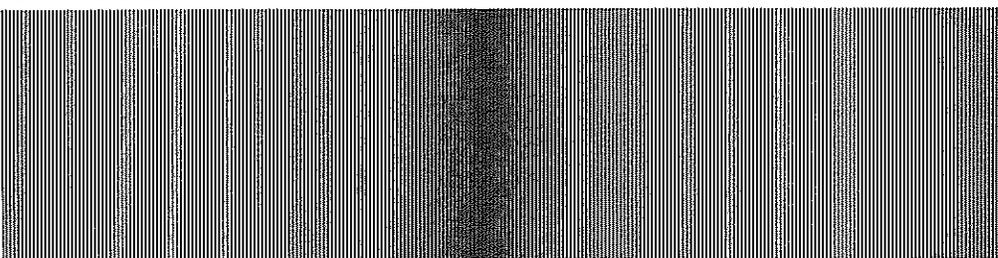


MICRO WAVE NEWS



Vol.V No.2

A Monthly Report on Non-Ionizing Radiation

March 1985

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

Polish Epidemiological Study Links RF/MW Exposures to Cancer

Polish researchers have identified a tripling of the incidence of cancer among military personnel exposed to radiofrequency and microwave (RF/MW) radiation as compared to unexposed servicemen. The observed cancer risk was greatest for the blood-forming organs, the lymphatic tissues and the thyroid gland.

The study, one of the first to link cancer to RF/MW radiation in a human population, provides independent confirmation of recent animal data that indicate that RF/MW radiation may act as a cancer promoter.

According to the new Polish results, the odds of developing cancer increase with the length of exposure and are greatest for younger age groups.

In a personal communication to *Microwave News*, Dr. Stanislaw Szmigielski of the Center for Radiobiology and Radioprotection in Warsaw said that he had found "a definite increased risk of neoplasms resulting from occupational exposures to RF/MW radiation for the tested population."

Szmigielski and a large team of collaborators spent two years compiling and analyzing all cancer cases reported from 1971 to 1980 in the total population of career servicemen in the Polish military. They also ascertained the length of time each patient was exposed to RF/MW radiation and the location of each type of tumor. This is by far the largest epidemiological study of the effects of non-ionizing radiation ever completed.

The exposed population was limited to those personnel with "sure, long-lasting and massive exposures to RF/MW radiation," according to Szmigielski. Just three percent of the career military personnel fit into this category but they accounted for about nine percent of the total number of cancer cases (see Table 1).

(continued on p.2)

FY86 Bioeffects Research: ELF Budget Outlook Bleak

President Reagan's 1986 fiscal year (FY86) budget would wipe out all research at the Environmental Protection Agency (EPA) on the bioeffects of non-ionizing radiation and would severely reduce the electric field effects program at the Department of Energy (DOE).

Research on power line, or extremely low frequency (ELF), radiation would be particularly hard hit by the President's proposal.

Dr. David Carpenter, director of New York State's Division of Laboratories and Research, said that he is "very worried about the funding situation" and that it is "an impending catastrophe." The public is anxious about ELF fields, he explained, and even if there is no real risk, research is needed to settle the question.

(continued on p.3)

Greatest Risk for the Young

Statistical analysis revealed that the relative incidence of cancer was highest for the youngest age group: 20-29 year-olds who were exposed to RF/MW radiation had a 550 percent greater chance of getting cancer than those in the same age who were not exposed. Cancer risks for the exposed group decreased with age but were still statistically significant for all age groups, especially for those under 50.

Breaking down the cancer data by the location of the tumor indicated that the blood-forming organs and lymphatic tissue were the most likely to develop cancer. Those soldiers exposed to RF/MW radiation had a 6.7 times greater chance of contracting these types of tumors than those in the control group. The thyroid was the next most vulnerable, with a 4.3 risk factor (see Table 2).

Overall, servicemen who worked with RF/MW radiation were 3.1 times more likely to get cancer than those in other military occupations — significant at the 0.01 level (see Table 3). Szmigielski's research team also found a "high correlation" between the chance of developing cancer and the number of years of exposure.

Interestingly, the exposed and non-exposed servicemen had essentially the same rate of lung cancer, the most common type of cancer in the Polish military.

The research team is planning to present their results at a symposium later this year.

Consistent with Guy Study

The Polish findings are consistent with the experimental data presented last summer by Dr. Bill Guy's research team at the University of Washington in Seattle. Guy reported a generalized increase in tumors among rats exposed to radar-type radiation, with the endocrine system particularly vulnerable to pulsed microwave radiation (see *MWN*, July/August 1984 and story on p.4). In addition, last October Dr. Ruey Lin of the Maryland Department of Health and Mental Hygiene reported a link between exposure to electromagnetic fields and the incidence of brain tumors among workers (see *MWN*, October 1984).

Szmigielski told *Microwave News* that "I am very surprised with the results we obtained," adding that the observed differences were much greater than he had suspected at the beginning of the study. He concluded: "There is an urgent need to repeat this study, using another well-defined and well-controlled population."

Internationally known for his studies on the effects of RF/MW radiation on the immune system, Szmigielski was a member of the editorial board of *Bioelectromagnetics* from 1980-1983. He has previously reported a synergy in the carcinogenic action of benzopyrene when coupled with exposure to 2450 MHz microwaves (see *MWN*, May 1981). Szmigielski can be contacted at the Center for Radiobiology and Radioprotection, 128 Szaserow, 00-909 Warsaw, Poland. ●

**TABLE 1
CANCER INCIDENCE
(percent)**

	Exposed	Non-Exposed
Population Size	3	97
Cancer Incidence	8.8	91.2

**TABLE 2
TUMOR RISK FACTORS
(Exposed v Non-Exposed)**

Tumor Type	Risk Factor
Esophageal & Stomach	3.2
Skin (including melanoma)	3.1
Thyroid	4.3
Blood-Forming Organs & Lymphatic Tissue	6.7

**TABLE 3
INCIDENCE OF ALL TUMORS
(per 100,000 subjects per year)**

Age Group	Whole Population	Exposed	Non-Exposed	Chi-Square	p	Risk Factor
20-29	9.2	44.2	8.0	15.49	< 0.01	5.5
30-39	19.4	81.7	17.2	25.86	< 0.01	4.7
40-49	90.4	348.8	82.9	63.06	< 0.01	4.2
50-59	364.7	558.6	353.4	6.74	< 0.05	1.6
Total	68.2	192.2	64.2	79.11	< 0.01	3.1

The New York State Power Line Project has been a major source of funds for ELF bioeffects research for the last few years. Carpenter said that his program has enough money to complete on-going projects but is otherwise "essentially broke" with "no realistic possibility for more funds."

The other major source of ELF research funds is the Electric Power Research Institute (EPRI), which is supported by member utilities. Dr. Robert Patterson of EPRI's Environment Assessment Department said that this year's funding level would be about the same as last year, \$1.5 million. He added that there are no plans to increase the research effort in light of the federal cuts.

