HEARING AID COMPATIBILITY
Volume Control Evaluation Report

FCC ID	:	**2ALJJP65R**
Equipment	:	**4G LTE Smartphone**
Brand Name	:	**PCD, LLC**
Model Name	:	**P65**
Receive Volume Control Results	:	**PASS**
Lowest Conversational Gain	:	**2N: 17.21 dB** **8N: 20.94 dB**
Applicant	:	**PCD, LLC** **7651 Southland Blvd. Orlando. FL 32809 USA**
Manufacturer	:	**PCD, LLC** **7651 Southland Blvd. Orlando. FL 32809 USA**
Standard	:	**FCC 47 CFR §20.19** **ANSI C63.19-2019** **ANSI/TIA-5050-2018**
Date Tested	:	**Jun. 15, 2024 ~ Jun. 18, 2024**

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample provide by manufacturer and the test data has been evaluated in accordance with the test procedures given in ANSI C63.19-2019 / 47 CFR Part 20.19 / ANSI/TIA-5050-2018 and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Si Zhang

Approved by: Si Zhang

ACCREDITED
Cert #5145.02

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History of this test report

Report No.	Version	Description	Issued Date
HA452122C	Rev. 01	Initial issue of report	Jun. 28, 2024
HA452122C	Rev. 02	Disabled WLAN 5.3/5.5/5.8GHz by software	Jul. 03, 2024

1. General Information

Product Feature & Specification	
Applicant Name	PCD, LLC
Equipment Name	4G LTE Smartphone
Brand Name	PCD, LLC
Model Name	P65
IMEI Code	352472095167073
FCC ID	2ALJJP65R
HW	A301E_M_V1.0
SW	PCD_P65_CLARO_PR_V1.0
EUT Stage	Identical Prototype
Frequency Band	GSM850: 824 MHz ~ 849 MHz GSM1900: 1850 MHz ~ 1910 MHz WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 41: 2496 MHz ~ 2690 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	GSM/GPRS/EGPRS AMR / RMC 12.2Kbps HSDPA HSUPA HSPA+ (16QAM uplink is supported) LTE: QPSK, 16QAM WLAN 2.4GHz : 802.11b/g/n HT20/ HT40 WLAN 5GHz : 802.11a/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE

2. Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory			
Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	AC01-KS	CN1257	314309

3. Applied Standards

- FCC CFR47 Part 20.19
- 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 Operating Mode

Air Interface	Band MHz	Type	C63.19 Volume Control Tested	Simultaneous Transmitter	Name of Voice Service	Power State Compliance
GSM	GSM850	VO	Yes	WLAN, BT	CMRS Voice	Head(2)
	GSM1900			WLAN, BT		
	EDGE850	VD	Yes	WLAN, BT	Google Meet	
	EDGE1900					
UMTS	Band 2	VO	Yes	WLAN, BT	CMRS Voice	Head(2)
	Band 4			WLAN, BT		
	Band 5			WLAN, BT		
	HSPA	VD	No	WLAN, BT	Google Meet	
LTE (FDD)	Band 2	VD	Yes	WLAN, BT	VoLTE / Google Meet	Head(2)
	Band 4			WLAN, BT		
	Band 5			WLAN, BT		
	Band 7			WLAN, BT		
	Band 12			WLAN, BT		
	Band 13			WLAN, BT		
	Band 66			WLAN, BT		
LTE (TDD)	Band 41	VD	Yes	WLAN, BT	VoLTE / Google Meet	
Wi-Fi	2450	VD	Yes	GSM, WCDMA, LTE, BT	VoWiFi / Google Meet	Head(2)
	5200			GSM, WCDMA, LTE, BT		
BT	2450	DT	No	GSM, WCDMA, LTE, WLAN2.4GHz/5GHz	NA	NA

Type Transport:
VO= Voice only
DT= Digital Transport only (no voice)
VD= CMRS and IP Voice Service over Digital Transport

Remark
1. 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.
2. The GSM/UMTS/LTE and WIFI set to highest device transmit power in a held to the ear mode.

5. Volume Control Requirements

<Conversational Gain>

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

<Receive Distortion And Noise Performance>

With a mounting force of 8N and 2N, the ratio of the stimulus signal power to the 100 Hz to 8000 Hz total A-weighted distortion and noise power shall be ≥ 20 dB when tested over the range of 1/3 octave band center frequencies:
a. Narrowband transmission mode: Each 1/3 octave band center frequency from 400 Hz to 3150 Hz
b. Wideband transmission mode: Each 1/3 octave band center frequency from 250 Hz to 5000 Hz
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 Acoustic 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 in 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 in 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

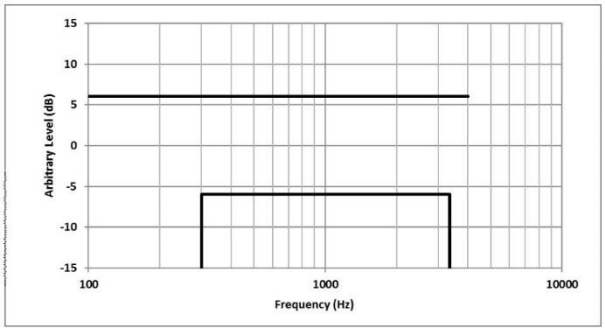
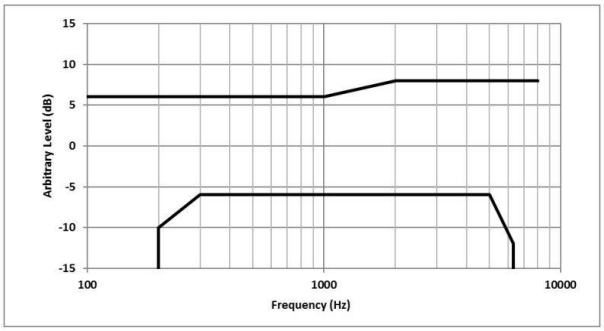
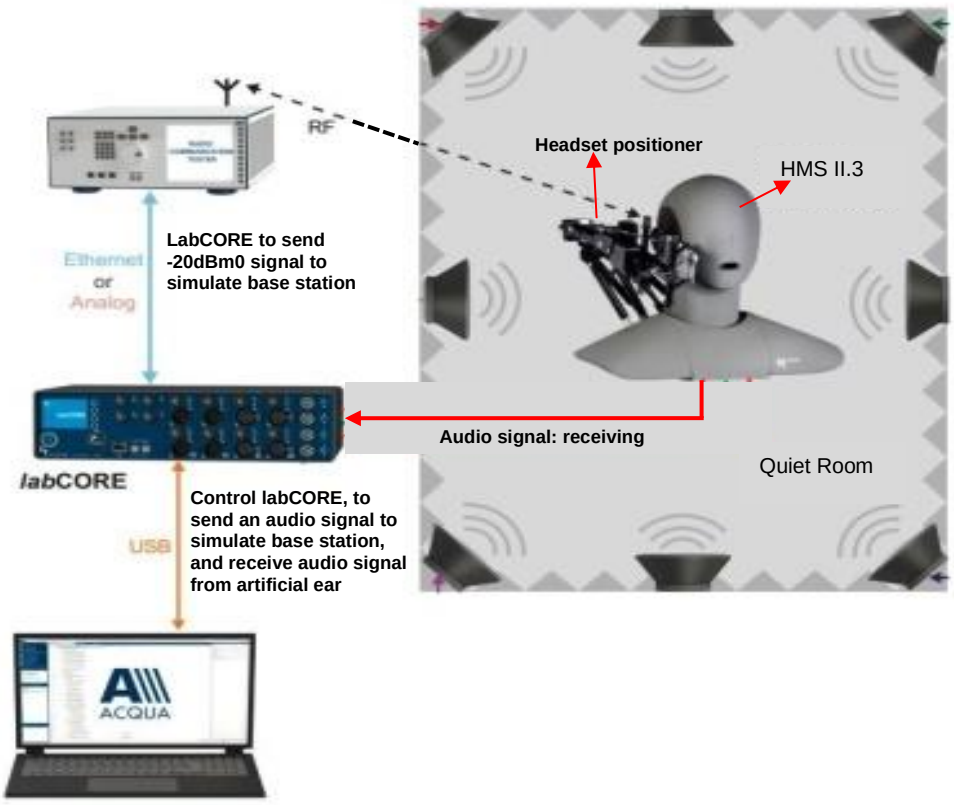


Table 2 – Wideband Receive Frequency Response Limits

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



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.
HMS II.3, artificial head	HMS II.3 supports measurements 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 requirements 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 version5.1.200 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>

1. Configure the DUT with a mounting force of 8N and test equipment as shown in section5 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 5.3.1 shall be used.
4. The ACQUA system is apply the real speech test signal at a level of -20 dBm0 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 the DRP to the Free Field (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:
   a. Narrowband 100 Hz through 4000 Hz.
   b. Wideband 100 Hz through 7720 Hz.
   Calculate the Conversational Gain by subtracting 70 dB from the measured dBSPL.
   [Conversational Gain = (Measured dBSPL Level – 70 dBSPL) dB]
7. Measure the 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 distortion 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 as described in ANSI/TIA-5050 Annex A.
3. To ensure DUT activation, the ACQUA system is 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 in ANSI/TIA-5050 Table A.1 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 the DRP to the FF using the translation data in ANSI/TIA-5050 Annex B.
5. Calculate the acoustic output unweighted total signal power of the stimulus measurement band as described in ANSI/TIA-5050 A.2.
6. Calculate the notched A-weighting distortion and noise components as described in ANSI/TIA-5050 A.3.
7. Calculate the ratio of the signal power to the total A-weighted distortion and noise power using ANSI/TIA-5050 Eq A-1.
8. Repeat for each of the remaining 1/3 octave center frequencies in Table A.1 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 calculates 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. The ACQUA system is 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 (include ANSI/TIA-5050 Annex B).
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
HEAD acoustic GmbH	Audio Analyzer	labCORE	77000544	2023/10/27	2024/10/26
HEAD acoustic GmbH	Fullband artificial head	HMS II.3	12306242	2023/11/2	2024/11/1
G.R.A.S	Sound Calibrator	42AB	31744	2023/10/27	2024/10/26
R&S	Base Station	CMW500	143030	2023/7/5	2024/7/4
Testo	Thermo-Hygrometer	608-H1	1241332126	2023/7/10	2024/7/9

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 section10
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	EFR NB
Bitrate	4.75kbps	6.60kbps	12.2kbps
	5.15kbps	8.85kbps	
	5.9kbps	12.65kbps	
	6.7kbps		
	7.4kbps		
	7.95kbps		
	10.2kbps		
	12.2kbps		

WCDMA Codec/bitrate		
Codec	AMR NB	AMR WB
Bitrate	4.75kbps	6.60kbps
	5.15kbps	8.85kbps
	5.9kbps	12.65kbps
	6.7kbps	14.25kbps
	7.4kbps	15.85kbps
	7.95kbps	18.25kbps
	10.2kbps	19.85kbps
	12.2kbps	23.05kbps
		23.85kbps

VoLTE/VoWIFI Codec/bitrate				
Codec	AMR NB	AMR WB	EVS NB	EVS WB
Bitrate	4.75kbps	6.60kbps	5.9kbps	5.9kbps
	5.15kbps	8.85kbps	7.2kbps	7.2kbps
	5.9kbps	12.65kbps	8kbps	8kbps
	6.7kbps	14.25kbps	9.6kbps	9.6kbps
	7.4kbps	15.85kbps	13.2kbps	13.2kbps
	7.95kbps	18.25kbps	16.4kbps	16.4kbps
	10.2kbps	19.85kbps	24.4kbps	24.4kbps
	12.2kbps	23.05kbps		32kbps
		23.85kbps		48kbps
				64kbps
				96kbps
				128kbps

Google meet Codec/bitrate investigation	
Codec	Opus (Full Band)
Bitrate	6Kbps~75Kbps

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 KDB 285076 D05 and document of DA 23-914 item 30, the manufacturer only perform EVS codec to meet distortion/noise and frequency response tests at the 2N and 8N force levels.
7. The device have similar frequency in some LTE bands: LTE B4/66, 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.
8. The worst case results of each air interface include in appendix A.

   The 2N mounting force lowest conversational gain is 17.21 dB with a hearing aid.
   The 8N mounting force lowest conversational gain is 20.94 dB without a hearing aid.

<Evaluation results for KDB 285076 D05 2.a>

<LTE>

HAC (Volume control) Test Record									Receive Volume Control Performance					Receive Distortion and Noise Performance				Receive Acoustic Frequency Response Performance
Plot No.	Air Interface	BW (MHz)	Modulation / Mode	RB Size	RB offset	Channel	Audio Codec	Mounting Force (N)	Measured dBSPL Level	Conversational Gain (Measured dBSPL Level – 70 dBSPL) (dB)	Limit (dB)	Margin to Limit (dB)	PASS/FAIL	Minimum PN-SDNR (dB) Doc. Section	Limit (dB)	Margin to Limit (dB)	PASS/FAIL	Free Field (FF)
	LTE Band 2	20M	QPSK	1	0	18900	EVS NB 24.4kbps	2N	88.13	18.13	≥6	12.13	PASS	25.58	≥20	5.58	PASS	1.79
	LTE Band 2	20M	QPSK	1	0	18900	EVS NB 24.4kbps	8N	92.16	22.16	≥6	16.16	PASS	25.83	≥20	5.83	PASS	0.93
	LTE Band 2	20M	QPSK	1	0	18900	EVS WB 128kbps	2N	87.99	17.99	≥6	11.99	PASS	24.31	≥20	4.31	PASS	1.04
	LTE Band 2	20M	QPSK	1	0	18900	EVS WB 128kbps	8N	92.2	22.2	≥6	16.2	PASS	23.4	≥20	3.4	PASS	0.7
	LTE Band 5	10M	QPSK	1	0	20525	EVS NB 24.4kbps	2N	88.31	18.31	≥6	12.31	PASS	25.63	≥20	5.63	PASS	1.75
	LTE Band 5	10M	QPSK	1	0	20525	EVS NB 24.4kbps	8N	92.33	22.33	≥6	16.33	PASS	25.46	≥20	5.46	PASS	0.92
	LTE Band 5	10M	QPSK	1	0	20525	EVS WB 128kbps	2N	88.26	18.26	≥6	12.26	PASS	24.29	≥20	4.29	PASS	1.4
	LTE Band 5	10M	QPSK	1	0	20525	EVS WB 128kbps	8N	92.43	22.43	≥6	16.43	PASS	23.76	≥20	3.76	PASS	0.52
	LTE Band 7	20M	QPSK	1	0	21100	EVS NB 24.4kbps	2N	88.2	18.2	≥6	12.2	PASS	25.72	≥20	5.72	PASS	1.71
	LTE Band 7	20M	QPSK	1	0	21100	EVS NB 24.4kbps	8N	92.27	22.27	≥6	16.27	PASS	25.61	≥20	5.61	PASS	1.17
	LTE Band 7	20M	QPSK	1	0	21100	EVS WB 128kbps	2N	88.2	18.2	≥6	12.2	PASS	23.97	≥20	3.97	PASS	1.39
	LTE Band 7	20M	QPSK	1	0	21100	EVS WB 128kbps	8N	92.41	22.41	≥6	16.41	PASS	24.41	≥20	4.41	PASS	0.45
	LTE Band 12	10M	QPSK	1	0	23095	EVS NB 24.4kbps	2N	88.41	18.41	≥6	12.41	PASS	25.2	≥20	5.2	PASS	1.56
	LTE Band 12	10M	QPSK	1	0	23095	EVS NB 24.4kbps	8N	92.51	22.51	≥6	16.51	PASS	25.32	≥20	5.32	PASS	0.85
	LTE Band 12	10M	QPSK	1	0	23095	EVS WB 128kbps	2N	88.23	18.23	≥6	12.23	PASS	24.12	≥20	4.12	PASS	1.37
	LTE Band 12	10M	QPSK	1	0	23095	EVS WB 128kbps	8N	92.46	22.46	≥6	16.46	PASS	24.23	≥20	4.23	PASS	0.62
	LTE Band 13	10M	QPSK	1	0	23230	EVS NB 24.4kbps	2N	88.26	18.26	≥6	12.26	PASS	25.18	≥20	5.18	PASS	1.74
	LTE Band 13	10M	QPSK	1	0	23230	EVS NB 24.4kbps	8N	92.56	22.56	≥6	16.56	PASS	26.01	≥20	6.01	PASS	0.86
	LTE Band 13	10M	QPSK	1	0	23230	EVS WB 128kbps	2N	88.27	18.27	≥6	12.27	PASS	24.35	≥20	4.35	PASS	1.42
	LTE Band 13	10M	QPSK	1	0	23230	EVS WB 128kbps	8N	92.49	22.49	≥6	16.49	PASS	23.88	≥20	3.88	PASS	0.49
	LTE Band 66	20M	QPSK	1	0	132322	EVS NB 24.4kbps	2N	88.38	18.38	≥6	12.38	PASS	25.83	≥20	5.83	PASS	1.5
	LTE Band 66	20M	QPSK	1	0	132322	EVS NB 24.4kbps	8N	92.44	22.44	≥6	16.44	PASS	25.78	≥20	5.78	PASS	0.85
	LTE Band 66	20M	QPSK	1	0	132322	EVS WB 128kbps	2N	88.43	18.43	≥6	12.43	PASS	24.18	≥20	4.18	PASS	1.42
	LTE Band 66	20M	QPSK	1	0	132322	EVS WB 128kbps	8N	92.39	22.39	≥6	16.39	PASS	23.93	≥20	3.93	PASS	0.55
	LTE Band 41	20M	QPSK	1	0	40620	EVS NB 24.4kbps	2N	87.9	17.9	≥6	11.9	PASS	25.67	≥20	5.67	PASS	2.02
	LTE Band 41	20M	QPSK	1	0	40620	EVS NB 24.4kbps	8N	91.96	21.96	≥6	15.96	PASS	26.1	≥20	6.1	PASS	1.06
	LTE Band 41	20M	QPSK	1	0	40620	EVS WB 128kbps	2N	87.76	17.76	≥6	11.76	PASS	24.1	≥20	4.1	PASS	0.67
01	LTE Band 41	20M	QPSK	1	0	40620	EVS WB 128kbps	8N	91.78	21.78	≥6	15.78	PASS	**23.08**	≥20	3.08	PASS	0.91

<WLAN>

HAC (Volume control) Test Record						Receive Volume Control Performance					Receive Distortion and Noise Performance				Receive Acoustic Frequency Response Performance
Plot No.	Air Interface	Modulation / Mode	Channel	Audio Codec	Mounting Force (N)	Measured dBSPL Level	Conversational Gain (Measured dBSPL Level – 70 dBSPL) (dB)	Limit (dB)	Margin to Limit (dB)	PASS/FAIL	Minimum PN-SDNR (dB) Doc. Section	Limit (dB)	Margin to Limit (dB)	PASS/FAIL	Free Field (FF)
	WLAN2.4GHz	802.11b 1Mbps	6	EVS NB 24.4kbps	2N	87.49	17.49	≥6	11.49	PASS	24.26	≥20	4.26	PASS	2.05
02	WLAN2.4GHz	802.11b 1Mbps	6	EVS NB 24.4kbps	8N	92.09	22.09	≥6	16.09	PASS	**21.8**	≥20	1.8	PASS	1.43
03	WLAN2.4GHz	802.11b 1Mbps	6	EVS WB 128kbps	2N	88.65	18.65	≥6	12.65	PASS	**20.23**	≥20	0.23	PASS	0.95
	WLAN2.4GHz	802.11b 1Mbps	6	EVS WB 128kbps	8N	92.47	22.47	≥6	16.47	PASS	21.97	≥20	1.97	PASS	0.69
	WLAN5GHz	802.11a 6Mbps	40	EVS NB 24.4kbps	2N	87.62	17.62	≥6	11.62	PASS	24.23	≥20	4.23	PASS	2.18
	WLAN5GHz	802.11a 6Mbps	40	EVS NB 24.4kbps	8N	92.25	22.25	≥6	16.25	PASS	25.97	≥20	5.97	PASS	1.5
	WLAN5GHz	802.11a 6Mbps	40	EVS WB 128kbps	2N	88.31	18.31	≥6	12.31	PASS	24.31	≥20	4.31	PASS	0.67
	WLAN5GHz	802.11a 6Mbps	40	EVS WB 128kbps	8N	92.72	22.72	≥6	16.72	PASS	23.33	≥20	3.33	PASS	0.82

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

<GSM>

HAC (Volume control) Test Record						Receive Volume Control Performance				
Plot No.	Air Interface	Modulation / Mode	Channel	Audio Codec	Mounting Force (N)	Measured dBSPL Level	Conversational Gain (Measured dBSPL Level – 70 dBSPL) (dB)	Limit (dB)	Margin to Limit (dB)	PASS/FAIL
	GSM850	GSM Voice	189	EFR NB 12.2Kbps	2N	88.13	18.13	≥6	12.13	PASS
	GSM850	GSM Voice	189	EFR NB 12.2Kbps	8N	92.45	22.45	≥6	16.45	PASS
04	GSM850	GSM Voice	189	AMR NB 4.75kbps	2N	87.5	**17.5**	≥6	11.5	PASS
	GSM850	GSM Voice	189	AMR NB 4.75kbps	8N	91.84	21.84	≥6	15.84	PASS
	GSM850	GSM Voice	189	AMR NB 12.2kbps	2N	88.15	18.15	≥6	12.15	PASS
	GSM850	GSM Voice	189	AMR NB 12.2kbps	8N	92.11	22.11	≥6	16.11	PASS
	GSM850	GSM Voice	189	AMR WB 6.60kbps	2N	87.81	17.81	≥6	11.81	PASS
	GSM850	GSM Voice	189	AMR WB 6.60kbps	8N	91.85	21.85	≥6	15.85	PASS
	GSM850	GSM Voice	189	AMR WB 12.65kbps	2N	88.23	18.23	≥6	12.23	PASS
	GSM850	GSM Voice	189	AMR WB 12.65kbps	8N	92.08	22.08	≥6	16.08	PASS
	GSM1900	GSM Voice	661	EFR NB 12.2Kbps	2N	88.25	18.25	≥6	12.25	PASS
	GSM1900	GSM Voice	661	EFR NB 12.2Kbps	8N	92.09	22.09	≥6	16.09	PASS
	GSM1900	GSM Voice	661	AMR NB 4.75kbps	2N	87.58	17.58	≥6	11.58	PASS
	GSM1900	GSM Voice	661	AMR NB 4.75kbps	8N	91.5	21.5	≥6	15.5	PASS
	GSM1900	GSM Voice	661	AMR NB 12.2kbps	2N	88.18	18.18	≥6	12.18	PASS
	GSM1900	GSM Voice	661	AMR NB 12.2kbps	8N	92.07	22.07	≥6	16.07	PASS
	GSM1900	GSM Voice	661	AMR WB 6.60kbps	2N	87.66	17.66	≥6	11.66	PASS
	GSM1900	GSM Voice	661	AMR WB 6.60kbps	8N	91.73	21.73	≥6	15.73	PASS
	GSM1900	GSM Voice	661	AMR WB 12.65kbps	2N	88.06	18.06	≥6	12.06	PASS
	GSM1900	GSM Voice	661	AMR WB 12.65kbps	8N	92.02	22.02	≥6	16.02	PASS

