Society Presidency Changes Hands

Robert Fenton and Sam McConoughey
"New Challenges for Vehicular Technology." This was the theme of the 20th Annual Vehicular Technology Conference in Columbus, Ohio in 1969. The date was important to me as it marked my first major participation in a VT national function. Now, sixteen years later and Society President, I cannot help but think how little some things change. New Challenges—clearly this is just as relevant today, probably even more so than in 1969. The growth in our fields of interest, land-mobile communications, vehicular electronics, and transportation systems, is expected to be explosive and with this should come those new challenges as well as opportunities for our Society to grow and prosper.

One way this can be achieved is through extensive member participation in our annual conference. Our 34th, thanks to an outstanding job by John Murray and his Conference Committee, provided the participants with an excellent, thought-provoking technical program and warm western hospitality. Marvelous job, Boulder!

Our 35th will be held in Dallas, Texas at the Anatole Hotel on May 20-22, 1986. At Markwardt the Conference Chairman, spent 4 days in Boulder carefully observing their operations, and I think he and his committee will have something special for us. You should receive the Call for Papers in the very near future. Plan now to submit a paper, or at the very least, mark this date on your calendar and plan to attend.

With prospects such as this, and with the assistance of an excellent, experienced Board of Directors, I hope to build on our past accomplishments and lay plans for the future.

Both Roger Madden, our new Vice President, and I appreciate the Board's vote of confidence in electing us. We also appreciate the willingness of Arthur Goldsmith and Sam Leslie to continue as Treasurer and Secretary, respectively.

Fortunately, both Sam McConoughy, now Junior Past President, and Stan Meyer, Senior Past President, will be available for counsel. A vote of thanks to these stalwarts for their past and continued support.

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**Editor's Notes**

A ballot for the election of IEEE Vehicular Technology Society members to the Board of Directors was issued on March 6, 1985. The ballots returned have been counted, and the following candidates have been elected:

Term Ending December 31, 1986
Alvin W. Goldstein
Samuel A. Leslie
Fred M. Link
Samuel R. McConoughy

Term Ending December 31, 1987
Arthur Goldsmith
Robert S. Madden
Robert A. Mazzola
William Missany
Evan B. Richards

We wish the newly elected members of the Board of Directors success and thank all nominees for their willingness to serve and for permitting their names to be included on the ballot.

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**On the Cover**

Sam McConoughy, retiring VTS President, congratulates new VTS President, Dr. Robert Fenton, at the Board of Directors' meeting in Boulder, Colorado, on May 20, 1985.
Society Officers and Board of Directors

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BOARD OF DIRECTORS

NAME
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Arthur Goldsmith
Al Goldswin
A. Kent Johnson
Samuel A. Leslie
Fred H. Link
Charles Lyon
Roger Hadden
Robert A. Mazola
George F. McClure
Samuel R. McConoughy
Stuart Meyer
William Misskey
Evan B. Richards
Eric Schimmel

RESPONSIBILITY
President
Treasurer
Conference Coordinator
Newsletter Editor
Society Secretary
Chairman, National Site Selection Comm.
Chairman, Paper of Year Comm.
Vice President
Chairman, Membership Committee
Chairman of Publications Comm.
Immediate Past President
Senior Past President
Vehicular Electronics Editor, Newsletter
National Conference Coordinator
Chairman, Personal Radio Committee

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Chapter News

Gaspar Messina
Chapter News Editor

Meetings

New Jersey Coast (EMC/VU/AF)

Sixteen and Eight Channel Multiplexers for Cellular Systems
by Dr. A. Kent Johnson, AT&T Bell Laboratories, Whippany, New Jersey.
Held on March 19, 1985, with 20 attending including 4 guests.

"Land Mobile Radio From The 20's, Through the 80's"
by Mr. Stuart Meyer, E.F. Johnson Company, Arlington, Virginia.
Held on April 16, 1985, with 28 attending including 2 guests.

"FCC Authorization Testing Program"
by Mr. Art Wall, Office of Science and Technology, Federal Communication Commission, Columbia, Maryland.
Held on March 27, 1985, with 74 attending including 26 guests.

Open House "ANSI-Information Systems All-Weather Open Area Test Site"
by Mr. D. B. Seiman
Held March 28, 1985, with 44 attending including 16 guests.

Gaspar Messina
Editor and Chapter Activities Chairman
9800 Marquette Drive
Bethesda, Maryland 20817

August 1985

Board of Directors Report

Samuel A. Leslie
VTS Secretary

MINUTES OF THE IEEE VTS BOARD OF DIRECTORS MEETING

The IEEE VTS Board of Directors met on May 28, 1985 at the Hilton Harvest House in Boulder, Colorado.
The Board meeting was called to order at 2:00 PM.

ROLL CALL

The following were in attendance:

#Samuel R. McConaghey President
#Michael E. Fenton Vice-President
#Ralph Goldsmith Treasurer
#Fred H. Link National Site Selection
#Evan Richards National Conf. Coord.
#Erik J. Schimmel Personal Radio Chairman
#William P. Miskey Electronics Editor
#Stuart Meyer Jr. Past President Secretary
#Samuel A. Leslie National Chairman
#Roger Madden Senior Past President
#George McClure Publications Chairman
#Robert Lyon Paper of Year Chairman
#Al Goldstein "85 Denver Conference Chairman
#John Murray "85 Denver Conference Finance
#Jack Neuhaus Awards and Standards
#Robert W. McIntyre UTS Chairman
#Greg Austin San Francisco Chapter
#Frank Lord PAC Chairman

(#) denotes elected Board member)

Thirteen of the nineteen present were elected Board members. A minimum of eight elected board members are necessary for voting on matters that come before the Board.

