IEEE ELECTROMAGNETIC COMPATIBILITY GROUP

NEWSLETTER

ISSUE NO. 75–October, 1972

EDITOR ROBERT D. GOLDBLUM

IEEE SPECTRUM ISSUE OUTSTANDING

The August 1972 issue of the IEEE Spectrum may turn out to be a real collectors item. First of all, it contains the relults of the IEEE EE salary survey which is presented in a new and comprehensive manner. Then, there is a good 9 page article entitled "Broadcast radiation: how safe is safe?" written by Richard A. Tell of the U.S. Environmental Protection Agency. Fred J. Nichols, President of LMI predicts "... the next generation of computers will most likely not work unless designed for and installed in a completely RF-fue environment," in his letter to the editor on page 14. On page 100, you will find a ½ page article entitled "Arc–quenching element uses avalanche diode to supress surges and noise across dc contacts" with photographs showing "before" and "after". Scanning the issues on page 105 touches upon two familiar subjects; "stopping man-made spectrum noise" and "Can radiation cause heart attacks?"

It is interesting to note that the terms EMC, EMI, and RFI, are not used in the text of the above material. Yet, all of the subject matter (except salary survey) falls within the scope of the G-EMC. Can there be a hidden message there somewhere?

SECOND EDITION OF AFSC DH 1–4 ISSUED

The second edition of the Air Force Systems Command Design Handbook 1–4, "Electromagnetic Compatibility" was issued in January 1972. This edition supersedes the First Edition and subsequent revisions thereto. The checklists have been deleted and inserted as Chapter 4 of AFSC DH 1–X.

The First Revision of the Second Edition was issued in July, 1972. In Section 7B, the design information on static electricity was expanded and the index modified.

Your comments on the handbook are desired. All comments may not be incorporated in the handbook, but each will be given careful consideration. All related correspondence should be directed to:

Mr. Morth
4950/TZH
Wright-Patterson AFB
Ohio 45433

ARE ELECTROMAGNETIC HAZARDS STILL AROUND?

After the controversy of a half decade ago concerning the emission of X rays from color television receivers, the U.S. Congress passed the "Radiation Control for Health and Safety Act of 1968" (PL-90-602), which was followed by the "Occupational Safety and Health Act of 1970" (PL-91-596). Since the passing of these laws, one would normally have expected that at least accurate data concerning the interaction of harmful electromagnetic waves with the human body would have been compiled so as to provide a valid means of regulating the manufacture and distribution of electronic products capable of emitting such hazardous radiation. According to a paper by Sol M. Michaelson in the April *Proceedings of the IEEE*, this is not the case; moreover, the ignorance that prevails in the area of biomedical effects of radiant energies has led to an astounding 10^3 difference in the permissible exposure standards of the United States and the Soviet Union.

Under the 1968 health and safety law just mentioned, the Department of Health, Education, and Welfare is responsible for protecting the public from unnecessary exposure to radiation from such electronic products as television receivers, microwave ovens, X-ray machines, lasers, UV lights, diathermy units, IR heaters, ultrasonic cleaners, and particle accelerators. Although many of the problems concerned with *ionizing* radiation emission from such equipment have been solved (e.g., X rays from color television receivers)–probably because this type of high-energy radiation is more easily detected and its effects more readily analyzed–there are still many questions that remain unanswered with regard to *nonionizing* (low-energy) radiation.

How serious are these problems and how adequate are the present sefeguards? These questions and others are reviewed in Michaelson's excellent paper.

(Excerpted from the May 1972 issue of the IEEE Spectrum)

ELECTROMAGNETIC COMPATIBILITY GROUP NEWSLETTER is published quarterly by the EMC Group of the Institute of Electrical and Electronics Engineers Inc., 345 East 47th Street, New York, N.Y. 10017. Sent automatically and without additional cost to each member of the EMC Group.

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LETTERS

June 15, 1972

J. J. O'Neil, President
Administrative Committee
IEEE EMC Group

Dear John:

Not long ago I attended a symposium given by NSA on the subject of TEMPEST testing. I was particularly intrigued by the attitude of the Government's DOD experts that EMC and TEMPEST were two distinct areas that should not be confused or mixed, even though industry usually treats TEMPEST as a part of the overall EMC problem.

Then I had the occasion both to review some contractor proposals in which EMP was a factor and to attend an industry seminar on EMP. Here again, there was this attitudinal tendency to sharply separate EMP as a specialized discipline from EMC.

It seems to me that EMC, as a general discipline dealing with systems in an electromagnetic environment, is in danger of being fractionated by those in closely allied areas of concern who seek to define a portion of the electromagnetic envrionmental problem as something qualitatively, rather than merely quantitatively, different from EMC. System Safety and RADHAZ are two other examples wherein the experts of the field have decided that these areas are not merely specialized subsets of EMC as an overall discipline, but rather are separate disciplines in of themselves. This can and has led to setting of conflicting and redundant requirements, and is hardly cost-effective.

There is a grave danger in this trend, for unless strong leadership is exerted by GEMC in industry and government, the EMC discipline will one day be deemed to encompass only MIL-STD-461 type-testing and little else, as it used to be in the days when our concern was radio noise or RFI. If, as I believe it must be, our concern is with the total electromagnetic environment, man-made and natural, then our conception of EMC as a discipline must encompass that total environment and we must include within it such factors as TEMPEST, EMP, RADHAZ, System Safety, etc., which are today treated as separate problem areas by separate disciplines.

It is often mentioned that both EMP and TEMPEST lead into security problems, and the IEEE cannot delve into such, but since so much of even simple EMI tasks are classified, this seems no justification for failure to include these significant areas in our discipline.

I urge ADCOM to address this issue, both within government and industry. All the current furor over a proposed name change for our Group in order to be more encompassing is irrelevant and inconsequential if the substantive subject areas of the Group are deemed the province of other groups outside the EMC community. We will be left a group with an all-encompassing name and a very restricted subject matter.

Sincerely,

Dr. C. B. Pearlston
Staff Engineer
Power and Electrical Department
The Aerospace Corporation

29 June 1972

Dr. C. B. Pearlston
The Aerospace Corporation

Dear Carl,

Thank you for your letter of 15 June 72. I fully concur in its contents.

However, the problems you cite are really only one segment of the overall problem. The IEEE EMC Group, as any EMC Group in industry or government, has broad responsibility–IF–management is willing to recognize it. We are actually concerned with everything that is electrical/mechanical to electronics. Microwave ovens–to pacemakers–to powerlines–to sophisticated radar equipments. Yet, because of politics, empire building or whatever you desire to call it, we cannot seem to erase the 'stigma' of being concerned only with RFI.

The EMC Group membership is dwindling; the general unannounced policy of IEEE, I believe, is to combine smaller Groups for ease of administration. We are one of the smaller groups and we are in a desperate financial status. We can readily be considered as a candidate for a take-over if we don't prove our viability in the next year or two. I am truly concerned.

