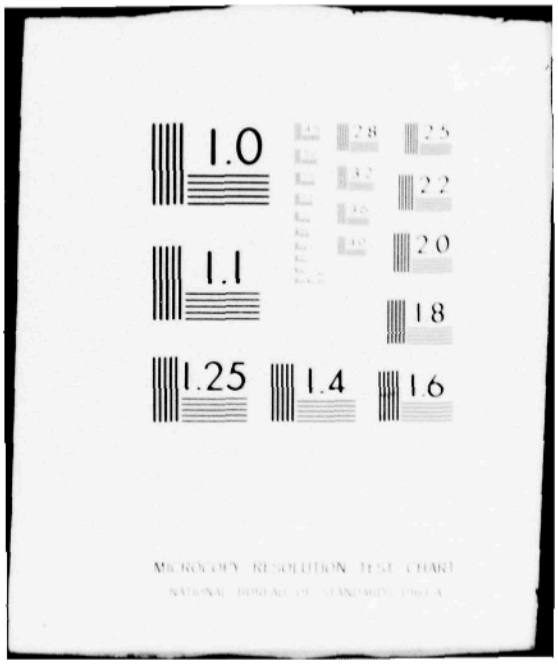
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NUMBER 4
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A DIGEST OF CURRENT LITERATURE

A Quarterly Publication Produced for
National Telecommunications and Information Administration
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OF NONIONIZING ELECTROMAGNETIC RADIATION

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Literature Selected and Abstracted
by
Biomedical Group, Science Information Services Organization

Bruce H. Kleinstein, Ph.D., J.D., Project Manager

Gary Freedman, Managing Editor

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BIOLOGICAL EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION

June, 1979 Volume III, Number 4

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PREFACE

Biological Effects of Nonionizing Electromagnetic Radiation is a publication researched and prepared by the Franklin Research Center, Science Information Services Organization, under contract to the National Telecommunications and Information Administration (NTIA); funding provided by the U.S. Navy under interagency agreement with NTIA.

This digest serves as a vehicle through which current documentation of research highlights on the biological effects and health implications of nonionizing electromagnetic radiation (microwave and other radio frequency radiation) are compiled, condensed, and disseminated on a regular basis. *Biological Effects of Nonionizing Electromagnetic Radiation* is intended to be a highly useful current awareness tool for scientists engaged in research or related activities. The great number and diversity of relevant publications make imperative the availability of the service to persons whose work requires that they keep abreast of current developments in the field.

Biological Effects of Nonionizing Electromagnetic Radiation is published quarterly. The issues of Volume III, and future volumes, will include materials received during the preceding three months. Each issue will include news items and announcements, a listing of meetings and conferences, abstracts of current literature, and a directory of current research. Materials for which full text is not available will be included as summary abstracts.

ABBREVIATIONS AND ACRONYMS

A, amp - ampere(s)
Å - angstrom(s)
BRH - Bureau of Radiological Health
C - centigrade
cm - centimeter(s)
cps - cycles per second
dB - decibel(s)
EPA - Environmental Protection Agency
FDA - Food and Drug Administration
g - gram(s)
G - Gauss
GHz - gigahertz
HEW - Health, Education, and Welfare
hr - hour
Hz - hertz
IEEE - Institute of Electronic and Electrical Engineers
IMPI - International Microwave Power Institute
IU - international unit(s)
J - joule(s)
k - kilo--
l - liter(s)
m - meter(s)
m - milli--
M - mega--
mho - unit of measurement of conductivity
min - minute(s)
mo - month(s)
n - nano--
NBS - National Bureau of Standard
NIH - National Institutes of Health
NSF - National Science Foundation
NIOSH - National Institute for Occupational Safety and Health
NTIA - National Telecommunications and Information Administration
NTIS - National Technical Information Service
Oe - oersted(s)
OSHA - Occupational Safety and Health Administration
OTP - Office of Telecommunications Policy
PHS - Public Health Service
rad - radiation absorbed dose
R - roentgen(s)
rpm - revolutions per minute
sec - second(s)
USAFSAM - U.S. Air Force School of Aerospace Medicine
USDA - U.S. Department of Agriculture
UV - ultraviolet
V - volt(s)
VA -Veterans Administration
W -watt(s)
Wb - Weber(s)
WHO - World Health Organization
wk - week(s)
wt - weight
yr - year(s)

μ - micro--

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NEWS ITEMS

SENATE COMMITTEE REPORT CALLS FOR MORE RADIATION RESEARCH

The Senate Committee on Commerce, Science and Transport, in a report on radiation health and safety issued in December, 1978, is calling for "experimental and epidemiological studies to determine the biological and/or behavioral effects of long-term exposure to low-levels of all forms of radiation." But it is particularly concerned by the uncertainty surrounding the effects of long-term exposure to nonionizing electromagnetic radiation, such as microwaves. "Research on the health effects of nonionizing radiation has been given an unacceptably low priority throughout the Federal establishment. Only about $9 million are spent each year for research on the biological effects of nonionizing radiation." The committee endorses the research priorities of the National Telecommunications and Information Administration. These are (1) experimental research on the effect of long-term, low-level exposures; (2) studies of persons exposed at work and in the home; (3) investment in basic research; and (4) improved measurement techniques and methods for extrapolating from animal experiments. The committee also wants OSHA to give greater priority to the control of radiation hazards--particularly from nonionizing radiation. For example, it wants OSHA to reexamine its current voluntary standard on nonionizing radiation (which, surveys show, is widely disregarded) and make a mandatory standard. Standards for nonionizing radiation in the environment outside the workplace should be considered and the Office of Technology Assessment should investigate the impact of such standards.

New Scientist 181(1138): 156; 1979.

BRH COMPILES MICROWAVE-OVEN-LABELING EXEMPTION GUIDELINES

A document entitled "Guidelines for Exemption from the Microwave Oven Labeling Requirements of 21 CFR 1030.10(c)(6)(i)" has been compiled and is available from the BRH. The guidelines were developed to aid in the preparation and evaluation of petitions for exemption from the labeling requirements of the microwave oven performance standard. The standard requires that a label be attached to microwave ovens to remind users of certain safety precautions. The warning must read as follows: "Precautions for use to avoid possible exposure to excessive microwave energy: Do not attempt to operate this oven with: (a) object caught in door, (b) door that does not close properly, (c) damaged door, hinge, latch, or sealing surface." The standard also permits the Bureau to approve a request for exemption from displaying this warning if it finds the oven will not exceed the allowable emission limits when operated under the conditions listed on the label. The Bureau developed the guidelines after reviews of exemption requests submitted by several manufacturers indicated that more definitive guidance on specific tests and criteria was needed for use in preparing and evaluating such submissions. In addition to providing a uniform methodology whereby both manufacturers and the Bureau can determine whether a specific oven model qualifies for exemption from the labeling requirements, the document also contains a summary of the rationale used for developing each of the tests and criteria.

