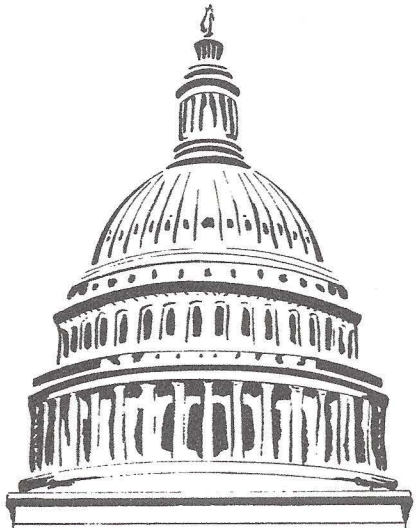
IEEE ELECTROMAGNETIC COMPATIBILITY GROUP

NEWSLETTER

ISSUE NO. 89 SPRING 1976 EDITOR: ROBERT D. GOLDBLUM



1976 IEEE INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

START PLANNING NOW!! JULY 13 TO 16, 1976
SHOREHAM HOTEL, WASHINGTON, D.C.

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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COURT KILLS ANTI-SKID BRAKING RULE

Federal Motor vehicle safety standard (FMVSS) 121, the controversial federal truck braking law, is falling apart, leaving in its wake a confusing judicial tangle. The regulation, which became effective Jan. 1, 1975, for trailers, and Mar. 1, 1975, for trucks and buses, mandated minimum stopping distances within a 12-ft.-wide lane. Compliance with the standard forced truck builders to beef up their front axles so they could better handle the increased strain from shorter stopping distances, and to fit the trucks, trailers, and buses with anti-lock brakes. The systems utilize a computer to sense imminent wheel lock-up, and automatically modulate the systems' air pressure to prevent a skid. The system added up to $1,000 per axle to prices, and truck buyers purchased ahead of the regulation's effective date, first jamming assembly lines, and then worsening the letdown suffered by truck builders as the recession slowed order rates over the last year.

Interference - In its first year of life, about everything that could go wrong with FMVSS 121 did go wrong. The worst performance was given by the complicated electronic anti-lock systems, which often worked when they were not supposed to, or vice versa. Three years ago, truck manufacturers, component suppliers, and electronics experts warned the government that a low voltage wire run the length of a truck trailer might be sensitive to radio frequency interference. As the law took shape, however, the component suppliers backed off, confident that they could adequately shield the systems against radio noise.

They were wrong. One brake supplier tells about a bridge over Chicago's Michigan Ave. that "gives us fits." It seems that this particular steel bridge is in just the right proximity to a nearby radio broadcast antenna to foul up the anti-skid system. Then the citizens band radio, now common on tractor-trailer rigs, can also cause trouble.

(Excerpted from "Industry Week," February 2, 1976.)

Our thanks to Fred Nichols, LMI, for sending us the article.

PERSONNEL CUTBACK MADE IN IEEE ECONOMY MOVE

The IEEE, in an effort to strengthen its financial position, has found it necessary to reduce the personnel of its headquarters staff by about eight percent. Dr. Herbert A. Schulke, Jr., General Manager, in making the announcement, stated that a general reorganization of the Institute has resulted in the separation of approximately 25 executive and supporting staff members out of a total work force of 288. A professional out-placement specialist firm has been retained by IEEE to assist employees in finding other jobs. Comparable professional and engineering societies are being canvassed to seek suitable positions for many of those who are leaving IEEE.

In overseeing the separation process, the personnel office of the Institute is arranging for all employees to receive one week's severance pay for every year of employment, vacation pay for 1976, and maximum continuation of group hospitalization and other health benefits. The aim is to give employees maximum time to straighten out their own personal affairs.

SAE AE4 TO MEET

The next meeting of the SAE AE4 Committee on Electromagnetic Compatibility is May 5-7, 1976, Sheraton Renton Inn in Renton, Washington. May 5th will be a closed-door executive board meeting, but the next 2 days will be open to all interested in attending.

A paper, "The Effects of the Electromagnetic Energy on Humans...What's Safe?" will be given by Dr. Wm. Guy, Director, Dept. of Rehabilitative Medicine, Univ. of Washington, and Pres. Ford's appointee on the Electromagnetic Effects on Humans Committee. John R. Cummings, Mgr. of EMC, McDonnell Douglas Corp. (Astro East) will present a paper, "The Electromagnetic Pollution Epidemic in Hospitals...A Prescription for Medical Electronics."

Featured is the installation of incoming chairman, Jack Moe, being installed by Mr. Phillip Harris Jones, Chrm. of Aerospace Equipment Div., SAE, and member of the Aerospace Council. Mr. Moe will offer the presentation, "The Spirit of '76 - Outline of the Organization of AE4 for the Late 70's."

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MEETINGS & EVENTS

ICC-76 TO HAVE TWO EMC SESSIONS

The International Communications Conference, scheduled for June 14-16, 1976, Philadelphia, PA, will present two EMC sessions as follows:

SESSION 37
EMC-Fact or Fantasy
Wednesday, June 16, 1976, 9:00 A.M. - 12:00 noon
Organizer & Chairman, R. D. Goldblum, R & B Enterprises
Sponsor: Electromagnetic Compatibility Group

37.1: Electromagnetic Compatibility Process (RFI vs. EMI)
Jacqueline R. Janoski, Electromagnetic Compatibility Analysis Cntr.

37.2: Genesis and Evolution of Military Electromagnetic Interference Specs
C. B. Pearlston, Aerospace Corp.

37.3: FCC Domestic Standards for Imported Equipment
H. Garlan, FCC

37.4: RFI As It Concerns the Radio Operator, The Consumer, and The Manufacturers of Home Entertainment Equipment
T. J. Cohen, Amateur Radio Relay League

37.5: The Electromagnetic Environment and The Communications Market
R. R. Goulette, Bell-Northern Research; S. K. Xavier, Bell-Northern Research

SESSION 45
Panel Discussion: EMC Impact of FCC Rules and Regulations
Wednesday, June 16, 1976, 2:00 P.M. to 5:00 P.M.
Organizer & Chairman, P. A. Major, Commander, Ecom, Ft. Monmouth, NJ
Sponsor: Electromagnetic Compatibility Group
Panelists and Topics:

45.1: EMC Consideration in Canadian Microwave Radio Technology
I. Godier, Bell Northern Research

45.2: Impact of FCC Rules and Regulations On Communications Equipment
U.S. Berger, Bell Telephone Laboratories, Inc.

45.3: FCC Regulatory Structure for Radio Equipment
H. Garlan, FCC

45.4: Effect of EMC Analysis on Government Radio Technical Standards

For additional information, contact Dr. R. W. Wyndrum, Jr., Technical Program Chairman, P. O. Box 8357, Phila., PA 19101.

IEEE POWER ENGINEERING SOCIETY TUTORIAL ON EMC

JULY 18-23, 1976
HILTON HOTEL - PORTLAND, OR.

Plans are well underway for a tutorial at the IEEE Power Engineering Society 1976 Summer Power Meeting on the subject of "The Location, Correction, and Prevention of RI and TVI Sources from Overhead Power Lines." The tentative schedule for this tutorial includes:

General Overview of Interference Sources, Complaint Statistics, and Limits - V. L. Chartier, Bonneville Power Administration

Characteristics of RI and TVI Sources - W. Janischewskyj, Univ. of Toronto

Instrumentation and Techniques for Locating RI Sources (up to 30 MHz) - P. E. Buller, Utah Power & Light Co.

Construction Practices - W. R. Nelson and W. R. Schlinger, Southern Calif. Edison Co.

Interference Correction and Signal-to-Noise Ratio Improvement - M. O. Loftness, Bonneville Power Administration (Retired)

Techniques for Training Personnel to Become Competent Interference Locators - W. R. Schlinger, Southern Calif. Edison Co. and P. E. Buller, Utah Power & Light Co.

More detailed information regarding the Tutorial may be obtained from:

Mr. V. L. Chartier
Bonneville Power Administration
P. O. Box 491 - ERJB
Vancouver, Washington 98660
(206)696-0351, ext. 289

GROUNDING OF ELECTRONICS SYSTEMS

Georgia Tech is offering a course on May 11-13, 1976 on the grounding of electronics systems. The course will be taught by staff members of the Electronics Technology Laboratory of the Engineering Experiment Station at Georgia Tech. Contents will include: grounding for personal safety, earth electrodes, EMI control, signal grounding, bonding, shield grounding, testing, measurements, maintenance procedures, and existing standards. Registration deadline is April 30, 1976 and the course fee is $200. For additional information, contact Dept. of Continuing Education, Georgia Institute of Technology, Atlanta, GA 30332.

THIRD ELECTROMAGNETIC COMPATIBILITY SYMPOSIUM - WROCLAW, POLAND SEPTEMBER 1976

The Third International Symposium and Technical Exhibition in the field of electromagnetic compatibility will be held in Wroclaw, Poland, September 22-24, 1976. It will be organized by the Association of Polish Electrical Engineers/SEP, the Technical University of Wroclaw, and the Institute of Telecommunications. Prof. J. Holownia is Symposium Chairman, and Mr. W. Moron, M.Sc.E.E., is Secretary General.

The International Symposium Council and Scientific Program Committee have been formed to provide an international platform for steering the symposium affairs. First under the chairmanship of Prof. W. Rotkieqicz, a past member of CISPR Steering Committee, and the second under the chairmanship of Prof. F. L. Stumpers, vice president of URSI, president of the Region 8 of IEEE and past president of CISPR.

