

IEEE

ELECTROMAGNETIC COMPATIBILITY GROUP



NEWSLETTER

EDITOR: ROBERT D. GOLDBLUM

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PROBLEMS AND OPPORTUNITIES IN EMC by Rexford Daniels

I would like to add several - not previously mentioned - thoughts to the report "Problems and Opportunities" which contains the answers to our President's letter of January 18, 1974 requesting "Your thoughts about our Group".

First of all, it seems that much of the romance and challenge may have been taken out of present RFI and EMC work because the elder members have pretty well solved most of the current routine problems and, thereby left to the younger members merely their study and application. These old subjects are no longer either sacred to the EMC Group as they are being incorporated into the technical courses of our schools and colleges which leaves only the more sophisticated aspects of interest mostly to MA's and PhD's. The situation is somewhat analogous to the editorial situation between the IEEE Spectrum and the Proceedings. G-EMC is becoming more like the Proceedings.

What is needed for G-EMC is again to become active in some new EM field, such as the incompatibilities which are developing between all disciplines in Nature which can challenge G-EMC engineers, of all ages, to duplicate their original successes when they brought order out of RFI. This new challenge could take in the whole EM spectrum.

Technical schools and colleges do not yet emphasize the importance which electricity plays in all the affairs of Nature although the scientists are beginning to stress the fact that electricity, in some form or other, exists in all Nature. The further the scientists dig deeper and deeper into the secrets of Nature, the more man is losing his biological independence and becoming merely an electrical component of his environment. Thus man's relationship to his environment becomes of increasing importance. A quick review may make this clearer.

For eons of time, Nature has been using electricity and magnetism to help create and maintain a world of constantly varying environments in which all flora and fauna had to be continually adapted. Centuries ago, however, man began to discover how to generate and use this same energy for his own purposes.

The more he found uses for electricity the more he became able to create new environments for himself. As a result, his life slowly began to become less dependent on Nature's electromagnetic energy and the combinations and variables of night and day; heat and cold; rain and shine; restriction to local sources of food and water - and many other restrictions. Soon it was found that he had actually created two distinct environments - one outdoors and the other indoors - with his preference for the indoor environment. Now that man lives, works and travels under cover, he has left Nature outdoors and Nature is slowly getting her revenge.

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Over the past half century, man's principal concern with electricity has been to keep his own uses compatible with each other. This largely involved instrumentation. During the past thirty years, Nature has begun to signal that she, herself, was not entirely happy with what man was doing with the same energy which she was using. Cataracts on the eyes; damage to genital organs; burns from X-rays; disturbances to nervous systems, etc., began to be Nature's warnings to man to be careful with certain frequencies.

In 1961, the United States Government became worried over what it saw was happening from man's instrumentation and initiated studies which resulted in Public Law 90-602 titled "Radiation Control for Health and Safety Act of 1968", which states, in part:

"Sec. 354. The Congress hereby declares that the public health and safety must be protected from the dangers of electronic product radiation. . . ."

In the last six years, it is interesting to note that the governmental concept of the harmful aspects of electricity have changed from "electronic product radiation" to "energy pollution of the environment" The latter is a much broader recognition of the harm which can be done by the entire electromagnetic spectrum rather than just what is known as "electronic".

On May 20, 1974, the Office of Telecommunications Policy, of the White House, sent a report to Congress on energy pollution which stated:

"Power levels in and around American cities, airports, Military installations, tracking centers, ships and pleasure crafts, industries and homes already may be biologically significant. Unless adequate monitoring programs and methods of control are instituted in the near future, men may soon enter an era of energy pollution of environment comparable in public health and ecological implications, to the chemical pollution of to-day. . . ."

An excerpt from a U.S. Department of Agriculture report, September 1973, contains an example of energy pollution of the environment other than electronic, as follows: (Referring to a study of 22 species of plant life to various types of street lighting)

"A major conclusion was that high-intensity sodium lamps are best avoided by plant life. . . .
"The high level of red light emitted by the sodium lamps in effect overrides the message of the environment to the plant. While shorter fall days and lower night temperatures tell the tree to go dormant, the increased red light tells it to keep growing. . . ."

With large cities installing these sodium lamps by the thousands, whole areas will be affected which might be just enough, when combined with "Acid Rain Pollution", as described by a study made by Dr. F. Herbert Bormann, of Yale University, and Dr. Gene E. Likens, of Cornell University, to cause very serious trouble. Excerpts from the study are as follows:

"The northeastern U.S. is now receiving rain that's essentially a combination of sulfuric, hydrochloric and nitric acid. In the last 20 years, rain falling on that region has increased in acidity 100 to 1,000 times its normal level. "This acid potentially has a very great effect on our human life support system-large areas of landscape, such as forests and fields. . . .
"Serious fish kills in some Canadian and Scandinavian lakes in recent years have been traced to acid rain. . . ."

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Thus can be seen the developing of increasingly harmful relationships between different disciplines where they combine to do harm to a third. In the above case, a relationship between light and air pollution. This is the outdoor environment which man is creating by various uses of electricity. Let us take a look at his indoor environment.

When man moves indoors, day and night disappear; heat and cold are regulated; the complicated light spectrum from the sun is reduced to one or two frequencies; the positive field of the earth is shut out and the magnetic fields of the earth are disturbed by building materials and height of structures. Man thus leaves many of Nature's beneficial forces outdoors and also her ways in which to use them. For Nature uses change and variation to maintain health and top physical performance which man's instrumentation indoors is not constructed to duplicate. The Architectural Psychology Unit of Sydney University in Australia states: "Boredom among office workers can be prevented if the temperature of air conditioning is continually raised and lowered." This suggests that a new and important ingredient be introduced into EMC namely; The use to which Nature puts spectrum energy in an environment. It is, therefore, incumbent upon electro-magnetic research not only to consider the physical characteristics of the energy and the frequencies involved but also the natural uses to which they should be put.

Dr. Henry L. Logan, Chairman of the Board, The Holophane Co., New York, and IEEE Fellow, in a recent paper stated: "The next big challenge to the electronic engineer will be to "package" man who is the most complex component in the electromagnetic environment of the earth. The problems will be very similar to packaging present electronic components except, with man, you will have to duplicate, internally the forces in nature to which he is accustomed externally. Unfortunately, these external forces are mostly variables. . ."

When it comes to making up a list of the external forces of Nature, which are known to influence man, the list seems to expand daily. Just to give some idea of the high spots, they are: Color, light, sound, heat, humidity, positive and negative ions, oxygen, CO₂, solar storms, mental, nervous and physical rhythms or cycles, positive and negative electrical fields, static fields, magnetic forces, Faraday cage conditions in metal buildings and maybe hundreds more, to say nothing of the harmful and beneficial results from certain combinations. When, however, man first started to move indoors he also started on his "packaging" although he has not considered it in this light.

One of the most important indoor duplications is now called "Bio-Lighting". Bio-Lighting is being developed to correct the biological shortcomings of indoor, artificial or commercial lighting. Dr. R. J. Wurtman, of M.I.T., states: "For the past few generations, humans have spent much of their lives under artificial light sources, which often were designed to satisfy cosmetic considerations, and whose spectra bear little similarity to the natural sunlight under which life on earth evolved. As a result, we may find ourselves, in a generation or two, worrying about "light pollution". . .

