COSMICO

QUANTUM COMPUTING

Scientists Shrink Quantum Components by 1,000x

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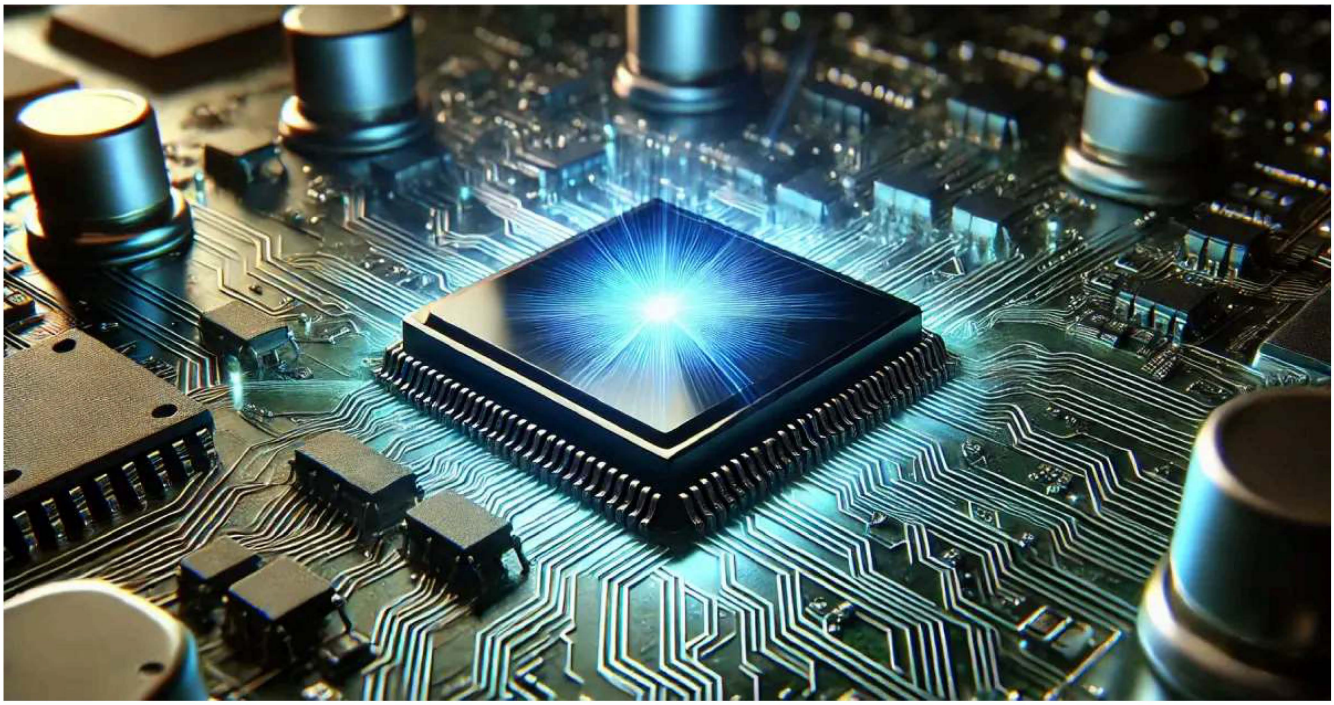
Dec 1, 2024 — 2 min read



Scientists at Nanyang Technological University (NTU), Singapore, have made a groundbreaking discovery in quantum computing. They developed a method to produce entangled photon pairs using ultra-thin materials, shrinking the size of critical quantum components by up to 1,000 times. This innovation could lead to simpler, more compact quantum systems and transform industries like climate science, pharmaceuticals, and secure communications.

The Discovery

Traditionally, quantum computers using photons as quantum bits (qubits) require bulky millimeter-thick crystals and additional optical equipment to produce entangled photon pairs. These pairs are essential for the synchronization needed in quantum computing. However, the size and complexity of these systems have made them impractical for integration into chips.

The NTU researchers addressed this challenge using niobium oxide dichloride, a crystalline material with unique optical properties. By stacking two ultra-thin crystal flakes (just 1.2 micrometers thick), the team successfully generated entangled photon pairs without needing additional synchronization equipment.

