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ELECTROMAGNETIC COMPATIBILITY GROUP

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Chapter News



completely absent. 88 -Every reader of these newsletters appreciates reading about his 88 own Chapter. He unconsciously compares the reports of previous 服服 meetings with his memories. When the news is more than a few 舊日 months old, these memories become rather dim, and there is really little interest in such a comparison. When the Chapter News is as current as possible, and even projects efforts into the

future, the member's interest is considerably heightened. Seeing the name of people he knows, and possibly even his own name, is 81 a sure-fire attentiongetter.

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It is obvious, then, that a new system -- a system incorporating speed currency, and future plans, as well as history -- must be devised to present the Chapter News in the best possible light.

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A new method of presenting Chapter News is proposed, and will go far toward cutting the intermediate delays in its presentation. Each Chapter chairman (or his representative) will fill out a form which will list previous meetings, current projects, and future activities planned or in progress. Included will be a list of meetings, educational programs, papers, symposia, and other projects either by individuals or by the Chapter. It will list speakers and attendance at meetings, and other details that will be of interest to the membership. The forms will be sent to the Chapters in quantity, so that they can be returned to them in sufficient time to meet printing deadlines.

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Implementation of the new Chapter News column depends primarily on one factor: cooperation. The cooperation of each Chapter in returning a simple form to the Newsletter Editor is the keynote of improving the Chapter News column. There is a certain necessary delay in the printing and distribution phase, but the form will cut down the printing time and will virtually eliminate the digesting and rewording. The timely submission of information to the Editor will bring the accumulating phase down to the minimum.

There will even be a new name for the column: Chapter Chatter:

88 To assist the Newsletter Editor, an Assistant Editor has been 88 appointed. He is Ira M. Berman, of the General Electric Company Re-Entry Systems 3001 Walnut Street, Philadelphia, Pennsylvania 19104. Ira will make sure that sufficient forms are available to all Chapters, collect the forms as the chairmen submit them, be certain that they will reproduce clearly, and make sure the Editor gets them in time for publication. Ira will also send out reminder notices prior to several issues of the Newsletter, until the Chapters become accustomed to sending the forms in on time.

PLEASE NOTE! Material for publication in the next issue (December) must be received by the editor by November 1 1069 the next issue (December) must be r by the editor by November 1, 1968.

CHAPTER CHATTER

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This past year (1967 - 1968) has been a busy year for the 15 G-EMC Chapters around the country. Most chapters held between 4 and 6 meetings during the year covering a great variety of subjects. Many of the speakers traveled a long way to address the various groups, and where attendance figures were presented, excellent showings resulted. Some of the newer Chapters showed great getup-and-go. Perhaps some of the less active chapters could take a few hintsfrom the new ones on activities that will attract hold, and serve our members.

Scanning the country, we can summarize the Chapter activities for this past winter and spring, as well as the planned efforts for the ensuing season.

METROPOLITAN NEW YORK CHAPTER - held three meetings between March and June. The May meeting included a fascinating field trip.

Date	Speaker	Affiliation	Topic
3/5/68	Mr. Paul Billick	US Army Electronics	A Transis- torized Stand-
		Fort Monmouth, N.J.	ard Response Indicator.
5/7/68	Film Field Trip	"Electro magnetic Con Budweiser Brewery Newark, N.J.	mpatibility"
6/4/68	Mr. Frank Platt	Airborne Instrument Labs. Deer Park, N.Y.	"A Technique for defining the Interface between Digital Equipments"

JERSEY COAST CHAPTER - Administrative committee held its initial meeting on July 17, 1968. At that time, it was decided to hold technical meetings on October 8 and November 12, 1968, and March 11 and April 8, of 1969. A joint meeting with the New York Chapter is planned for February 11, 1969, and the annual social meeting is scheduled for December 17, of this year.

WASHINGTON D. C. CHAPTER - the largest of the 15 EMC Chapters held two extremely interesting meetings to close out their year.

Date	Speaker	Affiliation	Topic
3/28/68 Atte	Charles Osborn endance - 55	Task Force	"President's Task Force on Communication Policy"
5/16/68	Henry Hoffart	General Elec	tric "EMC and Radiation

Attendance -45 Valley Forge, Pa. Hazards"

ATLANTA CHAPTER - Formed less than a year ago, this Chapter is going like a house on fire. The group officers will keep the members on their toes!!

Date	Speaker	Affiliation	Topic
3/12/68	Bill Free	Georgia Tech.	"Radiated EMI Measure- ments in Shielded Enclos- ures"
5/7/68	Bill Lambdin	Fairchild Electro Metrics	- "New Trends in Automated EMI Test Equipment"

Future meetings are planned for September and November, 1968, and January, 1969. So far, so good. But look at the following achievements:

1. The Chapter plans to sponsor the local January, 1968 IEEE Section Meeting.

- The Chapter appointed Bill Free of Georgia Tech. and Dave Voorman of Lockheed - Georgia to the Technical Program Committee of the 1969 Southeastern EMC Symposium.
- The Chapter members nominated Dave Robertson, Georgia Tech. for election to the EMC National Administrative Committee.
- 4. The officers appointed Jerry Archibold, of Brennan and Associates, as Chapter Membership Chairman.
- 5. The Chapter is preparing to host the 1969 Southeastern EMC Conference.

And to think this Chapter was only founded on November 29, 1967!! Hats off to the fellows in Atlanta for a wonderful first year.

<u>CHICAGO CHAPTER</u> - A real moving group. They hold monthly meetings keeping their subject matter practical and right to the point.

Date	Speaker	Topic
March, '68	Mr. Lindgren	"The Design of Shielded Room Enclosures"
April, 1968	Open House	Standard Electronics (new facility)
May, 1968	Mr. Del Black	"RF Sniffer - A Shielded Enclosure Leak Detectior System"

Chicago has a fine first meeting for 68 - 69, too.

September 17, 1968 Mr. Fred Nichols of Lectromagnetics, Inc. "Simplified RF Electromagnetic Shielding"

NEW ORLEANS CHAPTER - Closing meeting was well attended. The subject could serve as a fine prelude to an active 1968 - 1969 season.

Date	Speaker	Affiliation	Topic
May 7,1968	J.C.Hughes	, Jr. Chrysler Corp.	"Introduction to Electromagnetic Interference"

<u>SAN FRANCISCO</u> - The Bay Area has a large number of electronics firms, and this is reflected in the sophisticated topic discussed at their meetings.

Date	Speaker	Affiliation	Topic
May 20, 1968	Brian Unter	Hewlett-Packard Palo Alto	"A New Spectrum Analyzer for EMI Measurements" (Attendance 15)

Six meetings are planned for 68-69, starting with "The EMC Engineer vs the Design Engineers - a Communication Problem" in October.

SOUTHERN CALIFORNIA (LOS ANGELES) - A very active group. Here, as upon the Peninsula, many firms are doing heavy electronics work with large engineering groups which can support large meetings with discussion topics that delve quite deeply into the intricacies of EMC. Their more recent meetings were as follows:

Date	Speakers	Affiliation	Topics
March 21, ¹ 68	R. Cowdell	Genistron Los Angeles	"Practical Shield ing" (Attendance 45)
April 18, '68	F. Koide F. Hume	Autonetics Anaheim	"Calibration and Standardization of EMI Measure-
Co	ntá		ation" (Attendance 45)

May 23, '68	W.R.Johnso	n TRW Redondo Beach	"Computerized EMC Specification Development for Space Development"	1
	A.K. Thoma	as TRW Redondo Beach	"Math Modeling Techniques for a Computerized EMC Analysis." (Attend- ance 65)	
We hear that t For instance, busy preparin meetings sect with the follow	this Chapter is they plan to pu g for the 1970 ion). The mee ving:	planning a very ag blish a local news] Symposium (See re tings for the new s	gressive year. etter and are port under the eason will start	

Date	Speaker	Affiliation	Topic
Sept. 26, '68	Don B. Clark	U.S.Navy Civil Engineering Lab. Port Hueneme	"Power Filter Insertion Loss Evaluated in Operational - Type Circuits"

They also plan meetings for October and November.

PHILADELPHIA CHAPTER Completed its preliminary planning for activities for the 1968 - 1969 program. A total of six meetings have been scheduled. The first one which will be held on September 9th, will be a joint meeting with the local section. The meetings which are presently firmly scheduled are as follows:

> 9/9/68 Mr. George W. Haydon will travel from Boulder, Colorado to address the chapter on the problems concerning the utilization of the electromagnetic spectrum. The talk is entitled "The Silent Crisis Screams". The meeting will be held at the Philco-Ford Corporation, featuring a tour of their facilities.

10/3/68 Our retired Newsletter Editor, Rex Daniels, will leave the chills of Boston to address the chapter on "Man, Nature and EMC". This meeting will be held at AEL, Richardson Road, Lansdale, Penna., and will be preceeded by a tour of their facilities. The meet-the-speaker dinner will be catered by AEL's cafeteria. For additional information call the Chairman, Steve Garcia, at 274-4665.

Other meeting dates are:

December 10, 1968 January 15, 1969 - Joint with I & M Group February 5, 1969 March 15, 1969 - Joint with AES and I & M Groups

This chapter ranks among the most active. Not only have they increased their schedule from 4 to 6 meetings per season, but the chairman plans to issue a local newsletter prior to each meeting and one at the end of the season. Among their most recent achievements, the chapter has:

- 1. Nominated Frank Hamell of Burroughs Corp. for membership on the AdCom.
- Nominated Ira Berman as a regional publicity chairman for the 1969 International EMC Symposium.
- 3. Submitted a proposal to host the 1971 EMC Symposium which was successful.

That covers quite a spectrum of interest, (yes, the pun was intende ranging from introductory discussions to computerized with math models. And it represents a considerable education to those members who took advantage of it. For those who didn't, you see what you're missing. For those who would like a greater depth of subjec matter, you can see what other chapters are doing, and perhaps you can help your own Program Chairman along.