MINUTES OF LAST MEETING

George McClure moved, Bob Fenton seconded that the minutes of the last meeting be approved as presented. The motion carried with all in favor.

NOMINATIONS CHAIRMAN REPORT

Stu Meyer reported on the results of the recent combined election, with the following being elected:

Term Ending Dec. 86
A. Kent Johnson
Samuel A. Leslie
Fred Link
Sam McConaghey
Al Goldstein

Term Ending Dec. 87
Arthur Goldsmith
Robert Madden
Evan B. Richards
William Miskey

In addition, he noted that the following elected members have terms expiring at the end of this year:

Term Ending Dec. 85
Robert E. Fenton
Charles Lynk
George F. McClure
Stuart Meyer
Eric J. Schimmel

Candidates are to be solicited for the Dec. 88 term, with an election to be held this Fall.

TREASURER'S REPORT

Art Goldsmith reported that the Society is in better financial condition than originally projected, with a $17,748 surplus being achieved for 1984.

A preliminary budget has been submitted for 1985, with an income of $467,494 against expenses of $459,398 being projected.

The Treasurer again noted the importance of obtaining prior approval from the President for expenses which are expected to be reimbursed by the Society, and that properly executed receipts are to be submitted for such expenses.

Roger Madden moved, George McClure seconded that the Treasurer's report be accepted. The motion carried with a unanimous vote.

VICE-PRESIDENT'S REPORT

Bob Fenton reported that a large majority of the Land Transportation Committee (LTC) of the 160 voted in favor of watching with our Society. Some 508 members in the LTC are involved. He reported that this matter is back on the agenda for the next TAB meeting.

Stu Meyer moved, George McClure seconded that the Society accept a memorandum of understanding to welcome the IAS Land Transportation Committee members into the land transportation section of VTS. The motion carried with a unanimous vote.

Also, an updated and edited Field of Interest for the Society was passed to the Constitution and Bylaws Committee Members for review.
August 1985

CONFERENCE COORDINATOR REPORT

Evan reported that the Convergence ‘84 financial report is not yet finalized. The printing bill is not yet out. However, per John Melkonian, Conference Finance Chairman, the Society can expect a minimum of $468K return on an investment of $818K.

The 1985 Boulder Conference appears to be a success in spite of the United Airlines strike, with over 290 paid registrations being recorded the first day of the conference.

Evan noted a problem with the manufacturer’s symposium, with one wing missing in the Boulder Conference. Some of the Board members felt that the rate was too high for the half-hour exposure; others felt that solicitation of potential manufacturers was not done soon enough.

Evan also mentioned an issue with the Transactions Communications Editor chairs.

He reported that the page budget continues at 272 pages per year and that he expects to be within budget.

A special issue featuring the work of the ad hoc committee on mobile propagation is planned for 1986, with Neal Shephard as guest editor.

IEEE PRESS BOOK

Sam McConoghey reported that the royalties for the Land Mobile Communications Press Book have amounted to an income of $156K for the Society and $150K for the Authors, split three ways.

PUBLICITY

Bob McKnight reported that he had prepared six press releases for the Boulder Conference for distribution to over 158 publications in the area of operation, automotive, and communications fields.

PACE REPORT

Frank Lord reported on PACE activities, and presented a list of the 1984 US56 Task Force and Committee Membership.

He noted that any IEEE member can be a corresponding member (i.e., on the mailing list to receive committee reports) of any of the committees.

NEWSLETTER ADVERTISING

Stu Mayer noted that there were no paid advertisers lined up for the Newsletter as of this date.

FELLOWS SCHOLARSHIP

The Board noted that the contact for Fellow Awards is Al Isberg. Frank Lord also noted that the failure of any member who has been listed as a reference to return the evaluation sheet is sufficient to cause a nomination for Fellow grade to be rejected.

DAN NOBLE SCHOLARSHIP

Al Goldsmith reported that Steven B. Rothweiler has been selected for the 1985 Scholarship Award. Mr. Rothweiler has a GPA of 3.25, the highest grade average out of a possible 4.0.

He also reported that last year’s recipient has accepted a job rather than to continue with the Master’s program, thus resulting in only half of the scholarship award being expended.

IEEE Vehicular Technology Newsletter

August 1986

At further reported that there have been problems in getting cooperation from time to time to the recipients of the scholarship awards, with the delays apparently being due to not sending all the necessary approvals for the release of funds.

To resolve this matter, Roger Madden moved, Bob Fenton seconded that the Society president’s letter to Dr. Engelson (dated April 17, 1985) recommending that disbursement of funds be made by IEEE Headquarters should be the request of the Dan Noble Scholarship Committee Chairman with his statement that this will be handled with the approval of the UTS Board of Directors be approved as the new position. The motion carried with the vote unanimous in favor.

PAPER OF THE YEAR

Chuck Lyni reported that two papers from Japan have been selected, with one as the “Paper of the Year” and the other as the runner-up.

CHAPTER OF THE YEAR

Stu Mayer reported that the Chapter of the Year Award goes to the New Jersey Coast Chapter.

CERTIFICATES OF APPRECIATION

Stu Mayer stated that certificates of appreciation have been given to Simon (1982 Conference Chairman), Vino Visinadri (1983 Conference Chairman), Tom Seils (1984 Conference Chairman), Dave Talley (IEEE VTS Financial Advisor), and Dave Dobson (Standards and Liaison) have been presented.

The certificates were presented to Vino and to Dave Talley, who were present at the conference.

IEEE VTS RECOGNITION

Sam McConoghey indicated that Eric Schmelke has been appointed a member of the to attend the IEEE Communications and Information Policy Committee. Member of the UTS is also assigned to the committee to cover any technical question that may come up.

