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Spectroscopy of Charged Quantum Dot Molecules E.A. STINAFF, M. SCHEIBNER, A.S. BRACKER, I.V. PONOMAREV, M.E. WARE, M.F. DOTY, T.L. REINECKE, D. GAMMON, Naval Research Laboratory, V.L. KORENEV, A.F. Ioffe Physical Technical Institute — Spins of single charges in quantum dots are attractive for many quantum information and spintronic proposals. Scalable quantum information applications require the ability to entangle and operate on multiple spins in coupled quantum dots (CQDs). To further the understanding of these systems, we present detailed spectroscopic studies of InAs CQDs with control of the discrete electron or hole charging of the system. The optical spectrum reveals a pattern of energy anticrossings and crossings in the photoluminescence as a function of applied electric field. These features can be understood as a superposition of charge and spin configurations of the two dots and represent clear signatures of quantum mechanical coupling. The molecular resonance leading to these anticrossings is achieved at different electric fields for the optically excited (trion) states and the ground (hole) states allowing for the possibility of using the excited states for optically induced coupling of the qubits.

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