Abstract Submitted for the MAR14 Meeting of The American Physical Society

**Proposal for a phonon laser utilizing quantum-dot spin states**<sup>1</sup> ALEXANDER KHAETSKII, University at Buffalo, SUNY, VITALY GOLOVACH, CFM-MPC, Centro Mixto CSIC-UPV/EHU, San Sebastián, Spain, XUEDONG HU, IGOR ZUTIC, University at Buffalo, SUNY — We propose [1] a nano-scale realization of a phonon laser utilizing phonon-assisted spin flips in quantum dots to amplify sound. Owing to a long spin relaxation time, the device can be operated in a strong pumping regime, in which the population inversion is close to its maximal value allowed under Fermi statistics. In this regime, the threshold for stimulated emission is unaffected by spontaneous spin flips. Considering a nanowire with quantum dots defined along its length, we show that a further improvement arises from confining the phonons to one dimension, and thus reducing the number of phonon modes available for spontaneous emission. Our work calls for the development of nanowire-based, high-finesse phonon resonators. [1]. A. Khaetskii, V.N. Golovach, X. Hu, and I. Zutic, PRL **111**, 186601 (2013).

<sup>1</sup>Supported by the SPINMET Project (FP7-PEOPLE-2009-IRSES), by the ONR, DOE-BES DE-SC0004890, NSF-ECCS, US ARO, NSF-PIF, and by the Project FIS2011-28851-C02-02

Alexander Khaetskii University at Buffalo, SUNY

Date submitted: 15 Nov 2013

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