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Electron-nuclear interactions in lightly-doped GaAs, studied through optically-detected magnetic resonance (ODMR)[1] JOHN COLTON, Brigham Young University, LEE WIENKES, University of Minnesota-Twin Cities, ANDREW GIERKE, University of Wisconsin-Madison, SUSAN ALLEMANN, University of Wisconsin-La Crosse, ALLAN BRACKER, Naval Research Laboratory —
Electron-nuclear interactions have been studied in lightly-doped GaAs via optically-detected magnetic resonance (ODMR). Thermally-polarized electrons were resonated with ∼10 GHz microwaves; the spin states were detected with cw optical Kerr rotation. The electron-nuclear interaction was manifested through an effective magnetic field produced by the hyperfine interaction between nuclei and donor electrons, which caused a shift in the electron ODMR peak position. The effective nuclear field could be eliminated by simultaneous magnetic resonance of the three nuclear species. A measurement of the nuclear spin relaxation time was obtained (5.6 minutes) by tracking the amount of effective nuclear field, in the absence of nuclear magnetic resonance. Finally, optically-detected electron-nuclear double resonance (ODENDOR) was also performed, by monitoring changes in the electron Kerr rotation signal while sweeping through nuclear resonant frequencies one at a time.

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