On the Move in the '90's
May 6–9, 1990
Sheraton Plaza at Florida Mall
Orlando, Florida
President's Message

George McClure
President
IEEE Vehicular Technology Society

The theme for our Fortieth Annual Vehicular Technology Conference is "On the move in the '90s." This is not just a play on our Society's name. The Institute membership records show that ours was the second fastest-growing Society in 1989, in percent membership increase. Papers submitted for our 1990 conference increased by a third over 1989. Competition was keen and an excellent technical program has been the result, as you will see from the advance program information elsewhere in this issue.

1989 was noteworthy in another way: six of our members were elected to the Fellow grade by the Institute. They are:

- Professor Kyuhki Pujimato - for contributions to the development and design of small antennas and antennas for mobile communications.
- Professor Umberto Mengoli - for contributions to the theory of synchronization in digital communication systems.
- Dr. Louis L. Nagy - for contributions to the research and development of mobile communication systems for automobile applications.

Mr. Philip T. Porter - for contributions to the planning, definition, and design of mobile cellular radio communications and services.
- Mr. Anthony J. Ruston, Jr. - for contributions to the implementation of diversity combining techniques in cellular mobile radio systems.
- Dr. Carl-Erik W. Sandberg - for contributions to power- and bandwidth-efficient constant-amplitude modulation methods.

Our congratulations to all these Fellows in achieving this distinction in recognition of their professional achievements. We look forward to their continued association with VTS and to their further contributions to our branch of electrotechnology.

Please take time to review the program for our May 1990 annual conference. This year marks the fortieth anniversary of the founding of our predecessor group, the IEEE Professional Group on Vehicular Communications, and the conference will suitably recognize that fact.

The location for our conference this year is Orlando, Florida, which in terms of family-oriented recreation is striving to become the entertainment capital of the world. An assortment of tours and expeditions is offered for family members during the conference and group hotel rates apply for longer periods than the conference and include spouses in the basic fee.

See you in Orlando!

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Editor's Notes

A. Kent Johnson
Newsletter Editor

VTS Conference in Orlando, Florida, May 6-9, 1990

This edition of the newsletter features the upcoming Annual VTS Conference to be held at the Sheraton Plaza Hotel in Orlando, Florida from May 6-9, 1990. Elsewhere in the newsletter you will find the complete advanced program of the conference and as you will see, the committee has arranged an outstanding technical program. You will see that the program is varied, with papers covering the broad spectrum of interests encompassed by the Vehicular Technology Society. There continues to be great interest in cellular technology and land mobile systems with many papers being presented in those areas. It should be an exciting conference and we hope you will be able to make it to Orlando.

Six VTS Members Chosen as IEEE Fellows

This edition of the newsletter includes an input from AI Liberg listing those members of VTS recently elevated to the IEEE rank of Fellow. Al has also included a complete list of VTS Fellow members as of September 1989. We thank Al for this input and congratulate those recently elected Fellows.

Final Copy to be Rec'd by VTS Editor

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Chapter News

Gaspar Messina
Chapter News Editor

Meetings

Philadelphia Vehicular Technology Society

Subject: Modernization of SEPTA’S Norristown High Speed Line
By: Mr. John Griffith, SEPTA
714 Market Street, 4th Floor
Philadelphia, PA 19106

Held: September 14, 1989
Attendance: 47 (27 guests)

Subject: Tour of SEPTA’S New Solid State Frequency Converters
By: Mr. Robert Fisher
Held: October 12, 1989
Attendance: 32 (14 guests)

Subject: Rebuilding the LIRR’S Harold Interlocking
By: Mr. Simon Reich, District Manager,
Thomas & Eyer, Inc.
21st Floor, 333 Seventh Avenue
New York, N.Y. 10001
Held: November 9, 1989
Attendance: 32 (14 guests)

CoGeneration on AMTRAK
By: Mr. Ray Lamm, AMTRAK
National Passenger Corp.
60 Massachusetts Avenue, N.E.
Washington, D.C. 20002
Held: December 7, 1989
Attendance: 23 (10 guests)

Cleveland VTS

Subject: Communications Of The Future
By: Mr. Richard Kunath, NASA
Held: December 7, 1989
Attendance: 16 (3 guests and 6 students)

Subject: RFI Interception
By: Mr. Al Markwardt, Retired
826 Sherbrook Drive
Richardson, Texas 75050
Held: November 16, 1989
Attendance: 36 (10 guests)

Toronto Vehicular Technology Society

Subject: Elementary Properties Of Simple Antennas
By: Mr. Gene Dempsey, Threshold Communications
P.O. Box 188
Brant, Ontario L6V2L1 Canada
Held: October 25, 1989
Attendance: 6 (2 guests)

San Francisco Bay Area Vehicular Technology Society

Subject: Fleet Dispatching Using Automatic Vehicle Location Support
By: Mr. Rama Aysola, ETAK
4550 Williams Road
San Jose, CA 95129
Held: December 12, 1989
Attendance: 22 (5 guests)

Professional Activities (cont. from p. 13)

contact with the IEEE-USA Office and to respond by writing to your Representatives and Senators when IEEE-USA asks for your help in support of legislation. There’s a large number of us out there, and together I believe we can make a difference. I hope we can count on one another.

Any of the materials mentioned may be obtained from the IEEE USA Office. The new address is

1200 L Street N.W., 12th Floor
Washington, D.C. 20005

The phone number remains the same, 202-785-0017. You may also want to keep up to date by listening to the telephone hotline recording on 202-785-2180.

(Continued on page 4)
Transportation Systems

Bob McKnight
Transportation Systems Editor

ATCS: A Progress Report

The Advanced Train Control System Project (ATCS) of America's railroads is moving along. Several railroads have test installations in service. They are gaining experience in the operation of the various components and parts of ATCS. Union Pacific has a major installation in Nebraska on which it has been testing the data radio system, transponders, and equipment to allow locomotive computer and wayside interface units. Its work order system for train crews has been in operation for several months.

"A system configuration starts with our transportation control system. This is our train management system and our car records, inventory system. It operates on a computer that's located in St. Louis, Missouri. This is where we generate all the work reports that go to the crew for set outs, pick-ups, industry spots and industry pulls, right down to the individual conductor. That's connected to what we call an ATCS front end processor controller (FEPCC). It's a communications management that handles the dialogue between the host computer in St. Louis and the mobile locomotives."

"Five times we've overhauled existing communications networks, fiber optic, microwave, lease circuits in some cases, to a radio tower, and then over the RF network out to the train. Now, the RF network is 900 MHz data network to the locomotive on-board computer." reports Jeff Young, General Director ATCS, Union Pacific.

"Some of the benefits of work order reporting are increased service reliability through real time communications. We'll get locomotive reporting, train arrival and train departure reports, in train device reports.

"We need to equip just for work order reporting, locomotives, and we must have captive locomotives to the degree possible to insure that those jobs are equipped. We need to install 220 base stations."

"We've got one service unit, the Nebraska service unit (about a division of railroad lines) that's got 12 base station radios. We've got 30 locals and yard jobs reporting in that Nebraska service unit. We've cut over to the ATCS Communications Specification 200 using the AMI-Harris communications package in a production environment."

"During this year Union Pacific will probably cut in six service units, reports Jeff Young.

"One interesting thing that we found is when we turned on forward error correction we're seeing improvements in coverage in some cases up to 5 to 10 miles over what we had previously," reports Young.

Several railroads have tested the digital data radio links operating in the 900 MHz range. CSX has a test installation in Florida with a 900 MHz base station and a locomotive with an on-board computer.

"CSX Transportation said: 'We've had a small piloting program in the phosphate mining area east of Tampa. We are in the process of bringing a couple of additional base stations on line where we will have a network of three. We are equipping additional locomotives. We're wrestling with the question of whether we will equip the locomotive computer, or whether we use separate vital and nonvital computer and how we integrate the other functions of ATCS with the train control functions."

"We've all come to realize that the key element to fulfilling a data radio network. Once that's established there's a whole number of things that can be applied to it. Train control is one, certainly work order reporting is another. At CSX we're quite interested in a bit of work on applications of locomotive monitoring as well as some of the data radio network," Mott reports.