<UMTS>

HAC (Volume control) Test Record						Receive Volume Control Performance				
Plot No.	Air Interface	Modulation / Mode	Channel	Audio Codec	Mounting Force (N)	Measured dBSPL Level	Conversational Gain (Measured dBSPL Level – 70 dBSPL) (dB)	Limit (dB)	Margin to Limit (dB)	PASS/FAIL
05	WCDMA II	Voice	9400	AMR NB 4.75kbps	2N	87.21	**17.21**	≥6	11.21	PASS
06	WCDMA II	Voice	9400	AMR NB 4.75kbps	8N	90.94	**20.94**	≥6	14.94	PASS
	WCDMA II	Voice	9400	AMR NB 12.2kbps	2N	87.75	17.75	≥6	11.75	PASS
	WCDMA II	Voice	9400	AMR NB 12.2kbps	8N	91.67	21.67	≥6	15.67	PASS
	WCDMA II	Voice	9400	AMR WB 6.60kbps	2N	87.54	17.54	≥6	11.54	PASS
	WCDMA II	Voice	9400	AMR WB 6.60kbps	8N	91.62	21.62	≥6	15.62	PASS
	WCDMA II	Voice	9400	AMR WB 23.85kbps	2N	87.86	17.86	≥6	11.86	PASS
	WCDMA II	Voice	9400	AMR WB 23.85kbps	8N	91.82	21.82	≥6	15.82	PASS
	WCDMA IV	Voice	1413	AMR NB 4.75kbps	2N	87.32	17.32	≥6	11.32	PASS
	WCDMA IV	Voice	1413	AMR NB 4.75kbps	8N	91.14	21.14	≥6	15.14	PASS
	WCDMA IV	Voice	1413	AMR NB 12.2kbps	2N	87.98	17.98	≥6	11.98	PASS
	WCDMA IV	Voice	1413	AMR NB 12.2kbps	8N	91.76	21.76	≥6	15.76	PASS
	WCDMA IV	Voice	1413	AMR WB 6.60kbps	2N	87.63	17.63	≥6	11.63	PASS
	WCDMA IV	Voice	1413	AMR WB 6.60kbps	8N	91.71	21.71	≥6	15.71	PASS
	WCDMA IV	Voice	1413	AMR WB 23.85kbps	2N	87.8	17.8	≥6	11.8	PASS
	WCDMA IV	Voice	1413	AMR WB 23.85kbps	8N	91.89	21.89	≥6	15.89	PASS
	WCDMA V	Voice	4182	AMR NB 4.75kbps	2N	87.37	17.37	≥6	11.37	PASS
	WCDMA V	Voice	4182	AMR NB 4.75kbps	8N	91.34	21.34	≥6	15.34	PASS
	WCDMA V	Voice	4182	AMR NB 12.2kbps	2N	87.92	17.92	≥6	11.92	PASS
	WCDMA V	Voice	4182	AMR NB 12.2kbps	8N	91.92	21.92	≥6	15.92	PASS
	WCDMA V	Voice	4182	AMR WB 6.60kbps	2N	87.49	17.49	≥6	11.49	PASS
	WCDMA V	Voice	4182	AMR WB 6.60kbps	8N	91.51	21.51	≥6	15.51	PASS
	WCDMA V	Voice	4182	AMR WB 23.85kbps	2N	87.84	17.84	≥6	11.84	PASS
	WCDMA V	Voice	4182	AMR WB 23.85kbps	8N	91.94	21.94	≥6	15.94	PASS

<LTE>

HAC (Volume control) Test Record									Receive Volume Control Performance				
Plot No.	Air Interface	BW (MHz)	Modulation / Mode	RB Size	RB offset	Channel	Audio Codec	Mounting Force (N)	Measured dBSPL Level	Conversational Gain (Measured dBSPL Level – 70 dBSPL) (dB)	Limit (dB)	Margin to Limit (dB)	PASS/FAIL
	LTE Band 2	20M	QPSK	1	0	18900	AMR NB 4.75kbps	2N	88.06	18.06	≥6	12.06	PASS
	LTE Band 2	20M	QPSK	1	0	18900	AMR NB 4.75kbps	8N	92.23	22.23	≥6	16.23	PASS
	LTE Band 2	20M	QPSK	1	0	18900	AMR NB 12.2kbps	2N	88.11	18.11	≥6	12.11	PASS
	LTE Band 2	20M	QPSK	1	0	18900	AMR NB 12.2kbps	8N	92.26	22.26	≥6	16.26	PASS
	LTE Band 2	20M	QPSK	1	0	18900	AMR WB 6.60kbps	2N	88.12	18.12	≥6	12.12	PASS
	LTE Band 2	20M	QPSK	1	0	18900	AMR WB 6.60kbps	8N	92.23	22.23	≥6	16.23	PASS
	LTE Band 2	20M	QPSK	1	0	18900	AMR WB 23.85kbps	2N	88.15	18.15	≥6	12.15	PASS
	LTE Band 2	20M	QPSK	1	0	18900	AMR WB 23.85kbps	8N	92.25	22.25	≥6	16.25	PASS
	LTE Band 2	20M	QPSK	1	0	18900	EVS NB 5.9kbps	2N	88.12	18.12	≥6	12.12	PASS
	LTE Band 2	20M	QPSK	1	0	18900	EVS NB 5.9kbps	8N	92.28	22.28	≥6	16.28	PASS
	LTE Band 2	20M	QPSK	1	0	18900	EVS NB 24.4kbps	2N	88.13	18.13	≥6	12.13	PASS
	LTE Band 2	20M	QPSK	1	0	18900	EVS NB 24.4kbps	8N	92.16	22.16	≥6	16.16	PASS
	LTE Band 2	20M	QPSK	1	0	18900	EVS WB 5.9kbps	2N	88.07	18.07	≥6	12.07	PASS
	LTE Band 2	20M	QPSK	1	0	18900	EVS WB 5.9kbps	8N	92.27	22.27	≥6	16.27	PASS
	LTE Band 2	20M	QPSK	1	0	18900	EVS WB 128kbps	2N	87.99	17.99	≥6	11.99	PASS
	LTE Band 2	20M	QPSK	1	0	18900	EVS WB 128kbps	8N	92.2	22.2	≥6	16.2	PASS
	LTE Band 5	10M	QPSK	1	0	20525	AMR NB 4.75kbps	2N	88.33	18.33	≥6	12.33	PASS
	LTE Band 5	10M	QPSK	1	0	20525	AMR NB 4.75kbps	8N	92.44	22.44	≥6	16.44	PASS
	LTE Band 5	10M	QPSK	1	0	20525	AMR NB 12.2kbps	2N	88.35	18.35	≥6	12.35	PASS
	LTE Band 5	10M	QPSK	1	0	20525	AMR NB 12.2kbps	8N	92.48	22.48	≥6	16.48	PASS
	LTE Band 5	10M	QPSK	1	0	20525	AMR WB 6.60kbps	2N	88.39	18.39	≥6	12.39	PASS
	LTE Band 5	10M	QPSK	1	0	20525	AMR WB 6.60kbps	8N	92.45	22.45	≥6	16.45	PASS
	LTE Band 5	10M	QPSK	1	0	20525	AMR WB 23.85kbps	2N	88.37	18.37	≥6	12.37	PASS
	LTE Band 5	10M	QPSK	1	0	20525	AMR WB 23.85kbps	8N	92.44	22.44	≥6	16.44	PASS
	LTE Band 5	10M	QPSK	1	0	20525	EVS NB 5.9kbps	2N	88.35	18.35	≥6	12.35	PASS
	LTE Band 5	10M	QPSK	1	0	20525	EVS NB 5.9kbps	8N	92.41	22.41	≥6	16.41	PASS
	LTE Band 5	10M	QPSK	1	0	20525	EVS NB 24.4kbps	2N	88.31	18.31	≥6	12.31	PASS
	LTE Band 5	10M	QPSK	1	0	20525	EVS NB 24.4kbps	8N	92.33	22.33	≥6	16.33	PASS
	LTE Band 5	10M	QPSK	1	0	20525	EVS WB 5.9kbps	2N	88.34	18.34	≥6	12.34	PASS
	LTE Band 5	10M	QPSK	1	0	20525	EVS WB 5.9kbps	8N	92.43	22.43	≥6	16.43	PASS
	LTE Band 5	10M	QPSK	1	0	20525	EVS WB 128kbps	2N	88.26	18.26	≥6	12.26	PASS
	LTE Band 5	10M	QPSK	1	0	20525	EVS WB 128kbps	8N	92.43	22.43	≥6	16.43	PASS
	LTE Band 7	20M	QPSK	1	0	21100	AMR NB 4.75kbps	2N	88.26	18.26	≥6	12.26	PASS
	LTE Band 7	20M	QPSK	1	0	21100	AMR NB 4.75kbps	8N	92.38	22.38	≥6	16.38	PASS
	LTE Band 7	20M	QPSK	1	0	21100	AMR NB 12.2kbps	2N	88.23	18.23	≥6	12.23	PASS
	LTE Band 7	20M	QPSK	1	0	21100	AMR NB 12.2kbps	8N	92.35	22.35	≥6	16.35	PASS
	LTE Band 7	20M	QPSK	1	0	21100	AMR WB 6.60kbps	2N	88.25	18.25	≥6	12.25	PASS
	LTE Band 7	20M	QPSK	1	0	21100	AMR WB 6.60kbps	8N	92.33	22.33	≥6	16.33	PASS
	LTE Band 7	20M	QPSK	1	0	21100	AMR WB 23.85kbps	2N	88.27	18.27	≥6	12.27	PASS
	LTE Band 7	20M	QPSK	1	0	21100	AMR WB 23.85kbps	8N	92.36	22.36	≥6	16.36	PASS
	LTE Band 7	20M	QPSK	1	0	21100	EVS NB 5.9kbps	2N	88.29	18.29	≥6	12.29	PASS
	LTE Band 7	20M	QPSK	1	0	21100	EVS NB 5.9kbps	8N	92.37	22.37	≥6	16.37	PASS
	LTE Band 7	20M	QPSK	1	0	21100	EVS NB 24.4kbps	2N	88.2	18.2	≥6	12.2	PASS
	LTE Band 7	20M	QPSK	1	0	21100	EVS NB 24.4kbps	8N	92.27	22.27	≥6	16.27	PASS
	LTE Band 7	20M	QPSK	1	0	21100	EVS WB 5.9kbps	2N	88.22	18.22	≥6	12.22	PASS
	LTE Band 7	20M	QPSK	1	0	21100	EVS WB 5.9kbps	8N	92.35	22.35	≥6	16.35	PASS
	LTE Band 7	20M	QPSK	1	0	21100	EVS WB 128kbps	2N	88.2	18.2	≥6	12.2	PASS
	LTE Band 7	20M	QPSK	1	0	21100	EVS WB 128kbps	8N	92.41	22.41	≥6	16.41	PASS
	LTE Band 12	10M	QPSK	1	0	23095	AMR NB 4.75kbps	2N	88.33	18.33	≥6	12.33	PASS
	LTE Band 12	10M	QPSK	1	0	23095	AMR NB 4.75kbps	8N	92.55	22.55	≥6	16.55	PASS

	LTE Band 12	10M	QPSK	1	0	23095	AMR NB 12.2kbps	2N	88.36	18.36	≥6	12.36	PASS
	LTE Band 12	10M	QPSK	1	0	23095	AMR NB 12.2kbps	8N	92.58	22.58	≥6	16.58	PASS
	LTE Band 12	10M	QPSK	1	0	23095	AMR WB 6.60kbps	2N	88.35	18.35	≥6	12.35	PASS
	LTE Band 12	10M	QPSK	1	0	23095	AMR WB 6.60kbps	8N	92.53	22.53	≥6	16.53	PASS
	LTE Band 12	10M	QPSK	1	0	23095	AMR WB 23.85kbps	2N	88.31	18.31	≥6	12.31	PASS
	LTE Band 12	10M	QPSK	1	0	23095	AMR WB 23.85kbps	8N	92.51	22.51	≥6	16.51	PASS
	LTE Band 12	10M	QPSK	1	0	23095	EVS NB 5.9kbps	2N	88.26	18.26	≥6	12.26	PASS
	LTE Band 12	10M	QPSK	1	0	23095	EVS NB 5.9kbps	8N	92.53	22.53	≥6	16.53	PASS
	LTE Band 12	10M	QPSK	1	0	23095	EVS NB 24.4kbps	2N	88.41	18.41	≥6	12.41	PASS
	LTE Band 12	10M	QPSK	1	0	23095	EVS NB 24.4kbps	8N	92.51	22.51	≥6	16.51	PASS
	LTE Band 12	10M	QPSK	1	0	23095	EVS WB 5.9kbps	2N	88.3	18.3	≥6	12.3	PASS
	LTE Band 12	10M	QPSK	1	0	23095	EVS WB 5.9kbps	8N	92.54	22.54	≥6	16.54	PASS
	LTE Band 12	10M	QPSK	1	0	23095	EVS WB 128kbps	2N	88.23	18.23	≥6	12.23	PASS
	LTE Band 12	10M	QPSK	1	0	23095	EVS WB 128kbps	8N	92.46	22.46	≥6	16.46	PASS
	LTE Band 13	10M	QPSK	1	0	23230	AMR NB 4.75kbps	2N	88.33	18.33	≥6	12.33	PASS
	LTE Band 13	10M	QPSK	1	0	23230	AMR NB 4.75kbps	8N	92.51	22.51	≥6	16.51	PASS
	LTE Band 13	10M	QPSK	1	0	23230	AMR NB 12.2kbps	2N	88.35	18.35	≥6	12.35	PASS
	LTE Band 13	10M	QPSK	1	0	23230	AMR NB 12.2kbps	8N	92.53	22.53	≥6	16.53	PASS
	LTE Band 13	10M	QPSK	1	0	23230	AMR WB 6.60kbps	2N	88.31	18.31	≥6	12.31	PASS
	LTE Band 13	10M	QPSK	1	0	23230	AMR WB 6.60kbps	8N	92.54	22.54	≥6	16.54	PASS
	LTE Band 13	10M	QPSK	1	0	23230	AMR WB 23.85kbps	2N	88.3	18.3	≥6	12.3	PASS
	LTE Band 13	10M	QPSK	1	0	23230	AMR WB 23.85kbps	8N	92.57	22.57	≥6	16.57	PASS
	LTE Band 13	10M	QPSK	1	0	23230	EVS NB 5.9kbps	2N	88.37	18.37	≥6	12.37	PASS
	LTE Band 13	10M	QPSK	1	0	23230	EVS NB 5.9kbps	8N	92.55	22.55	≥6	16.55	PASS
	LTE Band 13	10M	QPSK	1	0	23230	EVS NB 24.4kbps	2N	88.26	18.26	≥6	12.26	PASS
	LTE Band 13	10M	QPSK	1	0	23230	EVS NB 24.4kbps	8N	92.56	22.56	≥6	16.56	PASS
	LTE Band 13	10M	QPSK	1	0	23230	EVS WB 5.9kbps	2N	88.36	18.36	≥6	12.36	PASS
	LTE Band 13	10M	QPSK	1	0	23230	EVS WB 5.9kbps	8N	92.58	22.58	≥6	16.58	PASS
	LTE Band 13	10M	QPSK	1	0	23230	EVS WB 128kbps	2N	88.27	18.27	≥6	12.27	PASS
	LTE Band 13	10M	QPSK	1	0	23230	EVS WB 128kbps	8N	92.49	22.49	≥6	16.49	PASS
	LTE Band 66	20M	QPSK	1	0	132322	AMR NB 4.75kbps	2N	88.46	18.46	≥6	12.46	PASS
	LTE Band 66	20M	QPSK	1	0	132322	AMR NB 4.75kbps	8N	92.43	22.43	≥6	16.43	PASS
	LTE Band 66	20M	QPSK	1	0	132322	AMR NB 12.2kbps	2N	88.42	18.42	≥6	12.42	PASS
	LTE Band 66	20M	QPSK	1	0	132322	AMR NB 12.2kbps	8N	92.45	22.45	≥6	16.45	PASS
	LTE Band 66	20M	QPSK	1	0	132322	AMR WB 6.60kbps	2N	88.41	18.41	≥6	12.41	PASS
	LTE Band 66	20M	QPSK	1	0	132322	AMR WB 6.60kbps	8N	92.41	22.41	≥6	16.41	PASS
	LTE Band 66	20M	QPSK	1	0	132322	AMR WB 23.85kbps	2N	88.44	18.44	≥6	12.44	PASS
	LTE Band 66	20M	QPSK	1	0	132322	AMR WB 23.85kbps	8N	92.43	22.43	≥6	16.43	PASS
	LTE Band 66	20M	QPSK	1	0	132322	EVS NB 5.9kbps	2N	88.42	18.42	≥6	12.42	PASS
	LTE Band 66	20M	QPSK	1	0	132322	EVS NB 5.9kbps	8N	92.44	22.44	≥6	16.44	PASS
	LTE Band 66	20M	QPSK	1	0	132322	EVS NB 24.4kbps	2N	88.38	18.38	≥6	12.38	PASS
	LTE Band 66	20M	QPSK	1	0	132322	EVS NB 24.4kbps	8N	92.44	22.44	≥6	16.44	PASS
	LTE Band 66	20M	QPSK	1	0	132322	EVS WB 5.9kbps	2N	88.51	18.51	≥6	12.51	PASS
	LTE Band 66	20M	QPSK	1	0	132322	EVS WB 5.9kbps	8N	92.47	22.47	≥6	16.47	PASS
	LTE Band 66	20M	QPSK	1	0	132322	EVS WB 128kbps	2N	88.43	18.43	≥6	12.43	PASS
	LTE Band 66	20M	QPSK	1	0	132322	EVS WB 128kbps	8N	92.39	22.39	≥6	16.39	PASS
	LTE Band 41	20M	QPSK	1	0	40620	AMR NB 4.75kbps	2N	87.86	17.86	≥6	11.86	PASS
	LTE Band 41	20M	QPSK	1	0	40620	AMR NB 4.75kbps	8N	91.81	21.81	≥6	15.81	PASS
	LTE Band 41	20M	QPSK	1	0	40620	AMR NB 12.2kbps	2N	87.81	17.81	≥6	11.81	PASS
	LTE Band 41	20M	QPSK	1	0	40620	AMR NB 12.2kbps	8N	91.87	21.87	≥6	15.87	PASS
	LTE Band 41	20M	QPSK	1	0	40620	AMR WB 6.60kbps	2N	87.83	17.83	≥6	11.83	PASS
	LTE Band 41	20M	QPSK	1	0	40620	AMR WB 6.60kbps	8N	91.85	21.85	≥6	15.85	PASS
	LTE Band 41	20M	QPSK	1	0	40620	AMR WB 23.85kbps	2N	87.85	17.85	≥6	11.85	PASS
	LTE Band 41	20M	QPSK	1	0	40620	AMR WB 23.85kbps	8N	91.82	21.82	≥6	15.82	PASS
	LTE Band 41	20M	QPSK	1	0	40620	EVS NB 5.9kbps	2N	87.82	17.82	≥6	11.82	PASS
	LTE Band 41	20M	QPSK	1	0	40620	EVS NB 5.9kbps	8N	91.88	21.88	≥6	15.88	PASS

	LTE Band 41	20M	QPSK	1	0	40620	EVS NB 24.4kbps	2N	87.9	17.9	≥6	11.9	PASS
	LTE Band 41	20M	QPSK	1	0	40620	EVS NB 24.4kbps	8N	91.96	21.96	≥6	15.96	PASS
	LTE Band 41	20M	QPSK	1	0	40620	EVS WB 5.9kbps	2N	87.84	17.84	≥6	11.84	PASS
	LTE Band 41	20M	QPSK	1	0	40620	EVS WB 5.9kbps	8N	91.86	21.86	≥6	15.86	PASS
07	LTE Band 41	20M	QPSK	1	0	40620	EVS WB 128kbps	2N	87.76	**17.76**	≥6	11.76	PASS
	LTE Band 41	20M	QPSK	1	0	40620	EVS WB 128kbps	8N	91.78	21.78	≥6	15.78	PASS

<WLAN>

HAC (Volume control) Test Record						Receive Volume Control Performance				
Plot No.	Air Interface	Modulation / Mode	Channel	Audio Codec	Mounting Force (N)	Measured dBSPL Level	Conversational Gain (Measured dBSPL Level – 70 dBSPL) (dB)	Limit (dB)	Margin to Limit (dB)	PASS/FAIL
	WLAN2.4GHz	802.11b 1Mbps	6	AMR NB 4.75kbps	2N	87.52	17.52	≥6	11.52	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	AMR NB 4.75kbps	8N	92.15	22.15	≥6	16.15	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	AMR NB 12.2kbps	2N	87.58	17.58	≥6	11.58	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	AMR NB 12.2kbps	8N	92.23	22.23	≥6	16.23	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	AMR WB 6.60kbps	2N	88.74	18.74	≥6	12.74	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	AMR WB 6.60kbps	8N	92.18	22.18	≥6	16.18	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	AMR WB 23.85kbps	2N	88.76	18.76	≥6	12.76	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	AMR WB 23.85kbps	8N	92.16	22.16	≥6	16.16	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	EVS NB 5.9kbps	2N	87.54	17.54	≥6	11.54	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	EVS NB 5.9kbps	8N	92.13	22.13	≥6	16.13	PASS
08	WLAN2.4GHz	802.11b 1Mbps	6	EVS NB 24.4kbps	2N	87.49	**17.49**	≥6	11.49	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	EVS NB 24.4kbps	8N	92.09	22.09	≥6	16.09	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	EVS WB 5.9kbps	2N	88.71	18.71	≥6	12.71	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	EVS WB 5.9kbps	8N	92.15	22.15	≥6	16.15	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	EVS WB 128kbps	2N	88.65	18.65	≥6	12.65	PASS
	WLAN2.4GHz	802.11b 1Mbps	6	EVS WB 128kbps	8N	92.47	22.47	≥6	16.47	PASS
	WLAN5GHz	802.11a 6Mbps	40	AMR NB 4.75kbps	2N	87.74	17.74	≥6	11.74	PASS
	WLAN5GHz	802.11a 6Mbps	40	AMR NB 4.75kbps	8N	92.33	22.33	≥6	16.33	PASS
	WLAN5GHz	802.11a 6Mbps	40	AMR NB 12.2kbps	2N	87.72	17.72	≥6	11.72	PASS
	WLAN5GHz	802.11a 6Mbps	40	AMR NB 12.2kbps	8N	92.38	22.38	≥6	16.38	PASS
	WLAN5GHz	802.11a 6Mbps	40	AMR WB 6.60kbps	2N	88.35	18.35	≥6	12.35	PASS
	WLAN5GHz	802.11a 6Mbps	40	AMR WB 6.60kbps	8N	92.35	22.35	≥6	16.35	PASS
	WLAN5GHz	802.11a 6Mbps	40	AMR WB 23.85kbps	2N	88.39	18.39	≥6	12.39	PASS
	WLAN5GHz	802.11a 6Mbps	40	AMR WB 23.85kbps	8N	92.48	22.48	≥6	16.48	PASS
	WLAN5GHz	802.11a 6Mbps	40	EVS NB 5.9kbps	2N	87.77	17.77	≥6	11.77	PASS
	WLAN5GHz	802.11a 6Mbps	40	EVS NB 5.9kbps	8N	92.51	22.51	≥6	16.51	PASS
	WLAN5GHz	802.11a 6Mbps	40	EVS NB 24.4kbps	2N	87.62	17.62	≥6	11.62	PASS
	WLAN5GHz	802.11a 6Mbps	40	EVS NB 24.4kbps	8N	92.25	22.25	≥6	16.25	PASS
	WLAN5GHz	802.11a 6Mbps	40	EVS WB 5.9kbps	2N	88.41	18.41	≥6	12.41	PASS
	WLAN5GHz	802.11a 6Mbps	40	EVS WB 5.9kbps	8N	92.61	22.61	≥6	16.61	PASS
	WLAN5GHz	802.11a 6Mbps	40	EVS WB 128kbps	2N	88.31	18.31	≥6	12.31	PASS
	WLAN5GHz	802.11a 6Mbps	40	EVS WB 128kbps	8N	92.72	22.72	≥6	16.72	PASS

Test Engineer : Martin Li, Varus Wang, Light Wang, Ricky Gu

11. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type A evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.
The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual “root-sum-squares” (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances. Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %.
The judgment of conformity in the report is based on the measurement results excluding the measurement uncertainty.

