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Inducing electron spin coherence in GaAs quantum well waveguides: Spin coherence without spin precession SUSANTA SARKAR, PHEDON PALINGINIS, HAILIN WANG, University of Oregon, Eugene, OR 97403, PEI-CHENG KU, CONNIE CHANG-HASNAIN, University of California, Berkeley, CA 94720, N. KWONG, R. BINDER, University of Arizona, Tucson, AZ 85721
— We report the experimental demonstration of inducing and detecting electron spin coherence in a GaAs quantum well without the use of either an *external* or *internal* magnetic field. We have taken advantage of the spin-orbit coupling in the valence band and have used light-hole transitions in a waveguide to induce coherent superposition of the electron spin states. In the absence of spin precession, the induced spin coherence is detected through quantum interference in the spectral domain, instead of time domain, coherent nonlinear optical response. We interpret the experimental results qualitatively using a few-level model with only the optical transition selection rule as its basic ingredients.

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