State Power Line Actions (continued from p.1)

Michigan

State Representative Ken DeBeaussaert has drafted legislation to set limits for radiation along power line ROWs in Michigan. The brief measure instructs the state's Public Service Commission (PSC) to develop a standard to mitigate shock, fire and interference hazards as well as "any other scientifically recognized effect associated with transmission lines."

DeBeaussaert will introduce the bill soon after the legislature reconvenes on November 13, but because of his defeat in the November elections, the bill will probably have to be reintroduced next January by co-sponsor Representative Lynn Jondahl.

A power plant siting bill introduced by DeBeaussaert and others on July 3 is also unlikely to see action. House Bill 5676 would require a utility planning to build a plant to obtain a certificate of need from the state Energy Administration. The utility would then have to obtain a certificate of environmental compatibility from the state Department of Natural Resources. Jondahl has introduced similar legislation for several years.

A much more limited measure authorizing the PSC to issue certificates of need, Senate Bill 815, was introduced earlier this year by State Senator Nick Smith.

Public concern in Michigan focuses on the Detroit Edison Company's planned 345 kV Yukon-Saratoga line. The utility has locked horns with several townships, including Columbus, Richmond and Armada, over local power line ordinances. Columbus settled with the utility out of court, Richmond's ordinance was overturned in a summary judgment and the utility's suit against Armada is just getting underway. Although some of the ordinances include radiation limits, this is not a key litigation issue.

Carroll County, VA

In a case similar to those brought in Michigan, the Virginia Supreme Court agreed in September to decide whether Carroll County has the right to establish requirements for ROWs. In September 1983 the Appalachian Power Company (APCO) successfully appealed the county's June 1982 ordinance to prohibit permanent residences within 600 feet on either side of a 765 kV power line. A lower court ruled that the county impinged on the authority of the State Corporation Commission. The utility had already purchased a substantial amount of property for a narrower ROW for its planned 72-mile Jacksons Ferry-Axton line. The county believes it has the right to impose rules to protect public health and safety.

Virginia

The joint legislative subcommittee, set up in March under Senate Joint Resolution No. 26 to determine whether power line health and safety regulations are needed in Virginia, will hold the last of three scheduled hearings on November 16 in Richmond (see *MWN*, June and July/August 1984). Under the chairmanship of State Senator Madison Marye, the group is authorized to draft legislation. Citizens groups are opposing construction of APCO's 765 kV line and are pushing for regulations.

Copies of the minutes for hearings held on August 9, October 12 and November 16 may be requested from Terry Mapp of the state's Division of Legislative Services, PO Box 3-AG, Richmond, VA 23208, (804) 786-3591.

Texas

The Public Utility Commission (PUC) of Texas has extended its review of potential health risks from a proposed ±400 kV DC power line. The September 14 decision is likely to delay a final ruling on whether to approve the Walker-Matagorda line for at least a year as more hearings are held.

On June 21, a PUC hearing examiner recommended that certification be denied because of potential health risks. Her findings were challenged by representatives of Central Power and Light Company, Houston Lighting and Power Company and Southwestern Electric Power Company, who argued that the PUC was overstepping its authority.

The state has grappled with power line health and safety issues in the past on a case-by-case basis. This is the first time it has had to evaluate a DC line, however.

Other Actions

Florida and New Jersey have also considered power line safety in the recent past. A 1983 amendment to Florida's statutes authorized the state Department of Environmental Regulation to establish public safety requirements for certain power line siting applicants (see *MWN*, July/August 1983 and July/August 1984). Toward that end, a study funded by state utilities is in progress under the chairmanship of Dr. H.B. Graves of Pennsylvania State University.

In New Jersey, the Commission on Radiation Protection has asked the federal Environmental Protection Agency to develop standards for power line radiation exposure. In addition to believing that uniform federal standards are desirable in general, the commission concluded this summer that the state does not have the resources to develop an informed standard. ●

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FAA Okays Use of Portable Computers In Flight

The Federal Aviation Administration (FAA) plans to issue rules clearly permitting passengers to use computers, calculators and electronic games in flight. The devices may not be used during takeoffs and landings, however, "to provide an extra margin of safety."

The FAA decision to issue a policy statement follows a year of study by the Radio Technical Commission for Aeronautics' (RTCA) Special Committee 156 on "Potential Interference to Aircraft Electronics Equipment from Devices Carried Aboard." Over the summer, in a memorandum prepared for RTCA SC156 members, Frank White, chairman of the RTCA committee, recommended the policy now adopted by the FAA (see *MWN*, September 1984).

So far, the FAA has only issued a press release announcing its decision, but the agency said that it will publish an "Advisory Circular" and new rules "to make it clear that computers, calculators and electronic games do not interfere with radio and navigation equipment."

The FAA will continue to prohibit the use of walkie-talkies, radio-controlled toys, portable televisions and AM-FM radios on aircraft because they are "proven sources of interference."

Indeed, there was a new report of electromagnetic interference at the last RTCA SC156 meeting in September. According to the minutes of the meeting, D.J. Tangney of United Airlines reported that a pilot of a Boeing 727, flying over southeastern Colorado, noticed a drifting of the plane's very high frequency omnidirectional radio range (VOR) needles. A check of the passengers revealed that one was using a Panasonic radio/cassette player-recorder. When the unit was turned off, the needles "corrected themselves." (United tried to buy the device but could not.)

The next RTCA SC156 meeting is scheduled for January 23-24 in Washington, DC.

Cataract Risks

Two recent papers, described below, shed new light on the susceptibility of the human eye to non-ionizing radiation.

Cataracts in Radio Linemen

Drs. F.C. Hollows and J.B. Douglas of the University of New South Wales in Australia have found an increase in posterior subcapsular cataracts among radio linemen exposed to radiation from radio and television towers as compared to controls with other occupations. Writing in the August 18 *Lancet*, they report that workplace exposures varied from 80 uW/cm^2 to 3956 mW/cm^2 in the frequency range from 558 kHz to 527 MHz.

The researchers note that there was a very small and statistically insignificant increase in nuclear sclerosis among the exposed workers as well. This type of lens opacity is often related to exposure to solar radiation.

Hollows and Douglas's report prompted a response from Dr. B. Hocking of Telecom Australia, published in the September 29 *Lancet*. Among other points, Hocking noted that the linemen worked for Telecom and that they may have worked with microwave frequencies up to 13 GHz.

Frey Reworks Appleton Data

Dr. Allan Frey of Randomline Inc. in Huntingdon Valley, PA, has reanalyzed the data presented in a 1972 paper by Drs. Budd Appleton and George McCrossan and found that, contrary to the original conclusion, there was a statistically significant increase in lens opacities among military personnel chronically exposed to microwave radiation.

In their paper, Appleton and McCrossan concluded that their study "does not support the assumption that cataracts which develop in personnel performing duties in the vicinity of microwave generating equipment are a result of microwave exposure," except for severe exposures (*Archives of Ophthalmology, 88,* 259, 1972).

Frey came to the opposite conclusion on the basis of the original data. He explains that he found three "fundamental faults" with the earlier work: (1) the exposed group most likely included people who had little or no exposure to microwaves; (2) the control group consisted of people working with equipment known to cause eye damage; and (3) Appleton and McCrossan did not do a statistical analysis of their data.

Frey reports that his new analysis reveals that "Appleton has a statistically significant difference between groups, with the microwave-exposed showing more lens opacities than would be expected by chance."

He goes on to note that, "When one considers that Appleton's study was set up in such a way as to minimize the possibility of showing microwave-induced lens opacities, the effect of the microwaves must be quite powerful."

Frey's paper has been submitted for publication.

Navy Review of EMP

Last month we reported on the potential impact of siting an electromagnetic pulse (EMP) simulator on the Chesapeake Bay near the Calvert Cliffs, MD, nuclear power plant. As a followup, details from the Navy's draft environmental impact statement (EIS) for the EMPRESS II facility regarding EMP biological effects and electromagnetic interference (EMI) are summarized below.

The Navy has concluded that radiation from EMPRESS II will have no biological effects on humans and is unlikely to affect birds or marine life. Bay area life will be monitored, however, when the simulator goes into operation in late 1986. The Navy also believes that the simulator's pulse will be too weak and the pulse rate too slow to create serious EMI problems.

Biological Effects

The draft EIS provides an interesting overview of EMP research, including health checks on approximately 600 workers conducted by defense agencies and their contractors in the 1970s. The largest study, encompassing approximately 400 workers, was conducted by Boeing Aerospace from 1970 to 1976. Much smaller studies were performed by

Bell Laboratories, the Air Force, the Navy, EG&G Inc., Science Applications Inc., Rockwell International, Physics International Co., Pulsar Associates Inc. and Avco. None of these surveys uncovered harmful effects.

Subtle EMP bioeffects were found in a small percentage of animal studies conducted in the late 1960s and early 1970s, all of which used extremely high intensity fields. For example, in studies for the Armed Forces Radiobiology Research Institute (AFRRI), W.D. Skidmore, S.J. Baum and coworkers found that the blood counts of rats were temporarily affected after exposure to 447 kV/m pulses for a 20-week period. These findings were dismissed as being either transient or insignificant.

Some temporary behavioral effects in animals were reported by F.G. Hirsch and coworkers at the Lovelace Biomedical and Environmental Research Institute. Behavioral changes in rodents, such as in level of activity and degree of heat stress, were also reported by W.C. Milroy and coworkers at the Naval Surface Weapons Center.

Present knowledge of potential effects of EMP on birds and marine life is limited. Very few studies have been done, so the EIS speculates on possible impacts based on other electromagnetic interactions such as interference with migration patterns.

The only defense agency standard for human EMP exposure is currently under review. According to the draft EIS, the Air Force occupational standard (AFOSH 161-9, October 10, 1978) of 100 kV/m — based on the old American National Standards Institute (ANSI) guidelines for other forms of non-ionizing radiation — is being reviewed "for possible significant downward revision." Both Bell Labs and Boeing established much lower in-house standards in the 1970s: the Bell limit varies from 1 to 5 kV/m, depending on the pulse repetition rate and Boeing's is "nearly comparable."

In the early 1970s, Boeing petitioned the Occupational Safety and Health Administration to promulgate an EMP standard to "assure that Boeing's duty to control employee exposures satisfied the employer requirements of OSHA Public Law 91-596."

The majority of comments on the Occupational Safety and Health Administration's (OSHA) 1974 proposal to set an EMP standard stressed that no standard should be issued, however, and OSHA shelved the proposal. The Navy states in the EIS that, "repeatedly, it was implied that an appropriate rationale for predicting EMP bioeffects was lacking." Further, it was noted at the time that an EMP standard would have to consider the possibility of non-thermal effects, which were not included in ANSI's deliberations.

Electromagnetic Interference

The Navy's evaluation of potential EMP-induced EMI covers cardiac pacemakers as well as communications equipment, computers and other electric or electronic systems.

In general, the Navy places the threshold for EMP damage to sensitive electronic/digital systems at 2.5 kV/m. The interference threshold for less serious disturbances is about 1.5 kV/m. These evaluations are in part based on observations of the effects caused by other simulators, as well as on laboratory tests.

The Navy cautions, however, that the current generation of electronic equipment may be more sensitive to EMPs than similar units produced only a few years ago because of the use of lower voltage (5 volts) digital logic circuits.

The Navy's specific examples of EMP EMI include televisions, AM/FM receivers and microcomputers. Several years ago, damage to a television and a short wave receiver was reported in a house where fields reached 5-6 kV/m. But in tests conducted for the Defense Nuclear Agency (DNA) in 1978, the lowest level for "sensitivity degradation" for a television was about 8 kV/m, with damage occurring above this level. According to the Navy, the DNA results are similar to those for military communications equipment.

Upsets were reported for digital systems such as word processors, desk top computers and peripheral equipment in buildings near the Naval Aircraft Vertical EMP Simulator II (NAVES II) at field intensities of 1.5 and 2 kV/m. A Hewlett-Packard series 9825 computer was among the affected units.

Interestingly, recent tests of an Apple II computer at the Army's Harry Diamond Laboratories revealed that EMPs may have a cumulative effect. An upset occurred only with the eleventh pulse of 10-13 kV/m radiation, and the computer's disk drive and an attached printer failed altogether after the twelfth pulse.

The Navy reports that more detailed information on EMP effects on small computers will be gathered by the Air Force Weapons Laboratory in upcoming tests of Radio Shack TRS-80 units.

The EIS describes a number of exposure situations for aircraft and aircraft communications facilities, none of which resulted in interference. For example, the control tower of the Albuquerque International Airport, which is 330 yards from the Vertically Polarized Dipole I (VPD I) simulator, was unaffected by EMPs ranging between 960 and 2000 V/m. And aircraft on a taxiway approximately 200 yards away from VPD I reported no problems in 1.75 kV/m fields.

The Navy believes its general threshold estimates apply to pacemakers. In the major EMP-pacemaker study, conducted by B.M. Jenkins and J.A. Woody for the DNA in 1978, none of the 40 units tested were affected at 1.35 kV/m. At a level of 5 kV/m, about 20 percent of the units suffered "temporary perturbations" but no permanent damage. It is generally acknowledged, however, that newer pacemakers are likely to be more susceptible to EMP.

Air Force tests showed that "single EMP exposures caused no catastrophic failures even at 50 kV/m." But the Air Force set an electric field limit of 300 V/m for repetitive pulses of two to one hundred pulses per second in unrestricted areas.

For further information on the draft EIS, contact Lt. Pietropaoli, Office of Information, Department of the Navy, Washington, DC 20350, (202) 697-5342.

Site Visit Report on Dr. Wendell Winters's ELF Research

On August 29, 1984, Drs. Jeffrey Trent of the University of Arizona and Ronald Buick of the University of Toronto visited Dr. Wendell Winters's laboratory at the University of Texas Health Science Center in San Antonio. Also present during the meeting were Dr. Michael Shelanski of New York University, the chairman of the New York State Power Lines Project scientific advisory panel, and Mr. T. McDermott of the Power Authority of the State of New York. (For background information on Winters's work see MWN, *April, September and October 1984 and* Updates, *p.11.) Reprinted below is the report submitted by Trent and Buick to the project, followed by Winters's October 9 reply to Michael Rampolla, administrator of the project. [All emphases in the text are in the originals.]*

Site Visit Report

Description:

Dr. Winters's laboratory efforts related to determining biologic effects of electromagnetic exposure are multiple, including analysis of antibody expression, immunologic features of canine hematopoietic cells, normal cell "transformation" and most recently, agar cloning. The purpose for this recent site visit was to review Dr. Winters's program solely in regard to the agar cloning studies performed in collaboration with Dr. Jerry Phillips of the Southwest Texas Cancer Research and Treatment Center of San Antonio (CRTC). Dr. Phillips declined to participate in the site visit, and neither he nor any representative of the CRTC was present for this review. The site visit followed an informal format, with Dr. Winters providing adequate data for review and answering all questions posed by the site visitors. *It can be stated categorically that Dr. Winters was fully cooperative with the site visit team.*

The basic experimental design applied by these investigators related to determining whether a significant and reproducible effect on agar clonogenicity occurred as a result of exposure to electric (E), magnetic (M) or electromagnetic (EM) fields. The investigators utilized agar clonogenicity in an apparent attempt to document changes in proliferative potential of established tumor cell lines. Dr. Winters's presentation provided detailed methodology of cell culture and EM exposure and the results of several of their current experiments. The site visitors also were provided with copies of Drs. Winters's and Phillips's published reports on this work (consisting entirely of abstracts to scientific meetings).

The data presented was primarily restricted to two different colon carcinoma cell lines (Colo 205 and Colo 320). [Although a single experiment on four different carcinoma cell lines also was presented (Hep 2, KB, MCF-7 and ZR-75).] The basic experimental design consisted of exposing tumor cell lines to E, M or EM fields with subsequent establishment of clonogenic potential in agar. The parameters varied included: 1) time of exposure, 2) dose of exposure, 3) cell concentration during exposure, 4) cell number plated and 5) colony size used as an endpoint. "Recloning" of several of the exposed populations was also performed and evaluated.

Critique:

Drs. Winters and Phillips have previously reported in abstract form the finding of a significant and "permanent" effect of low level EM fields on agar clonogenicity of human tumor cell lines. For numerous reasons presented below, it would appear that Drs. Winters and Phillips have prematurely reached a conclusion of significance from their preliminary data. Unfortunately, the area of electromagnetic field exposure has abounded in poorly designed and controlled studies which demonstrate "significant" biologic effects of treatment but which are irreproducible in independent laboratory tests. The present study would appear to fall in this category. With our poor knowledge of biophysical mechanisms underlying agar clonogenicity, and our equally imprecise knowledge of biophysical mechanisms of cell membrane and organelle structure and function, interpretations of treatment effects in this area and especially their biologic significance require considerable circumspection. The experiments of Drs. Winters and Phillips which were described at the site visit do not allow any definitive conclusions to be drawn with respect to the authors' central hypothesis, namely, that exposure to electromagnetic fields produces a significant alteration in agar clonogenicity. The reasons for this statement are manyfold and are provided below.

(a) Choice of Model

Disregarding any technical difficulties in accumulating data on agar clonogenicity, the choice of this endpoint as a marker of carcinoma cell behavior is problematic. If the experiments presented were in fact designed to assess tumor cell characteristics of importance to the *in vivo* situation, then the choice of agar clonogenicity of carcinoma cell lines as an endpoint is a bad one. At present, there is no established relationship between the ability of carcinoma cells to grow in agar culture and their ability to grow in xenografted host animals. Indeed there are many examples of aggressive transplantable tumors which cannot be induced to grow in semisolid culture. The reciprocal statement can also be made. Such a relationship (agar clonogenicity/tumorigenicity) does hold for fibroblastic tissue. Thus the experiments reported, if done properly, would allow statements about the phenotype of agar growth, but would not allow extrapolation to the *in vivo* growth of human carcinoma cells. The experiments might be better performed on a transformed fibroblast system in which there would be convincing evidence that agar clonogenicity does in fact correlate with *in vivo* tumor growth.

(b) Experimental Design

The data presented at the site visit did not allow any conclusions to be drawn even on the limited subject of the determinants of agar clonogenicity of human carcinoma cell lines. The major reason for this statement relates to the lack of reproducibility of the putative effects, a result caused in major part by an experimental design which varied multiple parameters in an apparently random fashion, not allowing direct comparison of separate experiments. For example, in the 27 experiments shown to us, the same combination of variables (field strength, time of exposure, cell line tested, cell concentration exposed, number of cells plated) was never used twice.

(c) Quality of Data

Of equal importance, the quality of the data presented at the site visit was poor. Since measurement of agar clonogenicity is known to be prone to artifact, the burden of proof of validity is clearly with the investigators. In the reviewers' opinion, Drs. Winters and Phillips have failed to demonstrate any effect of electromagnetic field exposure on the growth of their chosen cell lines. The basis for this conclusion is twofold:

(1) The statements by Dr. Winters that the majority of his data sets demonstrated a trend to increased clonogenicity after E or EM exposure are not justified. Only 2 of the 27 individual data sets we were shown would allow such a statement to be made with any statistical validity. When the "overall experience" is taken into account, the data demonstrated sufficient inherent noise to rule out any conclusion (positive or negative).

(2) The extent of the variability in the cloning efficiency of the

control cultures on a day-to-day basis is very disturbing. For example, both Colo 205 and 320 displayed a variance in plating efficiency (PE) over a ten-fold range on different days. There are a number of positive sources of artifact which might explain such variable behavior; (e.g., lack of linearity of colony growth with respect to cell number plated, cell clumping or general health of the cell cultures). Whatever the cause of the variability, when the postulated treatment effects are reported to be as small as sixfold, the fact that [tenfold] differences in control PE can be introduced in a random fashion clearly precludes the description of conclusions in a statistically-valid manner.

Conclusion

The unanimous consensus was that the experiments presented to the site visit team did not allow any definitive conclusion regarding either the positive or null effects of electromagnetic radiation on agar clonogenicity. Due to the inconsistency in the experimental design, it is impossible to state which variable(s) are the basis for the lack of observed reproducibility.

Winters's Reply

October 9, 1984

Dear Mr. Rampolla:

I am in receipt of the reports from you relating to the site visit of August 29, 1984.

There are a number of issues raised in these reports that do not reflect clearly the nature and quantity of the studies reviewed. Therefore, I would like to point out the following comments with specific reference to the report of the review by Drs. Trent and Buick.

Specifically commenting on (a) Choice of Model: We did not and have not raised the issue nor have we attempted to address the issue of extrapolating our *in vitro* studies into considerations of *in vivo* situations. Our discussions and objectives have been directed towards investigations of possible effects of EM exposure on a variety of structural and functional cellular parameters. The cancer cells selected have been well studied and characterized and they are ones with which we have had experience. Among the quantitative assays used, the cloning agar assay is one which we believe offered advantages as an indicator of changes in cell proliferation. To this end we have employed 2 human colon cancer cell lines, Colo 205 and Colo 320 DM, and limited studies have been performed with other cell lines. Within the context of our goals and objectives, we believe that these cell lines constitute a suitable system for study of EM exposure induced changes in cellular structure and function.

Specifically commenting on (b) Experimental Design and (c) Quality of Data: Of 27 experiments discussed at this meeting, it was pointed out that a number of them were preliminary experiments of the type used to help determine appropriate conditions for routine experimentation. Accordingly, a discussion of the experiments and the conditions of the experiments revealed a range of variables and parameters to provide the reviewers with information about the sequential progression of our experiments as we learned more about the system and about possible effects on the cells following exposure to EM fields. While the parameters may have appeared to vary in a random manner as these experiments were discussed, chronology of the experiments would indicate a sequence of decreasing variations appropriate to our aim of determining more standardized exposure conditions.

The basic experimental design used throughout the studies consisted of preparation of tumor cells from continuously growing parent cell cultures in sufficient numbers for each experiment so that equal numbers of cells from the same population were dispersed into 4 identical cell exposure chambers. Each of the cell chambers [was] exposed to one of 4 experimental conditions, namely 3 field exposures (E, M, EM) and one non-exposed control. Following exposure, cells from each of the 4 chambers were prepared and assayed for their clonogenic capacity in soft agar assay. In the experiments discussed at the site visit the colony size used as an endpoint was not varied and was constantly greater than or equal to 60 microns in diameter as counted by the Bausch & Lomb FAS II image analyzer.

It should be emphasized that each of our experiments was internally controlled with concurrent non-exposed cultures from the same population as the cells which were exposed to the three conditions of EM fields. Each experiment was evaluated individually on the basis of the internal control.

Statistical analysis of the data using the six individual plate counts for each data point, performed and analyzed at CRTC under the direction of Dr. Phillips, has indicated that for those studies

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reported at several scientific meetings, a significant effect of EM exposure on clonogenic capacity does exist.

Direct comparisons of the individually controlled experiments is undoubtedly complicated by differences in the populations of target cells from one time to the next. No one knows what constitutes a target for E, M or EM fields and the possible influences on cell state, cell orientation in the field and even the cell's relationship to geomagnetic forces are being recognized and are subjects of investigations by others.

The problem of inherent noise sufficient to rule out any conclusion is based on the variability of the number of cell clones produced within the sets of control cultures in each of the individual experiments shown. Data shown had variability in the magnitude of response of cells to EM fields. It was discussed and acknowledged that variability in the magnitude of response of cells is not unreasonable to expect. Until research identifies what allows a cell to respond and until research allows such responses to be maximized, such a variability in response is to be expected. For that reason, concurrent internal controls such as the ones we use are an absolute requirement for *in vitro* EM exposure studies.

In summary, 1) No attempt has been made nor is being made to correlate our *in vitro* studies with an *in vivo* situation, 2) A number of the experiments discussed were preliminary thus supplementing, but differentiated from, those performed under a set of standard experimental conditions, 3) Statistical analysis of CRTC data indicates a significant effect of EM field exposure on clonogenic capacity, an effect not explained on the basis of randomness or bounce in the system and 4) Since no one knows what constitutes a target for EM radiation, response in the system is expected to be variable and, accordingly, each experiment must be controlled and evaluated individually.

Sincerely,

Wendell D. Winters, Ph.D.

Draft Guidelines for Exposure of Personnel to Stray Emissions from Radiofrequency (RF) Dielectric Sealers and Heaters

In the October 11 issue of the Federal Register, *the Food and Drug Administration's Center for Devices and Radiological Health announced the availability of draft guidelines to limit the exposure of radiofrequency (RF) sealer and heater operators to electromagnetic fields (49* FR *39992). These guidelines, which were not included in the* Federal Register *notice, are reprinted below. A public meeting to discuss the guidelines has been scheduled for November 15-16 in Rockville, MD. For more information, contact the center's Howard Bassen (301-443-6536) or Dr. Zory Glaser (301-443-7155).*

The measured values of radiofrequency (RF) electromagnetic fields emanating from some RF dielectric heaters and sealers in the U.S. exceed all world RF exposure standards. Government agencies charged with protection of health and safety have a responsibility to act to reduce excessive RF exposure to people. The Food and Drug Administration (FDA) is concerned about the potential adverse health effects on individuals exposed to radiofrequency energy emitted by RF sealers, heaters and gluers. These devices (hereafter referred to as "RF sealers") are also known as: heat sealers, fusers, molders, fasteners or embossers, high frequency sealers or dryers, electronic or electromagnetic sealers or welders, and dielectric heaters. They are generally designed to operate at frequencies between 3 and 100 megahertz (MHz).

On September 12 and 13, 1979, FDA's Bureau of Radiological Health (BRH), now the Center for Devices and Radiological Health (CDRH), and the Occupational Safety and Health Administration (OSHA) sponsored a public meeting to gather information on, and to address their concern about, the potential adverse health effects on people exposed to RF sealer emissions. Representatives of BRH, OSHA and the National Institute for Occupational Safety and Health (NIOSH) presented data from surveys and measurements performed in workplaces where RF sealers, heaters and gluers were in use. These data showed that RF field strengths (electric and magnetic fields) were very high (more than 1,000 volts/meter (V/m) and 10 amperes/meter (A/m), respectively, both of which are far in excess of 100 milliwatts per square centimeter mW/cm^2 equivalent power density); thus, exposure of individuals often exceeded the existing U.S. voluntary RF personnel exposure standards. At the meeting, RF hazard survey instrumentation was discussed, including commercially available and experimental instruments. Usage considerations and future needs were also discussed. A review of biological effects, including known animal and human effects also took place. In general, all agreed that the level of knowledge about effects was low compared to that of microwave radiation (usually at frequencies of 300 to 10,000 MHz). RF sealer radiation control technologies, including shielding and grounding, and operator location factors were also discussed.

To address these concerns, FDA, which regulates emissions from electronic products, has developed the following guidelines for RF sealers:

> FDA recommends that manufacturers construct and users operate RF sealers and related equipment in such a way that people are not exposed to time-averaged root mean square (rms) electric or magnetic fields in excess of 60 V/m or 0.16 A/m, or maximum values (as a ceiling) of 300 V/m or 0.8 A/m, measured in the vertical frontal plane (anterior surface) of the normal position of the operator. RF sealer manufacturers should also supply instruction manuals and appropriate labeling of RF sealers which provide adequate directions for safe use and warn users of potential hazards which might result from improper equipment modification or use.

FDA makes these recommendations in light of recent scientific reviews of existing standards for exposure to RF energy by such groups as the American National Standards Institute (ANSI), the American Conference of Governmental Industrial Hygienists (ACGIH), the National Institute for Occupational Safety and Health (NIOSH) and Health and Welfare, Canada. In addition, FDA believes that newly manufactured RF sealers can be constructed and old units can be economically retrofitted by methods such as shielding so as to achieve these proposed levels.

FDA will encourage voluntary compliance with these guidelines because it believes the approach of voluntary compliance is an expedient and cost-effective means to significantly reduce exposure of people to stray RF energy emanating from RF sealers. FDA will continue to assess the significance and level of exposure of individuals to stray RF energy from RF sealers and the impact of implementation of these guidelines. FDA will work closely with other agencies and groups concerned with this human exposure situation, and will, if necessary, consider other actions such as a regulatory performance standard for newly manufactured sealers, "defect action" for sealers manufactured after October 1968 which emit RF levels significantly in excess of these suggested guidelines, and/or purchasing specifications for government acquisition of RF sealers.

UPDATES

BIOLOGICAL EFFECTS

VLF Bioeffects...ONR has awarded Dr. Ross Adey of the VA Hospital in Loma Linda, CA, a $248,000, two-year contract to investigate potential bioeffects in the 10-100 kHz frequency range. Adey and co-workers will examine behavioral and neurochemical effects of CW, pulsed and amplitude modulated fields. In addition, they will study possible cellular mechanisms of interaction. Last year, the Air Force funded researchers at the Universities of Washington and Utah to study VLF hazards (10 kHz-3 MHz), with the objective of setting safety standards to protect against shock, fibrillation or burns (see *MWN*, May and September 1983).

More on DNA Resonances... In our May issue, we described recent experiments which show that aqueous solutions of DNA can resonantly absorb microwaves. A paper detailing these findings has now been published in the September 24 issue of *Physical Review Letters*. The research group of Drs. Glenn Edwards and Christopher Davis of the University of Maryland, College Park, NCI's Dr. J.D. Saffer and FDA's Dr. Mays Swicord concludes: "Although there is no demonstrated relationship between these phenomena [microwave resonances] and reported genetic effects, these observations indicate that a mechanism exists for coherent frequency-specific deposition of microwave energy in DNA. This mechanism has surprising physical characteristics and intriguing implications for future polymer and biochemical research. It is unexpected that DNA solutions exhibit microwave resonances and fascinating that such sharp resonances occur in dense solutions at room temperature. It will be interesting to see if these phenomena can be used to alter biochemical processes and if similar phenomena exist in other symmetric macromolecules." The work will continue in Davis's lab under a new $103,000, two-year award from ONR. Edwards, who worked on this project as part of his doctoral thesis, will pursue his research on microwave effects under a one-year, post-doctoral fellowship at the Max Planck Institute in Stuttgart, Germany....The possibility that microwaves could interact with DNA was originally suggested by the theories of Dr. Earl Prohofsky of Purdue University. Science writer Stefi Weisburd outlines Prohofsky's work on DNA vibrations in the June 9 *Science News*.

