

SLOVENSKI STANDARD
SIST EN 300 175-8 V2.9.1:2022
01-maj-2022

**Digitalne izboljšane brezvrvične telekomunikacije (DECT) - Skupni vmesnik (CI) - 8.
del: Kodiranje in prenos govora in zvoka**

Digital Enhanced Cordless Telecommunications (DECT) - Common Interface (CI) - Part
8: Speech and audio coding and transmission

**iTeh STANDARD
PREVIEW
(standards.iteh.ai)**

**Ta slovenski standard je istoveten z: ETSI EN 300 175-8 V2.9.1 (2022-03)
SIST EN 300 175-8 V2.9.1:2022**

<https://standards.iteh.ai/catalog/standards/sist/2a529b6d-53d4-45bd-9124-deb86e7a4ccf/sist-en-300-175-8-v2-9-1-2022>

ICS:

33.070.30	Digitalne izboljšane brezvrvične telekomunikacije (DECT)	Digital Enhanced Cordless Telecommunications (DECT)
35.040.40	Kodiranje avdio, video, multimedijskih in hipermedijskih informacij	Coding of audio, video, multimedia and hypermedia information

SIST EN 300 175-8 V2.9.1:2022

en

**iTeh STANDARD
PREVIEW
(standards.iteh.ai)**

SIST EN 300 175-8 V2.9.1:2022
<https://standards.iteh.ai/catalog/standards/sist/2a529b6d-53d4-45bd-9124-deb86e7a4ccf/sist-en-300-175-8-v2-9-1-2022>

ETSI EN 300 175-8 v2.9.1 (2022-03)



**Digital Enhanced Cordless Telecommunications (DECT);
Common Interface (CI);
Part 8: Speech and audio coding and transmission**
(standards.iteh.ai)

SIST EN 300 175-8 V2.9.1:2022
<https://standards.iteh.ai/catalog/standards/sist/2a529b6d-53d4-45bd-9124-deb86e7a4ccf/sist-en-300-175-8-v2-9-1-2022>

Reference
REN/DECT-00358

Keywords
7 kHz, audio, broadband, codec, DECT, handsfree, IMT-2000, loudspeaking, mobility, narrowband, quality, radio, speech, TDD, TDMA, telephony, terminal

<i>ETSI</i>
650 Route des Lucioles F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

Important notice

The present document can be downloaded from:
<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at
<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommitteeSupportStaff.aspx>

If you find a security vulnerability in the present document, please report it through our
Coordinated Vulnerability Disclosure Program:
<https://www.etsi.org/standards/coordinated-vulnerability-disclosure>

Notice of disclaimer & limitation of liability

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.
In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.
The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2022.
All rights reserved.

Contents

Intellectual Property Rights	16
Foreword.....	16
Modal verbs terminology.....	16
1 Scope	17
2 References	17
2.1 Normative references	17
2.2 Informative references.....	19
3 Definition of terms, symbols and abbreviations.....	21
3.1 Terms.....	21
3.2 Symbols.....	23
3.3 Abbreviations	23
4 Configurations.....	25
4.1 Reference configuration	25
4.1.1 Basic configuration	25
4.1.2 Portable Part (PP)	26
4.1.2.1 Functional organization.....	26
4.1.2.2 Volume control	27
4.1.3 Fixed Part (FP).....	27
4.1.3.1 Digital interface.....	27
4.1.3.2 Analog interface.....	28
4.1.3.3 FP adaptive volume control	29
4.1.3.4 Voice over IP (VoIP) interface.....	29
4.2 Test configurations	30
5 Encoding.....	30
5.0 General	30
5.1 32 kbit/s full term (ADPCM) G.726	30
5.1.1 Algorithm... https://standards.itech.ai/catalog/standards/sist/2a529b6d-53d4-45bd-9124-deb86e7a4ccf/sist-en-300-175-8-v2.9	30
5.1.2 Bit sequence 53d4-45bd-9124-deb86e7a4ccf/sist-en-300-175-8-v2.9	30
5.1.3 Characteristics of G.726 ADPCM codec	30
5.2 64 kbit/s PCM G.711	31
5.2.1 Algorithm.....	31
5.2.2 Bit sequence.....	31
5.2.3 Characteristics of G.711 PCM codec	31
5.2.4 Automatic detection of FAX/modem tone and switch to G.711	31
5.3 Wideband speech codec G.722 at 64 kbit/s	31
5.3.0 General.....	31
5.3.1 Algorithm.....	31
5.3.2 Bit sequence.....	32
5.3.3 Characteristics of G.722 wideband codec.....	32
5.3.4 Optional Packet Loss Concealment algorithm (PLC)	32
5.4 Wideband speech codec G.729.1 up to 32 kbit/s.....	33
5.4.1 Algorithm.....	33
5.4.2 Bit sequence.....	33
5.4.3 Characteristics of G.729.1 codec	33
5.4.4 Packet Loss Concealment algorithm (PLC).....	33
5.4.5 Supported bit rate in DECT	34
5.5 Super-wideband MPEG-4 speech and audio coding	34
5.5.1 Algorithm.....	34
5.5.2 64 kbit/s, MPEG-4 ER AAC-LD codec	34
5.5.3 32 kbit/s, MPEG-4 ER AAC-LD codec	35
5.6 Narrowband, wideband, super-wideband, fullband, FBHR and ultra-band LC3plus speech and audio coding	35
5.6.1 Algorithm.....	35
5.6.2 NB mode at 32 kbit/s gross bit rate and 10 ms frame size	36

