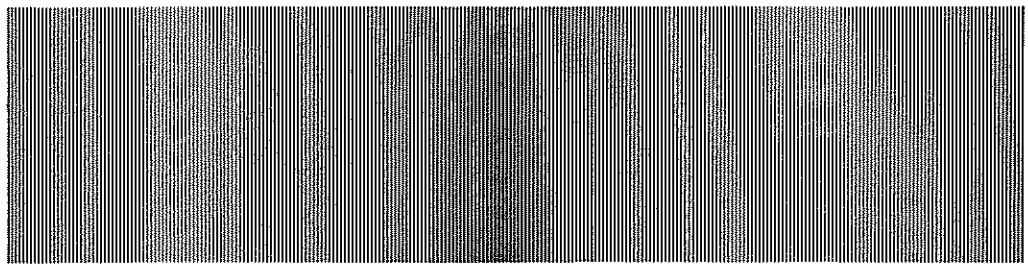


MICRO WAVE NEWS



Vol. I No. 6

A Monthly Report on Non-Ionizing Radiation

June 1981

INSIDE...

BIOLOGICAL EFFECTS p. 6

CONGRESSIONAL HEARINGS
Excerpts p. 4
Witness List p. 3

GOVERNMENT p. 7

LETTERS p. 8

UPDATE
VDTs, Technology
& Litigation p. 8

Microwave News is changing its publication schedule and will now appear ten times a year, monthly except for January and July. This year, Volume I will consist of eleven issues; next year, Volume II will have ten.

All current six-month and annual subscribers will have their subscriptions extended by one and two months respectively to reflect our initial commitment to a twelve issue year.

New orders received by June 15, 1981 will still be based on the twelve issue year; subsequent orders will follow the new schedule. The domestic and foreign subscription prices remain unchanged.

As a special offer to our current subscribers, we will accept renewals according to the old schedule (12 issues—14 months and 6 issues—7 months) through the end of July. Beginning in August, the new rates will apply to all subscribers.

Our next issue will appear in mid-August.

We have recently computerized our mailing list. We ask our subscribers to check their mailing labels and inform us of any errors.

CHINA ADOPTS 50 μ W STANDARD BASED, IN PART, ON U.S. STUDIES

Chinese microwave experts will soon recommend the promulgation of the provisional 50 μ W/cm² occupational standard as the formal non-ionizing radiation standard for the People's Republic of China, according to Allan Frey of Randomline, Inc. in Huntingdon Valley, PA. The 50 μ W/cm² standard is based, in part, on the published US literature, Frey told *Microwave News* in a telephone interview soon after his return from China.

Some 80 Chinese research scientists and representatives of civilian and military users met to discuss the standard at a national conference held in Hangchow the week of April 20.

The Chinese standard, which is not frequency dependent, stands in sharp contrast to the current NIOSH, ANSI and ACGIH proposals. These proposals are a factor of 20 less restrictive at the most stringently regulated frequencies—in the 30–300 MHz range—and 100 times weaker at the higher GHz frequencies. The Chinese standard is similar to the 50 μ W/cm² population stan-

(continued p. 7)

SUBCOMMITTEE FINDS RF SEALERS HAZARDOUS, CASE AGAINST VDTs STILL UNCERTAIN

Some 30 experts from government, labor and business tried to sort out the potential hazards associated with VDTs and RF sealers at congressional hearings held May 12–13. At their conclusion, there was a general consensus that RF heaters and sealers present a serious health risk to their operators. Radiation from VDTs was deemed less hazardous, though a number of important questions remain unanswered.

After the hearing, Albert Gore, Jr. (D-TN), the chairman of the Subcommittee on Investigations and Oversight of the House Committee on Science and Technology, said: "We believe that there are serious problems associated with RF sealers and heaters, and plan to vigorously pursue research and standards with the appropriate agencies." With respect to VDTs, he said, "The preponderance of evidence suggests that VDTs are safe, but we will encourage the Bureau of Radiological Health to set appropriate standards for VDTs and do more research on low frequency effects."

VDTs: More Research Needed?

An overflow crowd jammed the room to hear about the radiation emissions from VDTs, their health effects, and their possible regulation. Armed with his Bureau's recent report, *An Evaluation of Radiation Emissions from Video*

(continued p. 2)

GORE SUBCOMMITTEE HEARINGS

(continued from p. 1)

Display Terminals (see *MWN*, May 1981), John Villforth, the BRH director, told the subcommittee that VDTs "do not pose a significant radiation hazard to persons who operate them," and that BRH is not "currently planning a regulatory standard for [VDT] radiation."

Ophthalmologist Dr. Milton Zaret, of Scarsdale, NY, offered a different view. In a slide presentation, he showed the subcommittee examples of what he believed to be radiant energy cataracts caused by VDTs. In his prepared statement, Zaret called BRH's conclusion that there were no significant health effects from 15 to 125 kHz radiation "unwarranted."

There was considerable debate over the merits of an epidemiology of VDT operators. Representatives of the Newspaper Guild urged a "fullfledged government-funded study, unhampered by financial limitations... to determine whether VDT operators are developing cataracts or other health damage attributable to radiation."

Dr. Vilma Hunt of EPA's Office of Health Research expressed skepticism that a suitable study population could be identified. And John Rankine of IBM said that, through a "combination of conservative safety criteria, careful design—which incorporates numerous fail-safe features—rigid design testing, manufacturing checks, and company-sponsored research," he was sure VDTs do not present a radiation hazard.

