Declaration of Ross R. Sorci

I, Ross R. Sorci, hereby declare as follows:

1. I am Ross R. Sorci, Assistant Vice President, IIT Research Institute Center for Electromagnetic Science.

2. IITRI is a not-for-profit contract research organization serving both government and industry in a wide range of planning and engineering tasks related to the use of the electromagnetic spectrum. Since 1961, IITRI has been providing spectrum-related support to US Government agencies and the Department of Defense in the areas of spectrum planning and management, communications-electronics systems engineering, RF interference, electromagnetic compatibility, and the development and maintenance of supporting radio propagation and analysis computer models and databases. The Center for Electromagnetic Science (CEMS) was established in 1994 to leverage IITRI's experience and extensive range of computer models related to radio system engineering, and is now providing design, planning and engineering support to the commercial wireless community, as well as local and municipal governments.

I have over 20 years of telecommunications and RF systems engineering experience as a Division Manager and Project Manager. Specific areas of expertise include planning, conducting, and managing electromagnetic compatibility (EMC) and electromagnetic interference (EMI) analyses, radio system design, radio system performance evaluation, spectrum management, microwave link analysis, and computer modeling of communications and radar/ATC systems. I have also developed analysis techniques and design methodologies for high-capacity digital point-to-point systems, conducted radio communications site surveys, and generated test plans. My resume' is attached.

3. I prepared the accompanying Engineering Statement at the request of the ABC Television Affiliates Association, CBS Television Network Affiliates Association, Fox Television Affiliates Association, and NBC Television Affiliates Association (the "Network Affiliates") for use by the Network Affiliates in response to the *Notice of Proposed Rule Making*, FCC 00-17, released January 20, 2000, in the matter of Establishment of an Improved Model for Predicting the Broadcast Television Field Strength at Individual Locations.

4. I was assisted in the preparation of the Engineering Statement by Paul A. Petsu and David W. Eppink. Mr. Petsu is an IITRI Science Adviser with over 31 years of experience performing analyses of RF systems including communications and radar systems, spread spectrum systems, satellites, and digital wireless systems. In addition, he has expertise in computer modeling and simulation, evaluation and application of standards, and electromagnetic propagation. Mr. Eppink is an IITRI Senior Engineer with over 25 years of experience as a project manager and focal point for the development of radiowave propagation modeling capabilities and analysis projects. He is responsible for the design, programming, and testing of automated models for predicting propagation in varied environments. He has also developed upgrades, enhancements, and corrections related to numerous propagation models, and conducted analyses of radio and radar systems in the presence of noise, interference, and jamming. Resume's for Mr. Petsu and Mr. Eppink are attached.

5. The accompanying Engineering Statement is true and correct to the best of my information, knowledge, and belief.

This the 21st day of February, 2000

Ross R. Sorci
Assistant Vice President
IITRI Center for Electromagnetic Science

IIT Research Institute

RELEVANT EXPERIENCE

Program Manager	EMC/ EMI Analysis	Radio Communications	Radio Propagation
Computer Modeling	Radio Coverage	Radio System Design	Spectrum Management

NAME: ROSS R. SORCI

SKILL CLASSIFICATIONS: PRIMARY: TELECOMMUNICATIONS SYSTEM ANALYSIS, SECONDARY: SPECTRUM MANAGEMENT

SUMMARY OF EXPERIENCE: Over 20 years of telecommunications and RF systems engineering experience. Specific expertise in planning, conducting, and managing electromagnetic compatibility (EMC) and electromagnetic interference (EMI) analyses, radio system performance and design efforts, spectrum management, microwave link analysis, and computer modeling of RF communications systems and radar/ATC systems. Developed analysis techniques and design methodologies for high-capacity digital point-to-point systems, conducted radio communications site surveys, and generated test plans.

CHRONOLOGICAL EXPERIENCE:

1999 to Present -- Assistant Vice President, Division Manager, IIT Research Institute – Center for Electromagnetic Science

Division Manager of CEMS EM Engineering Division. Project responsibility includes, Extremely Low Frequency (ELF) Communications System Environmental Compatibility Assurance Program, HQDA Spectrum Management Engineering Support, Electromagnetic Environmental Effects (E3) Protection Program Engineering Technical Services for FEMA Facilities, ILC Data Device Corporation DC Motor Torque Controller Hardening Evaluation, UDLP Crusader Hardening Evaluation, UDLP Grizzly Nuclear Survivability, and M1 Tank Hardening projects.

Program Manager of an effort to provide spectrum certification and spectrum management engineering and information analysis support to the DoD Office of Spectrum Management and Analysis (OSAM). This effort has successfully defined DoD spectrum certification process improvements and practices to enhance DoD spectrum access and technology insertion. Specific accomplishments include identifying and aiding in the resolution of spectrum certification and management issues facing the DoD Joint Tactical Radio System, review and evaluation of emerging and future communications technologies such as software defined radios (SDR), and the assimilation of this knowledge to define a framework for a revised, unified DoD spectrum certification process that effectively supports technology insertion.

