



Physical Sciences Seminar

Single sideband microwave to optical photon conversion an electro-optic realization

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Superconducting microwave qubits are a likely driving force of future quantum information technologies and have boosted the interest in converting quantum states from the microwave to the optical domain. The reason lies in the fact that microwave photons decohere quickly at room temperature but optical photons with their much higher energy do not. Furthermore, the optical domain offers a readily available fibre network allowing for long distance communication. Moreover, the optical domain offers access to a large set of very well developed quantum optical tools, such as highly efficient single-photon detectors and long-lived quantum memories. In my presentation I show that single sideband operation is possible by harvesting strong polarization coupling, without the need for detuning of pump modes.¹ The photon conversion efficiency we reach is three orders of magnitude higher than in previous works.^{2,3} Furthermore, our system has a bandwidth of several MHz and is compatible with circuit QED. Within in the talk I will introduce the concept of high-Q whispering gallery mode resonators (WGM) and present some of their features that make them ideal for nonlinear optics and quantum optics. 1. A. Rueda et al., Efficient microwave to optical photon conversion: an electro-optical realization, *Optica*, OPTICA 3(6), 597 604 (2016) [doi:10.1364/OPTICA.3.000597]. 2. V. S. Ilchenko et al., Whispering-gallery-mode electro-optic modulator and photonic microwave receiver, *J. Opt. Soc. Am. B* 20(2), 333 342 (2003) [doi:10.1364/JOSAB.20.000333]. 3. D. V. Strekalov et al., Microwave whispering-gallery resonator for efficient optical up-conversion, *Phys. Rev. A* 80(3), 033810 033815 (2009) [doi:10.1103/PhysRevA.80.033810].

Wednesday, August 30, 2017 12:30pm - 01:45pm

Big Seminar room Ground floor / Office Bldg West (I21.EG.101)



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