Sealers: A "Shocking" Situation

The sharpest exchanges came the second day when there were smaller crowds and no TV cameras. After hearing how little enforcement is going on at RF sealer work sites, freshman Congressman Bob Shamansky (D-OH) said that he was "almost flabbergasted" by the situation and that it was "frankly shocking."

Earlier, when Gore found out that NIOSH intended to cut off funding for a long-planned epidemiology of RF sealer workers, he responded, "It's an outrage." Now, however, due to the congressional interest, NIOSH officials are planning to reinstate the funds for the study, according to knowledgeable sources.

In one of the most forceful presentations, Dr. Joseph Lary, a research biologist at NIOSH, told the subcommittee, "It is apparent that many sealer/heater operators are being exposed to hazardous levels of RF energy," and said that the OSHA standard "must be reexamined to assure that sufficient protection is afforded the worker." At one point Lary told Gore he would not want his wife exposed to RF sealer radiation.

But on the basis of the NIOSH and OSHA testimony, it became clear that it will be a long time before a new standard is proposed and promulgated. The NIOSH criteria document will only be ready for external review in December, three months later than the last estimated date. And OSHA officials said that the agency would need a considerable amount of time to do economic, feasibility and cost-benefit analyses. Then public hearings will have to be held. Dr. Bailus Walker, director of health programs for OSHA, would not specify how long this work will take.

Nor is a performance standard for new RF machines in the offing. Villforth told Gore that BRH did not "believe that a regulatory performance standard by FDA, applicable to new sealers, would be the most effective approach." Instead, he

endorsed the enforcement of exposure standards.

Despite the projected delays, Sheldon Samuels, director of health at the Industrial Union Department, AFL-CIO, said he was "delighted" with the hearings: "It was one of the most useful hearings that I have attended. The subcommittee saw itself in a role of forcing action in the public interest." He said that he did regret not having more hard data on those exposed to RF sealer radiation. Indeed, over and over again, the subcommittee was frustrated by the absence of data on the number of machines in the workplace, the number of people exposed, and the incidence of harm.

Howard Samuel, president of the IUD, recommended that an RF/microwave standards advisory committee be set up at OSHA to expedite the completion of the NIOSH criteria document and the setting of a new occupational standard.

The one spokesman for the RF sealer manufacturers, Angelo Vassallo of the Solidyne Corp. in NY, said that it may be possible to shield machines that now exceed OSHA emission standards. RF sealers that do not meet FCC specifications, however, are too old and should be replaced, he advised.

DOD Controversy

Perhaps the greatest controversy was generated by the Department of Defense's role in health research. Captain Paul Tyler, director of DOD's Radiobiology Research Institute, was scheduled to testify on the first day. Instead, Colonel Phillip Winter, who is responsible for the Tri-Service Electromagnetic Radiation Bioeffects Program, accepted the subcommittee's invitation.

Paul Brodeur, of the *New Yorker*, was scornful of the subcommittee's acceptance of the substitution. He told *Microwave News* that Dr. Ian Marceau, of the subcommittee staff, had indicated to him, after lengthy background discussions, that Tyler would be called to answer questions about his long-time role in setting bioeffects research policy for the military. "It was a sell out," Brodeur said. "The subcommittee had a tiger by the tail and could have exposed a large part of the cover-up in bioeffects research for the last 20 years. The Gore subcommittee furnishes a prime example of how the Congress is weakened by timidity in the performance of its oversight duties on DOD." Brodeur cited a memorandum written by Tyler on the 1975 Tri-Service Research Plan and excerpted in his book, *The Zapping of America* (p. 239). In it, Tyler recommends studies be done to "disprove" the claim that microwaves can cause delayed cataracts. "The fact that a high-ranking military doctor could call for such studies is a travesty of the intellectually honest scientific approach," Brodeur said.

When asked why he did not testify, Tyler said that he was not directly involved with DOD microwave/RF work and that DOD wanted to pick its own spokesman. When they learned the subcommittee "had invited me, there was panic at DOD," Tyler said. DOD selected Winter, he went on, because he represents the whole research program for all the services.

According to Marceau, the Congressional Liaison Office of DOD had recommended Winter over Tyler because the Radiobiology Institute deals only with ionizing radiation and because Tyler had been out of non-ionizing radiation research for three years. Tyler, however, said that he still considered himself an expert on RF and microwaves. He did agree that the

Institute no longer had any active research on non-ionizing radiation.

Winter also provided some excitement when he announced, on questioning, that he had "access to brand new data" suggesting that there may be other than thermal effects on the lens of the eye. Winter promised to supply the new information to the subcommittee on June 1. Reached in his office at the end of May, Winter said that he had been "mistaken," and that the evidence in question had already been published in the IEEE Microwave Theory and Techniques Society's *1980 International Symposium Digest: "Microwave and Temperature Effects on the Murine Ocular Lens In Vitro,"* (pp. 341-344) by six authors, including P. Jill Stewart-DeHaan of the University of Western Ontario and L.E. Larsen of the Walter Reed Institute of Research in Washington, DC.*

Other Highlights

Agency witnesses also made the following points about RF sealers:

- NIOSH surveys of more than 200 RF heaters and sealers revealed that emission from about 60 percent of the units created fields which exceeded the current OSHA standard, with maximum levels as high as 2,500 V/m for E-fields and 13 A/m for H-fields. Also, the fields can vary by a factor of ten over the human body.
- Three cases of birth defects and one of fetal development problems have been reported to NIOSH. Gore requested additional data on other types of reported injuries, including one death, two miscarriages and a case of blindness.
- NIOSH and the FCC agree that the approximately 21,000 registered heaters and sealers represent only a fraction of the machines in use. "At least 100,000 workers, and probably many more, have been exposed," OSHA's Mark Cowan reported.
- OSHA now has 20 trained investigators and ten new probes for monitoring workplace exposure levels of non-ionizing radiation. OSHA had to wait a year and a half to receive the meters.
- OSHA made 57 on-site inspections in the past two years. Six citations were issued during 33 inspections carried out under the federal compliance program. OSHA found equipment problems in 30 percent of the 57 sites.
- RF shielding costing \$300 to \$1,000 for a \$12,000 sealer can reduce RF exposures by one to three orders of magnitude.
- OSHA's Cowan said that there is no question that exposure to RF radiation is a serious health hazard, but the government must determine the extent of the problem before establishing priorities.