Letters to the Editor

The editor would like to invite all interested persons to air their views in the Newsletter through letters to the editor. Each responsible letter received will be carefully considered. Publication of the letter will depend upon its timeliness, interest to the EMC community and on space available. The authors name may be withheld upon request.

To the Editor:

I-would like to take this opportunity to thank the EMC Awards Committee and the Administrative Committee for honoring me with the EMC Certificate of Recognition which was presented to me at the Seattle Symposium banquet. Not being accustomed to receiving such honors, I was at a total loss, at the time, as just what to say.

> Just what do you say, when you know all the mistakes you have made, of the countless frustrations and the many things that you had to omit, and then find that, instead of being politely censored, to be p ublicly honored? It, somehow, seems to cover all your past troubles with a warm glow which makes them fade away. This is a hard thing to try to pass on to your successor who still has to live through them, but all I can say is that it will be worth his while.

> > Again, my thanks and to have, after a little thought, this opportunity to express them.

Very sincerely,

Rexford Daniels

ADCOM NEWS & VIEWS

The following was condensed from the verbal and written reports presented during the AdCom meeting on July 23, 1968.

Technical Papers Committee:

A. H. Sullivan, Jr., Chairman

A few weeks prior to the start of the Symposium, the G-EMC members were receiving the second consecutive special issue of the Transactions. Mr. Sullivan reported that the June issue was specifically on Filters, and contained 22 papers. The Transactions will now return to their normal format and size, starting with the September, 1968 issue which will contain 5 papers. The December issue will consist of at least six papers presently being reviewed for the February, 1969 issue. Issues are also scheduled for May and August of next year. (It is estimated that it will cost the G-EMC over thirteen dollars a member to publish the Transactions this year. This, by itself, would be a fair return on the four dollars a year Group Membership fee).

Awards Committee:

James S. Hill, Chair man

During the March, 1968 IEEE International Convention in New ork, Mr. Hill conducted a breakfast meeting with Chapter representatives. The meeting has resulted in greater chapter participation in the awards program. The committee would like to urge chapter chairmen to appoint a local awards committee, and to notify the G-EMC awards committee of this appointment.

Standards Committee:

J..F. Chappell, Chairman

Status of Standards Projects Underway:

a. <u>Proposed Standard on Radio Interference: Methods of</u> <u>Measurement of Spurious Transmitter Output</u>. Being prepared by Subcommittee for final submission to EMC Standards Committee.

b. <u>Recommended Practices for the Measurement of Shielding</u> <u>Effectiveness of High Performance Shielding Enclosures.</u> Has been reviewed by IEEE Standards Committee and was returned with comments on March 1, 1968. The comments are under study by by EMC Standards Committee.

c. <u>Measurement of Susceptibility of Electric Cables to</u> Electromagnetic Fields. Early conceptual stage.

d. <u>The Measurement of Impulse Strength and Impulse Band-</u> width. Draft of proposed standard completed by Basic Measurements Subcommittee and ready for submission to EMC Standards Committee.

e. <u>IEEE Dictionary</u>. A listing of 107 EMC related terms with their proposed definitions were submitted to IEEE Headquarters 16, June 1967 for incorporation into the IEEE Dictionary which is undergoing revision.

New Standards Projects Being Initiated:

The Basic Memberships Subcommittee is exploring the need for a standard for measuring peak power satisfactory to the EMC Area.

Areas Where Standardization Activity Would Be Desirable:

a. Measurement standard for oscillator radiation from TV and FM broadcast receivers.

b. Measurement standard for impulse noise measurement considering pulse amplitude and frequency above prescribed amplitude levels.

AWARDS PRESENTED AT THE SEATTLE SYMPOSIUM

Five members of the EMC Group were honored with awards presented at the annual banquet. The Certificate of Appreciation was presented to <u>Stanton A. Bennett</u> for his efforts in promoting membership in the group during his term as chairman of the Membership Committee. A second Certificate of Appreciation went to <u>Milton Kant</u> for his outstanding work while chairman of the Information Retrieval Committee in preparing and organizing the EMC Abstracts on a regular schedule. The Certificate of Appreciation is awarded annually to recognize outstanding contributions to the welfare, administration and overall success of the group.

The Certificate of Achievement, a new award this year, was presented to Richard B. Schulz and John F. Chappell. The award to Mr. Schulz carries the citation "For Outstanding Contributions to the Development of Shielding Theory and the Application and Evaluation of Shielding Techniques." Mr. Chappell's citation is "For Contributions to Fundamental Measurement Techniques of Radio Frequency Interference and the Development of Standards."

A special award, the Certificate of Recognition, was presented to <u>Rexford Daniels</u> recently retired Newsletter editor "For His Outstanding Service as Editor of the Newsletter from March 1958 to June 1968."

Two symposium papers were singled out for recognition and prize awards of one hundred dollars each. These prizes were set up for the best paper by a United States author and for the best paper in the International Session. The judging of the papers was based on the subject material the clarity of written presentation so that the judging could be completed before the symposium. The prize awards for United States authors was won by Drs. W.W. Cowles and R.M. Showers of the University of Pennsylvania for the paper "A General Model for Integrated Circuit Susceptibility Prediction". The paper judged best in the International Session was "Surface Transfer Impedance of Coaxia Cables" by Mr. Harry Salt of the Admiralty Surface Weapons Establishment Extension, Sussex, England.

Special certificates were presented to the Symposium Committee officers, advisors and chairmen in appreciation of their efforts in making the Symposium the success that it was. These certificates were presented at the Tuesday luncheon.

G-EMC SPECIALIST WORKING GROUPS

The Administrative Committee of G-EMC has approved a proposito form working groups or "colleges" within EMC to assist in defining those areas in need of further development and in which organized exchange of technical information would provide mutua benefits to the members. The specific groups to be formed will depend upon members interests; however, suggestions have been made for groups which individually fall into one of two classes: Systems, or Technical, as follows:



Group #	Systems	Group #	Technical
10	computers	20	shielding
11	control & audio	21	grounding
12	communication & navigation	22	filtering
13	aircraft & space craft	23	interference generation
14	power transmission	24	techniques & instrumentation
15	carrier systems	25	propagation
		26	interference

Any member of G-EMC is eligible to volunteer to serve on any of these working groups. As soon as enough members indicate interest in a specific area, a chairman for the group in that area will be designated. He will be required to call a meeting of the group at least once each year (probably at the Annual Symposium) to review and discuss, in general. progress and needs for work related to that group.

As presently conceived, the functions are purely evaluative and advisory. For the purpose of coordination, the groups will be organized under the Technical Advisory Committee of the AdCom of G-EMC.

If you wish to participate, please submit your name, address and company affiliation along with the group(s) in which you are interested to Dr. R. M. Showers, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pa. 19104.

INFORMATION RETRIEVAL ABSTRACTS

The first formal publication of the EMC Abstracts were published as part of the July 1968 issue of this Newsletter. It appeared as a blue tear-out booklet and contained the abstracts of 70 different papers and articles. Each abstract had been reduced such that the space which it took was approximately equal to that of a 3×5 file card. This was planned to enable the reader to set up a compact and simple filing system. Since the newsletter is always limited to twenty pages, the abstracts had to be printed on both sides of the sheets, thus requiring the reader to reproduce at least half of them. Some may feel that it is best to affix each abstract to a 3×5 card, but it may befound that paper upon which it is printed provides sufficient stiffness for filing.

If this first publication is typical of the publications to come, you may expect to accumulate around 420 abstracts over a period of one year. Obviously, the EMC Abstracts are not included with this newsletter. Since there is such a large quantity of EMC related papers published these days, it has been decided that it would be best to publish the abstracts independently. Thus, each member of the G-EMC will receive the abstracts separately and directly from the IEEE office in the future. The next issue shoul be mailed around the end of September.

The Information Retrieval Committee, under the Chairmanship on M. Kant, has an additional member. Ira M. Berman has joined Lawrence F. Babcock, Dr. Ralph M. Showers, and Richard B. Schulz in reviewing the vast number of publications and periodica (over 90) and in preparing the EMC Abstracts.

SYSTEMS AND SITUATIONS

EMI Delays 1st Test of Lunar Module

An article with the above title by Jack Robertson appeared in the August 21st, 1968 issue of Electronic News. Paragraphs of interest are excerpted as follows:

"Washington - Electromagnetic interference (EMI) problems have scrubbed the first test of the lunar module from Apollo 8 - pushing it back to next year, Maj. Gen. Samuel Phillips, NASA Apollo program director said here Monday.

NASA ran into continual EMI headaches in the lunar module's rendezvous radar, abort guidance, and flight director system, he said. Fixes have now been made on most of the electromagnetic interference culprits - but checkout on the corrections will delay the first manned lunar module test until next February.

The interference troubles are only the latest lunar module thorns in NASA's side. Indeed, many are a direct result of earlier problems on cracked printed circuit boards, Gen. Phillips said. The circuit boards were rewired to eliminate cracks - and the new wiring schemes tuned out to cause interference with the module's rendezvous radar."

"The EMI gremlins in the module were traced to faulty switches, coupling between wires, and improper circuit layout, Gen. Phillips said. Only minuscule interference is generated - sometimes for only microseconds - but this is enough to put glitches into the lunar module's super-sensitive rendezvous radar and digital abort guidance computer."

"The Apollo radar is three times more sensitive than the Gemini rendezvous radar - which encountered its share of EMI problems in early testing. The interference caused the radar to lock on false targets. EMI problems are being solved by rewiring, circuit isolation, and filtering, the Apollo program chief said. Abort guidance system trouble was traced largely to faulty springloaded switches, he said. The spring extended too far, making contact with the circuit for a microsecond - enough to put transient into the critical digital computer circuits."

"Despite the rash of electromagnetic interference headaches, NASA does not intend to write new electromagnetic compatibility specs on components, Gen. Phillips said. "Components are not our major problem - our present specs are doing the job. We are getting most EMI problems in wiring and circuit layout changes."

CONCENTRATED RF HAZARD FOR SATURN V?

