HEARING AID COMPATIBILITY Volume Control Evaluation Report

Report No.	:	**PSU-NQN2402060314AC02**
FCC ID	:	**2A28USN339D**
Equipment	:	**GSM/UMTS/LTE/5G Mobile phone**
Model Name	:	**SN339D**
Applicant	:	**COOSEA GROUP (HK) COMPANY LIMITED**
Address	:	**UNIT 5-6 16/F MULTIFIELD PLAZA 3-7A PRAT AVENUE TSIMSHATSUI KL**
Manufacturer	:	**COOSEA GROUP (HK) COMPANY LIMITED**
Address	:	**UNIT 5-6 16/F MULTIFIELD PLAZA 3-7A PRAT AVENUE TSIMSHATSUI KL**
Receive Volume Control Results Lowest	:	**PASS**
Conversational Gain	:	**2N:9.98dB** **8N:15.40dB**
Standards	:	**ANSI C63.19-2019** **ANSI/TIA-5050-2018**
Date of Testing	:	**Jan.18,2024~Feb.02.2024**

CERTIFICATION: The above equipment have been tested by **Huarui 7layers High Technology (Suzhou) Co., Ltd.**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's HAC characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement any government agencies.

Prepared By : Chao Wu

Chao Wu/Engineer

Approved By : Sun Pei bo

Peibo Sun / Manager

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Release Control Record

Report No.	Reason for Change	Date Issued
PSU-NQN2402060314AC02	Initial release	Feb. 02, 2024
PSU-NQN2402060314AC02	Added an overview of the worst-case conversational gain for each band 2N/8N on page 4, added the highlight of the smallest conversational gain for 2N/8N from page 17 to page 29.	Mar.18,2024

1. Summary of Minimum Conv.Gain Value

Mode	Band	Mounting Force (N)	Conv.Gain(dB)	Result
GSM CMRS Voice	GSM850	2N	10.05	PASS
		8N	16.24	
	GSM1900	2N	10.19	PASS
		8N	16.17	
UMTS CMRS Voice	Band II	2N	10.19	PASS
		8N	16.34	
	Band V	2N	10.04	PASS
		8N	16.42	
VoLTE	Band 2	2N	13.20	PASS
		8N	18.28	
	Band 12	2N	13.11	PASS
		8N	18.65	
	Band 14	2N	10.82	PASS
		8N	17.00	
	Band 26	2N	13.24	PASS
		8N	18.25	
	Band 30	2N	13.43	PASS
		8N	18.73	
	Band 48	2N	10.08	PASS
		8N	15.55	
	Band 66	2N	13.15	PASS
		8N	18.08	
	Band 71	2N	10.33	PASS
		8N	15.40	
VoNR	n5	2N	12.66	PASS
		8N	18.39	
	n25	2N	12.54	PASS
		8N	18.37	
	n26	2N	12.57	PASS
		8N	18.41	
	n30	2N	12.64	PASS
		8N	18.47	
	n41	2N	12.47	PASS
		8N	18.31	
	n48	2N	12.42	PASS
		8N	18.49	
	n66	2N	12.30	PASS
		8N	18.73	
	n71	2N	12.31	PASS
		8N	18.88	
	n77	2N	13.09	PASS

		8N	16.92	
VoWiFi	2.4G 802.11b	2N	10.24	PASS
		8N	15.86	
	2.4G 802.11g	2N	10.01	PASS
		8N	16.04	
	2.4G 802.11n-HT40	2N	10.30	PASS
		8N	15.88	
	5G 802.11a	2N	9.98	PASS
		8N	15.52	
	5G 802.11n-HT40	2N	10.20	PASS
		8N	15.89	
	5G 802.11ac-VHT80	2N	10.04	PASS
		8N	16.00	

2. Description of Equipemnt Under Test

Product Feature &Specification	
Applicant Name	COOSEA GROUP (HK) COMPANY LIMITED
Model Name	SN339D
Sample1 IMEI Code	356704760002334
Sample2 IMEI Code	356704760003902
FCC ID	2A28USN339D
HW Version	1.0
SW Version	SN339DD10010
Tx Frequency Bands (Unit: MHz)	GSM 850:824~849 GSM 1900:1850~1910 WCDMA Band II:1850~1910 WCDMA Band V:824~849 LTE Band 2:1850~1910 LTE Band 4:1710~1755 LTE Band 5:824~849 LTE Band 12:699~716 LTE Band 14:788 - 798 LTE Band 26:814 - 849 LTE Band 30:2305 - 2315 LTE Band 48:3550 - 3700 LTE Band 66:1710~1780 LTE Band 71:663 - 698 NR Band 2:1850 - 1910 NR Band 5:824 - 849 NR Band 25:1850 - 1915 NR Band 26:814 - 849 NR Band 30:2305 - 2315 NR Band 41:2496 - 2690 NR Band 48:3550 - 3700 NR Band 66:1710 - 1780 NR Band 71:663 - 698 NR Band 77:3300 - 4200 WLAN :2412 ~ 2462,2422-2452,5150~5250,5250~5350,5470~5725,5725~5850

	Bluetooth Version:5.2:2402-2480
EUT Stage	Identical Prototype
Mode	GSM :GMSK,8PSK&GMSK WCDMA:HSDPA,HSUPA,HSPA+,DC-HSDPA,DC-HSUPA LTE:QPSK,16QAM,64QAM,256QAM VONR：DFT-s-OFDM PI/2 BPSK，DFT-s-OFDM QPSK，DFT-s-OFDM 16 QAM，DFT-s-OFDM 64 QAM，DFT-s-OFDM 256 QAM， 802.11b:DSSS 802.11a/g/n/ac:OFDM Bluetooth:GFSK, π/4-DQPSK,8-DPSK

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.

3. Applied Standards

- FCC CFR47 PRT20.19
- ANSI C63.19-2019
- FCC KDB 285076 D01 HAC Guidance v06r04
- FCC KDB 285076 D04 Volume Control v02
- FCC KDB 285076 D05 CG Interim Waiver DA 23-914 v01
- ANSI/TIA-5050-2018

4. Air Interface and Operational Mode:

Air Interface	Bands	Transport Type	ANSI C63.19	Simultaneous But Not Tested	Name of Voice Service	Power Reduction
GSM	850	VO	Yes	WLAN, BT	CMRS Voice(1)	No
	1900					No
	EGPRS	DT	No	WLAN, BT	Google Meet(1)	No
UMTS	II	VO	Yes	WLAN, BT	CMRS Voice(1)	No
	V					No
	HSPA	DT	Yes	WLAN, BT	Google Meet(1)	No
LTE (FDD)	2	VD	Yes	WLAN, BT	VoLTE(1) / Google Meet(1)	No
	4					No
	5					No
	12					No
	14					No
	17					No
	26					No
	30					No
	66					No
	71					No
LTE(TDD)	48	VD	Yes	WLAN, BT	VoLTE(1) / Google Meet(1)	No
5G NR(FDD)	2	VD	Yes	GSM, WCDMA, LTE	No	No
	5					
	25					
	26					
	30					
	66					
	70					
	71					
5G NR(TDD)	41	VD	Yes	GSM, WCDMA, LTE	No	No
	48					
	77					
WLAN	2.4G	VD	Yes	GSM, WCDMA, LTE	VoWiFi(1) / Google Meet(1)	No
	5.2G					No
	5.3G					No
	5.8G					No
Bluetooth	2.4G	DT	No	GSM, WCDMA, LTE	N/A	No

Transport Type:
VO = Legacy Cellular Voice Service
DT = Digital Transport Only (No Voice)
VD = IP Voice Service over Digital Transport

Note:

1. For protocols not listed in Table 6.1 of ANSI C63.19:2019, the average speech level of −20 dBm0 should be used.
2. Per KDB 285076 D05 ,Wavier DA 23-914 only requires conversational gain compliance for CMRS narrowband and CMRS wideband voice codecs as started below.All other codecs either part of 3GPP set such as full-band and super-wideband codecs or OTT codecs are to be documented in the test report but not required to comply with the TIA 5050 Volume Control Standard
3. The device have similar frequency in some LTE/5G NR FR1 bands: LTE B4/66,LTE B5/26,LTE B12/17,5G NR N2/25 since the supported frequency spans for the smaller LTE/5G NR FR1 bands are completely cover by the larger LTE bands, therefore, only larger LTE bands were required to be tested for hearing-aid compliance.

5. Volume Control Requirement

<Conversational Gain>

a. Per KDB 285076 D05,with a mounting force of 8N,the DUT shall have at least one volume control setting that wil produce a conversational gain of ≥ 6 dB
b. Per KDB 285076 D05,with a mounting force of 2N,the DUT shall have at least one volume control setting that wil produce a conversational gain of ≥ 6 dB
c. Calculate the Conversational Gain by subtracting 70dB from the measures dBSPL. [Conversational Gain=(Measured dBSPL Level-70dsSPL)dB]

<Receive Distortion And Noise Performance>

With a mounting force of 8N and 2N,the ratio of the stimulus signal power to the 100Hz to 8000Hz total A-weighted distortion and noise power shall ≥20dB when tested over the range of 1/3 octave band center frequencies:

a. Narrowband transmission mode:Each 1/3 octave band center frequency from 400Hz to 3150Hz
b. Wideband transmission mode:Each 1/3 octave band center frequency from 250Hz to 5000Hz
c. Per KDB 285076 D05,choose one narrowband and one wideband for all voice services,bands of operation and air interfaces over which it operates using one codec bit rate of the applicant's choosing to meet Receive Distortion And Noise Performance requirement.

<Receive Acoustics Frequency Response Performance>

For the volume control settings determined in ANSI/TIA-5050-2018 section 5.1.1 with a mounting force of 8N and 2N,the receive frequency response shall be measured at the DRP in 1/12 octave bands.After translation to the FF,it shall fall between the applicable upper and lower limits.The exact limit values at any 1/12 octave band center frequency falling between two consecutive points specified in the table may be calculated using the formula given in Eq 2 below

$$X_f = X_1 + (X_2 - X_1) * \left(\frac{\log_{10} f - \log_{10} f_1}{\log_{10} f_2 - \log_{10} f_1}\right) \qquad \text{Eq 2}$$

Where

X_f = limit value at frequency f

X_1 = limit value at frequency f_1 as given in table

X_2 = limit value at frequency f_2 as given in table

For Narrowband:The 1/12 octave band frequency response after translation to the FF shall fall between the upper and lower limits given the Table 1

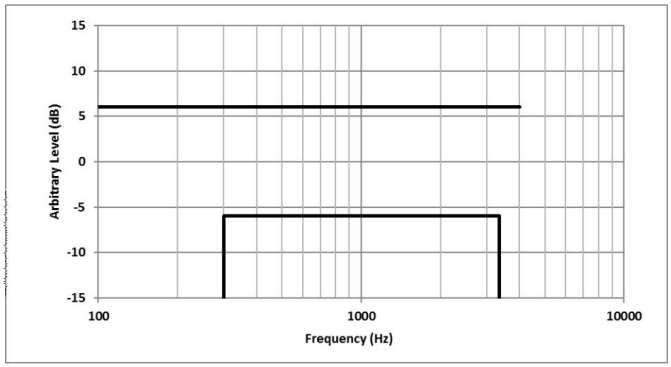
For wideband :The 1/12 octave band frequency response after translation to the FF shall fall between the upper and lower limits given the Table 2

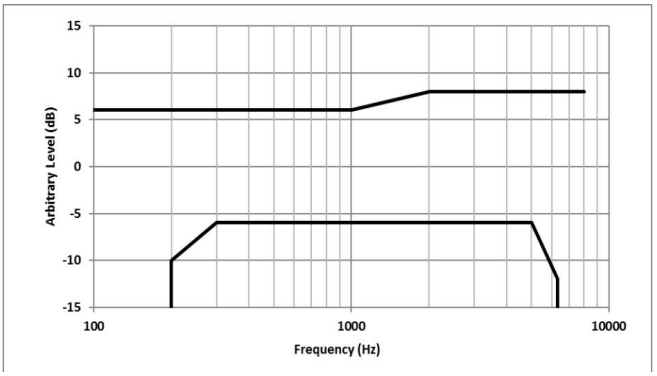
Table 1 – Narrowband Receive Frequency Response Limits

Lower Limit Frequency (Hz)	Lower Limit (dB)	Upper Limit Frequency (Hz)	Upper Limit (dB)
300	-6	100	+6
3400	-6	4000	+6

