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Polarization-dependent interference of coherent scattering from orthogonal dipole moments of a resonantly excited quantum dot[1]
DISHENG CHEN, GARY LANDER, West Virginia University, GLENN SOLOMON, NIST University of Maryland, 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. Our analysis indicates that interference between coherent scattering from the two fine structure split exciton states is the key to understanding this phenomenon. The RPLE spectra taken at multiple polarizations enable us to extract the steady-state coherence between the two exciton states. There are only two relatively unrestrictive conditions on observing this phenomenon: non-degenerate states with orthogonal dipole moments. Such requirements are naturally met 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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