The future of the Group and its finances is included on the agenda of the ADCOM meeting we will have during the Symposium. However one of the most alarming state of affairs I have encountered as President is the general lack of interest in the future of the Group by those who should be most concerned.

Thanks again for your letter and let's hope we can stay alive.

Sincerely,

JOHN J. O'NEIL
President, EMC Group

Dear Mr. Goldblum:

Congratulations on the improvement in both the content and graphics of the EMC Group Newsletter of July, 1972. Keep up the good work.

Yours truly,

R. E. Jones
Leesburg, Va.

ACKNOWLEDGEMENTS

The editor would like to thank the following individuals and their employers for their contributions to this issue of the Newsletter.

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HIROSHIMA—NAGASAKI SYNDROME

August 28, 1972

Mr. Robert D. Goldblum
Editor

Dear Mr. Goldblum,

Enclosed is a dissertation related to views of nuclear power generating facilities and EMC.

These views are offered for the interest of the G-EMC Newsletter readers and are submitted for inclusion, at your discretion, in News and Views or some other section of the newsletter as appropriate.

The newsletter is developing into a very commendable publication. We appreciate the personal efforts you and the others expend in bringing about the publication of each issue.

Very truly yours,

Charles I. Gause
Pacheco, Cal.

John A. Kuypers
Menlo Park, Cal.

LICENSING OF NUCLEAR POWER GENERATING STATIONS AND EMC SENSIBILITY

During recent public hearings conducted for the licensing of large nuclear power plants, reliability of the nuclear reactor protection system was challenged by various technically qualified interveners. The interveners raised a number of different questions. One of the questions reportedly concerned EMC. Specifically addressed was the question of whether or not proposals for the design and construction of the nuclear reactor protection system fully considered reliability of vulnerable solid state components when these components would be subjected to an environment of overvoltages and electromagnetic pulse (EMP) interference.

This question inspired some personal efforts to consider EMC sensibility factors for the design and construction of nuclear power plants. As a result of this independent effort, several thoughts were arrived at. This information is passed along to the EMC community for whatever value it may have.

Before the EMC problem was considered it was determined and is a matter of personal opinion that (1) there is indeed a power crises, (2) that properly designed and constructed nuclear power plants are a wise economical and ecological investment for public power, (3) that properly designed and constructed plants are radiation safe and the ionized radiation levels within the plant and vicinity are impecably low, so low as to be of no consequence and (4) that controversy regarding the nuclear reactor protection system is just about the "hottest" issue going.

Because the typical nuclear power plant is a complex facility and because the nuclear reactor protection system is the subject of such wide interest, this correspondence is limited to the EMC problem of reactor trip and alarm instrumentation of the nuclear reactor protection system.

A nuclear reactor protection system monitors physical parameters related to safe reactor operation and trips the reactor to protect the reactor core against fuel rod cladding caused by excessive nucleate boiling and to protect the coolant system from damage caused by excessive internal system pressures. The protection system would include nuclear and nonnuclear event sensors, a multichannel data transmission system for on-line transmission of sensor information, a logic system to initiate a reactor trip when two or more data channels agree an unsafe reactor condition is being approached, a reactor trip, and applicable alarm transducers.

It is a foregone conclusion that much of the protection system instrumentation will include solid state equipments. Such equipments can be expected to have spectrum signatures indicating catastrophic failures predictable at definitive threshold levels of sustained over voltage and transient voltage events.

It is assumed that power plant building structures are more than adequate to shield against ambient non-ionized electromagnetic environmental influences that might affect solid state systems. However, exposed power transmission lines extend beyond the nuclear power plant confines. Such conductors offer loops for outside ambient events to influence inside plant electrical systems. Therefore, nuclear reactor protection system instrumentation is not fully isolated from such influences even though a typical nuclear reactor protection system is powered by a power line-to rectifier-to battery plant-to inverter (AC to DC to DC to AC) primary power system. The primary power system design philosophy effectively achieves the desired goal of providing primary power to the reactor protection system during a period of power line supply outage. It is not evident, however, that criteria for nuclear reactor protection systems includes EMC design considerations for sustained periods of over voltages and/or an EMP where such overvoltages and/or EMP could cause catastrophic failure of solid state equipments within the protection system itself.

The principal criteria for nuclear reactor protection systems is IEEE Standard 279-1971 (Revision of IEEE Std. 279-1968) entitled "Criteria for Protection Systems for Nuclear Power Generating Stations," and IEEE Paper No. 71TP83-RWR entitled "Working Group Report For Design and Installation of Wire and Cable Systems in Power Generating Stations." It appears that neither of these documents specifically addresses EMC sensibility for solid state devices, modules, or systems as they would be implemented in a nuclear reactor protection system.

We suggest that the methods and concern for the safety and survivability of our present nuclear weapons systems be incorporated into the design and implementation of nuclear power systems. Unfortunately, the present negative public reaction to nuclear power source implementation can be closely correlated to the "Hiroshima-Nagasaki Syndrome" of nuclear weaponry. The same concern and integrity of EMC and EMP design considerations that have been, and are currently imposed upon the nuclear weapon system should now be applied to the nuclear power plant electronic systems. This should go far in allaying the knowledgable intervener's concern for the safety and reliability integrity of nuclear power sources.

John A. Kuypers
Charles I. Gause

Members of San Francisco Chapter, G-EMC

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CHAPTER CHATTER 74

by Ira (Marty) Berman

The sound of the katydid is to me the most beautiful sound of summer. The "chsh-chsh-chsh" that comes from the trees and bushes on these deep blue, cool August nights, with a golden harvest moon hanging low in the sky, seems to make the cares and problems of the world seem far away indeed. That's just an illusion, as September is hard on the heels of August, and it's back to the daily grind, with the Summer of '72 just a memory.

As usual, the Chapters are grinding away with lots and lots of news. I just shuffled the papers and here's how they came out.

MOHAWK VALLEY

New officers here: Hollis J. Hewitt is Chairman; CAPT. Gary A. Seasholtz is Vice-Chairman; Thomas E. Baldwin is Secretary-Treasurer; and Gerard T. Capraro is Program Secretary. I have no doubt these gentlemen will continue the excellent work of the Chapter, which is best exemplified by noting that only FOUR papers authored or co-authored by Chapter members were presented at the July Symposium. G. T. Capraro collaborated on "Frequency Assignment for Collocated Transmitters Using the Branch-and-Bound Technique;" K. R. Siarkiewicz and Dr. A. T. Adams wrote "Analysis and Prediction of Coupling Between Collocated Antennas;" Dr. Adams again and T. E. Baldwin with "Electric and Magnetic Near Fields of Arrays of Straight Skewed Wires;" and Dr. Adams once more with "Feedline Interference with Dipole Performance." Fantastic.

SEATTLE

Seems to be a while since we heard a sound from Puget Sound. (Think a pun would pry some news loose?) At least we know that Thomas H. Herring is the new Chapter Chairman.

