Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Tuning from coherent interaction to super- and subradiance with artificial atoms in a 1D waveguide KEVIN LALUMIÈRE, ALEXANDRE BLAIS, Université de Sherbrooke, BARRY C. SANDERS, University of Calgary, ARJAN F. VAN LOO, ARKADY FEDOROV, ANDREAS WALLRAFF, ETH Zurich — Taking advantage of the near ideal spatial mode-matching, strong interaction between light and artificial atoms fabricated in a 1D waveguide has been demonstrated experimentally [1]. Here, we study the situation where multiple and possibly un-identical atoms are fabricated in the same waveguide. We find that atom relaxation and Lamb-shift are modified, leading to collective effects. Depending on the distance between the artificial atoms, or equivalently the phase shift accumulated by light traveling from one atom to another, we find that it is possible to tune between a strong modification of individual atomic relaxation with the formation of sub- and superradiant states, and a strong modification of the Lamb-shift leading to a coherent exchange-type interaction between the atoms. These predictions are based on a master equation derived for an inhomogeneous set of atoms coupled to a transmission line. Comparison with experimental results will be discussed.

[1] O. Astafiev et al., Science 327, 840 (2010)

Kevin Lalumière
Université de Sherbrooke

Date submitted: 14 Dec 2012 Electronic form version 1.4