IEEE

Professional Technical Group on ELECTROMAGNETIC COMPATIBILITY

Number 28 July 1963

HIGHLIGHTS OF 5TH PTGRFI/EMC SYMPOSIUM

The highlights of the 5th National Symposium on RFI, held in Philadelphia, June 3 - 5th, 1963 were as follows:

PTG-RFI Member Registration	134
IEEE Member Registration	68
Non-member Registration	107
Total Paid Attendance	309
Speakers, Exhibitors, etc.	75
Total	384

The total was slightly under what had been expected but, apparently, it was a bad year for travel funds.

The banquet and luncheon were very well attended. Dr. Irven Travis, Vice President of Burroughs Corporation, was the banquet speaker and addressed the group on the impact of automation and foreign competition on the electronics industry. The luncheon speaker, Mr. E. L. Shoop, gave a very interesting description of the NAFEC facilities of FAA located outside of Atlantic City, New Jersey.

The majority of the exhibitors expressed enthusiasm about the results of theexhibits and wished to exhibit again at the next Symposium. Many favorable comments were made about keeping the group together and having one general cocktail party adjacent to the exhibit area. People could be easily found all during the day instead of being spread out in private rooms.

A sufficient number of Digests of the Symposium were printed up and will be distributed to all PTGRFI/EMC members who were not in attendance. This will be done through IEEE Headquarters. Thus comments on individual papers will be omitted from this report. Additional copies of the Digest may be purchased at $4.00 each.

What will not be sent to non-attendees will be mention of the Workshop. This was the experiment conducted by Prof. Ralph Showers, of the University of Pennsylvania.

The Workshop on Standards on Systems Electromagnetic Compatibility was held on the afternoon of the day before the Symposium and was composed of about 25 persons who had expressed their intention of attending the Symposium. Its general objective was to explore the possibilities of advancing the field of electromagnetic compatibility through standardization, to determine needs and explore ways to meet these demands. It was felt that there was a need for developing standard system concepts and associated definitions and thereby assisting and expediting new developments in methods of evaluation and control.

The Workshop plan was as follows: Initially, there was to be a general meeting at which the objectives would be reviewed and discussed, and in which certain system models be presented to be used as a basis for the work of several panels. The models were to be used as a basis for "classifying" systems with respect to their interference characteristics and properties for identifying parameters. These parameters were then to be later examined in some detail by appropriate panels. The panels were organized as follows: (1) Definitions; (2) Interference Criteria; (3) Instrumentation and Measurement Techniques; (4) Interference Sources, and (5) Systems Effectiveness.

These panels met at convenient times during the next two days and their discussions and conclusions were presented at a special session on Wednesday afternoon. The Workshop was originally planned as an experimental "one-shot" affair. However, discussions in each individual panel revealed that the scope was so tremendous that recommendation was made that some sort of Workshop be continued in the future as a vital necessity to accurate communication in the electromagnetic compatibility field. It is understood that ways are going to be explored in which the Workshop can be continued. For further details see page 24 of Electronic Design, June 21, 1963.

HIGHLIGHTS OF PTG-EMC ADMINISTRATIVE COMMITTEE MEETING, 6/30/63:

The name PTG-RFI was changed to PTG-EMC on May 15, 1963. It was suggested that members use PTG-RFI/EMC as a starter, for a time, in order to help others understand it is a change of name and not a new Professional Technical Group.

The Los Angeles Chapter presented its plans for the 6th National Symposium (see separate item) and stated that exhibits were under discussion and that they would wait to see what the experience of the 5th Symposium was.

Again, it was urged that everybody try to do an educational job wherever possible, such as giving papers at other Technical Society meetings, at business men's clubs and organizations, and in technical publications. It was voted to print 500 additional copies of three issues of the Newsletter and send them to committees in other technical groups which were working along allied lines. The purpose was to show the breadth of interest in PTG-EMC and how PTG-EMC might be of help to others. It was also suggested that papers be requested from other fields of interest to be presented at our meetings.

