ELECTRON SPIN RELAXATION AT HIGH FIELDS.

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At high fields and low temperatures both the Spin Lattice Relaxation time (T_1) and Spin-Spin Relaxation time (T_2) can change dramatically with respect to those at lower fields, with the T_2 typically increasing and the T_1 typically decreasing. Relaxation in spin systems is of crucial interest with respect to various possible applications like quantum information processing and storage, spintronics, and dynamic nuclear polarization (DNP). Many of the proposed spin systems for quantum information have relatively short spin-spin distances and frozen solutions used in DNP involve relatively concentrated spin systems, and the electron dipolar spin-spin interactions tend to become the dominating decoherence mechanism. High frequencies and fields in combination with low temperatures polarize the electron spins, and allow for considerably longer spin memory times at high fields and frequencies as compared to X-band[1]. On the other hand, high frequencies lead to a significantly increased contribution from direct single phonon processes in the spin-lattice relaxation, and at low temperature T_1 can be many orders of magnitude shorter than at low fields.

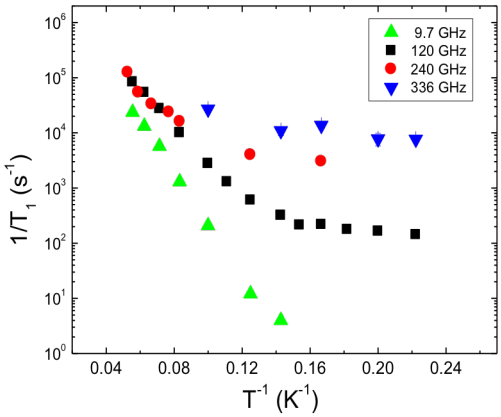

Figure 1 Spin Lattice Relaxation of a nitrogen substitutional defect in 4H-SiC at 9.7 GHz (0.34T), 120 GHz (4.28T), 240 GHz (8.56T), and 336 GHz (12.0T).

Here an overview of relaxation measurements in a variety of spin systems will be presented and a quantitative comparison to theory will be provided.

[1] S. Takahashi et al., Phys. Rev. Lett., 101, 047601 (2008). Takahashi et al. Nature 476, 76-79 (2011).

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