BRH Bulletin 13(1): 5; 1979.

MICROWAVE BIOEFFECTS AND RADIATION SAFETY ONE-DAY SHORT COURSE

IMPI, in cooperation with the Radiation Protection Services of the British Columbia Ministry of Health, is sponsoring a 1-day short course dealing with microwave bioeffects and radiation safety to be held June 15, 1979 at the Four Seasons Hotel in Vancouver, British Columbia, Canada. The program will include the basic principles and concepts of radio waves and microwaves, microwave biophysics, biologic and pathophysiologic effects of microwave radiation, protection standards, control of exposure in Canada, low frequency power line studies, and measurement of potentially hazardous fields. A panel discussion moderated by Dr. M. Wayne Greene, head of the Radiation Protection Services of the British Columbia Ministry of Health will conclude the session.

IMPI News Release

RADAR BIOEFFECTS TO BE STUDIED

Biologic effects caused by typical radars will be studied by researchers at the University of Washington, Seattle, WA, under contract to Wright-Patterson Air Force Base, OH to determine if low-power radar signals, on the order of 1 mW/cm^2 at 450 MHz, have adverse effects on humans. Absorption at 450 MHz will be determined thermographically using an infrared scan on a gelatin-filled human mock-up. Comparable absorption will then be induced in rats at 2,450 MHz, with concurrent postirradiation analysis of the test animals. After the proper power level is determined, 20 rats will be irradiated for 3 mo (with 20 control animals) in a pilot test sometime next year to "shake down" the system. If all goes well, 100 rats will then be irradiated for 3 mo using 100 waveguides, with 100 inactive waveguides for the control animals. "Since most radars use rotating pulsed beams, we'll irradiate the rats using groups of pulses," says Dr. A. William Guy, project engineer. A microprocessor will be used to control signal transmission with a representative irradiation pattern being 10 pulse groups per sec using 10-usec pulse widths and a duty cycle of 0.005. Characteristics of the incident radiation will be varied to simulate a number of radars. The rats will be exposed to circularly polarized signals using 20-cm diameter waveguides, and Guy expects 60-70% of incident energy to be absorbed by the rats. The 3-yr study was initiated in October, 1977 with $887,000 allocated for the first 18 mo, and $1.2 million forthcoming for the second 18 mo. "There's never been a microwave study conducted in the US for this long and at these power levels," states Guy.

"Long-term studies haven't been conducted in the past because funding just hasn't been available," he explains. "Researchers typically only have enough funding to irradiate animals for a few days." According to Guy, about $63 million was spent for bioeffects research during the last 5 yr, with average contracts in the $50,000-$100,000 range. The study was funded partially because of the growing concern over the effects of low-power electromagnetic radiation, and because of nonthermal effects reported in Soviet research.

Microwaves 17(12): 16; 1978.

SWEDISH RESEARCHERS CITE HARMFUL MICROWAVE BIOEFFECTS

Microwave radiation can affect respiration, the heart, and the cerebral cortex, according to an article in *FOA Tidningen*, the journal of Sweden's National Defense Research Institute. Animal studies revealed that microwave energy can also trigger changes in hormone activity and influence the hematopoietic system. Test animals, chiefly mice, were placed at various distances from a 2.45-GHz generator to achieve radiation intensities of 100, 10, and 1 mW/cm^2. Experiments on mice revealed that a radiation intensity of 100 mW/cm^2 can be fatal when maintained for 6 min, while tests on frogs revealed that pulsed energy at 0.6 $\mu W/cm^2$ is sufficient to affect heartbeats and to increase blood pressure. Other deleterious effects observed include a reduction in the number of cells that react to noise and pain, and changes in pupil reaction. Sweden currently has a radiation ceiling of 1 mW/cm^2, which is one-tenth the U.S. standard.

Microwaves 18(2): 39; 1979.

HEALTH EFFECTS FROM RADIO FREQUENCY RADIATION TO BE STUDIED

The American Health Foundation, under contract with the BRH, has initiated a study of the possible adverse health effects associated with exposure to low-level radio frequency radiation from microwave and shortwave diathermy equipment. The contract calls for a group of male physical therapists and their offspring to be studied through the use of a mailed questionnaire, with several followups planned for nonrespondents. The feasibility of conducting such a survey was determined by a pretest, and the full-scale survey was initiated in October 1978 with the mailing of questionnaires to male members of the American Physical Therapy Association. The objective of the study is to determine whether physical therapists or their offspring suffer adverse health effects related to occupational use of diathermy equipment. For the therapists, the study will consider such health effects as cataracts, high blood pressure, sterility, and persistent fatigue, dizziness, insomnia, or headaches. For the offspring, fetal and infant mortality, low birth weight, and congenital malformations will be evaluated. Therapists are being asked to supply information about medical and work histories for themselves and their wives. Items regarding smoking, as well as exposure to ionizing and nonionizing radiation and to chemicals, are included in the questionnaire. Analysis of the data will attempt to relate health and reproductive outcomes to the use of diathermy equipment so the possible associations can be identified. Although sources generating radio frequency energy have increased greatly in the past 30 yr, there have been relatively few studies of the possible biologic effects in human populations. The present study will provide a basis for the development of guidance concerning occupational and general population exposures.

BRH Bulletin 13(2): 3-4; 1979.

SHORT WAVE DIATHERMY RELIEVES HERPES ZOSTER SYMPTOMS

British physician, Dr. F. R. C. Manning, citing the therapeutic benefits of short-wave diathermy to the spinal cord in the treatment of nearly 400 herpes zoster cases, refutes claims that the effects are merely psychosomatic. According to Manning, "a large body of local practitioners and their patients will bear witness to the fact of the rapid relief of symptoms, particularly of postherpetic neuralgia, that this simple treatment can afford."

Br Med J 1(6158): 274; 1979.

