Holiday Inn
Tampa International Airport

June 1–3, 1987
37th Annual Conference
By now, I hope you have completed your plans to attend our 37th Annual Conference, VTC '87 in Tampa. If you have not, you should especially note that VTC '87 is highlighted in this Newsletter with a copy of the technical program included. Please examine the latter and note that our Tampa Conference Committee has compiled an excellent technical program with sessions in areas of high current interest and some outstanding panel discussions. Hopefully, this will convince you to join us for an outstanding technical event and an opportunity to enjoy Tampa.

Your Board of Governors will meet immediately after the Conference. Since the entire Board will be present both then and during the Conference, this will be a good opportunity for you to discuss matters of concern with Board Members and suggest issues that should be considered.

One Board action will be the election of a new slate of officers to serve for the upcoming year. Since I will have served my limit of two years as President of your Society, another Board Member will succeed me.

These two years, which have gone very fast, have been filled with IEEE and VTS activities. The experiences I've had were memorable and my participation has been a rewarding personal experience. I look forward to assisting the new officers and trying to keep Vehicular Technology on the move!

Hope to see you in Tampa!

Best regards,

Robert E. Fenton

A. Kent Johnson

Newsletter Editor

This edition of the newsletter features the upcoming Annual VTS Conference to be held June 1-3 in Tampa, Florida. Elsewhere in the newsletter you will find a complete listing of the papers to be presented at the conference and as you will see, the committee has arranged for an outstanding technical program. We hope you will be able to make it to Tampa and we look forward to seeing you there.

We would also like to extend sincere congratulations to two members of IEEE/VTS who were recently elected to Fellow Grade in the IEEE. They are:

Stephen S. Rappaport
For developing techniques for multiple-access communications and the acquisition of spread-spectrum signals.

Jerome G. Rivard
For leadership in the production and implementation of electronic control systems for vehicles.

We are proud to have these individuals as members of VTS and congratulate them on their accomplishment.
Society Officers and Board of Directors

ROBERT E. FENTON
Ohio State University
1919 M S. L., N.W.
Room 8202
Washington, D. C. 20554
(202) 632-7197

SAMUEL A. LESLIE
The Antennas Specialists Co.
99 Woodberry Lane
Annandale, VA 22003
(703) 941-1323

SAMUEL A. LESLIE
VTS Secretary

NOMINEE (Term thru)

Robert E. Fenton(88) Administrator
Arthur Goldsmith(87)
Leo M. Himmel(89)
A. Kent Johnson(89)
Samuel A. Leslie(88)
Fred L. Link(88)
Charles Lynn(88)
Roger Madden(87)
Robert A. Mazullo(87)
George F. McClure(88)
Samuel R. McCunoughy(89)
Stuart Meyer(88)
William Moskay(87)
Evan R. Richard(87)
Eric Schimmel(88)

Board of Directors Report

Minutes of the 1987 IEEs VTS Board of Governors Meeting

The IEEE VTS Board of Governors met on February 5, 1987 at the IEEE Washington Office at 1111 19th Street, N.W. The meeting was called to order at 9:05AM.

Roll Call

The following were in attendance:

# Robert E. Fenton
# Roger Madden
# Arthur Goldsmith
# Samuel Leslie
# Evan Richards
# Samuel McCunoughy
# Stuart Meyer
# Fred Link
# Allan Johnson
# Eric Schmimmel
# Bill Moskay
# Bob McNutt
# Dick Ubel

The following were elected:

President:
M. D. Link

Vice President:
A. Kent Johnson

Treasurer:
Samuel Leslie

Secretary:
Evan Richards

Chairman, National Conference Coordinator:
Stuart Meyer

Chairman, Membership Comm:
Samuel McCunoughy

Chairman, Publications Comm:
Bob McNutt

Chairman, Technical Activities:
Eric Schmimmel

Chairman, Public Relations:
Bill Moskay

Being elected was necessary for voting on matters that come before the Board. Thus, a quorum was present.

The Society President noted that Board Member Fred Link has been the recipient of the prestious Fred M. Link Award from the Radio Club of America.

TREASURER'S REPORT

Arthur Goldsmith submitted his treasurer's report, and noted that the Society will probably finish the 1986 year with a surplus of around $35K compared to a projected deficit of $16K. Sam McCunoughy moved, Bill Moskay seconded that the treasurer's report be accepted as presented. The vote was unanimous in favor.

CONFERENCES AND MEETINGS

1986 Dallas VTC

Evan Richards presented the Treasurer with a check of $5170 for the balance of the proceeds from the 1986 Dallas Conference. He also discussed recommendations that the Dallas committees had for future conferences. In particular, the spouse's program was not well attended, and they recommended that future conferences could save money by down-scaling such programs. Also, they recommended obtaining better head counts for the luncheon and banquet meals.

Maytag & Linear Drive Conferences

A copy of a letter from Tony Eastham was presented to the Board indicating that the Society's portion of the proceeds from the 1986 Maytag & Linear Drive Conference was $815.45 (isi). Bob McNutt indicated that he would like to receive timely information for the next Maytag & Linear Drive Conference for distribution through his publicity channels.

The Society is to be the technical sponsor for the next conference, which is scheduled for May 19-21, 1987 at Bakery's Hotel in Las Vegas.

Conferences - Conferences

Evan Richards submitted a report from Bob Mazullo indicating that a record number of over 2200 attended the 86 Conference, with 900 being paid attendees.

1987 Tampa VTC Conference (June 1-3)

Evan Richards reported that the 1987 Tampa conference planning and preparation is proceeding smoothly.

1988 VTC Philadelphia Conference

The 39th Conference is scheduled for June 15-17, and will be held at the Sheraton Inn - Center City, 1800 Market Street, Philadelphia, Pennsylvania, 19103. A new chairman has been named for this conference: John Valente, Network Manager

Bell Atlantic-Mobile Systems, Inc.
180 Mcl. Airy Road
Basking Ridge, N. J. 07920

In addition, Jesse Russell is the technical papers chairman, and Bob Swint continues as the local arrangements chairman.

1989 VTC San Francisco Conference

Fred Link reported that the San Francisco area is anxious to host the 1989 Joint Railroad/VTC. Roger Madden moved, Evan Richards seconded that the Board accept the offer from San Francisco to host the 1989 Conference. The vote was unanimous in favor.

After discussion on possible dates and conflicts with other conferences, Sam McCunoughy moved, Bill Moskay seconded that the date for the 1989 Conference should fall in the window from April 10 to June 10, and be to be coordinated with the Railroad committee and the Land Transportation Committee, Tony Eastham. The vote was unanimous in favor.

A problem with the location of the 1989 conference has been reported to Tony Eastham; the Board may have to revisit the issue, pending further inputs from the Land Transportation Committee.

1990 VTC

The preferred location for the 1990 VTC is Detroit, however little response has been received from potential committee members in the Detroit area. Fred Link and Sam McCunoughy is to continue pursuing Detroit area potential.

Sam McCunoughy moved, Stu Meyer seconded that the Conference Coordinator's report as presented be accepted by the Board. The vote was unanimous in favor.

Also, Sam McCunoughy moved, Bill Moskay seconded that an award of some form not to cost more than $1500 be presented to the Dallas Conference Coordinator for putting on a successful conference. Stu Meyer is to be the appropriate step to present this award at the upcoming Tampa Conference. The vote was unanimous in favor.

PUBLICATIONS

Bob Fenton reported that half of the papers presented at the Joint VTS/IES workshop at the Conference '86 Conference will be available for review and possible publication in the Society's Transactions.

Fred Link reported that the February Issue of the Society's newsletter will be loaded shortly.

Sam McCunoughy moved, Bob McNutt seconded that the Publications report be accepted as presented. The vote was unanimous in favor.

COMMITTEE REPORTS

Transportation Systems

The secretary distributed by mail Tony Eastham's Land Transportation report. In summary, Tony reports that the financial report for the 1986 Maytag & Linear Drive Conference has been accepted by the IEEE. The 1987 Maytag & Linear Drive Conference appears headed toward success with 38 papers being accepted.

The IEEE/ASME Joint Railroad Conference scheduled for April 21-23 is progressing well. The 1988 Joint Railroad Conference is scheduled to be held at the Willard Penn Hotel in Pittsburgh, probably April 14-16.

Tony reports that ASME would rather hold the 1989 Joint Railroad Conference somewhere in the Mid-west or East Coast, as they feel that attendance may be low on the West Coast.
May 1987

IEEE Vehicular Technology Society Newsletter

Nominations
Sae McConnohy submitted his nominations report with recommendations for President, Vice President, and Treasurer for the upcoming year. After considerable discussion concerning conflicts that several of the potential candidates may have, Arthur Goldsmith moved, Sae McConnohy seconded that the nominations report be tabled until the Taupo meeting. The vote was unanimous in favor.

