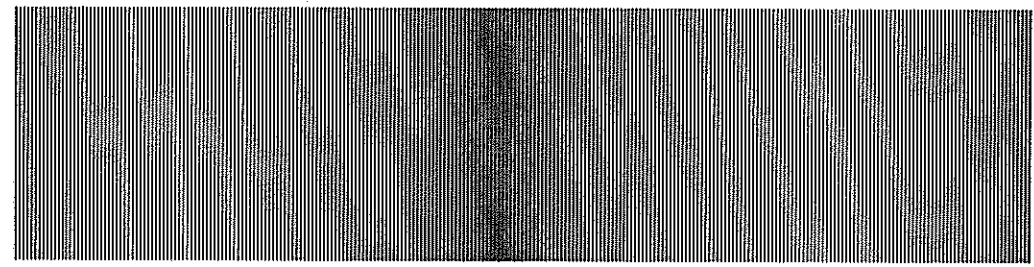


MICRO WAVE NEWS



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A Monthly Report on Non-Ionizing Radiation

June 1984

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Pulsed Magnetic Fields: Conflicting Results

Low frequency magnetic fields are becoming a focal point for bioeffects research. One of the major objectives is to replicate the experiments of Dr. Jose Delgado, who has shown that very low intensity, pulsed magnetic fields can have a dramatic effect on a developing chick embryo. Scientists are anxious to repeat and explain Delgado's experiments because, if confirmed, his results could shed new light on how radiation interacts with living systems and could force a major reassessment of radiation hazards.

At least three research groups are trying to replicate Delgado's experiments, with varying success. One team has failed, another has partially succeeded and a third will start work later this summer. In addition, workshops to exchange research ideas are being planned and funds are being set aside to allow scientists on both sides of the Atlantic to visit each other's labs.

Delgado's Experiment

In 1982, Delgado and his associates at the Centro Ramon y Cajal Hospital in Madrid, Spain, showed that pulsed magnetic fields at frequencies of 10, 100 and 1000 Hz can have a "consistent and powerful" effect on the growth and development of chick embryos at intensities ranging from 1.2-120 milligauss (see *MWN*, March 1983). In a follow-up study, Delgado's group concluded that pulse shape could be the decisive parameter for determining whether magnetic fields modified embryonic development, though the precise mechanism remained unknown (see *MWN*, November 1983).

(continued on p. 2)

EPA Delays Decision on Releasing RF/MW Guidance

The Environmental Protection Agency (EPA) has delayed the release of its proposed radiofrequency/microwave (RF/MW) radiation exposure guidance, which was scheduled for this month. In the first official statement to indicate rule making may be abandoned, EPA Assistant Administrator Joe Cannon announced in early June that the agency is considering a number of options for the guidance, including putting it on ice.

As we go to press, agency officials would only say that an active "internal debate" is in progress and that a decision should be reached later this summer.

Meanwhile, the Office of Research and Development's report on RF/MW bioeffects has received final approval from EPA's Scientific Advisory Board. The document was prepared as the basis for standard setting (see Standards Update, p. 12).

Miller Fails

Dr. Morton Miller, of the University of Rochester in New York, has completed his attempts to duplicate the effects reported by Delgado. "We found absolutely nothing," he said in a telephone interview. Miller studied only the two highest frequencies (100 and 1000 Hz) and the two highest intensity levels (12 and 120 milligauss) used in Delgado's original experiment. Professor Edwin Carstensen of the university's department of electrical engineering and Sandra Maffeo, a lab technician, collaborated with Miller on the study. Miller is with the department of radiation biology and biophysics at the School of Medicine and Dentistry.

Miller used 0.5 millisecond pulses with rise times of approximately 10 microseconds.

He noted that the study had been run "blind," but that there was one difference between his set up and that of Delgado's. The eggs in the two experiments had different orientations with respect to the coils. Thus, according to Miller, the induced electric fields in Delgado's eggs were "slightly higher."

Miller expressed disappointment about coming up empty-handed. "I haven't a clue why we did not get any results in comparison with Delgado's massive effects," he said.

A paper describing Miller's results has been accepted by the *Journal of Anatomy*, the same journal that published Delgado's two papers. In it, the Rochester team concludes: "Our failure to replicate the results of [Delgado's] earlier report cannot be said to invalidate that work. It does imply that if there are effects of magnetic fields on embryogenesis, they must be very subtly related to the conditions of exposure. In view of the obvious importance of the observations, we strongly encourage other independent investigators to try to replicate the observations." The paper should appear later this year.

Mild's Partial Success

Dr. Kjell Hansson Mild, of Sweden's National Board of Occupational Safety and Health in Umea, has had some success where Miller failed. In a telephone interview from Sweden, Mild said that he had detected the Delgado effect: "We seem to have confirmed the same general trend, but with a lower rate of malformation." Mild noted that the effect he observed was statistically significant.

In his original paper, Delgado reported that nearly 80 percent of the eggs developed abnormally when exposed to pulsed magnetic fields. Mild said that he was finding an abnormality rate of about 30 percent. He added that more of

the control eggs in his experiment were developing normally than in Delgado's.

There was at least one minor difference between Mild's and Delgado's experiments. Mild pointed out that, "We have slightly different techniques for preparing the embryos."

Mild used a 10 milligauss peak field, with pulses that were 0.5 milliseconds wide with 40 microsecond rise and fall times. The pulse repetition rate was 100 pulses per second (100 Hz).

Mild said that he is preparing a short communication describing his results for submission to *Bioelectromagnetics*.

EPA-NIEHS' Attempt

The third attempt to repeat Delgado's experiment will be made by a team from the Environmental Protection Agency (EPA) and the National Institute for Environmental Health Sciences (NIEHS) in Research Triangle Park, NC (see *MWN*, January/February 1984). According to the current schedule, the study will begin later this summer.

Before the power is turned on by the EPA-NIEHS team, EPA's Richard Tell and Dr. Ezra Berman will visit Delgado's lab in Madrid. "I want to understand all of Delgado's field parameters before we start," Tell said. The EPA trip will be sponsored by the Office of Naval Research (ONR).

According to ONR's Dr. Michael Marron, Dr. Tom Rozzell has visited Delgado's lab and was impressed with what he saw there. (Rozzell is on a two-year assignment at ONR's London office.) Using funds from ONR's visiting scientist program, the Navy is planning to fly two of Delgado's associates to the US later this year.

CW Fields

Dr. H.B. Graves would also like to try to repeat Delgado's experiment. He recently completed a study in which he exposed some 20,000 chicken eggs to continuous wave (CW) 60 Hz fields ranging from 100 V/m to 100 kV/m, and found no effects on a large number of end points, including growth, body weight and behavior. The study was sponsored by the Electric Power Research Institute (EPRI).

Graves, who is a professor of biology and poultry science at Pennsylvania State University, said that he had asked both EPRI and the US Department of Energy (DOE) for funds to attempt a Delgado replication with no success. "I feel like the Delgado study has implications that are too important to ignore," Graves said in a telephone interview. "We must seize upon this to try and understand how such a signal can couple with a living system."

Dr. Rob Kavet at EPRI told *Microwave News* that the institute has no immediate plans to fund a Delgado-type study because that kind of pulsed signal does not show up in transmission line environments.

Graves opposed this view. He maintained that, "It's an error for EPRI not to fund a replication. If Delgado's effect is robust, it has implications for utilities and many other industries." (Miller said that his study had been supported by DOE and the Empire State Electrical Energy Research

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Corp., a consortium of New York state private utilities modeled after EPRI.)

