

### IEEE DIVISION 4 MAGNETISM DELEGATION TO PEOPLES REPUBLIC OF CHINA

At the suggestion of Emerson Pugh, Director of Division 4, we are trying to arrange a technical visit to China. We hope to have, perhaps, two people from each of the five Societies in Division 4 to go. Each representative should be prepared to speak about his past work in the area of magnetics, and, perhaps, about related work recently published. The Chinese have agreed to arrange a brief conference and visits to a variety of their laboratories doing significant work in magnetics. The entire visit may take two or three weeks. It is anticipated that spouses will be welcome and that about 1/3 to 1/2 of our time may be available for sightseeing.

Anyone interested in participating should contact Fred E. Luborsky, General Electric Company, Corporate Research and Development, P.O. Box 8, Schenectady, NY 12301; Telephone: (518) 385-8692.

#### **EMC ZURICH**

The Sixth Symposium and Technical Exhibition on Electromagnetic Compatibility will be held in Zurich from March 5-7, 1985. The Symposium, sponsored by the Swiss Electrotechnical Association, will be accompanied by a technical exhibit. Topics may include: Social and Economical Impact of EMC; Special Techniques: Sequency Functions, Spread Spectrum, and Fibre Optics; National and International Cooperation in EMC; EMC Hazards to Ordnance and Vital Safety Systems; Compatibility of Medical Electronics; Biological Effects of RF Energy; Medical Electronics; EMC Education; NEMP Impact; and Measuring Methods and Instrumentation. Inquiries may be directed to Dr. T. Dvorak, ETH Zentrum - IKT, 8092 Zurich, Switzerland; Phone: (411) 256-2790, Telex: 53 178 ethbi ch.

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## **EDUCATION COMMITTEE NEWS**

The Education Committee has put together a preliminary draft of a book titled *EXPERIMENTS AND DEMON-STRATIONS IN ELECTROMAGNETIC COMPATI-BILITY*. The book is intended to be used as source material for courses or laboratory demonstrations on EMC. At present, it contains five experiments and will be expanded if other people are willing to contribute their experiments or demonstrations. A limited number of copies of the draft will be available at the EMC symposium in San Antonio in April. If you would like to receive a copy of the draft or contribute to the contents, please contact me.

Several short courses on EMC related topics are scheduled for the summer and fall of this year.

EMXX and CK Consultants are sponsoring a series of seminars and workshops on EMC. Design Methods for Emission and Susceptibility Control will be presented June 25-27 in Sunnyvale, CA. EMC Laboratory Experience Workshop will be offered June 28-29 in Mariposa, CA. The instructor for the above will be Chris Kendall. A Product Safety Seminar will be given on June 27 in Sunnyvale, CA. The instructor will be Bob Randall. Additional information can be obtained by contacting EMXX at 703-451-4619.

The Center for Professional Advancement is sponsoring two courses on *Electromagnetic Compatibility Engineering* to be given in East Brunswick, NJ on July 30 to Aug 2 and in San Mateo, CA on August 21- 24. The instructors will be Henry Ott and Don Heirman. For more information contact the Center at 201-249-1400.

Don White Consultants will be offering *Grounding and Shielding* in Chicago, IL on June 19-22 and in Boulder, CO on July 17-20. A course on *Tempest Design, Control and Testing* will be presented on June 4-8 in Washington, DC. For more information, contact Don White Consultants at 703-347-0030.

R & B Enterprises, a division of ROBAR Industries Inc., is offering a one-day course titled "The Understanding and Application of MIL-STD-461B" in San Antonio, TX, April 27. The seminar will be held immediately following the IEEE Symposium in San Antonio. Also scheduled is a two-day course EMI Military Test Workshop, May 31-June 1 at the R & B Testing Facilities in Suburban Philadelphia. For more information or to register, contact the seminar coordinator at 215-825-1960.

> Henry Ott Chairman, EMCS Education Committee

AT&T Bell Laboratories Room 1E-212A Whippany, NJ 07981 201-386-6660

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#### FIRST BOARD OF DIRECTORS MEETING IN 1984

Though it was mid-winter, the weather in San Diego was in the mid-60s and presented a pleasant backdrop for our first Board meeting for the new year. The meeting was held on 17 January, the day before and in conjunction with the San Diego Regional EMC conference at the Town and Country Hotel. We wish to thank the conference committee for their hospitality which was enjoyed by 11 of the 19 Board members present.

Acting in his new role as presiding officer of the Board, President Knowles called the meeting to order at 1:30 p.m. Immediate past secretary Art Wall distributed the appendices of the 22 August meeting. Don Clark, the newly-elected secretary, then accepted the minor changes to the minutes which were approved by the Board by a unanimous vote.

The other major topics addressed by the Board included the following:

1. The Treasurer's report was presented by Don Heirman for Treasurer Warren Kesselman who could not attend. Based on expenditures reported through October 31, 1983, the Society's net worth predicted for the end of the 1983 calendar year is \$133K, down from 1982 by about \$7K. That figure will change slightly when the final audit is completed for the 1983 Symposium. The treasurer's report was approved.

2. Bill Parker (incoming director) and Chet Smith (outgoing director and new Vice President) presented the report on Communications Services. The topic of publishing current technical articles in the EMCS Newsletter was discussed at length. The President set up a committee comprised of Bill, Bob Goldblum (Newsletter Editor), Dick Schulz (Transactions Editor), and Ed Bronaugh to report back at the next Board meeting the feasibility of such articles for the Newsletter. The committee is also to clarify the publishing policy of the Newsletter and offer suggested modifications, if necessary..

3. The various symposia activities continue to dominate the Board agenda. We now have committed sites through 1990 with Washington, D.C. hosting the symposium. The big item is that the Tokyo Chapter has, through the efforts of Tei Iki, a major cost reduction for round trip air fare to Tokyo for the EMCS October Symposium (October 16-18). United Airlines has agreed to a West Coast to Tokyo roundtrip cost of only \$700 with an additional round trip surcharge between New York/Washington, DC/ Pittsburgh and the West Coast of another \$275. The travel agent contact number is (619) 451-2330. The advance program for Tokyo will be available by the time you read this article. San Antonio in April (24-26) is shaping up with 80 papers and 75 exhibitors. The Hyatt has 500 rooms reserved, with additional rooms at the nearby St. Anthony. Boston in 1985 (August 20-22) was reviewed. Exhibit space will be at a premium with only 50 to 60 spaces available. Hence, exhibitors will be limited to booths comprised of a single space. The only other major announcement was the dates for the 1987 Atlanta symposium which will be held August 25-28.

4. Under international affairs, the Board voted to exchange the San Antonio and Tokyo proceedings with the EMC Symposium committee for the University of Surrey (England) EMC symposium which will be held on September 18-20.

5. Ed Bronaugh, newly-elected director of technical services, presented his report on EMCS standards, technical committees, and education. Don Heirman, Standards Committee Chairman, reported recent activity, including the desire of the Standards Office of the Institute to submit new Project Authorization Requests (PARs) so that our work is properly coordinated with other interested standards organizations. A more complete report on standards was contained in the Winter Issue of the Newsletter. The technical committees were being reconstituted due to new appointments. Dave Hantulla was named chairman of the technical committee on EMC Management; Don Heirman will chair the EMC Measurements Committee with Bob Hofmann as vicechairman; Wil Lauber takes over as EM Environments Committee chairman and Les Berry heads up Spectrum Management. Ed Skomal chairs the advisory committee for all 7 technical committees. Workshops are being formed by several chairmen for the San Antonio Symposium and possibly the Tokyo Symposium. The Board again brought up that two prime activities of the technical committees are writing or reviewing EMCS standards in their specialty and to review papers for symposia, in addition to preparing/organizing symposia technical sessions. Finally, Hank Ott, who chairs the Education Committee, moved that Society funds not be approved for supporting university EMC courses. The motion was carried. This puts to rest the request by the 1980 EMC Symposium Committee to use interest from the 1980 symposium surplus to fund such courses. Hank also passed around the first draft of an EMCS Lab Notebook containing various experiments to illustrate EMC principles. The Notebook is intended to aid college professors in providing meaningful experiments for students with an EMC interest. A more complete version will be available at San Antonio.

6. Don Clark presented Jim Toler's membership development and awards committees reports. The Society gained 84 new members as a result of the rebate provided to the 1983 symposium attendees who were either not IEEE members or IEEE members, but not Society members. That boosts our membership up to 2324 paid members. The Board also moved to distribute the 200 excess Washington, DC symposium records to students via an advertisement in the IEEE student magazine, "Potentials." In addition, all the certificates and founders placques were mailed to those who did not attend the Washington, DC symposium. The Society's IEEE Centennial Medal Awards will be given in Tokyo this year.

