

# HAC (Volume Control) Test Report

<b>Application No.:</b>	SUES2407001002AT
<b>FCC ID:</b>	2APQU-M2467
<b>Applicant:</b>	KonnectONE, Inc
<b>Applicant Address:</b>	40 Lake Bellevue Drive, Suite 340, Bellevue, Washington 98005, U.S.A
<b>Manufacturer:</b>	KonnectONE, Inc
<b>Manufacturer Address:</b>	40 Lake Bellevue Drive, Suite 340, Bellevue, Washington 98005, U.S.A
<b>Product Name:</b>	Smart phone
<b>Model No.(EUT):</b>	m2467
<b>Trademark:</b>	Moxee
<b>Standards:</b>	ANSI C63.19-2019 ANSI/TIA-5050-2018 47CFR Part 20.19 KDB 285076 D01 v06r04 KDB 285076 D04 v02 KDB 285076 D05 v01
<b>Date of Receipt:</b>	2024/06/10
<b>Date of Test:</b>	2024/06/14 to 2024/07/01
<b>Date of Issue:</b>	2024/07/05
<b>Test conclusion:</b>	<b>PASS *</b>

\* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Document.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.



**SGS-CSTC Standards Technical Services Co., Ltd. Suzhou Branch**

Report No.: SUES240700100201

Page: 2 of 14

Revision Record			
Version	Description	Date	Remark
00	Original	2024-07-05	/

Authorized for issue by:			
Tested By		<i>Hainan Sun</i>	
		_____	
Approved By		<i>Nada Cao</i>	
		_____	
		<b>Hainan Sun/Project Engineer</b>	
		<b>Nada Cao/Reviewer</b>	

## 2 Test Summary of Minimum Conversational Gain

Mode	Band	Conv. Gain (dB)		Limit (dB)	Result
		2N	8N		
GSM	850	6.12	<b>12.13</b>	≥6	Pass
	1900	<b>6.07</b>	12.17		Pass
WCDMA	II	<b>6.36</b>	<b>12.45</b>		Pass
	IV	6.40	12.48		Pass
	V	7.03	12.88		Pass
LTE	2	<b>6.17</b>	<b>11.36</b>		Pass
	4	6.38	11.43		Pass
	5	6.59	11.59		Pass
	12	6.56	11.74		Pass
	13	6.64	11.88		Pass
	17	6.71	11.94		Pass
	25	6.82	11.99		Pass
	26	6.92	12.05		Pass
	30	7.03	12.10		Pass
	41	6.20	12.11		Pass
	48	6.32	12.26		Pass
	66	6.41	12.03		Pass
NR	71	6.49	12.05		Pass
	n2	6.59	<b>11.60</b>		Pass
	n5	<b>6.45</b>	11.75		Pass
	n25	6.49	11.86	Pass	
	n66	6.55	11.92	Pass	
	n41	6.61	12.05	Pass	
	n48	6.89	12.19	Pass	
	n71	7.11	12.32	Pass	
WLAN-2.4G	n77	7.35	12.35	Pass	
	802.11b	7.59	<b>11.75</b>	Pass	
	802.11g	7.58	11.85	Pass	
WLAN-5G	802.11n	<b>6.89</b>	12.03	Pass	
	802.11a	<b>7.12</b>	<b>12.18</b>	Pass	
	802.11ac	7.39	12.35	Pass	
<b>Minimum Conversational Gain</b>		<b>6.07</b>	<b>11.36</b>		Pass

### **3 Contents**

	<b>Page</b>
<b>1 Cover Page .....</b>	<b>1</b>
<b>2 Test Summary of Minimum Conversational Gain .....</b>	<b>3</b>
<b>3 Contents .....</b>	<b>4</b>
<b>4 General Information.....</b>	<b>5</b>
4.1 General Description of EUT.....	5
4.2 Air interfaces and Operation Mode. ....	6
4.3 Test Environment .....	6
4.4 Measurement Uncertainty .....	7
4.5 Test Location .....	7
4.6 Test Facility.....	7
<b>5 Equipment list.....</b>	<b>8</b>
<b>6 Volume Control Requirement.....</b>	<b>9</b>
<b>7 Measurement Procedure .....</b>	<b>11</b>
<b>8 System Description .....</b>	<b>13</b>
<b>9 Test Result.....</b>	<b>14</b>
<b>10 Test Setup Photo .....</b>	<b>14</b>
<b>11 EUT Constructional Details (EUT Photos).....</b>	<b>14</b>



