Canadian Association of Physicists | Association canadienne des physiciens et physiciennes

Contribution ID: **1575** Type: **not specified**

Airborne Demonstration of a Quantum Key Distribution Receiver Payload

Wednesday 31 May 2017 14:30 (15 minutes)

Demonstrations of quantum key distribution (QKD) with moving platforms are important to prove the viability of future satellite implementations. Thus far, however, demonstrations of QKD to aircraft have operated exclusively in the downlink configuration where the quantum source and transmitter are placed on the airborne platform. While this approach ultimately has the potential for higher key rate, it is more complex and is not as flexible as an uplink configuration, which places the quantum receiver on the airborne platform while keeping the quantum source at the ground station. Here we present the first successful demonstration of QKD to a receiver on a moving aircraft.

The apparatuses for our demonstration consist of a QKD source and transmitter located at a ground station at Smiths Falls-Montague Airport, and a QKD receiver located on a Twin Otter research aircraft from the National Research Council of Canada. Optical links were established using strong beacon lasers (at a wavelength different from the quantum signal), an imaging camera, and tracking feedback to 2-axis motors at each of the two sites. Once at the aircraft, the QKD signals were recorded for later processing to complete the QKD protocol and extract secure key.

The airplane flew two path types: circular arcs around the ground station, and lines past the ground station. The distances for each type of pass varied from 3-10 km. The flight paths were prepared in advance of the flight and integrated with the flight software.

In total, we had successful quantum links in seven of 14 passes of the airplane over the ground station, generating asymptotic key in one pass and finite-size secure key in 5 passes, with one showing over 800 kb. The circular passes allowed the demonstration of longer link times, whereas the line passes were more representative of a satellite pass over a ground station. Angular speeds (at the transmitter) between 0.4 degree/s and 1.28 degree/s were achieved.

Authors: Mr PUGH, Christopher (University of Waterloo/Institute for Quantum Computing); Dr KAISER, Sarah; Dr HIGGINS, Brendon; Dr BOURGOIN, Jean-Philippe; Dr JIN, Jeongwan; Mr CHOI, Eric; Dr JENNEWEIN, Thomas (Institute for Quantum Computing)

Co-authors: Mr AGNE, Sascha; Mrs ANISIMOVA, Elena; Dr MAKAROV, Vadim; Mrs SULTANA, Nigar

Presenter: Mr PUGH, Christopher (University of Waterloo/Institute for Quantum Computing)

Session Classification: W3-2 Quantum Computing and Communication (DAMOPC/DTP/DCMMP) | Calcul quantique et communications (DPAMPC/DPT/DPMCM)

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