

# IEEE

# ELECTROMAGNETIC COMPATIBILITY GROUP



## NEWSLETTER

ATTENTION!! AdCom has made the late decision to send copies of the 1970 EMC Symposium Record to all G/47 members without charge.

ISSUE NO. 66 - OCTOBER 1970

EDITOR:

Robert D. Goldblum  
Re-entry Systems Division  
General Electric Co.  
608 Gawain Rd.  
Plymouth Meeting, Pa. 19462

### A FEW WORDS FROM YOUR CHAIRMAN

Dear Fellow Members:

The challenges permeating our country disturb a lot of us, particularly when these challenges extend into our professional life. Many an EMC Engineer is out of work or he hangs on precariously to his job. The resulting pre-occupation with basic personal problems keeps many a good AdCom Member from full participation in Group affairs. Many of our friends could not attend the excellent International IEEE EMC Symposium at Anaheim (and so we slid quite a bit into the red necessitating some drastic measures to compensate for that).

Against such a background of uncertainty, I have been asked, quite often, the question:

#### WHAT IS THE FUTURE OF G-EMC?

To answer this question, we have to look at EMC as a whole. There we see an ever-growing need for EMC spreading well beyond the military field we so very much concentrated on so far. There are, e.g., with increased generation of interference and increased numbers and sensitivity of sensors, urgent needs for effective EMC in:

- Industrial Control (great cost of down-time)
- Transportation (Human Safety)
- Computer Systems (Nuisance and cost of wrong data)
- Consumer Goods (Nuisance)
- Medical Instrumentation (Human life and utility of equipment)
- Protection (Safety)

Moreover, there is still the military EMI which does not disappear with the disappearing funds. And the enactment of Public Law 90-379 will positively affect EMC work.

Altogether we have established eleven Technical Area Representatives to investigate the areas of potential EMC growth and to help formulate assessing our participation.

In other words, if we want to comfortably continue doing what we have done before, we

do not have much of a future. But, if we search for and grab the opportunities to solve, effectively and economically, the many problems arising in the areas just mentioned, we have a bright future. It is up to us. Let me give a few more indications of what we are doing at the AdCom level concerning this reorientation. Because of the present general situation and of limited resources (all voluntary work!), we switched temporarily from long range planning to short range planning and concentrated on education, standards and, as already outlined before, penetration of new EMC areas.

The educational efforts: The Southwestern Regional EMC Symposium is well on its way. We are participating in the Division 3 session on cable television at the NEC. We are organizing a session on Interference in Consumer Goods for the International IEEE Convention in New York, in 1971. We are participating in the Walsh Function Symposium to be held in the fall of 1971, by the Naval Research Lab. The International EMC Symposium that will be held next year in Philadelphia looks very promising and will even improve some of the special sessions we held at Anaheim. (Our Symposia plans extend now already till 1975)

The Group Standards Chairman, Jack Bridges, after carefully planning, is getting well organized. In standards we are working toward the elicitation of sound principles and realistic test methods of broad, general import. Delineation of work done by other activities engaged in EMC problems is in preparation. The whole IEEE is putting its full support behind the standards efforts. We are soliciting individual EMC Chapters to participate in the standards efforts by working on particular problems in which they have expertise and interest in. Volunteers for standards work are needed. What about you?

We are co-operating with IEEE G-IGA on Noise Guidelines and we are waiting for the formation of the Environmental Protection Agency (EPA) to couple, hopefully, in the general anti-pollution effort. In side effects, we are moving into fascinating new realms.



In the meetings of TAB (Technical Activities Board of the IEEE), we are vocal on the establishment of a portable pension plan. In this context, I would like to urge all of you to write me a short note about your feelings in this matter, so that I can approach Headquarters not only with general statements, but with accumulative written evidence.

Granted, we may have to close, for the time being, one or two chapters, but we are in the process of forming two new EMC Chapters: One in the Pacific area and one in Ottawa.

Well, Gentlemen, I just gave you a few glimpses of our work and of our thinking. Our Group, with your help, will grow on multifaceted, but integrable objectives.

Heinz Schlicke

## PROGRESS & PRODUCTS

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Application for second class postage made in New York and other Post Offices.

### EMC ENGINEER PLACEMENT SERVICE

A new EMC Engineer placement service, dealing exclusively in personnel having experience in RFI/EMC, has been formed by R & B Enterprises. Operating on a fee paid basis, R & B will match the engineers' experience with client company requirements and arrange for pre-employment interviews. For more information on job requirements and resumes, write to R & B Enterprises, P.O. Box 328, Plymouth Meeting, Pa. 19462.

### MODERN MICROWAVE ABSORBERS AND APPLICATIONS

A paper entitled "Modern Microwave Absorbers and Applications" by Elery F. Buckley, Sc.D., Chief Electronic Engineer at Emerson & Cuming, Inc. is available on request.

Major topics discussed in the paper are: (1) absorber design including absorbers for anechoic chambers and other special types; (2) anechoic caps for antennas; (3) absorber reflectivity measurements; and (4) latest ideas in anechoic chamber design.

Three principal application areas for microwave absorbing materials are cited: (1) anechoic chambers and outdoor test ranges for reducing unwanted energy reflections; (2) terminations and attenuators in transmission line components, whether waveguide, coaxial or stripline; and (3) reduction of radar cross section of objects both airborne and ground based.

Write to Emerson & Cuming, Inc., Canton, Mass. 02021.

### BROADBAND POWER AMPLIFIER

High power, high gain and wide bandwidth are readily obtainable separately, but difficult to achieve simultaneously in a single amplifier.

The Model M404CW/P recently introduced by INSTRUMENTS FOR INDUSTRY, INC., 151 Toledo St., Farmingdale, New York, combines high gain (60 db), bandwidth (over 200 MHz) and output power (up to 2 kw peak).

The new amplifier features three operating modes to accommodate special demands. In its high-power burst mode, the amplifier offers high pulse power -- more than 2 kw with burst rise and fall times of less than 1-0 nsec and duty cycle of up to 20 percent. For applications requiring higher duty cycle, a second low-power burst mode is provided which permits bursts of up to 400 watts at any duty cycle including 100 percent. In the third mode the unit serves as a conventional high-power broadband linear amplifier capable of 400 watts continuous output without gating.

The M404CW/P covers all frequencies from 20 MHz to 250 MHz without tuning or bandswitching. The 20 MHz lower limit may be lowered if longer than 100 nsec rise and fall times can be tolerated in the pulse mode. The amplifier responds linearly to broadband signals or combinations of signals applied to its input and will operate into mismatched loads with reduced power -- when load mismatch becomes excessive, the amplifier shuts itself off and signals the operator or other controlling device.



# LETTERS & PENSIONS

Dear Editor:

I wish to comment about the suggested IEEE-sponsored retirement program in the July newsletter.

I feel that a retirement plan sponsored or administered by The IEEE is very desirable. Perhaps, such a program could be sponsored by all professional engineering organizations.

In my opinion, professional engineers would support a program and in turn, professional organizations would receive more support in other areas, such as technical areas, community activities, etc. Members would be willing to contribute as high as 5% of their salary to a program. They would feel that the company should contribute a portion to the program. Negotiation of company contributions would be difficult at best, but maybe an arrangement could be worked where the company contributions would only be paid in case an engineer stays with a company for a minimum time.

The companies would object to added costs resulting from participating in another retirement plan. The professional societies may be able to pay for all administrative costs.

I will follow future developments on this subject with great interest and will serve in any way I can to achieve a satisfactory plan.

