

# Electromagnetic Compatibility Society

Newsletter



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EDITOR: ROBERT D. GOLDBLUM

## NATIONAL BUREAU OF STANDARDS RECEIVES dB AWARD

The dB Society has voted unanimously to award its Traveling Trophy for the year 1983 to the National Bureau of Standards for their:

### *OUTSTANDING INTERNATIONAL CONTRIBUTIONS TO THE FIELD OF ELECTROMAGNETIC COMPATIBILITY*

The Traveling Trophy is awarded yearly to an outstanding individual, company or professional organization for technical contributions to Electromagnetic Compatibility (EMC) endeavors. Past recipients have been the IEEE (1977), Air Force Systems Command (1978), Naval Air Systems Command (1979), North Atlantic Treaty Organization (NATO) in 1980, where the Trophy was on display at NATO Headquarters in Brussels for that year, SAE Inc. for 1981, and the award presently resides with its 1982 winner, the Federal Communications Commission in Washington, D.C.

The dB Society is a fraternity of eminently qualified engineers devoted to excellence in the field of Electromagnetic

Compatibility. Its charter fosters the conservation of the electromagnetic spectrum, promotes the introduction of young engineers into the EMC field, and provides financial assistance to engineering students in pursuit of studies related to the field.

In awarding the trophy to the NBS, the following outstanding efforts and accomplishments were particularly noted:

- Fields characterization group (723.03) for their development of electric probes to measure the near fields of electromagnetic fields
- Interference characterization group (723.04) for the development of the TEM cell for EMI measurements
- Antenna systems metrology group (723.05) for the methods of calibration of EMI antennas

The trophy was presented in recognition of the management, leadership, and support such organizations received from the highest levels of the NBS.

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## SWISS HF EXPERT BORGNIS WAS IEEE DIRECTOR

Fritz E. Borgnis (F), who was active in Institute activities, died recently. He was 75 years old. Dr. Borgnis retired in 1977 from his post as professor of high-frequency electronics at the Federal Institute of Technology, Zurich, Switzerland, and as director of the Institute of HF electronics. He was one of the originators of the Montreux Television Symposium and a member of the ITU World Telecommunication Forum Committee. Dr. Borgnis was chairman of the 1975 and 1977 Montreux EMC Symposiums and also was the originator of this series of EMC symposiums. The fifth of this series will be held in Zurich in March 1983.

Among the IEE positions he held, Dr. Borgnis was a member of the IEEE Board of Directors, Awards Board, and *Spectrum* Editorial Board. He was also chairman of the Switzerland Section.

After graduating with a Ph.D. degree in electronic physics from the Technical University in Munich, Germany in 1936, Dr. Borgnis worked for several years in private industry and research laboratories as a physicist. He then started lecturing at universities in Europe and the United States. Among these were the universities of Munich, Germany; Graz, Austria; and Innsbruck, Austria. In the United States, he taught at Wesleyan University, Middletown, CT., Harvard University, Cambridge, MA., and the University of California at Berkeley. In 1960, he joined the faculty of the Federal Institute of Technology.

Dr. Borgnis received his IEEE Fellow citation in 1962 "for leadership in engineering education and research and contribution in the field of electronics and acoustics."

## NEWSLETTER STAFF

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## EMP AWARDS

Best Paper Awards for 1979 through 15 September 1981 recently were given by the EMP Awards Committee. Each award consisted of a certificate to the author(s), together with \$100 provided by SUMMA Foundation. The awards were presented at the May 26, 1982 banquet held during Joint Symposium 1982, combining NEM 1982 together with the International IEEE Antennas and Propagation Society Symposium and the National Radio Science Meeting (USNC/URSI) held in Albuquerque, N.M.

The awards were received by:

K. S. H. Lee - BEST BASIC EMP SOURCE  
REGION PAPER  
*A Note on EMP Propagation Over  
Imperfectly Conducting Ground*  
Theoretical Note 311, June 1980

F. C. Yang - BEST APPLIED EMP SOURCE  
REGION PAPER  
*A Distributed Source-Region EMP  
Simulator*  
*Sensor and Simulation Note 266,*  
*July 1980*

D. R. Wilton, S.M. Rao, and A.W. Glisson  
BEST BASIC EMP NON-  
SOURCE REGION PAPER  
*Electromagnetic Scattering by  
Surfaces of Arbitrary Shape*  
Interaction Note 388, September  
1979

E. F. VANCE - BEST APPLIED EMP NON-  
SOURCE REGION PAPER  
*On Electromagnetic Interference  
Control*  
Interaction Note 380, October 1979

## EMC SOCIETY MEMBERS RECENTLY ELECTED TO FELLOW GRADE

Four members of the EMC Society have been elected to Fellow Grade, the highest grade of membership in the IEEE. Two of these new Fellows have been very active in the affairs of the society. Warren A. Kesselman serves as treasurer. His citation for Fellow reads "For contributions to electromagnetic compatibility and interference measurement techniques." Harold E. Taggart serves as chairman of the Standards Committee. His Fellow citation reads "For developing standard field-strength measurement techniques." Eric Herz is well known in his position as General Manager of the IEEE. His citation is "For contributions to the development and management of information systems for testing aerospace vehicles and for valuable services to the Institute." The fourth recipient is Professor Chalmers M. Butler of the Department of Electrical Engineering of the University of Mississippi. His citation is "For contributions to aperture theory and to numerical techniques for solving electromagnetic boundary problems."

Fellow grade is the highest grade of membership in the IEEE and is achieved only by election by the IEEE Board of Directors. Nominations for the next (1984) class of Fellows should be considered and action must be taken so that all of the paperwork involved in the nomination can be completed and received by the IEEE Fellow Committee by April 30, 1983.

Any IEEE member, regardless of grade of membership, can act as nominator. In particular, chapter chairmen, members of the EMC Society Board of Directors, and present Fellows, because of their knowledge of the technical accomplishments of other IEEE members, have a special responsibility to see that "outstanding accomplishments" are recognized. Information on the nomination process and IEEE Fellow nominating kits can be obtained from: Staff Secretary, IEEE Fellow Committee, 345 East 47th Street, New York, NY 10017; Telephone 212-705-7750. Call A.H. (Sully) Sullivan, Jr. at 301-881-4033, Jim Hill at 703-451-4619, or Chairman of the Awards and Fellows Committee, Jim Toler, at 404-894-3964 for answers to questions and for help in preparing the nomination.

# **FIFTH SYMPOSIUM AND TECHNICAL EXHIBITION ON ELECTROMAGNETIC COMPATIBILITY**

Held every other year, the Fifth Symposium and Technical Exhibition on Electromagnetic Compatibility will be held in Zurich, Switzerland, March 8-10, 1983. "EMC 1983" will be organized under the auspices of the Director-General of the Swiss PTT, Mr. R. Trachsel, by the Institute for Communications Technology of the Swiss Federal Institute of Technology (ETHZ). The conference is being sponsored by the Association of Swiss Electrotechnicians (SEV/ASE) and will be presided over by Prof. Dr. P. Leuthold of Zurich. Organizing Chairman is Dr. T. Dvorak and the technical program committee is chaired by Prof. R.M. Showers.

Over 100 papers, originating from nearly 20 countries, will be delivered in eighteen sessions titled:

- Environment
- Interference Models
- Propagation and Wave Coupling
- NEMP (Nuclear Electromagnetic Pulse)
- Biological Effects
- Power Electronics
- NEMP Simulation
- Immunity
- Suppression Techniques
- Transmission Line Coupling
- Shielding and Grounding

- EMC Standards
- Non-Homogenous Fields
- Measurements
- EMC Computer Programs
- EMI in Microelectronics
- Spectrum Management
- EMC Analysis and Design

An exhibition and a number of workshops also will be part of the technical program.

The Symposium will review the current status and future trends of the EMC science. The workshops, organized on a question-answer basis in direct contact with the speakers, will provide an introduction to newcomers and will respond to the needs of practicing engineers. The exhibition, which also will be open to the non-registered public, will introduce modern measuring techniques, new technologies in materials and components, as well as EMC training programs. The full text of all conference papers will be made available in the conference proceedings, "EMC 1983."

Copies of the Preliminary Program, with registration forms and further information concerning the symposium and technical exhibition, may be obtained from: Dr. T. Dvorak, ETH Zentum-IKT, 8092 Zurich, Switzerland; Tel.: (+411) 256-2790, or Telex: 53-178 ethbi ch.

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## **GROUP BEING FORMED TO TRAVEL TO THE EMC SYMPOSIUM ZURICH, MARCH 1983**

Over 50 EMC Society members are participating in the 5th Symposium and Technical Exhibition on EMC to be held in Zurich, Switzerland, March 8-10, 1983. There is a saving in transatlantic air fares when a group of five or more can travel together. To take advantage of this saving, we would like to hear from those who plan to attend this EMC symposium and would like to travel in the group. Transportation will be arranged through Swissair, with departure from New York, Boston, and/or Chicago. If we have five or more interested in traveling from each of these cities, we can make up three groups. Reduced add-on fares can be arranged to travel from any location in the USA to any of these three departure points. The group travel package will include hotel accommodations near the Federal Institute of Technology, continental breakfast, and transfer between the airport and

the hotel. These special group rates require a stay of at least 7 days, thus, travel might be Sunday, March 6th, with return on Sunday, March 13th, or on a schedule convenient for members of the group. These arrangements are flexible, within the limits of available accommodations on Swissair and at the hotel. While tickets must be purchased at least 15 days before departure, reservations should be made much earlier to assure that space will be available on the aircraft. Anyone who might be contemplating travel to the Zurich symposium, should get in touch with Jim Hill. Reservations can be made to hold space and, even though they must be cancelled, there is no penalty if no ticket has been purchased.

Contact Jim Hill, 6706 Deland Dr., Springfield, VA 22152; Telephone: 703-451-4619.



# CALL FOR PAPERS 1984 INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY TOKYO, JAPAN OCTOBER 16-18, 1984

Authors are invited to submit papers on the current state of the EMC technology and related disciplines. Original, unpublished papers will be considered in the following areas:

- Noise, Spurious and Harmonics
- Contacts and Gap Discharge Phenomena
- Lightning Surge, EMP and ESD
- EM Field and Lines/Coupling and Crosstalk
- Scattering, TV Ghost Problem and Radar False Echoes
- EM Wave Propagation and Fading
- EM Environments
- Interference and Damages
- Noise and EM Field Measurement and Analysis
- EM Sensor, Probe and Antenna
- Shielding and Grounding/Technique and Material
- EM Energy Absorber/Anechoic Material
- Filter, Transformer and Isolator
- EMI/EMC Test
- Immunity and Susceptibility
- Biological Effects
- Hypothermia
- Non-sinusoidal Signal
- Spread Spectrum Techniques
- Optical and Ultrasonic Application

## EMC IN

- Communication and Automation Systems
- Instrumentation
- CPU/VLSI
- Radio Navigation/Aerospace
- Mobile Communication

- Consumer Products
- Micro Electronics
- Transportation
- High Energy Generation
- Mines
- Spectrum Economy and Management
- Standard, Regulation, Limit and Specification
- EMC Education
- Remote Sensing
- Others

Prospective authors should submit both a 30-50 word abstract and a 500-700 word summary written in English (up to 6 illustrations) that clearly explain their contribution, its originality, and its relevance to the EMC discipline. For anonymity of review, author(s) must be identified only on the cover sheet.

Upon acceptance, authors will receive forms and instructions for preparing materials to be printed in the Symposium Record. If poster session presentation is desired, this is to be indicated on the abstract/summary submitted.

## Abstract and Summary

(Original and 2 copies) . . . . . Jan. 31, 1984

Notification of Acceptance . . . . . Mar. 31, 1984

Camera-Ready Copy . . . . . June 30, 1984

For further information, contact Prof. Takagi, EMC '84 Tokyo, Tohoku Univ., Dept. of Comm., Sendai, Japan 980; Tel.: 0222-22-1800, Ext. 4266; TLX: (Japan) 852771 JAOPA J.

## SYMPOSIUM ON ANTENNAS AND PROPAGATION

The Third International Symposium on Antennas and Propagation (ISAP) Japan is scheduled for Kyoto, Japan, 20-22 August 1985. The Symposium was initiated in 1971 by the Institute of Electronics and Communication Engineers (IECE) of Japan, with the aim of providing a regular forum for discussion and exchange of information about antennas and propagation. The first and second ISAP were held in Sendai, Japan in 1971 and 1978.

This meeting, the third ISAP to be held in Japan, will take place in Kyoto and will treat a wider range of subjects. The theme will be "New Wave Frontiers" and discussions will embrace new insights into various systems in the field of antennas and propagation and related fields. Papers on interrelated topics pertaining to satellite communications,

remote sensing, vehicular technology, EMI, and so forth, will contribute to the theme of the Symposium, in addition to papers on theory, design, practice, and applications of antennas and propagation.

The third ISAP is sponsored by the IECE of Japan and supported by the IEEE Antennas and Propagation Society. The Chairman of the Symposium is Professor Fumio Ikegami, Kyoto University.

Persons interested in receiving the forthcoming announcement of the Symposium are invited to write: Professor Kazuaki Takao, Secretary of the Symposium, Department of Electrical Engineering, Kyoto University, Sayo-ku, Kyoto 606, Japan.

# CHAPTER CHATTER



by Charles F.W. Anderson

On December 7th, the Chapter was addressed by Captain Donald McCullough of the Flight Technology Engineering branch. His topic was "B-1B EMP Program, or How to Survive the Big Pow." He described the hardening approach for the aircraft, which combines structural and wire-level protection. Officers for 1983 were elected at the meeting. They are: Dr. Gary Thiele (Univ. of Dayton, Department of Graduate Research), Chairman; Rudy Beavin (WPAFB Aeronautical Labs), Vice Chairman; and Vic Morats (one of Bill Webb's EMC/EMI group at WPAFB), Secretary. There were 21 attendees at the meeting, including guest Stan Snyder from Boeing Aerospace - Seattle.

## LOS ANGELES

The Chapter's September 23rd meeting featured Kenneth Sanders, of Genisco Technology, who spoke on the topic, "Insertion-loss Testing of Common-core Filters." For the November meeting, Steve Marsden and Al Wilcox of HP - Santa Rosa spoke on "Spectrum Analyzer Use in CISPR EMC Measurements." On December 16th, Bernard Cooperstein, of XEROX - El Segundo, addressed the Chapter on the topic, "Radiation from Printed-wiring Boards." Bernie's talk was an update of the paper which he gave at the Santa Clara Symposium, and presented some new information on control of HF radiated EME from PCB assemblies.

Officers for '82/'83 are: Fred Nichols (LectroMagnetics), Chairman; Larry Toller (Eaton), Vice Chairman; Cal Ursey (Genisco Technology), Treasurer; and Glen Whiting (Lockheed) Secretary. Chapter meetings continue to be held at the Ponderosa, so if you are in the Basin area, call Janet Nichols at LectroMagnetics for times, topics, reservations.

## NEW JERSEY COAST

Continuing a Chapter tradition, the annual Christmas Party was held on December 21st at the Colt's Neck Inn. (Your Column Editor has fond memories of those he attended while a member of the NJ Coast Chapter - we had some *good* times!)

## SAN DIEGO

The Chapter held a meeting on October 13th. The technical program topic was "EMP Effects on Ship Platforms." Speaker Lloyd Duncan (IRT) covered ship EMP response, ports-of-entry for EMP, coupling assessment techniques and platform hardening.

Chapter Officers for '82/'83 are: Bill Johnson (EMT, Inc.) Chairman; Jim Knighten (IRT), Vice Chairman; Al Mills (G.D.E.), Secretary; Lou Messer (Teledyne Ryan) is program Chairman; Roger Hendricson (CERCO) handles membership matters; and Dr. Yih Shiao (to whom we are grateful for the meeting report) has charge of arrangements.

## CENTRAL NEW ENGLAND

The Chapter held its first meeting of the '82/'83 season on November 18th at the Chomerics' facility in Woburn, MA. Charles Kvist, Senior VP/Chief Scientist of Chomerics was the speaker. His topic was "Composite Conducting Materials for EMI Shielding and Transient Suppression for EMP and ESD." The talk was followed by a tour of the laboratories at Chomerics. Attendance was about 40, of which around half were Chomerics' staff members. Chapter Chairman John Clarke reported that it was a most instructive and educational meeting.

CNE's next meeting is to be held on February 9th, with the subject being "EMI Engineering for Advanced Rail Transient Applications." Additional meetings are in the planning stage.

## DAYTON

The first meeting of the season was held on October 19th in the Officers' Club at WPAFB. Dick Richmond, of the AFWAL Flight Dynamics Lab, gave a talk titled "Rocket-Triggered Lightning" (subtitled: An Enlightening Experience). He described the work on triggered lightning carried out by his group in the New Mexico mountains during the summer of 1982. Small solid-fueled rockets were used to launch wires into clouds so that measurements of lightning characteristics could be made. The activities were given a fine write-up in the Dayton Daily News for September 9th. Follow-on phases of the project, it is anticipated, will lead to improved lightning hardening of aircraft. There were 12 attendees.

