IEEE

Professional Technical Group on ELECTROMAGNETIC COMPATIBILITY

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REPORT On I I TRI 9th TRI-SERVICE EMC CONFERENCE:

Electronic News, October 21st, 1963, carried the following write-up of the above Conference:

EDP Analysis of Interference Held Next Task by: Walt Bohne

CHICAGO — Electromagnetic Compatibility's next frontier is "efficency and speed" in processing computer analysis of interference problems.

Brig. Gen. Allen Stanwix-Hay, Army Deputy Chief Signal Officer, made this observation at the ninth annual tri-service Electromagnetic Compatibility Conference here last week.

Computer time—and computer cost—are well on their way to becoming the limiting factor in how many interference studies we can undertake", said General Stanwix-Hay in his keynote address before approximately 400 industry and military engineers at the Museum of Science and Industry.

The three-day conference sponsored jointly by the Army, Navy and Air Force was conducted by ITT Research Institute in cooperation with the Professional Technical Group on Electromagnetic Compatibility of the Institute of Electrical & Electronics Engineers.

"We need quantitative, not just qualitative answers," the general said. "We need to know how much over-all communications will be degraded... in detail, how well target acquisition will be accomplished despite interference... and we need to have specific measures on the relative effectiveness of different possible fixes to a problem."

Spectrum Conservation

Needed "teamwork in spectrum conservation" was voiced by James D. O'Connell, Lt. Gen. USA (Ret.), chairman, Joint Technical Advisory Committee, IEEE and Electronic Industries Association, in his luncheon address.

General O'Connell, said that we need national leadership at the highest level now, to cope with currently compounding interference problems since radio spectrum use has increased 10 fold since 1949, according to Federal Communications Commission information, and that usage will increase up to another 10 fold in the next decade, "If we don't run into saturation first," he predicted.

The FCC is now said to be receiving some 600,000 applications for frequency allocation annually with marine licenses running at a 3500 per month rate and some 500 per month coming in for micro-wave radio relay purposes. FCC personnel strength in 24 districts dealing with interference, on the other hand, has been reduced to one-half its 1949 level in the face of growing spectrum conservation problems, it was said.

Supporting conference speakers, with the exception of two, mostly confined themselves to detailed analysis, modeling and synthesis approaches, instrumentation, measurement techniques and designs for interference control.

3-Tier Approach

Bert Mills, Vice-President, Genistron, Inc., Los Angeles, speaking for president Fred J. Nichols, who was ill, presented a three-tier approach to today's EMC military and space problem solution at the RFI/EMI crossroads.

"The majority of us are working to some 90 per cent of our own capabilities in the tier 3 level", he said, "where existing weapons systems and/or space systems that are at today's operational level, and are fire fighting today's EMC problems".

"We need to be more active immediately at the tier 2 level", which he defined as Governmental agencies who are at present developing specifications and design objectives, for future weapons and space systems.

With this background, Mr. Mills indicated we will then reach the tier 1 level and be invited into Governmental planning for use of the electromagnetic spectrum some five to 10 years hence.

Sub-Committee Formed to Cooperate in EMC Education:

The following action was taken at the October 1963 PTG-EMC Administrative Committee Meeting:

"At the PTG-EMC National Administrative Committee meeting in June, Mr. Henry Randall was appointed Chairman of a sub-committee to answer the question, 'What degree of participation should PTG-EMC assume in extra-EMC meetings and how should this be carried out?'

"As a result of his recommendation and the discussion at the October meeting in Chicago, the Administrative Committee took the following actions:

"1/ PTG-EMC will actively encourage the delivery of more electromagnetic compatibility papers at non-EMC or 'extra-EMC' meetings.

"2/ The following people have offered to assist in this task of disseminating compatibility information to a wider audience and constitute an Extra-EMC Committee:

"Herbert M. Bartman, AF Avionics Lab., Wright-Patterson AFB, Ohio
"Stan Bennett, Bureau of Yards and Docks, Navy Dept., Washington, D. C.
"Stan Cohn, ECAC, USNMEL, Annapolis, Maryland
"Harold E. Dinger, NRL, Washington, D. C.
"J. Paul Georgi, ECAC, Annapolis, Maryland
"Zigmund V. Grobowski, Jansky & Bailey, Washington, D. C.
"A. R. Kall, Ark Electronics Corp., Willow Grove, Penna.
"C. R. Miller, RAUMA, RADC, Rome, New York
"O. Paul Schreiber, Technical Wire Products, Cranford, N. J.
"Vic Siegfried, Lockheed Missiles and Space Div., Palo Alto, California

"Those that wish to volunteer to help in this task should send their names to the Chairman, Henry Randall, 1208 Seaton Lane, Falls Church, Virginia (or phone him at the Pentagon OXford 5-7261). There are ways in which you can help even with limited time.

"3/ The ADCOM proposes that individual members of PTG-EMC keep an eye out for extra-EMC meetings at which it would be appropriate to deliver one or more compatibility papers. There is an increasing number of such meetings, as outsiders become aware of the importance of electromagnetic compatibility. Members should volunteer to deliver such papers, or identify others who should do so.

"4/ PTG-EMC will sponsor tutorial sessions, to be prepared explicitly for appropriate meetings, in order to increase professional knowledge in our field."