Yours sincerely,  
Richard L. Williams  
2444 West Ramm Dr.  
Anaheim, California

Dear Mr. Goldblum:

With regard to your article entitled "Retirement & Pension" appearing in the July issue of EMC Newsletter, it is a commendable idea to promote some type of group pension plan through the IEEE.

It is true that Engineers move quite often, but it is also true that those of us work for small companies or are self-employed have no retirement fund at all.

The idea of a group pension plan seems very inviting and I would like to suggest that the IEEE staff do a further study.

Sincerely,  
Brian C. Thereault, Sr.  
3848 West 147th Place  
Hawthorne, California 90250

Dear Bob,

There is a need for a professional alliance which will support the engineer in his endeavor to speak out on current subjects without the fear of retribution or censure. This same alliance should be able to offer a retirement schedule commensurate with the number of years the member has been registered. Too often now we must rely on the retirement funds set up (by) the various employers. Their retirement plans usually require a ten year tenure. In this mobile and transient society, that type of service to one company is out moded. Therefore, the engineer, loses whatever retirement benefits he has built up.

The professional engineering society should offer other assistance; such as, employment assistance, legal advice and support, major medical plans (in this respect, they have begun an excellent one so far). If we are going to continue to pay dues and offer our volunteer support, then some degree of assurance of satility in the future should be offered. We call ourselves a professional society, but it is in name only. We are too afraid to speak out for fear of loss of our job or other harassment and yet we are at the mercy of the employer when cutbacks are evident. We have no recourse, no contract and he has no obligation to compensate us for our efforts on his behalf during the regular employment hours and those extending into our own free time. A type of professional status and security is a desire of every member of the association. Offer it to him and ask him if he will support it, and he will give you overwhelming support and assistance.

Sincerely,

George R. Ufen  
Glendale, Calif.

Dear Mr. Goldblum:

I feel strongly that the IEEE should add a pension plan to its insurance package. The problem of employer contributions to a pension plan that it does not control must be solved eventually, but that should not delay the initiation of the plan. This is an urgent requirement, as can be readily seen from the current upheavals in engineering employment.

Thank you for calling attention to this problem.

Very truly yours,

John E. Dodge  
P. O. Box 1217  
Sierra Vista, Arizona 85635

## PORTABLE PENSIONS

At its May 20, 1970 meeting at IEEE Headquarters, the Operating Committee of the Technical Activities Board concluded that a study of the possibility of a portable pension plan was an urgent need of electrical engineers; that a feasibility study was desirable on all aspects of establishing such a plan; and that the degree of involvement of IEEE could be treated as a separate issue. On a motion, OpCom voted unanimously that its position should be known to the IEEE Executive Committee that the pension plan study should be given urgent priority.

An Ad Hoc Committee on Portable Pensions has been appointed. The TAB member of this Committee is

Mr. Robert D. Briskman  
COMSAT  
950 L'Enfant Plaza South, S.W.  
Washington, D.C. 20024

You may address all communications about portable pensions to Mr. Briskman.



# G-EMC STANDING COMMITTEE REPORT

RICHARD B. SCHULZ



Dick Schulz was born in Philadelphia, Pennsylvania, on May 21, 1920. In 1942 and 1951, he received B.S. and M.S. degrees in electrical engineering from the University of Pennsylvania in Philadelphia.

After graduation, he worked on the development of a laboratory standard RFI meter at the University of Pennsylvania. Thereafter, he formed the Electro-Search Company, which designed shielding installations, tested shielding, and made field surveys of electro-interference at U.S. Naval establishments. In 1955, he joined the Armour Research Foundation (now IIT Research Institute), Chicago, Illinois as Program Development Coordinator for Electrical Engineering Research. He also served as Project Engineer on development of satellite RFI instrumentation. He joined the United Control Corporation in 1961 as Chief of the Electro-Interference Section, where he was directly engaged in the electrocompatibility aspects of the Minuteman Project. In 1962, he joined The Boeing Company as Staff Engineer in Aero-Systems Technology and was engaged in microelectronics and electromagnetic compatibility activities. He has recently joined the Southwest Research Institute

in San Antonio during September, 1970.

Dick represented IIT on the Board of Directors of the National Electronics Conference, Chicago, Illinois, and held various committee chairmanships from 1956 to 1960. He was a U.S. delegate to the CISPR Conference, Paris, in April 1965. He is a member and has been chairman of the Administrative Committee of the IEEE G-EMC and Chairman of the 1968 Symposium on Electromagnetic Compatibility. Dick is currently editor of the IEEE G-EMC Transactions and is Chairman of the IEEE Seattle Section. He is a member of Tau Beta Pi, Eta Kappa Nu, Sigma Tau, Sigma Xi and is a Fellow in IEEE.

## IEEE TRANSACTIONS ON EMC

Our technical publication, the IEEE Transactions on EMC, began with the formation of the EMC Group in 1958. For the first three years its Technical Editor (and chairman of the Papers Review Committee) was Al Kall, president and owner of ARK Electronics. Al was succeeded by A. H. Sullivan, now Technical Director of the Naval Scientific and Technical Intelligence Center, who very capably served for seven years. Beginning with the August 1969 issue, technical editorship is by Dick Schulz, Senior Specialist Engineer for The Boeing Company.

The purpose of the Transactions is to serve as the principal means for disseminating EMC information of archival (long lasting) value. Editorial objectives are:

1. To increase usefulness to an EMC engineer by providing increasingly better technical content of an archival (long lasting) value. This content includes analytical, experimental, and application orientations.
2. To support the first objective by accepting only papers which are technically sound and represent original work (or outstanding review and tutorial presentations).
3. To maintain high standards of technical writing and scholarship, to encourage clarity and conciseness combined with completeness of presentation, and to accept only material of value and significance to the EMC engineer.
4. To minimize the time between paper submission and acceptance (use air mail).
5. To accomplish the above objectives within page budgets.

In order to facilitate meeting these objectives with a reasonable personal effort, the technical editorship is reorganized



beginning with the August 1970 issue. The new organization follows:

#### EDITOR

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Southwest Research Institute  
8500 Culebra Road  
San Antonio, Texas 78228

#### ADMINISTRATIVE EDITOR

Reuben Goldman  
The Boeing Company

#### ASSOCIATE EDITORS

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ARK Electronics

##### SYSTEMS EMC ASSURANCE

James A. Spagon  
TRW Systems

##### SPECTRUM UTILIZATION AND ADVANCED EMC EFFECTS

William A. Stirrat  
Army Electronics Lab.

Publication of material should be sent to the Editor so that it may be logged in and assigned to the appropriate Associate Editor for processing.

Content of the Transactions is undergoing some expansion to make the publication of more value to all group members. Present material of a research and development nature will be continued. In addition, more design and applications oriented papers are desired, provided they are of archival value. Our Transactions could also be improved by more correspondence items, particularly on controversial subjects - or have we solved all the EMC problems?

Let me guide the prospective author by reference to the inside back cover of every Transactions issue for both G-EMC Policy and Information for Authors. In addition, please emphasize the relevance of material (for instance, an antenna development) to EMC use, particularly in the abstract, introduction and conclusion portions of a paper. Start with a good outline and write that paper you have been delaying! A good technical paper will tend to increase your stature in the eyes of compatriots, will help them with their problems, and will also be welcomed by your employer.

# EFFECTS & CONTROLS

#### ELECTROMAGNETIC FIELD HAZARDS SIMULATED

The following was excerpted from the August 1970 issue of Explosive and Pyrotechnics, a newsletter published by the Franklin Institute Research Labs, Philadelphia.

