

# MICRO WAVE NEWS

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Microwave News invites contributions to *From the Field*, our regular column featuring news and opinions from the RF/MW community. Letters from readers are also welcome.

## Navy Appeals ELF Decision

The US Navy has asked a federal court to reconsider its decision to stop all work on the Navy's Project ELF communications system until a new environmental impact statement (EIS) is prepared. Although the Navy has agreed to comply with the court's order to write a new EIS, it wants to continue construction.

On January 31, US District Judge Barbara Crabb ruled in favor of the state of Wisconsin and Marquette County, Michigan, requiring the Navy to revise its 1977 EIS to include "the significant new information on biological effects of electromagnetic radiation that has been generated since 1977." Until the new EIS is completed, Judge Crabb has barred the Navy from building the new ELF facility in Marquette County, upgrading the existing facility at Clam Lake, WI, or supplying submarines with ELF receivers.

Project ELF is designed to use 72-80 Hz extremely low frequency (ELF) signals to communicate with submarines without requiring them to come to the surface.

In a motion filed with the US District Court for the Western District of Wisconsin on February 10, US Attorney John Byrnes asked Judge Crabb to allow the Navy to resume construction pending the completion of the revised EIS. Byrnes contended that "the potential harm to the national  
(continued on p.6)

## OSHA Keeps RF/MW Limit; No Enforcement Possible

The Occupational Safety and Health Administration (OSHA) has decided to retain its voluntary standard limiting exposures to radiofrequency and microwave (RF/MW) radiation. As a result of this and past decisions, there are no enforceable occupational standards for RF/MW radiation in the United States.

The Occupational Safety and Health Review Commission and the courts have ruled that OSHA's voluntary standards cannot be enforced either directly or under the general duty clause of the Occupational Safety and Health Act (see *MWN*, April 1982). Under these decisions, OSHA can enforce a RF/MW safety limit only by deleting the voluntary 10 mW/cm<sup>2</sup> standard, and thereby allowing the use of the general duty clause, or by setting a new mandatory standard.

In final rules published in the February 10, 1984 *Federal Register*, OSHA revoked 153 of the 194 voluntary or duplicative standards originally targeted for deletion on May 28, 1982 (47 FR 23477). The RF/MW 10 mW/cm<sup>2</sup> standard was among those originally slated to be revoked, but was retained at the request of the Federal Communications Commission (FCC), according to OSHA.

Last October, OSHA disclosed that it had suspended work on a mandatory RF/MW health standard (see *MWN*, November 1983). The reasons  
(continued on p.6)

# HIGHLIGHTS

## Three States Consider RF/MW Actions

Three states are considering radiofrequency and microwave (RF/MW) radiation safety measures. In Wisconsin, an advisory group has urged the state to establish a non-ionizing radiation program. In Connecticut and New Jersey, officials have proposed exposure standards for the general public based on the 1982 American National Standards Institute (ANSI) guidelines.

Recent developments in these states are summarized below.

### Wisconsin

After two years of study, a special committee of the Wisconsin Radiation Protection Council has concluded that "there is an urgent need" for research on the effects of long-term, low-level RF/MW exposures and that little data are available for evaluating non-ionizing radiation health risks. In a February 1 final report, the group recommends that the state take a number of steps to address RF/MW radiation safety issues.

Noting that no state authority oversees RF/MW radiation safety, the committee has advised that the state develop a program to monitor radiation levels, provide public information and educate health care professionals. The group has also recommended that non-ionizing radiation be covered under Wisconsin's right-to-know labor law.

The committee's final report and recommendations were accepted by the council on February 17 and will be forwarded to the state Department of Health and Social Services. The department is responsible for making recommendations to the legislature.

Council staff scientist Teri Vierima told *Microwave News* that advice from the council carries a great deal of weight with the legislature. She added, however, that the proposals are unlikely to be considered in the current session, which ends in April.

In urging that public and private institutions in the state begin RF/MW bioeffects research, the committee stressed that little is known about non-thermal effects, which are of primary interest in terms of the general population. They state that, "while there is little evidence that current levels of exposure are hazardous, there is also little evidence that current levels of occupational, medical and public exposures do not produce long-term effects."

The eight-member Non-Ionizing Radiation Committee was set up in 1982 when the legislature began drafting Wisconsin's right-to-know law. The group has recommended that it become a permanent advisory committee under the Radiation Protection Council.

### Connecticut

Connecticut's joint Environment Committee has scheduled a March 8 hearing to consider a bill establishing a state RF/MW standard at least as restrictive as ANSI's guidelines. House Bill 5675 would allow state regulators to follow either Massachusetts, which last year adopted a standard five times more stringent than ANSI's (see *MWN*,

September 1983), or New Jersey, which has proposed using ANSI levels (see *MWN*, January/February 1984).

Connecticut's bill, introduced in committee by Rep. Moira Lyons in late February, mandates that the state Commissioner of Environmental Protection adopt a standard for public exposure to 300 kHz – 100 GHz radiation and that the department set up a registration and monitoring program. Operators of RF/MW sources would have to demonstrate compliance with the standard before receiving operating permits. Certain sources, including mobile radios and consumer products, would be exempt from the rule.

In an interview with *Microwave News*, Lyons reported that the bill has a good chance of passing before the legislative session ends on May 6. Lyons said hearings held last year indicate that the broadcast community supports a standard (see *MWN*, November 1983).

Lyons expects the committee to forward the bill to the House soon after the March 8 hearing.

The state Department of Environmental Protection would have one year to comply with the measure after it became law. Lyons said the department's radiation section would probably be responsible for drafting the standard and conducting public hearings.

### New Jersey

The New Jersey Commission on Radiation Protection is expected to vote on its proposed RF/MW standard this month. The group, which has the authority to establish state radiation guidelines, has recommended adopting ANSI guidelines (see *MWN*, January/February 1984).

After evaluating testimony from two public hearings and about a dozen written comments, the commission met on February 22 to discuss final revisions in the standard. According to RCA's Dr. Fred Sterzer, a commission member and the chairman of its non-ionizing radiation advisory committee, the only significant change was the exclusion of mobile RF/MW sources. (At one of the hearings, a representative from the state police warned that the use of police radios and other emergency communications systems could be affected by the ANSI standard.)

Sterzer said minor changes included a clarification of the standard's emission limits for microwave ovens. Emissions from ovens manufactured after 1971 would be limited to 5 mW/cm<sup>2</sup> measured at a distance of 5 cm.

At present there are no plans for further public hearings, though the state Department of Environmental Protection could decide that the revisions are extensive enough to require another meeting.

## New Industry Alliance for Policy and Standards

A new industry alliance was founded last month to push for federal safety standards for non-ionizing radiation. Manufacturers and users of radiofrequency and microwave (RF/MW) technology will use the organization to focus their lobbying and educational efforts and to sponsor independent research in areas related to radiation safety.

The Electromagnetic Energy Policy Alliance (EEPA) is an outgrowth of the RF/MW industry's concern over state and local radiation standards, such as those already adopted by Massachusetts, and over costly siting disputes generated by public apprehension about radiation hazards. EEPA believes that national exposure guidelines would go a long way in eliminating these problems.

Barry Umansky of the National Association of Broadcasters (NAB) told *Microwave News* that EEPA will be run by a private management firm in Washington, DC, with a start-up budget of about \$100,000. NAB, the Electronic Industries Association (EIA) and the Association of Home Appliance Manufacturers (AHAM) were early supporters of the organization, which was initially called the Alliance for Responsible Non-Ionizing Radiation Policy.

