Abstract Submitted
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Injection locking of a semiconductor double-quantum-dot micromaser[1] Y.-Y. LIU, J. STEHLIK, Department of Physics, Princeton University, M. J. GULLANS, J. M. TAYLOR, Joint Quantum Institute/NIST, J. R. PETTA, Department of Physics, Princeton University — Narrow linewidth lasers and masers are desirable for applications such as frequency standards and low-noise amplifiers. Recently we have demonstrated a double-quantum-dot (DQD) micromaser, which generates photons through single electron tunneling events.[2] Charge noise couples to the DQD energy levels and results in a maser linewidth that is 100 times larger than the Schawlow-Townes prediction. We demonstrate linewidth narrowing by more than a factor of 10 using injection locking. The injection locking range is measured as a function of input power and shown to be in excellent agreement with the Adler equation. The position and amplitude of distortion sidebands that appear outside of the injection locking range are quantitatively examined. Our results show that this unconventional maser, which is impacted by strong charge noise and electron-phonon coupling, is well described by standard laser models.[3]

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[2]Y.-Y. Liu, J. Stehlik, C. Eichler, M. J. Gullans, J. M. Taylor, and J. R. Petta, Science **347**, 285 (2015).
[3]Y.-Y. Liu, J. Stehlik, M. J. Gullans, J. M. Taylor, and J. R. Petta, Phys. Rev. A (in press).

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