**SGS-CSTC Standards Technical Services Co., Ltd. Suzhou Branch**

Report No.: SUES240700100201

Page: 5 of 14

**4 General Information**

**4.1 General Description of EUT**

IMEI:	1# 357916025680198/357916025680196		
Hardware Version:	J610_6835D4UFM10_G30U		
Software Version:	m2467_V01		
Antenna Type:	Integrated		
Frequency Bands:	Band	Tx (MHz)	Rx (MHz)
	GSM850	824 - 849	869 - 894
	GSM1900	1850 - 1910	1930 - 1990
	WCDMA Band II	1850 - 1910	1930 - 1990
	WCDMA Band IV	1710 - 1755	2110 - 2155
	WCDMA Band V	824 - 849	869 - 894
	LTE Band 2	1850 - 1910	1930 - 1990
	LTE Band 4	1710 - 1755	2110 - 2155
	LTE Band 5	824 - 849	869 - 894
	LTE Band 12	699 - 716	729 - 746
	LTE Band 13	777 - 787	746 - 756
	LTE Band 17	704 - 716	734 - 746
	LTE Band 25	1850 - 1915	1930 - 1995
	LTE Band 26	814 - 849	859 - 894
	LTE Band 30	2305 - 2315	2350 - 2360
	LTE Band 66	1710 - 1780	2110 - 2200
	LTE Band 71	663 - 698	617 - 652
	LTE Band 41	2496 - 2690	2496 - 2690
	LTE Band 48	3550 - 3700	3550 - 3700
	NR Band n2	1850 - 1910	1930 - 1990
	NR Band n5	824 - 849	869 - 894
	NR Band n25	1850 - 1915	1930 - 1995
	NR Band n66	1710 - 1780	2110 - 2200
	NR Band n41	2496 - 2690	2496 - 2690
	NR Band n48	3550 - 3700	3550 - 3700
	NR Band n71	663 - 698	617 - 652
	NR Band n77	3450-3550	3450-3550
		3700-3980	3700-3980
	Bluetooth	2400~2483.5	2400~2483.5
	Wi-Fi 2.4G	2412~2462	2412~2462
Wi-Fi 5G	5150~5250	5150~5250	
	5250~5350	5250~5350	
	5470~5725	5470~5725	
	5725~5850	5725~5850	

**4.2 Air interfaces and Operation Mode.**

Air Interface	Type	ANSI C63.19 Tested	Simultaneous Transmitter	Name of Voice Service	Power Reduction
GSM	VO	Yes	BT, WLAN	CMRS Voice	NO
EDGE	VD	Yes		Google Meet*	NO
WCDMA	VO	Yes		CMRS Voice	NO
HSPA	VD	Yes		Google Meet*	NO
LTE	VD	Yes		VoLTE	NO
				Google Meet*	NO
5G NR	VD	Yes		VoNR	NO
				Google Meet*	NO
WLAN	VD	Yes	WWAN	Google Meet*	NO

Transport Type:  
 VO: Legacy Cellular Voice Service  
 DT: Digital Transport (no voice)  
 VD: IP Voice Service over Digital Transport

- Note:
- a) \*For protocols not listed in Table 6.1 of ANSI C63.19, the average speech level of -20 dBm0 should be used.
  - b) Per KDB 285076 D05, Wavier DA 23-914 only requires conversational gain compliance for CMRS narrowband and CMRS wideband voice codecs as started below. All other codecs either part of 3GPP set such as full-band and super-wideband codecs or OTT codecs are to be documented in the test report but not required to comply with the ANSI/TIA 5050 Volume Control Standard
  - c) The device has similar frequency in some LTE bands: LTE B2/25, LTE B4/66, LTE B5/26, LTE B12/17 since the supported frequency spans for the narrower LTE bands are completely cover by the wider LTE bands, therefore, only wider LTE bands were required to be tested for hearing-aid compliance.
  - d) The test channel is middle channel of each operation band.