A three page article written by Charles D. LaFond, Chief, Washington News Bureau, with the above title appeared in the May 9, 1968 issue of Electronic Design. The first three paragraphs are as follows:

"Investigators at Cape Kennedy are studying an alarming possibility: Can the high concentration of radar that surround the Apollo/Saturn V vehicle during ground tests and early launching accidentally ignite separation devices between the stages or even the escape system of the Apollo capsule?

Measurements made by the Electromagnetic Compatibility (EMC) Branch of Federal Electric Corp., a division of ITT, indicate that the power densities generated by tracking radars might approx the maximum safety limits established for ordnance devices in the rocket and spacecraft. Since these electroexplosive devices control the firing of such equipment as booster stages and escape rockets and hatches, premature firing could damage the rocket severely and injure or kill ground personnel and astronauts.



The problem of electric-power transients and peak rf power buildup, according to H. Dean McKay, EMC Branch supervisor, is potentially so serious that a better basic understanding of it must be gained to establish reliable safety limits and preventive methods."

Computers Used to Calculate Interference Between Satellite and Radio Relay Systems: - A two page article with the above title appeared in the June, 1968 issue of Communications Designer's Digest. The first two paragraphs are as follows:

"Although all types of earth station create a potential hazard of mutual interference with terrestrial radio relay systems, which share the same frequency bands, J.V. Murphy of the Australian Post Office Research Laboratories in Melbourne thinks the greatest threat to the planning of such systems is the communicationssatellite earth station because it can cause interference across the entire RF band. As such, the Australian points out, this interference directly affects the siting of both the earth and the terrestrial radio relay station.

Basis for calculations. Murphy says that a brief examination of this situation shows that it's not usually necessary to calculate the interference in both directions. The maximum power of an earth station transmitter required for a 1200-channel FM system is 38.3 dBw, based on an antenna gain of 60 dB. From a comparison of the interference equations described in C.C.I.R. Report 382 (XIth Plenary Assembly, Oslo, 1966), and using 7 dBw for the radio relay transmitter power, the criterion of interference to an earth station and to a radio relay station is reached simultaneously when the earth station power is 52.8 dBw. Here, the dominant mode of interference is from the radio relay station to the earth station, and it's this mode that determines the separation distance in the communications satellite case."

ELIMINATE COMMON-MODE RESPONSE IN CLOSED-LOOP SYSTEMS

A two page article with the above title appeared in the August 1968 issue of the Electronic Engineer. Its authors are James G. Holbrook, Senior Engineer and Dr. Trevor H. Wilmshurst, Visiting Engineer of Varian Associates. The first two paragraphs are quoted as follows:

"Low-level signals are often transmitted from a detector to an operating console or other centralized equipment some distance away. Examples of such equipment are infrared tracking systems, electron spin resonance spectrometers, and even the simple magnetic phonograph cartridge. The remote connections commonly introduces a considerable ground loop signal at the input to the main console, even if you have a preamplifier at the detector location.

The differential amplifier solves the problem very simply. Figure 2 shows the two inputs connected via a balanced cable to the two terminals of the detector. Now only the common-mode gain of the amplifier operates on the interfering signal. Thus, the full common-mode rejection of the amplifier acts to reduce the ground loop interference. The differential-gain amplifies only the desired signal $e_{\rm in}$.

TEST TECHNIQUES

"Method Shown for Measuring Harmonic and Other Spurious Emissions from Radar Xmitters"

A one page article with the above title appeared in the June, 1968 issue of Communications Designer's Digest. The first two paragraphs are as follows:

"System designers are beginning to realize that it's not enough to recognize the possibility of interference -- you have to measure it so that you know exactly what frequencies and spurious levels are involved. Nowhere has this become more apparent than in those parts of the world, such as the United Kingdom, where the growing demand for new radar services in air defense and air traffic control has paralleled the growth of microwave radio relay links which, in conjunction with communications satellites, account for a large proportion of the trunk telephone, television and data traffic."

"As for radar's potential interference difficulties, D. E. Cridlan of the British Post Office Engineering Department in London, breaks them down into two categories: those powered by klystron oscillators and those by magnetrons. Because of the vagaries of these sources, and the inability to predict, with any accuracy, the unwanted outputs, Cridlan felt it essential to develop a method by which the unwanted components of a radar transmission could be measured. His approach, and the equipment which he proposes for such measurement, were described in a paper that he presented at a recent London conference on interference problems associated with the operation of microwave communication systems. His results, and a few simple tests on a working radio link with a traffic capacity of 960 telephone channels, compared favorably with an assessment of the maximum tolerable interference level in a terrestrial radio-relay system."

HOW TO MEASURE THE RMS VALUE OF PULSE TRAIN

A three page article written by Dr. Endel Uiga, Vice President of Engineering at Ballantine Laboratories, with the above title appeared in the August, 1968 issue of EEE. The first three paragraphs are as follows:

For most pulse measurements, a scope is the obvious instrument but not for all. A scope gives information about amplitude, pulse width, period and rep rate, rise and fall times, overshoot and, in fact, everything except the rms value. Yet we must know rms in noise-figure measurement and in applications where it's necessary to know the power in a pulse train.

It's true that we can calculate the rms value of a pulse train from scope measurements, but for highest accuracy we need a true-rmsresponding voltmeter. For a scope measurement to yield accurate rms values, we would need an ideal pulse with zero rise and fall time and no overshoot or droop. Since ideal pulses don't exist, scope measurements and calculations give only approximate rms value.

There are actually two kinds of rms calculations. One includes the dc component of the pulse train, as measured with a dc-coupled instrument. The other considers only the ac component.

Contd

NOISE FILTERS NEED REALISTIC TESTING

A four page article with the above title appeared in the May, 1968 issue of EDN. It was written by J.F. Fischer, Jr., and Bob Cowdell, both with the Genistron Division of Genisco Technology Corp. Two paragraphs of interest are excerpted as follows: "Past Practice

Previous test methods for finding filter insertion loss (attenuation) have often been unsatisfactory because they ignored core-saturation effects or because they specified unrealistic termination conditions. For instance, filters tested with 50-ohm input and output terminations (perMIL-STD-220A) often gave very different insertion loss when put to actual use. Also, if buffer networks were added to permit load current flow during insertion-loss measurement (per MIL-STD-220A) their shunting effects often seriously compromised measurement accuracy. Fig. 1 documents this effect in a test setup. Further complicating matters, buffer networks have a rather limited useful frequency range.

Current Injection Testing

An improved method for determining filter insertion loss involves injecting test currents into the line ahead of the filter, using a clamp-around coupling device. Sensing "probes", also clamparound, then determine the relative levels of test currents flowing in the filter input and output circuits. (Note that here we are referring to injected test currents - not the 60-Hz power passing through the filters.)

This current injection method offers decided advantages over the present one, which uses a ratio of voltages; yet they are mathematically equivalent." The following item is extracted from the July /August 1968 issue of the GEM Newsletter.

TWENTY BILLION MEASUREMENTS PER DAY

More than twenty billion measurements are made each day in the U.S. requiring an investment for measuring instruments of \$25 billion. That is the measurement of measurement according to th Department of Commerce whose Bureau of Standards maintains the U.S. standards. Industry has more than \$50 million invested in calibration development, and buys \$4.5 billion in new measuring instruments per year and pays \$10 billion in salaries to measurement people.



AIRWAVES & REGULATION

WHAT IS WRONG WITH EMI SPECIFICATIONS

A five page article with the above title, written by Carl B. Pearlston, Jr., of Aerospace Corp. appeared in the July, 1968 issue of the Electronic Engineer. The first three paragraphs are as follows:

"Do we really prevent electromagnetic interference if we apply the specs correctly? Unfortunately not always. Let's begin with a little of the background and then discuss the problems associated with various specifications.

The Department of Defence has its Electromagnetic Compatibility Program for all military systems. One of the chief tools is the individual equipment or subsystem EMI control specification, currently MIL-STD-461 and 462. Similar specs have been in use for the past 20 years, such as MIL-I-6181 and its subsequent revisions, B, C &D, MIL-I-26600, and MIL-STD-826 - all based on the control of interference to aircraft voice receivers operating in the range of 2 to 30 MHz.

Such receivers were connected to a long-wire antenna via an unshielded lead-in running within the aircraft fuselage, and were extremely susceptible to interference picked up through this antenna lead-in. All efforts to reduce interference were directed towards reducing radiated energy, in this frequency range, within the aircraft which might be picked up by the lead-in. Since there was little bypassing or filtering on the power leads to receivers, an effort was made to reduce interference coupled to these power leads to avoid responses in the receiver. The rationale was thus provided for conducted interference and susceptibility measurements on receiver power leads, as well as for radiated interference measurements from the equipment itself."

JTAC EMC - SPECTRUM ENGINEERING REPORT RELEASED

Late in 1963 the Joint Technical Advisory Committee initiated a significant project in the field of electromagnetic compatibility. Dr. Jerome B. Wiesner, then Acting Special Assistant to the President for Telecommunications, wrote to the JTAC requesting that it become the focal point for recommending "needed technical programs, and for the formulation of objectives for dealing with this subject as a national problem."

(The JTAC found such work definitely within its purview and under took the task allocating it to its Subcommittee 63.1. Since 1948, the JTAC has offered council on many technical matters relative to use of the electromagnetic spectrum. It was formed by the Boards of the Electronic Industries Association and the Institute of Electrical and Electronics Engineers, Inc., for the purpose of providing objective council on technical matters relative to spectrum utilization).

The report was first presented to the Federal Communications Commission and the Director of Telecommunications Management on Friday, July 12. On Monday, July 15, an extra briefing was held for other government agencies. A press briefing was given on July 16. Now, the results of the comprehensive four-year stuc by over 200 of the nation's leading experts on the use of the radio spectrum are released. Details of the study are reported in a new 1,200 page reference volume entitled SPECTRUM ENGINEER ING - THE KEY TO PROGRESS. Copies are \$15 each, and may be obtained from JTAC Secretary, 345 East 47th Street, New Yor New York 10017



The report presents a great challenge at an opportune time. It deals with the national goal of maximizing the effective use of the radio spectrum so that present uses, including national security, transportation, conservation, education, business, entertainment and recreation can be adequately accommodated, provision made for future growth and for new uses. It reveals the urgency of this challenge as it documents the strangulation already occurring in someservices due to lack of sufficient frequencies.

