Speech Performance Test Plan

Version 2.3

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Section 1 Introduction

1.1 Purpose

The purpose of this document is to define the test methods for measuring the performance of 3GPP and 3GPP2 speech capable wireless devices, in narrowband (NB),wideband (WB) modes, and super-wideband (SWB) modes.

1.2 Scope

This document defines a set of standard test measurements, with associated test setup and test signal conditions for narrowband, wideband, and super-wideband mode. Devices designed for LTE, GSM/UMTS and CDMA shall be tested per the respective standard contained herein.

1.3 Reference Documents

The following documents are referenced in this test plan:

[1]   3GPP TS26.132 v16.2.0 (2020-03): 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Speech and video telephony terminal acoustic test specification (Release 16)

[2]   ETSI TS 103 106, v1.4.1 (2016-11): Speech and multimedia Transmission Quality (STQ): Speech quality performance in the presence of background noise: Background noise transmission for mobile terminals – objective test methods.

[3]   ETSI ES 202 396-1, v1.7.1 (2017-08): Speech and multimedia Transmission Quality (STQ): Speech quality performance in the presence of background noise: Part 1: Background noise simulation technique and background noise database

[4]   3GPP2 C.S0056-A v.1.0 (2013-03): Electro-Acoustic Recommended Minimum Performance Specification for cdma2000 mobile stations

[5]   ITU-T Recommendation P.57 Ed. 6 (2011-12): Artificial Ears

[6]   ITU-T Recommendation P.58 Ed. 4 (2013-05): Head and torso simulator for telephonometry

[7]   ITU-T Recommendation P.64 Ed. 8 (2007-11): Determination of sensitivity/frequency characteristics of local telephone systems

[8]   ITU-T Recommendation P.380 Ed. 1 (2003-11): Electro-acoustic measurements on headsets

[9]   ITU-T Recommendation P.581 Ed. 3 (2014-02): Use of head and torso simulator (HATS) for hands- free and handset terminal testing

[10] IEEE 269-2010: IEEE Standard Methods for Measuring Transmission Performance of Analog and Digital Telephone Sets, Handsets, and Headsets

[11] 3GPP TS 26.131 v16.0.0 (2019-09): 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Terminal acoustic characteristics for telephony; Requirements (Release 16)

[12] ETSI TS 103 224 V1.3.1 (2017-07): A sound field reproduction method for terminal testing including a background noise database.

[13] ITU-T P.381 Ed. 4 (2017-03): Technical requirements and test methods for the universal wired headset or headphone interface of digital mobile terminals

[14] ITU-T Recommendation P.863 (09/2014): Perceptual objective listening quality assessment

[15] ITU-T Recommendation P.863.1 (09/2014): Application guide for Recommendation ITU-T P.863

[16] ETSI TS 103 334 V1.1.1 (2018-01): Speech and multimedia Transmission Quality (STQ); Transmission requirements for wearable wireless terminals from a QoS perspective as perceived by the user

1.4   Acronyms and Definitions

Table 1.4-1 Acronyms and Definitions

Acronyms	Definition
DRP	Drum Reference Point
ERP	Ear Reference Point
HATS	Head and Torso Simulator
HFRP	Hands Free Reference Position
MECRP	Manufacturer Ear Cap Reference Position
MRP	Mouth Reference Point
NB	Narrowband
SFR	Send Frequency Response
SLR	Sending Loudness Rating
SND	Sending or Transmit direction
SWB	Super-wideband
RCV	Receive direction
RFR	Receive Frequency Response
RLR	Receiving Loudness Rating
WB	Wideband

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Section 2   Test Requirements

2.1 Narrowband Test Cases

2.1.1   Test Cases for 3GPP and 3GPP2 Methods

Harmonization of 3GPP and 3GPP2 standards permits a common set of test methods, as listed in the tables below.

2.1.1.1   Handset Mode

Table 2.1-1 Narrowband Handset Mode Test Cases and Applicable Settings

Handset Narrowband Test Cases		Measurement Setup				Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Appl. Force [N]	Document	Rev.	Sect.
NB-001	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16 dBm0	nominal	8	3GPP TS 26.132	16.2.0	7.2.2.2
						3GPP2 C.S0056- A	1.0	2.1.2.2
NB-002 / NB-018	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16 dBm0	maximum	8 / 13	3GPP TS 26.132	16.2.0	7.2.2.2
						3GPP2 C.S0056- A	1.0	2.1.2.2
NB-019	RLR (dB) - Receive Loudness Rating in the presence of background noise	P.501 real speech / ETSI TS 103 224 or ES 202 396-1 Pub Noise	-16 dBm0	nominal	8	3GPP TS 26.132	16.2.0	7.2.2.3
NB-003	SLR (dB) - Sending Loudness Rating	P.501 real speech	-4.7 dBPa	nominal	8	3GPP TS 26.132	16.2.0	7.2.2.1
						3GPP2 C.S0056- A	1.0	2.2.2.2
NB-004	Idle Channel Noise SND	n/a[2]	n/a	nominal	8	3GPP TS 26.132	16.2.0	7.3.1
						3GPP2 C.S0056- A	1.0	2.2.4.2
NB-005	Idle Channel Noise RCV	n/a[2]	n/a	maximum	8	3GPP TS 26.132	16.2.0	7.3.2
						3GPP2 C.S0056- A	1.0	2.1.3.2
NB-006	RFR - Receive frequency response	P.501 real speech	-16 dBm0	nominal	8	3GPP TS 26.132	16.2.0	7.4.2
						3GPP2 C.S0056- A	1.0	2.1.1.2
NB-007	SFR - Send frequency response	P.501 real speech	-4.7 dBPa	nominal	8	3GPP TS 26.132	16.2.0	7.4.1
						3GPP2 C.S0056- A	1.0	2.2.1.2
NB-008[1]	TCLw (weighted terminal coupling loss)	P.501 compressed speech	-10 dBm0	maximum	2	3GPP TS 26.132	16.2.0	7.7.3
						3GPP2 C.S0056- A	1.0	2.2.3.2
NB-020	Echo control characteristics	P.501 double-talk speech	-4.7 dBPa	nominal	8	3GPP TS 26.132	16.2.0	7.11
NB-009*	Quality in presence of ambient noise: SMOS, NMOS, GMOS	real speech / ETSI TS 103 106	-1.7 dBPa	nominal	8	3GPP TS 26.132	16.2.0	7.12
						3GPP2 C.S0056- A	1.0	2.7.2
NB-010	Round-trip Delay (ms)	single word	-4.7 dBPa	nominal	8	3GPP TS 26.132	16.2.0	7.10
NB-011						3GPP2 C.S0056- A	1.0	2.6.2

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Handset Narrowband Test Cases		Measurement Setup				Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Appl. Force [N]	Document	Rev.	Sect.
NB-012	Max acoustic pressure	PeakLevel[3]	+3 dBm0	maximum	13	IEEE 269	2010	7.13.1
NB-013 / NB-014	STMR (Sidetone Masking Rating)	P.501 real speech	-4.7 dBPa	nominal, F=8 / maximum, F=13		3GPP TS 26.132	16.2.0	7.5.1.2
						3GPP2 C.S0056- A	1.0	2.5.1.2
NB-015	Sidetone delay	P.501 real speech	-4.7 dBPa	nominal	8	3GPP TS 26.132	16.2.0	7.5.4
						3GPP2 C.S0056- A	1.0	2.5.2.2
NB-074**	Delay and speech quality with packet jitter and loss[4]	P.501 real speech	-4.7 dBPa	nominal	8	3GPP TS 26.132	16.2.0	7.10.4
NB-076**	Speech Quality (reference condition)	P.501 real speech	-4.7 dBPa	nominal	8	3GPP TS 26.132 ITU-T P.863	16.2.0	7.10.4

Note 1: A test signal, such as CSS bursts, may have to be intermittently applied to prevent 'silent mode' operation of the MS. Such a test signal should be documented by the tester, if used.

