MICRO WAVE NEWS

Vol. I No. 3 A Monthly Report on Non-Ionizing Radiation March 1981

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STOP PRESS

The New York State Workers' Compensation Board upheld Yannon decision and award. Details next month.

RARE BLOOD DISORDER LINKED TO MICROWAVES

An Army pathologist has observed an asssociation between microwave exposure and polycythemia, a rare blood disorder. Polycythemia victims suffer from an excess of red blood cells, and are believed to stand an increased risk of developing leukemia.

Dr. Hylar Friedman, a pathology resident at the William Beaumont Army Medical Center in El Paso, Texas, reported his observation in a letter to the *New England Journal of Medicine* (February 5, 1981). Friedman's preliminary analysis indicated an incidence rate of three cases per year, or 18.7 per 100,000 men over forty—as compared to an average rate of 1.5 to 5.6 per 100,000 men between the ages of 40 and 59. Friedman himself identified seven male patients with polycythemia, who had "strong histories of past and present chronic exposures to microwaves."

The letter took the microwave research community by surprise. No prior connection between microwaves and polycythemia had been reported; many scientists have been directing their attention to the white rather than the red blood cells. As one researcher pointed out, the finding may not be so hard to explain since both types of cells originate in the bone marrow.

Dr. Charlotte Silverman of the Bureau of Radiological Health (BRH) in Rockville, Maryland, a co-author of the only epidemiology of Navy radar workers (*American Journal of Epidemiology 112,* 39, 1980), said that she found the letter "extremely interesting," and that BRH would be following up this new lead. The letter prompted Silverman to check the data in her radar study: she found no indication of polycythemia as a cause of death or as a secondary condition. She noted that there were some leukemias among the radar workers, but that poly-

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ANSI News

Committee Fails to Agree on New RF/MW Safety Standard

Meeting in New York City on February 26, 1981, the C95 Committee on Radio Frequency Radiation Hazards of the American National Standards Institute (ANSI) could not agree on a new RF and microwave safety standard. Professor Saul Rosenthal of the Polytechnic Institute of New York, the C95 chairman, sent the standard back to Subcommittee IV in a final attempt to reach consensus. Now Professor A.W. Guy of the University of Washington will try some new language, and circulate it among the subcommittee members before bringing it back to the full Committee for approval.

Microwave News will have a full report on the ANSI meeting and the sources of disagreement in our next issue.

Editorial Note

As the items that follow show, VDT operators continue to worry about radiation emissions from their sets. A central question in this controversy is: where does the radiation come from and what are its characteristics?

There is general agreement that the flyback transformer circuit, which has a fundamental frequency of 15 to 20 kHz, is the principal source of the radiation. (This frequency corresponds to the number of lines the machine traces a second.) The number and strength of the associated harmonics is less certain, however. Some sources said that the harmonics frequencies vary up to the 100 kHz range, while others say they may go even higher.

Dr. Samuel Hopfer, vice-president and director of R&D at the General Microwave Corporation in Farmingdale, New York, offered the following explanation for the distribution of the harmonics frequencies. They depend on the flyback or retrace time, that is the time interval in which the voltage goes from the full value to its starting value: the faster the retrace time, the richer the content of the harmonics. Normally the higher harmonics have a weaker intensity. A precise frequency distribution can only be experimentally determined with a spectrum analyzer. Furthermore, according to antenna theory, as you increase the frequency, the possibility of radiation emissions also increases. (This relationship only holds up to a point: in this case somewhere above 50 MHz.)

Microwave News *will continue to cover this story, and invites comments on the question posed above.*

RADIATION MEASUREMENTS

Holaday Warning

Holaday Industries of Eden Prairie, Minnesota, has issued a bulletin warning against the use of its HI-3001 E-field probe to measure VDT radiation. The company bulletin (#026), dated January 26, 1981, reads:

> WARNING!!!!!
> DO NOT ATTEMPT TO MEASURE E-field levels
>
> around video display terminals, television sets or any CRT. All of these units do emit low frequency, low level signals and do have a relatively high voltage which can induce false readings into the HI-3001 monitor. Any significant field strength can be characterized as having most of its energy spectrum well below the usable frequency range of the HI-3001 E-field probe. These fields will cause a reading, however, at this time it does not appear that this reading can be related to a meaningful value.

(According to the Holaday HI-3001 specification sheet, the meter's range is 0.5 MHz to 300 MHz.)

New York Post

In a survey of 16 VDTs at the *New York Post* on January 12, the National Institute for Occupational Safety and Health (NIOSH) recorded a 1500 V^2/m^2 reading at a Harris 1740 terminal with a Holaday HI-3001 meter. Levels of about 500 V^2/m^2 were found at several Burroughs terminals. The significance of these readings is uncertain, however, since the HI-3001 is not recommended for measuring frequencies below 0.5 MHz. (See above.) Dr. Wordie Parr and Bill Murray of NIOSH's Physical Agents Effects Branch in Cincinnati, who took the readings, had not seen the manufacturer's warning.

Parr had initially planned to investigate the terminals, although NIOSH does not think the reported levels pose any health risk. The high readings from the Harris particularly perplexed Parr because it is a solid state model, without a flyback transformer that is the usual source of radiation (15 kHz) emissions from VDTs.

NIOSH must now re-evaluate the *Post* results. In an interview last month, Murray said, "We are aware of measurement problems with VDTs, but we have not seen the Holaday warning letter. We are reconsidering our measurement data." Instrumentation clearly poses difficulties. Murray confessed, "We still don't know which meter to measure VDT radiation with."

Shields: Metal v Plastic

Radiation measurements from three VDT models used at the *Lexington Herald-Leader* in Kentucky have prompted the Newspaper Guild to recommend installing protective metallic shields around all plastic-cabinet VDT models as a precautionary measure.

NIOSH recorded high readings from the back of Ontel OP-1 and OP-1/16 and Systems Integrated ET960 models last August while measuring a sample of the *Herald-Leader's* VDTs. NIOSH dismissed these measurements as false readings, however, and concluded that there was no radiation hazard. The levels were attributed to electrical interactions between the Narda 8619 meter and the flyback transformer of the units. (NIOSH Technical Assistance Report 80-105-757, October 1980)

The Guild is not convinced the machines are safe. David Eisen, research and information director for the union, issued a memo to local presidents this January advising them to insist on either a shield for the Systems Integrated model, or a test indicating no radiation leaks exceeding 1 mW/cm^2. The Guild had already made this recommendation for the two Ontels and another plastic-bodied model, the Teleram 2277 Mark 1, after NIOSH tests found the same high readings from these terminals. Eisen stated, "By this time, it is clearly possible to generalize this recommendation to apply to all plastic-cabinet VDTs."

Montreal *Gazette*

Radiation readings from VDTs at the Montreal *Gazette* have alarmed the paper's unions despite government assertions that VDTs do not pose a health risk.

Quebec's Ministry of Environment, using a Raham Model 4 meter, checked about 24 *Gazette* VDTs on January 7. The readings were very low except for those taken from plastic-bodied Sperry-Univac UTS 400 and PSI Lobbyist (portable) models. According to John Saunders, a business reporter at the *Gazette*, some measurements from these models went "right off the dial"—over 20 mW/cm^2.

Since these measurements were taken, the VDTs in question have been rigged with makeshift aluminum foil shields. A second check made on January 21 showed these effectively reduced these readings, except for one terminal.

The significance of the initial measurements, however, is disputed. Dr. Maria Stuchly, an expert at the federal radiation protection bureau in Ottawa, insists the Raham meter must have been out of order. "There is no other explanation," she said. The Ottawa bureau did extensive tests on the same type of VDTs at the *Gazette*'s Ottawa office and recorded only low levels.

UK Survey

The United Kingdom's National Radiological Protection Board has completed a comprehensive field survey of all types of VDTs currently manufactured or marketed in the UK. More than 200 different termin-

als were tested for radiation emissions from the RF through the X-ray frequencies.

The maximum recorded readings were: X-ray: less than 10 microrems per hour; UV: none detected above 336 nanometers and 12.4 uW/cm² otherwise; visible: 0.25 mW/cm²; near IR: 5 uW/cm²; far IR: only hot body radiation.

In the microwave and radiofrequency range, a reading of 0.5 mW/cm² was found at one unit using a Narda 8300, while all the rest gave readings below 0.1 mW/cm². (The Narda's frequency range is 300 MHz-18 GHz.) Using a Raham 12 meter, 14 terminals gave responses greater than 10 mW/cm², with the maximum "approaching" 100 mW/cm². Using an EFS 1 meter, 39 units gave readings over 200 V/m, with a maximum over 300 V/m.

An outside contractor tested four of the terminals that had indicated electric field intensities above 300 V/m with a spectrum analyzer. The measurements, taken close to the line output transformer, showed field intensities above 1000 V/m at the fundamental and harmonics frequencies of the line scan frequency up to about 150 kHz. On all the units, the level fell rapidly to 1 V/m between 150 kHz and 3 MHz and to less than 0.2 V/m at 30 MHz. (The electric and magnetic field measurements were equivalent.)

The detailed readings were consistent with those taken with the EFS 1 meter and led the Board to conclude that the Raham 12 readings were "spurious."

E.A. Cox reported these results in his paper, "Radiation Emissions from Visual Display Units," presented at the Loughborough University conference last December. Given that an operator would be exposed to less radiation than that measured under test conditions of properly functioning VDTs, Cox concluded that "the radiation normally emitted from a VDU (video display unit) does not pose a hazard to operators either in the long or short term."

STUDIES

Mount Sinai Study

The Newspaper Guild and the Mount Sinai School of Medicine in New York City have announced plans for an epidemiological study of the health effects of VDTs. The study, coordinated by Dr. Arthur Frank at Mount Sinai, will include eye examinations, radiation tests, and a survey questionnaire. Approximately 2,000 employees, including both VDT users and controls, from four to six Guild locals will participate.

A questionnaire developed by Mount Sinai's Environmental Sciences Laboratory with assistance from the Guild will be tested soon at the Vancouver-New Westminster and the Los Angeles Newspaper Guilds. The full survey should begin this summer or fall.

If the questionnaire response indicates a need, Mount Sinai will seek funds for an additional study phase of full medical examinations for affected employees.

Charles Perlik, Jr., president of the Newspaper Guild, believes the study should help to determine if VDTs are responsible for eye damage or other radiation effects.

Baltimore *Sun* Study

Ophthamological tests are underway in a study of VDT operators at the Baltimore *Sun*. Dr. Shiro Tanaka of NIOSH is conducting the study in cooperation with the local Newspaper Guild, which requested the investigation, and the Baltimore Typographical Union.

The study includes a brief questionnaire and eye examinations performed by the University of Maryland. Up to 500 union members will be tested by mid-April. Tanaka says a report on the study results may be issued as early as this July. (See also *Columbia Journalism Review* story, March/April 1981.)

HEALTH EFFECTS

Toronto Star Follow-Up

News that four women working on VDTs at the *Toronto Star* had given birth to children with defects stirred widespread concern last summer. Calls requesting radiation checks for VDTs flooded the radiation protection service of Ontario's Ministry of Labor. The anxiety continued even after the Ministry's measurements of all 296 terminals at the *Star* failed to find any radiation.

The cause, if there is one linking the four defects, has remained undiagnosed. Checks for insufficient ventilation and hazardous chemicals have also turned up nothing.

John Brooks, director of communications at the *Star*, stressed that the paper "will take whatever further and reasonable steps are necessary to reassure our own employees and the public that there are no known environmental factors at the *Star* that contribute to birth abnormalities." This year the *Star* will consult three health experts, including an epidemiologist, for recommendations on possible ways to settle this case.

The announcement of this decision closely followed criticism from the City's Department of Public Health of the paper's initial follow-up study. After the Department ruled out radiation from VDTs as a possible cause of the defects last June, Dr. Murray Cathcart, the *Star*'s medical director, prepared a lengthy questionnaire to investigate other factors that might be responsible. Only two of the four women filled out the survey, however.

Gerald Caplan, coordinator of the Advocacy Unit of the Public Health Department, told Brooks that he considered the survey "quite unsatisfactory" and urged the *Star* to conduct a broader epidemiological survey that would include all *Star* employees.

The Southern Ontario Newspaper Guild welcomed the Health Department's concern. The Guild is still not convinced that no radiation hazard exists. It has set up its own ophthmalogical study of VDT operators and intends to "continue demanding testing for and monitoring of radiation as a right of all VDT users," according to John Bryant, executive officer of the Guild.

Toronto Cataract Case

An Ontario government employee has filed a claim with the Workmen's Compensation Board seeking compensation for cataracts, which she believes were caused by radiation from VDTs. Ms. Darlene Weiss's case is the first of its type before the Board.

Weiss, who is 40, said she first noticed problems with her vision while using VDTs at the Ministry of Transportation and Communications. An eye examination taken before she began her job at the Ministry did not indicate any abnormalities. Now, according to the Ontario Public Service Employees Union (OPSEU), Weiss has cataracts that must be surgically removed. She worked on terminals for 19 months, beginning in August 1978.

Dr. Milton Zaret, a well known ophthamologist specializing in nonionizing radiation effects, examined Weiss and is convinced her cataracts are radiation-induced.

The Ministry of Labor's occupational health and safety division must check the VDTs Weiss worked on before a decision from the Board can be reached. (One of these terminals was lost after its return to Bell Canada for checks, but it has since been found.)

According to Robert DeMatteo, occupational health and safety coordinator for the union, the Provincial government does not have the equipment to take detailed radiation measurements OPSEU thinks are necessary. Therefore, the union is hiring a private contractor to perform

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comprehensive tests on the Viewcom 3 and the three Sycor terminals Weiss used at the Ministry.

The union has also commissioned Zaret to design a questionnaire for its members who work on VDTs. This survey should get underway in mid-March.

Rashes

Reports from Europe are linking facial rashes to VDT use. Dr. H.H. Tjønn of the Norwegian Directorate of Labor Inspectorate in Oslo has verified that 16 cases of rash among VDT operators during 1979 and 1980 were related to the work environment.

According to Tjønn, Dr. Walther Cate Olsen at the Christian Michelsens Institute in Bergen, Norway, is researching the possible role of static electricity and airborne dust in causing the skin reaction. All of the reported cases occured during the winter in workplaces with low relative humidity and synthetic fiber carpets, factors that helped produce high measured levels of static electricity.

Radiation from the units was among the factors checked and ruled out as possible causes.

The rash symptoms are itching followed by redness on the cheeks, and sometimes the chin and forehead. Redness appears at the office, and usually disappears a few hours after work.

Four similar cases at one English office were observed by Drs. R.J.G. Rycroft and C.D. Calnan, from St. John's Hospital for Diseases of the Skin in London.

The Norwegian and English reports were presented at the Loughborough University Conference on VDTs last December.

Meanwhile, across the Atlantic, twelve cases of facial rashes among VDT operators have been reported to the Ontario Public Service Employees Union in the past 18 months. Robert DeMatteo, at the Union, says the Ministry of Labor does not think these complaints require radiation check of the VDTs in question.

The cause of this unusual problem remains undiagnosed.

Government Assurances

US and Canadian government officials assert there is no radiation hazard from VDTs. Commenting on the Weiss case and the *Toronto Star* incident, M.H. Repacholi, head of the non-ionizing radiation section in Ottawa, stated, "I cannot conceive of cataracts or birth defects coming from VDTs." David Conover of NIOSH's Physical Agents Branch in Cincinnati also argues there is nothing to worry about. He stressed that there is little field-body coupling and little absorption at 15-20 kHz, the frequencies most often emitted from VDTs.

BRIEFS

The long awaited **NIOSH Bay Area VDT study** will go to the printers soon. Copies of the report have been sent to the participating companies and unions...the **Bureau of Radiological Health** (BRH) is putting the final touches on its study, *An Evaluation of Radiation Emissions from Video Display Terminals.* The report of BRH's investigation of ultrasound, RF, microwave, X-ray and light emissions is due out by April...This month, **Dr. Steven Sauter** at the University of Wisconsin Department of Preventative Medicine and Wisconsin State officials are discussing possible State action on VDTs. Sauter may assist the State in designing a training program for public employees in proper VDT use and in developing a design standard for terminals used by the State...The **Cold Type Organizing Committee** has written a pamphlet, *Don't Sit Too Close to the TV: VDTs/CRTs and Radiation.* Copies are available for $1, or $1.50 by mail from the Committee at P.O. Box 40, Jerome Avenue Station, Bronx, NY, 10468...Visual fatigue and VDTs will be the focus of a sesesion at the 1981 **American Industrial Hygiene Conference,** May 24-29 in Portland, Oregon.

James H. Stebbings, Jr. Sc.D., has been selected as the tenth member of the Scientific Advisory Panel for the New York State Overhead Power Lines Project. Stebbings is an Associate Professor at the University of Minnesota School of Public Health.

Final approval of the Panel, which will oversee and evaluate a five year study on the health effects of electromagnetic radiation from the lines, is expected soon.

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The **Bioelectrical Repair and Growth Society** announced its formation "as a result of the burgeoning interest around the world in electrical mediation of biological repair and growth." The current president is Dr. **Carl T. Brighton,** while Dr. **Joseph Watson** is president-elect pro tem. (See conference calendar for address.)

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The **Georgia Institute of Technology** is seeking a new director for its **Electromagnetics Laboratory** at the Engineering Experiment Station. The laboratory has 65 research professionals studying such areas as millimeter/submilimeter wave technology; microwave solid-state technology; infrared/electro-optical systems; remote sensing, and physical sciences. All inquiries to D.W. Robertson, principal research engineer, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, GA 30332.

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History Professor **Nicholas H. Steneck** of the University of Michigan, Ann Arbor, is continuing his work on the development of microwave radiation safety standards. Steneck's chronicle of events up to 1960 was published last summer: "The Origin of US Safety Standards for Microwave Radiation," *Science, 208,* 1230, 13 June 1980, and "Early Research on the Biological Effects of Microwave Radiation: 1940-1960," *Annals of Science, 37,* 323, 1980. Funded by a National Science Foundation grant, Steneck will be bringing the microwave history up to the present.

Steneck would like to hear from anyone who can help him reconstruct the events leading to the microwave standard: Professor Nicholas Steneck. Department of History, University of Michigan, Ann Arbor, MI 48109. (313) 763-2230.

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Four researchers have joined the US Environmental Protection Agency's Experimental Biology Division at Research Triangle Park in North Carolina. They are: Dr. **James A. Rabinowitz,** a research physicist in the cellular biophysics branch, where he will study the interaction of microwaves with molecular systems. Dr. **Ronald J. Spiegel,** an electronics engineer in the bioengineering branch, whose studies center around the development and verification of numerical models to predict induced power densities and the thermal response to exposure to electromagnetic fields. Dr. **Christopher J. Gordon,** a physiologist in the developmental biology branch, who is interested in the effects of microwaves on the temperature regulation in test animals. And Dr. **William P. Watkinson,** also a physiologist in the developmental biology branch, who will be working on the cardiovascular effects of environmental agents on laboratory animals.

AGENCIES

The implications of the Reagan budget cuts for radiation programs are still unclear. As of the end of February, rumors were rampant in the Capitol, but federal agency officials were unwilling to speak "on the record" about the extent and impact of the cuts. *Microwave News* will have a complete report next month.

Bureau of Radiological Health

BRH has granted the Finessa Corporation of Threvos, Pennsylvania a variance from the microwave oven performance standard for the Microwave Tunneloven, model 7800-03/15 manufactured by Kreis AG in Switzerland. (46 *Federal Register* 7444, January 23, 1981) The variance is effective for two years.

The oven has a conveyor belt and can heat food on a continuous basis. Its main use is intended to be in hospital and hotel kitchens to reconstitute chilled food. The unit may also be used as an industrial heater for grain and cereal products.

The variance was granted under the conditions that permanent warning labels be attached to the oven, that the oven have three safety interlock switches on two different circuits, that there be microwave-absorbing material in both entry and exit channels and that the user and service manuals contain appropriate cautionary instructions.

Federal Trade Commission

The final FTC order requiring Litton Industries to stop making unsubstantiated claims about its microwave ovens, and forcing it to keep accurate records of any tests and surveys on oven performance used in such claims, has been published in the *Federal Register* (46 *FR* 8445, January 27, 1981). See *Microwave News*, February 1981.

National Cancer Institute

NCI has issued a request for proposals (RFP: NCI-CM-17480) to assess the performance of at least two heat generating and at least two thermometry systems. At least three patients with tumors in each of the major anatomic sites (e.g. brain, neck and head, lung, deep lymph nodes, etc.) must be treated with each system, and the temperature measured at multiple locations. A detailed analysis will be required, as well as the development of guidelines for the use of the equipment. Copies of the RFP may be obtained by submitting a request, in writing, to: Harold Thiessen II, Treatment Contracts Section, Research Contracts Branch, NCI, Room 228, Silver Spring, MD 20910.

RARE BLOOD DISORDER *(continued from p. 1)*

cythemia was not linked as a co-existing condition in the death certificates. Silverman had also looked through the Moscow epidemiology and found only one case of polycythemia; the case involved an individual who had not been exposed to microwaves.

Silverman warned that the reason her epidemiology had not picked up an increase in polycythemia may be that only a limited amount of morbidity data was collected for discharged Naval personnel. Her study would have picked up only those veterans who were treated in Navy or VA hospitals or who had service connected disabilities. Thus, a more extensive follow-up would be needed to indicate the presence or absence of such a rare disease.

In a telephone interview, Dr. Friedman said that he had originally met with considerable opposition to the publication of these findings; "The military was quite concerned—many people thought that it was premature to publish such unsubstantiated findings." Indeed, the Army had pointed to the negative data in the radar epidemiology as grounds for withholding publication.

After numerous written appeals, Friedman's Commander approved the letter. Friedman said that he had received considerable support from Captain Paul Tyler, director of the Armed Forces Radiobiology Research Institute, and Colonel Lawrence Larsen of the Walter Reed Army Institute of Research.

Friedman is planning to pursue his research on polycythemia by asking the patients to complete a questionnaire. He is especially interested in gaining information about microwave exposures. In order to protect his study against spurious symptoms suggested by microwave exposure, Friedman plans to confine his review to physical findings.

In his letter, Friedman noted that his patient population included many microwave exposed workers from the US Army Defense Center and the White Sands Missile Range.

Next month, Friedman is going overseas for more training and will return at the end of May.

On learning of the letter, Dr. Arthur Frank, an epidemiologist at the Mount Sinai School of Medicine, advised that the new results should be evaluated by doing complete blood counts on a large number of microwave exposed workers.

Harrison's *Principles of Internal Medicine* (seventh edition) describes polycythemia rubra vera, that is the type of polycythemia that does not develop in response to a known stimulus as a "disease of unknown cause, insidious onset, and chronic course. It is characterized by a striking absolute increase in the quantity of circulating red corpuscles and usually also by evidence of increased production of myeloid leukocytes and platelets." The symptoms are described as, in part:

> The onset is insidious and the progress gradual. Headache, dizziness, ringing in the ears, or visual disturbances; dyspnea lassitude, or weakness; skin or mucous membrane hemorrhages; pruritis, especially after a hot shower or bath; a sense of weight in the abdomen because of the enlarged spleen; or irritability, depression, forgetfulness, or vague symptoms suggesting neurasthenia are complaints which may be encountered in many patients. Various gastrointestinal symptoms, such as fullness, belching, or constipation may be present, or symptoms of peptic ulcer may be found. Sometimes the symptoms are those attributable to increased metabolism: lassitude, increased sweating, and loss of weight. Swelling and pain in the extremities may be very troublesome. However, in still other patients the symptoms are so insignificant that the polycythemia is discovered only accidentally.
>
> The face is a deep red rather than truly cyanotic....The blood pressure is more often normal than elevated. Enlargement of the liver is frequent, and spenomegaly is found in at least 75 percent of cases.

Confusion and Controversy in New York City

The new broadcast antennas atop the World Trade Center (WTC) in New York City continue to radiate confusion and controversy.

The twin 110-floor towers of the WTC—owned and operated by the Port Authority of New York and New Jersey (PA)—will eventually house most of the TV and FM stations in the New York metropolitan area, as well as many other specialized transmitters. Relocation of broadcast facilities from the Empire State Building—where the bulk of them have been until now—downtown to the $20 million master antenna at the WTC has touched off disputes about radiation levels near the antennas, and the radiation safety standards that should apply to them.

The shrinking TV broadcast range and loss of reception that followed the move, combined with citizen apprehension over microwaves, have produced an anxious situation for the broadcasters and the public alike. To a point, the PA is caught in the middle as the reluctant landlord.

Radiation Measurements

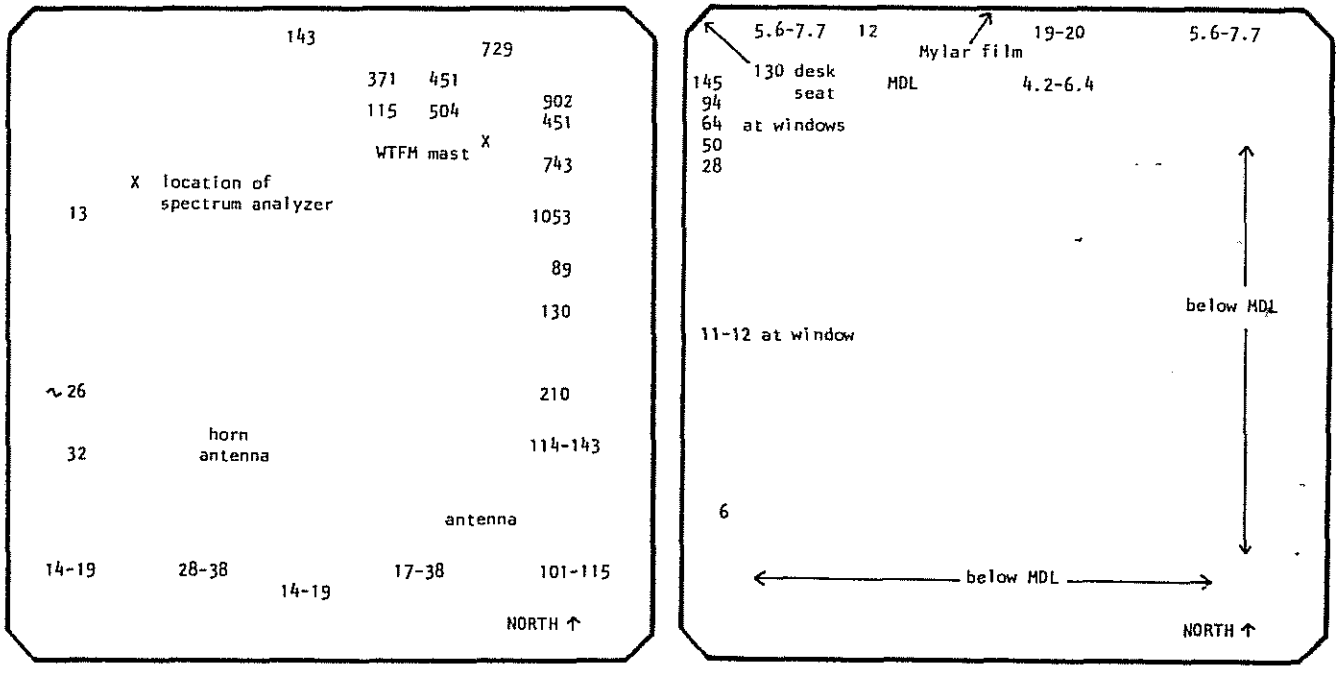
The only WTC radiation measurements now available were taken by Richard Tell, of the Environmental Protection Agency (EPA), during the early morning hours of July 16, 1980, and released to *Microwave News* in late January. At that time, two VHF TV stations (WCBS-2 and WNEW-5) and two UHF stations (WXTV-41 and WNJU-47) were broadcasting from the master antenna on the north tower; one TV translator (W60A1) and one FM station (WTFM) were broadcasting from the south tower. (Since then, WABC-7, located on the master antenna, the main mast, has been turned on.) Tell took a series of readings with a broadband Holaday meter (HI-3001) on the public observation deck on the roof and on the 107th floor observatory of the south tower. Due to high winds, Tell could make only one set of roof measurements of the individual station signals with a spectrum analyzer.

The maximum reading on the roof was 1053 uW/cm², due largely, according to Tell, to WTFM. Exposures below on the 107th floor fell in the 6-17 uW/cm² range generally, but peaked as high as 145 uW/cm² near the windows. A level of 130 uW/cm² was identified at a desk in the far northwest corner. (See accompanying diagrams for full set of measurements.) No readings were taken on the north tower, home of the main antenna.

Before and after the EPA survey, the PA's consultant, Robert Silliman, of Silliman and Silliman in Washington DC, took detailed measurements. They have not been released. Some of the numbers did reach the New York papers last February ("Making (Micro)waves over Trade Center TV," *Daily News,* February 25, 1980, and "Microwave Threat Stalls Trade Center TV Tower," *New York Times,* February 26, 1980). The resulting commotion prompted the PA to install mylar reflecting material on some windows in the northwest corner of the south tower. The mylar was already in place by the time Tell arrived. Though Silliman's numbers are still confidential, The PA maintains that they are significantly lower than Tell's EPA measurements.

Joyce Feldman, EPA's radiation representative in New York,

Broadband power densities (uW/cm²) measured by EPA's Tell on the south tower roof (left), and the 107th floor observatory (right). All dimensions are approximate. (MDL = Minimum Detectable Level)



explains that a report on the Tell measurements has not been issued because they are now out-of-date. After Tell's visit, the PA installed a protective shield, known as a wagonwheel, on the WTFM mast on the south tower. The wagonwheel has changed the radiation patterns on the towers.

Contradictory Results

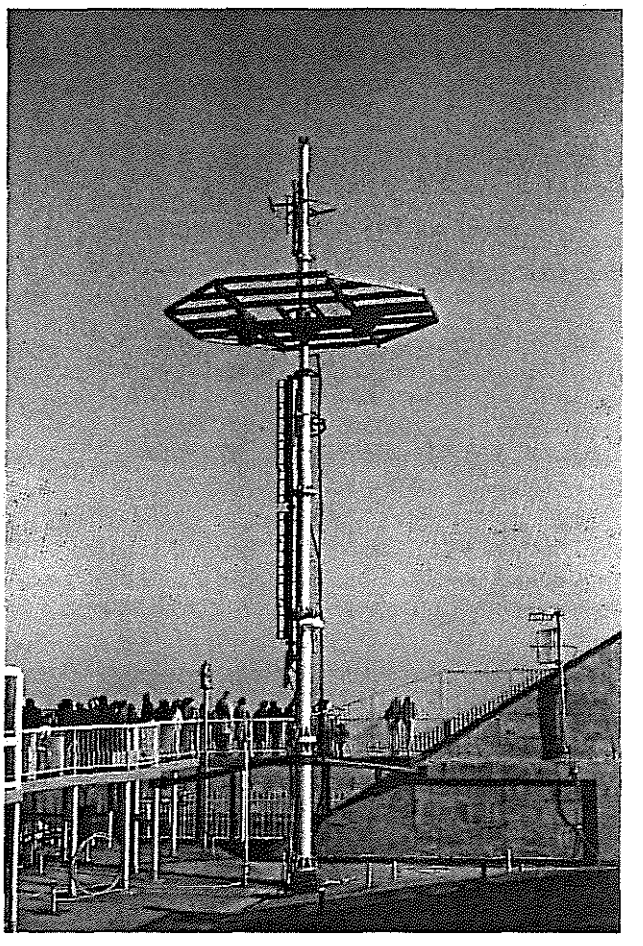
At a February meeting, PA officials, including Franklin Bass from the general counsel's office, Joseph Milano, manager of telecommunications and information systems, and Thomas Sorensen, broadcast coordinator, told *Microwave News* that the Tell numbers were "wrong" and "unreliable." In a yet to be released letter, Silliman had written the PA arguing that Tell's readings were really peak values, which had to be divided by an empirically derived factor of 1.54. The 1.54 factor was required because Tell, according to Silliman, had used the "peak hold" button on the Holaday meter when taking his readings. Silliman also wrote that any measurements of TV signals had to be further corrected to discount for synchronization pulses.

Speaking from his office in Las Vegas, Tell denied using the peak hold button. And Reed Holaday, president of Holaday Industries in Eden Prairie, Minnesota, said that his 3001 meter does not respond to TV "synch pulses."

On hearing about Tell's and Holaday's responses, Silliman withdrew his 1.54 conversion factor, and said, "There is some doubt that my point [about the meter] is valid."

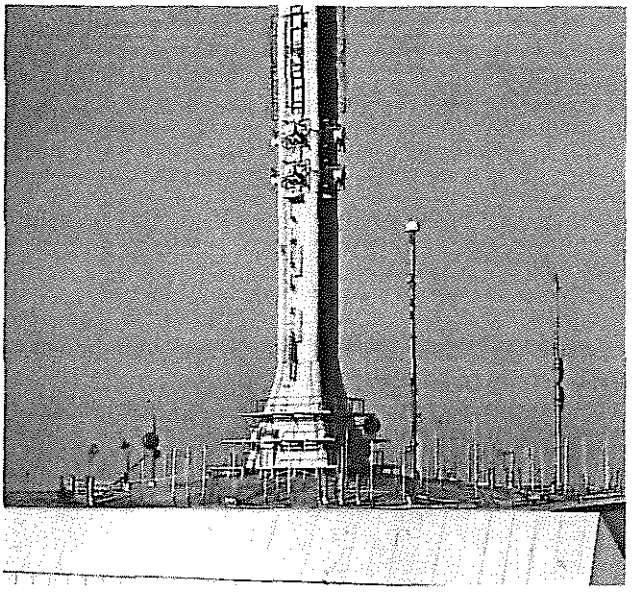
The PA and Silliman now explain the differences between the two reports by the method each used to take measurements. Tell surveyed a number of small areas and identified local maxima while Silliman took his readings at specific locations along a predetermined grid.

