

HAC Volume Control Test Report

FCC ID:	A3LSMS741U	Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea Certification
Model(s):	SM-S741U SM-S741U1	
Device Type:	Portable Handset	
Report Issue Date:	6/17/2026	

Provisions Tested	Volume Control
47 CFR 2.1033(d) & §20.19(b) FCC KDB 285076 D01 FCC KDB 285076 D03 FCC KDB 285076 D04 FCC KDB 285076 D05 ANSI/TIA 5050-2018	PASS

The measurement evaluation presented in this report are based on the tested device(s), which have been shown to be capable of compliance for hearing aid RF interference federal limits per 47CFR §20.19, in accordance with the measurement procedures specified in this report.

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Steve Liu
President

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1. Introduction

The FCC has a longstanding commitment to ensuring that all Americans, including individuals with disabilities, can access communications services on an equal basis. This commitment explicitly includes accessibility for individuals with hearing loss. More than 37.5 million Americans rely on equal access to communications services, as required under Section 710 of the Communications Act.

According to the FCC, the Hearing Aid Compatibility Act and other federal statutes require the Commission to ensure that wireless handsets are compatible with hearing aids and cochlear implants.

When people with hearing aids use telephones or wireless handsets that are not hearing-aid compatible, they may experience significant unwanted noise. Wireline telephones and wireless handsets certified as hearing-aid compatible under FCC requirements are designed to minimize such noise and to operate effectively with the magnetic coils (telecoils or T-coils) in hearing aids. These devices also provide volume control within prescribed amplification limits.

Hearing aids operating in acoustic coupling mode receive sound through a microphone and amplify all surrounding audio including both desired signals (e.g., handset audio) and unwanted ambient noise. To use a mobile handset with a hearing aid or cochlear implant in acoustic coupling mode, radiofrequency and other electromagnetic interference must be controlled.

The FCC employs a technical standard to determine whether a handset is hearing-aid compatible. The most recent standard is the 2019 ANSI Standard, and handsets meeting this standard are labeled as “hearing aid compatible.” Wireless communications devices are tested for compatibility during standard call conditions, in accordance with FCC HAC requirements.

This report provides the test results of **Volume Control Testing** performed to determine compliance with the **ANSI/TIA-5050-2018** and **ANSI C63.19-2019** standards. The purpose of this testing is to verify the device’s **volume control performance**, **frequency response**, and **distortion and noise** in both narrowband and wideband modes under various mounting force conditions.

The scope of this test includes the assessment of the following key parameters, as required by the ANSI C63.19-2019 standard:

- Volume Control, receive volume control performance
- Volume Control, receive distortion and noise performance
- Volume Control, receive acoustic frequency response performance

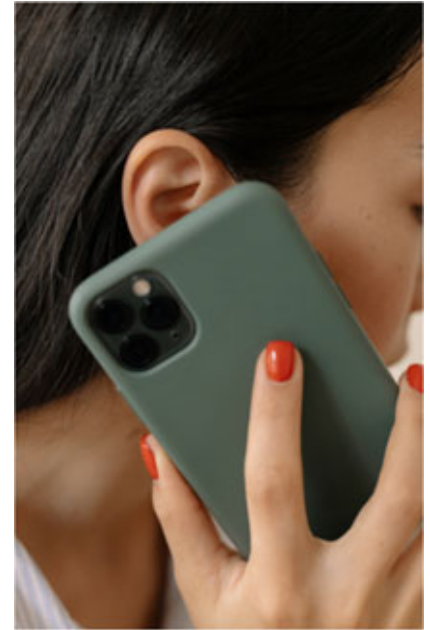


Figure 1.1 Smartphone
Held-to-Ear

2. Executive Summary

2.1. Scope

All relevant provisions and test cases from ANSI C63.19-2019 and TIA-5050 are included in the testing process, covering potential deviations in receive volume control performance (conversational gain, distortion, and frequency response) under both 2 N and 8 N mounting conditions for users with and without hearing devices.

2.2. Device Description

The equipment unit tested per ANSI C63.19-2019 Section 9.4 is as follows:

FCC ID:	A3LSMS741U
Model Number(s):	SM-S741U, SM-S741U1
Serial Number:	0762M
Product Type:	Portable Handset
Modifications:	None
Accessories or Cables:	N/A

2.3. Device Configuration

Phone Condition: Mute off; Backlight off

Radio Frequency Interference compliance was achieved with Hearing aid mode on (Phone > Call settings > Other Call Settings > Hearing aid compatibility).

Bluetooth and WIFI were disabled while testing 2G/3G/4G/5G modes.

Licensed data modes and Bluetooth were disabled while testing WIFI modes.

2.4. Air Interfaces

Table 2.1 –Air interfaces and Voice Services Capability

Air-Interface	Band (MHz)	Type Transport	Volume Control Tested	Simultaneous But Not Tested	Name of Voice Service	Audio Codec Evaluated			
						Supported Codec	Test Category		
							Conversational Gain	Distortion	Frequency Response
GSM ¹	850	VO	Yes	Yes: WiFi or BT	CMRS Voice	EFR	FR V1, FR V2, HR V1	NA	NA
	1900								
UMTS ¹	850	VD	Yes	Yes: WiFi or BT	CMRS Voice	AMR	NB AMR, WB AMR	NA	NA
	1700								
	1900								
LTE (FDD) ^{1,2}	680 (B71)	VD	Yes	Yes: NR, WiFi or BT	VoLTE	VoLTE: AMR, EVS	NB AMR, WB AMR, NB EVS, WB EVS	NB EVS 24.2KBPS, WB EVS 24.4KBPS	NB EVS 24.2KBPS, WB EVS 24.4KBPS
	700 (B12/13/14)								
	850 (B5/26)								
	1700 (B4/66)								
	1900 (B2/25)								
	2300 (B30)								
	2500 (B7)								
LTE (TDD) ^{1,2}	2600 (B38/41)	VD	Yes	Yes: NR, WiFi or BT	VoLTE	VoLTE: AMR, EVS	NB AMR, WB AMR, NB EVS, WB EVS	NB EVS 24.4KBPS, WB EVS 24.4BPS	NB EVS 24.4KBPS, WB EVS 24.4BPS
	3600 (B48)								
NR (FDD) ^{1,2}	680 (n71)	VD	Yes	Yes: LTE, WiFi or BT	VoNR	VoNR: AMR, EVS	NB AMR, WB AMR, NB EVS, WB EVS	NB EVS 24.2KBPS, WB EVS 24.4KBPS	NB EVS 24.2KBPS, WB EVS 24.4KBPS
	700 (n12/14)								
	850 (n5/26/70)								
	1700 (n66)								
	1900 (n2/25)								
	2300 (n30)								
	2500 (n7)								
NR (TDD) ^{1,2}	2600 (n38/41)	VD	Yes	Yes: LTE, WiFi or BT	VoNR	VoNR: AMR, EVS	NB AMR, WB AMR, NB EVS, WB EVS	NB EVS 24.4KBPS, WB EVS 24.4BPS	NB EVS 24.4KBPS, WB EVS 24.4BPS
	3600 (n48)								
	3800 (n77/78)								
WiFi ^{1,2,3,4}	2450	VD	Yes	Yes: GSM, UMTS, LTE, or NR	VoWiFi	VoWiFi: AMR, EVS	NB AMR, WB AMR, NB EVS, WB EVS	NB EVS 24.2KBPS, WB EVS 24.4KBPS	NB EVS 24.2KBPS, WB EVS 24.4KBPS
	5200 (U-NII 1)								
	5300 (U-NII 2A)								
	5500 (U-NII 2C)								
	5800 (U-NII 3)								
	5900 (U-NII 4)								
	6175 (U-NII 5)		No						
	6475 (U-NII 6)								
	6700 (U-NII 7)								
	7000 (U-NII 8)								
BT	2450	DT	No	Yes: GSM, UMTS, LTE, or NR	N/A	N/A			
Type Transport VO = Voice Only DT = Digital Data - Not intended for Voice Services VD = CMRS and/or IP Voice over Data Transport			Notes: 1. According to FCC guidance, waiver DA 23-914 and the extension of the waiver DA 25-759, all CMRS codecs supported by the model are tested for Conversational Gain. 2. According to FCC guidance and waiver DA 23-914 and the extension of the waiver DA 25-759, manufacturer has chosen NB EVS 24.4KBPS and WB EVS 24.4KBPS audio codecs and bitrate supported on this device for Frequency Response and Distortion evaluation. 3. WiFi U-NII band 5 was evaluated for operations which are entirely below 6 GHz. Operations partially or entirely above 6 GHz were not evaluated due to equipment limitations and being outside of the current scope of ANSI C63.19 and FCC HAC regulations. 4. WiFi U-NII bands 6 through 8 were not evaluated due to equipment limitations and being outside the scope of ANSI C63.19 and FCC HAC regulations.						

2.5. Location of Test Site

RF Safety Laboratory, LLC
5520 Research Park Drive, Suite 140
Catonsville, Maryland 21228 USA

2.6. Ambient Conditions / Test Environment

Per ANSI C63.19-2019, tests are performed at the manufacturer recommended normal operating temperature and humidity, and if important barometric pressure.

The basic ambient conditions specified in ANSI C63.19-2019 Section 8.2 are as follows:

Table 2.2 - Normal Operating Test Environment per ANSI C63.19

Ambient Temperature:	23 °C ± 5°C
Relative Humidity (RH):	0% < RH < 80%
Baseband magnetic ambient noise:	> 10 dB below the measurement level, where applicable

2.7. LTE Band Selection

This device supports LTE functionality across overlapping frequency ranges. When an LTE band's frequency range is fully contained within that of another LTE band with a broader range, and both bands have the same or higher target power (with the broader band having the greater power), and share identical transmission paths and signal characteristics, hearing-aid compatibility is evaluated only for the LTE band with the larger frequency range. In cases where overlapping LTE bands serve as anchor bands for dual connectivity (EN-DC) scenarios with NR, each LTE band is assessed independently.

2.8. NR Band Selection

This device also supports NR functionality with overlapping frequency ranges. If an NR band's frequency range is completely within another NR band with a larger range, and both bands have the same target power or the larger band has a higher power, sharing the same transmission path and signal characteristics, hearing-aid compatibility is evaluated solely for the NR band with the larger frequency range.

3. Volume Control Measurement System Information

3.1. Head and Torso Simulator



Figure 3.1
Head and Torso Simulator

Manufacturer	HEADacoustics
HATS Model	HMS II.3-LN
Construction	HEAD measurement system with impedance simulator
Frequency Range	3 Hz – 20000 Hz
Dynamic Range lower Limit	16 dB SPL(A)
Dynamic Range Upper Limit	148 dB SPL
Microphone Sensitivity	50 mV / Pa
Frequency response	According to ITU-T P.58 Polarization
Polarization Voltage	200 V
Supply voltage	±60 V (recommended) +120 V (possible)
Directivity characteristics	According to ITU-T P.58
Overall dimensions (W X H XD)	450 mm x 400 mm x 180 mm
Weight	approx. 5.4 kg

3.2. System Verification

Prior to any volume control test, the measurement system including the HATS, audio interface and acquisition system was validated as an entire system to ensure the reliability of test measurements.

All measurements were taken inside of a “quiet room”. 1kHz tone was applied into the HATS ear (microphone) using a sound calibrator. The sound calibrator generates an expected sound level of 94.0 dB at the HATS ear which was used to verify the measured signal from the HATS. This measured value was verified to be within ± 0.2 dB of the 94.0 dB expected value.

Additionally, according to ANSI/TIA-5050-2018 §3.1, Ambient noise was monitored inside the “quiet room” using a Real-Time analyzer between 20Hz to 20,000Hz with 1/12 octave filtering. “A-weighting” was applied to the measurements per the definition of a “quiet room” in ANSI/TIA-5050-2018.

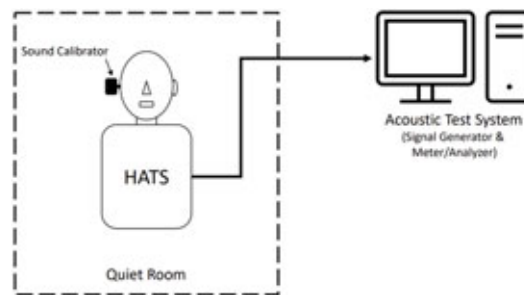


Figure 3.2
Verification setup with Sound Calibrator

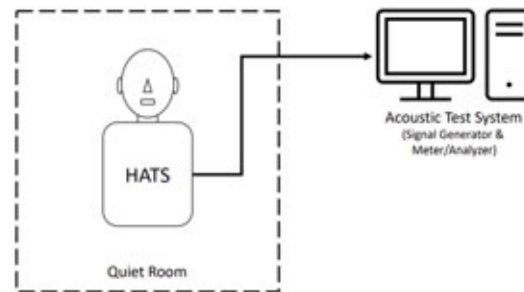


Figure 3.3
Verification set up for Ambient Noise

Table 3.1
System Verification Results

Date of Testing	Test Location	HATS Type	HATS SN	Audio Interface	Audio Interface SN	Acoustical Calibrator	Acoustical Calibrator SN	HATS Sensitivity [dB]	HATS Sensitivity Margin [dB]	Ambient Noise (dBA)
06/01/2026	ALPHA	HMS II.3 LN	17031015	LABCORE	77000631	Norsonic	125627058	93.90	-0.10	32.06
06/08/2026	ALPHA	HMS II.3 LN	17031015	LABCORE	77000631.00	Norsonic	125627058	93.90	-0.10	32.12

3.3. Volume Control Test Procedure

1. Test Setup:

- The DUT was mounted on the Head and Torso Simulator (HATS). The earphone was positioned to simulate real-world use for hearing aid users.

