhouse gases could soon be monitored with LiDAR

In research for the H2020 Holdon project, CEA-Leti helped develop a photonic detection system that meets the requirements of space missions for observing greenhouse gases CO<sub>2</sub> and methane.



© CEA

## PARTNERSHIP

### CEA-Leti and UCLouvain unveil a three-year partnership on hardware

Under the agreement, CEA-Leti and UCLouvain will work together to drive innovation in telecommunications (including 5G/6G antennas), computing beyond Moore's Law, and biotech with modular electronics.



© PICKUP/ADOBESTOCK

## ECO-INNOVATION

### Extending mobile device lifespans

Louis Gerrer developed an algorithm leveraging machine learning to pioneer a new parameter extraction methodology that could quantify wear at an early stage during the circuit manufacturing process. His research won a Best Paper Award at IRPS 2021!



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## MANUFACTURING

### Semiconductor giants join forces to migrate to lower nodes to better serve the automotive, IoT, mobile industries

The CEA, Soitec, GlobalFoundries and STMicroelectronics announced a new collaboration to develop the industry's next-generation roadmap for FD-SOI (fully depleted silicon-on-insulator) technology.

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**SAFETY****Triggering controlled avalanches from a safe distance**

CEA-Leti unveiled a wireless networked detonator at Mountain Planet 2022. Originally developed for the mining industry, it allows ski patrol members to trigger controlled avalanches from a safe distance.

**HEALTH****A microfluidic chip for on-the-go biological analysis**

FlowPad features disposable, credit card format microfluidic cartridges with fluidic channels designed to perform a selection of tests outside of a traditional lab environment.



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**PATENTS****World intellectual property day: CEA in the global top five for semiconductor patents!**

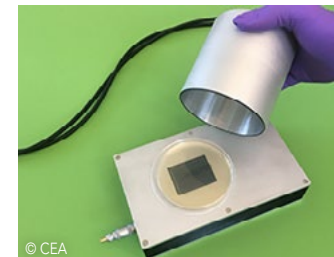
The European Patent Office (EPO) released its Patent Index 2021 report, which includes a ranking of global patent applications on the European market. The CEA is the only European RTO in the top five for semiconductor patents.



© CEA

**HEALTH****Healthcare in Africa: rapid, robust, and affordable microbial identification**

Mass spectrometry techniques used to identify bacteria require expensive equipment. CEA-Leti and CEA-Irig helped pioneer a fast, effective, and affordable diagnostic device based on their lensless imaging system as part of the EU Simble project.



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**> Don't miss this interview with Léa Di Cioccio, head of CEA-Leti's eco-innovation program!**

Learn how CEA-Leti made innovation more environmentally sustainable in 2022.





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## > Getinge acquires Fluoptics

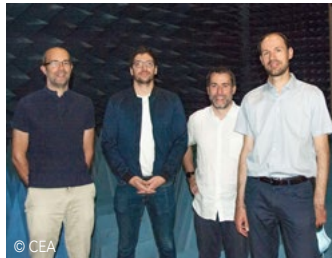
Sweden-based medical equipment giant Getinge acquired Grenoble-based Fluoptics, a leader in fluorescence imaging as an aid to surgery. Fluoptics' R&D and manufacturing will remain in France, helping make Getinge's site in Ardon, France, a center for excellence in optical imaging.



### AUGMENTED REALITY

## Integrated photonics: Could VR glasses soon look like eyeglasses?

CEA-Leti develops photonic circuits on transparent substrates, ideal for near-eye display technologies, which are garnering increasing interest as a solution for augmented reality.



### TELECOMMUNICATIONS

## Congratulations to the Astrid Measurement team for winning the IEEE AP-S Ulrich L. Rohde Award 2021!

The team came up with a new process that maps and minimizes echoes. They can now measure and map antenna radiation patterns regardless of the size of the anechoic chamber.



### HEALTH

## Breast cancer: new imaging techniques to limit painful biopsies

CEA-Leti is supporting non-invasive breast cancer screening strategies with two new imaging techniques: ultrasound and optical.



### COMPUTING

## Edge computing: 3D phase change memory could soon become a reality

CEA-Leti is committed to advancing phase change memory (PCM) technologies, including for automotive applications. PCM, with its high programming speeds and low operating voltages, is currently the frontrunner in the race to replace flash memory.