BRH DEVELOPS TEST FACILITY TO SUPPORT MICROWAVE DIATHERMY STANDARD

A facility for measuring the electrical properties of the phantoms of simulated fat and muscle tissue that are used in evaluating microwave diathermy applicators has been developed and put into operation by the Electromagnetics Branch of the BRH's Division of Electronic Products. Such measurements are needed to determine whether the dielectric properties of the phantoms--such as conductivity and permittivity--are within the limits set by the proposed performance standard for microwave diathermy equipment, and also to support Bureau studies of other agencies' clinical programs in microwave-induced hyperthermia treatments of cancer. Three methods for making routine dielectric measurements on liquid and semisolid materials at microwave frequencies presently are being used in the facility: (1) an impedance probe method, (2) a short-line method, and (3) a two-impedance method. Installation of a Bureau-developed semi-automated network analyzer with automatic calibration and correction features has made it possible to obtain accurate results with all three techniques. The impedance probe method, which was developed by the Georgia Institute of Technology and modified by the Bureau, shows promise for highly accurate and repeatable measurements on liquids and semisolids. The technique involves the use of a tiny monopole antenna inserted into the sample material. The input impedance of the probe depends on the properties of the sample, and these properties can be derived from a network analyzer measurement of the probe's input impedance. The short-line method is the most widely used technique for dielectric measurements and can be used with solids, liquids,

and semisolids. The network analyzer enables a very accurate determination of the properties of a sample in a shorted line. The two-impedance method was developed by the Bureau and is similar to the shorted-line method, except measurements are made on both a shorted line and a terminated line. Use of the network analyzer makes this technique feasible and accurate. Further work in progress on the network analyzer system, when combined with precision sample holders and probes which also are under development, is expected to improve the Bureau's dielectric measurement facility to a state-of-the-art system for microwave measurements. It is anticipated that this facility will be used to provide assistance to other university and government laboratories as well as to Bureau programs.

BRH Bulletin 13(1): 1-2; 1979.

BRH EVALUATES DIATHERMY APPLICATORS

Techniques for evaluating the relative effectiveness and safety of microwave diathermy applicators have been developed by the BRH. The effectiveness of an applicator is determined by measuring the heating patterns induced in phantoms in order to obtain the rate of energy deposition or specific absorption rate (SAR). The safety is determined by measuring the microwave leakage at 5 cm from the boundary of the phantom/applicator combination. According to the proposed standard, a leakage of not more than 10 mW/cm^2 at an SAR of 235 W/kg is required for safety. The Bureau already has evaluated several 2,450- and 915-MHz hyperthermia applicators for such clinical users as the Radiation Oncology Therapy Group and is continuing to perform similar evaluations for others.

BRH Bulletin 13(1): 2; 1979.

STUDY SHOWS NO EFFECT ON MORTALITY FOLLOWING OCCUPATIONAL EXPOSURE TO RADAR

An epidemiologic study of a large group of U.S. naval enlisted men occupationally exposed to radar over 20 yr ago has shown that the men's exposure to microwave radiation had no adverse effects on long-term mortality patterns or on hospitalized illness around the time of exposure. The study, which was supported by a BRH contract, was conducted by the Medical Follow-up Agency of the National Research Council, National Academy of Sciences, under the direction of Dr. Dennis Robinette and Mr. Seymour Jablon. The study population included approximately 40,000 men who served in the Navy during the Korean War period of 1950 to 1954. Of these men, approximately 20,000 were electronic equipment repair personnel who had maximum potential for exposure, and 20,000 were equipment operators who had minimal potential for exposure. The exposures were assessed in terms of occupational duties, length of time in occupation, and power of equipment at the time of exposure. The health indexes studied included mortality by cause of death, hospitalization during service, later hospitalization in Veterans Administration facilities, and disability compensation. Data on these health indexes were obtained largely through the use of automated record systems. Because the types of information obtained were limited by the availability of data on computer tapes, other aspects of health and exposure relevant to possible microwave effects could not be investigated. For example, it was not possible to determine hospital care outside the Navy and Veterans Administration system, the frequency and nature of less serious medical conditions during and after service, reproductive performance, health of offspring, or employment history after discharge from service. An extension of the study to investigate these other questions is possible, however, since a subsample of living men with high and low exposure patterns during service can be identified for individual followup.

BRH Bulletin 13(3): 1; 1979.

SOLAR POWER SATELLITE BIOEFFECTS HIGHLIGHTED

Commenting on the environmental impact of the proposed Solar Power Satellite (SPS) transmission system, Dr. Peter E. Glaser, Vice President of Engineering Sciences, Arthur D. Little, Inc., states that the SPS microwave transmission system must be designed so that the range of frequencies and microwave power flux densities will meet future international standards. At present, various standards for microwave exposure have been established, ranging from 10 mW/cm^2 for the U.S. to 0.01 mW/cm^2 for the Soviet Union. Whereas the U.S. standard is based on microwave heating of body tissue, the Soviet Union's standard is based on possible effects on the central nervous system, even at low exposure levels. Glaser points out that the SPS will incorporate several fail-safe features to assure control of microwave beam pointing and instantaneous shutoff of power to the microwave generators. Failure of the microwave beam-pointing system would not result in exceeding the Eastern European guidelines for microwave exposure. Predictions, analyses, and measurements of the SPS's specific microwave-induced biologic effects will be an essential component of the development program. Glaser adds that in addition to direct biologic effects, interference with electronic equipment, medical instrumentation, and electric devices must be avoided. Any sensitivity of such equipment to the low level of microwave exposure will have to be determined; if required, industrywide standards will have to be established. Possible effects, if any, on birds flying through the microwave beam also will have to be established, notes Glaser. Preliminary evidence indicates that birds can be affected at levels of microwave exposure greater than 20 mW/cm^2 of radiation in the X-band. The evidence suggests that birds avoid such exposure. Glaser concludes that the effects of microwave exposure on aircraft flying through the beam must also be considered. He notes, however, "the shielding of the metal

fuselage and the very short time of flight through the beam are unlikely to result in significant human exposure."

Adv Astronaut Sci 27(Part 1): 287-317; 1978.

U.S. EMBASSY EMPLOYEES IN MOSCOW NOT AFFECTED BY MICROWAVES

A medical study released by the State Department reported no evidence of health problems caused by microwave radiation beamed at the U.S. Embassy in Moscow. However, the report cautions that more investigation is required to determine long-range effects. The report is based on a 2-yr study conducted by Baltimore's Johns Hopkins University School of Hygiene and Public Health, which reviewed the records of nearly 4,500 State Department employees and their dependents who lived in Moscow between 1953 and 1976. The records were compared with those of other diplomatic families who served elsewhere in Eastern Europe and who were not subjected to known microwave bombardment. The study, which was begun in the summer of 1976, concentrated on over 1,800 employees at the Moscow embassy during the period and 3,000 of their dependents. A comparison group of over 2,500 employees at nine Eastern European posts and 5,000 of their family members were also identified. No differences were observed between the two groups with respect to cancer morbidity. A relatively high proportion of cancer deaths in both female employee groups was discovered, but no satisfactory explanation was found. The report also notes that the population studied was relatively young and that it was still too early to be able to detect long-term mortality effects except for those who had served in the earliest period of the study. Another problem cited in the report is that the highest exposure at the embassy--up to 18 $\mu W/cm^2$--was for the relatively short period of June 1975 to February 1976. The report recommends that the group with the highest exposure be contacted again in another 3 yr for a medical update, and that a surveillance system be developed to track deaths in the entire population that was studied.

