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ITU-T P.380

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SERIES P: TELEPHONE TRANSMISSION QUALITY, TELEPHONE INSTALLATIONS, LOCAL LINE NETWORKS

Subscribers' lines and sets

Electro-acoustic measurements on headsets

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ITU-T Recommendation P.380

Electro-acoustic measurements on headsets

Summary

This Recommendation provides testing methods for headsets using the head and torso simulator. The Recommendation addresses the following topics: selection of artificial ears, classification of headsets, positioning of headsets on HATS, test repeatability and contents of the measurement report.

Source

ITU-T Recommendation P.380 was approved by ITU-T Study Group 12 (2001-2004) under the ITU-T Recommendation A.8 procedure on 13 November 2003.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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Electro-acoustic measurements on headsets

1 Scope

This Recommendation is the result of a study held within ITU-T for defining the electro-acoustic testing methodologies for headsets, which provide the best correlation with the performance of headsets in real use, when using the couplers currently recommended in ITU-T Rec. P.57.

The results of this Round Robin test, aiming to compare the acoustic behaviour of headsets placed on humans and on HATS, can be found in the bibliography.

The recommended test methodology is based on the use of HATS, as this is the best approximation of acoustical conditions occurring in the real use of headsets.

This Recommendation focuses specifically on headsets and overrules ITU-T Rec. P.57 regarding the applicability rules of artificial ears to specific receivers, as long as these devices belong to headsets.

This Recommendation is complementary to the relevant ITU-T Recs P.64, P.79, etc., which specify the electro-acoustic and telephonometric testing methods applicable to telephone devices.

The recommendation of performance descriptors, such as masks or limit values, is left to the relevant performance standards.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[1] ITU-T Recommendation P.57 (2002), *Artificial ears*.

[2] ITU-T Recommendation P.58 (1996), *Head and torso simulator for telephonometry*.

[3] ITU-T Recommendation P.64 (1999), *Determination of sensitivity/frequency characteristics of local telephone systems*.

[4] ITU-T Recommendation P.79 (1999), *Calculation of loudness ratings for telephone sets*.

3 Definitions and abbreviations

This Recommendation defines the following terms:

3.1 recommended wearing position (RWP): corresponds to the position in which a headset should be placed on humans according to the intended use (e.g., as instructed by the manufacturer in the user manual etc.).

3.2 recommended test position (RTP): corresponds to the position in which the headset should be placed on HATS, e.g, as instructed by the manufacturer. In all cases the RTP should resemble the RWP on humans.

3.3 **headset**: Apparatus for telephony comprising essentially a "hands-free" handset which is typically secured to the head of the wearer. It includes a telephone microphone and a telephone receiver.

3.4 **CL**: Centre of lips of head and torso simulator.

4 Types of headsets

This Recommendation covers the headsets equipped with receivers and microphones as defined below.

4.1 Receiver

With reference to the definitions provided in ITU-T Rec. P.57 [1], the following receiver types are covered:

– Insert-type;
– Intra-concha;
– Supra-concha;
– Supra-aural.

4.2 Microphone

This Recommendation covers headsets equipped with microphones positioned as follows:

– In front of and around the mouth (e.g., long booms);
– At the cheek (e.g., short booms);
– At the ear;
– At the neck (e.g., hanging down or collar clip);
– At the chest (e.g., hanging down or clip).

5 Artificial ear selection

Insert-type headsets:	Type 3.3 and 3.4 artificial ears are recommended.[1]
Intra-concha headsets:	Type 3.3 artificial ear is recommended For intra-concha headsets where the receivers acoustic outlet face towards the ear canal Type 3.4 artificial ear is recommended as well.
Supra-concha headsets:	Type 3.3 artificial ear is recommended
Supra-aural headsets:	Type 3.3 artificial ear is recommended

6 Positioning and measurement of the headset

6.1 Measurements

The positioning methodology provided in this Recommendation has been validated [B-1, B-2], and shall be used, for measuring the frequency response and loudness ratings [4] for both receive and send directions.

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[1] It should be noted that, in some cases, the use of Type 3.3 or 3.4 ear simulator with an insert headset could provide a seal greater than that occurring on humans, leading to an overestimation of the level of the frequency response curve in the low frequency region (below 1 kHz). This is especially true for headsets relying on a close sealing with the ear canal.