7. A revised list of Chapter chairmen was distributed by Bob Hofmann. For a copy, call Bob on (312) 979-3627. Bob also has available the names and telephone numbers of the major active EMC members associated with Board of Directors activities.

8. Other reports include those in the area of professional services, handled by the newly-elected director — Dr. Sato. It was noted that Joe Chislow was appointed Division 4 representative to the Committee on Man and Radiation (COMAR). Bob Brook presented his report on the Society on Social Implications of Technology (SSIT). Woody Everett has formed a committee to represent EMCS interests on the R & D Committee for the Technical Activities Board.

9. Finally, the Board voiced its intention to abide by the by-laws as far as attendance by Directors at Large at Board meetings. Any board member who misses three consecutive meetings may be removed from the Board. Attendance will be published in subsequent Newsletter reports in this column.

10. The meeting adjourned at 4:45 p.m. The next meeting will be on Monday, April 21, 1984, at the Hyatt Hotel, site of the San Antonio Symposium. For more details, contact Don Clark on (404) 894-3535.

Respectfully submitted,

Don Heirman

## TRAVEL PLANS TO TOKYO FOR THE 1984 IEEE INTERNATIONAL SYMPOSIUM ON EMC

In the last issue of the EMC Society Newsletter, Society President Gene Knowles announced arrangements with Donick Travel & Tours, Inc., the official agency for travel arrangements to Tokyo for the Symposium. To those who have replied to our questionnaire in previous issues of the newsletter, we will be in touch with you to advise you on the plans that will be available and their cost. Many of you want to stay two weeks and include the hotel in the package. To those of you who have not replied to the questionnaire and may be interested in attending the symposium, we urge you to send in the questionnaire below. Your show of interest will be most helpful in our planning. It looks like there will be some flexibility in travel arrangements to allow stops at Shanghai, Hong Kong, and other points while travelling to or from Tokyo. Remember, this form is for general information only and does not obligate you in any way.

\_\_\_\_\_ Tel.: (

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#### TRAVEL PLANS TO TOKYO FOR THE 1984 IEEE INTERNATIONAL EMC SYMPOSIUM

1984 is the first year in which the IEEE International EMC Symposium will be held outside of the United States. The 1984 Symposium is scheduled for October 16-17-18 in Tokyo, Japan. Many engineers from the USA will be interested in attending, but may be hesitating because of the cost of air travel to Japan. If we can get enough people traveling together to form one or more groups, we should be able to take advantage of group fares or, possibly, charter a flight. While this event is a year away, it is not too early to poll the interest of IEEE members and non-members so that we can explore the possibilities of cost-saving on air travel. If you have any possible interest in attending the Tokyo Symposium, please fill in the questionnaire form below so that we can put you on the mailing list to keep you up-to-date on travel arrangements.

I am interested in traveling to Japan to attend the EMC'84 Symposium. I understand that my reply on this form does not obligate me in any way.

Name _	
Address	

1. Preferred point of departure: New York \_\_\_\_\_ Chicago \_\_\_\_\_ Washington \_\_\_\_\_ Los Angeles \_\_\_\_\_ San Francisco \_\_\_\_\_\_ Other \_\_\_\_\_

2.	My	employer	requires	that	I	travel	on	USA	Carrier.	Yes	]	No	
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- 3. I am interested in staying for just one week. Yes \_\_\_\_ No \_\_\_\_
- 4. I am interested in staying two weeks for the symposium and a week of travel. Yes \_\_\_\_\_ No \_\_\_\_\_ Before symposium \_\_\_\_\_ after \_\_\_\_\_
- 5. Include hotel in package \_\_\_\_\_ Include rental car in package \_\_\_\_\_
- 6. Other comments.

Return this form to Jim Hill, 6706 Deland Drive, Springfield, VA 22152; Telephone: 703-451-4619.



Richard B. Schulz IIT Research Institute Annapolis, Maryland 21401

## **TECHNOLOGY-ALERTING INDEX**

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## **POINT AND COUNTERPOINT**

by Anthony G. Zimbalatti



## WHAT'S IN A NAME?

In my first column (EMC-S Newsletter No. 118, Summer 1983), 1 asked for opinions on changing the name of our society to "Electromagnetic Environmental Effects." Twelve verbal responses, seven for and five against, were expressed to me during the 1983 EMC-S International Symposium in Washington, D.C. Since then, I have received two letters, both against the change. Ms. L. Gilda Haskins, Warminster, Pennsylvania, writes "Do engineers study the effects of the environment or are they concerned with producing equipment which can be used in the environment whether the fields/signals be equipment generated or from the atmosphere, e.g., lightning?" Also, she suggests 1 read the IEEE definition for EMC, "The capability of electronic equipments or systems to be operated in the intended operational electromagnetic environment at designed levels of efficiency." Answering her own question, Ms. Haskins said that "EMC engineers serve a useful purpose in developing electronic equipments compatible among themselves and with their environment." Thus, she feels that the name change is unnecessary since "electromagnetic environment" is clearly embodied in the definition of EMC. Mr. Wesley R. Johnson, Wichita, Kansas, makes the point that "the present name has been around long enough for everybody in the community (my italics) to know what it means" and "the only thing a change would do is cause confusion." I would like to hear from more of you on the name change.

#### WHAT'S GOING ON?

Perhaps, a technical topic would elicit more response from you. MIL-STD-461B, Part 1, (1 April 1980), Paragraph 4.9, "Testing Requirements," reads in part "when performing susceptibility testing, the thresholds of susceptibility shall be determined and reported in the EMI Test Report, whether below the contracted EMI requirement or above, within the maximum capability of the test equipment used. I can't help but wonder whether or not the pros, cons and consequences of such a requirement have been examined. For example, who pays for damage resulting from testing above the equipment contractual design levels; or, will test generators or set-ups be arranged to produce levels that just meet the contractual levels. On the other hand, if safety margins were a reason for establishing the susceptibility test requirements, then such margins should be an explicit contractual requirement. My point - it's a bad idea to require identification of equipment susceptibility threshold beyond design limits based on test equipment capability. If such thresholds are required, may I suggest adding a safety margin based on the intended or actual electromagnetic environment of the equipment. Let's hear your opinions on threshold testing or another topic that interests you. We are listening.

#### POSTSCRIPT: 1983 EMC SYMPOSIUM

More information has come in about the EMC Symposium in Washington, D.C., which was held last August 23-25.

A total registration of 1700 makes the 25th anniversary symposium the best attended to date. Thirty-eight IEEE members applied for membership in the EMC Society, and 46 of the 381 nonmembers applied for membership both in the IEEE and in the EMC Society. The 103 booths and 75 exhibitors, too, established benchmarks, with exhibits revealing how far EMC technology has advanced in a quarter of a century. Perhaps because of the growing awareness outside of the Society's membership of the need for EMC and EMI prevention and control, there were 385 registrants for the exhibit hall only. Registrants were offered a full menu of technical presentations from which to choose. The 118 technical papers were spread across 20 technical sessions, one poster session, and one workshop. Subjects discussed included EMC assessments and analysis, testing and measurement, EMI control technology, spectrum and EMC management, EMP and transients, and nonsinusoidal functions.

The quality of papers presented was high, with many so superior that the awards committee had great difficulty selecting the best. Criteria used to judge papers printed in the symposium record included: value of contribution to the field, originality of contribution, format and organization of the paper, balanced use of theory and data, legibility and effectiveness of illustrations, and clarity of language.

Awards for the best written papers, as announced at the symposium awards luncheon on August 24, were:

BEST PAPER (\$500 award): "Analysis and Modeling of Power Transmission Line Inductive and Ground Current Coupling to Railroad Communications and Signal Lines," by Allen Taflove, Korada Umshankar, and John Dunlap.

SECOND BEST PAPER (\$200 award): "An Analysis of MIL-STD-462 Application Note: Identification of Broadband and Narrowband Emissions," by Robert Cowdell, and

THIRD BEST PAPER (\$100 award): "Electromagnetic Near Fields as a Function of Electrical Size," by Arlon Adams, Yehuda Leviatan, and Knut Nordby.

For the first time at an EMC Symposium, awards also were made for excellence of oral presentations. An innovation of the Washington Symposium, the awards were equivalent in amount to those made for best written papers. Criteria and scoring of the oral presentations were patterned after those used by Toastmasters International: content (speech development, effectiveness, and support material) and delivery (voice, manner, duration, language, and audience response). Thanks to the untiring efforts of Dr. Paul Terry, Governor of District 37 of Toastmasters International, volunteer judges were recruited for all technical sessions. Once the judges' rating sheets were all in, it was evident that there were differences among the judges in scoring. Therefore, a lengthy process began of normalizing the scoring of individual judges by listening critically to most of the technical presentations which had been recorded on cassette tapes by AVCOM. Again, it was difficult determining the best among many excellent presentations. At long last the following finalists emerged:

BEST PRESENTATION (\$500 award): "Powerline Longitudinal Electric Fields — Measurement and Prediction," delivered by John Dabkowski.

