

# IEEE

# ELECTROMAGNETIC COMPATIBILITY GROUP



# NEWSLETTER

ISSUE NO. 95

FALL 1977

EDITOR: ROBERT D. GOLDBLUM

## EDUCATION COMMITTEE

An introduction is in order. I am Ken Exworthy, Engineering Manager of the EMC Department at Medtronic, Inc. I have worked in EMC for the last three years out of a total career of 20 years in Electrical Engineering. Our group works with external and implantable medical devices, doing EMC testing and serving as a resource for consumer EMI inquiries.

I accepted the G-EMC Education Committee Chairmanship last spring and will report on its activities in the Newsletter. Presently, there is work being done in three areas:

1. Feasibility of producing a college level course on EMC. This has been suggested and outlined by Tom Herring.
2. Encourage educational opportunities at the G-EMC Symposium. These are being set up by the Atlanta Symposium Committee for 1978.
3. Publish advance notice of educational opportunities so that managers and others can budget and otherwise plan for people to attend.

Presently, I am aware of three areas where EMC related course material is available:

- Don White Consultants, Inc. produces a series of 16 courses which are presented at various geographic locations, and will also produce seminars to be held at a customer facility. No 1978 schedule is available at this time, but information on courses to the end of 1977 may be requested by calling 301-948-0028.
- George Washington University periodically offers courses on EMC, lightning and antennas. Information may be requested by calling 800-424-9773.
- The IEEE Education Activities Board offers an EMC course which is available to IEEE sections or other organizations. Call 201-981-0060, Ext. 174 for information.

If you have or come across information of an educational nature which could be of help to others, please call me at 612-574-4970.

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.

Second class postage paid at New York, N.Y., and additional mailing offices.

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## AVAILABLE EMC FILMS

MN10932A, "Review of EMC." This is a basic tutorial film on EMC. This film starts with a dramatic example of an accident caused due to EMI and goes on to discuss the frequency spectrum and how it is shared, the DoD EMC program and the basic types of interference phenomena.

MN10932B, "Build in EMC." EMC control programs developmental life-cycle and EMC. This is a basic, tutorial film.

MN10932C, "Shielded and Anechoic Chambers." This film discusses measurements and demonstrates problems with open field testing use of shielded rooms or anechoic chambers. Goes through an excellent explanation of types of shielding and shielding requirements.

MN10932D, "Receiver Susceptibility." Discusses what causes susceptibility, how to test for it, and how to reduce it. (EMI Control Techniques) Higher technical level than films A and B; however, it is still basic information. It discusses adjacent channel EMI, non-linear effects, intermodulation and cross- goes over general requirements of MIL-STDs 461 and 462; and demonstrates a receiver being tested to 462.

MN19032E, "Operational EMC." Leans toward showing how proper maintenance contributes to EMC, the major portion of the film is aimed at demonstrating the importance of maintenance. The types or sources of interference are shown.

MN19032F, "EMI Control Methods." Discusses the proper uses of filters and shielding, good tutorial discussion of filters and their application to EMI control.

MN19032G, "Theoretical Aspects of EMI." Discusses predicting of possible EMI in a projected EM environment, problems for designers to avoid, frequency sharing and management, power restraints, time sharing, etc. (Tends to push narrowband as a preferred technique, could be said to date film, basic discussion is still good.) This film also discusses various noise sources such as arc welders, power lines, vehicles, atmospheric and so on. It also goes into a discussion of basic fourier analysis.

MN19032H, "EMC Program Considerations." This is a cartoon with the message of building in EMC prevents EMI.

In addition to the above, there are four films on the subject of lightning. For additional information, contact Jackie Janoski, ECAC, North Severn, Annapolis, MD 21402.

## SHORT COURSE ON LIGHTNING TECHNOLOGY

A short course on lightning technology will be held at the George Washington University, Washington, DC, on November 21-22, 1977. This course is designed for engineers, managers, scientists and others who need a better working knowledge of the characteristics of lightning and the most effective means of protection against it. The presentation is non-mathematical in nature and is designed for those who have a limited background in the field. A significant portion of the course is devoted to methods of protecting telephone and power lines, as well as buildings and equipment. Accordingly, grounding and bonding methods are treated in depth. This course will be of special value to technical personnel from telephone and power companies, as well as to broadcasters and all others who are engaged in radio and cablecommunication in any of its various forms. The fee for the course is \$250. For further information, please write to the Director, Continuing Education, George Washington Univ., Washington, DC 20052, or call 202-676-6106.

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## CHAPTER OF THE YEAR AWARD

A Chapter of the Year Award has been established by the Ad Com to recognize outstanding performance by a Chapter organization in serving its members and in establishing goodwill for the Group. One award will be made each year at the G-EMC Symposium for the one year period ending on December 31. The Award will be in the form of a suitable certificate, in multiple, to be presented to each elected officer of the Chapter. Reporting of the chapter activities for scoring purposes will be coordinated with chapter reporting to the EMC Group Newsletter. The scoring report will only be accepted in written form with a 50 point bonus for reports received on or before the established due dates.

The new scoring schedule is presented below.

1. CHAPTER MEETINGS AND TECHNICAL ACTIVITIES  
Credit 100 points multiplied by the percentage of listed chapter members in attendance.  
Credit 100 points multiplied by the ratio of non-members in attendance to listed chapter members of record according to the IEEE Headquarters reports issued during the award period. Dinner, luncheon, field trip and lecture series meetings shall be counted.
2. SPECIAL EVENTS  
Credit 100 points for the sponsorship of a G-EMC Symposium and 50 points for joint sponsorship of a technical symposium.  
Credit 25 points for a social meeting.  
Credit 25 points for joint sponsorship of a meeting.
3. CHAPTER NEWSLETTER  
Credit 25 points for each issue.
4. G-EMC NEWSLETTER REPORT  
Credit 25 points for each report filed before the deadline. This report will include Chapter of the Year point scoring information.
5. AWARDS PROGRAM  
Credit 25 points for an awards program to recognize outstanding service at a chapter level.  
Credit 25 points for participation in the G-EMC Awards Committee.

## 6. MEMBERSHIP

Credit 200 points multiplied by the percentage of increase or decrease in membership of the Chapter for the calendar year. This may be a negative value.

## 7. ADVANCE PLANNING

Credit 25 points when a complete annual program is issued to each chapter member before the first meeting is held.

The final scoring will be made by the Awards Committee on the basis of written reports received by the G-EMC Newsletter chapter news editor before established deadlines. Consideration may be given to unusual circumstances or activities of the chapters. The judgement of the Awards Committee will be considered final.

## AWARDS PRESENTED AT MONTREUX

Several awards were presented at the EMC Symposium in Montreux on June 29, 1977. A certificate Citation for outstanding leadership in promoting the international exchange of EMC technology was presented to Jim Toler, G-EMC President; Jim Hill, G-EMC International Affairs Committee Chairman; and Herb Mertel, SAE Workshop Organizer. The presentation was made by D. F. E. Borgnis, Montreux Symposium Chairman.

Dr. Borgnis was also the recipient of a plaque and gavel presented to him by Mr. D. E. Hinton, IEEE Vice President and Chairman of the International Electrical and Electronics Conference and Exposition held in Toronto September 26 to 28, 1977.