COMMUNICATIONS

Secure, Airborne and Cordless Telephones... President Reagan has signed an order to improve the security of classified phone calls. National Security Directive 145 could lead to the purchase of as many as 500,000 telephones protected against Soviet eavesdropping, thus guarding conversations between military and intelligence officials and private contractors. More than $33 million has already been allocated for computers to encode and decode telephone transmissions. Each phone is likely to cost between $15,000 and $30,000, though the NSA hopes to develop a less expensive model. Current plans call for the purchase of 30,000 secure units, but NSA officials are lobbying the administration to purchase an additional 470,000 phones, according to *The New York Times*. Concerned that excessive caution may end up costing taxpayers a lot of money, Oklahoma Congressman Glenn English has asked the GAO to evaluate the need for the new phones. "The national security bureaucracy has a tendency to require a degree of protection for classified information that may be excessive," he suggested to the GAO....Six airlines have introduced cordless telephones on some of their flights to allow passengers to "reach out and touch" people from their seats at 30,000 feet. Using a nationwide network of ground receiving stations, the Airfone Inc. system is capable of handling a total of 222 calls simultaneously. The cost of calls is likely to deter chatting, however — the first three minutes cost $7.50 and each additional minute is $1.25. The FCC has allocated the frequencies used by Airfone on a temporary basis only and has yet to decide whether the allocation should be permanent....A federal jury has awarded $150,000 to a St. Louis man who suffered hearing damage caused by the ringer in the earpiece of his cordless telephone. The precedent-setting decision is the first among more than a dozen pending suits. The FDA's Center for Devices and Radiological Health (CDRH) has received more than 120 complaints about the ringing problem. Officials there are studying the problem and considering action, including the possibility of a recall. Explaining the problem, a recent issue of the center's *Radiological Health Bulletin* (August 1984) notes that: "Laboratory tests indicate that some phones emit sound levels that may exceed thresholds for hearing loss as well as established standards for occupational auditory exposure." When cordless phones were introduced, many manufacturers put the bells, which ring at close to 140 decibels, in the phones' earpieces. Hearing experts explain that the intensity of the ring is comparable to a pistol shot beside your ear. Virtually all companies have since moved the ringers elsewhere in the phone. For information on CDRH's research, contact Wendy Johnson, CDRH (HFZ-100), 5600 Fishers Lane, Rockville, MD 20857, (301) 443-5860.

COMPATIBILITY & INTERFERENCE

Preparing for Radio Marti... The FCC has removed the $250,000 compensation cap for costs incurred by broadcasters who must protect against possible interference from Cuba in retaliation for Radio Marti broadcasts. At a meeting on August 1, the commission also ruled that the costs of protective equipment were reimbursable, less depreciation on the equipment being replaced (see *MWN*, April 1984). Notice of these changes appeared in the August 28 *Federal Register* (49, *FR* 34004). FCC action was prompted by a petition for reconsideration filed on April 30 by the Florida Association of Broadcasters and the South Florida Broadcasters Association. In its notice, the commission noted that congressional sponsors of the Radio Broadcasting to Cuba Act, which established Radio Marti, supported the petition, as did the United States Information Agency (USIA), which will operate Radio Marti through its Voice of America (VOA) branch. For information, contact FCC's Louis Stephens at (202) 632-7792....In related developments,

Paul Drew has been hired as a consultant to Radio Marti and is expected to take over as director, pending congressional approval. In addition to Drew, VOA has hired 58 of its projected staff of 150. The station, which USIA officials hope will begin operating soon, will broadcast at 1180 kHz....To help broadcasters determine the level of potential interference, the FCC has prepared a list of Cuban radio stations known to operate on the 107 channels allocated for AM broadcasting in the U.S. It is available for $0.49 from Wilbur Thomas, International Transcription Service, Inc., 4006 University Drive, Fairfax, VA 22030, (703) 857-3800.

GOVERNMENT

FCC RF Sampling Program... The FCC's Equipment Authorization Branch has changed its policy and will no longer test new types of equipment for potential RF interference before permitting them to be marketed. Branch Chief Charles Cobb explained that new products will be granted approval solely on the basis of testing data submitted by manufacturers. In the past, the agency required some applicants to provide prototypes for testing prior to market approval. Now, sampling will be done later on production models. Cobb emphasized that the change was made to "speed up development and introduction of new technology." Under the new procedures, sampling will focus on cordless telephones, computing devices and RF lighting sources. Cobb estimated that the FCC receives approximately 10,000 applications each year and that 20-25 percent are rejected because of possible interference problems, while 40-45 percent of the applicants are asked to provide additional testing data. For more information on the new program, contact Richard Fabina, FCC Laboratory, PO Box 429, Columbia, MD 21045, (301) 725-1585.

MEDICAL APPLICATIONS

Resources... Drs. Santi Tofani and Giovanni Agnesod of the Italian National Health Service in Ivrea report on their studies of stray electric fields from capacitor-plate applicators used with diathermy equipment operating at 27 MHz in the August 1984 issue of *Health Physics*....Dr. Leonard Taylor of the University of Maryland has shown that, in the near field, the electromagnetic waves from suitably designed applicators can penetrate far deeper than the skin surface. His explanation appears in the October *IEEE Transactions on Antennas and Propagation*....Drs. M.K. Hessary and K-M. Chen of Michigan State University in East Lansing present a theoretical method of analyzing capacitor-plate applicators in "EM Local Heating with HF Electric Fields" in the June 1984 *IEEE Transactions on Microwave Theory and Techniques*....A team from Carnegie-Mellon University in Pittsburgh, PA, headed by Dr. Robert Peloso has failed to observe any differences in the measured dielectric properties of normal and neoplastic tissues in the 1 MHz-1 GHz frequency range. See the November *IEEE Transactions on Biomedical Engineering*....Professors Thomas Budinger and Paul Lauterbur, two of the developers of NMR imaging, have written a review paper on "Nuclear Magnetic Resonance Technology for Medical Studies," published in the October 19 *Science*....Academic Press has started a new quarterly journal, *Magnetic Resonance in Medicine*, the official journal of the Society of Magnetic Resonance in Medicine. Subscriptions are $72.00 in the U.S. and Canada and $84.00 elsewhere. Contact: Academic Press, 111 Fifth Ave., New York, NY 10003, (212) 741-6802....The Congressional Office of Technology Assessment has released two new studies, *The Emergence of Nuclear Magnetic Resonance Imaging Technology: A Clinical, Industrial and Policy Analysis*, (GPO No. 052-003-00964-1) and *Federal Policies and the Medical Devices Industry* (GPO No. 052-003-00965-0). Copies are available for $5.50 and $7.00 respectively (prepaid) from the U.S. Government Printing Office (GPO), Washington, DC 20402....Professor Richard Borgens of Purdue University in West Lafayette, IN, has published "Endogenous Ionic Currents Traverse Intact and Damaged Bone" in the August 3 *Science*.

MEETINGS

Off and On... The *Workshop on Low Level Field Effects on Cells*, scheduled to be held at Brookhaven National Lab on Long Island, NY, in December has been cancelled. Eugene Findl, the workshop organizer, was caught in a "reduction in force" at the Department of Applied Science and left Brookhaven at the end of October. In a telephone interview, he said that his future plans are uncertain, but he was optimistic that the workshop would be held in 1985 with a new sponsor....On November 29-30, there will be a meeting in London, England, to explore what is known about the clusters of miscarriages and birth defects among VDT operators. Sponsored by Humane Technology, which was set up by Brian Pearce of the HUSAT Research Center at Loughborough University, *An International Meeting to Examine the Allegation of Reproductive Hazards from VDUs* will feature speakers from the UK, Canada and Sweden. Representatives from IBM-UK and the BBC are on the program, as is Dr. Karel Marha of the Canadian Center for Occupational Health and Safety. See "Conference Calendar" for details.

Proceedings Available... The proceedings of the *19th Annual Symposium of the International Microwave Power Institute* (IMPI), held in Minneapolis, MN, in September, are now available. Topics covered include microwave ovens, plasma wave heating for nuclear fusion, bioeffects, measurements and industrial applications. The 237-page volume, which includes a mix of abstracts and complete papers, is available for $25.00 (prepaid) from IMPI, Tower Suite 520, 301 Maple Ave. West, Vienna, VA 22180, (703) 281-1515....The American Institute of Medical Climatology (AIMC) has released the proceedings of its *Conference on Environmental Ions and Related Biological Effects*, which was held in October 1982 in Philadelphia, PA. The 159-page, typescript report features five papers on the bioeffects and measurement of ions associated with high voltage DC power lines and with indoor air pollution. Each paper is followed by a brief commentary. A copy of the proceedings

is available for $15.00 for AIMC members ($25.00 for others) from AIMC, 1023 Welsh Road, Philadelphia, PA 19115, (215) 673-8368.

MILITARY SYSTEMS

EMPRESS II Hearings... The Navy has scheduled three hearings on its proposal to site an Electromagnetic Pulse Radiation Environment Simulator for Ships (EMPRESS II) on the Chesapeake Bay. Hearings will be held in Virginia on November 14 at the Rappahannock Community College North Campus in Warsaw and on November 15 at the college's South Campus in Glenns. In Maryland, a hearing is scheduled for November 20 at South Dorchester High School in Cambridge. (See *MWN*, September 1984 and related story in this issue on p.4.) For further information, contact Lt. Pietropaoli, Office of Information, Department of the Navy, Washington, DC 20350, (202) 697-5342.

OVENS

Sales Boom... Microwave oven manufacturers shipped more units in the first three quarters of 1984 than in all of 1983. The Association of Home Appliance Manufacturers (AHAM) reports that 6.2 million units were distributed through September 30, an increase of 61.4 percent over the totals for the first three quarters of 1983. In September 1984 alone, the industry shipped 310,000 more microwave ovens than in the same month last year. Industry observers explain that smaller, less expensive models, combined with rising discretionary income among consumers, account for the sharp rise in sales. American oven manufacturers have lost some of their dominance over the market, however. They now produce just 60 percent of the ovens bought in the U.S., down from their 74 percent share of the market in 1981.

PEOPLE

Eric Lerner, a contributing editor of *IEEE Spectrum* well known for his 1980 and 1984 articles on bioeffects, is out of a job. His freelance contract with *Spectrum* has not been renewed because, as he was told by his editors, all writing and editing would now be done by the in-house staff. The decision to let Lerner go followed soon after a letter of complaint was sent to Dr. **Richard Gowen,** president of IEEE, by Drs. **Sol Michaelson** and **John Osepchuk.** Writing on University of Rochester stationery, they complained that the May 1984 *Spectrum* article, "Biological Effects of Electromagnetic Fields," presents "an unbalanced and misleading treatment of the subject," and that, "such a distorted presentation will be used by mischievous elements to stimulate unnecessary and irrational fears of electromagnetic fields in our modern society." Michaelson of the University of Rochester and Osepchuk of Raytheon accused Lerner of emphasizing material that is "speculative, far from being substantiated and of questionable validity." The Lerner article was based on a round table discussion held at the 1983 BEMS meeting. Those who participated included some of the leading researchers in the field: Drs. **Ross Adey, Larry Anderson, Frank Barnes, C.K. Chou, Friedrich Kremer, Shirley Motzkin, Mays Swicord,** and **Howard Wachtel.** Dr. **Ken Foster** was also involved but he later asked that his contributions be deleted from the article. Michaelson and Osepchuk concluded their letter with the following statement: "IEEE officials should ponder what type of actions are required to prevent further repetition and perpetuation of misinformation through *Spectrum* when the damage to IEEE's reputation finally becomes clear as events evolve in this field" *Spectrum* editor **Donald Christiansen** did not return telephone calls requesting comment. Barnes, who served as the chairman of the BEMS meeting panel, said that he had been told by IEEE staffers that Lerner's fate had nothing to do with the articles or the Michaelson-Osepchuk letter. Adey thinks differently. He told *Microwave News* that he doubts the events were unrelated. In addition, Adey said that *Spectrum* had recently refused an introductory paper on mechanisms of interaction between electromagnetic radiation and biological systems, which had been *invited* by the magazine. When Lerner was asked if he believes there was any connection between the cancellation of his contract and the Michaelson-Osepchuk letter, he said that not only had the magazine not renewed his contract but had initially tried to renege on the existing agreement, which had only a short time left to run. "It is impossible to say anything definitive," he said, "because I am the only freelancer at *Spectrum*, but the timing is suspicious."...Dr. **Lionel Jaffe** has dropped out of the AIBS committee preparing a report on the bioeffects of ELF radiation for the Navy (see *MWN*, July/August and September 1984). According to Dr. **H.B. Graves,** the chairman of the AIBS study panel, Jaffe pulled out due to time pressures caused by his leaving Purdue University to join Woods Hole Oceanographic Institution. Dr. **Asher Sheppard,** already a member of the committee, will take over Jaffe's responsibilities for covering bone growth and fracture repair. Sheppard said that he will be relying on Dr. **Richard Luben** for assistance in his new duties....Dr. **Larry Anderson** will be replacing Dr. **Richard Phillips** as the coordinator for bioelectromagnetic studies at Battelle Pacific Northwest Labs. Phillips is moving to EPA's Experimental Biology Division in North Carolina.

POWER LINES

Winters Replication... The New York State Power Lines Project has decided not to attempt an exact replication of Dr. Wendell Winters's study which found that exposure to ELF fields enhanced the growth rate of certain lines of human tumor cells. Instead, the project is likely to fund an investigation of the effects of 60 Hz fields on a different type of human tumor cell. Responding to criticisms from Drs. Jeffrey Trent and Ronald Buick following a site visit to Winters's lab this summer (see *From the Field*, p.6), the project's scientific advisory panel has asked Dr. Gordon Livingston of the University of Utah to collaborate with Trent on revising his original proposal for a $30,000 replication study (see *MWN*, October 1984). A final decision on the Livingston study is expected by the end of the year. At this point the panel has not decided what kind of support it

might offer to Dr. Maimon Cohen for additional work in the same area. The panel initially asked both Livingston and Cohen to submit proposals for replication studies. Both researchers are already project participants.

STANDARDS

San Diego Adopts ANSI Standard... San Diego County, CA, has adopted the 1982 ANSI exposure standard for RF/MW radiation. The September 12 action by the county's Board of Supervisors is part of a broad plan to develop a regional telecommunications policy (see *MWN*, September 1984). According to Bill Chatham of the Department of Planning and Land Use, the rules were adopted to eliminate uncertainty in the communications industry. Operators may request waivers to the rule on a case-by-case basis.

VDTs

Legislation... Massachusetts has allocated $75,000 for a six-month VDT health and safety study. Added to the state budget by Rep. Elizabeth Metayer, a sponsor of VDT legislation, the money will be used by the Department of Labor and Industries' Division of Occupational Hygiene to "evaluate virtually every aspect of VDT work," according to a legislative staffer....Oregon's Senate Interim Labor Committee has released a final report on its eight-month investigation of VDTs. Formed in late 1983 after proposed VDT legislation was tabled until the Senate reconvenes in January 1985, the 16-member committee has made several recommendations. It urges the Labor Committee to set a statewide policy defining safe, healthy working conditions, encourages research in areas of uncertainty — including reproductive hazards — and directs the state's Accident Prevention Division of the Workers' Compensation Department to develop an educational program. Radiation risks are downplayed by the committee. A committee staffer told *Microwave News* that proposed legislation is being prepared for consideration in early December. If it gains committee support, it will be introduced when the legislature reconvenes in January. A copy of the report is available from the committee, 331 State Capitol, Salem, OR 97310, (503) 378-5720....The New York State Assembly Standing Committee on Labor has published a report on hearings it held last year (see *MWN*, May 1983). *Video Display Terminals – Blessing or Curse?* urges legislators "to err on the side of caution" in assessing radiation risks and to legislate VDT use "to minimize this possible danger." For a copy of the report, contact the office of Assemblyman Frank Barbaro, Room 713, Legislative Office Building, Albany, NY 12248, (518) 455-5828....Pennsylvania State Senator Buzz Andrezeski has introduced two bills, SB 1450 and SB 1451. Similar in almost all respects, the proposals would require shielding to block RF emissions, periodic rest breaks, office design guidelines and a maximum of five hours per day of VDT work. In addition, both bills would mandate alternative work upon request for pregnant operators. The key difference between the bills is that SB 1450 applies only to public employees, and SB 1451 applies to both public and private employees....Berkeley, CA, has become the first locality to adopt VDT purchasing rules. Approved by the City Council, the new ordinance restricts the type of VDT-related equipment which the city may purchase but stipulates only that furniture be safe and comfortable and that displays have adjustable contrast controls.

CONFERENCES

November 29-30: **An International Meeting to Examine the Allegations of Reproductive Hazards from VDUs,** London, UK. Contact: Humane Technology, PO Box 2, Quorn, Leicestershire, LE12 8EG, UK, (0509) 237428.

December 4-8: **American Clinical Hyperthermia Meeting,** Americana Canyon Hotel, Palm Springs, CA. Contact: Dr. Haim Bicher, Daniel Freeman Memorial Hospital, 333 N. Prairie Ave., Inglewood, CA 90301, (213) 674-7050.

December 6-7: **24th Automatic RF Techniques Group Conference,** Columbia Inn, Columbia, MD. Contact: ARFTG, PO Box 432, Princeton, NJ 08540.

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January 23: **A Review of the State-of-the-Art in EMC in Commercial and Military Electronics,** LA Airport Hilton, Los Angeles, CA. Contact: Ms. Terry Cantine, Eaton Corp., 5340 Alla Rd., Los Angeles, CA 90066, (213) 822-3061.

January 23-25: **RF Technology Expo,** Disneyland Hotel, Anaheim, CA. Contact: Kathy Kriner, RF Tech Expo, 6530 S. Yosemite St., Englewood, CO 80111.

February 3-8: **1985 Winter Meeting of the IEEE Power Engineering Society,** Penta Hotel, New York, NY. Contact: T.A. Balaska, Bishop Electric Corp., 363 Old Hook Rd., Westwood, NJ 07675, (201) 666-5553.

March 5-7: **6th Symposium & Technical Exhibition on Electromagnetic Compatibility,** Zurich, Switzerland. Contact: EMC Symposium & Exhibition, ETH Zentrum-IKT, 8092 Zurich, Switzerland, (01) 256-27-90.

SHORT COURSES

December 17-18: **EMI & EMP Testing to the Requirements of MIL-STD-461/462,** West Conshohocken, PA. Fee: $595. Contact: R&B Enterprises, 20 Clipper Rd., West Conshohocken, PA 19428, (215) 825-1960.

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January 21-24: **Millimeter Wave Systems and Technology,** Atlanta, GA. Fee: $550 (3 days), $725 (4 days). Contact: Dept. of Continuing Education, Georgia Institute of Technology, Atlanta, GA 30332, (404) 894-2400.

January 22-24: **Cable Ampacity Calculations for Commercial, Industrial and Utility Applications,** Atlanta, GA. Fee: $575. Contact: Georgia Tech, see January 21 above.

January 28-29: **Grounding, Bonding & Shielding,** Washington, DC. Fee: $650. Contact: Continuing Engineering Education, George Washington University (GWU), Washington, DC 20052, (800) 424-9773, or (202) 676-6106 in DC. **Repeated** May 2-3.

February 5-8: **Modern Microwave Techniques,** Orlando, FL. Fee: $675. Contact: Linda Billard, Technology Service Corp. (TSC), 962 Wayne Ave., Suite 600, Silver Spring, MD 20910, (800) 638-2628, or (301) 565-2970 in Maryland.

February 13-14: **Microwave Devices: Present and Future,** Atlanta, GA. Fee: $475. Contact: Georgia Tech, see January 21 above.

February 19-22: **Modern Microwave Measurements and Applications,** Los Angeles, CA. Fee: $845. Contact: UCLA Extension Short Courses, PO Box 24901, Los Angeles, CA 90024, (213) 825-1295.

February 19-22: **Millimeter Wave Radar,** Washington, DC. Fee: $835. Contact: GWU, see January 28 above.

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Satcom Siting: The Search for Radiation Safety Assurance

The satellite communications industry is booming, and the demand for earth stations is brisk. Federal Communications Commission (FCC) records show that 911 transmit and 4,862 receive stations have been licensed or have applications pending. According to an informal survey of government agencies and earth station manufacturers, these numbers will grow sharply in the 1980s. This bullish forecast is bolstered by several major suppliers reporting annual sales growth of up to 50 percent.

Proposed stations have sparked community opposition, a common reaction to the siting of major facilities like power plants and highways. The technology of the communications revolution, however, has added a new dimension to these disputes: radiation health hazards. Potential neighbors of transmitting stations are worried and confused about microwaves. Industry and citizens would welcome a federal radiation standard clarifying what levels are safe, but rule making has been slow. The Environmental Protection Agency (EPA) is not expected to propose guidelines until 1983 or 1984.

The FCC is also examining radiation safety. Efforts toward a policy statement were begun in June 1979 with a notice of inquiry (44 *Federal Register* 37008). Expected for several months, the commission's statement may finally be released this November, according to the FCC's Robert Cleveland.

The following three case studies, involving rural, urban and farming com-

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Disagreement Over Microwaves at IEEE

Members of two committees of the Institute of Electrical and Electronic Engineers (IEEE) are at odds over microwaves. At issue is a draft position paper on human exposure to radiofrequency and microwave (RF/MW) radiation prepared by the IEEE's Committee on Man and Radiation (COMAR). COMAR wants the statement adopted by the IEEE as a whole, but has run into opposition from members of another IEEE group, the Committee on Social Implications of Technology (CSIT). An editorial in the CSIT newsletter has sharply criticized the COMAR paper and wants it changed. Relations between COMAR and CSIT are now strained.

The COMAR statement seeks to reassure a wary public that there is little to fear from RF/MW radiation. For instance, it states that "clearly the known benefits of EM [electromagnetic] technology outweigh even the most speculative risks to the general population," and that a large body of data indicate that "moderate levels of EM fields (average power densities of 1 to 5 mW/cm^2) are easily tolerated by human beings, at least for short periods, while prolonged whole-body exposure at high intensities (above 100 mW/cm^2) is dangerous at frequencies for which significant energy is coupled to the human body." It goes on to endorse the new ANSI standard.

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munities, reveal how the safety issue can affect satcom station siting.

RCA in Bainbridge Island

RCA Corp.'s plans for a satellite communications station in a rural community on Bainbridge Island, WA, are currently stalled. A local group, the Bucklin Hill Neighborhood Association (BHNA), which opposes construction of the $3-5 million facility, has won its fight for an environmental impact statement (EIS). On August 21, the Kitsap County Office of Community Development, which has jurisdiction in Bucklin Hill, ruled RCA must prepare an EIS under the State Environmental Protection Act. According to the written ruling, "an objective survey of current information of the short and long term impacts on human health" is of particular concern.

Possible radiation health hazards were the main issue in the BHNA push for the EIS. The association's lawyer, Roger Leed of Seattle, argued that very little is known about potential radiation levels from the proposed station and that "this lack of information is further compounded by the general lack of knowledge about human health hazards generated by microwave radiation."

Because of the safety debate, Bainbridge Island may take on larger proportions than an isolated challenge for RCA. According to Howard Johnson, RCA staff vice president for product safety, the decision to spend the time and the money on an EIS rather than to look for another site was influenced by the company's desire to resolve this issue: "If we leave this one, next time we could face the same problem."

Johnson cited Home Box Office's (HBO) bid for a station in Rockaway, NJ, to make his point. (See *MWN*, January 1981.) Faced with continuing delays caused by community opposition, HBO scrapped its proposal. He believes HBO's decision "gave people ammunition" to fight other projects.

Indeed, BHNA member Jerry Hellmuth has drawn a parallel between Rockaway and Bainbridge Island. A school 1,000 feet from the proposed HBO site was a major concern to Rockaway residents. Hellmuth, the director of a Bucklin Hill boarding school directly across from the 7.9-acre RCA site, is also worried about the long-term effects of microwaves on children.

BHNA members do not know what radiation levels are safe, and they question the validity of the voluntary ANSI safety standard. Among queries submitted for a community meeting on radiation issues, the association asked: "How can we, who live next to the RCA proposed microwave facility, be guaranteed any safety to our health when no US standard exists that could protect us?"

Calculated power levels near the proposed station are currently being revised. Worst case figures, developed by RCA, were as high as 32 uW/cm² in one location. The regional EPA office's review of these calculations, however, found that they were unrealistically high and that normal levels would be a factor of ten lower. In an August 12 letter to the Kitsap development office, EPA's Elizabeth Corbyn wrote that, based on ANSI's proposed standard, "we do not believe construction and operation of the proposed communications satellite earth station will create an exposure hazard from microwaves."

The EIS is being prepared by the Seattle office of C H_2M Hill, Inc., an international consulting firm, and should be completed by mid-October. Professor A.W. Guy from the University of Washington, Seattle, and Dr. Don Justesen of the VA Medical Center in Kansas City, MO, are assisting with the radiation bioeffects portion of the statement.

The Bainbridge Island station would be the eighth in RCA's national network providing private channel communications service in large cities. Two 43-foot-diameter satcom antennas would be built on the site.

Cylix in Haverford

The zoning board of Haverford, PA, has rejected a station proposed by Cylix Communications Network, Inc. of Memphis, TN. After an emotionally charged hearing in this heavily populated, working class neighborhood near Philadelphia, the board ruled against Cylix on September 21.

Cylix is appealing the decision to the Court of Common Pleas of Delaware County. Company vice president of operations, Dick Furnival, told *Microwave News* that "there were no grounds for turning us down." Finding another site would be difficult and could cost the company $100,000, Furnival said, because of the heavy microwave congestion in the Philadelphia area.

Judging by the initial community reaction to the Cylix proposal, it is likely that residents of Haverford and the adjacent township of Lower Merion will continue their opposition to the station.

Philadelphia lawyer John Trevaskis, a zoning law expert representing Cylix, is confident the appeal will be successful. In a telephone interview, Trevaskis questioned the need to hold a hearing on the Cylix request in the first place. He said hearings are held for satellite stations because "most zoning code enforcement officers just don't know what to do with these applications." His computer check found no earth station zoning cases on the books.

Haverford is slated to join the company's rapidly expanding national network of small, 0.7-watt data communications stations. Now over halfway toward a year-end goal of 25 stations, the company plans to operate over 100 by mid-1985.

COMSAT in Western PA

This summer the Cleveland Township, PA, zoning board approved the Communication Satellite Corporation's (COMSAT) application to build a $50 million earth station on a 107-acre farmland tract. People Questioning COMSAT, a small but active group, has fought the station and wants to appeal the decision. Lack of funds, however, may prevent it from taking further action.

According to People Questioning COMSAT member David Bensen, the group's challenge would be based on zoning law rather than radiation safety issues. "Although we are not convinced the installation is safe," he explained, "we could not prove it is unsafe to the satisfaction of a court of law." The appeal must be filed by mid-October.

COMSAT has described its project in a detailed two-volume application to the FCC. The installation, with three 105-foot-diameter antennas transmitting in the 6 GHz and 14 GHz bands, will join two existing East Coast stations at Etam, WV, and Andover, ME. The Pennsylvania station is designed to help meet an anticipated quadrupling of the region's communications traffic in the next decade.

COMSAT's radiation hazard analysis consists of two pages

out of over two hundred in the application. Company spokesman Roger Cochetti said that clarifying material, including EPA's evaluation of potential radiation levels near the station, will be sent to the FCC soon. These calculations, he points out, are "less conservative" than COMSAT's.

At the company's request, Norbert Hankin from EPA's Non-Ionizing Radiation Surveillance Branch calculated maximum possible microwave levels based on a minimum elevation angle of 5 degrees above the horizon and a maximum power per antenna of 5 kilowatts. (The actual elevation angle would be 26 degrees.) Maximum radiation levels for locations 1,000 feet from the 14 GHz and 6 GHz antennas would be less than 8.7 uW/cm² and 14.6 uW/cm² respectively and much lower for the area beyond 2,000 feet. (The third antenna could operate at either frequency and would function as a backup.) Upper limits rather than expected values were estimated because the near field—an area for which exact calculations are impossible—extends 7 miles for the 14 GHz antenna and 3 miles for the 6 GHz antenna.

In a letter to COMSAT, Hankin concluded that, on the basis of an analytical model and his own experience, "exposure power densities at distances beyond approximately 2,000 feet will be less than 1 uW/cm²....The anticipated microwave exposures which would be produced by the operation of the proposed facility under 'worst case' conditions of power and antenna orientation...should not have any environmental impact; i.e., should not affect the health of humans or animals, nor affect vegetation."

If no appeal is initiated and FCC approval comes through in the next few months, construction could begin next year and the station could be in operation some time in 1983.

BRIEFS

Satellite Communications has published its September directory issue, listing regulatory agencies, satellite carriers, satellite services and hardware and component suppliers....*Star Signals,* a monthly magazine for the earth station receiver industry, was launched this September by Interstar Satellite Systems, Inc. The magazine is the descendant of *Interstar Signals,* the company's widely distributed newsletter. For information, write *Star Signals,* 21708 Marilla Street, Chatsworth, CA 91331....The National Telecommunications Conference, sponsored by the IEEE's Communications Society Conference Board, will be held in New Orleans, LA, November 29–December 3. Contact: NTC '81, Dale Caston, 365 Canal Street, Box 45, New Orleans, LA 70130....The First International Space Communications Workshop will immediately follow NTC '81 in New Orleans on December 3–4. Topics include NASA's 30/20 GHz technical program and spatial frequency reuse techniques. Contact: Dr. A.S. Acampora, Bell Telephone Laboratories, Inc., Room 4E-336, Holmdel, NJ 07733; (201) 949-5692 or Dr. P.A. Kullstam, 6565 Arlington Blvd., Falls Church, VA 22046; (703) 533-8877 ....Antennas are the feature topic in the September *IEEE Communications Magazine*....Over 260 people attended "Space Communication in the '80s," the Sixth Annual Conference on Satellite Communications held September 23–25 in Washington, DC. The meeting was sponsored by the Public Service Satellite Consortium ....Scientific-Atlanta, Inc. is holding a satellite communications symposium in Atlanta, November 2–4. Over 700 participants from all aspects of the industry are expected to attend. For information, contact Betsy Crawley, (404) 449-2274.... Lockheed is developing a space antenna for extending the range of mobile communications units. According to *Science News,* August 29, the collapsible antenna would be 300 meters in diameter and weigh 200 pounds.