SECOND BEST PRESENTATION (\$200 award): "Noise Source Equivalent Circuit Model for Off-Line Connectors and Its Use in Input Filter Design," delivered by Lon Schneider, and

THIRD BEST PRESENTATION (\$100 award): "Defining and Measuring EMC Performance of Electronic Cables," delivered by Anatoly Tsaliovich. The Symposium Board decided to give awards for oral presentations because in the past there was criticism that papers at the EMC symposia often were poorly presented. Speakers failed to plan oral presentations for the limited time provided. They did not put their ideas across well. Far too often the slides were from the printed paper.

There is a significant difference between listening to an oral presentation and reading a written paper at one's own pace. Oral delivery of a paper affords an author the opportunity to convey insights into his work which the listeners might not get from the printed paper. It is an important skill which requires practice to develop, and it takes preparation, study, and rehearsal to achieve. EMC symposia speakers sometimes fail to invest the effort required.

It is unfair for speakers not to invest the required time and effort to prepare properly. Otherwise the result can be a poor presentation by the author and an ineffective use of time for the listeners who are eager to learn more about the author's work. Therefore, the Board of Directors of the 1983 EMC Symposium decided to encourage authors both to write a good paper and to present it well orally. Whether or not the cash incentive was effective cannot be determined, but it is believed that oral presentations at the 25th anniversary EMC symposium were improved over those at previous symposia.

The idea of awards for best presentation has met with enthusiastic approval by many. The committee for the April 1984 EMC Symposium at San Antonio is also planning to offer awards for best oral presentations. The challenge is to have these awards at all future EMC symposia.

Perhaps judges could be drawn from our own ranks. Toastmaster Governor Dr. Paul Terry observed from discussion at the 1983 Symposium that the EMC Society has a number of Toastmasters among its members. How many members are Toastmasters, or how many of them would volunteer to judge symposia sessions is not known. If you are a Toastmaster, we would like to hear from you. Bob Haislmaier, chairman of the awards committee for the 1983 EMC Symposium has agreed to collect responses and help the Society perpetuate the effort to have high quality presentations. Let him know if you are a Toastmaster, and whether you would be willing to judge a session at future symposia. Bob's address is: Rober J. Haislmaier, 3021 Gumwood Drive, Hyattsville, MD 20783.

## Book Reviews



by Jim Hill, EMXX Corporation.

Many of our past reviews have been on books covering the broad subject of electromagnetic compatibility. Some have been on the more specialized aspects of EMC. In this issue, we review a book dealing with the design of power supplies and including one chapter (of eleven) which deals with EMC. Power supply EMC is important because most electronic systems include at least one power supply. Even the battery operated systems often include a power supply such as a dc/dc converter or a dc/ac inverter. The book we are reviewing contains detailed information on power supply design, including the control of EMI.

The proliferation of main frame computers, minicomputers, microcomputers and peripherals, together with the advent of LSI memories, microprocessors, and integrated circuit voltage regulators, has increased the interest in, and demand for, switching power supplies. For these applications, the control of power supply EMI is of primary importance.

#### DESIGN OF SOLID-STATE POWER SUPPLIES, SECOND EDITION

by Eugene R. Hnatek Published by Van Nostrand Reinhold Company Inc. 135 West 50th Street, New York, NY 10020 Hardbound, 621 pages; \$29.95. Copyright 1981

The authors stated intent is to offer a practical approach to the design of solid-state power supplies and to provide in a single volume meaningful and practical information to give the designer all the tools and techniques available with which to effect a design solution. The material presented is done so on a practical basis and not in a textbook style.

We will give a brief overall summary of the book and then concentrate on Chapter 8 which deals with EMC. Chapter 1, the introduction, briefly reviews solid-state power supplies and describes the various design considerations that influence the selection of components and guide the specification of circuits. Chapters 2 through 9 deal with the components and circuits that are building blocks of the power supply. These chapters include operating characteristics, examples, and problems, as well as many drawings and photographs to illustrate the various design principles. Furthermore, since the majority of present-day power supplies are of the pushpull square-wave oscillator type, this configuration is emphasized. Chapters 10 and 11 integrate the discussion of power supply building blocks and discuss the overall design considerations for dc/dc converters and dc/ac inverters, proceeding from the electrical performance specification requirements and culminating in highly compact and lightweight solid-state power supplies.

Now, to zoom in on Chapter 8, "Electromagnetic Compatibility." The author's basic design objective for EMI suppression components is to provide the degree of EMI suppression required in each case, with a minimum increase in weight, bulk, circuit complexity, cost and a minimum decrease in circuit performance. In most instances, the problem can be brought under control by shielding, filtering, and rerouting system grounds, in which case the regulator should be mounted as close as possible to the point where the circuit ground joins the cabinet or chassis ground. There are, however, times when the only way to eliminate EMI is to relocate the regulator system in the rack.

This 52-page chapter is organized into sections devoted to: (1) noise sources in switching power supplies, (2) dc/dc conver-

ter EMI specifics, (3) EMI and the switching regulator, (4) suppressing EMI with power supply filters, (5) EMC requirements, (6) EMC design example, (7) references.

The first section, noise sources, includes a discussion of the "sneak" sources, those that are unseen on the circuit diagram and unseen in the resulting hardware. These are the lessons learned from grim experience that the author explains to the uninitiated. In the second section, on dc/dc converters, the author deals with the switching waveforms, their relation to EMI, and how to control them. He describes a unique two-core transformer using concentric toroids to reduce spikes by switching transistors before the outer core saturates. This technique not only improves conversion efficiency, but reduces EMI as well. The section on the switching regulatoralso discusses switching waveforms and their relation to EMI. In addition, it covers the effect of diode recovery time and the importance of Q control in the reduction of EMI.

Section four, on suppressing EMI with power supply filters, deals with input and output filters and describes the characteristics of the various types of filters. Section five, on EMC requirements, opens with the observation that, unfortunately, the primary noise generators that couple RF noise into the chassis are components that get hot. Transistors, power rectifiers, and even transformers and inductors, may be damaged or destroyed if not properly cooled. They are normally fastened to the chassis. The solutions to this and other isolation problems are addressed. The chapter ends with an example of a practical power supply designed to meet a MIL STD requirement. Each feature of the design and its impact on EMI/EMC is explained. A list of references contains 16 books and papers.

While chapter 8 is the treatise on EMC, the book also contains discussions of EMC design features in reference to specific types of power supplies in the other chapters of the book. As an example, the chapter on inverter design contains a section on EM1 considerations.

The book's index is quite thorough and I would recommend this book as a design reference book on solid-state power supplies. For the EMC engineer who is faced with after-thefact fixes, it offers numerous suggestions which can be applied to bring the out-of-spec power supply within limits.

#### **IEEE PUBLICATIONS**

The following books, which were recently published by the IEEE Press, are available from the IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854:

#### Spread-Spectrum Communications

Edited by Charles E. Cook, Fred W. Ellersick, Laurence B. Milstein and Donald L. Schilling. Sponsored by the IEEE Communications Society. 296 pages, \$39.95 (non-members), \$23.95 (members).

This book addresses spread-spectrum communications systems and their applications, including communicating in the presence of intentional or unintentional interference, combating multipath problems, and providing multiple access to a communications system shared by many users. Comprised of reprinted papers, the book analyzes the development of spectrum communications systems from early history to the most current technology. Frequency Stability: Fundamentals & Measurement

Edited by Veneceslav F. Kroupa, Czechoslovak Academy of Sciences. Sponsored by the IEEE Instrumentation and Measurement Society. 400 pages, \$62.95 (non-members), \$37.75 (members). (PC01644).

This collection of 38 papers covers the major developments in making precise measurements of frequency and frequency stability. The book is divided into six sections: Flicker Noise and its Statistical Treatment; Theoretical Backgrounds of Oscillator Noise; Mathematical Theory of Frequency Stability; Measurement of Frequency Stability; Noise Measurements at Microwave Frequencies; and Noise Properties of the Measurement-System Building Blocks.