Note 2: The Peak Level test signal from [4] is used for test case NB-012.

* This test case should be covered with background noise conditions as specified in 3GPP TS 26.132.

** This test cases should be covered with delay profiles as specified in in 3GPP TS 26.132

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2.1.1.2   Handheld Hands-free/Speakerphone Mode

Table 2.1-2 Narrowband Handheld Hands-Free/Speakerphone Mode Test Cases and Applicable Settings

HH Hands-free Narrowband Test Cases		Measurement Setup				Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Distance	Document	Rev.	Sect.
NB-040	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16 dBm0	maximum	HFRP[1]	3GPP TS26.132	16.2.0	7.2.4.2
						3GPP2C.S0056-A	1.0	Note[2]
NB-041	SLR (dB) - Sending Loudness Rating	P.501 real speech	-4.7 dBPa	nominal	HFRP[1]	3GPP TS 26.132	16.2.0	7.2.4.1
						3GPP2 C.S0056-A	1.0	Note[2]
NB-042	RFR - Receive frequency response	P.501 real speech	-16 dBm0	nominal	HFRP[1]	3GPP TS26.132	16.2.0	7.4.6
						3GPP2 C.S0056-A	1.0	Note[2]
NB-043	SFR - Send frequency response	P.501 real speech	-4.7 dBPa	nominal	HFRP[1]	3GPP TS26.132	16.2.0	7.4.5
						3GPP2 C.S0056-A	1.0	Note[2]
NB-044	TCLw (weighted terminal coupling loss)	P.501 compressed speech	-10 dBm0	maximum	HFRP[1]	3GPP TS26.132	16.2.0	7.7.2
						3GPP2 .S0056-AA	1.0	Note[2]
NB-075*	Quality in presence of ambient noise: SMOS, NMOS, GMOS	real speech from TS 103 106	+1.3 dBPa	maximum	HFRP[1]	3GPP TS26.132	16.2.0	7.12.2

Note 1: See section 2.3.2 (Device positioning Handheld Hands-free / Speakerphone mode for HFRP acceptable value).

Note 2: For 3GPP2 Test Cases; Handheld Hands-free mode is not in the scope of reference [4] and while testing should be carried out in a similar fashion and methodology as per reference [1] radio system setup shall be in compliance with reference [4].

* This test case should be covered with background noise conditions as specified in 3GPP TS 26.132.

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2.1.1.3   Headset Mode

Table 2.1-3 Narrowband Headset Mode Test Cases and Applicable Settings

Headset Narrowband Test Cases		Measurement Setup			Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Document	Rev.	Sect.
NB-060 / NB-061	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16 dBm0	nominal / maximum	3GPP TS 26.132	16.2.0	7.2.2.2
					3GPP2 C.S0056-A	1.0	Note[2]
NB-062	SLR (dB) - Sending Loudness Rating	P.501 real speech	-4.7 dBPa	nominal	3GPP TS 26.132	16.2.0	7.2.2.1
					3GPP2 C.S0056-A	1.0	Note[2]
NB-063	Idle Channel Noise SND	n/a[1]	n/a	nominal	3GPP TS 26.132	16.2.0	7.3.1
					3GPP2 C.S0056-A	1.0	Note[2]
NB-064	Idle Channel Noise RCV	n/a[1]	n/a	maximum	3GPP TS 26.132	16.2.0	7.3.2
					3GPP2 C.S0056-A	1.0	Note[2]
NB-065	RFR - Receive frequency response	P.501 real speech	-16 dBm0	nominal	3GPP TS 26.132	16.2.0	7.4.2
					3GPP2 C.S0056-A	1.0	Note[2]
NB-066	SFR - Send frequency response	P.501 real speech	-4.7 dBPa	nominal	3GPP TS 26.132	16.2.0	7.4.1
					3GPP2 C.S0056-A	1.0	Note[2]
NB-067	TCLw (weighted terminal coupling loss)	P.501 compressed speech	-10 dBm0	maximum	3GPP TS 26.132	16.2.0	7.7.3
					3GPP2 C.S0056-A	1.0	Note[2]
NB-068	Round-trip Delay (ms)	single word	-4.7 dBPa	nominal	3GPP TS 26.132	16.2.0	7.10
					3GPP2 C.S0056-A	1.0	Note[2]
NB-069 / NB-070	STMR (Sidetone Masking Rating)	P.501 real speech	-4.7 dBPa	nominal / maximum	3GPP TS 26.132	16.2.0	7.5.1.2
					3GPP2 C.S0056-A	1.0	Note[2]
NB-071	Sidetone delay	P.501 real speech	-4.7 dBPa	nominal	3GPP TS 26.132	16.2.0	7.5.4
					3GPP2 C.S0056-A	1.0	Note[2]

Note 1: A test signal, such as CSS bursts, may have to be intermittently applied to prevent 'silent mode' operation of the MS. Such a test signal should be documented by the tester, if used.

Note 2: For 3GPP2 Test Cases; Headset mode is not in the scope of reference [4] and while testing should be carried out in a similar fashion and methodology as per reference [1] radio system setup shall be in compliance with reference [4]

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2.1.1.4   Headset Interface Mode (Informative)

Table 2.1-4 Narrowband Headset Interface Mode Test Cases and Applicable Settings

Headset Interface Narrowband Test Cases		Measurement Setup			Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Document	Rev.	Sect.
NB-080 / NB-081	Level in Receive for Nominal speech input level	P.501 real speech	-16 dBm0	nominal / maximum	ITU-T P.381	4	7.1.4
NB-082	Level in Send for Nominal speech input Level	P.501 real speech	-60 dBV	nominal	ITU-T P.381	4	7.1.3
NB-083	Noise in Send	n/a[1]	n/a	nominal	ITU-T P.381	4	7.1.11
NB-084	Noise in Receive	n/a[1]	n/a	nominal	ITU-T P.381	4	7.1.12
NB-085	Receiving frequency response	P.501 real speech	-16 dBm0	nominal	ITU-T P.381	4	7.1.8
NB-086	Sending frequency response	P.501 real speech	-60 dBV	nominal	ITU-T P.381	4	7.1.7
NB-087	TCLw (weighted terminal coupling loss)	P.501 compressed speech	-10 dBm0	maximum	ITU-T P.381	4	7.1.18
NB-088	Delay (Send + Receive) (ms)	single word	-60 dBV	nominal	ITU-T P.381	4	7.1.2
NB-089 / NB-090	Sidetone Loss STMR	P.501 real speech	-60 dBV	nominal / maximum	ITU-T P.381	4	7.1.9
NB-091	Sidetone delay	P.501 real speech	-60 dBV	nominal	ITU-T P.381	4	7.1.10

Note 1: A test signal, such as CSS bursts, may have to be intermittently applied to prevent 'silent mode' operation of the MS. Such a test signal should be documented by the tester, if used.

Note 2: For 3GPP2 Test Cases; Headset mode is not in the scope of reference [4], and while testing should be   carried out in a similar fashion and methodology as per reference [1], radio system setup shall be in compliance with reference [4].

2.1.1.5 Additional Test Cases, Handset and Headset, for 3GPP Methods

Two additional test cases for each of Handset and Headset are added for 3GPP methods only.