On the developmental baseline, ATCS specification have been written and approved by the railroads. There are six series of specifications, namely:

1. 100 Universal of ATCS
2. 200 Communications
3. 300 Locomotives
4. 400 Dispatching Of Trains
5. 500 Field Equipment Of Systems
6. 600 Track Forces

Development work is continuing by consultants Raytheon TAD Associates, and Lapp-Hancock & Associates, on testing procedure for the various components and systems of ATCS as well as system safety analysis procedure.

A Communications Interoperability Tester (CIT) will be developed that will make sure that the communications components, whether they be a company or from several, will function satisfactorily together. Reports Peter J. Detmold, Executive Director, ATCS, for the Association of American Railroads.

Also, AAR has approved work to develop the Control Flow Validator (CFV) which should be available by the end of this year. "Using the computer added software engineering technology, it will extend the control flow charts to a full mathematical description to check for errors more thoroughly than could possibly be done by manual methods alone," says Detmold. The control flow provides a detailed description of ATCS system operation.

Canadian National is installing what will eventually be a 30 ATCS system on 180 miles of track in its British Columbia north line in the northwestern part of that province. This territory is now operated by a computer added manual block system, in which the dispatcher prepares his train order on a computer with safety software to ensure that an incorrect train order is not sent to the train crew.

During last summer, the ATCS installation work began with SEL Division of Alcatel Canada doing field work consisting of installing 26 power switch machines, transponders (Vapor Corp.) in the track bed for determining the location of trains, as well as bungalow to house equipment and snow melters on all power switches. Also, 54 locomotives will be equipped with on-board computers, digital data radio (Motorola) and wayside base stations operating on the 900 MHz range.

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The on-board terminal display provides the engineer with the text relating to his movement authorities and the graphical display of the territory over which he is operating. Also, he has a keypad with functions rather than a complete keyboard. The functional keypad makes "input more efficient," reports Walter Friesen, Director of Amketing, SEL Division, Alcatel Canada.

The locomotive on-board computer provides vital supervision, route profile, train tracking including handling inputs from transponders located in the track bed and tachometers mounted on the locomotive axles. Also, the on-board computer processes movement authorities and enforcement covering location, speed and travel direction.

The above mentioned ATCS system uses transponders for train location Burlington Northern's Defense Global Positioning Satellite (GPS) will use 21 Novactar navigation (not communications) satellites that are scheduled to be placed in rotating (not geosynchronous) earth orbit during 1989, 1990 and 1991.

Novactar satellites are broadcast only satellites; the on-board receivers do not transmit any signals back to the satellites.

Kith BN's Advanced Railroad Electronic System (ARES) road locomotives at the head of trains, switching locomotives, high-rail
The key element of ARES is a digital data link system, capable of sending messages in both directions between a control center and a train or any other party on the track. BN is using existing microwave and a new VHF radio system for the data link. The new VHF radio system will consist of dedicated VHF radios that will permit the transmission of digital data from the locomotive, track vehicle or wayside interface unit to a VHF receiver located so that it can access the existing communications network. The ARES data link will utilize a modified datagram packet message format and carrier sense multiple access (CSMA) channel access protocol. CSMA, as implemented in the ARES data link system, optimizes throughput on simplex VHF channels, and has been tested extensively since 1985. BN is using synthesized all-channel radios that have the capability of automatically switching between assigned channels. "As more and more information goes to and from trains and other vehicles over the digital data link, we expect Voice traffic to decrease over time, which in turn, should actually free up additional VHF channels in congested areas. The effective information transfer capacity of a channel assigned to digital data is 20 times greater than that of a channel assigned to voice traffic," reports Steven R. Ditemeyer, Chief Engineer, Research, Communications & Control Systems, Burlington Northern.

Each ARES equipped road locomotive cab has a Train Situation Indicator (TSI) which consists of a pair of cathode ray tube displays to provide train status as well as command and control information to the locomotive engineer. There are two 12-inch screens each providing a full-color display. Normally, one TSI screen displays an "operations page" showing train location and speed, the upcoming route profile, actual throttle and brake settings as well as recommended settings from the Energy Management System, and data from the end-of-train device. This page is where the engineer will receive movement authorities, including speed limits, from the dispatcher, in lieu of paper train orders, voice-transmitted track warrants, wayside signals or traditional cab signals. An on-board computer will automatically monitor and insure compliance with the movement authorities. The TSI will have an "acknowledge" key for the engineer to use to acknowledge receipt of movement authorities.

The other TSI screen will be used to call up a variety of displays, such as track warrants, track bulletins, train consist, car set-out and pick-up instructions, special handling instructions, locomotive health information (from Locomotive Analysis and Reporting System), and any other information that can be sent over the data link. If either screen malfunctions, all the information described here can be called up on the other screen.

BN has equipped 17 locomotives with ARES hardware for an operational demonstration on 230 miles of track in the Mesaba Iron Range in northern Minnesota. All 17 locomotives are equipped with the data links. GPS receivers are on 6 road locomotives designated as "lead" units and on 8 switchers. TSI's have been installed on the 6 "lead" units and simpler displays are on the switchers. Two data link and GPS packages have been placed on high-rail vehicles and 40 wayside interface units have been installed to control and monitor switches and pass on data from wayside detection equipment.

Testing of the system in the Iron Range is continuing. In some instances where conventional signaling is in service, the ARES system is operating in parallel so BN obtains a comparison of the two types of train operations management.
Communications

J. R. Cruz
Communications Editor

February 1990

IEEE Vehicle Technology Society Newsletter

Abstracts

"The Intelligibility of Amplitude Companded Sidelband Modulation Compared to Conventional Frequency Modulation," W. A. Kieck and L. T. Jones, NJU Report 203-47, June 1989. Amplitude companded sidetone (ACSB) is a narrow-band modulation technique that is now being used in land mobile radio. Land mobile communication is a necessary element of law enforcement activities, and it must meet certain requirements in terms of effectiveness. A number of the more important requirements are adequate speech intelligibility. Based on the assumption that the accepted minimum performance standard for measuring speech intelligibility in convectional FM (12 dB SINAD) represents the minimum (or acceptable) intelligibility, the values of objective performance measures for ACSB that produce this level of intelligibility have been determined. The Articulation Score (AS) is used as the subjective voice quality measure. The experiments reported here show that the intelligibility of ACSB operating at 12 dB SINAD (and an audio-to-pilot ratio of 10 dB) is as good as the same conventional FM operating at 12 dB SINAD.

"Characterization of UHF Multipath Radio Channels," 'Thesaurus T. Rappaport, IEEE Transactions on Antennas and Propagation, Vol. 37, No. 8, August 1989. Wideband multipath measurements at 1300 MHz have been made in five factory buildings in India. Root mean square (rms) delay spread measurements were taken between range 30 to 300 ns. Median values of rms 96 ns for line-of-sight (LOS) paths along alesles and 105 ns for non-LOS paths. A UHF channel model based on 300 ns was measured in a modern open plan metal-working factory. Delay spreads were not correlated with transmitter-receiver orientation topology, but were affected by factory inventory, building construction materials, and wall locations. Wide band path loss measurements consistently agreed with the received wave (CW) measurements at identical locations. It is shown here that such empirical data suggest independent and identical uniform distribution forms in the overall and the multipath signal components. Average factory path loss was found to be 27 dB compared to 2.2 power. Wideband fade propagation measurements have not been previously reported in the literature.

"Objective Speech Distortion Measures and Their Relevance to Speech Quality Assessments," S. Dimolaee, IEEE Proceedings, Vol. 135, Pt. 1, No. 5, October 1989. The paper presents a review of several commonly employed objective speech distortion measures and their relevance to subjective assessments of speech quality. Since many of the objective measures described in the paper have been covered previously in other papers, a few have been concentrated primarily on three aspects. First, the philosophy of progressively constrained and non-constrained measures is considered in order to incrementally improve their capability to predict subjective quality (typically done at the expense of complex calculations). Second, the relation of objective measures to the use of objective measures as complementary tools to subjective evaluations, and thirdly, on the methods for evaluating the relative performance of different objective measures.

"Priority Oriented Channel Access for Cellular Systems Serving Vehicular and Portable Radio Telephones," D. Hong, and S. S. Rappaport, IEEE Proceedings, Vol. 136, Pt. 1, No. 5, October 1989. A priority oriented channel access scheme for cellular mobile radio telephone systems serving vehicular and portable radio telephone users is described. The calls generated are divided into three different classes: new vehicular calls, new portable calls, and hand-off calls. Priority is given to hand-off calls over new calls and to vehicular calls over portable calls. Appropriate algorithms, models, and criteria are developed and used to derive performance characteristics. Blocking and forced termination FM Demodulation of packets of various kind of users are determined as functions of system parameters. Noncompleted call probability is defined as a useful performance measure and used in the derivation of call causing priorities and hand-off procedures on performance characteristics are investigated. General formulas are given and specific numerical results for nominal system parameters are presented.