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Component	Standard uncertainty (dB)	U^2 ($\%^2$)
Generator Accuracy To enable harmonic distortion measurements to 0.1%, the generator distortion must be <0.05%. This is equivalent to a standard uncertainty of 0.043 dB.	0.043	0.25
Ear Simulator Pressure Sensitivity (incl. Measurement Mic.) The uncertainty of the ear simulator as per the standards and quoted on its calibration certificate is 0.3 dB with a coverage factor of k = 2. This is equivalent to a standard uncertainty of 0.3/2 = 0.15 dB.	0.15	3.03
Microphone Preamplifier The manufacturer quotes the preamp to be within ± 0.02 dB with a 95% probability or 2σ. This is equivalent to a standard uncertainty of 0.02/2 = 0.01 dB.	0.01	0.01
Analysis System / RMS Detector Typical measurement system detector accuracy is 0.1 dB with a coverage factor of k = 2. This is equivalent to a standard uncertainty of 0.1/2 = 0.05 dB.	0.05	0.33
Effect of Positioning on Mid-Band Sensitivity For a handset, with the HATS positioning jig, the typical standard deviation estimated from a statistically significant number of measurements is ±2 dB. This is equivalent to a standard uncertainty of 2 dB.	2	670.42
Time Varying Effects of the Mouth Simulator for Send & Sidetone For a receive measurement on a handset, the mouth simulator is not used (its uncertainty is zero), The standard uncertainty of 0 dB	0	0.00
Total Standard Uncertainty (%)	25.96	
UMAX (k = 2) (%)	51.9	
UMAX (k = 2) (dB)	3.6	

Uncertainty Budget of Volume Control assessment

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

Appendix A. Plots of Volume Control Evaluation Results

The plots are shown as follows.

Measurement Protocol

Measurement Object	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N

Project	452122
Report Generation Date	24/06/15 3:41
Responsible Person	AC01-KS

Status Overview

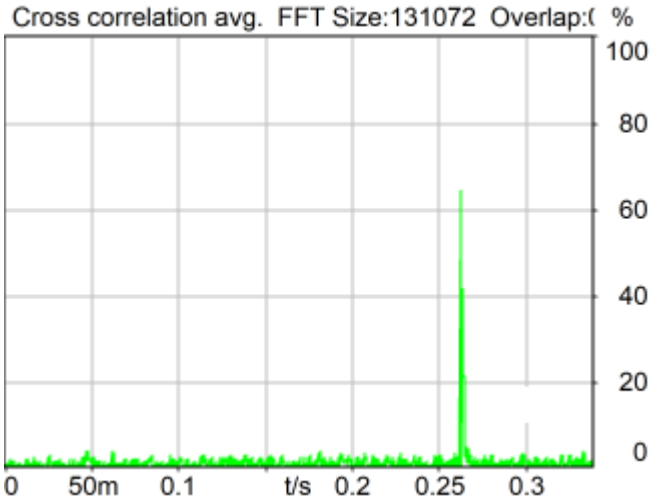
SMD	Status	Single Value Description	Single Value	Object
Overall Receive Delay WB	Done	Delay (Cross) [ms]	263.3	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.1a Receive Volume Control Performance 8N WB	Ok	Speech Level [dB[SPL]]	91.78	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 250 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	23.08	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 315 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	26.08	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 400 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	26.09	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 500 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	27.03	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 630 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	27.41	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 800 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	30.05	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 1000 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	35.14	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 1250 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	33.52	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 1600 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	42.45	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 2000 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	41.32	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 2500 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	43.31	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 3150 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	41.50	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 4000 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	47.12	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.2 RCV Distortion and Noise - 5000 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	47.92	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
Report - Receive Distortion	Ok	Minimum SDNR [dB]	23.08	LTE Band

and Noise (Conversational Gain)		, (occured at 250Hz)		41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.3 Frequency Response 8N FF	Ok	Min. dist. to tolerance scheme [dB], 611.7 Hz	0.91	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N
5.3 Frequency Response 8N DF	Ok	Min. dist. to tolerance scheme [dB], 205.7 Hz	0.89	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_8N

Overall Receive Delay WB 6
5.1a Receive Volume Control Performance 8N WB 7
5.2 RCV Distortion and Noise - 250 Hz WB 8
5.2 RCV Distortion and Noise - 315 Hz WB 9
5.2 RCV Distortion and Noise - 400 Hz WB 10
5.2 RCV Distortion and Noise - 500 Hz WB 11
5.2 RCV Distortion and Noise - 630 Hz WB 12
5.2 RCV Distortion and Noise - 800 Hz WB 13
5.2 RCV Distortion and Noise - 1000 Hz WB 14
5.2 RCV Distortion and Noise - 1250 Hz WB 15
5.2 RCV Distortion and Noise - 1600 Hz WB 16
5.2 RCV Distortion and Noise - 2000 Hz WB 17
5.2 RCV Distortion and Noise - 2500 Hz WB 18
5.2 RCV Distortion and Noise - 3150 Hz WB 19
5.2 RCV Distortion and Noise - 4000 Hz WB 20
5.2 RCV Distortion and Noise - 5000 Hz WB 21
Report - Receive Distortion and Noise (Conversational Gain) 22
5.3 Frequency Response 8N FF 23
5.3 Frequency Response 8N DF 24

Overall Receive Delay WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ Preparation - Delay measurement

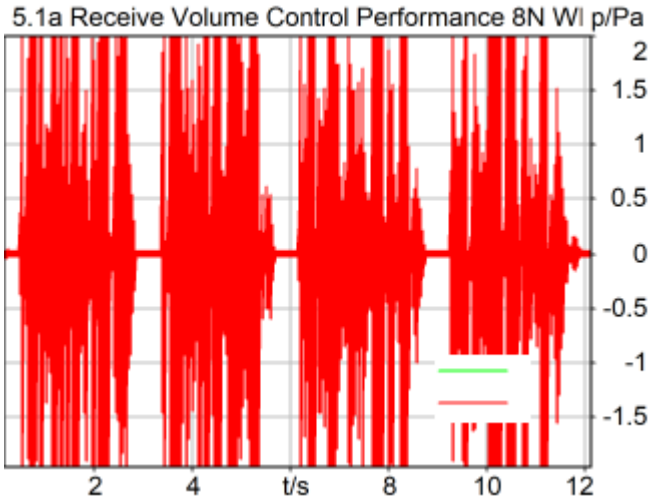


Delay (Cross): 263.3 ms

24/06/15 3:33 ACQUA 5.1.200

5.1a Receive Volume Control Performance 8N WB

TIA-5050 (2018-01) \ Measurements \ Wideband



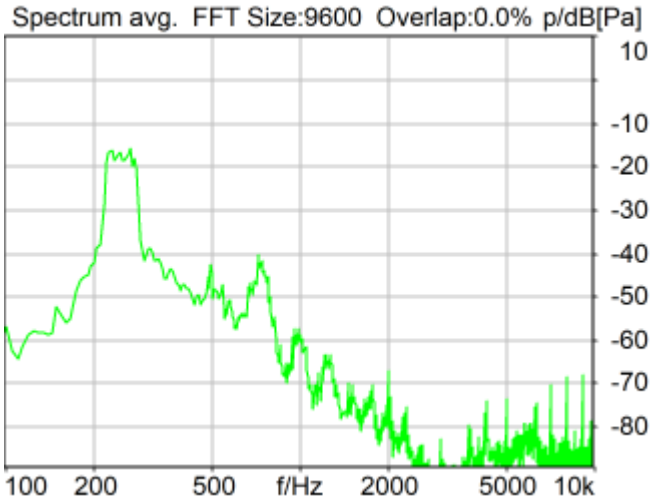
Speech Level RCV: 91.78 dB[SPL], Act.: 82.13% Ok

Ok

24/06/15 3:34 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 250 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



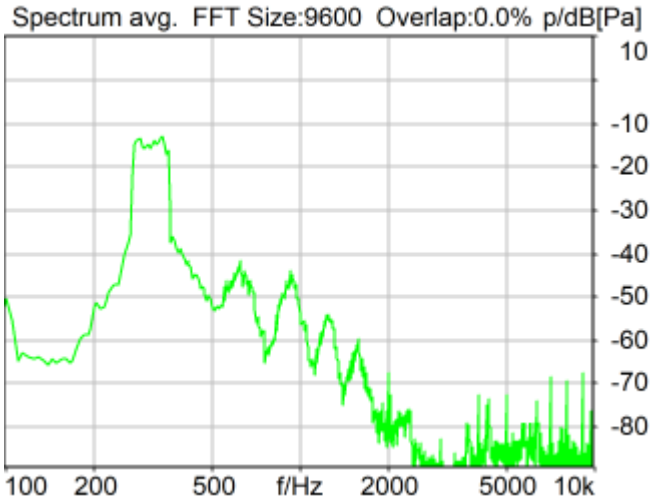
Distortion (Noise) RCV (packed): 23.08 dB (7.02%) Ok

Ok

24/06/15 3:34 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 315 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



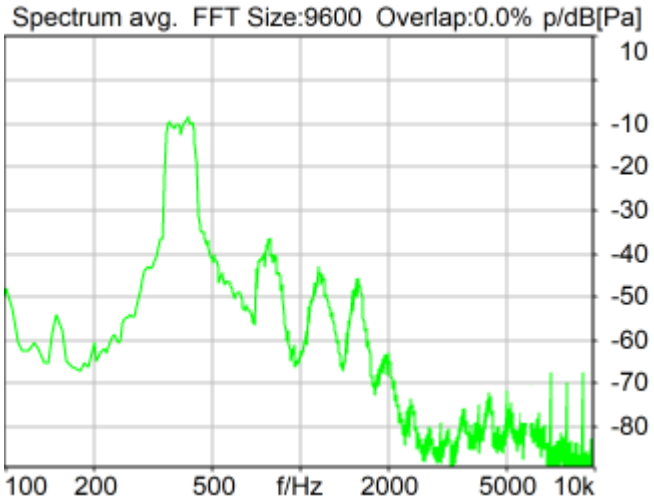
Distortion (Noise) RCV (packed): 26.08 dB (4.97%) Ok

Ok

24/06/15 3:35 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 400 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



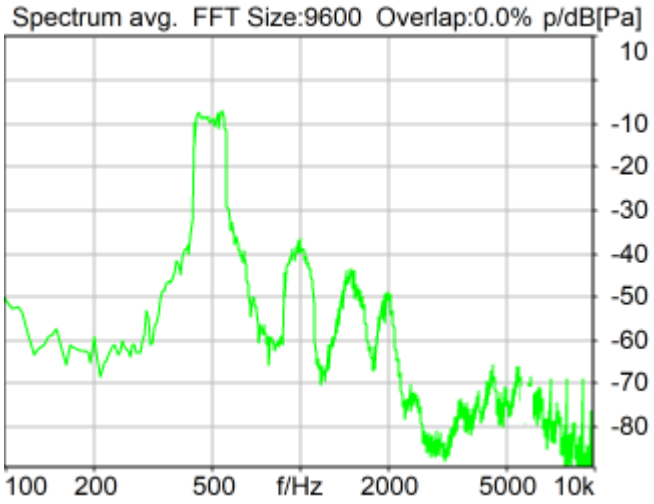
Distortion (Noise) RCV (packed): 26.09 dB (4.96%) Ok

Ok

24/06/15 3:35 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 500 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



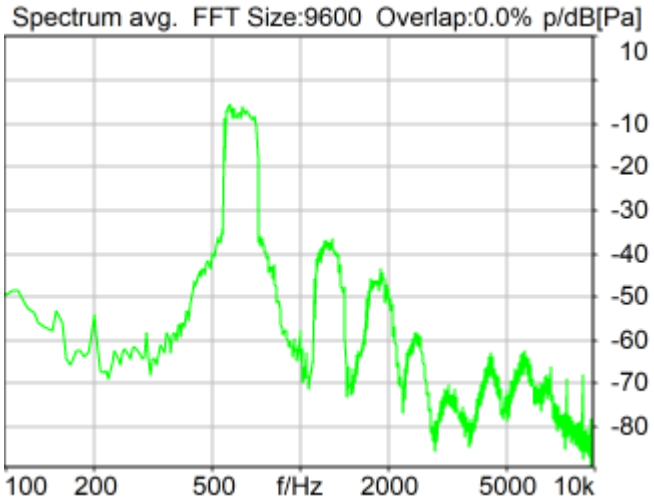
Distortion (Noise) RCV (packed): 27.03 dB (4.45%) Ok

Ok

24/06/15 3:36 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 630 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



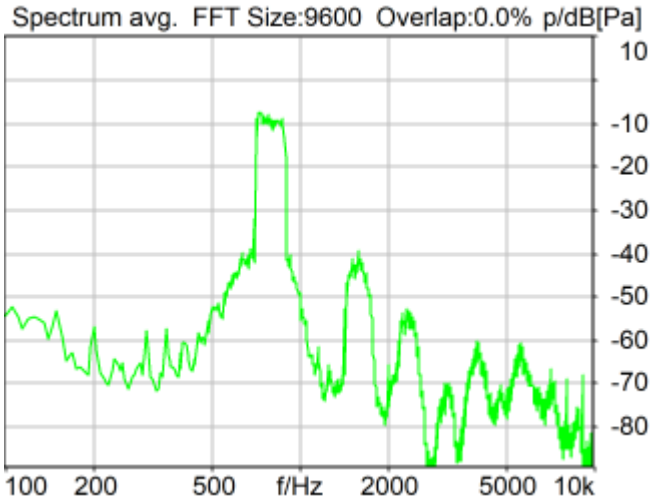
Distortion (Noise) RCV (packed): 27.41 dB (4.26%) Ok

Ok

24/06/15 3:36 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 800 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



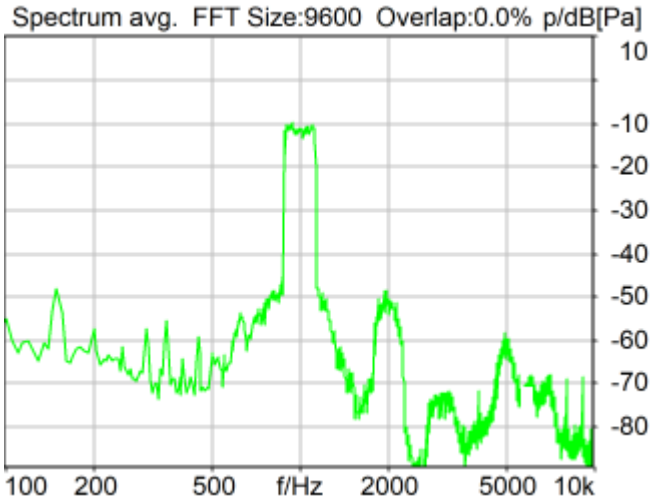
Distortion (Noise) RCV (packed): 30.05 dB (3.14%) Ok

Ok

24/06/15 3:36 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1000 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



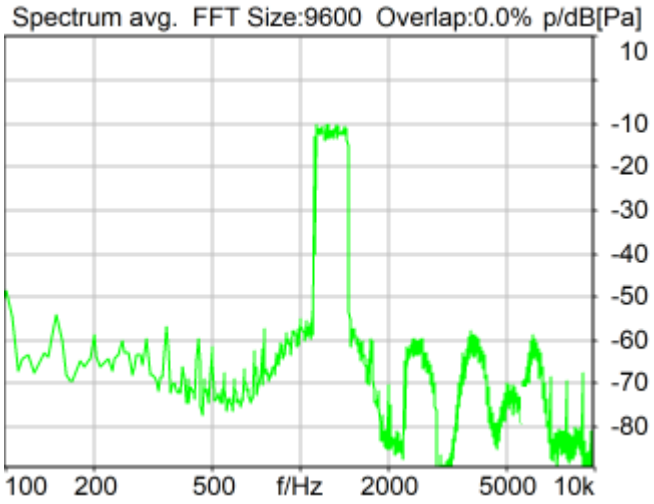
Distortion (Noise) RCV (packed): 35.14 dB (1.75%) Ok

Ok

24/06/15 3:37 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1250 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



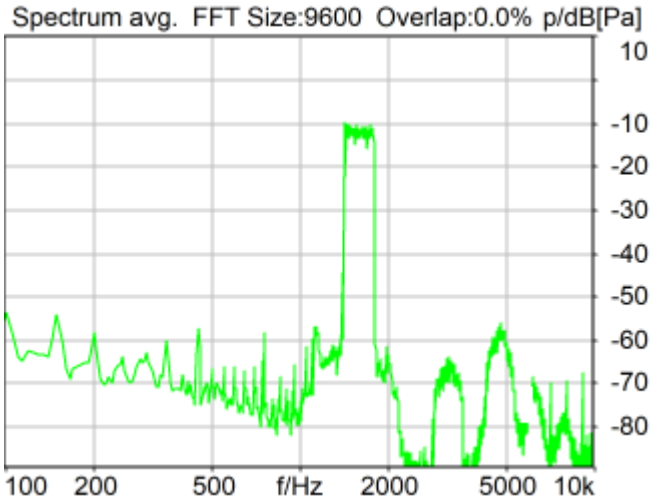
Distortion (Noise) RCV (packed): 33.52 dB (2.11%) Ok

Ok

24/06/15 3:37 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1600 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



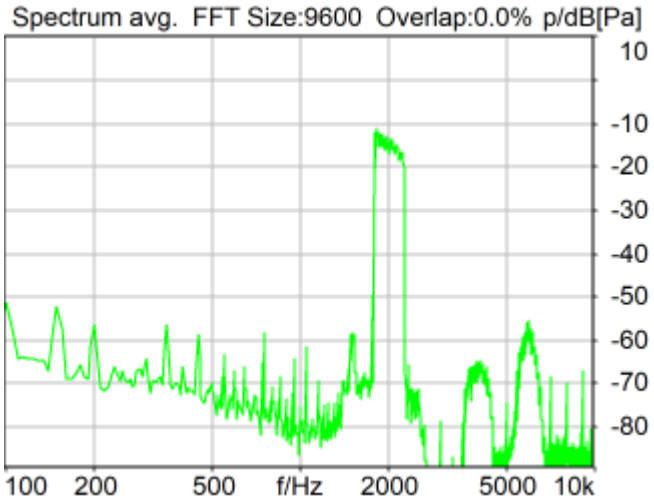
Distortion (Noise) RCV (packed): 42.45 dB (0.75%) Ok

Ok

24/06/15 3:38 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 2000 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



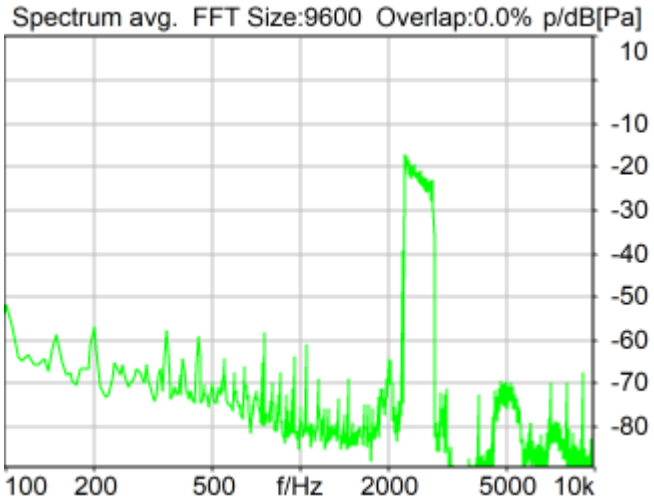
Distortion (Noise) RCV (packed): 41.32 dB (0.86%) Ok

Ok

24/06/15 3:38 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 2500 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