Researchers are also finding that the color spectrum has three main divisions which have different effects on man; the red end which projects thermal or heat producing radiations which act chiefly on the protoplasm and digestive juices; the middle part or green region is most radio-active and has a powerful influence on the nervous system, and the blue-violet end contains radiations which are felt through the whole circulatory system as they act on the blood stream and endocrine glands. When colored light is used either for health purposes or to invigorate the system, it must be done with great care and discrimination as the frequencies must exactly match their objectives or else they can do more harm than good.

Who is to tell the electronic design engineer how to avoid light and color pollution because there is little in his textbook on these subjects? However, the lighting engineers are already working on this problem and have designed a fluorescent lamp which radiates the light levels of the spectrum at sea level. It is already being installed in schools and hospitals with interesting results.

If the idea of "packaging man" has merit, it could be written up by an expert in such a manner as to present a new challenge to the electronic engineer. The need becomes more apparent every day and the phrase "packaging man" might be short and clear enough to catch on.

Criticisms and suggestions are more than welcome.

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Special Session at EMC, Montreux 75

A special session on Sequency Techniques has been added to the program of the EMC Symposium and Exhibition at Montreux, 1975. It is scheduled for Tuesday and Wednesday, May 20 and 21. Since this session is new and therefore not included in the preliminary program, we have listed the contents of this session below. Those who have completed their plans to attend the symposium may wish to make a note of this session, while those who have not may wish to reconsider.

- 1 P. L. Butzer, H. J. Wagner, K. Spletstoesser, Technical University Aachen, G.F.R.: "Walsh and Haar functions in the dyadic analysis".
- 2 G. Berauer, Technical University Aachen, G.F.R.: "A generalisation of discrete Walsh functions".
- 3 H. Kremer, H. Gethoeffler, Technical University Darmstadt, G.F.R.: "A unified representation of Walsh functions and convolution transforms".
- 4 C. Boesswetter, Deutsche Forschungs und Versuchsanstalt für Luft- und Raumfahrt, Oberpfaffenhofen, G.F.R.: "Analyzing and multiplexing signals: an approach to a unified treatment".
- 5 F. Pichler, Joh. Kepler's University, Linz, Austria: "On the design of pattern by Walsh functions".
- 6 G. Kraemer, Technical University Aachen, G.F.R.: "Coding of black-and-white facsimile pictures by means of transformations".
- 7 R. Nawrath, Technical University Aachen, G.F.R.: "Adaptive Walsh transform of images".
- 8 D. Roszetis, Technical University Aachen, G.F.R.: "Two-dimensional Walsh transform with a DAP-effect liquid crystal matrix - Principles and experimental results".
- 9 U. Kraus, Technical University Aachen, G.F.R.: "Two-dimensional real-time Hadamard transformation and coefficient processing of broadcast standard television signals".
- 10 H. K. Georgi, Technical University Darmstadt, G.F.R.: "Possibilities of redundancy reduction of German language with the help of Walsh transforms".
- 11 H. F. Harmuth, Catholic University of America, Washington, DC: "The case for nonsinusoidal carriers in radar".
- 12 W. Haelg, Federal Institute of Technology, Zurich, Switzerland: "Applications of Walsh functions in nuclear reactor theory".
- 13 H. Burkhardt, University Karlsruhe, G.F.R.: "Realization of optimal control algorithms in the sequency domain of the Walsh transformation".
- 14 G. Landwehr, Gesellschaft für Mathematik und Datenverarbeitung, Bonn, G.F.R.: "Application of the discrete Walsh transform to minicomputer evaluation of the EEG".

We again solicit items pertaining to the use of nonsinusoidal functions. This section of the newsletter can be useful only if news items, announcements, comments, etc., are brought to the attention of the editors. All correspondence should be directed to Dr. G. R. Redinbo (see inside front cover for address).

We are pleased to present the following remarks on the radiation of Walsh waves by Professor H. F. Harmuth of the Catholic University of America.

Why use electromagnetic Walsh waves?

We have all been told as students that a sinusoidal wave is attenuated but not distorted by a linear, time invariant channel. Have you ever realized that a lack of distortions means that a sinusoidal wave provides us with less information about the channel than a distorted wave? When you have a telephone conversation you would rather not be bothered with information about the channel. It's something else in radar. A surveillance radar is in essence monitoring the properties of radio channels. You definitely want all the information you can get about the channel. Radar is a natural for nonsinusoidal waves.

But why Walsh waves? Our semiconductor technology makes it easy to turn a current on and off, which means that two-valued functions are favored. Walsh functions are such two-valued functions. There are many others, but the Walsh functions are the only ones that have a generally accepted notation. Why is notation so important? Have you ever tried to calculate anything for sinusoidal waves without using the notation $\sin \omega t$ or $e^{j\omega t}$? You cannot do much without notation, and this is the reason why we talk and calculate in terms of Walsh functions. The results are usually applicable to many other two-valued functions.

We need powerful transmitters and selective receivers for radar. Could we not simply approximate the Walsh waves by a superposition of sinusoidal waves using the Fourier series? This would permit us to stick to the time honored theory and technology of sinusoids. Yes we could, provided we found a way to build many radar transmitters that are frequency-, phase- and amplitude-stable in the gigahertz region. Forget about it, you may find a way but you'll never find enough money to build such equipment.

One of our best power sources for sinusoidal radar is the Trapatt diode, and it puts out an on-off type current from which a sinusoidal current is derived by suppressing the higher Fourier components. It is a lot easier to use the on-off current directly. We teach students the approximation of waveforms by the Fourier series, but nobody builds a pulse generator that generates the pulses from a superposition of sinusoidal voltages. On the contrary, many "frequency synthesizers" approximate stable sinusoidal oscillations by a superposition of two-valued voltages obtained from digital circuits. Our education is still geared to the presemiconductor era, but practical engineering is way ahead.

A selective receiver for Walsh waves with two tuned stages exists at Catholic University in Washington, D.C. It uses coaxial cables as delay lines in a feedback circuit to obtain a resonance effect. The technology is different from that of resonant circuits for sinusoidal waves, but the effect is the same. The wanted wave is enhanced by resonance over noise and waves with wrong period.

The simplest radiator for Walsh waves is a Hertzian dipole with a switch at the input terminal. More sophisticated antennas have been developed theoretically and experimentally. The best ones are probably at the present the ones of Terrestrial Systems, Inc. in Lexington, Massachusetts.

What can we expect from a Walsh wave radar? The Doppler resolution can be increased one order of magnitude. The relative range resolution can be increased by several orders of magnitude. The discrimination between conductors, such as airplanes, and insulators, such as raindrops or the surface of the earth, is practically possible. Reflectors can be discriminated from scatterers, which are all objects returning an electromagnetic wave except radar reflectors. These are the best effects at the present, but there are several more good ones.

What is in it for the EMC engineer? Look at Walsh waves as wide band or spread spectrum signals occupying a frequency band in the order of gigahertz; you'll see nothing but EMC problems - and the job opportunities that go with them.