Kent Johnson moved, Arthur Goldsmith seconded that Sae McConnohy be rewound in his progress for getting the Board election process back on track. The vote was unanimous in favor.

Membership
A written report from Mark Shihlack indicates that the Society's membership had grown slightly (1%) for 1986, and that the total membership in the Society is now 256. Sae McConnohy moved, Kent Johnson seconded that the membership report be accepted as presented. The vote was unanimous in favor.

Publicity
Bob McNulty's written report indicated that he has press releases on upcoming VTC functions to one 58 magazines and newsletters that cover transportation, radio, communications, and automotive fields of interest. After discussion of the apparent lack of response to the Society's ads in the Publicity magazine, the vote was unanimous in favor.

Kent Johnson moved, Kent Johnson seconded that the Publicity Chairman's report be accepted as presented. The vote was unanimous in favor.

CCIP Representative
Eric Schmael submitted a written report on the activities of the IEEE Committee on Communications and Information Policy. He indicated that the committee's activities are now more harmonious with the policies of the Society, and that the next CCIP meeting is scheduled for March 15. Sae McConnohy moved, Kent Johnson seconded that the CCIP Representative's report be accepted as presented. The vote was unanimous in favor.

Transportation Electronics Fellowship
Arthur Goldsmith reported that IEEE specifies that a scholarship in the amount of $5000 or over should be called a fellowship. In addition, the Convergence Conference Committee recommends that the review committee be reduced to three members, all from VTC. Furthermore, they recommend that the title of the fellowship be changed to "Transportation Electronics Fellowship". Sae McConnohy moved, Sae McConnohy moved that the Convergence Conference Committee be given 30 days to consider the taupo board meeting. Sae McConnohy moved, Sae McConnohy seconded that the Propagation Committee Chairmen's report be accepted as presented. The vote was unanimous in favor.

In addition to the awards currently planned, Sae McConnohy moved, Kent Johnson seconded that the Society establish the "Transportation Electronics Fellowship". The vote was unanimous in favor.

Noble Fellowship
Arthur Goldsmith moved, Kent Johnson seconded that the title of the Nobles Scholarship be changed to the "Noble Fellowship" in recognition of contributions from the Noble Scholarship. The vote was unanimous in favor.

A written report from Tony van den Heuvel indicates that everything is in order for the 1986 recipient to receive the second half of his award.

Bob Fenton noted that the notice sent out for the 1987 Fellowship applicants had not been changed to reflect recent Board action to increase the amount of the Fellowship. This matter is to be taken up at the Taupo Conference to determine the amount of the award for the 1987 recipient.

Chapter Activities
Gasper Mesina reported that he has received seven LJ reports from IEEE headquarters, and based on these reports the Chapter of the Year Award goes to Cleveland, with the runner-up being the Sacramento Comsoc/VTS Chapter.

Gasper also noted that he has occasionally received requests for potential speakers for the chapter meetings. Bob Fenton assigned Stu Meyer to head up a local committee to determine how chapter activities can be better supported with guest speakers. A possibility of providing a guest speaker for the Orlando Comsoc Chapter at about the time of the annual conference in Taupo was mentioned as one possibility. Bob Fenton moved, Sae McConnohy seconded that the PACE Chairman's report be accepted as presented. The vote was unanimous in favor.

Fred Link moved, Kent Johnson seconded that the PACE Chairman's report be accepted as presented. The vote was unanimous in favor.

Standards
One response has been received in regard to the IEEE 203 standard. Jack Neuhauer is continuing to pursue this matter.

At this Propagation Committee
Meal Shepherd reported that the committee is late on getting loose ends finished for the special issue, and they have a meeting scheduled shortly to try to put the issue to bed.

Fred Link reported that the Propagation Committee's special issue has been completed, with Neal as the chairman. Bob Fenton instructed Neal Shepherd to provide a fire proposal to the Board for financial support of essential travel and expenses to support this committee work, with the proposal to be completed in time for consideration at the Taupo Board meeting.

Sae McConnohy moved, Sae McConnohy seconded that the Propagation Committee Chairmen's report be accepted as presented. The vote was unanimous in favor.

Fellow Program
A written report from Al Iseberg asks for nominations for Fellow candidates. The society had submitted three names last year, of which two had already made the list. Bob Fenton moved, Sae McConnohy seconded that the Fellow's Advocate's report be accepted as presented. The vote was unanimous in favor.

OLD BUSINESS
COMSOC Issue
Kent Johnson moved, Kent Johnson seconded that the Board reaffirm its opposition to the COMSOC proposed scope increase to include vehicular telecommunications. The vote was unanimous in favor.

NEW BUSINESS
Conference Sponsorship
Bob Fenton discussed correspondence which he had received from IEEE HQ which defines wording that can be used in co-sponsorship of conference or event with non-IEEE entities. In essence, to co-sponsor an event requires financial commitment and liability, whereas the Society can only "Participate" or "Co-Sponsor" with an event if no financial commitment is involved. Suggested wording for a participating type of sponsorship might be "In cooperation with IEEE VTC, or similar language. Also, IEEE must be able to purchase conference records at cost where the Society co-sponsors an event. The motion of the Board was that the wording of participation with the various conference be adjusted to meet the intent of the IEEE guidelines.

TEL Reimbursement for Board Members
The Board discussed at length a proposal to rebalance Board travel expenses when attending out of town Board meetings. No resolution was reached, and the Board directed Sae McConnohy to work the proposal to reflect the input from various Board members. The Society is to call the revised proposal to the Board for members review. This matter is to be addressed again during the Taupo Board meeting in June.

NEXT MEETING
Monday afternoon (June 1) was first selected as the next Board meeting date. After determining that there would be a conflict with sessions that are scheduled as a part of the Taupo VTC, Wednesday afternoon was selected as a more appropriate time. The Board meeting will be held at the Taupo hotel on June 3, and will run from 1:00 PM to 6:00 PM. A Board dinner will be held that night at 7:00 PM, with the Taupo VTC committee members and their spouses being invited.

ADJOURNMENT
The meeting was adjourned at 4:05 PM.

Respectfully submitted,
Samuel A. Leslie
Secretary

IEEE Vehicular Technology Society Newsletter

IEE Scope
The Society President is to continue monitoring the proposed change in the IEE scope for possible conflicts with our Society's scope.

IEEE Vehicular Technology Society Newsletter

IEEE Vehicular Technology Society Newsletter
**Announcing the 37th IEEE Vehicular Technology Conference**

**VTC'87**

**Holiday Inn, Tampa International Airport, Tampa, Florida**

**June 1-3, 1987**

- Mobile Radio Systems
- Network System Design
- Cellular Radio
- Land-Air & Marine Communication
- Satellite Mobile Communication
- Antennas & Propagation
- Land Transportation Systems
- Vehicle Location & Navigation
- Vehicle On-board computer systems

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**CONFERENCE REGISTRATION FORM**

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<tr>
<td>VTC'87 Registration, Department of Electrical Engineering, University of South Florida, Tampa, FL, 33620 USA</td>
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**HOTEL REGISTRATION FORM**

**HOLIDAY INN**

**TAMPA INTERNATIONAL AIRPORT**

**4500 W Cypress Street**

**P.O. Box 25157**

**Tampa, Florida 33622**

**P.O. Box 879-4000**

**IF RESERVING MORE THAN ONE ROOM, PLEASE LIST ONE NAME FOR EACH ROOM RESERVED**

**PLEASE PRINT OR TYPE**

**RESERVATIONS**

- This reservation card must be used to insure accommodations and must be received by hotel no later than two weeks prior to intended arrival date.
- Cut-off date for reservations is May 10, 1987 after which rooms will be sold on a space available basis at our published rate.

**GUESSTIMATE POLICY**

- You must guarantee your reservation with a first nights deposit or major credit card number.

