

IEEE

ELECTROMAGNETIC COMPATIBILITY GROUP

NEWSLETTER



ISSUE NO. 76—January, 1973

EDITOR ROBERT D. GOLDBLUM

EMC Problems and Solutions

The July 1972 issue of the EMC Newsletter published selected quotes from a newspaper article which warned of possible physiological and psychological dangers resulting from constant exposure to electromagnetic environments that exist in urban areas. Readers were requested to respond with their reaction and to provide references to other articles of this type.

A number of responses were received. Most of the readers expressed an interest in articles of this type and many references were provided. Mr. C. I. Gause of Pacheco, California, supplied a number of references including an article which appeared in *Business Week*, January 15, 1972. Portions of this article, which was titled "A Crackdown on Electronic Pollution", are presented below.

As the Eastern Airlines jet approached the runway at Memphis Airport, air-to-ground communication suddenly jammed. In a matter of hours, the Federal Communications Commission tracked the interfering signal to a small manufacturing plant outside Helena, Ark. The offender: a dielectric heater that workers were using to laminate water skis. The equipment was sending out vast amounts of radio-frequency energy that just happened to be on the wavelength assigned to Eastern. Production had to be shut down while the problem was corrected.

"This kind of thing used to happen only once in a while", says Donald White, a Germantown (Md.) consultant who specializes in electromagnetic interference (EMI), or "electronic pollution," as it has come to be known. "But the things explosion has blown the situation up to enormous proportions. Today every home has dozens of electric gadgets that emit stray signals. And interference from industrial plants has become a huge problem."

The situation has become so serious, in fact, that the FCC is now clamping down on manufacturers who persist in designing devices that wantonly emit EMI. The upshot could

be what amounts to a licensing procedure for all electrical and electronic products. Last month, the commission gave official notice it was drawing up tough "type approval" rules for a number of worrisome products. Manufacturers have until Feb. 15 to comment on the proposals.

Serious situation: Without this crackdown, experts believe, electronic pollution will increasingly require indirect, costly solutions. Such measures are already becoming commonplace. For example, several hundred square miles around a sensitive Navy radio telescope in West Virginia had to be set aside as an electronic "quiet zone." Within this circle, industrial equipment that produces troublesome emissions is forbidden. The airwaves over Washington, D.C., have grown so cluttered with vagrant signals that the National Bureau of Standards had to move deep into rural Maryland to avoid spurious readings in its measuring equipment. Plant managers setting up operations around Chicago's O'Hare Field discover that a new kind of zoning restriction prohibits use of the land "in such a manner as to create electrical or electronic interference."

Electronic pollution may even pose a health hazard. Scientists once thought that electromagnetic radiation was dangerous only if intense enough to raise body temperature. But lately a number of experts have suggested that a wide range of physical and psychological effects may stem from the constant barrage of even low-energy signals. The U.S. Air Force is now studying the problem. Recently, the head of Sweden's prestigious Royal Academy of Engineering Sciences called for more research into the risks.

Please send your EMI Problems to:

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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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WHAT IS A CISPR?

No! It is not a classified whisper! Would you believe Comité International Spécial des Perturbations Radioélectriques? This translates to "International Special Committee on Radio Interference". The primary objectives of CISPR are to foster satisfactory radio and TV broadcast reception and to facilitate international trade in these industries. These objectives are being met thru the efforts of three sub committees which attack the problems of interference by setting up international standards on a) interference limits, b) methods of measurement, and c) safety. All of us in the EMC community are aware of the problems involved in standardizing limits and test methods even within one military organization such as the U.S. Army. Just imagine this situation on an international scale and you will begin to appreciate the problems confronting this group.

The sub committees are further divided into working groups which tackle specific problems, such as interference limits. The results of the working groups hopefully result in compatible regulations by all of the participating countries. The working groups meet as often as necessary to accomplish their objectives but the entire committee meets in Plenary Assembly only once every three years.

The next Plenary Assembly meeting is going to be held in New York City during the week adjacent to the July 1973 EMC International Symposium in the same city. John O'Neil is a member of CISPR and (would you believe?) has some of our EMC Chapter people hard at work organizing the arrangements for the Plenary Assembly meeting.

In the months between now and next summer you will be hearing more about CISPR and its activities. I am sure John can count on the Jersey Shore EMC Chapter as a group or individually for any assistance he may need.

(Excerpted from the Oct. 1972 issue of the New Jersey Coast G-EMC Newsletter. Warren Thiers, Editor.)

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LETTERS

November 7, 1972

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Gentlemen:

So far I have received responses pertaining to TFA from the four of you addressed above. More later!

While I very much appreciate your comments, I am still waiting for more responses because it seems that the meager response so far will not permit us to perform an effective assessment and planning.

It is hoped that the repeat of my request for participation in TFA, as given in the last EMC Newsletter, will increase the number of responses to an operating level. We are also waiting for response from the committee for TFA which is supposed to comment on our plans.

It is felt that Technological Forecasting and Assessment is a great chance to plan our future within a much bigger framework than we could do if we were standing alone. As far as I can see, it will be a compromise between the Allen and the Schlicke plans; the first one being too simple and the second one too complex. It seems mandatory that we extricate the commonality of the different branches of EMC such that we present a much stronger common front than our presently highly diffused endeavor constitutes.

Let's get those letters coming in!
Sincerely yours,

H. M. Schlicke
TFA Coordinator for EMC Group
8220 N. Poplar Dr.
Milwaukee, Wis. 53217



New Technology Agency
Will Advise Congress

A special agency will be set up to advise Congress on the probable impact of technology on the economy, under the bill (H.R. 10243) signed into Public Law 92-484 by President Nixon.

This Office of Technology Assessment also will help Congress decide the relative priorities of programs submitted by the Executive Branch or by lawmakers themselves.

A \$5 million budget has been authorized for its first 2 years. Thereafter Congress will decide what funds are needed.

BOOK REVIEW

by James S. Hill

Electromagnetic Interference and Compatibility, Volume 5, EMI Prediction and Analysis Techniques, by William G. Duff and Donald R. J. White, published by Don White Consultants, 14800 Springfield Road, Germantown, Maryland 20767, 1972, \$42.00, 630 pages, cloth bound.