Why is Replication Difficult?

A number of scientists were asked why they thought it was so difficult to repeat Delgado's experiment. A common reply was that Delgado had not provided detailed descriptions of his study design in his published papers. For instance, in his first paper, Delgado does not specify the rise time of the pulses he used, a variable he claims in his second paper may be the "decisive parameter." In that latter paper, he reported finding a maximum effect with a rise time of 42 microseconds and an intensity of 10 milligauss.

Although Miller and co-workers claim to have attempted a replication of Delgado's experiment, they used a different pulse shape with a 10 rather than 42 microsecond rise time.

If Delgado's hypothesis that there are windows in the teratogenic effects of electromagnetic fields proves to be correct, the differences in pulse shape and field intensity could be decisive.

Others suggested that a number of variables could be critical: the orientation of the exposed eggs to the Earth's magnetic field, the temperature at which the eggs are incubated and the way the eggs are handled during the course of the experiment. Mild speculated that, "There may be some

other parameter that we are not controlling for."

According to Marron, Rozzell noted in a report on his visit to Delgado's lab that he had been told that the orientation of the exposed eggs to the Earth's magnetic field is a crucial variable. Neither Miller nor Mild took this factor into account in their experiments — because it is not cited in Delgado's papers.

Delgado was in Sweden in May, and Mild met with him. Mild reports that Delgado is now exposing live, pregnant rodents to pulsed magnetic fields and investigating changes in the brain chemistry of the embryos.

Workshops

ONR's Marron told *Microwave News* that he is considering organizing a workshop on low frequency fields for this fall.

In addition, there will be a symposium on "Magnetic Fields and Biological Systems" on the evening of July 15 at the Bioelectromagnetics Society (BEMS) meeting in Atlanta, GA. Among the papers to be presented is a review of preliminary attempts by Tell and co-workers to duplicate Delgado's results.

Delgado, Mild and Miller will not be at the BEMS conference; Mild and Miller are planning to attend the Hanford ELF symposium in Richland, WA, in early October. ●

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Health Hazards of Electromagnetic Fields

This new report reviews basic aspects and all latest research from ELF to microwaves, including 60 Hz power installations. Practical advice on health/environmental impacts. \$60 plus \$2 postage (US). Robert O. Becker, MD, Star Route, Lowville, NY 13367.

A Guide to FCC Equipment Authorizations

The updated second edition of the original book by William K. Roberts, former Assistant Chief Engineer of the FCC. Tells what type of authorization is required for your product and the procedure to use in obtaining FCC authorization. To be released in the second quarter of 1984. Send check or p.o. for \$79.50 to the EMXX Corp., 6706A Deland Drive, Springfield, VA 22152, (703) 451-4619.

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Computers on Aircraft: RFI More Likely

New test results from the Federal Aviation Administration (FAA) and the Boeing Airplane Co. indicate that electronic devices can interfere with an airplane's navigation and communications systems. According to Frank White, the chairman of a study panel investigating the potential dangers of radiofrequency interference (RFI) aboard aircraft, "There is now a definite possibility for RFI."

Although two incidents of RFI aboard aircraft have been reported, concerns over interference have been discounted by experts. Nevertheless the Radio Technical Commission for Aeronautics' (RTCA) Special Committee 156 (SC156) on Potential Interference to Aircraft Electronics Equipment from Devices Carried Aboard, under White's leadership, has been pressing computer manufacturers, aircraft companies, airlines and government agencies to generate data on the nature and scope of the problem (see *MWN*, October 1983 and April 1984).

In a memorandum prepared for the next meeting of RTCA SC156, Boeing reported that measurements made aboard one of its 757s indicated "that devices radiating at the specification limits produce interfering signal levels far above the receiver sensitivity threshold and therefore are a potential interference threat." Boeing concluded that, "In view of the results...we cannot rely on the inherent shielding of the aircraft fuselage to provide sufficient shielding effectiveness to protect airborne receivers from levels permitted for a class B device."

Previous FAA tests had shown that there was little likelihood of interference when the radiating source was placed in the aisle of the plane. More recent FAA measurements confirmed the Boeing findings: the mean minimum path loss for a radiating antenna against the window and in the aisle is 51.41 and 59.12 dB respectively. These new findings could affect the use of computers and other electronic devices on airplanes; as Boeing wrote to RTCA, "it is not practical to restrict the use of personal computers to those sitting in aisle seats."

In another memorandum to RTCA, David Hanttula of Apple Computer argues that the immunity of aircraft electronic equipment to RFI has not yet been fully characterized. "We must know what the immunity thresholds of the equipment are," he told *Microwave News*. Hanttula also wants RTCA to characterize the "interior electromagnetic ambients" aboard aircraft "to determine what RF levels are present without the presence of carried aboard electronic devices." (Hanttula is leaving Apple as of June 1, but he said that he plans to attend at least one more SC156 meeting.)

When asked in a telephone interview how serious the RFI problem might be, RTCA's White answered that, "We must see if the signals are strong enough and stable enough to cause RFI." To that end, White wants committee members to carefully characterize potentially interfering emissions. He added that the FAA and Boeing tests reflected worst case

rather than actual operating conditions.

More data will be generated before the next SC156 meeting on June 12-13. As White put it, "We have a lot of learning to do and I'm not drawing any conclusions yet."

Yannon v. RCA Suit Continues

The widow of a former New York Telephone radio technician has successfully appealed the dismissal of her \$3.5 million product liability suit against RCA. Mrs. Antoinette Yannon alleges long-term occupational exposure to microwave radiation caused her husband's illness and eventual death, a claim for which she won workers compensation benefits (see *MWN*, April 1981 and June 1982). RCA's motion for dismissal will now be reheard.

Samuel Yannon worked on microwave relay equipment at the Empire State Building for 15 years before being transferred to another site in 1968. The phone company forced him to retire in 1971 for medical reasons. Yannon died in 1974.

Mrs. Yannon's New York State workers compensation case was the first to present "substantial evidence to establish the necessary causal relationship" between exposure to microwave radiation and occupational disease ending in death. The current product liability case, however, will be much more difficult to win. Should RCA's motion for dismissal be denied, Mrs. Yannon must then prove that her husband's condition was causally linked to radiation exposure and that RCA, as the manufacturer of the equipment he worked on, was at fault.

In an April 30 decision, the Appellate Division of the New York State Supreme Court, Second Department, in Brooklyn reversed a July 1982 ruling by Supreme Court Judge Richard Goldberg which granted RCA's motion for dismissal based on the statute of limitations (see *MWN*, July/August 1982). A new hearing on the motion will be scheduled before the Supreme Court, Richmond County, for some time this year.

The key issue in this pre-trial action is whether Samuel Yannon was mentally capable of filing suit in 1968, the last year of his exposure to radiation. RCA maintains he was legally sane, and that therefore the statute of limitations had expired before Mrs. Yannon filed suit in 1976. Mrs. Yannon claims that by 1968 her husband was suffering from "chronic brain syndrome" caused by radiation exposure which left him incapable of managing his own affairs or defending his legal rights (see *MWN*, April 1982).

Brian Shoot, one of the attorneys representing Mrs. Yannon, told *Microwave News* that she has a good chance of defeating RCA's motion at the next hearing. The appellate court ruling will allow Mrs. Yannon to submit important evidence which was disallowed by Judge Goldberg. Shoot is a member of the New York City law firm of Schneider, Kleinick and Weitz, which was hired by Mrs. Yannon's personal attorney, David Paully, to handle the appeal and to act as trial counsel.

