NBSIR 73-313

COMMUNICATION CHANNEL SIMULATION AND PROPAGATION EFFECTS: 0.225 to 40.0 GHz A BIBLIOGRAPHY

Anne Y. Rumfelt

Electromagnetics Division
Institute for Basic Standards
National Bureau of Standards
Boulder, Colorado 80302

June 1973

Prepared for
Department of the Air Force
Air Force Avonics Laboratory (AFSC)
Wright-Patterson Air Force Base, Ohio 45433

NBSIR 73-313

Communication Channel Simulation and Propagation Effects: 0.225 to 40.0 GHz A Bibliography

Anne Y. Rumfelt

Electromagnetics Division
Institute for Basic Standards
National Bureau of Standards
Boulder, Colorado 80302

June 1973

Prepared for
Department of the Air Force
Air Force Avonics Laboratory (AFSC)
Wright-Patterson Air Force Base, Ohio 45433

U.S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary
NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director

Issued February 1973

CONTENTS

Abstract

This bibliography provides a literature search to locate as many propagation models as possible in the frequency range 0.225 to 40.0 GHz. There was reduced emphasis on high frequency, low frequency, and very low frequency models. The bibliography contains 534 references selected from a total of 3493 which were scanned in title and abstract. It is divided into three sections: communication channel simulation (105 citations); propagation effects (349 citations); and miscellaneous references (80 citations). The literature search covered the open literature from 1968 to 1972 and the reports literature from 1962 to 1972.

Key Words: Channel simulation; communications; propagation effects.

COMMUNICATION CHANNEL SIMULATION AND PROPAGATION EFFECTS: 0.225 TO 40.0 GHz

A BIBLIOGRAPHY

Compiled by
Anne Y. Rumfelt

INTRODUCTION

This bibliography is a report to sponsor listing citations* identified as being related to communication channel simulation, simulators and models or to propagation effects causing attenuation (path loss) in a communication channel.

OBJECTIVES

The original objectives of the project (WPAFB/AFAL/AAI Contract F33615-72-M-5014) were to provide an exhaustive literature search to locate all possible propagation models. These propagation models were to be sorted and bounded with appropriate constraints and mathematical equations provided for subsequent programming on a communication channel simulator. Gaps in the available knowledge were to be identified.

These project objectives were modified after a change in project personnel and after consultation with the sponsor. The modified objective of the project is to perform a literature search to locate as many propagation models as possible in the frequency range 0.225 to 40 GHz. The literature search is also to include communication channel simulators and propagation effects causing attenuation in a communication channel.

---

*The citations listed in this bibliography were taken directly from the NASA Literature Search, the DDC Report Bibliography, and Science Abstracts B. It was not practical within the project limitations to verify the citations against the original documents.

PROGRESS

The literature search has been completed and a bibliography compiled. The bibliography contains 534 references divided into three major categories: Part I -- Communication Channel Simulation, 105 citations; Part II -- Propagation Effects, 349 citations; and Part III -- Miscellaneous References, 80 citations.

The literature search covered the open literature from 1968 to 1972 and the unclassified reports literature from 1962 to 1972. The open literature was searched using Electrical and Electronics Abstracts, an abstracting service that covers both domestic and foreign journals. The reports literature was searched using machine literature searches available from the NASA Scientific and Technical Information Facility and from the Defense Documentation Center.

Machine literature searches on the topic of channel simulation yielded a total of 1231 potential references (152 from NASA and 1079 from DDC). On the topic of propagation effects, machine searches yielded 380 potential references (222 from NASA and 158 from DDC). The open literature search by means of Electrical and Electronics Abstracts (Science Abstracts B) yielded a total of 1882 additional potential references on both topics. Thus, the total number of references scanned in title and abstract in the preparation of this document was 3493. The number of references selected from this group was 534, or about 15%.

One of the references listed in PART III of this report deserves special comment. The "Bibliography on Propagation Effects," by Vogler and Van Horn, was not used as an input to this report. It partitions the spectrum into two regions: 10 GHz-300 GHz and 300 GHz-1000 THz. It thus does not cover a large part of the region of interest below 10 GHz. It covers the open literature primarily, rather than the reports literature.

PART I. COMMUNICATION CHANNEL SIMULATION

Simulation

Principles of Simulation of Randomly Time-Variant Multipath Propagation
Baghdady, E. J.
1969 IEEE International Conf. Communications, Boulder, Co. (New York: IEEE, 1969)
June 1969, 16 pages

Tapped Delay Line Simulation of Randomly Time Variant Channels
Bailey, C. C.
Report No. NASA-CR-80358 MEMO-66-2 (N67-12978)
Sept. 1966, 50 pages

Digital Simulation of a Randomly Time-Variant Communication Channel
Bailey, C. C. and J. C. Lindenlaub
Theoretical & Experimental Studies of Sub-Optimal Second & Third Self-Adaptive Binary Communication Systems
Dec. 31, 1966, 5-9

Design of a Satellite-to-Satellite Communications Experiment to Explore HF/VHF Guided Propagation in the Lower Ionosphere
Barker, J. I. and M. D. Grossi
Radio Science
Oct. 1966, Vol. 1, 1229-1234

Simple Estimators for Error Probability in Simulation Studies of Digital Communication Systems
Bell, D. A., N. A. Stewart and T. McCudden
Proc. IEE (GB)
Oct. 1971, Vol. 118, No. 10, 1398

A Technique for Characterizing the System Effectiveness of RF Voice Communications of a Military Organization
Chandler, D. S.
Symposium Record Electromagnetic Compatibility Washington (New York: IEEE, Inc., 1967)
1967, 258-266

INTELSAT IV Communication System Simulation
Chitre, N. K. M.
Proc. IEEE 7th Annual International Conf. Communications (Montreal, Canada: 1971)
June 1971, 35-24 to 35-29

On the Simulation of Auroral Induced Radio Signal Distortions
Coleman, J. T.
1970 G-AP International Symposium, Columbus, Ohio (New York: IEEE, 1970)
Sept. 1970, 272-273

The Simulation of Time-Dispersed Fading Channels
Courtney, J. E. and L. W. Martinson
RCA Review
Dec. 1967, Vol. 28, 710-730

Relative Improvement Factor of Error Correcting Codes by Computer Simulation
Gemelke, Duane E.
Report No. ECOM-3425 (AD-886545L)
May 1971, 30 pages

Computer Simulation of a Digital Satellite Communications Link
Hedderly, D. L. and L. Lundquist
International Conf. Communications, Philadelphia, Pa.
June 19-21, 1972, 2-15 to 2-20

A Digital Millimeter-Wave Waveguide Transmission System
Hutchison, P. T.
Conf. Trunk Telecommunications by Guided Waves, London (London, England: IEE, 1970)
Sept. 1970, 159-164

Some Achievements in the Investigation of Data Transmission Networks by Using a Flexible Simulation System
Javor, A. and A. Csakary
Hungarian Acad. Sci. Budapest (Report No. KFKI-71-19)
1971, 6 pages

Millimeter Investigations, Volume 4, Link, Test Facility and Results -- Final Report
Keelty, J. M.
Report No. RCA-3576-B/96690-3-Vol-4 (AD-857435L)
Jan. 1969, 105 pages

Millimeter Investigations, Volume 5, Listings of Detailed Results
Keelty, J. M. and R. A. Crane
Report No. RCA-3576-B/99690-3-Vol-5 (AD-857436L)
Jan. 1969, 114 pages

Millimeter Investigations, Vol. 1, Summary of Results and Conclusions
Keelty, J. M. and F. G. R. Warren
Report No. AD-857432L
Jan. 1969, 39 pages

The Need for Simulation
Kirby, R. S.
1969 IEEE International Conf. Communications, Boulder, Co.
(New York: IEEE, 1969)
June 1969, 2 pages

Validity of Computer-Controlled Media Simulation for Predicting On-Line Performance of Digital Tropo Modems
Klein, M. S.
1969 IEEE International Conf. Communications, Boulder, Co.
(New York: IEEE, 1969)
June 1969, 4 pages

Digital Communication and Display System Simulations
Lebow, K. and R. Propp
1970 Canadian Symposium Communications, Montreal, Canada
(New York: IEEE, 1970)
Nov. 1970, 38

Computer Simulation of a Troposcatter Multipath Communication Channel
Levshin, I. P and A. V. Prosin
Radiotekhnika
Feb. 1966, Vol. 21, 2-11 (In Russian)
English Translation: Telecommunications and Radio Engineering, Part II
Feb. 1966, Vol. 21, 64-70

Learning Theory Applied to Communications
Lindenlaub, John C. and Dwight F. Mix
Report No. TR-EE-65-20 (AD-474097)
Oct. 1965, 128 pages

Simple Estimators for Error Probability in Simulation Studies of Digital Communication Systems
McCudden, T. and N. A. Stewart
Proc. IEE (GB)
Mar.-Apr. 1971, Vol. 118, Nos. 3-4, 397-400

Digital Simulation of Multidimensional Gauss-Markov Random Processes
Mehra, R. K.
IEEE Trans. Automatic Control
Feb. 1969, Vol. AC-14, 112-113

Coding for Turbulent Channels. Volume V. Measured Performance of Coding Techniques
Mitchell, M. E.
Report No. AD-869973 (Final Technical Report)
Apr. 1970, 61 pages

Coding for Turbulent Channels. Volume III. Turbulent Channel Data Analysis and Evaluation of Coding Techniques
Mitchell, M. E. and L. E. Colley
Report No. AD-869942
Apr. 1970, 33 pages

Coding for Turbulent Channels. Volume IV. Coding Techniques Studies and Tests
Mitchell, M. E. and L. E. Colley
Report No. AD-869972L
Apr. 1970, 163 pages

Coding for Turbulent Channels. Volume I. Summary
Mitchell, M. E., C. A. Stutt and L. E. Colley
Report No. AD-869941 (Final Technical Report)
Apr. 1970, 22 pages

Influence of Phase Distortion on Error Probability in Data Transmission Channels
Pankratov, V. P.
Telecommun. & Radio Engng.
Aug. 1971, Vol. 25, No. 8, Part 1, 6-

The Interpretation of Ionospheric Radio Drift Measurements. III. Validation of Correlation Analysis by Computer Simulation
Pitteway, M. L. V., J. W. Wright and L. S. Fedor
J. Atmos. & Terr. Phys. (GB)
Apr. 1971, Vol. 33, No. 4, 635-660

A Digital Computer Simulation of the Rake Concept as Related to Tropospheric Scatter Measurement
Pool, R. H., D. M. Levy and W. P. Birkemeier
Proc. 3rd Hawaii International Conf. System Sciences, Honolulu, Hawaii
(Hollywood, Calif: Western Periodicals Co., 1970)
Jan. 1970, 829-832

Extremal Statistics in Computer Simulation of Digital Communication Systems
Richman, S. and M. Schwartz
Microwave Res. Inst. Programs (Polytechnic Institute of Brooklyn)
Nov. 1967

Test of Some Noise Generators for Digital Simulation
Strom, Torbjorn
Report No. TR-43 (AD-888116)
Apr. 1971, 44 pages

Generation of Idealized Surfaces for the Simulation of Ionospheric Propagation Conditions
Toman, K., A. H. Lorentzen, J. V. O'Brien and L. A. Whelan, Jr.
1971 International Symposium Antennas & Propagation, Sendai, Japan (Tokyo, Japan: Inst. Electronics & Communication Engrs. Japan, 1971)
Sept. 1971, 233-234

Millimeter Investigations, Volume 2, Millimeter Wave Propagation and Its Prediction
Warren, G. R.
Report No. RCA-3576-B/96690-3-Vol-2 (AD-857433L)
Jan. 1969, 130 pages

System Simulation Using the Fast Fourier Transform (FFT)
-
Report No. MSD-G3685.29.03B (AD-862477L)
Nov. 1968, 15 pages

Models

Characterization and Modeling of Real Communication Channels
Adoul, Jean-Pierre A, Bruce D. Fritchman and Laveen N. Kanal
Report No. AD-715288
July 1970, 128 pages

A Critical Statistic for Channels with Memory
Adoul, J.-P. A., B. D. Fritchman and L. N. Kanal
IEEE Trans. Inf. Theory
Dec. 1972, Vol. IT-18, No. 1, 133-141

Model Ionosphere for D Region at Summer Noon During Sunspot Maximum
Bain, W. C. and Marilyn D. Harrison
Proc. IEE
July 1972, Vol. 119, No. 7, 790-796

Transionospheric Propagation of F.M. Signals
Bedrosian, E.
IEEE Trans. Commun. Technol.
Apr. 1970, Vol. COM-18, No. 2, 102-109

Tropo-scatter Multi Channel Digital Systems Study
Bello, Phillip A., Leonard Ehrman and Thomas H. Crystal
Report No. AD-817211
May 1967, 304 pages

Modeling and Data Analyses -- Short and Medium Range Digital Troposcatter Tests. Volume I
Bello, Phillip A., Leonard Ehrman and Donald S. Arnstein
Report No. SIG-CR-950-VOL-1
Oct. 1969, 444 pages

Mathematical Computer Prediction Model for Applications Technology Satellite "F" and "G" Radio Interference Experiment at 6 GHz
Bergman, R. R., P. L. Rice, M. J. Miles and V. F. Henry
1970 G-AP International Symposium, Columbus, Ohio
(New York: IEEE, 1970)
Sept. 1970, 48-49

The Computation of Certain Communication Channel Error Probabilities by an Application of Difference Equation Methods
Berkovits, S. and E. L. Cohen
Report No. MTR-105 (AD-636399)
July 1966, 25 pages, Avail. NTIS

Error Clusters in a Markov Model for Communication Channels
Berkovits, Shimshon and Edward L. Cohen
Report No. MTR-420 (AD-828071)
Feb. 1968, 17 pages

Three Programs for Evaluating the Parameters of a Communication Channel Model
Berkovits, Shimshon and Edward L. Cohen
Report No. MTR-345 (AD-828234)
Mar. 1968, 33 pages

Characterization of Millimeter Wave Earth-Space Link Communication Channels
Brookner, E.
1969 IEEE International Conf. Communications, Boulder, Co.
(New York: IEEE, 1969)
June 1969, 8 pages

Atmosphere Propagation and Communication Channel Model for Laser Wavelengths
Brookner, E.
IEEE Trans. Commun. Technol.
Aug. 1970, Vol. COM-18, No. 4, 396-416

A Physical Model of Wave Propagation in Random Media
Brown, W. P., Jr.
URSI 1969 Spring Meeting, Washington, D.C.
(Washington, D.C.: URSI, 1969)
Apr. 1969, 10

A Generalized Estimator-Correlator for Feedback Communication Over Fading Channels
Chen, C.
Proc. 1970 International Symposium Information Theory, Noordwijk, Netherlands
(New York: IEEE, 1970)
June 1970, 1 page

Analytic Mathematical Models of Tactical Military Communications Channels
Chien, Robert T., F. P. Preparata, A. H. Haddad and C. L. Chen
Quarterly Progress Report No. 1 -- 1 July - 30 Sept. 1971
Report No. AD-890581L
Nov. 1971, 25 pages

Analytic Mathematical Models for Tactical Military Communications Channels
Chien, Robert T., F. Preparata, A. H. Haddad and C. L. Chen
Quarterly Progress Report No. 2 -- 1 Oct. - 31 Dec. 1971
Report No. AD-894157L
Jan. 1972, 48 pages