SCHOLARSHIP

Jack Newbauer noted that two IEEE measurement standards are five years in arrears (Spurious Emissions from Land Mobile Transmitters and FM Receiver Measurement Procedures), that the Vehicular Ignition Measurement Procedure is also in arrears.

EXECUTIVE COMMITTEE ELECTION

Stu Mayer presented a slate for election of the Society President, Vice President, and Treasurer for the Goldsmith four year term. Nominees were Bob Fenton for President, Roger Madden for Vice President, and Art Goldsmith for Secretary.

A problem was noted with the Bylaws for the position of Treasurer, since the Bylaws state that the Treasurer must have the same office for more than two consecutive terms. After discussion, the Board decided to not fill the Treasurer position by election at this time, but to temporarily appoint Art Goldsmith to this position until the problem can be resolved.

Steven Rothweiler (right) receives the Daniel Noble Fellowship Award from Alvin M. Goldstein, of the Noble Candidate Selection Committee.

The award in honor of Dan Noble, research scientist and Motorola executive, provides funding for graduate work in electrical engineering. Steven Rothweiler, a graduate of Rutgers University, will use the funds to continue his work toward a Master’s Degree in the EE field.
Professional Activities

Frank E. Lord
Professional Activities Editor

The Legislative Front

A great deal happens in legislatures that can affect your career environment. Until recently we had little or no participation in these processes. However, with the advent of professional activities in the Institute and the establishment of the United States Activities Board (USAB), we have the authority and means to become involved.

In many matters we can be satisfied that USAB is doing for us all that needs to be done. On the other hand, there are some legislative matters we as individuals can reinforce through our contacts with and letters to our individual representatives, who can provide the means for individuals to keep informed on national legislative items through Legislative Reports and Legislative Alerts. The former reports on current legislative items may be presented as a profession and can be useful in building up background knowledge in the institution. The Legislative Alerts are briefers, focus on key items and action needed by the individual. You may get on the mailing list for these publications by writing to Heidi Faith, IEEE USAB, 1111 19th St. N.W., Washington, DC 20036 or call her at 202-782-0017.

There are two significant bills which may not be acted upon by the time you read this. One concerns the pension aspect of the other, and the other the others. Most members are familiar with the latter, which are imbedded in these bills. By following these legislative matters and the aforementioned USAB publications you can be prepared for communication with your representative at the appropriate time.

In April, the IEEE along with three other Scientific and Engineering Societies presented testimony before the House Subcommittee on Labor/Management Relations of the Committee on Labor, our memberships, and other similarly mobile workers. The majority of our members are employees of corporations and are participants in employer pension plans that utilize ten (10) year "cliff" vesting. However, the average time spent with a single employer is less than ten (10) years. Mr. Chairman, we assure you that we are not simply trying to solve specific technical problems; and, when those problems are solved, we move on to the interest of the country, its productivity, its technological advancement, and its economic growth.

But, the price we pay for the fluid employment pattern is a process of repeated pension forfeiture. Indeed, many of our members change employers again and again, vesting pension plan after pension plan, and thus find it difficult to become vested in an employer pension plan. This scenario is a fact for our memberships and unfortunately is even more of an acute problem for women that are faced with giving up their contributing benefits often and, and scientific professionals — e.g., women.

Therefore, Mr. Chairman, we recommend that existing vesting requirements be modified to require full vesting with an employer who has completed one year of service with that employer, being retroactive to the commencement of employment.

Social Security Integration

The effects of integration of social security benefits with those provided by an employer-sponsored pension plan are equally confusing and difficult for most pension participants to understand. In many cases, an integrated plan may assure that lower pay is not a value or not lost when they pay vesting plan, however, this knowledge and understanding is not discovered by the employee only when it is too late for remedial action.

It is our position that the integration of government and private plan benefits:

1. Inherently reduces the benefits provided by the private plan;
2. Effectively provides a disproportionate loss of private plan benefits to lower paid employees and a corresponding gain of indeterminate plan benefits to highly paid employees;
3. Adds a substantial degree of complexity to pension plans, which militate against the understanding of plans by plan participants.

Therefore, we oppose integration of private and government benefits.

Portability of Vested Pension Benefits

As mentioned in previous paragraphs, our mobile employees are frequently forced to re-vest because of lack of vesting; however, on those occasions when they do become vested, an additional complication arises from the lack of portability. In the situation where an employee does manage to vest, the benefit is often exceedingly small, particularly if the vesting period is quite lengthy (e.g., 30 years). A mobile employee who has been fortunate enough to vest in several pension plans during the course of a career can find that these vested benefits are individually worth very little, scattered over a multitude of different pension plans. Pension portability would allow these fortunate mobile employees to take their vested benefits with them as they move from employer to employer, thus giving them the benefit of one repository for these increments of vested benefits. This in turn would allow the mobile individual to accumulate these vested benefits in much the same manner as an employee who is non-mobile. These benefits would vest in only one employer's plan. This type of single repository would permit the employees to benefit from the larger accumulation of retirement monies and subsequent benefits. The increase in benefits over the span of a career. However, there may be cases in which an employee may have vested benefits that they have a vested vested to remain with the employer's pension plan, and this should be encouraged.

Therefore, we support portability for all vested pension benefits, at the option of the employee.