## SYMPOSIUM SNAPSHOTS

On the following pages are a number of pictures taken during the 1977 International EMC Symposium held in Seattle during the first week of August. The originals are in color and are of excellent quality, taken by our Newsletter photographer, Fred Nichols. However, in order to fit as many persons as possible into the newsletter, they had to be cropped, crimped, and edited. Still, out of 81 photographs provided by Fred, only 37 could be used because of space limitations. Our thanks to Fred Nichols for his excellent photography.



1977

# SYMPOSIUM SNAP SHOTS











by  
G. R. Redinbo

The following article was written by Dr. Jamie Chapman who is founder and President, Terrestrial System, Inc. He has had extensive theoretical and practical experience with the radiation of very short pulses.

## WALSH FUNCTIONS AND RADIATED FIELDS

### Introduction

During the past decade, increasing attention has been given to the mathematics and physics associated with Walsh function antenna currents and the resulting radiation fields. This interest has been sustained by developments in semiconductor technology which have permitted the experimental realization and verification of the basic theoretical concepts. In turn, the availability of experimental results permitted the incorporation of further detail into the theoretical models. Most recently, these refined models have led to the development of increasingly sophisticated and sensitive instruments for the launching, detection, and processing of the radiation fields associated with Walsh function antenna currents.

Fortunately, space does not permit here a thorough review of the evolution of the theory and technology, nor, unfortunately, of the many contributors. A brief bibliography is provided at the conclusion of this note as a starting point for further information in this area.

Here we pursue a much more limited objective, namely, to explore the basis for radiation from Walsh function antenna currents and to indicate a few areas where these concepts may be applicable.

### Walsh Functions and Binary Waveforms

Walsh functions form a mathematically complete and orthonormal set of two-valued or binary functions. Of significance for the present discussion is the consequence that any binary waveform may be described, or synthesized, in terms of the Walsh function set. This permits us to concentrate upon the simplest binary waveform, the square wave of period  $T$ . This function has the two features required for the present discussion, namely, a set of leading edges (defining the transition from current  $I_0$  to current  $I_1$ ) and a set of trailing edges (defining the transition from current  $I_1$  to current  $I_0$ ). For an ideal and thus experimentally unrealizable square wave, the current transition times (the edge rise and fall times) are vanishingly small.

### Binary Antenna Currents and Radiated Fields

We consider first the radiated electric field  $\vec{E}_r$  resulting from the passage of a time-varying current  $I(t)$  through a geometrically linear antenna which is electrically non-dispersive and non-reflective. If

the linear antenna element is infinitesimally small, then the connection between the element current  $I(t)$  and the radiated electric field  $\vec{E}_r$  is that of a derivative:

$$\vec{E}_r = k \frac{dI}{dt} \hat{n} \quad (1)$$

The factor  $k$  includes geometric and radial distance effects, while the unit vector  $\hat{n}$  describes the electric field polarization. Retarded time effects are ignored and it is assumed that the electric field is observed in the plane whose normal is the unit vector  $\hat{n}$ . The relationship of eqn. (1) between an ideal square wave antenna current and the radiated

CURRENT  
 $I$



DERIVATIVE  
 $\frac{dI}{dt} \propto E_r$



electric field is illustrated below. We thus see from this simple model that the radiated fields resultant from the propagation of an ideal square wave current along an antenna of infinitesimal length take the form of unipolar pulses of vanishingly-small time duration. The polarity of the electric field pulses is determined by the slope of the associated current transition. From this model we may infer the connection between any Walsh function antenna current and the resulting sequence of electric field pulses.

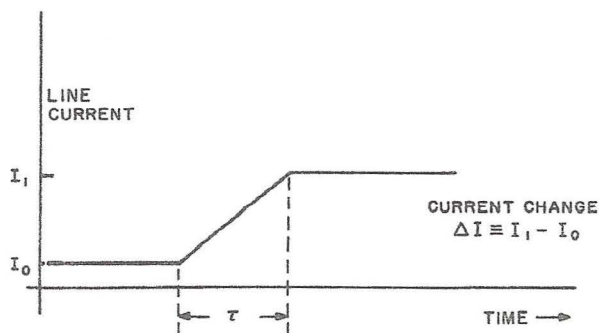
### A More Realistic Model

Next we inquire if we can extend this idealized model to include the effects of 1) a finite antenna element length, and 2) antenna currents of essentially binary form, but having transitions with finite rise- and fall-times. An array of such elements is shown in Fig. 1.

Such is indeed the case if we continue the remaining simplifications. However, we must now view the antenna element as a transmission line having characteristic impedance  $Z_0$  and propagation velocity  $v$ . For an antenna element of length  $L$ , the one-way propagation time  $t_L$  for a current transition launched at one end of the line is given by the expression

$$t_L = L/v. \quad (2)$$





If we assume that the current transition has the form of the linear ramp sketched below, then the width  $\Delta t$  of the radiated electric field pulse is the average of the element propagation time  $t_L$  and the transition width  $\tau$ :

$$\Delta t = (t_L + \tau)/2. \quad (3)$$

Thus we see that the inclusion of a finite element length  $L$  and a finite current transition time  $\tau$  into our previous model has the effect of broadening the delta function result of the first model into a radiated electric field pulse which depends upon the element and transition lengths as well as upon the strength of the transition (defined as  $\Delta I/\tau$ ).

The propagating transitions of the current waveform (from current  $I_0$  to current  $I_1$  and vice-versa) are responsible for the radiated electric fields. The physical basis for this is that the transitions locally accelerate the current charge carriers, which results in radiation.

#### Some Experimental Results

The results of these models have been experimentally verified through the construction of radiating structures similar to that shown in Fig. 1. Shown in Fig. 2 are oscilloscope traces which illustrate the connection between the edges of binary antenna current waveforms (i.e., Walsh functions) and the resulting radiated field.

The upper photograph of Fig. 2 was taken with low time resolution (1 usec/div). The upper trace shows the current waveform with two transitions, an initial 0 to 1 transition and a later 1 to 0 transition. The lower trace shows the radiated electric field as measured with a separate broadband antenna and receiver.

The lower photograph of Fig. 2 was taken with increased time resolution (10 nsec/div), and compares the leading edge of the 0 to 1 current transition with the corresponding radiated electric field.

#### Implications and Applications

The simple shape and short time duration (a few nsec or less) of these pulses imply a large spectral occupancy. The spectrum extends from a few MHz to an upper band edge whose value is proportional to the reciprocal of the pulse width  $\Delta t$ . That is, the energy of these pulses is extremely broadband in nature and can extend from a few MHz to a GHz or more.

If the antenna current is a square wave with period  $T$ , then the power spectrum of the radiated pulse sequence is a line spectrum with the spectral peaks spaced in frequency by the value  $1/T$ . The overall shape and envelope of the power spectrum is determined by the shape and time duration of the individual pulses or pulse pairs.

The relationship between the current and the radiated waveform together with the pulse temporal and spectral properties suggest a number of applications.

In view of the connection between the current and the radiated waveforms, we can understand the concern of the FCC, VDE, and other regulatory agencies with EMI from switching regulator power supplies. There are also implications for data security in digital computer installations.

The short duration and simple shape of the radiated pulses form the basis for high resolution, time-domain radar applications. These include systems for the discrimination of low-flying targets against various types of background clutter, the measurement of ocean wave height spectra from aircraft platforms, and subsurface geological remote sensing.