Provided spectrum management related analysis capabilities and engineering support to the US Army Spectrum Manager. Tasks included information analysis, development of software and databases, and electromagnetic compatibility/electromagnetic interference (EMC/EMI) studies required in support of the evaluation of spectrum reallocation impacts, frequency management, and international/host country frequency coordination issues.

Managed the successful marketing, packaging and sale of a commercialized version of an IITRI developed terrain dependent radiowave propagation computer model. This computer software has applications to radio antenna siting studies, interference analysis efforts, and radio coverage studies for mobile radio and broadcast radio and television station operators. Also oversaw the development of a state-of-the-art time division multiple access (TDMA) computer simulation model. This model was developed for use in evaluating radio spectral emission constraints, spectral efficiency studies, and system transition considerations.

1994 to 1999 -- Manager of Research, IIT Research Institute, Center For Electromagnetic Science

Designed and specified a Police and Fire Department mobile radio communications system for the Borough of Bogota, NJ. Effort consisted of defining the limitations of the current system, establishing requirements, and designing a new radio system consisting of fixed and mobile radios and repeaters to provide the desired radio coverage. Also assisted in producing specifications to be used for the competitive bidding process, and evaluating bids for construction of the specified system.

Successfully represented the Borough of Bogota, NJ at a public hearing concerning mobile radio antenna siting and safety, and also provided testimony concerning siting of cellular antenna facility at a public zoning hearing.

Program Manager for a digital wireless cable television system design project for CAI Wireless Systems, Inc. Responsible for planning, development, and implementation of the system design methodology, producing system designs for 13 markets in the mid-Atlantic and Northeast regions, and identifying and solving technical issues associated with the design effort. Worked closely with CAI Wireless and its partners to successfully define design analysis criteria, develop and present solutions to issues associated with implementation of new digital wireless technology, and present results of the design process.

Chairman of the Intelligent Transportation Society of America (ITS-A) Telecommunications Committee 1995-1996. Responsible for developing positions and recommendations pertaining to wireline and wireless telecommunications, integration, and identifying spectrum requirements. Also proactively engaged in spectrum management activities with the Federal Communications Commission (FCC), National Telecommunications and Information Administration (NTIA) and International Telecommunications Union (ITU) as the ITS-A focal point for telecommunications issues.

Project Manager for an effort to define terrain dependent NTSC and Digital Television (DTV) signal coverage for Fox Television affiliates in Pittsburgh, PA. The signal coverage data was used to determine the number of households covered within a defined market area. In addition to the coverage and demographic analyses, customer supplied coverage modeling assumptions and propagation data inputs were examined and evaluated. Also conducted a Grade B signal coverage analysis for 31 Los Angeles and Detroit TV stations for Fox Television. This study produced terrain dependent signal coverage maps and data where the impact of potential cochannel, adjacent channel, intermodulation, and receiver spurious response interference interactions were considered.

Lead Engineer for an analysis to rank the top 12 Rand McNally BTA's for Local Multipoint Distribution Service (LMDS) use as input for an FCC spectrum auction. The ranking was based on a comparison of terrain and ground cover features, climate factors affecting 28 GHz radio propagation applicable to LMDS service, and relative demographics of the BTAís of interest.

Provided wireless communications system consulting support to local government zoning board and community development officials in Cedar Grove, NJ. Consulting support consisted of evaluating radio coverage needs and predictions, assessing antenna and tower siting criteria, performing site surveys, and providing technical guidance.

Extensive experience in utilizing wireless communication coverage and performance computer models developed by Comsearch, MSI and EDX Engineering, as well as IITRI developed radiowave propagation models such as TIREM and Millimeter Wave. This includes selection of appropriate model inputs such as terrain elevation and ground cover data, system performance and interference criteria, equipment and antenna technical characteristics, and demographic data. Also developed signal coverage test plans, conducted measurements, and developed methodology and conducted statistical analyses to validate and verify radio coverage predictions produced by computer models.

1988 to 1994 -- Manager of Research, IIT Research Institute, Joint Spectrum Center / Electromagnetic Compatibility Analysis Center Support Services

Supervised staff assigned to US Air Force sponsored airborne and ground based radar, VHF/UHF communications, RADHAZ, cosite/intersite EMC, HF communications reliability, and air traffic control simulation and modeling efforts. Provided spectrum management and engineering analysis support to telecommunication development and in support of spectrum regulation on various projects.

Responsible for successful completion of a DoD frequency supportability evaluation, and vulnerability and cosite interference analyses of airborne radars. Developed computer models and automated performance evaluation tools of radar and air traffic control systems, and identified existing electromagnetic signal environments and appropriate system performance measures to assess impact of systems on the RF spectrum.

Performed site surveys of numerous communications and radar sites in Egypt, developed an automated frequency management system specification, and managed the development and successful delivery of the specified frequency management system to the Egyptian Air Force (EAF). Also performed an evaluation of cosite interference performance of a proposed VHF/UHF air-ground-air tactical communications system for the EAF.

