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Week of TBD

**HEADLINE:** Quantum Research Sciences awarded quantum software contract to support Air Force Advanced Battle Management System

**Subhead**: QRS to integrate quantum technology into next-generation command and control technology

**BODY COPY:**

WEST LAFAYETTE, Ind. — Purdue University-connected software company [Quantum Research Sciences](https://quantumresearchsciences.com/) (QRS) has received a U.S. Air Force contract to develop quantum resource allocation optimization software for the Advanced Battle Management System (ABMS).

QRS personnel will work on the software with leading quantum technologists from the [Air Force Institute of Technology](https://www.afit.edu/) (AFIT), [Air Force Research Laboratory](https://www.afrl.af.mil/) (AFRL) and [Atom Computing](https://atom-computing.com/).

Headquartered in Lafayette, QRS is a [Purdue Innovates](https://purdueinnovates.org/) client company and an affiliate company of the [Purdue Quantum Science and Engineering Institute](https://www.purdue.edu/discoverypark/quantum/). QRS collaborates on quantum computer software with [Andreas Jung](https://www.physics.purdue.edu/people/faculty/anjung.php), associate professor of physics and astronomy in Purdue’s [College of Science](https://www.purdue.edu/science/), and PhD candidate Andrew Wildridge.

**The ABMS challenge**

QRS CEO Ethan Krimins said ABMS dynamic resource allocation presents a formidable challenge characterized by high-dimensional complexity and the critical need for rapid, accurate coordination.

“Traditional computational methods struggle with the exponential scaling of this problem, particularly under dynamic conditions where air tasking variables and battlefield constraints rapidly evolve in real time,” he said. “QRS software applies the exceptional speed and accuracy of quantum computing to address the difficulties of iterating over multiple complex tactical schedules and solutions.”

Maj. Paul “Gus” Garcia, chief of Technology and Innovation, 613th Air Operations Center Headquarters, Pacific Air Forces, has been working to match cutting-edge technological capabilities with air tasking order needs. Garcia said that effort led to the connection with quantum optimization.

“Real-world combat environments demand a dynamic approach because of multiple changing requirements and temporal expansions/contractions; all while there is the potential for physical or economic fluctuation of resources,” he said. “Quantum optimization is the only technology available today that can juggle all those constraints.”

**The quantum solution**

Krimins said quantum computing efficiently solves combinatorial optimization challenges like those faced by ABMS.

“To do this, our quantum software can address allocation needs in the expansive classical construction used throughout ABMS; Joint All-Domain Command and Control, JADC2; and similar strategic Battle Management Command and Control technologies,” he said.

This comprehensive effort requires a collaborative team, which is why AFIT, AFRL and Atom Computing are included.

Maj. Leleia Hsia, Larry Merkle and Lt. Col. Sean McConville have been working with quantum technology at AFIT and are helping design the software to allow users to optimize resources with a model that utilizes variants of a Quantum Approximate Optimization Algorithm.

“The collaborative engagement with the Air Force will first address the complexity of resource allocation and then focus on high-dimensional operations,” Hsia said. “This will include customized modification of the algorithms to assist the Air Force in addressing the unpredictable variables of modern air warfare.”

Merkle added, “The team expects to demonstrate that by leveraging quantum technology, our software will be able to outperform traditional capabilities and adeptly handle the situational complexity encountered by today’s war fighters.”

**Continuous quantum innovation**

Collaborative engagement with the Air Force will focus on high-dimensional operations. This will assist the Air Force in addressing the unpredictable variables of modern air warfare. Michael Hayduk, deputy director of the AFRL Information Directorate, pointed out that quantum is not replacing classical computation, but that it is being tactically implemented to bolster computational bottlenecks that may stress current operational needs.

“Powerful generative AI being used today only reached its current capability via a lot of iteration,” Hayduk said. “Quantum software is following a similar trajectory, where initial efforts are growing into operational implementation as the technology proves its value.”