RCA refused to comment on the case.

Non-Union Fractures: PEMFs Ineffective?

Preliminary results from the first double-blind study of the efficacy of pulsed electromagnetic fields (PEMFs) for the treatment of non-union bone fractures indicates that immobilization without weightbearing may be more effective than PEMF therapy.

In the May 5 issue of *Lancet*, a team led by Dr. A.T. Barker of Sheffield University in England reports interim results on their study of tibial fractures that suggest that "conservative management of non-union is effective and this may explain much of the success attributed to pulsed magnetic field therapy." Conservative management involves stopping all movement and not placing any weight on the fracture.

The number of patients treated was small: nine received PEMF treatment, with seven controls. The fractures of five of the nine who had active coils had united at the end of 24 weeks, while five of the seven controls had also healed. All those participating in the study had fractures that were at least a year old.

One patient in the control group had been injured 11 years before the trial; his fracture was united after 24 weeks.

Those who wore active coils received 5 millisecond

pulses with a peak field of 1.5 millitesla, repeated at 15 Hz for approximately 12-16 hours a day for 24 weeks. Although the authors do not specify that they used Electro-Biology, Inc.'s coils, they credit the signal to Dr. C.A.L. Bassett, one of the company's founders.

The English researchers cite a number of possible explanations for their results, which they call unexpected: "high efficacy of long-term immobilization of the limb and avoidance of weightbearing, the placebo effect of the patients 'treating' themselves for extended periods each day, the limits on patient activity during waking hours caused by being connected to the machine with a cable approximately two meters long, the additional attention they received on their frequent visits to the clinic or any combination of the above."

Barker and his co-authors, Drs. R.A. Dixon, W.J.W. Sharrard and M.L. Sutcliffe, reported these "early" or interim results because only a small number of patients had come to their clinic. They recommend a multi-center study be undertaken with about 150 patients.

The researchers conclude, "Although long-term immobilization and conservative management is not common practice at present...it appears...that conservative management of non-union should be reappraised as a treatment of choice..."

(continued on p.6)

SHORT COURSES

July 9-12: Antenna Systems for Radar, Communications and Avionics, Los Angeles, CA. Fee: \$895. Contact: Continuing Education Institute, 10889 Wilshire Blvd., Los Angeles, CA 90024, (213) 824-9545. Repeated **July 30-August 2**: Boxborough, MA.

July 16-20: Microwave Antenna Measurements, Atlanta, GA. Fee: \$800. Contact: Dept. of Continuing Education, Georgia Institute of Technology, Atlanta, GA 30332, (404) 894-2400.

July 17-18: Radar Principles for the Non-Specialist, Washington, DC. Fee: \$625. Contact: George Harrison, Continuing Engineering Education, George Washington University (GWU), Washington, DC 20052, (800) 424-9773, or (202) 676-6106 in DC.

July 17-19: Advances in Magnetic Resonance Imaging, Andover, MA. Fee: \$655. Contact: Dick Murray, Institute for Graphic Communication, 375 Commonwealth Ave., Boston, MA 02115, (617) 267-9425.

July 17-22: Grounding & Shielding, Boulder, CO. Fee: \$815. Optional fourth day for \$235. Contact: Don White Consultants, Inc. (DWCI), Star Route 625, PO Box D, Gainesville, VA 22065, (703) 347-0030. Repeated **August 14-17**: Ottawa, Canada; **September 18-21**: San Diego, CA; **October 23-26**: Atlanta, GA.

July 31-August 3: Antenna Theory and Design, Myrtle Beach, SC. Fee: \$645. Contact: Ann Beckman, Southeastern Center for Electrical Engineering Education (SCEEE), Central Florida Facility, 11th & Massachusetts Ave., St. Cloud, FL 32769, (305) 892-6146.

August 6-10: Non-Ionizing Radiations: Biophysical and Biological Basis, Applications and Hazards in Medicine and Industry, Cambridge, MA. Fee: \$950. Contact: Office of Summer Session, Room E19-356, MIT, Cambridge, MA 02139.

August 7-9: Grounding & Interference Control in Buildings and Electrical/Electronic Facilities, Philadelphia, PA. Fee: \$785. Contact: DWCI, see July 17 above.

August 13-17: Antennas and Arrays, Ottawa, Canada. Fee: \$875. Contact: GWU, see July 17 above. Repeated **October 22-26**: Washington, DC.

August 14-15: EMI Diagnostics & Fixes, Virginia Beach, VA. Fee: \$635. Contact: DWCI, see July 17 above.

August 21-24: EMC Engineering, San Mateo, CA. Fee: \$770 (3 days); \$955 (4 days). Contact: Edith Webb, Center for Professional Advancement, PO Box 964, East Brunswick, NJ 08816, (201) 249-1400. Repeated **September 24-27**: East Brunswick, NJ.

August 27-28: Grounding, Bonding & Shielding, Washington, DC. Fee: \$625. Contact: GWU, see July 17 above.

August 27-29: Electromagnetic Pulse and Its Effects on Systems, San Diego, CA. Fee: \$695. Contact: GWU, see July 17 above. Repeated **November 19-21**: Washington, DC.

September 10-11: EMI Testing Workshop: Commercial, Philadelphia, PA. Fee: \$595. Contact: Michele Elkes, R&B Enterprises, 20 Clipper Rd., West Conshohocken, PA 19428, (215) 825-1965. Repeated **October 29-30**.

September 10-14: EMC Design & Measurement for Control of EMI, Philadelphia, PA. Fee: \$995. Contact: DWCI, see July 17 above.

September 17-21: Modern Radar Technology and Applications, Los Angeles, CA. Fee: \$895. Contact: UCLA Extension, 6266 Boelter Hall, UCLA, Los Angeles, CA 90024, (213) 825-1295.

September 17-21: Microwave Systems Planning, Washington, DC. Fee: \$875. Contact: GWU, see July 17 above.

September 20-21: EMI Testing Workshop: Military, Philadelphia, PA. Fee: \$595. Contact: R&B, see September 10 above.

September 24-25: Grounding, Bonding & Shielding, Chicago, IL. Fee: \$495. Contact: R&B, see September 10 above. Repeated **October 9-10**: Boston, MA; **November 13-14**: Washington, DC.

Immunity and ANS C63 Committees: Progress Reports

The work of the American National Standards Institute's (ANSI) Ad Hoc Committee on Public Law 97-259 has entered a new phase. The committee, which is developing voluntary standards to enhance the immunity of home electronic equipment, is now attempting to define the relationship between given levels of immunity and the resulting volume of consumer complaints.

According to committee chairman Don Heirman of AT&T Information Systems Labs, one of the next objectives of the committee is to come up with "protection distances" for TVs and VCRs from sources of interference. In this way, it is possible to suggest configurations that will reduce unacceptable RFI. This task, Heirman says, is very complex and will be difficult.

In an April 27 status report, Heirman notes that a draft standard on conducted (via the antenna) immunity of TV receivers in the 535 kHz-30 MHz frequency range has been circulated among members of the Electronic Industries Association's (EIA) Consumer Electronics Group. EIA Bulletin No.10 received general approval except from the American Radio Relay League (ARRL). ARRL wants to build in more protection from amateur radios.