Herman Garlan Reports to IEEE On His 1962-63 Administrative Activities

During the administrative year 1962-1963, PTG-EMC enjoyed a substantial growth in membership from 1,154 to 1,352. A new chapter at Dayton, Ohio was organized so that the Group closed the year with 11 chapters. Three issues of our TRANSACTIONS were published. Our Fifth National Symposium on Radio Frequency Interference was successfully conducted at Philadelphia, Pennsylvania on June 4-5, 1963. This Symposium is memorable as it is the first symposium with exhibits conducted by the Group.

The AdCom met three times: October 31st, 1962, in Chicago, March 26th, 1963, in New York, and June 3rd, 1963 in Philadelphia. The meetings were well attended by members of AdCom. Since these meetings are open to the entire membership of PTG-EMC, we usually have from 10-20 guests in attendance.

After extended discussion, the AdCom, on March 26th, 1963, approved a change in name for the Group. The former name - Professional Technical Group on Radio Frequency Interference was dropped in favor of the current name - Professional Technical Group on Electromagnetic Compatibility. The new name, it is felt, more adequately describes the scope of activities of the Group.

The AdCom took several initial steps toward a merger with Committees of the former AIEE. The chairmen of these committees were invited to attend our AdCom meetings. Several of these chairmen were present or represented at our June Meeting. It was agreed to publish 500 additional copies of our Newsletter and distribute these to (AIEE) Committee members. It was also agreed to solicit papers for our Symposia and TRANSACTIONS from these Committees.

The AdCom agreed to advocate participation by PTG-EMC members in symposia and conferences conducted by other organizations in order to alert and educate these other organizations regarding compatibility and interference problems. As a consequence, our Los Angeles Chapter cooperated with the SAE in organizing and presenting a session on Electromagnetic Compatibility and Radio Interference at the SAE meeting on Aeronautic and Space Engineering and Manufacturing held at Los Angeles on September 23-27, 1963. Four of our members presented tutorial papers at this meeting.

In association with our Fifth Symposium, but not a part thereof, Dr. Ralph Showers, member of our AdCom, invited about 30 persons active in this field to a Workshop on Standards on Systems Electromagnetic Compatibility. The workshop concerned itself with problems such as definitions of terms used in EMC, measurement techniques and instrumentation and the question of system effectiveness (how to relate interference effects to system performance). The workshop concept was discussed at our AdCom meeting in June and the AdCom agreed to support the workshop as a continuing activity.

Herman Garlan
Chairman PTG-EMC, 1962-63

CHAPTER ACTIVITIES

Cape Canaveral:

A meeting was held on February 28th, 1963 at which a paper was given by Ronald New, American Electronic Laboratories, Colmar, Pa., titled "Frequency Independent Antennas & RFI".

Another meeting was held on October 8th, 1963 and a paper was given by Lawrence W. Beard, Sprague Electric Company, North Adams, Mass., titled "Laboratory Substantiation of Interference Prediction Techniques".

Chicago:

On September 13th, 1963 a meeting was held and O. P. Schreiber, Technical Wire Products Corp., 129 Dermody Street, Cranford, New Jersey, gave a paper on "RF Shielding and Gasketing Symposium."

Los Angeles:

A meeting was held on July 18th, 1963 at which time Carl B. Pearlston, Jr., Northrop Nortronics, Hawthorne, California, gave a paper on "The Inter-Industry Committee Approach to Compatibility".

Seattle:

There was a meeting held on August 19th, 1963 and Dr. H. M. Schlicke, Allen-Bradley Company, Milwaukee, Wisconsin, gave a paper titled "New Concepts in RFI Filters".

Interference Recently handled by FCC:

The following cases are extracted from FCC General Information Bulletin, 10/14/63 No. 41995:

Radio Paging Annoys Citizens

Monitoring observations by the Denver FCC engineering office detected what appeared to be a stuck relay in a transmitter which cause radiation of a steady heterodyne on citizens radio transmissions. Hi buildings prevented defining a general location, so mobile equipment was called into service. It found the offending transmitter in a local newspaper office. It had been used for paging purposes but its innar had expired — also its license.

"And On The Left Bank You Will See FCC Inspectors"

The Chicago FCC engineering office was alerted that sightseeing boats were treating their customers to remote guided tours through a local museum via their ship-to-shore radios. It remembered interference caused by a like commercial stunt in Milwaukee. The Chica operator was warned that such use of boat radio is illegal because it endangers the safety of passengers.

Happy Days Again in Valparaiso

A sudden influx of interference complaints from Valparaiso, Ind., showed up in the Chicago FCC engineering office. The culprit was f to be a neutron generator operated by a university in non-compliance with the rules. Its radiation was bothering TV viewers within half a mile radius. University officials promptly contacted the manufactur who dispatched a technician to place the generator in proper operatin condition. The complaints had caused one local TV sales and servic firm to advertise that its sets were not responsible and urged annoye persons to write to the FCC. Following resolution of the trouble, th same firm published another advertisement, this time suggesting let of thanks be sent the FCC.

Garage Door Opener Jars Jets

Engineers of the Dallas FCC engineering office found utilization of a helicopter to be the only effective means of resolving a complaint of interference to communication with jet planes by an Air Force base. The investigators found that the trouble reported by the jets was not heard in the control tower. With the volunteered use of a helicopter bearings taken while hovering over selected areas placed the fix nea Big Springs. However, a four-hour ground search was fruitless, so more helicopter flights were made. Land mobile search eventually to a garage which had a faulty electronic door opener. Though radia 2 1/2 miles into the air, it was barely detectable 200 feet from the garage. The owner stopped using the equipment until repairs could made.