6th NATIONAL PTG-EMC SYMPOSIUM, JUNE 23 - 25, 1964

The plans for the 6th National PTG-EMC Symposium, to be held in Los Angeles, June 23 - 25, 1964 are fast getting under way. Symposium Chairman is Richard R. Stoddart; Symposium Vice-Chairman is Harry J. Delaney; Technical Program Chairman is John A. Eckert, and Registration Committee Chairman is John W. McDonald. The Symposium Theme will be "Down-To-Earth EMC in the Space Age" and the following major technical items will represent the platform on which the program will be built:

1. SPECIFICATIONS - Panel discussion of the intent, limitations, compatibility with other specifications. Application problems, philosophy behind and the interpretation of the specs and brief comments on new specifications. Invited Panel members from all services and organizations (including NASA, STL & Rand).
2. NEW INSTRUMENTATION AND MEASUREMENT TECHNIQUES IN EMC - New equipment and measurement methods - unique methods of using existing equipment. NewRIFI Meters plus instruments other than RIFI meters. Susceptibility testing - transient measurements- low Frequency methods and measurements at frequencies above 10 gc.
3. THE CONTRIBUTION OF EMC TO SYSTEM EFFECTIVENESS - The effect of EMC on system performance, cost and compatibility. The definition of system effectiveness as determined by EMC. The effects of non-compatible equipments on system effectiveness.
4. MICROMINIATURIZATION AND EMC - EMC considerations in high density packaging. The relation of physical size to circuit susceptibility. Selfcontamination problems in microminiaturization.

The application of good EMI control practice.

5. LOGIC TECHNOLOGY AND EMC - The application of EMC design practices to computers, data systems, switching circuitry and other logic systems.

6. EMC PROGRAM MANAGEMENT - The organization of EMI control in program management. Definition of objectives. Program budget. Design guidance. Quality control. Personnel and facilities. Preliminary testing for EMI. Overall program evaluation. Final operational capability.

7. WHO AND WHAT IN THE NATIONAL INTERFERENCE GROUPS - This invitational panel discussion will be designed to bring together the various groups concerned with EMI and RFI. Brief discussions showing the scope, aims and current programs of groups in ASA, SAE, AIA, EIA, NEMA and others.

8. EMC AND THE SPACE ENVIRONMENT - EMC design considerations in manned and unmanned vehicles. Problems of space communications.

9. EMC AND THE NUCLEAR ENVIRONMENT - EMI effects in electronic equipment in a nuclear environment. Deterioration of semiconductors. Nuclear magnetic field shielding. Life expectancy of components.

10. THE EMC SEMANTIC PROBLEMS - The language barriers between management, engineering, electronic designers, mechanical engineers, senior engineers and physicists. The evolution of terminology. Definition of terms in modern usage.

11. PENCIL AND SLIDERULE EMI ANALYSIS - The practical approach to the prediction of EMI in black boxes and systems. Analyses based on known system parameters with application of simple mathematics. Rapid analysis and simplified prediction techniques.

12. PREVENTIVE TECHNIQUES AND DESIGN CONCEPTS - EMI control through design techniques such as component selection and placement, signal to power circuit specification and placement, bonding, filter design, shielding, critical test points, etc. (This will be a primer session).

13. FREQUENCY SPECTRUM MANAGEMENT AND CONSERVATION - This panel discussion will have military and government frequency coordinators and managers outlining regulatory and enforcement problems and penalties. Regulations imposed by the 1963 Geneva Convention will be outlined.

14. EMI AND THE AVERAGE CITIZEN - RFI problems and complaints facing the public. Amateur and Citizen Band problems. Incidental radiation effects and sources. Cooperative Interference Committees.

15. THE EXPERIENCE AND EDUCATION REQUIREMENTS FOR EMC ENGINEERS. - Scholastic requirements. University courses now available. Recommended study programs to provide background for EMC. Practical experience and on-the-job training programs.

CHAPTERS

Dayton Chapter

A meeting was held on February 19, 1963 at which Mr. L. Avery, Aeronautical Systems Div., Wright-Patterson AFB, Ohio, spoke on "The Proper Role of the Interference Control Plan." Attendance was 24.

Dayton Chapter Holds Dinner Meeting:

A dinner-social meeting was held by the Dayton IEEE Chapter of PTG-EMC on March 19, 1963, with approximately forty people in attendance. A panel consisting of Mr. D. R. I. White, President of White Electromagnetics, Inc., Bethesda, Md., Mr. R. H. Sugarman, Laboratory Manager of American Electronics Laboratories, Inc. Colmar, Pa., Mr. B. Weinbaum, Project Manager of GD/Astronautics, San Diego, Calif., and Mr. S. Becker, Project Manager of Airborne Instruments Laboratory, Long Island, N. Y., provided an interesting discussion on the subject of Transient Measurement Techniques with general applicability to the various interference specifications.