Other applications include non-interfering communications systems and area surveillance systems. A further interesting possibility is the direct measurement of the transfer function of conventional wideband electromagnetic detection systems. In this application, the transfer function would be the voltage vs time waveform resultant when the antenna is illuminated with a delta function-like pulse of suitably short duration.

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J. C. Chapman  
Terrestrial Systems, Inc.  
Lexington, Massachusetts





# BOOK REVIEWS

## BOOK REVIEW

by Jim Hill, RCA Service Company

Again, this month, our column is shared by a review of a book on sequency theory and one on the more mundane matter of electromagnetic field coupling problems. The sequency theory book review came in on a volunteer basis from Professor Ahmed of Kansas State University. As associate editor for Walsh Functions of the EMC Transactions, he is well qualified as a reviewer of sequency theory literature.

The book on coupling problems of EM fields

is reviewed by Dr. Bernhard Keiser, well known consulting engineer and EMC course instructor at George Washington University. We have some correspondence from Mr. Sidney Frankel of Menlo Park, California, announcing that he has authored a book, "Multiconductor Transmission Line Analysis", to be published by Artech House in October or November. This book also deals with EM coupling to transmission lines. We promise a review of Mr. Frankel's book in a coming issue of the Newsletter.

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"COUPLING OF EXTERNAL ELECTROMAGNETIC FIELDS TO TRANSMISSION LINES" by Albert A. Smith, Jr. 132 Pages, \$14.50 clothbound John Wiley and Sons, New York/London/Sidney/Toronto

Reviewed by: Bernhard E. Keiser, Consulting Engineer-Keiser Engineering, Inc. Vienna, Virginia

The coupling of an electromagnetic field to a transmission line is known by every EMC engineer to be one of the means by which interference can be transferred from radiated to conducted form. Thus, the subject matter is one of significant interest in the EMC community.

While providing a thorough mathematical treatment of the subject, the author also gives the reader some highly useful numerical information in the form of curves based upon the equations presented. Some of the curves may be useful in preliminary esti-

mates of the magnitude of a problem. An accurate solution then can be obtained by knowing the significant geometrical dimensions of the circuit and by using suitable computational facilities.

The book should be most helpful to those who deal with the coupling of electromagnetic fields to transmission lines and to wires and who need effective techniques to solve these problems. Because most electromagnetic sources and susceptible conductors can be modeled in terms of their physical behavior, Smith bases the coupling equations on a transmission-line theory formulation.

An interesting facet of the book is the inclusion of a methodology for solving nonuniform electromagnetic field problems, as encountered in the close proximity of loops and wires.



The book is well suited to the solution of a wide variety of coupling problems. Systems engineers and circuit designers with interests in numerical solutions will find abundant application data in the form of solved examples and spectrum profiles. The electromagnetic specialist will find sufficient theoretical details for the solution of a wide variety of problems.

The book is readily understandable by anyone familiar with transmission line theory and field theory. The reviewer regards it as a valuable addition to his technical library.

SEQUENCY THEORY: FOUNDATIONS AND APPLICATIONS by H.F. Harmuth;

Academic Press, 1977; 505 pages.

Reviewed by N. Ahmed, Department of Electrical Engineering, Kansas State University - Manhattan, Kansas 66502

The notion of sequency theory was introduced by Dr. Harmuth about a decade ago. At the first meeting on sequency theory in May 1968 in Darmstadt, West Germany, the idea of using nonsinusoidal electromagnetic waves was essentially ridiculed. However, in January 1976, the first useful application in radar was demonstrated. The eight years in between have had their trying moments for Dr. Harmuth. But his persistence and dedication have led to some stimulating developments, some of which have been controversial. However, in this reviewer's opinion, the controversial aspects have contributed to many intriguing discussions in the scientific community.

Dr. Harmuth's latest book commences with a rigorous treatment of the mathematical

foundations associated with sequency theory. This is followed by an excellent chapter on electric filters - both one and two-dimensional. The related two-dimensional filter applications which are discussed are: (i) television picture processing, and (ii) acoustic image generation. Television bandwidth compression systems that have been developed in Japan, United Kingdom, United States, and West Germany are included. Again, starting with the fundamentals of acoustic imaging, the author presents an extremely interesting development of image generation system which involves a hydrophone array and a related processor.

Chapter 3 is devoted to the study of electromagnetic waves in general time variation. Both radiation and reception aspects are discussed. Certain interesting applications are included - e.g. radar and mobile communications. Some of the pioneering work of Dr. Harmuth related to the reception of nonsinusoidal waves is also included in this chapter.

The last chapter is titled "Concepts of Communications Applied to Physics." Motivated by the fact that Walsh-Hadamard spectrometers have been developed, the author commences with a discussion related to the decomposition of light into Walsh waves. That is followed by sections which discuss the Schrodinger, Klein-Jordan, and Dirac difference equations. The last section of this chapter is essentially an appendix which presents some mathematical supplements.

The book has a large number of illustrations, and the publisher has done a fine job of presenting the same.

This reviewer has no hesitation in recommending this book to researchers in the general area of communications and signal processing.



# CHAPTER CHATTER

The full effects of the usual Summer Slump are upon us - only a few chapters reporting and not very much news from most of those!

## Chicago

Jim Krystansky is attempting to re-activate the Chicago Chapter. Fred Nichols has written him a most encouraging letter, of which your Column Editor received a copy. There may be some sort of EMC get-together during MIDCON which would help to kick-off the re-activation. Best of luck, Jim; and let's hear about the developments.

## Central New England

Chairman John Clarke reports in with news of CNE Chapter's plans for '77/'78. They cosponsored a meeting with MTT, EMB and AES on 18 September. Topic: "Microwave Radiation Hazards in Perspective"; presented by Dr. J. M. Osepchuk of Raytheon, who is MTT's National Lecturer. (We hope to have details on this meeting for the Winter NL). Newsletter Editor Bob Goldblum is scheduled to be the speaker at the 19 October meeting, discussing "EMC Overview Including MIL-STD-461B Status". John notes that this will be both timely and of great interest to EMC members and guests. Plans for subsequent meetings include talks on shielding, IEMCAP, high-voltage line interference, MIL-STD-499 and EMP/lightning. The chapter may also participate in a Nuclear EMC seminar similar to the one held in November '76.

## New Jersey Coast

Via Jack Rubin, who was in Orlando for a design review of one of Martin Marietta's programs, came a report that this Chapter also had its first meeting of the '77/'78 season on 18 September - no details; but we'll have them for the Winter issue.

## Baltimore/Annapolis

The first IEEE Baltimore/Annapolis EMC meeting will be held at Westinghouse Defense & Electronics System Center, Baltimore, Maryland on Tuesday, 7:00 P.M. October 18. The subject of the meeting is an overview of Westinghouse products and a tour of the Environmental Laboratory facilities. The host is Al Roberts.

The Baltimore/Annapolis Chapter officers for 1977/78 are:

Chairman:	Carl C. Allen
Vice Chairman:	William D. Stuart
Program Chairman:	Jacqueline R. Janoski
Secretary:	Hugh Maddocks

The Chapter is off to a good start with the program largely prepared for the year.

