Sustainable integration of digital devices in SME processes

As far as the digital transition is concerned, technologies and components have little mass market focus and companies sometimes lack the information and the in-house skills needed to integrate new technologies. However, these technologies are also opportunities to expand their offering and strengthen their commercial position.

THE TECHNOLOGY DISSEMINATION PROGRAM IS MANAGED BY FLORENT BOUVIER (MINALOGIC), WHO LEADS THE EASYTECH INITIATIVE, AND CHRISTOPHE VAUTEY (CEA), IN CHARGE OF THE SYSTEM LAB INITIATIVE

FLORENT BOUVIER (MINALOGIC)

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CHRISTOPHE VAUTEY (CEA)

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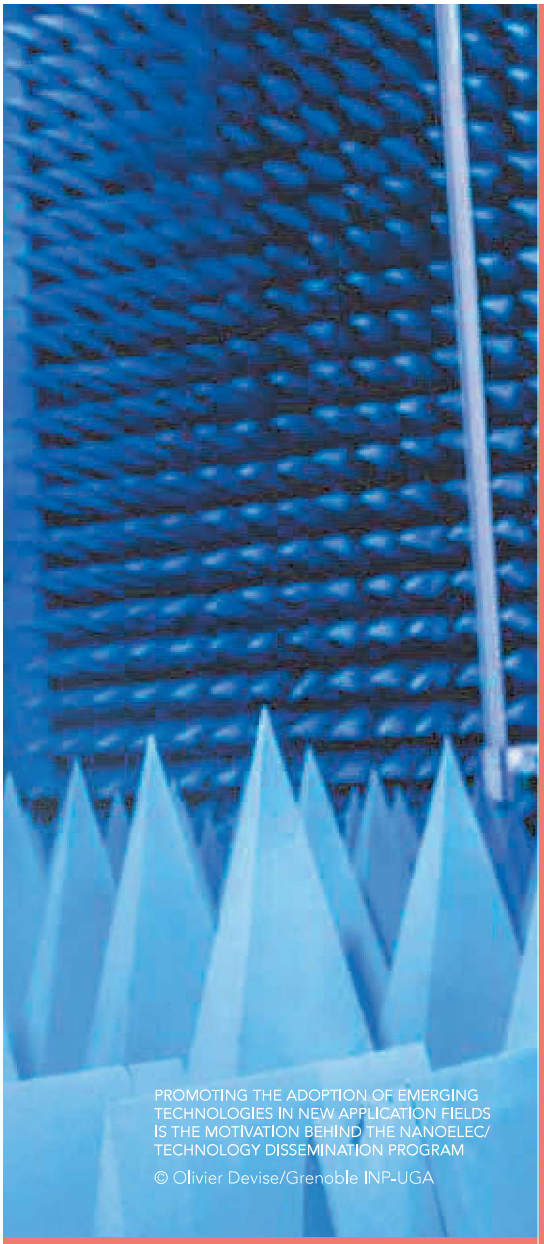
With the Technology Dissemination program, the partners in Nanoelec are promoting and accelerating the dissemination of emerging devices and new technologies in a variety of application fields; they are drawing more particularly on R&D skills in imaging, artificial intelligence, embedded software and electronic systems design. .

The program comprises two initiatives:

• The aim of the System Lab initiative is to exploit innovative imager components developed by the major industrial partners involved in R&D programs at Nanoelec. •••

AGENDA



PROMOTING THE ADOPTION OF EMERGING TECHNOLOGIES IN NEW APPLICATION FIELDS IS THE MOTIVATION BEHIND THE NANOELEC/ TECHNOLOGY DISSEMINATION PROGRAM

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• In the Easytech initiative, we make advanced electronic blocks and embedded software accessible to SMEs and mid-cap businesses, including those whose core business is anything but digital. The aim is to enable them to take part in the digital transition, to improve the added value of their products or their manufacturing processes. In 2024, Easytech assisted businesses positioned on a variety of markets and more particularely in the electronic components and embedded systems sector.

TECHNOLOGY DISSEMINATION PROGRAM AT A GLANCE

→ Vision
Sovereignty in the electronics industry requires efficient dissemination of innovative components and their adoption by national and European integrators and end-users

→ Ambition
To identify weak signals from the market and to accelerate the time to market of technologies developed by Nanoelec partners with fast prototyping and testing and access to emerging markets

→ Mission
- To help component and software manufacturers better understand the needs/possibilities of new applications,
- To provide companies, notably SMEs, with information to plan ahead for the arrival of new technologies,
- To contribute to the ambition of re-industrializing France and Europe,
- To strengthen investor confidence in IRT industrial partners

→ Partners
CEA, Minalogic, Grenoble-INP, Captronic/ Jessica France, STMicroelectronics, Lynred, Prophesee, GEM

AGENDA

Objective: Impact

Two startups which benefited from the Easytech initiative inaugurated their first plants in 2024.