The attendees included more than twenty-five people from the First Annual Electromagnetic Compatibility Research Contractors' Conference *, which was conducted by the Electromagnetic Environment Branch of the Electromagnetic Warfare and Communications Laboratory at the Aeronautical Systems Division on the 19th and 20th of March, 1963.

* The First Annual EMC Research Contractors Conference was sponsored by the AF Avionic Laboratory. ASRN-ASD, Wright-Patterson AF Base, Ohio. Twelve contractors conducting "EMC" research for ASD R&E Office provided a two-day review of their contractural efforts in order to obtain an exchange of information between the contractors concerned and the ASD "EMC" implementing activities.

Los Angeles Chapter

A general dinner meeting was held at the Engineers Club on May 16, 1963 at which Mr. Ben Weinbaum spoke on "Interference Control at Astronautics". Nominations for Chapter officers, which were approved from the floor, were Chairman, A. T. Parker, Vice-Chairman, Hollice A. Favors, and Secretary- Treasurer, H. E. Commons. Ballots have been sent to the membership. Attendance was 76.

Rome-Utica Chapter:

A meeting was held January 23, 1963 at which Dr. Frederick J. Morris, Electromechanics, Austin, Texas, presented a lecture called "Slide Presentation Covering Trip to South Pacific". Attendance was 51.

Washington Chapter:

A meeting was held on January 15, 1963, at which Mr. Harold R. Richman, F. C. C., spoke on "The FCC Sponsored C. I. C. Program for the Control of RFI". Attendance was 32. (Note: C. I. C. means Cooperative Interference Committee composed of volunteers in thirty-four localities to help the F. C. C. in handling complaints. A detailed description of the C. I. C. appeared in the January 1961 issue of SIGNAL.)

CALL FOR PAPERS

In line with the wishes of the PTG-EMC Administrative Committee that members of PTG-EMC present papers on EMC before other Group Conferences and Meetings, in order that other Groups will understand EMC more clearly, the following are Calls for Papers which the Administrative Committee would like to see answered by members of PTG-EMC.

International Conference & Exhibit on Aerospace Electro-Technology:

The Aerospace Electrical Conference of the IEEE for 1964 is being held in Phoenix, Arizona, April 19, through the 25th.

Papers representing original contributions are invited in the following fields: Electrical Systems; Electronics Systems; Energy Conversion and Thermoelectricity. Abstracts of no more than 250 words are to be submitted by August 19, 1963 to Technical Program Chairman, Arnold A. Sorensen, Mail 3016, The Martin Company, Baltimore 3, Md.

16th Annual Conference on Engineering in Medicine and Biology:

The 16th Annual Conference on Engineering in Medicine and Biology will be held in Baltimore, Md., at the Lord Baltimore Hotel, November 18-20, 1963. Persons wishing to submit papers should write immediately for an "Application to Present Paper" to 16th Annual Conference, Jenkins Hall, Johns Hopkins University, Baltimore 18, Md.

PAPERS DELIVERED At NATIONAL AERO NAUTICAL MEETING, Washington D. C. - April 8-11, 1963

The following papers were delivered at the joint meeting of the Society of Automotive Engineers, Inc. and the American Society of Naval Engineers, Inc. and may be obtained from the SAE, 485 Lexington Ave., New York 17, N. Y. for 75 cents each to SAE members and $1.00 each to non-members:

"Electromagnetic Compatibility Management Problem" by J. M. Bridges, ODDR&E, No. 675A. The abstract states:

"This paper emphasizes the need for all people concerned in the design and operation of electronic military devices to

recognize and take into account the existence of problems in electromagnetic compatibility. The Electromagnetic Compatibility Program of the Dept. of Defense is described, and numerous interdependent aspects of the program that require careful management attention are touched upon."

"Radio Frequency Compatibility - A Command Responsibility" by Commander Henry Bress, United States Navy, No. 675 B. The abstract states:

"This is an up-to-date report on the Navy's problems resulting from radio frequency interference. The Navy's approach is to preclude or minimize the interference problem by proper system design during research and development, by proper frequency management, and by engineered installations.

