IEEE ELECTROMAGNETIC COMPATIBILITY GROUP

NEWSLETTER

ISSUE NO. 96 WINTER 1978 EDITOR: ROBERT D. GOLDBLUM

CALL FOR PARTICIPATION IN TECHNICAL COMMITTEES

For the past year or so, the Administrative Committee of G-EMC has been organizing technical committees in specialized areas of interest to the membership. The committees that have been formed to date cover the following topics:

- Interference Control
- EMC Measurements
- EMC Management
- Spectrum Management
- EM Environment
- EMP

The purpose of this notice is to invite you to designate which of these committees you would be interested in joining. The technical committees will have responsibilities for organizing technical sessions at our various conferences, reviewing papers being considered for publication in the Transactions, developing standards, conducting seminarts, etc. In general, their function is to assist in developing the state of the art in specialized areas as expeditiously as possible.

If you would be interested in participating in one of these committees, please fill in the information below and return the form to: Dr. R. M. Showers, The Moore School of Electrical Engineering, Univ. of PA, Philadelphia, PA 19104.

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NAME _____

COMPANY _____

ADDRESS _____

_____

PHONE _____

I am interested in joining the following technical committee:

Interference Control ____ EM Environment ____

EMC Measurements ____ EMP ____

EMC Management ____

Spectrum Management ____

Other _____

IEEE ELECTROMAGNETIC COMPATIBILITY GROUP NEWSLETTER is published quarterly by the EMC Group of the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, N.Y. 10017. Sent automatically and without additional cost to each member of the EMC Group.

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EDUCATION COMMITTEE NEWS

After our first article for the Newsletter, the question was raised, "What is the purpose of the Education Committee?" A fair question.

One of the stated objectives of the IEEE is to provide educational opportunities for its members. In simplest form, the EMC Education Committee provides this function in the EMC specialty. This is the way we expect to do this job:

- Be an information center for people inside and outside of the EMC community concerning education. Specifically, I expect to keep up-to-date files on courses and seminars and a library listing of books, films and specifications available.

- Influence the G-EMC AdCom in its deliberations concerning education-related policies. An example is the present question concerning sponsorship of an EMC book.

- Facilitate educationally oriented projects within the policy limits. An example here is the includsion of short courses/seminars in the yearly conferences.

Updating the work being done:

- One university, Concordia of Montreal, Quebec, has expressed interest in the college level course on EMC. This is being pursued.

- Three organizations have expressed interest in providing short courses at the Atlanta conference. They will work with the conference coordinating committee.

- Some educational opportunities which will be coming in the future are:

  1. Don White Consultants, Inc. now have their 1978 schedule available. It includes eight courses which will be given in ten international locations. Specifics may be requested by calling 301-840-0300.

  2. The FAA/Georgia Institute of Technology Grounding and Lightning Protection Workshop will be held May 2-4, 1978. Call Hugh Denny at 404-894-3533.

  3. The Air Force Intrasystem Analysis program will be presented March 13-18, 1978. Call Mary Jo Fairbanks at 315-423-3511.

If you have information of an educational nature, please call me at 612-574-4970.

Kenneth Exworthy

Chairman
G-EMC Education Comm.

SAE AE-4 EMC COMMITTEE TO MEET

The 42nd meeting of the SAE AE-4 Committee on EMC will meet March 20-22, 1978 at Boulder, CO. The National Bureau of Standards (NBS) will host the event and will conduct a tour of their facilities during the last day. The second day will feature a joint meeting with the EMC sub-committee of the SAE Committee on Automotive Electronics. A limited number of rooms have been reserved at the Broker Inn and early reservations are recommended.

The following is a tentative lschedule of future SAE AE-4 meetings:

Mtg. No.	Date	Location
* 43	June 19, '78	Atlanta
44	November '78	Los Angeles
45	April '79	Dayton, OH
* 46	October '79	San Diego
47	April '80	Dallas
* 48	October '80	Baltimore
49	March '81	Biloxi
* 50	August '81	Denver
51	February '82	Phoenix
* 52	May '82	Washington,DC

* Adjunct to the IEEE EMC Symposium

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MEETINGS & EVENTS

IEEE SEEKING DELEGATES TO ATTEND 1978 USSR POPOV SOCIETY CONGRESS

The IEEE is seeking delegates to attend the 1978 USSR Popov Society Congress as part of its annual exchange. Members are requested to submit applications, together with a biography, to their respective Group or Society presidents as soon as possible.

The Popov Society has advised hat its four-day Congress will take place in Moscow in the latter part of May 1978. Plans are for the IEEE delegation to stay in the USSR about two weeks, attending the Congress and visiting several Soviet cities, where they will tour research centers, educational institutions, and operating installations.

Applicants ill be expected to provide their own funding for the trip. As a rule, the delegates have been funded by their own institutions or companies. However, in past years a limited number of delegates from academic institutions have been funded by the National Science Foundation, but this number has been small and it would be to your advantage to try to obtain your own funding.

The exchange will focus on the technical interests around Division III, i.e., Aerospace and Electronic Systems; Broadcast, Cable and Consumer Electronics; Communications; Electromagnetic Compatibility; Geoscience Electronics; and Oceanic Engineering. Members of other Groups/Societies in related fields may also apply.

Nominees will be recommended to the TAB Transnational Relations Committee (TRC) from applications made to the respective Group and Society presidents. The TRC will recommend to TAB OpCom those nominees whose interests best coincide with the sites and topics suggested by the Popov Society. In making nominations, it is expected that the Group and Society presidents will give precedence to applicants who are likely to be known by their Soviet hosts through professional achievement and/or positions.

1978 IEEE INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

June 20-22, 1978
Sheraton-Biltmore Hotel

P. O. Box 77167
Atlanta, Georgia 30357

EMC — 20 Years and Still Expanding

WORKSHOP ON GROUNDING AND LIGHTNING PROTECTION MAY 2-4, 1978

The Fifth Annual Grounding and Lightning Protection Workshop will be held in Atlanta, Georgia, May 2-4, 1978 under the co-sponsorship of the Federal Aviation Administration, Georgia Tech, and IEEE Atlanta EMC Chapter.

Areas to be covered include: measurement methods, power system ground design and performance, signal grounds and grounding, surge arrestor properties, design of surge protection circuitry (power, control and signal lines), EMP grounding and protection (unclassified only), air frame and shipboard grounding, aircraft/spacecraft lightning protection, and others.

For additional information, contact Mr. H. Denny, Engrg. Experiment Station, Georgia Tech, Atlanta, GA 30332; Tel.: 404-894-3533.

CALL FOR PAPERS

You are invited to submit a paper describing new developments in the theory or practice of communications for possible inclusion in the technical program of NTC '78. Only original and previously unpublished papers are acceptable, although publication in the NTC '78 proceedings will not preclude later publication in the IEEE TRANSACTIONS ON COMMUNICATIONS.

Technical Program Subcommittees:
- Aerospace & Electronic Systems
- Data Communication Systems
- Electromagnetic Compatibility
- Radio Communication
- Satellite & Space Communication

Authors are encouraged to suggest the particular subcommittee(s) which they feel should review their papers. Such papers must be received by the May 15th deadline in order to insure adequate consideration. Papers not utilized by the subcommittees because of subject matter mismatch will be considered for inclusion in general interest sessions sponsored by NTC '78 along with late papers received before June 15th.

Authors are requested to send five double spaced copies (in English) of the one-page summary and manuscript (not to exceed 3000 words) plus illustrations to: Dr. Ronald C. Houts, Chairman, Technical Program, P. O. Box 2478, University, AL 35486.

CHAPTER CHATTER

by Charles F. W. Anderson

Lo s of news from many chapters, I'm happy to say!

Albuquerque (joint Chapter with AP-S and MTT-S)

On 9 November, the Chapter heard Professor K. K. Mei of UC-Berkeley discuss "unimoment" techniques for solution of electromagnetic problems involving inhomegenous scatterers and scatterers over lossy ground. Election of officers for the 1978 term was held. Juinn Yu is the new Chapter Chairman, with Larry Scott as Vice Chairman, J. Phillip Castillo as Secretary and Robert Hutchens as Treasurer. Meeting attendance was 28, including eight guests. The Chapter is co-sponsoring the 1978 Nuclear EMP Meeting with the Department of Electrical Engineering and Computer Science of the Univ. of New Mexico.