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**HEALTH****Crohn's disease: toward a new treatment for chronic inflammatory**

Research conducted for the EU New Deal project has resulted in the development of an unprecedented therapy for treating chronic inflammatory bowel diseases such as Crohn's disease. The initial *in vitro* and pre-clinical tests results are promising.

**POWER ELECTRONICS****New 100 V–800 V multifunctional GaN components deliver increased energy efficiency**

A new process design kit (PDK), the most comprehensive on the market, will help support GaN/Si development.



© P.JAYET/CEA

**ECO-INNOVATION****Ecodesign: a paradigm shift for more reliable, longer-lasting ICs**

CEA-Leti leveraged machine learning and other techniques to develop component aging models. The goal? To extend integrated circuit lifespans.



© GERMINA/ADOBESTOCK

**INDUSTRY 4.0****PreCOM: monitoring wear on power tools**

To support manufacturing, CEA-Leti developed PreCOM, an ultra-low-power and robust system that identifies tool wear and remaining life.



© DACO\_ADOBESTOCK

**> Diabeloop grows in France and internationally**

Diabeloop trained hospital staff in two regions of France on its DBLG1 closed-loop automated insulin therapy device (DBLG1) and signed an agreement with Japanese medical equipment leader Terumo.



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› **Scintil Photonics raises €13.5M**

Scintil, a CEA-Leti startup, develops silicon-based photonic integrated circuits and creates high-speed optical transmission solutions for data storage centers, high-performance computing, and 5G.

**PARTNERSHIP**

### CEA-Leti and EPFL join forces on key societal innovations

Because innovation has an impact on so many different parts of our society, CEA-Leti and EPFL decided to pool their resources to pioneer disruptive human-centered innovations in fields like cybersecurity, computing, and medtech.

**HEALTH**

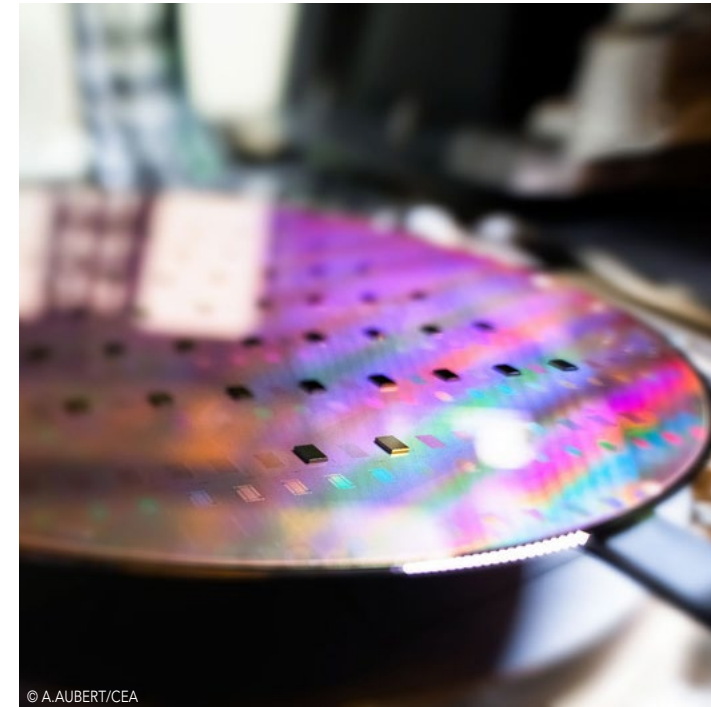
### Weighing particles to the nearest attogram

CEA-Leti is working with MIT on new sensors capable of weighing the tiniest individual particles to provide valuable information about their nature. The sensors could ultimately be used in the early detection of cancer.

**CYBERSECURITY**

### SecloT, an ultra-secure device for critical IoT applications

SecloT integrates an enhanced arsenal of hardware and software security features. It simultaneously ensures object authentication and protects the confidentiality and integrity of sensitive data.



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**MANUFACTURING**

### Bonding: CEA-Leti and Intel unveil die-to-wafer self-assembly breakthrough using water

CEA-Leti and Intel unveiled a breakthrough in die-to-wafer bonding with the potential to increase alignment accuracy and fabrication throughput by several thousand dies per hour. The approach uses the capillary forces of a water droplet to align dies on a target wafer.