Manufacturers are continuing their testing to determine the radiated immunity of TVs and VCRs. Preliminary data indicate that a target of 3 V/m is still out of reach, and some manufacturers are asking if the 3 V/m level is too strict.

An immunity level of 1 V/m may be sufficient to deal with CB radio radiofrequency interference (RFI). This problem area is diminishing because of the decreased use of CBs, improved TV receiver design and increased use of cable TV. The 1 V/m level may not take care of RFI from amateur radios, however. The question of immunity from signals above 30 MHz must still be addressed.

As the work on TVs and VCRs continues, a new working group on cordless telephones has been set up within the ad hoc committee under the chairmanship of Peter Bennett of EIA. The group's first order of business is to determine whether an electromagnetic compatibility (EMC) problem exists and, if so, how it should be approached. Interference to home security devices will be taken up later.

One of the objectives of the ANSI committee is to devise voluntary standards to reduce the number of interference complaints from consumers so that the Federal Communications Commission (FCC) can comply with the Communications Amendments Act of 1982 (PL 97-259) without setting mandatory standards (see *MWN*, October 1982 and May 1983). To make sure that the needs of the FCC are being met by the ANSI committee, an executive steering committee has been established. Its members are Don Heirman, Harold Gauper of General Electric, Dr. Ralph Showers of the University of Pennsylvania and E.N. Skomal of the Aerospace Corp.

The next meeting of the ad hoc committee is scheduled for June 12 in Washington, DC.

ANS C63

The American National Standards Committee (ANS) C63 Committee met in San Antonio, TX, on April 27 and officially changed its name to the C63 Committee on Electromagnetic Compatibility (instead of Committee on Radio-Electrical Coordination). The committee also redefined its scope:

Development of definitions and methods of measurement of electromagnetic noise and signal strengths (radiated and conducted), determination of levels of signal strength and levels of unwanted sources, limiting ratio of noise and/or unwanted sources to signal and development of methods of control of, and guidelines for, influence, coupling and immunity. *Note:* Where subjects dealt with overlap those of other national committees, appropriate liaison will be established.

Work is continuing on the revision of C63 standards. A vote on amending C63.4-1981 on measurement methods to include open area test sites was generally positive, but a number of semantic and technical problems remain unresolved. A task group under the chairmanship of Edwin Bronaugh of Electro-Metrics will tackle these details.

Within subcommittee 1 of C63, Al Smith, Jr., of IBM has completed the first draft of a two-part report on medical device EMC. Part I on emissions covers medical diathermy and ultrasound therapy equipment; Part II on immunity covers cardiac pacemakers, electroencephalographs (EEG) and electromyographs (EMG).

Meanwhile, Howard Bassen, of the Food and Drug Administration's (FDA) Center for Devices and Radiological Health, will no longer lead efforts to develop susceptibility limits for medical devices within C63. In a telephone interview, Bassen explained that there had been little support for past FDA work on medical device EMC and there was insufficient evidence that this area was a priority compared to other medical device problems.

The next meeting of the C63 Committee is tentatively scheduled for September in Washington, DC.

Bigger FY85 Research Budgets at EPA and DOE

Both the Environmental Protection Agency (EPA) and the Department of Energy (DOE) are requesting bigger budgets for their non-ionizing radiation research programs for fiscal year 1985 (FY85). Given the significant cuts in recent DOE budgets and the protracted battle to save EPA's entire radiofrequency and microwave (RF/MW) bioeffects program last year (see *MWN*, June 1983), the modest increases in the current proposals are encouraging for researchers in this field.

EPA

At EPA's Experimental Biology Division in Research Triangle Park, NC, Acting Director Dr. Joe Elder reports, "We're back and we expect to have our program continuing over the next few years." If approved, the new budget will

maintain the extra-mural research program at \$1 million but increase the in-house appropriation to \$897,700, a \$335,500 increase over FY84. The million dollars available for extra-mural contracts is triple the FY83 level.

Some of the additional funds will support new research on extremely low frequency (ELF) radiation, as work in other parts of the spectrum is extended. In its request to Congress, EPA noted that, "Presently, only continuous wave radiation (as averaged over the whole body) can be addressed in the [RF/MW exposure] guidance," and cited the need for more work in the following areas: (1) peak power, intermittent, partial body, lifetime exposures, wave modulation and non-uniform energy absorption; (2) central nervous system effects at extremely low exposure levels; and (3) frequencies outside the range of the RF/MW guidelines — especially ELF radiation.

Summing up, EPA reported that in 1985 it plans to evaluate the need for regulating exposures to radiation outside the RF/MW band and increase RF/MW research on "neurological effects, long-term low-level exposure and dose/extrapolation modeling."

DOE

DOE has requested \$3.7 million for its electric field effects program within the Electric Energy Systems Division for FY85, an increase of \$700,000 over this year's budget. The bulk of the DOE-funded research examines the health

and environmental effects of power line (ELF) radiation. Division Director Dr. Ray Dunlap reports that part of the increase will be used to evaluate whether a new program on magnetic fields is needed.

More funds will also be available for a "low-level" program on the effects of ions from DC power lines. A DOE staffer estimates that the current budget for this program is about \$300,000.

Although the proposed boost in funds for the Electric Energy Systems Division suggests a stronger commitment to ELF health effects research, the overall DOE budget shows that much of the proposed increase is the result of consolidation rather than real growth. Specifically, the ELF research program at the Office of Health and Environmental Research, which received \$1 million in FY82 and \$400,000 in FY83, was zeroed out in FY84 and will not be refunded.

The office's Martin Minthorn told *Microwave News* that "our budget has been under strong pressure for several years and some things just had to be cut." He said some of the work initially funded by Health and Environmental Research would be picked up by the Electric Energy Systems Division, which operates out of a different part of DOE.

A status report on DOE-funded research might be prepared later this year. In a telephone interview, Dunlap noted that he would like to write a brief overview of power line radiation research in addition to the abstracts from the department's annual contractors review meeting.

CONFERENCES

July 2-6: 1984 Nuclear EMP Meeting, Baltimore Hilton Hotel, Baltimore, MD. Contact: Dr. Arthur Sindoris, Harry Diamond Labs, 2800 Powder Mill Rd., Adelphi, MD 20783.

July 2-6: 4th International Symposium on Hyperthermic Oncology, Aarhus, Denmark. Contact: Dr. Jens Overgaard, Institute of Cancer Research, Radiumstationen, DK-8000 Aarhus C, Denmark.

July 9-12: 9th Annual Conference of the Australian Radiation Protection Society, Darwin, Australia. Contact: Ian Prince, C/GPO Box 1701, Darwin, NT 5794, Australia.

July 15-19: 6th Annual Bioelectromagnetics Society Meeting, Omni International Hotel, Atlanta, GA. Contact: BEMS, 1 Bank St., Gaithersburg, MD 20878, (301) 948-5530.

July 15-20: IEEE Power Engineering Society: 1984 Summer Meeting, Washington Plaza, Seattle, WA. Contact: Jack Richardson, Puget Sound Power & Light Co., 10608 NE Fourth St., Bellevue, WA. 98008, (206) 453-6800.

July 22-25: 21st Annual Conference on Nuclear and Space Radiation Effects, Broadmoor Hotel, Colorado Springs, CO; followed by **July 26-27: 1984 Hardened Electronics and Radiation Technology (HEART) Conference**, Fort Carson Army Base, Colorado Springs, CO. Contact for both meetings: B.D. Shafer, Division 2115, Sandia National Labs, Albuquerque, NM 87185, (505) 846-0629.