## TOKYO

Again - those impressive lists from Professor Sato of the papers presented at our Far East Chapter's meetings! At a two-day meeting in Sendai on September 20th and 21st, a total of 19 papers was presented. Topics included such items as a skewed-element yagi antenna for reducing TV reception ghosts, modeling of intra-system EMI, and low-pass filters using nonuniform transmission lines. Eight papers were presented at the October 26th meeting in Tokyo. Among the papers was one on a transient-hardened programmable sequence controller for industrial installations and one on shielding effectiveness of conductive plastics. Seven papers were presented at the November 25th meeting, including Professor Sato and Dr. Kami's report on the Santa Clara Symposium.

## GENERAL COMMENT:

Sy Krevsky, NJ Coast Chapter Chairman, was the *only* reporter who sent me a copy of the meeting report form.



**Richard B. Schulz**  
**IIT Research Institute**  
**Annapolis, Maryland 21401**

## TECHNOLOGY-ALERTING INDEX

This index lists recent manuscripts received (but, not yet accepted) for publication in the EMC Transactions. New indexing symbols are included to indicate the subjects treated. For details on the meaning of these symbols, refer to the editorial "Coding Scheme for a Technology-Alerting Index" which appeared in the May 1982 issue of the EMC Transactions. Draft copies of the manuscripts may be available, upon request, from participating authors.

- Ble 82-37 Frequency Characteristics of Atmospheric Noise at New Delhi - R. A. Agarwala, Department of Electronics & Comm. Engr., Regional Engineering College, Kurukshetra - 132 119, India. Telephone 83. B1d
- G6d 82-38 Varactor Tuning Diodes as a Source of Intermodulation in RF Amplifiers - J. H. Mulligan, Jr., School of Engineering, Univ. of California, Irvine, CA 92717, (714) 833-6486; and C. A. Paludi, Jr., Rome Air Development Center, RADC/RBCT, Griffiss AFB, NY 13441, (315) 330-2563.
- K4d 82-39 Frequency Coordination and Spectrum Economics - C. E. Agnew, Department of Engineering-Economic Systems, Stanford University, Stanford, CA 94305, (415) 497-3674, and R. G. Gould, Telecommunications Systems, Washington, D.C.
- H99 82-40 Conducting Radio Astronomy in the EMC Environment - P.J. Waterman, The Mitre Corporation, P.O. Box 208, Bedford, MA 01730, (617) 271-7345. B7j, B3j, B10j.
- F12d 82-41 Field Coupling Through Circular Apertures - W. T. Cathey, Department of Electrical and Computer Engineering, University of Colorado, 1100 Fourteenth Street, Denver, CO 80202. F12e.
- 11d 82-42 A Hybrid Method of Moments--GTD Technique for Computing Electromagnetic Coupling Between Two Monopole Antennas on a Large Cylindrical Surface - S. A. Davidson, ASD, Wright-Patterson AFB, OH 45433 and G. A. Thiele, School of Engineering, Univ. of Dayton, Dayton, OH 45469, (513) 229-2241
- H24j 82-43 On Impulsive Noise from Shin-Kansen - T. Nakai and Z. Kawasaki, Research Institute of Atmospherics, Nagoya University, Toyokawa, Aichi, 442, Japan, Telephone: 05338-6-3154. B3e.
- H24j 82-44 Measurement and Analysis of Radiated Electromagnetic Emissions from Rail Transit Vehicles - A. J. Mauriello and J. M. Clarke, ESD/SCTE, Hanscom AFB, Bedford, MA 01731, (617) 861-2655. B3e.
- 14d 82-45 A Partial Loop Source of E and H Fields for Antenna-Factor Calibration (A Loop Cell) - R. G. FitzGerrell, National Bureau of Standards, Boulder CO 80303, (303) 497-3737. A2j.
- H22j 82-46 Effects of CW Interference on the Carrier Tracking Loop of the Deep-Space Network - M. K. Sue, Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109, (213) 354-5084. B13j, G8d.
- J8j 82-47 Comment on "Calculation of Site Attenuation from Antenna Factors" - W. S. Bennett, Desktop Computer Division, Hewlett-Packard Company, 3404 East Harmony Road, Fort Collins, CO 80525, (303) 226-3800. 199j.
- 199d 82-48 A New Strip-Transmission Line as a Leaky-Feeder - M. F. Iskander and M. A. K. Hamid, Dept. of Electrical Engineering, Univ. of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2, (204) 474-9641. J8d.
- D7i 82-49 New Types of Helix-Coupled Leaky Transmission Lines for Special Communications - M. A. K. Hamid and H. Orgut (see 84-48). J8d.
- B10d 82-50 Analysis of Spaceborne VHF Incidental Noise Over the Western Hemisphere - E. N. Skomal, The Aerospace Corporation, Post Office Box 92957, Los Angeles, Ca 90009, (213) 648-7024. B11d, B11e, H12j.
- J1d 82-51 Propagation of Surface Waves on a Buried Coaxial Cable with Periodic Slots - J. H. Richmond, Ohio State University, ElectroScience Laboratory, 1320 Kinnear Road, Columbus, OH 43212, (614) 422-7601. D9d, D7d, I10d.
- 82-52 The University of York Undergraduate Course in EMC - A. C. Marvin, Department of Electronics, University of York, York, YO1 5DD, England, Telephone: 0904 59861, ext. 5565.
- 16d 82-53 Analysis of Thin Wires Loaded by Negative Impedance Amplifiers - M. Hamid and R. Antebi, The University of Manitoba, Department of Electrical Engr., Winnipeg, Manitoba, Canada, R3T 2N2, (204) 474-9603.
- 110d 82-54 Electromagnetic Near Fields as a Function of Electrical Size - A. T. Adams, Department of Elec. & Computer Engr., Syracuse University, Syracuse, NY, 13210, (315) 423-4397.
- 111d 82-55 Feedline Perturbation of Dipole Antenna Radiation Patterns - C. W. Trueman and S. J. Kubina, Loyola Campus, 7141 Sherbrooke Street West, Montreal, Quebec H4B 1R6. I2d, D2d.

# EMC SOCIETY STANDARDS ACTIVITY

**Richard B. Schulz**  
IIT Research Institute  
Annapolis, Maryland 21401

On 30 September 1982, Bud Taggart stepped down from chairing the EMC-S Standards Committee. Bud was replaced by Don Heirman. We would like to thank Bud for all his efforts the past many years he chaired the committee.

We now present a brief review of the standards activity for 1982. The most recent item came from IEEE headquarters. On October 29, 1982, Paul Lange, IEEE Standards Program Manager, requested that our Society and, in particular, the Standards Committee, review our role with the American National Standards Institute. As you know, we have close ties with and representation on ANS committee C63 (Radio-Electrical Coordination) and C95 (Radio-Frequency Radiation Hazards). We have to make a choice if this coordination and representation will continue. We will report the deliberations in the next Newsletter.

As of the end of the 1982 year, our standards committee is responsible for the following standards:

## *ELECTROMAGNETIC COMPATIBILITY SOCIETY*

139-1952	<i>Measurement of Field Intensity Above 300 MHz from Radio-Frequency Industrial, Scientific and Medical Equipments</i>
140-1950	<i>Minimization of Interference from Radio-Frequency Heating Equipment</i>
187-1951	<i>Open Field Method of Measurement of Result of Spurious Radiation from FM &amp; TV Broadcast Receivers</i>
213-1961(R1974)	<i>Radio Interference: Methods of Measurement of Conducted Interference Output to the Power Line from FM and TV Broadcast Receivers in the Range of 300 kHz to 25 MHz [C16.25-1962]</i>
214-1961	<i>Construction Drawings of Line Impedance Network Required for Measurement of Conducted Interference to the Power Line from FM and TV Broadcast Receivers in the Range of 300 kHz to 25 MHz</i>
263-1965	<i>Measurement for Radio Noise Generated by Motor Vehicles and Affecting Mobile Communications Receivers in the Frequency Range of 25 to 1000 MHz</i>
299-1969	<i>Measurement of Shielding Effectiveness of High-Performance Shielding Enclosures</i>
376-1975	<i>Measurement of Impulse Strength and Impulse Bandwidth [C16.60-1976]</i>
377-1980	<i>Spurious Emission from Land Mobile Communication Transmitters</i>
473-198x	<i>Electromagnetic Site Survey (10 kHz to 10 GHz)</i>
P475-198x	<i>Field Disturbance Sensors</i>
P476	<i>Susceptibility of Non-Implanted Cardiac Pacemakers</i>
P478	<i>Method of Testing Connector Shielding Effectiveness</i>
P482	<i>Method of Testing Cable Shield Transfer Impedance</i>
P509	<i>Measurement of the Shielding Characteristics of EMI Baskets and Fingerstock</i>
P626	<i>Signal Grounding Practices</i>



The status of these standards as of December 1982 and the respective chairpersons for each is summarized as follows:

<i>STANDARD</i>	<i>W/G CHAIRMAN</i>	<i>STATUS</i>
139-1952	Jim Klouda	No action being taken; W/G chairman reviewing action to be taken
140-1950	Gene Knowles	Ballot sent 1/82; 10 or 15 returned (less than 75%); 8 approved, 2 disapproved
187-1951	Dr. R. Sato	Ballot on revision sent 11/12/82; 2 returned to date; due 12/17/82
213-1961	Hank Knoller	Ballot sent 1/82; 13 of 15 returned; 11 approved, 2 disapproved; W/G chairman to resolve disapprovals and prepare new version for ballot
214-1961	Hank Knoller	Ballot sent 1/82; 13 of 15 returned; 12 approved, 1 disapproved; W/G chairman to resolve disapprovals and prepare new version for ballot
263-1965	Jack Newbauer	Ballot sent 2/16/82; 6 ballots returned (less than 75%); 2 approved; 4 disapproved; Responses from majority of standards committee due. W/G chairman should determine if other standards such as SAE/CISPR have more appropriate work and, hence, this activity should be dropped. Comments also should be sent to Neal Sheppard.
299-1969	Dick Schulz	W/G Chairman has been funded to proceed with this revision as part of his government work; expect ballot by mid-1983.
376-1975	Ralph Showers	IEEE Standards Board conditionally approved pending resolution of some questions. Understand all questions answered satisfactorily; W/G chairman to question why IEEE has not published this yet.
P377	Jack Newbauer/ Ralph Showers	Newbauer saw galley proofs; W/G chairmen to inform Standards committee chairman why this is not published. IEEE Standards Board indicates there is an ANSI public review pending-advise.
P473	Ed Skomal	Approved and reported to be in printing last Sept. 1982; W/G chairman advise release date to public sales.
P475	Ralph Taylor	Approved and reported forwarded to printer May 21, 1982. W/G chairman advise why IEEE has not published it.
P476	(No chairman)	Project to be withdrawn 7/21/82; AAMI may have a standard already; if no interest is shown, no renewal of project will be requested.
P478 P482 P509	George Kunkel	SAE Standards on subject being prepared; W/G chairman to determine if further EMC-S effort is warranted on this project.
P626	Hugh Denny	Atlanta Chapter working on draft (J.A. Woody, D.P. Miller identified); outline due 9/82; committee formed 12/82; Circulate draft 6/83; ballot draft fall 83; W/G chairman to submit outline and committee members by 12/82

Other Projects which may get to the PAR stage:

Surge Protection Devices      Ed Vance

IEEE Standard 587-1980 may apply; W/G chairman recommends that PES prepare standard with W/G chairman as resource; Chairman send letter to G.L. Gaibrors (Detroit Edison) — Taggart to provide draft of letter.

Home Appliance Control                      ?

No chairman assigned; if no interest, this will be dropped.

Absorber Lined Room Usage                      ?

Chairman wanted

Automatic EMC Testing                      ?

Chairman wanted

As you can see, we have a heavy load and variety of topics that need attention. We are responsible for some key standards. As usual, we need volunteers badly. If you feel you or your chapter can contribute, *please call* the Chairman, Don Heirman, on 201-949-5535. You also may want to contact the various chairpersons directly. Their phone numbers were distributed to all members last year in your EMC-S Committee Directory. Let's hear from you.

For reference, the EMC-S Standards Committee as of 12/31/82 is as follows:

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Harold A. Gauper, Jr., General Electric Company Corp., R&D, Building 37, Room 679, 1 River Road, Schenectady, NY 12345, Phone: 518-385-3422

Prof. Risaburo Sato, Department of Information Science, Faculty of Engineering, Tohoku University, Sendai, JAPAN 980

Feel free to contact any member if you want to ask any questions or to suggest new standards activity.

### MEMBER CONFIRMATION FORM

Each member renewing 1983 IEEE membership will have mailed to them a Member Record Confirmation form. This autumn, members who may qualify for Senior Member grade also will have included with the mailing a Senior Member application request form. These members are urged to return the request form with their Member Record Confirmation form to assure receiving Senior Member grade information and application. IEEE encourages all members to hold the highest grade of membership for which they are qualified. If you are a Senior in the profession, you should be a Senior in your Professional Society. When you renew membership and receive this important mailing, be sure to request a Senior Member grade application.

## ELECTROMAGNETIC SCATTERING

The following review of *Electromagnetic Scattering and its Applications* by L.P. Bayvel and A.R. Jones (Applied Science Publishers, London and New Jersey, 1981) originally appeared in the June 1982 *IEEE Antennas and Propagative Society Newsletter*. The 289 page volume was reviewed by Prof. Kenneth Demarest, Lafayette College, Easton, Pennsylvania.

From the title of this book, one might expect its scope to be similar to that of *Electromagnetic Scattering*, edited by P.L.E. Uslenghi. However a quick glance through the table of contents reveals that the authors' view of the subject is quite different from what we might have expected. Being chemical engineers, their interest in electromagnetic scattering stems from its usefulness in determining the physical properties of material media.

This book consists of six chapters, which are, in general, well written and laid out in a logical order. It is assumed that the reader is familiar with the fundamentals of electromagnetic theory; but, need not be an expert in optical inverse scattering techniques or radiative transfer analysis—the major topic considered in this book.

Before giving a chapter-by-chapter review of this book, two more general observations are in order. First, this work is most concerned with the scattering properties of random collections of simple scatters (such as clouds and aerosols) and not those of arbitrarily shaped bodies. This, of course, makes this book of limited usefulness to those interested in the scattering properties of deterministic geometries. On the other hand, those interested in the scattering properties of statistical scatters and inverse diffraction techniques will find this book useful.

Second, although adequate background material is presented in each section, the major emphasis in this book is to present material covering the advances of the past fifteen to twenty years. This is particularly true in the chapters on optical inverse scattering.

Chapter 1 begins by reviewing some fundamental aspects of scattering such as scattering cross-section, extinction, propagation, and the scattering matrix. This is followed by a thorough discussion of the major canonical solutions that are available in electromagnetic scattering: the sphere, the infinite cylinder, and the ellipsoid. The small particle approximations of these solutions also are discussed. Other topics

addressed here include Fraunhofer and anomalous diffraction, geometrical optics, and integral formulations of scattering problems.

Chapter 2 deals with the nature of the radiative transfer of electromagnetic energy through particle clouds. The equation of radiative transfer is developed, taking into account primary scattering, black body re-radiation, and multiple scattering effects. For cases involving multiple scattering, several numerical and approximate techniques for solving the resulting nonlinear differential equation are presented.

Chapter 3 addresses the problem of determining particle size distributions from scattering measurements. A sizable number of techniques are presented, utilizing both Fraunhofer and anomalous diffraction effects. Two types of inversion techniques are discussed: those in which the data is fitted to an assumed distribution function, and those which invert the data directly with no a-priori assumptions. Much of the material in this chapter summarizes recently published work.

Chapter 4 presents experimental procedures and techniques presently used to obtain the scattering data necessary to determine particle size distributions. The techniques are categorized according to the analytical techniques used to interpret the data.

Chapter 5 discusses measurement techniques for determining three other physical characteristics: velocity distribution, refractive index, and degree of anisotropy.

Chapter 6 contains an impressive dossier of studies performed in industry and research where many of the techniques described in this book have been utilized to determine various physical parameters of scattering media. Some of the studies described in this chapter involve steam turbine operation and cooling, particle sizes in a flame, crystal growth rates, and the size distribution in liquid and gaseous aerosols.

In summary, this book is well written and gives thorough review of the analytical and experimental techniques associated with optical scattering by random media. In spite of the fact that much of this work is oriented toward the types of scattering situations encountered by chemical engineers and chemists, the techniques presented here are very much applicable to many RF and microwave scattering problems involving random media.

# SURVEY DATA

## 1982 EMC SYMPOSIUM ATTENDEES

Ernest R. Freeman

Data were gathered at the 1982 EMC Symposium in Santa Clara. Unfortunately, there was a very limited response to the survey and only 31 questionnaires were submitted out of the approximately 700 attendees. It is, therefore, difficult to determine how representative such a small sample is of the overall attendance. The results do, however, correlate well with expected values based on overall IEEE data. Comparisons with prior data are presented below. Salaries are considerably above the 1981 IEEE survey data. The latest applicable data found was the Washington/Northern Virginia Section 1982 survey data. The symposium data shows salaries slightly above the section data until about 15-20 years of experience and then falling below as years of experience increase. The Washington/Northern Virginia group salary levels historically have been higher than other areas.

The overall employment trend appears to be more optimistic than in 1980, but, less optimistic than in 1979. There was a much higher percentage of non-members at the 1982 symposium. There appears to be a dramatic increase in professional engineer registration and in supervisory responsibility.