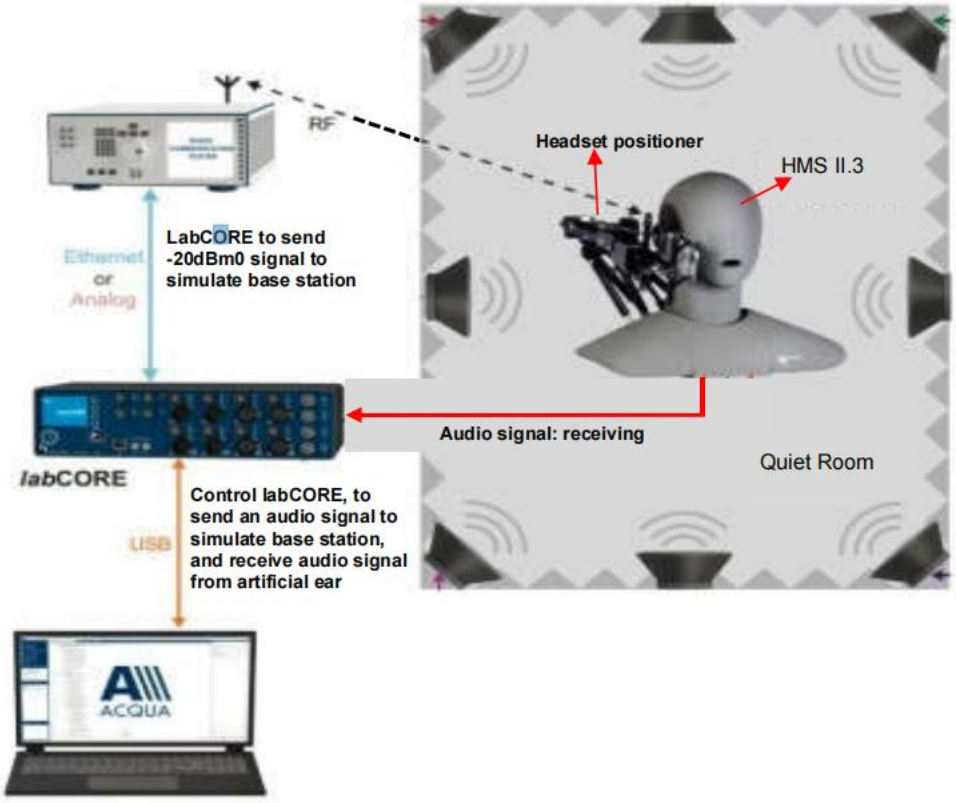
Table 2 – Wideband Receive Frequency Response Limits

Lower Limit Frequency (Hz)	Lower Limit (dB)	Upper Limit Frequency (Hz)	Upper Limit (dB)
200	-10	100	+6
300	-6	1000	+6
5000	-6	2000	+8
6300	-12	8000	+8


15
10
5
0
-5
-10
-15
Arbitrary Level (dB)
100
1000
10000
Frequency (Hz)


15
10
5
0
-5
-10
-15
Arbitrary Level (dB)
100
1000
10000
Frequency (Hz)

6. System Description



System Components:

Name of Equipment	Equipment Description
LabCORE Audio Analyzer	labCORE is a high-precision measurement hardware platform. It provides multiple channels, a wide variety of analog and digital inputs and outputs, high processing power and high-performance interfaces. labCORE is an all-in-one solution for measuring the voice and audio quality of a wide range of devices. labCore is used in conjunction with the communication quality analysis system ACQUA. Connected to a computer via USB (Plug & Play), it is configured and controlled by ACQUA. Combinations with other HEAD acoustics hardware platforms and software applications are possible. labCORE settings are controlled via the intuitive ACQUA settings. They can be stored and assigned to selectable measurement sequences.
HMSII.3 artificial HEAD	HMS II.3 supports measurement in sending and receiving direction.For this purpose,the artificial head is equipped with an impedance simulator in the right ear and a two-way mouth loudspeaker-both meeting the requirement in the recommendations ITU-T P.57 and P.58
Handset Positioner	Control the Newton's force(2N/8N) of the mobile phone on the artificial head
ACQUA,TIA 5050 Test Software	The SW version 5.1.200 can be evaluated TIA-5050 section5.1,5.2,5.3
R&S Base Station Simulator	RF connect with the mobile phone

7. Volume Control Test Procedure

<Conversational Gain>

According to ANSI /TIA-5050, the test procedure for wireless communications device is as below.

1. Configure the DUT with a mounting force of 8N and test equipment as shown in section 4 in an active call state with the applicable codec for the transmission mode under test.
2. Set the DUT volume control to the maximum setting.
3. If the DUT has an adjustable tone control feature,a tone control setting that meets the frequency response requirements in ANSI/TIA-5050 section 5.3.1shall be used.
4. The ACQUA system is apply the real speech test signal at a level of -20dBm0 at the RETP and measure the acoustic output at the Drum Reference Point(DRP) over one complete sequence of the test signal.
5. Translate the measurement made at DRP to Free Filed(FF) using the translation data in ANSI/TIA-5050 Annex B.
6. Over the applicable frequency band,determine the ASL in dBSPL for the resulting sound pressure level in accordance with Method B of ITU-T Recommendation P.56
   - Narrowband 100Hz through 4000 Hz
   - Wideband 100Hz through 7720 Hz

   Calculate the Conversational Gain by subtracting 70dB from the measured dBSPL.
   [Conversational Gain=(Measured dBSPL Level-70dBSPL)dB]
7. Measure output distortion per ANSI/TIA-5050 clause 5.2 .If a distortion failure occurs at the maximum volume control setting.reduce the volume control setting and repeat the measurement to determine if a setting can be found for which the conversational gain requirement is met without a distorton failure.
8. Repeat steps 2-8 with a mounting force of 2N.

<Receive Distortion and Noise Performance>

1. Configure the DUT with a mounting force of 8N and test equipment as shown in section in an active call state with the applicable codec for the transmission mode under test.
2. Receive distortion and noise is measured using the PN-SDNR procedure.
3. To ensure DUT activation, apply the real speech test signal at a level of -20 dBm0 followed immediately by the initial 1/3 octave center frequency PN test signal based on the narrowband or wideband operating mode. Measure the acoustic output at the DRP over the complete sequence of the PN test signal.
4. Translate the measurement made at DRP to the FF.
5. Calculate the acoustic out unweighted test signal power of the stimulus measurement band.
6. Calculate the notched A-weighting distortion and noise components .
7. Calculate the ratio of signal power to the total A-weighted distortion and noise power ad follow:

$$\text{PN-SDNR (dB)} = 20 * Log\left[\frac{measured\ stimulus\ amplitude}{measured\ distortion\ amplitude}\right]$$

8. Repeat for each of the remaining 1/3 octave center frequencies based on the narrowband or wideband operating mode.
9. Repeat steps 2-8 with a mounting force of 2N.

10. The measured value that the system equipment will automatically calculate or converts to define whether it meets the requirements of ANSI/TIA-5050 annex A and annex B.

<Receive Acoustic Frequency Response Performance>

1. Configure the DUT with a mounting force of 8N and test equipment as shown in Figure 1 in an active call state with the applicable codec for the transmission mode under test .
2. If the DUT has an adjustable tone control feature the initial measurement is to be performed with the default tone control setting.
3. Apply the real speech test signal with a level of -20 dBm0 at the RETP.
4. Capture the frequency spectrum at the DRP of the HATS using real-time analysis with 1/12 octave bands over the frequency range from 100 Hz to 4000 Hz for narrowband measurements, or over the frequency range from 100 Hz to 8000 Hz for wideband measurements, averaged over the entire duration of the test signal.
5. Transform the DRP frequency spectrum measurement to the FF .
6. Divide the 1/12 octave measurement data by the 1/12 octave frequency spectrum of the test signal at the RETP and present the measurement in terms of dB(Pa/V).
7. Apply the applicable frequency response limits to determine compliance.
8. If the default tone control setting does not meet the requirement, repeat the above steps for other tone control settings to determine a tone control setting that meets the requirements.
9. Repeat with a mounting force of 2N.
10. The receive acoustic frequency response performance was perform at max tone control setting.

8. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
R&S	Base Station	CMW500	169199	2022/6/27	2024/06/27
R&S	Base Station	CMX500	101872	2022/5/16	2024/5/16
HEAD acoustic GmbH	Audio Analyzer	labCORE	77000207	2022/12/25	2024/12/25
HEAD acoustic GmbH	Artificial head	HMSII.3	1236613	2022/4/24	2024/04/24
HEAD acoustic GmbH	Handset Positioner	HHP IV	14060074	N/A	N/A
Deli	Hygrometer	8813	YP2020008	2022/9/6	2024/09/06

9. Device Support Codec

General Note:

1. Per KDB 285076 D04, it is expected to investigate and document only the worst-case test conditions and results. Each submitted test report shall document the codec type (i.e., NB, WB, EVS, etc.), every air interface (i.e., LTE, 5G NR, WI-FI) and band supported for the worst-case codec bit rate, band channel, bandwidth, air interface bit rate, subcarrier spacings, and resource blocks
2. Through Internal codec and air interface configuration investigation (e.g. (i.e., NB, WB, EVS codec, bandwidth, modulation data rate, subcarrier spacing, and resource blocks) that the worst investigate results of codec, air interface configuration etc. were include in section 9
3. Per KDB 285076 D05, Waiver DA 23-914 only requires conversational gain compliance for CMRS narrowband and CMRS wideband voice codecs as stated below. All other codecs either part of 3GPP set such as full-band and super-wideband codecs or OTT codecs are to be documented in the test report but not required to comply with the TIA 5050 Volume Control Standard
4. If a handset does not have a wideband codec or the handset only has an AMR wideband codec, then the test report must document this fact and the passing requirement under these circumstances for the wideband codec test is waived. The passing results for the distortion/noise and frequency response tests must be reported in the handset's test report .

GSM Codec/bitrate		
Codec	AMR NB	AMR WB
Birate	4.75kbps	6.60kbps
	5.15kbps	8.85kbps
	5.90kbps	12.65kbps
	6.70kbps	
	7.40kbps	
	7.95kbps	
	10.20kbps	
	12.20kbps	

WCDMA Codec/bitrate		
Codec	AMR NB	AMR WB
Birate	4.75kbps	6.60kbps
	5.15kbps	8.85kbps
	5.90kbps	12.65kbps
	6.70kbps	14.25kbps
	7.40kbps	15.85kbps
	7.95kbps	18.25kbps
	10.20kbps	19.85kbps
	12.20kbps	23.05kbps
		23.85kbps

VOLTECodec/birate				
Codec	AMR NB	AMR WB	EVS NB	EVS WB
	4.75kbps	6.60kbps	5.9kbps	5.9kbps
	5.15kbps	8.85kbps	7.2kbps	7.2kbps
	5.90kbps	12.65kbps	8kbps	8kbps
	6.70kbps		9.6kbps	9.6kbps
	7.40kbps			13.2kbps

Birate	7.95kbps			
	10.20kbps			
	12.20kbps			

VoWIFI Codec/birate				
Codec	AMR NB	AMR WB	EVS NB	EVS WB
Birate	4.75kbps	6.60kbps	5.9kbps	5.9kbps
	5.15kbps	8.85kbps	7.2kbps	7.2kbps
	5.90kbps	12.65kbps	8kbps	8kbps
	6.70kbps		9.6kbps	9.6kbps
	7.40kbps			
	7.95kbps			
	10.20kbps			
	12.20kbps			

10. Volume Control Evaluation Results

General Note:

1. All the test result was done at quiet room and ambient noise is less than 40dBA.
2. Per KDB 285076 D05, in section2 addresses the technical testing requirements for the conversational gain, distortion, and frequency response tests that amends KDB 285076 D04 Volume Control under the conditions of the limited-term waiver DA 23-914, as follows:
   a. Under the waiver, only CMRS narrowband and CMRS wideband voice codecs are required to comply with the volume control requirements of the TIA 5050-2018 Volume Control Standard as amended as follows:
      1. For the 2N mounting force test, one narrowband and one wideband voice codec embedded with the handset must pass with at least one volume control setting with a conversational gain of ≥ 6 dB for all voice services, bands of operation and air interfaces over which it operates using one codec bit rate of the applicant's choosing .
      2. For the 8N mounting force test, one narrowband and one wideband voice codec embedded with the handset must pass with at least one volume control setting with a conversational gain of ≥ 6 dB 8 for all voice services, bands of operation and air interfaces over which they operate but is not required to meet or exceed the full 18 dB of conversational gain specified in section 5.1.1 of the TIA 5050 Volume Control Standard using one codec bit rate of the applicant's choosing
   b. For all other narrowband and wideband codecs not evaluated in 2.a. above, TIA 5050-2018 Receive Distortion and Noise Performance and Receive Acoustic Frequency Response Performance evaluations are not required; however, these codecs shall be assessed for conversational gain and documented in the test report at the 2N and 8N levels with a gain of ≥ 6 dB for all voice services, bands of operation and air interfaces over which they operate. The handset volume setting used to comply with 2.a. shall be used for these other CMRS codec evaluations.
   c. Any other codec for voice services embedded in the handset, not identified in 2.a. and 2.b. above, is not required to comply or demonstrate in the test reports for conversational gain.
3. All the test results were set the DUT volume control to the maximum setting.
4. Conversational Gain = (measured dBSPL Level – 70 dBSPL) dB

5. Through Internal radio configuration investigation (e.g. bandwidth, modulation data rate, subcarrier spacing, and resource blocks) that the worst radio configuration was document as below table.
6. Per DA 23-914 item 30, for the distortion/noise and frequency response tests at the 2N and 8N force levels, manufacturers must choose codecs that are within the scope of the TIA 5050 Standard, which include narrowband and wideband codecs, but these codecs do not necessarily have to be AMR codecs. That is, we are not limiting the codecs that manufacturers can choose for testing to just AMR narrowband and AMR wideband codecs as defined in sections 4.5.1 and 4.5.2 of the TIA 5050 Standard. While manufacturers may choose to test AMR narrowband and AMR wideband codecs, they can also choose EVS narrowband and EVS wideband codecs or any other narrowband or wideband codecs that are within the scope of the TIA 5050 Standard.
7. The device have similar frequency in some LTE bands: LTE B5/26, 4/66, 2/25, since the supported frequency spans for the smaller LTE bands are completely cover by the larger LTE bands, therefore, only larger LTE bands were required to be tested for hearing-aid compliance.