This is the third in the five volume Electromagnetic Interference and Compatibility Handbook series. The remaining two volumes (2 and 3) are scheduled for release in 1973.

Volume 5 provides an excellent description of the methods and techniques which may be used for EMC analysis. The handbook includes; a discussion of both manual and computer prediction techniques; a summary of EMC analysis mathematical models and methods; and a description of the application of these techniques to a variety of EMI related problems involving frequency management, frequency assignment, system planning, system design, specifications, etc.

This book is novel in a number of ways. It underscores the tutorial throughout, emphasizing fundamentals wherever possible so that the reader can understand the rationale. The "how-to-do-it" is illustrated wherever possible so that much of the heretofore "black-magic" is explained by the many figures, tables, and examples. Information on EMI prediction can be made realistic and easy. Because of the broad range of information contained in the handbook, it should prove to be a valuable reference for a wide variety of types of users.

The first chapter provides an overall discussion of the EMI problem, describes various stages and uses of EMI prediction techniques, identifies major users of the spectrum, and introduces basic prediction and analysis methods and techniques.

Chapter 2 introduces input functions and data that are needed to perform electromagnetic interference (EMI) prediction. It describes electromagnetic relationships that exist between these input functions, and presents equations that define these relationships. The chapter further defines basic concepts, procedures, and techniques that are used in performing an EMI prediction. The basic answer to the question "does EMI exist" is not a yes or no, dependent on the value of the interference margin, rather it is a statistical evaluation of the probability of interference expressed on a time basis. An organized procedure for predicting EMI is presented for both intra-system and inter-system interference. Inter-system EMI is emphasized via energy emitted by and received from antennas and may be applied to either operational systems or systems in the planning and design stages.

Transmitter, receiver and antenna EMI characteristics which must be considered in carrying out an EMI prediction and analysis are identified in Chapters 3, 4, and 5. Methods and mathematical models for representing these characteristics are presented, and techniques for selecting applicable models for a particular EMI prediction problem are described.

One of the most difficult problems in performing an EMC analysis is obtaining information on the EMI characteristics of equipment involved in the analysis. Volume 5 eliminates this problem by providing generalized models for transmitters, receivers, and antennas which may be used for EMI prediction when specific data are not available. Extensive data are presented on:

- transmitter emission spectra and spurious output levels.
- receiver selectivity, spurious response, susceptibility, inter-modulation characteristics, cross-modulation levels, and desensitization.
- antenna gains, beamwidths, side-and back lobe radiation characteristics, cross polarization effects, and out-of-band frequency characteristics.

Chapter 6 describes various modes by which an interfering signal may be propagated to a victim receiver, provides criteria that may be used to identify the most significant modes of propagation, and presents mathematical models which describe the

propagation loss resulting from these modes. The chapter also describes how these models may be used to calculate the propagation loss in EMI prediction. A number of curves are presented for propagation loss for typical situations of interest and these curves should be of use for system design as well as EMC analysis.

Sources of electromagnetic interference (EMI) emissions—both natural and man made—in the 10 Hz to 30 GHz frequency spectrum are surveyed in Chapter 7. Natural sources include terrestrial atmospheric noise and precipitation static and extra-terrestrial emissions originating from the sun, cosmos, and radio stars. Whenever practical, this chapter presents typical radiated emissions in terms of either power density or field intensities, generally at stipulated distances from identified EMI sources. Most such data are presently in broadband radiated units of either dBm/m²/kHz or dBuV/m/kHz. Some C-E spectrum signatures, however, are reported in terms of power relative to the fundamental in the transmitter output.

Chapter 8 discusses considerations relative to operational performance and systems effectiveness as they apply to EMI prediction. Two basic techniques are presented for translating EMI prediction results into a form that is meaningful from an operational performance standpoint. The first technique is based on the concept of "performance threshold" which is defined as the signal-to-interference ratio that separates acceptable performance from non-acceptable performance. The second technique is based on "performance scoring" and provides information which may be translated into "grades of service". This chapter also discusses the overall systems effectiveness problem and describes how EMI prediction results may be used to determine the Electro Magnetic Effectiveness (EME) of a system.

The overall prediction process as it relates to communication—electronics equipment is described in Chapter 9. Methods and techniques used to combine transmitter, receiver, antenna, and propagation models in various phases of EMI prediction are presented. Specific examples are provided to help the reader understand applications of each phase of the prediction process to various types of problems.

Chapter 10 describes some of the special considerations that apply to the intra-system EMI prediction, analysis, and control. This chapter considers interference which may exist because of electrical noise spikes, originating from nearby power supplies, switches, electrical motors, and a multitude of other sources, and which may be magnetically and/or electrically coupled into low-level sensitive circuits. This chapter also considers EMI which may couple by ground current paths or by direct radiation from box-to-box or box-to-cable.

Finally, Chapter 11 describes some of the general uses of the EMI prediction techniques presented in this volume, and summarizes some of the available computer programs, routines, and services.

Your reviewer found the extensive glossary of symbols preceding Chapter 1, exceedingly helpful in interpreting equations throughout the book. In addition, the numerous illustrations include useful graphs and tables. Each chapter includes a bibliography listing many additional sources of information on the chapter subject. The index is quite complete and provides a convenient means of finding a discussion of any subject covered in the book.

The authors have succeeded in producing a clearly-written, understandable treatment of their subject. The tutorial treatment and emphasis of fundamentals does much to enhance its usefulness to the reader. I recommend it as a fine reference work on EMI prediction and analysis which will prove to be very helpful to system planners and designers as well as to frequency management personnel. It should also find a place on the desk of the director of engineering or his equivalent who is responsible for overall performance of the system including achievement of electromagnetic compatibility.

CHAPTER CHATTER

by Ira (Marty) Berman

I think that I shall never see
A discipline as lovely as EMC
It teaches you to look and find
What signals the noise has behind.
The people who do this thing
Can do it winter, summer, fall or spring
It's tricky but it must be done
Or else someday we won't be able to communicate with any one!
(with apologies to the late Ogden Nash)

Now that we've gotten the literary bit out of the way, (this issue's sampling of "kultur") let's get down to business.