LOS ANGELES

Stop the presses! Hold everything! The mailman just brought in news from LA. (I know it's still there–I was in the Valley in late July.) First of all, the new officers: John E. Merrell, Chairman; Fred Motter, Vice-Chairman; John M. Dailey, Treasurer; and Larry Flint, Secretary. Nine (count 'em, folks) nine monthly meetings are scheduled, with one as a social meeting. I'm told the subject matter and the speakers have been selected, but they don't say exactly what or who right now. And just to rub it in a bit, they had an average attendance over 50 for last year's eight technical meetings. And they've promised more for the next columns. We'll all be looking–a little enviously, maybe–but we'll be looking.

NEW JERSEY COAST

Another delegation present but abstaining from voting. I can see the Chairman, Bruce C. Miller, sitting under his banner but not saying anything. Does the New Jersey Coast delegation have any news?

ATLANTA

There is a whole slate of new officers here, I am happy to report: Chairman, Hugh Denny; Vice-Chairman, Ernest E. Donaldson; and Secretary-Treasurer, James C. Toler, all three of Georgia Tech's Engineering Experiment Station. There are some articles in preparation, says the report, but there is also a bit of distressing news: "Declining employment of personnel in the discipline of EMC has brought membership in the EMC group in the Atlanta area to a critical level." None of that defeat talk, y'hear? Just say that "a nucleus of members is building a stronger and more viable Chapter." It's the same thing, really but the positive approach always sounds better!

WASHINGTON, D.C.

Hail, William C. Green, new Chairman! And hail, the other officers (who must remain nameless in this column because I don't know who they are). When I find out, I'll let everyone else know, too.

SAN FRANCISCO

Another one? Just the cryptic note from Headquarters that they are pleased to record the name of Robert E. Amwine as Chairman–and no more.

PACIFIC AREA COMMITTEE

Ah, news. And news good and plenty, too. There are no new officers yet, but Bob Ford expects the previous year's officers will be reelected, because of their skills and ability–and because no one else wants to volunteer right now. They had a meeting, on May 23, 1972, at Hickam AFB, where Gerry Rothhammer of Singer Instrumentation demonstrated new EMC meters and test equipment to 16. The big problem, says Bob, is that most of the best workers are constantly on the go–Korea, Japan, the Mainland–and can't sit down long enough to elect officers, or make up a program, or write papers. Their little Newsletter does indicate that they are busy and appraently having a ball solving 1/3 of the world's EMC problems.

METROPOLITAN NEW YORK

More news even. Metro New York also has new officers, and here they are: Chairman, A. G. Zimbalatti; Vice-Chairman, D.C. Emgle; Secretary, P. Ross; and Treasurer, S. Rubin. There was a meeting on May 4, 1972, at Manero's Restaurant in Syosset, Long Island. There Dave Engle, retiring Chapter Chairman, presented awards and presided over the formation of the 1973 Symposium Committee. The Chapter plans one meeting a month on the first Thursday starting in October. The Symposium Committee has been meeting regularly all summer. The Symposium will be headed up as follows: Chairman, Sam Perry; Vice-Chairman/Treasurer, Harold P. Westman, Jr.; Secretary, Paul L. Ross; Publications, Dave Engle; Program, Bob Brook; Publicity, Dick Mohr; Exhibits, Sy Rubin; and Logistics, Hank Burke, Jr. And the Symposium staff also asks for suggestions to be mailed to P.O. Box 171, Westbury, N.Y., 11590. The theme is "One World–One Spectrum, Pollution Free." That give you any ideas, fans?

BOSTON

Boston reports a lessening of interest in EMC efforts, which has been a problem on the east and west coasts for some time now. There is a new Chairman, Edward S. Mead, and a new Vice-Chairman, James Gordon. They indicate that they will not be able to set up an activity schedule until summer is over. As I said, think positive. Maybe the 1973 Symposium theme can be of help. Any way of stimulating interest with the pollution angle?

PHOENIX

I received a quickie from Sun Country. The new officers are the same as the old, and the next meeting is scheduled for September 13, 1972. And that's all–but at least we know they are still alive and kicking.

CENTRAL TEXAS

A note of optimism comes creeping up from Texas. There was what sounds like a very good meeting on May 15, when only 6 people took a plant tour of Texas Instruments in Austin and attended a Workshop session on EMC as it affects air traffic safety with ILS. Elections were scheduled in July, and the year's program should have been firm by August. Now that's encouraging! Central Texas participated in the July Symposium as well, with W. E. Cory chairing the session on Biological Effects, and R. B. Schultz presenting "RF Shielding and Electrical Properties of Boron and Carbon Fiber Reinforced Composites." And the Chapter is looking forward to 1972-1973, with the specific goals of increasing membership and increasing attendance. Now that's positive!

CHAPTER CHATTER *(Continued)*

PHILADELPHIA

Ev Raylman, the Chapter Chairman, announces three meetings for the coming activity year. In October, there will be a demonstration of the use of the Singer Spectrum Analyzer for MIL-STD-461 and -462 testing; in February, a discussion of non-ionizing radiation as a biological hazard will highlight a joint meeting with G-18; and in April new officers will be elected. The discussion subject for April is not yet firm. Keep going!

TUCSON

The bottom of the list, but not the least by any means. The Chapter met June 13 at the Pioneer Hotel in Tucson. Mr. Ralph McCluskey, Chief of Development for the Electromagnetic Branch, U.S. Army Electronic Proving Ground at Fort Huachuca, discussed the most recent additions to the Electromagnetic Environmental Test Facility. Sounds great.

Well! That's quite a lot, and I'm glad. I'm greedy, though, and I'd like the Chapters who did not report for this issue to drop me a line in the fall. I had entertained some notion of going to Chicago in July, but that was not to be. So I get my vicarious kicks out of your news. (See? I told you I was greedy.) But I like to share good news, and I've already shared all I had, and I'd like to be able to share more. So Happy Autumn Leaves!

CHAPTER CHAIRMEN

Mr. Hallis J. Hewett
Mohawk Valley

Mr. Thomas H. Herring
Seattle

Mr. John Merrell
Los Angeles

Mr. Bruce Miller
New Jersey Coast

Mr. Hugh Denny
Atlanta

Mr. William C. Green
Washington, D.C.

Mr. Edward S. Mead
Boston

Mr. Robert E. Amrine
San Francisco

Mr. Everett T. Raylman
Philadelphia

FCC AWARDS KELLY PACT FOR RADIO SPECTRUM STUDY

WASHINGTON (FNS)–The Federal Communications Commission last week awarded a $63,151 contract to Kelly Scientific Corp. to study radio spectrum management.

The study is entitled "Development of Technical/Engineering Mathematical Models for Establishment of Systems and Techniques for the Management of the Non-Government Portion of the Radio Spectrum."

The firm will review the automated land mobile frequency assignment program developed by the spectrum management task force for use on the FCC's Chicago regional computer. Kelly will also recommend changes in that program.

AIRWAVES

RULES PROPOSED TO IMPLEMENT NATIONAL ENVIRONMENTAL POLICY ACT

Rules to implement the National Environmental Policy Act of 1969 have been proposed in a rulemaking notice by the FCC, (Report No. 4295 dated July 27, 1972).