Minister of Telecommunications of Poland, Prof. E. Kowalczyk, is the patron of the Symposium. Associations of Electrical Engineers from many countries as well as international organizations, namely URSI, CCIR, and CISPR are invited to cosponsor it.

The purpose of the Symposium is to promote discussion and allow for the exchange of experience and ideas on traditional radio frequency interference as well as on new problems which arise from the nearly exponential increase of electromagnetic emission into our environment.

The Symposium will cover the following topics: general aspects of EMC, spectrum management, measurement techniques in EMC, man-made noise generation and suppression, immunity of electronic systems, propogation and attenuation of the noise, biological effects of non-ionizing radiation, limits, standards and specifications.

It is hoped that the Technical Exhibition will offer a good opportunity to producers of measuring equipment and suppression devices to present their products to the world-wide community.

Wroclaw Symposium is planned to be a cyclic international event held every two years alternatively with the Symposium and Exhibition on EMC in Montreux, Switzerland which, beginning from 1975, is to be organized every other two years. Coordination between those two events has been initiated.

Registration forms and further information are available from:

Technical University of Wroclaw
EMC Symposium
ul. Wybrzeze Wyspianskiego 27
50-370 Wroclaw, Poland

Deadlines: For papers - March 31, 1976
For registration - June 30, 1976

TRAVEL GROUP BEING ORGANIZED FOR POLISH EMC SYMPOSIUM

The International Symposium on EMC will be held in Wroclaw, Poland on September 22-24, 1976. The organizers of the Symposium are the Technical University of Wroclaw, the Institute of Telecommunication and the Association of Polish Electrical Engineers. It has been proposed that the IEEE Group on EMC also participate and negotiations are underway to this end. The Symposium will offer a truly international platform for contacts and the exchange of ideas and information in the field of EMC, i.e., in studying of the EMC environment status and of interaction between man-made electromagnetic radiation and technical as well as biological systems. The problems that are to be discussed become more and more important as civilization develops and the sphere of this newly formed discipline constantly enlarges. The official languages are English and Russian. Simultaneous interpretation will be offered.

Interest has been expressed in forming a group to travel to Wroclaw for the Symposium. If there is sufficient interest and a group of 15 can be formed to travel together, it will be possible for special rates for air transportation and hotel accommodations. Anyone interested in forming a travel group should contact: Jim Hill, RCA Service Co., 5260 Port Royal Rd., Springfield, VA 22151; Tel.: 703-321-8900.

EIA EMC MEETING

The next EIA G46 EMC Committee meeting, headed by the Chairman, Eldon Hughes, will be held on May 3-4, 1976 at the Sheraton Renton Inn in Renton, Washington. The featured topic of this meeting will be "EMC-Ten Year Forecast," in addition to the regular business. Persons wishing to attend this meeting should contact Mr. Eldon Hughes, P. O. Box 2429, Palos Verdes Peninsula, CA 90274, tel. 213-594-3151, in advance. Non-members are welcome as observers.

NEXT G-EMC ADCOM MEETING

The next meeting of the G-EMC Administrative Committee will be held on Monday, July 12th, at 1:00 P.M. at the Shoreham-Americana Hotel in Washington, DC. ADCOM members will receive a meeting notice and agenda directly from the ADCOM President, Jim Toler. However, all persons interested in observing or participating are invited to attend. Recommended agenda items must be submitted to the president in advance.

RECENT EMP NOTES

The following EMP related notes have been recently published and distributed.

Theoretical Note 206, Analytical Calculations on the Photoelectron-Induced Currents on a Model of the FLTSATCOM Satellite, L. Marin, K.S.H. Lee and T.K. Liu, Dikewood Corporation, Feb. 75.

Interaction Note 207, WAMP: A Users Manual for the Wire Antennas Modeling Program, F.J. Deadrick and E.K. Miller, LRL, Dec. 73.

Interaction 220, The Spherical Cavity Problem, T.B.A. Senior, University of Michigan, Jan. 75.

Interaction Note 221, Field Penetration into a Cylindrical Cavity, T.B.A. Senior, University of Michigan, Jan. 75.

Interaction Note 223, Analysis of Antennas and Scatterers with Non-Linear Loads, Tom K. Liu, Dikewood Corporation, Fred Tesche, Science Applications, Inc., May 75.

Interaction Note 229, On the Eigenmode Expansion Method for Electromagnetic Scattering and Antenna Problems, Part I: Some Basic Relations for Eigenmode Expansions, and Their Relation to the Singularity Expansion, Carl Baum, AFWL, 13 Jan 75.

Circuit and Electromagnetic System Design Note 19, 'Lark' - A Modest Repetitive Pulse Generator, C. Edwards, Imperial College of Science and Technology, London, England, M.D. Hutchinson, J.C. Martin, T.H. Storr, Atomic Weapons Research Establishment, Aldermaston, England, May 1975.

Interaction Note 197, Analytical and Numerical EMP Coupling Solutions for a Class of Structures Attached to the Wing of an Aircraft, R.E. Partridge, Los Alamos Scientific Laboratory of the Univ. of California, Oct. 75.

Interaction Note 198, The Analysis of Monopole Antennas Located on a Spherical Vehicle, R.E. Partridge, Los Alamos Scientific Laboratory of the Univ. of California, Oct. 75.

Interaction Note 199, On the Electromagnetic Field Penetration Through Apertures, R.E. Partridge, Los Alamos Scientific Laboratory of the Univ. of California, Oct. 75.

Interaction Note 200, Electromagnetic Dimensional Scale Modeling, R.E. Partridge, Los Alamos Scientific Laboratory of the Univ. of California, Oct. 75.

Interaction Note 226, Integral Equation Approach to Wideband Inverse Scattering: Volume I, Development of Procedures for Numerical Solution, C. Leonard Bennett, J.D. DeLorenzo, Alethia M. Auckenthaler, Sperry Rand Research Center, June 1970.

Interaction Note 239, Currents Induced on Metal/Dielectric Structures for TM Plane Wave Incidence, Yeongming Hwang, W. D. Burnside, Ohio State University Electro-Science Lab, January 1975.

Copies of these papers may be obtained directly from the author, from the Defense Documentation Center, Cameron Station, Alexandria, VA 22134, or from the note series editor, Dr. Carl Baum, Air Force Weapons Laboratory (EL), Kirtland AFB, 87117. In addition, these notes are available at many universities and companies doing research in EMP and electromagnetic theory.

The EMP note series actively solicits contributed papers in this area for publication. For such contributions, contact Dr. Baum for particulars.

Absorption of Short-Pulse Electromagnetic Energy by a Resistively Loaded Straight Wire, UCRL-51936, Oct 1975, by E.K. Miller, F.J. Deadrick and J.A. Landt

Here, absorption of short-pulse electromagnetic energy by a resistively loaded straight wire is examined. Energy collected by the wire, load energy, peak load currents, and peak load voltages are found for a wide range of parameters, with particular emphasis on nuclear electromagnetic pulse (EMP) phenomena. A series of time-sequenced plots is used to illustrate pulse propagation on wires when loads and wire ends are encountered.

Available from NTIS, U.S. Dept. of Commerce, 5285 Port Royal Rd., Springfield, VA 22151

The LLL Transient-Electromagnetic-Measurement Facility, UCRL-51933, Oct 75, by F.J. Deadrick, E.K. Miller and H.G. Hudson, Lawrence Livermore Laboratory

This report describes the operation and hardware of the Lawrence Livermore Laboratory's transient-electromagnetics (EM) - measurement facility. The transient-EM range is useful for determining the time-domain transient responses of structures to incident EM pulses. To illustrate the accuracy and utility of the EM-measurement facility, actual experimental measurements are compared to numerically computed values.

Available from NTIS, U.S. Dept. of Commerce. 5285 Port Royal Rd., Springfield, VA 22151

Cable and Connector Shielding Attenuation and Transfer Impedance Measurements Using Quadraxial and Quintaxial Test Methods, by P. J. Madle, TRW Systems, Redondo Beach, CA, November 1975.

G-EMC TRANSACTIONS SPECIAL ISSUE

Due to the continued prosperity of the IEEE-EMC treasury, the administrative committee, at its meeting on October 6, 1975 in San Antonio, decided to issue a special issue of the Transactions. Editor, Dick Schultz, IITRI/ECAC, indicated the subject most likely will be "Frequency/Spectrum Utilization" and will be published in the latter part of 1976. This will be an added bonus to all members of the G-EMC who will receive a copy of the Transactions free and automatically.

CHAPTER CHATTER

by Charles F. W. Anderson

Los Angeles

Warren Eberlen (LA Chapter Publicity Chairman) forwarded information on the Chapter's activities so far this season. In September, John Coddington, President of Eagle Magnetics, Indianapolis, started things off with his talk, "Taking the Black Magic Out of Magnetic Shield Design." October's meeting had Bob Cowdell (Collins Radio) presenting "An English Translation of MIL-STD-704A" (certainly a most timely topic for EMC/EMIers concerned with airborne equipment design and installation). In November, Melville Clark, R & D Program Manager for General Semiconductor, talked about "Devices and Methods for EMP Transient Suppression." The January meeting featured John Kemper, Chief of Frequency Management and Leased Communication of FAA's Los Angeles Region, speaking on the topic "FAA's Most Serious EMI Problems." (That's one your Column Editor would have liked to have been there for!) Steve Jensen of Genisco Technology gave the attendees of the February gathering some enlightening facts on Power Factor in Nonlinear Loads. No word on what the March and subsequent meetings will feature; but, if you're in the area around the last week of any month, contact Hildy Sullivan (Singer Instrumentation) at 822-3061 for info and reservations. (Credit Eldon Hughes with an assist in getting the above to your Column Editor - Thanks a meg.)

