



**Speech and multimedia Transmission Quality (STQ);  
Transmission requirements  
for wideband wireless terminals (handsfree)  
from a QoS perspective as perceived by the user**

*Full Standard Preview*  
<https://standards.iteh.ai/catalog/standards/si/08c1e49-d1a3-4468-9871-65744217385a/etsi-103-740-v1-3-1-2018-10>

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**Reference**

RTS/STQ-272-4

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**Keywords**

speech, terminal

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# Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Speech and multimedia Transmission Quality (STQ).

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# Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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# Introduction

The present document covers wireless speech terminals. It aims to enhance the interoperability and end-to-end quality with all other types of terminals.

The advanced signal processing of terminals is targeted to speech signals. Therefore, wherever possible speech signals are used for testing in order to archive mostly realistic test conditions and meaningful results.

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# 1 Scope

The present document provides speech transmission performance requirements for wireless terminals; it addresses all types of wireless terminals, including softphones. The present document addresses handsfree function of wideband wireless terminals.

In contrast to other standards which define minimum performance requirements it is the intention of the present document to specify terminal equipment requirements which enable manufacturers and service providers to enable good quality end-to-end speech performance as perceived by the user whatever be the radio link (terminals may implement different radio links with the access network).

When an additional radio link between the terminal and external electroacoustical devices is used (e.g. Bluetooth® link), the present document will address the overall quality.

In the present document objective measurement methodologies and requirements for wireless speech terminals are given.

In addition to basic testing procedures, the present document describes advanced testing procedures taking into account further quality parameters as perceived by the user.

The requirements available in the present document will ensure a high compatibility across access networks with all types of terminals.

It is the aim to optimize the listening and talking quality, conversational performance, as well as the use in noisy environment. Related requirements and test methods will be defined in the present document.

For all the functions, the present document will consider the limitations in audio performance due to different form factors (e.g. size, shape).

Terminals which are not intended to be connected to public networks are outside the scope of the present document.

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## 2 References

### 2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

- [1] Void.
- [2] ETSI TS 103 224: "Speech and multimedia Transmission Quality (STQ); A sound field reproduction method for terminal testing including a background noise database".
- [3] Recommendation ITU-T G.122: "Influence of national systems on stability and talker echo in international connections".
- [4] Recommendation ITU-T G.722: "7 kHz audio-coding within 64 kbit/s".
- [5] Recommendation ITU-T G.729.1: "G.729-based embedded variable bit-rate coder: An 8-32 kbit/s scalable wideband coder bitstream interoperable with G.729".
- [6] Recommendation ITU-T G.131: "Talker echo and its control".

- [7] Recommendation ITU-T P.56: "Objective measurement of active speech level".
- [8] Recommendation ITU-T P.58: "Head and torso simulator for telephony".
- [9] Recommendation ITU-T P.79 (2007): "Calculation of loudness ratings for telephone sets".
- [10] Recommendation ITU-T P.340: "Transmission characteristics and speech quality parameters of hands-free terminals".
- [11] Recommendation ITU-T P.341: "Transmission characteristics for wideband digital loudspeaking and hands-free telephony terminals".
- [12] Recommendation ITU-T P.501: "Test signals for use in telephony".
- [13] Recommendation ITU-T P.502: "Objective test methods for speech communication systems using complex test signals".
- [14] Recommendation ITU-T P.581: "Use of head and torso simulator (HATS) for hands-free and handset terminal testing".
- [15] IEC 61260-1: "Electroacoustics -- Octave-band and fractional-octave-band filters - Part 1: Specifications".
- [16] Recommendation ITU-T G.711.1: "Wideband embedded extension for G.711 pulse code modulation".
- [17] Recommendation ITU-T G.722.2: "Wideband coding of speech at around 16 kbit/s using Adaptive Multi-Rate Wideband (AMR-WB)".
- [18] ETSI TS 126 171 (V6.0.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); AMR speech codec, wideband; General description (3GPP TS 26.171 version 6.0.0 Release 6)".
- [19] IEC 61672 (all parts): "Electroacoustics -- Sound level meters".
- [20] ETSI TS 103 106: "Speech and multimedia Transmission Quality (STQ); Speech quality performance in the presence of background noise: Background noise transmission for mobile terminals-objective test methods".
- [21] Recommendation ITU-T P.1110: "Wideband hands-free communication in motor vehicles".
- [22] ETSI TS 126 441: "Universal Mobile Telecommunications System (UMTS); LTE; EVS Codec General Overview".
- [23] Recommendation ITU-T P.1010: "Fundamental voice transmission objectives for VoIP terminals and gateways".
- [24] Recommendation ITU-T P.863: "Perceptual objective listening quality prediction".
- [25] Recommendation ITU-T P.863.1: "Application guide for Recommendation ITU-T P.863".