5.6.3	WB mode at 32 kbit/s gross bit rate and 10 ms frame size	36
5.6.4	SWB mode at 64 kbit/s gross bit rate and 10 ms frame size	37
5.6.5	FB mode at 64 kbit/s gross bit rate and 10 ms frame size.....	37
5.6.6	FB mode at 96 kbit/s gross bit rate and 10 ms frame size.....	37
5.6.7	FB mode at 128 kbit/s gross bit rate and 10 ms frame size.....	38
5.6.8	FB mode at 128 kbit/s gross bit rate and 5 ms frame size.....	38
5.6.9	FB mode at 160 kbit/s gross bit rate and 5 ms frame size.....	38
5.6.10	FB mode at 192 kbit/s gross bit rate and 5 ms frame size.....	39
5.6.11	FB mode at 128 kbit/s gross bit rate and 2,5 ms frame size.....	39
5.6.12	FB mode at 256 kbit/s gross bit rate and 2,5 ms frame size.....	39
5.6.13	FBLFE mode at 32 kbit/s gross bit rate and 10 ms frame size.....	39
5.6.14	FBLFE mode at 64 kbit/s gross bit rate and 5 ms frame size.....	40
5.6.15	FB stereo mode at 128 kbit/s gross bit rate and 10 ms frame size	40
5.6.16	FB stereo mode at 256 kbit/s gross bit rate and 5 ms frame size	40
5.6.17	FB stereo mode at 320 kbit/s gross bit rate and 2,5 ms frame size	40
5.6.18	FB stereo mode at 512 kbit/s gross bit rate and 2,5 ms frame size	41
5.6.19	FBHR mode at 128 kbit/s gross bit rate and 10 ms frame size	41
5.6.20	FBHR mode at 160 kbit/s gross bit rate and 10 ms frame size	41
5.6.21	FBHR mode at 192 kbit/s gross bit rate and 10 ms frame size	41
5.6.22	UBHR mode at 160 kbit/s gross bit rate and 10 ms frame size.....	42
5.6.23	UBHR mode at 192 kbit/s gross bit rate and 10 ms frame size.....	42
5.6.24	UBHR mode at 256 kbit/s gross bit rate and 10 ms frame size.....	42
5.6.25	UBHR mode at 320 kbit/s gross bit rate and 10 ms frame size.....	42
6	Transmission aspects.....	43
6.1	Relative level.....	43
6.2	Acoustic reference level	43
6.3	Volume control.....	43
7	Audio specifications	43
7.1	Overall description	43
7.1.1	Introduction to DECT audio specifications	43
7.1.2	Introduction to the audio types	43
7.1.3	List of Audio types	44
7.1.4	Audio types for Portable Parts	45
7.1.5	Audio types for Fixed Parts	46
7.1.6	Complete DECT system	46
7.1.7	Structure of the specification of the audio types	47
7.1.8	Audio Types and codecs	55
7.1.9	Audio Types and physical interfaces	55
7.2	Audio types applicable to Portable Parts	55
7.2.0	General.....	55
7.2.1	Performance levels of DECT Portable Parts (handsets).....	55
7.2.2	Type 0: Reference PP (RePP)	57
7.2.3	PP Type 1a: "Classic" GAP narrowband handset	57
7.2.3.1	Introduction	57
7.2.3.2	Compatible services and codecs	57
7.2.3.3	Specification.....	57
7.2.4	PP Type 1b: "Improved" GAP narrowband handset	58
7.2.4.1	Introduction	58
7.2.4.2	Compatible services and codecs	58
7.2.4.3	Specification.....	58
7.2.5	PP Type 1c: HATS-tested "standard" narrowband handset	58
7.2.5.1	Introduction	58
7.2.5.2	Compatible services and codecs	58
7.2.5.3	Specification.....	58
7.2.6	PP Type 1d: HATS-tested "improved" narrowband handset	59
7.2.6.1	Introduction	59
7.2.6.2	Compatible services and codecs	59
7.2.6.3	Specification.....	59
7.2.7	PP Type 3a: HATS tested narrowband "standard" loudspeaking handsfree	59
7.2.7.1	Introduction	59

iTeh STANDARD PREVIEW (standards.itech.ai)