SCIENCE & TECHNOLOGY ACT OF 1974

The Senate on October 11, 1974 passed S-32 the "National Policy and Priorities for Science and Technology Act of 1974". This proposed Act would establish a Council of Advisors on Science and Technology in the Executive Office of the President. This Council would be comprised of three members appointed by the President with the advice and consent of the Senate. It would appraise and recommend programs, policies, and activities of the Federal Government in science and technology which impact the economic, social, esthetic and cultural needs and interests of the Nation.

The President would designate one of the members of the Council as Chairman who would also serve as Science and Technology Advisor to the President and as Chairman of the Federal Coordinating Committee for Science and Technology also created by Act. This latter Committee would supplant the present Federal Council for Science and Technology, have representation from all the principal Departments and Agencies having major interest in science and technology and recommend policies and measures to provide for effective planning and administration. It would:

- (1) identify research needs and areas requiring additional emphasis
- (2) achieve more effective utilization of resources and facilities and
- (3) eliminate duplication of scientific and technical efforts in Federal Agencies.

The Act would expand the charter of the National Science Foundation to include greater concern for the application of scientific and technical knowledge to the solution of national problems. It redefines the criteria for selection of members of the National Science Board and provides for a continuing education program in science and engineering. This will enable scientists and engineers who have been practicing in their profession for at least five years to keep current in their special fields or develop skills in new fields or of more value to the Nation.

There would be established within the National Science Foundation an Inter-governmental Science and Technology Advisory Committee of twenty-two members. Twenty of these would be appointed by the President, with the advice and consent of the Senate. Consideration will be given to nominations received from intergovernmental organizations and public interest groups such as the Council of State Governments, International City Management Association, National Association of County Officials, etc. The membership would include the Director of NSF and a member of the Council designated by the Chairman of the Council. The Committee would advise and assist the Foundation in identifying and defining problems of the State, regional and local levels needing priority application of civilian research and development activities to maximize the application of science and technology to civilian needs.

The Act would authorize the Director of NSF in consultation with the Committee to assist any State in establishing an Office of State Science and Technology. The Act also provides that the President submit an annual Science and Technology Report to the Congress.

Present indications are that the House of Representatives will not take up this bill or a House companion bill, H.R.17375, during the brief session of the Congress between now and January 3rd, in which case the Senate action is of course void and the subject will have to be taken up as a new matter in the 94th Congress. If there are indications that the House may be persuaded to consider the matter, you are urged to initiate a letter writing campaign in support of the legislation.

BOOK REVIEWS



BOOK REVIEW
by
Jim Hill

Electromagnetic Interference and Compatibility, Volume 2, EMI Test Methods and Procedures, by Donald R.J. White, MSEE/PE, Don White Consultants, Germantown, Maryland, 1974. \$52.00, 546 pages, cloth bound. This is the second in a series of five handbooks and the last of the five to be released. Now that the series of five has been completed an announcement has been made that Volume 6, EMI Specifications, Standards, and Regulations has been added with a publication date of mid 1975.

The author has done a commendable job in bringing together so much EMI/EMC technology in this handbook series. Emphasis is on the practical application but not to the complete exclusion of theory as it is required for explanatory purposes.

This volume, as the title implies, is concerned with test methods and procedures. It ranges from the general to the specific. It is general in its coverage to lend itself to application to conducted and radiated emission and susceptibility measurements yet also specific in its application to the current MIL-STD-461/462 standards and beyond this into the proposed revisions of these standards. Some users may be interested in details of terms and definitions and/or measurement error analysis. Other users may be interested in a tutorial treatment of design of tests while others are more concerned about the test instruments. Still others may be interested in using the handbook for applying test methods and procedures to their EMI measurement requirements. While the handbook emphasizes MIL-STD-462 test procedures, many techniques and considerations described are applicable to other EMI measurement situations.

The first chapter contains a general discussion of the various types of EMI measurements. Basic terms and definitions are covered in the second chapter. This includes a discussion of the various detector functions and their application. Chapter 3 contains a summary of EMI and related instruments. This includes test areas and enclosures, antennas, susceptibility test chambers, conducted sensors and injectors, receivers and spectrum analyzers, and signal calibration and susceptibility testing sources. The summary of power oscillator and amplifier characteristics is useful in planning susceptibility tests.

The reduction of measurement data involves calibration and correction factors. This is the subject of chapter 4. Equally important is the analysis of errors covered in Chapter 5. The subject of error in EMI measurement has never been covered so completely before this. The author discusses both random and systematic errors and presents techniques or methodologies to mitigate or in some cases eliminate the errors.

The remaining five chapters are devoted to MIL-STD-461/462 measurements. Chapter 6 gives the general background for these measurements with attention to layout and operation as well as measurement sampling practices. Chapters 7 through 10 present the whole gamut of test procedures from CE01 to RS04. For each one there is a discussion of specification limits, test preparation and setup and test procedures. This material will not be out of date when MIL-STD-462B appears because the proposed limits and procedures are discussed and where there are two versions of the proposed changes both are covered.

Bibliographies are included with chapters where applicable so that the reader can explore specific areas of interest. A complete index allows the user to pinpoint subject matter for ready reference. Volume 2 rounds out the series and contains material in a very complete coverage to aid the test plan formulator and the test engineer.

THE EMC TREE

(ELECTROMAGNETIC COMPATIBILITY)

Originally called RFI (radio frequency interference or noise), EMC was initially developed rather empirically for military and civilian communication systems. In these two fields, EMC is strongly specification oriented.

However, two strong new developments, namely

a) The just starting proliferation of digital integrated circuits with their sensitivity to switching transients (e.g., LSI devices like mini-computers and micro-processors on chips being introduced into industrial control, commercial data handling, mass transportation, instrumentation, health care, etc.), and

