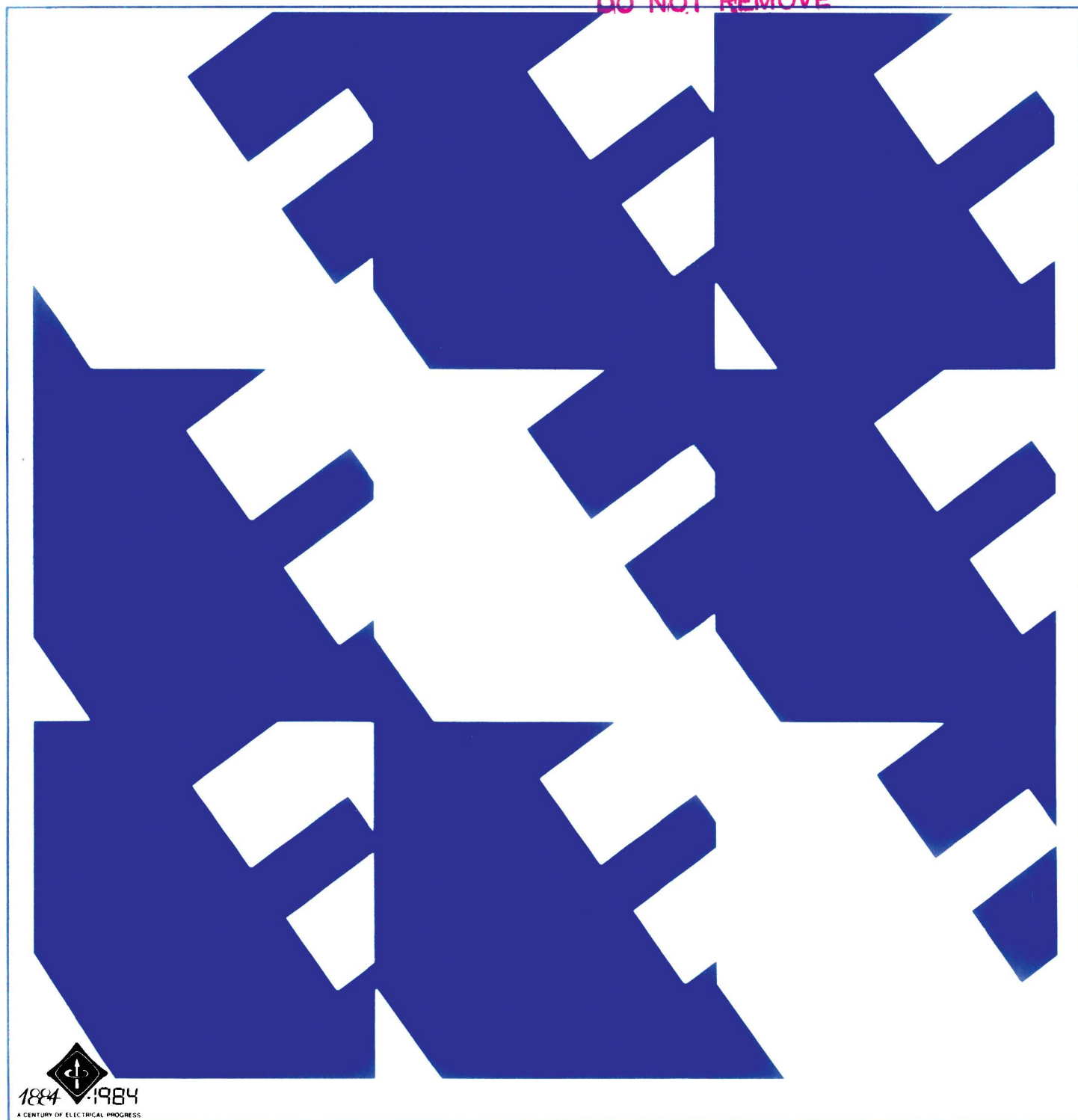


IEEE Standard Method for Measuring Transmission Performance of Telephone Sets

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December 7, 1983



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IEEE Standard Method for Measuring Transmission Performance of Telephone Sets

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**Transmission Systems Committee of the
IEEE Communications Society**

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Foreword

(This Foreword is not a part of IEEE Std 269-1983, IEEE Standard Method for Measuring Transmission Performance of Telephone Sets.)