	1979	1980	1982
<i>IEEE Membership Grade</i>			
None	8.5%	4.3%	19.4%
Associate	3.4%	3.2%	9.7%
Member	64.4%	67.7%	48.4%
Senior Member	19.5%	19.4%	12.9%
Fellow	4.2%	5.4%	6.5%
<i>Highest Earned Degree</i>			
None	4.6%	4.8%	3.2%
Associate	5.3%	1.9%	3.2%
Bachelor	41.1%	42.9%	35.5%
Professional Degree	3.3%	4.8%	3.2%
Master	31.8%	31.4%	38.7%
Doctorate	13.9%	14.3%	16.1%
<i>Employment Status</i>			
Employed full-time in EMC area	62.3%	71.2%	67.7%
Employed full-time in other than EMC area	18.5%	16.8%	12.9%
Employed part-time in EMC area	15.8%	11.2%	19.4%
Unemployed involuntarily	0%	0%	8%
Unemployed voluntarily	0%	0%	0%
Retired-not available for employment	0.7%	0%	0%
Retired-available for employment in EMC area	0.7%	0%	0%
Self employed	2.1%	0.8%	0%
<i>Registration/Organized Representation</i>			
Registered Professional Engineer	20.3%	27.6%	38.7%
Engineer in Training	6.1%	5.1%	9.7%
Certified Engineering Technician	2.7%	3.1%	3.2%
Member Professional Bargaining Unit	3.4%	0%	0%
None	67.6%	64.3%	48.4%

### Supervision Responsibility

No Supervision Responsibility	19.1%	27.2%	12.9%
Indirect or Staff Supervision	19.7%	28.7%	32.2%
Supervise Team or Unit	19.1%	16.8%	6.5%
Supervise Project or Section	21.1%	7.9%	25.8%
Manage Department or Division	12.2%	13.9%	22.6%
General Management	7.8%	3.0%	3.2%
Self Employed	2.0%	2.0%	3.2%

### Number of Years of Professional Experience

Average (Years):	19.9	18.6	20.6
< 2 yrs.	1.5%	5.6%	6.5%
2 - 4 yrs.	1.5%	4.4%	
5 - 9 yrs.	11.4%	12.2%	12.9%
10 - 14 yrs.	18.9%	13.3%	19.4%
15 - 19 yrs.	13.6%	10.0%	16.1%
20 - 24 yrs.	18.2%	17.8%	12.9%
> 25 yrs.	34.8%	36.6%	35.5%

### Present Annual Base Compensation or Salary

Under \$10 K	0%	1.0%	0%
\$10 - 20 K	4.7%	2.0%	0%
\$20 - 30 K	41.3%	28.4%	6.5%
\$30 - 40 K	35.3%	41.2%	35.5%
\$40 - 50 K	14.0%	19.6%	32.3%
\$50 - 60 K	4.7%*	7.8%*	19.4%
\$60 - 70 K			6.5%

\*50 K and above

### Number of Employees in Your Entire Company or Institution

1 - 99	11.2%	7.6%	6.5%
100 - 199	2.6%	3.8%	9.7%
200 - 499	9.2%	9.4%	6.5%
500 - 1499	14.5%	22.6%	12.9%
1500 - 2999	13.2%	16.0%	16.1%
3000 - 4999	9.9%	9.4%	6.5%
5000 - 9999	9.2%	5.7%	9.7%
10000 & Over	30.3%	25.5%	32.3%

### Number of EMC/EMI Employees at Your Place of Work

1 - 4	43.9%	39.2%	40%
5 - 9	18.2%	20.6%	20%
10 & Over	37.9%	40.2%	40%

### Are you Active In

EMC Chapter	50.7%	55.0%	48.4%
Other Technical Chapters	21.2%	16.3%	19.4%
IEEE Section	26.0%	28.7%	32.2%
Student Activities	1.4%	0%	0%

### Which of the Following Are Useful to You (Multiple Response)

EMC Symposia (held in USA)	34.0%	35.3%	100 %
EMC Symposia (held outside of USA)	8.3%	7.8%	16.1%
EMC Transactions	26.5%	28.6%	80.6%
EMC Newsletter	23.1%	18.4%	71.0%
EMC Chapter Symposia	8.1%	9.8%	22.6%

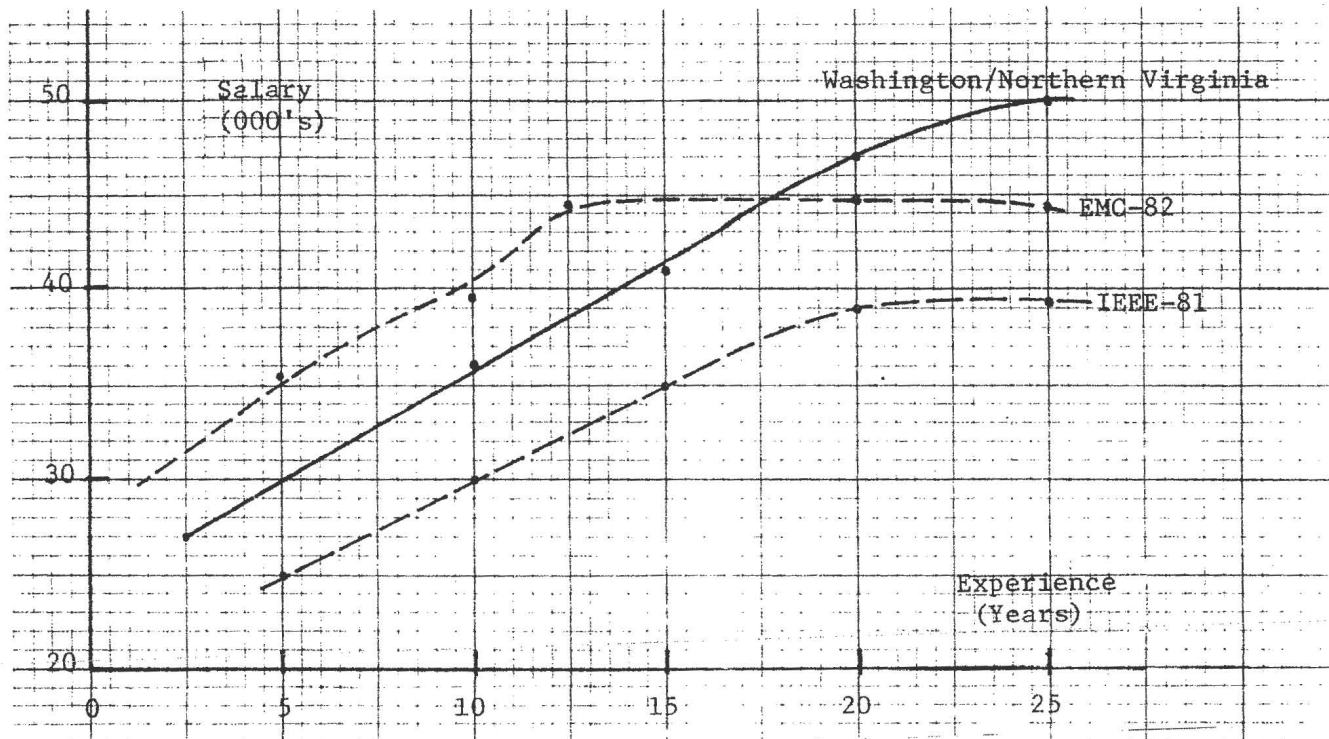
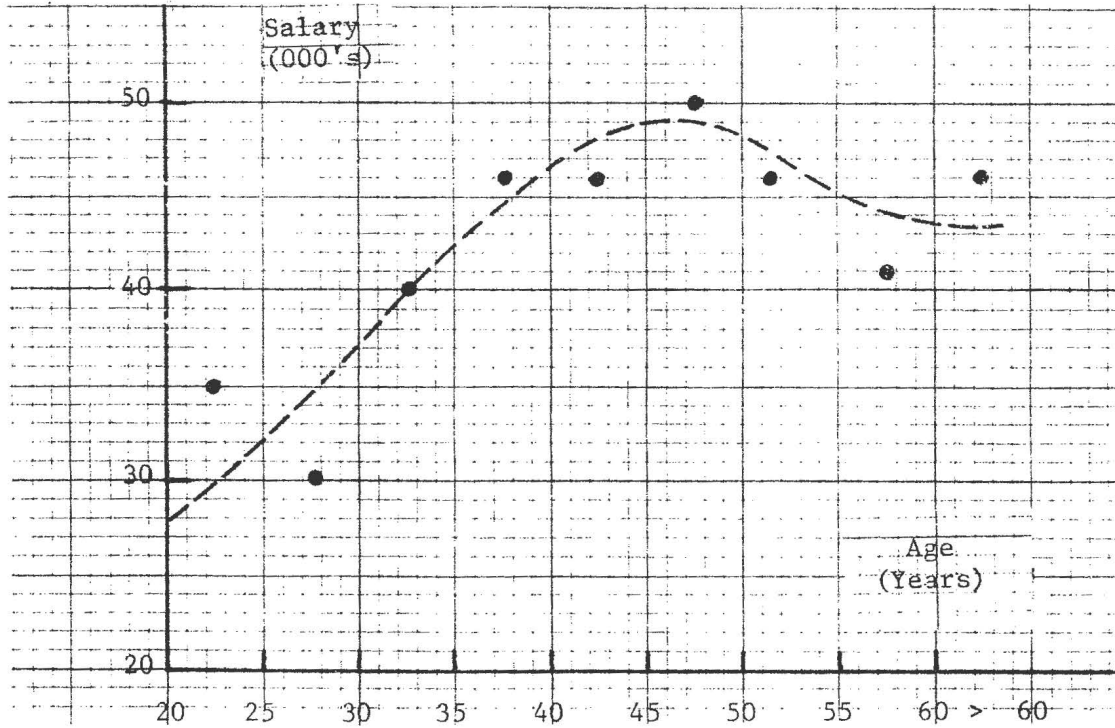


Do You See A Reduction of  
EMC Engineering  
Manpower in Your Company  
If so, indicate the time when this  
might occur:

Three Months	0%	2.4%	3.3%
Six Months	2.0%	1.2%	0%
One Year	1.4%	3.6%	3.3%
Two Years	1.4%	4.8%	0%
No Opinion		10.7%	6.6%
No Reduction	95.2%	77.4%	86.7%

Do You See An Increase in  
EMC Engineering  
Manpower in Your Company  
If so, indicate the time when this  
might occur:

Three Months	28.7%	28.4%	20.6%
Six Months	21.3%	14.7%	17.7%
One Year	16.4%	7.4%	23.5%
Two Years	8.2%	11.6%	2.9%
No Opinion		20.0%	8.8%
No Increase	25.4%	17.9%	26.5%



# Book Reviews

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by Jim Hill, EMXX Corporation.

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In the last issue, we promised a review of another filter book, a design manual, and the English edition of the Polish EMC book, "Electromagnetic Compatibility in Radiocommunication Systems". Sorry to say, only one of these reviews has come through: the design guide, "Electromagnetic Compatibility Design Guide for Avionics and Related Ground Support Equipment" by Freeman and Sachs. We are indebted to "Sully" Sullivan for the review. In place of the other two reviews, we have a book on wave propagation theory reviewed by Prof. Henning Harmuth and a book by Ed Skomal on automatic vehicle locating systems. Ernie Freeman, co-author of the design guide mentioned above, is the reviewer.

I'll mention three reviews that are in the works for the next issue: an electronic filter design handbook, the Polish EMC textbook, and an introduction to electromagnetic fields. These are in the works; but, no promises.

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*"Wave Propagation Theory"*

by

J.R. Wait

*Published by Pergamon Press Inc.*

*Maxwell House, Fairview Park*

*Elmsford, NY 10523*

*Copyright 1981*

*Hardbound, 348 pages, \$42.50; Paperback: \$22.50*

*Reviewed by Henning F. Harmuth*

*Catholic University, Washington, DC 20064*

This book is primarily a collection of previously published articles; 14 of the 23 chapters are reprints, four of them from the author's book, "Electromagnetic Waves in Stratified Media". Here is a listing of the topics of the reprinted chapters: reflection from stratified media; magneto-telluric fields (these are very slowly varying fields caused by earth currents); surface impedance of a spherically stratified conductor; excitation of the HF surface wave by vertical and horizontal apertures; fields of a dipole over an homogeneous anisotropic half-space; asymptotic evaluation of the field of a vertical dipole over an impedance plane surface; transmission in an idealized earth crust waveguide; reflection from inhomogeneous media with special profiles; approximate methods for inhomogeneous media; high frequency electro-

magnetic coupling between small loops over an inhomogeneous half-space; reflection of VLF radio waves from an inhomogeneous isotropic ionosphere; reflection from a lossy magnetoplasma half-space; EM propagation in the earth-ionosphere waveguide; guiding of microwaves by an elevated tropospheric layer.

Among the newly published chapters are two on the Zenneck wave; this is a wave propagating along the boundary of two homogeneous media such as the earth and the atmosphere, but also along the surface of an open waveguide. Two more chapters are on wave propagation in the ionosphere duct, one about scattering at irregularities in the duct, the other about mode conversion due to a changing refractive index along the propagation path. Further chapters are on the radiation of a horizontal dipole over a horizontally stratified medium, and the field of a circular current loop in a two-layer earth.

A book of this type consisting of a collection of previously published papers, sections of a book, reports, and, perhaps, papers in preparation for publications is primarily of interest to those requiring specialized information on the various topics covered. One cannot give an overall evaluation of this kind of book that goes beyond stating that the author is one of the best known scientists in the field of wave propagation.

*"Electromagnetic Compatibility  
Design Guide  
for  
Avionics and Related  
Ground Support Equipment"*  
by

Ernest R. Freeman  
and

Herbert M. Sachs

Published by Artech House, Inc.  
610 Washington Street, Dedham, MA 02026

Copyright 1981

Sofibound, 227 pages, \$30.00

Reviewed by A. H. Sullivan, Jr.

This book has been a long term (9 years) project of the staff of Sachs/Freeman Associates, Inc., and originally was published as NAVAIR AD1115. The publication was developed specifically to provide EMC guidance in connection with development and design of Navy Ground Support Equipment, with particular reference to electromagnetic environments (especially shipboard environments) in which avionics-oriented GSE must operate.

The book contains three chapters on shielding, bonding and grounding. Although much of this material is well-known, the approach here is with special reference to the avionics GSE EM environment. Of particular interest is the material on testing to determine the effectiveness of shields, bonds, and grounds. In a separate chapter, generalized testing requirements and techniques are discussed, including emission tests, susceptibility tests and transient tests, as well as use of EMC test instrumentation and enclosure.

Chapter 1, the Introduction, points up the special EMC problems of GSE, and Chapter 2 continues with a discussion of the sources and coupling of EM energy in the GSE environment. In a following chapter, Design Considerations are discussed, including specific examples of avionic and GSE designs, related material on flight and hangar deck operation, and shop testing.

Important material on EMC Control and Test Planning is contained in Chapter 4, with a complete discussion of the purpose of such plans, the specifications and other documents that are applicable, and the program management requirements.

In Chapter 10, a summary is presented, in tabular form, of 32 military specifications and standards applicable to GSE, as well as information on how to obtain them. There is also tabulated information on NASA Marshall Space Flight Center EMC Specification 279.

The book contains a very large number of illustrations, graphs and tabulations of specific interest to GSE designers. In Chapter 11, there is a collection of miscellaneous nomographs and tables useful in GSE design, including decibel tables, and various tables, equations and nomographs for calculation of EM wave shielding parameters, field strength and power density, cable separation distance, transmission path loss and other useful material.

One of the most important parts of the book is Chapter 8 on Filtering. Rather complete and thorough coverage is provided on general filter design; transient suppression; active power line filters; noise blanking, cancelling and limiting circuits; filter tests; filter installation and mounting; and methods of specifying filters. The authors have wisely pointed out that a thorough EMC control plan and EMI-free circuitry and equipment construction in the original design is the preferred procedure. Filters should be considered as only one of various alternatives in the design and installation process.

The book is well written, technically sound and, obviously, has been prepared for professional engineers and others with a background in electronics and electromagnetic compatibility. In my opinion, the book would be a valuable guide for anyone who must design or use equipment which is to operate in an environment of dense electromagnetic fields of various powers, frequencies and modulation types. I would expect that the many charts, tabulations and nomographs collected together in one place would not only materially assist the designer in getting the job done; but, would be a real time-saver since there would be no necessity for hunting through a number of books or documents for technical data specifically applicable to his job.

*"Automatic Vehicle Locating Systems"*  
by

Edward N. Skomal

Published by Van Nostrand Reinhold  
7625 Empire Drive, Florence, KY 41042

Copyright 1981

Hardbound, 336 pages, \$28.50

Reviewed by Ernest R. Freeman

Although this book is not specifically concerned with EMC, the author has, in other works, contributed much to the EMC field, and the concluding chapter of this book contains a valuable discussion of land mobile radio systems, ambient noise, and propagation models that anyone concerned with the interference aspects of these systems will find valuable.

The concerns of an AVL system user and operator are given prominence throughout this text, which opens with a basic discussion of the AVL system concept and how AVL systems may be employed. The reader is introduced to several applications of this technology, applications that have been field tested with differing technical approaches. The breadth of technical solutions now commercially available is emphasized by three categories of locating techniques: dead reckoning, proximity, and trilateration, all of which are defined in Chapter 1.