An impact assessment within the program was carried out in November 2024 on a representative sample of SME/mid-caps that had been supported since 2012. It confirmed that the system is warmly welcomed by entrepreneurs owing to its flexibility and its reactivity. 78% of the projects lead to concrete follow-up in different ways: additional development, industrialization or commercialization.

Last July, the Limatech startup opened its first lithium batteries production plant in Voreppe, near Grenoble, with an investment of 10 million euros. This new industrial site, covering 1,200 m^2, will host three production lines with the aim of producing 10,000 batteries per year by 2030.

Last September, Dracula Technologies opened its Green Micro Power Factory in Valence, with an annual production capacity of 150 million cm^2 of printed organic photovoltaic cells.

INAUGURATION AT LIMATECH, IN 2024

© P.Jayet/Limatech

Easytech

Driven by the technology cluster Minalogic, Easytech is one of the Nanoelec IRT's technology dissemination tools. It focuses on the dissemination of technology blocks and the resulting extension of the product offering, based on a market pull approach, where SMEs express their needs. It helps SMEs, the main targets of the program – even if other types of businesses could take part in certain actions that fall within the scope of Easytech – are to diversify and improve their existing product or their manufacturing process, by adding intelligence. The targets of the tool are SMEs/mid-caps, in all activity sectors, which have an ambitious project to develop their activity based on innovation in the field of microelectronics.
Since 2021, 322 Easytech projects have been carried out, 70% of them with companies based in the Auvergne Rhône Alpes region[1].

Lidars for the automotive sector

Specifying a hardware/software implementation architecture.

To meet the needs of the automotive sector, the Steerlight startup and CEA developed a digital processing simulation chain to estimate the distance of lidar[2] targets, improve performance by means of advanced processing and specify a hardware/software implementation architecture.
The simulation tool includes state-of-the art parameters, allows calculation of the achievable performance in terms of range, distance and speed estimation precision, an operational processing chain and a proposed implementation architecture.

LIDAR, THE AUTOMOBILE'S NEW ELECTRONIC EYE?

© RussPhotographer/ Pixabay

A network of foot-powered sensors

Connected insoles help prevent diabetic foot ulcers, blisters and neuropathies.

A patent has been filed as a result of Easytech's expertise implemented by Captronic for the Solecooler company. The company's goal is to retrieve energy from walking in order to power pressure and temperature sensors integrated into an insole. Solecooler, specializing in thermodynamic soles, is looking to instrument its insoles to transmit data to a smartphone. These connected insoles would be able to map the pressure and temperature across the sole of the foot, helping prevent diabetic foot ulcers, blisters and neuropathies.

The main difficulty in this project lies in the instrumentation of the insole to validate energy harvesting type operation.

The work performed within Easytech, with the support of CAP'TRONIC, includes the creation of a prototype silicon insole incorporating 150 battery-free measurement points, consuming only 1 mW. A consumption analysis was performed to extrapolate the energy needs of 50 sensors with Bluetooth transmission.

1. The European Earashi program, whose French node is coordinated by the CEA as part of the Nanoelec/Pulse program, enables similar actions to be carried out at Community level.

2. Remote detection by laser is a distance measurement technique based on analysis of the properties of an artificially generated beam of light reflected back to the transmitter by the target.

Waste heat

Sensors, system and protocol to exploit industrial discharges.

The Hevatech company is looking to create a complete diagnostic service to characterize sources of waste heat, a major industrial issue.

"The economic and environmental impacts are significant, because the utilization of waste heat and its conversion into electricity and useful heat are ways of reducing energy bills and CO_2 emissions." As part of an Easytech project, the Hevatech engineers worked with students from Grenoble INP-Esisar – UGA to develop a system including autonomous temperature, pressure and flow rate measurement in industrial smoke discharges, at a frequency of 1 to 10 minutes over a period of one month. The data can be sent to a cloud, stored, processed and displayed. The system must be reusable and upgradable.

The work done includes identification of the existing appropriate sensors, communication protocols, acquisition units and software, as well as the development of a new acquisition unit and communication architecture and software for collecting, processing and displaying the data.

EXPLOITING SOURCES OF WASTE HEAT, A MAJOR INDUSTRIAL ISSUE

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A miniature broad-band antenna

3D positioning for industry.

