Photonics21 Press Release

Chips to cut AI energy use being developed by European and South Korean scientists

A team of researchers from Europe and South Korea is using photonics to cut the energy cost of AI and strengthen cybersecurity for future digital services.

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A group of international scientists is developing a new generation of artificial intelligence hardware that runs on light instead of electricity to process information – a breakthrough that could dramatically cut energy consumption, speed up digital services, and improve cybersecurity for millions of people.

The computing power needed to provide artificial intelligence, alongside other systems that provide streaming, gaming, healthcare, transport and financial services, is growing at an extraordinary pace. Today's AI data centres already consume vast amounts of electricity, and experts warn that AI workloads could soon become one of the biggest drivers of global energy demand.

According to long-term modelling by Copenhagen Infrastructure Partners and think tank EUROPA in [Powering the Future – A Vision for Europe's Energy System in 2050](#), Europe alone will need to dramatically generate more electricity, a massive renewable expansion and a far smarter grid by 2050 to meet rising digital and industrial demand.

But the €1.49 million EU-funded 'HAETAE' project is building processors to resolve these future AI bottlenecks.

These new chips promise up to tenfold improvements in energy efficiency while improving security in cloud computing for future generations of AI assistants and ultra-fast internet. The result will enable faster, greener and more responsive digital services.

Photons Replacing Electrons

At the heart of the breakthrough is photonics, the science of generating, controlling and using light. Just as optical fibres replaced copper cables to give us much faster internet connections, computing with particles of light instead of electronic signals looks set to dramatically improve our use of AI in the future.

"By using light rather than electricity to perform calculations, we can make AI dramatically faster and far more energy-efficient, while opening the door to entirely new computing capabilities," said Miltiadis Moralis, coordinator of the HAETAE consortium. "To put it simply, if we think of today's AI hardware as a steam engine, this new photonics technology has jet propulsion."

Because photons can travel at extraordinary speeds and generate far less heat, they enable vastly more efficient computing, especially for energy-hungry AI workloads.

"Photonics offers a way to keep digital services improving without driving energy consumption through the roof. For everyday users, this could translate into faster and more responsive AI services, from digital assistants to real-time translation and search; lower

energy bills and reduced environmental impact, as data centres consume less electricity; and improved digital healthcare, transport and communication systems, powered by ultra-efficient AI," said Moralis.

European-South Korean Collaboration

The HAETAE consortium is a flagship EU–South Korea partnership, bringing together leading European photonics laboratories with cutting-edge Asian technology companies and research centres.

"Future computing will be built through international collaboration. This partnership allows Europe and South Korea to combine complementary strengths and push the boundaries of what AI hardware can achieve," said Moralis.

The collaboration also reflects a broader shift in how next-generation technologies are being developed, as nations seek to reduce strategic dependencies and build more resilient global supply chains. By linking Europe's leadership in photonics and materials science with South Korea's strength in semiconductor manufacturing and electronics, HAETAE creates a powerful bridge between two of the world's most advanced innovation ecosystems.

Greece's Innovation Renaissance

A major share of the project's research is being led from Thessaloniki, adding to Greece's role as a major European centre of excellence in photonics, optical computing and advanced semiconductor research.

Over the past decade, Greek universities and research institutes (including Aristotle University of Thessaloniki, NTUA, ICCS and FORTH) have quietly built a world-class ecosystem in photonic integration, chip design and optical systems. Today, this ecosystem is translating into industrial collaboration, spin-out companies and international partnerships.

"Greece has become one of Europe's most dynamic centres for photonics and optical computing research," Moralis said. "HAETAE reflects how European innovation can thrive through strong academic foundations combined with deep international collaboration."

Coordinated by Aristotle University of Thessaloniki, HAETAE unites leading research centres and technology companies from Europe and South Korea, including IMEC in Belgium, AkhETonics in Germany, and the Korean institutes KAIST and DGIST. Running until 2027, the project aims to deliver the scientific and industrial foundations needed for next-generation photonic AI hardware.

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Notes

- HAETAE is a three-year Horizon Europe / Chips Joint Undertaking project

- The consortium includes leading universities, research centres and technology companies from Europe and South Korea

- The project focuses on photonic integrated circuits, optical AI acceleration, cybersecurity and ultra-efficient computing