Essential Elements in Lotus Active Anti-Noise System
President’s Message

Stuart Meyer
President
IEEE Vehicular Technology Society

If you did not attend the 38th IEEE Vehicular Technology Conference during mid-June in Philadelphia, you really missed a great one.

John Galanti and his staff did an outstanding job in providing our Society with a well-planned and well-executed event. A standing ovation was given this group during our Thursday "Awards Luncheon" and I must say that I cannot recall a better event during my active years with VTS.

Pre-registration attendance was up, overall attendance was up, the number and quality of papers which made their way into the conference record were truly outstanding and to this group I say "well done". I know that many readers of this column feel the same way.

As I dictate this message, I have just returned from San Francisco where I took part in the second mini-conference sponsored by the Bay Area Chapter under the excellent leadership of Chairman, Frank Thatcher. Incidentally, at the Philadelphia Annual Conference, Frank accepted last year's "Chapler of the Year" award for his area. The San Francisco-Bay Area Chapter will be sponsoring the 39th Annual VTS Conference in 1989. Frank and his group are hard at work trying to outdo this years superior performance conference.

Plans are underway to further integrate the activities of the land transportation Committee to the overall Vehicular Technology Society. We are earnestly working towards a date when our Annual Conference will be combined thereby spreading the areas of interest and disciplines which will be reflected in future expanded conference activities.

Until the next issue of the Newsletter.

Sincerely,

Stuart Meyer
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Editor's Notes

A. Kent Johnson
Newsletter Editor

Our recently completed Annual Conference in Philadelphia was a huge success and John Galanti and his committee deserve a big vote of thanks from all of us. As Stuart Meyer points out in his column, attendance was up, the number of papers was up, and the quality of the papers and the overall quality of the conference was outstanding. I know that all of you who attended the conference will join me in applauding the efforts of those who arranged it.

The Philadelphia conference generated great enthusiasm for the upcoming conference in San Francisco. That conference will be held from April 28 to May 3, 1989, in the Sir Francis Drake Hotel in San Francisco. You will find a call for papers for that conference elsewhere in this newsletter. Start making your plans for another great conference in another great city.

The Philadelphia conference had a very strong "cellular" flavor. Of note were two outstanding evening panel sessions. On Wednesday night we had a panel discussion on "Cellular Technology in the 90's - A Prospective From Outside the U.S." and on Thursday night we heard about "Future Cellular Service Opportunities - The Service Provider's Prospective". The rapid growth of cellular technology in recent years has been a real boost to the Vehicular Technology Society. We will undoubtedly be hearing much more about "cellular" in our future conferences and publications and we look forward to its continued growth and expansion.

Month of Issue | Final Copy to be Recd | Mailing Target | Date
--- | --- | --- | ---
November | 9-13-88 | 10-15-88 | December
February | 12-30-88 | 1-27-89 | February
March | 3-10-89 | 4-14-89 | April
August | 6-09-89 | 7-13-89 | August
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John E. Dettra, Jr.
President

Board of Directors Report

August 1988

The acting secretary reported a quorum was present.

Link moved, McClure seconded of the minutes of the previous meeting.

Meyer invited modifications to the agenda. Suggestions were made to change the date in item 4–5 of the agenda to October 27, and under NEW BUSINESS to add of "Restructuring".

The treasurer's report was submitted by Goldsmith and is attached to these minutes. He also reported that the initial budget would be received in April, and if any deficiencies are noted, he contacted him for corrections. McClure moved, McKnight seconded approval of the treasurer's report. Motion passed.

In his transactions editor's report, McClure noted that the 900 MHZ Propagation Committee report was about at the printer's, and would appear as the May issue. The press run for this special issue is to be 5000 copies. He also reported that the February, '88 papers had been lost at IEEE and he was contacting the authors to obtain copies of the papers and artwork. The August issue will be larger than normal, due to the delayed publication of the February papers. McKnight moved, Trot seconded approval of the transactions editor's report. Motion passed.

For the newsletter, Johnson reported the May issue was on schedule, and would be sent to IEEE within two weeks. Maddern and Johnson discussed publication of the revised Constitution in the newsletter for member voting, with either a tear-off or blow-in card ballot. Johnson was to investigate and talk further with Maddern. Maddern was to prepare a version of the Constitution showing the delegations and additions for circulation to the members for voting. Johnson and Craft seconded approval of the newsletter editor's report. Motion passed.

Richards submitted a written report on conferences and meetings. The Board meeting was set for Thursday afternoon. Richards and Meyer to meet with Philadelphia conference staff to take care of any last minute problems.

The San Francisco conference committee was reported to be holding a mini-conference in May. Questions were raised regarding finances for the conference and the San Francisco Section participation. Meyer and Richards to work with Frank Thatcher to resolve any problems.

Orlando conference use of conference management services was noted. Meyer to discuss with Orlando committee. McClure reported he was attending an IEEE Workshop on Conferences and Final records. He indicated Orlando would need $1000 for travel.
Goldsmith reported that there were no issues significant to VTS under consideration by USAB committees in which he participates.

Madden reported that the IEEE Foundation had been queried as to the status of the Convergence fellowship. Dr. Robert Fenton was asked to chair the Convergence Fellowship Committee.

The Noble Fellowship was discussed. Goldsmith reported that the fund principal was earning enough to support the fellowship without decreasing the principal.

Gasper Mescina submitted a written Chapter Activities Report.

Awards were discussed. Mazella was asked to nominate persons for the Avant Garde Award. McClure moved, McKnight seconded that VTS present a special award, not to exceed $200, to Trevor Jones for his work in founding and encouraging Convergence. Passed unanimously.

Meyer reported that McCouguey has been elevated to Fellow.