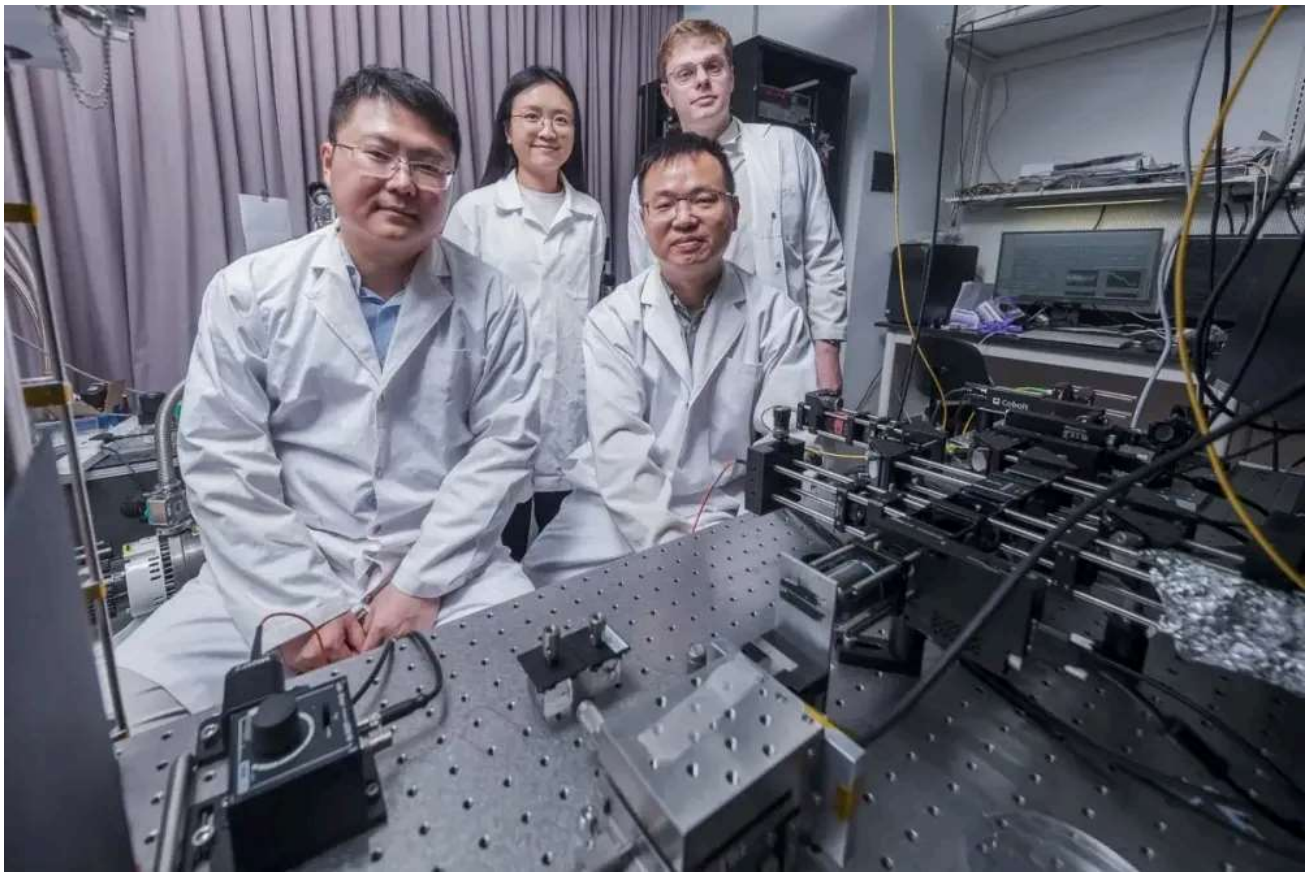


Image Credit: (From left) Professor Gao Weibo, Dr. Lyu Xiaodan, Professor Liu Zheng, and PhD student Leevi Kallioniemi from NTU Singapore developed a new method to create entangled photons using ultra-thin materials.

How It Works

1. **Photon-Based Qubits**: Photons can act as qubits, simultaneously existing in "on" and "off" states, allowing quantum computers to perform calculations exponentially faster than standard computers.
2. **Ultra-Thin Materials**: The thinness of niobium oxide dichloride ensures photons travel minimal distances within the material, keeping them synchronized and maintaining their

entangled state.

3. **Simplified Setup**: This innovation eliminates the need for bulky optical equipment, paving the way for integration into microchips and more practical quantum devices.