Table 2.1-5 Narrowband Additional Test Cases for 3gpp Methods in Handset and Headset Modes

Handset/Headset Narrowband Test Cases		Measurement Setup				Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Appl. Force [N]	Document	Rev.	Sect.
NB-016	Handset Distortion, SND	Sinusoidal	5, 0, -4.7, -10, -15, -20 dBPa	nominal	8	3GPP TS 26.132	16.2.0	7.8.1
NB-017	Handset Distortion, RCV	Sinusoidal + activation	0, -3, -10, -16, -20, -30, -40, -45dBm0	nominal	8	3GPP TS 26.132	16.2.0	7.8.2
NB-072	Headset Distortion, SND	Sinusoidal	5, 0, -4.7, -10, - 15, -20 dBPa	nominal	n/a	3GPP TS 26.132	16.2.0	7.8.1
NB-073	Headset Distortion, RCV	Sinusoidal+ activation	0, -3, -10, -16, -20, -30, -40, -45dBm0	nominal	n/a	3GPP TS 26.132	16.2.0	7.8.2

2.1.1.6 Wrist-worn Wearables Mode for Wearable Device

Table 2.1-6 Narrowband Wrist-Worn Wearables Mode Test Cases and Applicable Settings

Wearables Narrowband Test Cases		Measurement Setup				Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Distance	Document	Rev.	Sect.
NB-077	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16 dBm0	maximum	HFRP[1]	3GPP TS 26.132	16.2.0	7.2.4.2
						3GPP2 C.S0056-A	1	Note[2]
NB-078	SLR (dB) - Sending Loudness Rating	P.501 real speech	-4.7 dBPa	nominal	HFRP[1]	3GPP TS 26.132	16.2.0	7.2.4.1
						3GPP2 C.S0056-A	1	Note[2]
NB-079	RFR - Receive frequency response	P.501 real speech	-16 dBm0	nominal	HFRP[1]	3GPP TS 26.132	16.2.0	7.4.6
						3GPP2 C.S0056-A	1	Note[2]
NB-092	SFR - Send frequency response	P.501 real speech	-4.7 dBPa	nominal	HFRP[1]	3GPP TS 26.132	16.2.0	7.4.5
						3GPP2 C.S0056-A	1	Note[2]
NB-093	TCLw (weighted terminal coupling loss)	P.501 compresse d speech	-10 dBm0	maximum	HFRP[1]	3GPP TS 26.132	16.2.0	7.7.2
						3GPP2 C.S0056-A	1	Note[2]
NB-094*	Quality in presence of ambient noise: SMOS, NMOS, GMOS	Real speech	+1.3 dBPa	maximum	HFRP[1]	3GPP TS 26.132	16.2.0	7.12.2

Note 1: See section 2.4.4 (Device positioning Wrist-worn Wearables mode for HFRP acceptable value)

Note 2: For 3GPP2 Test Cases; Wearable Hands-free mode is not in the scope of reference and while testing [4] should be carried out in a similar fashion and methodology as per reference [1], radio system setup shall be in compliance with reference [4].

 * This test case should be covered with background noise conditions as specified in 3GPP TS 26.132.

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2.1.2 LTE Narrowband Radio Networks and Codecs (Normative)

For a device that supports AMR narrowband functionality, testing shall be performed over LTE using AMR 12.2 kbps. The specific VoLTE radio carrier frequency and channel number tested shall be documented. Please refer to Appendix B for applicable Bands and Frequency details.

For a device that supports EVS narrowband functionality, testing shall be performed over LTE using EVS 13.2 kbps. The specific VoLTE radio carrier frequency and channel number tested shall be documented. Please refer to Appendix B for applicable Bands and Frequency details.

2.1.3 CDMA Narrowband Radio Networks and Codecs (Informative)

For a device that supports EVRC narrowband, testing shall be performed over CDMA using EVRC-S03 8.55 kbps in Radio Configuration 3 and, if supported, also using EVRC-B-S068 6.6 kbps (Note: This does deviate from the C.S0056 standard). The specific VoLTE radio carrier frequency and channel number tested shall be documented. Please refer to Appendix B for applicable Bands and Frequency details.

2.1.4 UMTS Narrowband Radio Networks and Codecs (Informative)

For a device that supports AMR narrowband functionality, testing shall be performed over UMTS using AMR 12.2 kbps. The specific UMTS radio carrier frequency and channel number tested shall be documented. Please refer to Appendix B for applicable Bands and Frequency details.

2.1.5 GSM Narrowband Radio Networks and Codecs (Informative)

For a device that supports AMR narrowband functionality, testing shall be performed over GSM using AMR 12.2 kbps. The specific GSM radio carrier frequency and channel number tested shall be documented. Please refer to Appendix B for applicable Bands and Frequency details.

Test SIMs/PRLs in non-RF shielded environments may be required on any type of device and shall be documented.

2.2 Wideband Test Cases

2.2.1 Test Cases for 3GPP and 3GPP2 Methods

Harmonization of 3GPP and 3GPP2 standards permits a common set of test methods, as listed in the tables below.

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2.2.1.1 Handset Mode

Table 2.2-1 Wideband Handset Mode Test Cases and Applicable Settings

Handset Wideband Test Cases		Measurement Setup				Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Appl. Force [N]	Document	Rev.	Sect.
WB-001	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16dBm0	nominal	8	3GPP TS 26.132	16.2.0	8.2.2.2
						3GPP2 C.S0056- A	1.0	2.1.2.2
WB-02 / WB-018	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16dBm0	maximum	8 / 13	3GPP TS 26.132	16.2.0	8.2.2.2
						3GPP2 C.S0056- A	1.0	2.1.2.2
WB-019	RLR (dB) - Receive Loudness Rating in the presence of background noise	P.501 real speech / ETSI TS 103 224 or ES 202 396-1 Pub Noise	-16dBm0	maximum	8	3GPP TS 26.132	16.2.0	8.2.2.3
WB-003	SLR (dB) - Sending Loudness Rating	P.501 real speech	-4.7dBPa	nominal	8	3GPP TS 26.132	16.2.0	8.2.2.1
						3GPP2 C.S0056- A	1.0	2.2.2.2
WB-004	Idle Channel Noise SND	n/a[2]	n/a	nominal	8	3GPP TS 26.132	16.2.0	8.3.1
						3GPP2 C.S0056- A	1.0	2.2.4.2
WB-005	Idle Channel Noise RCV	n/a[2]	n/a	maximum	8	3GPP TS 26.132	16.2.0	8.3.2
						3GPP2 C.S0056- A	1.0	2.1.3.2
WB-006	RFR - Receive frequency response	P.501 real speech	-16dBm0	nominal	8	3GPP TS 26.132	16.2.0	8.4.2
						3GPP2 C.S0056- A	1.0	2.1.1.2
WB-007	SFR - Send frequency response	P.501 real speech	-4.7dBPa	nominal	8	3GPP TS 26.132	16.2.0	8.4.1
						3GPP2 C.S0056- A	1.0	2.2.1.2
WB-008	TCLw (weighted terminal coupling loss)	P.501 compressed speech	-10dBm0	maximum	2	3GPP TS 26.132	16.2.0	8.7.3
						3GPP2 C.S0056- A	1.0	2.2.3.2
WB-020	Echo control characteristics	P.501 double-talk speech	-4.7dBPa	nominal	8	3GPP TS 26.132	16.2.0	8.11
WB-009*	Quality in presence of ambient noise: SMOS, NMOS, GMOS	real speech / ETSI TS 103 106	-1.7dBPa	nominal	8	3GPP TS 26.132	16.2.0	8.12
						3GPP2 C.S0056- A	1.0	2.7.2
WB-010	Round-trip Delay (ms)	single word	-4.7dBPa	nominal	8	3GPP TS 26.132	16.2.0	8.10
WB-011						3GPP2 C.S0056- A	1.0	2.6.2
WB-012	Max acoustic pressure	Peak Level[3]	3dBm0	maximum	13	IEEE 269	2010	7.13.1
WB-013 / WB-014	STMR (Sidetone Masking Rating)	P.501 real speech	-4.7dBPa	nominal, F=8 / maximum, F=13		3GPP TS 26.132	16.2.0	8.5.1
						3GPP2 C.S0056- A	1.0	2.5.1.2
WB-015	Sidetone delay	P.501 real speech	-4.7dBPa	nominal	8	3GPP TS 26.132	16.2.0	8.5.4
						3GPP2 C.S0056- A	1.0	2.5.2.2
WB-074**	Delay and speech quality with packet jitter and loss[4]	P.501 real speech	-4.7dBPa	nominal	8	3GPP TS 26.132	16.2.0	8.10.4