**METHOD OF GUARANTEE**

- AX: American Express
- VISA
- DISCO
- PERSONAL CHECK
- MC: MasterCard
- DC: Discover Card
- TRAVELER'S CHECK

**NAME**

**ADDRESS**

**CITY**

**STATE**

**ZIP**

**CHECK IN TIME: 2:00 p.m.**

**CHECK OUT TIME: 12 Noon**

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**IEEE VTS Vehicular Technology Conference VTC-87**

**June 1-3, 1987**

**Holiday Inn Convention Center**

**4500 West Cypress Street**

**Tampa, Florida 33622-2515**

**(813) 879-4800**

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**Executive Committee:**

<table>
<thead>
<tr>
<th>General Chairman</th>
<th>Allan Gondek</th>
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<tr>
<td>Dept. Electrical Engineering</td>
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<tr>
<td>University of South Florida</td>
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<td>Tampa, Florida 33620-5350</td>
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<td>(813) 974-2581</td>
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<tr>
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<th>Gerard Lachm</th>
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<tr>
<td>Farzam Davarian</td>
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<tr>
<td>Jet Propulsion Laboratory</td>
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<tr>
<td>Tony Eastman</td>
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<tr>
<td>Queen's University</td>
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<tr>
<td>William Fleming</td>
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<tr>
<td>TRW - Auto. Product Tech.</td>
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<td>Sang Rhee</td>
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<td>Bell Laboratories</td>
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**Publicity and Publications Chairman**

Kenneth Buckle

Dept. Electrical Engineering

University of South Florida

Tampa, Florida 33620-5350

(813) 974-2581

---

**Finance Chairman**

Joseph King

Paradise Corporation

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Largo, Florida 34294-2826

(813) 580-8443

**Industrial Liaison**

Dave Kewl

Nielson Media Research

375 Patricia Ave.

Dunedin, Florida 33528

(813) 734-5473

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The 1987 Vehicular Technology Conference is being hosted in sunny Tampa, Florida on June 1-3, 1987. The IEEE Vehicular Technology Society Board of Directors joins me in extending to you a cordial invitation to attend VTC '87. Make your plans to attend now and encourage your colleagues to join you. The program offers concerned professionals the opportunity to stay abreast in a field undergoing such dramatic change.

This year's conference provides one of the largest technical programs ever scheduled with 106 technical papers, and two special evening programs. The technical authors from the US, Europe, Japan, Canada, and elsewhere represent some of the leaders in international research and development in vehicular technology. These authors will present to you those topics which are experiencing the greatest amount of growth and development. Here is your opportunity to meet and discuss with these international leaders of research and development.

With this intense technical program, relaxation periods will be important; and the Tampa Bay area offers a variety of fun activities. Both the beach and Busch Gardens are within a one-half-hour drive from the hotel. Or you may wish to stroll through the shops of the Boat Yard Village; or to relax at some of the interesting restaurants.

What over do, do come to the VTC'87 on June 1-3 in Tampa, Florida. We are certain that this conference will be beneficial to you, and you are anxious to meet you.

Allan R. Gondek

General Chairman
Travel
The Tampa International Airport is easily accessed from most major domestic airports and several international airports. Free shuttle service is available from the airport to the Conference site at the Holiday Inn. Car rentals are available for attendees who wish to tour the area, however, a car is not necessary for attendees who have rooms in the Holiday Inn.

Hotel
The Conference technical program is at the Holiday Inn, Tampa International Airport. The VTC-87 Executive Committee has booked a block of rooms at this hotel with the special rate of $86 per night for single room occupancy, and $74 for double occupancy. A hotel registration form is attached to this program. This form should be sent directly to the hotel. If you register at the hotel and do not use this form, be certain to identify yourself as a VTC87 attendee so as to receive these special rates.

Registration
Although attendees may register upon arrival at the Conference, advance registration by mail is strongly encouraged, as the advance registration fees are lower than those at the conference. Marks on Radio Network Planning, W. Sabin, AT&T Bell Laboratories, Whippany, N.J.


Characteristics and Applications of Antenna Cable for Microwave Radio Relay System, H. Kawai, National Institute of Technology, Sendai, Japan.

Television Antenna Rejection of Land Mobile Signals, A. Davidson, Motorola, Inc., Schaumburg, IL.

Speech Communications, Audio and Data Processing, Signaling and Traffic Control for Mobile Radio, W. H. Hafiz, J. H. Koo, H. K. Kim, Korea University, Korea.


An Integrated Solution for Audio Processing and Signaling in Mobile Radio System, G. Chiappano, A. Colomacino, M. Donati, Italtel, Italy.

LOADING CONSIDERATION FOR PUBLIC-SAFETY DISPATCH ON TRUNKED RADIO SYSTEMS, W. J. Hassett, J. J. Hanson, Metropolitan Toronto Police Force, Toronto, Canada.


Key States Approach in the Analysis of Traffic Control Strategies in a Trunked Mobile System, Y. M. Gogoskia, California Institute of Technology, Pasadena, Calif.

MOBILE SATELLITE COMMUNICATION - I

Propagation - Wide-Band Propagation Measurements at 800 MHz, E. Demaret, R. Limypsy, N. Nishim, CHeka, Italy.

A New Method of Data Transmission Using Natural Propagation of Electromagnetic Waves in Tunnels, M. Heddebaut, D. Degagne, University of Sherbrooke, Quebec, Canada.


Mobile Radio Signal Statistic in Non-Urban Environment, J. Lahou, Communications Research Centre, Ottawa, Canada.


MOBILE COMMUNICATIONS - NEXT GENERATION SYSTEMS

Introduction of Digital Narrow-Band Channel Technology to the Existing Cellular Spectrum and its Impact on the Usability, S. Halpern, AT&T Bell Laboratories, Holmdel, NJ.


United Kingdom.

Considerations in the Use of the Allocation of Additional Cellular Spectrum, R. Sheringham, AT&T Bell Laboratories, Whippany, NJ.


TRANSPORTATION SYSTEMS

Microwave Vehicle Sensor, R. Garceau, Centre De Recherche Industrielle Du Quebec (CRIQ), Montréal, Canada.

Synchronizing Error Control Coding for Railway Track Circuit Data Transmission, G. A. Nield, National Research Council, Ottawa, Canada.

ATSAT - Advanced Train Control System Communication Architecture and Data Transmission Consideration, A. Shesh, Lemp-Hancock Assoc., Ltd., Ottawa, Canada.


The Preliminary Design of High Speed Ground Levitation System - Single Side Slot Secondary - Computer Aided Calculations for the Optimal Experience and Active Force, Yung Long, National Taiwan University, Taiwan.

The Status of Development of Maglev System, A. R. Kamath, W. R. Hayes; Queen's University, Kingston, Ontario, CA; National Research Council, Ottawa, CA; Canada.

Mobile Satellite Communication - II


An Aeronautical Mobile Satellite System Study, W. K. Sue, Jet Propulsion Laboratory, Pasadena, California.

Recommended Procedures for the Federal Aviation Administration Air Traffic Control System, W. W. Chan, T. T. Yen, O. C. Kelly, FAA.

The Effect of Diffraction Multihop on the Reception of Mobile Satellite Signals, P. R. B. Carry, Simon Fraser University, Burnaby, BC, Canada.


In the United States, with the exception of some rural areas, the average cost of home phone service is relatively low compared to many other countries. For example, the cost of a basic home phone service in the United States is typically lower than in Europe.
MOBILIZATION AND CODING TECHNIQUES - III

**Performance of CM IX and Comparison with the Modulation Methods of the PHS Class**, C. Dariel, P. Huret, T. Valendic, CNET, Toulouse, France.


**Identification of Standards for Code Division Multiple Access**, J. K. Carver, Simon Fraser University, Burnaby, Canada.

**Adaptive Locally Optimal Detectors for CPFSK in Non-Gaussian Noise**, B. Zoghbi, Rice, Southern Methodist University, Dallas, Texas 75275.

HANDBOOK MOBILE COMMUNICATIONS


**A Frequency Offset Detector with an Oscillation Prevention Function for Land Mobile Communications**, Y. Ohno, NMTC, Ministry of Posts and Telecommunications, Tokyo, Japan.


MOBILIZATION SYSTEMS DESIGN - I

**Cellular Networking Functionality for Personal Communications**, AT&T Bell Laboratories, Lisse, NL.

**Performance Considerations of Cellular Systems**, R. M. Mangini, SMIT Cellular, New Haven, CONN.

**Integrating Voice Communications into 800 MHZ Trunked Systems**, L. M. Mohi, M. Kozan, Motorola, Dallas, TX.

**A Nationwide Paging Network**, S. P. Lapin, Contemporary Communications Research Corporation, Gurnee, IL.

**Further Sharing of USSR Television by Private Limited Mobile Radio Services**, G. Hers, Motorola, Inc., Schaumburg, IL.

AUTOMOTIVE ELECTRONICS - I


**Concepts in Data Communications for Vehicle Systems**, G. Schulmeister, Motorola, Inc., Schaumburg, IL.

**Development of QPSK Class 5V Antenna System**, H. Kondo, M. Yotsumoto, J. Oh, Toyota Motor Corporation, Nagoya City, Japan.