The work of the JTAC Subcommittee on Electromagnetic Compatibility was directed toward three objectives:

Identification of present electromagnetic compatibility (EMC) problems and existing control techniques.

Establishment of technical approaches that appeared to have promise for improved control of compatibility problems and for development of greater effectiveness in the use of the radio spectrum to provide for continued growth of its total value.

Recommendation of technically-based procedures that would, if implemented, increase effective and efficient use of the radio spectrum.

After exploring the areas to be studied, the Subcommittee organed its work into four main activities:

Survey of EMC practices, capabilities and existing major interference problems.

Analysis techniques that could serve in optimizing spectrum utilization.

Unintentional radio frequency interference and its impact on future utilization.

Electromagnetic side effects and their role in future spectrum utilization planning.

The first two activities were further subdivided into individual areas where studies of many aspects were conducted in depth. The following are examples.

- Urban area radio spectrum usage.
- Antenna Farm Study.
- Spectrum management records
- Frequency coordination and monitoring
- -EMC in selected government agencies.
- Microwave communications system spectrum usage.
- Spectrum utilization efficiency criteria.

In full awareness of the significantly increased funding required, the JTAC concludes and recommends.

That allocation and assignment procedures should be based on a spectrum engineering $P^{hilosophy}$ such as set forth in this report.

That spectrum engineering capabilities should be established to develop a spectrum management system - test it, improve it, and operate its technical aspects.

That the methods of analyzing the behavior of systems, subject to noise environments and means of predicting noise ambients, need to be developed. This will require agreement on measurement parameters and extensive coordinated data gathering.

That a central interdisciplinary coordinating body for "side effects" - the interaction of man's use of the spectrum with nature's use - should be developed.

In short, SPECTRUM ENGINEERING - THE KEY TO PRO-GRESS presents the challenge:

Finding present spectrum assignment procedures to be inadequate for meeting the continued growth of demands on the radio spectrum, to-day's methods must be revised and augmented by a new generation of spectrum engineering techniques.

MICROWAVE INTERFERENCE PROBLEMS ARE WORLD-WIDE!

A one page article with the above title, written by Elmer T. Ebersol, Managing Editor, appeared in the July, 1968 issue of Microwaves. The first three paragraphs are as follows:

"As important EMC (Electromagnetic compatibility) is to microwave engineers in the U.S., the concern is, if anything, even greater in Europe. This is because of the concentration of microwave communication and radar installations in a relatively small area thickly populated with all kinds of devices that emit electromagnetic radiation.

So important is the interference problem in the United Kingdom that a two -day conference of many serious-minded engineers and scientists was held recently (April 23-24, 1968) at the Institution of Electrical Engineers (IEE) Headquarters in London to map strategy and to review the technical state of the art of methods to minimize electromagnetic interference.

Keynoting the conference, sponsored by IEEE Electronics Div., and the U.K. and Ireland Sections, was J.W. Herbstreit, Director of the International Radio Consultative Committee (CCIR). He said, in effect, that the key to expanded communication services in available spectrum is to find ways to minimize or eliminate "harmful interference from other services operating on the same or neighboring frequencies."

CROWDING IN SPECTRUM NEARS A CRISIS

A four page article with the above title, written by Neil Sclater East Coast Editor appeared in the July 18, 1968 issue of Electronic Design. The first few paragraphs are as follows:

"..... A house burns to the ground in Los Angeles because the crowding of a radio channel prevents the rapid dispatch of fire-fighting equipment.

.....A sophisticated communications satellite is developed - but there are no suitable unallocated frequencies available to it (a problem only partly met by the sharing of frequencies already used by ground microwave services).

..... The operator of a delivery service inNew York City cannot improve his efficiency, and therefore his business, because he cannot obtain a mobile radio frequency.

These are just a few things that can happen as a result to today's crowded electromagnetic spectrum. How did the spectrum get so full, and what is the significance of the situation for the electronics industry and for the nation?

Communications technology has out-stripped our methods for controlling it. The spectrum is virtually saturated, and the widearea coverage of satellite broadcasts threaten the whole fabric of local-area frequency allocations.

Since the days of early radio broadcasting the Federal Communications Commission has allocated "blocks" of frequency to users radio broadcasters, TV stations, forest rangers, ships. As the lower frequencies were used up, higher frequencies were allocated and technology was developed to move into the new bands. Also, taking advantage of the limitations in range of transmitters and the curvature of the earth, the FCC allocated the same frequencies to many regions of the country.

Now the spectrum is in deep trouble. The higher bands still available lie in the millimeter region, an unattractive region even if the technology were developed to harness it because of its high atmospheric attenuation."

DESIGN & ANALYSIS

RFI SUPPRESSION, PART III

A seven page article with the above title appeared in the May, 1968 issue of Electromechanical Design. It was written by David P. Costa, who is a mechanical engineer with the Port of New York Authority. The first two paragraphs are as follows:

"Methods of suppression

Radio frequency interference falls into three classifications: natural interference, caused by natural electromagnetic disturbances; man-made interference, produced by electrical, electronic and mechanical devices; and mutual interference, when operation of one communication service produces abnormal operation or diminished performance in other services. You can distinguish manmade interference from the other by its regular rather than random nature, since the disruption is often caused by periodic generation of a pulse, interrupted motor operation or periodic firing of an ignition system. Table I lists in check list form some of the frequent man-made interference sources.

Before checking for interference from external causes, determine that the equipment itself is not at fault. Dirty or corroded contacts, intermittent connections, rosin joints, frayed insulation and microphonic tubes can cause noise. Externally radiated interference enters the circuits because of poor cabinet shielding or defective bonding."

VIBRATING CAPACITOR THWARTS NOISE

A one-page article with the above title appeared in the May, 1968 issue of EDN. The first three paragraphs are as follows:

"Voltage and current measurements performed under ultrahighimpedance conditions now are possible by virtue of an exceptionally low-noise input circuit. By combining the modulating ability of an electrically vibrating capacitor with the high input impedance of an FET amplifier, optimum electrometer input characteristics are achieved.

Key element of the circuit is the vibrating capacitor connected across the input of the FET a-c amplifier. It converts the d-c signal to be measured to a-c, which is then preamplified by the low-noise FET. The very high d-c resistance of both the vibrating capacitor and the guarded coupling capacitor (connecting it to the FET input) all but eliminates steady-state loading of the source.

By vibrating the capacitor plates at a high frequency (6kHz compared to 400 Hz), 1/f noise of the FET and thermal noise of the series input resistors are reduced substantially. Because noise from these sources is minimized, microvolt signals can be measured even from sources exceeding 10 megohms."

DOUBLE-BALANCED MIXER COVERS 0.2 TO 400 MHz

A short new item with the above title appeared in the May 23, 1968 issue of Electronic Design. The first two paragraphs are excerpted below. Additional information may be obtained from the Mini-Circuits Laboratory, 152 West 42nd street, New York, New York.

"The ASK-1 double-balanced mixer is a miniature broadband mixer measuring only 0.05 in.³ The device is believed to be the smallest vhf double-balanced mixer available. This unit covers the frequency range of 0.2 to 400 MHz and is enclosed in an rfi shielded microminiature package for direct plug-in to printed circuit board. Designed to operate in a 50 - ohm system, the machine finds use in signal processing applications. Possible applications include use as a mixer, phase detector, frequency doubler, electronic switch, and electronically controlled attenuator. The performance of the mixer is obtained through the use of hot carrier diodes and coaxial toroidal transformers. The four hot carrier diodes, matched at six bias points and mounted in a ring configuration, provide low conversion loss, high isolation and small size. The diodes are mounted, with a balanced lead configuration, on a printed circuit board. The diode leads measure only 30 thousandths of an inch. Width bandwidth, low mixer conversion loss (6.5dB) and high port-to-pcrt isolation (30dB) have been achieved."

<u>Crose Look Taken at Interfering Signals Produced by Microwave</u> Input Mixers

A one and a half page article with the above title appeared in the June 1968 issue of Communications Designer's Digest. The first two paragraphs are as follows:

"Most of the current microwave radio systems use receivers of the heterodyne type which necessitate conversion of an SHF signal to an intermediate frequency signal upon which you perform the processes of amplification and demodulation. During the conversion, interfering SHF signals which are present at the mixer input also combine with the local oscillator, or the desired signal frequency, to produce unwanted responses which may appear in the vicinity of the intermediate frequency and, after demodulation, within the wanted baseband frequency range.

Interfering signals produced in input mixers of microwave systems were the subject of a paper with that title recently presented at a London conference on interference problems in microwave communications systems by D. Davidson of England's Standard Telephones and Cables, Ltd. Considering unbalanced type mixers only Davidson laid the analytical groundwork for the potential interference problem and then presented measurements on a typical mixer which showed just how much trouble could develop at this junction in the signal reception process."

WHAT IS 'POPCORN' NOISE?

A two page article with the above title appeared in the May 23, 1968 issue of Electronic Design. It consists of three related questions with answers provided by Robert Widlar, Director of Advanced Circ Development, National Semiconductor Corp., Santa Clara, Califorr The first question and the two subsquent following paragraphs are excerpted as follows:

What is "popcorn" noise, as referred to in linear integrated circuits?

"Popcorn" noise is a low-frequency, step-fluctuation noise often encountered in connection with integrated operational amplifiers. When popcorn noise shows up, it does not occur on all devices made with a given process or even all devices on the same wafer. The phenomenon becomes worse at low temperatures, and there is some threshold temperature above which it disappears. A fairly severe case of popcorn noise is shown in Figure 1. Here, the step amplitude is about 50%V, peak-to peak, referred to the input of the operational amplifier, compared with a 20%V white noise component.

The exact origin of popcorn noise is unknown, however, it probably arises in surface states where the transition region of the emitterbased junction intersects the silicon surface......"

