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Polarization-dependent interference between dipole moments of a resonantly excited quantum dot[1] DISHENG CHEN, GARY LANDER, West Virginia University, GLENN SOLOMON, Joint Quantum Institute, National Institute of Standards and Technology, EDWARD FLAGG, West Virginia University
— An unconventional line-shape that depends on the detection polarization is observed in the resonant photoluminescence excitation (RPLE) spectrum of a neutral InGaAs quantum dot. We investigate this phenomenon by performing polarization-dependent RPLE measurements and simulating the measured spectra with a 3-level quantum model. This analysis enables us to extract the coherence between the two exciton states from the measured spectra. The good agreement between the data and model indicates that interference between the fine structure split exciton states is the key to understanding this phenomenon. There are only two necessary conditions to observe this interference: non-degenerate states, with orthogonal dipole moments. Since these conditions are relatively unrestrictive, such a situation may occur in many solid state systems, for example, quantum dots, NV centers in diamond, and possibly defect-bound states in 2-D materials.

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