The 2N mounting force lowest conversational gain is 9.98dB with a hearing aid.
The 8N mounting force lowest conversational gain is 15.40 dB without a hearing aid.

<Evaluation results for KDB 285076 D05 2.a>

<LTE>

HAC(Volume control)Test Record						Conversational Gain				Receive Distortion And Noise Performance			Acoustic Frequency Response Performance
Plot No.	Air Interface	Modulation/Mode	Channel	Codec	Mounting Force (N)	Measured-dBSPL Level	Conv.Gain (dB)	Limit (dB)	Margin to limit(dB)	Minimum PN-SDNR(dB)	Limit (dB)	Margin to Limit(dB)	Free Field(FF)
1	LTE Band 2	20_QPSK_100_0	18900	EVS NB 9.6kbps	2N	83.74	13.74	≥6	7.74	23.04	≥20	3.04	Pass
2	LTE Band 2	20_QPSK_100_0	18900	EVS NB 9.6kbps	8N	89.02	19.02	≥6	13.02	23.98	≥20	3.98	Pass
3	LTE Band 2	20_QPSK_100_0	18900	EVS WB 13.2kbps	2N	83.45	13.45	≥6	7.45	25.48	≥20	5.48	Pass
4	LTE Band 2	20_QPSK_100_0	18900	EVS WB 13.2kbps	8N	88.28	18.28	≥6	12.28	22.09	≥20	2.09	Pass
5	LTE Band 26(5)	15_QPSK_75_0	26865	EVS NB 9.6kbps	2N	83.26	13.26	≥6	7.26	21.39	≥20	1.39	Pass
6	LTE Band 26(5)	15_QPSK_75_0	26865	EVS NB 9.6kbps	8N	88.25	18.25	≥6	12.25	24.10	≥20	4.10	Pass
7	LTE Band 26(5)	15_QPSK_75_0	26865	EVS WB 13.2kbps	2N	83.24	13.24	≥6	7.24	25.04	≥20	5.04	Pass
8	LTE Band 26(5)	15_QPSK_75_0	26865	EVS WB 13.2kbps	8N	88.32	18.32	≥6	12.32	22.03	≥20	2.03	Pass
9	LTE Band 66(4)	20_QPSK_100_0	132322	EVS NB 9.6kbps	2N	83.15	13.15	≥6	7.15	24.25	≥20	4.25	Pass
10	LTE Band 66(4)	20_QPSK_100_0	132322	EVS NB 9.6kbps	8N	88.31	18.31	≥6	12.31	23.79	≥20	3.79	Pass
11	LTE Band 66(4)	20_QPSK_100_0	132322	EVS WB 13.2kbps	2N	83.20	13.20	≥6	7.20	25.09	≥20	5.09	Pass
12	LTE Band 66(4)	20_QPSK_100_0	132322	EVS WB 13.2kbps	8N	88.50	18.50	≥6	12.50	24.85	≥20	4.85	Pass
13	LTE Band 12(17)	10_QPSK_50_0	23095	EVS NB 9.6kbps	2N	83.25	13.25	≥6	7.25	21.39	≥20	1.39	Pass
14	LTE Band 12(17)	10_QPSK_50_0	23095	EVS NB 9.6kbps	8N	88.66	18.66	≥6	12.66	23.39	≥20	3.39	Pass
15	LTE Band 12(17)	10_QPSK_50_0	23095	EVS WB 13.2kbps	2N	83.85	13.85	≥6	7.85	23.86	≥20	3.86	Pass
16	LTE Band 12(17)	10_QPSK_50_0	23095	EVS WB 13.2kbps	8N	88.80	18.80	≥6	12.80	20.87	≥20	0.87	Pass
17	LTE Band 14	10_QPSK_50_0	23330	EVS NB 9.6kbps	2N	83.74	13.74	≥6	7.74	22.00	≥20	2.00	Pass
18	LTE Band 14	10_QPSK_50_0	23330	EVS NB 9.6kbps	8N	88.25	18.25	≥6	12.25	20.98	≥20	0.98	Pass
19	LTE Band 14	10_QPSK_50_0	23330	EVS WB 13.2kbps	2N	83.81	13.81	≥6	7.81	21.91	≥20	1.91	Pass
20	LTE Band 14	10_QPSK_50_0	23330	EVS WB 13.2kbps	8N	88.51	18.51	≥6	12.51	20.49	≥20	0.49	Pass
21	LTE Band 30	10_QPSK_50_0	27710	EVS NB 9.6kbps	2N	83.43	13.43	≥6	7.43	24.70	≥20	4.70	Pass
22	LTE Band 30	10_QPSK_50_0	27710	EVS NB 9.6kbps	8N	88.73	18.73	≥6	12.73	24.54	≥20	4.54	Pass
23	LTE Band 30	10_QPSK_50_0	27710	EVS WB 13.2kbps	2N	83.52	13.52	≥6	7.52	24.93	≥20	4.93	Pass
24	LTE Band 30	10_QPSK_50_0	27710	EVS WB 13.2kbps	8N	88.75	18.75	≥6	12.75	24.01	≥20	4.01	Pass
25	LTE Band 48	20_QPSK_100_0	55990	EVS NB 9.6kbps	2N	83.17	13.17	≥6	7.17	21.26	≥20	1.26	Pass
26	LTE Band 48	20_QPSK_100_0	55990	EVS NB 9.6kbps	8N	88.46	18.46	≥6	12.46	21.88	≥20	1.88	Pass
27	LTE Band 48	20_QPSK_100_0	55990	EVS WB 13.2kbps	2N	83.36	13.36	≥6	7.36	21.92	≥20	1.92	Pass
28	LTE Band 48	20_QPSK_100_0	55990	EVS WB 13.2kbps	8N	88.33	18.33	≥6	12.33	22.31	≥20	2.31	Pass
29	LTE Band 71	20_QPSK_100_0	133322	EVS NB 9.6kbps	2N	83.64	13.64	≥6	7.64	23.01	≥20	3.01	Pass
30	LTE Band 71	20_QPSK_100_0	133322	EVS NB 9.6kbps	8N	88.70	18.70	≥6	12.70	20.02	≥20	0.02	Pass
31	LTE Band 71	20_QPSK_100_0	133322	EVS WB 13.2kbps	2N	83.90	13.90	≥6	7.90	20.21	≥20	0.21	Pass
32	LTE Band 71	20_QPSK_100_0	133322	EVS WB 13.2kbps	8N	88.88	18.88	≥6	12.88	21.36	≥20	1.36	Pass

<WLAN>

HAC(Volume control)Test Record						Conversational Gain				Receive Distortion And Noise Performance			Acoustic Frequency Response Performance
Plot No.	Air Interface	Modulation/Mode	Channel	Codec	Mounting Force(N)	Measured-dBSPL Level	Conv.Gain(dB)	Limit(dB)	Margin to limit(dB)	Minimum PN-SDNR(dB)	Limit(dB)	Margin to Limit(dB)	Free Field(FF)
33	WIFI2.4GHz	802.11b 1Mbps	6	EVS NB 9.6kbps	2N	80.35	10.35	≥6	4.35	20.29	≥20	0.29	Pass
34	WIFI2.4GHz	802.11b 1Mbps	6	EVS NB 9.6kbps	8N	86.09	16.09	≥6	10.09	20.41	≥20	0.41	Pass
35	WIFI2.4GHz	802.11b 1Mbps	6	EVS WB 9.6kbps	2N	80.56	10.56	≥6	4.56	20.47	≥20	0.47	Pass
36	WIFI2.4GHz	802.11b 1Mbps	6	EVS WB 9.6kbps	8N	85.86	15.86	≥6	9.86	20.66	≥20	0.66	Pass
37	WIFI2.4GHz	802.11g 1Mbps	6	EVS NB 9.6kbps	2N	80.01	10.01	≥6	4.01	20.61	≥20	0.61	Pass
38	WIFI2.4GHz	802.11g 1Mbps	6	EVS NB 9.6kbps	8N	86.19	16.19	≥6	10.19	20.19	≥20	0.19	Pass
39	WIFI2.4GHz	802.11g 1Mbps	6	EVS WB 9.6kbps	2N	80.09	10.09	≥6	4.09	20.52	≥20	0.52	Pass
40	WIFI2.4GHz	802.11g 1Mbps	6	EVS WB 9.6kbps	8N	86.04	16.04	≥6	10.04	20.52	≥20	0.52	Pass
41	WIFI2.4GHz	802.11n-HT40 MCS0	6	EVS NB 9.6kbps	2N	80.49	10.49	≥6	4.49	20.07	≥20	0.07	Pass
42	WIFI2.4GHz	802.11n-HT40 MCS0	6	EVS NB 9.6kbps	8N	86.30	16.30	≥6	10.30	20.71	≥20	0.71	Pass
43	WIFI2.4GHz	802.11n-HT40 MCS0	6	EVS WB 9.6kbps	2N	80.75	10.75	≥6	4.75	20.10	≥20	0.10	Pass
44	WIFI2.4GHz	802.11n-HT40 MCS0	6	EVS WB 9.6kbps	8N	86.25	16.25	≥6	10.25	20.08	≥20	0.08	Pass
45	WIFI5GHz	802.11a 6M	40	EVS NB 9.6kbps	2N	79.98	9.98	≥6	3.98	20.27	≥20	0.27	Pass
46	WIFI5GHz	802.11a 6M	40	EVS NB 9.6kbps	8N	85.86	15.86	≥6	9.86	20.32	≥20	0.32	Pass
47	WIFI5GHz	802.11a 6M	40	EVS WB 9.6kbps	2N	80.37	10.37	≥6	4.37	20.06	≥20	0.06	Pass
48	WIFI5GHz	802.11a 6M	40	EVS WB 9.6kbps	8N	86.15	16.15	≥6	10.15	20.01	≥20	0.01	Pass
49	WIFI5GHz	802.11n-HT40 MCS0	38	EVS NB 9.6kbps	2N	80.47	10.47	≥6	4.47	21.16	≥20	1.16	Pass
50	WIFI5GHz	802.11n-HT40 MCS0	38	EVS NB 9.6kbps	8N	85.89	15.89	≥6	9.89	20.25	≥20	0.25	Pass
51	WIFI5GHz	802.11n-HT40 MCS0	38	EVS WB 9.6kbps	2N	80.65	10.65	≥6	4.65	20.04	≥20	0.04	Pass
52	WIFI5GHz	802.11n-HT40 MCS0	38	EVS WB 9.6kbps	8N	86.36	16.36	≥6	10.36	20.23	≥20	0.23	Pass
53	WIFI5GHz	802.11ac-VHT80 MCS0	42	EVS NB 9.6kbps	2N	80.63	10.63	≥6	4.63	20.66	≥20	0.66	Pass
54	WIFI5GHz	802.11ac-VHT80 MCS0	42	EVS NB 9.6kbps	8N	86.14	16.14	≥6	10.14	20.94	≥20	0.94	Pass
55	WIFI5GHz	802.11ac-VHT80 MCS0	42	EVS WB 9.6kbps	2N	80.34	10.34	≥6	4.34	20.02	≥20	0.02	Pass
56	WIFI5GHz	802.11ac-VHT80 MCS0	42	EVS WB 9.6kbps	8N	86.18	16.18	≥6	10.18	20.03	≥20	0.03	Pass

