Contribution ID: **410** Type: **Poster (Student, Not in Competition) / Affiche (Étudiant(e), pas dans la compétition)**

Adaptive Optics for Quantum Key Distribution between a Ground Station and a Satellite

Wednesday 18 June 2014 19:22 (2 minutes)

Global-scale distances for Quantum Key Distribution (QKD) can be achieved by utilizing an orbiting satellite acting as an intermediate node between two or more ground stations. With QKD states encoded in photon polarization, the total number of photons collected (or equivalently, the total received optical power) is the limiting factor to the secure key generation rate. In this study we analyze the scenario of an optical uplink, ground to satellite, and how atmospheric turbulence affects the signal strength. Atmospheric turbulence mixes air of different temperatures and, hence, possessing different refractive indices along the beam path, inducing phase errors in the propagating beam. These phase errors have negligible impact on the beam in the near field, but their evolution creates temporal intensity fluctuations (scintillation), beam wander, and beam broadening along the path to the satellite. Here we investigate the use of adaptive optics to mitigate the effects of the atmosphere on the collected power of an uplink to a satellite-based receiver for QKD. We model four representative scenarios of atmospheric conditions which relate to ground station locations, and determine the impact of using an adaptive optics system to improve optical signal collection by a satellite receiver of various sizes.

Authors: PUGH, Christopher (Institute for Quantum Computing); LAVIGNE, Jean-Francois (Institut national d'optique)

Co-authors: Dr HIGGINS, Brendon (Institute for Quantum Computing); BOURGOIN, Jean-Philippe (Institute for Quantum Computing); Dr JENNEWEIN, Thomas (Institute for Quantum Computing)

Presenter: PUGH, Christopher (Institute for Quantum Computing)

Session Classification: DAMOPC Poster Session with beer (6) / Session d'affiches DPAMPC, avec bière (6)

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