IEEE EMC SOCIETY Newsletter

ISSUE NO. 147 FALL 1990 (ISSN 0164-7644) EDITOR: ROBERT D. GOLDBLUM

STEPS TOWARD A SPECTRUM-EFFICIENT FUTURE
KEYNOTE ADDRESS BY
JANICE OBUCHOWSKI
ASSISTANT SECRETARY OF COMMERCE
FOR
COMMUNICATIONS AND INFORMATION
TO THE
IEEE
EMC SYMPOSIUM

When Saddam Hussein threatened to take the world's oil supply hostage, President Bush sent in the 82nd Airborne Division. When we run out of radio spectrum, calling in the cavalry won't help. Our only rescue will come from the people in this room: the spectrum engineers. But our call for help must come in time.

Every one of you knows a dozen ways to improve spectrum efficiency, but other engineers in the late 1960s knew how to improve gas mileage in automobiles and did little about it. When customers don't know or don't care about coming shortages, neither will the executives who set engineering priorities. What was true of the impending energy crisis in the late '60's is even more true of the impending spectrum shortage of the '90's: all of your expertise, all of your science, all of your capacity for hard work will be irrelevant to spectrum efficiency unless we can somehow build incentives to make your customers and executives care about it.

For the past half-century, Congress has decreed that radio spectrum should not be apportioned by the same kinds of market forces that govern access to other important resources. It has enjoined us to continue giving spectrum away on the basis of broadly defined and, on occasion, poorly articulated public interest standard.

With every other scarce resource, as supplies begin to dwindle, prices rise. That sends a signal to the marketplace: improve

(Continued on page 3)

IEEE ELECTROMAGNETIC COMPATIBILITY SOCIETY NEWSLETTER is published quarterly by the EMC Society of the Institute of Electrical and Electronic Engineers, Inc., 345 East 47th Street, New York, NY 10017. One dollar ($1.00) per member per year (included in the Society fee) for each member of the EMC Society. Second-class postage paid at New York, NY and additional mailing offices.

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IEEE NEWSLETTER PUBLICATION SCHEDULE

PUBLICATION DATES	EDITORIAL DEADLINES
May	March 15
August	June 15
November	September 15
February	December 15

Editorial contributions for February 91 issue should be received by December 15.

BACK ISSUES OF THE EMC NEWSLETTERS ON MICROFICHE

We still have a few sets of the uFiche copies of the back issues of the IEEE EMC Society Newsletters from the present to 1955 when it was called "Quasies and Peaks." The price is $25.00 post paid. If you would like to have one of these sets you can order it from: Dr. Chester L. Smith, EMC-Society Historian, 2 Jonathan Lane, Bedford, MA 01730.

your efficiency. The proven reserves of spectrum are dwindling, but some say we should respond by giving away more spectrum for free. That will send a confusing signal to the marketplace: let the good times roll. But if we don't learn to spend our spectrum more carefully, we will roll ourselves right into a radio recession.

Under the theory embodied in current law, radio licenses confer no property rights whatsoever, because all spectrum is said to belong to "the people." But you know, land once belonged to the people as well. In the year 1700, half the arable land in England was held in "open fields" or village commons. By 1800, the government had paid off the villagers and transferred most of that land to private owners. Parliament believed that open fields were inefficient, because they gave people no incentive to invest in long-term improvements. They were right: historians agree that the year 1800 would have seen a famine of catastrophic proportions if England's land had still been held in common fields.

At the beginning of this century, radio spectrum in this country was like one vast village common, owned collectively by all the people, with open grazing rights for all. The advent of commercial radio broadcasting proved that that system would not work. Congress created agencies to regulate the spectrum, yet it never took the next step: allowing private ownership of spectrum, with flexible rights of use. The result of that system, if we do not change it, could well be a spectrum famine by the end of this century.

The system of spectrum regulation that we have today is neither fish nor fowl. We pretend to grant limited term licenses to public "trustees," without giving rights of ownership. But I have never met a trustee who gave unused spectrum back to the government. Spending a dollar might save a megahertz, but, for a mere public trustee, that would be like writing a personal check to build an irrigation system for the village common. We might as well add an extra box on income tax returns: "check here if you would like your refund returned to the Treasury to reduce the federal deficit."

You may have heard these arguments before from economists or legal historians. A standard answer is that the marketplace may be fine in theory, but it won't allocate or assign spectrum. But I am here not as a economist or a legal historian: I am here as the administrator of an agency that must deal with the practical problems of implementing the present system of spectrum regulation, day in and day out. We have learned, not from theory but from practical experience, that the existing system of spectrum regulation has serious limitations.

If we were to fill this hall with public and private radio licensees, and ask if any of them had left-over spectrum to spare, you would see a room full of people shaking their heads no.

From NTIA's perspective, we have learned that asking a federal agency to relinquish radio spectrum in a time of severe budget crunches, with no compensation for equipment taken out of service, and no funding for alternative telecommunication services, is a losing proposition. Telling that same agency that you are taking their spectrum away in order to give it, free, to private entrepreneurs who could make millions by quickly reselling their rights to others, engenders the same kind of look that Dirty Harry gives down the barrel of a .44 magnum.

You can ask the FCC if they get any more cooperation from private licensees when they ask for give-backs of "spare" spectrum. I've been at the FCC, and frankly, I would expect about as much cooperation from my dog Spot if I asked him to give back a spare bone. The only time I've seen Spot drop a bone has been when somebody offered him something he wanted more. He understands the laws of economics. If Spot could talk, he would advise Congress: if the FCC is going to free up underused spectrum, it must offer licensees more than a few kind words and a pat on the head, or be prepared for some serious wrestling matches.

Frankly, the same logic applies to NTIA as well. My appointment calendar is not filled with federal agencies that knock on our door to say, "We could save some spectrum by spending more money. Take some back."

If the only tool that Congress gives NTIA is administrative edicts, we will have a very difficult time distinguishing spectrum that can safely be released to the private sector, from spectrum that may be critically important to the national interest. This is especially the case when deep-cover operations like the "Puzzle Palace" are involved. Telling NTIA to take spectrum away by administrative edict from an agency like the Pentagon's National Security Agency is like telling a surgeon to operate in the dark. As John McLaughlin often says to the other journalists on his TV show, we might at times "blunder uncontrollably into the truth,"
but more often than not we would take spectrum away where it is most needed.

It is true that the FCC and NTIA have some existing tools other than kind words and gentle persuasion. We can monitor frequency use, for example, but that rarely provides a complete answer. Some frequencies might only be needed when war breaks out, or a drug raid is on, or an off-course airplane is in trouble. Weighing the competing merits of these myriad applications is an extremely complex process, and, at times, is frankly beyond the capacity of any coordinating agency.

There is room for incremental improvements within the existing system of spectrum management, but incrementalism will not reach the roots of the problems we face. As most of you know, NTIA issued a notice of inquiry on spectrum last December, and since then we have been conducting a comprehensive analysis of the existing spectrum management system. Our work is still in progress, but the more we study the alternatives, the more apparent it becomes that fundamental changes are required.

NTIA would prefer to rely on incentives rather than administrative fiat, and we believe that the FCC could improve its performance in the same way. The right kinds of incentives

would encourage licensees to consider not only their own equipment costs, but also society's opportunity costs, when they use radio spectrum.

If both public and private radio licensees were given some form of property rights and authorized to sell their spare capacity, chances are that many of them would jump at the opportunity. Their willingness to sell would depend on their own realistic assessment of alternatives and needs. With funds derived from the sale of spectrum, public and private licensees could afford to re-locate to other bands, buy more spectrum-efficient equipment, or even, for many fixed operations, satisfy their communications needs with optical fiber.

As rational as that process sounds, it is prohibited by existing law, and Congress so far has been reluctant to authorize direct sales of spectrum by any licensees, though it allows some private licensees to engage in sales that transfer spectrum as an adjunct to other property. The result has been inefficient spectrum use. Some members of Congress are now seeking to "cure" the resulting shortage of spectrum in the private sector by taking 200 megahertz of spectrum away from federal users. But I must warn you and them: if Congress persists in its aversion to marketplace incentives, *and* directs NTIA to "liberate" spectrum for private use, my agency will face some very difficult problems of implementation.

We recognize that entrepreneurs and innovators must fight for years to obtain a tiny slice of spectrum to bring their good ideas to market. Many good ideas are lost when these pathfinders give up. They're daunted by a complex regulatory process and the power of incumbents to retain their spectrum, no matter how obsolete or inefficient the incumbents' use. Our country is fighting an international battle for technological competitiveness. We cannot afford this waste.

But in our society, as in others, the mere existence of a problem is not enough to elicit the desired solution. There must be some means of signaling the difficulty. A few months ago, newspapers reported that a jet engine had fallen off an airliner, but the pilot had flown on, unawares. It sounds crazy, until you think about the kind of signal lights they're likely to have on airliner instrument panels. They probably have a light for "engine on," and another light for "engine off," but they probably don't have a light for "engine *dropped* off."

What we have today in spectrum is a serious problem: an impending shortage. What we lack is a signaling mechanism: market mechanisms that respond to the growing shortage of spectrum, and send a message to licensees to conserve. What we do *not* lack is the best and brightest cadre of spectrum engineers in the world, many of them assembled right here in this room. If your government can get its act together and adopt the right kind of spectrum policies, the signal can get through to your customers and the executives who set spending priorities in your organizations. That is the sign you need to put us back on the high road to spectrum innovation and a competitive future in telecommunications.