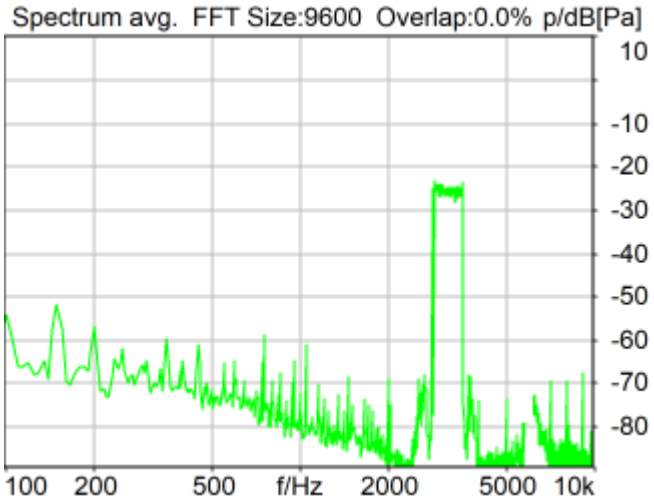
Distortion (Noise) RCV (packed): 43.31 dB (0.68%) Ok

Ok

24/06/15 3:39 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 3150 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



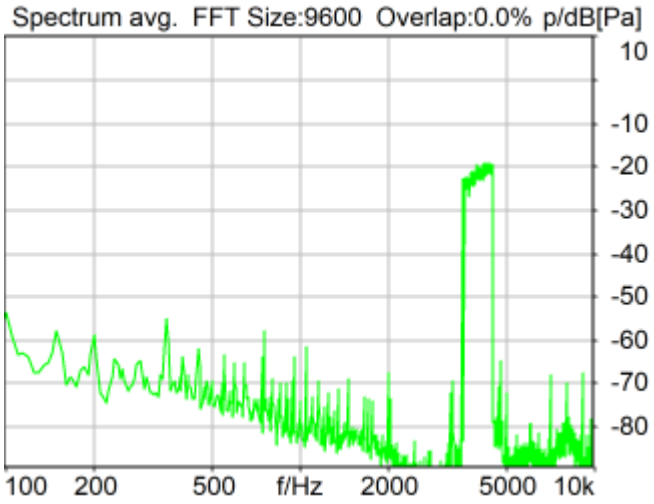
Distortion (Noise) RCV (packed): 41.50 dB (0.84%) Ok

Ok

24/06/15 3:39 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 4000 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



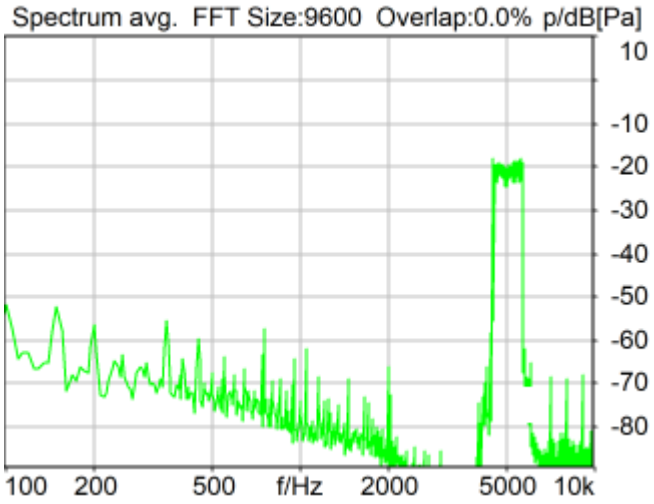
Distortion (Noise) RCV (packed): 47.12 dB (0.44%) Ok

Ok

24/06/15 3:39 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 5000 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



Distortion (Noise) RCV (packed): 47.92 dB (0.40%) Ok

Ok

24/06/15 3:40 ACQUA 5.1.200

Report - Receive Distortion and Noise (Conversational Gain)

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N

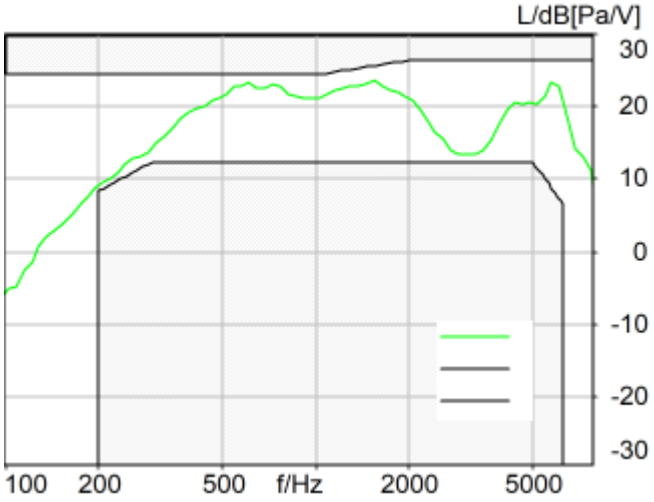
Region	Frequency	SDNR
1	250Hz	23.08 dB
2	315Hz	26.08 dB
3	400Hz	26.09 dB
4	500Hz	27.03 dB
5	630Hz	27.41 dB
6	800Hz	30.05 dB
7	1000Hz	35.14 dB
8	1250Hz	33.52 dB
9	1600Hz	42.45 dB
10	2000Hz	41.32 dB
11	2500Hz	43.31 dB
12	3150Hz	41.50 dB
13	4000Hz	47.12 dB
14	5000Hz	47.92 dB

All SDNRs were greater than 20.0 dB, requirement was met.
Smallest SDNR was 23.08dB at 250Hz.

24/06/15 3:40 ACQUA

5.3 Frequency Response 8N FF

TIA-5050 (2018-01) \ Measurements \ Wideband



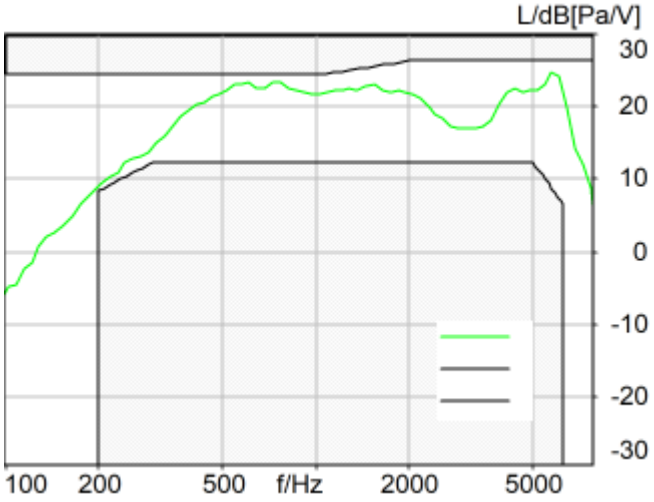
Absolute minimal distance
0.91 dB at 611.7 Hz Ok

Ok

24/06/15 3:40 ACQUA 5.1.200

5.3 Frequency Response 8N DF

TIA-5050 (2018-01) \ Measurements \ Wideband



Absolute minimal distance
0.89 dB at 205.7 Hz Ok

Ok

24/06/15 3:41 ACQUA 5.1.200

Measurement Protocol

Measurement Object	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24.4kbps_Ch6_8N

Project	452122
Report Generation Date	24/06/18 9:12
Responsible Person	AC01-KS

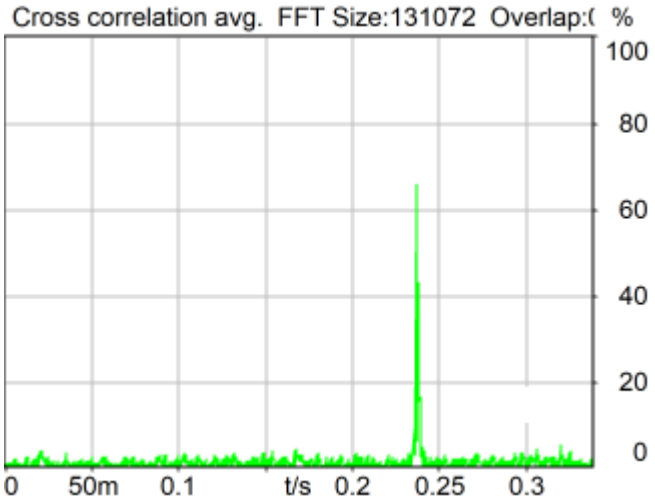
Status Overview

SMD	Status	Single Value Description	Single Value	Object
Overall Receive Delay NB	Done	Delay (Cross) [ms]	236.9	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
5.1a Receive Volume Control Performance 8N NB	Ok	Speech Level [dB[SPL]]	92.09	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
5.2 RCV Distortion and Noise - 400 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	25.54	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
5.2 RCV Distortion and Noise - 500 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	26.73	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
5.2 RCV Distortion and Noise - 630 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	27.13	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
5.2 RCV Distortion and Noise - 800 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	30.47	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
5.2 RCV Distortion and Noise - 1000 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	28.68	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
5.2 RCV Distortion and Noise - 1250 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	21.80	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
5.2 RCV Distortion and Noise - 1600 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	40.25	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
5.2 RCV Distortion and Noise - 2000 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	26.43	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
5.2 RCV Distortion and Noise - 2500 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	39.53	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
5.2 RCV Distortion and Noise - 3150 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	41.79	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
Report - Receive Distortion and Noise (Conversational Gain)	Ok	Minimum SDNR [dB], (occured at 1250Hz)	21.80	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
5.3 Frequency Response 8N FF HANB	Ok	Min. dist. to tolerance scheme [dB], 611.7 Hz	1.43	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N
5.3 Frequency Response 8N DF HANB	Ok	Min. dist. to tolerance scheme [dB], 544.4 Hz	2.23	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_8N

Overall Receive Delay NB 5
5.1a Receive Volume Control Performance 8N NB 6
5.2 RCV Distortion and Noise - 400 Hz NB 7
5.2 RCV Distortion and Noise - 500 Hz NB 8
5.2 RCV Distortion and Noise - 630 Hz NB 9
5.2 RCV Distortion and Noise - 800 Hz NB 10
5.2 RCV Distortion and Noise - 1000 Hz NB 11
5.2 RCV Distortion and Noise - 1250 Hz NB 12
5.2 RCV Distortion and Noise - 1600 Hz NB 13
5.2 RCV Distortion and Noise - 2000 Hz NB 14
5.2 RCV Distortion and Noise - 2500 Hz NB 15
5.2 RCV Distortion and Noise - 3150 Hz NB 16
Report - Receive Distortion and Noise (Conversational Gain) 17
5.3 Frequency Response 8N FF HANB 18
5.3 Frequency Response 8N DF HANB 19

Overall Receive Delay NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ Preparation - Delay measurement



Delay (Cross): 236.9 ms

24/06/18 8:55 ACQUA 5.1.200

5.1a Receive Volume Control Performance 8N NB

TIA-5050 (2018-01) \ Measurements \ Narrowband

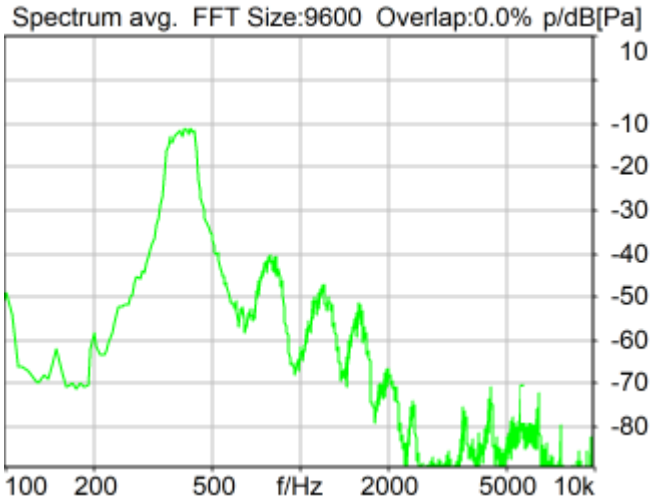
Speech Level RCV: 92.09 dB[SPL], Act.: 82.01% Ok

Ok

24/06/18 8:55 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 400 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 8N



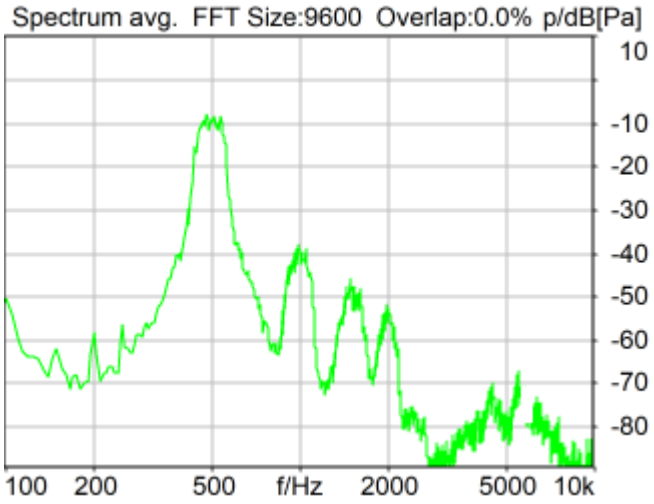
Distortion (Noise) RCV (packed): 25.54 dB (5.28%) Ok

Ok

24/06/18 8:56 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 500 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 8N



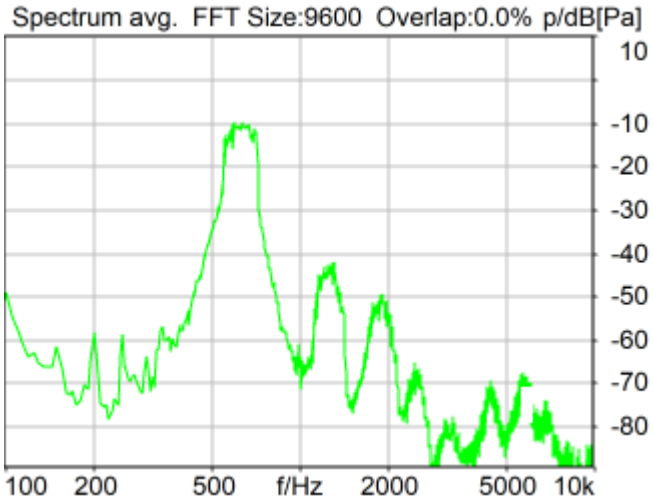
Distortion (Noise) RCV (packed): 26.73 dB (4.61%) Ok

Ok

24/06/18 8:56 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 630 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 8N



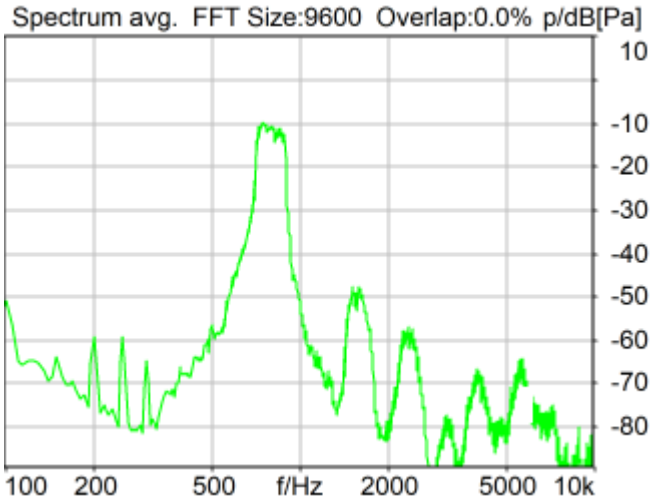
Distortion (Noise) RCV (packed): 27.13 dB (4.40%) Ok

Ok

24/06/18 8:56 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 800 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 8N



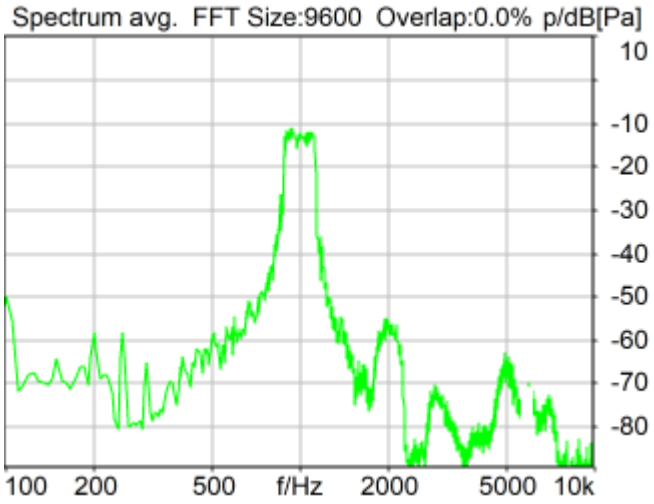
Distortion (Noise) RCV (packed): 30.47 dB (2.99%) Ok

Ok

24/06/18 8:57 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1000 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 8N



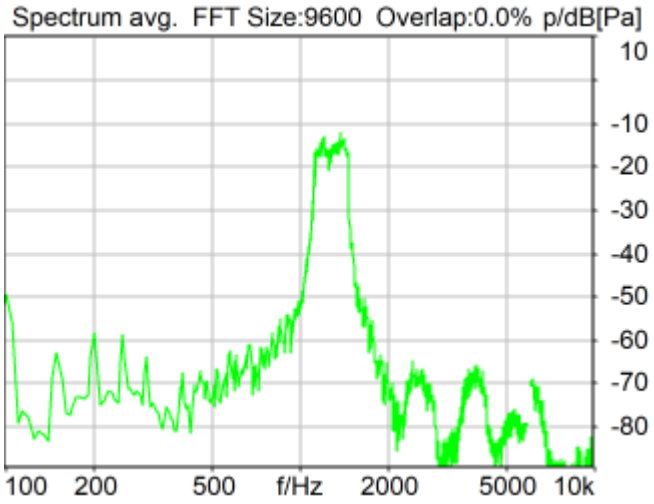
Distortion (Noise) RCV (packed): 28.68 dB (3.68%) Ok

Ok

24/06/18 8:57 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1250 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 8N



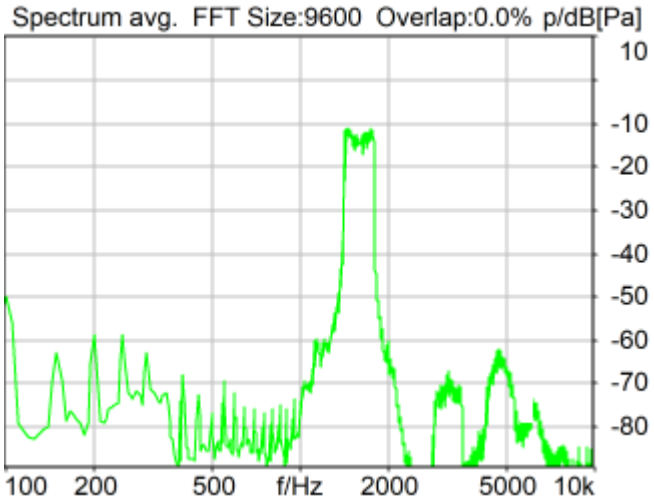
Distortion (Noise) RCV (packed): 21.80 dB (8.13%) Ok

Ok

24/06/18 8:58 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1600 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 8N



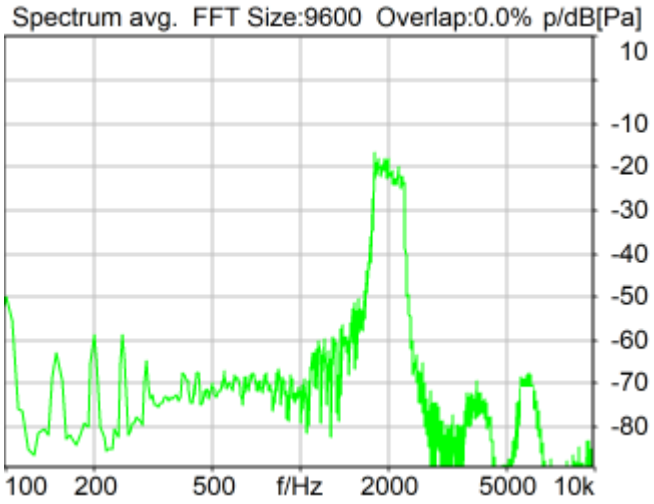
Distortion (Noise) RCV (packed): 40.25 dB (0.97%) Ok

Ok

24/06/18 8:58 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 2000 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 8N



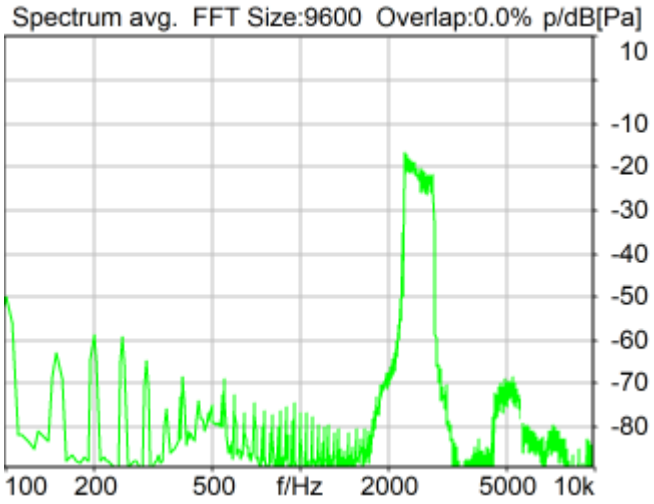
Distortion (Noise) RCV (packed): 26.43 dB (4.77%) Ok

Ok

24/06/18 8:59 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 2500 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 8N



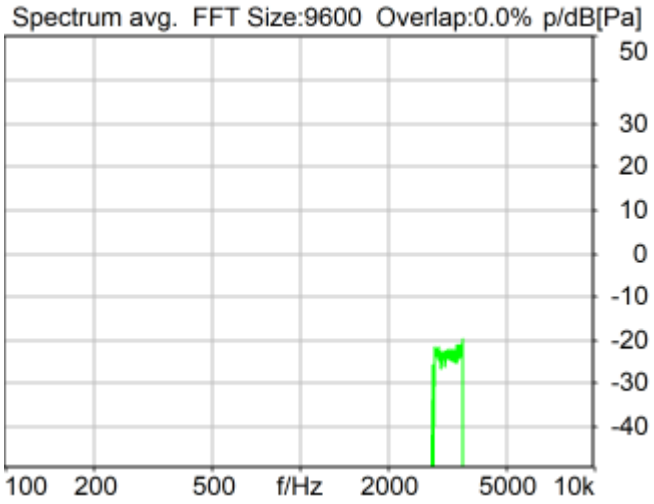
Distortion (Noise) RCV (packed): 39.53 dB (1.06%) Ok

Ok

24/06/18 8:59 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 3150 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 8N



Distortion (Noise) RCV (packed): 41.79 dB (0.81%) Ok

Ok

24/06/18 9:00 ACQUA 5.1.200

Report - Receive Distortion and Noise (Conversational Gain)

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 8N

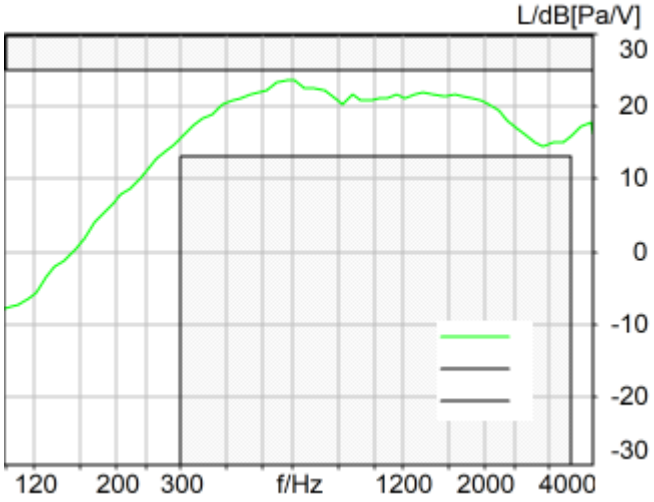
Region	Frequency	SDNR
1	400Hz	25.54 dB
2	500Hz	26.73 dB
3	630Hz	27.13 dB
4	800Hz	30.47 dB
5	1000Hz	28.68 dB
6	1250Hz	21.80 dB
7	1600Hz	40.25 dB
8	2000Hz	26.43 dB
9	2500Hz	39.53 dB
10	3150Hz	41.79 dB

All SDNRs were greater than 20.0 dB, requirement was met.
Smallest SDNR was 21.80dB at 1250Hz.