**EUT support Codec for Volume control test**

Air interface	Audio Codec Evaluated
GSM	HR V1, FR V1, FR V2
WCDMA	AMR-NB,AMR-WB
LTE	AMR-NB,AMR-WB,EVS-NB,EVS-WB
NR	AMR-NB,AMR-WB,EVS-NB,EVS-WB
WLAN	AMR-NB,AMR-WB,EVS-NB,EVS-WB

Codec /Birate					
NB AMR	WB AMR		EVS NB	EVS WB	
4.75 Kbps	6.60Kbps	18.25Kbps	5.9Kbps	5.9 Kbps	24.4Kbps
5.15Kbps	8.85Kbps	19.85Kbps	7.2Kbps	7.2Kbps	32Kbps
5.90Kbps	12.65Kbps	23.05Kbps	8.0Kbps	8.0Kbps	48Kbps
6.60Kbps	14.25Kbps	23.85Kbps	9.6Kbps	9.6Kbps	64Kbps
7.40 Kbps	15.85Kbps		13.2Kbps	13.2Kbps	96Kbps
7.95Kbps			16.4Kbps	16.4Kbps	128Kbps
10.20Kbps			24.4Kbps		
12.20Kbps					

**4.3 Test Environment**

Temperature	Relative humidity
Relative humidity	54%
Atmospheric pressure	101.7kPa
Background Noise	15dB

#### 4.4 Measurement Uncertainty

For ANSI/TIA-5050 testing, the EUT was linked and controlled by base station emulator. Communication between the EUT and the emulator was established by coaxial connection. The EUT was set from the emulator to radiate maximum output power during testing. Also EUT was set to backlight off during testing.

Test Item	Uncertainty
Receiving volume control	1.7dB
Receiving distortion and noise	1.7dB
Receiving frequency response	1.7dB

Note:

- All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor  $k=2$ .
- Depends on the microphone calibration. The value is valid if calibration is carried out with recommended pistonphone/calibrator in the HMS II.3 manual.
- Time and frequency accuracies of labCORE determined by the internal clock accuracy. The time and frequency resolution and accuracy may change due to analysis of the digital signals in ACQUA or if an external clock is applied.

#### 4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Suzhou Branch  
No. 10, Weiye Road, Kunshan Development Zone, Suzhou, Jiangsu, China

No tests were sub-contracted.

Note:

- SGS is not responsible for wrong test results due to incorrect information (e.g., max. internal working frequency, antenna gain, cable loss, etc) is provided by the applicant. (If applicable).
- SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (If applicable).
- Sample(s) provided by customer.

#### 4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **A2LA**

SGS-CSTC Standards Technical Services Co., Ltd. Suzhou Branch is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 6706.01.

• **FCC**

SGS-CSTC Standards Technical Services Co., Ltd. Suzhou Branch has been recognized by FCC as an accredited testing laboratory. Designation Number: CN1387.

• **ISED**

SGS-CSTC Standards Technical Services Co., Ltd. Suzhou Branch has been recognized by ISED as an accredited testing laboratory. Company Number: 32368

## 5 Equipment list

Equipment	Model	Equipment No.	Cal Data	Cal Due Data
Microphone	46AE	KSES307108	2024-06-13	2025-06-14
Sound calibrator	GRAS 42AG	KSES304302a	2024-06-13	2025-06-14
HEAD Measurement System	HMS II.3-LN	KSES330101	/	/
Multi-channel audio Analyzer	Labcore	KSES304303	2024-06-13	2025-06-14
Radio communication tester	CMW 500	SUWI-01-16-05	2024-02-02	2025-02-03
Radio communication tester	CMX 500	SUWI-01-56-02	2024-01-30	2025-01-31
Acoustic Chamber	/	KSES330801	2023-02-05	2025-02-06



## 6 Volume Control Requirement

### Conversational Gain

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

### Receive Distortion and Noise Performance:

With a mounting force of 8N and 2N, the ratio of the stimulus signal power to the 100Hz to 8000Hz total A-weighted distortion and noise power shall  $\geq 20$ 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 400Hz to 3150Hz.
- b) Wideband transmission mode: Each 1/3 octave band center frequency from 250Hz to 5000Hz.
- c) Per K 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:

- a) For the volume control settings determined in ANSI/TIA-5050 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:

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

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

- b) For Narrowband: The 1/12 octave band frequency response after translation to the FF shall fall between the upper and lower limits (Arbitrary level) given the Table 1.
- c) For wideband: The 1/12 octave band frequency response after translation to the FF shall fall between the upper and lower limits (Arbitrary level) given the Table 2.