Dan Van Atta, EPRI's manager of public information, said that the electric field effects program is "not a high priority" at this time, compared with other research areas such as acid rain.

Dr. Michael Marron of the Office of Naval Research voiced concern about the cutbacks in both ELF and radiofrequency and microwave (RF/MW) radiation research. In a telephone interview, Marron said, "I'm disturbed that civilian agencies are not more concerned about the bioeffects of non-ionizing radiation." He added that the perception that the problem is solved is "a long way from the truth."

Marron said that there was no basic research going on in any part of the Department of Defense on ELF. The Naval Aerospace Medical Research Lab had been doing studies, but these ended in this year's (FY85) budget (see *MWN*, September 1984). Some research is continuing on specific projects, like the Navy's ELF submarine communication system, but this is not considered to be basic research.

Zeroed Out at EPA

The non-ionizing radiation group at the Health Effects Research Laboratory in North Carolina will be dissolved next October 1, at the start of FY86, unless Congress intervenes and restores at least some of the cut funding.

Few EPA staffers would talk on the record about the budget, but informed sources told *Microwave News* that the Office of Management and Budget (OMB) had eliminated the request for non-ionizing radiation research in EPA's budget. Apparently, EPA officials did not contest this decision, and many observers believe the program is doomed without agency support.

These cuts come at an awkward time. EPA recently initiated a program on ELF bioeffects under orders from Congress, following a similar proposal two years ago to close down the EPA research program (see *MWN*, January/February 1983). In restoring funds, the House Committee on Science and Technology specifically directed EPA to look into the health impacts of power lines (see *MWN*, June 1983).

EPA research on higher frequency radiation would also be hurt. For instance, the agency was planning to begin a major lifespan study of rats exposed to 500 MHz radiation later this year. One objective of that study would have

been to investigate the findings reported by the University of Washington (see story on p.4 and *MWN*, July/August 1984).

The EPA non-ionizing radiation research budget for FY85 was about \$2 million, approximately evenly divided between extra- and intra-mural projects.

Dr. Richard Phillips, who took charge of the non-ionizing radiation program only a few months ago after leaving Battelle Pacific Northwest Labs, said in a telephone interview that he was surprised by the cuts but would not comment until he knew more about them.

A further complication arose after the President announced his budget: Joseph Cannon, EPA assistant administrator for air and radiation, resigned to practice law in Washington, DC. Cannon was responsible for the development of non-ionizing radiation standards and could have argued that EPA needed continued research to complete that mission. Indeed, there are rumors circulating in Washington that EPA might close down the Office of Radiation Programs and farm out its duties to other parts of EPA or transfer the responsibilities to other federal agencies like the Nuclear Regulatory Commission.

ELF and EMP Research at DOE

Ken Klein, acting director of DOE's Electric Energy Systems Division, which sponsors research on power line health effects and on electromagnetic pulse (EMP) impacts, reports that his budget would be cut in half compared to FY85—\$10.0 million, down from \$20.7 million.

The electric field effects work would be reduced from \$4.7 million to \$3.0 million under the President's proposal. EMP research would be cut from \$3.0 million to \$1.8 million.

In his FY85 budget proposal, Reagan had requested \$3.7 million for electric field effects research, but Congress later added \$1 million.

While the new budget is being considered by Congress, the Energy Engineering Board at the National Academy of Sciences will conduct its own review. Fred March, the board's staff officer, is arranging a workshop for April 24-26 to review the DOE program. Among those invited to present papers on electromagnetic effects are Drs. Don Justesen, Richard Phillips and Tom Tenforde. The workshop will be closed to the public, though March said that the board may later publish the proceedings.

FDA and NIEHS

At the Food and Drug Administration's (FDA) Center for Devices and Radiological Health, Dr. Mays Swicord said that the budget for his Electromagnetics Branch is still uncertain, though he expects his FY86 program to be comparable to that in FY85.

Similarly, Dr. Don McRee, who heads the Non-Ionizing Radiation Working Group at the National Institute of Environmental Health Sciences (NIEHS), said that his FY86 budget would be about the same as last year. In FY85, the NIEHS budget was \$485,000. Swicord's and McRee's combined research budgets are less than \$1 million. ●

Guy Study: New Tumors Found, Replication Attempt Unlikely

Researchers at the University of Washington in Seattle have identified two new primary tumors among rats chronically exposed to microwave radiation and one new tumor among the control group. The new finding adds further support to the well-publicized results from Professor Bill Guy's Bioelectromagnetics Research Lab that pulsed microwaves may act as a cancer promoter in experimental animals (see *MWN*, July/August 1984). At this time, there are no indications that a replication study will be funded.

The revised total tumor count is 18 to 5, exposed to controls. The two new malignancies among the exposed rats were in the endocrine system, increasing the incidence of this type of tumor from seven to nine as compared to only two among the controls.

"The corrected Guy results in no way diminish the reliability of the original findings, in fact their statistical significance is increased," according to Dr. Don Justesen of the VA Hospital in Kansas City, MO, who has been closely following developments related to the University of Washington study.

Professor Guy, the principal investigator on the \$4.5 million study funded by the U.S. Air Force, said that he knows of no plans to replicate his experiment or to further investigate the statistically significant increase in tumors among the exposed rats. "We're assuming we are not replicating," Guy told *Microwave News* in a telephone interview.

Guy said that he was uncomfortable about leaving the study as it is: "There are unresolved issues and I feel uneasy about them."

The Air Force has refused to comment on the new results or on the likelihood of funding for a replication study. Numerous phone calls over a two-month period to John Mitchell, chief of radiation physics at the School of Aerospace Medicine at Brooks Air Force Base in San Antonio, TX, and to Dr. Jerome Krupp, the project officer for the Guy study, were not returned.

A spokeswoman for Air Force Surgeon General Max Bralliar said that he was aware of the University of Washington study but would not comment until the final report had been received and evaluated.

Guy and co-workers exposed 100 male rats to 0.48 mW/cm² of 2450 MHz, 8 Hz amplitude modulated pulsed microwaves (10 microsecond pulses, 800 pulses per second) for 21 hours a day for up to 25 months. The rats received a maximum average specific absorption rate of 0.4 W/Kg. One hundred rats served as controls.

Guy explained that the three new tumors were identified when members of his research group reviewed the experimental data and found a number of metastatic tumors that were not associated with any primary tumors. On re-analyzing the slides, the missing tumors were located.

He added that the previously reported finding of an increase in adrenal weight among the exposed rats was a

direct result of the mass of the adrenal tumors and was no longer significant in itself.

Some time ago, the Air Force asked Guy's group to look into one positive result that was found halfway through the study: after 13 months, the exposed animals had a significant increase in splenic B and T cells as compared to controls. After 25 months, no difference was detected.