1982 to 1988 -- Research Engineer/Project Manager, IIT Research Institute, Electromagnetic Compatibility Analysis Center

Provided Analysis, Computer Simulation, Testing and Frequency Allocation support for a proposed next generation jam resistant, and secure military Identification Friend-or-Foe (IFF) system. Evaluated compatibility of new IFF systems with existing air traffic control (ATC) environment and military navigation and communication systems, supervised performance of, and reviewed and documented simulation results of IFF/ATC system performance, interfaced with US Air Force, Federal Aviation Administration (FAA), National Telecommunications and Information Administration (NTIA), and NATO member countries on frequency allocation and spectrum supportability issues. Planned and supervised laboratory bench testing of performance impacts to selected ATC transponders, interrogators, and beacons from military IFF signals.

Acted as an electromagnetic compatibility (EMC) and frequency management consultant to the US Air Force air-to-air and air-to-ground training ranges in Nevada. This highly successful effort included performing communications and microwave site surveys and cosite interference analyses, evaluating radar simulator interference, performing radar siting and coverage evaluations, and conducting backbone and point-to-point digital and analog microwave system siting and link analyses. Other tasks included investigating and recommending solutions to interference cases caused by training activities such as radar jamming, and developing a database of equipment technical characteristics necessary for training range spectrum management and EMC analyses.

1979 to 1982 -- Assistant/Associate Engineer, IIT Research Institute, Electromagnetic Compatibility Analysis Center Support Services

Provided timely and accurate technical support to a succession of spectrum engineering projects. Efforts successfully supported ranged from HAVE QUICK UHF frequency hopping spread spectrum communications systems EMC, AWACS UHF air-ground-air frequency planning, EMC of AMRAAM missile testing telemetry systems, compatibility of intrusion detectors utilizing pseudonoise spread spectrum modulation, system performance of air-to-air data links, and analog and digital microwave system link analyses and frequency plans.

ACTIVE SECURITY CLEARANCES:

Secret, DoD, August 1979

EDUCATION:

B.S., Electrical and Computer Engineering, June 1979

Clarkson College of Technology

Potsdam, NY 13676

OTHER COURSES:

National Defense University, Armed Forces Staff College, Norfolk, VA, Electronic Warfare Staff Officers Course, December 1990.

AWARDS/AFFILIATIONS

IITRI Commitment to Excellence Award, July, 1986

Letters of Appreciation: USAF Director, Combat Identification SPO, 16 April, 1986,

Director, ECAC, 28 April, 1986

USAF Director, Combat Identification SPO, December, 1986

Director, ECAC, January, 1987

Assistant Secretary of Defense, 7 November, 1989

Director, ECAC, 14 December, 1989

USAF Deputy for Air Force Projects, ECAC, 15 May, 1991

Asst. Director for Air Force Projects, ECAC, 17 January, 1992

Selected Publications for Ross R. Sorci

Cedar Peak Antenna Siting Analysis, ECAC-CR-81-164, February 1981, DoD ECAC, Annapolis, MD.

EMC Analysis of the Mobile Individual Resource Protection Sensor (MIRPS), ECAC-CR-80-104, March 1981, DoD ECAC, Annapolis, MD.

EMC Analysis of HAVE QUICK Operations Aboard the E-3A Aircraft, ECAC-CR-80-034, May 1981, DoD ECAC, Annapolis, MD.

EMC Analysis of the Mobile Individual Resource Protection Sensor (MIRPS) in the 1215-1400 MHz Band, ECAC-CR-81-045, August 1981, DoD ECAC, Annapolis, MD.

EMC Analysis of the Digital Microwave Communication System at Nellis AFB, NV, ECAC-CR-83-125, January 1983, DoD ECAC, Annapolis, MD.

An EMC Analysis of the Short-Haul Microwave System at Nellis AFB, NV, ECAC-CR-83-107, January 1983, DoD ECAC, Annapolis, MD.

A Cosite EMC Analysis of the VHF and UHF Tactical Nets at Angels Peak, NV, ECAC-CR-83-095, August 1983, DoD ECAC, Annapolis, MD.

A Cosite EMC Analysis of the VHF and UHF Tactical Nets at Highland Peak, NV, ECAC-CR-83-179, December 1983, DoD ECAC, Annapolis, MD.

An EMC Analysis of the CDLJ at Nellis AFB, NV, ECAC-CR-83-201, March 1984, DoD ECAC, Annapolis, MD.

Analysis of the Radio Coverage on the Alamo, Elgin, and Coyote Training Ranges, ECAC-CR-85-016, March 1985, DoD ECAC, Annapolis, MD.

PLSS IDL and DME Frequency Recommendations for Use in the FRG, ECAC-CR-85-038, May 1985, DoD ECAC, Annapolis, MD.

VHF/UHF Band Study for Nellis AFB Training Ranges, ECAC-CR-85-050, June 1985, DoD ECAC, Annapolis, MD

EMC of the MILSTAR Air Force Terminals, ECAC-CR-84-132, February 1987, DoD ECAC, Annapolis, MD.

An Empirical Antenna-to-Antenna Propagation Path Loss Model Applicable to Low Observable Aircraft, Title 876, November 1991, IIT Research Institute, Annapolis, MD.

EMC Analysis of the AN/MPS-T9 and AN/MPS-14 (MOD) Transmitters on the AN/GPN-25 Receiver, ECAC-CR-83-029, May 1983, DoD ECAC, Annapolis, MD.