Statistical Parameters of Radio Noise
Crippen, L. J.
1970 IEEE Regional Electromagnetic Compatibility Symposium Record, San Antonio, Texas
(New York: IEEE, 1970)
Oct. 1970, 14 pages

On Modeling the Time-Varying Frequency-Selective Radio Channel, Part II
Daly, R. F.
Report No. SRI-TR-2, Pt. II (AD-451278)
July 1964, 46 pages

A Model of a Quantum Communication with Attenuation
Deriugin, I. A., V. N. Kurashov and A. I. Mashchenko
Kvantovaia Elektronika
1969, No. 4, 212-217 (In Russian)

The Mechanism of Transequatorial Propagation
Gerson, N. C.
URSI 1969 Spring Meeting, Washington, D.C.
(Washington, D.C.: URSI, 1969)
Apr. 1969, 29

Timing and Framing Techniques for Troposcatter and Line-of-Sight. Volume 1
Gilbreath, R. E., J. L. Horrell, W. L. Eddy, M. W. Williard and C. C. Brummett
Report No. OR-9734-Vol 1 (AD-845212L)
Dec. 1968, 265 pages

A Statistical Model of Short-Wave Radio Signal Fading at Obliquely Reflection From the Ionosphere
Ginzburg, E. A. and O. G. Zhuravskii
Izv. VUZ Radiofiz. (USSR)
English Translation: Radiophys. & Quantum Electron. (USA)
1972, Vol. 15, No. 1, 5-10 (In Russian)

A New Model for 'Impulsive' Phenomena: Application to Atmosphere-Noise Communication Channels
Hall, Harry M.
Report No. TR-3412-8, SEL-66-052 (AD-648650)
Aug. 1966, 179 pages

A Channel Model for Selective Fading in Line-of-Sight Microwave Links
Henriksson, J. and V. Hentinen
Sahko (Finland)
Jan. 1971, Vol. 44, No. 1, 26-29 (In English)

18 GHz Propagation
Hickin, E. M.
Conf. Tropospheric Wave Propagation, London
(London, UK: IEE, 1968)
Sept. 1968, 183-190

Unified S-Band Telecommunication Techniques for Apollo. Volume II - Mathematical Models and Analysis
Hondros, G. and J. H. Painter
Report No. NASA-TN-D-3397 (N66-23452)
Apr. 1966, 190 pages, Avail. NTIS

Models for Message Transmissions and Interference-Caused Retransmission Through a Multi-channel Satellite Communications System
Jones, Charles William
Master's Thesis, Naval Postgraduate School, Monterey, Calif.
Report No. AD-736115
Sept. 1971, 37 pages

Analysis of a Propagation Channel for a Digital Communication System
Juroshek, J. R.
Report No. ESSA ERL-TM-ITS 218
Dec. 1969

Millimeter Investigations. Volume 3, Mathematical Models: Errors in Digital Transmission
Kaufman, H.
Report No. RCA-3576-B/96690-3-Vol-3 (AD-857434L)
Jan. 1969, 87 pages

On the Performance-Index Modeling of Digital Communication Channels
Large, Robert W.
Master's Thesis, Wright Patterson AFB School of Engineering
Report No. GE/EE/70-15
Mar. 1970, 137 pages

About the Algorithmization of the Problems of Modeling Multibeam Communication Channels on an Electronic Digital Computer
Levshin, I. P.
22nd All-Union Sci. Session Devoted to Radio Day Section on Propagation of Radio Waves (N66-37793)
Aug. 19, 1966, 41-50, Avail. NTIS

A Layer-Structure Model for Analysis of Angle Diversity Troposcatter Systems
Merrill, H. S., Jr.
1970 International Conf. Communications, San Francisco, Ca.
(New York: IEEE, 1970)
June 1970, 22 pages

A Power Impulse Response Model for Troposcatter Channels
Merrill, H. S.
7th International Conf. Communications, Montreal, Canada
(New York: IEEE, 1971)
June 1971, 26/13-26/18

A Note on Selection of a Channel Model
Metzner, J. J.
Report No. TR-400-103 (AD-611309)
Dec. 1964, 24 pages

New Viewpoint on Communication Channel Capabilities
Metzner, J. J.
IEEE Trans. Inf. Theory
Nov. 1970, Vol. IT-16, No. 6, 712-716

On Nonstandard Propagation of Radar Waves in a Troposphere with Stratified Water Vapor Concentration Due to Limited Vertical Mixing
Moene, A.
Meteorol. Ann. (Norway)
1970, Vol. 5, No. 12, 451-470 (In English)

Millimeter Wave Propagation. Final Report June 1965 - May 1966
Morgan, Lee A. and Carl A. Ekdahl, Jr.
Report No. SRA-511 (AD-489424)
Aug. 1966, 123 pages

On the Construction and Use of a Simple Ionospheric Model
Nisbet, J. S.
Radio Science
Apr. 1971, Vol. 6, No. 4, 437-464

Models of Binary Channels in Space Radiocommunication
Nowicki, T.
Proc. International Conf. Space & Communication, Paris
(Paris, France: Fed. Nat. Industries Elect., 1971)
Mar. 1971, 1 page

A Model for Ionospheric Wave Propagation Studies Including Viscosity and Heat Conduction
Raemer, H. R. and Y. P. Verma
Fourth International Antennas & Propagation Symposium, Palo Alto
(New York, IEEE Inc., 1966)
1966, 234-235

An Analytical-Numerical Approach to Analysis of Ionospheric Wave Propagation
Raemer, H. R. and Y. P. Verma
Radio Science
Aug.-Sept. 1970, Vol. 5, No. 8-9, 1175-1183

Interference Prediction Model Development: Tropospheric Transfer Function for Digital Propagation
Rashid, A., R. Riggs and D. Young
Report No. A70009-453 (AD-848624)
Nov. 1967, 28 pages .

On the Sensitivity of Channel Capacity for the Gaussian Bandlimited Channel
Sandberg, I. W.
Bell System Technical Journal
Nov. 1966, Vol. 45, 1475-1492

Diversity Performance of the Wide-Band f.s.k. System in a Three-Component Two-Path Channel
Schuchman, L.
IEEE Trans. Commun. Technol.
Oct. 1970, Vol. COM-18, No. 5, 551-562

A Generic Troposcatter Multichannel Data Transmission System Model
Shaver, Harry N.
Report No. TR-5 (AD-479676)
Nov. 1965, 64 pages

A General Computer Model of Radio Communication Link Performance
Smith, G. W.
Report No. GRC-TM-1013 (AD-857102L)
Jan. 1969, 130 pages

A Model of a Domestic Satellite Communication System
Tillotson, L. C.
Bell System Technical Journal
Dec. 1968, Vol. 47, 2111-2137

Tropospheric Effects on Design of Line-of-Sight Space-Diversity System
Tsao, Carson K. H.
Electronics Letters
July 27, 1972, Vol. 8, No. 15, 388-389

Analysis of Satellite Communications in a Multipath Environment
Uhran, J. J., Jr. and J. L. Massey
1970 International Conf. Communications, San Francisco, Ca. (New York: IEEE, 1970)
June 1970, 4 pages

System-Theoretical Description of the Transmission Channel in Tropospheric Scatter Propagation
Wasiljeff, A.
Arch. Elektron. And Ubertragungstech. (Germany)
Feb. 1972, Vol. 26, No. 2, 92-98 (In German)

Experimental Confirmation of an h.f. Channel Model
Watterson, C. C., J. R. Juroshek and W. D. Bensema
IEEE Trans. Commun. Technol.
Dec. 1970, Vol. COM-18, No. 6, 792-803

A Noncoherent Model for Microwave Emissions and Backscatter from the Sea Surface
Wu, S. T. and A. K. Fung
J. of Geophysical Research
Oct. 20, 1972, Vol. 77, No. 30, 5917

The Capacity of the Band-Limited Gaussian Channel
Wyner, A. D.
Bell System Technical Journal
Mar. 1966, Vol. 45, 359-395

Electromagnetic Compatibility Analysis of Selected System. Updated TD 25 Propagation Model
-
Report No. Mallard-TD-228/APR (AD-870283L)
Apr. 1970, 39 pages

Simulators

Troposcatter Modem Performance Prediction with a Complex Gaussian Troposcatter Channel Simulator
Bello, P. A. and L. Ehrman
1969 IEEE International Conf. Communications, Boulder, Co.
(New York: IEEE, 1969)
June 1969, 4 pages

Water Tank Random Channel Simulator
Clarke, K. K. and M. G. Unkauf
1969 IEEE International Conf. Communications, Boulder, Co.
(New York: IEEE, 1969)
June 1969, 6 pages

Stored Ionosphere -- Development and Use
Goldberg, B.
1969 IEEE International Conf. Communications, Boulder, Co.
(New York: IEEE, 1969)
June 1969, 1 page

Modem Tests On an Ionospheric Channel Simulator
Juroshek, J. R. and L. J. Demmer
Report No. ITS-185 (AD-861431)
July 1969, 44 pages

A Study Leading to the Construction of a Troposcatter Simulator
Klein, M. S.
Report No. CSI-67-TR-2338 (AD-648426)
Mar. 1967, 35 pages

A Study Leading to the Construction of a Troposcatter Simulator
Klein, M.
Report No. CSI-67-TR-2374 (AD-652279)
May 1967, 19 pages

A Study Leading to the Construction of a Troposcatter Simulator
Klein, M. S. and J. Harvey
Report No. CSI-66-TR-2298 (AD-645503)
Dec. 1966, 50 pages

A Study Leading to the Construction of a Troposcatter Simulator
Klein, Melvin S. and Jack B. Harvey
Report No. CSI-67-TR-2437 (AD-659413)
Sept. 1967, 55 pages

Measurement of Block Error Distributions with a Fading Channel Simulator
Levesque, A. H.
1969 IEEE International Conf. Communications, Boulder, Co. (New York: IEEE, 1969)
June 1969, 4 pages

The Simulation of Time-Dispersed Fading Channels
Martinson, L. W. and J. E. Courtney
RCA Rev.
Dec. 1967, Vol. 28, No. 4, 710-730

A Simulation Facility for Communication Systems
McNeill, Dale A.
Report No. TR-489 (AD-738297)
Dec. 1971, 28 pages

VHF Tactical Channel Simulator Advanced Development Model
Salwen, Howard
Quarterly Progress Report No. 1 - 4 June - 4 Sept. 1971
Report No. AD-891271L
Nov. 1971, 20 pages

VHF Tactical Channel Simulator Advanced Development Model
Salwen, Howard
Quarterly Progress Report No. 2 - 4 Sept. - 3 Dec. 1971
Report No. AD-893303L
Jan. 1972, 17 pages

VHF Tactical Channel Simulator Advanced Development Model
Salwen, Howard
Quarterly Progress Report No. 3 - 3 Dec. 1971 - 6 Mar. 1972
Report No. AD-894898L
May 1972, 17 pages

Recommended Specifications for Ionospheric Channel and Atmospheric Noise Simulators
Watterson, C. C. and R. M. Coon
Report No. ITS-89 (AD-699487)
Sept. 1969, 27 pages

Communications Channel Simulator with Minicomputers
Zaorski, R.
Telecommunications
June 1971, Vol. 5, No. 6, 54

PART II. PROPAGATION EFFECTS

Coherence

Variability of the Angle of Arrival of Microwaves
Akiyama, T., S. Aoyagi and H. Yoshida
J. Inst. Elect. Commun. Engrs. (Japan)
Feb. 1967, Vol. 50, No. 2, 12-13

Recent Results on Microwave Propagation
Barnett, W. T.
1971 International Symposium on Antennas & Propagation, Sendai, Japan (Tokyo, Japan: Inst. Electronics & Communication Engrs. Japan, 1971)
Sept. 1971, 243-244

Measurement of the Frequency Spread of an Ionospherically Reflected Radio Signal
Boys, J. T. and R. W. Bannister
J. Atmos. Terrest. Phys. (GB)
May 1970, Vol. 32, No. 5, 853-864

Experimental Observations of Correlation Bandwidth Over Troposcatter Paths
Branham, R. A.
7th International Conf. Communications, Montreal, Canada (New York: IEEE, 1971)
June 1971, 20/13-20/17

A Real-Time Correction Technique for Transionospheric Ranging Error
Burns, A. A. and E. J. Fremouw
IEEE Trans. Antennas & Propagation
Nov. 1970, Vol. AP-18, No. 6, 785-790

Coherence Properties of a 9-Gigahertz Propagation Path Near the Ground
D'Auria, G. and D. Solimini
Radio Science
Dec. 1970, Vol. 5, No. 12, 1387-1395

On the Determination of the Delay Doppler Scattering Function for a Ground-to-Aircraft Link
DeRosa, J. K.
1970 Canadian Symposium Communications, Montreal, Canada
(New York: IEEE, 1970)
Nov. 1970, 51-52

Correlation of Radio Field-Strength on Transhorizon Paths with Radio Refractive Index Profiles Near the Path Centres
Hall, M. P. M.
Conf. Tropospheric Wave Propagation, London
(London, UK: IEE, 1968)
Sept. 1968, 9-21

Line-of-Sight Propagation of Millimeter Radio Waves. Final Report, 1 December 1967 - 30 November 1970
Harp, J. C., R. W. Lee and A. T. Waterman, Jr.
Report No. AD-720276
Dec. 1970, Avail. NTIS

ATS-F Millimeter Wave Propagation Experiment Data Processing
Ippolito, L. J. and J. H. Nunnally
Electronics & Aerospace Systems Convention '71 Record, Washington, D. C.
(New York: IEEE, 1971)
Oct. 1971, 113-120

Comparison of Simultaneous Line-of-Sight Signals at 9.6 and 34.52 GHz
Janes, H. B., M. C. Thompson, Jr., D. Smith and A. W. Kirkpatrick
Report No. ITS-152 (AD-682472)
Dec. 1968, 33 pages

Comparison of Simultaneous Line-of-Sight Signals at 9.6 and 34.5 GHz
Janes, H. B., M. C. Thompson, Jr., D. Smith and A. W. Kirkpatrick
IEEE Trans. Antennas & Propagation
July 1970, Vol. AP-18, No. 4, 447-451

PCM Communications Using Millimeter and Submillimeter Frequency Bands
Keelty, J. M.
1970 Canadian Symposium Communications, Montreal, Canada
(New York: IEEE, 1970)
Nov. 1970, 53-54

A Comparison of Measured and Calculated Frequency Correlation Functions Over 4.6 and 7.6 GHz Troposcatter Paths
Kennedy, D. J.
7th International Conf. Communications, Montreal, Canada (New York: IEEE, 1971)
June 1971, 34/15-34/19

A Comparison of Measured and Calculated Frequency Correlation Functions Over 4.6- and 7.6-GHz Troposcatter Paths
Kennedy, D. J.
IEEE Trans. Commun.
Apr. 1972, Vol. COM-20, No. 2, 173-178

Determination of the Correlation Functions of the Signal and Noise at the Output of a Digital Communication Channel
Kozlenko, N. I., N. T. Petrovich and M. W. Kablukova
Telecommun. & Radio Engng.
Sept. 1971, Vol. 25-26, No. 9, 54-

Wavefront Observations at 35 GHz on a Line-of-Sight Radio-Wave Propagation Path -- Final Report 1 December 1966 - 30 November 1967
Lee, R. W. and A. T. Waterman, Jr.
Report No. 2278-F, SU-SEL-68-015 (AD-669101)
Dec. 1967, 164 pages