NCRP: Biophysics and Bioeffects

The National Council on Radiation Protection and Measurements (NCRP) has issued its first report on non-ionizing radiation. *Radiofrequency Electromagnetic Fields—Properties, Quantities and Units, Biophysical Interaction, and Measurements* is the product of eight years of work by a seven member committee, chaired by George Wilkening of Bell Labs.

The 119-page report includes a brief review of basic electricity and magnetism, a discussion of the interaction of microwaves with biological systems with special emphasis on specific absorption rates (SARs), a description of different types of monitoring instruments, a glossary and a definition of units.

Among the six technical appendices, there is a short discussion of natural background levels of non-ionizing radiation. An index and list of references are included.

The other members of Scientific Committee 39 that prepared the report were: Frank Barnes, Department of Electrical Engineering, University of Colorado, Boulder; Ronald Bowman, Electromagnetic Fields and Antennas Section, National Bureau of Standards; Arthur Guy, Department of Rehabilitation Medicine, University of Washington, Seattle; Karl Illinger, Department of Chemistry, Tufts University; the late Curtis Johnson, Department of Biophysics and Engineering, University of Utah, Salt Lake City; Saul Rosenthal, Department of Electrical Engineering, Polytechnic Institute of New York; and Charles Susskind, Department of Electrical Engineering and Computer Science, University of California, Berkeley.

The report (NCRP No. 67) is available for $10.00 from NCRP Publications, PO Box 30175, Washington, DC 20014. There is a small reduction in price for bulk orders of more than 100 copies.

Another NCRP scientific committee (No. 53) is preparing a report on the biological effects of radiofrequency and microwave radiation. At work since 1977 under the chairmanship of Arthur Guy, the report is nearing completion. According to Dr. Constantine Maletskos, a consultant in biophysics to NCRP and MIT, it is due out at the end of next year.

The members of the committee held a working meeting October 1–2 in Oregon. In addition to Guy, the other committee members are: Ross Adey, VA Hospital, Loma Linda, CA; Edward Alpen, University of California, Berkeley: Stephen Cleary, Medical College of Virginia; Don Justesen, VA Medical Center, Kansas City; Mary Ellen O'Connor, University of Tulsa; and Richard Phillips, Battelle Pacific Northwest Labs, Richland, WA.

OTA: Solar Power Satellites

The Office of Technology Assessment (OTA) has concluded that "too little is currently known about the technical, economic and environmental aspects of SPS to make a sound decision whether to proceed with its development and deployment." The just-released, 300-page OTA report evaluated three alternative systems for beaming solar energy from an orbiting satellite to Earth: microwave, laser and mirror transmission.

The OTA did not recommend a stop to SPS funding, as did the National Academy of Sciences in its own recent SPS report. (See *MWN,* July/August 1981.)

Among the major conclusions related to microwave radiation were:

- "Too little is known about the biological effects of long-term exposure to low-level microwave radiation to assess the health risks associated with SPS microwave systems."
- "The potential for interference with other users of the electromagnetic spectrum could constitute a severe drawback for the microwave option."

A copy of the report, *Solar Power Satellites,* is available from the US Government Printing Office. GPO stock number: 052-003-00848-3. The price is $7.50. A copy of the report's summary is available at no cost from OTA, US Congress, Washington, DC 20510, (202) 224-0885.

GOVERNMENT

Radiation Policy Council Closes Down

The Radiation Policy Council (RPC) went out of business at the end of September. The council, a victim of the Reagan-Stockman budget cuts, had all its funds deleted for the 1982 fiscal year which began on October 1.

Carl Gerber, the director of the RPC, said that the council would be ending its work prematurely but that he was glad he had been able to complete its first phase, issue identification. "It wasn't all a waste," he said, "but I wish I could have taken the issues on directly."

The RPC was set up by President Carter in February 1980 under Executive Order 12194 on the recommendation of an interagency task force chaired by Peter Libassi, the former general counsel of the Department of Health, Education and Welfare, now the Department of Health and Human Services. The task force itself was established after public disclosures that servicemen had been exposed to ionizing radiation from nuclear weapons testing. Under the original order, the council was given a four year mandate, ending in 1984.

The council never addressed non-ionizing radiation issues, though a number of groups had urged it to do so. (See *MWN,* January 1981.)

Gerber said that the council had won the support of the participating federal agencies, industry and professional societies, but that they had not created enough pressure to restore the lost funds. The original Carter FY82 budget had allocated $980,000 for the RPC. In addition to cutting this to zero, the Reagan administration reduced the FY81 budget from $942,000 to $300,000, limiting Gerber to a staff of two part-time consultants and a secretary.

A report on issue identification and analysis is now under review and should be released by the end of the year. Gerber is also writing a final report, which he hopes will one day provide the basis for a continuation of the council's work.

OSHA's Auchter Says RF Radiation is "Serious Hazard"

Thorne Auchter, the administrator of the Occupational Safety and Health Administration (OSHA), has listed radiofrequency radiation as one of the hazards "which OSHA believes merit consideration at this time." In an affidavit required by the Court of Appeals' decision in a suit brought by farm workers seeking a field sanitation standard,* Auchter stated: "The radiofrequency radiation standard addresses a serious hazard to an extremely large number of employees, and Congress indicated that it should be examined."

Auchter described first and second order priorities for OSHA's health standards staff. RF is in the lower category. These priority standards are to be the focus of the agency's work over the next two years. Auchter outlined the RF problem in his timetable:

> NIOSH has estimated that 20 million workers could be exposed to significant levels of radiofrequency radiation. Radiofrequency radiation has a heating effect on the body, and may raise body temperature and cause tissue damage. It may also affect the nervous system. OSHA is gathering information and considering amendment of its current standard (29 CFR §1910.97 Nonionizing radiation). On May 13, 1981 the Subcommittee on Investigations and Oversight of the House Committee on Science and Technology held a hearing on this hazard, and requested that OSHA move more rapidly in its efforts to minimize worker exposure to harmful levels of radiofrequency radiation. The project currently requires the work of two staff members on a part time basis.

**National Congress of Hispanic American Citizens (El Congreso), et al.* v *Ray Marshall, Secretary of Labor, et al.,* 626 F. 2d 882 (DC Cir 1979).

RF Sealer Meeting

The Bureau of Radiological Health (BRH) is hosting an all-day meeting on RF sealers, October 7 in Rockville, MD. Representatives from the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH) and BRH will explore strategies to deal with the RF sealer radiation problem.

Though the agenda is open to all possible control techniques, BRH does not favor performance standards for heaters and sealers. At last May's congressional hearing, chaired by Congressman Albert Gore, Jr., BRH Director John Villforth said that he did not think such emission standards would be effective because the agency did not have the authority to regulate old machines and because many users substantially modify the machines on delivery, thus undoing any built-in shielding. (See *MWN,* June 1981.)

EPA Plan Would Delay Release of Data

A new plan to control the release of research results from the Environmental Protection Agency (EPA) threatens to delay their publication, according to an article in *Science* magazine. Writing in the September 18 issue, R. Jeffrey Smith reports that, under the proposed policy, "scientific manuals and reports would have to follow a circuitous path through the agency involving as many as 30 steps before their conclusions become known to the general public." And "at five different steps, the material can be returned to the author for revision, whereupon the review process begins anew."

In a telephone interview from Research Triangle Park, NC, Daniel Cahill, director of the Experimental Biology Division in EPA's Office of Research and Development, confirmed that, if the proposal goes through, reports from his lab, which is responsible for EPA's research on radiofrequency and microwave bioeffects, could be held up. This would apply even to papers submitted for publication to peer reviewed journals.

With respect to the forthcoming criteria document on non-ionizing radiation, Cahill did not think the new review procedures would cause any extra delays. "This kind of document would normally go through extensive review in Washington," he said.

The criteria document should be ready for review by EPA's Office of Radiation Programs and Scientific Advisory Board (SAB) by mid-October. Cahill would also like to have a round of external reviews after the SAB has completed its work.

BRIEFS

It does not look as if NIOSH will be moving down to Atlanta. As we go to press the House Appropriations Committee has voted to block the use of CDC-NIOSH money to pay for the move. On the Senate side, the appropriations subcommittee has also voted against the plan. Darlene Christian, vice president of the American Federation of Government Employees Local 41, which represents NIOSH, said that "although no formal statement has been made by NIOSH or CDC, I'm 99 percent sure the move is a dead issue."...OSHA is re-evaluating its enforcement policy for RF/MW radiation. The Office of Field Coordination is in the process of weighing various options for Administrator Auchter....The medical surveillance report prepared by the Rocky Mountain Center for Occupational and Environmental Health at the University of Utah, under contract to OSHA, is now being revised by the center. (See *MWN,* February 1981.) A new draft is expected soon....The FCC staff has prepared a report on radiofrequency interference. A summary of the report was printed in the *Federal Register,* August 13, p. 40900.

BIOLOGICAL EFFECTS

ELF Literature Review

Jack Bridges and Dr. Maurline Preache of the IIT Research Institute in Chicago have published a detailed summary of the biological effects of 50–60 Hz electromagnetic fields. "Biological Influences of Power Frequency Electric Fields—A Tutorial Review from a Physical and Experimental Viewpoint," appears in the September issue of the *Proceedings of the IEEE*. The 19-page review covers the literature through 1979, with 145 references selected from some 3,000 publications.

In their abstract, the authors state:

> ....While considerable data exist on this subject major problems were found in much of the literature. It was found that electric field induces about the same body current into humans as that experienced by individuals touching household appliances. As a consequence, the electric field environment from EHV [extra high voltage] lines is only a subset of the ubiquitous 50–60 Hz electromagnetic environment found throughout industrialized communities. The omission of such environmental considerations has limited the usefulness of a number of studies.
>
> A lack of understanding of how electric fields couple energy into animals has resulted in inconclusive research or inappropriate interpretation of results. A common misinterpretation has been to extend experimental results observed for fish or quadrupeds to erect humans on a simplistic volts-per-meter exposure basis.
>
> While some of the studies reviewed noted potential deleterious effects at likely field levels for animal subjects, none of these reported effects could be unequivocally attributed to direct efforts of the electric fields....

BRIEFS

Martha Piana, David Hellums and William Wilson of Rice University have found that the response of human blood platelets to 2-hour exposure to 40 mW/cm² of 2.45 GHz microwaves is consistent with that predicted by a thermal model. They conclude that the work "yielded no evidence of adverse effects of microwaves on human blood platelets other than those associated with temperature increase in the specimens." *IEEE Transactions on Biomedical Engineering*, September 1981, p. 661....The Smithsonian Science Information Exchange is offering a digest of on-going research projects in government, private and foreign labs on "Hazards of Microwaves." The package (No. AR04) consists of 291 different summaries covering the years 1979–1981. The cost is $55. For more information, contact: SSIE, Room 300, 1730 M Street, NW, Washington, DC 20036, (202) 634-3933....In contract news, the Office of Naval Research has awarded a $217,500 grant to the University of Colorado, Boulder, for research on electromagnetic neural effects. And the R&D Directorate at Wright-Patterson AFB has awarded a $135,281 contract to the Georgia Institute of Technology in Atlanta to study RF radiation effects on excitable tissues.

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AROUND THE WORLD

IRPA

The International Radiation Protection Association's (IRPA) International Non-Ionizing Radiation (NIR) Committee has prepared an assessment of the biological effects of radiofrequency and microwave radiation as a first step toward developing an exposure standard. Environmental Health Criteria Document No. 16 also covers sources of radiation in use as well as levels of exposure. It is at the printer and should be available soon. The IRPA standard, which will cover the frequency range between 100 kHz and 300 GHz, is still under discussion. Another criteria document on extremely low frequency (ELF) radiation should be ready by 1982–83. In addition, the International Labour Office has asked IRPA to prepare an overview of occupational hazards from NIR.

In Washington, DC, for the Bioelectromagnetics and URSI meetings, Annette Duchene, the secretary of the IRPA NIR committee, said that the primary objectives of the committee are:

- to collect all available background data relevant to health protection against NIR
- to establish the basic principles of non-ionizing radiation protection and to develop appropriate internationally acceptable recommendations in this field
- to explore with other international organizations ways for furthering protection against the different types of NIR.

The other members of the committee are: H. Jammet (chairman, France), B.F.M. Bosnjakovic (Netherlands), P. Czerski (Poland), M. Faber (Denmark), D. Harder (F.R. Germany), J. Marshall (United Kingdom), M.H. Repacholi (Canada), D.H. Sliney (USA), J.C. Villforth (USA). The committee also has three consultants: G. Kossoff (Australia), G. Nimtz (F.R. Germany), and G. Wilkening (USA).

Jammet and Duchene can be reached at the Commissariat à l'Energie Atomique, Institut de Protection et de Surete Nucleaire, Departement de Protection, 92260 Fontenay-aux-Roses, France.

UK Postal Workers Want More Research

The Post Office Engineering Union has accused the British government of not doing enough research on the health effects of microwave radiation, according to the London *Times*. A September 9 news item reported that the union had leveled the charge at the Trade Union Congress meeting in Blackpool.

The piece went on to note that the National Radiological Protection Board (NRPB) had the only on-going research program in the country. Professor Edward Grant of Queen Elizabeth College at the University of London had applied to do some bioeffects research but failed to win a grant. A spokesman for the NRPB told the *Times* that a set of safety standards would be proposed next year. (Speaking at last August's URSI meeting in Washington, DC, NRPB's Frank Harlan said that the United Kingdom was presently using a 10 mW/cm² radiofrequency and microwave radiation safety standard.)

Meanwhile the *New Scientist* (September 17) reports that the NRPB has a new director. John Dunster had been named to replace Andrew MacClean, who died two months ago. Dunster was the NRPB's assistant director for operations until 1976, when he joined the Health and Safety Executive.

UPDATE

VDTs....Bill Shea, a typesetter with Local 226 of the International Typographical Union in Vancouver, British Columbia, has filed a workman's compensation suit alleging radiation induced cataracts as a result of working with VDTs....The Ontario Public Service Employees Union (OPSEU) has signed a contract with Dayton T. Brown of Bohemia, NY, to test the VDTs used by Darleen Weiss, a VDT operator seeking workers' compensation for alleged radiation induced cataracts. (See *MWN*, March and May 1981.) Under the $65,000 contract, Dayton Brown will check the units for radiofrequency, microwave, ultraviolet and X-ray radiation, as well as static fields. Similar tests will be performed in gas discharge displays, possible alternatives to CRTs....OPSEU, the Southern Ontario Newspaper Guild and the Ontario Institute for Special Education are sponsoring a three-day conference on VDTs, October 16–18 in Toronto. Paul Brodeur and Jeanne Stellman are among the scheduled speakers....The American Optometric Association has issued recommendations for VDT operator eye care. Eye examinations for new workers and rest breaks are among the association's suggestions, based in part on NIOSH's Bay Area VDT study. For a copy, contact the association at 243 North Lindbergh Blvd., St. Louis, MO 63141 ....Additional coverage of the National Academy of Sciences (NAS) symposium on VDTs and vision held this August in Washington, DC, appeared in the August 27 issue of *New Scientist* and the August 29 issue of *Science News*. (See *MWN*, September 1981.) In the September 5 issue, *Science News* continued its VDT coverage with a detailed report on a Norwegian study linking facial rashes among VDT operators with static electric fields. A report on this work was presented at the NAS symposium....Scientific measurements of fatigue among various types of VDT workers are being performed at the Institute of Ophthalmology at Moorfields Hospital, London. According to a September 23 report in the London *Times*, researchers are monitoring physiological signals in an attempt to establish objective measures for worker fatigue.

Medical Applications....The IEEE MTT-S and COMAR are sponsoring a one-day workshop on medical applications of electromagnetic energy on June 18, 1982, following the International Microwave Symposium (see Conference Calendar p. 8). Invited and contributed papers as well as panel discussions are scheduled. Topics to be covered include hyperthermia, NMR imaging, and radiometry. For more information contact one of the workshop's co-chairmen: Dr. J. Gordon Short, BSD Medical Corp., 420 Chipeta Way, Salt Lake City, UT 84108, (801) 582-5550; or Dr. Gideon Kantor, BRH, 12721 Twinbrook Parkway, Rockville, MD 20857, (301) 443-3840....The proceedings of the symposium on *Biomedical Thermology*, held in Strasbourg, France, last June 30–July 4 (see *MWN*, July/August 1981) are being edited by Dr. Michel Gautherie and Professor Ernest Albert and will be published early next year by Alan Liss, Inc., 150 Fifth Avenue, New York, NY 10011. If you order by November 15, you will receive a 20% discount on the yet-to-be-set publication price....The June 1981 issue of the *Journal of Microwave Power* is devoted to the use of RF and MW hyperthermia for cancer therapy.... According to an article in the September 7 *New York Times*, Intermagnetics General Corp. is the first US company to win a contract to deliver magnets for an NMR imaging system. Columbia Presbyterian Medical Center in New York City has ordered two from the Guilderland, NY, company. According to one market analyst quoted in the article, the NMR market may one day equal and perhaps surpass that of CAT scanners, which now runs about $450 million a year.

Technology....The FCC anticipates a "great demand" for Digital Termination Systems (DTS) radio systems and is now proposing to authorize the 17.7-19.7 GHz band for DTS, in addition to the already allocated 10.55–10.68 GHz band. The commission is also acting favorably on a petition by Farinon Electric to "rechannelize the 18 GHz band to permit narrower bandwidth channel assignments than are currently provided for." (46 *Federal Register* 45635, September 14)....Robert Lagace of Arthur D. Little, Cambridge, MA, presented a paper at last August's URSI conference on a theoretical model to predict "the most favorable operating frequencies and maximum communication ranges for portable radios with loop antennas" in coal mines. The range turns out to peak between 300 and 700 kHz, and is "highly dependent" on the electrical conductivity of the coal seam and its surrounding rock....The Bureau of Mines in Pittsburgh is negotiating a contract with R.A. Isberg, a communications engineer in Berkeley, CA, to design, construct, test and build a mine-wide monitoring system....Rome Air Development Center at Grifiss AFB, NY, is looking for a company to develop a portable, direct current, miniature, multiplexed microwave link for simultaneous transmission and receipt of six color video signals (*Commerce Business Daily*, September 17)....The US Army Mobility Equipment Research and Development Command at Fort Belvoir, VA, is negotiating a contract with Aerodyne Research of Bedford, MA, for additional work on an "advanced microwave pumped laser."

Military Systems....The Air Force will prepare an environmental impact analysis on its proposal to build a third PAVE PAWS radar at Robins AFB, GA. The EIS will also evaluate Moody AFB, GA, as an alternative site. No contractor has yet been selected to do the work....The AF's Electronic Systems Division is looking for a contractor to develop and produce a very low frequency (VLF) miniature receiver, operating between 14 and 60 kHz, for its FB-111 and B-52 bombers (*Commerce Business Daily*, September 1)....Janet Raloff reports on the use of lasers for military communications, especially the blue-green system, which might replace Project ELF, in an article on laser research in the September 19 issue of *Science News*....The Naval Electronic Systems Command in Washington, DC, has awarded the IIT Research Institute in Chicago a $465,535 contract for "technical support for ELF environmental compatibility assurance program."

Litigation....Jill Jonnes's article "Microwave Suits Heat Up" appeared in the September 14 issue of the *National Law Journal*.

Radar and MM Waves....A team from the Department of Atmospheric Sciences at the University of Washington, Seattle,

have concluded that 8.6 mm radar "can provide a unique and powerful tool in evaluating the effects of cloud seeding." (*Science,* September 11)....The IEEE's Microwave Theory and Techniques Society is planning a special transactions issue on *Millimeter Waves* to be published in February 1983. For more information contact: V.G. Gelnovatch or Harold Jacobs, US Army Electronics Technology & Devices Lab, ATTN: DELET-M, Fort Monmouth, NJ 07703....The US Army Communications-Electronics Command at Fort Monmouth is looking for a contractor to review near mm wave communications technology (*Commerce Business Daily,* September 18)....A collaboration between anthropologists and a radar scientist has thrown new light on ancient Mayan land use. In an article in the September 25 *Science,* the group describes their use of 1225 MHz synthetic aperture radar ....The Army's Harry Diamond Labs in Adelphi, MD, is negotiating with the Environmental Research Institute of Michigan in Ann Arbor to develop and demonstrate synthetic aperture radar technology.

EMP....The General Accounting Office (GAO) has issued a report, *Countervailing Strategy Demands Revision of Strategic Force Acquisition Plans* (MASAD-81-35, August 5, 1981), which concludes in part: "If the United States is to maintain deterrence until new weapons are deployed in significant numbers, the current [command, control and communications] network must be rapidly improved." The GAO is worried about the C^3 network's vulnerability to EMP ....William Broad outlined the DOD's plans to deal with the EMP threat in "Military Grapples with the Chaos Factor," in the September 11 *Science.* One strategy is to place greater emphasis on satellite communication systems. Broad concluded, "The EMP threat looms larger as the electronic revolution moves forward."...In response to some of Broad's earlier articles on EMP, UCLA's W.D. Hershberger presented some history of the early strategic work on EMP during the 1960s. His letter appeared in the August 21 *Science*....The Defense Nuclear Agency will host a closed meeting of its Scientific Advisory Group on the effects of nuclear weapons, October 20–22. On the agenda is the survivability of missiles and strategic weapons (46 *Federal Register* 45408, September 11)....The Naval Air Systems Command in Washington, DC, is seeking a contractor for EMP management and technical advisory support (*Commerce Business Daily,* September 21).

Ovens....Magic Chef has laid off 250 workers at its microwave factory in Anniston, AL. In a telephone interview from his office in Cleveland, TN, company spokesman Clyde Whitfield said that the reduction was only temporary—an attempt to reduce inventory. "The current rate of orders has not been up to expectations," he continued. He blamed the downturn on the economy and interest rates. The microwave oven industry as a whole remains strong however. According to the American Home Appliance Manufacturers' monthly report, factory shipments through this August are up 33% over last year: 2,670,000 over 2,003,000 for the first eight months of the year.

ANSI

Health Standard

A couple of negative ballots have been filed on the latest draft of the American National Standards Institute (ANSI) C95.1 safety standard for radiofrequency and microwave (RF/MW) radiation. Consumers Union voted against the proposed revision again, as did Leo Birenbaum of the Polytechnic Institute of New York. Since only negative votes were invited, there is no count of those affirming the new standard.

The Electronic Industries Association (EIA), which has consistently opposed the standard in the past, abstained because it did not have a chance to meet to discuss the changes. Although the trade association passed up this opportunity to vote, individual companies will submit comments in the next round of public review, when ANSI itself requests comments. Howard Johnson of RCA said that his company would probably oppose the standard at that stage, not because of objections to the proposed numerical limits but because of the process by which they were selected. Johnson wants the government rather than a voluntary organization to set a standard.

The Environmental Protection Agency (EPA) did not submit a negative vote, although it too does not approve of the standard. EPA's Dave Janes did not think his silence would be interpreted as approval: "My position has already been made clear, and it has not changed," he said.

The Bureau of Radiological Health (BRH) has dropped its objections and is now willing to support the standard. "While it does not answer all our concerns, we consider it an improvement over the old standard," said BRH's Henry Rechen. Rechen intends to file an official letter, citing the BRH position in the near future.

New Warning Symbol

The new ANSI symbol to warn the public and workers of potentially hazardous RF/MW fields has been approved. The symbol can be placed in a variety of signs but when used separately it must be enclosed in a triangle, as shown in the figure below. The triangle should be yellow. The new abstract symbol replaces the old sign, which was adopted in 1966 and reaffirmed in 1974. The C95.2 standard is now at the printer, and will soon be available from ANSI, 1430 Broadway, New York, NY 10018.



CONFERENCES

CALL FOR PAPERS

• 10th Annual *Northeast Bioengineering Conference,* March 15–16, 1982. Dartmouth College, Hanover, NH. Contact: Professor Eric Hansen, Thayer School of Engineering, Dartmouth College, Hanover, NH 03755, (603) 646-2205.

• *International Microwave Symposium,* June 15–17, 1982. (See calendar.) One or two sessions are planned on bioeffects and medical applications. Contact: Professor Om Gandhi, Department of Electrical Engineering, University of Utah, Salt Lake City, UT 84112, (801) 581-7743. Papers are also being sought for the workshop on medical applications to be held June 18. See Update on p. 6.

• *IMPI Symposium,* July 25–30, 1982. (See calendar.) Papers on non-communication aspects of microwaves. Contact: Gandhi, address given above.

CALENDAR

• October 26–27: *Microwaves and Thermoregulation: A Symposium,* hosted by the John B. Pierce Foundation, New Haven, CT. Contact: Office of Graduate and Continuing Education, Yale School of Medicine, 333 Cedar Street, New Haven, CT 06510.

• November 9–11: 1st Annual Meeting of the *Bioelectrical Repair and Growth Society,* Philadelphia, PA. Contact: Executive Secretary of the Society, 425 Medical Education Building, 36th and Hamilton Walk, Philadelphia, PA 19104.

• December 7–12: 6th International *Conference on Infrared and Millimeter Waves,* Carillon Hotel, Miami Beach, FL. Contact: K.J. Button, MIT National Magnet Laboratory, Cambridge, MA 02139.

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• January 13–15: *National Radio Science Meeting,* University of Colorado, Boulder, CO. Contact: S.W. Maley, Dept. of Electrical Engineering, University of Colorado, Boulder, CO 80309.

• March 15–18: *International Workshop on Physics and Engineering in Medical Imaging,* Asilomar Conference Grounds, Pacific Grove, CA. Contact: University Extension, University of California, PO Box AZ, Irvine, CA 92716.

• March 29–April 2: 3rd *International Congress of Thermology,* Bath, England. Contact: Congress Secretariat, Martlet Conference Services, 24 Preston Street, Brighton, Sussex BN1 2HN, England.

• May 24–28: *International IEEE/APS Symposium, National Radio Science Meeting and Nuclear Electromagnetic Pulse Meeting,* University of New Mexico, Albuquerque, NM. Contact: Dr. Kendall F. Casey, Dikewood Corp., 1613 University Blvd., NE, Albuquerque, NM 87102.

• June 15–17: IEEE MTT-S *International Microwave Symposium,* Hyatt Regency Hotel, Dallas, TX. Contact: J.R. Griffin, Texas Instruments, Mail Stop 3432, PO Box 405, Lewisville, TX 75067.

• June 29–July 2: 4th Annual *Bioelectromagnetics Society Meeting,* Beverly Wilshire Hotel, Los Angeles, CA. Contact: BEMS, PO Box 3651, Arlington, VA 22203.

• July 25–30: 17th Annual Symposium of the *International Microwave Power Institute,* Town and Country Hotel, San Diego, CA. Contact: IMPI, 211 East 43rd Street, New York, NY 10017.

• September 6–10: 7th *Colloquium on Microwave Communication,* Budapest, Hungary. Contact: Secretariat of the 7th Microcoll, H-1525, Budapest 114, POB 15, Hungary.

SHORT COURSES

• November 16–20: *Principles of Modern Radar,* Georgia Institute of Technology, Atlanta, GA. Fee: $475. Contact: Department of Continuing Education, GIT, Atlanta, GA 30332, (404) 894-2400.

• December 7–9: *Millimeter-Wave Radar,* George Washington University, Washington, DC. Fee: $575. Contact: Continuing Engineering Education, GWU, Washington, DC 20052, (202) 676-6106 or (800) 424-9773.

Disagreement at IEEE

(continued from p. 1)

Writing in the September issue of the CSIT newsletter, *Technology and Society,* Dr. Norman Balabanian, its editor, found the COMAR document marred by inconsistencies, logical fallacies and inaccurate implications. He specifically objected to COMAR and ANSI's failure to recognize the risks of non-thermal, long-term and partial-body effects. Balabanian feared that the IEEE, and engineers in general, will be viewed as just another special interest group unless its public statements are "factual, objective and unbiased."

In an interview, Balabanian said it was not his intention to comment on the technical content of the COMAR position paper: "I only used it as an example of what IEEE position papers should be like, and the COMAR statement falls short of the desired characteristics."

Some of the language in the COMAR statement, as published side-by-side with the Balabanian editorial, has already been toned down due to pressure from the IEEE. COMAR President Om Gandhi admitted that certain phrases were "unnecessarily abrasive," and these have been edited out. Otherwise, he maintained that "COMAR was sticking by its position paper."

"We are the technical expert committee of the IEEE," Gandhi said, "and we don't see how there can be two expert committees in the field." He referred to "the large number of knowledgeable people on the committee: Professor Carl Durney, the president of the Bioelectromagnetics Society (BEMS), Dr. Donald McRee, of the National Institute of Environmental Health Sciences and the president-elect of BEMS, and Dr. Elliot Postow of the National Naval Medical Center, the editor of the BEMS journal." And "we have obviously looked at low-level phenomena," Gandhi added.

Robert Bogumil, the chairman of CSIT, said that while he is encouraged by some of the changes made by COMAR, "they do not go as far as I would like." He stressed that the purpose of Balabanian's editorial was not to offer an official CSIT position but to stimulate a response from the newsletter readership in order to develop such a position and to make suggestions to COMAR.

Dr. Irving Engelson, director of Technical Activities for the IEEE, said that the solicitation of views from a wide variety of people is a common procedure: "This is the process we go through with all our position papers."

The COMAR statement will be on the agenda of the IEEE's US Activities Board at its October 20–21 meeting in Rapid City, SD, and will be presented for approval at the IEEE's Technical Activities Board's (TAB) December 3–4 meeting in Savannah, GA, according to Gandhi. By then, reactions from CSIT and other IEEE members should be apparent. Engelson would not predict how the 60 TAB members would vote. If approved by TAB, the position paper must still win the endorsement of the full IEEE board of directors.

COMAR is also working on a position paper on "Health Aspects of Video Display Terminals." The first draft, written by John Osepchuk of Raytheon Corp. and Maria Stuchly of Health and Welfare, Canada, is now being reviewed by the COMAR membership. COMAR's plans to make a movie about microwaves are also continuing.

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Microwave News *invites letters from its readers. We ask writers to be brief, and we reserve the right to edit contributions for length.*

Electromagnetic Compatibility Symposium

Making Systems Work Together

There was no sign of a recession at this year's *International Symposium on Electromagnetic Compatibility (EMC).* The convergence of experts from computer companies, defense contractors and the military together with the usual complement of interference and compatibility engineers swelled attendance to a new record: more than 700 people came to the conference in Santa Clara, CA, in the heart of Silicon Valley.