Ms. Janice Obuckowski serves as the Assistant Secretary for Communications and Information, U.S. Department of Commerce, and as Administrator of the National Telecommunications and Information Agency (NTIA). Prior to joining NTIA, she was the Executive Director, International Affairs, for NYNEX. In that position, she managed NYNEX's International Government Affairs and Diplomatic Program.

Earlier, Janice Obuchowski was the Senior Advisor to the Chairman of the Federal Communications Commission (FCC), advising him on telecommunications policy and international communications issues, including participation in International Telecommunication Union (ITU) conferences and telecommunications trade and policy talks. She then ('82 to '83) became Chief of the FCC's Common Carrier Bureau, International Policy Division.

Ms. Obuchowski received her Juris Doctor degree from the Georgetown University Law Center in 1976. She was a member and editor of the Georgetown Law Journal. In 1973, she received her B.A. degree from Wellesley College with honors, and was named a "Wellesley Scholar." She also attended the University of Paris.

EDUCATION COMMITTEE NEWS

Clayton Paul
Associate Editor

The meeting of the Education Committee was held at the Washington, DC symposium on Tuesday. Kimball Williams will be sending out the minutes of the meeting to the large number of attendees. Copies of the Experiments Manual as well as the EMC Bibliography were available to the committee members as well as the symposium attendees at the IEEE booth. We are still in need of additional experiments.

A number of other matters were discussed which will be detailed in the minutes. Clayton Paul presented a proposed packet of material for assisting university educators in setting up a course on EMC. Members will comment on the format and content and it is hoped that the committee will have a final version for distribution by the next EMC symposium. The packet consists of a statement of purpose, a suggested outline, the EMC Experiments Booklet, and EMC Bibliography.

The Distinguished Lecturer Program, under the capable guidance of Dave Hanttula, has four lecturers; Ed Bronaugh, Bob Cowdell, Henry Ott and Joe Fischer. We encourage you to make use of this program. Anyone interested in having a Distinguished Lecturer speak at a chapter meeting or other gathering should contact the lecturers directly or through the program director, Dave Hanttula at 26787 Robleda Court, Los Altos Hills, CA 94022 or call him at his work number (415) 335-1071, FAX (415) 967-1042.

TECHNICAL COMMITTEE TC-2 AND YOU!

TC-2 (EMC Measurements) is the standing committee of the Society responsible for promoting the activities in the area of EMC measurement and instrumentation, including rationale for setting performance limits for emission and susceptibility tests through the use of the following procedures:

a. Receive, generate, and review papers on EMC Measurements and Instrumentation in cooperation with the TRANSACTIONS Editor or the Technical Papers Committee for each EMCS symposium.

b. Organize and operate sessions at meetings of the IEEE at meetings of other organizations with which the EMCS is desirous of cooperating, in accordance with the rules in effect at such meetings.

c. Arrange through appropriate editors for publishing EMC measurements and instrumentation related papers in IEEE publications in cooperation with the cognizant Technical Program Committees.

d. Generate and develop appropriate standards in its field for processing by the IEEE Standards Committee, through the EMCS Standards Committee and otherwise in accordance with Institute policies and EMCS bylaws and constitution.

TC-2's activities in item "a" revolve mainly around reviewing papers for acceptability for presentation at our annual EMC Symposium. For the Washington, DC symposium, we reviewed 56 (33% of those submitted for the entire symposium) abstracts and summaries. Papers were rank ordered in quality and several were rejected. Ed Bronaugh served as the Chairman of TC-2's paper review committee. He is now looking for reviewers for the 1991 Call For Papers. If you have measurement expertise and want to help review papers, call Ed on (512) 835-4684.

In item "b", TC-2 is again very active at all EMC symposia. For Washington, DC sessions 1A (Basic EMC Measurement Principles), 3C, 4C and 5C (EMI Measurements I, II, and III), and 3E (EMI Measurement Procedures) are all sponsored by TC-2. You can help here in preparing for the 1991 symposium by suggesting session themes and soliciting authors to submit key papers. Ed or Anatoly Tsaliovich (908-834-1808), who is also our liaison representative to the Society's standards committee, will be happy to discuss such topics with you.

In item "c", our TC has provided inputs for IEEE publications and has reviewed articles to be published on EMC topics. This is an area where we need more effort to provide EMC oriented articles for publication in trade journals and magazines, as well as in other IEEE Society publications. We have close ties with the Instrumentation and Measurement, Microwave Theory and Techniques, Vehicular Technology, and Antennas and Propagation Societies. It would be most appropriate to share our expertise with our sister organizations and vice-versa.

Finally, the TC-2 is quite active in sponsoring EMC Society Standards activities. Table 1 lists the 10 standards sponsored by TC-2: Standards 299, 475, 478/482, 509, 626, 1128, 1140, and 1190 are currently being updated. Those interested in participating in these working groups should contact Anatoly or Don Heirman (908) 834-1801. If you have ideas for new EMC measurement standards, Anatoly and Don would like to hear from you. We also need to know who you consider key players that can form the working group to prepare the standard.

TC-2 is very active, but as in all our TCs, we need volunteers to bring new ideas and perspectives. For example, we are now working on ideas for measurement tutorials at the 1991 EMC symposium. The TC-2 steering committee is most anxious to hear from you. The steering committee is comprised of:

Don Heirman, TC-2 Chairman
Ed Bronaugh, Paper Review Chairman
Anatoly Tsaliovich, EMCS Standards Committee Liaison Chairman
Bill Lambdin, Coordinator for CISPR activity

The Committee itself is open to anyone interested in EMC measurements and instrumentation. Working group chairmen and the steering committee members must be EMCS members. Working group members need not. The Committee holds its annual meeting each year at the EMC Symposium. For 1990, the committee met on August 21 between 8:00 and 9:00 AM in the Washington Hilton. It will next meet in Cherry Hill, New Jersey, for the 1991 symposium during the week of August 12, 1991. Between now and then you can communicate by phone (telephone numbers are shown throughout the article) or via FAX correspondence to:

D. N. Heirman, Chairman
IEEE EMC Society Technical Committee TC-2
143 Jumping Brook Road
Lincroft, NJ 07738-1442
908-834-1801 (B)
908-741-7723 (H)
908-834-1830 (B-Fax)
908-530-5695 (H-Fax)

Hope to hear from you or see you at our next meeting.

Respectfully submitted,
D.N. Heirman, Chairman of TC-2

BOD ACTIVITIES

Don Heirman
Associate Editor

The third EMC Society Board of Directors meeting of 1990 was held between 10:15 am and 5:00 pm on August 20,1990, at the Washington DC Hilton in conjunction with the EMCS Symposium. Board members present included: Ed Bronaugh, Dick Ford, Bob Hofmann, Don Clark, Don Heirman, Don Weber, Warren Kesselman, Walt McKerchar, Pat Coles, Janet O'Neil, Gene Knowles, Bob Haislmaier, Herb Mertel, Joe Bulter, Dan Hoolihan, Al Mills, Chet Smith, Dave Staggs. Members absent: Charlotte Tysenn, A. Akao. Guests present were: Y. Kami, R. Sato, K. Soh, S. Berger, E. Jensen, R. Brook, E. Cory, J. Adams, H. Denny, D. Traver, and J. McBain.

President Ed Bronaugh called the meeting to order and led the introductions. After adoption of the agenda, Secretary Janet O'Neil presented the minutes of the May 19 meeting. With minor changes, the minutes were approved. Next, treasurer Dick Ford indicated that the Society's net worth as of 30 June was $360K. He has processed over $30K worth of disbursements since the first of the year. He also indicated that our long term investments are at $200K of the $360K. The Board approved the Treasurer's report.

The reports by the four directors were then presented:

1. Director Bob Haislmaier (Communications Services) noted that the Newsletter was on schedule. He then presented the Transaction report. Bob noted that there were several new subject matter reviewers: W. S. Bennett (Standards), E. Kuestser (Electromagnetic Theory), D. Giri (Electromagnetic Propagation), M. Master (Lightning), C. Wu (System EMC), J. Norgard (Antennas).

   Haislmaier indicated that there is a strict paper review process and that more papers are being rejected to ensure high quality papers. There were questions raised by submitters about the process that he and editor Dr. Kanda, will be discussing. Chet Smith indicated that the History Committee has microfiched all the back issues of the Newsletter. He will be reporting elsewhere in the Newsletter as to how to order microfiche copies for your own records and use. Gene Cory, Symposium Committee, introduced various symposium chairmen who gave reports. John Adams reported an $18K surplus for the Denver 1989 symposium. Tom Doeppner indicated that the Washington DC Call for Papers was overwhelming, (147 papers accepted) and that all was looking positive for an outstanding symposium. As we all now know, Tom was right! Don Heirman then reported that the call for papers and exhibitor contracts were sent and handed out for the 1991 Symposium. The Hyatt Cherry Hill (Philadelphia area) has guaranteed a base hotel rate of $85 per night. A full week of activities from Sunday through Saturday, 11-17 August 1991, is planned around the technical program on 13-15 August. The Board approved the revised budget for the Cherry Hill Symposium. A corrected date of 25-27 May 1992 was presented for the Beijeng, China, Symposium. Finally, the 1994 International EMC symposium dates were announced as 17-19 May in Sendai, Japan.