<VoNR>

HAC(Volume control)Test Record						Conversational Gain				Receive Distortion And Noise Performance			Acoustic Frequency Response Performance
Plot No.	Air Interface	Modulation/Mode	Channel	Codec	Mounting Force(N)	Measured-dBSPL Level	Conv.Gain (dB)	Limit(dB)	Margin to limit(dB)	Minimum PN-SDNR(dB)	Limit(dB)	Margin to Limit(dB)	Free Field(FF)
57	NR n5	20_DFT-s-OFDM	167300	EVS NB 9.6kbps	2N	82.72	12.72	≥6	6.72	21.99	≥20	1.99	Pass
58	NR n5	20_DFT-s-OFDM	167300	EVS NB 9.6kbps	8N	88.39	18.39	≥6	12.39	21.82	≥20	1.82	Pass
59	NR n5	20_DFT-s-OFDM	167300	EVS WB 13.2kbps	2N	82.66	12.66	≥6	6.66	22.06	≥20	2.06	Pass
60	NR n5	20_DFT-s-OFDM	167300	EVS WB 13.2kbps	8N	88.48	18.48	≥6	12.48	21.81	≥20	1.81	Pass
61	NR n25（2）	40_DFT-s-OFDM	376500	EVS NB 9.6kbps	2N	82.68	12.68	≥6	6.68	22.06	≥20	2.06	Pass
62	NR n25（2）	40_DFT-s-OFDM	376500	EVS NB 9.6kbps	8N	88.37	18.37	≥6	12.37	21.79	≥20	1.79	Pass
63	NR n25（2）	40_DFT-s-OFDM	376500	EVS WB 13.2kbps	2N	82.54	12.54	≥6	6.54	22.08	≥20	2.08	Pass
64	NR n25（2）	40_DFT-s-OFDM	376500	EVS WB 13.2kbps	8N	88.63	18.63	≥6	12.63	21.81	≥20	1.81	Pass
65	NR n26	20_DFT-s-OFDM	166300	EVS NB 9.6kbps	2N	82.74	12.74	≥6	6.74	22.09	≥20	2.09	Pass
66	NR n26	20_DFT-s-OFDM	166300	EVS NB 9.6kbps	8N	88.47	18.47	≥6	12.47	21.83	≥20	1.83	Pass
67	NR n26	20_DFT-s-OFDM	166300	EVS WB 13.2kbps	2N	82.71	12.71	≥6	6.71	22.08	≥20	2.08	Pass
68	NR n26	20_DFT-s-OFDM	166300	EVS WB 13.2kbps	8N	88.53	18.53	≥6	12.53	21.83	≥20	1.83	Pass
69	NR n30	10_DFT-s-OFDM	462000	EVS NB 9.6kbps	2N	82.64	12.64	≥6	6.64	22.07	≥20	2.07	Pass
70	NR n30	10_DFT-s-OFDM	462000	EVS NB 9.6kbps	8N	88.47	18.47	≥6	12.47	21.77	≥20	1.77	Pass
71	NR n30	10_DFT-s-OFDM	462000	EVS WB 13.2kbps	2N	82.69	12.69	≥6	6.69	22.06	≥20	2.06	Pass
72	NR n30	10_DFT-s-OFDM	462000	EVS WB 13.2kbps	8N	88.62	18.62	≥6	12.62	21.79	≥20	1.79	Pass
73	NR 41	100_DFT-s-OFDM	518598	EVS NB 9.6kbps	2N	82.63	12.63	≥6	6.63	22.08	≥20	2.08	Pass
74	NR 41	100_DFT-s-OFDM	518598	EVS NB 9.6kbps	8N	88.31	18.31	≥6	12.31	21.84	≥20	1.84	Pass
75	NR 41	100_DFT-s-OFDM	518598	EVS WB 13.2kbps	2N	82.47	12.47	≥6	6.47	22.07	≥20	2.07	Pass
76	NR 41	100_DFT-s-OFDM	518598	EVS WB 13.2kbps	8N	88.50	18.50	≥6	12.50	21.83	≥20	1.83	Pass
77	NR 48	40_DFT-s-OFDM	641666	EVS NB 9.6kbps	2N	82.42	12.42	≥6	6.42	22.06	≥20	2.06	Pass
78	NR 48	40_DFT-s-OFDM	641666	EVS NB 9.6kbps	8N	88.49	18.49	≥6	12.49	21.82	≥20	1.82	Pass
79	NR 48	40_DFT-s-OFDM	641666	EVS WB 13.2kbps	2N	82.63	12.63	≥6	6.63	22.07	≥20	2.07	Pass
80	NR 48	40_DFT-s-OFDM	641666	EVS WB 13.2kbps	8N	88.63	18.63	≥6	12.63	21.81	≥20	1.81	Pass
81	NR n66	40_DFT-s-OFDM	349000	EVS NB 9.6kbps	2N	82.34	12.34	≥6	6.34	22.02	≥20	2.02	Pass
82	NR n66	40_DFT-s-OFDM	349000	EVS NB 9.6kbps	8N	88.73	18.73	≥6	12.73	21.74	≥20	1.74	Pass
83	NR n66	40_DFT-s-OFDM	349000	EVS WB 13.2kbps	2N	82.30	12.30	≥6	6.30	22.02	≥20	2.02	Pass
84	NR n66	40_DFT-s-OFDM	349000	EVS WB 13.2kbps	8N	88.78	18.78	≥6	12.78	21.74	≥20	1.74	Pass
85	NR 71	15_DFT-s-OFDM	136100	EVS NB 9.6kbps	2N	82.31	12.31	≥6	6.31	21.99	≥20	1.99	Pass
86	NR 71	15_DFT-s-OFDM	136100	EVS NB 9.6kbps	8N	88.88	18.88	≥6	12.88	21.68	≥20	1.68	Pass
87	NR 71	15_DFT-s-OFDM	136100	EVS WB 13.2kbps	2N	82.35	12.35	≥6	6.35	22.00	≥20	2.00	Pass
88	NR 71	15_DFT-s-OFDM	136100	EVS WB 13.2kbps	8N	89.03	19.03	≥6	13.03	21.68	≥20	1.68	Pass
89	NR n77	100_DFT-s-OFDM	650000	EVS NB 9.6kbps	2N	82.52	12.52	≥6	6.52	21.99	≥20	1.99	Pass
90	NR n77	100_DFT-s-OFDM	650000	EVS NB 9.6kbps	8N	88.84	18.84	≥6	12.84	21.68	≥20	1.68	Pass
91	NR n77	100_DFT-s-OFDM	650000	EVS WB 13.2kbps	2N	82.50	12.50	≥6	6.50	21.99	≥20	1.99	Pass
92	NR n77	100_DFT-s-OFDM	650000	EVS WB 13.2kbps	8N	88.95	18.95	≥6	12.95	21.67	≥20	1.67	Pass

<Codec Investigation and Evaluation results for KDB 285076 D05 2.b>

<GSM>

HAC(Volume control)Test Record						Conversational Gain			
Plot No.	Air Interface	Modulation/Mode	Channel	Codec	Mounting Force(N)	Measured-dBSPL Level	Conv.Gain(dB)	Limit(dB)	Margin to limit(dB)
	GSM 850	Voice	189	AMR NB 4.75kbps	2N	80.58	10.58	≥6	4.58
	GSM 850	Voice	189	AMR NB 12.2kbps	2N	81.43	11.43	≥6	5.43
	GSM 850	Voice	189	AMR WB 6.6kbps	2N	80.10	10.10	≥6	4.10
93	GSM 850	Voice	189	AMR WB 12.65kbps	2N	80.05	10.05	≥6	4.05
	GSM 850	Voice	189	AMR NB 4.75kbps	8N	86.80	16.80	≥6	10.80
	GSM 850	Voice	189	AMR NB 12.2kbps	8N	87.60	17.60	≥6	11.60
	GSM 850	Voice	189	AMR WB 6.6kbps	8N	86.34	16.34	≥6	10.34
	GSM 850	Voice	189	AMR WB 12.65kbps	8N	86.24	16.24	≥6	10.24
	GSM 1900	Voice	661	AMR NB 4.75kbps	2N	80.73	10.73	≥6	4.73
	GSM 1900	Voice	661	AMR NB 12.2kbps	2N	81.29	11.29	≥6	5.29
	GSM 1900	Voice	661	AMR WB 6.6kbps	2N	80.19	10.19	≥6	4.19
	GSM 1900	Voice	661	AMR WB 12.65kbps	2N	80.51	10.51	≥6	4.51
	GSM 1900	Voice	661	AMR NB 4.75kbps	8N	86.87	16.87	≥6	10.87
	GSM 1900	Voice	661	AMR NB 12.2kbps	8N	87.61	17.61	≥6	11.61
	GSM 1900	Voice	661	AMR WB 6.6kbps	8N	86.17	16.17	≥6	10.17
	GSM 1900	Voice	661	AMR WB 12.65kbps	8N	86.64	16.64	≥6	10.64

<UMTS>

HAC(Volume control)Test Record						Conversational Gain			
Plot No.	Air Interface	Modulation/Mode	Channel	Codec	Mounting Force(N)	Measured-dBSPL Level	Conv.Gain(dB)	Limit(dB)	Margin to limit(dB)
	WCDMA II	Voice	9400	AMR NB 4.75kbps	2N	80.75	10.75	≥6	4.75
	WCDMA II	Voice	9400	AMR NB 12.2kbps	2N	81.31	11.31	≥6	5.31
	WCDMA II	Voice	9400	AMR WB 6.6kbps	2N	80.19	10.19	≥6	4.19
	WCDMA II	Voice	9400	AMR WB 12.65kbps	2N	80.50	10.50	≥6	4.50
	WCDMA II	Voice	9400	AMR NB 4.75kbps	8N	86.90	16.90	≥6	10.90
	WCDMA II	Voice	9400	AMR NB 12.2kbps	8N	87.55	17.55	≥6	11.55
	WCDMA II	Voice	9400	AMR WB 6.6kbps	8N	86.34	16.34	≥6	10.34
	WCDMA II	Voice	9400	AMR WB 12.65kbps	8N	86.68	16.68	≥6	10.68
	WCDMA V	Voice	4182	AMR NB 4.75kbps	2N	80.79	10.79	≥6	4.79
	WCDMA V	Voice	4182	AMR NB 12.2kbps	2N	81.28	11.28	≥6	5.28
94	WCDMA V	Voice	4182	AMR WB 6.6kbps	2N	80.04	10.04	≥6	4.04
	WCDMA V	Voice	4182	AMR WB 12.65kbps	2N	80.36	10.36	≥6	4.36
	WCDMA V	Voice	4182	AMR NB 4.75kbps	8N	86.93	16.93	≥6	10.93
	WCDMA V	Voice	4182	AMR NB 12.2kbps	8N	87.66	17.66	≥6	11.66
	WCDMA V	Voice	4182	AMR WB 6.6kbps	8N	86.42	16.42	≥6	10.42
	WCDMA V	Voice	4182	AMR WB 12.65kbps	8N	86.71	16.71	≥6	10.71

