MAR15-2014-001311

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Semiconductor double quantum dot micromaser[1]

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The coherent generation of light, from masers to lasers, relies upon the specific structure of the individual emitters that lead to gain. Circuit quantum electrodynamics (cQED) allows strong coupling between microwave photons and a solid-state quantum device. Photon emission has recently been observed from a cavity coupled double quantum dot.[2] Here we demonstrate a two atom maser that is created by coupling two double quantum dots (DQDs) to a microwave cavity. Charge transport through the DQDs results in a gain as large as 1000 in the cavity transmission. With no cavity drive, the free emission spectrum has a linewidth of 34 kHz, which corresponds to a coherence length of 3 km. We verify maser action by comparing the statistics of the emitted microwave field above and below the maser threshold.

[1]Research was performed in collaboration with Jiri Stehlik, Christopher Eichler, Michael Gullans, Jake Taylor and Jason Petta. We acknowledge support from the Sloan and Packard Foundations, ARO, DARPA, and the NSF.

[2]Y. Y. Liu, K. D. Petersson, J. Stehlik, J. M. Taylor, and J. R. Petta, Phys. Rev. Lett. **113**, 036801 (2014).