7.2.7.2	Compatible services and codecs.....	60
7.2.7.3	Specification.....	60
7.2.8	PP Type 3b: HATS tested narrowband "improved" loudspeaking handsfree	60
7.2.8.1	Introduction.....	60
7.2.8.2	Compatible services and codecs.....	60
7.2.8.3	Specification.....	60
7.2.9	PP Type 2a: P.311-tested wideband handset.....	60
7.2.9.1	Introduction.....	60
7.2.9.2	Compatible services and codecs.....	60
7.2.9.3	Specification.....	60
7.2.10	PP Type 2b: HATS-tested "standard" wideband handset or headset	61
7.2.10.1	Introduction.....	61
7.2.10.2	Compatible services and codecs.....	61
7.2.10.3	Specification.....	61
7.2.11	PP Type 2c: HATS tested "improved" wideband handset or headset	61
7.2.11.1	Introduction.....	61
7.2.11.2	Compatible services and codecs.....	61
7.2.11.3	Specification.....	61
7.2.12	PP Type 4a: HATS tested wideband "standard" loudspeaking handsfree	62
7.2.12.1	Introduction.....	62
7.2.12.2	Compatible services and codecs.....	62
7.2.12.3	Specification.....	62
7.2.13	PP Type 4b: HATS tested wideband "improved" loudspeaking and handsfree	62
7.2.13.1	Introduction.....	62
7.2.13.2	Compatible services and codecs.....	62
7.2.13.3	Specification.....	62
7.2.14	PP Type 5a: super-wideband 14 kHz handset or headset.....	63
7.2.14.1	Introduction.....	63
7.2.14.2	Compatible services and codecs.....	63
7.2.14.3	Specification.....	63
7.2.15	PP Type 5b: super-wideband 14 kHz loudspeaking handsfree	63
7.2.15.1	Introduction.....	63
7.2.15.2	Compatible services and codecs.....	63
7.2.15.3	Specification.....	63
7.2.16	PP Type 6: PPs with external 2 wire, 3,1 kHz telephony interface	63
7.2.16.1	https://standards.etsi.org/etsiloc/standards/sist/2a529b6d-53d4-45bd-9124-deb86e7a4ccf/sist-en-300-175-8-v2-9-1-2022	63
7.2.16.2	Introduction.....	63
7.2.16.3	Compatible services and codecs.....	63
7.2.17	PP Type 7a: fullband 20 kHz handset or headset.....	63
7.2.17.1	Introduction.....	63
7.2.17.2	Compatible services and codecs.....	64
7.2.17.3	Specification.....	64
7.2.18	PP Type 7b: fullband 20 kHz loudspeaking handsfree	64
7.2.18.1	Introduction.....	64
7.2.18.2	Compatible services and codecs.....	64
7.2.18.3	Specification.....	64
7.2.19	PP Type 7c, d, e, f: fullband 20 kHz stereo audio device	64
7.2.19.1	Introduction.....	64
7.2.19.2	Compatible services and codecs.....	64
7.2.19.3	Specification.....	64
7.2.20	PP Type 7g: FBHR 24 kHz headset device	65
7.2.20.1	Introduction.....	65
7.2.20.2	Compatible services and codecs.....	65
7.2.20.3	Specification.....	65
7.2.21	PP Type 7h: FBHR 24 kHz loudspeaking device	65
7.2.21.1	Introduction.....	65
7.2.21.2	Compatible services and codecs.....	65
7.2.21.3	Specification.....	65
7.2.22	PP Type 7i: FBLFE 250 Hz loudspeaking device	65
7.2.22.1	Introduction.....	65
7.2.22.2	Compatible services and codecs.....	65
7.2.22.3	Specification.....	65

7.2.23	PP Type 7j: fullband 20 kHz low-latency microphone device.....	65
7.2.23.1	Introduction.....	65
7.2.23.2	Compatible services and codecs.....	65
7.2.23.3	Specification.....	66
7.2.24	PP type 8a: ultra-band 48 kHz headset device	66
7.2.24.1	Introduction.....	66
7.2.24.2	Compatible services and codecs.....	66
7.2.24.3	Specification.....	66
7.2.25	PP type 8b: ultra-band 48 kHz loudspeaking device	66
7.2.25.1	Introduction.....	66
7.2.25.2	Compatible services and codecs.....	66
7.2.25.3	Specification.....	66
7.3	Audio transmission types applicable to Fixed Parts	66
7.3.0	General.....	66
7.3.1	FP Type 0: Reference FP (ReFP).....	67
7.3.2	FP Type 1a: "classical" Fixed Part for ISDN Network	67
7.3.2.1	Introduction.....	67
7.3.2.2	Compatible services and codecs.....	67
7.3.2.3	Specifications	68
7.3.2.3.1	Transcoding and equalization.....	68
7.3.2.3.2	PP type detection	68
7.3.2.3.3	Activation of audio processing functions	68
7.3.2.3.4	Transmission specification	68
7.3.3	FP Type 1b: Fixed Part for ISDN Network	69
7.3.3.1	Introduction.....	69
7.3.3.2	Compatible services and codecs.....	69
7.3.3.3	Specification.....	69
7.3.3.3.1	Transcoding and equalization.....	69
7.3.3.3.2	PP type detection	69
7.3.3.3.3	Activation of audio processing functions	70
7.3.3.3.4	Transmission specification	70
7.3.4	FP Type 2: FP with analog 2-wire interface, 3,1 kHz service	70
7.3.4.1	Introduction.....	70
7.3.4.2	Compatible services, physical interfaces and codecs	70
7.3.4.3	Specification.....	71
7.3.4.3.1	https://standards.iteh.ai/catalog/standards/sist/2a529b6d-5344-45bd-9124-dcb86e7a4cf/sist-en-300-175-8-v2-9-1-2022	71
7.3.4.3.2	Transcoding, equalization and conversion	71
7.3.4.3.3	PP type detection and activation of audio processing functions	71
7.3.4.3.4	Transmission specification	71
7.3.5	FP Type 3: VoIP narrowband Fixed Part.....	71
7.3.5.1	Introduction.....	71
7.3.5.2	Compatible services, physical interfaces and codecs	71
7.3.5.3	Specification.....	72
7.3.5.3.1	Transcoding and equalization	72
7.3.5.3.2	PP type detection	72
7.3.5.3.3	Activation of audio processing functions	73
7.3.5.3.4	Transmission specification	73
7.3.6	FP Type 4: ISDN wideband Fixed Part	73
7.3.6.1	Introduction.....	73
7.3.6.2	Compatible services and codecs	73
7.3.6.3	Specification.....	74
7.3.6.3.1	Transcoding and equalization	74
7.3.6.3.2	PP type detection	74
7.3.6.3.3	Activation of audio processing functions	74
7.3.6.3.4	Transmission specification	74
7.3.7	FP Type 5: VoIP wideband, super-wideband, FBHR, fullband or ultra-band Fixed Part.....	75
7.3.7.1	Introduction.....	75
7.3.7.2	Compatible services, physical interfaces and codecs	75
7.3.7.3	Specification.....	75
7.3.7.3.1	Transcoding and equalization	75
7.3.7.3.2	PP type detection	76
7.3.7.3.3	Activation of audio processing functions	76
7.3.7.3.4	Transmission specification	76