Fenton reported he has solicited nominees for the upcoming term. The incumbents have indicated they will run for re-election, and he expects to have a full slate of candidates in place some have not yet responded. Fenton moved, Link seconded that the current slate of officers serve until the end of 1988 with the new slate to be elected to take office beginning in 1989. Motion passed.

Meyer reported that the recommendation of the Executive Committee was that a $20,000 fund be set aside for travel and Board of Governors meetings to pay up to $500 expenses for Board member attendance if a Board member does not have employer support. Link moved, Johnson seconded the motion to adopt the Executive Committee recommendation. Motion passed.

New Business

Meyer expressed concern about the failure of active individuals, who practice in a minority discipline of the Society, to attain a Board seat. Meyer requested that the Board discuss whether the Bylaws should be amended to set aside certain seats on the Board for each of the disciplines, or whether there was some other avenue to provide representation of the various disciplines. McKnight moved, McGregor seconded that the VTS endorse the concept of representation at the Board level of all the disciplines of the Society. Motion passed unanimously. Bochner stated that the Land Transportation Committee also endorsed the concept.

Meeting terminated at 4:00 PM.
June 1988

August 1988

Convergence '88

Stu Meyer reported that the planning for the 1988 Convergence Conference is well under control by the Convergence committee. He also reported that the conference will run for two days this year.

Post-Convergence IES/VTC Workshop

Roger Madden reported that the joint IES/VTS workshop is scheduled to follow the Convergence Conference on Wednesday. Four sessions for the workshop are planned, with the first starting at 9:00 AM and the last ending at 4:30 PM. Thirteen papers have been submitted for this workshop.

EUROMIX '88, June 13-17, Stockholm

Kent Johnson reported that Ed Olsen from AT&T Bell Labs is representing VTS at this conference, and that a report will be available at the next Board meeting.

Annual Conference on Road Traffic Data Collection

The secretary reported on a request to co-sponsor with no financial interest the 1990 Annual Conference on Road Traffic Data Collection in London (the Society has already agreed to co-sponsor the 1989 conference). Roger Madden moved, Bob Fenton seconded that the Society accept the invitation to co-sponsor this conference. The vote was unanimous in favor.

1989 VTS Conference

Stu Meyer indicated that no new information in regard to meeting dates for the 1989 VTS Conference in Toronto was available.

Roger Madden moved, Ray Trotz seconded that the remainder of the conference report be accepted as presented. The vote was unanimous in favor.

Committee Reports

Land Transportation

AI Engel reported that the 1988 Joint Railroad Conference was a success, and that expenses where near the break-even point. The 1989 Joint Railroad Conference will be held April 25-28 at the Warley Hotel in Philadelphia. He noted that this conference will usually have from 120 to 160 attendees, and that about two dozen papers are presented.

AI Engel also noted that the Joint Railroad Conference has tentatively been scheduled to be in St. Louis in 1990, and in Chicago in 1991. Since one of the goals of the Board is to get the VTC and Joint Railroad conferences in step, AI volunteered to investigate the feasibility of swapping the two locations proposed for the Joint Railroad Conference such that the two could coincide in St. Louis in 1990. If that is not feasible, then the proposed 1992 conference in Denver will be the next target for a combined VTC/JRC.

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Committee Reports

Land Transportation

AI Engel reported on a request seeking the Society's endorsement to start an international program on linear electric motors. No financial support of such a program would be required. After discussion, AI Engel moved, Evans Richards seconded that the Society endorses the formation of an international program on linear electric motors, the purpose of which is to provide technical exchange at no financial expense to the Society. The vote was unanimous in favor.

Constitution and Bylaws

Roger Madden reported that corrections to the revised constitution, as suggested by IEEE HQ, have been returned to HQ. A formal ballot to approve the new constitution should be in the mail to all VTS members within the next few weeks.

Membership Report

Jim Sears reported that membership is up by 130 over the past year, and that he has seen a few applications which were probably a result of the ad placed in the IEEE "Potentials" magazine last year.

Publicity

No report on publicity activity was available at this meeting.

IEEE Vehicular Technology Society Newsletter

IEEE Vehicular Technology Society Newsletter
Communications

J. R. Cruz
Communications Editor

ABSTRACT


Portable UHF factory multipath measurement apparatus is used to measure multipath delays, profiles and narrowband fading at five large manufacturing sites in the midwestern U.S. Preliminary data indicate that typical RMD delay spreads range from 100 to 250 ns and that average CW path loss varies as distance to the power 2.2. This work is the first report of extensive multipath measurements in factory environments.


The performance of a high-capacity digital radio system is evaluated in the presence of ground induced reflections and atmospheric fading. Results indicate that ground reflections significantly contribute to outage even when their amplitude is 20-25 dB below the main signal. A three-path channel model is used to simulate reflections from the terrain and atmosphere. With this model, the group delay suffers extremely rapid phase transitions and the amplitude pattern shows the presence of minima deeper than that produced by either ray alone.


The bit error rate performance of narrow-band digital FM with limiter discriminator detection is considered for the cases of 1) integrate and dump postdetection filtering with partial-bit integration and 2) sample and hold bit detection at the discriminator output. Error rate curves are presented for Gaussian, white-element Butterworth and two-stage synchronously tuned IF filters. The calculations illustrate just how much more Eπ/2 is required in the partial-bit integration time goes from 100 percent down to the limiting case of sample and hold. The results show that it is important to have a well designed IF filter especially if the entire bit time is not available for detection.


A direct-sequence spread-spectrum packet radio is described which has versatile signal processing and local control capabilities designed to support the function required of a robust mobile communications network. Noteworthy capabilities include 11 selectable data rates with accurate range measurements in a fading multipath channel. The radio employs a hybrid analog/digital signal processor and nonrepeating spreading codes for suppression of inter-symbol interference and jamming. It incorporates two sets of monolithic surface-acoustic-wave convolvers as programmable matched filters with time-bandwidth products of 64 and 360. The analog matched filters are coupled by binary postprocessing for the functions of detection, RAKE demodulation, and range measurements over a wide multipath spread. The data rate can be selected, in response to varying channel conditions, from 1.45 Mbit/s down to 44 bits/s with an almost ideal tradeoff in signal processing gain from 18 dB up to 61 dB prior to multipath combining.