The Wheere company has developed a precise 3D positioning system (tracker), capable of operating both outdoors and indoors, with one-meter precision and one-kilometer range, using VHF signals and innovative processing. This system is independent of GPS, quick to set up and has low energy consumption.

Within Easytech, Captronic and Wheere evaluated the feasibility and performance of a specific antenna for the tracker with far greater wavelengths than the dimensions available in the package. Its expertise enabled a compact antenna to be designed and optimized, offering performance equivalent to a standard antenna. 20 prototypes were produced and used for demonstrations in the defense and oil & gas sectors.

Electronics for music

Identifying a guitar's impedance to reproduce its behavior.

The Monday Noise startup is developing innovative electronic effects pedals for musicians. It is looking to rationalize its product development phase, testing in particular, which was hitherto primarily performed empirically.
The lack of scientific references on microphone circuits and their electronic interactions are a major stumbling block for a detailed understanding of the phenomena involved, thus limiting innovation in this field.
The Easytech project, developed in 2024 with Grenoble INP-UGA, designed an experimental module capable of recording, analyzing and playing back the signal of an electrical guitar, while faithfully reproducing the non-linear behavior of its impedance. This module can identify the impedance characteristics of each instrument and simulate their effect on the audio signal.
A dedicated software interface was developed to use these functionalities intuitively. It thus facilitates the test and research phases, while improving understanding and control of the electroacoustic interactions within the effects circuits.

THE LACK OF UNDERSTANDING OF THE NON-LINEAR PHENOMENA BETWEEN THE ELECTRONIC COMPONENTS AND THE SOUND PICKED UP BY A BASS GUITAR'S MICROPHONES CONSTITUTES A REAL TECHNOLOGICAL HURDLE IN THIS FIELD

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The need for a more integrated approach to eco-innovation

Aligning technological development with sustainable development criteria.

An article in the Sustainability review published by a team from CEA and Grenoble INP-UGA collaborating within the Easytech initiative of the Nanoelec/technology dissemination program, examines the essential aspects of eco-design that must be evaluated in the initial phases of innovation and explores the involvement of the decision-makers and entrepreneurs in the sustainability assessment process[3].
The study identifies the essential key criteria for assessing sustainable development criteria at an early stage, such as description of the innovation, the systemic vision, the functionality and the involvement of the stakeholders.

The results will help guide the political decision-makers, researchers and practitioners in the eco-innovation field, by providing a complete framework for assessing and promoting sustainable innovations right from the outset. The conclusions show the importance of obtaining expert knowledge in the eco-innovation diagnostic process. They also show the need for a more integrated approach to eco-innovation.

3. Peigné, S.; Ben Rejeb, H.; Monnier, E.; Zwolinski, P. Navigating the Eco-Design Paradox: Criteria and Methods for Sustainable Eco-Innovation Assessment in Early Development Stages. Sustainability 2024, 16, 2071. https://doi.org/10.3390/su16052071

System Lab/Addvisia

The Addvisia technology platform, sponsored by a CEA team and derived from an IRT Nanoelec initiative, creates a community of interest around the topic of multimodal and multispectral imaging, in order to explore the full potential of combined imagers and identify new applications.

This modular platform brings together technology suppliers, integrators and users around common objectives: better understanding why and how imagers can be combined for new uses, in an agile experimentation environment. In 2023, the platform was implemented for numerous use cases, including snowpack analysis, observation of soil core sampling for environmental analysis, as well as trajectory analysis and physiological effort monitoring.

