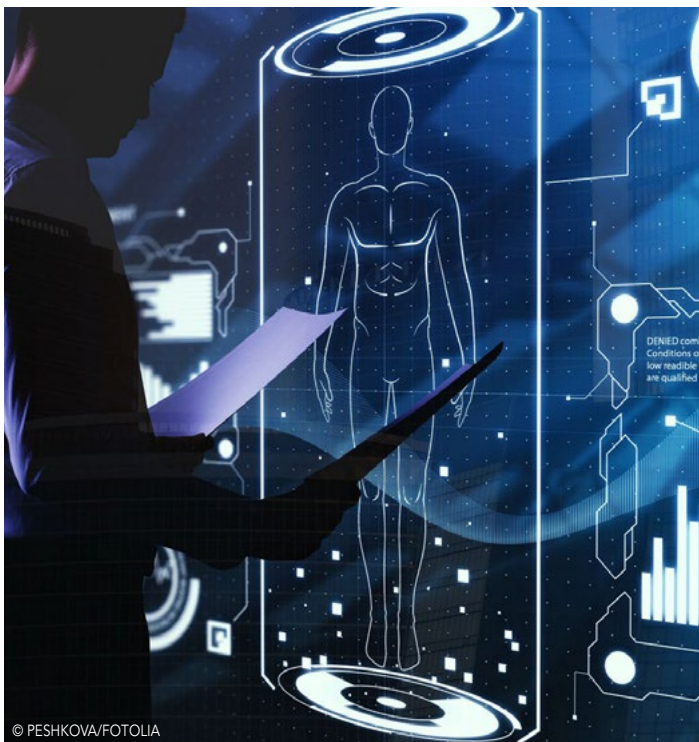




# 2021

## HIGHLIGHTS





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Scientific Excellence

**CEA-Leti reports machine-learning breakthrough that opens way to edge learning**

**NatureElectronics**—Imagine an implantable drug pump able to locally update its operation based on the evolving state of a patient. CEA-Leti researchers are trying to develop fully independent systems, able to learn from new data and take decisions by themselves.

Human Health

**Discover Recue Drone, smartphone location technology for mountain rescue**

In an avalanche, every minute counts! CEA-Leti researchers equipped a drone that can locate your smartphone to within a meter and inspect 10,000 m<sup>2</sup> of terrain in just minutes!

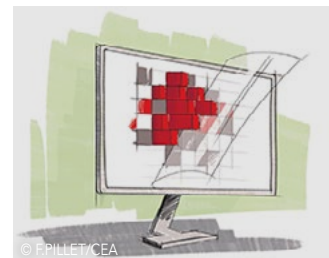


© ANDREAS P. MACIEJ GERSZEWSKI/ADOBESTOCK

Display

**OLED is gradually replacing LCD in our smartphones!**

Now, OLED requires the use of anti-glare filters that also drastically reduce the amount of light emitted by the diodes. A recent innovation is changing all that! CEA-Leti scientists developed the ideal optical system for this modified OLED.



© P. PILLET/CEA

Cybersecurity

**Discover Argos, IIoT networks: End-to-end security & supervision**

Cybersecurity is key when it comes to industrial networks, factories and health systems. Discover ARGOS, CEA-Leti's 3-in-1 solution integrating state-of-the-art countermeasures to ensure in-depth defense featuring.



© SKÓRZEWIAK/ADOBESTOCK

> **Are you a cycling enthusiast? Or simply caring for the Earth?**

**CES 2021**—Wise-integration, CEA-Leti's startup is presenting the world's smallest electric bicycle charger, "Power Cube". The tech behind: a reduced number of components and a clever electronic architecture.

> **Interested in PowerElectronics?**

Be sure to order the new, hot off the press "AspenCore Guide To Gallium Nitride" book. This book provides a comprehensive look at the GAN technology: applications, market, and future includes a special R&D review from CEA-Leti expert Raphael Salot.



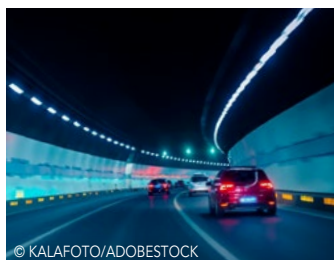
> **Objectives of the Quantum Photonics Platform**

**ECOC 2021**— Segolène Olivier, Quantum Photonics Program Manager, details the objectives of the quantum photonics platform developed at CEA-Leti for cryptographically secured fiber optic communications. Watch the replay.



> **Next-generation wireless connectivity EU Project**

—6G is already around the corner. The RISE-6G EU project will design, prototype and test smart and energy-sustainable technological advances based on reconfigurable intelligent surfaces that will enable programmable control and shaping of the wireless propagation environment.



**Mobility**

**CEA-Leti reports breakthrough high-performance gyroscope for automotive, aeronautic and industrial applications**

In driverless cars, gyroscopes can ensure safe navigation when GPS is blocked in a tunnel and when LiDAR fails. CEA-Leti and Politecnico di Milano reports a world's first for NEMS-Based Gyroscope operating at 50 kHz in severe environments.

**Edge AI**

**Behind the paper: Memristor-based Markov chain Monte Carlo, by Thomas Dalgaty**

**DeviceMaterialsCommunity.nature.com**—In the second year of my PhD I was attending my first large conference in Sapporo – the largest city on the northmost island of Japan, Hokkaido. There were a large number of contributions addressing resistive memory technologies (i.e., memristors) and how they might be applied in machine learning.



**Human Health**

**Bioresources enable antimicrobial bandages**

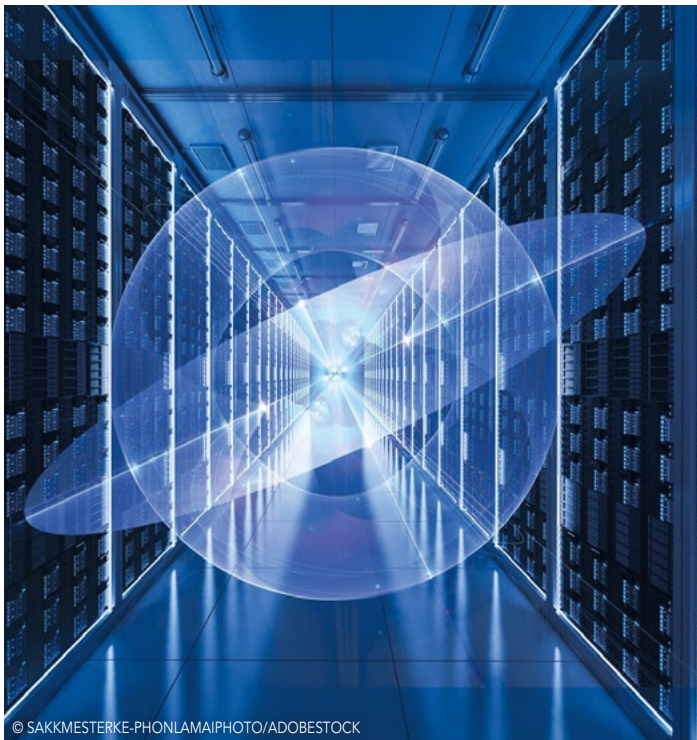
Medical waste at hospital generate serious concerns nowadays. Researchers are currently developing natural antimicrobial bandages to treat infected wounds with nanocellulose obtained from wood.