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**EVENT**

## Leti Innovation Days 2022: Next-generation Electronics to Drive Your Business' Value Up

This year's event was a success with: 700+ attendees from 18 countries, 200+ business meetings scheduled, 100+ keynote speakers provided amazing tech content to our audience. Watch the recordings!

**HEALTH**

### Active micro-needles measure biological parameters and deliver therapies

Less invasive than traditional needles, micro-needles reach the deep layers of the epidermis to deliver drugs, measure physiological characteristics, or emit light at specific wavelengths.



© CEA

**DISPLAY**

### Congratulations to Lucile Arnaud's team for winning a 2021 3D IC Best Paper award!

CEA-Leti's experts developed a CMOS process and new hybrid bonding technique to manufacture high-performance microLEDs. The future is bright for smart displays!



© CEA-ANATOLY/ADOBESTOCK

**HUMAN HEALTH**

### Improved precision for certain brain tumor removal surgeries

Atomic force microscopy was used to identify new markers, independent of conventional imaging, that can help delineate pituitary adenomas for more accurate removal.



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### > CEA-Leti welcomes three international researchers in affective computing

Affective computing focuses on analyzing a cognitive state, facial expressions, gestures, tone of voice, and other physical parameters to develop technological devices that respond intelligently to natural human emotional feedback.



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### > Remedee Labs endorphin stimulator granted FDA breakthrough device status

CEA-Leti spinoff Remedee Labs provides an answer to chronic pain, improving patients' quality of life. Recently, the startup introduced a product, Remedee Well, that helps fibromyalgia patients manage their pain.

### > Dive into CEA-Leti's world-class semiconductor cleanroom

Watch the video!

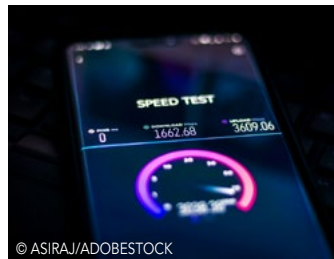


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#### QUANTUM

### VLSI 2022: CEA-Leti invited paper boost silicon quantum computing scaleup

CEA-Leti, CEA-Irig, and CNRS presented a paper on their progress toward manufacturing a silicon quantum processor at the VLSI Symposium.



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#### TELECOMMUNICATIONS

### Spectronite introduces a high-performance 5G wireless solution for mobile operators

Spectronite turned to CEA-Leti to boost the spectral efficiency of its wireless point-to-point backhaul solutions for 5G networks. Operators will now be able to serve more users simultaneously with the same capacity or give users more capacity.



© SEBASTIAN KAULITZKI/FOTOLIA

#### COMPUTING

### Ngoc-Anh Nguyen receives 2022 ECS Vancouver Best Paper award!

How far will More-than-Moore go? CEA-Leti is pioneering smaller synaptic transistors to bring efficient neuromorphic circuits to life.



© GORODENKOFF/ADOBESTOCK

#### HEALTH

### Onward awarded European Innovation Council grant to develop brain-spine interface

Onward will support the development of Brain-Spine Interface (BSI) technology to restore mobility and upper limb function in people with spinal cord injuries. The consortium will use the €3.6 million grant to fund the integration of Onward's Arcim Therapy and Clinatéc's Wimagine.

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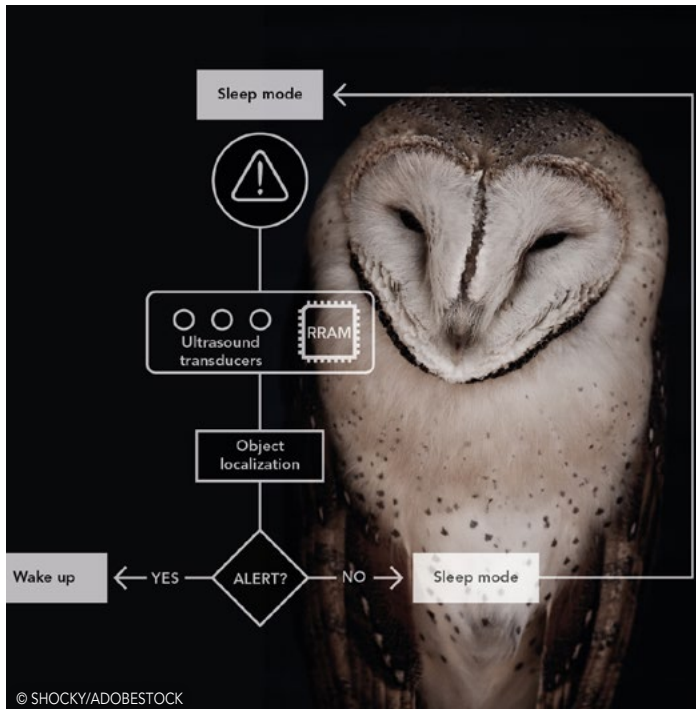
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**MEMORY****CEA-Leti develops ultra-low-power object localization system**