WASHINGTON, D.C.

We've already said that Bill Green is Chairman; it's time to note that Bill Gamble is Vice-Chairman and John Leopold is Secretary-Treasurer. Now for meetings: On May 18, 1972, 55 people came out to hear Col. Ackerland speak on ECAC. Five meetings are scheduled for 1972-1973: Sept. 21, 1972, where Richard A. Tell from EPA spoke on "Environmental RF and Microwave Hazards", and Nov. 16, 1972, when Clarence J. Saunders of the Bureau of Standards described the "EMC Considerations in Design and Operation of NBS Gaithersburg, Md. Facility". Sorry, no attendance figures on either of those. Three more meetings are planned for 1973: Jan. 18, Mar. 15, and May 17. The September and November speakers were members of the Chapter and Dick Tell had a paper in the August 1972 SPECTRUM. There was such a get-up-and-go spirit in the Chapter last season that they have formed two working groups on "Standards" and "Technology Forecast and Assessment" to cooperate with the corresponding Group Committees. Now who says electronic engineering is down and out? And to top it all off, on Sep. 26-28, 1972, there was a three-day symposium at Sachs-Freeman Associated in Hyattsville, Md. with the subject "Time-Sharing Computer Techniques for Spectrum Management and EMC". Heavy, man.

PHOENIX

Schenectady, NY set a new low record for the date of 5° (above zero) on Nov. 22, 1972. Bob Lash, Phoenix Chairman, reports that 53 heard Will McGibbons, Director of the FCC Spectrum Management Task Force, discuss FCC Spectrum Management, Frequency Coordination Progress, Decisions and Future plans. I'll bet they were in their shirt sleeves. I will try for the new slate of officers in the next issue. This Chapter also reports on a "definite feeling of accomplishment" (in caps in their report, no less). Man, that's great!

PACIFIC AREA COMMITTEE

Bob Ford indicates that elections in PAC are a three-month arrangement which, considering his area is about 1/4 of the globe, is not too bad. He lists two meetings: Oct. 30, 1972, at Tokyo, where he and Bob Kugler were supposed to talk about (1) Noise and EMI; (2) G-EMC PAC Organization; and (3) Elections, if the two speakers were available (if not, substitutes were standing by); and Nov. 28, 1972 at Pearl Harbor, when Mike Look (U.S. Navy) spoke on Programmable Calculators, and there will be more on the elections. There are lots of ideas in the mill but no firm actions, he says, and he sends along a copy of issue no. 6 of the PAC Newsletter which is a joy to read (even if he doesn't mention Chapter Chatter in every issue). My spies tell me he does it all by himself—even pays for it occasionally. Wild.

TUCSON

Only news from Tucson is that Robert R. Seach is now Chairman. Welcome aboard, Bob, and let us know how well you're making out.

CENTRAL TEXAS

Welcome, new officers: Dr. Fred J. Morris, EMCO, Chairman; Ray Welty, Vice-Chairmen; and John Osburn, Tracor, Secretary. Two meetings: Oct. 16, 1972, with Fred Morris speaking on "Sowing Seeds for RFI" to 18, and Nov. 9, 1972, when the Chapter will participate in IEEE Student Night at the Austin Convention Center. That may be a good night to reap some new members. Sow—reap—get it? Good luck, anyway, fellows.

CHICAGO

Howard L. Wolfman is the answer, What's the question? Why, who is Chairman of the Chicago Chapter. Now, what else is new there?

SAN FRANCISCO

Would you believe there is a Chapter in the City by the Bay? And that they hold *monthly* meetings? Who'd have thought—until now, when they sent me a schedule: Sept. 18, 1972, William Becher, Singer, "Trends in RFI Instrumentation"; Oct. 16, 1972, Dr. Gaetan Richard, President, Electro Magnetic Processes, "Electromagnetic Pulse Stimulation Techniques"; Nov. 20, 1972, William Berger, Philco-Ford WDL, "Semi-Conductor Failure Analysis"; Dec. 4, 1972, Dr. Saregh Bahil, Ayra-Mehr University, Tehran, Iran, "EMI Space Applications"; Jan. 15, 1973, Fred J. Nichols, President, LectroMagnetics, supporting the EMC portion of a discussion on "Technological Forecasting and Assessment", jointly with the ASME Chapter; and Feb. 20, 1973, C. Louis Cuccia and Richard S. Davies, Philco-Ford WDL, "Operation of Information Satellite in an Interference Environment". Those are the ones definitely committed. March 1973 (Space Communications), April 1973 (NSPE/IEEE Incorporation), May 1973 (Biomedical), and June 1973 (Transportation) are in the planning stage. Phew! and Bravo!!

LOS ANGELES

LA rarely lets me down, and this issue is no exception. I'm not positive they are in competition with their sister chapter in San Francisco, but who cares with a program like this: Sep. 28, 1972, John McEachen, Litton, "EMC on the DD-963 Class Ships" (51 attendees); Nov. 2, 1972, Don. B. Clark "EMP"; Nov. 16, 1972, a Panel (C. B. Pearlston, Aerospace Corporation, Analysis; D. Black, DB Associates, Components; J.E. Fischer, Litton, Instrumentation; E. Hughes, NAR, Specifications) with the topic of discussion "What's New in '73"; December 1972, Christmas Party; Jan. 25, 1973, Herb Mertel, G-D Convair, "Explicit Grounding Allusions" (I wonder what *that* was about?); Feb. 22, 1973, Al Heibert, Rand Corp., and J. Shearer, RADC, "USAF EMC Analysis"; Mar. 22, 1973, Walt McKerchar, Boeing, "Susceptibility of Cardiac Pacemakers"; Apr. 26, 1973, Eldon Hughes, NAR, "EMC on the B-1 Aircraft and Tour of the B-1 Mckup"; and May 24, 1973, Harold E. Taggart, NBS, "Law Enforcement Communications Standards". Now if that schedule doesn't beat all, I don't know what does. Let's hear some applause for the troops on the Western Front!