ADDVISIA PLATFORM UNDERGOING TESTING IN Y.SPOT LAB CEA GRENOBLE

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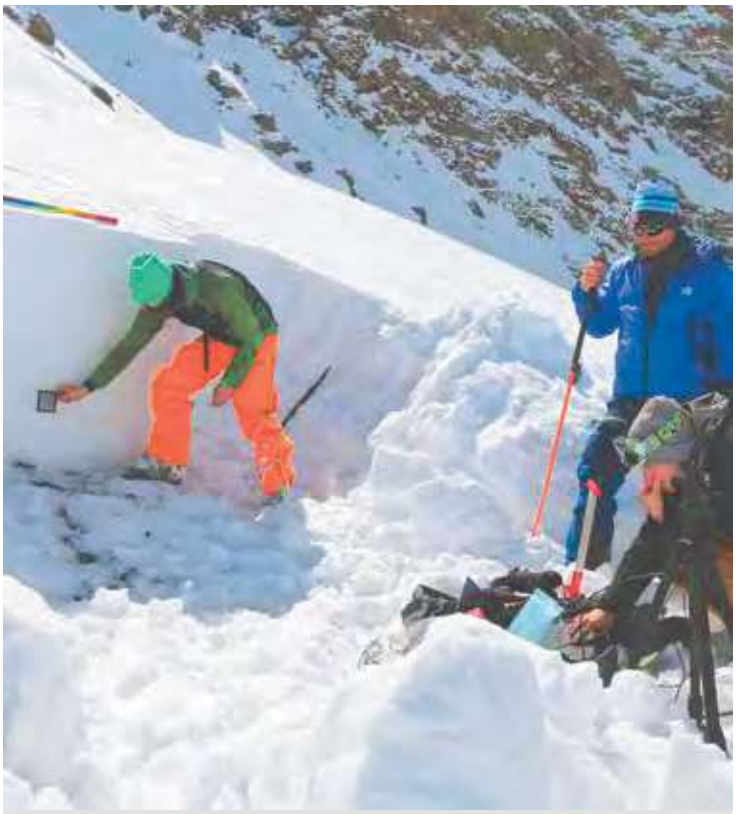
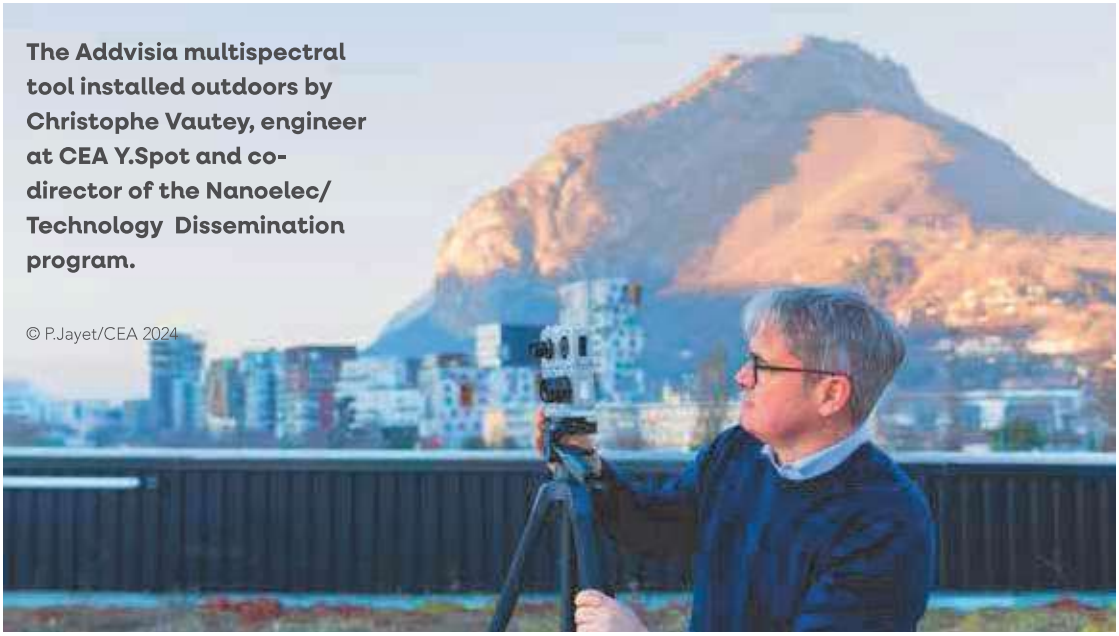


Displaying strata in the snowpack

The Addvisia platform could help achieve a clearer understanding of the physics of avalanches.

Propagation Saw Tests (PST) are designed to evaluate the propensity of a snowpack layer to fracture and potentially lead to an avalanche. PST offer valuable insights into snowpack structural integrity, identifying weak layers that may fail under stress. *"We conducted PSTs utilizing infrared imagers and event-based sensors to capture detailed imagery of the snowpack,"* reports Charles-Elie Goujon (CEA) as a first author of a study published by a team from CEA, Université de Savoie Mont Blanc and the Data Avalanche Association[4]. This innovative approach enabled information beyond the visible spectrum to be examined with a SWIR imager and micro-movements within the snow to be detected using an event-based sensor. SWIR imaging offers a groundbreaking method for analyzing snowpack layers, revealing critical details invisible to the naked eye. *"The methodology introduces new parameters for snowpack and PST analysis. Following these new parameters could improve knowledge of the weak layer and the propagation of rupture,"* underlines Charles-Eli Goujon.



