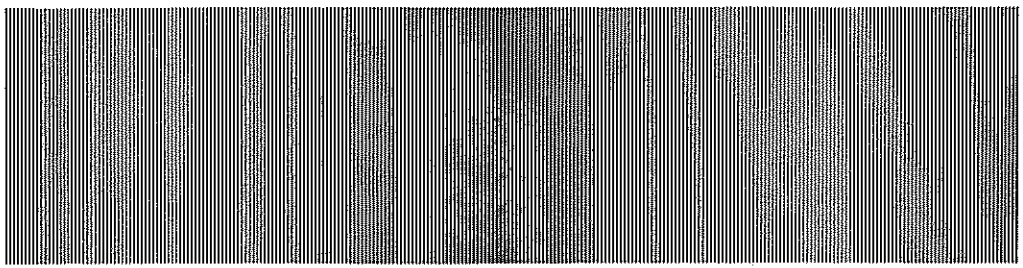


MICRO WAVE NEWS



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

Electromagnetic Compatibility Symposium

Making Systems Work Together

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

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

The Aegis Cruiser

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

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

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

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

(continued p. 2)

EMC Symposium (continued from p. 1)

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

CREAM Program

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

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

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

Computing Devices

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

Movshin closed his remarks with some advice: "The FCC has the authority to force compliance, so don't ignore the rules because the FCC will find you and get you." To back up his warning, he said that the commission takes complaints

from competitors "very seriously." In addition, he said that the commission was stepping up its audits and cited as an example a recent check of all equipment in a retail store in Baltimore.

Computer Interference

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

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

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

Open Area Test Sites

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

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

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

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

HIGHLIGHTS

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

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

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

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

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

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

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

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

EPA and OSHA Delay Health Standards

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

At EPA, the ANPRM is now in "red border" review. This is the last step in the agency's evaluation process when all pro-

posals are examined by the senior EPA staff and are forwarded to Administrator Anne Gorsuch for a final decision. There is no word as to whether Gorsuch will sign the ANPRM. If she does, it would probably be published in the *Federal Register* in November. One EPA staff member said that if it is approved, the Office of Radiation Programs would still try to meet its original schedule of publishing a proposed rule in September 1983 and final guidance in September 1984.

At OSHA, a draft ANPRM will be submitted to agency management in mid-October. If approved without changes, it would take about 4-6 weeks to publish the notice. (In May, OSHA officially proposed to delete all its voluntary standards including its advisory 10 mW/cm² RF/MW standard.)

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

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

Minnesota Advisory Panel Reviews DC Power Line Safety

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

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

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

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

10-10⁴ times greater than ambient levels," it concludes that such exposure "at distances more than a few hundred meters from the conductors appears unlikely." It also states, however, that "there are insufficient data to determine what effects, if any, might be observed with exposures to high ion concentrations over extended periods of time." According to the report, "air ions and/or charged aerosols, measured as enhanced electric fields, can probably be carried downwind from the line for hundreds of meters before the fields dissipate to natural background levels."

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

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

Do-It-Yourself Oven Checks

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

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

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

The HI-1501 can measure 2450 MHz radiation used for most microwave cooking at power levels from .01 mW/cm² (10 uW/cm²) and up. The Bureau of Radiological Health has set acceptable emission limits for new ovens at 1 mW/cm² at a distance of 5 cm (2 inches) from the oven surface and at 5 mW/cm² for used equipment. ●

Industry Legal and Policy Seminar

The Electronic Industries Association (EIA), the Association of Home Appliance Manufacturers (AHAM) and the National Association of Broadcasters (NAB) are sponsoring a

seminar on *RF Radiation: Legal and Policy Implications* to be held at the Homestead in Hot Springs, VA, October 27-29. The meeting is designed "to give participants an authoritative overview of problems caused by arousal of the public's fears of 'radiation,' and to consider how these problems, which confront manufacturers and users of electronic and electrical equipment, may be solved."

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

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

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

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

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

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

UPDATES

Biological Effects... Dr. Jim Toler of the Georgia Institute of Technology has been awarded \$71,000 by EPA to develop a new dosimetry system for his chronic study of the effects of 500 MHz radiation. Toler has developed a new type of radiation exposure facility involving circular, parallel waveguides stacked in a tier arrangement. These will be housed in a converted grain silo, which has the advantage of allowing easy control of its temperature and humidity. According to present plans, Toler's team will run a lifetime study of 95 rats exposed to unmodulated 500 MHz fields; 95 control rats will be housed in a

similar silo. They will then attempt to discover the causes of death. The level of exposure is tentatively set at 10 mW/cm², though no decision will be made until a pilot study is completed. The preliminary experiment could start this winter, and the full study could get under way by next summer or fall... The AF School of Aerospace Medicine at Brooks AFB, TX, has contracted with the University of Utah for a 15-month research project on the biological effects of millimeter radiation—in the 26.5 to 90 GHz frequency range. The work, which is a continuation of a previous effort, involves the measurement of

