QED-C® Announces Member Advancements in Cryogenics for Quantum Technology

FormFactor, Northrop Grumman, Quantum Opus, Triton Systems Cite Progress in Research Supported by NIST

ARLINGTON, VA, UNITED STATES, February 18, 2025 /EINPresswire.com/ -- The Quantum Economic Development Consortium (QED-C) today announced the results of a research and development (R&D) program that focused on using cryogenic technologies to advance innovation in quantum technology.

> Cryogenics is a vital technology for quantum and we were delighted to partner with QED-C members to advance U.S. innovation and industrial competitiveness."
> *Andrew Wilson, NIST quantum research program technical lead*

Cryogenic technologies are critical components for many quantum systems, keeping quantum devices close to absolute zero temperature, thereby reducing noise and errors. QED-C was established to identify gaps in enabling technologies and strategies for filling those gaps. QED-C members previously identified cryogenics technology as a potential barrier in the development of quantum-based systems for computing, sensing and communications.

To address the identified cryogenic technology gaps, the National Institute of Standards and Technology (NIST) sponsored the R&D program with co-funding by the companies involved, which competitively awarded proposals from four QED-C members a combined $877,000 in 2022. Those members, FormFactor, Northrop Grumman, Quantum Opus and Triton Systems, all reported advancements, including research that underpinned a new commercial product.

"We are proud of the results that our members are reporting as a result of the cryogenics research program," said QED-C Executive Director Celia Merzbacher. "While work remains, thanks to these projects we are making steady progress in novel cryogenic technologies that are more energy efficient, compact, and affordable."

· Livermore, California-based FormFactor, created new testing capabilities for quantum chips by speeding up cryogenic testing for complex dies and devices. The capabilities allow users to test dies with hundreds of DC connections, dozens of RF connections, at temperatures as low as 2 Kelvin (-271 °C), in as little as two hours. FormFactor extended the system's capabilities into

electro-optics, which allow devices like complex photonic integrated circuits and single photon detectors to be tested quickly at low temperatures. This research led to the creation of a commercial product, the HPD IQ2000 chip scale prober.

· Falls Church, Virginia-based Northrop Grumman studied the use of Porous Wall Hollow Glass Microspheres as a low cost, non-magnetic, readily available regenerator matrix for high frequency Stirling type cryocooler regenerators operating down to 3 Kelvin (K). The research team successfully identified key design constraints in using the Porous Wall Hollow Glass Microspheres. Researchers noted that while initial results were positive, the material requires additional development to be used as a regenerator matrix.

· Plymouth, Michigan-based Quantum Opus worked to develop a low cost, compact 2.5 K cooler, which would reduce the barrier to entry for quantum technologies. Researchers worked on the technology using two technical paths, one focusing on a Gifford-McMahon 2.5 K cooler, while the other focused on a 2.5 K pulse tube cooler. Quantum Opus says the research was successful in bringing the company closer to its goal of a commercially viable, low-cost, and compact 2.5 K cryocooler.

· Chelmsford, Massachusetts-based Triton Systems successfully demonstrated a fourth-stage expander of a Modified Collins Cycle cryocooler. The fourth-stage cryocooler will allow cryogenic devices to reach temperatures of 4 K-10 K. Triton's project focused on including a full four-stage integrated thermodynamic design model to aid in hardware sizing for each stage, a cycle control algorithm to attain optimal high-performance operation under dynamic conditions, and development of compact, reliable, low temperature cold end valves.

"Cryogenics is a vital technology for quantum and we were delighted to partner with QED-C members to advance U.S. innovation and industrial competitiveness," said Andrew Wilson, technical lead for the NIST quantum research program. "We are excited to build on this progress and look forward to where our partners go next."

About QED-C

The Quantum Economic Development Consortium (QED-C) is the world's premier association of pioneers in the quantum technology marketplace. QED-C was established with support from the National Institute of Standards and Technology (NIST) as part of the Federal strategy for advancing quantum information science and as called for by the National Quantum Initiative Act. Members of QED-C enable the real-world application of quantum technology, and, in turn, grow a robust commercial industry and supply chain. QED-C is managed by SRI. More information: https://quantumconsortium.org/.

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