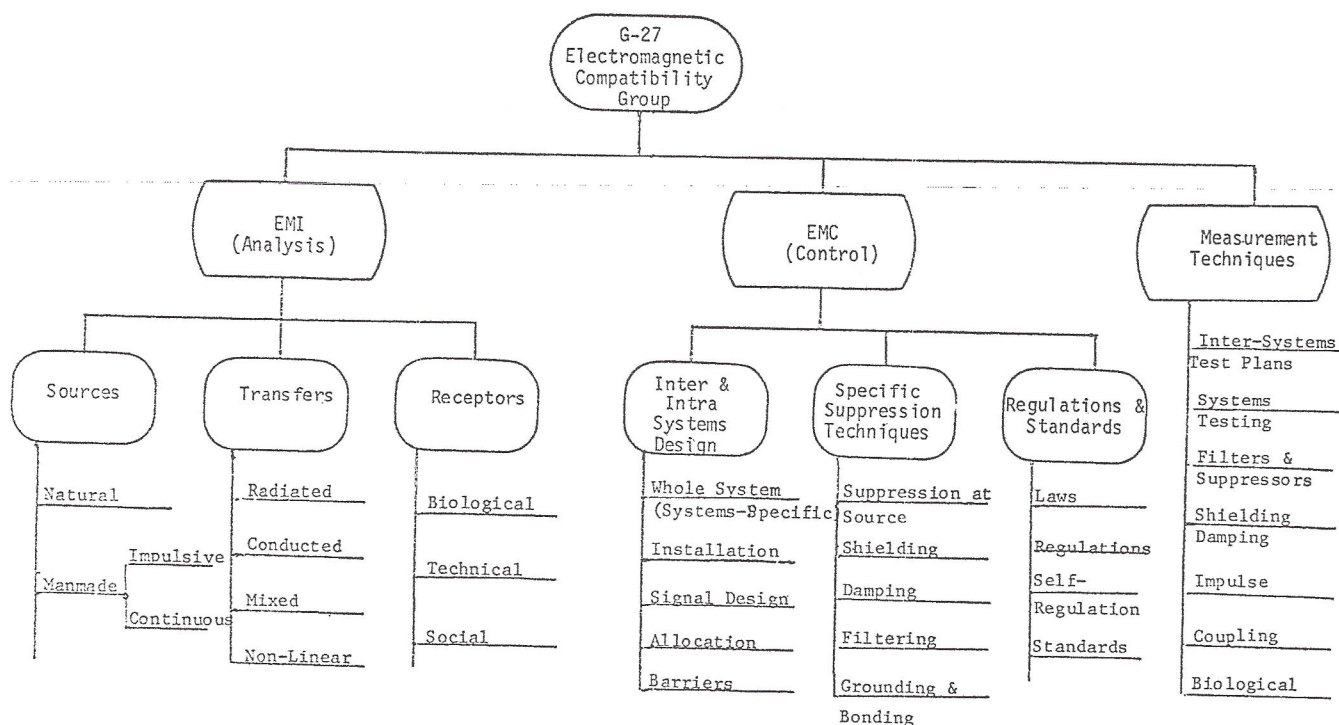
b) The slowly growing awareness and gradual establishment of a data base on "side effects" of electromagnetic waves (from brainwave synchronization to ATP resonances and biological microwave effects)

make EMC a rapidly expanding, ubiquitous necessity because even relatively low levels of electromagnetic energy significantly affect the performance and economy of modern technical systems and the safety and health of humans.

The early corrective approach to "electrical noise" is being replaced by predictive EMC planning of systems. Such work now becomes more based on exacting theory and overall cost considerations. More and more adequate standards, specifications, and guidelines are being developed by a variety of institutions.

Because of the interdisciplinary and predominantly advisory nature of EMC, the attached EMC tree was developed to stress the commonality of all EMC work. In agreement with the IEEE TFA coordinator, Dr. W. Morsch, it seems advisable to make a system-specific subdivision of the tree only after further progress has been made in that IEEE TFA work that is done by other groups more concerned directly with hardware (in this respect EMC is similar to reliability).

H.M. Schlicke



TREE FOR EMC

CHAPTER CHATTER

by
Charlie Anderson



Los Angeles: Fred Nichols, Area Coordinator, reports turnouts of 50 to 100 for the Los Angeles area dinner meetings. The November meeting, sponsored by Lectro-Magnetics and held at The Ponderosa in Culver City, had Mr. James Briggs (J.B. Briggs & Associates) speaking on the status of activities in the area of effects of RF energy at levels below the so-called safety limits on animal brain tissue.

Philadelphia: Steve Garcia, Chapter Chairman, forwarded information on their 26 November meeting, which featured Dr. Carl Schleicher, who is Director of Mankind Research Unlimited in Washington. He discussed various psychological and biocybernetic techniques, such as biofeedback, Kirlian electrophotography, ESP, man-plant interaction, and other parapsychological activities. This was a dinner meeting held at the University of Pennsylvania Faculty Club; and jointly sponsored by the Philadelphia Section, the Engineering Management Society, the Engineering in Medicine and Biology Group, and the Systems, Man and Cybernetics in addition to G-EMC. Dr. Heinz Schlicke addressed the G-EMC Chapter in December. His topic was: "Adapting to More Interference" (See the Jersey Shore report for what I believe is a summary of essentially the same talk presented the following day.) Philadelphia's January meeting will have Dr. Salati of U. of Pennsylvania presenting the topic "Grounding Principles for Electrical and Communications Systems". Congrats, Steve, on becoming a Senior Member of IEEE!

Jersey Coast: The Chapter's October meeting had Dr. William M. Mazer, of General Research Corporation - McLean, VA., speaking on the new U.S. Army EMC Guide for Developers. This document, which is in final review status, will supplement AR 11-13 (Army Electromagnetic Compatibility Program). Dr. Mazer explained the purposes, philosophy and content of the Guide; which, among other items, establishes the various EMC milestones throughout the life cycle of an equipment in the Army inventory.

In November, Phil Porter, of Bell Labs, spoke on the new Cellular Communications System; which will be implemented for service trials in the Philadelphia area about three years from now. He described the system objectives, outlined shortcomings of the existing land mobile communications approach, and presented technical features of the cellular concept.

The annual Christmas Party was again held at the Officer's Club at Ft. Monmouth, with about 40 members and their wives enjoying an excellent assortment of hors d'oeuvres and, of course, the usual libations.

The December technical meeting saw Dr. Heinz Schlicke talking on Electrical and Social Noise. His extremely wide-ranging presentation covered such diverse areas as freedom versus data processing; need for a data base to obtain realistic source and load impedances for power lines for revision of MIL-STD-220A; and the benefits of Zen Buddhism. Over 20 members and guests heard Dr. Schlicke's talk.

In January, Mr. Miles A. Merkel, of USACOM, will speak on the Army's EMC World-Wide Responsibilities.

Pacific Area: No personal-type items in Bob Ford's latest issue; but lots of good jokes and epigrams, plus more on small calculator usage. (Thanks, Bob, for the re-publication of the items about Gene Knowles' project to accumulate EMC/EMI-related calculator/mini-computer programs and the ARRL RFI Task Group).

Washington: In November, Mr. Raymond Spence, Chief Engineer of the FCC, addressed the Chapter meeting on "What's Next in EMC?" He described the FCC's efforts in such areas as reduction of automotive ignition interference and susceptibility of home entertainment devices. He stated that, in the typical urban/suburban area represented by Arlington County VA, the likelihood of occurrence of transmitter fields of a magnitude in the range which could cause interference to home entertainment

CHAPTER CHATTER

equipments was not the industrys' optimistic "1%" but more on the order of 50 to 70%. He pointed out the problems of getting voluntary action by manufacturers to reduce susceptibility; but stated that the Commission will continue to push for action, and will also support legislation to get some authority for the FCC in the area of susceptibility. (Copy of Mr. Spence's talk furnished courtesy of Dr. Theodore Cohen, Secretary ARRL RFI Task Group).

Delmer Ports, Vice President for Engineering of the National Cable Television Association, will address the January Chapter meeting on Frequency Compatibility of Cable Television. This will be on the 16th. If you're going to be in the area, call Al Paul at 632-7075 to find out the details.