"Effects of Selectivity Diversity on Error Performance of Digital Mobile Radio Data Systems," M. Pajanic, J. A. Edwards, and I. S. Stojanovic, IEEE Proceedings, Vol. 136, Pt. 1, No. 5, October 1989. The effect of selectivity diversity reception on the error performance of the digital mobile radio systems is investigated. Binary frequency shift keying (FSK) system using non-coherent (VC) demodulation at the base band or a serial demodulator/ discriminator receiver is considered. All major error causing factors, fading and Gaussian and impulsive noise, are taken into account. The corresponding general expression for the error probability (BER) is derived. This expression is used to calculate the BER whose large 200 ns of variance was chosen as the system model gained by the M-brach selection diversity technique.

"GSNK With Limits Discriminator Integrator Detection in Satellite Mobile Channel," I. Korn, IEEE Proceedings, Vol. 136, Pt. 1, No. 5, October 1989. The authors consider the optimal response of partial response frequency shift keying with limited discriminator integrator detector and with different decision feedback phase提前 of the multiple channel, which is considered as special cases the Gaussian channel and the land mobile channel. One can apply the formulas to Gaussian minimum shift keying and complete the error probability as a function of energy to noise ratio and other system parameters (Doppler frequency, Doppler bandwidth, frequency offset and ratio of power in the direct and diffuse signal components).

"Signal-to-Interference Calculations for Balanced Decision Patterns in Cellular Communication Systems," C. K. Wang, and Stephen S. Rappaport, IEEE Transactions on Communications, Vol. 37, No. 12, December 1989. The effects of adjacent channel interference, together with cochannel interference, for fixed channel assignment patterns, are considered in this paper. The paper emphasizes on the use of objective measures as complementary tools to subjective evaluations, and thirdly, on the methods for evaluating the relative performance of different objective measures.

"On the Performance of Spectrally Efficient Trellis Coded Modulation Employing Noncoherent FM Demodulation," Donald L. Schilling, and Radmore Borovies, IEEE Proceedings, Vol. 137, No. 7, September 1989. This paper analyzes the problem of noncoherent FM demodulation of trellis coded constant-phase M-ary FSK. The FM demodulation process is divided into two parts: first, a forced termination FM demodulation and the second being trellis decoding of the data. Upper bounds on the bit error rate as well as the 99 percent confidence bounds are derived for the codes under consideration.

In particular, we consider trellis codes with rates 1/2 and 2/3 with symmetric and asymmetric signal constellations. Upper bounds on the probability of error are obtained for the symmetric and the optimum asymmetric signal constellation. Finally, a formula which minimizes the bit error probability. The performance of this code for 'Blind' fading is extended to the case of noncoherent demodulation using FSK modulation employing noncoherent detection.

"Performance of Interleaved Trellis-Coded Differential 8-PSK Modulation Over Fading Channels," Francis E. Gams, IEEE Journal on Selected Areas in Communications, Vol. 7, No. 9, December 1989. The performance of interleaved trellis-coded differential phase shift keying (coded 8-PSK) with differentially coherent detection and soft decision Viterbi decoding is investigated. The impact of the imperfect BPSK whose 700 ns of variance was chosen as the system model gained by the M-brach selection diversity technique.

"An Efficient Modulation/Coding Scheme for MF SK Systems on Bandwidth Constrained Channels," Guillermo E. A. Atkin, and Hector P. Corrado, IEEE Journal on Selected Areas in Communications, Vol. 7, No. 9, December 1989. The performance of a bandwidth efficient scheme for multimode transmission of encoded trellis coded data is simulated with a computer simulation program. The performance of the bandwidth efficient scheme is compared to different schemes using the same signaling codes. The unquantized outputs up to 3 symbol detectors with delays of 1, 2, and 3 symbol periods are used for metric computation. The performance of these schemes is determined by the error probability as a function of energy to noise ratio and other system parameters. Interference and frequency error sensitivity is shown to be 2.5 dB at BER = 10^-6 with respect to uncoded 4-PSK.

Much larger gains are achieved for fading channels if interleaving is applied. Furthermore, the performance is determined on Rayleigh and Ricean channels for various Doppler spreads and interleaver sizes.


Conventional digital modulation schemes provide poor performance over moderately and severely fading channels without the use of coding. The drawback of applying 8PSK to blocks of recently developed trellis coded modulation schemes to such channels is that they require coherent detection to achieve their full potential. The paper describes TCMP, a novel modulation strategy for Ricean fading channels, which multiplies a time domain pilot sequence with trellis coded data to permit coherent detection. This technique is shown to provide remarkably robust performance in the presence of fading. It is also shown that when choosing trellis codes for fading channels, time diversity is of greater importance than asymptotic coding gain. The motivation for switching this strategy to a signaling scheme for transmitting data at 4.8 kbit/s rate over a mobile satellite channel, with 5 kil channel spacing.


Achieving reliable digital communications over fading channels is one of the main challenges in high-speed data networks. The efficiency of the existing schemes for reducing the bit error rate (BER) for fading channels, in particular, for time diversity signaling. Recently it has been shown, however, that bandwidth efficient data transmission for fading channels using wideband coded modulation, introduced for the AWGCH channel, is also feasible on fading channels, and that the Chernoff bounding technique can be used to obtain performance bounds for bandwidth efficient trellis codes on fading channels with various degrees of side information. It has been shown that the Chernoff bound is one of the most important design parameters for trellis coded modulation schemes. Continuous phase modulation techniques employing noncoherent detection.

"Performance of Interleaved Trellis-Coded Differential 8-PSK Modulation Over Fading Channels," Francis E. Gams, IEEE Journal on Selected Areas in Communications, Vol. 7, No. 9, December 1989. The performance of interleaved trellis-coded differential phase shift keying (coded 8-PSK) with differentially coherent detection and soft decision Viterbi decoding is investigated. The impact of the imperfect BPSK whose 700 ns of variance was chosen as the system model gained by the M-brach selection diversity technique.

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Vehicular Electronics

Bill Fleming
Vehicular Electronics Editor

NEW PRODUCTS

Automatic Parking System -- The VW Futura concept vehicle, displayed at the 1989 Frankfurt Auto Show, features an automatic parking system [1]. The driver steps ahead of, near to, or behind a parking space. Laser and ultrasonic sensors provide a "picture" of the parking situation. Sensors scan the space while ultrasonic sensors detect obstacles in front or behind the car. Ultrasonic sensors use their broadband sounding to detect objects, and also to precisely measure the distance from the car. It is claimed that the system can also be used to maintain safe distances from other vehicles while driving under poor visibility conditions.

Adjustable Damping Suspension -- The Dodge Daytona Shelby and Chrysler LeBaron 1990 models introduce driver-adjustable damping on their suspension systems [2,3]. The system, supplied by Monroe Auto Equipment Co., can be manually set to either: firm, normal, or soft settings. The hydraulic shock absorbers have three sets of orifices, wherein rotating shutters uncover orifices corresponding to selected damping settings.

The next economical step towards an active suspension control system would be closed-loop damping systems such as the Hysed (Hydraulically Actuated Remotely Adjustable Dampers) System currently being developed by Hysed Corporation in Tuscaloosa [4]. This system utilizes fast-acting servo valves to make large and/or small changes in damping rates within milliseconds, based on sensor inputs from: vehicle brakes, steering, throttle, wheel speed, etc.

Electronic Engine Mounts -- The 1990 Honda Accord includes electronically controlled engine mounts. The mount contains two fluid-filled chambers, separated by a valve. Below 650 rpm, the valve opens to allow both chambers to more effectively dampen larger-amplitude engine vibrations. At higher engine speeds, the valve shuts and the mount becomes firmer.

Mercedes Mobile Office -- The 1990 Mercedes-Benz S-Class vehicle offers a "mobile office" option [6,7]. This option includes a personal computer, ink-jet printer, telephone, and facsimile machine. Fax messages and phone messages are received even when the vehicle is left unattended. Pricing for this option has not been announced (but then again if you have the money, it's probably not for you).