NEW JERSEY COAST

Bruce Miller, Chairman, announces the following new officers: John Prorok, Vice-Chairman; John A. Soboleski, Secretary-Treasurer; and a full Administrative Committee of ten that looks like a small G-EMC AdCom. On Oct. 19, 1972, Jacqueline Janoski of ECAC presented the "Life and Times of a Lady Engineer" to 40 members and 18 guests. (Who says EMC—and EMC People—are not beautiful?) Meetings are planned for Dec. 5, 1972 (Christmas Party), Feb. 15, 1973, Apr. 19, 1973, and Jun. 21, 1973. Efforts for a joint meeting with the Bio-Engineering Chapter are in progress, as well as a "Beer Night" for Students. Bruce sends along the Sep. and Oct. 1972 Newsletters (Warren Thiers, Editor), and a quite readable and interesting paper it is, too. All in all, the Chapter looks to be prospering.

PHILADELPHIA

My old Chapter is still hanging on, but apparently by the eyelids. There was a meeting on Oct. 17, 1972, when Dr. Gunther Sorger of Singer Instrumentation spoke to 13 on Spectrum Analyzers and SHF Measurements. A Singer analyzer was set up at the dinner (12 stories above street level) and, as you might expect in a heavy industrial area, showed a great deal of interference (seven TV channels less than two miles away didn't help). On Feb. 15, 1973, Al Kall of Ark Electronics will speak on "EMC in Hospitals", and Allan H. Frey of Randomline will discuss "Biological Effect of E-M Radiation". An April meeting date and topic will be announced. A copy of the Chapter Newsletter edited by (who else) Bob Goldblum included in the report gave local news and the word that Richard R. Stoddart, the founder of Stoddart Aircraft Radio, passed away in September. The name "Stoddart" brings back a flood of memories in the EMC instrumentation field (NM-10, -20, -30, -50 and -62 plus the development of the Slideback Circuit and the unit uv/m/kc).

And thus passes another Chapter Chatter column., too. Your Associate Editor for Chapter News would like to publicly request anyone who is active in the field of EMC and interested in people to drop his name to Bob Goldblum, Newsletter Editor, with an eye toward taking over the column. I have been writing Chapter Chatter for 4½ years, watching chapters start up and close down, and watching names (that I occasionally meet face-to-face) start as Chapter Secretaries and become G-27 AdCom members. But I have been out of EMC for 2½ years, and writing about something that distant just doesn't seem right. My objective is to turn the books over in July 1973 at the Annual Symposium in New York. So please, all you 1600+ members, think about it. And have a fine Holiday Season!

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HAPPY ANNIVERSARY

The 10th anniversary of the merger between the IRE and AIEE was January 1, 1973. Serious stocktaking? Lavendar & old lace? Hoop-la? (Comments by I.S. Coggeshall, Editor of Electrical Engineering, Oct. 1972)

IEEE NEWS & VIEWS

IEEE & G-EMC DUES INCREASE

As you probably know by now, the IEEE dues has been raised from \$30 to \$35.00 per year while the G-EMC dues have gone up to \$7.00 from \$5.00 per year. In other words, it will now cost you a minimum of \$42.00 a year to be a member of our Group.

In a recent IEEE survey, the majority of members stated that they would be willing to pay more if the IEEE would do more for their well being. The chances are that you were one of those who agreed to this. But, how quickly we forget. Your first reaction to your 1973 invoice was probably not suitable for print. Yet, if the IEEE is to increase its scope of activity, it must also increase its resources. Members and dues are its main resources.

The L.A. Chapter of the G-EMC, under the fine leadership of John Minell, circulated a questionnaire to survey the attitudes & opinions of local EMC engineers. Among the questions were:

"How do you feel about the \$42 cost of joining IEEE?"

- a. Reasonable
- b. Too much
- c. Excessive
- d. Keeps me from joining

Please comment on value received.

- a. IEEE (in) General—\$35.00
- b. G-EMC—\$7.00

Should the G-EMC-

- a. go independent?
- b. remain with IEEE?
- c. affiliate with SAE?
- d. affiliate with EIA?

I am hoping that John will send us the results. What is your opinion? Are you going to abandon a sinking ship, just hang-on & ride the waves, or shore-up the holes & bring in new members? What else? Affirmative action must take place from within. The first step is to let your ideas & position known. To this end, the G-EMC Newsletter is at your disposal. Lets hear from you. Names will be withheld upon request.

Bob Goldblum
Editor

1973 ELECTRICAL & ELECTRONIC MEASUREMENT & TEST INSTRUMENT CONFERENCE

May 15-17, 1973 Ottawa, Ontario, Canada at the Skyline Hotel. Sponsored by the Ottawa Section of IEEE and by the Group on Instrumentation and Measurement. The U.S. Commission I of URSI will be a participating sponsor. The technical program will emphasize practical engineering applications of recent developments in the field of instrumentation. Subject areas include:

- 1) Measurement techniques in the dc, low frequency, high-frequency and microwave areas
- 2) Automation of measurements and specifying and designing systems
- 3) Use of transform and correlation techniques in instrumentation
- 4) The use of LSI digital techniques in instruments
- 5) Time and frequency measurements

IMPI AFFILIATION

Affiliate membership in the International Microwave Power Institute (IMPI) is available to IEEE—EMC group members for the reduced fee of \$10/year for the first membership year. The regular fee is \$15/year. The membership includes a subscription to the Journal of Microwave Power a quarterly publication in the area of Industrial, Scientific and Medical Applications of Microwave Power.

Applications for membership to be sent to:

IMPI,
Box 1556,
Edmonton,
Alberta, Canada

WASHINGTON LAW CONSULTANT

Frank Cummings, Washington attorney, has been retained by IEEE to guide IEEE's responses to questions raised by legislative representatives; to act as counsel for our Government Relations committee; and to explore alternative means of providing better pensions for engineers.

NEW IEEE SOCIETIES

Final approvals have been voted to establish two additional IEEE Societies.