Los Angeles

George Ufen has sent reports on Southern California area G-EMC activities. Biggest news is formation of a San Diego Chapter (see below). The Los Angeles Chapter's September meeting, held jointly with the Vehicular Technology Chapter, featured Ed Bronaugh of Southwest Research Institute speaking on intra and inter-vehicle automotive EMC. At their October meeting, C.M. Kendall presented a talk on his recent experiences in testing to VDE requirements on a large computer in West Germany. His presentation included slides showing test configurations, and a discussion of the interpretation of VDE 0871 and 0875, plus some information on the new "yellow copy" version of 0871. The November meeting was addressed by Jay Soltys of Technical Wire Products who discussed new products and unique applications using conductive materials. Contact George at 213-845-8771 for information on meetings when you're in L.A.

San Diego

As indicated above, we have a new Chapter! Their initial meeting was held on 15 November at the Holiday Inn (Hotel Circle) in San Diego and also featured Jay Soltys with the topic mentioned above. No information on Chapter officers and plans as yet; but, hope to have the word for the next issue.

Atlanta

The Chapter's October meeting, held at the Georgia Tech Student Center, was addressed by Lewis E. Rhoden of Georgia Power Company who described GPC's continuing program of interference control in communities which they serve. This "good neighbor" approach includes location and elimination of interference reported by outside parties and instruction of operating crews on installation practices to prevent RFI. The speaker also presented some examples of interesting RFI cases which have been encountered. Meetings are planned for December and January, with tentative plans for March and May meetings also. Chairman Gene Knowles has lined up several people to act as EMC/EMI focal points in a number of organizations. So far, these include: Bob Hammack, Bell System; Hugh Denny, FAA and airlines; Bill Free, Goergia Tech; J. Andy Moon, Georgia Power. The Chapter's meeting announcements are in the form of a newsletter, which Gene hopes will grow in size.

Mohawk Valley

IEE HQ informed me that Carmen Paludi, Jr. is the new Chapter Chairman; but, I have no other news. Let's hear from you!

Central New England

The Chapter's September meeting (topic and speaker reported previously) had an attendance of about 20. Dr. Opsechuk's presentation on "Microwave Radiation Hazards in Perspective" included review of recent bioeffect research and how such results scale to Mankind. He also discussed the relationship of the research to ongoing developments in microwave heating applications. Importance of sound microwave engineering in establishing realistic perspectives in this field was emphasized. Adequacy of U.S. standards relative to Eastern European ones in this area was compared, and ANSI C95, IEEE and IMPI roles in developing realistic perspectives were pointed out as important. The October meeting was addressed by Bob Goldblum, who presented "EMC Overview, Including 461B Status." Bob discussed the status of the Standard in detail, including the outlook of the Navy, Army and Air Force. (See Bob's article in October ENR for some of the details on this topic.) He also discussed EMC activity in the U.S. and the specifications to be issued by SEMA for industrial controls EMC, by FDA for medical devices, and by FCC for all electronic devices. Interest was high in this presentation, as evidenced by the number of questions directed to Bob by the audience. There were 23 attendees. Future plans call for a presentation on IEMCAP in February, and a jointly-sponsored (with PES) meeting on the Northeast Corridor Railroad Electrification and associated EMI problems in March. (John Clarke indicates that this may be rescheduled for April or May.)

New Jersey Coast

My former Chapter continues to be quite active. Don Heirman, in his double role as Chairman and Newsletter Editor, keeps us well informed. The October meeting featured a talk by Henry W. Ott of Bell's Whippany Labs on "Interference in Home Entertainment Equipment and What You Can Do About It." He discussed the growing interference to television and home audio equipment from such sources as CB radio. Symptoms produced by various types of interference sources were described, as well as typical effects of strong rf fields on stereos, tape recorders, electronic organs and other devices. Some information on elimination/alleviation of interference for the average user was given, along with procedures for complaints to FCC, manufacturers and servicemen.

Both the October and November/December issues of the Chapter's Newsletter have much on the Tenth anniversaryof its founding. John O'Neil (who received the Honorary Life Member Award at the Seattle Symposium) is authoring a history of the Chapter, which is being run in the N.L. An anniversary party is presently scheduled for April 15, 1978. Plans are now being finalized and include inviting all present and past EMC Group and Chapter ADCOM members, present and past sponsors, Headquarters, IEEE personnel and local dignitaries. In addition, invitations will be extended to all those who can be located who participated in the formation of the Chapter and in the conduct of the 1969 EMC Symposium and those who were active in the EMC community at that time. It is considered that this will be an excellent time to renew old friendships with those who have retired or are no longer active in EMC matters. The Arrangements Committee consists of Warren Kesselman (201-544-4877), John O'Neil (201-946-8736), and Maxwell Brown (201-775-7829). If you have an address of someone who you feel may be overlooked, give any of the Committeemen a call. It should be a great party!

The Jersey Coasters have established a "Chapter Special Technical Projects" activity. This will be integrated with their regular meetings on alternate-month basis. The regular meetings wiil be slanted towards topics of more general EMC/EMI interest, while the Special Projects meetings will address particular technical areas, with the objectives of coming up with such things as Chapter sponsored sessions at the EMC Symposiums, Transactions papers, or proposed new standards. John Prorok (ECOM) is steering this activity. The December meeting, held at Bell's Holmdel Labs, was the kick-off ofor this commendable effort. One of the aims is to enable the Chapter members to achieve position papers withich would represent N.J. Coast Chapter thinking, not that of any of the members' employers.

The Chapter also is proposing formation of a joint Chapter with the Vehicular Technology Group members in the area. Letters already have been prepared requesting approval of the merger. Activity also is in progress to determine if the Antennas and Propagation and the Instrumentation and Measurements Groups would be interested in affiliating with the joint Chapter.

Washington

Bernie Keiser is keeping me well posted on the NATCAP Chapter's doings. Their second meeting of the '77-'78 season was held on 17 November. Mr. Samuel R. McConoughey, Chief of the Mobile Services Division of FCC's Common Carrier Bureau, was the featured speaker. His topic was "Interference Standards for the Domestic Public Land Mobile Radio Services." He discussed the standards now in use, some of the shortcomings thereof, and the need for revised and up-dated standards, including those for the new 900 MHz band. There were 36 members and 11 guests present. Future meetings are scheduled for 19 January, 16 March and 19 April. Contact Bernie at 703-281-9582 if your plans call for you to be in the area on one of the meeting dates so you can join the DC G-EMCers for lunch and a good program.

Philadelphia

From the same source: the new Chapter Chairman is Michael Becher. No news here also. How about some activity, Philadelphia?

CHARLIE'S CORNER

Some updating on ARRL's RFI activities: The RFI Handbook still is in work, with no definite publication date. Harold Richman, one of the League's RFI Technical Advisors, has come up with a revised list of personnel at various home entertainment equipment manufacturers who should be contacted for information relating to interference complaints. This is just about ready for mailing. To obtain a copy, address: American Radio Relay League, 225 Main St., Newington, CT 06111 requesting the RFI list.

The 1978 edition of the famous ARRL Handbook will have considerable material relating to RFI problems and solutions of home entertainment type equipments. Tony Dorbuck, who headed the ARRL Lab's RFI investigations, took care of this area as Handbook Editor. (I will have a review of the new edition ready for the next issue of the N.L.)

RFI investigations are continuing at the ARRL Labs, but I could not obtain any details on recent progress for this issue. Hope to have something by April '78.

BOOK REVIEWS

by Jim Hill, EMXX Corporation

Editor's Note: You'll notice that Jim Hill is no longer with RCA. He retired from RCA on January 1, 1978 and formed a corporation to engage in EMC consulting and some non-related sidelines. We all wish him good luck and are glad that he will continue as Book Review Editor for our Newsletter.

Don White Consultants, Inc. is continuing with his 42 volume EMC encyclopedia series. The first volume off the press is Volume IX, not Volume I. (Look for Volume I some time in 1978). Volume IX is titled Digital Modulation Techniques in an Interference Environment. The author, Dr. K. Fehrer, has taught a number of courses on the subject and has written this book as an outgrowth of his course notes. He plans to use this as a textbook in future courses.

The second review book for this Newsletter issue is one of those reference books you might want to add to your library or recommend it to your librarian for the company library. Electronics Engineers Reference Book is an up-to-date (1976) edition. This is the fourth edition - prepared by 63 experts representing the British electronics community.

"Digital Modulation Techniques in an Interference Environment"

BY

Dr. Kamilo Feher

186 pages, 80 illustrations, $25.00 postpaid
Publ. by Don White Consultants, Inc.
656 Quince Orchard Rd., Suite 410
Gaithersburg, MD 20760

In this book, the reader concerned with the control of EMI via the design and application of digital modulation techniques should find the answers to many questions. The opening chapter gives a brief review of the most popular analog and digital modulation techniques. This material is an introduction to an in-depth study of digital baseband coding techniques and filtering requirements for data transmission. Succeeding chapters deal with digital modulation techniques, PSK, FSK, and APK modems and their performance in realistic interference environments. In Chapters 8 and 9, measurement techniques and comparison of digital modulation techniques in an interference environment are discussed. Chapter 10 covers the 2 to 18 GHz band for hybrid transmission systems for simultaneous medium speed digital and analog information transmission. State-of-the-art satellite system applications are described in Chapter 11. The last chapter highlights techniques in an interference environment.

