ETSI TS 126 132 V8.0.0 (2009-01)

Technical Specification

Universal Mobile Telecommunications System (UMTS);
LTE;
Speech and video telephony terminal acoustic test specification
(3GPP TS 26.132 version 8.0.0 Release 8)

Reference
RTS/TSGS-0426132v800

Keywords
LTE, UMTS

ETSI

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Sous-Préfecture de Grasse (06) N° 7803/88

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Foreword

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Contents

Foreword

This Technical Specification has been produced by the 3GPP.

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z the third digit is incremented when editorial only changes have been incorporated in the specification.

Introduction

The present document specifies test methods to allow the minimum performance requirements for the acoustic characteristics of GSM and 3G terminals when used to provide narrow-band or wideband telephony to be assessed.

The objective for narrow-band services is to reach a quality as close as possible to ITU-T standards for PSTN circuits. However, due to technical and economic factors, there cannot be full compliance with the general characteristics of international telephone connections and circuits recommended by the ITU-T.

The performance requirements are specified in TS 26.131; the test methods and considerations are specified in the main body of the text.

1 Scope

The present document is applicable to any terminal capable of supporting narrow-band or wideband telephony, either as a stand-alone service or as the telephony component of a multimedia service. The present document specifies test methods to allow the minimum performance requirements for the acoustic characteristics of GSM and 3G terminals when used to provide narrow-band or wideband telephony to be assessed.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 26.131: "Terminal Acoustic Characteristics for Telephony; Requirements".

[2] ITU-T Recommendation B.12 (1988): "Use of the decibel and the neper in telecommunications".

[3] ITU-T Recommendation G.103 (1998): "Hypothetical reference connections".

[4] ITU-T Recommendation G.111 (1993): "Loudness ratings (LRs) in an international connection".

[5] ITU-T Recommendation G.121 (1993): "Loudness ratings (LRs) of national systems".

[6] ITU-T Recommendation G.122 (1993): "Influence of national systems on stability, talker echo, and listener echo in international connections".

[7] ITU-T Recommendation G.711 1988): "Pulse code modulation (PCM) of voice frequencies".

[8] ITU-T Recommendation P.11 (1993): "Effect of transmission impairments".

[9] ITU-T Recommendation P.38 (1993): "Transmission characteristics of operator telephone systems (OTS)".

[10] ITU-T Recommendation P.50 (1993): "Artificial voices".

[11] 3GPP TS 03.58 (Release 1997): "Digital Cellular Telecommunications System (Phase 2+) Characterization test methods and quality assessment for hands-free mobiles".

[12] IEC Publication 60651: 'Sound Level Meters'.

[13] ITU-T Recommendation P.51 (1996): "Artificial mouth".

[14] ITU-T Recommendation P.57 (2005): "Artificial ears".

[15] ITU-T Recommendation P.58 (1996): "Head and torso simulator for telephonometry."

[16] ITU-T Recommendation P.79 (2007) with Annex A: "Calculation of loudness ratings for telephone sets."

[17] 3GPP TS 06.77 R99 Minimum Performance Requirements for Noise Suppresser Application to the AMR Speech Encoder.

[18] ITU-T Recommendation P.64: "Determination of sensitivity/frequency characteristics of local telephone systems".

[19] ITU-T Recommendation P.581: "Use of head and torso simulator (HATS) for hands-free terminal testing".

[20] ITU-T Recommendation P.340: "Transmission characteristics of hands-free telepones".

[21] ITU-T Recommendation G.712: "Transmission performance characteristics of pulse code modulation channels".

[22] ITU-T Recommendation P.501: "Test signals for use in telephonometry".

[23] ITU-T Recommendation O.41: "Psophometer for use on telephone-type circuits".

[24] ITU-T Recommendation O.131: "Psophometer for use on telephone-type circuits".

[25] ISO 9614: "Acoustics - Determination of sound power levels of noise sources using sound intensity".

[26] ISO 3745: "Acoustics - Determination of sound power levels of noise sources - Precision methods for anechoic and semi-anechoic rooms".

[27] ITU-T Recommendation O.132: "Quantizing distortion measuring equipment using a sinusoidal test signal".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document the term *narrow-band* refers to signals sampled at 8 kHz; *wideband* refers to signals sampled at 16 kHz.

For the purposes of the present document, the following terms: dB, dBr, dBm0, dBm0p and dBA, shall be interpreted as defined in ITU-T Recommendation B.12; the term dBPa shall be interpreted as the sound pressure level relative to 1 pascal expressed in dB (0 dBPa is equivalent to 94 dB SPL).

