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Using InAs Quantum Dots for Quantum Sensing of Mechanical Motion[1] JOSHUA CASARA, University of California Merced, SAMUEL CARTER, ALLAN BRACKER, Naval Research Laboratory, MIJIN KIM, Sotera Defense Solutions, Inc., CHUL SOO KIM, MAXIM ZALALUTDINOV, BRENNAN PURSLEY, Naval Research Laboratory, SOPHIA ECONOMOU, Virginia Tech, CYPRIAN CZARNOCKI, University of California Merced, DAN GAMMON, Naval Research Laboratory, MICHAEL SCHEIBNER, University of California Merced — Quantum sensing has proven to be one of the most precise tools ever devised. Consequently, the ability to couple quantum systems to mechanical motion is a promising avenue of research. We study a system consisting of an InAs quantum dot embedded in a mechanical resonator to better understand the effects of mechanical motion on a nanoscale system. Mechanical oscillations of the resonator induce large shifts in the optical transition energies, and influence the spin states of the quantum dot charge carriers. The ability to couple such spin states to mechanical motion is therefore favorable to high-precision sensing, and an interesting demonstration of interaction between the quantum and classical regimes.

[1]Defense Threat Reduction Agency

Joshua Casara
University of California Merced

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