Microwaves 18(1): 27; 1979.

ITEMS FROM THE COMMERCE BUSINESS DAILY

☐ EXPLORATORY EVALUATION OF VIDEO DISPLAY TERMINAL OPERATOR STRESS/STRAIN

The contracting officer, National Institute for Occupational Safety and Health, 5600 Fishers Lane, Room 8-29, Rockville, MD is soliciting proposals for the above study. (January 11, 1979)

☐ STUDY OF EFFECT OF ELECTRICAL STIMULATION OF THE CEREBELLUM

The National Institute of Neurological and Communicative Disorders and Stroke, NIH, Bethesda, MD has contracted with the University of Minnesota for the above study. (January 23, 1979)

☐ CONTINUED RESEARCH ON THE EFFECT OF RADIO FREQUENCY AND MICROWAVE ENERGY ON THE NERVOUS SYSTEM

The Office of Naval Research, 800 N. Quincy St., Arlington, VA 22217 has contracted with the University of Pennsylvania, 3451 Walnut St., Philadelphia, PA 19104 for the above study. (February 26, 1979)

☐ A STUDY ENTITLED "THE EFFECTS OF MICROWAVE RADIATION ON CEREBRAL METABOLISM"

The Environmental Protection Agency, Contracts Management Division (MD-33), Office of Administration, Research Triangle Park, NC will negotiate with Duke University Medical Center, Durham, NC for the above study. (February 28, 1979)

☐ PRE- AND POST NATAL EXPOSURE OF SQUIRREL MONKEYS TO 2450 MHz EMR

The Environmental Protection Agency, Office of Administration, Research Triangle Park, NC has contracted with Stanford Research Institute International, 333 Ravenswood Ave., Menlo Park, CA 94025 for the above study. (March 9, 1979)

MEETINGS AND CONFERENCES

AMERICAN INDUSTRIAL HYGIENE CONFERENCE

Date: May 27-June 1, 1979
Place: Chicago, IL: Palmer House
Sponsor: American Industrial Hygiene Assoc. (AIHA); American Conference of Governmental Industrial Hygienists (ACGIH)
Requests for Information: W. E. McCormick, American Industrial Hygiene Association, 475 Wolf Ledges Parkway, Akron, OH 44311

Selected Bibliography of Papers to be Presented:

RF AND MICROWAVE STANDARDS IN CANADA.
M. Rappacholi, M. Stukley

NIOSH CRITERIA DOCUMENT AND RECOMMENDED OCCUPATIONAL EXPOSURE STANDARDS FOR RF AND MICROWAVE RADIATION: A STATUS REPORT.
R. F. Boggs, Z. Glazer, T. K. Tielman

BIOLOGICAL EFFECTS OF MICROWAVE.
S. Cleary

1979 CLEVELAND ELECTRICAL ELECTRONICS CONFERENCE AND EXPOSITION (CECON 79)

Date: June 5-7, 1979
Place: Cleveland, OH: Cleveland Convention Center
Sponsor: Institute of Electrical & Electronics Engineers (IEEE)--Region 2, Cleveland Section
Requests for Information: M. Lapine, 2728 Euclid Ave., Cleveland, OH 44115
Content: Topics will include biomedical--medicine, biology, and biologic effects; standards--national, international, performance, regulatory

MICROWAVE POWER SYMPOSIUM 1979

Date: June 11-15, 1979
Place: Monte Carlo, Monaco
Sponsor: International Microwave Power Institute
Requests for Information: Int'l Microwave Power Institute, Box 634, SUB 11, Univ. Alberta, Edmonton, Alberta, Canada T6G 2E0
Content: Topics will include fundamental properties, microwave power generation, transmission and rectification, industrial microwave systems, microwave instrumentation and measurement, microwave properties of materials, industrial applications, food industry applications, medical and biological applications, biological effects of microwaves, domestic and catering microwave ovens, microwave field distribution and measurement, energy balance of microwave processes, equipment safety, RF interference and frequency allocations, economics and marketing of microwave ovens.

Selected Bibliography of Papers to be Presented:

ELECTROMAGNETIC WAVES AND LIVING SYSTEMS. A. J. Berteaud (C.N.R.S., Thiais, France)

MEDICAL ASPECTS OF INTERACTION BETWEEN MICROWAVES AND LIVING SYSTEMS. B. Servantie (Centre de Recherches du Service de Sante des Armees, France)

MICROWAVE APPLICATIONS IN DIAGNOSIS AND THERAPY. M. Gautherie (Institut National de la Sante et de la Recherche Medicale, Strasbourg, France)

MEASUREMENTS AND INSTRUMENTATION IN INVESTIGATION OF THE BIOLOGICAL EFFECTS OF ELECTROMAGNETIC WAVES. A. Priou, A. Deficis (Departement Etudes et Recherches en Micro-ondes, C.E.R.T., France)

MICROWAVE RADIATION PROTECTION STANDARDS. M. A. Stuchly (Nonionizing Radiation Section, Radiation Protection Bureau, Environmental Health Centre, Canada)

MEASUREMENTS OF COMPLEX DIELECTRIC CONSTANT OF HUMAN SERA AND ERYTHROCYTES. B. Bianco, *et al.* (Consiglio Nazionale delle Ricerche, Italy)

MICROWAVE DOSIMETRY MEASURING DEVICE. K. Dzieciolowski, *et al.* (Polish Acad. Science, Poland)

TOTAL RADIATION EXPOSURE USING LIQUID CRYSTALS AND THERMOLUMINESCENCE. G. E. Fanslow (U.S.A.)