The tone of the September 8–10 meeting was set by Dr. Walter LaBerge of Lockheed Missiles & Space Co. when he warned of impending EMC problems in increasingly complex military hardware. "The world is going to get coupled together and whether it works is still to be determined," he said. LaBerge, the keynote speaker, catalogued the large number of "smart" weapons coming on line—especially those with very high speed integrated circuits (VHSIC)—and pleaded for renewed emphasis on their operations in the real world. Precautions must be taken, he said, to make sure that diverse electronic equipment can operate together without harmful electromagnetic interference (EMI) in all environments, at home and abroad, in a conventional conflict as well as in a tactical nuclear war. Planners must look beyond the rules dictated by the Federal Communications Commission (FCC), he advised.

The Aegis Cruiser

A clear example of the complexities of the task at hand is the new Aegis Combat System aboard the Ticonderoga, the navy's latest guided-missile cruiser: it boasts 25 individual radars, sonars and communication and weapon systems. A dozen of these either radiate or receive electromagnetic radiation making compatibility a necessity. Milton Kant, an EMC engineer with RCA's Government Systems Division in Moorestown, NJ, admitted that there are EMC problems on the Ticonderoga even though it is hardened by an order of magnitude greater than any other navy ship sailing today.

The heart of the Aegis control system is the AN/SPY-1A, a high-powered, phased array radar capable of tracking hundreds of targets simultaneously. Richard Durham, also from RCA, said that during the Ticonderoga's recent sea trials there were no RFI incidents related to the AN/SPY-1A radar, and that the cruiser can operate in a fleet environment where other ships are using the same radar. The ship's X- and L-band radars, however, are not yet free of interference, according to Kant.

In an interview, Kant said that the various systems used on the Ticonderoga were essentially off-the-shelf equipment. He recommended a new research and development program to improve inter-system compatibility. Similar pleas were voiced by other experts at the meeting.

Kant discounted a recent Congressional report that the Aegis cruiser is top heavy and unstable. The claims should be taken with "a grain of salt," he

(continued p. 2)

EMC Symposium *(continued from p. 1)*

said. (The House Appropriations Committee report has not been made public.) The navy maintains that the Ticonderoga met all its objectives during the trials, including speed. "Although the ship has grown in weight, it is not overweight and it is not unstable," a navy spokesman said.

CREAM Program

Dr. Robert Haislmaier, an EMC advisor to the Chief of Naval Operations, presented a progress report on the navy's Combat Readiness Electromagnetic Analysis and Measurement (CREAM) Program. He termed it an "aggressive get well" effort for EMI control. Begun in 1979, the program is developing three new test sets: for antennas and transmission lines (AN/PSM-40), for arc detection (AN/PSM-41) and for intermodulation interference (IMI) (AN/PSM-42).

The antenna test set, devised by the Systron Donner Corp., Van Nuys, CA, has performed well in trials and a follow-up contract has been awarded. The arc detector, developed by the James Biddle Co. in Blue Bell, PA, has proved itself useful in locating RF arcing, caused by induced voltages in shipboard structures capable of generating broadband noise interference to receiving equipment. Similar success is anticipated for the IMI test set developed by the Atlantic Research Corp. of Alexandria, VA. (IMI occurs when two or more high-power transmitters induce RF currents through non-linear junctions in a ship's hull and superstructure. Resulting re-radiation can degrade the performance of sensitive receiving devices.) Engineering development contracts for the latter two sets are scheduled to be awarded in fiscal year 1983.

The CREAM program is also sponsoring a new RF/microwave measurement set, the AN/PSM-46. According to Haislmaier, current ways of measuring radiation on ships are "complicated and inadequate." The objective, he said, is "to make sure our people are protected." Design specifications for the navy's test set are keyed to the new American National Standards Institute (ANSI) safety standard (C95.1). The meter will not measure absolute power densities but will yield a relative reading of the weighted signal levels compared to the maximum intermittent exposure. In response to a request for proposals, the navy has just received two bids from meter manufacturers. These are in the process of being evaluated and a contract could be awarded by the end of the calendar year.

Computing Devices

The FCC's computing devices rules (Part 15, Subpart J) on EMC have prompted increased attention to interference issues from a large number of computer and video game manufacturers. Lawrence Movshin, an attorney with McKenna, Wilkinson & Kittner in Washington, DC, presented a tutorial on his interpretation of the commission's regulations to a packed audience. While all Class A equipment (intended for commercial use) first marketed after October 1, 1981 and all equipment manufactured after October 1, 1983 must be verified for compliance with the rules, there are uncertainties as to how the commission will deal with existing but modified devices. Movshin offered three rules of thumb: (1) when changes are made, test; (2) bring the device into compliance whenever possible; and (3) maintain records so that, if audited, a company can show a good faith effort to comply.

Movshin closed his remarks with some advice: "The FCC has the authority to force compliance, so don't ignore the rules because the FCC will find you and get you." To back up his warning, he said that the commission takes complaints from competitors "very seriously." In addition, he said that the commission was stepping up its audits and cited as an example a recent check of all equipment in a retail store in Baltimore.

Computer Interference

One intriguing example of the growing susceptibility of modern computers to EMI was revealed by Robert Goldblum of R&B Enterprises in Plymouth Meeting, PA. He said that he had a client at the World Trade Center in downtown New York City whose computers were going "haywire." Goldblum told *Microwave News* that many computers were not designed to operate in environments with spurious electric fields: fields of 1-10 V/m and sometimes as high as 20 V/m are not uncommon in congested urban areas. Retrofitting can be very expensive, costing tens of thousands of dollars, and in some cases manufacturers are not covering EMI effects under their warranties. Goldblum said that he is receiving two or three calls a month from New York City alone, alleging EMI, mostly from companies with computers in high-rise buildings in line-of-sight with the Empire State Building or the World Trade Center antennas.

(In its July 19 issue, *Computerworld* described "intermittent hardware failures" among users of Hewlett-Packard HP 3000 computer systems. The article cites a Hewlett-Packard spokesman as saying that radio transmissions from the Empire State Building and the World Trade Center are responsible for interference to HP disk drives.)

There are no federal standards governing computer susceptibility to EMI. Indeed, it is not clear which agency would be responsible for such regulations.

Open Area Test Sites

By far the best attended session at the meeting was the workshop on open area test sites. With new FCC EMI requirements for devices with integrated circuits, there has been a movement towards improved techniques for measuring and characterizing radiated emissions. Manufacturers are striving for more standardized and reliable testing procedures to ensure that design changes are cost effective. Donald Heirman of Bell Labs in Holmdel, NJ, described the construction of an all-weather, open field test site. He stressed that they are not necessarily very expensive; his cost only about $60,000, excluding the price of real estate and instrumentation.

Edwin Bronaugh reviewed the work of the ANSI C63 Committee on Radio-Electrical Coordination of which he is the chairman. Subcommittee 1 is in the process of revising the C63.4 standard for the "establishment and characterization of open air test sites for EMC measurements." The eighth draft of the proposed revision is now up for a vote. A subcommittee meeting has been re-scheduled to consider the ballots and will now be held on November 3 at the FCC in Washington, DC. The full C63 committee will meet the following day. Bronaugh, who recently moved to Electro-Metrics in Amsterdam, NY, from the Southwest Research Institute in San Antonio, TX, said that he hoped that the C63.4 standard would be adopted early in 1983.

At the end of September, Leonard Thomas, Sr., the secretary of C63, said that it is possible that a ninth draft will have to be circulated among the subcommittee members before the proposal is presented to the full committee for a final vote.

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The date and location of next year's EMC meeting has just been changed. The 1983 symposium will now be held at the Hyatt Regency-Crystal City in Arlington, VA, on August 23-25. ●

HIGHLIGHTS

Reagan Signs Communications Bill: FCC Granted Authority To Set RFI Standards

As expected, President Reagan signed the Communication Amendments Act of 1982 into law on September 13. Public Law 97-259 authorizes the Federal Communications Commission (FCC) to set minimum performance standards for electronic equipment used in the home in order to reduce its susceptibility to radiofrequency interference (RFI). (See *MWN*, September 1982.) Among other provisions, the amendments allow the FCC to stop licensing CB radio operators and to simplify its procedures for issuing amateur radio licenses. The managing director of the FCC has appointed a task force to sort out the commission's responsibilities under the new law and to expedite its implementation.

The Senate and House had originally passed their own bills (S.929 and H.R. 5008). The differences between the two versions were reconciled in a House-Senate conference at the end of August: the resulting legislation (H.R. 3239) was approved by the President.

While the commission can now issue RFI standards, it does not have to do so. As the conference report (House Report No. 97-765) explains: "In view of complaints regarding home devices, the conferees believe that commission authority to impose appropriate regulations on home electronic equipment and systems is now necessary to insure that consumers' home electronic equipment and systems will not be subject to malfunction due to RFI. However, the legislation does not mandate [the] commission [to] exercise this authority; that decision is well within the technical expertise of the agency."

The final determination on whether or not to set standards lies with the commission's chief scientist. An FCC staffer said that the issue was still under review and that no decision has yet been made on how to proceed.

One expert predicted that the FCC would not move to set standards immediately. Lawrence Movshin, an attorney with McKenna, Wilkinson & Kittner in Washington, DC, told *Microwave News that he expects the commission to use the* new authority to press industry into adopting voluntary guidelines.

In the report accompanying the bill, the conferees preempt state and local action on RFI regulations. They state that only the FCC has the jurisdiction to deal with RFI incidents.

The original House bill (H.R. 5008) contained a provision that would have authorized independent laboratories to test *and* certify devices for their potential to cause RFI. The Computer and Business Equipment Manufacturers Association, among others, objected: companies were worried that conflicts of interest would arise if the FCC delegated its certification authority to private companies. The FCC agreed and withdrew the proposal. ●

EPA and OSHA Delay Health Standards

The release of advanced notices of proposed rulemaking (ANPRM) on new radiofrequency and microwave (RF/MW) radiation standards by the Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OHSA) have been delayed. Both agencies were scheduled to issue notices in September; EPA a guidance for general population exposures and OSHA a standard for occupationally exposed workers.

At EPA, the ANPRM is now in "red border" review. This is the last step in the agency's evaluation process when all proposals are examined by the senior EPA staff and are forwarded to Administrator Anne Gorsuch for a final decision. There is no word as to whether Gorsuch will sign the ANPRM. If she does, it would probably be published in the *Federal Register* in November. One EPA staff member said that if it is approved, the Office of Radiation Programs would still try to meet its original schedule of publishing a proposed rule in September 1983 and final guidance in September 1984.

At OSHA, a draft ANPRM will be submitted to agency management in mid-October. If approved without changes, it would take about 4–6 weeks to publish the notice. (In May, OSHA officially proposed to delete all its voluntary standards including its advisory 10 mW/cm^2 RF/MW standard.)

OSHA has received a report on the potential economic impacts of various occupational RF/MW standards from its contractor, Centaur Associates of Washington, DC. According to an OSHA staffer, the consulting firm's analysis is too sketchy to satisfy the Reagan Administration's executive order requiring that economic analyses accompany all major proposed rules. Due to budgetary constraints, OSHA has no plans to let another contract. The agency does not intend to release the Centaur report.

Work is continuing on the National Institute for Occupational Safety and Health's (NIOSH) criteria document on RF/MW radiation. While the timetable for its completion is not firm, a draft for internal review could be completed by the end of the calendar year. ●

Minnesota Advisory Panel Reviews DC Power Line Safety

A Minnesota scientific advisory panel investigating the health effects of high-power DC lines has concluded that there is no evidence they pose hazards. In a September 2 draft report to the Minnesota Environmental Quality Board (MEQB), the group reviews and rules out possible harmful effects from electromagnetic fields, air ions and electric shocks from the lines. A minority report appended to the draft, however, states that too little is known about air ions to issue safety assurances.

The investigation is part of a MEQB project for reevaluating the state's power line construction permit requirements. The board's efforts began several years ago in response to local opposition to the construction of a 430-mile, 800-kV DC line, which is now in operation between a North Dakota coal field and Minneapolis, MN. In addition to the panel's final report, MEQB will consider the results of an $86,000 retrospective study on the health and performance of dairy cattle near the line, underway at the University of Minnesota's College of Veterinary Medicine, and an interim report on the state's ongoing monitoring of the power line's electric fields and ion currents. The board will review permit requirements in December.

In the majority draft report, six out of seven panel members conclude that no new standards addressing power line safety are needed, though they do call for more research on air ions. They recommend that the state continue its monitoring program and that it offer support for an epidemiological study. The panel also notes that AC fields within the line's power-converter stations might affect pacemakers and asks the state's health department to evaluate this hazard.

Although the panel found "behavioral and biological effects have been reported in the literature at ion concentrations

$10–10^4$ times greater than ambient levels," it concludes that such exposure "at distances more than a few hundred meters from the conductors appears unlikely." It also states, however, that "there are insufficient data to determine what effects, if any, might be observed with exposures to high ion concentrations over extended periods of time." According to the report, "air ions and/or charged aerosols, measured as enhanced electric fields, can probably be carried downwind from the line for hundreds of meters before the fields dissipate to natural background levels."

In the minority report, panel member Dr. Robert Brambl concedes that there is no proof of ill effects caused by air ions but argues that the "uneven quality and limited quantity" of research makes risk assessment impossible. He recommends that air ion concentrations in the vicinity of the line "be reduced to ambient levels by any of several technical modifications of the transmission line that are now available."

The draft, which includes an executive summary, is now being circulated for review. According to George Durfee, manager of the MEQB's Power Plant Siting Program, a final report should be out in early November. An interim report on the state's monitoring program and the results of the dairy cattle study will also be out in November. ●

Do-It-Yourself Oven Checks

A southern California public library now offers borrowers more than books: a meter to check microwave ovens for radiation leaks. The Orange city library's El Modena branch has developed a lending program that makes reliable equipment available to oven owners.

Barbara Brotherton, the unit's librarian, came up with the idea after receiving a number of questions about microwave oven safety. The library purchased the HI-1501 meter and will lend it out with an easy to follow instruction booklet prepared by the manufacturer, Holaday Industries, Inc. of Eden Prairie, MN. The equipment cost the library less than $400.

Holaday's Burton Gran reports that the company now hopes to interest other communities in similar programs and is mailing information to 3,000 public libraries. The program "provides an excellent opportunity to educate the public about oven safety," he explained, "and of course, it also provides a new market for our product."

The HI-1501 can measure 2450 MHz radiation used for most microwave cooking at power levels from .01 mW/cm^2 (10 uW/cm^2) and up. The Bureau of Radiological Health has set acceptable emission limits for new ovens at 1 mW/cm^2 at a distance of 5 cm (2 inches) from the oven surface and at 5 mW/cm^2 for used equipment. ●

Industry Legal and Policy Seminar

The Electronic Industries Association (EIA), the Association of Home Appliance Manufacturers (AHAM) and the National Association of Broadcasters (NAB) are sponsoring a seminar on *RF Radiation: Legal and Policy Implications* to be held at the Homestead in Hot Springs, VA, October 27–29. The meeting is designed "to give participants an authoritative overview of problems caused by arousal of the public's fears of 'radiation,' and to consider how these problems, which confront manufacturers and users of electronic and electrical equipment, may be solved."

Dr. John Osepchuk of Raytheon, the organizer of the seminar, expects up to 150 people to attend. In a telephone interview he said that "people in industry, like the general public, need to be educated." Only in this way, he went on, "can we defend ourselves."

One of the major issues to be addressed at the meeting is the siting of new radiofrequency and microwave sources. Jules Cohen, a consulting engineer from Washington, DC, and Lt. Col. Peter Daley, an environmental advisor to the Secretary of the Air Force, will review commercial and military siting problems.

In the letter of invitation, EIA Vice-President John Sodolski states that there is an "irrational fear" of radiation from 60 Hz to the higher microwave frequencies: "The organizers of this seminar believe that this 'radiation fear' phenomenon is based primarily on unfounded allegations of scientific fact and rumors, and on irresponsible behavior by a few individuals in both the media and professional communities. We believe that to preserve the health of US electrical technology and its use by society, responsible manufacturers and users must take steps aimed at positive objectives in the areas of public policy, regulation, scientific research and public education." And, "If, as we believe, there is no scientific basis for many of these fears, then it is important that we present a vigorous defense in radiation litigation actions, encourage rational government actions, support sound research and help bring about public education in this area."

One possible approach suggested by Sodolski is the formation of an alliance among manufacturers and users patterned on one set up in response to a move to ban chlorofluorocarbons. These chemicals, used in refrigeration equipment and aerosol cans, are believed to cause the catalytic destruction of the earth's ozone layer. The degree of depletion is uncertain and is the subject of intense scientific debate. A detailed proposal for such an alliance on radiofrequency and microwave radiation will be presented at the meeting.

Among the attorneys scheduled to discuss litigation strategies are AT&T's Christopher Mills, Richard Bennett of Bennett & Bennett, NY Telephone's Saul Scheir, Bell Labs' Godfrey Preiser, Raytheon's William Van Gemert and Pacific Telephone & Telegraph's Roger Downes.

Attendance at the meeting is by invitation only and costs $250. In an effort to encourage a free exchange of ideas on this "sensitive subject," the seminar will be closed to the press and all cameras and recording equipment will be banned from the meeting rooms. A similar seminar was held last year (see *MWN*, June 1981). ●

UPDATES

Biological Effects... Dr. Jim Toler of the Georgia Institute of Technology has been awarded $71,000 by EPA to develop a new dosimetry system for his chronic study of the effects of 500 MHz radiation. Toler has developed a new type of radiation exposure facility involving circular, parallel waveguides stacked in a tier arrangement. These will be housed in a converted grain silo, which has the advantage of allowing easy control of its temperature and humidity. According to present plans, Toler's team will run a lifetime study of 95 rats exposed to unmodulated 500 MHz fields; 95 control rats will be housed in a similar silo. They will then attempt to discover the causes of death. The level of exposure is tentatively set at 10 mW/cm^2, though no decision will be made until a pilot study is completed. The preliminary experiment could start this winter, and the full study could get under way by next summer or fall.... The AF School of Aerospace Medicine at Brooks AFB, TX, has contracted with the University of Utah for a 15-month research project on the biological effects of millimeter radiation—in the 26.5 to 90 GHz frequency range. The work, which is a continuation of a previous effort, involves the measurement of

physical quantities such as complex permittivities of biological materials at these frequencies. Professor Om Gandhi is the principal investigator....On another front, the AF has just received a number of proposals in response to a request for a survey of RF interactions with biological systems, with special emphasis on where the interactions might occur....The Plenum Publishing Co. in New York City has issued *Biological Effects and Dosimetry of Non-Ionizing Radiation: Radiofrequency and Microwave Energies.* The volume, the proceedings of a NATO Advanced Study Institute meeting held in Erice, Sicily March–April 1981, was edited by Dr. M. Grandolfo at the Superior Institute of Health in Rome, Italy; Dr. S. Michaelson of the University of Rochester; and Dr. A. Rindi of the National Institute of Nuclear Physics in Rome. The 650-page book costs $79.50 in the US and Canada and $95.40 elsewhere.

Communications...Onondaga, NY, has extended its moratorium on new broadcast sources in order to develop a town RF/MW exposure standard. (See Standards Update.)...A local suit to block construction of ITT's proposed 20-watt relay tower in Coventry, CT, is now expected to come before the state's Superior Court in November at the earliest. Although community concern has focused on microwave health hazards, the case will address zoning board procedures. The board approved the tower on April 20. (See *MWN,* June and September 1982.)...The FCC's Private Radio Bureau has published a *Private Microwave Licensing Policy Study,* August 1982, which reviews current rules and examines possible deregulatory actions. A limited number of copies are available from the FCC's Office of Public Affairs, Room 207, 1919 M Street, NW, Washington, DC 20554, (202) 254-7674. Otherwise, they can be purchased from the Downtown Copy Center, 1114 21st Street, NW, Washington, DC 20037, (202) 452-1422....Three competing transmission systems for stereo TV are compared in the September *IEEE Spectrum.* The US Electronic Industries Association (EIA), which has tested the systems, plans to recommend one to the FCC as a transmission standard. An EIA report, *Multichannel Television Sound: the Basis for Selection of a Single Standard,* Vol. 1, is available from the EIA, 2000 I Street, NW, Washington, DC 20006....Comments submitted on the FCC's proposed allocation of 6 MHz for shared fixed services use by government and others are outlined in the August 30 *Broadcasting.* ...In its September 20 issue, the magazine summarizes industry response to the FCC's proposal for creating more FM radio slots....A report on electronic espionage and the Soviet-owned estate in Glen Cove, NY, appears in the September 3 *Science.* In "Evading the Soviet Ear at Glen Cove," William Broad notes that this post on Long Island could easily be used to monitor the busy communications traffic along the Northeastern seaboard....Those interested in this subject are referred to James Bramford's new book, *The Puzzle Palace: A Report on NSA, America's Most Secret Agency,* published by Houghton Mifflin Co. in Boston, MA ($16.95)....The September-October 1982 issue of *Radio Science* features a collection of papers on "Mathematical Models in Radio Propagation." These papers were originally presented at a symposium held in conjunction with the XXth URSI meeting in Washington, DC, in August 1981.

Compatibility and Interference...The FCC has decided to re-classify coin-operated electronic games from Class B to Class A computing devices, subject only to verification by the manufacturer. Despite reports of interference from electronic games, mostly to land mobile radio communications, the commission loosened the rules because it believes that Class A restrictions should be sufficient to protect communication receivers. But the FCC did move up the date for compliance as compared to other Class A computing devices: all coin-operated games manufactured after December 1, 1982 must be verified before marketing. The commission warned, however, that if Class A restrictions are found to be insufficient it will initiate rule making to impose Class B requirements. The FCC advises that it "will be closely monitoring this situation for the next year or so."... In a related decision, the FCC has denied a petition by Texas Instruments to classify hand-held electronic games according to their clock frequency. The commission concluded that clock frequency alone does not determine the potential for interference. Hand-held games manufactured after October 1, 1983, must be verified for compliance with Class B rules....The National Association of Broadcasters (NAB), among others, has filed comments with the FCC on a petition from RF Power Labs to allow a wireless security system to operate at UHF-TV frequencies. The NAB cites the dangers of interference to low-power TV stations....On August 30, the FCC detected "appreciable" power increases in AM broadcasts from Cuba on 570 kHz, 670 kHz, 1040 kHz, 1160 kHz and 1380 kHz. Of the 96 AM stations that could have been affected, only WHO in Des Moines, IA, complained that the Cuban signals caused interference....The Senate Foreign Relations Committee approved plans for Radio Marti (S.1853) by a vote of 11–5 on September 9. The measure now awaits action by the full Senate. A companion bill (H.R. 5427) has already passed the House....Attendees at the *International Conference on Electromagnetic Compatibility,* organized by the Institution of Electronic and Radio Engineers in England, were scheduled to hear Dr. J. M. Thomson of the Royal Aircraft Establishment in Farnborough deliver the keynote address on "Research on EMC for Aircraft Systems," at the University of Surrey on September 21. Among the other papers to be presented were "The Interference Effects of Citizen Band Radio," by A.C.D. Whitehouse of the Home Office and "The Susceptibility of Analog Circuits to Radiofrequency Interference: Prediction and Measurement," by M. Elliot of A&AEE, Boscombe Down.

Government...The Bureau of Radiation Control (BRC) at the Texas Department of Health in Austin, TX, held a five-day workshop on *Radiofrequency Electromagnetic Principles and Survey Techniques for Health Physicists,* August 23–27. Experts from EPA, BRH and OSHA participated in the training program. According to the bureau's Suzy Kent, the BRC now has 16 field inspectors who can monitor both X-ray and non-ionizing radiation sources, including microwave ovens, RF sealers and heaters, broadcast communications sources and medical devices like diathermy machines. The workshop attendees were taught how to use Narda and Holaday meters. Kent said that the BRC intends to buy an Instruments for Industry meter to measure low frequency radiation....The FCC has issued its *47th Annual Report/Fiscal Year 1981.* It presents a wealth of details on the commission's many programs. The report (No. 004-000-00395-1) is available from the Government Printing Office, Washington DC 20420, (202) 783-3238. The price had yet to be determined at press time.

International...The National Institute of Environmental Health Sciences (NIEHS) has published the *Proceedings of [the] US-USSR Workshop on Physical Factors: Microwaves and Low Frequency Fields,* dated April 1981. The workshop was held at the University of Washington, Seattle, in June 1979. Copies are available from Dr. Donald McRee, NIEHS, PO Box 12233, Research Triangle Park, NC 27709....The National Radiological Protection Board (NRPB) has issued a report, *The Work of the NRPB 1977/80 and a Review of the First 10 Years.* Though focussing mainly on ionizing radiation, the report does include a brief review of the board's work on non-ionizing radiation. Contact: NRPB, Chilton, Didcot, Oxfordshire OX11 ORQ, United Kingdom.

Measurement... EPA has published a summary of its *Radiofrequency Measurements Workshop,* held in Las Vegas, NV, November 3–5, 1980. The report presents observations on a number of RF/MW meters, including those manufactured by Holaday, Instruments for Industry, Narda and General Microwave. The workshop participants conclude that, "At present, the state of the art of electromagnetic survey instrumentation and survey techniques is such that under certain conditions, valid measurements can be made; however, a general statement about the validity and reliability of such measurements under all conditions cannot be made because of the following problems: (1) Published instrument specifications are generally incomplete; e.g., it is often unclear as to the applicability of frequency response data at frequencies where the instrument was not calibrated and there is usually no indication as to out-of-band performance or susceptibility to interference from radiofrequency signals (RFI) by the instruments. (2) Published instrument specifications are often unreliable; e.g., the response of individual instruments does not always

agree with the calibration provided by the manufacturer. (3) Measurements are often made under uncontrolled and/or unknown conditions. (4) Measurements are often made with instrumentation and/or techniques inappropriate to the conditions present at the time and location of the measurement. (5) In general, there is a lack of suitably calibrated antenna, for various regions of the spectrum, that can be used for spatial characterization of the electromagnetic environment in a given frequency domain." They recommend that a group such as ANSI set standards for minimal uniform reporting of performing characteristics and for minimal testing procedures for existing meters and for performance characteristics of future ones. And that, "Standardized measurement techniques be developed based on existing instrumentation, applicable standards and exposure situations." The 14-page report, No. EPA 520/2-82-010, July 1982, will be available from the National Technical Information Service, Springfield, VA 22161, though its NTIS order number and price have not yet been assigned .... The September issue of *Test & Measurement World* features a chart of many RF/MW spectrum analyzers, listing their key operating characteristics.... The Continuing Education Institute is sponsoring a short course on *Microwave Theory and Measurements* to be held in Columbia, MD, on November 2-5, and in Palo Alto, CA, on November 30-December 3. The course will be taught by Dr. Stephen Adams of Hewlett Packard; the fee is $750. For more information contact CEI, 10889 Wilshire Blvd., Los Angeles, CA 90024, (213) 824-9545 .... NBS has prepared *A Bibliography on Laboratory Accreditation* (No. NBSIR 82-2523), a compilation of references from 16 countries. It is available from NTIS (see above) for $12. Order No. PB 82-237694.

Medical Applications...Two researchers working in London have investigated the effects of pulsed electromagnetic fields (PEMF)—the type used to heal non-union fractures—on the nerve cells of rats. In the August 21 issue of *Lancet*, A.R.M. Raji and Ruth Bowden indicate that they have found "significant evidence that PEMF has no effect on healthy nerves but that beneficial effects are obtained in treating degenerating and regenerating nerves after crushing (and after section and primary suture) of nerves in rats." They suggest as a possible mechanism an increase in blood flow, though they recommend more studies: "There is a need for carefully controlled clinical trials of the effects of PEMF upon the degree and quality of functional recovery after peripheral nerve injuries in man."...Writing in the *Journal of the American Medical Association* (August 27), a doctor from Hawaii raises his concern about a recent paper by Dr. Andrew Bassett and co-workers that reported successes in healing non-union fractures with PEMFs. (See *MWN*, March 1982.) He recommends a controlled double-blind study on the safety and efficacy of using PEMF treatments to ensure that they are preferred over spontaneous healing; he also questions their cost effectiveness. Bassett's team responds that many of the fractures cited in his original report had not healed spontaneously—a group of 332 patients had an average disability time of 4.7 years, and in 29 percent of the cases at least one orthopedic surgeon had recommended amputation. They do point out, however, that such a double-blind study is now underway in the United Kingdom. With respect to cost, they note that a financial analysis by an insurance company had found that "PEMF treatment reduces medical costs to a greater extent than any other therapeutic plan, short of a simple plaster cast and crutches." The study cited by Bassett is being carried out at a number of research centers in the UK and is being coordinated by Electro-Biology International (UK) Ltd. in Reading....The National Cancer Institute (NCI) wants to develop guidelines for the use of NMR imagers. The institute plans to have a contractor compare NMR to other diagnostic imaging techniques. RfP NCI-CM-37564-27 is scheduled for release at the end of September with proposals due on December 1....The Plenum Publishing Co. in New York City has issued a new book, *Hyperthermia and Cancer*, by George Hahn of Stanford University Medical Center. The 275-page book costs $35.00 in the US and Canada and $42.00 elsewhere .... More than 200 papers were presented at the first *Southern Biomedical Engineering Conference* held in Shreveport, LA, last June 7-8. Abstracts of the papers are published in *Biomaterials, Medical Devices and Artificial Organs*, Vol. 9, Number 4, 1981 ....The Association for the Advancement of Medical Instrumentation recorded the technical sessions at its annual meeting. Cassettes on NMR imaging and hyperthermia therapy for cancer, among many other subjects addressed at the May 9-12 conference, are available from Eastern Audio Associates in Columbia, MD, (301) 596-3900. They are $16.00 each....The Office of Technology Assessment has released a report, *Strategies for Medical Technology Assessment*, critical of current methods of evaluating the safety, efficacy, cost and social impact of medical systems. The report (No. 052-003-00887-4) is available from the Government Printing Office, Washington, DC 20052 for $7.50....When using NMR machines, be careful: the fields can demagnetize your credit cards, making them useless.