EPA's Feldman offered the same explanation. But no one outside the PA—including EPA—has yet seen the Silliman reports. Asked about all the confusion over the radiation levels, Feldman said that in the absence of federal standards, she had no legal authority to intervene, and that communication problems arose when so many people were involved in such an informal way.



Station WTFM mast with "wagonwheel" protective shield on the south tower. Behind, tourists enjoy New York views.

The base of the master antenna on the north tower.



The wagonwheel shield, installed to reduce WTFM radiation, had an unanticipated result. Signals from WKCR, an FM station originally located on the same mast under WTFM, were reflected downward by the wagonwheel. Silliman said that while local peaks had changed, the general radiation levels were about the same. WKCR-FM is not now operating from the WTC. The PA stressed that, before WKCR begins broadcasting, it will be moved to another antenna.

The PA claims to have spent more than $50,000 on monitoring—or a total of $200,000 when corrective action is included. Future PA surveys are planned, but no firm dates have been set.

At the end of his report, Tell recommended that a "more exhaustive field survey be accomplished to determine the absolute contribution of fields from the various broadcast frequencies."

(continued p. 8)

(continued from p. 7)

He also advised: "a survey of field levels inside the offices of several top floors would be worthwhile." Tell said that he could not predict if, or when, he would be able to return to the WTC to do such follow-up surveys for EPA. Federal travel budgets have been slashed, and he could not come to New York before the next fiscal year. If he does return, he wants to take a detailed set of measurements over the course of several days.

Safety Standards

The PA has consistently maintained that it will meet a 100 uW/cm² general population exposure standard. This level, set for the PA by Dr. Paul Tyler, director of the Armed Forces Radiobiology Research Institute in Bethesda, Maryland, is purely voluntary. The EPA has not issued any guidance for public exposures to non-ionizing radiation.

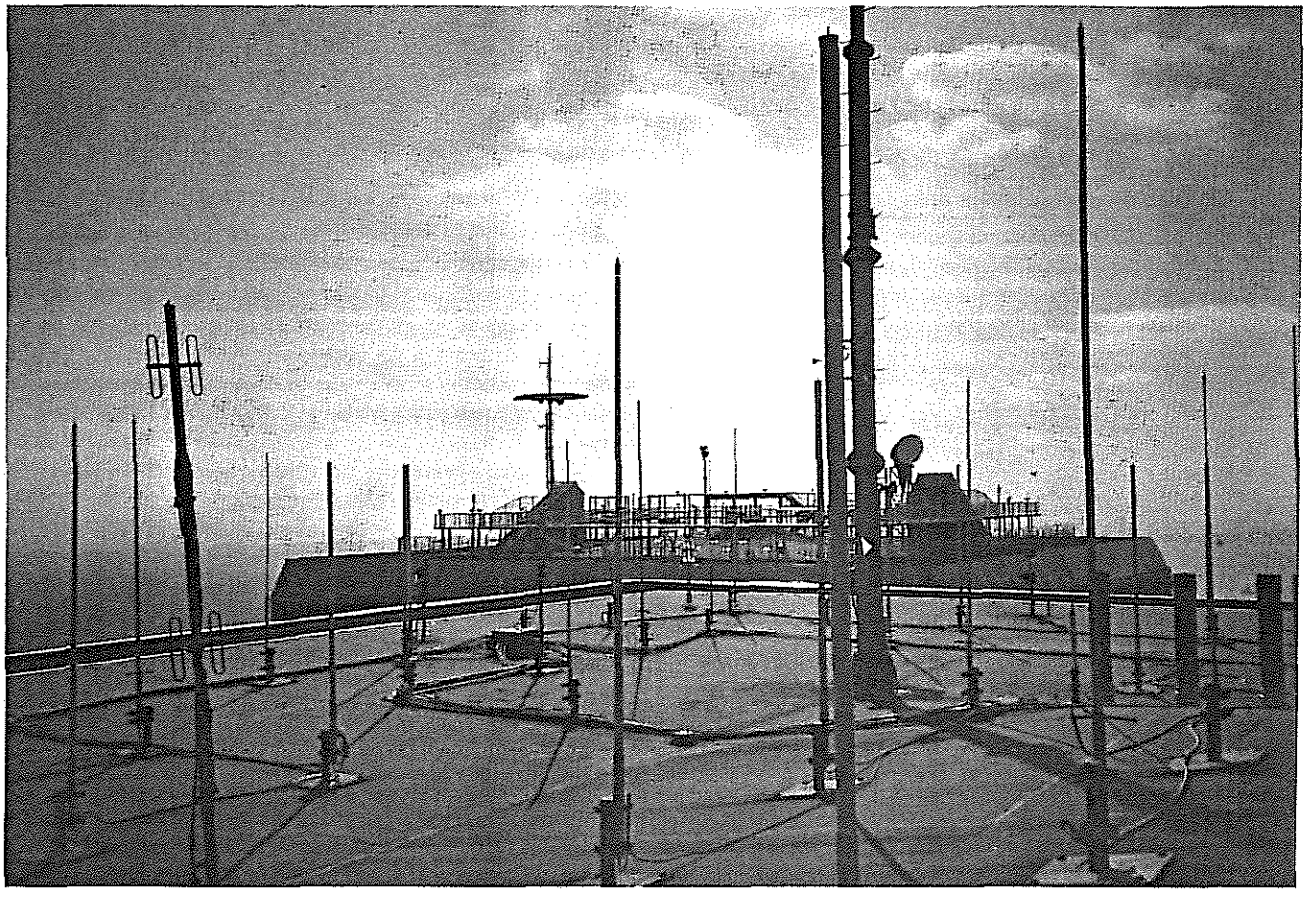
At a New York State Senate committee hearing, held last summer at the WTC, Patrick Falvey, general counsel and assistant executive director of the PA, testified that the PA "has undertaken a moratorium wherein no new broadcasting will be permitted from the [WTC] unless it can meet this strict standard."

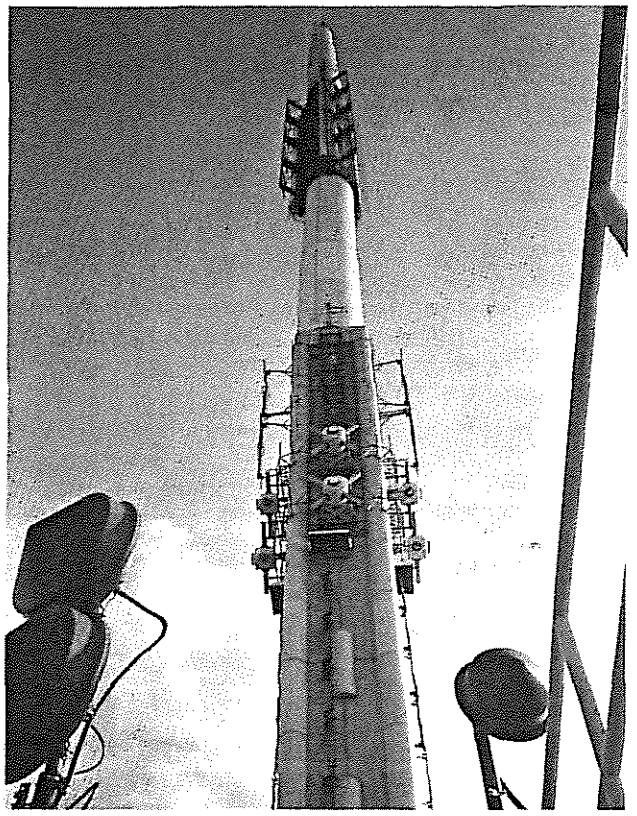
The PA's safety standard is twice as high as the 50 mW/cm² level proposed by Dr. Leonard Solon, the director of the City's Bureau for Radiation Control. The broadcasters, on the other hand, feel that the PA standard is far too stringent. Otis Freeman of WPIX, and a member of the TV Broadcasters All Industry Commitee—an organization of New York City's TV stations—says "100 is much too low." In Freeman's view, such a standard would interfere with the TV industry, disrupting the City's—and if applied generally, the nation's—communications system.

Attempting to meet its standard, the PA has kept the UHF stations (41 and 47) operating at only 50 percent power, and has turned away many other potential clients. Bass, the PA attorney, complained of losing a lot of money from unrented space as a result. He added that one of the UHF stations was lobbying the State legislature to force the PA into letting them turn up the power. Some, tired of the delays, are threatening to sue the PA for breach of contract.

In some ways the PA is a reluctant landlord. It agreed to house the antenna in 1967, but only after public reaction to TV interference that could have been caused by the WTC threatened to block the towers' construction. The PA wound up having

The south tower from the base of the master antenna on the north tower. In the foreground, various specialized communications antennas.





Master antenna on the north tower, flanked by receiving antennas.

to pay for moving the antenna downtown to the Empire State Building. As the WTC neared completion, however, the PA sought a review of its commitment. It was rejected by the Federal Communications Commission.

Two more TV stations (WOR-9 and WPIX-11) plan to move into the WTC by late March, and two more (WNBC-4 and WNET-13) by Labor Day. The dates for moving the five FM stations (WNYC, WPIX, WNEW, and WPAT) onto the master antenna have yet to be announced. WKCR will not go on the air until it is moved to another antenna, being built for the Coast Guard by Motorola.

TV Reception

The stricter the safety standard, the lower the broadcast power and hence the smaller the audience that can be reached. Ironically, stations threatened with losing their outlying markets due to weak signals also face troubles close to the antenna. As TV stations move to the WTC, viewer complaints follow. When WCBS moved, it began to receive 100 calls a day; people grumbled about fuzzy reception, ghosts, and poor color. Jim Baker, chief engineer at WABC, reports that his station heard from some 2000 disgruntled customers. WABC has since distributed 7500 pamphlets, "How to Improve Television Reception on Channel 7."

Part of the problem is that viewer antennas are still pointed towards the Empire State Building. Freeman of WPIX said that the biggest mistake was moving the stations piecemeal: They should have all gone to the WTC at the same time.

Local Apprehension

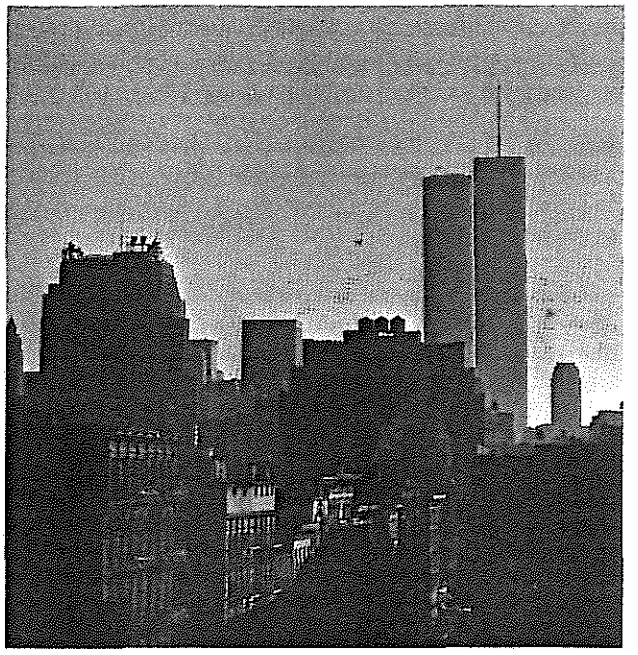
Meanwhile, residents living in neighborhoods near the WTC are worried about the potential threat of microwave radiation. On January 29, Community Board No. 1 in lower Manhattan sponsored a briefing session on microwaves. Some eighty residents heard the EPA's Feldman and a representative of Solon's Bureau for Radiation Control explain that the radiation levels emitted by the WTC antennas were very low. But one reaction from the audience summed up the prevailing attitude: "Do we have cause for concern or not? That is why we came here, the numbers don't mean anything to us."

* * * * *

This article very nearly became academic. According to news stories released February 26, an Argentinian Boeing 707 jet, with 58 people aboard, just missed crashing into the WTC mast last February 20. The jet was less than a minute and a half away from the bottom of the 350 foot mast (each of the towers is 1350 feet high), when an air traffic controller ordered it to turn and climb out of danger.

As we go to press, the PA has agreed to release the Silliman data to Microwave News. *They will be featured in the April issue.*

The World Trade Center, as seen looking south from lower Manhattan.



CONFERENCES

PROCEEDINGS

Now Available:

Thermal Characteristics of Tumors: Applications in Detection and Treatment, papers presented at a conference at the New York Academy of Sciences, March 14-16, 1979. Edited by Rakesh K. Jain and Pietro M. Gullino. *Annals of the New York Academy of Sciences, 335*, 1980.

•

The Mechanisms of Microwave Biological Effects, a report of a workshop held at the University of Maryland, College Park, Maryland, May 14-16, 1979. Edited by Leonard S. Taylor and Augustine Y. Cheung. Available free from the Office of Naval Research, Code 441, Arlington, VA 22217: enclose a self-addressed label.

•

Direct Broadcast Satellite Communications, a symposium conducted by the Board on Telecommunications-Computer Applications and the Space Applications Board on April 8, 1980. Available from the Space Applications Board, National Research Council, 2101 Constitution Avenue, NW, Washington DC 20418.

•

Health Hazards of VDUs?, a conference held on December 11, 1980. Available for £5 from the HUSAT Research Group, Department of Human Sciences, Loughborough University of Technology, The Elms, Elms Grove, Loughborough, Leics. LE 11 1RG, England.

CALENDAR

• April 13-15: Annual *Conference and Trade Show of the International Association of Satellite Users*, Washington Hilton Hotel, Washington DC. Contact: A. Fred Dassler, IASU, 6845 Elm Street, Suite 710, McLean, VA 22101.

• May 31-June 4: 29th Annual Scientific Meeting of the *Radiation Research Society*, Hyatt Regency Hotel, Minneapolis, MN. Contact: Office of the Executive Director of the Society, 4720 Montgomery Lane, #506, Bethesda, MD 20014.

• June 9-12: 16th Annual *Symposium of the International Microwave Power Institute*, Royal York Hotel, Toronto, Canada. Contact: IMPI, 211 East 43rd Street, New York, NY 10017.

• June 15-19: *IEEE and URSI Symposium*, Bonaventure Hotel, Los Angeles, CA. Sponsored by the Antenna and Propagation Society and the Microwave Theory and Techniques Society of the IEEE and four Commissions of URSI. Contact: IEEE, 245 East 47th Street, New York, NY 10017.

• June 27-July 2: 6th International Symposium on *Bioelectrochemistry and Bioenergetics* and 1st Meeting of the *International Bioelectrochemical Society*, Kibbutz Kiryat Anavim, Israel. Contact: Mrs. R. Goldstein, Secretary, Bioelectrochemistry Symposium, The Aharon Katzir-Katchalsky Center, The Weizmann Institute of Science, Rehovot, Israel.

• June 30-July 4: *International Symposium on Biomedical Thermology*, Palais de la Musique et des Congres, Strasbourg, France. Includes sessions on hyperthermia in cancer treatment (July 3) and bioelectromagnetics (July 1). Simultaneous translation in English, French, and German. Contact: Dr. M. Gautherie, Laboratoire de Thermologie Biomedicale, Faculte de Medicine, Universite Louis Pasteur, 11 rue Humann, 67085 Strasbourg, France.

• July 13-16: 10th *L.H. Gray Conference: The Biological Action of Radiofrequency, Microwave, and Ultrasonic Radiations*, Oxford England. Contact: Dr. G.R. ter Haar, Physics Division, F Block, Institute of Cancer Research, Clifton Avenue, Sutton, Surrey SM2 5PX, England.

• August 10-12: 3rd Annual *Bioelectromagnetics Society Meeting*, Washington DC. Contact: BEMS, P.O. Box 3651, Arlington, VA 22203.

• August 10-19: 20th *General Assembly of the International Union of Radio Science (URSI)*, Hyatt Regency Hotel, Washington DC. Includes a series on "Interaction of Electromagnetic Waves with Biological Systems," on August 13-14, chaired by Professor Saul Rosenthal of Polytechnic Institute of New York, and an "Open Symposium on Millimeter and Submillimeter Waves." Contact: Mr. Richard Y. Dow, Organizing Committee of URSI General Assembly, National Academy of Sciences, 2101 Constitution Avenue, NW, Washington DC 20418.

• August 19-21: 3rd Annual *Satellite Communications Users Conference*, Regency Hotel, Denver, CO. Contact: SCUC '81, Satellite Communications Magazine, 3900 S. Wadsworth Blvd, Denver, CO 80235.

• September 7-11: 11th *European Microwave Conference*, Amsterdam, The Netherlands. Contact: Microwave Exhibitions & Publishers Ltd., Temple House, 36 High Street, Sevenoaks, Kent TN13 1JG, England.

• 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.

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MICRO WAVE NEWS

Vol. I No. 1 A Monthly Report on Non-Ionizing Radiation January 1981

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MICROWAVES IN MOSCOW

At its August 26, 1980 meeting, the Electromagnetic Radiation Management Advisory Council (ERMAC) concluded that an investigation, such as the formal study of the health of Americans exposed to microwave radiation in the U.S. embassy in Moscow, would be pointless. Without dissent, members of ERMAC agreed that, based on current knowledge, there are no scientific or theoretical grounds to predict potential health impacts of the Moscow signal.

A consequence of the ERMAC finding may well be that the State Department will do no further epidemiological research on the 1,827 employees who worked at the embassy during the 22 year period when the Russians irradiated the upper floors with low levels of mostly continuous and some pulsed microwaves. As Stephen Cleary of Virginia Commonwealth University, an ERMAC member, explained, the sample population is too small and the dose too low for anything but a grave risk to show up, and therefore any money allocated to such research could be better spent elsewhere. One ERMAC member went so far as to say that he would not hesitate to expose himself or his family to those levels of microwaves found in the embassy.

ERMAC is an advisory committee to the Administrator of the National Telecommunications and Information Administration, Mr. Henry Geller.

(continued p. 7)

ANSI News

Meeting Scheduled

There will be a meeting of the C95 Committee on Radio Frequency Radiation Hazards of the American National Standards Institute (ANSI) on Thursday, February 26, 1981 at the ANSI headquarters in New York City (1430 Broadway). The main purpose of the meeting is to seek final approval of the new subcommittee IV standard on radiofrequency and microwave safety levels. Other business will include the new standards on measurements (subcommittee I) and hazard signs (subcommittee II/III).

Standard Nears Completion

The ANSI safety standard went out for C95 Committee vote last July. Although the standard was accepted by a majority vote of the Committee three important organizations withheld their approval: the Bureau of Radiological Health, the Environmental Protection Agency, and the Electronic Industries Association.

At a meeting in Bethesda in late October, the subcommittee was able to satisfy BRH objections and it is now very likely that the Bureau will cast a positive vote on the new standard. While an attempt was also made to win EIA's approval, it is not yet clear how EIA will vote. Apparently EPA does not intend to vote at all.

Microwave News will present an in-depth look at the new ANSI standard in a forthcoming issue.

GOVERNMENT

CONGRESS

The Congressional Research Service of the Library of Congress has updated its issue brief on "Radiation Health and Safety Issues of Congressional Interests." The brief written by Christopher Dodge of the Science Policy Research Division covers both ionizing and non-ionizing radiation and includes a listing of legislative authorities, federal regulatory authorities, pending legislation, hearings, and a chronology of events. (Brief Number IB77062, October 23, 1980.)

AGENCIES

Air Force

The Air Force wants to develop new and improve existing hardening techniques for its systems exposed to a nuclear electromagnetic pulse (EMP). See *Commerce Business Daily*, November 7, 1980.

Bureau of Radiological Health (FDA)

BRH promulgated a final rule amending the performance standard for microwave ovens in the *Federal Register* on November 28, 1980 (45 *FR* 79028). The rule, which becomes effective on November 30, 1981, deletes the error limit and effective aperture requirements for instruments used to detect leaks from microwave ovens.

The rule was on the agenda of the Technical Electronic Product Radiation Safety Standard Committee (TEPRSSC) meeting held on December 3-4 in Washington.

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BRH proposed a performance standard for microwave diathermy products in the July 29, 1980, *Federal Register* (45 *FR* 50359). A summary of the comments on the standard submitted to BRH will appear in our February issue.

Department of Commerce

The Commerce Department ruled in early December that the Toshiba Corporation of Japan sold countertop microwave ovens at prices so low that they were unfair and violated the Tariff Act. The case has been forwarded to the US International Trade Commission, which will determine whether Toshiba ovens injured domestic production. If the ITC makes such a finding, penalty duties will be assessed.

According to the December 3 *Federal Register* (45 *FR* 80157) notice, ovens made by the Matsushita Electric Industrial Company, the Sanyo Electric Company, and the Sharp Corporation were not dumped in the American market. The four companies accounted for 98% of the 740,000 ovens imported into the United States from Japan in 1979 at a value of $149 million.

Environmental Protection Agency

EPA sponsored a workshop on RF measurements in Las Vegas last November 3-5. Thirty government officials and a limited number of outsiders held intensive discussions on the current status of measuring electromagnetic fields. According to Richard Tell of EPA, the workshop organizer, "This was the first time all the instrumentation experts from the government were in the same room at the same time."

The participants agreed to two sets of recommendations:

1. That a group, such as the American National Standards Institute (ANSI), should set the following standards for broad band RF survey instruments: a) minimum, uniform reporting requirements of performance characteristics for existing instruments; b) minimum testing procedures for evaluating instrument performance; and c) performance characteristics for future instruments.

2. That standardized measurement techniques be developed based on: a) existing instrumentation, b) applicable safety standards, and c) specific exposure situations.

The second set of recommendations arose from the lack of uniformity in the way measurements are taken.

The recommendations will be published at a later time, though the form of publication has yet to be decided, perhaps an EPA technical report or a journal article.

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The Nonionizing Radiation Surveillance Branch of EPA is providing all the Agency's regional offices with a new Holaday electric field probe to permit local surveys of radiofrequency levels. According to Branch Chief, Dave Janes, "We are providing only the training and equipment, the time and resources devoted to this are up to each individual regional office."

EPA is also buying higher frequency probes: one of five or six Narda probes will be lent to a regional office when requested as soon as they are delivered by the manufacturer. A single field intensity meter and associated antennas which can identify the frequency of a particular source will also be available for loan. A four day training course for regional personnel was held by EPA in mid-December in Las Vegas.

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Department of Energy

The DOE's Office of Electric Energy Systems held its annual contractors review meeting on the biological effects of electric fields from overhead transmission lines in Washington DC last November 18-19. Researchers from about a dozen on-going projects in the multi-million dollar program reviewed their progress.

The DOE program is now focused on AC work, but in the years ahead the emphasis will change to DC lines.

For a copy of the abstracts presented at the November meeting contact: Mr. Alec O. Bulawka, US DOE/EES, Mail Stop 3344, 12th and Pennsylvania Avenue, NW, Washington DC 20461, (202) 633-8638.

Federal Communications Commission

At the end of January, the FCC will issue a statement in response to the comments received on its 1979 Notice of Inquiry (NOI) [44 *FR* 37008, June 25, 1979] concerning the biological effects of radiofrequency radiation.

The FCC has decided not to issue any interim radiation standards, according to Robert Cleveland of the Commission's Technical Planning Staff. But the FCC will participate in the rulemaking proceedings of other agencies on RF issues. The statement will include a summary of the some 25 comments submitted to the FCC in response to the NOI.

Cleveland said that the FCC issued the NOI to meet its duties to promote safety under the Communications Act, and to satisfy its responsibilities under the National Environmental Policy Act.

National Cancer Institute

NCI has issued a request for proposals for the synthesis and evaluation of radiosensitizers, chemicals which selectively sensitize hypoxic (oxygen deficient) tumor cells to radio-therapy. A three year project is planned. RFP NCI-CM-17485 is available from Maria Decker, NCI, Treatment Contracts Section, Blair Building, Room 228, NIH, Bethesda, MD 20205.

National Institute for Occupational Safety and Health

The schedule for the NIOSH criteria document on radiofrequency and microwave (RF/MW) radiation is still slipping. Drafts of the document were released in 1979, but were withdrawn due to unfavorable reviews. NIOSH is now aiming for a substantially shorter document, one that is less encyclopedic with more critical analysis. NIOSH's consultants are in the process of evaluating the RF/MW biological data. This phase of the operation is going slowly, and the agency cannot proceed until it is completed. A review draft may be finished by the spring.

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The NIOSH procurement office in Cincinnati has issued a request for quotation [RFQ 81-12; November 14, 1980] for the writing of two television scripts on the health risks associated with Video Display Terminals (VDT's).

NIOSH, BRH, OSHA

A team from NIOSH, BRH and OSHA is developing a bulletin on control technologies for dielectric heaters, including RF sealers.

Preliminary tests indicate that shielding can have a significant effect on both the magnitude and direction of the impinging field. The team is not yet ready to make firm recommendations on control technologies.

The joint bulletin is due to be out in late Spring.

National Telecommunications and Information Agency

The Electromagnetic Radiation Management Advisory Council (ERMAC), the advisory committee to NTIA, is anticipating holding a meeting at the end of January or early February in Washington.

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The BENER Task Force report, "Nonionizing Electromagnetic Radiation Safety: A Program of Coordinated Federal Activities Related to Biological Effects of Nonionizing Electromagnetic Radiation (0-300 GHz)," was published last summer, but has yet to receive any official attention.

Dr. Howard Clark of the National Bureau of Standards who served as the Task Force chairman hoped that the report would provide "a frame of reference for examination of the various agency programs and budgets that relate to the coordinated federal BENER program," and would be "useful to federal agencies in planning or describing their individual activities as related to a common goal."

The Task Force was set up by Henry Geller, the Administrator of NTIA at the request of Dr. Frank Press, the President's science advisor. Nevertheless, the report has not been officially forwarded to Press, nor does it seem to be a planning tool of the individual agencies involved in bioeffects research.

Occupational Safety and Health Administration

Bob Curtis of OSHA's Salt Lake City office organized a training session for two members of each of OHSA's ten regional offices to teach them how to measure radiofrequency and microwave radiation levels in the workplace. As a result of the December 3-4 sessions, held in Salt Lake City, workers will have a greater opportunity to check their on-the-job exposures to non-ionizing radiation.

Helping Curtis were Michael Larsen and Alfred Owyand of OSHA and Edward Aslan of Narda.

Radiation Policy Council

The US Radiation Policy Council, the interagency group created by the President in February 1980, has issued its "Progress Report and Preliminary 1981-1983 Agenda." (No. RPC-80-001, September 30, 1980).

The Report concentrates on ionizing radiation to the virtual exclusion of non-ionizing radiation. Beyond intending to grapple with general radiation policy which may (or may not) spill over

(continued p. 4)

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BIOLOGICAL RESEARCH

Frey Reworks BBB Data

Allan Frey of Randomline Inc. believes he has resolved some of the contradictions in the experimental results of the blood brain barrier (BBB) research. Writing in the November 1980 issue of the *Bioelectromagnetics Society Newsletter*, Frey argues that the use of inappropriate statistical analysis explains why many researchers erroneously concluded that microwaves do not change the permeability of the BBB.

At least three teams of researchers, including one led by Frey himself, have shown that microwaves can cause certain dyes to pass through the BBB into the brain. In one of the most significant studies, Oscar and Hawkins discovered that pulsed 1.3 GHz radiation could change the permeability of the BBB at average power densities of only 0.03 mW/cm² (*Brain Research, 126*, 281, 1977).

However, three groups of scientists cast doubt on these results by reporting no microwave effects on the BBB for various exposure conditions. Frey has taken the published data of two of the groups, and, by applying what he thinks are more appropriate statistical tests, found that the opposite conclusions hold: they demonstrate increased permeability. One set of results by Merritt *et al.* now supports Frey's original paper, and another by Preston *et al.* confirms Oscar and Hawkins' work. Frey also speculates that the third group, Spackman *et al.*, may have also used inappropriate statistical analyses and a faulty experimental design.

As Frey concludes: "The supposed conflicting and controversial data actually are quite consistent and indicate that something is happening in the brain under low intensity microwave energy exposure."

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New Review Article

Richard Lerner has published a comprehensive review of current research on health effects of non-ionizing radiation, with special emphasis on low-level effects, in the December 1980 issue of *IEEE Spectrum*: "RF Radiation: Biological Effects." The article also details some of the controversy surrounding the new ANSI standard.

EPA Funds Teratological Study

The Environmental Protection Agency's Health Research Laboratory has awarded Dr. Mary Ellen O'Connor and Dr. Robert Strattan of the University of Tulsa a contract to study the teratological effects of microwave radiation.

The two-year, $230,377 study will consist of exposing mice *in utero* throughout the gestation period with 2450 MHz continuous wave radiation. The irradiation will stop after they are born. The experiment will begin with exposures to power levels of 30 mW/cm²; the levels will decrease to 10, 1, and 0.1 mW/cm² until no effects are observed. The mice will be monitored for fetal weight and developmental abnormalities.

Dr. O'Connor is with the Department of Psychology and Dr. Strattan is with the Electrical Engineering Department.

New Idea about Cataract Formation

A new explanation for cataract formation has been developed by a group of physiologists at Rush University in Chicago (*Science, 209*, 1007, August 29, 1980). The group has rejected the view that the lens of the eye is a homogeneous mass. Instead, based on a combination of biophysical techniques and mathematical models, the scientists have proposed that the interior cells of the lens have imperbeable membranes that block the entry of small ions. These fibrous cells can stop the flow of sodium and water into the lens' interior, thereby preserving its volume and transparency.

Microwave Hearing

How do people hear pulsed microwaves? The mechanism for the perceived buzzing or clicking sound is still a mystery; various hypotheses continue to be proposed, rejected, and defended. In a tart exchange of views in *Science* (*209*, 1143, 5 September 1980), two opposing camps reaffirmed their positions. One group led by C.K. Chou of the University of Washington Medical School maintains that hearing results from a tiny pressure wave in the head when the radiation pulse is converted to thermal energy. Allan Frey and Elaine Coren of Randomline, Inc. continue to offer the hypothesis that microwave hearing is the result of the thermoacoustic expansion within the cochlea, the small snail-shaped region of the inner ear.

GOVERNMENT *(continued from p. 3)*

to the non-ionizing portion of the spectrum, the RPC agenda promises little attention to microwave, radiofrequency, or ELF radiation.

Included in the report are summaries of the RPC public meetings held across the country during 1980, and the public comments submitted to the Council.

Three of the public comments address non-ionizing radiation:

- AFL-CIO, Food and Beverage Trades Department: strengthen occupational exposure standards for microwave and radiofrequency radiation from microwave ovens and sealing equipment, and radiation emanating from video display terminals. (p. E-12)
- Natural Resources Defense Council: Examine both ionizing and non-ionizing radiation since many of the problems that have hindered past work on ionizing radiation are also obstacles in the study of non-ionizing radiation. (p. E-4)
- Raytheon Corporation: Encourage EPA to develop a mandatory Federal standard on exposure of the general public to non-ionizing radiation or recommend a definition of current consensus standards (ANSI C95) by Congress as a mandatory national standard until formal Federal standards are developed. Ensure active participation by federal agencies in legitimate efforts of public education in the area of non-ionizing radiation. (p. E-8)

If you want to be on the RPC mailing list, write to: US Radiation Policy Council, Room 3026, New Executive Office Building, 726 Jackson Place, NW, Washington, DC 20503.

RF Radiation, A New Tool in Cancer Treatment

Radiofrequency radiation is a promising weapon against cancer, according to a December 1980 *IEEE Spectrum* article. "RF Therapy for Malignancy" explains how this treatment works and describes equipment design and function, tissue models used in research, and various hyperthermia methods.

Radiofrequency induced heating of tissue (42 to 43.5°C) is used alone or in conjunction with radiation (ionizing) therapy or chemotherapy to treat malignancies. A range of frequencies is used; higher ones—up to 2450 MHz—are easier to focus than the lower frequencies which can penetrate more deeply into the body. Because solid tumors generally have poor blood circulation, a tumor can be selectively heated without significantly increasing the temperature of surrounding, healthy tissue. The authors state that for localized treatment, there are no serious side effects from radiofrequency hyperthermia.

VDT's

The *Columbia Journalism Review* will feature a story on VDT's in the newsroom in its January-February issue. The article looks at both the health hazards associated with the machines and the reporting of this story by the press.

Electrotherapy Controversy

New York Magazine, in a two-part article that ran November 23 and December 1, detailed the controversy over the use of low-level electricity for bone healing.