EFFECTS OF CHRONIC LOW LEVEL MICROWAVE RADIATION ON SLEEP PATTERNS IN THE RAT. M-J. Klein, *et al.* (Centre de Recherches de Medecine Aeronautique, France)

EFFECTS OF MICROWAVES ON THE SENSITIVITY OF MICE TO A CURARE-LIKE DRUG. J-C. Dumas, *et al.* (ONERA/C.E.R.T., France)

CHANGES IN THE LEVEL OF ATP, ADP, AND AMP IN DEVELOPING RAT BRAIN FOLLOWING REPEATED WHOLE-BODY 2,450 MHz MICROWAVE IRRADIATION. A. Jamakosmanovic, L. M. Shore (Inst. Physiology and Biochemistry, Yugoslavia)

THE EFFECT OF 2,450 MHz RADIATION ON TWO SOIL BORNE PATHOGENIC FUNGI (*Botrytis cinerea*, *Fusarium*). M. Diprose, *et al.* (Univ. Sheffield, Sheffield, England)

NECESSARY CONDITIONS FOR OBSERVATION OF BIOLOGIC EFFECTS OF MICROWAVE RADIATION. S. L. Arber (Scientific Res. Inst. of Health Resorts and Physiotherapy, USSR)

EEG ACTIVITY UNDER THE CONDITION OF SINGLE ACUTE WHOLE-BODY MICROWAVE 2,450 MHz IRRADIATION IN DEVELOPING RATS. M. Drecun, L. M. Shore (Inst. Physiology and Biochemistry, Yugoslavia)

EFFECT OF 10-GHz PULSED ELECTROMAGNETIC RADIATION AT SAR 1 W/kg ON *Escherichia coli*. S. K. Dutta, C. Chambers (Howard Univ., Washington, DC)

STUDIES CONCERNING THE EFFECTS OF NON-THERMAL PROTRACTED PRENATAL 915-MHz MICROWAVE RADIATION ON PRENATAL AND POSTNATAL DEVELOPMENT IN THE RAT. R. P. Jensch, *et al.* (Thomas Jefferson Univ., Philadelphia, PA)

LOW-LEVEL MICROWAVE RADIATION AND DIGESTIVE TRANSIT. R. Santini, *et al.* (Institut National des Sciences, France)

INDUCED FIELDS AND POWER ABSORPTIONS WITHIN THE HUMAN HEAD BY ELECTROMAGNETIC PLANE WAVE IRRADIATION USING AN ELLIPSOIDAL MODEL. H. Taha Al-Hafid, *et al.* (Coll. Engineering, Univ. Mosul, Iraq)

ELECTROMAGNETIC POWER DISTRIBUTION INDUCED IN BIOLOGICAL TISSUES IN A CLOSED ENVIRONMENT. P. Bernardi, *et al.* (Istituto di Elettronica, Universita di Roma, Rome, Italy)

NUMERICAL SIMULATION OF ELECTROMAGNETIC ENERGY AND TEMPERATURE DISTRIBUTION IN A CANCEROUS BREAST IRRADIATED BY MICROWAVES. R. Zimmer, *et al.* (Faculte de Medecine de Strasbourg, Strasbourg, France)

TEMPERATURE DISTRIBUTION IN ELECTROMAGNETICALLY IRRADIATED CYLINDERS SIMULATING LIVING TISSUES. G. Gerosa, *et al.* (Istituto di Elettronica, Universita di Roma, Rome, Italy)

IN VIVO TEMPERATURE/HEAT FLOW SENSING IN MICROWAVE FIELDS. G. M. Samaras, *et al.* (Univ. Maryland, Sch. Medicine, College Park, MD)

USE OF CONFORMAL MICROSTRIP ANTENNAS FOR BIOMEDICAL APPLICATIONS OF MICROWAVES. A. Van de Capelle, P. J. Luypaert (Katholieke Universiteit Leuven, Leuven, Belgium)

THE EFFECTS OF MICROWAVES (9.7 GHz) ON THE IN SITU MEMBRANE-BOUND ACETYLCHOLINESTERASE IN THE VAGAL HEART SYSTEM. W. Young, *et al.* (San Jose State Univ., San Jose, CA)

EFFECTS OF FETAL EXPOSURE OF MICE TO R.F. RADIATION. J. C. Nelson, *et al.* (Wayne State Univ., Detroit, MI)

WIDE BAND (1-10 GHz) CHARACTERIZATION OF ELECTRICAL PROPERTIES OF TISSUE EQUIVALENT BOLUS. A. Y. Cheung, *et al.* (Univ. Maryland, College Park, MD)

BIOLOGICAL EFFECTS OF RADIOFREQUENCY AND MICROWAVE RADIATION AND THEIR RELEVANCE TO OCCUPATIONAL SAFETY AND HEALTH STANDARDS IN THE UNITED STATES. R. F. Cleveland, *et al.* (Equitable Environmental Health, Inc., U.S.A.)

AN INTERNATIONAL PROGRAM ON NONIONIZING RADIATION PROTECTION. M. J. Suess (World Health Organization, Denmark)

TOWARDS PRUDENT DEFINITION OF NONIONIZING RADIATION HAZARD. H. Aamlid, M. Brady (Norwegian Nonionizing Radiation Committee, Norway)

NONIONIZING ELECTROMAGNETIC R.F. AND U.H.F. RADIATIONS: APPLICATIONS AND HAZARDS. M. Vautrin (Institut National de Recherche et de Securite, France)

DRAFT REQUIREMENTS FOR SAFETY IN INDUSTRIAL MICROWAVE HEATING EQUIPMENT. M. Kleinpeter (Commission Electrotechnique Internationale, France).

PRESENT AND FUTURE MEDICAL USES OF MICROWAVES, ESPECIALLY IN CANCER THERAPY. M. Gautherie (INSERM, France)

MICROWAVE THERMOGRAPHY (68 GHz AND 30 GHz) AND BREAST CANCER. M. Gautherie, *et al.* (Faculte de Medecine de Strasbourg, Strasbourg, France)

COMBINED METHODS OF DOSIMETRY IN MICROWAVE HEATING. Y. Leroy, *et al.* (Universite des Sciences et Techniques de Lille, Lille, France)

COMPUTER-CONTROLLED MULTIPLE BEAM MICROWAVE THERMOTHERAPY. G. M. Samaras (Univ. Maryland, Sch. Medicine, College Park, MD)

MICROWAVE RADIOMETRY AT 9 GHz: APPLICATION TO BREAST CANCER AND OTHER TUMOR SITES. PRELIMINARY RESULTS. M. Gautherie, *et al.* (Universite de Strasbourg et Universite des Sciences et Techniques de Lille, Lille, France)

MEASUREMENT OF HYPERTHERMIA OF HEALTHY AND TUMOR-BEARING MICE IN A 432-MHz FIELD BY MICROWAVES AND INFRARED THERMOGRAPHY AND BY THERMOCOUPLES. J. Robert, *et al.* (Laboratoire de Biophysique, Nancy, France)

INHIBITION OF ACUTE EXPERIMENTAL VIRAL INFECTIONS BY WHOLE-BODY MICROWAVE (2,450 MHz) HYPERTHERMIA. S. Szmigielski (Center for Radiobiology and Radioprotection, Poland)

EFFECT OF LOCALIZED MICROWAVE HEATING ON RAT EMBRYOS. V. P. Popovic (Emory Univ., Sch. Medicine, Atlanta, GA)

TREATMENT OF EXPERIMENTAL NEOPLASMS BY LOCAL MICROWAVE (2,450 MHz) HYPERTHERMIA. W. Roskowski, *et al.* (Center for Radiobiology and Radioprotection, Poland)