<LTE>

HAC(Volume control)Test Record						Conversational Gain			
Plot No.	Air Interface	Modulation/Mode	Channel	Codec	Mounting Force(N)	Measured-dBSPL Level	Conv.Gain(dB)	Limit(dB)	Margin to limit(dB)
	LTE Band 2	20_QPSK_100_0	18900	AMR NB 4.75kbps	2N	83.26	13.26	≥6	7.26
	LTE Band 2	20_QPSK_100_0	18900	AMR NB 12.2kbps	2N	83.20	13.20	≥6	7.20
	LTE Band 2	20_QPSK_100_0	18900	AMR WB 6.6kbps	2N	83.40	13.40	≥6	7.40
	LTE Band 2	20_QPSK_100_0	18900	AMR WB 12.65kbps	2N	83.57	13.57	≥6	7.57
	LTE Band 2	20_QPSK_100_0	18900	EVS NB 5.9 kbps	2N	83.45	13.45	≥6	7.45
	LTE Band 2	20_QPSK_100_0	18900	EVS NB 9.6kbps	2N	83.74	13.74	≥6	7.74
	LTE Band 2	20_QPSK_100_0	18900	EVS WB 5.9kbps	2N	83.40	13.40	≥6	7.40
	LTE Band 2	20_QPSK_100_0	18900	EVS WB 13.2kbps	2N	83.45	13.45	≥6	7.45
	LTE Band 2	20_QPSK_100_0	18900	AMR NB 4.75kbps	8N	88.66	18.66	≥6	12.66
	LTE Band 2	20_QPSK_100_0	18900	AMR NB 12.2kbps	8N	88.60	18.60	≥6	12.60
	LTE Band 2	20_QPSK_100_0	18900	AMR WB 6.6kbps	8N	88.71	18.71	≥6	12.71
	LTE Band 2	20_QPSK_100_0	18900	AMR WB 12.65kbps	8N	88.81	18.81	≥6	12.81
	LTE Band 2	20_QPSK_100_0	18900	EVS NB 5.9 kbps	8N	88.71	18.71	≥6	12.71
	LTE Band 2	20_QPSK_100_0	18900	EVS NB 9.6kbps	8N	89.02	19.02	≥6	13.02
	LTE Band 2	20_QPSK_100_0	18900	EVS WB 5.9kbps	8N	88.72	18.72	≥6	12.72
	LTE Band 2	20_QPSK_100_0	18900	EVS WB 13.2kbps	8N	88.28	18.28	≥6	12.28
	LTE Band 26(5)	15_QPSK_75_0	26865	AMR NB 4.75kbps	2N	83.38	13.38	≥6	7.38
	LTE Band 26(5)	15_QPSK_75_0	26865	AMR NB 12.2kbps	2N	83.51	13.51	≥6	7.51
	LTE Band 26(5)	15_QPSK_75_0	26865	AMR WB 6.6kbps	2N	83.41	13.41	≥6	7.41
	LTE Band 26(5)	15_QPSK_75_0	26865	AMR WB 12.65kbps	2N	83.24	13.24	≥6	7.24
	LTE Band 26(5)	15_QPSK_75_0	26865	EVS NB 5.9 kbps	2N	83.42	13.42	≥6	7.42
	LTE Band 26(5)	15_QPSK_75_0	26865	EVS NB 9.6kbps	2N	83.26	13.26	≥6	7.26
	LTE Band 26(5)	15_QPSK_75_0	26865	EVS WB 5.9kbps	2N	83.41	13.41	≥6	7.41
	LTE Band 26(5)	15_QPSK_75_0	26865	EVS WB 13.2kbps	2N	83.24	13.24	≥6	7.24
	LTE Band 26(5)	15_QPSK_75_0	26865	AMR NB 4.75kbps	8N	88.63	18.63	≥6	12.63
	LTE Band 26(5)	15_QPSK_75_0	26865	AMR NB 12.2kbps	8N	88.45	18.45	≥6	12.45
	LTE Band 26(5)	15_QPSK_75_0	26865	AMR WB 6.6kbps	8N	88.58	18.58	≥6	12.58
	LTE Band 26(5)	15_QPSK_75_0	26865	AMR WB 12.65kbps	8N	88.64	18.64	≥6	12.64
	LTE Band 26(5)	15_QPSK_75_0	26865	EVS NB 5.9 kbps	8N	88.69	18.69	≥6	12.69
	LTE Band 26(5)	15_QPSK_75_0	26865	EVS NB 9.6kbps	8N	88.25	18.25	≥6	12.25
	LTE Band 26(5)	15_QPSK_75_0	26865	EVS WB 5.9kbps	8N	88.64	18.64	≥6	12.64
	LTE Band 26(5)	15_QPSK_75_0	26865	EVS WB 13.2kbps	8N	88.32	18.32	≥6	12.32
	LTE Band 66(4)	20_QPSK_100_0	132322	AMR NB 4.75kbps	2N	83.68	13.68	≥6	7.68
	LTE Band 66(4)	20_QPSK_100_0	132322	AMR NB 12.2kbps	2N	83.45	13.45	≥6	7.45
	LTE Band 66(4)	20_QPSK_100_0	132322	AMR WB 6.6kbps	2N	83.55	13.55	≥6	7.55
	LTE Band 66(4)	20_QPSK_100_0	132322	AMR WB 12.65kbps	2N	83.40	13.40	≥6	7.40
	LTE Band 66(4)	20_QPSK_100_0	132322	EVS NB 5.9 kbps	2N	83.58	13.58	≥6	7.58
	LTE Band 66(4)	20_QPSK_100_0	132322	EVS NB 9.6kbps	2N	83.15	13.15	≥6	7.15
	LTE Band 66(4)	20_QPSK_100_0	132322	EVS WB 5.9kbps	2N	83.55	13.55	≥6	7.55
	LTE Band 66(4)	20_QPSK_100_0	132322	EVS WB 13.2kbps	2N	83.20	13.20	≥6	7.20
	LTE Band 66(4)	20_QPSK_100_0	132322	AMR NB 4.75kbps	8N	88.14	18.14	≥6	12.14
	LTE Band 66(4)	20_QPSK_100_0	132322	AMR NB 12.2kbps	8N	88.11	18.11	≥6	12.11

	LTE Band 66(4)	20_QPSK_100_0	132322	AMR WB 6.6kbps	8N	88.08	18.08	≥6	12.08
	LTE Band 66(4)	20_QPSK_100_0	132322	AMR WB 12.65kbps	8N	88.15	18.15	≥6	12.15
	LTE Band 66(4)	20_QPSK_100_0	132322	EVS NB 5.9 kbps	8N	88.11	18.11	≥6	12.11
	LTE Band 66(4)	20_QPSK_100_0	132322	EVS NB 9.6kbps	8N	88.31	18.31	≥6	12.31
	LTE Band 66(4)	20_QPSK_100_0	132322	EVS WB 5.9kbps	8N	88.21	18.21	≥6	12.21
	LTE Band 66(4)	20_QPSK_100_0	132322	EVS WB 13.2kbps	8N	88.50	18.50	≥6	12.50
	LTE Band 12	10_QPSK_50_0	23095	AMR NB 4.75kbps	2N	83.15	13.15	≥6	7.15
	LTE Band 12	10_QPSK_50_0	23095	AMR NB 12.2kbps	2N	83.21	13.21	≥6	7.21
	LTE Band 12	10_QPSK_50_0	23095	AMR WB 6.6kbps	2N	83.16	13.16	≥6	7.16
	LTE Band 12	10_QPSK_50_0	23095	AMR WB 12.65kbps	2N	83.14	13.14	≥6	7.14
	LTE Band 12	10_QPSK_50_0	23095	EVS NB 5.9 kbps	2N	83.18	13.18	≥6	7.18
	LTE Band 12	10_QPSK_50_0	23095	EVS NB 9.6kbps	2N	83.25	13.25	≥6	7.25
	LTE Band 12	10_QPSK_50_0	23095	EVS WB 5.9kbps	2N	83.11	13.11	≥6	7.11
	LTE Band 12	10_QPSK_50_0	23095	EVS WB 13.2kbps	2N	83.85	13.85	≥6	7.85
	LTE Band 12	10_QPSK_50_0	23095	AMR NB 4.75kbps	8N	88.65	18.65	≥6	12.65
	LTE Band 12	10_QPSK_50_0	23095	AMR NB 12.2kbps	8N	88.70	18.70	≥6	12.70
	LTE Band 12	10_QPSK_50_0	23095	AMR WB 6.6kbps	8N	88.85	18.85	≥6	12.85
	LTE Band 12	10_QPSK_50_0	23095	AMR WB 12.65kbps	8N	88.88	18.88	≥6	12.88
	LTE Band 12	10_QPSK_50_0	23095	EVS NB 5.9 kbps	8N	88.79	18.79	≥6	12.79
	LTE Band 12	10_QPSK_50_0	23095	EVS NB 9.6kbps	8N	88.66	18.66	≥6	12.66
	LTE Band 12	10_QPSK_50_0	23095	EVS WB 5.9kbps	8N	88.80	18.80	≥6	12.80
	LTE Band 12	10_QPSK_50_0	23095	EVS WB 13.2kbps	8N	88.80	18.80	≥6	12.80
	LTE Band 14	10_QPSK_50_0	23330	AMR NB 4.75kbps	2N	80.97	10.97	≥6	4.97
	LTE Band 14	10_QPSK_50_0	23230	AMR NB 12.2kbps	2N	80.98	10.98	≥6	4.98
	LTE Band 14	10_QPSK_50_0	23230	AMR WB 6.6kbps	2N	81.07	11.07	≥6	5.07
	LTE Band 14	10_QPSK_50_0	23230	AMR WB 12.65kbps	2N	81.23	11.23	≥6	5.23
	LTE Band 14	10_QPSK_50_0	23230	EVS NB 5.9 kbps	2N	80.90	10.90	≥6	4.90
	LTE Band 14	10_QPSK_50_0	23230	EVS NB 9.6kbps	2N	83.74	13.74	≥6	7.74
	LTE Band 14	10_QPSK_50_0	23230	EVS WB 5.9kbps	2N	80.82	10.82	≥6	4.82
	LTE Band 14	10_QPSK_50_0	23230	EVS WB 13.2kbps	2N	83.81	13.81	≥6	7.81
	LTE Band 14	10_QPSK_50_0	23230	AMR NB 4.75kbps	8N	87.03	17.03	≥6	11.03
	LTE Band 14	10_QPSK_50_0	23230	AMR NB 12.2kbps	8N	87.00	17.00	≥6	11.00
	LTE Band 14	10_QPSK_50_0	23230	AMR WB 6.6kbps	8N	87.20	17.20	≥6	11.20
	LTE Band 14	10_QPSK_50_0	23230	AMR WB 12.65kbps	8N	87.02	17.02	≥6	11.02
	LTE Band 14	10_QPSK_50_0	23230	EVS NB 5.9 kbps	8N	87.16	17.16	≥6	11.16
	LTE Band 14	10_QPSK_50_0	23230	EVS NB 9.6kbps	8N	88.25	18.25	≥6	12.25
	LTE Band 14	10_QPSK_50_0	23230	EVS WB 5.9kbps	8N	87.04	17.04	≥6	11.04
	LTE Band 14	10_QPSK_50_0	23230	EVS WB 13.2kbps	8N	88.51	18.51	≥6	12.51
	LTE Band 30	10_QPSK_50_0	27710	AMR NB 4.75kbps	2N	85.98	15.98	≥6	9.98
	LTE Band 30	10_QPSK_50_0	27710	AMR NB 12.2kbps	2N	86.11	16.11	≥6	10.11
	LTE Band 30	10_QPSK_50_0	27710	AMR WB 6.6kbps	2N	86.02	16.02	≥6	10.02
	LTE Band 30	10_QPSK_50_0	27710	AMR WB 12.65kbps	2N	85.98	15.98	≥6	9.98
	LTE Band 30	10_QPSK_50_0	27710	EVS NB 5.9 kbps	2N	85.96	15.96	≥6	9.96
	LTE Band 30	10_QPSK_50_0	27710	EVS NB 9.6kbps	2N	83.43	13.43	≥6	7.43
	LTE Band 30	10_QPSK_50_0	27710	EVS WB 5.9kbps	2N	86.02	16.02	≥6	10.02
	LTE Band 30	10_QPSK_50_0	27710	EVS WB 13.2kbps	2N	83.52	13.52	≥6	7.52