Guy reports that the replication of this part of the experiment did not support the original finding but did turn up abnormal concentrations of B lymphocytes in the bone marrow. These results will be reported at next June's Bioelectromagnetics Society meeting in San Francisco.

The Air Force has now issued seven volumes of the final report on the Guy study. Still to come is Volume 8, which contains the tumor data that researchers are waiting for. A complete list of the tumors identified by the Guy team appears in "From the Field" on p.7. Guy has sent the final manuscript of Volume 8 to Brooks and expects it to be published soon. A final summary volume will be completed in March, Guy said.

For a copy of Guy's reports, write to Jerome Krupp, USAF School of Aerospace Medicine, Brooks AFB, TX 78235.

NBS Asked To Set Up Program for EMC Testing

Five companies have asked the National Bureau of Standards (NBS) to establish a laboratory accreditation program (LAP) for electromagnetic compatibility (EMC) and telecommunications testing. If the LAP is approved, it would become part of NBS's National Voluntary Laboratory Accreditation Program (NVLAP).

Walter Poggi, president of Retlif Testing Laboratories in Ronkonkoma, NY, urged NBS to set up the LAP in order "to better control the quality of electromagnetic compatibility testing laboratories in this country and to help to promote better acceptance of U.S. generated test data overseas." (The complete text of Poggi's letter appears on p.6.)

In his January 23 letter, Poggi wrote that the "lack of a national accreditation program has seriously hurt laboratories." Without some type of program, he explained, "it is going to continue to be difficult to have U.S. generated data accepted by foreign government agencies."

In a telephone interview with *Microwave News*, Poggi cited examples of the problems faced by U.S. labs: For testing to be acceptable in Canada, a lab must have a licensed Canadian engineer on staff. In Japan, rules can force a lab to disclose technical and financial data. These are trade barriers, Poggi said, making it nearly impossible for small manufacturers to enter foreign markets.

The U.S. has an open door policy, Poggi said, so American labs need a LAP to ensure an "equitable and efficient" system.

Joining Retlif in the letter to NBS were: Met Electrical Testing Co., Inc., of Baltimore, MD; Hyak Laboratories, Inc., of Springfield, VA; Timco Engineering, Inc., of

Miami, FL; and Emaco, Inc., of San Diego, CA. All five companies are members of the American Council of Independent Laboratories.

NBS has invited comments on the need for the LAP. Submissions should be sent to the Director, Office of Product Standards Policy, NBS, ADMIN A 603, Gaithersburg, MD 20899 before April 9. For further information, contact NBS's Peter Unger at (301) 921-3431.

Operator Exposures to Induction Heaters

The majority of induction heaters expose operators to magnetic fields above 2.3 A/m, the plane-wave equivalent of greater than 200 mW/cm², according to a recent Canadian survey. Officials at the Radiation Protection Bureau in Ottawa believe that the high intensity of these stray fields may pose a potential health hazard.

Dr. Maria Stuchly and David Lecuyer measured the magnetic fields near 76 induction heaters operating at frequencies from 180 Hz to 27 MHz and with output powers often exceeding 100 kilowatts — two were over one megawatt.

More than 55 percent of the heaters caused maximum worker exposures of more than 2.3 A/m, the highest field intensity that could be measured with the available equipment. Averaged over a 6-minute period to allow for the unit's on-off cycle, operator exposures exceeded 2.3 A/m for 38 percent of the units. Nearly 60 percent exceeded 1.6 A/m, the plane-wave equivalent of approximately 100 mW/cm². (Note that the operators are in the near field, so the concept of power density does not strictly apply.)

In general, the lower the operating frequency, the higher the power output, which results in larger stray fields. For low frequency heaters, Stuchly and Lecuyer found that the intensities can be very high, up to 1000 A/m. These results are in line with those from surveys conducted in the early 1980s in Poland and Sweden.

A limited number of electric field measurements were also made. These confirmed theoretical predictions that the electric fields associated with the heaters were much weaker than the magnetic fields.

Induction heaters have a wide range of applications in processing metals, such as hardening, welding, melting and sealing. In their on-off cycle, the units are on for 2 to 60 seconds and then off, so that the metal target can be replaced. Operators generally stand one meter or less from the heater's energized coil.

Stuchly presented these results in a poster paper at the July 1984 *Annual Meeting of the Bioelectromagnetics Society* in Atlanta, GA, and in an address to the URSI symposium on the *Interaction of Electromagnetic Fields with Biological Systems*, held in Florence, Italy, last August. They will be published in a forthcoming issue of *Health Physics*.

In Florence, Stuchly pointed out the difficulties in assessing the health impacts of these fields because of the lack of bioeffects research at low frequencies and the absence

of applicable standards. She concluded by posing the question: "What do these exposure levels mean? Is there a risk?"

In a telephone interview with *Microwave News*, Stuchly said that "a potential health hazard" may exist. Interestingly, she pointed out that at low frequencies, the fields would not violate current Russian and Polish standards. Stuchly also noted that the fields produced by the heaters are likely to be amplitude modulated at extremely low frequencies, which may have additional biological consequences.

Stuchly said that she has no information on the number of Canadian workers exposed to electromagnetic fields from induction heaters, or on the total number of units now in operation.

SHORT COURSES

April 22: **Tutorial on Part 15 and Part 68 FCC Regulations**, at Electro/85, New York, NY. Fee: \$170 (IEEE members), \$210 (others). Contact: IEEE METSAC, 614 Hammond St., Chestnut Hill, MA 02167, (800) 833-3613 or (617) 232-4193 in MA.

April 24: **FCC/VDE Commercial Applications**, Portland, OR. Fee: \$295. Contact: EMXX Corp., 6706 Deland Dr., Springfield, VA 22152, (703) 451-4619. Repeated May 8: Boston, MA.

April 29-May 3: **Antennas and Arrays: Analysis, Synthesis and Applications**, Washington, DC. Fee: \$920. Contact: Continuing Engineering Education, George Washington University (GWU), Washington, DC 20052, (800) 424-9773 or (202) 676-6106 in DC.

May 1-2: **EMP Design & Test**, Orlando, FL. Fee: \$595. Contact: Greg Gore, R&B Enterprises, 20 Clipper Rd., West Conshohocken, PA 19428, (215) 825-1960. Repeated May 6-7: Philadelphia, PA; May 8-9: Boston, MA; June 12-13: Chicago, IL.

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

May 7-10: **Near-Field Antenna Measurement Techniques**, Atlanta, GA. Fee: \$715. Contact: Technology Service Corp., 962 Wayne Avenue, Suite 600, Silver Spring, MD 20910, (800) 638-2628 or (301) 565-2970 in MD.