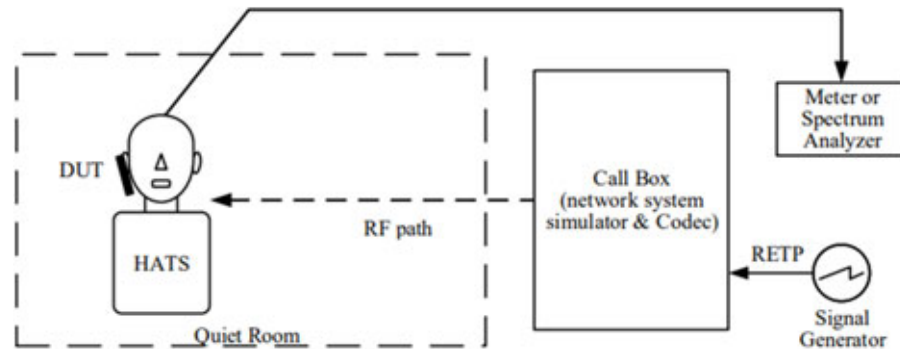


Figure 3.4
Volume Control Test Setup

2. Ambient Noise Check:

- The ambient noise levels were measured and ensured to meet the quiet room criteria specified in ANSI/TIA-5050-2018.

3. Conversational Gain Measurement:

- The DUT was set to specified volume settings in the report which complies to the current TIA-5050 standard.
- The test signal specified for use in this document is the uncompressed real male speech as published with IEEE Std 269. The test signal Active Speech Level (ASL) for wireless (mobile) device testing was set to -20 dBm0.
- The conversational gain was measured for both 2N and 8N mounting forces, simulating different pressure levels.

4. Distortion and Noise Testing:

- A pulsed noise signal was used to test distortion and noise.
- The PN-SDNR was measured and compared against the minimum requirement of 20 dB.

5. Frequency Response Testing:

- The frequency response was measured for narrowband (400 Hz to 3.15 kHz) and wideband (250 Hz to 5 kHz) modes.
- Measurements were analyzed using a real-time analyzer to confirm compliance with the limits.

4. ANSI/IEEE C63.19-2019 Performance Requirements

The testing was performed according to the following standards:

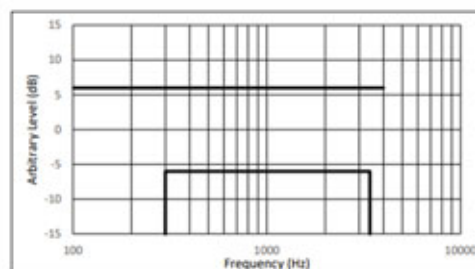
- **ANSI/TIA-5050-2018:** Volume Control Performance Requirements for Hearing Aid Compatible Devices.
- **ANSI C63.19-2019:** American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

Performance Requirements:

- **Conversational Gain:** Conversational Gain = (Measured dB SPL Level – 70 dB SPL) dB
 - **2N Mounting Force:** Minimum of **6 dB** required
 - 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 with the output distortion
 - **8N Mounting Force:** Minimum of **18 dB** required
 - With a mounting force of 8N, the DUT shall have at least one volume control setting that will produce a conversational gain of ≥ 18 dB with the output distortion
- **Distortion and Noise:** The **Pulsed Noise Signal-to-Distortion Ratio (PN-SDNR)** must be at least **20 dB**.
 - 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
- **Frequency Response:**
 - **Narrowband** and **wideband** limits based on ANSI/TIA-5050-2018 frequency response criteria.

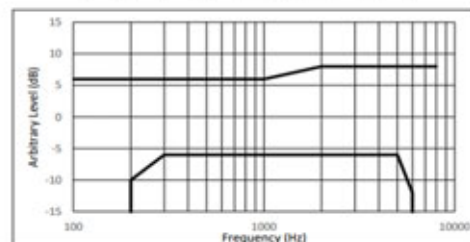
Narrowband Receive Frequency Response Limits

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



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
6000	-12	8000	+8



5. Volume Control Waiver

5.1 Interim Waiver DA 23-914

1. Scope: Under the waiver, volume-control compliance is required only for narrowband (NB) and wideband (WB) voice codecs within the scope of TIA-5050
2. 2N mounting force, Conversational Gain: The handset must pass the conversational-gain requirement (≥ 6 dB) on all available NB and WB codecs and air-interface combinations (covering the voice services, bands, and air interfaces the model operates on).
3. 8N mounting force, Conversational Gain: You must perform the 8N conversational-gain test on all available NB/WB codec + air-interface combinations using the same test parameters as 2N. The 18 dB minimum is waived; there is no pass/fail threshold at 8N under the waiver.
4. Distortion/Noise (PN-SDNR) & Acoustic Frequency Response: These must pass at ≥ 1 NB and ≥ 1 WB codec of the manufacturer's choosing. Limit testing to one bit-rate and only those air interfaces associated with the chosen codecs. Other NB/WB codecs do not need distortion/noise or frequency-response testing.
5. Under the waiver, the manufacturer has chosen NB-EVS 24.4kbps and WB-EVS 24.4kbps audio codec bitrates for full evaluation.

5.2 Extension of the Waiver

1. DA-25-759A (Aug. 26, 2025) extends the temporary HAC volume-control testing regime first adopted in DA-23-914 (Sept. 29, 2023): new wireless handsets shall be certified as Hearing Aid compatible using the same interim conditions while standards bodies finish a permanent method; the extension runs through Sept. 29, 2027, and will terminate sooner if the Commission adopts a new volume control standard, and it adds periodic progress reporting from CTIA/TIA on that standards work.

6. Test Results

Table - 6.1 Test Summary

	Conversational Gain (CG) (dB)		Distortion Margin (dB)	FR Margin (dB)	ANSI C63.19 Verdict
	2N	8N			
GSM	17	22	-	-	Compliant
UMTS	15	18	-	-	Compliant
LTE	15	19	7.83	2.20	Compliant
NR	15	20	7.98	2.08	Compliant
WLAN	15	19	7.11	2.06	Compliant

7. GSM Mode

GSM Mode was tested to ensure that the supported bands do not substantially affect the measurement results. Acoustic performance was found to be independent of the radio configuration. Observed differences were driven by the audio codec. All codecs do pass the current Volume Control requirement for conversational gain. See below table for comparisons between different bands and codecs.

Table 7.1
GSM Voice Codec Evaluation

Test Condition								
Mode: GSM	Test Date: 6/1/2026	HAC MODE: ON	DUT Position:			Test Result:		
	Ambient Noise (dBA): 32.06	Volume Level: MAX -1	A: 0°	B: 5°	C: 0°	PASS		
RF Configuration						Conversational Gain		
Band	Channel	Antenna Configuration	Mounting Force (N)	Codec, Bitrate	Codec Bandwidth	Measured dB SPL Result (dB)	FCC CG Limit (dB)*	Measured CG (dB)
GSM850	190	A	2	FR V1	NB	87.08	6	17
			8	FR V1	NB	91.90	6	22
			2	FR V2	NB	87.24	6	17
			8	FR V2	NB	92.15	6	22
			2	HR V1	NB	87.24	6	17
			8	HR V1	NB	91.78	6	22

* Per FCC waiver DA 23-914, the 8N minimum Conversational Gain requirement is 6 dB. The 18 dB minimum per TIA-5050 is not required per the waiver.

Table 7.2
GSM Band Investigation

Test Condition								
Mode: GSM	Test Date: 6/1/2026	HAC MODE: ON	DUT Position:			Test Result:		
	Ambient Noise (dBA): 32.06	Volume Level: MAX -1	A: 0°	B: 5°	C: 0°	PASS		
RF Configuration						Conversational Gain		
Band	Channel	Antenna Configuration	Mounting Force (N)	Codec, Bitrate	Codec Bandwidth	Measured dB SPL Result (dB)	FCC CG Limit (dB)	Measured CG (dB)
GSM850	190	A	2	FR V1	NB	86.99	6	17
		E	2	FR V1	NB	87.08	6	17
GSM1900	661	A	2	FR V1	NB	86.95	6	17

8. UMTS Mode

UMTS Mode was tested to ensure that the supported bands do not substantially affect the measurement results. Acoustic performance was found to be independent of the radio configuration. Observed differences were driven by the audio codec. All codecs do pass the current Volume Control requirement for conversational gain. See below table for comparisons between different bands and codecs.

Table 8.1
UMTS Voice Codec Evaluation

Test Condition							
Mode: UMTS	Test Date: 6/2/2026	HAC MODE: ON	DUT Position:			Test Result:	
	Ambient Noise (dBA): 32.06	Volume Level: MAX -1	A: 0°	B: 5°	C: 0°	PASS	
RF Configuration					Conversational Gain		
Band	Channel	Antenna Configuration	Force (N)	Codec, Bitrate	Measured dBSPL Result (dB)	FCC CG Limit (dB)*	Measured CG (dB)
UMTS Band 5	4183	A	2	AMR NB 4.75kbps	86.33	6	16
			8	AMR NB 4.75kbps	90.91	6	21
			2	AMR NB 12.20kbps	87.11	6	17
			8	AMR NB 12.20kbps	91.81	6	22
			2	AMR WB 6.60kbps	84.87	6	15
			8	AMR WB 6.60kbps	87.70	6	18
			2	AMR WB 23.85kbps	85.51	6	16
			8	AMR WB 23.85kbps	87.99	6	18

* Per FCC waiver DA 23-914, the 8N minimum Conversational Gain requirement is 6 dB. The 18 dB minimum per TIA-5050 is not required per the waiver.

Table 8.2
UMTS Band Investigation

Test Condition							
Mode: UMTS	Test Date: 6/2/2026	HAC MODE: ON	DUT Position:			Test Result:	
	Ambient Noise (dBA): 32.06	Volume Level: MAX -1	A: 0°	B: 5°	C: 0°	PASS	
RF Configuration					Conversational Gain		
Band	Channel	Antenna Configuration	Mounting Force (N)	Codec, Bitrate	Measured dB SPL Result (dB)	FCC CG Limit (dB)	Measured CG (dB)
UMTS Band 5	4183	A	2	AMR WB 6.60KBPS	84.79	6	15
	4183	E			84.92	6	15
UMTS Band 4	1412	A			84.99	6	15
UMTS Band 2	9400	A			84.95	6	15

9. LTE Mode

LTE Mode was tested to ensure that the supported radio configuration and bands do not substantially affect the measurement results. Acoustic performance was found to be independent of the radio configuration. Observed differences were driven by the audio codec. All conversational gain results from LTE codecs are compliant. NB EVS 24.4kbps and WB EVS 24.4kbps codecs are fully compliant to the distortion and frequency response portion of the requirement. See below table for comparisons between different bands, radio configurations and codecs.

Table 9.1
LTE Voice Codec Evaluation

Test Condition														
Mode: LTE		Test Date: 6/8/2026			HAC MODE: ON			DUT Position:			Test Result:			
		Ambient Noise (dBA): 32.12			Volume Level: MAX -1			A: 0°	B: 5°	C: 0°	PASS			
RF Configuration					Conversational Gain			Distortion			Frequency Response			
Mode / Band	BW (MHz)	Radio Configuration (Modulation/RB/RB offset)	Channel	Force (N)	Codec, Bitrate	Measured dB SPL Result (dB)	FCC CG Limit (dB)*	Measured CG (dB)	Result (dB)	FCC Limit (dB)	Margin (dB)	FR DRP Translation	Margin (dB)	Mask Verdict
LTE B25	20	QPSK/1RB/0RB offset	26365	2	AMR NB 4.75kbps	85.66	6	16	-	-	-	-	-	-
				8	AMR NB 4.75kbps	90.56	6	21	-	-	-	-	-	
				2	AMR NB 12.2kbps	86.51	6	17	-	-	-	-	-	
				8	AMR NB 12.2kbps	91.35	6	21	-	-	-	-	-	
				2	AMR WB 6.60kbps	84.85	6	15	-	-	-	-	-	
				8	AMR WB 6.60kbps	89.53	6	20	-	-	-	-	-	
				2	AMR WB 23.85kbps	85.30	6	15	-	-	-	-	-	
				8	AMR WB 23.85kbps	89.99	6	20	-	-	-	-	-	
				2	EVS NB 5.90kbps	85.87	6	16	-	-	-	-	-	
				8	EVS NB 5.90kbps	90.57	6	21	-	-	-	-	-	
				2	EVS NB 13.20kbps	86.18	6	16	-	-	-	-	-	
				8	EVS NB 13.20kbps	90.89	6	21	-	-	-	-	-	
				2	EVS NB 24.40kbps	86.93	6	17	32.18	20	12.18	DF	2.53	PASS
				8	EVS NB 24.40kbps	91.84	6	22	32.84	20	12.84	DF	2.20	PASS
				2	EVS WB 5.90kbps	84.76	6	15	-	-	-	-	-	
				8	EVS WB 5.90kbps	89.17	6	19	-	-	-	-	-	
				2	EVS WB 24.4kbps	85.13	6	15	27.83	20	7.83	DF	2.82	PASS
				8	EVS WB 24.4kbps	90.07	6	20	27.92	20	7.92	DF	2.68	PASS
				2	EVS WB 128kbps	85.54	6	16	-	-	-	-	-	
				8	EVS WB 128kbps	90.37	6	20	-	-	-	-	-	