2. Director Don Heirman (Technical Services) presented his reports, First, as Chairman of the EMCS Standards Committee, Don reported that the last of the 1950-1960 era versions of IEEE standards sponsored by the EMCS have been approved for publishing by the IEEE Standards Board as current standards. Herb Mertel reported on the progress in the summer Newsletter. Don also noted that Standard 299 on Shielding Effectiveness Measurements of Shielded Enclosures is in final coordination and should be approved for publication in September, or at the very latest in December. Clayton Paul, Education Committee Chairman, noted that his committee has prepared a package on developing an undergraduate EMC course. It contains an outline, a copy of the EMC experiments booklet and the EMC bibliography that Kimball Williams generated. Clayton also reported that Technical Committee TC-1 was preparing an Engineering Skills Assessment Program (ESAP) on EMC in conjunction with his committee. For more information on the Education Committee work, call Clayton on (606) 257-1644. Clayton then introduced Dave Hanttula, Distinguished Lecturer Program (DLP) Chairman, who reported that in the past 12 months 9 DLP presentations were made at an average cost to the Society of $733. Ninety percent of all lecturer ratings were in the very good to excellent range. To get more information of what is available from the DLP for local chapter use, call Dave on (415) 656-1661, X-249. Wilf

Lauber, Technical Advisory Committee Chairman, submitted a report on the TC activity at the Washington DC symposium. In particular, 7 of the 8 TCs met at the symposium in addition to the chairs of each TC meeting with Wilf. Plans for the 1991 symposium activity, including workshop/tutorial proposals, were discussed; the 5-year plan for each TC was requested as well. Finally, Joe Butler, Representative Advisory Committee Chairman, passed around his organizational chart for RAC representation on non-IEEE entities such as ANSI C63, EIA G-46, SAE AE-R and CISPR. IEEE Technology Policy Council RAC representation includes the Aerospace R&D, Man and Radiation, and IEEE Standard Board New Standards Committees. Joe has RAC vacancies for the Defense R&D, Engineering R&D, and Energy Committees. If you are interested, call Joe on (617) 935-4850x267.

3. Director Dan Hoolihan (Member Services) presented his reports. The Society membership as of 7/31/90 was 3633 which represents a growth rate of 3.7%. There are 31 active chapters and three that are in the process of becoming chapters. Dan indicated that the chapter chairman's breakfast, during the Washington DC symposium was rescheduled as a luncheon with a follow-up meeting where Board members presented information on Society activity. Dan also reported that Charlotte Tyson resigned as BoD member and her role as chairperson of the Awards and Membership committees is being assumed by Board member Pat Coles. We thank Charlotte for her long hard work and wish Pat success.

4. Director Walt McKerchar (Professional Services) gave his report. Randal Pride of EMCO was the winner of the EMC Society logo contest. Walt received Board approval to register the logo to protect its use. Randal received a $100 prize and a Certificate of Achievement. Walt also requested and received Board approval to hire Empire Video, Alexandria, VA, to shoot scenes from the Washington DC Symposium to be used as a method for promoting the EMC Society. Did you get on camera when you were at the symposium? Herb Mertel, Transnational Committee Chairman, reported that an EMCS membership booth was arranged with the UK EMC Symposium in York, England, for the week of 27-31 August. Herb staffed the booth with help from Dick Ford, Seigfried Linkwitz, and Don Heirman. Finally, Al Mills, PACE Chairman, continues to advertize PACE activities by sending material to each chapter chairman each month. Chapter chairmen not receiving Al's information should call him on (619) 463-2123.

5. In other business, the Board approved a waiver of EMCS membership fees for those applying for membership at the Washington DC symposium. The Board also approved an amount not to exceed $1500 to support the TC-8 (Product Safety) Newsletter with the understanding that a concerted effort will be made to continue to gain alternate sources of funding. The Board authorized removing the four distinguished lecturers per year limitation, thus providing for lecturers to be named by the DLP chairman for special projects and presentations to other than EMC chapters. This flexibility was approved provided that the DLP fiscal year budget is not exceeded. Len Carlson, Division IV Director, presented his report. It was on the voluntary restructuring of the IEEE, a new RAB/TAB Committee, the Video Training Committee and the Transnational Committee. A presentation by the IEEE Press manager, Dudley Kay, requesting EMCS involvement in reviewing manuscripts on EMC topics, was made. Present plans are for Press projects on an RF Shielding Guide for Architects and Engineers, Interference Cancellation, Understanding Lightning, Grounding for Explosive Environments and EMC in Power Electronics. Directors Bob Haislmaier and Don Heirman are to discuss the EMCS involvement with their committees.

6. President Bronaugh adjourned the meeting at 5:00 pm. The next meeting will be on 9 November in Phoenix in conjunction with ANSI C63 S/C 1, EMCS Standards Committee, and related working groups, which will meet the three previous days. Contact Secretary Janet O'Neil on (213) 870-9383 for more details.

Respectfully submitted,
Donald N. Heirman

BOARD OF DIRECTORS ELECTION BALLOT

A ballot for the election of six members to the IEEE Electromagnetic Compatibility Society Board of Directors was issued on August 3, 1990. The ballots returned have been counted and the following candidates have been elected for a three-year term beginning January 1, 1991.

Edwin L. Bronaugh
William E. Cory
Hugh W. Denny
Donald N. Heirman
Herbert K. Mertel
Henry W. Ott

Congratulations to the newly elected members of the Board of Directors and thanks to all nominees for their willingness to serve.

CHAPTER CHATTER

Charlie Anderson
Associate Editor

First, I must apologize for not having submitted anything for the previous issue. Second, I certainly enjoyed meeting some of you at the Symposium, sorry I didn't get a chance to talk with each of those who attended. The Chapter representatives' luncheon really did allow me an opportunity to get to know quite a few whom I had never met before. This column will be based primarily on the annual reports which were presented at the meeting following the luncheon, copies of which were sent to me by Dan Hoolihan. Thanks a meg, Dan!

A few preliminary remarks - It was truly great to find out that there are so many active Chapters. I was also pleased to hear that those Chapters outside the U.S. are doing so well. Please! PLEASE! send me copies of your meeting reports so that I can put the information into the Newsletter.

ALBUQUERQUE

The Chapter has been having meetings quite regularly, with eight in the period between last October and June of this year. Per Mike Dinallo, there will be three or four more before the end of 1990. This Chapter, by the way, is joint with the local AP-S and MTT-S Chapters.

CENTRAL NEW ENGLAND

Five meetings were held during the '89/'90 period, one of which was a "dry run" for a paper presented at the Symposium. This was the Long/Stockwood/Wojtowicz "EMC and the (amateur) 20-meter Band." On September 11, the Chapter had a meeting, at which Tim Dwyer (Eurotest Labs) gave a paper titled "Preparing for the European Market."

CHICAGO

This Chapter also had five meetings during the '89/'90 season. Attendance varied from 12 to 70. In addition to EMCS members, their mailing list is enhanced by names provided by local reps for companies with EMC interest. (Sounds like a fine way to contact more potential members.)

FRANCE

The Chapter has made significant progress in achieving coordination with the French Scientific Society (SEE). An agreement between it and the IEEE concerning sponsorship and organization of EMC-related meetings in the Francophone countries should be forthcoming shortly. Cooperation with the French universities is also being firmed up. There is now a representative for those EMCS members in Belgium. A Chapter Newsletter is being planned, with the first issue scheduled before the end of the year (Dear Ferdy - please put me on the mailing list, Charlie A.). An EMC Conference is being planned for 1992 in Paris.

LITTLETON, CO

Four meetings were held since the May '89 Denver Symposium. Meeting locations are moved around within about a 50 km radius of Denver to give more members convenient opportunities to attend. The Chapter is requesting a name change to "Rocky Mountain Chapter"; in view of the fact that the Boulder/IES/EMC chapter has been inactive for some time from an EMC standpoint and is dropping EMC from their title.

MOHAWK VALLEY

The Chapter had four meetings in '89/'90. One of their local problems seems to be competition with the Computer Society. (Perhaps this is a situation where joining with other Society Chapters in the area might be fruitful). They do have excellent relations with the local colleges and universities (other Chapters note!).

NEW JERSEY COAST

Never any problem with news from this Chapter! Copies of their local-company/local reps-supported NL arrive regularly. Right now, of course, their main thrust is towards the '91 Symposium.

PHILADELPHIA

Activity seems to be reviving a bit. They are hoping that the '91 Symposium will provide some impetus.

SANTA CLARA VALLEY

Eight meetings were held between September '89 and May of this year. They were responsible for the EMC Session at WESCON in November '89 and are planning a Bay Area Regional EMC Colloquim which will be held in June '91. They are also doing preliminary planning for the EMCS Symposium to held there in '96.

SOUTHEASTERN MICHIGAN

This Chapter is joint with A&P-S, ED-S and MT&T-S. They have held three meetings so far this year at two of which the speakers were EMCS Distinguished Lecturers Herb Mertel and Ed Bronaugh. Local-area corporations are co-sponsoring the meetings.

SWEDEN

This new Chapter was formally recognized in April of this year. Their first meeting is planned for October. Because the area of Sweden is about that of California, they are trying to schedule Chapter activities in various locations.

TOKYO

Previous columns have reported on the monthly "paper fests" which this very active Chapter conducts. During the period of May "89 through April '90, nearly 100 papers were presented!

