IEEE EMC SOCIETY Newsletter

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FRED NICHOLS
1917- 1990

Mr. Fred Nichols, a well-known, well-liked and highly respected member of the IEEE EMCS died suddenly on November 4, 1990. Mr. Nichols is perhaps best known as the Founder and President of LectroMagnetics. We sadly mark his passing with this biography, written by Donald Stevens, former IEEE Chairman for Nuclear Effects and Medicine, and his daughter, Janet Nichols O'Neil.

How did LectroMagnetics (LMI) start? It all began in 1965 when Fred was approached by several notable people from the Defense Department, as well as his fellows from the IEEE, to evaluate the impact on the technical community of implementing a new, very stringent security radiation standard, FED STD 222. This new standard was raising havoc among contractors because no one really knew how to implement it.

A special technical security conference was held in Washington to review the standard and outline an approach of apportioning security to take advantage of the location and other concerting factors. The attendees argued for nearly a week, then the Air Force Chairman had to step out for an urgent call. Fred stepped in, called for order, made everyone stop talking and start listening. In a few well-chosen pronouncements he outlined a common sense approach to apportioning component, subsystem and system level requirements that immediately made sense. The question then was who could build a shielded (test) chamber that would meet the low background noise level dictated by the new standard, operate from utility power and function continuously. Fred knew that he could do just that and shortly after he formed the LectroMagnetic Corporation (LMI), which was off and running in a few weeks.

Because of Fred's obvious understanding of security apportionment he was asked to participate in the formation of a new industry standard which would replace the FED Standard 222 and its final revision - 232. The Tri-service Committee was formed with key contributors selected from the military users and capable contractors. This led to the NACSEM series of standards which are now used and regularly updated.

(Continued on page 3)

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NEWSLETTER STAFF

IEEE NEWSLETTER PUBLICATION SCHEDULE

PUBLICATION DATES	EDITORIAL DEADLINES
May	March 15
August	June 15
November	September 15
February	December 15

Editorial contributions for the May 91 issue should be received by March 15.

BACK ISSUES OF THE EMC NEWSLETTERS ON MICROFICHE

We still have a few sets of the uFiche copies of the back issues of the IEEE EMC Society Newsletters from the present to 1955 when it was called "Quasies and Peaks." The price is $25.00 post paid. If you would like to have one of these sets you can order it from: Dr. Chester L. Smith, EMC-Society Historian, 2 Jonathan Lane, Bedford, MA 01730.

FRED NICHOLS *(Continued from page 1)*

In 1969 Fred was asked to join a working group which was formed to define a retrofit package that would increase survivability and nuclear hardness of the WS-133 Minuteman weapon system. Fred attacked the problems with his usual "keep it simple" approach. His contributions were immediately recognized as being of great merit and embodied with real cost of ownership data. In 1971 Fred was invited to become a key member of the Defense Nuclear Agency's nuclear hardening panel that was planning to harden the first airplane, the B-1. Fred helped in defining a maximum performance versus weight compartment which was to be built into the B-1 avionics bays. With his help, the hardening committee achieved remarkable shielding effectiveness with lightweight aluminum and ferrous alloys.

For his work with the B-1, and other significant type of contributions, Fred received many awards. His office walls were covered with pictures of programs he had been involved in dating back to the war years. These programs entailed a great deal of effort. However Fred always found time and was a most delightful panelist because he took the most complicated technical matters and explained them as if he were talking to a child of five.

Fred balanced his outside activities of panelist, IEEE affairs, with those of running a thriving firm. Within a few years, he was sought after by government people from the NATO members, Middle East, Far East and South Pacific SEATO countries. The LMI shielded rooms had earned a reputation for top performance throughout the world. Some of Fred's special shielded rooms were built at the factory complete with power wiring and air conditioning and then loaded on a transporter and taken to the customer site. Frequently these facilities were high security areas so the rooms were shoved in place manually through a hole cut in a wall. In one case, a room was placed by means of a heavy lift helicopter lowering it into the site. The down time for the customer was a few hours as compared with local construction methods that often took months. The success of the LMI rooms was due in large part to the design of a pneumatically sealed door assembly that eliminated the very troublesome and costly fingerstock magnetic seals. The LMI design was reliable, long-lived and could be opened with one hand. The days of leaking fingerstock, extreme door pressures and emergency exit time had been eliminated. Fred and his team had created a first in the industry, a door that worked.

It appears that the wheels that were probably set in motion when he attended Texas A&M in the thirties never slowed but gained momentum, improving ever forward.

Fred was one of a kind, a real human being, and the IEEE is much richer because of him.

Fred Nichols is survived by his wife, Florence, to whom he was married 45 years. Fred and Florence attended many EMC Symposa where Fred was known as "The Flasher" due to his interest in photography. Fred would often take rolls of photos of symposium attendees which he would later distribute as a courtesy. Fred was the "official" photographer for the EMC Society.

In addition to his interest in photography, Fred was also an active member of the Texas A&M Alumni Society. He regularly attended the annual Class of '39 reunions in Texas as well as the college football games. Fred always took special pride in his "Aggie" affiliation and the state of Texas held a fond place in his heart.

A major part of Fred's life was devoted to his family. He is survived by eight children and eight grandchildren. Family vacations, which included this large group, were a favorite activity. He delighted in planning these trips and taking photos during the vacation which he would then place in an album that he frequently looked at long after the trip.

Fred's goal was to send all of his children to college, as education was very important to him. He lived to see his youngest son graduate from the University of California at Santa Barbara in 1989 and was very proud that all his children received college degrees from California universities. He was especially proud that his four sons received advanced degrees.

When Fred wasn't spending time with his family or at the office, he devoted time to his coin collection. He collected coins since his boyhood and his collection was quite extensive.

The IEEE EMC Society has established an award in Fred's honor which will be presented at the 1991 IEEE EMC Symposium in Cherry Hill, New Jersey by his daughter, Janet Nichols O'Neil, who remains active in the EMC Society as a member of the Board of Directors. Contributions to this award, payable to the IEEE EMC Society, may be sent to Janet's attention c/o LectroMagnetics, Inc., 6056 W. Jefferson Blvd., Los Angeles, California, 90016.

PRACTICAL PAPERS, ARTICLES, AND APPLICATION NOTES

EDWIN L. BRONAUGH
ASSOCIATE EDITOR

This article was run in the Fall, 1990 Newsletter. Because the figure was inadvertently omitted, the article is presented here in its entirety.

SPECIAL JOINT TO FACILITATE MOVING ANTENNA MAST THROUGH DOORWAY

Richard L. Schieve, AT&T Bell Laboratories

Moving one of the more popular antenna mast assemblies through the 7-foot high by 4-foot wide doorway of our open-area test site (OATS) proved to be quite difficult. When the 4-meter mast was tilted utilizing the pivot at the base of the assembly provided by the manufacturer, the 7-foot cross member that the antenna mounts on would not allow the assembly to fit through the doorway. The antenna had to be removed and the entire mast assembly had to be lifted and rotated to fit through the doorway.

To solve this problem, a special hinge or "knee" joint was fabricated (Figure 1). The mast itself is contructed with 3" square, hollow fiberglass sections. The mast was cut at a height of 5 feet. The phenolic "knee" illustrated was inserted in the mast at the 5-foot cut, immediately above the movable 7-foot horizontal cross member that the antenna is mounted on when the cross member is at the bottom of the mast. After releasing the tension on the rope that lifts the cross member and ensuring that the cross member is as low as possible, the mast section above the "knee" can be tilted by lifting the upper section past the pivot point and slowly allowing the upper section to rotate to the ground. If desired, the upper mast section can then be pulled completely off of the "knee" and placed on the base of the mast assembly, parallel to the still mounted 7-foot cross section. The antenna need not be removed and the entire assembly can be rolled through the doorway. For more information, contact;

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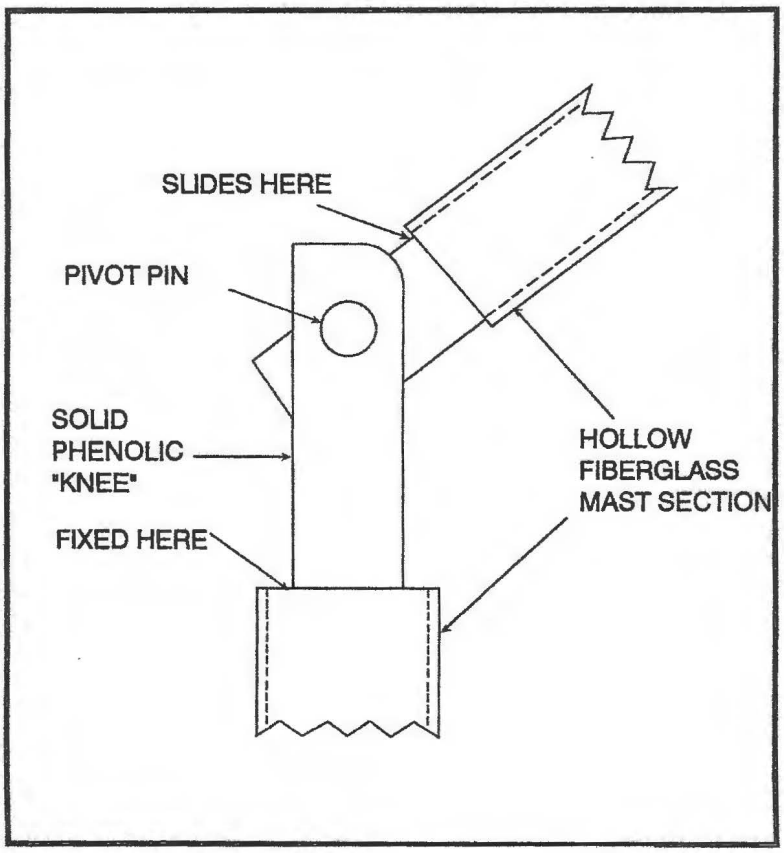

Figure 1. Antenna Mast Hinge.

BoD ACTIVITIES AT THE SCOTTSDALE MEETING

The final EMC Society Board of Directors meeting of 1990 was held on November 9, at the Marriott Suites Hotel in Scottsdale, Arizona. Board members present included Ed Bronaugh, Bob Hofmann, Dave Staggs, Don Heirman, Pat Coles, Dan Hoolihan, Dick Ford, Hugh Denny, Walt McKerchar, Don Clark, Al Mills, Herb Mertel, Bob Haislmaier, Warren Kesselman, and Joe Butler. Members absent were Charlotte Tyson, Gene Knowles, Chet Smith, Don Weber, Gene Cory and Henry Ott. Terry Cantine, Al Gross, and Bill Rittenauer were guests.

President Ed Bronaugh called the meeting to order and appointed Dan Hoolihan meeting secretary for Janet O'Neil. Ed reported a real loss to our Society -the passing of Fred Nichols. Fred was a real pillar of our Society and Board and his absence will be sorely felt. The Board expressed its condolences to Fred's family and especially the Board's secretary -Janet (Nichols) O'Neil -Fred's daughter. Those wishing to contact the family can write to Janet at 3409 Vista Drive, Manhattan Beach, CA 90266. Personally, I will always remember Fred for his support and friendship when I was a relative newcomer to the EMC Society in 1973.

Moving into the meeting agenda, The Board accepted the minutes with minor modifications. Next, Treasurer Dick Ford brought the Board up to date with our current net worth which is $345K, with an operating surplus of about $36K. All of these figures are through August 1990. The Board approved his report.

Each of the four Directors presented their reports. Director Bob Haislmaier (Communication Services) indicated that both the Newsletter and Transactions are on schedule. He reported that Chet Smith, History Committee, will be submitting a Newsletter article indicating the availability of old Newsletters on microfiche. (See page 2 for ordering information.) Next, several symposium reports were presented. First, the Washington DC Symposium had a record 1854 attendees, including 1-day participants, exhibitors and their staffs. Don Heirman, General Chairman for the 1991 Symposium in Cherry Hill, NJ (Philadelphia area), indicated that a full week of activities is being planned with tutorials the day before and after the core 3-day symposium. The usual batch of associated meetings are scheduled from Sunday to Saturday to avoid conflicts with the Technical Program. The exhibit reservations are flowing in. Bob Goldblum, Exhibits Chairman, can be reached on (215) 825-1960 to answer questions on exhibiting. Next, Terry Cantine reported that the 1992 symposium venue - the Anaheim Marriott - has been remodeled and looks great. The Board approved a $6000 cash advance for the 1992 symposium committee. Bob Haislmaier then discussed our Society's liaison with the IEEE Press. He is looking for volunteers to review suggested IEEE Press books on EMC as well as to propose other EMC book topics. Call Bob on (202) 269-8600 if you are interested.