Table 9.3
LTE Band Investigation

Test Condition									
Mode: LTE	Test Date: 6/9/2026		HAC MODE: ON		DUT Position:			Test Result:	
	Ambient Noise (dBA): 32.12		Volume Level: MAX -1		A: 0°	B: 5°	C: 0°	PASS	
RF Configuration							Conversational Gain		
Band	Radio Configuration (Modulation/RB/RB offset)	Antenna Configuration	RF Bandwidth (MHz)	Channel	Mounting Force (N)	Codec, Bitrate	Measured dB SPL Result (dB)	FCC CG Limit (dB)	Measured CG (dB)
LTE Band 71	QPSK/1RB/0RB offset	A	20	133297	2	EVS NB 24.40kbps	86.76	6	17
		E					86.80	6	17
LTE Band 12		A	10	23095			86.65	6	17
		E					86.64	6	17
LTE Band 13		A	10	23230			86.55	6	17
		E					86.63	6	17
LTE Band 14		A	10	23330			86.62	6	17
		E					86.43	6	16
LTE Band 26		A	15	26865			86.49	6	16
		E					86.52	6	17
LTE Band 66		A	20	132322			86.60	6	17
		F					86.66	6	17
LTE Band 25		A	20	26365			86.68	6	17
		F					86.69	6	17
LTE Band 30		A	10	27710			86.71	6	17
		F					86.64	6	17
LTE Band 7		B	20	21100			86.52	6	17
		F					86.61	6	17
LTE Band 41 (PC3)		B	20	40620			86.63	6	17
		F					86.64	6	17
LTE Band 48		F	20	55990			86.69	6	17

10. NR Mode

NR Mode was tested to ensure that the supported radio configuration and bands do not substantially affect the measurement results. Acoustic performance was found to be independent of the radio configuration. Observed differences were driven by the audio codec. All conversational gain results from NR codecs are compliant. NB EVS 24.4kbps and WB EVS 24.4kbps codecs are fully compliant to the distortion and frequency response portion of the requirement. See below table for comparisons between different bands, radio configurations and codecs.

Table 10.1
NR Voice Codec Evaluation

Test Condition - Variant 1														
Mode: NR			Test Date: 6/9/2026			HAC MODE: ON			DUT Position:			Test Result:		
DFT-s-OFDM			Ambient Noise (dBA): 32.12			Volume Level: MAX -1			A: 0°	B: 5°	C: 0°	PASS		
RF Configuration					Conversational Gain				Distortion			Frequency Response		
Mode / Band	BW (MHz)	Radio Configuration (Modulation/RB/RB offset)	Channel	Force (N)	Codec, Bitrate	Measured dB SPL Result	FCC CG Limit (dB)*	Measured CG (dB)	Result (dB)	FCC Limit (dB)	Margin (dB)	FR DRP Translation	Margin (dB)	Mask Verdict
NR n25	40	QPSK/1RB/ORB offset	376500	2	AMR NB 4.75kbps	86.78	6	17	-	-	-	-	-	-
				8	AMR NB 4.75kbps	91.45	6	21	-	-	-	-	-	-
				2	AMR NB 12.20kbps	87.51	6	18	-	-	-	-	-	-
				8	AMR NB 12.20kbps	92.12	6	22	-	-	-	-	-	-
				2	AMR WB 6.60kbps	85.67	6	16	-	-	-	-	-	-
				8	AMR WB 6.60kbps	90.39	6	20	-	-	-	-	-	-
				2	AMR WB 23.85kbps	85.95	6	16	-	-	-	-	-	-
				8	AMR WB 23.85kbps	90.78	6	21	-	-	-	-	-	-
				2	EVS NB 5.90KBPS	86.66	6	17	-	-	-	-	-	-
				8	EVS NB 5.90KBPS	91.51	6	22	-	-	-	-	-	-
				2	EVS NB 13.20KBPS	87.03	6	17	-	-	-	-	-	-
				8	EVS NB 13.20KBPS	91.71	6	22	-	-	-	-	-	-
				2	EVS NB 24.40KBPS	85.93	6	16	32.68	20	12.68	DF	2.42	PASS
				8	EVS NB 24.40KBPS	90.53	6	21	32.34	20	12.34	DF	2.56	PASS
				2	EVS WB 5.90KBPS	85.07	6	15	-	-	-	-	-	-
				8	EVS WB 5.90KBPS	89.87	6	20	-	-	-	-	-	-
				2	EVS WB 24.4KBPS	85.01	6	15	31.17	20	11.17	DF	2.87	PASS
				8	EVS WB 24.4KBPS	89.51	6	20	30.11	20	10.11	DF	2.44	PASS
				2	EVS WB 128KBPS	86.27	6	16	-	-	-	-	-	-
				8	EVS WB 128KBPS	91.07	6	21	-	-	-	-	-	-

* Per FCC waiver DA 23-914, the 8N minimum Conversational Gain requirement is 6 dB. The 18 dB minimum per TIA-5050 is not required per the waiver.

Table 10.2
NR Radio Configuration (CP-OFDM) Investigation

Test Condition														
Mode: NR			Test Date: 6/11/2026			HAC MODE: ON			DUT Position:			Test Result:		
Waveform: CP-OFDM			Ambient Noise (dBA): 32.12			Volume Level: MAX -1			A: 0°	B: 5°	C: 0°	PASS		
RF Configuration						Conversational Gain			Distortion			Frequency Response		
Mode / Band	BW (MHz)	Radio Configuration (Modulation/RB/RB offset)	Channel	Codec, Bitrate	Force (N)	Measured dBSP L	FCC CG Limit (dB)	Measured CG (dB)	Result (dB)	FCC Limit (dB)	Margin (dB)	FR DRP Translation	Margin (dB)	Mask Verdict
NR n25	40	QPSK/1RB/1RB offset	376500	EVS WB 24.4KBPS	2	84.80	6	15	29.05	20	9.05	DF	2.37	PASS
		16QAM/1RB/1RB offset				84.68	6	15	28.12	20	8.12	DF	2.36	PASS
		64QAM/1RB/1RB offset				85.49	6	15	27.98	20	7.98	DF	2.08	PASS
		256QAM/1RB/1RB offset				85.13	6	15	32.00	20	12.00	DF	2.55	PASS
		QPSK/1RB/108RB offset				84.74	6	15	28.02	20	8.02	DF	2.58	PASS
		QPSK/1RB/214RB offset				85.15	6	15	32.29	20	12.29	DF	2.49	PASS
		QPSK/108RB/0RB offset				85.15	6	15	32.11	20	12.11	DF	2.50	PASS
		QPSK/108RB/54RB offset				85.01	6	15	32.40	20	12.40	DF	2.28	PASS
		QPSK/108RB/108RB offset				85.00	6	15	32.77	20	12.77	DF	2.47	PASS
		QPSK/216RB/0RB offset				84.94	6	15	32.76	20	12.76	DF	2.29	PASS



Table 10.3
NR Radio Configuration (DFT-s-OFDM) Investigation

Test Condition														
Mode: NR		Test Date: 6/11/2026			HAC MODE: ON		DUT Position:			Test Result:				
Waveform: DFT-s-OFDM		Ambient Noise (dBA): 30.63			Volume Level: MAX -1		A: 0°	B: 5°	C: 0°	PASS				
RF Configuration						Conversational Gain			Distortion			Frequency Response		
Mode / Band	Bw (MHz)	Radio Configuration (Modulation/RB/IRB offset)	Channel	Codec, Bitrate	Force (N)	Measured dBSPSL Result	FCC CG Limit (dB)	Measured CG (dB)	Result (dB)	FCC Limit (dB)	Margin (dB)	FR DRP Translation	Margin (dB)	Mask Verdict
NR n25	40	BPSK/1RB/1RB offset	376500	EVS WB 24.4KBPS	2	85.15	6	15	31.88	20	11.88	DF	2.43	PASS
		QPSK/1RB/1RB offset				85.22	6	15	32.62	20	12.62	DF	2.48	PASS
		16QAM/1RB/1RB offset				85.14	6	15	33.84	20	13.84	DF	2.59	PASS
		64QAM/1RB/1RB offset				85.45	6	15	32.80	20	12.80	DF	2.79	PASS
		256QAM/1RB/1RB offset				85.31	6	15	32.26	20	12.26	DF	2.64	PASS
		QPSK/1RB/108RB offset				85.27	6	15	32.33	20	12.33	DF	2.71	PASS
		QPSK/1RB/214RB offset				85.00	6	15	33.05	20	13.05	DF	3.08	PASS
		QPSK/108RB/0RB offset				84.99	6	15	33.19	20	13.19	DF	2.35	PASS
		QPSK/108RB/54RB offset				84.90	6	15	32.50	20	12.50	DF	2.17	PASS
		QPSK/108RB/108RB offset				85.04	6	15	32.80	20	12.80	DF	2.34	PASS
		QPSK/216RB/0RB offset				85.13	6	15	32.32	20	12.32	DF	2.49	PASS

Table 10.4
NR Band Investigation

Test Condition										
Mode: NR		Test Date: 6/9/2026		HAC MODE: ON		DUT Position:			Test Result:	
Waveform: DFT-s-OFDM		Ambient Noise (dBA): 32.12		Volume Level: MAX -1		A: 0°	B: 5°	C: 0°	PASS	
RF Configuration							Conversational Gain			
Band	Radio Configuration (Modulation/RB/RB offset)	Antenna Configuration	RF Bandwidth (MHz)	Channel	Force (N)	Codec, Bitrate	Measured dB SPL Result	FCC CG Limit (dB)	Measured CG (dB)	
NR n71	QPSK/1RB/0RB offset	A	35	136100	2	EVS NB 24.40kbps	86.62	6	17	
		E					86.13	6	16	
NR n12		A	15	141500			86.44	6	16	
		E					86.02	6	16	
NR n14		A	10	158600			86.50	6	17	
		E					86.31	6	16	
NR n26		E	20	166300			86.41	6	16	
		A					86.18	6	16	
NR n70		A	15	340500			86.70	6	17	
		F					86.34	6	16	
NR n66		A	45	349000			86.66	6	17	
		F					86.37	6	16	
NR n25		A	40	376500			86.10	6	16	
		F					85.97	6	16	
NR n30		A	10	462000			86.53	6	17	
		F					86.13	6	16	
NR n7		B	50	507000			86.23	6	16	
		F					86.66	6	17	
NR n41 (PC2)		B	100	518598			86.49	6	16	
		F					86.53	6	17	
NR n48		F	100	518598			86.28	6	16	
NR n77 DoD (PC2)		F	100	633334			86.61	6	17	
NR n77 C (PC2)		F	100	656000			86.68	6	17	

11. WIFI Mode

WIFI Mode was tested to ensure that the supported antenna configuration, IEEE standards, and data rates do not substantially affect the measurement results. Acoustic performance was found to be independent of the radio configuration. Observed differences were driven by the audio codec. All conversational gain results from WIFI codecs are compliant. NB EVS 24.4kbps and WB EVS 24.4kbps codecs are fully compliant to the distortion and frequency response portion of the requirement. See below table for comparisons between different antenna configurations, IEEE standards, data rates and codecs.

Table 11.1
WIFI Voice Codec Evaluation

Test Condition														
Mode: WLAN			Test Date: 6/13/2026			HAC MODE: ON			DUT Position:			Test Result:		
			Ambient Noise (dBA): 32.12			Volume Level: MAX -1			A: 0°	B: 5°	C: 0°	PASS		
RF Configuration						Conversational Gain			Distortion			Frequency Response		
Band / Standard	Bandwidth	Channel	Data Rate	Force (N)	Codec, Bitrate	Measured dB SPL Result	FCC CG Limit (dB)*	Measured CG (dB)	Result (dB)	FCC Limit (dB)	Margin (dB)	FR DRP Translation	Margin (dB)	Mask Verdict
2.4GHz IEEE 802.11b	20	6	11MBPS	2	AMR NB 4.75kbps	86.16	6	16	-	-	-	-	-	-
				8	AMR NB 4.75kbps	91.05	6	21	-	-	-	-	-	-
				2	AMR NB 12.20kbps	86.96	6	17	-	-	-	-	-	-
				8	AMR NB 12.20kbps	91.82	6	22	-	-	-	-	-	-
				2	AMR WB 6.60kbps	85.08	6	15	-	-	-	-	-	-
				8	AMR WB 6.60kbps	89.95	6	20	-	-	-	-	-	-
				2	AMR WB 23.85kbps	85.51	6	16	-	-	-	-	-	-
				8	AMR WB 23.85kbps	90.36	6	20	-	-	-	-	-	-
				2	EVS NB 5.90kbps	86.05	6	16	-	-	-	-	-	-
				8	EVS NB 5.90kbps	90.96	6	21	-	-	-	-	-	-
				2	EVS NB 13.20kbps	86.49	6	16	-	-	-	-	-	-
				8	EVS NB 13.20kbps	91.28	6	21	-	-	-	-	-	-
				2	EVS NB 24.40kbp	86.80	6	17	32.38	20	12.38	DF	2.20	PASS
				8	EVS NB 24.40kbp	91.68	6	22	31.18	20	11.18	DF	2.06	PASS
				2	EVS WB 5.90kbps	84.62	6	15	-	-	-	-	-	-
				8	EVS WB 5.90kbps	89.43	6	19	-	-	-	-	-	-
				2	EVS WB 24.4KBPS	85.18	6	15	27.70	20	7.70	DF	2.76	PASS
				8	EVS WB 24.4KBPS	90.13	6	20	31.29	20	11.29	DF	2.71	PASS
				2	EVS WB 128KBPS	85.87	6	16	-	-	-	-	-	-
				8	EVS WB 128KBPS	90.70	6	21	-	-	-	-	-	-

* Per FCC waiver DA 23-914, the 8N minimum Conversational Gain requirement is 6 dB. The 18 dB minimum per TIA-5050 is not required per the waiver.

