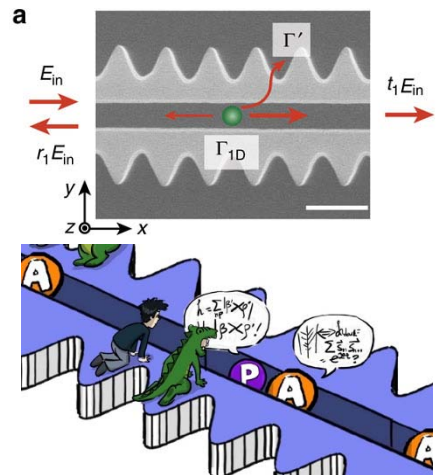




Seminar by Jonathan Hood Jeff Kimble Group, Caltech, CA

Strong atom-light interactions in 1D photonic crystals

We investigate opportunities that emerge from the integration of cold atoms with nanoscopic photonic crystal waveguides (PCWs). PCWs enable the light-matter interaction to be engineered for both trapping and strong atom-photon coupling [1,2], thereby opening new avenues for novel quantum transport and quantum many-body phenomena [3,4]. We have succeeded in trapping Cesium atoms approximately 110nm above the surface of the 1D PCWs [5]. Trapped atoms are probed by light in a guided mode of the device. By way of both steady-state transmission spectra and transient decay after short-pulse excitation, we infer that the peak decay rate for one trapped atom is $\Gamma_{1D}/\Gamma^* = 1.0 \pm 0.1$, where Γ_{1D} (Γ^*) is the atomic spontaneous emission rate into the guided (all other) mode (s). We discuss progress towards measuring coherent atom-atom interactions within the band-gap of the photonic crystal.



[1] C.-L. Hung, S.M. Meenehan, D. E. Chang, O. Painter, and H. J. Kimble, *New J. Phys.* 15, 083026 (2013).

[2] S.-P. Yu, J. Hood, J. Muniz, M. Martin, R. Norte, C.-L. Hung, S. M. Meenehan, J. D. Cohen, O. Painter, and H. J. Kimble, *Appl. Phys. Lett.* 104, 111103 (2014).

[3] D. Chang, L. Jiang, A. Gorshkov, and H. J. Kimble, *New J. Phys.* 14, 063003 (2012).

[4] J. S. Douglas, H. Habibian, C.-L. Hung, A.V. Gorshkov, H. J. Kimble, and D. E. Chang, *Nature Phot.* 9, 326-331 (2015)

[5] A. Goban, C.-L. Hung, J. D. Hood, S.-P. Yu, J. A. Muniz, O. Painter, H. J. Kimble, *Phys. Rev. Lett.* 115, 063601 (2015)

Speaker Bio



Jonathan Hood joined Jeff Kimble's Quantum Optics group at Caltech in 2010. He spent two years working on an optomechanics experiment which optically levitated and cooled a nano-disk. In 2012, he helped start a new experiment that studies strong atom-light interactions in nano-photonic devices. He has been involved with the fabrication and simulation of the nano-devices, as well as the atomic physics measurements. Jonathan did his undergraduate at the University of Maryland, where he worked with Dr. Luis Orozco on an experiment measuring parity violation in Francium atoms.

October 22nd, Thursday

2:00-3:00pm

BRK 2001



Contact us: spie.purdue@gmail.com osa.purdue@gmail.com

Find us on Facebook (<http://on.fb.me/1P5Mu88>)

