Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Quantum scars in quantum dots ESA RASANEN, JOONAS KESKI-RAHKONEN, Tampere University of Technology, PERTTU LUUKKO, MPIPKS Dresden, LEV KAPLAN, Tulane University, ERIC HELLER, Harvard University — A quantum scar [1] corresponds to enhanced density along an unstable classical periodic orbit. Recently, it was shown that two-dimensional (2D) separable quantum systems perturbed by randomly distributed bumps show a new type of scarring, which is unexpectedly strong and robust [2]. These scars follow the classical orbits of the corresponding unperturbed system (without bumps). In this work we show that 2D harmonic oscillators – common models for semiconductor quantum dots – exhibit strong quantum scarring under a perpendicular magnetic field and perturbation in the potential. Moreover, both the geometry of the scar (line, triangular, square, etc.) and its orientation can be controlled even by a single bump in the potential. Thus, the scheme allows us to use local voltage gates to control quantum conductance along strongly scarred states in semiconductor quantum dots. [1] E. J. Heller, Phys. Rev. Lett. 53, 1515 (1984); [2] P. J. J. Luukko, A. Klales, B. Drury, L. Kaplan, E. J. Heller, and E. Rasanen, Sci. Rep. (in print, 2016).

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Date submitted: 11 Nov 2016 Electronic form version 1.4