Table 11.2
WIFI Antenna Configuration Investigation

WLAN Antenna Configuration Investigation - Test Condition														
Mode: WLAN			Test Date: 6/13/2026			HAC MODE: ON			DUT Position:			Test Result:		
5GHz - IEEE 802.11ac			Ambient Noise (dBA): 30.63			Volume Level: MAX -1			A: 0°	B: 5°	C: 0°	PASS		
RF Configuration					Conversational Gain				Distortion			Frequency Response		
Standard	RF Bandwidth (MHz)	Channel	Data Rate	Codec, Bitrate	Force (N)	Measured dB SPL Result	FCC CG Limit (dB)	Measured CG (dB)	Result (dB)	FCC Limit (dB)	Margin (dB)	FR DRP Translation	Margin (dB)	Mask Verdict
Antenna 1 SISO	20	40	MCS 0	EVS NB 24.40KBPS	2	86.24	6	16	32.68	20	12.68	FF	2.37	PASS
Antenna 2 SISO	20	40	MCS 0			86.61	6	17	33.25	20	13.25	FF	2.42	PASS
WLAN MIMO	20	40	MCS 0			86.46	6	16	33.39	20	13.39	FF	2.30	PASS

Table 11.3
WIFI Data Rate Investigation

Data Rate Investigation - Test Condition														
Mode: WLAN			Test Date: 6/13/2026			HAC MODE: ON			DUT Position:			Test Result:		
2.4GHz			Ambient Noise (dBA): 32.12			Volume Level: MAX -1			A: 0°	B: 5°	C: 0°	PASS		
RF Configuration						Conversational Gain			Distortion			Frequency Response		
Standard	RF Bandwidth (MHz)	Channel	Data Rate	Codec, Bitrate	Force (N)	Measured dB SPL Result	FCC CG Limit (dB)	Measured CG (dB)	Result (dB)	FCC Limit (dB)	Margin (dB)	FR DRP Translation	Margin (dB)	Mask Verdict
IEEE 802.11b	20	6	1	EVS NB 24.40KBPS	2	86.66	6	17	32.81	20	12.81	FF	2.39	PASS
	20	6	2			86.49	6	16	33.06	20	13.06	FF	2.40	PASS
	20	6	5.5			86.70	6	17	32.90	20	12.90	FF	2.35	PASS
	20	6	11			86.66	6	17	33.22	20	13.22	FF	2.28	PASS



Table 11.4
2.4GHz WIFI standard Investigation

Test Condition															
Mode: WLAN			Test Date: 6/13/2026				HAC MODE: ON		DUT Position:			Test Result:			
2.4GHz			Ambient Noise (dBA): 32.12				Volume Level: MAX -1		A: 0°	B: 5°	C: 0°	PASS			
RF Configuration							Conversational Gain			Distortion			Frequency Response		
Standard	RF Bandwidth (MHz)	U-NilBand	Channel	Data Rate	Codec, Bitrate	Force (N)	Measured dB SPL Result	FCC CG Limit (dB)	Measured CG (dB)	Result (dB)	FCC Limit (dB)	Margin (dB)	FR DRP Translation	Margin (dB)	Mask Verdict
IEEE 802.11b	20	N/A	6	1	EVS WB 24.4KBPS	2	85.25	6	15	27.56	20	7.56	DF	2.92	PASS
IEEE 802.11g	20	N/A	6	6			85.23	6	15	27.91	20	7.91	DF	2.42	PASS
IEEE 802.11n	20	N/A	6	MCS 0			85.04	6	15	27.36	20	7.36	DF	2.51	PASS
IEEE 802.11ac	20	N/A	6	MCS 0			85.11	6	15	27.17	20	7.17	DF	2.58	PASS
IEEE 802.11ax (SU)	20	N/A	6	MCS 0			85.15	6	15	29.67	20	9.67	DF	2.69	PASS
IEEE 802.11ax (RU)	20	N/A	6	MCS 0			85.38	6	15	27.61	20	7.61	DF	2.64	PASS

Table 11.5
5GHz WIFI standard Investigation

Test Condition															
Mode: WiLAN				Test Date: 6/13/2026				HAC MODE: ON		DUT Position:			Test Result:		
5GHz				Ambient Noise (dBA): 30.63				Volume Level: MAX -1		A: 0°	B: 5°	C: 0°	PASS		
RF Configuration							Conversational Gain			Distortion			Frequency Response		
Standard	RF Bandwidth (MHz)	U-NilBand	Channel	Data Rate	Codec, Bitrate	Force (N)	Measured dBSP/L	FCC CG Limit (dB)	Measured CG (dB)	Result (dB)	FCC Limit (dB)	Margin (dB)	FR DRP Translation	Margin (dB)	Mask Verdict
IEEE 802.11a	20	1	40	6	EVS WB 24.4KBPS	2	84.95	6	15	27.51	20	7.51	DF	2.94	PASS
IEEE 802.11n	20	1	40	MCS 0			85.01	6	15	27.11	20	7.11	DF	2.75	PASS
IEEE 802.11ac	20	1	40	MCS 0			84.96	6	15	31.14	20	11.14	DF	3.04	PASS
IEEE 802.11ax (SU)	20	1	40	MCS 0			85.04	6	15	27.46	20	7.46	DF	2.82	PASS
IEEE 802.11ax (RU)	20	1	40	MCS 0			85.09	6	15	27.72	20	7.72	DF	3.00	PASS

12. Conclusion

This wireless device was tested for volume control performance and based on the results, the device complies with the requirements of **ANSI/TIA-5050-2018** and **ANSI C63.19-2019** for hearing aid compatibility.

Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

13. Testing Equipment List

Table 12.1
Equipment List

Manufacturer	Model	Serial #	Description	Cal Interval	Cal Due
Rohde & Schwarz	CMW 500	168212	Wideband Radio Communication Tester	Annual	9/30/2026
Rohde & Schwarz	CMX OBT	100198	Radio Communication Tester	Annual	8/28/2026
Rohde & Schwarz	CMX-ZG180A	*	USB Audio Interface	CBT*	N/A
Rohde & Schwarz	SMCV100B	103882	Vector Signal Generator	Annual	12/19/2025
HUBER & SUHNER	74Z-0-0-21	27655	Torque Wrench (100 cN·m)	Biennial	10/7/2026
Norsonic	Nor1256	125627058	Sound Calibrator Class I	Biennial	5/13/2026
HEADacoustics	HMS II.3 LN	17031015	HEAD Measurement System (HATS)	Annual	6/19/2026
HEADacoustics	LABCORE	77000631	Audio Interface	Annual	6/18/2026

*Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements



14. Measurement Uncertainty

The measurement uncertainty was calculated to account for the following factors:

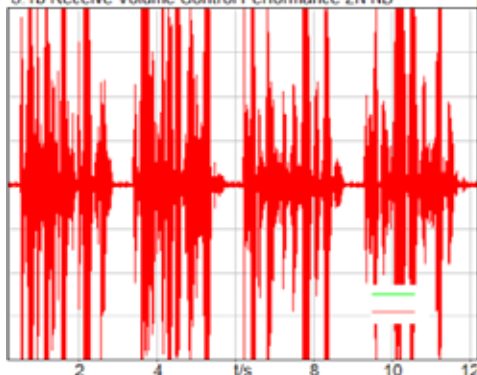
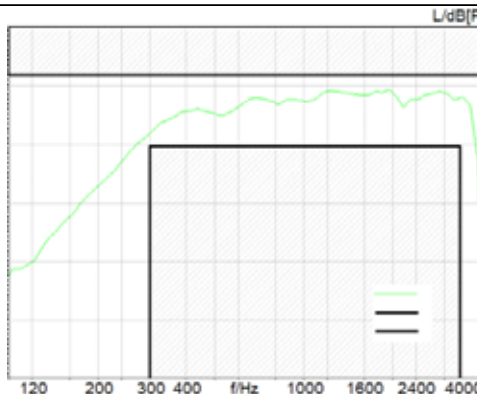
Volume Control uncertainty according ANSI C63.19-2019 / TIA-5050					
Contribution	Data (dB)	Data type	Prob. dist.	Divisor	Uncertainty dB
Accuracy of the HMS II.3	0.50	Spec	R	$\sqrt{3}$	0.29
Uncertainty of HMS II.3	0.19	Std. Dev.	N	1	0.19
Resolution of HMS II.3 w/labCORE/ACQUA system	0.01	Spec	R	$\sqrt{3}$	0.01
Repeatability/Reproduceability	0.00	Std. Dev.	N	1	0.00
LTS of Test Setup	0.00	Spec	R	$\sqrt{3}$	0.00
LTS of the calibrator	0.02	Spec	R	$\sqrt{3}$	0.01
Uncertainty of the calibrator	0.14	Std. Dev.	N	1	0.14
Combined standard uncertainty, $uc(V)$			N	1	0.37
Expanded uncertainty, $U(y)$			N	k = 2	0.73

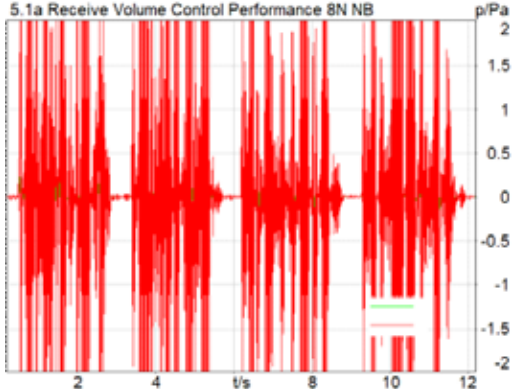
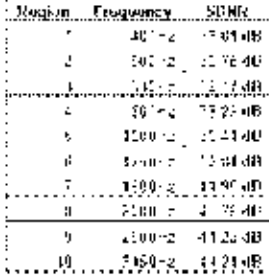
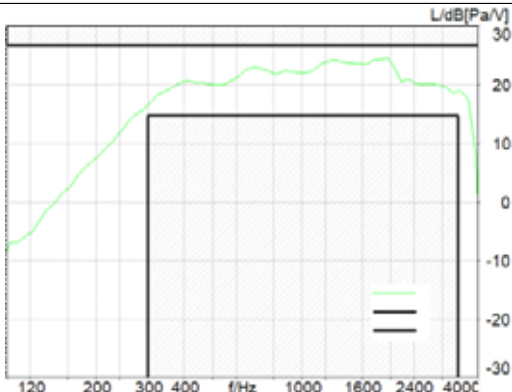


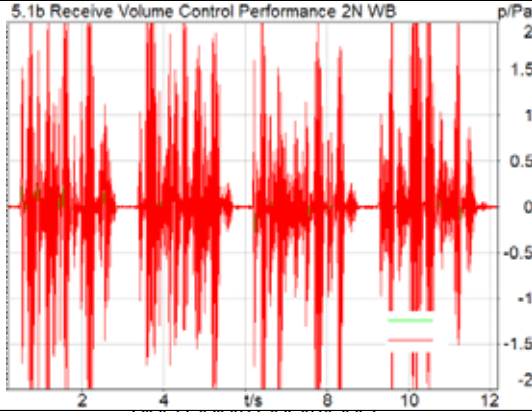
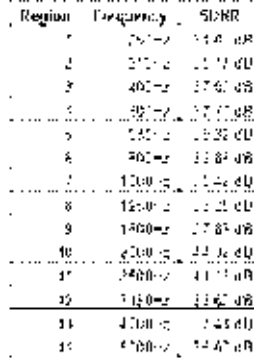
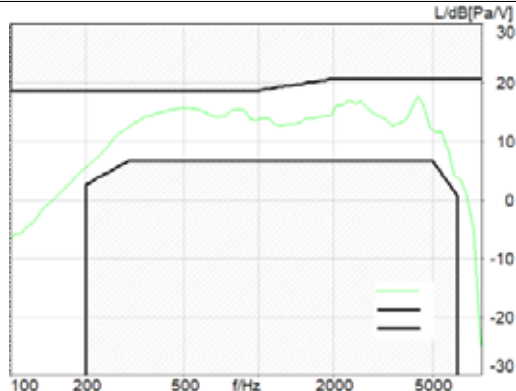
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Appendix A: Volume Control Test Plots