7.3.8	FP Type 6a: FP handling an Internal call inside a DECT FP (any service)	77
7.3.8.1	Introduction	77
7.3.8.2	Compatible services, physical interfaces and codecs	77
7.3.8.3	Specification	77
7.3.9	FP Type 6b: FP handling an n-party conference inside a DECT FP (any service)	77
7.3.9.1	Introduction	77
7.3.9.2	Compatible services, physical interfaces and codecs	77
7.3.9.3	Specification for the conference bridge	77
7.3.10	FP Type 7: DECT Repeater Part (REP)	78
7.3.10.1	Introduction	78
7.3.10.2	Compatible services, physical interfaces and codecs	78
7.3.10.3	Specification	78
7.4	Additional features	78
7.4.1	Introduction	78
7.4.2	Echo canceller in Fixed Part	79
7.4.3	Echo suppressor in Fixed Part	79
7.5	Transmission characteristics for Portable Parts	80
7.5.1	Transmission characteristics for Portable Part type 1a ("Classic GAP" handset)	80
7.5.1.1	PP frequency responses	80
7.5.1.1.1	Sending	80
7.5.1.1.2	Receiving	80
7.5.1.2	PP sending and receiving loudness ratings	81
7.5.1.2.1	Nominal values	81
7.5.1.2.2	User-controlled volume control in PP	81
7.5.1.2.3	PP adaptive volume control	82
7.5.1.3	Sidetone	82
7.5.1.3.1	Talker sidetone	82
7.5.1.3.2	Listener sidetone	82
7.5.1.4	Terminal coupling loss	83
7.5.1.4.1	Weighted Terminal Coupling Loss (TCLw)	83
7.5.1.4.2	Stability loss	83
7.5.1.5	Distortion	84
7.5.1.5.1	Sending	84
7.5.1.5.2	Receiving	84
7.5.1.5.3	Sidetone	84
7.5.1.6	Out-of-band signals	84
7.5.1.6.1	Sending (discrimination against out of band input signals)	84
7.5.1.6.2	Receiving (spurious out of band signals)	85
7.5.1.7	Noise	85
7.5.1.7.1	Sending	85
7.5.1.7.2	Band-limited noise	85
7.5.1.7.3	Receiving	85
7.5.1.7.4	Level of sampling frequency (receiving)	85
7.5.1.8	Acoustic shock	86
7.5.1.8.0	General	86
7.5.1.8.1	Continuous signal	86
7.5.1.8.2	Peak signal	86
7.5.1.9	PP Delay	86
7.5.1.10	PP ambient noise rejection	86
7.5.2	Additional requirements for PP type 1b ("improved GAP" handset)	86
7.5.2.0	General	86
7.5.2.1	Terminal coupling loss	87
7.5.2.1.1	Weighted Terminal Coupling Loss (TCLw)	87
7.5.2.2	Attenuation Range in Sending Direction during Double Talk $A_{H,S,dt}$	87
7.5.2.3	Attenuation Range in Receiving Direction during Double Talk $A_{H,R,dt}$	87
7.5.2.4	Activation in Sending Direction	88
7.5.2.5	Activation in Receiving Direction	88
7.5.3	Transmission characteristics for PP types 1c and 1d (HATS tested, narrowband telephony handsets)	89
7.5.3.1	Frequency responses	89
7.5.3.1.1	Sending	89
7.5.3.1.2	Receiving	90
7.5.3.2	Sending and receiving loudness ratings	92

