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An ultra-low field electron paramagnetic resonance technique for biomedical research P. BHUPATHI, Physics Department, California Institute of Technology, I. HAHN, Jet Propulsion Laboratory, California Institute of Technology — Conventional electron paramagnetic resonance (EPR) imaging systems use high magnetic fields confined to small spaces and therefore have limitations on the sample size and safety issues related to the high level of radiation. We are developing an ultra-low field SQUID (Superconducting Quantum Interference Device)-magnetometer system for EPR detection from room temperature samples in magnetic fields of a few Gauss, corresponding to EPR frequencies of a few MHz. Operation at low EPR excitation frequencies of a few MHz ensures negligible sample heating and high penetration depth in biological systems. A new measurement system consists of a specially designed low noise, non-magnetic 4K dewar with a hollow tail housing a superconducting second order gradiometer inductively coupled to a two-stage dc SQUID amplifier. This unique gradiometer design allows a sample at room temperature to be positioned at the middle turns, which significantly improves the signal-to-noise ratio. We present preliminary results and discuss the prospects for in vivo biomedical EPR imaging.

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