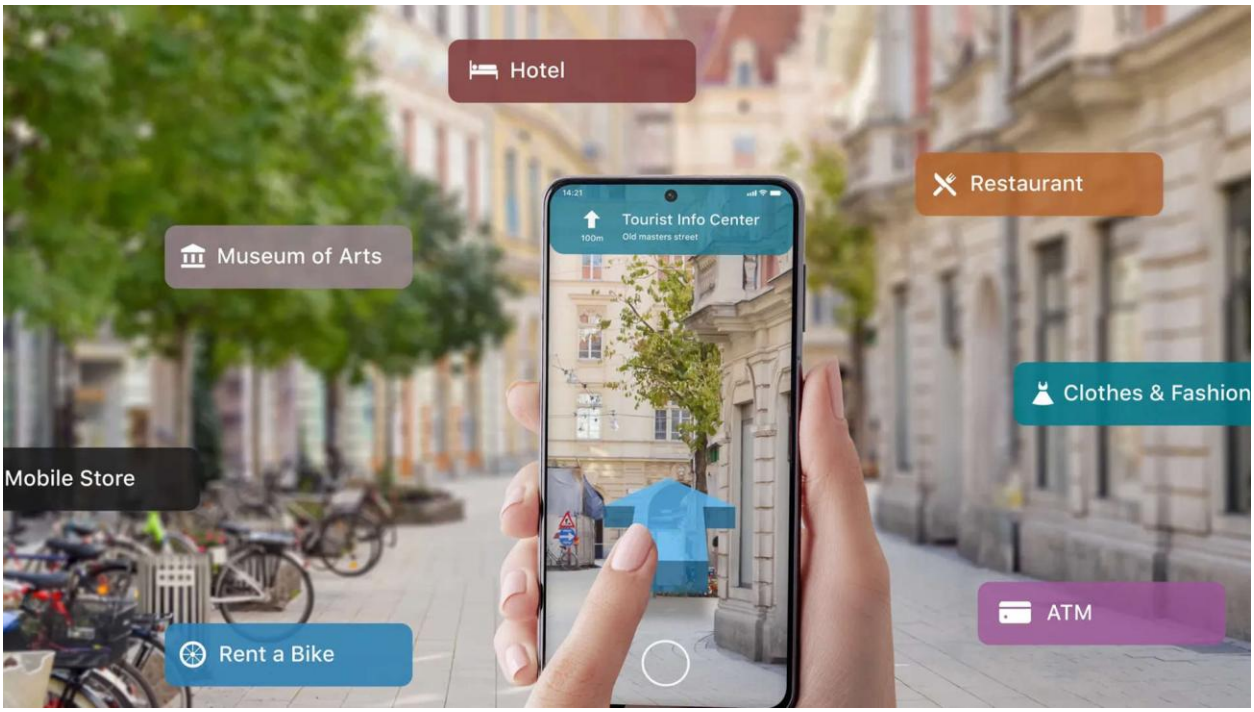
Quantum Phones? Not yet…

Some articles suggest we may see quantum chips in consumer phones within a few years. Experts disagree. Most roadmaps place fault-tolerant quantum computers in the late 2020s to 2030s, and these systems still require refrigerators at millikelvin temperatures.

The closest we've come to "quantum phones" is devices like the Galaxy A Quantum, which includes a quantum random number generator (QRNG) chip for stronger security, not a quantum processor.



Augmented reality and simulation

Quantum circuits could one day simulate materials and environments with stunning accuracy, potentially transforming how devices handle augmented reality. For now, realistic AR depends on powerful GPUs, graphics engines, and clever software optimizations. Quantum's role in delivering real-time AR remains a speculative, long-term possibility rather than an immediate reality for smartphones or consumer electronics.

Quantum sensors sneak into next-gen phones for epic precision

As technology evolves at a breakneck pace, quantum sensors have begun to infiltrate next-generation smartphones. These cutting-edge components are set to redefine precision, opening a world of untapped potential.

Understanding Quantum Sensors

A quantum sensor is a type of device that uses quantum mechanics – the theory that explains how tiny particles like atoms and photons behave – to measure physical quantities. In simple terms, these sensors exploit the peculiar properties of quantum particles to gauge diverse aspects with unparalleled precision. Unlike traditional sensors that measure physical quantities by interacting with an environment, quantum sensors are designed to minimize interaction, thereby reducing inaccuracies.

When compared to traditional sensors, quantum sensors come up trumps in various aspects. For starters, they offer higher sensitivity and precision, even at low signal levels. This means they can detect changes that conventional sensors might miss. Additionally, quantum sensors are capable of measuring multiple parameters simultaneously, something ordinary sensors are typically not capable of. You can learn more about their work and the benefits from chapter 1 of the book, Reimagining Microelectronics: Evolution and Future Potential of Modern Circuit Design Paradigms.