Vehicle operators and users may be segregated into one or two functioning categories, mass transit or vehicle dispatch services. The measurable benefits of AVL systems to each is treated separately. The contribution to either that can be expected from an AVL system deployment is discussed in Chapter 2. This contribution can be measured either by a

reduction in capital investment (usually by the number of required mobiles) or in the time needed to execute the service, or both. The required fleet size for a stipulated quality of service or the time to respond to a dispatch initiation are related to the position determining the accuracy attainable in any AVL technique in Chapter 2. From this treatment, a user or operator may judge the potential performance benefit from varying levels of AVL system sophistication that are reflected in the AVL system costs. Further, the user and operator are, thus, able to assess their minimum requirement for positioning accuracy, based on the costs and time savings. A system designer can use the information given in Chapter 2 to relate potential user and operator benefits to the capabilities of the six commercially available AVL techniques that are presented in the first three chapters and, thus, able to select the desired precision in vehicle position estimation.

Chapters 3-5 present separate treatments of the technology of dead reckoning, proximity, and trilateration AVL systems, respectively. Each of the three AVL system categories is addressed in a similar manner. Equipment configurations are presented and examined, stressing the features that are of importance to both users and AVL system designers. Principles of operation are analyzed; this leads to the critical measure of AVL system position estimation accuracy.

Chapters 3, 4 and 5 each discuss two commercial embodiments of each AVL system category, addressed in com-

parable depth and from both a user's and a system designer's viewpoint. In all cases, the primary measure of AVL system performance, position estimation accuracy, is analyzed for its functional dependence upon equipment characteristics, such as odometer error or receiver noise figure, or dependent physical process, for instance, radio path loss or man-made radio noise level. Parametric interdependencies are presented between position determination accuracy and the many independent system design and physical process variables. Analytic models and graphic aids are included for subsequent system design applications. Examples of AVL system accuracy are calculated for each of the six commercially available methods. Whenever experimental performance data on AVL system position accuracy are known, they are compared with the theoretical results obtained using the performance models derived in Chapters 3-5. The comparisons exist for five of the six AVL system embodiments treated in the book.

This book is a valuable and unique reference for those involved in AVL system design, analysis or operation. It also contains data that those involved in EMC for land mobile radio systems will find worthwhile in their work.

The final chapter contains radio noise data for the land mobile radio bands and step-by-step methods to determine received signal levels. This chapter also includes a section on FCC regulations concerning AVL systems.

## EMCABS

In this issue, we are publishing 60 abstracts. These are abstracts on various EMC topics. We plan to continue publishing abstracts of papers from previous EMC Symposia and from other conferences. The EMCABS committee is composed of the members listed below. By way of introduction to the community, they are listed with their company affiliations.

L.F. Babcock, Bell Aerospace Textron  
E.L. Bronaugh, Southwest Research Institute  
R.N. Hokkanen, Naval Training Equipment Center  
R. Jacobson, Sperry Flight System

D.R. Kerns, Southwest Research Institute  
S. Kuniyoshi, Naval Sea Systems Command  
R.B. Schulz, IITRI/ECAC  
R.M. Showers, University of Pennsylvania



MELVIN J. JOHNSON

**"HOW CAN I GET A COPY OF AN ABSTRACTED ARTICLE?"** The answer to this frequently asked question follows.

Most large public libraries, some small public libraries, all engineering school libraries, and most other college or university libraries have copies of publications in which articles appear. If they happen not to have the desired publication, such libraries usually can obtain it or a copy of the article from other libraries or sources. Many company libraries, both large and small, also have such arrangements. Many articles also are available from the National Technical Information Service (NTIS) and/or the Defense Technical Information Center (DTIC). To retrieve an article or publication containing an article abstracted in EMCABS, it is suggested that you contact your company library, a nearby engineering school library, a university library, or your municipal public library. If the library does not have the publication, go to the librarian, explain what you need and he or she will help you get the publication on loan, perhaps, from another library, or for a nominal charge, from NTIS. If you have a Department of Defense contract, the contracting officer, or your company librarian, can help you get publications from DTIC. The information needed is contained in the EMC abstract heading.



Development and Evaluation Program-Electromagnetic Systems Compatibility  
K.A. Davis, W.B. Grant, E.L. Morrison, and J. Juroshek  
Battelle Pacific Northwest Labs., Richland, WA.  
Contract AC06-76RL01830, DOE/ER-0096, PC AO5/MF AO1  
Jan 81, 93p

EMCABS: 1-1-83

**ABSTRACT:** The EMC analysis addressed only the direct effects of electromagnetic emissions from the SPS on other technological systems. Emissions were defined quite broadly, including not only those from the microwave system, but also thermal blackbody emission and scattered sunlight from the satellite. The analysis is based on the design for an SPS as described in the Reference System Report and some quantitative conclusions, e.g., ranges from rectenna sites at which effects are expected are specific to that design. The methodology and qualitative conclusions, however, apply to an SPS concept using microwave power transmission. Quantitative conclusions have been obtained parametrically and can be adjusted as SPS designs change. The *electromagnetic environment* that the Reference System would produce, and in which other systems would have to function, is described. As an early part of the EMC Assessment, the problems expected for a hypothetical rectenna site, in the Mojave Desert of southern California, were analyzed in detail.

**INDEX TERMS:** Satellite Power System, electromagnetic environment, quantitative indication, EMC problems, rectenna site selection, microwave emissions, electromagnetic radiation.

EMCABS: 4-1-83

Railroad Electromagnetic Compatibility Locomotive Volume 2, Summary of  
E-60 CP Road Test Electromagnetic Emission Measurements  
Daniel J. O'Neill  
Electromagnetic Compatibility Analysis Center, Annapolis, MD.  
Interim Report, Prepared in Cooperation with ITT Research Inst. Chicago, IL  
Jan 81, 57p, ECAC-CR-80-73, FRA/ORD-80/66.11

**ABSTRACT:** Results of *electromagnetic emission measurements* performed on an E-60 locomotive during a revenue service run from Washington, DC, to New Haven, Connecticut, and back are presented. A description of the *measurements* and *methodology* employed is included.

**INDEX TERMS:** Electromagnetic emission measurements, locomotive, measurements, methodology.

Regulatory Considerations for Telecommunications Equipment EMC  
Frank L. Rose

Federal Communications Commission

**ABSTRACT:** The Federal Communications Commission specifies technical standards in order to control interference; and then only when and to the extent needed. Recently, in Docket 20780, the FCC promulgated *technical standards concerning emissions from digital equipment*. These requirements are shown in part 15, which applies to devices not requiring specific licensing. For *radio frequency equipment* which is authorized under other Parts of the FCC rules, the limits of Part 15 do not apply. At this time, Parts 21, 90, and 94 contain emission standards for equipment using digital modulation, and the standards therein apply in lieu of the Part 15 requirements. It is planned that careful observation will be made of equipment operated under the FCC rules where Part 15 limits do not apply. If needed, appropriate changes in the technical standards will be made to address the matter of interference from such digital devices. At this time additional or modified standards for digital devices covered by individual licenses under FCC rules do not appear necessary.

**INDEX TERMS:** Technical standards, emissions from digital equipment, radio frequency equipment.

EMCABS: 2-1-83

A Study of Radio Frequency Interference with the Nimbus-7 Scanning  
Multichannel Microwave Radiometer (SMMR)

J.A. Kogut  
Research and Data Systems, Inc., Lanham, MD.  
NASA-CR-166638, NBI-19362/5, PC AO4/MF AO1  
5 Nov 80, 58p, Contract NAS5-25997

**ABSTRACT:** One of the important objectives of the NIMBUS-7 *Scanning Multichannel Microwave Radiometer* (SMMR) is to demonstrate the feasibility of all weather measurements of various *ocean parameters*; such as sea surface temperature (SST) and near surface wind speed (WS). These ocean parameters can be determined from multispectral measurements of ocean brightness temperatures in the microwave region of the electromagnetic spectrum. These microwave measurements, however, are distorted if the field of view of the SMMR antenna encounters radio transmissions from terrestrial sources. Sources of *terrestrial Radio Frequency Interference* (RFI) on the SMMR ocean data were identified. Its extent and characteristics over different ocean areas on the Earth were determined.

**INDEX TERMS:** Scanning Multichannel Microwave Radiometer, ocean parameters, terrestrial Radio Frequency Interference.

EMCABS: 5-1-83

Measurements of Electromagnetic Noise radiated from Automotive Ignition  
Systems

Robert J. Matheson

National Telecommunications and Information Administration, Boulder, CO.

Institute for Telecommunications Sciences.

Technical Report, PB81-153611, PC AO3/MF AO1

Nov 80, 40p, NTIA-REPORT-80-54

**ABSTRACT:** *Measurements of the amplitude probability distributions and the average crossing rates* of the electromagnetic noise radiated by *automotive ignition systems* were made at 30 MHz, 147 MHz, 224 MHz and 445 MHz. The ignition noise from a single car and a 12-car matrix were each measured in a 10 kHz bandwidth, using a field-intensity meter, a DM-4, a desktop calculator, and an X-Y plotter. The DM-4 is an instrument built by NTIA to measure amplitude probability distributions and average crossing rates. Numerical integration of the amplitude probability distributions was used to determine the rms, the average, and the average logarithm of the envelope of the measured noise.

**INDEX TERMS:** Measurements, amplitude probability distributions, average crossing rates, automotive ignition systems.

EMCABS: 3-1-83

Index of Publications on Biological Effects of Electromagnetic Radiation  
(0-100 GHz)

James B. Kinn and Eliot Postow  
National Naval Medical Center, Bethesda, MD.  
EPA-600-9-81/011, PB81-181430, PC A24/MF AO1  
Feb 81, 575p

**ABSTRACT:** Considerable research effort has been made into the *biological effects of electro-magnetic radiation* over the frequency range of 0-100 GHz. This work intensified since 1966 when occupational exposure guidelines were made by American Standards Institute C95.9. During this period and especially in the last several years it has become clear that a cumulative bibliography of peer reviewed publications lists 3627 articles published in the world literature dealing with the biological effects of electromagnetic radiation over the frequency range of 0-100 GHz. The contents have been compiled from the data bases of the U.S. Environmental Protection Agency and the Navy Department. The *bibliography* covers the published work that was available to March 1980.

**INDEX TERMS:** Biological effects, electro-magnetic radiation, bibliography.

EMCABS: 6-1-83

<p>Transportable Automated Electromagnetic Compatibility Measurement System (TAEMS) C.J. Chilton, A.H. Diede, W.M. Welch, R.A. McLean and F.G. Stewart National Telecommunications and Information Administration, Boulder, CO. (Institute for Telecommunication Sciences) NTIA-R-81-58, PB81-177008, PC AO7/MF AOI Jan 81, 147p</p> <p><b>ABSTRACT:</b> An <i>automated</i>, computer-controlled receiver system developed by ITS for the U.S. Army Communications Command provides a unique solution to such problems as <i>spectrum management</i>, <i>EM hazards measurements</i>, and <i>site surveying</i>. This receiving system is designed around a commercially available automatic receiver system and covers the frequency band 1 kHz-40 GHz, thus extending the capability of the receiver system by providing extended frequency coverage, multiple antenna selection, improved noise figure performance, built-in test capability, noise figure measurement capability, and 160 dB measurement range; as well as 10 Hz frequency resolution to 40 GHz, computer-controlled directional antenna pointing, and automatic real-time calibration to 40 GHz.</p> <p><b>INDEX TERMS:</b> Automated, receiver system, spectrum management, EM hazards measurements, site surveying.</p>	<p><b>EMCABS: 7-1-83</b></p>	<p>Advanced Composite Aircraft Electromagnetic Design and Synthesis R. Wallenberg, G. Dike, J. Birken, J. Barrett, and E. Burt Syracuse Research Corp., NY Interim Report Sep 78-May 80, Contracts N00014-78-C-0673, N00019-79-C0172 AD-AO96 291/0, PC A13/MF AOI May 80, 284p, NAVAIR-518-1</p> <p><b>ABSTRACT:</b> The construction of <i>aircraft</i>, <i>missiles</i> and <i>helicopters</i> with unprotected advanced composite materials increases their <i>electromagnetic environment vulnerability</i>. This is further aggravated by the diminishing susceptibility of <i>high density digital devices</i> (LSI, VLSI, and VHSIC) which are being utilized in the digital control systems. This study quantifies the threat to difference devices in different composite airframes. It shows which composite materials exhibit the least vulnerability and initiates trade-offs to compensate it. <i>Thin metal coatings</i> are shown to significantly improve this with very small weight penalties for aluminum coatings. The use of coatings offers other desirable spin-offs, one being simple design composite structural joints exhibiting low electromagnetic vulnerability.</p> <p><b>INDEX TERMS:</b> Aircraft, missiles, helicopters, electromagnetic environment vulnerability, high density digital devices, thin metal coatings.</p>	<p><b>EMCABS: 10-1-83</b></p>
<p>Communications-Electronic Intrasystem Electromagnetic Interference Measurement Techniques and Instrumentation Lester E. Polisky and John W. Savage Atlantic Research Corp., Alexandria, VA. Final Report, Contract DAAK80-79-C-0786, AD-AO94 757/2, PC AO5/MF AOI (June 79-20 Jun 80) Dec 1980, 83p, CORDACOM-79-0786-F</p> <p><b>ABSTRACT:</b> This report concludes the results obtained during the Communications-Electronics Intrasystem Electromagnetic Interference Measurement Techniques and Instrumentation Project. The major effort consisted of an <i>EMCAP feasibility study</i>, development of a <i>broadband measurement technique</i> from below 14 kHz to over 100 GHz, development of a <i>distance transfer function</i> accurate in both the near and far field and preparation of a draft intrasystem EMC Measurement Standard.</p> <p><b>INDEX TERMS:</b> IEMCAP feasibility study, broadband measurement technique, distance transfer function.</p>	<p><b>EMCABS: 8-1-83</b></p>	<p>Electromagnetic Pulse Sensor and Simulation Notes-EMP 1-27 Air Force Weapons Lab., Kirtland AFB, NM. Final Report, AD-AO96 097/1, PC A19/MF AOI May 80, 450p AFWL-TR-80-401, AD-E200 522</p> <p><b>ABSTRACT:</b> This is a series of ten <i>notes on electromagnetic pulse sensors and simulation</i>. Subjects covered in this volume are: A Study of Waveguide Mode Excitation and Propagation in a Parallel Plate Transmission Line; EMP Simulation and its impact on EMP Testing; Electromagnetic Considerations of a Spatial Model Filter for Suppression of Non-TEM Modes in the Transmission Line Type of EMP Simulators; An Investigation of Portable EMP Simulators/Alternate Simulators; Electromagnetic Surface Wave Propagation Over a Rectangular Bonded Wire Mesh; Electromagnetic Wave Propagation Along a Pair of Rectangular Bonded Wire Meshes; Surface Wave Propagation on a Rectangular Bonded Wire Mesh Located Over the Ground; Equivalent Electromagnetic Properties of a Concentric Wire Cage as Compared to a Circular Cylinder; Source Excitation of an Open, Parallel-Plate Waveguide; Numerical Results.</p> <p><b>INDEX TERMS:</b> Notes, electromagnetic pulse sensors, simulation.</p>	<p><b>EMCABS: 11-1-83</b></p>
<p>The Development and Application of Novel Methods for the Solution of EMP Shielding Problems Charles H. Papas California Institute of Technology, Pasadena. Antenna Lab. Final Report, Grant AFOSR-77-3451 Feb 81, 37p, AFOSR-TR-81-0336, AD-AO97 362/8, PC AO3/MF AOI</p> <p><b>ABSTRACT:</b> The purpose of this report is to summarize the electromagnetic research that was performed through the support of AFOSR. The problems worked on pertain to <i>EMP shielding theory</i> and deal with (a) the transmission of electromagnetic waves through <i>small apertures</i>, (b) the propagation of electromagnetic waves through <i>chiral media</i>, (c) the steady state and transient electromagnetic coupling through <i>slabs</i>, and (d) the <i>pondermotive forces and torques</i> produced by electromagnetic waves.</p> <p><b>INDEX TERMS:</b> EMP shielding theory, small apertures, chiral media, slabs, the pondermotive forces and torques.</p>	<p><b>EMCABS: 9-1-83</b></p>	<p>Characterization of Errors Inherent in System EMP Vulnerability Assessment Programs R.M. Bevensee, H.S. Cabayan, F.J. Deadrick, L.C. Martin, and R.W. Mensing California University, Livermore, Lawrence Livermore Laboratory Report No. UCRL-52954, AD-AO96 696/0, PC A12/MF AOI 1 Oct 80, 252p, Contract W-7405-Eng-48</p> <p><b>ABSTRACT:</b> The overall objectives of the DNA-funded program at LLL are to provide a measure of <i>accuracy</i> of currently used <i>EMP vulnerability assessment methodology</i>. In addition, system tools are to be provided to improve the confidence in assessment efforts, which in turn will result in <i>improved confidence</i> in establishing <i>hardening requirements</i>. During Phase I, assessment techniques currently used by the EMP community are surveyed and the sources of uncertainty are identified. Typical data are presented for quantifying the major sources of uncertainty in all phases of the assessment effort. During this phase, a <i>statistical methodology</i> to assess the impact of uncertainty on the survivability of a system has been partially validated with a simple system test.</p> <p><b>INDEX TERMS:</b> Accuracy, EMP vulnerability assessment, improved confidence, hardening requirements, statistical methodology.</p>	<p><b>EMCABS: 12-1-83</b></p>

EMCABS: 13-1-83

## Co-Channel Interference Separation

Robert J. Dick

Pattern Analysis and Recognition Corp., Rome, NY.