A 3GPP softphone is a telephony system running on a general purpose computer or PDA complying with the 3GPP terminal acoustic requirements (TS 26.131 and 26.132).

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ADC	Analogue to Digital Converter
DAC	Digital to Analogue Converter
DTX	Discontinuous Transmission
EEC	Electrical Echo Control
EL	Echo Loss
ERP	Ear Reference Point
HATS	Head and Torso Simulator
LSTR	Listener Sidetone Rating
LRGP	Loudness Rating Guardring Position
MRP	Mouth Reference Point
OLR	Overall Loudness Rating
PCM	Pulse Code Modulation
PDA	Personal Digital Assistant
POI	Point of Interconnection (with PSTN)
PSTN	Public Switched Telephone Network
RLR	Receive Loudness Rating

SLR	Send Loudness Rating
STMR	Sidetone Masking Rating
SS	System Simulator
TX	Transmission
UE	User Equipment

4 Interfaces

Access to terminals for acoustic testing is always made via the acoustic or air interfaces. The Air Interface is specified by the GSM 05 or 45 and the 3G 25 series specifications and is required to achieve user equipment (UE) transportability. Measurements can be made at this point using a system simulator (SS) comprising the appropriate radio terminal equipment and speech transcoder. The losses and gains introduced by the test speech transcoder will need to be specified.

The POI with the public switched telephone network (PSTN) is considered to have a relative level of 0 dBr, where signals will be represented by 8-bit A-law, according to ITU-T Recommendation G.711. Measurements may be made at this point using a standard send and receive side, as defined in ITU-T Recommendations.

Five classes of acoustic interface are considered in this specification:

- Handset UE including softphone UE used as a handset;
- Headset UE including softphone UE used with headset;
- Vehicle Mounted Hands-free UE including softphone UE mounted in a vehicule;
- Desktop-mounted hands-free UE including softphone UE with external loudspeaker(s) used in handsfree mode;
- Handheld hands-free UE including softphone UE with internal loudspeaker(s) used in handsfree mode.

(See definition of softphone in Clause 3.1)

NOTE: The test setup for a softphone UE shall be derived according to the following rules:

- When using a softphone UE as a handset: the test setup shall correspond to handset mode.
- When using a softphone UE with headset: the test setup shall correspond to headset mode.
- When a softphone UE is mounted in a vehicle: the test setup shall correspond to Vehicle-mounted handsfree mode.
- When using a softphone UE in handsfree mode:
  - When using internal loudspeaker(s), the test setup shall correspond to handheld hands-free.
  - When using external loudspeaker(s), the test setup shall correspond to desktop-mounted hands-free.

5 Test configurations

This section describes the test setups for terminal acoustic testing.

NOTE: If the terminal has several mechanical configurations (e.g. sliding design open or closed), all manufacturer-defined configurations shall be tested.

5.1 Setup for terminals

The general access to terminals is described in Figure 1. The preferred acoustic access to GSM and 3G terminals is the most realistic simulation of the 'average' subscriber. This can be made by using HATS (head and torso simulator) or LRGP (Loudness Rating Guardring Position), with appropriate ear simulation and appropriate mountings for handset terminals in a realistic but reproducible, way to the HATS / LRGP. . Hands-free terminals shall use the HATS or free

field microphone techniques in a realistic but reproducible way. Headset measurement methods are for further study, awaiting input from ETSI TC-STQ.

HATS is described in ITU-T Recommendation P.58, appropriate ears are described in ITU-T Recommendation P.57 (type 3.3 and type 3.4 ear), a proper positioning of handsets in realistic conditions is found in ITU-T Recommendation P.64 , the test setups for various types of hands-free terminals can be found in ITU-T Recommendation P.581.

LRGP is described in ITU-T Recommendation P.64, appropriate ears are described in ITU-T Recommendation P.57 (type 3.2).

The preferred way of testing is the connection of a terminal to the system simulator with exact defined settings and access points. The test sequences are fed in either, electrically using a reference codec or using the direct signal processing approach or acoustically using ITU-T specified devices.

