Austrian breakthrough in quantum cryptography: Record in the transmission of entangled photon pairs (Update)

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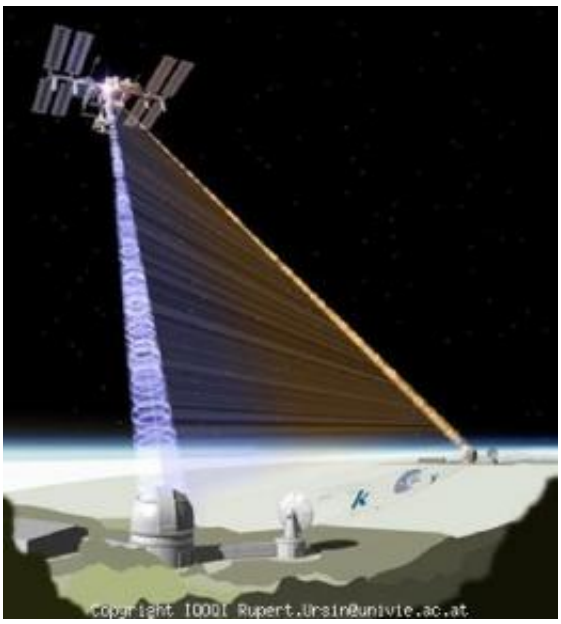

Distribution of Entanglement from the ISS. [Copyright ESA]

Austrian physicists say a breakthrough in next-generation quantum cryptography could allow encrypted messages to be bounced off satellites, the British journal Nature reported Sunday.

A team from Austria's Institute for Quantum Optics and Quantum Information (IQOQI) managed to send entangled photons 144 kilometres (90 miles) between the Spanish islands of Las Palmas and the Balearics.

Because of the success of the test, the IQOQI team said it was now feasible to send this kind of unbreakable encrypted communication through space using satellites.

Quantum cryptography works by sending streams of light particles, or photons, making it entirely secure, as any eavesdropping would leave traces and immediately be detected.

In quantum cryptography, photons are used as the key for the encrypted communication -- just as mathematical formula are used in conventional cryptography.

Update: Please find IQOQI's press release below:

On 3 May 2009 an Austrian contribution will be published in the physical journal *Nature Physics* online edition, entitled "High-fidelity transmission of entanglement over a high-loss free-space channel", by Alessandro Fedrizzi, Rupert Ursin, Thomas Herbst, Matteo Nespoli, Robert Prevedel, Thomas Scheidl, Felix Tiefenbacher, Thomas Jennewein and Anton Zeilinger.

In a project funded by the European Space Agency ESA and the Austrian Space Agency FFG, Austrian physicists succeeded in transmitting a pair of entangled photons from La Palma over a distance of 144 km to Tenerife. This is an important milestone in the endeavour of ESA to distribute entangled photons from a satellite to ground stations.

La Palma transmitter [Copyright IQOQI]

Based on the philosophical debate about entanglement in the 1930s, it took 40 years until the first experimental proof. Over the last decades the concepts of quantum mechanics have been developed to a point where entanglement as a practical technology can be deployed in quantum cryptography to ensure absolutely secure communications. Quantum mechanics originates from the 1930s to explain processes at the atomic level.

The application of entangled photons on satellites and their distribution will allow us to test quantum mechanics over a distance of many thousand of kilometres. Albert Einstein and his colleagues discovered the “spooky action at a distance,” whereas the term “entanglement” found its way into quantum language and quantum information through the Austrian scientist Erwin Schrödinger.

With the development of novel ideas which produce more then 2. Mio. pairs of entangled photons per second, it is now possible to think seriously about the use of satellites. In this experiment, created by a team around Anton Zeilinger and Rupert Ursin, both photons were sent on a 144 km long journey from La Palma to Tenerife, before being received

by the ESA ground station. The photons were exposed to the conditions they would find on the way from the satellite to earth. With that the feasibility of transmission from satellite to an optical ground station has been proven.

Indeed quantum cryptography is possible over a modern glass fibre net, but because of the high rate of transmission loss, this is limited to around 100 km. To realise future quantum communication networks on a global scale, satellite based systems must be developed and photons transmitted over optical free space distant from the ground. Therefore we are working in parallel with partners in the industry on the development of this source until capability in space is realised. If these preparations work to the schedule planned by the ESA, we can reckon on a start in space in the next decade.

More information: www.nature.com/nphys/journal/v … t/abs/nphys1255.html

Provided by IQOQI