Next, Director Don Heirman (Technical Services) presented several reports. First, as Chairman of the Society's Standards Committee, Don reported that eight standards were being updated on schedule. He was very pleased to note that IEEE Standard 299 on the Measurement of Shielding Effectiveness of Shielded Enclosures, a long overdue standard, was approved for publication by the IEEE Standards Review Committee (REVCOM) on 5 December 1990. The standard is expected to be on the street by April and to replace MIL-STD-285. Don read Clayton Paul's Education Committee report. Clayton's committee has prepared a preliminary package from which academics can form an EMC course. The package includes a suggested course outline and texts, our EMC experiments manual, and our EMC bibliography. For more information call Clayton on (606) 257-1614. In Wilf Lauber's report on the Technical Committees, the TCs were asked to develop 5-year plans on their future activities. The TCs were also reviewing papers for the 1991 symposium. Five tutorials were proposed as well. More in our next article. Finally, Joe Butler, Representative Advisory Committee Chairman, reported progress on mapping out the scope and appointing liaison representatives for the RAC. The Board approved his preliminary outline. Joe has written a Newsletter article, printed on page 10, describing the RAC and requesting volunteers. For more information, call Joe on (617) 935-4850, Ext. 267. Dan Hoolihan, COMAR representative, described six position papers being prepared by COMAR (Committee on Man and Radiation). Most addressed concern on possible effects of electromagnetic fields on biological systems. The sources supposedly come from 60 Hz through microwave frequencies. The Board was asked to read and keep abreast of these positions and to learn the facts from IEEE experts. The Board also discussed its concern over the misuse of acronyms which are used, but not checked against the IEEE dictionary (IEEE STD 100) to ensure that an accepted definition is not already in place. Such misuses create confusion, especially for those that have EMC implications but are used in articles and journals that have nothing to do with EMC. Don Heirman is a member of IEEE Standards Coordinating Committee 10 which is responsible for revisions to IEEE STD 100. He expressed the Board's concern for acronym misuse in writing to Gene Kurpis, SCC 10 Chairman. If any of our members have seen incidences of

(Continued on page 19)

TC-7 SEQUENCY UNION: PURPOSE & ACTIVITIES

H.F. HARMUTH, CHAIRMAN TC-7 FOR W.R. LAUBNER, TAC CHAIRMAN

The purpose of TC-7 is to advance the use of nonsinusoidal waves. In essence this is an extension of the digital technology from circuits to wave transmission. Until 1989 this was mainly an academic topic with the exception of ground probing radar, of which some 400 have been produced, and represents a substantial effort for military applications in the Soviet Union that is surprisingly well-documented in the Russian literature. (Papers in this field use terms like ultra-wideband radar, large relative bandwidth, impulse radar, and carrier-free technology.)

Late in 1989 Congress appropriated $25 million specifically for developments in this field. As one might expect, this created more interest than all the scientific papers published by IEEE Transactions on Electromagnetic Compatibility. Experimental work is currently carried on for synthetic aperture radar - where the theoretically possible resolution of 1.5 x 1.5 cm^2 provides a strong incentive - and submarine communication as well as anti-submarine radar due to the possibility of movable, high power radiators based on a principle not available for sinusoidal waves. There is much discussion about the anti-stealth radar, but prudent people tend to avoid the topic due to the powerful constituency of the stealth technology.

In 1990 a Panel Discussion chaired by Dr. W. Thompson of DIA and a Poster Session were organized by TC-7 at the IEEE-EMC International Symposium in Washington, D.C. A panel discussion is currently being organized by Lt. Col. J. Taylor of Hanscom AFB for the 1991 Symposium at Cherry Hill, NJ. We are trying to get started on compatibility standards for the use of nonsinusoidal waves in a world largely divided into frequency bands, but this is difficult to do on a fractional time basis. Anyone willing and able to help?

CALL FOR BoD NOMINATIONS

Nominations are now being accepted for candidates for the IEEE EMC Society Board of Directors. In accordance with the Bylaws, nominations may be made by petition or by the Nominations Committee. The petition shall carry a minimum of 15 names of Society members, excluding those of students. Nominees should possess professional stature and significant technical skills in electromagnetic compatibility. They should have adequate financial support outside the Society and have approval of their organization or employer to actively participate. Duties will include attendance to three or four Board meetings a year and participation on committees, both of which require telephone communications, correspondence, etc. Nominees must be full members of the IEEE and members of the EMC Society. Elected Directors must serve a three-year term starting January 1, 1992. No member can serve for more than six consecutive years, including partial terms. All nominees are required to submit a biographical summary to the Nominations Chairman. The summary must not exceed a one-half typewritten page and must be in the following format:

1st paragraph	Name, title, place of employment, educational background
2nd paragraph	Technical and professional experience
3rd paragraph	IEEE service and activities including offices, committees, awards, etc.

Please submit petitions and biographical summaries to the Nominations Chairman. Submissions must be postmarked no later than May 30, 1991.

Donald E. Clark
Nominations Chairman
Electronics Research Building
Georgia Tech Research Institute
Atlanta, GA 30332
Telephone: (404) 894-4315
FAX: (404) 894-3906

Information can be obtained from the Nominations Chairman.

(Nomination petition is printed on facing page.)

NOMINATION PETITION
ELECTROMAGNETIC COMPATIBILITY SOCIETY
BOARD OF DIRECTORS

(Nomination guidelines given on page 6.)

I. **NOMINEE'S NAME** _____

MEMBERSHIP NO: _____

ADDRESS: _____

_____

PHONE: _____

II. **BIOGRAPHICAL SUMMARY:** ATTACH TYPED COPY

III. **SIGNATURES:** (Minimum of 15 names.)

We, the undersigned, all of whom are current IEEE Electromagnetic Compatibility Society (EMCS) members in good standing, nominate the above mentioned person to serve on the EMCS BoD for a three-year term beginning January 1, 1992.

	MEMBER'S NAME (PRINT)	SIGNTATURE	MEMBERSHIP NO.
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CAEME CATALOG

The NSF/IEEE CAEME Center for Computer Applications in Electomagnetics Education is developing a comprehensive catalog of available EM educational software. This catalog will be distributed on diskettes free of charge to all ABET-accredited Electrical Engineering Departments, and to participants of the AP-S, MTT-S, and ACES Symposia. Listing in the catalog provides a valuable opportunity to advertise your software, and contact colleagues who have software of interest to you. If you have or know of an EM educational software package and want to list it in the CAEME Catalog, please call or send the information to:

Dr. Magdy F. Iskander
Electrical Engineering Department
3280 MEB
University of Utah
Salt Lake City, Utah 84112
(801) 581-6944

For listing in the catalog, the following information is required:

Title of software
Name of address of author(s)
Availability
Description of capabilities
Hardware platform
Fee, if any

For additional information, please contact Dr. Iskander.

NOTICE TO EMC SYMPOSIUM EXHIBITORS

The 1991 EMC Symposium will be held in Cherry Hill, NJ on August 13-15, 1991. Exhibit space is being assigned based upon the previously published priority system. On February 1, 1991, the first series of booths were assigned based upon that system. The remaining exhibit space will be assigned based upon date of receipt and availability. For additional information, contact Bob Goldblum or Fin O'Connor at R&B Enterprises, 20 Clipper Road, West Conshohocken, PA 19428. Phone: 215-825-1960 or FAX 215-825-1964.

EMC ZURICH '91

EMC Zurich '91 will be held from March 12 to 14, 1991 at the Federal Institute of Technology in Zurich, Switzerland. The conference enjoys an ever increasing attendance. Sixty-nine exhibitors and 1061 participants from 34 countries attended the 8th symposium in March 1989. EMC Zurich '91 is supported by the Swiss Electrotechnical Association and has the co-operation of IEEE, URSI and other international and national bodies. The conference language is English.

Information may be obtained from the Symposium Chairman, Dr. G. Meyer, ETH Zentrum-IKT, CH-8092 Zurich, Switzerland, phone (..411) 256-2793, FAX (..411) 262-0943.

CALENDAR 1991

March 12-14	**9TH INTERNATIONAL ZURICH SYMPOSIUM & TECHNICAL EXHIBITION ON EMC**	Contact: Dr. G. Meyer ETH Zentrum -IKT CH-8092 Zurich, Switzerland
April 15-18	**IEE INTERNATIONAL CONFERENCE ON ANTENNAS AND PROPAGATION** University of York, UK	Contact: ICAP 91 Secretariat Conference Services IEE Savoy Place London WC24 OBL UK
August 13-15	**IEEE 1991 EMC SYMPOSIUM** Hyatt Cherry Hill Cherry Hill, NJ	Contact: Ed Bronaugh IEEE 1991 Intl. Symposium on EMC P.O. Box 609 Lincroft, NJ 07738 (800) 253-3761
September 24-16	**13TH ANNUAL ELECTRICAL OVERSTRESS/ELECTROSTATIC DISCHARGE SYMPOSIUM** Riviera Hotel Las Vegas, NV	Contact: Terry Welsher AT&T Bell Laboratories 600 Mountain Avenue, Rm. 3B-321 Murray Hill, NJ 07974 (201) 582-5279

IEEE DIVISION IV DIRECTOR'S REPORT

B. LEONARD CARLSON
ASSOCIATE EDITOR

During the past three months, aside from the normal Director's duties, I have participated in three significant IEEE functions: the Region 9 Colloquium (September 1-15, 1990); the Society Chapter Coordinators Workshop in Toronto (October 4, 1990); and the Sections Congress 90 Chapters Plenary and Workshop Sessions (October 5-7, 1990).

During the Region 9 Colloquium a team made up of Region 9 Director, IEEE President, Carlton Bayless, members of TAB/TAD and distinguished lecturers from participating societies visited Rio de Janeiro, and San Paulo, Brazil, Buenos Aires, Argentina, Montevideo, Uruguay and Santiago, Chile. In each of these cities technical presentations, and industrial and educational institution visits were made by IEEE volunteers. In addition, while visiting each city a two-part round table discussion was held during which the visiting IEEE members provided short presentations on RAB/TAB activities as they pertain to the Sections and Chapters. I presented a briefing on RAB/TAB Chapter activities, E-Mail, video taping, and chapter operations guide. The second part of the round table was devoted to the local IEEE Section/Chapter volunteers presenting any problem related to IEEE activities in Region 9.

At the end of the round table discussions, issues were formulated for action with both an in-county IEEE volunteer contact and an IEEE delegate to follow up on the mutual action item. Some of the key issues are as follows:

1) Region 9 Sections would like to have more technical seminars with small groups (2-3 people) of three to five days in length, with plenty of prior coordination on subjects to be discussed.
2) The IEEE (EAB) needs to make more technical course seminars available to chapters in South America and, if possible, in Spanish. (English is not as prevalent as in the past, a trend reported by some of the older members.)
3) Better communications are needed between Societies and Chapters. For example, Chile has never hosted a technical conference. There is very little, if any, communication between the Societies and Chapters.

A Society Chapters Coordinators workshop was held in Toronto on October 4, 1990. A list of (12) workshop topics were provided by attendees during the meeting. This was reduced to three topics: communications, Chapter developments, and Chapter needs.

During the workshop, presentations were made by three Society Chapter coordinators on "How We Take Care of Our Chapters." The number of Chapters per society ranged in size from 5 to 33, scattered throughout all IEEE regions. The workshop identified some real challenges for the role of the Chapter Coordinators within the Society. It was pointed out that the Power Engineering Society has a Chapter Council (approaching in size the Ad Com's on some of the smaller societies) which cares and provides for its Chapters throughout the world using four manuals, each describing Society and Chapter roles. Results of the workshop will be mailed to all the Societies.

The Sections Congress 90' gave the volunteers from the Chapters, Societies, and Sections an opportunity to interact. As a result, many issues were discussed and a list of priorities was formulated and submitted to the various IEEE entities for consideration and resolution.

This will be my last column as the IEEE Director for Electromagnetics and Radiation. As of January 1, Dr. Martin V. Schneider of the Microwave Theory and Techniques Society will assume the duties of your representative on the IEEE Board of Directors. Dr. Schneider is with AT&T Bell Laboratories, P.O. Box 400, Holmdel, NJ 07733. Telephone (201) 888-7122.