"The term 'radio frequency compatibility' as used is defined. The background and evolution of the radio frequency interference problem is explained. Shipboard interference problem areas coupled with command responsibility are set forth with interesting examples."

"Electrical Interference Problems on Boeing Transports" by C. E. Shappell, The Boeing Company, No. 675C. The abstract states:

"This paper presents a short discussion of lesser known aircraft electrical interference problem areas and their causes. Each problem area is illustrated with a typical example that has caused trouble on Boeing transports. Also, the size and complexity of electrical interference possiblities on modern transport type aircraft are briefly discussed."

"Extreme Ambient Electromagnetic Interference Control" by Donald E. Clark, Scintilla Div., The Bendix Corporation, No. 675D. The abstract states:

"This paper is tutorial in nature, based mainly on the author's own experience in electromagnetic interference control. Suggestions are offered for overcoming the effects of extreme environments as they influence interference control techniques. The techniques explained pertain to gasketing, connectors, shielding braid, shielding materials, and filters.

"The development of a high temperature feed-thru capacitor with solid impregnation capable of withstanding temperatures to 400 F and the environmental conditions of specification MIL-E-5009B is explained."

RFI As A DYNAMIC ENVIRONMENT:

Under the title "Radio Frequency Interference as a Dynamic Environment", James C. Senn, Senior Project Engineer, Genistron, Inc., Los Angeles, California, gave a paper before the 1963 Institute of Environmental Sciences (IES) April 18, 1963, in Los Angeles, California.

"The purpose of this paper is to give the environmental engineer a brief introduction to the characteristics of the interference environment, and to the philosophies of its measurement and control."

The paper is 10 pages and copies may be obtained by writing to the author, on company letterhead, at 6320 West Arizona Circle, Los Angeles, 45, Calif.

Other RFI papers at IES Conference:

The Effects of Strong Electromagnetic Fields on Electroexplosive Devices

Under the above title is a paper by Harry Schaeffer, Electronic Designer, Douglas Aircraft Company, Missile & Space Systems, Santa Monica, Calif., The abstract states:

"Electroexplosive devices such as squibs, have found a wide application in the operation of missile and space vehicles. Along with the advantages offered by squibs over other devices designed to do the same job, comes the problem of controlling the stray electrical energy which causes the squib to fire. In particular, a possible hazard exists when the squib circuit is located in the presence of strong electromagnetic fields. The wiring of the firing circuit leading to the squib acts as an antenna, capable of receiving electromagnetic energy and transmitting it on EED causing a temperature rise. If the field strengths are of sufficient magnitude and lie in a frequency range which would result in a sufficient amount of induced voltage, the squib will fire. Premature firing of squib circuits, due to electromagnetic fields, present a hazard to personnel working around them, as well as rendering a system inoperable, or in the destruction of the system.

"This paper explains the possible sources of electromagnetic energy and how these fields vary with frequency and distance from the source. Also, it is explained how the squib circuit receives and absorbs energy resulting in the heating of the squib bridge wire which leads to the detonation of a charge. Some approaches to eliminating this potential hazard by reducing the amount of induced voltage in the squib circuit are also discussed."

Instrumentation Requirements toMeasure and Define RF Fields

Under the above title is a paper by G. P. Rothhammer, Instrumentation Engineer, Stoddard Aircraft Radio Company, Hollywood 38, Calif. The abstract states:

"The measurements of RF fields requires well defined techniques and instrumentation, and each of these vary with the bands of the RF spectrum. Microvolts in the RF frequencies cannot be measured as volts, amperes, or other direct means. By international definitions, units of measurements such as centimeters, gallons, amperes, volts and ohms, to name a few, are well defined. However, in the RF spectrum, tuned RF instrumentation is necessary in order to tune to each discrete frequency. Tuned devices have to have predetermined and known bandwidths, gain, slideback functions, etc. This paper will describe these necessary properties and other unique features between a standard field strength meter and a typical RF radio receiver.

"Considerations will be illustrated as to the use of field strength meters when used for measuring the electric and magnetic fields of an RF field."

RF Shielded Enclosures for Electromagnetic Fields

Under the above title is a paper by Lee Appelman, President-General Manager, Topatron, Inc., Garden Grove, Calif. The abstract states:

"Military specifications on Radio Frequency Interference requires that the ambient of test areas must be at least 6 db below the specification limit. In most cases, the RF ambient in 'free space' exceeds the various specification limits, thus an RF ambient free, or 'noise free' area is a requirement to meet the military specifications.

