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# Ultrahigh-Bandwidth Low-Latency Reconfigurable Memory Interconnects by Wavelength Routing

Tech ID: 33805 / UC Case 2021-901-0

# ABSTRACT

Researchers at the University of California, Davis, have developed a memory system that uses optical interconnects.

# **FULL DESCRIPTION**

The technology encompasses low latency memory systems and a novel silicon photonics (SiPh) architecture using Wavelength Division Multiplexing based optical interconnects. The silicon photonic interconnects enable optical parallelism and wavelength routing to reduce contention in the entire path from a processor to a memory subarray. The low latency architecture can include three pieces: a contention-less optical data plane, a low-bandwidth electrical control plane, and fine-grained memory banks with integrated photonics. In the data plane, the arrayed wavelength grating router (AWGR)-based optical interconnect can provide a dedicated data path from every requester to every memory bank, with no intermediate buffering, to reduce the queuing and interconnect latency. In the control plane, a low-bandwidth electrical or optical interconnect can communicate the addresses and commands between processors and memory and coordinate the time that a processor sends or receives data. The fine-grained memory banks (also referred to as microbanks) can be directly accessed by the memory controller to allow for massive amounts of parallelism.

#### **APPLICATIONS**

- Low Latency Memory System Architecture
- ▶ Silicon Photonics (SiPh) with space saving scalability
- Processor and Memory Interconnect Solution
- Suitable for processor, memory, and system designers and manufacturers

#### **FEATURES/BENEFITS**

- High parallelism data communication in memory systems
- ▶ Fast throughput and low energy data communication
- Replaces conventional electrical interconnects

# PATENT STATUS

Country	Туре	Number	Dated	Case
United States Of America	Published Application	20250085856	03/13/2025	2021-901

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### OTHER INFORMATION

**KEYWORDS** low-latency memory, memory, optical interconnects, Silicon Photonics (SiPh)

#### **CATEGORIZED AS**

#### Optics and

# **Photonics**

- All Optics and
  Photonics
- Computer
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- Nanotechnology
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  - ▶ Other
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