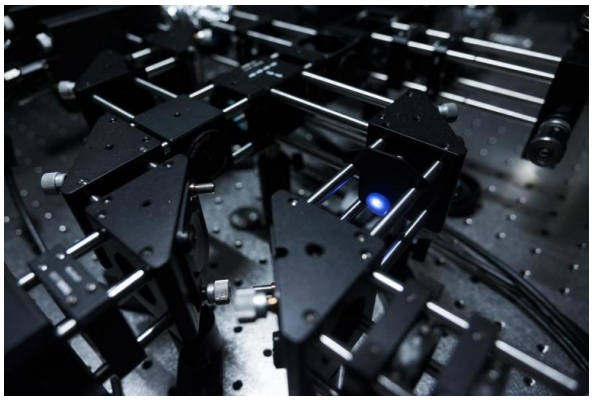
中关村在线
ZOL (China)
3 Dec 2024

English translation

Scientists break through technical barriers, new method shrinks quantum computer components by 1,000 times



Scientists have made progress in quantum computing, successfully generating entangled photon pairs using ultra-thin materials. This discovery is expected to significantly reduce the size of quantum computing components by 1,000 times, opening up a new, simpler and more compact way for the application of quantum technology.

The breakthrough was achieved by Leevi Kallioniemi, a PhD student in a research team from Nanyang Technological University, Singapore (NTU Singapore), who successfully generated entangled photon pairs using a blue laser device in the university's School of Physical and Mathematical Sciences. These photon pairs were generated by irradiating an ultra-thin material called niobium oxide dichloride (only 1.2 microns thick, 80 times thinner than hair).

Traditional quantum computers rely on entangled photon pairs for calculations, but the traditional generation method - using lasers to illuminate millimeter-thick crystals and using optical equipment to ensure the entanglement of photons - has the problem of being too large to be integrated into computer chips. The NTU research team cleverly avoided this problem. The ultra-thin materials they used not only reduced the volume, but also did not require additional optical equipment to maintain the connection between the photon pairs, making the entire device simpler and more efficient.

This breakthrough is of great significance to the development of quantum computing. Quantum computers are able to handle multiple calculations at the same time, and entangled photon pairs are the key to achieving this function. By using ultra-thin materials to generate entangled photon pairs, scientists have paved the way for the miniaturization of quantum optical entanglement sources, which is essential for the application of quantum information and photon quantum computing.

In addition, quantum computers also have great potential in areas such as addressing climate change and developing new drugs. For example, a calculation that today's supercomputers take millions of years to complete may only take a few minutes for a quantum computer. This breakthrough will further promote the development of quantum computers and bring them to practical applications faster.

The NTU research team plans to further optimize the design of its device to improve the efficiency of generating entangled photon pairs. They are exploring methods such as introducing tiny patterns and grooves on the surface of niobium oxide dichloride flakes, as well as the possibility of stacking with other materials, in order to increase the number of photon pairs generated.

This research result is not only expected to promote the development of quantum computing, but may also have a profound impact on areas such as secure communications. As quantum technology continues to advance and miniaturize, we can expect more innovative applications to emerge, bringing unprecedented changes to human society.

https://biz.zol.com.cn/924/9242968.html