Preliminary EMC Analysis of MILSTAR Air Force Terminals, ECAC-CR-86-095, February 1987, DoD ECAC, Annapolis, MD.

F-16 Electromagnetic Configuration Manual, JSC-PR-98-016, March 1999, DoD Joint Spectrum Center, Annapolis, MD.

Technical Reports and White Papers for Ross R. Sorci

Preliminary RF Performance Assessment for Project Langley, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 10 February 1995. (Prepared for Bell Atlantic Enterprises International, Inc. 1310 North Courthouse Rd, Arlington, VA 22201)

Project Langley Scenario Analysis, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 24 April 1995, (Prepared for Bell Atlantic Enterprises International, Inc. 1310 North Courthouse Rd, Arlington, VA 22201).

Project Langley Radar Testing, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 26 April 1995, (Prepared for Bell Atlantic Enterprises International, Inc. 1310 North Courthouse Rd, Arlington, VA 22201)

LOS Field Observation Program for Project Langley, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 3 July 1995, (Prepared for CAI Wireless Systems, 12 Corporate Woods Blvd, Albany, NY 12211)

Statistical Reduction of Field Observation Data and Calculation of Servable Homes, , IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 25 July 1995. (Prepared for CAI Wireless Systems, 12 Corporate Woods Blvd, Albany, NY 12211)

High Power and Adjacent Signal Radar Interference, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 5 August 1995, (Prepared for CAI Wireless Systems, 12 Corporate Woods Blvd, Albany, NY 12211)

Comparison of Near-In Blockage Due to Foliage and Buildings, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 12 December 1995, (Prepared for CAI Wireless Systems, 12 Corporate Woods Blvd, Albany, NY 12211)

Calculation of the Average Number of Households Covered for Systems Containing Large Numbers of Transmitters, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 4 January 1996. (Prepared for CAI Wireless Systems, 12 Corporate Woods Blvd, Albany, NY 12211)

Digital Multichannel Multipoint Distribution Service (MMDS) RF Site Engineering Program Plan, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 15 January 1996, (Prepared for CAI Wireless Systems, 12 Corporate Woods Blvd, Albany, NY 12211)

Discussion of Building Blockage in the Observations, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 15 January 1996, (Prepared for CAI Wireless Systems, 12 Corporate Woods Blvd, Albany, NY 12211)

Discussion of the 15 dBi Burnthrough Margin for Penetration Of Trees, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 15 January 1996, (Prepared for CAI Wireless Systems, 12 Corporate Woods Blvd, Albany, NY 12211)

Application of the Near-In Blockage Computation Algorithms, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 17 January 1996, (Prepared for CAI Wireless Systems, 12 Corporate Woods Blvd, Albany, NY 12211)

Evaluation of Potential Radar Interference To Digital MMDS, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706. 1 February 1996. (Prepared for CAI Wireless Systems, 12 Corporate Woods Blvd, Albany, NY 12211)

Survey of Commercially Available Point-To-Point Microwave Link and Interference Analysis Computer Models, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 1 March 1996, (Prepared for Video/Phone Systems, Inc, Suite 3050 Atrium, 2701 Summer St, Stamford, CT 06905)

Calculation of Serviceable Households Within the Top Five Zip Code Deciles for Boston, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 5 March 1996, (Prepared for CAI Wireless Systems, 12 Corporate Woods Blvd, Albany, NY 12211)

Evaluation of Potential Digital MMDS Interference to the FAA ASR-9 Radar in Boston, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 22 July 1996. (Prepared for CAI Wireless Systems, 12 Corporate Woods Blvd, Albany, NY 12211)

Methodology for Determining the Feasibility of Sharing Between High-Density Fixed Service and Fixed Satellite Service Operations in Frequency Bands Above 30 GHz, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, November 1996, (Prepared for Biztel)

Sharing Between the Fixed Service and the Fixed Satellite Service in Frequency Bands Above 30 GHz, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, November 1996. (Prepared for Biztel)

Modification of Near-In Blockage Observation Data Due to the Application of the ñ71 DBM Burnthrough Criteria, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 7 December 1996, (Prepared for CAI Wireless Systems, 12 Corporate Woods Blvd, Albany, NY 12211)

Grade B Coverage Test Case Analysis for Los Angeles and Detroit, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, June 1997. (Prepared for News Corporation, 10201 West Pico Blvd, Los Angeles, CA 90035)

NTSC and DTV Signal Coverage and Demographic Analysis for KDKA and WPGH in Pittsburgh, PA, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, October 1997, (Prepared for News Corporation, 10201 West Pico Blvd, Los Angeles, CA 90035)

Ranking of the Top 12 Basic Trading Areas for LMDS Use According to Demographics, Terrain, Ground Cover, and Climate Factors, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, 7 November 1997. (Prepared for RDL-CTC, 5800 Uplander Way, Culver City, CA 90230)

Application of Digital Adaptive Equalization to Support Spectrum Re-Use at a Wireless Point-To-Point Relay Facility, IIT Research Institute, Center For Electromagnetic Science, 4409 Forbes Blvd, Lanham, MD 20706, November 1997. (Prepared for Headquarters of the Army (HQDA) Spectrum Management, Pentagon, Washington, D.C.)