Space Correlations of 35-GHz Transmissions Over a 28-KM Path
Lee, R. W. and A. T. Waterman, Jr.
Radio Sci.
Feb. 1968, Vol. 3, No. 2, 135-139

Correlation Analysis and Scintillation for 15-GHz Line-of-Sight Propagation Channels
Mondre, E.
Report No. NASA-TN-D-5613
Apr. 1970, 16 pages, Avail. NTIS

Characterization and Measurement of Time- and Frequency-Spread Parameters for Scatter Communication
Norlander, Staffan
Report No. TR-39 (AD-883701)
June 1970, 98 pages

Atmospheric Propagation Studies at Optical, Millimeter and Microwave Frequencies. Part II. The Mechanism of Scintillation
Taylor, Paul B.
Report No. AD-466031
Mar. 1965, 20 pages

Measurements of Phase-Front Distortion on an Elevated Line-of-Sight Path
Thompson, M. C., Jr. and H. B. Janes
IEEE Trans. Aerospace Electronic Syst.
Sept. 1970, Vol. AES-6, No. 5, 645-656

Measurement of Phase Fluctuations on Millimetric Radiowave Propagation
Vilar, E. and P. A. Mathews
Electron. Lett. (GB)
Sept. 9, 1971, Vol. 7, No. 18, 566-568

Statistical Investigation of the Effect of the Troposphere on Millimeter-Wavelength Radiation and Coherence. Final Report 15 November 1967 - 14 February 1969
Young, G. O. and G. Hrycenko
Report No. AD-685246
Feb. 1969, 110 pages

Proposed Experiment for Measurement of Amplitude and Phase Decorrelation -- Semiannual Status Report 1 December 1966 - 31 May 1967
-
Report No. X67-19620
June 9, 1967, 15 pages

Multipath

On the Quantitative Characteristics of Multipath Propagation
Barabashov, B. G.
English Translation: Geomagn. & Aeron. (USA)
(Geomagn. & Aeron. (USSR))
1970, Vol. 10, No. 3, 438-439

A Study of the Relationship Between Multipath Distortion and Wave-Number Spectrum of Refractive Index in Radio Links
Bello, P. A.
Proc. IEEE
Jan. 1971, Vol. 59, No. 1, 47-75

Observations of Atmospheric Structure with Phase-Coherent Measurements of Troposcatter Multipath and Doppler-Shift
Birkemeier, W. P. and D. W. Thomson
Conf. Tropospheric Wave Propagation, London
(London, UK: IEE, 1968)
Sept. 1968, 85-92

Multipath Considerations in an Aircraft-Space-Craft Communications Link
Brown, D.
URSI 1969 Spring Meeting, Washington, D.C.
(Washington, D.C.: URSI, 1969)
Apr. 1969, 12

Coming to Grips with Multipath Ghosts
Dayton, D. S.
Electronics
Nov. 27, 1967, Vol. 40, No. 24, 104-109

Millimeter Wave Propagation Over an Aircraft Carrier Deck
Decker, K. M.
Report No. NRL-7195 (AD-719384)
Jan. 1971, 19 pages

Overwater Line-of-Sight Space Diversity Measurements at 37 GHz (Interim Report)
Decker, K. M., R. C. Dodson and J. A. Vignali
Report No. NRL-6826 (AD-851327)
Apr. 2, 1969

Experimental Measurement of Space Diversity Improvement at 37 GHz -- Final Report
Dodson, R. C.
Report No. NRL-7199 (AD-879201L)
Dec. 1970, 11 pages

Ionospheric Multipath
Grossi, M. D.
Application of Propagation Data to VHF Satellite Communication and Navigation Systems, Canada
(Neuilley-sur-Seine, France: AGARD, 1970)
June 1970, 28 pages

Multipath Communication Links
Hayre, H. S.
Proc. 3rd Hawaii International Conf. System Sciences, Honolulu, Hawaii
(Hollywood, Calif.: Western Periodicals Co., 1970)
Jan. 1970, 382-385

Characteristic Ionospheric Multipath Phase Fluctuations
Humphrey, L. C.
IEEE Trans. Antennas & Propagation
Mar. 1971, Vol. AP-19, No. 2, 299-300

Ionosphere Propagation Delay Measurement Techniques Using Dual Phase Coherent Doppler Frequencies and a Thin Shell Model
Landia, G. P. and L. D. Breetz
Report No. NRL-6861 (AD-686650)
Apr. 1969, 26 pages, Avail. NTIS

Measurements of Noise Due to Multi-Path Propagation on Oversea Line-of-Sight Path
Makino, H., O. Sasaki and T. Amekura
1971 International Symposium Antennas & Propagation, Sendai, Japan (Tokyo, Japan: Inst. Electronics & Communication Engrs. Japan, 1971)
Sept. 1971, 245-246

The Determination of Multipath Time-Delay on Radio Links Between a Synchronous Satellite and an Aircraft
May, G.
Report No. RAE-TR-68192 (AD-845435)
July 1968, 14 pages

SHF Digital Radio Systems -- Future Trends
Murphy, J. V.
Data Transmission Conf. Technical Papers, Brisbane, Australia
(Brisbane, Australia: Instn. Engrs. Australia, 1970)
June 1970, 8 pages

Multipath Delay and Doppler Spectra from Atmospheric Layer Streams in Troposcatter Beam Swinging
Nicolis, J. S.
URSI 1969 Spring Meeting, Washington, D.C.
(Washington, D.C.: URSI, 1969)
Apr. 1969, 16-17

On the Measurement of Atmospheric Multipath and Doppler Spread by Passive Means
Reiffen, Barney
Report No. TN-1965-6 (AD-614787)
Mar. 1965, 21 pages

Characteristics of Satellite-to-Aircraft Links
Salwen, H. C.
7th International Conf. Communications, Montreal, Canada
(New York: IEEE, 1971)
June 1971, 29/14-29/18

A Prediction Model for Multipath Propagation of Pulse Signals at VHF and UHF Over Irregular Terrain [Technical Report]
Schmid, H. F.
Report No. SU-SEL-69-071 (AD-699421)
Oct. 1969, 29 pages, Avail. NTIS

Effects of Sea Reflections on Phase of Arrival of Line-of-Sight Signals
Thompson, M. C., Jr. and H. B. Janes
IEEE Trans. Antennas & Propagation
Jan. 1971, Vol. AP-19, No. 1, 105-108

The Number of Fades in Space-Diversity Reception
Vigants, A.
Bell System Technical Journal
Sept. 1970, Vol. 49, No. 7, 1513-1530

Overwater Line-of-Sight Space Diversity Measurements at 37 GHz -- Interim Report NRL-6826
Vignali, J. A., K. M. Decker and R. C. Dodson
Report No. AD-851327L
Apr. 1969, 30 pages

Fading

Predicting and Optimizing Satellite Communication Performance Under Unfavourable Geographic and Atmospheric Conditions
Albrecht, H. J.
IEEE-EUROCON 71
(Lausanne, Switz., Oct. 18-22, 1971)
Nov. 1971, 35 pages, Avail. NTIS

A 6 GHz Narrowband Channel Characterization Experiment and Observed Propagation Effects
Babler, G. M.
7th International Conf. Communications, Montreal, Canada
(New York: IEEE, 1971)
June 1971, 34/7-34/9

Digital Communication Systems Subject to Frequency Selective Fading
Bailey, C. C. and J. C. Lindenlaub
Report No. NASA-CR-91078 (N68-11921)
Nov. 1967, Avail. NTIS

Occurrence of Selective Fading as a Function of Path Length, Frequency and Geography
Barnett, W. T.
URSI 1969 Spring Meeting, Washington, D.C.
(Washington D.C.: URSI, 1969)
Apr. 1969, 13

Microwave Line-of-Sight Propagation With and Without Frequency Diversity
Barnett, W. T.
Bell System Technical Journal
Oct. 1970, Vol. 49, No. 8, 1827-1871

Fading Radio Channels in Telecommunications
Barrow, B. B.
1967 IEEE International Convention Record
(New York: IEEE, 1967)
1967, Pt. 11, 122-129

Remote Probes for the Study of Atmospheric Sources of Fading on Optical and Microwave Line-of-Sight Paths
Bean, B. R., R. E. McGavin and H. T. Dougherty
1971 International Symposium on Antennas & Propagation, Sendai, Japan (Tokyo, Japan: Inst. Electronics & Communication Engrs. Japan, 1971)
Sept. 1971, 237-238

Phase and Amplitude Variations in Multipath Fading of Microwave Signals
Bullington, K.
Bell System Technical Journal
July-Aug. 1971, Vol. 50, No. 6, 2039-2053

Unlocking the Secrets of Microwave Propagation
Bullington, K.
Bell Laboratories Record
Jan. 1972, Vol. 50, No. 1, 8-13

High Frequency Variations in the Fading Characteristics of Tropospheric Transmissions
Burrows, W. G.
Conf. Tropospheric Wave Propagation, London
(London, UK: IEE, 1968)
Sept. 1968, 66-76

Burst Statistics for Digital Signaling on Frequency Selective Fading Channels
Coffrin, W. E.
1970 International Conf. Communications, San Francisco, Ca.
(New York: IEEE, 1970)
June 1970, 14 pages

A Statistical Study of Fading in Line-of-Sight Microwave Radio Links
Colavito, C.
Alta Frequenza (Italy)
Nov. 1970, Vol. 39, No. 11, 964-973

Fading Characteristics on Air-to-Air Communication Links
Ellington, T. D. and K. W. Kirk
Electronic Commun.
Sept.-Oct. 1967, Vol. 2, No. 5, 10-15

Auto-Correlation of the Fading of Multiple Echoes from the Ionosphere
Essex, E. A. and F. H. Hibberd
J. Atmos. Terrest. Phys. (GB)
Aug. 1967, Vol. 29, No. 8, 1025-1027

Characteristics of Fading in Microwave Networks
Farell, E.
Rev. Electrotec. (Argentina)
July 1971, Vol. 57, No. 4, 229-244 (In Spanish)

Communication Over Fading Dispersive Channels With Feedback
Glave, F. E.
1970 Canadian Symposium Communications, Montreal, Canada
(New York: IEEE, 1970)
Nov. 1970, 71-72

A Note on Correlation Distance of V.H.F. Fading From Irregularities in the Equatorial Ionosphere
Golden, T. S.
Radio Science
June 1970, Vol. 5, No. 6, 943-947

Performance and Modeling of a PCM Channel at 15.3 GHz Under Varying Weather Conditions
Gregg, W. D. and N. Epstein
Technical Report No. 70-2, University of Texas Electrical Engineering Research Laboratory
Apr. 30, 1970

Low Angle Fluctuation [of Satellite Signals]
Hartman, G.
Application of Propagation Data to VHF Satellite Communication and Navigation Systems, Canada
(Neuilley-sur-Seine, France: AGARD, 1970)
June 1970, 11 pages

Multiple Ground Reflection Effects on Fading Behavior of V.H.F./U.H.F. Satellite Transmissions
Hortenbach, J.
IEEE Trans. Antennas & Propagation
Nov. 1970, Vol. AP-18, No. 6, 836-838

Tropospheric Propagation: Radio-Meteorological Correlations Over Bass Strait
Jenkinson, G. F.
Proc. Instn. Radio Electronics Engrs. (Australia)
Aug. 1967, Vol. 28, No. 8, 260-268

Millimeter Investigations Supplement
Keelty, J. M. and F. G. R. Warren
Report No. RCA-3576-B/96690-3-suppl. (AD-857437L)
May 1969, 28 pages

Fading Statistics at 950 MHz Over a Long Line-of-Sight Oversea Path
Kinase, A. and S. Ito
NHK. Tech. J. (Japan)
1970, Vol. 22, No. 4, 1-10 (In Japanese)

Fading Problems in Microwave Links
Krul, L.
Tijdschrift Ned. Elektronica Radiogenoot (Netherlands)
1967, Vol. 32, No. 6, 149-163 (In Dutch)

Measurement of the Fading Behaviour of a 11-GHz Radio Relay Link With Horizontal Vertical Polarization and Depolarization
Kuhn, U.
Nachrichtentechnik (Germany)
Jan. 1971, Vol. 21, No. 1, 13-14, 19-21 (In German)

The Effect of Fading on the Performance of a Multihop p.c.m. Radio System
Kwan, R. K. and O. Shimbo
IEEE Trans. Commun. Technol.
Dec. 1970, Vol. COM-18, No. 6, 804-810

Statistical Behaviour of Deep Fades of Diversity Signals
Lin, Sing-Hsiung
IEEE Trans. Communications
Dec. 1972, Vol. COM-20, No. 6, 1100-1107

Intermittent Binary Communications in a Rayleigh Fading Medium
Martin, J. W.
IEEE Trans. Commun. Technol.
Oct. 1967, Vol. COM-15, No. 5, 717-718

The Faraday Fading Rate for Nearly Transversal Propagation
Mass, J.
Radio Sci.
Oct. 1966, Vol. 1, No. 10, 1137-1140

Low Angle Tropospheric Fading in Relation to Satellite Communications and Broadcasting
Maynard, L. A. and K. S. McCormick
1971 International Symposium Antennas & Propagation, Sendai, Japan (Tokyo, Japan: Inst. Electronics & Communication Engrs. Japan, 1971)
Sept. 1971, 255-256

Measurements of Tropospheric Fading on Satellite-Earth Paths Using Spaced Receivers
McCormick, K. S. and L. A. Maynard
Statistical Methods & Instrumentation in Geophysics, Skeikampen, Norway
(Oslo, Norway: Teknologisk Forlag, 1971)
Apr. 1971, 125-136

Low Angle Tropospheric Fading in Relation to Satellite Communications and Broadcasting
McCormick, K. S. and L. A. Maynard
7th International Conf. Communications, Montreal, Canada
(New York: IEEE, 1971)
June 1971, 12-18-23

Time Rate-of-Change of a Multipath Fading Signal; Theory and Experimental Data
Menzel, C. H.
7th International Conf. Communications, Montreal, Canada
(New York: IEEE, 1971)
June 1971, 34/10-34/14

Complex and Envelope Covariance for Rician Fading Communication Channels
Mondre, E.
IEEE Trans. Commun. Technol.
Feb. 1971, Vol. COM-19, No. 1, 80-84

Prediction of Rayleigh Fading Occurrence Probability of Line-of-Sight Microwave Links
Morita, K.
Rev. Elec. Commun. Lab. (Japan)
Nov.-Dec. 1970, Vol. 18, No. 11-12, 810-822

Statistical Studies on Atmospheric Refractive Index
Morita, K., T. Fukuda and H. Yoshida
Rev. Elec. Commun. Lab (Japan)
Nov.-Dec. 1971, Vol. 19, Nos. 11-12, 1233-1248

Error Probability for Multipath Fading -- The Slow and Flat Idealization
Nesenbergs, M.
IEEE Trans. Commun. Technol.
Dec. 1967, Vol. COM-15, No. 6, 797-805

Estimation of Transfer Function of a Fading Medium
Prabhakar, J. C.
21st Annual Southwestern IEEE Conf. & Exhibition, Houston
(New York: IEEE, 1971)
Apr. 1971, 334-337

Communication Over Fading Dispersive Channels
Richters, John S.
Report No. TR-464 (AD-665355)
Nov. 1967, 149 pages

Fading Due to Sea Surface Reflection in Tropospheric Propagation
Rider, G. C.
Conf. Tropospheric Wave Propagation, London
(London, UK: IEE, 1968)
Sept. 1968, 1-8