Susceptibility of munitions to unplanned detonation from effects of high-powered electromagnetic fields can be tested with improved accuracy in one of the newest research facilities at Picatinny Arsenal. The electromagnetic hazard simulation chamber is believed unique in its capability of creating concentrated power (radiation up to 10,000 watts) and dissipating it at the chamber's center for test purposes. The chamber is 70 feet long, 30 high and 30 wide.

Through electronic measurement of the power in the test environment, the chamber provides a means of estimating the amount of current that flows to the precise spot in a munitions item where a detonator would be placed. Test results enable the munitions engineer to determine how susceptible a propellant may be to the hazard from sources of electromagnetic fields. Included among such sources are nuclear bursts, lightning, a static charge, or communications and radar systems.

Researchers say the chamber is four orders of magnitude more efficient than an antenna for establishing high-quality electromagnetic fields for testing the radio frequency (RF) susceptibility of munitions to undesirable detonation.

Field intensities of 100 V/m can be established that are uniform over a 20-foot diameter and can have a field impedance of 377 ohms or greater than 4,000 ohms; also, 266 ma/meter with impedance less than 40 ohms. The system now operates over the frequency range from 300 kHz to 3MHz and will soon perform down to 50 Hz. (Army R&D News-magazine, Vol. 11, No. 3, March-April 1970, p. 9.)

#### MAGNETIC-FIELD-FREE CHAMBER BUILT AT M.I.T.

Scientists at the Massachusetts Institute of Technology, studying the faint magnetic fields generated by electrical activity within the human body, have completed work on a shielded chamber that is virtually free of all externally produced magnetism, both natural and man-made. The chamber, for example, screens out even the earth's own field.

The new facility, located at M.I.T.'s Francis Bitter National Magnet Laboratory, is said to be the only one of its kind.

The chamber is roughly spherical (more precisely, it is a rhombicuboctahedron, a 26-sided figure) with an outside diameter



# EFFECTS & CONTROLS

of 4 meters and an inside diameter of 2.5 meters, ample for the subjects and the magnetometer probes. Controls, recorders, and other support equipment, which themselves produce unwanted magnetic fields, are located outside the chamber.

Walls are more than half a meter thick and consist of five layers of metal sheeting separated by air spaces. Two layers are aluminum sheeting and three are formed from sheets of a special nickel-molybdenum-iron alloy sometimes known as Hipernom.

The alloy contributes most of the shielding because it is easily magnetized by external magnetic fields and, under magnetic influence, its atoms tend to form clusters, or domains, that orient themselves in the direction of impinging fields.

The M.I.T. design also employs a technique known as "shaking" to enhance response of the clusters. During operational runs, small electric currents flow through the alloy sheets, shaking the clusters and keeping them free to reorient themselves when external fields are encountered.

To pick up magnetic fields, the M.I.T. scientists are employing a probe called a SQUID (superconducting quantum interference device). The instrument is kept in the tip of a thermos tube filled with liquid helium.

## EIA REVIEWING EED STANDARD

The EIA Safety (G-48) Committee and EMC (G-46) Committee is currently reviewing a proposed AF Standard on "Electroexplosive Subsystems, Electrically Initiated, Test Methods and Design Requirements". This Standard is the outgrowth of an Air Force plan to first issue a plan to first issue a Standard for the design and testing of EES's and EED's which will ultimately be complemented by a procurement specification for EED's. It is their intention to adopt the Standard first for AF use, then coordinate through the Services for Tri-Service acceptance.

## 461A NOTICE 3 CHANGES ARE SIGNIFICANT

Notice 3 to MIL-STD-461A has been issued (dated 1 May 1970). The following excerpts and interpretations may have significant impacts on present and future programs.

"Units or equipments that are intended to be used together shall be tested as a subsystem. Tests on individual units of the subsystem are not required unless directed by the procuring activities." (What effect will this have on "interchangeability"?)

"Subsystems/Equipments which are in the inventory and which were originally designed to the requirements of an inactive EMI specification, should normally continue to meet the inactive spec when additional quantities are reprocurd."

"If the limits of figure 13 are not applicable for CEO2, appropriate limits shall be included in the control or test plan with justification." (The same is true for figures 13 and 14 with respect to CEO2)

"The broadband test and figure 12 are no longer required." (30Hz - 20 KHz)

REO3 should be performed only when CEO6 cannot be accomplished and when authorized by the procuring activity.

Emission limits have been relaxed from 10 to 30 db depending upon class of equipment. Equipment have been reclassified.

Radiated susceptibility levels have been raised as follows:

For equipment within an aircraft or other metallic structure

14 kHz to 35 MHz	10 V/M
35 MHz to 10 GHz	5 V/M
10 to 40 GHz	20 V/M (optional)

For equipment within non-metallic structures, or pylons or other external aircraft mounting

10 kHz - 40 GHz	200 V/M (this is not a typographical error)
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Get your copy of Notice 3 while they last. This should be a "Best Seller".



## HIGHLIGHTS

The following highlights were excerpted from the presentation given by W. Dean Jr., Assoc. Director, Frequency Management Office of Telecommunications Management, at the 1970 International EMC Symposium:

Before setting out on a program of improved physical fitness, a visit to the doctor is always recommended. Thus, the question is raised "What shape is the patient, i.e. the RF Spectrum, in"?

First we can say that the spectrum is strong. It is already supporting in the U.S. the most advanced and efficient telecommunication structure in the world. The application of electronic technology has become an integral part of our American way of life -- to a much greater extent than many realize.

Take for example the lowest portion of the radio frequency spectrum allocated for communications purposes -- the Very Low Frequency (VLF) band. A close look at the International Frequency List of Radio Frequency Assignments shows that in the most useful 13 kHz of spectrum between 14 and 27 kHz there are 270 discrete entries, representing 258 VLF transmitter operations in some 17 nations. Many of these operations are in excess of 1 megawatt power. In reality, this area of the spectrum is one of the most congested and it is virtually impossible to establish new operations therein.

At Medium Frequencies (MF), strain is evident from the fact that national frequency assignment records contain over 22,000 line entries in the portion of the spectrum between 2000 and 2850 kHz, most entries representing numerous operational units.

The story of High Frequencies (HF) is well known with international registrations at least doubling every decade. Overcrowding becomes evident when one considers that the only way High Frequency Broadcasting has been contained within the radio spectrum is through adherence on the part of all nations to rigid propagation and time sharing scheduling. Some 90 countries, employing over 700 transmitters, a large percentage being 100 and 250 kW, are engaged in HF international broadcasting. Many more operations are on the way.

Overcrowding also exists at Very High Frequency (VHF) as witness delays due to "stack ups" at Air Traffic Control Centers serving major air terminals, attributable in no small measure to the taxing of communications and navigational facilities.

It is estimated that demand for air control service will almost treble by 1989 as compared to 1968, and will again treble by 1995. Future strain at VHF may be gathered from projections that non-Government growth in the use of two-way land mobile radios will increase from nearly 3 million transmitters in 1968 to about 6 million in 1980.

The advent of satellite technology has afforded exciting new avenues of adventure and expanded service to man. It has also increased the burden on the radio frequency spectrum, particularly in the Ultra High Frequency (UHF) and Extremely High Frequency (EHF) regions. Millions of dollars and many man-years are being spent engineering high powered earth station transmitters and companion sensitive receivers into areas already congested to a large degree with telecommunication systems.