**Diagnostic Units for Electronic Automotive Equipments**, A. Brandt, K. Schuer, Bayerische Motoren Werke AG, Munich, W.Germany.

**Polarization of Vehicles Via Electromotive**, W. Wehrfath, H. D. Fournier, Bayerische Motoren Werke AG, Munich, W.Germany.

**Vehicular Terminal and Base Station Equipment Design**

**A Linear Amplifier Amplifier**, A. M. Johnson, R. A. Sway, AT&T Bell Laboratories, Whippany, NJ 07981.


**A Frequency Offset Detector with an Oscillation Prevention Function for Land Mobile Communications**, Y. Ohno, NMTC, Ministry of Posts and Telecommunications, Tokyo, Japan.


DIGITAL MOBILE COMMUNICATIONS


**A Search Algorithm for Syncochronezation Over Fading Dispersive Channels**, S. S. Soliman, Southern Methodist University, Dallas, Texas.

COMMUNICATIONS SYSTEMS DESIGN - II


**Comparison of TDMA and FH Diversity Radio Systems for Error-Rate Reduction at Base Station Sites in Digital Mobile Radio Systems**, J. D. Parsons, M. T. Feeney, University of Liverpool, Liverpool, United Kingdom.

**A Simulation of Wideband Mobile Radio Channels and Its Correlation with the Environmental Parameters**, G. Wallcric, F. Frulon, G. Mure, Universite de Nantes, France.


**Interference Protection Ratios Between SSN, ACSS, and BM Channels in the HM Land Mobile Radio Band**, L. M. Rohier, Communications Research Centre, Ottawa, Ont., Canada.

AUTOMOTIVE ELECTRONICS - II


**Modulation and Coding Techniques - III**


**Contribution to the Standardization of DVB Pitchband Mobile Radio**, A. Bateman, J. F. McGowan, J. W. S. Marshall, University of Bristol, Bristol, United Kingdom.


**ESD-Station Error and Erasure Connection with 450HM In Mobile Channels**, G. D'Arco, G. Tarlone, CNET, Torino, Italy.

**Modulation Waveform for 1000 baud DSKF Podcast Transmitter**, J. J. Kellogg, Rice, Communications Research Laboratories, Houston, TX.

VEHICULAR DATA COMMUNICATIONS

**Spectrum Utilization Efficiency for SIMULCAST Data Transmission**, G. F. Immel, H. M. Hafes, G. Sehme, J. F. Towjian, Carleton University, Ottawa, Canada.

**Data Over Cellular - One Year Later**, F. Fontana, American Mobile Communications, Schaffhausen, IL.


**The Switched Tone Concept for Speech and Data Transmission**, H. T. Chen, H. M. Hafes, R. A. Goubrun, Carleton University, Ottawa, Canada.


CELLULAR SYSTEMS ENGINEERING AND PERFORMANCE EVALUATION TECHNIQUES


**Baltimore/San Diego System - Serving More than 1,000,000** **Mobile Users per Site**, G. M. Davis, Bell Atlantic Mobile System, Hanking Ridge, NJ.

INFORMATION, MEASUREMENT, AND MOBILE EQUIPMENT DESIGN TECHNIQUES


**Test Equipment for Digital Channel Analyzer and for Signal Analysis**, F. R. D. C. Massar, Motorola, Indianapolis, IN.


**Detection of DME in Portable Radar**, G. D'Arco, G. Tarlone, CNET, Torino, Italy.
INTERNATIONAL PANEL DISCUSSIONS

MONDAY
JUNE 1, 1987 7:00 - 9:00 PM

CELLULAR SYSTEM PERFORMANCE EVALUATION AND OPTIMIZATION TECHNIQUES
CHAIRMAN: DUANE HUFF
AT&T BELL LABORATORIES
WHIPPANY, N.J.

Cellular systems operators from various countries in the world will discuss the approaches being taken to optimize the performance of their growing systems. Operational support tools and techniques used to evaluate and improve the performance of large cellular systems will also be discussed.

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TUESDAY
JUNE 2, 1987 7:00 - 9:00 PM

FUTURE DIRECTIONS OF CELLULAR TELECOMMUNICATIONS
CHAIRMAN: MIKE CALLENDAR
BRITISH COLUMBIA TELEPHONE CO.
BURNABY, B.C., CANADA

An international panel of cellular experts will discuss the future directions of cellular telecommunications including cellular ISDN and the evolution of the current cellular technology toward wireless access telecommunications network design. A need for an international standard and the current status of available technologies in each country will also be discussed.

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VTS Tokyo Chapter Activities in 1986

The VTS Tokyo Chapter has been organizing and coordinating the VTS activities in Japan. It has been about 7 years since this chapter was established in 1979. The registered members are now about 100. Technical Meetings are held several times a year. The meetings cover all the technical subjects of VTS, Transportation, Communications, and Automotives. In 1986 the following subjects were reported and discussed:


Moreover, in these few years Dr. S. McConnell, Junior Past President, and Dr. J. Miki, Nokoriki, Motorola, Inc., presented technical topics in mobile communications in the USA, which were held in high opinion by the chapter members.

In this year, Comoc is going to hold GLOBECOM '87 in Tokyo in November. Therefore, in these days we are going to hold the chapter meeting. The VTS members, who are coming to Tokyo, please inform us.

Board of directors of the VTS Tokyo Chapter are as follows:

Chairman
Masanofu Watanabe
0427-45-9225
JRC LAB. 5-1-1, Shimo-Reniyuka, Mitaka-shi, Tokyo, 188 Japan

Vice Chairman
Takashi Seijo
03-452-2201
Dept. of Elec. Eng., Shibaura Institute of Technology, 3-9-14, Shibaura, Minato-ku, Tokyo, 108 Japan

Secretary
Kenichiro Hirade
0468-59-2790
Digital Mobile Commun. Sec. ECL of NTT
1-2356, Take, Yokohama-ku, Kanagawa-ken, 228-08 Japan

Treasurer
Shin Sakai
0425-72-2151
Signal Commun. Sec. Railway Traffic Lab. of INR
2-8-38, Hikari-shi, Tokyo, 185 Japan

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American people must demand that our Federal tax policies support and encourage the efforts of such individuals to engage in private enterprise.

Further developments have been summarized in the February 16 issue of the Legislative Report, written by Edith Carper and published by our Washington Office, Ms. Carper reports: "The questions raised by technical people on the meaning and scope of a seemingly discriminatory tax law amendment are valid ones, according to some members of Congress. The provision at issue—Section 1706 of the 1986 omnibus tax reform legislation—affects a specific segment of the technical workforce: engineers, designers, drafters, computer programmers, and systems analysts.

"The new law and the IRS guidelines issued January 22, 1987, say that technical specialists who use brokers or third parties to find jobs may be treated as employees, rather than as independent contractors or consultants. In order to claim status as independent contractors, those who use brokers must meet tough common law standards. Those standards are based on court precedents and are used by IRS to determine independent contractor status for certain other professional groups. If they fail to meet the standards, they will be treated as employees of the broker. There was some relief in the technical community that the IRS ruling "does not automatically convert" these technical people from independent contractors to employees.

"IEEE people are affected by Section 1706 and many members are communicating their concerns to Congress. IEEE has retained counsel to provide advice on interpretation, applicability, and the possibility of changing the law. A draft position paper has been endorsed by USAB OpCom stating that the organization will fight any legislation that imposes 'unfair or discriminatory' treatment on engineers, scientists, and other technical personnel.

"Sympathetic members of Congress, sensing a lack of awareness in letting Section 1706 go through, have recently introduced bills to postpone the effective date of the law or to repeal it.

Frank E. Lord
Professional Activities Editor
Transportation Systems

Bob McKnight
Transportation Systems Editor

Carnegie-Mellon sets up high speed transport center

Pittsburgh, Pennsylvania long known as a transport and steel center, now has an international center at Carnegie Mellon University for the study of high speed ground transportation. The High Speed Ground Transportation Center (HSGTC) received a grant of $94,000 from the Commonwealth of Pennsylvania and will be operated by Mellon Institute’s Industry Systems Center under Carnegie Mellon, headed by Dr. Richard A. Uber. The HSGTC budget will be $750,000 by next year, according to Uber.

"The High Speed Ground Transportation Center will play an important role in the development of new industry and technology of high speed rail, both steel-wheeled systems and magnetic levitation, or maglev, systems," said Richard M. Cyert, president of Carnegie Mellon University.

