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Knight shift and quadrupolar relaxation measured by NMR in Fe/GaAs heterostructures KEVIN CHRISTIE, CHAD GEPPERT, MUN CHAN, University of Minnesota, Minneapolis, QI HU, CHRIS PALMSTRÖM, University of California, Santa Barbara, PAUL CROWELL, University of Minnesota, Minneapolis — We report on all-electrical measurements of nuclear magnetic resonance (NMR) in epitaxial (100) Fe/GaAs heterostructures with a channel doping (Si) of $n = 5 \times 10^{16}$ cm^{-3}. By changing the electrical bias, measurements of NMR were performed as a function of spin accumulation. A Knight shift due to the presence of spin-polarized electrons is demonstrated under conditions of large (10-20%) spin polarization. The effects of nuclear quadrupole moments are also investigated. Although GaAs is cubic, strain induced field gradients split the NMR line into quadrupole multiplets. We investigate the role of nuclear quadrupole relaxation as a function of temperature. Phonon induced quadrupolar relaxation is expected to increase strongly with temperature and be more pronounced for the As nuclei. We show that the evolution of the relative magnitude of the NMR peaks as a function of temperature agrees well with a model dominated by quadrupole relaxation. Supported by NSF DMR-0804244 and DMR-1104951.

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