The story began as a profile of Arthur Pilla, a chemical engineer at Columbia University. Pilla, who claimed to have played a major role in developing the electrical technology to treat fractures that previously would not heal, piqued the reporter's interest by claiming that the device was now being tested for its efficacy in treating cancer and that human applications could start within the year.

Dr. Andrew Bassett, a doctor at Columbia's medical school, cautioned that Pilla was overstating the prospects and further, downgraded Pilla's contributions in their research.

Bassett had worked with Dr. Robert Becker, then at the VA Hospital in Syracuse, New York, to show that stress applied to any bone is translated into electricity. Bassett's later cooperation with Pilla resulted in a practical, non-invasive electrical coil device, which Pilla and another colleague patented. They all formed a private corporation, Electro-Biology, Inc. of Fairfield, New Jersey with the financial backing of Wall Street entrepreneurs.

Zimmer-USA, Inc. and Telectronics Proprietary Ltd. offer other bone-growth stimulators, although Electro-Biology's is the only one which does not require implanting an electrode under the skin.

Dr. Bassett received more than $1 million in government grants in the course of his research. The writer, Lally Weymouth, raised questions about transferring medical research paid for by public funds to profit-making private companies. She noted that the government gets a share of Zimmer-USA royalties because its product was underwritten by the Navy.

New Reports

Two major studies of the Department of Energy's SPS system are nearing completion. Each will contain an analysis of the impact of microwave radiation on human health and the environment.

One study by the National Research Council (NRC) is due to be completed by the end of June 1981, with a draft report by early January 1981. The other by the Congressional Office of Technology Assessment (OTA) was due to be published by the end of January 1981, but is running late.

NRC

The Environmental Studies Board (ESB) of the NRC appointed a Committee on Satellite Power Systems to provide an independent review of DOE's assessment of the SPS concept. Towards this end, the ESB organized a "Workshop on Mechanisms Underlying Effects of Long-term, Low-level, 2450 MHz Radiation on People." A workshop summary, prepared by Christopher Dodge of the Science Policy Research Division of the Library of Congress, was released last fall. (See box for conclusions of workshop participants.)

OTA

The two-year OTA project was requested by the House Committee on Science and Technology. The completed study will compare the impacts of beaming energy from collecting satellites by lasers, microwaves, and reflected light. With respect to microwaves, the study will look at both the DOE reference system and a solid state system which would use lower power densities and smaller rectenna sites.

SRI

Last summer, SRI International completed a study for the Environmental Protection Agency, "An Assessment of the Potential Impact of Microwave Radiation from a Solar Power Satellite." This then became the basis for a chapter in the DOE report, "Environmental Assessment of the Satellite Power System (SPS) Concept Development and Evaluation Program (CDEP)," prepared by Anthony Valentino of Argonne National Laboratory (No. DOE/ER-0069, August 1980).

CONCLUSIONS OF SPS-NRC WORKSHOP

A. There are relatively little microwave health and bioeffects data available of direct relevance to the radiation parameters of the proposed SPS. What data are available are difficult to evaluate in terms of a potential health impact of the SPS.

B. There is no presumptive evidence in the data available that exposure of the general public to 0.1 mW/cm² or lower at the frequency of 2450 MHz generated by the SPS will result in any health decrements. However, because a number of functional phenomena of known significance have been reported in response to exposure to low-intensity microwaves, further research and evaluation...is necessary in order to decrease present uncertainties about potential low-level microwave health effects.

Georgia Power Challenged on Microwaves

A group of 27 residents of rural Clayton, Georgia, have filed suit in county court to prevent Georgia Power Company from erecting a 180-foot microwave tower on top of nearby Screamer Mountain. Citizens Against Microwaves, led by homeowner David Kraft, brought the case in September, shortly after the Rabun County Commission approved the tower in a 2-1 vote before a packed hearing room.

The suit, which names the power company and the two county commissioners who approved the tower, charges that allowing Georgia Power to build on land seized by the county for nonpayment of taxes is a violation of covenant, will create a health hazard and constitutes an improper disposal of county property. *Atlanta Weekly*, the Sunday magazine of the *Atlanta Constitution*, ran a long article on the controversy in its November 23, 1980 issue.

HBO Cancels Out

In late November, Home Box Office (HBO), Time-Life's subscription TV network, withdrew its application to build a satellite communications complex in Rockaway Township, New Jersey.

The HBO proposal was under intense scrutiny by the Rockaway Board of Adjustment which had to grant a variance before construction could begin. The Concerned Citizens' Committee of Rockaway Township was formed to oppose the HBO proposal. The Committee was worried about the siting of a major source of microwave radiation in a residential area, only 1000 feet from a neighborhood school. The Board had held 16 hearings since last spring, and another 30 were scheduled.

Edward Horowitz, HBO vice-president of studio and network operations, explained that while "the local Board was responsive and HBO was overcoming the local opposition, we could not afford the delay."

The cancellation will not hurt HBO's immediate programming. The Rockaway site would have provided the pay TV system with added flexibility. As for a new site, Horowitz said that HBO will look for suitable areas across the country: "The primary interest is in the New York-New Jersey Metropolitan area, but once away from here, it doesn't really matter where you go."

California OSHA

California's Occupational Safety and Health Standards Board has proposed a substitution in the State's General Industry Safety Orders on non-ionizing radiation. The standard remains at 10 mW/cm^2; the purpose of the change is to make it more enforceable. Cal OSHA held a public hearing on the proposal on November 19, 1980.

Dr. Daniel Cahill of the Environmental Protection Agency's Health Effects Research Laboratory in Research Triangle Park, North Carolina, has been awarded the Public Health Service Commendation Medal. Dr. Cahill, the Director of the Lab's Division of Experimental Biology was cited for: "Outstanding research and research management in the areas of ionizing and non-ionizing radiation health effects in the environment."

•

Mays Swicord, Chief of the Electromagnetics Branch at the Bureau of Radiological Health, was awarded his doctorate last month from the Electrical Engineering Department at the University of Maryland. He completed the thesis: "Studies of Microwave Absorption in Liquids by Optical Heterodyne Detection of Thermally Induced Refractive Index Fluctuations" in November. The objective of the research was to develop a spectroscopic method, flow spectroscopy, to look at microwave absorption of specific molecules. Swicord investigated DNA and found enhanced absorption as predicted by E.W. Prohofsky of Purdue University.

•

COMAR wants to make a movie about microwaves. **John Osepchuk** of the Raytheon Corporation and **Don Justesen** of the VA Medical Center in Kansas City, two active members of the Institute of Electrical and Electronics Engineers' (IEEE) Committee on Man and Radiation (COMAR), are exploring the idea of producing a 30-minute film on non-ionizing radiation for public television. The project is in its early stages of development and must still be approved by the IEEE. Once the go ahead is given, Dr. Osepchuk estimates that it will take a year and a half to complete.

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Over a hundred colleagues and friends of Professor **Herman Schwan** gathered at the University of Pennsylvania in Philadelphia last November 24-25, to wish him a happy 65th birthday.

Those who attended the two-day *Festschrift*, "The Interaction of Acoustical and Electromagnetic Fields with Biological Systems," funded by the Office of Naval Research, heard twenty presentations. The proceedings will be published in a special issue of *Bioelectromagnetics*, the Journal of the Bioelectromagnetics Society.

Professor Schwan is currently on sabbatical at the Max Planck Institute of Biophysics in Frankfurt, Germany.

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A profile of **Dr. Andrew Marino** of the Veterans Administration hospital in Syracuse, New York, "Law with a Spark," appeared in the September 29, 1980 issue of the *National Law Journal*. Marino, who is both a biophysicist and an attorney, does research on the bioeffects of ELF and at the same time is participating in various cases involving high voltage transmission lines. The article was written by Jill Jonnes.

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MOSCOW *(continued from p. 1)*

Follow-Up Studies

If the State Department decides to discontinue formal follow-up studies of Moscow employees, the decision would be at odds with the earlier advice of Professor Abraham Lilienfeld of Johns Hopkins University who completed an epidemiology of the Moscow employees in 1978, and of the Senate Commerce Committee. Both urged the State Department to pursue the health studies.

Dr. Herbert Pollack, a medical consultant to the State Department, did say, however, that he and Dr. Charles Brodine were continuing to monitor those employees present during the period of maximum exposure (May 1975-February 1976). "We have a complete roster of all those exposed, and every time they get a medical check up, one of us reviews their complete medical history," Pollack emphasized.

"a follow-up would buy a sense of security."
— Lilienfeld

In a recent interview, Professor Lilienfeld agreed that from a scientific point of view he would not expect to see any deleterious effects at such low doses. But from a political and personal point of view, he felt that continued examinations would be a "prudent thing to do." "It's a matter of judgment," he said, "a follow-up would buy a sense of security." Professor Lilienfeld pointed out that the major costs had already been spent and future surveys would be comparatively cheap.

The ERMAC advice could have some effect on pending claims by former embassy workers. John Parker Hills, an attorney who is handling four claims, said that up to now the State Department has been basically "ignoring" him. Hills has two claims before the Workmen's Compensation Board and two before the State Department, one of which is a class action on behalf of all women irradiated in Moscow. According to Justice Department and Veterans Administration spokesmen, neither agency has any Moscow-related claims pending.

ERMAC took up the question of a follow-up to the 1978 epidemiology at the request of the State Department, which paid the expenses for the ERMAC meeting. In a January 16, 1980 letter to Henry Geller, the State Department asked whether there was any basis for continued study. Mr. Geller referred the matter to ERMAC. According to Pollack, the State Department is waiting for the ERMAC recommendation before responding to any Moscow claims.

Before debating the merits of a follow-up investigation, ERMAC heard R.C. Mallalieu of Johns Hopkins University's Applied Physics Laboratory describe the results of his attempt to reconstruct the radiation levels on the upper floors of the embassy. According to Mallalieu's report ("A Model of the Microwave Intensity Distribution Within the US Embassy in Moscow, 1966 to 1977," No. FS-80-166, JHU-APL, August 1980), the most intense microwave exposures occurred between May 1975 and February 1976, with average levels of continuous wave radiation of 3.5 to 5.0 uW/cm² and average peak intensities due to multiple reflections of 7 to 10 uW/cm². The largest recorded power density was 24 uW/cm². From 1966 to 1975, the average signal strengths for those rooms with the greatest exposure was about 1.5 uW/cm² with maximum levels of 4 uW/cm², though there were transient peaks of as high as 20 uW/cm². Areas more distant from the radiation sources had microwave levels of less than 0.1 uW/cm². In February 1976, protective shielding was installed which reduced all exposures to 0.1 uW/cm² or less. Based on these data, the State Department has estimated that over a 22 year period, about 240 employees were exposed to average power levels of about 1.5 uW/cm² for about 2 hours during the workday. ("Exposure of Model Personnel," State Department, August 26, 1980.)

Lilienfeld Study

The Lilienfeld epidemiology failed to identify any major differences in either mortality or morbidity between Moscow embassy personnel and a comparative population working in other embassies in Eastern Europe. Lilienfeld had only minimal information on the signal strength inside the embassy building, though he did know that the maximum exposure took place during the nine months ending in February 1976. The radiation surveys were classified until after his study was released. Since only a short time has elapsed between the period of maximum exposure and his study, Lilienfeld recommended that "it would seem desirable that this particular study population should be contacted at periodic intervals, of 2 to 3 years, within the next several years, in order to ascertain if any health effects would appear." He went on: "it would be important to develop a surveillance system for deaths in the entire study population to be certain that no mortality differences occur in the future and to monitor the proportion of deaths due to malignancies, especially among the women."

"every time they get a medical check up, one of us reviews their complete medical history," — Pollack

In an April 1979 report, the Senate Committee on Commerce, Science and Transportation "urged" that the State Department pursue this Lilienfeld recommendation, especially for those people exposed between June 1975 and February 1976. ("Microwave Irradiation of the U.S. Embassy in Moscow") The Committee noted that its recommendation reflected a "precautionary attitude."

A subcommittee made of Dr. Marylou Ingram (chairwoman), Professor Cleary, Professor Mary Ellen O'Connor and George Wilkening wrote up the ERMAC recommendations, which are now circulating among the full ERMAC membership. A statement is expected to be released in January.

CONFERENCES

NEWS

BEMS

More than 300 people attended the second annual meeting of the Bioelectromagnetics Society in San Antonio, Texas, last September. Some 160 papers were presented providing a rich blend of new research findings and open discussion.

In the months ahead, *Microwave News* will feature a series of articles on some of the important topics covered in San Antonio. The first in this series, "Microwave-Drug Synergy," will appear next month. Later, we will run a piece on Professor A.W. Guy's long-term experiment which began last fall at the University of Washington in Seattle.

VDT's

A one day conference on "Health Hazards of VDU's" was held at the Human Sciences and Advanced Technology Research Group, Department of Human Sciences, Loughborough University in Leicestershire, England on December 11, 1980. (VDU is the European equivalent of our VDT.) Among the papers presented were two reports of skin rashes among VDT operators in England and Norway.

IMPI

The International Microwave Power Institute (IMPI) held a symposium on "The Washington Impact: How It Affects Microwave Users" on November 13-14, 1980. A host of government officials briefed the more than two dozen attendees on what the government agencies are doing.

The proceedings of the symposium will be available from IMPI for $40.00 for members and $50.00 for non-members. Order from: IMPI, 211 East 43rd Street, New York, NY 10017.

PROCEEDINGS

Now Available:

Proceedings of a Workshop on Thermal Physiology, held in Rockville, Maryland, March 29, 1979. Edited by Dr. T. Whit Athey, Bureau of Radiological Health, sponsored by the Radiofrequency and Microwave Committee of the Interagency Regulatory Liason Group. Dated March 1980. Available from BRH, Rockville, MD 20857.

Non-Ionizing Radiation, Proceedings of a Topical Symposium held in Washington D.C., November 26-28, 1979, sponsored by the American Conference of Governmental Industrial Hygienists. Order from: ACGIH, P.O. Box 1937, Cincinnati, OH 45201.

Proceedings of the International Symposium, *Electromagnetic Waves and Biology,* held in Jouy en Josas (outside Paris) France, June 30-July 4, 1980. Send $40.00 to Dr. A.J. Bertaud, CNRS, 2 rue H. Dunant, 94329 Thiais, France.

CALENDAR

• January 12-16: *National Radio Science Meeting,* University of Colorado, Boulder, CO. Sponsored by the US National Committee of IEEE Societies. Contact: Center for Conferences and Management/Technical Programs, 970 Aurora Avenue, University of Colorado, Boulder, CO 80302.

• February 16-17: *Treatment of Cancer by Radiofrequency and Microwave Thermotherapy,* Princess Kaiulani Hotel, Honolulu, HI. A short course arranged by the Bioelectromagnetics Corporation of Rockville, MD. Fee: $495. Contact: Dr. S.S. Stuchly, Department of Electrical Engineering, University of Ottawa, Ottawa, Canada K1N6N5.

• April 13-15: Annual *Conference and Trade Show of the International Association of Satellite Users,* Washington Hilton Hotel, Washington DC ($95 IASU Members; $195 Others). Contact: A. Fred Dassler, IASU, 6845 Elm Street, Suite 710, McLean, VA 22101.

• June 9-12: 16th Annual *Symposium of the International Microwave Power Institute,* Royal York Hotel, Toronto, Canada. Contact: IMPI, 211 East 43rd Street, New York, NY 10017.

• June 15-19: *IEEE and URSI Symposium,* Bonaventure Hotel, Los Angeles, CA. Sponsored by the Antenna and Propagation Society and the Microwave Theory and Techniques Society of the IEEE and four Commissions of URSI. Contact: IEEE, 245 East 47th Street, New York, NY 10017.

• June 30-July 4: *International Symposium on Biomedical Thermology,* Palais de la Musique et des Congres, Strasbourg, France. Includes sessions on hyperthermia in cancer treatment (July 3) and bioelectromagnetics (July 1). Simultaneous translation in English, French, and German. Contact: Dr. M. Gautherie, Laboratoire de Thermologie Biomedicale, Faculte de Medicine, Universite Louis Pasteur, 11 rue Humann, 67085 Strasbourg, France.

• August 10-12: 3rd Annual *Bioelectromagnetics Society Meeting,* Washington DC. Contact: BEMS, P.O. Box 3651, Arlington, VA 22203.

• August 10-19: 20th *General Assembly of the International Union of Radio Science (URSI),* Hyatt Regency Hotel, Washington DC Includes a series on "Interaction of Electromagnetic Waves with Biological Systems," on August 13-14, chaired by Professor Saul Rosenthal of Polytechnic Institute of New York, and an "Open Symposium on Millimeter and Submillimeter Waves." Contact: Mr. Richard Y. Dow, Organizing Committee of URSI General General Assembly, National Academy of Sciences. 2101 Constitution Avenue, NW, Washington DC 20418.

• August 19-21: 3rd Annual *Satellite Communications Users Conference,* Regency Inn, Denver, CO ($145 pre-paid; $195 at the door). Contact: SCUC '81. Satellite Communications Magazine, 3900 S. Wadsworth Blvd, Denver, CO 80235.

MICRO WAVE NEWS

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NEXT MONTH

The report on the new ANSI standard and the Port Authority's data on radiation levels atop the World Trade Center, originally scheduled for this issue, will appear next month.

CORRECTIONS: March

- In the report on the World Trade Center, the proposed New York City population standard was mistakenly given as 50 mW/cm². The correct value is 50 uW/cm².
- In Cox's UK survey of VDTs, no UV radiation was detected at wavelengths *less* than 336 nanometers—not above 336 nm as originally stated.

MICROWAVE DEATH AWARD UPHELD IN COMPENSATION COURT, NY TEL APPEALS AGAIN

In a precedent setting decision, the Workers' Compensation Board of New York has upheld a previous ruling that Samuel Yannon, a New York Telephone Company radioman, had died of overexposure to microwave radiation. On February 26, the three member Board panel found that "there was a direct causal relationship between decedent's exposure to microwave radiation during his employment and his subsequent disability all of which ultimately resulted in his death." New York Telephone immediately filed another appeal, taking the case to the Appellate Court of New York for review. (See p. 5 for complete text of decision.)

The case, brought by Yannon's widow, Nettie, in 1974, is the first to successfully establish chronic exposure microwave radiation as a cause of death. Yannon spent the last 15 of his 42 years with the phone company adjusting microwave relay equipment on the 87th floor of the Empire State Building.

As a result of the February decision, New York Telephone has paid more than $29,000 in retroactive awards to Mrs. Yannon and will now pay her $45 a week for life, or until she remarries. (Yannon has already received the award, regardless of the appeal, as dictated by a New York State law.) "I never gave up," Mrs. Yannon says of her six-year case against the phone company. "They

(continued p. 4)

Navy May Scrap Project ELF

The Secretary of the Navy has recommended abandoning its controversial, extremely low frequency (ELF) submarine communications system, according to a spokesman for Michigan Senator Carl Levin.

The one-way communication system, known as Project ELF and previously named Project Sanguine and Project Seafarer, is designed to send messages to submerged submarines, especially during a nuclear war. The signal, with a carrier frequency of 76 Hz, would be transmitted by a large underground antenna. The Navy has been trying to find a site for the antenna since the late 1960's, but has met repeated opposition in Wisconsin, Texas, and Michigan. Democratic Senator Levin has been a long-time opponent of the project, and has sought to stop its construction in his home state.

In the past, the Navy has said that the ELF system is essential to the national defense. Now, however, the Navy is no longer in favor of the project because the system would be vulnerable to nuclear attack, according to James Crutchfield, press aide to Senator Levin. Critics have charged that the system is too expensive and may not work. Questions about the biological and ecological effects of the ELF signals have also been raised.

The latest recommendation was made in a letter from Navy Secretary John Lehman and Under-Secretary Robert Murray to Defense Secretary Caspar

(continued p. 8)

GOVERNMENT

BUDGETS

Key agency officials have indicated that non-ionizing radiation programs will not be badly hurt by the proposed Reagan-Stockman budget cuts—though as some noted, the programs were not large to begin with. Through a series of interviews, *Microwave News* compiled the following agency-by-agency analysis:

Bureau of Radiological Health: For FY81, Reagan cut the total BRH budget by $1 million to $26 million, while staff years were cut to 545 from 556. In FY82, staff years were down to 528 from 556 and the budget to $26.6 million from $27.8 million. According to Neil Goldstein, associate director for management and systems, these cuts must now be allocated among the various programs (e.g.: ionizing and non-ionizing radiation, ultrasound, nuclear medicine, etc...) The FY82 planning process has begun, and will be completed over the summer. Goldstein believed the cuts could be met by postponing certain contracts and by retirement and attrition. One early indication of the FY81 cuts is that the publication office has had to delay printing certain reports until FY82.

Environmental Protection Agency: (1) Office of Research and Development: Daniel Cahill's Division of Experimental Biology reports that the 10% reduction in staff and 1.5% budget cut from the original Carter FY82 budget will cause essentially no impact on the non-ionizing radiation technical program at Research Triangle Park. The total FY81 budget is $2.98 million (about $2 million for Cahill's Division). This will now be reduced to $2.94 million in FY82. Full time staff equivalents will go from 27.6 to 24.9. (2) Office of Radiation Programs: No positions were lost in the non-ionizing radiation group, although the office suffered a 35% staff cut, according to David Rosenbaum, deputy assistant administrator for radiation programs. (Non-ionizing radiation has about 6–10% of the staff.) While the Office's contract budget will be reduced to $2 million in FY82 from $8 million in FY81, this will not affect non-ionizing programs too much since they do not depend heavily on contracts, according to Dave Janes, chief of the electromagnetic radiation analysis branch. The Office's equipment budget will rise to $1 million in FY82 from zero in FY81. In sum, as Janes put it: "It doesn't look too bad."

Radiation Policy Council: The FY81 budget was cut from $942,000 to an estimated $600,000, and the FY82 budget of $980,000 was eliminated altogether, according to Carl Gerber, RPC director. The budget of the Council, which was set up after the Libassi report was released in 1979, may still be restored, but the decision will lie with the many high-level officials still to be nominated and appointed. While the RPC has focused almost exclusively on ionizing radiation, if it does survive, the budget cuts will no doubt block it from extending its work to non-ionizing radiation.

National Institute for Occupational Safety and Health: Reagan cut the FY81 budget to $64 million and 835 positions from Carter's proposed $83 million and 928 positions. The FY82 budget was further reduced to $59 million and 773 positions. These cuts have yet to be allocated among the various programs, and so their impact on the development of the MW/RF criteria document and Wordie Parr's Physical Agents Effects Branch in Cincinnati is still unknown. Institute priorities will not be set until a replacement for Anthony Robbins, who was fired by HHS Secretary Schweiker March 5, is in office.

Other Agencies: Spokesmen from the **National Bureau of Standards, the Office of Naval Research,** and the **Naval Medical R&D Command** could not say what the impact of the new budget would be. In each case, non-ionizing radiation is not a line item, and the outcome of the budget deliberations is some months away.

BRIEFS

The Interagency Regulatory Liaison Group (IRLG) published Volume II, Issue II of its *Regulatory Reporter,* dated December 1980, outlining EPA, FCC, FDA, NIOSH & OSHA's on-going and future activities on radiation control....The Frequency Management Advisory Council (FMAC) held a meeting in Washington on February 20. On the agenda were the SPS program, long-range spectrum planning, and FCC rules and regulations (Part 15) on radiofrequency devices....Recent contract awards: $254,179 to Bendix Field Engineering of Columbia, MD, from the Naval Research Lab in Washington for "microwave oceanographic sensing system tasks;" on January 30; $646,700 to a joint venture group of A.D. Ring & Associates, Jules Cohen & Associates, and DataWorld, all of Washington, DC, from the FCC for "conversion of AM station directional antenna radiation patterns to standard patterns;" on March 4; $112,134 to UCLA from DOE, Nevada office, for "microwave experimental simulations"; and $5,807,700 to Eaton Corp. in Farmingdale, NY, from NASA for the delivery of two microwave scanning beam landing system ground stations on February 13; $140,784 to the Franklin Research Institute in Philadelphia from the Bureau of Mines for the "study of RF hazards at low and medium frequencies to blasting in underground mines;" on February 18....The Naval Air Development Center in Warminster, PA, is looking for a contractor to design, fabricate, and deliver test panels of radar absorbing materials....Kirtland AFB in New Mexico is soliciting R&D proposals on "theoretical and analytical investigations and testing of equipment and facilities to effects of EMP phenomenon"....The building housing the non-ionizing radiation office of the Naval Medical R&D Command at the National Naval Medical Center in Bethesda was severely damaged by fire last February, forcing the office to move to another building in the compound. The new telephone number is (202) 295-0134.

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UPDATE

VDTs....A bill specifying occupational safety and health requirements for VDT operators has been introduced in the Maine State Legislature. Legislative Document No. 1049 includes requirements for workplace conditions, eye tests and rest periods....*Health Hazards of VDTs? 2, "Some Solutions to the Common Problems",* a second HUSAT conference at Loughborough University, England, was scheduled for March 19. Indirect health effects from VDT use were on the agenda this time....Several presentations on VDTs are scheduled for the May 25–29 American Industrial Hygiene Conference in Portland, Oregon: J.S. Johnson on job stress in office work; R.H. Arndt on telephone operator reactions; and M.S. Gottlieb and co-workers, also on job stress—all from the University of Wisconsin; W. Loew from BRH on radiation emissions; and O. White, Jr. and E.J. O'Connell from Occupational and Environmental Health Analysts and H. Siegel and A. Blayer from the *New York Times* on a mass screening program. For conference information, contact Margaret Jordan, American Industrial Hygiene Association, 475 Wolf Ledges Parkway, Akron, OH 44311, (216) 762-7294.... Canada's Ministry of Labor has issued its report on radiation measurements from the VDTs used by Darlene Weiss, a government employee who is seeking workers' compensation for cataracts she believes are VDT related....WNYC-FM radio in New York City will air a series of five special reports on VDTs April 6–10. Station reporters Tom Vitale and Sandy Tolan interviewed a broad range of experts and workers on the workplace impact and possible health effects of the terminals ....VDTs can cause high-level strain, according to a recent *New York Times* story. On March 24, Edwin McDowell reported that Jimmy Carter "endured several hours of anxiety" when he accidentally erased several manuscript pages from his word processor's memory. The former President is writing his memoirs on a Lanier "No Problem" unit.

Health Effects....A British neurologist believes the flashing display of an electronic space war game, "Astro Fighter", is of a "size, brightness and frequency that can cause seizures in sensitive individuals." In a letter to *Lancet,* the British medical journal (February 28, 1981), D.N. Rushton of the Department of Neurology at King's College Hospital in London wrote that a "multicolored stroboscopic effect, flashing at about 15 Hz," provoked attacks in a 17-year old youth after 20–30 minutes of playing the game.

Around the Country....The Scientific Advisory Panel for New York State's study on the health effects of high-voltage power lines scheduled its first public meeting for March 23 in Albany....The National Park Service of the Department of Interior has prepared a draft environmental impact statement on the Appalachian Power Co. proposal to cross the Blue Ridge Parkway with a 765 kV electric transmission line. Copies available from the NPS, 75 Spring Street, SW, Atlanta, GA 30303, (404) 221-5835....New York City's transit authority cancelled plans to spend more than $500,000 designing a way to protect its ailing subway system from EMP radiation.

LETTERS

To the Editor: Your conclusion that the report of the BENER Task Force*, which I chaired, does not "seem to be a planning tool of the individual agencies involved in bioeffects research," [see *Microwave News,* January 1981, p. 3] is an editorial opinion, not a conclusion based upon careful investigation of the facts.

The process of writing the document was, in and of itself, a planning and coordinating exercise. Note, for instance, statements like the following (which refers to the assessment of occupational exposure):

> BRH will take the lead role in identifying and/or developing appropriate instrumentation and survey techniques. NIOSH has the lead role in the collection of exposure data to support epidemiological studies. OSHA and BRH will continue to conduct field surveys as part of their compliance programs. (p. 21)

Such statements give a clear indication of the roles that the various agencies do or do not plan to assume.

Several new efforts, called for in the task force document, are now underway. For instance, on p. 33, the task force recommended "Future research will need to explore functional and morphologic consequences of NER exposure with an emphasis on the development of quantitative dose-response data." The award of a contract by EPA for conducting such a study was announced on p. 4 of your newsletter. Similarly, the report concluded,

> Developing new or improved instruments for numerically characterizing electric and magnetic fields under near- and complex radiofrequency field conditions represents one of the most important needs in this area and will continue to receive major attention.

At the IMPI symposium, "The Washington Impact: How It Affects Microwave Users;"** Col. Winter announced, "The Navy is developing a personnel dosimeter which will measure and record important variables in an individual's RFR exposure." The National Bureau of Standards is participating in this effort.

I have also been told that the task force report is used by personnel within the federal agencies to demonstrate how their work fits into the larger, more cohesive, national program. In this way, scientists can demonstrate to budget examiners how their work supports the efforts of the larger group and meets the priorities agreed upon by representatives of 16 other federal agencies including the Office of Science and Technology Policy. A number of other uses were specified on p. 5 of the task force report.

In conclusion, I congratulate you on a fine start and thank you for the opportunity to "set the record straight." Finally, I will admit that the report of the BENER Task Force could be an even more effective planning tool if it were to receive a broader distribution.

Howard E. Clark, Ph.D.
Scientific Adviser
Electromagnetic Radiation Hazards
Electromagnetic Fields Division
National Bureau of Standards
Washington, DC 20234

*"Nonionizing Electromagnetic Radiation Safety, A Program of Coordinated Federal Activities Related to Biological Effects of Nonionizing Electromagnetic Radiation (0–300 GHz)," NTIA-SP-80-7, available from Office of Public Information, National Telecommunications and Information Administration, 1800 G Street, NW, Washington, DC 20504.

**Proceedings available from the International Microwave Power Institute, 211 East 43rd Street, New York, NY 10017. $40 for members, $50 for nonmembers.

(continued from p. 1)

wanted me to say there was no connection between Sam's illness and microwaves, but that just wasn't true!"

Speaking from her home in Staten Island, New York, Mrs. Yannon says she expected the appeal victory after the initial favorable ruling by Administrative Law Judge Mary Egan on June 12, 1980. Egan found that Yannon had "sustained an occupational microwave radiation disease...resulting in brain changes, tissue destruction and an acceleration of arteriosclerosis, whose etiology was the exposure to the harmful effects of microwave radiation." Asked about the phone company's latest action she said, "It might take years, but the truth will prevail."

Mr. Angelo Gucciardo, who represented Mrs. Yannon before the Workers' Compensation Board anticipated this appeal and is confident the ruling will be upheld again.

A spokesman for New York Telephone would not comment on the case, beyond confirming the appeal.

RCA Suit

In addition to her case against the phone company, Mrs. Yannon has also brought a third party suit against the RCA Corporation, the manufacturer of relay equipment Yannon used at the Empire State Building. The $3.5 million suit, filed in 1976 in the New York State Supreme Court, Richmond County, charges RCA with breach of warranty and negligence. Mrs. Yannon's lawyer, David Paully, who recommended workers' compensation specialist Gucciardo to her, says the February ruling will be extremely helpful in their action against RCA. This suit, now in pre-trial proceedings, involves a very different burden of proof, however, and may require years to complete.

Neither Donald Dietemann, the RCA attorney handling the case, nor Bower and Gardner, the law firm representing RCA, would comment on the case. However, Mrs. Yannon reports that RCA asked New York Telephone for transcripts of all the hearings in the compensation suit. When the phone company refused to cooperate, Gucciardo agreed to supply them. He also allowed *Microwave News* to review these records, which are otherwise accessible only to concerned parties at the Workers' Compensation Board offices at Two World Trade Center in New York City.

Working At the Empire State Building

During the hearings, Daniel Rieu, a colleague of Yannon's at the phone company, described the 87th floor facilities and the work schedule. (See p. 6 for list of hearing witnesses.) Yannon was there almost continuously from 1954 to 1969. "No one had ever worked up there as long as Sam Yannon," he said. Other employees, including Rieu, had only brief tours at the Empire State Building.

Radiomen spent part of each shift adjusting low power (mostly one watt) transmitters mounted in a separate room on the 87th floor. The number of transmitters operating at any one time varied, but Rieu guessed there were two or three on average, and occasionally as many as 15. Adjustment required removing the rear housing on a unit and tuning the Klystron tube, which converts direct current into RF current. Sometimes a man had to stand in front of a transmitter, but according to Rieu, procedural instructions required cutting off the power before stepping in front of the transmitter dish and into the beam path.

From the hearing testimony, it is unclear exactly what equipment Yannon tuned over the years. RCA transmitters installed after his departure operating at 6 GHz and 11 GHz were similar to previous ones, according to phone company engineer Robert Vuono, but no detailed description of earlier equipment was entered into the record.

Conflicting Diagnoses

Nettie Yannon says her husband began to complain about headaches in 1964. He continued to work his usual long hours, but by 1968 he was persistently plagued by fatigue, eye trouble, sleep problems, forgetfulness, and clumsiness. By the time Dr. Alfredo Santillo of Staten Island examined Yannon in June 1970, he was physically and mentally disoriented. Yannon was unable to write his own name or to recognize his wife, he had very poor vision, and he had lost 30 of his usual 160 pounds. In his testimony before the Board, Santillo said he soon realized that this case "was in a field all by itself." Yannon, at 58, was too young to fit into the category of advanced cerebral arteriosclerosis, a diagnosis Santillo had initially reached.