Vehicle Security -- The business of deterring vehicle theft keeps getting bigger. The FCC has established a nationwide radio frequency spectrum allocation for use by stolen vehicle tracking systems [4]. The frequency of 173.075 MHz, formerly used by the FBI (and undepliably close to the audio spectrum of television channel 7), has been licensed to LoJack Corporation of Needham MA for use in tracking stolen vehicles.

Other companies such as Code-Alarm in Madison Heights MI, TrackMobile in San Diego CA, and PacTel Telesprac in Los Angeles CA -- all sell $500-to-$1000 electronic products designed to electronically track the location of stolen vehicles [9].

Just as these technologies are being developed in an effort to support the law, other technologies ironically appear to be under development for just the opposite reasons.

Detector Radar Wars Heat Up -- Cincinnati Microwave has announced its new digital signal processing radar detector which "uses technology currently used by NASA to create detailed space photos [10,11]." This technology has improved the detector's radar detection sensitivity by 9 dB and reduced its power consumption by a factor of 50. The battery-operated unit, called Solo, superseded the Escort detector model and retails for $245.

Escalation in Canada -- Meanwhile, Canada has been increasing the war on radar detectors [12]. Canada has made the use of radar detectors illegal in 7 of its 12 provinces. But the Catch-22 was obvious: detectors allow drivers to exceed their 100-km/h speed limit because of their advance warning of radar. This allows for speeding, and therefore of protecting possession of the detector.

Radar detector wars have, however, escalated. The Ontario Provincial Police now use the VW Futura Automatic Parking System Sensor Layout

WV Futura Automatic Parking System Sensor Layout

Mercedes Mobile Office Sensor Option

VO-2, affectionately called the "vee-gee" [12]. This device detects leakage radiation of the local oscillator frequency in the driver's radar detector. The VO-2 is therefore essentially a radar detector or "jammer." Due to cost, and the need to detect both X-band and K-band police radar, all radar detectors use the very same 11.55-GHz local oscillator frequency. This makes it easy to build an effective VO-2 detector.

Added cost and added size will prevent most detector manufacturers from redesigning their units to avoid police detection.

It's Not A Game -- Over 10,000 illegally operated detectors were seized in Ontario and Quebec in 1988. Radar detectors are confiscated in Canada for one main reason. "On the congested highway 401, use of detectors has contributed to higher speeds and an accident rate well surpassing last year's rate [12]."

Technology: The End and Begins? Not Yet -- To summarize, these are technologies for and against the law. Vehicle tracking and radar detector technologies are definitely designed for use in enforcing the law. While police-radar digital-signal-processing detector technology is definitely against the spirit of the law.

As far as I know, it is not, and never has been, a constitutional right in the USA to have the freedom (and the tools, i.e., radar detectors) to break speed limits -- and it certainly isn't so in Canada [12].

INTELLIGENT VEHICLE HIGHWAY SYSTEM

Delphi Corporation -- Under the coordination of the University of Michigan Transportation Research Institute, a delphi panel of 30 experts predicted that the full intelligent vehicle highway system (IVHS) would not be implemented.
WE ALL NEED TO PITCH IN

From time to time in this column, I have mentioned the importance of each individual member getting involved in the legislative process through contact with his or her representative. Per the National Government Activities policy outlined at IEEE's Annual General Meeting, all members are encouraged to contact IEEE at the Washington, D.C. office on current legislative matters, such as the Legislative Report, Hotlines and Legislative Alerts.

In a recent piece in IEEE IMPACT, a newsletter for those active in professional actions, Jack labkowski, Chair of the IEEE-USA Government Activities Council, urged everyone to become involved. Dr. labkowski's participation in IEEE has been extensive, and he brings to us his IEEE experience as an IEEE Congressional Fellow with Senator John Glenn's Staff. In his article he explains the process of creating the IEEE-USA Federal Legislative Agenda and how an Initiative is derived from it. He also makes us aware of the extensive work that volunteers are doing on our behalf. Further he firmly makes clear the involvement of the interest of each of us. Jack presents such a well-defined view of this vital subject that I shall just proceed to quote from his article.

"Many of you have probably already learned something about IEEE-USA's "Legislative Initiative." It is one of the most ambitious efforts IEEE has ever undertaken. This Initiative was developed collaboratively by representatives of each of IEEE's 5 councils. It focuses on priorities and competitions of two vital issues that concern U.S. members. A lot of hard work and dedication has already gone into the legislative initiative effort, but its success of failure will depend on participation by all U.S. members, not just a few.

Why Pensions and Competitiveness?

IEEE-USA is concerned with a wide range of issues, all of them important in the long-term development of our nation. Before focusing on pensions and competitiveness, it is important to note that IEEE-USA's legislative agenda for the 104th Congress was developed.

IEEE-USA's Federal Legislative Agenda combines summaries of IEEE's views on a wide range of technical and professional issues into a single, short document. It includes an index of terms and abbreviations and a glossary of IEEE-USA's legislative agenda. This document describes the process involved to

1. "Using IEEE-USA's leaders narrow down into nine areas the breadth of U.S. members' interests was like seeing a miniature congress at work. Prior to meetings, and Fosters represented two of representatives of each of the five IEEE-USA councils"
News From Washington

Eric Schimmel
Washington News Editor

AN INTERESTING YEAR AHEAD FOR MOBILE RADIO

Following a hiatus of activity while the lame duck FCC was cleaning out its drawers, a stream of interesting proceedings has begun to flow from the newly constituted Commission. Among items of particular interest to the land mobile radio community are two Notices of Inquiry (NOI’s). Docket 88-441 (reproduced below) poses 25 questions regarding the desirability of encouraging the use of digital technology in the Public Safety Services. With the introduction of digital cellular equipment just around the corner, the regulatory pressure for the traditional FM services to adopt more spectrum efficient technologies is inevitable. Interested parties may file comments in the proceeding by March 16.

A second NOI (Docket 89-554), is the first proceeding to prepare a U.S. position to the 1992 World Administrative Radio Conference (WARC) which will make global spectrum allocation decisions, primarily in the 1 to 3 GHz range. Comments and reply comments are due February 16 and March 16 respectively. If you have a strong interest in this matter, I urge you to consider participating with the U.S. CCR delegation and preparatory advisory committee.

Another spectrum related proceeding is an NOI issued by the U.S. Department of Commerce’s National Telecommunications and Information Administration (NTIA) which proposes to study spectrum use and management and may lead to some reallocation or sharing of government bands. NTIA seeks comment in five major policy areas:

The Regulatory Process - NTIA requests comments on improving the regulatory process by which NTIA and the FCC manage the spectrum. It asks for comments on such areas as improving FCC and NTIA domestic management practices, coordination, and U.S.

preparations and participation in international agencies such as the International Telecommunications Union. In particular, NTIA is interested in improving procedures that hinder the interchange of new international standards and technologies, in order to promote efficient access to the spectrum and to enhance U.S. international competitiveness.

Block Allocation - The current system of allocating radio frequencies in blocks – a system in use since the invention of radio – has a number of problems. The present system can be overly rigid and can impede innovation and the introduction of new technologies, especially when a new radio communication application is developed that does not conform to one of the existing defined radio services. There may be excess demand for particular blocks, while other blocks may be underused. NTIA’s Notice requests comment on the extent of these problems and ways of addressing them.

Alternatives for Apportioning Spectrum - NTIA’s notice requests comment on a number of specific alternatives that meet the current criteria that it and the FCC use for allocating and assigning spectrum, with the goal of identifying more efficient and equitable alternatives. The notice examines such alternatives as “flexible use” concepts, auctions, and leasing arrangements. These latter proposals would increase government revenues.

Spectrum Conservation: Technology Issues - NTIA is examining the role that technology can play in conserving the spectrum resource. As part of its examination, NTIA requests comment on costs and benefits of present technical standards for radio systems, and their effects on innovation. It also is studying the effects of alternatives to spectrum use – such as fiber optics – on the availability of spectrum for other purposes.

Forecasting Future Spectrum Requirements - NTIA recognizes that the forecasting of future spectrum requirements and long range planning are fundamental tools for an orderly spectrum management process. NTIA requests comment on how it and the FCC can best identify current and future spectrum needs and jointly determine how those needs can best be accommodated.

Comments are due on February 23, 1990, and reply comments are due on March 30, 1990.