Final Technical Report Sep 79-Sep 80, AD-AO96 059/1, PC AO5/MF AO1

Dec 80, 100p, PAR-80-57, RADC-TR-80-365, Contract F30602-79-C-0278

**ABSTRACT:** The objective of this effort was to investigate techniques to reduce the *signal degradation* due to *co-channel* and *adjacent-channel voice-on-voice interference*. *Sorting* and *suppression* techniques using linear prediction coefficients and adaptive comb filter were investigated. Limited success was achieved. A procedure for estimating the frequency shift due to mistuning was developed.

**INDEX TERMS:** Signal degradation, co-channel, adjacent-channel, voice-on-voice interference, sorting, suppression.

An Analysis of the Compatibility of Spread-Spectrum and Narrowband FM Mobile Radio Systems in the 156- to 162-MHZ Band

T. de Haas and C.C. Watterson

National Telecommunications and Information Administration, Boulder, CO. (Institute for Telecommunication Sciences)

MA-RD-940-81011, PB81-157711, PC AO4/MF AO1

Nov 80, 54p

**ABSTRACT:** It has been suggested that the present limited availability of channels for VHF-UHF land-mobile *voice radio communication* in urban areas might be alleviated by using *spread-spectrum* (SS) systems in the same frequency bands and geographic areas presently used by *frequency-multiplexed*, *narrowband*, *frequency-modulated* (FM) systems. This report presents an analysis of the *compatibility* of FM and direct-sequence SS systems under these conditions, and applies the results to a specific case: SS communication with ships in the Mississippi River in the New Orleans area. The analysis shows that SS and FM systems in the same frequency band and geographic area cause *intolerable mutual interference* that makes them incompatible. Some alternative possibilities which may be worth further investigation are given.

**INDEX TERMS:** Voice radio communication, spread-spectrum, frequency-multiplexed, narrowband, frequency-modulated, compatibility, intolerable mutual interference.

EMCABS: 16-1-83

EMCABS: 14-1-83

## Measurements of Interference Between AM Radios due to Local Oscillator Radiation

J.R. Juroshek, D.D. Crombic, and G.E. Wasson

National Telecommunications and Information Administration, Boulder, CO.

(Institute for Telecommunication Sciences)

NTIA-REPORT-80-56, PB81-177537, PC AO3/MF AO1

Dec 80, 33p

**ABSTRACT:** This report describes the *measurement of local oscillator radiation* from a sample of test radios. Measurements were made of local oscillator frequency for various tuning conditions. Also described in the report are measurements of the *separation distance* required to produce a given amount of *interference* in a victim receiver and the image rejection ratio with 9 kHz and 10 kHz spacings.

**INDEX TERMS:** Measurement, local oscillator radiation, separation distance, interference.

## Lightning Arresters for Domestic and Commercial Electrical Power Supplies

New England Research Application Center, Storrs, CT

Citations from the Engineering Index Data Base, PB81-860827, PC NO1/MF NO1

Report for Jan 70-Feb 81, Feb 81, 148p

**ABSTRACT:** The *citations* cover information on *design*, *materials*, *construction*, and *testing* of various types of *lightning arresters*. (Contains 158 citations fully indexed and including a title list.)

**INDEX TERMS:** Citations, design, materials, construction, testing, lightning arresters.

EMCABS: 17-1-83

EMCABS: 15-1-83

## Report on the International Conference on Radio Spectrum Conservation Techniques, London, 7-9 July 1980.

George M. Sokol

Office of Naval Research, London, England

Conference Report, AD-AO96 675/4, PC AO2/MF AO1

31 Dec 80, 8p, Report No. ONRL-C-11-80

**ABSTRACT:** This is a review of the highlights of a *conference* reviewing the results of recent research in developing improved techniques for reducing the requirements for band width in communications. *Bandwidth-efficient* interference resistant modulation, *frequency re-use*, *cellular organization of short range transmitters*, and *satellite systems* are among the techniques discussed. Areas of interest include mobile radio, broadcasting telephone systems, satellite systems, and spectrum planning, assignment and measurement.

**INDEX TERMS:** Conference, bandwidth-efficient, frequency re-use, cellular organization, short range transmitters, satellite systems.

## Degradation of the Performance of Communication Systems in the Presence of Interference

Shaw-Yueh Lin and R.M. Showers

Moore School of Electrical Engineering, Philadelphia, PA (Department of Electrical Engineering and Science)

Technical Report 1979-1980, Contract N00140-79-C-6628, AD-AO97 685/2, PC AO4/MF AO1

Jan 81, 51p, Report No. MS-EES-TR-81-1

**ABSTRACT:** The relationship between measures of *degradation* (for digital systems; *error probability*; and for analog systems; *articulation score*) has been examined for the purpose of establishing quantitative criteria for satisfactory performance of various *modulation systems* in the presence of various types of *interference*. Two empirical relationships are proposed which, with adjustment of only two parameter values, provide good correspondence between *signal-to-interference ratio* and the performance measure for each case.

**INDEX TERMS:** Degradation, error probability, articulation score, modulation systems, interference, signal-to-interference ratio.

EMCABS: 18-1-83

EMCABS: 19-1-83

Rf Environment Survey of Space Shuttle Related EEE Frequency Bands  
J. Simpson, B. Pringel and J. Postelle  
National Scientific Labs., Inc., Falls Church, VA.  
Contract NAS5-23734, Prepared in part for General Electric Co, N81-17316/3,  
PC AO7/MF AO1

1 Nov 77, 147p, NASA-CR-160081, NSL-21-136

**ABSTRACT:** *Radio frequency assignments* within the continental United States in frequency bands between 121 MHz and 65 GHz were surveyed and analyzed in order to determine *current utilization* of anticipated frequency bands for the *shuttle* borne electromagnetic environment experiment. Data from both government and nongovernment files were used. Results are presented in both *narrative* form and in *histograms* which show the total number of unclassified assignments versus frequency and total assigned power versus frequency.

**INDEX TERMS:** Radio frequency assignments, current utilization, shuttle, narrative, histograms.

EMCABS: 22-1-83

The 1980 Direct Strike Lightning Data  
F.L. Pitts and M.E. Thomas  
National Aeronautics and Space Administration, Hampton, VA., Langley  
Research Center  
NASA-TM-81946, N81-20668/2, PC AO3/MF AO1  
Feb 81, 45p

**ABSTRACT:** *Data waveforms* are presented which were obtained utilizing the NASA F-106B aircraft specially instrumented for *lightning electromagnetic measurements*. The aircraft was operated in a thunderstorm environment to elicit strikes. Concurrently recorded electric and magnetic field and lightning current data were obtained.

**INDEX TERMS:** Data waveforms, lightning electromagnetic measurements, aircraft.

EMCABS: 20-1-83

Lightning Arresters for Domestic and Commercial Electrical Power Supplies  
New England Research Application Center, Storrs, CT.

Citations from the Energy Data Base, PF81-860819, PC NO1/MF NO1

Feb 81, 106p, Report for Jan 76-Feb 81.

**ABSTRACT:** The citations cover information on *design, materials, construction, and testing* of various types of *lightning arrestors*. (Contains 107 citations fully indexed and including a title list.)

**INDEX TERMS:** Citations, design, materials, construction, testing, lightning arrestors.

EMCABS: 23-1-83

An Improved Model for EMP-Included Lightning

William T. Wyatt, Jr.

Henry Diamond Labs, Adelphi, MD.

Technical Report, AD-AO96 811/5, PC AO2/MF AO1

Apr 80, 20p, Report No. HDL-TR-1919

**ABSTRACT:** *Lightning flashes* have been observed to be induced by large-yield *nuclear detonations* in the Pacific. Previous researchers have judged a vertical gradient of 100 kV/m to be necessary to induce the strokes, but have predicted *EMP-induced fields* of only about 30 kV/m. In this report an improved model of the EMP is developed which predicts vertical electric fields up to an order of magnitude higher than previous estimates. The new *predictions* exceed the 100-kV/m threshold for lightning stroke initiation and justify the hypothesis of EMP-induced lightning.

**INDEX TERMS:** Lightning flashes, nuclear detonations, EMP-induced fields, predictions.

EMCABS: 21-1-83

Study of Distribution System Surge and Harmonic Characteristics

R.E. Owen and J.R. Vivirito

McGraw-Edison Co., Canonsburg, PA

Final Report, EPRI-EL-1627, PC A12/MF AO1

Nov 80, 269p

**ABSTRACT:** The characteristics of *electrical noise* and *power harmonics* from *power converters* and other harmonic sources, as well as the *effects* of such noise and harmonics on distribution system equipment and operation are described. Power system *surges* and their effects on converter equipment are also described. *Field tests* were conducted on two different distribution systems. Measurements were made of harmonic voltage and current magnitudes, capacitor-switching transients, and impulsive electromagnetic noise in the frequency range of .3 kHz to 300 kHz. Test methodology and instrumentation are described, and the measured results are presented. The implications of this high-frequency noise on power line *communication systems* are discussed. A computer program was developed to aid in analyzing distribution system response to harmonic sources on the system. Simulations performed for the two distribution systems tested are described, and comparisons between simulation results and measured harmonic magnitudes are presented. The project also addressed methods of controlling harmonics on distribution systems. The different methods for harmonic control, principally the filtering and/or phase cancellation of harmonics, are described.

**INDEX TERMS:** Electrical noise, power harmonics, power converters, effects, surges, field tests, communication systems.

EMCABS: 24-1-83

*Frequency Assignment Methodology: An Annotated Bibliography*

William K. Hale

National Telecommunications and Information Administration, Boulder, CO.

(Inst. for Telecommunication Sciences)

NTIA-SP-80-10, PB81-153421, PC AO3/MF AO1

Nov 80, 47p

**ABSTRACT:** Improving the way in which frequencies are assigned has become an important international goal. *Spectrum* managers should be aware that recently proposed frequency assignment techniques have been shown to consume less spectrum than does the state-of-the-art operational system. These new techniques serve as efficient tools for accurately determining the amount of spectrum to allocate for a proposed new service and have been applied to economically quantify relationships between spectrum efficiency, equipment characteristics and operational procedures. In addition, recent discoveries about the computational complexity of frequency assignment problems provide valuable information to managers faced with choosing the most productive areas for future investigation.

**INDEX TERMS:** Frequency Assignment Methodology, bibliography, spectrum, overview, general references, engineering applications, exact algorithms, approximate algorithms, complexity of frequency assignment problems, upper bounds, and lower bounds.



<p>Mine Grounding Systems. Evaluation of In-Mine Grounding System and Codification of Ground Bed Construction and Measurement Techniques Wils L. Cooley and Robert L. McConnell West Virginia University, Morgantown, Engineering Experiment Station Open File Report 24 Jun 74-30 Jun 79, Grant G0144138, PB81-178881, PC A14/MF A01 30 Jun 79, 302p BUMINES-OFR-23-81</p> <p><b>ABSTRACT:</b> This report describes two major grounding topics: <i>mine ground systems</i> and <i>ground-check monitors</i>. <i>Performance characteristics</i> of ground-check monitors for high-voltage surface mine distribution cables and low-voltage underground mine trailing cables are evaluated. Over 20 commercially available monitors are studied to determine their utility. Several <i>monitoring concepts</i> are incorporated into an unusual monitor design; the prototype is described in detail. A comparative study of the effectiveness of several alternate methods of grounding surface mine equipment supports the system currently proposed by MSHA. An instrument design to measure earth voltage gradients is described, as well as an instrument design for measuring the effectiveness of dc haulage current return systems. An extreme analysis is made of techniques for measuring earth resistivity and resistance of safety ground beds. <i>Electrolytic corrosion studies</i> of earth electrodes are reported extensively also.</p> <p><b>INDEX TERMS:</b> Mine ground systems, ground-check monitors, performance characteristics, monitoring concepts, electrolytic corrosion studies.</p>	<p><b>EMCABS: 25-1-83</b></p>	<p><b>EMCABS: 28-1-83</b></p> <p>The Prevention of Electronical Breakdown and Electrostatic Voltage Problems in the Space Shuttle and its Payloads. Part 2: Design Guides and Operations Considerations D. W. Whitson National Aeronautics &amp; Space Administration, Lyndon B. Johnson Space Center Houston, TX N80-31444/6, PC A03/MF A01 3 Feb 75, 48p, NASA-TM-81138, JSC-09331-2-PT-2</p> <p><b>ABSTRACT:</b> The specific <i>electrical discharge</i> problems that can directly affect the <i>shuttle vehicle</i> and its payloads are addressed. General <i>design guidelines</i> are provided to assist flight hardware managers in minimizing these kinds of problems. Specific data are included on workmanship practices and system testing while in low pressure environments. Certain electrical discharge problems that may be unique to the design of the shuttle vehicle itself and to its various mission operational models are discussed.</p> <p><b>INDEX TERMS:</b> Electrical discharge, shuttle vehicle, design guidelines.</p>
<p>Development of a New Type of Nonlinear Resistance Valve Block for Surge Arresters T.O. Sokoly, M.A. Seitz, J.P. Guertin, P.P. Schumacher, and M.E. Potter. McGraw-Edison Co., Franksville, WI. Final Report, EPRI-EL-1647, PC A07/MF A01 Dec 80, 136p</p> <p><b>ABSTRACT:</b> Present day <i>surge arresters</i> based on silicon carbide material have approached their technological performance limits because of the relatively low degree of <i>nonlinearity</i> in their V-I characteristics. Series gaps were introduced to compensate for this, but the gaps complicate arrester assembly and raise costs, while reducing both protection and reliability. Since 1970, electrical equipment manufacturers have been improving the quality of arresters with material based on <i>zinc oxide</i>. This ceramic material has a very high degree of nonlinearity in its V-I characteristic. The research project conducted here investigated how chemical composition and processing variables affected the electrical and physical characteristics of these metal oxide varistors. Various <i>chemical compositions</i> were studied. Bismuth oxide, antimony oxide, cobalt oxide, manganese oxide, chromium oxide, nickel oxide, and aluminum oxide in a zinc-oxide based varistor were evaluated.</p> <p><b>INDEX TERMS:</b> Surge arresters, nonlinearity, zinc oxide, chemical compositions, leakage current, discharge voltage, energy handling.</p>	<p><b>EMCABS: 26-1-83</b></p>	<p><b>EMCABS: 29-1-83</b></p> <p>The Prevention of Electrical Breakdown &amp; Electrostatic Voltage Problems in the Space Shuttle &amp; Its Payloads. Part 1: Theory and Phenomena D. W. Whitson National Aeronautics and Space Administration, Lyndon B. Johnson Space Center Houston, TX. Final Report, N80-31443/8, PC A06/MF A01 3 Feb 75, 110p NASA-TM-81137, JSC-09331-1-PT-1</p> <p><b>ABSTRACT:</b> An introduction to the <i>theory</i> of <i>corona discharge</i> and <i>electrostatic phenomena</i> is presented. The theory is mainly qualitative so that workers in the field should not have to go outside this manual for an understanding of the relevant phenomena. Some of the problems that may occur with the <i>space shuttle</i> in regard to electrical discharge are discussed.</p> <p><b>INDEX TERMS:</b> Theory, corona discharge, electrostatic phenomena, space shuttle.</p>
<p>Massachusetts Non-Ionized Radiation Regulations Microwave Journal Vol. 25, No. 5; May 1982; P 170-171</p> <p><b>ABSTRACT:</b> The Mass. Dept. of Public Health is preparing regulations governing radiation. The regulations apply to any transmitter or signal source capable of radiating RF energy and to operators of such equipment.</p> <p><b>INDEX TERMS:</b> Radiation limits, Massachusetts, safety, RF hazard, microwave oven.</p>	<p><b>EMCABS: 27-1-83</b></p>	<p><b>EMCABS: 30-1-83</b></p> <p>Initial Direct Strike Lightning Data F. L. Pitts and M. E. Thomas National Aeronautics and Space Administration, Langley Research Center, Hampton, VA. NASA-TM-81867 Aug 80, 25p</p> <p><b>ABSTRACT:</b> Data waveforms of the rate of change of <i>electric flux density</i> obtained during two <i>lightning</i> strikes to an <i>aircraft</i> specially instrumented for lightning <i>electromagnetic measurements</i> are presented. The aircraft was operating in a thunderstorm environment to elicit strikes. The instrumentation system configuration, flight conditions, and strike scenario showing probable lightning path on the aircraft are described. The waveforms, which were obtained at a 10 nanosecond sample interval, indicate significant excursions of the rate of change of electric flux density occurred over a few hundred nanoseconds time interval.</p> <p><b>INDEX TERMS:</b> Electric flux density, lightning, aircraft, electromagnetic measurements.</p>