The phone company terminated Yannon for medical reasons in the same month as Santillo's first examination. Thereafter, his condition rapidly deteriorated. By his death in 1974, Yannon, aged 62, weighed under 70 pounds and had lost almost all sight, memory, speech, and motor coordination. Santillo remained Yannon's doctor until 1973 and finally diagnosed his condition as "chronic brain syndrome with psychotic overtones due to biological brain changes resulting from prolonged exposure to short wave radiation."

New York Telephone has maintained throughout the compensation case the Yannon suffered from retinitis pigmentosa, or pigmentary degeneration of the retina, and pre-senile dementia, probably Alzheimer's disease—a common cause of senility. Neither ailment is known to be associated with microwave radiation. To support this claim, Professor Sol Michaelson and Dr. Robert Herndon from the University of Rochester School of Medicine, and Dr. Paul Tyler, director of the Armed Forces Radiobiology Research Institute, testified for the phone company. "I can find no evidence to suggest that [Yannon's] illness was unusual or mysterious," Herndon said, "and nothing to suggest it was due to microwave irradiation."

Testifying for Mrs. Yannon, Dr. Milton Zaret, a well-known New York ophthalmologist and controversial expert on microwave radiation, supported Santillo's diagnosis. He had no doubt after examining the medical records that Yannon suffered from "an extreme case of microwave radiation sickness, and that it resulted ultimately in his death."

The only neurologist to perform tests on Yannon did not make a definitive diagnosis. In 1969 Dr. Martin Geller, then at St. Vincent's Hospital in Staten Island, examined Yannon. According to Gucciardo, Geller's report suggested looking in-

to Yannon's exposure to microwave radiation for a possible link to his illness. Geller was not called to testify and the phone company's lawyer did not contest Geller's report.

No Exposure Data

The lack of data on the radiation levels at the Empire State Building during Yannon's tenure there, as well as the difficulty of diagnosing his condition, presented problems for both sides of this case. No measurements were taken on the 87th floor prior to Yannon's death. Finally, in 1975 at the request of Mrs. Yannon, Bell Labs helped the Occupational Safety and Health Administration take measurements. But by this time all the equipment Yannon worked on had been replaced. It is now impossible to determine how much radiation Yannon received.

Although the Yannon decision is not the first workmen's compensation award for microwave radiation health damage, Yannon's is the first death attributed to microwaves by a Compensation Board.

Text of Appeal Decision

The self-insured employer seeks review of the Workers' Compensation Law Judge (Referee) decision filed 6/18/80 insofar as findings are made that the decedent sustained a causally related occupational microwave radiation disease within the meaning of Paragraph 30, Section 3, Subdivision 2 of the Workers' Compensation Law, notice and causally related death, and from the awards made pursuant to such findings. The self-insured contends that the decedent suffered from Alzheimer's Disease which was not demonstrated to be occupationally induced and that based on the evidence, the decision in both cases should be rescinded in toto and the claims dismissed.

Case #2308 was indexed on behalf of claimant for exposure to radiation with a subsequent claim filed by widow (case #3602) for death in connection with radiation exposure. Dr. Santillo testified that he treated claimant from 6/24/70 to 2/20/73 with an original diagnosis of premature senility that upon final diagnosis he felt was caused by prolonged exposure to microwaves. Dr. Santillo stated his diagnosis was based on his own questioning and research in medical literature which showed that a hazard exists when working near microwaves, and debilitation can occur. Dr. Santillo stated at time he first saw claimant, he had lost 30 lbs; was unable to care for himself and had almost complete removal of memory and said while there was no test he could carry on the claimant, he felt condition was perhaps very strongly related to microwaves. Dr. Shaner, testifying from N.Y. Telephone Company medical records for the claimant, stated that original diagnosis received from claimant's treating physician was left homonymous hemianopsia with possible disease of the right eye, with a final diagnosis of bilateral encephalopathy (dissection of the brain) degenerative with no evidence whatsoever of any job relationship. Dr. Shaner stated her research showed any exposure severe enough to cause internal damage due to excessive heat would cause so much heat to surface of the skin that person would not stay in the area but admitted her medical experiences were limited to the N.Y. Telephone Company and she was not conversant with any foreign research on the subject of microwave exposure.

D. Rieu, Radioman, testified he worked same job as claimant from May 1955 tuning microwave equipment varying from 2/3 to over 15 microwave lengths at one time. Rieu testified that one would have to go up to unit and open a door to tune the unit inside or walk between a glass area and the dish to fix a feedhorn. Rieu stated that claimant worked an exceptionally long number of years compared to other craftsman in the group; that claimant also worked a good bit of overtime during that time; that he noticed a deterioration of sight, hearing and coordination in claimant and said that Radiomen are issued a sheet cautioning them about the hazards of the equipment. Dr. Santillo on retestimony stated nothing he heard of Mr. Rieu's testimony causes him to change his opinion.

R. Vuono, Sr. Staff Engineer, testified that he had over 24 years experience with microwave irradiation; that he is experienced with physical set up of the facility and that there is a difference between emission and exposure; pointed out the range of emission (power output) from radar (high) to microwave radio used in T.V. pick-up (low); stated that the equipment in use would not produce a power output greater than 1.5 watts and that studies in the U.S. show there is no cumulative effect of even 10 milliwatts and continuous exposure.

C. Hinson, Service Foreman, testified that he worked with claimant as a co-worker; agreed that claimant would be close to a machine about 2-3 times a day, 20 minutes each time; that claimant would be in same room as transmitters about one-half of each day and that for each signal received a transmitter was used. Hinson testified that shields were removed when they were being adjusted; that he did not believe levels that were transmitted could damage one's body but admitted he would not stand in front of one.

O. Tamuzs, NYS Sr. Radiological Health Specialist, testified his testing found radiation levels within Federal guidelines permitted (10 milliwatts per square centimeter permitted; 9 milliwatts per square centimeter found), but admitted some of the information his report was based on was given by Phone Company personnel and that machines were not working except for his testing purpose.

Dr. Zaret testified that in his field of ophthalmology, he performed studies for various departments of the U.S. Government on the effects of exposure of microwaves on the ape, primates, etc. Dr. Zaret testified that the standard accepted by the Federal Government had become void in 1971 and revalidated without further study in 1973; that Soviet standard is around 1,000 times less than U.S. standard and that studies involving microwaves and apes showed some monkeys were being killed at lower intensity than anticipated. Dr. Zaret stated, in answer to a hypothetical question incorporating claimant's work history, activities and autopsy findings, that claimant suffered an extreme case of microwave or radiowave sickness which resulted ultimately in his death. Dr. Zaret stated direct action is one of the two ways microwave radiation can produce the kind of brain damage claimant exhibited and said there are Soviet and American studies documenting this. Dr. Zaret, on retestimony, stated that while claimant's physician's diagnoses were similar in some degree to other conditions, he agreed with Dr. Geller's findings of degenerative disease attributed in some form to microwave exposure.

Dr. Michaelson testified that he is a Doctor of Veterinary Medicine and a Professor of Radiation, Biology and Biophysics; that based on his research with the biologic effect of microwave exposure that there is no reason to believe there is a cause/effect relationship between the injury and microwave frequency exposure. Dr. Michaelson stated safety factor standards were based on some information related to functional change in animals and said that his opinion was based on his review of those records and depositions made available to him. Dr. Michaelson testified he disagreed with the findings of the Bureau of Radiological Health which analyzed and criticized his findings because of lack of adequate evidence to substantiate the conclusions.

Dr. Hendon testified he reviewed claimant's records and concluded that he suffered from retinitis pigmentosa and pre-senile dementia, probably Alzheimer's Disease. Dr. Hendon stated that based on his reading and research work, he finds no material indicating a relationship between microwave exposure and Alzheimer's Disease or cataract

(continued p. 6)

YANNON AWARD

(continued from p. 5)

formation or causal relationship between claimant's work and his disability or death. Dr. Hendon stated he was associated at same school as Dr. Michaelson; was suggested by him as a consultant in the case and had discussed it with him prior to testifying and admitted he had no personal exposure to people who were alleging exposure to or damage from microwaves.

Dr. Tyler testified that he is qualified in radiobiology as a specialist; that he reviewed all records made available to him and agreed with autopsy report which gave immediate cause of death as bilateral lower, low bronchial pneumonia with secondary findings of pre-senile dementia, retinitis pigmentosa and generalized arteriosclerosis. Dr. Tyler stated that retinitis pigmentosa is found with some degenerative diseases of the brain but he found no medical literature associating it with pre-senile dementia; that he finds no relationship between claimant's microwave exposure and diseases found and that he disagrees with Dr. Zaret's diagnosis. Dr. Tyler stated that his clinical impression was claimant had Alzheimer's Disease although it was possible there were two other types of brain disease similar to the above. Dr. Tyler admitted that there was a book in print critical of himself and accusing him of conducting a coverup for Defense Department in relation to microwave exposure and that Dr. Geller, a neurologist, did not diagnosis Alzheimer's Disease in the claimant. Dr. Michaelson, on retestimony, identified studies done by an ad hoc review committee on which he sat which found part of Dr. Zaret's experiments as adequate and part not well done. Dr. Michaelson admitted that he had been contacted by claimant's widow and had recommended that claimant's attending physician would be in best position to give an answer as to causal relationship.

Upon review the Board Panel finds based on the entire record and particularly the testimony of D. Rieu and Drs. Santillo and Zaret, that there was a direct causal relationship between decedent's exposure to microwave radiation during his employment and his subsequent disability all of which ultimately resulted in his death. The Board Panel further finds that the decedent sustained an occupational microwave radiation disease within the meaning of Section 3, Subdivision 2, Paragraph 30 of the Workers' Compensation Law and that his death was causally related to his occupation.

Accordingly, the Workers' Compensation Law Judge (Referee) decision filed 6/18/80 is AFFIRMED and the case is continued.

All concur.

Francis J. Griffin Daniel J. Higgins Ferdinand Tremiti

Workers' Compensation Board

New York City February 26, 1981

Witnesses at the Yannon Workers' Compensation Board Hearings

(In order of appearance.)

Dr. Alfredo Santillo, Staten Island, New York

Dr. Alice Shaner, Medical Specialist, New York Telephone Company

Daniel Rieu, Radioman, New York Telephone Company

Robert Vuono, Senior Staff Engineer, New York Telephone Company

Charles Hinson, Service Foreman, New York Telephone Company

Olgerts Tamuzs, Bureau of Radiological Health, White Plains Regional Office, New York State Department of Health

Dr. Milton Zaret, Scarsdale, New York

Dr. Sol Michaelson, Professor of Radiation Biology and Biophysics, University of Rochester

Dr. Robert Herndon, Center for Brain Research, University of Rochester

Dr. Paul Tyler, Director of Armed Forces Radiobiology Research Institute

LITIGATION

Collecting information on current and past cases involving microwave radiation is difficult: most defendant companies and plaintiff attorneys refuse to comment on on-going litigation, and many cases are settled out of court, leaving few records. Filed complaints are a matter of public record and many plaintiffs and defendants were willing to confirm official details.

A spokeswoman for Western Electric, which has three cases pending, issued a statement to *Microwave News,* stating in part: "We will defend ourselves, and deny the equipment was hazardous and that the equipment caused the injury." She would not comment, however, on the Imoto case, which was settled out of court, saying that this was company policy for cases where more than one company was involved.

The litigation survey presented below was collected during the last couple of months. While we have no reason to doubt its accuracy, because of the secrecy surrounding these matters, we advise the interested reader to check with the attorneys and corporations listed in the appended directories.

Air Traffic Controllers: Young has settled four claims of air traffic controllers with job-related cataracts under the Federal Employees' Compensation Act, winning substantial awards. Eight more cases are pending, seven cataract injuries and one non-operable eye disability. Young's clients are from all over the country.

Ovens: Two women, who claim to have been burned by a microwave oven while working in a restaurant in Spokane, Washington, are suing Litton for $3 million. They are represented by Deglow and Belli.

Moscow: A number of suits have been filed against the US government over the irradiation of the US embassy in Moscow. Two attorneys believed to be handling some of these cases are Hills (see *Microwave News,* January 1981) and Peery.

Radar: Suits over microwave-related injuries are the most common type of litigation. Among the plaintiffs were and are:

- Robert Barbee, a former radar repairman with cataracts, represented by Leavitt, filed a complaint against Bendix, GE, Raytheon, and RCA in federal court in Nevada in November 1979, and against Western Electric in March 1980. Barbee is seeking $500,000 in damages and $5 million in punitive damages.
- Stanley Burgis, a former M-33 radar technician represented by Stopford, alleges microwave-induced cataracts and retina damage in a products' liability claim against Western Electric filed in Pennsylvania state court in summer 1980 (later moved to federal court in eastern Pennsylvania). According to Stopford, Burgis is now blind.
- Robert Engell, a TACAN radar repairman from 1964 to 1975, represented by Moller and Shafner, alleges microwave-induced pancreatic cancer and endocrine disorders. The $4.5 million suit against General Dynamics, ITT, Raytheon, Rockwell, Teledyne, and Varian was filed in federal court in Hartford in 1977 and is still in discovery. A jury trial is due to begin soon.
- William Farnham, represented by Ellison, alleges microwave-induced cataracts sustained aboard USAF aircraft in a complaint against Hughes, Northrop, and Rockwell filed in state court in San Francisco in October 1978.

- Leo Foley, represented by Ellison, alleges radar induced cataracts while aboard an EC-121 constellation in a complaint against GE, Hazeltine, Hughes, Lockheed, Philco-Ford, Raytheon and Telerad-Lionel filed in state court in Sacramento in April 1979.
- Tobias Imoto, a former radar maintenance man represented by Davidson, settled a case out of court against GE, Raytheon, and Western Electric, alleging cataracts as well as skin and brain disorders.
- Roy Josey, represented by Sweeney, developed bilateral posterior subcapsular cataracts after working on radar development at Elgin AFB for Bendix. The AF settled out of court for $171,000 in 1971, with Bendix making a substantial contribution. Josey also won a workers' compensation claim for about $20,000. Five years later Josey, aged 38, died of a brain tumor.
- Ronald Karras, a former radar repairman represented by Phillips, suffers from multiple, serious injuries. While there are reports that this case was just settled out of court, repeated calls to Phillips for confirmation were not returned.
- Joseph Kerch, a pilot for Air America from June 1965 to June 1974, has a case represented by Shafner before a Department of Labor administrative law judge alleging a radiant energy cataract as well as hearing loss. Briefs were filed in December 1980.
- Glenn Lough, represented by Ellison, alleges radar-induced cataracts in a complaint filed against ITT, Raytheon, Sperry Rand, and Western Electric in state court in San Francisco in late 1978.
- Don Turner, represented by Ellison, alleges cataracts sustained aboard US aircraft in a complaint against Hughes, Lockheed, McDonnell Douglas, and Northrop filed in state court in San Francisco in May 1978. The case has since been moved to Los Angeles.

In addition, Spears has just abandoned a case against RCA and Western Electric, alleging radar-induced ocular damage. Leonard and Lyons are both considering bringing legal action. Leonard represents a former B-47 crew chief, who believes he was badly injured by an electronic countermeasure jamming device. Lyons's client is a former EC-121 radar operator, who has assorted serious injuries.

Lyons is interested in forming a bar group for the attorneys representing the victims of radar and microwave injuries.

CORPORATE DEFENDANTS IN MICROWAVE CASES

Air America
Bendix
Ford Motor (Philco Division)
General Dynamics
General Electric
Hazeltine
Hughes Aircraft
ITT (ITT Electron Tube Division)
Lionel (Telerad Division)
Litton
Lockheed
McDonnell Douglas Aircraft
Northrop Aviation
RCA
Raytheon
Rockwell International
Sperry Rand
Teledyne
Varian Associates
Western Electric

DIRECTORY OF PLAINTIFF ATTORNEYS WORKING ON MICROWAVE CASES

Melvin Belli
722 Montgomery Street
San Francisco, CA 94111
(415) 981-1849

Keith Davidson
Louis Davidson & Associates
111 West Washington Street
Chicago, IL 60602
(312) 372-5124

Riner E. Deglow
The Grace Building
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Spokane, WA 92201
(509) 328-6770

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1005-1045 Sansome Street
San Francisco, CA 94111
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Israel, Adler, Ronca & Gucciardo
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(301) 627-8170

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229 Las Vegas Boulevard South
Las Vegas, NV 89101
(702) 384-3963

Richard Leonard
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5 Prospect Street
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(603) 883-0928

James F. Lyons
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225 Main Street
PO Box 368
Bonners Ferry, ID 83805
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99 Park Avenue
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Staten Island, NY 10301
(212) 447-6820

Charles E. Peery
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2000 IBM Building
Seattle, WA 98101
(206) 623-7580

John Phillips
180 North LaSalle Street
Room 2630
Chicago, IL 60601
(312) 346-4262

Matthew Shafner
O'Brien, Shafner, Bartinik, Stuart & Kelly
Bridge Street at Route One
PO Drawer 929
Groton, CT 06340
(203) 445-2463

Michael Spears
Swofford, Proliakoff, Spears & Skeen
251 Magnolia Street
Spartanburg, SC 29301
(803) 582-5472

Jeffrey M. Stopford
Litvin, Blumberg, Matusow & Young
210 West Washington Square
Philadelphia, PA 19106
(215) 925-4500

John E. Sweeney
800 West First Street
Plaza Level
Los Angeles, CA 90012
(213) 620-0401

Robert G. Young
Webb, Young, Daniel & Murphy
1901 Peachtree Center, Cain Tower
229 Peachtree Street, NE
Atlanta, GA 30303
(404) 522-8841

PUBLICATIONS

BOOKS

A.J. Baden Fuller, *Microwaves, An Introduction to Microwave Theory and Techniques,* second edition (Elmsford, NY: Pergamon), 1979, 326 pp., $30 hardbound, $13 paperback.
This revised and expanded edition now includes up-to-date information on semiconductor oscillations and amplifiers as well as a chapter on stripline devices.

Charles Panati and Michael Hudson, *The Silent Intruder, Surviving the Radiation Age* (Boston, MA: Houghton Mifflin), 1981, 208 pp., $9.95
Using a question and answer format, Panati, a radiation health physicist and former Newsweek *science editor, and Hudson, a* Newsweek *staffer, discuss the various types of radiation and their health effects. A chapter on RF and microwaves and one on ELF review some of the work of Adey, Becker, Frey, Marha, Schwan, and Zaret in language easily accessible to a general audience.*

REPORTS AND PERIODICALS

BRH

Carl I. Vassar, Jr., et al., *Report of State and Local Radiological Health Programs,* Fiscal Year 1979, Bureau of Radiological Health, October 1980, No. FDA 81-8034.

ELF

Roland J. Starkey, Jr., "The Renaissance in Submarine Communications, Part III, The ELF Odyssey 1958-1979," *Military Electronics/Countermeasures,* January 1981, p. 26.

Ovens

"Microwave Ovens," *Consumer Reports,* March 1981, p. 128. *A feature report including brand name ratings.*

Power Lines

John A. Molino, et al., *Psychoacoustic Evaluation of Transmission Line Audible Noise: Building Attenuation Effects, Methodology Comparison, and Field Study Feasibility,* January 1, 1979 to December 31, 1979, Volume 1, Department of Energy, No. DOE/RA/29323-1.

Stephen Shoenholz, Joel Ray, "High Power Lines," *Bulletin of the Atomic Scientists,* February 1981, p. 59. *An exchange about an earlier article by Ray.*

RF Heaters

Guide for Submission of Information on Industrial Radiofrequency Dielectric Heater and Sealer Equipment Pursuant to 21 CFR 1002.10 and 1002.12, Bureau of Radiological Health, November 1980, FDA 81-8137.

Report on the Survey of Radiofrequency Heaters, Environmental Health Directorate, Health Protection Branch, Ottawa, 1980, 80-EHD-47. Available from the Information Directorate, Minister of National Health and Welfare, Brooke Claxton Building, Ottawa, K1A 0K9.

VDTs

Colin Mackay, *Human Factors Aspects of Visual Display Unit Operation,* Health and Safety Executive, London (UK): Her Majesty's Stationery Office, 1980.

SHORT COURSES

- May 5-8, *Modern Antenna Measurements,* Holiday Inn of Bethesda, MD. Contact: Technology Service Corporation, 8555 16th Street, Silver Spring, MD 20910, (301) 565-2870 or 2950 31st Street, Santa Monica, CA 90405, (213) 450-9755. Fee: $525.

- May 27-29, *Microwave Technology and Applications for Industry,* Central New Jersey, Center for Professional Advancement, in conjunction with the International Microwave Power Institute. Contact: Mrs. Edith Webb, P.O. Box 964, The Center for Professional Advancement, East Brunswick, NJ 08816, (201) 249-1400. Fee: $390 for two days, $560 for three days.

- June 9, *Measurements for Microwave Safety and Compliance,* Royal York Hotel, Toronto (immediately prior to the International Microwave Power Institute annual meeting). Contact: IMPI, 211 East 43rd Street, New York, NY 10017, (212) 867-4659. Fee: $125 IMPI members, $150 non-members.

- July 6-8, *Diagnostic and Therapeutic Applications of Microwave Technology,* George Washington University. Contact: Continuing Engineering Education Program at GWU, Washington, DC 20052, (202) 676-6106 or (800) 424-9773 toll free. Fee: $595.

- August 17-21, *Ultrasound, Microwaves, Laser, and Ultraviolet: Biophysical and Biological Basis, Applications, and Hazards in Medicine and Industry,* Massachusetts Institute of Technology. Contact: Office of the Summer Session, Room E19-356, MIT, Cambridge, MA 02139. Fee: $725.

Navy May Scrap Project ELF

(continued from p. 1)

Weinberger. Crutchfield said that the decision was based on the advice of Chief of Naval Operations Thomas Hayward. A spokesman for the Navy would only say that the Secretary of the Navy had sent his recommendation to the Secretary of Defense, and that the final decision would be made by the President.

In a 1979 report, the General Accounting Office recommended that the project be scrapped. And in its FY81 Department of Defense authorization last August, Congress required the President to report back on the Administration's plans for the deployment of Project ELF or its cancellation by April 1, 1981.

More than $100 million have been spent on the ELF project, and another $500 million would be needed to complete it.

MICRO WAVE NEWS

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Microwave News is conducting a survey of microwave-related litigation. If you have already received our questionnaire, please return your completed form as soon as possible. If you would like to participate, please contact us for more information. Survey results will appear in the newsletter this spring.

Microwave Oven Cataract Trial Adjourned—All Parties Silent

After one day of a jury trial, in which two legal secretaries sought damages for radiation-induced cataracts from an Amana microwave oven, the attornies for both sides agreed to an adjournment. None of the parties would comment on the resolution of the case.

According to the clerk at the US District Court in Providence, RI, a "consent decree was entered for the defendant on March 22, and the case was dismissed." But no further details on the nature of the agreement could be discovered.

Mark Decof of Decof and Grim in Providence, RI, representing the plaintiffs, refused to discuss the case. Steve Gustafson, general counsel for Amana Refrigeration Co. in Amana, IA, would only say that it was "company policy not to discuss litigation, especially litigation of this type."

Dolores Delsesto and Lynn Spinella had been seeking $3 million from Amana; they claimed they had developed cataracts from microwave radiation leaking from a Radarange oven. (See *MWN,* November 1981.) Delsesto had two cataracts and Spinella one. Dr. Milton Zaret, an ophthalmologist in Scarsdale, NY, had concurred with another diagnosis that the cataracts had been caused by "radiant energy."

The two women, both in their 30's, worked as legal secretaries for the firm of Adler, Pollack and Sheehan in Providence. The lunch room at the office had an Amana oven, Model RR-4D operating at 2450 MHz and purchased in 1975. The employees had assigned seats in the room, with Delsesto and Spinella closest to the oven.

The oven was tested for leaks by Dr. Marc Richman of the mechanical engineering department at Brown University. His measurements indicated

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NMR Indicates Rabbit's Lens May Be Wrong Model for Human Lens

The biochemistry of the rabbit's eye is significantly different from that of the human eye, according to recent studies of phosphorus-containing metabolites in the lens. The findings could have a profound impact on the study of cataract formation due to microwave radiation.

Using phosphorus-31 nuclear magnetic resonance (NMR), researchers from the Chicago College of Osteopathic Medicine have studied the enzymatic processes that regulate the metabolism of the lens. They conclude: "Overall results indicate that the cat and dog lenses most closely resemble the human lens in that they have the fewest number of significant metabolite differences, four and three respectively, relative to the human. The rabbit and cow lenses are the least similar to the human with 10 and 12 significant metabolite differences, respectively."

Rabbits' lenses have long been used to study cataract formation in humans. Drs. Stephen Kopp, Thomas Glonek and Jack Greiner report in the March 26 *Science* that their previous studies had indicated a pronounced difference between rabbit and human lenses—greater than they had anticipated—and

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HIGHLIGHTS

OSHA Stops Enforcement of RF/MW Hazards

According to new enforcement guidelines, Occupational Safety and Health Administration (OSHA) inspectors can no longer issue citations to companies for exposing their workers to radiofrequency and microwave (RF/MW) fields of greater than 10 mW/cm^2.

New instructions, dated March 17, from OSHA's Office of Compliance Programming and approved by OSHA Administrator Thorne Auchter specify that the general duty clause "may not be used to enforce 'should' standards." The 10 mW/cm^2 RF/MW standard was found to be an "advisory" or a "should" standard in the *Swimline Corporation* case (decided in 1975 and affirmed in 1977) and, as such, was ruled unenforceable. Occupational standards for RF/MW are therefore in limbo; the 10 mW/cm^2 standard is unenforceable and OSHA will not enforce the standard under the general duty clause.

The general duty clause is Section 5(a)(1) of the Occupational Safety and Health Act, which provides that each employer shall furnish employees with a work place that is free of recognized hazards.

Officials at OSHA confirmed that the enforcement of nonionizing radiation standards was now "up in the air." Harold Engel of the Solicitor's Office said that OSHA was in the process of deleting all "should" standards and that the effort could be accomplished in about a year. Work on a new standard continues; a spokesman from the Office of Physical Agents Standards said that the estimated schedule for publishing an advanced notice of proposed rule making in the *Federal Register* is now the early fall.

Massachusetts Proposed Standard Delayed

The Massachusetts ad hoc committee on radiofrequency/microwave radiation has delayed issuing its draft guideline for general public exposures. At a March 26 meeting, the committee extended the peer review period for its working draft 90 days to June 15 and cancelled a public hearing scheduled for April 29. Release of an official draft is now tentatively set for late August, with public hearings to follow in the fall.

The guideline sets a 200 uW/cm^2 limit for public exposure to 30-300 MHz radiation, more stringent by a factor of five than the new ANSI standard. Like its ANSI counterpart, the Massachusetts draft is frequency dependent, with higher exposure limits at other frequencies. (See *MWN*, March 1982.)

According to Robert Watkins of the state's Radiation Control Program, the 20 or so comments received so far are generally favorable. The Canadian Department of Health and Welfare has suggested a safety factor of 10, while a couple of reviewers have recommended adopting ANSI's 1 mW/cm^2 limit. The largest number of comments have addressed registration and exemption issues.

In a telephone interview, Professor A.W. Guy of the University of Washington, Seattle, said that the Massachusetts plan for combining a lower exposure limit with a longer averaging time for measuring exposures was a "clever" way of dealing with the chronic exposure problem. Guy chaired the panel that drafted the new ANSI standard.

Several experts contacted by *Microwave News* feared that the Massachusetts action was part of a trend toward independent state and local regulation which could create problems for manufacturing and communications companies. In fact, Arizona has begun work on a guideline that, said the director of the state's Radiation Regulatory Agency, Charles Tedford, "won't necessarily be the same as Massachusetts'."

Guidelines for Exposure to NMR Systems

The Bureau of Radiological Health (BRH) has issued guidelines to help evaluate the risks from nuclear magnetic resonance (NMR) devices in clinical trials. Exposure below the following levels is believed to be free of unacceptable risk. *Static (DC) Magnetic Fields:* Whole or partial body exposures of 2 tesla. *Time-Varying Magnetic Fields:* Whole or partial body exposures of 3 tesla/second. *Radiofrequency Electromagnetic Fields:* Exposure to RF fields that result in a specific absorption rate (SAR) that exceeds 0.4 W/Kg as averaged over the whole body or 2 W/Kg as averaged over any one gram of tissue.

Under Food and Drug Administration (FDA) rules, medical devices can qualify for an investigational device exemption (IDE) for use in trials if they do not present a "significant risk." By meeting these new BRH guidelines, NMR devices can win exemption from a local institutional review board. A finding of significant risk does not mean the device is too hazardous for clinical trials, only that an IDE must be submitted to the FDA for approval.

BRH's Dr. Whit Athey explained that the guidelines "are not meant to be general safety standards." They simply indicate permissible levels for clinical trials, he said.

The guidelines are modeled after those recently published by Professor Thomas Budinger of the University of California, Berkeley ("Nuclear Magnetic Resonance (NMR) *In Vivo* Studies: Known Thresholds for Health Effects," *Journal of Computer Assisted Tomography, 5,* 800, 1981), and by the National Radiological Protection Board (NRPB) ("Exposure to Nuclear Magnetic Resonance Clinical Imaging," *Radiography, 47,* 258, 1981). The BRH proposal for time varying magnetic fields is more stringent than that of the NRPB, which recommends a limit of 20 tesla per second for pulses of 10 msec or less. BRH's Athey explained that the bureau had opted to set one level to cover all contingencies, including variations in waveforms and repetition rates.

The guideline for partial body exposure to RF fields is stricter than the new ANSI standard which specifies an allowable SAR of 8 W/Kg. BRH notes that the ANSI standard is "based on the assumption that the far-field or near-field exposure produces a localized maximum in SAR." But in the case of NMR coils, "the peak SAR is deposited regionally in a layer of near-surface tissue that extends completely around the body. Therefore, a lower level of 2 W/Kg was chosen as the limit on peak SAR to prevent overloading the thermoregulatory system in any region of the body."

A number of NMR clinical trials are underway across the country. To date, there have been no reports of unanticipated effects from use of the machines.

For a copy of the guidelines contact: Robert Phillips, HFX-460, BRH, Rockville, MD 20857, (301) 443-3426. See also: 47 *FR* 11972, March 19, 1982.

Bioeffects Literature Digest Published

The National Telecommunications and Information Administration (NTIA) has resumed publication of its quarterly compilation of the bioeffects literature, *Biological Effects of Non-Ionizing Electromagnetic Radiation: A Digest of Current Literature.* This issue, Volume VI No. 1, covers July-

September 1981 and is the first to appear since work on the digest was suspended in September 1980 (after Volume V No. 1) because of lack of funds. A catch-up volume for the intervening period, ending June 1981, is at the printer now and should be available soon. Volume 6 No. 2 is due out in June.

The digest includes full citations and abstracts for current research as well as author and subject indexes. Continued publication of the series, which began in 1974, is very uncertain. There are no funds for it in the present NTIA budget.

The new volume is available from the National Technical Information Service (NTIS), Springfield, VA 22161. At press time its NTIS accession number and price had not been assigned, but it can be ordered by its NTIA number, NTIA-CR-81-15. For more information contact: Eugene Zucker, acting executive secretary of ERMAC, NTIA, 1325 G Street, NW, Washington, DC 20005, (202) 724-3323.

Power Line Studies Chosen in NY

The New York State Overhead Power Lines Project's Scientific Advisory Panel has recommended funding 15 studies on the health effects of power line radiation. These two- and three-year studies will receive the bulk of the project's $3.5 million research budget.

The panel will initiate two other efforts to confirm and to replicate Dr. Nancy Wertheimer's epidemiological study that found a correlation between 60 Hz magnetic fields and the incidence of childhood cancer. ("Electrical Wiring Configurations and Childhood Cancer," *American Journal of Epidemiology, 109,* 273, 1979.) First, $25,000 will be allocated to put Wertheimer's data into a machine-readable format suitable for re-analysis. Second, the state will soon issue a request for proposals for a replication study slated to cost about $500,000.

The advisory group has chosen three engineering experts to assist with the dosimetry in the various studies. They are: Dr. Don W. Deno of General Electric Co., Pittsfield, MA; Dr. Stephen D. Umans of MIT, Cambridge, MA; and Dr. Anthony R. Valentino of Argonne National Laboratory, Argonne, IL.

Dr. Maria Reichmanis, the scientific research coordinator for the project, resigned as of April 1. Michael Rampola of the state's Department of Health will fill in until a replacement is found.

Recommended Awards

Genetic, Cytogenetic, Teratogenic and Reproductive Studies: Dr. Maimon M. Cohen; University of Maryland School of Medicine, Baltimore, MD; $162,813; 2 years; *In Vitro* Genetic Effects of Electromagnetic Fields. Dr. Gordon K. Livingston; University of Utah Medical Center, Salt Lake City, UT; $151,088; 2 years; Reproductive Integrity of Mammalian Cells Exposed to 60 Hz Electromagnetic Fields. Dr. Arland L. Carsten; Brookhaven National Laboratory, Upton, NY; $384,864; 3 years; Mutagenicity and Toxicity of Electric and Magnetic Fields.