In retrospect, the past two years have passed all too quickly, and much has happened during my tenure as your representative on the IEEE Board of Directors. Probably the most noteworthy is the restructuring of the Technical Activities Board (TAB) volunteers to more directly involve the Societies in the decision making process. The Staff Technical Activities Department was also reorganized to handle the workload due to increased membership and expansion of technical activities. An attempt was also made to restructure the IEEE volunteer organization and was eventually postponed at the November BoD Meeting. Results of an outside study to increase the efficiency of the IEEE Staff operations was implemented. The Publications Department was revamped and desktop publishing explored in order to become more competitive with outside publishers. Electronic mail is being studied and implemented in selected areas on a trial basis. A RAB/TAB Chapters Committee was established, composed of representatives from both the Technical and Regional Activities Boards. The Committee was charged with improving relations between Chapters and the Societies and Sections. An IEEE Branch Office was established in Region 8 in conjunction with the Computer Society office in Brussels, Belgium. A study to locate another office in Region 10 is underway. A Video Training Committee was started to provide Societies with training material for incoming officers.

All in all, it has been an exciting and busy two years, and I've especially enjoyed meeting and working with the members and volunteers of the five technical Societies that make up Division IV (Electromagnetic Compatibility, Antennas and Propagation, Microwave Theory and Techniques, Nuclear Plasma Sciences and Magnetics). Keep up with the good work. I plan to remain active in the Technical Activities Board and with the RAB/TAB Chapters Committee.

REPRESENTATIVE ADVISORY COMMITTEE ON THE IEEE EMC SOCIETY BOARD OF DIRECTORS

JOE BUTLER

The Representative Advisory Committee (RAC) is a standing committee of the IEEE EMC Society Board of Director's (IEEE EMCS BoD) organization. This committee has been set up to provide technical liaison between the EMC Society and various IEEE technical committees, as well as non-IEEE EMC organizations. The appointed representatives are expected to monitor the activities of their particular committee with a view toward making recommendations to the Board of Directors on any required coordination of those activities with those of the EMC Society. In addition, by serving as the technical liaison, the particular representative would provide a liaison for information of mutual interest between the particular entity and the EMC Society.

As part of a minor restructuring on the BoD, I have been appointed Chairman of the RAC reporting to Technical Director Don Heirman. In my efforts to reorganize the RAC, I have proposed several positions to allow representation of IEEE EMC Society interests on various technical committees. The technical committees are subdivided into IEEE Technology Policy Council (TPC) committees and other EMC organizations. The list of these, as well as the current appointees are as follows:

NON-IEEE ENTITIES	RAC REPRESENTATIVE
ANSI C63	D. Heirman/E. Bronaugh
EIA G-46	J. Butler
SAE AE-4	H. Mertel
CISPR A&G	D. Heirman
CCIR	None Required (CISPR G Liaison)
CBEMA	None Required (C63 Liaison)
NIST	None Required (C63 Liaison)
FCC	None Required (C63 Liaison)
URSI	None Required
CISPR B, C, D, E, F	None Required

IEEE TECHNOLOGY POLICY COUNCIL (TPC) COMMITTEES	RAC REPRESENTATIVE
Aerospace R&D	Leonard Carlson
Defense R&D	Dick Ford
Engineering R&D	Vacant
Energy	Vacant
Communications & Information Policy (CCIP)	None Required
Health Care Engineering Policy	None Required
Man & Radiation (COMAR)	Dan Hoolihan
IEEE New Standards (NESCOM)	Don Heirman

The non-IEEE entities listed above are usually various national and international EMC bodies whose work is of great interest to the IEEE EMC Society. Those committees that are listed as not requiring an RAC representative are either ones which have liaison to the EMCS via the American National Standards Institute (ANSI) Accredited Standards Committee C63 or whose work is such that a full-time representative is not felt to be necessary at this time. However, should strong arguments be presented to the contrary, consideration would be given to proposed additions/deletions. The IEEE TPC Committee are joint committees of the Technical Activities Board and the United States Activities Board of the IEEE. The objectives of these committees are the development and dissemination of IEEE positions in their respective areas of interest. The non-IEEE entities are as follows:

ANSI C63: American National Standards Institute Accredited Standards Committee C63 on Electromagnetic Compatibility

EIA G-46: Electronics Industries Association G-46 Electromagnetic Compatibility Committee

SAE AE-4: SAE International, The Engineering Society for Advancing Mobility Land Sea Air and Space Committee AE-4 Electromagnetic Compatibility

CISPR: International Electrotechnical Commission (IEC) International Special Committee on Radio Interference

Subcommittee A: Radio interference measurements and statistical methods

Subcommittee B: Interference from industrial, scientific

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PCs FOR EMC

EDMUND K. MILLER
ASSOCIATE EDITOR

I recently enjoyed the opportunity to participate as a U.S. delegate to the 23rd URSI (International Scientific Radio Union) General Assembly (GA) held in Prague, Czechoslovakia. As is becoming routine at other meetings I attend, the URSI GA was heavily sprinkled, if not downright dominated, by computationally-oriented presentations. These appear increasingly in the measurement activities of Commission A on Metrology, and of course in connection with Commission B on Fields and Waves. The activities of Commission C on Signals and Systems are now heavily computer dependent for implementing a wide variety of signal processing algorithms, which involve solutions of matrix equations at about the same rate as do EM modelers using the moment method. Similar observations can be made about Commission D on Electronic and Optical Devices and Applications; Commission E on Electromagnetic Noise and Interference; Commission F on Wave Propagation and Remote Sensing; Commission G on Ionospheric Radio and Propagation; Commission H on Waves in Plasmas; and Commission J on Radio Astronomy. In the area of each commission's activities, computational techniques, as one component of the troika of methods now available for problem solving in modern science and engineering have assumed an importance comparable with analytical and experimental procedures.

Although I don't have space or inclination to provide a comprehensive review of the Prague GA, I will mention just a few of the highlights about which I thought you might be interested.

In addition to General Lectures, tutorial lectures (TL) were sponsored by each of the commissions, with most included in a separate publication provided to the GA attendees. S. Strom of Sweden, for example, gave the TL for Commission B titled "Solution Techniques in Electromagnetic Field Problems." Another particularly interesting TL was by C. Baum of the U.S. and D. Hansen of Switzerland for Commission E on "What Is the Scientific Approach to EMC Control and Vulnerability."

Many individual commission-specific sessions were also held. Session JS22 on Time-Domain Metrology featured 12 presentations on various aspects of making transient measurements. A paper that I found especially intriguing was by our AP-S Magazine Editor, Ross Stone, who described a technique for inverting symmetric Toeplitz matrices in order Nlog2(N) steps. Session B3 was addressed to Time-Domain Fields, with 11 presentations on the three general topics of "Focused Energy Transfer," followed by "Analytical Techniques" and "Numerical Techniques." It was my decidedly unenviable chore to give the last paper in the session, "The State of Direct Time-Domain Integral-Equation Models in Electromagnetics." I was allotted just 10 minutes.

In Session B4 on "Numerical Solution Techniques in Scattering" a number of interesting papers were presented. Perhaps most provocative was "Differential Equation-Based Methods for Electromagnetic Wave Scattering and Radiation: Review of the State-of-the-Art and Future Directions" given by A. C. Cangellaris of the U.S., who discussed the apparently recent finding that PDE-based methods may require a spatial sampling density per wavelength that increases as the problem space gets bigger. This evidently means that rather than the total number of spatial samples X_s growing as $(L/DL)^D$, where D is the number of space dimensions, L is the problem size, and DL is the spatial resolution (proportional to frequency^{-1} = f^{-1}), we would have instead $X_s \simeq (L/\Delta L)^{D(1+x)}$, where the parameter x ~ 1/3. For a 3D problem this would add another factor of f to the overall sample count, meaning that the FDTD (Finite-Difference Time-Domain) technique would grow more like f^5 rather than f^4 (the extra f factor comes from the time stepping). The reason for the increased sampling is evidently the need to maintain the error in fields propagated across the problem mesh below some threshold, and of course these errors accumulate in proportion to the distance propagated.

A presentation in session C5 by A. Fettweis and G. Nitsche of the FRG, titled "Numerical Integration of Maxwell's Equations by means of Multidimensional Wave Digital Filters (WDF)," was also of special interest. The basic idea is to employ filter concepts (explained more fully in a paper titled "Wave Digital Filters: Theory and Practice" by A. Fettweis, Proceedings of the IEEE, Vol. 74, February 1986, pp. 270-327) for solving PDEs such as Maxwell's Equations. Since I have come to regard numerical modeling as a generalized filtering problem, I found the approach described by Fettweis especially appealing. It esentially models the discretized PDE equations as digital circuits, leading to a special-purpose computer architecture whose design in some respects "mimics" the problems it is intended to solve. In this respect, the WDF approach brings the computer design closer to the problem being solved than does the WaveTracer approach which is itself closer to the problem description than a standard Von Newman machine. The difference, as I see it, is how the numerical relationships of the discretized and sampled EM model are mapped onto, and affect the architecture of, the computer which processes it.

In session B6 on Microstrip and Dielectric Antennas, J.R. Mosig of Switzerland, in a presentation titled "A Survey of Analytical Techniques for Microstrip Antennas and Scatterers," provided an informative overview of this increasingly important area. Applications of numerical models to the inverse problem were discussed in Session B7 on Electomagnetic Inverse Scattering by K. Betzold of the FRG in a talk titled "Numerical Modelling of Eddy Current Inspection Problems in Nondestructive Testing." Using the numerical model to assess the feasibility of conducting a particular inspection was one topic emphasized, as well as using the model to interpret test signals.

TECHNICAL COMMITTEE TC-2

TC-2 (EMC Measurement) is the standing committee of the Society responsible for promoting activities in the area of EMC measurement and instrumentation, including rationale for setting performance limits for emission and susceptibility tests.

Among its many responsibilities and goals, the TC-2 sponsors EMC Society Standards activities. Table 1 lists the 10 standards sponsored by TC-2: Standards 299, 475, 478/482, 509, 626, 1128, 1140, and 1190 are currently being updated. Those interested in participating in these working groups should contact Don Heirman (908) 834-1801.

Hope to hear from you or see you at our next meeting.

Respectfully submitted,
D.N. Heirman, Chairman of TC-2

STANDARD	TITLE
139	Recommended Practice for the Measurement of Radio Frequency Emissions from Industrial, Scientific, and Medical (ISM) Equipment on User's Premises.
140	Minimization of Interference from Radio Frequency Heating Equipment
187	Standard on Radio Receivers Open Field Method of Measurement of Spurious Radiation from Frequency Modulation and Television Broadcast Receivers
213	Procedure for Measuring Conducted Emissions in the Range of 300 kHz to 25 MHz from FM and Television Broadcast Receivers to Power Lines
263	Measurement of Radio Noise Generated by Motor Vehicles and Affecting Mobile Communications Receivers in the Frequency Range 25-1000 MHz
299	Standard Measurement Procedure for Measuring the Shielding Effectiveness of Shielded Enclosures
475	Standard Measurement Procedure for Field-disturbance Sensors
P1128	Recommended Practice for RF Absorber Evaluation in the Range 30-1000 MHz
P1140	Standard for Near-field Testing Procedures for Electric and Magnetic Field Radiation
P1190	Calibration Procedure for Line Impedance Stabilization Networks
NOTE:	P stands for working group activity to publish a new standard.

TABLE 1. EMC Standards Committee Current Standards and Working Groups Sponsored by Technical Committee TC-2.

GRADUATE DEGREES IN EMC

DICK FORD
ASSOCIATE EDITOR

The Universities of York and Hull, in a collaborative effort, are now offering Master of Science as well as Diploma Degrees in EMC engineering. Both full-time and part-time students are enrolled. The normal graduate full-time study period is one year. N. Riley, a faculty member of Hull University, gave an overview of the curriculum at the IEE sponsored 7th Annual Conference on EMC, recently held at York University. The Course is composed of lectures, laboratories, Specialists seminars and a Thesis/Project. A series of 185 lectures address the following topics: Antennas; Electromagnetic Theory; Transmission Lines, Shielding, and Cross Talk; EM Measurements and Environments; Computer Modeling of EM; Radio Propagation;Measurements and Measurement Systems; EMC Standards and Testing/Spectrum Management; Signals, Noise and Interference; and Fiber Optic Techniques. In addition, six specialist seminars are presented by industry/academic experts in selected EMC areas. At present, most students are part-time and from the U.K. but the Universities are encouraging interest from the international community. In fact, Dr. Andy Marvin, a member of the IEEE EMCS Education Committee, noted that a part-time student resides in the U.S. After completing an on-campus qualifying exam, this student is completing the curriculum via video classes. Anyone wishing additional information on this graduate program in EMC, may contact Dr. Andy Marvin at York University, 99 Heslington Rd., York, Y01 5BJ. Phone 0904 432342; FAX 2335.