"This paper will describe the more commonly used RF shielded enclosures and will describe various technical and mechanical requirements to obtain RF ambient free conditions. Various RF shielding properties of single and milti-wall cell type rooms, and their fabrication techniques will be discussed."

NOTE: Copies of the last three papers may be obtained from the authors or, possibly, by writing to the Institute of Environmental Sciences, Post Office Box 191, Mt. Prospect, Illinois.

TREASURY DEPARTMENT CREATES RF SPECTRUM JOB:

Joe L. Stewart has been designated Chief of the newly-established Radio Frequency Spectrum Staff in the office of the Chief of Staff, U.S. Coast Guard Headquarters. The new staff has been established to assist and advise officials of the Treasury Department, the Department of Health, Education and Welfare, and the Federal Reserve System with respect to the regulatory aspects of telecommunications affecting utilization of the radio frequency spectrum. A primary responsibility of the staff is to handle radio frequency management problems for the Treasury Department's Bureau of Customs, Bureau of Engraving and Printing, Bureau of the Mint, Bureau of Narcotics, Internal Revenue Service (Alcohol and Tobacco Tax, Intelligence, and Inspection Divisions), Secret Service and the Coast Guard; the Department of Health, Education and Welfare's Public Health Service, Food and Drug Administration, and U.S. Hospitals; and the banks of the Federal Reserve System.

Mr. Stewart has been associated with the U.S. Coast Guard and the Treasury Department for twenty years and during this period he has served as a member of the U.S. Delegation to three world communication administrative conferences and numerous international technical conferences.

FCC Makes Changes in Part 15:

Docket No. 14376 permits wireless mikes and miniature tele-

metering transmitters (without a license) in FM band 88 - 108 Mc/s under limitations on radiation and bandwidth. Emissions from the device shall be confined within a band 200 kc/s wide centered in the operating frequency and entirely within 88 - 108 Mc/s.

Docket 14580 describes the operation of low power communication devices above 70 Mc/s. There must be no external controls capable of defeating duty cycle requirements and it clarifies duty cycle requirements.

Relay Conference Papers Available:

A complete report has been made available of the 47 papers given at the 11th National Conference on Electromagnetic Relays and may be obtained by writing to Alex White, Executive Director, National Association of Relay Manufacturers, P. O. Box 1, Bellerose 26, Long Island, N. Y.

A 14-1/2 page write-up of the Conference appears in the June 1963 issue of Electromechanical Design, 167 Corey Road, Brookline 46, Mass.

Nomogram On Antenna And Field Strenth Noise:

The Quarterly Radio Noise Data, Technical Note 18-15, by the National Bureau of Standards, contains a nomogram for transforming effective antenna noise figure to noise field strength as a function of frequency. The frequency range is between.01 and 100 megacycles. Copies of the Technical Note can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. for 45 cents.

Too Much Gold Can Corrupt A Soldered Joint:

I. V. Williams, head, Metallurgical Engineering Dept., Bell Tel. Labs., Murray Hill, N. J., gave the following information in a talk at the ASM meeting, May 10, 1963:

"Too much gold can corrupt a soldered joint. This became evident to Bell Lab researchers as a result of failures that occurred when heavy gold plates had been used prior to soldering. It was found that when the proportion of gold in lead or lead-tin reached about 75%, a brittle alloy formed. Better joints were obtained when gold was held to a flash coating."

New Oxide Reduces Tape Noise:

Under the above title, Robert A. von Behren, Technical Director, Magnetic Products Division, 3M company, St. Paul, Minn., has written a two-page article for Electronic Products Magazine, April 1963. A chart is given of frequency characteristics of low-noise tape and conventional tape.

Westinghouse Has New Wall Chart of EM Spectrum:

Westinghouse Electric Corporation, Printing Division, P. O. Box 398, Trafford, Pa., has brought out a new electromagnetic spectrum chart, 29 by 41 inches in full color and suitable for hanging on the wall. A chart will be sent for $3.50. The entire spectrum from 10 to 10^{24} cycles per second is displayed.

Transistor Switch Cuts Arcing, Increases Relay Sensitivity:

A column description of the above relay, authored by P. Cutler, research engineer, Autonetics Div., Ford Motor Co., Anaheim, Calif., appeared in the March 1, 1963 issue of Electronic Design.

