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Charging Dynamics of Single InGaAs Quantum Dots under Resonant Excitation SAMANTHA ISAAC, GARY LANDER, DISHENG CHEN, SAMET DEMIRCAN, West Virginia University, GLENN SOLOMON, University of Maryland and National Institute of Standards and Technology, EDWARD FLAGG, West Virginia University — Quantum dots (QDs) have potential to generate single indistinguishable photons, thus are prime candidates to be sources of photonic quantum bits, or qubits, necessary for quantum computation protocols. In theory, photon emission requires only resonant excitation. But resonant excitation can cause a QD to transition to a different charge state, eliminating the resonance fluorescence and reduces the QD's suitability to act as an efficient photon source. A counter to this effect is implementation of a low-power above-band laser that supplies the local environment with charge carriers. Ultimately, the carriers can relax into the quantum dot, returning it to the initial charge state. If QDs are to be used to generate photonic qubits, the charge relaxation processes must be characterized. To probe the charging dynamics, we modulate the above-band excitation while measuring the time-resolved resonance fluorescence. We phenomenologically fit the time-resolved fluorescence and extract the corresponding charging and neutralization rates as functions of both laser powers. The power dependence of the rates suggest there exists an external reservoir that supplies charge carriers to the QD, and that neutralization is dominated mostly by Auger processes.

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