PLOT 1		VoLTE over IMS																																		
Manufacturer	Model	CodecConfiguration	Newton Force																																	
SAMSUNG	A3LSMS74IU	EVS NB 24.4KBPS	2N																																	
Hardware Setup																																				
HATS SN	Calibration Date	Audio Interface SN	Calibration Date																																	
17031015	6/19/2025	77000631	6/18/2025																																	
Communication Systems																																				
LTE Band/ Bandwidth	Antenna Configuration	Channel	Frequency [MHz]																																	
Band 25 / 20MHz	Antenna A	26365	1882.50																																	
Results																																				
Test Date	Audio File	Conversational Gain dB	Limit dB																																	
6/8/2026	IEEE 269 Uncompressed Male Speech	16.93	6.00																																	
PN-SDNR [dB]	PN -SDNR Worstcase Frequency [Hz]	Frequency Response [dB]	FR Worstcase Frequency [Hz]																																	
32.18	1250	2.53	1948.0																																	
Conversational Gain	5.1b Receive Volume Control Performance 2N NB 																																			
Distortion	<table><thead><tr><th>Region</th><th>Frequency</th><th>SDNR</th></tr></thead><tbody><tr><td>1</td><td>400 ± 100</td><td>11.41 dB</td></tr><tr><td>2</td><td>400 ± 100</td><td>11.72 dB</td></tr><tr><td>3</td><td>100 ± 100</td><td>11.64 dB</td></tr><tr><td>4</td><td>200 ± 100</td><td>11.15 dB</td></tr><tr><td>5</td><td>1000 ± 100</td><td>11.11 dB</td></tr><tr><td>6</td><td>1000 ± 100</td><td>11.15 dB</td></tr><tr><td>7</td><td>1000 ± 100</td><td>11.22 dB</td></tr><tr><td>8</td><td>2000 ± 100</td><td>11.27 dB</td></tr><tr><td>9</td><td>2000 ± 100</td><td>11.73 dB</td></tr><tr><td>10</td><td>4000 ± 100</td><td>11.72 dB</td></tr></tbody></table>			Region	Frequency	SDNR	1	400 ± 100	11.41 dB	2	400 ± 100	11.72 dB	3	100 ± 100	11.64 dB	4	200 ± 100	11.15 dB	5	1000 ± 100	11.11 dB	6	1000 ± 100	11.15 dB	7	1000 ± 100	11.22 dB	8	2000 ± 100	11.27 dB	9	2000 ± 100	11.73 dB	10	4000 ± 100	11.72 dB
Region	Frequency	SDNR																																		
1	400 ± 100	11.41 dB																																		
2	400 ± 100	11.72 dB																																		
3	100 ± 100	11.64 dB																																		
4	200 ± 100	11.15 dB																																		
5	1000 ± 100	11.11 dB																																		
6	1000 ± 100	11.15 dB																																		
7	1000 ± 100	11.22 dB																																		
8	2000 ± 100	11.27 dB																																		
9	2000 ± 100	11.73 dB																																		
10	4000 ± 100	11.72 dB																																		
Frequency Response																																				

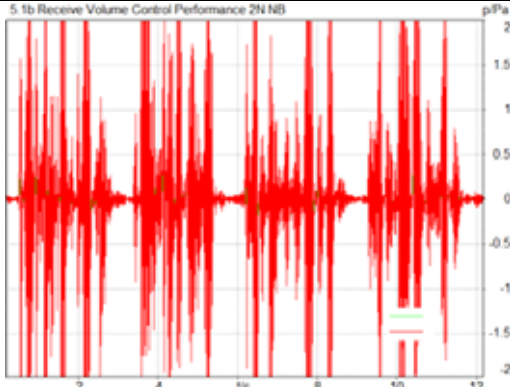
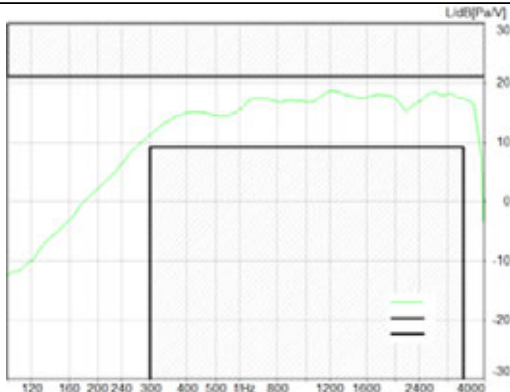
PLOT 2		VoLTE over IMS	
Manufacturer	Model	CodecConfiguration	Newton Force
SAMSUNG	A3LSMS741U	EVS NB 24.4KBPS	8N
Hardware Setup			
HATS SN	Calibration Date	Audio Interface SN	Calibration Date
17031015	6/19/2025	77000631	6/18/2025
Communication Systems			
LTE Band/ Bandwidth	Antenna Configuration	Channel	Frequency [MHz]
Band 25 / 20MHz	Antenna A	26365	1882.50
Results			
Test Date	Audio File	Conversational Gain dB	Limit dB
6/8/2026	IEEE 269 Uncompressed Male Speech	21.84	6.00
PN-SDNR [dB]	PN -SDNR Worstcase Frequency [Hz]	Frequency Response [dB]	FR Worstcase Frequency [Hz]
32.84	1250	2.20	2883.7
Conversational Gain			
Distortion			
Frequency Response			

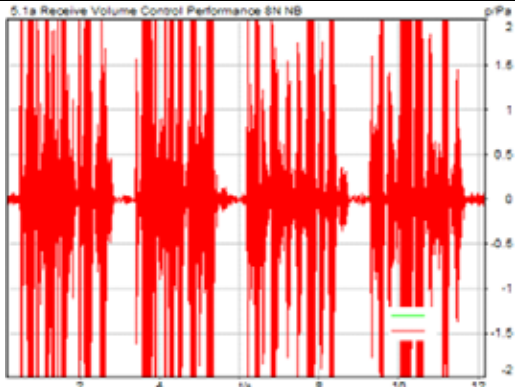
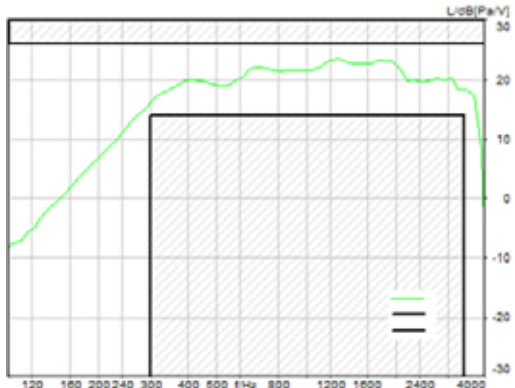
PLOT 3		VoLTE over IMS	
Manufacturer	Model	CodecConfiguration	Newton Force
SAMSUNG	A3LSMS741U	EVS WB 24.4KBPS	2N
Hardware Setup			
HATS SN	Calibration Date	Audio Interface SN	Calibration Date
17031015	6/19/2025	77000631	6/18/2025
Communication Systems			
LTE Band/ Bandwidth	Antenna Configuration	Channel	Frequency [MHz]
Band 25 / 20MHz	Antenna A	26365	1882.50
Results			
Test Date	Audio File	Conversational Gain dB	Limit dB
6/8/2026	IEEE 269 Uncompressed Male Speech	15.13	6.00
PN-SDNR [dB]	PN -SDNR Worstcase Frequency [Hz]	Frequency Response [dB]	FR Worstcase Frequency [Hz]
27.83	1600	2.82	4369.4
Conversational Gain			
Distortion			
Frequency Response			

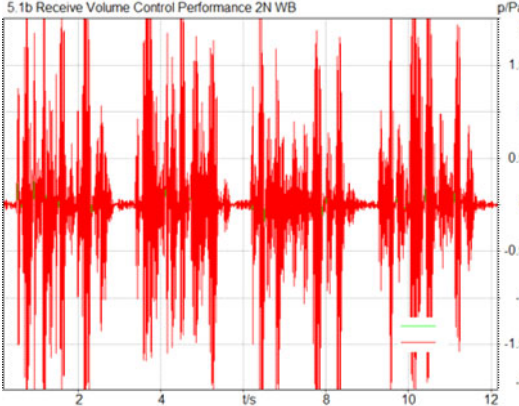
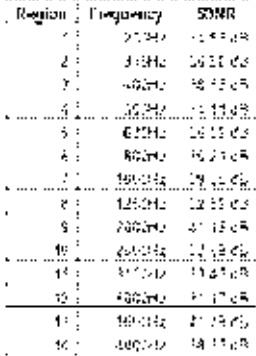
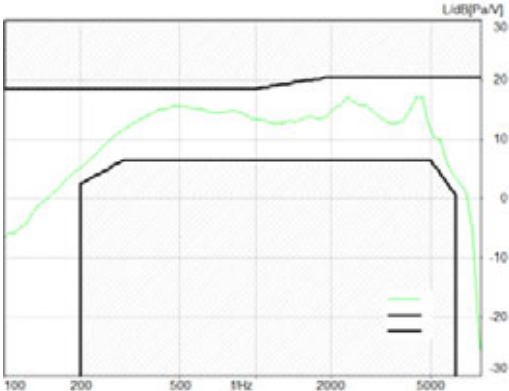


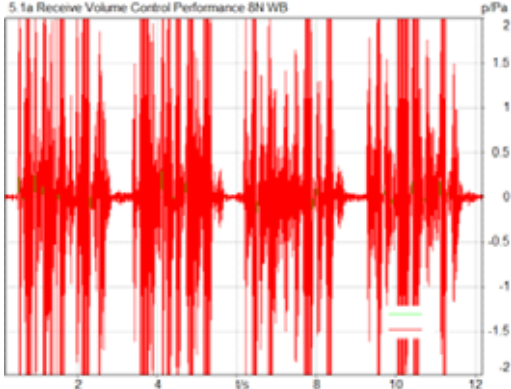
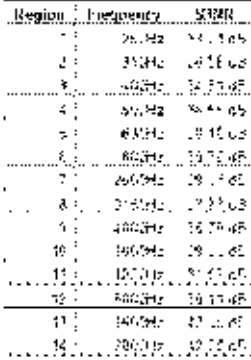
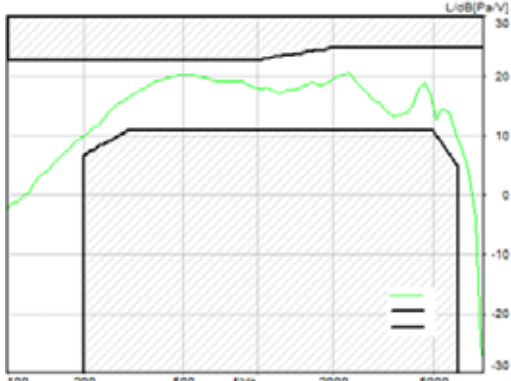
PLOT 4		VoLTE over IMS																																														
Manufacturer	Model	CodecConfigurition	Newton Force																																													
SAMSUNG	A3LSMS74IU	EVS WB 24.4KBPS	8N																																													
Hardware Setup																																																
HATS SN	Calibration Date	Audio Interface SN	Calibration Date																																													
17031015	6/19/2025	77000631	6/18/2025																																													
Communication Systems																																																
LTE Band/ Bandwidth	Antenna Configuration	Channel	Frequency [MHz]																																													
Band 25 / 20MHz	Antenna A	26365	1882.50																																													
Results																																																
Test Date	Audio File	Conversational Gain dB	Limit dB																																													
6/8/2026	IEEE 269 Uncompressed Male Speech	20.07	6.00																																													
PN-SDNR [dB]	PN -SDNR Worstcase Frequency [Hz]	Frequency Response {dB}	FR Worstcase Frequency [Hz]																																													
27.92	5000	2.68	514.4																																													
Conversational Gain																																																
Distortion	<table><thead><tr><th>Region</th><th>Frequency</th><th>SDNR</th></tr></thead><tbody><tr><td>1</td><td>200-250 Hz</td><td>24.94 dB</td></tr><tr><td>2</td><td>250-500 Hz</td><td>24.01 dB</td></tr><tr><td>3</td><td>500-750 Hz</td><td>23.21 dB</td></tr><tr><td>4</td><td>750-1000 Hz</td><td>22.51 dB</td></tr><tr><td>5</td><td>1000-1250 Hz</td><td>21.71 dB</td></tr><tr><td>6</td><td>1250-1500 Hz</td><td>21.01 dB</td></tr><tr><td>7</td><td>1500-1750 Hz</td><td>20.31 dB</td></tr><tr><td>8</td><td>1750-2000 Hz</td><td>19.61 dB</td></tr><tr><td>9</td><td>2000-2250 Hz</td><td>18.91 dB</td></tr><tr><td>10</td><td>2250-2500 Hz</td><td>18.21 dB</td></tr><tr><td>11</td><td>2500-2750 Hz</td><td>17.51 dB</td></tr><tr><td>12</td><td>2750-3000 Hz</td><td>16.81 dB</td></tr><tr><td>13</td><td>3000-3250 Hz</td><td>16.11 dB</td></tr><tr><td>14</td><td>3250-3500 Hz</td><td>15.41 dB</td></tr></tbody></table>			Region	Frequency	SDNR	1	200-250 Hz	24.94 dB	2	250-500 Hz	24.01 dB	3	500-750 Hz	23.21 dB	4	750-1000 Hz	22.51 dB	5	1000-1250 Hz	21.71 dB	6	1250-1500 Hz	21.01 dB	7	1500-1750 Hz	20.31 dB	8	1750-2000 Hz	19.61 dB	9	2000-2250 Hz	18.91 dB	10	2250-2500 Hz	18.21 dB	11	2500-2750 Hz	17.51 dB	12	2750-3000 Hz	16.81 dB	13	3000-3250 Hz	16.11 dB	14	3250-3500 Hz	15.41 dB
Region	Frequency	SDNR																																														
1	200-250 Hz	24.94 dB																																														
2	250-500 Hz	24.01 dB																																														
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13	3000-3250 Hz	16.11 dB																																														
14	3250-3500 Hz	15.41 dB																																														
Frequency Response																																																



