Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Force-Detected Magnetic Resonance Imaging in Micron-Scale Liquids AIMEE SIXTA, Department of Physics, The University of Texas at Austin, Austin, TX 78712 USA, SOPHIA BOGAT, DIEGO WRIGHT, SHIRIN MOZAFFARI, DANIEL TENNANT, JEREMY PASTER, JOHN MARKERT, Department of Physics, The University of Texas at Austin — We report our efforts in the development of Nuclear Magnetic Resonance Force Microscopy (NMRFM) for the study of biological materials in liquid media at the micron scale. Our probe contains microfluidic samples sealed in thin-walled (few m) quartz tubes, with a micro-oscillator sensor nearby in vacuum to maintain its high mechanical resonance quality factor. An initial demonstration utilizes a permalloy magnet on the oscillator tip, which provides a resonant slice of thickness 0.5 m and an area of diameter 10m; these first measurements aim to demonstrate a single-shot measurement of the longitudinal relaxation time T1 in aqueous solutions of Cu2SO4. We also aim to implement a sawtooth 2? cyclic inversion of the nuclear spins, a detection scheme that effectively eliminates common measurement artifacts. At the micron scale, both spin diffusion and physical diffusion in liquids tend to blur images in conventional magnetic resonance imaging (MRI); we aim to exploit the local nature of the NMRFM probe to obtain higher resolution dynamical images, with the ultimate goal of imaging within individual biological cells.

John Markert
Department of Physics, The University of Texas at Austin

Date submitted: 25 Nov 2015 Electronic form version 1.4