The initial goal is to develop a database of information on current systems and high speed magnetic levitation, Uber said.

The center will be in partnership with the Pennsylvania High Speed Rail Commission, a state agency that is studying the feasibility of a 180-250 mph, 2-hour passenger service from Pittsburgh to Philadelphia, and the High Speed Rail Association, a multidisciplinary trade group. The HSGTC will work with these groups, and with others, to "build the world's most reliable and complete database of information on high speed rail of all types."

"At the Carnegie Mellon Center we intend to provide a reference library of technical data and progress reports on high speed ground transportation projects," Uber added. "We will maintain a database of construction and operating costs, technologies, project time frames and short- and long-term job creation data."

High speed ground transportation - the historical perspective

At the January 22 opening of Carnegie Mellon’s High Speed Ground Transportation Center, Dr. Richard A. Uber, dean of the school of engineering, discussed progress in the race of high speed ground transportation and its historical background, and summed up some of the remarks that were made.

"High speed rail transportation is discussed today, ground systems which can travel above 185-250 mph qualify. In this context, modern high speed ground transportation is a challenge that we are playing in the United States with the development of the MetroLink service between New York City and Washington, DC. Those trains are designed and built with a top speed capability, but we have never achieved that goal."

"The reasons generally given, in hindsight, are that an adequate prototype development program was never carried out (in fact, all of the cars were prototypes). The test program could be conducted, and the railroad between New York and Washington could never support high speed trains. Initially, the MetroLink service ran with a top speed of 125 mph about the same time that Japan began service on the Tokaido Line (Shinkansen). The only difference between the two services were that the MetroLink top speed became lower over the next few years in its service conditions became bad, while the Japanese continued to improve their service. The same top speed (125 mph) while maintaining their trains to keep them in a good condition. The Metrolink and the Shinkansen services at that time would have been considered high speed services in terms."

Research and development into high speed ground transportation is now being conducted by the Office of High Speed Ground Transportation of the US Department of Transportation in the late sixties and early seventies. The research resulted in two prototype vehicles: the first was a low-speed Linear Induction Motor Research Vehicle (LIMRV), and the second was called the Tracked Air Cushion Research Vehicle (TACRV). Both of these vehicles were built for the Transportation Test Center near Pueblo, Colorado.

In Japan, the National Railways built a 20-mile test track on which it has operated a maglev vehicle at 222 mph. The Japanese National Railways also built a maglev system that has been tested at more than 300 mph.

"In the French TGV, operates daily at 168 mph between Paris and Lyons, carrying 300,000 passengers per week. Other high speed trains are running in Germany, Spain and Italy. Magnetic levitation trains, propelled by a powerful wave of magnetic energy along a specially fitted guideway, have been tested in various parts of the world. A number of countries have developed a maglev vehicle on a 20-mile test track on which it has operated a maglev vehicle at 222 mph. The Japanese National Railways have also built a maglev system that has been tested at more than 300 mph.

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Microprocessors in rail transit systems will be the subject of a three-day symposium sponsored by Carnegie Mellon University at the Intercontinental Hotel, Pittsburgh, Pennsylvania, September 14-16, 1987.

The symposium is intended for rail transit personnel from transit authorities, manufacturers, researchers, and others to better understand the operation and application of microprocessors to rail transit systems.

The symposium will cover: managing microwave equipment; use in safety and security systems; use in maintenance and management. Critical issues facing transit authorities such as service optimization, accessibility, and planning will also be addressed.

The symposium fee is $175 for rail transit personnel and $275 for non-transit personnel.

The call is for potential speakers on the following topics:
- "The Use of Microwave Technology in Rail Transit Systems," by Linda Sue Boerner, symposium manager.
- "The Use of Microwave Technology in Rail Transit Systems," by Mrs. Boerner.
- "The Use of Microwave Technology in Rail Transit Systems," by Mrs. Boerner.

Please include your name and affiliation in your submission. Questions or comments should be directed to Mrs. Boerner at the Intercontinental Hotel, Pittsburgh, Pennsylvania, or call (212) 633-2341.

The symposium will include a technical program, a social program, and a tour of the city.

The conference will conclude with a tour of Pittsburgh's new light rail maintenance facility, hosted by managers of the Port Authority of Allegheny County.

The symposium is being organized by Carnegie Mellon's Rail Systems Center under a grant from the Urban Mass Transportation Administration (UMTA). The program is sponsored by UMTA in response to rail transit industry needs. Cost per person including meals and materials is $235.

For more information and reservations for the meeting write or call Linda Sue Boerner, Manager, Microprocessors in Rail Transit Symposium, Mellon Institute, 4400 Fifth Avenue, Pittsburgh, PA 15213, phone number is (412) 268-2960.

VTS seeks speakers to talk about radio, automotive electronics and land transportation

The Vehicular Technology Society is seeking knowledgeable engineers who are members of the Vehicular Technology Society and others to become members of a VTS speakers bureau. There is need for such qualified persons to give technical talks on special situations at local chapter meetings of the Vehicular Technology Society.

VTS is looking for you engineers with knowledge and expertise in subjects in the main stream of VTS activity:
- Radio-two way, cellular, antenna design, equipment and systems.
- Land transportation including command and control systems for rail and rapid transit. High speed ground transportation is also included.
- Automotive electronics including sensors and control systems for passenger cars and trucks.

As speakers you will be expected to travel to distant cities to present their views to local VTS chapters, there will be some expense for travel and accommodations. Although details are worked out between the speakers and the local chapters, VTS generally picks up transportation costs while the local VTS chapter pays for hotels and costs incurred at that location.

The call is for potential speakers, so for those interested, please write to Leo M. Himmel, Sr., Chairman VTS Education Committee: Society for Microwave & Signal Division, AAB, 50 F Street, NW, Washington, DC 20001, or call 202-633-2315.

Please include your educational and work experience as well as subjects you would be willing to address at VTS chapter meetings.

The conference will conclude with a tour of Pittsburgh's new light rail maintenance facility, hosted by managers of the Port Authority of Allegheny County.

The symposium is being organized by Carnegie Mellon's Rail Systems Center under a grant from the Urban Mass Transportation Administration (UMTA). The program is sponsored by UMTA in response to rail transit industry needs. Cost per person including meals and materials is $235.

For more information and reservations for the meeting write or call Linda Sue Boerner, Manager, Microprocessors in Rail Transit Symposium, Mellon Institute, 4400 Fifth Avenue, Pittsburgh, PA 15213, phone number is (412) 268-2960.

All VTS Chapter Chairmen in Region 7 are once again reminded to submit any newsworthy item which you would like to appear in "The Canadian Report" to me at the following address:

William J. Misskey, P.Eng.
Electrical Information Systems Engineering
University of Regina
Regina, Saskatchewan
CANADA S4S 0A2

or telephone me at (306) 857-4066 or, by ENVOY 100 at WJ.MISSKEY. Please note the deadline dates for receipt of final copy listed on page 3 of every newsletter.

Any other readers or the IEEE VTS NEWSLETTER are also welcome to submit items of interest to Region 7 VTS members.

APPEAL FOR PAPER REVIEWERS
The IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY requires qualified paper reviewers in the area of Vehicular Electronics. Please contact me at the above address if you can provide some assistance in this regard or if you know of someone who can.

TECHNICAL NOTE
This issue we have one interesting application in Vehicular Location Systems. VTS readers who wish additional information on this approach should contact:

Prof. R.J. Palmer, P.Eng.
Faculty of Engineering
University of Regina
Regina, Saskatchewan
CANADA S4S 0A2
tel. (306) 584-4709

SHORT RANGE RADIO LOCATION SYSTEM INSTALLED
There are operations, such as farming and drilling that could be improved from a control center system. A system that is targeted for these short range (1 mile) applications was installed by Accutrac Systems Ltd. of Regina, Saskatchewan. The system is used at the Kaidam Chemical potash mine just outside of Moose Jaw, Saskatchewan. The drudge operates continuously, around the clock, every day of the year. The location of the drudge is displayed in Cartesian coordinates (x,y) in either feet or meters and is updated every second. The displayed position helps the operator in determining his position and width and also provides the necessary coordinates to log the area covered. Staffers can also log the position in using the positional information to construct an automatic drudge. The radio location system uses two stationary transceiver beacons and a mobile unit, each frequency modulating 436 MHz with a continuous wave. The module unit transmits a RF burst and this is received by the beacon which measures the signal back in a time multiplexed format. The phase delay measured at the mobile unit is proportional to the distance which in turn is used to compute the x,y location.