Lastly, the FCC has issued a Notice of Proposed Rulemaking (Docket 89-552) for narrowband operations in the 220-22 Mhz band. Comments to this proceeding are due March 15. Depending on space available, the editor’s prerogative, exceptions may or may not be included in this issue.
Economic Considerations

8. One of the most important factors that will influence the possible conversion of the public safety radio services to digital radio is the need to ensure that the benefits of adopting digital are worth the cost. This issue is explored in the following sections within the context of three areas: the price of digital radio equipment; the investment by users in embedded equipment; and the decisions of other land mobile services with regard to digital conversion.

Equipment Cost

Question 8:

a. If and when public safety digital radio equipment is introduced, are digital systems (for either voice communication or data transmission) likely to be more expensive than analog systems? How much more? Will the price of digital drop to the level of analog? When?

b. Would public safety users be inclined to continue using analog until the cost of digital drops to the level of analog equipment, or would they be willing to pay extra for the voice communications features that may be offered by digital? How much more?

Investments

Many public safety licensees have invested considerable amounts of money in their analog radio systems, and others will be purchasing new systems in the next few years as regional public safety plans are developed and licensing begins in the 821-824/866-869 MHz bands.

Question 9:

a. Over what period of time do public safety agencies amortize their investments in radio systems, or alternatively, what is the typical replacement cycle for public safety radio equipment?

b. Is there a possibility that users will be willing to exchange their analog equipment for digital before the analog equipment has to be replaced?

c. If the public safety community decides to adopt digital technology, how long after that time could digital radio equipment be manufactured and made available to users?

Land Mobile Influence

Question 10:

a. What is the likelihood that the private land mobile services (other than public safety) will turn to digital in the near future? When is this likely to occur?

b. Most of the users involved in the production of public safety radio equipment also produce equipment for the other land mobile radio services. If these services, which represent a significantly larger market to manufacturers than does public safety alone, convert to digital, will the public safety community also switch to digital? Conversely, would a move by the public safety community to digital encourage non-public safety services to adopt digital technology?

c. Should public safety users delay adoption of digital until other land mobile digital systems are proven to be effective?

INTRODUCTION

1. On September 6, 1988, we issued a Report and Order in General Doct No. 97-14 (Allocation Order) reallocating the 220-222 MHz band from the fixed, land mobile, and amateur services to provide public safety licensed land mobile radio use.

2. In the Allocation Order, we required that licensees identify the location of the newly-allocated band in another proceeding. On November 21, 1988, we received a Petition for Rule Making (UPS Petition) filed on behalf of Unied Parcel Service of America, Inc. (UPS). The UPS Petition urges that we initiate a rule making to establish those services, rules, and sets forth proposals that UPS believes will optimize spectrum efficiency in the band. We are issuing this Order to propose Rule Making for the purpose of proposing service rules for the band and inviting comments on the proposal.

3. In general terms, UPS proposes that the 220-222 MHz band be divided into two hundred 5 kHz channel pairs. UPS also proposes that there be no restrictions on access to any of the frequencies based on eligibility under the subparts of Part 90 of our Rules. Rather, UPS proposes that the two hundred channels be divided into twenty 10-channel blocks, with six blocks set aside for nationwide and local assignments to single licensees for a period of two years from the date we begin accepting applications.

4. Under the UPS proposal, the nationwide-channel block and any thirty-five conventional channel bands would be set aside exclusively for use a period of two years from the date we begin accepting applications. UPS further proposes that the nationwide-channel block and the nationwide-channel bands be set aside exclusively for use a period of two years from the date we begin accepting applications. UPS further proposes that the nationwide-channel block and the nationwide-channel bands be set aside exclusively for use a period of two years from the date we begin accepting applications.

5. From a technical standpoint, UPS proposes to establish a maximum transmitter effective radiant power (ERP) of 500 watts and an antenna height above average terrain (HAAT) of 500 feet. resulting in a 70 mile co-channel base station separation. According to UPS ERP proposal, permissible ERP would be reduced to the HAAT increase to maintain a 70 mile co-channel base station separation. According to UPS ERP proposal, permissible ERP would be reduced to the HAAT increase to maintain a 70 mile co-channel base station separation.
55. Emissivity, Mark. UPS proposes a transmission power spectral density emission mask designed to minimize energy specularly into adjacent channels and thus avoid a coordination requirement for transmitters on adjacent channels. The emission mask proposed by UPS requires no emission attenuation for frequencies up to 1.8 kHz offset from the center of the authorized channel. Attenuation of emissions for frequencies offset by 1.8 kHz from the center of the authorized channel would increase until frequencies that are 2.5 kHz offset are attenuated by 70 dB and attenuation for frequencies beyond 2.5 kHz from the center of the authorized channel would increase until frequencies 5 kHz and more removed are attenuated by 80 dB. Lacking definitive information at this time, we are proposing to utilize this emission mask for all systems regardless of the modulation technique utilized. However, because there was concern in the comments that the mask was overly restrictive and would result in uneconomical equipment, we are requesting comments on the feasibility of adopting a less restrictive mask that would enable adjacent channel operation with minimum interference. We have also proposed specific measurement requirements and request comments on them as well as suggested alternatives.

56. Frequency Tolerance. UPS proposes a frequency tolerance of ±0.0001% for base stations and ±0.00015% for mobile and portable units operating in this band. The comments agreed that these tolerances were reasonable from an economic and a performance standpoint. We are therefore proposing these frequency tolerances for equipment in the 220-222 MHz band.

Communications (cont. from p. 11)

By using a pulse amplitude modulation representation of the binary continuous phase modulation signals, we develop a new optimum Viterbi sequence detector and a new optimum Viterbi receiver with low complexity. Also, for the modulation index 0.5 where a linear receiver is used, a minimum mean-square error linear receiver filter is derived. Their performance is analyzed. The Gaussian minimum shift keying signal (GMSK) is used for illustration. It is shown that an MESK receiver consisting of two matched filters and a four-state Viterbi algorithm performs with less than 0.24 dB degradation compared with the optimal receiver. The linear receiver is optimum for all values of Eb/N0 (bit energy to noise on-sideband spectral density ratio). A design method for the filter is given. The filter is equivalent to a cascade of a matched filter and a Weaver filter estimator. Both an upper and lower bounds for the error probability of this filter are calculated. Simulation results which confirm the analysis are also given.
CALL FOR FELLOW NOMINATIONS

Nominations for Fellow Members can be submitted by any Member, Senior or Fellow of IEEE. At least five Fellow Members must support the nomination. The nominations are evaluated and scored by the VTS Fellows Evaluating Committee, which submits the nominations to the IEEE Fellow Committee who recommend the highest grade nominations to the IEEE Board of Directors. Approximately 400 nominations are received each year and approximately 240 are nominated. It is important that qualified Members upgrade their status to Senior Member in order that their peers can nominate them for Fellow membership. Fellow nominations are confidential until a nominee has been elected, preferably the nominee should not be aware of his or her nomination but this is quite difficult because some information is available only from the nominee.

The qualifications for Fellow Grade are established by the IEEE Bylaws. The grade of Fellow recognizes unusual distinction in the profession and shall be conferred only by invitation of the Board of Directors upon a person of outstanding and extraordinary qualifications and experience in IEEE designated fields (including electrical engineering, electronics, computer engineering and computer sciences), who has made important individual contributions to one or more of these fields, that have been reflected in an improved quality of life for society.

In July 1989 the Vehicular Technology Society had 2,734 active members of all grades, 333 Senior Members and 83 Fellow Members. The six new Fellow Members who were elected in November 1989 are:

Philip Thomas Porter, Bell Communications Research, Inc., Red Bank, N.J.

Anthony Joseph Runtako, Jr., AT&T Bell Laboratories, Holmdel, N.J.

Louis M. Naga, GM Research Labs., Warren, MI

Kyohi Fujimoto, University of Tsukuba, Institute of Applied Physics, Sakura, Ibaraki, Japan.

Umberto Mengali, Instituto Di Elettronica, Pisa, Italy

Carl E. Sandberg, AT&T Bell Labs, Murray Hill, N.J.

For information about nominations, contact:
either R.A. Urick, Chairman of VTS Fellow Search Committee, 1215 Henry St., Berkeley, CA (510) 520-1446

or Peter McLean, E.E. Dept., Queens University, Kingston, Ontario, Canada K7L 3N6 (613) 542-2937.