24/06/18 9:08 ACQUA

5.3 Frequency Response 8N FF HANB

TIA-5050 (2018-01) \ Measurements \ Narrowband



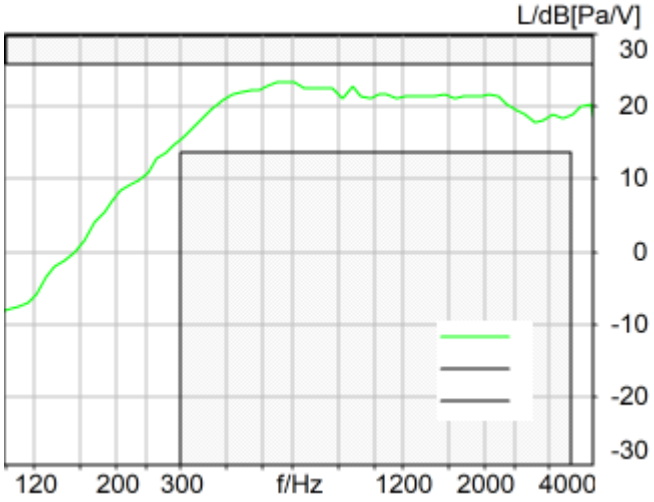
Absolute minimal distance
1.43 dB at 611.7 Hz Ok

Ok

24/06/18 9:09 ACQUA 5.1.200

5.3 Frequency Response 8N DF HANB

TIA-5050 (2018-01) \ Measurements \ Narrowband



Absolute minimal distance
2.23 dB at 544.4 Hz Ok

Ok

24/06/18 9:09 ACQUA 5.1.200

Measurement Protocol

Measurement Object	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N

Project	452122
Report Generation Date	24/06/18 10:13
Responsible Person	AC01-KS

Status Overview

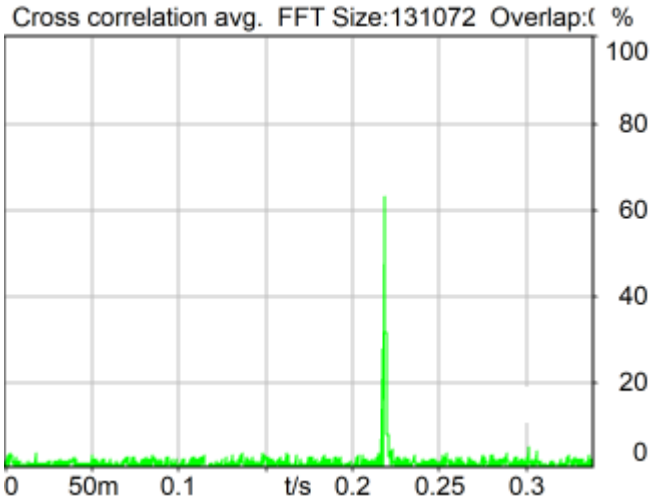
SMD	Status	Single Value Description	Single Value	Object
Overall Receive Delay WB	Done	Delay (Cross) [ms]	218.7	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.1a Receive Volume Control Performance 8N WB	Ok	Speech Level [dB[SPL]]	88.65	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 250 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	22.91	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 315 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	24.07	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 400 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	24.09	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 500 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	24.78	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 630 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	25.59	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 800 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	25.56	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 1000 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	26.43	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 1250 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	20.23	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 1600 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	29.41	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 2000 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	27.24	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 2500 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	29.21	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 3150 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	30.29	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 4000 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	34.84	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.2 RCV Distortion and Noise - 5000 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	32.51	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
Report - Receive Distortion	Ok	Minimum SDNR [dB],	20.23	WLAN2.4GHz_802.11b

and Noise (Conversational Gain)		(occured at 1250Hz)		1Mbps_EVS WB 128kbps_Ch6_2N
5.3 Frequency Response 8N FF	Ok	Min. dist. to tolerance scheme [dB], 5767.3 Hz	0.95	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N
5.3 Frequency Response 8N DF	Ok	Min. dist. to tolerance scheme [dB], 5767.3 Hz	0.12	WLAN2.4GHz_802.11b 1Mbps_EVS WB 128kbps_Ch6_2N

Overall Receive Delay WB 6
5.1a Receive Volume Control Performance 8N WB 7
5.2 RCV Distortion and Noise - 250 Hz WB 8
5.2 RCV Distortion and Noise - 315 Hz WB 9
5.2 RCV Distortion and Noise - 400 Hz WB 10
5.2 RCV Distortion and Noise - 500 Hz WB 11
5.2 RCV Distortion and Noise - 630 Hz WB 12
5.2 RCV Distortion and Noise - 800 Hz WB 13
5.2 RCV Distortion and Noise - 1000 Hz WB 14
5.2 RCV Distortion and Noise - 1250 Hz WB 15
5.2 RCV Distortion and Noise - 1600 Hz WB 16
5.2 RCV Distortion and Noise - 2000 Hz WB 17
5.2 RCV Distortion and Noise - 2500 Hz WB 18
5.2 RCV Distortion and Noise - 3150 Hz WB 19
5.2 RCV Distortion and Noise - 4000 Hz WB 20
5.2 RCV Distortion and Noise - 5000 Hz WB 21
Report - Receive Distortion and Noise (Conversational Gain) 22
5.3 Frequency Response 8N FF 23
5.3 Frequency Response 8N DF 24

Overall Receive Delay WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ Preparation - Delay measurement



Delay (Cross): 218.7 ms

24/06/18 9:50 ACQUA 5.1.200

5.1a Receive Volume Control Performance 8N WB

TIA-5050 (2018-01) \ Measurements \ Wideband

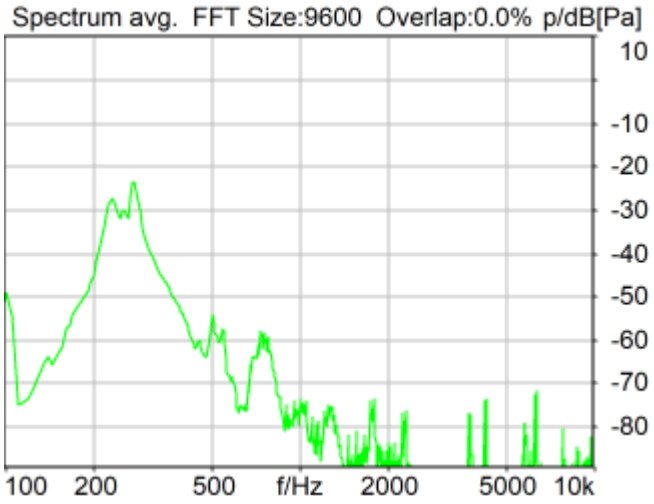
Speech Level RCV: 88.65 dB[SPL], Act.: 84.36% Ok

Ok

24/06/18 9:51 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 250 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



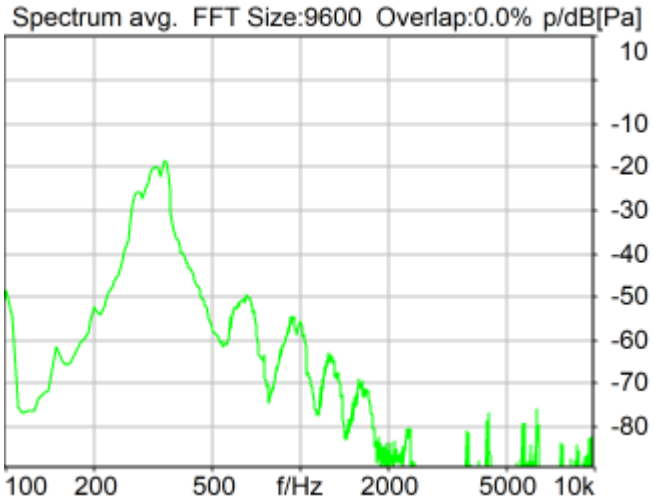
Distortion (Noise) RCV (packed): 22.91 dB (7.15%) Ok

Ok

24/06/18 9:51 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 315 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



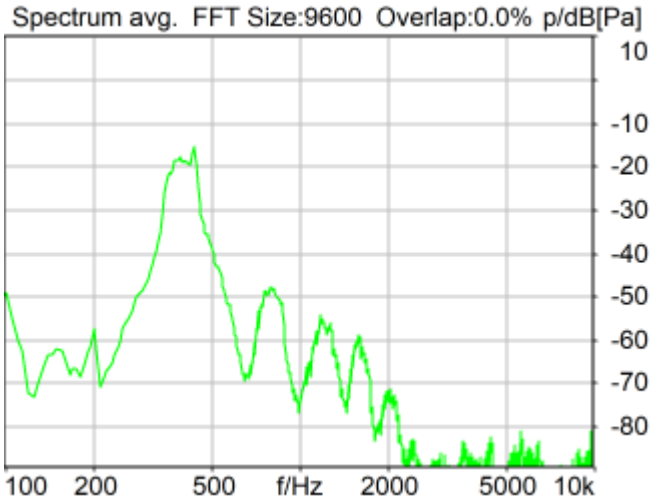
Distortion (Noise) RCV (packed): 24.07 dB (6.26%) Ok

Ok

24/06/18 9:52 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 400 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



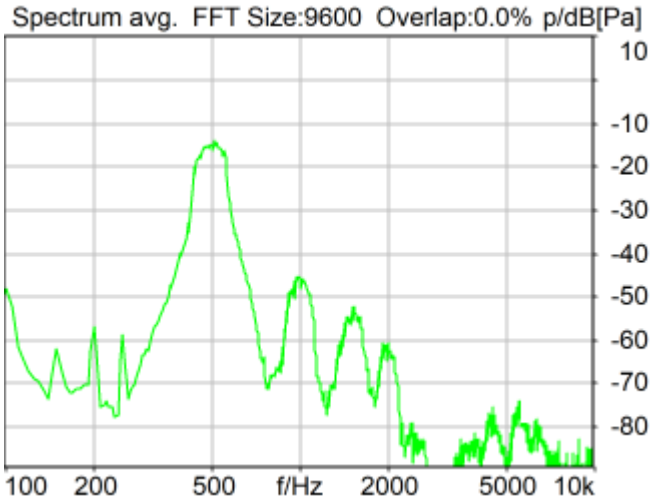
Distortion (Noise) RCV (packed): 24.09 dB (6.24%) Ok

Ok

24/06/18 9:52 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 500 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



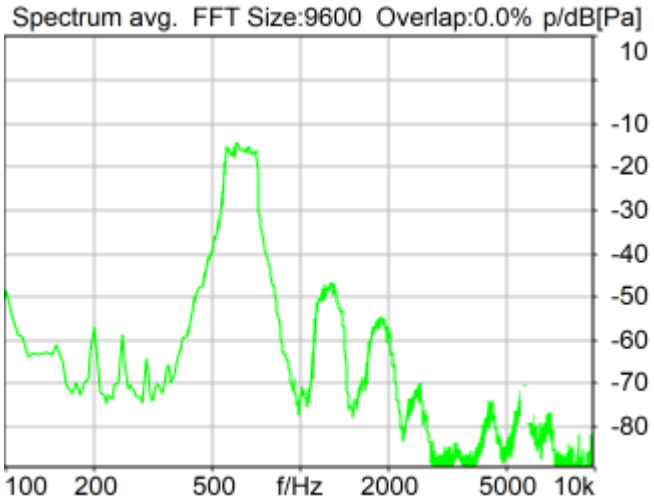
Distortion (Noise) RCV (packed): 24.78 dB (5.77%) Ok

Ok

24/06/18 9:53 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 630 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



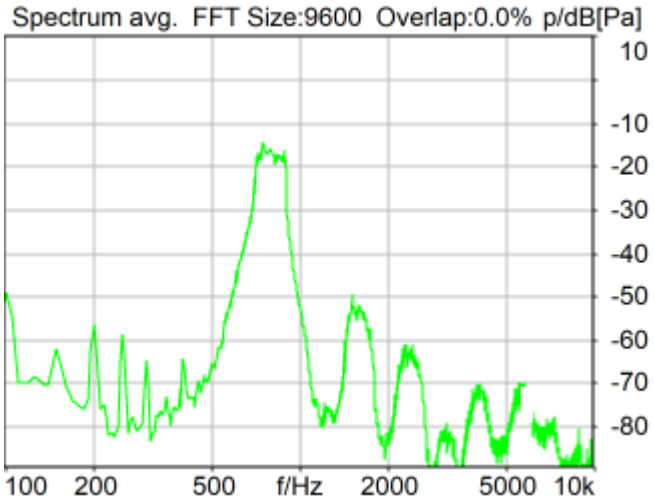
Distortion (Noise) RCV (packed): 25.59 dB (5.25%) Ok

Ok

24/06/18 9:53 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 800 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



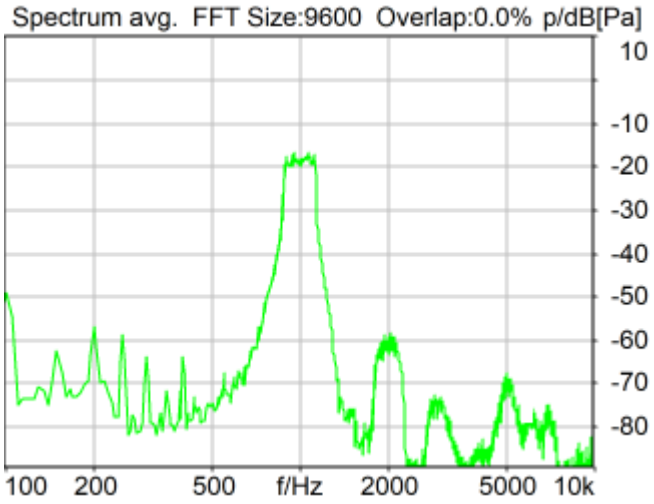
Distortion (Noise) RCV (packed): 25.56 dB (5.27%) Ok

Ok

24/06/18 9:54 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1000 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



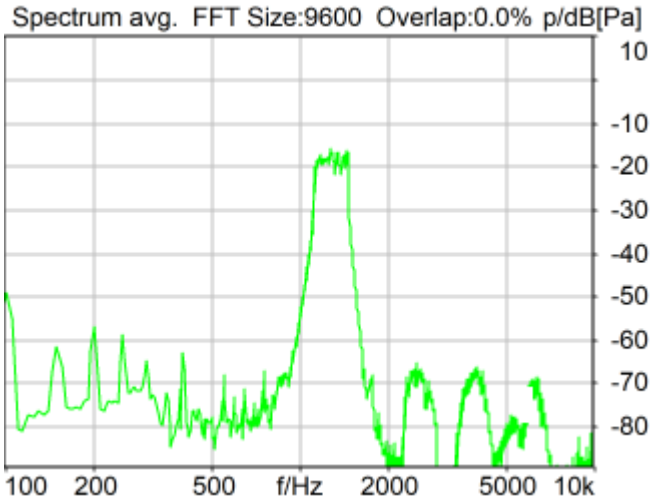
Distortion (Noise) RCV (packed): 26.43 dB (4.77%) Ok

Ok

24/06/18 9:54 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1250 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



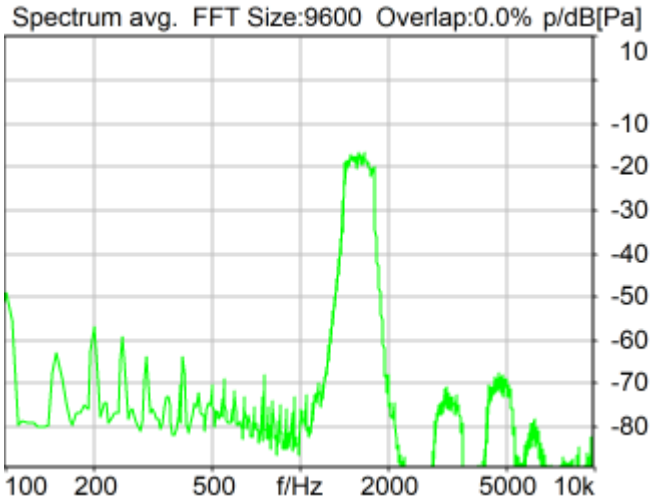
Distortion (Noise) RCV (packed): 20.23 dB (9.74%) Ok

Ok

24/06/18 9:54 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1600 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



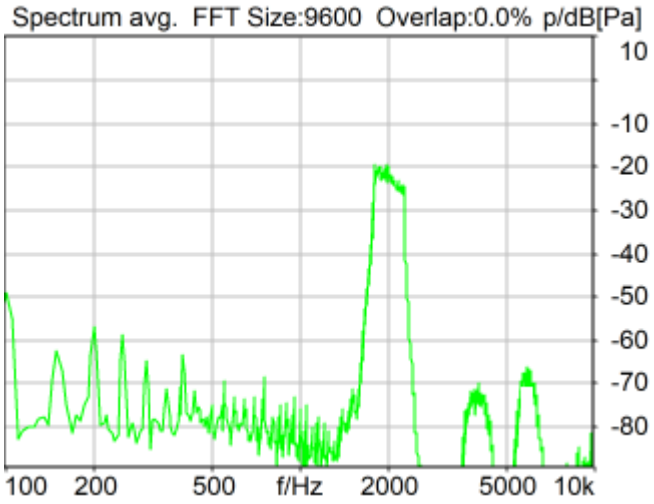
Distortion (Noise) RCV (packed): 29.41 dB (3.38%) Ok

Ok

24/06/18 9:55 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 2000 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



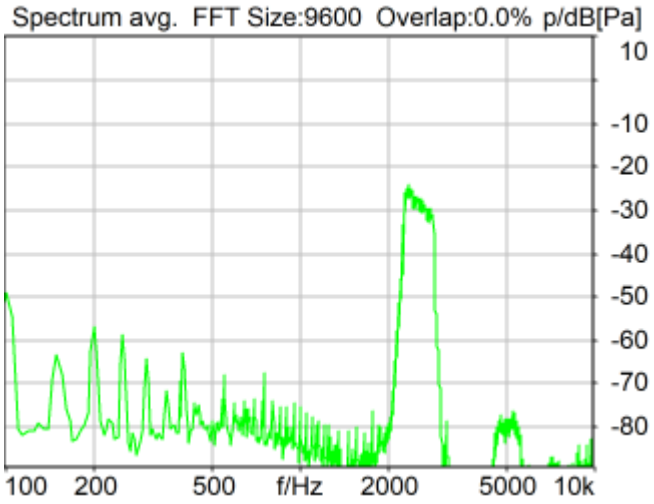
Distortion (Noise) RCV (packed): 27.24 dB (4.35%) Ok

Ok

24/06/18 9:55 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 2500 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



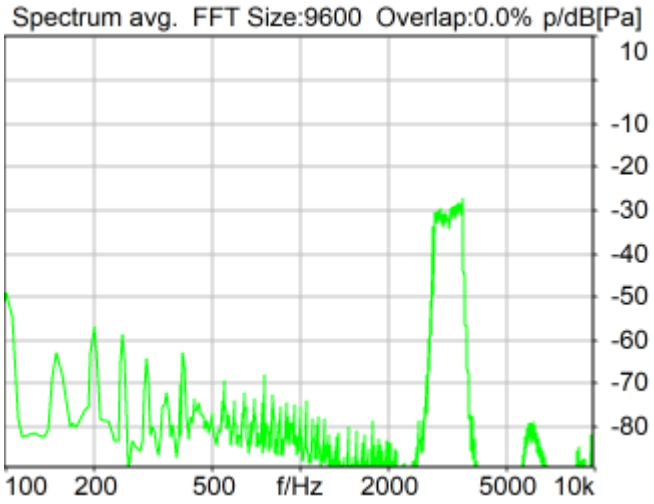
Distortion (Noise) RCV (packed): 29.21 dB (3.46%) Ok

Ok

24/06/18 9:56 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 3150 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



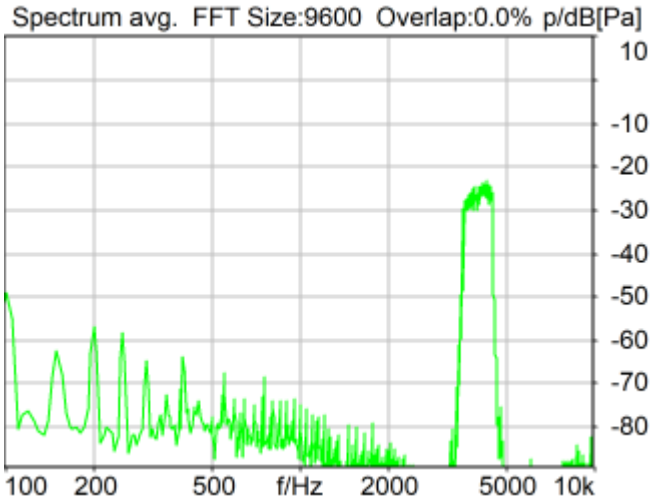
Distortion (Noise) RCV (packed): 30.29 dB (3.06%) Ok

Ok

24/06/18 9:56 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 4000 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



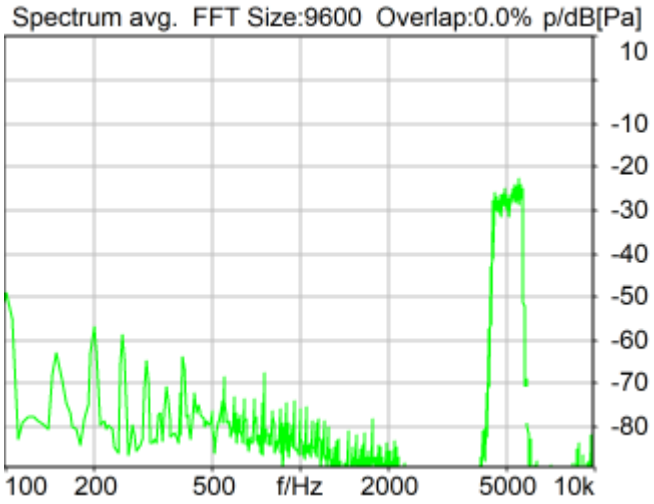
Distortion (Noise) RCV (packed): 34.84 dB (1.81%) Ok

Ok

24/06/18 9:57 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 5000 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N



Distortion (Noise) RCV (packed): 32.51 dB (2.37%) Ok

Ok

24/06/18 9:57 ACQUA 5.1.200

Report - Receive Distortion and Noise (Conversational Gain)

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 8N

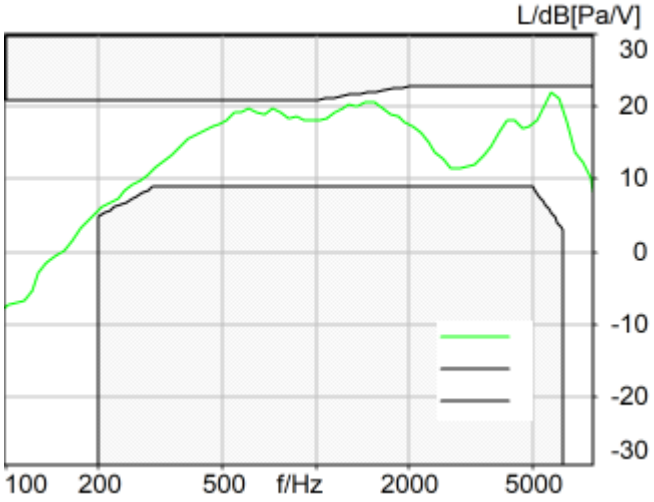
Region	Frequency	SDNR
1	250Hz	22.91 dB
2	315Hz	24.07 dB
3	400Hz	24.09 dB
4	500Hz	24.78 dB
5	630Hz	25.59 dB
6	800Hz	25.56 dB
7	1000Hz	26.43 dB
8	1250Hz	20.23 dB
9	1600Hz	29.41 dB
10	2000Hz	27.24 dB
11	2500Hz	29.21 dB
12	3150Hz	30.29 dB
13	4000Hz	34.84 dB
14	5000Hz	32.51 dB

All SDNRs were greater than 20.0 dB, requirement was met.
Smallest SDNR was 20.23dB at 1250Hz.