## Special Notice to the Chapter Chairmen listed below:

Just because your Chapter may not be having regular meetings or may be in a state of low activity doesn't mean that your Chapter Chatter Editor isn't anxious to hear whatever news there may be to publish. Did any of your members attend Montreux and/or Seattle? Have any of them presented papers or talks at meetings of IEEE or other organizations? Have any of them received any special recognitions for accomplishments in EMC or other areas? All of the above (and similar) news is of the nature which should be appearing in this column.

SEND IT IN!!

Thomas Hassett	Tucson
Carl Jespersen	Phoenix
Jim Lambert	Seattle
Steve Garcia	Philadelphia
Bob Hanna	Los Angeles



by Charles F. W. Anderson



Ollie Jouffray	Texas
Tony Zimbalatti	New York Metro
Gerard Capraro	Mohawk Valley
David Chang	Boulder
Carl Baum	Albuquerque

The above listings are for Chapters I have not heard from for some time. If there are any corrections, please let both Jim Toler and me know, so that our records can be updated. AGAIN: Please send in the news!

#### Region 8 EMC Chapter Status Report by Jim Hill

Mr. Dieter Hohmann, Region 8 Chapter organizer, has reported on the results of his organizational activities. In June a letter was sent to 142 G-EMC members in Region 8. The letter proposed to form the chapter as a loosely grouped community of G-EMC members within Region 8 with communication by correspondence and with the collection and dissemination of information provided by way of the G-EMC Newsletter and/or circular letters. In addition Region 8 Chapter meetings could be organized within Region 8 jointly with EMC-related symposia and conference that are also sponsored by IEEE.

As of July 15, 1977 seventeen responses were received. Twelve of these signed a petition for the formation of the chapter. This does not yet suffice to establish a chapter. If more replies are received it may be possible to go ahead with some type of organization. This activity, although rather small may generate interest in recruiting new members for G-EMC and even for IEEE. Already 25 Montreux Symposium participants have expressed an interest in IEEE, G-EMC, and a Region 8 chapter activity.

Pending approval of the G-EMC Administrative Committee, Mr. Hohmann has plans to form a loosely-grouped community of Region 8 G-EMC members which could be termed "Region 8 G-EMC Member Liaison". Members of this liaison group could provide information on national and local EMC-related events and publications which could be included in the G-EMC Newsletter, possibly as a Region 8 news section under "Chapter Chatter".

Mr. Hohmann offers his own office as the headquarters of the Region 8 G-EMC Membership Liaison where there can be a clearing house for literature and information on meetings and EMC-related activities open to any interested G-EMC members. This will provide a larger basis for IEEE G-EMC support for future EMC symposia in Europe.

Members who have not yet responded to the chapter organization letter should send their comments to:

Mr. Dieter B. Hohmann  
Preusserstr. 1a  
D-2000 Hamburg 52,  
West Germany  
Tel: (040)880 71 19

#### Washington

The Washington Chapter held its opening meeting of the 1977-78 season on September 23, 1977, with a talk by Dr. Larry Campbell on "Fiber Optics for the Control of EMI." The attendance was 39. Dr. Campbell discussed fiber transmission, cabling, connectors, light sources, detection and sensors. Special awards were presented to Mr. Ralph Taylor of Goddard Space Flight Center and also to the 1976 officers in recognition of the Washington Chapter having received the Chapter of the Year Award. Future meetings will be held on November 17th, January 19th, March 16th and May 18th.



## SPACE VEHICLE SPECIFICATIONS

Several military specifications and standards issued for space vehicle applications have been in use for several years with generally good results. In the case of the specifications and standards for electronic equipments for use on space vehicles, a preliminary technical review has just been completed. As a result of this review, revisions are proposed to correct deficiencies in the documents, to relax requirements where possible, to clarify requirements to reduce ambiguities, and to make editorial corrections. In addition, changes have been proposed to allow the tailored applicability of the documents to launch vehicles, injection stages, reentry vehicles, and to ballistic missiles. This is possible because many electronic equipment requirements for these vehicle types are the same or the requirements can be stated in ways that "self tailor" to an application. The intent of the proposed revisions is to document current requirements and practices that have been found to be cost effective for major SAMSO space and missile programs. These requirements can then serve future procurements as a framework of applicable requirements or for comparison of alternative proposals or for tailoring to less stringent program requirements. In any case, the consistent use of the same requirement documents would seem to be advantageous both to the contractors and to the government.

The proposed revisions are:

- A. MIL-W-83575A "Wiring Harness, Space Vehicle, Design and Testing" dated 4 April 1977
- B. MIL-E-8983C "Electronic Equipment, Aerospace, Extended Space Environment, General Specification for" dated 6 April 1977
- C. MIL-STD-1541A "Electromagnetic Compatibility Requirements for Space Systems" dated 5 April 1977

They are currently at different stages of informal coordination, with MIL-STD-1541 being the least coordinated of the three. They will undoubtedly be separated as they enter formal coordination and certainly will be published at different times. A combined technical review of the three documents, however, seems to be a desirable logical step at this time. This will enable the reviewer to make comments in the context of the total requirements package for space avionics as well as comment on individual documents or sections of a document, as may be appropriate.

An attempt was made to make the scope of the documents include more of the requirements that are common to missiles, launch vehicles, injection stages, and reentry vehicles, as well as space vehicles. For example, general requirements for an EMP environment have been added. These are self tailoring to various applications since EMP requirements would not apply if the vehicle design re-

quirements did not include an EMP environment.

The major technical changes in MIL-W-83575A and reasons are:

- A. Relaxed requirements were included in areas of circuit isolation (3.4.3), mockup (3.4.4), routing (3.4.5), connectors (3.6), splices (3.7.3), and environmental testing (4.2.7).
- B. Changes in (3.4.1) Circuit categories. A minor realignment and redefinition of the various subcategories was made to be consistent with current electromagnetic compatibility practices. Table I was added to clarify and summarize the categories and shielding requirements.
- C. Changes in (3.4.2) Terminations and shielding. Minor changes and clarification of shielding requirements were made to be consistent with current electromagnetic compatibility practices. Requirements both for wire and shield terminations were added. Clarification of shield grounding requirements was included.
- D. Changes in (4.2) Acceptance testing. A contact retention test for connector pins or sockets has been added (4.2.1). A contact separation force test has also been added (4.2.6). These tests are necessary to assure the proper assembly of the connectors. An acceptance test criteria has been added (4.2.8) to avoid any misunderstandings.

The major technical changes in MIL-E-8983C and reasons are:

- A. The incorporation of changes resulting from the last Tri-service coordination cycle.
- B. The inclusion of appropriate references to other space vehicle standards that have been published since the B issue such as MIL-STD-1540 testing requirements, MIL-STD-1541 EMC requirements, and MIL-STD-1543 reliability requirements.
- C. A clarification that military specification parts were referenced to limit the variety of physical parameters and not to impose lower quality than required by the mission. Part selection and control requirements were, therefore, deleted from MIL-E-8983C and listed as a requirement to be separately specified in the contract or detailed specification.

The major technical changes in MIL-STD-1541 and reasons are:

- A. The standard has been completely reorganized and rewritten in such a way as to identify the requirements and background for the requirements



in more concrete terms. System and equipment engineering requirements for analyses have been directed toward achieving electromagnetic compatibility in a predictable, timely and economical manner and are given greater emphasis.