July 29-August 4: 8th International Biophysics Congress, Bristol, England. Contact: Meon Conferences Services, Petersfield, Hampshire GU32 3JN, England, (0730) 66561.

July 30-August 3: Gordon Conference on Bioelectrochemistry, Tilton School, Tilton, NH. Contact: Dr. Alexander Cruickshank, Gordon Research Center, University of Rhode Island, Kingston, RI 02881, (401) 783-4011.

August 13-14: Industrial Applications of Computed Tomography and NMR Imaging, Hecla Island, Manitoba, Canada. Contact: Optical Society of America, 1816 Jefferson Place, NW, Washington, DC 20036, (202) 223-8130.

August 19-23: Electromagnetic Waves and Neurobehavioral Function: A Workshop, Corsendonk, Belgium. Contact: Dr. Richard Lovely, Battelle Pacific NW Labs, PO Box 999, Richland, WA 99352, (509) 375-2269.

August 20-24: Conference on Precision Electromagnetic Measurements, Delft, Netherlands. Contact: Mrs. I.J. Smits, Department of Electrical Engineering, Delft University of Technology, PO Box 5031, 2600 GA Delft, Netherlands, 31-15-781736.

August 27-30: Open Symposium on Interaction of Electromagnetic Fields with Biological Systems, Florence, Italy. (The symposium will be held as part of the URSI Assembly, see August 28 below.) Contact: Dr. Elliot Postow, Naval Medical R&D Command, Bldg. 142, National Navy Medical Center, Bethesda, MD 20814, (202) 295-1140.

August 28-September 5: 21st General Assembly of the International Union of Radio Science (URSI), Florence, Italy. Contact: Professor A.M. Scheggi, Istituto Ricerca Onde Elettromagnetiche (IROE), Consiglio Nazionale delle Ricerche, Via Panciatichi 64, 50127 Florence, Italy, (55) 4378512.

September 10-13: 14th European Microwave Conference, Liege, Belgium. Contact: Microwave Exhibitions & Publishers, Convex House, 43 Dudley Rd., Tunbridge Wells, Kent TN1 1LE, England.

September 17-19: 19th Annual Microwave Power Symposium, Minneapolis Plaza Hotel, Minneapolis, MN. Contact: IMPI, Suite 520, 301 Maple Ave. West, Vienna, VA 22180, (703) 281-1515.

September 17-19: 37th Annual Conference on Engineering in Medicine and Biology, Los Angeles Hilton, Los Angeles, CA. Contact: Patricia Horner, Alliance for Engineering in Medicine and Biology, Suite 402, 4405 East-West Hwy., Bethesda, MD 20814, (301) 657-4142.

FDA Guide for Measurement Devices

The Food and Drug Administration (FDA) has published a useful guide to the array of non-ionizing radiation measurement devices now on the market. The report, developed by the Conference of Radiation Control Program Directors' Subcommittee G-3 on Non-Ionizing Radiation, lists the specifications for almost all commercially available instruments for measuring extremely low frequency, radiofrequency and microwave radiation, and ultrasound.

The guide was assembled specifically for state and local radiation control officers by staffers at the FDA's Center for Devices and Radiological Health and the Electrosystems Division of the National Bureau of Standards (NBS).

According to the center's Dr. Whit Athey, who headed this joint effort, the report was kept as simple and straightforward as possible in order to be of the most use to local authorities. References are provided for those needing more detailed information.

In addition to listing instrument specifications, the authors characterize each type of radiation and provide a brief

description of appropriate measurement techniques and applicable standards or safety guidelines.

The equipment specifications were provided by the manufacturers and were *not* verified by FDA or NBS. Athey said product testing will continue to be done on a case by case basis only.

The publication's tables for devices measuring extremely low frequency radiation and RF/MW radiation, and its list matching specific products with the meters that are most suitable for measuring their emissions are reprinted below. A separate list is provided for microwave oven survey instruments. The authors have excluded several inexpensive (less than \$50) devices for checking microwave oven emissions because "there are serious questions" about whether they work.

Copies of *Instrumentation for Non-Ionizing Radiation Measurement*, FDA 84-8222, January 1984, are available for \$2.00 from the Government Printing Office, Washington, DC 20402; Order No. 017-015-00220-9.

Instruments Currently Used in Microwave Oven Manufacturers' Compliance Testing Programs

| Narda Microwave Corporation | Holaday Industries |
|-----------------------------|-----------------------|
| Narda Model 8100* | Holaday Model 1700 |
| Narda Model 8110B* | Holaday Model 1501 |
| Narda Model 8201 | (5/N-20915 and above) |
| Narda Model 8250 | Holaday 1510 |
| Simpson Electric Company | |
| Simpson Model 380 M | |

* Suitable for testing 915 MHz ovens

50/60 Hertz Instruments

| Manufacturer/Instrument | E-Field Full Scale | H-Field Full Scale | Price |
|------------------------------------|--|--|--------|
| Monroe Model 238A-1 | 5/10/25 kV/m | N/A | \$595 |
| Electric Field Meas. Co. Model 111 | 1/3/10/30/100/300/1000/3000/10000/30000/100000 V/m | .01/.03/.1/.3/1/3/10/30/100/300/1000 A/m | \$1200 |

DC Electric Field Meters

| Manufacturer | Model | Full Scale | Price |
|---|-------|---|--------|
| Electric Field Measurement Co. *Requires Model 111 AC field meter. | 112* | 10/30/100/300/1000/3000/10000/30000/100000/300000 V/m (±) | \$800 |
| Monroe Electronics, Inc. | 245 | .1/.2/.5/1/2/5/10 kV/cm (±) | \$1850 |
| | 245K | (Model 245 x 2) | \$1850 |
| Trek, Inc. | 354 | Digital, to ±100 kV/m | \$695 |

Instruments Capable of Measuring Emissions from Specific Products

| Product | Instruments (numbers refer to Table 1 entries) | |
|---|--|---|
| | E Field | H Field |
| Microwave Diathermy - - - - - | 10, 15, 16, 17, 18, 19, 20, 21, 23, 24, 30, 31, 35 | Not Required |
| Microwave (cw) Industrial Equipment - - - - - | 10, 15, 16, 17, 18, 19, 20 | Not Required |
| Radar (Microwave-Short Pulse) - - - - - | 15, 17, 30, 35 | Not Required |
| Shortwave Diathermy - - - - - | 1, 2, 3, 16, 18, 19, 20, 21, 23, 24, 25, 26, 35, 37 | 4, 5, 22, 23, 32, 33, 34 |
| RF Sealers - - - - - | 1, 2, 3, 16, 18, 19, 20, 21, 23, 25, 26, 35, 37 | 4, 5, 22, 23, 32, 33, 34 |
| Video Display Terminals - - - - - | Active Antenna & Spectrum Analyzer or EMC receiver, 6, 7, 20 | 11, 12 (one-axis probe), shielded loop and spectrum analyzer, EMC receiver. |
| Police Radar - - - - - | 10, 15, 17, 18, 19, 20, 30, 31 | Not Required |
| Microwave Intrusion Alarms/Door Openers - - - - - | 10, 15, 17, 18, 19, 20, 30, 31 | Not Required |
| Mobile and Hand Field Transceivers - - - - - | 1*, 2*, 3*, 10*, 15*, 16*, 17*, 18*, 19*, 20, 21*, 23, 24, 25*, 26*, 30*, 31*, 37* | 4*, 5*, 22, 23, 32, 33, 34 |
| Microwave Ovens - - - - - | (See section on oven instruments) | Not Required |

*Partial frequency coverage.