One of the more obvious signs of astigmatism is the lack of application of adequate standards and the ability to measure whether such standards have been applied. In many cases, standards oriented toward conservation of the spectrum resource are either non-existent or deficient. For example, one standard having widespread application calls for an antenna side lobe suppression of 30 db whereas 57 db suppression is readily attainable in the current state of the art. The proliferation of effort in the standards area is also a source of "blurred vision." One leading manufacturer of communications equipment recently advised me that a survey was conducted within his organization as to the number of committees, subcommittees, working groups and bodies which were engaged in matters dealing with or relating to standards. The number was almost unbelievable -- 271 organizations. There is definitely a need for standardization among the standards pertaining to telecommunications and action is underway in this regard. Hopefully this will lead to greater commonality among specifications which, from a manufacturer's standpoint, would afford a more readily marked to a greater number of users with consequent reduction in cost per unit.

Increased emphasis should be placed on technical options. For example, bidders on new communications-electronics systems should include not only lowest estimates in their submissions but also those options necessary, with companion associated costs, to make a better product from the standpoint of electromagnetic compatibility. This means that the bidder would have to learn more about the intended operational environment and would also place the user in the position of determining whether he wanted to ensure that his equipment could operate satisfactorily.

In the non-Government domain, the absence of standards for TV receivers has permitted the introduction of equipments so susceptible to interference that adjacent frequencies can not be used for other purposes in the same geographical areas as TV. For instance, the FAA has noted that TV receivers tuned to Channel 4 (66-72 MHz) or 5 (76-82 MHz) have experienced interference from the primary emission of aeronautical radionavigation systems in the band 74.6-75.4 MHz. Similar limitations are experienced in use of the Government communications-electronics systems in the bands 162-174 MHz and 216-225 MHz. It is also noted that for every UHF-TV assignment, 108 MHz (18 channels) of spectrum space are excluded from use over an area of at least 1,250 square miles around the



transmitter. The rules establishing these restrictions were established in 1952. Another example is in the case of marine beacons where, due to poor quality of many receivers in the hands of the general public, the U.S. Coast Guard is unable to activate any more stations from Florida to Cape Cod without causing unacceptable interference potential. The need for improved receiver standards is thus a prerequisite to better use of the spectrum.

Pollution in its strictest sense is caused in the spectrum by those devices which unintentionally radiate electromagnetic energy -- auto ignition systems, fluorescent lights, arc welders, etc. In certain frequency bands, ideally suited for urban communications applications, measurements disclose a variance of up to 40 dB between quiet rural and noisy urban areas. If permitted to go uncontrolled in heavily populated areas, man-made noise

will preclude optimum employment of one of nature's resources and a most willing servant, the electromagnetic spectrum.

We are also deficient in our knowledge as to the true and long range effects of electromagnetic radiation upon man and materials. This field of endeavor is called "side-effects" and is an area in need of increased exploration. For example, it is well known that, at sufficient energy levels, microwaves can be harmful to biological organisms. It is also generally recognized that damage can result from the conversion of electromagnetic energy into heat energy within the cells. However, there is little consensus as to the minimal levels at which microwave energies are deemed to be harmful. Question also exists as to what should be measured, what sort of mechanisms are responsible for the effects, and to what extent these effects are frequency responsive.

A survey of Soviet literature shows that Eastern Europe has been more attentive to the possible problems associated with "side-effects" than the United States. Perhaps the fact that their population is more fixed in nature has facilitated a more comprehensive study of personnel exposed to the same environment for extended periods of time. Their documentation contains reports of headaches, dizziness, forgetfulness and nausea resulting from microwave exposures. The Russians also claim that microwave energy levels can, among other physiological symptoms, affect heart rate and sexual activity. However, these conclusions have not been confirmed in the United States.

While on the matter of "side-effects", it is interesting to note that the CCIR Study Group meetings in Geneva in September October, 1969, a draft fixed question was adopted for study which asks: "what are the radio-frequency power flux densities to be expected from earth stations or terrestrial stations; what design precautions and operational procedures at transmitting stations are necessary to prevent the exposure of humans to hazardous radio frequency radiation?"

There are also indications that "side-effects" may have beneficial attributes. For example, it is foreseen that microwaves can selectively destroy white cells in situ -- a possible useful technique for treating leukemia. The phenomena whereby fowl lose consciousness in a radar beam suggests a possible method for ridding airports of the danger of birds getting sucked into jet engines. Other experiments show that microwaves can be used to destroy plant eating insects without also destroying the plants being eaten. Another benefit is that microwaves can be shown to accelerate crop production while at the same time producing healthier and larger plant species. It is obvious that the "side-effects" area is one which warrants greater in-depth exploration.

Funding support is being sought for the establishment of a National Electromagnetic Compatibility Analysis Facility which would bring increased engineering expertise to bear so that electronic devices of the Federal Government will be better able to meet their intended design performance levels in their operational environments. The resources of the National Academy of Engineering have been utilized on such issues as defining the economic and social values of the radio frequency spectrum so that such values may be taken into account in the radio frequency management decision process; and an Electromagnetic Radiation Management Advisory Council has been established comprised of leading authorities in the U.S., in the fields of biology, medicine, electronics, etc., to assist and advise the Office of Telecommunications Management as regards "side-effects."

Much more effort must be expended by all if the spectrum is to be brought into a healthy condition. Specifically: (a) existing endeavors must be continued and expanded, particularly in the areas of standards and development of measures of performance; (b) spectrum limitations and the need for conservation of the resource must become a primary consideration on the part of the designer, the developer, the manufacturer and the user; (c) the requirement for "systems design", which has become increasingly to the fore in the past decade, needs expanded attention so as to embrace intersystems considerations. Also, the systems designer needs to take into account not only the potential interoperability among systems in a common environment but also the effects of the environment itself; (d) additional light must be shed in the form of research seeking answers to questions such as: what really causes interference and what is the true impact of communications-electronics radiations upon people and things?; (e) effort must be expended to bring about an increased awareness of the fact that RF spectrum considerations are "cradle to the grave" aspects of electronic systems; (f) developers must fulfill their responsibilities to the customer by "following through" and making certain that electronic systems do "in fact" work under operational conditions; (g) the era of the "band aid" engineering should be brought to a close; (h) educational and training programs should be instituted to insure that the results of not building



# IEEE NEWS & VIEWS

## THE U.S. AND THE METRIC SYSTEM

Over the years, organizations within the United States have been involved in problems posed by standardization on a world-wide system of units. Such standardization will obviously revolve around the Metric System.

The latest coordination activity toward United States adoption of the Metric System has been under the auspices of the Engineering Foundation. A National Metric Study Conference is scheduled, in conjunction with a study by the National Bureau of Standards, to determine what action should be taken in the United States toward increasing domestic use of the Metric System. The conference will take place in August at Deerfield Academy in Massachusetts. Technical societies and industrial organizations will be presenting position papers on the subject and IEEE will be among them. A preliminary meeting was held at the United Engineering Center in early June, at which background information and a progress report on the National Metric Study were presented to representatives of the technical societies.

Many organizations have been examining their position on this difficult subject. The Society of Automotive Engineers has conducted a survey among the other technical societies on the implementation of metric units. Thirty-six societies responded and the general posture ranged from relative disinterest to complete conversion to SI units.

The IEEE position has been well defined since the appearance of an article prepared by Dr. Bruce Barrow in the March 1966 Spectrum. It is formalized in IEEE Standard #268, "Recommended Practice for Units in Published Scientific and Technical Work," which is available from headquarters at \$1.50 per copy to members and \$3.00 to non-members.

