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Level Anti-Crossing Spectroscopy - Optically Mapping the Electronic Structure of Coupled Quantum Dots[1] M. SCHEIBNER, M. YAKES, A.S. BRACKER, I.V. PONOMAREV, M.F. DOTY[2], C.S. HELLBERG, L.J. WHITMAN, T.L. REINECKE, D. GAMMON, Naval Research Laboratory — We introduce an all optical level anti-crossing spectroscopy (LACS) with which the ground *and* the excited state energy levels of quantum dots (QDs) can be measured for a hole(electron) by itself and in the presence of other charges.[1] Analogies are drawn to the atomic shell-model and connections are made in an average way to structural STM measurements. An applied bias provides an electric field between two InAs/GaAs QDs which "tilts" the energy levels of both QDs relative to each other. Molecular resonances between energy levels of the two QDs are measured purely optical as sequences of anti-crossing patterns in the electric field dependent PL spectrum. These sequences provide in situ characterization of the level structure. We anticipate that such measurements will precede more sophisticated quantum control demonstrations, allow precise reverse engineering and boost detailed theoretical modeling of QD structures. This work is supported by NSA/ARO.

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