## 2.2 Informative references

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- [i.1] Void.
- [i.2] ETSI EG 201 377-1: "Speech and multimedia Transmission Quality (STQ); Specification and measurement of speech transmission quality; Part 1: Introduction to objective comparison measurement methods for one-way speech quality across networks".
- [i.3] Recommendation ITU-T P.800.1: "Mean Opinion Score (MOS) terminology".

---

## 3 Definitions of terms and abbreviations

### 3.1 Terms

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

**artificial ear:** device for the calibration of earphones incorporating an acoustic coupler and a calibrated microphone for the measurement of the sound pressure and having an overall acoustic impedance similar to that of the median adult human ear over a given frequency band

**codec:** combination of an analogue-to-digital encoder and a digital-to-analogue decoder operating in opposite directions of transmission in the same equipment

**ear-Drum Reference Point (DRP):** point located at the end of the ear canal, corresponding to the ear-drum position

**freefield equalization:** artificial head equalized for frontal sound incidence in anechoic conditions

**freefield reference point:** point located in the free sound field, at least in 1,5 m distance from a sound source radiating in free air (in case of a head and torso simulator [HATS] in the center of the artificial head with no artificial head present).

**group audio terminal:** handsfree telephony terminal primarily designed for use by several users which will not be equipped with a handset.

**handsfree telephony terminal:** telephony terminal using a loudspeaker associated with an amplifier as a telephone receiver and which can be used without a handset

**HATS Hands-Free Reference Point (HATS HFRP):** reference point "n" from Recommendation ITU-T P.58 [8]: "n" is one of the points numbered from 11 to 17 and defined in table 6a of Recommendation ITU-T P.58 [10] (coordinates of far field front point)

NOTE: The HATS HFRP depends on the location(s) of the microphones of the terminal under test: the appropriate axis lip-ring/HATS HFRP is to be as close as possible to the axis lip-ring/HFT microphone under test.

**Head And Torso Simulator (HATS) for telephonometry:** manikin extending downward from the top of the head to the waist, designed to simulate the sound pick-up characteristics and the acoustic diffraction produced by a median human adult and to reproduce the acoustic field generated by the human mouth

**loudspeaking function:** function of a handset telephone using a loudspeaker associated with an external amplifier as a telephone receiver



**Mouth Reference Point (MRP):** point located on axis and 25 mm in front of the lip plane of a mouth simulator

**nominal setting of the volume control:** when a receive volume control is provided, setting which is closest to the nominal RLR

NOTE: If no user operable volume control is available, this should be noted in the test report.

**softphone:** speech communication system based upon a computer

## 3.2 Abbreviations

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

a.c.	alternative current
$A_{H,S,dt}$	attenuation range in send direction during double talk
AM-FM	Amplitude and Frequency Modulated
AMR-WB	Adaptive MultiRate codec - Wideband
CDMA	Code Division Multiple Access
CS	Composite Source
CSS	Composite Source Signal
DECT	Digital Enhanced Cordless Telecommunications
DFT	Discrete Fourier Transformation
DRP	ear Drum Reference Point
DUT	Device Under Test
EC	Echo Cancellation
EL	Echo Loss
EVS	Enhanced Voice Services
FFT	Fast Fourier Transformation
G-MOS-LQOw	Overall transmission quality for wideband systems
GSM	Global System for Mobile telecommunication
HATS	Head And Torso Simulator
HF	Hands-Free
HFRP	Hands Free Reference Point
HFT	Hands-Free Terminal
IEC	International Electrotechnical Commission
ITU-T	International Telecommunication Union - Telecommunication standardization sector
LQO	Listening Quality Objective
LTE	Long Term Evolution (3GPP)

NOTE: See Recommendation ITU-T P.79 [9].

MOS	Mean Opinion Score
MRP	Mouth Reference Point

NOTE: See Recommendation ITU-T P.800.1 [i.3].