This positioning of the headset on the HATS is, however, also recommended for performing measurements related to other electro-acoustic parameters such as STMR, D-factor, distortion, etc.

Furthermore, special conditions apply to headsets in some respects.

Some headsets are binaural devices. In case the required RLR is only specified for a monaural device, the corresponding required RLR for a binaural device should be 6 dB higher (for each of the receivers measured separately). In a similar way, other receive related requirements should be adapted for binaural devices.

6.2 Positioning

For a given headset, one single position shall be defined to test all the electro-acoustic parameters on a given HATS.

The reasons for this provision are the following:

– This is close to what happens in real life, so this procedure is consistent with the basic goal of the Recommendation; e.g., resembling the real-use conditions.

– It is simple.

– It allows for sidetone (and other related) measurements to be performed.

The positioning of the headset shall reflect the way it is intended by the manufacturer to be used in a real situation.

For this reason, the manufacturer should provide in the user's guide a recommended wearing position describing in a precise way how the device should be placed on the user's head.

From this RWP, the recommended test position shall be derived, as close as possible to the RWP.

Also the RTP description should hopefully be provided by the manufacturer and shall state in which way the receiving part of the headset shall be placed against or inside the ear simulator, and also describe the positioning of the microphone, once the receiver(s) of the headset have been placed on the ear simulator.

The exact positioning of the microphone shall be specified by using geometric coordinates relative to centre of lips.

NOTE – A good laboratory practice may refer to ITU-T Rec. P.64, which defines "a set of Cartesian axes with origin at CL, the centre of lips", and further defines the axes as follows:

– x-axis: horizontal axis of the mouth, with positive direction into the mouth;

– y-axis: horizontal, perpendicular to the x-axis, with positive direction towards the side of the mouth on which the handset is held;

– z-axis: vertical, with positive direction upwards.

The way in which the coordinates are defined and checked is left to the choice of the manufacturer, or of the test lab in case the RTP is not defined by the manufacturer, but it should be noticed that the closer the microphone is to the mouth, the more sensitive the results will be to any inaccuracy of the geometrical positioning.

As an essential complementary information, the manufacturer shall state what is the recommended orientation of the microphone towards the mouth.

In the case where no RWP information is available for the headset under test, then a suitable RWP and the derived RTP shall be defined by the testing lab, aiming at best-guessing the expected real-use position. All the relevant parameters of these assumed positions shall be reported together with measurement results.

7 Test repeatability

Due to the sensitivity of the test results to the headset positioning, the tests shall be repeated at least 5 times by completely repositioning the headset, following the rules described in this Recommendation.

The test report shall individually provide the test results for each repetition, plus any additional statistic analysis as required.

NOTE 1 – It is recommended that the test operators get acquainted with the specific headset characteristics by running some preliminary learning test sessions.

NOTE 2 – The use of positioning jigs can improve the test repeatability so that no repetition is required. This generally applies to all tests from test repetitions carried out by a single operator to tests carried out at different laboratories. However, the jig must be customized or adjusted for the particular type of headset under test, fully respecting the positioning principles outlined for the RTP. The purpose of the jig is to reduce the variability of test results, especially for microphones, without changing the mean of the test results. So care must be taken to validate the designed jig for its intended use, and it should be verified that the jig does not introduce a bias to the results (i.e, the jig should be verified by comparing the mean of results obtained with and without the jig).

8 Measurement report

The following information shall be reported additionally to the generally requested information:

– Precise description of the positioning of the headset used for the tests, along with pictures when relevant.

– The number of measurements taken into account in the calculation of the statistic parameters.

9 Bibliography

[B-1] ITU-T Contribution COM 12-C 54-E (May 2003), *Conclusions of the Round Robin Test on headsets: Receiving Side, http://www.itu.int/md/meetingdoc.asp?type=sitems&lang=e&parent=T01-SG12-C-0054*

[B-2] ITU-T Contribution COM 12-C 47-E (November 2002), *Rapporteur Report. Workshop on Headsets/Sending Part, http://www.itu.int/md/meetingdoc.asp?type=sitems&lang=e&parent=T01-SG12-C-0047*

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