The calculation of outage probability is discussed in relation to cochannel interference problems inherent in narrow-band cellular radio systems. Outage probability equations are presented for each single cochannel interferer situation are reviewed briefly, and examples of the application of these results to the estimation of the service area of a typical cellular base station are given. An analytical technique for multiple uncorrelated interferers in a Raleigh fading environment is presented and the effect of several cochannel Rayleigh interferers on the service area of a cellular base station is examined.


The bit-error-rate (BER) performance of pseudonoise (PN) and multi-code PN signal detection algorithms is evaluated when the frequency of the PN signal is unknown. The systems using frequency detection (FD) in conjunction with 1 bit decision feedback equalization (DFE) is theoretically investigated. The introduction of the predetection modulation can cause severe inter-symbol interference (ISI) in the waveform of the input to the PN modulator. DFE is used for reducing this effect and therefore improving the BER performance. Applying the analysis to
Transportation Systems

Bob McKnight
Transportation Systems Editor

High tech and practical issues highlight AAR meeting on communications & signals

The 28th Annual Technical Conference of the Transportation Systems Group will be held August 22-24, 1988 at the Washington Hilton. Technical paper presentations range from the latest in high technology--satellite train tracking--to maintenance free batteries and certified testing of cabinture structures for highway grade crossing warning devices.

The Monday morning session will have Dennis F. Sullivan, Vice President Operations & Maintenance, Amtrak, as the keynote speaker.

Federal Communications Commission activity will be related by Ralph A. Hauer, Chief, Private Radio Bureau.

Federal Railroad Administration actions will be reported by Administrator John Riley.

As in the past, over $1 million in exhibits will be on display at the three-day technical conference. Walter Wood, Jr., Chairman & President, Railway Systems Suppliers, Inc., extended a hearty welcome to attendees to visit the exhibits where the latest in communication and signaling technology will be on display.

Concurrent sessions on Monday afternoon will cover communications and signaling subjects.

The following communications topics will include the following:

- Report of Committee C - Telecommunications of the C&O
- Technical paper covering Grand Trunk Western's Railroad Control Block System for moving trains over a 190-mile line
- Evolution of data radio technology since the Advanced Train Control System was born in 1981
- Panel discussion concerning FCC activity be several staff members.

Signal session on Monday afternoon will feature the report of Committee E - Signal Systems and a report of the Signal Liaison Group cooperating with the Federal Railroad Administration.

CRA's Sylvan K. Halpin will moderate for Safety Joseph W. Walsh will be a key speaker at this afternoon session.

Four technical papers will be presented:

- Train-Wayside Information Transmission for High-Speed Rail Lines
- Light Source Development Concept for Improved Signal Performance and Maintenance
- Nickel Cadmium Pocket Plate Batteries: Safety Features - Maintenance Free Batteries- The Final Solution to the Battery Problem.
- Federal Railroad Administration

The Tuesday morning session will feature reports by Committee D - Highway Grade Crossing Warning Systems; and Committee G - Education & Labor.

Technical papers at this session include:

- Design Certification and Testing for Signal Cabinture and Bridge Structures
- Automatic Vehicle Identification- A Pilot Test on Burlington Northern
- Radio Electronic Token Block System in Service on British Rail
- The advanced Train Order System on Queensland Railways, Australia
- The Cabinture Supervision System on the French Railways
- Technical excellence in Communications Program for Signal Supervisors
- Training Program for Signal Supervisors

Advanced Train Control Systems will be featured at the Tuesday afternoon technical session. Technical papers include:

- June 1988 Integration Requirements for ATCS
- Space-age train concept to reality
- Continent-Wide Train Management - Applications and Economic Justification for On-Board Locomotive Computers
- Plans to implement ATCS on the nation's railroads
- Principal ATCS Decisions Made

The wrap-up session on Wednesday morning will feature presentations on regional control and lightning protection factors.

Chicago Railroad Museum will feature the report of Committee F - Special Applications with emphasis on direction, cabinture, repair, new signal Manual parts and railroad use of digital event recorders.

Technical papers include:

- Integration of an Acoustic Bearing Analyzer in a Defective Bearing Filter System
- Acoustical Detection of Defective Wheelsets
- Low-Cost Hot Bearing Detector
- Treaded Cone Condition - Philosophy and Design
- Grounding Lightning and Surge Protection: Factors to be Considered

Florida East Coast to install automatic train control on its 195-mile main line

Florida East Coast Railway is planning to spend $6 million over the next three years to install an automatic train control system on its mainline between Jacksonville and Miami.

In addition, FEC is embarking on an extensive program to install signaling and automatic train warning devices at rail-highway grade crossings.

The automatic train control system will make use of Harman Industries Ultra-Cab 40 system which uses an on-rail frequency of 40 Hz instead of the new 60 Hz and 100 Hz frequencies used by other train control systems.

The system will provide four cab signal aspects and seven speed control conditions.

The automatic train control system will automatically apply brakes and bring a train to a stop if the engineer feels to heed the aspects displayed in the cab.

According to Harman staff engineers, the new 60 cycle system can distinguish between passing a permissive stop signal and absolute stop signals. Also, the cab signal decoder will recognize a change of conditions while a train is between signals and will display a new aspect.

A microprocessor on board the locomotive processes the train control signals and makes use of braking curves for the various speeds and weights of a train.