Cell and Organ Culture Studies: Dr. Wendell D. Winters; University of Texas Health Science Center, San Antonio, TX; $125,668; 2 years; Biological Functions of Immunologically Reactive Human and Canine Cells Influenced by *In Vitro* Exposures to Electric and Magnetic Fields. Dr. Ross W. Gundersen; University of Wisconsin-Parkside, Kenosha, WI; $122,374; 3 years; Effects of 60 Hz Electromagnetic Fields on Calcium Efflux and Neurotransmitter Release. Dr. Prasanta K. Basu; University of Toronto, Toronto, Ontario; $134,380; 2 years; Biological Effects of Extremely Low Frequency Electric and Magnetic Fields on the Ocular Tissues; An *In Vitro* Study. Dr. Gideon A. Rodan; University of Connecticut Health Center School of Dental Medicine, Farmington, CT; $106,513; 2 years; Effect of 60 Hz Electric and Magnetic Fields on Neural and Skeletal Cells in Culture.

***In Vivo* Animal Physiology and Pathophysiology:** Dr. Frank M. Sulzman; State University of New York at Binghamton, Binghamton, NY; $134,161; 3 years; Effects of Electromagnetic Fields on Circadian Rhythms.

Animal and Human Neurobiology: Dr. Amos G. Gona; University of Medicine and Dentistry of New Jersey, Newark, NJ; $118,306; 3 years; Effects of 60 Hz Electric and Magnetic Fields on the Developing Rat Brain. Dr. Jonathan R. Wolpaw; New York State Department of Health, Albany, NY; $251,785; 3 years; Chronic Effects of 60 Hz Electric and Magnetic Fields on Primate Central Nervous System Function. Dr. Klaus-Peter Ossenkopp; University of Western Ontario, London, Ontario; $32,993; 2 years; ELF Low Intensity Magnetic Fields and Epilepsy.

Animal and Human Behavior: Dr. John R. Thomas; Naval Medical Research Institute, Bethesda, MD; $110,390; 2 years; Investigation of Potential Behavioral Effects of Exposure to 60 Hz Electromagnetic Fields. Prof. Kurt Salzinger; Polytechnic Institute of New York, Brooklyn, NY; $199,365; 3 years; Biological and Behavioral Effects of ELF.

Multidisciplinary Human Studies with Controlled Exposure Conditions: Dr. Charles Graham; Midwest Research Institute, Kansas City, MO; $375,000; 2 years; Influence of 60 Hz Fields on Human Behavior, Physiology and Biochemistry.

Epidemiology of Human Populations: Dr. Samuel D. Kaplan; SRI International, Menlo Park, CA; $280,958; 2 years; Historical Cohort Mortality Study of Electric Utility Workers Exposed to Strong Electromagnetic Fields.

Miscarriage Cluster in Toronto

A cluster of miscarriages among employees in Toronto's Old City Hall is being investigated by the Ontario government. In 1980-1981, 10 out of 19 pregnant women working for the provincial Ministry of the Attorney-General had miscarriages; the 10 included all four of the pregnant women working in an office with two video display terminals (VDTs). All of the women used two photocopy machines located in a separate room. The ministry employs approximately 150 women in the office complex.

At the attorney-general's request, the Ontario Ministry of Health will soon appoint Dr. John Harkins, a physician at the University of Toronto, to determine if the ratio of miscarriages to pregnancies is statistically significant and if further investigation is necessary. Meanwhile, the Ministry of Labor has tested the VDTs for radiation leaks and has collected air samples from the offices to check for abnormal levels of ozone and toners and other potentially hazardous substances. According to a spokesman for the Ministry of Labor, Harkins could finish his investigation by early May.

Union officials are not satisfied with the government action. Robert DeMatteo of the Ontario Public Service Employees Union has called for a "thorough and truly independent investigation to resolve office safety issues," rather than a "statistical manipulation" that could dismiss a potential problem. At the Communications Workers of Canada, Gary Cwitco agreed that an epidemiology is needed, adding that "at this point simply testing the VDTs is not conclusive proof of their safety." US and Canadian government experts are of the opinion that the five other recently reported clusters of pregnancy problems among clerical workers were probably statistical quirks. (See *MWN,* November 1981 and January/February 1982.)

Dr. Anthony Muc of the labor ministry's Radiation Protection Service reported that the radiation levels from the two

VDTs "conform to levels seen in all other responsible testing." He said, "There is no adequate indication, and I don't think there will be, of any link between alleged clusters and something in the working environment."

The government's investigation began after minority party members of the provincial legislature questioned Labor Minister Russell Ramsay and Attorney-General Roy McMurtry on March 15 about the miscarriages. The situation, which has received national television coverage in Canada, has prompted the legislature's Richard Johnson to reintroduce his VDT safety bill, which failed to reach committee earlier this year. (See *MWN,* December 1981.)

According to DeMatteo, workers first told a supervisor at the ministry about the miscarriages last November. At the same time, the workers complained that using the photocopy machines, located in an unvented room, caused respiratory problems.

BRH Reorganization Moves Forward

The reorganization of the Division of Biological Effects (DBE) at the Bureau of Radiological Health (BRH) has taken another step forward with the announcement that four new branches have been approved by the parent agency, the Food and Drug Administration (FDA). Last year BRH revealed that it would transform DBE into the Division of Risk Assessment to reflect a greater emphasis on risk analysis (see *MWN,* December 1981). This change requires approval from FDA's parent, the Department of Health and Human Services, and is not expected until the end of the year.

In a shift from past practice, the four branches are arranged by radiation type rather than by biological or medical area. The new branches and their chiefs, who are expected to be named soon, are: Electromagnetic Radiation, Dr. Mays Swicord; Light, Dr. Elizabeth Jacobson; Ionizing Radiation: Dr. Richard Chiacchierini; and Ultrasound, Dr. Melvin Stratmeyer.

The electromagnetics branch will have responsibility for non-ionizing radiation with a staff of 10–12 professionals—significantly larger than before. The ultrasound program has also been increased.

EISs Out for Proposed Satcom Stations

RCA

A draft environmental impact statement (EIS) for RCA's proposed satellite communications station on Bainbridge Island, WA, has been released for public review. The facility would relay commercial communications to and from the Seattle area.

The two-volume document, prepared at RCA's expense by CH2M Hill, Inc., in Seattle, contains lengthy discussions of the bioeffects of microwave radiation prepared by Professor A.W. Guy of the University of Washington, Seattle, Dr. Don Justesen of the VA Medical Center in Kansas City, MO, and the Battelle Human Affairs Research Center in Seattle.

The maximum public radiation exposure next to the 7.9 acre site is estimated to be 4.14 uW/cm² with 14 transponders on each of three antennas in use. RCA wants to start with only two 12-meter parabolic antennas, each with three transponders in use, though, which drops potential exposure to 0.228 uW/cm².

Comments on the EIS are due by April 14. Officials at the Kitsap County Department of Community Development hope to publish a final EIS around mid-May. The county hearing examiner and the Board of County Commissioners will then hold public hearings before the board issues a final ruling. Rick Kimball of the development department said a decision could come as early as mid-August. Either side could then appeal the decision to the courts.

A draft EIS for an alternative site in a forest north of Bainbridge Island was released on March 31, with comments due by May 5. RCA opted to process two separate proposals simultaneously after the Bucklin Hill Neighborhood Association, led by Jerome Hellmuth, delayed construction plans for Bainbridge by successfully arguing that the county should require an EIS. (See *MWN,* October 1981.)

Copies of both draft EISs are available from CH2M Hill. After initial supplies are gone, the company will charge ten cents per page. Contact: Signe Gilson, CH2M Hill, Bellevue, WA 98105, (206) 453-5000.

Hughes Aircraft

The National Satellite Services, Inc., a subsidiary of Hughes Aircraft Co., has filed a draft EIS with the City of New York on its proposal to build a satcom station in the Spring Creek section of Brooklyn, NY. The draft EIS, released March 5, was prepared for Hughes by Fred Hart Associates of New York, NY, and has already been favorably reviewed by the city's Department of Environmental Protection and Department of Health.

The Hughes station would be part of its $20 million domestic communications satellite network known as the "Galaxy System." The Brooklyn proposal calls for building a total of seven 33-foot antennas operating at 6 GHz (with a 4 GHz downlink), though only two would be built initially.

According to an analysis by Hughes, public exposures to electromagnetic radiation from the station will never exceed 1–2 uW/cm². The power density study was performed by E. Villaseca and R. Berchtold of Hughes' Communications and Radar Division. They used Geometric Theory of Diffraction which, they claim, "provides precision computation of the fine structure of the antenna patterns." The calculations were validated by Dr. Samuel Koslov of the Johns Hopkins University's Applied Physics Laboratory.

Hughes also contracted with Dr. Herbert Pollack for an evaluation of the health implications of the station. Pollack concluded: "The power density at ground level and the nearest buildings from the proposed [station] will be in the very low microwatt level....In no area of the world is this considered a health hazard."

The site will have a microwave link with a relay facility on the roof of Two World Trade Center in downtown Manhattan. An interference analysis by Spectrum Planning of Richardson, TX, indicates that the station is compatible with Kennedy airport, local TV stations and other RF sources. A 40-foot wall will be built, however, to "improve interference margins."

According to Mira Ledman, director of the city's Office of Environmental Impact, a monitoring procedure will be set up once the station becomes operational to check ambient radiation levels. If the levels exceed some still to be determined level, mitigation measures will be initiated, she said.

The EIS is now being reviewed by Community Board No. 5 in Brooklyn. The board held a hearing on the proposal on March 24; neighborhood residents approved of the plan in concept, but wanted more information on the health effects of microwaves. Another hearing is scheduled for April 28. If it is approved by the board, the proposal will be the subject of a joint hearing by the city's Department of Environmental Protection and Department of City Planning this summer.

For information on the availability of the EIS contact: James Coyle at Fred Hart Associates, (212) 840-3990.

Hyperthermia Systems Under Study

Five teaching hospitals are in the process of evaluating hyperthermia systems for the National Cancer Institute (NCI). Each institution will be testing at least two systems. (See *MWN,* November 1981.) At the request of *Microwave News,* NCI has released a list of the types of equipment available at each medical center. The table given below is a modified and updated version of the NCI data.

The deadline for proposals in NCI's hyperthermia quality assurance program—a second and separate initiative—has been extended to April 30 and a pre-proposal conference was held on March 17 at NCI in Bethesda, MD.

Institution and Principal Investigator	*Type of Equipment*					
	Interstitial	*RF Capacitive*	*RF Inductive*	*Microwave*	*Phased Array*	*Ultrasound*
University of Arizona Medical Center Dr. Michael Manning, (602) 626-6723	✓*	✓*	✓+&*	✓*	✓*	
M.D. Anderson Hospital, University of Texas Dr. Peter Corry, (713) 792-3292	✓*	(✓*)	✓*			✓*
MIT-New England Deaconess Hospital Dr. Padmakar Lele, (617) 253-5235		✓†	✓+		✓‡‡	✓*
Stanford University Medical Center Dr. Malcolm Bagshaw, (415) 497-5650	✓*			✓‡	✓‡‡	✓*
University of Utah Medical Center Dr. J. Robert Stewart, (801) 581-8793			✓+	✓‡	✓‡‡	

* = in-house design; + = Henry Radio Magnetrode; † = IIMS System; ‡ = BSD-1000; ‡‡ = BSD Phased Array; (✓*) = rarely used; IIMS = International Institute for Medical Sciences.

UPDATES

Biological Effects....Some 35 scientists and engineers participated in the March 16–19 *Workshop on the Behavioral Effects of Microwave Radiation Absorption.* Workshop organizer Professor John D'Andrea said he was pleased with its outcome: "It gave everyone an opportunity to hash out controversial subjects." The proceedings, papers and excerpts from the discussions will be edited by D'Andrea and BRH's John Monahan and should be available next February ....Dr. William Morton's study correlating RF/MW levels with cancer among Portland, OR, residents (see *MWN,* January/February 1982) has been circulated for peer review by EPA....The AF's School of Aerospace Medicine at Brooks AFB will issue an RFP at the end of April for research on the physics of RF/MW interactions with biological systems. The AF wants to develop data on mechanisms. For more information contact: Dr. David Erwin, (512) 536-3582, cite PMRN 82-95....Drs. Przemyslaw Czerski and Ewa Manikowska's paper on their recent work, which we said last month would be covered in this issue, has been delayed at the typist. We hope to report on it next month....Drs. Robert Becker and Andrew Marino's new book *Electromagnetism and Life* has just been published by the State University of New York Press in Albany, NY (cloth: $33.50, paper: $10.95). And John Ott's *Light, Radiation, & You* will soon be released by Devin-Adair Co. of Old Greenwich, CT (cloth: $14.50). We will review both books in a forthcoming issue.

Communications....Local opposition could hold up the World Christian Broadcasting Corp.'s plans for a 100 kW shortwave (5.9–17.9 MHz) radio station near Anchor Point, AK. An informal objection filed with the FCC by a citizen's group last November has prompted the commission to ask EPA to analyze radiation levels from the proposed Alaskan station....Another community group, in Scotts Mills, OR, has hired a lawyer in its fight against an existing KECH-TV broadcasting tower that it fears might pose health risks....The FCC has published its notice of proposed rule making to bring RF/MW hazards under its environmental protection rules in the February 25 *Federal Register* (47 *FR* 8214). (See *MWN,* March 1982.) Note the correction for a formula footnoted in the original notice (47 *FR* 10871, March 12)....The commission is seeking comments in preparation for the 1984/1986 WARC on the use of the HF bands allocated to the broadcasting service....Five companies must compete for the new AM stereo market. Broadcasters and receiver manufacturers had hoped the FCC would approve a single system in its final rules for AM stereo broadcasting (47 *FR* 13152)....On the cellular communications front, Western Union has entered the arena by acquiring an interest in Cellular Communications Inc. of New York City and by joining a venture with three other companies to get franchises for mobile telephone networks....Meanwhile, Millicom Inc. plans to begin testing its mobile telephone system in the Raleigh-Durham, NC, area this month.... The FCC published its final rules for the new cellular service on March 9 (47 *FR* 10018)....Up to 4,000 new low-power television stations are expected to spring up in the next few years. The FCC is bracing itself for as many as 18,000 new license applications for the stations, which received final approval on March 4....At the request of Marti Electronics Inc., the commission has released a notice of proposed rule making for microwave boosters, a relay device that receives and retransmits a signal at the same frequency.

Compatibility and Interference...."Do radio broadcasts and radar transmissions pose a threat to chemical plant safety? The answer is yes, according to a small body of experts, who now suspect that large metal structures can act as receiving antennas for wave energy. Under the right conditions, they say, this energy can be converted into sparks of static electricity strong enough to cause explosions of flammable gases." So begins a special report on RFI in the chemical and oil industry in the March 8 *Chemical Engineering* magazine. According to the article, while no one has yet linked a disaster with electromagnetic energy, the UK and West Germany will soon issue guidelines for the joint siting of antennas and chemical plants. The authors refer to the case of a local AM station in Scotland which will have to move to make way for a tanker-loading terminal. They quote a British expert's view that loop-shaped structures like cranes and piping are the most efficient absorbers at frequencies below 30 MHz; radar at higher frequencies is also a threat due to its high energy pulses. An accompanying editorial advocates regulation before an accident happens "that would put vast areas of the country off-limits to the builders of new plants."...The space shuttle's third mission was hailed as a success despite problems with the mechanical arm and radio transmitters. The *Washington Post*'s Thomas O'Toole reported on a less publicized disturbance: every time the spacecraft flew north toward the Soviet Union, the astronauts heard loud static noises. Engineers at the Johnson Space Center in Houston speculated that the interference was caused by the Soviet's "Woodpecker" over-the-horizon radar at Rostov....The FCC has decided that anyone applying to build a new TV station on channel 14 or 69 (or modify an existing one) will have to protect against "objectionable interference to existing land mobile facilities in the 460–470 MHz (channel 14) or in

the 806–816 MHz (for channel 69) band *prior to program test authorization*."...The National Association of Broadcasters released a report on interference to US AM radio stations from Cuban transmitters to a House Foreign Affairs Committee hearing on March 4. The administration wants to set up a 50 kW station, Radio Marti, at 1040 kHz to broadcast news to Cuba. Some fear that Cuba will retaliate by building more interfering transmitters. At the mark up of HR 5427, which allocates funds for Radio Marti, Congressman Dante Fascell (D-FL) added a provision that would compensate AM stations for Cuban RFI. For a copy of the NAB report call (202) 293-3557....A team from Japan reports on an experimental study of noise generated by microwave oven magnetrons in the December 1981 *Journal of Microwave Power.*

EMP....William Broad continues to report on the potentially crippling effects of electromagnetic pulse (EMP) radiation in the March 12 *Science.* In his article, "A Fatal Flaw in the Concept of Space War," he writes that a single nuclear blast in outer space "would instantly set up an electric pulse of up to a million volts per meter in hundreds of satellites and battle stations....A 2-megaton blast just outside the earth's atmosphere would set up a pulse in objects as far away as geosynchronous orbit, some 36,000 kilometers above the earth." Such pulses could knock out laser weapons that DoD is developing at a cost of $300 million a year. Broad attributes part of the snafu to the lack of coordination between the Defense Advanced Projects Agency (DARPA) and the Defense Nuclear Agency (DNA). DARPA is responsible for the laser program and DNA for radiation effects....In contrast to Broad's article, William Scott writes in the March 15 *Aviation Week and Space Technology* that recent test data from DNA indicate that satellite hardening techniques currently in use are "more effective than predicted initially."...With respect to the vulnerability of electronics on earth, the February *Microwave Systems News* quotes James Wade, the deputy under secretary of defense for research and engineering, as telling a closed session of the House Armed Services Committee's r&d subcommittee that he favors an above ground nuclear test to gauge the impact of EMP on hardened electronics....In contract news, the air force at Kirtland AFB, NM, has awarded the Dikewood Corp. of Albuquerque, NM, more than $6 million for "EMP hardening and hardness assurance development." And the Naval Surface Weapons Center in Silver Spring, MD, is negotiating with Rockwell International of Anaheim, CA, for EMP testing of Tacamo aircraft.

Government....The Senate Judiciary Committee's subcommittee on agency administration will hold a hearing on the *Feres* doctrine on April 14. Under the doctrine, the federal government is not liable for injuries to members of the armed services on active duty. A suit is possible, however, if Congress passes a "private release bill." Spokesmen from DoD, the VA and Justice will address such bills at the hearing. In addition, Senator Claiborne Pell (D-RI) will testify on the Charles Day case. Day died under mysterious circumstances while in the Navy—some people suspect microwaves were involved. (See *MWN,* December 1981.) Christopher Scanlan has written a long piece on the case for the *Providence Sunday Journal Magazine* (March 28): "What Killed Chuck Day? His parents blame malnutrition, malpractice and microwave radiation. The Navy won't talk about it."... BRH has announced the names of the new members of the Technical Electronic Product Radiation Safety Standards Committee (TEPRSSC). They are: Dr. Thomas Budinger, University of California, Berkeley; Janice Gordon, International Union of Electrical, Radio and Machine Workers; David Janes, Environmental Protection Agency; Maurice Neuweg, Illinois Department of Nuclear Safety; David Sliney, US Army Environmental Hygiene Agency; and Dr. Max Weiss, Bell Laboratories. For more information contact: BRH's Dr. Zory Glaser, (301) 443-3429....DOE is planning to prepare an EIS on the construction and operation of an overhead, 450 kV powerline, which will run between a Hydro-Quebec substation in Sherbrooke, Quebec, and a New England Power Pool facility in Grafton County, NH. For more information contact DOE's Linda Desell at (202) 252-6374 and see 47 *FR* 8619, March 1.

Litigation....A trial date of May 10 has been set in the case of Leo and Muriel Schuerman v Pacific Telephone and Telegraph Co. in Superior Court of California, County of Riverside (No. 136703). Pacific Telephone is building a line of sight microwave relay system between Los Angeles and San Diego with seven 55-watt transmitters. The Schuermans own property that lies beneath the proposed microwave beam. In their complaint (filed September 16, 1980, and amended August 5, 1981), they charge Pacific Telephone with nuisance and trespass as well as conducting an "ultra hazardous activity." Dr. A.W. Guy and Don Justesen are scheduled to testify for Pacific Telephone. The Schuermans, represented by Joseph Aklufi of Redwine and Sherrill in Riverside, want the telephone company to buy their property and are seeking punitive damages.

Medical Applications....There is a new association for those interested in NMR: *The Society of Magnetic Resonance in Medicine.* Its president, Dr. Paul Lauterbur of SUNY, Stonybrook, is being assisted by Dr. Gerald Pohost of Mass General Hospital (MGH). The new group was incorporated on the first of the year, and has already received some 500 inquiries about membership. Its first meeting is scheduled for August 16–18 in Boston; see conference calendar on p. 8 for details....On April 21, Professor Robert E. Steiner of Hammersmith Hospital, London, UK, will deliver the 15th Aubrey O. Hampton Lecture at MGH and NMR and its clinical applications. Contact Dr. Juan Taveras at MGH for details (617) 726-8344....The meeting on the *Application of Optical Instrumentation in Medicine,* scheduled for New Orleans, LA, May 9–12, will feature two sessions on NMR. For more information contact the Society of Photo-Optical Instrumentation Engineers in Bellingham, WA 98227, (206) 676-3290....Yet another popular article on NMR ran in the April *Discover*....Dr. Betty Sisken of the University of Kentucky, Lexington, was this month's participant at the ONR seminar series in Bethesda, MD. She spoke on "Electrical Stimulation of Nerve Growth in Vitro and Limb Regeneration in Vivo."...Recent studies of hyperthermia applicators (operating at 2450 and 434 MHz) by a team of French scientists demonstrate "the necessity of surface cooling and the advantage of 'cross-fire' configuration in localized hyperthermia." Their report appears in the most recent issue of the *Journal of Microwave Power,* December 1981....And a group from the University of Utah is working on models to determine the optimal arrangement of dipoles in regional and whole-body applicators. See the March *Proceedings of the IEEE.*

Military Systems....The Wisconsin state senate did not pass a resolution calling for the dismantling and removal of the Project ELF antenna on March 23. The vote was 19–13 with one abstention....Dr. Thomas Amlie, the former technical director (1968–70) of the Naval Weapons Center at China Lake, CA, has caused quite a stir with an article in the April *IEEE Spectrum:* "Radar: Shield or Target? Costly radar being developed by the US may give an opponent a decisive advantage by broadcasting the position and makeup of forces." Before the issue reached the IEEE membership, it was front page news in the *Washington Post,* and the next day a feature story in the *New York Times.* Amlie does not want to eliminate radar but to reduce its vulnerability. He cites the case of an American Shrike missile homing in on a US destroyer's radar in the gulf of Tonkin....The navy's development of a laser submarine communications system continues: the Naval Ocean Systems Center is negotiating a contract with W.J. Schafer Associates of Wakefield, MA, for research on operational concepts; the Naval Electronic Systems Command in Washington, DC, has signed a $1.3 million contract with GE's Space Systems Division in Philadelphia, PA, for a conceptual design study; and ONR is negotiating with the Westinghouse R&D Center in Pittsburgh, PA, for work on the blue-green laser itself....The army's Electronics R&D Command in Fort Monmouth, NJ, has contracted with Hughes Aircraft Co. of Fullerton, CA, for 12 AN/TPQ-37 artillery-locating radar systems at a cost of $59.7 million.

Occupational Health....Two congressmen have introduced bills which would move NIOSH out of CDC and into NIH. After holding hearings before the subcommittee on labor and HHS of the House Appropriations Committee on February 25, Congressman David Obey (D-WI) sponsored HR 5914, which would reorganize the Public Health Service, with NIOSH becoming one of the institutes under the NIH umbrella. Congressman Henry Waxman (D-CA), chairman of

the health and environment subcommittee of the Committee on Energy and Commerce, introduced HR 5919 on March 22, which, among other provisions, would have the same effect on NIOSH. Hearings on the Waxman proposal are scheduled for April 23....The Rocky Mountain Center for Occupational and Environmental Health (RMCOEH) at the University of Utah is sponsoring a course on *Current Issues and Trends in Controlling Occupational Exposures to RF/Microwave Radiation,* September 8–10 and again February 9–11, 1983. Robert Curtis, a clinical instructor at RMCOEH and a senior industrial hygienist with OSHA, will teach the course. For more information contact: Ms. K. Blosch, RMCOEH, Bldg. 512, University of Utah, Salt Lake City, UT 84112, (801) 581-5710.

Ovens....Worries about the spread of trichonosis from the incomplete cooking of infected pork in microwave ovens cropped up again last month when newspapers picked up some comments by Dr. Peter Schantz of CDC. The Department of Agriculture had warned customers about the possibility of non-uniform heating of pork in microwave ovens and the attendant risk of failing to kill any *Trichinella* larvae last year (see *MWN,* June 1981). Schantz wrote up the USDA report for CDC's *Veterinary Public Health Notes;* this was picked up by the Atlanta papers and by others across the country. The message remains the same as last year: be sure to heat *all* parts of the pork to above 137° F (58.3° C). Or at least about the same. USDA had recommended that the pork reach 170° F. Schantz's warning appeared in the last issue of the *Notes;* CDC stopped its publication due to budget cuts....Factory shipments of microwave ovens were down again in February in relation to both January and February 1981. The Association of Home Appliance Manufacturers' statistics show that 261,800 ovens were produced or imported in February, compared with 333,900 in February 1981 and 304,000 in January 1982.

Satellite Communications....*NASA Space Communications Program,* February 1982, a report on the 30/20 GHz project, is now available from the House Committee on Science and Technology.... NASA has scheduled its third industry briefing on the 30/20 GHz program for April 20–21 in Cleveland, OH....Comsat is building a satcom station with a 61-foot dish antenna near Lenox, WV, to serve as a backup for its Etam facility 22 miles away....The company is also building an earth station at Palau, Micronesia, the first of seven Intelsat earth stations planned for island communications....The first international teleconferencing service could start this year. Intercontinental Hotels Corp. and Comsat plan to link New York and London in December....The FCC has received many unfavorable responses to its proposed reduction of satellite spacing to 2° from 4°. Both the March 29 *Electronic News* and the March 15 *Broadcasting* review the comments on the plan....The National Association of Broadcasters has come out against quick approval of direct broadcast satellite (DBS) service. In a recent policy statement, the NAB favored developing high definition television in the 12 GHz band over DBS, which would not provide a new service....But the FCC's broadcast bureau chief, Larry Harris, has said the commission will authorize DBS this summer or earlier, according to a report in *Broadcasting,* March 22....United Satellite Television is ready for this move. The company plans to offer four channels of programming via DBS next year....Britain has already approved the service, which could begin there in 1986....European worries over DBS are explored in the March 22 *Wall Street Journal*....The RCA transponder saga continues: the FCC approved RCA's plans to lease transponders on its new Satcom IV satellite at a price reflecting market demand. A suit filed by UTV Cable Network and Kentucky Educational TV temporarily blocked the scheme, but then a federal appeals court freed the company to offer transponders at $13 million each.

Short Courses....• April 27–29: *Electromagnetic Radiation Hazards and Medical Applications* by Dr. L. Larsen and J. Jacobi of Walter Reed Army Institute of Research at Georgia Institute of Technology, Atlanta, GA, fee $400. Contact: (404) 894-2400....• May 17–18: *Hazardous Electromagnetic Radiation and its Biological Effects* by Dr. Bernhard Keiser at George Washington University (GWU), Washington, DC, fee $530. Contact: (202) 676-6106 or (800) 424-9773....• August 9–13: *Laser, Microwaves, Ultraviolet and Ultrasound: Biophysical and Biological Basis, Applications, and Hazards in Medicine and Industry* by Dr. P. Lele at MIT, Cambridge, MA, fee $775. Contact: Director of Summer Sessions, Room E19-356, MIT, Cambridge, MA 02139. In addition, GWU sponsors a host of other courses on radar, spectrum management, remote sensing, and microwave and millimeter technology. Contact GWU for details. See also occupational health update.

Standards....ANSI is making a last minute effort to reach consensus on its new RF/MW standard, which is already in galleys. ANSI asked Allan Eckhaus of Consumers Union to reconsider his negative vote; it would have settled for an abstention. In a March 12 letter, Eckhaus stood firm; he still could not agree with ANSI's six-minute averaging time for measuring exposures (see *MWN,* May 1981). It's not clear what action, if any, ANSI will now take....There will be a session on state regulations for non-ionizing radiation on May 26 at the *Conference on Radiation Control;* see conference calendar (p. 8) for details.

Technology....Microwave landing systems are beginning to be installed at airports across the country. With them come citizen apprehension over radiation risks; FAA officials are attempting to reassure them that there are no hazards....The FAA's 20-year, $10 billion program to modernize and automate the national airspace system is described in the March 8 *Aviation Week & Space Technology* and the April *Technology Review*....The March 1 *Aviation Week* reports that Westinghouse has successfully demonstrated a railgun that fired a projectile at more than 13,000 feet per second. The launcher will now be moved to the Picatinny Arsenal, NJ, where tests will resume in August....Microwaves continue to dominate the *Wall Street Journal*'s weekly "Technology" column: on March 12, the *Journal* reported that Ideal Research Inc. of Rockville, MD, has developed a device that can measure the thickness and growth rate of ice on a plane's surface—ice changes the principal frequency of the beam. There is one hitch, though: the instrument does not work too well if there is water mixed with the ice. On March 19, the *Journal* ran a piece about a radar system developed by the Canadian government for use on satellites to gather data on ice fields in shipping lanes....*Science* ran a two-part series on the first ten years of Landsat in its March 26 and April 2 issues....A three-day international conference on *Electrotechnologies in Industry* is scheduled for May 25–27 in Montreal, Canada. There will be a number of sessions on the use of RF energy. Contact: Sandra Wilkins, MITRE Corp., 1820 Dolley Madison Blvd., McLean, VA 22102, (703) 827-6211.

VDTs....The Massachusetts legislature will consider a VDT safety bill during its 1982 session. House bill 2910, introduced by Rep. John Driscoll, a Republican from Northbridge, MA, includes a number of ergonomic requirements for VDT work stations and calls for periodic rest breaks and annual eye exams for operators....Bell Canada tested several hundred of its VDTs for X-ray radiation between July and November of last year. According to the company's regional director of safety, Jim Allan, "nothing came up to cause any concern whatsoever, so we don't plan to do more testing."...An Australian Postal and Telecommunications Union's report on VDTs (or VDUs), *VDUs and Ill-Health: The Evidence,* found "a sufficiently large body of evidence to cast grave doubts on the claim that [VDTs] are completely safe." Its concluding policy statement calls for a three-day week for full-time operators until more is known about the terminals. Contact: G. Slater at the union, PO Box 208, Carlton South, Victoria, 3053, Australia....David Eisen of the Newspaper Guild and William Murray of NIOSH have called for research on the low-level, low-frequency radiation emitted by VDTs. According to an article in the March 12 *Guild Reporter,* both men noted the complete absence of knowledge about 15–125 kHz radiation at the American Industrial Hygiene Association seminar on VDTs, March 1–2 in Denver....A summary of the National Academy of Sciences' August 1981 symposium on VDTs and vision will soon be published in *Behavior and Information Technology.* In their abstract, authors Barbara Brown and Key Dismukes of the NAS Committee on Vision and Edward Rinalducci of the Georgia Institute of Technology recommend "properly designed epidemiological studies comparing the incidence of visual problems in VDT operators with that of non-VDT workers."

Etc....Professor James Gould of Princeton University has published "The Map Sense of Pigeons," in the March 18 *Nature,* and

Thomas Maugh II reviews the implications of recent findings that species ranging from humans to algae contain magnetic material in "Magnetic Navigation and Attractive Possibility," in the March 19 *Science*.... Could quartz-bearing rock emit radio waves before an earthquake? If so, they could become the basis of a warning system. See the March 20 *Science News* for details.... IMPI's membership directory is now available to the institute's members for $10. Contact: IMPI, 301 Maple Ave. W., Tower Suite 520, Vienna, VA 22180.... Dr. Vernon Riley died of a sudden heart attack on March 30 while attending the American Cancer Society meeting in Daytona Beach, FL. Riley had been affiliated with the Hutchison Cancer Research Center and the University of Washington Medical School in Seattle. He was well known for his work on the relationship between stress and cancer.

Microwave Oven Trial *(continued from p. 1)*

that the oven met the Bureau of Radiological Health's 1970 emission standard, which specifies a maximum leakage of 5 mW/cm^2, five centimeters from the external surface of the oven after purchase.

Zaret, who was scheduled to testify at the trial, said that he thought the adjournment of the case was a "form of censorship," placing the cataract case out of reach of the medical community. "There is no reason in the world to settle," he added, "if the cataracts were not caused by the oven."

Others scheduled to participate at the trial were Leo Birenbaum of the Polytechnic Institute of New York in Brooklyn, NY, for the plaintiffs and Drs. Przemyslaw Czerski of BRH, A. William Guy of the University of Washington, Seattle, and John Osepchuk of the Raytheon Co. for the defendant. Amana is a subsidiary of Raytheon.

In the first and only day of the jury trial, Leonard Decof made the opening statement for the secretaries, followed by their testimony and cross-examination. Before the trial could resume the next day, both parties agreed to call it off.