The organization's founding members are AT&T, GTE, MCI Telecommunications, Motorola, NAB, Raytheon, RCA and Rockwell/Collins.

According to Raytheon's Dr. John Osepchuk, chairman of the EEPA organizing committee, the alliance's first year will be largely devoted to building up membership. Member contributions will vary but the precise formula has not been worked out. Asked what research areas might receive funding, Osepchuk said "it could be anything from 60 Hz fields to millimeter waves."

Work to set up the alliance started in late 1982, after a private conference held at the Homestead resort in Hot Springs, VA. That meeting, sponsored by NAB, EIA and AHAM, provided an intimate forum for industry representatives to discuss RF/MW policy and legal issues (see *MWN*, October 1982). The press was barred from the conference and no minutes were prepared.

EEPA's first board meeting is tentatively scheduled for March 9 in Washington, DC. The board's chairman is Dr. Daniel Walters of MCI. Also serving are Howard Rosenthal, RCA; Morton Topfer, Motorola; Edward Fritts, NAB; John Whittaker, GTE; Dr. Howard Sobol, Rockwell/Collins; and Dr. Joseph Shea, Raytheon. An eighth appointment will be made later.

## **Workshop on Space Shuttle EMC**

A *Workshop on Payload Susceptibility to Space Shuttle Ku-Band Radiated Fields* will be held at the Johnson Space Center in Houston, TX, on May 30.

The workshop was prompted by concern that the relatively high fields radiated by the shuttle orbiter's Ku-band antenna might interfere with the payloads deployed from the spacecraft.

"A lot of people are worried," according to Ralph Lawton of McDonnell Douglas, who is organizing the workshop, "and we want to clear up any technical confusion that may exist."

Among the topics to be discussed are the susceptibility of integrated circuits and general avionics to Ku-band (11-18 GHz) radiation. Lawson said that there has already been so much interest in the workshop that it may be expanded into a two-day meeting.

When asked if there was any possibility that the loss of the two satellites launched from the space shuttle Challenger last month could have resulted from a failure in electromagnetic compatibility (EMC), Lawton answered with a quick and emphatic "No."

For more information, contact Lawton at McDonnell Douglas Technical Services Co., 16441 Space Center Blvd., Houston, TX 77058, (713) 488-5660, ext. 468.

## **IRPA Approves Interim RF/MW Exposure Guidelines**

The International Radiation Protection Association (IRPA) has approved limits for occupational and public exposures to radiofrequency and microwave (RF/MW) radiation. After ten years of deliberations by a working group that became the International Non-Ionizing Radiation Committee (INIRC) in 1977, the interim exposure guidelines were approved by the IRPA Executive Council on July 8. The guidelines are scheduled for publication in the April issue of *Health Physics*.

The limits for occupational exposures are similar to — but stricter than — the safety levels adopted by the American National Standards Institute (ANSI) in 1982.

Like ANSI, IRPA's most stringent occupational exposure limit is 1 mW/cm<sup>2</sup>. But IRPA mandates this level over a wider range of frequencies. While ANSI specifies a maximum exposure of 1 mW/cm<sup>2</sup> in the 30-300 MHz band, rising to 5 mW/cm<sup>2</sup> at 1.5 GHz, the IRPA band is 10-400 MHz and the 5 mW/cm<sup>2</sup> limit takes effect at 2 GHz.

IRPA's guidelines are also much stricter at lower frequencies: in the 100 kHz-1 MHz band, IRPA's exposure limit is 10 mW/cm<sup>2</sup>, as compared to ANSI's 100 mW/cm<sup>2</sup> limit for 300 kHz-3 MHz.

For the general population, the IRPA limits are five times more stringent than its occupational limits; thus, for 10-400 MHz the limit is 200 uW/cm<sup>2</sup>. ANSI recommends the same limits for workers and the general public. Above 2 GHz, the public would be exposed to a maximum of 1 mW/cm<sup>2</sup> under the IRPA guidelines.

The IRPA and ANSI limits for frequencies above 10 MHz are based on the same conclusion: that exposures should not exceed a whole-body specific absorption rate (SAR) of 0.4 W/Kg when averaged over six minutes.

In its appended rationale for the guidelines, the IRPA committee cautions that present knowledge on biological effects is limited and that its guidelines should be "subjected to periodic revisions" as more information becomes available. For instance, "The emerging evidence for non-thermal mechanisms of biological effects cannot be ignored and has to be considered in establishing exposure limits" and "For frequencies below 10 MHz, very little information on biological effects exists."

Unlike all other RF/MW standards, the IRPA guidelines include a maximum exposure level for pulsed fields: instantaneous peak values for all frequencies should not exceed 100 times the six-minute averaged limits.

The IRPA committee recommends that radiation in the

extremely low frequency (ELF) range be considered separately. According to Dr. P. Czerski, a member of the IRPA committee, an ELF document is now in preparation by a joint IRPA and World Health Organization (WHO) working group. Its report should be published next year.

The members of IRPA's INIRC group were: H.P. Jammet, Chairman (France), B.F.M. Bosnjakovic (Netherlands), P. Czerski (Poland), M. Faber (Denmark), D. Harder (Germany), J. Marshall (Great Britain), M.H. Repacholi (Australia), D.H. Sliney (USA) and J.C. Villforth (USA); A.S. Duchene (France) served as Scientific Secretary.

### **Labor Group Reports Ninth VDT-Pregnancy Problem Cluster**

Half of the pregnancies among VDT operators at a San Francisco airline reservations center ended in miscarriages, birth defects or other abnormal outcomes, a survey of VDT users by a women office workers' group has revealed. This is the ninth cluster of pregnancy problems identified among VDT operators (see *MWN*, November 1981 and January/February, April, May and July/August 1982).

The group, 9 to 5, the National Association of Working Women, which surveyed 873 VDT operators nationwide, said it had located 14 other possible clusters. The results of the survey were made public February 16 at a press conference in New York City.

Among 48 pregnancies at the United Airlines office in San Francisco between 1979 and 1984, 24 ended abnormally, according to 9 to 5. There were 15 miscarriages; the other nine pregnancies ended in still births or neo-natal deaths, premature births, birth defects or other irregular outcomes. Approximately 300 people operated VDTs at the United office during the period in which the cluster occurred.

Employees at United have asked the National Institute for Occupational Safety and Health (NIOSH) to do a Health Hazard Evaluation (HHE), and 9 to 5 has asked to observe the NIOSH investigation.

Dr. Jim Melius, chief of NIOSH's Hazards Evaluation and Technical Assistance Branch, said that NIOSH will make an initial site evaluation in mid-March. In a telephone interview, Melius told *Microwave News* that the investigation will be limited to gathering basic data, such as air quality and lighting intensity. This information will be used to determine whether further work is needed.

Joseph Hopkins, speaking for United Airlines, said the company would try to cooperate fully with NIOSH, but cautioned that company lawyers might advise otherwise. United had "no prior knowledge" of the February 16 release of the reported cluster, he said, and "we feel that we were singled out...without any chance to defend ourselves."

Between 75,000 and 100,000 VDTs are used by air carriers, including United, according to the Air Transport Association, a trade group. Most of these are operated by reservations clerks.