Defined Contribution Pension Plans

A basic objective of pension benefits is to provide an income sufficient to maintain a reasonable standard of living after an individual retires. In the case of employees who are professionals like engineers, this objective is often not met because of the nature of defined benefit pension plans. Under these plans, benefits are determined by factors such as salary and early vesting. The effects of inflation could wipe out the value of these benefits over time. Under the system of Defined Contributions, however, there is portability and early vesting. In addition, an individual's benefit would not be frozen, but would be compared with the investment return and would grow over the individual's career. It offers advantages to both the employee and the employer.

For the employer (simplicity):

- There is no need to designate a normal retirement age, and no actuarial computations are required for actuarial employees, thereby resulting in a small expense saving;

For the employee (simplicity):

- These plans are not at all expensive, and are not actuarial in any way, thereby reducing administrative costs for the employer.
pension costs are always fully funded, further costs do not need to be estimated; and,
the plans are not subject to termination insurance, and there is no contingent liability if the plan should terminate.

For the employee (flexibility and possible portability):
the participant can watch the account grow, and can, at any time, calculate its current value; additionally, unlike the defined benefit plan, the defined contribution plan does not have the risk of forfeiture;
the participant can usually choose from a range of options on how to invest the account;
the account fund continues to grow, even after the participant’s employment terminates; and
the entire account balance is available as a death benefit.

Therefore, we support legislation that would encourage employers to offer defined contribution pension plans in the case of terminating defined benefit pension plans, we would encourage employers to start to make available defined contribution plans to new and existing employees without any loss of existing benefits deriving from defined benefit plans.

Mr. Chairman, this concludes our testimony on behalf of the IEEE, AIC, ASCF, and ASRE. We look forward to working with you, your colleagues and staff on these issues of concern to our memberships.

SUMMARY OF POSITIONS

Mr. Chairman, we recognize and commend actions taken in recent years by the Congress to assist individuals to save for their retirement. The expansion of IRA availability to all working individuals was a major step forward in encouraging people to provide for their own retirement through investment in these tax-deferred savings vehicles; however, we feel that there is much more that needs to be done to bring equity into the pension/retirement system. Thus, based upon the philosophies espoused in the foregoing papers, the IEEE, AIC, ASCF and ASRE ask that the subcommittee support legislation that would:

(1) Mandate full vesting after one year of employment, with credit being retroactive to the commencement of employment.
(2) Eliminate integration of social security with private pension benefits.
(3) Provide for portability of vested pension benefits, at the option of the employee; and,
(4) Encourage new employers to offer defined contribution plans, and encourage existing employers to offer new employees the option of the defined contribution plan without any loss of existing benefits deriving from defined benefit plans.

Mr. Chairman, the conference concludes our testimony on behalf of the IEEE, AIC, ASCF, and ASRE. We look forward to working with you, your colleagues and staff on these issues of concern to our memberships.

VT 85 Conference was a success

The 1985 Vehicular Technology Conference can be characterized by these comments—good weather, scenic scenery, many excellent technical papers, wide ranging discussions, and a general atmosphere conducive to good technical conferences.

Over 200 attended the May 21-23, meeting in Boulder, Colorado. Several features drew good sized crowds, especially the International Cellular Radio Panel on Wednesday afternoon where representatives of Canada, Federal Republic of Germany, Great Britain, Japan and the U.S. discussed systems and progress in their respective countries.

One of the highlights of the 3-day meeting was the Awards Luncheon on Wednesday at which time several members of VTF were honored for their exemplary service to the Society.

Highlight of the Wednesday evening banquet was the positive outlook for cellular radio worldwide. We look forward to working with you, your colleagues and staff on these issues of concern to our memberships.

Bob McKnight
Transportation Systems
Editor

Hi-Tech eases transport transition

Transportation entities have relatively large capital investments in plant and equipment that often make it uneconomical to rapidly or dramatically change their methods of operations. However, the recent rapid advances in technology have enabled many transportation organisations to use modern scientific methods and equipment to bring them "up to speed" in the modern world.

Now this is being done was described in five papers presented at the Vehicular Technology Conference held May 21-23 in Boulder, Colorado.

The Transportation Session lead off with a description of a Microprocessor Based Automated Voice Defect Detector System. The most widely used defect detector used by the railroads is the hotbox detector, which first made its appearance in 1956. Today over 3,000 such units are in service on U.S. and Canadian railroads.

Robert D. Douglas, president, Detronics, Inc., manufacturer of the microprocessor based unit that gives a "voice" to the hotbox detector said a major advantage of this system is that the train crew can be alerted as soon as a train has passed the hotbox detector that an overheated journal has been found on the train. Thus, the crew can take action to stop the train and examine the problem. The detector counts axles from the rear of the train and the voice message broadcasts over the radio giving this information to the train crew. Also, they are told the side of the train on which the overheated journal is located.

While an earlier version of this talked user a voice recorder, the microprocessor provides a greater amount of information for transmission as well as greater flexibility to meet the various detector requirements.

Several railroads are now operating freight trains without cabooses— all crew members ride in the locomotives. Thus there is no one back at the rear of the train to observe any visual signal displayed at the detector location. So the "talking hotbox detector" is now a very useful tool for today's railroading.

Receiving certificates of appreciation for their fine work in making the 1985 Vehicular Technology Conference such a success are Bill Whiskey (left), Chairman of the Arrangements Committee, and John Shaffer, a Conference advisor. Presenting the awards is Sam McNamnagh, Immediate Past President (at the podium).
Automatic Vehicle Identification has many uses

A vehicle identification system which uses RF techniques in the near-microwave region has application to a variety of transportation modes, including bus, truck, and rail. The system, described by Daniel J. Reitz, Marketing Specialist, General Railway Signal Co., includes an active reader or reader device, a transmit/receive antenna and a series of uniquely encoded tags. An attractive feature of the tag is that it requires no direct power supply, as power is derived from the radiated RF energy of the reader. The system is being used in rail car, truck and automobile identification and bus vehicle location applications.