Another Hearing Planned

The subcommittee had originally planned a third session on a new Department of Agriculture report, which warned consumers that microwave ovens may fail to kill pathogenic organisms in pork. See story p. 7.

The published record of the hearings will not be available for some months. For a copy, write to Congressman Albert Gore, Jr., Subcommittee on Investigations and Oversight, Committee on Science and Technology, US House of Representatives, Washington, DC 20515.

*In that paper, the authors state: "Preliminary observations on lenses exposed to either [pulsed or continuous wave] microwave radiation indicate that both types can apparently cause an additional effect—holes in the cell membranes—when compared to unirradiated controls at the same temperature."

WITNESSES BEFORE THE SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT (In Order of Appearance)

May 12, 1981

Charles Perlik, Jr., President, The Newspaper Guild
David Eisen, Research and Information Director, The Newspaper Guild
John Villforth, Director, Bureau of Radiological Health (BRH)
Dr. Alan Anderson, Associate Director, Division of Biological Effects, BRH
Bill Herman, Associate Director, Division of Electronic Products, BRH
Dr. Milton Zaret, Director of Research, The Zaret Foundation
Colonel Phillip Winter, Military Assistant for Medical and Life Sciences, Office of the Under Secretary of Defense for Research and Engineering
Dr. Elliot Postow, EMR Program Manager, Research and Development Command, National Naval Medical Center
Dr. Joe Elder, Chief, Cellular Biophysics Branch, Environmental Protection Agency (EPA)
John Rankine, Director of Standards and Data Security, IBM Corp.
Dr. Bruce Dickerson, Corporate Director for Health and Safety, IBM Corp.
George Mine, Advisory Engineer, IBM Corp.
Vico Henriques, President, Computer and Business Equipment Manufacturers Association (CBEMA)
Dr. Myron Wolbarsht, Professor of Ophthalmology, Duke University Medical College
William Hanrahan, Senior Director, CBEMA

May 13, 1981

George Cashau, Coordinator of Operations, American Newspaper Publishers Association Research Institute
Howard Samuel, President, Industrial Union Department, AFL-CIO
Sheldon Samuels, Director of Health, Industrial Union Department, AFL-CIO
Dr. Joseph Lary, Research Biologist, Division of Biomedical and Behavioral Science, National Institute for Occupational Safety and Health (NIOSH)
Dr. Barry Johnson, Director, Division of Biomedical and Behavioral Sciences, NIOSH
Dr. Richard Lemen, Acting Director, Division of Criteria Documentation and Statement Development, NIOSH
Dr. Ezra Berman, Research Biologist, Experimental Biology Division, EPA
Dr. Ralph Smialowicz, Chief of Immunology Section, Experimental Biology Division, EPA
Dr. Vilma Hunt, Deputy Assistant Administrator, Office of Health Research, EPA
Dr. David Conover, Research Physicist, Division of Biomedical and Behavioral Science, NIOSH
Mark Cowan, Special Assistant for Regulatory Affairs and Director of Policy, Occupational Safety and Health Administration (OSHA)
Robert Curtis, Senior Industrial Hygienist, OSHA
Dr. Bailus Walker, Director of Health Programs, OSHA
Stephen Finan, Acting Director of Legislation, OSHA
Angelo Vassallo, Technical Consultant, Solidyne Corp.

CONGRESSIONAL HEARINGS: EXCERPTS

VDTs

Perlik: "If we are going to be the guinea pigs in front of the VDT screens, then we want some early answers.... [The situation requires] a fullfledged government-funded study... of a large population of VDT users."

Villforth: [Based on the BRH survey which found that VDTs] do not pose a significant radiation hazard... we are not currently planning a regulatory standard for radiation.

Albert Gore (D-TN) questioned Villforth about VDT emissions in the 15 to 125 kHz range:

Gore: Well, if there is no standard for the emissions in that range, why is it reassuring to you that the non-existent standard is not violated?

Villforth: The voluntary scientific community has not felt a need for standards in this area based on non-observance of biological effects.

Gore: But you say yourself... [that] research on bioeffects for the 15 to 125 kHz range is lacking.... It may be that your reassurance is valid, but it doesn't appear to be based on any scientific evidence at all.

Gore posed the same question to Zaret:

Zaret: It's idiotic, sir... you have no standard, you don't need a standard, we don't need it because there is no research to show that you need it. But we haven't done the research. It makes no sense.

Gore sought a response on this point from Anderson:

Anderson: In the region of say 10 to 100 kHz... we have both a theoretical analysis of the way in which both the electric field and the magnetic field will interact with biological material and we also have just recently done a modeling calculation which indicates the level of absorption of radiation that you would expect in something the size of a human being.

Gore: In other words, you don't have any actual tissue tests.

Anderson: From the standpoint of work we've conducted in house, no, we do not.

Gore: All you have is some theoretical work that has led you to believe that it is probably not a problem.

