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**Investigation of the Phonon Frequency Shifts in ZnO  
Quantum Dots** KHAN A. ALIM, VLADIMIR

A. FONOVEROV, ALEXANDER A. BALANDIN, Nano-Device Laboratory (<http://ndl.ee.ucr.edu/>), Department of Electrical Engineering, University of California, Riverside, CA 92521 — Nanostructures made of ZnO have recently attracted attention due to their proposed applications in low-voltage and short-wavelength electro-optical devices. However, the origin of the observed phonon frequency shifts in such nanostructures is not always understood. We carried out both resonant and non-resonant Raman measurements for 20 nm-diameter ZnO quantum dots (QDs) and bulk ZnO reference samples [1]. A comparison with a recently developed theory [2], allowed us to clarify the origin of the phonon frequency shifts in ZnO QDs. It was found that the phonon confinement results in phonon frequency shifts of only few  $\text{cm}^{-1}$ . At the same time, the UV laser heating of the QD ensemble was found to induce a large red shift of phonon frequencies for up to  $14 \text{ cm}^{-1}$ . The authors acknowledge the support of MARCO and its Functional Engineered Nano Architectonics (FENA) Focus Center. [1] K.A. Alim, V.A. Fonoberov, and A.A. Balandin, *Appl. Phys. Lett.*, in review (2004). [2] V.A. Fonoberov and A.A. Balandin, *Phys. Stat. Solidi C* **1**, 2650 (2004); cond-mat/0405681; cond-mat/0411742.

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