N. Riley discusses the Master of Science program at the Universities of York and Hull.

EMC PERSONALITY PROFILE

ERNIE MAGYAR

Ernest (Ernie) Maygar grew up in Central New Jersey about 20 miles from New York City during the roaring 20's and depressed 30's. During that time, he developed an interest in ham radio. The hams of that era, most of whom built their own receivers and transmitters, were great experimenters. Ernie enjoyed listening about their experimentation with antennas, frequency control, amplifier circuits, etc., and soon picked up the rudiments of bonding, grounding, infiltration, isolation, shielding and other elements required for good EMI control. His first transmitter was an elementary spark gap type. His first receiver utilized a crystal detector. Ernie graduated to better systems as he grew up.

In 1940, Ernie graduated from Rensselaer Polytechnic Institute, with a BME degree and a minor in electrical engineering. He received a good power background and noted that he was able to take two electronics courses.

He then took a position in the engineering department of the Glenn L. Martin Co., located in Baltimore, MD. That short work experience terminated upon a call to active duty by the U.S. Navy in September 1941.

Ernie was assigned to the USS Barnett (APA-5) as the electrical officer after which he was promoted to the position of Assistant Chief Engineer. He was next assigned to a repair ship, the USS Maui (ARG-8) as its Repair Officer. Ernie was discharged from the Navy in 1946.

Ernie then joined the Pratt & Whitney Aircraft Corp. in East Hartford, CT as a test engineer, where he worked on a Free-piston engine development which did not fly. The balance of his time was spent working on the first turbo-prop engine program.

After a short stint with the TEXAS Co. in various marketing positions, the U.S. Navy called Magyar to serve in the Korean War. He was assigned to the New York Naval Shipyard with a ship repair unit and was discharged during the latter part of 1953.

At that time, Magyar joined Titeflex, Inc. of Newark, NJ as an applications engineer with the aircraft engine ignition systems and microwave components department. It was at that point in his career that he finally was exposed to the

WILLIAM G. DUFF
ASSOCIATE EDITOR

RFI bug, and became acquainted with MIL-E-16910, George Rees and Leonard Thomas of the U.S. Navy BUSHIPS. An early project was the correction of some EMI problems on a wooden hull Navy mine sweeper. He also became acquainted with John O'Neil of the ARMY EMC branch at Fort Monmouth. Ernie also earned an MBA from New York University during that period.

Magyar joined Armstrong Engineering Consultants in the latter part of 1957. The company was involved with classified projects for the Air Force and U.S. Navy. Some classified projects for the Navy included siting studies for the location of ECAC, the development of a blanking device for a communications receiver and preliminary studies on spectrum signatures for some radars.

In early 1961, Magyar founded Magyar & Associates which was involved in marketing and applications engineering for shielded enclosures, filters, current probes and transient suppressors. His firm was contracted by the Naval Air Development Center for the rewrite of MIL-E-6051.

Ernie has also enjoyed a 30-year association with the G&H Technology Corporation in the development of specialized electrical and RF connectors for aerospace, ordnance and military aircraft. In addition a non-pyrotechnic initiator was developed for many NASA space capsule programs. For the past four years, he has been involved with the development of their PULSEGUARD material which has shown a potential for transient suppression devices for the control of lightning, ESD and EMP applications.

Magyar is an IEEE member and has been involved in four EMC Symposia. He is also a member of the Instrument Society of America and the American Energy Association.

On the personal side, Ernie has been married for 49 years. He has two daughters and two grandchildren. His grandson is a senior at North Carolina State and will be graduating as a materials engineer.

BOOK REVIEW

J.L. NORMAN VIOLETTE
ASSOCIATE EDITOR

GROUNDING & SHIELDING IN FACILITIES

Ralph Morrison and Warren H. Lewis, John Wiley & Sons, New York, 1990. $39.95

The authors of this book are "veterans" when it comes to grounding and shielding for noise mitigation and safety in facilities. This is evident from reading the first page of the preface and the tongue-in-cheek scenario presented therein on how many "expert" engineers it takes to solve "real-world" facility noise problems. According to the authors, there are usually as many solutions (or opinions!) on how to solve a problem as there are "experts" (consultants!) involved. The oft-encountered conflict of noise mitigation and safety codes is covered, with a clear statement of the facility engineering objective which "...should be to design a noise-free system that is also safe and conforms to applicable codes and standards."

The preface of the book presents a good summary of the comparison of academic engineering education and experience gained from practical applications of techniques such as grounding and shielding. The need for good basic engineering knowledge, such as derived from basic physics courses, is indicated as being essential (along with experience) in the interpretation and application of "rules" in solving technical problems. The point is made that digital designers are well-schooled in logic design, but not experienced in RF design where the worst troubles can occur. A case is also made for having a good understanding of the applications of field theory. In general, the preface is highly recommended reading for the ideas presented and for setting the tone for specific chapters in the book.

Chapter 1, entitled BASICS, provides an introduction to grounding, and discusses the semantic difficulties encountered in defining and communicating the meaning of such common English words as ground, shield, isolation, and earth, in the electrical sense. The fundamental role played by the word *earth* within electrical parlance is developed, specifically as it is used in safety applications such as in the definition and implementation of *ground* as used in the National Electrical Code (NEC). The complexity of earth as a conductor is described, the consequences of the finite resistance (impedance) of earth are indicated, and the role of earth in safety implementations are discussed.

It is shown how the word *ground* can have a different meaning as used by the electronic and power engineer. Small potential differences (microvolts) between ground points can cause problems for electronic system designers but may not affect power systems. However, ground potentials of several kilovolts can cause damage to most systems. Designers have to consider all aspects of the grounding problem.

Society's acceptance of rules and regulations is described where safety is the issue. The imperfection of rules, the need for their interpretation, and the possible existence of "loopholes" are discussed. The desirability of having rules, in spite of some drawbacks, is indicated. The flexibility of the NEC rules allows the control of noise and provides for lightning protection by allowing the use of certain equipment and techniques. *The safe use of these tools to control noise and interference is the stated subject of this book.*

The path followed by a lightning discharge and basic lightning protection concepts are described. The undesirability of using earth as an intentional conductor is addressed. A discussion of the importance of corrosion control is also included.

The electrical properties of conductors are presented, starting with DC resistance and the resistivities of materials. This is followed by a discussion of inductance and conductor geometry, skin effect, and the impedance of common conductors.

Field concepts and electromagnetic energy storage and propagation are presented along with frequency considerations. The transport of energy at high frequencies is described with a discussion of transmission line concepts. The characteristic impedance of "unenclosed" conductor pairs is discussed, as well as RF energy in "enclosed" conductor configurations. The topic of RF leakage of enclosed transmission lines is described in terms of electromagnetic fields. This includes a description of the problems associated with the topic of shield terminations at connectors and bonding.

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External field-to-cable coupling is described, presumably using an incident plan wave development. This section is confusing to follow.

Chapter 2 is entitled An Introduction to Power Grounding. The reasons for power system grounding and the typical means of implementation are presented. It is clearly stated that the grounding requirements of the NEC for electrical safety do not address equipment performance such as noise mitigation. The authors emphasize that system designers must meet code requirements and still provide noise-free systems.

Straightforward, summary descriptions are given on six reasons for grounding, including fire protection, electrical shock avoidance, ground fault protection, lightning protection, electrical noise control, and limiting of high voltage. This serves as an introduction to the topics to be covered in the rest of the book.

A major part of Chapter 2 is devoted to much-needed definitions. The authors recognize that electrical terms used by electric power engineers often have different meanings to electronic engineers.

Sections of Chapter 2 address in detail: Grounded Power Systems; Ungrounded Power Systems; Facility Grounding and the National Electrical Code; a Note on Earth Resistance; A Typical Fault Hazard; The Grounding Electrode System; Qualified Grounding Electrodes; "Made" and Other Grounding Electrodes; Measuring the Earth Connection; The Code's 25-Ohm Resistance Requirement; Grounding and Lightning Rods; Lightning and the Grounding Electrode System; Other Grounding Electrodes; and Cable TV Grounding. The bases for these developments are the requirements of the NEC. Examples are presented of different facility equipment and system configurations, the impact of earth resistance and distributed capacitance, fault hazards, grounding electrode configurations, bonding, and the measurement of earth connections.

Chapter 3 addresses Power Grounding. Power entry at the service entrance of a manufacturing or residential facility is described including the respective interface responsibilities of the utility company (which abides by the rules of the National Electrical Safety Code) and the subscriber. Details of power entrances are described. Multiple service entrances in one building and service requirements for separate buildings are also described. Premise wiring, branch and feeder circuits, multiconductor cables, wiring enclosures, busways, and conductor color coding and marking are addressed. Three tables are provided listing (1) various insulating materials used in power wiring, (2) common cable types, and (3) standard wiring enclosures. The chapter ends with a discussion of grounding conductors.

Chapter 4 is directed at Equipment and Hardware. Equipment grounding is described, where the term *equipment* is used as defined in the NEC. Figure 4.1 illustrates typical, accepted, "solidly" grounded AC wiring systems, as part of equipment grounding practices. The role of good bonding practices is highlighted in view of the flow of fault currents through said bonds. The "key word" is *impedance* along the path of a fault current, specifically the inductance along this path. Potential overheating effects due to fault currents are described, along with the proper connection, routing, and bonding of grounding conductors. The effects of mechanical forces induced in equipment and conductors by the magnetic interaction produced by large currents are identified. Practices for resistance grounding, the requirements for high fault current handling, and lightning air terminal and grounding electrode system considerations are presented. The uses of conduits, raceways, flexible metallic tubing, liquid-tight flexible metallic conduit, electrical metallic tubing (EMT), cable trays, outlets, junction boxes, fittings, a variety of receptacles and switches are described. General requirements for appliances are presented. Transformer applications are described and illustrated including the use of (zig-zag, wye-delta) grounding transformers. Applications of autotransformers, instrument transformers, and ground-fault interrupters (GFIs) are presented and illustrated.

Chapter 5 addresses Power Grounding. Topics presented and discussed in this chapter include: multiple sources of AC power to the same location; separately-derived AC systems; grounding of auxiliary power sources; ground fault current flow in solidly grounded neutral systems; impedance grounding of AC power systems; switchboard and service neutral bus fault protection; load shedding and load restart; parallel power sources; harmonics in power generation; power factor and power factor connection; local power generation and UPS systems; load-induced harmonics; noise signatures; motor loads; ac line transients; transformer inrush current; and motor start current. This chapter provides and illustrates good introductory or supplementary information on power grounding applied to the specific areas selected.

Chapter 6 introduces Electromagnetic Interference. The authors invoke field theory as the preferred approach to understanding noise and interference control. The authors consider the circuit theory approach as useful but secondary to the field concepts. The concept of energy storage in electric and magnetic fields is described in basic,

(Continued on page 16)

nonmathematical terms. Familiar signal and power transfer, Poynting's vector, the reflection of energy at a surface, and the transmission line model are presented in a basic format (without mathematics). This provides "easy reading" material aimed at developing a basic level of understanding field concepts. The concept and use of ground planes are presented. Basic concepts of interference measurement are briefly discussed. The application and installation of filters are presented, including the effect of lead impedance on filter performance, proper filter location, and filter grounding.

The concepts of normal (differential) and common modes are described. Comments are provided on differential mode receptacle filtering and transient protection. The hazards of equipment reactive ground current at power frequencies and the impact on power line filter design are described, as are the problems associated with conductive emission control at power frequencies, such as noise produced by Triacs, SCRs, and other sources.

Controlling noise currents in equipment grounding is addressed in terms of controlling the fields produced by load switching. A "field energy" approach is presented.

Some basic shielding concepts are discussed along with the merits of the shielding effectiveness of a solid-wall, ferrous, rigid conduit.

Chapter 7 addresses Facility Considerations. The chapter commences with *the search for perfect ground*. The authors make a good case for the non-existence of a so-called "perfect ground," including the technically-meaningless terms often applied to entities such as: "sump theory," "quiet ground," "isolated ground," "dedicated ground," and "insulated ground," to name a few. However, although the authors point out some of the many misconceptions vis-a-vis grounding, the book does not clearly provide direction (at least in this first section) as to how one is to proceed to bypass the identified pitfalls to produce an acceptable grounding configuration.