The March meeting of the Chapter will have William C. Green as the speaker. His topic will be "Tempest, COMSEC and Red/Black: An Introduction". This presentation will be tutorial in nature but will be related to such specs as NACEM 5100. In keeping with IEEE policy, it will be an open session. Mr. Green, who has had many years experience in Tempest engineering, is a consulting engineer in private practice in communications security areas. The meeting is scheduled for March 20th. San Francisco: Meetings were held in September, October and November. Twenty attendees at the September meeting heard Maise Hamaoni of Fairchild-Mt. View speak on applications of operational amplifiers for active filtering. In October, Dr. Alan B. Grebene, Vice President of Engineering at Exar Integrated Systems, Inc., spoke on linear LSI circuits. This was a joint meeting with the Engineering Management and Aerospace and Electronic Systems Society Chapters. Both of the above meetings were held at Rick's Chalet in Palo Alto, with social hours preceding the dinners. The November meeting was held at the Philco-Ford Auditorium, with William W. Raukke, Chairman of the IEEE Professional Activities Committee, leading a panel and discussion on some of the questions facing the engineering profession and some of the actions underway in IEEE to alleviate them.

The January meeting will feature Mr. John Bohn, of Watkins-Johnson, Palo Alto, speaking on EMC Measurements System (Tempest). In February, Fred Nichols will discuss Engineering Management Responsibilities for EMC.

The Chapter is sponsoring a session on EMC for the June 1975 International Conference on Communications in San Francisco.

Although it will probably be too late by the time this reaches you, if you have a paper you would like to submit for the ICC, get at least an abstract to: Victor M. Turesin, 1731 Walnut Drive, Mountain View, CA. 94040; as soon as possible.

"Education is man's going forward from cocksure ignorance to thoughtful uncertainty". (From PAC Newsletter - Bob Ford, Editor.)

AWARDS PRESENTED AT 1974 SYMPOSIUM IN SAN FRANCISCO

A number of G-EMC awards were made at the annual awards luncheon in San Francisco on July 17, 1974. The highest award, the Certificate of Appreciation was presented to Joseph F. Fischer, Jr., past AdCom President, and to Warren A. Kesselman, AdCom Treasurer. The Certificate of Achievement was presented to Leonard W. Thomas, Sr. for his pioneering work in the development of RFI instrumentation, and to Samuel J. Burruano for his pioneering work in filtering and shielding. The Certificate of Acknowledgement went to Victor Siegfried as Symposium Chairman, and to Richard B. Schulz as Transactions Editor.

The Honorary Life Membership Award was made to J. Paul Georgi, for his continuing efforts over the years in support of G-EMC. Retiring AdCom members Joseph S. Fisher, J. Paul Georgi, Eldon S. Hughes, and Harold E. Taggart received Certificates of Gratitude. Certificates were also awarded to retiring committee chairmen J. Paul Georgi (Nominating Committee), Anthony G. Zimbalatti (Membership Committee), and James A. Spagon (Student Affairs Committee).

While the San Francisco Bay Chapter was busily engaged in putting on the G-EMC Symposium it also did an outstanding job of serving its members. The chapter scored highest and received the Chapter-of-the-Year award. The annual best transactions paper award went to Prof. Clayborne D. Taylor for his paper "Electromagnetic Pulse Penetration Through Small Apertures".

MEETINGS & EVENTS

1975 CONFERENCE ON

LIGHTNING & STATIC ELECTRICITY

Sponsored by the RAeS/IEE Joint Committee on the Applications of Electricity and Electronics in Aircraft (UK) and the SAE Committee AE-4 on Electromagnetic Compatibility.

An International Conference on LIGHTNING AND STATIC ELECTRICITY will be held at the Culham Laboratory near Oxford, England from 14th-17th April 1975. This will be the fourth in the series, the three previous Conferences having been held in the USA. The Conferences will provide a forum for the exchange of information and new ideas on the problems caused by Lightning and Static Electricity, particularly in the aerospace environment.

There will be sessions on fundamental aspects and test criteria, fuel, structures and materials, aircraft applications and missiles and spacecraft. The working language will be English. Listed below are the titles of some of the papers it is hoped will be presented during the meeting.

Registration forms for this Conference will be available later this year and application should be made to: Miss R.B. White, The Royal Aeronautical Society, 4 Hamilton Place, London W1V 0BQ, England.

Session I - Fundamentals & Test Criteria

1. The Initiation of Lightning in Thunderclouds - Professor J. Latham, UMIST
2. Lightning Strike Point Location Studies on Scale Models - T.E. James, Culham Lab., H.J. Ryan, A. Reyrolle & Co., D.J. Tedford, Strathclyde University and E.L. White, ERA
3. Scale Model Lightning Attach Point Testing - D.W. Clifford, McDonnell Douglas Corp.
4. Simulation of Lightning Currents in Relation to Measured Parameters of Natural Lightning - J. Phillpott, Culham Laboratory

5. Natural Lightning Parameters and their Simulation in Laboratory Tests - Dr. E.T. Pierce, Stanford Research Inst.
6. Aerospace Recommended Practice Lightning Effects Tests on Aerospace Vehicles and Hardware - J.A. Plumer, General Electric and J.D. Robb, Lightning and Transients Res. Inst.
7. A Preliminary Investigation into the Screening of the Electrical Charges of a Thundercloud - E.S. Hotston, Culham Laboratory
8. Airborne Measurements of the Electrical Properties of Convective Clouds - P. Ryder, Meteorological Office, A.J. Illingworth and I.M. Stromberg, UMIST.

Session 4 - Aircraft Applications

1. Lightning Protection of Supersonic Transport Aircraft - S.T.M. Reynolds, BAC Filton
2. Aircraft Applications of Segmented Lightning Diverter Systems - M.P. Amason and J.T. Kung, Douglas Aircraft Co.
3. General Installation Bonding Requirements and Techniques - A. Alric, Aerospatiale
4. Induced Voltages, Measurement Techniques and Typical Values - B.J.C. Burrows, Culham Laboratory
5. Static Electrification of Windscreens and Canopies - P.J. Sharp, Lucas Aerospace.

Session 5 - Missiles and Spacecraft

1. Influence of Photon and Particle Interactions with Surfaces on the Satellite Environment - R.J.L. Grard, Esro-Estec
2. Electrical Discharges Carried by Satellite Charging at Synchronous Orbit Altitudes - J.E. Nanevich, R.C. Adamo, Stanford Research Institute and R.R. Shaw, Aerojet Electrosystems Company
3. Electrostatic Involvement in Spacecraft Contamination - C.G. Miller and J.E. Chirivella, California Institute of Technology
4. Spacecraft Charging: Imp-6 Observations and an Overview - D.P. Cauffman, Aerospace Corp., U.S.A.

PRELIMINARY PROGRAM RELEASED
FOR MONTREUX EMC SYMPOSIUM

The preliminary program of the Symposium and Technical Exhibition on Electromagnetic Compatibility Montreux 1975 has been arranged and copies have been mailed out to engineers and scientists throughout the world including all members of G-EMC. The date May 20-22 immediately precedes the Biennial International Television Symposium held in Montreux.

Due to the large number of papers submitted and accepted (over 100) it became necessary to schedule three parallel sessions, morning and afternoon in each of the three days. In addition on the 21st there is a late morning session with a panel discussion of the work of the Figure of Merit (FOM) Committee. The report of the committee will be published in the February 1975 issue of the IEEE Transactions on EMC.