The Integration of Quantum Sensors in Smartphones

The integration of quantum sensors into smartphones is a complex process that involves a lot of technical expertise. These sensors are typically embedded into the phone's hardware during the manufacturing process. However, incorporating quantum technology into a device as compact as a smartphone poses several challenges. The biggest hurdle is the need to maintain extremely low

temperatures for the sensors to function optimally. Overcoming this obstacle requires innovative solutions, such as the development of room-temperature quantum devices.

Despite the challenges, companies are investing heavily in this technology, driven by the potential benefits. For instance, Samsung and Google are reportedly exploring the incorporation of quantum sensors into their future smartphone models. Their goal is to enhance the accuracy and speed of data processing, thus providing a superior user experience.

Impact on Precision and Performance

Quantum sensors are poised to bring a significant boost in precision and performance to next-gen smartphones. By leveraging quantum mechanics, these sensors can detect minute changes in environmental parameters with exceptional accuracy. This vastly improves the precision of measurements, leading to more accurate data processing and enhanced performance of various applications.

Take, for example, the case of GPS navigation. Quantum sensors can detect tiny variations in gravitational fields, which allows them to pinpoint a device's location with far greater accuracy than traditional GPS. This can lead to improved navigation apps, making them particularly useful in areas where GPS signals are weak or non-existent. A study exploring these possibilities provides more insights (listed below).

Applications of Quantum Sensors in Next-gen Phones

The introduction of quantum sensors in smartphones opens the door to a plethora of new applications. For instance, healthcare apps could leverage the exceptional precision of quantum sensors to monitor vital signs, potentially leading to more accurate diagnoses and treatments. Similarly, augmented reality apps could benefit from the enhanced data accuracy, offering a more immersive and realistic experience.

Looking ahead, quantum sensors could unlock even more exciting possibilities. For example, they could enable more precise indoor navigation, a feature that has long been a challenge due to the limitations of traditional GPS. Furthermore, they could lead to the development of new security features, such as quantum-based encryption for improved data protection

Role of Quantum Sensors in Advanced Defense Platforms

The potential of quantum sensors extends beyond smartphones and into the realm of defense and security. For instance, the Defense Advanced Research Projects Agency (DARPA) has selected Q-CTRL, a leading quantum technology company, to develop next-generation quantum sensors for navigation on advanced defense platforms. The aim is to leverage the high precision of quantum sensors to enhance navigation capabilities, especially in GPS-denied environments. This partnership underscores the significant potential of quantum sensors in revolutionizing defense measures. By providing more accurate data, these sensors could contribute to the development of more efficient and effective defense platforms.

Future Prospects of Quantum Sensors in Mobile Technology

The future of quantum sensors in the smartphone industry looks promising, but it’s not without hurdles. The main challenge lies in the cost and complexity of quantum technology, which could slow down widespread adoption. However, as research progresses and the technology matures, these barriers are likely to diminish.

Looking ahead, quantum sensors are poised to become a key component of next-gen smartphones, driven by their potential to significantly enhance precision and performance. The future might see even more innovative applications, from quantum-secured communication to advanced health monitoring, transforming our smartphones into truly smart devices.

DARPA Selects Q-CTRL to Develop Next-Generation Quantum Sensors for Navigation on Advanced Defense Platforms

NEWS PROVIDED BY EIN Presswire August 27, 2025

Funding will support quantum-based navigation technologies in collaboration with Lockheed Martin

We look forward to supporting Q-CTRL and DARPA in the development of robust quantum-enhanced navigational technology."

— Thomas Loftus, Senior Fellow at Lockheed Martin

SYDNEY, AUSTRALIA, August 27, 2025 /EINPresswire.com/ -- Q-CTRL, the global leader in quantum infrastructure software, today announced its selection for two awards under DARPA's Robust Quantum Sensors (RoQS) program. With this selection, DARPA has awarded Q-CTRL contracts valued at A$38M (US$24.4M) to augment Q-CTRL's field-validated quantum sensing technologies for demanding real-world use cases in high-performance military vehicles.

Navigational technology that is resilient to denial, jamming, spoofing, and other denials in the environment has become increasingly critical to defense applications from battlefield operations to intelligence and surveillance. With conflict zones expanding, the risks to crewed and uncrewed defense missions are growing daily. Quantum sensing offers a complementary solution to GPS that is resilient against external interference while filling coverage gaps.

Q-CTRL will develop next-generation quantum sensors for navigation based on their success in field trials of airborne, maritime, and ground-based quantum navigation augmented by their proprietary AI-powered software ruggedization. This technology enables sensors to operate reliably on moving defense platforms subject to challenging real-world conditions, without the need for traditional shielding or isolation. Q-CTRL will be joined by Lockheed Martin as a subcontractor on one aspect of the RoQS program, leveraging its expertise in GPS and quantum technology.

RoQS was established by DARPA to accelerate the development, testing, and validation of quantum sensors for real-world defense applications, which include maintaining stability

against environmental interference, mechanical vibrations, and heavy g-forces.