IIT Research Institute

RELEVANT EXPERIENCE

Communications	Spectrum Engineering	Radiowave Propagation	DSP
Software	Modeling		

NAME: PAUL A. PETSU

SKILL CLASSIFICATIONS: COMMUNICATIONS AND RF SPECTRUM ENGINEERING; SOFTWARE AND MODEL DEVELOPMENT

SUMMARY OF EXPERIENCE: 31 years experience performing analyses of RF systems including Communications and Radar Systems, Spread Spectrum Systems, Satellite Systems, and Digital Wireless Systems. Additional experience in computer modeling and simulation, evaluation and application of standards and electromagnetic propagation.

CHRONOLOGICAL EXPERIENCE:

IITRI, SEG; Center for Electromagnetic Science (CEMS)
1996 - Present - Science Advisor, IIT Research Institute

Performed research of emerging radiocommunications technology to identify areas that may have an impact on the RF spectrum management and system certification processes.

Performed design and testing of digital wireless cable transmission systems. Identified and evaluated locations for main and booster transmitters, and specified antenna and transmitter characteristics. Also evaluated candidate system designs with respect to radio coverage, population demographics, and compliance with FCC standards and rules. Developed test procedures and algorithms for selecting test locations used to evaluate design performance. Performed post-test data reduction and analysis.

Performed EMC analysis of Terrestrial Digital Audio Broadcast Systems with Search and Rescue Satellite System. Determined interference mechanisms and evaluated conditions under which unacceptable RFI can occur to the onboard satellite receivers. Performed analysis in support of EPLRS antenna integration on the F-15 aircraft, and evaluation of spectrum requirements for the Airborne Communications Node which integrates several communication functions including SATCOM, HAVE QUICK, and SINCGARS. Evaluated spectrum supportability to determine the optimum band to accommodate multiple airborne functions.

1987 - 1996 - Project Manager, IIT Research Institute

Project manager for the Joint Electromagnetic Interference (JEMI) Joint Test Force (JTF). Directed the analysis, test and evaluation of RFI interactions between combat participants pertaining to an actual battlefield situation involving joint forces. Developed a PC based software model that allowed all potential EMI interactions between joint force participants to be evaluated as part of the operational planning process. Performed pre-test analysis, test planning, data collection and data reduction/post-test analysis for 13 major DOD system interactions.

Performed spectrum studies to determine the optimum band for the Next Generation Target Control System (NGTCS). Evaluated system compliance with US national, DoD, and civilian frequency allocation policies and EMC standards as part of the band selection process. Conducted analysis to determine EMI potential between competing band users and participated in the source selection process.

Project management for the Digital European Backbone (DEB) System involved directing frequency engineering studies to develop interference free frequency plans to support system upgrades. Frequency engineering considered cochannel and adjacent channel interactions between RF links within

radio line-of-sight and accounted for the transmitter emission, receiver selectivity, antenna coupling and terrain dependent propagation effects.

Participated in the development and implementation of the JSC Joint Spectrum Interference Resolution (JSIR) program which eventually replaced the MIJI program. Prepared modifications to existing DOD standards and directives required to implement the new JSIR program.

1984 - 1987 - Manager of Research, IIT Research Institute

Technical management of 22 engineers and technicians in support of the JTIDS test and evaluation program including support to the JTIDS test and evaluation working group chaired by the NTIA. Activities included the development and validation of computer simulation models to evaluate the performance of TACAN/DME interrogators and beacons, and the JTIDS receiver.

1971 - 1984 - Staff Engineer, IIT Research Institute

Project management for a variety of communication-electronics system development programs including MILSTAR, HAVE QUICK, SEEK TALK, and RAJPO Datalink. Developed programs to support the various program development stages, performed analysis and test efforts to help mitigate potential EMI related problems. Support included evaluation of system parameters against frequency allocation/assignment, system EMC/EMI, and emission standards. Assisted in the development of techniques for the evaluation of EMC between spread spectrum and conventional systems which were used to support the SEEK TALK and HAVE QUICK programs.

Provided project management for Nellis and Eglin AFB training range RF integration efforts. Performed siting and coverage analysis for various RF systems in support of the 554th Range Group engineering team's maintenance of the RED FLAG training environment.

Participated in a variety of analysis projects including GPS and CONUS OTH-B programs with emphasis on the application of computer models to engineering problems. Developed a computer model for the evaluation of RFI between a high power HF radar system and a multi-continent user environment using HF skywave prediction techniques.

1970 - 1971 - Applications Programmer, KMS Technology Center

Software development for application to simulation and database management. Developed a software model to simulate the performance of ship's inertial navigation system. Participated in the development of a database management system utilizing relational database principles for application to a wide variety of DOD databases. Programming languages included FORTRAN, COBOL, IBM Assembly and PL/1.

1968 - 1970 - Electronics Engineer, HRB Singer, Inc

Design and development of spectrum management systems that included database management and frequency engineering tools for HF and VHF frequency assignments. Utilized propagation prediction models to assist DOD frequency assignment engineers in evaluating candidate frequencies for assignment to the services. Maintained a database for pending frequency assignment actions to allow engineers easy access to frequency assignment data and facilitate transition to the Government Master File.

