

# An Introduction to Quantum in Chattanooga and Hamilton County



## WHAT IS QUANTUM?

At the subatomic level—where particles such as photons, ions, atoms, and electrons exist—matter behaves differently than the objects we interact with every day.

One important concept is that these objects can behave both as particles and as waves, a property known as wave-particle duality. While this may seem counterintuitive, it is one of the foundational principles that makes quantum technologies possible.

Some of these behaviors can seem unusual, but when harnessed in new technologies they can be extremely powerful. Two important quantum properties include:

### Entanglement .....

When two particles become entangled, they remain connected and behave in coordinated ways even when separated by large distances.

Why it's useful: This property enables new forms of ultra-secure communication, where attempts to intercept information can be detected before there's been a data breach.

### Superposition .....

Unlike classical systems that must exist in one state at a time (0 or 1), quantum particles can exist in multiple states simultaneously.

Why it's useful: This allows quantum computers to explore many possible solutions at once, rather than processing calculations strictly one step at a time.

Another key concept in quantum computing is the **qubit** (quantum bit). In classical computing, information is stored as bits (0 or 1). In quantum computing, information is stored as qubits, which can exist in multiple states simultaneously due to superposition.

Qubits can be built using different types of physical systems, including:

→ **trapped ions** → **photons (light particles)** → **atoms** → **electrons**

Each approach has different strengths, and multiple hardware technologies are being developed in parallel. In simple terms, classical computers process information step-by-step, while quantum systems can evaluate many possibilities at once for certain types of problems.

Although these properties were first observed more than a century ago, scientists and engineers have only recently begun developing technologies that can take advantage of them. While still emerging, quantum technologies are expected to become powerful tools for solving complex problems in science, industry, and national security.

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## THREE MAJOR AREAS OF QUANTUM TECHNOLOGY .....

### 1 Quantum Computing

A new type of computing designed to solve certain complex problems much faster than classical computers.

Quantum computers are being developed using different technical approaches (or “modalities”), including superconducting systems, trapped ions, and photonic systems.

The system being deployed in Chattanooga uses a trapped ion approach, in which individual ions are manipulated with lasers to perform calculations.

### 2 Quantum Networking & Communications

Uses quantum physics to transmit information with unprecedented levels of security.

### 3 Quantum Sensing

Highly sensitive instruments that can measure time, gravity, magnetic fields, or motion with extraordinary precision.

## WHY WE'RE PAYING ATTENTION TO QUANTUM NOW

Quantum technologies could help tackle problems that are currently beyond the reach of today's computing and sensing tools.

Global public and private investment in quantum technologies has already reached tens of billions of dollars, reflecting expectations that the field will become a foundational technology in the coming decades.

### Regions that engage early often see several advantages:

#### → Early movers capture disproportionate value

Research suggests that organizations and regions that engage early with emerging technologies often capture a larger share of long-term economic and innovation benefits.

#### → Talent and expertise cluster

Quantum ecosystems depend on specialized scientists, engineers, and entrepreneurs. Once talent begins to concentrate in a region, it attracts additional researchers, companies, and investment.

#### → Infrastructure creates lasting advantages

Quantum technologies rely on specialized infrastructure—labs, advanced computing resources, networks, and fabrication capabilities—that are difficult and expensive to replicate once clusters form.

#### → Innovation clusters drive long-term economic opportunity

Many transformative technologies—from semiconductors to biotechnology—have produced regional industry clusters that generate high-wage jobs, startup formation, and new supply chains over decades.

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## HOW QUANTUM IS GAINING STEAM IN CHATTANOOGA AND HAMILTON COUNTY?

Several factors give the Chattanooga/Hamilton County region a strong foundation for participating in the emerging quantum technology ecosystem.

### **EPB's Advanced Fiber Network and Quantum Infrastructure**

EPB operates one of the most advanced fiber networks in the United States and has already deployed commercial quantum networking technologies.

### **A Commercial Quantum Computer Commissioned by EPB**

EPB has commissioned a commercial quantum computing system that, in the summer of '26, will connect to its fiber network. Developed by IonQ, this resource will provide researchers, students, and industry partners with early access to quantum computing capabilities

### **The University of Tennessee at Chattanooga's Investment in Quantum**

UTC has launched new academic programs, research initiatives, and partnerships focused on quantum information science and engineering. In fact, UTC was the first university in the country to be connected to a commercial quantum network.

### **Research Partnerships with Leading Institutions**

Collaborations with institutions such as Vanderbilt University strengthen the region's access to world-class expertise in quantum research and engineering.

### **Proximity to Oak Ridge National Laboratory**

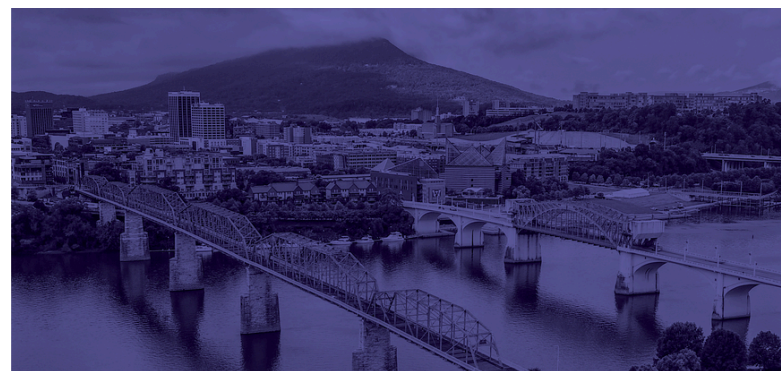
Oak Ridge National Laboratory—one of the nation's leading research institutions in quantum information science, advanced computing, and materials—is located just two hours away.

### **A Unique Environment for Energy Innovation**

With both EPB and TVA active in the region, Chattanooga sits at the intersection of advanced energy systems and digital infrastructure—an environment well suited for exploring quantum applications in energy systems and grid optimization.

### **Access to Nearby Technology Ecosystems**

Chattanooga is within close proximity to other advanced technology hubs, including Huntsville, Alabama and Atlanta, Georgia.



Quantum technologies will not replace today's computers or networks. Instead, they will complement them, serving as powerful tools for solving specific classes of problems important to science, industry, and society.

In practice, most applications are expected to rely on hybrid systems that combine classical high-performance computing with quantum capabilities, allowing each to be used where it is most effective.

Regions building quantum expertise today are helping shape where the next generation of technological innovation will emerge.

**For more resources and information on Quantum Computing, visit [ChattanoogaQuantum.com](https://ChattanoogaQuantum.com)**