Military Systems...The air force has identified possible sites for its West Coast Over-the-Horizon Backscatter (OTH-B) radar and will evaluate them in a draft environmental impact statement (EIS) to be prepared by SRI International. The AF will consider two different locations near Christmas Valley, OR, for the radar transmitter and two sites 35 miles from Alturas, CA, for the OTH-B receiver. The transmitter site will require about 1000 acres and the receiver site about 700 acres. Possible locations for the operations center include Kingsley Field, OR; Mountain Home AFB, ID; McClellan AFB, CA; and McChord AFB, WA. The AF plans to have the draft EIS ready for public review in early 1983 ....The navy is contending that a House Appropriations defense subcommittee is forcing it to spend more than $85 million on a phased array radar system it does not want, according to an item in the September 14 *Washington Post*. The X-band radar for the Mark 92 fire control system aboard the navy's FFG7 frigate is being built by the Sperry Corp. in Great Neck, NY. The measure is supported by Congressman Joseph Addabbo (D-NY), the chairman of the subcommittee who represents a constituency near the Sperry plant....The Coast Guard has announced that the eighth and final OMEGA station went into operation in mid-August near the town of Woodside in southeast Australia.The OMEGA Navigation System uses a very low frequency signal (10.2-13.6 kHz) to provide ships and aircraft with a means of determining their location anywhere in the world to an accuracy of two to four nautical miles. Other OMEGA stations are already in operation in North Dakota and Hawaii, and in Argentina, France's Reunion Island, Japan, Liberia and Norway. The Coast Guard is in the midst of a study to verify the overall system's accuracy and extent of coverage....By the end of the decade, DoD plans to have its Navstar satellite navigation system in operation. Meanwhile, *Aviation Week & Space Technology* (August 30) reports that the USSR is planning its own system which is nearly identical to Navstar....The September 20 *Businessweek* features a cover story on "Killer Electronic Weaponry," with details on how the Israelis knocked out Syrian radars during the invasion of Lebanon....The Association of Old Crows is set to meet in San Francisco, CA, October 12-14. The symposium will highlight the latest developments in electronic warfare.

Mobile Communications ... The FCC's recently released interim report, *Future Private Land Mobile Telecommunications Requirements*, predicts a substantial excess demand for services by 1990. In addition to evaluating the future market, the report reviews the spectrum currently available for mobile communications and the potential sources for additional capacity. Comments on the draft are due November 19. A limited number of copies are available from the FCC's Office of Public Affairs, (202) 254-7674....A flood of major amendments to cellular applications received on June 7 has slowed down processing and has prompted the commission to stop accepting new filings for the time being....The commission published its final rules on releasing the remaining frequencies in the 806-821 and 851-866 MHz bands for private land mobile radio services (PLMRS) in the September 16 *Federal Register* (47 *FR* 41002)....The final FCC action allocating frequencies in the 928-941 MHz band for PLMRS appears in the September 8 *Federal Register* (47 *FR* 39502).

Occupational Health ... OSHA's Training Institute in Des Plaines, IL, outside Chicago, has expanded its facilities. The institute features a non-ionizing radiation laboratory....The Continuing Engineering Studies program at Northwestern University's Technological Insti-

tute is sponsoring a course on *Radiation Safety* in Evanston, IL, November 15–19. The short course, which addresses both ionizing and non-ionizing radiation issues, will be taught by the university's Dr. Herman Cember. The fee is $650. For more information, contact the institute at (312) 492-3365.... And the Rocky Mountain Center for Occupational and Environmental Health at the University of Utah is hosting a three-day course, *Current Issues and Trends in Controlling Occupational Exposures to RF/Microwave Radiation,* next February 8–10. OSHA's Robert Curtis will be the instructor, the fee is $350. Contact: Ms. E. Hunt at the center, (801) 581-5710.

Ovens...Janette Marshall has a look at the use of microwave ovens in England in a two-part article in the July and August issues of *Here's Health.* Only two and a half percent of British homes (about 700,000) now have microwave ovens, but sales are jumping—almost doubling between 1980 and 1981 from 130,000 to 240,000—and projections indicate that as many as 20 percent of the households will use microwaves for cooking by 1990. Marshall discusses oven performance and preferred utensils and reviews the microwave safety issue. *Here's Health* is offering a four-page "Microwave Guide" which gives details on ovens available in England. It is available from the magazine for 50 pence (less than $1.00) at 30 Station Approach, West Byfleet, Surrey, England....The Single Service Institute (SSI) has put together a guide to using disposables in microwave ovens. For a copy contact: Nancy Culotta, SSI, 1025 Connecticut Ave., NW, Washington, DC 20036, (202) 347-0020....A team from BRH has published a paper on "Spatial Distribution of Microwave Oven Leaks," in the June 1982 issue of the *Journal of Microwave Power*....Some 382,600 microwave ovens were shipped from factories in August 1982, according to the Association of Home Appliance Manufacturers. Though this is an almost five percent decline from August 1981, it represents an increase of 50,000 units over factory shipments in July 1982.

Power Lines...The New York State Overhead Power Lines Project has received a $198,600 grant from the Department of Energy (DOE) to aid its investigation of power line radiation health effects. Greg Alvord, the project's newly appointed Scientific Research Coordinator, reports that the grant will help pay for three consulting engineers hired to evaluate and monitor dosimetry in studies funded by the project. This spring, the scientific advisory panel for the $3.5 million program awarded 15 contracts for two- and three-year research studies. (See *MWN,* April and May 1982.)...The USDA Forest Service is looking for a contractor to study the effects of a 500 kV transmission line on elk near Butte, MT. According to its RfP (R1-11-82-140), the service wants to know what will happen to the animals' winter home as a result of the construction and operation of a line along the North Boulder River.

Radar....The FCC is threatening to force the Speed-O-Matic Co. of Harbor City, CA, to take one of its products, which helps speeders evade traffic tickets, off the market, according to the September 22 *Washington Post.* The device was originally intended to tell a driver his speed by emitting high frequency signals. The FCC contends that Speed-O-Matic has modified it to interfere with police radar so that it appears as if the car is going slower than its true speed....Among the papers scheduled to be presented at the *Radar-82 International Conference* in London, October 18–20, are "An Experimental Microwave Phased Array Radar" by a group from the Beijing Institute of Radio Measurement in China, "The Dolphin Naval Surveillance Radar" by Dr. J. Blogh of Plessey Radar Ltd., and "HF Sky Wave Backscatter Radar for Over-the-Horizon Detection" by G.R. Nelson and Dr. G.H. Millman of General Electric (US)....The Georgia Institute of Technology's Department of Continuing Education in Atlanta is sponsoring a week-long short course on *Principles of Modern Radar,* November 15–19. The fee is $525. For more information call: (404) 894-2400.

Satellite Communications ... RCA's planned satcom station near Seattle continues to meet community resistance. Residents of the Indianola-Kingston area, now the primary site proposed by RCA's Americom subsidiary, are appealing a Kitsap County hearing examiner's recommendation for approval. The Board of County Commissioners will hold an appeal hearing in early October. RCA originally planned to put the station on Bainbridge Island but met well-organized local opposition. (See *MWN,* July/August 1982.)...The EIS for Teleport, a satcom complex sponsored by the Port Authority of NY and NJ and Merrill Lynch, is set for release in mid-October. (See *MWN,* June 1982.)... Comsat has received FCC approval to begin building DBS facilities. Eight other applications will receive FCC attention this month....The commission's decision to allow Comsat to compete in international communications markets and its proposed restructuring of the company to separate its competitive and monopoly activities are outlined in the September 17 *Federal Register* (47 *FR* 41116)....International Resource Development Inc., of Norwalk, CT, has published *Direct Broadcast Satellite Systems.* The market research study sells for $985 and is available from IRD, (800) 243-5008.... *New Scientist* features satellite TV as the cover story in its September 9 issue.

Standards...The town of Onondaga, NY, has decided to adopt its own RF/MW exposure standard. On August 16, the town board extended its moratorium on new broadcast sources, begun in 1980, and told the Onondaga Environmental Advisory Council to develop recommendations for general population exposure rules. According to Ray D'Agostino, the town's attorney, the board had expected a federal standard to be out by now and was tired of waiting. D'Agostino said the environmental council will now look into various local standards, including Multnomah County's (OR), and review the new ANSI standard. The moratorium began shortly after Filmways Communications of Syracuse, NY, proposed building a TV station in Onondaga. The company has since filed suit in the US District Court for Northern New York seeking more than five million dollars in damages from the town....Massachusetts' final draft standard for RF/MW radiation exposure for the general population is out for review. The proposed rule is five times stricter than the new ANSI standard and sets a 200 uW/cm^2 exposure limit for the 30–300 MHz frequency band. Unlike an earlier version, the draft standard does not address occupational exposures and is limited to fixed radiation sources. (See *MWN,* March and April 1982.) A public hearing on the proposal is scheduled for November 29 in Boston. Another hearing will be held in the western part of the state on December 2. For copies of the draft and for more information on the hearings, contact: Radiation Control Program, Room 770, 600 Washington Street, Boston, MA 02111, (617) 727-6214 .... ANSI has published the new "Radiofrequency Radiation Hazard Warning Symbol" (C95.2-1982). (See *MWN,* October 1981.) A copy is available for $5 from ANSI's Sales Dept., 1430 Broadway, New York, NY 10018.... DoD has joined ANSI as a governmental member....The International Electrotechnical Commission (IEC) has issued two draft rules: "CISPR/C (Central Office) 29, Document CISPR/C (Secretariat) 36: Manual on interference from overhead power lines and high voltage equipment, Clause 8: Limits on interference, Sub-clause 8.1: Definition of nuisance limits, Sub-clause 8.3: Methods for derivation of limits;" and "CISPR/D (Central Office) 8, Amendments to CISPR Publication 12" on interference relating to motor vehicles and internal combustion engines." In addition, the IEC has published a standard, IEC 725-1981, on EMC between electrical equipment: "Considerations on reference impedances for use in determining the disturbance characteristics of household appliances and similar electrical equipment." These are also available from the ANSI Sales Office.

VDTs...Another VDT worker at Surrey Memorial Hospital in Vancouver has miscarried, bringing the number of abnormal pregnancy outcomes among the accounts department employees to six out of seven. Since terminals were installed in 1978, three women have miscarried, two babies were born with health problems and one birth was premature. (See *MWN,* July/August 1982.) The union has hired Dr. Hari Sharma of the University of Waterloo in Ontario to check the terminals for non-ionizing and ionizing radiation and to take air samples in the room..... An August 2 *Computerworld* editorial on VDT's and pregnancy problems focuses on managing worker stress. It states, "Overexposure to [VDTs] can lead to stress in the form of headaches and eyestrain, both of which were reported by the British

UPDATES: VDTs *(continued)*

Columbia hospital workers. NIOSH admits that stress could be a factor in pre- and postnatal problems." The editorial concludes, "Innovative employers are finding ways to regulate [VDT] exposure and maintain office productivity. It is time for *all* employers with [VDT] terminals to follow their lead."...Union officials at District 65 of the United Autoworkers Union in Boston, MA, are worried about the effects of VDTs on pregnant women. Over the last 3–4 years, three women in the keypunch department at Boston University (BU) have had four problem pregnancies. One of the women miscarried and then stopped work during a subsequent pregnancy; she had a healthy baby. One woman had premature contractions in her fifth month of pregnancy; she left work and later had a healthy baby. A third woman became sick while pregnant and left the university; the union has not been able to follow up on her pregnancy. According to Ferd Wulkan of District 65, the local has written to BU management requesting that women be taken off VDTs during pregnancy. The union is also concerned about the eyesight of VDT operators. During recent eye examinations, 20 percent of some 100 women working on VDTs for at least 45 percent of their time were referred for further testing. Wulkan said that, although the union does not know the specifics on all these complaints, the eye problems appear to require more than new glasses to correct....A draft report from the Labor Education and Studies Center of the Canadian Labor Conference in Ottawa has recommended a long-term study on VDT health effects. The report concludes: "Measures to detect any adverse reproductive outcomes in VDT workers and to determine what the causative agent(s) might be must be undertaken at once." Publication of *Towards a More Humanized Technology* is scheduled for this month....The Ontario Public Service Employees Union has challenged the validity of VDT radiation tests taken at Toronto's Old City Hall by the Ontario Ministry of Labor. Ten out of 19 pregnant women working in the building for the provincial attorney-general's office miscarried in 1980–81. (See *MWN*, April 1982.) The union's Robert DeMatteo has asked Ontario's Director of Occupational Health and Safety for new tests and for shields for the VDTs....The Washington State Labor Council has established a VDT committee and plans to set up a VDT resource center at the council's Seattle office. For information, contact the council's Karen Kaiser (206) 682-6002....The New York Committee for Occupational Safety and Health (NYCOSH) is sponsoring a conference on the *Health Hazards of Office Work* on November 20 in New York City. For information, contact NYCOSH, (212) 674-1595....A summary of the National Research Council's August 1981 Symposium on VDTs and the Vision of Workers has been published in *Behaviour and Information Technology*, Vol. 1, No. 2, 1982. (See *MWN*, September 1981.) The report states: "NIOSH and the Food and Drug Administration's Bureau of Radiological Health have found no evidence of radiation hazards in operating VDTs. Routine radiation surveys appear unwarranted, however NIOSH is continuing limited field surveys and will continue to survey new design technology to ensure that there are no significant changes in radiation emission."...Doctors at the VA Medical Center in Washington, DC, have warned that old color TV sets when used as VDTs for personal computers may expose children to hazardous levels of X rays. In a letter appearing in the September 30 *New England Journal of Medicine*, Drs. David Nashel and Louis Korman and John Bowman report that people using color sets made prior to 1970 for two hours a day could receive radiation doses of 779 mrem to the thyroid and 890 mrem to the lens of the eye per year. This exposure was calculated for a viewing distance of 40 cm with an exposure rate at the face of the tube of 2.7 mR per hour. The National Council for Radiation Protection and Measurement recommends an exposure limit of 100 mrem per year for people under 18 years old. The authors note: "Since radiation intensity is a function of distance from the emitting source, the spatial separation of viewer and display screen is extremely important." To decrease the chance of excessive exposures, they suggest that "only newer color television receivers (those manufactured after January 15, 1970) be used as display elements for computer function."...*The Ergonomics Newsletter* has begun publication. Topics on the office include R&D, standards and product evaluations. The cost per year (at least six issues) is $126. Contact the Koffler Group, (213) 459-4429.

CONFERENCE CALENDAR

• October 17–20: 1982 *IEEE Military Communications Conference*, Stouffer's Bedford Glen Hotel, Bedford, MA. Contact: Lawrence Jeffery, MITRE Corp., PO Box 208, Bedford, MA 01730.

• October 18–20: *Radar-82*, Royal Borough of Kensington and Chelsea Town Hall, London, England. Contact: Institution of Electrical Engineers, Savoy Place, London, WC2R 0BL, England.

• October 20–22: *Military Microwaves '82*, Cunard International Hotel, London, England. Contact: Roger Marriott, Microwave Exhibition and Publishers Ltd., Convex House, 43 Dudley Road, Tunbridge Wells, Kent TN1 1LE, England.

• October 26–28: 1st *International Symposium on Medical Imaging and Image Interpretation*, Berlin, West Germany. Contact: Dr. Judith Prewitt, c/o IEEE Computer Society, PO Box 639, Silver Spring, MD 20901.

• October 30: *Conference on Environmental Ions and Related Biological Effects*, Drexel University, Philadelphia, PA. Contact: American Institute of Medical Climatology, 1023 Welsh Road, Philadelphia, PA 19115.

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• January 5–7: *National Radio Science Meeting*, University of Colorado, Boulder, CO. Contact: T.E. VanZandt, NOAA/ERL/R445, 325 Broadway, Boulder, CO 80303.

• February 14–19: 7th *International Conference on Infrared and Millimeter Waves*, University of St. Jerome, Marseille, France. Contact: Kenneth Button, National Magnet Lab, MIT, Cambridge, MA 02139.

• March 8–10: *Microwave Systems Applications Technology*, Sheraton Washington, Washington, DC. Contact: Richard Hartman, EW Communications, 1170 East Meadow Drive, Palo Alto, CA 94303.

• March 8–10: 5th *Electromagnetic Compatibility Symposium and Technical Exhibition*, Zurich, Switzerland. Contact: Dr. T. Dvorak, EMC-83, ETH Zentrum-IKT, 8092 Zurich, Switzerland.

• April 5–8: *International Magnetics Conference*, Franklin Plaza Hotel, Philadelphia, PA. Contact: F.J. Friedlander, School of Electrical Engineering, Purdue University, W. Lafayette, IN 47907.

• May 2–5: *Test & Measurement World Expo*, Convention Center, San Jose, CA. Contact: Meg Bowen, Conference Director, 215 Brighton Avenue, Boston, MA 02134.

• May 22–25: 18th Annual *Meeting of the Association for the Advancement of Medical Instrumentation*, Loews Anatole, Dallas, TX. Contact: AAMI: 1901 N. Fort Myer Drive, Arlington, VA 22209.

• May 23–26: *International IEEE/APS Symposium and National Radio Science Meeting*, University of Houston, TX. Contact: Professor Liang Shen, Department of Electrical Engineering, University of Houston, TX 77004.

• June 13–17: 5th Annual *Bioelectromagnetics Society Meeting*, University of Colorado, Boulder, CO. Contact: BEMS, 1 Bank Street, Gaithersburg, MD 20878.

• June 21–23: *International Aerospace and Ground Conference on Lightning and Static Electricity*, Fort Worth, TX. Contact: Nick Rasch, FAA Technical Center, ACT-340, Atlantic City Airport, NJ 08405.

• August 23–25: *IEEE International Symposium on Electromagnetic Compatibility*, Hyatt Regency-Crystal City, Arlington, VA. Contact: Aaron Sullivan, Jr., 7121 Wolf Tree Lane, Rockville, MD 20852.

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Microwave News invites readers to contribute letters or reports for *From the Field*, our monthly column featuring news and opinions from the RF/MW community.

SAB Panel Wants Changes in EPA RF/MW Bioeffects Report

The Environmental Protection Agency's (EPA) draft report on the biological effects of radiofrequency/microwave (RF/MW) radiation will undergo significant revision before a final version is approved. Responding to criticisms from a special review panel, the agency's Office of Research and Development (ORD) has agreed to rewrite its assessment of thermal risks, the backbone of the report.

EPA will use the three-volume literature review and assessment as the basis for a general population exposure standard for RF/MW radiation. The agency's Office of Radiation Programs (ORP) had hoped to release a draft of this "guidance" in September but is now unlikely to publish a proposal until next year. (The EPA guidance will be binding only for federal agencies.) Problems in setting up a Scientific Advisory Board (SAB) panel to evaluate the draft report contributed to the delay in ORP's schedule.

The SAB panel met to discuss the draft report on September 22-23 in Washington, DC. Despite its request for major changes, the panel asked ORD's Dr. Joe Elder, the principal author of the bioeffects document, to complete the revisions by December. Elder said the schedule is optimistic but possible. Elder was "very pleased" with the meeting, stressing that "the bottom line is that ORP has something to use to move forward with the guidance."

Controversy Over Thermoregulatory Thresholds

The panel's section-by-section review went smoothly until it reached Section 4.1 on thermal physiology, prepared by ORD's Dr. Christopher Gordon. The panel found the analysis generally inadequate and directed special criticism at Gordon's extrapolation of thermal threshold response in animals to humans. Several panel members told Gordon that humans are better thermoregulators than the report indicates. The panel as a whole asked Gordon to rewrite the section and several members asked him to recalculate the thresholds using data from different animal experiments and human models.

The debate over thermoregulation was complicated by Dr. Eleanor Adair's criticism that it is impossible to extrapolate from animals to humans in this area. Elder told *Microwave News* that it is too early to tell what effect Adair's opinion will have on either ORD's revisions or the guidance. The onset of thermal effects is one of three approaches used in the report to identify thresholds.

Elder agreed to revise the assessments in Section 6 of the report which are based on Gordon's work. Drs. Barbara Chang, Sol Michaelson and Adair were particularly upset by the conclusion that the thermal activation

(continued on p. 2)

point for humans, calculated in terms of specific absorption rates (SARs), would be approximately 0.27 to 0.81 W/Kg. This translates into power density exposures of 1.2 to 2.6 mW/cm^2 at resonant frequencies.

The panel's criticisms are echoed in written comments submitted to the SAB by John Mitchell of the Air Force School of Aerospace Medicine and to EPA by John Bergeron of General Electric (see excerpts on p.3).

Panel members were fairly pleased with the rest of the report, except for a subsection on the nervous system which must be rewritten. The contributing authors attending the meeting were generally receptive to the panel's recommendations.

Key Issues

Early in the meeting, Elder asked the panel to consider several key issues in the course of its review, starting with the adequacy of the data base. Most panel members felt that, however incomplete the data, a standard must be set. They went on to discuss whether ORD should have assessed which RF radiation effects are hazardous instead of simply describing where and at what levels the effects occur.

ORP's Dr. David Janes, who is heading EPA's guidance development, told the panel this issue is not up for debate; ORP will make this assessment and consider it, along with a number of other factors, in setting exposure limits. Janes reported that the limits in the draft guidance "are not sufficiently in hand to discuss at this time."

Elder also asked how ORD should handle literature published after 1980, the cutoff date for most of the material included in the report. He said his group considered this issue at an August meeting and found that recent data "substantiated" the conclusions in the report and "served to reinforce the general conclusion that the data base is becoming more solid and more quantitative."

Dr. Michael Marron of the Office of Naval Research briefed the panel on experiments underway at Johns Hopkins University's Applied Physics Lab which indicate the endothelial layer of the cornea can be damaged by pulsed 2450 MHz radiation at power densities below 10 mW/cm^2. He said the work by Henry Kues and co-workers also provides evidence of cumulative RF/MW radiation effects (see *MWN*, July/August 1983).

Elder cited two human studies completed after 1980. In one, first reported in 1981, Dr. William Morton of Portland, OR, found a correlation between RF/MW levels and the incidence of leukemia in some Portland neighborhoods (see *MWN*, January/February 1982); he confirmed this conclusion in a June 1983 revised report. Peer reviews of both reports found that the author's data did not substantiate his conclusion. The other study, published in the March/April 1982 issue of the *Archives of Environmental Health* by Swedish researchers, found a higher than expected incidence of fetal deaths and malformed infants among physiotherapists who used shortwave diathermy equipment (see *MWN*, June 1982).

Elder also raised the issues of whole body versus localized SARs, potential psychological effects of RF hearing and extrapolation from animals to humans. The panel skipped over the first two items, though Professors Arthur Guy and Stephen Cleary argued over the clinical significance of RF hearing. Problems with extrapolation received considerable attention. ORD was criticized for its assumption, listed in the report's introduction, that humans and other mammals are equally sensitive to RF radiation.

Revision Schedule

Professor Charles Susskind, panel chairman, skillfully kept the meeting on track and on schedule. But in the push to complete final business, the panel had no time to discuss seven questions submitted by ORP's Janes. These are reprinted below.

Susskind requested that EPA's revisions for those sections of the report requiring only minor changes be sent to panel members by October 15 and returned to Elder by October 31. Sections requiring major rewrites should reach the members by November 15 and be returned by November 30. By handling the revision process through the mail, Susskind hopes that only a few panel members will have to meet in December for the final review. Susskind plans to submit a written report on the panel's initial findings to the SAB executive board when it meets October 13-14.

Minutes for the meeting will be available from Dr. Douglas Seba, SAB Executive Secretary, EPA Headquarters, 401 M Street, SW, Washington, DC, (202) 382-2552. A transcript of the entire proceedings is available for $0.40 per page from the Executive Court Reporters, 8525 Colesville Road, Silver Spring, MD 20910, (301) 565-0054. The transcript is approximately 300 pages.

Copies of ORD's draft report, *Biological Effects of Radiofrequency Radiation*, No. EPA-600/8-83-026A are now available from David Janes at the Office of Radiation Programs, EPA Headquarters, (703) 557-8217.

SAB Panel Membership

Dr. Eleanor Adair, John Pierce Foundation, New Haven; Dr. Barbara Chang, Medical College of Georgia, Augusta; Dr. Stephen Cleary, Virginia Commonwealth University, Richmond; Dr. Carl Durney, University of Utah, Salt Lake City; Dr. Arthur Guy, University of Washington, Seattle; Dr. Steven Horvath, University of California, Santa Barbara; Dr. Abraham Lilienfeld, Johns Hopkins University, Baltimore (unable to attend meeting); Dr. Sol Michaelson, University of Rochester; Dr. Mary Ellen O'Connor, University of Tulsa; Dr. Charlotte Silverman, FDA National Center for Devices and Radiological Health, Rockville; Dr. Charles Susskind (Chairman), University of California, Berkeley. Dr. Douglas Seba, SAB Executive Sectretary, EPA, Washington.

Questions on RF/MW Draft Report from ORP's David Janes

1. Should data on perception and shock phenomena be considered in addition to SAR-related effects, particularly at lower frequencies? If yes, is it appropriate for this subject to be addressed in this document or in another independent report?

2. Is the available data adequate to address the effects of pulsed fields, including the hearing phenomenon? Is this topic sufficiently treated in the document? Is the scientific data base sufficiently evolved to permit development of environmental exposure guidance for pulsed fields?

3. Is the available data adequate to address the consequences of time-averaging of SAR-related biological effects? Is this topic sufficiently treated in the document? Is the scientific data base sufficiently evolved to permit development of environmental exposure guidance which includes concepts of time-averaging?

4. Is there enough information currently available to consider the clinical or public health significance of observed biological effects as reported in the document?

5. The onset of thermoregulatory response appears to be a threshold phenomenon. Does the report properly project the SAR for the onset of thermoregulatory responses in humans? If not, what is a better estimate? Are there data, either in the document or elsewhere, that argue for the occurrence of adverse effects at levels below those that trigger thermoregulatory responses?

6. To what extent can SAR-related biological effects be projected to define effects at frequencies other than the frequency of study? (Please address extrapolation to frequencies both within and beyond the range of coverage of the document.) If yes, what are the exceptions, if any?

7. Do recent refinements in models, i.e., actual human shapes, cause significant deviations from predictions of SARs based on the spheroidal models used in the document? If yes, should they be treated in the document?

Excerpts from Comments on EPA's External Review Draft Report on RF/MW Bioeffects

The extracts below are taken from six sets of comments on EPA's external review draft of its report Biological Effects of Radiofrequency Radiation, *submitted prior to the September 22-23 meeting of SAB's special review panel. EPA's Environmental Criteria and Assessment Office in Research Triangle Park, NC, received comments from Warren Gleseking for AT&T, John Bergeron for General Electric, Daniel Bart for GTE, Kenneth Cox for MCI and John Osepchuk for Raytheon. John Mitchell of the Air Force School of Aerospace Medicine submitted his comments to the agency's Scientific Advisory Board.*

Air Force: Any extrapolation from animal data to the human condition should be based on all available data of comparable validity. There are major scientific flaws in mixing different thermoregulatory responses in different species, measured in different ambient conditions and comparing actual data with predictive data from models. Our analysis of some relevant data shows that the extrapolation provided in this document is probably not correct. Ideally, data for a single thermoregulatory response in a single species over a wide range of masses at constant ambient conditions should be used to establish a relationship of threshold SAR to body mass.

AT&T: It is our opinion that this critical and comprehensive review of the available literature on the subject is a thorough and competent effort, and should be a good basis for the EPA to arrive at reasonable and effective environmental exposure standards or recommendations.

General Electric: Although localized internal energy deposition can occur in specific experimental exposures, in real life three factors tend to nullify any such effect: The first is that most exposures will be non-resonant, the second is that normal motion and posture changes will produce fluctuations in the location and intensity of energy deposition, and the third is that real-life environmental exposures entail such low SARs that localized "hot spots" are very unlikely given thermal diffusion and blood circulation. Given these factors, the fear of "hot spots" in real-life exposures seems greatly exaggerated....If EPA were to accept for policy purposes the inappropriate species extrapolations and untested model that underlie [an estimated response threshold that occasionally may be lower than 0.4 W/Kg], the limit obtained would not only be tenuously founded but also would reflect a "no-effect" goal rather than a "no-harm" goal....What is novel in the draft document is the use of resting metabolic rate to scale the relative importance of a given SAR between species, a device that makes it appear initially that man is 6.4-fold more susceptible than the mouse to a given small SAR. It is not incorrect to say that an SAR of 1 W/Kg is proportionately greater with respect to the resting metabolic rate in man than in the mouse, but it is misleading and inappropriate to imply thereby that man is correspondingly at greater risk....Because of the great differences in mechanisms and capacity to thermoregulate between rodents and man, even valid comparisons for a given facet of thermoregulation would be inappropriate guides if taken out of the context of overall thermoregulation.

GTE: The final report should include a summary of known or deduced energy windows or thresholds, along with considerations that suggest the highest permissible peak levels for short exposure....Pertinent to establishment of a standard is an understanding of the variations in power density likely to occur in the far field owing to terrain irregularities and structures. For compliance purposes, suggestions should be included on spatial averaging as a means of establishing a representative power density.

MCI: MCI Communications commends the Environmental Protection Agency on its comprehensive review of the scientific information on the biological effects of radiofrequency (RF) radiation....MCI submits this filing not to comment on the technical accuracy of the report, with which MCI takes no issue, but for the purpose of urging the agency to move expeditiously to address the remaining task of establishing standards for safe exposure to radiofrequency energy....The absence of a generally accepted safe level of exposure for the population at large will continue to have a financial impact on the radio route construction plans of MCI and the other common carriers. An increase in the costs of developing, engineering and constructing radio routes is caused by the need to re-route segments of a radio route in order to overcome construction denials and withholding construction permits.

Raytheon: The review generally adheres to a critical standard of high scientific values and criteria. It emphasizes the hard scientific data, which is on a quantitative basis, with more discriminating attention to soft or speculative material....It is desirable that the frequency range of interest be extended down to 10 kHz from 0.5 MHz in order to include presently relevant public issues used as safety near navy VLF transmitters....The assumption of "equal sensitivity" for man and experimental animal is unwarranted. On the other hand, no account is made of the unique stress associated with the artificial constraints of a laboratory animal vs. the free human being....The general caveat on pulsed fields producing different effects than CW is of doubtful validity....It would appear from the recent literature that there is no substantiation for alleged BBB effects at flux densities less than 10 mW/cm^2.