In one application, tractor-trailer trucks are being identified as they pass over weigh-in-motion scales and tickets produced with the vehicles’ identity and weight. This system is being used to identify overweight trucks.

Melding the New with the Old in Transit

Bay Area Rapid Transit District in the San Francisco Bay area has now implemented a new radio system for fire protection and works it in with existing radio systems. This blending the new with the old is a constant situation on many rapid transit and railroad systems. They cannot economically remove a system completely and replace it.

"Improving Underground Radio Communications and Use of RF Simulcast Networks in Rapid Transit Operations," was the topic presented by Gregory E. Austin, Senior Communications Engineer for BART.

One of the new systems installed on BART provides simultaneous broadcast of emergency messages to all personnel regardless of whether they are on trains, in stations or along the right of way.

Basic signal controls upgraded with hi-tech

The basic control for railway signaling is the track circuit. Originally powered by a battery feeding current into track rails and then through a relay, the application of microprocessors has brought this basic control unit into the 21st century.

"Evolution of Electronics in Railway Signaling from the Track Circuit Standpoint," was the subject of a paper presented by Robert F. Sewell, Director of Marketing, SAB Harmon Industries.

The evolutionary nature of the track circuit has been an advantage for the railroads in that the changes have enabled them to make progress without changing out enormous sections of controls at one time.

The microprocessor based track circuit controls used today eliminate the use of relays and the very vulnerable trackside pole line, susceptible to storm damage. The microprocessor based systems use the rails for transmission of the controls.

Track circuits, the basic railway signal control function, are now making use of microprocessors, says Robert T. Sewell of SAB Harmon Industries, Inc.

Trains without cabooses; a hi-tech reality

Railroads are now able to operate freight trains without cabooses, yet provide the engineer in the locomotive cab information about the air pressure at the rear of the train.

"End-of-train Monitor System for Caboose Elimination" was the title of the paper presented by Robert C. Kull, Manager Systems & Product Planning, Union Switch & Signal Division, American Standard, Inc.

Again, using a microprocessor coupled to an air brake gauge and a radio transmitter, the brake pipe pressure is mounted on the rear coupler of the last car of a freight train. Changes in brake pipe pressure are transmitted via UHF radio to the cab of the locomotive where the pressure in pounds per square inch is displayed for the engineer to see.

Now the crew rides in the locomotive and there is no need for the caboose at the rear of the train.

Freight trains can now operate without cabooses by using an end-to-train monitor system, reports Robert C. Kull of Union Switch & Signal.

Phil Porter (left) a member of the New Jersey Coast Chapter, accepts the Chapter of the Year award from Fred Link.

VTS President Robert Fenton discusses the new VTS chapter in Sweden with Sven-olaf Ohn liked.
News From Washington

The Vehicular Traffic Systems of the Future

Erich Schimmel
Washington News Editor

IEEE Vehicular Technology Newsletter
August 1985

September 2015 - The Future of Transportation: A Look Back

In the year 2035, the transportation landscape has dramatically evolved. Autonomous vehicles have become a common sight on the roads, offering increased safety and efficiency. The integration of advanced technologies has revolutionized the transportation sector, leading to a future where personal mobility is not only more accessible but also environmentally sustainable.

1. **Current Challenges and Opportunities**
   - The increasing demand for personalized mobility and the need for sustainable transportation solutions.
   - The role of technology in addressing traffic congestion, environmental impacts, and public health concerns.

2. **Technological Advancements**
   - **Autonomous Vehicles**
     - Self-driving cars and trucks that can navigate safely without human intervention.
   - **Urban Transportation Systems**
     - Smart cities with integrated transportation networks, including seamless public transit, bicycle-sharing systems, and pedestrian-friendly urban design.
   - **Energy-Efficient Technologies**
     - Electric and hybrid vehicles that significantly reduce carbon emissions.

3. **Policy and Regulatory Changes**
   - The need for policy frameworks that support the deployment of advanced technologies while ensuring public safety and accessibility.
   - The importance of international cooperation in setting standards and guidelines for vehicle integration.

4. **Economic Implications**
   - The potential economic benefits of reduced traffic congestion and increased productivity resulting from autonomous vehicles.
   - The job market disruptions and the need for retraining programs to support transitioning workers.

5. **Ethical and Social Considerations**
   - The ethical implications of autonomous vehicles, particularly in scenarios involving potential harm to pedestrians and other road users.
   - The impact of autonomous vehicles on social cohesion and community dynamics.

6. **Conclusion**
   - The future of transportation is shaped by a complex interplay of technological advancements, policy decisions, and societal values. As we continue to navigate this transformative period, it is crucial to balance innovation with safety, accessibility, and environmental sustainability to ensure a prosperous and equitable future for all.

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**August 1985 - The Vehicular Traffic Systems of the Future**

The Vehicular Traffic Systems of the Future: A Look Back

IEEE Vehicular Technology Newsletter
August 1985

September 2015 - The Future of Transportation: A Look Back

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Figure A. Test Setup

2.1101 Figure A. Test Setup

- Test Transmitter T1
- Test Transmitter T2
- Test Transmitter T3
- Varyable Attenuator
- Desired Path Transmitter
- SLBASMeter
- Desired Path Receiver

---

Section 2.1101 is added to read as follows:

(a) For an SST which is proposed to cover more than oneeronal service, the test results may be modified to show that the SST is acceptable to the conditions described in the current regulations. The test results are expressed in terms of the maximum deviation in the channel under test and the corresponding acceptable deviation for the SST.