The proposed rules apply to all applications filed with the Commission involving the construction, abandonment, or razing of a structure. They also apply to applications for license for new or modified facilities in the Safety and Special Radio Services.

The proposed rules would require an applicant for authority to construct to provide notice to appropriate persons or organizations if the construction is likely to involve a significant environmental problem. Thirty days would be allowed for comment.

Since conditions may vary, depending on the nature and scope of the construction project, the form and extent of notice would be left to the judgment of the applicant, subject to review by the Commission. In some situations the environmental effect might be strictly local–where notice could be posted at the site, discussed with neighboring property owners, or raised at a meeting of a community group. Other situations might call for newspaper or broadcast notice or for contact with State or Federal agencies and organizations which may have an interest in the environmental effect of the project.

Under certain specified conditions, the proposed rules would require the submission of a preliminary environmental report. The purpose of the preliminary report is to permit the Commission to ascertain whether the construction would involve a significant environmental problem.

TECHNOLOGICAL FORECASTING AND ASSESSMENTS
A CALL FOR AN EXPRESSION OF SENTIMENTS

REPORT ON CONVENTIONAL LAND MOBILE OPERATIONS AT 950 MHZ ISSUED BY FCC

A report entitled "Examination of the Feasibility of Conventional Land Mobile Operations at 950 MHz" (R-7202) has been issued by the Federal Communications Commission. Prepared by the Research Division of the FCC's Office of Chief Engineer, the report covers Phase 2 of the study–Mobile to Base.

The first phase of the report (R-7102, dated March 31, 1971) was concerned with base-to-mobile field testing at 950 MHz and was developed from data compiled in metropolitan Washington, D.C. The new report (R-7202) contains propagation data and communication quality observations, mobile to base, at 950 MHz. It also contains similar information for 450 MHz for comparison purposes. R-7202 should be of interest to parties or companies concerned with the use of land mobile radio for vehicular communications.

In addition to coverage maps based on communication quality, the report finds that two 950 MHz satellite receiving points are sufficient for good reception from mobile units operating within 23.6 percent of the District of Columbia area. The propagation information is useful for either conventional or cellular land mobile systems.

A limited supply of R-7202 is available from the Research Division, Room 214, 1229-20th St., N.W., Washington, D.C.

MEETINGS & EVENTS

LIGHTNING & STATIC ELECTRICITY CONFERENCE

12-15 December 1972
Hotel Sahara
Las Vegas, Nevada

Will be conducted in cooperation with the SAE Committee AE-4 on Electromagnetic Compatibility and the Air Force Avionics Laboratory. Technical sessions will include:

Fundamental Aspects of Lightning
Fundamental Aspects of Static Electricity
Electrification–Operational Problems
Missiles & Spacecraft
Aircraft (2 sessions)
Advanced Composites, Materials & Structures
Electrostatics in Aviation Fuel Systems
Workshop: Simulation, Testing & MIL-B-5087B

A Message from the Chairmen

Several years ago, it became evident that a need existed for an international forum concerning Lightning and Static Electricity. Of particular importance was the opportunity to publicize the problems and solutions in the field for the various elements of the Aerospace Industry. Accordingly, a conference was held in December 1968 for the purpose of providing the opportunity to discuss problems, explore solutions, and provide food for thought while planning for the future. Again, in 1970, a conference was held to disseminate new information and discuss the additional research which had been accomplished since the proceeding conference.

This year, the Air Force and SAE Committee AE-4 on Electromagnetic Compatibility have again teamed to present this third biennial Conference on Lightning and Static Electricity. It is our hope that this 1972 Conference will successfully accomplish its twin goals of highlighting the state-of-the-art while making available a forum for the enlightened interchange of ideas and information.

Advanced plans for a fourth biennial Conference have been discussed by SAE Committee AE-4. Until the next officers are appointed, the current Chairmen will act as an ad-hoc committee for the next Conference.

J. L. MOE
Chairman for Industry

C. E. SETH
Chairman for Government

For additional information, contact Mr. Charles Seth, ENVCCC, Aeronautical Systems Division, Wright Patterson AFB, OH. 45433 (513) 255-2960.

* * * *

ELECTRICAL NOISE POLLUTION & CONTROL

December 4-8, 1972
Director: Don White, DON WHITE CONSULTANTS, INC.

COURSE DESCRIPTION

This is a one-week seminar on Electromagnetic Interference (EMI) control and Electromagnetic Compatibility (EMC), alias electrical or radio noise and control, alias Radio-Frequency Interference (RFI) and control. The course is comprehensive and covers the entire RFI/EMI/EMC field including inter- and intra-system/equipment analysis, EMC specifications, control and test plans, instruments, test methods and procedures, and EMI control, fix, and retrofit techniques.

While the course reviews basic fundamentals and theory of the physics, electronics, and mathematics involved, it is pragmatically oriented. Case histories and illustrative examples are used throughout to help the student assimilate all the material presented.

The two principal texts used are Vol. 1 of the EMI/EMC Handbook Series, *Electrical Noise and EMI Specifications* and Vol. 4, *EMI Test Instruments and Systems.* Other supplementary training notes on EMI control and related topics are passed out to the class.

For additional information contact Don White Consultants, Inc., 14800 Springfield Road, Germantown, Md. 20767 (301) 948-0028.

CALL FOR PAPERS

1973 IEEE CONFERENCE ON COMMUNICATIONS TO BE HELD JUNE 11-13, 1973–SEATTLE, WASHINGTON

The 1973 International Conference on Communications (ICC '73) will be held in Seattle, Washington, June 11-13, 1973 sponsored by the Communications Society and the Seattle Section, IEEE. The Conference theme for the ninth annual conference is "Communications–Catalyst for Progress."

Papers of a theoretical, experimental and developmental nature are solicited in the areas of:

Communication Switching
Radio Communications
Space Communications
Wire Transmission Systems
Communications Theory
Communications Systems
Spectrum Utilization
Vehicular Communications
Home Information Systems
Satellite Communications
Urban Communications Concepts
Data Communications Systems

Prospective authors are requested to submit four (4) copies of an abstract not to exceed 250 words to:

Dr. S. Tashiro
ICC '73
P.O. Box 648
Bellevue, Washington 98009

The completed manuscript (3000-5000 words) must be submitted for review by January 1, 1973.

Authors of papers accepted for presentation at ICC '73 will receive authors' kits at notification of acceptance. Final manuscripts, prepared in accordance with the instructions in the authors' kit, must be submitted for publication by May 15, 1973.

ICC TO INCLUDE EMC SESSION

The 9th Annual ICC will be held at the Seattle Center on June 11-13, 1973.

ICC'73 will involve leading scientific and technical members of the communications industry–it will feature more than 30 technical sessions–exhibits by many communications firms–luncheon and banquet with well-known speakers–popular exhibitis at the Pacific Science Center–tours of interesting sites in the Puget Sound Area.

