

World's First Optoelectronic Fusion Chip



Overview

Chinese scientists develop world's first intelligent chip enabling full. Utilizing advanced thin-film lithium niobate photonic materials and a novel arch.

Key Takeaways

The first fully analog optoelectronic fusion chip, ACCEL, was developed by Tsinghua University researchers, achieving unprecedented computing power and energy efficiency.

Overview

The ACCE

L chip represents the world's first fully analog optoelectronic intelligent computing chip, combining optical and electronic components on a single platform to perform high-speed, energy-efficient computations. It leverages thin-film lithium niobate photonic materials and advanced integrated architectures to enable broadband signal processing, low-noise carrier generation, and digital baseband modulation. This chip overcomes the limitations of traditional electronic hardware, which typically operates within a single frequency band, by supporting ultra-wideband operation from 0.

5 GHz to 115 GHz.

Technical Features

Computing Power: ACCEL achieves system-level computing performance over 3,000 times that of current high-performance commercial chips in tasks like intelligent visual target recognition. Energy Efficiency: The chip reaches 74.8 Peta-OPS/W, approximately 4 million times higher than existing GPU and TPU architectures.

Fabrication: Optical components are processed with line widths of a few hundred nanometers, while electronic circuits use a 180nm CMOS process, offering significant cost and material advantages. **Architecture:** The chip integrates optoelectronic oscillators (OEOs) with high-precision optical micro-ring resonators, enabling real-time, flexible frequency reconfiguration across nearly eight octaves. **Applications** ACCEL and related optoelectronic fusion chips are designed for ultra-high-performance computing, including: AI and machine learning: Accelerating visual recognition and neural network computations.

Telecommunications: Supporting broadband wireless and optical signal conversion for next-generation networks. **Edge and cloud computing:** Providing high energy efficiency and algorithm flexibility for both cloud-side and edge-side scenarios. **Security and signal processing:** Integrated programmable photonic chips can perform network switching, encryption, and photonic computing acceleration.

Significance

The development of ACCEL and other optoelectronic fusion chips marks a major milestone in post-Moore computing, offering a path to overcome the physical limits of traditional electronic chips. By combining optical and electronic processing, these chips achieve orders-of-magnitude improvements in speed, energy efficiency, and bandwidth, enabling applications in AI, autonomous driving, and high-speed communications. In addition, companies like Light Standard are advancing optoelectronic fusion computing cards that integrate optical and electronic chips for commercial deployment, demonstrating the technology's potential for real-world applications.

Overall, the first optoelectronic fusion chips like ACCEL represent a paradigm shift in computing, bridging the gap between optical and electronic technologies to meet the growing demands for high-performance, energy-efficient computation.

Article Content

Chinese scientists develop world's first intelligent chip enabling full ...

Utilizing advanced thin-film lithium niobate photonic materials and a novel architecture, researchers in China have developed the first adaptive, full-band, high-speed wireless communication...

Chinese scientists develop the first fully analog optoelectronic ...

After long-term joint research, the Tsinghua University research team broke through the physical bottleneck of traditional chips, creatively proposed a new computing framework for optoelectronic

Chinese chips are shocking the world! The world's first 6G ...

A joint team from Peking University and City University of Hong Kong has successfully developed an ultra-wideband optoelectronic fusion integrated system, realizing for the first time

Significant Breakthrough: Monolithically Integrated Optoelectronic ...

The chip adeptly toggles between bias voltage control and polarization control tasks within millisecond-level time intervals, marking the first instance of monolithic cooperative control over heterogeneous

Chinese scientists have developed the first fully analog optoelectronic ...

Currently, the team has only developed prototype optoelectronic fusion chips with specific computing functions, and further development of general-purpose intelligent visual computing chips is urgently

Ultrabroadband on-chip photonics for full-spectrum wireless ...

Here we demonstrate adaptive wireless communications over an unprecedented frequency range spanning over 100 GHz, driven by a thin-film lithium niobate (TFLN) photonic

Peking University scholar publishes article in Nature! Clearing key ...

Based on an advanced thin-film lithium niobate photonic material platform, they successfully developed an ultra-wideband optoelectronic fusion integrated chip, enabling adaptive,

Chinese scientists develop adaptive chip for ultra-fast wireless ...

Researchers in China have unveiled the world's first intelligent chip capable of full-band, high-speed wireless communication. The breakthrough, published in Nature, uses advanced

World's First Full-Band High-Speed Communication

Chinese researchers have unveiled the world's first adaptive, full-band, high-speed communication chip, a breakthrough that could power 6G

Center Achieves Major Scientific Breakthrough with Ultrabroadband ...

Based on an advanced thin-film lithium niobate photonics platform, they successfully developed an ultrabroadband optoelectronic integrated chip that enables adaptive, reconfigurable, and...

NTT Innovative Devices — Accelerating the introduction of ...

The optoelectronic fusion devices being developed by the company consist of three key devices: logic ICs, analog ICs, and silicon photonics modulation chips/ thin-film laser chips. The

IBM Debuts World's First Sub-1 Nanometer Chip Technology

IBM unveiled a major semiconductor breakthrough with the introduction of the world's first sub-1 nanometer (nm) chip technology, featuring a revolutionary transistor architecture at the 0.7 nm,

Chinese chips are shocking the world! The world's first 6G ...

This breakthrough in optoelectronic fusion chips further enables China to exert direct influence on 6G standards at the hardware level. • Patent advantages: China's 6G patent

CN117059631A

A heterogeneous optoelectronic fusion integrated chip based on wafer-to-wafer bonding is from bottom to top: silicon substrate layer, silicon dioxide layer, silicon thin film layer, germanium thin film layer,

China builds world's first ultra-high parallel optical computing chip ...

Chinese scientists have developed the world's first ultra-high parallel optical computing integrated chip that's capable of delivering a theoretical peak computing power of 2560 TOPS (Tera

Chinese chips are shocking the world! The world's first 6G ...

Chinese chips are shocking the world! The world's first 6G optoelectronic fusion chip is born. Who will be the winner? 2025-09-01 19:07

The Tsinghua team develops an optoelectronic fusion chip with a ...

A few days ago, a team of academicians and associate researchers from Tsinghua University welcomed new achievements in chips. They created an optoelectronic fusion chip called ACCEL. The system

A Deep Dive into Optoelectronic Fusion and Optical Devices: This

Summary: Optoelectronic Fusion is a "Silent Revolution" Structural Points
Optoelectronic fusion is inevitable due to the power limitations of AI data centers.
Japanese companies may not be

Contact Us

Continue your research online:

Website: <https://cjcconsultants.co.za>

Technical inquiry: <https://cjcconsultants.co.za/contact.html>

This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

