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Ultra-low field T1 vs. T1rho at 3T and 7T: study of rotationally immobilized protein gels and animal brain tissues[1] HUI DONG, Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, BEN INGLIS, Henry H. Wheeler Jr. Brain Imaging Center, University of California, Berkeley, IAN BARR, College of Chemistry, University of California, Berkeley, JOHN CLARKE, Department of Physics, University of California, Berkeley — Clinical magnetic resonance imaging (MRI) machines operating in static fields of typically 1.5 T or 3 T can capture information on slow molecular dynamics utilizing the so-called T1rho technique. This technique, in which a radiofrequency (RF) spin-lock field is applied with microtesla amplitude, has been used, for example, to determine the onset time of stroke in studies on rats. The long RF pulse, however, may exceed the specific absorption rate (SAR) limit, putting subjects at risk. Ultra-low-field (ULF) MRI, based on Superconducting Quantum Interference Devices (SQUIDs), directly detects proton signals at a static magnetic field of typically 50–250 μT. Using our ULF MRI system with adjustable static field of typically 55 to 240 μT, we systematically measured the T1 and T2 dispersion profiles of rotationally immobilized protein gels (bovine serum albumin), ex vivo pig brains, and ex vivo rat brains with induced stroke. Comparing the ULF results with T1rho dispersion obtained at 3 T and 7 T, we find that the degree of protein immobilization determines the frequency-dependence of both T1 and T1rho. Furthermore, T1rho and ULF T1 show similar results for stroke, suggesting that ULF MRI may be used to image traumatic brain injury with negligible SAR.

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