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Parameters study of frequency-modulated continuous wave electrically detected magnetic resonance in phosphorus doped silicon at low magnetic field. LIHUANG ZHU, CHANDRASEKHAR RAMANATHAN, Dartmouth College, Department of Physics and Astronomy — In this study we investigate the detection sensitivity of frequency-modulated CW-EDMR to study paramagnetic spin defects in silicon. Our experiments are performed on phosphorus-doped natural silicon wafers with a home-built 2.5 GHz system (˜80 mT) at 5 K, where the low Q resonator together with the QuickSyn microwave source allows us to perform well controlled frequency modulation at 2.5GHz.Frequency modulation can potentially minimize the relative contribution of magnetic field induced currents in the EDMR experiment. We measure the signal to noise ratios of both the dangling bond and phosphorus dopant as a function of multiple experimental parameters such as modulation amplitude and modulation frequency. The optimal modulation frequency and modulation amplitude for both phosphorous and angling bond is found in our experiment. For frequency modulated low field CW-EDMR we observed that the resulted signal to noise ratio is qualitatively similar to field modulated CW-EDMR. The frequency modulated low field CW-EDMR provides technical advantage over field modulated CW-EDMR without sacrificing the signal to noise ratio.

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