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Radiative Cascades in Charged and Neutral Semiconductor Quantum Dots

DAVID GERSHONI, Physics Dept. Technion, 32000, Haifa, Israel

We measured, for the first time, two photon radiative cascades due to sequential recombination of quantum dot confined electron hole pairs in the presence of an additional spectator charge carrier. We identified direct, all optical cascades involving spin blockaded intermediate states, and indirect cascades, in which non radiative relaxation precedes the second radiative recombination. I will discuss the potential of semiconductor quantum dots as reliable sources for polarization entangled photon pairs and the possibility to use them for entangling information carrying flying qubits (photons) with anchored matter qubits (charge carriers' spins).