100 Years Ago

In 1888 Chicago, Burlington & Quincy Railroad operated trains by signal indication by means of a manual block system over a distance of 5.5 miles in the 4-track line between Canal Street, Chicago, and Belvidere, Illinois. This was extended in the next 7 years to cover all the 17-mile section of the railroad from Aurora, Illinois to West Benton, Illinois.
The Thursday luncheon speaker, William W. Millar, gave an informative and entertaining overview of the Pittsburgh transit environment, past, present and future. It was excellent background for the Friday tour of PAT’s rail line and new operation and maintenance facility.

The tour provided by the Port Authority of Allegheny County began in the subway station across the street from the conference hotel, on a chartered LRT, part of PAT’s new light rail fleet (55 vehicles) purchased from Siemens-Duessel. It proceeded on a loop downtown and back through the subway, then across the river and through a tunnel to the South Hills suburbs, winding through dedicated rail right of way, paved right of way with buses and sections of street running. An informative running commentary was provided on board by PAT manager Norm Voigt. At hour was spent at the state of the art operations facility and the new maintenance building, where all rail maintenance, repair and rehab is performed. Several knowledgeable PAT supervisors and engineers were on hand to answer questions. The tour group then boarded a rehabilitated PCC car for a slightly different route on the return trip, a satisfying end to the conference.

First Prize ($150.00): R.M. Groth, Harmoon Industries

Tools for Analytical Examination of Alarm Decision Algorithms for Hot Box Detectors

Second Prize ($100.00): G. Gazgin, Knorr Brake Corporation (U. Kroger & E. Schauweber, Knorr-Bremse AG)

Eddy-Current Magnetic Track Brakes for High Speed Trains

Third Prize ($50.00): M.L. Long, Morrison-Knudsen Engineers (A. Ueno, Seattle Metro)

Traction Power System Design for Lines 15/18 - Seattle Metro Trolley Coach Expansion Project

The Wednesday luncheon speaker, T.P. Smithberger, informed the assembled ASME and IEEE members about the American Railway Engineering Society (AREA), including what its committees do and how to join. AREA is open to future joint sponsorship of events.

WHAT’S HAPPENING

1983 IEEE US MEMBER OPINION SURVEY

The 1988 IEEE US Member Opinion Survey has just been published. This survey included questions on such topics as standards for membership in profession, the condition of the profession, personal computers in the workplace, the influence of technology on public welfare, IEEE service, IEEE government, and demographics. Copies of the Survey report are available at $5.00 to IEEE members from the IEEE Service Center in New Jersey (Order No. UH1080-6). Two related documents, "Comments on the Survey," by the Opinion Survey Committee, and "Written Comments from the Respondents: A Compendium," are available at no charge from the IEEE/USAB Washington Office. Courtesy copies of all three will be sent to those who helped formulate the questionnaire, Section PACE leaders, and Regional Directors.

1988 NATIONAL PACE WORKSHOP

The 1988 National PACE Workshop will be held over Labor Day weekend, September 2-5, at the Point at Squaw Peak, in Phoenix, Arizona. Announcements of the Workshop have been sent to all PACE Chairmen and other officers.

The theme of the 1988 Workshop is "IEEE/USAB Responds to the Changing Environment." Five half-day sessions will address different aspects of this theme. The two sessions (Employment Strategies, Specialty Certification, and discussion, followed by breakout discussion groups, cappled by reports back to the plenary) are the two sessions (Financial Matters and USAB Member Surveys) will be tutorials.

A special effort is being made this year to facilitate two-way communication between PACE leaders and other IEEE/USAB volunteers. It is hoped that PACE representatives attending the 1988 Workshop will return home feeling that their voices have been heard and that they have contributed to the decision-making process in IEEE/USAB.

Frank E. Lord
Professional Activities Editor

NEW USAB POSITIONS

At its May 8 meeting in Boston, Massachusetts, the United States Activities Board approved the following IEEE/USAB Entity Position Statements:

- Independent Research and Development Funding, which states that federal government's methodology of handling R&D funding for national security contractors is detrimental to investment in R&D and threatens the future of U.S. leadership of advanced technology. The statement includes suggestions for change in the methods currently used.
- The Role of Engineers in Restructuring the Electronic Power Systems in the United States, which recommends that full consideration be given by public policy makers to technical and safety factors, theoretical economic factors, and reliability of service when evaluating restructuring proposals for the electric power industry.
- Photovoltaic Technology Development, which calls for photovoltaic systems as a technically viable energy source for U.S. electric utilities. The statement recommends that Federal government and private research and development support should be increased to maintain the momentum of technology advancement, that a broad-based photovoltaic development strategy should be developed and implemented; that public awareness of such alternative energy options as photovoltaic industry in both domestic and international markets should receive increased Federal support.

UNCOMPENSATED OVERTIME

In a letter to Robert P. Bedell, Administrator of the Office of Federal Procurement Policy, USAB Chairman Edward C. Bertoloni explained IEEE's opposition to a wage-busting practice that has surfaced recently in Federal contracting. "We are opposed to the practice of bidding mandatory uncompensated overtime and support legislative or regulatory means for prohibiting continuation of this practice," Dr. Bertoloni wrote.

He cited a Senate Armed Services Committee report on defense acquisition problems and suggested that the report's section on mandatory uncompensated overtime, and highlighted IEEE concerns. The practice of mandatory uncompensated overtime is having a negative impact on the government's ability to obtain quality professional services", the report's statement. "The financial foreseeable results are a reduction in the quality of work, with serious impacts in safety and reliability areas, and a migration of highly skilled professional away from the defense mobilization base."
On behalf of IEEE, Dr. Bertinelli asked Mr. Bedell for assistance in eliminating this undesirable practice by modifying the Federal Acquisition Regulations to require bidding based on a 40-hour work week/3080 person-year standard as the basis for cost analysis and bids.