The volume has been streamlined with the omission of long mathematical derivations. Practical constraints of the final equations of mathematical models, the underlying physical principles, the design philosophy, applications and system performance case studies are stressed. For readers interested in further research, up-to-date references are given at the end of each chapter.

This book is recommended to practicing engineers, scientists, and management personnel who may be confronted with modern digital transmission problems. System designers will also find it helpful in describing the capabilities of the rapidly expanding field of digital modulation. Users who specify the performance of digital communication systems in an interference environment will find it valuable.

"Electronics Engineer's Reference Book"

4th Edition, 1976, Edited by L. W. Turner
1500 pages, $49.50
Publ. by Newnes-Butterworths
19 Cummings Park, Woburn, MA 01801

Reference works for electronics engineers age rapidly. The ever expanding state of knowledge as techniques become more complex means inevitably that specialization is intensified. The trap of over specialization is wide open and for the technologist who seeks broad professional leadership it is wise to avoid it. This is particularly the case in middle life when the tendency is too often to continue to develop the expertise of early academic training. Therein lies the course to obsolescence. In avoiding this one way of proved value is by maintaining close contact with appropriate reference books and in the expanding electronics field the "Electronics Engineer's Reference Book" is an excellent example.

The book is organized to give a logical grouping and sequence of its 27 sections which broadly follow the general order of: basics, materials and components, devices, circuits, measurements and applications.

The opening sections provide general information, such as units, symbols, and formulas; a history of electronics; and general physical background. Following this, there are sections on subjects such as solid state devices, integrated circuits, microelectronics, basic electronic circuits, radio astronomy, space exploration, public address and sound reinforcement systems. The final section is on electronic aids to medicine.

While a majority of the 63 contributors are associated with the British electronics industry, the list includes representatives of the American firms, Hammond Organ, Texas Instruments and RCA.

Each section includes a list of references and literature for further reading. Many of these are USA publications by IEEE, the U.S. Government Printing Office and other sources readily available in the U.S.A.

The text is well illustrated with photographs as well as line drawings and there is an adequate index to aid in finding specific subject matter. Whereas prices on British publications were not long ago at a bargain level, this is no longer true. The current plight of the dollar on the international money exchange has not helped. I believe the price of this reference work is in line with the present market scale.

"PATENT PENDING" HOW TO FILE YOUR OWN PATENT

Wesley J. Haywood, Jr. and George L. Haywood
Joe Lane Publ. Co., 1976
P.O. Box 2646
Evergreen, CO 80439

Paperback, 109 pgs., Write to firm for prices

If you have anything that you would like to patent, and do not want to spend the money for an attorney, then this book may be for you. Your editor starts out in a not too convincing tone, because he is not exactly in tune with the do-it-yourself legal operations; they tend to get one into trouble. Still, you have little to lose by following the guidelines of this book if you don't want to invest the money in the patent process--and it can be expensive!

The authors tell us that if you follow the directions exactly, apply the ingenuity to the process you applied to the invention itself, there is no reason you won't be able to do without high priced legal talent.

The authors tell how to document the invention--either with a bound notebook and every page signed, dated, witnessed, notarized or with a method called Disclosure Documents Program from the U.S. Patent Office which costs $10.00.

The most important part of this book, in your reviewer's opinion (from personal experience), is how to do a search. I spent over $1500 for legal talent to do two searches before moving on patents for devices I am working on. The book would have allowed me to do them for the cost of air fare and hotel rooms--which might have been considerably less. It irritated the hell out of me that the preliminary searches did not reveal a single patent close to mine. Yet, when the patent was submitted by my attorney, the examiner came up with half a dozen that were very, very close. Sometimes I wonder if there is a tendency to downplay an early discovery of a close prior patent because the client just might not go ahead with the application should such be found.

The authors go deeply into the contents of the application and filing of same. I found it very disturbing that they chose to present their material via quotations from the Code of the Federal Register which gives the patent law as opposed to rewriting the material into laymen's language. The authors tell us to write the patent application in clear language because the examiner may not have a background in the subject. They really should have heeded their own advice in writing the material. The topics are here; the topics are covered; the topics require a hell of a lot of reading and thinking to interpret what is to be done before the book material is usable. Again, if you want to save money and don't mind wading through a lot of words and legalese, this is acceptable. If you are afraid some of this wading through process will cost you in the end, when your patent protection is less good than it should be, take need accordingly.

(Reprinted from Nov/Dec. 1977 issue of the IEEE G-EM Newsletter)

STANDARDS NEWS

The second edition of the "IEEE Standard Dictionary of Electrical and Electronics Terms" was scheduled for publication before the end of 1977. Typesetting has been completed and copies of the dictionary will be available by January.

Five years in the making, the 1977 edition will have over 20,000 entries. This is 7,000 more terms than were included in the 1972 edition, and the new edition will exceed the previous edition by nearly 200 pages. A new feature of the second edition is a listing of 10,000 acronyms and sigla that are in current use in the areas of electrical and electronics science, business, industry, government and the military.

GROUP FORMING FOR WROCLAW EMC SYMPOSIUM

The Fourth Wroclaw Symposium on Electromagnetic Compatibility is scheduled for September 13-15, 1978 at the Wroclaw Technical University. Wroclaw is the scientific and cultural capitol of the southwest region of Poland with a population of over 600,000. The climate in Wroclaw is mild and pleasant in September with an average day temperature of 65 degrees F.

Papers will cover a broad range of EMC related subjects. A specialized exhibition will be an adjunct of the Symposium. The official languages of the Symposium are English and Russian. Simultaneous interpretation will be provided. The full texts of papers presented will be printed in the "Symposium Record" and made available to participants immediately before the Symposium.

The Symposium is under the auspices of Professor E. Kowalczyk, Minister of Posts and Telecommunications of the Polish Peoples Republic. Organized by the Association of Polish Electrical Engineers and the Wroclaw Technical University, the IEEE Electromagnetic Compatibility Society is a cooperating organization.

A group package tour is now being organized to attend the Wroclaw Symposium with stopovers in Copenhagen, Warsaw, and London. Tentative plans call for departure from New York on Thursday, September 7, 1978 and return to New York on Friday, September 22, 1978. The itinerary will include four days in Copenhagen, four days in Wroclaw, two days in Warsaw, and four days in London. Arrangements will include air travel and ground transportation, hotel accommodations, a limited number of meals, service charges and taxes. Those interested in joining the group should write or call Jim Hill, 6706 Deland Dr.; Springfield, VA 22152; Tel.: 703-451-4619.

PAPERS ON ELECTROMAGNETIC SHIELDING

Three selected papers on electromagnetic shielding have been compiled in booklet form by George M. Kunkel. The papers are: "Introduction to Electro Magnetic Shielding" by G. M. Kunkel, "Transfer Impedance and Transfer Admittance Measurements on Gasketed Panel Assemblies, and Honeycomb Air-Vent Assemblies" by P. J. Madle, and "Corrosion Control in EMI Design" by E. Groshart. Complimentary copies are available from George Kunkel at Electro-Data Technology, 2808 N. Naomi St., Burbank, CA 91504; Tel.: 213-843-5880.

EMCABS

EDWIN (ED) L. BRONUAGH

This month we are publishing 60 abstracts. These are all current work of the committee.

"HOW CAN I GET A COPY OF AN ABSTRACTED ARTICLE?" This question has come up several times since we have been publishing abstracts, so the following general answer is presented.

Most large public libraries, some small public libraries, all engineering school libraries, and most other college or university libraries can get copies of articles or publications in which articles appear. This usually is done through an inter-library borrowing arrangement if the library contacted does not have the publication itself. Many company libraries, both large and small, also have such borrowing arrangements. Many articles also are available from the National Technical Information Service (NTIS) and/or the Defense Documentation Center (DDC). To retrieve an article or publication containing an abstract published in EMCABS, it is suggested that you contact your company library, a nearby engineering school library, a university library, or your municiple public library. Go to the librarian, explain what you need and he or she will 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 DDC. The information needed is contatined in the EMC abstract heading.

