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Coherent optical wavelength conversion via cavity-optomechanics
JEFF HILL, AMIR SAFAVI-NAEINI, JASPER CHAN, OSKAR PAINTER, California Institute of Technology — In this talk we theoretically propose and experimentally demonstrate coherent wavelength conversion of optical photons using photon-phonon translation in a cavity-optomechanical system. Our system is an engineered silicon optomechanical crystal nanocavity supporting a 4 GHz localized phonon mode, optical signals in a 1.5 MHz bandwidth are coherently converted over a 11.2 THz frequency span between one cavity mode at wavelength 1460 nm and a second cavity mode at 1545 nm with a 93% internal (2% external) peak efficiency. The thermal and quantum limiting noise involved in the conversion process is also analyzed, and in terms of an equivalent photon number signal level are found to correspond to an internal noise level of only 6 and 4×10^{-3} quanta, respectively [1].

[1] J. T. Hill, A. H. Safavi-Naeini, J. Chan, O. Painter, arXiv:1206.0704 (2012).

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