## DIAL ACCESS

The Educational Activities Board of IEEE has had a number of continuing education projects under review and development over the past year. One of these projects holds particular significance for IEE Groups.

The project we would like to start, hopefully in 1970, will be the production of a "Dial Access" information system. In concept this system would work as follows: A fairly extensive list of topics would be developed in conjunction with each of the Groups. The

electromagnetic compatibility into our communications-electronics systems are well recognized and the consequences of not reporting interference situations should also be made vividly clear to the operating activities; and (i) "spectrum conservation" should become bywords for the entire electronics community which has an obligation to be alert to the needs of society -- in such areas as air pollution, information handling, law enforcement, education, urbanization and transportation and the contributions which communications-electronics can make in these areas..

basis content of the material related to these topics would answer the question "What is the current status of WYX technology?". These "current status" dissertations would be approximately 5 to 8 double spaced type-written pages. They would be written by eminent workers in the field and in turn would be recorded by headquarters on magnetic tape cartridges. These tape cartridges would then form a library to which any member would have access by merely dialing a special telephone number at IEEE headquarters, asking to hear tape number --. We would play the tape over the telephone and thus provide our members with current information on a topic of interest to them.

The member would know about the availability of these current reports through listings in SPECTRUM, other publications, as well as individual flyers which would be mailed to him. The only cost involved insofar as the member is concerned would be the cost of a telephone call to access the information. Comments should be directed to the Editor.

## IEEE RECEIVES GRANT FOR INFORMATION SERVICES

IEEE has received an additional grant from the National Science Foundation for a project entitled "Strengthening Information Services in Electrical and Electronics Engineering."

The recent grant of \$18,666 will support an extension to the project, now in progress for over a year, which has led to the development of new methods of author-assisted indexing and to the creation of a computer-readable bibliographic data base of IEEE literature. This additional award brings the total funds under this grant to \$91,684.

The Information Services Department of IEEE is the principle operating unit for the grant. Established in 1967, the department's aim has been to explore the new computer-based technologies for solutions to information problems. This work has led to a magnetic tape service which enables computerized information systems to take advantage of a large data base in electrical and electronics engineering, computer science, and applied physics. The Information Services Department plans to be able eventually to provide on-line computer access to the data base, so that scientists and engineers may be able to interact more effectively with the information it contains.

## FORTESCUE FELLOWSHIPS AVAILABLE FOR 1971-72

The IEEE announces that funds have been made available for one or more Charles LeGeyt Fortescue Fellowships for 1971-72. The \$4,000 awards are made to postgraduate students in the field of electrical engineering who have received an appropriate baccalaureate degree from a duly recognized technical school.

The candidates are selected by an IEEE committee that administers the fund. It is intended that candidates shall pursue their studies at engineering schools and engage in research programs meeting the



approval of the Fellowship Committee. To be eligible, the student must have received a bachelor's degree from an engineering college of recognized standing by the time his work under the fellowship would begin and must not hold or subsequently receive another fellowship that carries a stipend greater than the tuition required by the institution at which the graduate work is to be done.

Candidates for the Fortescue Fellowships should file applications on the form provided by IEEE so that they reach the Fellowship Committee by January 15, 1971. Applicants are required to take the Graduate Record Examination and should arrange for the GRE scores to be sent to the Fellowship Committee by January 15, 1971. Awards will be made as soon thereafter as possible. Copies of the application forms are available at accredited colleges or may be obtained from Miss Una B. Lennon, Staff Secretary of the Awards Board, IEEE Headquarters, 345 East 47 Street, New York, N. Y. 10017.

## HELP WANTED

The Educational Activities Board of IEEE seeks your assistance in obtaining qualified individuals to serve on curriculum inspection teams under the Engineers' Council for Professional Development. Our Group is being asked to submit the names of two nominees who are willing to serve in this important accreditation procedure. These nominees will comprise a pool from which the annual list of team visitors will be compiled.

Visitors should be prepared to make one or two visits per year, although it is quite possible that any particular individual may receive no call for service. A fraction of the visitors should be drawn from industry, but the educators usually are predominant.

EAB-IEEE has approved some constraints of which you should be aware. These are as follows:

- 1) Nominees to be Senior Member or Fellow grade of IEEE.
- 2) Educator nominees to be from ECPD-accredited programs.
- 3) Educator nominees to be of full professor rank.
- 4) Young engineers with creative outlook are to be included.
- 5) Nominees agree to be available for three years of possible service.
- 6) Nominees are re-eligible for consideration after a one-year interval off the list.

Volunteers should contact Dr. Heinz Schlicke, 8220 N. Poplar Drive, Milwaukee, Wis. 53217.

## 1970 EMC SYMPOSIUM RECORDS AVAILABLE

The Record of the 1970 EMC SYMPOSIUM held in Anaheim, California on July 14-16 has been printed in sufficient quantities so as to be available to persons who were unable to attend the event. The contents includes 57 papers on the following subjects:

EMC Standards  
Susceptibility Analysis  
Air Traffic Control & EMC  
Shielding  
Systems EMC Management  
ECAC Status Report  
Electromagnetic Smog  
Antennas & Fields  
Bonding & Grounding  
Aircraft Lightning  
EMC Education  
EMC in Space  
Analysis & Modeling  
Emission Analysis  
EMC Design for the 1970's

The Student Supplement contains the five prize winning papers as follows:

Pulse Shape Multiplexing & Modulation

Computation of the Microwave Spectrum of Gaussian Envelope Pulse with Pulse Modulation

Frequency Allocation by Computer

Electric Field from Lightning Stepped Leader

Effects of Interference and Noise on the Operation of a Phase-Locked Loop

	<u>IEEE Members</u>	<u>Non-Members</u>
Record	\$6.00	\$9.00
Student		
Supplement	\$1.00	\$1.50

For your copy, send a check or money order to Pub., IEEE Office, 345 East 47th St., New York, N.Y. 10017. (Make checks payable to the IEEE) Limited copies available.

## NOVEMBER EMC TRANSACTIONS

The following is the contents for the November 1970 issue of the EMC Transactions.

On the Capacity of Randomly Shared Channels	F. Haber
Dynamic Range Problems Encountered in RFI/EMC Measurements	R. Matheson
Reception of Non-Homogeneous Signal Fields in the Presence of Homogeneous Noise Fields	A.A. Smith, Jr.
An Accurate Representation of the Complete Electromagnetic Field in the Vicinity of a Base-Driven Cylindrical Monopole	C. W. Harrison C. D. Taylor E. A. Aronson M. L. Houston



# PUBLICATIONS

Radiolocation Experiments  
in an Urban Environment

D. N. Travers  
W. M. Sherrill  
M. P. Castles

## NON-IONIZING RADIATION

The journal Non-ionizing Radiation is now published by Kendervic Ltd. The next issue (Vol. 1, No. 4) is scheduled to be published in October, 1970, and thence quarterly.

The journal contains review and survey articles, original R & D papers on the effects, applications and hazards of non-ionizing radiation, i.e. radio, microwave, infra-red, lasers and ultrasonics.

These are complemented with up to date news, current events, reports of significant events, and an abstract service.

Subscription orders and orders for back issues should be sent (cash with order) to Kendervic Ltd., P.O. Box 13, Guildford, Surrey, England.

