



The [Defense Business Accelerator, or DBX, Microelectronics Challenge](#) aims to revolutionize how the Department of Defense (DoD) drives the development of dual-use technology, which can be used for both civilian and military applications. (Learn more about the challenge following the story.)

DBX Awardee Story: **PseudolithIC is Blending Lower Cost with Greater Power**

PseudolithIC is betting that, when it comes to the next-generation of radio frequency (RF) semiconductors, blended is better.

Limited by RF chips that are either too costly or not powerful enough, federal agencies and commercial businesses are struggling to take full advantage of fifth-generation cellular networks (5G). And with 6G fast approaching, there's huge demand for improved semiconductors that can support more powerful communications solutions to enhance national security and spur new economic opportunities.

Silicon wafers, the foundation of semiconductors, are relatively inexpensive, but can't adequately support cutting-edge applications that work at the higher frequencies needed for 5G and 6G. Meanwhile, compound semiconductors that can support those higher frequencies are prohibitively expensive. PseudolithIC sought to find a middle-ground. The company is pioneering a new way to build RF semiconductors that delivers the performance of a compound chip for the lower cost of a silicon wafer.

"Advanced communications tools, high-performance radars, more adept sensing equipment; in each of these use cases, the government and businesses are constantly on the hunt for more powerful spectrum enabled through better chips," said co-founder Daniel Green. "And higher frequency communications solutions like 5G and 6G haven't seen the broad adoption that was expected. Providers would love to put these spectrums to use. But companies need better semiconductors to make the technology valuable for them."

However, scaling from producing a handful of finished components to potentially millions, requires immense capital. And the company had to grow quickly to take advantage of booming commercial and federal demand. That meant moving beyond traditional, restrictive government funding, to investments that would provide more flexibility, certainty and long-term support. What the company needed was a vote of confidence from an authoritative voice to help convince

potential financial backers it was more than a research company and deliver on its promise of transforming compound semiconductor manufacturing.

That's when PseudolithIC became aware of the DBX Microelectronics Challenge. Created by the Department of Defense (DoD) and executed by the U.S. Partnership for Assured Electronics (USPAE), the DBX Awards support companies that are pursuing transformative technology applicable across both commercial and government use cases. Following an initial application, as well as a round of five-minute pitch presentations, PseudolithIC was chosen as one of the seven winners and awarded \$1 million.

Now, with validation of its business model and the dual-use benefit of its technology, conversations with potential stakeholders have become more serious. In fact, after winning the award in December 2023, PseudolithIC closed a multi-million-dollar funding round in March 2024.

Push it to the (network) limit

Every ten seconds, according to Green, the equivalent of the entire Netflix library flows through global telecom networks. This intense growth in capacity is starting to become a problem for those looking to deploy applications that require high amounts of throughput, like satellite communications devices.

Within each frequency band, there are limits to how much data can be sent. And as the number of connected devices grows, many of the commonly used bands are nearing those transmission ceilings. Increasingly, federal and commercial customers want to tap larger "data pipelines," which requires operating at higher frequencies.

"The limits of conventional networks are real," said Green. "There's growing interest in pushing the operating frequencies of commercial communications networks higher."

This requires better hardware. Existing silicon-based commercial solutions, which can be produced in high-volumes for relatively cheap, are an option, but the performance of the material suffers as the frequency goes up. Or producers can use specialty, compound semiconductors based on materials like gallium nitride or gallium arsenide, which are more capable but more expensive.

PseudolithIC's approach is to blend the two processes together. In specialty RF semiconductors, the portion that drives the overall performance takes up less than 5% of the whole circuit, with other components, like passives, filling the remainder. The company builds those features using a silicon-based process, then integrates into the more expensive, specialty wafers only where it's needed.

The resulting mixture gives the overall circuit the power of a gallium nitride or gallium arsenide-based semiconductor, with the cost and scalability of a silicon-based solution.

Size and Customization

Part of the challenge in developing communications hardware that can work at higher-level frequencies is the lack of space. Reaching those levels – including satellite frequencies, like X and K Band – requires many components that must be crammed into a single board. Often, there's not enough real estate to support traditional, monolithic semiconductors.

Meanwhile, customers might want to connect different components to ultimately power the device. In the case of a high-performance radio, for example, the DoD or a commercial entity will want to use different technology for transmitting and receiving signals.

This is where so-called chiplets become so powerful. The small size makes them ideal for applications where space is limited. And PseudolithIC can “mix-and-match, and we can optimize those separate pieces of the circuit on the same chip. This creates a higher performance system, in a more cost-effective way,” said Green.

Ultimately, PseudolithIC is not just unlocking the future of telecommunications, it's giving its customers the upper hand in a world where split seconds can decide a company's fate or prevent disaster from occurring. And with the backing of DBX, PseudolithIC is ready to scale to meet the opportunity ahead.

“The DBX award is a vote of confidence from the community. As a result, we had a lot more appetite from commercial investors and customers,” said Green. “Now, we have partners that will help us bring this revolutionary technology to the masses.”

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What is the DBX Microelectronics Challenge?

The challenge was created by the DoD Manufacturing Capability Expansion and Investment Prioritization (MCEIP) office and is administered by the U.S. Partnership for Assured Electronics (USPAE). It provides monetary awards intended to help accelerate the commercialization of vital, next-generation capabilities that also have defense applications. With the additional funding from a DBX Award, companies can get the resources needed to overcome critical manufacturing or technology development hurdles to reach full-scale production more quickly.

With the DBX Award, DoD and USPAE are helping companies build a sustainable business to ensure the supply of essential hardware for both commercial and defense needs.

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