



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: **Freedom Photonics Is Laser Focused**

Freedom Photonics President Milan Mashanovitch and team are trailblazing yet another exciting use case for laser technology.

Purchased by Luminar in 2022, the nearly 20-year-old-company specializes in high-performance, semiconductor-based lasers. And there are many applications, from optical telecommunications to medical applications. But after a project with the National Aeronautics and Space Administration (NASA), Freedom Photonics stumbled upon an exciting opportunity to push the boundaries of its own innovation.

The company is now on the cusp of mass-producing photonic integrated circuits (PICs). Similar to the electronic circuits powering laptops and phones, PICs contain multiple components, providing different functionalities. And they all work together to help manipulate light. It's a game-changing innovation that is helping revolutionize data transmission transforming the fields of communications, transportation and sensing.

That's the challenge Freedom Photonics is trying to tackle.

"We have to go from building ten or fifty, to building a few thousand Photonic Integrated Circuits per semiconductor wafer. Then, we have to actually optimize the fabrication process to have sufficient yields to turn this into a product," said Mashanovitch. Fabrication of multiple wafer lots will quickly scale into millions of devices.

Freedom Photonics is one of a few U.S.-based companies with access to the cutting-edge technology required to mass-produce PICs. But it needed a final push to get there.

That's when Mashanovitch came across the DBX Microelectronics Challenge. Just several weeks after applying, Mashanovitch and team were at the Department of Defense (DoD)-sponsored event. And quickly after the final five-minute pitch, Freedom Photonics found out they won a \$1.5 million funding award.

“It was a little bit mind-blowing,” said Mashanovitch. “On the same day, the decision was made. And the funding was available in two days. That’s quite different from the way anyone else does it.”

Now, armed with a fresh infusion of cash and staring down potentially huge demand for their new product in both the public and private sectors, Mashanovitch and team are ready to execute.

The DBX award will “lead us to our first really high-volume, commercial product in the telecommunications space – and basically unlock this whole new area for us. It’s very important for us,” Mashanovitch said.

A new way of funding

It’s another example of the success that can come by bringing the public and private sector together to solve the most pressing challenges facing the electronics supply chain. And it’s why the U.S. Partnership for Assured Electronics (USPAE) is so focused on making those connections even deeper.

In the past, the government would fund very specific technology that was likely made by a single company. If anything were to delay production, there were few other alternatives. In fact, it wasn’t uncommon for companies to go out of business after the government already invested in development.

That model no longer works. Technology is advancing too quickly to fit this old paradigm. Instead, as needs arise, USPAE will bring the government and private sector together to discuss the needs. Then, USPAE will convene working groups that will execute on a solution.

Under this more flexible model, agencies like the DoD can reduce the risk they face when funding innovative new technology, while also ensuring continued access to trusted electronics.

“It makes a lot more sense this way. It’s a lot more sustainable,” said Mashanovitch

A laser-focused future

When an iPhone user unlocks their phone, more than 300 lasers are scanning their face. That’s just one example of how prevalent the technology is in our daily lives. And the use cases are constantly growing.

For example, Light Detection and Ranging (LiDAR) is a foundational component for Advanced Driver Assistance Systems (ADAS) and self-driving cars. The technology uses lasers to create a map of the surrounding area, which then informs the navigation system. Of course, all that has

to happen in milliseconds. Freedom Photonics' lasers are helping its parent company Luminar Technologies be at the forefront of first mass deployment of LiDAR in consumer vehicles.

The broad application of laser technology is how Freedom Photonics first started working with NASA. The company built a system to help the agency detect methane emissions. But Mashanovitch and his team saw the potential for the same technology to open up a new frontier in communications for the private and public sectors.

"We realized that the laser structure that we developed for NASA's application could actually work really well for other types of very commercial applications," said Mashanovitch.

Shortly after patenting the component developed for NASA, Freedom Photonics received a new request. A commercial partner was building a transceiver and needed help. Every transceiver has four parts: the casing, the transmitter, the receiver and the control electronics.

The partner was looking for a transmitter that would enable the transceiver to meet very specific performance requirements needed for Next-generation Passive Optical Network 2 (NG-PON2), a communications protocol that enables telecommunications companies to build a unified infrastructure that works across consumers and businesses – as well as their cell phone tower infrastructure.

Typically, it's difficult to design and produce a single transmitter chip that meets all the necessary requirements. Attempts have even been made using multiple transmitter chips, but that adds cost and complexity to the control electronics and other parts of the transceiver. But with the innovation underway at Freedom Photonics, telecom giants may soon be able to dramatically streamline their operations.

"To basically have this one network, one protocol, one set of devices that support all of these different applications, it's a game-changer. And from a carrier standpoint, it simplifies their life and reduces their expenses," said Mashanovitch.

But Freedom Photonics had a tight timeline to meet. The company was under pressure to quickly provide its own customers with a final product so they could then begin developing the other components. Without the DBX Award, Freedom Photonics wouldn't have been able to meet those demands and might have lost out on the chance to become a market leader for this exciting technology.

"There is a very strict market window. If we had to wait for six months, that would have derailed all the plans. We just would not have been able to have everything ready in time. So the DBX Award was tremendously important,"

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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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