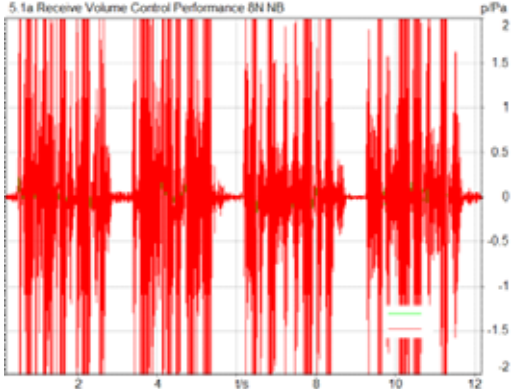
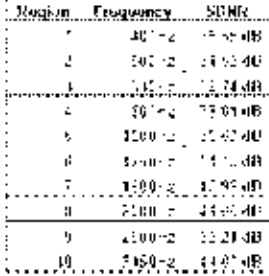
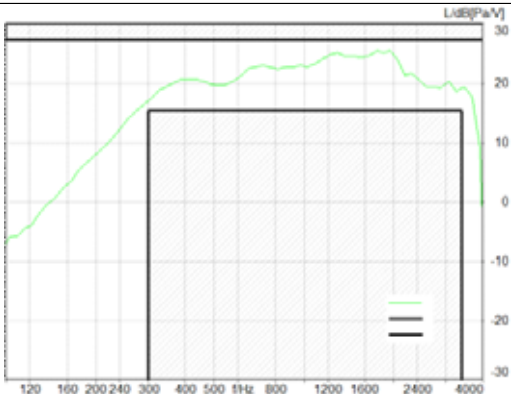
PLOT 5		VoNR over IMS																																		
Manufacturer	Model	CodecConfiguration	Newton Force																																	
SAMSUNG	A3LSMS74IU	EVS NB 24.4KBPS	2N																																	
Hardware Setup																																				
HATS SN	Calibration Date	Audio Interface SN	Calibration Date																																	
17031015	6/19/2025	77000631	6/18/2025																																	
Communication Systems																																				
NR Band/ Bandwidth	Antenna Configuration	Channel	Frequency [MHz]																																	
NR n25 / 40MHz	Antenna A	376500	1882.50																																	
Results																																				
Test Date	Audio File	Conversational Gain dB	Limit dB																																	
6/9/2026	IEEE 269 Uncompressed Male Speech	15.93	6.00																																	
PN-SDNR [dB]	PN -SDNR Worstcase Frequency [Hz]	Frequency Response [dB]	FR Worstcase Frequency [Hz]																																	
32.68	1250	2.42	1216.1																																	
Conversational Gain																																				
Distortion	<table><tr><th>Region</th><th>Frequency</th><th>SDNR</th></tr><tr><td>1</td><td>400Hz</td><td>86.00dB</td></tr><tr><td>2</td><td>500Hz</td><td>80.00dB</td></tr><tr><td>3</td><td>600Hz</td><td>77.14dB</td></tr><tr><td>4</td><td>800Hz</td><td>78.14dB</td></tr><tr><td>5</td><td>1000Hz</td><td>75.00dB</td></tr><tr><td>6</td><td>1200Hz</td><td>78.00dB</td></tr><tr><td>7</td><td>1500Hz</td><td>71.00dB</td></tr><tr><td>8</td><td>2000Hz</td><td>74.00dB</td></tr><tr><td>9</td><td>2500Hz</td><td>73.94dB</td></tr><tr><td>10</td><td>3000Hz</td><td>73.00dB</td></tr></table>			Region	Frequency	SDNR	1	400Hz	86.00dB	2	500Hz	80.00dB	3	600Hz	77.14dB	4	800Hz	78.14dB	5	1000Hz	75.00dB	6	1200Hz	78.00dB	7	1500Hz	71.00dB	8	2000Hz	74.00dB	9	2500Hz	73.94dB	10	3000Hz	73.00dB
Region	Frequency	SDNR																																		
1	400Hz	86.00dB																																		
2	500Hz	80.00dB																																		
3	600Hz	77.14dB																																		
4	800Hz	78.14dB																																		
5	1000Hz	75.00dB																																		
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7	1500Hz	71.00dB																																		
8	2000Hz	74.00dB																																		
9	2500Hz	73.94dB																																		
10	3000Hz	73.00dB																																		
Frequency Response																																				

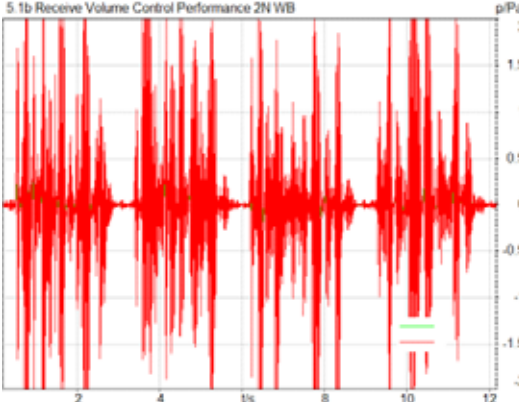
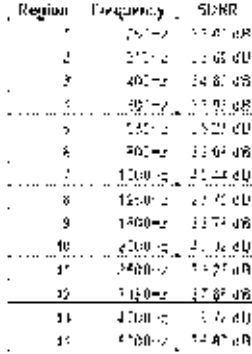
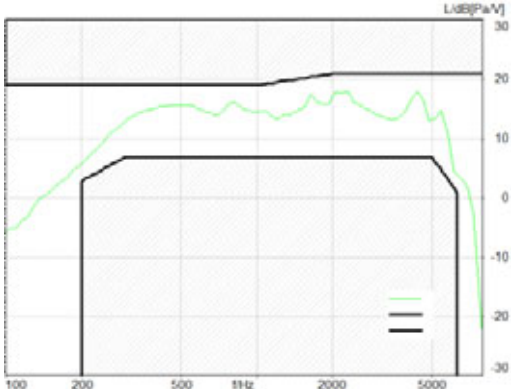
PLOT 6		VoNR over IMS																																		
Manufacturer	Model	CodecConfiguration	Newton Force																																	
SAMSUNG	A3LSMS741U	EVS NB 24.4KBPS	8N																																	
Hardware Setup																																				
HATS SN	Calibration Date	Audio Interface SN	Calibration Date																																	
17031015	6/19/2025	77000631	6/18/2025																																	
Communication Systems																																				
NR Band/ Bandwidth	Antenna Configuration	Channel	Frequency [MHz]																																	
NR n25 / 40MHz	Antenna A	376500	1882.50																																	
Results																																				
Test Date	Audio File	Conversational Gain dB	Limit dB																																	
6/9/2026	IEEE 269 Uncompressed Male Speech	20.53	6.00																																	
PN-SDNR [dB]	PN -SDNR Worstcase Frequency [Hz]	Frequency Response [dB]	FR Worstcase Frequency [Hz]																																	
32.34	1250	2.56	1285.9																																	
Conversational Gain																																				
Distortion	<table><thead><tr><th>Region</th><th>Frequency</th><th>SDNR</th></tr></thead><tbody><tr><td>1</td><td>40.4Hz</td><td>72.11 dB</td></tr><tr><td>2</td><td>50.4Hz</td><td>26.12 dB</td></tr><tr><td>3</td><td>63.4Hz</td><td>75.16 dB</td></tr><tr><td>4</td><td>55.4Hz</td><td>78.15 dB</td></tr><tr><td>5</td><td>100.4Hz</td><td>27.15 dB</td></tr><tr><td>6</td><td>125.4Hz</td><td>38.74 dB</td></tr><tr><td>7</td><td>150.4Hz</td><td>31.12 dB</td></tr><tr><td>8</td><td>200.4Hz</td><td>14.23 dB</td></tr><tr><td>9</td><td>250.4Hz</td><td>39.17 dB</td></tr><tr><td>10</td><td>275.4Hz</td><td>33.17 dB</td></tr></tbody></table>			Region	Frequency	SDNR	1	40.4Hz	72.11 dB	2	50.4Hz	26.12 dB	3	63.4Hz	75.16 dB	4	55.4Hz	78.15 dB	5	100.4Hz	27.15 dB	6	125.4Hz	38.74 dB	7	150.4Hz	31.12 dB	8	200.4Hz	14.23 dB	9	250.4Hz	39.17 dB	10	275.4Hz	33.17 dB
Region	Frequency	SDNR																																		
1	40.4Hz	72.11 dB																																		
2	50.4Hz	26.12 dB																																		
3	63.4Hz	75.16 dB																																		
4	55.4Hz	78.15 dB																																		
5	100.4Hz	27.15 dB																																		
6	125.4Hz	38.74 dB																																		
7	150.4Hz	31.12 dB																																		
8	200.4Hz	14.23 dB																																		
9	250.4Hz	39.17 dB																																		
10	275.4Hz	33.17 dB																																		
Frequency Response																																				

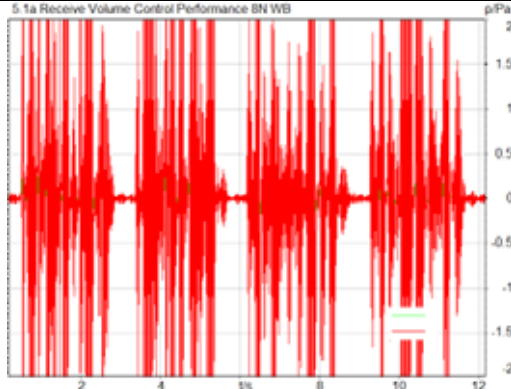
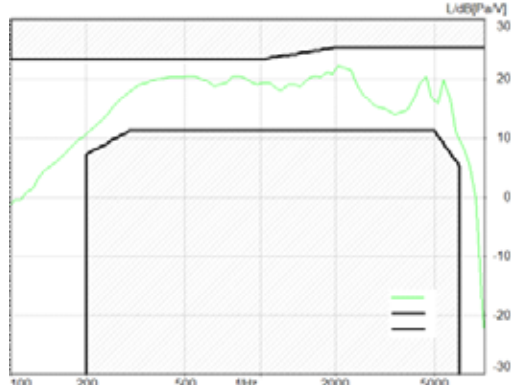
PLOT 7		VoNR over IMS	
Manufacturer	Model	CodecConfiguration	Newton Force
SAMSUNG	A3LSMS74IU	EVS WB 24.4KBPS	2N
Hardware Setup			
HATS SN	Calibration Date	Audio Interface SN	Calibration Date
17031015	6/19/2025	77000631	6/18/2025
Communication Systems			
NR Band/ Bandwidth	Antenna Configuration	Channel	Frequency [MHz]
NR n25 / 40MHz	Antenna A	376500	1882.50
Results			
Test Date	Audio File	Conversational Gain dB	Limit dB
6/9/2026	IEEE 269 Uncompressed Male Speech	15.01	6.00
PN-SDNR [dB]	PN -SDNR Worstcase Frequency [Hz]	Frequency Response [dB]	FR Worstcase Frequency [Hz]
31.17	5000	2.87	487
Conversational Gain			
Distortion			
Frequency Response			

PLOT 8		VoNR over IMS	
Manufacturer	Model	CodecConfiguration	Newton Force
SAMSUNG	A3LSMS74IU	EVS WB 24.4KBPS	8N
Hardware Setup			
HATS SN	Calibration Date	Audio Interface SN	Calibration Date
17031015	6/19/2025	77000631	6/18/2025
Communication Systems			
NR Band/ Bandwidth	Antenna Configuration	Channel	Frequency [MHz]
NR n25 / 40MHz	Antenna A	376500	1882.50
Results			
Test Date	Audio File	Conversational Gain dB	Limit dB
6/9/2026	IEEE 269 Uncompressed Male Speech	19.51	6.00
PN-SDNR [dB]	PN -SDNR Worstcase Frequency [Hz]	Frequency Response [dB]	FR Worstcase Frequency [Hz]
30.11	5000	2.44	487
Conversational Gain			
Distortion			
Frequency Response			

PLOT 9		VoWiFi over IMS																																		
Manufacturer	Model	CodecConfiguration	Newton Force																																	
SAMSUNG	A3LSMS74IU	EVS NB 24.4KBPS	2N																																	
Hardware Setup																																				
HATS SN	Calibration Date	Audio Interface SN	Calibration Date																																	
17031015	6/19/2025	77000631	6/18/2025																																	
Communication Systems																																				
Band / Standard	Antenna Configuration	Channel	Frequency [MHz]																																	
2.4GHz / IEEE802.11b	Ant 1 SISO	6	2437.00																																	
Results																																				
Test Date	Audio File	Conversational Gain dB	Limit dB																																	
6/13/2026	IEEE 269 Uncompressed Male Speech	16.80	6.00																																	
PN-SDNR [dB]	PN -SDNR Worstcase Frequency [Hz]	Frequency Response [dB]	FR Worstcase Frequency [Hz]																																	
32.38	1250	2.20	1948																																	
Conversational Gain																																				
Distortion	<table><thead><tr><th>Region</th><th>Frequency</th><th>SDNR</th></tr></thead><tbody><tr><td>1</td><td>400-500</td><td>14.45 dB</td></tr><tr><td>2</td><td>500-600</td><td>14.65 dB</td></tr><tr><td>3</td><td>600-700</td><td>15.02 dB</td></tr><tr><td>4</td><td>700-800</td><td>15.81 dB</td></tr><tr><td>5</td><td>800-900</td><td>16.21 dB</td></tr><tr><td>6</td><td>900-1000</td><td>16.72 dB</td></tr><tr><td>7</td><td>1000-1100</td><td>16.82 dB</td></tr><tr><td>8</td><td>1100-1200</td><td>17.11 dB</td></tr><tr><td>9</td><td>1200-1300</td><td>17.15 dB</td></tr><tr><td>10</td><td>1300-1400</td><td>17.75 dB</td></tr></tbody></table>			Region	Frequency	SDNR	1	400-500	14.45 dB	2	500-600	14.65 dB	3	600-700	15.02 dB	4	700-800	15.81 dB	5	800-900	16.21 dB	6	900-1000	16.72 dB	7	1000-1100	16.82 dB	8	1100-1200	17.11 dB	9	1200-1300	17.15 dB	10	1300-1400	17.75 dB
Region	Frequency	SDNR																																		
1	400-500	14.45 dB																																		
2	500-600	14.65 dB																																		
3	600-700	15.02 dB																																		
4	700-800	15.81 dB																																		
5	800-900	16.21 dB																																		
6	900-1000	16.72 dB																																		
7	1000-1100	16.82 dB																																		
8	1100-1200	17.11 dB																																		
9	1200-1300	17.15 dB																																		
10	1300-1400	17.75 dB																																		
Frequency Response																																				