- B. The content has been structured to enable making use of the developments arising out of the DoD Intra-system Analysis Program, but with emphasis on the use of analytical methods rather than on particular computer programs. The way in which the analyses are structured and performed remains optional.
- C. Test methods peculiar to this standard have been gathered in a separate section, and a new section on quality assurance has been included.
- D. Requirements for safety margins are defined in terms of the criticality categories of MIL-E-6051.
- E. Safety margins are required to be provided with any combination of variational effects and certain failure conditions.
- F. Safety margins are required to be satisfied after superposition of narrowband and broadband interference at all significant ports for a critical system function.

#### CHANGES TO MIL-F-15733

The preparing activity, Aeronautical Systems Division has requested that cancellation notices be issued for the below listed military specification sheets:

- A. Filters, Radio Interference, Style FL37, Sheet MIL-F-15733/32 dated October 6, 1972
- B. Filters, Radio Interference, Style FL38, Sheet MIL-F-15733/33A dated July 10, 1975
- C. Filters, Radio Interference, Style FL 34, Sheet MIL-F-15733/34 dated December 27, 1972
- D. Filters, Radio Interference, Style FL30, Sheet MIL-F-15733/35 dated December 27, 1972
- E. Filters, Radio Interference, Style FL31, Sheet MIL-F-15733/37A dated July 10, 1975
- F. Filters, Radio Interference, Style FL43, Sheet MIL-F-15733/47C dated June 8, 1976
- G. Filters, Radio Interference, Style FL47, Sheet MIL-F-15733/50F dated December 19, 1975
- H. Filters, Radio Interference, Style FL32, Sheet MIL-F-15733/52B dated November 7, 1975

#### EJC, NSPE ADOPT RESOLUTIONS ON THE SERVICE CONTRACT ACT

The following is a resolution passed by the members of EJC at their January 29th meeting in Puerto Rico, the NSPE resolution adopted by the Executive Committee at their January 17th meeting and their earlier resolution, passed in the summer of 1976, is also attached.

#### NSPE Statement on the Employment of Engineering and Technical Personnel on Government Service Contracts

The Board of Directors of the National Society of Professional Engineers being particularly concerned with serious deficiencies in legislative and procedural acts applying to the utilization of engineering and technical manpower through government contracts and which inflict discriminatory and unfair penalties in many instances, herewith expresses its position by the following:

1. NSPE condemns the applications of law or regulations which unfairly and discriminately penalize engineers and other technical personnel by economic and other pressures incurred under current competitive procurement and service contracts developed by the government.
2. The NSPE Board of Directors directs that appropriate resources of the Society be expended forthwith individually and cooperatively with other concerned organizations to secure modification of existing laws and procedures and the introduction of new legislation and other remedial measures to secure a level of economic protection for engineering and technical personnel employed through government generated contracts commensurate with that provided by the normal compensation patterns for other professional employees.
3. NSPE efforts shall be continuing and fully expressive to the public and the total engineering community as to its long standing interest and efforts in this matter on a long and short range basis and, thusly, its expertise and knowledge will continue to guide the direction of corrective effort.

Moved by Director Middleton, seconded by Director Alpern, that the Board adopt the proposed statement on the Employment of Engineering and Technical Personnel on Government Service Contracts.

Moved by Director Birdwell, seconded by Director Forrster, that the motion be amended to add in Item 2 following the words "other concerned organizations" the words "particularly IEEE and AIAA." Failed.

Following indications of satisfaction with actions to date and the desire to show continued activities to remedy the situation, original motion to approve statement carried.



1978 IEEE-MTT-S  
INTERNATIONAL MICROWAVE SYMPOSIUM

FIRST CALL FOR PAPERS

The 1978 IEEE MTT-S International Microwave Symposium will be held at the Chateau Laurier Hotel, Ottawa, Canada, within view of the Parliament Buildings.

Papers are solicited describing original work, not published or presented previously, which can be theoretical, technological or application oriented. Although any papers concerned with microwave techniques, devices, systems and applications will be considered, the following subject areas are regarded as particularly appropriate for this conference.

- Computer Aided Design and Measurement Techniques
- Biological Effects and Medical Applications
- Satellite Communication
- Microwave Acoustics
- Digital Techniques at Microwave Frequencies
- Submillimeter and Millimeter Wave Techniques
- Ferrite Devices
- Filters and Passive Components
- High Power Techniques
- Low Noise Techniques
- Integrated Optics, Fibre Optics and Optical Techniques
- Field Theory and Network Theory
- Technology Forecasting and New Ideas

Concurrently, the IEEE Conference on Precision Electromagnetic Measurements and the International Microwave Power Institute Symposium will be held in Ottawa. Joint sessions are being planned with IMPI in the area of biological effects and medical applications of microwaves.

Authors are requested to submit both 35 word abstracts and a 500-1000 word summary (up to six illustrations), clearly explaining their contribution, its originality, and its relative importance. For anonymity of review, please identify author(s) only on the cover sheet. Abstracts and summaries (5 copies) must be received on or before January 7, 1978 by:

Dr. Willem Steenart  
TPC 1978 MTT-S Symposium  
Electrical Engineering Department  
University of Ottawa  
Ottawa, Ontario, Canada K1N 6N5

Notices of acceptance or rejection will be mailed to authors by March 5, 1978. At that time, authors of accepted papers will receive forms and instructions for preparing material to be printed in the Symposium Digest.

CALL FOR PAPERS  
1978 IEEE INTERNATIONAL SYMPOSIUM  
ON  
ELECTROMAGNETIC COMPATIBILITY  
JUNE 20-22, 1978

Authors are invited to submit papers describing new developments in theory, concepts, methodology and applications in EMC. Session topics are listed below; however, papers in other EMC areas may also be submitted. Only original unpublished papers will be accepted.

EMC in Transportation Systems  
EMC in Computing Systems  
EMC in Consumer Electronic Systems  
EMC in Military Electronic Systems  
EMC Measurements  
EMC Program Management  
EM Environments  
EM Analysis/Prediction/Modeling  
Biological Effects of EM Exposure  
EMP/Lightning Phenomena  
EMC in Power Systems  
EMC in Medical Electronic Systems  
EMC in Spectrum Management  
EMC in Communication Systems  
EMC Control Techniques  
EMC Standards/Specifications  
Static Electricity/Space Charge  
TEMPEST (Unclassified)  
Inductive Coupling  
EM Materials

Prospective authors should submit both a 35-50 word abstract and a 500-750 word summary (up to six illustrations) that clearly explain their contribution, its originality, and its relevance to the EMC discipline. For anonymity of review, please identify author(s) only on the cover sheet.

Upon acceptance, authors will receive forms and instructions for preparing material to be printed in the Symposium Record.

AUTHOR'S SCHEDULE

Abstract & Summary (3 copies required)

Deadline: December 1, 1977

Notification of Acceptance, By February 1, 1978

Full Photo-Ready Manuscript

Deadline: April 1, 1978

Submit Abstracts/Summaries to:

H. W. Denny  
Technical Program Committee Chairman  
P. O. Box 77167  
Atlanta, Georgia 30357  
404-894-3536

For more information, contact:

J. C. Toler  
General Chairman  
P. O. Box 77167  
Atlanta, Georgia 30357  
404-894-3964



FIRST ESTEC SPACECRAFT EMC SEMINAR  
CALL FOR PAPERS

The First ESTEC Spacecraft EMC Seminar will take place on 24-25-26 May 1978 at ESTEC, Noordwijk (Netherlands).