The Chairman of the VTS Fellow Evaluating Committee is Jerome G. Rivard, 31078 Rivers Edge Court, Birmingham, MI 48010 (313) 646-4560.
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ADVANCE CONFERENCE REGISTRATION
1990 IEEE Vehicular Technology Conference

Sheraton Plaza Hotel, Orlando, Florida May 6-9, 1990

TO INSURE YOUR CONFERENCE REGISTRATION, PLEASE NOTE: No telephone registrations can be accepted. Do not mail conference registration form without payment; only paid registrants can be processed. Be sure that all registrant names are enclosed with all checks, both personal and company. You will receive a receipt and ID badge on check-in at the conference. Hotel reservations must be made with the hotel. See the attached hotel reservation form.

Registration Fees

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Registration (excluding IEEE Student/Life Member) includes reception, 3 luncheons, and conference record.

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Total Enclosed (checks payable to VTC '90): $5

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Last Name
First Name
Company/Organization
City
State/Province
Zip/Postal Code
Telephone (with area code)

February 1990
IEEE Vehicular Technology Society Newsletter

Advancement Conference Registration
1990 IEEE Vehicular Technology Conference

Sheraton Plaza Hotel, Orlando, Florida May 6-9, 1990

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# Advance Conference Schedule - VTC '90

**Saturday, May 6**
- **8:30 AM - 12:00 PM**
  - Session 1: Antennas
  - Session 6: System Design
  - Session 10: Spectrum Efficiency
  - Session 17: Modulation Techniques
  - Session 5: Vehicular Electronics
- **12:00 PM - 1:30 PM**
  - Keynote Luncheon
- **1:30 PM - 5:00 PM**
  - Session 2: Hardware Circuits
  - Session 7: Microwave Engineering
  - Session 26: Channel Assignments
  - Session 18: Modulation Techniques
  - Session 16: Propagation
- **5:30 PM - 7:30 PM**
  - Panel Discussion on Digital Cellular Technologies

**Sunday, May 7**
- **8:30 AM - 12:00 PM**
  - Session 3: Hardware and Circuits
  - Session 8: System Design
  - Session 14: Data Transmission
  - Session 19: Modulation Techniques
  - Session 4: Land Transportation Systems
- **12:00 PM - 1:30 PM**
  - Awards Luncheon
- **1:30 PM - 5:00 PM**
  - Session 22: Hardware Circuits
  - Session 9: System Design
  - Session 21: Propagation
  - Session 23: Channel Coding
  - Session 28: Mobile Satellite Technologies
  - Session 24: Propagation
  - Session 12: System Design
- **5:30 PM - 7:30 PM**
  - Panel Discussion on Digital Cellular Technologies

The reception and luncheons require tickets which you will find in your registration packet. Extra tickets may be purchased. See the advance registration form.

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# VTC '90 TECHNICAL PROGRAM

**SESSION 1: ANTENNAS**

- *Multiple FM Window Antenna System for Scanning Diversity with an Integrated Processor*  
  - J. K. Lindemann, L. M. Rall, J. P. Hopf - Universität der Bundeswehr München, Germany
- *A New Enhanced-Bandwidth Internal Antenna for Portable Communication Systems*  
  - Josef Rasinger, Arpad L. Schultz, Ernst Bonek - Technical University, Vienna
- *An Elevated Microstrip Antenna for Cellular Radio Handholds*  
  - Andy McGirr, Paul Carew - Novatel Communications, Canada
- *Vehicle Terminal Antennas for Mobile Satellite Applications*  
  - A. Kumar - Agilent Electromagnetic Inc., Canada
- *A Multipurpose Flush-Mounted Antenna System for Satellite-Land Mobile Communications and Positioning*  
  - J. Gadamer, G. Gerloch, M. L. Hernandez, G. Martin, J. Vazquez - C.S.I.C., Madrid, Spain

**SESSION 2: HARDWARE AND CIRCUITS I**

- *A New Generation of High-Power Cellular Boosters*  
  - Radoslaw J. Jakubowiski - The Antenna Specialists Co., Cleveland, Ohio, U.S.A.
- *On the Behavior of the LINC Transmitter*  
  - Fernando Casadevall, Juan J. Olmos - Universidad Politecnica de Catalunya, Barcelona, Spain
- *Amplifier Linearity Using Pre-Distortion*  
  - M. Faith, T. Mattison, W. Yates - Postgraduate Institute of Technology, Australia
- *A Linearizing Predistorter with Fast Adaptation*  
  - James K. Coates - Simon Fraser University, Canada
- *Acoustic Noise Suppression Using Regressive Adaptive Filtering*  
  - R. A. Goodwin, R. Haber, H. M. Kaloust - Carleton University, Canada

**SESSION 3: HARDWARE AND CIRCUITS II**

- *Dielectric Receiving Multi-Band Fitting Filter for Cellular Base Stations*  
  - Toshio Nishikawa, Kikuo Watano, Jun Nattori, Yoshio Ishikawa - Morita Manufacturing Co., Japan
- *Dielectric Filter with Attenuation Poles*  
  - Tomotaka Kuniyama, Kazuaki Gyuji - Oki Electric Industry Co., Japan

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**SESSION 4: LAND TRANSPORTATION SYSTEMS**

- *An Interactive Train Operations Simulator for Integrated Applications in Transit Systems*  
  - Stuart R. McKay, Floyd J. John, Graham E. Dawson - Queen's University, Canada
- *Mobile Data Transmission in a Railway Transit Environment*  
  - Alfred F. Mautchke, Ramsay P. Deckor - Automated Monitoring and Control Intl, Omaha, Nebraska
- *Electromagnetic-Induction Vehicle Sensor Detecting the Gradient of Magnetic Flux*  
  - Takuya Fujimoto, Masaaki Mizuno, Kenji Kanayama - Ororon Takabi Electronics Co., Japan
- *ATCO RF Channel Modeling Using Computer Aided Engineering*  
  - Edward L. Fulman, Hamil R. Shant - Automated Monitoring and Control Intl, Omaha, Nebraska
- *Inductive Power Transfer to an Electric Vehicle: Analytical Models*  
  - Maroohood Eghbali - Systems Control Technology, Inc., Palo Alto, California

**SESSION 5: VEHICULAR ELECTRONICS**

- *Vehicle Distance Sensor Using a Segmented IR Laser Beam*  
  - J. Duetsch, P. Schnibel, E. Rife - Wild Leitz Ltd, Switzerland
- *Indoor Wireless LAN Access Methods for Factorization*  
  - Edward Le, R. H. S. Hardy - Simon Fraser University, Canada
- *Development of an Autonomously Guided Vehicle for Indoor Propagation Measurements*  
  - Lynn H. Altma, Theodore S. Jagapathy - Virginia Polytechnic University, Blacksburg, Virginia
- *Development of Input Interface IC for Automotive Electronic Control Unit*  
  - Norio Fujita, Koichi Murakami, Masahiro Shimamura - Nissan Motor Co., Japan
- *A P/2 Based General Purpose Engine Analyzer*  
  - Giorgio Rizzoni, Francisco T. Connolly, Yong Dong, Peter M. Olin - University of Michigan, Ann Arbor, Michigan
SESSION 6 SYSTEM DESIGN I

"European Perspectives on Search Generation Personal Communication Systems"
Grossi Guido, Gerard Macluskie - Fondazione Ugo Bordoni, Rome, Italy

"A Study on System Compatibility of Cellular Systems"
Kim Bok Tae, Koji Ishibashi, Kyoto Nagoya-Nippon Telegraph and Telephone, Japan

"A Consideration of TMDA Cellular Radio System"
Yoshihiko Shigemoto, Torinohira, Kousei Takahashi, Tohoku University, Japan

"Ouage Predictions for Digital Cellular Radio Systems"
Gerd Sobel, D.H. Binn - Georgia Institute of Technology, Atlanta, Georgia

SESSION 9 SYSTEM DESIGN III

"Transmission Techniques for Terrestrial Aeronautical Public Correspondence Systems"
Giovanni D'Alba, Renato Zingarelli - Centro Studi e Laboratori Telecommunications, Torino, Italy

"Applications Systems Based on Mobile Satellite Services"
S. Thomas Whipple - Tektronix, Berkeley, California

"A Proposal of Time-Division, Time-Compressed Multiplexing FM Mobile Radio System"
Shinji Takita - Nippon Electric Co., Japan