The United Airlines cluster was identified using data gathered last year by 9 to 5 from a "VDT Hotline" which received more than 6,000 calls (see *MWN*, June 1983). A self-selecting sample of callers completed questionnaires. Karen Nussbaum, 9 to 5's executive director, said that the survey "confirms that the health complaints of VDT operators are widespread and serious."

The eight previous clusters remain unexplained. Government officials have maintained that the clusters are chance events resulting from the widespread use of VDTs. 9 to 5's Nussbaum urged that research be focused on resolving the uncertainty about the nine clusters.

When it released the survey data, 9 to 5 also recommended that:

- NIOSH establish a national tracking system to monitor reported VDT-related health problems;
- Employers provide properly designed and maintained equipment, allow adequate rest breaks and generally adopt policies that reduce stress among their employees;
- Manufacturers produce equipment with standardized safety features and provide training and information to purchasers to lessen user risks.

NIOSH is considering these requests, according to Melius.

The 9 to 5 survey also found that a majority of questionnaire respondents "often or daily" experienced eyestrain (53.5 percent), exhaustion (51.6 percent) or muscle pain (56.2 percent) as a result of working at a VDT. Nearly half (48.6 percent) reported treatment by eye doctors for vision problems or changes in eyesight, and 43.6 percent said they experienced tension or anxiety.

More than 62 percent of the respondents are clerical or secretarial employees, and among the entire group the greatest number (38.7 percent) have worked at VDTs for between one and three years.

The reported cluster has renewed the controversy about VDT health and safety risks. For example, an editorial in the February 27, 1984 *Computerworld* criticized 9 to 5 for making broad charges and acting "in a manner designed to raise fear" among VDT operators. The group lacked sufficient data, the editorial charged, but added that, "This is not to shrug off the possibility of a long-range health hazard from VDTs," particularly from radiation; but it urged that this possibility "be studied coolly, rationally and thoroughly to prevent VDT radiation from becoming, like asbestos, a hazard that is discovered too late."

Copies of 9 to 5's report on the survey can be requested from the group at 1224 Huron Road, Cleveland, OH 44115.

### **VDT Hearings Resumed by Congressional Subcommittee**

A congressional subcommittee continued its study of health and safety problems associated with video display terminals (VDTs) at a hearing held in Washington, DC, on February 28. At the first of several hearings planned for this year, the subcommittee on health and safety of the House

Committee on Education and Labor was urged to enact VDT safety rules by a representative of the Service Employees International Union (SEIU), District 925.

The subcommittee had met in October 1983 to consider the results of the Newspaper Guild/Mt. Sinai VDT study (see *MWN*, November 1983). A subcommittee spokesman said that scientists from the National Institute for Occupational Safety and Health (NIOSH), representatives of computer manufacturers and other union officials are scheduled to testify at three hearings planned for March and April.

District 925 Executive Director Jackie Ruff called for legislation to protect all VDT workers, not just those who belong to unions. She urged the subcommittee to require metal shielding and periodic testing for X-ray radiation and to guarantee the right to alternative work during pregnancy for VDT operators. No legislation on VDT health and safety is now pending in Congress.

Ruff also presented the results of the VDT hotline survey completed by 9 to 5, the National Association of Working Women (see preceding story). Among the findings were a possible cluster of pregnancy problems at a United Airlines reservations office in San Francisco and 14 other possible clusters which the group is investigating. At a press conference after the hearing, Ruff said that it is "very likely" that some of these clusters will be publicly identified in the near future.

Testifying with Ruff, Rebecca Alford, a VDT operator at the Equitable Life Assurance Society in Syracuse, NY, said that she "cannot help but think there is a connection" between her work and the multiple birth defects suffered by her recently-born child. The introduction of VDTs at Equitable three years ago "enslaved us to the new machinery and subjected us to health and safety hazards," according to Alford.

At the hearing, subcommittee Chairman Joseph Gaydos (D-PA) said that he will "proceed in a persistent manner" to evaluate possible risks of VDT use. The ranking minority member of the panel, Rep. Steve Gunderson (R-WI), added that, "If we can prove there is clearly a problem, then this subcommittee wants to act."

SEIU represents more than 90,000 clerical workers in the public and private sectors. Its District 925 is affiliated with 9 to 5.

## **Cable TV RFI**

The National Cable Television Association (NCTA) has urged its members to ensure their systems are not potential sources of radiofrequency interference (RFI). This message follows stepped-up inspections of cable TV systems by the Federal Communications Commission (FCC), which resulted in thousands of dollars in fines to operators in 1983.

Though the commission is primarily interested in enforcing its rules for protecting aeronautical communications, FCC staffers report that interference to amateur radio is also a major problem.

In a special January 20 letter to its members, NCTA underscored that the FCC is taking a "tough stand" on

noncompliance with its technical standards, "especially in areas of prior clearance for aeronautical frequency and signal leakage." The commission requires that cable operators report the use of all signals which fall into the aeronautical band.

Though there are relatively few reports of cable TV RFI with ground-to-air communications, the commission levied approximately \$200,000 in fines last year for non-compliance with its rules to protect this service. For the most part, operators had failed to comply with FCC requirements for reporting the use of frequencies in the aeronautical communications bands. According to FCC spokesmen, the commission has not imposed any fines for actual interference.

The FCC's efforts have apparently impressed cable TV operators. For example, a recently fined cable systems owner fired off a memo to its managers explaining the importance of compliance with FCC rules and requesting that they monitor for leaks on a regular basis.

Airplane communications can be very sensitive to interference. For example, two years ago the commission discovered that planes landing at Andrews Air Force Base were picking up stray signals from a store's cash register scanner, a device that reads standardized bar codes on product labels.

In contrast to aeronautical RFI, interference to amateur radio has elicited scores of complaints but only one FCC fine of \$6,000 against Sonic Cable TV of California in 1982 (see *MWN*, November 1982 and January/February 1984). Although amateur radio is a much lower FCC priority than safety services like ground-to-air communications, the American Radio Relay League (ARRL) maintains this RFI is a major problem among its 400,000 members.

Discussions between the league and NCTA on how to handle ham operator complaints became so heated last year that talks between the two groups broke down altogether. Insiders say the organizations have now reached a truce. NCTA's Wendell Bailey reports that "there is now a spirit of mutual cooperation" as the two groups "look into the boundaries of the problem."

ARRL and NCTA have been bickering over a January 1982 league petition asking the FCC to bar cable TV systems from using any amateur radio frequencies (see *MWN*, October 1983). Because hams use sensitive receivers to pick up very weak signals, amateur radio is susceptible to all kinds of interference. Jeff Young of the FCC's Field Operations Bureau explained that almost all complaints are resolved without FCC intervention.

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for that action have not been made public, but, at the time, OSHA officials said that non-ionizing radiation was not a high priority and that they intended to use the agency's limited resources to develop other health standards.

In a series of interviews, OSHA officials suggested that the agency had not intended to stop its efforts to control worker exposures to RF/MW radiation. The reason work on a new RF/MW standard had stopped while the voluntary standard remained in place was that two different offices within OSHA were involved and each thought that the other would cover RF/MW hazards. The staff at OSHA's Health Standards Programs believed that the voluntary 10 mW/cm<sup>2</sup> standard would be revoked, allowing enforcement under the general duty clause, while those writing the rules deleting the voluntary standards thought that a new standard was being prepared.

