

IEEE Standard Methods for Measuring Transmission Performance of Telephone Handsets and Headsets

Sponsor

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

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IEEE Standards Board

Abstract: Practical methods for measuring the transmission characteristics of a telephone handset or headset by means of using a test connection to obtain objective measurements are provided. The obtained test results may be used as a means of evaluating or specifying the transmission performance of a handset or headset on a standardized basis.

Keywords: telephone handset, telephone headset, transmission performance

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Introduction

(This introduction is not a part of IEEE Std 1206-1994, IEEE Standard Methods for Measuring Transmission Performance of Telephone Handsets and Headsets.)

This standard has been developed in response to a widely expressed need by the telecommunications industry for a standard, comprehensive method for testing the transmission performance of telephone handsets and headsets.

The testing of handsets and headsets using a continuous spectrum excitation signal in addition to a sinusoidal signal is introduced in this standard. Changes have been made in the calibration procedure from past issues. These changes must be considered when comparing results. To bring this standard into agreement with the International Telecommunication Union (ITU)* test position, the use of the loudness rating guarding position (LRGP) is being recommended in addition to the AEN position (AEN stands for *Affaiblissement Equivalent pour la Netteté* or equivalent articulation loss).

The IEEE will maintain this standard current with the state of the technology. Comments on this standard and suggestions for any additional material that should be included are invited (see p. ii).

This new standard, begun in 1986, was prepared by the Subcommittee on Telephone Instrument Testing of the Transmission Systems Committee of the IEEE Communications Society.† At the time this standard was approved, the members of the subcommittee were as follows:

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*The ITU was formerly the International Telegraph and Telephone Consultative Committee (CCITT).

†The IEEE Communications Society was formerly the IEEE Communication Technology Group.

The final conditions for approval of this standard were met on March 23, 1994. This standard was conditionally approved by the IEEE Standards Board on March 17, 1994, with the following membership:

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1. Overview

This standard extends the telephone set transmission measurement methodology of IEEE Std 269-1992¹ to handsets and headsets. It also draws heavily on ITUT Recommendation P.51: 1993 and ITUT Recommendation P.57: 1993 for definition of suitable artificial mouths and artificial ears. Handsets and headsets are telecommunication devices having electroacoustic transducers for converting sound energy into electrical energy (transmitters) and electrical energy into sound energy (receivers). They may also contain amplifiers and other circuitry, but are distinguished from conventional telephones in that they maintain separate speech paths for the transmitted and received signals.

Headsets differ from handsets in that they are hands-free devices typically worn on the head of the user. While handsets have fixed physical relationships between the transmitter and receiver sound ports, headsets generally allow the user to adjust the location of the transmitter sound port relative to that of the receiver. And while handsets usually have supra-aural (on-ear) receivers, headsets use a variety of techniques for coupling the sound energy from the receiver to the ear.

The methods used to measure handset and headset transmission performance may be divided into two classes: objective methods and subjective methods. The objective methods, discussed in this standard, utilize a sound source with acoustic characteristics resembling those of the human mouth to drive the transmitter, and a coupler with acoustic characteristics resembling those of the human ear as a termination for the receiver.

The sound source comprises a source of electrical energy and a loudspeaker unit having supplementary electrical and acoustical components that 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 that 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 artificial ear are useful in comparing the performance of handsets and headsets at frequencies in the significant portion of the speech range.

The subjective measurements particularly applicable for rating overall communication connections include real-voice and real-ear calibrations. These types of calibrations are based on the ratio of the sensations of

¹Information on references can be found in clause 2.

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 handset or headset, the control of the characteristics can be maintained by purely objective methods using the artificial mouth and ear.

The relationships established between subjective and objective measurements vary with the physical constants of the handset or headset design (such as size and shape) and the sound leakage between the receiver and the user's ear. Therefore, correlation between subjective and objective measurements should be established separately for each handset or headset design before measurements obtained using the techniques covered in this standard can be interpreted to reflect performance under conditions of actual use.

1.1 Scope

This standard covers handsets and headsets whose receive performance can be measured using standardized artificial ears, as defined in ITUT Recommendation P.57: 1993 and ANSI S3.36-1985. The standard also covers handsets and headsets whose transmit performance can be measured with the center of the transmitter sound port in front of the artificial mouth lip plane.

Other types of handsets or headsets, having transmitters whose sound ports fall behind the lip plane in normal use, are not covered by this standard. However, the general methods described in this standard may be used as guidelines for testing such handsets or headsets.

This standard covers measurements on four-wire handsets and headsets having separate transmit and receive speech paths. This standard also applies to three-wire handsets and headsets in which a common lead is shared between the transmit and receive circuitry. When handsets and headsets are connected to hybrid speech networks performing four-wire to two-wire conversion, their transmission performance may be measured using the methods of IEEE Std 269-1992, with due consideration given to the relevant transmitter positioning and receiver coupling issues discussed in this standard.

1.2 Purpose

This standard describes practical methods for measuring the transmission characteristics of a telephone handset or headset by means of using a test connection to obtain objective measurements. Although the various methods generally produce similar results, some deviations can be expected depending on handset or headset characteristics. Measurement conditions should be noted when reporting results. The obtained test results may be used as a means of evaluating or specifying the transmission performance of a handset or headset on a standardized basis.

This standard is intended for measuring the transmission performance over the frequency range most useful for speech, 100–5000 Hz. It is to be used for both single-frequency and varying-frequency measurements (such as continuous slow sweeps or equivalent, e.g., closely-spaced discrete steps). Continuous spectrum signals with one- or two-channel spectrum analysis methods, to the extent that they are equivalent to or better than the methods described herein, may also be used. These two types of signals (sinusoidal and continuous spectrum) give essentially identical results for devices measured in the linear region of their operation, when the measurement is sufficiently noise-free. For nonlinear devices, however, the continuous spectrum is preferable. Nonlinear devices include carbon microphones, compressors, automatic gain control (AGC) circuits, etc. For guidance in using continuous spectrum signals, see IEEE Std 269-1992.