SOFTWARE: ASSEMBLY, VISUAL BASIC, FOXPRO COMMAND, MAPBASIC

ACTIVE SECURITY CLEARANCES:

SECRET, DISCO

INACTIVE SECURITY CLEARANCES:

TS, DISCO, date issued, inactive date

EDUCATION:

M.S. Electrical Engineering, 1978, George Washington University, Washington, D.C.

B.S., Electrical Engineering, 1968, Pennsylvania State University, State College, PA

IIT Research Institute

RELEVANT EXPERIENCE

Propagation	Ionospheric	Tropospheric	Groundwave
Radio	Radar	EMC	ATE

NAME: DAVID W. EPPINK

SKILL CLASSIFICATIONS: PROPAGATION MODELING AND EMC ENGINEERING; AUTOMATED TESTING OF WEAPONS SYSTEMS

SUMMARY OF EXPERIENCE:

15 years experience as project manager/focal point for the development of the radiowave propagation capability for the JSC and for propagation projects. Responsible for the design, programming, and testing of automated models for predicting radiowave propagation in varied environments. Developed upgrades, enhancements, and corrections to radiowave propagation models. Wrote technical documents, white papers, memos, etc. in support of projects. Served as an advisor to analysis projects. 10 years experience as EMC analyst of the operation of radio and radar systems in the presence of noise, interference, and jamming. Prior experience as a test engineer for weapons systems.

CHRONOLOGICAL EXPERIENCE:

IITRI, Engineering Quality and R&D Division;
Project manager/focal point for propagation, March 1984 – Present

Responsible for planning, project plans, quarterly and period status reports, consultation and supervision of all tasks related to propagation.

Achievements: Projects managed and significant products include:

• Participated in the investigation of aircraft accidents and supported legal counsel for cases involving propagation of communications or navigation signals. Received letters of thank you from Brigadier General Charles H. Coolidge and from Dr. Richard H. McFarland.

• Devised methods to use one-way propagation models to predict two-way radar effects

• Types of propagation models that have been developed

• Groundwave propagation over a smooth, spherical earth with non-homogeneous electrical characteristics

• Groundwave propagation over irregular terrain with homogeneous electrical characteristics

• Propagation by tropospheric forward scatter

• Propagation by ionospheric reflections

• Propagation in unique environments such as buildings, urban regions or forests

• Tropospheric ducting

IITRI, Engineering Quality and R&D Division;
Project manager/EMC Engineer; April 1974 – March 1984

Responsible for supervision of Electromagnetic Compatibility (EMC) analyses of the operation of radio and radar systems in the presence of noise, interference, and jamming.

Achievements: Projects managed and significant products include:

• Investigated EMC aspects of development of the AFSATCOM II with the environment and on Navy aircraft.

• Performed EMC analysis of communications and radar equipment co-located on the Joint Airborne Communications Center/Command Post (JACC/CP). Project was cited as a "notable accomplishment" by Colonel Robert K. Ace, Deputy for Procurement, USAF.

• Directed a series of analyses for the Division Air Defense (DIVAD) gun system (later named the SGT YORK Gun System.)

Gould, Inc., Ocean Systems Division;
Electronics Engineer; June 1972 – March 1974

Performed programming, troubleshooting, repair, and calibration of tape-programmable ATE for the Mark 48 Mod 1 homing torpedo.

Achievements: Projects managed and significant products include

• Performed machine language programming of ATE to troubleshoot and isolate problems in a sophisticated homing weapon system employing digital and analog circuitry.

• Prepared procedures for production testing, calibration, and repair of circuit boards, electronic and mechanical assemblies, and test sets.

PROFESSIONAL REGISTRATION:

Hold FCC General Radiotelephone Operator License with Ship Radar Endorsement, FCC Amateur Extra Class Radio License - Call sign W3DE, FAA Private Pilot Certificate.

HARDWARE:

Continual Technology, 80486-50, operation

SOFTWARE:

Microsoft, Office 97, operation

ACTIVE SECURITY CLEARANCES:

Secret, DISCO, August 1983

INACTIVE SECURITY CLEARANCES:

Top Secret, DISCO, August 1983 to August 1985

EDUCATION:

Kent State University, MBA, 1971, Finance

University of Louisville, BA, 1954, Physics

OTHER COURSES:

None

PUBLICATIONS/PRESENTATIONS:

- *Radiowave Propagation from 2 MHz to 3 GHz*, Title 1063, **David W. Eppink**, Homer L. Riggins, and Richard D. Albus, JSC, Annapolis MD, 1998.
- Propagation Analysis Using TIREM. In: *Proc. of the Electromagnetic Workshop*, R. Paulus, TD 2891, NCCOSC, NraD, San Diego, CA, pp. 314-320 (1995). **D. Eppink** and H. Riggins

