

PHOTONICS - EUROPHOTONICS MASTER COURSE

PROPOSAL FOR A MASTER THESIS

Course 2015 –2016

Laboratory/Institution: ICFO-Institut of Photonic Sciences

City, Country: Castelldefels, Barcelona, Spain

Title of the master thesis: Frequency up-conversion of single photons at 810 nm to 532 nm

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Summary of the subject (maximum 1 page):

The goal of this project is to design experimentally a module to up-convert photons at 810 nm to 532 nm (with the help of a coherent beam at 1550 nm) by means of the nonlinear process of sum frequency generation in a LiNbO₃ crystal. This experiment is part of a project aimed to implement experimentally a protocol of spatial teleportation.

References

- [1] Marius A. Albota and Franco N. C. Wong, *Efficient single-photon counting at 1.55 μ m by means of frequency upconversion*, Opt. Lett. **29**, 1449 (2004).
- [2] Carsten Langrock, Eleni Diamanti, Rostislav V. Roussev, Yoshihisa Yamamoto, M. M. Fejer, and Hiroki Takesue, *Highly efficient single-photon detection at communication wavelengths by use of upconversion in reverse-proton-exchanged periodically poled LiNbO₃ waveguides*, Opt. Lett. **30**, 1725 (2005).
- [3] Aaron P. VanDevender and Paul G. Kwiat, *Quantum transduction via frequency up-conversion*, J. Opt. Soc. Am B **24**, 295 (2007).
- [4] Hiroki Takesue, *Erasing Distinguishability Using Quantum Frequency Up-Conversion*, Phys. Rev. Lett. **101**, 173901 (2008).
- [5] S. Ramelow, A. Fedrizzi, A. Poppe, N. K. Langford, and A. Zeilinger, *Polarization-entanglement-conserving frequency conversion of photons*, Phys. Rev. A **85**, 013845 (2012)

Keywords: Single photons, sum-frequency generation

Additional information:

* Amount of the monthly allowance (if it is the case):

* **Required skills:** Experimental skills, interest in seeing quantum effects and calculations in the lab, entanglement

* **Miscellaneous:** This is an experimental project.