Parts of Section 7.2, titled Shielding the Electric Field, are deemed to be misleading. The first two sentences of this section are: "At frequencies below 100 kHz the control of field-related currents can be handled by electrostatic shielding. At these low frequencies for currents below a few amperes, magnetic phenomena are usually not an issue." According to literature on shielding concepts, and supported by the experience of the reviewer, this contradicts the well-known fact that *low frequency magnetic fields are the most difficult fields to shield against.* Depending upon the threshold of susceptibility, low frequency (e.g., 60 Hz magnetic fields can and do cause interference. It is well understood that low frequency electric fields can be shielded with relative ease. This point needs to be clarified.

The typical sources of electromagnetic fields that can enter a facility and their potential frequency ranges are described, as well as the shielded and screen rooms used to control the levels of these fields. Shielded room power entry, grounding, filter installation, the magnetic field shielding problem, and problems associated with equipment located inside shielded rooms are presented. Shielded room penetration techniques are presented including the treatment of apertures created by doors, windows, ventilation ports, etc. Anechoic shielded rooms and shielded buildings are briefly described. The chapter ends with the presentation of brief concepts associated with electrostatic discharge (ESD) phenomena and its control.

Chapter 8 provides More Basics of EMI, including brief developments of decibels, time-frequency domain analysis and transformations, the concept of near and far fields, fields from current loops, coaxial versus shielded cables, ribbon cable, foil shields, braided cable, transfer impedance, shield terminations, and multiple shields. The discussion of these topics is purely prosaic with very little quantitative (mathematical) information.

The emphasis of the book and its major usefulness is definitely in the facility power area, aimed at power grounding and meeting NEC requirements, with the NEC as an emphasized basic. It is easy to read and it can serve as a very good supplement to a copy of the National Electrical Code and/or the National Electrical Code Handbook, such as that published by The NFPA. It is also recommended as a stand-alone introductory reference to AC power distribution and grounding associated with facilities. By the authors' design, the book is without mathematical rigor, and is useful as a general, easy-to-read reference. The book essentially provides no outside references and no significant illustrative examples which limit its usefulness as a stand-alone textbook. It should also be noted that the 1987 version of the NEC is used as reference.

IEEE EMC SOCIETY QUESTIONNAIRE RESULTS -- 1990 SYMPOSIUM

At its November 8, 1990 meeting, the EMC Society Board of Directors reviewed the results of the member survey distributed during the August 1990 Washington Symposium. The Board recommended that the results be shared with all members of the Society via the Newsletter.

The following is a summary of the responses received from the survey. Many of the responses listed were given several times, and only those that were different were listed separately. Those responses that appeared more than once have an (M) following the response.

Since many members were unable to attend the symposium, and since the Board needs the opinions of as many members as possible, the Board would like to have your opinion on the survey questions. Please address your comments to: H.R. Hofmann, Room 2B-220, AT&T Bell Labs, 2000 North Naperville Rd, Naperville, Illinois, 60566.

1. If you have a "local" EMC Society chapter, do you find it worthwhile to attend the chapter meetings? Why?
   a. I attend because the subjects are related to my area of interest. (M)
   a. I don't go because they are not of interest.
   a. I attend to keep up with the latest technology and to meet the other attendees. (M)
   a. Meetings are not held on a regularly scheduled basis so I don't go too often.
   a. Guest speakers are usually educational.
   a. Distinguished lecturers are excellent.
   a. I attend because the technical program is usually good and it is a good place to have a technical interchange with my peers. (M)
   a. I don't like dinner meetings and never attend.
   a. It is the best technical interchange I can offer my people.

How could chapter meetings be improved?
   a. More public forums, coordinate with local events or other organizations.
   a. Improve the technical content.
   a. Increase attendance.
   a. Make use of videos on relevant subjects.
   a. Schedule meetings on a regular basis, improve technical quality, include information on basics.
   a. Eliminate the good-old-boy type of meeting and present good technical information.
   a. Provide higher quality speakers, talk about actual case studies and application of theory to actual practice.
   a. Improve meeting notices.
   a. Bring in more outside speakers. (Didn't seem to know about Distinguished Lecturer Program.)
   a. Hold joint meetings with other chapters in the area. (M)
   a. Provide some career planning as one of the chapter activities.

2. If you do not have a "local" EMC Society chapter, would you be interested in helping to form a chapter? Would you be willing to serve the Society in some other manner? If yes, please write your name and address on the back of this page. (Information received was forwarded to Dan Hoolihan.)

3. Do you find the quarterly newsletter interesting enough to read more than 50% of the material? Why?
   a. I read it because it contains information interesting to me.
   a. It helps me keep current on what is happening in the EMC community.
   a. It is very interesting and informative. (M)
   a. I read the meeting schedules, Chapter Chatter, and Abstracts.
   a. Very useful and I read almost every word.
   a. I read to get new information on current activities.
   a. I read the abstracts.
   a. I read it to learn what's happening in EMC and to hear about people I know and respect.
   a. I read it because it is interesting, concise, and practical.

How could the newsletter be improved?
   a. Take on issues of broader interest such as education reform.
   a. More chapter news if possible.
   a. More abstracts, more historical sketches.
   a. Publish more frequently.
   a. Add tutorial articles.
   a. More people/activities news.
   a. More personal information on EMC people.
   a. Include more information about innovative chapter meetings.

4. Do you find the EMC Society Transactions interesting enough to read more than 50% of the material? Why?
   a. Don't read much because it is incredibly specialized, nothing of interest to me.
   a. Read because it keeps me current.
   a. I read because it is an excellent technical source.

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a. I don't read much because information is on different areas of interest. Many articles are very slow reading.
a. I don't read much because they are only of use to mathematicians and theoreticians who wouldn't recognize a real problem if they saw one.
a. It is too technical. (M)
a. I only read it when the topics are applicable to my work.
a. The papers are too narrow for me. (M)
a. There is very little applicability to real life working problems. (M)
a. Most papers are too theoretical for direct use, but too sketchy for understanding unless you are an expert in a particular narrow field.
a. I don't read much of it because many articles are not even related to EMC. (M)
a. Much too technical/theoretical for average working engineer. (M)
a. I don't read it much because it seems to be only for university types, not for working engineers.
a. Although the articles are technical and narrow, it is probably necessary.

How could the Transactions be improved?

a. Longer abstracts summarizing the significance and conclusions reached by the paper.
a. Maybe more review type articles.
a. Eliminate some of the mathematical theory and include some papers with practical real-world problems and solutions. (M)
a. Include some articles on basics that would be more understandable.
a. It is hard to make a scholarly document interesting to a large number of readers, so it is probably ok.
a. Less theory and more applications of the theory. (M)
a. Automatically eliminate any paper which has double integrals or sequency union theory.
a. Limit papers in the transactions to authors who are member of the EMC society, and to EMC-related topics.
a. Include application oriented papers.
a. Provide physical protection. My copies frequently arrived damaged.
a. Use more words to explain what the math is about, provide an executive summary at the start of each paper.
a. Present both sides of a controversial issue in the same transactions, with explanations of the differences of opinion in language that the average reader can understand.

5. What can the Board of Directors of the Society do to help you in your career?

a. Get the IEEE involved in public policy debate, e.g., ethics, education, R&D, etc.
a. Continue to try to provide a better interchange of useful technical information.
a. Tell me what they are currently doing and then I might be able to make suggestions.
a. Support technology and standards development.
a. Maintain a data base of career opportunities in the EMC field.
a. Attend chapter meetings to provide us with up-to-date information on what is going on in the EMC arena.
a. Start an IEEE accreditation program similar to NARTE.
a. Work for social benefits in addition to technical benefits already existing. Change IEEE management to better reflect the working engineer rather than the academics and managers.
a. Appointing me (name given) to some administrative positive would help me with my company. (Information was given to Dan Hoolihan).
a. Help foster EMC education that individuals can study on their own.
a. Form/provide a data bank of references and technical papers in the EMC field so that members can get these documents easily.
a. Provide good reasons for companies to support younger engineers in EMC activities as well as allowing them to get involved in symposia activities. That is reserved for senior engineers at many companies.

6. What does the Board of Directors of the Society presently do that you feel is unneeded or unnecessary?

a. Argue abut trivial matters.
a. I'm not sure what the BoD even does. (M)

7. Please give us any other opinions that you may have about Society activities.

a. We need to also address the practical applications of EMC in areas outside of R&D. Notably, how to educate and make management aware of EMC importance, EMC in manufacturing products and services, and how to build an education/training curriculum for an internal organization. The best session at 1990 in Washington was 4D: Socio-economic Aspects of EMC. I would have submitted as paper if I had known this was a planned session. Also, one paper in session 3C on EMC lab standards and procedures really belonged in 4D.
a. Improve the technical content of papers at the symposium and institute some sort of penalty if authors don't show to present their paper.
a. Continue to make symposium proceedings available

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QUESTIONNAIRE RESULTS *(Continued from page 18)*

to all members, especially those symposia held outside the U.S.

a. Severely limit the number of papers in future symposia to keep the number of parallel sessions down. Furthermore, many of the papers did not have enough new technically sound information to warrant acceptance.

a. The symposia are critically important for sharing technology.

a. The number of parallel sessions (7) is out of control. Reduce the number of sessions and increase the quality of the papers. Since a fewer number of people will be presenters, provide non-presenters with a list of reasons why their companies should let them attend even if they're not presenting a paper.

a. Increase support of Product Safety technical committee.

a. Have a second, less expensive hotel available for symposia attendees, Washington Hilton was too expensive for attendees with limited travel/expense funds.(M)

a. Provide support for industry/government work on MIL-STDs.

a. A well-run symposium, such as 1990 in Washington, is great to rekindle enthusiasm.

a. Eliminate the purported "humorist" from the awards ceremony.

a. Become more internationally involved.

a. Need to separate symposia papers and IEEE/ANSI/SAE/EIA committee meetings during the symposia so that active committee members can also attend papers.

a. Have one session left specifically open where late-breaking events can be presented.

BoD ACTIVITIES *(Continued from page 5)*

acronym misuse, pass them along to Don on (908) 741-7723.

Director Dan Hoolihan (Member Services) presented his report. The EMCS membership is at 3743 as of September 30, 1990, which represents a growth rate of 5.5% over the previous year. The IEEE's growth rate is 3.1%, so we are ahead of that by a significant amount. There are 33 active chapters (25 in the United States and 8 outside, with Beijing being the latest addition). Five chapters are pending: Austria, India, Spain, United Kingdom, and Buena Ventura, California. Dan also summarized the many awards presented at the Washington DC Symposium. He also announced the two Fellows from our Society - Myron Crawford and John Norgard - that were approved by the Institute in 1990. Dan and Pat Coles were eager to extend the awards to those at Institute level, which are called Field or Major Awards. An article on nominations appears in this Newsletter. (See page 6.)

Director Walt McKerchar (Professional Services) reported on the procedure to use in applying our new EMCS logo, which is now being officially registered with the IEEE. He also discussed the availability of our 7-minute video tape on Society activity. The Board approved the reproduction of 50 VHS, 10 PAL, and 10 SECAM versions of the tape. Initial free distribution will be one to each Chapter and one to each Board member. Contact your Chapter Chairman to view the tapes. The Board also authorized $3000 to purchase a compact traveling EMCS exhibit package. This will be used to advertise the Society activities and symposia at meetings and conferences outside regions 1 through 6. Herb Mertel, Transnational Committee, moved and the Board approved selling the records from the last WROCLAW EMC Symposium for $50.00. Any remaining copies after one year will be sent to Board members for their distribution. Al Mills, PACE coordinator, and Bob Brook, SSIT liaison, presented their reports which covered a host of topics. For more information contact Walt McKerchar on (206) 697-1259.

Under new business, Don Clark conducted the elections of BoD officers for 1991. Those elected by an unanimous vote were:

President	Ed Bronaugh
Vice President	H. Bob Hofmann
Secretary	Janet O'Neil
Treasurer	Dick Ford

Directors:

Communications Services	Bob Haislmaier
Technical Services	Don Heirman
Member Services	Dan Hoolihan
Professional Services	Walt McKerchar

Congratulations to those volunteers and best wishes for a successful 1991!

Chet Smith requested member help in archiving old symposium records. Contact Chet on (617) 271-7086. Finally, Bob Hofmann presented the results of the Washington DC symposium attendee questionnaire. The Board was very interested in member comments and plans to thoroughly review the comments and respond accordingly. For more details, call Bob on (708) 979-3627.