<p>EMP Coupling to Ships F. J. Deadrick, H. S. Cabayan, Karl F. Kunz, R. M. Bevensee, and L. C. Martin California University, Livermore Lawrence, Livermore Lab. Prepared in cooperation with Lu Tech, Inc., Contract W-7405-ENG-48, AD-A089 165/5, PC A08/MF A01 Jan 89, 165p, Report No. UCRL-52803</p> <p><b>ABSTRACT:</b> Scale-model <i>tests</i> were conducted to establish the adequacy and limitations of model measurements as tools for predicting <i>electromagnetic pulse (EMP) coupling</i> voltages and currents to the critical antennas, cables, and metallic structures on ships. The <i>scale model predictions</i> are compared with the results of the full-scale EMP simulation test of the Canadian ASW ship, HMCS Huron. (The EMP coupling predictions in this report were made without prior knowledge of the results of the data from the HMCS Huron tests.) This report establishes that the scale-model tests in conjunction with the data base from our EMP coupling modules provides the necessary information for source model development and permits effective, low cost study of particular system configurations.</p> <p><b>INDEX TERMS:</b> Tests, electromagnetic pulse (EMP), coupling, scale-model, predictions.</p>	<p>EMCABS: 31-1-83</p>	<p>Study of Interferences in <i>Satellite Communication Systems</i>, Volume 3: Study Report K. Allsebrook, D. Pictor, and D. Salter British Aerospace Dynamics Group, Bristol, England (Communications and Countermeasures Group) Final Study Report, N80-30635/0, PC A07/MF A01, Contract ESTEC-3647/78-NL-AK(SC) Jul 79, 134p, ESS/CCG-66-V-3, ESA-CR(P)-1338-V-3 (Document includes a Microfiche Supplement)</p> <p><b>ABSTRACT:</b> Literature on the subject of <i>interference</i> was summarized. <i>Phase shift keying</i> and <i>analog FM systems, code division multiple access</i> systems, recommended methods of computing the effect of an energy dispersed FM TV interferer on a narrow band victim receiver are included along with effects of interference on a phase-locked-loop receiver, and applicability of the models used, for the case of multiples interference.</p> <p><b>INDEX TERMS:</b> Satellite Communication Systems, interference, phase shift keying, analog FM systems, code division, multiple access.</p>	<p>EMCABS: 34-1-83</p>
<p>Fortan Program for Helicopter Blade Modulation Signal R. L. Mitchell MARK Resources Inc., Marina Del Rey, CA. Technical Note, Contract DAAK40-78-C-0031, AD-A089 575/5, PC A02/MF A01 22 May 78, 12p, Rept Nos MRI 149-19, MRI-TN-105-042</p> <p><b>ABSTRACT:</b> The <i>modulation signal</i> for the rotating <i>helicopter blade</i> is derived in Reference 1. Two basic models were proposed in this reference: a model based on <i>scattering</i> from the blade tip and a <i>specular flash</i> model. Evidence presented in Reference 2 is somewhat inconclusive, although the statement is made that 'most of the echo is derived from the outer portions of the rotor blade (approximately the outer 20% of the blade length)'. Such a statement supports the model where scattering is assumed to occur at the blade tip.</p> <p><b>INDEX TERMS:</b> Modulation signal, helicopter blade, scattering, specular flash.</p>	<p>EMCABS: 32-1-83</p>	<p>Studies on the Reduction of Intermodulation Generation in Communications Systems G. H. Stauss, G. C. Bailey, C. D. Bond, C. A. Carosella and A. C. Ehrlich Naval Research Lab, Washington, DC Final Report, AD-A086 995/8, PC A05/MF A01 7 Jul 80, 94p, NRL-MR-4233, AD-E000 492</p> <p><b>ABSTRACT:</b> Potential means of intermodulation generation in multiplex systems are reviewed and evaluated theoretically. The dominant mechanisms involve non-ohmic junctions and ferromagnetic components. Junctions through aluminum oxide films have been studied experimentally and a possible means of improvement is described. Experimental tests of ferromagnetic components show the need to exclude them entirely from multiplex and high performance systems. With care in the choice and assembly of components, it is concluded that inter-modulation signals can be kept to the level of thermal noise in most configurations.</p> <p><b>INDEX TERMS:</b> Intermodulation generation, multiplex systems, junctions, ferromagnetic components.</p>	<p>EMCABS: 35-1-83</p>
<p>Helicopter Blade Modulation Model (REVISED) R. L. Mitchell MARK Resources Inc., Marina Del Rey, CA. Technical Note, Contract DAAK40-78-C-0031, Revision of Report No. MRI-149-12, AD-A089 574/8, PC A02/MF A01 29 Mar 78, 4p Rept Nos MRI-149-16, MRI-TN-105-040</p> <p><b>ABSTRACT:</b> Two basic <i>helicopter blade modulation models</i> were described in Reference 1. One was based on <i>scattering</i> from the blade tips and the other was based on the <i>specular flash</i>. Evidence presented in Reference 2 supports the latter model.</p> <p><b>INDEX TERMS:</b> Helicopter blade, modulation models, scattering, specular flash.</p>	<p>EMCABS: 33-1-83</p>	<p>Study of Interferences in Satellite Communication Systems, Volume 4: Executive Summary K. Allsebrook British Aerospace Dynamics Group, Bristol, England (Communications and Countermeasures Group) Contract ESTEC-3647/78-NL-AL(SC), N80-30636/8, PC A02/MF A01 Jul 79, 22p, ESS/CCG-67-V-4, ESA-CR(P)-1338-V-4</p> <p><b>ABSTRACT:</b> A computer library of calculation techniques was established, forming the basis of a reference set of procedures for determining the effects of an interfering signal on a wanted link. The programs were designed in an expandable, modular form. The literature was searched for appropriate methods of computing the baseband degradation for the particular wanted and interfering modulation types. The merits and difficulties in implementing each calculation method were assessed and the accuracy of the results produced were considered.</p> <p><b>INDEX TERMS:</b> Satellite Communication Systems, interference, calculation techniques, references.</p>	<p>EMCABS: 36-1-83</p>

EMCABS: 37-1-83

## Radar EMI at Sea

Louis J. Lavedan

Naval Research Lab., Washington, DC.

Memorandum Report, AD-A087 213/5, PC A02/MF A01

28 Jan 80, 22p, NRL-MR-4082, AD-E000 449

**ABSTRACT:** As quantity and complexity of electronic systems on Navy ships increases, so does the probability of RF interference between systems, even those located on separate ships. This report briefly describes the coupling mechanisms possible between 200 MHz and 4000 Mhz and supplies data in the form of graphs and describes a method whereby the magnitude of the interference can be quickly calculated for the various sea environments.

**INDEX TERMS:** Radio frequency interference, ships, sea environment, coupling.

EMCABS: 40-1-83

## An Automatic Lightning Detection System in Northern California

James A. Rea and Chris E. Fontana

National Weather Service, Salt Lake City, UT. Western Region

Technical Memo, PB80-225592, PC A02/MF A01

Jun 80, 25p, NOAA-TM-NWS-WR-153, NOAA-80073106

**ABSTRACT:** In 1977, Automatic Lightning Detection System Direction Finder (ALDS DF) units were installed at Susanville, California, and Lakeview, Oregon, as part of the Great Basin ALDS. The ALDS is capable of detecting and locating cloud to ground lightning discharges over considerable areas. This paper describes the performance and capabilities of the ALDS in relation to radar coverage, satellite imagery, and actual lightning fire starts during the 1979 fire season in northern California.

**INDEX TERMS:** Direction finder, lightning detection system.

EMCABS: 38-1-83

## Analysis of Electrical Transients Created by Lightning

J. E. Nanevich and E. F. Vance

SRI International Corp., Menlo Park, CA.

Final Report, Contracts NAS1-13792, SRI PROJ. 4026, NBO-30645/9, PC

A06/MF A01

Jul 80, 107p, NASA-CR-159308

**ABSTRACT:** A series of flight tests was conducted using a specially-instrumented NASA Learjet to study the electrical transients created on an aircraft by nearby lightning. The instrumentation included provisions for the time-domain and frequency-domain recording of the electrical signals induced in sensors located both on the exterior and on the interior of the aircraft. The design and calibration of the sensors and associated measuring systems is described together with the results of the flight test measurements. The results indicate that the concept of providing instrumentation to follow the lightning signal from propagation field, to aircraft skin current, to current on interior wiring is basically sound. The results of the measurement indicate that the high frequency signals associated with lightning stroke precursor activity are important in generating electromagnetic noise on the interior of the aircraft. Indeed, the signals produced by the precursors are often of higher amplitude and of longer duration than the pulse produced by the main return stroke.

**INDEX TERMS:** Lightning, sensors, measurement, aircraft.

EMCABS: 41-1-83

## Atmospheric Electricity-Aircraft Interaction

Advisory Group for

Aerospace Research and Development Neuilly-sur-Seine (France)

Lecture Series, AD-A087 976/7, PC A11/MF A01

May 80, 230p, Report No. AGARD-LS-110

**ABSTRACT:** The potential susceptibility of aircraft to atmospheric electricity hazards (such as lightning and static charging phenomena) appears as an increasing threat to future aircraft for two reasons: on the one hand, more and more sensitive solid-state electronics and microprocessors will be used in the future on flight critical equipment, as can be anticipated from advanced guidance and control hardware developments; on the other hand, new structural materials, such as dielectrics and composites, will be extensively used for aircraft, leading to potential problems due to surface charges and reducing the electromagnetic shielding protection offered by the conventional metallic skins on present-day vehicles. Starting with fundamentals of atmospheric electricity phenomena, the Lecture Series reviews the hazards, criteria, testing and avionics protection, and provides insights from both pilot and design perspectives. In view of the above, this Lecture Series should be of interest to aircraft manufacturers, airline operators, government and industrial research establishments, and avionics.

**INDEX TERMS:** Aircraft susceptibility, atmospheric electricity, lightning, static discharge.

EMCABS: 39-1-83

## Lightning 1974-July 1980 (Citations from the International Aerospace

Abstracts Data Base)

Samuel C. Mauk

New Mexico University, Albuquerque Technology Application Center

Report for 1974-Jul 80. Sponsored in part by National Technical Information

Service, Springfield, VA.

Sep. 80, 73p

**ABSTRACT:** These citations from the international literature concern various aspects of lightning. Included are articles covering aircraft hazards, aircraft safety, radio meteorology, circuit protection, electromagnetic pulses, and electromagnetic radiation. Articles concerning atmospheric electricity and thunderstorms are stressed. (This updated bibliography contains 304 citations, 95 of which are new additions to the previous edition.)

**INDEX TERMS:** Lightning, bibliography, hazards, safety, protection, electromagnetic pulse, electromagnetic radiation.

EMCABS: 42-1-83

## Skin Effect in Electrical Conductors, January 1975-August 1981.

Citations from the International Information Service for the Physics and

Engineering Communities Data Base.

National Technical Information Service, Springfield, VA.

PB81-873978, PC N01/MF N01

Report for Jan 75-Aug 81, 120p.

**ABSTRACT:** Research reports and articles cited in this bibliography discuss the theory, effects, and calculation of skin effect in various types of electrical conductors. Topics include the skin effect phenomenon in conductors of several crosssectional shapes, transmission lines, coaxial cable, and superconductors. Some reference is made to the effect of frequency level and magnetic field strength on skin effect. (Contains 106 citations fully indexed and including a title list.)

**INDEX TERMS:** Skin Effect, Electrical Conductors, bibliography, theory, effects, calculation, transmission lines, coaxial cables, and superconductors.

EMCABS: 43-1-83

Electromagnetic Interference Susceptibility of Airborne Fiber Optics Systems.

John P. Uyemura

Georgia Inst. of Tech., Atlanta School of Electrical Engineering.

AD-A101 727/6, PC A05/MF A01, Phase Rept Oct 79-Sep 80.

May 1981, 95p RADC-TR-81-62, Contract F30602-78-C-0120.

**ABSTRACT:** The EM problems associated with an airborne fiber optic communication system are examined. Interest is directed towards identifying possible noise sources and coupling channels which may exist. It is found that fiber optics transmission links can exhibit high degrees of immunity to stray EMI so long as certain precautions are taken in the original system design. Qualitative guidelines for decreasing the EMI susceptibility are given. Particular problem points are also discussed.

**INDEX TERMS:** Electromagnetic Interference Susceptibility, Fiber Optics Systems, EMI airborne, fiber optic, fiber optics transmission links, and immunity.

EMCABS: 46-1-83

Sandia Studies Lightning's Effects on "Nukes"

Design News

Vol. 38, No. 2; 18 January 1982; P 20-23

**ABSTRACT:** A lightning simulator which produces exceptionally powerful lightning strokes has been built at Sandia National Labs for an investigation of what would happen if lightning struck a nuclear weapon. The facility duplicates the extreme lightning flash with 200,000 amps peak current, 2 micro sec. rise time and 75 microsec. decay time for a total charge transfer of 300 coulombs.

**INDEX TERMS:** Lightning, simulator, nuclear weapon, vulnerability, Marx Generator.

CISPR Publication 8D, Reports and Study Questions of the CISPR

International Special Committee on Radio Interference (CISPR)

International Electrotechnical Commission (IEC)

IEC, Geneva, Switzerland

May 1982, 19 pages

**ABSTRACT:** CISPR Publication 8D contains two reports approved by CISPR Subcommittee A: Radio interference measurements and statistical methods.

The first, Report 52, discusses and gives the technical parameters of current probes used for measuring radio interference on the power mains of devices on the frequency range of 30 Hz to 100 MHz. One intended current probe application is the measurement of interference current on primary power lines which may carry up to 300A of dc or 100A of ac.

The second, Report 53, discusses and gives the technical parameters of a buffer network suitable for testing radio interference suppression components and filters using the sweeping frequency technique. The buffer network is used to supply a load current through the component or filter under test. This report describes a buffer network which can be used throughout the frequency range 0.1 to 300 MHz. It supplements the two networks described in Appendix B of CISPR Publication 17: Methods of measurement of the suppression characteristics of passive radio interference filters and suppression components.

**INDEX TERMS:** Radio interference, current probes, specifications, frequency response, filters, buffer networks.

EMCABS: 44-1-83

EMCABS: 47-1-83

Coping With Static Electricity, Part 27, Non-destructive Testing for Surface

Resistivity

B. I. Rupe

Naval Avionics Center, Indianapolis, IN

Evaluation Engineering

Vol. 21, No. 1; January 1982; p 84-88

**ABSTRACT:** The recent discovery that many Melamine and Formica workbench surfaces inherently possess adequate antistatic properties has led to the need for providing "soft" grounding systems on large quantities of existing workbenches. This modification results in a workbench suitable for use as a static-free work station without the need for add-on static dissipative or antistatic matting.

**INDEX TERMS:** Static electricity, grounding, surface resistivity, testing.

EMCABS: 45-1-83

EMCABS: 48-1-83

Circuit Protection Across the Board

Neil Selater

Contributing Editor

Design Engineering

Vol. 52, No. 6; June 1981; P 54-56

**ABSTRACT:** Electronic circuits operate most effectively when free from voltage spikes and current surges. Providing adequate protection of circuitry requires careful analysis of potential electrical energy threats and the specification of one or more complimentary protective devices.

**INDEX TERMS:** Integrated circuits, suppression, zener, varistor, transients.

Static Electricity: A Problem in American Industry (Part 2)

Joseph P. Lerro

Senior Editor

Design News

Vol. 37, no. 21; November 1981; P 72-81

**ABSTRACT:** Static electricity and its related problems are becoming extremely prevalent. Most major manufacturers that utilize static-sensitive devices are forming committees to cope with the problems of static electricity and are establishing procedures to limit its effects.

**INDEX TERMS:** Static electricity, integrated circuits, ionization, grounding, plastic material.



EMCABS: 49-1-83

EMCABS: 52-1-83

Circuit Eliminates Radio Interference  
Design News

Vol. 38, no.8; 19 April 1982; P 21-22

**ABSTRACT:** In military applications, a tiny circuit chip will provide a means for recognizing and amplifying specially encoded signals containing the voice communications. Thus the message will come through, and the jamming noise will be filtered out.

**INDEX TERMS:** Radio interference, jamming, IC filter.

Program Quickly Figures Complex Filter Parameters  
Steven Hageman

EH International Inc., Oakland, CA

Electronic Design

Vol. 30, No. 7; 31 March 1982; P 105-110

**ABSTRACT:** Aided by friendly alphanumeric prompting from a powerful calculator, a 269 step program makes short work of Butterworth and Chebyshev high and low pass filters with just four input parameters.

**INDEX TERMS:** Calculator program, filters, high pass, low pass, Butterworth, Chebychev.

EMCABS: 50-1-83

EMCABS: 53-1-83

Noise-Suppression Schemes Highlight Power Conference  
Electronic Design

Vol.30, no. 13; 24 June 1982; P 43-44

**ABSTRACT:** Responding to recent RFI and EMI noise-abatement regulations from the FCC, Powercon 9 will feature methods of generating clean voltage and current waveshapes to reduce power-line harmonics and EMI.

**INDEX TERMS:** FCC, Powercon 9, EMI, conference, agenda, power supplies.

Meeting the New Radio Interference Standards

Robert Brunelle

Electronic and Industrial Cable Div./Brand-Rex Co.

Digital Design

Vol. 12, No. 11; November 1982; P-36-38

**ABSTRACT:** The new FCC regulations take effect on Oct. 1, 1983. After that date any electronic device or system that generates or uses timing signals at a rate in excess of 10,000 pulses per second and uses digital techniques must meet the limits now set by the FCC. So must any device that generates and uses RF energy to perform data processing functions.

**INDEX TERMS:** Standards, FCC, interference, shielding, VDE, computers, RF radiation.

EMCABS: 51-1-83

EMCABS: 54-1-83

Power Line Disturbances and Their Effect on Computer Design and Performance.