Radiation Damage to Transistors:

Space/Aeronautics, May 1963 carries a two-page article, under the above title, by W. C. Honaker, and F. R. Bryant, Aerospace Technologists, Longley Instrument Research Div., NASA. It is a condensation of an article in NASA TN D 1490. The final paragraph states: "Interestingly, the transistors were damaged more at 40 than 440 Mev, which is consistent with previous experiments. Radiation damage shows a frequency dependence, and damage is greater at the low energies."

Identification of RFI Events in PERT Networks:

The Electronics Systems Division, AFSC, in November 1962, published for ESD use a model ESD PERT Network. This model network identifies events concerning radio frequency interference. These model networks are as a guide by SPO and PERT technical personnel in PERT network preparation. Final decision, however, on the events included in any PERT network is the responsibility of the System Program Director. Inquiries for additional information should be addressed to the new PERT Orientation and Training Center, Bolling Air Force Base, Washington 25, D. C.

Low Noise Reception at U. H. F. and Microwaves:

Under the above title, G. O. Chalk, of the English Valve Co., Ltd., wrote a paper which appeared in the May 1962 issue of Radio and Electronic Components, 9 Gough Square, Fleet Street, London, E. C. 4. The conclusions state:

"The important features and requirements in the design of low-noise receiving systems for the u. h. f. and microwave region have been described. Although properly designed aerial and transmission systems from vital parts of the complete system it has been shown that in the majority of cases most can be gained by improvements in the first-stage low-noise amplifiers themselves.

"There are many low-noise amplifiers to choose from and many factors to weigh up in deciding on a particular device for a particular application. Since the present trend at lower frequencies is towards all solid-state receivers on the grounds of both size and power consumption it may well invade the microwave region also, in which case probably the only thermionic device to remain eventually will be the low noise T. W. T. in applications where its wide bandwidth is mandatory."

Laboratory Substantiation of Interference Prediction Techniques:

Sprague Electric Co., North Adams, Mass., has issued, as Sprague Technical Paper No. 62-14, the paper delivered by Lawrence W. Beard, Section Head, Systems Engineering, Interference Control Field Service, under the above title, at the 8th Armour Conference. Copies may be obtained by writing to Sprague. Sprague also issues Filter Application Notes, and Engineering Bulletins which may be obtained on request.

The Radio Frequency Interference Meter:

Under the above title, BuShips, U.S. Navy, has brought out a report, NAVSHIPS 94180, which presents the technical information accumulated over a period of 15 years under contracts with the University of Pennsylvania. Copies are now available only to Navy Activities and Inspectors of Navy Material from the Navy Supply Depot in Philadelphia but copies will later be available through either the Government Printing Office or ASTIA. The Report is 200 pages.

Underground Corrosion:

Under the above title the National Bureau of Standards has brought out a condensed summary of its investigations on the corrosion of metals in soils conducted over a period of 45 years. The aim is to provide a useful reference for the technician who is interested in the theoretical aspects of underground corrosion, and for the engineer who may be interested only in the practical aspects of the methods commonly used for the prevention of corrosion. 1957, 227 pages, Cloth, $3.00. Catalogue No. C 13.4:579.

Radio Communication Within the Earth's Crust:

Under the above title, Charles R. Burrow, Senior Scientist, Radio Engineering Labs., Inc., Bethesda, Md., delivered a paper before the URSI Spring Meeting, April 30, 1963. Copies are available, on company letterhead, from Mr. Burrows. The Summary stated, in part:

"This paper discusses four methods of electrical communication within the earth's crust. Mode I may be described as similar to propagation over the ground, except that the rock dielectric substitutes for air as the propagation medium and the under surface of the overburden takes the place of the earth's surface. Mode II results when the Q of the propagating medium is small so that the antennas must be modified which also results in a modification of the propagation formulas.

"Two other modes are considered for conditions where the depth to the good dielectric basement rock is prohibitive. Mode III is indicated when the overburden is a highly conducting layer. It makes use of "dc signaling" with vertical antennas extending below the surface layer. Mode IV is indicated when the overburden is so thin that it does not provide an effective conducting plane. It makes the use of "dc signaling" with the antennas consisting of a pair of vertical conductors insulated from the thin layer of high conductivity, but making contact with the medium of intermediate conductivity, hence, generating a horizontally polarized wave."