Plan to be in Seattle for ICC'73–and bring the family to enjoy the time of their lives in the mountains and on the waters of the Pacific Northwest!

Of special interest to Group members, will be the EMC Session, chairmanned by Walt McKerchar. Other noted participants of the EMC Group are R. Goldman and E. D. Knowles. All three members are with the Boeing Company. Watch for additional information in the Newsletter or write to ICC'73, P.O. Box 648, Bellevue, Pa. 98009.

NEXT G-EMC ADCOM MEETING

The next IEEE G-EMC Administrative Committee Meeting will be held adjunct to the Lightning & Static Electricity Conference on December 12-15, 1972 in Las Vegas. Election of officers for 1973 will take place at this time. For additional information, contact Mr. John J. O'Neil, President of G-EMC, Mountainside Drive, Colts Neck, N.J. 07722 (201) 535-1877.

EMP AWARENESS COURSE

The Defense Nuclear Agency EMP Awareness Course will be given at IIT Research Institute, November 14, 15, 16, 1972. By this time the Course will have been presented to over 1,500 engineers and scientists, largely with the government or associated with large weapon systems contractors.

EMP is the abreviation for the Electromagnetic Pulse, which is generated during the detonation of a nuclear weapon. EMP is a non-ionizing pulse of electric and magnetic fields. This EMP is very crudely similar to the electromagnetic fields associated with a nearby lightning stroke, and the bulk of the energy of these fields lies in the radio frequency spectrum.

IITRI under the sponsorship of the Defense Nuclear Agency, is offering a special version of the EMP Awareness Course specifically for personnel associated with electronic equipment and component manufacturers. Notification of the presentation of this Course is being made directly to prominent equipment and component suppliers to the Department of Defense, as well as through the usual notification procedures. To prevent undue delays, Course enrollments and security procedures will be handled directly with IIT Research Institute. Enrollment applications will be considered on a first-come basis because of class size restrictions; and, in any event, these must be completed and returned before October 23, 1972. No more than three persons per organization will be accepted, unless by special arrangement. The Course is designed for the engineers, scientists, who may have a direct supervisory or working responsibility to protect electronic/electrical equipment or to design protection components and EMP immune devices.

This Course will be given November 14, 15, 16, 1972, at IIT Research Institute, 10 West 35th Street, in Chicago, Illinois. It will be open to technically qualified personnel, who currently hold a Secret Clearance and are citizens of the United States. While there is no cost to attend the Course, each attendee and associated organization will have to bear any travel and subsistance costs.

1973 SYMPOSIUM ON APPLICATIONS OF WALSH FUNCTIONS

Date: 16, 17, 18 April 1973
Place: The Catholic University of America, 620 Michigan Avenue, N.E., Washington, D.C.
Supporting Organizations: Naval Research Laboratory, IEEE Electromagnetic Compatibility Group, Catholic University of America.

Instructions for Authors

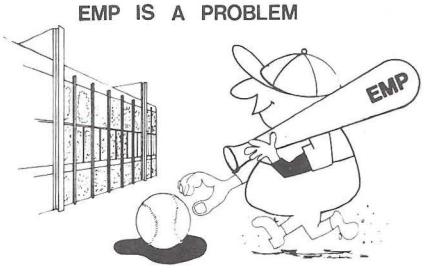
Papers reporting the results of research and development on the applications of Walsh and other nonsinusoidal functions in engineering, physics, biology, medicine, etc. are invited. The time allotted for presentation and discussion of these papers is, in general, between 10 and 30 minutes. All papers will be published in the Proceedings of the 1973 Symposium on Applications of Walsh Functions, which will be available in August 1973. One or two page abstracts of papers should be submitted to one of the following members of the Papers Committee before 15 December 1972:

H. C. Andrews, Department of Electrical Engineering, University of Southern California, Los Angeles, California 90007
G. R. Redinbo, Department of Electrical Engineering, University of Wisconsin, Madison, Wisconsin 53706
H. Ueberall, Department of Physics, Catholic University of America, Washington, D.C. 20017

Good papers will not be rejected due to numerical limitation, but all acceptable papers will be shared with organizers of Walsh functions sessions at other meetings. Authors should indicate if they do *not* want to have their paper pooled with other meetings.

Further information may be obtained from IEEE EMC-Group (Sequency Union), Department of Electrical Engineering, Catholic University, Washington, D.C. 20017, U.S.A.

EMP IS A PROBLEM



The Nuclear EMP (Electromagnetic Pulse) Awareness Course* sponsored by the Defense Nuclear Agency is presented by IIT Research Institute periodically throughout the country. The next three day course in the Chicago area will be presented in early Nov., 1972. For further information contact:

Mrs. Connie Emrich
EMP Course Administrator
IIT Research Institute
10 W. 35 th Street
Chicago, Illinois 60616
312 / 225-9630 ext. 4511

Course Topics Include:

EMP Generation Mechanisms
Component Damage and Degradation
System Hardening Aspects
Testing And Simulation Approaches
Vulnerability Assessments
Typical Examples

*The course is intended for DOD contractors having a security clearance

TRADE SHOWS

Trade shows have been encountering many problems in recent years. Biggest complaint of the exhibitors has been the costs they face in certain cities. For instance, one firm at IEEE was tapped for $8,500 for a small display area. In addition to that figure, here are a few other charges that were assessed:

- Installation of an extra electrical outlet at the booth, $80.
- Having the carpet vacuumed once a day–$12 per day.
- Having ashtrays emptied every two hours–$11.60 a day.

In addition, the company salesmen were asked to take it easy on the dinners when they were not entertaining clients. A marketing executive at the firm says, however, the men had trouble finding restaurants where the single dinner tab was below $12.

One odd note–the same marketing man says that despite the slower tone of the show, he received the greatest number of inquiries at his booth this year. He's not sure whether this was due to the smaller number of exhibits or the caliber of the audience . . . During the regular post-mortems on the show at the hospitality suites, there was one constant note injected by many industry people: This may be the last year for IEE in New York. Everyone seems to be putting their bets on Atlanta for future exhibits . . . Another sign of the changing times at the show. It was obvious from a tour of the technical sessions that the marketing seminars were outdrawing the purely technical meetings. Most of the former were standing-room-only. On the other hand, the technical paper sessions were generally thinner on attendance. One marketing man said he welcomed the change and noted only a few years ago marketing sessions would not have been on the program. A point of interest: At the marketing talks, a show of hands indicated the majority of the audience were salesmen, not just visiting engineers.

(Excerpted from May '72 issue of *Electro-Procurement*)

IEEE NEWS & VIEWS

IEEE ELECTROMAGNETIC COMPATIBILITY GROUP REPORT OF THE INTERNATIONAL AFFAIRS COMMITTEE

July 17, 1972 (condensed)

As a result of the papers solicitation by this committee the 1972 Seminar program includes seven papers by authors representing Australia, England, Germany, Italy, Switzerland, and the Netherlands. All but one of these authors plan to attend and deliver their paper.

