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Phonon Mediated Off-resonant Quantum Dot-Cavity Interaction ARKA MAJUMDAR, ERIK KIM, MICHAL BAJCSY, ARMAND RUNDQUIST, JELENA VUCKOVIC, E. L. Ginzton Lab, Stanford, CA-94305 — Optically controlled quantum dot (QD) spins coupled to semiconductor microcavities constitute a promising platform for robust and scalable quantum information processing devices. In recent experiments on coupled QD optical cavity systems a pronounced interaction between the dot and the cavity has been observed even for detunings of many cavity linewidths. This interaction has been attributed to an incoherent cavity enhanced phonon-mediated scattering process and is absent in atomic systems. We demonstrate that despite its incoherent nature, this process preserves the signatures of coherent interaction between a QD and a strong driving laser, which may be observed via the optical emission from the off-resonant cavity. Under bichromatic driving of the QD, the cavity emission exhibits spectral features consistent with optical dressing of the QD transition, namely Rabi side-bands. These cavity emission measurements are more akin to absorption measurements of a strongly driven QD rather than resonance fluorescence measurements. In addition to revealing new aspects of the off-resonant QD-cavity interaction, this result provides a new, simpler means of coherently probing QDs and opens the possibility of employing off-resonant cavities to optically interface QD-nodes in quantum networks.

[X] Prefer Oral Session
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