May 13-17: **Adaptive Antenna Signal Processing for Interference Rejection**, Los Angeles, CA. Fee: \$945. Contact: UCLA Extension, Dept. of Engineering & Science, 10995 Le Conte Ave., Rm 637, Los Angeles, CA 90024, (213) 825-1047.

May 14-15: **Grounding, Bonding & Shielding**, Philadelphia, PA. Fee: \$545. Contact: R&B, see May 1 above. Repeated May 16-17: Boston, MA; June 18-19: Chicago, IL.

May 14-16: **Military Uses of High Frequency Spectrum**, Washington, DC area. Fee: \$360-510. (Classified U.S. Secret) Contact: Armed Forces Communications & Electronics Association/Professional Development Center, 5641 Burke Centre Parkway, Burke, VA 22015, (800) 336-4583 or (703) 425-8535 in VA.

May 20-24: **Millimeter-Wave Engineering and Applications**, Washington, DC. Fee: \$835. Contact: GWU, see April 29 above.

May 21-23: **Digital Design for Interference Specifications**, Clearwater Beach, FL. Fee: \$800. Contact: Ms. Jean Whitney, TKC, 8609 66th Street N., Pinellas Park, FL 33565, (813) 544-2594.

June 10-14: **EPRI High Voltage Transmission Line Design Seminar**, Lenox, MA. Fee: \$150 (EPRI members); \$1150 (others). Contact: L.D. Anzivino, HVTRF (Mail Code H63), GE, 100 Woodlawn Ave., Pittsfield, MA 01201, (413) 494-3320.

FROM THE FIELD

Retlif's Request for an EMC LAP

Reprinted below is the complete text of Walter Poggi's letter to the National Bureau of Standards (NBS) requesting the establishment of a laboratory accreditation program (LAP) for electromagnetic compatibility (EMC) and telecommunications testing. Poggi is president of Retlif, Inc., an independent testing lab. See story on p.4.

January 23, 1985

Office of the Director
National Bureau of Standards
ADMIN A1134
Gaithersburg, MD 20899
Sir:

I, Walter A. Poggi, representing Retlif, Inc. Testing Laboratories and authorized in the matter to represent Met Electrical Testing Company, Inc., Hyak Laboratories, Inc., Timco Engineering, Inc., and Emaco, Inc., hereby request the development of a Laboratory Accreditation Program (LAP) under the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Bureau of Standards (NBS) in the *Test Technology: Electronics*, covering the *Test Disciplines: Electromagnetic Compatibility (Military Standards), Electromagnetic Compatibility (FCC Standards) and Telecommunications Testing (FCC Standards)*. It is our desire that this LAP will cover testing services provided under military standard MIL-STD-461 and Federal Communications Commission Standards Part 2, Part 15, Part 18 and Part 68.

In an effort to better define the areas covered and to present a logical breakdown of the areas, we have attached for your review (Appendix A) our suggested outline for such a LAP.

It is the opinion of the group that a LAP is required in this area to better control the quality of electromagnetic compatibility testing laboratories in this country and to help to promote better acceptance of U.S. generated test data overseas. As I am sure you are aware, at this time there is not a national accreditation program in this country covering this type of laboratory. Although many laboratories in this area are listed or recognized by the FCC this does not represent an approval by the FCC and certainly does not attest to the quality of the measurements and procedures used by such laboratories. This lack of national accreditation program has seriously hurt laboratories such as ours in international matters. It is now evident that without some type of an accreditation program it is going to continue to be difficult to have U.S. generated test data accepted by foreign government agencies. This is most evident at this time in regards to the acceptance of telecommunication equipment manufactured in the country by Japan. Without acceptable U.S. generated test data the ability to export to Japan becomes a difficult problem mandating testing of U.S. manufactured products in Japan. This situation certainly will force most small to mid size manufacturing companies out of the Japanese marketplace because of cost and logistics. We can see the type of problems occurring with most European countries as well. Unfortunately most, if not all, foreign marketplaces are nowhere near as open as ours and we therefore must have such items as laboratory accreditation programs in place so that we have viable and reputable tools to use in international negotiations regarding testing of products.

We assume that additional independent as well as in-house laboratories will avail themselves of this LAP. Obviously, our

group as listed above would immediately be involved and we would estimate that an additional 10 to 15 laboratories may take part. As far as the users of such laboratories, we would feel that each laboratory should, on the average, maintain a customer file of approximately 300 customers evenly divided between military and commercial work. Certainly we would look forward to being involved and supporting the development of this LAP. This support would be in the form of both personnel and funding. However, we would feel that it would be unfair for the laboratories alone to fund such a program which will aid manufacturers and even governmental agencies when it comes to international trade. We would hope that the funding required would be so as to not be overbearing for the involvement of independent laboratories which for the most part can be classified as small business.

We look forward to your timely action on this request and certainly stand ready to be of assistance to you in any way we can.

Very Truly Yours,

Walter A. Poggi
President
Retlif, Inc.

Appendix A

- *Test Technology: Electronics.*
- *Test Disciplines: Electromagnetic Compatibility (FCC Standards), Electromagnetic Compatibility (Military Standards), Telecommunications (FCC Standards).*
- *General Requirements: (A) Company History; (B) Staffing; (C) Instrumentation FCC/CISPR: — Mil-spec: —; (D) Applicable Documents (Calibration and QC Manuals); (E) General Laboratory Practices; (F) Facility Layout (Including FCC Listed Outdoor Site).*
- *Electromagnetic Compatibility (FCC Standards) Requirements:*
Line Conducted Emission: 20 Hz-10 kHz, 10 kHz-150 kHz, 150 kHz-30 MHz, 30 MHz-200 MHz;
Radiated Emissions: 20 Hz-10 kHz, 10 kHz-150 kHz, 150 kHz-30 MHz, 30 MHz-1000 MHz, 1 GHz-400 GHz;
Antenna Conducted Emissions: 10 kHz-18 GHz;
Frequency Stability (Temperature): 10 kHz-1 GHz, 1 GHz-18 GHz;
Frequency Stability (Voltage): 10 kHz-1 GHz, 1 GHz-18 GHz;
Occupied Bandwidth;
Modulation Characteristics;
Power Output.
- *Electromagnetic Compatibility (Military) Requirements: Line Conducted Emissions: MIL-STD-461 A and B all notices; Line Conducted Susceptibility: MIL-STD-461 A and B all notices; Radiated Emissions: MIL-STD-461 A and B all notices; Radiated Susceptibility: MIL-STD-461 A and B all notices; High Level Radiated Susceptibility: 200 V/m, 10 kHz-40 GHz.*
- *Telecommunications (FCC Standards) Requirements: Environmental Simulation; Leakage Current Limitations; Hazardous Voltage Limitations; Signal Power Limitations; Longitudinal Balance Limitations; On Look Impedance Limitations; Billing Protection.*

CONFERENCES

Primary Malignant Tumors Among University of Washington Rats

To The Editor:

Here is a breakdown of the primary neoplastic lesions in our Air Force rats, diagnosed by Dr. Larry Kunz.

