Contribution ID: **761** Type: **Oral (Student, In Competition) / Orale (Étudiant(e), inscrit à la compétition)**

Towards quantum repeaters using frequency multiplexed entanglement

Tuesday 16 June 2015 09:45 (15 minutes)

Quantum communication is based on the possibility of transferring quantum states, generally encoded into so-called qubits, over long distances. Typically, qubits are realized using polarization or temporal modes of photons, which are sent through optical fibers. However, photons are subject to loss as they travel through optical fibers or free space, which sets a distance barrier of around 100 kilometers. In classical communications, this problem can be straightforwardly solved by amplification, but this is not an option in quantum mechanics because of the non-cloning theorem. Fortunately, photon loss can be overcome by implementing quantum repeaters [1], which create long-distance entanglement via entanglement swapping from shorter-distance entanglement links. Such protocols require the capacity to create entanglement in a heralded fashion, to store it in quantum memories, retrieve it after feed-forward information, and to swap it.

A variety of architectures and protocols have been proposed for implementing quantum repeaters [2]. Ideally, a quantum repeater protocol should minimize the physical resources required to establish entanglement between two points. Our team is working on a specific quantum repeater scheme that explores frequency multiplexing. This will allow us to increase the probability of generating short-distance entanglement, with a success rate close to 100%, while taking maximum benefit of the quantum memories developed by other members of our group [3]. The proposed scheme requires quantum memories and entangled photons pair sources capable to work in the frequency multiplexing domain. This presentation will focus on the description of the general scheme and on the multiplexed entangled photon pair sources that we are developing.

Authors: Mr GRIMAU, Marcel-lí (University of Calgary); Mr LEFEBVRE, Pascal (University of Calgary); Prof. TITTEL, Wolfgang (University of Calgary)

Presenter: Mr LEFEBVRE, Pascal (University of Calgary)

Session Classification: T1-10 THz science and applications (DAMOPC) / Sciences et applications des THz (DPAMPC)

Track Classification: Division of Atomic, Molecular and Optical Physics, Canada / Division de la physique atomique, moléculaire et photonique, Canada (DAMOPC-DPAMPC)