Abstracts

A Microwave Decoupled Electrode for the Electroencephalogram (Short Papers)

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The recording of the electroencephalogram (EEG) in an amplitude-modulated microwave field presents two related but distinct problems when conventional electrodes are employed. The electrode and its associated conductors extract power from the incident radiation, resulting in increased local power deposition which confounds dosimetric arguments and imposes local thermalization; the electrode tissue interface is a nonlinear system that demodulates amplitude-modulated signals with the results that the demodulate is additively mixed with the EEG. The problems were studied in a series of bench tests with conventional and thin-film microwave integrated circuit (MIC) electrodes. The latter are decoupled from the magnetic component of the field by virtue of radically reduced dimensions of the thin-loop component of its geometry, and suppression of dipole (i.e., electric field interaction) currents by use of integrated Nichrome series resistance. The result is that the demodulation artifact is undetectable in the ensemble averaged-power spectrum from the in vitro electrode up to an S-band incident-power density of 100 mW/cm/sub 2/. Thermalization was studied in a dielectric brain phantom with high-resistance monofilament leads to the MIC with a result that 0.6°C heating is attributable to the electrode with prolonged exposure to a 50-mW/cm/sub 2/ field.

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