Sincerely yours,

C.K. Chou, Ph.D.
Research Associate Professor
Bioelectromagnetics Research Laboratory
University of Washington
Seattle, WA 98195

Primary Malignant Tumors in Animals

Exposed

Animal	Tissue	Lesion
A14	thyroid	c-cell carcinoma
B06	lymph node	myelomonocytic leukemia
B14	thyroid	c-cell carcinoma
B19	urin/bladder	transitional cell carcinoma
C11	adrenal	cortical carcinoma
D15	subcutaneous tissue	fibrosarcoma
E10	adrenal	cortical carcinoma
E14	skin	basal cell carcinoma
E19	pituitary	carcinoma
G05	blood vessel	hemangiosarcoma
G06	pituitary	carcinoma
G11	peritonium	liposarcoma
H01	adrenal	cortical carcinoma
H05	thymus	lymphocytic lymphoma
H10	stomach	squamous cell carcinoma
H15	thymus	myelomonocytic leukemia
J05	bone marrow	malignant lymphoma
J11	skin	auditory sebaceous gland squamous carcinoma

Sham Exposed

B09	liver	carcinoma
B12	cervical lymph node	lymphocytic lymphoma
C12	lymph node	myelomonocytic leukemia
G04	adrenal	carcinoma
H12	thymus	malignant lymphoma

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April 9-11: **Electrical Overstress Exposition**, Hynes Auditorium, Boston, MA. Contact: EOE, 2504 N. Tamiami Trail, Nokomis, FL 33555.

April 14-17: **63rd Annual Convention of the National Association of Broadcasters**, Las Vegas, NV. Contact: NAB, 1771 N Street, NW, Washington, DC 20036, (202) 293-3570.

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

April 16-19: **4th International Conference on Antennas and Propagation (ICAP 85)**, Coventry, UK. Contact: Institution of Electrical Engineers (IEE), Savoy Place, London WC2R 0BL, UK, (01) 240-1871, ext. 222.

April 17-19: **3rd International Conference on Developments in Power System Protection**, London, UK. Contact: IEE, see April 16 above.

April 22-24: **47th Annual American Power Conference**, Palmer House, Chicago, IL. Contact: Illinois Institute of Technology, IIT Center, Chicago, IL 60616.

April 24-27: **3rd European Workshop on NMR in Medicine**, Copenhagen, Denmark. Contact: Dr. S.B. Petersen, Dept. of Neurology 2082, State University Hospital, Rigshospitalet, Blegdamsvej 9, DK 2100 Copenhagen 0, Denmark.

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

April 30-May 4: **International Conference on Magnetic Resonance in Cancer**, Banff, Alberta, Canada. Contact: Mrs. H.D. Milligan, Division of Continuing Medical Education, 12-103 Clinical Sciences Bldg., University of Alberta, Edmonton, Alberta T6G 2G3, Canada.

May 4-7: **5th Annual Meeting of the North American Hyperthermia Group**, Biltmore Hotel, Los Angeles, CA. Contact: NAHG, 925 Chestnut St., Philadelphia, PA 19107, (215) 574-3153. Held in conjunction with the Radiation Research Society Meeting.

May 5-9: **33rd Annual Meeting of the Radiation Research Society**, Biltmore Hotel, Los Angeles, CA. Contact: RRS, 925 Chestnut St., Philadelphia, PA 19107, (215) 574-3153.

May 6-9: **IEEE 1985 International Radar Conference**, Washington, DC. Contact: J.Q. Adams, IIT-Gillfillan, M/S 45, 7821 Orion Ave., PO Box 7713, Van Nuys, CA 91409, (818) 988-2600, ext. 6903.

May 6-10: **2nd Annual Magnetic Resonance Imaging 1985: National Symposium**, MGM Grand, Las Vegas, NV. Contact: Educational Symposium, PO Box 17241, Tampa, FL 33682, (813) 879-8765.

May 14-16: **3rd Transmission & Distribution Expo**, O'Hare Expo Center, Chicago, IL. Contact: Conference Management Corp., 17 Washington St., PO Box 4990, Norwalk, CT 06856.

May 14-16: **Test & Measurement World Expo**, Convention Center, San Jose, CA. Contact: Meg Bowen, T&M Expo, 215 Brighton Ave., Boston, MA 02134, (617) 254-1445.

May 14-17: **1st Annual Meeting of the Electromagnetic Energy Policy Alliance**, Hotel Intercontinental, San Diego, CA. Contact: Richard Ekfelt, EEPA, 1800 M St., NW, Washington, DC 20036, (202) 452-1070.

May 19-23: **17th Annual Meeting of the Conference of Radiation Control Program Directors**, Milwaukee, WI. Contact: CRCPD, 71 Fountain Place, Frankfort, KY 40601, (502) 227-4543.

May 20-24: **8th International Conference on Electricity Distribution**, Brighton, UK. Contact: IEE, see April 16 above.

May 26-31: **30th Annual Meeting of the Health Physics Society**, Chicago, IL. Contact: HPS, Suite 300, 1340 Old Chain Bridge Rd., McLean, VA 22101, (703) 790-1745.

June 4-6: **1985 IEEE MTT-S International Microwave Symposium**, St. Louis, MO. Contact: John Bogdanor, McDonnell Aircraft, Dept. 313, St. Louis, MO 63166, (314) 232-3936.

BIOLOGICAL EFFECTS

Lightning Injuries...Doctors at the Army Institute of Surgical Research's Burn Center at Fort Sam Houston, TX, have been studying injuries caused by lightning. Writing in the January 11 *Journal of the American Medical Association (JAMA)*, they present five case studies of patients who survived lightning strikes. The degree of injury depended on the power, duration, sites of entry and exit of the lightning bolt and the position and grounding of the victim. Of the five, two showed signs of cardiac abnormalities — including one who also suffered ear damage (bilateral perforated tympanic membranes). Another patient developed peripheral neuropathy. In some lightning injuries, cataracts can develop over time: as of 1972, there were 90 examples in the literature. For the five cases reported in *JAMA*, the doctors observed no "visual aberrations," though they note that cataracts could have developed after the patients left the hospital.