**Report**

**CEA-Leti's 2020 scientific report: Download it now!**

Are you working within an R&D unit on the lookout for NEW ready-to-be-transferred microelectronics technologies? CEA-Leti's open access scientific report outlines in a lively and dynamic manner the latest you need to know for industry.



© SAKKMESTERKE-PHONLAMAIPHOTO/ADOBESTOCK

**Quantum**

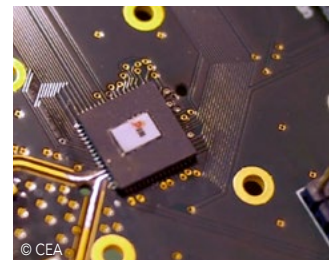
**Interested in quantum computing? CEA-Leti is unveiling its latest breakthroughs**

Discover the institute comprehensive brief now, including: The fundamental advantages of silicon spin; CEA-Leti & partner's objective: Develop a "Full Stack" of production-ready technology; The remaining challenges.

**Edge AI**

**Discover SamurAI, an IoT node in 28nm FDSOI**

In the near future, millions of sensor nodes (IoT) will collect and share data to address the sustainable environmental and power reduction challenges. Collecting and processing the data locally with an Artificial Intelligence is the key to address these requirements.



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**Telecom**

**On route towards 6G!**

CEA-Leti today announced the creation of a new European Union initiative to lay the groundwork for future wireless networks with a broad-based approach that converges multiple technologies, fields and disciplines. With an eye toward adapting and exploiting leading-edge R&D already underway at consortium partners, the NEW-6G initiative anticipates creating common projects to pursue further work.

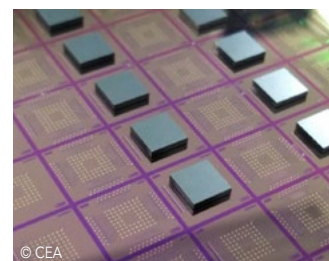


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**Quantum**

**CEA-Leti team paves the way for massive integration of qubits, critical for achieving quantum supremacy**

Silicon-spin qubits have a small size and are compatible with CMOS technology. They therefore present advantages for large-scale integration compared to other types of qubits.



© CEA

**> There will be more than 60 billion of connected objects by 2030!**

**SEMI Global Summit 2021**—CEA-Leti's CEO, Emmanuel Sabonnadière, is unveiling his vision on Edge AI. Watch this video to discover how hardware will be a game changer.



**> Fluoptics revolutionizes surgery**

The stagnant economy has not put a dent in sales of Fluoptics products. This CEA-Leti startup offers a fluorescence imaging solution that is literally revolutionizing breast cancer and thyroid surgeries.

2021

JANUARY

**FEBRUARY**

MARCH

APRIL

MAY

JUNE

JULY

AUGUST

SEPTEMBER

OCTOBER

NOVEMBER

DECEMBER

> **New EU Quantum Flagship consortium launches a project on silicon spin qubits as a platform for large-scale quantum computing**

The QLSI project brings together 19 top European groups to focus on developing highly scalable quantum processors in silicon, and marks a recent addition to the EU's Quantum Flagship a 10-year, €1 Billion R&D initiative launched in 2018.

> **Leti Photonics Workshop 2021: Emerging photonics and integration technologies for healthcare**

One-hour digital discussion of key photonics technologies for healthcare. Watch the entire replay!



© A.AUBERT/CEA

**Quantum**

**CEA is the first research center to acquire a cryogenic prober for testing quantum bits**

CEA announced today the acquisition of a Cryogenic Wafer Prober manufactured by Bluefors Oy, the Finnish specialist in designing and manufacturing ultralow temperature-dilution refrigerator systems for cutting-edge research in quantum computing and nanotechnology.

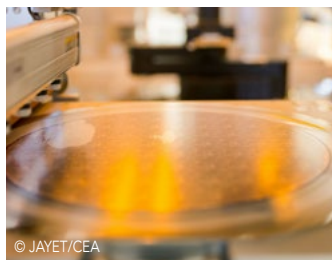


© LEGRAND

**Energy Harvesting**

**A stand-alone switching solution to leverage energy harvesting**

Legrand and CEA combine their expertise to develop a new generation wireless and batteryless switch. This technological innovation makes the connected home more sustainable by reducing environmental impact and maintenance operations due to battery use.

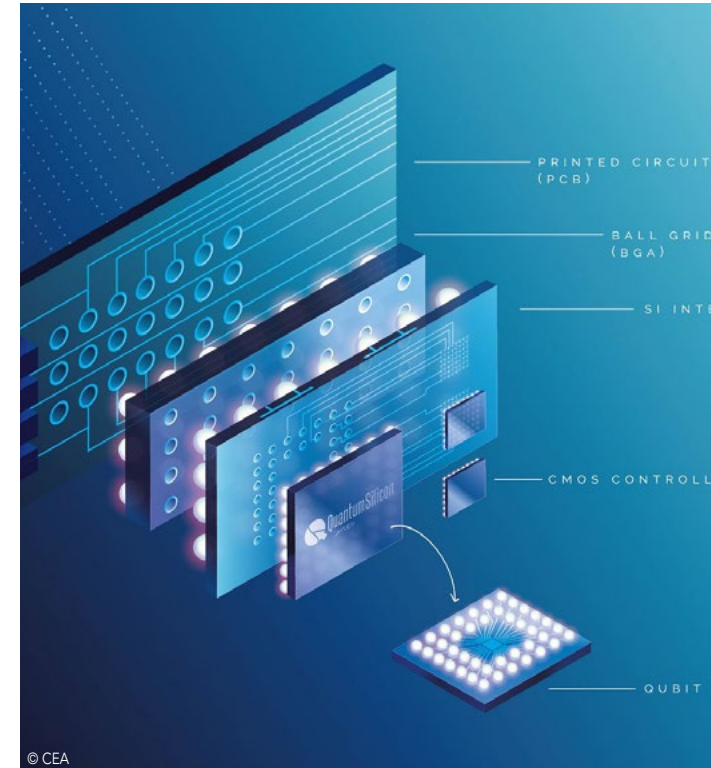


© JAYET/CEA

**Low-power**

**CEA-Leti & Dolphin Design report FDSOI breakthrough**

ISSCC 2021—Discover this new adaptive back-biasing (ABB) architecture for FD-SOI chips that that boosts operating frequency by 450% and reduces power consumption by 30%!



© CEA

**Quantum**

**On route towards an interposer prototype for quantum**

A team of French scientists has started to build an interposer that meets requirements of quantum computing by allowing integration and testing of both quantum and control chips fabricated from different materials and technologies.