Results of an Experimental Study on Baseband Gain and Noise Stability of a Fading Microwave Radio Channel
Rogers, D. E.
Proc. National Electronics Conf., Chicago, Ill.
(Oak Brook, Ill: National Electron. Conf. Inc., 1970)
Dec. 1970, 724-728

Multiple-Path Fading on Line-of-Sight Microwave Radio Systems as a Function of Path Length and Frequency
Ruthroff, C. L.
Bell System Technical Journal
Sept. 1971, Vol. 50, No. 7, 2375-2398

The Ionosphere and its Effect on Telecommunications
Sanchez-Cordoves, J.
Met. & Elec. (Spain)
June 1971, Vol. 35, No. 405, 278-283 (In Spanish)

The Number of Fades and Their Durations on Microwave Line-of-Sight Links With and Without Space Diversity
Vigants, A.
1969 IEEE International Conf. Communications, Boulder, Co.
(New York: IEEE, 1969)
June 1969, 11 pages

Mathematical Description of Frequency-Diversity Data from Line-of-Sight Microwave Links
Vigants, A.
URSI 1969 Spring Meeting, Washington, D.C.
(Washington, D.C. URSI, 1969)
Apr. 1969, 12

Number and Duration of Fades at 6 and 4 GHz
Vigants, A.
Bell System Technical Journal
Mar. 1971, Vol. 50, No. 3, 815-841

Overwater Line-of-Sight Fade and Diversity Measurements at 37 GHz
Vignali, J. A.
IEEE Trans. Antennas & Propagation
July 1970, Vol. AP-18, No. 4, 463-471

Overwater Line-of-Sight Fade Measurements at 37 GHz
Vignali, J. A., K. M. Decker and R. C. Dodson
Report No. NRL-6774 (AD-684071)
Dec. 1968, 43 pages

Reflections and Fadings in Microwave Systems
Wallsten, E., Jr.
IEEE Electrolatina
Sept. 1967, Vol. 1, 23-30 (In Spanish)

A Correlation Study of Microwave Signal Fading Over Geographically Separated Paths
Wisterman, J. D., J. O. Herbert, Jr. and D. F. Fitzgerald
URSI 1969 Spring Meeting, Washington, D.C.
(Washington, D.C.: URSI, 1969)
Apr. 1969, 12

Noise-Free Method of Transmission of Binary Information in the Presence of Fading and High-Power Pulse Interference
Yurlov, F. F. and S. Kh. Nurdinov
Izv. VUZ Radioelektron. (USSR)
English Translation: Radioelectronics & Commun. Syst. (USA)
Sept. 1970, Vol. 13, No. 9, 1099-1106 (In Russian)

Attenuation

Measurements of Millimetre Wave Attenuation Due to Rain
Akeyama, A. and R. Satou
Elec. Commun. Lab. Tech. J. (Japan)
1971, Vol. 20, No. 11, 2415-2427 (In Japanese)

Experimental Studies for Microwave Propagation on Oversea Line-of-Sight Path
Akiyama, T., T. Inoue and S. Sakagami
1971 International Symposium Antennas & Propagation
(Tokyo, Japan: Inst. Electronics & Communication Engrs.)
1971, 247-248

Statistical Investigation of Amplitude Fluctuations Detected on Carrier Signals Propagated at 9.7 GHz and 69 GHz
Alt, James H and V. Balachandran
Report No. AD-872517
July 1970, 190 pages

Storm Models for Space-Path Attenuation Calculations
Altman, F. J.
7th International Conf. on Communications
(New York: IEEE, 1971)
1971, 27/6-27/10

Earth-to-Space Communications at Millimeter Wavelengths
Altshuler, Edward E.
Report No. AD-621942
Aug. 1965, 42 pages

Tropospheric Effects in Earth-to-Space Propagation at Millimeter Wavelengths
Altshuler, E. E.
Proc. Conf. on Tropospheric Wave Propagation
Sept. 30-Oct. 2, 1968, 151-158

New Applications at Millimeter Wavelengths
Altshuler, E. E.
Microwave Journal
Nov. 1968, Vol. 11, No. 11, 38,40,42

Atmospheric Effects on Propagation at Millimeter Wavelengths
Altshuler, E. E., V. J. Falcone, Jr. and K. N. Wulfsberg
IEEE Spectrum
July 1968, Vol. 5, 83-90

Rain Attenuation at Millimeter Wavelengths
Altshuler, E. E., V. J. Falcone and K. N. Wulfsberg
AGARD Tropospheric Radio Wave Prop.
Feb. 1971, Part 1

Propagation in Snow
Asari, E.
English Translation: Electron. Commun. Jap. (USA)
(Inst. Electronics Commun. Engrs. (Japan))
Nov. 1969, Vol. 52, No. 11, 69-76

Attenuation of Radiation at a Wavelength of 0.96 mm in Snow
Babkin, Yu. S., I. A. Iskhakov, A. V. Sokolov, L. I. Stroganov and Ye. V. Sukhonin
English Translation: Radio Eng. & Electron. Phys. (USA)
(Radiotekh. & Elektron. (USSR))
Dec. 1970, Vol. 15, No. 12, 2171-2174

Measurement of Attenuation in Rain over 1 km Path at a Wavelength of 0.96 mm
Babkin, Yu. S., N. N. Zimin, A. O. Izyumov, I. A. Iskhakov, A. V. Sokolov, L. I. Stroganov, Ye. V. Sukhonin and G. Ye. Shabalin
English Translation: Radio Eng. & Electron. Phys. (USA)
(Radiotekh. & Elektron. (USSR))
Dec. 1970, Vol. 15, No. 12, 2164-2166

Determination of the Attenuation Due to Rain for Frequencies Above 10 GHz
Battesti, J., L. Boithias and P. Misme
Ann. Telecommun. (France)
Nov.-Dec. 1971, Vol. 26, No. 11-12, 439-444 (In French)

Millimeter Wavelengths for Space Communications?
Binkley, W. O. and J. J. Kelleher
Microwave Journal
Nov. 1968, Vol. 11, No. 11, 30, 32, 34, 36

Calculation of Attenuations in Over-the-Horizon Propagation Based on Radiometeorological Parameters
Boithias, L.
Conf. Tropospheric Wave Propagation, London
(London, UK: IEE, 1968)
Sept. 1968, 238-246

Some System Considerations for Millimeter Wave Space Communications
Bonelle, G. J.
Proc. 1970 IEEE Conf. on Communications
June 8-10, 1970, Vol. 1, 22-1 to 22-13

Radiometric Measurement of Attenuation and Emission by the Earth's Atmosphere at Wavelengths from 4 cm to 8 mm
Brown, W. E., III and G. G. Haroules
IEEE Trans. Microwave Theory & Techniques
Sept. 1968, Vol. MTT-16, 611-620

Oxygen Absorption in the Earth's Atmosphere
Carter, C. J., R. L. Mitchell and E. E. Reber
Conf. Tropospheric Wave Propagation, London, IEE Conf. Publication No. 48 (London, UK: IEE, 1968) Sept. 1968, 230-237

CTR Notes: Attenuation Statistics at 15.3 GHz for Clarksburg, Maryland
Craft, H. D., Jr.
COMSAT Tech. Rev.
Fall 1971, Vol. 1, No. 1, 221-225

Rain Attenuation at Millimeter Wavelengths
Crane, Robert K.
IEEE International Convention Digest
1968, 65

Propagation Phenomena Affecting Satellite Communication Systems Operating in the Centimeter and Millimeter Wavelength Bands
Crane, R. K.
Proc. IEEE
Feb. 1971, Vol. 59, No. 2, 173-188

Anomalies in Attenuation and Emission by Rain at 37 GHz (8.1 mm)
Croom, D. L, P. G. Davies and R. J. Powell
Electronics Letters
Apr. 20, 1972, Vol. 8, No. 8, 189-191

Comparison of Attenuation Statistics at 19 and 37 GHz for Sun-Earth Paths
Davies, P. G.
Electronics Letters (GB)
Jan. 28, 1971, Vol. 7, No. 2, 51-52

Statistics of Tropospheric Attenuation at 190 GHz from Observations of Solar Noise
Davies, P. G. and J. A. Lane
Electronics Letters (GB)
Aug. 6, 1970, Vol. 6, No. 16, 522-523

Propagation Measurements at 7 GHz on a Satellite-to-Earth Path
Day, J. W. B. and K. S. McCormick
Conf. Tropospheric Wave Propagation, London, IEE Conf. Publication No. 48 (London, UK: IEE, 1968) Sept. 1968, 138-142

A Millimeter Wave Propagation Experiment from the ATS-E Space Craft
Dees, J. W., J. L. King and J. C. Wiltse
Report No. NASA-TM-X-60763 (N68-17924)
1967, Avail. NTIS

Practical PCM Data Transmission Tests at 15.3 GHz Under Different Atmospheric Conditions
Epstein, Norman and William D. Gregg
Report No. TR-71-3 (AD-887629L)
July 1971, 70 pages

Attenuation on Earth-Space Paths at Frequencies up to 30 GHz
Evans, H. W.
7th International Conf. Communications, Montreal, Canada (New York: IEEE, 1971)
June 1971, 27/1-27/5

Comments on Attenuation of Millimeter Wavelength Radiation by Gaseous Water Vapor
Falcone, V. J., Jr.
Appl. Optics
Nov. 1967, Vol. 6, No. 11, 2005-2006

Atmospheric Inhomogeneities and Space Communications
Fengler, C.
Nachrichtentech. Z. (NTZ) (Germany)
Feb. 1972, Vol. 25, No. 2, 89-91 (In English)

Observations of Tropospheric-Scatter Path Loss at C-Band Frequencies and Meteorological Conditions in Cyprus
Fitzsimons, T. K.
Conf. on Tropospheric Wave Propagation, London (London, UK: IEE, 1968)
Sept. 1968, 247-251

Atmospheric Noise at 33.5 GHZ
Flett, A. M., P. R. Foster and I. H. Howie
Nature
Jan. 11, 1969, Vol. 221, 160

Atmospheric Effects at 9-mm. Wavelength
Foster, P. R.
IEEE Trans. Antennas & Propagation
Sept. 1969, Vol. AP-17, No. 5, 684-686

UHF Transmission Loss Estimates for GOES
Gierhart, G. D. and M. E. Johnson
Telecommunications Technical Memorandum
Sept. 1972, OT TM-109, 40 pages

Propagation of Centimeter and Millimeter Wavelengths Through Precipitation
Godard, S.
IEEE Trans. Antennas & Propagation
July 1970, Vol. AP-18, No. 4, 530-534

Attenuation of Millimeter Wavelength Radiation by Gaseous Water
Hall, J. T.
Appl. Optics
Aug. 1967, Vol. 6, No. 8, 1391-1398

Radiometric Techniques Applicable to the Measure of Solar Activity and Atmospheric Attenuation at Millimeter Wavelengths
Haroules, G. G.
Report No. N69-22951
Apr. 1969, Avail. NTIS

Attenuation of 8.6 MM-Wavelength Radiation in Rain
Harrold, T. W.
Proc. IEE (GB)
Feb. 1967, Vol. 114, 201-203

The Attenuation of Short-Waves in the Upper Ionosphere
Hense, U.
Tech. Mitt. RFZ (Germany)
Sept. 1967, Vol. 11, No. 3, 134-140 (In German)

Millimeter-Wave Communication Through the Atmosphere
Hogg, D. C.
Science
Jan. 5, 1968, Vol. 159, 39-46

Statistics on Attenuation of Microwaves by Intense Rain
Hogg, D. C.
Bell System Technical Journal
Nov. 1969, Vol. 48, No. 9 2949-2962

Atmospheric Limitations on Satellite Communications at Frequencies Exceeding 15 GHz
Hogg, D. C.
1970 G-AP International Symposium, Columbus, Ohio
(New York: IEEE, 1970)
Sept. 1970, 206-207

Rain on Earth-Space Paths
Hogg, D. C.
1971 IEEE Group Antennas and Propagation International Symposium
(New York: IEEE, 1971)
Sept. 1971, 322-324

Determination of Atmospheric Attenuation at 35 GHz Over Earth-Space Paths
Hudson, C. L.
University Denver, Colo., Thesis
USA Order No. 71-8028
1970, 76 pages, Avail. Univ. Microfilms, Ann Arbor, Mich.

Millimeter Wave Propagation Measurements from the Applications Technology Satellite |ATS-V|
Ippolito, L. J.
IEEE Trans. Antennas & Propagation
July 1970, Vol. AP-18, No. 4, 535-552

ATS-5 Millimeter Wave Experiment Data Report. January - August 1970. Vol. 2
Ippolito, L. J.
Report No. N71-10654
Oct. 1970, Avail. NTIS

Effects of Precipitation on 15.3 and 31.65-GHz Earth-Space Transmissions with the ATS-V Satellite
Ippolito, L. J.
Proc. IEEE
Feb. 1971, Vol. 59, No. 2, 189-205

Waveguide Effects Above the Seas on the Propagation in the Millimeter and Centimeter Band Along Transhorizon and Beyond-the-Horizon Paths
Jeske, H.
Trans. Arbeitsgemeinschaft Ionosphaere
1971, 13-18 (In German)

Statistics of Attenuation Due to Precipitation of Radio Waves in 10 GHz Band at Higher Angles of Elevation
Kinase, A. and A. Kinpara
NHK Lab Note (Japan)
Aug. 1969, No. 130, 1-25

Attenuation Due to Precipitation in the 10 GHz Band at Propagation With Higher Angles of Elevation
Kinpara, A.
J. Inst. Telev. Eng. Jap. (Japan)
Sept. 1971, Vol. 25, No. 9, 706-714 (In Japanese)

Attenuation of Millimeter in Fog
Koester, K. L. and L. H. Kosowsky
14th Radar Meteorology Conf., Tucson, Ariz.
(Boston, Mass.: American Meteorological Soc., 1970)
Nov. 1970, 231-236

Millimeter Wave Propagation in Fog
Koester, K. L. and L. H. Kosowsky
1971 Group Antennas & Propagation International Symposium, Los Angeles, Calif.
(New York: IEEE, 1971)
Sept. 1971, 329-332

Certain Problems of Propagation of Millimeter and Submillimeter Radiowaves
Kolosov, M. A. and A. V. Sokolov
Radio Engineering & Electronic Physics
Apr. 1970, Vol. 15, 563-570

Attenuation of Millimeter and Submillimeter (MMW and SBMW) Radiowaves in the Atmosphere of the Earth
Kolosov, M. A., A. V. Sokolov and E. V. Sukhonin
Proc. 18th International Congress Electronics, Rome, Italy (Rome, Italy: Internat. Electronic Nuclear Radio & Television Assoc.)
Mar. 1971, 9-17 (In English)

Radar Characteristics of Precipitation of Different Nature, Spectra, Intensity and Temperatures in the Centimeter and Millimeter Ranges of Radio Waves
Krasyuk, N. P., V. I. Rozenberg and D. A. Chistyakov
Report No. FTD-MT-24-246-69 (AD-700401)
Oct. 1969, 48 pages

Attenuation of Fixed Echo [Clutter] Signals
Kroszczynski, J.
Problemy Elektron. Telekomun. Metody Wspolczesnej Radiol.
1966, No. 11, 103-127 (In Polish)

The Attenuation of mm Waves by Meteorological Precipitation
Lammers, U.
Nachrichtentechnische Zeitschrift
1966, Vol. 19, 551-557 (In German)