Vehicular Electronics

Bill Fleming
Vehicular Electronics Editor

Robert Bosch GmbH recently introduced an electronic contact-pressure control system for windshield wipers. Wiper blade force is automatically adjusted, as vehicle speed and/or rainfall intensity increases. This not only gives better wiping action at high vehicle speeds and at high rainfall rates, but also protects wiper blades by reducing contact pressure under light duty conditions [1].

Bosch Electronic Contact-Pressure Control Wiper System [1]

HIGH-TECH WRECKS ARE PREDICTED

IHNSA fears that active suspension, ABS (Anti-skid Braking Systems), on-board navigation, collision avoidance, radar, and vision enhancement systems may make drivers either overconfident or inattentive. "If an individual can drive a rough road comfortably at 50-60 mph when only 35-40 mph would have been possible in the absence of active suspension systems, will that make a safer driver?" Moreover, on-board navigation and/or heads-up displays may only distract drivers. IHNSA concludes that the advance technology of today appears to be far ahead of the science of human factors engineering that should be accompanying it [2].
August 1988

News From Washington

Eric Schimmel
Washington News Editor

AN ALTERNATE ALTERNATE

As indicated by the docket number, this proceeding was initiated in 1987 and will be familiar to some readers. The first time around, the pro-
posal met with considerable resistance from the traditional land mobile radio manufacturers. Apparently believing that the concept of “alter-
native type-acceptance” is a good thing, the FCC has substantially modified its proposal in the hope of mitigating the objections voiced to the original scheme. Check it out. It sets the Commission known to think by June 20. (At press time, it is expected that the reply comment due date will be extended).

Gn. Docket No. 85-171

In the Matter of
The Technical Flexibility in
Mobile Communications Services,
Rules Parts 2, 22, 74, and 90.

FURTHER NOTICE OF PROPOSED
RULE MAKING

Adopted: February 25, 1988; Released: March 22, 1988

By the Commission:

INTRODUCTION

1. By this action, the Commission seeks further comment and information on a proposed equipment testing and authorization procedure for land mobile transmitters, called alternative type acceptance (ATA). The principal goal of this proceeding is to encourage the introduction of new equipment and technology into existing land mobile radio bands in the most efficient manner. To accomplish this goal, adoption of the proposed rules would eliminate the need for lengthy rule making proceedings that are presently required to establish new technical standards. In addition, an applicant does not have to reveal the tech-

nical details of proposed equipment as would occur in a rule making proceeding. This confidentiality may be a significant factor in obtaining venture capital for the de-
velopment of new technologies.

BACKGROUND

2. On May 31, 1985, the Commission adopted a Notice of Inquiry and Proposed Rule Making (Notice) in this proceeding. In this Notice, the Commission proposed es-
blishing an equipment testing and authorization procedure, called ATA, for transmitters that did not meet existing land mobile technical requirements. The ATA procedure would allow the use of new technology without the need for lengthy rule making. In addition, applicants for equipment authorization would not have to reveal the technical details of their proposed equipment as they would in a rule making proceeding. The ATA procedure would ensure that such new technology would not cause more interference than equipment that met the existing land mobile technical requirements.

3. Under the present procedure, accommodation of new technology necessitates amendment of appropriate rules through a rule making procedure. In order to give ade-
quate background for the rule making, the applicant must provide full supporting documentation and explanation of the technology, that is then made available to the public. This may expose concepts or other information that the applicant might wish to remain proprietary. Under the ATA methodology originally proposed in the Notice, the manufacturer or distributor of the equipment employing new technology would be required to perform specific tests to determine its interference potential to the FM land mobile service. The characteristics of a “standard” FM Noise Figure and the power of the equipment would determine the interference potential of the new technology equip-
ment. This test methodology would determine a “power de-
erating factor.” The power derating factor would deter-
mine the transmitter output power that would be permit-
ted under the ATA procedure to ensure that the new
equipment did not cause more interference than conven-
tional FM transmitting equipment. The results of these
tests would be included in the equipment authorization
application and would be reviewed by the Commission.

4. Eight parties filed comments in response to the No-
tice. The commenters supported the ATA concept. They believed that such a procedure would be beneficial and could foster the introduction of more efficient radio equip-
ment. At the same time, however, the commenters in-
dicated that the ATA proposal did present a number of technical and operational problems. Commenters cited technical problems with realizing a standard test receiver, problems with determining an appropriate modulating sig-
nal for the equipment under test, and problems associated with using the proposed SINAD ratio. Commenters also cited operational problems in coordinating frequencies for systems using ATA equipment.

DISCUSSION

5. The comments support the concept of ATA, and we
are convinced that it has considerable merit. We do find, however, several serious concerns with regard to our proposed test methodology and frequency coordination. Therefore, we are proposing a different methodology for testing and certifying new technology.

6. The original ATA proposal was based on developing a model for a standard receiver. The standard receiver would be used to gauge the interference potential of the new equipment and to develop the power de-
erating factor. However, as pointed out by the commenters, receiving equipment designers make a number of design trade-offs. For example, some of the factors that are taken into account are receiver bandwidth, sensitivity and selectivity. Since receiver designs have generally not been subject to Commission regulation, designers have taken a number of approaches to the problem of receiver designs. Accord-

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August 1988

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igy, the choice of a standard receiver that does not unfairly prejudice any existing equipment and still provides the benefits of the ATA procedure becomes very important.

7. We are therefore modifying our original ATA proposal to use a methodology based on transmitter characteristics and mobile system characteristics. This methodology compares the characteristics of a transmitter against the characteristics of a mobile system. For this purpose, a new technology to the characteristics of a conventional FM land mobile transmitter. The transmitter characteristics of FM TMD1 mobiles are often known and have been regulated by the Commission for many years. This new ATA approach is premised on the fact that the key parameters of the transmitted signals (such as bandwidth and power) are controllable, and the interference potential of a transmitter or multiple collocated transmitters should be no greater than the interference potential of a conventional FM transmitter. While this new methodology limits usable bandwidth more than our original proposal and thus restricts somewhat the potential technologies that may take advantage of ATA, we believe that ATA will be extremely valuable for the introduction of new technology. There is still considerable potential to benefit from the ATA proposal.