### FCC Changes Its Mind

In the preamble to its February 10 rules, OSHA said that it retained the RF/MW standard to comply with a request from the FCC. Although the FCC had asked OSHA to keep the 10 mW/cm<sup>2</sup> standard, it later reversed its stand. But by then, OSHA would not consider the FCC's new position.

In order to understand what happened between the two federal agencies, a brief review of the events of 1982 is necessary. On January 28, 1982, the FCC proposed rules to control potential RF/MW radiation hazards (see *MWN*, March 1982). The commission planned to base its rules on OSHA's 10 mW/cm<sup>2</sup> standard: those projects which would result in occupational or public exposures in excess of 10 mW/cm<sup>2</sup> would be considered "major actions" under the National Environmental Policy Act (NEPA), which requires federal agencies to prepare an environmental impact statement for such projects.

Then, on May 28, OSHA proposed deleting the 10 mW/cm<sup>2</sup> standard. The FCC responded on July 27, saying that, "If OSHA removes the only existing federal non-ionizing radiation standard from its rules without adopting a replacement standard, the FCC will not have the means by which to fulfill its obligation to assess the environmental significance of its actions with respect to [RF/MW] radiation hazards."

Meanwhile, the FCC was receiving comments on its own proposal. Many of the responding companies asked the commission to rely on the American National Standards Institute (ANSI) guidelines, which were approved on July 30, 1982 (see *MWN*, September 1982). Robert Cleveland of the FCC's Office of Science and Technology told *Microwave News* that when he reviewed these comments and discovered an industry preference for the ANSI limits, he relayed the news to OSHA, only to be told it was too late because OSHA's comment period had closed on July 27. The FCC's comment period closed on August 18.

OSHA's Tom Seymour, who developed the rules deleting the voluntary standards at the Office of Fire Protection, confirmed that he knew the FCC had changed its mind. But, he said, the agency could not take this into account because "it would jeopardize the public record."

Thus, OSHA stated in the preamble to its final February

10 rules that standards like the 10 mW/cm<sup>2</sup> RF/MW limit, though advisory, "are used by other federal agencies, such as the FCC in exercising its own statutory obligations. OSHA believes that revocation of these provisions would have deleterious effects and would not accomplish the purposes of the revocation as expressed in the proposal."

### OSHA's Other Rationale

In addition to responding to what he perceived to be FCC needs, OSHA's Seymour said that his agency had decided to keep the 10 mW/cm<sup>2</sup> standard because it was referred to in another set of OSHA regulations.

Section 1910.268(p)(2) of OSHA's health and safety rules requires the posting of a warning sign in "accessible areas associated with microwave communication systems where the electromagnetic radiation level exceeds the [10 mW/cm<sup>2</sup>] radiation protection guide..." Section 1910.268(p)(3) requires employers to "institute measures that insure that the employee's exposure is not greater than that permitted by the radiation guide." But these regulations only apply to "microwave transmission" for telecommunications, which is defined as the 1-300 GHz frequency band. The 10 mW/cm<sup>2</sup> protection guide, Section 1910.97, covers 10 MHz-100 GHz.

No one interviewed for this article, other than Seymour, had ever heard of these OSHA rules.

In the introduction to its February 10 rules, OSHA noted that the National Advisory Committee on Occupational Safety and Health (NACOSH) had advised the agency to turn the voluntary standards into mandatory ones. OSHA said it "agreed with NACOSH that rule making action might be warranted in the future..." and later added that a revision of the RF/MW standard is "planned in the future."

Seymour expressed his confidence that work on a new RF/MW standard would begin soon.

OSHA Administrator Thorne Aughter has announced that he will resign effective March 30 to join a construction company in Kansas. No replacement had been named at press time. ●

### ELF Decision (continued from p.1)

defense caused by a delay in implementing Project ELF substantially outweighs any potential environmental effect."

Byrnes stated that if the Navy's motion is denied, an appeal to the US Court of Appeals is "highly likely."

In support of his motion for reconsideration, Byrnes submitted affidavits from Secretary of the Navy John Lehman, Jr., and Ronald Koontz, the Navy's program manager for the ELF communications system. According to Koontz, a one-year delay in completing the system, originally scheduled for April 1986, would increase the cost of the project by an estimated \$10-15 million. The full text of Lehman's declaration is reprinted on p.9.

On February 23, the state of Wisconsin asked Judge Crabb to clarify whether her January 31 decision stopped the Navy from using the ELF facilities, already installed and

operational, at Clam Lake until a new EIS is completed.

Briefs from each side will be submitted to the court by the middle of March, with Wisconsin's final reply brief due on March 20.

### Work on EIS Begins

The Navy has announced that it will write a new EIS and has asked the IIT Research Institute (IITRI) in Chicago, IL, to collect bioeffects data published since 1977 as a first step in its preparation. IITRI's Dr. Anthony Valentino told *Microwave News* that the Navy has not asked IITRI to evaluate the data or to write the EIS. A decision on who will prepare

the EIS had not been made at press time. Valentino recently rejoined IITRI as manager of electromagnetic and environmental effects after five years at Argonne National Laboratory.

In her 69-page decision, Judge Crabb presents a history of Project ELF and recent developments in research on the bioeffects of ELF radiation, with special emphasis on studies linking ELF to leukemia, on Dr. Jose Delgado's experiments on the teratological effects of low frequency pulsed magnetic fields and on Drs. Ross Adey and Carl Blackman's demonstration of frequency and power windows. Excerpts from her decision are reprinted on pp.8-9. ●

## SHORT COURSES

**April 3:** *EMC: The FCC Means Business*, Boston, MA. Fee: \$595. Contact: Carol Clark, McGraw-Hill Seminar Center, 331 Madison Ave., Suite 603, New York, NY 10017, (212) 687-0243.

**April 9-10:** *Grounding, Bonding & Shielding*, Washington, DC. Fee: \$625. Contact: Continuing Engineering Education, George Washington University (GWU), Washington, DC 20052, (800) 424-9773, or (202) 676-6106 in DC.

**April 10-11:** *Radar Principles for the Non-Specialist*, Washington, DC. Fee: \$625. Contact: GWU, see April 9 above.

**April 10-12:** *Grounding & Shielding*, Philadelphia, PA. 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 **May 8-11:** Honolulu, HI; **June 19-22:** Chicago, IL.

**April 16:** *Applying Military Electromagnetic Compatibility Specifications*, Chicago, IL. Fee: \$295. Contact: Jean Tucker, ECOS Environmental Solutions, 205 W. Harrison St., Oak Park, IL 60304, (312) 383-2505.

**April 23:** *Electrostatic Discharge Control*, San Antonio, TX. Fee: \$275. Contact: EMXX Corp., 6766 Deland Dr., Springfield, VA 22152, (703) 451-4619. Repeated **May 18:** Boston, MA.

**April 23-26:** *Modern Microwave Measurements*, Palo Alto, CA. Fee: \$895. Contact: Continuing Education Institute (CEI), 5410 Leaf Treader Way, Columbia, MD 21044, (301) 596-0111 or (213) 824-9545.

**April 24-27:** *Phased Array Antenna Technology*, Boulder, CO. 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.

**April 26-27:** *Cellular Radio Communications*, Washington, DC. Fee: \$625. Contact: GWU, see April 9 above.

**April 30-May 4:** *EMC Design & Measurement for Control of EMI*, San Diego, CA. Fee: \$995. Optional fifth day for \$235. Contact: DWCI, see April 10 above.