## EOS/ESD SYMPOSIUM

The sixth annual EOS/ESD Symposium will be held from October 2-4, 1984 at the Marriott Hotel in Philadelphia, PA. The symposium, dealing with electrical overstress (EOS) and electrostatic discharge (ESD) effects on solid state microelectronics, is being sponsored by IIT Research Institute and the EOS/ESD Association. The symposium will be devoted to the understanding of fundamental phenomena associated with transient electrical overstress and the application of this knowledge to the solution of problems in military, industrial, communications, consumer and automotive electronics. Subject areas may include:

Failure Mechanisms

- · Modeling and Physics of Damage
- Breakdown in Solids
- Latent Failures
- Second Breakdown

Design for Electrical Overstress

- Design Hardening
- Transient Protective Devices
- New Microelectronic Structures
- New Materials, Processes, and Technologies

Testing

- Test Methods and Procedures
- Specifications and Standards
- Simulation
- Failure Analysis Techniques

Precautionary Measures

- Facilities
- Line Transients
- Implementation Procedures
- Packaging and Handling

For more information, contact Burt Unger, Bell Laboratories, 600 Mountain Avenue, Murray Hill, NJ 07974; (201) 582-2555.

## ELECTROLESS SHIELDING SEMINAR

The American Society of Electroplated Plastics will sponsor an intensive one-day seminar on EMI Electroless Shielding. The schedule is given below:

April 25, 1984	The Grand Hotel, Anaheim, CA
June 12, 1984	The Bloomington Marriott, Min-
	neapolis, MN
October 18, 1984	Longboat Key Club, Longboat Key
	(Sarasota), FL
1 00 1001	A 1' A TEN A 1' A TONE

November 29, 1984 Arlington Hilton, Arlington, TX

For more information, write to ASEP, 1133 15th St., N.W., Washington, DC 20005, or phone ASEP headquarters, (202) 429-9440.

## 1984 IEEE SANTA CLARA VALLEY FORUM ON EMC

The 1984 IEEE Santa Clara Valley Forum on EMC will be held on May 22-23, 1984 at the Hyatt Hotel Mediterranean Complex in San Jose, CA. The forum will feature two days of tutorials covering practical knowledge presented by experts in the field, and exhibits on the latest hardware and services in the fields of EMI, EMC, TEMPEST, FCC and ESD.

The technical program will consist of presentations in the following subjects:

FCC Regulations VDE Regulations FCC/VDE Testing Test Facilities MIL-STD-461 MIL-SPEC-Testing Power-Line EMI ESD Package Design EMP and Lightning PC Board Design Product Safety EMI Measurements Power Supply EMI Test Chambers Shielding Effectiveness Testing

Registration forms are available by writing to the IEEE Forum, P.O. Box 70577, Sunnyvale, CA 94088.

## IEEE WORKSHOP ON PAYLOAD SUSCEPTIBILITY

A workshop on payload susceptibility to space shuttle Kuband radiated fields will be held on May 30, 1984 at the Gilruth Center, Johnson Space Center in Houston, TX. The workshop is co-sponsored by AIAA Houston Section -Communication Systems Technical Committee and the IEEE, Galveston Bay Section.

The purpose of the workshop is to provide a better understanding among NASA, DOD, Payload organizations, and potential Shuttle users of technical issues related to K-band radiated emissions. The Space Shuttle Orbiter Ku-band system antenna radiates relatively high field intensities. This workshop will provide a forum for the exchange of technical information related to K-band radiated emission effects on components and systems, EMC test results and analyses involving frequencies outside the K-band system and susceptibility characteristics as a function of frequency will also be discussed.

The following specific areas may be addressed:

- Orbiter Ku-Band Radiated Field Characteristics
- Orbiter Ku-Band System Operations
- General Avionics Susceptibility
- Sensor and other Special Device Susceptibility
- Pyrotechnics and Associated Circuitry Susceptibility
- RF Communication Systems Susceptibility

Additional information is available from Ralph Lawton, Workshop Coordinator, McDonnell Douglas Technical Services Co; (713) 488-5660, Ext. 468.

# **EMC PERSONALITY PROFILES**



#### **MELVIN JOHNSON**

Mel is presently at Southwest Research Institute in San Antonio, Texas where he manages and directs the EMC Concepts and Development Section in the Department of Electromagnetic Compatibility. This work consists of studies of EMC phenomena, standards development, measurement techniques, and reduction of emissions. The development work is oriented toward special equipment including EM field generation, reception, conducted emission probes, and special receivers and analyzers. Mel also manages and directs the TEMPEST and Advanced Communications Section, which consists of research, development, test, and evaluation of programs involving the measurement, analysis and suppression of signals as required by government agencies. Mel has developed probes and instrumentation used in major biological research studies of 60 Hz electric fields, and has researched and performed design work for probe systems throughout the frequency spectrum up to 20 GHz. He has also been involved in fiber optic sensor design work, results of which are published in the 1982 IEEE Symposium record, and in more detail, in reports to the automotive industry.

Prior to his career at Southwest Research Institute, Mel, who was born in Grand Rapids, Minnesota on August 13, 1940, worked as a Russian language interpreter with the U.S. Air Force from 1958 to 1970, when he received his degree in electrical engineering from Oklahoma State University. He then received a commission in the Air Force and served



by William G. Duff

continuously until his retirement in 1980. His assignments included research and testing of nuclear generated electromagnetic pulse (EMP) effects on aircraft and missile systems, high voltage susceptibility of aircraft fuel systems, and work with EMP sensors and simulators at the Air Force Weapons Laboratory in Albuquerque, New Mexico. Aircraft and missile systems that he has tested include the F-111 and B-52 Aircraft, Short Range Attack Missile, Hound Dog and Emergency Rocket Communications System Missiles, and the Boeing 747 Advanced Airborne Command Post, Additional assignments included Program Management responsibilities for secure voice and digital communications systems and TEMPEST work at the Electronic Security Command (formerly United States Air Force Security Service) in San Antonio, Texas. In this capacity, Mel received the United States Air Force Meritorious Service Medal for outstanding contributions to aircraft Identification Friend of FOE(IFF) Systems.

Mel has been very active in IEEE and EMC activities, and in addition to serving as chairman of the 1984 National EMC Symposium, is presently Chairman of the IEEE EMC Chapter of the Central Texas Section, having previously served as Vice Chairman and Treasurer. Mel is also an associate editor of the EMC-S Newsletter, with responsibility for the EMC abstracts, a member of the SAE EMI Standards and Test Methods Subcommittee, and a member of the Passenger Car Activity of the Electrical and Electronics Systems Committee. Mel is a Senior Member of the IEEE and a registered Professional Engineer in the State of Texas.

He has authored and co-authored several technical papers in various EMC symposia, SAE meetings, and ITEM Magazine, in addition to reports authored while in the Air Force.

Mel would especially like to have EMC stressed to other IEEE Societies and educational institutions, and feels that the future of EMC depends on members of industry becoming aware of what the EMC community can do for them. He stresses educational institutions since these are the sources of our future EMC talent.

#### **NEWS FROM WASHINGTON**

#### MORE SPECTRUM STUDIES

If the printed word could be converted into radio spectrum, there would be no shortage. Since our last issue, in which we reproduced excerpts from the final report of the FCC's Private Radio Bureau on "Future Private Land Mobile Radio Requirements", several other FCC reports relating to this subject have been released.

The Commission's Office of Science and Technology has published one report (FCC/OST R83-3) entitled "Analysis of Technical Possibilities for Further Sharing of the UHF-TV Band by the Land Mobile Services in the Top Ten Land Mobile Markets", (honest), and another (FDD/OST TH83-7) which reports on lab and field tests which compare ACSB to conventional FM for VHF mobile radio applications.

The Office of Plans and Policy has issued a report entitled "Implementing New Technology in the Land Mobile Radio Services. Another OPP product which has relevance to mobile radio spectrum issues is the report of "A" Framework for a Decentralized Radio Service."

To give you some indication of the substance of each of these reports, selected excerpts are reproduced below. As usual, those who would like to obtain complete copies should contact the appropriate FCC office or the FCC's reproduction contractor.

"ANALYSIS OF TECHNICAL POSSIBILITIES FOR FURTHER SHARING OF THE UHF TELEVISION BAND BY THE LAND MOBILE SERVICES IN THE TOP TEN LAND MOBILE MARKETS"

#### SUMMARY

An estimate has been made of the amount of further accommodation that could be made for land mobile services in the UHF-TV spectrum. The estimate is in terms of specific TV channels that could be designated for land mobile use in specific cities with minimum impact on licensed or allocated full power television services. The specific cities are the ten in which land mobile services are deemed to be most congested.

The impact on the projected low power TV service of such an accommodation of land mobile has also been estimated. The Commission requested these estimates when it adopted, on March 4, 1982, a report and order in BC Docket 78-253 authorizing low power television. On that occasion the Commission instructed the Office of Science and Technology to evaluate the technical feasibility of further sharing of the television band by land mobile services in the ten largest land mobile markets and to assess the impact this would have on the new LPTV service. It was understood that the evaluation would require a technical study of some depth.