WASHINGTON DC/N. VIRGINIA

First, a humorous note - one of the Executive Committee meetings was held in the vicinity of an airline ticket counter at Dulles Airport. It seems that several of the Committee were departing on business travel the day after a holiday; so the airport was a logical spot for their meeting. The Chapter continues its every-other-month luncheon meetings (at which your Column Editor tries to be present). Local-member interest is quite high, and a dozen or more non-member attendees usually show up.

1988 & 1990 EMC SYMPOSIUM RECORDS

The IEEE EMC Society has an Exchange Program for Symposium Records with the Wroclaw EMC Symposium.

A limited number of Wroclaw EMC Symposium Records are still available from the EMC Society as follows:

1988 Wroclaw EMC Symposium Record $50.00
1990 Wroclaw EMC Symposium Record $50.00

Please order from: Herbert K. Mertel, EMACO, INC., 7562 Trade Street, San Diego, CA 92121

Orders must include a check payable to the IEEE EMC Society.

EMC SOCIETY VIDEO

A seven-minute video has been prepared describing the EMC Society and the benefits of membership. Much of the film footage was shot during the recent IEEE Symposium held at the Washington Hilton this past August. The video describes the various publications of the Society, has personal interviews of attendees from the Symposium and does an excellent job as a recruitment video in describing the overall activity which takes place during a Symposium.

This video will be used for membership recruitment purposes and to promote the general welfare of the Society. It is not for sale but copies may be borrowed by contacting Walter D. McKerchar, P.O. Box 1888, Poulsbo, WA 98370. Tel. (206) 779-7069, FAX (206) 697-1259. Your editor recently reviewed the film and has one comment to describe it: "Dynamite."

INTER-SOCIETY ACTIVITIES

Donald Weber, Associate Editor

ELECTRONIC INDUSTRIES ASSOCIATION

The Electronic Industries Association (EIA) G-46 EMC Committee is focusing on the Tri-Service effort to update the MIL-STD-461/462/463 series of EMI standards. The committee solicited recommendations from throughout the industry for revisions to MIL-STD-462 and has submitted this compilation to the Tri-Service Working Group. G-46 is actively supporting the ANSI C-63 Committee in their effort to develop a draft test procedures document for submission to the working group. They are also attempting to research the history of the existing MIL-STD--461 limits to provide the rationale for establishing the limits and to give guidance for tailoring the limits for specific procurement.

SAE SURFACE VEHICLE EMC STANDARDS ACTIVITY

EMI Standards Committee

SAE J1113 August 87. This fundamental module/component test document is undergoing a complete revision to incorporate the latest technology as developed here in the U.S. and as negotiated in ISO. The document will include both susceptibility and emissions test methods and will establish recommended test limits for most, if not all, test methods. To be reissued as a multi-part document, the first revised parts are expected to be complete late this year.

A second multi-part document is being drafted for vehicle susceptibility test methods and limits. At its completion, documents such as J1595, J1338, J1407, and J1448 are expected to be withdrawn. As with J1113, the input for the new document will be based on information from within SAE as well as that negotiated in ISO.

Within the activity of the EMI Standards Committee, there has been a broadened representation so that the interests of more industry segments are represented. In particular, there is close interaction between the passenger car and the truck and bus segments of the industry.

EMR STANDARDS COMMITTEE

SAE 1551. The Mar90 version of the document is being printed. This version includes many changes that bring it and CISPR Publication 12, 3rd Edition, into very close harmony.

SAE J1816 Oct 87. Based on the concepts of FCC Part 15J test requirements, this document has been adopted as a U.S. National Standard.

New activities for the EMR Standards Committee include test methods and limits for modules/components. This information will become a part of the new SAE J1113 format so that all module/component tests and limits are in one reference document.

BOOK REVIEW

ELEKTROMAGNETISCHE VERTRAGLICHKEIT

Adolf J. Schwab, Springer-Verlag, Berlin, 1990

Review conducted from original German edition.

Dr. Werner Graf, Guest Book Review Editor

This new book on Electromagnetic Compatibility evokes a mixed reaction. On the one hand, it covers every conceivable topic having to do with EMC, and the number of pages is quite large for a book of this kind: over 400 pages. On the other hand, there are many errors and omissions that make it difficult for me to give the book an unqualified recommendation. The purpose of the book, as stated in the preface, is to provide an introduction to the topic of EMC as well as to be a reference for developers, manufacturers and engineers in all disciplines, who might encounter EMC problems or questions.

Chapter 1. Introduction to Electromagnetic Compatibility. Overall, this is a good introduction that contains some excellent observations and recommendations. For example, on page 32 a simple figure shows why (fundamentally) there is no reason to ground a signal circuit. However, I would quibble with a few other statements and figures. For example, Figure 1.3 on page 6 attempts to demonstrate the importance of early planning for EMC. The abscissa shows the probability of incurring costs, depending on whether EMC was considered during planning and design or later, when a problem was discovered. The two curves are added to show the minimum cost. However, since the figure has no scale, it really does not give any information other than to restate the obvious: planning ahead is good thing. On the next page the concept of logarithmic levels is introduced. The definition of the dB is given in terms of a voltage ratio, which is incorrect. The "Bel" was defined to be the log of a power ratio, and the dB is simply ten times that. Any other ratio, such as a voltage ratio, is derived from the power ratio, and therefore gets the factor of 20 instead of 10. For the power ratio, the author uses 1 pW as a reference level. I'd think 1 mW to be more common. The author then equates the ratio of 10:1 to 20 dB. The unit dB always refers to a power ratio, and 10:1 equals 10 dB unless it is stated that the ratio refers to voltage or current (or some other quantity related to power by a square root). In addition to the dB, the Neper is also defined. Why in a modern book, space is devoted to an archaic quantity is not clear.

A good overview of the different coupling mechanisms, galvanic, electric, magnetic, and radiated, is given on pages 20-23. Common mode and differential mode are discussed next. The figure on page 30 is a bit misleading: it shows a ground loop, but if the two shields are closed, the loop is really inside the two equipment units. In practice, the shields are most likely open but then they should be drawn as such, and not give the illusion of a closed shield. An error occurred in the translation of earth ground and signal ground on page 32: in German, signal common is referred to by an entirely different word (Masse) from an earth ground (Erde), whereas in English, we use "earth," "ground," and "common" synonymously. (Schwab translates Erde as earth, and Masse as ground.) The figure, as mentioned before, is an excellent illustration of why an electric circuit does not (*a priori*) need a connection to earth ground. The discussion on these pages makes the distinction between earth ground and signal ground quite clear, and explains why and when it is desirable to connect the two. A table on page 33 summarizes the various terms used in both English and German. (Throughout the book key terms are translated into English, a very nice feature.) The different grounding schemes are discussed next, with single point grounding given much weight, despite the recognition of its shortcomings and the impossibility of having (or wanting) a single point ground at high frequencies. The introduction continues with a somewhat laborious description of Fourier series, Fourier integral, and Fourier transforms. A scheme for doing a Fourier transform graphically is discussed at length. No mention of digital computers or an FFT is made.

Chapter 2. Sources of Interference. Sources are classified as narrowband or broadband depending on the bandwidth of the receiver. However, the figure on page 64 only shows the band of the source, and the figure fails to convey the message of the text. The reader is then led to believe that narrowband sources are usually manmade, whereas, broadband sources are natural. I'm not sure why the distinction is made. Broadcast (narrowband) sources are then further divided into five groups ((page 67): commercial radio and TV broadcast; police and other communications; satellite communications; navigation; and radar. I don't see what the purpose of the grouping is. (The table on page 68 contains a typo: FM extends to 108 MHz, not just to 100 MHz as stated.) Many other sources of interference are then discussed, including cars, fluorescent lights, motors, and lightning. The latter is discussed as having a peak current of 200 kA. The probability of such an occurrence should be stated, or perhaps the more typical value of 20 kA given. A brief description of high-altitude EMP is also given, but the peak value of the field (50 kV/m) is never stated, and the figure on page 93 has no scale. The chapter concludes with a classification of interference sources in accordance with VDE and IEC rules.

Chapter 3. Coupling. This chapter discusses in more detail the different coupling mechanisms that were mentioned in the

introduction. The description of optical couplers (page 113) should mention that these micro-devices only decouple effectively at low frequencies, since their coupling capacitance is usually quite small (a few pF). Page 144 shows a good example of how a cable shield should be bonded to an equipment unit i.e., peripherally.

Chapter 4. Interference Control: Passive Components. This chapter describes a large number of devices, such as filters, surge arresters, common mode rejection devices, and others, that can be used to protect an equipment unit from interference. What is curiously absent here is the relationship of these devices used in conjunction with an electromagnetic shield. All of these items, including a shield, are elements of an electromagnetic barrier. Indeed, a filter often does not work as advertised simply because it is not part of a barrier and is thus not as effective as it could be. This is my major bone of contention with this book. Its stated purpose is to reduce the difficulty of understanding field problems for the circuit engineer. Indeed, many arguments arise because of misunderstandings between circuit analysis and electromagnetic fields and waves. Many interference problems are electromagnetic problems. They are then modeled (and solved) as circuit problems. If the equivalent circuit is a good model of reality, this works just fine. However, all too often, important parameters are missing in the model, since it is very difficult to estimate parasitic quantities with any degree of accuracy.

