INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

P.10

Amendment 1
(11/2003)

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

Vocabulary and effects of transmission parameters on customer opinion of transmission quality

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Vocabulary of terms on telephone transmission quality and telephone sets

Amendment 1: New Annex A – List of psychoacoustic parameters

ITU-T Recommendation P.10 (1998) – Amendment 1

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TELEPHONE TRANSMISSION QUALITY, TELEPHONE INSTALLATIONS, LOCAL LINE NETWORKS

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ITU-T Recommendation P.10

Vocabulary of terms on telephone transmission quality and telephone sets

Amendment 1

New Annex A – List of psychoacoustic parameters

Summary

Psychoacoustic terms are used increasingly in telecommunications. In order to provide guidance for the use and interpretation of such psychoacoustic parameters, Annex A to ITU-T Rec. P.10 was created. This annex contains a list of psychoacoustic parameters and their definitions to be used in telecommunications.

Source

Amendment 1 to ITU-T Recommendation P.10 (1998) 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.

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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.

CONTENTS

Introduction

Psychoacoustic terms are used increasingly also in telecommunications. In order to achieve a common understanding of the meaning of the different terms, a list of definitions is provided which unambiguously describes their meaning. For psychoacoustic terms which have a different meaning in telecommunications, the telecommunication-specific definition is given.

ITU-T Recommendation P.10

Vocabulary of terms on telephone transmission quality and telephone sets

Amendment 1

Add a new Annex A as follows:

Annex A

List of psychoacoustic parameters

A.1 Loudness

Definition generally used in psychoacoustics

Loudness belongs to a category of intensity sensations. Loudness is that attribute of auditory sensation in terms of which sounds can be ordered on a scale extending from quiet to loud. Loudness takes into account the spectral and temporal sensitivity of the human ear. Generally, masking effects in time and frequency are taken into account. The loudness level measure according to Zwicker [A-1] was created to characterize the loudness sensation of tones. The loudness calculation procedure for stationary signals is defined in [A-2]. For the calculation of the loudness of time variant signal, different models are known.

Specific definition used in telecommunications

In telecommunications, the generally accepted loudness measurement methodology is defined as Loudness Ratings in ITU-T Rec. P.79. The ITU-T Loudness Ratings calculations do not take into account the masking effects.

A.2 Pitch

Definition generally used in psychoacoustics

Pitch is an attribute of an auditory image that reflects listeners' impression on the location of the dominant spectral component along the frequency scale. In the case of complex harmonic tones, the pitch corresponds to a frequency close to the frequency difference between the harmonic components, i.e., the fundamental frequency.

A.3 Timbre (sound colour)

Definition generally used in psychoacoustics

Timbre is that attribute of auditory sensation in terms of which a listener can judge two sounds similary presented and having the same loudness and pitch and duration are dissimilar. Timbre depends primarily on the spectrum of the stimulus but also depends on the waveform, the sound pressure, the frequency location of the spectrum and the temporal characteristics of the stimulus.

A.4 Fluctuation strength

Definition generally used in psychoacoustics

The amplitude or frequency modulation of tones leads to different hearing events. If the envelope fluctuation is below 20 Hz, the characterization for such a sound is fluctuation strength. The human ear is able to follow the fluctuation of the signal.

A.5 Roughness

Definition generally used in psychoacoustics

The amplitude or frequency modulation of tones leads to different hearing events. A sound is perceived as rough if the envelope fluctuation is within the frequency range from 20 Hz to 300 Hz. The roughness perceived depends on the modulation frequency and the modulation depth.

A.6 Sharpness (also used: thinness)

Definition generally used in psychoacoustics

Sharpness is the centre of gravity of the spectrum and gives information on the balance between high and low frequency energy in the sound. The more the centre of gravity (of the spectral envelope) is moved to higher frequencies, the sharper is the sound perceived.

A.7 Tonality

Definition generally used in psychoacoustics

Tonality is the logarithm of the ratio between the arithmetical and geometrical means of the spectrum and gives information on the presence of high peaks in the spectrum.

A.8 Spaciousness

Definition generally used in psychoacoustics

Spaciousness is a multidimensional perception of the auditory image that reflects a listener's impression of the location of a sound source and of the characteristics of the space in which the sound event exists. While the perception of loudness, pitch, duration and timbre is restricted to monotic hearing, the perception of spaciousness typically arises from dichotic stimulation.

A.9 RML: Ratio Medium/Low

Definition generally used in psychoacoustics

None

Specific definition used in telecommunications

RML is the ratio of the energy in the 2/3-octave band, 1.5-kHz centred frequency, to the energy in the 2/3-octave band, 0.5-kHz centred frequency. This descriptor was defined by systematic analysis of long-term spectra of speech recordings.

A.10 Articulation index

Definition generally used in psychoacoustics

A measure of the intelligibility of voice signals, expressed as a percentage of speech units that are understood by the listener, when heard out of context. The articulation index is based on partially empiric, partially theoretic principles to predict the speech intelligibility under known signal-to-noise conditions.

Bibliography

[A-1] ZWICKER E., FASTL H. (1991), *Psychoacoustics – facts and models*, ISBN 3-540-52600-5

[A-2] ISO 532:1975, *Acoustics – Method for calculating loudness level*.

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