Mr. Burrows has another paper, Transient Response in an Imperfect Dielectric, as well as the above paper in the

NEW PREFIXES:

The following is reprinted from the March 1963 issue of the Professional Technical Group on Microwave Theory and Techniques' Newsletter:

At the October 1962 meeting of the International Committee on Weights and Measures, held in Paris, two new prefixes for denoting submultiples of units were adopted. They are: femto, 10^{-15}, symbol "f"; and atto, 10^{-18}, symbol "a". This brings the list of numerical prefixes to a total of 14. The full list is: Multiples and

Submultiples	Prefixes	Symbols	Pronunciations
10^{12}	tera	T	tĕr'ȧ
10^{9}	giga	G	jĭ'gȧ**
10^{6}	mega	M	mĕg'ȧ
10^{3}	kilo	k	kĭl'ō
10^{2}	hecto	h	hĕk'tō
10	deka*	da	dĕk'ȧ
10^{-1}	deci	d	dĕs'ĭ
10^{-2}	centi	c	sĕn'tĭ
10^{-3}	milli	m	mĭl'ĭ
10^{-6}	micro	μ	mī'krō
10^{-9}	nano	n	năn'ō**
10^{-12}	pico	p	pē'cō**
10^{-15}	femto	f	fĕm'tō
10^{-18}	atto	a	ăt'tō

*The official French spelling for the prefix representing the multiple ten is deca. This prefix has long been spelled deka in the United States, Great Britain, Germany, and a few other countries. The continued use of this spelling is consistent with our use of gram for the French gramme and meter for metre. The symbol, however, should be universal and even though dk has been long in use in the United States for the symbol for deka, the National Bureau of Standards will from now on adhere to the official international symbol da for the prefix representing the multiple ten and recommends that this practice be followed throughout the United States.
** These pronunciations differ from those previously given, and are the result of international discussions to promote uniformity of pronunciation in various languages.

Documentary Sound Record Available:

Raybestos-Manhattan, Inc. Passaic, N. J., offers a 12" Documentary Sound Record titled "The Space Age/The Age of Reliability" which traces the development of the space age in America from the first rudimentary experiments in rocketry to the present Moon Shot program. Over seventy-five authentic sounds of the times are included, each recorded in high fidelity. For those who are interested in identifying certain signals, such as the Sputnik signals, and others, a complimentary album may be had by addressing Raybestos-Manhattan, Inc. Passaic, N. J., on your letterhead.

What RFI Control Means to Systems Design:

Electronics, April 26, 1963 has a four-page article by Mike Revzin, RFI Mgr., Loral Electronics Corp., Bronx, N. Y. titled Radio-Interference Control, What It Means to Systems Design. The sub-title states: "The rfi control group influences the design and development of a system from the initial proposal to the final testing. Case history of a counter-measures receiver project shows how rfi control works."

American Ordnance Asso. Appoints RFI/EMC Packaging Committee:

The American Ordance Association, Packaging Division, Container Section, has appointed Vincent J. Pachiano as Chairman of the RFI and Magnetic Shielding Committee to study the problem of shipping containers designed to protect equipment that may be affected by or emit RFI/EMC and magnetic forces, such as magnetrons. The committee will confine its studies to shipping containers - packaging, as distinguished from electronic black boxes - packaging. Mr. Pachiano is a packaging engineer with Autonetics, 9150 E. Imperial Hwy., Downey Calif.

Protection from RFI:

Under the above title, J. J. Walls, Autonetics Division, North American Aviation, Inc., has written an article of three pages for the May-June 1963 issue of "Ordnance", the magazine of the American Ordnance Association. The sub-title states: "Radio-frequency and electromagnetic interference has been causing damage to diodes, transistors, magnetic tapes, laser rubies, and similar devices, and packaging methods must be found to protect them."

EMC Control in Large Weapon Systems:

Under the above title, William J. Baldau, Electronic Branch, Advanced Technology Department, Douglas Missile & Space Systems Division, presented a paper before the National Aerospace Electronics Conference, Dayton, Ohio, 14 May 1963. Copies of the paper known as EngineeringPaper No. 1635, may be obtained from David A. Nesheim, Advanced Space Technology, Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif.

