

Partner of the BLOSSOM project, Gradiant is developing a photonic neuron able to operate without external power in remote environments

The neuron stands out for being self-sustaining, able to reuse its own light losses, and autonomous, as it can operate without external control and decide where to direct that energy within a circuit.

At a time when AI's energy demand continues to grow, this development, currently undergoing the patenting process, could help to significantly reduce the energy consumption of these systems.

Its ability to operate locally, without an external connection or power supply, makes it an ideal solution for remote environments or extreme conditions.

Vigo, May 2026. The Spanish RTO Gradiant is developing the first self-sustaining photonic neuron, able to operate without external power by harnessing and reusing its own light losses to power and control the behaviour of its own components.

In addition to its energy self-sufficiency, this neuron, which is currently in the patenting process, stands out for its autonomous nature: it can operate without external control and independently decide how and where to direct energy in order to activate itself. This positions Gradiant's neuron as a key element in the development of more advanced intelligent architectures.

Marta Castro, Head of Micro-Nanoelectronics and Photonics division at Gradiant, explains that "unlike traditional electronics, which face greater limitations in terms of energy consumption and heat dissipation, photonics –based on the use of light to transmit information– offers greater efficiency. However, even these systems are not free from light losses. The innovation we are developing lies precisely in the ability to harvest those losses and reuse them as a source of energy, thereby achieving a self-sufficient and self-sustaining system."



BLOSSOM

This development represents a paradigm shift in the way photonic systems and their efficiency are conceived. “We are not only reducing consumption; we are transforming what until now was considered a loss into a resource. This opens up new possibilities for designing more sustainable and autonomous systems, especially in environments where access to energy is limited or non-existent,” adds Castro.

Applications with global impact

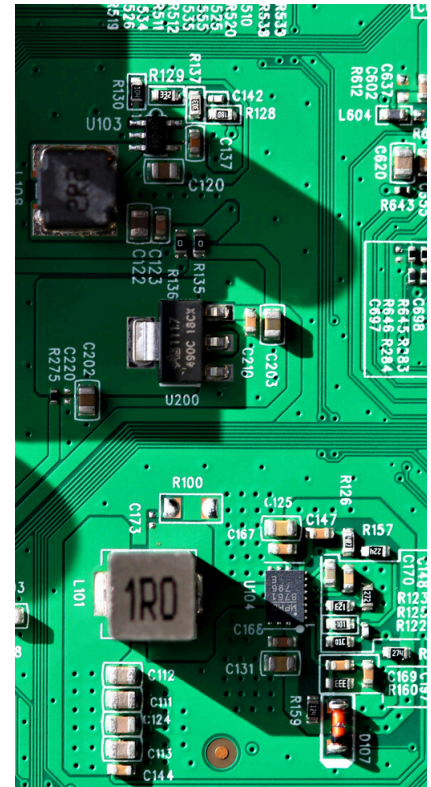
This breakthrough is a significant step towards the development of more efficient and sustainable technological systems, especially in areas such as Artificial Intelligence, whose training and operation require huge amounts of electricity.

In a context in which this demand is growing faster than supply capacity, this photonic neuron could contribute to a significant reduction in energy consumption, enabling a more sustainable development of these systems. Its ability to process and operate locally, without an external connection or power supply, also makes it an ideal solution for remote environments or extreme conditions, such as isolated infrastructure, devices in hard-to-reach locations or even space applications.

A flagship European project

This breakthrough forms part of the bLOSSom project (Sustainable Photonic Systems through Autonomous Loss Harvesting), which focuses on the development of self-sustaining photonic systems through autonomous loss harvesting.

The project aims to create self-sufficient photonic devices that do not depend on external energy sources or external interaction to operate, and that can reduce energy consumption by a factor of between 100 and 1,000. To this end, it will integrate advanced energy harvesting and management technologies that enable energy to be stored and redistributed according to the system's needs.



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BLOSSOM is also the only project promoted from Galicia selected under the European Innovation Council Pathfinder Open 2025 call, one of the most competitive calls in the Horizon Europe programme.

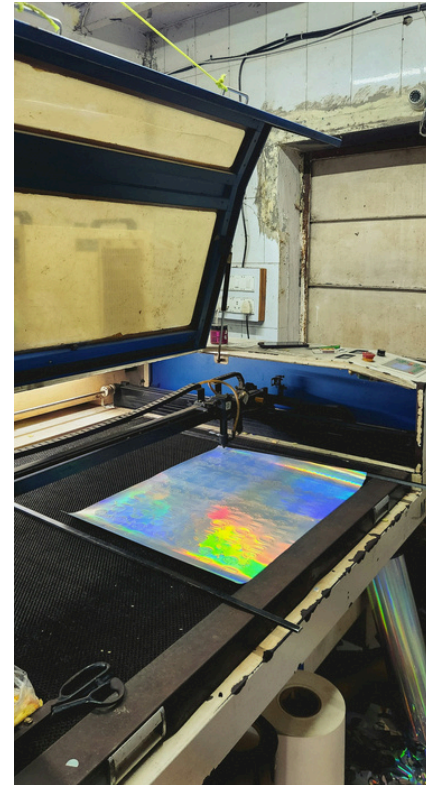
The consortium is led by Gradiant and includes the CiTIUS research centre of the Universidade de Santiago de Compostela, together with international partners including F6S Innovation (Ireland), the International Iberian Nanotechnology Laboratory (Portugal) and the Łukasiewicz Research Network Institute of Microelectronics and Photonics (Poland).

About Gradiant

Gradiant is a private ICT technology centre focused on industry needs and specialised in cybersecurity, artificial intelligence, advanced communications (5G-6G), quantum and photonic technologies, drones and smart industry.

Since it was founded in 2008, Gradiant has developed more than 900 projects and worked with over 400 clients in 30 countries. In 2025, Gradiant secured a total of €5.5 million in European project funding for R&D in Spain, 180.6% more than in 2024. In addition, the Centre is participating as a key partner in 1HealthAI, the European artificial intelligence factory led by the Galicia Supercomputing Centre (CESGA) and co-led by the Spanish National Research Council (CSIC), which will have a budget of €82 million and will focus on accelerating research and innovation in the field of health.

With more than 250 professionals in its team, Gradiant has spent almost 20 years contributing to the strengthening of the technological innovation ecosystem in ICT, both in Spain and in Europe. It develops solutions related to connectivity, intelligence and security, helping to reinforce and improve the competitiveness of strategic sectors worldwide, including the primary sector, health, telecommunications and aerospace, among others.



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