Tucson

Under new Chairman Jerry Sorkin, the chapter got underway with a dinner meeting in December. Plans are to have a meeting each quarter. On 18 February, Dr. Harold Gurev of the University of Arizona Optical Sciences Center presented a talk on "The Role of Spectrally Selective Surfaces in Improving Solar Energy Conversion Efficiency." (Yes, we're going to have EMC problems with these systems, too - wait and see.)

Florida

Nick Nicholson of IMB-Boca Raton reports that despite the lack of an active chapter in Florida and only himself and two other G-27ers in the Palm Beach area, he is "trying to keep the word out and promote EMC whenever possible." (My apologies, Nick, for missing the Winter Issue with that item.) Back in August, Nick and W. S. Cushing (Past Chairman - Palm Beach Section) gave a presentation titled "Introduction to EMI and EMC" to a group of 35 members of the PB Section. They showed the Navy "Introduction to EMC" film (provided by Fred Nichols). The enthusiastic reception prompted Nick to suggest that other G-EMC members in areas without a local chpater consider making such a presentation at one of their Section meetings. (Sounds like a marvelous idea.)

Central New England

Chairman John Clarke wants to set the record straight: There is no Boston G-27 chapter! But, there is an active CNE Chapter. Their December meeting featured Chapter Secretary/Treasurer Dale Samuelson (subbing for Dean McKay who was unable to be present) presenting "Spectrum Management for the Military," which emphasized the SEAPS approach. On March 24, John Shrewood of Hewlett-Packard spoke on the "CISPR Regulations." ADCOM President Jim Toler is scheduled to present "EMC Applications in Medicine and Biology" one evening during the ELECTRO show in May.

Washington

From Al Paul (Chapter Secretary) comes the following report on this active (very) chapter. The January meeting had Mr. Brendan Harrington, Legislative Assistant to Congressman Charles Vanik of Ohio, presenting "H.R. 7052 - A Bill to Reduce Interference from Radio Frequency Energy." As might have been expected, a spirited discussion followed. The March 28th meeting featured Mr. Ray Vincent of Develco, Inc. presenting information on and a demonstration of a three-axis (time/frequency/amplitude) spectrum analyzer display. Remember, if you are in the Washington area near the end of one of the odd-numbered months, give Al a call at 623-7093 to find if there will be a meeting while you're there. Gathering place is usually Blackie's House of Beef, 22 & M, NW, at 11:30 A.M.

Jersey Shore

From Don Heirman, Chapter Newsletter Editor and Vice Chairman, fine reports. Mr. Donald Jansky, of OTP/EoP, spoke on the new "Career Development Program for Radio Spectrum Management." Need for trained spectrum managers is critical, because of the attrition due to retirement of numerous senior specialists in this area. The March meeting feature was a presentation of the HEW film "Electronics in the Home." The Jersey Shore Chapter, by the way, has over a dozen organizations in the Institutional Listings Section of its Chapter Newsletter!

BOOK REVIEWS

BOOK REVIEW

by Jim Hill, RCA Service Company

We bring you two reviews again in this issue. Mr. Ed Wetherhold reviews the "Handbook of Electronic Circuit Designs" and finds that while a considerable portion of the text can be useful to the engineer required to design circuits, he need not invest his money in this book to get the information contained therein. Ed continues his campaign, started in the last issue, to urge engineering book publishers to weed out the incompetent authors and the errors and omissions which muddle their books.

We are indebted to Mr. Charlie Anderson for the second review. The book is one which your book review columnist has co-authored with Mr. Donald R. J. White. Hopefully, it will fill a need for a single volume containing most of the specs and standards and miscellaneous control documents of interest to the EMI/EMC community. Pending acceptance by the community, it will be revised and updated periodically as new documents make their appearance. As I write this column, I have not seen Charlie's review. I trust that he has been charitable in his evaluation of our effort.

"Handbook of Electronic Circuit Designs"

by
John D. Lenk

307 pages, 9"X6" hardbound, $15.95
Prentice-Hall, Inc., Englewood Cliffs, NJ, 1976

Reviewed by E. E. Wetherhold
102 Archwood Avenue
Annapolis, MD 21401

The EMI/RFI engineer and/or his technicians are frequently involved in the design and construction of filters or other electronic circuits that are usually required in the normal course of their work. Consequently, a handbook of electronic circuit design, focusing on the practical aspects, would be very useful. The HANDBOOK OF ELECTRONIC CIRCUIT DESIGNS, recently published by Prentice-Hall, is therefore of interest to readers of the EMC Group Newsletter and is a suitable subject for review. This review is especially timely because during the last week of February, Prentice-Hall completed a wide distribution of a four-page sales blurb featuring this book. If you are a subscriber to ELECTRONIC DESIGN magazine, you probably received a copy of the blurb. And if you requested a trial copy of this circuit design handbook, you will be particularly interested in the following review.

The Handbook, costing about $18.40 including tax, postage, and handling, is comprised of 302 pages of text and a 5-page index attractively hard-bound and printed on a 6 x 9 inch page format. The book contains eight design chapters covering the topics of filters and attenuators, RF circuits, wave-generators, phototransistors, AF and RF amplifiers, transistor switches, and oscillator circuits. It was the intent of the author and publisher to emphasize the "practical applications and the most straightforward methods....to provide design guidelines that are stated in simple terms....theory is included only where required for practical design." A substantial portion of the text undoubtedly has merit and can be useful to the circuit designer; nevertheless, this book is definitely not recommended for one attempting to assemble a good technical library on circuit design. The resons for this negative opinion should become obvious in the following discussion.

For the most part, the Handbook text is derived, sometimes almost verbatim, from the many application notes published by Motorola, General Electric, Texas Instruments, and RCA. For example, part of the text on transistor switches was copied almost verbatim from portions of the Motorola Application Note AN-220, "Field Effect Transistors in Chopper and Analog Switching Circuits." Also, Section 7-4.1, page 236, of the Hnadbook, "Basic Transistor Inverter Theory," was similarly copied from the Motorola Application Note AN-222, "The ABC's of DC-to-AC Inverters." Although manufacturer application notes were used almost exclusively as the reference sources, no listing of the specific application notes used is given. The only acknowledgements given appear in the Preface of the Handbook and in the caption of the figures and tables which were copied from the application notes. These acknowledgements in the captions are in the form of "Courtesy General Electric," or "Courtesy Motorola," etc. This is not particularly informative to the reader and if he wishes to confirm a portion of the text, or if he wishes to explore additional aspects of a particular subject not ade-

quately discussed in the Handbook, he will have to find the appropriate application note title and number by himself. In this reviewer's opinion, there is nothing wrong with publishing a book based on the application notes of several manufacturers. Organizing and condensing the diverse texts from the different manufacturer's application notes into a single book is a useful service that provides the reader with a convenient single-source of up-to-date technical information. There is much useful design data in these application notes, but because the publication is dispersed between four or more manufacturer's application notes, it is inconvenient for the average technician or engineer to assemble and organize the material under one cover. If properly handled, a text based on these application notes would have much to recommend for it; however, for this to be successfully accomplished, the compiling author must have theoretical knowledge and practical experience almost equal to that of the authors of the original text. This is necessary so the compiling author can properly edit, organize, and discuss the practical aspects of the material which may have been originally presented from a different perspective and for a different audience. The main failing of this book, then, is the author's too frequent inability to correctly explain the theory involved and, contrary to the publisher's statements and the author's intents, examples of practical designs are either absent or poorly presented. For example, in chapter one, no examples are given of attenuator or passive filter designs.

The publisher must assume a considerable portion of the blame for the obvious weaknesses in this book. A competent and thorough review of the author's manuscript would have at least made it possible for the more serious errors and omissions to be corrected before the book was published. This oversight by the publisher is unfortunate as the gross errors that appear in the text seriously undermine the reader's confidence in other portions of the text that may be quite satisfactory and useful to the circuit designer. In this reviewer's opinion, the $18.40 cost of the book would be better invested in obtaining copies of the original manufacturer's application notes that were used as the basis for this book. Most manufacturers will provide these application notes at no cost if the request is made on company letterhead paper. There are too many errors in this book to list and discuss separately, but the following examples will give the reader an idea of what to expect.

Chapter 1, Filter and Attenuator Circuit Design -

(1) LC Filters, para. 1-2, page 7: "Except for special applications, it is not practical to use LC filters for audio frequencies." This is, of course, incorrect. LC audio filters have been used for practical applications ever since Zobel and Campbell developed the image parameter filter design procedures more than 40 years ago. However, active filters, using integrated circuits, are now becoming more practical than LC filters in some applications.