8. We believe that this modified procedure will eliminate the frequency coordination problems raised previously by the Commission coordination of ATA equipment will require no more effort than a conventional FM procedure. The ATA procedure will be the same as for conventional FM land mobile equipment.

9. The proposed ATA test procedure will require that emissions fit under a "spectrum signature mask." A spectrum signature is defined as an amplitude versus frequency display of a signal. A "mask" is a graphical approximation of such a spectrum signature. Figure 1 of Appendix A shows the "ATA mask." A simulated type of signal is generated using an FM signal modulated with a 1.5 kHz bandwidth Gaussian noise source. This provides a good approximation of the noise-modulated data that is used in the air.

11. The spectrum signature of the equipment under test is measured with a spectrum analyzer. The spectrum analyzer's resolution bandwidth is set to 500 Hz, its video bandwidth is set to 1 kHz, and it is held to hold peak amplitudes of the input signal. The emissions from the transmitter or multiple collocated transmitters shall be compared against the spectrum analyzer's mask, which shall be modulated so as to display maximum operational amplitudes at 173.1 MHz (a), 93.233 MHz (b) and 93.033 MHz (c), to cooperate in avoiding interference in the use of shared channels.

12. The maximum emission from the transmitter, or each transmitter in the case of multiple collocated transmitters, is used in determining the operating relative to the ATA mask. The derating is the difference in decibels between the amplitude of the ATA mask at its center and the maximum emission level. The maximum emission will be specified in the grate that indicates the number of Minusple collocated transmitters permitted in an FM land mobile channel. Comments are invited about the derivation and methodology of the ATA mask.

13. The maximum usable power of the applicant's transmitter(s) is measured with a power meter. The combined power cannot exceed the power for equivalent interference as required for determining the derating. The transmitter(s) shall be measured so as to display maximum operational amplitudes at 22.903 (d) MHz and 22.903 (e) MHz. 

14. The ATA test procedure utilizes specific spectrum analyzer and power meter characteristics. We recognize that test instruments with these characteristics may not be readily available at equipment rental companies and are therefore relative to use. Tests with instruments that are described are believed to be sufficient for the purposes of ATA. For example, the specific spectrum analyzer setting exists with equipment bandwidth for a wide range of signal types. These settings, however, do not represent the power of complex emissions in an FM receiver's passband, hence the requirement for measurement of power with a meter that measures the average power of emissions.

15. With the showing of conformance to the ATA mask and the limitation of total average power, the applicants may be informed to the Commission of Section 1451 of the Communications Act of 1934. The FCC is considering the ATA mask as an appendix to a proposed change in the Rules, and it is proposed to amend Parts 22, 72, 74, and 90 as set forth in the APPENDIX A below.

16. From a type acceptance applicant's perspective, the ATA test procedure focuses on transmitter characteristics that determine the potential interference. The simulated type of signal was employed such as noise and modulated data emission. The purpose of the test is to determine whether the equipment meets the standards of the Commission. The Commission will ensure that the equipment approved under the ATA procedure does not cause more interference than existing FM equipment.

17. As noted above, we propose that the ATA test be a subset of the test used for the Public Mobile Service 2) Broadcast Remote Pickup licensees. We propose that the test be performed if they are conventional FM land mobile radio licensees. However, we do not propose to restate the terrestrial FM land mobile radio licensees. However, we do not propose to restate the terrestrial licensees, and the licensees shall be shown to be compatible with the interfering transmitter(s) services. For example, ATA users would subject to existing licensees at 90 MHz (a), 109.173 (b), 90.233 (a) and 93.033 (e), to cooperate in avoiding interference in the use of shared channels.

18. We propose to define "Domestic Public Cellular Radio Telecommunications Service, for Personal Radio Services (Part 95), or for land mobile frequencies shared with UHF television. The engineering model used to develop ATA appears inadequate for authorization of advanced technology transmitters in cellular radio. It does not take into account technical factors occurring in the cellular environment. These factors include automatic power control, mobile handoff, and mobility from one cell to another, and control signalling. However, the Commission recently issued a proposal in General Dockets 86-242 and 86-243 to introduce the cellular service based on a detailed investigation of multiple sets of proposals. The Rules 

19. The new proposal on interference to television would not in order to reduce the need for separate analyses.

20. We also are not proposing the ATA for the Federal Radio Service, and the appropriate regulations will be introduced in the present this service. With respect to use of ATA transmitters on systems that are for governmental use only, there is an existing rule where the equipment authorized under ATA would cause more interference to television than would FM land mobile radio.

PROCEDURAL MATTERS

21. In view of the foregoing and pursuant to Sections 4(j), (q), and (303) of the Communications Act of 1934, and the Commission's rules, it is hereby proposed in the Rules of Sections 1546(e) and 1547(e), and it is proposed to amend Parts 22, 72, 74, and 90 as set forth in the APPENDIX A below.

22. In accordance with the procedures set forth in Section 1415 of the Commission's Rules, interested persons may file comments on or before July 20, 1988, and reply comments on or before August 9, 1988. All relevant and timely comments will be considered by the Commission before action is taken in proceeding. In deciding its decision, the Commission may take into consideration information and ideas not contained in the comments presented. The application information and ideas not contained in the comments presented. The information and ideas not contained in the comments presented. The information and ideas not contained in the comments presented. The information and ideas not contained in the comments presented. The information and ideas not contained in the comments presented.