Application of Millimeter-Wavelength Radiation to Naval Communication by Satellite
Lefande, R. A.
Report No. NRL 7234 (AD-883291L)
Mar. 1971, 39 pages

Theoretical Model of Equivalent Precipitation Over a Radio Path. Application to the Propagation of Waves at Frequency Above 10 GHz
Lefrancois, G.
Ann. Telecommun. (France)
Nov.-Dec. 1971, Vol. 26, No. 11-12, 445-453

Propagation Delay in the Atmosphere
LeVine, D. M.
Radio Science
June 1972, Vol. 7, No. 6, 625

Propagation of Millimeter Waves in Rain
Lin, James C. and Akira Ishimaru
Report No. Scientific-4, TR-144 (AD-735291)
May 1971, 36 pages

Rainfall Attenuation at 110 and 890 GHz
Llewellyn-Jones, D. T. and A. M. Zadovy
Electron. Lett. (GB)
June 17, 1971, Vol. 7, No. 12, 321-322

Microwave Attenuation Due to Rain at 110 GHz in South-East England
Llewellyn-Jones, D. T. and A. M. Zavody
Electron. Lett. (GB)
Feb. 24, 1972, Vol. 8, No. 4, 97

Measurements of 11 and 18 GHz Radio Wave Attenuation Due to Rainfall at Higher Angles of Elevation
Makino, H., K. Morita, A. Akeyama and S. Kato
1971 International Symposium Antennas & Propagation, Sendai, Japan (Tokyo, Japan: Inst. Electronics & Communication Engrs. Japan, 1971)
Sept. 1971, 253-254

A Comparison of Precipitation Attenuation and Radar Backscatter Along Earth-Space Paths
McCormick, K. Stewart
IEEE Trans. Antennas & Propagation
Nov. 1972, Vol. AP-20, No. 6, 747-755

Overwater Propagation of Millimeter Waves
Mondloch, A. J.
IEEE Trans. Antennas & Propagation
Jan. 1969, Vol. AP-17, No. 1, 82-85

Atmospheric Effects on Millimeter Wave Communication Channels
Mondre, E.
Report No. N70-34446
Mar. 1970, Avail. NTIS

Secure Communications at Millimeter Wavelengths
Murray, Richard G.
Report No. ECOM 5412 (AD-735686)
Nov. 1971, 21 pages

On Millimeter and Submillimter Radio Waves Attenuation in Rain
Naumov, A. P. and V. S. Stankevich
Izv. VUZ Radiofiz. (USSR)
English Translation: Soviet Radiophys. (USA)
1969, Vol. 12, No. 2, 181-184 (In Russian)

Propagation of Centimeter, Millimeter and Submillimeter Radio Waves in the Earth's Atmosphere
Naumov, A. P. and S. A. Zhevakin
Propagation & Absorption of Radio Waves in the Atmosphere and Troposphere
(Washington, D.C.: Joint Publications Research Service)
Aug. 28, 1968, 1-35

An Adaptive Multiple Access Satellite Communication System at Millimeter Wavelengths
Nishida, S., S. Murakami, S. Asakawa and N. Goto
International Conf. Digital Satellite Communication, London (London, England: IEE, No. 59)
Nov. 1969, 387

On the Propagation Loss of Centimeter and Millimeter Waves in Rainfall
Nishitsuji, Akira
Electronics & Communications in Japan
Sept. 1971, Vol. 54, No. 9, 64-

Problems on the Radio Wave Attenuation in Millimeter and Microwave Regions at Snowfall
Nishitsuji, A., M. Hirayama and A. Matsumoto
Monogr. Res. Inst. Appl. Elec. (Japan)
1971, No. 19, 79-91

On the Millimeter Wave Propagation Test at Snowfall
Nishitsuji, A., A. Matsumoto, K. Hatori, K. Ono, Y. Kawase, N. Nagai, S. Yajima, T. Ushizaka and K. Kamada
Monogr. Res. Inst. Appl. Elec. (Japan)
1971, No. 19, 1-20

Calculation of Radio Wave Attenuation Due to Snowfall
Nishitsuji, A. and A. Matsumoto
Monogr. Res. Inst. Appl. Elec. (Japan)
1971, No. 19, 63-78

Problems on the Radio Wave Attenuation in Millimeter and Microwave Regions at Rainfall
Nishitsuji, A. and A. Matsumoto
Monogr. Res. Inst. Appl. Elec. (Japan)
1971, No. 19, 93-105

Microwave Attenuation at 35.8 GHz Due to Rainfall
Norbury, J. R. and W. J. K. White
Electron. Lett. (GB)
Feb. 24, 1972, Vol. 8, No. 4, 91-92

A Presumptive Formula for Snowfall Attenuation of Radio Waves
Oomori, Takeo and Syozo Aoyagi
Electronics & Communications in Japan
Sept. 1971, Vol. 54, No. 9, 34-

Measurement of Sky Noise Temperature at 16 GHz and 35 GHz
Otsu, Y.
J. Radio Research Laboratories (Japan)
Mar. 1971, Vol. 18, No. 96, 87-111

Absorption of the 4- to 6-mm Wavelength Band in the Atmosphere
Reber, E. E.
1971 IEEE Group Antennas & Propagation International Symposium, Los Angeles, Calif.
(New York: IEEE, 1971)
Sept. 1971, 325-328

Attenuation of the 5-mm Wavelength Band in a Variable Atmosphere
Reber, E. E., R. L. Mitchell and C. J. Carter
IEEE Trans. Antennas & Propagation
July 1970, Vol. AP-18, No. 4, 472-479

Additional Propagation and Modulation Measurements at Millimeter Wavelengths Over a 32-km Path
Roche, James F. and Herman Lake
Report No. AD-849950L
Jan. 1969, 37 pages

Radar Derived Statistics on Slant-Path Attenuations at 10 GHz
Rogers, R. R.
Radio Science
June 1972, Vol. 7, No. 6, 631-

Attenuation Statistics From Weather Radar Observations
Rogers, R. R., G. Drufuca and I. I. Zawadzki
1971 Group Antennas & Propagation International Symposium, Los Angeles, Calif.
(New York: IEEE, 1971)
Sept. 1971, 282-285

Microwave Attenuation and Rain Gauge Measurements
Ruthroff, C. L.
Proc. IEEE
June 1969, Vol. 57, No. 6, 1235

Rain Attenuation and Radio Path Design
Ruthroff, C. L.
Bell System Technical Journal
Jan. 1970, Vol. 49, No. 1, 121-135

Influence of Rain Droplet Size Distribution on the Attenuation of Microwaves at Wavelengths of 5.77, 3.3 and 2 mm
Sander, J.
Trans. Arbeitsgemeinschaft Ionosphaere
Oct. 1971, 35-40 (In German)

Microwave Propagation Studies
Saxton, J. A.
Int. Broadcast Eng. (GB)
Feb. 1972, No. 85, 22-23

Attenuation by Rainfall at 18.5 GHz and 30.9 GHz
Semplak, R. A.
URSI 1969 Spring Meeting, Washington, D.C.
(Washington, D.C.: URSI, 1969)
Apr. 1969, 18

Effect of Oblate Raindrops on Attenuation at 30.9 GHz
Semplak, R. A.
Radio Science
Mar. 1970, Vol. 5, No. 3, 559-564

The Influence of Heavy Rainfall on Attenuation at 18.5 and 30.9 GHz
Semplak, R. A.
IEEE Trans. Antennas & Propagation
July 1970, Vol. AP-18, No. 4, 507-511

Dual Frequency Measurements on Rain-Induced Microwave Attenuation on a 2.6-kilometer Propagation Path
Semplak, R. A.
Bell System Technical Journal
Oct. 1971, Vol. 50, No. 8, 2599-2606

Some Measurements of Attenuation by Rainfall at 18.5 GHz
Semplak, R.A. and R.H. Turrin
Bell System Technical J.
July 1969, Vol. 48, No. 6, 1767-1787

Attenuation and Emission of the Atmosphere at 3.3 mm
Shimabukuro, F. I. and E. E. Epstein
IEEE Trans. Antennas & Propagation
July 1970, Vol. AP-18, No. 4, 485-490

Rain Attenuation Measurements in Mississippi at 10 and 14.43 GHz
Skerjanec, R. E. and C. A. Samson
IEEE Trans. Antennas & Propagation
July 1971, Vol. AP-19, No. 4, 575-578

Atmospheric Attenuation at 15, 31, and 53 GHz
Snider, J. B. and E. R. Westwater
Report No. ESSA-TR-ERL-156-WPL-11
Dec. 1969, Avail. SOD

Attenuation of Submillimetre Radio Waves in Rain
Sokolov, A. V. and Ye. V. Sukhonin
English Translation: Radio Eng. & Electron. Phys. (USA)
(Radiotekh & Elektron. (USSR))
Dec. 1970, Vol. 15, No. 12, 2167-2171

Propagation Characteristics of Millimetre Radio Waves
Straiton, A. W.
Progress Radio Science 1960-1963
Sept. 15-20, 1963, 275-287

Amplitude Variations of 15-GHz Radio Waves Transmitted Through Clear Air and Through Rain
Straiton, A. W., C. R. Bailey and W. Vogel
Radio Science
Mar. 1970, Vol. 5, No. 3, 551-557

Atmospheric Limitations on the Use of the Longer Millimeter Wavelengths
Straiton, A. W. and B. M. Fannin
Report No. AD-875950
Oct. 1970, 250 pages

Performance Characteristics of a 9.5 Mile Radio Link at 15 and 35 GHz
Straiton, A. W., Lai-iun Lo and David N. Pate
Report No. AFAL-TR-71-233 (AD-887645)
July 15, 1971, 35 pages

Factors Affecting Earth-Satellite Millimeter Wavelength Communications
Straiton, A. W. and C. W. Tolbert
IEEE Trans. Microwave Theory & Techniques
Sept. 1963, Vol. MTT-11, No. 5, 296-301

Simultaneous Measurement of Attenuation, Emission, and Backscatter by Precipitation Along a Satellite to Earth Path
Strickland, J. I.
14th Radar Meteorology Conf., Tucson, Ariz.
(Boston, Mass: American Meteorological Soc., 1970)
Nov. 1970, 215-219

Slant Path Microwave Attenuation Due to Precipitation
Strickland, J. I. and K. S. McCormick
Conf. Tropospheric Wave Propagation, London
(London, UK: IEE, 1968)
Sept. 1968, 143-150

Millimeter-Wavelength Radio Systems
Tillotson, L. C.
Science
Oct. 2, 1970, Vol. 170, 31-36

Variation of Tropospheric Slant-Path Attenuation in the UK at 11.75 and 17 GHz
Turner, D.
Electronics Letters
Sept. 7, 1972, Vol. 18, No. 18, 453-454

Attenuation Due to Rainfall on a 24-km Microwave Link Working at 11, 18 and 36 GHz
Turner, D. J. W. and D. Turner
Electronics Letters (GB)
May 14, 1970, Vol. 6, No. 19, 297-298

Rainfall Attenuation at 6.25 mm Wavelength
Ugai, S. and K. Shimada
1971 International Symposium Antennas & Propagation, Sendai Japan (Tokyo, Japan: Inst. Electronics and Communication Engrs. Japan, 1971)
Sept. 1971, 251-252

Atmospheric Attenuation Studies in the 200-300 GHz Region
Ulaby, F. T.
Thesis, University of Texas, Austin (Order No. 68-16151)
1968, 110 pages, Avail. Univ. Microfilms, Ann Arbor, Mi.

Atmospheric Attenuation Studies in the 183-325 GHz Region
Ulaby, F. T. and A. W. Straiton
IEEE Trans. Antennas & Propagation
May 1969, Vol. AP-17, No. 3, 337-342

Evaluation of the Characteristics of an 8.6 Millimeter Radar. Part II
Vander Meer, William E.
Report No. TR1495A (AD-446320)
Aug. 1963, 19 pages

Overwater Line-of-Sight Frequency Diversity Measurements at 37 GHz -- Interim Report NRL-6885
Vignali, J. A., K. M. Decker and R. C. Dodson
Report No. AD-851636L
Apr. 1969, 22 pages

Rain Attenuation and Backscatter of Radio Waves in the Millimeter Region
Vogel, W.
Report No. TR-69-3 (AD-852713)
Apr. 30, 1969, 53 pages

Propagation Studies in Millimeter-Wave Link Systems
Weibel, Gerhard E. and Herman O. Dressel
Proc. IEEE
Apr. 1967, Vol. 55, No. 4, 497-513

A Study of Millimeter Propagation in the Earth's Atmosphere
Winkler, L.
Report No. AD-853254
Apr. 8, 1969

Rain Attenuation at 15 and 35 GHz
Wulfsberg, K. N. and E. E. Altshuler
IEEE Trans. Antennas & Propagation
Mar. 1972, Vol. AP-20, No. 2, 181-187

Attenuation and Scintillation of Microwaves Originating from Space Sources
Yokoi, H., M. Yamada and T. Satoh
Trans. Inst. Electron. Commun. Eng. Japan A.B.C.
May 1970, Vol. 53, No. 5, 14-15 (In English)

Atmospheric Attenuation and Scintillation in Satellite Communications
Yokoi, H., M. Yamada and T. Satoh
KDD Tech. J. (Japan)
July 1970, No. 65, 1-10 (In Japanese)

ADA: An Instrument for Measuring Attenuation to Rain Over Slant Path
Zawadzki, I. I. and R. R. Rogers
Radio Science
June 1972, Vol. 7, No. 6, 619-

Propagation of Centimeter, Millimeter and Submillimeter Radiowaves in the Earth's Atmosphere
Zhevakin, S. A. and A. P. Naumov
Izv. VUZ Radiofiz. (USSR)
1967, No. 9-10, 1213-1243 (In Russian)
English Translation: Soviet Radiophys. (USA)
Sept.-Oct. 1967, No. 9-10

Research Summary 1964
-
Report No. AD-854296
1964, 57 pages

Automatic Rain Measurement as a Basis of Future Microwave Communications
-
Elektron. Ind. (Germany)
Oct. 20, 1971, Vol. 2, No. 10, 182-183 (In German)

Absorption

Radio Wave Absorption During Oblique Propagation Through the Ionosphere
Belikovich, V. V. and Ye. A. Benediktov
English Translation: Geomagn. & Aeron. (USA)
(Geomagn. & Aeron. (USSR))
1971, Vol. 11, No. 3, 464-465

Laboratory Measurements of Atmospheric Absorption in the Submillimeter Region
Breeden, K. H. and A. P. Sheppard
Conf. Tropospheric Wave Propagation, London
(London, UK: IEE, 1968)
Sept. 1968, 159-165

Oxygen Absorption in the Earth's Atmosphere. Technical Report May 1965 - March 1968
Carter, C. J., R. L. Mitchell and E. E. Reber
Report No. AD-680771
Nov. 1968, Avail. NTIS

Absorption and Emission in the 8-Millimeter Region by Ozone in the Upper Atmosphere
Caton, W. M., W. J. Welch and S. Silver
J. Geophys. Res.
Dec. 15, 1967, Vol. 72, No. 24, 6137-6138

Atmospheric Emission and Absorption at Millimeter Wavelengths
Falcone, V. J., Jr., K. N. Wulfsberg and S. Gitelson
Radio Science
Mar. 1971, Vol. 6, No. 3, 347-355

