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Enhancing 29Si Dynamic Nuclear Polarization Through Microwave Frequency Modulation[1] MAJA CASSIDY, MEN YOUNG LEE, CHARLES MARCUS, Harvard University — We demonstrate up to a four-fold enhancement in the dynamic nuclear polarization (DNP) of silicon particles by applying an a.c. modulation to the microwave frequency used for irradiation of the electron spin system. The DNP enhancement is studied at temperatures ranging from 2-20 K and across a range of microwave powers. The total nuclear polarization is found to increase with decreasing temperature and increasing microwave power however, surprisingly, the polarization enhancement increases as the temperature is increased. The DNP enhancement is seen to increase with polarization time and is highest in spin-diffusion regime of polarization. By varying the frequency and amplitude of the applied modulation, dynamics of the electron spin system are probed. We find that the highest polarization enhancements are achieved with the frequency is modulated at a rate much greater than the electron spin lattice relaxation rate, where higher order electron spin processes can contribute to the polarization process.

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