Contribution ID: **788** Type: **Oral (Student, In Competition) / Orale (Étudiant(e), inscrit à la compétition)**

Towards a Quantum Non-Demolition Measurement for Photonic Qubits

Tuesday 16 June 2015 16:30 (15 minutes)

Many applications of quantum information processing benefit from, or even require, the possibility to detect the number of photons in a given signal pulse without destroying the photons nor the encoded quantum state. We propose and show first steps towards the implementation of such a Quantum Non-Demolition (QND) measurement for time-bin qubits. To implement this measurement, we first store a 'probe'pulse in a cryogenically cooled Tm:LiNbO3 waveguide using an Atomic Frequency Comb (AFC) quantum memory protocol [1]. We then send a 'signal'pulse comprised of two temporal modes off-resonantly with the AFC through a previously prepared transparency window. The off-resonant interaction between the propagating signal and the thulium ions, onto which the probe pulse was mapped, results in the atomic state acquiring a phase-shift. This phase shift is imprinted onto the recalled probe pulse and can be determined using an interferometric measurement. The magnitude of this phase-shift depends on the signal pulse's energy, and detuning w.r.t to the probe pulse. Hence, knowing the phase-shift, we can determine the intensity or the number of photons in the signal pulse.

[1] E. Saglamyurek et al, ⋯Nature 2011

Author: DESHMUKH, Chetan (University of Calgary)

Co-authors: Prof. SIMON, Christoph (Collaborating professor); Dr OBLAK, Daniel (Post-Doc); Dr HESHAMI, Khabat (Post-doc); Mr SINCLAIR, Neil (PhD student); Prof. TITTEL, Wolfgang (Advising professor)

Presenter: DESHMUKH, Chetan (University of Calgary)

Session Classification: T3-2 Quantum Computation and Communication (DTP-DCMMP-DAMOPC) / Communication et calcul quantique (DPT-DPMCM-DPAMPC)

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