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Handset Wideband Test Cases		Measurement Setup				Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Appl. Force [N]	Document	Rev.	Sect.
WB-076**	Speech Quality (reference condition)	P.501 real speech	-4.7dBPa	nominal	8	3GPP TS 26.132 ITU-T P.863	16.2.0	8.10.4
WB-077***	Bandwidth for Bandwidth Extension	P.501 real speech	-4.7dBPa	nominal	8	ITU-T P.863.1 Suppl. 27	2017	7.2

Note 1: A test signal, such as CSS bursts, may have to be intermittently applied to prevent 'silent mode' operation of the MS. Such a test signal should be documented by the tester, if used.

Note 2: The PeakLevel test signal from [4] is used for test case WB-012.

Note 3: Test case for Voice over LTE only.

* This test case should be covered with background noise conditions as specified in 3GPP TS 26.132.

** This test cases should be covered with delay profiles as specified in in 3GPP TS 26.132

***This test case is informative

2.2.1.2   Handheld Handsfree/Speakerphone Mode

Table 2.2-2 Wideband Handheld Handsfree / Speakerphone Mode Test Cases and Applicable Settings

Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Distance	Document	Rev.	Sect.
WB-040	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16 dBm0	maximum	HFRP[1]	3GPP TS 26.132	16.2.0	8.2.4.2
						3GPP2 C.S0056- A	1.0	Note[2]
WB-041	SLR (dB) - Sending Loudness Rating	P.501 real speech	-4.7 dB Pa	nominal	HFRP[1]	3GPP TS 26.132	16.2.0	8.2.4.1
						3GPP2 C.S0056- A	1.0	Note[2]
WB-042	RFR - Receive frequency response	P.501 real speech	-16 dBm0	nominal	HFRP[1]	3GPP TS 26.132	16.2.0	8.4.6
						3GPP2 C.S0056- A	1.0	Note[2]
WB-043	SFR - Send frequency response	P.501 real speech	-4.7 dB Pa	nominal	HFRP[1]	3GPP TS 26.132	16.2.0	8.4.5
						3GPP2 C.S0056- A	1.0	Note[2]
WB-044	TCLw (weighted terminal coupling loss)	P.501 compressed speech	-10 dBm0	maximum	HFRP[1]	3GPP TS 26.132	16.2.0	8.7.2
						3GPP2 C.S0056- A	1.0	Note[2]
WB-075*	Quality in presence of ambient noise: SMOS, NMOS, GMOS	real speech from TS 103 106	+1.3 dBPa	maximum	HFRP[1]	3GPP TS 26.132	16.2.0	8.12.2

Note 1: See section 2.4.2 (Device positioning Handheld Hands-free/Speakerphone mode for HFRP acceptable value).

Note 2: For 3GPP2 Test Cases; Handheld Hands-free mode is not in the scope of reference [4] and while testing should be carried out in a similar fashion and methodology as per reference [1] radio system setup shall be in compliance with reference [4]

* This test case should be covered with background noise conditions as specified in 3GPP TS 26.132.

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2.2.1.3 Headset Mode

Table 2.2-3 Wideband Headset Mode Test Cases and Applicable Settings

Headset Wideband Test Cases		Measurement Setup			Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Document	Rev.	Sect.
WB-060 / WB-061	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16 dBm0	nominal / maximum	3GPP TS 26.132	16.2.0	8.2.2.2
					3GPP2 C.S0056-A	1.0	Note[2]
WB-062	SLR (dB) - Sending Loudness Rating	P.501 real speech	-4.7 dBPa	nominal	3GPP TS 26.132	16.2.0	8.2.2.1
					3GPP2 C.S0056-A	1.0	Note[2]
WB-063	Idle Channel Noise SND	n/a[1]	n/a	nominal	3GPP TS 26.132	16.2.0	8.3.1
					3GPP2 C.S0056-A	1.0	Note[2]
WB-064	Idle Channel Noise RCV	n/a[1]	n/a	maximum	3GPP TS 26.132	16.2.0	8.3.2
					3GPP2 C.S0056-A	1.0	Note[2]
WB-065	RFR - Receive frequency response	P.501 real speech	-16 dBm0	nominal	3GPP TS 26.132	16.2.0	8.4.2
					3GPP2 C.S0056-A	1.0	Note[2]
WB-066	SFR - Send frequency response	P.501 real speech	-4.7 dBPa	nominal	3GPP TS 26.132	16.2.0	8.4.1
					3GPP2 C.S0056-A	1.0	Note[2]
WB-067	TCLw (weighted terminal coupling loss)	P.501compressed speech	-10 dBm0	maximum	3GPP TS 26.132	16.2.0	8.7.3
					3GPP2 C.S0056-A	1.0	Note[2]
WB-068	Round-trip Delay (ms)	single word	-4.7 dBPa	nominal	3GPP TS 26.132	16.2.0	8.10
					3GPP2 C.S0056-A	1.0	Note[2]
WB-069 / WB-070	STMR (Sidetone Masking Rating)	P.501 real speech	-4.7 dBPa	Nominal / maximum	3GPP TS 26.132	16.2.0	8.5.1.2
					3GPP2 C.S0056-A	1.0	Note[2]
WB-071	Sidetone delay	P.501 real speech	-4.7 dBPa	nominal	3GPP TS 26.132	16.2.0	8.5.4
					3GPP2 C.S0056-A	1.0	Note[2]

Note 1: A test signal, such as CSS bursts, may have to be intermittently applied to prevent 'silent mode' operation of the MS. Such a test signal should be documented by the tester, if used.

Note 2: For 3GPP2 Test Cases; Handheld Hands-free mode is not in the scope of reference [4] and while testing should be carried out in a similar fashion and methodology as per reference [1], radio system setup shall be in compliance with reference [4].

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2.2.1.4 Headset Interface Mode (Informative)

Table 2.2-4 Wideband Headset Interface Mode Test Cases and Applicable Settings

Headset Interface Wideband Test Cases		Measurement Setup			Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Document	Rev.	Sect.
WB-080 / WB-081	Level in Receive for Nominal speech input level	P.501 real speech	-16 dBm0	nominal / maximum	ITU-T P.381	4	7.1.4
WB-082	Level in Send for Nominal speech input Level	P.501 real speech	-60 dBV	nominal	ITU-T P.381	4	7.1.3
WB-083	Noise in Send	n/a[1]	n/a	nominal	ITU-T P.381	4	7.1.11
WB-084	Noise in Receive	n/a[1]	n/a	nominal	ITU-T P.381	4	7.1.12
WB-085	Receiving frequency response	P.501 real speech	-16 dBm0	nominal	ITU-T P.381	4	7.1.8
WB-086	Sending frequency response	P.501 real speech	-60 dBV	nominal	ITU-T P.381	4	7.1.7
WB-087	TCLw (weighted terminal coupling loss)	P.501 compressed speech	-10 dBm0	maximum	ITU-T P.381	4	7.1.18
WB-088	Delay (Send + Receive) (ms)	single word	-60 dBV	nominal	ITU-T P.381	4	7.1.2
WB-089 / WB-090	Sidetone Loss STMR	P.501 real speech	-60 dBV	nominal / maximum	ITU-T P.381	4	7.1.9
WB-091	Sidetone delay	P.501 real speech	-60 dBV	nominal	ITU-T P.381	4	7.1.10

Note 1: A test signal, such as CSS bursts, may have to be intermittently applied to prevent 'silent mode' operation of the MS. Such a test signal should be documented by the tester, if used.