One Way Atmospheric Absorption Characteristics at 36 GHz
Fenstermacher, R. L.
URSI 1969 Spring Meeting, Washington, D.C.
(Washington, D.C.: URSI, 1969)
Apr. 1969, 18

Survey of Gaseous and Hydrometeor Absorption in the Atmosphere in the 10-100 GHz Frequency Band
Fowler, M. S. and A. H. LaGrone
Report P-37 (PB-186223)
Oct. 1969, 120 pages, Avail. NTIS

Influence of the Statistical Properties of the Ionosphere on Radio Wave Absorption Measurements
Gorshkova, V. Ye.
Geomagn. and Aeronomy
1967, Vol. 7, No. 1, 152-154

Investigation of Tropospheric Absorption of Radio-Waves by Radio Astronomical Methods
Kisylokov, A. G. and K. S. Stankevich
Soviet Radiophys.
Sept.-Oct. 1967, No. 9-10

Dispersion and Absorption Under Atmospheric Conditions Due to the 22 GHz Water Vapor Line
Liebe, H. J.
URSI 1969 Spring Meeting, Washington, D.C.
(Washington, D.C.: URSI, 1969)
Apr. 1969, 18

Calculated Tropospheric Dispersion and Absorption Due to the 22-GHz Water Vapor Line
Liebe, H. J.
IEEE Trans. Antennas & Propagation
Sept. 1969, Vol. AP-17, No. 5, 621-627

Dispersion Studies of Moist Air Near 1.35 cm Wavelength
Liebe, H., T. Dillon, M. Vetter and M. C. Thompson, Jr.
Conf. Tropospheric Wave Propagation, London
(London, UK: IEE, 1968)
Sept. 1968, 175-182

Experimental Study of the Propagation of Millimeter Waves in the 5- and 3-mm Bands
Misme, P.
Annales Des Telecommunications
Nov.-Dec. 1966, Vol. 21, 226-234 (In French)

Atmospheric Radio Wave Absorption in the Region of Rotational Resonance of Water Vapour at $\lambda \simeq 1.35$ cm
Plechkov, V. M.
Izv. VUZ Radiofiz. (USSR)
English Translation: Soviet Radiophys. (USA)
1969, Vol. 12, No. 2, 185-188 (In Russian)

Atmospheric Absorption of Radio Waves Between 150 and 350 GHz
Ulaby, F. T. and A. W. Straiton
IEEE Trans. Antennas & Propagation
July 1970, Vol. AP-18, No. 4, 479-485

Some Radio and Optical Observations of Ionospheric Modification by Very High Power h.f. Ground-Based Transmission
Utlaut, W. F.
1970 G-AP International Symposium, Columbus, Ohio
(New York: IEEE, 1970)
Sept. 1970, 208-212

The Radio Spectrum from 10 Gc to 300 Gc in Aerospace Communications. Volume I. General Description of Phase I Study and Phase II Program
Warren, F. G. R. and H. J. Moody
Report No. TR61 589 V1 (AD-276274)
Jan. 1962

Consideration of Propagation of Satellite Communication Waves of Frequencies Above 10 GHz
Yamada, M. and H. Yokoi
K.D.D. Tech. J. (Japan)
Oct. 1971, No. 70, 14-20 (In Japanese)

Millimeter Communication Propagation Program. Volume I, Final Report 1 November 1964 - 1 November 1965
Report No. NASA-CR-76093 (N66-30163)
1965, 177 pages, Avail. NTIS

Millimeter Wave Transmission Investigation -- Engineering Report

Report No. AD-382250
Aug. 31, 1966

Scattering

The Measurement of Precipitation Scatter Interference and Space-Path Attenuation
Altman, F. J.
1970 International Conf. on Communications
(New York: IEEE, 1970)
June 1970, 8 pages

Microwave Scattering from Underdense and Overdense Turbulent Plasmas
Attwood, D.
Report No. AD-737655
1971, Avail. NTIS

Multiple Scattering of Microwave Signals in the Troposphere
Austin, M. E.
Conf. Tropospheric Wave Propagation
(London, UK: IEE, 1968)
Sept. 1968, 191-198

Measurement of Precipitation Scatter Effects on Propagation at 6, 12, and 18 GHz
Buige, A. and J. L. Levatich
Progress in Astronautics and Aeronautics Vol. 26.
Communication Satellites for the 70's: Systems
(London, England: MIT Press)
1971, 539-553

Auroral Radar Backscatter Study
Chesnut, W. G., J. C. Hodges and R. L. Leadabrand
URSI 1969 Spring Meeting, Washington, D.C.
(Washington, D.C.: URSI, 1969)
Apr. 1969, 34

Monostatic and Bistatic Scattering from Thin Turbulent Layers in the Atmosphere
Crane, R. K.
Report No. AD-678061
Sept. 18, 1968, Avail. NTIS

The Radio Frequency Interference and Propagation Program
Eckerman, J.
1971 IEEE Group Antennas & Propagation International Symposium, Los Angeles, Calif.
(New York: IEEE, 1971)
Sept. 1971, 255-257

Measurements of Path Intermodulation Distortion Over Five Tropospheric Scatter Paths
Elliott, J. C.
IEEE Trans. Commun. Technol.
Oct. 1970, Vol. COM-18, No. 5, 537-543

International Antenna Propagation Symposium (1965) Program and Digest
Emberson, Richard M.
Report No. 3C12 (AD-475985)
1965, 345 pages

Theoretical Study of the Bandwidth Capabilities of Radio Propagation Media
Fannin, B. M.
Report No. 62 5846 46 (AD-286387)
Aug. 1962

Calculation of Rain Scattering Effects in Radiometric Measurements
Fannin, B. M. and A. H. Kwesah
1971 IEEE Group Antennas & Propagation International Symposium, Los Angeles, Calif.
(New York: IEEE, 1971)
Sept. 1971, 319-321

Incoherent Scattering at Radio Frequencies
Farley, D. T.
J. Atmos. Terrest. Phys. (GB)
Apr. 1970, Vol. 32, No. 4, 693-704

Measured Scattering from a Turbulent Plasma at 31 GHz
Graf, K. A., H. Guthart and D. G. Douglas
1970 G-AP International Symposium, Columbus, Ohio
(New York: IEEE, 1970)
Sept. 1970, 262-264

Some Calculations on Coupling Between Satellite Communications and Terrestrial Radio-Relay Systems due to Scattering by Rain
Gusler, L. T. and D. C. Hogg
Bell System Technical Journal
Sept. 1970, Vol. 49, No. 7, 1491-1511

Scattering and Attenuation of Microwave Radiation Through Rain
Haddock, F. T.
Report No. X68-85656
1947

Millimeter-Wavelengths Propagation Studies
Hodge, D. B.
Report No. X72-74199
Jan. 1972

Backscatter From Snow and Ice Surfaces at Near Incident Angles
Hoekstra, Pieter and Dennis Spanogle
IEEE Trans. Antennas & Propagation
Nov. 1972, Vol. AP-20, No. 6, 788-790

An Experimental Study of the Temporal Statistics of Radio Signals Scattered by Rain
Hubbard, R. W.
1971 IEEE Group on Antennas & Propagation International Symposium, Los Angeles, Calif.
(New York: IEEE, 1971)
Sept. 1971, 258-261

Millimeter-Wave Propagation Experiments Utilizing the ATS-5 Satellite
Ippolito, L. J.
Report No. NASA-TM-X-65404 (N71-14738)
Nov. 1970, Avail. NTIS

Terrain Backscatter Measurements at 40 to 90 GHz
King, H. E., C. J. Zamites, D. E. Snow and R. I. Colliton
IEEE Trans. Antennas & Propagation
Nov. 1970, Vol. AP-18, No. 6, 780-784

Atmospheric Propagation Properties in the 10 to 75 GHz Region -- A Survey and Recommendations
Liebe, H. J.
Report No. ESSA-TR-ERL-130-ITS-91 (N70-33797)
Sept. 1969, Avail. SOD

Multiple Scattering Effects on Wave Propagation in Isotropic Scattering Media
Lin, J. C. and A. Ishimarv
Report No. AD-735284
March 1971, Avail: NTIS

The Study of Precipitation Backscatter at 1.8 cm with a Polarization Diversity Radar
McCormick, G. C. and A. Hendry
14th Radar Meteorology Conf., Tucson, Ariz.
(Boston, Mass.: American Meteorological Soc., 1970)
Nov. 1970, 225-230

Millimeter Wave Research -- Past, Present, and Future
Meyer, J. W.
Technical Report No. 389 (AD-620727)
May 17, 1965, 25 pages

Radar Meteorology at Millimeter Wavelengths
Mitchell, R. L.
Report No. TR-669(6230-46)-9 (AD-488085)
June 1966, 30 pages

Environmental Effects on Radar and Radiometric Systems at Millimeter Wavelengths
Richer, K. A.
Proc. Symposium in Submillimeter Waves
(New York: Wiley-Interscience)
1971, 533-543

Radar Scattering of Centimeter Electromagnetic Radiation by Flaky Hail
Rosenberg, V. I.
Izv. Akad. Nauk SSSR Fiz. Atmos. Okeana
1970, Vol. 6, No. 2, 168-177 (In Russian)
English Translation: Bull. Acad. Sci. USSR Atmos. Oceanic Phys. Ser. (USA)

Scattering and Attenuation of Microwaves by Inhomogeneous Hail Particles
Rozenberg, V. I. and B. M. Vorob'ev
Izv. Akad. Nauk. SSSR. Fiz. Atmos. & Okeana
June 1971, Vol. 7, No. 6, 632-637 (In Russian)
English Translation: Bull. Acad. Sci. USSR Atmos. Oceanic Phys. Ser. (USA)

Computed Transmission Through Rain at Microwave and Visible Frequencies
Setzer, D. E.
Bell Systems Technical Journal
Oct. 1970, Vol. 49, No. 8, 1873-1892

Anisotropic Scattering Due to Rain at Radio-Relay Frequencies
Setzer, D. E.
Bell System Technical Journal
Mar. 1971, Vol. 50, No. 3, 861-868

Computer Routines for Synthesizing Ground Backscatter from Three-Dimensional Raysets
Stephenson, J. J. and T. M. Georges
Report No. ESSA-TR-ERL-120-ITS-84
July 1969, 112 pages, Avail. NTIS

A Survey of Millimeter Wavelength Radio Propagation Through the Atmosphere
Straiton, A. W., D. C. Scarpero and W. Vogel
Report No. TR-68-1 (AD-844946)
Nov. 30, 1968, 78 pages

Scattering Intensity Plots and Transmission Coefficients for Millimeter-Wave Propagation Through Rain
Vogel, W.
Report No. AD-890408L
Dec. 1971, 175 pages

Backscattering by Turbulent Irregularities: A New Analytical Description
Wheelon, A. D.
Proc. IEEE
Mar. 1972, Vol. 60, No. 3, 252-265

Some Effects of Radio Wave Scattering in the Ionosphere. I
Yerukhimov, L. M. and V. Yu. Trakhtengerts
Geomagn. I Aeronomiya (USSR)
1969, Vol. 9, No. 5, 834-842 (In Russian)
Geomag. & Aeronomy (USA)
1969, Vol. 9, No. 5, 673-678

Refraction

Variability of the Angle of Arrival of Microwaves
Akiyama, T., S. Aoyagi and H. Yoshida
J. Inst. Elect. Commun. Engrs. (Japan)
Feb. 1967, Vol. 50, No. 2, 12-13

On Diffraction of Radio Waves in Stratified Atmosphere
Armand, N. A.
1971 International Symposium on Antennas & Propagation
(Tokyo, Japan: Inst. Electronics and Communication Engrs.)
1971, 211

A World Atlas of Atmospheric Radio Refractivity
Bean, B. R., B. A. Cahoon, C. A. Samson and G. D. Thayer
ESSA Monograph
1966, No. 1, 1-130

Field Strength Calculations for an Algorithmic Refractive Index Profile
Becker, K. D.
Arch. Elekt. Ubertragung (Germany)
Oct. 1967, Vol. 21, No. 10, 528-534 (In German)

Compensating for Propagation Errors in Electromagnetic Measuring Systems
Bertram, S.
IEEE Spectrum
Mar. 1971, Vol. 8, No. 3, 58-63

Note on the Tabular Presentation of the Radio Refractive Index as a Function of Meteorological Parameters
Brady, M. M.
Radio Science
Dec. 1967, Vol. 2, No. 12, 1523-1524

The Suitability of Frequencies Above About 10 GHz for Use in Radio-Communication
Brussaard, G.
Ned. Elektron.-& Radiogenoot. (Netherlands)
Nov. 1970, Vol. 35, No. 11, 171-177 (In Dutch)

Anticipated Super-Refraction Over India, Based on the Climatology of the Vertical Structure of Radio Refractivity
Chatterjee, K.
Radio Science
Dec. 1971, Vol. 6, No. 12, 1033-1038

Amplitude Fluctuations on a 9.5 Mile Radio Link at 15 and 35 GHz
Fannin, Bob M. and Lai-Iun Lo
Technical Report 1 Feb. 71 - 1 Mar. 72
Report No. AD-894842L
May 1972, 138 pages

Complex Index of Refraction of Airborne Fly Ash Determined by Laser Radar and Collection of Particles
Grams, G. W., I. H. Blifford, Jr., B. G. Schuster and J. J. DeLuisi
J. of the Atmospheric Sciences
July 1972, Vol. 29, No. 5, 900-905

Measurement of Refractive-Index Structure-Function Constant and Across-the-Path Wind on a 28-km Propagation Path at 35 GHz
Harp, J. C., R. W. Lee and A. T. Waterman, Jr.
1971 IEEE Group Antennas & Propagation Intl. Symposium (New York: IEEE, 1971)
Sept. 22-24, 1971, 335

Variation of Radio Refraction in the Lower Atmosphere
Ikegami, F., T. Akiyama, S. Aoyagi and H. Yoshida
IEEE Trans. Antennas & Propagation
Mar. 1968, Vol. AP-16, No. 2, 194-200

Fluctuations of a Beam-Wave Propagating Through a Locally Homogeneous Medium
Ishimaru, A.
Radio Science
Apr. 1969, Vol. 4, 295-305

Temporal Frequency Spectra of Multifrequency Waves in a Turbulent Atmosphere
Ishimaru, A.
Report No. TR-141 (AD-720869)
Nov. 1970, Avail. NTIS

Atmospheric Radio Refractive Index Measurements and Their Applications in Radio Propagation Research
Jenkinson, G. F.
National Radio & Electronics Engineering Convention, Sydney (Sydney: Institution Radio & Electronics Engineers, 1967)
1967, 72-73

Radio Refractive Index Investigations Over Bass Strait, Southern Australia
Jenkinson, G. F. and M. H. van Dijk
IEEE Trans. Antennas & Propagation
Sept. 1969, Vol. AP-17, No. 5, 606-613

The Fine-Scale Structure of the Refractive Index Over Sea Within the Height Interval 50 to 2400 m
Jeske, H.
Z. Geophys. (Germany)
1969, Vol. 35, No. 5, 529-550 (In German)

Refractive Qualities of the Stratospheric Layer Exposed to Circularly Polarized Radio Waves in the 30-45 Gigahertz Band
Kinnievskii, A.
Report No. FTD-HT-23-1511-71 (AD-738242)
Nov. 1971, 9 pages

Radio-Climatology of India: III. Radio Refractive Index at 700-mb Level
Kulshrestha, S. M. and K. Chatterjee
Indian J. Meteorol. Geophys.
Apr. 1967, Vol. 18, No. 2, 185-196