	LTE Band 30	10_QPSK_50_0	27710	AMR NB 4.75kbps	8N	91.88	21.88	≥6	15.88
	LTE Band 30	10_QPSK_50_0	27710	AMR NB 12.2kbps	8N	91.82	21.82	≥6	15.82
	LTE Band 30	10_QPSK_50_0	27710	AMR WB 6.6kbps	8N	92.17	22.17	≥6	16.17
	LTE Band 30	10_QPSK_50_0	27710	AMR WB 12.65kbps	8N	92.04	22.04	≥6	16.04
	LTE Band 30	10_QPSK_50_0	27710	EVS NB 5.9 kbps	8N	92.01	22.01	≥6	16.01
	LTE Band 30	10_QPSK_50_0	27710	EVS NB 9.6kbps	8N	88.73	18.73	≥6	12.73
	LTE Band 30	10_QPSK_50_0	27710	EVS WB 5.9kbps	8N	92.13	22.13	≥6	16.13
	LTE Band 30	10_QPSK_50_0	27710	EVS WB 13.2kbps	8N	88.75	18.75	≥6	12.75
	LTE Band 48	20_QPSK_100_0	55990	AMR NB 4.75kbps	2N	80.18	10.18	≥6	4.18
95	LTE Band 48	20_QPSK_100_0	55990	AMR NB 12.2kbps	2N	80.08	10.08	≥6	4.08
	LTE Band 48	20_QPSK_100_0	55990	AMR WB 6.6kbps	2N	80.18	10.18	≥6	4.18
	LTE Band 48	20_QPSK_100_0	55990	AMR WB 12.65kbps	2N	80.30	10.30	≥6	4.30
	LTE Band 48	20_QPSK_100_0	55990	EVS NB 5.9 kbps	2N	80.41	10.41	≥6	4.41
	LTE Band 48	20_QPSK_100_0	55990	EVS NB 9.6kbps	2N	83.17	13.17	≥6	7.17
	LTE Band 48	20_QPSK_100_0	55990	EVS WB 5.9kbps	2N	80.36	10.36	≥6	4.36
	LTE Band 48	20_QPSK_100_0	55990	EVS WB 13.2kbps	2N	83.36	13.36	≥6	7.36
	LTE Band 48	20_QPSK_100_0	55990	AMR NB 4.75kbps	8N	85.55	15.55	≥6	9.55
	LTE Band 48	20_QPSK_100_0	55990	AMR NB 12.2kbps	8N	85.62	15.62	≥6	9.62
	LTE Band 48	20_QPSK_100_0	55990	AMR WB 6.6kbps	8N	85.61	15.61	≥6	9.61
	LTE Band 48	20_QPSK_100_0	55990	AMR WB 12.65kbps	8N	85.59	15.59	≥6	9.59
	LTE Band 48	20_QPSK_100_0	55990	EVS NB 5.9 kbps	8N	85.59	15.59	≥6	9.59
	LTE Band 48	20_QPSK_100_0	55990	EVS NB 9.6kbps	8N	88.46	18.46	≥6	12.46
	LTE Band 48	20_QPSK_100_0	55990	EVS WB 5.9kbps	8N	85.55	15.55	≥6	9.55
	LTE Band 48	20_QPSK_100_0	55990	EVS WB 13.2kbps	8N	88.33	18.33	≥6	12.33
	LTE Band 71	20_QPSK_100_0	133322	AMR NB 4.75kbps	2N	80.43	10.43	≥6	4.43
	LTE Band 71	20_QPSK_100_0	133322	AMR NB 12.2kbps	2N	80.34	10.34	≥6	4.34
	LTE Band 71	20_QPSK_100_0	133322	AMR WB 6.6kbps	2N	80.33	10.33	≥6	4.33
	LTE Band 71	20_QPSK_100_0	133322	AMR WB 12.65kbps	2N	80.42	10.42	≥6	4.42
	LTE Band 71	20_QPSK_100_0	133322	EVS NB 5.9 kbps	2N	80.41	10.41	≥6	4.41
	LTE Band 71	20_QPSK_100_0	133322	EVS NB 9.6kbps	2N	83.64	13.64	≥6	7.64
	LTE Band 71	20_QPSK_100_0	133322	EVS WB 5.9kbps	2N	80.38	10.38	≥6	4.38
	LTE Band 71	20_QPSK_100_0	133322	EVS WB 13.2kbps	2N	83.90	13.90	≥6	7.90
	LTE Band 71	20_QPSK_100_0	133322	AMR NB 4.75kbps	8N	85.49	15.49	≥6	9.49
	LTE Band 71	20_QPSK_100_0	133322	AMR NB 12.2kbps	8N	85.59	15.59	≥6	9.59
	LTE Band 71	20_QPSK_100_0	133322	AMR WB 6.6kbps	8N	85.40	15.40	≥6	9.40
	LTE Band 71	20_QPSK_100_0	133322	AMR WB 12.65kbps	8N	85.56	15.56	≥6	9.56
	LTE Band 71	20_QPSK_100_0	133322	EVS NB 5.9 kbps	8N	85.70	15.70	≥6	9.70
	LTE Band 71	20_QPSK_100_0	133322	EVS NB 9.6kbps	8N	88.70	18.70	≥6	12.70
	LTE Band 71	20_QPSK_100_0	133322	EVS WB 5.9kbps	8N	85.61	15.61	≥6	9.61
	LTE Band 71	20_QPSK_100_0	133322	EVS WB 13.2kbps	8N	88.88	18.88	≥6	12.88

<WLAN>

HAC(Volume control)Test Record						Conversational Gain			
Plot No.	Air Interface	Modulation/Mode	Channel	Codec	Mounting Force(N)	Measured-dBSPL Level	Conv.Gain(dB)	Limit(dB)	Margin to limit(dB)
	WIFI2.4GHz	802.11b 1Mbps	6	AMR NB 4.75kbps	2N	80.24	10.24	≥6	4.24
	WIFI2.4GHz	802.11b 1Mbps	6	AMR NB 12.2kbps	2N	80.37	10.37	≥6	4.37
	WIFI2.4GHz	802.11b 1Mbps	6	AMR WB 6.6kbps	2N	80.45	10.45	≥6	4.45
	WIFI2.4GHz	802.11b 1Mbps	6	AMR WB 12.65kbps	2N	80.52	10.52	≥6	4.52
	WIFI2.4GHz	802.11b 1Mbps	6	EVS NB 5.9 kbps	2N	80.49	10.49	≥6	4.49
	WIFI2.4GHz	802.11b 1Mbps	6	EVS NB 9.6kbps	2N	80.35	10.35	≥6	4.35
	WIFI2.4GHz	802.11b 1Mbps	6	EVS WB 5.9kbps	2N	80.40	10.40	≥6	4.40
	WIFI2.4GHz	802.11b 1Mbps	6	EVS WB 9.6kbps	2N	80.56	10.56	≥6	4.56
	WIFI2.4GHz	802.11b 1Mbps	6	AMR NB 4.75kbps	8N	85.87	15.87	≥6	9.87
	WIFI2.4GHz	802.11b 1Mbps	6	AMR NB 12.2kbps	8N	86.01	16.01	≥6	10.01
	WIFI2.4GHz	802.11b 1Mbps	6	AMR WB 6.6kbps	8N	85.94	15.94	≥6	9.94
	WIFI2.4GHz	802.11b 1Mbps	6	AMR WB 12.65kbps	8N	86.20	16.20	≥6	10.20
	WIFI2.4GHz	802.11b 1Mbps	6	EVS NB 5.9 kbps	8N	86.23	16.23	≥6	10.23
	WIFI2.4GHz	802.11b 1Mbps	6	EVS NB 9.6kbps	8N	86.09	16.09	≥6	10.09
	WIFI2.4GHz	802.11b 1Mbps	6	EVS WB 5.9kbps	8N	86.13	16.13	≥6	10.13
	WIFI2.4GHz	802.11b 1Mbps	6	EVS WB 9.6kbps	8N	85.86	15.86	≥6	9.86
	WIFI2.4GHz	802.11g 1Mbps	6	AMR NB 4.75kbps	2N	80.03	10.03	≥6	4.03
	WIFI2.4GHz	802.11g 1Mbps	6	AMR NB 12.2kbps	2N	80.04	10.04	≥6	4.04
	WIFI2.4GHz	802.11g 1Mbps	6	AMR WB 6.6kbps	2N	80.03	10.03	≥6	4.03
	WIFI2.4GHz	802.11g 1Mbps	6	AMR WB 12.65kbps	2N	80.02	10.02	≥6	4.02
	WIFI2.4GHz	802.11g 1Mbps	6	EVS NB 5.9 kbps	2N	80.07	10.07	≥6	4.07
	WIFI2.4GHz	802.11g 1Mbps	6	EVS NB 9.6kbps	2N	80.01	10.01	≥6	4.01
	WIFI2.4GHz	802.11g 1Mbps	6	EVS WB 5.9kbps	2N	80.12	10.12	≥6	4.12
	WIFI2.4GHz	802.11g 1Mbps	6	EVS WB 9.6kbps	2N	80.09	10.09	≥6	4.09
	WIFI2.4GHz	802.11g 1Mbps	6	AMR NB 4.75kbps	8N	86.11	16.11	≥6	10.11
	WIFI2.4GHz	802.11g 1Mbps	6	AMR NB 12.2kbps	8N	86.17	16.17	≥6	10.17
	WIFI2.4GHz	802.11g 1Mbps	6	AMR WB 6.6kbps	8N	86.30	16.30	≥6	10.30
	WIFI2.4GHz	802.11g 1Mbps	6	AMR WB 12.65kbps	8N	86.25	16.25	≥6	10.25
	WIFI2.4GHz	802.11g 1Mbps	6	EVS NB 5.9 kbps	8N	86.24	16.24	≥6	10.24
	WIFI2.4GHz	802.11g 1Mbps	6	EVS NB 9.6kbps	8N	86.19	16.19	≥6	10.19
	WIFI2.4GHz	802.11g 1Mbps	6	EVS WB 5.9kbps	8N	86.16	16.16	≥6	10.16
	WIFI2.4GHz	802.11g 1Mbps	6	EVS WB 9.6kbps	8N	86.04	16.04	≥6	10.04
	WIFI2.4GHz	802.11n-HT40 MCS0	6	AMR NB 4.75kbps	2N	80.30	10.30	≥6	4.30
	WIFI2.4GHz	802.11n-HT40 MCS0	6	AMR NB 12.2kbps	2N	80.49	10.49	≥6	4.49
	WIFI2.4GHz	802.11n-HT40 MCS0	6	AMR WB 6.6kbps	2N	80.51	10.51	≥6	4.51
	WIFI2.4GHz	802.11n-HT40 MCS0	6	AMR WB 12.65kbps	2N	80.43	10.43	≥6	4.43
	WIFI2.4GHz	802.11n-HT40 MCS0	6	EVS NB 5.9 kbps	2N	80.47	10.47	≥6	4.47
	WIFI2.4GHz	802.11n-HT40 MCS0	6	EVS NB 9.6kbps	2N	80.49	10.49	≥6	4.49
	WIFI2.4GHz	802.11n-HT40 MCS0	6	EVS WB 5.9kbps	2N	80.42	10.42	≥6	4.42
	WIFI2.4GHz	802.11n-HT40 MCS0	6	EVS WB 9.6kbps	2N	80.75	10.75	≥6	4.75
	WIFI2.4GHz	802.11n-HT40 MCS0	6	AMR NB 4.75kbps	8N	86.12	16.12	≥6	10.12
	WIFI2.4GHz	802.11n-HT40 MCS0	6	AMR NB 12.2kbps	8N	86.20	16.20	≥6	10.20
	WIFI2.4GHz	802.11n-HT40 MCS0	6	AMR WB 6.6kbps	8N	86.14	16.14	≥6	10.14

	WIFI2.4GHz	802.11n-HT40 MCS0	6	AMR WB 12.65kbps	8N	86.22	16.22	≥6	10.22
	WIFI2.4GHz	802.11n-HT40 MCS0	6	EVS NB 5.9 kbps	8N	85.88	15.88	≥6	9.88
	WIFI2.4GHz	802.11n-HT40 MCS0	6	EVS NB 9.6kbps	8N	86.30	16.30	≥6	10.30
	WIFI2.4GHz	802.11n-HT40 MCS0	6	EVS WB 5.9kbps	8N	85.96	15.96	≥6	9.96
	WIFI2.4GHz	802.11n-HT40 MCS0	6	EVS WB 9.6kbps	8N	86.25	16.25	≥6	10.25
	WIFI5GHz	802.11a 6M	40	AMR NB 4.75kbps	2N	80.32	10.32	≥6	4.32
	WIFI5GHz	802.11a 6M	40	AMR NB 12.2kbps	2N	80.03	10.03	≥6	4.03
	WIFI5GHz	802.11a 6M	40	AMR WB 6.6kbps	2N	80.53	10.53	≥6	4.53
	WIFI5GHz	802.11a 6M	40	AMR WB 12.65kbps	2N	80.38	10.38	≥6	4.38
	WIFI5GHz	802.11a 6M	40	EVS NB 5.9 kbps	2N	80.25	10.25	≥6	4.25
96	WIFI5GHz	802.11a 6M	40	EVS NB 9.6kbps	2N	79.98	9.98	≥6	3.98
	WIFI5GHz	802.11a 6M	40	EVS WB 5.9kbps	2N	80.47	10.47	≥6	4.47
	WIFI5GHz	802.11a 6M	40	EVS WB 9.6kbps	2N	80.37	10.37	≥6	4.37
	WIFI5GHz	802.11a 6M	40	AMR NB 4.75kbps	8N	85.95	15.95	≥6	9.95
	WIFI5GHz	802.11a 6M	40	AMR NB 12.2kbps	8N	86.04	16.04	≥6	10.04
	WIFI5GHz	802.11a 6M	40	AMR WB 6.6kbps	8N	85.52	15.52	≥6	9.52
	WIFI5GHz	802.11a 6M	40	AMR WB 12.65kbps	8N	86.11	16.11	≥6	10.11
	WIFI5GHz	802.11a 6M	40	EVS NB 5.9 kbps	8N	86.08	16.08	≥6	10.08
	WIFI5GHz	802.11a 6M	40	EVS NB 9.6kbps	8N	85.86	15.86	≥6	9.86
	WIFI5GHz	802.11a 6M	40	EVS WB 5.9kbps	8N	86.15	16.15	≥6	10.15
	WIFI5GHz	802.11a 6M	40	EVS WB 9.6kbps	8N	86.15	16.15	≥6	10.15
	WIFI5GHz	802.11n-HT40 MCS0	38	AMR NB 4.75kbps	2N	80.20	10.20	≥6	4.20
	WIFI5GHz	802.11n-HT40 MCS0	38	AMR NB 12.2kbps	2N	80.46	10.46	≥6	4.46
	WIFI5GHz	802.11n-HT40 MCS0	38	AMR WB 6.6kbps	2N	80.46	10.46	≥6	4.46
	WIFI5GHz	802.11n-HT40 MCS0	38	AMR WB 12.65kbps	2N	80.54	10.54	≥6	4.54
	WIFI5GHz	802.11n-HT40 MCS0	38	EVS NB 5.9 kbps	2N	80.56	10.56	≥6	4.56
	WIFI5GHz	802.11n-HT40 MCS0	38	EVS NB 9.6kbps	2N	80.47	10.47	≥6	4.47
	WIFI5GHz	802.11n-HT40 MCS0	38	EVS WB 5.9kbps	2N	80.57	10.57	≥6	4.57
	WIFI5GHz	802.11n-HT40 MCS0	38	EVS WB 9.6kbps	2N	80.65	10.65	≥6	4.65
	WIFI5GHz	802.11n-HT40 MCS0	38	AMR NB 4.75kbps	8N	86.21	16.21	≥6	10.21
	WIFI5GHz	802.11n-HT40 MCS0	38	AMR NB 12.2kbps	8N	86.28	16.28	≥6	10.28
	WIFI5GHz	802.11n-HT40 MCS0	38	AMR WB 6.6kbps	8N	86.43	16.43	≥6	10.43
	WIFI5GHz	802.11n-HT40 MCS0	38	AMR WB 12.65kbps	8N	86.31	16.31	≥6	10.31
	WIFI5GHz	802.11n-HT40 MCS0	38	EVS NB 5.9 kbps	8N	86.40	16.40	≥6	10.40
	WIFI5GHz	802.11n-HT40 MCS0	38	EVS NB 9.6kbps	8N	85.89	15.89	≥6	9.89
	WIFI5GHz	802.11n-HT40 MCS0	38	EVS WB 5.9kbps	8N	86.41	16.41	≥6	10.41
	WIFI5GHz	802.11n-HT40 MCS0	38	EVS WB 9.6kbps	8N	86.36	16.36	≥6	10.36
	WIFI5GHz	802.11ac-VHT80 MCS0	42	AMR NB 4.75kbps	2N	80.04	10.04	≥6	4.04
	WIFI5GHz	802.11ac-VHT80 MCS0	42	AMR NB 12.2kbps	2N	80.30	10.30	≥6	4.30
	WIFI5GHz	802.11ac-VHT80 MCS0	42	AMR WB 6.6kbps	2N	80.55	10.55	≥6	4.55
	WIFI5GHz	802.11ac-VHT80 MCS0	42	AMR WB 12.65kbps	2N	80.37	10.37	≥6	4.37
	WIFI5GHz	802.11ac-VHT80 MCS0	42	EVS NB 5.9 kbps	2N	80.37	10.37	≥6	4.37
	WIFI5GHz	802.11ac-VHT80 MCS0	42	EVS NB 9.6kbps	2N	80.63	10.63	≥6	4.63
	WIFI5GHz	802.11ac-VHT80 MCS0	42	EVS WB 5.9kbps	2N	80.66	10.66	≥6	4.66
	WIFI5GHz	802.11ac-VHT80 MCS0	42	EVS WB 9.6kbps	2N	80.34	10.34	≥6	4.34
	WIFI5GHz	802.11ac-VHT80 MCS0	42	AMR NB 4.75kbps	8N	86.00	16.00	≥6	10.00