**April 30-May 4:** *NBS Noise Measurement Seminar*, Boulder, CO. Fee: \$775. Contact: Sunchana Perera, Div. 723.05, National Bureau of Standards, Boulder, CO 80303, (303) 497-3546.

**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 7-11:** *Microwave Circuits Design: Linear Circuits*, Palo Alto, CA. Fee: \$895. Contact: CEI, see April 23 above. Repeated **June 4-8:** Boston, MA.

**May 7-11:** *Electromagnetic Interference and Control*, Washington, DC. Fee: \$875. Contact: GWU, see April 9 above.

**May 8-11:** *Modern Antennas*, Washington, DC. Fee: \$675. Contact: TSC, see April 24 above.

**May 14-18:** *Fundamentals of Communication Satellite Systems*, Washington, DC. Fee: \$875. Contact: GWU, see April 9 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; and **September 11-13:** Atlanta, GA.

**May 15-17:** *Design Methods for Emission and Susceptibility Control*, Boston, MA. Fee: \$695. Contact: EMXX, see April 23 above. Repeated **June 25-27:** Sunnyvale, CA.

**May 15-17:** *An Introduction to EMI/RFI/EMC*, Los Angeles, CA. Fee: \$815. Contact: DWCI, see April 10 above.

**May 21-23:** *Hazardous RF Electromagnetic Radiation*, Washington, DC. Fee: \$695. Contact: GWU, see April 9 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 April 9 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 April 10 above.

**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.

**June 4-5:** *Lightning Protection*, Washington, DC. Fee: \$625. Contact: GWU, see April 9 above.

**June 12-14:** *Transmission Line Design Optimization*, Schenectady, NY. Fee: \$100 (EPRI members), \$600 (non-members). Contact: B. Gnat, Power Technologies, Inc., PO Box 1058, Schenectady, NY 12305, (518) 374-1220. Repeated **June 26-28:** Haslet, TX; **July 10-12:** Palo Alto, CA.

**June 13-15:** *Biological Effects of Transmission Lines and Substations*, Chicago, IL. Fee: \$685. Contact: Ms. Hargett, Professional Development Services (PDS), 4 Professional Dr., Suite 148, Gaithersburg, MD 20879, (301) 926-2797.

**June 18-19:** *Electrical Accidents Involving Power Lines*, Washington, DC. Fee: \$475. Contact: PDS, see June 13 above. Repeated **June 21-22:** Denver, CO.

# EXCERPTS

## Project ELF Decision

*Reprinted below are portions of District Judge Barbara B. Crabb's decision in State of Wisconsin v. Caspar W. Weinberger, the US Department of Defense, John F. Lehman, Jr., and the US Department of the Navy, decided on January 31, 1984.*

I begin with the threshold question whether the information on biological effects generated since 1977 is significant enough to impose upon the Navy the duties of evaluation and explanation....

In 1977, there was little or no evidence to contradict the findings and conclusions of the 1977 National Academy of Sciences study and the Navy's 1977 environmental impact statement that extremely low frequency electromagnetic radiation had no effect upon animal fertility, growth and development or behavior. Scientific studies undertaken since then have produced results that raise questions about the validity of prior assumptions of the safety of extremely low frequency electromagnetic radiation.

In the areas of cellular function, enzymatic function, animal behavior, and growth and development, researchers such as Delgado, those at UCLA, and Adey and Blackman have found evidence that the biological effects of extremely low frequency electromagnetic radiation occur in a nonlinear dose-response relationship. These researchers and others have identified both the phenomenon of frequency and power intensity windows and the probable existence of two such windows at 15 Hz and 75 Hz.

Researchers at Battelle Laboratories have found teratogenic effects, as well as effects on animal behavior and on neurophysiology from exposure to electromagnetic fields at 60 Hz. Goodman at University of Wisconsin-Parkside has observed alterations in basic cell functions and in oxygen consumption in slime mold exposed to extremely low frequency electromagnetic radiation....

The primate studies at Pensacola and at UCLA reveal effects upon growth rate and behavior from exposure to electromagnetic radiation.

In addition, epidemiology studies raise the possibility that there may be a correlation between the incidence of cancer and the magnetic fields associated with electric power lines. Although they are only suggestive at this time, the 1977 epidemiology studies, such as those by Wertheimer-Leeper, provide quantified data and descriptions of control group characteristics and selection criteria sufficient to allow outside evaluation of their merit, in contrast to the earlier epidemiology studies from Eastern Europe and the USSR.

These studies provide new information that was not available to the Navy or to the public in 1977. Although the research results do not prove that biological effects will result from exposure to extremely low frequency electromagnetic radiation, neither are they mere reconfirmations of the Navy's 1977 assessment of the negligibility of any potential environmental effects.

The merit of the new information has been attested to by the expert witnesses....

The new information was accessible to the Navy. It derives entirely from Navy-sponsored studies or from published articles.

The new information raises questions about long-term exposure to ELF electromagnetic radiation that should be taken into consideration by the decisionmakers. For example, the window studies cast doubt on the Navy's reliance on long-term hazard-free experience with electric power lines as well as the Navy's discounting of research performed at frequencies and intensities different from those of the ELF facility. The studies demonstrate that the nature of the relationship between exposure and effect is not yet sufficiently understood to permit extrapolation from the presence or

absence of effects at any one frequency. Moreover, the observation of a frequency window effect within the range at which the ELF antennae will operate is information that is highly relevant to an assessment of the environmental impact of the project.

The 1977 environmental impact statement is no longer adequate as a source of information necessary to a rational decision on the relative risks and benefits of Project ELF....

I conclude that the scientific information on biological effects generated since 1977 is significant enough to require careful review by the Navy. I refrain expressly from finding that any one of the studies, or all of them taken together, invalidate the Navy's previous assertion that long-term exposure to ELF electromagnetic radiation will produce no adverse biological effects. The research results remain equivocal. The scientists do not agree on the import of that research, and I am not prepared to evaluate the substance of the individual studies or to weigh the relative merits of the various scientific opinions in this complex area....

Despite the continuing uncertainty over the potential biological effects of electromagnetic radiation, those effects must be taken into account by the Navy because they represent significant new information relevant to the environmental consequences of the proposed action. This does not mean that the Navy must postpone operation of Project ELF until all uncertainty has been resolved. It does mean that the Navy must undertake a considered review of all that is known to date and evaluate the relative risks and benefits before proceeding with Project ELF.

Defendants contend that the Navy's establishment of an Environmental Review Committee and an ecological monitoring program, the various research projects it funded and its contract with IIT Research Institute for literature reviews and other work demonstrate a high degree of concern for keeping abreast of the relevant developments in the field of electromagnetic radiation effects and a careful consideration of those developments.

However, my view of the Navy's efforts is that they are of relatively little use in assessing the potential danger of electromagnetic radiation on animal life. By themselves, the activities do not show a high degree of care and, in any event, they are not a substitute for a thorough review of the relevant information and a careful weighing of the risks and benefits of Project ELF.

For example, the Environmental Review Committee focused primarily on the impact of Project ELF on the physical environment....

Similarly, the Navy's ecological monitoring program was devoted essentially to the environmental consequences of Project ELF. Only one of the thirteen research projects that made up the program was concerned with potential biological effects of extremely low frequency electromagnetic radiation and that was the Goodman slime mold field study at Clam Lake, for which there are no results as yet.