7.5.3.2.1	Nominal values	92
7.5.3.2.2	Void.....	92
7.5.3.2.3	Void.....	92
7.5.3.2.4	Microphone mute.....	93
7.5.3.2.5	Positional robustness	93
7.5.3.2.6	Send Loudness Level.....	93
7.5.3.2.7	Receive Loudness Level	93
7.5.3.3	Sidetone.....	94
7.5.3.3.1	Sidetone masking rating (STMR).....	94
7.5.3.3.2	Void.....	94
7.5.3.3.3	Sidetone delay	94
7.5.3.4	Terminal coupling loss	94
7.5.3.4.1	Terminal Coupling Loss weighted (TCLw).....	94
7.5.3.4.2	Stability loss	94
7.5.3.5	Distortion	95
7.5.3.5.1	Sending Distortion.....	95
7.5.3.5.2	Receiving Distortion.....	95
7.5.3.6	Out-of-band signals	95
7.5.3.6.1	Out-of-band Signals in Send direction	95
7.5.3.6.2	Out-of-band signals in receiving direction	96
7.5.3.7	Noise	96
7.5.3.7.1	Sending.....	96
7.5.3.7.2	Receiving.....	96
7.5.3.8	Acoustic shock	97
7.5.3.8.0	General	97
7.5.3.8.1	Continuous signal	97
7.5.3.8.2	Void.....	97
7.5.3.9	Delay	97
7.5.3.10	Void.....	97
7.5.3.11	Double Talk Performance	97
7.5.3.11.0	General	97
7.5.3.11.1	Attenuation Range in Sending Direction during Double Talk $A_{H,S,dt}$	98
7.5.3.11.2	Attenuation Range in Receiving Direction during Double Talk $A_{H,R,dt}$	98
7.5.3.11.3	Detection of Echo Components during Double Talk	99
7.5.3.11.4	Minimum activation level and sensitivity of double talk detection	99
7.5.3.12	Switching characteristics.....	99
7.5.3.12.0	General	1-2022
7.5.3.12.1	Activation in Sending Direction	100
7.5.3.12.2	Activation in Receiving Direction	100
7.5.3.12.3	Silence Suppression and Comfort Noise Generation	100
7.5.3.12.4	Performance in sending direction in the presence of background noise	100
7.5.3.12.5	Speech Quality in the Presence of Background Noise	101
7.5.3.12.6	Quality of Background Noise Transmission (with Far End Speech)	101
7.5.3.12.7	Void.....	101
7.5.3.12.8	Positional Robustness of Speech Quality in the Presence of Background Noise	101
7.5.3.13	Quality of echo cancellation.....	102
7.5.3.13.0	General	102
7.5.3.13.1	Temporal echo effects	102
7.5.3.13.2	Spectral Echo Attenuation	102
7.5.3.13.3	Variable echo path	102
7.5.4	Transmission characteristics for PP types 3a and 3b (narrowband loudspeaking and handsfree devices)	103
7.5.4.1	Sending sensitivity/frequency response	103
7.5.4.2	Receive sensitivity/frequency response.....	104
7.5.4.3	Send loudness rating	105
7.5.4.4	Receive loudness rating	106
7.5.4.5	Sending distortion	106
7.5.4.6	Receiving distortion	107
7.5.4.7	Out-of-band signals in sending direction	107
7.5.4.8	Out-of-band signals in receiving direction	108
7.5.4.9	Sending noise	108
7.5.4.10	Receiving noise	108

7.5.4.11	Terminal Coupling Loss weighted (TCLw)	108
7.5.4.12	Stability Loss.....	109
7.5.4.13	Double Talk Performance	109
7.5.4.13.0	General	109
7.5.4.13.1	Attenuation Range in Sending Direction during Double Talk $A_{H,S,dt}$	109
7.5.4.13.2	Attenuation Range in Receiving Direction during Double Talk $A_{H,R,dt}$	110
7.5.4.13.3	Detection of Echo Components during Double Talk.....	110
7.5.4.13.4	Minimum activation level and sensitivity of double talk detection	111
7.5.4.14	Switching characteristics.....	111
7.5.4.14.0	General	111
7.5.4.14.1	Activation in Sending Direction	111
7.5.4.14.2	Activation in Receiving Direction	112
7.5.4.14.3	Silence Suppression and Comfort Noise Generation.....	112
7.5.4.14.4	Performance in sending direction in the presence of background noise	112
7.5.4.14.5	Speech Quality in the Presence of Background Noise.....	112
7.5.4.14.6	Quality of Background Noise Transmission (with Far End Speech).....	113
7.5.4.15	Quality of echo cancellation.....	113
7.5.4.15.0	General	113
7.5.4.15.1	Temporal echo effects	113
7.5.4.15.2	Spectral Echo Attenuation.....	113
7.5.4.15.3	Variable echo path.....	114
7.5.4.16	Microphone mute	114
7.5.4.17	Delay	114
7.5.4.18	Send Loudness Level	115
7.5.4.19	Receive Loudness Level	115
7.5.5	Transmission characteristics for PP type 2a (P.311 tested, wideband handset)	116
7.5.5.0	General	116
7.5.5.1	Sending characteristics	116
7.5.5.1.1	Loudness rating	116
7.5.5.1.2	Sensitivity/frequency characteristics	116
7.5.5.1.3	Noise.....	116
7.5.5.1.4	Distortion.....	116
7.5.5.1.5	Discrimination against out-of-band input signals	116
7.5.5.2	Receiving characteristics	117
7.5.5.2.1	Loudness rating	117
7.5.5.2.2	Sensitivity/frequency characteristics	117
7.5.5.2.3	Noise.....	117
7.5.5.2.4	Distortion.....	117
7.5.5.2.5	Spurious out-of-band receiving signals	118
7.5.5.3	Sidetone characteristics	118
7.5.5.3.1	Talker sidetone	118
7.5.5.3.2	Sidetone distortion.....	118
7.5.5.4	Echo path loss characteristics.....	118
7.5.5.4.1	Weighted terminal coupling loss	118
7.5.5.4.2	Stability loss	118
7.5.6	Transmission characteristics for PP type 2b and 2c (HATS tested wideband handsets)	119
7.5.6.1	Frequency responses	119
7.5.6.1.1	Sending	119
7.5.6.1.2	Receiving.....	120
7.5.6.2	Send and receive loudness ratings.....	123
7.5.6.2.1	Nominal values	123
7.5.6.2.2	Void.....	123
7.5.6.2.3	Void.....	123
7.5.6.2.4	Microphone mute.....	123
7.5.6.2.5	Positional robustness	124
7.5.6.2.6	Send Loudness Level.....	124
7.5.6.2.7	Receive Loudness Level.....	124
7.5.6.3	Sidetone.....	124
7.5.6.3.1	Sidetone masking rating (STMR).....	124
7.5.6.3.2	Void.....	125
7.5.6.3.3	Sidetone delay	125
7.5.6.4	Terminal coupling loss	125