PLOT 10		VoWiFi over IMS	
Manufacturer	Model	CodecConfiguration	Newton Force
SAMSUNG	A3LSMS74IU	EVS NB 24.4KBPS	8N
Hardware Setup			
HATS SN	Calibration Date	Audio Interface SN	Calibration Date
17031015	6/19/2025	77000631	6/18/2025
Communication Systems			
Band / Standard	Antenna Configuration	Channel	Frequency [MHz]
2.4GHz / IEEE802.11b	Ant 1 SISO	6	2437.00
Results			
Test Date	Audio File	Conversational Gain [dB]	Limit [dB]
6/13/2026	IEEE 269 Uncompressed Male Speech	21.68	6.00
PN-SDNR [dB]	PN -SDNR Worstcase Frequency [Hz]	Frequency Response [dB]	FR Worstcase Frequency [Hz]
31.18	1250	2.06	1747.8
Conversational Gain			
Distortion			
Frequency Response			

PLOT 11		VoWiFi over IMS	
Manufacturer	Model	CodecConfiguration	Newton Force
SAMSUNG	A3LSMS74IU	EVS WB 24.4KBPS	2N
Hardware Setup			
HATS SN	Calibration Date	Audio Interface SN	Calibration Date
17031015	6/19/2025	77000631	6/18/2025
Communication Systems			
Band / Standard	Antenna Configuration	Channel	Frequency [MHz]
2.4GHz / IEEE802.11b	Ant 1 SISO	6	2437.00
Results			
Test Date	Audio File	Conversational Gain [dB]	Limit [dB]
6/13/2026	IEEE 269 Uncompressed Male Speech	15.18	6.00
PN-SDNR [dB]	PN -SDNR Worstcase Frequency [Hz]	Frequency Response [dB]	FR Worstcase Frequency [Hz]
27.7	1250	2.76	823.9
Conversational Gain			
Distortion			
Frequency Response			

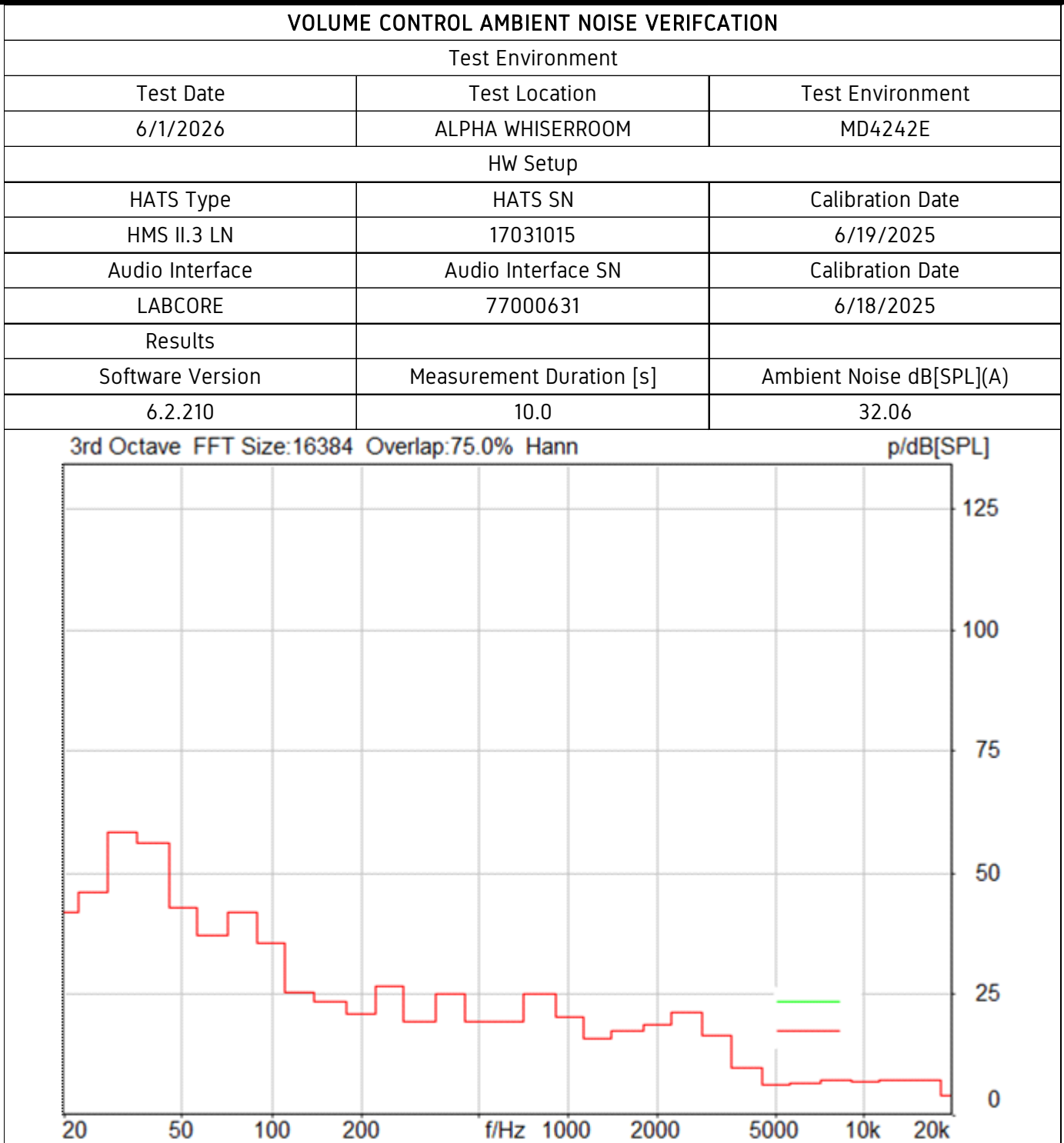
PLOT 12		VoWiFi over IMS																																														
Manufacturer	Model	CodecConfigurion	Newton Force																																													
SAMSUNG	A3LSMS74IU	EVS WB 24.4KBPS	8N																																													
Hardware Setup																																																
HATS SN	Calibration Date	Audio Interface SN	Calibration Date																																													
17031015	6/19/2025	77000631	6/18/2025																																													
Communication Systems																																																
Band / Standard	Antenna Configuration	Channel	Frequency [MHz]																																													
2.4GHz / IEEE802.11b	Ant 1 SISO	6	2437.00																																													
Results																																																
Test Date	Audio File	Conversational Gain dB	Limit dB																																													
6/13/2026	IEEE 269 Uncompressed Male Speech	20.13	6.00																																													
PN-SDNR [dB]	PN -SDNR Worstcase Frequency [Hz]	Frequency Response [dB]	FR Worstcase Frequency [Hz]																																													
31.29	1250	2.71	544.4																																													
Conversational Gain																																																
Distortion	<table><thead><tr><th>Region</th><th>Frequency</th><th>SDNR</th></tr></thead><tbody><tr><td>1</td><td>200-2</td><td>11.41 dB</td></tr><tr><td>2</td><td>200-2</td><td>11.05 dB</td></tr><tr><td>3</td><td>200-2</td><td>11.11 dB</td></tr><tr><td>4</td><td>200-2</td><td>11.11 dB</td></tr><tr><td>5</td><td>200-2</td><td>11.11 dB</td></tr><tr><td>6</td><td>200-2</td><td>11.11 dB</td></tr><tr><td>7</td><td>1200-2</td><td>11.11 dB</td></tr><tr><td>8</td><td>1200-2</td><td>11.11 dB</td></tr><tr><td>9</td><td>1200-2</td><td>11.11 dB</td></tr><tr><td>10</td><td>1200-2</td><td>11.11 dB</td></tr><tr><td>11</td><td>2000-2</td><td>11.11 dB</td></tr><tr><td>12</td><td>2000-2</td><td>11.11 dB</td></tr><tr><td>13</td><td>4000-2</td><td>11.11 dB</td></tr><tr><td>14</td><td>4000-2</td><td>11.11 dB</td></tr></tbody></table>			Region	Frequency	SDNR	1	200-2	11.41 dB	2	200-2	11.05 dB	3	200-2	11.11 dB	4	200-2	11.11 dB	5	200-2	11.11 dB	6	200-2	11.11 dB	7	1200-2	11.11 dB	8	1200-2	11.11 dB	9	1200-2	11.11 dB	10	1200-2	11.11 dB	11	2000-2	11.11 dB	12	2000-2	11.11 dB	13	4000-2	11.11 dB	14	4000-2	11.11 dB
Region	Frequency	SDNR																																														
1	200-2	11.41 dB																																														
2	200-2	11.05 dB																																														
3	200-2	11.11 dB																																														
4	200-2	11.11 dB																																														
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6	200-2	11.11 dB																																														
7	1200-2	11.11 dB																																														
8	1200-2	11.11 dB																																														
9	1200-2	11.11 dB																																														
10	1200-2	11.11 dB																																														
11	2000-2	11.11 dB																																														
12	2000-2	11.11 dB																																														
13	4000-2	11.11 dB																																														
14	4000-2	11.11 dB																																														
Frequency Response																																																



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Appendix B: System Verification Plots





VOLUME CONTROL AMBIENT NOISE VERIFICATION

Test Environment

Test Date	Test Location	Test Environment
6/8/2026	ALPHA WHISERROOM	MD4242E

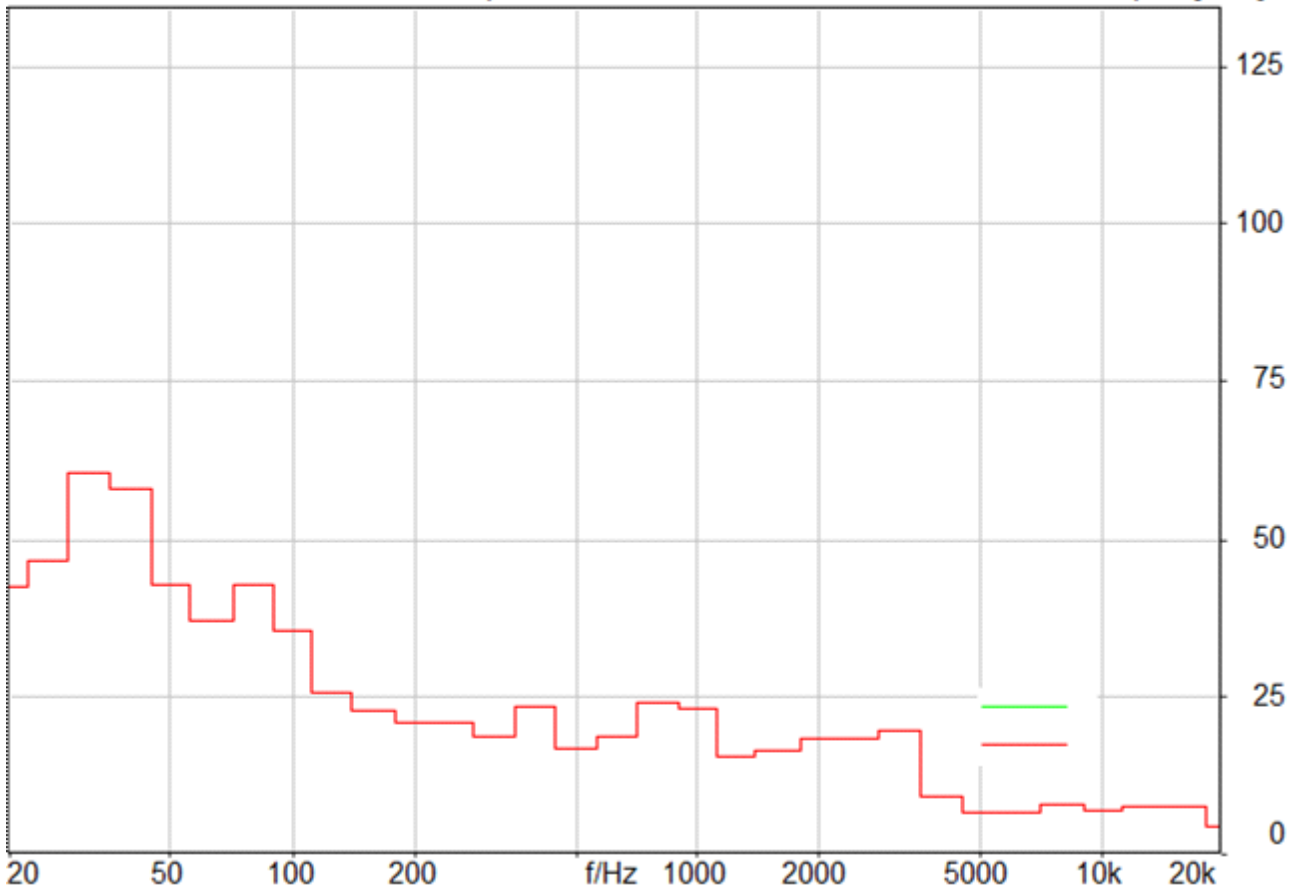
HW Setup

HATS Type	HATS SN	Calibration Date
HMS II.3 LN	17031015	6/19/2025
Audio Interface	Audio Interface SN	Calibration Date
LABCORE	77000631	6/18/2025

Results

Software Version	Measurement Duration [s]	Ambient Noise dB[SPL](A)
6.2.210	10.0	32.12

3rd Octave FFT Size:16384 Overlap:75.0% Hann p/dB[SPL]





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Appendix C: Calibration Certificates



Certificate #L2288



HEAD acoustics, Inc.
6964 Kensington Road

ISO17025 Accredited Calibration Certificate

Object: HEAD MEASUREMENT SYSTEM, LOW NOISE, WITH RIGHT EAR AND ARTIFICIAL MOUTH

Type: HMS II.3 LN

Manufacturer HEAD ACOUSTICS GMBH

Serial Number: 17031015

Asset Number:

Customer: RF SAFETY
5520 RESEARCH PARK DR.