- Propagation Analysis Using TIREM. In: *63rd MORSS—Joint Analysis for Joint Operations*, Cynthia Kee-LaFreniere, (Ed.), Military Operations Research Society, Alexandria, VA, pp.81-82 (1995). **Dave Eppink** and Homer Riggins
- BLOS Propagation Capabilities at ECAC. In: *Beyond Line-of-Sight (BLOS) Conference*, ARL, Univ. of Texas at Austin (1994) Homer L. Riggins and **David W. Eppink**
- *TIREM/SEM Handbook*, HDBK-93-076, **David W. Eppink** and Wolf Kuebler, ECAC, Annapolis MD, 1994.
- *TIREM/SEM Programmer's Reference Manual, Supplement 1*, CR-90-039Sp1, **David W. Eppink**, Steven Leach, and Margaret A. Staehle, ECAC, Annapolis MD, 1993.
- *Users Manual for Interactive propagation Models*, UM-86-042, J. Hoban, **D. Eppink**, J. Alexiou, and J. Lockard, ECAC, Annapolis MD, 1986.
- Use of Ambiguity Functions in EMC Analysis. In: *Proc. of the 1984 IEEE National Symposium on Electromagnetic Compatibility*, IEEE, San Antonio, TX, April 24-26, 1984, pp. 359-363. **David W. Eppink** and Marvin D. Aasen
- *SGT YORK Radar Engineering Design EMC Test Plan Evaluation*, CR-83-188, **D. Eppink**, ECAC, Annapolis MD, 1984.
- *SGT YORK Fire Control Computer EMI Test Plan Evaluation*, CR-83-131, **David W. Eppink**, ECAC, Annapolis MD, 1983.
- *SGT YORK Radar EMI Test Plan Evaluation*, CR-83-130, **D. Eppink**, ECAC, Annapolis MD, 1983.
- *SGT YORK IFF Interrogator EMC Test Plan Evaluation*, CR-83-090, **D. Eppink**, ECAC, Annapolis MD, 1983.
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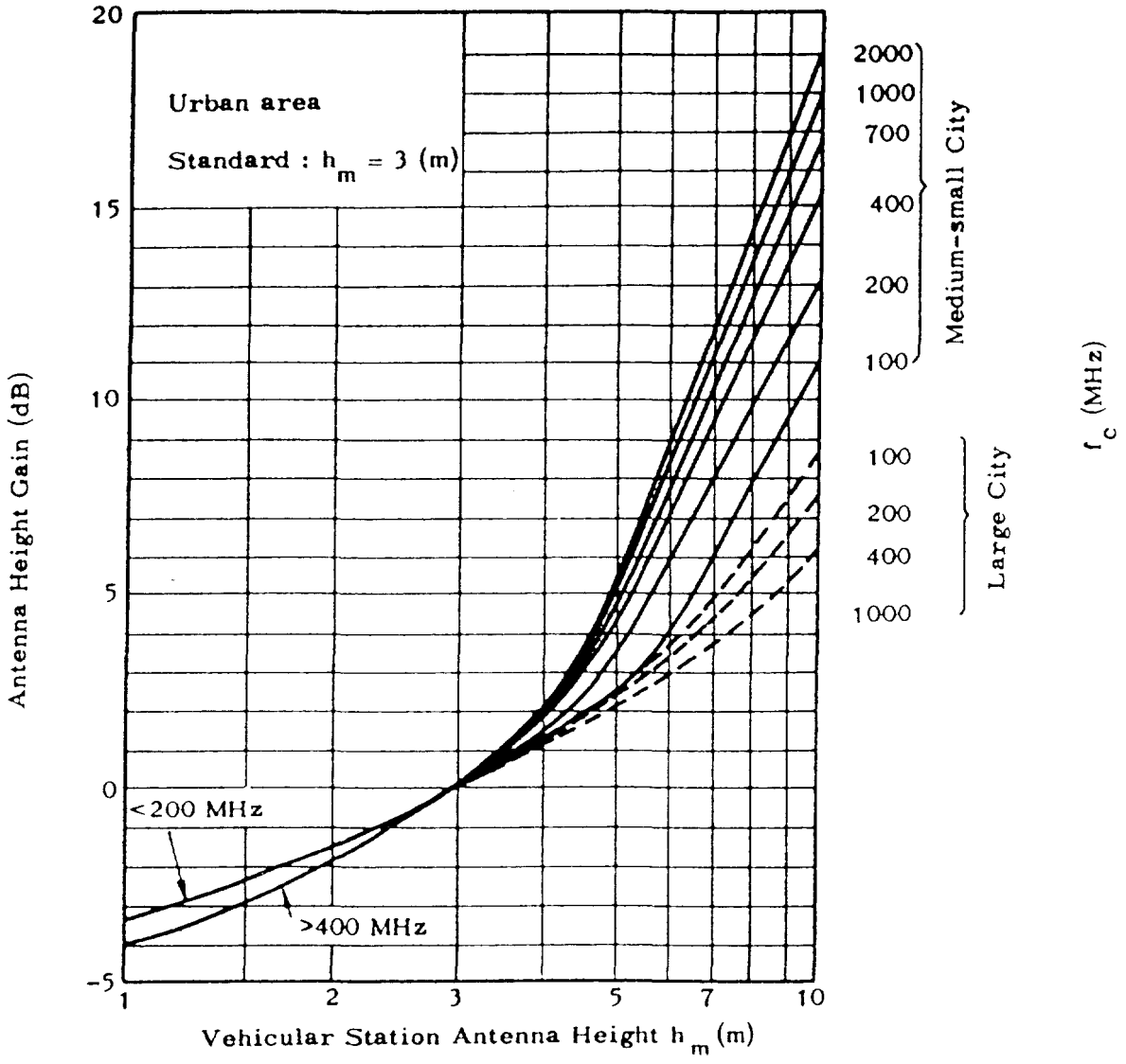
AWARDS/AFFILIATIONS: LIST LAST TO FIRST, WITH AWARDS BEFORE AFFILIATIONS

