Firing photons makes advance in space communication

27 March 2008

For the first time, physicists have been able to identify individual returning photons after firing and reflecting them off of a space satellite in orbit almost 1,500 kilometres above the earth. The experiment has proven the possibility of constructing a quantum channel between Space and Earth.

Research published on Friday, 28 March, in the *New Journal of Physics*, discusses the feasibility of building a completely secure channel for global communication, via satellites in space, all thanks to advances in quantum mechanics.

The research team, led by Paolo Villoresi and Cesare Barbieri from Padova University, Italy, has taken intricate steps to fire photons directly at the Japanese Ajisai Satellite. The researchers have been able to prove that the photons received back at the Matera ground-based station, in southern Italy, are the same as those originally emitted.

This news will be welcomed by communication companies, banks, and MI5-types worldwide as it paves the way for quantum-encrypted communication - the only form of communication that could ensure beyond any doubt that there are no eavesdroppers.

Until now, quantum-encrypted communication has only been proven possible at distances up to about 150 kilometres, either down optical fibres or via telescopes. When sent down optical fibres, photons are dissipated due to scattering and adsorption and, when using telescopes, photons are subject to interfering atmospheric conditions.

Anton Zeilinger, 2008 winner of the Institute of Physics' premier award, the Newton Medal, was involved in the research. The team now believes that Space-to-Earth quantum communication is possible with available technology.

The scientists write, "We have achieved significant experimental results towards the realization of a quantum communication channel, as well as how to actually adapt an existing laser ranging facility for quantum communication."

The team will now be furthering the research by making it possible to emit and receive quantum keys, uncrackable strings of 1s and 0s that enable quantum communication from an active sender in space. Very recently, the Italian Space Agency has funded the initial phase of this project.

The published version of the paper "Experimental verification of the feasibility of a quantum channel between Space and Earth" (2008 *New J. Phys.* 10 033038) will be available online from Friday 28 March at stacks.iop.org/NJP/10/033038 .

Source: Institute of Physics