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Magnetic resonance force microscopy with two-dimensional spatial encoding KAI W. EBERHARDT, URBAN MEIER, ANDREAS HUNKELER, BEAT H. MEIER, ETH Zurich — We demonstrate a novel method of creating Magnetic Resonance Force Microscopy (MRFM) images that eliminates the need to scan the probe-sample distance. Conventionally, scanning a magnetic tip over the sample in at least two dimensions is required for imaging with MRFM. At each position the signal from a different slice of the sample is acquired, where the slice is defined by the the rf field and the ferromagnetic gradient tip geometry. An image can be reconstructed by deconvolving the shape of the slice from the data. The new method we demonstrate keeps the sample-tip distance constant and resolves the signal origin by spatial encoding with rf pulses. For spatial encoding in one dimension rf pulses are applied with a gradient field coil. These pulses produce a Fourier-encoding in the longitudinal magnetization. In the second dimension Hadamard encoding [1] is employed. 2D images of a patterned $(NH_4)_2SO_4$ crystal sample are reconstructed from the known field distributions with a resolution of 1 μm at room temperature.
[1] K. W. Eberhardt et al., Phys. Rev. B 76: 180405 (2007)

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