Riding Down An Offending Signal

In another case, a Coast Guard whirlybird was instrumental in eliminating an unmodulated signal that was potentially harmful to searc and rescue operations in the Gulf Coast area. FCC monitoring fixed the source near New Orleans. Using this information, the helicopte homed in on the signal of the suspected coast radio station. The latt promptly corrected a transmitter defect.

Out of Tune With "SOP" (Standard Operating Procedure)

Steady, unrelenting sounds on Coast Guard reception at Norfolk, Miami and New Orleans brought FCC monitoring aid which identified the offending signal as teleprinter transmission on a Navy channel. Call to Washington Naval communication headquarters brought quick confirmation and correction of a badly tuned frequency-shift teletype transmitter on a Navy vessel.

Air Force Runs Own Interference

An Air Force base in Maryland requested FCC monitoring help to locate the source of unwanted telegraphic code transmission on one of its air-ground channels. The Laurel FCC monitoring station determined the call signal by reading the dots and dashes and identified it as a second harmonic of an amateur station. The FCC easily determined the address of the station and passed it on to the complainant for follow-up action. The interference quickly ceased. The licensee was a member of the force of the complaining base.

Restricted Interference

A commercial telegraph company complained of continuous wave interference to ship communication. FCC monitoring placed the source in the San Francisco area. Using mobile equipment, an FCC field engineer tracked it to the local Naval air station. He was escorted into the restricted dock area where the signal was heard coming from a compartment which, in compliance with security regulations, was properly locked. A call went out for the man with the key who, upon arrival, opened the final door. Inside was found a 500-watt transmitter that had been left in an "on the air" position. Another turn of a key and the interference ceased.

Interference Knows No National Boundaries

With global radio use increasing with each passing day, it is not uncommon for stations of one country to interfere with those of another country. FCC monitoring facilities are adequate to identify most of these long-range signals as a preliminary step to resolving the inevitable conflicts involving stations in the United States.

A commercial radio station on the Pacific Coast, troubled by a clatter of telegraph sounds mixed with voice communication from its station in Sydney, Australia, asked the FCC to locate the source of the gratuitous transmissions. Synchronized observations by the FCC's Western direction finding net determined the origin to be a like station in Melbourne, Australia.

Other recent DX interference examples were:

Interference on a U. S. Navy ship-shore frequency was traced to a coast station in Brazil that had wandered off its assigned frequency.

Interference to U. S. Navy operations in Hawaii was found to come from a French naval station in Algeria, North Africa.

Interference to a commercial radio operation in Hawaii was caused by a commercial station in Colombia, South America.

A Coast Guard station in Virginia received wayward signals from a commercial station in Tunisia, Africa.

A radio press service at New York was plagued by transmissions from an aeronautical station at Dakar, Africa.

Modern Signal Processing Technique for Optimal Signal to Noise Ratios:

R. D. Moore and O. C. Chaykowsky, of Princeton Applied Research Corporation, P. O. Box 565, Princeton, New Jersey, have written a 5-page discussion available as Technical Bulletin 109. The sub-head and first paragraph are as follows:

"Phase sensitive detection provides the theoretically optimum technique for the recovery of signal intensity information from noise. Application of this technique to signal processing problems encountered in typical experiments in physics, chemistry, astronomy and biology is discussed.

"It is probably a safe statement to make that the majority of present day research in the physical sciences involves the measurement of small effect phenomena where noise sets the limit to attainable precision or detectability. In noise one includes all disturbing elements over which the experimentalist has no control, such as effects produced by the fundamental thermal fluctuations of all matter not at absolute zero, or by statistical fluctuations due to the quantized nature of light, electrical currents, etc. Also in noise one groups such extraneous disturbances as building vibrations, variations in room temperature and stray electrical signal pickup; disturbances which in principle can be reduced to an arbitrarily small value but which in practice are difficult to remove entirely from the picture."

Another "Silent Spring"? Electromagnetic Compatibility

Under the above title, the October 1963 issue of the New Englander, published by the New England Council, has a four-page article written for management. Extracts of interest are:

"Another Silent Spring may be in the making . . . . .

"The problem is at one and the same time simple and complex. It is brought on by a multitude of electronically emitting equipment - all of which could interfere with other units - and all of which can cause undesired signals with undesired and even potentially deadly responses.

"Official reaction to the urgency of the situation ranges from denials that there is any problem at all, through placid apathy, up to multi-million dollar government efforts to control the problem. How real is it? How intense is it? How widespread is it?"

Copies may be obtained by writing to The New England Council, 1032 Statler Building, Boston 16, Massachusetts.

Some Things That Can Cause Transistor Failure:

Electronic Industries, October 1963, has the following item on page 208:

Telstar Recovery Bears out Westinghouse Study

"The recovery of Telstar confirms a recent study of the failure of electronic devices recently conducted by Westinghouse for the AF Rome Air Development Center.

"The Westinghouse study, though unrelated to the Telstar project, explains transistor failure due to surface charge, and says the transistors recover when the charge leaks off or is removed.

"Westinghouse scientists, beginning in July, 1961, found the temporary failure of a transistor due to a charge from ions on its surface has several causes: Transistor surface charge may result from space radiation effects, electrical discharge, static charging of a transmitter by an nylon-clad assembler, transmitter exposure to ultra-violet light, or even in some cases from transient pulses during operation".

