New OIDA report says photonics engineering is needed to commercialize quantum technology

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Quantum technologies are expected to have major impacts in markets ranging from telecom and medicine to finance but advances in product engineering are necessary to bring the technologies to market, according to the newly released OIDA Quantum Photonics Roadmap: Every Photon Counts produced in collaboration with Corning.

The OSA Industry Development Associates (OIDA) roadmap clarifies the applications and timing for quantum technologies and specifies improvements in optics and photonics components needed to enable commercialization. It covers the three major application areas: quantum sensing and metrology, quantum communications and quantum computing.

Commercialization of products such as quantum sensors for GPS-free navigation and field-deployable quantum repeaters for communications will be significant milestones in an emerging market but more investments in product engineering are critical. Lower SWAP-C devices would enable progress, for example, across multiple sensing categories, and integration of these systems onto photonic chips is a critical path to doing so. While some integration is possible today, more on-chip functionality (e.g., sources, modulators, switches) is needed.

"While the field still needs breakthroughs in quantum science, such as a quantum repeater, the photonics technology already largely exists for

laboratory experiments," says Tom Hausken, senior industry advisor, The Optical Society (OSA). "The product engineering—low size, weight, power and cost—is missing, or it is applied to a specific customer application, without benefit to the rest of the field. The need is analogous to the talent shortage, not just with scientists, but with engineers in photonics, microwave and control electronics, packaging and cryogenics who have the specialized expertise to bring the technology to market."

Although the quantum technology market is still in the early stages, the optics and photonics community already supplies critical enabling components to research and development labs in the near term to ensure progress. OIDA estimates sales of optics and photonics for lab equipment used by quantum researchers at about US$100 million per year. The commercial market for quantum end-use products is expected to rise to billions of dollars by 2030.

"The real impact of quantum technology is what it can do, which could be far greater than the market for the technology itself," Hausken adds. "The fear of missing out (FOMO) on that impact on competitiveness and security is driving funding in quantum research, which OIDA estimates at about US$2 billion annually."

The public and private sectors worldwide are making multi-year investments in quantum technologies with an end-goal of market ready applications. In the U.S., the National Quantum Initiative Act, a multi-agency plan, proposes US$1.2 billion in funding for quantum information science over five-years. The European Union's Quantum Flagship program is budgeted at 1 billion euros over a ten-year period.

Investments in the product engineering of quantum technology could support classical applications as well. For example, investments in lower loss integrated photonics and single-photon detectors could yield benefits

in classical optical communications and low-light imaging, respectively. Integrated photonics offers many promising solutions for quantum technology, at a time when it offers multiple solutions in other fields.

More information: The full report is available online: www.osa.org/OIDARoadmap

Provided by The Optical Society

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