Contd

DO IT YOURSELF - LOW-COST rf CONTROL

A news item with the above title appeared in the July, 1968 issue of Microwaves. The text reads as follows:

"The National Bureau of Standards offers circuit diagrams for an inexpensive rf signal stabilizer which cuts voltage fluctuations by a factor of 1000 over a range of 0.5 - to 10- peak volts and from 50 to 1000MHz.

The device can be built with about \$80 worth of solid-state parts in a space only 2x3x6 inch and does the job of more expensive stabilized rf generators. No feedback to the generator is used; instead the generator output is controlled directly.

The device, designed by L.D.Driver of the Boulder, Colorado, NBS Division uses two pin diodes directly in the rf signal path to act as a voltage-dependent attenuator. The stabilizer consists of a dc-reference voltage source, voltage comparison network and dc-feedback amplifier. The bias voltage for the pin diodes comes from the feedback amplifier. The error signal for the feedback amplifier is proportional to the difference between the dc-reference voltage and the detected peak amplitude of the rf signal.

PSEUDO-EXACT BAND-PASS FILTER DESIGN SAVES TIME (PART I)

A 10 page article with the above title appeared in the August, 1968 issue of Microwaves. It was written by Robert L. Sleven, Section Head, at the Airborne Instruments Laboratory, Deer Park, New York 11714. It is part I of a six part article which will appear in subsequent issues of the periodical. Complimentary copies of the complete paper may be obtained from the author after the last part has been published by Microwaves early in 1969. The first two paragraphs are as follows:

"A procedure whereby optimum filter response can be realized without experimental trials or modification. For a specified rejection level, dissipative pseudoexact design results in an excellent combination of low loss, flat pass band and low VSWR.

The pseudo-exact filter response is used for most band-pass filter applications. Yet an accurate design procedure has not been available until now. Thus, cut-and-try methods have been required. Using the computer-obtained response curves presented here, however, satisfactory design can be achieved on the first try. The curves take into account the effects of dissipation on amplitude, VSWR and time delay. The filter designer can optimize desire electrical characteristics. And, the system engineer will have data to specify filter requirements and to evaluate a filter's effect on over-all system performance."

ACTIVE-FILTER IC MAY START A REVOLUTION

A two page article with the above title appeared in the August, 1968 issue of EEE. The first two paragraphs are quoted as follows:

"Western Microwave Labs is scaring the hell out of some filter manufacturers. If WML does what it hopes to do, then its competitors face lean times ahead. Announcing its new WML-5 active filter IC, the company called the device, "the first of a series designed to replace every passive filter under 100 kilohertz on the basis of better performance and lower cost."

The new device's real threat lies in its versatility. It is a basic building block that can be easily modified to form a broad range of different filter types. The same basic unit functions simultaneously as a band-pass, low pass or high pass filter. By carefully choosing the ratios of just three external resistors, you can shape the response to any of the popular minimum-phase functions: Butterworth, Chebychev, Butterworth-Thomson and Bessel. The same external resistors can also be tailored to shift the filter's center frequency from its nominal value, over a range of a decade or more."

MEETINGS & EVENTS

.968 IEEE International Convention, New York, March 18 - 21, 1968

As in the past, the G-EMC organized and conducted a session at this convention. It was session 1F, conducted on Monday, March 18, 1968 it 10:00 A. M. The 1968 convention differed from the past in that all apers were invited. Secondly, they were grouped in three types of ressions: interdisciplinary, tutorial, and new concepts and ideas. The EMC session was in the interdisciplinary area.

The session was very successful. Attendance was about 75, and it vas apparent from the questions asked from the floor that the subect matter has aroused a great deal of interest. In addition, a number of individuals spoke up from the floor to present their experience in the area of side effects of RFenergy.

The session organizer was Herman Garlan of the FCC Washington, D.C., and session chairman was Alfred W. DiMarzio of RCA, Burlington, Mass.

The session described and discussed some of the effects of electromagnetic energy in biology, on ordnance and on people. It pointed out that man himself is being found to be an active electromagnetic component. The three papers presented were as follows:

1F-1 Nature - The New Interface in Electronics, Rexford Daniels, Interference Consultants, Bocton, Mass.

1F-2 Hazards of Electromagnetic Radiation to Ordnance, Charles M. Cormack, Naval Air Systems Command, Washington, D.C.

1F-3 Radio Noise Predicts Inversions and Forcasts Smog, Walter E. Buchler, Boeing Company, Seattle, Washington.



REPORT ON THE 1969 INTERNATIONAL IEEE EMC SYMPOSIUM

Final plans for the 1969 IEEE Symposium on Electromagnetic Compatibility are now being formulated by the Steering Committee of the New Jersey Coast EMC Chapter under the direction of Chairman John J. O'Neil. The 1969 convention will be held June 17 - 19 at the Berkeley-Carteret Hotel, Asbury Park, N.J. The Site is approximately 10 miles from the U.S. Army Electronics Command and Satellite Communications Agency at Fort Monmouth, New Jersey.

This annual EMI/EMC conference is held in alternate years on the East and West Coast. It is conceded to be the largest technical meeting of industrial and government engineers who work in the complex field of electromagnetic compatibility.

Chairman O'Neil has stated that the Department of Defense EMC Conference will be held immediately after the IEEE Symposium on Thursday afternoon, June 19th and June 20th. It will include classified sessions that will present to the IEEE Symposium conferees information regarding Tri-Service research and development efforts in the area of Electromagnetic compatibility. The facilities of the Electronics Command will be made available for the DOD conference.

Technical Program Committee Chairman Charles D. Joly invites authors to submit 250 word abstracts to him at P.O. Box 1969. Eatontown, N. J. 07724. Papers will also be solicited from abroad, continuing the international theme of the symposium introduced at the Seattle conference in July 1968. Two awards are planned for authors. The work of younger engineers in the EMC field will be recognized in that one award will be made to an engineer, 30 years of age or younger, who prepares a paper of outstanding merit. The second award will be given for a paper prepared by one engineer which, in the opinion of the judges, extends the state-of-the-art in the design techniques area.

The following heads of the symposium planning committee have been named by Chairman, John J. O'Neil:

Bruce Miller, Assistant to the Chairman Fred Alvarez, Arrangements Maxwell Brown, Finance Harry Estelle, Publicity Charles Joly, Technical Program Warren Kesselman, Publications Dick Linhart, Exhibits



WESCON 68 - ELECTROMAGNETIC COMPATIBILITY

A brief item with the above heading appeared in the August, 1968 issue of EDN. The text is as follows:

"You may be aware that engineers and scientists practicing the disciplin of electromagnetic compatibility have struggled for years solving problems whose parameters, at best, are poorly defined," says J. F. Fischer, Jr., session 19 organizer. "This has led in many instances to inadequate documentation of not only the problem statement, but how it was solved. This in turn led to the term 'black magic' to emphasize the fact that there were few if any scientific techniques that could be used in this field.""

Mr. Fischer disagrees with the black magic concept and feels that electromagnetic theory and sound engineering practices will solve the problem. He has assembled a broad cross-section of papers, each timely and current, that present material for solving today's problems."



The SAE/AE-4 is forming an EMC Education Committee.

Mr. Charles M. Clarke of General Electric - Daytona Beach, Florida will Chairman the committee and members will include Mr. Charles Seth of Wright-Patterson Air Force Base, Ohio; Ben Weinbaum of General Dynamics/Convair of San Diego, California; Henry M. Hoffart of General Electric, Valley Forge, Pennsylvania and Jack Moe of General Dynamics of Fort Worth, Texas. The objectives of the Committee will be to foster the dissemination of techniques of EMI control and EMC through educational bulletins training aids, and seminars for both industry and government.

In so doing, the education committee will endeavor to help reduce EMC engineering from an esoteric black magic art to a defined engineering discipline





1969 IEEEG-MTT INTERNATIONAL MICROWAVE SYMPOSIUM

TO BE HELD MAY 5 - 8, 1969 -- DALLAS, TEXAS

Papers are solicited on subjects in the areas of solid state devices integrated circuits including techniques of fabrication, sol id state sources, transmission lines, filters, switches, attenuators, magnetoelastic and acoustic devices for microwave applications, millimeter wave devices and components, optical techniques for microwave components, ferrite materials and components, computer aided design techniques, microwave superconducting devices, microwave subsystems, and other topics pertinent to the field of microwave theory and techniques. Authors should submit five copies of each summary and abstract. Specifications are -- summary: 500 - 1,000 words, illustrations; 6 maximum; abstract: approximately 200 words with no illustrations.

Summaries and abstracts should be mailed to --

J. B. Horton Chairman - Technical Program Committee Texas Instrument Inc., MS - 905 P.O. Box 5012 Dallas, Texas 75222

DEADLINE: January 3, 1969

Authors will be notified of acceptance by January 31, 1969.



969 IEEE INTERNATIONAL COMMUNICATIONS CONFERENCE

O BE HELD JUNE 9 - 11, 1969 BOULDER, COLORADO

Audio and Electroacoustics

Communication Technology

Communication Switching

Data Communication Systems

Communication Theory

Communica tion System Disciplines

Circuit Theory

Computer

The 1969 IEEE International Conference on Communications -- ICC 9 --- will be held at the University of Colorado, Boulder, Colorado, une 9 - 11, 1969, under the sponsorship of the IEEE Group on Comnunication Technology and Denver Section. The Environmental cience Services Administration, the National Bureau of Standards and the University of Colorado are hosts for the conference. The main heme of the conference is "Communications Needs for the Next Decade," and the following IEEE Groups are participating:

hese groups invite their members to submit original communications -

elated papers. The attention of members of the Communication

'echnology Group is directed to these key technical areas:

INSTRUCTIONS FOR AUTHORS

Authors are requested to submit either formal papers (for 20 to 30 minute presentation) or informal papers (for 8 to 10 minute presentation). The manuscript of the formal papers is required to be betwe 2000 and 4000 words, including symbols and equations. A 50-word abstract should be included, and up to eight (8) captioned photos or drawings are acceptable. Informal papers will be selected on the basis of a 250 word abstract.