Rabbit's and Human Lenses *(continued from p. 1)*

that they had undertaken the present work to identify the type of mammal whose lens most resembles the human one.

Speaking from the NMR Laboratory at the college, Kopp warned that the rabbit's eye should not be used as a surrogate for the human eye. "We need to reassess the animal models we are using," he said.

Most experts on the effects of microwaves on the eye contacted by *Microwave News* had not had a chance to review the paper. All agreed, however, that the rabbit's eye had been the preferred experimental system to study microwave-induced cataracts because of its size, its general anatomical similarity to the human lens and because rabbits are cheap and easy to work with. Professor Stephen Cleary of Virginia Commonwealth University pointed out that research to date indicates the rabbit is one of the species most sensitive to cataract development.

Kopp and his co-workers found that, "generally, the rank order of lens metabolism from most to least similar to human is: cat > dog > pig > rat > sheep > rabbit > cow."

See also: J.V. Greiner *et al.*, "Organophosphates of the Crystalline Lens: A Nuclear Magnetic Resonance Spectroscopic Study," *Investigative Ophthalmology & Visual Science* (St. Louis), *21*, 700, 1981; and S.J. Kopp *et al.*, "Analysis of Intact Lens Metabolites by P-31 NMR Spectroscopy," *Current Eye Research* (London), *1*, 375, 1981.

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

CONFERENCE CALENDAR

• May 24–27: 14th Annual *National Conference on Radiation Control,* Holiday Inn, Portland, ME. Contact: Wallace Hinckley, Maine Dept. of Human Services, 157 Capitol St., Augusta, ME 04333.

• 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 3–8: *International Symposium on Electromagnetic Effects,* University of Ottawa, Canada. Contact: Dr. Patrick Babin, 1982 Learned Societies Conference, University of Ottawa, 65 Halsey Street, Ottawa, Ontario, Canada K1N 6N5.

• 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. On June 18 immediately after the conference, there will be a one-day workshop on *Medical Applications of Electromagnetic Energy.* Contact: Dr. Gordon Short, BSD Medical Corp., 420 Chipeta Way, Salt Lake City, UT 84108.

• June 28–July 1: *Conference on Precision Electromagnetic Measurements,* University of Colorado, Boulder, CO. Contact: Robert Kamper, National Bureau of Standards, Boulder, CO 80303.

• June 28–July 2: 4th Annual *Bioelectromagnetics Society Meeting,* Beverly Wilshire Hotel, Beverly Hills, CA. Contact: BEMS, 1 Bank Street, Suite 307, Gaithersburg, MD 20878.

• July 20–22: IEEE Annual Conference on *Nuclear and Space Radiation Effects,* Caesars Palace, Las Vegas, NV. Contact: A. Ochoa, Jr., Div. 2144, Center for Radiation-Hardened Microelectronics, Sandia National Laboratory, Albuquerque, NM 87185. This meeting will be followed on July 23 by the *Hardened Electronics and Radiation Technology Conference* hosted by the Defense Nuclear Agency. A Secret security classification is required to attend. Contact: Director, DNA, Attn: ISSO/Barbara Perkins, Washington, DC 20305.

• July 25–30: 17th Annual Symposium of the *International Microwave Power Institute,* Town and Country Hotel, San Diego, CA. Contact: IMPI, 301 Maple Ave. W., Tower Suite 520, Vienna, VA 22180.

• August 11–13: 4th Annual *Satellite Communications Users Conference,* Regency Inn, Denver, CO. Contact: Satellite Communications Magazine, 3900 S. Wadsworth Blvd., Denver, CO 80235.

• August 16–18: 1st Annual *Meeting of the Society of Magnetic Resonance in Medicine,* Boston, MA. Contact: Deedee Correia, NMR Laboratory, Research 501, Massachusetts General Hospital, Boston, MA 02114.

• September 5–11: *World Congress on Medical Physics and Biomedical Engineering,* including the 13th *International Conference on Medical and Biological Engineering* and the 6th *International Conference on Medical Physics,* Congress Center, Hamburg, Germany. Contact: MPBE 82, Congress Organization, PO Box 302360, D-2000 Hamburg 36, Federal Republic of Germany.

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

• September 8–10: *International Symposium on Electromagnetic Compatibility,* Marriott Hotel, Santa Clara, CA. Contact: Dr. Andrew Nalbandian, 20617 Debbie Lane, Saratoga, CA 95070.

• September 13–17: 12th *European Microwave Conference,* Helsinki, Finland. Contact: Prof. M. Tiuri, Helsinki University of Technology, Radio Lab, Otakaari 5A, 02150 Espoo 15, Finland.

• September 20–21: 4th Annual *Conference of the IEEE Engineering in Medicine and Biology Society,* Marriott Hotel, Philadelphia, PA. Contact: Dr. Alfred R. Potvin, Department of Biomedical Engineering, PO Box 19138, University of Texas, Arlington, TX 76019.

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A Monthly Report on Non-Ionizing Radiation April 1983

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

A report on the 1983 EMC conference held in Zurich on March 8-10 will appear next month.

States Propose VDT Legislation

State regulations for video display terminals (VDT) may be on the way. An informal survey conducted by *Microwave News* last month found safety bills or requests for VDT studies pending in five states and planned in four others.

For the most part, legislators are addressing ergonomic issues. As the list of proposed actions on page 2 shows, guidelines for lighting, furniture and terminal design are the central elements in bills from Connecticut, Illinois, Maine, Massachusetts and Oregon. Groups in California, Ohio, Texas and Washington are also considering introducing legislation.

Only Oregon and Massachusetts would require employers to offer alternative work to pregnant women, a clause included in several Canadian union contracts. Many of the states would require regular eye examinations.

No state has proposed monitoring VDT radiation emissions. A provision requiring radiation checks for VDTs was cut from Connecticut's safety bill before it left committee.

In addition to bills with specific regulations, Connecticut and Massachusetts are considering setting up committees to investigate VDTs and then draft legislation if necessary. In New York, a hearing on VDTs scheduled for April 14 could result in the introduction of a safety bill.

Several bills have also been introduced in Canadian provincial legislatures but none has become law.

Though growing public awareness of VDT health issues has prompted some legislators to propose rules, the need for regulations is under dispute. At a March hearing on Connecticut's proposed VDT safety bill, for example, spokesmen for IBM advised that long experience and numerous studies show that VDTs are completely safe. Further, the company maintained that marketplace competition assures manufacturer responsiveness to the needs of users.

(continued on p. 2)

VDT-VLF Radiation Tests in Canada

Two recent reports from Canada describe measurements of the very low frequency (VLF) radiation emitted by video display terminals (VDTs). One by Dr. Stuart Harvey of Ontario Hydro details the characteristics of pulsed 16 kHz radiation. The other by Dr. Hari Sharma of the University of Waterloo, Ontario, presents the results of his VDT surveys at Surrey Memorial Hospital in Vancouver, BC.

As part of an ongoing investigation of VDTs at Ontario Hydro, Harvey measured and analyzed terminal emissions below 10 MHz. His tests of four VDTs found "no fields having characteristics presently known or suspected of being detrimental to human health."

For VLF, the peak pulse value of the 16 kHz field ranged from 19 to 170 V/m at a distance of 30 cm from the front of the sets: the pulses had a rise time of 2 to 4 microseconds and harmonics were observed up to 1 MHz. The root mean square (rms) varied from 3 to 30 V/m at 30 cm. VLF levels at the back of the terminals near the flyback transformers were much higher than at the front and Harvey notes that someone working within one foot of a VDT's rear casing "could receive an exposure in excess of the most restrictive standards." He describes this risk as being "largely confined to service personnel."

(continued on p. 2)

VLF Radiation Tests *(continued from p.1)*

Sharma, on the other hand, is not convinced exposure to pulsed VLF fields is safe. On the basis of his radiation tests at Surrey Memorial and an informal survey of workers at seven other British Columbia hospitals, Sharma believes a careful study at the hospitals is warranted. But he warns that a "linkage" between adverse health effects and VLF radiation may not be inferred at this time. He recommends shielding to reduce VLF emissions as a precautionary step.

Radiation measurements were taken at the request of the Hospital Employees Union last fall after six out of seven pregnancies among workers in Surrey's accounting office ended in miscarriage, birth defects or premature birth (see *MWN*, July/August 1982). Sharma's survey of hospital clerks using the same type of plastic-cased VDTs found an unexpectedly high incidence of pregnancy problems: workers, including the Surrey operators, reported only five normal births out of 17 pregnancies.

An arbitration panel was recently set up to hear the union's grievance against Surrey's administration for its handling of VDT safety issues. The hospital maintains that the terminals are safe; radiation tests by its consultant, Professor A.W. Guy of the University of Washington, Seattle, found no emissions over a few volts/meter (see *MWN*, March 1983). The union seeks guaranteed safeguards against potential VDT health hazards. Meanwhile, concerned workers in the accounting office staged a protest last month and turned off their machines for four days.

According to Sharma's preliminary report released last month, the "maximum average value" of VLF radiation at the back of the VDTs near the flyback transformers was as high as 1,250 V/m, with a peak pulse value of up to 15,000 V/m. The average value of the field at 30 cm from the sets dropped to 25 V/m. Sharma found no evidence of significant emissions of X-ray, ultraviolet, infrared or microwave radiation or of PCBs.

The December 16 Ontario Hydro report states that available evidence suggests shielding for VLF is unwarranted. Harvey did investigate the effectiveness of shielding, however, and found that lining the inside of a plastic-cased terminal with copper foil and then grounding the foil substantially reduced 16 kHz emissions.

Harvey, who is with Ontario Hydro's research division in Toronto, also looked at the DC fields produced by the positively charged display screen: field levels ranged from 700 to 7,000 V/m at a distance of 30 cm. The DC field was "modulated, when a display is present, by the process of writing on the CRT screen." He found that "the modulation waveform has a 60 Hz repetition rate and can be quite complex, depending on the display format." The report states that "although there are no known direct health effects from such fields, an indirect effect from atmospheric positive ions has been suggested."

Ontario Hydro has also completed an ergonomics survey among some of its clerical workers. See the VDT update on page 8.

VDT Legislation *(continued from p.1)*

Labor representatives disagree. Carl Rude of the CWA in Washington state argued that "we need rules because there are still too many unanswered questions and too many user complaints. Until more research is done, we need some type of protection." Commenting for the Newspaper Guild, David Eisen said "legislation will provide a minimum workplace standard to protect millions of non-union workers." He is confident that "sooner or later, laws will be pushed through."

The Computer and Business Equipment Manufacturers Association (CBEMA) opposes the proposed regulations. The trade association maintains that "inflexible regulation" of this fast developing technology will hurt businesses, users and manufacturers. The threat of VDT legislation has been targeted as a major issue by CBEMA and will be addressed by Columbia University Professor Alan Westin at the group's annual spring meeting in Phoenix, AZ.

Proposed State VDT Legislation

Connecticut: House Study Bill 5132: An Act Establishing a Committee To Investigate Workplace Hazards Caused by Video Display Terminals. Sponsor: Rep. William Kiner. Would set up a study committee which could develop appropriate VDT legislation. Status: approved by the Committee on Labor in March and sent to the Appropriations Committee.

Connecticut: Senate Bill 811: An Act Concerning Protection for Users of Video Display Terminals. Sponsor: Senator Michael Skelley. Employers would be required to inform workers of potential hazards associated with VDTs, including eye problems, headaches and musculoskeletal problems. Workers would also be informed of the advisability of annual eye exams and the need for a rest period of up to 20 minutes after two hours of work. Also calls for study of VDTs. Status: approved by the General Law Committee in March.

Illinois: House Bill 274: An Act to Provide Occupational Safeguards for Operators of Video Display Terminals. Sponsor: Rep. John Matijevich. Parallels Maine's proposed bill (see below) with the addition of specific requirements for terminal design, office furniture and lighting as presented in an earlier Maine bill (HP 880, 1981). Status: tabled after March hearing and unlikely to see action this session.

Maine: House Paper 657: An Act to Provide Occupational Safeguards for Operators of Video Display Terminals. Sponsors: Reps. Edith Beaulieu and James Mayo. Would require employers to ensure safe workplace conditions, inform employees of potential hazards associated with VDTs, provide semiannual terminal maintenance, pay for annual eye exams, provide a 15-minute rest break every two hours. Status: hearing before the Joint Standing Committee on Labor expected late March or early April. An almost identical bill, HP 880, failed to win approval in 1981.

Massachusetts: House Study Bill 2267: Untitled. Sponsor: Rep. Timothy Bassett. Order for the Committee on Commerce and Labor to investigate VDTs and draft legislation, if necessary. Status: hearing scheduled for April 20 in Boston.

Massachusetts: House Bill 2658: An Act to Provide Occupational Safeguards for Employees Resulting from the Introduction and Utilization of Video Display Terminals. Sponsor: Rep. Elizabeth Metayer. Employer intending to install over $5,000 in hardware would be required to notify employees six months in advance, pay for annual eye exams, provide properly designed furniture, terminals, and lighting and adequate air quality, provide 15-minute breaks every one or two hours depending on visual demands of work, provide semiannual terminal maintenance and offer alternative work to employees during pregnancy without loss of pay. Limit total VDT work to five hours per day. Status: hearing scheduled for April 20 in Boston.

New York: Hearing on VDT safety issue and possible need for legislation tentatively scheduled for April 14 in New York City. Sponsor: Rep. Frank Barbaro.

New York: Hearing on consumer products and radiation, including VDTs, expected in late spring. Sponsor: Senator Tony Masiello.

Oregon: Senate Bill 568. Untitled. Sponsor: Senator Margie Hendriksen. Employers would be required to ensure adequate lighting, furniture and terminal design, pay for annual eye exams, provide semiannual terminal maintenance, inform workers of potential hazards associated with VDTs, provide 30-minute break from VDT work after two hours at terminal, provide alternative work for pregnant women on request. Status: hearing before Labor Committee expected mid- to late April.

Washington: Plans underway to place rules similar to those in the Maine bill (see above) in the state's administrative code. Status: the Department of Labor and Industries plans to form a committee this spring to draft rules.

HIGHLIGHTS

More Comments on EPA's RF/MW Guidance

The Environmental Protection Agency (EPA) has received 23 sets of comments on its plans to propose a public exposure guideline or "guidance" for radiofrequency/microwave (RF/MW) radiation. Of the fifteen responses summarized below and the eight reviewed last month (see *MWN*, March 1983), the majority call for quick action in adopting a pre-emptive federal guideline.

Federal Communications Commission (FCC) Chairman Mark Fowler summed up the concern of his agency and of the companies it regulates: both, he wrote, "are concerned about safe exposure levels and the possiblity of a confusing and costly proliferation of inconsistent state and local standards." Fowler asked EPA to set standards for use by the FCC and other agencies "as expeditiously as possible." The problems posed by local regulations were also addressed by the American Radio Relay League (ARRL), Raytheon, RCA and Westinghouse Electric.

The New Jersey Department of Environmental Protection cited its own plans to adopt an RF/MW exposure standard in urging the EPA to speed up its schedule for the guidance. Comments submitted by the Commission on Radiation Protection Chairman M.M. Weiss of Bell Labs and Frank Cosolito of the NJ Bureau of Radiation Protection explained why the state's action is necessary: local decision makers, spurred by growing public apprehension, are "inhibiting the often vital expansion of the nation's communications system by declining to issue required permits, variances, etc."

Many of those commenting suggested modeling federal rules on the American National Standards Institute (ANSI) standard. Robert Misterka of the New England Power Service, for example, called the ANSI guideline "the latest most comprehensive document available" and "well recognized as the authoritative guide" for evaluating exposure to non-ionizing radiation. Also recommending the ANSI standard were John Mitchell of the Air Force School of Aerospace Medicine, Raytheon's John Osepchuk, F.S. Beal of Western Electric, S. Baron of Burns and Roe and Christopher Imlay for the ARRL.

EPA received the following responses to specific questions in its advanced notice of proposed recommendation (47 *FR* 57338, December 23, 1982):

- Many of the comments recommended that the guidance cover frequencies below the 300 kHz cutoff in the ANSI standard. L.J. Chapman of Madison, WI, urged including frequencies down to 1 Hz, Ford and the Motor Vehicle Manufacturers Association recommended starting at 60 Hz and the ARRL at 1 kHz. Raytheon suggested including frequencies down to at least 100 kHz. Westinghouse preferred ANSI's 300 kHz and the air force suggested starting higher, at 3 MHz.
- All comments comparing a flat with a frequency dependent standard concluded the guidance should set different exposure limits for different frequencies.
- Responses varied over whether limits should be set for partial body exposures. The Air Force, the ARRL, the Federal Aviation Administration and Westinghouse recommended addressing only whole body exposures. Raytheon and the NJ Department of Health supported partial body exposure rules and Ford suggested that these rules be developed later. Motorola advocated a detailed approach, which is excerpted below.

EPA's Office of Radiation Programs is finishing its preliminary draft of the guidance and plans to meet April 14 with the interagency group established to help with guidance development. The final draft of the agency's criteria document on RF/MW bioeffects, the basis of the guideline, will be reviewed by an ad hoc committee of the Scientific Advisory Board in May (see *MWN*, March 1983). The document will be made publi at that time.

For a review of EPA's notice of proposed recommendation, see *MWN*, January/February 1983.

Excerpts From Comments on EPA RF/MW Guidance Development

The 15 sets of comments excerpted below, along with eight sets reviewed in Microwave News *last month, were submitted to EPA in late February. (See* MWN, *March 1983.)*

Air Force School of Aerospace Medicine: Whole body average specific absorption rate (SAR) with a maximum localized SAR should be used to establish exposure limits in terms of incident power density (mW/cm^2)....The ANSI standard...is intended to apply to non-occupational (general public) as well as to occupational exposures and should receive serious consideration in setting safety guidelines for public exposure to [RF] radiation.

American Radio Relay League: We emphasize the need to distinguish between biological *effects* from RF energy and biological *hazards* from RF energy. While advances in technology and science may increase our ability to detect biological effects, such advances need not directly result in changes in protection standards.

Burns and Roe: Our view is that the ANSI standard provides sufficient guidance while additional necessary research is being performed and we therefore endorse the proposed standard.

L.J. Chapman: Present standards and research programs do not adequately address the low frequency portion of the RF spectrum. Especially in the frequency range from 1 to 100 Hz, population exposures may have significance and the existent research information base is minimal.

Federal Aviation Administration: In developing your guidance document you should consider setting limits for maximum as well as average exposure. We urge you to address nonthermal effects and their health implications, an issue which is far more sensitive in the general public arena than in the occupational.

Federal Communications Commission: The FCC lacks the necessary expertise and statutory authority to promulgate its own health and safety standards and, therefore, must look to EPA and other responsible agencies for guidance in this area....We would like to make clear our support for your guidance development. We encourage the EPA to complete this process as expeditiously as possible so that a uniform federal standard will be available for use by the FCC and other affected agencies.

Ford: We see no reason to limit the range of frequencies included in the guidance. In particular, those frequencies which are known to be used by powerful radiating sources should be included. These frequencies could extend, for example, from the 60 Hz employed in domestic electric power transmission and the 10.2 to 13.6 kHz employed by Omega radionavigation systems through the commercial AM and FM broadcast spectrums to the frequencies employed by microwave radar and the satellite communications/energy systems.

Motor Vehicle Manufacturers Association: MVMA is particularly interested in whether mobile radio transmitters, not specifically identified in the ANPR, will be considered in the course of this rule making....MVMA recommends that the [frequency] ranges not be limited. In particular, we recommend that frequencies of known high field strengths in the proximity of public roads should be included.

Motorola: In the close vicinity of sources, reactive electric energy can cause high readings in E-field sensing instruments, even though limited

power flow (in the far-field sense) may be present. It is therefore recommended that the EPA weigh the H-field levels more heavily than E-field levels in the case of partial body exposure. In addition, it is recommended that the EPA allow the same peak and average SAR in human organs for whole and partial body exposure....The best known (and independently repeated) of [non-thermal] effects is the change of [calcium ion] efflux from brain tissue in certain amplitude modulated fields... This effect may concern the EPA because it points out that there might be particular windows of bio-response to certain weak electric signals. Motorola would like to point out that the frequency modulated (FM) signals usually employed by the land mobile communications industry do not cause such [a calcium ion] efflux effect.

New England Power Service: It is in the best interest of the public and the users of devices which generate electromagnetic fields that any regulations promulgated to regulate exposures to these fields provide a clear, understandable and straightforward standard of compliance which will allow both EPA and the radio users to easily insure that exposure guidelines are not exceeded....We recommend that EPA consider [adopting the ANSI standard] in its guidance.

New Jersey Department of Environmental Protection: The subject of radiofrequency hazards has become of increasing concern to this [Commission on Radiation Protection] in the face of increasing proliferation of [RF] radiation sources in the state and an accompanying and inevitable apprehension on the part of residents as to whether they are being unduly exposed to possibly hazardous radiations....In the absence of a national guide for [RF] radiation limits, and lacking the resources to independently develop state limits, this commission is in the process of adopting guideline limits patterned after [ANSI's].

New Jersey Department of Health: Even though the Eastern European studies, which were based on behavioral and clinical studies, have not been repeated in the United States, we recommend that the data from these studies be used for setting exposure limits until a peer reviewed study from the Western countries either confirms or disproves the findings of the Eastern European countries.

Raytheon: The exposure limits should exhibit frequency dependence as in ANSI C95– so that the safety factor or real risk is the same regardless of which part of the spectrum is involved. Furthermore, such limits should be expressed as continuous functions of frequency. Mixed fields or sources can be evaluated as in ANSI C95 by adding fractions representing ratios to exposure limits for the respective frequencies. The relatively minor calculations are a minor burden to those responsible for using the guidance (professional users, not the public) and are a small price to pay for the avoidance of a distorted and unfair perspective on risk which would result if a simplistic single number approach were to be followed....Survey instruments will measure only time-averaged fields (averaging time in the order of 1 second). At present there is no limit on instantaneous fields or power densities such as exist in a pulsed radar beam. There is no evidence that existing environmental radar fields are hazardous. Certainly any limitation on peak fields should be set above those already in the environment accessible to the general public. In such existing cases the peak values may be 10,000 times the six-minute average or more.

RCA: The lack of a general population radiation limit has seriously complicated siting plans for the communications industry....In the absence of national guidance, state and local jurisdictions have felt the need for establishing radiofrequency exposure limits. Not surprisingly, these limits lack uniformity; e.g., Texas has an exposure limit of 10,000 uW/cm^2, New Jersey is proposing 1,000 uW/cm^2, and Massachusetts is proposing 200 uW/cm^2. The consequences of this regulatory patchwork quilt are that those who are concerned about the potential hazards are confused and fearful, and those who have responsibility for maintaining the communications resources of this country cannot allay these fears by comparing their predicted exposure levels with nationally accepted, uniform exposure limit levels.

Westinghouse Electric Corp.: The ANSI committee, as well as other scientific committees (e.g. National Council on Radiation Protection), use the threshold for adverse biological effects concept and include an order-of-magnitude safety factor when establishing limits for exposure to humans. This conceptual approach should be used by EPA in order to maintain consistency in establishing limits for exposure to the general public....The range of frequencies to be included should be from 300 kHz to 100 GHz....The standard should consider only whole body exposure rate. The only partial body exposure rate to the general public would be from sources to which they are in close proximity such as microwave ovens. Exposure rates from these and other consumer products are best controlled through product performance standards.

EMP and Nuclear Power...

Electromagnetic pulse (EMP) radiation from a high altitude nuclear blast would not stop a nuclear power plant from achieving a safe shut down, according to a report prepared for the Nuclear Regulatory Commission (NRC) by Sandia National Laboratories. A number of experts have taken issue with the study's conclusions, however.

Critics of the report contend that the study's assumptions —especially the way the EMP problem is defined— seriously undermine the value of its findings. As Dr. Conrad Longmire cautioned, "with a sufficiently long chain of plausible assumptions one could reach almost any conclusion desired." He advocated an investigation of the EMP threat on reactors "with the maximum degree of realism." Longmire, who is with Mission Research Corp. in Santa Barbara, CA, offered these comments on a draft of the report. The authors contend that the assumptions are "solid and reasonable" and that running tests with a nuclear power plant would be "extremely expensive."

In an interview, NRC's Demetrios Basdekas said that "the report presents a pre-conceived set of conclusions." Calling the study a potential "embarrassment" for the agency, Basdekas said that the primary damage from EMP is not due to the energy imparted by the radiation itself, but from the secondary and tertiary effects on the system as a whole. "These can be very significant and are left out of the report," he said. Basdekas was the first to publicly raise the issue of an EMP-nuclear power plant threat at congressional hearings in 1976.

A spokesman for the NRC said that the question of whether or not more research is needed is still "under review and is not resolved."

Interaction of Electromagnetic Pulse with Commercial Nuclear Power Plant Systems by David Ericson, Jr., *et al.* (No. NUREG/CR-3069; SAND82-2738/1&2; Volume 1: Executive Summary, Volume 2: Main Report) is available from the NRC/GPO Sales Program, NRC, Washington, DC 20555 or from the National Technical Information Service, Springfield, VA 22161. The GPO price for Vol. 1 is $4.75 and Vol. 2 is $11.00. An appendix to the main report contains reviewers' comments.

...NAS To Study EMP Threat

The National Academy of Sciences (NAS) has set up a committee to evaluate models which estimate electronic stress and failure due to EMP radiation from nuclear explosions. The Committee on Electromagnetic Pulse Environment of the National Research Council held its first meeting in early February, and is scheduled to issue its report in the summer of 1984.

The committee, which is working under the council's Energy Engineering Board, will determine the reliability of methodologies now used to determine EMP effects and the efficacy of shielding and other protective strategies.

Much of the data for the committee's work is classified, but according to Dr. John Richardson, the study's director at the NAS, "the present thinking is that an unclassified report would make the widest and greatest contribution to the problem."

Members of the committee are: Dr. John Pierce, Professor Emeritus, California Institute of Technology (chairman); Profes-

sor Herman Chernoff, MIT; William Cory, Southwest Research Institute; Professor Donald Gaver, Naval Postgraduate School, Monterey, CA; Professor Walter Karplus, University of California, Los Angeles; Dr. Nancy Mann, University of California Medical School, Los Angeles; Dr. Stewart Personick, TRW Technology Research Center, El Segundo, CA; Professor Allen Peterson, Stanford University; Dr. Henry Pollack, Bell Labs., Murray Hill, NJ; and Professor Nozer Singpurwalla, George Washington University.

Air Force EMC Center to Close

The Air Force's Electromagnetic Compatibility Intrasystem Analysis Program (EMC/IAP) Support Center at the Rome Air Development Center (RADC) will close at the end of September after five years of operation. The support center, which is located at Griffiss Air Force Base in the heart of New York state, develops techniques and computer codes to diagnose and correct system-level and specific EMC problems for the air force and industry.

According to the center's Kenneth Siarkiewicz, the electric field analysis group at Rome will now turn its attention to compatibility and interference issues associated with the new generation of technology based on very-high-speed integrated circuits (VHSIC). Because these chips have higher speeds, higher frequencies, greater "broadbandeness" and closer spacings, they have a greater susceptibility to low-level signals than earlier integrated circuits, he said.

When the center opened in 1978, its services were free. Two years ago a nominal fee was imposed. Now, the government is leaving it up to industry to keep the ball rolling, according to Siarkiewicz. After the EMC/IAP closes, the EMC computer codes will still be available from RADC but there will no longer be any support for users. Some of the computer codes are 19,000 lines long.

There are now about 100-150 active users of the center's services, including Boeing and McDonnell Douglas. (The EMC/IAP mailing list has some 1800 names.) The F-14 and F-15 are examples of equipment tested with EMC/IAP programs.

The EMC/IAP Support Center is run by the IIT Research Institute. IITRI's Program Manager John Dobmeier expressed his disappointment over the air force's decision, but said "we understand the economic realities." Both Dobmeier and Siarkiewicz stressed that the move to close the center was the result of a change in direction and not a budget cut.

Although the navy has used the EMC/IAP center on occasion, it is writing its own computer codes at the Naval Ocean System Center in San Diego, CA. Of special interest to the navy is the problem of below deck EMC. Industry users may now turn to TRW Defense and Space System's Electromagnetic Environmental Effects Branch in Redondo Beach, CA, the developer of the SEMCAP codes, which are similar to the EMC/IAP programs.

FDA Withdraws Diathermy Standard

The Food and Drug Administration (FDA) has withdrawn its proposed performance standard for microwave diathermy devices. The FDA decided to withdraw the rule because few, if any, *new* diathermy units operate in the microwave band and because the agency does not have the authority to set a performance standard for equipment already in use.

The standard, as proposed in July 1980, applied to new diathermy and hyperthermia equipment operating at 915 MHz and 2450 MHz. It specified that the units' applicators must deliver heat efficiently (depositing over 235 W/Kg in standardized phantoms) and not leak more than 10 mW/cm^2 at a distance of 5 cm.

The FDA's National Center for Devices and Radiological Health plans to issue a technical report that could serve as the basis for a voluntary standard for the 15,000 microwave diathermy units in use. No publication date has yet been set, however.

The center will continue to monitor both microwave and shortwave diathermy equipment —the latter is becoming increasingly popular. The center's Dr. Melvyn Altman said that while the agency could not set standards for existing diathermy equipment, it does have the authority to regulate any units that present a health risk.

The proposed standard drew widespread criticism from researchers who feared that it would inhibit the development of improved cancer therapies (see *MWN*, February 1981). Altman pointed out that if the standard had been promulgated, the FDA could have excluded hyperthermia devices. In any case, such equipment is classified as Class III and requires FDA approval prior to marketing, he said.

Notice of the FDA decision appears in the March 11 *Federal Register* (48 *FR* 10373) and the original proposal is in the July 29, 1980 issue (45 *FR* 50359).

FY84 Military Budget: Requests and Dissent

Congress and the Pentagon continue to wrangle over the fiscal year 1984 (FY84) Department of Defense (DoD) budget. Outlined below is a recap of some of the military's requests for radar, communications and weapons systems, with some responses from critics.

Aegis Weapon System: The first Aegis guided missile cruiser, USS Ticonderoga (CG-47), joined the fleet in January and a second, the USS Yorktown, is scheduled for christening in mid-April. Criticisms are mounting as the navy continues to request funds for the progam in FY84 —$16.6 million for R&D on the Aegis system and $3.4 billion for procurement (each cruiser costs more than $1 billion). The General Accounting Office (GAO) has released a digest of a classified report (No. GAO/C-MASAD-83-11, February 22), which found that the Aegis system was inadequately tested before the CG-47 was commissioned and that the ship may be unstable. The GAO recommended a stop to the acquisition of SPS-49 air search radars for future cruisers. DoD responded that the SPS-49 adds to the CG-47's flexibility and that the navy does not believe the CG-47 is "overweight or unsafe." Meanwhile, presidential hopeful Senator Gary Hart (D-CO) is urging a delay in funding three cruisers while a rigorous testing program for the CG-47 and Aegis system is set up. Hart wants to know if the Aegis radar can shoot down a sea-skimming missile, like the Exocet used by the Argentinians against the HMS Sheffield in the Falklands war.

Over-the-Horizon Backscatter Radar: The air force is requesting $99 million for R&D and $176 million for procurement of the OTH-B radar system. In another classified report (GAO/C-MASAD-83-14, March 15), the GAO found that the air force intends to begin the production of the OTH-B radar before development is complete. Noting that "the air force and the navy plan to develop tactical warning systems for use during the 1990s that will withstand a greater threat environment than the OTH-B," the GAO recommended that the air force "fully reassess the need and justify the decision to acquire the OTH-B radar system." DoD replied that the OTH-B hardware was successfully tested and only refinements to the design are needed.

PAVE PAWS: The air force wants $101 million for procurement and $3.8 million for R&D for the PAVE PAWS radar system, which detects and tracks submarine launched missiles.

Project ELF: The navy has asked for $58.5 million for full-scale development of its submarine communication system in Michigan and Wisconsin. Meanwhile Senator William Proxmire (D-WI)

issued the results of a poll showing that 60.5 percent of his constituents oppose the system.

Other DoD budget requests include: $7.2 million for R&D on EMP radiation at the air force's radiation test facility at Kirtland AFB, NM; $4 million for R&D on the Joint (AF and Army) STARS (Surveillance Target Attack Radar System) program—the old PAVE MOVER program; and $7.3 million for the navy's electromagnetic spectrum management program to reduce interference among deployed systems and run electromagnetic compatibility analyses.

Last month President Reagan added new complexity to the military budget debate by proposing an ambitious plan for developing an anti-ballistic missile (ABM) system based on directed energy weapons. The program is still in the definition phase, but this type of research already has some $500 million in the proposed FY84 budget. According to an article by Jeff Hecht in the December 16 *New Scientist*, about 90 percent of this sum is for high energy lasers, with most of the balance for particle beam systems. About one percent, or $5 million, will be spent on research for new microwave weapons.

As part of its plan to convince the public that a military buildup is needed, DoD has released *Soviet Military Power 1983*. The report opens with an artist's rendering of the new Pushkino ABM phased array radar, which provides 360 degree coverage and is 120 feet high and 500 feet wide.