(2) Lowpass LC Filter, para. 1-2.1, page 8: "The characteristic impedance of the filter remains constant - hence the name constant-k filter." This is not correct. The characteristic impedance of the constant-k filter is NOT constant, but instead varies markedly with frequency. This particular filter type is so called because the product of the series and shunt impedance is a constant at any frequency. Explanations of the basic short-coming of the constant-k filter (fixed resistive terminations cannot be used) and the procedure developed by Zobel to solve this problem (m-derived matching sections) are completely omitted from the text. Other portions of the chapter are equally vague and incomplete. It is especially irritating to this reviewer that the superior method of modern filter design is completely ignored in this supposedly up-to-date handbook. It has been thirteen years since the publication of Philip Geffe's book, SIMPLIFIED MODERN FILTER DESIGN, and one would think that the "word" would finally get around!! Instead, the reader of this Handbook is left to struggle with an incorrect, incomplete, and confusing discussion of the image parameter design procedure. The uselessness of the text in Chapter One is indicated by the complete lack of any filter or attenuator design examples.

The Handbook text is considerably better where the author has manufacturer application notes for reference. Thus, the chapters on wave-generation and phototransistor circuits may be quite useful to those seeking this particular information. The chapters on oscillator, a.f., and r.f. circuit design are also vastly superior to Chapter One. However, the reader must be constantly on guard for gross inaccuracies such as those found in Section 5-2, Amplifier Coupling Circuit Design, page 114, paragraph (3): "With impedance (inductive) coupling at very high frequencies, the gain drops because of the increased reactance." This is incorrect. The proper explanation is that the gain drops above the self-resonant frequency of the inductor because of its decreased impedance since the distributed capacity of the inductor now becomes the controlling factor. Even when using the application notes, the author gives incorrect explanations such as on page 164 under the head Filtering. The function of R3 and C2 (which form a lowpass filter to attenuate hum and noise above 1 Hz) is incorrectly identified as a "high-pass filter."

Seven weeks before the writing of this review, a listing of errors was sent by this reivewer by Prentice-Hall to be forwarded to the author of the Handbook for his comments. Except for an acknowledgement by the publisher of receipt of the error listing and the promise to forward this listing to the author, no further correspondence has been received from either the publisher or the author.

"EMI Specifications, Standards and Regulations"

(Volume 6 in the Handbook Series on Electromagnetic Interference and Compatibility)

by

James S. Hill and Donald R. J. White

Published by:
Don White Consultants, Inc.
Germantown, MD, 1975

Reviewed by Charles F. W. Anderson

At last! Under one cover - essentially all of the requirements documents (except the classified ones) to which the EMC/EMI engineering community has occasion to refer. Jim Hill and Don White have performed a monumental job in compiling this volume. One thousand pages - not including Table of Contents and Index! Just to hold it down to that number, obviously, requires some intensive editorial efforts. In addition to the documents one would expect to see (such as the MIL-STD-461 through -463 series, and FCC Rules and Regulations and OCE Bulletins), there are publications from HEW, the Radio Technical Commission for Aeronautics (RTCA), ANSI and Bureau of Radiological Health, plus others. In an excellent introductory chapter, the authors discuss the historical background of EMC/EMI related documents, summarize the military specifications and standard, and present information on industrial, commercial and consumer EMI publications. Although the complete texts of all the various documents obviously could not have been included, excerpted sections cover interference and compatibility aspects quite adequately.

A few comments - One, RTCA Document DO-138 (Environmental Conditions and Test Procedures for Airborne Electronic/Electrical Equipment and Instruments) was replaced by DO-160 (same title) in the Spring of '75, as announced in Issue #85 of this Newsletter. Two, MIL-STD-1310 (Shipboard

Bonding, Grounding and Other Techniques for Electromagnetic Compatibility and Safety) should have been included. Three, because of the frequent changes and additions to the specifications/standards literature, the next edition of this volume could advantageously be issued with an insertion/removal feature (similar to Sweet's File), perhaps.

IECAP ANALYSIS PROGRAM COURSE

Over the past year, the Air Force has been developing and promoting its Intrasystem Analysis Program (IAP) consisting of the Intrasystem EMC Analysis Program (IEMCAP) and supplemental models covering lightning, static electricity, TEMPEST, nonlinear receiver effects and EM field analysis. The IAP provides a computer-oriented mathematical modeling technique to help design EMC into a system. The first training course was held in Mar. '75 at the Rome Air Development Center (RADC). The purpose of this one week course was to give the different Air Force organizations a basic understanding of the IAP. It was attended by the following agencies: Hq AFSC, Hq AFLC, AFFDL, AFATL, AFAL, ASD, ESD, Sacramento ALC, Mitre Corp., Aerospace Corp., and Radd Corp.

The second course was held in Aug. '75 at the Space and Missile Systems Organization (SAMSO). This was a two-week course covering the IEMCAP program in detail as well as lectures on the lightning, static electricity, nonlinear receiver modeling, and electromagnetic field analysis programs. Thirty-seven students attended representing the following companies and government agencies: Hughes, Rockwell International, Martin Marietta, Aerospace, Lockheed, Westinghouse, General Dynamics, Northrup, Atlantic Research, Sacramento ALC, Air Force Weapons Lab, Teledyne, TRW, Air Force Communications Service, Naval Weapons Center, and Department of Commerce.

A third course is being contemplated for June '76 if enough interest is expressed. This will be held at Syracuse University, Syracuse, NY or ESD, Hanscom AFB, MA. For further information on the IAP, contact Mr. James C. Brodock, RADC/RBCT, Griffiss AFB, NY 13441, or call (315)330-3490.

REPORT COMPARES TRANSIENT VOLTAGE SUPPRESSORS

General Semiconductor Industries has recently published an 8-page report titled "TransZorb versus Metal Oxide Varistors Comparison" for designers concerned about transient voltage suppression. This report provides comparative data on published specs and presents actual data from comparative tests. Oscillographs demonstrates the dynamic performance parameters of each type of device under simulated transient conditions. They show comparisons of response time and clamping voltage for suppressors with various voltage ratings. Graphs show results of aging on breakdown voltage and leaking current. The report points out the key parameters in specifying transient voltage suppressors, defines these parameters, and tells how to make meaningful comparisons between the two types of devices. Copies may be obtained by contacting Maurice Osborn, General Semiconductor Industries, P.O. Box 3078, Tempe, AZ 85281; Tel.: (602)963-3101.

NOTES FROM SEQUENCY UNION

by

G.R. Redinbo

I received the following letter from Professor Reuven Kitai, McMaster University, concerning the article in the last issue of the EMC Newsletter which dealt with music synthesizers based upon Walsh functions. Dr. Kitai has worked with waveform synthesis for several years and has published extensively on the subject. I found the letter refreshing not only from a technical view but from the revealing personal thoughts of an active researcher; the story is even more interesting in the telling. In light of his technical results, the excellent results achieved by the Walsh music synthesizers are understandable.

Perhaps readers of your page would like to share the surprise I felt when first discovering the strange properties of the truncated Walsh expansion of a sinusoid.

Having built a Walsh array generator of low orthogonality error, which incorporates true and complement outputs, the natural and simplest thing to do with it was to synthesize periodic waveforms of various types. This was easily done, and a wide range of waveforms were synthesized, including the familiar ones such as triangular waves, ramps, square pulses of various duty cycles and the like. At first it seemed that there would be little point in synthesizing a sinusoid; my hesitation was presumably due to the mistaken notion that since only a fair representation of a square wave would result from the synthesis of a few sinusoids, so, likewise, a poor sinusoid would result from a truncated Walsh series.

The first eight non-zero terms in the Walsh series of cos t are

$$0.6366\,\mathrm{cal}\ 1 + 0.2637\,\mathrm{cal}\ 3 - 0.0525\,\mathrm{cal}\ 5 + 0.1266\,\mathrm{cal}\ 7 - 0.0125\,\mathrm{cal}\ 9 - 0.0052\,\mathrm{cal}\ 11 - 0.0260\,\mathrm{cal}\ 13 + 0.0627\,\mathrm{cal}\ 15$$

The complement outputs of the Walsh generator are used for terms having negative coefficients. The coefficients seem awkward to set; however, if one shifts and rescales a Walsh wave so that Walsh level-1 corresponds to 0 volts, and level+1 to say +5 volts, then each coefficient in the series can be set accurately on a potential divider by connecting a dc digital voltmeter at the output of the summing operational amplifier: One applies each Walsh function in turn in order to set the magnitudes to conform with the series; then one applies all eight Walsh waves together, and finally, a dc voltage is also applied at the input to remove the dc component from the output. Likewise a wave sin t may be formed from sal waves, using the same scaling of terms as for cos t, but some of the signs are different. Following this procedure, eight non-zero Walsh terms were summed. The resultant waveform is the stepped wave in the figure. It has eight steps of equal duration per quarter-cycle, with no dwell on the horizontal axis.

The natural question one now asks is "What is the Fourier spectrum of the stepped sinusoid?" Clearly it has no even harmonics, and its fundamental would be near 100% of the wave which would result from a synthesis which is not truncated. Being inclined more towards experiment that to theory, I applied the wave to a wave analyzer and found, to my surprise, that the first non-zero harmonics were the 31st and 33rd, with magnitudes 1/31 and 1/33 respectively (for a fundamental of unit magnitude). The next harmonic pair was the 63rd and 65th, again with magnitudes inversely proportional to frequency, and so on.

To substantiate these measurements, I next resorted to the known expression for the Fourier spectrum of a Walsh wave, and programmed our large digital computer to compute the Fourier spectrum from the truncated Walsh expansion. The computed results were found to agree with the wave analyzer readings.

