DAMOP15-2015-000677

Abstract for an Invited Paper
for the DAMOP15 Meeting of
the American Physical Society

Phonon Assisted Gain in a Semiconductor Double Quantum Dot Maser

MICHAEL GULLANS, NIST - Natl Inst of Stds & Tech

Lasers provide fundamental insights into the interaction between light and matter. Those operating in the few-emitter limit probe this interaction at the level where quantum effects are crucial for understanding the device operation. We develop a microscopic model for the recently demonstrated double quantum dot (DQD) maser. In characterizing the gain of this device we find that, in addition to the direct stimulated emission of photons, there is a large contribution from transitions that involve the simultaneous emission of a photon and a phonon. These theoretical results are compared to experiment and good agreement is found. Due to the sharp threshold behavior of the lasing transition, this work indicates that the maser can serve as an extremely sensitive probe of the mesoscopic environment of the DQD and provides insight into the prospects for long-distance entanglement between two cavity coupled DQDs.