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An improved system for SQUID-detected MRI at microtesla fields S. BARRIGA, P. KOO, A. HUNT, S. BUSCH, D. KINION, M. HATRIDGE, W. MYERS, M. MÖßLE, A. PINES, JOHN CLARKE, UC Berkeley and LBNL, M. MÜCK, U. of Giessen — We perform magnetic resonance imaging (MRI) by detecting protons precessing at 5.6 kHz in a 132-μT field with a superconducting gradiometer coupled to a superconducting quantum interference device (SQUID). We have designed, built, and tested an improved system with an increased signal to noise ratio, intended to reduce data acquisition time and/or increase spatial resolution. By using a SQUID with a lower noise and an input coil inductance optimally matched to that of the gradiometer we have reduced the intrinsic magnetic field noise referred to one pickup loop by a factor of four to 0.4 fT $\mathrm{Hz}^{-1/2}$. To take advantage of this reduced noise we have enclosed the entire system in a 6-mm thick aluminum shield that attenuates 5.6-kHz magnetic noise by a factor of about 60. Our new coils provide more homogeneous imaging fields and field gradients and are more compact than those employed in our prototype. Finally, we align the precession field perpendicular to the fields generated by the building elevator to minimize shifts in the precession frequency. We present images obtained in our new system. This work was supported by the USDOE.

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