	WIFI5GHz	802.11ac-VHT80 MCS0	42	AMR NB 12.2kbps	8N	86.10	16.10	≥6	10.10
	WIFI5GHz	802.11ac-VHT80 MCS0	42	AMR WB 6.6kbps	8N	86.24	16.24	≥6	10.24
	WIFI5GHz	802.11ac-VHT80 MCS0	42	AMR WB 12.65kbps	8N	86.19	16.19	≥6	10.19
	WIFI5GHz	802.11ac-VHT80 MCS0	42	EVS NB 5.9 kbps	8N	86.15	16.15	≥6	10.15
	WIFI5GHz	802.11ac-VHT80 MCS0	42	EVS NB 9.6kbps	8N	86.14	16.14	≥6	10.14
	WIFI5GHz	802.11ac-VHT80 MCS0	42	EVS WB 5.9kbps	8N	86.27	16.27	≥6	10.27
	WIFI5GHz	802.11ac-VHT80 MCS0	42	EVS WB 9.6kbps	8N	86.18	16.18	≥6	10.18

<VoNR>

Plot No.	Air Interface	Modulation/Mode	Channel	Codec	Mounting Force(N)	Measured-dBSPL Level	Conv.Gain(dB)	Limit(dB)	Margin to limit(dB)
	NR n5	20_DFT-s-OFDM	167300	AMR NB 4.75kbps	2N	83.45	13.45	≥6	7.45
	NR n5	20_DFT-s-OFDM	167300	AMR NB 12.2kbps	2N	83.42	13.42	≥6	7.42
	NR n5	20_DFT-s-OFDM	167300	AMR WB 6.6kbps	2N	83.45	13.45	≥6	7.45
	NR n5	20_DFT-s-OFDM	167300	AMR WB 12.65kbps	2N	83.47	13.47	≥6	7.47
	NR n5	20_DFT-s-OFDM	167300	EVS NB 5.9 kbps	2N	83.25	13.25	≥6	7.25
	NR n5	20_DFT-s-OFDM	167300	EVS NB 9.6kbps	2N	82.72	12.72	≥6	6.72
	NR n5	20_DFT-s-OFDM	167300	EVS WB 5.9kbps	2N	83.25	13.25	≥6	7.25
	NR n5	20_DFT-s-OFDM	167300	EVS WB 13.2kbps	2N	82.66	12.66	≥6	6.66
	NR n5	20_DFT-s-OFDM	167300	AMR NB 4.75kbps	8N	89.12	19.12	≥6	13.12
	NR n5	20_DFT-s-OFDM	167300	AMR NB 12.2kbps	8N	89.13	19.13	≥6	13.13
	NR n5	20_DFT-s-OFDM	167300	AMR WB 6.6kbps	8N	89.24	19.24	≥6	13.24
	NR n5	20_DFT-s-OFDM	167300	AMR WB 12.65kbps	8N	89.25	19.25	≥6	13.25
	NR n5	20_DFT-s-OFDM	167300	EVS NB 5.9 kbps	8N	89.14	19.14	≥6	13.14
	NR n5	20_DFT-s-OFDM	167300	EVS NB 9.6kbps	8N	88.39	18.39	≥6	12.39
	NR n5	20_DFT-s-OFDM	167300	EVS WB 5.9kbps	8N	89.23	19.23	≥6	13.23
	NR n5	20_DFT-s-OFDM	167300	EVS WB 13.2kbps	8N	88.48	18.48	≥6	12.48
	NR n25（2）	40_DFT-s-OFDM	376500	AMR NB 4.75kbps	2N	83.40	13.40	≥6	7.40
	NR n25（2）	40_DFT-s-OFDM	376500	AMR NB 12.2kbps	2N	83.67	13.67	≥6	7.67
	NR n25（2）	40_DFT-s-OFDM	376500	AMR WB 6.6kbps	2N	83.52	13.52	≥6	7.52
	NR n25（2）	40_DFT-s-OFDM	376500	AMR WB 12.65kbps	2N	83.53	13.53	≥6	7.53
	NR n25（2）	40_DFT-s-OFDM	376500	EVS NB 5.9 kbps	2N	83.55	13.55	≥6	7.55
	NR n25（2）	40_DFT-s-OFDM	376500	EVS NB 9.6kbps	2N	82.68	12.68	≥6	6.68
	NR n25（2）	40_DFT-s-OFDM	376500	EVS WB 5.9kbps	2N	83.46	13.46	≥6	7.46
	NR n25（2）	40_DFT-s-OFDM	376500	EVS WB 13.2kbps	2N	82.54	12.54	≥6	6.54
	NR n25（2）	40_DFT-s-OFDM	376500	AMR NB 4.75kbps	8N	89.17	19.17	≥6	13.17
	NR n25（2）	40_DFT-s-OFDM	376500	AMR NB 12.2kbps	8N	89.19	19.19	≥6	13.19
	NR n25（2）	40_DFT-s-OFDM	376500	AMR WB 6.6kbps	8N	89.33	19.33	≥6	13.33
	NR n25（2）	40_DFT-s-OFDM	376500	AMR WB 12.65kbps	8N	89.31	19.31	≥6	13.31
	NR n25（2）	40_DFT-s-OFDM	376500	EVS NB 5.9 kbps	8N	89.20	19.20	≥6	13.20
	NR n25（2）	40_DFT-s-OFDM	376500	EVS NB 9.6kbps	8N	88.37	18.37	≥6	12.37
	NR n25（2）	40_DFT-s-OFDM	376500	EVS WB 5.9kbps	8N	89.31	19.31	≥6	13.31
	NR n25（2）	40_DFT-s-OFDM	376500	EVS WB 13.2kbps	8N	88.63	18.63	≥6	12.63
	NR n26	20_DFT-s-OFDM	166300	AMR NB 4.75kbps	2N	82.84	12.84	≥6	6.84

	NR n26	20_DFT-s-OFDM	166300	AMR NB 12.2kbps	2N	82.73	12.73	≥6	6.73
	NR n26	20_DFT-s-OFDM	166300	AMR WB 6.6kbps	2N	82.72	12.72	≥6	6.72
	NR n26	20_DFT-s-OFDM	166300	AMR WB 12.65kbps	2N	82.69	12.69	≥6	6.69
	NR n26	20_DFT-s-OFDM	166300	EVS NB 5.9 kbps	2N	82.63	12.63	≥6	6.63
	NR n26	20_DFT-s-OFDM	166300	EVS NB 9.6kbps	2N	82.74	12.74	≥6	6.74
	NR n26	20_DFT-s-OFDM	166300	EVS WB 5.9kbps	2N	82.57	12.57	≥6	6.57
	NR n26	20_DFT-s-OFDM	166300	EVS WB 13.2kbps	2N	82.71	12.71	≥6	6.71
	NR n26	20_DFT-s-OFDM	166300	AMR NB 4.75kbps	8N	88.41	18.41	≥6	12.41
	NR n26	20_DFT-s-OFDM	166300	AMR NB 12.2kbps	8N	88.45	18.45	≥6	12.45
	NR n26	20_DFT-s-OFDM	166300	AMR WB 6.6kbps	8N	88.51	18.51	≥6	12.51
	NR n26	20_DFT-s-OFDM	166300	AMR WB 12.65kbps	8N	88.54	18.54	≥6	12.54
	NR n26	20_DFT-s-OFDM	166300	EVS NB 5.9 kbps	8N	88.44	18.44	≥6	12.44
	NR n26	20_DFT-s-OFDM	166300	EVS NB 9.6kbps	8N	88.47	18.47	≥6	12.47
	NR n26	20_DFT-s-OFDM	166300	EVS WB 5.9kbps	8N	88.60	18.60	≥6	12.60
	NR n26	20_DFT-s-OFDM	166300	EVS WB 13.2kbps	8N	88.53	18.53	≥6	12.53
	NR n30	10_DFT-s-OFDM	462000	AMR NB 4.75kbps	2N	86.04	16.04	≥6	10.04
	NR n30	10_DFT-s-OFDM	462000	AMR NB 12.2kbps	2N	86.11	16.11	≥6	10.11
	NR n30	10_DFT-s-OFDM	462000	AMR WB 6.6kbps	2N	86.12	16.12	≥6	10.12
	NR n30	10_DFT-s-OFDM	462000	AMR WB 12.65kbps	2N	86.07	16.07	≥6	10.07
	NR n30	10_DFT-s-OFDM	462000	EVS NB 5.9 kbps	2N	86.19	16.19	≥6	10.19
	NR n30	10_DFT-s-OFDM	462000	EVS NB 9.6kbps	2N	82.64	12.64	≥6	6.64
	NR n30	10_DFT-s-OFDM	462000	EVS WB 5.9kbps	2N	86.17	16.17	≥6	10.17
	NR n30	10_DFT-s-OFDM	462000	EVS WB 13.2kbps	2N	82.69	12.69	≥6	6.69
	NR n30	10_DFT-s-OFDM	462000	AMR NB 4.75kbps	8N	91.84	21.84	≥6	15.84
	NR n30	10_DFT-s-OFDM	462000	AMR NB 12.2kbps	8N	91.70	21.70	≥6	15.70
	NR n30	10_DFT-s-OFDM	462000	AMR WB 6.6kbps	8N	91.92	21.92	≥6	15.92
	NR n30	10_DFT-s-OFDM	462000	AMR WB 12.65kbps	8N	91.95	21.95	≥6	15.95
	NR n30	10_DFT-s-OFDM	462000	EVS NB 5.9 kbps	8N	91.08	21.08	≥6	15.08
	NR n30	10_DFT-s-OFDM	462000	EVS NB 9.6kbps	8N	88.47	18.47	≥6	12.47
	NR n30	10_DFT-s-OFDM	462000	EVS WB 5.9kbps	8N	92.01	22.01	≥6	16.01
	NR n30	10_DFT-s-OFDM	462000	EVS WB 13.2kbps	8N	88.62	18.62	≥6	12.62
	NR 41	100_DFT-s-OFDM	518598	AMR NB 4.75kbps	2N	85.64	15.64	≥6	9.64
	NR 41	100_DFT-s-OFDM	518598	AMR NB 12.2kbps	2N	85.52	15.52	≥6	9.52
	NR 41	100_DFT-s-OFDM	518598	AMR WB 6.6kbps	2N	85.77	15.77	≥6	9.77
	NR 41	100_DFT-s-OFDM	518598	AMR WB 12.65kbps	2N	85.68	15.68	≥6	9.68
	NR 41	100_DFT-s-OFDM	518598	EVS NB 5.9 kbps	2N	85.56	15.56	≥6	9.56
	NR 41	100_DFT-s-OFDM	518598	EVS NB 9.6kbps	2N	82.63	12.63	≥6	6.63
	NR 41	100_DFT-s-OFDM	518598	EVS WB 5.9kbps	2N	85.70	15.70	≥6	9.70
	NR 41	100_DFT-s-OFDM	518598	EVS WB 13.2kbps	2N	82.47	12.47	≥6	6.47
	NR 41	100_DFT-s-OFDM	518598	AMR NB 4.75kbps	8N	91.67	21.67	≥6	15.67
	NR 41	100_DFT-s-OFDM	518598	AMR NB 12.2kbps	8N	91.67	21.67	≥6	15.67
	NR 41	100_DFT-s-OFDM	518598	AMR WB 6.6kbps	8N	91.82	21.82	≥6	15.82
	NR 41	100_DFT-s-OFDM	518598	AMR WB 12.65kbps	8N	91.79	21.79	≥6	15.79
	NR 41	100_DFT-s-OFDM	518598	EVS NB 5.9 kbps	8N	91.66	21.66	≥6	15.66
	NR 41	100_DFT-s-OFDM	518598	EVS NB 9.6kbps	8N	88.31	18.31	≥6	12.31
	NR 41	100_DFT-s-OFDM	518598	EVS WB 5.9kbps	8N	91.78	21.78	≥6	15.78