24/06/18 10:05 ACQUA

5.3 Frequency Response 8N FF

TIA-5050 (2018-01) \ Measurements \ Wideband



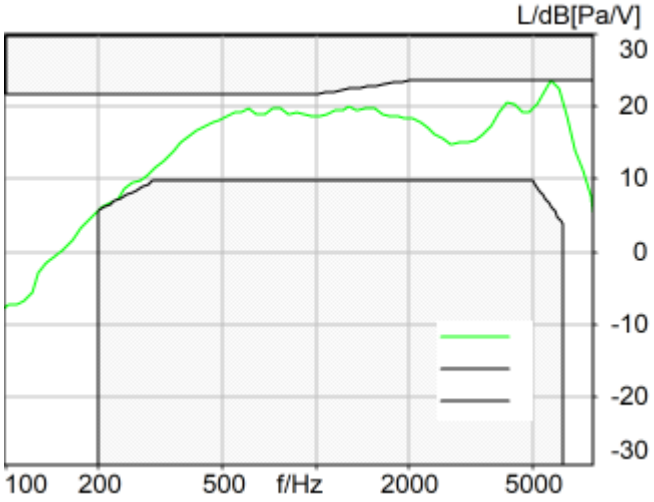
Absolute minimal distance
0.95 dB at 5767.3 Hz Ok

Ok

24/06/18 10:05 ACQUA 5.1.200

5.3 Frequency Response 8N DF

TIA-5050 (2018-01) \ Measurements \ Wideband



Absolute minimal distance
0.12 dB at 5767.3 Hz Ok

Ok

24/06/18 10:06 ACQUA 5.1.200

Measurement Protocol

Measurement Object	GSM850_GSM Voice_AMR NB 4.75kbps_Ch189_2N

Project	452122
Report Generation Date	24/06/16 7:35
Responsible Person	AC01-KS

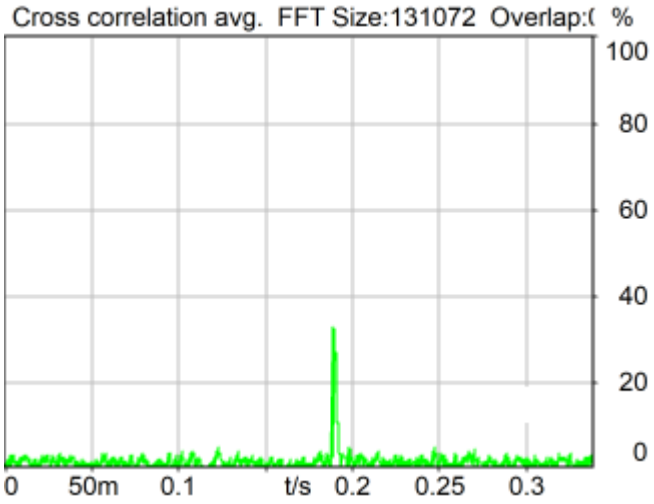
Status Overview

SMD	Status	Single Value Description	Single Value	Object
Overall Receive Delay NB	Done	Delay (Cross) [ms]	189.8	GSM850_GSM Voice_AMR NB 4. 75kbps_Ch189_2N
5.1b Receive Volume Control Performance 2N NB	Ok	Speech Level [dB[SPL]]	87.50	GSM850_GSM Voice_AMR NB 4. 75kbps_Ch189_2N

Overall Receive Delay NB 5
5.1b Receive Volume Control Performance 2N NB 6

Overall Receive Delay NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ Preparation - Delay measurement

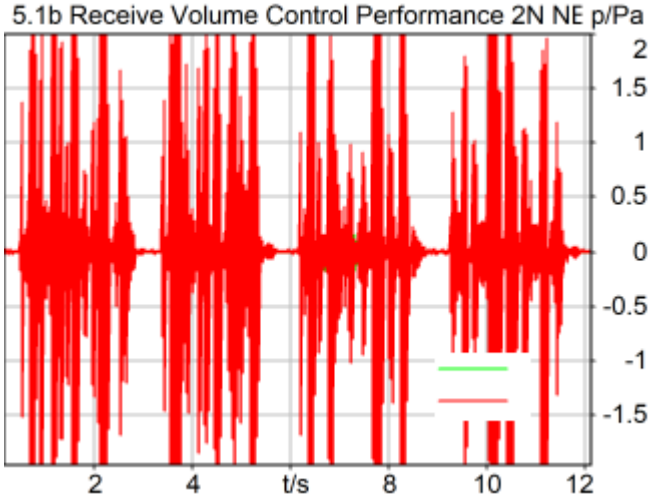


Delay (Cross): 189.8 ms

24/06/16 7:35 ACQUA 5.1.200

5.1b Receive Volume Control Performance 2N NB

TIA-5050 (2018-01) \ Measurements \ Narrowband



Speech Level RCV: 87.50 dB[SPL], Act.: 80.54% Ok

Ok

24/06/16 7:35 ACQUA 5.1.200

Measurement Protocol

Measurement Object	WCDMA II_Voice_AMR NB 4.75kbps_Ch9400_2N

Project	452122
Report Generation Date	24/06/18 3:14
Responsible Person	AC01-KS

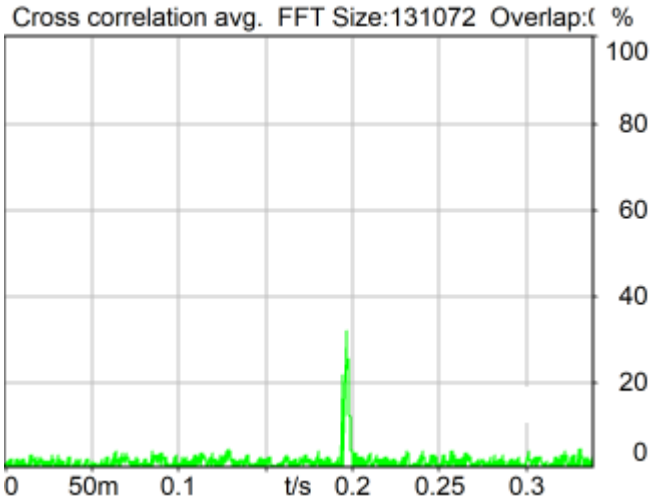
Status Overview

SMD	Status	Single Value Description	Single Value	Object
Overall Receive Delay NB	Done	Delay (Cross) [ms]	196.1	WCDMA II_Voice_AMR NB 4. 75kbps_Ch9400_2N
5.1b Receive Volume Control Performance 2N NB	Ok	Speech Level [dB[SPL]]	87.21	WCDMA II_Voice_AMR NB 4. 75kbps_Ch9400_2N

Overall Receive Delay NB 5
5.1b Receive Volume Control Performance 2N NB 6

Overall Receive Delay NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ Preparation - Delay measurement

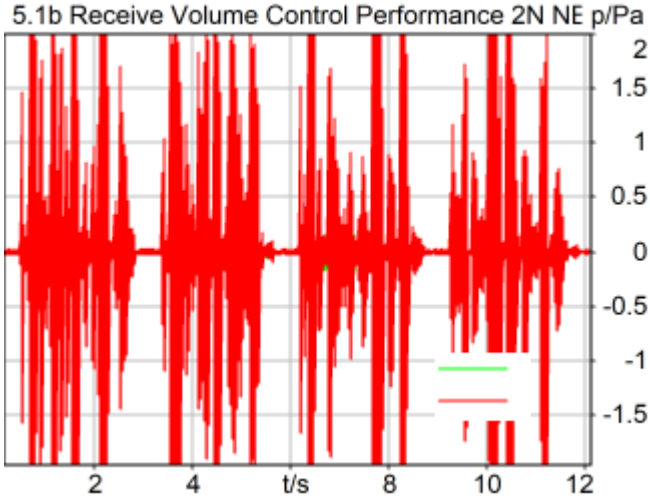


Delay (Cross): 196.1 ms

24/06/18 3:13 ACQUA 5.1.200

5.1b Receive Volume Control Performance 2N NB

TIA-5050 (2018-01) \ Measurements \ Narrowband



Speech Level RCV: 87.21 dB[SPL], Act.: 80.44% Ok

Ok

24/06/18 3:14 ACQUA 5.1.200

Measurement Protocol

Measurement Object	WCDMA II_Voice_AMR NB 4.75kbps_Ch9400_8N

Project	452122
Report Generation Date	24/06/18 3:16
Responsible Person	AC01-KS

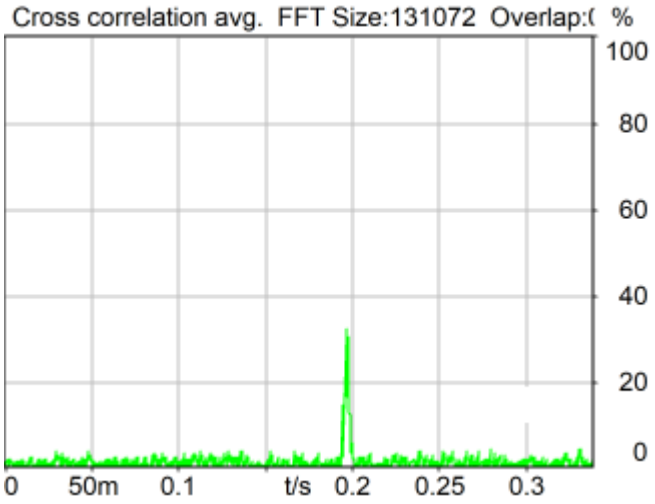
Status Overview

SMD	Status	Single Value Description	Single Value	Object
Overall Receive Delay NB	Done	Delay (Cross) [ms]	196.2	WCDMA II_Voice_AMR NB 4. 75kbps_Ch9400_8N
5.1a Receive Volume Control Performance 8N NB	Ok	Speech Level [dB[SPL]]	90.94	WCDMA II_Voice_AMR NB 4. 75kbps_Ch9400_8N

Overall Receive Delay NB 5
5.1a Receive Volume Control Performance 8N NB 6

Overall Receive Delay NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ Preparation - Delay measurement

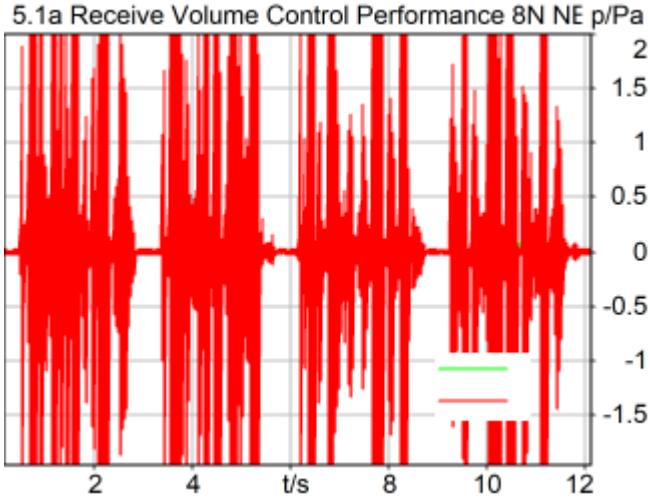


Delay (Cross): 196.2 ms

24/06/18 3:15 ACQUA 5.1.200

5.1a Receive Volume Control Performance 8N NB

TIA-5050 (2018-01) \ Measurements \ Narrowband



Speech Level RCV: 90.94 dB[SPL], Act.: 80.60% Ok

Ok

24/06/18 3:16 ACQUA 5.1.200

Measurement Protocol

Measurement Object	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N

Project	452122
Report Generation Date	24/06/15 3:32
Responsible Person	AC01-KS

Status Overview

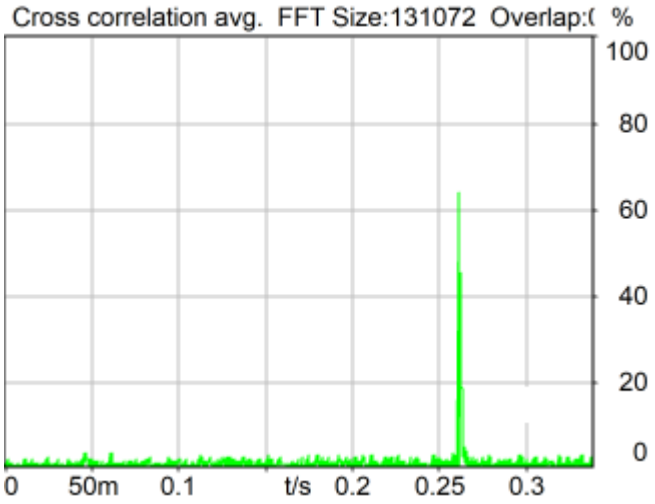
SMD	Status	Single Value Description	Single Value	Object
Overall Receive Delay WB	Done	Delay (Cross) [ms]	262.2	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.1b Receive Volume Control Performance 2N WB	Ok	Speech Level [dB[SPL]]	87.76	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 250 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	24.10	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 315 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	24.67	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 400 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	25.58	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 500 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	27.08	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 630 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	26.81	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 800 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	28.74	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 1000 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	34.62	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 1250 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	33.11	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 1600 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	41.50	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 2000 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	39.41	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 2500 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	41.62	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 3150 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	40.36	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 4000 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	45.51	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.2 RCV Distortion and Noise - 5000 Hz WB	Ok	Distortion (Noise) [dB], 0.0 dB	45.86	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
Report - Receive Distortion	Ok	Minimum SDNR [dB]	24.10	LTE Band

and Noise (Conversational Gain)		, (occured at 250Hz)		41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.3 Frequency Response 2N FF	Ok	Min. dist. to tolerance scheme [dB], 611.7 Hz	0.67	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N
5.3 Frequency Response 2N DF	Ok	Min. dist. to tolerance scheme [dB], 5767.3 Hz	0.12	LTE Band 41_20M_QPSK_1RB_0Offset_EVS WB 128kbps_Ch40620_2N

Overall Receive Delay WB 6
5.1b Receive Volume Control Performance 2N WB 7
5.2 RCV Distortion and Noise - 250 Hz WB 8
5.2 RCV Distortion and Noise - 315 Hz WB 9
5.2 RCV Distortion and Noise - 400 Hz WB 10
5.2 RCV Distortion and Noise - 500 Hz WB 11
5.2 RCV Distortion and Noise - 630 Hz WB 12
5.2 RCV Distortion and Noise - 800 Hz WB 13
5.2 RCV Distortion and Noise - 1000 Hz WB 14
5.2 RCV Distortion and Noise - 1250 Hz WB 15
5.2 RCV Distortion and Noise - 1600 Hz WB 16
5.2 RCV Distortion and Noise - 2000 Hz WB 17
5.2 RCV Distortion and Noise - 2500 Hz WB 18
5.2 RCV Distortion and Noise - 3150 Hz WB 19
5.2 RCV Distortion and Noise - 4000 Hz WB 20
5.2 RCV Distortion and Noise - 5000 Hz WB 21
Report - Receive Distortion and Noise (Conversational Gain) 22
5.3 Frequency Response 2N FF 23
5.3 Frequency Response 2N DF 24

Overall Receive Delay WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ Preparation - Delay measurement

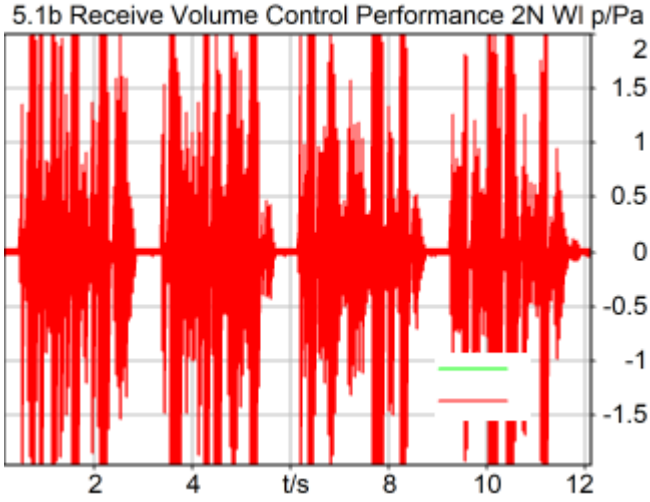


Delay (Cross): 262.2 ms

24/06/15 3:22 ACQUA 5.1.200

5.1b Receive Volume Control Performance 2N WB

TIA-5050 (2018-01) \ Measurements \ Wideband



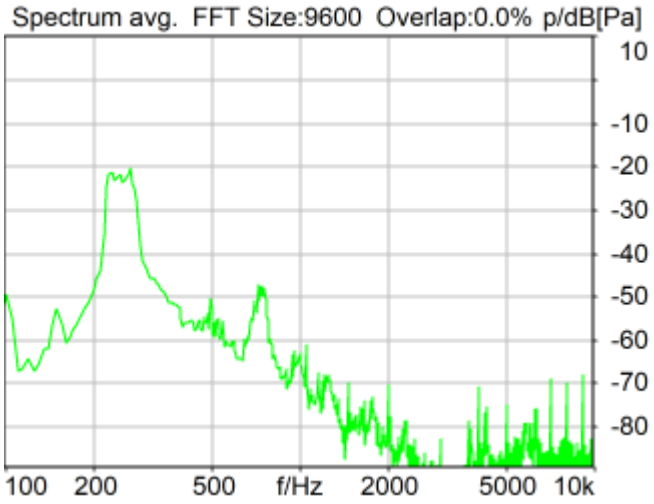
Speech Level RCV: 87.76 dB[SPL], Act.: 84.01% Ok

Ok

24/06/15 3:23 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 250 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



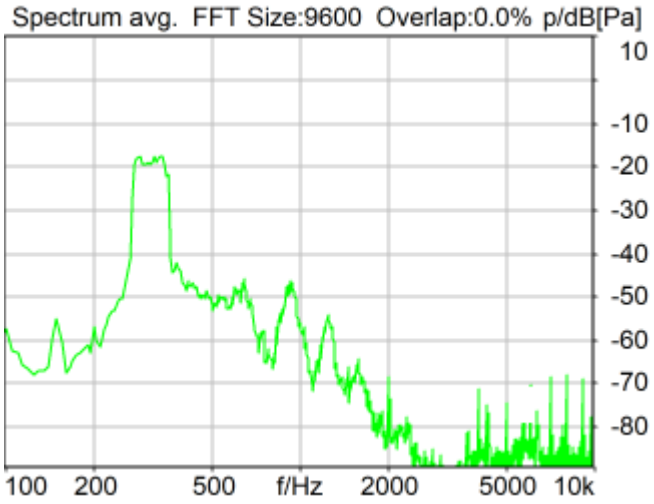
Distortion (Noise) RCV (packed): 24.10 dB (6.24%) Ok

Ok

24/06/15 3:23 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 315 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



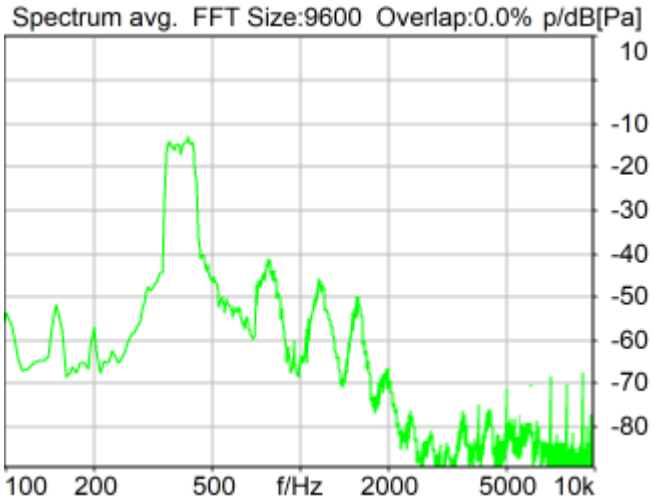
Distortion (Noise) RCV (packed): 24.67 dB (5.84%) Ok