This IEEE Standard Method for Measuring Transmission Performance of Telephone Sets has been prepared in response to a widely expressed need by the telecommunications industry for a standard, comprehensive method for testing the transmission performance of telephone sets. The present standard is a revision of IEEE Std 269-1971 prepared by the task force on Telephone Instrument Testing of the Wire Communication Committee of the IEEE Communication Technology Group.

This revision incorporates changes considered to be necessary as a result of several years of experience in using the standard. Individuals from a broad segment of private and government design, manufacturing, and research organizations have given freely of their time in preparing, testing, and reviewing this standard.

The IEEE will maintain this standard current with the state of the technology. Comments on this standard and suggestions for the additional material that should be included are invited. Comments should be addressed to:

Secretary

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This revision, begun in 1976, was prepared by the subcommittee (formerly task force) on Telephone Instrument Testing of the Transmission Systems (formerly Wire Communication) Committee of the IEEE Communication Society (formerly the IEEE Communication Technology Group).

At the time this standard was approved the members of the subcommittee were as follows:

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Contents

SECTION	PAGE
1. Introduction	7
2. Scope and Purpose	7
3. References	8
4. Definitions	8
5. Test Equipment	11
5.1 General	11
5.2 Artificial Mouth	11
5.3 Standard Circuits.	11
5.4 Artificial Ear	16
5.5 Standard Microphone	16
5.6 Microphone Amplifier.	17
5.7 Variable Frequency Generator	17
5.8 Level Recorder	17
5.9 Harmonic Analyzer	17
5.10 Distortion Analyzer.	17
5.11 Impedance Bridge	17
5.12 DC Milliammeter.	17
5.13 DC Voltmeter	18
5.14 AC Voltmeter	18
5.15 Noise Meter.	18
5.16 Sound-Attenuating Cover for the Handset Transmitter.	18
5.17 Sound-Attenuating Cover for the Handset Receiver	18
6. Test Procedure	18
6.1 General	18
6.2 Transmitting	18
6.3 Receiving.	21
6.4 Sidetone	22
6.5 Overall Transmission	22
6.6 Telephone-Set Impedance	22
6.7 Telephone-Set Resistance	23
FIGURES	
Fig 1 Modal Position Recommended by the CCITT for AEN Measurements	9
Fig 2 Calibration Position of Microphone in Sound Field of Artificial Mouth	11
Fig 3 Simulated Partial and Overall Telephone Transmission Test Circuits.	12
Fig 4 Feed Circuits.	13
Fig 5 Test Circuits for Measuring Transmitting Characteristics.	13
Fig 6 Test Circuits for Measuring Receiving Characteristics	14
Fig 7 Circuit for Measuring Telephone-Set Transmitting Noise.	15
Fig 8 Circuit for Measuring Carbon Transmitter Resistance	15
Fig 9 Circuit for Measuring Telephone-Set Impedance	16
Fig 10 Circuit for Measuring Telephone-Set Resistance	16
TABLE	
Table 1 Artificial-Mouth Sound Field Characteristics.	11

IEEE Standard Method for Measuring Transmission Performance of Telephone Sets

1. Introduction

The methods that are used to measure telephone-set transmission performance may be divided into two classes: objective methods and subjective methods. The objective methods, which are those discussed in this standard, utilize a sound source resembling the human mouth to drive the transmitter, and an acoustic coupler resembling the human ear as a termination for the receiver. The sound source comprises a source of electrical energy and a moving-coil loudspeaker unit having supplementary electrical and acoustical components which produce a sound field simulating that of a typical human voice. This special loudspeaker is referred to as an *artificial mouth*. The acoustic coupler comprises a microphone and a terminating air volume having supplementary acoustic components which produce a load on the receiver simulating that of a typical human ear. This coupler is referred to as an *artificial ear*. The artificial mouth and ear are useful in comparing the performance of telephone sets at frequencies in the significant portion of the speech range.

The subjective measurements which are particularly applicable for rating overall communication connections include real-voice and real-ear calibrations. This type of calibration is based on the ratio of the sensations of loudness and clarity, perceived when a real ear is in the sound field produced by a real voice, to those perceived when a telephone connection intervenes between the real voice and real ear. Other subjective methods include articulation tests, repetition counts, and judgment tests.

The disadvantages of subjective methods are that they involve human subjects and necessitate a large number of tests for the results to have significance.