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

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

Compatibility and Interference. . . . The FCC has decided to re-classify coin-operated electronic games from Class B to Class A computing devices, subject only to verification by the manufacturer. Despite reports of interference from electronic games, mostly to land mobile radio communications, the commission loosened the rules because it believes that Class A restrictions should be sufficient to protect communication receivers. But the FCC did move up the date for compliance as compared to other Class A computing devices: all coin-operated games manufactured after December 1, 1982 must be verified before marketing. The commission warned, however, that if Class A restrictions are found to be insufficient it will initiate rule making to impose Class B requirements. The FCC advises that it "will be closely monitoring this situation for the next year or so." . . . In a related decision, the FCC has denied a petition by Texas Instruments to classify hand-held electronic games according to their clock frequency. The commission concluded that clock frequency alone does not determine the potential for interference. Hand-held games manufactured after October 1, 1983, must be verified for compliance

with Class B rules. . . . The National Association of Broadcasters (NAB), among others, has filed comments with the FCC on a petition from RF Power Labs to allow a wireless security system to operate at UHF-TV frequencies. The NAB cites the dangers of interference to low-power TV stations. . . . On August 30, the FCC detected "appreciable" power increases in AM broadcasts from Cuba on 570 kHz, 670 kHz, 1040 kHz, 1160 kHz and 1380 kHz. Of the 96 AM stations that could have been affected, only WHO in Des Moines, IA, complained that the Cuban signals caused interference. . . . The Senate Foreign Relations Committee approved plans for Radio Marti (S.1853) by a vote of 11-5 on September 9. The measure now awaits action by the full Senate. A companion bill (H.R. 5427) has already passed the House. . . . Attendees at the *International Conference on Electromagnetic Compatibility*, organized by the Institution of Electronic and Radio Engineers in England, were scheduled to hear Dr. J. M. Thomson of the Royal Aircraft Establishment in Farnborough deliver the keynote address on "Research on EMC for Aircraft Systems," at the University of Surrey on September 21. Among the other papers to be presented were "The Interference Effects of Citizen Band Radio," by A.C.D. Whitehouse of the Home Office and "The Susceptibility of Analog Circuits to Radiofrequency Interference: Prediction and Measurement," by M. Elliot of A&AEE, Boscombe Down.

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

International. . . . The National Institute of Environmental Health Sciences (NIEHS) has published the *Proceedings of [the] US-USSR Workshop on Physical Factors: Microwaves and Low Frequency Fields*, dated April 1981. The workshop was held at the University of Washington, Seattle, in June 1979. Copies are available from Dr. Donald McRee, NIEHS, PO Box 12233, Research Triangle Park, NC 27709. . . . The National Radiological Protection Board (NRPB) has issued a report, *The Work of the NRPB 1977/80 and a Review of the First 10 Years*. Though focussing mainly on ionizing radiation, the report does include a brief review of the board's work on non-ionizing radiation. Contact: NRPB, Chilton, Didcot, Oxfordshire OX11 0RQ, United Kingdom.

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

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

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

on NMR imaging and hyperthermia therapy for cancer, among many other subjects addressed at the May 9-12 conference, are available from Eastern Audio Associates in Columbia, MD, (301) 596-3900. They are \$16.00 each. . . . The Office of Technology Assessment has released a report, *Strategies for Medical Technology Assessment*, critical of current methods of evaluating the safety, efficacy, cost and social impact of medical systems. The report (No. 052-003-00887-4) is available from the Government Printing Office, Washington, DC 20052 for \$7.50. . . . When using NMR machines, be careful: the fields can demagnetize your credit cards, making them useless.

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

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

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

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

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

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

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

Satellite Communications. . . . RCA's planned satcom station near Seattle continues to meet community resistance. Residents of the Indianola-Kingston area, now the primary site proposed by RCA's Americom subsidiary, are appealing a Kitsap County hearing examiner's recommendation for approval. The Board of County Com-