(b) For the above the test the following procedure shall be used:

1. The desired transmitter shall be on the channel where deviation in the channel is to be measured. The relay mark shall be turned on and off and the deviation in the channel shall be measured.

2. The desired transmitter shall be off the channel where deviation in the channel is to be measured. The relay mark shall be turned on and off and the deviation in the channel shall be measured.

(c) The deviation of interference or the deviation in the channel for the purposes of this test shall be a linear function. The linear function shall be defined in terms of the deviation in the channel as a function of the deviation in the channel.

(d) The deviation of interference or the deviation in the channel for the purposes of this test shall be a linear function. The linear function shall be defined in terms of the deviation in the channel as a function of the deviation in the channel.

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David Talley (left) receives recognition and appreciation certificate from Fred Link as an expression of appreciation for an excellent job of advertising VTS on financial matters.

The 1983 Toronto VTS Conference Chairman C. Vinodrai (left) gets recognition and appreciation certificate from Fred Link.
Communications

J. R. Cruz
Communications Editor

In this issue we are publishing another tutorial, the first of a continuing series. This time the topic is mobile cellular systems. Its author, Dr. William T. Lee, reflects Defense Department research and provides us with a birdseye view of the critical issues in cellular systems. We thank him for his contribution.

We continue soliciting articles on different topics from time to time to our readership. In addition we will publish preprints of recent product releases, book reviews and thesis abstracts.

Your correspondence with suggestions and comments about the format or content of our contribution is always welcome. Please address all correspondence to:
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Communications Editor
IEEE Satell. Tech. Newsletter
School of Electrical Engineering
The University of Oklahoma
Norman, OK 73019

ABSTRACTS


In this paper we describe a new approach to dual-channel space diversity combining in microwave digital radio systems. The approach features (1) an adaptive control of the relative power in the two channels; and (2) a search strategy, based on noncoherent orthogonal spread codes, at the combiner output, that simultaneously searches for both states of the carrier phase. Computer programs have been developed to simulate the search process and to analyze the resulting performance. In this approach, the adaptive channel response and the phase at the combiner output are postulated and performance formulas are presented for each. They show that the channel provides a high degree of improvement over existing systems and improvements in detection performance may be obtained by using it in low signal-to-noise environments.


In this paper we analyze the performance of the K-level quaternary amplitude modulation digital radio systems subjected to microwave channel noise and thermal noise. The performance of adaptive receive techniques, either single or in combination, is compared to that of the conventional diversity receive system and adaptive equalization. The space diversity is assumed to be of the continuous-combining type, and the equalization is assumed to be of the equal error protection type. We describe a specific form of combining which is optimum when no post-combiner equalization is used. A primary aim of the study is to quantify the performance of this combining approach as compared to that of the equalizer.


The limited-path-noise effect is a phenomenon observed in the reception of frequency modulated (FM) signals. It is found to be of particular importance in the quasi-quasiorandom (QQ) mobile radio channels, where significantamplitude fades are possible. The phenomenon is essentially characterized by carrier phasor interaction. It results in sharp noise diodes which are characterized by a consequent degradation in the speech quality. This degradation is caused by high in-phase carrier and quadrature components interaction. We demonstrate that the phenomenon can be described as the result of an optimizing receiver implementation, which is implemented as a receiver modification incorporating this effect. The modification revealed that an improvement of 12 dB in the output signal-to-noise ratio was achieved.


A large number of small-area statistical data sets obtained from experiments in the form of average-power-time-delay spread are meaningful parameters which adequately describe the data, and the large and small-scale variations of these parameters over a large area. In the course of the construction of a large-scale model for characterization of urban mobile radio channels it was found that urban areas exhibit quite different characteristics, which are a function of the particular nature of the environment. The variability of the statistical parameters obtained is also a useful estimator of the performance bound of the mobile radio systems. Using the measured data, together with relationships available in the literature for the performance of a given system in the presence of fading, a model is given to several systems, such as 8PSK data, DSB wideband telephony, and wideband automatic vehicle location system. It is concluded that in urban areas, spatial and temporal diversity reception can often lead to useful improvements in performance.


In this paper we show that many spectrally efficient modulation techniques based on quadrature phase shift keying (QPSK) and generalized MSK, although not representable as OSK, may nevertheless be (suboptimally) demodulated using an I-Q receiver with a phase offset. The resulting demodulator is termed a correlation receiver, and the new representation is called correlatively coded MSK scheme. We consider several IQ channel codes generated from the product of two binary phase shift keying (BPSK) codes, the so-called phase shift keying (PSK) codes. We consider two specific codes, one being the 4-state code and the other the 5-state code. We show that the 4-state code is a modulator of two independent BPSK modulators, and the 5-state code is a modulator of two independent 90°-shifted BPSK modulators.


In the May 1979, Issue of Communications, under the title "Spread Spectrum - Myths and Realities," we pointed out some basic facts about spread spectrum techniques for a variety of communication system application systems and their applications. To date, there have been no rebuttals; so, it would appear that the "myths" are well founded and the "myths" of both were related to military communication.

Independently, however, there appears to have arisen a new and independent spread spectrum myth concerning small earth terminals for commercial satellite communication. Lately stated, the claim is that spread spectrum techniques make small user terminals more efficient in the way that spread frequency, channel regulation is unnecessary, and that spectrum reuse is possible, and that from nearby satellites is mitigated.

1) By demonstrating that the space segment is so inefficiently used as to render "inconsequential" compared to the network cost of a small user terminal, a frequency channel regulation is unnecessary, and that the space segment is so inefficiently used as to create artificially low space segment costs.

2) By analyzing the effect of intermodulation and distortion on the satellite communication system, and even this when the spectra is not spread when it is not.


