Abstracts

Interaction of Microwave and Radio Frequency Radiation with Biological Systems

H.P. Schwan. "Interaction of Microwave and Radio Frequency Radiation with Biological Systems." 1971 Transactions on Microwave Theory and Techniques 19.2 (Feb. 1971 [T-MTT] (Special Issue on Biological Effects of Microwaves)): 146-152.

A survey of thermal and nonthermal effects is presented with some recommendations for future work. A basis of all biophysical considerations are the electrical properties including dielectric constants and conductivities for nearly all body tissues. Equations are presented which summarize previous experimental work and state dielectric constant and conductivity for tissues of high water content as functions of macromolecular content and frequency. No evidence is available supporting resonance behavior. Previous thermal work includes determination of depth of penetration values and the relative absorption cross section of man and was the basis for present standards. Nonthermal principles which explain many previous observations are largely due to field-induced forces. Such effects occur in the human body only at field-strength levels which are thermally dangerous. Several important conclusions are made. 1) Field-force effects cannot be enhanced by use of pulsed fields. 2) It is not possible to directly stimulate nerve membranes by microwave fields. 3) It is fluids and tissues. Finally, a guideline for future standard work in complex fields is proposed. It is based on the concept of a tolerance current density, which is stated to be near 3 mA/cm between 1 and 1000 MHz. The biophysical principles which pertain to the interaction of nonionizing electromagnetic radiations with biological systems are not discussed. This was done in the past on several occasions. The field will be summarized only briefly and attention will be given to problems not already delt with satisfactorily. We intend to concentrate on some topics that are presently of particular interest.

❑ Return to main document.