Inspired by the barn owl's neuroanatomy, CEA-Leti's object localization technology couples state-of-the-art piezoelectric ultrasound transducer sensors with a neuromorphic resistive memory-based computational map. This event-driven system uses up to five times less energy than existing technologies. The advance was published in Nature Communications.

**MICROELECTRONICS****"A close look at major microelectronics challenges": Q&A with Sébastien Dauvé**

Did you know that FD-SOI was developed at CEA-Leti? 2022 brought the good news that FD-SOI will soon have a dedicated production line in the Grenoble area. Don't miss Sébastien Dauvé's Q&A interview.

**AUTOMOTIVE****CEA-Leti introduces a new generation of 100 kW+ electric powertrains for electric and hybrid vehicles**

The ModulED (Modular Electric Drive) offers high power density, leveraging a compact powertrain that is fully built into the engine block.

**HEALTH****Diagnosing heart attacks in under an hour**

Researchers from CEA-Leti and CEA-Irig recently developed a new highly sensitive testing technology that can detect and count biomarkers without using antibodies.

**> Leti Semicon Workshop 2022: Accelerating Social Transformation with Semiconductor Innovations**

CEA-Leti is tackling social transformation by fueling deep and sustainable innovation for health, mobility, and digitalization. Download the presentations!





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### > CEA-Leti home to four i-Lab 2022 innovation competition winners!

Congratulations to Siquance, Admir, Baio-DX, and Lobx!



### > Check out our new Scientific Report for Technologies for Systems

You'll find the latest results on embedded systems, industrial IoT, localization, wireless connectivity, electronics for energy, and sensing and learning. Download the report!



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#### SENSING

### Discover CEA-Leti's high-end loudspeakers for smartphones and small electronic devices

CEA-Leti made a step toward loudspeakers compatible with micro-fabrication processes, developing a new piezoelectric micro-loudspeaker using almost exclusively silicon.

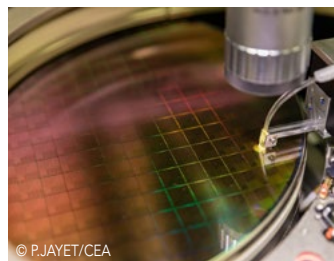


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#### CYBERSECURITY

### SecWay, a secure gateway for protecting sensitive data

SecWay is a secure-by-design gateway that guarantees the privacy and integrity of data exchanged between unsecured connected objects and remote (cloud) servers. Its security features are based on secure hardware (TPM, TrustZone) and software components to ensure end-to-end security.



© P.JAYET/CEA

#### OPTICS

### CEA-Leti startup Scintil Photonics raises €19 million in four years!

Optical interconnections capable of reaching speeds of 3,200 Gbit/s at a very competitive cost is what Scintil Photonics intends to bring to the market. Next, the startup will expand its global supply chain and accelerate market deployment in the Americas and Asia-Pacific.



© CEA

#### REPORT

### CEA-Leti publishes its European Activities Report

Horizon Europe is the EU's key funding program for research and innovation, with a budget of €95.5 billion. With over 100 projects, CEA-Leti supports Europe's initiatives for a better tomorrow and sovereignty in the semiconductor industry.

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**MEMORY****Heading for new memory technologies**

The non-volatile memory market is expected to reach \$15.2 billion by 2027. This type of memory offers the advantage of being able to store information when not powered and delivers enhanced performance. CEA-Leti reviewed the advantages and disadvantages of the main non-volatile memory technologies to help you gain a deeper understanding.