The phase shift of the signal through the circuit is continuously measured and subtracted from the total phase delay and this gives long term stable values, even if the circuit changes due to temperature or age. A proprietary digital technique can read phase differences of less than 1 part in 10,000 with complete linearity and with no need to do analog multipath cancellation. As with all UHF radio equipment, multipath was encountered and modifications in software were necessary to keep this from significant delaying the signal. The extent of error due to multipath is not known at this time.

Further tests this summer will be conducted to test for error due to multipath, non-linearities, and accuracy.
Vehicular Electronics

Bill Fleming
Vehicular Electronics Editor

May 1987

IEEE Vehicular Technology Society Newsletter

FORD MOTOR HIGH-TEMPERATURE BALL SENSOR

For crankshaft, camshaft, and wheel position measurements; magnetic-based Hall effect sensors find wide application in automotive electronics. As engine technology tends toward higher-rpm, higher-temperature designs; more robust sensors and electronics are required. In addition, wheel-speed sensors are often mounted close to brake rotors, creating high temperature operating conditions. To satisfy this need, Ford Microelectronics Inc. has developed Hall sensors made from gallium arsenide, a material with about a 50 C higher operating temperature limit than that for silicon. These sensors will appear in Ford’s antilock brake systems and engine controls as early as the 1990 model year [5].

GENTEX AND DONNELLY BOTH INTRODUCE ELECTROCHROMIC MIRRORS

Although electrochromics never made it as an automotive dashboard-display technology (because of slow transition response time), two Michigan companies think it’ll go big in automotive rearview mirrors [6,7]. Despite the higher cost of electrochromic mirrors -- $30 to $50 apiece compared to $2 to $2.50 for conventional mirrors -- the luxury car market is enthusiastically accepting the mirrors.

Electrochromic mirrors feature continuously variable, automatic glare reduction for night and day driving; integral lighting (added interior lighting); and integral warning indicators for low fuel, oil, coolant, washer fluid, or other information. Electrochromic mirrors are expected to show up on 1989 model year Fords, and on 1990 Cadillacs [6]. In addition, electrochromics may be suited for large-area applications such as variable-light sunroofs, rear hatches, and windshields [6].

REFERENCES


Cross Section of Diesel Kiki Acceleration/Inclination Sensor

Response Characteristic Curve of Diesel Kiki Sensor

LOCATION OF TOYOTA TORQUE SENSOR INSIDE ENGINE

INSTALLATION OF TORQUE SENSOR (AND ASSOCIATED THERMOCOUPLE) IN BEARING CAP

DIESEL KIKI ACCELEROMETER/INCLINOMETER

Also at this winter’s SAE meeting, Diesel Kiki reported on a new type of accelerometer/inclinometer for automotive application [4]. A steel ball, serving as a seismic mass, is contained inside a cylindrical-shell permanent magnet. Due to equilibration of magnetic forces, the ball is magnetically bound at the center of symmetry of the magnet. However, forces due to acceleration or inclination act to move the ball off center. An LVDT (linear variable differential transformer) detector provides a high-level output signal. The sensor features: ruggedness, low cost, and dc-to-10 Hz bandwidth response.

Diesel Kiki Torque Sensor

20
The effects of greater-than-free-space propagation path loss associated with line-of-sight fading are modeled and analyzed. Analytic models are used to examine the effects of higher-order path loss on signal-to-interference contours for single- and linearly distributed interference scenarios. The computer model can be used to investigate link performance for interference contours in which the link assets and each source of interference are independently located in three dimensions. A propagation submodel permits independent calculation of the loss over each link or interference signal path. Computer-generated plots are presented that illustrate the affect of antenna heights and frequency on the shape of the interference contours. A closer examination of the 3/2 contours. Of particular interest is the affect on link region of operability when either the link transmitter or the sources of interference are at a higher altitude than the other.


This paper presents the laboratory and theoretical performance of a pilot-aided digital radio system. The technique incorporates a pilot signal that allows the system to determine the multipath fading channel. The system is referred to as the multi-carrier TCT (MCT). We report on the performance of a 600 MHz prototype system employing 24 Kbps data under Ricean fading conditions. Both experimental and analytical results show that the error floor is significantly improved with a pilot-aided transmission technique. The results are also compared with experiments on the performance of a 24 Kbps data transmission system under Ricean fading conditions. The results are compared to a 24 Kbps data transmission system under Ricean fading conditions. The results are compared to the results of a 24 Kbps data transmission system under Ricean fading conditions. The results are compared to the results of a 24 Kbps data transmission system under Ricean fading conditions.


In the case of inter-symbol interference, the minimum shift keying (MSK) has been shown to be optimal for minimizing the probability of error. In both minimum shift keying (MSK) and differential detection, the probability of error is obtained by characterizing the signal-to-noise ratio (SNR) of the received signal. In the case of QPSK, the probability of error is obtained by characterizing the signal-to-noise ratio (SNR) of the received signal. In the case of QPSK, the probability of error is obtained by characterizing the signal-to-noise ratio (SNR) of the received signal. In the case of QPSK, the probability of error is obtained by characterizing the signal-to-noise ratio (SNR) of the received signal.
The probability of error for the transmission of a signal via a fading radio channel is influenced by the statistical behavior of fading. This is characterized by the cumulative distribution function (CDF) for the received signal envelope, and the correlation of random variations across the channel bandwidth. It is therefore important for system design purposes to determine the distribution function for envelope fading and the frequency correlation of radio channels in propagation environments where the use of digital radio systems is planned.

This paper details experiments that were conducted under conditions similar to those which would be typical on 800/900 MHz band satellite-mobile channels in rural environments. The impulse response functions of measured channels were estimated by operating a pseudonoise channel probe from a 65 m tower through dielectric trees to a receiver at close range. Measurement results include: channel impulse responses, envelope fading statistics, and double impulse responses. Comparisons are made between channel characteristics during the summer and during the winter after the leaves have fallen from the trees. Estimates of digital channel characteristics and limitations are also given. Aside from the fading statistics, these channel characteristics have not previously been reported.


The results of indoor multipath propagation experiments performed at 900 to 1100 MHz, 1.5 GHz, and 2.3 GHz, with a delay spread of about 20 ns, are presented. The signal was received by a fixed and a movable receiving antenna. The received signal was very slowly time-varying, with a delay spread extending over a range up to about 2000 ns, or about 500 ns. The attenuation varied over a 60 dB dynamic range. A simple statistical multipath model of the indoor radio channel is also presented, which fits our measurements well, and more importantly, appears to be extendable to other buildings. The received signal envelope and the correlation of random variations across the channel bandwidth are therefore important for system design purposes to determine the distribution function for envelope fading and the frequency correlation of radio channels in propagation environments where the use of digital radio systems is planned.

"The dependence of trellis coding and MPSK signaling with the addition of asymmetry to the signal set is discussed with regard to its suitability as a modulation/coding scheme for the fading mobile satellite channel. For MPSK, introducing nonuniformity (asymmetry) into the spacing between signal points can improve the constellation in terms of robustness. For trellis coded using the FSK method, the constellation is improved by using a more complex constellation. In particular, the constellation is improved by using a more complex constellation. The results show that the use of trellis coded MPSK can significantly improve the performance of the fading channel.


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Discrete multipath propagation is generally considered to impose severe limitations on the performance of mobile satellite systems. These limitations are due to the information transmission capacity of a communication link. To overcome these problems, several methods of relieving multipath effects, generally concentrating on the characteristics of the received signal, have been developed. One of the most promising techniques is based on combining directional and processing techniques, which can significantly reduce the distortion caused by multipath propagation.

In this paper, the emphasis is on separation of desired signals. The output of a small number of discrete paths not only for freeing the path of at least one interference path, but also for combining the various path outputs. This advantage of the additional signal energy that each path provides. Novel techniques for the treatment of multipath are described, based on combining directive principles and processing techniques, which can significantly reduce the distortion caused by multipath propagation.


Error performance analysis for the VHF digital mobile systems is presented. The binary frequency-shift keying (FSK) system using nonsynchronous (NC) detection has been considered. An error rate formula for the NC receiver, is considered. All major errors are considered, namely the channel noise, Gaussian and impulsive noise, are taken into account. The results indicates that the expression for the error probability is derived, which is limited to the bit error rate (BER) evaluations for the channel. A computer program is described, which uses the different mathematical models of their impulse responses. The


For Dick Tracy of comic-strip fame and Captain Kirk of "Star Trek," voice communication from tiny equipment over vast distances posed no problem, but in the real world of 1986 the situation is much more difficult. Historically, mobile telephone systems using HF, VHF and UHF radio have been developed since the Second World War with military and commercial systems. Although often the military needs have led the technological development, recent advances in communications have taken the lead in many areas. Initially voice communication by mobile radio was used in closed groups of users on an 'all-informed' basis, but, more recently connection to the world's telephone network has been possible and incoming calls are automatically routed to mobile subscribers wherever they may be in the system - a real breakthrough in the concept of personal communication. But can this be extended ultimately to a worldwide system? And can the hardware really approach the convenience available to mobile communication systems? The paper considers some of the technical problems to be solved, and the general radio system and touches on the prospects for future developments. The paper concludes that it will be some time before we can match the facilities available to our fictional heroes.