UPDATES

Biological Effects...A team from Bowman Gray School of Medicine (Winston-Salem, NC) and Tulane University (New Orleans, LA) has found evidence of an intensity window due to exposure to a 60 Hz electric field at 10 kV/m. In a paper published in *Life Sciences (32,* 691, 1983), the researchers report that exposure of rat adrenal tissue *in vitro* to 60 Hz radiation appears to "directly alter an important cellular activity." No statistically significant effects were found at 5, 100 or 1,000 kV/m. Noting that intensity windows have already been reported by Bawin and Adey and confirmed by Blackman, they argue: "Intensity and frequency windows might be a general characteristic for all biological reactions to electromagnetic fields and might help explain many of the inconsistencies and controversies in the literature on biological effects of ELF fields."...Two researchers from the University of Salford in the UK have raised an interesting hypothesis about the effects of power line radiation. In a letter to *Health Physics* (December), C.W. Smith and E. Aarholt suggest that long-term exposure to 50-60 Hz fields could give rise to the production of opiates in the human body: "Thus it is possible that the continuous production of beta-endorphins by electric currents induced in the body for extended periods by environmental circumstances might give rise to unpleasant symptoms only on withdrawal from the field or the cessation of the current."...Dr. Asher Sheppard of Redlands, CA, has submitted his report on *Biological Effects of High Voltage AC Transmission Lines* to the Montana Department of Natural Resources and Conservation's Energy Division in Helena. Sheppard's study specifically addresses the Bonneville Power Administration's 500 kV line, which will be built in Montana as part of the Colstrip Power Project....Two review papers have recently been published: EPA's Drs. Claude Weil and James Kinn's "Advances in Experimental Exposure Methods and Dosimetric Techniques Used in Radiofrequency Radiation Biological Effects Studies" is in the February issue of the *Proceedings of the IEEE;* and University of Illinois Professors Alan Segal and Richard Magin's "Microwaves and the Blood-Brain Barrier" appears in Volume 1, Number 3 of the *Journal of Bioelectricity*. With respect to the BBB, Segal and Magin conclude that "many questions remain unanswered, and more questions are emerging with each new study" and that "there is a definite need to carry out [studies on] long-term chronic exposure to low-level microwaves."...*Microwaves and Thermoregulation*, the proceedings of a symposium held at Yale University in October 1981 (see *MWN*, November 1981) will be published this month by Academic Press. The volume was edited by Dr. Eleanor Adair of the John Pierce Foundation Laboratory at Yale.

Communications...New Jersey Assemblyman Dean Gallo and Assemblywoman Leanna Brown have proposed that the governor's Science Advisory Committee investigate RF/MW bioeffects and that the state impose a 90-day moratorium on new broadcast towers until the study is completed. Their resolution was referred to the assembly's Energy and Natural Resources Committee on March 14....The FCC's Office of Science and Technology has issued *Advanced Technology UHF Receiver Study, Part I, Receiver Performance Measurements*. A limited number of copies are available from the Office of Public Affairs, (202) 254-7674....The FCC has okayed teletext, the one-way transmission of information to home TVs. With a special decoder, viewers will be able to tune into news, games, guides, announcements and more....Comments on the FCC's rules to allow land mobile and fixed services to share some UHF television channels are reviewed in the March 21 *Broadcasting*.... A 300-page report on US long-range goals in international telecommunications and information (No. PB83-175893) has been released by NTIA.

Compatibility & Interference...Among recent contract awards are: • ESL, Inc., a subsidiary of TRW in Sunnyvale, CA, will investigate the potential for RF interference on the tracking and data relay satellite system (TDRSS) under a $230,000 contract from NASA. According to ESL, the most likely sources of RFI are foreign, mostly military, radar systems operating in the S-band (2-2.3 GHz) and the Ku-band (13.4-15.3 GHz). ESL will evaluate the accuracy and limitations of an already developed RFI synthetic model. • In a study for ONR, Professor J. Reese Roth of the University of Tennessee in Knoxville will do experimental and theoretical research on RF emissions from plasmas, particularly at low frequencies, that are capable of interfering with submarine communications. Roth will place special emphasis on the "newly discovered RF emission at the geometric mean plasma frequency." • The Naval Air Development Center in Warminster, PA, has negotiated an award to Dayton Brown of Bohemia, NY, for the development of techniques to reduce electromagnetic vulnerability and interference in the LAMPS MK III avionic and armament systems. LAMPS stands for Light Airborne Multipurpose System and is designed to enhance the capability of surface ships in anti-submarine and anti-ship warfare by allowing ships and helicopters to work together electronically. • The Southeastern Center for Electrical Engineering Education in St. Cloud, FL, has won a $1 million contract from the Naval Surface Weapons Center, Dahlgren, VA, for a host of studies on electromagnetic environmental effects on aircraft and ships. Among the tasks are the development of ways to improve EMI-EMC programs and an assessment of the shipboard test equipment being developed under the navy's CREAM (combat readiness electromagnetic analysis and measurement) program. • And, the FAA is inviting bids for the measurement of RF emissions from ISM (industrial, scientific and medical) equipment and ILS (instrument landing systems) to ADF (automatic direction finding) receivers. If the FAA fails to receive qualified bids, it will try and extend its contract with Ohio State University, which is now doing similar work for the agency (see *MWN*, January/February 1983)....The National Association of Broadcasters (NAB) is opposing any decrease in the FCC's minimum required mileage separation among FM stations. One of the NAB's concerns is "unnecessary interference" when the separation is at a minimum.

Government...The turmoil at EPA has taken its toll on the agency's senior management: most have resigned under pressure. Their positions remain unfilled as William Ruckelshaus, Reagan's nominee for EPA administrator, awaits Senate confirmation. What all this will mean for the agency's FY84 budget is still unclear. Meanwhile, two congressional subcommittees are looking into the proposed closing of the RF/MW radiation program at the agency's Health Effects Research Laboratory in North Carolina (see *MWN*, January/February 1983). At a March 2 hearing before the subcommittee on HUD-independent agencies of the House Committee on Appropriations, Congressman Bill Green (R-NY) asked EPA managers some pointed questions about the RF/MW cuts: "Why do you believe the job for R&D is over with the completion of [EPA's RF/MW guidance]?

Aren't there areas of radiation which require additional monies?" Acting Assistant Administrator for R&D Courtney Riordan replied in part: "As a result of [past research] programs...we have yet to come up with what we call a potential significant risk and adverse health effects from exposure to non-ionizing radiation....we feel this is not a terribly productive area of research..." Green followed up with: "[Haven't] such things as central nervous system involvement and response to low-level exposures, so-called calcium efflux in neural tissue and behavioral effects as well as immune responses, been demonstrated? Wouldn't these have important health implications?" Later Green asked the EPA team: "Can you give us assurances that work in this area will in fact be picked up and funded by NIEHS or other agencies?" No assurances were offered, though Assistant Administrator for Air, Noise and Radiation Kathleen Bennett said, "We have discovered that DOE and other budgets contain research in this area we can tap into." The subcommittee plans to invite outside experts to discuss the EPA budget at hearings scheduled for late April. The RF/MW research budget cuts were also addressed by Congressman James Scheuer's (D-NY) subcommittee on natural resources, agriculture research & environment of the House Committee on Science and Technology at hearings on March 17. Afterwards, the subcommittee submitted a number of questions to Riordan on RF/MW R&D. The answers were due at the end of March. Overall, congressional staff say there is a good chance that at least some of the RF/MW research funds will be restored. As Green's legislative director John Cuttell explained, the subcommittee is aware of and interested in this issue and there is a general feeling that too much has already been cut from EPA's R&D program. The first real indication of the status of the RF/MW program will come when the appropriations subcommittee marks up the EPA budget bill later this spring. (For a review of the impact of ex-EPA Administrator Anne (Gorsuch) Burford on EPA's R&D program, see Eliot Marshall's article in the March 25 *Science*.)...One of the many irregularities to surface during the congressional investigations at EPA was a "hit list" of scientific consultants. Made up by the incoming Reagan Administration, the list indicates who should stay on EPA's advisory committees and who should go. One member of the RF/MW community is on list: Professor Sol Michaelson of the University of Rochester. Written next to his name is: "reported to be liberal and environmentalist." In an interview with *Microwave News*, Michaelson said he "deplored" the whole idea of the list....President Reagan has nominated David Markey to replace Bernard Wunder as the administrator of NTIA. Markey, a former lobbyist for the National Association of Broadcasters, is serving as a special advisor to Deputy Administrator Susan Stuebing until he is confirmed.

Measurement...The first portable isotropic magnetic field meter developed by NBS has been delivered to NIOSH. Although the new MFM-10 meter was designed to measure worker exposures in industrial settings (especially at RF sealer plants), it can measure and display each of the three orthogonal H-field components —ideal for monitoring the fields associated with broadcast antennas. The battery-operated meter operates over a frequency range of 300 kHz to 100 MHz, with an uncertainty of less than ± 1 dB, for magnetic fields of 0.01 to 16 A/m. According to NBS's Joe Cruz, Holaday Industries of Eden Prairie, MN, has expressed an interest in manufacturing the meter. A paper by Cruz and L.D. Driver describing the MFM-10 was presented at the 1982 EMC conference in Santa Clara, CA, and appears in the conference proceedings. Those wishing to get a copy should contact Fred McGehan, Division 360.2, NBS, Boulder, CO 80303, (303) 497-3246....NBS' R.G. FitzGerrell has developed an easy and cheap way of measuring the antenna factor of electrically small antennas. The method is accurate to within ± 2 dB in the 250 kHz-1 GHz frequency range. For more information contact FitzGerrell at NBS, Division 723.04....Narda Microwave Corp. of Hauppauge, NY, is now offering calibration services down to 300 kHz for its broadband isotropic meters. The company is extending the range from 10 MHz in response to the needs presented by the new ANSI RF/MW exposure standard (ANSI C95.1-1982). Priority service is available. For price information contact Narda's Bill Reich, (516) 231-1700....Donald Griffin of the University of Adelaide in South Australia will report on "A Microwave Antenna Method of Measuring the Effect of Metal-Framed Spectacles on Microwaves Near the Eyes" at the *International IEEE/AP-S Symposium and National Radio Science Meeting* on May 24 in Houston, TX.

Medical Applications...What cures asthma, hemorrhoids, stomach cramps, arthritis, whiplash and insomnia? It's *Pocketdoc*. Or so claims its manufacturer, the Igon Corp. of Minden, NV. An Igon leaflet entitled "Relief from Pain Without Drugs" suggests that Pocketdoc "induces healing by the use of low frequency low power electric field." An FDA investigation did indicate that Pocketdoc, which is the size of a cigarette pack, is a very low power ELF generator. But FDA said there is no evidence in the scientific literature that weak ELF fields are a panacea for all these ills. The agency charged Igon with false and misleading labeling and asked the US District Court in Nevada for permission to stop the distribution of the device (Complaint No. CV-R-83-002-BRT, filed January 6, 1983). The judge agreed and on January 20 issued an order for the government to seize all the Pocketdocs FDA could find....Reinhard Knoechel of Phillips Research Lab in Hamburg, West Germany, describes his studies with multi-applicator arrays for hyperthermia treatment in the January issue of *IEEE Transactions on Microwave Theory and Techniques*.

Satellite Communications...KOMO Radio in Seattle, WA, has agreed to provide satellite communications facilities for RCA Americom. The company is seeking a conditional use permit to add three satcom dishes to its facilities on Vashon Island. A public hearing on the request is scheduled for April 26 at the King County Courthouse in Seattle. Americom's proposal to build its own station in Kitsap County was rejected by the Kitsap County Board of Commissioners for the second time early this year....The New York City Planning Commission has approved plans for Teleport, the huge communications complex proposed for Staten Island. An *Electromagnetic Energy Study* prepared by the NYC engineering consulting firm of Ammann & Whitney and the project's final environmental impact statement have been released. The February 1983 Ammann & Whitney report, which includes radiation calculations and frequency coordination data, concludes, "There will be no health effects from radiofrequency energy levels to the public both within and without the Teleport complex. Estimated energy intensities are well below current accepted tolerances and anticipated future standards."

Standards...The new American Conference of Governmental and Industrial Hygienists (ACGIH) exposure standard for RF/MW radiation has cleared a major hurdle on the road to final approval. The ACGIH's Physical Agents TLV Committee voted to accept proposed revisions at a meeting in San Antonio, TX, March 23-24. The new standard is similar to, though less stringent than, ANSI's and will cover frequencies down to 10 kHz (see *MWN*, September 1981 and July/August 1982). For example, the ACGIH will stay with a 10 mW/cm^2 limit above 1 GHz. The committee approved the changes by a vote of 13-1; the one dissenting ballot was cast by Dr. Zory Glaser of the FDA's National Center for Devices and Radiological Health. In a February 3 letter to the committee, Glaser and some of his associates at the center explain that they have objections to the standard's "exposure limits, their frequency dependence, and the lack of an appropriate rationale for these parameters." They note that the 10 mW/cm^2 value "leaves no thermal safety factor at high environmental temperatures and humidities" and state "the belief that thermal effects are the only factors to be accounted for in evaluating health hazards is untenable in the present state of knowledge." In a telephone interview, Herbert Jones, the chairman of the physical agents committee, said that he was happy an agreement was reached. He said that the standard and its accompanying documentation will undergo some minor revisions for "editorial clarification" and be submitted for final approval to the ACGIH Board of Directors and membership at the *American Industrial Hygiene Conference* in Philadelphia, PA, in May....The National Radiological Protection Board (NRPB) in the United Kingdom has proposed a new standard for ELF and RF/MW radiation. The RF/MW exposure limits for *adults* are nearly identical to those of ACGIH, while those for the *general population including children* are like those of ANSI. For power line frequencies (50 Hz), the board "accepts that exposures to power frequency fields of less than 10 kV/m are safe, although the field may be perceptible at lower values, and that exposures to fields of up to 30 kV/m are unlikely to be harmful." Comments on *Proposals for the Health Protection of Workers and Members of the Public Against the Dangers of Extra Low Frequency, Radiofrequency and Microwave Radiations: A Consultative Document* are welcome through July 1. For more information contact: The Secretary, NRPB, Chilton, Didcot, Oxon, OX11 0RQ, UK....The Standards Association of Australia's Committee TE/7 on Hazards of Non-Ionizing Radiation is also proposing a revision to its RF/MW standard. According to an August 1982 draft, occupational exposure limits will be

identical to those of ANSI, while those for the general population will be a factor of 10 lower. Thus at 30-300 MHz, the limits will be 1 mW/cm² for workers and 100 uW/cm² for others. For more information contact the association at 80 Arthur Street, North Sydney, NSW, 2060, Australia....ANSI's Committee C63on Radio-Electrical Coordination is set to meet on April 6 in Washington, DC. On April 6 and 7, C63's subcommittee 1 will review its work on open area test sites, immunity test procedures and a general EMC standard....Canada has proposed amendments to its RFI regulations. Notice No. DGTR-021-82, published in the December 11 *Canada Gazette* prescribes limits for radio noise produced by AC high voltage power systems. For more information contact: Director General, Telecommunication Regulatory Service, 300 Slater Street, Ottawa, Ontario K1A 0C8.

VDTs...The possible effect of VDT use on pregnancies will be examined as part of an extensive two-year study underway in Montreal, Canada. The project, sponsored by the Occupational Health and Safety Research Institute, began last fall and will include information on approximately 50,000 pregnancies. The city's 11 major hospitals and the doctors affiliated with them are helping with the study....FDA's National Center for Devices and Radiological Health has concluded that "the reported clusters of problem pregnancies among VDT users would be expected from chance alone, and it is highly unlikely that they have been caused by low radiation emissions from the machines." This assurance was published in the center's February 22 *Radiological Health Bulletin* in response to inquiries it has received. The center "has found no evidence that the levels of radiation from VDTs are responsible" for clusters, such as the one reported at Surrey Memorial Hospital in Vancouver, BC....A survey of 1,160 Ontario Hydro clerical workers found a significant link between VDT use and complaints of eye irritation, blurred vision and neck and shoulder aches. According to the study's head, Dr. Roland Mallette, confounding factors were carefully weeded out. The Canadian utility plans to do more detailed VDT health studies, particularly on the effects of VDT use on vision. Hydro currently has 1,700 VDTs and plans to have 6,000 by 1990....A number of meetings on VDTs are scheduled for this spring. *The Pandora Connection: Dangers and Hazards of Video Display Terminals*, will be held April 16 in Madison, WI. It is sponsored by the Health Writers, 1127 University Avenue, Madison, WI 53715, and the Madison Federation of Labor. On April 30, the Labor Council of Metropolitan Toronto and the Humber College for Labor Studies are holding a conference on *VDTs and Stress*. For information, call (416) 675-3111, ext. 414. *Vision et Ecran Cathodique* will be addressed by the Quebec Association of Optometrists at their conference in Quebec City on May 6. Contact the association at 465 rue St. Jean, Montreal, Quebec H2Y 2R6, (514) 849-8051. M. Lundquist, a consultant from Milwaukee, WI, will teach a course on "Health Hazards of VDTs" at the *American Industrial Hygiene Conference* on May 22 in Philadelphia, PA. Lundquist does not believe radiation emissions are a problem and will focus on ergonomic issues. In the fall, those willing to do serious traveling can attend the *International Scientific Conference on Ergonomics and Health Aspects of Modern Office Jobs*, November 7-9 in Turin, Italy. The senior American advisor for the gathering sponsored by the International Ergonomics Association is H.L. Davis of the Human Factors Group, Eastman Kodak, in Rochester, NY....If you are in the market for an alternative to the common CRT, IBM has introduced a gas panel display screen for use with its 370, 30XX and 4300 series computers. The 3290 screen has a wire grid with 730,000 intersections surrounded by neon-argon gas; electrical charges in the grid make the gas glow. The panel can be yours for $7,100. Another new screen based on tungsten-oxygen technology is being developed by Professor Paul Holloway at the University of Florida in Gainesville. The screen does not require constant refreshing and requires relatively little power, according to a brief report in the March 14 *Computerworld*....Is VDT screen glare driving you crazy? Anti-Glare Material Inc. claims you can spray it away. The Fort Myers, FL, company says its product will relieve up to 95 percent of the problem and last for three years. ●

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SHORT COURSES

• April 26-28: *Seminars on How to Cope with the FCC and VDE Regulations on Radio Frequency Interference*, Washington, DC. Three one-day seminars on (1) *Regulatory Requirements and Grounding Methods*, (2) *Shielding and Packaging Concepts*, and (3) *Cost Saving Design Techniques for Achieving Compliance*. Fee $250 for any one day; $475 for two days, and $675 for three days. Contact: EMXX Corp., 6706 Deland Drive, Springfield, VA 22152, (703) 451-4619. Repeated • May 3-5, in Dallas, TX; and • May 24-26 in San Diego, CA.

• April 26-29: *Radar System Simulation*, Eglin AFB, FL. Fee: $550. Contact: Marie Saunders, Mark Resources, Inc., 2665 30th St., Santa Monica, CA 90405, (800) 874-8104.

• May 2-4: *Radiowave Propagation in Satellite Communications Systems*, Washington, DC. Fee: $685. Contact: Continuing Engineering Education Program, George Washington University (GWU), Washington, DC 20052, (800) 424-9773.

• May 2-4: *Spread Spectrum and Anti-Jam Communication*, Los Angeles, CA. Fee: $750. Contact: Continuing Education Institute, 10889 Wilshire Blvd., Los Angeles, CA 90024, (213) 824-9545.

• May 2&4: *EMI Test and Evaluation*, San Jose, CA. Fee: NA. Contact: Don White Consultants, Inc., Star Route 625, PO Box D, Gainesville, VA 22065, (703) 347-0030. This course will be given at the *Test & Measurement World Expo*. A number of other courses and workshops are also scheduled. Contact: Meg Bowen, (617) 254-1445.

• May 2-6: *HF Spectrum: New Concepts and Technologies*, Washington, DC. Fee: $855. Contact: GWU, see May 2 above.

• May 2-6: *EMI Design and Testing*, Chicago, IL. Three one-day sessions on *Requirements & Testing per FCC Docket 20780, Designing to Meet FCC Docket 20780* and *Printed Circuit Board and Wiring Design for EMI Control*. And one two-day session on *Grounding, Bonding and Shielding*. Fee: $260 for one-day sessions and $495 for two-day session. Contact: R&B Enterprises, 1050 Colwell Lane, Conshohocken, PA 19428, (215) 828-6236. Repeated • May 9-13 in Boston, MA.

• May 9-11: *Trends in Military Satellite Communication Systems*, Vienna, VA. Fee: $650. Contact: Satellite Systems & Technology Inc., 3134 Juniper Lane, Falls Church, VA 22044, (703) 532-6274. Repeated • May 23-25 in Torrance, CA.

• May 16-20: *Spread Spectrum Communications Systems*, Washington, DC. Fee: $855. Contact: GWU, see May 2 above.

• May 16-20: *Basic Radiological Health Course*, San Antonio, TX. Fee: $450. Contact: University of Texas (UT) Health Science Center, Medical School Continuing Education Services, 7703 Floyd Curl Drive, San Antonio, TX 78284, (512) 691-6295.

• May 22: *Recognition, Evaluation and Control of RF/MW Radiation Hazards*, Philadelphia, PA. Fee: NA. The three-hour course will be held at the *American Industrial Hygiene Conference*. Contact: AIHA, 475 Wolf Ledges Parkway, Akron, OH 44311, (216) 762-7294.

• May 23-24: *Grounding, Bonding and Shielding*, Washington, DC. Fee: $625. Contact: GWU, see May 2 above.

• May 23-27: *Radar Systems and Technology*, Washington, DC. Fee: $855. Contact: GWU, see May 2 above.

• May 26-27: *Satellite Fundamentals*, Washington, DC. Fee: $445. Contact: Walter Morgan, Communications Center of Clarksburg, 2723 Green Valley Road, Clarksburg, MD 20871, (301) 428-9000. Repeated • June 6-7 in Los Angeles, CA, and • August 19-20 in St. Louis, MO.

• June 2-3: *FCC Regulation of Computing Devices: EMI Design, Testing and Compliance with Part 15 Subpart J Rules*, Washington, DC. Fee: $315. Contact: GWU, see May 2 above.

• June 6-8: *Electromagnetic Pulse and Its Effects on Systems*, Washington, DC. Fee: $685. Contact: GWU, see May 2 above.

• June 13-17: *The Modern Geometrical Theory of Diffraction*, Columbus, OH. Fee: $750. Contact: Ohio State University, Engineering Short Courses, 2070 Neil Avenue, Columbus, OH 43210, (614) 422-6153.

• June 14-15: *Radar Principles for the Non-Specialist*, Washington, DC. Fee: $625. Contact: GWU, see May 2 above.

• June 27-29: *Microwave Technology and Applications for Industry*, Central NJ. Fee: $695. Contact: Center for Professional Advancement, PO Box 964, East Brunswick, NJ 08816, (201) 249-1400.

• July 10-15: *Design Against RF Emission*, University of Sussex, UK. Fee: NA. Contact: Institution of Electrical Engineers (IEE), Savoy Place, London WC2R 0BL, United Kingdom, 01-240-1871, ext. 272 or 282.

• August 8-12: *Non-Ionizing Radiations: Biophysical and Biological Basis, Applications and Hazards in Medicine and Industry*, Cambridge, MA. Fee: $850. Contact: Director of Summer Sessions, Room E19-356, MIT, Cambridge, MA 02139.

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

RF Hazards in Honolulu

The Environmental Protection Agency (EPA) will measure radiofrequency (RF) radiation levels in Honolulu, HI, where public exposures are estimated to fall in the 1-10 mW/cm^2 range in certain locations. If confirmed, these levels would be well above the safety limits EPA plans to propose this June and the highest ever documented in an urban area in the United States. The potential hazards in Hawaii will force the federal government to establish a precedent for the enforcement of EPA's "guidance," the nation's first general population standard for RF radiation.

Although EPA has been aware of the exposure conditions in Honolulu since 1975, it had been unwilling to take measurements until last month. Now, in response to a February 14 request from the Federal Communications Commission (FCC), EPA has agreed to a field survey, which EPA Administrator William Ruckelshaus believes will provide an "opportunity for both our agencies to work together on the problems of [RF guidance] implementation."

Interviews with officials at both agencies indicate that these problems could be considerable. The issue of public safety may be sidelined as the agencies work out their respective responsibilities for enforcing RF exposure limits.

EPA staffers maintain that exposure conditions similar to those in Honolulu are possible elsewhere, although the number and magnitude of potential problems in the city are probably unmatched. Since Honolulu's zoning laws bar transmitters from the surrounding hills, broadcasters have nestled antennas in the midst of the high-rise city. A number of antennas are at eye level with apartments in adjacent buildings, and, in some cases, recreation areas share rooftops with multiple antennas.

An EPA official has estimated that the survey will cost less than $5,000.

Exposure Guidance

EPA's exposure guidance is rumored to set a 100 uW/cm^2 limit for the 30 MHz to 1 GHz band, which includes most broadcast frequencies. This limit is approximately fifty times lower than the estimated exposures in Honolulu and a factor of ten lower than the 1982 American National Standards Institute (ANSI) 1 mW/cm^2 guideline, which EPA is using as a benchmark until the guidance is proposed.

The guidance will be enforced independently by all federal agencies. Once it is signed by the President, each agency will be responsible for assuring compliance by RF and microwave sources under its jurisdiction. In his letter to FCC Chairman Mark Fowler, Ruckelshaus wrote that once the RF survey is completed, "I believe the commission should then act to correct any detected problems."

The FCC has yet to announce how it will interpret its responsibility to enforce the standard among its licensees, or more specifically, how it will respond if measurements show that exposures in Honolulu fall between the forthcoming guidance and the ANSI limit. Nor is it clear who will pay for the costs of any regulatory actions.

(continued on p.7)

HIGHLIGHTS

NCRP Study on RF Measurements

The National Council on Radiation Protection and Measurements (NCRP) has initiated a study tentatively titled "A Practical Guide to the Determination of Human Exposure to RF Radiation."

NCRP's newly established Scientific Committee (SC) 78 will develop easy-to-use guidelines for making measurements in the 10 kHz to 100 GHz frequency range and for interpreting them in light of present knowledge of biological effects. The committee, which is chaired by Richard Tell of the Environmental Protection Agency (EPA), will also investigate how to handle variations in polarization, work in the near field and allow for time averaging of signals.

In addition to Tell, the members of SC 78 are: Howard Bassen of the Food and Drug Administration's National Center for Devices and Radiological Health, Jules Cohen of Cohen and Associates, Dr. David Conover of the National Institute for Occupational Safety and Health, Dr. Carl Durney of the University of Utah (presently visiting MIT) and Ronald Petersen of AT&T Bell Labs.

NCRP Executive Director Roger Ney said that the new committee will continue the work described in NCRP Report No. 67, *Radiofrequency Electromagnetic Fields: Properties, Quantities and Units, Biophysical Interaction and Measurements* (see *MWN*, October 1981).

In a telephone interview from his office in Las Vegas, NV, Tell said that the committee plans to finish a draft report in about a year. "If we are successful," he added, "a user of a given standard will have a practical methodology to apply it."

Progress Report on New York Power Lines Studies

The Scientific Advisory Panel of the New York State Power Lines Project met in Albany, March 25-26, to review the status of 16 ongoing studies on the biological effects of 60 Hz fields. None of the studies are complete, but the preliminary findings of two investigators are causing some excitement.

The most surprising results were those of Dr. Wendell Winters, who found that exposures to electromagnetic fields at levels comparable to those under some power lines significantly enhanced the growth of cultured human tumor cells. The panel plans to ask other researchers already under contract to the project to replicate Winters's experiments.

Winters's team at the University of Texas Health Sciences Center in San Antonio exposed tumor cells grown in culture to 60 Hz electric and magnetic fields, singly and in combination, for periods of up to 24 hours. The current densities ranged from 0 to 300 mA/m^2 (a density approximately associated with an electric field of 30 kV/m) and magnetic fields from 0 to 1 gauss. Examination of cells 10-14 days after exposure indicated that the growth of tumor cells was enhanced by magnetic fields alone and by a combination of electric and magnetic fields, but not by electric fields alone.

According to project Administrator Michael Rampolla, assistance in replicating the work will be sought from Drs. Maimon Cohen of the University of Maryland School of Medicine in Baltimore and Arland Carsten of Brookhaven National Lab in Upton, NY.

In a telephone interview, Winters said that he has repeatedly achieved the same enhancement effect, which he called "quite unexpected." Winters will present his findings at the Bioelectromagnetics Society (BEMS) meeting in July.

The second set of results that sparked the panel's interest were those of Dr. Klaus-Peter Ossenkopp on low intensity ELF magnetic fields and epilepsy. Ossenkopp found that exposure for one hour to a 60 Hz alternating magnetic field of 1 gauss had a beneficial effect: it reduced the severity, duration and number of seizures in epileptic rodents treated with a seizure-inducing drug. The panel asked Ossenkopp, who is at the University of Western Ontario in London, Canada, to expand his dose-response data.

A semiannual progress report on all the studies was released before the March meeting. Though the majority of the studies are still in the preparatory stage, preliminary findings were also reported by Dr. Charles Graham of the Midwest Research Institute in Kansas City, MO, and Dr. Gordon Livingston of the University of Utah Medical Center in Salt Lake City, UT.

Graham has completed the first part of his $465,000 study on the "Influence of 60 Hz Fields on Human Behavior, Physiology and Biochemistry." According to the status report, "The results of the electric and magnetic field perception study have indicated the feasibility of conducting a valid, double blind investigation of field effects."

Livingston has failed to find an effect in his $162,000 study of "Reproductive Integrity of Mammalian Cells Exposed to 60 Hz Electromagnetic Fields." Livingston is studying human and rodent cells to see whether exposure could cause damage to cellular DNA or disturb cell growth. Human lymphocytes were exposed to a current density of 0.003-3 mA/cm^2 and a magnetic field of 2 gauss. The project summary states that Livingston found a consistent "absence of treatment effect as measured by sister chromatid exchange frequency or replication index in the human lymphocytes."

The project's two epidemiolgical studies on the possible relationship between certain types of cancer and electromagnetic fields were not far enough along to appear in the current report but will be included in the next report, due in August.

To obtain copies of the status report and the minutes of the March 25-26 meeting, contact Rampolla at the Center for Laboratories and Research, New York State Department of Health, Albany, NY 12201, (518) 474-7888.

Aircraft RFI Tests

The Federal Aviation Administration (FAA), computer manufacturers, aircraft companies and airlines are running a large number of tests to determine whether electronic devices, especially portable computers, can cause harmful

radiofrequency interference (RFI) to aircraft navigation and communication systems.

The preliminary results do not permit firm conclusions, but the magnitude of the investigation is impressive. Outlined below are some of the findings presented at the second meeting of the Radio Technical Commission for Aeronautics' (RTCA) Special Committee 156 on "Potential Interference to Aircraft Electronics Equipment from Devices Carried Aboard" held in Washington, DC, on February 28-29.

The FAA has collected path loss data aboard a Boeing 727 and concluded that an interfering signal is more likely to originate from outside the plane than from inside. In the tests run inside the plane, the signal source was placed in the aisle, however, and not next to the windows. More tests may be needed to determine if the location of the source inside the aircraft affects the likelihood of interference.

Eastern Airlines presented the results of its tests aboard Lockheed 1011, Airbus 300, McDonnell Douglas DC-9 and Boeing 727 planes in a hangar and of much more limited tests in flight. Some RFI was reported on the ground under very controlled conditions — with the interfering source outside the plane and near the target antennas. No interference was found when the plane was in flight.

Boeing and McDonnell Douglas have also completed tests, but the results were not ready in time and will be on the committee's agenda for its next meeting on June 12-13. Air Canada, United, Western and Delta Airlines also have testing programs in progress.

Representatives from Radio Shack, Apple Computer and Hewlett Packard all presented data from their respective emission tests. The findings indicate that computer peripheral equipment, such as disk drives, printers and displays, are the worst emitters and that cabling between devices is usually not shielded and could therefore amplify such emissions.

Another part of the RTCA's investigation is the search for known incidents of RFI caused by electronic equipment brought aboard the aircraft. Statistics from NASA's Aviation Safety Reporting System (ASRS), presented at the February meeting, show that there has only been one aircraft RFI incident in 30,000 safety reports. (It should be noted that ASRS is a voluntary program and there are no penalties for failing to report an unusual event.)

The incident occurred on a December 10, 1982 Eastern flight. The minutes of the RTCA meeting describe what happened: "The crew of the DC-9 had reported that all three of their navigation receivers were unreliable. Maintenance personnel had checked these receivers out and had reported no apparent problems with the navigation equipment. During the flight, flight attendants had checked the cabin area to see if any passengers were using electronic devices and had not found anyone using such devices. It was suspected that two large cases in the cargo area may have contained some sort of electronic devices or that a passenger's luggage may have contained some devices which were turned on. In any case, no positive conclusion could be reached on the cause of this interference...."

It was this incident, not previously reported in any detail, which played a role in initiating the RTCA study (see *MWN*, October 1983). For a number of months, Eastern banned the use of computers on its flights, but the airline lifted the restriction in late January (see *MWN*, March 1984).