Ok

24/06/15 3:23 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 400 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



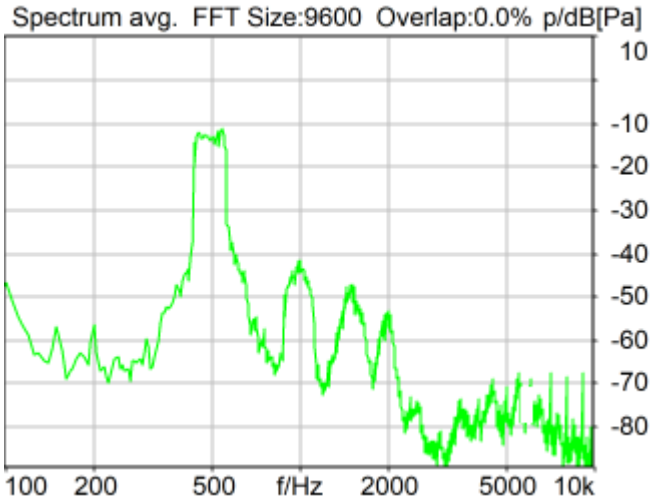
Distortion (Noise) RCV (packed): 25.58 dB (5.26%) Ok

Ok

24/06/15 3:24 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 500 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



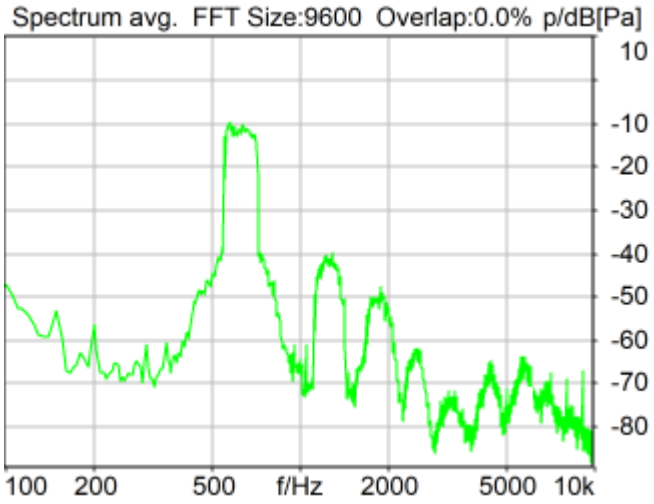
Distortion (Noise) RCV (packed): 27.08 dB (4.43%) Ok

Ok

24/06/15 3:24 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 630 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



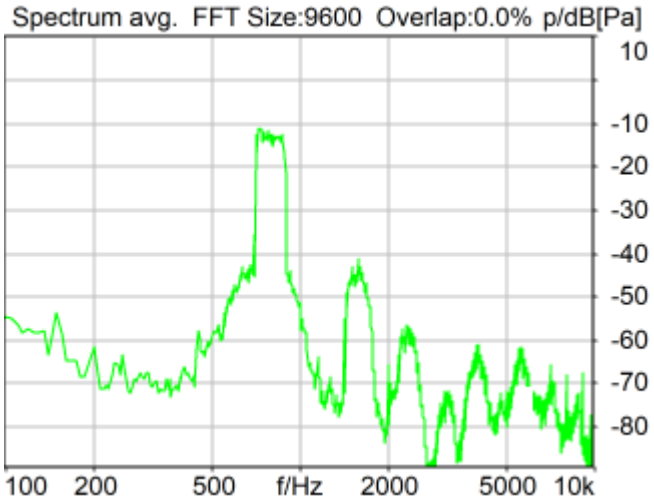
Distortion (Noise) RCV (packed): 26.81 dB (4.57%) Ok

Ok

24/06/15 3:25 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 800 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



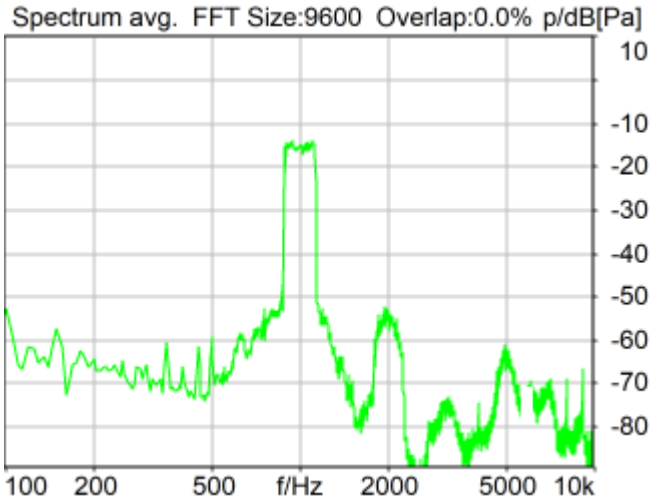
Distortion (Noise) RCV (packed): 28.74 dB (3.66%) Ok

Ok

24/06/15 3:25 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1000 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



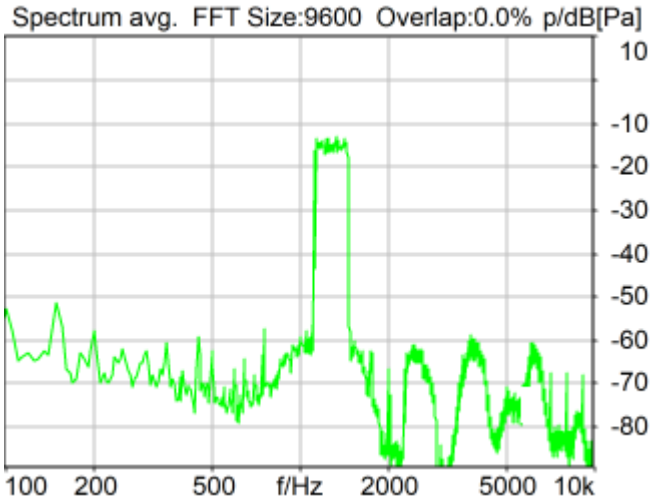
Distortion (Noise) RCV (packed): 34.62 dB (1.86%) Ok

Ok

24/06/15 3:26 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1250 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



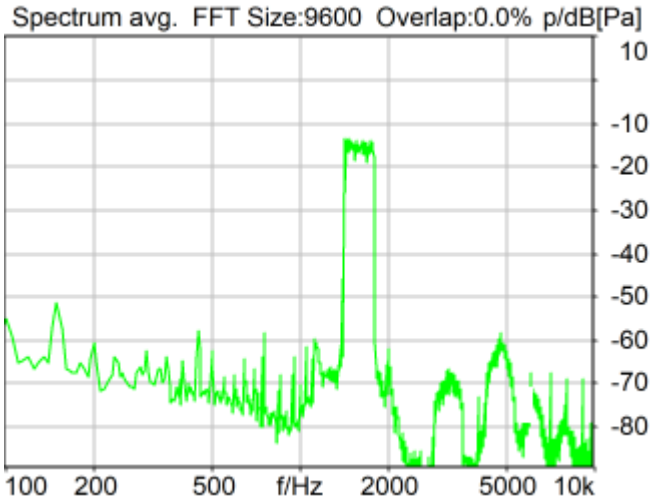
Distortion (Noise) RCV (packed): 33.11 dB (2.21%) Ok

Ok

24/06/15 3:26 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1600 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



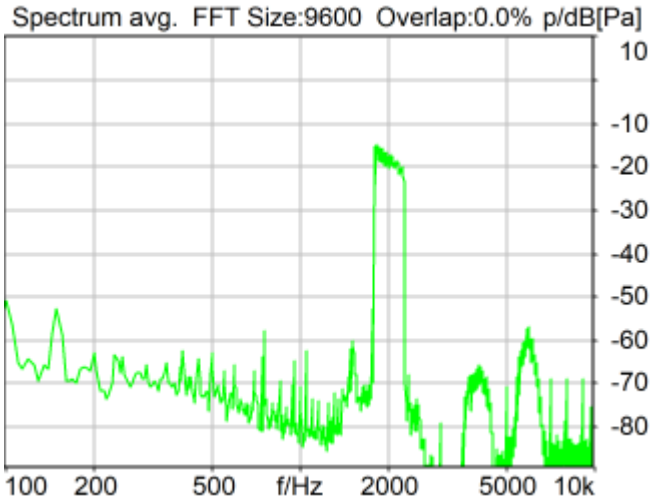
Distortion (Noise) RCV (packed): 41.50 dB (0.84%) Ok

Ok

24/06/15 3:26 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 2000 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



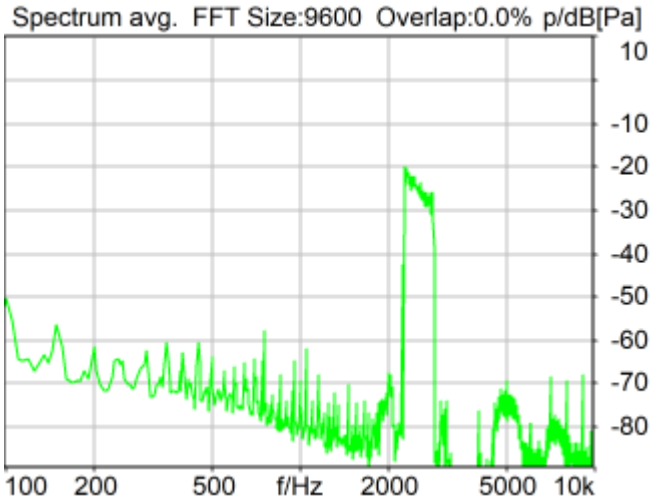
Distortion (Noise) RCV (packed): 39.41 dB (1.07%) Ok

Ok

24/06/15 3:27 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 2500 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



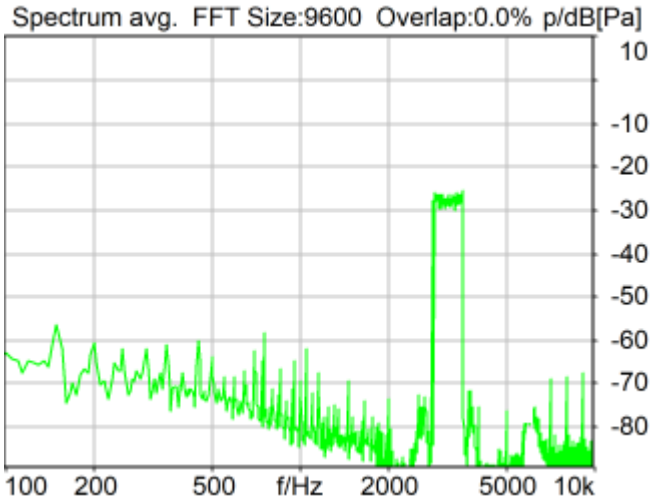
Distortion (Noise) RCV (packed): 41.62 dB (0.83%) Ok

Ok

24/06/15 3:27 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 3150 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



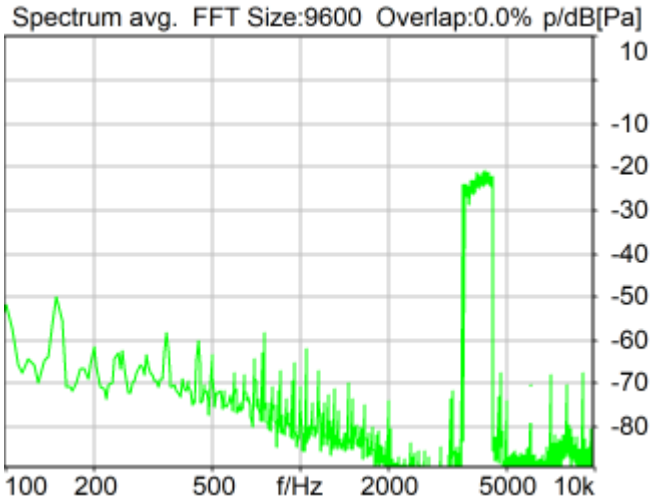
Distortion (Noise) RCV (packed): 40.36 dB (0.96%) Ok

Ok

24/06/15 3:28 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 4000 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



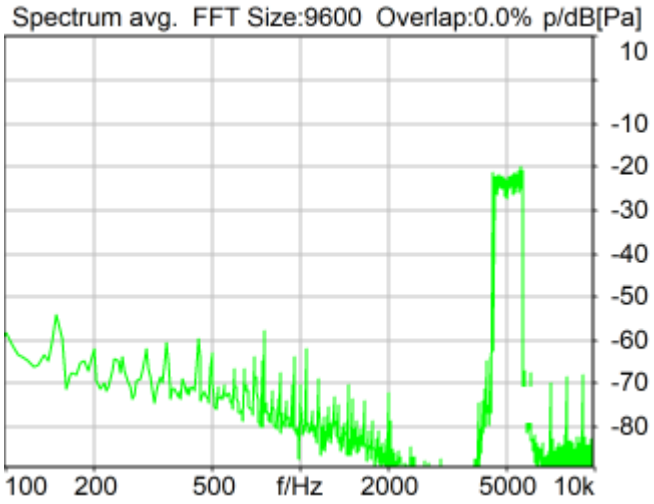
Distortion (Noise) RCV (packed): 45.51 dB (0.53%) Ok

Ok

24/06/15 3:28 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 5000 Hz WB

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N



Distortion (Noise) RCV (packed): 45.86 dB (0.51%) Ok

Ok

24/06/15 3:29 ACQUA 5.1.200

Report - Receive Distortion and Noise (Conversational Gain)

TIA-5050 (2018-01) \ Measurements \ Wideband \ 5.2 Receive Distortion and Noise 2N

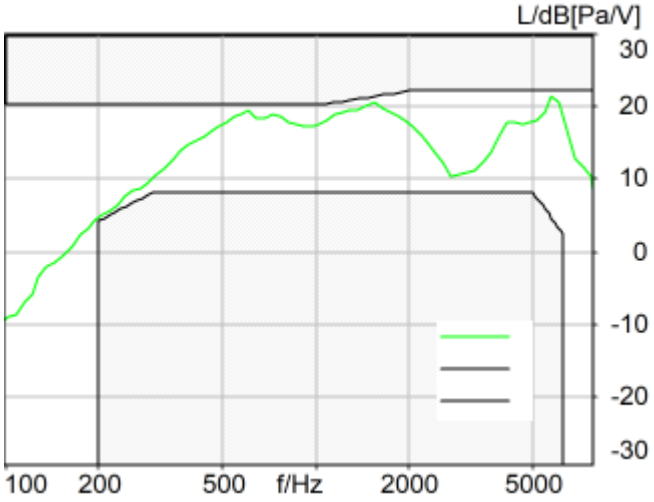
Region	Frequency	SDNR
1	250Hz	24.10 dB
2	315Hz	24.67 dB
3	400Hz	25.58 dB
4	500Hz	27.08 dB
5	630Hz	26.81 dB
6	800Hz	28.74 dB
7	1000Hz	34.62 dB
8	1250Hz	33.11 dB
9	1600Hz	41.50 dB
10	2000Hz	39.41 dB
11	2500Hz	41.62 dB
12	3150Hz	40.36 dB
13	4000Hz	45.51 dB
14	5000Hz	45.86 dB

All SDNRs were greater than 20.0 dB, requirement was met.
Smallest SDNR was 24.10dB at 250Hz.

24/06/15 3:30 ACQUA

5.3 Frequency Response 2N FF

TIA-5050 (2018-01) \ Measurements \ Wideband



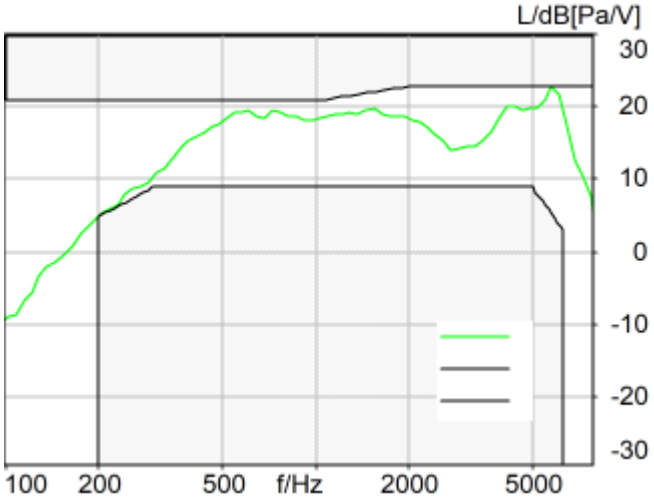
Absolute minimal distance
0.67 dB at 611.7 Hz Ok

Ok

24/06/15 3:30 ACQUA 5.1.200

5.3 Frequency Response 2N DF

TIA-5050 (2018-01) \ Measurements \ Wideband



Absolute minimal distance
0.12 dB at 5767.3 Hz Ok

Ok

24/06/15 3:30 ACQUA 5.1.200

Measurement Protocol

Measurement Object	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24.4kbps_Ch6_2N

Project	452122
Report Generation Date	24/06/18 9:16
Responsible Person	AC01-KS

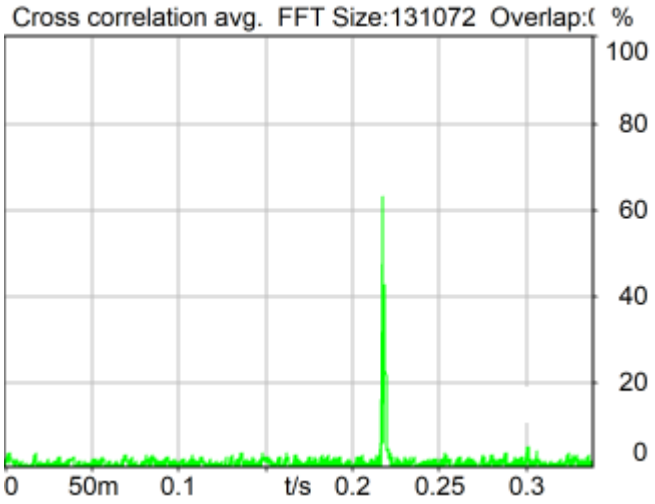
Status Overview

SMD	Status	Single Value Description	Single Value	Object
Overall Receive Delay NB	Done	Delay (Cross) [ms]	218.3	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
5.1b Receive Volume Control Performance 2N NB	Ok	Speech Level [dB[SPL]]	87.49	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
5.2 RCV Distortion and Noise - 400 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	25.86	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
5.2 RCV Distortion and Noise - 500 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	26.87	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
5.2 RCV Distortion and Noise - 630 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	24.26	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
5.2 RCV Distortion and Noise - 800 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	25.12	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
5.2 RCV Distortion and Noise - 1000 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	29.62	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
5.2 RCV Distortion and Noise - 1250 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	30.36	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
5.2 RCV Distortion and Noise - 1600 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	36.04	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
5.2 RCV Distortion and Noise - 2000 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	35.01	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
5.2 RCV Distortion and Noise - 2500 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	27.75	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
5.2 RCV Distortion and Noise - 3150 Hz NB	Ok	Distortion (Noise) [dB], 0.0 dB	38.80	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
Report - Receive Distortion and Noise (Conversational Gain)	Ok	Minimum SDNR [dB], (occured at 630Hz)	24.26	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
5.3 Frequency Response 2N FF HANB	Ok	Min. dist. to tolerance scheme [dB], 1547.5 Hz	2.05	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N
5.3 Frequency Response 2N DF HANB	Ok	Min. dist. to tolerance scheme [dB], 611.7 Hz	2.31	WLAN2.4GHz_802.11b 1Mbps_EVS NB 24. 4kbps_Ch6_2N

Overall Receive Delay NB 5
5.1b Receive Volume Control Performance 2N NB 6
5.2 RCV Distortion and Noise - 400 Hz NB 7
5.2 RCV Distortion and Noise - 500 Hz NB 8
5.2 RCV Distortion and Noise - 630 Hz NB 9
5.2 RCV Distortion and Noise - 800 Hz NB 10
5.2 RCV Distortion and Noise - 1000 Hz NB 11
5.2 RCV Distortion and Noise - 1250 Hz NB 12
5.2 RCV Distortion and Noise - 1600 Hz NB 13
5.2 RCV Distortion and Noise - 2000 Hz NB 14
5.2 RCV Distortion and Noise - 2500 Hz NB 15
5.2 RCV Distortion and Noise - 3150 Hz NB 16
Report - Receive Distortion and Noise (Conversational Gain) 17
5.3 Frequency Response 2N FF HANB 18
5.3 Frequency Response 2N DF HANB 19

Overall Receive Delay NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ Preparation - Delay measurement

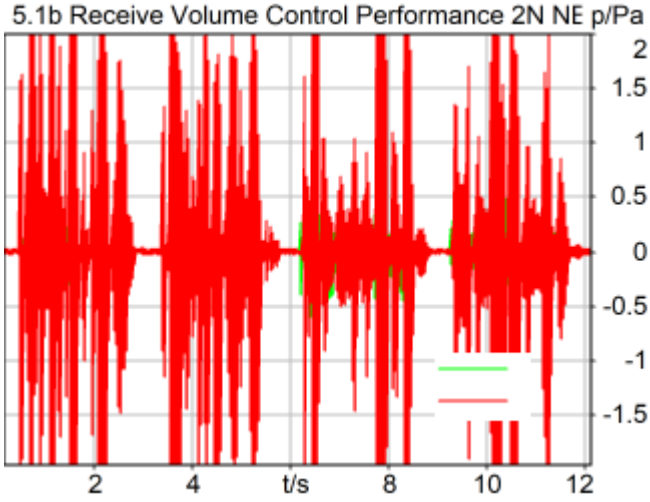


Delay (Cross): 218.3 ms

24/06/18 8:28 ACQUA 5.1.200

5.1b Receive Volume Control Performance 2N NB

TIA-5050 (2018-01) \ Measurements \ Narrowband



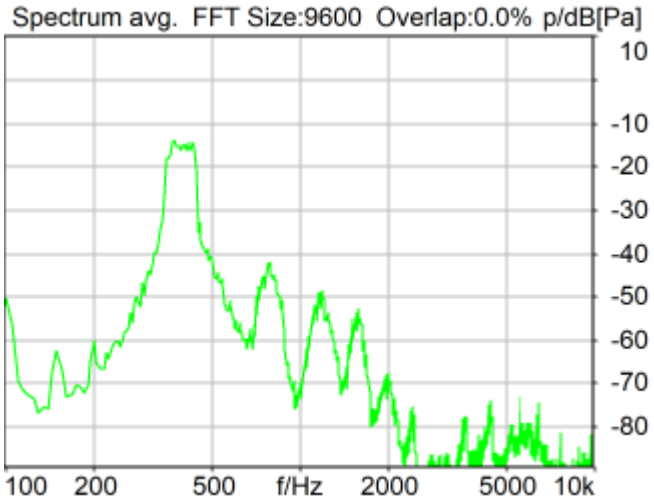
Speech Level RCV: 87.49 dB[SPL], Act.: 81.21% Ok