The author's name, affiliation, complete return address, and telephone number should appear on the first page, and his name should be forwarded by January 1, 1969 to the Technical Program Chairman

> Dr. Martin Nesenbergs Environmental Science Services Administration Institute for Telecommunication Sciences, R614 Boulder, Colorado 80302

Any reasonable manuscript format is permissible, but authors of accepted papers will be required to prepare a final manuscript in accordance with an IEEE kit which they will receive.

All formal papers will be included in a Conference Record. This does not preclude the author's subsequent submission of the paper to a technical journal for open publication.

> NOTE! Dr. R. C. Baird, of the National Bureau of Standards, has agreed to organize this session for our group. Additional information pertaining to the EMC session will be published in forthcoming issues of the Newsletter.

New Products Brochures

Electromagnetic Compatibility

Microwave Theory & Techniques

Information Theory

Vehicular Technology

Radio Communication

Space Communication

Wire Communication

Telemetering

BROCHURES AVAILABLE

ower Line Filter Paks

new brochure entitled "Sanders Power Line Filter Paks" has been eleased by Sanders Associates, Inc. The eight-page brochure includes epresentative examples of custom design single and multi-section ower line filters. The filters illustrated are prime examples of hat can be done when size, weight, altitudes and extreme temperature anges are a critical factor of the design criteria. All filters shown re presently operating as an integral part of existing electronic quipments. Additional information and a copy of this brochure may e obtained from Mr. C.A. Bernard, Sanders Associates, Inc., 5 Canal Street, 1-1-6/1-2360, Nashua, New Hampshire 03060.

BROCHURE DESCRIBES ELECTRICALLY CONDUCTIVE ADHESIVES AND COATINGS

four-page brochure suitable for notebook or wall mounting describes ne Eccobond line of conductive adhesives together with the Eccocoat ine of conductive coatings.

isted in tabular form are the important handling features of the naterial such as mix preparation, consistency, and curing conditions, s well as certain of the cured properties, e.g. volume resistivity, naximum service temperature, bond strength and thermal coefficient f expansion.

he text gives a concise description of each product with the emphasis n the type of application each is designed for. Photographs illustrate ome of the many uses for these materials.

opies may be obtained by writing to: Mr. Paul R. Seery, Emerson nd Cuming, Inc., Canton, Mass. 02021

IEW PRODUCTS

lew Series of Subminiature MIL-Type Filters

new subminiature line of "Pi," "T" and "L" type filters for feedaru mounting has been developed by RF Interonics. The entire line f 12 new models - designated Series 2500 are housed in 3/8" cylindrical cases. Case lengths run from .45" to 1.14" for the "Pi" and "T" categories, and are .54 for all "L" types. Additional information may be obtained by writing to RF Interonics, Inc., 100 Pine Aire Drive, Bay Shore, L.I., New York 11706

The following item appeared in the June 1968 edition of FRECUENCY:

POWER SOURCE FOR RFI SUSCEPTIBILITY TESTING

This high power broadband source, Model M402, is designed for driving broadband antennas in creating high intensity fields for equipment operational testing per MIL-STD-826A, MIL-STD-461 and others. The source is capable of feeding 50 to 100 watts into a 50-ohm load over a frequency range of 10 kHz to 220 MHz - nearly 15 octaves - without tuning or bandswitching.

Using six 4CX25OB radial beam tetrodes in its final power amplifier the M402 has a total power gain of 40 DB and can be driven to full output power by a laboratory type signal generator. The manufacture states that it is the highest power broadband amplifier system available for operation from single phase, 115/230 Volt, 50/60 Hz line power. Instruments For Industry, Inc., Farmingdale, L.I., N.Y.

FILTER DISCHARGE UNIT FOR HUMAN SAFETY

EMI/EMC filters may store lethal electrical charges for long periods of time in their large, high quality capacitors. Such charges represes a very real danger even after the source of electrical power has been switched off. Filtron's FDU-100 Series of filter discharge units proviprotection by discharging the capacitors without interfering with the filter function. In so doing, they fulfill the mandatory requirements for safety under the National Electrical Code Article 460 and the National Electrical Manufacturers Association, NEMA Standard 11-17-1960.

For further details and information write Filtron Co., Inc., 131-15 Fowler Avenue, Flushing, N.Y., 11355.

Number 6 September, 1968

CHAPTER CHAIRMAN'S NOTES

During the April 18, 1968, meeting held at the WCAU studios we made a number of comments about our desire to keep all Chapter Members advised as to the various activities that the Chapter Officers become involved in both voluntarily and involuntarily; as well as what does go on during the sessions of such groups as the EIA Electromagnetic Compatibility Committee (G-46), the Philadelphia Section Executive Committee Meetings, as well as the GEMC National ADCOM Meetings. We feel that a considerable amount of the items and ideas discussed are of interest to the Chapter Membership. Now how to accomplish this, appeared to be a problem. Ordinarily we would address the membership at each Chapter meeting prior to introduction of our speaker. However, our experience the past several years at these meetings has been that this cannot be done without cutting into the Speaker's time. Therefore, we have concluded that the natural answer, or vehicle to accomplish our objective, is to use this Newsletter as the method for passing along the goodies to all concerned. It will be our policy to comment for several minutes prior to introduction of our speaker, on any subject or idea that may be appropriate to the moment. All non-urgent information will be passed along via the Newsletter. We hope to release an issue of the Newsletter prior to each Chapter meeting thereby bringing the membership current up to a time period of 3 or 4 weeks prior to each meeting.

The Newsletter is published for the benefit of all, and we sincerely hope that anyone, member of the IEEE or not, who has an idea or information of interest to the Chapter, will pass the data along to us for publication in the Newsletter.

ADCOM:

One of the pleasures of being Chairman of an IEEE Technical Group Chapter is that you are also an ex-officio member of the National Administrative Committee (ADCOM) for that group. In his new capacity the editor attended the last ADCOM meeting held concurrent with the EMC Symposium at Seattle, July 23-24-25, 1968. Also Dr. Showers of the University of Pennsylvania and Bob Goldblum,Past Chapter Chairman attended in the interest of the Philadelphia Chapter. The session was called to order at 5:30 p.m. on July 23, 1968, with the Chairman R. B. (Dick) Schultz of Boeing presiding. The following items of major interest were acted upon by elected members of the ADCOM eligible to vote:

- 1. After considerable and enlightening discussion, a recommendation from Fred Nichols (LectroMagnetics) that the ADCO M Committee Members be elected for a five year term rather than the present three was withdrawn. A second recommendation to increase the total committee members from the present 15 to 18, was approved.
- <u>EMC Symposium</u>: The discussion here also was enlightening but considerable energy was expanded by all present in presenting their viewpoints.

1968 Symposium: It was reported that there was a total registration of 481 plus 51 ladies. From what we saw during the working hours portion of July 23rd, plus the report that the registration was well in excess of the break even point, it was obvious to all that the 1968 EMC Symposium was an inspiring success.

1969 Symposium: This event will be held at Asbury Park. No report was available due to the absence of the New Jersey Chapter Committee Chairman. It was indicated during a brief discussion that the Symposium may have a DOD session following with the folks at Fort Monmouth having the DOD responsibility.

<u>1970 Symposium</u>: This Symposium will be held July 14, 15, 16, w 1970 at the Grand Hotel, Anaheim, California. A detailed report on progress to date was submitted by the Committee Chairman George R. Ufen. 1971 Symposium: We believe that it is common knowledge among the Philadelphia GEMC Chapter members that under the spear heading of Bob Goldblum and Dr. Ralph Showers, we have for the past year been attempting to convince the ADCOM to award the Symposium to Philadelphia. In competition with the representatives of the Washington GEMC Chapter, the representatives of Philadelphia entered into the debate with energy expending diligence When the vote was cast the award was given to the Philadelphia Chapter.

- 3. The recommendation of Fred Nichols for a change in name of the EMC Group was not discussed due to lack of time, but was appended to the minutes of the meeting. Elsewhere in this issue are comments on the subject.
- Changes In Bylaws EMC Group. Changes to the bylaws as of July 23, 1968, were discussed and will be published by Bob Goldblum in the December issue of the national Newsletter for the information of all.

1968 EMC Symposium: The three-day affair at the Seattle Civic Center with free rides on the monorail from downtown Seattle to the Center, from the start developed into a very successful operation. Even the weather cooperated with the best weather for a period of one week that the editor has experienced during many stops in Seattle.

The speakers at the Symposium banquet were inspiring, with a total of 600 present. Mr. Haraden Pratt, President Emeritus of the IEEE, spoke on "Reminiscences on Early Avionics." If the editor's memory is correct Mr. Pratt signed his first membership card in the old IRE in 1936. It was a pleasure to enjoy a personal chat with Mr. Pratt during one of the breaks between technical papers at the Civic Center. The principal speaker was Mr. Maynard L. Pennell, Vice-President of the Boeing Company, whose topic was the "SST". The tremendous complexity of the technical problems involved in the Supersonic Transport design were elaborated upon by Mr. Pennell. The airframe of this jet transport is so long (in excess of 330 feet) that the total length varies two to three feet with variations in temperature, thereby obsoleting the usual system of cables for controlling the aircraft. Mr. Pennell advised that this will be the first aircraft in history to depend entirely upon electronics for airframe control functions. The evening following the Symposium banquet, a tour of the Renton Production Plant of the Boeing Company's Commercial Airplane Division, was conducted for approximately 87 persons.

RADIO FREQUENCY INTERFERENCE REDUCTION - NAVSHIPS 900,000.105

Another informative document which recently came to our attention is the above NAVSHIPS published by the Department of the Navy, Bureau of Ships. It is a Non-Registered publication which also has the number 0967 000 0150 in the upper right-hand corner together with the notation "Formerly 0284 001 0200." We leave it to the reader to determine the current identification. The published date is September, series under the title of "Electronics Installation and Maintenance Book," NAVSHIP 0967-000-0120, which is available from the Superintendent of Documents at a cost of \$2.75 for the original issue and \$1.75 for Change 1 dated, December 1966. The Electronics Installation and Maintenance Book (EIMB), NAVSHIPS 900,000 series, provides subordinate policies and installation and maintenance standards for Naval electronic equipment.