Optimum Design of Two-Pole Bandpass Filters:

Electronic Design, October 25th, 1963, starting on page 58, has a 6-page article under the above title by William A. Geckle, Engineer, Westinghouse Electric Corporation, Air Arm Div., Pittsburgh, Pa. The sub-title and first paragraph state:

"Improved design procedure for two-pole bandpass filter provides all optimum characteristics, including minimum insertion loss for unequal loaded Qs.

"Two-pole bandpass filters can be optimized for all circuit specifications, including insertion loss, to yield the ideal design. Calculations for this solution are simplified by the use of special curves."

RFI Measurements Emphasize Exhibitor Problem:

FREQUENCY, September-October 1963, carried the following

item (RFI recording of interference not shown):

"To the uninitiated, the accompanying 10-hour recording of radiation in the 16 to 16.4 Mc/s band might appear to be an example of unusually effective Russian Jamming. In reality, it's an indication of a condition - all too common - which plagues many exhibitors at major electronic trade shows: unrestricted radiation.

"While most of the products at these shows represent an extremly high level of competence, many of the displays themselves are the epitome of slip-shod 'engineering'. Responsible show managements have partially succeeded in eliminating 'christmas trees' of cube-taps, bare-wire splices in power lines and the use of band-aids or masking tape for insulation. However, inadequate shielding, grounding, terminating, or other such engineering lapses, which result in the type of RFI revealed in this record still run rampant to the severe detriment of many exhibitors."

Plastics That Conduct Electricity:

Jack E. Hauck, Associate Editor, Materials in Design Engineering has written a 4-page article, in the October, 1963, issue, under the above title. The sub-title states:

"Use of a conductive filler or a carefully tailored polymer structure can provide plastics in many forms having a wide range of conductivity - sometimes approaching that of metals."

Gold Worse Than We Said:

On page 27 of the October, 1963, issue of Materials in Design Engineering is the following letter to the Editor:

"In a news note published in the June '63 issue of M/DE (p 9), Mr. I. V. Williams, Head, Metallurgical Engineering Dept. of the Laboratories was erroneously quoted as stating that 75% gold in lead or lead-tin would cause embrittlement.

"From tests made in our laboratory, it has been found and reported that serious embrittlement is caused when the gold concentration is in excess of 5%. It is known that where two gold-plated parts having a plating thickness of 0.0002 in. and separation of 0.003 in. are joined by soldering, the gold concentration can reach 23%.

"Considering the importance of the soldering of gold-plated surfaces now being done in the industry, we believe that an error of this magnitude can lead to serious equipment failures....."

F. G. Foster - Member of Technical Staff, Bell Telephone Laboratories, Inc., Murray Hill, New Jersey.

The Radio Frequency Interference Meter:

The above report mentioned on page 4 PTG-EMC Newsletter No. 28 is now available through the Government Printing Office. The description of the report is as follows:

"The subject of radio interference measurement has been receiving increased interest in recent years. The principal concerns of this report are technical aspects of radio-interference measurement. Part I discusses the basic problems involved; Part II, together with the appendices, delve into the various problems in technical detail; Part III gives a summary of a series of tests for evaluating RI-FI meters. 1963. 201 p. il. Catalog No. D 211. 2:R 11/2 $1.25."

Satellite Broadcasting Raises Problems:

A report dated March 19th, 1960, prepared by the U. S. Committee on Aeronautical and Space Sciences, titled " Radio Frequency Control in Space Telecommunications" has this to say about the interference of satellites with earth communications:

"Oscar Schachter in his book 'Across the Space Frontier' discusses the problem of control of radio programs broadcast from a station in outer space, but not necessarily over the traditional boundaries of its country of origin. A more detailed discussion was offered by Michael Aaronson, writing on 'Space Law' in the journal International Relations of April 1958. In one portion, Aaronson stated:

"Insofar as aircraft in space is in radio communication with Eart it is a mobile radio station and the terms of the Buenos Aires Convention (of the ITU) apply. They certainly apply insofar as an aircr in airspace is in communication with the ground as is the case with Earth satellites.

"It has been estimated that interference with radio services took place approximately three times in 24 hours as the Soviet Earth satellite appeared in the airspace over the United Kingdom. It is not known how much interference is caused by the U. S. satellite. How ever, this interference may be regarded as taking place under the tacit agreement obtained during the International Geophysical Year. So far, the power used by these mobile radio stations is small, but may well increase in the future. Furthermore, a number of these craft may be launched into orbit later. If they communicate back to Earth from higher altitudes, the power required will be much great than now used and there is little doubt that the interference will be more harmful. Such interference may also be anticipated should ra communication with Earth take place from space.

"The general procedure for dealing with harmful interference is contained in the 'International Radio Regulations,' though there is n provision for arbitration under annex 4 of the Buenos Aires Convent It is anticipated that this matter will be taken up at the next Ordinar Administrative Radio Conference scheduled to take place in 1959, at which it is proposed to draw up a new table of frequency allocations extend the planned spectrum considerably. But it is clear that mor than a mere technical approach will be necessary if subsequent problems are to be avoided."

"A paper was delivered on the subject by Andrew G. Haley at the symposium on 'Outer Space' held on October 9th, 1958, by the Com ittee on Aeronautics of the Federal Bar Association of New York, New Jersey, and Connecticut entitled 'Law of Outer Space - Radio-frequency Controls Urgently Needed'."