"Integration of Air Ground ATC Data Links"
Motohito Sato - Fujitsu, Paul Payne - E-Systems Inc., St. Petersburg, Florida

"Mobile Satellite Broadcast Systems Design"
Gary Norre - Satellite Radio Corp., Pasadena, California

SESSION 10 SPECTRUM EFFICIENCY

"Narrowband FM Cellular System"
Steve Levine, Scott Gentry - Motorola, Inc., Schaumburg, Illinois

"On Spectrum Efficiency in Terrestrial Cellular Air- 
Ground Communication Systems"
Masahiro Nakajima, Akihiko Honma - Nippon Telegraph and Telephone, Japan

"Evaluation of VHFB, SSBS, and ACCR Systems in the Interface Context of the Land Mobile Band"
H. Bouchier, H. M. Hall - Department of Communications, Canada

"Standards Efficient Signal Sets with Partitioned Equivalentcorrelated Properties for the AWGN Channel"
Guillermo Atkin, Ranon Khazin - Illinois Institute of Technology, Chicago, Illinois

"Rayleigh Fading Compensated QPSK Coherent Mobile Radio Modems Operated at a Practical 2 b/s/Hz Efficiency"
Srinath Turaga, Laila Fehy - University of California, Davis, California

SESSION 11 SYSTEM CONTROL

"Evaluation of a Proposed Handover Algorithm for the GSM Cellular Telephone System"
Wolf Meende - Fern University, West Germany

"Control Channel Structure and Radio Link Control for Narrow Band TMDA Digital Radio Systems"
Satoshi Ohsato, Jinn Tazawo, Takahiro Uda, Naruhito Umeda - NTT Radio Communications Laboratories, Japan

"Handover Criteria for a City Microcellular Radio System"
S. B. Stolper, J. R. Waber - British Telecom Research Laboratories, United Kingdom

"Time-Slot Management in Frequency Reuse Digital Portable Radio Systems"
Richard Bernhardt - Bellcore, Red Bank, New Jersey

"Multiple-Call Hand-Off Procedures for High-Capacity Cellular Communication Systems"
Stephen Rappaport - State University of New York, Stony Brook, New York

SESSION 12 SYSTEM DESIGN IV

"Design Concepts for a TMDA Mobile Radio System"
Mitar Karamatic, Nobuo Nakajima, Akihiko Honma, Masaharu Hata - NTT Radio Communication Laboratories, Japan

"In-building Portable Telephone System"
Kazuhito Oshita, Akihiko Suzuki, Tadashi Ishi - Tokyo Electric Power Co., Japan

"Traffic Statistics, In a Self-Organizing Cellular Telephone System"
Ray Latoff - Bell Atlantic Management, Inc., Arlington, Virginia

"An Improved Integrated Voice/Data Mobile Radio System"
H. S. Stover - Stanford University, Texas, Texas

"Future Pan-European Digital Private Mobile Radio Services"
Ghassan Freij, Virginia Polytechnic Institute, Blacksburg, Virginia

SESSION 13 SPEECH CODING

"Data Compression of Voiceband Modem Signals"
D. Lin, S.D. Kirti, B.M. McCarthy, J.M. Roese - International Mobile Machines, Philadelphia, Pennsylvania

"Design, Implementation and Evaluation of a 8.0 Kbps Coder on a Single AT&T DSP232 Digital Signal Processor"
Kumman Suresh - AT&T Bell Labs, Whippany, New Jersey

"Multi-access Speech Codec for Digital Cellular Mobile Use"
D. Miller, R. Rajbouch, P. Yarou, P. Mokmamala - Bell Northern Research, Canada
**SESSION 16 PROPAGATION I**

**"MSRM - A Prediction Tool for Radio System Design"**
Philip Nottleman, Don Larsen - NovAtel Communications Ltd., Canada

**"A Computer Algorithm for Prediction of Service Area in a Mobile Radio Communication System"**
P. S. Mitra, T. L. Biegel, T. S. Kamal - Purdue Engineering College, India

**"Investigation of Radio Propagation and Macroscopic Diversity in Indoor Microwaves at 1700 MHz"**
Peter Karlsson - Lund University, Sweden

**"Investigation of Propagation Characteristics Above 1 GHz for Microwavelength Land Mobile Radio"**
Turkka Ivarva, Elmasu Miyajima, Hirohumi Ryuka, Shinya Satsumiya, Tajji Saruwatari - Communications Research Lab., MPT, Japan

**"Multipath Delay Estimation for Indoor Wireless Communication"**
Tatsuya Tekaboh, Masahiko Sako, Susumu Yoshida - Kyoto University, Japan

**SESSION 17 MODULATION TECHNIQUES I**

**"Noncoherent Block Demodulation of PSK"**
Harry Leib, Subbarayan Pasupathy - University of Toronto, Canada

**"SER Performance of Multi-point Modulation PSK/LP and Its Optimum Phase-Range"**
Fumio Tabara - ATR Communications Research Lab., Japan

**"Performance Evaluation of Differential p/4-Shift DPSK Systems in a Rayleigh Fading/Delay Spread/CI/AGWN Environment"**
G. Gou, Kazuo Fehri - University of California, Davis, California

**"Performance of Trellis Coded QPSK in Mobile Radio Channels"**
Gaid Elouadi, Eman Fathy, El-Sayed Elhady - Wichita State University, Wichita, Kansas

**"Switched-Diversity Trellis-Coded 8-DPSK for Mobile Radio Applications"**
G. Femminia, R. Agrati - Universita Politecnica di Catania, Spain

**"A New Generation of Rayleigh Faded Compensated p/4-QPSK Coherent Modems"**
Chia-Liang Liu, Kazuo Fehri - University of California, Davis, California

**SESSION 18 MODULATION TECHNIQUES II**

**"Linear Prediction Aided Differential Detection of GMSK Signals Transmitted Over Rayleigh Flat Fading Channels"**
R. J. Young, J. H. Lodge - Communications Research Centre, Canada

**"Short-Term Variations of the Mobile Channel and the GMSK Signal"**
P. E. Migos, B. L. Anderson, B. J. Anderson - University of Adelaide, Australia

**"Bit Error Rate Field Test Results for Digital 9600"**
Robert Mulcahy, Irving McLean - AT&T Bell Labs, Whippany, New Jersey

**"Design of an Adaptive Coding and Retransmission Strategy of a Multipath Fading Channel"**
Saei Yamasaki, R. Lyamnpapammit - Memorial University of Newfoundland, Canada

**"Performance of Trellis Coded Modulation Using Multi-frequency Channels in Land Mobile Communications"**
Toshiyuki Kambu - Communications Research Lab., MPT, Japan

**SESSION 19 MODULATION TECHNIQUES III**

**"Performance of Multi-laval GMS with Maximum Ratio Combining Spacing Diversity for Land Mobile Communications"**
Sachtzi Sampol, Tarumi Sunaga - Communications Research Lab., MPT, Japan

**"Miller Coded Pilot Aided Modulation Schemes for Digital Mobile Radio"**
Dilruka Subasinghe-Dias, Kazuo Fehri - University of California, Davis, California

**"Performance of Trellis Coded QPSK in Mobile Radio Channels"**
Gail Elouadi, Eiman Fathy, El-Sayed Elhady - Wichita State University, Wichita, Kansas

**"Switched-Diversity Trellis-Coded 8-DPSK for Mobile Radio Applications"**
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**"A New Generation of Rayleigh Faded Compensated p/4-QPSK Coherent Modems"**
Chia-Liang Liu, Kazuo Fehri - University of California, Davis, California

**SESSION 20 SIGNALING**

**"The Signalling Protocol Structure on the Radio Link for the Digital Mobile Communications System"**
Koji Yamamoto - NTT Mobile Communications Division, Japan

**"Performance of GMSK-Transmission Under Typical Urban and Rural Channel Conditions using Coherent and Noncoherent reception"**
Robert Morarac, Franz J. Salkiet - Technical University, Austria

**"The Implementation of the Mobile Channel Simulator in the Baseband and its Application to the Quadrature Type GMSK Modem Design"**
Myung Seob Lim, Hans Kyu Park - Yonsei University, Korea

**"The Error Probability Performance of Gray Encoded QPSK. Scheme with On-Channel Interference In a Slow Fading Indoor Channel"**
Rajeev Reddythamarthi, Somasundar Gupta - Southern Methodist University, Dallas, Texas