Circuits and Systems 4-CAS
Nuclear & Plasma Societies 5-NPS

Please note that the latter will publish two Transactions:
Nuclear Science-4NS
Plasma Science-4PS

AFFILIATE FEE

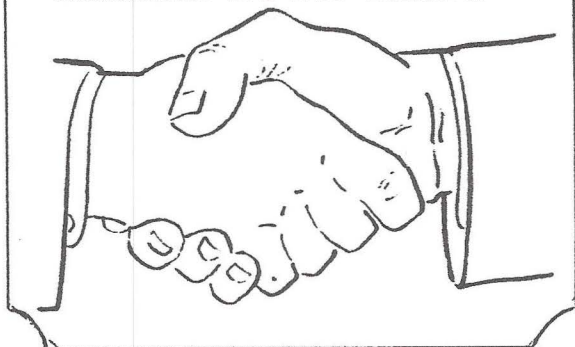
The IEEE affiliate fee was raised to \$18 last year, in anticipation of an increase of the IEEE dues.



IEEE G-EMC ADMINISTRATIVE COMMITTEE MEMBERSHIP

	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Burrano															
Grobowski															
Pakala															
Showers															
Daniels															
Dinger															
Egli															
Fairweather															
Garlan															
Gauper															
Milton															
Randall															
Schreiber															
Schulz															
Thomas															
Bennett															
Hill															
Kall															
White															
Maynard															
Sullivan															
Nichols															
Eckert															
Krstansky															
Georgi															
Gregory															
Mitchell															
Schlicke															
Skolnik															
Roman															
Chappell															
Fischer															
Seth															
Senn															
Zimbalatti															
Cumming															
Free															
O'Neil															
Cory															
Fisher															
Hughes															
Powers															
Taggart															
Cowdell															
Kesselman															
Knowles															
McKay															
Sachs															
No. of members	15	15	15	15	15	15	15	15	15	16	17	18	18	18	18

WE'D LIKE TO SHAKE YOUR HAND



THANK YOU—JOHN McDONALD

The past few years have been tough on many of us. Poor economic conditions resulted in unemployment & underemployment for many competent EMC engineers. As a result, our ranks have coarctated with much personal turmoil. One shining light through this dark period, was the unselfish effort of John McDonald. Although a victim of circumstances himself, John initiated a major effort to locate job openings, under the auspices of the IEEE G-EMC, and circulated the resumes of the unemployed. Even when things were at their lowest level in the Los Angeles area, he was still helping and with considerable success. The exact number of engineers that were hired as a result of John's efforts is not known, but now that things have improved, he can rest and reminisce. Unfortunately, many of those whom he helped were remiss in not thanking him and others didn't even take the time to tell him that found a job. John has never complained nor sought recognition, but his efforts have not gone unnoticed. THANK YOU JOHN McDONALD, we would like to shake your hand.

CEMEC EXPANDS

CEMEC, Inc. of 1605 W. 51st Chicago, Illinois is announcing the opening of an additional facility in Cocoa Beach, Florida to be able to serve the Southeast and Eastern United States more effectively. This new facility is located at 4309-11 Banana River Blvd. in Cocoa Beach, Florida 32931. Direct sales offices and laboratory facilities will be located there. The facility will go into operation December 1, 1972. Mr. Arthur L. Fuller will be the southeast district manager. All phases of EMI/EMC work are to be conducted through this facility. FCC certifications to Part 15 and Part 18 will be available too.



RICHARD R. STODDART DECEASED

It is with regret that we note the passing of one of the foremost pioneers in EMI Instrumentation. Richard R. Stoddart, born in New York City December 1, 1900, began his electronics career at the age of 15 working for the Telefunken Wireless Company, then a "loft" operation. Several years later he built and operated one of the first spark transmitters in that area. Later he served as radio operator on merchant ships flying the Atlantic Ocean to South America.

In the 1920's he was one of the first to receive a commercial pilot's license and spent time "barnstorming" with light aircraft in and around the Poughkeepsie airport. In the 1930's he was a field engineer for NBC in New York and became well acquainted with radio celebrities of the day.

In 1938 he became one of the five man crew accompanying Howard Hughes on the record-breaking flight around the world in a two-engine aircraft. As radio operator, Dick arranged all the contacts in the countries visited and was applauded for his skill and organization of his part in the flight's success.

In 1940, Dick organized Stoddart Aircraft Radio Company designing and manufacturing radio receivers and transmitters for aircraft, principally the aircraft which were being ferried to Europe to assist the British in World War II. On an Air Force contract in 1944, Dick and several of his engineers designed and manufactured the first VHF receiver which was continuously tunable over the range 100 MHz to 400 MHz. This instrument utilized the average detector and the quasi-peak detector and was used to measure narrowband radiation and the "nuisance value" of broadband radiation. A year later the slide-back peak detector was added and broadband calibration was expressed in present day terms "microvolts-per-meter-per-kilocycle".

Based on this revolutionary instrument, Dick negotiated with the Navy Bureau of Ships for contracts which resulted in the development of the URM-6 (NM-10A) in 1948, the PRM-1 (NM-20A) in 1949, and the URM-17 (NM-50A) in 1950. In the decade from 1950 to 1960, the URM-47 (NM-30A), the NM-40A and the NM-62A instruments were completed, thus providing EMI instrumentation over the range 20 Hz to 10 GHz without hiatus. Many of these equipments are still in service and performing a creditable job in accordance with EMI specification requirements.

In 1953 he was an American delegate to the International Conference on EMI, the plenary session of the C.I.S.P.R. held in London, England.

Dick Stoddart was made a Fellow in the IEEE in 1958 in recognition of his important contribution to the field of EMI Instrumentation.

In 1962 he sold his company and retired from business to pursue his many hobbies, including ham radio, fishing, boating and flying. He flew his own twin engine airplane until nearly 70 years of age.

His friends and admirers knew him for his enthusiasm, diligence and energy and they will miss him.