This brings up a final point. I have been referring incorrectly to our committee as the Information Retrieval Committee, The charter of our committee from the EMC AdCom is more restrictive than this title implies. The name of our committee is the Electromagnetic Compatibility Abstracts Committee (EMCABS Committee). This title better connotes our charter--to abstract articles or publications pertinent to EMC and to publish these for the use of IEE G-EMC members. The committee is comprise of the following members:

L.F. Babcock	E.L. Bronuagh
J.S. Hill	R.N. Hokkanen
J.R. Janoski	M. Kant
D.R. Kerns	G.R. Redinbo
R.B. Schulz	R.M. Showers

SCIENTIFIC PANEL GIVES PROJECT SEAFARER CLEAN BILL OF HEALTH--WITH RESERVATIONS

Project Seafarer, the 4,000-square mile radio antenna the U.S. Navy wants to build in Michigan's Upper Peninsula to communicate with submerged submarines, received a nearly clean bill of health from the National Research Council committee that spent nearly 18 months examining its possible biologic and ecologic effects. The committee found most of the concerns raised about the biologic effects of Seafarer's extremely-low-frequency (ELF) radiation "invalid and unwarranted" and concluded that "the likelihood of serious adverse biologic effects ... is very small." But the committee did fault the project's proposed design in two separate areas and recommended that the system not be approved until these two matters are satisfactorily resolved.

The two problem areas ideitified by the committee were the system's procedure for detecting breaks in the underground cables and the proposed ground terminals for feeding electric current directly into the earth. As presently designed, said the committee, both elements could--under certain circumstances--produce electric shocks in animals and humans venturing in the immediate vicinity of a broken cable or a ground terminal.

The committee stressed that neither problem derived from ELF radiation but rather were classic engineering problems associated with large electrical systems and likely subject to design solutions.

During its study, the committee examined a number of concerns about possible effects of Seafarer's ELF radiation, including a much discussed 1971 study which indicated that exposure to an ELF field might increase serum triglyceride levels. The committee concluded that the original study was incorrect and that recent research carried out with monkeys shows that there are no changes in a variety of physiologic characteristics, including serum triglyceride content. In fact, the committee was unable to "identify with certainty any specific biologic effects that would definitely result from exposure to a proposed Seafarer field."

Nevertheless, the committee recommended that "If the Seafarer system is built, an energetic and carefully designed long-term program of monitoring should be coupled with basic research." Of special concern are possible, although as yet undemonstrated, effects on bird navigational patterns and the behavior of freshwater fish in the areas within the buried antenna grid. Baseline studies on both should be started before Seafarer is built and continued after it is in operation, the committee recommended.

The Research Council's Committee on Biosphere Effects of Extremely-Low-Frequency-Radiation was chaired by J. Woodland Hastings, Professor of Biology at Harvard Univ. The committee was established in early 1976 in response to a request from the U.S. Navy for a study to identify whether any biologic and ecologic effects might be established with the electric and magnetic fields of the Seafarer communication system. It did not consider the necessity of the system, possible alternative submarine communication systems, technical feasibility, costs, or interference with telephone, radio, and television.

Copies of the full report are available for inspection in the Library of the National Academy of Sciences Building, 2101 Constitution Ave., N.W., Washington, DC 20418.

MYSTERY DEVICE WINS ISRAELI HONOR MEDAL

Sidney Hurwich, a 63-year-old Toronto inventor and mechanic, has been given the Medal of Honor by the State of Israel, though neither he nor Israeli representatives will divulge the reason. The self-taught electronics expert, who still does repairs at home, believes that a device that he invented scrambled Ugandan President Idi Amin's radar and allowed Israeli aircraft to land undetected during the Entebbe Airport rescue mission in July, 1976 - which may explain the reason for the medal.

A widower, father of two and grandfather of four, he described his device not as an invention but simply as "a different use for one of the oldest basic principles of electronics - and it stops bombs from going off." It started out as a device, apparently electromagnetic, to help banks prevent thefts of money bags from their night deposit boxes, In 1969, Hurwich called up two police inspector friends and suggested they bring some bankers' representatives over to his house. The battery-powered device was hidden under a bedspread, and when he switched it on, no one could lift any of the bags they had brought for the demonstration or pull the triggers on their unloaded service revolvers. They also discovered that their watches had stopped.

The following year, Hurwich presented his device to Israel because he had found it could save lives by stopping the mechanism on bombs, and for other military purposes. Recently, he confirmed that it was used at Entebbe.

by
G. R. Redinbo

The following article describes several useful techniques that have been successfully applied to the analysis of nonlinear systems. Professor Maqusi, University of Jordan briefly develops the notation necessary to outline the analysis procedures. This article is intended to bring several of these new approaches to the attention of EMC engineers and it contains several references for that purpose.

On Some Walsh Analysis Techniques For Nonlinear Systems

INTRODUCTION

The use of Fourier analysis methods continues to serve many facets of engineering problems. However, with the advent of digital computers and their introduction in various fields, the use of other methods of analysis such as Walsh function methods [1] has become desirable in certain respects.

For linear dyadic-invariant (L DI) systems, Walsh analysis techniques have been developed in a paralled manner to Fourier techniques applied to linear time-invariant systems. And a working Walsh theory has been formulated to cover many aspects similar to their counterparts in Fourier theory.

Applications of Walsh functions in various fields have only been recently explored. Most of them are devoted to linear problems. The nonlinear case which includes many problems of interest to EMC engineers has received little attention. In this latter respect, Corrington [2] was the first to define a graphical procedure for specification of the output of a memoryless device excited by Walsh-type signals. In a later work, Weiser [3] studied instantaneous nonlinear transformations of stochastic signals described in terms of approximating Walsh series expansions. However, both works do not present results in computationally convenient forms.

In a subsequent work [4], we have studied instantaneous nonlinear systems via Walsh function techniques in order to arrive at suitable output expressions which allow for convenient computions of output dyadic and stayadic (statistical dyadic) correlation functions.

DISCUSSION

We devote this discussion to some new techniques based on Walsh functions and applied to nonlinear systems [4], [5], [6]. Three different approaches will be discussed. As indicated in the respective discussion, these approaches are designed for different types of problems.

We assume an instantaneous nonlinearity given by

$$y(t) = g[x(t)] \ , \ t \geq 0. \qquad (1)$$

In case $x(t)$ is random, it is called weak dyadically stationary (WDS) if

i) $E\,[x^2(t)] < \infty$

ii) $E\,[x(t_1)x(t_2)] = C_x(\tau)$, where $t_2 = t_1 \oplus \tau$ and $\oplus$ denotes componentwise modulo 2 addition.

The function $C_x(\tau)$ is called a stayadic correlation function. On the other hand, dyadic correlation is defined in the familar manner.

$$D_x(\tau) = \lim_{T\to\infty} \frac{1}{T} \int_0^T x(t)\ x(t \oplus \tau)\ dt \qquad (2)$$

<u>Walsh Characteristic Function (WCF) Method</u>

For a random variable x, a WCF denoted by $S_x(\sigma)$ is defined as the expectation of a Walsh function (kernel) $\psi(\sigma,x)$. The function $\psi(\sigma,x)$ is a Walsh-Paley type. The nonnegative real parameter σ will be labeled as zequency.

Now, if the nonlinearity is Walsh-transformable, an output stayadic correlation function may be derived as

$$C_y(\tau) = \int_0^\infty \int_0^\infty S_x(\sigma,z;\tau)\ G(\delta)\ G(z)\ d\delta\ dz, \qquad (4)$$

where $G(\tau)$ is the Walsh transform of $g(x)$, and $S_x(\sigma,z;\tau)$ is given by

$$S_x(\sigma,z;\tau) = E[\psi(\sigma,x(t))\ \psi(z,x(t \oplus \tau))]. \qquad (5)$$

The objective of this technique is to determine the output stayadic correlation. Consequently, a Walsh power spectral density, when it exists, may be derived from $C_y(\tau)$ by taking the inverse Walsh transform.

<u>Quasi-Linear Approximation Method</u>

In this method the output of the nonlinearity is approximated by a weighted linear combination of input components. The weighting filters employed are LDI systems. Hence, the approximation at the output has the form

$$y_a(t) = \sum_{n=0}^{N-1} \int_0^1 h_n(t)\ x_n(t+\tau)\ dt; \quad 0 \leq \tau < 1. \qquad (6)$$

To derive the optimal filter sequence $\{h_n(t)\}$, we employ the minimum mean-squared error criterion. Further, we assume the input to be sufficiently approximated by a truncated Walsh series expansion as

$$x(t) \doteq \sum_{n=0}^{N-1} x_n(t) = \sum_{n=0}^{N-1} A_n w(n,t). \qquad (7)$$

The function $w(n,t)$ is a Walsh function ordered in sequency [1]. Under these conditions, the optimal filters are specified by

$$h_{on}(t) = \frac{\langle y(o)\ A_n \rangle}{\langle A_n^2 \rangle}\ w(n,t)\ ; \quad n=0,1,\ldots,N-1. \qquad (8)$$

Although superposition does not hold for this type of linearization, the resulting output model can still be useful in computing output correlations and the associated Walsh power spectal densities.