ELECTROMAGNETIC WAVE APPLICATOR FOR HYPERTHERMIA. CHOICE OF FREQUENCY BANDS AND POWER LEVELS ACCORDING TO TUMOR DEPTH. D. Michel, S. Lefeuvre (France)

FOCUSSING LONG-WAVE THERMOGRAPHY. J. Edrich (Univ. Denver, Denver, CO)

BIOELECTROMAGNETICS SYMPOSIUM

Date: June 18-22, 1979
Place: Seattle, WA: Univ. Washington
Sponsor: USNC/URSI (Commissions A and B); Bioelectromagnetics Society
Requests for Information: A. W. Guy, Technical Program Committee Chairman, Bioelectromagnetics Symposium, c/o Dept. Rehabilitation Medicine, Univ. Washington School of Medicine, Seattle, WA
Content: Behavioral effects; Central Nervous System effects; diagnostic applications; dosimetry; extra low frequency effects; exposure systems and instrumentation; hyperthermia and therapeutic applications; immunological and hematopoietic effects; macromolecular and cellular effects; mutagenic and developmental effects; sensory effects; thermometry

Selected Bibliography of Papers to be Presented:

KEYNOTE ADDRESS, FROM MICE TO MAN. W. A. G. Voss

USA-USSR EM RESEARCH EXCHANGE PROGRAM: PROGRESS REPORT. D. I. McRee, M. G. Shandala

EM RESEARCH PROGRAM: INSTITUTE OF BIOLOGICAL PHYSICS, ACADEMY OF SCIENCES, USSR. I. G. Akoev

METABOLIC AND PHYSICAL SCALING IN MICROWAVE/RADIOFREQUENCY BIOEFFECTS STUDIES. S. M. Michaelson, S-T. Lu

DIFFERENTIAL HEATING OF THE CORTEX, HYPOTHALAMUS AND RECTUM IN THREE SPECIES BY 2,450-MHz MICROWAVES. V. Bruce-Wolfe, D. L. Reeves, D. R. Justesen

THERMAL EFFECTS ON COLONIC AND REGIONAL BRAIN TEMPERATURE IN UNANESTHETIZED RATS EXPOSED TO 2450 MHz MICROWAVES. W. M. Williams, S-T. Lu, S. M. Michaelson

MODIFICATION OF MICROWAVE BIOLOGICAL END-POINTS BY INCREASED RESTING METABOLIC HEAT LOAD IN RATS. S-T. Lu, N. Lebda, S. Pettit, S. M. Michaelson

MICROWAVE MODIFICATION OF THERMOREGULATORY BEHAVIOR: THRESHOLD AND SUPRATHRESHOLD EFFECTS. E. R. Adair, J. B. Pierce

MICROWAVES AFFECT THERMOREGULATORY BEHAVIOR IN RATS. S. Stern, L. Margolin, B. Weiss, S-T. Lu, S. M. Michaelson

MICROWAVE EFFECT ON THE PARAMETERS OF THE MODEL SYNAPTIC MEMBRANE. O. V. Kolomitkin, V. I. Kuznetsov, I. G. Akoev

EVIDENCE OF NEUROPATHOLOGY IN CHRONICALLY IRRADIATED HAMSTERS BY 2450 MHz MICROWAVES AT 10 mW/cm^2. E. N. Albert

ELIMINATION OF MICROWAVE EFFECTS ON THE VITALITY OF NERVES AFTER ACTIVE TRANSPORT HAS BEEN BLOCKED. D. I. McRee, H. Wachtel

EFFECTS OF RADIO FREQUENCY FIELDS ON THE EEG OF RABBIT BRAINS. S. Takashima, H. P. Schwan

IN VITRO STUDY OF MICROWAVE EFFECTS ON CALCIUM EFFLUX IN RAT BRAIN TISSUE. W. W. Shelton, Jr., J. H. Merritt

RETINAL GANGLION-CELL ACTIVITY INDUCED BY ELF-FIELDS. P. Lovsund, P. A. Oberg, S. E. G. Nilsson

MICROWAVE SHORT-TIME EXPOSURE EFFECT ON GONADS. A. Ch. Achmadieva, E. N. Smirnova, I. G. Akoev

CHANGES IN THE ELECTROCARDIOGRAMS OF RATS AND DOGS EXPOSED TO DC MAGNETIC FIELDS. C. T. Gaffey, T. S. Tenforde

CARDIOVASCULAR RESPONSE OF RATS EXPOSED TO 60-Hz ELECTRIC FIELDS. D. I. Hilton, R. D. Phillips

DUAL ACTIONS OF MICROWAVES ON SERUM CORTICOSTERONE IN RATS. S-T. Lu, S. Pettit, S. M. Michaelson

ENDOCRINE FUNCTION IN RHESUS MONKEYS AND RATS EXPOSED TO 1.29 GHz MICROWAVE RADIATION. W. G. Lotz

MEASUREMENTS OF THE RF POWER ABSORPTION IN HUMAN AND ANIMAL PHANTOMS EXPOSED TO NEAR-FIELD RADIATION. M. F. Iskander, H. Massoudi, C. H. Durney, S. J. Allen

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A METHOD OF CALCULATING ELECTROMAGNETIC ABSORPTION UNDER NEAR-FIELD EXPOSURE CONDITIONS. I. Chatterjee, O. P. Gandhi, M. J. Hagmann, A. Riazi

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A THERMAL MODEL OF THE HUMAN BODY EXPOSED TO AN ELECTROMAGNETIC FIELD. D. M. Deffenbaugh, R. J. Spiegel, J. E. Mann

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ELECTRIC AND MAGNETIC FIELD INTENSITIES AND ASSOCIATED INDUCED BODY CURRENTS IN MAN IN CLOSE PROXIMITY TO A 50 kW AM STANDARD BROADCAST STATION. R. A. Tell, E. D. Mantiply, C. H. Durney, H. Massoudi

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A BRAODBAND AND COMPACT APPLICATOR FOR DEEP TISSUE HEATING USING FOCUSSED MICROWAVE. M. F. Iskander, C. H. Durney, D. A. Christensen, A. Riazi

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LOCALIZED RF HYPERTHERMIA ON HAMSTER CHEEK POUCH CARCINOMA. D. P. Colvin, B. S. Burgess, A. L. Patra, J. D. Doss, B. R. Marsh, J. K. Frost

LOCALIZED MICROWAVE HYPERTHERMIA AT X-BAND ON EXTERNAL TUMORS IN MICE. A. Feldman, L. H. Piette

LOCALIZED HYPERTHERMIA IN DOG BRAIN USING AN INVASIVE MICROWAVE PROBE. J. W. Strohbehn, E. B. Douple, D. W. Roberts, D. DeSieyes, B. S. Trembly, R. Matic, S. Brown, P. Runstalder