September 26, 1972

MEETINGS & EVENTS

THE EFFECTS OF LOW-FREQUENCY MAGNETIC AND ELECTRIC FIELDS ON BIOLOGICAL COMMUNICATION PROCESSES

February 18-24, 1973 Wildwood Inn-Silvertree/El Dorado Snowmass-at-Aspen, Colorado 81611, sponsored by the National Science Foundation, Neuroelectric Society, International Institute for Medical Electronics and Biological Engineering, and Marquette University. The state of current knowledge will be examined regarding the effect of static and slowly-changing magnetic and electric fields on communication processes in humans, animals and plant life. The widespread use of various man-made devices that introduce emanations into the environment increases the potential for damage to living systems. Topics are: I. Fundamental mechanisms of low-frequency electric and magnetic field interactions with biological systems, II. Observed effects of low-frequency electric and magnetic fields on biological systems, III. Natural and man-made sources of low-frequency electric and magnetic fields and safe levels of exposure.

1973 IEEE INTERNATIONAL CONFERENCE ON COMMUNICATIONS

June 11-13, 1973 Seattle, Washington Sponsored by the Communications Society and the Seattle Section, IEEE. Papers of a theoretical, experimental and developmental nature in the areas of communication switching, radio communications, space communications, wire transmission systems, communications theory, communications systems, spectrum utilization, vehicular communications, home information systems, automatic technical control, satellite communications, urban communications concepts, data communications systems, digital voice video technology, integrated voice and data systems, optical and millimeter-wave technology, digital techniques for public safety.

1973 SOUTHEAST-CON

April 30-May 2, 1973 at the Galt House, overlooking the Ohio in downtown Louisville, Kentucky. This conference timing coincides with the Kentucky Derby Festival Week, and features a party cruise aboard the renowned stern-wheeler "Bell of Louisville" to be held a day before her annual race with the "Delta-Queen". The technical program of the Region III Conference will feature 170 papers with a balance between important original research and tutorial survey papers, with emphasis on practical applications. Topics of interest are: power systems, biomedical applications, electromagnetics, electronics, instrumentation, systems engineering, computer applications, computer hardware, communications, environmental engineering, control systems, lassers, social factors in technology, education and management, electronic devices, circuit theory, and antennas and propagation.



1973 EMC SYMPOSIUM TO BE HELD IN NEW YORK CITY

New York City has the honor of hosting the IEEE International EMC Symposium on June 20, 21, 22, 1973.

Attendees are expected from many areas including: medical, engineering, universities, government, and the military. Additionally, since the symposium will follow right on the heels of the CISPR Conference, also to be held in New York City, June 11-19, 1973, we expect very good attendance by our colleagues from overseas.

The symposium theme is: "One World, One Spectrum, Pollution-Free". Emphasis will be placed on the environmental impact of electromagnetic energy. Particularly, radiation hazards to personnel will be covered in depth. Also, for the first time, a full session will be devoted to the problem of electromagnetic pulse-EMP.

Exhibitors, from over 60 companies, are expected to display their state-of-the art wares in electromagnetic compatibility. Potential exhibitors are advised to reserve their booths early to assure choice locations. Companies wishing to participate, but not exhibit, may do so as co-sponsors.

The family is invited; don't forget to bring them. A full program of activities is being planned, and you should plan to take full advantage of the many cultural opportunities New York City offers. Many fine hotels and motels in New York City, and its general area, provide excellent accommodations. The host hotel is the ultra-modern New York Hilton.

Don't forget to note the dates on your calendar, and plan NOW to attend.

SEVENTH ANNUAL CRIME CONFERENCE 1973 CONFERENCE THEM: COMMUNICATION

A session of invited papers on the subject of communication will be a feature of the 1973 Conference. Topics include cost effectiveness, optimum utilization of electromagnetic spectrum, innovative modulation techniques, non-voice communication, information storage, retrieval and display, communication security and privacy. Other areas will include: IDENTIFICATION, CONTRABAND DETECTION, ALARM SYSTEMS AND DEVICES, LOW LIGHT LEVEL TECHNIQUES, COMMAND AND CONTROL, AUTOMATIC VEHICLE LOCATION.

This Conference provides a forum for the discussion of current state-of-the-art developments in this field of engineering. Users as well as producers of this technology are encouraged to participate actively. A permanent record, the Conference Proceedings, is published each year and is distributed to selected engineering libraries and law enforcement agencies throughout the world. Copies may be obtained from the Office of Research and Engineering Services, College of Engineering, or from the National Clearinghouse for Scientific Information, Springfield, Virginia.

Produced in cooperation with these IEEE entities:

- Aerospace and Electronic Systems
- Audio and Electroacoustics
- Electromagnetic Compatibility
- Microwave Theory and Techniques
- Systems, Man and Cybernetics
- Vehicular Technology

MISCELLANY

A COOPERATIVE RESEARCH PROGRAM in APPLIED ELECTROMAGNETIC TECHNOLOGY

Southwest Research Institute is making its experience in Basic and Applied Electromagnetic Technology available to all industrial and commercial organizations, government agencies and individuals through the establishment of a cooperative program. The activities will include studies, surveys, technical and techno-economic development, design, testing, and evaluations related solely to the application of electromagnetic waves.

The Electromagnetic Technology (EMT) program establishes a CENTRAL LOCATION where industrial firms and government agency members can obtain technical assistance and techno-economic evaluations in solving problems involving the use of electromagnetic energy, on a cooperative, timely, and least cost basis.

The EMT Program will:

- Perform applied research in selected areas of electromagnetic technology for, and in cooperation with, member organizations engaged in research, development, manufacture, marketing, and operation of electromagnetic systems and equipment. These include members who use electromagnetic effects of these equipments and techniques to serve society.

- Invite memberships from all who need or want additional support in the research, development design, manufacture, operation, evaluation, and testing of electronic products and systems.

- Offer to industrial firms, public agencies, and the public services and facilities in electromagnetic spectrum utilization and control, instrumentation, materials and structural research, biomedical engineering, and testing in connection with the development, design, manufacture, and operation of electromagnetic systems and equipment.

- Assist its members in interpreting, applying, and supplementing new technology furnished by agencies as a result of federally-sponsored R and D programs in the field of electromagnetic technology. This assistance will be given by collecting; critically reviewing; evaluating, by calculations and experiments where necessary; and reporting data believed to be of practical use to EMT members in their area of interest. The R and D program results will be procured from the Federal Scientific and Technical Information Clearinghouse, NASA/AEC briefs, and government-owned patents available to members.