Resources...In a letter published in the December 8 issue of the British medical journal, *Lancet*, J.A. Bonnell of the Central Electricity Generating Board (CEGB) in London presents preliminary results of a health survey of workers exposed to 50 Hz power line electric fields. According to Bonnell, the study did not identify any ill effects. A paper describing the findings will be published in the *British Journal of Industrial Medicine*. . . . Dr. Stuart Lindsay, a physicist at Arizona State University in Tempe, has won a two-year, \$66,811 contract from EPA to investigate observed resonances in DNA at 600 MHz. Lindsay will try to determine possible molecular bases for the effect, using a multipassed vernier tandem interferometer. This work should complement that being done by the University of Maryland, FDA and NCI in testing the theories of Dr. Earl Prohofsky of Purdue University (see *MWN*, May and November 1984). There are still skeptics who do not believe that this work will lead to a better understanding of the interaction of microwaves with living systems. For instance, Dr. Kenneth Foster of the University of Pennsylvania in Philadelphia is convinced that the observed DNA resonances are at best "a startling spectroscopic finding about the behavior of DNA in solution," rather than a possible mechanism for bioeffects of low-level microwaves. In a letter published in the January 26 *Science News*, Foster repeats the well-known argument that the energy of the microwaves is much smaller than that of DNA's random motion. . . . M.F. Diprose and F.A. Benson of the University of Sheffield's (UK) Department of Electronic and Electrical Engineering and A.J. Willis of the university's Department of Botany have published an extensive review paper, "The Effect of Externally Applied Electrostatic Fields, Microwave Radiation and Electric Currents on Plants and Other Organisms, with Special Reference to Weed Control," in the April-June 1984 *The Botanical Review*. Copies are available from the Scientific Publications Office, New York Botanical Garden, Bronx, NY 10458, for \$10.75 (U.S.), \$11.50 (elsewhere), prepaid, postage included. Ask for issue 50(2). . . . Dr. Jonathan Charry, for-

merly with Rockefeller University and now at the Institute for Basic Research in Developmental Disabilities on Staten Island in New York City, has published a 38-page review article on the bioeffects of small air ions, such as those from high voltage DC power lines, in *Environmental Research*, 34, 351, 1984. He concludes that "small air ions are likely to have biological effects, that these effects may be related to polarity and that where effects occur they are likely to be small in magnitude and difficult to detect reliably."

INTERNATIONAL

U.S.-U.S.S.R. Cooperation...Exchanges between American and Soviet scientists continue. In March, three Soviet researchers will visit Dr. Don McRee's lab at the National Institute for Environmental Health Sciences (NIEHS) in Research Triangle Park, NC. The following month, McRee will head a delegation to Kiev for a meeting with Professor Mikhael Shandala at the A.N. Marzeev Research Institute of General and Communal Hygiene. Traveling with McRee will be Drs. Clifford Mitchell (NIEHS), Jack Monahan (FDA), Mays Swicord (FDA), Bill Guy (University of Washington), William Kaune (Battelle) and Don Justesen (VA); EPA's Richard Phillips may also go. On the agenda in Kiev are a review of the duplicate experiment (see *MWN*, July/August 1982 and June 1983) and the development of a research plan for the next two years. NIEHS recently released a two-volume report, *Proceedings of U.S.-U.S.S.R. Workshop on Nervous System Effects of Electromagnetic Waves*, which was held in Research Triangle Park in May 1982. Volume 1 includes a review of the U.S. and U.S.S.R. literature (for exposure in the 0-300 GHz frequency range) by Dr. Richard Lovely and Professor Shandala and co-authors, respectively. Volume 2 includes 14 papers by researchers from both countries and the protocol for the duplicate experiment (see *MWN*, July/August 1982 and October 1983.) A limited number of copies are available free from McRee, NIEHS, PO Box 12233, Research Triangle Park, NC 27709.

German Exposure Standard...West Germany has set its own exposure standard for the frequency range 10 kHz-3000 GHz. The standard applies to workers and the general public. Dr. Tom Rozzell of the Office of Naval Research outlines the standard in the December 1984/January 1985 issue of the *Bioelectromagnetics Society (BEMS) Newsletter*. The following average values are set for six-minute or greater exposures (f = frequency in MHz). 10 kHz-30 kHz: 2,000 V/m (E-field), 500 A/m (H-field); 30 kHz-2 MHz: 1,500 V/m (E), $7.5/f$ A/m (H); 2 MHz-30 MHz: $3000/f$ V/m (E), $7.5/f$ A/m (H); 30 MHz-3 GHz: 100 V/m (E), 0.25 A/m (H) or an average power density of 2.5 mW/cm²; 3 GHz-12 GHz: $100(f/3000)^{1/2}$ V/m (E), $0.25(f/3000)^{1/2}$ A/m (H), or an average power density of 2.5(f/3000) mW/cm²; 12-3000 GHz: 200 V/m (E), 0.5 A/m (H), or an average power density of 10 mW/cm². The standard (DIN 57 848, Teil (Part) 2 or VDE 0848 Teil 2) was adopted in July 1984. For a copy of the BEMS newsletter,

send \$1.50 and a self-addressed, stamped envelope to BEMS Newsletter, PO Box 3651, Arlington, VA 22203. For more information, contact: Dr. J.G. Bernhardt, Institut für Strahlenhygiene des Bundesgesundheitsamtes, In-golstadter Landstrasse 1, 8042 Neuherberg, West Ger-many.

MEASUREMENT

New from NBS... Researchers at the National Bureau of Standards have been busy. Here is a list of some of their recent papers and reports and how to get them: • "Calibration of Flat 60 Hz Electric Field Probes" by Martin Misakian appears in *Bioelectromagnetics*, 5, 447, 1984. • "Multiple-Source, Multiple-Frequency Error of an Electric Field Meter" by Drs. J. Randa and M. Kanda has been published in *IEEE Transactions on Antennas and Propagation*, 33, 2, 1985. • "An Electromagnetic Near-Field Sensor for Simultaneous Electric and Magnetic Field Measurements" by Kanda is in *IEEE Transactions on Electromagnetic Compatibility*, 26, 102, 1984. • *Theory of Near-Field Phased Arrays for Electromagnetic Susceptibility Testing* by David Hill, Technical Note 1072. Order No. 003-003-02559-3, \$4.50, prepaid, from U.S. Government Printing Office (GPO), Washington, DC 20402. • *An Error Analysis for the Use of Presently Available Lunar Radio Flux Data in Broadbeam Antenna-System Measurements* by William Daywitt, Technical Note 1073. Order No. 003-003-2555-1, \$2.00, prepaid, from GPO. • *Building Penetration Project*, No. NBSIR 84-3009, by J.C. Wyss, W.J. Anson and R.D. Orr, describes electromagnetic properties of various building materials and a computer program that calculates building attenuation in the frequency range 10 kHz-10 GHz. The 310-page document is available, prepaid, for \$25.00 from the National Technical Information Service (NTIS), Springfield, VA 22161. Order No. PB 85-126001. • *Comparison of Measured and Calculated Mutual Coupling in the Near Field Between Microwave Antennas* by Carl Stubenrauch and Michael Francis, No. NBSIR 84-3010. Order No. PB 85-105963, \$10.00, prepaid, from NTIS. • *Metrology for Electromagnetic Technology: A Bibliography of NBS Publications* edited by R.A. Kamper and K.E. Kline, No. NBSIR 84-3014. (This volume covers the period between 1970 and 1983.) Order No. PB 84-112985, \$10.00, prepaid, from NTIS. • *A Preliminary Investigation into Using the Sun as a Source for G/T Measurements*, No. NBSIR 84-3015. (Useful for antennas 4-6 meters in diameter; G/T is gain-to-system noise temperature.) Available for \$7.00, prepaid, from NTIS. Order No. PB 85-128148. Single copies of the following NBS papers are available from Fred McGehan, Division 360.2, NBS, Boulder, CO 80303: • *Some Problems Associated with Interpreting Shielding Effectiveness Measurement Results* by P.F. Wilson and M.T. Ma; and • *Preliminary Investigations into Shielding Effectiveness Measurement Techniques* by J.W. Adams and A.R. Ondrejka (discusses five methods for lossy materials).