All tables reprinted from: *Instruments for Non-Ionizing Radiation Measurement*, FDA 84-8222, January 1984. Data provided by the manufacturers.

(Based on Manufacturers' Data)

Broadband Radiofrequency/Microwave Survey Instruments

(Table I) (Based on Manufacturers' Data)

| Manufacturer/Instrument Model Number | Price | Frequency Range | Sensor Type (E=electric, H=magnetic) | Quantity Reported (E=V/m, H=A/m, S=mW/cm ²) | Dynamic Range (Full Scale Reading) | Field Strength | Equivalent Power Density (mW/cm ²) |
|--|-------|-----------------------------------|--|---|---------------------------------------|--|--|
| ● Aeritalia (Amplifier Research) TE 307 | | | | | | | |
| (w/Fiber Optic Link) Probes | 3760 | | | E or H | | | |
| (1) 13RV1001-1 | 840 | 4-500 MHz | E | | | 10 V/m | 0.027 |
| (2) 14RV1001-1 | 840 | 1.5-500 MHz | E | | | 100 V/m | 2.7 |
| (3) 15RV1001-1 | 840 | 1-500 MHz | E | | | 1000 V/m | 270 |
| (4) 16RV1001-1 | 1040 | 2-100 MHz | H | | | 10 A/m | 3770 |
| (5) 17RV1001-1 | 1040 | 2-100 MHz | H | | | 1 A/m | 37.7 |
| (6) 19RV1001-1 | 1250 | 0.005-2.5 MHz | E | (switch selectable) < | 10/100/1000 V/m | | N/A |
| (7) 19RV1001-2 | 1250 | 0.005-2.5 MHz | E | | | 1/10/100 V/m | N/A |
| (8) 19RV1001-3 | 1250 | 0.02-10 kHz | E | | | 10/100/1000 V/m | N/A |
| (9) 19RV1001-4 | 1250 | 0.02-10 kHz | E | | | 10 ² /10 ³ /10 ⁴ V/m | N/A |
| ● EIT | | | | | | | |
| Meter w/Precision Fiber Optic Link 679/1079 | 9300 | | | E ² or S | | | |
| (10) Probe 979 | 1500 | 0.1-12 GHz (useable to 40 GHz) | E (single axis) | | | 140 V/m | 5 |
| ● Electromechanics Co. | | | | | | | |
| Meter 6640 | 9900 | | | E or H | | | |
| Probes | | | | | | | |
| (11) 3201 | 1400 | 0.1 Hz-50 KHz | H (single axis) | | | 80μA/m-0.8 A/m | N/A |
| (12) 3202 | 1400 | 0.1 Hz-50 KHz | H | | | 0.8-80 A/m | N/A |
| (13) 3204 | 1400 | 0.1 Hz-50 KHz | H | | | 2 - 2500 A/m | N/A |
| (14) 3302 | 1600 | 0.1 Hz-50 KHz | E | | | 20 μV/m-0.2 V/m | N/A |
| ● General Microwave | | | | | | | |
| (15) Raham 1 | 950 | 0.3-18 GHz | E (single axis) | S | | 87/275/870 V/m | 2/20/200 |
| (16) Raham 2 | 795 | 0.01-3 GHz | E | S | | 87/275/870 V/m | 2/20/200 |
| (17) Raham 3 | 1500 | 0.3-18 GHz | E | S | | 8.7/27/87/275 V/m | .02/.2/2/20 |
| (18) Raham 4* | 1520 | 0.01-26 GHz | E | S | | 8.7/27/87/275 V/m | .02/.2/2/20 |
| (19) Raham 4A | 1520 | 0.2 MHz-26 GHz | E | S | | 87/275/870 V/m | 2/20/200 |
| (20) Raham 12 (Raham 1 & 2) | 1295 | 0.01-18 GHz | E (single axis) | S | | 87/275/870 V/m | 2/20/200 |
| ● Holaday Industries | | | | | | | |
| (21) HI 3001 with E Probe | 2495 | 0.5-1000 MHz | E | E ² | | 10 ² /10 ³ /10 ⁴ /10 ⁵ / /10 ⁶ /10 ⁷ V/m ² | 0.03-2650 |
| (22) STH-01 Optional H Probe | 600 | 3-300 MHz | H | H ² | | 0.1-1 A/m | 0.38-37.7 |
| (23) HI-3002 (includes E and H Probes) | 2795 | 0.5-6000 MHz | E | E ² | | 10 ³ /10 ⁵ /10 ⁶ /10 ⁷ V ² /m ² | 0.26-2650 |
| (24) HI-3003 (3 axis switches) | 3750 | 0.5-6000 MHz | H | H ² | | .1/1/10/100 A ² /m ² | 0.38-3770 |
| HI-3004 (same as 3002 w/o H-field probe) | 2395 | | E | S | | 87/192/275/615 V/m | 2/10/20/100 |
| ● Instruments for Industry | | | | | | | |
| (25) RM-1 | 1195 | 0.01-220 MHz | E | E | | 3/10/30/100/ /300 V/m | .0024/.026/ .24/2.6/24 |
| (26) RM-2 | 1375 | 0.01-220 MHz | E | E | | | |
| (27) EFS-9 | 595 | 0.01-220 MHz | E (single axis) | E | | | |
| (28) EFS-2 (pulse capability) | 945 | 0.01-220 MHz | E | E | | | |
| (29) EFS-3 (monopulse capability) | 1145 | 0.01-220 MHz | E | E | | | |
| ● Narda Microwave | | | | | | | |
| 8616 Meter } one used with | 1220 | | | S | | | (Three Ranges) |
| 8611 Meter } following: | 350 | | | S | | | |
| (30) 8621B probe | 1450 | 0.3-26 GHz ** | E | | | 8.6-275 V/m | 0.2/2/20 |
| (31) 8623B probe | 450 | " " | E | | | 20-614 V/m | 1/10/100 |
| (32) 8631 probe | 975 | 10-300 MHz | H | | | 0.02-0.73 A/m | 0.2/2/20 |
| (33) 8633 probe | 975 | " " | H | | | 0.05-1.6 A/m | 1/30/100 |
| (34) 8635 probe | 2950 | 10-300 MHz | H | | | 0.5-16 A/m | 10 ³ /10 ⁴ /10 ⁵ |
| (35) 8644 probe | 2650 | 10-3000 MHz | E | | | 86-2750 V/m | 20/200/2000 |
| (36) 8652 probe | 300 | 0.3-10 MHz | H | | | | |
| (37) 8662 probe | 1200 | 0.3-300 MHz | E | | | | |
| 8619 meter (used with 8633/35/44 probes) | 1500 | | | E ² or H ² | | | |

* Older units must be modified to meet low frequency (10-30 MHz) published specifications.

** These probes will operate to 40 GHz. Calibration for 26-40 GHz available.

BIOLOGICAL EFFECTS

Adey to Head ELF Panel...The National Council on Radiation Protection and Measurements (NCRP) has chosen Dr. Ross Adey, the associate chief of staff for R&D at the VA Hospital in Loma Linda, CA, to head its new study panel on the bioeffects of ELF radiation. Scientific Committee No. 79 is being set up under a \$150,000, three-year contract from EPA (see *MWN*, December 1983). Adey has presented NCRP's Board of Directors with a list of 10-12 proposed panel members. According to NCRP Executive Director Roger Ney, the board will make its selections at or before its next meeting on July 21.

