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Time-resolved Spin Dynamics in Semiconductor Microdisk Lasers[1] SAYANTANI GHOSH, YONGQING LI, FLORIAN MEIER, ROBERTO MYERS, DAVID D. AWSCHALOM, Center for Spintronics and Quantum Computation, University of California, Santa Barbara, CA 93106, WEI-HUA WANG, NITIN SAMARTH, Department of Physics, Penn State University, University Park PA 16802 — Optical microcavities offer unique means of controlling the interaction of light and matter, which have led to the development of a wide range of applications in optical communications and have stimulated discussions of quantum computational schemes based on cavity QED. We present a study of the dynamics of optically injected spins in GaAs/AlGaAs multiple quantum well microdisk lasers, where emission intensity and line width measurements reveal very high quality factor modes, using a pump-probe, time-resolved Kerr rotation technique with picosecond resolution. We measure the spin decoherence as a function of the pump wavelength and input power and find that the spins in these structures couple selectively to the cavity modes at the resonant wavelengths. This is manifested by an enhancement of the spin decoherence time at the lasing threshold of the cavity modes followed by a sharp decrease at greater pump power, where the stimulated emission dominates the radiative decay.

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