Radio-Climatology of India: IV. Vertical Structure of Radio Refractive Index Distribution in the Lower Troposphere
Kulshrestha, S. M. and K. Chatterjee
Indian J. Meteorol. Geophys.
July 1967, Vol. 18, No. 3, 335-348

High Resolution Measurement of Microwave Refraction on Short Tropospheric Paths
Lees, M. L.
IEEE Trans. Antennas & Propagation
Mar. 1972, Vol. AP-20, No. 2, 176-181

Observations of Radio Refractivity Gradients in the Mekong Delta
Samson, C. A. and L. J. Maloney
Radio Science
Dec. 1971, Vol. 6, No. 12, 1027-1032

Advances in Radio Research, London: Volume I.
Saxton, J. A.
Academic Press, London
1964, 1-226

Contribution of Water Vapor to Index of Refraction Structure Parameter at Microwave Frequenices
Sirkis, M. D.
IEEE Trans. Antennas & Propagation
July 1971, Vol. AP-19, No. 4, 572-574

The Radio Refractive Index of the Atmosphere in Indonesia
Sutanto, B.
Telecomm. J. (Switzerland)
Nov. 1969, Vol. 36, No. 11, 542-546

Atmospheric Error in Range and Range-Rate Measurements Between a Ground Station and an Artificial Satellite
Takahashi, K.
IEEE Trans. Aerosp. & Electron. Syst.
Nov. 1970, Vol. AES-6, No. 6, 770-779

Errors in Range of a Ground Station to a Stationary Satellite and in Range-Rate Measurement Induced by the Atmosphere
Takahashi, K., K. Hashimoto, K. Murata, K. Yamaya and M. Yokoyama
J. Radio Res. Lab. (Japan)
May 1969, Vol. 16, No. 85/86, 99-115

Radio-Refractive Index Over India & Neighbourhood for Microwave Propagation
Venkiteshwaran, S. P. and V. S. Narayan
J. Sci. Industr. Res. (India)
Feb. 1970, Vol. 29, No. 2, 76-110

Refraction of Millimetre and Submillimetre Waves in the Lower Atmosphere
Zhevakin, S. A. and A. P. Naumov
Radiotekhnika i Elektronika (USSR)
June 1967, Vol. 12, No. 6, 955-964 (In Russian)
English Translation: Radio Engng. Electronic Phys. (USA)
June 1967, Vol. 12, No. 6

Millimeter Communication Propagation Program. Vol. II. Final Report 1 November 1964 - 1 November 1965

Report No. NASA-CR-76095 (N66-30164)
1965, 230 pages, Avail. NTIS

Reflection

Kalinin's Tropospheric Partial Reflection Modes
Carroll, T. J. and R. M. Ring
URSI 1969 Spring Meeting, Washington, D.C.
(Washington, D.C.: URSI, 1969)
Apr. 1969, 10

Reflection and Refraction of Radio Waves from the Ionosphere in Presence of Time-Varying Irregularities
De, S. S.
International Journal of Electronics
Sept. 1972, Vol. 33, No. 3, 255-

Atmospheric Inhomogeneities and Space Communications
Fengler, C.
Eurocon 71 Digest, Lausanne, Switzerland
(New York: IEEE, 1971)
Oct. 1971, 2 pages

Fluctuations of the Angles of Arrival of Radiowaves Reflected from an Inhomogeneous Reflecting Layer in the Fraunhofer Zone
Gusev, V. D. and L. I. Prikhod'ko
Radio Engineering & Electronic Physics
Jan. 1972, Vol. 17, No. 1, 121-124

Changes in Radio Field Strength at V.H.F. and U.H.F. Due to Disintegration of Reflecting Layers in the Troposphere
Hall, M. P. M. and C. M. Comer
Proc. IEE (GB)
Oct. 1970, Vol. 117, No. 10, 1925-1932

The Reflection of Radio Waves From Irregularly Ionized Meteor Trains
Jones, J.
Planet. Space Sci. (GB)
Aug. 1969, Vol. 17, No. 8, 1519-1526

Propagation of Millimeter and Centimeter Radio Waves in Tropospheric Waveguides Close to a Sea Surface
Kanevskii, M. B.
Radiofizika
1966, Vol. 9, No. 5, 867-875 (In Russian)

Radio Reflectivity of Tropospheric Layers
Thayer, G. D.
Radio Science
Nov. 1970, Vol. 5, No. 11, 1293-1299

The Reflection Property of Radio Wave on the Artic Glacier Ice
Yoshino, T.
Fourth International Antennas & Propagation Symposium, Palo Alto
(New York: IEEE, Inc., 1966)
1966, 336-338

Scintillation

Scintillation of Synchronous Satellite Transmissions at 136 MHz
Aarons, J.
Report No. AGARD-566 (AD-689721)
Nov. 1968, 20 pages, Avail. CFSTI

World Wide Morphology of Scintillations
Aarons, J., H. E. Whitney and R. S. Allen
Application of Propagation Data to VHF Satellite Communication and Navigation Systems, Canada
(Neuilley-sur-Seine, France: AGARD, 1970)
1970, 22 pages

Global Morphology of Ionospheric Scintillations
Aarons, J., H. E. Whitney and R. S. Allen
Proc. IEEE
Feb. 1971, Vol. 59, No. 2, 159-172

Prediction of Ionospheric Scintillations for Satellite Signals in Communications and Navigation
Albrecht, H. J.
IIC Conf. (N72-27189)
(Genoa, Oct. 12-16, 1971)
Nov. 1971, 19 pages, Avail. NTIS

40-HMz Ionospheric Scintillation and the Sporadic-E Layer
Anastassiadis, M., D. Matsoukas and G. Moraitis
Radio Sci.
June 1970, Vol. 5, No. 6, 953-957

Scintillation Effects at 4 and 6 GHz on a Line-of-Sight Microwave Link
Babler, G. M.
IEEE Trans. Antennas & Propagation
July 1971, Vol. AP-19, No. 4, 574-575

The Latitude Variation of Sizes of the Ionospheric Irregularities Producing Radio-Satellite Scintillation
Clark, D. H.
J. Atmos. & Terr. Phys. (GB)
Aug. 1971, Vol. 33, No. 8, 1267-1272

Amplitude, Phase and Angle-of-Arrival Fluctuations
Forsyth, P. A.
Application of Propagation Data to VHF Satellite Communication and Navigation Systems, Canada
(Neuilley-sur-Seine, France: AGARD, 1970)
June 1970, 6 pages

A Brief Review of Scintillation Studies
Hartmann, G. K.
J. Sci. & Ind. Res. (India)
Aug. 1971, Vol. 30, No. 8, 414-420

Scintillation Studies of a Synchronous Satellite's Radio Signals at a Low-Latitude Station
Houminer, Z.
Radio Science
June 1970, Vol. 5, No. 6, 949-951

Observations of Transitions in Satellite Scintillation
Kaiser, A. B. and G. F. Preddey
J. Atmos. Terrest. Phys. (GB)
Feb. 1968, Vol. 30, No. 2, 285-291

Scintillation and Absorption Fading on Line-of-Sight Links at 35 and 100 GHz
Lane, J. A.
Conf. Tropospheric Wave Propagation, London
(London, UK: IEE, 1968)
Sept. 1968, 166-174

Aperture Effects on the Spectrum of Amplitude Scintillation
Lee, R. W.
Radio Science
Dec. 1971, Vol. 6, No. 12, 1059-1060

Measurements and Data Processing of Scintillation on a 36 GHZ Line-of-Sight Radio Link
Matthews, P. A.
Statistical Methods & Instrumentation in Geophysics, Skeikampen, Norway
(Oslo, Norway: Teknologisk Forlag, 1971)
Apr. 1971, 121-123

Study of Ionospheric Scintillations from ATS Satellite Signals
Norman, T.
URSI 1969 Spring Meeting, Washington, D.C.
(Washington, D.C.: URSI, 1969)
Apr. 1969, 34

Observations of Simultaneous Scintillation on VHF and S Band Satellite Transmissions at High Latitudes
Pope, J. H. and R. B. Fritz
NOAA Technical Report No. ERL 207-0D6
Nov. 1970, 33 pages

Mid-Latitude Radio-Satellite Scintillation: The Variation with Latitude
Preddey, G. F.
Planet. Space Sci. (GB)
Aug. 1969, Vol. 17, No. 8, 1557-1561

Atmospheric Propagation Studies at Optical, Millimeter and Microwave Frequencies. Part II. The Mechanism of Scintillation
Taylor, Paul B.
Report No. AD-466031
Mar. 1965, 20 pages

Ionospheric Research and Propagation Studies. Quarterly Report 11 1 January - 31 March 1963
Webb, H. D. and R. A. Davidson
Report No. AD-406684
Mar. 1963, 27 pages

On the Amplitude Distribution of Scintillating Radio Signals from Artificial Satellites
Wernik, A. W. and L. Liszka
Ark. Geofys. (Sweden)
1969, Vol. 5, No. 5, 501-514 (In English)

Scintillation Observations with Four Synchronous Satellites
Whitney, H. E., R. S. Allen and J. Aarons
1968 International Antennas & Propagation Symposium, Boston (New York: IEEE, 1968)
Sept. 1968, 373-374

Dependency of Scintillation Fading of Oppositely Polarized v.h.f. Signals
Whitney, H. E. and W. F. Ring
IEEE Trans. Antennas & Propagation
Jan. 1971, Vol. AP-19, No. 1, 151

The Pennsylvania State University Radio Astronomy Observatory Study of Millimeter Propagation in the Earth's Atmosphere. Final Report October 1965 - October 1968
Winkler, L.
Report No. AD-687391
Nov. 1968, 66 pages, Avail. NTIS

Polarization

Polarization Observations in Alberta
Barge, B. L.
14th Radar Meteorology Conf., Tucson, Arizona
(Boston, Mass.: American Meteorological Soc., 1970)
Nov. 1970, 221-224

Wave Polarisation and Its Influence on the Power Available from a Radio Signal Propagated Through the Ionosphere. III. Two Hop Modes
Bradley, P. A. and E. N. Bramley
Proc. IEE (GB)
Sept. 1971, Vol. 118, No. 9, 1190-1196

Theory of the Limiting Polarization of Radio Waves Emerging Obliquely From the Ionosphere
Hayes, M. G. W.
Proc. R. Soc. A (GB)
1971, Vol. 324, No. 1558, 369-390

Behavior of Polarization of Downcoming Radio Waves Including Transverse Magnetic Field
Kantor, I. J., D. B. Rai, and F. De Mendonca
IEEE Trans. Antennas & Propagation
Mar. 1971, Vol. AP-19, No. 2, 246-254

Polarisation of Waves Reflected From the Ionosphere
Knight, P.
Electronics Letters (GB)
Aug. 21, 1969, Vol. 5, No. 17, 389

Fluctuation of Cross Polarization Discrimination Ratio Due to Fading
Morita, K.
Rev. Elec. Commun. Lab. (Japan)
May-June 1971, Vol. 19, Nos. 5-6, 649-652 (In English)

Cross Polarization at 18 and 30 GHz Due to Rain
Sauders, Morton J.
IEEE Trans. Antennas & Propagation
Mar. 1971, Vol. AP-19, No. 2, 273-277

Investigations of the Influence of Polarization in the Medium Waveband
Taumer, F.
Tech. Mitt. RFZ (Germany)
Sept. 1970, Vol. 14, No. 3, 119-127 (In German)

Cross-Polarization Distortion in Microwave Radio Transmission Due to Rain
Thomas, D. T.
Radio Science
Oct. 1971, Vol. 6, No. 10, 833-839

Wave Polarization Effects on the Transmission and Reception of Ionospheric Radio Waves
Tou, C. P. and C. R. Chow
IEEE Trans. Broadcasting
June 1970, Vol. BC-16, No. 2, 44-48

PART III. MISCELLANEOUS

Propagation

Atmospheric Effects on Millimeter Wave Propagation
Alt, J. H.
Report No. UDRI-TR-71-37 (AD-889104L)
Oct. 1, 1971, 40 pages

Atmospheric Propagation Studies at Optical, Millimeter, and Microwave Frequencies -- Part III -- Final Report
Alt, J. H. and I. P. Peteranecz
Report No. AD-819867
Aug. 1967, 73 pages

Earth-to-Space Communications at Millimeter Wavelengths
Altshuler, E. E.
1965 International Symposium Space Electronics Record
Nov. 2-4, 1965, 7-F1 to 7-F18

Propagation Measurements and Data Transmission Tests at Millimetric Wavelengths -- Phase I (Final Report 17 June 1966 - 31 May 1968)
Barquist, W. S., H. Lake and J. F. Roche
Report No. X69-14485 (AD-849119)
Dec. 31, 1968

A Survey of UHF Tropospheric Propagation Measurements Carried Out by the BBC
Bell, C. P.
Conf. Tropospheric Wave Propagation, London
(London, UK: IEE, 1968)
Sept. 1968, 101-109

Wave Hop Radio Propagation Theory
Berry, L. A.
Conf. M.F., L.F. and V.L.F. Radio Propagation, London
(London: IEE, 1967: Conf. Publication No. 36)
1967, 63-73

Millimeter Wavelengths Propagation Studies, Annual Status Report September 1, 1967 - August 31, 1968
Bohley, P. and R. L. Riegler
Report No. N69-13532
Nov. 1, 1968

Microwave Propagation Studies
Bray, W. J.
Int. Broadcast Eng. (GB)
Feb. 1972, No. 85, 10-12

Implication of Millimeter Wave Research and Technology of Naval Problems -- Semi Annual Report
Cohn, M. and R. S. Littlepage
Report No. X67-19822 (AD-813462)
Jan. 23, 1967, 195 pages

A Nomenclature for Oblique Ionospheric Soundings and Ray Tracing
Davies, K.
Radio Science
Nov. 1967, Vol 2, No. 11, 1395-1396

Ionospheric Radiopropagation
Dominici, P.
Ann. Geofis. (Italy)
1971, Vol. 24, Suppl., 1-157 (In Italian)

Tropospheric Radiowave Propagation Beyond the Horizon
Du Castel, F.
Pergamon Press Ltd., Oxford
1966, xii + 236 pages

Spherical Lens Semi-Active Radar Anti-Air Guidance (SRAG) System -- Quarterly Progress Report 6 June - 21 September 1967
Forman, B. J.
Report No. AD-853057L
1967, 43 pages

Tropospheric Microwave Propagation
Gaudissart, E.
Revue HF (Belgium)
1971, Vol. 8, No. 8, 173-182 (In French)

Transit-Time Variations in Line-of-Sight Tropospheric Propagation Paths
Gray, D. A.
Bell System Technical Journal
July 1970, Vol. 49, No. 6, 1059-1068

A Review of the State-of-the-Art in Millimeter Technology
Green, A. H., Jr.
Report No. N64-12367
Sept. 18, 1963, 26 pages

Propagation Problems in Microwave Links
Grosskopf, J.
Kleinheubacher Report
1967, Vol. 12, 111-126 (In German)

Propagation Through the Atmosphere at Frequencies Greater than 10 GHz
Hogg, D. C.
Progress in Radio Science 1966-1969
Aug. 1969, Vol. 2, 49-58

ATS-5 Millimeter Wave Experiment Data Report, October - December 1969.
Ippolito, L. J.
Report No. X70-14856
Mar. 1970

The ATS-F Millimeter Wave Propagation Experiment
Ippolito, L. J.
Report No. X72-10021
Oct. 1971