Threshold for Fetotoxicity...Dr. Ezra Berman and Hershell Carter of EPA's Experimental Biology Division in Research Triangle Park, NC, have identified a possible threshold for the effects of 2450 MHz CW microwaves on pregnant rats. In a paper published in the March *Health Physics*, they report that female rats exposed to power levels of 40 mW/cm² for 100 minutes daily on the sixth through 15th day of gestation (SAR=6.0 W/Kg), had no significant differences in the number of live or abnormal births as compared to controls, but that the mean fetal body weight was significantly lower. When they grouped these new data with those from past teratological studies, Berman and Carter discerned a possible threshold: "The break from a no-effect level of SAR to one which causes a significant decrease in fetal weight is at approximately 6.0 W/Kg." They conclude that microwaves can induce a decrease in fetal body weight (fetotoxicity) without also causing defects or death (embryotoxicity) and that "body weight may be a better variable with which to delineate a threshold of detrimental fetal response to [radiofrequency radiation]."

Resources...The second part of Eric Lerner's special report on electromagnetic fields appears in the May *IEEE Spectrum*. The 13-page article, which reviews low-level bioeffects, is based on a round table discussion held at last year's Bioelectromagnetics Society meeting....In our July/August 1982 issue we reported the upcoming publication of a cumulative index for the bioeffects bibliographies compiled by FDA's Dr. Zory Glaser and published by the Navy, NIOSH and the Bioelectromagnetics Society since 1971. Now, after a host of unforeseen delays, the index is finally available. In addition to author and subject indexes, the 285-page book includes a frequency and wavelength index. It is available for \$25 from Julie Moore & Associates, 6130 Camino Real, PO Box 5156, Riverside, CA 92517.

COMMUNICATIONS

EPA Completes Honolulu Radiation Survey...EPA has completed its survey of RF/MW radiation levels in Honolulu, HI, where for several years it has suspected that some exposures exceed 1 mW/cm² (see *MWN*, April 1984). EPA's Richard Tell told *Microwave News* that no results will be made public until a report is submitted to the FCC. Tell would only say that "we found levels in the range we

had anticipated" in some locations. Agency officials do not yet know how long it will take to complete the report. The survey team—including Tell, two other staffers from EPA in Las Vegas, NV, and Robert Cleveland of the FCC—spent more than a week in Hawaii last month. Earlier this year, the commission asked EPA to take measurements and evaluate whether or not Honolulu broadcasters are creating potential radiation health hazards.

COMPATIBILITY & INTERFERENCE

Pacemakers at Substations...An interdisciplinary group from England headed by Dr. G.S. Butrous of St. Bartholomew's Hospital in London has been investigating the effect of high intensity fields on implanted cardiac pacemakers. They review their findings in two recent papers. In the November-December 1983 issue of *PACE* (Vol.6, pp.1282-1292), they report that the field strengths necessary to affect pacemakers vary from unit to unit and from model to model. Units made by Telectronics were found to be the most sensitive; all others needed more than 5 kV/m to alter their behavior. The fields did not change the units' programming. The authors stress that the general public is not at risk from transmission line fields. In the second paper, appearing in the November 1983 issue of the *British Journal of Industrial Medicine* (Vol.40, pp.462-465), they document two cases of interference among workers at electric substations. They found that, "High intensity electric fields induced reversion to the interference mode [a fixed pulsing schedule], producing in one case competitive rhythm and in the other inappropriate slow pacing which resulted in asymptomatic pauses of up to 2.5 [seconds]." The workers could be protected with a somewhat bulky "Faraday suit." The researchers also tested a new Medtronic pacemaker with a special circuit that allows it to ignore interfering signals in fields of up to 20 kV/m (which induce body currents of greater than 300 uA).

LPTV RFI...On May 15, the Association of Maximum Service Telecasters (AMST) petitioned the FCC to protect existing, full power television stations from possible interference from low power television and translators (LPTV). The association, which is made up of some 250 TV broadcasters, asked the commission to set a specific standard for determining when a LPTV station causes objectionable RFI to a full-service station and to extend the deadline for filing objections to successful LPTV applicants from 15 to 45 days. AMST is located at 1735 DeSales St, NW, Washington, DC 20036, (202) 347-5412.

GOVERNMENT

Nominations for FDA Committees...FDA is seeking nominations for a number of advisory committees to its Center for Devices and Radiological Health. The Radiologic Devices Panel, which reviews and evaluates data on the safety and efficacy of radiation emitting medical devices, is seeking two new members with expertise in diagnostic radiology, radiation therapy, hyperthermia or

NMR imaging. The Technical Electronic Product Radiation Safety Standards Committee (TEPRSSC), which advises FDA on the adequacy of emission standards from electronic products, has nine open slots: two from government agencies, four from industry and three from the general public. (TEPRSSC has been dormant for quite a while, and FDA notes that while it wants nominations, no appointments will be made until a meeting is scheduled.) You can nominate one or more persons for a four-year term. You can even nominate yourself. There is no deadline for nominations. For details, see the May 24 *Federal Register* (49 FR 21991) or contact the center's Kay Levin at (301) 443-3516.

INTERNATIONAL

WHO Completes ELF Report...A joint World Health Organization/International Radiation Protection Association (WHO/IRPA) working group has finished its report on the biological effects of ELF radiation (WHO Technical Report No.35). The group, chaired by Dr. M.H. Repacholi of the Royal Adelaide Hospital in Adelaide, Australia, met for the last time in Geneva in March. The report has gone to the printers and will be published this fall.

IRPA Guidelines...IRPA's International Non-Ionizing Radiation Committee has published "Interim Guidelines on Limits of Exposure to [RF] Electromagnetic Fields in the Frequency Range from 100 kHz to 300 GHz" (see *MWN* March 1984) and "Interim Guidelines on Limits of Human Exposure to Airborne Ultrasound" in the April issue of *Health Physics*.

LITIGATION

Air Traffic Controllers Win Settlement...Four product liability suits against the manufacturers of equipment at an air traffic control center in Hilliard, FL, reached a surprising conclusion early this year: a publicly disclosed \$160,000 settlement from Raytheon. In claims filed in 1979 in the US District Court for the Middle District of Florida, Jacksonville Division, four controllers maintained that they developed cataracts as a result of workplace radiation exposure. Although makers of RF/MW equipment such as radar have settled similar suits out of court, the defendants in several prior cases have imposed gag orders on the terms of settlement (see *MWN*, December 1982 and January/February 1983). Raytheon would not comment on the Hilliard case, and the plaintiffs' attorneys at the Jacksonville, FL, firm of Bedell, Dittmar, DeVault, Pillans and Gentry, do not seem to know why the settlement was allowed to be made public. According to John Tucker, who worked on the case with William Gentry, this could have been an oversight, "but who knows?" In addition to the \$160,000 settlement reached in January, the four men and a fifth worker at Hilliard shared an earlier settlement of \$60,000 from Rockwell International, Admiral and Collins Radio. Ophthalmologist Dr. Milton Zaret was brought in by the plaintiffs and found that four of the men had cataracts and that a fifth had lenticular and retinal damage. Zaret told *Microwave News*

there was "overwhelming evidence" that radiation was part of the etiology. The plaintiffs have also filed workers' compensation claims with the Department of Labor which are still pending. The defendants in this case manufactured the radar scopes, radars, radio transmitters and other electronic equipment used in air traffic control and monitoring.