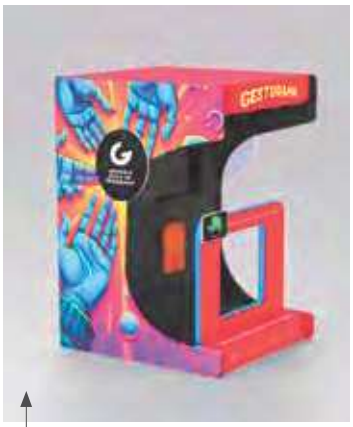
The Addvisia multispectral tool installed outdoors by Christophe Vautey, engineer at CEA Y.Spot and co-director of the Nanoelec/ Technology Dissemination program.

© P.Jayet/CEA 2024

The imaging game

The Gesturama game was presented at the Tech&Fest Grenoble festival on February, 2025, and offers a unique experience in which technology meets creativity.

"The aim of the Gesturama project is to offer the general public access to complex technologies by offering an entertaining, immersive experience," explains Hélène Michel, lecturer-researcher at the Grenoble Management School (GEM), who conceived the project.



GESTURAMA DEMONSTRATOR
© GEM

The collaboration with Nanoelec/ Addvisia is an ideal opportunity to combine our students' game design skills with the technology of the ecosystem. After several iterations, we opted for a captivating concept: an arcade game with gaming mechanics inspired by a cult classic from our childhood, offering fluid and engaging interaction. Over and above the game itself, Gesturama stimulates the curiosity of the participants, who can then explore further by discovering the Addvisia platform, the Lynred photobox and by taking part in a creative session on future uses of imagers," Hélène Michel explains.

Gesturama incorporates the innovative VL53L8 Time of Flight sensors of the FlightSense range from STMicroelectronics, through gesture memorization games produced by a collaboration between GEM, STMicroelectronics and CEA/Y.Spot. The Lynred imagers were also present around the Addvisia platform at Tech&Fest 2025.

For Christophe Vautey, co-director of the technology dissemination program at IRT Nanoelec: *"Addvisia explores the potential of many of the existing imagers, in order to identify new applications. Using gaming as a means of disseminating technology is a challenge enthusiastically tackled by the team, creating the entire Gesturama system in just a few weeks."*
"In combination with an STM32 microcontroller, the VL53L8 Time-of-Flight module from ST's FlightSense® range is a key element in the arcade game," says Jean-Pascal Mangano, Head of collaborative projects at STMicroelectronics. *"It opens the door to new ways of understanding the interactions between the player and the gaming platforms and offers the users a unique, innovative and entertaining experience."*

AGENDA

4. Goujon, C.-Elie, Duclos, A., Perillat, C., & Pourraz, F. (2024). ISSW 2024, Tromso, Norway

Biathlon tracker

Recording the impact of a bullet on a target.

Following the ideas competition with the "high level sports" class at the GEM, the "Biathlon Tracker" project was selected for exploration with Addvisia. The project concerned the use of the platform's imagers to help biathletes know where the bullet touched the target, so that they could improve their aim.

Addvisia was used during two test sessions on a firing range. The purpose of these tests was to find out how to use the sensors in order to record the impact of the bullet on the target.

The first session identified the correct locations and settings of the imagers in order to pick up the impact of the bullet and observe that the bullet's trajectory to the target was visible. The second session highlighted the superposition of visible and event-based imaging in order to visualize the target and the trajectory and impact of each shot.

DURING A BIATHLON SESSION

© Image by Ebowalker/Pixabay

Biathlon tracker: a use case selected for an entrepreneurial innovation course

An entrepreneurial innovation course was designed by GEM in collaboration with Nanoelec/Addvisia. It includes a marketing and strategy approach (business model) based on technological use cases. The target audience consists of professionals liable to be involved in an entrepreneurial process, more specifically high-level sportspersons. Pedagogical engineering aims to explore the value creation potential of the technologies to solve their problems.
"What the students produce in a serious gaming context such as this is always interesting," observes Xavier Brenière, Head of the applications laboratory at Lynred. *"This shows the extent to which there are still uses to be explored with our sensors."*

Movement capture and analysis in sport

Addvisia's movement capture and analysis capabilities are showing promise for several uses in the field of sports, notably for greater athlete safety and improved umpiring.

The pertinence of Addvisia's sensors in analyzing rapid movements, was demonstrated for two different but complementary applications, the prevention of concussion and improving umpiring in tennis.

To prevent concussion, the Prophesee event-based sensors demonstrated sufficient time precision to measure accelerations during impacts. This enables the data to be correlated with the events, thus offering a solid base for developing prevention protocols.

For umpiring in tennis, merging data from the event-based and visible sensors made it possible to accurately recreate the trajectory and position of the ball. This paves the way for the creation of an automated line judge, thus improving umpires' decision-making.