## PUBLICATIONS

NASA Tech Brief, TSP 69-10362, "An Overview of Electromagnetic Interference Problems in Spacecraft." A compendium of EMI problems arising in spacecraft; will be found useful and applicable in many industrial situations. EMI from static electricity, measurement of transient spikes, grounding techniques, EMC prediction by means of a computer model are among the subjects covered. Available from the Clearinghouse, Springfield, Virginia 22151, for \$3.00.

(Excerpted from the July 1970 issue of Spikes and Ripples, the SAE AE-4 EMC Newsletter)

## CURRENT PUBLICATIONS BULLETIN

As a new service to libraries and information centers, the "IEEE Publications Bulletin" is to be released on a bi-monthly basis from the Institute of Electrical and Electronics Engineers.

The Bulletin will give complete listings and ordering information for such items as new conference publications, special IEEE journal issues, new information services, and new standards publications. Each issue will feature the most recent material which IEEE, one of the world's largest publishers of technical information, makes available for purchase.

In addition to featuring new products, the Bulletin will cumulate information over a one-year period, making each issue as easy-to-use as possible.

The Bulletin is offered as an answer to the much-expressed need of libraries for clear, timely, and accurate publications information. It is intended to become a "one-stop" notification and ordering vehicle for all of IEEE's many publications activities. The Bulletin represents the latest in a growing line of information products associated with IEEE's computer-stored data base.

## AFSC DH 1-4, ELECTROMAGNETIC COMPATIBILITY

Design Handbook 1-4 contains design data applicable to aerospace systems and significant components operating in an electromagnetic environment. It includes material on the nature and characteristics of the compatibility problem, interference sources and effects, analytical and simulation methods, design methods, lightning and static electricity, atmospheric electrical hazards, and test methods.

The Design Handbooks are provided without charge to qualified agencies supporting USAF technical interests and objectives. However, they are subject to special export controls and each transmittal to foreign governments or foreign nationals may be made only with prior approval of the Design Handbook Management Branch (ASNPB-10), Aeronautical Systems Division, Wright-Patterson AFB, Ohio 45433. U.S. Government organizations must justify requests based on their need for specific handbooks in carrying out their assigned missions and functions. Non-Government organizations must satisfy at least one of the following requirements:

a. The specific handbook is cited in an active Air Force contract or current Invitation for Bid. In such cases, identify the handbook and state the contract or IFB number, title of the work, and responsible Government Office.

b. The specific handbook is needed in private or educational technical efforts, the results of which will directly benefit the Air Force. In such cases, identify the handbook and describe the requesting organization, work, and expected benefits to the Air Force.

It should be noted that Revision No. 2 has been distributed and that Revision No. 3 should be out shortly. Persons holding handbooks who have not received Revision No. 2 should contact the Design Handbook Management Branch at the above address.

QUANTIFYING HAZARDOUS MICROWAVE FIELDS: ANALYSIS, by Paul F. Wacker, National Bureau of Standards Technical Note 391, issued April 1970, 19 pages; 30 cents.

This Technical Note analyzes the problems involved in measuring microwave field hazards. It shows that existing standards for microwave hazards based on far-field concepts may have little or no validity in the near-field situation where hazards are most common and dangerous.



## COOKING UP RadHaz IN MCO's

Microwave cooking ovens have become popular and widely distributed in a few recent years. One Eastern city claims over 6000 units are operating in commercial eateries throughout the town. MCO's come in various sizes to accommodate different objectives. But, whether ruggedized for commercial use or competitively constructed for the home market they are all suspect of RadHaz. Coin operated, unattended, and rarely inspected vending machines are beckoning anyone with the proper coin to try their "instantaneous" hot foods. Even the local Elks Club has an oven that can turn out a hot Pastrami sandwich that the "Stage" would envy. You add mustard and pickle yourself.

The MCO is here to stay. We wouldn't suggest otherwise. However, they are capable of producing conditions hazardous to health. The degree of capability appears related to maintenance rather than basic design. In a routine check of over 150 commercial ovens in one city, inspectors found 13% were emitting EMR in excess of 10 milliw/sq.cm. Many recorded emissions of 200 milliw/sq. cm. Here lies a paradox. The present standard of acceptance is 10/milliw/sq. cm. voluntarily established by the industry. Prominent health hygienists differ on the amount of EM radiation to which a human can safely be exposed. A generally accepted limit for prolonged and proximate exposure is 100/milliw/sq. cm. before causing bodily harm. But, cases have been reported where cataracts have developed from overexposure to microwave emissions (radar). Unfortunately field intensities and frequencies are seldom given. All that can be concluded is a potential hazard to human health exists from overexposure to high intensity microwave EM fields. Take heart though. All is not hopeless. Federal agencies are now combining the efforts and knowledge of health and MW technology to establish a more factual and safe limit of EM radiation for ovens and similar microwave devices. Proposals now being studied set a limit of 1 milliw/sq. cm. for ovens leaving the factory and not over 5 milliw/sq. cm. after wear and tear deterioration in service. One manufacturer featuring a patented "choke seal", claims no deterioration of his design since metal-to-metal contacts are not involved. The choke seal is a type of reflective, phase-back, 1/4 wave channel. Most ovens operate on 2450 MHz.

(Excerpted from the July 1970 issue of Spikes and Ripples, the SAE AE-4 EMC Newsletter)

## BUSINESS RADIO FREQUENCIES MUST NOW BE COORDINATED

The FCC has ruled that, as of November 1, application for authority to establish and operate business radio services in the 450-470 MHz range will have to show "evidence of frequency coordination". This change in rules was in response to a petition filed by the National Association of Business and Educational Radio, Inc. (NABER) approximately two years ago.

Coordination is required with all stations operating within a 75 mile radius on the same channel and within 35 miles for adjacent channels. The ruling affects some 119 channel pairs and 21 individual channels. The coordination may be done through NABER, which, by the FCC action, is formally recognized as the frequency advisory organization for these channels, or it may be done by the individual user. If done by the applicant, a report, based on a field study indicating the probable degree of interference, must accompany the application in addition to a signed statement that all the existing licensees within the coordination area have been notified of the filing.

The FCC indicated that they do not expect that this process would eliminate interference on these channels, but that they expected that a more orderly assignment process would ensue resulting in a more balanced occupancy of the channels.

## SPECTRUM SPACE IN 900 MHz AREA ALLOCATED FOR LAND MOBILE USE: TRANSLATORS TO BE RELOCATED

Land mobile services have been allocated a total of 115 MHz of spectrum space in a FCC order reallocating frequencies between 806 and 947 MHz. The action was taken to meet the needs for additional land mobile frequencies (Docket 18262). (In a companion order, the Commission allocated certain TV channels between 14 and 20 in the top ten markets for land mobile use.) The actions become effective July 10, 1970.

The FCC estimated that private land mobile requirements could be expected to at least double by 1980 and said that it was "not persuaded" by broadcasters' arguments that land mobile services did not require additional spectrum space. It said that the Stanford Research Institute land mobile study, carried out in 1969 for the Commission, indicated that major cities would soon face saturation of land mobile frequencies if no additional spectrum space were provided.

The Commission noted that since there would not likely be much use of the 806-890 MHz area by land mobile services for several years, translator services would have a "reasonable period" in which to plan their moves. It said translator applications for Channels 70-83 would be accepted while the rule making was pending but that no new licenses would be granted after a decision was issued. Translators operating on Channels 70-83 would be protected from land mobile interference until the end of their license periods, after which, while they will not be forced to move, they would not be protected against land mobile interference and will be required to prevent interference to land mobile services.