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**Augmented Reality**

**CEA-Leti unveils key results for retinal projection displays**

**Photonics West 2021**—Expanding on its previous advances in integrated optics and silicon photonics, CEA-Leti presented four related papers that show key steps toward improved AR capabilities with retinal projection: Microscopic holograms, New optical concepts, Enhanced device design.

**Cybersecurity**

**What's new for Blockchain?**

CEA-Leti is currently very active on the Blockchain topic exploring how to embed cryptographic functions on a physical system like a robot. The idea behind? To certify the data produced by the physical system and store the certificates on a blockchain.



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**Human Health**

**Diffuse contaminants in the crosshairs**

You sure used at least once a sticky roller to keep your clothes free from pet hair... Now, imagine a sticky roller that could trap viruses or bacteria... CEA-Leti developed a similar tool capable of rapidly collecting and analyzing surface contaminants of a biological or chemical nature.



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**Mobility**

**On the road towards low-cost LIDARs with integrated optical phased arrays**

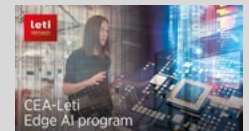
**Photonics West 2021**—CEA-Leti unveils its latest results for low-cost Lidars that will benefit society and make industry more efficient: autonomous vehicles; holographic displays; biomedical imaging... and many other applications.



© METAWORKS/ADOBESTOCK

**> Edge AI Program : to pioneer reliable and energy efficient semiconductor solutions**

Discover how Edge AI can help avoid data transfer with In-Memory Computing and how this “out-of-the-Cloud” solution will help drastically reduce latency while keeping citizen’s data safe and private.



**> Shorter time-to-market for CPS-based solutions**

**EU Project**—Do you remember the European FED4SAE project launched 3 years ago to accelerate cyber-physical-systems to market? FED4SAE helped so far 32 companies from across Europe with prototypes and innovative products.

> **UE is reinforcing the nanotechnology transnational cooperation**

**EU Project**—An additional EU investment of €10 million for ASCENT+ to make world-class facilities available and to foster the Nanoelectronics community.

> **Kalray recently raised €5.2 million**

Kalray is a CEA-Leti and CEA-List spinoff founded in 2008. The company, which designs multicore, massively parallel microprocessors has now raised a total of €97 million.

> **Discover the latest for brighter color microdisplays**

**EU Project**—With luminance of at least 50,000 candelas per sq. m, around twice that of today's top-performing LCD and OLED microdisplays, CEA-Leti is developing, through the EU H2020 Hilico project a GaN color microdisplay that delivers excellent resolution and very high brightness.

Scientific Excellence

**3D: The El Dorado of Heterogeneous Integration**

**3Dincites.com**—From the cloud to edge computing, the quest for ever-greater power efficiency remains researchers' top priority. From high-end niche to mass-market applications, the best cost-to-performance tradeoff is key to providing a competitive advantage. While Moore's Law has helped meet the performance required so far, it is no longer relevant when it comes to cost-sensitive applications such as edge artificial intelligence and internet of things (IoT) devices.



© SDECORET/ADOBESTOCK

Cybersecurity

**Discover IMRC, more resilient cybersecurity for IoT devices**

As the number of IoT grows, so does the number of entry points for hackers! iMRC focuses on the development of a hardware and software architecture with an integrated secure element and a monitoring system, all connected to a supervision server running AI-based threat analysis software.

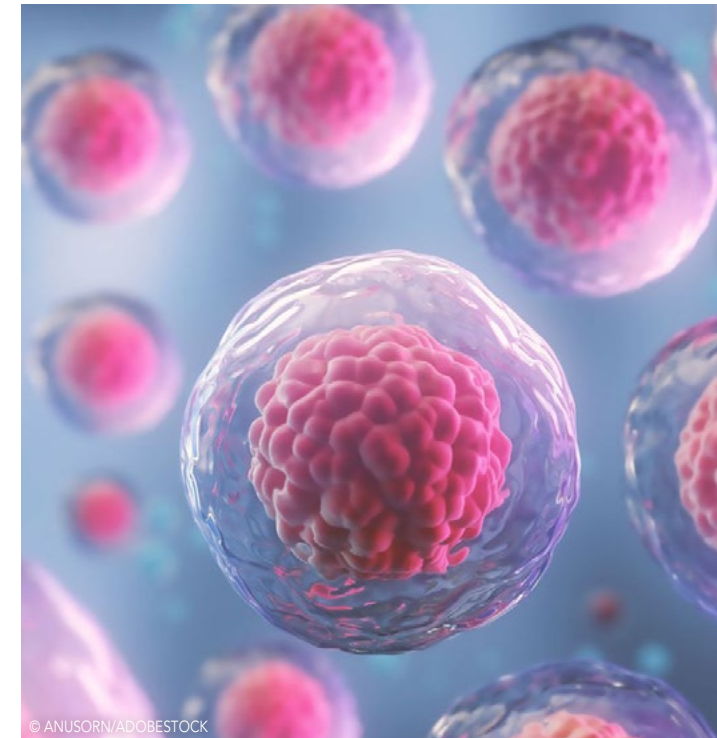


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Human Health

**Fewer post-op complications for colorectal cancer patients**

CEA-Leti is developing a comprehensive CAL (colorectal anastomotic leakage) monitoring system that will include a device that can be integrated into the surgical drain, an algorithm to trigger alerts at certain thresholds, and a user interface for caregivers.

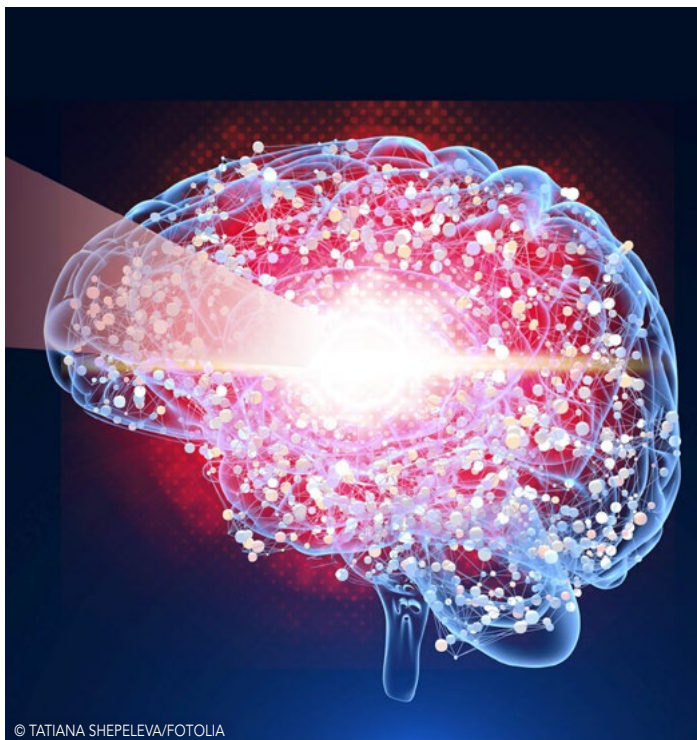


© ANUSORN/ADOBESTOCK

Human Health

**CEA-Leti unveils a new imaging technique to detect cancer**

In the fight against cancer, time and precision are our allies. CEA-Leti researchers unveil an imaging technique to detect cancer for more accurately and faster analysis than tumor-biopsy procedure. The technology behind? A lensless, infrared spectral-imaging system.