NLP	Non Linear Processor
N-MOS-LQOw	Transmission quality of the background noise for wideband systems
OTT	Over The Top solutions
PDA	Personal Digital Assistant
PN	Pseudo random Noise
POI	Point Of Interconnect
QoS	Quality of Service
RF	Radio Frequency
RLR	Receive Loudness Rating
RMS	Root Mean Square
SLR	Send Loudness Rating
S-MOS-LQOw	Transmission quality of the speech for wideband systems
TCL	Terminal Coupling Loss
TELR	Talker Echo Loudness Rating
TOSQA	Telecom Objective Speech Quality Assessment
UE	User Equipment

UMTS	Universal Mobile Telecommunications System
VAD	Voice Activity Detector
VoLTE	Voice over LTE
WIFI	Wireless Fidelity
WIMAX™	Worldwide Interoperability for Microwave ACCess

NOTE: It is a trademark.

---

## 4 Configurations and interfaces

### 4.0 Introduction

The present document is intended to be applicable for different wireless access networks and for additional radio links.

### 4.1 Access networks

The present document applies to any wireless terminal whatever the access network, e.g. GSM, UMTS, VoLTE, DECT, Bluetooth®, WIFI, WIMAX™, CDMA, etc.

### 4.2 Additional (radio) links between the terminal and external electroacoustical devices

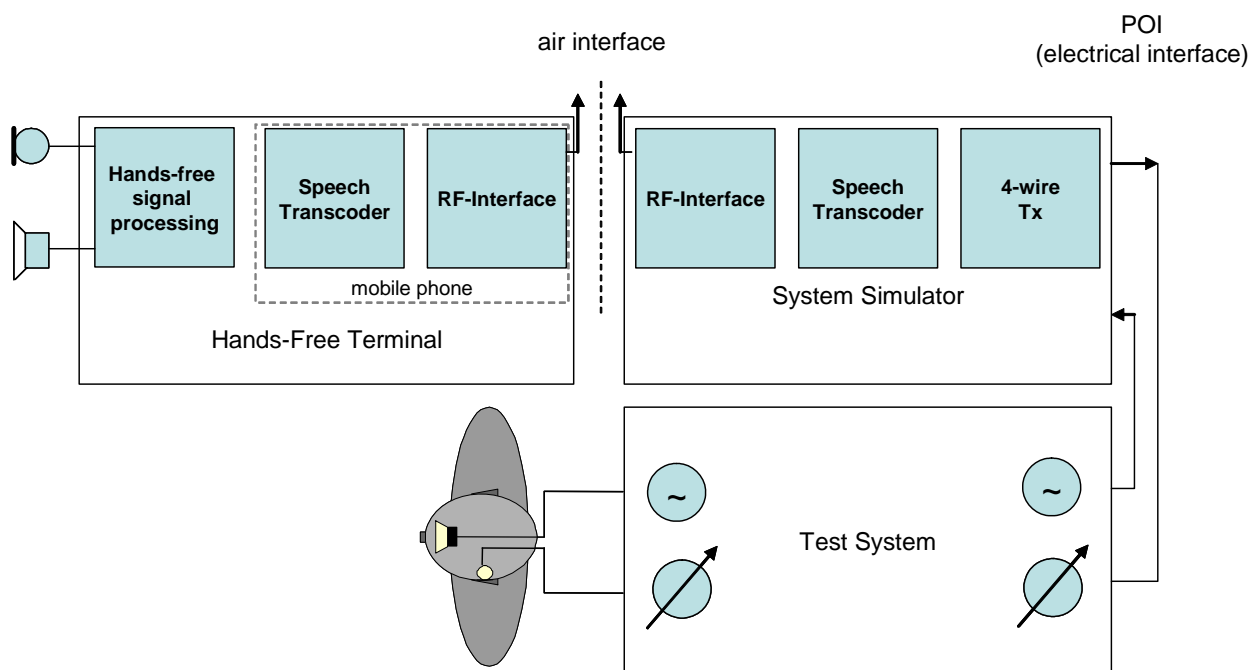
The present document also applies when an additional radio link exists between the wireless terminal and external electro acoustic devices, e.g. Bluetooth.

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## 5 Test Configurations

### 5.1 Set-up interface

The generic schematic as defined in figure 5.1.F is applicable to any wireless link.



NOTE: The "whole" terminal includes all the components from "RF interface" to the transducers and may include an additional (radio) link. The air interface considered in the figure is not the additional radio link.

Figure 5.1-1: Set-up interface

## 5.2 Set-up for terminals

### 5.2.0 Introduction

For electroacoustical testing, HATS as described in Recommendation ITU-T P.58 [8] shall be used.