7.5.6.4.1	Terminal Coupling Loss (TCL)	125
7.5.6.4.2	Stability loss	125
7.5.6.5	Distortion	126
7.5.6.5.1	Sending Distortion.....	126
7.5.6.5.2	Receiving Distortion.....	126
7.5.6.6	Noise	126
7.5.6.6.1	Sending.....	126
7.5.6.6.2	Receiving.....	127
7.5.6.7	Acoustic shock	127
7.5.6.7.0	General	127
7.5.6.7.1	Continuous signal	127
7.5.6.8	Delay	127
7.5.6.9	Void.....	128
7.5.6.10	Double talk Performance.....	128
7.5.6.10.0	General	128
7.5.6.10.1	Attenuation Range in Sending Direction during Double Talk $A_{H,S,dt}$	128
7.5.6.10.2	Attenuation Range in Receiving Direction during Double Talk $A_{H,R,dt}$	129
7.5.6.10.3	Detection of Echo Components during Double Talk.....	129
7.5.6.10.4	Minimum activation level and sensitivity of double talk detection	130
7.5.6.11	Switching characteristics.....	130
7.5.6.11.0	General	130
7.5.6.11.1	Activation in Sending Direction	130
7.5.6.11.2	Activation in Receiving Direction	130
7.5.6.11.3	Silence Suppression and Comfort Noise Generation.....	130
7.5.6.11.4	Performance in Sending in the Presence of Background Noise.....	130
7.5.6.11.5	Speech Quality in the Presence of Background Noise	131
7.5.6.11.6	Quality of Background Noise Transmission (with Far End Speech).....	131
7.5.6.11.7	Void.....	132
7.5.6.11.8	Positional Robustness of Speech Quality in the Presence of Background Noise	132
7.5.6.12	Quality of echo cancellation.....	132
7.5.6.12.0	General	132
7.5.6.12.1	Temporal echo effects	132
7.5.6.12.2	Spectral Echo Attenuation	132
7.5.6.12.3	Variable echo path.....	133
7.5.6.13	Out-of-band signals.....	133
7.5.6.13.1	Out-of-band signals in sending direction.....	133
7.5.6.13.2	Out-of-band signals in receiving direction.....	133
7.5.7	Transmission characteristics for PP types 4a and 4b (HATS Tested wideband loudspeaking and handsfree devices).....	133
7.5.7.1	Sending sensitivity/frequency response	133
7.5.7.2	Receive sensitivity/frequency response.....	134
7.5.7.3	Send loudness rating	136
7.5.7.4	Receive loudness rating.....	137
7.5.7.5	Sending distortion	137
7.5.7.6	Receiving distortion	138
7.5.7.7	Out-of-band signals in sending direction	138
7.5.7.8	Out-of-band signals in receiving direction	139
7.5.7.9	Sending noise	139
7.5.7.10	Receiving noise	139
7.5.7.11	Terminal Coupling Loss.....	139
7.5.7.12	Stability Loss.....	140
7.5.7.13	Double Talk Performance	140
7.5.7.13.0	General	140
7.5.7.13.1	Attenuation Range in Sending Direction during Double Talk $A_{H,S,dt}$	141
7.5.7.13.2	Attenuation Range in Receiving Direction during Double Talk $A_{H,R,dt}$	141
7.5.7.13.3	Detection of Echo Components during Double Talk.....	142
7.5.7.13.4	Minimum activation level and sensitivity of double talk detection	142
7.5.7.14	Switching characteristics.....	142
7.5.7.14.0	General	142
7.5.7.14.1	Activation in Sending Direction	143
7.5.7.14.2	Activation in Receiving Direction.....	143
7.5.7.14.3	Silence Suppression and Comfort Noise Generation.....	143