© TATIANA SHEPELEVA/FOTOLIA

Human Health

## Neuroillumination: a new hope for parkinsons disease

Scientists unveil a near-infrared based technology that could slow down motor impairment: first patient implant in first clinical trial. The project is based on a near-infrared technology, also called photobiomodulation, developed by CEA-Leti in collaboration with Boston Scientific.

Human Health

## CEA-Leti are improving scanner's images with new algorithmic models

For an even more accurate, rapid image, researchers at CEA-Leti are improving image reconstruction by introducing an algorithmic model that takes the spectral data into account effectively.



© TRISH20/FOTOLIA

Mobility

## Are you a cyclist or a "fixie" lover?

The "fixie", a fixed-gear city bike with no mudguards, could soon enjoy the comfort of a streamlined and quiet electric start-assist motor! CEA-Leti developed elementary motor components that can be adapted in terms of size, number, and arrangement to suit the target application.



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Human Health

## Nanoparticles for drug delivery: next-generation biological drugs to treat inflammatory bowel diseases

**European Pharmaceutical Review (page10)**—Nanoparticles offer a promising alternative to conventional drug delivery that allow for more precise targeting and controlled release. Here, Dr Navarro discusses the benefits of these nanocarriers and their potential as a therapy for inflammatory bowel diseases (IBDs).

### > IoT: Making security better, together

**EU Project**—CEA-Leti will help develop a solution effective at keeping hackers out through the European DigiFed project. This EU project brings together 16 European SMBs around cybersecurity for IoT applications.

### > On the lookout for latest Optics & photonics technologies?

Download CEA-Leti's latest report. You'll find within the latest for all-wavelength imaging (Gamma and X rays, visible, infrared, THz), optical data communications, optical environmental and 3D sensors and information displays.





> **Neuromorphic Computing**

**EU Project**—Discover MeM-Scales, EU's latest project to develop a novel class of algorithms, devices and circuits that reproduce multi-timescale processing of biological neural systems.



**Telecom**

**A new 5G for critical IoT applications**

CEA-Leti, is part of a consortium led by Sequans Communications that is gearing up to deploy 5G for critical IoT applications requiring reliable, low-latency communications.



**Scientific excellence**

**Germanium laser on silicon contacts could become more stable**

Optronics researchers love the idea of germanium lasers on silicon, but the devices' contacts are highly thermally unstable. In a world-first, a PhD research project being conducted at CEA-Leti has explained this unpredictable behavior.

**Cybersecurity**

**Blockchain & Digital Identification White Paper now available**

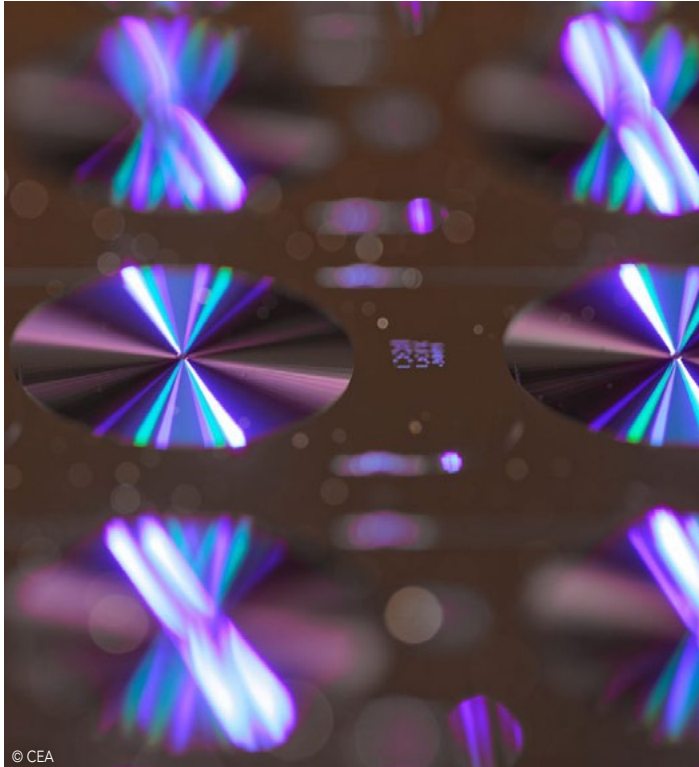
**French government**—France just released a book on how to protect identity data as per its cultural criterions.



**Human Health**

**Discover CEA "all-in-one" technique to fast track phage-therapy diagnosis**

The growing number of drug-resistant bacterial infections worldwide is driving renewed interest in phage therapy. A team of French scientists has demonstrated a lensless imaging technique that could easily be implemented in cost-effective and compact devices in phage laboratories to accelerate phage-therapy diagnosis.



© CEA

Scientific Excellence

**Silicon can emit single photons at 1.28 microns...**

CEA-Irig was among the partners on an ANR project that resulted in the on-demand emission of single photons in silicon at 1.28  $\mu\text{m}$ , a wavelength used in telecommunications. They did it by introducing carefully-engineered defects into the material. The goal is to integrate this photon source into CEA-Leti chips for quantum communications!

2021  
**MAY**

Cybersecurity

**CEA-Leti unveils its latest demonstration to protect our everyday devices...**

TILT explains why and how IoT data flows can be secured using lightweight, efficient encryption mechanisms.

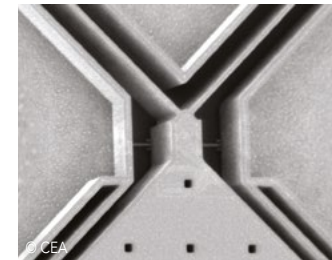


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Scientific excellence

**Discover CEA-Leti's latest M&NEMS technology offer**

On the lookout for technologies to enable high performance accelerometers, pressure sensors and gyrometers? CEA-Leti has developed a new design and detection method combining micro- and nano-electromechanical systems (M&NEMS), further pushing the boundaries of existing MEMS technologies.



© CEA

Internet

**Could the future of Optical fiber be plastic? CEA-Leti unveils H-Link**

H-Link is the very first system that transmits, with one single integrated component, radiofrequency waves both in the air and in a plastic link!



© SONOVISION

**> Aryballe, winner of the "Plan France Relance"**

One more ! € 1.1 million and 41 jobs at stake... Our startup Aryballe, a pioneer in digital olfaction, will be able to launch a pilot line for its production of olfactory sensors.

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

Managing increasingly complex microelectronics systems effectively and securely has become vital! Download the report.