The purpose is to:

- review progress in Spacecraft EMC design and test
- stimulate discussion on common problem areas
- document experience, new techniques and publish standards and works of reference.

Papers are solicited on the following topics:

1. LESSONS LEARNED  
Particular and technologically interesting design and test problems, and their solutions on existing projects.
2. TECHNOLOGY  
Bonding. Grounding. Shielding. Harness. Interface circuits. Filters. Conductive coats. Lightning protection, etc.
3. ANALYSIS AND PREDICTION  
Electromagnetic. DC magnetic. Electrostatic. Conducted. Error analysis.
4. COMPUTER PROGRAMS  
Experience. Flexibility. Data Collection. Prediction errors.
5. TEST METHODS AND FACILITIES  
Set-ups. Instrumentation. Electrostatic tests. Test areas. Interpretation of requirements. Feasibility of testing performance requirements. Errors.
6. EMC SPECIFICATIONS AND STANDARDS  
Specified format and content. Specified levels. Advantages/disadvantages of existing standards. Proposed changes.
7. MANAGEMENT  
Management/engineering interface. Effect of EMC on cost and schedules. EMC education of engineers in other disciplines.

Prospective authors must submit extended abstracts containing at least 500 words plus relevant figures and captions, with indications of author's affiliation, mailing address, telephone and telex numbers of the principal author. Those abstracts selected by the Selection Committee will be published in a Preprint. Deadline for receipt of abstracts: 1st November 1977.

All mail must be addressed to the Seminar Organisers:

A. For general topics, and design & analysis:

Mr. J.F. Purchase  
ESTEC  
Spacecraft Power Supplies Division  
NOORDWIJK  
The Netherlands, Tel:(0)1719-82792

B. For testing topics:

Mr. H. Bachmann  
ESTC  
Testing and Engineering Division  
NOORDWIJK  
The Netherlands, Tel:(0)1719-82501

IEEE OFFERS ONE-DAY WORKSHOP ON "CAREER/  
LIFE WORK PLANNING"

The Continuing Education Department of the Institute of Electrical and Electronic Engineers, Inc. (IEEE) announces a workshop entitled "Career Life Work Planning". This workshop will be given at the following locations:

State	City	Date
Florida	Orlando	12/19/77
Florida	Cape Canaveral	12/20/77
Illinois	Chicago	11/4/77
Maryland	Baltimore	1/21/78
New Jersey	Rutgers	3/10/78
New York	New York	10/1/77
New York	New York	2/10/78
Pennsylvania	Philadelphia	3/11/78
Virginia	Reston	10/29/77
Virginia	Reston	12/17/77
Virginia	Roanoke	1/20/78
Washington	District of Columbia	2/11/78
Washington	Seattle	11/17/77
Wisconsin	Milwaukee	11/5/78

The course is designed to help all people at all levels to become more effective on the job by setting goals and finding ways to reach those goals. The instructor is John Crystal who has taught under the auspices of many U.S. Government institutions including the U.S. State Department, U.S. Office of Education, N.A.S.A., and the U.S. Forestry Service.

For further information and enrollment, contact: Mrs. Lorraine Castiglia, 445 Hoes Lane, Piscataway, N.J. (201) 981-0060 ext. 175.

Course Fees: IEEE member - \$40.00; non-member - \$60.00; IEEE student - \$25.00 employed member - \$20.00

TECHNOLOGY ASSESSMENT

Executives both in private industry and public agencies say they are finding technology assessment to be an increasingly important planning tool and policy guide, a Congressional report reveals.

In hearings conducted by the Congressional Office of Technology Assessment (OTA), several business leaders indicated they make use of this analytical technique to better understand the future business environment. Also, some government agency officials employ TA analysis and findings in part in response to a "growing emphasis on bringing the future into sharper focus."



## ADCOM HIGHLIGHTS

### GENERAL

Mr. Ken Exworthy had accepted the Chairmanship of the AdCom Educational Committee, and will be presenting his new ideas on education to the membership.

Mr. Andrew Nalbandian had accepted the Chairmanship of the AdCom Nominations Committee, and will be presenting his new ideas on nominations to the membership.

There were five IEEE TAB Special Committees to which Groups and Societies could designate representatives. These Committees were:

- The Coordinating Committee on Energy
- The Environmental Quality Committee (EQC)
- The Committee on Social Implications of Technology (CSIT)
- The Committee on Technological Forecast and Assessment (TFA)
- The Committee on Man and Radiation (COMAR)

The EMC Group has previously designated representatives to the EQC and TFA. The President, Jim Toler, requests suggestions from members as to Group designees to the remaining three committees be forwarded to him. Another committee on Electronic Materials had also extended an invitation to the Group to appoint a liaison representative, but the extent of Group interest in this committee is yet to be determined.

The Joint Telecommunications Advisory Committee (JTAC), formerly the Joint Technical Advisory Committee, had advised Dr. Emberson (IEEE Hdqtrs.) of a vacancy on the Committee, and the desire for closer alliance with the EMC Group. Nominations

to fill this vacancy were requested from the Group. The JTAC is now solely supported by the IEEE. The President, Jim Toler, and Secretary, Len Thomas, will discretely select the names of four Group members, taking membership (JTAC) constraints into consideration, and forward them to Mr. Sidney Metzger, the present JTAC Chairman, for their consideration.

The recent aircraft disaster on the Canary Islands was discussed, and it had been suggested that a possible cause of the accident was radio frequency interference to communications. It was the consensus that the Group should obtain a copy of the official report on this accident in order that a study could be made to determine if RFI was involved.

Interest was expressed in setting up an EMC Symposium in the Pacific Area, and that 1982 might be an appropriate date. The difficulty in getting government personnel to attend foreign technical meetings was recognized; however, it was observed that military dominance in the EMC field was on the decline and that the Group should continue to sponsor overseas

symposiums. Suggested locations were Tokyo and Hawaii. Mr. Cory was requested to look into the feasibility of Group sponsorship of an EMC Symposium in the far-Eastern area and contact with Bob Ford for ideas was suggested.

### SYMPOSIUMS

It was noted that Canadian EMC standards were in a state of flux, and that new standards being issued were similar in many respects to present CISPR Standards. This was causing great concern among American manufacturers who have Canadian branches, wherein they were being asked to conform to new standards they have no knowledge of. Mr. Heirman was requested to correspond with Mr. Liddell of the Phillips Company in Canada and relate to him the Group's opinions expressed at this meeting and our desire to cooperate with him for our mutual benefit.

Mr. Exworthy, newly appointed Chairman of the Committee on Education, proposed that all information on education, which would be of interest to Group members, be coalesced into one area for quarterly review; that EMC-related topics be integrated into college courses of study; and that his Committee be the one point-of-contact in the Group for information on education. He proposed to use the Group Newsletter for publicity, publishing information on tutorial papers and EMC sessions at conferences.

1978 - Mr. Toler, Chairman of the 1978 EMC Symposium to be held on June 20-22 in Atlanta, GA, reported that all Symposium Committee chairmanships had been filled, and Committee meetings were being held. The major activity was developing the Symposium Master Calendar.