This paper evaluates the double symbol error rates for differentially detected and non-differentially detected narrow-band FM (NB-FM). Numerical results are presented for two types of NB-FM systems: one a Gaussian IF receiver filter. It is shown that this latter can be obtained for the single symbol error probability of such systems. The paper is concerned with the performance of performance can occur when intersymbol interference is ignored.


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The performance of a first-order digital phase-locked loop (SPLL) using nonuniform sampling is studied in the mobile radio channel environment. The mobile radio channel is characterized by introducing fast Rayleigh fading and random phase variation to the signal envelope and phase, respectively.

The nonlinear stochastic difference equation describing the loop operation in fading environments is introduced. The joint probability density function (pdf) of the random variables of this equation is derived by transformation of random variables for fast Rayleigh fading channels. A closed-form expression for the transition probability of the Chapman-Kolmogorov (C-K) equation is obtained for phase step plus noise input and for frequency step plus noise input. The probability of the loop function of the steady-state phase error is obtained by solving the C-K equation numerically.


The autocorrelation function of a binary multi-h coded signal is determined analytically. This is done by considering the probability density of the "phase change variable" and then deriving the characteristic function. From the autocorrelation, the power spectrum can be found by an analytical or numerical Fourier transformation. Two examples are given.

I. INTRODUCTION

In our radio communication community, the major problem in the lack of available frequency resources. A conventional mobile system is usually designed by using a large set of allocated frequency channels into associated networks and serving them in several geographical zones.

The communication coverage of each zone is normally planned as large as possible. If a call which initiates in a zone happens to be lost at its zone boundary, the user has to reinitiate the call in another new zone. In this kind of system, the number of users is limited to the number of channels assigned to that zone. Also this system is not a desirable radio telephone system since there is no guarantee that every call can be a complete call.

It is always a great help to the FCC in allocating the frequency spectrum if a system needs less bandwidth and provides most usage of that band in service with consumer's satisfaction. One system which fits this requirement is the recently developed mobile cellular system. The cellular system embodies many different concepts which are described below.

II. USE OF FREQUENCY CHANNELS AND COCHANNEL INTERFERENCE CONSIDERATION

A particular frequency channel, say F1, used by one user in a geographical zone called a cell, may F2, with a coverage radius R, will be used by another user in another cell with the same coverage radius at a distance D away.

This frequency reuse concept is the core of the cellular mobile radio system. In this frequency reuse system, there is more than one user using the same frequency channel. With increased B, this would cause interference to occur. The interference due to the common use of the same channel is called cochannel interference.

Actually, cochannel interference is not a function of the transmitted power but a function of both the number of cochannel cells, N and a ratio of the radius R and the distance D, a = D/R. We may call the parameter as the cochannel interference reduction factor. For a T-cell system, there are seven cochannel cells as shown in Figure 1. Among the seven cochannel cells, any one cell is interfered with by the other six cells. The signal-to-interference can be expressed as

\[ I = \frac{6}{D} \]

where (2 ≤ D ≤ 5) is a propagation factor dependent on the actual terrain environment. Assume that all D1 are the same for simplicity, then

\[ I = \frac{6}{D} \]

Thus,

\[ I = \frac{6}{D} \]

\[ D = \frac{6}{I} \]

In Eq. (3) the value of S/I is based on the required system performance, and the specified value of Y based on the terrain environment. With given values of S/I and Y, the cochannel interference reduction factor a can be determined. In most cases we are setting (S/I) to be 10 dB, and Y to be four, then

\[ a = \frac{4.6}{(4)} \]

Based on a = D/R the determination of D by choosing a radius R in Eq. (4) can be reached. Usually, we always like to achieve a larger value of a than that shown in Eq. (4). The larger the value of a, the less the cochannel interference. In a real environment, Eq. (1) is always true, but Eq. (2) is not. Dispersion (4) is derived from Eq. (2), its value may not be large enough to maintain a signal-to-interference ratio of 10 dB.
III. SEPARATION BETWEEN CELLS

Once the value of $a$ is determined, the mobile cellular system must be implemented in its service area. For a given value of radius $R$, a specified value of $D$ is associated with the value of $a$.

$$D = a R$$

For a startup system, the radius $R$ of a cell can be very large, that means a large coverage for a light traffic density. The size of the cell is determined by the required signal-to-noise ratio received at the cell boundary rather than the signal-to-interference ratio. Therefore, the size of the cell can be increased if the antenna height is increased, antenna gain is increased, and/or transmitted power is increased.

IV. HANDOFF MECHANISM

The handoff occurs each time the mobile unit enters a different cell which associates with a different frequency. The handoff processing scheme is an important task for any successful system. How does one make any of the necessary handoffs successful? How does one reduce all unnecessary handoffs in the system? Also, there are circumstances when handoffs are necessary, but cannot be made. The first such circumstance is when the mobile unit is located at a signal strength hole within a cell but not at the boundary. Sometimes the mobile unit is at the cell boundary but the new cell which the mobile unit moves into may not have available frequency channels to be assigned. Under the first circumstance, the cell has to be kept in the old frequency channel until the cell drops due to the unacceptable signal level. Under the second circumstance, the cell has to be dropped, or the new cell has to rearrange its frequency assignment based on the priority.

The system switching office usually controls the frequency assignment in each cell and can be smart enough to rearrange the channel assignment or split the cells when the second circumstance occurs. The cell splitting is described in the following section.

V. CELL SPLITTING

If the traffic density starts to build up, each set of frequency channels in each cell cannot provide enough mobile phones, then the original startup cell can be split into smaller cells. Usually after a first split, the new radius is one-half of the original radius.