Muscle Voltage Moves Artificial Hand:

Electronics, October 11th, 1963, carried a 3-page article with above title by Dr. G. W. Horn, Como, Italy. It describes how the myoelectric signals in the stump of the arm can control the artifici hand. A paragraph of interest is as follows:

"Interference arises from stray electromagnetic fields, especially power lines, and myoelectric tissue noise (some 10 uv i amplitude), involuntary contractions and electrodeskin contact inst ility."

Your editor wrote to Dr. Horn asking for amplification of the effec of interference on electromyographic signals and received the follo ing reply:

"About your question, interference represents, in fact, a gr problem in detecting small electromyographic signals, especially in the measuring set-up no bandwidth limitation is allowed. This happens when all the information content has to be extracted from the EMG signal: because of noise and interference, the amount of gain which can be usefully employed in a recording channel is alw smaller than the theoretical one. Only auto-correlative technique of detection allow means to measure signals actually buried in the noise; the difficulty to employ this technique in electrobiology lies the uncertainty that each repeated stimulus is producing similar physiological events.

"Fortunately the situation is not so serious in the detection EMG signals for controlling prosthetics (artificial limbs) or ortho (braces for polio - or paraplegic - patients) devices.

"The actuating signal, which is a sample of the integrated electrical activity of the whole muscle, is, by its nature, a very irregular raw signal. To obtain a steady voltage, useful for contr purpose, the EMC signal must be integrated over a determined ti interval (usually 100 msec.); an electronics transformation of this kind cleans the signal from transients which arise particularly fr electromagnetic pulses.

"In every case, however, some 50 Hz a.c. components are at EMG-amplifier input. The rejection of 50 Hz spurious signals induced by stray a.c. fields, very difficult to obtain with vacuum-tube equipments, is much easier to achieve with transistors; since there is no return path to mains or ground, the induced spurious signals are considerably lower in amplitude.

"To reject the 50 Hz spurious signals, the only possible solution is to design the input stage as a differential one. By the way, it is not always possible to make full use of a high degree of common-mode rejection; surface electrodes are characterized by a considerably high contact impedance, which is quite variable, too. Contact and amplifier input impedance form a divider, the instability of which degrades the common-mode rejection.

"In very serious cases, as when the EMG-controlled prosthetic device must operate in near proximity of electric power machines, it may be unavoidable to introduce into the amplifier, at a suitable point, a compensating 50 Hz signal, adjustable in amplitude and phase.

"Another kind of interference arises when the prosthetic device must operate near some strong sources of electromagnetic field (as a radio-transmitter, a RF furnace, etc.). For a biological amplifier to operate as a RF detector, it is necessary that there be a rectification process somewhere in its input circuit, but this is probably the rule rather than the exception. A small amount of non-linearity will suffice, but even without this, in a circuit comprising skin-metal contacts it is hardly surprising that a rectifying junction exists. The only possible cure consists in a severe bandwidth limitation, in conjunction with usual RF filtering: in a prosthetic device no grounding or shielding is clearly possible!

"Skin-contact or surface electrodes are certainly a door, through which interference passes very easily to the biological amplifier. If possible, it is always advisable to adopt stainless steel wire-electrodes which are implanted directly in the muscle concerned. This type of electrode has been found to be far superior to surface electrodes, in that noise pick-up (especially e.m) is negligible and irritation of the skin is reduced, too. These electrodes have been left inserted on subjects as long as four weeks at a time with no ill effects observed. Unfortunately there are some psychological contra-indications against surgically implanted wire-electrodes: usually the patient refuses to submit himself to every surgical operation which is not absolutely necessary!"

Quan-Tech Laboratories Brings Out "NOISE FILE":

Quan-Tech Laboratories, Inc., Boonton, New Jersey, has assembled a number of its technical reports dealing with the nature and origin of electrical noise, together with specifications of equipment for its measurement, into what it calls a "Noise File". Technical reports included are:

"Electrical Noise & Component Reliability"
"Current Noise Tests Indicate Resistor Quality"
"Techniques of Transistor-Noise Analysis"
"Transistor Noise Figure"
"Table of Electrical Noise"
"Noise Analysis and Potential Failure Mechanisms in Semiconductor Diodes"
"A Method of Detecting 'Hot Spots' in Silicon Semiconductor Junctions in the Breakdown Region"

New EMC Models Speed Analysis of Interference:

Electronic Design, November 8th, 1963, carries a two-page article, under the above title, on the papers given at the 9th Tri-Service Conference on EMC. The first two paragraphs state:

"Development of more accurate prediction models and more efficient use of computer time are being viewed as key factors in improving the electromagnetic compatability (EMC) picture.

A new master simulation program (MSS-2), described at the Ninth Tri-Service Conference on EMC, is said to be an important step in this direction...."

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100 Frequently Used Relations in Communications Electronics:

White Electromagnetics, Inc., Bethesda, 14, Maryland, has brought out a Technical Bulletin, Vol 3, No. 3 with the above information as a centerfold. A glossy 18" x 26" copy of the centerfold equations and terms is available from the WEI librarian at $2.00 per copy or three for $5.00. The Technical Bulletin is available by request on company letter-head.

