Contribution ID: **1119** Type: **Oral (Student, In Competition) / Orale (Étudiant(e), inscrit à la compétition)**

Photon pair generation in fiber microcouplers for quantum information

Wednesday 15 June 2016 09:15 (15 minutes)

Due to its inherent stability and compactness, integrated photonics can allow for experimental complexity not currently achievable with bulk optics. This opens up the possibility for large-scale quantum technological applications, such as quantum communication networks and quantum information processing. Most demonstrations so far have featured the on-chip manipulation of photon states using a free-space bulk-optic source of photons [1, 2]. This has the drawback that it introduces loss due to mismatch between the diverse spatial modes of the produced photons and the chip's waveguide modes. In this way loss limits the number of photons that are simultaneously in the integrated optical device, and thus limits the number of qubits. One way to avoid this loss is to generate the photons in another waveguide device. This can be done through, for example, spontaneous four-wave mixing (SFWM) [3].

In this work, we experimentally and theoretically investigate the SFWM generation of photons in a waveguide coupler comprised of two touching tapered optical fibres, which we call a microcoupler. The two silica tapered fibers are 1 micron in diameter and 10 cm long. The device has three advantages over a standard telecom 2x2 fiber coupler. 1. The small mode area enhances the photon generation rates. 2. Since the coupler exhibits both birefringence and has two output fibres, in principle the device should be able to produce polarization-entangled photon pairs. 3. The strong waveguide-waveguide coupling and waveguide dispersion (due to the tapering) forces the photons to be far in wavelength from the background light around the pump. We present experimental characterizations of the produced photons.

References:

[1]. Matthews, J. C. F. et al. Nat. Photon. 3, 346–350 (2009).

[2]. Silverstone, J. et al. Nat. Photon. 8, 104–108 (2014).

[3]. Smith, B. et al. Opt. Express 17, 23589-23602 (2009).

Primary author: CHENG, Xinru (University of Ottawa)

Co-authors: SUSSMAN, Benjamin J. (National Research Council of Canada); BAKER, Chams (University of Ottawa); ENGLAND, Duncan G. (National Research Council of Canada); LUNDEEN, Jeff S. (University of Ottawa); GINER, Lambert (University of Ottawa); BUSTARD, Philip J. (National Research Council of Canada); BAO, Xiaoyi (University of Ottawa)

Presenter: CHENG, Xinru (University of Ottawa)

Session Classification: W1-9 Nonlinear Optics and High Field Physics (DAMOPC) / Optique non linéaire et physique en champs intenses (DPAMPC)

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