Since the situation is continuously changing, the analytical method described in this report is particularly valuable because it is systematic and can be repeated. New TV stations are authorized from time to time and the table of TV allotments is occasionally modified to reflect changes in demand for TV service. Hence the particular TV channels suitable for land mobile use will not necessarily be the same in the future, and the analysis would have to be repeated. It is based on the technical approach to sharing that was used in Docket 18261; that is, it is considered technically feasible for land mobile to operate on particular UHF-TV frequencies if sharing criteria similar to those used in Docket 18261 can be satisfied.

The data presented in this report suggest that the impact on the UHF-TV services varies from market to market and depends on the selection of the size of the land mobile operating area in each market as well as the technical interference-protection criteria for sharing between land mobile and broadcast. For example, suppose it is desired to reallocate one additional television channel for land mobile use in each market. If the interference-protection criteria developed in Docket 18261 are strictly applied and allowance is made for wide land mobile operating areas - as wide or nearly so as those adopted in Docket 198261 - the impact on the broadcast services would be significant. In eight of the ten markets this would require the deletion of (presently vacant) full power television allotments, for some of which there are applications pending. Licensed translators would also be affected and some low power TV applications would be precluded. The remaining two markets could not be accommodated under this option.

On the other hand, if the technical criteria for interservice sharing are relaxed certain land mobile service areas of minimum size can be accommodated with much less impact on the UHF-TV broadcast services. In four out of the ten markets there would be no loss of existing, applied-for or allocated broadcast services. In five others licensing of one or two low power television assignments would be precluded. In the tenth market a full power television allotment would be deleted.

The implications just described of various reallocation options refer to the current situation of broadcast services. Details of the current situation will change, and details of the impact of the options will then be different. The impact of any proposal for increased interservice sharing may in time become substantial as full service allotments are filled and lower power TV stations are licensed.

#### IMPLEMENTING NEW TECHNOLOGY IN THE LAND MOBILE RADIO SERVICES

The Communications Act of 1934 mandates that the Federal Communications Commission "encourage the larger and more effective use of radio in the public interest" (47 U.S.C. 303(g). This mandate provided the fundamental premise of this report:

It would be in the public interest for the FCC to allow, encourage and promote the introduction of spectrum efficient technologies in the land mobile radio services.

If the Commission were to agree with this premise and decide that the encouragement and introduction of new technology in the land mobile radio services is an important policy goal, it could take various regulatory approaches. The purpose of this report is to indicate and describe the approaches that appear to be the most desirable. Implementation of new technologies can be limited by two factors: (1) mandatory technical standards that prohibit the implementation of new systems, and (2) insufficient incentive for users to employ spectrum efficient systems. Significantly, considerable progress has been made in the last several years to eliminate these barriers. Positive steps include:

Allowing some users wide *technical flexibility* in the types of systems they may operate.

Use of *exclusive channel assignments* so that users may benefit from improvements they make.

Encouraging efficient operation by allowing *profit-making* and resale of excess capacity.

The report shows how these three elements provide a cohesive structure for regulation of the land mobile radio services, and it recommends that these concepts be extended to frequency bands where they are not now used.

Chapter II of the report is a description of the current regulatory structures that are applied to land mobile radio. These regulatory approaches vary across different land mobile bands, and some appear more able than others to encourage efficient radio communications during times of rapid technological change.

Some of the most promising technologies are described in Chapter III. There are additional spectrum efficient technologies beyond trunking, single sideband and cellular, but these three are notable in that they can be implemented now in bands where they are not now used.

Chapter IV describes several approaches that appear to encourage the implementation of new technologies and innovations.

This article was written by Eric Schimmel, and was originally published in the February 1984 issue of the IEEE Vehicular Technology Society Newsletter.

## NEW PUBLICATION ASSISTS WITH NEAR-FIELD ANTENNA MEASUREMENTS

A new NBS publication provides electrical engineers with approximate formulas for calculating the gain and far-field pattern for open-ended rectangular waveguide probes used in making probe-corrected near-field antenna measurements. Two methods were developed, both of which significantly reduce the previous limits of uncertainty for calculated probe characteristics. Previously, the only means of adequately determining the required far-field gain and complex pattern of the probe was by direct measurement --a tedious and time consuming operation. Direct measurement still is required when the highest accuracy is sought, but calculated probe characteristics based on these new formulas can now be used for less demanding cases. Approximate Formulas for the Far-Fields and Gain of Open-Ended Rectangular Waveguide (NBSIR 83-1689) is available for \$8.50 prepaid from the National Technical Information Service, Springfield, Va. 22161. Specify PB #83-233999 when ordering.

### NEW LIST OF TECHNICAL REPORTS ISSUED BY FAA

The department of Transportation's Federal Aviation Administration published a list of 163 scientific and technical aviation-related reports available to the public. The list, which was published in February, covers the period January thru June, 1982. Airports and aircraft safety, air traffic control, approach and landing systems, aviation medicine and security, communications, and environmental and frequency management are among the subjects included.

Copies of the list of available reports are available from the Federal Aviation Administration, Office of Public Affairs, APA-300, Washington, DC 20591. Government agencies and their contractors can order individual reports from the Defense Technical Information Center (DTIC). Individuals can order individual reports from the NTIS, 5285 Port Royal Road, Springfield, VA 22161.

## **EMCABS**

In this issue, we are publishing 24 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, Electro-Metrics/Penril Corp. R.N. Hokkanen, Naval Training Equipment Center R. Jacobson, Sperry Flight System



MELVIN J. JOHNSON

D.R. Kerns, Southwest Research Institute S. Kuniyoshi, Naval Sea Systems Command R.B. Schulz, Xerox Corp./Off. Prod. Div. R.M. Showers, University of Pennsylvania

"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.

	EMCABS:1-3-84		EMCABS:4-3-84		
Electromagnetic Coupling to an Infinite Wire through a Slot in a Conducting Pla Yang Naiheng and Roger F. Harrington Syracuse University, Syracuse, NY IEEE Transactions on Antennas and Propagation Vol. AP-31, No. 2, March 1983, pp. 310-316 ABSTRACT: The problem of electromagnetic coupling to a long wire behind a slo plane is considered by the method of moments. An equivalent circuit is obtained mode of the wire-slot system. An interesting result of the analysis is that, when the w for maximum power transfer, orders of magnitude more power may be transferred to wire is present than when the wire is absent. INDEX TERMS: Coupling, Slots, Long wires, Method of moments	ane ot-perforated conducting for the transmission line vire is terminated in loads through the slot when the	RFI Remarks Bill Orr, Editor Ham Radio Magazinc Vol. 16, Number 2; pp. 47-48 ABSTRACT: A series of letters from Amateur Radio Operators dealing with radio and TV interference from various microwave ovens. Suggested corrective measures and Federal Communications Commission read- ings and compliants are detailed. INDEX TERMS: Microwave oven, radio and TV interference			
	EMCABS:2-3-84	Use of the AURORA Flash X-Ray Machine as a Source-Region EMP Simulator and Antenna Coupling Analysis Facility	EMCABS:5-3-84		
Large-Signal Transient Responses of a Switching Regulator Takashi Nabeshima and Koosuke Harada Kyushu University IEEE Transactions on Aerospace and Electronic Systems Vol. AES-18, No. 5, September 1982, pp. 545-551 ABSTRACT: Analytical and experimental considerations of the large-scale tra buck-type switching regulator are described. The dynamic behavior under the I different from the small-signal operation because of the saturation characteristics of tor feedback controller. The effect of this non-linearity is analyzed by dividing its ope As a result the peak values of the inrush current and output voltage are obtained start-up and for the step change of the load condition. INDEX TERMS: Transient response, Switching regulator, Power supplies	unsient responses of the large-signal condition is f the pulsewidth modula- eration into three modes, analytically both for the	Harry Diamond Labs, Adelphi, MD AD-A 122 024/3, PC A04/MF A01, Technical Rept. Oct. 82, 64p., Rept no. HDL-TR-1975, Contract MIPR-80-581 ABSTRACT: In the AURORA flash x-ray machine, a bremsstrahlung spectrum is tantalum targets by four synchronous 10-MeV electron beams. The bremsstrah electromagnetic pulse (EMP) signal through the same mechanism as does a nu Compton electron currents in the AURORA test cell chamber (20 x 15 x 5 m). As the slowed down, they ionize the air and also produce an electromagnetic field in the Compton current is confined to a relatively small volume so that a relatively small produced, rendering the unmodified AURORA machine unsuitable as a source- simulator. A large parallel-plate transmission line has been designed to produce a ( This transmission-line simulator can be placed in the AURORA test cell. When AU fired synchronously, an SREMP-like environment is produced, with AURORA pro air conductivity. INDEX TERMS: Aurora, EMP, Simulator	produced in four thick lung then produces an clear bomb. It induces e Compton electrons are chamber. However, the electromagnetic field is region EMP (SREMP) threat-like) EMP pulse. IRORA and the line are oviding the time-varying		
Airframe Electrical Grounding Requirements Program, Volume 1	EMCABS:3-3-84	Engineering Design Guidelines for Electromagnetic Pulse Hardening of Naval	EMCABS:6-3-84		
Naval Atr Systems Command, Washington, D.C. AD-A115 064/8, PC A03/MF A01, Final Report Feb. 17, 1981, 46 page <b>ABSTRACT:</b> An investigation of airframe electrical grounding requirements, me been made to resolve conflicts and establish a basic grounding philosophy. A technic that it is necessary to continue and extend the use of airframe grounding for personr protection. The committee also concluded that present static ground impedanc stringent, resulting in costly grounding systems. Aircraft mooring padeyes on parki than 10,000 ohm resistance to earth and are recommended as a static ground attack found that for external power grounding, the existing requirements are vague and the based on an analysis of total power requirements and circuit protection levels. A recommended for ground systems when external power is connected to the aircra <b>INDEX TERMS:</b> Airframe grounding	ethods, and facilities has cal committee concluded nel safety and equipment ce requirements are too ing aprons measured less hment point. It was also may be unsafe when not vdditional guidelines are ft or used near it.	S. R. Rogers, R. A. Perala, R. K. Rosich, R. B. Cook, T. H. Rudolph Electro-Magnetic Applications, Inc., Denver, CO AD-A 123 711/4, PC A22/MF A01, Final Rept. 15 Jul 81, 508p., Contract N60921-80-C-0190 ABSTRACT: This document is intended to be used by engineers who design and equipment. It is complete in the sense that both the EMP hazard and the means (hardening) are presented. The hazard is described, which not only discusses EMF sense, but it also presents specific threat levels for EMP fields and transient currents cables and antennas which are connected to electronic equipment. This specific this survivability criteria which must be met by the mission critical equipment. T technology areas include volume shielding, cable shielding and connectors, interfac terminal protective devices, upset and upset hardening, common mode rejection tech and grounding/bonding techniques. Test techniques which can verify equipment along with methods to observe the equipment's hardness and maintain the hardne	manufacture shipboard of mitigating the hazard generation in a general and voltages included on reat constitutes an EMP he necessary hardening se susceptibility analysis, iniques, optical isolation, hardness are presented ess.		