MEDICAL APPLICATIONS

Electricity in Medicine... Margaret Rowbottom, formerly with the Wellcome Historical Medical Museum in London, UK, and Professor Charles Susskind of the University of California, Berkeley, are the authors of *Electricity and Medicine: History of Their Interaction*. The 303-page illustrated volume, complete with extensive footnotes, covers a host of treatments, including diathermy. It is available for \$30.00 (cloth) or \$12.50 (paper) from the San Francisco Press, Box 6800, San Francisco, CA 94101, (415) 524-1000.

New Hyperthermia Journal... Taylor & Francis will begin publishing the *International Journal of Hyperthermia* in 1985. The new quarterly, which costs \$80.00 in the U.S. and 40 pounds in the U.K., will cover biological and clinical studies, as well as techniques for delivering heat and measuring temperature. Its editors are Drs. S.B. Field (U.K.), G. Hahn (U.S.), J. Overgaard (Denmark) and T. Sugahara (Japan). This is the official journal of the North American Hyperthermia Group, the European Cooperative Hyperthermia Society and the Japanese Hyperthermia Society. For subscriptions or sample copies, contact Taylor & Francis, Inc., 242 Cherry St., Philadelphia, PA 19106, (215) 238-0939.

MEETINGS

Bologna Meeting... The Office of Naval Research (ONR) is sponsoring a "mini-symposium" on the influence of electromagnetic fields on organized biological structures, such as membranes, at the *8th International Symposium on Bioelectrochemistry and Bioenergetics*, which will be held in Bologna, Italy, June 24-29. The Bologna meeting is being sponsored by the Bioelectrochemical Society (BECS) and the Italian Group of Bioenergetics. The Bioelectromagnetics Society (BEMS) is helping arrange the mini-symposium — which should allow for discussions among BECS and BEMS members. For more information about the mini-symposium, contact Dr. Tom Rozzell, ONR London, Box 39, FPO, NY 09510; and for the main symposium, contact Dr. C. Bonfiglioli, c/o Institute of Botany, Via Imerio 42, 40126 Bologna, Italy, (051) 234276.

T&D Expo... The *3rd Transmission and Distribution Expo* will be held at the O'Hare Expo Center in Chicago, May 14-16. Among the scheduled seminars are "Lightning Protection of Distribution Lines and Equipment," "Locating Radio and TV Interference," "Transmission Siting and the Regulatory Agency" and "Future Role of HVDC." See Conference Calendar for details on whom to contact.

URSI... The next General Assembly of the International Union of Radio Science (URSI), its 22nd meeting, will be in Tel Aviv, Israel, August 24-September 4, 1987....URSI has released a *Review of Radio Science 1981-1983*, which was prepared for the participants at last year's assembly, held in Florence, Italy, in September. The summary papers, with a huge number of accompanying references,

cover a wide range of subjects, including EMI, bioeffects, metrology, propagation, remote sensing, etc. The volume, edited by S.A. Bowhill of the University of Illinois at Urbana-Champaign, is available for \$20.00 (including surface postage) from: URSI, Avenue Albert Lancaster 32, B-1180 Brussels, Belgium.

MILITARY SYSTEMS

Navy EMC...The U.S. Navy is accepting proposals for assistance in establishing an Electromagnetic System Environment Design and Engineering (EMSEDE) program. The new initiative is "to institutionalize EMC in the design of ships," explained Dr. Bob Haislmaier, who coordinates EMC activities in the Office of the Chief of Naval Operations. EMSEDE should help avoid EMI problems before they arise, he added. The successful bidder will require a security clearance. For a copy of RFP No. N00039-85-R-0207(Q), call NAVALEX at (202) 692-6050; closing date at the end of March.

Project ELF...The AIBS report on ELF bioeffects should go to the Navy in mid-March and be available to the public soon afterwards (see *MWN* July/August and September 1984). ELF Program Manager Capt. Ronald Koontz at the Naval Electronics Systems Command in Arlington, VA, told *Microwave News* that the Navy has not yet decided whether or not it will write a new environmental impact statement for Project ELF. That decision, he explained, will depend on the comments received on the AIBS report....In other developments, the Navy announced that it will not prepare an EIS for the construction of ground systems for the transmitter facility in Republic, Michigan. The finding of "no significant impact" appears in the January 7 *Federal Register* (50 FR 875)....In Wisconsin, "Stop Project ELF," a group that has actively tried to prevent the Navy from building the submarine communication system, has lost two of its leaders. John Stauber and Jennifer Speicher have turned over the project to Madge Micheels-Cyrus, who will continue grass roots organizing against Project ELF out of Hayward, WI....Progress is being made on an alternative communication system using lasers. The January 21 *Aviation Week* reports that the wavelength of the laser has been shifted to the deep blue part of the spectrum (from blue-green) and preliminary tests are overcoming previous skepticism about its reliability. DOD estimates that the laser system and submarine receivers would cost about \$1 billion.

EMPRESS II...The Navy has extended the deadline for comments on its draft environmental impact statement on the second Electromagnetic Pulse Radiation Environment Simulator for Ships (EMPRESS II) until December 1 (see *MWN*, October 1984). The extension was granted at the request of Maryland Governor Harry Hughes to allow for the inclusion of new test data being collected at the University of Maryland. (This is the second delay; comments were originally due on November 5, 1984, but that date was extended until December 1, 1984.) In late January, the

governor said that the Navy had reassured him that "if the studies indicate there will be adverse environmental effects, EMPRESS II testing will *not* be conducted in the Chesapeake Bay."