ELECTRICAL PROPERTIES OF TISSUE EQUIVALENT BOLUS FOR MICROWAVE HYPERTHERMIA. A. Y. Cheung, G. H. Harrison, L. S. Taylor, P. D. Hrycak

A SYSTEM FOR PRODUCING LOCALIZED HYPERTHERMIA IN BRAIN TUMORS THROUGH MAGNETIC INDUCTION HEATING OF FERROMAGNETIC IMPLANTS. P. R. Stauffer, T. C. Cetas, R. C. Jones, M. R. Manning

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INFLUENCE OF MICROWAVE-INDUCED TEMPERATURE GRADIENTS ON THE UPTAKE OF CHEMOTHERAPEUTIC AGENTS BY EXPERIMENTAL BRAIN TUMORS IN MICE. C. H. Sutton, F. B. Carroll, Q. Balzano

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MOLECULAR LEVEL EFFECTS OF MICROWAVES ON NATURAL AND MODEL MEMBRANES: A RAMAN SPECTROSCOPIC INVESTIGATION. J. P. Sheridan, B. P. Gaber, F. C. Cavatorta, P. E. Schoen

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THE EFFECTS OF 9-GHz PULSED MICROWAVES ON CIRCULATING ANTIBODY TITERS OF MICE. C. G. Liddle, J. P. Putnam, J. Y. Lewis, B. Bell, M. W. West, O. L. Huey

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SERUM AND LYMPHOCYTES FROM MICROWAVE EXPOSED MICE ENHANCE CELL-MEDIATED EFFECTOR FUNCTION: INCREASED LYMPHOCYTE-MEDIATED CYTOTOXICITY DURING ALLOGRAFT REJECTION OF EL-4 LYMPHOMA CELLS. R. P. Liburdy

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EFFECTS OF 60 Hz ENVIRONMENTAL ELECTRIC FIELDS ON THE CENTRAL NERVOUS SYSTEM OF LABORATORY RATS. S. M. Bawin, I. Sabbot, B. Bystrom, P. M. Sagan, W. R. Adey

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EFFECTS OF HIGH INTENSITY 60 Hz ELECTRIC FIELDS ON PRIMATE BEHAVIOR: EXPOSURE FACILITY, FIELD MEASUREMENT TECHNIQUES AND INDIVIDUAL PERFORMANCE. C. S. Feldstone, R. T. Smith, H. F. Barsun, E. Bronaugh, R. Spiegel, J. Polonis, E. E. Dean, K. St. Mary, A. D. Smith

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AN IMPROVED IMPLANTABLE ELECTRIC FIELD PROBE FOR MICROWAVE DOSIMETRY. H. Bassen, K. Franke, S. Neuder, E. Aslan

AN NONPERTURBING TEMPERATURE PROBE SYSTEM DESIGNED FOR HYPERTHERMIA MONITORING. D. A. Christensen, R. J. Volz

AN OPTICAL NONPERTURBING PROBE FOR TEMPERATURE MEASUREMENTS IN BIOLOGICAL MATERIALS EXPOSED TO MICROWAVE RADIATION. F. Cavatorta, P. E. Schoen, J. P. Sheridan

COMMERCIAL MICROWAVE HAZARD METERS: A LABORATORY EVALUATION. W. A. Herman, D. M. Witters, Jr.

A HIGH-SENSITIVITY, ULTRA-BROADBAND RADIATION PROBE. S. Hopfer, Z. Adler

DOSIMETRIC USE OF SCHOTTKY DIODES. W. A. Herman

POWER DENSITY FLUX MEASUREMENTS. T. M. Babij, H. Trzaska

CONSIDERATIONS AND CRITERIA FOR A RECOMMENDED STANDARD FOR OCCUPATIONAL EXPOSURE TO RADIOFREQUENCY AND MICROWAVE FIELDS. R. F. Boggs, Z. R. Glaser, J. K. Kielman

DEVELOPMENT OF OCCUPATIONAL EXPOSURE RECOMMENDATIONS: OBSERVATIONS ON THE USES OF RF/MICROWAVE ENERGY. Z. R. Glaser, R. F. Boggs, R. F. Cleveland, J. K. Kielman

MEASURED MODULATION WAVEFORM OF LEAKAGE RADIATION MICROWAVE OVENS. H. S. Ho, W. P. Edwards

MICROWAVE-INDUCED PRESSURE WAVES IN A MODEL OF BIOLOGICAL TISSUE. R. G. Olsen, W. C. Hammer

ELECTROMAGNETIC EXPOSURE EFFECTS ON THE VISUAL SYSTEM OF A FLYING INSECT. S. S. Sandler, W. Peros

RADIATION OF OPEN WAVEGUIDES APPLICATION TO BIOMEDICAL PROBES. J. Audet, J. Ch. Bolomey, Ch. Pichot

A CORRUGATED WAVEGUIDE APPLICATOR. Q. Balzano, O. Garay, C. H. Sutton

MEASURED INTERNAL ELECTRIC FIELD IN PHANTOM HUMAN HEADS EXPOSED TO LEAKAGE RADIATION FROM MICROWAVE OVENS. H. S. Ho, W. P. Edwards, H. Bassen

MEASUREMENTS OF ELECTOMAGNETIC ACTIVITIES OF THE HUMAN BODY IN THE FREQUENCY REGION 1 kHz-2 GHz. B. Enander, G. Larson

MICROWAVE DIATHERMY TREATMENT OF THE HUMAN THIGH: THE SIMULTANEOUS MEASUREMENT OF MUSCLE BLOOD FLOW (MBF) AND TEMPERATURE OF THE HUMAN THIGH DURING MICROWAVE DIATHERMY. K. M. Sekins, A. F. Emery, J. F. Lehmann, W. B. Nelp, D. Dundore

IMMUNOLOGIC ASPECTS IN CANCER TREATMENT BY MICROWAVE HYPERTHERMIA. W. Roszkowski, S. Szmigielski, M. Janiak

MICROWAVE EFFECTS ON ENERGY LEVELS OF BRAIN AND MALIGNANT BRAIN TUMOR. A. P. Sanders, D. J. Schaefer, W. T. Joines

ELECTRICAL STIMULATION OF ALVEOLAR BONE. D. B. Harrington, T. A. Chen, P. Mollica, F. Davis

IN VIVO STUDY OF 60 Hz ELECTRIC FIELD EFFECTS. D. M. Koltun, S. N. Ackerman, D. M. Weissfeld, J. M. Seto, Y. J. Seto