New Bulletin on Small, High Insertion Loss, Cylindrical Filters:

RF Interonics, Inc., 15 Neil Court, Oceanside, New York, 11572, has brought out a Bulletin, No. 3609, describing a new series of small, high insertion loss cylindrical interference filters designed for use through the frequency range of 14 kcs to 1000 mcs. The filters are designed for use on low voltage DC lines and may be used at currents up to 5 amperes.

Human Response to Very-Low-Frequency Electromagnetic Energy:

Naval Research Reviews, August 1963, carries a four page article, by Allan H. Frey, Institute for Research, State College, Pa., with the above title. The final paragraph states:

"Whether or not VLF and LF electromagnetic radiations have subtle or long-range effects on men working in the near fields is not yet known. This question is expected to be answered by a supplementary investigation."

Diplomat's Dog Is Howling Counterspy:

Radio-Electronics, August, 1963, has the following article under the above title:

"The State Department's most experienced electronic security specialist, inspecting the home of an overseas U. S. attache, was distracted recently by the whining of the attache's dog. The pet was 'obviously in pain and appeared to be in heated combat with an invisible enemy in a corner of the room'.

"The security specialist lifted one of the floor slabs in the corner and found an FM radio, which was 'transmitting to a distant eavesdropper all the conversations held in the room'. The device was turned on and off by a sound signal too high-pitched for detection by the human ear, but annoying and painful to a dog.

"The State Department, declining to state where the bugging occurred, calls the incident 'The Case of the Howling Dog.' "

A Systematic Approach for Electrical Interconnections:

Electronic Packaging and Production, June 1963, carried an article under the above title by William J. Volk, Air Arm Division, Westinghouse Electric Corporation, Baltimore, Maryland. A paragraph of interest is as follows:

"Layout of the subsections begins by placing component dolls on a pre-determined area and interconnecting the components; the layout is usually at some scale greater than the final size. As the interconnection of the components progresses and points of interference in interconnections occur, components are shifted until these interference points are eliminated. Needless to say, this technique is expensive and time consuming. Compounding the problem is this human factor: Experience has shown that some people have the knack for schematic analysis of best component locations; others, no matter how experienced, always encounter difficulties and request deviations from standard practices in order to alleviate a bothersome situation. Nevertheless, this stage of system layout proves the least difficult and few problems are encountered".

Walter Winchell Says:

In his column of September 13th, 1963, Walter Winchell had this to say:

"If you know anyone who carries a walkie-talkie (on the street) remind him that he can blow himself and others sky-high if he happens to turn it on while passing dynamite for new buildings being erected....."

Microwaves - A Market in Transition:

Electronic Industries, November 1963, carried a seven page article with the above title. A paragraph of interest is as follows:

"RFI Approach Now Positive

"A special aspect of microwave marketing is the need to design systems with filters to prevent growing interference among radar, guidance systems, communications links and other systems. The original negative concept was to combat RFI: Radio Frequency Interference. Now the positive approach means cooperation between microwave systems people and the Department of Defense. This is done mostly through the Electromagnetic Compatibility Analysis Center at Annapolis, Maryland. Failure to cooperate could prevent firms from selling systems".

Couplers Kill Reflected RFI:

Electronics, November 8th, 1963, page 75, carried a page write-up of the paper delivered at the Ninth Tri-Service Conf., in Chicago, by L. Young, of Stanford Research Institute. The title of the paper, at the Conference, was The Use of Directional Couplers as Harmonic Pads.

Are We Still "Black Magic"?:

To the Editor:

"I have received the IEEE Professional Technical Group on Electromagnetic Compatibility Newsletter, Number 30, for October, 1963 and as an ardent follower of this worthy Newsletter, and of your activities in the EMC field, I feel that I have to take a little issue with you on your editorial note at the end of page 5.

"Your news note, as you know, states that you 'received several comments from members of the Electromagnetic Compatibility Professional Technical Group that we were not doing enough to separate the hard facts from their empirical application and, as a result, the subjects of RFI and EMC are still being treated as an art and not as good engineering practice, so as to increasingly minimize the personal element, etc.'.

"I feel that this editorial note is contrary to the present state of the art in the electromagnetic compatibility field. I believe that those who write this information, who you refer to as 'the comments', are reading many good technical papers presented at Armour and at the annual symposium on electromagnetic compatibility and elsewhere and are reading the results of empirical applications which are basically tutorial papers. Now, if a well qualified engineer reads a tutorial paper, he can immediately see that empirical application test results are based on sound engineering practice and they are just as sound in the EMC field as they are in any form of applied engineering, law, medicine, or any other professional technical group. In fact, the practice of any of the engineering sciences is an art. Sometimes it is difficult to separate the art from the science but, unless these go hand in hand and are thoroughly understood, one does not become a proficient engineer or scientist.

"Good engineering practices are, in turn, an art because practice is the application of the science and, if we list practice, we are, in essence, listing empirical applications. So, somewhere I missed the main issue of this text. The point that I would like to make is that one of the most difficult problems that we encounter in educating others in our field is that they read the various information published in the EMC field and do not take the time, or perhaps, they are not qualified fully to evaluate the engineering practice and/or empirical applications, and they come up with 'that this or that field is black box magic'. I think that if you will contact any of the engineering profession that are in the electromagnetic compatibility field, you will find a number of outstanding gentlemen with advanced degrees in the service and in industry and that these fellows are leaders in practicing a science and advancing at the same time the engineering practice.