Table 1 – Narrowband Receive Frequency Response Limits

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

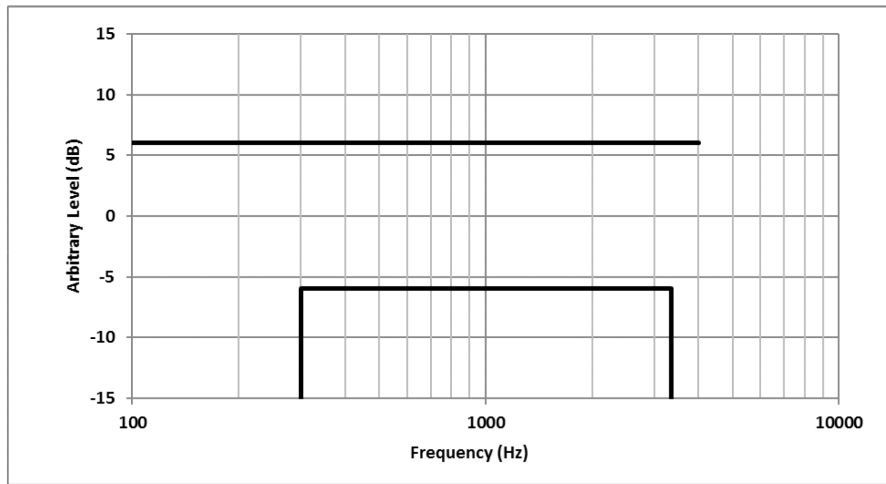


Figure 2 – Narrowband Receive Frequency Response Limits

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

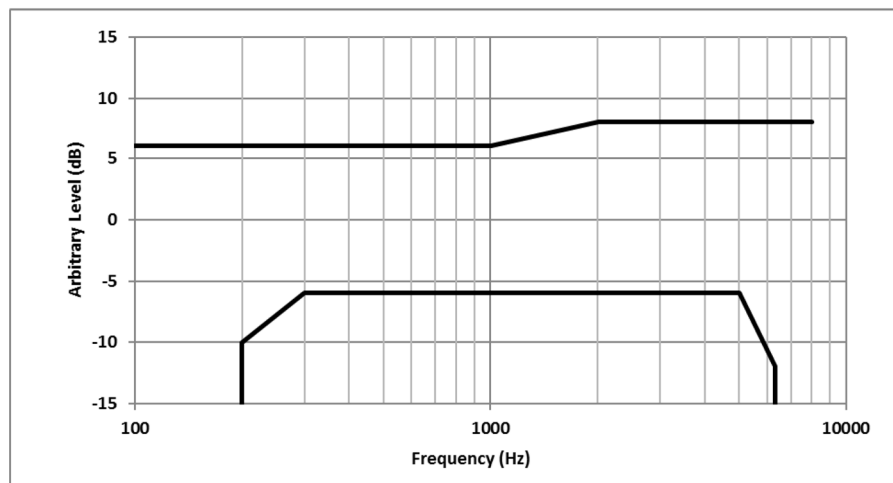


Figure 3 – Wideband Receive Frequency Response Limits

## 7 Measurement Procedure

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

### Conversational Gain

- a) Configure the DUT with a mounting force of 8N and test equipment as shown in section 4 in an active call state with the applicable codec for the transmission mode under test.
- b) Set the DUT volume control to the maximum setting.
- c) 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.
- d) The ACQUA system is apply the real speech test signal at a level of -20dBm0 at the RETP and measure the acoustic output at the Drum Reference Point (DRP) over one complete sequence of the test signal.
- e) Translate the measurement made at DRP to Free Filed (FF) using the translation data in ANSI/TIA-5050 AnnexB.
- f) Over the applicable frequency band, determine the ASL in SPL for the resulting sound pressure level in accordance with Method B of ITU-T Recommendation P.56,  
Narrowband 100Hz through 4000 Hz  
Wideband 100Hz through 7720 Hz  
Calculate the Conversational Gain by subtracting 70 from the measured dBSPL.  
[Conversational Gain = (Measured dBSPL Level – 70dBSPL) dB]
- g) Measure output distortion per ANSI/TIA-5050 clause 5.2. If a distortion failure occurs at the maximum volume control setting. reduce the volume control setting and repeat the measurement to determine if a setting can be found for which the conversational gain requirement is met without a distorton failure.
- h) Repeat steps 2-8 with a mounting force of 2N.