A newly reported RFI incident was also reported at the meeting by Mr. E. Hoare of British Airways: on November 8, 1983, there were strong indications that a Sony Walkman affected the performance of an Omega system aboard a Brittania Airways Boeing 737. (Omega is a worldwide radionavigation system.)

Frank White, chairman of the RTCA committee, cautioned that these two incidents do not provide positive proof that passenger-operated devices were the sources of RFI. But, he added, they do indicate the need for more testing.

More work is planned before the June meeting. Among the assignments are additional tests with a Sony Walkman and collection of emission data from computer watches and other types of computing devices.

In general, all air carriers have been asked to test a variety of devices on aircraft to see if they cause interference. Also, one of the committee members will investigate the possibility of studying airplanes leased by the press to see if they have experienced RFI from the devices used by reporters on the road.

NJ Adopts and CT Proposes ANSI Standard

The state of New Jersey has adopted the American National Standards Institute (ANSI) guidelines for general population exposure to radiofrequency and microwave (RF/MW) radiation, a move which Connecticut may follow later this spring. The standard, which at its strictest level limits exposures to 1 mW/cm^2, will not affect commercial broadcasters, the primary source of environmental nonionizing radiation.

New Jersey

New Jersey's Commission on Radiation Protection adopted the ANSI standard at a March 28 meeting. The measure sets limits for public exposures to 300 kHz to 100 GHz radiation and establishes emission limits for microwave ovens. (Emissions are limited to 5 mW/cm^2 measured at a distance of 5 cm for units manufactured after 1971 and to 10 mW/cm^2 for units made before then.) The commission exempted emergency mobile communication services, such as police radios, from compliance. In public hearings held before the final commission vote, a representative from the state police warned that these services could be affected by a 1 mW/cm^2 limit.

Now that an RF/MW standard has been adopted, RCA's Dr. Fred Sterzer, chairman of the commission's nonionizing radiation subcommittee, told *Microwave News* that his group will address 60 Hz power line radiation. He noted that New Jersey has a voluntary field strength limit of 3 kV/m at the edge of power line right-of-ways (ROW), but that this two-year-old committee resolution is unenforce-

able. The guideline does not specify the width for ROWs.

A report of a playground located under a high power transmission line where electric fields are significantly higher than the voluntary limit aroused interest in reevaluating power line radiation safety. According to commission member Eugene Fisher of the State Bureau of Radiation Protection, only a preliminary report has been prepared and no details on the situation are available for release.

The commission, composed of representatives from state agencies, industry and the research community, is chaired by Max Weiss of AT&T Bell Labs.

Connecticut

Connecticut lawmakers will vote on adopting the ANSI standard before the legislative session ends May 6. Assembly Bill 5675, sponsored by Rep. Moira Lyons, originally called for establishing exposure limits at least as restrictive as ANSI's, but the qualifying language was dropped before the measure was reported out of the joint Environment Committee late last month (see *MWN*, March 1984).

The bill would empower the Commissioner of Environmental Protection to establish a non-ionizing radiation program for implementing and enforcing the standard. The commissioner's office would have the authority to exempt specific sources from compliance.

If the bill becomes law, Connecticut would become the third state to set its own RF/MW standard. Last year Massachusetts was the first, choosing exposure limits five times stricter than ANSI's (see *MWN*, September 1983).

Conferences: Busy Summer and Fall

The conference line-up for late summer and fall offers something for just about everyone interested in non-ionizing radiation, from ELF to visible light. And this is the year to go to Italy or Japan, if your travel budget will allow it.

In October, the Engineering Foundation will sponsor a small gathering on regulations governing the use of electromagnetic radiation. Those planning to site facilities but concerned about the uncertain and changing regulatory climate will want to consider attending the Hershey, PA, conference. You must apply, however, and attendance is limited to approximately 120 people. According to Dr. Sam Koslov, co-chairman of the conference organizing committee, the meeting is modeled on the Gordon Conferences, with all dissussions off-the-record to allow the free exchange of ideas and opinions.

Dr. Arthur Pilla of Mount Sinai Medical Center is arranging a Gordon Conference on bioelectrochemistry, especially the bioeffects and medical uses of electromagnetic energy. Pilla reports that there has already been a great deal of interest in the July 30-August 3 meeting, and he is scheduling a poster session every day. Those planning to go should consider bringing a paper along. Application forms are in the March 2 issue of *Science*, which also lists speakers and discussion leaders. Here again, a maximum of 120 attendees will be allowed.

Those working on the bioeffects of ELF and static electromagnetic fields will want to attend the Hanford Life Sciences Symposium in early October in Washington state. A preliminary program will be released by August 1. Those interested in the other end of non-ionizing spectrum will want to consider attending a meeting on the medical and biological effects of visible light to be held at the New York Academy of Sciences at the end of October.

If you can afford to go further afield there are two meetings in Italy this summer and two in Japan in the fall. The 21st General Assembly of the International Union of Radio Science (URSI) will be held in Florence at the end of August through early September. At that time there will be an open symposium on the interaction of electromagnetic fields with biological systems. Two weeks after URSI, a NATO workshop on electromagnetic field effects on cells will be held in Erice, on the island of Sicily. Attendance at the workshop is by invitation only.

There will be an international symposium on electromagnetic compatibility (EMC) in Tokyo in mid-October and the annual meeting of the Bioelectrical Repair and Growth Society (BRAGS) will be in Kyoto at the beginning of November. Special travel arrangements are being made for those wishing to attend both these meetings. For information on travelling to the EMC meeting, contact Donick Travel & Tours, 12425 Rancho Bernardo Rd., San Diego, CA 92128, (619) 451-2330; for the BRAGS meeting, contact the International Professional Meeting Coordinators, 711 Third Avenue, New York, NY 10017, (800) 221-2216, or (212) 757-5710 in New York. Details for all these conferences are provided below.

- July 30-August 3: *Bioelectrochemisty*, Tilton School, NH. Contact: Dr. Alexander Cruickshank, Gordon Research Center, University of Rhode Island, Kingston, RI, 02881, (401) 783-4011, or Dr. Arthur Pilla, Bioelectrochemistry Lab, Mount Sinai Medical Center, New York, NY 10029, (212) 650-7741.

- August 27-30: *Open Symposium on Interaction of Electromagnetic Fields with Biological Systems*, Florence, Italy. Contact: Dr. Elliot Postow, Naval Medical R&D Command, National Naval Medical Center, Bethesda, MD 20814, (202) 295-1140 or Ms. Alma Paoluzi, Physics Lab, Istituto Superiore di Sanita, Viale Regina Elena, 299, 00161 Rome, Italy. For information on the URSI General Assembly, to be held August 28-September 5 in Florence, contact: Professor A.M. Scheggi, IROE-CNR, Via Panciatichi, 64, 50127 Florence, Italy, (55) 4378512.

- September 17-21: *NATO Advanced Research Workshop on Interactions Between Electromagnetic Fields and Cells*, Erice, Italy. Contact Prof. A. Chiabrera, Biophysical and Electronic Engineering Department, Via all'Opera Pia, 11A, 16145 Genoa, Italy, (10) 311811

- October 2-4: *Interaction of Biological Systems with Static and ELF Electric and Magnetic Fields*, Holiday Inn, Richland, WA. Contact: Patricia Bresina, Biology and Chemistry Dept., Battelle Pacific NW Labs, PO Box 999, Richland, WA 99352, (509) 376-0100.

• October 16-18: *1984 International Symposium on Electromagnetic Compatibility,* Hotel Pacific, Tokyo, Japan. Contact: Professor T. Takagi, Dept. of Communications, Tohoku University, Sendai, 980, Japan, (0222) 22-1800, ext. 4266.

• October 21-26: *Managing the Electromagnetic Environment,* Pocono Hershey Resort, White Haven, PA. Contact: Harold Comerer, Engineering Foundation, 345 East 47th St., New York, NY 10017, (212) 705-7835.

• October 31-November 2: *Medical and Biological Effects of Light,* Barbizon-Plaza Hotel, New York, NY. Contact: New York Academy of Sciences, 2 East 63rd St., New York, NY 10021, (212) 838-0230.

• November 5-8: *4th International Meeting of the Bioelectrical Repair and Growth Society,* Holiday Inn, Kyoto, Japan. Contact: BRAGS, 425 Medical Education Bldg., 36th & Hamilton Walk, Philadelphia, PA 19104, (214) 898-8653.

Oven Sales Rebound in 1983

Microwave oven sales rebounded last year, with factory shipments running 64 percent over 1982's disappointing levels. Year-end figures from the Association of Home Appliance Manufacturers (AHAM) show that over six million units were shipped in 1983, two million more than the year before and a new annual record.

Shipments reached an all time high for one month when 737,800 units were sent out from factories in January 1984, supporting recent predictions that this will be another record year. In estimates released before the exceptionally strong December and January showings, AHAM predicted 1984 sales would fall a little short of 1983.

According to industry surveys, approximately 30 percent of American households already have microwave ovens.

Though sales are up, highly competitive marketing has left many retailers scrambling for profits. The February 13 *Home Furnishing Daily* (now a weekly) reports that some ovens are selling for as little as $139. As profit margins slip on many ovens, retailers push different models and hard sell accessories. *HFD* cites one store owner who explains, "If you merchandise microwave ovens today the same way as you did one year ago, you'll lose money."

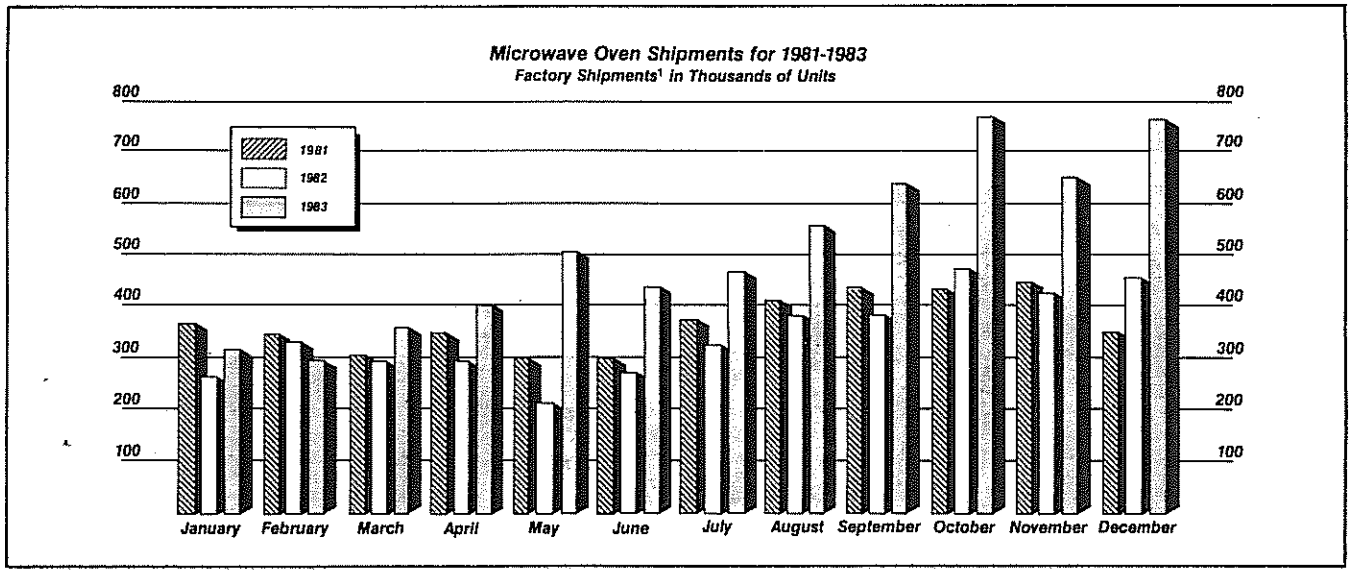
It appears that compact ovens will be a strong growth area in 1984. Sanyo's national sales manager predicted in the March 26 *HFD* that compacts will make up more than 30 percent of the seven million ovens he expects will be sold in 1984. He noted that, although market saturation is relatively high in urban areas where small ovens sell best, the premium on space in city apartments sustains the demand for compacts.

Selling compacts does not preclude offering consumers a stunning array of models and options. For example, one of the new Litton-Aire Generation II over-the-range ovens automatically determines cooking time and power setting and Magic Chef's Big-Little ovens can now be built into a wall with a special kit.

The upswing in microwave oven demand is clearly demonstrated in the table and chart below, which is based on AHAM statistics for ovens shipped in 1981-83.

Microwave Oven Shipments[1] (in Thousands)

		% Change Over				% Change Over	
	1983	1982	1981		1983	1982	1981
Jan.	312.0	16.7	-13.8	July	461.4	42.6	25.7
Feb.	291.0	-10.2	-12.8	Aug.	544.4	45.9	35.5
Mar.	356.5	20.4	18.9	Sept.	635.7	66.2	48.4
Apr.	398.2	39.4	17.0	Oct.	770.7	63.8	76.8
May	492.4	132.2	66.4	Nov.	648.1	52.9	46.0
June	431.3	55.3	29.1	Dec.	771.6	77.6	113.1
				Annual Total:	6113.3	50.2%	38.8%



[1]Includes US produced and imported microwave ovens and combination microwave ovens/ranges.
Source: the Association of Home Appliance Manufacturers (AHAM)

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SHORT COURSES

May 1-3: Mutual Design of Natural Gas Pipelines and Electric Power Lines, Palo Alto, CA. Fee: $75 (EPRI members), $275 (non-members). *Contact: John Dunlap,* Electric Power Research Institute (EPRI), PO Box 10412, Palo Alto, CA 94303, (415) 855-2305.

May 2-4: Health Safety and Other Human Factor Issues in Computer Graphics, Washington, DC. Fee: $695. Contact: George Harrison, Continuing Engineering Education, George Washington University (GWU), Washington, DC 20052, (800) 424-9773, or (202) 676-6106 in DC.

May 7-11: Electromagnetic Interference and Control, Washington, DC. Fee: $875. Contact: GWU, see May 2 above.

May 7-11: Microwave Circuits Design: Linear Circuits, Palo Alto, CA. Fee: $895. Contact: Continuing Education Institute (CEI), 5410 Leaf Treader Way, Columbia, MD 21044, (301) 596-0111 or (213) 824-9545. Repeated ***June 4-8:*** Boston, MA.

May 8-11: Grounding & Shielding, Honolulu, HI. Fee: $815. Optional fourth day for $235. Contact: Don White Consultants Inc. (DWCI), Star Route 625, PO Box D, Gainesville, VA 22065, (703) 347-0030. Repeated ***June 19-22:*** Chicago, IL.

May 14-18: Fundamentals of Communication Satellite Systems, Washington, DC. Fee: $875. Contact: GWU, see May 2 above.

May 15-17: Seminar on Mutual Design of Overhead Transmission Lines and Railroad Communications and Signal Systems, Chicago, IL. Fee: $100 (approx.). Contact: EPRI, see May 1 above. Repeated ***June 19-21:*** Washington, DC; ***September 11-13:*** Atlanta, GA.

May 15-17: Design Methods for Emission and Susceptibility Control, Boston, MA. Fee: $695. Contact: EMXX Corp., 6766 Deland Dr., Springfield, VA 22152, (703) 451-4619. Repeated ***June 25-27:*** Sunnyvale, CA.

May 15-17: An Introduction to EMI/RFI/EMC, Los Angeles, CA. Fee: $815. Contact: DWCI, see May 8 above.

May 18: Electrostatic Discharge Control, Boston, MA. Fee: $275. Contact: EMXX, see May 15 above.

May 21-23: Hazardous RF Electromagnetic Radiation, Washington, DC. Fee: $695. Contact: GWU, see May 2 above.

May 21-25: Microwave Circuit Design I: Linear Circuits, Los Angeles, CA. Fee: $895. Contact: UCLA Extension Short Course Program, PO Box 24901, 6266 Boelter Hall, Los Angeles, CA 90024, (213) 825-1295.

May 21-25: Radar Systems & Technology, Washington, DC. Fee: $875. Contact: GWU, see May 2 above.

May 21-25: Radiation Safety Officer's Course, San Antonio, TX. Fee: $650. Contact: Medical School Continuing Education Services, University of Texas Health Science Center, 7703 Floyd Curl Dr., San Antonio, TX 78284, (512) 691-6295.

May 22-25: MIL-STD-461/462 & System-Level EMI Testing & Procedures, Washington, DC. Fee: $995. Contact: DWCI, see May 8 above.

May 22-25: Modern Antennas, Washington, DC. Fee: $675. Contact: Linda Billard, Technology Service Corp (TSC), 8555 16th St., Suite 300, Silver Spring, MD 20910, (800) 638-2628, or (301) 565-2970 in MD.

May 24-26: European Workshop on Nuclear Resonance in Medicine, Wiesbaden, West Germany. Fee: $260. Contact: Dr. Peter Rinck, PO Box 2149, D6200 Wiesbaden 1, West Germany.

May 31-June 1: MIL-STD-461/462 Test Workshop, Suburban Philadelphia, PA. Fee: $575. Contact: R&B Enterprises, 20 Clipper Rd., W. Conshohocken, PA 19428, (215) 825-1960.

June 4-5: Lightning Protection, Washington, DC. Fee: $625. Contact: GWU, see May 2 above.

June 5-8: Radar Cross-Section Measurement Techniques, Atlanta, GA. Fee: $675. Contact: TSC, see May 22 above.

Different Views at FCC and EPA

EPA's willingness to take measurements in Honolulu is a recent change in policy. Correspondence obtained through the Freedom of Information Act by *Microwave News* reveals that as late as last fall officials at EPA's Office of Radiation Programs (ORP) were reluctant to start a field study, although they acknowledged that exposures created by commercial FM broadcast sources probably exceeded 1 mW/cm^2. (For excerpts of the letters and memoranda on the Hawaii radiation situation, see pp.8-9.)

In a November 28, 1983 letter to a concerned resident, which was later forwarded to Honolulu Councilwoman Marilyn Bornhorst and Hawaii Senator Daniel Inouye, ORP's David Janes stated there was sufficient evidence of a hazard without EPA measurements for residents to seek "corrective action." Janes cited measurements taken by Robert Hall, a Honolulu resident, and calculations made by Richard Tell, an EPA physicist in Las Vegas, NV.

Janes noted that it is "highly unlikely" that the agency will select limits higher than ANSI's 1 mW/cm^2 guideline and that, "Therefore, as an interim position, the agency considers exposures above the ANSI limit to be excessive."

The letter advised that EPA had no enforcement authority and recommended that concerned parties approach the broadcasters involved, the FCC, state health officials or local zoning officials.

The FCC strongly disagreed with EPA's conclusion. Having learned of the potentially hazardous situation in Honolulu from Councilwoman Bornhorst, FCC's Fowler wrote to EPA's Ruckelshaus on February 14 to argue that no "adequate measurement data are available on which to base any decision on corrective action," and that only EPA has the expertise to take these measurements.

Just what the commission will do if EPA provides evidence of unacceptably high exposures is unclear. Since commercial broadcasters are the primary source of environmental non-ionizing radiation exposures for the general public, the FCC could play a key role in implementing the guidance. The commission has announced its intention to enforce the guidance among new or modified broadcast facilities under the National Environmental Policy Act, but has said nothing about how it will handle existing sources.

The FCC's lack of a non-ionizing radiation program, as well as its lack of a radiation safety policy, worries EPA officials who believe the commission must develop its own resources for ensuring that commercial broadcasters comply with the guidance. The agency's March 12 response to the FCC pointed out that the field survey should give FCC field personnel "some valuable experience and training on how to measure potentially hazardous levels of radiofrequency radiation." Although the FCC has offered to help with the survey, it has not made a commitment to send its field personnel, who specialize in measuring sources of RF interference.

The FCC maintains that it is only reasonable for the commission to take a wait and see attitude, given the years EPA has already spent developing RF guidelines. As for the immediate problem in Honolulu, the commission's Robert Cleveland would only say that "we have never been faced with a situation like this before, and our general counsel's office is currently exploring our possible options." Another staffer, who asked to remain anonymous, explained that "the ball is in EPA's court until they provide hard evidence of exposures they consider to be hazardous."

EPA Action in 1975

Conditions in Honolulu were first reviewed by EPA in 1975, in response to a request from the Hawaii Department of Health after the state legislature ordered an RF hazard study. The calculations subsequently prepared by Tell revealed that exposures in several locations near broadcast sources could exceed 1 mW/cm^2 and go as high as 6 mW/cm^2 on the rooftop of one hotel. Requests for actual measurements to confirm these estimates have been made periodically by residents and state officials since the publication of Tell's report, *An Analysis of Broadcast Radiation Levels in Hawaii,* (Technical Note No. ORP/EAD-75-1) in August 1975.

The agency initially argued that actual measurements were not needed because the calculated levels were below the Occupational Safety and Health Administration's (OSHA) 10 mW/cm^2 voluntary standard for worker exposures, which was based on the then current ANSI guidelines. ANSI revised its standard downward from 10 to 1 mW/cm^2 for the 30-300 MHz band in 1982.

In 1975, EPA's Acting Deputy Assistant Administrator for Radiation Programs William Mills summed up the agency's position, stating that even if the estimates were confirmed by field measurements, "there would be no further guidance we could give at this time. Therefore, field studies [in Honolulu] are not required at this time."

Although the agency was planning to measure environmental levels to help develop its guidance, Mills explained that: "It is our determination that these efforts can most efficiently be carried out on a generic basis by a prescribed set of metropolitan area surveys. The choice of metropolitan areas will be based on their ease of access, representative characteristics and potentially unique contributions. These criteria do not appear to be met by the Hawaii situation."

No readings in subsequent field surveys in 15 cities approached the levels calculated for Honolulu. In its advanced notice for proposing the guidance (47 *FR* 57338, December 23, 1982), the agency reported that the maximum levels found near FM antennas were 350 uW/cm^2 in a residential neighborhood and 97 uW/cm^2 in an office building. The agency estimated that more than 99 percent of the population is exposed to less than 1 uW/cm^2 (see *MWN*, January/

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February 1983).

The only measurements on a par with calculated levels for Honolulu were taken at an isolated antenna farm on Mt. Wilson in California, where EPA found maximum readings in the 1 to 7 mW/cm^2 range. The agency's April 1977 report on these readings (ORP/EAD-77-2) states that Mt. Wilson is "probably unique to the entire nation in terms of source density and total number of stations."

Current Status

In describing developments in Honolulu since 1975, EPA's Tell reported in an October 25, 1983 memo to ORP's Janes that "the principal change has been an increase in the number of roof-mounted broadcast antennas." He wrote that measurements taken without professional assistance by Robert Hall were as high as 8.2 mW/cm^2 on the rooftop of the Villa at Eaton Square condominium. Noting that the readings "are in the range of my calculations," Tell concluded that "the time has come to conduct a careful field study in Honolulu."

In a telephone interview, Hall told *Microwave News* that he believes his measurements "were fairly accurate," though he stressed the need for "independent verification."

The scope of the EPA field survey in Honolulu has not been determined. The letters between the FCC and EPA only mention the Villa condominium, though Tell's 1975 report and subsequent correspondence between Tell and Hall indicate there are a number of similar trouble spots in the city. The FCC's Cleveland told *Microwave News* that the commission expects EPA to take measurements at a number of sites.

Tell suggested in the October 25 memo that the Hawaii survey be expanded to include the Lualualei Naval Communications Area Master Station and the US Coast Guard Omega low frequency navigational station elsewhere on the island. Tell noted that these sites would "fit directly into our interest of conducting federal guidance impact investigations at US government facilities that have been suggested as possibly exceeding our proposed guidance exposure limits." ●

EXCERPTS

Correspondence and Memoranda on RF Radiation in Honolulu, 1975-1984

Excerpted below are letters and memoranda to and from the Environmental Protection Agency (EPA) and the Federal Communications Commission (FCC) regarding radiofrequency radiation exposures in Honolulu, HI. The material was obtained by Microwave News *through the Freedom of Information Act.*

The following abbreviations are used for state and federal offices: EPA/ORP — EPA Office of Radiation Programs, Washington, DC; EPA/SF — EPA Regional Office for Region IX, San Francisco, CA; EPA/LV — EPA Electromagnetic Radiation Analysis Branch, Las Vegas, NV; EPA/HI — EPA State Office, Honolulu, HI; HDH — Hawaii Department of Health, Honolulu, HI.

May 22, 1975: Letter from George Yuen, HDH, to James Channell, EPA/SF. The Hawaii State Legislature has adopted a resolution...requesting the State Department of Health to study the possible effects of radiation emission from broadcast towers and the advisability of their relocation or redesign....[We] call on you for assistance in conducting investigations of radiation emission from broadcast towers located in Honolulu....

July 3, 1975: Memorandum from W.D. Rowe, EPA/ORP, to Frank Covington, EPA/SF. At this time it is premature to discuss field verification studies, since the need for such studies strongly depends upon the bounds placed on potential and possible exposure by the analytical study [of Honolulu exposures] now underway....

August 21, 1975: Memorandum from William Mills, EPA/ORP, to Frank Covington, EPA/SF. Enclosed is a report prepared by Mr. Richard Tell of our Environmental Analysis Division, which examines the potential for exposure to radiation from broadcast stations in Hawaii....There is a potential for a small number of people to be exposed in the range from 1 to 10 mW/cm^2. We term this a significant exposure range, because it lies within a factor of 10 of the occupational exposure standard, and it is of interest to document such potential exposures should research indicate that a limiting criteria should be established somewhere in this range....We would not recommend that any present action be taken by the Hawaiian State Health Department....Because none of the calculated values exceeds 10 mW/cm^2, verification that actual values are as high as calculated values would not alter our recommendation....The choice of metropolitan areas [for field studies] will be based on their ease of access, representative characteristics and potentially unique contributions. These criteria do not appear to be met by the Hawaii situation....

September 3, 1975: Memorandum from Richard Tell, EPA/LV, to James Channell, EPA/SF. In actuality the only exact method of determining the exposure level [in Honolulu] would be careful field measurements....

April 12, 1977: Letter from Robert Hall, Director, Yacht Harbor Towers Condominium Association, Honolulu, to EPA/HI. As a direct result of the new television antenna atop the Ala Moana Hotel, we have [seven] questions that reflect our concern....

April 15, 1977: Letter from Richard Tell, EPA/LV, to Robert Hall. ...a value of 0.9 mW/cm^2 might occur at a distance of 350 feet from the [Ala Moana Hotel] antenna complex, the distance you say your building is from the Ala Moana....I am most interested in keeping in touch about this situation....

April 27, 1977: Letter from Robert Hall to Richard Tell, EPA/LV. According to information that I have developed and information that you have sent to me, we apparently have a theoretical possibility of 450 uW/cm^2 in my apartment and 540 uW/cm^2 in an apartment on the 40th floor....I request that your agency take on-site readings in Honolulu....

May 6, 1977: Memorandum from Richard Tell, EPA/LV, to David Janes, EPA/ORP. ...the Yacht Harbor Towers in Honolulu may well represent an ideal site for [a detailed, single building] study in that the situation has already uncovered itself, and the maximum exposures are predicted to be very intense relative to our other metropolitan area survey measurements....

November 16, 1977: Letter from Edward Kuramoto, HDH, to James Channell, EPA/SF. I have enclosed a copy of "Electronic Smog in Honolulu" by Robert W. Hall and a copy of a survey report done for KITV Channel 4 by John Mullaney, Consulting Radio Engineer, "Engineering Statement in Support of Response to Comments of Robert W. Hall Regarding Electronic Smog in Honolulu." Would you please determine if Mr. Mullaney's report appears to be valid....

December 2, 1977: Letter from Richard Tell, EPA/SF, to John Mullaney, Consulting Radio Engineers Inc., Potomac, MD. I was happy to see that you have recently conducted [field] measurements to determine the actual exposure levels....From our own estimates of population exposure I have determined that your measured values of electric field strength by Mr. Hall's apartment mean that the exposure is more than an order of magnitude greater than our estimate of the median exposure in the cities we have looked at and represents a value to which only five percent of these cities' populations are more intensely exposed....

October 26, 1979: Letter from Richard Tell, EPA/LV, to John O'Connor, FCC, Washington, DC. In accordance with our recent telephone conversation...regarding a new proposed UHF TV installation in Honolulu, Hawaii...I am writing to you concerning my analysis of this situation. My analysis was prompted by the close proximity of the proposed installation to nearby high rise buildings and a concern over the possibility of a radiofrequency radiation hazard should the station be constructed....I feel that it would be wise to obtain and very carefully evaluate detailed information pertaining to this installation before it is concluded that it will be perfectly safe....

October 8, 1983: Letter from Robert Hall, Hawaii Institute for Biosocial Research, Honolulu, to Richard Tell, EPA/LV. Since your original study, *An Analysis of Broadcast Radiation Levels in Hawaii* in August of 1975, the situation in Honolulu has changed considerably with regard to several new stations and generally more power....I have personally talked with a supervisor for the painting contractor for the [Villa on Eaton Square] where he reported that his men had difficulty handling metal objects while painting the side of the building facing the [KPOI-FM] tower....

October 25, 1983: Letter from Richard Tell, EPA/LV, to Robert Hall. We have performed a cursory look at the authorized broadcast stations in Honolulu following your inquiry and have noted a significant increase in the number of roof-mounted transmitting antennas....A major factor in interpreting the situation in Honolulu is the extremely complicated environment of many tall buildings with high power broadcasting facilities located on rooftops and adjacent tall towers....The only way to accurately determine these exposure levels is via careful field measurements which take into account the polarization of the incident fields, the frequency of the many signals simultaneously illuminating a given area and the complex reflection patterns which occur in such situations....

October 25, 1983: Memorandum from Richard Tell, EPA/LV, to David Janes, EPA/ORP. Mr. Hall's most recent letter provides some rooftop measurement data taken on the Villa on Eaton Square that show exposures as high as 8.2 mW/cm^2. In all honesty I don't know if the instrument he used was properly functioning but his data are in the range of my calculations. I believe that the time has come to conduct a careful field study in Honolulu....

November 1, 1983: Letter from Robert Werner, President, Villa on Eaton Square Board of Directors, Honolulu, to Richard Tell, EPA/LV. If you feel we are excessively concerned about this [RF exposure] situation please explain to us the reasons why we should be less concerned. On the other hand, if our situation is potentially dangerous, corrective action must be initiated now and a field study by your agency could provide us with the foundation necessary to launch such a program....

November 28, 1983: Letter from David Janes, EPA/ORP, to Robert Werner. Both model calculations by our Non-Ionizing Radiation Branch and measurements by the Hawaii Institute for Biosocial Research [Robert Hall] indicate that fields on the roof of the Villa exceed the recommendations of the American National Standards Institute (ANSI). This should be enough information for you to seek relief....In developing [RF] guidelines it is highly unlikely that EPA would choose levels in excess of the present ANSI voluntary standard and we may select lower levels. Therefore, as an interim position, the agency considers exposures above the ANSI limit to be excessive....We do not believe that additional measurements are needed for you to begin to explore avenues of corrective action....

December 8, 1983: Letter from Honolulu Councilwoman Marilyn Bornhorst to EPA/DC. [Honolulu] is a city with many high rises and very many radio and television transmitting stations. If there is a health problem to my consituents, I would like to know and I would like to have your best advice as to how this danger can be corrected....

December 21, 1983: Letter from David Janes, EPA/ORP, to Councilwoman Marilyn Bornhorst. We have received correspondence on [high RF levels in Honolulu] from Mr. Robert Werner and Senator Daniel K. Inouye and I have enclosed copies together with copies of our replies....If levels exceed those specified in the American National Standards Institute's (ANSI) standard, 1 mW/cm^2 for most of the broadcast frequencies, relief should be sought from the operator of the source, the Federal Communications Commission or state or local health or zoning authorities.

February 14, 1984: Letter from Chairman Mark Fowler, FCC, Washington, DC, to Administrator William Ruckelshaus, EPA, Washington, DC. We do not feel that adequate measurement data are available on which to base any decision on corrective action....Furthermore, the FCC lacks the resources and expertise to conduct the very specialized type of survey that would be required in this type of situation....We, therefore, ask that you commit the resources necessary to obtain the data needed on the RF environment in Honolulu. We will be happy to cooperate and assist in this endeavor to the full extent of our capabilities, but we must emphasize that although the commission may have certain jurisdictional authority over the broadcast transmitters in question, we are heavily dependent on EPA to provide us with the technical assistance necessary to determine the near-field RF environment in and around the area in question....

February 17, 1984: Letter to Councilwoman Bornhorst from Robert Powers, FCC. It is difficult at the present time to answer all of your questions satisfactorily since we feel that a comprehensive survey must be performed before we or any other government organization can determine whether a potential health hazard may exist at the location in question....We would also suggest that you consider contacting your local broadcasters and the Hawaiian Association of Broadcasters for assistance in resolving this matter....

March 12, 1984: Letter from Administrator William Ruckelshaus, EPA, to Chairman Mark Fowler, FCC. The field study you propose could provide an opportunity for both our agencies to work together on the problems of [guidance] implementation. The study should also give your field personnel some valuable experience and training on how to measure potentially hazardous levels of radiofrequency radiation. Once the study is completed, I believe the commission should then act to correct any detected problem....