**Advanced computing**

The QRS team has focused on leveraging state-of-the-art quantum computing and improving application of this powerful technology. Hardware innovation is constantly occurring, and QRS is racing to leverage every new advancement.

“Practical application of a cutting-edge tech is not easy,” Krimins said. “But if we embrace the challenge, the U.S. can decisively outmatch our adversaries in the battlespace.”

**About Quantum Research Sciences**

Quantum Research Sciences is an American technology company focused on the discovery, development, and delivery of practical quantum software. QRS created the DOD’s first operational quantum software and is working toward new quantum software applications every day. For more information on QRS, visit <https://quantumresearchsciences.com/>.

**About Purdue Innovates**

[Purdue Innovates](https://purdueinnovates.org/) is a unified network at Purdue Research Foundation to assist Purdue faculty, staff, students and alumni in either IP commercialization or startup creation. As a conduit to technology commercialization, intellectual property protection and licensing, startup creation and venture capital, Purdue Innovates serves as the front door to translate new ideas into world-changing impact.

For more information on licensing a Purdue innovation, contact the Office of Technology Commercialization at [otcip@prf.org](mailto:otcip@prf.org). For more information about involvement and investment opportunities in startups based on a Purdue innovation, contact Purdue Innovates at [purdueinnovates@prf.org](mailto:purdueinnovates@prf.org).

**About Purdue University**

Purdue University is a public research institution demonstrating excellence at scale. Ranked among top 10 public universities and with two colleges in the top four in the United States, Purdue discovers and disseminates knowledge with a quality and at a scale second to none. More than 105,000 students study at Purdue across modalities and locations, including nearly 50,000 in person on the West Lafayette campus. Committed to affordability and accessibility, Purdue’s main campus has frozen tuition 13 years in a row. See how Purdue never stops in the persistent pursuit of the next giant leap — including its first comprehensive urban campus in Indianapolis, the new Mitchell E. Daniels, Jr. School of Business, and Purdue Computes — at <https://www.purdue.edu/president/strategic-initiatives>.

**About Air Force Institute of Technology**

The Air Force Institute of Technology, with its main campus located at Wright-Patterson AFB, Ohio, is the Department of the Air Force’s leader for advanced, multidisciplinary academic education, as well as its institution for initial technical and professional continuing education. A component of Air University and Air Education and Training Command, AFIT is committed to providing defense-focused graduate education and related research, and operationally relevant initial skills training and professional continuing education to sustain the technological supremacy of America’s air, space and cyber forces.

**About Air Force Research Laboratory/Information Directorate**

The Air Force Research Laboratory Information Directorate is the Air Force’s and nation’s premier research organization for Command, Control, Communications, Computers, and Intelligence (C4I) and Cyber technologies. The directorate explores, prototypes and demonstrates high-impact, affordable and game-changing technologies. These technologies transform data into information and subsequently knowledge for decision-makers to command and control forces. This knowledge gives our air, space and cyberspace forces the competitive advantage needed to protect and defend the nation.

**About Atom Computing**

Atom Computing is building scalable quantum computers with arrays of optically trapped neutral atoms and collaborates with researchers, organizations, governments and companies to help develop quantum-enabled tools and solutions for the growing global ecosystem. Learn more at [atom-computing.com](https://atom-computing.com/), and follow them on [LinkedIn](https://www.linkedin.com/company/atom-computing).

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**IMAGE OR VIDEO:** Quantum Research Sciences has received a U.S. Air Force contract to develop quantum resource allocation optimization software for the Advanced Battle Management System. QRS will work on the software with leading quantum technologists from the Air Force Institute of Technology, Air Force Research Laboratory and Atom Computing. QRS personnel are (left to right) Andrew Wildridge, CTO and Purdue University doctoral student; CEO Ethan Krimins; and Andreas Jung, COO and Purdue University associate professor of physics and astronomy. (Purdue Research Foundation photo/Jennifer Mayberry)

<https://www.purdue.edu/uns/images/2024/qrs-usafcontractLO.jpg>

<https://www.purdue.edu/uns/images/2024/qrs-usafcontractOG.jpg>