The probability of error for the transmission of a signal via a fading radio channel is influenced by the statistical behavior of fading. This is characterized by the cumulative distribution function (CDF) for the received signal envelope, and the correlation of random variations across the channel bandwidth. It is therefore important for system design purposes to determine the distribution function for envelope fading and the frequency correlation of radio channels in propagation environments where the use of digital radio systems is planned.

This paper details experiments that were conducted under conditions similar to those which would be typical on 800/900 MHz band satellite-mobile channels in rural environments. The impulse response functions of measured channels were estimated by operating a pseudonoise channel probe from a 65 m tower through dielectric trees to a receiver at close range. Measurement results include: channel impulse responses, envelope fading statistics, and double impulse responses. Comparisons are made between channel characteristics during the summer and during the winter after the leaves have fallen from the trees. Estimates of digital channel characteristics and limitations are also given. Aside from the fading statistics, these channel characteristics have not previously been reported.


The results of indoor multipath propagation experiments performed at 900 to 1100 MHz, 1.5 GHz, and 2.3 GHz, with a delay spread of about 20 ns, are presented. The signal was received by a fixed and a movable receiving antenna. The received signal was very slowly time-varying, with a delay spread extending over a range up to about 2000 ns, or about 500 ns. The attenuation varied over a 60 dB dynamic range. A simple statistical multipath model of the indoor radio channel is also presented, which fits our measurements well, and more importantly, appears to be extendable to other buildings. The received signal envelope and the correlation of random variations across the channel bandwidth are therefore important for system design purposes to determine the distribution function for envelope fading and the frequency correlation of radio channels in propagation environments where the use of digital radio systems is planned.
IEEE Vehicular Technology Society Newsletter

May 1987


A postdetection diversity system using a phase-cancellation loop modified by the inclusion of a differential demodulator (DD) or a frequency demodulator (FD) is described. Binary and quaternary digital modulation for DPSK and digital FM are considered. An analysis of a two-carrier Gaussian noise signal shows that, although the diversity combiner is inherently the postdetection type, the well-known postdetection equal-gain combining (EGC) or maximal-ratio combining (MRC) action can be approximately achieved. A unified analysis of bit error rate (BER) is presented for a Rayleigh fading environment, and fairly simple results are obtained. It is shown that the diversity gain of postdetection EGC is about 0.62 dB inferior to that of postdetection MRC when two-branch diversity is employed.


A cellular handoff treatment based on cell membership degree is presented. The proposed method permits the systematic incorporation of a variety of different weight criteria. An example of application is given, and it is shown that the procedure leads to a low number of handoffs without excessive cell coverage overlapping. If one of the criteria is derived from traffic considerations, then traffic imbalance may be reduced without recourse to channel borrowing.

NEWS FROM WASHINGTON

Eric Schimmel
Washington News Editor

WHO GETS THE "HAM" BONE

by the time this issue is mailed, the dates for filing Comments in two new FCC proposals will probably have passed, but they are of sufficient interest to the mobile radio community to warrant public notice. The proposed spectrum allocations themselves, are the probable technological innovations and developments which will result. Narrowband and digital technologies will find these proceedings to offer new opportunities for visibility.

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Notice of Proposed Rule Making

Adopted: February 2, 1987
Released: February 12, 1987

By the Commission:

INTRODUCTION

1. By this action the Commission proposes to: 1) maintain the existing 216-220 MHz band allocation; 2) allocate the 220-225 MHz band on a exclusive basis to the land mobile service for both government and nongovernment purposes; and, 3) allocate the 222-225 MHz band on a exclusive basis to the amateur service. This proceeding addresses only the allocation of this spectrum. A subsequent proceeding will address the necessary service rules for the new allocations that may result from this proceeding.

Planning Activities

1. Prior to the 1979 World Administrative Radio Conference (1979 WARC), the 216-225 MHz band was allocated for the governmental land mobile, fixed and land mobile services for telemetry operations; and, there was a secondary allocation in the 220-225 MHz portion for the amateur service. During the preparation for the 1979 WARC, it was determined that the 221-225 MHz band was not sufficient to meet future United States radiofrequency requirements. 1 Therefore, this band was considered a candidate for reallocation for other purposes. At about the same time, a requirement for maritime mobile public correspondence was identified that could be accommodated in this band. Accordingly, the United States proposed at the 1979 WARC that the entire 216-225 MHz band be reallocated internationally to the maritime mobile service. That proposal was not adopted in its entirety. However, the 1979 WARC did allocate the 216-220 MHz portion to the maritime mobile service along with the fixed service on a primary basis and allocated the 220-225 MHz portion to the mobile service along with the fixed service on a primary basis.

The 1979 WARC also provided for phasing-out the radiofrequency service.

3. Shortly after the 1979 WARC the Commission allocated the 216-220 MHz band to the maritime mobile service on a primary basis for the inland waterways communication system. 2 Secondary allocations in the 216-220 MHz band were retained for the aeronautical mobile, fixed and land mobile services for telemetry operations. Subsequently, the Commission reallocated the 220-225 MHz band to the amateur, fixed and mobile services on a coequal primary basis for nongovernment services. 3 The National Telecommunication and Information Administration (NTIA), in implementing the 1979 WARC results into the government table of frequency allocations, allocated the 220-225 MHz band on a coequal primary basis to the fixed and mobile services. However, NTIA and the FCC agreed on the operation of the fixed and mobile services in the 220-225 MHz band would not be initiated until an allocation plan was developed for sharing the band by government and nongovernment users. 4 Later, an FCC/NTIA planning group recommended that a portion of the 220-225 MHz band be designated for narrowband land mobile operations on a shared basis between government and nongovernment users.

Petitions for Rulemaking

The Commission also has received three petitions for rulemaking addressing allocations in the 216-225 MHz band. These were submitted by Land Mobile Communications Council (LMCC), Time Warner, Inc. (STI) and LAOAD Radio and Microwave Communications Consultants (LAOAD). The petitioners requested that a portion of the 220-225 MHz band be allocated to the land mobile service for narrowband voice operations (5 kHz channels). The petitioners argued that an additional land mobile allocation is needed to help meet the private land mobile service requirements. They stated that current narrowband equipment designed to operate in the 150 MHz land mobile band could be easily modified for operation in the 220 MHz band. Further, they asserted that since transmission characteristics at 220 MHz are similar to those in the 150 MHz band, the 220 MHz band would be attractive to users who otherwise would be seeking channels at 150 MHz. They argued that the 220 MHz band would be a good place to implement 5
kHZ channel land mobile operations, due to the light loading of the basestation planning plan would not have to work around existing FM channels.

4.10 Further, all services to be fixed to the service in the 212-220 MHz band for narrowband voice and telemetry operations (5 kHz and 2.5 kHz channels respectively). It also shows a growing need for telemetry channels, notably particularly oil, gas and seafood operations, and can help ensure control and management of many remote stations from a single location.

5. In response to the petitions, there was strong support from the land mobile operators for a fixed allocation for land mobile; however, there was only modest support for a fixed allocation. There was strong opposition from the land mobile operators for a fixed allocation in the 212-220 MHz band and amateurs operating in the 220-225 MHz band.

6. Based on our analysis and the comments submitted in response to the petitions, we believe that the present allocations in the 212-220 MHz band are appropriate and should be maintained.

A. The terms and conditions of the spectrum. With regard to the 220-225 MHz portion of the band, we are considering this band is currently underutilized for narrowband voice and telemetry service. We have determined that it is appropriate to allocate land mobile services in the 212-220 MHz band. A further, land mobile allocation in this region of the spectrum would provide an opportunity for the further development of the telecommunications market. Therefore, we are proposing a 2 megahertz allocation to all land mobile services in the 212-220 MHz band.

B. The terms and conditions of the spectrum. With regard to the 220-225 MHz portion of the band, we are considering a 3 megahertz allocation for land mobile services in the 212-220 MHz band. The remaining 3 megahertz, 222-225 MHz, is proposed to be made an exclusive allocation for the amateur service. These matters are discussed below.