Matrix Method

This method is suitable in case the input can be sufficiently approximated by a truncated Walsh series expansion such as in (7). It may be written in matrix form as

$$x(t) \doteq [A]^T[w(t)] \; ; \quad \text{T denotes matrix transposition.} \tag{9}$$

Furthermore, representing the Walsh function column matrix $[w(t)]$ over $[0,1]$ by a Walsh matrix W, yields an output expression given by

$$y(t) \doteq [g([A]^T W)]^T W^T [w(t)]$$
$$= [B]^T W^T [w(t)] = [C]^T [w(t)]. \tag{10}$$

The orthogonal Walsh matrix W (order=$N=2^m$, m a positive integer) forms the kernel of the discrete Walsh transform for which fast computing techniques have been developed. Thus, according to (10), computation of the output can be implemented by fast Walsh transform (FWT) techniques. Explicitly, the row matrix $[A]^T W$ can be computed via such techniques. This carries over directly to the computation of $[B]^T$. Similarly, since $W^T = \frac{1}{N} W$, the desired output sequency coefficients residing in $[C]^T$ may also be computed via the FWT.

Furthermore, under the condition that $N=2^m$, no new sequencies are generated at the output of the nonlinearity. This entails suppression of harmonic distortion which is an inherent result for sinusoids.

CONCLUSIONS

The discussed techniques for analysis of nonlinear systems are designed primarily for Walsh-type excitations. Typically, the use of nonlinear systems in signal processing poses difficult problems. These techniques can find applications in such areas. Their use can readily be extended to integrated systems comprised of LDI and nonlinear systems [4]. The full merits of the techniques have not received wide advertisement yet.

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IEEE PUBLISHES NUCLEAR RELIABILITY DATA MANUAL

A comprehensive and up-to-date collection of reliability data is now available in a single volume published by the IEEE. This new standard, IEEE Nuclear Reliability Data Manual (IEEE Std 500-1977), includes over 500 pages of reliability data on failure rates, failure rate ranges, failure modes, and environmental factor information. More than 1,000 generic electrical, electronic, and sensing components are presented. Included are motors, generators, circuit-breakers, valve operators, annunciators, pumps, blowers, and many other electric components found in most nuclear power generating stations, as well as in conventionally fueled generators and industrial plants.

Until now, the data necessary to perform an analysis for a reliable nuclear power generating station have been unavailable, but the new IEEE data manual fills this long-existing gap by providing significant industry data, guidance on data collection methods, and failure rate information.

Although the data contained in the Nuclear Reliability Data Manual provide needed information for reliability analysts working on problems related to nuclear plants, the document is applicable to all segments of the power industry. Numerous other large industries such as steelmaking, chemical production, marine transportation, off-shore drilling, rail transportation, and refining will find the manual a valuable source of reliability information.

The manual offers a data base to be used for the performance of qualitative and quantitative systematic reliability analyses in nuclear power generating stations. A step-by-step analysis utilizing the data contained can aid in the performance of availability assessments, evaluation of maintenance and testing programs, selection of equipment, and formulation of design alternatives.

The data collection effort undertaken in the preparation of IEEE Std 500-1977 involved the cooperation of over 200 volunteers within the IEEE organizational structure. The manual was synthesized from from over 20 major data sources, more than 100 individual data sources, and countless individual failure reports covering millions of experience hours. Administrative support was provided to the project by the Office of Nuclear Regulatory Research of the US Nuclear Regulatory Commission.

Titled "IEEE Guide to the Collection and Presentation of Electrical, Electronic, and Sensing Component Reliability Data for Nuclear Power Generating Stations," the data manual now is available from IEEE. Copies may be obtained from IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. Price of IEEE Std 500-1977 is $41.50 per copy, IEEE members price is $37.35. A $2.00 handling/shipping fee must accompany each order.

ARE MICROWAVE HAZARDS IMMINENT?

Microwave radiation is becoming a serious matter for government and electronic manufacturers. Although those interests have regarded the current standard for nonionizing radiation as totally acceptable, Paul Brodeur, a staff writer for New Yorker magazine, has written "The Zapping of America" to warn the general public of alleged risks associated with prolonged radiation.

Beginning with a historical perspective of microwave technology, Brodeur highlights situations leading up to the 3-day symposium in 1969 on the Biological Effects and Health Implications of Microwave Radiation, which was proposed by the Bureau of Radiological Health. Prior to this meeting, public awareness of the biological hazards associated with prolonged radiation was virtually nil. He points out that this meeting provided a focal point for subsequent discussions on low-level, nonthermal effects on the cellular or molecular level.

According to Brodeur, industry before 1969 was generally inclined to believe that safeguards already in place were satisfactory for production and use of electronic, medical and microwave systems that employed this technology.

Dr. Milton Zaret, an opthamologist, completed a survey of personnel employed at military and civilian installations. He found no incidence of cataracts, but he did report a slight excess of minor defects in the eye lenses of subjects exposed to microwaves.

Throughout the book, Brodeur raises serious biological and technical questions. He discusses cumulative effects of nonionizing radiation and highlights Government and electronic industries' ineptness and misunderstandings of the problem. He specifically refers to the Project Pandora incident, in which Government employees at the U.S. Embassy in Moscow, U.S.S.R., were reprotedly exposed to microwave bombardment.

Brodeur alleges that the State Department's report on Project Pandora was written ambiguously, a valid point since biological effects in that case cannot be substantiated from blood tests given to the U.S. employees in Miscow. Raising the question of an alleged "cover-up," Brodeur leaves the reader wondering whether or not isolated incidents of conflicting reports point toward a secret assembling of data to refute the State Department's stand on the radiation-exposure level that occurred at the Embassy.

Hinting at a possibility of a link between cancer and microwave radiation, Brodeur refers to a press release on the Pandora incident from Abigniew Brzezinski, national security advisor to President Carter, that calimed the cancer rate among Americans at the U.S. Embassy in Moscow was the highest in the world. Again, Brodeur raises a puzzling question as to whether the results of embassy personnel medical tests do indeed reflect damage resulting from irradiation.

Again, Brodeur discusses the issue of biological effects of radiation with regard to the Fort Rucker affair, wherein helicopter pilots allegedly flew into radar patterns. He denounces the Government findings of this affair as a sham aimed toward public nondisclosure and claims that incidences of genetic defects in the immediate geographical area were discounted by local medical officials.

Although Brodeur is obviously trying to create public awareness of damage due to extended irradiation, he forgets to establish the opposing viewpoint that microwaves are opening up promising new avenues for medical and communication applications. General press coverage of microwave techniques has been mishandled because of lack of technical understanding of the subject. For instance, Brodeur confuses the reader with his coverage of the Tactical Airborne Navigation (TACAN) incident when he suggests combining excerpts from studies of adverse biological effects from microwaves with reports of X-ray effects. The TACAN incident is intriguing because of medical anomolies: Pancreatic cancer was diagnosed among employees at the Naval Air Station at Quonset Point, R.I. Normally, the statistical age group affected by the disease is people over 40 years old, but affected people there were under that age.

Information on page 228 seems inappropriate since reference to CB, burglar alarm, etc., background radiation demand better perspective. Chapter 21 is interesting, but totally unrealistic. Besides, discussions about weapons don't help the continuity of the subject matter. In fact, readers can skip to Chapter 25 unless they're really interested in weapons (and mind control?).

Brodeur sometimes implements key testimony by microwave officials, then deletes it or disregards it altogether. I hope the reading public will question the facts that Brodeur presents and remain open as further information becomes accessible. Forget the P.R. effort to sell the book and the overall skepticism presented by Brodeur. His questions are being addressed and answered by officials involved in the microwave complex.

A totally enjoyable book, The Zapping of America puts technical discussions into a thoroughly readable format. Perhaps, Brodeur is correct in alleging a massive cover-up by the military-electronics industry.

SCIENTIST CLAIMS MICROWAVE RADIATION FEAR UNFOUNDED

Adequate safeguards for microwave-radiation hazards are being scrutinized by members of the engineering, medical and media professions. Speaking at an IEEE Long Island section meeting, Dr. John Osepchuk, consulting scientist from Raytheon's research division, said he would like to see the nontechnical public educated about microwaves since he feels a severe lack of public understanding leads many people to fear even minute amounts of radiation.