For additional information, contact Dr. Carl Frederick, Southwest Research Institute, 8500 Culebra Road, San Antonio, Texas 78284.

NSF OFFERS GRADUATE FELLOWSHIPS

The National Science Foundation has reopened competition for 500 Graduate Fellowships for 1973, leading to master's or doctor's degree in science, social science, mathematics or engineering. Graduate Fellows receive stipends of \$300 per month—no dependency allowances. Details available from NSF, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.

COMPUTER PROGRAM AVAILABLE FOR POINTING ANTENNAS TO REDUCE INTERFERENCE REACHING SATELLITE ORBIT

A new computer program, describing the calculations needed to enable terrestrial radio-relay operators to avoid pointing their antennas at the geostationary orbit of communications satellites, is available in a new report by the FCC Common Carrier Bureau (Report No. CC-7201, "Geostationary Orbit Avoidance Computer Program" Sept. 1972).

The computer program was jointly developed by the common carrier industry, the FCC and other Government organizations. It will be used by the Commission staff in analyzing disputed cases.

FCC rules prohibit radio-relay operators from pointing 6 GHz transmitting antennas within two degrees of the geostationary satellite orbit (Section 21.108(e)). The rules refer to two methods for making this determination. One is a graphical procedure described in CCIR Report 393, based largely on techniques developed by Richard Gould, Common Carrier Bureau Special Assistant, and described in "Protection of the Stationary Satellite Orbit," *Telecommunications Journal*, Vol. 34, No. 8, Aug. 1967. The second technique is set forth in "Radio-Relay Antenna Pointing for Controlled Interference with Geostationary Satellites," by C. Lundgren and A. S. May, B.S.T.J., Vol. 48, No. 10, Dec. 1969, Pp. 3387-3422.

The first method is an approximate one useful mainly as a screening tool, and the second is a more precise technique, satisfactory for calculations by hand. Several computer programs based on the Lundgren/May method are in use, but do not always produce identical results. The new computer program was prepared to meet requests by terrestrial operators, for a single, agreed computer method to make large numbers of highly precise calculations.

The new program is written in Fortran, and was designed for use on IBM system 360 computers, but can easily be modified for other machines. The report includes a description of the main program and its subroutines, a program block diagram, a flow chart, a source code listing, the input/output formats and several test cases to aid in checking proper operation.

Copies of the report are available at \$3.00 each from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Va. 22151 (Accession No. PB 211500). A card deck, consisting of the source code and data cards for the test cases, is also available from NTIS for \$7.00 (Accession No. PB 211501).



NBS INAUGURATES MILLIMETRE-WAVE CALIBRATION SERVICE

Millimetre waves are here to stay—at least that's the strong implication drawn from the Bureau's move into mm-wave calibration services. The Bureau announced the availability of interim services at their Boulder, Colo., laboratories, in February 1972. By extending its long-established microwave services into the 55- to 65-GHz millimetre-wave region, NBS fills a need that has existed since the early days of millimetre-wave research and exploration. They now have ready a millimetre-wave capability to measure power, attenuation, impedance, antenna gain, and noise and can calibrate devices needed to make such measurements. The services will be classified interim until the projected accuracies stated below are given final approval.

To measure power, NBS developed a microcalorimeter as a reference power standard plus a transfer method permitting bolometer-coupler units up to 20 dB to be calibrated to within ± 2 to ± 3 percent.

To measure variable attenuators, a 30-MHz i-f substitution measurement system was developed to determine the attenuation difference to within ± 0.05 dB per 10 dB in a range of 0 to 50 dB.

On-axis antenna gain is measured using two existing facilities, refitted for millimetre-wave frequencies. Two separate techniques permit results to be cross-checked and help resolve individual limitations, thus increasing the confidence and reliability of both measurement techniques.

Two new WR-15 waveguide noise sources were developed by NBS for making noise-figure measurements to better than ± 0.1 dB (2.3%) where circumstances permit this accuracy.

NBS developed a special facility with a goal of making noise-figure measurements to ± 0.1 dB (2.3%). Resolution is of the order of 0.001 dB; precision is about 0.01 dB; accuracy has not been resolved at this time.

(Excerpted from the May 1972 issue of NBS Technical News Bulletin.)

MARKET ANALYSIS REPORT AVAILABLE ON EM POLLUTION/SPECTRUM MANAGEMENT AND EMC

Projections indicate that this market currently is approximately \$277 Million dollars and will grow to more than \$513 million dollars by 1973.

A 300 page, nine chapter Market Analysis Report is available containing: An Executive Summary, Introduction, Market Potential, Market Structure, Markets related to Military Specifications and Hardware Developments, Markets related to Health Radiation Hazards and Non-Thermal Effects of Radiation, Markets in EM Pollution, Tactical and Strategic Spurious EM Radiation, and Industry Structure.

For further and more detailed information contact: MC-DONALD ASSOCIATES, 14657 Aetna Street, Van Nuys, California 91401. (213) 780-4257.

NBS TO MAINTAIN U.S. LEGAL VOLT USING $2e/h$

On July 1, 1972, the National Bureau of Standards, U.S. Department of Commerce, adopted a new procedure for maintaining the U.S. legal volt. The new method is based on the determination of the ratio of twice the electron charge to Planck's constant, $2e/h$, using the ac Josephson effect in superconductors. Recent work at NBS and elsewhere has shown that $2e/h$ can be determined in terms of a particular as-maintained unit of voltage to 1 part in 10 million or better. Since $2e/h$ is an invariant fundamental constant of nature, the Josephson effect provides, for the first time, a means of deriving a reproducible, invariant voltage.

MOLE ADOPTED AS INTERNATIONAL SYSTEM BASE UNIT

Representatives of 41 nations, serving on the General Conference of Weights and Measures (CGPM), recently voted to adopt the "mole" as a "base unit" of the International System of Units (SI). The mole, a measure of the quantity of matter, joins that special class of units that already includes mass, length, time, temperature, electric current, and luminous intensity.

