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A Nuclear Magnetic Resonance Force Microscope for Micron-scale Liquids FELIPE GIRALDO, JEREMY W. PASTER, DANIEL M. TENNANT, JOHN T. MARKERT, Department of Physics, The University of Texas at Austin — We have designed and constructed a Nuclear Magnetic Resonance Force Microscopy (NMRFM) probe for the analysis of liquid and soft matter samples. This NRMFM probe uses a magnet-on-cantilever geometry and is equipped with dual x-y-z piezoelectric motion stages, for micron-step coarse positioning and sub-nanometer fine positioning of both the laser interferometer and the sample with respect to the cantilever, permitting three-dimensional scanning-mode detection of nuclear magnetism. The probe keeps the cantilever detector in high vacuum, maintaining a high Q, while the local NMR properties of nearby aqueous samples in glass microtubes are measured. The entire probe head fits in either a 3.5-cm bore magnet or in an electromagnet with a similarly small gap. We plan to demonstrate the ability to scan and distinguish microscale NMR properties using a copper sulfate solution with concentrations in the 2-20 millimolar range, thus providing dynamical imaging of regions with differing longitudinal relaxation times, T_1. This concentration range will permit us to compare the conventional saturation-recovery pulse sequence with a more efficient single-pulse detection, possible when T_1 is comparable to or less than the duration of the modified cyclic-adiabatic-inversion pulse.

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