Chapter 5. Shielding. Schwab neglects to point out that a shield is designed to accomplish the same thing as the passive components discussed in the previous chapter. Each is an impediment to the flow of electromagnetic energy, and they work best together. Attention is focused on the various parts of the spectrum, properties of magnetic and electric fields, shielding effectiveness as a function of source distance, and various other details. However, nowhere is mention made that in order to be effective, a shield must be closed. If it is closed, then most of the detail considerations become unimportant in practice, because the shielding material is not the limiting factor.

Chapter 6. Theory of shielding. This is a highly theoretical chapter that really has no place in a book that is otherwise filled with practical information. If I wanted to solve Maxwell's equations, I would not look for a book on interference control. Furthermore, only the most tractable cases are discussed (cylinder and sphere). Then Schelkunoff's transmission line approximation is given (with the explanation that it is widely used because of its simplicity, and despite its shortcomings). But at the end, with all the various formulas derived, no conclusion is reached. For example, it would have been instructive to give numerical examples of the reflection and absorption properties of copper and steel. It would have quickly become evident that even very thin conductors have a rather high insertion loss, and that therefore any questions regarding the shielding material should be answered by mechanical engineers and not EMC engineers.

Chapter 7. Emission Measurement Techniques. This chapter discusses the various ways that interference can be measured. It is one of the more useful chapters in the book. I'd only quibble with a few minor details. For example, on page 267, we find the statement that the impedance of a line impedance stabilization network (LISN) was chosen to be 150 ohms, since it's between 500 ohms for overland transmission lines, and 40 ohms for power cabling. And on page 289 the author states that the advantage of measuring the noise power lies in its reproducibility, especially when measuring an equipment unit that is well shielded, since the interference is then confined to the power cabling! If the unit is indeed well shielded, it better include a power line filter. Otherwise why spend the money for the shield?

Chapter 8. Susceptibility Measurement Techniques. This chapter gives a good description of the various ways in which interference can be simulated to test the susceptibility of the unit under test. The discussion includes narrowband as well as transient sources.

Chapter 9. Component Testing. This chapter describes how the various elements used to combat interference can be tested. Most measurements described are insertion loss measurements. Unfortunately, it is not made clear that an insertion loss measurement, although reproducible, usually contains at least part of the test equipment mixed in with the property of the item under test (good examples are MIL-STD-285 measurements).

Chapter 10. Selected Problems. This chapter discusses problems of interference control that may be encountered in practice. It is a useful chapter that illustrates the large variety and complexity of EMC. It even includes a brief discussion of the biological effects of electromagnetic radiation.

Chapter 11. EMC Regulations. This brief chapter gives an overview of the various VDE, IEC, CISPR, and other regulations.

Overall, the book could be a welcome addition to a library on interference control. It contains a wealth of information. It's too bad that it isn't always accurate. The level is generally introductory, although here and there formulas show up out of nowhere. Chapter 6 is too theoretical and a bit out of place. The author appears to be proud that the entire book was produced on a personal computer, including all of the illustrations. The advantage of such a procedure is a certain uniformity of the layout. Unfortunately, this can also backfire: the many drawings with shadow boxes get to be boring and they convey no more information than a table would. The overall quality of the illustrations is not as good as in some older books, although it's certainly better than some other books on interference control.

EMC-90 SYMPOSI

Tom Doeppner, General Cha

The IEEE 1990 International Symposium on EMC was a big success, according to reports from attendees, exhibitors, and speakers. Total registered attendance (including exhibitor personnel, speakers, paying attendees and guests) was 1,854; of those, 564 were full registrants, 151 were one-day registrants, and 23 were students. Also included in the total are 15 EMC Life Members and 5 IEEE Life Members. (The remainder were exhibitor personnel and "exhibits only" registrants.)

The Symposium was unique in three respects. First, there was a truly international flavor; about thirty percent of the 140-odd papers presented were of non-U.S. origin, as were about 170 of the attendees. Second, there was greater than usual interest in the tutorials ("EMC Measurement Principles" and "Product Safety"), and third, the variety of topics presented received many favorable comments. (Examples: The panels on MIL-STD-461/2/3, the special session and panel discussion on Sequency Union, and the sessions that dealt with the environmental and socio-economic aspects of EMC.)

In addition to the usual awards presented at an EMC Symposium, we initiated an "Aaron H. Sullivan Jr. Award" in memory of "Sully," whom most of you remember as one of the finest EMCers in the history of our Society. The award honors the author(s) of the Symposium's Best Paper as selected by a panel of three highly respected EMC engineers. The unanimous choice of the panel was the paper "Effect of an Image Plane on Printed Circuit Board Radiation," and the winning co-authors were Robert F. German, Henry W. Ott, and Clayton R. Paul, each of whom received a plaque, and a share of the $1000 cash prize. We sincerely hope that future EMC Symposia consider continuation of this award.

Dudley Kay, IEEE Press Manager

Tom Doeppner, General Chairman, 1990 IEEE EMC Symposium

Ernie Magyar (left) and Flo Haislmaier (right) help with registration

UM BIG SUCCESS

nan, IEEE EMC Symposium

Our keynote speaker was The Honorable Janice Obuchowski, Assistant Secretary of Commerce and Director of the National Telecommunications and Information Agency. Rather than present her staff-created bureaucratic draft, she discussed the controversial concept of selling *Spectrum Space on the Marketplace*, and subjected herself to lively discussions after she left the podium.

An unusual number of favorable comments came from the exhibitors who were pleased both with the physical layout (Washington Hilton Hotel is particularly well designed for a symposium: the breakout rooms surround the Exhibit Hall), and with the schedule, which provided staggered 30-minute coffee breaks during the technical sessions, with coffee being served in the far end of the Exhibit Hall.

The Hospitality program provided ample tours in the Washington and Annapolis area; one innovation was to include a tour on the Monday preceding the Symposium; this tour was well attended by guests of EMCers who attended pre-symposium meetings.

Speaking for all the EMC-90 Committee members, I take this opportunity to thank you, the members of the EMC Community, for your support -- be it as attendees, authors, exhibitors, or advisors. It was your support that made the Symposium a success, and our job a professionally gratifying experience.

Special thanks to Dick Ford for supplying the photographs.

Janice Obuchowski, Keynote Speaker

EMC Board of Directors

Activity at the IEEE EMC Symposium

EMC PERSONALITY PROFILE

Abul Rashid

William G. Duff
Associate Editor

Abul received his B.S. and M.S. degrees from the DACCA Engineering College (Bangladesh) and the University of Illinois, respectively. He was fortunate to learn electromagnetic engineering from Dr. E. C. Jordan from the University of Illinois and Dr. Kraus from the Ohio State University. He is an honorary member of the Phi-mu-epsilon mathematical society.

His professional EMC engineering career began with the Bell Aerospace Company where he developed statistical antenna and propagation models to analyze the performance of the U.S. Army military communication systems. After having experience in U.S. Army mobile communication systems, his interest shifted to EMC engineering in weapon design. He hardened the Tomahawk cruise missile against EMP, lightning, ESD and intense operational electromagnetic fields of friendly and enemy radars. He also hardened the MX Launcher against high electromagnetic threats. Abul established an EMC program for the MX missile, monitored associate contractors' EMC programs, and as an EMC control board member, resolved EMC issues. In the area of space vehicles, he hardened the GPS satellite against ESD and electromagnetic threats. He developed susceptibility criteria for digital, analog, ordnance and command control lines within missiles. He also monitored and performed both subsystem and system level EMC tests for missiles.

He is presently developing analytical port susceptibility models for linear and digital devices commonly used in modern weapons at frequencies from 14 kHz to 40 GHz. While working at Northrop Corporation, where he is currently employed, Abul has hardened the Tacit Rainbow missiles against extremely high electromagnetic threats. Northrop Corporation considers EMC a very important aspect of weapon design and has established a corporate level EMC Council; Abul is the chairman of this council.

He established EMC chapters at Tucson, AZ; San Diego, CA, and Littleton, CO. He generated statewide IEEE EMC interests in Arizona and held a statewide EMC Conference in which then Governor Williams was the keynote speaker. Personnel from the U.S. Army at Ft. Huachuka, the University of Arizona and various industries in Arizona attended the conference. Local banks, television stations and news media supported and publicized this EMC Conference. He organized the regional Mountain West Conference in EMC at Tucson, AZ. This conference was attended by the IEEE EMC Society President and Board of Directors. The conference was held at the University of Arizona to reduce operational costs and the IEEE EMC Society benefited financially from this conference. The IEEE EMC Society became well-known in various mountain states due to the statewide and Mountain West regional conferences.

During the difficult days of the 1970s he communicated with all IEEE sections worldwide as a chairman of an Ad Hoc Committee under the Tucson section of the IEEE. He painfully remembers the hardships of EMC engineers during the 1970s. With the assistance of the state of Arizona, he established a working group to find jobs for unemployed engineers. He also called upon both the Republic and Democratic parties to discuss possible means to reduce hardships of unemployed engineers at a conference in Phoenix, Arizona. At his request, the IEEE held a special session during the annual meeting in New York to discuss unemployed engineers' problems and possible solutions.

Abul has three children; he teaches Shatalee, his nine year old daughter how to play soccer. At present he is organizing the IEEE EMC Chapter at Thousand Oaks, CA. Please call him at (805) 373-3574 and assist him in establishing the EMC Chapter within the Bueno Vista section of the IEEE.