In addition to the slime mold study, the Navy has sponsored several animal studies. Of these, the Pensacola primate growth study and the UCLA monkey behavior study appear to be the most substantive. The Pensacola study was reviewed by a National Academy of Sciences panel and the UCLA study has been referred to frequently in other literature on biological effects of extremely low frequency electromagnetic radiation. However, other Navy studies such as the bird migration study, the multigenerational mice study and the review of the physical condition of Navy workers at the Clam Lake site produced inconclusive results or merely confirmed earlier findings. Moreover, the Navy never subjected any studies other than the Pensacola primate study to peer review and it never attempted a comprehensive review of the pieces of information generated by the studies it had sponsored.



With respect to the contract with IIT Research Institute for literature reviews, the evidence shows that IIT Research Institute evaluated articles and provided the Navy with studies and summaries of articles only on a sporadic basis and only after the decision had already been made not to supplement the 1977 environmental impact statement....

I conclude that the record does not demonstrate that the Navy fulfilled its duty of conducting a thorough and comprehensive review of the new scientific information on the biological effects of extremely low frequency electromagnetic radiation and the significance of that information....

In summary, I find and conclude that in proceeding with the reactivation of Project ELF without undertaking a thorough and comprehensive review of the significant new information on biological effects of electromagnetic radiation that has been generated since 1977 the Navy abused its discretion. In so proceeding, the Navy acted in violation of the National Environmental Policy Act....

I am not in a position to determine the full significance of the new information on biological effects. It may be that the significance of the new information is such that the Navy could have fulfilled its obligation of explanation in some way other than by filing a supplemental environmental impact statement. However, at this time it would not be in the public's interest or in the Navy's to permit the Navy to go forward with Project ELF without requiring it to file a supplemental environmental impact statement. The public has displayed an interest in this case and in the human health implications of Project ELF. A supplemental environmental impact statement will allow the public to address the issue of biological effects, as well as serving to advise the public that the Navy has taken the issue into consideration....

### **Declaration of John F. Lehman, Jr.**

*Reprinted below is the declaration of John F. Lehman, Jr., Secretary of the Navy, in support of the Navy's motion for reconsideration of Judge Barbara B. Crabb's decision to require a new environmental impact statement for Project ELF.*

1. I, John F. Lehman, Jr., am the Secretary of the Navy.

2. The Trident and Poseidon submarines of the Navy's submarine force represent an integral part of the nation's strategic nuclear deterrence and are the nation's most survivable strategic deterrent.

3. In my capacity as the Secretary of the Navy, it is my responsibility to ensure the effective operation, safety and survivability of the Navy's submarine force. The survivability of the Trident and Poseidon submarines depends on their ability to remain undetected. They must also maintain continuous communication with the President and Secretary of Defense.

4. With current systems, continuous communication is possible only when submarines deploy a receiving antenna while operating at or near the surface. This requirement imposes an enormous restriction upon the submarine's operating depth and its speed, as well as increasing its exposure to detection. The ELF system permits submarines to receive communications without reducing speed, operating at the surface, or trailing an antenna. Thus, the ELF system represents a critical safeguard against a scientific breakthrough in submarine detection by another nation using aircraft or satellite systems that exploit nonacoustic phenomena such as kelvin wakes and internal waves near the surface.

5. The Soviets are devoting considerable time and money to anti-submarine research and to new techniques and systems of submarine detection. Any potential Soviet anti-submarine breakthrough that might result from this research can best be countered by assuring that US submarines have the ability to operate independent of depth and speed restrictions. Only ELF provides this capability.

6. Intelligence reports indicate that the Soviets have the ELF capability. In order to ensure the effectiveness of our own submarine forces, a comparable ELF capability is imperative.

7. We have long been aware of concerns about possible effects of extremely low frequency electromagnetic fields on human health. Our studies and research have revealed no human health hazards from the Navy's ELF Communication System. Nevertheless, it has been and remains the policy of the United States Navy that, in the event significant and serious human health hazards are shown to exist, the operation of the ELF Communication System will be discontinued.

8. In my judgment, the ELF system is essential to the national defense, and, therefore, any delay in its construction is contrary to national defense interests.

9. I certify under penalty of perjury pursuant to 28 USC 1746 that all of the above statements are true, complete and correct to the best of my knowledge and belief.

John F. Lehman, Jr.  
February 9, 1984

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## BIOLOGICAL EFFECTS

**Non-Thermal Effect in Plants...**A research group headed by Dr. Andrew Marino of LSU Medical Center believes it has identified the first electric field effect in plants caused by a non-thermal mechanism. Writing in the December issue of the *IEEE Transactions on Biomedical Engineering*, Marino and co-workers report that an applied electric field of 5 kV/m at 60 Hz, producing an internal E-field of 0.00075-37.5 V/m in sunflower seeds, caused a statistically significant decrease of five percent in the germination rate. (The internal E-field is strongly dependent on moisture content and is hard to characterize.) An applied field of 1 kV/m (0.00015 V/m inside the seed) had no effect. In a telephone interview from his office in Shreveport, LA, Marino said that he did not intend to continue studying E-field effects on plants because they are extremely dependent on temperature and humidity. "They are too sensitive to changes in the microenvironment," he added.

**Health Along a DC Line...**People living near a 400 kV DC power line did not report more health complaints than those living far away from it, according to a survey of 438 Californians published in the January issue of the *American Journal of Public Health*. Drs. Roy Haupt and James Nolfi caution that the population used in their study was too small to rule out the "possibility of low incidence effects." Haupt, who now works for the state of Vermont, told *Microwave News* that one of the strengths of the study was that those responding to the survey were unaware that they were living near the power line and thus their perception of its effects did not come into play.

## COMPATIBILITY & INTERFERENCE

**Computing Aboard Eastern...**Eastern Airlines has changed its policy and will now allow passengers to use computers aboard its aircraft (see *MWN*, October 1983). In a statement released January 31, Eastern said that the decision was reached "after extensive testing" which showed no evidence of electronic equipment interference with aircraft navigation and communications equipment. No reports or other documentation on the tests are available. The policy shift follows the retirement of D.W. Crosby, Eastern's chief engineer, who wrote to RTCA last August, prompting a new investigation into the potential problem of RFI by the commission's Special Committee 156. That committee held its second meeting on February 28-29, and new measurement data on path loss were presented. Details next month.

**Resources...**The February 1984 issue of the *IEEE Transactions on Power Apparatus and Systems* features an article on "Television Interference Due to Electromagnetic Scattering by the MOD-2 Wind Turbine Generators." K.H. Cavcey of the University of Missouri in Columbia and L.Y. Lee of BPA in Portland, OR, report supporting data for their thesis that at ground level the near field scattered component is an amplitude modulated secondary signal...KeyTek has published *Electrostatic Discharge (ESD) Protection Test*

*Handbook*. The 64-page booklet, complete with index, is available for \$5.00 from KeyTek Instrument Corp., 12 Cambridge St., Burlington, MA 01803.