Next I approached some of my colleagues for help with the theory. Dr. Arthur Gladwin responded -- but in his characteristically independent way, he pursued the topic without using Walsh waves at all. He showed, very elegantly, that if a sinusoid is approximated to by way of steps of equal duration per quarter cycle, and if this approximation is nearest to the true sinusoid in a least mean square error sense, then the Fourier spectrum of the stepped wave conforms with my findings. (The least mean square error approximation is, of course, a property of any orthogonal function expansion). It took me a few months, working at the problem from time to time, to establish a general theory of sorts which is based on a Walsh synthesis. This work is published in the IEEE Transactions on Instrumentation and Measurement, Dec 1975, pp. 313-317. The figure shown here is taken from that paper; the upper stepped wave is of fundamental frequency 100 Hz and it was applied to a low-pass filter of cut-off frequency 3K Hz. The smooth sinusoid at the filter output, which is also shown in the figure, demonstrates that no harmonics in the range 2 to 30 are contained in the stepped wave. If 16 Walsh terms were used, the first non-zero harmonics would be the 63rd and 65th, and so on.

Some years ago Medawar in Britain, developed the theme that the scientific paper is a fraud -- in the sense that what it reports is invariably far from what actually happened. Any reader of this anecdote who has also perused the IEEE Trans. I.M. paper will recognize how right Medawar is; the IEEE paper is written in the usual "classical" style. It is impersonal and unemotional; it makes no mention of chronological events, and it does not reveal how one dithers about in the pursuit of knowledge. I suppose that papers should be written in this way -- but they certainly leave out all the fun.

Dr. Reuven Kitai

BOOK ALERT

A new book "Walsh Functions and Their Applications" is available. It is authored by K.G. Beauchamp and published by Academic Press. Mr. Beauchamp also authored "Signal Processing Using Analog and Digital Techniques," 1974 Wiley text. The new book is being reviewed through the book editor of this newsletter; so watch for it.

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NONSINUSOIDAL FUNCTIONS AT 1976 INTERNATIONAL EMC SYMPOSIUM

A session devoted to the application of nonsinusoidal functions is scheduled for Wednesday afternoon, July 14. This session has been designed to demonstrate some of the connections between electromagnetic compatibility and nonsinusoidal functions. A preliminary list of the papers and authors can be given.

"Antennas for Nonsinusoidal Electromagnetic Waves," Henning F. Harmuth, The Catholic University of America; "Communications with Walsh Waves," Heinz H. Schreiber, Grumman Aeorspace Corporation; "Transient Radiation from Digital Signals on Transmission Lines," J.C. Chapman, Terrestrial Systems, Inc."; "On the Digital Processing of EEG Data," N. Ahmed, D. Hein, D. Walker, Kansas State University, S. Twemlow, (M.D.) and R.O. Williams, Veterans Administration Hospital; "Microprocessor Application in Walsh-Fourier Conversion," P. Bansod and R. Kitai, McMaster University; "The Question of Sequency: A Spatial Interpretation of Walsh Analysis," J.E. Gibbs, National Physical Laboratory, England, and S. Cohn-Sfetcu, McMaster University.

Plan to attend. What city is more appropriate to visit during the bicentennial than Washington, D.C.? The July 4th crowds will have gone and the city will have returned to normal. Even the politicians will be preoccupied elsewhere with nominating conventions and the like.

RFI LEGISLATION INTRODUCED INTO THE U.S. SENATE

On 25 February 1976, The Honorable Barry Goldwater (Arizona) introduced radio-frequency interference (RFI) legislation into the U.S. Senate. The bill, S.3033, is virtually identical to the RFI bill introduced into the House of Representatives last year by Mr. Charles A. Vanik.

Mr. Goldwater's bill has been referred to the Senate Commerce Committee, and so, interested readers should forward their comments on the bill to:

The Honorable John O. Pastore
Chairman, Communications Subcommittee
Senate Commerce Committee
United States Senate
Washington, DC 20510

Letters may also be sent to one's senators at the following address:

The Honorable.....
United States Senate
Washington, DC 20510

Correspondence should indicate that a similar measure is awaiting hearings in the House of Representatives (H.R. 7052).

G-EMC CONSTITUTION AND BYLAWS REVISED

During 1975, both our Group's Bylaws and Constitution were revised by the Administrative Committee (ADCOM). In accordance with Article IX of the Constitution, both documents must be published in the Newsletter before they officially take effect.

Since the Bylaws have been duly approved by ADCOM, they are now in effect. The Constitution will take effect within 30 days of this publication unless ten per cent of the Group members (approximately 150 members) file an objection with our Secretary. Since this Newsletter will reach our members at various times during the month of April, May 28, 1976 has been set as the cut-off date. Thus, comments should be sent to Mr. Lenard W. Thomas, Sr., 1604 Buchanan St., N.E., Washington, DC 20017. For ease of identification, changes to the Constitution have been underlined.

The editor would like to thank Gene Cory of Southwest Research Institute for retyping the documents for publication.

IEEE ELECTROMAGNETIC COMPATIBILITY GROUP
(G-EMC)
CONSTITUTION

Article I

Name and Objective

1. This organization shall be known as the IEEE Group on Electromag-
ompatibility of the Institute of Electrical and Electronics Engineers, Inc.

2. Its objects shall be scientific, literary and educational in character.
up shall strive for the advancement of the theory and practice of electrical
ctronic engineering and of the allied arts and Sciences, and the maintenance
gh professional standing among its members and affiliates, all in consonance
e Constitution and Bylaws of the IEEE and with special attention to such aims
the field of interest of the Group as are hereinafter defined.

3. The Group shall aid in promoting close cooperation and exchange of tech-
nformation among its members, and to this end shall hold meetings for the
ation of papers and their discussion, and through its committees shall study
vide for the needs of its members.

Article II

Field of Interest

1. The Field of Interest of the Group shall be the enhancement of Electro-
ic Compatibility (Electromagnetic Compatibility is defined as the capability
ctronic systems or equipments to be operated in the intended operational en-
ent at designed levels of efficiency without degradation due to unintentional
omagnetic interference), including:

1) The generation of Engineering Standards
2) Measurement Techniques and Test Procedures
3) Measuring Instruments and
4) Equipment and Systems Characteristics, such as:
   - susceptibility
   - vulnerability
   - related propagation effects
   - subjective effects, frequency allocation and assignment
5) Improved (interference reduction or control) techniques and components
6) Education in Electromagnetic Compatibility
7) Studies of the origins of interference, both man-made and natural, and their classification
8) Spectrum Conservation
9) Spectrum Utilization
10) Shielding Techniques
11) Side effects of electromagnetic energy
12) Scientific, technical, industrial or other activities that contribute to this field, or utilize the techniques or products of this field, subject as the art develops, to additions, subtractions, or other modifications directed or approved by the IEEE

Section 2. The field of interest of the Group may be enlarged, reduced or shifted moderately as the needs of the occasion indicate with the provision that such revisions shall be processed as an amendment to this Constitution.

Article III

Membership

Section 1. Membership in the Group shall be available only to members of the IEEE in any grade, including students, having a professional interest in any phase of the field of interest of the Group.

Section 2. Affiliates may participate in the Group activities, as provided by the IEEE Bylaws and subject to the applicable IEEE rules and regulations and any additional limitations imposed by the Group Bylaws.

Article IV

Financial Support

Section 1. The Group shall collect from its members an annual assessment or fee, in accordance with the IEEE Bylaws and applicable rules and regulations. The amount of the fee shall be prescribed in the Bylaws.

Section 2. The Group may make registration charges at its Group meetings, symposia, conferences, and conventions. The registration fee for non-members of the IEEE may be higher than for IEEE members.

Section 3. The Group may raise revenues by other means, such as advertising, shows, requests for contributions, and charges for sending out notices to non-Group members, provided such means are consistent with applicable IEEE rules and regulations, and do not encroach on revenue fields of prior established Groups or Sections. Any new revenue means not explicitly covered by IEEE rules and regulations must be approved by the General Manager before being adopted by the Group.

Article V

Administration

Section 1. The Group shall be managed by an Administrative Committee of not more than 18 elected members of the Group plus members "ex-officio without vote" as specified in the Bylaws. (There may also be members "ex-officio without vote.") No less than 70% of the voting members of an Administrative Committee shall be elected members.

Section 2. Subgroups may be formed as provided in the IEEE rules and regulations and the nature of subgroups, and the supervision of subgroup affairs other than by the Administrative Committee, shall be prescribed in the Bylaws.

Section 3. The terms of the 18 members-at-large of the Administrative Committee shall be for three years, six members to be elected each year. Only two consecutive full terms are permitted, but eligibility is restored after a lapse of one year.

Section 4. The Administrative Committee shall annually elect one of its elected members as President, and another as Senior Vice President whose terms shall be for one year. A Secretary and a Treasurer shall also be elected annually for a one-year term, which officer need not be a member of the Administrative Committee, and he may be re-elected.

Section 5. Newly elected President, Senior Vice President and members of the Administrative Committee shall assume office on the first of January of each year, unless a different time is provided by the Bylaws.

Section 6. The duties and responsibility of the officers shall be as defined hereunder and in the Bylaws and as delineated by the Administrative Committee.

Section 7. The President, under direction of the Administrative Committee, shall have general supervision of the affairs of the Group. He shall preside at meetings of the Administrative Committee, at general meetings of the Group, and at the Annual Meeting of the Group, and have such other powers and perform such other duties as may be provided in the Group Bylaws, or as may be delegated to him by vote of the Group Administrative Committee. In his absence or incapacity, his duties shall be performed by the Senior Vice President.