EMC CERTIFICATION AND ACCREDITATION

PROGRESS REPORT

Russell V. Carstensen
Associate Editor

In any endeavor no matter how spectacular the progress, there will be some events that "set you back." I've just experienced one this week. Recently, Norfolk Naval Shipyard, one of the lead activities for the industrial EMC portion of the Shipboard Electromagnetic Compatibility Improvement Program (SEMCIP) solicited proposals for EMC engineering and technical services.

This solicitation was made as an agent of the Naval Sea Systems Command which does not have a requirement for EMC personnel certification. (As pointed out before in this column, the Naval Air Systems Command is presently executing a model EMC certification requirement endorsed by the Chief of Naval Operations as part of a multifaceted approach to EMC excellence.) So it came as no surprise to me that the Norfolk solicitation was silent on the certification issue.

As a consequence of this silence, one of the prospective offerors submitted the following question:

> "The RFP does not appear to require EMC (or EMI) certification of persons proposed for the work. Is such certification to be required, or will such certification enhance the position of an offeror who has it?"

The response to this question is reproduced totally and in context as follows:

> "Rationale: The certification "program" as proposed by the EMC/EMI community has the effect of creating a closed community and restricts competition in the area where new ideas and fresh viewpoints are needed.
>
> Answer: there is no requirement for EMC (or EMI) certification of personnel under this contract. The Navy has not established Navy-wide EMI certification of personnel, only certification that ships are EMI free."

Someone has not done their homework! For openers, EMC certification was not proposed by the "EMC community." In fact, the IEEE EMC Society (which is the only broadly based formal body representing the EMC/EMI control community) is still on record as being neutral on this issue. They publish this column only as an educational service to their membership.

Certification was originally proposed by the Naval Air Systems Command as one part of a package which responded to the Chief of Naval Operation's demand that the Navy improve its performance in mitigating EMI problems. To assure integrity and to facilitate maximum utilization, NARTE, a non-profit, non-Governmental entity was asked to execute the EMC certification process as a self-sustaining service to the user community.

Certification does not create a closed community. Anyone who can meet the credential requirements of education, work experience, peer endorsement and demonstrate competency in EMC fundamentals can be certified. Thus far, over 1500 people have met these standards and will achieve certification. So what does Norfolk mean by a "closed community"? People who can't easily change what they do for a living to fit the next contract on which they're bidding?

I can guarantee you the list of currently certified people cuts across all boundaries; Non-DOD, Navy, Army, Air Force, U.S. and Canada, as well as other countries. These are people who have demonstrated a real commitment to the technology of electromagnetic effects. There is only one common thread, that these are folks who have made a visible demonstration of commitment to their craft. And they have no shortage of new ideas and fresh viewpoints. It's just that at the senior practitioner level those ideas and viewpoints will be sound and pragmatic technically. It would seem a bit cavalier to look for new ideas and fresh viewpoints from unqualified suppliers. Sounds a bit like letting the inmates run the asylum!

In May of this year, DOD issued a policy memorandum requiring procurement to be awarded on the basis of "best value" to the government. What better way to show value than to ask for a validated means of demonstrating competency in a critical skill area?

(Continued on page 18)

POINT AND COUNTERPOINT

DECLINING U.S. DEFENSE BUDGET IMPACT ON EMC

Anthony G. Zimbalatti
Associate Editor

I am disturbed by and disagree with certain statements on the declining U.S. defense budget and its impact on EMC Engineers, which were made by Dr. E. Thomas Chesworth, P.E., Technical Editor, in his Editor's Note column of the March/April 1990 Electromagnetic News Report (ENR), a bimonthly publication of Seven Mountains Scientific Inc.

I am most disturbed by Dr. Chesworth's statement, "It is time for EMC Engineers in the U.S. to leave the relative safety and security of nearly cost-independent military requirements and move toward cost-competitive, performance-oriented commercial engineering practice." He goes on to say: "In this world (meaning the commercial world) EMC principles are applied to design and production because they ensure and enhance performance of the product and not because they are mandated by some arbitrary contractual specification which may or may not have a basis in enhanced system performance."; and "Ultimately this transition to performance-oriented EMC design and verification will benefit military and aerospace systems as well as strengthen the EMC engineering community."

Since when has contractor or government EMC Engineers working for military or other governmental agencies, say for example NASA, been safe and secure because of ".....nearly cost-independent military requirements..."? There was neither safety nor security for those EMC Engineers who had to leave EMC or change to another EMC employer after World War II, the Korean War, the Eisenhower Recession, or after completion of Project Apollo or similar large government projects.

Since when have "...military EMC requirements been cost-independent..."? Don't take my word that EMC manpower and time estimates are reduced, or even slashed, to meet program costs and schedules; one could ask EMC Engineers if EMC requirements are cost-independent.

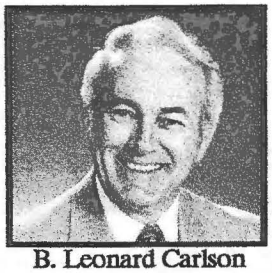
Because Dr. Chesworth fails to cite those EMC requirements that he deems cost-independent, I am unsure whether he is talking about management or technical requirements, subsystem or system procurement, or about requirements delineated in military specification MIL-E-6051 for systems EMC or standard MIL-STD-461/462 for subsystems EMC. However, a clue may be provided by Dr. Chesworth's aforementioned quoted statement that "...commercial engineering practices are performance oriented...", thus; it seems like management requirements like control plans or advisory boards are excluded and that he is focusing on technical requirements.

It seems like Dr. Chesworth is referring to selected requirements of 6051, or to all or selected requirements of 461/462 because 6051 is almost entirely performance-oriented as to system EMC design and verification compliance. Why? Specification 6051, except for a small number of requirements, is performance oriented because it requires that the system performance not be limited by EM interference without delineating permissible radiation or susceptibility limits, system performance or allowable interference degradation criteria. However 6051 does provide for EMC safety margins which are performance-oriented criteria. On the other hand, unlike 6051, Standard 461/462 is not performance-oriented because it delineates that subsystems (equipment) radiation and susceptibility meet permissible limits that are relatively independent of the ultimate use of these subsystems. (To my knowledge no one has succeeded in justifying subsystem radiation and susceptibility limits for 461/462 or any of its predecessors like standard MIL-STD-826, or specification MIL-STD-6181. It should be noted that there is a basis for these limits going back to World War II and that a U.S. government agency had a project for justifying subsystem limits for aerospace systems that was cancelled immediately after the Request For Quote was issued.)

Turning to Dr. Chesworth's assertion that using commercial EMC requirements will automatically enhance or benefit military and aerospace systems, coupled with his failure to cite those commercial EMC engineering practices or requirements that he considers performance-oriented or cost-effective or performance-enhancing as compared to those of 6051 and 461/462, I am not swayed by his assertion. In fact, it is well known that the U.S. commercial EMC requirements for ground and aerospace subsystems have been and continue to be deficient, lack the state-of-the-EMC-art and the commercial EMC requirements of other countries; especially in the area of aerospace systems EMC, for example: until recently, the lack of susceptibility requirements for immunity of consumer electrical/electronic/computer equipment to somewhat intense radiation and for immunity of commercial airplanes' subsystems to high energy radiation. (Several years ago, the FAA began

(Continued on Page 18)

IEEE ELECTROMAGNETIC AND RADIATION DIVISION DIRECTOR'S REPORT



B. Leonard Carlson
Associate Editor

Since the beginning of the year, I have been assigned to several ADHOC and standing committees. This report is intended to be an overview of what is happening as it pertains to society activities.

ADVOSC

Volunteer restructuring committee. Although not a very popular subject, nonetheless, this committee was chartered to look at the volunteer structure and determine if changes could be made which will enhance our transnational commitments and responsibilities. The comments, as a result of the preliminary report submitted to the BOD in July of 1989, have now been incorporated in the report. In addition, meetings have been held with the Educational Activities Board and Standards Board to better understand their concerns and comments. As of August 20, the committee has completed its study and a final report will be presented to the BOD at the August meeting in Denver. Any decision on accepting or rejecting will be postponed until the November meeting in San Diego. In the meantime, each society will receive copies of the report and TAB will have the chance to vote in November, unless the August BOD refuses to accept the report; in which case, it becomes history. I might add that the ADVOS committee spent a lot of time going over all the comments and concerns. The background and rationale for the recommendations is included in the report.

RAB/TAB CHAPTERS COMMITTEE

The RAB/TAB chapters committee is new and the charter has been approved by both RAB and TAB with bylaws to be approved at the August BOD. The central issue being dealt with is how TAB/RAB can better support the chapters. RAB has agreed to have a regional chapter coordinator who will oversee the professional aspects of chapters much the same as a society chapter coordinator now worries the technical issues of the chapter. The big show for chapters this year is the Sections Congress 90 being held in Toronto. During the February TAB meeting, it was decided that $1,000 be given to each society, to be passed on to the most deserving chapters for use in sending a representative to SC90. This is in addition to the societies sending their own chapter coordinators. A Chapters Interest Survey for SC90 has been prepared and will be handed out and conducted in Toronto. I will be organizing a session for society chapter coordinators, tentatively scheduled for Thursday, October 4, 1990.