Why This Matters

1. **Compact Quantum Systems**: The reduction in size makes it easier to integrate quantum computing components into chips, bringing us closer to scalable quantum devices.
2. **Cost Efficiency**: Producing entangled photons at room temperature without additional cooling systems or equipment reduces costs.
3. **Wider Applications**: This breakthrough could enable quantum technologies in fields like secure communication, big data processing, and medical research.

Overcoming Challenges

Historically, thinner materials produced fewer photons, making them impractical for quantum computing. However, the NTU team's innovative stacking technique overcame this limitation, generating entangled photon pairs efficiently. Future research aims to enhance production rates further, possibly by introducing patterns or combining materials.

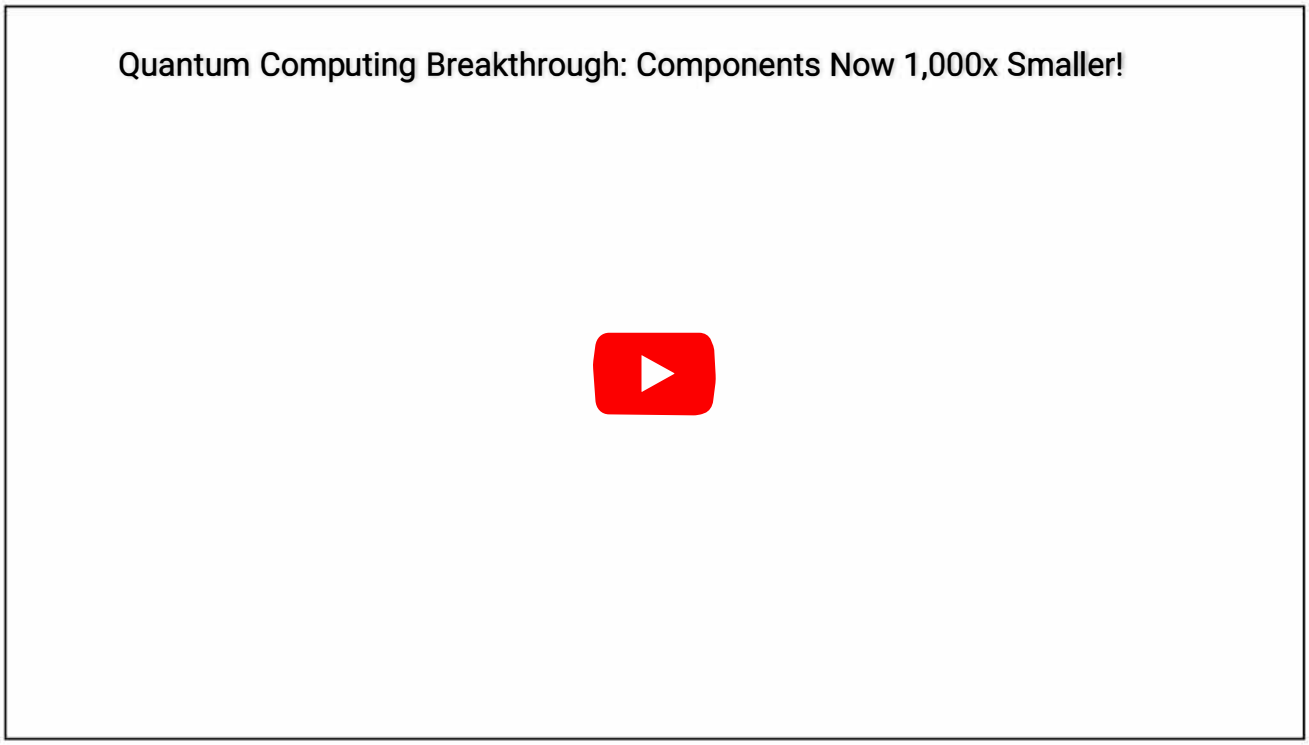
The Future of Quantum Computing

This breakthrough has the potential to revolutionize quantum computing by making it more accessible and scalable. As quantum systems become smaller and more efficient, their applications in solving complex problems—from drug discovery to understanding climate change—will expand significantly.

The NTU team plans to refine their technique further, exploring new materials and configurations to maximize photon production, ensuring quantum computing continues its march toward mainstream adoption.

Final Thoughts

This innovation marks a major step in making quantum computing practical, compact, and cost-effective. With ultra-thin materials enabling the production of entangled photons, the future of quantum technologies looks brighter and more accessible than ever before.


Quantum Computing Breakthrough: Components Now 1,000x Smaller!