HIGHLIGHTS

NMR: More than Spectroscopy and Imaging

Living systems can have unexpected biochemical and physical properties under conditions of nuclear magnetic resonance (NMR), according to recent experiments at the University of Salford in England. Although NMR spectroscopy has long been used to decipher molecular structure, and NMR imaging is winning a huge following as a diagnostic tool in medicine, this is the first indication that the biology of living organisms is affected by radiation at magnetic resonance frequencies.

The key finding of the Salford group, reported in a paper in the *Journal of Biological Physics*, is that "NMR can induce marked changes in the growth of biological cells." More generally, they found that biological materials are susceptible to specific frequencies, which are easily identified. The implications of the Salford experiments go far beyond the safety of NMR imagers because they show that the resonance frequencies associated with the earth's magnetic field can affect biological systems.

The location of resonance frequencies is a function of a nucleus' magnetic moment and the strength of the applied magnetic field. For example, a hydrogen atom (a proton) in a magnetic field of 400 gauss has a resonance frequency of 1.7 MHz. Thus a FONAR QED-80 imaging system with a 400 gauss permanent magnet uses an RF signal of 1.7 MHz (see p.10). In the earth's magnetic field of 0.5 gauss, the proton resonance frequency is 2.13 kHz.

Each nucleus with a magnetic moment will have its own set of resonance frequencies. Though not all isotopes have nuclear magnetic moments, many do, including carbon-13, nitrogen-14, oxygen-17 and chlorine-35.

Professor Cyril Smith and co-workers at Salford University found that in the earth's ambient magnetic field there were sharp resonances in the dielectric loss of live yeast cells at the NMR frequencies associated with hydrogen-1, sodium-23, phosphorus-31, chlorine-37 and potassium-39.

They also exposed soil bacteria to proton NMR conditions (a magnetic field of 250 gauss with an RF field of 1.06 MHz) and measured their rate of growth. To their surprise, they found nearly a doubling in the growth rate. The researchers conclude that these "unexpected" results "suggest that proton NMR speeds up DNA replication in the cells, which in turn implies that the test cells are ready to divide at an earlier stage in the cell cycle than the control cells."

They close the paper with an intriguing suggestion: the nuclear magnetic resonances may explain some of the effects claimed to be associated with power lines because, in the earth's magnetic field, the resonance frequency of potassium-39 is only one percent away from the second harmonic of 50 Hz and that of chlorine-35 is near the third harmonic of 60 Hz.

"Dielectric Measurements on Live Biological Materials Under Magnetic Resonance Conditions" by A.H. Jafary-Asl, S.N. Solanki, E. Aarholt and C.W. Smith appears in *Journal of Biological Physics, 11*, 15-22, 1983. The Salford group promises to elaborate on their findings in a subsequent paper.

Last year two of the authors, Smith and Aarholt, put forward the hypothesis that 50-60 Hz fields could promote the production of opiates in the human body (see *MWN*, April 1983). Their address is: Department of Electronic and Electrical Engineering, University of Salford, Salford, M5 4WT, England.

RTCA To Study RFI Aboard Aircraft

The Radio Technical Commission for Aeronautics (RTCA) has set up a special committee to study the potential for radiofrequency interference (RFI) from electronic and electrical equipment used aboard aircraft. The action came in response to growing concerns that radiation leaking from portable computers and similar devices could affect a plane's navigation and communication systems.

RTCA's Bill Fuchs told *Microwave News* that there are doubts this type of RFI is a problem, but that it is prudent to settle it one way or another.

The RTCA decision, reached at an Executive Committee meeting on September 23, was precipitated by a request from Eastern Airlines' D.W. Crosby, director of quality assurance and chief of engineering. Eastern asked RTCA to set industry-wide standards for use of electronic devices on aircraft. In his August 25 letter, Crosby cited an incident in which a hand-held Pac Man video game caused a jet engine to shut down.

Crosby also pointed to a number of press stories that questioned the safety of allowing passengers to use computers in flight. For instance, a widely circulated cover story in the August 22 *InfoWorld*, "Portable Computers: Hazards in the Air?" noted that Eastern Airlines had banned the use of computers by passengers on its jets as a precaution against RFI (see *MWN*, September 1983).

On September 22, the day before the RTCA Executive Committee meeting, the *Wall Street Journal* reported that American, United, Western and Continental Airlines had issued prohibitions similar to Eastern's. The article also cited an RFI incident aboard a United jet; a portable computer appeared to cause faulty readings in the plane's navigation equipment. Undeterred, Pan Am, Republic and TWA continue to allow their customers to compute in flight. The editorial writers at the *Journal* took a dim view of the ban in the next day's editions, calling it a dangerous case of over-regulation.

RTCA's Special Committee 156 will be chaired by Frank C. White, a technical advisor to RTCA and former staffer at the Air Transport Association of America. The committee's first meeting is scheduled for December 1-2.

The committee will offer recommendations on ways of controlling RFI in aircraft and on possible performance standards, which RTCA will use to revise its report *Interference to Aircraft Electronic Equipment from Devices Carried Aboard*, No. DO-119, issued April 12, 1963.

RTCA is a non-profit association of government and

non-government organizations, based in Washington, DC, with an interest in promoting aviation safety.

GTE Sprint Sues Over Local Microwave Law

GTE Sprint Communications Corp. has gone to court in an attempt to overturn a microwave transmission law enacted by the town of Pompey, NY, where the company operates a point-to-point relay facility. The law, which is intended to protect public health, would prevent GTE Sprint from expanding its operating capacity at the Pompey site.

Local Law No. 2 of 1982, passed by the Pompey Town Board on December 12, 1982, prohibits new commercial broadcasting facilities and requires a town permit for modifications of existing facilities. *A Law Regulating the Emission of Non-Ionizing Electromagnetic Radiation Within the Town of Pompey* also imposes a $100 annual fee on all commercial operators.

The US District Court for Northern New York issued a preliminary injunction August 30 blocking enforcement of the law. The town agreed to GTE Sprint's request for the injunction.

In its brief to the court, GTE argues that the Federal Communications Commission's (FCC) jurisdiction over microwave transmissions supersedes local laws, making the Pompey law unconstitutional. In any event, the company claims it is exempt from the law under an agreement with the town signed before the law was enacted.

Anthony Rivizzigno, attorney for Pompey, told *Microwave News* that the town's response to the suit was due in court October 3 but refused to comment further on the case.

GTE Sprint is concerned that enforcement of the law would establish a precedent permitting local jurisdictions to regulate the siting and operation of microwave transmitters. According to Bob Sills, an attorney with the New York City firm of Reboul, MacMurray which is representing GTE, this case is the first instance in which GTE Sprint has filed suit for the right to operate as it chooses on an existing site. The company previously has contested zoning challenges, he said.

Citing potential serious health hazards associated with non-ionizing electromagnetic radiation (NEMR), the Pompey law states that, "it is considered appropriate to restrict the increase of NEMR emission facilities." Pompey is located in an area of high ground in New York's Onondaga County which is the site of several microwave transmission facilities. Elsewhere in the county, as well as across the nation, sitings of microwave facilities have created controversies (see *MWN*, October and December 1982).

GTE Sprint's facility began operation in 1970 and is used by the company as a link between its midwestern and eastern telecommunications networks. Sills said that the facility was operating "at capacity" and that it is neither financially nor technically feasible to detour microwave transmissions around Pompey. GTE Sprint will suffer significant commercial losses due to insufficient transmission capacity if the town law prevents it from expanding the Pompey facility, the attorney said.

Local Law No. 2 was the outcome of a two-year effort by the Pompey Town Board to limit microwave transmissions. A moratorium on construction of commercial broadcast facilities was enacted October 13, 1980 and extended twice.

During the moratorium period, GTE Sprint negotiated an agreement with the town that it says exempted it from future laws as well as existing ones. In return, the company agreed to dismantle the smaller of two towers operating at its Pompey facility, which it did by June 30, 1983.

Six months after the agreement, on December 12, 1982, the Town Board passed Local Law No. 2, which required all commercial broadcasters to file a statement within 90 days providing technical data on operating broadcasting facilities. Also required is the annual fee of $100 "for the use by the town to conduct tests and studies concerning the emission levels and effects of NEMR and to monitor the levels of NEMR at various sites throughout the town." Sills says that GTE Sprint did not file a statement or pay the fee because it believed the prior agreement excluded it from having to do so.

On August 15, 1983, the town ordered GTE Sprint to comply with the law no later than September 1. The company then filed suit.

US Union Wins Alternative Work for Pregnant VDT Users

A Boston clerical workers' union has won the right for VDT operators to be assigned to non-VDT work during pregnancy in a contract agreement reached with Boston University (BU). This is the first major union contract in the US that allows VDT users to request alternative work for health and safety reasons. Union members ratified the agreement August 3.

Jenny Hochstadt, Health and Safety Officer for the United Auto Workers District 65 local at BU, told *Microwave News* that the contract, "provides very concrete improvements in working conditions at the university." The agreement does not acknowledge health risks associated with VDT use, however, stating that, "research to date has not proven that VDTs are a health and safety hazard."

The contract says that, "the university will attempt to reassign a pregnant employee to work which does not require the use of a VDT," at the employee's request. If alternative work is not "practicable" the employee will be eligible for up to three months of unpaid leave in addition to six months unpaid leave already provided for maternity.

Several Canadian unions have won the right for workers to be assigned alternative work. The Communication Workers of Canada was the first when Bell Canada agreed more than 2 years ago to allow pregnant operators to switch jobs or take extended maternity leave (see *MWN*, April 1981). Other major Canadian unions subsequently negotiated similar agreements including the Ontario Public Service Employees Union (see *MWN*, September 1982).

The contract also requires that BU make "every reasonable effort to ensure that workstation designs are appropriate for VDT use," reflecting the concern of many operators about musculo-skeletal and minor visual health effects. The university will prepare and distribute to all departments advisory guidelines explaining "appropriate installation and utilization" of VDT equipment. Hochstadt said that the 825-member union will be involved in preparation of the guidelines.

VDT health and safety became "the major issue" of the union's Health and Safety Committee a year ago, Hochstadt said, when four women operators had problem pregnancies (see *MWN*, October, 1982). In the past year another VDT user at the university has had a difficult pregnancy.

Hochstadt said that the new contract language grew out of the university's refusal to reassign a pregnant operator last fall. BU later reversed its decision following complaints from the woman's co-workers, making this a union issue. She said that six women at the university now have requested and been assigned to non-VDT work, all prior to the recent contract agreement. These reassignments set a precedent that Hochstadt said will discourage the university from urging maternity leave rather than providing alternative work.

BEMS '83: Part II

In our July/August issue we surveyed a number of reports from the annual meeting of the Bioelectromagnetics Society (BEMS) which dramatized the importance of the time variable in bioeffect studies. Outlined below are some of the other papers that were presented in Boulder, CO, the week of June 12th.

ELF

• A new type of effect on DNA from extremely low frequency (ELF) radiation exposures was reported by Dr. Abraham Liboff, a visiting scientist at the Naval Medical Research Institute in Bethesda, MD. Liboff used a wide range of frequencies between 10 Hz and 4 kHz and found that magnetic fields at intensities of 0.2-4.0 gauss, on the order of the earth's magnetic field, significantly increased DNA synthesis in human embryonic cells. The enhancement reached a maximum some 20 hours after the start of exposure during the mid-S phase of the cell cycle. Liboff has confirmed the effect with 13 different cell types. While he has been unable to find a consistent trend in the results, Liboff said that the effect was not dependent on heating, induced current (that is, changes in the magnetic field [dB/dt]) or frequency. Liboff plans to continue his experiments when he returns to Oakland University in Rochester, MI, in early October.

• Professor Hans-Arne Hansson of the Institute of Neurobiology at the University of Gothenburg, Sweden, disclosed new details on the "lamellar" bodies induced in Purkinje nerve cells of newborn rabbits by chronic exposure to 50 Hz radiation at an intensity of 14 kV/m (see *Brain Research, 216*, 187, 1981). Though he could not explain the cause or significance of the lamellar bodies, Hansson said that the effect appears to be species-dependent. He found the same kind of structures in pigs (30 kV/m at 60 Hz) as in rabbits but *not* in rats (14 kV/m at 50 and 60 Hz). The effect was only observed when the exposed animals were housed outdoors, not indoors, leading him to speculate that climatic and stress factors could be important variables.

• Dr. Hana Pafkova of the Institute of Hygiene and Epidemiology in Prague, Czechoslovakia, was unable to present her paper on the effect of electrostatic and 50 Hz fields on chicken embryos; Dr. Don Justesen of the VA Medical Center in Kansas City, MO, read it for her. Pafkova found "no important embryotropic effect" of a 50 Hz field, but did detect a significant retardation in development after repeated exposures (4-6 hours a day for a week) to a 17 kV/m pulsed electrostatic field. Acute exposures to a pulsed electrostatic field had no effect.

• Dr. Carl Blackman and co-workers at EPA's Health Effects Research Lab in Research Triangle Park, NC, have extended their studies on calcium efflux in chick brain tissue (see *MWN*, July/August 1982 and January/February 1983). Since last year's BEMS meeting, Blackman has experimented with frequencies as high as 120 Hz, using multiples of 15 Hz. Blackman reported finding highly significant results at odd multiples of 15 Hz, but that 60 and 90 Hz fields also showed significant efflux as compared to sham exposed animals. Signals at 120 Hz were not effective. Blackman advised that those planning large scale animal experiments should consider those frequency and intensity combinations that are biologically active.

• In an interview at the BEMS meeting, Dr. Jose M.R. Delgado of the Centro Ramon y Cajal in Madrid, Spain, said that he was preparing a new paper, to be published in the *Journal of Anatomy*, discussing the influence of pulse shape on the effects of low level, ELF magnetic fields on chick embryo development (see *MWN*, March 1983). He also said that his group was beginning work on an epidemiological study of workers exposed to 50 Hz radiation.

RF/MW Radiation

• Members of Professor A.W. Guy's lab at the University of Washington, Seattle, gave an advance report on the outcome of their long-term, low level study. Rats were exposed to 2450 MHz, 8 Hz modulated pulsed microwaves (10 us, 800 pps) for 25 months at a power density of 480 uW/cm^2, with an SAR of about 0.4 W/Kg. The data are now being analyzed; a final report should go to the project sponsor, the air force, by this fall. While a significant enhancement of B and T cells was observed in the interim kill, Dr. Lawrence Kunz reported that there was no change in these cells at the end of the experiment. Dr. Robert Johnson said that the exposed rats had a reduced food intake during the last 20 weeks of the experiment, showed variations in their corticosterone levels (no consistent trend was apparent) and had increased adrenal masses. There was no overall difference in death rate compared to controls. Kunz added that the animals were able to perceive a microwave environment but

that "there is no indication that this change in perception has any effect on the biology of the animal." They conclude: "Although final integration and interpretation of all data are still in progress, it is clear that while various end points show significant changes following exposure to pulsed RF [radiation], they appear to be of minor clinical significance with regard to overall mortality of the exposed population compared to sham exposed populations."

• Dr. Przemyslaw Czerski offered new data on his continuing studies on the mutagenic potential of microwaves. He said that he and Drs. Ewa Manikowska-Czerska and William Leach at FDA's National Center for Devices and Radiological Health in Rockville, MD, had demonstrated changes in chromosomes of male mice during spermatogenesis at 0.915, 2.45 and 9.45 GHz with SARs of 1 and 20 W/Kg. He warned that these results should be interpreted with caution because the effect was a function of dose rate, frequency, pulsing characteristics, method of exposure and sampling procedure. For instance, he explained that other experiments at 27 MHz at SARs of 1 and 3 W/Kg showed no mutagenic effect. He said that more research is needed to see whether the effect is reversible and to determine its biological significance.

• FDA's Dr. John Monahan presented some data on his experiments which are part of the US-USSR identical experiment (see *MWN*, July/August 1982). Researchers in each country are exposing male rats to 2450 MHz radiation at a power level of 10 mW/cm^2 for 7 hours. He reported that exposed rats displayed "altered behavior," but that it was not clear whether the effect reflected "changes in activity levels, altered emotionality, changes in memory or some other behavioral parameter."

Millimeter Waves

• A group led by Dr. Friedrich Kremer from the Max Planck Institute for Solid State Physics in Stuttgart, West Germany, reported that they had discovered a "significant" nonthermal effect of millimeter waves at a power level of less than 5 mW/cm^2 in the 64-69 GHz frequency range. Their experiment, which was run double blind, showed an impairment of the puffing pattern of giant chromosomes of a midge. They hypothesize that the observed effect could be understood in terms of Frohlich's theory of coherent excitations. (This paper has already been published in *Coherent Excitations in Biological Systems*, edited by H. Frohlich and F. Kremer, New York: Springer-Verlag, 1983.)

• US scientists have been unable to find any response to millimeter wave radiation. Professor Shirley Motzkin and co-workers at the Polytechnic Institute of New York in Brooklyn exposed E. coli to 45.5-46.1 GHz (6.5-6.59 mm) radiation at power levels of 0.05, 0.5 and 5 mW/cm^2, looking for enhanced colicin production as had been reported by Soviet researchers. They found no effect. Similarly, L. Furia, Dr. O. Gandhi and Dr. D.W. Hill of the University of Utah in Salt Lake City were unable to observe any change in the growth rate of yeast exposed to 41.82 and 41.84 GHz waves at a power density of 20 mW/cm^2 in the waveguide. (See also Bioeffects Update on p.9.)

Spectrum Static: Radio & TV RFI

The increasingly crowded radio spectrum is generating more and more complaints of radiofrequency interference (RFI) among users who share frequencies or whose allocations are next to each other. Three RFI cases now pending before the Federal Communications Commission (FCC) illustrate the commission's difficulties in finding equitable solutions which are politically viable. Indeed, the problem may get worse before it gets better.

UHF-Land Mobile

An FCC-backed plan to resolve interference between an Atlanta UHF-TV station and nearby land mobile services is losing momentum. In a June 23 letter the FCC instructed WVEU, Channel 69, to arrange and pay for the frequency relocation of 23 land mobile licensees and ordered the land mobile licensees to cooperate with WVEU. More than three months later little progress has been made.

The problem began in 1981 when WVEU began full power (2,630 kW) testing of its transmitter atop Atlanta's Peachtree Plaza Hotel, also the site of the land mobile repeaters (see *MWN*, December 1982). The proximity of the WVEU signal, at 800-806 MHz, to the land mobile facilities operating at 806-807 MHz produced out-of-band interference that persisted at much lower power levels. The station was ordered to cut power to 2.63 kW, a 30dB or a 1000-fold reduction.

When the FCC rejected WVEU's subsequent petition for half-power operation, the station proposed paying for changing the frequency of the land mobile licensees rather than its own frequency, which it estimated would cost 10 times more. The station says that relocation will not impair the operation of the land mobile repeaters.

The FCC gave WVEU 30 days from June 23 in which to submit a report regarding the "final decision of the affected parties," but an FCC spokesperson told *Microwave News* at the end of September that no report has yet been provided. WVEU officials could not be reached for comment but one indication that things have turned sour is that three land mobile licensees have filed petitions asking the commission to reconsider its support for the WVEU relocation plan.

Cable TV-Amateur Radio Conflict

The American Radio Relay League (ARRL) has renewed its request that the FCC prohibit cable TV from broadcasting on amateur radio frequencies. The National Cable Television Association (NCTA) objected to the League's action in formal comments submitted to the commission. Previously NCTA had called the ARRL plan a "draconian proposal."

Citing the "burgeoning cable TV signal leakage interference problem," ARRL asked the FCC to expedite consideration of its January 1982 petition seeking the frequency exclusion. ARRL contends that NCTA has failed to follow through on joint attempts to resolve interference problems. After the original September 15, 1982 FCC deadline for filing comments on the ARRL plan, NCTA "ceased all

efforts to work with the league to resolve interference problems," according to ARRL. The league says that more than 100 cases of cable-amateur radio interference remain unresolved and that "the problem is as acute as, or worse than" it was when the original petition was filed.

Wendell Bailey, Vice President for Science and Technology for NCTA, told *Microwave News* that ARRL is unrealistic in demanding a clear radiofrequency environment. NCTA says that cable-amateur interference is a "two way street" and that cable broadcasters experience interference from amateur radio transmissions. Bailey said that NCTA had worked with ARRL to resolve 42 cases of RFI and that the issue is a "high priority with NCTA."

The cable association asked the FCC to deny ARRL's request to expedite proceedings and also urged that the January 1982 petition be dismissed. An FCC staffer said that the ARRL petition is pending and that no date for commission action has been set.

TV6-FM Interference

Responses to a proposed FCC rule intended to minimize FM radio interference with channel 6 TV (47 *Federal Register* 24144, June 3, 1982) indicate sharp differences between commercial TV and non-commercial FM broadcasters. The FCC's final decision in this case could greatly affect how the broadcasters do business in the future.

National Public Radio (NPR) and the Corporation for Public Broadcasting (CPB) contend that the "long-term solution" lies in improved TV receiver selectivity. The National Association of Broadcasters (NAB), the Association of Maximum Service Telecasters (AMST) and other commercial broadcast organizations argue for restrictions on FM spectrum allocation and other measures that place the burden on FM stations operating between 88 and 92 MHz, a range allocated to non-commercial educational assignments (for a review of the comments to the FCC, see the September 12 *Broadcasting*).

An FCC spokesperson called this a "no-win situation, a hopeless case." Whichever way it is resolved, he said, one side will be greatly inconvenienced. Review of the comments received will begin in early November and a report is likely by May of next year, he said.

The upper limit of Channel 6 transmissions, at 88 MHz, abuts the noncommercial FM radio frequencies. TV signals are susceptible in large part because they are transmitted over a wide band whereas FM uses smaller bands.

Prior efforts by radio and TV broadcasters to resolve this RFI problem have failed and the debate on the basic issue of who will make the necessary changes remains polarized.

CONFERENCES

November 7-9: ***Department of Energy and Electric Power Research Institute Contractors Review,*** Hilton Plaza Inn, Kansas City, MO. Dr. William Wisecup, Aerospace Corp., 955 L'Enfant Plaza, SW, Suite 4000, Washington, DC 20024, (202) 488-6328.

November 7-9: ***Non-Linear Electromagnetic Interactions with Tissue,*** University of Maryland, College Park, MD. Contact: Professor Leonard Taylor, Dept. of Electrical Engineering, University of Maryland, College Park, MD 20742, (301) 454-6850.

November 7-9: ***1983 Satellite Communications Symposium,*** Hyatt Regency Hotel, Atlanta, GA. Contact: Betsy Crawley, Symposium Coordinator, 3845 Pleasantdale Rd., Atlanta, GA 30340. (404) 577-1234.

November 8-11: ***29th Annual Conference on Magnetism and Magnetic Materials,*** Hilton Hotel, Pittsburgh, PA. Contact: F.E. Werner, Westinghouse R&D Center, 1310 Beulah Rd., Pittsburgh, PA 15235, (412) 256-3556.

November 13-18: ***69th Annual Meeting of the Radiological Society of North America,*** McCormick Place, Chicago, IL. Contact: George Schyler, RSNA, 1415 W. 22nd St., Suite 11509, Oak Brook, IL 60521, (312) 920-2670.

November 14-17: ***1983 Radio Technical Commission for Aeronautics Annual Assembly and Technical Symposium,*** Marriott Crystal Gateway Hotel, Arlington, VA. Contact: RTCA Secretariat, One McPherson Square, 1425 K St., NW, Suite 500, Washington, DC 20005, (202) 682-0266.

November 16-17: ***JINA 83,*** (2emes Journees Internationale de Nice sur les Antennes), Nice, France. Contact: J.L. Guiraud, Centre National d'Etudes des Telecommunications, Centre de La Turbie, 06320 Cap D'Ail, France. (93) 41-17-17.

December 8-9: ***Radiation and Energy: Confronting the Challenges of the Eighties –Law, Regulation, Risk Liability, Litigation and Compensation,*** New York, NY. Contact: James Lawrence, Lloyd's of London Press, 817 Broadway, New York, NY 10003, (212) 673-4700.

December 12-17: ***8th Annual IEEE International Conference on Infrared and Millimeter Waves,*** Carillon Hotel, Miami Beach, FL. Contact: Dr. K.J. Button, National Magnet Laboratory, Building NW-14, MIT, Cambridge, MA 02139, (617) 253-5561.

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January 11-14: ***National Radio Science Meeting,*** University of Colorado, Boulder. Contact: S.W. Maley, Dept. of Electrical Engineering, University of Colorado, Boulder, CO, 80309, (303) 492-7004.

January 16-20: ***Microwave Signatures in Remote Sensing,*** URSI Commission F Specialist Meeting, Toulouse, France. Contact: Dr. Richard Moore, Remote Sensing Laboratory, University of Kansas Center for Research, 2291 Irving Hill Drive, Lawrence, KS 66045, (913) 864-4836.

January 17-19: ***Instrumentation & Measurement Society Technology Conference (IMTC) 1984,*** Aboard the Queen Mary, Long Beach, CA. Contact: Robert Myers, 1700 Westwood Blvd., Suite 101, Los Angeles, CA 90024, (213) 475-4571.

January 27-29: ***Symposium on NMR Imaging,*** Fontainebleau Hotel, Miami Beach, FL. Contact: American College of Radiology, 6900 Wisconsin Ave., Chevy Chase, MD 20815, (301) 654-6900.

February 6-8: ***NIH Consensus Development Conference on Use of Diagnostic Ultrasound Imaging in Pregnancy,*** National Institutes of Health, Bethesda, MD. Contact: Michaela Richardson, NIHCD, Bldg. 31, Room 2A32, 9000 Rockville Pike, Bethesda, MD 20205, (301) 496-5133.

February 20-22: ***Office Automation & You,*** Los Angeles Convention Center, CA. Contact: American Federation of Information Processing Societies, Inc., 1815 N. Lynn St., Arlington, VA 22209, (703) 558-3617.

March 13-14: ***1984 National Radar Conference: Radar Technology for the 80's,*** Atlanta, GA. Contact: Dr. Edward Reedy, Georgia Institute of Technology, Engineering Experiment Station, Radar & Instrumentation Lab, Atlanta, GA 30332 (404) 424-9621.

UPDATES

BIOLOGICAL EFFECTS

Birth Defects... It is well known that heat is a teratogen, and that high doses of RF/MW radiation, which cause heating, can hurt the growth and development of the embryo and fetus. Still unresolved, however, is whether RF/MW radiation can be teratogenic if it does *not* cause a temperature increase. Two new studies by researchers at NIOSH in Cincinnati, OH, affirm that temperature rise in the exposed organism is the key variable. In a paper published in the most recent issue of *Bioelectromagnetics* (Volume 4, Number 3, 1983), a group headed by Dr. Joseph Lary reports that the temperature of the dam and the length of time the temperature is elevated determine the incidence of teratogenic and embryotoxic effects: the longer the exposure, the smaller the temperature rise necessary to cause abnormalities. The NIOSH team used fairly high levels, SARs of 11 W/Kg at a frequency of 27.12 MHz. In a second paper, appearing in the May issue of the *Scandinavian Journal of Work, Environment and Health,* Lary and co-workers exposed animals to lower levels of radiation which did not cause any heating, 0.4 W/Kg at 100 MHz, and observed no adverse effects. In a telephone interview, Lary said that, based on known mechanisms, it is "highly unlikely" that there would be a teratological effect without a temperature rise, although he would not totally eliminate the possibility of some kind of athermal response. The question of whether there is a threshold remains unresolved, Lary added. The NIOSH results are in general agreement with those from EPA's Health Effects Research Lab and from Dr. Ronald Jensh's group at Thomas Jefferson University.

Millimeter Waves... Thirty-nine scientists from eight countries participated at the URSI symposium on *Techniques in Studies of Biological Effects of Low Level Millimeter Waves,* September 4-6. Dr. Fritz Keilman of the Max Planck Institute for Solid State Physics (Festkorperforschung), the chairman of the symposium, was pleased with the opportunity for "lively discussions," as were other attendees such as Professor Saul Rosenthal of the Polytechnic Institute of New York, who was the US organizer of the meeting. Keilman was especially happy that Dr. O.V. Betsky, a member of N.D. Devyatkov's group of the USSR Academy of Sciences in Moscow, was able to attend. We plan to have a more detailed report of the symposium in a later issue....Those trying to keep up with the Soviet work at these frequencies will be interested in the new issue of *Biological Effects of Non-Ionizing Radiation: A Digest of Current Literature,* Volume VII, Number 2-4. The issue contains a complete translation of "Effect of Millimeter Band Electromagnetic Radiation on Bacterial Cells" by A.Z. Smolianskaia, which appeared in *Non-Thermal Effects of Millimeter Band Radiation* edited by N.D. Deviatkov and published by the USSR Academy of Sciences in 1981.

Non-Linear Interactions... Professor Leonard Taylor of the University of Maryland is hosting a two-day workshop on *Non-Linear Electromagnetic Interactions with Tissue.* The workshop, supported by FDA and ONR, will review the theoretical background and the latest progress towards understanding the physical basis for non-linear phenomena and will consist of both tutorials and poster papers with plenty of time for open discussion. Attendance is limited to about 75 participants and by invitation only. Taylor expects to publish a summary report of the meeting. For more information contact Taylor at the Dept. of Electrical Engineering, University of Maryland, College Park, MD 20742, (301) 454-6850....Some non-linear phenomena are governed by Chaos Theory, which has been getting some attention in technical and lay journals recently. Here are some references: "Simplicity and Universality in the Transition to Chaos" by Alan Wolf and "Chaos in Complicated Systems" by Arun Holden in *Nature,* September 15, 1983; "Pathways to Chaos" by Ivars Peterson in *Science News,* July 30, 1983; and "Connoisseurs of Chaos" by Judith Hooper in *Omni,* June 1983.

COMPATIBILITY & INTERFERENCE

ASTM Emergency Standard...ASTM (the American Society for Testing and Materials) Committee D-9 is developing an emergency standard at the request of the Society of Plastics Industry, *Standard Test Method for Electromagnetic Shielding Effectiveness of Planar Materials.* According to ASTM's James Dwyer, it is rare for the society to issue emergency standards. This one was prompted by the FCC regulations on computer emissions. Copies of the standard will be available as soon as the committee completes its balloting and gives its final approval. Meanwhile ANSI Committee C63 has set up a special task group, under the leadership of EMACO's Herb Mertel, to review the ASTM standard.