Note 2: For 3GPP2 Test Cases; Headset mode is not in the scope of reference [4] and while testing should be carried out in a similar fashion and methodology as per reference [1] radio system setup shall be in compliance with reference [4]

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2.2.1.5 Additional Test Cases, Handset and Headset, for 3GPP Methods

Two additional test cases for each of Handset and Headset are added for 3GPP methods only.

Table 2.2-5 Wideband Additional Test Cases For 3gpp Methods In Handset And Headset Modes

Handset/Headset Wideband Test Cases		Measurement Setup				Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Appl. Force [N]	Document	Rev.	Sect.
WB-016	Handset Distortion, SND	Sinusoidal	5, 0, -4.7, -10, -15,-20 dBPa	nominal	8	3GPP TS 26.132	16.2.0	8.8.1
WB-017	Handset Distortion, RCV	Sinusoidal + activation	0, -3, -10, -16, -20, -30, -40, -45 dBm0	nominal	8	3GPP TS 26.132	16.2.0	8.8.2
WB-072	Headset Distortion, SND	Sinusoidal	5, 0, -4.7, -10, -15, -20 dBPa	nominal	n/a	3GPP TS 26.132	16.2.0	8.8.1
WB-073	Headset Distortion, RCV	Sinusoidal+ activation	0, -3, -10, -16, -20, -30, -40, -45 dBm0	nominal	n/a	3GPP TS 26.132	16.2.0	8.8.2

2.2.1.6 Wrist-worn Wearables Mode

Table 2.2-6 Wideband Wrist-Worn Wearables Mode Test Cases and Applicable Settings

Wearables Wideband Test Cases		Measurement Setup				Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Distance	Document	Rev.	Sect.
WB-078	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16 dBm0	maximum	HFRP[1]	3GPP TS 26.132	16.2.0	8.2.4.2
						3GPP2 C.S0056-A	1.0	Note[2]
WB-079	SLR (dB) - Sending Loudness Rating	P.501 real speech	-4.7 dBPa	nominal	HFRP[1]	3GPP TS 26.132	16.2.0	8.2.4.1
						3GPP2 C.S0056-A	1.0	Note[2]
WB-092	RFR - Receive frequency response	P.501 real speech	-16 dBm0	nominal	HFRP[1]	3GPP TS 26.132	16.2.0	8.4.6
						3GPP2 C.S0056-A	1.0	Note[2]
WB-093	SFR - Send frequency response	P.501 real speech	-4.7 dBPa	nominal	HFRP[1]	3GPP TS 26.132	16.2.0	8.4.5
						3GPP2 C.S0056-A	1.0	Note[2]
WB-094	TCLw (weighted terminal coupling loss)	P.501 compressed speech	-10 dBm0	maximum	HFRP[1]	3GPP TS 26.132	16.2.0	8.7.2
						3GPP2 C.S0056-A	1.0	Note[2]
WB-095*	Quality in presence of ambient noise: SMOS, NMOS, GMOS	Real speech	+1.3 dBPa	maximum	HFRP[1]	3GPP TS 26.132	16.2.0	8.12.2

Note 1: See section 2.4.4 (Device positioning Wrist-worn Wearables mode for HFRP acceptable value)

Note 2: For 3GPP2 Test Cases; Wearable Hands-free mode is not in the scope of reference [4], and while testing should be carried out in a similar fashion and methodology as per reference [1], radio system setup shall be in compliance with reference [4]

* This test case should be covered with background noise conditions as specified in 3GPP TS 26.132.

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2.2.2 LTE Wideband Radio Networks and Codecs (Normative)

For a device that supports AMR wideband functionality, testing shall be performed over LTE using AMR 12.65 kbps. The specific VoLTE radio carrier frequency and channel number tested shall be documented. Please refer to Appendix B for applicable Bands and Frequency details.

For a device that supports EVS wideband functionality, testing shall be performed over LTE using EVS 13.2 kbps CA. The specific VoLTE radio carrier frequency and channel number tested shall be documented. Please refer to Appendix B for applicable Bands and Frequency details.

2.2.3 CDMA Wideband Radio Networks and Codecs (Informative)

For a device that supports EVRC wideband, testing shall be performed on EVRC-NW SO-73 8.5 kbps in Radio Configuration 3. The specific VoLTE radio carrier frequency and channel number tested shall be documented. Please refer to Appendix B for applicable Bands and Frequency details.

2.2.4 UMTS Narrowband Radio Networks and Codecs (Informative)

For a device that supports AMR narrowband functionality, testing shall be performed over UMTS using AMR 12.65 kbps. The specific UMTS radio carrier frequency and channel number tested shall be documented. Please refer to Appendix B for applicable Bands and Frequency details.

Test SIMs/PRLs in non-RF shielded environments may be required on any type of device and shall be documented.

2.3 Super-wideband Test Cases

2.3.1 Test Cases for 3GPP Methods

Test cases for super-wideband are available from 3GPP, as noted in the tables below.

2.3.1.1 Handset Mode

Table 2.3-1 Super-Wideband Handset Mode Test Cases and Applicable Settings

Handset Super-Wideband Test Cases		Measurement Setup				Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Appl. Force [N]	Document	Rev.	Sect.
SWB-001	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16 dBm0	nominal	8	3GPP TS 26.132	16.2.0	9.2.2.2
SWB-002 / SWB-035	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16 dBm0	maximum	8 / 13	3GPP TS 26.132	16.2.0	9.2.2.2
SWB-036	RLR (dB) - Receive Loudness Rating in the presence of background noise	P.501 real speech / ETSI TS 103 224 or ES 202 396-1 Pub Noise	-16 dBm0	maximum	8	3GPP TS 26.132	16.2.0	9.2.2.3
SWB-003	SLR (dB) - Sending Loudness Rating	P.501 real speech	-4.7dBPa	nominal	8	3GPP TS 26.132	16.2.0	9.2.2.1
SWB-004	Idle Channel Noise SND	n/a[1]	n/a	nominal	8	3GPP TS 26.132	16.2.0	9.3.1
SWB-005	Idle Channel Noise RCV	n/a[1]	n/a	maximum	8	3GPP TS 26.132	16.2.0	9.3.2
SWB-006	RFR - Receive frequency response	P.501 real speech	-16 dBm0	nominal	8	3GPP TS 26.132	16.2.0	9.4.2
SWB-007	SFR - Send frequency response	P.501 real speech	-4.7 dBPa	nominal	8	3GPP TS 26.132	16.2.0	9.4.1
SWB-008	TCLw (weighted terminal coupling loss)	P.501 compressed speech	-10 dBm0	maximum	2	3GPP TS 26.132	16.2.0	9.7.3
SWB-011	Echo control characteristics	P.501 double-talk speech	-4.7dBPa	nominal	8	3GPP TS 26.132	16.2.0	9.11
SWB-009*	Quality in presence of ambient noise: SMOS, NMOS, GMOS	real speech	-1.7 dBPa	nominal	8	3GPP TS 26.132	16.2.0	9.12
SWB-010	Round-trip Delay (ms)	single word	-4.7 dBPa	nominal	8	3GPP TS 26.132	16.2.0	9.10
SWB-012	Max acoustic pressure	Peak Level[2]	+3 dBm0	maximum	13	IEEE 269	2010	7.13.1
SWB-013 / SWB-014	STMR (Sidetone Masking Rating)	P.501 real speech	-4.7 dBPa	nominal, F=8 / maximum, F=13		3GPP TS 26.132	16.2.0	9.5.1
SWB-015	Sidetone delay	P.501 real speech	-4.7 dBPa	nominal	8	3GPP TS 26.132	16.2.0	9.5.4
SWB-016**	Delay and speech quality with packet jitter and loss[3]	P.501 real speech	-4.7dBPa	nominal	8	3GPP TS 26.132	16.2.0	9.10.4
SWB-036	Handset Distortion, SND	Sinusoidal	5, 0, -4.7, -10, -15, -20 dBPa	nominal	8	3GPP TS 26.132	16.2.0	9.8.1
SWB-037	Handset Distortion, RCV	Sinusoidal + activation	0, -3, -10, -16, -20, -30, -40, -45 dBm0	nominal	8	3GPP TS 26.132	16.2.0	9.8.2
SWB-076**	Speech Quality (reference condition)	P.501 real speech	-4.7 dBPa	nominal	8	3GPP TS 26.132 ITU-T P.863	16.2.0	9.10.4