1979 - Mr. Nichols reported that planning was proceeding for the 1979 EMC Symposium to be held after Labor Day, probably during the first or second week in October in Southern California, tentatively in San Diego. Key Symposium Committee Chairmen had been identified, and a second tentative budget had been prepared. Mr. Nichols raised the matter of holding cocktail parties in conjunction with Symposiums.

1980 - Miss Janoski reported that planning was proceeding satisfactorily for the 1980 EMC Symposium to be held in Baltimore on October 7-9. Regular Symposium Committee meetings were being held.

1981 - Mr. Cory stated he was advising the Boulder/Denver Chapter that an EMC Symposium to be held in Denver was approved, and that the tentative budget and identification of the Symposium Committee Chairman and Committee members was requested by the AdCom.

1982 - Mr. Doeppner submitted the proposal to hold the 1982 EMC Symposium in Washington, DC, possibly early in the year. His



proposal included a tentative budget and the naming of the Chairman of the Symposium Committee. He stated that many of the members of the 1976 EMC Symposium Steering Committee had indicated a desire to serve on the 1982 Symposium Steering Committee. It was voted to designate Washington, DC as the site of the 1982 EMC Symposium.

1983 - Mr. Cory suggested that the 1983 EMC Symposium be held in Honolulu, and if there were sufficient interest in the suggestion, he would pursue it further by contacting both the Honolulu Chamber of Commerce and Bob Ford, Chairman of the AdCom Pacific Area Committee to determine what policies exist with respect to holding a symposium in Hawaii. Several questions were raised, including whether government or industry representatives would travel to Hawaii to attend. During the discussions, other locations were suggested, including Tokyo. Mr. Cory's proposal received slightly less than enthusiastic support.

#### IEEE GOOD GOVERNMENT GROUP

A number of members of the Institute of Electrical and Electronics Engineers (IEEE) have announced the formation of the IEEE Good Government Group, or IEEE/GGG. According to a press release of July 8, 1977, the activities of the IEEE/GGG are solely concerned with identifying and endorsing the best available candidates for IEEE President, Vice President and Director. The group will not be involved with candidates at the Society or Section levels. No member of IEEE/GGG will be a candidate for Institute-wide offices.

A Steering Committee consisting of C. C. Cutler, Paul E. Gray, William R. Newlett, John Pierce, M. E. Van Valkenburg, and F. Karl Willenbrock will coordinate IEEE/GGG activities. Dean Willenbrock of the School of Engineering and Applied Science at Southern Methodist University is Secretary of the Committee.

The first candidate endorsed by IEEE/GGG is Dr. C. Lester Hogan, a petition candidate for IEEE Executive Vice President. Other candidates for IEEE offices may be endorsed after appropriate investigation.

The published goal and platform of this organization is as follows:

**GOAL:** To strengthen the leadership of the IEEE by identifying, endorsing, and actively supporting the best available candidates for president, vice presidents, and directors.

**PLATFORM:** The goals of the IEEE are to serve its members and the society of which they are part.

The activities of the Institute should assist its members to reach their technical

objectives by providing technical information and educational services, and to reach their professional objectives by improving the environment in which they practice their profession.

The Institute serves society primarily by increasing the technical competence of electrical and electronics engineers through the dissemination of technical information and also by improving the profession so that the members have satisfying and continuing career opportunities.

To attain its goals and to provide its members with quality technical and professional services, the Institute needs able leadership. It should seek those who have demonstrated their capabilities in both their technical and professional careers, as well as those who are sensitive to society's needs.

In order to assist the members of the Institute to identify the most able leaders, we propose to seek and endorse candidates for positions as officers and Directors of the Institute.

For additional information on this group and a list of members, contact: Dr. F. Karl Willenbrock, Dean, School of Engineering and Applied Science, Southern Methodist University, Dallas, TX 75275; Tel.: 214-692-3051.

#### IEEE TAD USING UNIVAC 1108

A computer has joined the staff of IEEE's Technical Activities Department at Headquarters. Useable through the end of 1977, and renewable thereafter, is a general-purpose local Univac 1108, available to the staff on a time-shared basis. The decision to renew or not to renew will depend on whether IEEE's Piscataway Service Center IBM 370 computer's capabilities are to be enhanced next year. Meanwhile, over 90 percent of the general utility and software capabilities of the Jet Propulsion Laboratory have been obtained for IEEE use at no cost. And Technical Activities Staff Director, Narendra Dwivedi, who came to IEEE from JPL, is hard at work automating staff functions that once were extremely time consuming.

#### IEEE CONSIDERING MEMBERSHIP LOAN PLAN

The IEEE is considering endorsing a membership loan plan developed by Commercial Credit Corp. The plan is designed to meet the needs of those members who require unsecured loans with long repayment schedules. For instance, a \$10,000 loan for 60 months would be available at a 14 per cent annual rate. Persons who feel that such a plan would be of benefit to our members should express their opinions by post card or letter to: Mr. John J. Guarrera, Vice Pres. Professional Activities, IEEE, 2029 K St., N.W., Washington, DC 20006.



# EMC PERSONALITY PROFILES

by William G. Duff



DONALD R. J. WHITE

Don White is well known to most members of the EMC community and to many others who are concerned about EMI. Since 1970, Don has been President of Don White Consultants, Inc. In this capacity, he personally has been responsible for authoring and publishing a number of Handbooks on EMC and for teaching and instructing over 2,000 students worldwide on EMC Design, Measurements, and Control. His recent publications included a six volume series on EMI/EMC, and he is currently in the process of publishing a 42 Volume Encyclopedia on EMC/EMI. Don's efforts as an EMC educator have been instrumental in helping many others to appreciate and understand EMI problems and to achieve EMC.

Don received his academic training from the University of Maryland. He received the B.S.E.E. and M.S.E.E. degrees in 1948 and 1953, respectively.

Following his graduation, he worked for the Naval Research Laboratory for several years. Next, he worked for ACF and AMF for several years each. In 1959, he accepted a position as Vice President, Director of Research, for Frederick Research Corp. In 1961, Don formed White Electromagnetics, Inc. and he served as President until he formed his present company, Don White Consultants, Inc., in 1970.

Don's career has involved working in all areas of EMC/EMI including:

- Consulting on EMC design and EMI control
- EMC consulting on industrial, commercial and military weapon system
- EMC design on rapid transit, tanks, ships, aircraft and spacecraft systems and equipments
- EMI prediction, analysis, design and retrofit



- EMI and TEMPEST instrumentation and test procedures
- Communications-electronics system design and analysis
- Electromagnetic warfare and SIGINT (ELINT & PESM)
- Electromagnetic mathematical modeling and simulation
- EMC teaching and instructing over 2,000 students worldwide

He has presented 76 papers at symposiums and seminars and has had 44 papers published in trade journals. Don has authored and published the following books:

- "Electrical Filters - Synthesis, Design and Applications," 1962
- "Methods and Procedures for Automating RFI/EMI Measurements," 1966
- Six Volume Series on EMI/EMC covering: Specifications, Standards & Regulations, Instruments, Test Methods, EMI design and Control Techniques
- "Electromagnetic Shielding and Performance," 1975
- "EMI Control Methodology and Procedures"

In addition to pursuing a busy career, Don also has found time to be very active in the IEEE and other societies. He is a senior member of the EMC, A&P, MT&T, and other professional groups. Don is Past National Chairman of the EMC Group, 1963; Past National Chairman of the Third Annual Symposium on EMC, 1961; and Past Chairman on EMC Site Surveying Measurement Techniques. He received the IEEE Pioneering Award on EMC Automation. Last, but not least, Don is a Registered Professional Engineer in the District of Columbia.