Antenna Method Minimizes Co-Channel Interference:

Under the above title, Electrical Design News carries, in its June 1963 issue, an article by Robert Leitner, Chief Engineer, Technical Appliance Corp., Sherburne, N. Y. The sub-title states:

"The problem of co-channel interference is troublesome, particularly for community systems and TV stations employing stand-by, "off-the-air" rebroadcast systems."

Metal Foil Wallpaper for RF Shielding:

Electrical Design News, June 1963, carries a two-page article under the above title. It shows the application of Emerson & Cuming, Inc. Eccoshield and the epoxies for installing them.

JTAC Article Available:

An eighteen page article is available on the history of JTAC titled "JTAC Through the Years" and contains a list of all members through July 1960. Copies may be obtained by writing to L. G. Cumming, Secretary, Box A, Lenox Hill Station, New York 21, N. Y.

JTAC stands for the Joint Technical Advisory Committee which is a joint venture of IEEE and EIA to furnish the government with unprejudiced technical advice in the radio field and to give similar advice to industry. Electromagnetic Interference Problems are discussed in the article and how JTAC handled them.

Faster Way to Inspect Soldered Joints:

Electronic News, April 1, 1963 carries an article under the above title which describes a new method for inspecting soldered joints which has been developed by Eastman Kodak Co., Rochester, N. Y. Two pertinent paragraphs are as follows:

"Willard Zinke, Eastman research engineer, told a session of the Society for Nondestructive Testing that the technique uses fluorescent penetrant and subsequent inspection under ultraviolet light.

"It was developed by his company under contract from the Army's Frankford Arsenal, Philadelphia, and is in use by Eastman in the production of proximity fuses with high reliability, he said."

What Price RFI Control?

Electronics, June 14, 1963, devotes a page of Crosstalk to the above subject. The article mentions seven catagories in the field of electronics which an engineer should be familiar with. It also estimates that RFI costs the electronics industry as much as five per cent of the industry's annual sales.

Electronic Terms for Space Age Language:

A two-page listing of electronic terms for space age language is in the June 1963 issue of Electronic Products, Tech. Publishers Inc., 645 Stewart St., Garden City, Long Island, N. Y. The terms go from "absolute address" to "xasers".

NEW PRODUCTS

Jansky & Bailey Establish RF Branch:

The Jansky & Bailey division of Atlantic Research Corp., Alexandria, Va., has formed a new radio frequency instrumentation branch which will be responsible for designing and developing special measurement equipment for use in RFI and EMC applications. One of their first products is a radiometer which can be added to existing

receivers and bring field strengths down to threshold levels.

Solar Electronics Company is Formed:

Solar Electronics Company has been formed as a division of A. T. Parker and Associates, 5909 Melrose Avenue, Hollywood 38, Calif., to manufacture ancillary and auxiliary devices used in RFI testing, other than presently available RIFI meters. They have already developed an RFI Transient Generator, Audio Isolation Transformer, Phase-Controlled Solid State Switch, and a Servo System with Power Supply Units.

Lavoie Laboratories Brings Out Spectrum Analyzers:

Lavoie Labs., Inc. Morganville, N. J. is bringing out two new spectrum analyzers. One is a Single Sideband Spectrum Analyzer, LA-40, which has a frequency range from 2 - 80 Mc, high stability an 10 cps resolution. The other is a Microwave Spectrum Analyzer, LA-18M-1, which has a frequen cy range from 10 - 44,000 Mc, 500 Kc - 25 Mc frequency dispersion continuously variable, and cariable resolution from 1 - 80 Kc.

A New Switch in Electronics:

Under the above title, Edmund A. Bolton, Vitramon, Inc. Bridgeport 1, Conn., has written a two-page article in Military Systems Design, June 1963 on a new switch. The first paragraph states: "Bounce, electrical noise generation and failure in dry circuit switching applications have plagued switch users for many years. By combining novel design principles with careful material selections, a mechanical switch has been produced which largely overcomes these three greatest switch problems."

EDITOR'S NOTE

The intimacy of the 5th Symposium demonstrated how much more can be accomplished by personal contacts, even for fleeting moments, than by correspondence or by telephone. It should be possible to work out some formula for future meetings, which everybody could be asked to adhere to, whereby meetings could be more of a unit during specified times.

Rexford Daniels, Editor
PTG-EMC Newsletter