7.5.7.14.4	Performance in sending direction in the presence of background noise	143
7.5.7.14.5	Speech Quality in the Presence of Background Noise.....	144
7.5.7.14.6	Quality of Background Noise Transmission (with Far End Speech).....	144
7.5.7.15	Quality of echo cancellation.....	144
7.5.7.15.1	Temporal echo effects	144
7.5.7.15.2	Spectral Echo Attenuation.....	144
7.5.7.15.3	Variable echo path.....	145
7.5.7.16	Microphone mute	145
7.5.7.17	Delay	145
7.5.7.18	Send Loudness Level	146
7.5.7.19	Receive Loudness Level	146
7.5.8	Transmission characteristics for PP type 5a ("super-wideband 14 kHz handset or headset")	147
7.5.8.1	Frequency responses	147
7.5.8.1.1	Sending.....	147
7.5.8.1.2	Receiving.....	148
7.5.8.2	Send and receive loudness ratings.....	149
7.5.8.2.1	Send Loudness Rating	149
7.5.8.2.2	Receive Loudness Rating	150
7.5.8.2.3	Send Loudness Level.....	151
7.5.8.2.4	Receive Loudness Level	151
7.5.8.3	Sidetone.....	151
7.5.8.3.1	Sidetone Masking Rating STMR (Mouth to ear).....	151
7.5.8.3.2	Sidetone Delay.....	151
7.5.8.4	Terminal Coupling Loss.....	152
7.5.8.4.1	Unweighted Terminal Coupling Loss.....	152
7.5.8.4.2	Stability Loss.....	152
7.5.8.5	Distortion	152
7.5.8.5.1	Sending Distortion.....	152
7.5.8.5.2	Receiving Distortion.....	153
7.5.8.6	Noise	153
7.5.8.6.1	Sending.....	153
7.5.8.6.2	Receiving.....	153
7.5.8.7	Acoustic shock	154
7.5.8.7.0	General	154
7.5.8.7.1	Continuous signal	154
7.5.8.8	Delay	154
7.5.8.9	Double talk performance	154
7.5.8.9.0	General	154
7.5.8.9.1	Attenuation range in send direction during double talk $A_{H,S,dt}$	154
7.5.8.9.2	Attenuation range in receive direction during double talk $A_{H,R,dt}$	155
7.5.8.9.3	Detection of echo components during double talk	155
7.5.8.10	Switching Characteristics	156
7.5.8.10.0	Note	156
7.5.8.10.1	Activation in send direction.....	156
7.5.8.10.2	Silence suppression and comfort noise generation	156
7.5.8.10.3	Performance in Sending in the Presence of Background Noise.....	156
7.5.8.10.4	Speech quality in the presence of background noise	157
7.5.8.10.5	Positional Robustness of Speech Quality in the Presence of Background Noise	157
7.5.8.10.6	Quality of background noise transmission (with far end speech)	158
7.5.8.11	Quality of echo cancellation.....	158
7.5.8.11.1	Temporal echo effects	158
7.5.8.11.2	Spectral echo attenuation.....	158
7.5.8.11.3	Variable echo path.....	159
7.5.9	Transmission characteristics for PP type 5b ("super-wideband 14 kHz loudspeaking and handsfree devices")	159
7.5.9.1	Sending sensitivity/frequency response	159
7.5.9.2	Receive sensitivity/frequency response.....	160
7.5.9.2.1	Handheld terminal	160
7.5.9.2.2	Desktop terminal	160
7.5.9.2.3	Terminals intended to be used simultaneously by several users.....	161
7.5.9.3	Sending loudness rating	161

7.5.9.3.1	Nominal Value.....	161
7.5.9.3.2	Microphone mute.....	162
7.5.9.4	Receive loudness rating.....	162
7.5.9.5	Sending distortion	163
7.5.9.5.1	Signal to harmonic distortion versus frequency	163
7.5.9.5.2	Signal to harmonic distortion for higher input level	163
7.5.9.6	Receiving distortion	163
7.5.9.7	Sending noise	164
7.5.9.8	Receiving noise	164
7.5.9.9	Terminal Coupling Loss.....	165
7.5.9.9.1	Unweighted Terminal Coupling Loss.....	165
7.5.9.9.2	Stability Loss.....	165
7.5.9.10	Double Talk Performance	165
7.5.9.10.0	General	165
7.5.9.10.1	Attenuation Range in Sending Direction during Double Talk $A_{H,S,dt}$	165
7.5.9.10.2	Attenuation Range in Receiving Direction during Double Talk $A_{H,R,dt}$	166
7.5.9.10.3	Detection of Echo Components during Double Talk.....	166
7.5.9.10.4	Minimum activation level and sensitivity of double talk detection	167
7.5.9.11	Switching characteristics.....	167
7.5.9.11.0	Note	167
7.5.9.11.1	Activation in Sending Direction	167
7.5.9.11.2	Silence Suppression and Comfort Noise Generation.....	167
7.5.9.11.3	Performance in sending direction in the presence of background noise	168
7.5.9.11.4	Speech Quality in the Presence of Background Noise.....	168
7.5.9.11.5	Quality of Background Noise Transmission (with Far End Speech).....	168
7.5.9.12	Quality of echo cancellation.....	169
7.5.9.12.1	Temporal echo effects	169
7.5.9.12.2	Spectral Echo Attenuation.....	169
7.5.9.12.3	Variable echo path	169
7.5.9.13	Delay	170
7.5.9.14	Send Loudness Level	170
7.5.9.15	Receive Loudness Level	170
7.5.10	Transmission characteristics for PP type 7a ("fullband 20 kHz handset or headset").....	171
7.5.10.1	Frequency responses	171
7.5.10.1.1	https://standards.iteh.ai/catalog/standards/sist/2a529b6d-3d44-45bd-9124-deb86e7a4ccf/sist-en-300-175-8-v2-9-1-2022	171
7.5.10.1.2	Sending.....	171
7.5.10.2	Send and receive loudness ratings	174
7.5.10.2.1	Send Loudness Rating	174
7.5.10.2.2	Receive Loudness Rating	174
7.5.10.2.3	Send Loudness Level.....	175
7.5.10.2.4	Receive Loudness Level.....	175
7.5.10.3	Sidetone.....	175
7.5.10.3.1	Sidetone Masking Rating STMR (Mouth to ear).....	175
7.5.10.3.2	Sidetone Delay.....	176
7.5.10.4	Terminal Coupling Loss.....	176
7.5.10.4.1	Unweighted Terminal Coupling Loss.....	176
7.5.10.4.2	Stability Loss.....	176
7.5.10.5	Distortion	176
7.5.10.5.1	Sending Distortion.....	176
7.5.10.5.2	Receiving Distortion.....	177
7.5.10.6	Noise	177
7.5.10.6.1	Sending.....	177
7.5.10.6.2	Receiving.....	177
7.5.10.7	Acoustic shock	178
7.5.10.7.0	General	178
7.5.10.7.1	Continuous signal	178
7.5.10.8	Delay	178
7.5.10.9	Double talk Performance.....	178
7.5.10.9.0	General	178
7.5.10.9.1	Attenuation range in send direction during double talk $A_{H,S,dt}$	178
7.5.10.9.2	Attenuation range in receive direction during double talk $A_{H,R,dt}$	179

