A team of researchers affiliated with several institutions in China has found that quantum key distribution (QKD) networks can be used to accurately measure ground vibration. In their paper published in the journal *Physical Review Letters*, the group describes their implementation of a twin-field, fiber-based QKD network over a distance of 658 km. They also determined that the network could be used as a means for sensing ground vibrations associated with earthquakes or landslides.

QKD networks make use of unique quantum properties of photons to encrypt data sent between communication devices. Because of their quantum properties, such networks are nearly impossible to hack without the system hosts noticing the activity and ceasing transport of messages. Because of this feature, scientists in several countries have been working to improve the technology for widespread use. In this new effort, the researchers developed and installed a twin-field, fiber-based QKD network that takes advantage of the way photons interfere as a means of encrypting data, and were surprised to find that the fiber network could also be used to sense ground vibration.

In their work, the researchers successfully sent encrypted data over a 658-km fiber cable, extending the previous distance record by approximately 100 km. In such a network, fluctuations in the phase of the light passing through the fiber cable must be noticed and corrected by stretching the cable in order for the key distribution to work correctly. Such fluctuations, the researchers noted, typically arise due to ground vibrations.

In their system and others like it, a separate fiber cable is used to lock the frequencies between
nodes on the network. The researchers found that
the timing information in the second cable can
accurately determine, to within approximately 1
kilometer, where along the cable the fluctuation
was created. That suggests that systems such as
theirs could also serve as ground vibration sensors,
possibly warning of an ongoing earthquake or
landslide. Notably, for real-world application, the
data transfer rate would have to be improved.

More information: Jiu-Peng Chen et al, Quantum
Key Distribution over 658 km Fiber with Distributed
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