Quantum Repeaters

Hugues de Riedmatten coauthors a review paper on quantum repeaters in Reviews of Modern Physics.

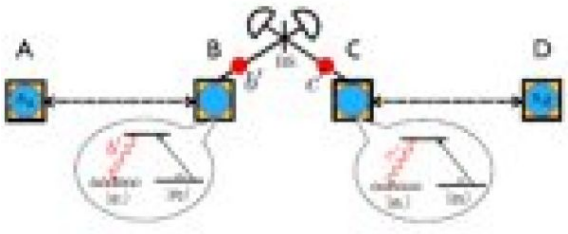
April 11, 2011

The authors, from the universities of Geneva, Paris 7, Calgary, and ICFO review the theoretical and experimental progress towards the experimental realization of a quantum repeater that would allow the distribution of quantum entanglement and quantum cryptography over continental scale.

Quantum repeater protocols are needed to solve the problem of photon loss in the distribution of quantum states over long distances in optical fibers, since in quantum communication straight forward amplification is not an option due to the no-cloning theorem. The practical realization of quantum repeaters is very challenging and requires the ability to temporarily store the quantum information carried by photons in quantum memories. In the review, the authors focus on an promising strategy which uses atomic

ensembles as quantum memory, together with linear optics, and photon counting. This approach was proposed in 2001 by Lu-Ming Duan, Mikhail Lukin, Peter Zoller and Ignacio Cirac, and has generated an intense research effort worldwide, both at the theoretical and experimental level.

The paper **"Quantum repeaters based on atomic ensembles and linear optics"** has been published in *RMP* by Dr Nicolas Sangouard, Group of Applied Physics of the University of Geneva (Switzerland) and University Paris 7; Prof. Christoph Simon, U. Geneva and University of Calgary (Canada); Prof. Nicolas Gisin, U. Geneva; and ICREA Prof. Hugues de Riedmatten, leader at ICFO of the group of quantum photonics with solids and atoms.



Linear optics protocol for a quantum repeater