VIDEO TRAINING COMMITTEE

This ad hoc committee is chartered to prepare video training material for societies and chapters. Currently, a video training script has been prepared and taping is being done at the North Carolina State Video Studios in Raleigh, NC. The title of the first tape is "Society Leadership - An Introduction - Your Society and TAB," which runs approximately 15 minutes; the second tape is entitled "Society Organization and Governance," also 15 to 20 minutes. The script is in approval routing. The third tape planned for this year is "Society Finances" and the outline is being finalized and a preliminary script is being written.

TRANSNATIONAL COMMITTEE

The Transnational Committee is comprised of both RAB and TAB directors and essentially the charter is to help enhance the transnational aspects of the IEEE. There are currently four task forces: (1) The first is the establishment of an IEEE office outside the U.S. This is currently underway with space being provided by the Computer Society in Brussels, Belgium. (2) The second is a task force on establishing IEEE relationships with non-IEEE entities. (3) The third is a task force on value added aspects. (4) The fourth is international participation. All the above task forces have some impact on societies since societies are, by nature of their existence, transnational.

EDUCATIONAL ACTIVITY BOARD

As the TAB representative, I attended the EAB meeting in Vienna, Austria on July 1, 1990. The meeting was held in conjunction with the FIE symposium being held 2-5 July 1990.

AUDIT COMMITTEE

The IEEE audit committee has met two times this year and one of the issues that keeps coming up is G&A (General and

(Continued on Page 18)

EPA DRAFT ON EMF RISK

An Environmental Protection Agency (EPA) report concluded that insufficient data on the biological effects of electrical and magnetic fields (EMF) preclude a determination on the exposure risk. Particularly, the correlation between cancer incidences and exposure to 60 Hz electricity is unknown because the interaction mechanisms between biological processes and EMF are not thoroughly known.

Although the report does acknowledge a response pattern between EMF and certain cancers, the data does not prove a causal connection between the disease and electrical exposure. Tests indicate EMF induces effects in accordance with several possible carcinogenic processes. However EMF has not been experimentally linked to tumor growth in humans or animals, where it is believed to act as a promoter, not as an initiator of cancer.

A comprehensive $34 million EMF research bill is currently in the congressional committee process.

[*Source: Electrical Code Watch, June 1990*]

EMC CERTIFICATION *(Continued from page 15)*

Norfolk says that the only certification needed is that the ships be free of EMI. Heck, an unqualified supplier will have a much easier time doing that than a qualified supplier! Testing or inspecting a ship at the end of the overhaul is just not the best time to determine if the engineering talent was up to the task. The Navy's board of inspection has been doing that, and has had to report to congress for the better part of two decades that our Fleet is awash in serious EMI problems, many of which are self-inflicted.

Let's take a lesson from the Quality Control Gurus, Demming, Juran and Crosby. Stop relying on "mass inspection" as the assurance of product integrity. Start managing quality into the process. If the ship is to be certifiable as EMI free (and there is a strong question of ever being able to certify that any ship is EMI free) make the central focus to manage the process of design and corresponding manufacturing oversight to assure that the ship was overhauled in a manner so as to minimize the likelihood of EMI induced performance degradation. How can that be done without the direct involvement of proven specialists? And more importantly, how is an evaluator to make a best value selection in a highly specialized field without some objective measure of the worker's credentials?

I've written Norfolk a letter. I'll keep you informed.

On the other hand, the cadre of certified people continues to grow. The first certification examination was held recently. In the next issue I will be able to report on the examination's success.

ELECTROMAGNETICS AND RADIATION *(Continued from page 17)*

Administrative) costs and how should they be recovered. The end result is that the Finance Committee at its meeting on G&A in July received a report that the 1990 General Fund would have a $2.5M deficit. The committee discussed the possibility of a general dues increase and a G&A percentage of 3.5% to be assessed for services rendered (this was not accepted). The committee discussed various possibilities, following is a list: (1) Across the board percentage cuts, (2) program reviews by staff, (3) increase dues ($10 generates $2.0M), (4) allocation of G&A, (5) increased service rates, (6) conference surcharges, and (7) new income sharing. The following proposal was recommended for forwarding to Budget Development Committee and BOD.

(a) $2.00 dues increase for student member
(b) $6.00 dues increase for members
(c) Reduce the deficit by $1.0M, a 2% reduction in spending
(d) Ask the TAB Long Range Finance Committee to recommend a G&A mechanism to IEEE Finance Committee for implementation in 1991.

The bottom line is that a G&A cost will somehow be added to services provided to Societies by the IEEE.

POINT AND COUNTERPOINT *(Continued from Page 16)*

instituting an airplane immunity requirement.) Moreover, before saddling the military with commercial requirements, there are deficiencies in the military EMC requirements that need correction if aerospace systems performance is to be enhanced. I have identified some of these military EMC requirement deficiencies in previous Newsletter Columns. (Issues No. 145, Spring 1990; 144, Winter 1990; 143, Fall 1989; 141, Spring 1989.

What has the aforementioned to do with the declining U.S. military budget and its impact on EMC Engineers? According to Dr. Chesworth's column, "What looks on the surface to be a bad decade (meaning the 90's) for EMC is really a decade of opportunity." U.S. EMC Engineers are to seize this opportunity by leaving "the relative safety and security of nearly cost-independent military requirements and move toward cost-competitive, performance-oriented commercial engineering practice." I agree with Dr. Chesworth that the use of performance-oriented requirements would be good for all military requirements, but I believe the development of such requirements would prove extremely difficult. Furthermore, I am not sure that the commercial world offers such requirements and that the EMC engineering community or the military will be strengthened by using commercial requirements.

Let me know your views on the use of commercial requirements for military products. Also, let me know of topics that you would like to see discussed in this column, or perhaps you would like to write an article for this column.

PCS FOR AP

E. K. Miller, Associate Editor

One of the driving forces behind computation electromagnetics (CEM) is a growing need to determine the electromagnetic performance of increasingly complex systems at ever higher frequencies. The ideal approach would probably be some appropriate combination of measurement, analysis, and computation so that system design and assessment can be achieved to a needed accuracy at some acceptable cost.

In the pre-computer era, say before 1950 or so, EM system design was achieved using what analysis could be done, while relying heavily on experimental measurements. Today, computational evaluation has joined analysis and measurement, with the three parts of this EM "troika" all benefiting from the continuing growith of computer technology. Since the early 1950s, computers have increased by a factor of more than a million in speed and storage. For example, a CRAY2 has an effective throughput (not the clock rate) of about 10^{11} floating-point operations per hour compared with the approximate 10^5 provided by the UNIVAC-1.

Although the CRAY2 offers an effective computation bandwidth of about 10^{11}/hour, future supercomputers can be anticipated to continue the approximate two-order-of-magnitude improvement per decade that has prevailed since the introduction of UNIVAC-1 about 1950. However, whereas these speed increases have been largely due to use of faster components as tube technology gave way to transistors, which were in turn replaced by integrated circuits of greater and greater density, future speed growth will increasingly depend on improvements in computer architecture. Parallelism is the key to increasing computation bandwidth, ranging from the modest degree of parallelism of the Hypercube architecture that has a few hundreds of complex CPUs, to the massive parallelism of the Connection Machine architecture that can have many thousands of simpler CPUs. Presently, both kinds of parallel machines are factoring or inverting complex matrices of 20,000 unknowns in a few hours, and projections are for computation bandwidths of 1 *TeraFLOP* by 1995 and 100 *TeraFLOPS* by the year 2,000. [Rattner, J. (1989), "Towards the Teraflop Machine," presented at the Workshop on Highspeed Simulation and Visualization, California Institute of Technology, June 19-21, Pasadena, CA.]

EMC SOCIETY LOGO

The EMC Society conducted a logo contest last year. Many excellent designs were submitted, but the winner was submitted by Mr. Randall Pride of EMCO in Austin, TX. The logo was first shown during the awards luncheon at the Washington Hilton during the recent EMC Symposium.

From time to time, the editor has invited members to submit masthead and logo designs for the EMCS Newsletter. We will try to use the new Society logo and create our own new masthead as an interim measure. However, we will be receptive to your ideas. Please send them to the attention of the Newsletter Editor. The address is given on page 2.

PRACTICAL PAPERS, ARTICLES, AND APPLICATION NOTES

Edwin L. Bronaugh, Associate Editor

In this issue we have a handy solution to a problem often faced by people who use portable antenna masts. Our thanks to Mr. Richard L. Schieve for this one.

SPECIAL JOINT TO FACILITATE MOVING ANTENNA MAST THROUGH DOORWAY

Richard L. Schieve, AT&T Bell Laboratories

Moving one of the more popular antenna mast assemblies through the 7-foot high by 4-foot wide doorway of our open-area test site (OATS) proved to be quite difficult. When the 4-meter mast was tilted utilizing the pivot at the base of the assembly provided by the manufacturer, the 7-foot cross member that the antenna mounts on would not allow the assembly to fit through the doorway. The antenna had to be removed and the entire mast assembly had to be lifted and rotated to fit through the doorway.