Note 1: A test signal, such as CSS bursts, may have to be intermittently applied to prevent 'silent mode' operation of the MS. Such a test signal should be documented by the tester, if used.

Note 2: The PeakLevel test signal from [4] is used for test case SWB-012.

Note 3: Test case for Voice over LTE only.

* This test case should be covered with background noise conditions as specified in 3GPP TS 26.132.

** This test cases should be covered with delay profiles as specified in in 3GPP TS 26.132

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2.3.1.2   Handheld Handsfree/Speakerphone Mode

Table 2.3-2 Super-Wideband Handheld Handsfree / Speakerphone Mode Test Cases and Applicable   Settings

HH Hands-free Super-Wideband Test Cases		Measurement Setup				Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Distance	Document	Rev.	Sect.
SWB-017	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16 dBm0	maximum	HFRP[1]	3GPP TS 26.132	16.2.0	9.2.4.2
SWB-018	SLR (dB) - Sending Loudness Rating	P.501 real speech	-4.7 dB Pa	nominal	HFRP[1]	3GPP TS 26.132	16.2.0	9.2.4.1
SWB-019	RFR - Receive frequency response	P.501 real speech	-16 dBm0	nominal	HFRP[1]	3GPP TS 26.132	16.2.0	9.4.6
SWB-020	SFR - Send frequency response	P.501 real speech	-4.7 dB Pa	nominal	HFRP[1]	3GPP TS 26.132	16.2.0	9.4.5
SWB-021	TCLw (weighted terminal coupling loss)	P.501 compressed speech	-10 dBm0	maximum	HFRP[1]	3GPP TS 26.132	16.2.0	9.7.2
SWB-022*	Quality in presence of ambient noise: SMOS, NMOS, GMOS	real speech from TS 103106	+1.3 dBPa	maximum	HFRP[1]	3GPP TS 26.132	16.2.0	9.12.2
Note 1: See section 2.4.2 (Device positioning Handheld Hands-free / Speakerphone mode for HFRP acceptable value).								
* This test case should be covered with background noise conditions as specified in 3GPP TS 26.132.								

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2.3.1.3 Headset Mode

Table 2.3-3 Super-Wideband Headset Mode Test Cases and Applicable Settings

Headset Super-Wideband Test Cases		Measurement Setup			Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Document	Rev.	Sect.
SWB-023 / SWB-024	RLR (dB) - Receive Loudness Rating	P.501 real speech	-16 dBm0	nominal / maximum	3GPP TS 26.132	16.2.0	9.2.2.2
SWB-025	SLR (dB) - Sending Loudness Rating	P.501 real speech	-4.7 dBPa	nominal	3GPP TS 26.132	16.2.0	9.2.2.1
SWB-026	Idle Channel Noise SND	n/a[1]	n/a	nominal	3GPP TS 26.132	16.2.0	9.3.1
SWB-027	Idle Channel Noise RCV	n/a[1]	n/a	maximum	3GPP TS 26.132	16.2.0	9.3.2
SWB-028	RFR - Receive frequency response	P.501 real speech	-16 dBm0	nominal	3GPP TS 26.132	16.2.0	9.4.2
SWB-029	SFR - Send frequency response	P.501 real speech	-4.7 dBPa	nominal	3GPP TS 26.132	16.2.0	9.4.1
SWB-030	TCLw (weighted terminal coupling loss)	P.501 compressed speech	-10 dBm0	maximum	3GPP TS 26.132	16.2.0	9.7.3
SWB-031	Round-trip Delay (ms)	single word	-4.7 dBPa	nominal	3GPP TS 26.132	16.2.0	9.10
SWB-032 / SWB-033	STMR (Sidetone Masking Rating)	P.501 real speech	-4.7 dBPa	nominal / maximum	3GPP TS 26.132	16.2.0	9.5.1.2
SWB-034	Sidetone delay	P.501 real speech	-4.7 dBPa	nominal	3GPP TS 26.132	16.2.0	9.5.4
SWB-072	Headset Distortion, SND	Sinusoidal	5, 0, -4.7, -10, -15, -20 dBPa	nominal	3GPP TS 26.132	16.2.0	9.8.1
SWB-073	Headset Distortion, RCV	Sinusoidal+ activation	0, -3, -10, -16, -20, -30, -40, -45 dBm0	nominal	3GPP TS 26.132	16.2.0	9.8.2

Note 1: A test signal, such as CSS bursts, may have to be intermittently applied to prevent 'silent mode' operation of the MS. Such a test signal should be documented by the tester, if used.

2.3.1.4   Headset Interface Mode (Informative)

Table 2.3-4 Super-Wideband Headset Interface Mode Test Cases and Applicable Settings

Headset Interface Super-Wideband Test Cases		Measurement Setup			Standards Reference for each Test ID		
Test ID	Parameter (Metric)	Test Signal	Level	DUT Volume Control	Document	Rev.	Sect.
SWB-080 / SWB-081	Level in Receive for Nominal speech input level	P.501 real speech	-16 dBm0	nominal / maximum	ITU-T P.381	4	7.1.4
SWB-082	Level in Send for Nominal speech input Level	P.501 real speech	-60 dBV	nominal	ITU-T P.381	4	7.1.3
SWB-083	Noise in Send	n/a[1]	n/a	nominal	ITU-T P.381	4	7.1.11
SWB-084	Noise in Receive	n/a[1]	n/a	nominal	ITU-T P.381	4	7.1.12
SWB-085	Receiving frequency response	P.501 real speech	-16 dBm0	nominal	ITU-T P.381	4	7.1.8
SWB-086	Sending frequency response	P.501 real speech	-60 dBV	nominal	ITU-T P.381	4	7.1.7
SWB-087	TCLw (weighted terminal coupling loss)	P.501 compressed speech	-10 dBm0	maximum	ITU-T P.381	4	7.1.18
SWB-088	Delay (Send + Receive) (ms)	single word	-60 dBV	nominal	ITU-T P.381	4	7.1.2
SWB-089 / SWB-090	Sidetone Loss STMR	P.501 real speech	-60 dBV	nominal / maximum	ITU-T P.381	4	7.1.9
SWB-091	Sidetone delay	P.501 real speech	-60 dBV	nominal	ITU-T P.381	4	7.1.10

Note 1: A test signal, such as CSS bursts, may have to be intermittently applied to prevent 'silent mode' operation of the MS. Such a test signal should be documented by the tester, if used.