Section 8. The President shall be an ex-officio member of all Committees of the Group. He is a member of the IEEE Technical Activities Board, and when notified of a meeting of said Board, he shall insure representation of the Group at such meeting by himself, or by an alternate. If an alternate cannot be found, the President shall present the views of the Group by a letter of proxy.

Section 9. The Administrative Committee may establish standing or ad hoc committees as prescribed in the Bylaws, including both functional committees (e.g. Awards, Chapters, Membership, Nominations) and technical committees. Technical Committees may be established as needed to develop specific areas of the field of interest. All appointments to committee and similar posts will be for a term of one year or until successors are appointed or the committees dissolved.

Section 10. The Administrative Committee may utilize the services of Headquarters as bursar, for all or part of the Group funds, as provided by the IEEE Bylaws and rules and regulations. If any part of the Group funds are received and deposited separately, the terms and conditions shall be in accordance with IEEE policies and subject to the provisions of the Group Bylaws and to any special limitations imposed by the Administrative Committee.

Section 11. Neither the Electromagnetic Compatibility Group, nor any officer or representative thereof, shall have any authority to contract debts for, pledge the credit of, or in any way bind the IEEE, except in accordance with previously approved budgets.

Article VI

Nomination & Election of Administrative Committee

Section 1. The nominating procedure shall include provision for petition by Group members to place a name on the ballot.

Section 2. Election of the 18 members-at-large of the Administrative Committee shall be as prescribed in the Bylaws.

Section 3. Within-term vacancies on the Administrative Committee shall be filled by appointments, for the unexpired terms, by the President with the consent of the Committee.

Article VII

Meetings

Section 1. The Group may hold meetings, conferences, symposia, or conventions either alone or in cooperation with Sectional, Regional, or National Convention Committee of the IEEE, or other technical organizations, subject to IEEE rules and regulations. The Group shall sponsor at least one technical conference of national scope each year, which may be held during the International Convention, or during some other IEEE meeting, or as a separate conference.

Section 2. Meetings, Conferences or Conventions of the Group shall be open on an equal basis to all members of the IEEE. The Group may not sponsor or co-sponsor a meeting which is subject to security clearance.

Section 3. The Administrative Committee shall hold at least two meetings, one an Annual Meeting at a time specified in the Bylaws. Other meetings of the Administrative Committee shall be held at such times as are found necessary and/or convenient. Special meetings of the Committee may be called by the President of the Group at his own discretion or upon request of three other members of the Committee, with at least 10 days notice.

Section 4. Fifty percent of the members of the Administrative Committee shall constitute a quorum. When fifty percent of the members of the Administrative Committee is not a whole number, the next largest whole number shall designate a quorum. All members shall have an equal vote. Ex-officio members will not have a vote unless the Bylaws specifically provide otherwise.

Section 5. A majority vote of those members of the Administrative Committee attending a meeting shall be necessary for the conduct of its business except as otherwise provided in the Constitution.

Section 6. Business of the Administrative Committee may be handled by correspondence, telephone, or telegraph where in the opinion of the President matters requiring action can be adequately handled in that manner. A majority vote of the members of the Committee is necessary for approval of actions handled in that manner, unless otherwise provided.

Article VIII

Publications

Section 1. Publications undertaken by the Group shall be subject to IEEE policies and to any further guidance or controls prescribed by the Administrative Committee or its duly appointed committees. The Group shall be responsible for the financial aspects of its publication program.

:ion 2. The President, with the advice and consent of the Administrative Com-
:ee, shall appoint such editors as may be required to implement the publication
gram. The duties of an editor, and his compensation, if any, shall be prescribed
the Bylaws.

Article IX

Amendments

:tion 1. Amendments to this Constitution may be initiated by petition submitted by
members of the Group or by the Administrative Committee, such petition being
omitted to the IEEE Technical Activities Board, and to the Executive Committee
the IEEE for approval. After such approval, the proposed amendment shall be
blished in the Group Transactions or Newsletter, or otherwise publicized by direct
iling to the membership with notice that it goes into effect unless ten percent of
e Group members object within 30 days. If such objections are received, a copy
the proposed amendment shall be mailed with a ballot to all members of the Group
least 30 days before the date appointed for return of the ballots, and the ballots
all carry a statement of the time limit for their return to the IEEE office. When
mail vote of the entire Group membership is made necessary, approval of the
nendment by at least two-thirds of the ballots returned shall be necessary for its
nactment.

ection 2. Suitable Bylaws, and amendments thereto, may be adopted by a two-thirds
ote of the Administrative Committee present in meeting assembled, provided that
notice of the proposed Bylaw or amendment, has been sent to each member of the
dministrative Committee at least a week prior to such meeting; or a bylaw or amend-
ment, may be adopted by a two-thirds mail vote of the members of the Administrative
Committee provided a 30-day period is provided for such responses. In either event,
the proposed bylaw or amendment shall be published in the Group Transactions or
Newsletter. No bylaw, or amendment, shall take effect until it has been published
and has been mailed to the Technical Activities Secretary of the IEEE, and he has
obtained approval of the General Manager.

(AdCom approved Revision 10/6/75)

BYLAWS

IEEE Group on Electromagnetic Compatibility (G-27)

1. These Bylaws provide detailed guidance for the supervision and management of the G-EMC affairs, in accordance with the Group Constitution. Amendments may be made by means of the procedures described in Article VIII, Section 2, of the Constitution.

Suitable Bylaws, and amendments thereto, may be adopted by a two-thirds vote of the Administrative Committee in meeting assembled, provided that notice of the proposed Bylaw, or amendment, has been sent to each member of the Administrative Committee at least a week prior to such meeting; or a Bylaw, or amendment, may be adopted by a two-thirds mail vote of the members of the Administrative Committee, provided a 30-day period is provided for such responses. In either event, the proposed Bylaw, or amendment, shall be published in the Group Transactions or Newsletter. No Bylaw, or amendment, shall take effect until it has been published and it has been mailed to the Technical Activities Secretary of the IEEE, and he has obtained approval of the General Manager.

2. Membership: There shall be only one grade of Group membership available to all IEEE members, based on the payment of the annual fee prescribed in Bylaw 8.1.

2.1 Honorary Life Members: Such membership, exempt of the payment of the annual fee, shall be based on the recommendation of the Group Awards Committee, the endorsement of the Group Administrative Committee, and the approval of the General Manager of IEEE.

2.2 Affiliates: Affiliation may be based on membership in other societies that have been recognized for affiliate purposes by specific action of the Administrative Committee. A list of approved societies will be maintained by the Technical Activities Secretary of the IEEE. Further, affiliates may join in accordance with any other provision that may be incorporated in the IEEE rules and regulations.

A Group Affiliate may not serve in elective office in the Group or in a Chapter or vote for candidates for these offices, however he may serve in any appointive office in the Group or a Chapter of the Group. A Group Affiliate is entitled to receive notices of all meetings sent to

Group members, to receive copies of publications of the Group, to attend and participate in any function of the Group by payment of IEEE member charges, and to receive any award bestowed upon him by the Group. A Group Affiliate may not receive any IEEE benefits that are derived through IEEE membership except as approved by the Executive Committee of the IEEE.

2.3 Students: An exception to the annual fee shall be made for students, as prescribed by IEEE rules and regulations.

2.4 Special Provisions: Any special members (life, or other honorary) and affiliates of the Group on (date of adopting the new Bylaws), may continue even though their respective attainment of such special membership or affiliation was by a means other than as defined above.

3.0 Administrative Committee: Article V, Section 1, of the Constitution provides that the AdCom shall consist of 18 elected members-at-large plus ex-officio members. Article VII, Section 4, provides that a quorum shall be 50% of the members, without distinction between the members-at-large and the ex-officio members with vote, and that all members shall have an equal vote.

3.1 Ex-officio. The President, Senior Vice President, the immediate past President, Secretary, Treasurer, "service" Vice Presidents, Chapter Chairmen and Standing Committee Chairmen, if not elected members-at-large, shall be ex-officio AdCom members.

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3.2 Ex-officio Members with Vote. The President, Senior Vice President and the immediate past President, if not elected members-at-large, shall be the only ex-officio AdCom members with vote.

3.3 In order to ensure a continuously active AdCom, elected AdCom members who miss three consecutive meetings will be dropped from membership in the absence of extenuating circumstances. Vacancies thus or otherwise created shall be filled by the appointments for the unexpired terms by the President with the consent of the AdCom.

3.4 Roberts Rules of Order (Newly-Revised) shall govern conduct of AdCom meetings on all matters not otherwise specified in these Bylaws or the Constitution.

4.0 Nomination and Election of the AdCom: The Nominating Committee shall be reconstituted by the President on or before April 1st of each year. The Nominating Committee shall consist of a chairman and four or more members of the Group, not more than half of which may be members of the AdCom.

4.1 The Nominating Committee shall immediately after 1 April mail notices for the soliciation of Nominations for membership on the administrative committee to AdCom members, and to Chapter Chairmen. There shall also be published in the Newsletter prior to 15 April a call for nominations for AdCom membership. Such nominating petitions shall be received by the Chairman of the Nominating Committee by 30 May.

4.2 On or before 10 June the Chairman of the Nominating Committee shall mail to IEEE Headquarters the slate of at least 12 nominees for election to the six offices to be filled on the AdCom.