Anderson: The theory is corroborated by the admittedly small but nonetheless real bit of information that comes from those researchers who have attempted to expose laboratory animals to radiation....

Gore: Why have you not promulgated standards for performance and testing?

Villforth: Because we don't think there is a problem.

Bob Shamansky (D-OH) and Gore questioned Winter: Should the public be assured there are no low frequency radiation problems despite little data?

Winter: Yes... The best available evidence, in my opinion, warrants a statement that, so far as we know, there is no appreciable risk at those frequencies....

Shamansky: How good is the best evidence available? You didn't give me a value judgment on that.

Winter: I would agree that the data in the frequency range in question is very sparse, and one, I think, is forced, given the need to come to a judgment at the moment, to extrapolate from what data as exist in nearby frequency ranges—this is the basis on which the ANSI standards are established, in any case.

Shamansky: But isn't there another alternative: to refuse to give such a judgment? So you don't have enough to give a valid judgment?

Winter: Certainly that's an option.

Shamansky: Isn't it a medically more sound option?

Winter: I'm not sure that I'd agree with that.... We are often called upon to make judgments in the absence of adequate information.... At the moment we have no firm reason to believe that there is a hazard. However, the possibility exists and further study in the area is warranted.

Shamansky: It seems to me that the brunt of Dr. Zaret's testimony is exactly that.

Winter: It is sir, if you accept the data at face value.

Shamansky: Hearing the testimony, do you think that at this point there is enough circumstantial evidence, enough clinical evidence, to warrant a study?

Winter: Yes sir.

Gore asked Hunt if EPA supports the need for an epidemiological study of VDT users:

Hunt: The basic question is the extent to which it is a feasible and practical approach... To identify an appropriate population large enough for good statistical analysis of the data comes to be probably not a good use of resources when compared with all the research that can be done under more controlled circumstances. That is not to say that if a population is available we should not make every endeavor to insure that the exposure assessment goes forward with the best methods available, with the best quality control available....

Robert Walker (R-PA) asked Cashau if the newspaper publishers regard VDT safety as a high priority issue to resolve with their employees:

Cashau: Yes. We certainly regard any health and safety issue as a matter of high priority... and yet we use approximately one percent of the total VDTs in the US.

Henriques: In view of the work that has been going on in our industry for many years, it comes as no surprise to us that this recent FDA testing program and a similar NIOSH testing program conclude what we have known for some time, that radiation from VDTs is well within safe levels.

RF HEATERS AND SEALERS

Exposed Population

The subcommittee had been informed that as many as one million workers are exposed to radiation from RF heaters and sealers. Gore asked Samuels for his figures:

Samuels: In one industry—and we are just now beginning to add up the numbers—namely the lumber and plywood industry... we are making a very rough estimate that the 40,000 RF sealers expose about 80,000 workers.

Gore: Well now, that is one industry among a hundred or so where these instruments are used. Is that correct?

Samuels: That's correct. In the plastics industry, where you have a larger percentage of female employees, you would find a substantial number of women exposed.... I think a million is reasonable.

Biological Effects

Smialowicz: Whereas chronic stress can lead to physiological disorders including immune dysfunction, whether significant dysfunctions in the immune system occur under chronic exposure conditions remains to be determined....

Berman: It is my opinion that only RF levels which cause very high body temperatures are associated with birth defects. It is also my opinion that it is only the high temperature which causes RF-induced birth defects.

Lary: Most RF induced birth defects occur only after significant elevation of maternal body temperature. However, there have been reports of minor developmental deviations, increased embryonic death, delayed development, and decreased fetal weight in animals exposed during pregnancy to levels at or below 10 mW/cm².

Numerous disturbances attributed to RF/microwave exposure have been reported in endocrine, nervous, auditory, ocular, cardiovascular, hematologic, and immunological systems in animals. Many of the changes noted were reported at levels at or below the current 10 mW/cm² standard....

Since NIOSH and OSHA measurements indicate that unshielded RF heaters and sealers commonly emit radiation in the vicinity of the operator which far exceeds the current OSHA standard, it is apparent that many sealer/heater operators are being exposed to hazardous levels of RF energy....

We are currently conducting research to determine if protracted exposure of pregnant rats to lower intensity RF radiation at a level which causes no measurable rise in body temperature is teratogenic or embryotoxic. In addition, cooperative research with teratologists at the University of Cincinnati Medical School is being conducted to determine the mechanisms of RF-induced fetal malformations and death.

Villforth: We have also undertaken research to determine the feasibility and cost of a full-scale study of the risk of psychological disorders resulting from exposure to RF sealer radiation. This study is complementary to an effort being planned by NIOSH to review reproductive histories in such exposed persons.

Gore: If you had a pregnant woman operating one of these machines, would you feel comfortable?

Lary: Frankly, I wouldn't feel comfortable at all.... I can say on the basis of my research and on the basis of an analysis of the literature that if significant heating of the maternal body during pregnancy occurs, you run the risk of having a birth defect. But I cannot state with any degree of certainty that women being exposed to RF heaters and sealers indeed run a significant risk of having birth defects under the conditions in which they are exposed. In a broader sense, not considering just the possibility of birth defects, but considering the possibility of any health effect, I would not want my wife exposed to the radiation.

Toward a Regulatory Decision

Villforth: Considering the large number of sealers already in use, their long working lifetimes, and the relatively low rate at which new sealers are being manufactured, we do not believe that a regulatory performance standard by FDA, applicable only to new sealers, would be the most effective approach to solving this problem. Another important drawback in promulgating a standard aimed at the manufacturer of sealers is that the units are often modified by the user. Thus, the most effective enforcement of standards would be in the workplace rather than at the place of manufacture. This is the approach taken in the IRLG plan.

