Secure Communication via Space

April 22 2008

The exchange of information between distant sources is the basis of all communications, but quantum mechanics may open up this distant exchange as never before.

Quantum key distribution, for instance, would allow for absolutely secure encryption of information exchange by encoding information keys on single photons. These photons are so sensitive that there is physically no way to undetectably tamper with them as they travel from sender to receiver.

Teleportation of quantized states is another possible application. This would allow future quantum computers to be interconnected using the properties of individualized photons or other quanta.

To achieve this type of technology, an exchange of single quanta between a sender and a remote receiver must occur. Already, some companies have explored ways of achieving quantum key distribution over fiber optics, but it has never been done using satellites.

Paolo Villoresi and his colleagues at the University of Padova in Italy, in collaboration with the group of Anton Zeilinger in Austria, have taken the first step to establishing quantum communications in space by exchanging single photons from an orbiting satellite to Earth.

They demonstrated how the Matera Laser Ranging Observatory in Matera, Italy, used for satellite laser ranging with ultimate precision, can be adapted as a quantum communication receiver to detect single quanta

emitted by an orbiting source—in this case a Japanese low-Earth-orbiting satellite. They also identified the exact techniques needed to detect the very weak quantum signal to be exploited in a dedicated satellite.

The research will be presented at the 2008 Conference on Lasers and Electro-Optics/Quantum Electronics and Laser Science Conference (CLEO/QELS) May 4-9 at the San Jose McEnery Convention Center in San Jose, Calif.

Source: Optical Society of America