President Bronaugh adjourned the meeting at 5:00 pm. The next meeting will be on 8 February in San Antonio, TX. The EMCS Standards Committee will meet for 90 minutes immediately proceeding the BoD meeting. Contact Secretary Janet O'Neil on (213) 870-9383 for more details.

Respectfully Submitted
Don Heirman
Associate Editor, BoD Activities

REPRESENTATIVE ADVISORY COMMITTEE
(Continued from page 10)

and medical radio frequency apparatus

Subcommittee C: Interference from overhead power lines, high voltage equipment and electric traction systems

Subcommittee D: Interference relating to motor vehicles and internal combustion engines

Subcommittee E: Interference characteristics of radio receivers

Subcommittee F: Interference from motors, household appliances, lightning apparatus, and the like

Subcommittee G: Interference characteristics of information technology equipment

CCIR: International Radio Consultive Committee (operated under the auspices of the International Telecommunications Union, ITU)

CBEMA: Computer Business Equipment Manufacturers Association

NIST: National Institute of Standards and Technology

FCC: Federal Communications Commission

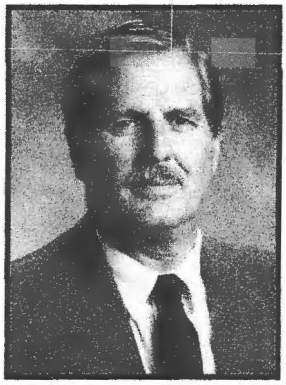
URSI: International Scientific Radio Union

Two committees not mentioned above, but which have been suggested for inclusion, are the SAE Automotive EMI and EMR standards committees. Likewise, questions have been raised as to whether or not some of the other committees mentioned above should have RAC representation. There are probably several other such committees that deserve consideration.

Your inputs on these matters are welcome. As RAC chairman, I am also looking for volunteers to fill slots on the RAC committee. Note, even if a name is already listed as an RAC representative, please indicate interest if you have it for a particular organization. Requirements for appointment are that the individual be a member of the IEEE EMC Society, have technical competence and interest in the particular area of committee endeavor, and be willing to serve a three-year term. RAC representatives function as individuals in their position. Committee formulation is not necessary. Brief activity reports are required to the Chairman of the RAC prior to each BoD meeting, and a year-end formal written report for inclusion in RAC annual report is required.

Should you wish to volunteer for an RAC position or have any comments or suggestions on the above, your inputs would be appreciated. Please contact Joseph Butler at Chomerics, Inc., 77 Dragon Court, Woburn, Massachusetts 01888. Phone (617) 935-4850, ext. 267. FAX (617) 935-2758.

EMCABS



WILLIAM H. McGINNIS
ASSOCIATE EDITOR

In this issue we continue publishing abstracts of papers from previous EMC Symposia, other conferences, meetings and publications. The EMCABS committee is composed of the members listed below. By way of introduction to the community, they are listed with their company affiliations:

Mike Crawford, National Bureau of Standards
Bob Hunter, Texas Instruments
R. M. Showers, University of Pennsylvania
Yoshio Kami, University of Electro-Communications
Daniel Keneally, Rome Air Development Center
Diethard Hansen, Asea Brown-Boveri, Switzerland

"HOW CAN I GET A COPY OF AN ABSTRACTED ARTICLE?"
The answer to this frequently asked question follows:

Most large public libraries, some small public libraries, all engineering school libraries and most other college or university libraries have copies of publications in which articles appear. If they do not have the desired publication, such libraries usually can obtain it or a copy of the article from other libraries or sources. Many company libraries, both large and small, also have such arrangements. Many articles are available from the National Technical Information Service (NTIS) and/or the Defense Technical Information Center (DTIC). To retrieve an article or publication containing an article abstracted in EMCABS, contact one of these libraries. If the library does not have the publication, the librarian can help you get the publication on loan, perhaps from another library or, for a nominal charge, from NTIS. If you have a Department of Defense contract, the contracting officer or your company librarian can help you get publications from DTIC. The information needed is contained in the EMC abstract heading.

NOTE: The steering staff of the EMC Japan Technical Group and the EMCS Tokyo Chapter have graciously offered to act as a central point for requests of papers abstracted. Most of the papers will be in Japanese only. The Steering Staff will assist in routing your request to the author(s) but will not do translating of the papers. The contact person is Yoshio Kami, The University of Electro-Communications, 1-5-1, Chofugaoka, Chofu-Shi, Tokyo 182, Japan.

An AC Power Line Filter Consisting of Lossy Filters **EMCABS: 01-03-91**

Katsutoshi Iwasaki and Tetsuo Ikeda
NTT and Nagoya Institute of Technology
EMCJ Meeting Abstracts, April 20, 1990 EMCJ90-1

ABSTRACT: EMC power line noise filters, discussed include lumped, passive, simple, low-pass responses, and those terminated in resisters. For a filter to function as designed, it must operate from the design level source impedance into the design level load impedance. In this paper, we discuss a filter terminated in a reactor. The mismatches associated with the use of reflective filters can result in an increase of interference level. In such cases, the undesired frequencies may leave to be dissipated by means of a lossy filter. The lossy filter is built in the form of a ferrite core and a dielectric consisting of lossy materials. Such lossy filters are useful on power lines. (See note for contacting authors.)

INDEX TERMS:EMI, EMC, Noise Filter, Power Line, Ferrite, Loss Measuring Method

Approach to the Response of a Digital IC Exposed to Electromagnetic Fields **EMCABS: 02-03-91**

Y. Yamanaka, A. Nishikata, K. Ohgami and Y. Niwata
Communications Research Lab M.P.T. and Pioneer Co., Ltd. and Oki Electric Ind. Co., Ltd.
EMCJ Meeting Abstracts, May 25, 1990 EMCJ90-8

ABSTRACT: This paper deals with the response of a digital IC on a printed circuit board exposed to electromagnetic fields. A transmission line model and loop antenna model are proposed to estimate the induced voltage on a signal line. Measurement results using a TEM cell in the frequency range 1-300 MHz proved that these models can be applicable. In addition, the lumped parameter circuit model is proposed for analyzing the dynamic response of digital IC's to the disturbance induced. Its parameters, which vary with bias level, are determined so as to fit measured value of input/output impedance. Behavior of the circuit is obtained by solving non-linear equations with bias dependent parameter. This mode was verified by comparing with a experimental result in the LS-TTL invertor. (See note for contacting authors.)
INDEX TERMS: Digital IC, Electromagnetic Fields, Lumped Parameter Circuit

Biologishe Auswirkungen Nichtionisierender Elektromagnetischer Strahlung Auf Den Menschen Und Seine Umwelt **EMCABS: 03-03-91**

Staff, The Swiss Environmental Protection Agency
Buwal, Bundesamt Fur Umwelt, Wald and Landschaft, Hallwylstresse 4, 3003 Bern, Switzerland
Report 121, June 1990, Bern (Note: Report can be ordered in German or French)

ABSTRACT: This report reviews the "biological effects of non-ionizing electromagnetical radiation on human beings and their environment." Part 1 covers the frequency range from 100 kHz to 300 GHz. Switzerland adopted the IRPA values 1988 which are 27 V/m between 10 MHz and 400 MHz. The report covers a comparison of all relevant international foreign limits including Eastern Block countries addressing both thermal effects as well as non-thermal effects and gives an interesting review of the most important literature references.
INDEX TERMS: Bioeffects, Eastern Block Limits, Thermal and Non-thermal Effects

Cable Products and Electromagnetic Compatibility **EMCABS: 04-03-91**

A. Goldstein
Polytechnical Institute, 664074, Irkutsk, USSR
Tenth International Wroclaw Symposium on Electromagnetic Compatibility
Parts 1 & 2, June 26-29, 1990

ABSTRACT: This paper suggests an improved model for inner intensity calculation in a coaxial noise-suppressing cable with a braided outer conductor, in which monochromatic noise current flows. The model is specific in using more accurate parameters of the cable substitution scheme: transfer impedance, propagation coefficient and wave impedance. A procedure has been shown and justified, which enables to narrow discrepancy between transfer impedance predictions and measurements for frequencies over 1 MHz. The procedure is recommendable for braided shields with the fill of the braid less than 85%. For this purpose the geometry coefficient is determined, which is largely dependent on the braiding technique of a specific producer.
INDEX TERMS: Modeling, Cables, Shielding

Calculation of Face-SAR Due to Portable Transmitter **EMCABS: 05-03-91**

O. Fujiwara, H. Higashihama and T. Azakami
Naygoya Institute of Technology, Nagoya 466, Japan
Tenth International Wroclaw Symposium on Electromagnetic Compatibility
Parts 1 & 2, June 26-29, 1990

ABSTRACT: In order to study the harmful influences of a portable transmitter on the human head, we examine numerically the face specific absorption rate (SAR) using the spherical model exposed to the near-fields of a half-wavelength dipole antenna. The spatial SAR locally averaged over one gram inside the sphere due to 915 MHz and 1250 MHz near-field exposures are calculated. The numerical results are also discussed in relation to the exclusion criterion in the ANSI protection guide revised in 1982.
INDEX TERMS:SAR, Bioeffects

Determining the Electric Parameters of the Crawford Cell **EMCABS: 06-03-91**

A. Karwowski,* J. Janiszewski, R. Zielinski
*Silesian Tech University, Gliwice, and Tech University of Wroclaw, Wyspianskiego 27, 50-370 Wroclaw, Poland
Tenth International Wroclaw Symposium on Electromagnetic Compatibility
Parts 1 & 2, June 26-29, 1990

ABSTRACT: This paper describes one of the measuring set-ups equipped with TEM Crawford cell. This set-up was erected at the Wroclaw EMI-ITE Laboratory. An effective technique for the numerical modeling of the TEM cell is presented. The calculated characteristics of the input impedance are compared with relevant values obtained by measurement.
INDEX TERMS: Modeling, TEM

Electric and Magnetic Fields Research **EMCABS: 07-03-91**

Taylor Moore
Electric Power Research Institute (EPRI)
IEEE Power Engineering Review
Vol. 10, No. 7, July 1990, pp. 14-19

ABSTRACT: This paper surveys the results of recent work that indicates a change is taking place in the research community on the subject of ELF EMF (50/60 Hz) hazards. Citing an OTA report: "In our view, the emerging evidence no longer allows one to categorically assert that there are no risks. But it does not provide a basis for asserting that there is a significant risk."

Calls are made for expanding the epidemiologic database on possible ELF hazards. Dosimetry techniques are described that will permit the measurement of actual field humans "see." Also needed are laboratory studies and basic scientific understanding of mechanisms to assess the risks of birth defects and cancer. The potential role of ELF EM Fields as a promotor rather than a cause in a two-stage model of cancer is being investigated.

INDEX TERMS:ELF RADHAZ, 50/60 Hz EM Field Hazards, Dosimetry for 50/60 Hz EM Fields, Epidemiology of Cancer and Birth Defects in Relation to 50/60 Hz EM Fields

Electromagnetic Coupling Through DB-25 Subminiature Connectors **EMCABS: 08-03-91**

Lothar O. Hoeft and Joseph S. Hofstra
BDM International, Inc., Albuquerque, NM
Tenth International Wroclaw Symposium on Electromagnetic Compatibility
Parts 1 & 2, June 26-29, 1990

ABSTRACT: The surface transfer impedance of a variety of dB-25 subminiature connectors, such as are used on personal computer peripherals, was measured over the frequency range of 1 kHz to 100 MHz. The test samples included die-cast and metalized plastic backshells, receptacles with and without gaskets, braid terminations that used circumferential braid terminations, such as dual cones or a compression insert, as well as strain relief devices or a simple compression set screw and a plastic backshell in which the shield was terminated to a pin and the shell of the plug by a short pigtail. All samples included several CM of braid beyond the point where the backshell made contact to the braid. The measured results will be presented along with a discussion of electromagnetic significance of each of these design features. Finally, the electromagnetic performance of these samples will be compared to that of circular connectors.