23. For purposes of this non-restricted notice and comment rule making proceeding, members of the public are authorized to file comments, except during the Sunset Agenda period. See generally Section 1

24. In general, an ex parte presentation is any presentation directed to the merits or outcome of the proceeding made by an attorney or other representative who is not served on the parties to the proceeding, or (2), if oral, is made without advance notice to the parties to the proceeding and without an opportunity for them to be present. Section 1.201(b). Any person who makes an oral ex parte presentation that presents data or arguments not already reflected in that person's previously-filed written comments, memoranda, or filings in the proceeding must, on or before the day of the written presentation a written memorandum to the Commission. The memorandum must be complete and must be accompanied by a copy of the memorandum to which it relates. Section 1.206.

INITIAL REGULATORY FLEXIBILITY ANALYSIS

25. Pursuant to the Regulatory Flexibility Act of 1980, section 603, the Commission's initial analysis is as follows:

I. Need and purpose of this action

The Commission believes that its rules and polices should be reviewed in the context of current, and if necessary, modified, regulatory, and financial environments in which licensees and applicants operate, so that the service to the public may be for the public, the Commission believes in this light that it is considering modification of its rules, Parts 22, 72, 74, and 90.

II. The objectives

The objectives of this proposal is to accommodate new mobile radio technology to the extent possible, consistent with the need for maximum extent feasible. The Commission believes that this proposal may be a step towards a more rational development of mobile radio technology.

III. Legal basis

Action proposed herein is pursuant to Sections 4(i) and 303 of the Communications Act of 1934, as amended.

IV. Description, potential impact and number of small entities affected

We do not believe that this further Notice will have a detrimental impact upon small entities in light of steps we have taken to control interference. Operation of current licensees that are not regulated by the Commission's action permits new technology, it is likely that it will not be allowed whether small or large, because it will provide the Commission with additional equipment and services that
seek to enter the markets that this action will create. Also, since the action is deregulatory in nature, it should provide expanded business opportunities for all vendors and users of communications equipment, both small and large. Beyond this, we are unable to quantify the potential effects of this action on small entities. Comments are requested on this point by interested parties.

V. Recording, record keeping and other compliance requirements:

The proposed modifications to Part 2 of the Rules will require only record generation by the manufacturer sufficient to meet type acceptance standards for the equipment. The option of using existing procedures is retained.

VI. Federal rules which overlap, duplicate or conflict with this rule:

None.

VII. Any significant alternatives minimizing impact on small entities and consistent with the stated objective:

None.

PAPERWORK REDUCTION ACT STATEMENT

26. The proposal contained herein has been analyzed with respect to the Paperwork Reduction Act of 1980 and found to impose a modified information collection requirement on the public. Implementation of a modified information collection requirement will be subject to approval by the Office of Management and Budget as prescribed by the Act.

27. For further information concerning this proceeding contact Hector Davis, FCC Laboratory, Office of Engineering and Technology, 7435 Oakland Mills Road, Columbia, Maryland 21046, (301) 725-1585.

FEDERAL COMMUNICATIONS COMMISSION

H. Walker Feaster III
Acting Secretary

APPENDIX A

PROPOSED CHANGES FOR FCC RULES AND REGULATIONS

PARTS 22, 74, and 90

1. In 47 CFR Part 2, Subpart J - Equipment Authorization Procedures, Section 2.900 is proposed to be added to read as follows:

Section 2.900 Alternative type acceptance (ATA) grant.

(a) In lieu of the measurements required in Sections 2.985 and 2.989 of this part, an applicant may elect to apply for an equipment authorization grant under alternative type acceptance (ATA) as contained in this section. ATA is intended as an expedient alternative for applicants who wish to market new mobile radio transmitter technologies that will not require additional federal land mobile systems in the land mobile bands. Under ATA, licensees have an option to use new technologies with the understanding that their transmitter power has been derated in order to prevent interference to other licensees. Note that an applicant electing to use ATA shall comply with the other technical requirements of this part.

(b) An applicant for an ATA grant shall derate the emissions of the proposed equipment compared to the transmitter power allowed for conventional FM land mobile radio equipment. The proposed equipment may consist of multiple collocated transmitters in an FM land mobile channel.

(c) The applicant shall perform the following tests in order to determine the derating with respect to the FM transmitter power permitted for conventional FM land mobile radio equipment:

Frequency Rel. to Center of Channel Amplitude

<35 kHz -70 dB

-25 kHz -70 dB

-25 kHz -60 dB

-11 kHz -7 dB

-4 kHz -7 dB

0 kHz 0 dB

+11 kHz -60 dB

+25 kHz -60 dB

+25 kHz -70 dB

>35 kHz -70 dB

The measurements shall be made with a spectrum analyzer with the following settings: 300 Hz resolution bandwidth, 30 Hz video bandwidth, and peak hold. The maximum emission from the transmitter or each transmitter in the case of multiple collocated transmitters shall be plotted so as to touch the ATA mask. The derating of each transmitter is the amplitude of its maximum emission relative to 0 dB at the center frequency of the ATA mask.

(2) The power of the transmitter(s) is measured to ensure that the combined power is no greater than the allowable FM transmitter power. A power meter that measures average power shall be used. The transmitter(s) shall be modulated and operated as described for determining the derating. No adjustments for duty cycle will be made. Therefore 100% duty cycle will be required for the purposes of this test.

(d) The applicant for ATA shall submit a description of the above test results with his application, including a graph showing the ATA mask with the emissions from the transmitter(s).

(e) The Commission staff will review the application and may request the applicant to furnish a representative transmitter(s) in order to reproduce the tests. If the equipment meets the basic requirements it will be type accepted under an ATA grant, that specifies the transmitter(s) power as derated for the grant.

2. In 47 CFR Part 22, Subpart C - Technical Standards, Section 22.120 is proposed to be amended to add paragraph (e) as reads follows:

Section 22.120 Type acceptance of transmitters.