**ELECTRIC MOBILITY****Valeo and the CEA to collaborate on advanced research in power electronics**

The CEA and Valeo announced an agreement to collaborate on the next generations of power electronics, which are at the heart of the challenges facing tomorrow's electric mobility.

**TELECOMMUNICATIONS****CEA RF chip enables ultra-low-power IoT connectivity for remote devices via Astrocast's nanosatellite network**

CEA and Astrocast announced their successful collaboration on a low-cost, bidirectional communication module that enables businesses to communicate with their remote assets in areas not covered by terrestrial networks.

**TELECOMMUNICATIONS****Orestis Koutsos wins Best "Young Engineer" Paper Award at EuMW 2022**

Results like this award-winning paper by Orestis Koutsos confirm CEA-Leti's position as a major player in the race to satisfy growing demand for high-gain, high-efficiency wideband antennas.



© E.TOLWINSKA/CEA



© ASTROCAST



© CEA/L.GODART

**› Direct bonding: a key enabler for 3D technologies**

Read CEA-Leti's article in *Chip Scale Review* on how direct bonding is a key enabler for 3D technology. You'll learn about the main direct bonding techniques, their applications in the microelectronics industry, and CEA-Leti's R&D in this area.





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### > Leti Innovation Days Tokyo 2022: Could Innovations in Semiconductors Trigger the Metaverse Revolution?

Amid growing demand for a one-stop-shop R&D partner in Europe, CEA-Leti has invested in multidisciplinary R&D facilities with unique equipment and expertise. Download the slides!



### > World Electronics Forum Grenoble 2022

The event brought key digital technology and electronics stakeholders together to discuss innovation, the market, and global challenges. Watch the highlights video.



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#### CYBERSECURITY

### CEA & Schneider Electric extend R&D collaboration on secure and resilient digital solutions

The partners decided to extend their joint lab for three more years to continue to test and improve the security of world-leading process and energy technologies for greater resilience across industries.



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#### HEALTH

### CEA-Leti and Thales work toward more mobile, flexible medical radiology

CEA-Leti is providing silicon wafers and image reconstruction technologies for a sovereign medical equipment and e-health services industry in France.



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#### ENERGY HARVESTING

### CEA-Leti partnership with Legrand earns recognition at 2022 Carnot forum

The Ubiquity project team, represented by Sebastien Boisseau, lab manager at CEA-Leti, and Bruno Vulcano, R&D manager at Legrand, won a Carnot award for a three-year research partnership that resulted in the deployment of a new technology called SELF-e.



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#### EDUCATION

### Don't miss PhD Generation season 3!

PhD Generation is a series of testimonials from PhD students conducting research in microelectronics at CEA-Leti. Season 3 offered up twelve new episodes, available online. Watch and learn how PhD students are tackling challenges in their fields and laugh along with their fun anecdotes.

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DECEMBER

**QUANTUM****Siquance: France's silicon quantum computing startup**

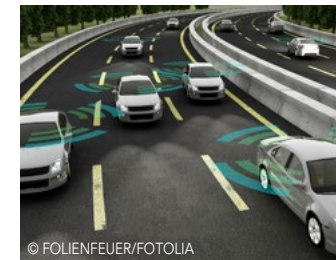
Co-founded and led by CEA-Leti's Maud Vinet, the CEA-CNRS spinoff Siquance will develop and commercialize a quantum computer built on advanced semiconductor technology and the expertise of European chip manufacturers.

**ENERGY****GaN/Si micro-inverter reduces solar power cost per watt**

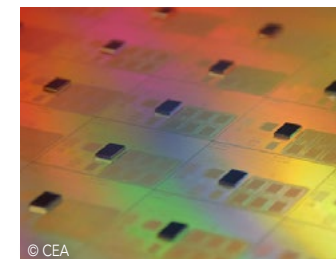
Conventional silicon-based micro-inverters—the most critical components for improving solar panel performance—have reached their limits. CEA-Leti researchers are now offering more compact 650 V and 100 V GaN/Si power transistors to reduce the cost of solar power.

**LIDAR****CEA-Leti research leads to improved MEMS micro-mirrors for automotive applications**

This innovative technology was developed to detect car tires from 100 meters. These research results emerged from the European VIZTA Project and are protected by three new patents.