RFI from ISM Sources... Dr. Satish Kashyap reviews RF/MW emissions from ISM sources and compares them to the limits set by the US, Canada and CISPR for controlling RFI in the June issue of the *Journal of Microwave Power* (Volume 18, Number 2). Kashyap, who is with the Electromagnetic Engineering Section of the National Research Council of Canada and is the editor of the *Journal,* presents some interesting facts. For instance, some 75,000 kW of high frequency dielectric heating is used in industrial applications in the US, and induction heating has ten times the power of dielectric heating. Kashyap also found that the total amount of high frequency power used for ISM applications most probably exceeds the total kilowatts used for communications. He points out an apparent inconsistency: while it is widely believed that ISM equipment is the largest source of radio noise, the number of documented cases of ISM interference is less than one percent of all the RFI complaints. In 1981, there were 35,063 RFI complaints in Canada but only 69 of these were related to ISM equipment....The ad hoc committee for the CCIR Interim Working Party 1/4 on ISM equipment interference limits will meet on October 13 at the FCC to discuss the US position on new limits. A task force, chaired by T. Lamont Wilson, has

been studying a preliminary US proposal and is preparing a progress report for the meeting.

All Eyes on Coleco Certification.... It is not often that the FCC's rules on computer RFI emissions are the subject of daily national news stories, but then Coleco Industries' new Adam home computer is not a typical computer. Coleco has been one of Wall Street's favorite stocks and the Adam system, which includes a letter quality printer and 80K of RAM for only $600, may bolster Coleco's fortunes at a time when many small computer companies are going bust. But before the Adam could be shipped to stores for the Christmas buying rush, the FCC had to certify that it did not emit excessive amounts of RF radiation. (All personal computers designed for home use are "Class B" devices and must win FCC certification.) Coleco was having problems debugging Adam's software for the printer, causing FCC to delay its RFI tests. Industry analysts who had predicted a big market for Adam started getting nervous. As Gary Putka reported in the September 21 *Wall Street Journal,* Coleco "shares have been gyrating wildly lately, as rumors and counterrumors have spread about the production and shipment schedules for Adam." News stories about the RFI tests were probably only surrogates for progress reports on Coleco's success in resolving programming bugs, nevertheless it generated an unusual amount of interest in the FCC's RFI rules. On September 22 the FCC certified Adam and daily coverage subsided. The consumer will now decide whether all the interest was justified.

Resources... In last month's issue, we referred to a proposed EMC standard prepared for the FDA by McDonnell-Douglas. The title of the document is *Electromagnetic Compatibility Standard for Medical Devices, MDS-201-0004,* October 1, 1979....The *1983 Electrical Overstress/Electrostatic Discharge Symposium* was held in Las Vegas, NV, September 27-29. A copy of the proceedings will be available next January for $24 (US) or $34 (non-US) from the Reliablity Analysis Center, RADC/RAC, Griffiss AFB, NY 13441, (315) 330-4151. Ask for Catalog No. EOS-5. All orders must be prepaid....The Radio Technical Commission for Aeronautics (RTCA) has released *TCAS I: Functional Guidelines,* Document No. RTCA/DO-184 prepared by Special Committee 147, May 1983. It contains functional guidelines for the surveillance, proximity warning and cross-link elements of the Traffic Alert and Collision Avoidance System I (TCAS I), primarily used in general aviation aircraft. The report addresses minimum performance requirements for EMC and equipment test procedures. It is available for $16 (prepaid) from RTCA Secretariat, One McPherson Square, Suite 500, 1425 K Street, NW, Washington, DC 20005. RTCA has also set up a new special committee to prepare minimum operational performance standards for airborne microwave landing system (MLS) area navigation equipment. Robert Schwab of the Boeing Airplane Co. has been appointed the chairman of Special Committee 151....The FCC has proposed rules to give AM stations in Alaska more protection from interference. The commission acted in response to a petition from the Alaska Broadcasters Association. The FCC proposal appears in the August 10 *Federal Register,* (48 *FR* 36278).

MEDICAL APPLICATIONS

Notes on NMR... Patient and operator exposures to static and RF magnetic fields from an NMR imager are far below recommended guidelines, according to a report in *Magnetic Resonance Imaging,* a new Pergamon Press journal. Dr. Whit Athey and Paul Ruggera of FDA's National Center for Devices and Radiological Health in Rockville, MD, and Dr. Ronald Ross of Diagnostic Imaging Associates (DIA) in Cleveland, OH, measured the electric and magnetic fields from FONAR Corp.'s QED-80 imaging system and found that patients are exposed to time-averaged magnetic fields of 4.6 A/m at 1.7 MHz —resulting in an SAR of 0.017 W/Kg. The electric field was below 10 V/m, the detection limit of the Holaday 3002 meter used in the survey. Last year the FDA recommended guidelines for exposures from NMR (see *MWN,* April 1982), specifying a maximum power deposition of 0.4 W/Kg. (The FDA limits do not take into account frequency specific effects. These may be more important than previously believed, see story on p.4.) Operator exposures are "at least an order of magnitude lower than for the subject, even at the point of closest approach." With respect to the static magnetic field, this Fonar imager has a permanent magnetic field of about 0.04 Tesla (400 gauss), well below the FDA's 2 Tesla exposure limit. The FONAR QED-80 does not use time varying magnetic fields, so the third FDA exposure criterion which covers these does not apply. In a telephone interview, Athey said that FDA had no immediate plans to do additional surveys, partly because such data are submitted to the agency by the manufacturers in their pre-market approval applications. Athey added a note of caution on over-interpreting his findings; the FONAR unit studied will not be marketed. While DIA began the first clinical trials of an NMR imaging system in the US in late 1980 with the QED-80 unit, the company is now developing a newer model for commercial production. The survey appears in Volume 1, Number 3 of *Magnetic Resonance Imaging,* which, though dated 1982, only appeared in July 1983....The American College of Radiology has published a *Glossary of NMR Terms.* It is available for $4.00 from the college's Publication Service, 6900 Wisconsin Avenue, Chevy Chase, MD 20815.

MILITARY SYSTEMS

Project ELF Litigation.... Expert witnesses testified before District Court Judge Barbara Crabb on September 20-22 in the case of *State of Wisconsin v. Weinberger.* The court will decide whether the navy must prepare a new environmental impact statement for its Project ELF communication system (see *MWN,* July/August 1983). Duwayne Gebken of the Wisconsin Department of Natural Resources, Professor John Moulder of the Medical College

of Wisconsin in Milwaukee and Dr. Nancy Wertheimer of the University of Colorado Medical Center appeared for Wisconsin. Dr. Robert Becker came down with pneumonia and was unable to testify. The navy pared down its witnesses to four: Admiral William Smith, the former Director of Naval Communications in the Office of the Chief of Naval Operations, Martin Abromavage of IITRI, Dr. Don Justesen of the VA Medical Center in Kansas City, MO, and Dr. Karl Straub of the VA Hospital in Little Rock, AR. The court is scheduled to hear Becker's testimony followed by the navy's rebuttal during the week of October 17. A date has not yet been set. Meanwhile, the navy will soon release an environmental impact assessment on its ELF activities in Michigan. The navy has told the court that it will not begin construction until 30 days after the document's release, to allow for public comment.

POWER LINES

DC Bioeffects Report... In the last few issues we have reported on Bonneville Power Administration's (BPA) 500 kV AC transmission line from Garrison, ND to Spokane, OR. While there are no plans to convert the line to DC, BPA had raised this as a possibility when the line was announced and the necessary permits were sought. As a result, the Montana Department of Natural Resources and Conservation in Helena commissioned Dr. Asher Sheppard of the VA Hospital in Loma Linda, CA, to study the health implications of a DC line. Sheppard's *Biological Effects of High Voltage Direct Current Transmission Lines*, a companion volume to his earlier AC report, is now available from the National Technical Information Service (NTIS). Sheppard reviews the bioeffects literature on air ions and electric and magnetic fields as well as shock hazards and possible interference to cardiac pacemakers. Report No. PB 207258 costs $13.00 for a paper copy or $4.50 for microfiche from NTIS, Springfield, VA 22161.

VDTs

Radiation... The Computer and Business Equipment Manufacturers Association (CBEMA) may file a petition with the Federal Trade Commission (FTC) to stop what it believes to be false claims about health and safety risks of VDTs. The trade group has launched an information-gathering campaign to aid in research. According to CBEMA general counsel John Voorhees, advertisements for products claiming to protect against emissions from VDTs make "false claims." Voorhees said that, "In fact, there are no dangerous X-rays or emissions coming from visual display units." CBEMA is asking people to submit advertisements for products that purport to block radiation emissions from VDTs. The group says that when appropriate it will contact the advertisers and ask for retractions. An FTC petition will be filed "if we establish a pattern of false advertising," Voorhees said....Studies of extremely low frequency (ELF) and radiofrequency (RF) emissions from VDTs done as part of a Canadian government study released earlier this year appear in the September *Health Physics* (Volume 45, Number 3). "Extremely Low Frequency Electromagnetic Emissions from Video Display Terminals and Other Devices" and "Radiofrequency Emissions From Video Display Terminals" were based on research used in preparation of *Investigation of Radiation Emissions from Video Display Terminals* (see *MWN*, July/August 1983) published by Canada's Department of National Health and Welfare.

Ergonomics... The Australian Bank Employees Union's State Bank Division has instructed its members not to help install or implement the use of new VDTs at the State Bank of Victoria until the bank agrees to a set of ergonomic standards. The union has a policy requiring an assessment of terminals and associated furniture, according to the September 12 *Computerworld*....The Canadian Standards Association's (CSA) draft *Guidance on Ergonomics of the Office Environment* has been delayed at least until January,

(continued p.12)

CLASSIFIEDS

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UPDATES *(continued from p.11)*

a CSA spokesperson told *Microwave News*. The draft had been scheduled for a September release (see *MWN*, July/August 1983). CSA established a Technical Committee on Ergonomics of the Office earlier this year to undertake preparation of the guidance. The committee now plans to produce a final guidance next fall....The International Ergonomics Association (IEA) will hold an "International Scientific Conference on Ergonomics and Health Aspects of Modern Office Jobs" November 7-9 in Turin, Italy. The conference will address VDTs and other office equipment as well as toxic agents and indoor air quality. For more information contact Mr. H.L. Davis, General Secretary, IEA, Human Factors Group, Eastman Kodak, Rochester, NY. The conference will be in English.

Research and Reports... After four meetings, the new *Technology in the Workplace* committee formed by CBEMA this summer announced it will concentrate on six general areas. One of the topics to be addressed is the health and safety of new information technologies, including VDTs. The committee, chaired by Earl Behm of 3M, has no plans to release any details of its work until next year....The final report of an extensive study of Ontario Hydro clerical workers will be presented to the company's board of directors in early October, a spokesperson for the company told *Microwave News*. A lengthy (1,000-page) draft of the report has been completed but is being condensed for the board and for the general public. A prior study at Ontario Hydro found a significant link between VDT use and complaints of eye irritation, blurred vision and neck and shoulder aches (see *MWN*, April 1983). The full report probably will be made available to interested researchers. For more information, contact the Office of Safety Services, Ontario Hydro, 757 McKay Road, Pickering, Ontario, Canada, L1W 3C8.

CORRECTIONS

Narda... In our July/August issue, we reported that Narda Microwave of Hauppauge, NY, had introduced a new electric field probe, Model 8682, capable of measuring radiation levels relative to the new ANSI RF/MW safety standard. The listed price for the probe was incorrect. It costs $2,500....**CCOHS...**In the same issue, the mission of a new section on physical hazards formed by the Canadian Center for Occupational Health and Safety in Hamilton, Ontario, was misdefined. The section will focus on nonionizing radiation in general and electromagnetic fields in particular.

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SHORT COURSES

November 1-3: An Introduction to EMI/RFI/EMC, Los Angeles, CA. Fee: $815. Contact: Don White Consultants, Inc. (DWCI), State Route 625, PO Box D, Gainesville, VA 22065, (703) 347-0030.

November 1-4: Advanced Radar Concepts, Rockville, MD. Fee: $720. Contact: Linda Billard, Technology Service Corp. (TSC), 8555 16th St., Suite 300, Silver Spring, MD 20910, (800) 638-2628.

November 1-4: Grounding & Shielding, Philadelphia, PA. Fee: $815. Contact: DWCI, see November 1 above. Repeated • January 24-27: Phoenix, AZ.

November 2-4: Millimeter Wave Systems, Devices and Markets, Mountain View, CA. Fee: $595. Contact: Microwave Training Institute (MTI), 444 Castro St., Mountain View, CA 94041, (415) 969-7363.

November 7-9: Digital Communications: Satellite/Earth Station, Terrestrial Microwave, Mobile Radio & Cable Systems, Toronto, Canada. Fee: $700 (Canadian). Contact: Ms. E. Lepage-Feher, DIGTECH, 3003 Southmore Dr. East, Ottawa, Ontario K1V 6Z5, Canada, (613) 733-7105. Repeated • November 30-December 2: Palo Alto, CA. Fee: $700 (US) Contact: Ms. Marie Huang, (408) 268-4312.

November 7-9: Strategic/Tactical Communications by Satellites, Vienna, VA. Fee: $675. Contact: Satellite Systems & Technology Inc., 3134 Juniper Lane, Falls Church, VA 22044, (703) 532-6274. Repeated • November 14-16: Palo Alto, CA.

November 7-11: Synthetic Array and Imaging Radars, Los Angeles, CA. Fee: $875. Contact: Short Course Program Office, UCLA Extension, PO Box 24901, Los Angeles, CA 90024, (213) 825-1295.

November 8-10: EDP Equipment Design Seminar on Coping with the FCC/VDE Regulations on RFI, San Francisco, CA. Contact: EMXX Corp., 6706 Deland Drive, Springfield, VA 22152, (703) 451-4619

November 11: Product Safety Seminar: National and International Aspects, San Francisco, CA. Fee: $275. Contact: EMXX, see November 8 above.

November 14-18: Protection Against MW/RF Radiations, Electric and Magnetic Fields, Ispra, Italy. Fee: 350,000 Lira. Contact: Secretariat ISPRA Courses, Centro Commune di Ricerca, 21020 ISPRA (Varese), Italy, (0332) 781128.

November 14-18: Principles of Modern Radar, Atlanta, GA. Fee: NA. Contact: Department of Continuing Education, Georgia Institute of Technology (GIT), Atlanta, GA 30332, (404) 894-2547.

November 15-25: Biological Effects and Dosimetry of Non-Ionizing Radiation: Static and ELF Electromagnetic Fields, Erice, Italy. Fee: $500. Contact: Professor Martino Grandolfo, Instituto Superiore di Sanita, Viale Regina Elena, 299, 00161 Rome, Italy.

November 21-23: Hazardous RF Electromagnetic Radiation, Washington, DC. Fee: $685. Contact: Continuing Engineering Education, George Washington University (GWU), Washington, DC 20052, (800) 424-9773.

November 22: Microwave Components Market Forecast Seminar, Mountain View, CA. Fee: $295. Contact: MTI, see November 2 above.

November 28-30: Electromagnetic Pulse, London, England. Fee: $785. Contact: GWU, see November 21 above.

November 30-December 2: Microwave Testing, Mountain View, CA. Fee: $595. Contact: MTI, see November 2 above.

December 5-6: EMI Workshop, Philadelphia, PA. Fee: $575. Contact: R&B Enterprises, 20 Clipper Road, W. Conshohocken, PA 19428, (215) 825-1960.

December 5-9: Microwave Circuits: Theory & Applications, Sunnyvale, CA. Fee: $850. Contact: Continuing Education Institute, Suite 1000, 10889 Wilshire Blvd., Los Angeles, CA 90024, (213) 824-9545 or (301) 596-0111.

December 5-9: EMC Design & Measurement for Control of EMI, Los Angeles, CA. Fee: $995. Contact: DWCI, see November 1 above.

December 6: Electrostatic Discharge Control Seminar, Phoenix, AZ. Fee: $275. Contact: EMXX, see November 8 above.

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Microwave News invites contributions to *From the Field*, our occasional column featuring news and opinions from the non-ionizing radiation community. Letters from readers are also welcome.

EMPRESS II: EMI Threat to Nuclear Power Plants

The Navy's plan to build a powerful electromagnetic pulse (EMP) simulator on the Chesapeake Bay has provoked new concern about the susceptibility of nuclear power plants to interference from EMP radiation. The proposed facility is designed to test the vulnerability of ships to electric fields of up to 50 kV/m.

No nuclear plant has ever been subjected to EMP radiation, and some observers fear that pulses from the proposed EMPRESS II facility might cause "false-trips" in electronic or electrical systems at the Calvert Cliffs nuclear generating plant, located approximately 30 miles from the preferred EMP antenna site. Repeated false-trips could trigger a reactor shutdown, or as one expert believes, in a worst case scenario result in a core meltdown.

Maryland state officials believe that electromagnetic interference (EMI) at Calvert Cliffs could be a serious problem, and this is one reason why they oppose siting EMPRESS II — the second Electromagnetic Pulse Radiation Environment Simulator for Ships — anywhere in the Chesapeake Bay. According to Robert Lunsford of the state Department of Natural Resources, "those who are the most informed are also the most concerned about interference."

The Navy and other defense agencies use simulators like EMPRESS II to determine how military hardware would be affected by EMI from a "real" EMP, the burst of non-ionizing radiation created by a high-altitude nuclear blast.

(continued on p.10)

EPA To Reopen Public Record on RF/MW Guidance

High-ranking officials at the Environmental Protection Agency (EPA) have decided not to propose a federal guidance on radiofrequency and microwave (RF/MW) radiation safety. Instead, the agency will seek public comment on a host of technical issues related to RF/MW radiation — everything from bioeffects to economics.

According to Sheldon Meyers, acting director of the EPA Office of Radiation Programs, the agency will return to the *Federal Register* to round up information that has become available since EPA first issued its advanced notice of proposed rule making in December 1982 (see *MWN*, January/February 1983).

Joe Cannon, assistant administrator for air and radiation programs, recommended this approach as a compromise between stopping all work on the RF/MW guidance and issuing a proposed guidance for public comment. Deputy EPA Administrator Al Alm concurred with Cannon's recommendation.

Although Meyers said that he hoped a notice of inquiry would appear by the end of the year, other agency commitments may delay it until early 1985.

HIGHLIGHTS

Electrical Work Again Linked to Cancer

Two new epidemiological studies have linked occupational exposures to electromagnetic (EM) fields to cancer. Maryland researchers have identified an increase in the relative risk of brain tumors among exposed workers and a UK study has found a rise in the incidence of eye cancer among male electrical and electronics workers in England and Wales.

There are now eleven reports from the US and Europe connecting low frequency EM radiation with cancer (mostly leukemia) or reproductive problems (see *MWN*, March, June and December 1983).

Brain Tumors in Maryland

In a paper presented at the *1984 Annual Meeting of the Society for Risk Analysis* in Knoxville, TN, on October 2, Dr. Ruey Lin announced that he had found an association between exposures to EM radiation and the development of brain tumors. In addition, those workers in electrical occupations with the highest exposure to EM fields died at a significantly younger age than those who were not exposed.

Lin and co-workers at the Maryland Department of Health and Mental Hygiene in Baltimore reviewed the death certificates of 951 white adults who died of brain tumors between 1969 and 1982. They found that compared to controls, who were matched on the basis of age and date of death and who died of causes other than malignancy, a significantly higher proportion of workers who died with a primary brain tumor had been employed in electrical occupations, such as electrician, electric or electronic engineers and utility company servicemen.

In a telephone interview following the risk analysis meeting, Lin told *Microwave News* that the new research "supports the theory that non-ionizing radiation may be a brain tumor promoting agent." He went on to add a note of caution, however, saying that there is still uncertainty due to the absence of exposure data. For instance, Lin said that he does not know whether the increased risk of brain tumors is related to magnetic or electric fields. In addition, he said that he could not rule out the possibility that other agents, such as polychlorinated biphenyls, solvents, or metal fumes are involved.

Lin recommended that additional epidemiological and animal studies are needed to explore the possible relationship between electrical occupations and cancer. A paper describing the results presented in Knoxville has been submitted for publication.

Cancer Among Electrical Workers

Dr. A.J. Swerdlow of the Department of Community Medicine at the University of Glasgow in Scotland, UK, has uncovered a significant increase in eye cancer among adult men (47 percent) and women (50 percent) in England and Wales, between 1962 and 1977. The increased incidence was "notably high" for male electrical and electronics workers, 15-74 years of age, between 1968-1975.

Swerdlow noted that the general increase was "unexpected," and he offered no explanation for the finding. He used cancer registration data as a measure of cancer incidence and believes that the higher registration rates "reflect a real rise in incidence of eye cancer, and therefore probably of eye melanoma, which accounts for the great majority of eye cancer."

Proportional registration ratios were also higher among three occupational groups in addition to electrical and electronics workers: administrators and managers, professional technical workers and artists. Generally, Swerdlow found that eye cancer incidence was "generally higher in the non-manual social classes than in the manual classes." He cautions that the occupational and social class results should be interpreted with caution because of the small sample size and the possibility of errors in occupational classification and in coding.

Nonetheless, Swerdlow concludes that "the high ratios found for electrical and electronics workers...would not have been expected from their social class and are of particular interest."

No gradient of incidence with geographical latitude was identified, in contrast to other reports of an association between skin melanoma and latitude. Swerdlow's paper appears in the *American Journal of Epidemiology, 118*, 294, 1983.

NY State Plans Replication of Winters's ELF Study

The New York State Power Lines Project will fund at least one replication study of Dr. Wendell Winters's experiments on the effects of 60 Hz fields on human tumor cells. Winters's finding that electromagnetic fields can enhance the growth of cells by up to 5.6 times the normal rate is the most startling result reported to date among the project's 16 studies and has generated considerable interest inside and outside the non-ionizing radiation community (see *MWN*, April and September 1984).

Because of the implications of Winters's findings, earlier this summer the project's scientific advisory panel asked Drs. Gordon Livingston of the University of Utah and Maimon Cohen of the University of Maryland to submit proposals for replication studies. Both researchers are already project participants.

Livingston's proposal has now won tentative approval from the panel. His study is expected to take about six months and cost approximately $30,000. Cohen, however, is not expected to respond to the panel's invitation until his own study is closer to completion.

The panel has also received two evaluations of Winters's work following site visits to his lab at the University of Texas Health Science Center in San Antonio this summer. A joint report by Drs. Jeffrey Trent of the University of Arizona and Ronald Buick of the University of Toronto, and another by panel chairman Dr. Michael Shelanski of New York University were sent to Winters for comment last month. (Trent, a cancer biologist, will be a consultant to

Livingston during his replication study.) Copies of the two evaluations and Winters's response should be available by late October.

Project manager Michael Rampolla told *Microwave News* that a final decision on whether to move ahead with the second replication study will be made after the DOE-EPRI-NYS contractors meeting in St. Louis in November. Winters's final report is due at the end of the year.

Developments in the other project studies include:

- Preliminary results from Livingston's study on the reproductive integrity of mammalian cells show that the growth of CHO cells was retarded by exposure to 60 Hz fields. Earlier, Livingston received a no-cost extension to do more work, and his final report is due October 31. No genetic effects were observed.
- Dr. Charles Graham at the Midwest Research Institute (MRI) exposed human subjects to 9 kV/m and 0.2 gauss electromagnetic fields in his study of "The Influence of 60 Hz Fields on Human Behavior, Physiology and Biochemistry." The observed effects were consistently variable and "appear to have no single or simple explanation," according to the latest semiannual project status report. Graham's final report should be completed in November.
- Work at MRI on the biochemical analyses of samples from Graham's subjects is being funded by the Department of Energy and is not under the management of the power lines project. A preliminary report on these results is expected soon.
- Dr. Richard Stevens has replaced Dr. Lowell Sever as the head of Battelle's epidemiological study of cancer among people exposed to electromagnetic fields, one of two project studies based on Dr. Nancy Wertheimer's findings. Stevens left the Institute for Cancer Research in Philadelphia to join Battelle's Pacific Northwest Laboratories. No delay is anticipated as a result of the switch.

RFI Amendments in Congress

Senator Barry Goldwater (R-AZ) and Representative Jim Bates (D-CA) have introduced bills to "eliminate willful or malicious interference with communications." Goldwater introduced S.2975 on September 10 and Bates proposed H.R.6195 on September 6. The bills have the support of the FCC.

The proposals, which seek to amend the Communications Act of 1934, are similar. Both would make causing deliberate radiofrequency interference (RFI) a violation of the act rather than a violation of Federal Communication Commission (FCC) administrative rules. This change would facilitate FCC enforcement and would increase penalties to up to $10,000 and one year in prison for a first offense and up to two years in prison for repeated violations.

Goldwater's bill would also arm the FCC with the power to seize interfering transmitting equipment. Offenders could then be prevented from causing further harm during the commission's lengthy and complex administrative and judicial proceedings.

There is very little chance that either bill will be enacted into law during the current session of Congress. Congress has adjourned for the elections and there is no indication that it will reconvene before next year.

A spokesman for Bates said that the amendments are a response to a number of incidents of harmful RFI which have taken place in his southern California district. The FCC has been investigating RFI cases in the San Diego area for some time.

One blatant case involved an amateur radio operator who was recently placed on three years probation by a federal court for causing disruptive jamming for more than 20 years. The amateur's license was revoked in 1979, but the RFI continued. In February 1984, U.S. marshals seized his radio equipment.

In remarks accompanying his bill, Goldwater stated that "the increase in willful interference to authorized communications simply must be stopped," adding that "I expect the FCC to use these provisions aggressively."

The Republican senator, who is a long-time radio hobbyist, warned that if this new bill is insufficient, "I am prepared to...further increase the penalties for violation and include...mandatory disqualification of those convicted from being licensees in the future."

His proposed legislation takes aim at four types of interference: (1) Transmissions, such as unmodulated carriers, recorded material, music and threats, made directly over the ongoing transmissions of other operators. (2) Long continuous transmissions on a frequency known by defendant to be used as a repeater input frequency without monitoring the repeater output frequency. (3) Initiation of transmissions when others were already using the frequency. (4) Whistling on frequency for long periods of time for jamming purposes.

The Senate bill would add a new Section 333 to Title III of the Communications Act: "No person shall willfully *or maliciously interfere with or cause interference to any* radio communication." And it would add the following paragraph to Section 510(a) of the Act:

> Any electronic, electromagnetic, radiofrequency, or other device or component thereof within the control of any person accused by the Commission of an alleged criminal violation of Section 333 of this Act or rules prescribed thereunder, *and capable of emitting the radiation alleged to violate* such section or rules, may, after issuance of written notice delivered by certified or registered mail or in person of such alleged violation, be seized by the United States when there exists reasonable belief that seizure is necessary to prevent continued willful or malicious interference to any radio communication. Such equipment is subject to forfeiture to the United States upon conviction of such person rendered *in United [States] District Court for violation of Section* 333. For purposes of this paragraph "reasonable belief" shall be deemed to exist in, but not limited to, instances where continued interference is caused by use of the same or similar equipment by any person after that person has been issued such written notice from the Commission alleging violation of Section 333 and requesting that the person cease the actions alleged to constitute violation of such section until a final determination is made.

A copy of the S.2975 appears in the September 10 *Congressional Record*, p.S10866, as amended on September 18, p.S11423.

Bates's bill, H.R.6195, is much briefer than Goldwater's, specifying only that causing malicious RFI is a violation of the Communications Act.

The Bates bill has been assigned to the subcommittee on telecommunications, consumer protection and finance of the House Committee on Energy and Commerce. The Goldwater proposal has yet to be assigned to a subcommittee within the Senate Committee on Commerce, Science and Transportation.

ANSI C95 Work Stalled— ELF Standard Under Consideration

Revision of the American National Standards Institute (ANSI) radiofrequency and microwave (RF/MW) radiation safety standard has bogged down under a new literature review system. "We are proceeding at a snail's pace," said one ANSI official at the last meeting of the institute's C95 committee on radiation hazards and C95.IV subcommittee on human safety standards. Meanwhile, the structure and operation of the subcommittee and its parent committee C95 have come under attack from Professor Nicholas Steneck, a historian at the University of Michigan.

In other developments, at the July 15 C95 meeting in Atlanta, GA, a group was formed to weigh the need for a new subcommittee on extremely low frequency (ELF) radiation bioeffects. (The ANSI standard, C95.1-1982, only covers frequencies above 300 kHz.) The ELF group was established after some members argued that ANSI should expand the scope of its safety guidelines to include 60 Hz and very low frequency (VLF) radiation and pulsed fields. Dr. Richard Phillips, who will soon leave Battelle's Pacific Northwest Labs to join the Environmental Protection Agency (EPA) in North Carolina on December 3, was named chairman of the group.

In addition, the largely inactive subcommittee C95.VII on medical surveillance was combined with C95.IV at the request of C95.VII chairman, Dr. Paul Tyler.

The ANSI RF/MW safety guidelines were revised in 1982 and, according to ANSI rules, must be reaffirmed or updated within five years. When Dr. F. Kristian Storm took over the chairmanship of C95.IV subcommittee for the current review, he set up a complex system of five committees and 14 working groups to evaluate new data on health risks (see *MWN*, July/August 1983).

Dr. John Osepchuk was one among those concerned about the paralysis of the subcommittee, commenting that "Storm's system of review does not seem to be working." Osepchuk, who is with Raytheon and is the secretary of C95.IV, said that more than 200 papers on RF/MW bioeffects had been selected for review as possibly germane to the revision of the safety standard, but that none had yet been evaluated.

Dr. Don Justesen of the VA Medical Center in Kansas City, MO, who chaired the July subcommittee meeting, also expressed concern over this bottleneck in Storm's organizational structure.

In letters to Storm and Professor Saul Rosenthal, chairman of ANSI C95, Steneck has challenged the fairness of the subcommittee's composition and actions. He suggested that if the committee and subcommittee could not be reformed, ANSI should stop issuing standards on RF/MW radiation safety (see "From the Field," pp.6-7).

Storm did not respond to written and telephone requests from *Microwave News* for comment on the Steneck letters. In a telephone interview, Rosenthal said that he was concerned about the allegations and was discussing them with members of C95 and its subcommittees but would not reply to them directly.

In a brief discussion at the meeting, Justesen said that it is only the statements of people like Steneck that are undermining the credibility of the ANSI standard. But Dr. P. Czerski of the Food and Drug Administration advised that the committee should set firm definitions and criteria to satisfy the problems raised by Steneck.

