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Internal and external polarization memory loss in single quantum dots Q.Q. WANG, A. MULLER, University of Texas at Austin, M.T. CHENG, H.J. ZHOU, Wuhan University, P.R. China, P. BIANUCCI, C.K. SHIH, The University of Texas at Austin — Exciton spin relaxation counts among the most basic features of quantum dot (QD) ground-state dynamics and is intimately connected to the ubiquitous fine-structure doublet anisotropy. Numerous resonant measurements on QD ensembles support a spin relaxation frozen on the exciton lifetime, in agreement with theoretical expectations. Recent investigations, however, question this breakdown based on strictly non-resonant experiments on single QDs, pointing to possible variations among QDs. By using non-linear resonant control of single QDs we examine spin relaxation under different environments and excitation conditions. Data from dots with different dipole moments reveals two distinctive channels for polarization memory loss: (i) an external pathway due to carrier escape and capture to and from the wetting layer that is responsible for memory loss increasing with intensity; and (ii) an internal loss channel, independent of external excitation, due to intrinsic spin relaxation. The values obtained for the latter rule out a universal freezing of exciton spin relaxation in self-assembled QDs.

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