The IEEE G-EMC is cosponsoring the Montreux Symposium. Many of the authors of papers to be presented there are G-EMC members and in addition the Figure of Merit session is a presentation of the EMC Figure of Merit Committee, an ad hoc committee jointly sponsored by the G-EMC and the Electromagnetic Compatibility Analysis Center (ECAC). The first technical session on the program, EMC and the Hospital, is a session organized and sponsored by the G-EMC.

In addition to the program described above the Sequency Union has set up a provisional program on Walsh Functions including 14 papers. This is further augmented by three workshops. The first of these on EMC Diagnostics is sponsored by the SAE AE-4 Committee on EMC with W.D. McKerchar and H.K. Mertel as co-chairmen. A second workshop on Applications of the HP-65 Hand-Held Computer to Prediction and Control of EMI will be offered by Don White. The third workshop is concerned with Discontinuous Interference Analysis and will be put on by A.S. McLachlan and R.J. Harry of the British Post Office.

For additional information on the Symposium direct inquiries to Mr. T. Dvorak, Sternwartstrasse 7, ETH-HF, 8006 Zurich, Switzerland or James S. Hill, RCA, 5260 Port Royal Road, Springfield, VA. 22151; phone (703) 321-8900.

1975 THEORY AND APPLICATIONS
OF
WALSH FUNCTIONS SYMPOSIUM

The Hatfield Polytechnic, in association with the IEEE UKRI Section and the IEEE, is sponsoring an international symposium on the principles and applications of Walsh and other non-sinusoidal functions, to be held at Hatfield on July 1-3, 1975. This 1975 symposium will combine the two separate symposia which were to have been held in the UK and the USA, and will provide an international forum for discussion of progress in this field.

Offers of papers in the fields of

- (a) theoretical aspects of Walsh, Haar, Rademacher and similar functions
- (b) practical applications in fields such as telecommunications, image processing, biology and medicine, control systems

will be welcomed, and should be sent to P.D. Lines, Department of Electrical Engineering, The Hatfield Polytechnic, P.O.Box 109, Hatfield Herts, England.

"HOW TO CONVERT YOUR IDEAS INTO DOLLARS"
Friday, January 17, 1975
"HOW TO START AND FINANCE A NEW BUSINESS"
Saturday, January 18, 1975

At the Center of Adult Education, University of Maryland, College Park, M.D.

These courses are directed towards those individuals who are, or will be, interested in starting and financing a new business.

The programs have been expertly designed to bring timely techniques and concepts to potential businessmen or entrepreneurs.

	One day	Two days
Member	\$50.00	\$ 90.00
Non-member	65.00	110.00
Students, spouses and those unemployed	25.00	45.00

For further information contact:

Ms. Betty English
IEEE Washington Section
815 Fifteenth St.NW, Suite 800
Washington, D. C. 20005
(202) 347-0909

1975 ELECTRICAL AND ELECTRONIC MEASUREMENT AND TEST INSTRUMENT CONFERENCE

The 1975 Electrical and Electronic Measurement and Test Instrument Conference will be held May 13, 14, and 15, 1975 at the Skyline Hotel, Ottawa, Canada. The conference is sponsored by the Ottawa Section of the IEEE and by the IEEE Group on Instrumentation and Measurement. The U.S. Commission I of URSI will be a participating sponsor.

"New Directions in Instrumentation and Measurement" will be the theme of the conference. The technical program will emphasize new instrumentation development and methods as well as their practical engineering applications.

Original papers (not submitted elsewhere) are invited. Subject areas of interest include:

- 1) Innovative instrumentation developments in the areas of DC and AC measurement from low frequency thru microwave.
- 2) The development of instrumentation standards in the newer fields of environmental quality and pollution control.
- 3) The use of microprocessors and other LSI for the enhancement of instrument capability.
- 4) The design and specification of computer or calculator controlled instrumentation systems.
- 5) Advances in time and frequency technology.
- 6) New instrumentation in the area of digital measurement.

Three copies of an abstract and a summary of each paper should be submitted to the chairman of the Technical Program Committee, Mr. Donald E. Lawrence, Hewlett-Packard Co., Automatic Measurement Division, 974 E. Arques Avenue, Sunnyvale, California 94086. The abstracts should be less than 200 words and without illustrations. The summary should be limited to 500-1000 words and may contain a few illustrations and will be used to aid the committee in selecting suitable papers for the conference. The abstracts of selected papers will be used for publicity and program purposes. The deadline for receipt of abstracts and summaries is December 31, 1974.

General questions concerning the conference should be directed to Mr. Richard F. Clark, Conference Chairman, National Research Council, Division of Physics, Montreal Road, Bldg. M-36, Ottawa, Ontario, K1A 0S1, Canada.

EM WAVE PROPAGATION COURSE

Course No. 249 entitled "Electromagnetic Wave Propagation for Communications System Design" is being offered by George Washington University on February 10 - 14, 1975.

Designed for managers, scientists, and engineers who need a better understanding of the propagation phenomenon affecting the design and performance of communication systems. It will cover the propagation factors governing the performance of space and terrestrial systems, including VLF, LF, HF, and microwaves. These factors will then be employed for characterizing, modeling, and predicting the performance of digital communication systems.

Registration fee is \$395.

For further information, write to the Director Continuing Engineering Education, George Washington University, Washington, D.C. 20052, or call (202) 676-6106.

SHORT COURSE ON DIGITAL FILTERS

February 24 - 26, 1975

This intensive short course is for design engineers, system engineers, and technical managers in government and industry who need a better understanding of the design and application of digital filters. Digital filters have become increasingly important components for use in signal processing in telecommunications, instrumentation, radar, sonar, seismology, and medical electronics. This course will emphasize design. Fee: \$305. For further information, please write to the Director, Continuing Engineering Education, George Washington University, Washington, D.C. 20052, or call (202) 676-6106.

RESULTS OF THE AD COM ELECTION

As you know, a ballot for the election of six AdCom members for the Electromagnetic Compatibility Group was issued on August 10, 1974. The ballots returned have been counted, and the following members have been elected for the term beginning on January 1, 1975:

Robert B. Cowdell
James S. Hill
Warren A. Kesselman
Fred J. Nichols
Heinz M. Schlicke
Ralph M. Showers

We wish to thank all nominees for their willingness to serve and for permitting their names to be included on this ballot.

PROGRESS REPORT ON AMERICAN RADIO

RELAY LEAGUE RFI TASK GROUP

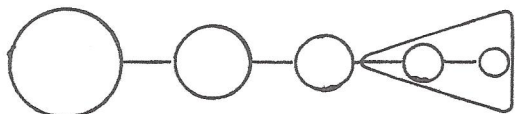
Dr. Theodore Cohen, Secretary of the ARRL RFI Task Group, has circulated several mailings relating to the problems involved in this area of EMC/EMI. In one of these, tables of calculated and measured field strengths for transmitters operating in the 14 to 50 MHz range are presented. The measured levels were obtained in the vicinity of 14 MHz by the Directorate of Radio Technology in Great Britain. One interesting fact which emerges is that the measured levels tended to diverge below the theoretical as the distance from the source was varied from 10 m to 100 m; the difference being one dB at 10m and six dB at 100m.

