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P. L. RICE, ET AL

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**TRANSMISSION LOSS PREDICTIONS FOR  
TROPOSPHERIC COMMUNICATION CIRCUITS**

VOLUME II

P. L. RICE, A. G. LONGLEY, K. A. NORTON,  
AND A. P. BARSIS



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**U. S. DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS**

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# NATIONAL BUREAU OF STANDARDS

## *Technical Note 101*

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### TRANSMISSION LOSS PREDICTIONS FOR TROPOSPHERIC COMMUNICATION CIRCUITS

#### VOLUME II

P. L. Rice, A. G. Longley, K. A. Norton, and A. P. Barsis  
Institute for Telecommunication Sciences and Aeronomy\*  
Environmental Science Services Administration  
Boulder, Colorado

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## FOREWORD

A short history of the development of the prediction methods in this Technical Note will permit the reader to compare them with earlier procedures. Some of these methods were first reported by Norton, Rice and Vogler [1955]. Further development of forward scatter predictions and a better understanding of the refractive index structure of the atmosphere led to changes reported in an early unpublished NBS report and in NBS Technical Note 15 [Rice, Longley and Norton, 1959]. The methods of Technical Note 15 served as a basis for part of another unpublished NBS report which was incorporated in Air Force Technical Order T. O. 31Z-10-1 in 1961. A preliminary draft of the current technical note was submitted as a U. S. Study Group V contribution to the CCIR in 1962.

Technical Note 101 uses the metric system throughout. For most computations both a graphical method and formulas suitable for a digital computer are presented. These include simple and comprehensive formulas for computing diffraction over smooth earth and over irregular terrain, as well as methods for estimating diffraction over an isolated rounded obstacle. New empirical graphs are included for estimating long-term variability for several climatic regions, based on data that have been made available.

For paths in a continental temperate climate, these predictions are practically the same as those published in 1961. The reader will find a number of graphs have been simplified and that many of the calculations are more readily adaptable to computer programming. The new material on time availability and service probability in several climatic regions should prove valuable for areas other than the U. S. A.

Changes in this revision concern mainly sections 2 and 10 of volume 1 and annexes I, II and V of volume 2, and certain changes in notation and symbols. The latter changes make the notation more consistent with statistical practice.

Section 10, Long-Term Power Fading contains additional material on the effects of atmospheric stratification.

For convenience in using volume 2, those symbols which are found only in an annex are listed and explained at the end of the appropriate annex. Section 12 of volume 1 lists and explains only those symbols used in volume 1.

Note: This Technical Note consists of two volumes as indicated in the Table of Contents.

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