This committee is working with the 1973 Symposium Committee to coordinate the CISPR meeting with the G-EMC Symposium. A list of IEC national committees has been obtained and letters of invitation will be sent to each delegation. Through these contacts we may have an increased international participation.

The 1975 European symposium investigation has been progressing in several directions. The most promising one has been in discussions with the Department of Commerce, Office of International Trade Promotion. This office, following a market survey, will organize USA exhibitors to take a block of exhibit space and aid the exhibitors in transportation and other arrangements. With this help we would be guaranteed a certain income from USA exhibitors. In addition to this we could expect income from European exhibitors who would be solicited through a show manager such as Dr. Bammatter of Basel, Switzerland. Dr. Bammatter has complete facilities in Basel for exhibits, technical sessions, and banquets.

Walter McKerchar has been working with the TWA Travel Bureau on arrangements for a charter or group fare travel from Los Angeles, Chicago, and Washington to Zurich.

At the last AdCom meeting Robin Smith made a presentation ofr Montreux as a symposium site. He promised to develop his plan into a package which would budget a surplus of $5000 for our treasury. This package plan has not been received.

A representative of the Israeli Tourist Office has expressed an interest in our symposium for Israel. He had planned to discuss this with Herman Garlan while he was travelling in Israel recently but missed connections and has not been heard from since then.

The committee has had several contacts with Richard Kirby regarding a joint symposium in Europe. The Communications AdCom discussed this at their recent meeting in July and decided to proceed along the following lines:

(1) work out a joint sponsorship arrangement with the pertinent French, German and British (IEE) societies plus the appropriate IEEE section in Europe and any other interested groups.
(2) use the International Switching Conference as a pattern of organization and operation.
(3) select a time period in 1974 or 1975.
(4) probably hold the symposium in Switzerland.
(5) make it a joint financial venture among all participating sponsors.
(6) rely on European direction and management of the symposium with USA participation instead of USA management.
(7) plan in terms of a series of such symposia.

The committee has also had an expression of interest and offer to help from Dolf Poetschke, the European representative for Fairchild. He is located near Frankfurt. Mr. George Stelzenmuller of the Office of Telecommunications of the Department of Commerce works with European organizations concerned with interference and he has offered to help in arranging a technical program.

Respectfully submitted,

James S. Hill
Chairman

WALSH FUNCTIONS A G-EMC SPECIALIST WORKING GROUP?

For some period of time the EMC Group and FAST, a small charter group for the utilization of Walsh functions, have been negotiating for the absorption of the latter into the former as a Specialist Working Group on Walsh Functions of the IEEE EMC-Group. The results of these negotiations are now final and the founding members for the advancement of Walsh functions are pleased to become a part of the EMC-Group of the IEEE. The objectives of the Specialist Working Group are:

1. To advance understanding in the uses of general systems of orthogonal functions, in particular Walsh and other systems of two-valued functions.
2. To diffuse the knowledge of these uses.
3. To assist the members in these activities.

This at least embraces the theory of these functions and the concreate embodiments using these functions, e.g. in devices, and the use of these functions both to increase man's comprehension of nature, e.g. in science, and to harness nature to enhance the quality of his life, e.g. in engineering.

Initial interests illustrating the above include:

a) Theory of sets of functions identified by sequency, especially Walsh functions.
b) Uses of these functions in information processing, propagation of electromagnetic waves and general science.
c) Comparison, analysis and prediction of problems concerning electromagnetic compatibility caused by simultaneous use of sets of nonsinusoidal and sinusoidal functions.

This specialist working group, chaired by

Professor H. F. Harmuth
Department of Electrical Engineering
The Catholic University of America
620 Michigan Avenue, N.E.
Washington, D.C. 20017

plans to continue its annual symposium and other related activities under the auspices of the EMC-Group.

DATE–DIAL ACCESS TECHNICAL EDUCATION

In the last EMC Newsletter we presented a short dissertation on DATE, one of the more recent solutions by IEEE to the problem of continuing and broadening the education of engineers.

IEEE provides reviews and synopses of selected subjects on audio-tape cassettes. The tapes are prepared by IEEE educational services from papers prepared by members of the technical interest groups. One of these groups is, of course, EMC.

Since that notice in the Newsletter we have received a few inquiries asking for the EMC topics which are now included and which ones are to be included in the future. The truthful answer is–there are more now, but we should be represented.

This note is a call for authors to contribute to the DATE Program. There are a few presentations in preparation now. Those subjects discuss spectrum pollution, heart pacemaker susceptibility, high-level EMC testing, EMC grounding, and connector and cable shield design aspects.

More EMC subjects can be accepted. Presentations are needed on computer prediction, biological effects, international EMC standards, EMC and consumer products, or other EMC-oriented subjects of the author's choice. Papers should be 5 to 8 typewritten pages but may be longer. Guidelines for prospective authors are available.

Interested parties may contact:

Gene Knowles
The Boeing Company
2566-128th Avenue S.E.
Bellevue, Washington 98005
206-655-9839

AWARDS PRESENTED AT SYMPOSIUM BANQUET

The annual awards presentation ceremony was held on July 19, 1972 at the 1972 Symposium Banquet in the ballroom of the Arlington Towers Hotel. The highest award of the G-EMC group, the Honorary Life Membership, was presented to Herman Garlan of the FCC in recognition of his outstanding service to the group as a member of the Ad Com 1960-66, Treasurer Ad Com 1961-62, Chairman Ad Com 1962-63 and Chairman Meetings Committee 1963-72.

The second highest award, the Certificate of Appreciation, was awarded to Heinz Schlicke of Allen-Bradley Company in appreciation of his dedicated work in furthering the interests of the group.

Jack E. Bridges, Illinois Institute of Technology, was the recipient of the Certificate of Achievement for his leadership in the advancement of technical standards and EMP protection programs.

For his leadership in organizing an outstanding symposium, Howard L. Wolfman of Teletype received the Certificate of Acknowledgement.

Dr. Robert L. Elder, the banquet speaker, was honored with the Certificate of Recognition for his contributions in the field of radiological health standards.

Prize paper awards were made to the authors of outstanding papers presented at the symposium. For authors from Regions 1-6 (U.S.A.) the following awards were made:

First Prize of $100.00 and Certificate to Denmer D. Baxter and John J. O'Neil for their paper "Establishing EMC Requirements for Digital Receivers."

Second Prize of $50.00 and Certificate to Theodore M. Madzy for his paper "A General Model to Predict Circuit Susceptibility to Noise."

For authors from Regions 7-10 the following awards were made:

First Prize of $100.00 and Certificate to M. L. Jarvis of the Royal Aircraft Establishment, Hants, England, for his paper "An Improved Design and Measurement of Attenuation."

Second Prize of $50.00 and Certificate to T. Dvorak of the Swiss Federal Institute of Technology, Zurich, Switzerland, for his paper "Electromagnetic Field Immunity–A New Parameter in Receiver Design."

G–EMC AWARDS

The Certificate of Appreciation

This Certificate has been awarded annually since 1962 to the member who has made a significant contribution to the overall welfare of the Group.

