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Polarization and Optically Detected Magnetic Resonance of P1 Centers in Diamond[1] ERIC KAMP, BRIAN CARVAJAL, NITIN SAMARTH, Pennsylvania State Univ — To achieve the highest magnetic field sensitivity, sensors for nitrogen vacancy (NV) center magnetometry require high densities of NV centers. In these sensors, the electron spin of the substitutional nitrogen (P1) center is the primary cause of decoherence. One route to eliminate this decoherence is to polarize the P1 centers. We demonstrate a simple technique for transferring optically induced polarization in the NV center onto the P1 center, relying on simultaneous driving of the mutual spin flip transitions within the NV-P1 center system and optical pumping of the NV center. By modeling the density operators for this system, we show that due to the large optically induced spin polarization of the NV center, this process generates large enhancements in the P1 center spin polarization. To corroborate our models, we compared them with optically detected magnetic resonance (ODMR) signals generated by the mutual spin flip transitions at zero field. Further, we show that the generated polarization enables ODMR measurements of the P1 center, conditional on the driving of mutual spin flip transitions. This technique should enable polarization of the electronic component of the P1 center and prolong coherence times of high-density NV center ensembles at room temperature.

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