Twenty-six MHz of spectrum space, received from the Government shortly before the rule making was initiated, was centered in the 915 MHz area reserved for Industrial, Scientific and Medical (ISM) uses. This is a section of the spectrum set aside for non-communications equipment that produces electron-magnetic radiation, to isolate



# WAVES

signals that could interfere with electronic communications. The Commission set limits for ISM uses in this area at  $915 \pm 13$  MHz - that is, this equipment must operate between 902 and 928 MHz. The Commission noted that the 915 MHz frequency is presently used mainly by microwave ovens made by General Electric (G.E.) In response to G.E. arguments for increased limits, the Commission said it could no longer "afford the luxury" of permitting noncommunication devices to use "excessive" bandwidths in the radio spectrum. The Commission asked for comments on "co-existence" with ISM devices until equipment with the required technical characteristics could be developed.

## INDUSTRIAL TELEMETRY SERVICE PROPOSED

Readex Electronics, Inc., submitted a request for experimental authorization to the FCC to permit field testing of a new concept in gas, electric and water meter reading. The petition is for the establishment of an "Industrial Telemetry Radio Service" in the 216-220 MHz frequency band.

The system would interrogate remote units in the home from a high-altitude aircraft and record the information on magnetic tape. The home units are expected to radiate 0.5 watt on command, and the airborne transmitter about 5 watts. The occupied bandwidth will be about 40 KHz. The aircraft is anticipated to operate at 40,000 feet.

## WEI PERFORMS ENVIRONMENTAL POLLUTION SURVEY

White Electromagnetics, Inc./Technical Services Division, Rockville, Md., announces the completion of a survey for the Department of Health, Education and Welfare, Bureau of Radiological Health, entitled "Environmental Site Surveys to Determine Electromagnetic Energy Levels in the Spectrum Ranging from 20Hz to 10GHz".

All work was performed exclusively in the Washington, D. C. metropolitan area, which encompasses the District of Columbia proper, as well as Maryland and Virginia suburbs. Sites were chosen within a 25 mile radius of the Nation's Capital.

The purpose of the study was to determine the levels of electromagnetic energy that currently exist in a typical urban environment. Data were compiled in the frequency levels ranging from 20Hz to 10.5GHz. The peak level of electromagnetic energy and the RMS level of electromagnetic energy were recorded as a function of frequency, utilizing WEI/TSD's Mobile Measurement Laboratory. Peak levels of electromagnetic energy from less than  $10^{-10}$  mW/cm<sup>2</sup>/MHz to greater than 8mW/cm<sup>2</sup>/MHz were recorded and levels of RMS or narrowband electromagnetic energy from less than  $10^{-10}$  mW/cm<sup>2</sup>/MHz to greater than .05mW/cm<sup>2</sup>/MHz were recorded during the test.

Test sites included airports, hospitals, downtown locales, shopping centers, schools, and military installations. Seven of the ten sites surveyed were done so during normal working hours i.e., from 8:00 AM to 5:00 PM; two of the sites surveyed were

measured during normal working hours and also in the evening to determine the effect of "peak loading" traffic on the electromagnetic environment. Finally, one of the sites surveyed was measured for a 24 hour period continuously to determine the baseline data independent of time of day and to accurately define the electromagnetic environment.

## ELECTROMAGNETIC SMOG THREATENS SPECTRUM

(Excerpted from the May 1970 issue of Microwaves)

Our "sixth" natural resource, the radio frequency or electromagnetic spectrum, is threatened with pollution due to unnecessary radiations, according to W. Dean Jr. "While the spectrum is unique in that it cannot be consumed like most other resources, it can, however, be rendered useless by excessive interference in a way comparable to pollution of other natural resources," he said at the 1970 IEEE convention.

Unintentional radiation of electromagnetic energy by auto ignition systems, fluorescent lights, arc welders and other sources puts useless strains on an already overcrowded spectrum. Poor receiver design necessitates overly wide reservation of spectrum space. Inadequate engineering and poor operating practices account for degraded performance and waste of frequency space.

Spectrum preservation must be a primary consideration of the designer, developer, manufacturer, and user of electronic equipment, Dean concluded. More must be learned about performance measurement, interference, and the effects of communications upon people and things.

## LAND MOBILE TASK FORCE MEETS WITH CHICAGO USERS GROUPS

The FCC's recently established Task Force on Spectrum Management, headed by Raymond E. Spence, met with about thirty representatives of the Chicago member organizations of the Land Mobile Communications Council (LMCC) in June. The purpose of the meeting was to interface with the users of mobile radio in the Chicago area which has been selected as the test area for the pilot project.

One of the proposed changes to be incorporated is that the FCC will assign frequencies to applicants, based on computer processing techniques, rather than merely approve or disapprove a requested frequency as is now done. Continuous monitoring of the environment is also being considered to help determine channel utilization. A working group of the task force is assigned to design an appropriate data base, including data elements, format, sources and operating procedures.

The decision as to the exact configuration of the test area has not been made but it is expected to be large enough to include Milwaukee, and the Task Force is soliciting recommendations from the LMCC members as to the boundaries of the area.



# MEETINGS AND EVENTS

## CALL FOR PAPERS

### 1971 EMC INTERNATIONAL SYMPOSIUM IN PHILADELPHIA

The 1971 International EMC Symposium will be held in Phila. Pa. July 13-15, 1971. Sessions are planned in the categories listed below and relevant papers concerning new results in these and related areas are solicited:

- Interference Control (circuit design, grounding, bonding, shielding, filtering, etc.)
- Measurement and Instrumentation (including specification testing)
- Interference Effects (impairment of service and biological hazards)
- Interference Prediction (EM propagation, effects of linear and non-linear networks)
- Sources of Interference
- Spectrum Conservation (frequency allocation, time sharing)
- Systems Analysis (compatibility of proximate units case histories, mathematical methods, specification limits)
- Management (allocation of resources for interference control)

Summaries of approximately 300 words in 3 copies are to be sent for review to Dr. Fred Haber, Chairman, Technical Papers Committee, Moore School of Electrical Engineering, University of Pennsylvania, Phila. Pa. 19104. Summaries are due by December 14, 1970. Authors will be notified by February 1, 1971. Completed papers which will be published in the Symposium Record, will be due by April 1, 1971.

### 1970 LIGHTNING AND STATIC ELECTRICITY CONFERENCE

The 1970 Lightning and Static Electricity Conference cosponsored by the SAE and Air Force Avionics Laboratory will be held at the Town and Country Hotel in San Diego, California on December 9-10-11, 1970. There will be eight technical sessions, one which will be classified as Confidential. The titles of the others are:

1. Lightning (Discussions of recent research on triggering mechanisms and lightning stroke sweeping effects).
2. Static Electricity and Instrumentation Techniques.
3. Commercial Aircraft (The problems of P-static and Lightning are identified with current as well as advanced aircraft designs).
4. Military Aircraft (This session will cover Rotary Wing Aircraft, Cargo Aircraft, Fly-by-wire Design, Rotor Blade Testing and Fixes, F-14 Design Approach and Surge Penetration Studies on Wings).
5. Spacecraft (New approaches to limit the effects of lightning will be proposed).

6. Ground Complexes (Considerations for lightning protection of extensive ground complexes located at launch centers and air terminals with emphasis on shielding and grounding).

7. Advanced Materials (Lightning stroke damage).

Further information on the Lightning and Static Electricity Conference may be obtained from Mr. A. J. Favata, Society of Automotive Engineers, Inc., Two Pennsylvania Plaza, New York, New York 10001.

