300 mm Silicon Photonics Wafer Platform

An AIM Photonics Project | Department of Defense Manufacturing Innovation Institutes

Technology: 300 mm silicon photonics wafer

Project Participants: Devices on this quantum wafer were manufactured by AIM Photonics with designs provided by our members and customers using the AIM Photonics process design kit.

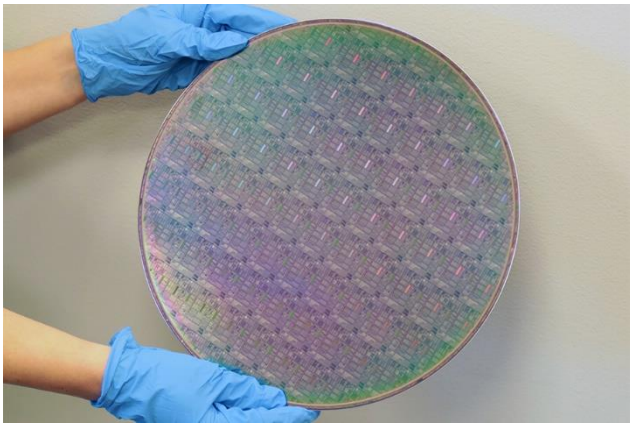
Institutes' Role: Recently, there has been a push to further advance silicon photonics technology to address critical research areas with greater platform requirements, such as quantum photonics. AIM Photonics—in collaboration with teams from the Air Force Research Laboratory (AFRL), the Naval Research Laboratory (NRL), the Army Research Laboratory (ARL), Rochester Institute of Technology (RIT), Massachusetts Institute of Technology (MIT), Purdue University, and Columbia University—is developing a quantum-capable photonic integrated circuit platform to address this resource-intensive technology.

Technology Description: AIM Photonics provides services that enable the design and manufacture of photonic integrated circuits (or PICs) through our design enablement and multi-project wafer manufacturing programs.

In semiconductor manufacturing, a process design kit (PDK) contains the infrastructure needed to design chips in a given fabrication process. AIM Photonics has developed our own PDK for our wafer manufacturing process. We provide designers with the industry's most extensive library of photonic design components to develop their own intellectual property specific to their application, performance, and business needs.

Multi-project wafers reduce design time, improve manufacturing efficiency and lower the price of entry to develop silicon photonics applications. With our MPW arrangement, different chip designs are aggregated on a wafer with multiple projects per wafer. And with large-scale foundry fabrication cycles typically running between 4-6 months and costing over $500,000 per cycle, MPWs significantly reduce manufacturing expense through shared mask and wafer fabrication costs.

Impact: Perhaps the greatest advantage of silicon photonics technology is that it can be manufactured on a silicon wafer using a standard silicon foundry process, which allows for cost-effective high-volume fabrication of complex circuits.



But unlike traditional transistors that use electrical signals to process information, photonic integrated circuits (PICs) use light to transmit even more data while consuming less power, providing a platform for the development of other advanced technologies such as Quantum, AI, and neuromorphic computing—all of which have been identified by both the DoD and the U.S. scientific community as critical research areas. Further development in any of these areas will greatly advance the current state of processing, communication, and networking capabilities.