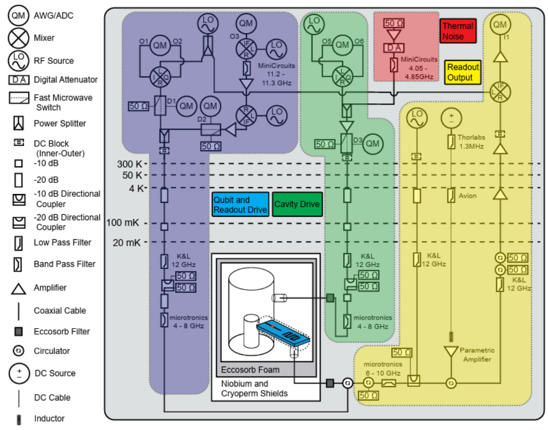
VOL. 56 APR 2025

NTU Q

HOT SCHRÖDINGER CAT STATES

A research team at the University of Innsbruck has achieved a groundbreaking result in quantum physics: they successfully generated Schrödinger cat states at temperatures as high as 1.8 Kelvin. These so-called "hot cat states" demonstrate quantum superposition in thermally excited systems, challenging the long-held assumption that such phenomena can only emerge in near-zero temperature environments. This discovery opens new pathways for the development and application of quantum technologies under less-than-ideal thermal conditions.



The Schrödinger cat state originates from a famous thought experiment that describes a cat simultaneously being alive and dead, representing a quantum system existing in mutually exclusive states. In practice, such states have been realized through the superposition of quantum properties like particle location or electromagnetic resonator oscillations. Until now, these effects were only observed by cooling the system to its ground state. The current study marks the first time that quantum interference was generated starting from a non-ground, thermally excited state.

In their experiment, the researchers employed a transmon qubit coupled to a superconducting microwave resonator and adapted two previously known protocols originally designed for ground-state preparation. Remarkably, they were able to create distinct quantum features, including coherent superpositions, even at temperatures sixty times higher than the resonator's equilibrium thermal condition.This work overturns the traditional view that temperature inherently destroys quantum effects. Instead, it demonstrates that if the necessary quantum interactions can be engineered within a system, thermal fluctuations need not prevent the emergence of quantum phenomena. This insight is particularly relevant for systems such as nanomechanical oscillators, where reaching ground-state temperatures can be technically challenging.According to the researchers, this study not only represents a technological advance in quantum state control but also broadens the fundamental understanding of quantum mechanics. In the future, quantum devices may operate effectively without the need for extreme cooling, bringing the vision of practical, real-world quantum technologies one step closer to reality.

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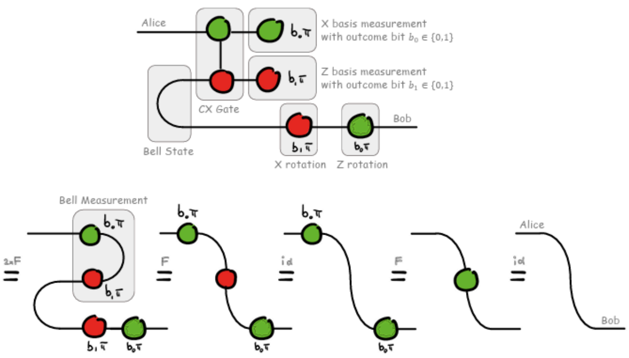
MAKING THE QUANTUM WORLD ACCESSIBLE TO YOUNG LEARNERS THROUGH QUANTUM PICTURALISM: AN EXPERIMENTAL STUDY

A new study shows that high school students can grasp the core principles of quantum computing without learning complex mathematics, thanks to a visual method known as Quantum Picturalism (QPic). Developed by researchers from Quantinuum, the University of Oxford, and University College London, QPic replaces traditional equations with diagrams, making quantum science more accessible to younger learners.



In an eight-week program, 54 students aged 16 to 18 received 16 hours of live tutorials. Despite having little or no background in quantum science or advanced math, 82% of students passed a rigorous post-training exam, and 48% earned distinction. The results suggest QPic lowers cognitive barriers and increases student motivation, potentially expanding the STEM talent pipeline. Unlike conventional methods that rely on complex matrix operations and linear algebra, QPic uses ZX calculus to visually represent quantum processes. This diagrammatic reasoning allows students to understand entanglement and even perform quantum teleportation without solving equations. Researchers argue that QPic could democratize quantum education by bypassing mathematical prerequisites that exclude most students—especially in state-funded schools. They also link its effectiveness to visual learning theories like Gestalt psychology and dual coding, suggesting the brain may grasp abstract concepts more easily through images than symbols. Although this was a small-scale, proof-of-concept study, it marks the first formal assessment of QPic's impact on pre-university learners. Replication efforts are underway internationally, and future research will explore its potential for reducing gender and socio-economic gaps in quantum education. With the growing demand for quantum-literate professionals, QPic could play a crucial role in preparing the next generation—without requiring years of advanced mathematics.

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