When agreements, on the basis of subjective methods, are reached as to the desirability of particular performance characteristics for a given type of telephone connection, the control of the characteristics can be maintained by purely objective methods using the artificial mouth and ear.

The relationships which are established between subjective and objective measurements will vary with the physical constants of the telephone design, such as size and shape of the handset. Therefore, correlation between subjective and objective measurements should be established separately for each telephone-set design before measurements obtained using the techniques covered herein can be interpreted to reflect performance under conditions of actual use.

2. Scope and Purpose

2.1 The purpose of this standard is to describe a practical method for measuring the transmission characteristics of a telephone set by means of objective measurements on a test connection. The test results thus obtained may be used as a means of evaluating or specifying the transmission performance of a telephone set on a standardized basis.

The basic accuracy and reproducibility of measurements made in accordance with this

standard will depend primarily upon the accuracy of the test equipment used, the care with which the measurements are conducted, and the inherent stability of the telephone set or transducers under test, or both.

Where a given set of measurements is repeated in the same laboratory and by the same operator, a relatively high degree of reproducibility should normally be obtained.

However, when comparing measurements made by different laboratories, allowances should be made for the influencing factors mentioned above.

NOTE: An experimental test program based upon this standard indicated that differences of as much as 6 dB could occur in transmitting and overall measurements and as much as 3 dB in receiving measurements. In most cases, however, these differences can be significantly reduced by means of special correlation studies between the participating laboratories.

2.2 The method requires a suitable artificial mouth. It also specifies a standard artificial ear, standard circuits comprising dc power feed and connecting loops, and a standard microphone.

2.3 This standard is intended for use in measuring the transmission characteristic over the frequency range most useful for speech, 200 Hz to 5000 Hz. It is to be used for single-frequency measurements and for measurements with varying frequencies such as continuous slow sweeps or equivalent (for example, closely spaced discrete step).

2.4 This standard is intended for measuring the transmission performance of conventional telephone sets equipped with handsets using carbon transmitters and used with 2-wire circuits. Methods of this standard are also generally applicable for telephone sets incorporating noncarbon transmitters. It is not intended to be applicable to special devices such as noise-exclusion transmitters, distant-talking transmitters, insert-type receivers, or noise-exclusion receivers equipped with large ear pads.

2.5 This standard uses a standard microphone to measure the sound field produced by the artificial mouth and to measure the pressure developed in the artificial ear.

2.6 Drawings and test procedures as well as other pertinent information are included as an aid in setting up the tests.

3. References

- [1] ANSI S1.1-1960 (R1976), American National Standard Acoustical Terminology (Including Mechanical Shock and Vibration).¹
- [2] ANSI S1.10-1966 (R1976), American National Standard Method for the Calibration of Microphones.
- [3] ANSI S1.12-1967 (R1977), American National Standard Specifications for Laboratory Standard Microphones.
- [4] ANSI S3.7-1973, American National Standard Method for Coupler Calibration of Earphones.
- [5] ANSI/IEEE Std 661-1979, IEEE Standard Method for Determining Objective Loudness Ratings of Telephone Connections.
- [6] ANSI/IEEE Std 100-1977, IEEE Standard Dictionary of Electrical and Electronics Terms.
- [7] CCITT PB82-187642-1980, Telephone Transmission Quality, vol 5.²
- [8] COCHRAN, W. T. and LEWINSKI, D. A. *A New Measuring Set for Message Circuit Noise*. Bell System Technical Journal, July, 1960.

4. Definitions

These definitions apply specifically to measurements of the transmission performance of telephone sets, and may not be applicable to other disciplines. For definitions not covered, see ANSI/IEEE Std 100-1977 [6]³ and ANSI S1.1-1960 (R1976) [2].

acoustic input. The free field sound pressure level developed by an artificial mouth at a specified location, called the calibration position (see 5.2.1), measured in decibels referred to an rms sound pressure of 1 Pa.⁴

¹ ANSI publications are available from Sales Department, American National Standards Institute, 1430 Broadway, New York, NY 10018.

² CCITT publications are available in the US from National Technical Information Service, Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161.

³ The numbers in brackets correspond to those of the references listed in Section 3.

⁴ The Pascal (Pa) is a unit of pressure equal to 1 N/m². 0 dB (ref 1 Pa) is 94 dB above the other commonly used reference pressure of 20 μ Pa. (20 μ Pa equals $2 \cdot 10^{-5}$ N/m²).