## INTERNATIONAL

**Canadian Diathermy Guidelines...**The Non-Ionizing Radiation Section of the Canadian Radiation Protection Bureau has issued guidelines to limit occupational exposures to stray radiation emitted by shortwave (27 MHz) diathermy equipment. The guidelines stem from surveys of diathermy operator exposures, which indicated a pattern of over-exposures (see *MWN*, September 1981 and *Health Physics*, March 1982). A copy of *Safety Code 25 — Shortwave Diathermy Guidelines for Limited Radiofrequency Exposure* (No. 83-EHD-98) is available from the Public Affairs Directorate, Department of National Health and Welfare, 5th Floor, Brooke Claxton Bldg., Ottawa, Canada K1A 0K9.

## MEASUREMENTS

**Resources...**Two new publications from NBS' Electromagnetic Fields Division: (1) *Approximate Formulas for the Far Fields and Gain of Open-Ended Rectangular Waveguide* (NBSIR 83-1689), by Arthur Yaghjian, describes two methods that significantly reduce the previous limits of uncertainty for calculated probe characteristics when making near field antenna measurements. It is available for \$8.50, prepaid, from the National Technical Information Service, Springfield, VA 22161. Order No. PB 83-233999. (2) *Eigenmodes and the Composite Quality Factor of a Reverberating Chamber* (TN 1066), by a team from the University of Colorado in Boulder and NBS, describes a theoretical basis for the design of a metal chamber to contain a localized, homogeneous and isotropic EM field for EMI/EMC tests on electronic products and components. Available for \$4.00, prepaid, from the Government Printing Office, Washington, DC 20402. Order No. 003-003-02510-1.

## MEDICAL APPLICATIONS

**Hyperthermia Notes...**The January 1984 issue of the *IEEE Transactions on Biomedical Engineering* is devoted to hyperthermia and cancer therapy. The 21 papers, edited by Drs. John Strohbehn, Thomas Cetas and George Hahn, cover electromagnetic and ultrasound applicators, dosimetry and modeling. Hahn leads off the special issue with an introduction to hyperthermia for the engineer...A host of recent articles on hyperthermia applicators: FDA's Dr. Gideon Kantor and Donald Witters describe the performance of one operating at 915 MHz with reduced leakage in the June 1983 issue of the *Journal of Microwave Power*. A team from the University of Illinois, Urbana, has published "Frequency Optimization of Focused Microwave Hyperthermia Applicators" in the February 1984 *Proceedings of the IEEE*. Two researchers from Shimane Medical University in Japan have designed an inductive applicator, which

they claim "produces much less heat in the fat layer than in the muscle layer." And Dr. J.J.W. Lagendijk from Utrecht, the Netherlands, describes a simple and cheap applicator for deep body heating. These last two papers are in the most recent issue (December 1983) of the *Journal of Microwave Power*. ...A "Diagnostic and Therapeutic Technology Assessment" of whole-body hyperthermia for the treatment of solid tumors, which appears in the January 13 *Journal of the American Medical Association*, concludes that this type of therapy is still investigational: "The clinical use of whole-body hyperthermia in combination with radiation therapy or chemotherapy is still in an early stage of investigation, although there is good in vitro evidence that a synergism with heat may exist with the other treatments." ...The 4th Annual Meeting of the North American Hyperthermia Group (NAHG) will be held at the Sheraton Twin Towers Hotel in Orlando, FL, March 23-27 — immediately before the 32nd Annual Meeting of the Radiation Research Society. Last year some 250 hyperthermia experts attended the NAHG meeting, and the attendance promises to be as high this year, with about 125 papers scheduled for presentation. For more information, contact Sherry Phillips, NAHG, 925 Chestnut St., Philadelphia, PA 19107, (215) 574-3153.

**Ultrasound Risks...**A panel of experts has warned that the use of ultrasound imaging during pregnancy should be limited to situations in which there is an "accepted medical reason for the procedure." The experts, who met at NIH in Bethesda, MD, February 6-8, said that they could not endorse routine ultrasound screening of pregnant women because there is not enough evidence that "routine screening benefits either the mother or the fetus." The panel concluded that ultrasound could be useful in risky or complicated pregnancies but warned that many of the studies on the safety of ultrasound in humans have been "inadequate" and that there is not enough information to "reliably assess" the risks of ultrasound imaging.

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### MILITARY SYSTEMS

**Latest from Clear...**The AF's Office of the Surgeon General has completed its review of the radar accident at Clear AF Station and presented it to Congressman Don Young (R-AK) (see *MWN*, November 1983 and January/February 1984). The AF has concluded that a reenactment of the accident is not warranted. A spokesman for Young said that the report "was totally unacceptable." As we go to press, OSHA's regional office in Seattle has decided to send OSHA's Health Response Team, based in Salt Lake City, UT, to Clear to run a new simulation of the accident and to determine the exposure levels experienced by the eight workers. Details next month.

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### OCCUPATIONAL HEALTH

**Resources...**Dr. Samuel Milham's report *Occupational Mortality in Washington State 1950-1979* (No. 83-116) has been published by NIOSH. The report contains the data

with which he linked leukemia with workers exposed to ELF electric and magnetic fields (see *MWN*, July/August 1982). Contact: Division of Surveillance, Hazard Evaluations and Field Studies, NIOSH, 4676 Columbia Parkway, Cincinnati, OH 45226...OSHA has published a booklet *Controlling Electrical Hazards* and a report *An Illustrated Guide to Electrical Safety*. The 12-page booklet is available free from OSHA's Publication Office, Room N-4101, Washington, DC 20210 (send a self-addressed mailing label). The 172-page guide is available for \$5.50, prepaid, from the Government Printing Office, Dept. 36-CV, Washington, DC 20402. To order with Visa or Mastercard, call (202) 783-3238.

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### POWER LINES

**EPRI Seminars...**The Electric Power Research Institute (EPRI) is organizing a series of seminars on methods of analyzing the effects power lines have on gas pipelines and railroad equipment when they share a common right-of-way. *Mutual Design of Natural Gas Pipelines and Electric Power Lines* will be held in Palo Alto, CA, May 1-3. The fee is \$75 for EPRI members and \$275 for non-members. A *Seminar on Mutual Design of Overhead Transmission Lines and Railroad Communications and Signal Systems* will be held in Chicago, IL, May 15-17; in Washington, DC, June 19-21; and in Atlanta, GA, September 11-13. The fee for each seminar in this series has not yet been set but is expected to be about \$100. For more information about the seminars contact John Dunlap, EPRI, PO Box 10412, Palo Alto, CA 94303, (415) 855-2305. The railroad seminar will be taught by staffers at IITRI, who recently published a two-volume report (EL-3301) for EPRI on the potential interference of power line radiation with railroad systems (see *MWN*, September 1983). Volume 1, *Engineering Analysis*, (\$29.50) describes the interaction of power lines and railroads and develops a methodology for siting them together. Volume 2, *Appendices* (\$25.00) documents the results of the study and is designed for the in-depth reader. They are available from EPRI's Research Reports Center, PO Box 50590, Palo Alto, CA 94303, (415) 965-4081.

**1985 Meetings...**This year has hardly begun, but it's not too early to start planning for 1985. The Institution of Electrical Engineers, based in London, England, is hosting two conferences: The 8th International Conference on Electricity Distribution (CIRED) will be held in Brighton, May 20-24. And the International Conference on AC and DC Power Transmission will be held in London, September 23-26. CIRED meetings are held every two years, alternately in England and in Belgium. The 1983 meeting attracted nearly a thousand participants from 35 countries. The AC-DC conference was last held in 1980. For more information on both these meetings, contact: Conference Services, IEE, Savoy Place, London WC2R 0BL, England.

