

Long distance, top secret messages

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When the military needs to send the key to encrypted data across the world, it can't necessarily rely on today's communication lines, where the message could be covertly intercepted. But physicists at the Georgia Institute of Technology in Atlanta are developing a new, more secure way to send such information across far distances, using existing cables and the laws of quantum mechanics.

Alex Kuzmich and colleagues have built a critical component of a quantum repeater, a device that allows [quantum communications](#) -- such as the encryption keys used to encode data transmitted over traditional lines -- to be relayed over larger distances. They will describe this device at the Optical Society's (OSA) 94th annual meeting, Frontiers in Optics (FiO) 2010, at the Rochester Riverside Convention Center in Rochester, N.Y., from Oct. 24-28.

[Quantum cryptography](#) is an emerging technology currently used by both military and financial organizations to send information as entangled particles of light. In theory, anyone who tries to tap into this information changes it in a way that reveals their presence.

A quantum repeater is similar to a transformer on a traditional power line. Instead of converting electricity, it regenerates a communication signal to prevent it from degrading over distance. It contains two banks of memory, one to receive an entangled message and a second line to copy it.

Previously, the longest distance over which an encrypted key could be

sent was approximately 100 kilometers. The new technology developed by the Georgia Tech team increases 30-fold the amount of time the memory can hold information, which means that series of these devices -- arrayed like Christmas lights on a string -- could reach distances in excess of 1,000 kilometers.

"This is another significant step toward improving [quantum information](#) systems based on [neutral atoms](#). For quantum repeaters, most of the basic steps have now been made, but achieving the final benchmarks required for an operating system will require intensive optical engineering efforts," says Kuzmich.

Their device also converts the photons used in quantum devices from an infrared wavelength of 795 nm to a wavelength of 1,367 nm. This wavelength is used in traditional telecommunications lines, so the new device could someday plug into existing fiber optic cables.

"In order to preserve the quantum entanglement, we perform conversion at very high efficiency and with low noise," says Alexander Radnaev, who also works on this project at Georgia Tech.

More information: The talk, "Quantum Correlations Between Telecom Light and Memory" is at 9:15 a.m. on Wednesday, Oct. 27.

Provided by Optical Society of America

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