(Editor's Note: Since the measurements were made with a source antenna having a gain of eight dBi, the possibility of close-in field anomalies could exist). Dr. Cohen has suggested some tentative standard susceptibility field levels in the range of 1 to 20 V/m. He points out, however, that significantly higher levels would pertain in many typical urban and suburban environments. Consequently, even though a device might be capable of performing satisfactorily in a 10 to 20 V/m field, it would still be susceptible to interference from many sources. Among the factors mentioned which complicate the situation are:

- (1) Lack of good information on attenuation factors provided by typical residential structures;
- (2) Resonance effects in output and input leads (particularly in view of the rather wide variations in the dimensions and geometry of these which will inevitably occur in use).

Ted also forwarded a copy of EIA's Consumer Products Engineering Bulletin No. 7, titled "Audio Rectification". One paragraph in the introduction takes a much-needed step in the right direction. It is stated that the OEM should no longer expect the serviceman to deal with normal type interference problems encountered in the field; since occurrences are too common and fix costs too high. Although somewhat naive in some of its approaches, this bulletin should at least alert some manufacturers to a situation that won't go away just because it's ignored.

Doug Hughes, who is Manager of ECAC's Engineering Systems Section, wrote me a fine letter in which he stated that the 20 odd amateur radio operators at the ECAC facility want to support the ARRL Task Group. He mentioned the possibility of analytic support. More on this for the next issue, I hope.



NASA GODDARD MAKES EMI SURVEY FOR

MARITIME SATELLITE, L-BAND,

SHIPBOARD TERMINAL

Mr. Ralph E. Taylor, GSFC Mobile Radiodetermination Branch, recently announced the release of a report on an EMI survey for the maritime satellite, L-Band, shipboard terminal. In the proposed system two geostationary, maritime satellites, one over the Pacific and one over the Atlantic Ocean, will make available high-speed communications and navigation services to ships at sea. A satellite shipboard terminal, operating within the 1636.5 - 1645.0 MHz maritime band, will allow ships to pass voice, teletype, facsimile and data messages to shore communication facilities with a high degree of reliability. The shore-to-ship link will operate within the 1535.0 - 1543.5 MHz maritime band.

A significant number of ships of over 100 gross tons will be equipped with an L-Band satellite terminal by the year 1980. There is an interest in determining the extent of electromagnetic interference between the L-Band shipboard terminal and existing shipboard communications/ electronics and electrical systems, as well as the influence of shore-based interference.

The shipboard EMI survey described in this paper was made on a commercial container ship of the American Leader class (15,690 tons). The 1.2 m-diameter, paraboloid antenna, duplexer, low-noise preamp amplifier and down converter of a prototype L-Band terminal were used in a series of EMI measurements to investigate interference to the ship's 10-cm. wavelength (S-Band) and 3-cm. wavelength (X-Band) radars, as well as potential interference to the L-Band terminal. Measurements were made of conducted emissions on the ship's power lines which were compared with similar measurements made on land-based power lines.

Using a radiometer, antenna sky-noise temperature measurements were made using the L-Band shipboard terminal antenna. Measurements were made at sea and repeated again in USA harbors where land-based noise sources received by antenna back and side lobes increased the apparent sky-noise temperature. Antenna-noise temperature values ranged from 300K to 1500K, at 1.6 GHz, depending upon elevation angle.

Copies of the report may be requested from:

Mr. Ralph E. Taylor
Code 953, Mobile Radiodetermination Br.
Goddard Space Flight Center
Greenbelt, Maryland 20771

MISCELLANY

AUTHORS WANTED

A new multivolume series of books on electromagnetic compatibility and related subjects will be published by Don White Consultants, Inc. starting in 1975. According to White, this project will extend over a period of at least five years producing an average of five to six volumes a year. Each volume will contain from 100 to 150 pages and will be priced to fit the budget of the practicing engineer.

For 1975, the following subjects have been identified as priority volumes:

- "CISPR and National EMC Regulations & Procedures"
- "FCC Regulations, Test Methods and Procedures"
- "Fiber Optics and Optical Isolators"
- "Electromagnetic Ambients and Man-made Noise"
- "Spectrum Management Techniques"

Other subjects are planned for 1976 and thereafter. However, the schedule is flexible and may be changed depending upon author and readership response.

A generous honorarium will be paid to all authors, whether they write a full volume or a part thereof. Persons who desire more information about becoming an author are invited to contact Bob Goldblum, Editor, Don White Consultants, Inc., Publishing Division, P.O. Box 325, Plymouth Meeting, Pa. 19462.

IEEE AUTHORIZES

AMICUS CURIAE IN BART CASE

The Board of Directors of the IEEE has authorized its legal counsel to offer the services of the Institute as an "amicus curiae" in the matter of HJORTSVANG et al vs. the San Francisco Bay Area Rapid Transit District. This case is now in litigation in the Superior Court of the State of California. In taking this step, the IEEE's Board of Directors reconfirmed its commitment to have the Institute become involved in matters concerning ethical practices of members of the engineering community affecting the public health, safety, and welfare. In addition the Board of Directors indicated that the Institute would not assume positions of advocacy in such matters, but would attempt to provide expert guidance to the court in establishing understanding of existing codes of ethics within the profession.

EDITOR'S NOTE

Your editor has resigned his position as an EMC Consultant with the General Electric Company, Re-entry and Environmental Systems Division. I will now spend full time as President of R&B Enterprises, a company which I formed in 1970. My activities will include the continued publishing of ITEM and ENR, plus offering EMC Marketing and Engineering Consulting Services.

I have thoroughly enjoyed serving as editor of the G-EMC Newsletter over the past seven years, and plan to continue in this capacity without the support of G.E. Therefore, Newsletter correspondence should now be addressed to me at R&B Enterprises, P.O. Box 328, Plymouth Meeting, Pa. 19462, and I can be called at (215) 828-6237.

Bob Goldblum



DR. SCHLICHE RETIRES

Dr. H.M. Schlicke, Fellow IEEE, (8220 N. Poplar Dr., Milwaukee, Wisc., 53217; (414) 352-7085 took "early retirement" from Allen-Bradley, where he was Chief Scientist. He has formed his own consulting firm, "Interference Control", specializing in cost effective prevention and control of electrical noise in industrial and commercial systems. In this context, he is interested in becoming a field consultant for filter, opto-isolator, shielding, etc. manufacturers. At present, he is finishing work, based on a broad statistical database of interfacial impedances, on optimizing non-ringing power feedline filters. He is an active member of the IEEE IAS committee for the "Noise Guide".

Heinz was twice President of the IEEE Group on EMC. He will continue his speaking engagements in conjunction with IEEE Outstanding Speakers Tours. As ADCOM member of G-EMC he is mainly concerned with Technology Forecasting and Assessment. Broader aspects of TFA and special assignments constitute his work as Staff Consultant to the IEEE Technical Activities Board. He is also course director (on EMC) for the Center for Professional Advancement.

EHLRI NEWS

the Environmental Health and Light Research Institute

SCIENCE DIGEST (October, 1974) titled its story "Radiation That's Good for You." Describing Ott as "one of the outstanding American pioneers in photobiology," the article relates his early work with time-lapse photography which brought photobiological spinoffs. The article tells of Ott's work in developing a fluorescent bulb that not only duplicates the visible natural spectrum but delivers the beneficial ultraviolet range. Industrial firms using the Vita-Lites have reported less absenteeism, better and increased production and fewer employees reporting sick.

