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The site and high field βNMR properties of $^{8}Li^{+}$ implanted into α-Al_2O_3

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We present high magnetic field βNMR measurements of $^{8}Li^{+}$ implanted in single crystals of sapphire, a commonly used backing material for other samples. From the well-resolved quadrupolar splitting, we extract the electric field gradient (EFG) at the implanted $^{8}Li^{+}$ site. Comparison with supercell density functional theory calculations of the EFG allows us to identify the octahedral interstitial site as the most likely candidate. In contrast to the zero field βNQR spectra, only a single site is evident at high field. We discuss possible explanations for this discrepancy. The high field spin lattice relaxation is extremely slow ($1/T_1 < 0.02$ s^{-1}) from 4 to 300 K. This regime, where cross relaxation to the ^{27}Al nuclear spins is quenched, extends down to at least 2.2 Tesla.

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