Earth-Satellite Propagation Above GHz: Papers From the 1972 Spring URSI Session on Experiments Utilizing the ATS-5 Satellite
Ippolito, Louis J. (Compiler)
Report No. NASA-TM-X-65990, X-751-72-208 (N72-30141)
May 1972, 131 pages, Avail. NTIS

Survey: Atmospherics
Jones, D. L.
Conf. M.F., L.F. & V.L.F. Radio Propagation, London
(London: IEE, 1967: Conf. Publication No. 36)
1967, 204-227

Experimental Results on Radio Wave Propagation in the Ionosphere
Kamada, T. K.
Proc. Res. Inst. Atmos. Nagoya Univ. (Japan)
Jan. 1971, Vol. 18, 39-45

Millimeter Waves
King, D. D.
Proc. Space Communications Inst.
(Maryland Univ. College Park, Md.)
June 1963, 78-92

Additional Propagation and Modulation Measurements at Millimeter Wavelengths Over a 32-KM Path (Final Report)
Lake, H. and J. F. Roche
Report No. AD-849950L
Jan. 30, 1969

Propagation Measurements and Data Transmission Tests at Millimetric Wavelengths
Lake, Herman, James F. Roche and William S. Barquist
Report No. AD-849119
Dec. 1968, 106 pages

A Survey of Tropospheric, Ionospheric, and Extra-Terrestrial Effects on Radio Propagation Between the Earth and Space Vehicles
Millman, G. H.
AGARD Conf., Proc. No. 3
1967, 3-55

Ionospheric Dispersion of an f.m. Electromagnetic Pulse
Millman, G. H. and C. D. Bell
IEEE Trans. Antennas & Propagation
Jan. 1971, Vol. AP-19, No. 1, 152-155

Contribution to the Determination of Ionospheric Radio Wave Propagation Effects from the Faraday and Doppler Effects of Coherent Signals from Geophysical Rockets Recorded at Spaced Points
Misyura, V. A., Ye. B. Krokhmal'nikov, G. N. Zinchenko, G. A. Biryukov and A. N. Gridin
English Translation: Geomagn. & Aeron. (USA)
(Geomagn. & Aeron. (USSR))
1970, Vol. 10, No. 3, 335-340

First Result from 15.3-GHz Earth-Space Propagation Study
Penzias, A. A.
Bell System Technical Journal
July 1970, Vol. 49, No. 6, 1242-1245

Research Project on Propagation of e.m. Waves with Frequencies Above 10 GHz
Peroni, B. and F. Fedi
Note Recens. Not. (Italy)
May 1970, Vol. 19, No. 3, 289-303 (In Italian)

Parameters Affecting the Propagation of 15, 35 and 95 GHz Radio Signals in Cold Regions -- Technical Report 1 Feb. - 30 Apr. 1971
Perry, J. W.
Report No. TR-71-1 (AD-884794)
Apr. 30, 1971, 46 pages

Microwave Propagation Over Periodic Rough Surfaces
Spence, L. B.
1967 Symposium Record Electromagnetic Compatibility
(New York: IEEE, Inc.)
1967, 170-172

Research and Experimentation on Space Applications of Millimeter Waves
Stacey, J.
Report No. TDR169 3250 41TN2 (AD-434543)
Feb. 1964, 331 pages

Propagation of 15.3 and 35 GHz Over a 15.5 km Path
Straiton, A. W., L. Lo and D. N. Pate
1971 IEEE Group Antennas & Propagation International Symposium
Sept. 22-24, 1971, 333-334

A Review of Propagation Factors in Telecommunications Applications of the 10- to 100-GHz Radio Spectrum
Thompson, M. C., Jr., L. E. Vogler, H. B. Janes and L. E. Wood
Telecommun. Research & Engineering Report 34, OT/TRER 34
Aug. 1972, 76 pages

Atmospheric Transmission Handbook: A Survey of Electromagnetic Wave Transmission in the Earth's Atmosphere Over the Frequency (Wavelength) Range 3 kHz (100 km)-3000 THz (0.1 micron)
Thompson, W. I., III
Report No. NASA-CR-117173; DOT-TSC-NASA-71-6
Feb. 1971, 296 pages, Avail. NTIS

ATS-5 Millimeter Wave Propagation Experiment
Vammen, C. M. and F. L. McCormick
IEEE Trans. Aerosp. & Electron. Syst.
Nov. 1970, Vol. AES-6, No. 6, 825-831

Bibliography on Propagation Effects from 10 GHz to 1000 THz
Vogler, L. E. and S. F. Van Horn
Telecommun. Research & Engineering Report 30, OT/TRER 30
Mar. 1972, 73 pages

Propagation of Electromagnetic Waves Over a Smooth Multi-Section Curved Earth -- An Exact Theory
Wait, J. R.
J. Math. Phys.
Sept. 1970, Vol. 11, No. 9, 2851-2888

Phase of the Electromagnetic Field on the Surface of an Inhomogeneous Earth for Sky-Wave Illumination
Wait, J. R. and K. P. Spies
IEEE Trans. Antennas & Propagation
Sept. 1967, Vol. AP-15, No. 5, 708-709

Millimeter Investigations, Volume 2, Millimeter Wave Propagation and Its Prediction
Warren, F. G. R.
Report No. RCA-3576-B/96690-3-Vol-2 (AD-857433L)
Jan. 1969, 130 pages

Characteristics of Free-Space Propagation Near the 183-GHz H_2O Line
Whaley, T. W., Jr. and B. M. Fannin
IEEE Trans. Antennas & Propagation
Sept. 1969, Vol. AP-17, No. 5, 682-684

One Method of Solving the Problem of Electromagnetic Wave Propagation in a Three-Dimensionally Inhomogeneous Isotropic Ionosphere
Yegorov, I. V. and M. P. Kiyanovskiy
Geomagn. Aeronomiya (USSR)
139-140
English Translation: Geomagn. & Aeron. (USA)
1970, Vol. 10, No. 1, 109-110

Papers Presented at Unclassified Sessions of "A Symposium on Electromagnetic Warfare" -- November 14-15, 1963, Part II
-
Report No. AD-430651
Feb. 1964, 217 pages

Millimeter Communication Propagation Program. First Quarterly Report, 1 November 1964 - 1 February 1965
-
Report No. N66-27949
1965, 367 pages, Avail. NTIS

Millimeter Communication Propagation Program. Second Quarterly Report, 1 February - 1 May 1965
-
Report No. N66-29485
1965, 211 pages, Avail. NTIS

Millimeter Communication Propagation Program. Vol. III. Final Report, 1 November 1964 - 1 November 1965
-
Report No. N66-30305
1965, 104 pages, Avail. NTIS

Basic Indices for Ionospheric Propagation
-
Telecommun. J. (Engl. Ed.) (Switzerland)
Feb. 1971, Vol. 38, No. 2, 103-104

Second Scientific Technical Conference on Radio Communication
-
Report No. NASA-TT-F-14406 (N72-27169)
Apr. 1972, 13 pages, Avail. NTIS

Diversity

Comments on "Performance of an Experimental Angle-Diversity Troposcatter System"
Henley, Edward J.
IEEE Trans. Communications
Dec. 1972, Vol. COM-20, No. 6, 1200-1201

Millimeter-Wavelengths Propagation Studies
Semiannual Status Report, November 1971 - April 1972
Hodge, D. B. and L. R. Zintsmaster
Report No. NASA-CR-122452, SASR-2374-9 (N72-30139)
May 1972, 35 pages, Avail. NTIS

Path Diversity in Propagation of Millimeter Waves Through Rain
Hogg, D. C.
IEEE Trans. Antennas & Propagation
May 1967, Vol. AP-15, 410-415

Performance of an Experimental Angle-Diversity Troposcatter System
Monsen, P.
IEEE Trans. Communications
Apr. 1972, Vol. COM-20, 242-247

Investigation of the Atmosphere at Small Angles Above Horizon by Methods of Radio Astronomy
Stankevich, K. S. and O. N. Shipulya
English Translation: Radio Engng. Electronic Phys. (USA)
Jan. 1967, Vol. 12, No. 1, 10-15
Radiotekhnika i Elektronika (USSR)
Jan. 1967, Vol. 12, No. 1, 13-18

Miscellaneous

Millimeter Wave Communications Experiments for Satellite Applications
Dees, J. W., G. P. Kefalas and J. C. Wiltse
1970 International Conf. Communications, San Francisco, Ca.
(New York: IEEE, 1970)
June 1970, 6 pages

State Variables and Numerical Evaluation of Intersymbol Interference
de Lama, A. and A. Luvison
Alta Frequenza (Italy)
Nov. 1970, Vol. 39, No. 11, 953-963

Voice Communication Factors Resulting from Interference
Duff, W. G., H. L. Stemple and H. J. Hewitt
Symposium Record Electromagnetic Compatibility Washington
(New York: IEEE, Inc., 1967)
1967, 20-25

Noise of the Atmosphere at Millimeter Wavelengths
Feix, G.
Frequency
Nov. 1968, Vol. 6, 27-28

An Upper Bound of Error Probability in Data-Transmission Systems
Hansler, E.
Nachrichtentech. Z. (NTZ) (Germany)
Dec. 1970, Vol. 23, No. 12, 625-627 (In English)

UHF Radio Frequency Interference Measurements at Synchronous Altitude
Hurlbut, K. H. and C. J. Zamites, Jr.
Report No. TR-0066(5230-01)-1 (AD-703712)
Jan. 1970, 20 pages, Avail. NTIS

Design and Construction of a 35 GHz Transmitter System Technical Report 1 February - 15 November 1971
Karm, Richard G.
Report No. AD-890967L
Jan. 1972, 79 pages

Limitations of Technological State-of-the-Art with Satellite and Space Communications Above 10 GHz
Menzel, R. and Kh. Rosenbach
Eurocon 71 Digest, Lausanne, Switzerland
(New York: IEEE, 1971)
Oct. 1971, 2 pages

Double Error Probability in Differential PSK
Oberst, J. F. and D. L. Schilling
Proc. IEEE
June 1968, Vol. 56, 1099-1100

Microwave and Millimeter-Wave Communications in Japan
Oguchi, Bunichi
IEEE Trans. Communications
Aug. 1972, Vol. COM-20, No. 4, 717-725

On Optimum Receivers for Channels with Intersymbol Interference
Omura, J. K.
Proc. 1970 International Symposium Information Theory, Noordwijk, Netherlands
(New York: IEEE, 1970)
June 1970, 1 page

A Theory of Quantum Communications -- Scientific Report No. 2
O'Neal, J. B., Jr.
Report No. AD-429721
Dec. 5, 1962, 74 pages

Advances in Radio Research, Volume II
Saxton, J. A.
Academic Press, London
1964, 1-215

Low-Latitude Ionospheric High-Frequency Doppler Dispersion Study
Sears, R. D.
Radio Science
Aug. 1970, Vol. 5, No. 8-9, 1147-1152

Ionospheric Self Distortion of Radio Waves
Sodha, M. S., A. K. Chakravarti and V. K. Tripathi
J. Atmos. & Terr. Phys. (GB)
Jan. 1971, Vol. 33, No. 1, 123-126

Radio Characteristics of a Standard Atmosphere for Tropics
Srivastava, H. N.
Indian J. Meteorol. Geophys.
Jan. 1967, Vol. 18, No. 1, 135-136

ATS-5 Signal Characteristics at 15.3 GHz and Related Experiments at 15 and 35 GHz. Part 1: Basic Features of the Experiments and Primary Results -- Final Report
Straiton, Archie W.
Report No. NASA-CR-122438 (N72-27174)
1972, 18 pages, Avail. NTIS

Topics in Millimeter-Wave and Optical Space Communication
Ward, W. W. and S. L. Zolnay
Proc. IEEE Fall Electronics Conf., Chicago, Ill.
(New York: IEEE, 1971)
Oct. 1971, 216

Further Comment on "Microwave Propagation Over Mountain-Diffraction Paths"
Waterman, A. T. and A. B. Carlson
IEEE Trans. Antennas & Propagation
Sept. 1967, Vol. AP-15, No. 5, 716

Some Basic Criteria for a Regional Communications Satellite System Operating Above 10 GHz
Willett, R. R.
Proc. Conf. Earth Station Technology, London, England
(London, England: IEE, 1970)
Oct. 1970, 43-47

Ray-Tracing Study of H.F. Ducting Propagation With Satellites
Wong, M. S.
Radio Science
Oct. 1966, Vol. 1, No. 10, 1214-1222

System Error Rate Measurement
Woolridge, A. R.
Conf. Trunk Telecommunications by Guided Waves, London
(London, England: IEE, 1970)
Sept. 1970, 244-249

Measurements of Atmospheric Attenuation on an Earth-Space Path at 90 GHz Using a Sun Tracker
Wrixon, G. T.
Bell System Technical Journal
Jan. 1971, Vol. 50, No. 1, 103-114

Average Period of Utilization of an Extremum Channel in a Multichannel System
Yelizev, V. F., A. N. Sharov, V. K. Prokhorov and G. G. Velikanov
Radio Engineering & Electronic Physics
June 1972, Vol. 17, No. 1, 56-59

Radio Spectrum from 10 Gc to 300 Gc in Aerospace Communications Volume V. Plasma Effects in Aerospace Communication
-
Report No. TR61 589 V5 (AD-282610)
Mar. 1962

FORM NBS-114A (1-71)

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. NBSIR 73-313	2. Gov't Accession No.	3. Recipient's Accession No.

4. TITLE AND SUBTITLE

COMMUNICATION CHANNEL SIMULATION AND PROPAGATION EFFECTS: 0.225 to 40.0 GHz
A BIBLIOGRAPHY

5. Publication Date: June 1973

6. Performing Organization Code

7. AUTHOR(S)
Anne Y. Rumfelt

8. Performing Organization

9. PERFORMING ORGANIZATION NAME AND ADDRESS

NATIONAL BUREAU OF STANDARDS , Boulder Labs.
DEPARTMENT OF COMMERCE
Boulder, Colo. 80302

10. Project/Task/Work Unit No.: 2728444

11. Contract/Grant No.: F33615-72-M-5014

12. Sponsoring Organization Name and Address

Department of the Air Force, Air Force Avonics Laboratory (AFSC), Wright-Patterson Air Force Base, Ohio 45433

13. Type of Report & Period Covered

14. Sponsoring Agency Code

15. SUPPLEMENTARY NOTES

16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)

This bibliography provides a literature search to locate as many propagation models as possible in the frequency range 0.225 to 40.0 GHz. There was reduced emphasis on high frequency, low frequency, and very low frequency models. The bibliography contains 534 references selected from a total of 3493 which were scanned in title and abstract. It is divided into three sections: communication channel simulation (105 citations); propagation effects (349 citations); and miscellaneous references (80 citations). The literature search covered the open literature from 1968 to 1972 and the reports literature from 1962 to 1972.

17. KEY WORDS (Alphabetical order, separated by semicolons)

Channel Simulation; Communications; Propagation Effects.

18. AVAILABILITY STATEMENT

[X] UNLIMITED.

[ ] FOR OFFICIAL DISTRIBUTION. DO NOT RELEASE TO NTIS.

19. SECURITY CLASS (THIS REPORT)	21. NO. OF PAGES
UNCLASSIFIED	
20. SECURITY CLASS (THIS PAGE)	22. Price
UNCLASSIFIED	

USCOMM-DC 66244-P71

USCOMM - ERL