Boeing Lab Tests Mark Major Step Toward Space-Based Quantum Network

- Boeing’s Q4S mission demonstrates leading entanglement swapping capability within the power, weight and environmental constraints of a compact satellite payload

- The milestone supports Boeing’s long-term vision to enable a global quantum internet connecting quantum sensors and quantum computers

- The flight payload has completed environmental qualification testing and is now in final spacecraft integration ahead of a planned 2027 launch and on-orbit demonstration

EL SEGUNDO, Calif., June 18, 2026 — Boeing [NYSE: BA] today announced that its Q4S quantum networking satellite system successfully demonstrated high-fidelity entanglement swapping during ground testing on a compact, space-qualified payload. This result marks a major step toward proving quantum networking in orbit. Based on Boeing’s analysis of peer-reviewed publications of comparable entanglement-swapping experiments, the payload demonstrated leading performance within the real-world power and weight constraints of spaceflight.

The team also completed environmental qualification testing, a series of tests designed to verify that the flight payload can withstand launch stresses and the harsh conditions of space. With the commencement of final spacecraft integration, the Q4S mission remains on track for a 2027 launch and on-orbit demonstration.

This milestone supports Boeing’s long-term vision to enable a global quantum internet that connects quantum sensors and computing systems across vast distances. Entanglement swapping, a quantum process that helps extend quantum links beyond simple point-to-point connections, is a core building block for these future quantum networks.

Quantum networks could eventually help connect distant sensors, clocks and computing resources with greater precision, resilience and confidence in the integrity of the link. In the nearer term, the underlying technologies could help support future secure communications architectures, more precise timing for navigation and distributed systems, validation of network integrity, and advanced sensing concepts that combine data across air, ground, sea and space.

“Quantum networking has the potential to transform how information is shared, timed and protected across global systems, but only if it can work outside the lab, under real mission constraints,” said Lane Ballard, Boeing chief technology officer. “Q4S is about taking an important quantum capability and proving it on mission-ready hardware. That is how breakthrough science becomes useful technology.”

In conventional lab settings, quantum experiments often rely on large, delicate equipment and ample power. Space systems do not have that luxury. Q4S is designed to show that entanglement swapping can be achieved on a payload that is small, rugged and efficient enough to operate in orbit.

“One of the hardest parts of quantum networking is maintaining strong performance while working within the size, weight and power limits of a spacecraft,” said Jay Lowell, chief scientist for Boeing’s Quantum Systems organization. “These test results show that we can produce high-fidelity swaps on a payload engineered for space, not just for a controlled lab bench. That is a meaningful step toward practical quantum networks.”

Q4S is planned as a one-year on-orbit demonstration mission. Data from the mission is expected to be used to assess payload performance in space and help inform future quantum networking architectures. Boeing expects to submit technical results from the program for peer review.

Boeing is investing in quantum networking as part of a broader portfolio spanning communications, sensing, navigation, and computing. Q4S is a key step in moving quantum networking toward practical aerospace and defense applications.

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