"Many researchers thought that they had found biological damage from nonionizing radiation. However, many of these results have been disproved or can never be duplicated," explained Osepchuk. He contends that if a correct analysis of exposure levels were understood, much of the popular skepticism would disappear.

Osepchuk made an analogy of size to radiation penetration: "There is a resonant frequency for each object that varies with size and shape. Optimum deep heating of food occurs when the wavelength of the radiation is of the order of the food size." Maximum deep heating for a hamburger, for example, occurs at 2.45 GHz (microwave oven frequency), while a normal human being is resonant at 100 MHz, according to Osepchuk. The electromagnetic resonance of the human body, varying with the size of the person, provides the thrust for Osepchuk's explanation of biological effects of microwave irradiation.

Differences in U.S. and U.S.S.R. microwave-exposure standards have resulted in conflicting reports from the U.S. State Department, especially regarding the U.S. Embassy in Moscow being the target of microwave bombardment. Osepchuk's testimony before the U.S. Senate Committee on Commerce, Science and Transportation, focused on the insignificant level of radiation reported by the State Department. "There appears to be no basis for the fearful speculation of the press, and the official denial by the State Department of a relationship existing between radiation and personal health problems appears valid," stated Osepchuk.

Osepchuk says that people are afraid of blood-system effects of radiation, but he maintains that experiments conducted in this area have produced inconclusive results.

Criticizing the book, The Zapping of America, by Paul Brodeur, Osepchuk stated, "The assumption of hazardous nonthermal effects at low densities of radiation is a misunderstood concept." He and members of the Committee on Man and Radiation (COMAR) have criticized Brodeur's articles on Microwave in New Yorker magazine, calling them sensational and built upon very restrictive sources.

TELECOMMUNICATIONS UNIT SHIFT

Most of the functions now performed by the White House Office of Telecommunications Policy would be transferred to the Commerce Department under President Carter's proposed reorganization of the Executive Office. The functions would be placed under a new assistant Secretary of Commerce for telecommunications. They would be broadened to encompass such things as communications-information transmission policies, privacy, and security.

Another possibility, under consideration by some members of Congress concerned with telecommunications is an amendment that would make the Commerce Department organization a more autonomous national telecommunications agency, comparable in status to the Federal Aviation Administration under the Transportation Department.

The Office of TELECOMMUNICATIONS POLICY was created in 1970 by President Nixon. It currently has approximately 40 full time employees many of whom would have the opportunity to move to the Commerce Department. Present thinking is that a small nucleus may remain within the Executive Office.

FCC ORDERS CABLE TV FREQUENCY OFFSETS

The FCC has ordered operators of cable TV systems to put into effect a system of frequency offsets and monitoring to prevent leakage of cable systems from interfering with aeronautical navigation and communication systems. All carrier signals must be offset in frequency from aeronautical navigation and safety services operated within 60 nautical miles of any portion of the cable TV system, the FCC rules, unless a specific waiver is obtained from the commission. Required frequency separation is 50 kHz in the bands 108-118 MHz and 328.6-335.4 MHz, and 100 kHz in the bands 118-136 MHz, 225-328.6 MHz, and 335.4-400 MHz. All cable systems must be checked at least once a year for emissions with a field strength equal to 20 microvolts per meter at three meters. The commission also said it may increase the "radius of protection" when low altitude service actually is being provided by an aeronautical facility. The new rules take effect January 1, 1978.

FIRMS CAN'T SUE U.S. TO RECOVER DAMAGES

Defense contractors, who make products according to Pentagon specifications and later are sued for liability by servicemen, cannot sue the government to recover damages. That is the effect of a recent Supreme Court ruling. The High Court rejected claims which maintained that third parties are allowed to seek indemnity for any damages a contractor may be required to pay a serviceman.

ANOTHER INTERFERENCE SOURCE UNVEILED

by

A. K. "KENNY" GUTHRIE
COMMUNICATIONS EDITOR

The function of a UHF-TV converter is, no kidding, to convert! It accepts a signal on a UHF-TV channel (14-83) and heterodynes it to VHF-TV channels 5 or 6. The output channel is "user's choice." In areas where there is a usable signal on Channel 5, the converters are set up for output on Channel 6. Where local service is on Channel 6, the converters gravitate to Channel 5. Where neither Channel 5 nor Channel 6 are in use, you'll find a random mix of converter output frequencies.

These things exist by the thousands in areas where the first (or only) reliable television service was on VHF channels. There is a smattering of UHF-TV converters elsewhere. They were the easy answer to receiving UHF-TV in its introductory phase. Fortunately, they are on the way out, since the "All-Channel TV Tuner" makes them unnecessary. But, since large numbers were already in service before the "better mousetrap" appeared, it will be years and years before the last of the pesky things hit the trash can.

Ordinarily, we're not too concerned with the products of the consumer side of the electronics industry, but some UHF-TV outboard converters can almost qualify as transmitters! The injection source can and does radiate. In some cases, it is a potent source, indeed. For some combinations of UHF-TV channel being watched and VHF-TV channel being output, the converter's oscillator falls in our UHF bands (406- 420 MHz, 450-470 MHz and 470-512 MHz). This makes it our business! A radiating converter "sounds" like a fairly "clean" carrier, unmodulated, and just stable enough to be miserable if it happens to rest within a channel on which you try to receive. Occasionally, you detect a frequency modulated trace of modulation by the sound which accompanies the received UHF-TV signal. The modulating mechanism is a bit non-conventional--you could call it "shake modulation." A hard-of-hearing viewer runs with volume control wide open; the audio jars the TV cabinet and the insides of the UHF-TV converter sitting thereon.

Not all UHF-TV converters are equally bad at the beginning, and only some of them get worse with age. But, given the concentration which exists in some UHF-only areas, the law of averages guarantees that some will create a problem--given an unfortunate frequency relationship between the UHF channel received, the converter output VHF channel and your operating frequency. Knowing the UHF channels in use, you can predict the approximate frequency of the converter oscillators. Since the boxes can be set up for two output channels, you get two answers. If you know one of the possibilities to represent a VHF-TV channel "in use" in the area, you can strike out one. But, don't expect all of them to be "dead on" the predicted frequency. These $49.95 wonders aren't frequency standards! They don't have to be. The user can "soak up" some frequency error with his VHF fine-tuning control. And, don't be surprised if an attempt at confirming measurement is "off" by exactly 10 KHz. Many TV station frequencies are deliberately offset by 10 KHz to relieve co-channel interference in "overlap" areas. Your predictions may suggest some frequencies you want to avoid if you're in the business of choosing channels for new uses. And, if you recognize the UHF-TV converter as a potential interference generator, you'll have a head start when you encounter it for the first time. Unwarned, it will drive you "nuts." To make matters worse, the trace of UHF-TV audio may lead you in the wrong direction!

You can predict the nominal UHF-TV converter oscillator frequency by subtracting the video carrier frequency for Channel 5 (77.25 MHz) and Channel 6 (83.25 MHz) from the video carrier for the UHF channel. Here are the ones which fall within our UHF assignments:

UHF Ch	Conv Output Ch5	Conv Output Ch6	UHF Ch	Conv Output Ch5	Conv Output Ch6
16	406		28	478	472
17	412	406	29	484	478
18	417	411	30	490	484
19		418	31	496	490
24	454		32	502	496
25	460	454	33	508	502
26	466	460	34		508
27	472	465			

Reprinted from the February 1977 issue of the IEEE Newsletter of Vehicular Technology Group.

TIGHT BUDGET CONTROLS PAY OFF

Surpluses have been achieved in four major areas of IEEE's 1976 budget, thanks to efforts of the volunteer officers and staff. Unaudited results indicate budget surpluses have been met--and exceeded--in the areas of Institute operations, Group/Society funding, and the United States Activities Board. IEEE's investment portfolio has also offered a favorable return for the year.

Based on a preliminary analysis of this excellent performance for 1976, IEEE's 1977 Treasurer, Robert D. Briskman, forecasts no dues increases for 1978, providing that no program changes are implemented which would require additional funding. Details of the 1976 budgetary surpluses can be found in February Spectrum.

CAN SOVIETS SEND ELECTRICITY - WIRELESS?

It is possible the Russians have learned how to transmit electric power without use of wires. For months now, mysterious Russian electronic signals have been disrupting worldwide communications, and a number of Canadians who have been monitoring the signals are speculating that the Russians may have accomplished that feat. The Canadians contend that the Russians may be experimenting with a long-disused process developed by Nikola Tesla, the Yugoslav inventor who died in 1943.

In what he considered his most important discovery, Tesla in 1900 proved that the earth could be used as a conductor of electricity and would be as responsive as a tuning fork to electrical vibrations of a certain pitch. His experiments succeeded in lighting 200 electric lamps from a distance of 25 miles without wires. Some use was made of his process for many years in Canada.