Note 2: For 3GPP2 Test Cases; Headset mode is not in the scope of reference [4], and while testing should be carried out in a similar fashion and methodology as per reference [1], radio system setup shall be in compliance with reference [4]

2.3.2   LTE Super Wideband Radio Networks and Codecs (Normative)

For a device that supports EVS super wideband functionality, testing shall be performed over LTE using EVS 13.2 kbps CA. The specific VoLTE radio carrier frequency and channel number tested shall be documented. Please refer to Appendix B for applicable Bands and Frequency details.

Test SIMs/PRLs in non-RF shielded environments may be required on any type of device and shall be documented.

2.4 Device Positioning

2.4.1 Handset Mode

When testing a handset telephone, the device is mounted on the HATS in position and orientation as described in ITU-T P.64 [7] as per Annex E and the Manufacturers Ear Cap Reference Position. If no Ear Cap Position is declared by the Manufacturer, the Standard Position per Annex E shall be used. As defined in P.64 Annex E, the Standard Position angles A, B, and C are reproduced in Table 2.4-1. Note that the tolerance of these values is to within ±0.1°, as given by the precision of the values.

Table 2.4-1 Handset Standard Position Angles

Angle	Value [Degrees]
A	21.2
B	-12.9
C	2.3

For handsets where MECRP is provided, the values for Table P.64/E.1, reproduced below as Table 2.4-2, must be reported. See the user guide from the specific HATS' manufacturer for relative angle positioning.

Table 2.4-2 Table for Reporting MECRP Positioning Values

MECRP (Delta From Actual ECRP)	
Axis	**Delta [mm]**
ye	
ze	
Angle Settings	
Angle	Delta from standard angle [°]
A	
B	
C	

The artificial mouth shall conform to ITU-T P.58 [6]. The artificial ear shall conform to ITU-T P.57 [5]. Type 3.3 artificial ear shall be used. The applied force shall be as indicated in Table 2.1-1 and Table 2.2-1.

Note: Measurements of noise suppression performance in alternate positions may be desirable. The test report shall include details of handset position and orientation in accordance with Annex E of ITU-T P.64 [7].

For tests requiring a Nominal volume setting and a user controllable receive volume control is provided on the Device under test, the setting shall be chosen such that the nominal RLR of 2 dB is met as closely as

possible. For tests where a Maximum volume setting is required, the user controllable volume control shall be set to the maximum setting.

OEMs strive to meet the receiving frequency response mask at Nominal Receive volume, so in case the Receiving Frequency response is failing, MECRP values should be reconfirmed or the Device under Test slightly re-adjusted as the HATS artificial pinna is pliable and the Device may seal up the ear concha cavity, resulting in a bass heavy response. Alternatively, the Device may not seal well to the pinna and have a weak bass response, a remount or ever so slight adjustment may correct this. Reconfirm the Nominal RLR after any such adjustment and document settings.

2.4.2   Handheld Handsfree/Speakerphone Mode

When testing a handheld handsfree telephone, the device is mounted in the HATS HFRP in position and orientation as described in 3GPP TS 26.132 [1] as per Section 5.1.3.3. The distance dHF and the angle ΘHF between the HATS Reference point and the device display is defined by the Manufacturer; if no such position is declared a Standard Position of 42cm and angle of 0° will be used. Testing with HATS shall be in compliance with ITU-T P.581 [9]. The artificial mouth shall conform to ITU-T P.58 [6]. The artificial ear shall conform to ITU-T P.57 [5]. Type 3.3 artificial ear may be used.

2.4.3   Headset Mode

When testing a telephone including a headset, the headset is mounted in its recommended wearing position as described in 3GPP TS 26.132 [1] per Section 5.1.2 and per ITU-T P.380 [8] Clause 6. The OEM Device manufacturer should provide at least one Headset to be used for this test. For first time tests of headsets; 5 repeat measurements with refit of the headset in the pinna is recommended and the average of at least 3 consistent measurements be reported. The artificial mouth shall conform to ITU-TP.58 [6]. The artificial ear shall conform to ITU-T P.57 [5]. Type 3.3 artificial ear shall be used.

2.4.4   Wrist-worn Wearables Mode

When testing a wrist-worn wearables device, the device is mounted in front of the HATS, similar to the HATS HFRP, as shown in Figure 2.4-1. The distance from device to HATS lip-ring d_{LF} and the angle Θ_{LF} between the HATS lip-ring and the device is defined by the Manufacturer. If d_{LF} and Θ_{LF} are not defined by the manufacturer, then the distance d_{LF} and the angle Θ_{LF} between the HATS lip-ring and the device visual user interface should be 30cm and angle 0°. The artificial arm should be mounted parallel to the lip plane of the HATS, as shown in Figure 2.4-1 with the device visual   user interface positioned normal to the HATS lip plane.

The device under test should be mounted on an artificial arm, with dimensions consistent with [REF: relevant clause of OTA Test Plan] If the artificial arm is constructed of rigid material, it should be covered with a compliant material. A cloth of thickness 2±1 mm, or compliant material (Shore-A 25±10) of the same thickness should be used to cover the surface of the arm in vicinity of the device under test. The compliant material should be placed between the device and the arm, and sized so that the material extends at least 1 cm along the arm beyond each side of the device. The device should be mounted on the arm, on top of the compliant material, so that it can be repositioned intentionally, but not so tightly that the surface of the arm is deformed or that the device under test cannot be rotated or repositioned. Wrist-worn devices are often equipped with straps that provide for a discrete range of diameters. One approach is to select the tightest option and then open by one step to somewhat lessen the tightness of mounting.
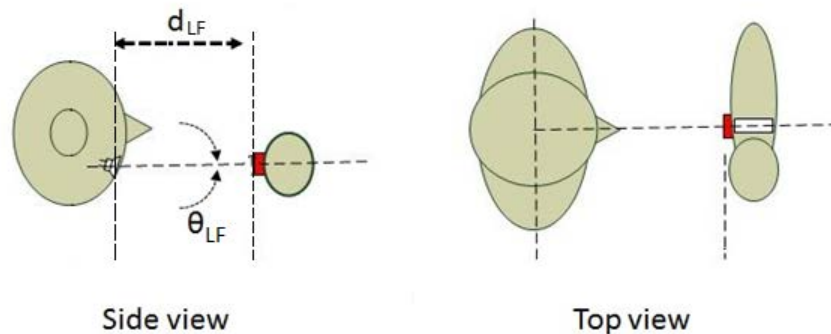
Figure 2.4-1 Figure Device Under Test (in Red) Mounted on Arm Positioned in Front of HATS

The artificial mouth shall conform to ITU-T P.58 [6]. The artificial ear shall conform to ITU-T P.57 [5]. Type 3.3 artificial ear may be used.

The HATS HFRP must be adjusted for the distance d_{LF}. If the distance d_{LF} of 30cm is used, the HFRP correction should be 16.0 dB.

2.5   Test Methods for Quality in the Presence of Ambient Noise

2.5.1   Speech Material

Appropriate speech material are referenced in Annex C of ETSI TS 103 106 [2]. Only the last 16 sentences are used for individual predictions, then the 16 numbers are averaged into per-condition scores. The first 4 sentences are used to secure a steady voice channel.