To quote from the PREFACE:

"The Radio Frequency Interference Reduction Handbook, Navships 900,000.105 indicates the various sources of radio frequency interference (RFI). It provides standards and criteria that, when applied in the installation and maintenance of all electronic equipments and devices, will aid in keeping RFI within acceptable limits."

The 54-page document is of definite interest to those of us concerned with shipboard EMC.



Recent Additions to Editor's EMC Bibliography:

Physical Aspects of Irradiation (Recommendations of the International Commision on Radiological Units and Measurements, ICRU). This report of the ICRU has been released as National Bureau of Standards Handbook 85, Issued March 31, 1964, and is available from the Superintendent of Documents for 70 cents. To quote in part from the Foreword:

"This Handbook is one of the new series presenting the recommendations of the Commission on one aspect of the field with which the Commission is concerned. It presents recommendations agreed upon at the meeting of the Commission held in Montreux, Switzerland, in April 1962."

Radioactivity (Recommendations of the International Commission on Radiological Units and Measurements). This report of the ICRU as been released as National Bureau of Standards Handbook 86, with an Addendum dated January 20, 1964, and is available from the Superintendent of Documents for 40 cents. To quote in part from the Preface:

"This report consists of four sections: 1. Direct and Relative Measurements of the Activity of Radioactive Sources, 2. Lowlevel Radioactivity in Materials and its Relation to Radiological Measurements, 3. Availability of Radioactivity Standards; Present and Future Requirements, 4. Techniques for Measuring Radioactivity in Samples and Living Subjects."

Specifications for Radio-Noise and Field-Strength Meters 0.015 to 30 Megacycles/Seconds, C63.2-1963. This is a specification for anFIM in the HF range. The foreword contains an enlightening history of the development of the specifications. Published by the U.S.A. Standards Institute, 10 East 40th Street, New York, N.Y. 10016.

American Standards Methods of Measurement of Radio-Noise Voltage and Radio-noise Field Strength 0.015 to 25 megacycle/Second, Low Voltage Electric Equipment and Nonelectric Equipment, Ct3.4-1963. To quote from the "Scope":

"This standard covers uniform methods of measurement for radio-noise voltage and radio-noise field strength, in the frequency range of 0.015 to 25 megacycles/second, associated with low-voltage electric equipment -- up to 600 volts dc and ac rms (root-mean-square)-- and non-electric equipment. These methods cover measurements of both components and systems wherever this standard is applicable."

Published by the U.S.A. Standards Institute, 10 East 40th Street, New York, New York 10016.

EIA Systems Effectiveness Workshop.

SYSTEMS EFFECTIVENESS ---"A measure of the degree to which an item can be expected to achieve a set of specific mission requirements and which may be expressed as a function of availability, dependability and capability."--MIL-STD-721B.

The following are the major topics for the workshop:

- 1. Reliability in Systems Effectiveness
- 2. Maintainability in System Effectiveness
- 3. Quality Assurance in System Effectiveness
- 4. Value Engineering in System Efeectiveness
- 5. Human Factors in System Effectiveness
- 6. Electromagnetic Compatibility in System Effectiveness
- 7. Effectiveness Quantification
- 8. Safety in System Effectiveness
- 9. ILS in System Effectiveness

The Co-Chairman for the EMC Workshop are: Eldon S. Hughes of the Autonetics Division of North American Rockwell, and B. Weinbaum, of General Dynamics-Convair. Mr. Hughes is also Chairman of the EIA Committee on Electromagnetic Compatibility (G-46) of which your Editor is a member. From what discussion we participate in at the G-46 Committee meeting in Seattle, July 22, 1968, the EMC Workshop is recommended to all who can schedule their attendance.

Further information can be obtained from the EIA Headquarters in Washington, D.C., (Mr. J. F. Hessman, Code 202/659-2200X281), or from the editor.

EMC Definitions:

The battle for a title to our field of endeavor continues and the editor would like to add the following for information:

To quote from DOD Directive No. 322.3, Section III, July 21, 1967:

"Electromagnetic Compatibility (EMC) is the ability of Communications-electronics (C-E) equipment, sub-systems and systems to operate in their intended operational environments without suffering or causing unacceptable degradation because of unintentional electro-magnetic radiation or response. It does not involve a separate branch of engineering but directs attention to improvement of electrical and electronic engineering knowledge and techniques to include all aspects of electromagnetic effects."

At the Seattle IEEE GEMC Symposium ADCOM Committee meeting July 23, 1968, Fred Nichols of Lectromagnetics submitted the following:

'Recommendation of Added Scope and Name Change.

Mr. Chairman: The present G-EMC of the IEEE has two broad areas of interest within the scope of Electromagnetic Compatibility.

One broad area is that of non spectrum usage typically associated with compatibility at the component, subsystem and inter and intra systems levels.

The second broad area is concerned with spectrum utilization. Spectrum utilization has many facets such as spectrum management, conservation etc.

These separate, yet paralled and interlocking engineering disciplines can be better served by adequate recognition and avenues to operate more effectively.

My first recommendation would be for a name change of the G-EMC. My first choice for such a new name would be Electromagnetic Compatibility and Spectrum Utilization.

Further, I feel that it is in our best interest to have two vice chairmen, one for electromagnetic compatibility and one for spectrum utilization. The two vice chairmen would assure proper channels for these overlapping functions."

Pressure of time to get this issue in the hands of the Chapter members before our September 9th meeting prevents our comments from being included, but we hope no name change will occur before we have an opportunity of presenting our viewpoint.

Quoting from the Electronics and Nucleonics Dictionary:

"Electromagnetic Compatibility - General term covering all types of r-f interference."

Cuoting from MIL-STD-463, paragraph 4.12:

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"Electromagnetic compatibility. Capability of electronic equipments or systems to be operated with a defined margin of safety in the intended operational environment at designed levels or efficiency without degradation due to interference."

Cont'd

Zero-Point Switching and RFI.

The Electronic Engineer issue for January, 1968, has an interesting article on the problem of SCR's vs RFI, written by John K. Buchanan of Motorola, Phoenix. Design details are given for a circuit suitable for firing SCR's at the cross-over point (zero voltage) of the line supply.

The same issue has an article on "Locating Ground Faults in a Shielded Room, " by means of passing DC currents through the shielded enclosure and measurement of potential variations measured over the shield room wall area. Report is based on work done by Richard Rufer and George Tyler at the Lawrence Radiation Laboratory, University of California.

EMC Related Legislation.

The following is the current situation concerning legislation of technical interest to the EMC fraternity:

National:

For several years a number of bills have been under consideration by the U.S. Congress House and Senate Commerce Committee, the objectives of which is to grant the FCC power to control the radiofrequency interference potential of electrical and electronic devices at the manufacturing level. The latest in the series of bills are House Bill HR 14910 and Senate Bill S1977. Both of these bills were recently approved by the Congress. The President signed these bills, now known as Public Law PL 90-379 on July 5, 1968. An additional section is added to the Federal Communications Commission Act of 1934 as follows:

"Section 302.(a) The Commission may, consistent with the public interest, convenience, and necessity, make reasonable regulations governing the interference potential of devices which in their operation are capable of emitting radio frequency energy by radiation, conduction, or other means in sufficient degrees to cause harmful interference to radio communications. Such regulations shall be applicable to the manufacture, import, sale, offer for sale, shipment, or use of such devices.

(b) No person shallmanufacture, import, sell, offer for sale, ship, or use devices which fail to comply with regulations promulgated pursuant to this section.

The provisions of this section shall not be applicable (c) to carrier transporting such devices without trading in them, to devices manufactured solely for export, to the manufacture, assembly, or installation of devices for its own use by a public utility engaged in providing electric service, or to devices for use by the Government of the United States or any agency thereof. Devices for use by the Government of the United States or any agency thereof shall be developed, procured, or otherwise acquired, including offshore procurement, under United States Government criteria, standards, or specifications designed to achieve the common objective or reducing interference. SAE ARP 936 Capacitor, 10 mfd, for EMI Measurements - issued to radio reception, taking into account the unique needs of national defense and security."

The above legislation was one of the items on the agenda of the Electronic Industries Association's G-46 Committee meeting in Seattle, Washington, held the day preceding the International EMC IEEE Symposium, July 22, 1968.

The FCC Represesentative on this Committee was questioned at length by the Committee members present regarding application of the new law. The Committee was advised informally that the Commission has no plans to enter into any wholesale promulgation of new legislation on the subject of radiofrequency interference control, but would as soon as practicable, apply the existing regulatory restrictions (Parts 15 & 18) to the manufacturing level of Electrical and Electronic Devices. It was commented that any other course by the Commission at the present time, would be beyond the manpower and funding capability of the Commission.

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The Editor would like to thank the Philco-Ford Note: Corporation, Communications and Electronics Division for their assistance in the publication of this Newsletter.

EXTRACTS FROM "SPIKES AND RIPPLES" AE-4 NEWSLETTER

The following extracts are from the August 1968 issue of the SAE AE-4 EMC Newsletter.

MORE ON ESSA

Your editor has been a staunch supporter of the Environmental Science Service Administration (ESSA) since weather became a serious part of workday life. Members wishing to learn more about this infant service (organized 1965) are directed to a book by Roy Popkin entitled, "The Environmental Science Service Administration." It is illustrated and the 278 pages sell for \$5.95 from the Praeger Library of the U.S. Government Department and Agencies. Briefly, ESSA is the result of a reorganization of the scientific activities of the Department of Commerce in which the Weather Bureau, the Coast and Geodetic Survey and the Central Radio Propagation Lab of the Bureau of Standards were brought together. The book is perhaps historical in recounting the past roles of individual services in the great guessing game of weather... The Praeger Library series is intended to give the general reader an understanding of the development, scope and operation of the several departments under the executive branch of Government. It's a book for general reading, not a text.