### NAVAIR - SAE ANNOUNCE NEW EMC COURSE

A new EMC course, Electromagnetic Compatibility Program Management, is scheduled to be given on October 26-27, 1970 in Washington, D.C. according to Joseph J. Fisher, NAVAIR EMC engineer. SAE is represented by Walter D. McKerchar, Chairman of the AE-4 Committee.

This course is intended to provide top management in industry with a quick overall review of current conditions in the EMC field. It stresses the importance of establishing a strong EMC management and control program within the Naval Air Systems Command, including a strong and well managed EMC program within each contractor's organization producing electrical or electronic equipment for NAVAIR.

Attendance is by invitation. Classes will be limited in size to 25 students in each of two groups. An introductory session is scheduled for Monday evening. The formal lecture sessions will run a full day on Tuesday. The course will cover the following:

1. Introduction to the NAVAIR EMC Educational Program
2. The Department of Defense EMC Program
3. The Navy Planning System
4. EMC Program Considerations
5. Compatibility Engineering
6. Principles of Electromagnetic Interference
7. Military EMC Standards and Specifications
8. Achievement of Electromagnetic Compatibility
9. Management for EMC Control

In the Introductory Session, Wilfred Dean, Jr. will give an overview of the present EMC technology. Rear Admiral G. S. Morrison, of the Office of the Chief of Naval Operations, Tactical Electromagnetic Coordinator, will give the luncheon address on Tuesday. The teaching staff is made up of outstanding authorities in the EMC field:

Joseph Fisher, Course Chairman, NAVAIR  
James Blower, Naval Electronics Systems Command  
Stephen Caine, Naval Electronics Systems Command  
Jacqueline Janoski, ECAC  
Walter McKerchar, Breeze-Illinois, Inc.  
Richard Otero, National Scientific Labs, Inc.  
Charles Seth, USAF Aeronautical Systems Division  
Anthony Zimbalatti, Grumman Aerospace Corp.

Registration is being handled by the



Society of Automotive Engineers, Two  
Pennsylvania Plaza, New York, N.Y. 10001.

#### SHORT COURSE ON ELECTRICAL NOISE

An intense three day course on electrical noise (EMI) will be offered by the Center for Professional Advancement on December 2 - 4, 1970 in Northern New Jersey, and January 11 - 13, 1971 in the San Francisco area. The course director is Bob Goldblum, EMC Consultant, General Electric Company (RESO), who is also the Editor of the G-EMC Newsletter and Chairman of the 1971 International EMC Symposium. Don White, EMC Consultant, will be a principle lecturer, and will be joined by guest speakers in selective topics. This course will be of interest to practicing engineers involved in design, test or quality control, who seek an introduction to electrical interference and compatibility design, an understanding of specification requirements, and knowledge of EMI test techniques. It will also be of use to technical managers whose scope of work requires an understanding of the interference problem, requirements and impact on product development. For more information, write to the Center for Professional Advancement, P.O. Box 997, 29 Division Street, Somerville, N.J. 08876. Phone (201)722-8111.

#### WEI OFFERING COURSES IN EMC

A series of EMC/EMI/RFI courses will be offered by the WEI Training School, White Electromagnetics, Inc., 660 Lofstrand Lane, Rockville, Md. 20850. These courses include:

- MIL-STD-462 Testing
- EMC Analysis for Proposal Preparation
- EMC System Design
- Ambient Site Surveying
- Radiation Hazards to Ordnance and Humans
- Tempest Testing
- EMC Control and Test Plans

For a free brochure and additional information, write to John D. Osburn, General Manager at WEI.

#### COURSE ON COMPUTER-ORIENTED TECHNIQUES FOR EMC ANALYSIS

A 30-hour course on using time-sharing terminals for EMC analysis is being offered by Sachs/Freeman Associates, Inc., 7515 Annapolis Road, Hyattsville, Md. 20784.

Specifically, here's what the course will give you:

Demonstrations of a variety of intra-system/inter-system time-sharing programs directly useful to EMC engineers.

Actual classroom experience with these programs, including problem-solving sessions on time-sharing terminals.

Copies of listings and tapes of EMC-oriented time-sharing programs; additional course documentation.

Information on when to go the time-sharing route, how to select the right

service for your needs, how to program for time-sharing.

Courses are planned for Fall 1970. For more information, write to Sachs/Freeman Associates.

#### EMC SYMPOSIUM ATTRACTS OVER 600 ATTENDEES

Despite the poor economic environment, large unemployment among engineers, and heavy travel restrictions, over 600 persons attended the 1970 International EMC Symposium in Anaheim. There were over thirty exhibitors displaying their latest developments in instrumentation, filters, gaskets, and other EMC related products. The papers and workshops were the highlight of the event, capturing the minds and interest of the Nation's leading EMC specialists.

The 1970 Symposium initiated a new style of G-EMC convention. It had the charm and feeling of freedom so prevalent in today's generation. The Symposium maintained a high standard of technology and disseminated this information through facilities of extreme high quality and convenience for both the speakers, exhibitors and attendees.

Willard Dean Jr., Associate Director, Frequency Management Office of Telecommunications Management, and Ralph Nader were the guest speakers at the banquet. Mr. Dean's paper was quite stimulating (see highlights) and left our community



Dr. Heinz Schlicke, Chairman of the AdCom presenting Ralph Nader with a certificate after his presentation during the awards luncheon in Anaheim

with a feeling of belonging. Ralph Nader's talk was also very interesting, although lacking direct identity with the EMC community. Nader displayed poise and humor through the brief interruptions incurred by the central music system playing excerpts from the hit parade. The picture shows Dr. Heinz Schlicke, Chairman of the G-EMC Administrative Committee, presenting Ralph Nader with an honorary membership to our Group.



# PEOPLE

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TX 78238

Our congratulations go out to CARL B. PEARLSTON, JR. of Aerospace Corp. who received his law degree in June, 1970 from the South Bay University, College of Law, Torrance, California. Carl is well known for his work in the area of EMC specifications.

IRA M. BERMAN (MARTY) has been appointed Chairman of the newly formed G-EMC Slide-Tape Committee. His Committee will function with the Headquarters Slide-Tape Committee to secure recorded tapes and accompanying slides of lectures on EMC that may be of general interest to the IEEE membership at large. After selection by the G-EMC Committee, Headquarters will process and duplicate the material and make it available for loan to Sections and Chapters requesting it.

Marty plans to contact the Chapter Chairmen for possible inputs after the summer activities' hiatus. He will be assisted by Mr. James Hill, who brings considerable experience in this field.

DONALD R. J. WHITE resigned as president of White Electromagnetics on July 31, 1970. Mr. Duane Ekedahl has been named as the new president. Don is now an independent consultant currently writing a series of books on EMC.

TERRY W. DIETRICH succumbed after a long illness on June 28, 1970. Terry was the manager of the EMC Group at Philco-Ford in Philadelphia, and was Vice Chairman of the Phila. EMC Chapter of the IEEE. His untimely passing is a loss to the many members of the Philadelphia Chapter whom he served.

The editor would like to thank the following individuals and their employers for their contributions to this edition of the G-EMC Newsletter.

R. B. Schulz  
H. Garlan  
J. S. Hill  
E. Freeman  
H. Schlicke  
P. Andress

Southwest Research  
Institute  
FCC  
RCA Service Corp.  
Sachs/Freeman Assoc.  
Allen-Bradley  
ANDCO Sales Engr. Co.