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

Standards. . . . The town of Onondaga, NY, has decided to adopt its own RF/MW exposure standard. On August 16, the town board extended its moratorium on new broadcast sources, begun in 1980, and told the Onondaga Environmental Advisory Council to develop recommendations for general population exposure rules. According to Ray D'Agostino, the town's attorney, the board had expected a federal standard to be out by now and was tired of waiting. D'Agostino said the environmental council will now look into various local standards, including Multnomah County's (OR), and review the new ANSI standard. The moratorium began shortly after Filmways Communications of Syracuse, NY, proposed building a TV station in Onondaga. The company has since filed suit in the US District Court for Northern New York seeking more than five million dollars in damages from the town. . . . Massachusetts' final draft standard for RF/MW radiation exposure for the general population is out for review. The proposed rule is five times stricter than the new ANSI standard and sets a 200 uW/cm² exposure limit for the 30-300 MHz frequency band. Unlike an earlier version, the draft standard does not address occupational exposures and is limited to fixed radiation sources. (See *MWN*, March and April 1982.) A public hearing on the proposal is scheduled for November 29 in Boston. Another hearing will be held in the western part of the state on December 2. For copies of the draft and for more information on the hearings, contact: Radiation Control Program, Room 770, 600 Washington Street, Boston, MA 02111, (617) 727-6214. . . . ANSI has published the new "Radiofrequency Radiation Hazard Warning Symbol" (C95.2-1982). (See *MWN*, October 1981.) A copy is available for \$5 from ANSI's Sales Dept., 1430 Broadway, New York, NY 10018. . . . DoD has joined ANSI as a governmental member. . . . The International Electrotechnical Commission (IEC) has issued two draft rules: "CISPR/C (Central Office) 29, Document CISPR/C (Secretariat) 36: Manual on interference from overhead power lines and high voltage equipment, Clause 8: Limits on interference, Sub-clause 8.1: Definition of nuisance limits, Sub-clause 8.3: Methods for derivation of limits;" and "CISPR/D (Central Office) 8, Amendments to CISPR Publication 12" on interference relating to motor vehicles and internal combustion engines." In addition, the IEC has published a standard, IEC 725-1981, on EMC between electrical equipment: "Considerations on reference impedances for use in determining the disturbance characteristics of household appliances and similar electrical equipment." These are also available from the ANSI Sales Office.

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

UPDATES: VDTs (continued)

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

CONFERENCE CALENDAR

- October 17-20: 1982 *IEEE Military Communications Conference*, Stouffer's Bedford Glen Hotel, Bedford, MA. Contact: Lawrence Jeffery, MITRE Corp., PO Box 208, Bedford, MA 01730.
- October 18-20: *Radar-82*, Royal Borough of Kensington and Chelsea Town Hall, London, England. Contact: Institution of Electrical Engineers, Savoy Place, London, WC2R 0BL, England.
- October 20-22: *Military Microwaves '82*, Cunard International Hotel, London, England. Contact: Roger Marriott, Microwave Exhibition and Publishers Ltd., Convex House, 43 Dudley Road, Tunbridge Wells, Kent TN1 1LE, England.
- October 26-28: 1st *International Symposium on Medical Imaging and Image Interpretation*, Berlin, West Germany. Contact: Dr. Judith Prewitt, c/o IEEE Computer Society, PO Box 639, Silver Spring, MD 20901.
- October 30: *Conference on Environmental Ions and Related Biological Effects*, Drexel University, Philadelphia, PA. Contact: American Institute of Medical Climatology, 1023 Welsh Road, Philadelphia, PA 19115.

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- January 5-7: *National Radio Science Meeting*, University of Colorado, Boulder, CO. Contact: T.E. VanZandt, NOAA/ERL/R445, 325 Broadway, Boulder, CO 80303.
- February 14-19: 7th *International Conference on Infrared and Millimeter Waves*, University of St. Jerome, Marseille, France. Contact: Kenneth Button, National Magnet Lab, MIT, Cambridge, MA 02139.
- March 8-10: *Microwave Systems Applications Technology*, Sheraton Washington, Washington, DC. Contact: Richard Hartman, EW Communications, 1170 East Meadow Drive, Palo Alto, CA 94303.
- March 8-10: 5th *Electromagnetic Compatibility Symposium and Technical Exhibition*, Zurich, Switzerland. Contact: Dr. T. Dvorak, EMC-83, ETH Zentrum-IKT, 8092 Zurich, Switzerland.
- April 5-8: *International Magnetics Conference*, Franklin Plaza Hotel, Philadelphia, PA. Contact: F.J. Friedlander, School of Electrical Engineering, Purdue University, W. Lafayette, IN 47907.
- May 2-5: *Test & Measurement World Expo*, Convention Center, San Jose, CA. Contact: Meg Bowen, Conference Director, 215 Brighton Avenue, Boston, MA 02134.
- May 22-25: 18th *Annual Meeting of the Association for the Advancement of Medical Instrumentation*, Loews Anatole, Dallas, TX. Contact: AAMI: 1901 N. Fort Myer Drive, Arlington, VA 22209.
- May 23-26: *International IEEE/APS Symposium and National Radio Science Meeting*, University of Houston, TX. Contact: Professor Liang Shen, Department of Electrical Engineering, University of Houston, TX 77004.
- June 13-17: 5th *Annual Bioelectromagnetics Society Meeting*, University of Colorado, Boulder, CO. Contact: BEMS, 1 Bank Street, Gaithersburg, MD 20878.
- June 21-23: *International Aerospace and Ground Conference on Lightning and Static Electricity*, Fort Worth, TX. Contact: Nick Rasch, FAA Technical Center, ACT-340, Atlantic City Airport, NJ 08405.
- August 23-25: *IEEE International Symposium on Electromagnetic Compatibility*, Hyatt Regency-Crystal City, Arlington, VA. Contact: Aaron Sullivan, Jr., 7121 Wolf Tree Lane, Rockville, MD 20852.

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