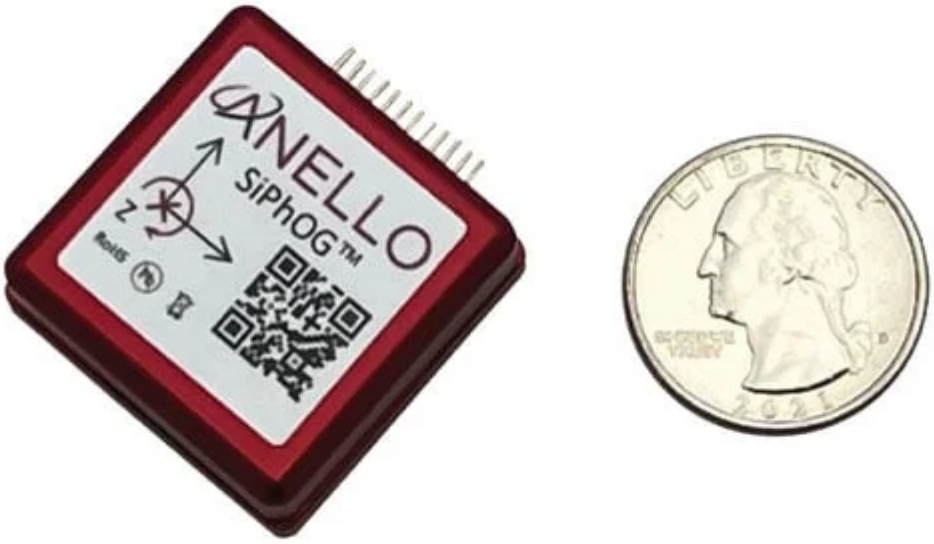
ANELLO Photonics Miniaturizes Navigation Systems for Unmanned Systems



ARLINGTON, Va. – A Silicon Valley-based technology company is finding success in developing and producing small, silicon chip-based navigation systems ideal for unmanned systems operating in GPS-denied environments across land, air and sea.

ANELLO Photonics, headquartered in Santa Clara, California, develops advanced navigation systems based on silicon photonics technology. The company integrates optical sensing and inertial navigation capabilities onto compact silicon chips to deliver high-performance positioning and guidance solutions.

Its core product, the SiPhOG (Silicon Photonic Optical Gyroscope), is a photonic integrated circuit that provides the functionality of a traditional fiber-optic inertial navigation

system used in aircraft, ships, and submarines, while significantly reducing size, weight, power consumption, and system complexity.

“Fiber-optic gyros are high-end, navigation-grade sensors usually used for ICBMs, fighter jets, [and] submarines. They’re the gold standard, [and] often can navigate for weeks or months at a time,” said Dr. Kirstin Schauble, Vice President for Systems Engineering at ANELLO, in an interview with Seapower. “They’re fantastic sensors; the problem with them is that they are big, bulky, power hungry, and extremely expensive.”

As such, fiber-optic gyros are impractical for small unmanned systems, particularly attritable systems.

“We’ve taken the core physics behind traditional fiber-optic gyroscopes – systems that conventionally rely on numerous discrete optical components – and integrated them onto a compact silicon photonics chip,” said Schauble. “By integrating active and passive photonic elements onto a two by five millimeter chip , we’ve dramatically reduced the size and complexity of high-performance inertial navigation technology. The SiPhOG is also mass producible and highly robust, while still delivering the precision expected from traditional fiber-optic gyroscopes due to the significant innovations we’ve achieved in silicon photonics.”

Because the SiPhOG is relatively inexpensive, small, lightweight, and consumes little electric power, it is ideal for equipping swarms of autonomous systems such as unmanned aerial vehicles (UAVs), unmanned surface vessels (USVs) and unmanned underwater vehicles (UUVs).

Schauble said the SiPhOG is ideal for Group 2/3 fixed wing drones, USVs, and 10-foot-to-200-foot vessels.

“We’re able to bring high precision capability to lower-cost, lower size-weight-power form factors for smaller vessels

that previously couldn’t afford FOG-level performance,” she said.

The company’s Maritime Inertial Navigation System (INS) delivers precise and reliable navigation in GPS-denied or contested environments, enabling continuous positioning, heading, and motion tracking for autonomous maritime platforms.

ANELLO’s X3 IMU (Inertial Measurement Unit) integrates seamlessly into existing systems and can operate either independently or as part of a larger navigation architecture, according to Schauble. Designed with an open interface and modular architecture, the X3 supports flexible plug-and-play integration across a wide range of aerial autonomous applications.

According to a company press release, ANELLO was selected in January by the Department of War (DoW) for a $20 million award under the Accelerate the Procurement and Fielding of Innovative Technologies (APFIT) program to fast-track the procurement, production, and scaling of ANELLO’s GPS-denied navigation technology.

ANELLO’s SiPhOG-based Maritime INS is integrated on several autonomous systems, including HavocAI’s USVs and BlackSea Technologies’ Chaser USV.

Schauble said ANELLO’s workforce is expanding from its current 35-to-40 personnel.

“We can’t build these things fast enough,” she said commenting on the flood of orders.