(3) Applying for new remote pickup broadcast stations, Section 74.451(a) is proposed to be revised to read as follows:

Section 74.451 Type acceptance of equipment.

(a) Applications for new remote pickup broadcast stations for changing transmitting equipment in an existing station will not be accepted unless the transmitters to be used have been type accepted by the FCC prior to the application. Transmitters not exceeding the output power limits specified in 74.461(b), or have been granted alternative type acceptance (ATA) under Section 2.990. In addition to the requirement in the 74.461(b), or have been granted alternative type acceptance (ATA) under Section 2.990. In addition to the requirement in the 74.461(b), or have been granted alternative type acceptance (ATA) under Section 2.990. In addition to the requirement in the 74.461(b), or have been granted alternative type acceptance (ATA) under Section 2.990. In addition to the requirement in the 74.461(b), or have been granted alternative type acceptance (ATA) under Section 2.990. In addition to the requirement in the 74.461(b), or have been granted alternative type acceptance (ATA) under Section 2.990.

(2) Transmitters authorized under alternative type acceptance (ATA), Section 2.990, are exempt from the restrictions on types of emissions and bandwidth limitations set out in this subpart. Such transmitters may not operate in the continuous carrier transmit mode. They will be licensed on channels that their authorized bandwidths of 25 kHz or greater are allowed.

6. In 47 CFR Part 90, Subpart J - Non-Voice and Other Specialized Operations, Section 90.231 is proposed to be amended to add the following sentence.

Section 90.231 Scope.

Transmitters authorized under alternative type acceptance (ATA), Section 2.990, are exempt from the restrictions on types of emissions set out in this subpart. Such transmitters may not operate in the continuous carrier transmit mode. They will be licensed on channels that their authorized bandwidths of 25 kHz or greater are allowed.

APPENDIX B

COMPARISONS OF FM INTERFERENCE WITH INTERFERENCE FROM ETA - TYPE SIGNALS

1. Two typical FM land mobile receivers were used for comparisons of FM interference with interference from ETA-type signals. One receiver was a relatively insensitive FM transceiver, while the other was a more expensive base station transceiver. These receivers were tested with several emission combinations, including transmitters that might be authorized under ETA.

2. The tests were based on procedures for adjacent channel selectivity given in Electronic Industries Association Standard RS-204-C, January 1982. First, the reference sensitivity of the receiver under test was determined. This is the tuned signal level resulting in a 12 dB SINAD. Then, the level of the tuned signal was increased 3 dB, resulting in an improvement (increase) of the standard 12 dB SINAD. Next, the level of an interfering undesired channel FM signal was found that decreased the SINAD to 12 dB again. (The modulations of the desired and undesired FM signals were found from the EIA Standard 1 kHz at 3 kHz deviation and 400 Hz at 3 kHz deviation, respectively.)

3. The undesired channel FM signal was replaced by a simulated channel ETA-type area, derated with respect to the previously measured undesired channel FM by using the proposed ATA mask and power measurement. If the receiver sensitivity was 12 dB or more, the receiver was judged to be satisfactory, resulting in "no more harm" than the undesired FM signal.
Two carriers, one centered in the channel, one at the center frequency less 1 kHz, both double sideband suppressed carrier amplitude modulated with 400 Hz.

One of the above signals, centered in the channel.

Two amplifiers and 4-kHz bandwidth Gaussian noise.

For example, the ATA test procedure could be used to permit multiple channel narrow band equipment to operate within a conventional land mobile channel. Since conventional land mobile systems operate with 25 kHz channel spacing and frequency modulation, it might be possible to operate multiple channel narrow band equipment, such as 5 kHz amplitude modulated single sideband (ACSSB) equipment in an FM channel, without causing additional channel or adjacent channel interference. This would be accomplished by attenuating or reducing the power in some or all of the 5 kHz channels. The amount of attenuation would represent the power derating factor and, theoretically, the multiple 5 kHz channels would represent the equivalent interference potential of a conventional 25 kHz FM channel transmission.

3 SINAD is a ratio of signal plus noise and distortion to noise and distortion. SINAD is defined in Electronics Industries Association Standard RS-204-C, January 1982, p. 3.

We are proposing to limit the applicability of ATA to those land mobile channels where the channel bandwidth is 25 kHz or greater, including 25 kHz FM channels at a center frequency spaced 12.5 kHz. While the ATA concept is applicable for FM channels less than 25 kHz in bandwidth, the present proposal was developed and tested assuming a channel bandwidth of 25 kHz. It is applicable to channels of 25 kHz bandwidth and wider. Interference could be expected if it were employed for narrower channels, since the emissions within adjacent channels may be excessive. However, appropriate conditions for ATA could be developed for such channels. This development may follow successful implementations of the present proposal.

6 As an example, let us assume an applicant chooses to implement two transmitters with their peak emissions at plus and minus 4 kHz from the center of the channel. To ensure that the transmitters comply with the frequency roll-off characteristic of the ATA mask, each transmitter should be reduced in power by 7 dB, as required by the mask. Therefore, for the typical case of an FM transmitter with a power of 17 dBW, each of the applicant’s transmitters should be attenuated so that they do not exceed 10 dBW. Be aware that the applicant may have to reduce the combined power of the two transmitters in an additional amount to ensure compliance with the combined power requirement discussed in paragraph 11.

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Authors are requested to submit five copies of the abstract for their proposed paper by September 30, 1988 to:

Joe Castellani
Meetings Chairman, Land Transportation Committee
Rail Systems Center, Mellon Institute
Carnegie Mellon University
4400 Fifth Avenue
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Selected papers are to be submitted on IEEE "Authors Kit" format by December 15, 1988. For further information, call Joe Castellani at: (412) 268-2960.

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Please submit a brief typewritten summary of your paper and a brief personal biography by August 1, 1988 to: Wrex W. Beaman, Chairman
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