> **Biosynex acquires our startup Avalun!**

Avalun democratizes biological analyzes, all at your fingertips with its portable LabPad®!

> **Discover European Projects coordinated by CEA-Leti!**

Wondering what RTOs & Industry are doing to achieve greater sovereignty for Europe? Get a snapshot of what we are doing to build a better tomorrow!

> **CEA-Leti celebrates its 70th deeptech startup!**

Watch the video to discover the name of its brand new startup... Stay tuned to learn what this new startup does to help reduce waste.



**Award**

**Francois Templier, our display expert, received the Society For Information Display Fellow Award!**

"For his many contributions to the science and technology of thin-film transistors, flexible displays, OLED microdisplays, and GaN micro-LED displays."

**Telecom**

**Taking 6G KPIs to a new level**

**EE Times Europe**—Like any generational advance in technology, the 5G-6G transition will greatly improve our ability to meet key performance indicators (KPIs). We'll have the ability to link several-orders-of-magnitude-more devices; create zero-latency, zero-energy, ultra-reliable links; perform semantic-enhanced data mining; and seamlessly share knowledge between humans and machines in support of artificial intelligence and other advanced applications.



**Human Health**

**Why sensing levels of oxygenation within skin tissues is important?**

CEA-Leti unveils its new demonstration for a low-cost, compact, wearable tissue oxygenation sensor. Main benefits: help pinpoint areas likely to become necrotic (in reconstructive surgery patients, for example); less invasive monitoring for sleep apnea.



**Artificial Intelligence**

**World's first autonomous imager for smartphones and small appliances through face recognition!**

The autonomous imager is the world's first highly efficient, compact and ultralow-power, smart-awaken system designed for everyday small appliances.



Environment

**Can you trust current air quality sensors? The answer is NO...**

CEA-Leti expands the detection of air pollutant with its new  $\mu$ PMSense technology. What's new?  $\mu$ PMSense can identify inorganic, metallic and carbon-based particles, currently not addressed by standard commercial products. It can detect of particle matter down to 0.3  $\mu$ m. CEA-Leti works hand-in-hand with industrials to transfer  $\mu$ PMSense technology. Let's take a breath of fresh air!

Cybersecurity

**How secure is your smartphone's facial recognition system?**

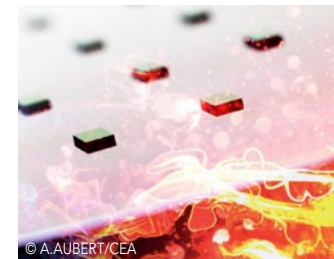
CEA-Leti's CESTI became the first testing center in France to obtain FIDO accreditation for biometric systems. The new FIDO certification provides additional assurance that your favorite device's biometric authentication system is secure. in partnership with ELITT.



Scientific Excellence

**Discover CEA-Leti's temperature record for 3D sequential**

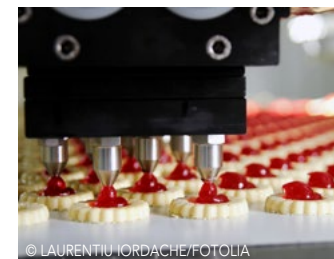
VLSI 2021—When it comes to 3D sequential technologies, processing the upper-level transistors at temperatures higher than 500°C can damage the metal interconnects and the silicide of the bottom-level transistors. The institute has demonstrated record performance in top-tier nMOSFETs using CoolCube™.



Human Health

**Direct Analysis reduces food bacteria detection time by 4!**

Direct Analysis developed a microfluidic technology that detects the presence of food contamination, such as Listeria, Salmonella and E.coli, in less than 6 hours vs 22 hours today! The system seamlessly leverages biomolecular testing and CEA-Leti's lensfree imaging technology, in a device that integrates DNA analysis.



**> CEA-Leti co-recipient of the prestigious Leenaards Foundation award**

The Leenaards Foundation has awarded two scientific prizes, for a total amount of €1.3 million. One of the two prizes goes in part to CEA-Leti. The project aims to study the brain-spinal cord interface to enable paraplegics to regain the use of their legs.

**> Leti Innovation Days 2021: Hardware is back!**

Discover what's coming next for the semiconductor industry. You were not able to finish a presentation or want to watch it again? Watch the replay.



> **Scientists & Pioneers**

Grenoble, land of microelectronics, but not only! The GIANT Innovation Campus 'Scientifiques et Pionniers' mini-series highlights our expert in computation and memory. Because yes, microelectronics is everywhere in our daily lives.



> **UE scientific & industry leaders are laying the groundwork for 6G**

Watch CEA-Leti, Ericsson, Nokia, Orange, GlobalFoundries, Sequans Communications (etc.) discussion on roadmaps & cooperation opportunities.



**Corporate Affairs**

**CEA-Leti unveils its new director Sébastien Dauvé**

Sebastien Dauvé was named Director of CEA-Leti effective on July 1, 2021, after more than twenty years of experience in microelectronics technologies and their applications, including clean mobility, medicine of the future, and cybersecurity.



**Design**

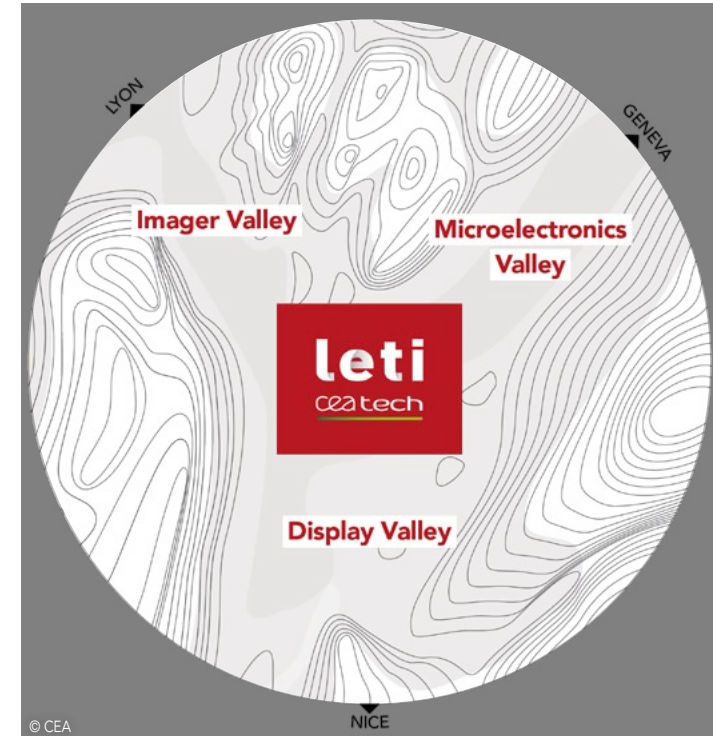
**Discover a new addition to component designers' arsenal!**

CEA-Leti unveils its brand new design kit that expands the range of tools designers now have available to them. Co-developed with Siemens EDA, the kit includes a library of validated components from CEA-Leti's portfolio of mature technologies created using Siemens EDA's new Tanner CAD software.