Gore: I hope that OSHA doesn't take a go slow attitude to it, because we are talking about serious effects.

Cowan: The last impression we would like to leave you with today is that we do not consider this a serious problem. If we felt it was not a problem we would not be enforcing it.... When we receive the NIOSH criteria document... then we will proceed to reexamine our current standard.... I understand it will be presented to us some time near the end of the year in December, NIOSH suggests.

Lary: Until the NIOSH review process is completed, we cannot predict what maximum permissible exposure levels NIOSH will recommend.

Gore: If [NIOSH] gets it to you by the end of September, how long will it take you to deal with it? To act as a result?

Walker: I don't want to talk in terms of months, but it will take us a considerable amount of time because we have to do an economic analysis. We have to examine the whole question of feasibility as required by the Act and under the President's executive order. We now have to look at the whole cost/benefit question. So there is a lot of activity that will have to take place even before we can go to a public hearing and get public input on such a document.

Gore asks Cowan how long it will take OSHA to decide on the most efficient regulatory option after the NIOSH criteria document is in hand:

Cowan: I would like to ask our economists... Until our economists can look at the data provided... to determine what they would have to do further, I certainly am not in a position to say how long it will take our economists to do a cost/benefit analysis of this issue or that issue.

Gore: What is your reaction to all this today?

Cowan: My personal reaction is that it is somewhat confusing in several regards. One is that there seems to be a delay... in the final compilation of data.... Another concern I have, being in the position I am, is when you start dealing with figures and someone says there are 20,000 workers and, of course when we start talking about significant risk, this is obviously a factor we have to consider when we have 20 or 30 items on the plate and we have to pick one or two or three at a time. One figure is that there are 20,000 workers; our colleagues at NIOSH suggest that there are 100,000 workers... another one million.... We have to determine how broad this problem is. There is no question that there is a problem, and that there is a serious health hazard involved in exposure to radiation.

Gore: In light of the testimony that you've heard, Mr. Curtis, on bio-effects and based on your own test results, do you agree with the conclusion of NIOSH that there is a serious risk to operators of some RF heaters and sealers?

Curtis: In fact, yes, I do. And it is on that basis that we enforce the standard under the general duty clause, and we have to declare that we feel that it is a serious risk. And that is our policy and that is my position.

Current Action

Shamansky tried to determine who has the authority to require manufacturers to supply shielding and who is currently attempting to enforce OSHA standards. Cowan said that of the 1,200 OSHA enforcement officers in the field and the five and a half million workplaces to monitor, there are 20 trained equipment inspectors with the authority to cite and attach penalties to manufacturers and to require them to retrofit equipment. Shamansky was frustrated by the OSHA representatives' explanations of why shielding is not now required and why so little enforcement has been done.

Shamansky: I'm almost flabbergasted. It's frankly shocking.

Later:

Shamansky: Having probed behind the surface of your [Cowan's] statement, I am not at all pleased. I'm disturbed by that. In fact, there is more form than substance to what you are actually doing in the market place where the things are going on. So it's a very nice statement, it's very reassuring, if you only read what you are saying. In fact, the performance is not very reassuring.

Vassallo: It is our belief that enforcement of the present standards and the continued self-monitoring of the industry is sufficient to protect users of RF equipment from harmful effects unless there is evidence to the contrary.

BIOLOGICAL EFFECTS

Microwaves and the Lens: A New Report

Working Group 35 of the National Research Council's Committee on Vision has issued a six-page report, *Effects of Microwave Radiation on the Lens of the Eye*. Among the findings and conclusions are:

- "Existing evidence does not suggest that microwave fields of less than 10 mW/cm² can induce cataracts."
- "Existing evidence does not suggest that routine screening for cataracts of all Air Force personnel working in the vicinity of microwave devices is justified at this time."
- "More research is needed to characterize the effects of low-level microwave radiation, particularly for chronic exposure."
- "Laboratory research is required to elucidate the mechanisms of ocular damage from microwave exposure."
- "A well-designed prospective study, with careful matching of test and control groups, could provide valuable information about possible effects on humans of low-level microwave exposure. However, such a study, if adequately designed, would be expensive."
- "A study of the use of microwave diathermy devices might be useful."

The Membership of Working Group 35 is: Stanley Ballard (Chairman), University of Florida; Russell Carpenter, BRH; Stephen Cleary, Medical College of Virginia; Arthur Guy, University of Washington; William Ham, Medical College of Virginia; Heinrich Rose, retired, Stanford University Medical School; and Myron Wolbarsht, Duke University Medical Center.

Key Dismukes was the study director. The work was done under a contract from the Office of Naval Research. Copies are available from the Committee on Vision, 2101 Constitution Avenue, NW, Washington, DC 20418, but supplies are limited.

Membrane Break in Cataract Formation

Professor Abraham Spector and his research group at Columbia University's College of Physicians and Surgeons in New York City have refined their model, first proposed approximately two years ago, detailing the mechanism of cataract formation in the human lens (*Proceedings of the NAS*, 78, 1892, March 1981). On the basis of new experimental studies, Spector now postulates that the lens fiber plasma membrane may be *ruptured* in the cataract lens, in conjunction with the accelerated oxidation of membrane proteins.

Spector told *Microwave News* that "any energy source of sufficient power, including appropriately focused microwaves, could potentially perturb the membrane, and set off the sequence described in the model." He warned, however, that "I don't know of any evidence that microwaves do break the membrane."