4.3 On or before 1 August IEEE Headquarters will mail ballots to Group members, with the request that the ballots be returned to IEEE Headquarters by 1 September.

4.4 IEEE Headquarters will have completed ballot count, and by 30 September will have notified the new AdCom members and the AdCom officers of the results of the election.

4.5 During the first AdCom meeting following 30 September the new AdCom members will be introduced to their duties in preparation for their assuming their duties on 1 January.

4.6 A nominating petition shall carry a minimum of 15 names of Group members, excluding students, for the nominee to be placed on the slate.

4.7 The nominating committee may make nominations for the Administrative Committee in addition to those nominated by petition.

4.8 The AdCom may make contingent elections to be effective in case an elected member fails to accept the office, or a disapproval is received from Headquarters.

4.9 In the preparation of the slate of nominees, consideration shall be given to both geographical representation and technical interests. In the event the 2/3 AdCom carry-over members into the following year and the nominations received by petition do not include members and nominees from IEEE regions one through six, The Nominating Committee will contact Group members in these unrepresented regions (who are qualified for AdCom membership, and who are willing to serve in that capacity if elected), and submit their names in the slate of nominees on or before 10 June.

4.10 Persons nominated and elected to the AdCom should have adequate resources and company backing to be able to attend meetings and actively contribute to the AdCom, including Committee activities, correspondence, telephone calls, etc. The technical qualifications and the stature of the proposed nominee in the EMC community should also be taken into consideration.

5.0 Officers: Following the election of the incoming AdCom members, the AdCom, including the newly elected members, and all current members, (both elected and ex-officio), during its first meeting following 30 September, shall nominate and elect from among themselves a President, a senior Vice President and four "Services" Vice Presidents and, from the Group membership, a Secretary and a Treasurer who will occupy those respective offices for the succeeding year. (See 11.0).

5.1 Terms of Office: The term of elected officers shall be one year. The President may be re-elected to a second term of one year. Whether he serves one or two years, he shall not again be eligible for election to the Presidency until a lapse of three years. The Senior Vice President may hold office for not more than two consecutive terms. His eligibility is restored after a lapse of one year. There is no restriction on the terms of office of the "service" Vice President, the Secretary and the Treasurer. It is of benefit to the Group that both the Secretary and the Treasurer be encouraged to serve at the request of the AdCom for terms of not less than three years in order that the expertise developed by these officers not be lost to the Group by early replacement. All officers shall continue to serve until their successors take office.

5.2 Officer Understudies or Assistants: It is recommended that the Secretary and Treasurer each recruit from the Group membership, qualified understudies or assistants who will be in a position to assume the duties of these respective offices upon request of the AdCom in the event of the unavailability of either of the elected officers to continue in their positions.

5.3 Presidential Duties: The President shall supervise the affairs of the Group and shall speak for the Group on all matters not specifically delegated to others.

5.4 Senior Vice Presidential Duties: The Senior Vice President shall fulfill the duties of the President in his absence or incapacity. He shall also fulfill such other functions as the President of the AdCom may from time to time direct.

5.5 Secretarial Duties: The Secretary shall be responsible for keeping the records of the Administrative Committee in the areas commonly ascribable to his functions. He shall prepare and distribute reports, notices or such documents as may be required by the President and the AdCom.

5.6 Treasurer's Duties: The Treasurer shall be responsible for keeping the financial records of the Administrative Committee in the areas commonly ascribable to his functions. He shall prepare vouchers for withdrawal of Group funds for payment to officers or members of the Group; certify bills to be paid by IEEE Headquarters direct to suppliers; make a report at each Group business meeting covering the current financial status of the Group; prepare the Group budget, and perform such other duties as may be assigned to him by the President.

5.7 Vice Presidential Duties. The "service" Vice Presidents shall supervise and coordinate the activities of the various Standing Committees and Technical Committees assigned to them.

6.0 Sub-Groups. Sub-Groups are voluntary associations of a significant portion of the total Group membership and hence differ from Standing Committees, which are appointive.

6.1 Chapters. Chapters are sub-groups organized on a geographical basis. This subject is fully treated in the IEEE Bylaws and the Groups and Section Manuals.

6.2 Technical Sub-Groups. A Technical Sub-Group may be organized to cover a specific portion of the field of interest of the Group. Each Technical Sub-Group shall be governad by a Technical Committee. Sub-Groups may organize sessions at a Group Symposium or Technical Conference, and may organize separate specialized symposia. Sub-Groups may organize special issues of the Transactions or a special section in an issue. Any service for Sub-Group members, beyond those provided all Group members, must be paid for by the Sub-Group and the amount must be endorsed by the AdCom and approved by the General Manager of the IEEE.

7.0 Publications. The Group shall sponsor such publications as are recommended by the Committees for Communications Services and are approved by the AdCom. The President, in consultation with the appropriate "service" Vice President and with the advice and consent of the AdCom, shall appoint an editor for each publication.

7.1 Editors Terms of Office. An editor may serve indefinitely, subject to mutual agreement with the President and the appropriate "service" Vice President. The compensation for an editor may be set by the President in consultation with the appropriate "service" Vice President with advice and consent of the AdCom.

7.2 Editors Duties. Each editor shall implement the approved publications program. In accordance with the guidance provided, and general IEEE rules and regulations he shall designate associate editors, special guest editors and manuscript reviewers.

7.3 Editorial Expenses Editorial expenses shall be subject to review and approval of the "service" Vice President, the President and the Treasurer, the latter being explicitly responsible for adherence to the annual publications budget.

8. Group Funds: The Group may raise funds as specified in Article IV of the Constitution and in the IEEE Bylaws and rules and regulations.

8.1 The annual Group fee shall be determined by action of the Administrative Committee.

a. Failure of a Group member to pay the annual Group fee will not render him liable to dismissal from the IEEE, but any Group member who fails to pay such fee before March 31 of each year will be automatically dropped from the Group membership.

8.2 IEEE Headquarters shall act as bursar for all Group funds except as specified hereunder. Billings and receipt of the annual fee shall be via the IEEE Membership and Fiscal Departments. All other fiscal affairs shall be handled through the office of the Technical Activities Secretary.

8.3 The general committee for a symposium or technical conference may, with the advice and consent of the AdCom, authorize the symposium treasurer or fiscal officer to open an account to be used for the deposit and disbursement of funds related to the symposium. In each case, the AdCom shall be advised of the name of the bank, the anticipated size of the account, the names of the account signatories, and of arrangements for insurance and for bonding. Symposia jointly sponsored with other technical societies are excluded where a charter of operations with those societies is approved by the AdCom and the IEEE.

8.4 For other special circumstances, such as co-sponsorship of a symposium, the AdCom shall make prudent arrangements to safeguard the Group funds that may be involved.

9. Group Business: The President and officers shall conduct the Group affairs subject to the advice and consent of the AdCom, except where other authorization is specified.

9.1 No AdCom meetings shall be held for the purpose of transacting business unless each member shall have been sent notice of the time and place of such meeting 30 days prior to the scheduled date of the meeting.

If less than a quorum attend a duly called meeting, tentative actions may be taken which will become effective upon subsequent ratification, either at a meeting or by mail by a sufficient number of members as to constitute a majority. Minutes of such meetings shall be mailed by the Secretary to each Committee member who shall register his disapproval of any actions taken at such meetings, within ten days after receiving said minutes, or he shall be deemed to have ratified.

9.2 The Group shall sponsor at least one symposium each year.

10.0 Technical Committees: A Technical Committee, which may organize a sub-group if desired, functions in a specific technical area as directed by the appropriate "service" Vice President with a scope to be approved by the AdCom.

10.1 Appointment: Members and officers of Technical Committees shall be appointed by the President of the AdCom.

10.2 Term of Appointment:

a. Committee membership - three years
b. Committee officer - two years

10.3 Functions: Each Technical Committee shall promote activities in its field and shall provide the expert knowledge and assistance to:

a. Receive, generate, and review papers within its scope in cooperation with the Transactions Editor and/or the Technical Papers Committee.

b. Organize and operate sessions at meetings of IEEE at all levels and at meetings of other organizations with which the Group is desirous of cooperating, in accordance with the rules in effect at such meetings.

c. Arrange through appropriate editors for publishing pertinent papers in IEEE publications in cooperation with the cognizant Technical Program Committees.

d. Generate and develop appropriate standards in its field for processing by the IEEE Standards Committee, through the Group Standards Committee and otherwise in accordance with Institute policies.

10.4 Operations: The operation of each Technical Committee shall be in accordance with the Manual for Operation of Technical Committees, or other Administrative Committee rules.

11.0 Executive Committee: The Executive Committee consists of the President, the Senior Vice President, the "service" Vice Presidents, the Secretary and the Treasurer. These persons are elected officials (See para.5) The functions of the Executive Committee will be to:

a. Establish avenues of communication between past Presidents and the present President.

b. Act for the AdCom in emergency situations wherein time is not available to call a special meeting of the AdCom.

c. Assist the incumbent President and Vice President as necessary.

12.0 Standing Committees: Standing Committees, shall be appointed by the President with the advice and consent of the AdCom. It will be discretionary with the President to appoint any part or all of any Standing Committee, or to appoint the Chairman only of a Committee, and request the latter to appoint additional members. Such appointments shall be for a period of one year. Each Standing Committee will be assigned to the appropriate officer for overall supervision.

12.1 Standing Committee's Duties. The specific duties of each Standing Committee shall be as recommended by the President, after consultation with appropriate officers, and approved by the AdCom.