“DARPA has an incredible track record of delivering innovations that change the face of society, from the internet and mobile phones to night vision and stealth,” said Michael J Biercuk, CEO and Founder of Q-CTRL. “We’re honored that our recent demonstrations and exciting new ideas earned Q-CTRL’s selection to deliver a new generation of software-ruggedized quantum sensors for the most challenging defense missions. We’re here to win and are excited to work with the team at DARPA for the benefit of the warfighter.”

“We look forward to supporting Q-CTRL and DARPA in the development of robust quantum-enhanced navigational technology,” said Thomas Loftus, Senior Fellow at Lockheed Martin. “This award signifies the priority defense agencies are placing on the potential for quantum navigation solutions to deliver transformational national security capabilities that complement GPS.”

Some sectors and organizations are fast-maturing quantum navigation for use on land, sea, in space, and in the air. The aerospace industry is actively exploring the potential for magnetic navigation technologies, with companies like aircraft manufacturer Airbus pursuing their development.

Additionally, Q-CTRL’s programs target the complementary missions of geophysical mapping of gravity and magnetic fields, as well as positioning based on matching detected signals to the pre-generated maps. This approach provides huge advantages in navigational missions and delivers new insights into minerals prospecting and underground target detection.

“USGS, NASA, and other Federal Agencies are exploring how to use the emerging generation of highly capable, mobile quantum sensors to detect and assess mineral deposits, and to map out detailed subsurface patterns for GNSS-denied navigation,” said Jonathan Stock, Chief Scientist for Innovation, NASA Ames Intelligent Systems Division. “DARPA's awards to Q-CTRL illustrate the potential for impactful new use of this technology, and NASA looks forward to pursuing a deeper relationship with Q-CTRL.”

Ironstone Opal, the company’s quantum-assured navigation system, recently outperformed a high-end inertial navigation system (INS) in flight for the first time, achieving up to 111x greater positioning accuracy when GPS was unavailable – a significant step forward for real-world applications of quantum sensing to defense missions. In these tests, the company’s proprietary AI-driven, software-level innovation was the key to the removal of platform interference.

Ironstone Opal’s navigation system was also recently validated in maritime trials on board the Royal Australian Naval vessel, MV Sycamore.

In March, Lockheed Martin and Q-CTRL were awarded a contract by the U.S. Department of Defense's Innovation Unit (DIU) to prototype a quantum-enabled Inertial Navigation System (INS).

Visit Q-CTRL's website to learn more about Ironstone Opal and to request more information about evaluation kits for crewed aviation use cases.

Editor's Note

Quantum sensors offer unmatched precision in measuring time, gravity, and motion, but they've historically been confined to laboratories due to extreme sensitivity to environmental noise. The RoQS program addresses this challenge by supporting new sensing architectures that are inherently resilient to vibration, electromagnetic interference, and platform-induced motion, enabling real-world performance in mission environments.

Q-CTRL's unique approach pairs custom hardware with quantum control software that automatically suppresses noise and maintains sensor performance. The resulting software-ruggedized sensors are designed for integration into a variety of defense platforms, providing critical capabilities in navigation, targeting, and situational awareness, especially when GPS is denied or degraded.

About Q-CTRL

Q-CTRL is a key player in the global quantum technology industry as a category-defining business for AI-driven quantum infrastructure software. Leading quantum computing hardware providers integrate its performance-management software with their superconducting and silicon-based platforms to deliver unprecedented capabilities to end users. The company's global leadership in quantum sensing for defense and dual-use was featured in The New York Times. Q-CTRL also developed Black Opal, an award-winning edtech program that enables users to learn quantum computing quickly.

Founded by Michael J. Biercuk in November 2017, Q-CTRL has assembled the world's foremost team of expert quantum-control engineers, providing solutions to global quantum technology leaders, including Fortune 500 companies, startups, national research labs, and academic institutions. The company has international headquarters in Sydney, Los Angeles, San Francisco, Berlin, and Oxford.

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Quantum Computing, Wearables, and Next-Gen IC Packaging

- First Online: 23 April 2025
- pp 161–180

Introduction to Microelectronics Advanced Packaging Assurance

- Navid Asadizanjani, Himanandhan Reddy Kottur & Hamed Dalir

Part of the book series: Synthesis Lectures on Engineering, Science, and Technology

Abstract

This chapter explores cutting-edge packaging techniques for quantum computing, wearable devices, and future trends in IC packaging. It delves into quantum computing's 2.5D and 3D integration, emphasizing security challenges and the quest for secure materials. For wearable gadgets, it discusses flexible substrates, miniaturization, and biocompatible materials, highlighting the importance of advanced packaging for comfort and durability. Future trends in IC packaging, including improvements in interconnects and the potential of nanomaterials and machine learning, are also addressed, providing readers with insights into upcoming advancements.