Tesla gave a number of possible uses for his equipment, including power transmission, geological exploration, national defense and weather modification. His work was never completed, and his ideas remain in his notebooks which are in the Tesla Museum in Belgrade.

Fueling the Canadians' speculation is a report that a Soviet scientist - so far unidentified - spent several months in Quebec occasionally interviewing Tesla's last known living assistant, Arthur H. Matthews.

Questions concerning the possibilities of the Russian experiments were brought to the Canadian Department of Communications last winter by Andrew Michrowski, who had been working with a Canadian senator on the question of resurrecting Tesla's experiments as a means of alleviating some electric energy problems in eastern Canada.

W. W. Scott, director of operations at the department, said that after Michrowski's request for help, all nine of the agency's listening posts were asked to analyze the Russian signals. By this time, however, the Russians, in response to a barrage of complaints primarily from other European governments, had begun to limit the duration of the transmissions that were causing the interference.

Scott said it was determined that, although the signals originated several thousand miles east of Canada, the monitoring stations noticed that the same signals were heard coming around in the opposite direction - from the west - with greater intensity a half hour later.

The signals were heard in the high frequency bands - anywhere from 3 to 30 megahertz (one megahertz is one million cyles per second). Tesla's experiments were on very low frequencies - ranging from about 6 to 100,000 cycles per second. Scott said it was theorized, then, that the Russian transmissions may have been harmonics - multiples - of very low frequency transmissions. Scott said that on at least one occasion Canadian technicians observed the signals coming from two different locations-both of them apparently close to one another - at the same time.

U.S. scientists working with the Canadian group seem to give credence to the view of what the Russians may have achieved. One of them is Dr. Andrija Puharich, of Ossining, NY, a onetime physician who gave up medical practice some years ago and has devoted the past 25 years to a study of Tesla's work and electronics experimentation.

Puharich would not rule out the possibility that the Russians may be using Tesla's theories for weather modification. "I think they have a lot of reason to do it," he said, pointing out that the Russians would like to push their cold, arctic air mass elsehwere - perhaps toward America - and increase their own agricultural growing seasons. According to persons knowledgeable about Tesla's theories, weather modification would be accomplished by regulating the movement of electrically charged particles in the upper atmosphere resulting in changes in the jet stream.

PENTAGON CONCERNED OVER BLUE COLLAR/WHITE COLLAR PAY

The Pentagon has expressed serious concern over the growing inequities between the federal white-collar and blue-collar pay systems. The restrictions on white-collar pay raises in recent years while blue-collar salary increases are unhampered and considerably larger has caused serious administrative problems not only in Defense but also in the rest of the government's departments and agencies.

In recent years, blue-collar pay raises have far outstripped those of white-collar employees. The result is that blue-collar journeymen are often making more money than their white-collar bosses and junior engineers and scientists. Efforts of agencies to get blue-collar workers to transfer to the white-collar pay system so they can be "promoted" to technical and professional positions have been stymied. The employees balk because what in previous years would have been considered a legitimate sought-after promotion would actually mean a lesser salary for them.

EMC TRANSACTIONS CONTENTS

EMC-20 (FEBRUARY), PART II

SOUTH KOREAN EVANGELIST LURES SCIENTISTS

Over 400 scientists, social scientists and philosophers attended a three-day International Conference on the Unity of the Sciences (ICUS) in Washington recently. The meeting, whose theme was "The Search for Absolute Values," drew several representatives from the physical sciences whose attendance caused a few raised eyebrows since it was sponsored by South Koren evangelist Sun Myung Moon.

Although Moon has figured in influence-peddling scandals here and has stated that he intends to capture the world, the scientists indicated that they did not take him too seriously.

ENGINEERS STILL IN DEMAND

Year after year, the good times and bad, the demand for qualified engineers has held up well. If there's any sign of change, it points to even wider opportunities in the field. Vincent Luber, placement coordinator for Illinois Institute of Technology, came up with a few hard facts and figures for young potential engineers:

- Engineering graduates received 6 percent of all bachelor of science degrees awarded in the United States, according to the 1975-76 survey by the College Placement Council. But those same people received 50 percent of all job offers from large employers recruiting on college campuses. Luber calls that "a very startling statistic."

- Over the last two decades, the national unemployment rate for engineers never rose above 3.2 percent. That peak occurred during the 1969-70 cutback in the aerospace industry.

- Today, the unemployment rate for all engineers is somewhere around 2 percent. For those with advanced degrees, it is well under 1 percent.

- The Labor Department recently predicted that 25 percent more engineering and technical jobs would open up over the next 15 years.

Starting salaries now roughly average $1,250 a month for those with a bachelor degree, $1,450 for those with a master's degree. Traditionally, 80 percent of all engineers have gone directly into jobs with their bachelor degrees -- a pattern that's expected to continue. But the demand for advanced degrees is growing gradually, and many companies now subsidize further education for staff engineers.

TVI FROM OVERHEAD POWER LINES

The Southeastern Michigan Section of IEEE and the Power Engineering Society will present the PES Tutorial Course, "RI and TVI Sources from Overhead Power Lines," on October 28-29, 1977. Two nationally recognized experts in the field, Marv Loftness from Capitol Cable Consultants and Pat Buller from Utah Power and Light, will be principle speakers. The second day will feature a "hands-on" field demonstration of various manufacturers' equipment. Participants are encouraged to bring their own equipment for demonstration purposes. A registration fee of $50 for IEEE members and $60 for non-IEEE members will apply. For additional information, contact Ed A. Hansen, Detroit Edison Co., 200 Second Ave., Detroit, MI 48226; Tel.: 313-237-7148.

NATIONAL RADIO SCIENCE MEETING

6-9 November 1978
University of Colorado, Boulder, CO

CALL FOR PAPERS

This open scientific meeting is sponsored by the U.S. National Committee for the International Union of Radio Science (URSI). It is being held in cooperation with the IEEE Societies and/or Groups on: Antennas and Propagation, Circuits and Systems, Electromagnetic Compatibility, Geoscience Electronics, Information Theory, Instrumentation and Measurements, Microwave Theory and Techniques, and the Nuclear and Plasma Sciences.

The following USNC/URSI commissions will hold sessions: COMMISSION A (on Electromagnetic Metrology, COMMISSION B (on Fields and Waves), COMMISSION C (on Signals and Systems), COMMISSION D (on Physical Electromics), COMMISSION E (on Interference Environment), COMMISSION F (on Wave Phenomena in Non-Ionized Media), COMMISSION G (on Ionospheric Radio), COMMISSION H (on Waves in Plasmas), COMMISSION J (on Radio and Radar Astronomy).

Please submit the original typed abstract and four readable Xerox copies. The deadline for receipt of this material, mailed to T. E. Mode, The Electromagnetics Laboratory, Dept. of Electrical Engrg., Univ. of Colorado, Boulder, CO 80309, is 31 July 1978. Do not submit any material that has not been fully cleared by your organization or sponsor.

NUCLEAR EMP MEETING

FIRST CALL FOR PAPERS

The 1978 Nuclear EMP (electromagnetic pulse) Meeting (NEM 1978) sponsored by the IEEE Albuquerque Chapter Joint AP-S, S-MTT, G-EMC, and the Dept. of Electrical Engineering and Computer Science of the Univ. of New Mexico, will be held at the Univ. of New Mexico campus on June 6-8, 1978. This, like the one in 1973, will cover the broad spectrum of nuclear EMP related topics, including an assessment of the state-of-the-art (theory and applications), as well as a look into the future, including SGEMP, in and out of source region.

Subject areas of interest for this conference include: Environment, Simulation Technology, Measurement Techniques, Interaction, System Level Testing, System Hardening Technology.

Unclassified papers are solicited describing original work, which can be analytical, numerical, experimental and/or applications oriented. Although any papers dealing with nuclear electromagnetic pulse related matters will be considered, the above subject areas are regarded as particularly appropriate for this conference.

Authors are requested to submit a one-page abstract, original plus five copies, by February 15, 1978 to: B. K. Singaraju, AFWL/DYC, Kirtland Air Force Base, Albuquerque, NM 87117.

AFWL TO HOLD MEETING

The Air Force Weapons Laboratory (AFWL) will be holding a meeting following NEM 1978 on 9 June 1978 at which technical papers may be presented which cannot be separated from classified information. Any subject area related to nuclear electromagnetic pulse which would be appropriate for presentation at NEM 1978 except for its classified nature may be considered at this meeting. The requirements for the unclassifield abstracts are identical to those submitted for NEM 1978.