Two incidents prompted Ott's recent invention of a TV radiation shield. One was a report that a group of children were always tired, nervous, unable to sleep and suffering from headaches and nausea--until they quit watching TV. Physicians blamed this on psychological over-stimulation but Ott carried out a test that showed TV radiation would kill bean sprouts and make rats increasingly hyperactive, then lethargic. Color TV would kill the rats within 12 days but rats protected from the TV by a lead shield showed no physical changes.

The second incident involved the flowers Barbra Streisand sang to in the movie, "On a Clear Day You Can See Forever." While growing the flowers, Ott noticed that the ones growing under the ends of the fluorescent tubes didn't do so well. At the ends of all fluorescent tubes is a little cathode ray gun, similar to the ones used in TV picture tubes and hospital X-ray machines. When lead shields were placed around the ends of the tubes, both flowers and school children showed marked improvement. Such shielded tubes are now made under exclusive license by the Specto Lite Company of Holiday, Fla.

Ott's TV radiation shield has not been adopted by manufacturers of television sets because they are already complying with government standards on TV radiation. Although Ott's testimony before the House Committee helped bring about the 1968 Radiation Health and Safety Act, limiting sets to .5 milliroentgens of radiation per hour, he believes that level is not low enough to safeguard viewers. His shield, a mirror device, would achieve zero-level radiation because the viewer would no longer be looking directly into the cathode ray gun of the picture tube.

NEW THEORY PROPOSED FOR

HEARING MICROWAVES

A new theory has been proposed to explain human ability to hear pulsed microwave energy. It now appears that microwave pulses incident on head tissue produce heat and the resultant thermal expansion of tissue water is detectable (in the audio range) by bone conduction to the ear. This latest theory, proposed by researchers at the Naval Medical Research Institute, Bethesda, MD, is in contrast to one previously reported in *MicroWaves* ("Do you Hear What I Hear," p.9, February, 1974) in which direct perception by the central nervous system was thought to be responsible. As reported then, aural perception of "clicks" occurred when a person's head was radiated by pulsed microwave power of up to 500 mW/cm².

The new theory is being proposed by Drs. Kenneth R. Foster and Edward D. Finch of the Bio-physics Division of the Naval Research Institute. While they do not claim the mechanism is an acoustic transient effect - this would require extensive physiological experiments -- analysis does show that pulsed microwave energy, incident on soft tissue (mostly fluid), can produce pressure transients. These correspond respectively to the leading and trailing edges of the incident microwave pulse.

FIELD TESTS WITH LIGHT BULB

We are told that there is a reference for the technique of detecting RF energy and other stray currents by means of a light bulb. Can a reader supply details and source? It was said that a light bulb (No. 47?) is inserted in place of a blasting cap when working in the field. Could this be an outdated procedure? It seems inferior to using a modern blasting meter. Perhaps someone has a manual with specifics. Would you please mail a copy of the pertinent pages or send other information. Many thanks. *Gunther Cohn, Editor, Explosives and Pyrotechnics, The Franklin Institute of Research Labs., Phila., Pa. 19103 - 215-448-1236.*



U.S. METRIC POLICY

The U.S. Government has officially stated that its encouragement of a major facet of metric conversion is a matter of policy. An amendment to the Elementary and Secondary Education Act recently passed by the Congress states that "it is the policy of the United States to encourage educational agencies and institutions to prepare students to use the metric system of measurement with ease and facility as a part of the regular program." The amendment authorizes \$50 million to be used at the discretion of the U.S. Commissioner of Education for metric education purposes through fiscal 1978.

IEEE BYLAW CHANGES

Bylaw Changes approved by the Board of Directors include the following, all of which will be incorporated in the next edition of the Bylaws to be distributed in January 1975:

*Rewording of the Senior Member grade qualifications to make this grade more meaningful and to encourage greater submission of applications for upgrading.

*With the phasing out of the draft for military service in the United States, reduced dues for members in the military has been discontinued.

*In view of the tendency toward earlier retirement, IEEE members who are retired may now apply for dues reduction at age 62.

*With continued unemployment problems in some areas, reduced dues for unemployed members will be extended through 1975.

*The composition of the Educational Activities Board (EAB) was changed to include the Chairman of the Electrical Engineering Department Heads Association (if an IEEE member), ex-officio, and liaison members appointed by PUB, RAB and TAB.

*The title for the Vice President elected by the voting members was changed to Executive Vice President. The duties and responsibilities of this Office remain unchanged.

*A person serving as Secretary and Treasurer will have one vote on all Boards and Committees of which the Secretary or the Treasurer is a member. When the two offices are held separately, the number of Executive Committee members increase from 9 to 10 and the number of B of D members increase from 28 to 29.

*USAB shall recommend policies and implement programs specifically intended to serve the members of the United States in appropriate non-technical professional areas of economic, ethical, legislative and social concern, supported by funds provided by the Regional assessment paid by such members. USAB shall appoint standing and ad hoc committees to carry out such programs. USAB will receive and make proposals and suggestions to other IEEE entities regarding appropriate educational and technical activities of concern to U.S. members, and may support such activities from funds provided by the Regional assessment.

*For IEEE elections and elections of all units where mail ballots are used, space shall be provided on the ballot for write-in candidates. If a successful write-in candidate declines to serve, the candidate receiving the next highest vote shall be declared to have won the election.

*Future petitions proposing candidates for IEEE Office or for elective office in any unit of IEEE, shall be accompanied by a statement by the petitioners that the nominee named in the petition has indicated willingness to serve, if elected.

*Future petitions for Constitutional amendments shall include statements of petitioners in support of the petition, which statement shall accompany the ballot submitted to the voting members.

ENGINEER DEMAND INCREASES

A hefty national demand for engineers triggered an upsurge in college recruiting activity in 1973-1974 according to the College Placement Council. The total number of job offers rose 25% for new bachelor's, 11% for master's and 34% at the doctoral level. There was evidence of keen competition for engineers with a 31% increase in the number of offers to bachelor's engineering candidates. Altogether, engineering offers accounted for 56% of the total bachelor's volume. For bachelor's candidates, the prime source of employment reported in the survey was manufacturing and industry. Because of the emphasis on engineering candidates and the scarcity of women in this discipline, male graduates collected 80% of all offers reported for bachelor's graduates.

TAX REFORM

Engineers should be aware of some of the tax reform items being considered by the House Ways and Means Committee:

Repeal: \$100 dividends deduction, state gasoline tax deduction, sick pay exclusion, first \$200 employee business-related expense deduction, (The latter would include IEEE dues, conferences, etc.).

Disallow: Deductions for travel expenses to conventions and meetings outside the U.S.

Increase: Holding period for long-term capital gains to 8 months in 1975, 10 months in 1976, 12 months in 1977.

Restrict: Deductions for business use of home.

Ways and Means Committee will wait for the President's message on inflation before continuing deliberation, thus making it unlikely that any bill will be passed during the session. Consequently IEEE members have an excellent opportunity for communicating with their Congressmen on this matter.