**MANUFACTURING****Improving the precision and speed of direct hybrid bonding**

CEA-Leti recently wrapped up an R&D partnership with SET (Smart Equipment Technology) on its direct hybrid bonding die-to-wafer process that combines precise alignment (under 1 micron) and high throughput.

**> A panorama of the latest optics & photonics technologies**

Download CEA-Leti's latest report. You'll find the latest in infrared and THz imaging, CMOS imaging, X- and gamma-ray imaging, silicon photonics, optical environmental sensors, and depth sensing inside!





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### > Leti Devices Workshop 2022: Highly Efficient Innovative Technologies for More than Moore Solutions

This event in San Francisco brought in 115 attendees from around the globe to hear key results in the fields of efficient computing, radiofrequency devices and innovative co-integration with sensors. Download the slides!

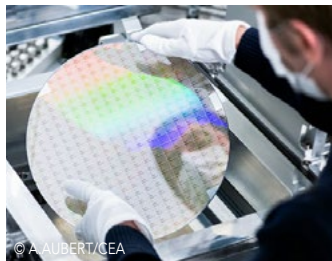


© PANUWAT/ADOBESTOCK

#### TELECOMMUNICATIONS

### RFID tags could soon precision-locate stock for automated inventory processes

CEA-Leti developed a miniaturized superdirective antenna with dedicated algorithms to read commercial RFID tags with record positioning accuracy in the reading range.



© A. AUBERT/CEA

#### QUANTUM

### IEDM 2022: CEA-Leti presents its recent advances and future challenges in quantum computing

CEA-Leti presented three papers on quantum computing using Si-based qubit devices with FD-SOI technologies. A plenary talk mapped out the path towards scalable Si quantum computers.

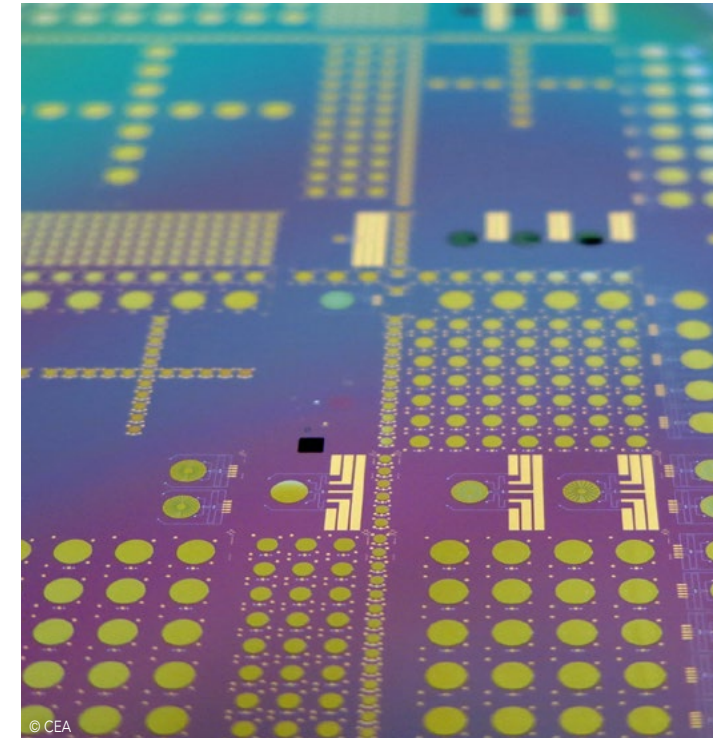


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#### ENERGY HARVESTING

### Optimizing energy harvesting in closed, confined environments

Congratulations to Adrien Morel for his Best Paper Award from the EEA Club for his work on power management for piezoelectric harvesters.



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#### MEMORY

### CEA-Leti ReRAMs bring promising advantages to neuromorphic/in-memory computing

A CEA-Leti tutorial presented by Elisa Vianello at IEDM 2022 highlighted the promising advantages that resistive random-access memory (ReRAM) technologies could bring to implementing novel neuromorphic/in-memory computing systems for massively parallel, low-power, and low-latency computing.



© CEA

**HEALTH****Mimicking the physiology of human organs**

Organoids-on-chip are systems that use cells from real patients to replicate the functioning of an organ on a chip for much less invasive tests. Watch the video.