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### VDTs

**Legislation...**The push for state VDT laws continues. Hawaii has passed a bill that directs the state Bureau of

Labor Standards to study VDT health and safety risks and, if necessary, to develop regulations. In Maine, the Bureau of Labor Standards is holding a public hearing on March 15 as part of its consideration of possible VDT safety rules, in keeping with the law passed in that state last June. The Ohio Health and Retirement Committee held a series of hearings on House Bill 552, which began January 25 and continued with three meetings in February. The Rhode Island House Labor Committee has scheduled a hearing for March 8 on Bill H7012, which is modeled on legislation drafted by the Newspaper Guild. And in Massachusetts, five more bills have been introduced, bringing to nine the number of proposals that will be under consideration when the Committee on Labor and Commerce meets March 14. California Assemblyman Tom Hayden has introduced the "Video Display Terminal Operator Occupational Safeguards Act of 1984": Assembly Bill 3175 would require employers to meet minimum office standards for lighting, furniture, radiation protection and terminal maintenance. Pregnant employees would be entitled to non-VDT work, and all VDT operators would be provided 15 minutes away from terminals for each hour of work. Free annual eye examinations and free eyeglasses (when necessitated by VDT work) would be available to all employees, to be paid for by their employers. In Connecticut, where legislators are awaiting the results of a study they ordered last June, Rep. William Kiner has prepared a new bill and hearings are planned for the spring. Kiner's proposal, which has yet to be introduced, would require annual eye examinations, regular monitoring and testing of all VDTs and ongoing evaluation of possible radiation risks from VDTs.

**Resources...** Measurement of X-ray radiation from VDTs has led two Canadian researchers to conclude that levels are "extremely low." In fact, the measurements indicated there was "no difference whether the VDT is switched on or off." C. Pomroy and L. Noel of the Radiation Protection Bureau in Ottawa estimate that the annual dose from working at 5 cm from a VDT for 2,000 hours over one year is 0.0006 mR. The current FDA standard is 0.5 mR/hr. Their report appears in the February 1984 *Health Physics*. ...In our last issue, we reported the results of an ongoing investigation of VDTs at Ontario Hydro, a Canadian electric utility. The company has now also released "Analysis of Operator Exposure to Electric Fields From Video Display Units" (Report No. 83-503-K). Written by Dr. S.M. Harvey of the company's Electrical Research Department, the report can be requested from Ontario Hydro, 757 McKay Road, Pickering, Ontario L1W 3C8, Canada....The Library of Congress has published a white paper on VDTs. *Video Display Terminals: The Controversy About Health and Safety Issues* summarizes major research to date and discusses possible causes of VDT operator health complaints. Written by Christopher Dodge, a specialist in the library's Science Policy Research Division of the Congressional Research Services, the white paper can be obtained from him at the Library of Congress, Washington, DC 20540.

**April 4-5: 20th Annual Meeting of the National Council on Radiation Protection and Measurements**, Washington, DC. Contact: NCRP, Suite 1016, 7910 Woodmont Ave., Bethesda, MD 20814, (301) 657-2652.

**April 9-13: International Magnetics Conference**, Hamburg, West Germany. Contact: T.S. Nelson, PO Box 480, Murray Hill, NJ 07974.

**April 10-11: Satcom'84**, Sheraton Washington, Washington, DC. Contact: International Association of Satellite Users, PO Box DD, McLean, VA 22101, (703) 759-2094.

**April 14-19: 19th Annual Association for the Advancement of Medical Instrumentation Meeting and Exhibit**, Washington Hilton, Washington, DC. Contact: AAMI, 1901 North Fort Myer Dr., Suite 602, Arlington, VA 22209, (703) 525-4890.

**April 24-26: IEEE 1984 National Symposium on Electromagnetic Compatibility**, Hyatt Regency Hotel, San Antonio, TX. Contact: William McGinnis, Southwest Research Institute, PO Drawer 28510, San Antonio, TX 78284, (512) 684-5111, ext. 2721.

**April 29-May 2: 62nd Annual Convention of the National Association of Broadcasters**, Las Vegas Convention Center, NV. Contact: NAB, 1771 N Street, NW, Washington, DC 20036, (202) 293-3570.

**April 29-May 4: 9th Conference & Exposition on Overhead and Underground Transmission and Distribution**, Bartle Hall, Kansas City, MO. Contact: J.R. Miller, Kansas City Power & Light Co., PO Box 19964, Kansas City, MO 64141.

**April 30-May 3: 5th Annual Meeting of the Canadian Radiation Protection Association**, Banff, Alberta. Contact: Stuart Hunt, 15 Glacier Place, St. Albert, Alberta, T8N 1R7, Canada

**May 6-12: 6th International Congress of the International Radiation Protection Association (IRPA)**, Berlin, West Germany. Contact: Dr. R. Neider, Bundesanstalt für Materialprüfung, Unter den Eichen 87, D-1000 Berlin 45, West Germany.

**May 7-9: 1984 Microwave Power Tube Conference**, Naval Postgraduate School, Monterey, CA. Contact: John Skowron, Raytheon Co., Foundry Ave., Waltham, MA 02254, (617) 899-8400, ext. 4311.

**May 7-11: Nuclear Magnetic Resonance 1984: National Symposium**, Hyatt Regency Grand Cypress Resort, Orlando, FL. Contact: Ms. Norine Karwel, Educational Symposia, PO Box 17241, Tampa, FL 33682, (813) 879-8765.

**May 20-24: 16th Annual Meeting of the Conference of Radiation Control Program Directors**, Des Moines, IA. Contact: CRCPD, 71 Fountain Pl., Frankfort, KY 40601, (502) 227-4543.

**May 30: Workshop on Payload Susceptibility to Space Shuttle Ku-Band Radiated Fields**, Johnson Space Center, Houston, TX. Contact: Ralph Lawton, McDonnell Douglas Technical Services Co., 16441 Space Center Blvd., Houston, TX 77058, (713) 488-5660, ext. 468.

**May 30-June 1: IEEE MTT-S International Microwave Symposium**, San Francisco, CA. Contact: Dr. Ferdo Ivanek, Harris Corp., Farinon Division, 691 Bayport Ave., San Carlos, CA 94070, (415) 594-3529. The 1984 IEEE Microwave and Millimeter Wave Monolithic Circuits Symposium will be held in San Francisco May 29-30 in conjunction with the MTT-S meeting.

**June 3-8: 29th Annual Meeting of the Health Physics Society**, Hyatt Regency, New Orleans, LA. Contact: Richard Burk, Jr., HPS, 4720 Montgomery Lane, Suite 506, Bethesda, MD 20814, (301) 654-3080.

**June 25-28: 1984 International IEEE/AP-S Symposium and National Radio Science Meeting**, Westin Hotel, Boston, MA. Contact: Professor Harold Raemer, Dept. of Electrical Engineering, Northeastern University, Huntington Ave., Boston, MA 02115.

**June 26-28: 7th International Symposium and Exhibition on Electromagnetic Compatibility**, Wroclaw, Poland. Contact: W. Moron, EMC Symposium, Box 2141, 51-645 Wroclaw 12, Poland.

**June 26-28: 1984 International Conference on Lightning and Static Electricity**, Orlando, FL. Contact: J.J. Fisher, US Naval Air Systems Command, PO Box 15036, Arlington, VA 22215, (202) 692-7822.