7.5.10.9.3	Detection of echo components during double talk	179
7.5.10.10	Switching Characteristics	180
7.5.10.10.0	Note	180
7.5.10.10.1	Activation in send direction.....	180
7.5.10.10.2	Silence suppression and comfort noise generation	180
7.5.10.10.3	Performance in Sending in the Presence of Background Noise.....	181
7.5.10.10.4	Speech quality in the presence of background noise	181
7.5.10.10.5	Positional Robustness of Speech Quality in the Presence of Background Noise	181
7.5.10.10.6	Quality of background noise transmission (with far end speech).....	182
7.5.10.11	Quality of echo cancellation.....	182
7.5.10.11.1	Temporal echo effects	182
7.5.10.11.2	Spectral echo attenuation.....	182
7.5.10.11.3	Variable echo path	183
7.5.11	Transmission characteristics for PP type 7b ("fullband 20 kHz loudspeaking and handsfree devices") ..	183
7.5.11.1	Sending sensitivity/frequency response	183
7.5.11.2	Receive sensitivity/frequency response.....	184
7.5.11.2.0	General	184
7.5.11.2.1	Handheld terminal	184
7.5.11.2.2	Desktop terminal	185
7.5.11.2.3	Terminals intended to be used simultaneously by several users.....	186
7.5.11.3	Sending loudness rating	186
7.5.11.3.1	Nominal Value.....	186
7.5.11.3.2	Microphone Mute	186
7.5.11.4	Receive loudness rating.....	187
7.5.11.5	Sending distortion	187
7.5.11.5.1	Signal to harmonic distortion versus frequency	187
7.5.11.5.2	Signal to harmonic distortion for higher input level	188
7.5.11.6	Receiving distortion	188
7.5.11.7	Sending noise	189
7.5.11.8	Receiving noise	189
7.5.11.9	Terminal Coupling Loss.....	189
7.5.11.9.1	Unweighted Terminal Coupling Loss.....	189
7.5.11.9.2	Stability Loss.....	189
7.5.11.10	Double Talk Performance	190
7.5.11.10.0	General	190
7.5.11.10.1	Attenuation Range in Sending Direction during Double Talk A _{H,S,dt}	190
7.5.11.10.2	Attenuation Range in Receiving Direction during Double Talk A _{H,R,dt}	191
7.5.11.10.3	Detection of Echo Components during Double Talk	191
7.5.11.10.4	Minimum activation level and sensitivity of double talk detection.....	192
7.5.11.11	Switching characteristics.....	192
7.5.11.11.0	Note	192
7.5.11.11.1	Activation in Sending Direction	192
7.5.11.11.2	Silence Suppression and Comfort Noise Generation.....	192
7.5.11.11.3	Performance in sending direction in the presence of background noise	192
7.5.11.11.4	Speech Quality in the Presence of Background Noise.....	193
7.5.11.11.5	Quality of Background Noise Transmission (with Far End Speech).....	193
7.5.11.12	Quality of echo cancellation.....	194
7.5.11.12.1	Temporal echo effects	194
7.5.11.12.2	Spectral Echo Attenuation	194
7.5.11.12.3	Variable echo path	194
7.5.11.13	Delay	194
7.5.11.14	Send Loudness Level	194
7.5.11.15	Receive Loudness Level	195
7.5.12	Transmission characteristics for PP type 7c, d, e, f ("fullband 20 kHz stereo audio device")	195
7.5.13	Transmission characteristics for PP type 7g ("FBHR 24 kHz headset device")	195
7.5.14	Transmission characteristics for PP type 7h ("FBHR 24 kHz loudspeaking device").....	196
7.5.15	Transmission characteristics for PP type 7i ("FBLFE 250 Hz (LFE) loudspeaking device").....	196
7.5.16	Transmission characteristics for PP type 7j ("fullband 20 kHz low-latency microphone device")	196
7.5.17	Transmission characteristics for PP type 8a ("ultra-band 48 kHz headset device")	196
7.5.18	Transmission characteristics for PP type 8b ("ultra-band 48 kHz loudspeaking device")	196
7.6	Transmission characteristics for Fixed Parts	196