**Corporate Affairs**

**Commissioner Thierry Breton visited this summer CEA-Leti's cleanroom facilities**

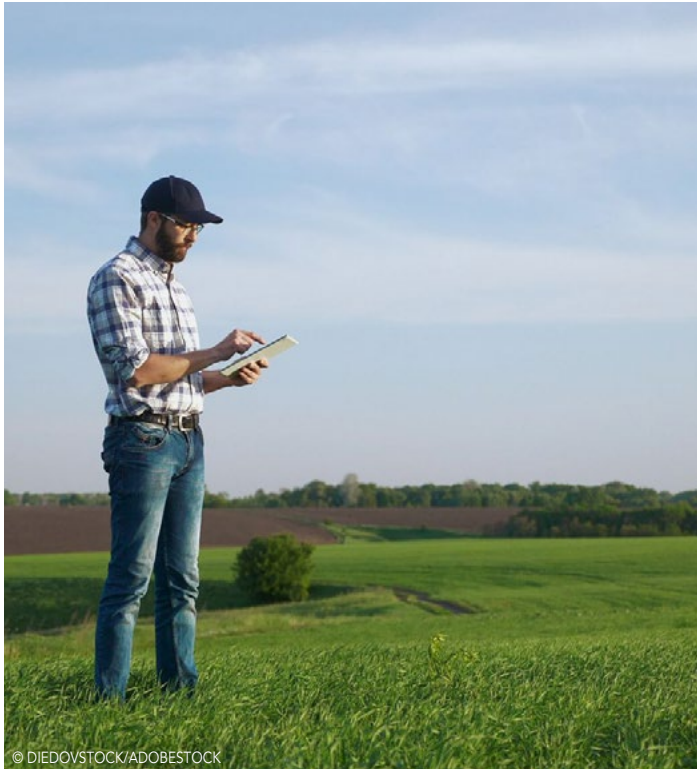
CEA-Leti's team was delighted to welcome Thierry Breton within its 10,000m<sup>2</sup> of world-class cleanroom space to discuss: Quantum Computing, Edge Artificial Intelligence and other key technologies developed at CEA-Leti.



**Ecosystem**

**Grenoble Alpes: three valleys and a booming nanotechnology ecosystem**

While not as well known to the general public as Silicon Valley, the Grenoble Alpes site is a hotspot for microelectronics and More than Moore technologies. Based around its center of gravity, CEA-Leti, the site is home to some fifty companies and is spread across three valleys: one for microelectronics, one for imagery and one for displays.



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Telecom

## Internet for rural communities

A step closer towards broadband internet access in rural areas! One of the main IoT communication protocols called narrowband IoT could, with a few minor tweaks, be useful wherever terrestrial base stations are lacking rural or mountain areas and oceans.

Computing

## In-memory computing could help improve circuit performance

Theoretically, in-memory computing should make it possible to reduce circuit power consumption. Researchers recently verified this hypothesis in the lab, using tools they developed for the programming of innovative computing architectures.



© MONSITJ - ADOBESTOCK

Manufacturing

## Automatic wafer-level testing of photonics circuits now available

Did you know that optically-coupled photonic chips cannot currently be tested at wafer level? CEA-Leti is changing that! Optically-coupled photonic chips don't have to be cut, packaged, and then tested individually anymore!



© D.MOREL/CEA

Neuromorphic

## En route towards brain-inspired chips capable of learning on several time scales

CEA-Leti is coordinating the EU H2020 MeM-Scales project on brain-inspired chips. The main objective of the EU H2020 MeM-Scales project is the development of a novel class of algorithms, devices, and circuits that reproduce multi-timescale processing of biological neural systems.



© BURANIJKHUMPAIROJ/FOTOLIA

## > Ground-breaking PEROvskite technologies for advanced X-ray medical Imaging Systems

**EU Project**—The PEROXIS project aims to develop the next generation of highly sensitive X-ray detectors that will enable better diagnostics and treatment for better patient outcomes.

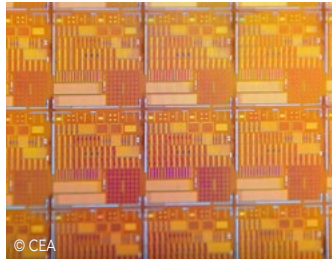
### > PhD Generation, season #2

Dive into PhD student experiences & projects with CEA-Leti's PhD Generation miniseries.



### > Optics & Photonics Report

Download CEA-Leti's latest report. You'll find within the latest for all-wavelength imaging (Gamma and X rays, visible, infrared, THz), optical data communications, optical environmental and 3D sensors, information displays.



© CEA

#### Memory

### Discover CEA-Leti's new tweaks that make FeRAMs memories great

This non-volatile memory provides key advantages. However, current FeRAMs are based on PZT material... To make sure FeRAMs operate at their full potential, CEA-Leti introduced a new material called  $\text{HfO}_2$ —hafnium oxide.



© COFFEEMILL/ADOBE STOCK

#### Quantum

### CMOS withstands very low temperatures

Good news for silicon-based quantum computing. In the future, quantum devices cooled to 10 mK will be used together with conventional electronics.

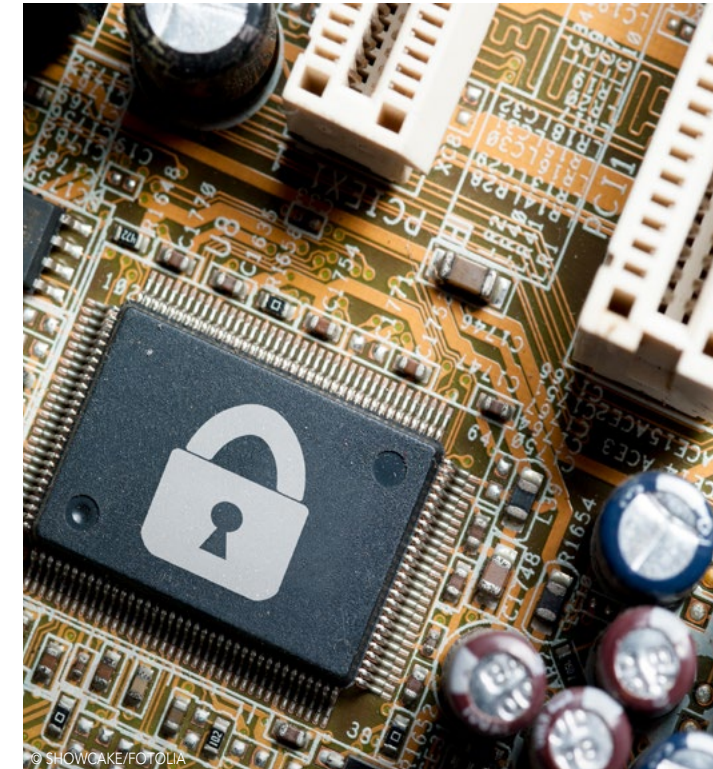


© --/ADOBESTOCK

#### Sustainability

### Extending battery lifespans for IoT devices

Did you know that IoT devices generally last around ten years, but their batteries have to be replaced after just two years? CEA-Leti and CEA-Liten engineers are changing that by: improving battery lifespans, embedding ambient energy harvesting capabilities, Improving energy storage systems



© SHOWCAKE/FOTOLIA

#### Cybersecurity

### Discover the power of Ferrite particles to protect IC against almost all physical attacks!

CEA-Leti introduces ChaXa, the institute latest cybersecurity demonstration. ChaXa combines, within a single device, passive and active shielding involving a range of protections against almost all physical attacks.