Research in Utah

The University of Utah has won a number of research grants and contracts in recent months. They include:

- Approximately \$150,000 from EPA/ORD to Professors Om Gandhi and John D'Andrea of the Electrical Engineering Department for a four month chronic exposure study of male rats to 0.5 mW/cm², 2450 MHz radiation. The rats, exposed seven hours a day, seven days a week, will undergo blood and urine analyses, as well as tests for susceptibility to electric shock. The study, begun last October, will include some dosimetry and computer modeling at 2450 MHz.
- A \$153,000 grant from the Air Force to Gandhi on the bioeffects of millimeter waves, specifically 26.5-90 GHz. He will investigate the mutagenic effects of mm waves on *E. coli* and other biological organisms, Raman and Brillouin spectra of biological molecules in order to understand the mechanism of interaction and the dielectric properties of biological tissues at mm wavelengths.
- A three-year, three-phase, \$160,000 (approx.) NIEHS grant to D'Andrea, begun last February, to (i) develop a computer model to predict whole body absorption and local "hot spots" in rats at frequencies in the range of 300-5,500 MHz; (ii) study acute behavioral effects at those frequencies that create hot spots and those that do not; and (iii) compare the effects of chronic exposure, three to six

months, seven days a week, seven hours a day, at two different frequencies, with and without hot spots, but with equivalent SARs.

- A \$130,329 contract from the AF to Professor Carl Durney, also of the EE Department, for theoretical and experimental comparisons of RF absorption. Predictions from computer models will be compared to results from experiments using prolate spheroid and human-shaped phantoms. The contract, awarded in April, is a continuation of previous work, which will allow Durney to extend his calculations to the near field.

- A \$107,547, one-year contract from the Office of Naval Research to Professor Lester Partlow and Larry Stensaas of the School of Medicine and Gandhi for (i) new work on calcium efflux in monolayers cultures of embryonic chick brains. The team will use a quantitative autoradiographic technique (described in a forthcoming paper in *Bioelectromagnetics*), which can measure quick changes in calcium concentrations; (ii) continuation of a study involving the irradiation of whole rats and the investigation of the deposition of microwaves in the central nervous system. Here the group will look at the heating patterns in different portions of the brain at different frequencies and different orientations, calorimetric measurements of dead animals to learn heat gain data, and studies of the uptake of 2-deoxy-D-glucose to determine the pattern of electrical activity in the brain.

Cleary Begins New Project

The Office of Naval Research has awarded Professor Stephen Cleary, of Virginia Commonwealth University Medical College in Richmond, \$110,000 for a 20-month study of cellular effects of X-band radiation. Working with 8-10 GHz pulsed and continuous wave microwaves, Cleary will investigate changes in cell-to-cell communication in culture under far field conditions. He is finishing up his work with blood cells to pursue this new line of research.

Bioeffects Research at BRH

BRH has released its *Annual Report of the Division of Biological Effects, Bureau of Radiological Health, Fiscal Year 1979, October 1, 1978-September 30, 1979* (HHS Publication FDA 81-8152, dated June 1980, but released April 1981). The report includes brief abstracts of active research as of September 30, 1979 on ionizing, light, RF and microwave radiation and ultrasound, and of epidemiological and experimental studies. In many cases unpublished results are presented.

Among the abstracts are updates on: "The Effect of Pre-natal Microwave Exposure on the Development of Behavioral Responses in the Mouse," "Mutagenic, Chromosomal, and Reproductive Effects of Microwaves—Chromosomal Effects of Low-level Microwaves," "The Effect of Millimeter Wave Radiation on Induction Phenomena in *E. coli*," "Evaluation of the Effects of Long-Term, Low-Level Microwave Exposure on the Absorption of Calcium Ions Across Cell Membranes," and "Effect of 10 GHz Pulsed Electromagnetic Radiation in *E. coli*."

In "Measured Modulation Waveform of Leakage Radiation from Microwave Ovens," Henry Ho and W.P. Edwards note that "leakage radiation from microwave ovens is known to be low-frequency amplitude-modulated because of the effect of the modestirrer built into the ovens."

There is also a report of a study by Dr. Asim Jamakosmanovic from the University of Sarajevo, Yugoslavia, on the "Effect of Microwave Radiation on the Nervous System."

The report for FY80 is scheduled for November 1981.

Medical and Legal Seminar

Bell Labs, RCA and Raytheon jointly sponsored a seminar on medical and legal aspects of microwaves at the Homestead in Hot Springs, VA, this May 7-8. Ron Peterson of Bell Labs, the seminar's co-organizer with Howard Johnson of RCA and John Osepchuk of Raytheon, reports that about 100 lawyers, engineers and doctors attended tutorials on the biological effects of RF and microwave radiation. The seminar was patterned after the New York Institute of Medicine's April 1979 "Symposium on Health Aspects of Non-Ionizing Radiation," according to Peterson. The registration fee was \$200.

GOVERNMENT

USDA Issues Alert on Cooking Pork in MW Ovens

Uneven microwave heating could fail to kill harmful microorganisms in pork, according to the Department of Agriculture. Preliminary, unpublished studies by Professor William Zimmerman of the Veterinary Medical Research Institute in Ames, IA, prompted the May 8 notice cautioning consumers that pork must reach 170°F throughout to ensure killing trichinae parasitic worms and other pathogenic bacteria present in a very small number of US hogs. Donald Houston, administrator of the USDA's Food Safety and Quality Service, said the Department is in the process of verifying the results.

No cases of illness have been linked to microwave-cooked pork. "Consumers who follow prudent cooking procedures face no health hazard," assured Houston. Specifically, USDA recommends that dishes be rotated during cooking and that meat be allowed to stand for several minutes after cooking. In this way, cold spots created by variations in water distribution, uneven deposition of microwaves and potential blockage by bones in the meat can be eliminated.