INDEX TERMS: Transfer Impedance, Shielding, Connector Design

Electromagnetic Field Inside Loaded TEM Cells **EMCABS: 09-03-91**

A. Kucharski
Tech University of Wroclaw, Wyspianskiego 27, 50-370 Wroclaw, Poland
Tenth International Wroclaw Symposium on Electromagnetic Compatibility

ABSTRACT: This paper presents a brief review of methods which are used in theoretical analysis of Crawford cells. A generalized numerical method using the method of moments is applied to evaluate the field pattern and the characteristic impedance of loaded cells with objects of any shape. Results for rectangular cylinders are presented.
INDEX TERMS: Modeling, TEM

Electromagnetic Fields' Impact on Health: A New Wave of Debate **EMCABS: 10-03-91**

Dr. James C. Lin
Chairman, IEEE-USA Committee on Man and Radiation
IEEE Technology and Society Magazine, Vol. 9, No. 1, March/April 1990, pp. 24-28

ABSTRACT: This paper is a statement and information that the author gave to a House subcommittee in March of 1990. Lin points out that some epidemiological studies suggesting an increase in cancer were based on **estimated fields** (emphasis added). The basic problem of correlating EMF exposure to cancer by epidemiology studies is reviewed, but some have "provoked concern." The findings of the New York State panel are reviewed, as are two WHO reports and the background paper released by the congressional office of Technology Assessment. The reports recommend that caution can be exercised by reducing field intensity and by limiting personal exposure, but Lin advises that limiting exposure without an adequate scientific base may not be effective.
INDEX TERMS:ELF RADHAZ, 50/60 Hz EM Field Hazards, Limits for 50/60 Hz EM Fields, Needed Research: Interaction Mechanisms, Animal Studies

Electromagnetic Hazards for Biological Systems and Strategy of Electromagnetic Compatibility Control **EMCABS: 11-03-91**

H. Mikolajczyx
Institute of Occupational Medicine, 90-950 Lodz, POB 199 Poland
Tenth International Wroclaw Symposium on Electromagnetic Compatibility
Parts 1 & 2, June 26-29, 1990
ABSTRACT: Biological and epidemiological data indicate that electromagnetic fields exert adverse effects on living organisms, including humans. Electromagnetic radiations bring about impairment of the regulatory functions affecting nervous and endocrine systems. As a result of long-term exposure to electromagnetic fields, some functional and morphological abnormalities were found in different systems including suppression of immune reactions, promotion of malformations and organ dysfunctions. The strategy of ALARA (As Low as Reasonably Achievable) is suggested to control EMC with biological systems in their natural environment.
INDEX TERMS: Bioeffects, ELF

Status of the Standardization Work on EMC in IEC, CENELEC and Other Organizations — **EMCABS: 12-03-91**

G. Goldberg, Chairman IEC TC 77
Landis & Gyr Energy Management AG - BASC/2721, CH-6301 Zug, Switzerland
Tenth International Wroclaw Symposium on Electromagnetic Compatibility
Parts 1 & 2, June 26-29, 1990

ABSTRACT: The aim of this report is to give an overview on the present status - beginning 1990 - of the work related to electrical and electronic equipment or systems. The report gives general information on: the relevant organizations (IEC, CENELEC, etc.); the disturbance phenomena; the types and subjects of the EMC standards (basic, generic, product related standards); the status of EMC standardization in IEC (world-wide); the status of EMC standardization in CENELEC (EMC-Directive of the European Community); standardization in other organizations; and the most important future aspects.
INDEX TERMS: Standards, Regulations

Electromagnetic Radiation Indicators — **EMCABS: 13-03-91**

E. Grudzinski, K. Rozwalka, and H. Trzaska
Institute of Telecomm. & Acoustics, Technical University of Wroclaw
Wyspianskiego 27, 50-370 Wroclaw, Poland
Tenth International Wroclaw Symposium on Electromagnetic Compatibility
Parts 1 & 2, June 26-29, 1990
ABSTRACT: The work presents electromagnetic radiation indicators designed at the Technical University in Wroclaw. The indicators are destined for personnel working in the vicinity of EM radiation sources as a personal protection means. Presented designs work within 27.12 MHz and 2.45 GHz ISM bands. Their sensitivity is in accordance with Polish labor safety standards and general public protection standards. The problem of mutual interaction of the indicators measuring antenna and a human body was taken into account and estimated, the results were implemented into designs and standardization procedures.
INDEX TERMS: Instrumentation, Bio-hazard

Influences of IC No-Connection Pins on Noise Immunity (Part 1) — **EMCABS: 14-03-91**

Shuichi Nitta and Hong-Der Hsu
Tokyo University of Agriculture and Tech.
EMCJ Meeting Abstracts
March 9, 1990 EMCJ89-89

ABSTRACT: This paper describes the experimental results where the existence of not-connected pins (open pins) of ICs degrades the noise margin. The experiment is performed by applying pulse noise to input terminals of TTL IC NAND gate, and the degradation is evaluated by comparing noise immunity of ICs having open pins with ICs having pins clamped by power supply through resistor (no-existence of open pins). Oscillation phenomena occurring near threshold are observed on both cases of existence and no existence of open pins. (See note for contacting authors.)
INDEX TERMS: Noise-Margin, Digital IC's, Noise Proof Techniques, Oscillation Phenomena

Investigation of the Amount of Radiation Noise From High Speed — **EMCABS: 15-03-91**

CMOS Logic Circuit Board
H. Oka, R. Koga, M. Kosaka and O. Wada, H. Sano
Okayama University and Fukuyama University
EMCJ Meeting Abstracts
May 25, 1990 EMCJ90-7

ABSTRACT: The amount of impulsive noise radiated from high-speed CMOS logic circuit boards was measured, and a dependence of the noise has been found on decoupling capacitors, switching interval, and output loads at each gate. Decoupling capacitors suppress radiation noise from Vcc lines. It has been found that radiation noise depends on a number of switching times per unit second, but not on switching interval. Noise radiated from an IC of advanced CMOS(AC) series is larger than that from one of HC series. (See note for contacting authors.)
INDEX TERMS: Radiation Noise, CMOS Logic, PWB, Mathematical Model

Mathematical Model For Analysis of Electromagnetic Noise Generated by Resistance Welding Machines — **EMCABS: 16-03-91**

B. A. Budilov, L. I. Sakhno, O. I. Sakhno, & N. YA. Smirnov
All-Union Elec. Welding Equip. Research Institute
10 Litovskaya UL. Leningrad 194100, USSR
Tenth International Wroclaw Symposium on Electromagnetic Compatibility
Parts 1 & 2, June 26-29, 1990
ABSTRACT: Important features of resistance welding machines are substantial current pulsations in the welding circuit and a highly non-uniform power intake from the supply mains. In order to develop welders that would comply with electromagnetic noise level specifications and be compatible with the supply mains, a careful analysis of higher harmonics generated by resistance welders is therefore essential. With this end in view, a mathematical model was developed which makes it possible to calculate electromagnetic processes and to analyze harmonic composition of currents and voltages in any component of a resistance welder power source.
INDEX TERMS: Modeling, Harmonic Noise

Measurement of Electromagnetic Shielding Effects Using Transfer Impedance — **EMCABS: 17-03-91**

Toshio Kudo, Misubishi Cable Ind. Co.
EMCJ Meeting Abstracts, March 9, 1990 EMCJ89-96
ABSTRACT: To examine the practical applicability of the fixture for testing newly developed EMI shielding materials we evaluated shielding effects of metal tapes with different thicknesses by measuring transfer impedance vs. frequency characteristics using the testing fixture. The evaluation results were obtained by multiplying the measurement values by coefficient ($120\pi/50$), which represents the ratio of plane wave impedance to measurement system impedance. They were consistent with the theoretical values obtained from multi-reflection models on the basis of Schelkunoff's theory in any situation from near fields to far fields, and in both electric fields and magnetic fields. It was confirmed that our evaluation method has an advantage that EMI shielding effects in any situation are easily obtained from the measurement results of transfer impedance of materials. (See note for contacting authors.)
INDEX TERMS: Shielding Effectiveness, Transfer Impedance, Testing Fixture

Measures to Ensure the Electromagnetic Compatibility (EMC) in Automotive Electronics — **EMCABS: 18-03-91**

Dieter Sperling
U. of Tech., Dept. of Automatization Engineering, GDR 9540 Zwickau
Tenth International Wroclaw Symposium on Electromagnetic Compatibility
Parts 1 & 2, June 26-29, 1990

ABSTRACT: The increasing application of electronic devices in motor vehicles necessitates measures to guarantee EMC. They can be carried out at the interference source (reduction of the interference emission), transmission path (limitation of the interference transmissions), or interference drain (limitation of the interference effects, i.e., increase of the interference immunity). The following measures are possible for these three objects: assembly, separation, filtering, earthing, screening and arrangements over operation runs. Transposition and mode of transmission can be additionally used for the transmission path.
INDEX TERMS: Automotive, EMC Control

Numerical Analysis of Microwave Energy Absorption in a Multilayered Cylindrical Human Model — **EMCABS: 19-03-91**

Shuzo Kuwano and Kinchi Kokubun
Nihon University
EMCJ Meeting Abstracts
March 9, 1990 EMCJ89-91

ABSTRACT: This paper points out an analytical error of the original paper for electromagnetic absorption in a multilayer cylindrical human mode. An exact procedure is also presented to calculate the absorption effects due to clothing. Numerical results indicate that for frequencies above a few gigahertz, the average specific absorption rate (SAR) in the model with wet and dry clothing is very small and several times as large as when compared with the nude model, respectively. These results disagree with original ones. (See note for contacting authors.)
INDEX TERMS: Human Model, Microwave Absorption, Exact Analysis

Set of Probes for Measuring Pulsing and Continuous Magnetic Fields — **EMCABS: 20-03-91**

V. A. Yatskevich, K. A. Bochkov, U. A. Yuditsky
The Byelorussian Inst. of Railway Engrs., Kirov St. 34, Gomel, 246653
Tenth International Wroclaw Symposium on Electromagnetic Compatibility
Parts 1 & 2, June 26-29, 1990

ABSTRACT: Measures to establish electromagnetic compatibility (EMC) of radio-electronic means involves experimental assessment of magnetic fields. To shape the electromagnetic environment, the power and frequency radiated fields, environmental situation and distance from the sources of radiation and various sources of magnetic fields should be taken into account. The complexity and variability of such compatibility require the development of methods and means for measuring it. Here we summarize the results of development of various probes for measuring the electromagnetic compatibility.
INDEX TERMS: Measurements, Magnetic Fields

Study of Numerical Model for Electromagnetic Noise Emission From a Digital Circuit Board — **EMCABS: 21-03-91**

T. Hiraoka, R. Koga, O. Wada, M. Kosaka and H. Sano*
Okayama University and *Fukuyama University
EMCJ Meeting Abstracts
January 26, 1990 EMCJ89-84

ABSTRACT: This paper presents a new idea to predict electromagnetic noise radiated from a digital circuit board (PCB). We propose a numerical model to express the amount of radiated noise, which is estimated as the algebraic sum of the amount of noise from each IC on a PCB. The model is based on the assumption that each logic IC has a characteristic noise driving power which is specific to each series, LS series or HC series, etc., and common between ICs of its members. The assumption was confirmed through experiments. CMOS logic ICs of HC series were examined. (See note for contacting authors.)
INDEX TERMS: Electromagnetic Noise, Digital PWB, Numerical Modeling, Noise Driving Power

Transmission-line Matrix Modelling of Wide-band Absorbing Surfaces — **EMCABS: 22-03-91**

J. Uher and W. J. R. Hoefer
Lab for Electromagnetics and Microwaves, EE Dept, U of Ottawa,
Ottawa, Ontario, Canada K1N 6N5
Tenth International Wroclaw Symposium on Electromagnetic Compatibility
Parts 1 & 2, June 26-29, 1990

ABSTRACT: A novel type of EM wave absorber is presented. The absorber consists of a thin ferrite layer and a biasing circuit. The ferrite is magnetized by the biasing circuit, thus adjusting the resonant absorption to the frequency of the EM field. This feature allows wideband performance of such absorber. The absorbing properties of the structure are simulated by Transmission-line Matrix method. The results of this simulation demonstrate clearly the superiority of presented structure if compared with standard thin-coating ferrite absorber. The manufacturing method by APS-technique is finally discussed.
INDEX TERMS: Absorber, Ferrite, Modeling

A Universal Simulator of Sources of Strong Electromagnetic Fields Intended for Studying the Sensitivity of Electronic Equipment to Such Fields — **EMCABS: 23-03-91**

V. P. Bulekov, V. G. Boldyrev, V. V. Bockarov, S. B. Rezikov, and V. V. Savost'Yanov
Dept. of Theor. Elec. Engnring, Moscow Aviation Inst., 4 Volokolamakoe Shosse,
Moscow, A-80, 125871 USSR
Tenth International Wroclaw Symposium on Electromagnetic Compatibility
Parts 1 & 2, June 26-29, 1990

ABSTRACT: The structure of a strong electromagnetic field source simulator is examined, which makes the radiators of electric and magnetic fields interrelated but synchronized. The structure is constructed with the help of Helmholtz coils and capacitance electrodes with a guard ring, which are placed in the planes at right angles to each other with a common symmetry center, the coils being connected with the current generator, and the electrodes with the voltage generator. Both generators are constructed by using the same circuit design on the basis of a two-stroke inductive batcher with regeneration of the residual energy.
INDEX TERMS: Instrumentation, Susceptibility, Field Generation

MEMBERSHIP DRIVE A SUCCESS AT YORK, ENGLAND EMC SYMPOSIUM

DON HEIRMAN, ASSOCIATE EDITOR

Our EMC Society Transnational Committee, chaired by Herb Mertel, staffed an EMC Membership booth at the IEE EMC Symposium in York, England last August. A display booth was furnished by the IEE which was strategically located in the main lecture hall at the University of York. Along with Herb, Don Heirman, Dick Ford, and Sigfried Linkwitz took their turns in being present throughout the 3-day conference, even during lunch and breaks. The effort paid off! Twenty-two new EMCS members were enrolled, 17 from the UK, as well as individuals from the Netherlands, Germany, France, Scotland and Norway. That was an exceptional turnout. As an added incentive, we handed out a free copy of the 1990 EMC Symposium Conference Proceedings which was only two weeks old.

