Congress of the United States
House of Representatives
SELECT COMMITTEE ON THE CHINESE COMMUNIST PARTY

October 27, 2024

The Honorable Gina Raimondo
Secretary
U.S. Department of Commerce
1401 Constitution Ave NW
Washington, D.C. 20230

Dear Secretary Raimondo,

We write to request that the U.S. Department of Commerce (Commerce) consider measures to protect American national security and competitiveness in the increasingly critical silicon photonics industry. Specifically, we ask Commerce to consider investigating leading photonics entities based in the People's Republic of China (PRC) and consider amending the Commerce Control List (CCL) to explicitly include silicon photonics equipment and products. Silicon photonics represents the next front in our semiconductor competition with the PRC, and the United States is currently not winning this competition. The U.S. government should examine the tools at its disposal—both preventing U.S. investment and know-how from supporting our adversaries and bolstering domestic innovation—to ensure continued American leadership in critical and emerging technologies like silicon photonics.

The U.S. advantage over the PRC in semiconductor technology is based on etching ever smaller features onto the surface of silicon wafers. In doing so, U.S. chip designers and manufacturers expand the processing power and energy efficiency of their products and improve the accuracy, speed, and cost-effectiveness of artificial intelligence, quantum computing, and other high-intensity algorithmic and deep learning applications. However, chips can only be so small. As we reach the physical limits of current technology, industry and governments will look toward new solutions.

One such solution is photonics. Rather than using electrons and electronics to transmit information, photonics relies on photons, or light particles. When combined with electronics in semiconductors, silicon photonic technology can "create large-scale computing systems with higher bandwidth and improved energy efficiency that go beyond the physical limitations of

traditional electronic chips."[1] Some experts believe photonic chips can offer a 1,000-fold improvement in computational speed compared to existing electronic chip designs.[2] Silicon photonics has the potential to upend the semiconductor industry and redefine battlelines in the United States' technological competition with the PRC, rendering moot the October 7, 2022, export control rules and creating a critical chokepoint for future semiconductor supply chains.

The CCP recognizes that possibility and does not hide its ambitions. Chen Wenling, an economist at a PRC government think tank, identified silicon photonics last year as a technology in which the PRC's advantage could allow the country "to change lanes and overtake" the United States, leapfrogging ahead of current technology.[3] The PRC has incorporated its commitment to advancing photonics technology in its national strategies; it was explicitly identified in the 14th Five-Year Plan as part of technologies for which national labs should be built,[4] and General Secretary Xi Jinping noted in 2022 that silicon photonics is "a high-tech industry in which our country has the conditions to achieve breakthroughs ahead of others."[5] PRC state-owned companies and state-sponsored research institutes known to be national security risks to the United States are beginning to invest billions of dollars in the technology. Xu Wenwei, the President of Huawei's Strategic Research Institute, declared in 2021 that the company would be heavily supporting photonic R&D, and the company filed a patent for a "photonic chip" that same year.[6] Additionally, researchers of the Nanjing Electronic Devices Institute determined that photonics is a disruptive technology with immense military potential. Huawei and Nanjing Electronic Devices Institute, otherwise known as the 55th Research Institute of the China Electronic Technology Group Corporation, are both listed on the Entity List with a presumption of denial license policy for unauthorized military end-use.[7]

For years, the PRC has built out photonics R&D with U.S. support,[8] and it is beginning to commercialize the technology in semiconductor manufacturing. SinTone (中科鑫通), a PRC photonics company, built the PRC's first production line for photonic chips last year in Beijing.

---

[1] Matthew Reynolds, *Controlling Light: Is Silicon Photonics an Emerging Front in U.S.-China Tech Competition?*, CTR. FOR STRATEGIC AND INT'L STUD. (Jan. 12, 2024), https://www.csis.org/analysis/controlling-light-silicon-photonics-emerging-front-us-china-tech-competition.

[2] Sunny Cheung, *Illuminating the Future: Developments in PRC Photonic Microchip Production*, 24 CHINABRIEF 8, 9 (2024).

[3] Reynolds, *supra* note 1.

[4] Cheung, *supra* note 2.

[5] *Id.*

[6] *Id.*

[7] *Id.*; Addition of Certain Entities; and Modification of Entry on the Entity List, 83 Fed. Reg. 37,423 (Aug. 1, 2018) (final rule), https://www.federalregister.gov/documents/2018/08/01/2018-16474/addition-of-certain-entities-and-modification-of-entry-on-the-entity-list.

[8] A 2013 collaboration between the Harbin Institute of Technology, one of the Seven Sons of National Defense and now sanctioned by the U.S. government, and the Lawrence Berkeley National Laboratory involved photonics research and a coauthor affiliated with the People's Liberation Army. Jeffrey Stoff & Glenn Tiffert, *Under the Radar: National Security Risks in US-China Scientific Collaboration, in* GLOBAL ENGAGEMENT: RETHINKING RISK IN THE RESEARCH ENTERPRISE 105 (Glenn Tiffert ed., 2020), https://www.hoover.org/sites/default/files/research/docs/tiffert_globalengagement_full_0818.pdf. Additionally, Google made significant investments into PRC firm Zhongji Innolight back in 2014—Innolight is now the world's leading provider of optical modules.

Its president, Sui Jun, claimed to PRC media that the production line will allow the PRC to innovate without needing technology currently restricted by the United States and its allies from entering the PRC, since SinTone's photonic chips can be made with materials and equipment already found in the PRC.[9] We believe that Commerce should consider investigating leading PRC photonics companies, especially those designing equipment for the PRC's second photonic chip production line.[10] These companies are potentially operating directly contrary to U.S. national security and foreign policy interests, and U.S. technology should not further support these efforts.

Moreover, Commerce should examine the possibility of amending the Commerce Control List (CCL) to explicitly incorporate photonics technology and photonic chips as part of its controlled technologies. The dual-use nature of photonics technology makes it particularly susceptible to military end-use diversion by problematic actors. U.S. technology with clear military applications should be fully protected, yet the existing CCL potentially does not include any reference to or mention of photonics equipment or products. Some photonics equipment is likely classified under Export Control Classification Number (ECCN) 6A005, but equipment that would fall under that ECCN represents a narrow subsection of silicon photonics as a discipline. Additionally, photonic chips and hybrid electronic-photonic chips are likely not covered by existing ECCNs due to their unique composition and physical operations. Ensuring that existing U.S. safeguards are honed and sharpened to cover advancements in emerging and critical technology is vital to protecting U.S. national security, and amending the CCL could be one way to do so for photonics.

We appreciate the significant steps Commerce has taken on issue. Additional steps such as restricting the flow of U.S. technology to key PRC photonics companies and investing in our domestic photonics competitiveness will go a long way towards ensuring American leadership in this critical industry. We further request that you brief Select Committee staff by December 1, 2024, and provide responses to the following questions:

1. What do you assess to be the national security threat posed by the PRC silicon photonics industry?
2. What is the current landscape of the U.S. domestic silicon photonics industry?
3. What resources are needed for Commerce to carry out this effort, including the knowledge and talent that is required to assess silicon photonics?

[9] Reynolds, *supra* note 1; Cheung, *supra* note 2.
[10] Cheung, *supra* note 2.

Thank you for your attention to this important matter and prompt reply. Thank you for your work on behalf of the American people.

Sincerely,

John Moolenaar
Chairman

Raja Krishnamoorthi
Ranking Member