**EDUCATION****Are you interested in a career in microelectronics but don't know where to start?**

Last year, ten learners completed a four-month custom vocational training program offered by Greta, a Grenoble-based center for continuing education, successfully launching their cleanroom careers!



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**SCIENTIFIC EXCELLENCE****CEA-Leti researchers publish four papers in Nature journals in 2022!**

The year 2022 was a record-breaking one for our scientists, who racked up an impressive four publications in *Nature* journals.



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**SUSTAINABILITY****CEA-Leti featured in EE Times 50th anniversary e-book**

CEA-Leti was honored to be featured in the EE Times e-book, "The Next Silicon Frontier." Our CTO Jean-René Lèquepeys outlined the institute's vision for a sustainable path for massive data generation (pages 108-111).

**> CEA-Leti eco-innovation program white paper**

A seminar in March interrogated scientists' role in today's society and reviewed the main eco-innovation needs, challenges, and tools. CEA-Leti's approach to eco-innovation and the rebound effect were also addressed.





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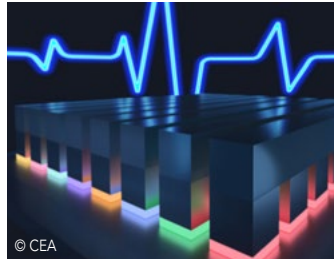
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### Acknowledgments

The research presented in this document is supported in part by the EU Horizon 2020 research and innovation program, France's national research agency (ANR), and the Carnot Network. The equipment in CEA-Leti's world-class cleanrooms is financed in part by the Auvergne Rhône-Alpes region.



#### MEMORY

### Resistive Random Access Memory

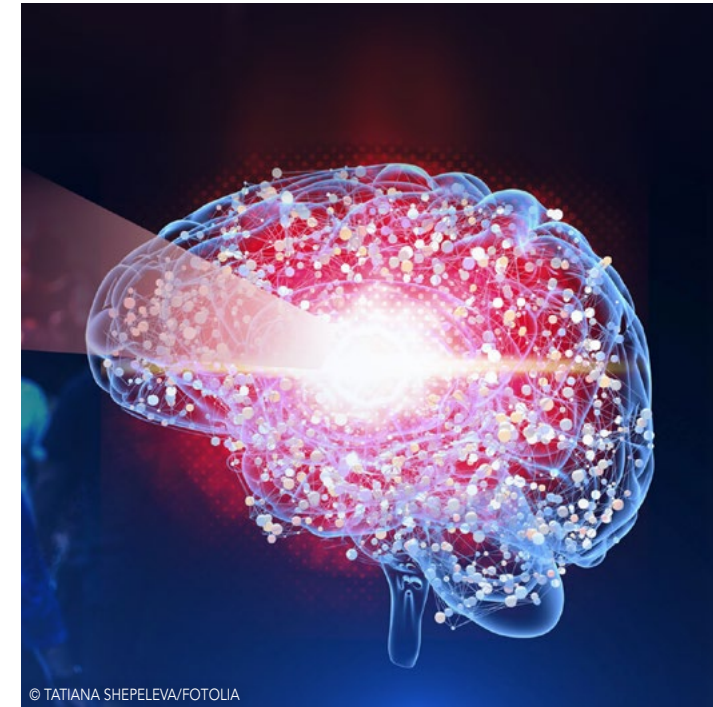
Elisa Vianello was part of a team that experimentally demonstrated multilevel resistive random access memory (ReRAM) programming that delivers stable neural network inference accuracy for up to two months, highlighting the potential of resistive memory for the implementation of low-power neural networks with long-term stability.



#### AWARD

### Simon Deleonibus receives the 2022 IEEE Cleo Brunetti Award

The award recognized Simon's 35+ years of outstanding contributions to and leadership in nanoscale CMOS device and process technologies at Thomson Semiconductors, now part of STMicroelectronics, and CEA-Leti.



© TATIANA SHEPELEVA/FOTOLIA

#### HEALTH

### Light-based medicine could slow the progression of Parkinson's disease

Learn about a clinical trial of CEA-Leti intracerebral device designed to slow neurodegeneration using neuro-protective light. Current treatments for Parkinson's only temporarily mitigate the symptoms of the disease. Watch the video.

### Stay up to date

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