	EMCABS:7-3-84	EMCABS:10-3-84				
	Electromagnetic Pulse (EMP): Phenomena, Simulation, and Hardening. 1972-January 1983 (Citations from the International Aerospace Abstracts Data Basc). National Technical Information Service, Springfield, VA PB83-859223, PC N01/MF N01, Rept. for 1972-Jan 83. Jan 83, 134p., Supersedes PB82-869165. Prepared in cooperation with the National Aeronautics and Space Administration, Washington, DC <b>ABSTRACT:</b> This bibliography contains citations concerning electromagnetic pusle (EMP) generation and propagation mechanisms and interactions and coupling with various structures, aircraft, spacecraft, and missiles as well as electronic components, electrical circuits, and antennas. Physical and computerized simulations of EMP and EMP environments and interactions are considered. EMP protection methods and devices, including hardening, shielding, and isolation are also covered. (This updated bibliography contains 127 citations, 31 of which are new entries to the previous edition.) <b>INDEX TERMS:</b> EMP Simulation, Hardening, Bibliography	Interaction of Electromagnetic Pulse with Commercial Nuclear Power Plant Systems. Volume 11, Main Report David M. Ericson, Jr., David F. Strawe, Steven J. Sandberg, Vincent K. Jones, Gary D. Rensner Sandia National Labs., Albuquerque, NM NOREG/CR-3069-V2, PC A18/MF A01, Technical rept. Feb. 83, 414p. SAND-82-2738/2, Prepared in cooperation with Boeing Aerospace Co., Booz-Allen, and Hamilton, Inc. and IRT Corp. See also NUREG/CR-3069-V1 ABSTRACT: The study examines the interaction of the electromagnetic pulse from a high altitude nuclear burst with commercial nuclear power plant systems. The potential vulnerability of systems required for safe shutdown of a specific nuclear power plant are explored. EMP signal coupling, induced plant response and component damage thresholds are established using techniques developed over several decades under Defense Nuclear Agency sponsorship. A limited test program was conducted to verify the coupling analysis technique as applied to a nuclear power plant. The results are extended, insofar as possible to other nuclear plants. INDEX TERMS: EMP interaction, Power plant				
	EMCABS:8-3-84	EMCABS:11-3-84				
17	Electromagnetic Pulse (EMP): Phenomena, Simulation and Hardening. 1976-December, 1982 (Citations from the Energy Date Base). National Technical Information Scrvice, Springfield, VA PB83-858795, PC N01/MF N01, Rept. for 1976-Dec 82 Dec 82, 140p., Supersedes PB82-869173. Prepared in cooperation with the Department of Energy, Washing- ton, DC ABSTRACT: This bibliography contains citations concerning various aspects of electromagnetic pulse (EMP) from the environment through systems design and testing. The interactions and coupling of electronic components and systems, communication and power transmission systems, and sea, air, and spacecraft with EMP are considered, as is their protection from it by shielding, isolation, and hardening methods and devices. Some attention is given to physical and computerized simulations of EMP and to health and safety hazards associated with its generation. (This updated bibliography contains 145 citations, 10 of which are new entries to the previous edition.) INDEX TERMS: EMP Simulation, Hardening, Bibliography	<ul> <li>Interaction of Electromagnetic Pulse with Commercial Nuclear Power Plant Systems. Volume I, Executive Summary.</li> <li>David M. Ericson, Jr., David F. Strawe, Steven J. Sandberg, Vincent K. Jones, Gary D. Rensner Sandia National Labs., Albuquerque, NM</li> <li>NUREG/CR-3069-VI, PC A03/MF A01, Technical Rept., Prepared in cooperation with Boeing Aerospace Co., Booz-Allen and Hamilitorn, Inc., and IRT Corp. See also NUREG/CR-3069-V2, Feb 82, 41p. SAND-82-2738/1</li> <li>ABSTRACT: The study examines the interaction of the electromagnetic pulse from a high altitude nuclear burst with commercial nuclear power plant systems. The potential vulnerability of systems required for safe shutdown of a specific nuclear power plant are explored. EMP signal coupling, induced plant response and component damage thresholds are established using techniques developed over several decades under Defense Nuclear Agency sponsorship. A limited test program was conducted to verify the coupling analysis technique as applied to a nuclear power plant. The results are extended, insofar as possible to other nuclear plants.</li> <li>INDEX TERMS: EMP interaction, Power plant</li> </ul>				
	Electromagnetic Pulse (EMP): Phenomena, Simulation, and Hardening. 1975-1982 (Citations from the International Information Service for the Physics and Engineering Communitics Data Base). National Technical Information Service, Springfield, VA PB83-858803, PC N01/MF N01, Rept. for 1975-Dec 82 Dec 82, 169p., Supersedes PB82-869181. ABSTRACT: This bibliography contains citations concerning natural and nuclear electromagnetic pulse (EMP) phenomena. Analyses and simulations of EMP interactions and coupling with various susceptible objects and devices and their responses are covered. Protective methods and technology are also considered along with test techniques and results. Attention is also given to computer aided EMP analysis. (This updated bibliography contains 149 citations, 16 of which are new entries to the previous editions.) INDEX TERMS: EMP Simulation, Hardening, Bibliography	Effect of Frequency-Dependent Soil Parameters on Reflection Coefficients Norman V. Hill Harry Diamond Labs., Adelphi, MD AD-A124 798/0, PC A03/MF A01, Technical rept. Dec. 82, 33p. Rept. No. HDL-TR-2004 ABSTRACT: The degree with which electromagnetic pulse (EMP) energy is predicted above a reflecting plane is strongly dependent on the nature of the plane. The reflection of electromagnetic energy from a surface can be accurately described mathematically, and equations which predict these fields are common knowledge to the EMP community. Although this is the case, some predictive analysis use models for the earth's surface which are independent of frequency and considers only an average soil moisture content. This report describes the varieties of electrical properties with frequency and moisture content. It applies these variations to a reflected EMP and assesses the energy difference between models which use parameters independent of frequency and those which use varying parameters. Finally, it discusses the variation of soil properties with depth and predicts the magnitude of energy, above the ground, which may result from this variation. INDEX TERMS: EMP, Reflection, Soil				