212-220 MHz Band

1. We believe it would be appropriate to order additional services in the 212-220 MHz band. The inherent waveguides in this band have a chance to develop and it is also our belief that the geographical limitations on land mobile operations at 212-220 MHz create a higher potential for the destruction of land mobile services in this band. This would be especially the case in the major cities where land mobile demand is greatest.

2. Further, there is no need for an allocation in this portion of the band, as the existing mobile operations for other countries that are operating in accordance with the international Table of Frequency Allocations. This might restrict domestic use of this band for narrowband voice and telemetry. For these reasons, we do not believe it is in the public interest to propose a primary land mobile allocation below 220 MHz.

3. We believe that the needs of the fixed services can be satisfied within the existing allocation in the 212-220 MHz band. We reject LACQ's request to upgrade to the 212-220 MHz band. We note that the LACQ proposal is not based on the needs of the fixed services. We do not believe it is in the public interest to accommodate a further fixed frequency allocation below 220 MHz.

4. Petitioners propose that the BERT service should have a lower priority than the BERT service in the 450 MHz band and the 800 MHz band assigned to common carrier services. In addition, the rulemaking process for the BERT service should take into consideration information and ideas not contained in the fixed service rules for this band.

220-225 MHz Band

10. The 220-225 MHz band, which is allocated to the amateur service, is a fixed allocation for the amateur service, and is currently utilized only by the amateur and radioastronomers service as noted above. The amateur service is primarily for the operation of amateur repeater operations, along with some special operations.

11. The Commission is cognizant of the services provided by the amateur service for the amateur community and the other amateur bands. We are also aware of the investiture of the amateur community in equipment in this region of the spectrum. However, these requirements for frequency bands are needed to meet their own respective spectrum requirement.

12. Further, we are concerned about potential interference to the reception of TV channel 13 operations in adjacent spectrum at 210-216 MHz.

DISCUSSION

4. Propositions that the BERT service should have a lower priority than the BERT service in the 450 MHz band and the 800 MHz band assigned to common carrier services. In addition, the rulemaking process for the BERT service should take into consideration information and ideas not contained in the fixed service rules for this band. Petitioners suggest that frequencies shall be selected by an exchange carrier association, and the BERT service should have a lower priority than the portion from the specification most suitable for basic exchange service uses from this band.

5. Petitioners suggest that frequencies shall be selected by an exchange carrier association, and the BERT service should have a lower priority than the portion from the specification most suitable for basic exchange service uses from this band.

6. Comments on the BERT Proposal

A. In addition, an exchange carrier submitting an application under this Subpart must submit a design for the proposal that demonstrates performance in regard to the effects of mutually harmful interference with the systems of other radio licensees sharing the assigned frequencies in other geographic areas.

B. Petitioners suggest that there are no requirements for basic service, or which use 4-8 or 2-line pair service.

7. The lack of service, and argue Petitioners that are by the high costs associated with building and maintaining wire or cable links between widely dispersed subscribers and the central office locations. Petitioners point out that radio systems are designed for basic telephone service which can be economically and in making basic telephone service available for the first time at a low cost.

8.Comments on the BERT Proposal

A. In addition, there are concerns about BERT being an underutilized service. It is noted that BERT is not only an underutilized service, but it is also an underutilized service.

B. Issues such as the lack of a BERT proposal, and the lack of a BERT proposal, are those in unqualified agreement with the BERT proposal. Moreover, Petitioners are for the BERT proposal, who are generally in favor of BERT, but who oppose the use of one or both frequency bands requested by the Petitioners. In addition, the National Association of State Telecommunications 

C. Petitioners propose an amendment to Part 71 of the Commission's Rules.

D. Petitioners propose an amendment to Part 71 of the Commission's Rules.

E. Petitioners propose an amendment to Part 71 of the Commission's Rules.

F. Petitioners propose an amendment to Part 71 of the Commission's Rules.

G. Petitioners propose an amendment to Part 71 of the Commission's Rules.

H. Petitioners propose an amendment to Part 71 of the Commission's Rules.

I. Petitioners propose an amendment to Part 71 of the Commission's Rules.

J. Petitioners propose an amendment to Part 71 of the Commission's Rules.

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U. Petitioners propose an amendment to Part 71 of the Commission's Rules.

V. Petitioners propose an amendment to Part 71 of the Commission's Rules.

W. Petitioners propose an amendment to Part 71 of the Commission's Rules.

X. Petitioners propose an amendment to Part 71 of the Commission's Rules.

Y. Petitioners propose an amendment to Part 71 of the Commission's Rules.

Z. Petitioners propose an amendment to Part 71 of the Commission's Rules.


Existing Telecommunication Techniques for Rural Areas

11. The current rules for providing telephone service to rural areas are found in Part II of Title II. These rules allow either telephone companies or non-wireline companies to provide telephone service, provided that they are capable of serving a minimum of 152 MHz and 450 MHz mobile frequencies to subscribers who cannot receive conventional wireline telephone service. These frequencies are allocated to the companies by the FCC. To provide mobile or wire service in rural areas, a company must first apply for a license and pay a fee.

12. In addition to the methods of providing local exchange service to rural subscribers, the use of cellular telephony is described in the Cellular Lottery, 46 F.C.C. 2d 175 (1974), where applicants for cellular telephone service are required to demonstrate the feasibility and practicality of using cellular radio in rural areas. The FCC has not yet decided on the frequency bands that will be used for cellular telephone service. These decisions are being made by the Federal Communications Commission (FCC) and the Federal Reserve Board. The FCC is responsible for allocating frequency bands and determining the technical requirements for cellular telephone service.

13. Petitioners argue that the lack of availability of cellular service, secondary frequency assignments for fixed service, and the high cost of service are elements of Rural Radio policy that must be addressed. We agree that Rural Radio may have considerable limitations due to its secondary status. With new technology, digital modulation techniques such as that described by IMT, offers the potential for economical rural radio service. Opportunity to provide fixed service to the public is important because fixed service will be readily available to the public.

14. Unfortunately, there are significant problems with fixed service in the Rural Radio service and mobile service in the Public Land Mobile Service on the 450 MHz band. First, Rural Radio Service licensees serve a number of small businesses or rural areas in rural areas, using a wideband channel in the 414-419 MHz range. These licensees are required to have a frequency assignment for both the 450 MHz band and the 800 MHz band. Second, Rural Radio Service licensees are required to have a frequency assignment for both the 450 MHz band and the 800 MHz band. Third, Rural Radio Service licensees are required to have a frequency assignment for both the 450 MHz band and the 800 MHz band. Fourth, Rural Radio Service licensees are required to have a frequency assignment for both the 450 MHz band and the 800 MHz band.

15. Although Petitioners address only basic exchange telephone service carriers in public areas, the Petition states that no-wireline telephone companies, such as cellular telephone companies, provide a broad range of services. The Commission has not yet determined whether these companies can provide fixed service, and the Rural Radio Service, in our opinion, is no longer necessary for the provision of such service.

21. Although Petitioners address only basic exchange telephone service carriers in public areas, the Petition states that no-wireline telephone companies, such as cellular telephone companies, provide a broad range of services. The Commission has not yet determined whether these companies can provide fixed service, and the Rural Radio Service, in our opinion, is no longer necessary for the provision of such service.

22. Some comments, particularly in the American GUM, requested that the Commission reconsider the Petitioners' proposal to specify by placing the service within the cellular rules, which, while not necessary, would provide the opportunity to improve the quality of service. In addition, the interference problem is automatically handled by the carrier, and the carrier is responsible for ensuring that all equipment that the carrier uses is in compliance with the carrier's service agreement.

23. Another comment, the National Conference on Rural Telephone Service, suggested that it might be appropriate to limit the fixed cellular telephone service described herein to certain regions, particularly those that are sparsely populated and where the corresponding number of households and businesses is not sufficient. However, such a limitation might exclude rural telephone service, and this would be contrary to the purposes of rural telephone service.

24. Comments on all aspects of the analysis and proposals are encouraged. Interested persons are invited to submit comments in accordance with Section 1.419 of the Commission's Rules, 47 C.F.R. §1.419. Comments must be filed by March 30, 1987, and reply comments by April 27, 1987.
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Six copies of a 500-word summary should be submitted by December 15, 1987 to:

D.L. Huff
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Authors will be notified of acceptance by January 29, 1988. The complete text must be submitted by March 31, 1988 and will be published in the 38th Vehicular Technology Conference Record, which will be available at the conference.