The highest level of classification which will be considered for presentation is Secret-Restricted Data. Should an author feel that it is absolutely necessary that his paper include Critical Nuclear Weapons' Design Information (CNWDI), he should call the Classified Meeting Chairman at the AFWL at 505-264-0506 prior to submitting his abstract.

Authors and those individuals who desire to attend these meetings at the AFWL should send their visit requests no later than 1 May indicating at least a Secret security clearance to: AFWL/DAAS, Attn.: A. Jones, Kirtland AFB, NM 87117, referencing the AFWL Meeting Following NEM 1978.

Unclassified abstracts for the classified meeting (one page, original plus 5 copies; see NEM 1978 Call for Papers) should be submitted by 1 March 1978 to: Capt. John A. Gaudet, AFWL/ELT, Kirtland AFB, NM 87117/

LIGHTNING STRIKES AGAIN

By A. K. "Kenny" GUTHRIE
COMMUNICATIONS EDITOR

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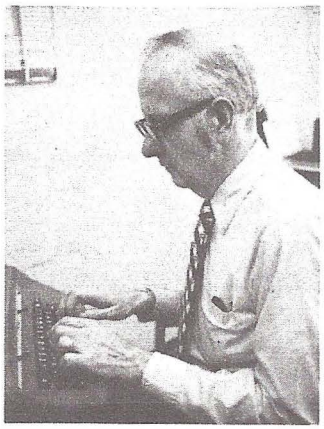

Anyone with more than a smattering of intellectual curiosity can find rewarding outlets for it in the two-way radio business. Time and again, my interest is captured by some sidetrack which leads off the mainstream of daily problems and opportunities, and I find myself delving into other people's fields of specialty. The most recent, and probably the most interesting, is brought up by the practical necessity to protect land-based two-way radio equipment from the damaging effects of lightning. Only a little digging exposes an entire industry, with its own language, disciplines, literature and "sacred cows" which responds to similar concerns. We have much in common with the Lightning Protection Industry.

This industry has a father--Benjamin Franklin, the noted inventor/statesman. He published the basics of lightning protection in POOR RICHARD'S ALMANACK in 1753. Ben's approach is still recognized as valid! It involves: air terminals (the modern term for "lightning rods") which collect lightning strokes, interconnecting cables (which Ben called "middling wires") which tie terminals at the same elevation together; then comes down conductors which convey the stroke current to earth, and ground connections which dump the stroke current into earth. The entire system is a massive shunt. It protects structures by directing potentially damaging current to a safe direction.

The lightning protection industry publishes a wealth of "how to" information which is useful to we in the two-way radio field. Conductor material and size, grounding techniques, solutions to mechanical problems, etc., have been refined for more than 200 years, and it's all written down. Two current publications are especially useful:

* Underwriters' Standard UL96, Installation Requirements, Master Labeled Lightning Protection Systems, issued by Underwriters' Laboratories, Inc., 207 E. Ohio Street, Chicago, IL. 60611

*Installation Code LPI-175, published by Lightning Protection Institute, Room 205, 35 N. Ayer St., Harvard, IL. 60033

Our problems and those of the lightning protection industry are the same but different! To them, our tower is an air terminal which can help protect nearby structures, if handled correctly. To us, we're putting antenas on something they might consider to be a glorified lightning rod--and we want the antenna and everything connected to it to survive every stroke which comes our way!

Our interests and those of the lightning protection industry converge on occasion. When we put an antenna support structure on or near a structure which has an engineered lightning protection system, it's time to get together. Our appurtenances, unless properly handled, can "louse up" the lightning protection. We may not hurt it technically, but its likely that we'll foul things up administratively! Lightning protection installations are often certified, subjected to official inspection, and taken into account in setting insurance rates. Unauthorized and uninformed tinkering can create big problems later when something goes wrong, and help keep the courts loaded to capacity! Metal masts on a protected building must be bonded to the main conductor of the lightning protection system, using a "main-size" conductor. This is the same size they use in their installation. It's big...bigger than #4 solid copper or 1/4" cable with strands no smaller than #17 AWG. When a tower is adjacent to a protected building, it needs a main-size bond to the lightning protection system in addition to normal grounding treatment. Any new metal which we locate within 6 feet of a lightning protection down conductor must be bonded to it.

We can gain a number of valuable tips for our handling of grounding conductors from the lightning protection industry literature:

1. Air terminals (equivalent to our towers) should be grounded in two directions.

2. Grounding runs are routed downward or horizontally--never upward.

3. Grounding conductors must not be kinked; bends must be smooth. No bend can enclose an angle less than 90 degrees. For un-

supported cable, bending radius must not be less than 8 inches. For sharper bends, the cable must be clamped within 3 inches from the center of the bend on both sides. (Great force which may sever the conductor can be developed by high currents at a bend).

4. Grounding conductors should never be run inside conductive pipe or conduit unless absolutely necessary to prevent conductor damage. If run in conductive tubing, the conductor must be bonded to the tube, top and bottom.

The most critical grounding point in most radio systems is at the base of the tower. After all, the tower is the tallest thing in the area and, therefore, most likely to intercept a lightning stroke. And, every ampere delivered to earth at this point is one amp which will never damage the radio gear! The minimum grounding one should consider for a tower is mentioned in EIA Standard RS-222. It calls for the following as a minimum: Two (2) driven ground rods, 5/8" x 8', adjacent to the tower on opposite sides, each bonded to the nearest leg or the metal base with a lead no smaller than #6 copper, and a similar rod, located at and bonded to each guy anchor.

These recommendations are reasonable when you deal with reasonable soil conductivity, such as with moist clay soil. When soil conductivity is poor or non-existent, the typical radioman is out of his element and needs some expert advice. The most readily available source for local guidance is the grounding expert within the local power utility or telephone company.

Tower grounding protects the radio gear. It also protects the tower itself. Stroke current has blown concrete tower and anchor foundations right out of the ground! This can convert a nice looking tower into an unsightly pile of scrap metal, scattered all over the surrounding real estate! Ground rods should be kept at least two feet from concrete foundations. The ground rod at the guy anchors should be bonded to each guy on the tower side of the turnbuckles to avoid subjecting these devices to unusual strain.

The literature is silent about "what to do" when a tower is mounted atop a building not equipped with a lightning protection system. Since my inquiry to two people active in the lightning protection industry brought the same recommendations, I feel safe in passing them on to you.

For an unguyed antenna support, run two (2) "main-size" conductors, each bonded to the tower, down opposite sides of the building to independent protection ground rods. Bond at least one to the building water piping, and be sure that AC neutral is bonded to the same water piping system.

For a guyed antenna support, each guy must be picked up at each anchor and interconnected with the grounding network. This may be done with perimeter wiring which connects the anchors together and connects to the downleads at the crossover points. Or, one might take a separate cable from the tower to each anchor (where it's bonded to each guy), and extend it over the side to a protective ground.

The article in the Newsletter for July, 1975 is full of "hints & kinks" which work. With improved practices in grounding and running grounding connectors, they'll work even better.

AWARDS PRESENTED AT SEATTLE SYMPOSIUM

The annual G-EMC awards presentation was made at the Seattle Symposium Awards Luncheon. A Certificate of Appreciation was awarded to Don Heirman of Bell Telephone Labs in recognition of his work as Intersociety Relations Chairman in organizing EMC sessions in several conferences during the past two years. Don also serves as an Ad Com member and as Chairman of the New Jersey Coast chapter. The Certificate of Achievement was presented in absentia to Ralph E. Taylor for his leadership in the Space Program application of EMC technology and the investigation of electromagnetic environment. Due to the activities associated with his daughter's wedding, Ralph was unable to attend the symposium.

A Certificate of Acknowledgement was presented to Len Carlson of Boeing for his dedicated service as 1977 Symposium Committee Chairman responsibile for the smooth management of this very successful meeting in Seattle.

John J. O'Neil Jr., recently retired as EMC Team Leader at Ft. Monmouth, was made an Honorary Life Member of the Group. This was awarded in appreciation of John's dedicated service over a period of years as member of Ad Com and as group treasurer. In addition John has provided valuable and effective liaison between the military and the EMC community.

The 1976 Chapter-of-the-Year award was made to the Washington, D.C. Chapter. It was received for the Chapter by George Hagn of SRI International, who served as Chapter Chairman in the first half of the year, and Tom Doeppner of General Research Corporation, who filled the last half of the year as Chapter Chairman. Al Paul of the FCC and Bill Duff of Atlantic Research Corporation are also listed on the certificate as officers during 1976.

INSTITUTIONAL LISTINGS

The IEEE Electromagnetic Compatibility Group 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.

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 R. M. Emberson, The Institute of Electrical and Electronics Engineers, Inc., 345 East 47 Street, New York, NY 10017.

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