W. Vincent Roland

Hewlett-Packard

Hewlett-Packard Journal

Vol. 32, No. 8; August 1981; P 25-32

**ABSTRACT:** Noise induced on the AC power line by machinery, lightning, and even appliances can be detrimental to computer performance. By becoming familiar with the nature of the noise and its causes, the designer and user can take steps to minimize the effect on computers.

**INDEX TERMS:** Single point ground, multipoint ground, power line, transients, signal isolation, power supply, computer, optical isolator, shielded cable.

Magnetic Shielding for Top Performance of Components and Equipment

Richard D. Vance

Ad-Vance Magnetics, Inc., Rochester, IND

Insulation/Circuits

Vol. 27, No. 9; August 1981; P 37-38

**ABSTRACT:** Firms are learning the necessity of using magnetic shielding to achieve the performance desired from their components and systems. Denser packaging has incited much of the recent interest in shields. With components positioned even closer together, and radiating components affecting adjacent components, increased electromagnetic interference frequently occurs.

**INDEX TERMS:** Shielding, magnetic field, foil, permeability CRT shields.

EMCABS: 55-1-83

Peripherals Added to Spectrum Analyzer Provide Low Cost EMI Tester  
MSN

Vol. 12, No. 11; November 1982; P 113

**ABSTRACT:** Systems Research Laboratory has a device that should allow developers to initiate and maintain an EMC program from the start of even simple developments. The basic concept takes an available spectrum analyzer, and adds peripheral equipment to it, resulting in a usable EMI tester at relatively low cost.

**INDEX TERMS:** EMI tests, spectrum analyzer, tempest, radiated emission.

EMCABS: 58-1-83

Awareness Growing for ESD-Control  
Evaluation Engineering

Vol. 21, No. 7; October 1982; P 54-60

**ABSTRACT:** The problems associated with electrostatic discharge remain, but happily the number of electronic manufacturers recognizing the problem and doing something about it, has increased.

**INDEX TERMS:** ESD products, ESD programs, ESD packaging, conductive floor finish.

EMCABS: 56-1-83

Using Waveform Recorders for Power Supply Testing

Kim Gray

Hewlett-Packard, Santa Clara, CA

Electronics Test

Vol. 5, No. 10; October 1982; P 44-48

**ABSTRACT:** Based on an analog-to-digital converter and a high speed memory, a waveform recorder can acquire even the most elusive power supply transient.

**INDEX TERMS:** Transients, waveform recorder, power supply.

EMCABS: 59-1-83

EMI Protection and Fiber Optics Lead at Connector Meeting  
Electronic Design

Vol. 30, No. 22; 28 October 1982; P 38-40

**ABSTRACT:** New approaches to reducing EMI and developing new military type connectors for fiber-optic applications will be holding center stage at the 15th annual Connectors and Interconnection Technology Symposium to be held Nov. 1-2 in Philadelphia.

**INDEX TERMS:** Symposium, connectors, fiber optics, ESD, EMI, FCC.

EMCABS: 57-1-83

Hybrid Isolates Megavolts for Low Level Signals

Mark Amarandos

Burr-Brown Corp., Tucson, Ariz.

Electronic Design

Vol. 30, No. 23; 11 November 1982; P 135-141

**ABSTRACT:** A fiber-optic cable and a hybrid dip with an integral connector are the only elements needed to transmit low level transducer signals in the face of millions of volts of common-mode noise.

**INDEX TERMS:** Common mode noise, fiber-optic cable, isolation.

EMCABS: 60-1-83

More Wire Used in Electronic Products

Design News

**ABSTRACT:** A major new trend in the design of electronic equipment is the use of a steel wire chassis to contain power supply components. Welded wire chassis have achieved considerable savings in cost, weight assembly time and servicing and in combination with perforated metal, have eliminated EMI problems.

**INDEX TERMS:** Shielding, power supplies, FCC requirements, perforated sheets, wire chassis.

# PAPERS PRESENTED AT THE RESEARCH MEETINGS ON EMC JAPAN

**September 20, 1982, Sendai**

1. "Defrosting by Microwave Power Heating Model of Foods with Phase Change," by Kazunari NISHII, Shigeru KUSUNOKI, Katsumi ISHII, Keiziro MORI, Matsushita Housing Products Co., Ltd., Housing Products Research Lab. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 125, EMCJ 82-23, pp. 1-7  
**ABSTRACT:** We had computer simulation from frozen to non-frozen state of foods, for grasping defrosting process by microwave power. Further, we made experiments on microwave heating at 2450 MHz frequency. As a result, we had correspondence with experiments and computer simulations, on the whole.  
 — DEFROST, SIMULATION
2. "Development of 22GHz-70GHz Gyrotron," by K. SUGIMORI, K. FUJITA, Toshiba Corp.; Y. TERUMICHI, S. TANAKA, Kyoto Univ.; T. IDEHARA, Fukui Univ. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 125, EMCJ 82-24, pp. 9-14  
**ABSTRACT:** This paper describes our gyrotron development status which has been carried out since 1980. We have developed 22GHz gyrotron and output power of 40KW was obtained. And, useful test results on the efficiency characteristics, the influence of cathode angle of magnetron-injection-gun on the tube efficiency, was obtained. And efficiency of 40-45% was measured. Furthermore, we now are developing 70GHz gyrotron, which is now under the evaluation test. Current experimental data was shown.
3. "Variational Formula for Magnetostatic-Wave Resonators and its Applications," by Takashi OHIRA, Makoto TSUTSUMI, Nobuaki KUMAGAI, Faculty of Engineering, Osaka University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 125, EMCJ 82-25, pp. 15-22
4. "Nonradiative Dielectric Waveguide Coupler with Bends," by Norio TOZAWA, Tsukasa YONEYAMA, Shigeo NISHIDA, Research Institute of Electrical Communication, Tohoku Univ. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 125, EMCJ 82-26, pp. 23-28
5. "Millimeter Wave Integrated Circuits," by Yoshiyuki NAITO, Tokyo Institute of Technology. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 125, EMCJ 82-27, pp. 29-36
6. "Report on 1982 IEEE International Microwave Symposium," by Yoshihiro KONISHI, NHK Res. Lab., Shizuo MIZUSHINA, Shizuoka Univ., Tsutomu NOGUCHI, Nippon Electric, Takuro KOIKE, Tamagawa Univ., Sachihito TOYODA, Osaka Inst. Tech., Tsukasa YONEYAMA, Tohoku Univ. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 125, EMCJ 82-28, pp. 37-44
7. "Freespace Optical Data Communication System Using Infrared Beam," by Akira TAKAHASHI, Motoyoshi MORITO, YAGI Antenna Co., Ltd. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 125, EMCJ 82-29, pp. 45-52  
**ABSTRACT:** Optical transmission of data through freespace has several particular features, and a high-speed transmission circuit can be built quite easily. However, by nature of the method, the propagation efficiency of optical beam varies to the atmospheric conditions at the site. Accordingly, this method is rather suitable for a short span of data link just as to cross over river, road, etc. In this paper, a report is given for the freespace optical communication system driven by near-infrared emitting diode on its merits, practical application examples, and its future possibilities.
8. "A Practical Measurement Method of Scattering Characteristics of the Pyramidal Absorber," by Mitsuhiro ONO, Toru SHIBUYA, Yamagata University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 125, EMCJ 82-30, pp. 53-60  
**ABSTRACT:** The direct measurement method of space standing waves at oblique incidence is established as the measurement method of scattering characteristics of the absorber. Using this method, the standing wave ratio at the front of the sample owing to the strongest wave among many scattering ones and its scattering angle can be measured easily at a wide range of frequency and angles of incidence. Special measuring apparatus or complicated operation is not required.
9. "Problems about Design and Measurement of Filters," by Tsuruo SHIMAYAMA, Keiichiro OKU, Fuji Electronic Industry Co. and Sadayuki OSUGI, Nagoya Electrical Communication College. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 125, EMCJ 82-31, pp. 61-67  
**ABSTRACT:** The H.F. filters have been designed and measured so that their source and load impedances are resistive. But, actually, they are reactive, then the voltage attenuations measured by usual methods are different. This paper shows how to design and measure the filters connected to a complex impedance circuit.

10. "A Design Method for Low Pass Filter Using Nonuniform Transmission Lines," by K. KOBAYASHI, Yamagata Univ., Y. NEMOTO, R. SATO, Tohoku Univ. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 125, EMCJ 82-32, pp. 69-74  
**ABSTRACT:** A design method for low pass filter using nonuniform transmission lines is presented. First, we show approximate representations of nonuniform transmission lines by simple mixed lumped and distributed circuits. Transmission characteristics of both circuits agree well over wide frequency region. Second, we show the design method for low pass filter using mixed lumped and distributed circuits. Partial sections of low pass filter consisting of mixed lumped and distributed circuits can be replaced with nonuniform transmission lines, approximately. Consequently, low pass filter using nonuniform transmission lines are obtained.
11. "1/f Noise in Compound Semiconductor Hall Elements," by Sumihisa HASHIGUCHI, Hisahsi SUGIYAMA, Faculty of Engineering, Yamanashi Univ. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 125, EMCJ 82-33, pp. 75-82  
**ABSTRACT:** Temperature dependence of 1/f noise in GaAs and InSb Hall elements is measured. It is found that the noise levels are much lower and the temperature dependence is much larger than formerly reported values.

## September 21, 1982, Sendai

1. "Yagi Antenna with Skewed Array Elements," by Shinji SHASHAKI, Toyama Machine Works, LTD.; Kiyooki NAGAKI, Yoshinori MORITA, Mashashi MIKKAICHI, Toyama University; Akira TAKAHASHI, Yagi Antenna Works, LTD.; Hiroshi INOUE, Kanazawa Institute of Tech.; Risaburo SATO, Tohoku University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 126, EMCJ 82-34, pp. 1-8  
**ABSTRACT:** This paper evaluated various characteristics of Yagi antenna arranging array elements obliquely, and showed numerical results in a graph and verified that this antenna was effective as anti-ghost antenna. An angle of the main beam direction measured from the array element direction is also shown in a graph, and its merits are as follows:  
(1) The depth of null point (vs. the magnitude at maximum point) is deeper than 30db; this level is enough to suppress the ghost.  
(2) The direction of null point is independent of the frequency.  
(3) Power gain in the main beam direction doesn't fall too much.  
(4) The used antenna is only one unit, setting against conventional two antenna system.

2. "Distributed Constant Circuit Theory Under the Electromagnetic Environment (VIII)," by Yoshio KAMI, Jr. Tech. College of Electrocommunications and Risaburo SATO, Faculty of Eng., Tohoku University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 126, EMCJ 82-35, pp. 9-14  
**ABSTRACT:** By applying the state variable method to the line equations of externally excited transmission lines, the equivalent circuits of the finite length transmission lines are deduced in three types: one is such that the equivalent voltage and current sources due to the external waves are shown at both line terminals, and the others have concentrated sources at one side. It is useful to apply these to the composite cascaded transmission lines excited by external waves. Moreover, these circuits are formally applicable to multi-conductors lines.
3. "Transmission Characteristics of Very Low Loss Pair-type Cables," by Junji TADA, TATSUTA Electric Wire & Cable Co. Ltd. and Risaburo SATO, Tohoku University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 126, EMCJ 82-36, pp. 15-22
4. "Discriminator for Multichannel Impulsive Signal," by K. OHMURA, M. NAKAO, R. SATO, Faculty of Engineering, Tohoku Univ. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 126, EMCJ 82-37, pp. 23-28

**ABSTRACT:** There is a demand for separating impulsive signals coming from multiple sources on a single channel into each signal. In this paper, an instrument which discriminates multiple impulsive signals on the basis of their amplitude is described. This instrument has adaptability to the variation of amplitude to improve discriminating ability. Multiple neutral impulses are discriminated by this instrument and its performance is found fully effective.

5. "Spectrum of Noise Current Traveling Along the Line Connected to Electrical Contacts at Contacts on Closure with Arc Discharge," by S. MINEGISHI, T. OHMORI, Faculty of Engineering, Tohoku Gakuin University and H. ECHIGO, R. SATO, Faculty of Engineering, Tohoku University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 126, EMCJ 82-38, pp. 29-36  
**ABSTRACT:** Spectrum of noise current caused by electrical contacts on closure with arc discharge is described. The problem associated with closing contacts is chatter. That is, when the contacts are closed, the contacts repeat multiple "making" and "breaking" of the current. Therefore, the chatter also was considered. The spectrum of the noise current which travels along the line connected to the contacts was analyzed, experimentally and theoretically. The results of both analyses agreed very well and, consequently, the following conclusion may be submitted: The main cause of the noise caused by electrical contacts on closure with arc discharge is multiple reflections of the step wave at the time of making contacts and arc generation on breaking contacts in the line.



6. "An Experimental Study on the Error Rate Performance in Correlative Coding Transmission with CTD Correlator," by H. SONE, T. YAGUCHI, H. SHIZUYA, H. ECHIGO, T. TAKAGI, Tohoku University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 126, EMCJ 82-39, pp. 37-44

**ABSTRACT:** The correlative coding transmission has many advantages, including multiple access and the improvement of SNR, and stabilized high speed operation and compact construction will be allowed with charge transfer device (CTD). The experimental results with BBD correlators confirmed the above advantages and the measured error rate performance was consistent with the results of computer simulation and theoretical value.

7. "Evaluation of an Effect of Impulsive Noise on TV Picture Patterns using Composite Noise Generator," by Nobuo HANDA, Hiroshi ECHIGO, Hideaki SONE, Tasuku TAKAGI, Faculty of Engineering, Tohoku University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 126, EMCJ 82-40, pp. 45-48

**ABSTRACT:** Results of evaluation of an effect of impulsive noise on TV picture pattern using composite noise generator (C.N.G.) are shown. The C.N.G. can generate a noise of any amplitude probability distribution (A.P.D.) to simulate an actual noise which is observed in practice. Using the C.N.G., each effect of impulsive noise parameters such as A.P.D., maximum voltage, duration, and time interval on TV pattern was examined and the results were discussed by using a regression analysis.

8. "On a Model of Intra-System EMI," by Hiroshi ECHIGO, Tasuku TAKAGI, Faculty of Engineering, Tohoku University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 126, EMCJ 82-41, pp. 49-54

**ABSTRACT:** This paper gives a consideration on Intra-System EMI, based on an example which shows interference with low level circuits by a high level shielded line. Equivalent circuits were introduced and analyzed to understand the mechanism of EMI. These results of analyses are helpful to know EMI reduction techniques.

## October 26, 1982, Tokyo

1. "Specifications of Radio Frequency Interference and Its Status - In Connection with the Activities of International Special Committee on Radio Interference," by Masuo OKAMURA, Japan Machinery and Metals Institute, Interference Radiation Branch. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 160, EMCJ 82-42, pp. 1-4

**ABSTRACT:** Recent technical innovation of electric and electronic manufacturers has resulted in generation of radio frequency energy, a part of which, and a whole of which, are used in order to control devices themselves and to achieve the aimed functioning of devices and/or equipment. As a result, we have to carefully develop specifications for controlling the interference radiation emanated from electric and electronic devices and equipment. In addition to this fact, we, engaging in designing electronic devices, have to design devices which become immune to electromagnetic interference surrounding us in this present mixed-up world. In this regard, it should be said that the specifications of radio interference and its status should be carefully watched and, if possible, be adopted as the National Standards in order to harmonize with the International Specifications.

2. "Industrial Computer System Guarded from High Level Electromagnetic Interference (2)," by Yoshio MAEHANA, Shinichiro SAKURABA, Yoshihiro NAKAO, Shuichi NITTA, Mitsubishi Electric Corp. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 160, EMCJ 82-43, pp. 5-12

**ABSTRACT:** Recently programmable sequence controllers are used in power stations, automobile works and other plants instead of relay logics; since programmable sequence controllers must have high capability, enduring to impulse noise through signal cables, surge noise caused by thunderbolts and other noise. Fitting to above conditions, MELCOM350-50/A2010S programmable sequencer was developed and it is capable to endure, 2000Vpp impulse noise, 4.5kV surge noise, and AC2000V withstanding voltage.

3. "Shielding Effectiveness of Conductive Plastics," by Yasuo SEKI, RIKEN EMC Inc. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 160, EMCJ 82-44, pp. 13-20

**ABSTRACT:** Some findings on W.D. Nason's method and MIL-STD-285 method in the measurement of electromagnetic shielding effectiveness. The following results were obtained on the test samples: In the W.D. Nason's method, (1) Because matching cannot be obtained at a frequency below 200 MHz, shielding effectiveness is given in the form "more than \_\_\_\_ dB" and the condition of "more than" may be lost in the computer processing, depending on BASIC programming. (2) An intense resonance of dominant mode is observed near 400 MHz where all the measured values drop. Therefore, the measurement of this method between 100 MHz and 1GHz is less reliable than that of the MIL-STD-285 method. (3) The measurements can be near-field values; however, it is not clear what they are based on, electromagnetic static field, electric field or magnetic field. (4) Careful consideration is necessary for the type of the antenna and the distance between transmitting antenna and receiving antenna in view of impedance matching and field on which the measurement is based. (5) Problems may occur unless Schulz's correction is applied to fixed seam and access seam.