A new cell radius = 1/2 of the old cell radius

Then based on Eq. (5), the following equation is true

$$S = \frac{(s - d_0)^2}{d_2}$$

VI. NEAR-END AND FAR-END RATIO INTERFERENCE

In the mobile radio system, all the mobile units are in motion. Their relative positions change from time to time. There is a fixed frequency plan that can possibly be carried out to avoid mutual interference among them.

The situation, when a distance $d_0$ between a calling mobile transceiver and a base-station receiver is much larger than the distance $d_1$ between the mobile transceiver and the same base-station receiver, is shown in Figure 7. This interference based on the distance ratio can be expressed as

$$S = \frac{(s - d_0)^2}{d_2}$$

The ratio $d_0/d_1$ is the near-end to far-end ratio. From Eq (10) the near-end to far-end ratio affects the signal-to-interference ratio according to the relative positions due to the motion of the mobile units.

If the calling mobile unit is 10 miles away from the base station receiver and the interfering mobile unit is 0.5 miles away from the base station receiver, then the signal-to-interference ratio is received at the base station receiver with $S = 52$ dB.

VII. FREQUENCY MANAGEMENT

A frequency management plan is very crucial in a cellular system. As we have mentioned previously, the problem indicated in the frequency reuse, the handoff, the cell splitting, and the near-end to far-end ratio interference, depend upon a good frequency management plan. Here, we use an existing commercial frequency management chart to illustrate its advantages. The chart is shown in Figure 3. There are 7 cells, and 21 frequency channel sets which are provided for those seven. In each set, say 1, the adjacent channel separation is 21B which is used to reduce the near-end to far-end ratio interference. The distance $D_2$ for this system is 9.6B. For the sake of further reducing the cochannel interference, the insert in the middle of the chart discloses a system using three 120° - directional antennas at each cell site in the system. The directorly is a mean to help reduce the cochannel interference.

VIII. SUMMARY AND CONCLUSION

The mobile cellular system is a high capability system. The idea of using the smallest frequency resource and providing the most telephone services has been described in this paper. The techniques include frequency reuse, handoff, and cell splitting. The major problems which this system faces are cochannel interference and near-end to far-end interference. The reduction of transmitted power for small cells, the requirement of cochannel interference reduction, and frequency channel separation for adjacent channel isolation are introduced. Finally, a typical frequency management chart is used to illustrate the implementation of a mobile cellular system.

BIBLIOGRAPHY

FIGURE 2  NEAR-END TO FAR-END RATIO INTERFERENCE

A distinctive feature of the experimental vehicle is an all-glass upper section, with the rear window and trunk lid being one unit. The removeable glass roof over the front seats incorporates 66 solar cells that power a fan in the ventilation air exhaust. Even with the car turned off, the fan runs if the solar cells "see" sunlight. Maximum fan capacity is 106 cfm -- union allows one interior air change per minute (1:2).

FIGURE 3  FREQUENCY MANAGEMENT CHART
Electronically Controlled Truck Header

Truck makers are turning to electronic sensors, microprocessors and satellite communications to make the big rigs safer, more efficient, and easier to operate. Indeed, 21st-century truck drivers will function as supervisors who oversee a variety of computer based systems. The first step toward computerization of diesel engines has already been taken with the electronic truck engine control (ETEC) from FMK's Transportation Electronics Division in Farmington Hills, Michigan. ETEC was introduced in 1982 and is now used on about 9,000 trucks. One trucking company reports that ETEC improved fleet economy from 5.9 mpg to 7.1 mpg, saving over $1 million a year in fuel costs.

Following the introduction of electronic engine control, electronic control of transmission shifting should come next. These devices could radically simplify the drivers job. "We should not have people doing control systems work that a small, inexpensive computer can do more effectively," states Trevor O. Jones, Vice President and General Manager of FMK's Transportation Electronics Division. "I would like to see the driver not be an integral part of any control system other than the steering and to a limited extent, braking.

A planned satellite communication service should begin in 1986, according to its developer, Mobile Satellite (King of Prussia, Pa.). Sensors on the truck (such as an electronic speedometer) will send the readings to an on-board microwave transmitter which can then relay the signals to a Fleet terminal via satellite.

Such a system could also provide a continuous log of the trucks location to within 1/4 of a mile. What's more, a fleet manager could remotely control certain truck functions, such as the operation of the refrigeration unit when perishables are being shipped. The system could handle voice transmission as well, permitting truckers to talk to each other and to other companies anywhere in the country. The celebrated CB radio, which can not reach past the horizon, may then become obsolete.

Human-factors problems would also be addressed such as driver fatigue. One example is the automatic adjustment of the springiness of the drivers seat which would be adjusted according to electronically sensed road conditions. On smooth highways the seat would be firm to minimize fatigue; on bumpy roads suspension would soften to assure comfort. Another example is variable assist power steering. Drivers would get extra assistance at low speeds, when greater force is required to turn the wheels. Fuel would be conserved too, by shutting off the assist mechanism (servo motors, pneumatic or hydraulic pumps) at highway speeds.

Electronic Innovations for Improving Safety, Comfort, and Efficiency of Heavy-duty Trucks.

References:
Society members will be interested in COMPINT '85, the first international conference and exhibition on computer-aided technologies (taking place in Montréal September 8-12). One of the themes of the Technical Program of particular interest is Computer-Aided Transportation, organized by George Kocur of M.I.T., during which a number of invited papers will be presented. For more information, write to:

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Authors will be notified of acceptance by January 1, 1986. The complete text must be submitted by March 1, 1986 and will be published in the 36th Vehicular Technology Conference Record, which will be available at the conference.