The Certificate of Achievement

This Certificate has been awarded annually since 1968 in recognition of technical accomplishments in the field of EMC which are significant but which fall short of the accomplishments which would qualify for Fellow grade

The Certificate of Recognition (Special Award)

This Certificate is bestowed as a very special mark of recognition to a person not necessarily a member of the group.

The Certificate of Acknowledgement (Special Award)

This certificate is awarded as an acknowledgement of some special service. In the past such services as chairman of the G-EMC Symposium, organizer of an IEEE Convention session, or liason with another group or organization have been acknowledged with the certificate

The G-EMC Citation (Special Award)

This has been awarded for outstanding performance of EMC engineering at a crucial point in the space program.

Honorary Life Member (Special Award)

This is the highest order of recognition for outstanding service to the Group over a period of time.

RECIPIENTS OF G-EMC AWARDS

Certificate of Appreciation

1962	Rexford Daniels
1964	Dr. Ralph M. Showers
1965	Leonard Thomas
1966	Aaron H. Sullivan, Jr.
1966	Herman Garlan
1967	Harold Dinger
1967	John Maynard
1968	Milton Kant
1968	Stanton Bennett
1969	Richard B. Schulz
1969	James S. Hill
1970	Fred J. Nichols
1970	James A. Spagon
1971	Robert D. Goldblum
1971	James J. Krstansky

Certificate of Achievement

1968	Richard B. Schulz
1968	John F. Chappell
1969	Donald B. Clark
1970	Donald R. J. White
1971	Richard J. Mohr
1971	Edward N. Skomal

Certificate of Recognition

1968	Rexford Daniels
1969	Barry M. Goldwater
1970	Ralph Nader
1971	Wilbur L. Pritchard

Certificate of Acknowledgement

1969	John Egli
1969	J. Paul Georgi
1969	Herman Garlan
1969	John J. O'Neil
1970	Gene Corey
1970	George Ufen
1971	Robert D. Goldblum
1971	Abul F. Rashid
1972	Robert R. Ford

G-EMC Citation

1969	Henry M. Hoffart

Honorary Life Member

1970	Rexford Daniels
1971	Dr. Ralph M. Showers
1971	Leonard W. Thomas

REPORT OF THE PUBLIC RELATIONS COMMITTEE

The following is a report from the Public Relations Committee, IEEE/G-EMC, submitted to the Ad Com at the meeting July 17, 1972, in Arlington Heights, Ill.

The Public Relations Committee has been active in several areas. Specific tasks which have been worked on by the Public Relations Committee are as follows:

1. The PR Committee submitted a "Proposed G-EMC Group Objectives" outline to the Tucson Ad Com meeting. No further action has been taken, pending recommendations of the Ad Com.

2. At the request of the Chairman, the PR Committee has undertaken the task of increasing the number of contributors to the TRANSACTIONS' "Institutional Listings." The number had dropped to two listings. Due to the campaign, companies which have committed to list number between 9 and 12 at this time, and we can expect up to 15. The Ad Com needs to find a permanent home for this activity.

3. The PR Committee is developing a list of publications and editors who should be sent future G-EMC news releases. The PR Committee would like to solicit the support of Ad Com to develop such a list which could be used by future symposiums.

4. As per the request of Dick Schultz, a PR Release has been generated for the EMC Bibliography published in Canada.

Respectfully submitted,
H. Dean McKay
Chairman
Public Relations Committee

RESULTS OF THE AD COM ELECTION BALLOT

A ballot for the election of six AdCom members for the Electromagnetic Compatibility Group was issued on July 27, 1972. The ballots returned have been counted, and the following members have been elected for the term beginning on January 1, 1973:

H. D. McKay	R. B. Schulz
J. J. O'Neil	A. H. Sullivan
H. M. Sachs	L. W. Thomas, Sr.

TECHNOLOGICAL FORECASTING AND ASSESSMENT: A CALL FOR AN EXPRESSION OF SENTIMENTS

To All EMC Group Members

Our survival in a changing society is of great concern to all of us. The EMC Group, and its parent organization, the IEEE, are undergoing drastic, adaptive changes. But changes, to be successful, cannot be without planning. So, among others, it is highly fortunate that the IEEE, TAB, with financial support of the National Science Foundation, has started a Technological Forecasting and Assessment (TFA) project of rather ambitious scope with Training and Interdisciplinary Task Forces located in the Washington Section.

This TFA will be IEEE-wide and will last at least three years:
1972–Complete the tree of the activity (of each group).
1973–Begin the forecasting.
1974–Begin the assessment.

Dr. H. Schlicke of Allen-Bradley will be the group coordinator in this effort and Carl Allen of Honeywell the vice-coordinator. They shall start planning by establishing a tree characterising the group activities. It should be finished by the beginning of next year.

The setting up of a tree is dependent on our mental attitude and our ambitions. You find two trees, presenting extreme cases:
a. A simple tree provided by Carl Allen (Figure 1).
b. A more complex tree prepared by Heinz Schlicke (Figure 2).

The simple plan by Carl Allen is easily understood but it contains basic limitations; namely, many activities overlap and still, we are missing any unification, any improvement beyond the dispersion we have experienced so far and which has kept the group relatively weak. Everybody does his own thing.

In contrast, Schlicke's plan (see explanation provided in Appendix II) is rather ambitious, maybe too much so, and it may be too complex to be manageable within the voluntary constraints we have. On the other hand, it is systematic and an attempt to ferret out the commonality of conditions and remedies in EMC. In other words, it is an attempt to organize the ubiquity in EMC into a unique opportunity.

Let us look at these two contrasting plans from another angle. The Allen plan is a continuation of the status quo. Many people may want to do it that way. The Schlicke plan takes into account and exploits synergetically the great dispersion of the EMC Group. Instead of accepting the overlapping of activities and the repetition and multiplication which goes all through our work, this plan is an attempt to streamline our efforts by eliciting common denominators.

We must realize that what is presented here is incomplete, represents only a skeleton to be completed by you. For practical reasons, mostly depending on your response, we most likely will have to arrive at a compromise between these two trees.

To reach a broad participation of the group, we are addressing all chapter chairmen, all ADCOM and Committee members, and all those who have something to say, to send their comment to Dr. Schlicke at 8220 N. Poplar Dr., Milwaukee, Wis. 53217.

1. Do you prefer: a) the Allen tree.
   b) the Schlicke tree.
   c) a compromise tree.
2. If you answered "c" affirmatively, please sketch your idea of an EMC tree that is viable and will make the group more viable in years to come.
3. Indicate your preference (first and second) of the branch of the tree you would like to work out in more detail and completeness.

You will get later training in forecasting and assessment, in the Delphi method and other appropriate methods. Thus, if you participate now, you will not only have the benefit of greatly furthering your own cause in terms of the IEEE, EMC, and your own professional life, but also you will learn long range forecasting and assessment and thereby be guided by professional planning people as they are available in the management group of the IEEE.