**"An Adaptive Pilot Tone Filtering Technique for Pilot Aided Transmission Systems"**
Harry G. James, James Davis - Simon Fraser University, Canada

**SESSION 21 PROPAGATION II**

**"An Improved Channel Signalling Technique Applied to Wideband Mobile 500 Mhz Propagation Measurement"**
Armand J. Levy, Jean-Pierre Rosel, Jean-Pierre Barbois, Jacques Martin - National Center for the Study of Telecommunications, France

**"Equalization of a Hard-Limited Slowly-Fading Multipath Signal Using a Phase Equalizer with a Time-Reversal Structure"**
Stefan Archimassas - Belferd, Red Bank, New Jersey

**"High Bit-Rate Field Transmission of an Anti- Multipath Modulation Technique PSK/4RZ"**
Satoshi Yoshida, Tatsuomi Takatani, Motieku Nakamura - Kyoto University, Japan

**"Selection Diversity Reception Based on a Novel Multipath Delay Spread Estimation Method for Digital Mobile Radio"**
Hsing Zhao, Susumu Yoshida, Tatsuomi Takatani - Kyoto University, Japan

**"Propagation Measurement for Microwaves in Central Stockholm"**
Fredrik Lottell, Anna Wilke - Ericsson Radio Systems, Sweden

**SESSION 22 HARDWARE III**

**"Backoff Improvement of an 800 MHz G.A.A Fet Amplifier Using an Adaptive Non-linear Distortion Canceller for G.M.R.S Modulated Signal Transmitter"**
M. Mousa, M. A. Grado, E. Fuquive, Y. Dado - Fujitsu Laboratories, Ltd., Japan

**"A New Spectral Notch Generator for Pilot Tone Systems"**
James Casey, Robert Marcohm - Simon Fraser University, Canada

**"Experimental Performance Evaluation of Equalizers Employing RLS Algorithms for Digital Mobile Radio Communications"**
Takahisa Ueda, Hiroshi Suzuki - NTT Radio Communications Labs., Japan

**"GMSK Modulator/Demodulator Design and Implementation"**
John McGrath - University of Limerick, Ireland

**"Design of an Adaptive Equalizer and its Performance Over Fading Multipath Channels"**
Kazuhiko Kikumori, Koji Ueda, Michiaki Taken, Tadao Fujino - Mitsubishi Electric Corp., Japan

**SESSION 23 CHANNEL CODING**

**"Comparison of Two ARQ Protocols in a Flat Rayleigh Fading Channel"**
Justin C.-T. Chung - Belford, Red Bank, New Jersey

**"Time Diversity Techniques for Digital Mobile Radio"**
A. M. D. Turkman, A. F. de Toledo - University of Liverpool, United Kingdom

**"8-BITMA's MAC Protocol for Short-range Radio Mobile Communications"**
Sam Tabbane, Philippe Godlewski - Ecole Nationale Superieure des Telecomunications, France

**"NFT 1237 Protocol Extension to 900 BHZ"**
Jean Beaulieu, Miguel Rodrigo-Palma - Telestra España S.A., Spain

**"FEC for Digital Cellular"**
C. A. Eyerman - AT&T Bell Labs, Whippany, New Jersey

**SESSION 24 PROPAGATION III**

**"Recovery Effect in Cellular Radio Systems"**
T. M. Metskens, L. U. Carter - University of Auckland, New Zealand

**"Simulation of UHF Indoor, Radio Channels for Manufacturing Environments"**
Scott Small, Theodore Rapagnan - Virginia Polytechnic Institute, Blacksburg, Virginia

**"Measured Propagation Characteristics of 900 MHz Mobile Radio Channels in Mountainous Terrain"**
Paul Johnston, Cory McCauley, Canada

**"Local Mean Signal Variability in Rural Areas at 900 MHz"**
S. Mooker, A.M. Turkan, J. D. Parsons - University of Liverpool, United Kingdom

**SESSION 25 HARDWARE IV**

**"Pulse Design for Linear TDMA Modulation"**
Nilsen Sollenberger - Belford, Red Bank, New Jersey

**"Radio Systems Design Using Optical Modulators/Demodulators for RF Transmission over Fiber Optic Cable"**
John Clark - Debel Products, Inc., Hoffman Estates, Illinois

**"Fiber Optic Antenna Remoting for Cellular Radio Applications"**
Donald Frye - GTE Labs, Welham, Massachusetts

**"Indoor Radio Wideband propagation Measurement System at 1.33 GHz and 4.9 GHz"**
Dagny Haebeler, Theolore Rapagnan - Virginia Polytechnic Institute, Blacksburg, Virginia
IEEE Vehicular Technology Society Newsletter

SESSION 25  CHANNEL ASSIGNMENT STRATEGIES

"Dynamic Channel Assignment in Cellular Radio"  Kumar Sriprasad, Robert McEliece, John Katchum - Cal Tech, Pasadena, California

"Adaptive Resource Allocation in Metropolitan Area Cellular Mobile Radio Systems"  Herbert Panzer, Reiner Beck - Philips Communications Industry, Germany

"On the Impact of Traffic Burst on the Blocking Probability of High Capacity Cellular Systems"  M. Pratikno - Fondazione Ugo Bordoni, Italy

"Practical Channel Assignment Using Neural Networks"  Dietmar Kuss - Philips GmbH Forschungslaboratorium Hamburg, West Germany

"An Adaptive Stop-and-Wait ARQ Strategy for Mobile Data Communications"  Kurti Goh, Tri T. Ha - Naval Postgraduate School, Monterey, California

SESSION 27  HARDWARE V (Receivers)


"A New Incoherent Direct Conversion Receiver for Mobile Communication System"  Gеhaid Sаlhаbа, Syed Sаhid - Ernst Bonke, Peter Veith - Technical University of Vienna, Austria

"A Receiver for the Registration of Mobile Communications Traffic Data"  Jоsеf Rаfinnger, Fitt Ljо, Werner Schulte-Voss, Syed Salha - Technical University of Vienna, Austria

"Performance of a Novel Discriminator-Based Quaternary CPM Receiver"  Mоhammаd Tаvаsаli, S. A. Mahmood - Carleton University, Canada


SESSION 28  MOBILE SATELLITE TECHNOLOGIES

"Experiments on ACESS Land Mobile Satellite Communications"  S. Iтоa, T. Іsagаmе, R. Sаzуkі - Sаzуkі, H. Kеwаkаhа, S. Таzа - Communications Research Laboratory, MРТ, Japan


"Communications Service Provision to Land Mobiles in Northern Europe by Satellites in Highly Inclined Orbits - Propagation Aspects"  V. Se Маrkоv - University of Bradford, England

"Multichannel Access Protocol for Satellite Mobile Data Services"  Vісtor Lаungr - University of British Columbia, Canada

"Error Floors in the Satellite and Land Mobile Channels"  Ісааеl Bаm - University of New South Wales, Australia

SESSION 29  POTPOURRI I

"Proof of Performance Testing"  Earl H. Flath, Jr. - Consultant, Dallas, Texas

"Error Protection for A 4.9kbps VG Based CELP Codec"  G. Yang, P. Ho, V. Cupeman - Simon Fraser University, Canada

"A Digital Rayleigh Fade Compensation Technique for Coherent DQPSK Systems"  Jоsеf Yаng, Каnно Коеr - University of California, Davis, California

"Viterbi Differential Detection for Partial Response Continuously Phase Modulation"  Gаhаnаn Каsаwа Kаiеh - Еnсоle Nаtіоnаlе Suрrоrсе Сеntеr dе Telexcommunications, France

"Radio Transmission Simulations using a High Performance Graphics Workstation"  Gеоrd F. G. Рutеrа, - MСS Uніv., & Pаul Рorстооmеnt, - Hіdоа-Quіbес, Canada

SESSION 30  PAGING

"Method for Over-the-Air Programming of Paging Receivers"  Grgоog Сlаоbo - Motorola, Boynton Beach, Florida

"Automatic Simulcast Radio Transmission Control System"  Jоеl Е. Саndеh - Glopas Сhоntох Сhiсао, Quinсоо, UСа

"The Mobiles Public Packet Data System"  Jаmеs L. Trее - РАМ Dаta Dаttæ, Wооdbооgh, Nеw Jерсу

"Cluster Paging for Traveling Subscribers"  Dаvid M. Роldoсhеnt - Сenter for Рhаsеs and Аdvаnсеd Сhеrсhеs, Мехісо

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