"In the early days of RFI or electromagnetic compatibility I think that your editorial would have been most worthwhile, particularly at the time of the first few Armour meetings, as those in the electromagnetic compatibility area were basically technicians and few engineers. This was due to the fact that industry, in general, considered RFI to be more or less a test function, and it was delegated to the role of the laboratory technician. A few of the industry leaders in the aerospace industry, however, had seen the need of engineering recognition and had elevated their departments to design functions rather than test functions. With the need and recognition to eliminate the 'built and measure and fix cycle', more and more companies who are prime Military Contractors as well as the Military themselves, and who are highly proficient in electronic industry, put graduate engineers into supervisory and management positions to fill the need of electromagnetic compatibility at the earliest possible stage within their plant.

"I can name many excellent companies who are prime Military Contractors, who have been doing this for years, and were some of the earlier pioneers in setting up complete electromagnetic engineering departments. Unfortunately, I can also mention some who have not done this at this time, and still delegate the electromagnetic compatibility to the technician at the test level, after the equipment has been completely manufactured and is ready to deliver. There is a natural place for these technicians and it is not my purpose of this letter to criticize them nor their functions.

"If you will read in the same October 1963 Newsletter you will find references to many excellent papers by well known engineers. I do not believe that these engineers, nor the Armour and/or the Military Services, would sponsor papers of this type year after year if they felt there was not any advancement in the state-of-the-art and that these advancements were not based upon good engineering practice. The hard cold engineering facts, as well as the scientific foundations, are contained in each and every one of these papers.

"I agree that if we want to be a recognized branch of the engineering profession, we have got to present excellent technical papers and, as I have said, I feel that we have been doing this for years and that we are not a group of 'magicians'. I have heard many of the 'magician' type bull sessions in various technical meetings. Inasmuch as one person says that it has to be done this and his only reason being 'because', and the 'because' is traced to his direct experience on a given project at a given time. We are finding in our field, by invitation of prime contractors and the Government Agencies themselves, that our engineering is not only required but is indeed welcome these days. We are working on numerous contracts where the need for electromagnetic compatibility engineers has been recognized early in the contractual stages and is recognized as an engineering and design function.

"Another form of recognition, that we now have as engineers, is a professional technical group in the IEEE. Drawing again upon the West Coast experience we have seen many EMC papers presented in the last year to other engineering societies. A few of these have been the Institute for Environmental Engineering, The Aerospace Electrical Society, and The Society of Automotive Engineers.

"We EMCers have a good valid engineering message and, as shown, we are being invited by other engineering societies to present this message to them as they, in turn are realizing that this is a branch of science. In fact, many engineers are now thoroughly convinced that the electromagnetic field is just as much an environmental field as vibration, acoustics, and other forms of forces that affect the performance of a given system. In fact, James Senn, of our Staff, has presented the corollary of the stresses set up due to electromotive forces as compared to mechanical forces. You have generously referenced this paper in a recent Newsletter and we have received numerous requests.

"In the interest of continuing cooperation with the electromagnetic engineers and others, I am attaching a reprint of a paper presented to the Society of Automotive Engineers in Los Angeles on September 27th, 1963. This paper, prepared by myself, you will notice, is entitled, 'Management Responsibility for Electromagnetic Compatibility'. This paper was given by invitation to SAE and it was requested that this be along similar lines to the paper that I presented in 1962 to the Eighth Tri Service Symposium sponsored by the Armour Research Foundation. Therefore, the papers are very similar with

the exception that this has been rewritten and more of the stress is on large electrical as well as electronic complexes and also slanted towards the ground support and installation people.

"The Society of Automotive Engineers is very, very active in the structural and electrical fields, that is power, signals, etc., on large military bases and many of the architectural and engineering firms, who designed this equipment, and their members belong to the Society of Automotive Engineers. The Society of Automotive Engineers have a very keen interest in vehicular communication and the electromagnetic compatibility problems associated with vehicles and vehicle communication in general. Copies of the SAE are available upon request to all PTG-EMC members.

"I believe that we are experiencing good growth and recognition in other engineering societies. My comment on this is that I feel that some of it is too little, too late. However, I think that we are doing the best that we can under present circumstances, however, I readily agree with you, as we have discussed many times, there is need for further improvement.

"I still feel that there is a very valid need for a national safety electromagnetic field code, as an equivalent of the national electric safety code, and also some type of a ground plane system that could be incorporated in all types of buildings that would be an RF neutral, or RF ground as well as a so called 'green wire' or safety ground in respect to shock hazards covered by the National Safety Code.

"If you agree or disagree, please let me have your comments."

Sincerely yours,

Fred J. Nichols, President
Genistron, Inc.

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New Books:

Filters Handbook, Theory and Practice:

A handbook of 250 pages, 100 tables and figures and 25 illustrative examples which will teach the techniques of how to apply filters to solve problems and how to specify filters - all without the need for complex mathematics. Will be published November 15th, 1963 by White Electromagnetics, Inc., 4903 Auburn Avenue, Bethesda, Maryland, 20014 for $11.75

Low Noise Electronics:

Contents includes, Survey Papers, Parametric Amplifiers, Masers, Systems and Applications, Antennas for low noise receivers. 360 pages, $15.00, Pergamon Press, Inc., 122 East 55th Street, New York 22, New York.