EMCABS:13-3-84 Lightning, Surge and Transient Protection. 1978-November 1982 (Citations from the NTIS Data Base). National Technical Information Service, Springfield, VA PB83-801597, PC N01/MF N01 Jan 83, 264p., Supersedes PB81-808677, and PB80-810781. ABSTRACT: Techniques and devices for the protection of electronic and electrical equipment are presented in these Federally-sponsored research reports. The citations include research on suppressors, limiters, lightning arresters, electromagnetic pulse protection devices, and over-voltage protection networks. Electro- magnetic shielding is excluded. (This updated bibliography contains 256 citations, 72 of which are new entries to the previous edition.)		Lightning Attachment Patterns and Flight Conditions for Storm Hazards, 1980. B. D. Fisher, G. L. Keyser, Jr., P. L. Deal National Aeronautics and Space Administration, Hampton, VA, Langley Research Center N83-14077/2, PC A04/MF A01, Contract NAS1-15884 Dec. 82, 71p., NAS 1.60:2087, L-15438, NASA-TP-2087, Prepared in cooperation with Lightning Technolo- gies, Inc. ABSTRACT: As part of the NASA Langley Research Center Storm Hazards Program, 69 thunderstrom penetrations were made in 1980 with an F-106B airplane in order to record direct strike lightning data and the associated flight conditions. Ground based weather radar measurements in conjunction with these penetra- tions were made by NOAA National Severe Storms Laboratory in Oklahoma and by NASA Wallops Flight Center in Virginia. In 1980, the airplanc received 10 direct lightning strikes; in addition, lightning transient data were recorded from 6 nearby flashes. Following each flight, the airplane was thoroughly inspected for evidence of lightning attachment, and the individual lightning attachment points were plotted on isometric				
INDEX TERMIS: Electronic and electrical protection devices		strikes to the airplane, shows the strike attachment patterns. This report presents prot the patterns with respect to aircraft protection design. INDEX TERMS: NASA, Thunderstorm penetrations, Lightning data	cusses the implications of			
EMC	CABS:14-3-84		EMCABS:17-3-84			
<ul> <li>The Development and Testing of Lightning Flash Counters in the Republic of South 1980-1981.</li> <li>R. B. Anderson, H. Kroeninger, D. V. Meal, and M. A. Smith National Electrical Engineering Research Inst., Pretoria (South Africa) N83-11660/8, PC A03/MF A01, Final Report</li> <li>Sep 81, 49p. CSIR-SR-ELEK-227</li> <li>ABSTRACT: A program of measurement and research with lightning flash counters is discut the lightning flash density of the Republic of South Africa and of South West Africa (Nami Detailed lightning statistics for the Pretoria area of the Transvaal Province are given. A r covering the characteristics of lightning flash counters, including counters for cloud flash counting positive and negative ground flashes separately, is discussed. In the national survey 380 field counters for another year are added to the previous year's data and a map for the June 1981 was completed. Comparisons are made between CIGRE 500 Hz and 10 kHz costituations.</li> <li>INDEX TERMS: Lightning, South Africa</li> </ul>	th Africa During sussed. A survey of nibia) is discussed. research program h density and for ty, the results from le six years ending sounters at several	<ul> <li>Rocket-Borne Electric Field Meter for the Middle Atmosphere</li> <li>G. J. Dettro, L. G. Smith</li> <li>Illinois Univ. at Urbana-Champaign, Aeronomy Lab</li> <li>N83-16715/5, PC A06/MF A01, Contract NGR-14-005-181</li> <li>1 Dec 82, 114p., NAS 1.26:169791, UILU-ENG-82-2505, NASA-CR-169791</li> <li>ABSTRACT: The design and construction of a rocket-borne electric field metatmosphere's electric field and the conductivity in the middle atmosphere are concharacteristics of the instrument are discussed and a proposed flight configuration is prototype is described and suggestions are advanced for further improvements.</li> <li>INDEX TERMS: E-Field meter</li> </ul>	eter for determining the onsidered. The operating s given. The testing of the			
EM	(CABS:15-3-84	Laboratory Modeling and Analysis of Aircraft-Lightning Interactions C. D. Turner, T. F. Trost Texas Tech Univ., Lubbock, Dept. of Electrical Engineering	EMCABS:18-3-84			
Lightning Warning Systems for Explosive Operations/Facilities Mitchell A. Guthrie Navał Surface Weapons Center, Dahlgren, VA AD-P000 462/2, PC A02/MF A01, This article is from "Minutes of the Explosives Safety Held at OMNI International Hotel, Norfolk VA on 24-26 Aug 1982 Vol. 1, "AD-A124 400, Aug 82, 21p. ABSTRACT: This report presents a review of lightning warning techniques with empha facilities and operations. An explanation of how each technique is used to detect the present that can lead to these discharges, with the advantages and limitations of these techniques is gi an attempt is made to show how the lightning detection hardware can be incorporated Hazardous Wcather Plan. INDEX TERMS: Lightning, Warning systems	ty Seminar (20th) nasis on explosive ence of conditions given. In addition, d into a facility's	N83-10023/0, PC A08/MF A01, Contract NAG1-28 Aug 82, 168.p, NAS 1.26:169455, NASA-CR-169455 ABSTRACT: Modeling studies of the interaction of a delta wing aircraft with dire carried out using an approximate scale model of an F-106B. The model, which subjected to direct injection of fast current pulses supplied by wires, which simulate t are attached at various locations on the model. Measurements are made of the result netic fields using time derivative sensors. The sensor outputs are sampled and dig noise level is reduced by averaging the sensor output from ten input pulses at each analysis of the measured fields includes Fourier transformation and the computation the model. Prony analysis is also used to determine the natural frequencies of the model natural frequencies extracted by Prony analysis with those for in flight direct lower damping in the in flight case. This is indicative of either a lightning channel than the wires on the model, only one attachment point, or short streamers inste <b>INDEX TERMS:</b> Modeling, Aircraft, Lightning	ect lightning strikes were is three feet in length, is the lightning channel and ing transient electromag- gitized by computer. The a sample time. Computer n of transfer functions for e model. Comparisons of t strike data usually show with a higher impedance and of a long channel.			