The preferred way of testing a terminal is to connect it to a network 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.

When a coder with variable bit rate is used for testing terminal electroacoustical parameters, the bit rate giving the best characteristics or the most commonly used should be selected, e.g.:

- AMR-WB: 12,65 kbit/s [18];
- Recommendation ITU-T G.729.1: 32 kbit/s [5];
- EVS: 13,2 kbit/s [22].

### 5.2.1 Handheld terminal

HATS measurement equipment shall be configured to the Handheld hands-free UE according to figure 5.2.1-1. The HATS should be positioned so that the HATS Reference Point is at a distance  $d_{HF}$  from the centre point of the visual display of the Mobile Station. The distance  $d_{HF}$  is specified by the manufacturer. A vertical angle  $\theta_{HF}$  may be specified by the manufacturer. In case it is not specified the distance  $d_{HF}$  shall be 42 cm and  $\theta_{HF}$  shall be 0.

NOTE: The nominal distance of 42 cm corresponds to lip plane-HATS reference point distance (12 cm) with an additional 30 cm giving a realistic figure as a reference usage of handheld terminals.

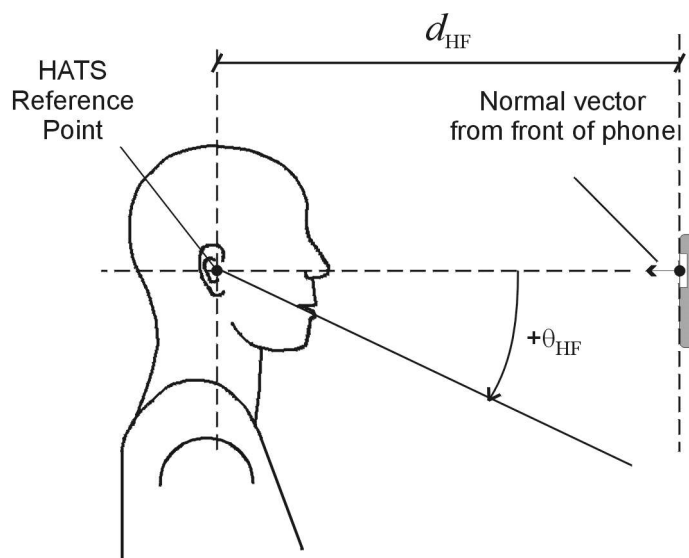


Figure 5.2.1-1: Configuration of Handheld Hands-free UE relative to the HATS

## 5.2.2 Vehicle mounted hands-free

Test arrangement, test methods and performance requirements are according to Recommendation ITU-T P.1110 [21].

## 5.2.3 Desktop hands-free terminal

For HATS test equipment, definition of hands-free terminals and setup for desktop hands-free terminals is based on Recommendation ITU-T P.581 [14].

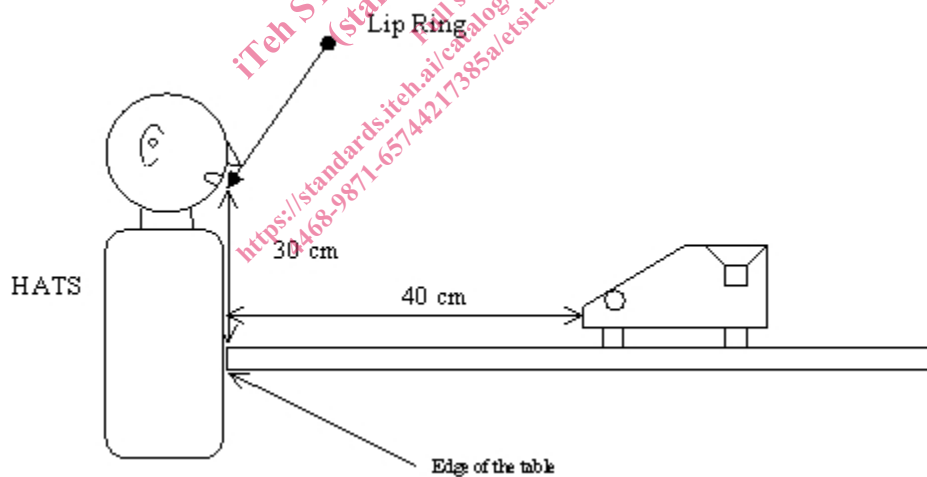


Figure 5.2.3-1: Position for test of desktop hands free terminal side view