Technical Proceedings of NEP/CON 1963:

The 47 papers presented at the National Electronic Packaging and Production Conference, New York, June 1963, have been printed in one volume of over 400 pages, cost $10.00. Copies may be ordered from Electronic Packaging and Production, 222 West Adams Street, Chicago 6, Illinois.

GOVERNMENT PUBLICATIONS:

Laser Output Influenced By Magnetic Fields:

The spatial and energy distribution of a gas discharge laser are changed by the influence of a magnetic field. Experiments show that this effect may be useful for adjustment and modulation of the laser emission. "Influence of A DC And AC Magnetic Field Upon a Gas Discharge Laser," Army Electronics Research and Development Lab., Fort Monmouth, New Jersey, December 1962, 22 pp. $1.60. Order AD-296 782.

This report is available from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

Mutual Interference Between Surface and Satellite Communication Systems:

The primary purpose of this paper is to predict the condition under which a service will be interference-free for a given percent of the time. The prediction methods that are developed are intended to have a wide range of applicability. Examples are used to illustrate the use of the method for specific systems. 1963. 50 p. il. Catalog No. C 13.46:126 - 35¢.*

Static Electricity:

One of a series on "Safety in Industry" as related to mechanical and physical hazards, this bulletin discusses static electrical phenomena not as an exhaustive treatise but as a short survey of possible causes and controls. The explanations used have been simplified and are included to develop a practical basis for understanding and discussion. 1963. 20 p. il. Catalog No. L 16.3:256-15

NASA PERT "B" Computer Systems Manual:

This manual describes the NASA-PERT "B" computer program and associated operating procedures. This program is the standard computer program used by NASA in conjunction with the NASA-PERT and Companion Cost System since November 30th, 1962. 1963. 71 p. Catalog No. NAS 1.18:P 94/3 - 45¢*.

* The above three publications are available through the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

DC Corona Probe Measurements Achieved:

Measurements at a given point in an electrical field can be made by utilizing the volt-ampere characteristics of an oscillograph probe. The space charge density may be determined without knowle of the probe's capacitance. A Method for Probe Studies of a D-C Corona Field Using an Oscillograph; Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, January, 1963, 16 pages, $1.60. Order AD-295 735.

NBS To Publish National Radio Science Journal:

The National Bureau of Standards has announced important changes soon to be made in Section D of its Journal of Research, now published under the title, "Radio Propagation".

Beginning in January 1964, Section D will become a national journal of radio science published by NBS in cooperation with the U. S. National Committee of the International Scientific Radio Union (URSI). In keeping with the broadened scope of the new publication, its title will be changed to "Radio Science" and it will be published monthly rather than six times a year as before. The new subscriptio price will be $9.00 a year ($11.50 foreign).

C. Gordon Little, Chief of the NBS Central Radio Propagation Laboratory at Boulder, Colorado, has been appointed Editor of Radio Science. In addition, L. A. Manning of Stanford University, Stanford California, will serve as Editor for URSI.

NEW PRODUCTS:

UHF Semicon Noise Level 4 db at 450 mc:

An ultra high frequency silicon transistor said to have a noise figure of 4db at 450 mc has been introduced by the Electronic Components & Devices group of Radio Corporation of America.

William H. Painter, Vice-President and General Manager of the RCA Commerical Receiving Tube and Semiconductor division, said that the figure is at least 2 db below that of commercially available silicon transistors.

Zener Diode Series Has Noise Limit Specified:

A new 250 mw low-level oxide-passivated Zener diode

series (types IN4099-IN4135, 6.8 to 100v) are the first EIA registered units available with specified maximum noise limits.

Voltage and impedance ratings of these units from Motorola are characterized at 250 ma. At this current level, specified maximum noise density is 40mv per sq root cycle - said to be 50 percent lower than conventional diffused Zener diodes.

In addition to the noise-limit specification, features include an 80 percent lower knee impedance, two orders of magnitude lower leakage current, 33 percent lower forward voltage drop, and a wider temperature range (-65 to 200 C) than conventional 250 to 400 mw devices, reports the manufacturer.

Explosive Device:

Electro-explosive initiators which will not fire when 1 amp and 1 watt of electrical current is applied for 5 minutes are now available. Developed by Special Devices, Inc., 16830 W. Placerita Canyon Road, Newhall, California, these devices have withstood 1 amp for 10 minutes at temperatures of 350 deg F. Dual circuit units have taken simultaneous application of 1 amp for 5 minutes without firing. Available in pressed load gas producting or detonating types, and in heat sink models with deflagrating or dextrinated lead azide loads, minimum practical size is said to be about 0.250 in. diameter by 0.400 in. long.

Editorial Note

The writer of the letter on page 6 is one of the old-timers in the RFI/EMC field and has continually fought to get proper recognition for it in both engineering and scientific circles. Everything he writes is true.

But your editor, who has tried to do the same, but because of his editorial position is still down on all working levels and is often the appreciative target for all kinds of criticism, feels there is another side to the story. For there seems to be valid criticism that we are not reaching all levels in the way that they would like.

The writer, also, has taken a great deal of time and effort to try and explain the present position of RFI/EMC. Is there some younger member of PTG-EMC who will help us by explaining where we have fallen down? Such a criticism would be of inestimable value to the whole RFI/EMC field and greatly appreciated by us old-timers who want to continue to do a good job. Your answers will be published in the next issue of the Newsletter. A Merry Christmas to you in the meantime.

Rexford Daniels, Editor
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