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Pulsed ESR of photo-polarized NV centers in diamond at X-band magnetic fields BRENDON ROSE, ALEXEI TYRYSHKIN, STEPHEN LYON, Princeton U., CHRISTOPH WEIS, THOMAS SCHENKEL, LBNL — Recently nitrogen-vacancy (NV) color centers in diamond have become the focus of many studies aimed towards their use as quantum bits (qubits) in quantum computing applications and as precision magnetic field sensors in scanned imaging applications. The NVs have a ground triplet state (S=1) with ZFS of 2.88 GHz. It has been previously shown that optical excitation, when shining green light at low magnetic fields (below 100 G), polarizes spins preferentially into the T_0 state. Here we will report an X-band pulsed ESR measurement and demonstrate that the optical spin polarization is more complex at higher magnetic fields (3400 G) and can lead to preferential spin polarization into T_+ and T_- states, instead of T_0. This effect can be understood from a simple one electron spin Hamiltonian and depends mainly on the relative orientation of the ZFS and external magnetic field. In addition, we observe strong ESEEM effects originating from the central nitrogen nucleus which are most prominent when measuring the T_0 to T_- transition and when the field is along the ZFS. From the orientation dependence of ESEEM we are able to accurately determine the nitrogen hyperfine and nuclear quadrupole tensors. Spin coherence of 0.8 ms is seen at 10 K, limited by 1 percent of magnetic ^{13}C nuclei in our natural diamond sample.

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