We warmly welcome our new transnational members and want to acknowledge their names as follows:

Mr. John Martin Wright
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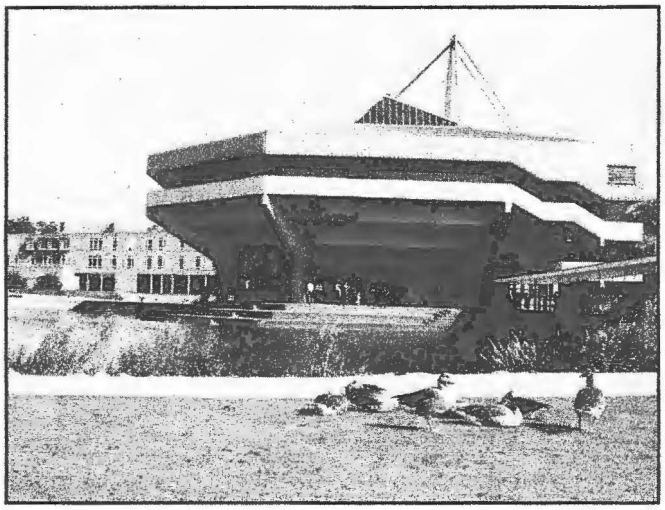
Norway

(Continued on page 26)

MEMBERSHIP DRIVE AT YORK *(Continued from page 25)*

The York meeting also spawned interest in a UK EMC Chapter. Andy Slater of British Telecom has taken charge of the chapter formation. His first organizational meeting was on 10 December 1990 where Don Heirman, as part of the EMCS Distinguished Lecturer Program, described the role, activities, and services of the Society to the prospective chapter members. We will have further information on the UK activity in later Newsletters. Again, we welcome our new transnational members and hope to see them at our EMC Symposium in Cherry Hill this August.

Herb Mertel (left center) and Don Hierman (right center) man the booth at the IEE 7th Annual International EMC Conference, York, U.K.



Site of IEE 7th Annual EMC Conference, York, U.K.

NOMINATIONS FOR 1991 AWARDS

In all Award categories listed below, nominees must be members of the IEEE, with the exception of the Certificate of Recognition.

The Certificate of Appreciation is awarded annually to a member who has made a significant contribution to the welfare, administration, and overall success of the Society.

The Certificate of Acknowledgement recognizes a special service to the Society (i.e., General Chairman of International Symposium, liaison with another society, etc.).

The Certificate of Achievement is awarded in recognition of significant technical accomplishments in the field of EMC.

The Certificate of Recognition is bestowed as a very special mark of recognition to a person who is not necessarily a member of the Society (i.e., Keynote speakers).

Chapter of the Year Award is coordinated through the Chapter Activities Chairman based on input from the chapters.

The EMC Society Citation is awarded for significant contributions to technology in the field of EMC engineering.

The Richard R. Stoddard Award is given in recognition of outstanding contribution of an EMCS member to the advancement of EMC technology or to the solution of a socio-technological problem.

The Laurence G. Cumming Award is given in recognition of outstanding service of an EMCS member's contribution to the administration and overall success of the Society.

The International EMC Award recognizes outstanding contributions to the international exchange of EMC technology.

Honorary Life Membership is the highest order of recognition for sustained outstanding service to the EMC Society.

EMC Transaction Prize Paper Award is given in recognition of the outstanding paper published in the EMC Transactions, selected by the editor. In addition, EMCS members are eligible for IEEE medals, awards and prizes as listed in the December issue of The Institute. Nominations with letters of support for the field awards are due as early as April 1, 1991. A listing of these awards is available from Pat Coles (see below).

To submit nominations for 1991 awards or to request additional information contact:
Patricia L. Coles,Hewlett-Packard
11000 Wolfe Road m/s 42LS, Cupertino, CA 95014
Telephone: 408-447-6847; FAX: 408-257-5034

1990 IEEE EMC SOCIETY AWARDS

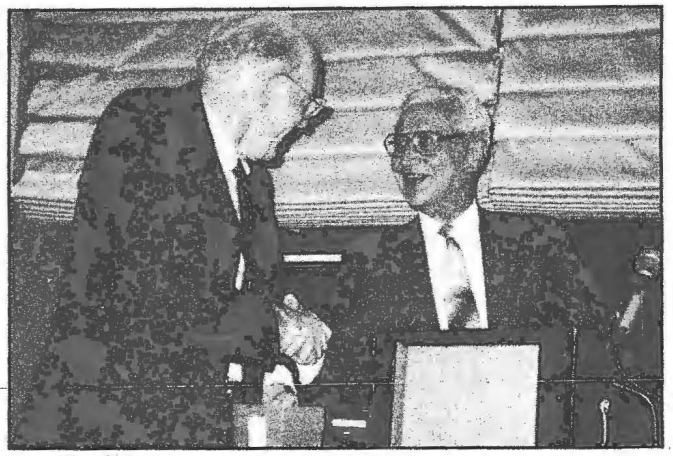
The IEEE EMC Society recognized and honored twenty-eight individuals at the Awards Banquet during the August 1990 International Symposium in Washington, DC.

Certificates of Appreciation were awarded to: Daniel D. Hoolihan, Janet Nichols O'Neil, and Charlotte R. Tyson for Outstanding Service to the Society; Henry Ott for services as the Chairman of the Education Committee; David M. Hantulla, Chairman of the Distinguished Lecture Program; Michael J. Hart for revision of IEEE Standards; Dr. Motohisa Kanda, Editor of the Transactions; Herbert K. Mertel, Roger A. Southwick, W. Scott Bennett and Donald N. Heirman, Distinguished Lecturers.

Certificates of Acknowledgement were awarded to: Thomas W. Doeppner, Chairman of the 1990 International Symposium; Dr. Yasua Akao, Chairman of the 1989 International Symposium; H. R. (Bob) Hofmann for his various work within the EMC community.

A Certificate of Achievement was awarded to Dr. Clayton R. Paul for his work to further EMC education at the undergraduate level.

EMCS President, Ed Bronaugh (center right) presents EMCS Certificate of Appreciation to Henry Ott (center left) for his many years of service as Chairman of the IEEE Education Committee.



Tom Doeppner (right) General Chairman of the 1990 EMCS Symposium Committee thanks Charlie Anderson for his work on publicity for the Symposium.

Certificates of Recognition were awarded to: Janice Obuchowski, the Keynote Speaker at the Symposium; Randal Pride for his design of the EMC Society logo; and John M. Lindsay, Lloyd S. Riggs and Thomas S. Shumpert for the Best Transactions Paper for 1989.

The Tokyo Chapter was recognized as the Chapter of the Year.

Donald E. Clark was awarded the Lawrence G. Cummings Award for sustained contribution to the success of the Society; and Peter E. Leuthold, the International EMC Award for his service through the Zurich Symposium. William G. Duff was made an Honorary Life Member. Myron Crawford and John Norgard became Fellows of the EMC Society.

The Symposium Committee presented a Best Paper Award in memory of Aaron H. Sullivan, Jr. to Robert German, Henry Ott and Clayton Paul.

Our congratulations to all!

NEWLY ELECTED IEEE FELLOWS

The following members of the IEEE have been elected IEEE Fellows:

Mr. Robert D. Goldblum
R&B Enterprises
20 Clipper Road
W. Conshohocken, PA
19428

Mr. Goldblum was cited for his contributions in electromagnetic compatibility testing and standards, and for promulgating increased awareness of EMC problems and their solutions.

Dr. Leonard Ehrman
26 Village Drive
East Sandwich, MA
02537

Dr. Ehrman was cited for contributions to the development of real-time simulators of communications channels and to the analysis of nonlinear circuits.

Congratulations to these gentlemen on receiving this esteemed honor.

INSTITUTIONAL LISTINGS

The IEEE Electromagnetic Compatibility is grateful for the assistance given by the firms listed below and invites application for Institutional Listings from other firms interested in the electromagnetic compatibility field.

AMPLIFIER RESEARCH, 160 School House Road, Souderton, PA 18964-9990
Telephone: (215) 723-8181, TWX: 510-661-6094, FAX: (215) 723-5688
Broadband RF power amplifiers, 1 W to 10 kW, 10 kHz to 1 GHz; RFI test accessories and antennas; EMP simulators.

ARK ELECTRONICS CORPORATION, 1325 Industrial Highway, Southhampton, PA 18966
Telephone: (215) 322-6510, FAX: (215) 322-4231
RF shielded enclosures, custom-manufactured shielded doors, RF filters, waveguide air vents, EMI laboratory testing, EMC consulting; a complete EMC capability.

FAIR-RITE PRODUCTS CORP., P.O. Box J, 2 Commercial Row, Wallkill, NY 12589
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Ferrite EMI suppressor elements for cables, ferrite beads on leads for circuit board insertion, ferrite beads for surface mount technology, ferrite sleeves for filter pin connectors.

INSTRUMENTS FOR INDUSTRY, INC., 731 Union Parkway, Ronkonkoma, NY 11779
Telephone: (516) 467-8400, FAX: (516) 467-8558
Anechoic shielded rooms, turnkey systems, EMC/susceptibility measurement systems, broad-band amplifiers, leveling pre-amps, TEM cells, E-field sensors up to 40 GHz,radiation hazard monitors, E-field generating antennas.

MAXWELL LABORATORIES, INC. - MAXWELL/ELGAL, 8888 Balboa Avenue, San Diego, CA 92123
Telephone: (619) 576-3737, FAX: (619) 277-6754
Products, consulting, testing, and training for all electromagnetic disciplines and technologies.

OMEGA SHIELDING PRODUCTS, 1384 Pompton Avenue, Cedar Grove, NJ 07009
Telephone: (201) 890-7455, FAX: (201) 890-9714
EMI/EMP/ESD shielding materials, gaskets and contact strip both standard and custom designed.

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R & B ENTERPRISES, 20 Clipper Road, West Conshohocken, PA 19428
Telephone: (215) 825-1960, TWX: 510-660-8120, FAX: (215) 825-1684
EMI testing/consulting. Full-threat EMP simulation. EMC training/publications. EMP test equipment.

SPECTRUM CONTROL, INC., 2185 West 8th Street, Erie, PA 16505
Telephone: (814) 445-0966, FAX: (814) 455-2550
Complete EMC, FCC/MIL consulting, testing, repair, mfr. RFI filters, RFI gaskets, D-subminiature connectors. Surface mounted devices: chip capacitors, capacitor networks, HIC and QUAD fastbus line drivers.

TECKNIT, Inc., a TWP Company, 129 Dermody Street, Cranford, NJ 07016
Telephone: (201) 272-5500
EMI/EMP/ESD shielding materials, gaskets, vent panels, windows, and conductive coatings and adhesives.

An Institutional Listing recognizes contributions to support the publication of the IEEE NEWSLETTER and TRANSACTIONS ON ELECTROMAGNETIC COMPATIBILITY. Minimum rates are $75.00 for listing in one issue; $200.00 for four consecutive issues. Larger contributions will be most welcome. No agency fee is granted for soliciting such contributions. Inquiries, or contributions made payable to the IEEE, plus instructions on how you wish your Institutional Listing to appear, should be sent to Marilyn Prusas, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08055-1331, Technical Activities Department.