	EMCABS:19-3-84		EMCABS:22-3-84			
Review and Comparison of Lightning Return Stroke Models Using Experimental Data Shad M. Hanif Air Force Inst. of Tech., Wright-Patterson AFB, OH School of Engineering AD-A124 680/0, PC A09/MF A01, Master's Thesis Dec. 82, 182p. Rept. no. AFIT/GE/EE/82D-61 ABSTRACT: Over the last three decades many lightning return stroke models have been proposed to predict the current pulse of the return stroke as it propagates in the channel. These models were mainly proposed by trying to solve the inverse problem of suggesting the current in the channel which will give the experimental measurement of the electromagnetic (EM) fields on the ground. Due to the lack of airborne data, the validity of these models as a function of height have not been verified. In this thesis we provide a discussion of all the significant return stroke models and their credibility as a function of height by comparing their EM fields with recent acquired airborne lightning data. The equations to compute the electric and magnetic fields in space due to a vertical channel are also derived. The last part of the thesis is related to the comparison of these models. The predicted fields due to Master et al were plotted and compared with the empirical results. INDEX TERMS: Lightning return strokes, EM fields		Interpretation Methodology and Analysis of In Flight Lightning Data T. Rudolph, R. A. Perala Electro Magnetic Applications, Inc., Denver CO N83-11661/6, PC A09/MF A01, Final Report, Contract NASI-16489 Oct 82, 181p., NAS 1.26:3590, EWA-82-R-21,NASA-CR-3590, Prepared for Research Triangle Inst., Research Triangle Park, NC ABSTRACT: A methodology is presented whereby electromagnetic measurements of inflight lightning stroke data can be understood and extended to other aircraft. Recent measurements made on the NASA F-106B aircraft indicate that sophisticated numerical techniques and new developments in corona modeling are required to fully understand the data. Thus the problem is nontrivial and successful interpretation can lead to a significant understanding of the lightning/aircraft interaction event. This is of particular importance because of the problem of lightning induced transient upset of new technology low level microcircuitry which is being used in increasing quantities in modern and future avionics. Inflight lightning data is analyzed and lightning environments incident upon the F-106B are determined. INDEX TERMS: Lightning, Aircraft, Interaction				
	EMCABS:20-3-84	The Drive to Regulate Electromagnetic Fields	EMCABS:23-3-84			
Effects of Simulated Lightning of Composite and Metallic Joints W. E. Howell, J. A. Plumer National Aeronautics and Space Administration, Hampton, VA, Langley Research Center N83-14170/5, PC A03/MF A01, Presented at the Army Symp. on Solid Mech., Cape Cod, Mass, 21-23 Sep, 1982 Oct. 82, 29p. NAS 1.15:84554, NASA-TM-84554 ABSTRACT: The effects of simulated lightning strikes and currents on aircraft bonded joints and access/inspection panels were investigated. Both metallic and composite specimens were tested. Tested on metal fuel feed through elbows in graphite/epoxy structures were evaluated. Sparking threshold and residual strength of single lap bonded joints and sparking threshold of access/inspection panels and metal fuel feed through elbows are reported. INDEX TERMS: Lightning effects, Aircraft		Eric J. Lerner IEEE Spectrum, Contributing Editor IEEE Spectrum Vol. 21, No. 3, March 1984, pp. 63-70 ABSTRACT: A few years ago, the electronics and communications industries were more than content that, in the United States, there were no compulsory regulations limiting human exposure to electromagnetic fields. In the view of many industry spokesmen, the dangers of such fields were minimal in any case. Today many corporations and trade groups are urgently demanding that the EPA or some other national agency set up standards. The reason for this shift is rooted in large part in actions by state and local lawmakers. Some states have begun either to consider or to impose their own regulations, some stricter than the only existing U.S. national standard, the voluntary one set forth by the American National Standards Institute. As a result, the industry may face a morass of contradictory state and local regulations. Thus, there is growing demand for national regulation. INDEX TERMS: Electromagnetic Fields, Human exposure, EPA, regulation, National standards				
	EMCABS:21-3-84		EMCABS:24-3-84			
Telecommunication Equipment: Atmospheric Discharge Protection, 1975-January, 1983 (Citations from the International Information Service for the Physics and Engineering Communities Data Base.) National Technical Information Service, Springfield, VA PB83-858969, PC N01/MF N01, Rept. for 1975-Jan 83. Jan 83, 111p., Supersedes PB82-865478 ABSTRACT: This bibliography contains citations concerning the effects of atmospheric discharge on telecommunication installations. Lightning protection design methods for telecommunications equipment employing solid-state devices are emphasized. Travelling wave phenomenon and resulting overvoltage are considered showing protection circuitry. The operation of lightning arresters and protection of overhead cable lines are included. (This updated bibliography contains 100 citations, 18 of which are new entries to the previous edition.) INDEX TERMS: Bibliography, Lightning effects, Telecommunications		Electromagnetic Fields Coupled into a Cavity with a Slot-Aperture under Reson Chang-Hong Liang and David K. Cheng Syracuse University, Syracuse, NY IEEE Transactions on Antennas and Propagation Vol. AP-30, No. 4, July 1982, pp. 664-672 <b>ABSTRACT:</b> The electromagnetic coupling of an incident plane wave through a s lossy rectangular cavity is analyzed by using a generalized network formulation ba the equivalence principle. Two types of aperture-cavity resonances manifest thems the existence and the characteristics of such double aperture-cavity resonances are sions for field strength in the aperture, field distributions in the cavity, and maximu derived. Appropriate expressions for an equivalent magnetic current to replace the numerical example is given. <b>INDEX TERMS:</b> Cavity, Coupling, Slot, Aperture, Resonance	ant Conditions slot-aperture backed by a ased on an application of selves. The conditions for studied. General expres- im power penetration are aperture are discussed. A			

#### THE 21ST GENERAL ASSEMBLY OF URSI

The triennial General Assembly of the International Union of Radio Science will be held in Florence, Italy from August 27 to September 6, 1984. There will be several Administrative Sessions, complemented by a very extensive Scientific Program. The Opening Ceremony will be held on Tuesday August 28 at 5 P.M., and the Closing Ceremony on Wednesday September 5 at 5 P.M., both in the Palazzo dei Congressi. The Scientific Program will run from August 29 to September 5 in the Palazzo dei Congressi and the neighboring Centro Affari. The Program will consist of Sessions organized by the nine URS1 Commissions, individually or on a joint basis. There will also be three General Lectures, to be given by internationally known scientists, and four Open Symposia. The titles of the latter are:

Biological Effects and Electromagnetic Waves; Active Experiments in Space Plasmas: Ionosphere heating, Non-linear mixing of waves, Electron and Ion beams, Chemical releases;

Recent Developments in Radio Techniques for Planetary Exploration;

Data, Signal and Image Processing in Radio Science.

The contributions to the Open Symposia will be selected on the basis of a Call for Papers, which was issued in the Fall of 1983. The First Announcement of the Assembly is available, and the Second Announcement, which will include detailed data on the Scientific Program, will be out in the late fall. These Announcements, and any other information on the General Assembly, can be obtained from the Chairman of the Organizing Committee. Write to Prof. Vito Cappellini, 1ROE, Via Panciatichi 64, 50127, Firenze, Italy.

## INTERNATIONAL CONFERENCE ON EMC

The International Conference on Electromagnetic Compatibility will be held 18-21 September 1984 at the University of Surrey in Guildford, England.

The problems of interference have grown with the proliferation of electrical and electronic systems. The Institution of Electronic and Radio Engineers considers it timely to hold the fourth in its established series of EMC Conferences to provide a forum for the exchange of views on these problems, methods of analysis and solutions. Co-sponsors of the Conference are the Institution of Electrical Engineers, The Institute of Electrical and Electronics Engineers, The Institute of Quality Assurance and the Royal Aereonautical Society.

Some 46 papers will be presented. The subjects scheduled to be addressed are:

Tuesday, 18 September:	Specifications, Test Methods and Theoret- ical Studies
Wednesday, 19 September:	Studies of the EM En- vironment Together with Considerations of Specific Equipment
Thursday, 20 September:	Case Studies, Com- munications Problems and EMP and Light- ning Protection
Friday, 21 September:	Studies of the Effects of Coupling and Bonding

The Keynote Address will be given by Mr. G. M. Stone, Director of Air Radio at the Ministry of Defense. A small trade exhibition will be held in conjunction with the Conference. Full details and registration forms are available from the Conference Department, IERE, 99 Gower Street, London WC1E 6AZ; Telephone: (01) 388-3071.

### **1984 HEART CONFERENCE**

The 1984 Annual HEART Conference will be held July 26-27 at Fort Carson Army Base in Colorado Springs, Colorado. The purpose of the annual HEART Conference is to provide a high-quality scientific forum for research investigation of a classified or sensitive nature. This conference will broadly cover the subject areas of nuclear and space radiation and electromagnetic pulse effects on electronic devices, materials, circuits, and systems. Also addressed are hardened semi-conductor processing technology and techniques for production radiation-tolerant (hardened) devices and integrated circuits.

The following or related areas may be addressed:

- Radiation Effects, SGEMP Phenomena, and Spacecraft Charging in Satellites
- Underground Test Results
- Directed Energy Phenomena
- · Processing and Manufacturing Technology for

Radiation-Hardened Electronic Devices and Integrated Circuits

- Radiation Effects on Electronic Devices, Integrated Circuits, Components, and Systems
- Radiation-Hardening Techniques for Electronic Systems
- Electromagnetic Pulse Phenomena, Coupling, and Simulation for Ground Systems, Aircraft, and Missiles in Flight
- New Developments and Topics of General Interest to the Nuclear and Space Radiation Effects Community

The program will consist of three to five concurrent sessions over two days. Contributed papers, several invited papers, and a poster session will be included. Questions should be addressed to the Technical Program Chairman, William F. Crevier, Mission Research Corporation, 735 State St., Santa Barbara, CA 93101; Tel: (805) 963-8761.

### INSTITUTIONAL LISTINGS

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

SERVICE DIVISION, AMERICAN ELECTRONICS LABS., INC., Monmouth County Airport, P.O. Box 691,

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Telephone (201) 938-5191

Avionic Retrofit; EMI Testing, Antennas; EW Systems, Hybrids/MIC's.

ELECTRO-METRICS, Division of Penril Corp., 100 Church St., Amsterdam, NY 12010 Telephone (518) 843-2600

EMI Meters/Spectrum Analyzers/Systems incl.; Computer Control-20 Hz-40 GHz-MIL-STD & FCC/VDE/CISPR, etc.

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An Institutional Listing recognizes contributions to support the publication of the IEEE Newsletter and TRANSAC-TIONS ON ELECTROMAGNETIC COMPATIBILITY. Minimum rates are \$75.00 for listing in one issue; \$200.00 for four consecutive issues. Larger contributions will be most welcome. No agency fee is granted for soliciting such contributions. Inquiries, or contributions made payable to the IEEE, plus instructions on how you wish your Institutional Listing to appear, should be sent to M. Bonaviso, The Institute of Electrical and Electronics Engineers, Inc., 345 East 47 Street, New York, NY 10017.