Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Tuning the linewidth of spin-flip Raman emission from a quantum dot molecule BRENNAN C. PURSLEY, NRC Associate residing at the Naval Research Laboratory, S. G. CARTER, Naval Research Laboratory, M. KIM, Sotera Defense Solutions, Inc., , C. S. KIM, Naval Research Laboratory, S. E. ECONOMOU, Virginia Tech, M. YAKES, A. S. BRACKER, D. GAMMON, Naval Research Laboratory — Single quantum dots have many promising attributes for quantum information due to their bright emission, indistinguishable single photons, and robust solid state engineering. Quantum dot molecules, comprised of two quantum dots with tunnel coupled carriers, should retain the benefits of single quantum dots while offering an array of novel physics. When each dot is charged with a single electron, the coupled spin ground states form a singlet and three degenerate triplets. The singlet and spin-0 triplet share an excited state which forms a lambda system allowing for spin-flip Raman emission—a source of tunable and potentially indistinguishable photons. Here we perform high resolution spectroscopy of the Raman emission and determine the processes that control the linewidth. By analyzing the effects of cotunneling to the electron reservoir and line wandering as a function of bias, we extract their relative importance to the lineshape. We have also demonstrated that using a pulsed laser can increase the linewidth of Raman emission to match that of the pulse, which has the potential to control the bandwidth of emitted photons and overcome detrimental line-broadening effects.

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Date submitted: 13 Nov 2016 Electronic form version 1.4