MEDICAL APPLICATIONS

Magnetic Fields from Diathermy Equipment...Drs. Raymond Lau, of the Charing Cross Hospital in London, England, and P.B. Dunscombe, of the Manitoba Cancer Treatment and Research Foundation in Winnipeg, Canada, have studied the stray magnetic fields from a Siemens Ultratherm 608 diathermy unit, which operates at 27.12 MHz. In a short note published in the April issue of *Health Physics*, they report that the stray fields depended on the unit's power setting, increased with the size of the capacitor plate and were significantly affected by the cables.

NMR Assessment...The Office of Health Technology Assessment (OHTA) has initiated a study of the safety, efficacy and usefulness of NMR imaging. Among the data sought by OHTA are how NMR compares with other diagnostic techniques as well as any unique applications of NMR. OHTA will issue a report and a recommendation to assist the Health Care Financing Administration in setting Medicare coverage policy. All submissions are due by July 30. For more information call (301) 443-4990 or see the May 1 *Federal Register* (49 FR 18624).

MEETINGS

URSI Bioeffects Symposium...Fourteen countries will be represented on the program of URSI's *Open Symposium on Interaction of Electromagnetic Fields with Biological Structures*, to be held in Florence, Italy. Researchers from most European countries will attend, as will scientists from Japan and Argentina. No one from the Soviet Union will be coming, however. During the first three days, August 27-29, 76 papers will be presented; on the 30th, there will be eight invited review papers on the bioeffects of ELF, RF, MW radiation and MM waves. See Conference Calendar for details.

UK EMC...The program for the *4th International Conference on Electromagnetic Compatibility*, scheduled for September 18-21 at the University of Surrey, UK, has been issued. Among the agenda items are papers by: R.J. Harry of the Home Office on "The Measurement of the Immunity of Handheld Radar Speedmeters;" B.T. Maloney of British Aerospace on "Spacecraft EMC Specifications — An Overview;" P.J. Kerry of the Department of Trade and Industry on "Potential EMC Problems Arising from the Reception of DBS;" J.L. ter Haseborg and H. Trinks of the Technical University in Hamburg on "Problems Concerning EMP and Lightning Protection of High Frequency Transmission Lines;" Frank Harlen of the UK's NRPB on "A Rationale of Microwave RF Exposure Standards;" R.A. Hobbs of the Royal Aircraft Establishment on "The Mea-

surement of Field Strengths in the Vicinity of HF Transmitters;" R.J. Clowes of Plessey Electronic Systems Ltd., on "Computation of the Near Field of Aperture Antennae for Assessment of Hazards;" and J. Gannaway, also of Plessey, on "A Simple Method of Estimating Signal Levels from Distant Transmitters at VHF and Microwave Frequencies." For more information, contact: The Institution of Electronic and Radio Engineers, 99 Gower St., London WC1E 6AZ, (01) 388-3071.

MILITARY SYSTEMS

AWACS and Radar Radiation...What are the radiation risks to pilots who fly near an AWACS aircraft? This question was raised in a letter to *Aviation Week*, May 14. The editors replied that the AWACS radar would be turned off if other aircraft were flying nearby—even though the antenna might continue to rotate. Before responding, the editors of *Aviation Week* had consulted John Mitchell of the AF School of Aerospace Medicine. In a telephone interview with *Microwave News*, Mitchell said that the technicians inside the AWACS are shielded by the plane's fuselage. Mitchell said that a number of radiation surveys have been carried out to confirm this....In the wake of the radar accident at Clear AF Station in Alaska, Mitchell is preparing a report on some 60 Air Force cases of over-exposure to non-ionizing radiation in his files. The report is not yet complete, but Mitchell will present a preview on July 17 at the Bioelectromagnetics Society meeting.

POWER LINES

Michigan Power Lines Report...The Legislative Science Office of the Michigan State Legislature has published *The Effects of Electromagnetic Fields Produced by High Voltage Transmission Lines*. The report was sponsored by Rep. Ken DeBeaussaert. For information, contact Bill Robinson, Office of Rep. DeBeaussaert, c/o State Capitol, Lansing, MI 48909.

Virginia Legislature Plans Hearings...The Virginia State Legislature has voted to hold hearings on power line health and safety issues. Senate Joint Resolution 26, sponsored by state senators Madison Marye and Virgil Goode, Jr., was approved this spring. The measure calls for "establishing a joint subcommittee to study the adequacy of present protections afforded the citizens of Virginia when high voltage electrical transmission lines are constructed and maintained." Marye expects to hold at least one public hearing in mid-summer. The seven-member subcommittee will report back to the legislature before the 1985 session.

Kavet Leaves EPRI...Dr. Rob Kavet is leaving the Electric Power Research Institute (EPRI) in Palo Alto, CA, where he has been the program manager for health studies on AC and DC transmission lines, to join the Health Effects Institute in Cambridge, MA. The institute, funded by EPA and the motor vehicles industry, investigates the potential health effects of tail pipe emissions. EPRI is in the process of recruiting a replacement for Kavet.

STANDARDS

Connecticut Adopts ANSI Limits...Connecticut has become the third state to adopt RF/MW radiation exposure guidelines for the general public. Legislators approved House Bill 5675 in early May, establishing the 1982 ANSI guidelines as the state standard (see *MWN*, April 1984). The measure does not apply to hand-held or mobile sources, consumer products, or scientific and medical equipment. According to the fiscal impact statement accompanying the bill, the only appreciable cost of standard setting will be the purchase of about \$100,000 worth of monitoring equipment. Enforcement will occur on a complaint basis and "few violations are anticipated." At its strictest level, ANSI sets a 1 mW/cm² exposure limit for the 30-300 MHz band. New Jersey has already adopted the ANSI standard for the general public, while Massachusetts has chosen limits five times more stringent.

EPA Bioeffects Report Approved...EPA's Scientific Advisory Board has given final approval to the Office of Research and Development's (ORD) report, *Biological Effects of Radiofrequency Radiation*. The lengthy document, prepared under the direction of ORD's Dr. Joe Elder, will serve as the basis for the guidance (see *MWN*, October 1983 and January/February 1984). The document could be printed as early as mid-July, though publication details were not available at press time. A publication announcement will appear in an upcoming *Federal Register*.

VDTs

Rhode Island Study Commission...Lawmakers in Rhode Island have set up a special panel to review VDT health risks and to report its findings to the legislature. The 13-member commission will include state representatives and senators, business and labor officials, and specialists from the state's Departments of Health and Labor. No limitations were placed on the scope of the panel's study. The study bill, H 7012 (Substitute A), was approved on May 8, as a compromise in place of a more extensive measure (see *MWN*, January/February 1984). The Rhode Island and Providence Chambers of Commerce supported the substitute after opposing the original legislation, but several computer manufacturers, particularly IBM, strongly objected to the compromise. Appointments are expected soon to the study panel, which has until February 15, 1985 to complete its work.

Legislation...The Illinois House of Representatives has convened a special subcommittee to consider House Bill 2397, the state's only pending VDT measure. After holding a hearing on April 25 in Springfield, the subcommittee planned three more hearings: in Chicago, in Springfield and in a yet to be named location....On March 16, Maryland's House Committee on Economic Matters unfavorably reported House Joint Resolution 47, a bill directing the state's Division of Labor and Industry to study the health effects of VDTs, draft occupational standards and report to the General Assembly on its findings.