The report was to be the subject of congressional hearings by the Gore subcommittee in mid-May (see p. 1), but they were delayed until later this summer because of the preliminary nature of the findings.

EMP News

Electromagnetic pulse radiation was the subject of a flurry of popular articles last month. *Science News* ran a two-part series on EMP: "A Sleeping Electronic Dragon," May 9, and "Defensive Strategies," May 16, by Janet Raloff. Eric Lerner's "Electromagnetic Pulses: Potential Crippler" was featured in the May issue of *IEEE Spectrum*. *Science* began a three-part series by William Broad with "Nuclear Pulse (I): Awakening to the Chaos Factor" in the May 29 issue. And Richard Schaffer highlighted EMP vulnerability in the *Wall Street Journal's* May 29 technology column. They all focus on EMP's potential disruption of electronic devices, everything from communications networks to power grids and protective "hardening" strategies.

In her first article, Raloff states: "EMP is presumed to be no more harmful to humans than a flash of distant lightning." *Microwave News* is interested in learning about studies on the biological effects of EMP. We invite readers to send us relevant scientific information.

In EMP contract news, the AF Systems Command, Norton AFB, CA, is negotiating a contract with EG&G, Albuquerque, NM, on the construction of a horizontal shelter site for EMP hardness tests, and the Defense Nuclear Agency is issuing a RFP on the development of technical reports supporting DNA's EMP simulation test effects (*Commerce Business Daily*, May 18).

Oven Variance

BRH has granted a two-year variance to microwave ovens used in combination microwave and electric or gas self-cleaning ranges, manufactured by the Caloric Corp. of Topton, PA (46 *Federal Register* 23810, April 28).

The ovens sold under the names Caloric, Montgomery Ward, Sharp Electronics and Amana Refrigeration will have three safety interlocks, instead of the usual two, and may still be operated if the first two fail, as long as the third and its monitor are functioning.

BRIEFS

The latest, semi-annual summary of EPA's agenda of forthcoming regulations indicates that a notice of proposed rulemaking on public exposure to RF radiation will be issued in December 1981, with a final rule in December 1982 (46 *Federal Register* 23696, April 27). . . . The FDA is seeking nominations for membership on the Technical Electronic Product Radiation Safety Standards Committee (TEPRSSC).

The Committee gives advice on radiation performance standards for electronic products. Nominations are due July 21. For more information contact: Zory Glaser, Executive Secretary, TEPRSSC at BRH, (301) 443-3429. . . . The Air Force Office of Scientific Research has awarded Professor Arthur Oliner, of the Polytechnic Institute of New York, \$290,000 to continue research on "microwaves, electromagnetic theory and information processes" . . . The International Communications Agency has signed an estimated \$75,000 contract with the Institute of Telecommunication Sciences in Boulder, CO, for "Radio Propagation Predictions" . . . The Rome Air Development Center in NY is seeking R&D proposals on the development of a terrestrial microwave line-of-sight radio system (*Commerce Business Daily*, May 7). . . . The Bureau of Mines wants to fund a study on the use of a narrow band pulsed audio tone transmitter to detect and locate trapped miners (*CBD*, May 1). . . . The Naval Research Lab, Washington, DC, is negotiating a contract with Norden Systems, Melville, NY, for measurements related to spurious emissions from AN/SPS-40B, C&D radars.

CHINA ADOPTS 50 uW STANDARD

(continued from p. 1)

dard proposed by Dr. Leonard Solon of the New York City Bureau for Radiation Control in 1978.

Two Chinese scientists, Drs. Huai Chiang and K.C. Yee of Chechiang Medical College, toured some of the leading US labs last year. At a seminar on research and standard setting in China reported to the Bureau of Radiological Health in Rockville, MD, last June, Dr. Chiang discussed the then-provisional standard, which Frey understands the Chinese will soon formally adopt with essentially no change. The standard specifies an average power density of 50 uW/cm² during a six-hour working day. For an eight-hour shift, the exposure has to be less than 40 uW/cm², with an integrated dose for a whole day of 300 uW.hr/cm². The maximum exposure can never exceed 5 mW/cm². The standard makes no distinction between pulsed and continuous wave exposures.

Frey found the Chinese experts well versed in the US literature but their labs light on equipment. He also notes that researchers are doing interesting epidemiological studies of factory workers. Frey says the Chinese have devised innovative medical applications for microwave energy—for instance, they are treating uterine cancer with an antenna inserted within the uterus during treatment.

Frey was invited to China to lecture in various cities on the biological effects of microwave radiation. Frey, a prominent member of the bioeffects research community, is well known for his work on the blood brain barrier and microwave hearing.

MICROWAVE NEWS is published monthly, except in January and July. • ISSN 0275-6595. • P.O. Box 1799, Grand Central Station • New York, NY 10163 • (212) 794-9633 • Editor: Louis Slesin, Ph.D., Associate Editor: Martha Zybko • Subscription: \$165 per year (overseas \$200) • Copyright © 1981 by Louis Slesin • Reproduction in any form is forbidden without written permission.