Ok

24/06/18 8:22 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 400 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 2N



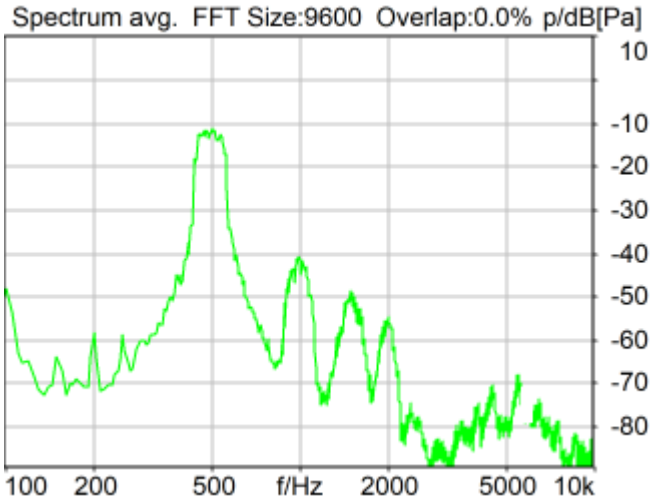
Distortion (Noise) RCV (packed): 25.86 dB (5.09%) Ok

Ok

24/06/18 8:23 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 500 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 2N



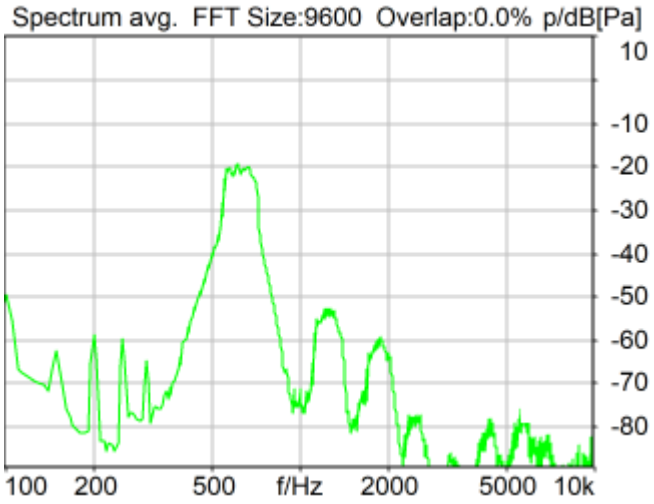
Distortion (Noise) RCV (packed): 26.87 dB (4.53%) Ok

Ok

24/06/18 8:23 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 630 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 2N



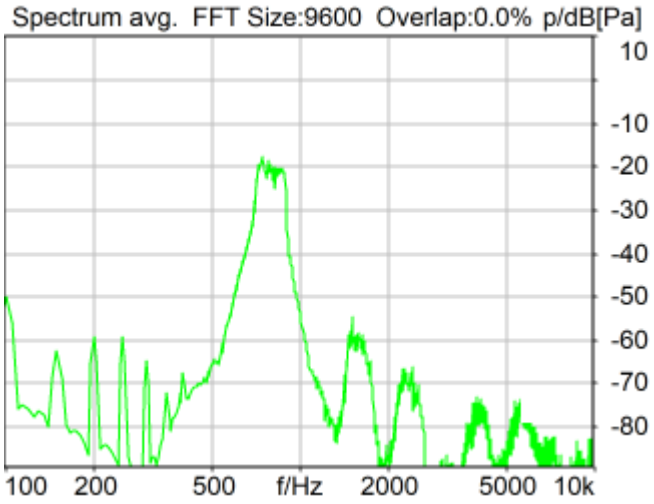
Distortion (Noise) RCV (packed): 24.26 dB (6.12%) Ok

Ok

24/06/18 8:24 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 800 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 2N



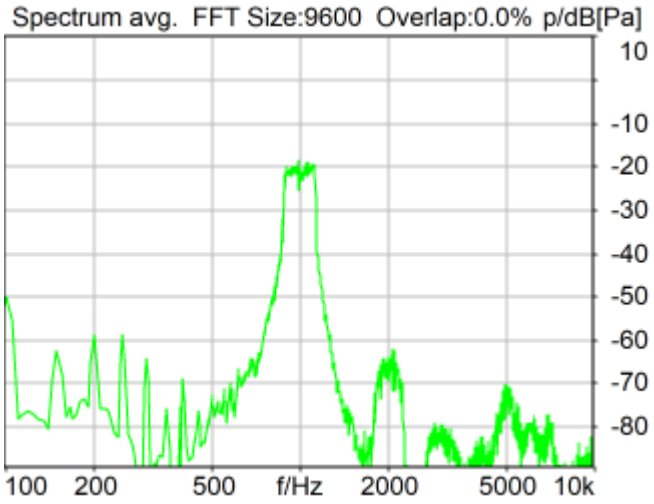
Distortion (Noise) RCV (packed): 25.12 dB (5.54%) Ok

Ok

24/06/18 8:24 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1000 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 2N



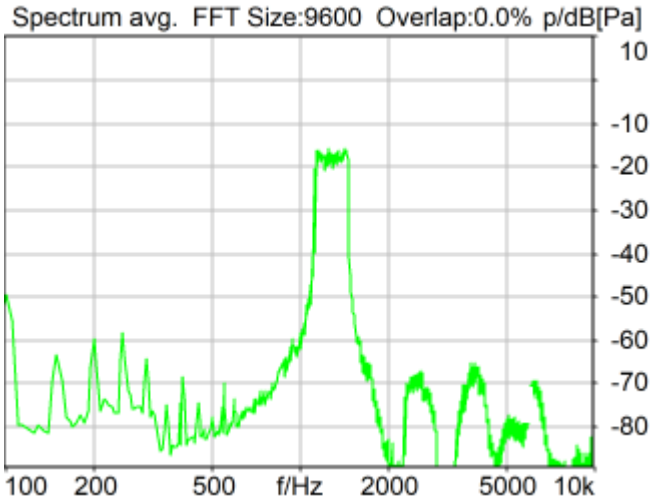
Distortion (Noise) RCV (packed): 29.62 dB (3.30%) Ok

Ok

24/06/18 8:25 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1250 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 2N



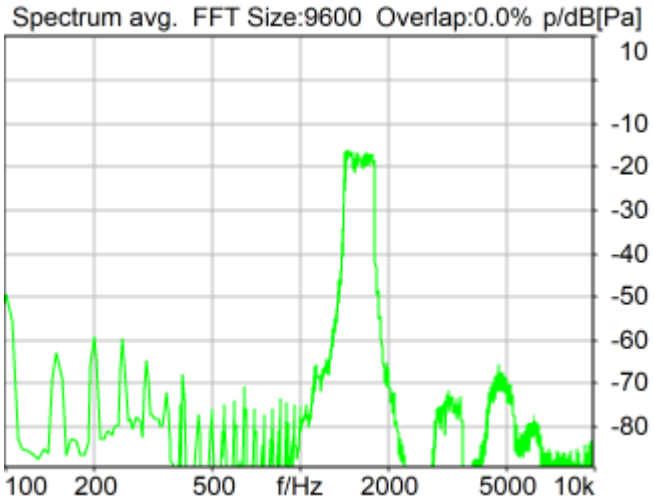
Distortion (Noise) RCV (packed): 30.36 dB (3.04%) Ok

Ok

24/06/18 8:29 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 1600 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 2N



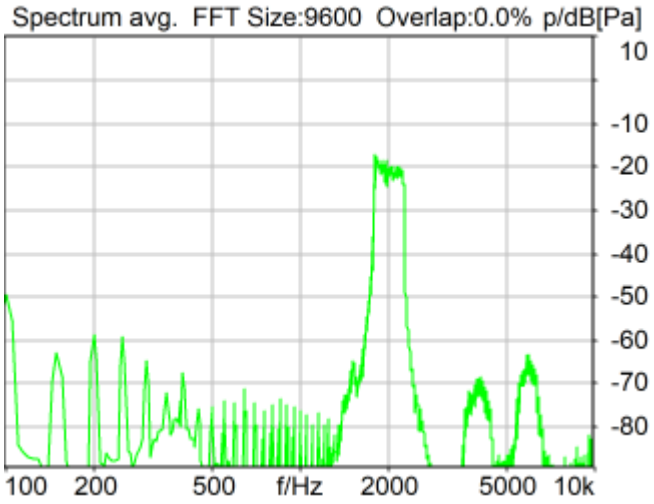
Distortion (Noise) RCV (packed): 36.04 dB (1.58%) Ok

Ok

24/06/18 8:26 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 2000 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 2N



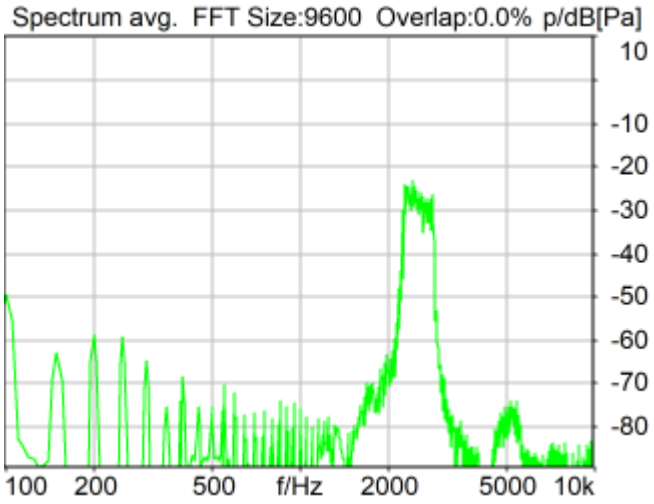
Distortion (Noise) RCV (packed): 35.01 dB (1.78%) Ok

Ok

24/06/18 8:26 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 2500 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 2N



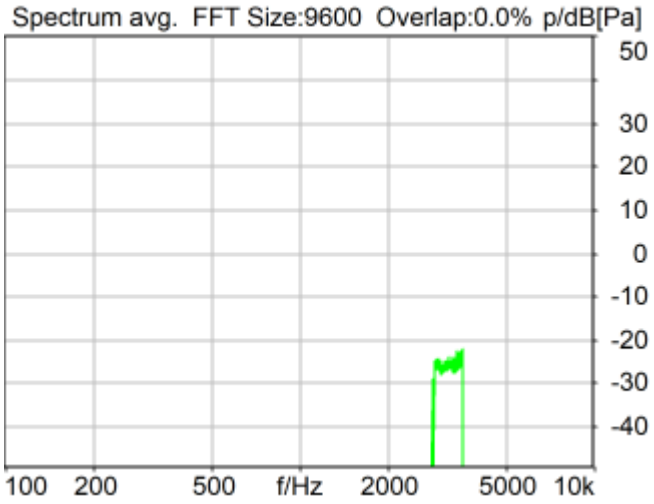
Distortion (Noise) RCV (packed): 27.75 dB (4.10%) Ok

Ok

24/06/18 8:27 ACQUA 5.1.200

5.2 RCV Distortion and Noise - 3150 Hz NB

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 2N



Distortion (Noise) RCV (packed): 38.80 dB (1.15%) Ok

Ok

24/06/18 8:27 ACQUA 5.1.200

Report - Receive Distortion and Noise (Conversational Gain)

TIA-5050 (2018-01) \ Measurements \ Narrowband \ 5.2 Receive Distortion and Noise 2N

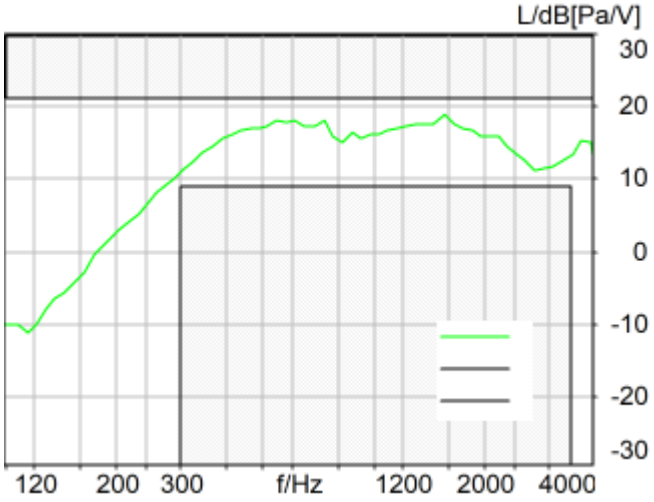
Region	Frequency	SDNR
1	400Hz	25.86 dB
2	500Hz	26.87 dB
3	630Hz	24.26 dB
4	800Hz	25.12 dB
5	1000Hz	29.62 dB
6	1600Hz	36.04 dB
7	2000Hz	35.01 dB
8	2500Hz	27.75 dB
9	3150Hz	38.80 dB
10	1250Hz	30.36 dB

All SDNRs were greater than 20.0 dB, requirement was met.
Smallest SDNR was 24.26dB at 630Hz.

24/06/18 8:29 ACQUA

5.3 Frequency Response 2N FF HANB

TIA-5050 (2018-01) \ Measurements \ Narrowband



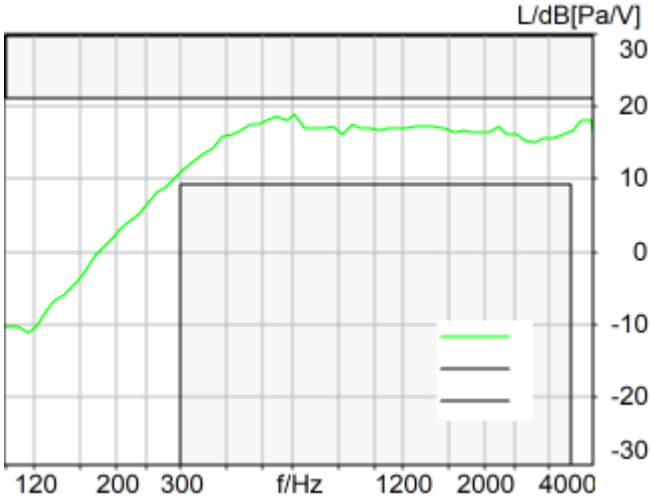
Absolute minimal distance
2.05 dB at 1547.5 Hz Ok

Ok

24/06/18 8:30 ACQUA 5.1.200

5.3 Frequency Response 2N DF HANB

TIA-5050 (2018-01) \ Measurements \ Narrowband



Absolute minimal distance
2.31 dB at 611.7 Hz Ok

Ok

24/06/18 8:30 ACQUA 5.1.200

Appendix B. Calibration Certificate

The calibration certificates are shown as follows.

上海市计量测试技术研究院

SHANGHAI INSTITUTE OF MEASUREMENT AND TESTING TECHNOLOGY

华东国家计量测试中心

NATIONAL CENTER OF MEASUREMENT AND TESTING FOR EAST CHINA

校准证书

Calibration Certificate

委托者 Customer	Sporton
联络信息 Contact information	/
器具名称 Name of Instrument	多通道声分析仪
制造厂 Manufacturer	HEAD acoustics
型号/规格 Model/Specification	labCORE
器具编号 No. of instrument	77000544
器具准确度 Instrument accuracy	/

（机构校准专用章）

批准人 Approved by	姜志华	姜志华
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未经本院/中心批准，部分采用本证书内容无效。
Partly using this certificate will not be admitted unless allowed by SIMT.

国家法定计量检定机构计量授权证书号(中心/院)：(国)法计(2022)01039号/(2022)01019号
The number of the Certificate of Metrological Authorization to The Legal Metrological Verification Institution is No.（2022）01039/ No.（2022）01019

本次校准所依据的技术规范（代号、名称）：
Reference documents for the calibration (code 、name)

JJF 1288-2011《多通道声分析仪校准规范》

本次校准所使用的主要计量标准器具：
Main measurement standards used in this calibration

名称 Name	型号规格 Model	编号 Number	测量范围 Measurement range	不确定度或准确度等级或最大允许误差 Uncertainty/Accuracy Class/Maximum Permissible Error	溯源机构名称 Name of traceability institution	证书编号/有效期限 Certificate No./Due date
正弦/噪声发生器	1054	2515963	2Hz～200kHz	幅频特性:MPE: ±0.2dB	SIMT	2023F00-10-4451793001 / 2024-03-05
数字多用表	8508A	900151275	0.01V～1000V	MPE:±0.2%	NIM	DCsy2023-01703/ 2024-06-27
频率计数器	E312A	87090459	10Hz～10MHz	MPE:±0.01%	SIMT	2022F34-10-4263795001 / 2023-11-16
多通道声分析仪	3160-A-042	3160-107018	混响时间：0.01s～30s 频率：10Hz～50kHz 声压级：1dB～140dB	混响时间：±5%，频率响应：±0.1dB	SIMT	2023D51-10-4786532001 / 2024-08-21
/	/	/	/	/	/	/

以上计量标准器具的量值溯源至国家基准/测量标准。
Quantity values of above measurement standards used in this calibration are traced to the national primary standards of P.R. China / national measurement standards.

其他校准信息：
Calibration Information

地点： 张衡路1500号机械楼203室
Location

温度： 21.5℃ 湿度： 68.5%RH 其他： 气压：101.5 kPa
Ambient temperature Humidity Others

受样日期 2023年10月27日 校准日期 2023年10月27日
Received date Date for calibration

备注： /
Note:

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校准结果/说明：
Results of calibration and additional explanation

输入通道：1

一、 频率计权和频率响应：

频率/Hz	频率计权和频率响应/dB			频率/Hz	频率计权和频率响应/dB		
	A	C	L		A	C	L
10	-70.7	/	-0.3	500	-3.2	/	0.0
12.5	-63.5	/	-0.1	630	-1.9	/	0.0
16	-56.7	/	0.0	800	-0.8	/	0.0
20	-50.5	/	0.0	1000	0.0	/	0.0
25	-44.7	/	0.0	1250	0.6	/	0.0
31.5	-39.4	/	0.0	1600	1.0	/	0.0
40	-34.6	/	0.0	2000	1.2	/	0.0
50	-30.2	/	0.0	2500	1.3	/	0.0
63	-26.2	/	0.0	3150	1.2	/	0.0
80	-22.5	/	0.0	4000	1.0	/	0.0
100	-19.1	/	0.0	5000	0.5	/	0.0
125	-16.1	/	0.0	6300	-0.1	/	0.0
160	-13.4	/	0.0	8000	-1.1	/	0.0
200	-10.9	/	0.0	10000	-2.5	/	0.0
250	-8.6	/	0.0	12500	-4.4	/	-0.1
315	-6.6	/	0.0	16000	-7.0	/	-0.4
400	-4.8	/	0.0	20000	-10.1	/	-0.8

频率计权和频率响应校准值的扩展不确定度U=0.1dB(k=2)

二、 级线性（1kHz）

起始点指示声级 90.0 dB

起始点以上间隔10dB点的最大误差 0.0 dB；

起始点以下间隔10dB点的最大误差 0.0 dB。

上限以下5dB以内的1dB点的最大误差 0.0 dB；

下限以上5dB以内的1dB点的最大误差 0.0 dB。

级线性校准值的扩展不确定度U=0.2dB(k=2)

三、 自生噪声：A 5.3 dB；C / dB；L 9.0 dB。

自生噪声的扩展不确定度U=0.2dB(k=2)

注：自生噪声非我院CNAS授权范围。

校准结果内容结束

校准证书编号：
Calibration certificate series No.
2023D51-10-4912002001

上海市计量测试技术研究院

SHANGHAI INSTITUTE OF MEASUREMENT AND TESTING TECHNOLOGY

华东国家计量测试中心

NATIONAL CENTER OF MEASUREMENT AND TESTING FOR EAST CHINA

校准证书

Calibration Certificate

委托者 Customer	Sporton
联络信息 Contact information	/
器具名称 Name of Instrument	声学用人头和躯干模拟器
制造厂 Manufacturer	Head Acoutics
型号/规格 Model/Specification	HMS II.3
器具编号 No. of instrument	12306242
器具准确度 Instrument accuracy	/

（机构校准专用章）

批准人 Approved by	姜志华	姜志华
核验员 Checked by	杨易宁	杨易宁
校准员 Calibrated by	邓峥	邓峥

发布日期 Issue date 2023 年 Year 11 月 Month 03 日 Day

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本次校准所依据的技术规范（代号、名称）：
Reference documents for the calibration (code 、name)

JJF 1520-2015《声学用头和躯干模拟器校准规范》

本次校准所使用的主要计量标准器具：
Main measurement standards used in this calibration

名称 Name	型号规格 Model	编号 Number	测量范围 Measurement range	不确定度或准确度等级或最大允许误差 Uncertainty/Accuracy Class/Maximum Permissible Error	溯源机构名称 Name of traceability institution	证书编号/有效期限 Certificate No./Due date
多通道声分析仪	3160-A-042	3160-107018	10Hz～50kHz;-10dB～160dB	MPE:±0.1dB	SIMT	2023D51-10-4786532001 / 2024-08-21
/	/	/	/	/	/	/

以上计量标准器具的量值溯源至国家基准/测量标准。
Quantity values of above measurement standards used in this calibration are traced to the national primary standards of P.R. China / national measurement standards.

其他校准信息：
Calibration Information

地点： 张衡路1500号声学楼全消声室
Location

温度： 23.3℃ 湿度： 60.3%RH 其他： 气压（kPa):101.2
Ambient temperature Humidity Others

受样日期 2023年10月27日 校准日期 2023年11月02日
Received date Date for calibration

备注： /
Note:

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校准结果/说明：
Results of calibration and additional explanation

一、耳自由场频率响应

右耳

频率/Hz	100	125	160	200	250	315
频率响应/dB	0.5	0.5	0.4	0.2	0.0	0.5

频率/Hz	400	500	630	800	1000	1250
频率响应/dB	1.5	2.8	3.6	4.9	5.2	3.6

频率/Hz	1600	2000	2500	3150	4000	5000
频率响应/dB	4.0	12.4	16.9	16.0	14.0	12.4

频率/Hz	6300	8000	10000
频率响应/dB	8.0	6.6	5.2

耳自由场频率响应校准值的扩展不确定度U=1.0 dB(k=2)

校准结果内容结束