© SHUTTERSTOCK

Sustainability

**9 research tracks to guide ICT Industry's quest to reduce its carbon footprint**

IEEE ESSDERC/ESSCIRC 2021— CEA-Leti unveils an urgent proposal to improve energy efficiency by a factor of 1,000 by 2030. CEA-Leti unveiled 9 research tracks to manage the data deluge while taking into account sustainable electronics constraints.

Telecom

**Miniature satellite IoT antennas**

CEA-Leti and Kinéis are developing the next generation of miniature hybrid terrestrial/satellite antennas for IoT sensors. How can we ensure continuous IoT services around the World... even in the middle of nowhere? Startup Kinéis develops IoT devices leveraging hybrid terrestrial and satellite radio.

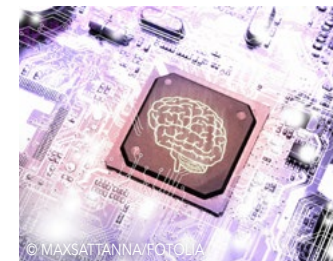


© XXX

Memory

**OxRAM resistive memory almost ready to scale up for manufacturing!**

In a recent demonstration by CEA-Leti, 16-kbit arrays were successfully fabricated on 300 mm, 28 nm FDSOI wafers & 100,000 cycles were run with zero memory-point failures. Why use OxRAM ? It is affordable, high-density, and easy to manufacture.



© MAXSATTANNA/FOTOLIA

Optics

**Lasers can now be made without III-V materials**

III-V semiconductor materials are expensive and increasingly rare! CEA-Leti researchers were part of an international team that found an alternative solution: an optically-pumped IV-IV semiconductor device capable of producing a 2.5 micron laser beam with an ultra-low threshold at temperatures of 100 K.



© ISCATEL/SHUTTERSTOCK

**> Towards 6G: from technology to system innovation**

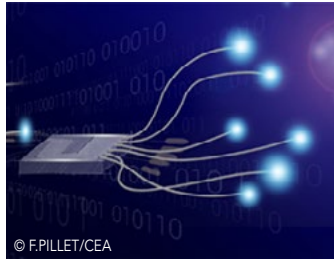
Watch this video to discover how the future wireless communication generation will support sustainable evolution of society and economics.





> **CEA and SOITEC receive the EARTO "Innovation Award" for their work on SmartCut™**

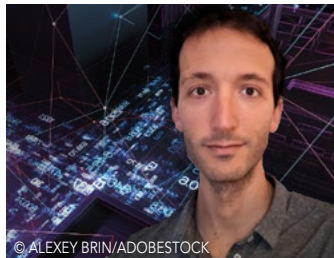
Invented by CEA-Leti, SmartCut technology consists in transferring a thin layer of silicon from one substrate to another, which allows to obtain components with high performance and low energy consumption. Today, all smartphones integrate this technology and 20 million integrated circuits based on RF-SOI substrates are on the market!



Telecom

**Scaling silicon photonics toward terabit/s communications**

Scientists at CEA-Leti are pushing silicon photonics to new limits to achieve terabit/s communication in data centers. CEA-Leti is investigating several approaches that could support this ongoing shift: Miniaturizing the photonic module, 3D or "monolithic" integration techniques, New generations of more efficient modulators made from new materials



Award

**Congratulations to Quentin Wilmart for his SSDM 2021 Award!**

An important step towards data deluge management has been made: Quentin Wilmart recently unveiled the first integration of an hybrid III-V laser on the backside of a Si/SiN platform. Join us in congratulating quentin wilmart who recently received the Young Research Award at SSDM for this World first!



Automotive

**Driving simulation gets augmented**

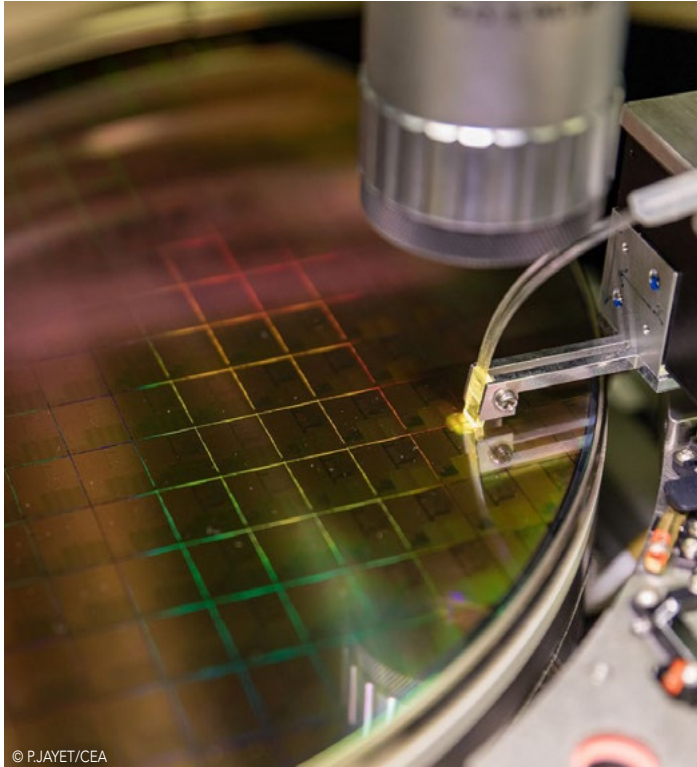
In the future, vehicles will be able to tell how their drivers are feeling, both physically and mentally! This is already happening at CEA-Leti. Discover CEA-Leti's driving simulator equipped with physiological sensors.



Human Health

**Breast Cancer: Novel imaging technology that rules out false positives & negatives**

Did you know that mammograms are only 65% reliable when it comes to large breasts? CEA-Leti has developed a new generation of ambient spectrometric detectors that can clearly distinguish breast tumor tissue from healthy tissue at first glance.



© P.JAYET/CEA

**Manufacturing**

**Photonic Chip: toward high-throughput alignment of optical fibers**

Photonic chips could soon be connected to several optical fibers five to ten times faster than today's processes. CEA-Leti scientists have developed a sub-micron-precision passive automated microlens alignment process.

**Human Health**

**Magnetoencephalography: towards high resolution at room temperature**

In a world first, a CEA-Leti team has produced a MEG prototype operating at room temperature that can produce brain images comparable with those generated by current equipment running at temperatures close to absolute zero.