Explanation to Schlicke's EMC Tree for the IEEE Technology Forecasting & Assessment

Since EMI/EMC is an interdisciplinary, complex affiar, it is necessary to design a tree with the proper perspective and to stress, for economic reasons, the *commonality* of EMI *phenomena* and *remedies* as one key ingredient of a *badly needed data base.*

1.) 2 major stems [1.] EMI, technological
[2.] EMI, sociological (see point 6)
They are interconnected are involved.
by the branch [3.] the data base (see point 7)

2.) [1] is branching into [1.1] natural phenomena, and
[1.2] man-made sources and effects

3.) a.) [1.1] is forking into generic natural phenomena, in the table tentatively listed so far, only [1.1.1] and [1.1.4]
b.) [1.2] is forking into generic human activities groups, like [1.21] industry, [1.22] transportation, [1.23] communication, etc.

4.) a.) Now onto *each* branch listed under 3.) is coupled [1.3], the instrumentation needed to measure the phenomena under consideration.
b.) Each branch [1.3] is split into:
sources of EMI, [1.31]
coupling of EMI, [1.32]
sensors of EMI, [1.33]
and each of these is divided into sub-groups as given in the chart as, for instance, [1.33] being divided into [1.3.3.1], which includes side effects, and [1.3.3.2], which covers non-live EMI.
Now, all these entities comprise *EMI (what happens)* and all are fed into [1.4], constituting EMC.

5.) *EMC* [1.4] compatibility. = *What has to be done to make it compatible?*
This again is sub-divided into 3 major groups:
[1.41] systemic EMC
[1.42] management of EMC (see how it is divided)
[1.43] suppression of EMI, resulting in EMC

6.) Stem [2] is self-explanatory
[2.2] (standards, specs, and limits) are forked into
[2.2.1] activity–self-regulated voluntary standards, and
[2.2.2] directives and laws as, for instance, PL-90-367

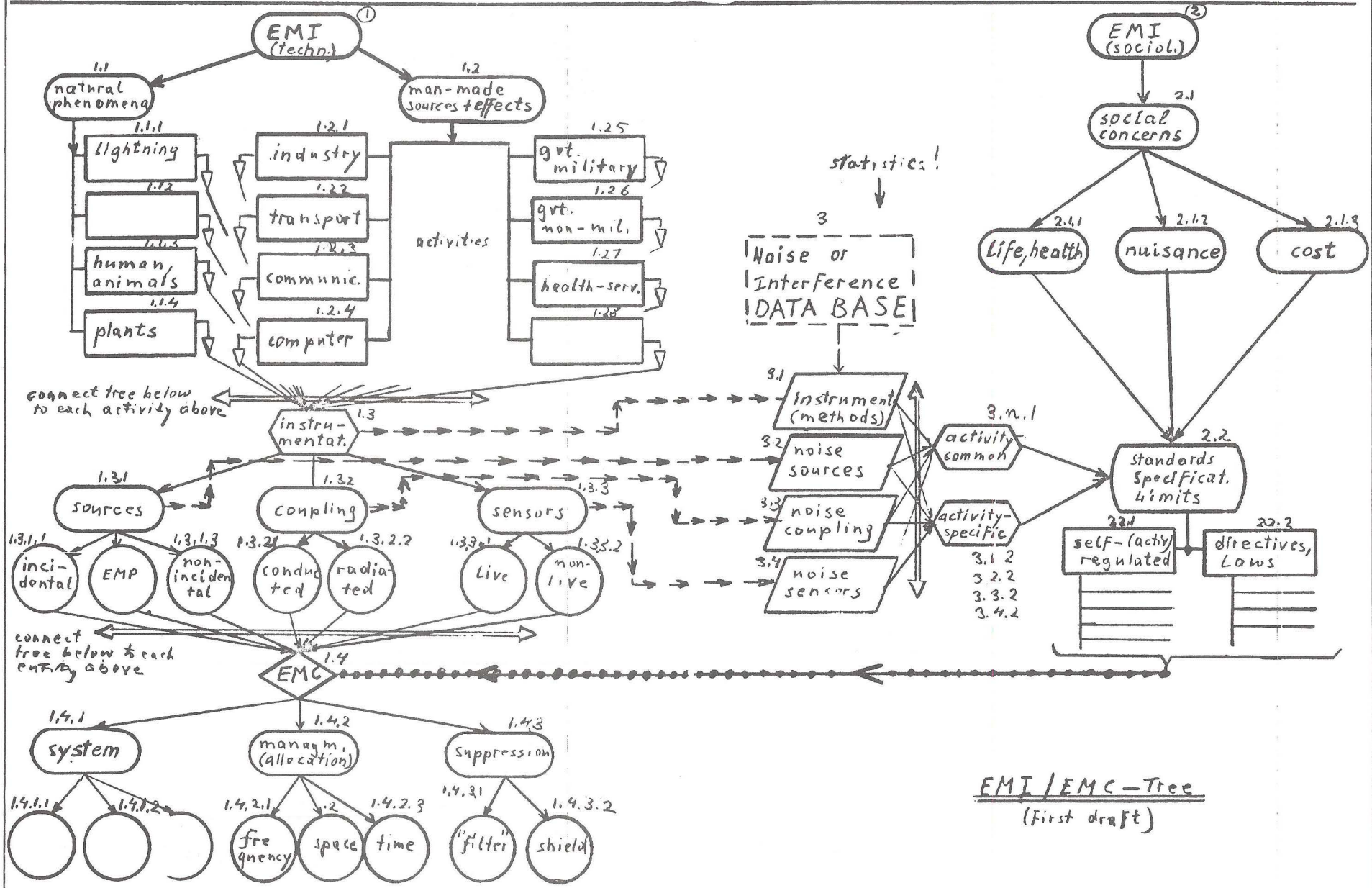
7.) Now the key to the practicality of the tree is the interconnection [3] between [1] and [2].
[3] constitutes the data base for EMC, which is needed to make [2.2] meaningful.
But because of the ubiquity of EMI, the data base 3 consisting of:
[3.1] instruments
[3.2] noise sources
[3.3] noise coupling
[3.4] noise centers
is bundled into 2 integrating groups:
[3.n.1] comprising those EMI data that are in *common to all activities* 1.1 and 1.2
[3.1.2] these EMI data that
[3.2.2] are *specific* to each
[3.3.2] activity listed under
[3.4.2] [1.1] and [1.2]

8.) The output of the data base 3, just described, forms the foundation and (input) of [2.2] (see point 6).

9.) The output of [2.2.1] and [2.2.2] (standards work) is fed forward to [1.4], EM compatibility, where it constitutes the sociological influence.
The grouping into *activity-common* and *activity-specific data* is considered indispensable if one desires, and we certainly do, to obtain an economically acceptable and manageable data base as a foundation of realistic and reasonable standards, specifications, and limits.

Effects & Remedies of Electro-magnetic Spectrum Crowding

(Natural Resource)



EMI / EMC — Tree

(First draft)

1972

SYMPOSIUM SNAP SHOTS