4. "Measurement of Surge Voltage and Surge Wave Form Depending upon Circuit Constants and Contactor Performance at the Current Interrupting of Inductive Load Circuit," by Masaru KIZAKI, Tadahiko HON-AMI, Hideaki Ikegami, The Tokyo Metropolitan Industrial Technology Center. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 160, EMCJ 82-45, pp. 21-28

**ABSTRACT:** The voltage and wave form of switching surge, chopping current, and chopping time of inductive load circuits connected to the DC power supply is measured. Waveform of the chopping current and switching surge voltage can be roughly classified into five patterns (A,B,C,D,E) and the rate of occurrence of each patterns are obtained depending upon circuit constants. The measured mean value of switching surge voltage is only about half of the value calculated by using the circuit constants. The peak voltage of the switching surge, which occasionally have a needle like wave form, reaches up to 2000-5000V.

5. "Protection of Electronic Equipment and Systems from Lightning Surge by ZnO Surge Suppressor," by Takeaki HOSOKAWA, Ceramic Division, Matsushita Electronic Components Co., LTD. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 160, EMCJ 82-46, pp. 29-36

6. "A Method for Cancelling Radar False Echo and Counter False Echo Architecture for Large Bridges," by Yoshizo HAGINO, Japan Radio Co. Ltd. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 160, EMCJ 82-47, pp. 37-42

**ABSTRACT:** In spring 1976, many newspapers reported false echo on ship's radar scope near the large bridge OSHIMA OHASHI constructed at West area of inland sea SETO NAIKAI. It seemed impossible to solve the problem result from radar cross section equation  $4\pi A^2/\lambda^2$ , and echo level measuring method on board. Author considered that Fresnel type of new cross section should be applied for large target, and measured the false echo level by radar PPI-VTR over whole route in the area, -40dBm to -70dBm, and proposed the construction method, echelette grating of aluminium net (less than  $\lambda/2$   $\lambda/4$  mesh). The bridge grating is now under construction. This paper explains the Fresnel cross section and the effect of grating.

7. "How to Generate R.F. Noise from Electric Devices," by Turuo SHIMAYAMA, Fuji Electronic Industry Co. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 160, EMCJ 82-48, pp. 43-48

**ABSTRACT:** When pulse current flows into the electric devices having windings or connected to electric lines, it generates r.f. noise. There are 6 to 7 kinds of noise generation mechanisms. Winding or line distributed circuits have many equivalent series and parallel resonances. When opening the circuit, damped oscillations, having parallel resonances, occur. When closing the circuit, damped oscillations, having series resonances, occur. Circuit voltage goes up 100V or more, and harmonics and mutual modulation products of parallel resonance frequencies are induced due to sparking.

8. "System Reliability of Industrial Robots Safety Analysis of Industrial Robots with Fault Tree (FT)," by Noboru SUGIMOTO, Research Institute of Industrial Safety, Ministry of Labour. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 160, EMCJ 82-49, pp. 49-55

## November 25, 1982, Yokosuka

1. "In-phase Synthetic Method for the Measurement of Reflection Characteristics of Materials by means of UHF TV Broadcasting Wave," by Nozomu HASEBE, Hiroaki KOBAYASHI, Nihon University; Fujio SHIMIZU, Nippon Electric Co. Ltd. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 184, EMCJ 82-50, pp. 1-8

**ABSTRACT:** A new method for the measurement of reflection characteristics of materials is presented, the principle of which is based on the focused synthetic aperture radar techniques. By the application of the phase focus process on linearly moving sample, the true reflective wave from the sample is emphasized, while multi-path reflective waves are suppressed. Furthermore, combining a two element endfire array and a hybrid circuit, incident main wave is cancelled out. From this result, it is possible to show that the measuring dynamic range is expanded widely. Reflection characteristics of a few samples are measured at 700MHz, utilizing a UHF TV broadcasting wave.

2. "A Measurement Method of Characteristics of Absorbers by Short Pulse," by O. HASHIMOTO, H. JIROMARU, Y. WATANABE, A. KISHIMOTO, 1st Research Center of Japan Defence Agency. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 184, EMCJ 82-51, pp. 9-14

**ABSTRACT:** In order to reduce the influence of background scattering and antenna coupling on received signal, we use transmitted pulse having 10 nsec duration as well as the time gate of around 10 nsec in this absorber testing method. For the 300x300mm sample, the measurable range of wider than 60 dB has been obtained. The normal incidence characteristics of both vertical and horizontal polarization are in close agreement with the theoretical values. Oblique incidence characteristics of the absorber in this system also are presented.

3. "Design of Gas-Filled Protector for Telecommunication Systems," by Yoshiaki KAMIJO, Hideyuki KUROSAWA, Musashino Electrical Communication Laboratory NIT. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 184, EMCJ 82-52, pp. 15-21

**ABSTRACT:** The effects of discharge light radiation and constructive parts on spark-over voltage and impulse life characteristics are shown. As the results of discharge light radiation caused by discharge, impulse sparkover voltages are decreased for Ne plus Ar compared to the pure gas (Ne, Ar) and for electrode coating material such as  $(\text{Ba}, \text{Sr}, \text{Ca})\text{CO}_3$  compared to the metal electrode such as Fe-Ni-Co alloys. The physical designs and characteristics for a 2-electrode gas-filled protector, a 3-electrode G.P. and a 5-electrode G.P. are shown.

4. "Equipment Voltage Withstanding Determination Method for Economized Lightning Protection," by Tamio MOTOMITSU, Hiroaki KOGA, Nobuo KUWABARA, Fumio OHTSUKI, Ibaraki Electrical Communication Laboratory, N.T.T. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 184, EMCJ 82-53, pp. 23-28

**ABSTRACT:** Based on the lightning surge voltage dependence on area, this paper proposes an equipment voltage withstanding determination method for each area. If the whole land of Japan were divided into 2-3 equipment voltage withstanding regions, total protection circuit cost for equipment can be reduced by 30-40%, compared with applying one kind of protection circuit uniformly in Japan.

5. "Visualization of Electric Field Around a Human-Model," by Koichi SHIMIZU, Hideto ENDO, Goro MATSUMOTO, Research Institute of Applied Electricity, Hokkaido University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 184, EMCJ 82-54, pp. 29-36

**ABSTRACT:** A system was developed which visualizes the electric field distribution around a human-model. To minimize the field perturbation, an optical field-sensor was used. A mechanical X-Y scanner controlled by a microcomputer memorizes the contour of the human-model and moves the sensor automatically scanning the space around the model. The measured data are processed and the field distribution is presented in a color distribution pattern. The agreement with the theoretical calculation was reasonable. The usefulness of this technique for the study of the biological effects of electric field was shown.

6. "Analysis of the Electric Field Around a Moving Mouse and its Representation in Animation," by Hide-masa SEKIMIZU, Tetsuo KOBAYASHI, Koichi SHIMIZU, Goro MATSUMOTO, Research Institute of Applied Electricity, Hokkaido University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 184, EMCJ 82-55, pp. 37-44

**ABSTRACT:** A technique is presented for the calculation of the E-field around a freely moving mouse. The mouse is photographed in a 16mm cinefilm, and each frame is transformed in a digital image. This image is used as a boundary condition in the calculation. The E-field around a mouse is presented in two ways, i.e., in the distribution of equipotential lines and the pattern of E-field vector as the body-surface. They are represented in an animation movie. This technique enables us to analyze the dynamic properties of the E-field, such as the time-integrated dose of the field exposure, current flow due to the fast motion of the mouse, etc.

7. "Report on 1982 IEEE International Symposium on Electromagnetic Compatibility," by Yoshio KAMI, Jr. Tech. College of Electrocommunications and Risaburo SATO, Faculty of Eng., Tohoku University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 184, EMCJ 82-56, pp. 45-50

**ABSTRACT:** The report has given an outline of the 1982 IEEE International Symposium on Electromagnetic Compatibility held at Santa Clara, California, from September 8 to 10, 1982.

## December 13, 1982, Toyohashi

1. "Harmonic Filter for R.F. Industrial Heating Oscillators," by Sadayuki OSUKI, Nagoya Electrical Communication College; Keiichiro, OKU, Tsuruo SHIMAYAMA, Fuji Electronic Industrial Co., LTD. Report of Technical Group on EMC, IECE, and IEE of Japan, Vol. 82, No. 197, EMCJ 82-57, pp. 1-6

**ABSTRACT:** The harmonics leaked from R.F. industrial heating oscillators are permitted to reach a limit as severe as 0.01uW. Normally used filters today are not enough to satisfy the above limit in all cases. Then, we investigated a new type of filter which can be used for any kind of loads and conditions without leak out of harmonics.

2. "A Design Method of Wide Band-Pass Filter Using Transmission Lines and Lumped Capacitances Based on Lumped Network," by Toshikazu SEKINE, Senji YOKOKAWA, Faculty of Engineering, Gifu University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 197, EMCJ 82-58, pp. 7-14

**ABSTRACT:** This paper presents the design of the band pass filter which is composed of the cascade of two types of resonator using transmission lines and lumped capacitances suitable for broad bandwidths as VHF and UHF. As the transmission lines are less than  $\frac{1}{4}$  wavelength at the midband frequency, this filter may well be compacted in physical realization. In this design, a frequency transformation suitable for mixed lumped and distributed circuits is used, and we are able to designate the characteristic impedances of the transmission lines within a certain range.

3. "A New Thermometry of a Hot Spot for Hyperthermia using NMR with a Line-Shaped Magnetic Field," by Yoshitsugu KAMIMURA, Yoshifumi AMEMIYA, Faculty of Engineering, Nagoya University. Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 197, EMJC 82-59, pp. 15-22

**ABSTRACT:** A non-invasive thermometry of deep interior of human body is required when the clinical hyperthermia is applied to the cancer therapy. This paper proposes a new temperature measurement method using the thermal equilibrium magnetization in the nuclear magnetic resonance. This new method can detect necessary temperature rise within a region of about 2 centimeters in radius, combined with a line-shaped magnetic field.

4. "Effects of the Ground and the Wire Impedance to the Reduction of the Electromagnetic Noise of the Shinkansen using the Wire Array," by Takashi YAMAGUCHI, Kanazawa Institute of Technology; Yoshifumi AMEMIYA, Nagoya University; Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 197, EMCJ 82-60, pp. 23-30

**ABSTRACT:** The electromagnetic noise is radiated from the contacts between pantographs and trolley wires when trains run along the Shinkansen, and it causes the television jamming in VHF-band. To reduce the noise, we propose to set up the array consisting of several thin wires at the sides of the railroad. The formula of the reduction level is induced analytically, including the effects of the imperfectly conducting ground and the internal impedance of a wire. Numerical computations are executed for several parameters of the wire array. The array is useful for the reduction of the noise.

5. "Current Distribution on the Antenna Using Iterative Approaches by Variational Methods," by Kiyoaki NAGAKI, Yoshinori MORITA, Masashi MIKKAICHI, Faculty of Engineering, Toyama University; Hiroshi INOUE, Kanazawa Institute of Technology; Risaburo SATO, Tohoku University; Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 197, EMCJ 82-61, pp. 31-36

**ABSTRACT:** This paper evaluated the phase and attenuation constant of the antenna, which were obtained as the extreme values of iterative approaches by variational methods, regarded as a transmission line with loss, assuming that the current distribution on the antenna was a hyperbola function. Consequently, it became clear for about half wavelength antenna that the phase and attenuation constant approached free-space phase constant and zero, respectively, as the antenna became thin.

6. "Contact-free Detection of  $1/f$  Fluctuation," by Yoshitaka SUZUKI, Sumihisa HASHIGUCHI, Faculty of Engineering of Yamanashi University, Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 197, EMJC 82-62, pp. 37-44

**ABSTRACT:** In  $1/f$  fluctuation measurements, the accuracy is strongly affected by the quality of ohmic contacts. It is desirable to reject the influence of the electrodes. We propose a method to measure  $1/f$  fluctuation without employing any contacts. It is shown that samples with relatively low resistivity and a driving current with high frequency are preferred in this method.

7. Electromagnetic Absorption Properties of Multilayer Inhomogeneous Absorbers of Plastics Containing Carbon and Metal," by Syozi TOMINAGA, Masaoki TANAKA, Yasumitsu MIYAZAKI, Toyohashi University of Technology, Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 197, EMCJ 82-63, p. 45-50

**ABSTRACT:** The purpose of this report is to make very thin plastic absorbers that can be applied to IC and LSI packages and electronic systems. We fabricated electromagnetic plastic absorbers, which contain small particles of resistance and conductance materials, and measured reflection and transmission factors of the plastics. These electromagnetic absorbers are very thin, compared to other absorbers reported so far. They have good mechanical strengths. Reflection and transmission factors for microwave frequency ( $f=11.6\text{GHz}$ ) with incident angle of 10 degrees, were  $-17\text{dB}$  and  $-26\text{dB}$ , respectively. Thickness of the plastic was  $10.7\text{mm}$ .

8. "Scattering Characteristics Due to Resonance of Automobile for Mobile Communication," by Masaoki TANAKA, Yasumitsu MIYAZAKI, Toyohashi University of Technology, Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 197, EMCJ 82-64, pp. 51-56

**ABSTRACT:** Microwave simulation on measuring internal electric field of an automobile was carried out using a miniaturized model of the automobile and a box which is simplified in the form of it. The measured internal electric field in the box is given by linear combination of modes expected of the box which is operated as a cavity. The field intensities observed in the automobile and the box are 10 times larger than that observed in free space. Taking account of these experimental results, we propose a new type of receiving antenna which is fabricated inside of the automobile.



## FREEDOM OF THE (ELECTRONIC) PRESS ADVOCATED IN SENATE HEARINGS

The Senate Commerce Committee, in hearings held in late September, has started to explore the need for a new Constitutional amendment to guarantee full First Amendment rights to all electronic media. An amendment is necessary because the First Amendment (which guarantees free speech and freedom of the press) applies to broadcast media to a limited extent only. Radio and television stations, unlike print media, are subject to various regulations, including the "fairness doctrine" and "equal time" requirements. Print media are fully protected; but, the government indirectly could impose editorial controls when information is disseminated in new ways, such as the electronic newspaper, videotext, teletext, and direct broadcast satellite.

In his opening statement on Sept. 28th, Senator Bob Packwood noted that Congress, the Supreme Court, and the FCC all agree that electronic media are not fully protected by the First Amendment. "The result is that the government is free to regulate the content of our most numerous and important sources of information." Continuing, he said:

*New communications methods have increased the number of people who can use the spectrum, but restrictions based on scarcity have not been removed. Instead, these restrictions have expanded with developments in technology to cover new services . . . Cable TV is also subject to these restrictions . . . I fear that, for reasons of administrative convenience or because the government wants to extend its control over electronic media, other new services will be subjected to these same content regulations.*

Among the witnesses representing communications technology was Dr. Solomon J. Buchsbaum, Executive Vice President of Bell Laboratories, who made three main points:

1. Technology has been opening up new regions of the spectrum that can be used for public communications and it will continue to do so.
2. Technology is allowing the spectrum to be used with ever increasing efficiency.
3. Technology, especially digital technology, is enabling other electronic transmission media - old media such as cable and wire, and new media such as lightguide - to reduce our dependence on the spectrum for public communications.

Buchsbaum noted that vast streams of information currently flow into homes and offices via print and electronic media. In addition to different transmission media and services, we have a variety of computer terminals and other machines to record, retrieve, display, process and store information. The number of data bases available to the public has grown rapidly - 1200 now - triple the number three years ago.

The problem that looms is the interfacing of information technologies, Buchsbaum said. "Changes are taking place as a result of the proliferation of these services. It is important that the Congress be informed of, and consider the potential effects of, changes. I believe that in the near term, the principal effect will be a blurring of the distinction between many of the electronic media themselves."

"If we are to have an information society that truly works, all of these machines will have to be able to understand and talk to each other and the interface between users and the machines will have to permit a 'friendly' dialogue. These needs constitute an enormous challenge to those of us in the communication and information businesses."

Another representative of the technical community, Dr. Charles Jackson, undertook to clarify the nature and "size" of the spectrum. "If there is a single point an engineer can make in a forum like this," Jackson said, "it is that the spectrum is limited. They are not making any more of it. But the limits on spectrum are not the same as limits on the number of channels you can get out of the spectrum. The tradeoff is very simple: the more channels you want, the more you pay."

He went on to say that the myth of spectrum scarcity has confused communications policy for a long time. "In my view, the major cause of that perceived scarcity has been legal constraints on our ability to build and use new channels." He then cited a 1967 Supreme Court decision (the Carter Mountain case) in which the court allowed a lower court decision to stand. The case involved the denial by the FCC of a microwave license to a communications company on the ground that the company's customer (a cable television system) would create competition for an existing television station. "There was no scarcity and yet a radio license was denied. A voice was silenced in the community, and the future of cable television was set back because of the economic handicaps the FCC imposed on cable television in that proceeding."

Jackson noted that several newspapers are transmitted today by satellite and if the FCC were to follow the same reasoning, it could deny a microwave license to the satellite system that carries the signal of the paper *USA Today* into the Washington community. "Whether the FCC or the courts would go so far as to say *USA Today* might harm the *Washington Post* and, therefore, we will have to deny the microwave license, is unclear."

Soon after the hearings, the National Association of Broadcasters announced support for Packwood's constitutional amendment. NAB's executive committee also urged Congress to seek repeal of the fairness doctrine and the equal time provision.

## INSTITUTIONAL LISTINGS

The IEEE Electromagnetic Compatibility Society is grateful for the assistance given by the firms listed below and invites application Institutional Listings from other firms interested in the electromagnetic compatibility field.

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