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Nuclear Magnetization by Rotating Magnetic Fields Detected with a Superconducting Quantum Interference Device SEUNGKYUN LEE, ERWIN L. HAHN, JOHN CLARKE, UC Berkeley Physics and LBNL — We demonstrate that, in the absence of any static magnetic field, protons in a liquid sample can be polarized along the z-direction by application of a magnetic field rotating in the xy-plane. By detecting spin precession in 3 μT with a low-T_c Superconducting QUantum Interference Device, we observed that a rotating field can induce nuclear polarization comparable to that from a static field of the same magnitude. The spin-lattice relaxation times of Cr-doped methanol samples in the frame rotating at 10 kHz were the same as those in the laboratory frame within the error of the experiment. This experiment provides a direct test of the modified Bloch equation that includes spin relaxation in the instantaneous field when strong oscillating fields are present. A field rotating at several kHz is capable of polarizing only materials with short correlation times of spin fluctuation ($\tau_c \ll 1$ ms) such as liquid. Therefore, use of such fields to prepolarize the sample enables high-resolution liquid-state nuclear magnetic resonance experiments even in the presence of strongly magnetic solid material near the sample. Supported by USDOE.

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