2.5.2   Background Noise Simulation and Spectral Validation

Background noise simulation is to be in accordance with ETSI ES 202 396-1 [3] for handsets, note the test room requirements in section 6.1. If an office type room is used, reverberation time should be in the interval 0.2 s < RT60 < 0.7 s between 100 Hz and 8 kHz, and noise floor should be below 30 dBSPL(A). Background noise types to be used are listed in Tables 2d and 2h of 3GPP TS 26.132 [1]. For hand-held speakerphones, the preferred background noise simulation is found in ETSI TS 103 224 [12]. Noise types are found in Tables 2d2 and 2h2.

In particular, reliable results require accurate simulation of background noise levels and power spectra. It is required to perform spectral validation for each noise type to be used. Spectral validation consists of recording the simulated background noise, and recording at the two HATS artificial ears. After appropriate application of Independent of Direction equalization to the DRP recordings, the measured power spectra are compared to the power spectra of the source noise signals, in 1/3rd octave bands. The measured power spectra shall be within ±3dB of the reference source power spectra.

A final check on the background noise simulation shall be conducted using the method described in Appendix A.

2.5.3   Measurement Procedure

Measurements shall follow the requirements in TS 103 106 [2], Section 9, with the background noise setup in accordance to ETSI ES 202 396-1 [3].

Appendix A   Verification Method for Background Noise Simulation

A.1   Objective

This method is based on 3GPP contribution S4-130400, Reference scores for 3Quest [A1]. The goal is to provide an additional validation of the background noise simulation.

A.2   Method

After the background noise simulation has been set up and verified to be in compliance with requirements in ETSI ES 202 396-1 [3] and the HATS properly equalized with speech levels set, recordings are taken using the method of ETSI TS 103 106 [2], but with measurement microphones used to provide the required 'processed' and 'unprocessed' signals. A measurement microphone placed at HATS MRP is used to provide the 'processed' signal (i.e., good SNR), while the HATS ear with ID equalization is used to provide the noisy 'unprocessed' signal (i.e., poor SNR).

The speech and noise levels are as referenced for Test Case NB-009 of Table A.2-1.One additional measurement is taken using speech but no additional background noise.

Reference scores using ETSI TS 103 106 [2] are computed in both wideband and narrowband modes, with the proxy 'processed' signal (recorded at MRP) filtered appropriately as in Table A.2-1. Both Highpass and Lowpass filters are applied to simulate the effect of the telephone channel of corresponding bandwidth. No filter (other than ID equalization) is applied to the proxy 'unprocessed" signal (recorded at DRP).

Table A.2-1 Filters for Reference Scores

Test Case	Highpass Filter	Lowpass Filter
Narrowband	4th order, at 100 Hz	4th order, at 4000 Hz
Wideband	4th order, at 100 Hz	4th order, at 8000 Hz

Reference scores should be within ±0.2 MOS of the values in Table A.2-2 for Narrowband and Table A.2-3 for wideband. Filenames are taken from ETSI ES 202 396-1 [3].

Table A.2-2 Reference Scores for Narrowband

Condition	Filename	SMOS	NMOS
Recording in pub	Pub_Noise_binaural_V2	3.1	2.0
Recording at pavement	Outside_Traffic_Road_binaural	3.0	1.9
Recording at pavement	Outside_Traffic_Crossroads_binaural	3.3	2.5
Recording at departure platform	Train_Station_binaural	3.4	2.4
Recording at the drivers position	Fullsize_Car1_130Kmh_binaural	3.8	2.4
Recording at sales counter	Cafeteria_Noise_binaural	3.9	2.5
Recording in a cafeteria	Mensa_binaural	4.1	2.7
Recording in business office	Work_Noise_Office_Callcenter_binaural	4.3	3.1
Quiet	<none>	4.7	3.9

Table A.2-3 Reference Scores for Wideband [From [A2]]

Condition	Filename	SMOS	NMOS
Recording in pub	Pub_Noise_binaural_V2	4.2	2.4
Recording at pavement	Outside_Traffic_Road_binaural	3.3	2.6
Recording at pavement	Outside_Traffic_Crossroads_binaural	4.3	2.3
Recording at departure platform	Train_Station_binaural	4.3	3.0
Recording at the drivers position	Fullsize_Car1_130Kmh_binaural	4.4	2.8
Recording at sales counter	Cafeteria_Noise_binaural	4.4	2.8
Recording in a cafeteria	Mensa_binaural	4.5	3.1
Recording in business office	Work_Noise_Office_Callcenter_binaural	4.6	3.4
Quiet	<none>	4.6	4.3

A.3　References

[A1] S4-130400, Reference scores for 3Quest, Qualcomm, 3GPP SA4#73, 15-19 March 2013, Qingdao, China [http://www.3gpp.org/ftp/tsg_sa/WG4_CODEC/TSGS4_73/Docs/S4-130400.zip].

[A2] S4-131124, Summary of reference scores for ETSI TS 103 106, Qualcomm, 3GPP SA4#75, 23-27 September 2013, Vancouver, CA. [http://www.3gpp.org/ftp/tsg_sa/WG4_CODEC/TSGS4_75/Docs/S4-131124.zip]

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Appendix B   Radio Network and Codec Information

See the Excel spreadsheet *Appendix B_Radio Network and Codec Information.xls.* in the Attachments area of the PDF file.

Appendix C   Revision History

Date	Version	Description
November 2014	1.0	Initial release
May 2016	1.1	• Added LTE to list of transmission technologies • Updated references to 3GPP Release 13 • Corrected citation for max acoustic pressure test NB- 012 and clarified test signal • Added wideband test cases section 2.2 Clarified language in Device Positioning section 2.3
December 2016	2.0	• Changed title to Speech Performance Recommendations • Added super-wideband test cases, section 2.3 • Added handset speech delay and quality with jitter and packet loss, test cases NB-074 and WB-074 Added background noise for hand-held speakerphone, NB-075 and WB-075
January 2018	2.1	• Added Speech Quality P.863 for Handset, test cases NB-076, WB-076 and SWB-076 • Added Background Noise for Super-wideband speech, test cases SWB-009 and SWB-022 • Added Distortion for Super-wideband speech, test cases SWB-036, SWB-037, SWB-072, SWB-073 • Added Handset Bandwidth extension, test case WB- 077 • Added Headset Interface testing as sections 2.1.1.4, 2.2.1.4 and 2.3.1.4, test cases NB-080 – NB-091, WB- 080 – WB-091, and SWB-080 – SWB-091 • Added Wearables Mode testing as sections 2.1.1.6, 2.2.1.6 and 2.4.4, test cases NB-077 – NB-079, NB-092 – NB-094, WB-078 – WB-079, and WB-092 – WB-095. Updated references to 3GPP Release 14, and latest revision of referenced standards. Added Standard [16] in section 1.3.
April 2019	2.1.1	• Changed title to Speech Performance Test Plan • Added Radio Network and Codec Information to Appendix B • Added super-wideband reference to sections 1.1 and 1.2. • Categorized all the sections as normative and informative. Headset interface mode sections are categorized as informative and unmarked sections are categorized normative. • Added notes referring to 3GPP TS 26.132 based background noise conditions in the applicable sections with "Delay and speech quality with packet jitter and loss" test cases. • Added notes referring to 3GPP TS 26.132 based delay profiles in the applicable sections with "Speech quality" test cases. • Updated NB/WB/SWB Radio Network and Codec sections with codec details. Included Appendix B with additional details on bands and codecs. • Updated Wrist-worn Wearables Mode section 2.4.4 with device positioning change.
December 2019	2.2	• Revised 3GPP2 requirements in Notes in Section 2.1.1.3, 2.1.1.6, 2.2.1.2, 2.2.1.3, 2.2.1.4, 2.2.1.6, 2.3.1.4.
July 2020	2.3	• Updated references to 3GPP Release 16.2.0

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