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# **CHINA'S QUANTUM SATELLITE**

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## CHINA'S QUANTUM SATELLITE

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<https://www.scmp.com/news/china/science/article/3186802/china-launches-new-satellite-important-step-towards-global>

Quantum communication is a field of applied quantum physics closely related to quantum information processing and quantum teleportation. A quantum key network uses entangled particles to encrypt a message. The most well-known and developed application of quantum cryptography is quantum key distribution (QKD). QKD describes the use of quantum mechanical effects to perform cryptographic tasks or to break cryptographic systems. Any attempt to steal or decode will alter the message physically and alert the receiver, thanks to the law of quantum physics. Ranges of QKD links can be significantly increased with satellites to allow intercontinental key exchanges. The most important job of a quantum satellite is to generate entangled particles to be used as quantum keys between pair of connected nodes. These keys could then be stored in a quantum key pool to be utilised when required. Use of satellite enable QKD is a challenge owing to the complexity of quantum mechanics, divergence of the laser beam and atmospheric attenuation and propagation errors. On 27 Jul 2022, China launched a micro-nano quantum satellite named Jinan1 atop a Lijian-1 quick response carrier rocket from the Jiuquan Satellite Launch Centre in northwest China. This is the second such satellite launched by China and its weight is about one-sixth of Micius, the world's first quantum satellite that was made operational in August 2016.

Micius had conducted record-breaking experiments in quantum physics, including proving the feasibility of quantum communication from one continent to another (Beijing to Vienna). However, it can only establish a stable link with the ground at night because the sun produces so much noise that the light signals are drowned out. Also, the bandwidth for quantum key distribution is low, thus restricting communication to voice or low-resolution videos. Efforts have been on to find solutions to these issues and developing new technologies to maintain quantum communication during the daytime and in bad weather. This includes developing more accurate targeting systems and larger receiving mirrors.

Jinan1, placed in the Low Earth Orbit (LEO) has been designed to conduct real-time quantum key distribution experiments between the satellite and ground station, and to carry out technical verification. The key distribution experiments are expected to be conducted after a month of testing. The new satellite has been jointly developed by Chinese universities and institutions such as the USTC, the Chinese Academy of Sciences and the Jinan Institute of Quantum Technology and is expected to have the capability to generate quantum keys at speeds two or three magnitude higher.

China intends to put more such satellites into orbit, both LEO and Geosynchronous Orbit (GEO), towards creating a high-speed, stable and ultra-secure communications network with global coverage. LEO satellites have the advantages of small channel loss and low latency, whereas GEO based satellites provide wider coverage. Reportedly, China has been testing quantum telecommunication technology on GEO based Shijian 20, an advanced communication satellite. The aim is to support more than 100 users around the globe with secure communications powered by laws of quantum mechanics, unmatched by classical cryptographic methods.

China remains the only country in the world to deploy quantum communication satellites. This type of secure communication has potential strategic implications. While other countries have woken up to this advanced technology and would want to replicate it, none is even close to demonstrating equivalent terrestrial quantum communication capabilities. India has taken initial steps in achieving terrestrial quantum communication and has demonstrated it over small distances. The Chinese demonstrations have spurred the interest and efforts in this technology application.