12.2 Typical Standing Committees. The Standing Committees may include, but are not limited to, the following:

a. Administrative Committees

(1) Constitution and Bylaws
(2) Nominations and Appointments
(3) Planning

b. Technical Service Committees

(1) Education
(2) Spectrum Studies
(3) Standards
(4) Technical Forecasting and Assessment

c. Professional Services Committees

(1) Environmental and Quality Control
(2) Public Relations
(3) Government Relations
(4) Employment Analyses
(5) Inter-Society Relations

d. Member Services Committees

(1) Awards and Fellows
(2) Chapters
(3) International Affairs
(4) Membership
(5) Student Activities

e. Communications Services Committees

(1) Information Retrieval
(2) Meetings
(3) Newsletters
(4) Symposiums
(5) Transactions

13.0 Special or ad hoc Committees. Special or ad hoc Committees may be created by the AdCom. For each case, the AdCom shall specify the number of members the committee shall have and how the members are to be selected, and the terms of the members if other than for the life of the committee. Special or ad hoc committees shall automatically be dissolved after two years unless the AdCom sets an expiration date.

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MAY 1976 ISSUE OF EMC TRANSACTIONS

FCC MEASUREMENT PROCEDURE FOR A MICROWAVE FIELD DISTURBANCE SENSOR

The FCC has released Bulletin OCE 40, dated February 1976, covering the above topic. Excerpts from the Bulletin are as follows:

This bulletin is intended to assist manufacturers and others who find it necessary to make measurements on microwave field disturbance sensors to determine compliance with the technical specifications in FCC Rules Part 15. It explains the test procedures presently used by the Commission's Laboratory and points out several factors which have been found to affect the accuracy of measurements on these devices. This Bulletin is primarily concerned with measurements of frequency and radiated field strength of sensors operating at 10.525 GHz.

Measurements must be made of the operating frequency and of the field strength of the radiation on the fundamental frequency, on the second and third harmonics and on any non-harmonic spurious emission in the range 10 kHz to 40 GHz. Non-harmonic spurious emissions are commonly caused by oscillators used to modulate the fundamental operating frequency.

TRANSIENT PULSES IN EED's

The transient pulse test for determining bridgewire interface parameters of a hot-wire explosive device produces an analog of resistance change as a function of time in response to a square wave electrical signal. Previously used approaches to interpretation of this analog have been based on establishing an electrical equivalent or graphical balance. A procedure has been devised to interpret the response signal using relatively simple electronic data processing equipment. The analog is reduced to mathematical expressions representing the initial and final states of the primary time constant. These expressions, together with test equipment calibration and variables data allow direct computation of component parameters. The technique will facilitate development of a test data system requiring a minimum of operator effort and interpretation in data reduction.

"Methodology for Computation of Interface Parameters of a Hot-Wire Explosive Device from the Electrothermal Response Analog," by C. Strasburg, Sandia Laboratories, December 1973. Order as report SLA-73-1034 from National Technical Information Service, US Dept. of Commerce, Springfield, VA 22141, $4.50. (Reprinted from Explosives & Pyrotechnics, The Franklin Institute Newsletter).

EED TESTING PAPER AVAILABLE

An EED accepts electrical energy and converts it into heat sufficient to initiate a primary explosion which is then transferred to the major system. For the majority of cases, the electrical energy is delivered as a pulse or discharge that adiabatically heats a bridgewire, which in turn, through intimate thermal contact, heats a small volume of explosive material. The energy required to fire 100% of the items is the practical sought-after performance parameter. All items are not identical due to manufacturing variations, and statistical evaluation methods are required. The sensitivity of the EED can be determined by delivering pulses of increasing energy in a step-wise fashion. An energy firing contour relating the energy required to the programmed step size describes the single pulse firing energy and the possible sensitization of the device under test. Paper includes discussion of test principles, apparatus, circuitry, and experimental observations. For additional information, see "Programmed Pulsing to Initiation Apparatus for Electroexplosive Testing," by L. A. Rosenthal and V. J. Menichelli, Jet Propulsion Laboratory, Review of Scientific Instruments, Vol. 46, No. 9, September 1975, pp. 1215-1220.

IEEE COMMITTEE ON MAN AND RADIATION (COMAR)

By H. A. Ecker and A.W. Guy

Because of the widespread misunderstanding of biological effects of microwave radiation, the IEEE Technical Activities Board formed a Committee on Man and Radiation (COMAR) in October 1972. Leo Young was instrumental in the formation of COMAR and recruited Mark Grove of the Walter Reed Army Institute of Research to serve as its first chairman.

The stated purpose of COMAR is to collect, examine, and comment on the accuracy of information published on the biological effects of electromagnetic radiation. Such publications can range from detailed technical reports of research activity to news articles concerning controversy on microwave radiation hazards. The output from COMAR consists of reports, press releases, and letters to appropriate agencies that can be readily understood by laymen. Specific examples of activities of COMAR are outlined below.

One of COMAR's first tasks was to develop comments for the Oversight Hearings of Public Law 90-602, by the U.S. Senate Committee on Commerce in the spring of 1973. Also in 1973 a detailed review of the World Health Organization report on the biological effects of nonionizing radiation was conducted at the request of the World Health Organization. COMAR developed a position on, and in response to, the Consumers' Union Microwave Oven article. On January 25, 1974 Mark Grove was asked by John Osepchuk to respond to articles appearing in the Honolulu Star Bulletin, pertaining to a press campaign by Dr. Milton Zaret, incriminating microwave ovens in the production of cataracts in the eyes of humans. His response appeared on February 4, 1974, as a letter to the Editor of the Honolulu Star Bulletin. Later, a statement representing input from the entire COMAR group was given at a press conference on February 28, 1974, which received worldwide coverage.

In March a preliminary outline was prepared for the IEEE Reprint Volume on "Nonionizing Radiation Bioeffects". The Committee is presently assembling recommended papers to support the formal proposal to the IEEE press. COMAR also responded to the proposed OSHA Exposure Standard on Electromagnetic Pulses.

In June 1974, Mark Grove left Walter Reed and joined the Air Force Avionics Laboratory in a position not closely related to biological effects of microwave radiation. Allen Ecker of the Engineering Experiment Station at Georgia Tech has been appointed the new Chairman of COMAR.

One of the 1974 goals of COMAR was to prepare a white paper on nonionizing radiation effects, including recommendations for needed research and/or action. This activity is scheduled to start after completion of the Reprint Volume. Interfaces outside

the IEEE have been established through participation of non-IEEE members on COMAR and through peer review practices on the Committee output. This process appears to be both more efficient and more valuable than inclusion of inordinately large numbers of members on the Committee.

There has been lengthy discussion on the recent expiration of the charter of the FDA'S Grant Review Committee on Radiation. Now there would appear to be no commensurate review committee in the entirety of the Public Health Service. The absence of a body of advisors with competence on the biological effects of nonionizing electromagnetic radiation may impose difficult and troublesome problems on the FDA with respect to the administration of its extramural grants program. It is feared that FDA'S problems in turn could result in a slackened or misdirected scientific effort in the area of microwave research. It was suggested that John Guererra, President of the IEEE, contact the Secretary of Health, Education, and Welfare, Mr. Casper Weinberger, for more information about the demise of the Review Committee, and especially about HEW's intentions regarding the establishment in the future of a competent body of advisors. On July 12, 1974, President Guarrera did write such a letter to Mr. Weinberger.

COMAR has responded to a Food and Drug Administration proposal to require two labels on microwave ovens. The first label cautions the user not to operate the oven using microwave energy with objects caught in the oven door or if the door is damaged in such a way that it does not close properly. The second label cautions the user to have the device serviced only by properly qualified service personnel. COMAR objects to the FDA singling out the microwave oven as requiring a permanent warning label when other devices also are known to produce injuries. COMAR maintains that the warning label implies that the microwaves are of a uniquely dangerous nature and that the HEW emission tests and standards are not adequate. There was also some criticism but no objections to the second label.

COMAR's other current interests include the well-publicized incident of alleged microwave produced cataracts on the eyes of a potato farmer living next to the Grumman aerospace plant in Calverton, New York. It is alleged that microwaves emanating from a Navy radar in the Aerospace plant produced the cataracts. The EPA Regional Office was called, and their measurements indicated that the power level was far below 10 mW/cm^2. COMAR offered its services to the individuals involved with the problem.

Another activity of COMAR involves a controversy over the installation of a microwave relay tower in Mahwah Township, N.J. The Orange and Rockland Utility Company has proposed a 125-150 foot microwave relay tower there, and a group of citizens in the area is opposing the installation on the grounds of microwave radiation hazards. The Township Administrator and the Chairman of the Environmental Commission for the Township were offered the services of COMAR in evaluating the situation. Bill Mumford, a member of COMAR, agreed to serve as a consultant to the Township Board of Adjustment. Bill reviewed the pertinent technical information and reported his findings to a hearing of the Township Board of Adjustment on 11 September.

COMAR's guidelines direct that the committee is not to undertake research programs to discover new knowledge, nor is it to set safety standards. Its role, as indicated by the cases outlined above, is to collect existing information, filter it, and present it in an authoritative manner. The committee is concerned mainly with the biological effects of electromagnetic radiation, particularly (but not only) on Man. Its purview includes positive aspects such as medical applications.

(Reprinted from the IEEE Society on Microwave Theory & Techniques Newsletter).