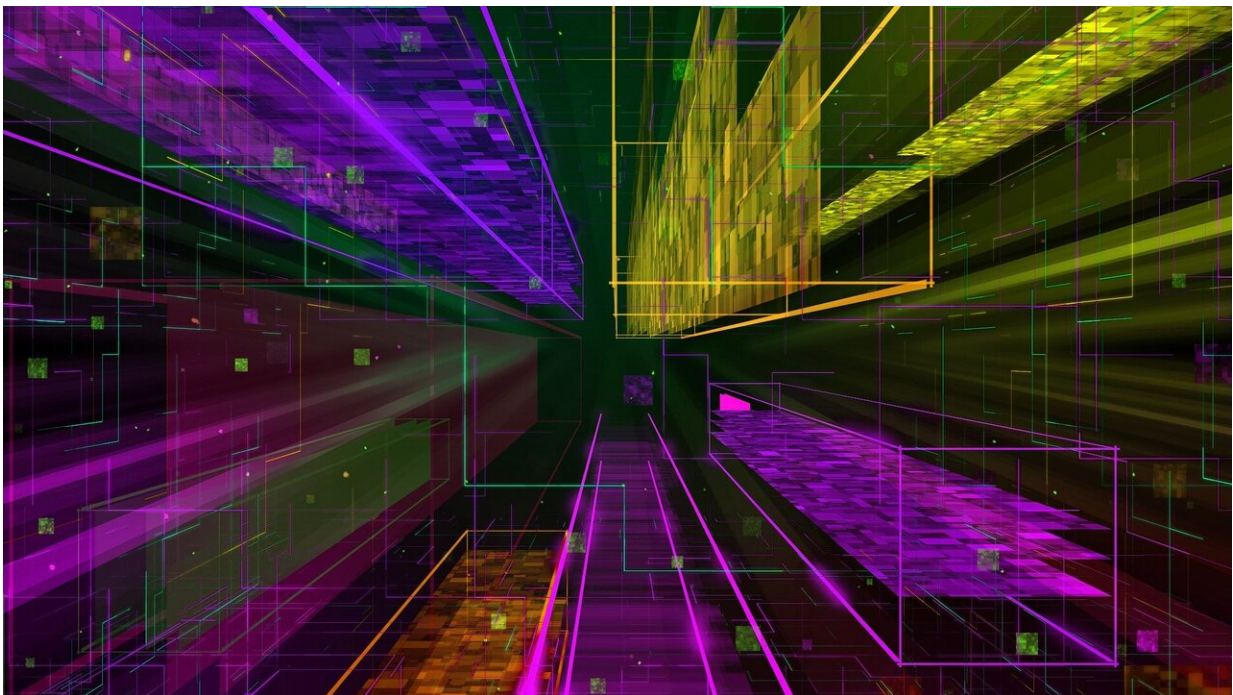


# Quantum cryptography keys for secure communication distributed 1,000 kilometers farther than previous attempts

June 16 2020, by Chen Na

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The exchange of a secret key for encrypting and decrypting messages over a distance of 1,120 kilometers is reported in *Nature* this week. This achievement is made using entanglement-based quantum key distribution, a theoretically secure communication technique. Previous

attempts to directly distribute quantum keys between two ground users under real-world conditions have reached distances of only around 100 kilometers.

Quantum communication uses photons to securely distribute a "secret key" to allow the exchange of encrypted messages. Previous work has demonstrated quantum [key distribution](#) along up to 404 kilometers of coiled optical fiber in a laboratory, or from a satellite to a ground station up to 1,200 kilometers away. However, real-world application between two users has been limited to around 100 kilometers. This is due to photon losses, which increase rapidly with distance. Trusted relays or "repeaters" offer a way to extend the distance and avoid [photon](#) loss, but the relay stations introduce security risks.

Jian-Wei Pan and colleagues circumvented the need for repeaters by using a satellite to establish a secure link between two [ground stations](#) on Earth, using entangled photons. Entangled photons are linked in such a way that, even when separated by long distances, outcomes of measurements of their quantum properties are perfectly correlated. Two telescopes, designed to receive such quantum signals, were built 1,120 kilometers apart in Delingha and Nanshan in China. Entangled photons produced by the Micius satellite are transmitted to the ground as the satellite passes over the stations. Although satellite-based entanglement distribution has been reported before, the authors have now increased their transmission efficiency and reduced error rates enough to use entanglement to transmit quantum keys. They show that the system produces a secure channel that is resistant to attacks.

The results represent a path toward entanglement-based global quantum networks, the authors conclude.

**More information:** Juan Yin et al. Entanglement-based secure quantum cryptography over 1,120 kilometers, *Nature* (2020). [DOI:](#)

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