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Dynamics of the electron–nuclear spin interaction in bulk GaAs

MICHAEL OESTREICH, STEFANIE DÖHRMANN, DANIEL HÄGELE, Institute for Solid State Physics, University Hannover, Appelstrasse 2, 30167 Hannover, Germany, GROUP OF PROF. OESTREICH TEAM — We study systematically the interaction between electron spins and nuclear spins in bulk GaAs with 10^{15}cm^{-3} Si in dependence on excitation energy, excitation density, and sample temperature by time- and polarization resolved spin quantum beat spectroscopy in an external magnetic field. The electron–nuclear spin interaction strongly depends on the energy of the optical excitation and yields an elaborated tool to distinguish directly between localized and free electrons. The detailed understanding of the nuclear spin polarization, which emerges also without optical excitation of spin polarized electrons, in combination with the ability to distinguish between free and localized electrons explain measured electron spin quantum beat frequencies (g-factors) which are in contrast to many published experiments.

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