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Dynamic nuclear polarization from current-induced electron spin polarization in n-InGaAs CHRISTOPHER TROWBRIDGE, BENJAMIN NORMAN, Department of Physics, University of Michigan, Ann Arbor, MI 48109, YUICHIRO KATO, Institute of Engineering Innovation, University of Tokyo, Tokyo, Japan, DAVID AWSCHALOM, Institute for Molecular Engineering, University of Chicago, Chicago, IL 60652, VANESSA SIH, Department of Physics, University of Michigan, Ann Arbor, MI 48109 — Control of the nuclear spin system could prove useful for applications in spintronics or spin-based quantum computation for intermediate term data storage and for the suppression of electron spin dephasing resulting from hyperfine coupling. We investigate the role of nuclear spins in materials with electrically generated spin polarization. The electron spin polarization generated by electrical current in a non-magnetic semiconductor is transferred via dynamic nuclear polarization to the nuclei. The resulting nuclear field is interrogated using Larmor magnetometry. We measure the nuclear field as a function of applied magnetic field, current magnitude and direction, and temperature. An unexpected spatial asymmetry in saturated nuclear field is found. The direction of the nuclear polarization is determined by the directions of the electron spin alignment and external magnetic field, allowing electronic control over the sign of the nuclear alignment direction. Careful study of the nuclear field also enables characterization of the current-induced electron spin polarization in situations that are otherwise experimentally inaccessible. Work supported by AFOSR, NSF and ONR.

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