GROWTH OF RATS AND MICE EXPOSED TO 60 Hz ELECTRIC FIELDS. R. D. Phillips, J. H. Chandon, D. I. Hilton, R. L. Sheldon

EFFECTS OF EXPOSURE TO 60 Hz ELECTRIC FIELDS ON GROWTH AND DEVELOPMENT IN THE RAT. L. D. Montgomery, L. G. Smith, M. R. Sikov

CHRONIC EXPOSURE OF RATS TO 100-MHz (CW): ASSESSMENT OF BIOLOGICAL EFFECTS. R. J. Smialowicz, E. Berman, S. J. Bursian, J. B. Kinn, C. G. Liddle, L. W. Reiter, C. M. Weil

THE EFFECT OF PRENATAL MICROWAVE EXPOSURE ON THE DEVELOPMENT OF BEHAVIORAL RESPONSES IN THE MOUSE. J. C. Monahan

DEVELOPMENT ALTERATIONS IN RATS FOLLOWING IN VIVO EXPOSURE TO 500 $\mu W/cm^2$, 2450 MHz MICROWAVES. S. J. Mizumori, R. H. Lovely, R. R. Johnson, A. W. Guy

THE EFFECT ON THE HEART RATE OF EMBRYONIC QUAIL OF 2450 MHz ELECTROMAGNETIC WAVES. P. E. Hamrick, D. I. McRee

TERATOGENICITY OF 27.12 MHz RADIOFREQUENCY RADIATION IN RATS. J. M. Lary, D. L. Conover, E. D. Foley, P. L. Hanser

STUDIES CONCERNING THE EFFECTS OF NON-THERMAL PROTRACTED PRENATAL 2450 MHz MICROWAVE IRRADIATION ON PRENATAL AND POSTNATAL DEVELOPMENT IN THE RAT. R. P. Jensh, W. H. Vogel, J. Ludlow, T. McHugh, R. L. Brent

EXPOSURE OF PREGNANT MICE TO 2.45 GHz MICROWAVE RADIATION. D. I. McRee, P. Nawrot

TERATOGENIC EFFECTS OF RF RADIATION ON MICE. J. C. Nelson, J. C. Lin, M. E. Ekstrom

OBSERVATIONS OF RAT FETUSES AFTER IRRADIATION WITH 2.45 GHz (CW) MICROWAVES. E. Berman, H. B. Carter, D. House

TERATOLOGY IN RATS EXPOSED TO 2450 MHz MICROWAVES AT INTENSE AND INTERMEDIATE DOSE RATES. M. E. Chernovetz, D. Reeves, D. R. Justesen

XII INTERNATIONAL CONFERENCE ON MEDICAL AND BIOLOGICAL ENGINEERING/V INTERNATIONAL CONFERENCE ON MEDICAL PHYSICS

Date: August 19-24, 1979
Place: Jerusalem, Israel
Sponsor: Israel Society for Medical & Biological Engineering (ISMBE); International Federation for Medical & Biological Engineering (IFMBE); Internat'l Organization for Medical Physics (IOMP); Israel Society for Medical Physics (ISMP)
Requests for Information: Dr. A. Werner, Chaim Sheba Medical Center, Dept. Oncology, Sackler School of Medicine, Tel-Hashomer, Israel
Content: Tentative topics include artificial organs, biomaterials, biomechanics, clinical engineering, diagnostic radiology, hazards and safety, health physics, nonionizing radiation, medical instrumentation, and radiation dosimetry

NINTH EUROPEAN MICROWAVE CONFERENCE

Date: September 17-21, 1979
Place: Brighton, England: The Brighton Centre
Sponsor: The Institution of Electrical Engineers; Institution of Electronic and Radio Engineers
Requests for Information: Professor Peter Clarricoats, European Microwave Conference Chairman, Dept. Electrical & Electronic Engineering, Queen Mary Coll., Mile End Rd., London, E.1. 4NS, England
Content: Topics will include microwave technology and instrumentation

ENGINEERING IN MEDICINE AND BIOLOGY: 32nd Annual Conference

Date: October 6-10, 1979
Place: Denver, CO: Denver Hilton Hotel
Sponsor: Alliance for Engineering in Medicine and Biology (AEMB)
Requests for Information: Mrs. P. I. Horner, Administrative Director, Alliance for Engineering in Medicine and Biology, 4405 East-West Highway, Suite 404, Bethesda, MD 20014
Content: Topics will include bioelectric signals--EKG, EEG, EMG; biomaterials; biotelemetry; noninvasive diagnostic technology; biomedical transducers; mathematical models and simulation; microprocessors in biomedical applications; standards and regulations

WESTERN OCCUPATIONAL HEALTH CONFERENCE

Date: October 11-13, 1979
Place: San Francisco, CA: Fairmont Hotel
Sponsor: Western Occupational Medical Assoc. (WOMA); American Industrial Hygiene Assoc. (AIHA); Health Physics Society (HPS); American Society of Safety Engineers (ASSE); Western Assoc. Occupational Health Nurses (WAOHN)
Requests for Information: B. H. Bravinder, WOMA, Box 201, Alamo, CA 94507
Content: Topics will include Fundamentals and New Directions in Industrial Hygiene; Fundamentals of Radiation Safety; Magnetic Fields in New and Old Technologies and Their Potential Biomedical Effects

INTERNATIONAL RADIATION PROTECTION ASSOCIATION: SECOND ASIAN REGIONAL CONGRESS ON RADIATION PROTECTION

Date: November 19-23, 1979
Place: Manila, Philippines
Sponsor: Philippine Association for Radiation Protection; Japan Health Physics Society
Requests for Information: Dr. Celia T. Anatalio, Congress President, Director, Radiation Health Office, Ministry of Health, San Lazaro Compound, Rizal Avenue, Sta. Cruz, Manila, Philippines
Content: Topics will include environmental radiation hazards and protection, medical radiation hazards and protection, nuclear power and irradiation facilities, dosimetry, public education and acceptance, research and new developments in radiation protection, regulations, codes and standards, nonionizing radiation, special topics on radiation protection, and health physics training and manpower development

RADIOLOGICAL SOCIETY OF NORTH AMERICA: Annual Meeting

Date: November 25-30, 1979
Place: Atlanta, GA
Sponsor: Radiological Society of North America (RSNA)
Requests for Information: Ms. A. Swenson, RSNA, Suite 1150, Oak Brook Regency Towers, 1415 W. 22nd St., Oak Brook, IL 60521
Content: Topics will include diagnostic radiology, therapeutic radiology, nuclear medicine, ultrasound, pediatric radiology, neuroradiology, physics, cardiovascular radiology, and radiobiology