### Receive Distortion and Noise Performance:

- a) 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.
- b) Receive distortion and noise is measured using the PN-SDNR procedure.
- c) To ensure DUT activation, apply the real speech test signal at a level of -20 dBm0 followed immediately by the initial 1/3 octave center frequency PN test signal based on the narrowband or wideband operating mode. Measure the acoustic output at the DRP over the complete sequence of the PN test signal.
- d) Translate the measurement made at DRP to the FF.
- e) Calculate the acoustic out unweighted test signal power of the stimulus measurement band.
- f) Calculate the notched A-weighting distortion and noise components.
- g) Calculate the ratio of signal power to the total A-weighted distortion and noise power ad follow:  

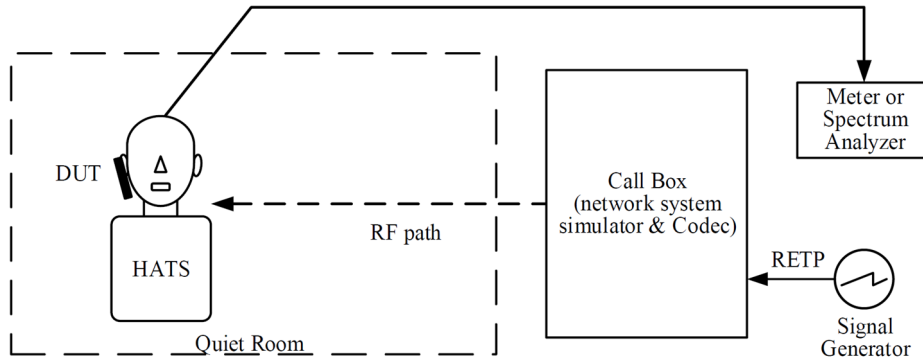
$$PN-SDNR (dB) = 20 * \text{Log} \left[ \frac{\text{measured stimulus amplitude}}{\text{measured distortion amplitude}} \right]$$
- h) Repeat for each of the remaining 1/3 octave center frequencies based on the narrowband or wideband operating mode.
- i) Repeat steps 2-8 with a mounting force of 2N.

- j) The measured value that the system equipment will automatically calculate or converts to define whether it meets the requirements of ANSI/TIA-5050.

**Receive Acoustic Frequency Response Performance:**

- a) 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.
- b) If the DUT has an adjustable tone control feature the initial measurement is to be performed with the default tone control setting.
- c) Apply the real speech test signal with a level of -20 dBm<sub>0</sub> at the RETP.
- d) 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.
- e) Transform the DRP frequency spectrum measurement to the FF.
- f) 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 (Pa/V).
- g) Apply the applicable frequency response limits to determine compliance.
- h) 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.
- i) Repeat with a mounting force of 2N.
- j) The receive acoustic frequency response performance was performed at max tone control setting.

## 8 System Description



Above is the measurement set-up diagram, and the sequence of the measurement is Volume Control testing procedure over a wireless communication device:

- In order to satisfy the quiet room condition below 40 dBA background noise according to TIA-5050 standard, HATS and DUT were placed in Acoustic Chamber and the noise level was checked using Sound Level Meter 46AE.
- labCORE equipment is used for signal generator and meter. This equipment directly provided operating voltage for HATS's microphone and -20 dBm0 sound source to Call Box RETP Point.
- CMW500 Call box was used for GSM, WCDMA, LTE and WIFI call tests, where the audio input level was set to 1.572 V so that the signal source level supplied from labCORE to RETP matched -20 dBm0. When testing NR calls using CMX500 Call box.
- Handset Position, in all tests, handset was placed at the standard test position of IEEE std 269.



## **SGS-CSTC Standards Technical Services Co., Ltd. Suzhou Branch**

Report No.: SUES240700100201

Page: 14 of 14

### **9 Test Result**

Refer to Appendix A - Volume Control Test Data and Plots.

### **10 Test Setup Photo**

Refer to Appendix - Test Setup Photo

### **11 EUT Constructional Details (EUT Photos)**

Refer to Appendix - Photographs of EUT Constructional Details

**--- End of the Report ---**