	NR 41	100_DFT-s-OFDM	518598	EVS WB 13.2kbps	8N	88.50	18.50	≥6	12.50
	NR 48	40_DFT-s-OFDM	641666	AMR NB 4.75kbps	2N	85.48	15.48	≥6	9.48
	NR 48	40_DFT-s-OFDM	641666	AMR NB 12.2kbps	2N	85.58	15.58	≥6	9.58
	NR 48	40_DFT-s-OFDM	641666	AMR WB 6.6kbps	2N	85.60	15.60	≥6	9.60
	NR 48	40_DFT-s-OFDM	641666	AMR WB 12.65kbps	2N	85.67	15.67	≥6	9.67
	NR 48	40_DFT-s-OFDM	641666	EVS NB 5.9 kbps	2N	85.86	15.86	≥6	9.86
	NR 48	40_DFT-s-OFDM	641666	EVS NB 9.6kbps	2N	82.42	12.42	≥6	6.42
	NR 48	40_DFT-s-OFDM	641666	EVS WB 5.9kbps	2N	85.76	15.76	≥6	9.76
	NR 48	40_DFT-s-OFDM	641666	EVS WB 13.2kbps	2N	82.63	12.63	≥6	6.63
	NR 48	40_DFT-s-OFDM	641666	AMR NB 4.75kbps	8N	91.66	21.66	≥6	15.66
	NR 48	40_DFT-s-OFDM	641666	AMR NB 12.2kbps	8N	91.70	21.70	≥6	15.70
	NR 48	40_DFT-s-OFDM	641666	AMR WB 6.6kbps	8N	91.95	21.95	≥6	15.95
	NR 48	40_DFT-s-OFDM	641666	AMR WB 12.65kbps	8N	91.89	21.89	≥6	15.89
	NR 48	40_DFT-s-OFDM	641666	EVS NB 5.9 kbps	8N	91.63	21.63	≥6	15.63
	NR 48	40_DFT-s-OFDM	641666	EVS NB 9.6kbps	8N	88.49	18.49	≥6	12.49
	NR 48	40_DFT-s-OFDM	641666	EVS WB 5.9kbps	8N	91.82	21.82	≥6	15.82
	NR 48	40_DFT-s-OFDM	641666	EVS WB 13.2kbps	8N	88.63	18.63	≥6	12.63
	NR n66	40_DFT-s-OFDM	349000	AMR NB 4.75kbps	2N	85.90	15.90	≥6	9.90
	NR n66	40_DFT-s-OFDM	349000	AMR NB 12.2kbps	2N	86.02	16.02	≥6	10.02
	NR n66	40_DFT-s-OFDM	349000	AMR WB 6.6kbps	2N	86.07	16.07	≥6	10.07
	NR n66	40_DFT-s-OFDM	349000	AMR WB 12.65kbps	2N	85.85	15.85	≥6	9.85
	NR n66	40_DFT-s-OFDM	349000	EVS NB 5.9 kbps	2N	85.96	15.96	≥6	9.96
	NR n66	40_DFT-s-OFDM	349000	EVS NB 9.6kbps	2N	82.34	12.34	≥6	6.34
	NR n66	40_DFT-s-OFDM	349000	EVS WB 5.9kbps	2N	85.93	15.93	≥6	9.93
97	NR n66	40_DFT-s-OFDM	349000	EVS WB 13.2kbps	2N	82.30	12.30	≥6	6.30
	NR n66	40_DFT-s-OFDM	349000	AMR NB 4.75kbps	8N	91.78	21.78	≥6	15.78
	NR n66	40_DFT-s-OFDM	349000	AMR NB 12.2kbps	8N	91.76	21.76	≥6	15.76
	NR n66	40_DFT-s-OFDM	349000	AMR WB 6.6kbps	8N	92.01	22.01	≥6	16.01
	NR n66	40_DFT-s-OFDM	349000	AMR WB 12.65kbps	8N	91.97	21.97	≥6	15.97
	NR n66	40_DFT-s-OFDM	349000	EVS NB 5.9 kbps	8N	91.79	21.79	≥6	15.79
	NR n66	40_DFT-s-OFDM	349000	EVS NB 9.6kbps	8N	88.73	18.73	≥6	12.73
	NR n66	40_DFT-s-OFDM	349000	EVS WB 5.9kbps	8N	91.98	21.98	≥6	15.98
	NR n66	40_DFT-s-OFDM	349000	EVS WB 13.2kbps	8N	88.78	18.78	≥6	12.78
	NR 71	15_DFT-s-OFDM	136100	AMR NB 4.75kbps	2N	85.63	15.63	≥6	9.63
	NR 71	15_DFT-s-OFDM	136100	AMR NB 12.2kbps	2N	85.54	15.54	≥6	9.54
	NR 71	15_DFT-s-OFDM	136100	AMR WB 6.6kbps	2N	85.67	15.67	≥6	9.67
	NR 71	15_DFT-s-OFDM	136100	AMR WB 12.65kbps	2N	85.51	15.51	≥6	9.51
	NR 71	15_DFT-s-OFDM	136100	EVS NB 5.9 kbps	2N	85.68	15.68	≥6	9.68
	NR 71	15_DFT-s-OFDM	136100	EVS NB 9.6kbps	2N	82.31	12.31	≥6	6.31
	NR 71	15_DFT-s-OFDM	136100	EVS WB 5.9kbps	2N	85.81	15.81	≥6	9.81
	NR 71	15_DFT-s-OFDM	136100	EVS WB 13.2kbps	2N	82.35	12.35	≥6	6.35
	NR 71	15_DFT-s-OFDM	136100	AMR NB 4.75kbps	8N	91.64	21.64	≥6	15.64
	NR 71	15_DFT-s-OFDM	136100	AMR NB 12.2kbps	8N	91.68	21.68	≥6	15.68
	NR 71	15_DFT-s-OFDM	136100	AMR WB 6.6kbps	8N	91.91	21.91	≥6	15.91
	NR 71	15_DFT-s-OFDM	136100	AMR WB 12.65kbps	8N	91.89	21.89	≥6	15.89
	NR 71	15_DFT-s-OFDM	136100	EVS NB 5.9 kbps	8N	91.69	21.69	≥6	15.69

	NR 71	15_DFT-s-OFDM	136100	EVS NB 9.6kbps	8N	88.88	18.88	≥6	12.88
	NR 71	15_DFT-s-OFDM	136100	EVS WB 5.9kbps	8N	91.79	21.79	≥6	15.79
	NR 71	15_DFT-s-OFDM	136100	EVS WB 13.2kbps	8N	89.03	19.03	≥6	13.03
	NR n77	100_DFT-s-OFDM	650000	AMR NB 4.75kbps	2N	85.70	15.70	≥6	9.70
	NR n77	100_DFT-s-OFDM	650000	AMR NB 12.2kbps	2N	85.89	15.89	≥6	9.89
	NR n77	100_DFT-s-OFDM	650000	AMR WB 6.6kbps	2N	85.83	15.83	≥6	9.83
	NR n77	100_DFT-s-OFDM	650000	AMR WB 12.65kbps	2N	85.88	15.88	≥6	9.88
	NR n77	100_DFT-s-OFDM	650000	EVS NB 5.9 kbps	2N	85.79	15.79	≥6	9.79
	NR n77	100_DFT-s-OFDM	650000	EVS NB 9.6kbps	2N	83.22	13.22	≥6	7.22
	NR n77	100_DFT-s-OFDM	650000	EVS WB 5.9kbps	2N	85.93	15.93	≥6	9.93
	NR n77	100_DFT-s-OFDM	650000	EVS WB 13.2kbps	2N	83.09	13.09	≥6	7.09
	NR n77	100_DFT-s-OFDM	650000	AMR NB 4.75kbps	8N	90.86	20.86	≥6	14.86
	NR n77	100_DFT-s-OFDM	650000	AMR NB 12.2kbps	8N	90.86	20.86	≥6	14.86
	NR n77	100_DFT-s-OFDM	650000	AMR WB 6.6kbps	8N	91.17	21.17	≥6	15.17
	NR n77	100_DFT-s-OFDM	650000	AMR WB 12.65kbps	8N	91.09	21.09	≥6	15.09
	NR n77	100_DFT-s-OFDM	650000	EVS NB 5.9 kbps	8N	90.92	20.92	≥6	14.92
	NR n77	100_DFT-s-OFDM	650000	EVS NB 9.6kbps	8N	86.92	16.92	≥6	10.92
	NR n77	100_DFT-s-OFDM	650000	EVS WB 5.9kbps	8N	91.08	21.08	≥6	15.08
	NR n77	100_DFT-s-OFDM	650000	EVS WB 13.2kbps	8N	86.96	16.96	≥6	10.96

Test Engineer:Gao Guannan and Wang Yuyan

11. Uncertainy Assessment

For ANSI/TIA5050 testing, the EUT was linked and controlled by base station emulator. Communication between the EUT and the emulator was established by coaxial connection. The EUT was set from the emulator to radiate maximum output power during testing. Also EUT was set to backlight off during testing.

Item	Accuracy
Electrical signal power of labCORE analog inputs	±0.1dB at 1kHz for levels>-50dBm
	±0.2dB at 1kHz for levels>-100dBm
	±0.05dB spectral flatness for 20Hz to 20 kHz
Sound pressure	±0.2dB[1]
Time	±2.25 ppm[2]
Frequency	±2.25 ppm[2]
Clock	±2.25 ppm

Note:1.Depends on the microphone calibration.The value is valid if calibration is carried out with recommended pistonphone/calibrator in the HMS II.3 manual.

2.Time and frequency accuracies of labCORE determined by the internal clock accuracy.The time and frequency resolution and accuracy may change due to analysis of the digital signals in ACQUA or if an external clock is applied.

12. References

[1] ANSI C63.19:2019, " American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids", Aug. 2019.

[2] FCC KDB 285076 D01v06r04, "Equipment Authorization Guidance for Hearing Aid Compatibility", Sep. 2023.

[3] FCC KDB 285076 D04 Volume Control v02, "GUIDANCE FOR PERFORMING VOLUME CONTROL MEASUREMENTS ON MOBILE HANDSETS", Sep. 2023

[4] FCC KDB 285076 D05 HAC Waiver DA 23-914 v01, "HAC COMPLIANCE UNDER WAIVER DA 23-914", Sep. 2023

[5] ANSI/TIA-5050-2018, "Receive Volume Control Requirements for Wireless (Mobile) Devices", Jan. 2018

[6] Head Acoustic System Handbook

13. Information of the Testing Laboratories

We, Huarui 7layers High Technology (Suzhou) Co., Ltd., were founded in 2020 to provide our best service in EMC, Radio, Telecom and Safety consultation.

If you have any comments, please feel free to contact us at the following:

Add: Tower N, Innovation Center, 88 Zuyi Road, High-tech District, Suzhou City, Anhui Province
Tel: +86 (0557) 368 1008

The road map of all our labs can be found in our web site also
Web: http://www.7Layers.com

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Appendix A. Volume Control Evaluation Results

Appendix B. Calibration Certificate

Appendix C. Test Setup Photos