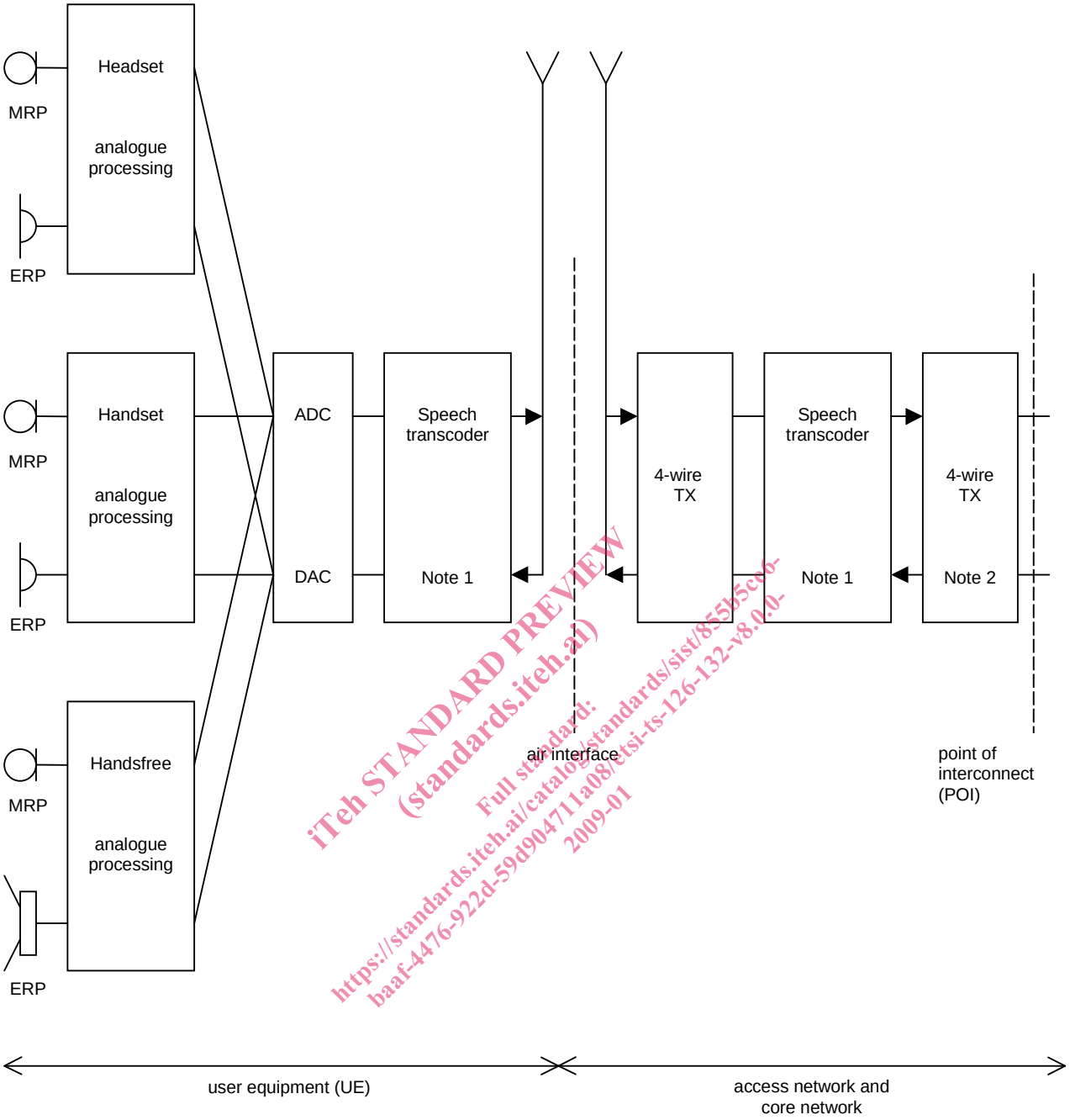
5.1.1 Setup for handset terminals

HATS Method : When using a handset telephone the handset is placed in the HATS position as described in ITU-T Recommendation P.64 . The artificial mouth shall conform with P.58 when HATS is used. The artificial ear shall conform with Rec. P.57, type 3.3 or type 3.4 ears shall be used.

LRGP Method : When using a handset telephone the handset is placed in the LRGP position as described in ITU-T Recommendation P.64 . The artificial mouth shall conform with P.51 when LRGP is used. The artificial ear shall conform with Rec. P.57, type 3.2 ear shall be used. Either the high leak or low leak version may be used.

5.1.2 Setup for headset terminals

For further study.



NOTE 1: Includes DTX functionality.
NOTE 2: Connection to PSTN should include electrical echo control (EEC).

Figure 1: GSM/3G Interfaces for specification and testing of terminal narrow-band acoustic characteristics

5.1.3 Setup for hands-free terminals

5.1.3.1 Vehicle mounted hands-free

Vehicle mounted hands-free may be measured either in a vehicle or in an anechoic room. For both of these two types of test environments, the setup will depend on whether HATS or a discrete artificial mouth and discrete microphone are used as the acoustic test equipment.

For in-vehicle measurements, if HATS test equipment is used, it should be positioned in the car as per ITU-T Recommendation P. 581. If in-vehicle measurements are made with a discrete microphone and discrete artificial mouth,