Member, Sigma Pi Sigma; Member, Phi Kappa Phi; Member, Omicron Delta Kappa

Exhibit 1

Exhibit 1



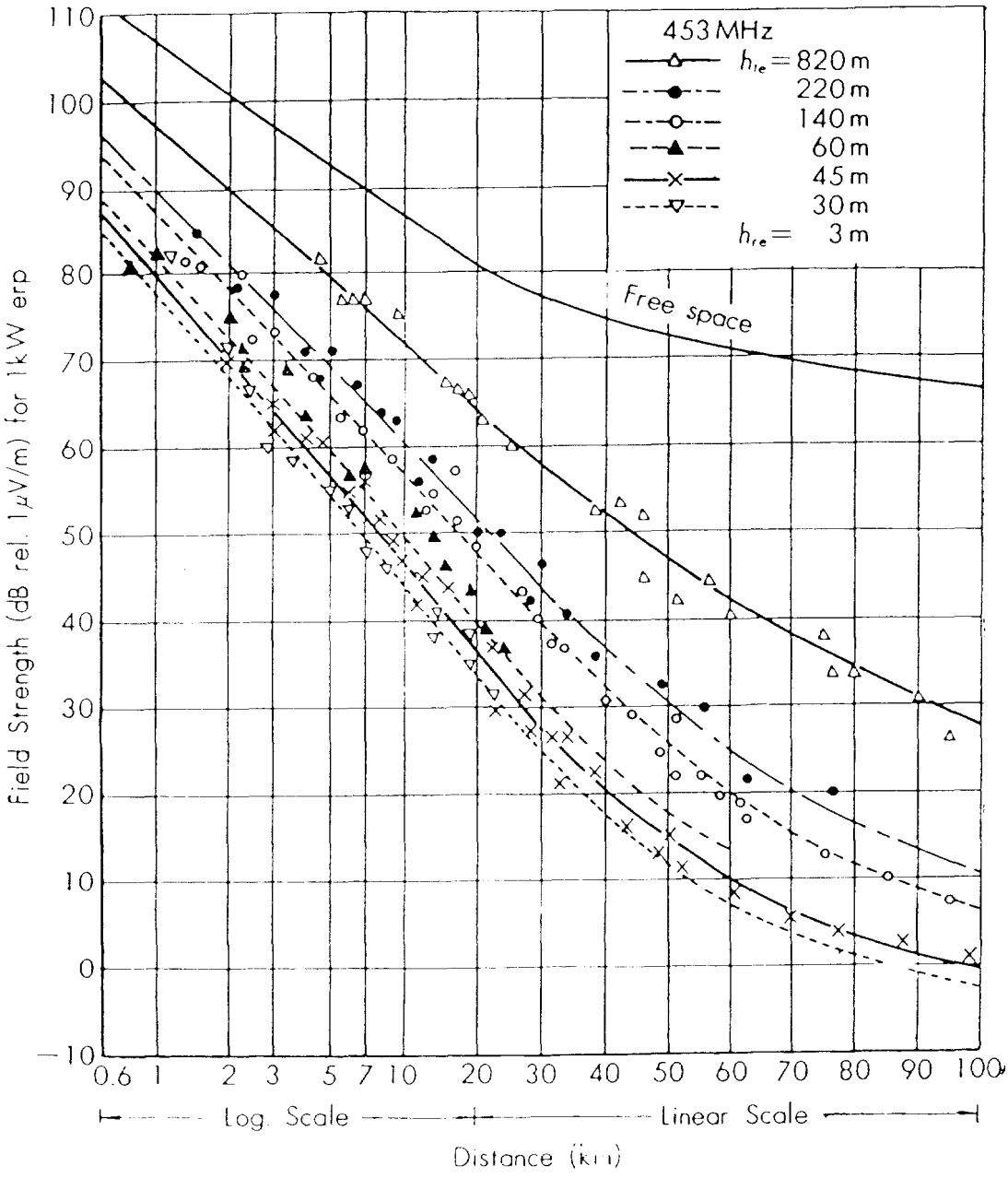
Prediction curves for vehicular antenna height gain in an urban area.

Source: M. Hata, *Empirical Formula for Propagation Loss in Land Mobile Radio Services*, 29 **IEEE Trans. on Vehicular Tech.** 317 (Aug. 1980), 320.

Exhibit 2

ALL-STATE® LEGAL 800-222-0510 EDR11 RECYCLED

Exhibit 2



Median field strength versus distance in urban areas, 453 MHz.

Source: Y. Okumura et al., *Field Strength and Its Variability in VHF and UHF Land-Mobile Radio Service*, 16 **Rev. of the Elec. Comm. Lab**. 825 (Sept.-Oct. 1968), 836.