The mole is defined as "the amount of substance of a system containing as many elementary entities as there are atoms in 0.012 kg of carbon-12." Its symbol is "mol". When the mole is used, the elementary entities must be specified and may be atoms, molecules, ions, electrons, or other particles, or other specified groups of such particles.

Two of the derived units in the International System, namely pressure and conductance, were given additional names. The new short name for the SI unit of pressure, newton per square metre, is the pascal (symbol Pa), while that of conductance, the reciprocal ohm, is the siemens (symbol S). The pascal was already legal in many countries and its adoption at this time may lead to further abandonment of the bar. Similarly, the siemens has been in official use since 1935 by the International Electrotechnical Commission.

Other actions by the conference included adoption of the following definition: "Atomic International Time (TAI) is the time reference coordinate established by the International Bureau of the Hour (BIH) on the basis of readings of atomic clocks functioning in various laboratories in conformity with the definition of the second, which is the unit of time of the International System of units." Any instant may be defined on such a scale with an accuracy of the order of 1 μ s and world synchronizations are possible with this precision. Unfortunately, the definition of TAI as given above includes no prescription for BIH to follow in coordinating the various laboratories or synchronizing their clocks. This matter has received and continues to receive a great deal of attention, but is technically a very demanding problem.

SOCIO-ECONOMIC ISSUES

U.S. ACTIVITIES COMMITTEE (USAC) consists of Directors of Regions 1 to 6 (U.S.) is chaired by the elected Vice President. Its considerations are confined to interests of U.S. members. Much of the work is being done through *ad hoc* committees, the following being very active at present: Government Relations, Employment Practices (employees and employers), Manpower Planning, Professional Activities, Salary Survey, and Pension Committees. The entire structure is *ad hoc* in the sense that its scopes and personnel have not yet reached Bylaw and Organization Roster stage; but the cluster of efforts are fulfilling a function where time is of the essence. There may be further adaptations if Constitutional changes are approved.

METRIC CONVERSION

The Senate Commerce Committee has voted to approve the amended version of Pell's S.2483, calling for the conversion to metric measurements over the next ten years. The bill, introduced a year ago, has been on the back burner for nearly nine months. The version as recommended to the Senate deletes Title II, the provisions for tax assistance to companies converting equipment to metric measurement. It includes the requirement for Federal agencies to buy metric as an incentive for conversion. The bill provides for an 11-man National Metric Conversion Board to develop a plan for conversion.

RIBBON CABLE BREAKTHROUGH: CROSSTALK REDUCED TO UNDER 4%

The following has been excerpted from an article with the above title from the June 15, 1972 issue of EDN.

Flat flexible cabling has come to the fore with the recent invention of a low-crosstalk cable. Joseph B. Marshall, engineering director for the Ansley Div. of Thomas & Betts Company, terms his new multi-conductor black-cover cable "Black Magic." It offers a five-fold improvement over conventional flat cable (twisted pairs) in near-end crosstalk and an eight-fold improvement in far-end crosstalk.

Crosstalk is the voltage pulse caused in a quiet signal line when an adjacent line (or lines) is activated. Crosstalk can cause false triggering of logic circuits either at the cable's input (near-end crosstalk) or at its output (far-end crosstalk).

The new Black Magic cable is said to offer under 4% crosstalk; whereas, most conventional flat cables offer crosstalk performance ranging from 10 to 20%.

The key to the cable's design is the use of two dielectric mediums—an inner polyethylene cone with a dielectric constant of 2.3 and an outer PVC jacket with a higher dielectric constant of 3.5.

By replacing the traditional outer jacket of air found in conventional flat cables with the PVC jacket, Marshall was able to confine the field of signal electro-magnetic propagation to such a degree that there was a dramatic improvement in crosstalk.

The attenuation characteristics of the cable were changed very slightly since only 2% of the field propagates within the PVC jacket. At 100 MHz, attenuation is about 1.5 dB per 10 feet.



FAA ENGINEERING MANAGEMENT IMPROVEMENTS

All engineering and development functions of the Federal Aviation Administration of the Department of Transportation have been consolidated into one service. In the new structure, the National Airspace System Program Office which is responsible for the implementation of the FAA's air traffic control automation program, will be incorporated into the Systems Research and Development Service. It is expected that the consolidation will improve the overall management of the engineering programs and will reduce overhead costs. IEEE Member Alexander B. Winick, has been named Acting Deputy Director of the new organization.

A STUDY OF THE 1973 BUDGET

A serious and scholarly approach to the 1973 budget and its subsequent effects has been taken by the Brookings Institution in a 468-page analysis called "Setting National Priorities, the 1973 Budget". This book is the third in a series of reviews of national priorities as established in the President's budget. The authors, under the leadership of Charles L. Schultz, a former director of the Bureau of the Budget, examine controversial issues of public policy that will shape the pattern of public spending for years to come. They also analyze trends that are significantly altering the way federal programs are financed and managed. Available from well stocked bookstores or directly from the Brookings Institute at \$3.50.

MEASUREMENT OF EED INPUT ENERGY

Various methods were investigated to measure the input energy of electroexplosive devices. The method of measurement has to be selected according to the kind of energy source. It makes a difference if the energy stores in a capacitor, a galvanic element with constant voltage, or a magnetic generator with fixed current. Even the oldest kind of EED, the bridgewire unit, as it is used for instance in the model P 65, shows a number of interesting effects, if it is started by different methods. The effects are discussed in detail. "Measurement of the energy supply for low voltage wire bridge igniters," by M. Held, *Explosivstoffe*, Vol. 19, No. 2, February 1971, pp. 25-38 (article in German).

MEMBERSHIP APPLICATION

IEEE ELECTROMAGNETIC COMPATIBILITY GROUP

Send to: IEEE Headquarters, 345 East 47th Street, New York, N.Y. 10017

NAME _____ IEEE MEMBERSHIP NO. _____

MAILING ADDRESS _____

COMPANY _____

FIELD OF INTEREST _____

☐ I am a _____ member of IEEE and hereby apply for membership in G-EMC.

(Grade)

☐ My fee* is enclosed.

☐ I am interested in joining IEEE and the G-EMC. Please send information.

*Fee: \$7.00 for IEEE members of all grades except Student.