The EMC community certainly owes Don a debt of gratitude for his many contributions to the field.



## DR. OTT TRANSFERS INSTITUTE TO BUFFALO

Dr. John N. Ott, author of "Health and Light" and Chairman and Executive Director of the "Environmental Health and Light Research Institute" of Sarasota, Florida, transferred his Institute to Buffalo, New York, now the "Center for Light Research" at Roswell Park Memorial Institute. After the move, Dr. Ott retired and now spends his time writing and visiting other institutions on speaking engagements.

Until they have sufficient resources, they will limit activities to studying the effect of fluorescent lighting on the general health condition, reproduction, body and organ weights, and enzyme levels of mice, and also tumor inhibition in rodents with and without chemotherapy. The effect of light on specific pathogenic organisms usually affecting cancer patients also will be studied. The lamps to be used for these various studies are black UV, blue, green, yellow, pink, red, Chroma 50 (a full spectrum lamp), and Cool White (limited to the blue-green spectrum).

Dr. Ott still remains active in the fields of environmental light and radiation hazards. He has been asked by Representative Paul Rogers of Florida to contact persons who have completed research in the area of radiation hazards so that they might be invited to testify before the spring hearings of the House Subcommittee on Public Health and Environment of which Rep. Rogers is chairman. Allowable radiation safety levels again will be examined and Rep. Rogers plans to review reports from six major medical centers that have studied the effect of light and radiation on tumor development. Ott is concerned that testing of TV sets both by public and by private organizations indicates that approximately 20-25 percent of the units emit measureable amounts of X-rays.

## IEEE PRESS WELCOMES PROPOSALS FOR NEW BOOKS

With 45 titles already in print, the IEEE PRESS is attaining the stature of an established book publisher. PRESS books, which for the most part are carefully edited collections of reprinted papers, have been well received, particularly by the IEEE membership.

The PRESS Editor and his Editorial Board are constantly on the lookout for new Books of Selected Reprints, especially on subjects that are of wide interest to the profession. Book proposals, either from individuals or from Groups or Societies, are always welcome. Such proposals should be submitted on a standardized form, copies of which are available from

the Managing Editors, IEEE PRESS (345 E. 47th St., NY, NY 10017).

Each proposal for a new book is reviewed carefully by the IEEE PRESS Editorial Board and by others to determine the need and marketability for the book and to ascertain its likely quality. Books on most subjects require the endorsement and sponsorship of the appropriate IEEE Group or Society, so a proposal normally should be submitted to the proposed sponsor before or at the same time it is submitted to the IEEE PRESS.

Any reader wishing a copy of a brochure describing the books published so far should request one from the Managing Editor of the IEEE PRESS at the address shown above.

## IEEE SHORT COURSE

### APPLIED PRINCIPLES OF COST-EFFECTIVE CONTROL OF INTERFERENCE AND HAZARDS (IN THE NON-MILITARY DOMAIN)

COURSE DURATION: Two Days

FOR WHOM INTENDED: The course is primarily intended for engineers concerned with the prevention of interference and hazards in civilian systems (industrial controls, transportation, etc.) where the emphasis is on cost. It is also of value to engineers concerned with military EMC, but not to rigid minds.

A B.S. in Electrical Engineering is required as a prerequisite.

COURSE OBJECTIVE: In contrast to conventional EMC courses, prepared by military-oriented engineers, this course responds to the growing problems of EMI imparted by solid-state devices in modern systems. Emphasis is on results for job safety in civilian systems (as opposed to military), impulsive, incidental noise, and the circumventing of pitfalls. It is devoted to the principles and theory as related to unsuspected customer problems.

TEXTS: Guide for the Installation of Equipment to minimize Electrical Noise Inputs to Controllers from External Sources. IEEE, Industrial Application Society (noise guide) and selected IEEE reprints and notes neoteric notes.

COURSE INSTRUCTOR: Dr. H. M. Schlicke, IEEE Fellow and President of Interference Control, Fox Point, Wisconsin.

For additional information, contact: Manager of Continuing Education, IEEE, 445 Hoes Lane, Piscataway, NJ 08854; Tel.: 201-981-0060, Ext. 174.



## RF ENERGY AND WEAPONS

This comprehensive engineering handbook discusses how to protect explosives and related items against electrical hazards. The components used for control, timing, sensing, initiation, and other functions in most of the modern weapon systems are electrical in nature. Power to operate the systems is supplied from electric sources, and the explosive components which are used to perform a multitude of functions are electroexplosive devices (EED's); i.e., they are electrically initiated. While many advantages have been gained by the use of these systems, EED's are susceptible to malfunction and degradation as a result of spurious electric signals if the systems and components are not properly protected.

The combined natural and man-made environment which can serve as a source of spurious signals is at an all-time high and is still increasing. As a result, the engineer designing a weapon system must not only consider the effects of such natural phenomena as lightning and electrostatic charge, but also man-made electric sources such as unwanted circuit transients and radio frequency energy originating from communication equipment, radars, transmitters associated with weapon systems, and nuclear explosions. System effects produced by these electrical environments can vary from partial failures of components resulting in changes in their characteristics so that they no longer function properly at their design levels, to complete dudding of components resulting

in a failure to operate under any conditions. In the case of the EED, it is possible to have premature initiation, frequently resulting in cataclysmic failure of the system. Furthermore, failures may be produced by spurious signals appearing in portions of the components not considered part of the normal path.

### Handbook contents:

1. Introduction  
Effects of RF, static, lightning, and coupling these into weapon systems
2. Sources of RF, Static, Lightning sources, susceptibility, protection
3. Hardening Concepts
4. Design Techniques - Shielding effectiveness, materials, applications, shipping containers  
Electrical circuitry balance  
Grounding, design and applications  
Component selection, EED's and others
5. Evaluation Techniques
6. MIL-Specs for RFI/EMI  
Applicable specs and compliance
- A. Shielding Effectiveness Formula  
Glossary, Bibliography, Index

There are many specifications related to RF energy, some apply to weapon systems and all of the facts - and much is known - in this difficult field. 300 pages, 160 references. Engineering Design Handbook "Hardening Weapon Systems Against RF Energy," Army Materiel Command, AMCP 706-235, February 1972. Order as AD-894 910 from National Technical Information Service, U.S. Dept. Commerce, Springfield, VA 22151, \$9.00.

## 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.

Service Division, American Electronics Labs., Inc., Richardson Rd., Colmar, PA 18915

EMI/EMC, shield, enc. consult. test. & anal.; Scrm. rm. (incl. for large veh.); Comp. instr. for Mil. EMI test.

SINGER INSTRUMENTATION, 5340 Alia Road, Los Angeles, CA 90066

Computer operated/automatic/manual EMI test systems, EMI meters, antennas, and components.

SPECTRUM CONTROL INC., 152 E. Main, Fairview, PA 16415

Telephone (814) 474-5593

EMC test and consulting VDE, CISPR, MIL 461, FCC. Mfr. RF, filters, RFI capacitors, chips, variable caps—in stock at HALLMARK.

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.