Storm did not attend the C95 meetings in Atlanta. He was believed to be at a conference in Geneva, Switzerland.

At the July meeting, Steneck said that the committee "should broaden its expertise to develop a standard that is more sensitive to the world-at-large."

Indeed, during the C95 committee meeting, Rosenthal, who is with the Polytechnic Institute of New York, called for new members to increase the public's participation. One setback followed almost immediately. Dr. Edward Groth III of Consumers Union declined to join the committee for evaluation of exposure risk set up by Storm and chaired by EPA's David Janes. In a letter to Janes, Groth cited time pressures as well as a lack of expertise on RF/MW bioeffects.

Navy Stops RF/MW Bioeffects Research at Bethesda Institute

The Navy has decided to end research on the bioeffects of microwave radiation at the Naval Medical Research Institute (NMRI) in Bethesda, MD. According to knowledgeable sources, the decision was made by the Navy's senior management.

Only the in-house research program at NMRI has been eliminated. Most of the Navy's research on microwave bioeffects is funded by the Office of Naval Research (ONR) and will be unaffected by the NMRI cutback.

Most of the $385,000 budget for the microwave project at NMRI in fiscal year 1984 (FY84), which ended September 30, was used to support Dr. John Thomas's laboratory. Thomas is best known for his work on the synergistic action between microwaves and drugs, such as Librium (see *MWN*, February 1981). There are no funds for this intramural effort in the FY85 budget.

In a telephone interview, Thomas said the cutback on microwave research reflects a decision by the Naval Medical Research & Development Command (NMRDC) to place

a higher priority on the health effects associated with physically extreme environments (hot and cold) and with chemical warfare.

During the last two years, Thomas has also been working on a $101,000 contract with the New York State Power Lines Project on the potential behavioral effects of 60 Hz fields. The study is due to be completed in mid-November.

The end of FY84 also marked the end of bioeffects research on extremely low frequency (ELF) radiation at the Naval Aerospace Medical Research Lab (NAMRL) in Pensacola, FL. The lab's research on microwave bioeffects will continue (see *MWN*, September 1984). Both NMRI and NAMRL report to NMRDC.

Dr. Elliot Postow, program manager for electromagnetic radiation at NMRDC and editor of *Bioelectromagnetics*, told *Microwave News* that he is devoting more time to other issues now that the Navy had made microwave research a lower priority.

SHORT COURSES

We would like to hear from those readers who use our short course calendar. First, is it useful? Should we expand the calendar or run it less frequently? And second, how far in advance do you make plans to attend a short course? At present, we list courses that begin about the middle of the month following our issue date: in this October issue, the first listing is for the 13th of November. Does this allow you enough time to decide which courses to take? (One drawback to working too far in the future is that many courses are announced only a few weeks before they are scheduled to be given.)

November 12-16: **Radiation Safety,** Evanston, IL. Fee: $895. Contact: Continuing Engineering Studies, 2804 Technological Institute, Northwestern University, Evanston, IL 60201, (312) 492-3365. **Repeated** May 6-10.

November 13-14: **Magnetic Analysis Program,** Milwaukee, WI. Fee: $495. Contact: A.O. Smith Engineering Systems, 8901 N. Kildeer Court, Milwaukee, WI 53209, (800) 558-6980, ext. 2860. **Repeated** December 11-12.

November 13-14: **Grounding, Bonding & Shielding,** Washington, DC. Fee: $495. Contact: Greg Gore, R&B Enterprises, 20 Clipper Rd., West Conshohocken, PA 19428, (215) 825-1965.

November 13-15: **EMC Design Applications,** Sunnyvale, CA. Fee: $745. Contact: Jim Hill, EMXX Corp., 6706 Deland Dr., Springfield, VA 22152, (703) 451-4619.

November 13-16: **Grounding & Shielding,** Sunnyvale, CA. Fee: $815. Optional fourth day for $235. Contact: Don White Consultants, Inc. (DWCI), State Route 625, PO Box D, Gainesville, VA 22065, (703) 347-0030. **Repeated** December 4-7: New York, NY.

November 14-16: **Hyperthermia in Cancer Therapy,** Seattle, WA. Fee: $350. Contact: Continuing Medical Education, University of Washington, SC-50, Seattle, WA 98195, (206) 543-1050.

November 14-17: **Fundamentals of NMR Imaging,** San Antonio, TX. Fee: $385. Contact: Continuing Medical Education, University of Texas Health Science Center, 7703 Floyd Curl Drive, San Antonio, TX 78284, (512) 691-6295.

November 15-16: **EMI Prediction & Analysis,** Washington, DC. Fee: $495. Contact: see R&B, November 13 above.

November 16: **Electrostatic Discharge Control,** Sunnyvale, CA. Fee: $295. Contact: EMXX, see November 13 above.

November 19-21: **EMP and Its Effects on Systems,** Washington, DC. Fee: $695. Contact: Continuing Engineering Education, George Washington University (GWU), Washington, DC 20052, (800) 424-9773, or (202) 676-6106 in DC.

November 21-23: **Safety in the Use of Microwave Equipment,** Loughborough, UK. Fee: 295 Pounds. Contact: Mrs. K. Gilbert, Center for Extension Studies, University of Technology, Loughborough, Leicestershire LE11 3TU, UK, (0509) 263171, ext. 249.

November 26-30: **HF Spectrum: New Concepts and Technologies,** Washington, DC. Fee: $875. Contact: GWU, see November 19 above.

CONFERENCES

November 5-7: **DOE-EPRI-NYS Contractors Review: Research on Bioeffects of Transmission Lines,** Sheraton St. Louis, MO. Contact: Dr. William Wisecup, Aerospace Corp., Suite 4000, 955 L'Enfant Plaza, SW, Washington, DC 20024, (202) 488-6328.

November 5-8: **4th International Meeting of the Bioelectrical Repair and Growth Society,** Holiday Inn, Kyoto, Japan. Contact: BRAGS, 425 Medical Education Building, 36 and Hamilton Walk, Philadelphia, PA 19104, (215) 898-8653.

November 13-15: **JINA'84: International Symposium on Antennas,** Nice, France. Contact: Secretariat JINA'84, CNET-PAB Centre de la Turbie, 06320 Cap d'Ail, France.

November 27-30: **30th Annual Conference on Magnetism and Magnetic Materials,** Town and Country Hotel, San Diego, CA. Contact: Richard Josephs, Code 5023, Naval Air Development Center, Warminster, PA 18974.

December 4-8: **American Clinical Hyperthermia Meeting,** Americana Canyon Hotel, Palm Springs, CA. Contact: Dr. Haim Bicher, Daniel Freeman Memorial Hospital, 333 N. Prairie Ave., Inglewood, CA 90301, (213) 674-7050.

December 9-12: **Workshop on Low Level Field Effects on Cells,** Brookhaven National Lab, Upton, NY. Contact: Eugene Findl, Brookhaven National Lab, Upton, Long Island, NY 11973, (516) 282-4907.

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January 23-25: **RF Technology Expo,** Disneyland Hotel, Anaheim, CA. Contact: Kathy Kriner, RF Tech Expo, 6530 S. Yosemite St., Englewood, CO 80111.

February 3-8: **1985 Winter Meeting of the IEEE Power Engineering Society,** Penta Hotel, New York, NY. Contact: T.A. Balaska, Bishop Electric Corp., 363 Old Hook Rd., Westwood, NJ 07675, (201) 666-5553.

March 5-7: **6th Symposium & Technical Exhibition on Electromagnetic Compatibility,** Zurich, Switzerland. Contact: EMC Symposium & Exhibition, ETH Zentrum-IKT, 8092 Zurich, Switzerland, (01) 256-27-90.

March 21-22: **IMTC/85: Instrumentation/Measurement Technology Conference,** Hyatt Regency, Tampa, FL. Contact: Dr. Robert Ashley, Sperry Corp., PO Box 4648, Clearwater, FL 33518, (813) 577-1900, ext. 2228.

April 3-4: **21st Annual Meeting of the National Council on Radiation Protection and Measurements,** Washington, DC. Contact: NCRP, Suite 1016, 7910 Woodmont Ave., Bethesda, MD 20814, (301) 657-2652.

April 16-17: **8th International Colloquium on the Prevention of Occupational Risks due to Electricity,** London, UK. Contact: International Fire Security & Safety, Exhibitions & Conferences, Cavendish House, 128/134 Cleveland St., London W1P 5DN, UK, (01) 387-5050.

April 29-May 2: **23rd International Magnetics Conference,** St. Paul, MN. Contact: R.O. McCary, GE, Corporate R&D, Schenectady, NY 12345, (518) 385-5436.

May 3-9: **33rd Annual Meeting of the Radiation Research Society,** Biltmore Hotel, Los Angeles, CA. Contact: RRS, 925 Chestnut St., Philadelphia, PA 19107, (215) 574-3153.

Steneck Letters to ANSI C95.IV and ANSI C95

Reprinted below are two edited letters by Professor Nicholas Steneck concerning the ANSI standard C95.1-1982, Safety Levels with Respect to Human Exposure to Radiofrequency Electromagnetic Fields, 300 kHz to 100 GHz *(see* MWN, *September 1982). Steneck addressed his concerns to Dr. F. Kristian Storm, chairman of the American National Standards Institute's (ANSI) C95.IV subcommittee on "Safety Levels and/or Tolerances with Respect to Personnel," and to Dr. Saul Rosenthal, chairman of the full ANSI C95 Committee on "Radiofrequency Hazards." (See story about ANSI C95 and C95.IV on p.4.)*

Steneck is a professor of history and the director of the Collegiate Institute for Values and Science at the University of Michigan. He is the author (with three associates) of "The Origins of US Safety Standards for Microwave Radiation," Science, 208, *1230, 1980 and "Science and Standards: The Case of C95.1-1982,"* Journal of Microwave Power, 19, *153, 1984. Last month, MIT Press (Cambridge, MA) published Steneck's book,* The Microwave Debate *($25.00).*

June 5, 1984

Dear Dr. Storm:

The arrival of the latest set of ANSI C95 minutes and the agenda for this year's meeting was like an encounter with a ghost from the past. For over 20 years, C95 and C95.IV have periodically been rejuvenated with new committee structures, chairpersons and goals, always with the hope that new revisions will lead to the establishment of a generally acceptable radiofrequency protection guide (RFPG).

To date, the hoped-for goal of general acceptability has yet to be achieved. It is frequently argued that the primary cause of present discontent is a lack of understanding on the part of the public. The public, it is argued, fails to distinguish high-level from low-level exposure and has as a consequence all too often objected to actions that involve no threat to public health. Hence, the present thrust of policy in this area is one that stresses more public education and the collection of more scientific data, presumably to aid public education. The activities of your own subcommittee fall squarely into this pattern.

I would like to suggest for your consideration another explanation of the lack of public confidence in ANSI's RFPG, one that will hopefully cause you to question the validity of current C95.IV actions.

It can be argued, I believe, that public objection has been aimed not so much at ANSI's RFPG as at the way it has been set. The public sees in C95.IV deliberations actions that are not responsive to their needs. This being the case, they can find no compelling reason to accept the RFPG. Let me be more specific, mentioning just two of the several problems.

1. The absence of broadbased decision making. Over the past twenty-plus years, C95 and C95.IV have spent the vast majority of their time discussing one issue— bioeffects. The assumption that is made is that extrapolation from knowledge about bioeffects to an RFPG is a simple process that can be carried out by those who understand bioeffects. This assumption is wrong! The most controversial aspect of any standard is the process of extrapolation, of going from facts to judgments and policy. C95 and C95.IV have to my knowledge never engaged in extended discussion of the extrapolation process or called on experts to help them with this difficult aspect of standard setting.

C95.1-1982 informs the public that exposure below its RFPG is not harmful, but it does not specify what is meant by *harmful.* What is harm? Who is being protected? From what are they being protected? What degree of certainty is built into the RFPG?...

2. C95 and C95.IV membership. If deriving a standard were equivalent to adding two plus two, the membership of your committee would not matter. However, setting standards is not a straightforward objective process; values enter into decision making at every step. Thus, who sits on C95 and C95.IV matters very much to the public, because it is through the membership that different points of view are expressed.

Who on your subcommittee speaks for the public? When key decisions have to be made, what is the balance between those with user interests or ties and those whose only responsibility is to the public? What is the balance between the public and RF users on the larger parent committee you must ultimately satisfy? I submit that if you take a close look at this issue you will again discover an extremely compelling reason for a lack of public confidence in your deliberations....

Public confidence cannot be restored by yet again attacking the bioeffects issue....

The public does not lack understanding. They understand that deliberations on microwave policy have reflected and continue to reflect limited points of view. They also understand that such an approach to policy is not justifiable. It is time that C95 and C95.IV achieved similar understanding and modified its procedures accordingly. This is the area that calls for more education!

As the newly appointed head of C95.IV, you are in a position to foster this education. I strongly urge you to do so, realizing that the consequences of a failure to act responsibly could in the long run present the greatest threat to the safe and constructive use of microwave technology in society.

Sincerely,

Nicholas H. Steneck

September 20, 1984

Dear Dr. Rosenthal:

Following the invitation issued by Don Justesen at the July 15 C95.IV meeting, I have set out below some specific suggestions for revising the methods used to set ANSI C95.1. I am addressing these suggestions to you as chairman of C95 with the hope that they will be considered on their merits and used constructively as appropriate.

Needless to say, I was disappointed in the response at this year's C95.IV meeting to my earlier letter to Dr. Storm. Considering John Osepchuk's notification to C95.IV members that "discussion of this letter will be in order at the meeting in Atlanta" and the promises of more discussion made during the opening C95 meeting, the motion to adjourn C95.IV without any discussion of the issues I raised is difficult to understand. These events, along with the failure of Dr. Storm to acknowledge receipt of my letter, leads to the conclusion that the leadership of C95.IV has no interest in changing the methods that are being used to set and revise ANSI's RF standard. If this is the case, you are the next logical person to address.

There are at the very least four crucial areas that need to be considered in more detail before going forward with present plans to revise C95.1-1982.

1. The scope and significance of C95.IV actions. C95 members have never adequately addressed the issue of the scope and significance of their activities. It has always been understood that ANSI is not a regulatory body and that ANSI standards are not binding standards. This fact has been repeatedly used over the years to diffuse concern about the scope and significance of C95.IV actions. Why become overly concerned if the final product

is only a guideline that can be used or not used as deemed appropriate?

An appropriate starting point for discussion would be this common assessment of the significance of ANSI standards. Does the fact that ANSI is a private organization that facilitates the generation of voluntary standards limit the responsibility that C95 must assume, particularly its legal responsibility? I believe that a very convincing case could be made that would argue otherwise and that your committee and its subcommittees may not be as far removed from responsibility as is commonly assumed.

C95 members cannot be ignorant of the fact that C95.1 has been widely used for making judgments about the safety of exposure to RF radiation. Moreover, such use has frequently been at the urging of prominent C95 members who have, when giving advice, listed among their credentials their membership on C95 or C95.IV. In other words, your membership knows that its judgments about standards are used for setting public policy and have recommended that this is appropriate. Can there be any doubt, therefore, that C95.IV and C95 must bear some responsibility when questions are raised about the adequacy of present standards, even when such questions are raised in legal settings?

Is C95 ready to accept this responsibility? Are you ready to defend in court all of the activities that have taken place under your chairmanship? Are you prepared to explain and defend the relationships between ANSI, its members, and their activities, as for example between ANSI, EPA, EEPA, and recent pressure brought to bear on EPA to adopt ANSI's standard and not a more conservative one generated within EPA? Are you satisfied that ample consideration was given to the issue of target population when C95.1-1982, breaking with past tradition, was applied to general populations and not limited to occupational exposure?...

2. Broadening ANSI's approach to setting standards. Our legislative bodies and our legal systems in this country have made very clear their expectations regarding exposure standards for the general public and working populations. The requirements for responsive standards have been discussed at length by policy experts, philosophers, social scientists and public interest groups. As a consequence of these activities, setting standards has become a relatively sophisticated process, demanding of those who set standards broad abilities and sensitivities, not only in the sciences but in the social sciences and humanities as well.

In comparison to the methods used in government and elsewhere to set standards, the methods used by C95.IV are primitive at best. Government and the courts have mandated that cost-benefit analysis be used to set standards that affect the public. C95.IV has steadfastly ignored cost-benefit analysis. None of its members has expertise in this area, making it impossible for such an analysis to be planned or undertaken....

3. Eliminate obvious conflicts of interest. As I am sure I do not have to bring to your attention, there is no such thing as an absolute scientific exposure standard. The advice you give when you issue and revise C95.1 reflects judgments that are made under the pressure of competing interests. Two interests in particular are of importance when considering RF radiation— health interests and development interests. Either interest could be maximized by ignoring the other. Health interests could be maximized by forbidding any exposure to RF radiation. Development interests could be maximized by outlawing RF exposure standards. Hopefully, the task C95.IV sets for itself is reaching a fair and equitable compromise between these competing interests.

Now ask yourself, what are the chances that C95.IV will reach a fair and equitable compromise? How much confidence should the public have in the ability of this subcommittee to act fairly? The scientist who heads the [sub]committee is one whose primary interest is technological development. Within his own field, his approach to the control of a particular disease, cancer, is interventionist, not preventionist. C95.IV's secretary works for industry. The person who will select the scientific literature that will be used to set standards is under contract from the Air Force, a development conscious organization. The two scientists who oversee the evaluation of the literature selected for review have worked for the military and have testified for industry. And so it goes.

Keep in mind, I am not seeking to undermine the integrity of the persons above by mentioning their affiliations. Each is engaged in activities that are recognized as important to the vitality and well-being of US society. However, I am questioning the wisdom of staffing a committee that will make judgments that affect the public with persons who so consistently are allied with only one of the groups that has an interest in RF exposure standards....

4. More openness in disseminating information. If, when all is said and done, you feel that C95 and its subcommittee, C95.IV, are doing the best they can, it would seem reasonable to explain your satisfaction and rationales more fully. The rationale document added to C95.1-1982 was a positive step in the direction of disclosure, but only a small step. It provides partial explanation of the scientific methods used, but completely ignores all of the other decisions that were made in setting C95.1-1982.

C95.IV members know that many of the judgments they made involve complex sets of assumptions. The decision to use average SARs, thereby ignoring hotspots, has important ramifications, most of which were raised in C95.IV meetings. The use of SAR itself as the basic unit of the standard also has ramifications. If you do not mention these ramifications, pointing out for example that the use of average SAR could perhaps fail to take into account a localized effect, they will become the topic of intense discussion and a source for skepticism when raised by persons who are wondering whether to accept your judgments or reject them.

If C95.IV members are confident that their judgments are the best that can be made, then explain fully, especially to the public, why this is the case. If it is decided that cost-benefit analysis is not important, give reasons for eliminating such considerations. If the factor-of-ten safety factor is adopted, explain why....

• • •

These suggestions may be difficult to implement. I am aware of this fact. They call for increased complexity, more work and additional members. You are working with a volunteer organization and no real budget. It may be unrealistic to expect C95 and C95.IV to do more.

But if more cannot be expected, what course of action should follow? My own feeling is that it is irresponsible and possibly immoral to continue with the status quo. If C95 cannot do the job required to set responsible standards, then perhaps it should not set standards, or even issue guidelines, since it can reasonably be assumed that ANSI's recommended guidelines will be used to set public policy.

ANSI's departure from this field would most likely result in a temporary state of confusion. Without ANSI's judgments, industry would have no reference point for demonstrating to the public the safety of proposed facilities. But maybe complete chaos is what is needed to once and for all force responsible decision making. It is in allowing irresponsible decision making to continue that I see the immorality of C95 and C95.IV actions....

Sincerely,

Nicholas H. Steneck
Department of History
University of Michigan
Ann Arbor, MI 48109

UPDATES

COMPATIBILITY & INTERFERENCE

FCC Rules for ISM... Be on the lookout for FCC action on ISM equipment RFI. Docket 20718 has been dormant since the commission proposed rules in 1978 and 1979, but a notice covering all ISM devices, including RF lighting, should appear in the *Federal Register* in December. It is likely that the FCC action will address the concerns of the National Electrical Manufacturers Association (NEMA) regarding requirements for test marketing RF lighting devices. In two petitions filed last February, NEMA asked the commission to relax labeling and reporting requirements for lights sold under a waiver of Part 18 Subpart H rules (see *MWN*, September 1983).

Computer RFI Rule Exemption... The FCC has proposed exempting "one-of-a-kind" large computers and similar equipment from existing RFI rules. The proposed rule comes in response to a petition from Electronics Associates Inc., which argues that testing some of its products for verification of compliance with Part 15 Subpart J rules is costly and very difficult. In a notice published in the August 30 *Federal Register* (49 *FR* 34370), the commission noted that it may be more cost effective to handle any RFI from these units on a case by case basis and proposed exempting large systems built in quantities of 10 or less. For information, contact the FCC's Julius Knapp at (202) 653-8247.

ANS C63... American National Standards Committee C63 on EMC and its subcommittee 1 will meet on November 15-16 at the FCC offices in Washington, DC. According to the current schedule, subcommittee 1 will meet on the afternoon of the 15th and the full committee will assemble on the morning of the 16th. For more information, contact IEEE's Fred Huber at (212) 705-7960.

GOVERNMENT

FDA and Guy Experiment... Some consumers have expressed concern over the safety of their microwave ovens after hearing about the University of Washington study that found an increase in malignant tumors among rats exposed to microwave radiation (see *MWN*, July/August 1984). To calm these fears, the FDA released a *Talk Paper* on August 28, stating that such concerns are "unwarranted" in light of the agency's performance standard for microwave ovens and the actual operation of the units in tests. The FDA notes that "even persons making extensive use of a microwave oven" would be exposed to levels far below those used in the University of Washington study. A number of newspapers carried editorials expressing the same opinion about ovens, after running news stories about the study. For instance, the August 21 *Kansas City Star* proclaimed, "Don't Throw It Away Quite Yet."

MEDICAL APPLICATIONS

Reporting Serious Injuries... Beginning December 13, the FDA will require manufacturers of medical devices to report deaths or serious injuries caused by their products. Malfunctions that *could* cause death or serious injury should they recur must also be reported. FDA Commissioner Dr. Frank Young explained that the new rule will formalize what has been a largely voluntary reporting system. For details, see the September 14 *Federal Register* (49 *FR* 36326), see also correction on September 19 (49 *FR* 36644), or call Robert Forst at (301) 443-4874.

MEETINGS

Proceedings... The record of the *7th International Wroclaw Symposium on EMC*, which was held last June, is now available. Printed in two volumes, the proceedings contain about 100 papers. Many of the papers are in Russian, with abstracts in English. Copies are available for $40.00 (prepaid) from: EMC Organizing Committee, Box 2141, 51-645 Wroclaw 12, Poland. A limited number of copies of the records of the 1976, 1980 and 1982 symposia are still available. Ask for details....The proceedings of the August workshop on *Electromagnetic Waves and Neurobehavioral Function*, held in Corsendonk, Belgium, will be published by Alan Liss, Inc. Though the price of the volume has not yet been set, you can get a 30 percent discount off the regular price if you order before December 10, 1984. Contact: Alan Liss, Inc., 150 Fifth Ave., New York, NY 10011.

MILITARY SYSTEMS

OTH-B Radar Developments... The USAF has released a final EIS for its west coast over-the-horizon backscatter (OTH-B) radar (see *MWN*, May 1983). Components of the mammoth system, including transmitter, receiver and control center, will be located at four sites in California, Idaho and Oregon. For information, contact Ro Raffa, Electronic Systems Division, Hanscom AFB, MA 01731, (617) 271-7976....As construction begins in the West, the AF will use some of its $60 million-plus budget for OTH-B development in FY85 to expand its eastern radar in Maine, which is scheduled to reach full 180-degree coverage in FY86. The Navy is also studying the possibility of building one or more OTH-B radars in the South. Development of a transportable system will begin soon, under a $18.5 million contract recently awarded to Raytheon....Australia has decided to upgrade its Jindalee experimental OTH-B radar to an operational system.

New DEW Line EIS... The USAF's Electronic Systems Division has announced that it will prepare an EIS for the planned upgrading of the Distant Early Warning (DEW) Line radars into the North Warning System, designed to detect airborne missiles heading towards the US. The system will consist of short and long-range radars at 52 sites in Alaska and Canada; it will be able to protect against high flying bombers as well as low flying cruise missiles. The AF estimates that a draft EIS, covering five or six sites in Alaska, will be issued in late 1985. In August, the Sperry Corp. of Great Neck, NY, won a $79.7 million contract to design and develop 39 short-range radars. Although no contract has yet been awarded for the long-range radars, negotiations are underway with GE of Syracuse, NY. GE is already working on 13 similar units, AN/FPS-117s, in Alaska, which are part of the AF's Seek Igloo program. Deployment of the new North Warning radars will begin in the summer of 1986 and the whole system should be operational in 1992.

OVENS

Resources... Gerling Laboratories has issued two reports: (1) *A Listing of Microwave Patents Associated with Industrial Processing and Domestic/Commercial Microwave Ovens*, updated edition dated August 22, 1984; and (2) *Index to the Gerling Laboratories Technical Library*, May 30, 1984. The library has catalogued more than 1500 patents. Reference materials listed in the latter report are broken down into five categories: bioeffects, food processing, industrial applications, microwave ovens and standards and specifications. Each report is available for $25.00 from Gerling Labs, 1628 Kansas Ave., Modesto, CA 95351, (209) 521-6549.

STANDARDS

IEC on MW Therapy Equipment & RF Measurements for Satcom Stations... The International Electrotechnical Commission (IEC) has released *Publication 601-2-6: Medical Electrical Equipment. Part 2: Particular Requirements for the Safety of Microwave Therapy Equipment*. The standard covers devices which use radiation in the 300 MHz-30 GHz band to treat patients, but does not apply to hyperthermia equipment. Under the new standard, leakage shall not exceed 10 mW/cm^2 at 5 cm from the equipment, 1 m from the front of the applicator or 25 cm from the rear of the applicator. In addition, the equipment must comply with the requirements of CISPR Publication 11 which specifies RFI limits from ISM equipment. The IEC has also published a new world standard, *Publication 510-1-2: Methods of Measurement for Radio Equipment Used in Satellite Earth Stations. Part 1: Measurements Common to Sub-Systems and Combinations of Sub-Systems. Section 2: Measurements in the RF Range*. It covers both transmitting and receiving equipment and establishes test methods for frequency, impedance and a host of other parameters. The medical equipment standard costs $30.00 and the satcom standard is $40.00, both from ANSI, International Sales Dept., 1430 Broadway, New York, NY 10018.

Now Available...• New Jersey's RF/MW standard is published in the August 6 *New Jersey Register* (16 *NJR* 2120). The state adopted the 1982 ANSI guidelines this spring (see *MWN*, April 1984)....• The Underwriters Laboratories has issued a review draft of the 13th edition of *Safety Standard for Television Receivers and Video Products*, No. UL1410, which covers power-operated sets intended for household or commercial use. Comments are due by October 30. Order from Carolyn Dobrei, UL, 333 Pfingsten Road, Northbrook, IL 60062....• The Association for the Advancement of Medical Instrumentation (AAMI) has released a proposed revision of *Safe Current Limits for Electromedical Apparatus*. A copy is available for $10.00 for AAMI members and $16.00 for others from Dawn Boots, AAMI, 1901 N. Fort Myer Dr., Arlington, VA 22209....• IEEE Standard 81-1983, *IEEE Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potential of a Ground System*, is under review before becoming an American National Standard. A copy is available for $8.50 from Ms. M. Lynch, IEEE, 345 East 47 St., New York, NY 10017....• ANSI has printed a collection of four speeches presented at a conference earlier this year. Single copies of *Standards and the Law* are available free from Marie Brown, ANSI, 1430 Broadway, New York, NY 10018.

VDTs

UK Cluster... An apparent cluster of problem pregnancies among VDT operators has been reported in England. Preliminary results of a study of workers at the Department of Employment at Runcorn, Cheshire, indicate that 36 percent of the 55 pregnancies among VDT users ended abnormally, compared to 16 percent among controls. The cluster was uncovered during a study of pregnancies at the site by the Civil Service Medical Advisory Service of the Council of Civil Service Unions. In response, the council has urged the Central Computer and Telecommunications Agency to permit workers to be reassigned to non-VDT work during pregnancy. The agency has rejected the council's request. A final report on the cluster has not yet been released, but union officials already are calling for a "large-scale study to disentangle the effects of VDTs from other factors."

Radiation... In last month's story on very low frequency (VLF) pulsed fields, we mentioned a new set of measurements completed by Dr. Hari Sharma of the University of Waterloo in Ontario, Canada. That study has now been released. Sharma tested terminals at the Surrey Memorial Hospital in Vancouver, British Columbia, where one of the reported cluster of problem pregnancies occurred (see *MWN*, July/August 1982), and at seven other hospitals in British Columbia. The report concludes that, "The data on adverse pregnancy outcomes...indicated that there might be linkage between exposure to the [electromagnetic] fields and adverse pregnancy outcomes." Noting that both electric and magnetic components of VLF fields can be biologically active, Sharma found peak electric field values at 30 cm from the screen ranging from 19-170 V/m at approximately 16 kHz. Maximum magnetic fields along the surface of the terminal casings approached 20 A/m. He recommends maximum limits of 25 V/m and 2 A/m for 16 kHz pulsed electric and magnetic fields and for 60 Hz magnetic fields at the terminal surface. In the report, Sharma states that the data, which had been questioned when released in preliminary form (see *MWN*, April 1983), are consistent with other researchers' findings....The congressional Office of Technology Assessment (OTA) has released *Potential Office Hazards and Controls*, September 1984, which concludes that further radiation testing of VDTs is unnecessary. While acknowledging that there is insufficient evidence with which to assess radiation risks and there now exists "nearly epidemic proportions of fear among pregnant VDT operators," the report recommends better education and training of employers and employees as the primary response to worker concerns. "Due to the complexity of studying radiation effects, laboratory research does not appear to offer a feasible approach to dealing with the issue of fear of radiation," according to the report. Field testing, it adds, "is difficult and expensive. The value of such testing is questionable." A copy of the report can be obtained from the OTA, Washington, DC 20510, (202) 226-2070.