PUBLICATIONS

Step by step instructions for making measurements to MIL-STD-826, determination of spurious responses and front end overload, procedures for calibrating impulse bandwidth and amplitude plus a data sheet are all contained in a publication by Hewlett-Packard, "EMI Measurement Procedure Using the Spectrum Analyzer" (Model 8552A/8553L). A frequency range of 1kHz to 100 MHz is covered. The instrument features absolute calibration of vertical and horizontal displays. Fritz Weinert tells us that copies may be obtained by writing to:

> Al Steiner Hewlett-Packard Company Microwave Division 1501 Page Mill Road Palo Alto, California 94304

31 May '68

SAE ARP 958 Broadband Electromagnetic Interference Measurement Antennas; Standard Calibration Requirements and Methods - Corrected copy issued 10 July '68

SAE ARP 937 (Proposed) Jet Engine Electromagnetic Interference Test Requirements and Test Methods. Approved by the Aerospace Council subject to editorial and SAE publication procedural corrections.

EMI, THE STOCK MARKET GREMLIN

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The Associated Wire Office in Miami encountered EMI head on. New wire being strung for the GOP Convention became inductively coupled to the AP financial lines. Several Florida newspapers received confused and incomplete market quotations as a result. We couldn't find out what the "intelligence" was on the convention wire at the time.

Contd

NOVEL EMI GENERATOR

Mr. James C. Buzzell, Jr., of the Department of Civil and Environmental Engineering, Washington University, reports that in his work with chromatography he has ".... experienced interferences in the 200-230 mu range and tracked the source to the rubber tubing in the deionized water storage bottles"

DOCUMENTS CIRCULATING FOR REVIEW AND COMMENT

EMC Program-Project 0009, Questionnaire. Study to determine the feasibility need and desirability for a combined document that would include Electromagnetic Compatibility requirements for all types of systems used by the Air Force, Navy and Army. The Air Force has been designated the preparing activity in the development of a coordinated standard similar to the existing service document, MIL-E-6041D. Uncoordinated individual comments are solicited on whether such a proposal and subsequent document would be more desirable than the existing individual Service documents.

SAE is polling Committee AE-4 on the question at the request of the Air Force (ASD-ASNAC-30).

SAE ARP (Proposed) Filter, Conventional, Electromagnetic Interference Reduction, General Specification for, is now circulating to Committee AE-4 on letter ballot by the sponsor, Mr. Jules Milton.

MIL-STD-462, Electromagnetic Interference Characteristics. Measurement of - Proposed Revision (Project EMC P-0002) Future proposed revision (Project EMC P-0004). The Aeronautical Systems Division (ASD-AFSC), through SAE, is circulating the proposed revision for review and comment by Committee AE-4.

NEXT MEETING OF COMMITTEE AE-4

Walt McKerchar wrote a long letter to tell of the successful Las Vegas Workshop sessions. (Meeting #22) He also confirmed the dates and places for the next meetings of the Committee. They will be:

> Meeting Number 23 The Cabana Motor Hotel Atlanta, Georgia

October 7 through 9, 1968

Charles M. Dean, Editor Post Office Box 12865 St. Petersburg, Florida 33733

Out of the Past The following was extracted from the Professional Group on Radio Frequency Interference Newsletter, Number 1, January 2, 1958.

PGRFI TO SPONSOR SESSIONS AT THE IRE NATIONAL CONVENTION

Although approved only last October, the PGRFI is participating in the IRE National Convention to the extent of sponsoring one session by itself and jointly sponsoring another session together with the Professional Group on Military Electronics and the Professional Group on Communications Systems. The PGRFI session is tentatively scheduled for Monday afternoon, March 24, 1958 and the joint session for Thursday morning, March 27, 1958. The PGRFI session will present papers dealing with various aspects of the interference problem while the joint session will feature papers on interference effects on Communications and Military Electronic Systems. If you will be in New York for the Convention, don't miss these sessions. If you can't make it, this is a reminder that a copy of the IRE National Convention Record Volume containing these papers will be sent to all paid up members of the PGRFI. The participation of the PGRFI is due to generousity of the representatives of the other professional groups on the Technical Papers Committee of the IRE convention in referring papers on various aspects of interference to this group. Since the PGRFI did not exist at the time the call for papers went out, authors could not indicate it as the proper group to present the papers.

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1958 PGRFI NATIONAL SYMPOSIUM

One of the main functions of a Professional Group is to sponsor a national symposium. In the past the Armour Research Foundation has held three conferences on Radio Interference Control and the U.S. Army Signal Engineering Laboratories has recently sponsored a Symposium on Electromagnetic Interference. We are all grateful to these organizations for furthering the work of radio interference control, but believe that now that a professional group has been formed, for this purpose, it should be the proper organization to sponsor a national symposium. Therefore, the Administrative Committee has tentatively decided to sponsor a symposium either alone or jointly with other groups or organizations in the fall or winter of 1958, if arrangements still can be made at this time. We hope that this advance notice will prompt potential authors to start preparing papers for this symposium,



TV X-RAY DETECTOR DESIGNED

A new article with the above title appeared in the May 9, 1968 issue of Electronic Design. Several paragraphs of interest are excerpted as follows:

The Public Health Service has designed an instrument for measuring X-ray emissions from home color television receivers to determine if a hazard exists.

The instrument was used in a recent survey of 1124 color sets in the Washington, D.C., area, where detectable X-radiation from 268 sets was found. It was similar in design to the measuring equipment field-tested for the first time by the National Center for Radiological Health during a pilot survey, in November, 1967, in Florida.

In a report prepared by the Public Health Service on the Washington survey, high-voltage shunt regulator tubes, high-voltage rectifier tubes and picture tubes were found to be the primary sources of X-ray emissions. By lowering operating high-voltages in color receivers, X-radiation from components can be reduced. In some cases, faulty regulator and rectifier tubes were replaced in the sets.

A report containing a description, schematics and operating instructions for the instrument used in the tests is available without charge from the National Center for Radiological Health, Rockville, Maryland 20852.

COLOR TV X-RAYS: CAUSE AND CURE

A one page article with the above title appeared in the August, 1968 issue of EEE. Paragraphs of interest are as follows:

"By its very nature, the large screen color TV is a potential projector of low energy X-radiation produced by bremsstrahlung (radiation emitted by fast moving electrons striking heavy nuclei and thus deaccelerating rapidly). The three primary sources within the set that have been identified are:

The color picture tube - close to 80% of the electrons emitted by the CRTs electron gun impact against the thin steel shadow mask, and are available for X-ray generation.

The high-voltage rectifier - electrons within the tube's space charge are accelerated back to the cathode structure during each reverse cycle, and generate X-rays that are emitted radially. Measurements have not detected significant X-radiation from the anode structure during forward current flow.

The high-voltage power supply shunt regulator tube - X-rays are emitted in a more or less continuous flow from the inner surface of the tube's anode structure."

RADIATION

"Although very little hard information exists at the present time about the biological hazards of relatively low-energy X-rays - below the 35 kV level- the trend has been to play it safe, and to assume that TV generated X-rays are the unhealthy equals of their high-power brethern."

"In 1959, the National Council on Radiation Protection and Measuremeri (NCRP) issued a set of recommendations that suggested the maximum permissible level of X-ray exposure dose rate from TV receivers, be 0.5 milli-Roentgen per hour, at any accessible point 5 cm from a set's surface. This figure insures that at "normal viewing distance," (assumed to be at least 6 feet), the inverse square law effect will reduce viewer dose rate to well below normal background radiation doses (about 15 mR/hr at sea level)."

A SENSIBLE LOOK AT RADIATION FROM TV SETS

A two page article with the above title appeared in the September 1968 issue of Consumer Reports. Several paragraphs of interest are quoted as follows:

"Man pollutes his world gradually, almost imperceptibly, and in many different ways. One of the least obtrusive ways he has yet invented is the introduction of man-made radiation into the environment."

"If any hazards are posed by the radiation levels found in the PHS survey, they are far too subtle to be detected in the present generation of the U.S. population. One authority on radiation effects, Dr. Victor P. Bond of Brookhaven National Laboratory, saw no need for individual^{\$} to take precautions. He called the probability of medical effects "vanishingly small," and he discounted the possibility of genetic effects, even to the descendants of viewers who might themselves have been exposed to radiation from a seriously faulty set for many years before conceiving a child."

"Until a limit of exposure to radiation from all man-made sources is imposed to safeguard the total population, there remains the chance that at some unknown future time too many people will have become exposed too often to excessive radiation."

"Hence, CU goes along with radiation authorities who advise some modest viewing precautions. There is no justification for worrying that radiation might pass through walls or floors, and we judge those who consider 10 feet a safe minimum viewing distance to be erring on the side of hypercaution. We do advise against habitual viewing distances closer than six feet from a large-screen set (18-inches or more in diagonal measurement). Children should be trained to keep that distance, too. In households with young children, the underside of a color television console should be blocked off so that a child cannot sit with his legs underneath the set."



The following two items were extracted from the August 1968 issue of the Group Circuit Theory Newsletter.

SOCIETY FOR THE HISTORY OF TECHNOLOGY

he Society for the History of Technology (SHOT) is an organization hose name covers its purpose. It is devoted to technology and not a society for the history of science. Although relatively young s societies go, it now has more than 1400 members and publishes quarterly. This journal is not devoted to electrical engineering one, but to all aspects of technology. It serves as a vehicle for iteresting original studies in the history of our broad field.

HOT has recently been admitted to associate membership in EJC us recognizing the interest of engineers in its work. Anyone who ould like to join is invited to write to Dr. Melvin Kranzberg, epartment of the History of Technology, Case Western Reserve niversity, Cleveland, Ohio 44106

IEEE CONFERENCE PUBLICATIONS

Libraries and other technical book centers may now arrange to receive, automatically, as they are published, all new IEEE conference publications. These publications are now available on an OPEN-ORDER-PLAN which enables the purchaser to receive the publication automatically on a ship-and bill basis. This new plan excludes preprints on conference papers and conference issues of Group Transaction. The IEEE is offering subscribers to this plana ten per cent discount off the list price they would normally pay. For further information, write to: IEEE Subscriber Order Unit, 345 East 47th Street, New York, New York 10017.





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ELECTROMAGNETIC COMPATIBILITY GROUP

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