© PICTURE PARTNERS/FOTOLIA

**Automotive**

**World's Smallest-Footprint MEMS-based Gyroscope for High Volume Markets**

Discover the world's smallest-footprint gyroscope that provides navigation-grade performance. CEA-Leti scientists, in collaboration with Politecnico di Milano (POLIMI), have developed a sensor footprint of only 1.3 mm<sup>2</sup> for large volume markets.



© TEMP-64GTX/ADOBESTOCK

**Telecom**

**SmartphoneLab: CEA-Leti technologies for today and tomorrow**

Did you know that 1+Billion smartphones in circulation contain at least one technology developed by CEA-Leti? From computing, display technologies to RF-SOI filters, CEA-Leti is developing a complete palette of technologies



© B.TRUONG/CEA

**> Record fundraising for Primo1D**

Congratulations to Primo1D for this last record fundraising: 15 million euros... Primo1D is revolutionizing textile yarn by integrating RFID devices. Ideal for the fight against counterfeiting, theft and managing stocks. And that's not all, our startup is recruiting: + 150 jobs by 2025!

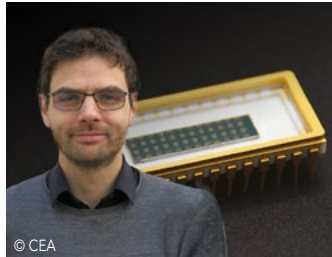
**> CEA-Leti's Silicon & Technologies Components report is now available!**

Find within the latest advances for your devices. Excellent results were reported this year, download the 2020 report NOW!



> **Injectpower:  
Ultra Miniaturized  
Rechargeable  
Micro Battery  
for Medical Devices**

The main question facing the medical community is: how to minimize the size of an autonomous implant while ensuring adequate energy density for continuous long-term operation? Injectpower answers this unmet need with an innovative safe, rechargeable and highly reliable solid-state micro-battery technology.



© CEA

**Award**

**Congratulations to Bruno Fain & team for his award at Smart Systems Integration on pMUTs!**

Did you know that bad angular resolution is currently the main limitation of pMUTs? Bruno Fain's team demonstrated precise localization of an obstacle 40cm away from the device using receive beamforming.



© NORTONGO/FOTOLIA

**Human Health**

**GTP Nano & CEA: drugs for precision therapies**

GTP Nano leverages CEA's NanO'up R&D facility to validate an innovative manufacturing model and produce its first batches of drugs for precision therapies



©CEA/BILLIONPHOTOS.COM/ADOBESTOCK

**Award**

**Congratulations to Salam Hamieh for her MuSe Stress Challenge 2021 Award!**

Can today's electronic appliances help us diagnose stress? Salam Hamieh, a CEA-Leti PhD, received an award for her work towards stress recognition.



© C.MOREL/CEA

**Telecom**

**Semiconductor technologies for 6G: Find within everything you want to know!**

6G relies more than ever on the semiconductor industry. What technologies will be required? Can 6G be sustainable? Because research starts now, CEA-Leti today unveils its plan...



© L.O'CONNELL/CEA

Memory

### CEA-Leti unveils RRAM Energy-Storage Breakthrough

New CEA-Leti research shows that RRAM memory could also provide energy storage. Researchers succeeded in using RRAM memory points to store energy instead of data. Their research confirmed that RRAM memory planes do work as an energy storage medium, offering supercapacitor-level power and energy density.

Sustainability

### Critical materials in white LEDs: Grenoble scientists identify eco-friendly alternatives

Gallium, indium, yttrium... have you heard of these rare materials in your white LEDs? With CEA-Leti's support, LMGP, Institut Néel CNRS, and applied economics lab GAEL have been investigating the rare and critical elements (gallium, indium, yttrium, and cerium) in white LEDs.



© NYS/FOTOLIA

Award

### Congratulations to Simon Deleonibus who received an IEEE Cleo Brunetti Award

This prize has been granted for his 35 years+ of outstanding contributions to and leadership in nanoscale CMOS device and process technologies at Thomson Semiconductors (nowadays fused into STMicroelectronics) and CEA-Leti!



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Quantum

### CEA-Leti unveils main challenges facing large-scale Si quantum computing

CEA, in collaboration with CNRS Néel, a leading team in Si-based quantum computing, presented two papers at IEDM 2021, including an invited paper that identifies the material and integration challenges facing large-scale Si quantum computing.



©SAKM/ESTERKE, PHONLAMA/PHOTO/ADOBESTOCK

### > Leti Devices Workshop: Semiconductor Solutions to Speed up the Telecom Revolution

Explore materials, devices and systems that will fast track the upcoming of unprecedented 6G high speed networks. Watch the replay.

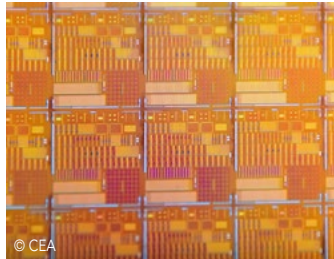


### > Electronic noses could make holiday dinners easier

Stress-free dinners? Aryballe's electronic nose recognizes 1000+ of smells and may help you prepare tastier roasts! Aroma and fragrance industries are Aryballe's top markets. CEA-Leti is proud of its spin-off and latest NeOse Advance product. Great promises are also expected in the health sector.

> **Check out our new Scientific Report for Technologies for Biologies and Health!**

It includes sensors and actuators, imaging technologies, microfluidics, chemistry, biochemistry and electrochemistry, biology and instrumentation, including mechanics, software, information processing and electronics!

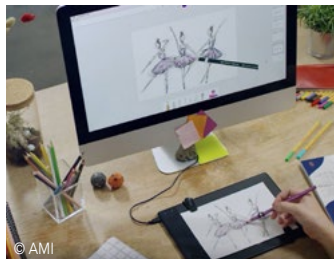


© CEA

**Memory**

**CEA-Leti unveils a world's first that brings FeRAM technology closer to manufacturability**

CEA-Leti has reported the world's-first demonstration of 16-kbit ferroelectric random-access memory (FeRAM) arrays at the 130nm node that advances this energy-saving technology closer to commercialization.



© AMI

**Startup**

**AMI - Enriching and facilitating interactions with the digital world**

ISKN, now AMI, revolutionized the relationship between physical objects and the digital world through a smart "Slate" that digitizes drawings, notes, and sketches in real time.



© DRAGONIMAGES/ADOBESTOCK/CEA

**Human Health**

**Knee-Implants: CEA-Leti unveils multi-sensor system that detects infection, improves accuracy & rehab**

CEA-Leti will introduce a smart, integrated multi-sensor system for knee implants at CES 2022 that help surgeons more accurately position the implant, dramatically reduce risk of follow-up surgery, and enhance rehabilitation.

*Stay tuned!*  
Follow us on social media



[cea-leti.com](http://cea-leti.com)