VDTs... The Norwegian Labor Directorate has introduced draft rules that would prevent workers from working in front of VDTs for more than two hours without a break, according to the *New Scientist*, May 7. The regulations would also require that operators spend no more than half their time doing straight input typing, that their eyes be checked every two years up to the age of 45, and annually thereafter, and that high frequency sound be eliminated... The National Research Council's Committee on Vision is sponsoring a public symposium to be held in Washington, DC, August 20-21, as part of its study of the impact of VDTs on the vision of workers. For more information, contact the Committee at (202) 389-6068. Experts from abroad will be invited... The HUSAT research group at Loughborough University in England has published the papers presented at its second conference, *Health Hazards of VDTs? 2, Some Solutions to the Common Problems*, held March 19, and has scheduled a third meeting for July 2, *A Positive Approach to the Future*... The Health Advocacy Unit of Toronto's Department of Public Health has published *Health Effects of Video Display Terminals: The Non-Radiation Problems*, by Linda Rosenbaum, May 1981... A revised version, Legislative Document No. 1612, of the Maine VDT bill was released May 15... A report of the April 24 hearing on VDT safety held by the Joint Standing Committee on Labor of the Maine Legislature appeared in the May 8 issue of the *Guild Reporter*... The same issue notes that a tentative pact between the Guild and the *New York Times* and the *Daily News* has a provision that requires monitoring of VDTs and the reporting of the data to the Guild... Meanwhile, according to an article in the *New York Times*, May 29, Harvey Siegel, the *Times*'s safety director, described the paper's policy on VDTs: they should not emit any detectable levels of RF radiation. The article also outlined a paper, delivered at the AIHA meeting in Portland, OR, May 28, by Siegel and Otto White, of Occupational Environmental Health Analysts in Upton, NY: a survey of 437 VDTs (15 models) at the *Times*, with "sensitive detectors," found power densities indistinguishable from background levels for 420 of them. (No mention was made of the now infamous 1 mW/cm² background level found by NIOSH in its 1977 survey of the *Times*.) The 17 machines that emitted "low levels" of RF were modified to eliminate the emissions.

Technology... Xerox Corp. has dropped its Xten project, the planned data communications network for major cities. Despite FCC's allocation of 130 MHz for the service at about 10.6 GHz (*MWN*, February 1981), the company scrapped Xten last month, citing economic reasons... A blue-green laser has successfully sent messages from an aircraft to a submerged submarine, according to *Aviation Week & Space Technology* (May 25). The laser system has now passed three tests. The Senate added \$20 million to its FY82 budget, for a total of \$42 million, but this authorization must still win approval in a House-Senate conference. The system is described in the fifth part of Roland Starkey's series on submarine communications: "Blue-Green Laser/Satellite Technology: The Search for the Rainbow," in the March issue of *Military Electronics/Communications*. Whether DOD will substitute the new laser for the ELF antenna is still an open question... Dr. F. Kristian Storm's Magnetron hyperthermia unit, still seeking FDA market approval (*MWN*, May 1981), is described by Denise Grady in the June *Discover*... Rakesh Jain of Carnegie-Mellon University told *Science News* (May 2) some good and some bad news about his research team's work on hyperthermia. Tests show that glucose therapy can lower the blood flow rate and increase pH differences between normal and cancerous cells, and help shrink tumors in rats when used with hyperthermia treatment. Unfortunately, metastases—cancer cells that create new tumors elsewhere in the body—grow much more easily with the glucose treat-

To the Editor: Let me bring to your attention a point of information. In *MWN*, January 1981, you mention the exchange between Chou, *et al.* and me about microwave hearing (*Science*, 209, 1143, 5 September 1980). You noted that we disagreed about the mechanism for microwave hearing. You indicated that we differed in that they contended the hearing was due to thermoacoustic expansion occurring in the head with consequent bone conducted acoustic waves stimulating the cochlea and that I contended it was due to thermoacoustic expansion occurring in the cochlea. That's not quite correct.

The problem was that Chou, *et al.* concluded that they had explained the microwave hearing phenomena and that it was all wrapped up. In a paper published in *Science* (206, 232, 12 October 1979), I pointed out that there were five lines of evidence indicating that an explanation based on thermoacoustic expansion in the head was not particularly satisfactory and showed that the results of their experiments could be attributed to uncontrolled variables such as microwave induced vibration in the foam on which the animal lay. However, my key point was that microwave hearing had not been explained and wrapped up.

A few weeks after the exchange between us appeared in *Science*, the Bioelectromagnetics Society Annual Meeting was held in San Antonio. At that meeting, Wilson, *et al.* and Lebovitz presented evidence from independent experiments that showed, with some microwave energy parameters, that the microwave hearing phenomena can be attributed to specific effects within the cochlea. Thus, it would appear that the question of the mechanism for microwave hearing is not all wrapped up.

Allan H. Frey
Randomline, Inc.
County Line & Mann Roads
Huntingdon Valley, PA 19006

To the Editor: We have a position available for a research associate with an MD or PhD degree and at least two years of clinical, neuro-anatomical and neuropathologic training. Knowledge of microwave and biological tissue interactions is desirable.

Dr. Ernest Albert
Professor of Anatomy
The George Washington University
Medical Center
2300 I Street, NW
Washington, DC 20037

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

ment. The result is a shorter lifespan for the rat... The National Weather Service has plans to convert its conventional radar system to Doppler radar by 1990 with a \$340 million program (*Wall Street Journal*, May 29). The new radar would enable forecasters to predict approaching tornadoes 20 minutes before they hit, compared with the present system which cannot provide an early warning.

Litigation... Attorneys working on microwave injury cases are planning a meeting at the American Trial Lawyers Association, to be held in San Francisco the last week of July. For more information, contact Matthew Shafner of Groton, CT (203) 445-2463 or Seymour Ellison of San Francisco, CA, (415) 392-1884... Shafner also reports that the Engel case (see *MWN*, April 1981) is moving slowly: no trial date has yet been set.