OCCUPATIONAL HEALTH

Supermarket Rashes...It might have been a case for a medical detective when employees at an Ohio supermarket reported a high incidence of a mysterious rash. Luckily, recent findings on the activation of drugs and chemicals by light provided the answer. It all started last July, when a 33-year-old supermarket cashier went to an Ohio clinic with a serious rash on her forearm. It turned out that several of the woman's co-workers had similar rashes. NIOSH representatives examined a cross section of the workers and found that 27 percent had developed the rash, but they also observed that the condition struck only certain kinds of employees — cashiers, baggers and produce clerks. What these workers all had in common was contact with fresh produce and flowers. Putting the pieces of the puzzle together, NIOSH made a diagnosis of phytophotodermatitis, a condition caused by contact with certain plants followed by exposure to sunlight. These plants — such as celery, dill, parsley and chrysanthemums — contain psoralens, which can rub off on skin and cause rashes if stimulated by long-wave UV light (350 nm). Sunlight is usually enough to provoke phytophotodermatitis; however, in this case, NIOSH found that workers who had used tanning salons were more likely to develop rashes. NIOSH urged employees who handle produce to wash exposed areas regularly and to avoid tanning salons and excessive exposure to sunlight. A report on this episode is described in the January 11 *Morbidity and Mortality Weekly Report* — but it is not the first such report: NIOSH had investigated similar episodes in supermarkets throughout the midwest in 1980 and 1981.

POWER LINES

Studies...The Florida study on the health and safety of power lines, headed by Professor H.B. Graves of Pennsylvania State University, did not meet its January 1 deadline. But because the state Department of Environmental Regulation will not be taking any action until the fall, the pressure to complete the report has abated. William Palmer of the Florida Electric Power Coordination Group in Tampa estimates that the report should be out by early April. The price of the report has not yet been set....A team at Carnegie-Mellon University in Pittsburgh, PA, headed by Professor M. Granger Morgan has published a paper on its risk assessment studies, "Power Line Fields and Human Health," in the February *IEEE Spectrum*. A longer paper on the perception of the risks associated with ELF electric and magnetic fields will appear in a forthcoming issue of *Risk Analysis*, the journal of the Society for Risk Analysis, based in McLean, VA. One of the group's conclusions cited in the *Spectrum* article is that "Im-

provement is needed in the way many states site and approve power-transmission facilities."

STANDARDS

C95 Changes its Name...The ANSI C95 committee on RF Radiation Hazards, best known for its 1982 RF/MW exposure standard, is proposing to change its name to "Non-Ionizing Radiation Hazards," and to change its purview to: "Hazards to mankind, volatile materials and explosive devices which are created by man-made sources of electromagnetic radiation. It is not intended to include infrared, X-rays or other ionizing radiation." C95 members are voting on the two proposals, as well as on new procedures to accredit the committee. Ballots are due by April 15.

Surge Arresters...The new ANSI/IEEE C62.1-1984 standard, *Surge Arresters for AC Power Circuits*, was approved on December 17. The new standard, which has not yet been printed, is a revision of the 1981 standard. Meanwhile, NEMA and IEEE have requested that the C62 committee be accredited as an American National Standards Committee with the following scope: "Definitions, classifications, ratings, methods of test, performance characteristics, physical characteristics and application of surge arresters of all types." For more information, contact NEMA, Suite 300, 2101 L St., NW, Washington, DC 20037.

TECHNOLOGY

EPRI on Industrial MW Applications...EPRI has published *Microwave Power in Industry*, an overview and assessment of microwave drying and heating applications. According to R.D. Smith of Thermo Energy Corp. in Palo Alto, CA, who wrote the report, sales of industrial microwave heating equipment amount to only \$4 million a year, compared with an annual domestic market for microwave ovens of about \$1.6 billion. Of the 24 megawatts (MW) of presently installed industrial capacity for microwave drying and heating, food processing accounts for 19 MW and rubber manufacturing for 3.2 MW. Because microwave heating is relatively expensive, it is only suitable for certain processes. The report examines case studies of the jobs microwaves do well: frozen food tempering, rubber vulcanization, bacon cooking and pasta drying. It is available for \$13.00 from the EPRI Research Reports Center, Box 50490, Palo Alto, CA 94303, (415) 965-4081. Ask for Report No. EM-3645.

VDTs

Marha on VDT Radiation...In a paper presented at the first international conference on VDTs and reproductive risks held in London, UK last November (see *MWN*, January/February 1985), Karel Marha of the Canadian Center for Occupational Health and Safety (CCOHS) suggested that VDT radiation emissions might have a biological effect and recommended directions for further research. Cit-

ing the differences in field characteristics (repetition rates and wave shapes) between published studies and those associated with VDTs, he concluded that "it is imperative to experimentally evaluate any biological effects of the actual fields or simulated fields identical to those emitted by some VDTs." In the meantime, Marha advocated using copper foil and grounding wire to shield against the pulsed VLF electric fields (see *MWN*, December 1983). He cautioned that his studies indicate that lead aprons do not absorb or reflect VLF emissions. One way to protect workers, Marha said, was to use the fact that the fields decrease rapidly with distance. He recommended that operators should not sit or stand close to the side or rear of the units. Shielding against the pulsed ELF and VLF magnetic fields is much more difficult, and Marha concluded that the solution to the problem probably lies with flat screen displays replacing CRTs. Marha can be contacted at CCOHS, 250 Main Street East, Hamilton, Ontario L8N 1H6, Canada, (416) 523-2981.

Legislative Affairs...A published transcript is now available from last year's congressional hearings on VDT health and safety (see *MWN*, May 1984). Single copies of the 623-page document, *OSHA Oversight - Video Display Terminals in the Workplace*, can be requested from the subcommittee on health and safety of the House Committee on Education and Labor at Room B345A, Rayburn Building, U.S. House of Representatives, Washington, DC 20515, (202) 225-6876. At least two other congressional subcommittees are reportedly studying the VDT issue, but it is unclear whether either will hold hearings... Meanwhile, as expected, the list of states considering VDT legislation is growing. In one state, **Oregon**, the senate has already approved a bill. Oregon SB57 (sponsored by Sen. Margie Hendriksen) is now pending before the house labor committee, which is expected to act soon. Other bills awaiting action are: **California** Assembly Bill No. 687 (Assemblyman Tom Hayden), **Connecticut** Bill No. 6011 (Rep. Irene Favreau) and Bill No. 6012 (Rep. Joe Adamo), **Maine** Legislative Document No. 318 (Rep. Edith Beaulieu), **Maryland** House of Delegates Bill No. 1258 (Delegate Anne Perkins), **Minnesota** House File 2333 (Rep. Karen Clark), **Missouri** House Bill No. 406 (Rep. Ron Auer), **New Jersey** Assembly Concurrent Resolution 132 (Assemblywoman Jacqueline Walker), and **Washington** state House Bill No. 468 (Rep. Janice Niemi).

Seizures...Epileptic seizures induced by the flicker of computer displays are rare, though reported cases continue to raise concern. A letter in the February 2 *Lancet* from researchers at the U.K.'s University of Aston in Birmingham suggests that VDTs are so unlikely to induce epileptic seizures in photosensitive people that "for practical reasons [the risk] can probably be ignored." Television sets used as computer monitors may be slightly more likely to cause seizures in photosensitive users. The researchers are all members of the Department of Vision Sciences at the university.

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