CATONSVILLE, MD 21228

Calibration Certificate No.: 17031015 - 68804

Date of Calibration 6/19/2025

This calibration certificate may not be reproduced other than in full except with the permission of HEAD acoustics, Inc. Calibration certificates without signature and seal are not valid.

Seal



Date

6/19/2025

Responsible Signatory

TIM MAKUSHIK

Cert #

17031015 - 68804

Page 1 of 3



HEAD acoustics, Inc.
6964 Kensington Road

Certificate #L2288

ISO17025 Accredited Calibration Certificate

Calibration Procedure

KA HMS II.X SERVICE PROCEDURE	Revision	01
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Evaluation

As Found Condition:	PASS
As Left Condition:	PASS

Environmental Conditions

Temperature (deg C):	23
Relative Humidity (%)	50
Barometric Pressure (mbar):	975

Pistonphone Reference

Nominal Pistophone Level dB(SPL)	113.96
Barometric Correction dB(SPL)	-0.33
Adaptor Correction dB(SPL)	-1.90
Corrected Pistophone Level dB(SPL)	111.73

Place of Calibration

Calibration was performed at: CALIBRATION LAB OF HEAD ACOUSTICS, INC.

Traceability

This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).

Measurement Uncertainty

This unit is provided an ISO 17025 calibration utilizing standards with; a 95% confidence level, and with a coverage factor of K=2 unless otherwise stated above in this contract. HAI Decision Rule: If the measurement result is within (or below) the tolerance when the measurement uncertainty is taken into account, the calibration is reported as a pass.

All testpoints that are followed by an asterisk are not a part of HEAD acoustics, Inc's scope of accreditation.

The Microphones For The System Are Listed Below:

Left S/N: N/A Right S/N: N/A

Calibration Standards

Model	Serial Number	Description	Last Cal.	Traceability #
42AA	415178	PISTONPHONE	8/7/2024	51740
ISERVER 2	F2215020206	ISERVER 2- ENVIRONMENTAL LOGGER	11/25/2024	US011-DET-CI-24419222

Cert # 17031015 - 68804

Page 2 of 3



Calibration Protocol

Measurement	Unit	Nominal	Lower	Upper	Adj. As Found	As Left	MU
Correction Value for Left Mic Channel		0.00	-3.00	3.00			0.19 dB
Correction Value for Right Mic Channel		0.00	-3.00	3.00	-0.4100	-0.4100	0.19 dB
Measured Sensitivity for Left Mic Channel		50.00	40.00	60.00			0.27 mVAC
Measured Sensitivity for Right Mic Channel		50.00	40.00	60.00	52.3900	52.3900	0.27 mVAC
Microphone Input SPL Left	dB	111.73	111.53	111.93			0.19 dB
Microphone Input SPL Right	dB	111.73	111.53	111.93	111.7300	111.7300	0.19 dB
Mouth Speaker Distortion at 112 Hz*	%	0.00	0.00	1.00	0.6900	0.6900	
Mouth Speaker Distortion at 141 Hz*	%	0.00	0.00	1.00	0.4200	0.4200	
Mouth Speaker Distortion at 179 Hz*	%	0.00	0.00	1.00	0.2300	0.2300	
Mouth Speaker Distortion at 224 Hz*	%	0.00	0.00	1.00	0.1400	0.1400	
Mouth Speaker Distortion at 280 Hz*	%	0.00	0.00	1.00	0.1000	0.1000	
Mouth Speaker Distortion at 355 Hz*	%	0.00	0.00	1.00	0.0500	0.0500	
Mouth Speaker Distortion at 450 Hz*	%	0.00	0.00	1.00	0.0200	0.0200	
Mouth Speaker Distortion at 560 Hz*	%	0.00	0.00	1.00	0.0600	0.0600	
Mouth Speaker Distortion at 710 Hz*	%	0.00	0.00	1.00	0.0800	0.0800	
Mouth Speaker Distortion at 900 Hz*	%	0.00	0.00	1.00	0.0200	0.0200	
Mouth Speaker Distortion at 1120 Hz*	%	0.00	0.00	1.00	0.0400	0.0400	
Mouth Speaker Distortion at 1410 Hz*	%	0.00	0.00	1.00	0.0800	0.0800	
Mouth Speaker Distortion at 1790 Hz*	%	0.00	0.00	1.00	0.0700	0.0700	
Mouth Speaker Distortion at 2240 Hz*	%	0.00	0.00	1.00	0.1600	0.1600	
Mouth Speaker Distortion at 2800 Hz*	%	0.00	0.00	1.00	0.0400	0.0400	
Mouth Speaker Distortion at 3550 Hz*	%	0.00	0.00	1.00	0.0400	0.0400	
Mouth Speaker Distortion at 4500 Hz*	%	0.00	0.00	1.00	0.0600	0.0600	
Mouth Speaker Distortion at 5600 Hz*	%	0.00	0.00	1.00	0.1200	0.1200	
Mouth Speaker Distortion at 7100 Hz*	%	0.00	0.00	1.00	0.0800	0.0800	
Mouth Speaker Distortion at 9000 Hz*	%	0.00	0.00	1.00	0.0300	0.0300	
Mouth Speaker Distortion at 11200Hz*	%	0.00	0.00	1.00	0.0700	0.0700	



HEAD acoustics, Inc.
6964 Kensington Road

Certificate #L2288

ISO17025 Accredited Calibration Certificate

Object: ACQUALAB MODULAR MULTI-CHANNEL HARDWARE
PLATFORM FOR SPEECH AND AUDIO QUALITY TESTING

Type: LABCORE

Manufacturer HEAD ACOUSTICS GMBH

Serial Number: 77000631

Asset Number:

Customer: RF SAFETY
5520 RESEARCH PARK DR.

CATONSVILLE, MD 21228

Calibration Certificate No.: 77000631 - 68801

Date of Calibration 6/18/2025

This calibration certificate may not be reproduced other than in full except with the permission of HEAD acoustics, Inc. Calibration certificates without signature and seal are not valid.

Seal



Date

6/18/2025

Responsible Signatory

TIM MAKUSHIK

Cert #

77000631 - 68801

Page 1 of 3



HEAD acoustics, Inc.
6964 Kensington Road

Certificate #L2288

ISO17025 Accredited Calibration Certificate

Calibration Procedure

KA HHP IV SERVICE PROCEDURE	Revision	5
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Evaluation

As Found Condition:	PASS
As Left Condition:	PASS

Environmental Conditions

Temperature (deg C):	26
Relative Humidity (%)	43
Barometric Pressure (mbar):	978

Place of Calibration

Calibration was performed at: CALIBRATION LAB OF HEAD ACOUSTICS, INC.

Traceability

This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).

Measurement Uncertainty

This unit is provided an ISO 17025 calibration utilizing standards with; a 95% confidence level, and with a coverage factor of K=2 unless otherwise stated above in this contract. HAI Decision Rule: If the measurement result is within (or below) the tolerance when the measurement uncertainty is taken into account, the calibration is reported as a pass.

All testpoints that are followed by an asterisk are not a part of HEAD acoustics, Inc's scope of accreditation.

Calibration Report# 77000631-6182025

Firmware Version: 3.9.2

Calibration Standards

Model	Serial Number	Description	Last Cal.	Traceability #
OGRAMMABLE C	101339	3 GHZ PROGRAMMABLE COUNTER	3/11/2025	Z238757-678504
KEI 2100(D)	1373850	DIGITAL MULTIMETER 6.5 DIGIT USB	10/14/2024	Z227658-645383
ISERVER 2	F2215020206	ISERVER 2- ENVIRONMENTAL LOGGER	11/25/2024	US011-DET-CI-24419222

Cert # 77000631 - 68801

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Calibration Protocol

Measurement	Unit	As Found	As Left	MU	MU UoM
Timebase Clock Frequency Adjustment		Pass	Pass	9.41	mHz
Analog Output, Channel 0		Pass	Pass	0.89	mVAC
Analog Output, Channel 1		Pass	Pass	0.89	mVAC
Analog Input, Channel 0		Pass	Pass	0.89	mVAC
Analog Input, Channel 1		Pass	Pass	0.89	mVAC
Headphone Output, Channel 0		Pass	Pass	0.89	mVAC
Headphone Output, Channel 1		Pass	Pass	0.89	mVAC
All Components Installed and Calibrated		Pass	Pass		

Cert #

77000631 - 68801

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Certificate of Calibration

Certificate No.: Cal 022-2024-18974



MAB
7/19/24

Test object: Sound calibrator Class 1
Manufacturer: Norsonic
Type: 1256
Serial No.: 125627058

Customer: Scantek Stock

Address: USA

Order No.: SO2419015

Calibration and verification performed:

The tests are performed according to IEC 60942:2017, Annex B. A detailed description of the calibration procedure is available separately. The equipment was preconditioned for more than 12 hours at the specified calibration temperature and humidity. The calibrator was placed on top of the reference microphone, only held in place by gravity. The submitted adapter ring marked Nor4583 was used to obtain half inch configuration. The customer submitted an instruction manual for this test object.

Date of calibration: 2024-05-13
Date of issue: 2024-05-13

Environmental conditions	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101.325 kPa	23.0 °C	50 % RH
Measurement conditions:	98.99 ± 0.20 kPa	23.4 ± 1.0 °C	47.3 ± 3.1 %RH

Calibration performed by:
Fredrik Pettersen

Supervisor:
Daniela Toledo Helboe

This document is electronically signed, hence there are no handwritten signatures.

This certificate of calibration is issued by a laboratory accredited by Norwegian Accreditation (NA). NA is one of the signatories to the EA Multilateral Agreement for mutual recognition of calibration certificates (European Co-operation for Accreditation). The accreditation states that the laboratory meets the NA requirements concerning competence and calibration system for all the calibrations contained in the accreditation. It also states that the laboratory has a satisfactory quality assurance system and traceability to accredited or national calibration laboratories. This certificate is only valid for the objects stated and may not be reproduced other than in full.

Page 1 of 2



Certificate No.: Cal 022-2024-18974



Results

1 kHz 94 dB	Exact	Measured	Uncertainty
Frequency	1 kHz	1000.00 Hz	1.00 Hz
Level	94 dB	94.01 dB	0.14 dB
Level stability		0.03 dB	0.02 dB
Distortion		0.15 %	0.30 %

1 kHz 114 dB	Exact	Measured	Uncertainty
Frequency	1 kHz	1000.00 Hz	1.00 Hz
Level	114 dB	114.01 dB	0.14 dB
Level stability		0.01 dB	0.02 dB
Distortion		0.03 %	0.30 %

250 Hz 114 dB	Exact	Measured	Uncertainty
Frequency	250 Hz	251.20 Hz	0.25 Hz
Level	114 dB	114.00 dB	0.14 dB
Level stability		0.02 dB	0.02 dB
Distortion		0.12 %	0.30 %

250 Hz 94 dB	Exact	Measured	Uncertainty
Frequency	250 Hz	251.20 Hz	0.25 Hz
Level	94 dB	94.00 dB	0.14 dB
Level stability		0.05 dB	0.03 dB
Distortion		0.26 %	0.30 %

The stated levels are relative to 20μPa.

The distortion measure is a "total distortion and noise to signal" ratio.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02.

Statement of Conformity: (Decision rule: IEC 60942:2017)

As public evidence was available, from a testing organization responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2017, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2017.

Instrumentation:

WSM6 Norsonic 1236 / 08647
MA14 Norsonic 1203 / 138531
DAC3 National Instruments 4461 / 19D0B2F
U7 Norsonic Nor484 / 48431304
THM5 Vaisala PTU303 / S5120042

Traceability:

DFM 2024-07-26
Norsonic 2024-06-15
Norsonic 2024-12-31
Norsonic 2025-01-04
Justervesenet 2025-11-30

Expire date:

2024-07-26
2024-06-15
2024-12-31
2025-01-04
2025-11-30

Measurements performed by



Street address: Gunnersbråtan 2, N-3409 Tranby, Norway

Tel.: +47 32858900 email: ncl@norsonic.com

Certificate version 7

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