To solve this problem a special hinge or "knee" joint was fabricated (Figure 1). The mast itself is constructed with 3" square, hollow, fiberglass sections. The mast was cut at a height of 5 feet. The phenolic "knee" illustrated was inserted in the mast at the 5-foot cut, immediately above the movable 7-foot horizontal cross member that the antenna is mounted on, when the cross member is at the bottom of the mast. After releasing the tension on the rope that lifts the cross member and ensuring that the cross member is as low as possible, the mast section above the "knee" can be tilted by lifting the upper section past the pivot point and slowly allowing the upper section to rotate to the ground. If desired, the upper mast section can then be pulled completely off of the "knee" and placed on the base of the mast assembly, parallel to the still mounted 7-foot cross section. The antenna need not be removed and the entire assembly can be rolled through the doorway. For more information, contact

Richard L. Schieve,
Senior Technical Associate,
EMC Procedures and Test Group,
AT&T Bell Laboratories,
Room 2B-223
2000 N. Naperville Road,
Naperville, IL 60566-7033.

EMCABS

William H. McGinnis
Associate Editor

In this issue we continue publishing abstracts of papers from previous EMC Symposia, other conferences, meetings and publications. The EMCABS committee is composed of the members listed below. By way of introduction to the community, they are listed with their company affiliations:

Mike Crawford, National Bureau of Standards
Bob Hunter, Texas Instruments
R. M. Showers, University of Pennsylvania
Yoshio Kami, University of Electro-Communications
Daniel Keneally, Rome Air Development Center
Diethard Hansen, Asea Brown-Boveri, Switzerland

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NOTE: The steering staff of the EMC Japan Technical Group and the EMCS Tokyo Chapter have graciously offered to act as a central point for requests of papers abstracted. Most of the papers will be in Japanese only. The Steering Staff will assist in routing your request to the author(s) but will not do translating of the papers. The contact person is Yoshio Kami, The University of Electro-Communications, 1-5-1, Chofugaoka, Chofu-Shi, Tokyo 182, Japan.

A Computer Aided Accurate Adjustment of Cellular Radio RF Filters

EMCABS: 01-11-90

T. Ishizaki, H. Ikeda, T. Uwano, M. Hatanaka*, and H. Miyake*
Image Tech Research Lab, Matsushita Electric Industrial, and
*Mitsushita Nittoh Electric Companies, Japan
1990 IEEE MTT-S International Microwave Symposium Digest
Vol. 1, May 8-10, 1990, Pgs. 139-142

ABSTRACT: An accurate and speedy tuning algorithm of cellular radio filters is presented. From measured performance, a computer instructs one on how to trim the dielectric resonators. To reduce the optimization error and secure the good convergence, analytical considerations are taken to derive the proper expression of a resonantor equivalent circuit. By using this method, a beginner took only 5 minutes to adjust a five-resonator-filter.
INDEX TERMS: Antennas, Modeling

Low-Loss Analog Fiber-Optic Links

EMCABS: 02-11-90

C. H. Cox III, D. Z. Tsang, L. M. Johnson, and G. E. Betts
Lincoln Lab, MIT, Lexington, MA 02173-9108
1990 IEEE MTT-S International Microwave Symposium Digest
Vol. 1, May 8-10, 1990, Pgs. 157-160

ABSTRACT: Experimental and theoretical studies of high-performance fiber-optic links are reported. For the experimental directly modulated link, the measured electrical insertlon gain was -4.9 dB at a bandwidth of 1500 MHz, and 0.3 dB at a bandwidth of 200 MHz. For the experimental externally modulated link operating at a bandwidth of 800 MHz, the calculated electrical insertion gain based on actual device parameters is -1.0 dB, while at 150 MHz a gain of 6.0 dB is expected. Both links have no active amplification. The directly modulated links have higher noise figures because of the high relative intensity noise of the diode laser.
INDEX TERMS: Fiber-optics, Interface

Full-Wave Analysis of Aperture Coupled Shielded Microstrip Lines

EMCABS: 03-11-90

N. L. Van Den Berg and P. B. Katachi
Radiation Laboratory, University of Michigan, Ann Arbor, MI
1990 IEEE MTT-S International Microwave Symposium Digest
Vol. 1, May 8-10, 1990, Pgs. 163-166

ABSTRACT: A full-wave space-domain integral equation analysis of aperture coupled shielded microstrip lines is presented based on Pocklington's integrals and the equivalence principle. The derivation of the associated dyadic Green's functions in the form of waveguide LSE and LSM modes is described. The line currents and slot voltage are expanded in terms of subsectional basis functions and the method of moments, together with even and odd mode transmission line analysis, is applied to determine the two-port scattering parameters.
INDEX TERMS: Micro strip, Modeling, Shielding

Optical Techniques for Microwave Generation, Transmission and Control

EMCABS: 04-11-90

L. Goldberg, R. D. Esman, and K. J. Williams
Naval Research Laboratories, Washington, DC
1990 IEEE MTT-S International Microwave Symposium Digest
Vol. 1, May 8-10, 1990, Pgs. 229-232

ABSTRACT: Techniques for optical generation of microwave signals to 35 GHz, including direct laser diode modulation, FM sideband injection locking of lazer diodes, and offset frequency phase locking of solid state lasers are reviewed. Optical methods for controlling microwave devices, including phased array radar and oscillators are described together with recent advances in optical transmission of microwave signals.
INDEX TERMS: RF Generation, Microwave, Fiber-Optics

Waveguide-to-Microstrip Power Splitter

EMCABS: 05-11-90

Y.S. Wu, M. V. Schneider and R. Trambarulo
AT&T Bell Laboratories, Holmdel, NJ
1990 IEEE MTT-S International Microwave Symposium Digest
Vol. 1, May 8-10, 1990, Pgs. 475-478

ABSTRACT: A novel coupling structure which permits both power combining and division is described. The structure divides power equally from a rectangular waveguide to two microstrip lines. The microstrips are T-shaped conductor patterns placed symmetrically in the waveguide. The splitter has a return loss of better than 20 dB from 3.3-4.6 GHZ measured at the waveguide port. The power difference between the two microstrip output ports is less than 0.1 dB. The coupler is useful for power combining at microwave and millimeter-wavelengths with minimal power loss.
INDEX TERMS: Microwave, Microstrip, Interface

A New Rectangular Waveguide to Coplanar Waveguide Transition

EMCABS: 06-11-90

George Ponchak and Rainee Simons
NASA Lewis Research Center, Cleveland, OH and
Case Western Reserve University, Cleveland, OH
1990 IEEE MTT-S International Microwave Symposium Digest
Vol. 1, May 8-10, 1990, Pgs. 491-492

ABSTRACT: A new rectangular waveguide to coplanar waveguide transition is described. The transition uses a ridge in one of the broad walls of the waveguide and a nonradiating slot in the opposite wall to split and rotate the electromagneitcfields of the rectangular waveguide TE10 mode into the CPW fields.
INDEX TERMS: Microwave, Microstrip, Probes

CALENDAR

1991

April 15-18	IEE International Conference on Antennas and Propagation University of York, UK	Contact:	ICAP 91 Secretariat Conference Services IEE Savoy Place London WC24 OBL UK
August 13-15	IEEE 1991 EMC Symposium Hyatt Cherry Hill Cherry Hill, NJ	Contact:	Ed Bronaugh IEEE 1991 Intl. Symposium on EMC P.O. Box 609 Lincroft, NJ 07738 (800) 253-3761
September 24-16	13th Annual Electrical Overstress/ Electrostatic Discharge Symposium Riviera Hotel Las Vegas, NV	Contact:	Terry Welsher AT&T Bell Laboratories 600 Mountain Avenue, Rm. 3B-321 Murray Hill, NJ 07974 (201) 582-5279

A SPECTRUM OF EMC ISSUES FOR THE 90'S

1990 IEEE INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY
WASHINGTON HILTON, WASHINGTON, DC
AUGUST 21 - 23, 1990

CASSETTE TAPE ORDER FORM

Tuesday, August 21, 1990

2:00 PM - 5:00 PM - Concurrent Sessions

001* _____ (1A) Basic EMC Measurement Principles
002* _____ (1B) Shielding Effectiveness
003 _____ (1C) System Level EMC
004 _____ (1D) EM Effects
005 _____ (1E) EM Pulse
006* _____ (IF) Product Safety Special Session

Wednesday, August 22, 1990

9:00 AM - 12:00 Noon - Concurrent Sessions

007* _____ (2A) Circuit Level EMI Testing
008 _____ (2B) EMI Control
009 _____ (2C) System Level EMC Analysis
010 _____ (2D) EM Environment

2:00 PM - 5:00 PM - Concurrent Sessions

013 _____ (3A) ESD Testing
014 _____ (3B) PCB Design for EMC
015* _____ (3C) EMI Measurements I
016* _____ (3D) Electromagnetic Environment Effects
017* _____ (3E) EMI Measurement Procedures
018* _____ (3F) Special Session: Spectrum Issues in the Twenty-First Century

Thursday, August 23, 1990

9:00 AM - 12:00 Noon - Concurrent Sessions

019* _____ (4A) Antennas and Propagation Effects on EMI Testing
020* _____ (4B) EMI Control in Cables
021 _____ (4C) EMI Measurements II
022* _____ (4D) Special Session on Socio-Economic Aspects of EMC
023 _____ (4E) Spectrum Management
024* _____ (4F) Special Session for Sequency Union

2:00 PM - 5:00 PM - Concurrent Sessions

025* _____ (5A) Cables
026* _____ (5B) EMI Control in Systems
027 _____ (5C) EMI Measurements III
028 _____ (5D) Radiation and Coupling
029* _____ (5E) Special Session on Certification and Accreditation

** Indicates Two (2) Tape Session*

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