SQUID-detected microtesla MRI: a new modality for tumor detection? MICHAEL MÖßLE, SARAH BUSCH, MICHAEL HATRIDGE, WHIT-TIER MYERS, ALEXANDER PINES, JOHN CLARKE, UC Berkeley and LBNL, LARS SCHMITT, JEFF SIMKO, UC San Francisco — We are investigating the use of low-field magnetic resonance imaging with enhanced longitudinal-relaxation-time ($T_1$)-weighted contrast to detect tumors. Our technique involves prepolarizing the sample in a magnetic field up to 0.3 T and detecting the nuclear magnetic resonance (NMR) signal at microtesla fields using a superconducting quantum interference device. This technique enables us to obtain $T_1$ dispersion curves and $T_1$-weighted contrast images in fields from 1.4 $\mu$T to 0.3 T. We have shown that for materials such as agarose gel the $T_1$-weighted contrast is greatly enhanced in microtesla fields.

To investigate the use of this enhancement for tumor imaging we measured the $T_1$ relaxation times of healthy and cancerous tissue specimens, maintained at 4 °C, shortly after their surgical removal. To minimize artifacts we measured normal and cancerous tissues simultaneously and separated their NMR signals by applying a magnetic field gradient. We present $T_1$ dispersion curves for several sets of samples, and discuss the applicability of this technique to in vivo imaging. Work supported by USDOE.

Michael Moessle
UC Berkeley and LBNL

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