

Developed the first large-scale quantum computer simulation of nuclear physics exceeding 100 qubits

Why is this important? Demonstrating larger, more sophisticated quantum computer applications is essential for advancing scientific discovery, energy innovation, and national security.



Commercialized the first open-source hardware for programming quantum computers

Why is this important? The Quantum Instrumentation Control Kit (QICK) is an open-source qubit controller that accelerates quantum computing experiments.

QICK's broad popularity in the quantum community led DOE to invest in transitioning the technology to a commercial partner for productization.



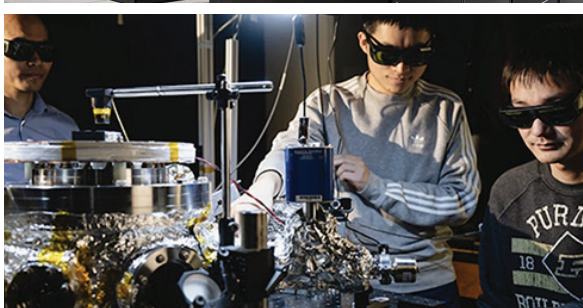
Created matching above- and below-ground instruments to test effects of noise and errors on quantum computers

Why is this important? The test chambers enable controlled experiments that use quantum sensors to directly compare environments that are significantly shielded from radiation and cosmic rays with those that are not.



Developed the first protocol for certifying new classes of quantum materials

Why is this important? Quantum materials have properties that make them uniquely promising for building high-quality quantum computing components. Certifying materials as quantum-ready is critical to ensure stability and error reduction for quantum computing.



Integrated the open-source programming of industrial quantum computers with DOE leadership computing systems

Why is this important? A suite of software tools for programming and operating quantum computers allows researchers to transition scientific applications to the Oak Ridge Leadership Computing Facility to run more complex quantum simulations in tandem with high-performance computing systems.

Tested the frontiers of entanglement by simulating topological matter with custom quantum computers

Why is this important? Creating new hardware platforms that use photonic and atomic qubits enables scientists to reconfigure quantum simulations of exotic matter and extend the understanding of materials that cannot yet be made in the laboratory.