

FCC 15.407 U-NII 5GHz Test Report

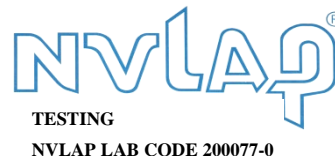
for

LG Electronics Inc.

**222, LG-ro, Jinwi-myeon Pyeongtaek-Si, Gyeonggi-Do,
17709 Republic of Korea**

Product Name : Notebook Computer
Model Name : (1)16Z90TS (2)16ZD90TS
(3)16ZG90TS (4)16ZB90TS
Brand : LG
FCC ID : BEJ-16Z90TS

**Prepared by: : AUDIX Technology Corporation,
EMC Department**



The test report is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

TABLE OF CONTENTS

Description	Page
TEST REPORT.....	4
1. REVISION RECORD OF TEST REPORT	5
2. SUMMARY OF TEST RESULTS	6
3. GENERAL INFORMATION	7
3.1. Description of Application	7
3.2. Description of EUT	8
3.3. Reference Test Guidance.....	9
3.4. Antenna Information	9
3.5. EUT Specifications Assessed in Current Report	10
3.6. Description of Key Components	12
3.7. Test Configuration.....	14
3.8. Output Power Setting	20
3.9. Tested Supporting System List.....	21
3.10. Setup Configuration.....	22
3.11. Operating Condition of EUT	22
3.12. Description of Test Facility	22
3.13. Measurement Uncertainty	23
4. MEASUREMENT EQUIPMENT LIST.....	24
4.1. Conducted Emission Measurement	24
4.2. Radiated Emission Measurement	24
4.3. RF Conducted Measurement	25
5. CONDUCTED EMISSION.....	26
5.1. Block Diagram of Test Setup	26
5.2. Conducted Emission Limit	26
5.3. Test Procedure	26
5.4. Test Results	26
6. RADIATED EMISSION	27
6.1. Block Diagram of Test Setup	27
6.2. Radiated Emission Limits.....	28
6.3. Test Procedure	31
6.4. Measurement Result Explanation.....	33
6.5. Test Results	33
7. EMISSION/OCCUPIED BANDWIDTH.....	34
7.1. Block Diagram of Test Setup	34
7.2. Specification Limits.....	34
7.3. Test Procedure	34
7.4. Test Results	35
8. MAXIMUM OUTPUT POWER	36
8.1. Block Diagram of Test Setup	36
8.2. Specification Limits.....	36
8.3. Test Procedure	37
8.4. Test Results	37
9. POWER SPECTRAL DENSITY	38
9.1. Block Diagram of Test Setup	38

Audix Technology Corp.
No. 491, Zhongfu Rd., Linkou Dist.,
New Taipei City 244, Taiwan

Tel: +886 2 26099301
Fax: +886 2 26099303

9.2. Specification Limits.....	38
9.3. Test Procedure	38
9.4. Test Results	38
10. FREQUENCY STABILITY	39
10.1. Block Diagram of Test Setup	39
10.2. Specification Limits.....	39
10.3. Test Procedure	39
10.4. Test Results	39
11. DEVIATION TO TEST SPECIFICATIONS	40

APPENDIX A TEST DATA AND PLOTS
APPENDIX B TESTPHOTOGRAPHS

TEST REPORT

Applicant : LG Electronics Inc.
Manufacturer : LG Electronics Inc.
Factory : LG Electronics Nanjing New Technology Co., Ltd.
EUT Description
(1) Product : Notebook Computer
(2) Model : (1)16Z90TS (2)16ZD90TS (3)16ZG90TS (4)16ZB90TS
(3) Brand : LG
(4) Power Supply: DC 20V, 3.25A

Applicable Standards:

Title 47 FCC CFR Part 15 Subpart E

Audix Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Audix Technology Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

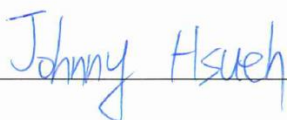
Date of Report: 2024. 09. 02

Reviewed by:



(Annie Yu/Supervisor)

Approved by:



(Johnny Hsueh/Section Manager)

1. REVISION RECORD OF TEST REPORT

Edition No	Issued Date	Revision Summary	Report Number
0	2024. 09. 02	Original Report	EM-F240374

2. SUMMARY OF TEST RESULTS

Rule	Description	Results
15.207	Conducted Emission	PASS
15.205/15.209	Undesirable Emissions Limits: Radiated Band Edge and Radiated Spurious Emission	PASS
15.407(a)(5)/15.407(e)	Emission/Occupied Bandwidth	PASS
15.407(a)	Maximum Output Power	PASS
15.407(b)	Conducted Band Edges	N/A
15.407(a)	Power Spectral Density	PASS
15.407	Frequency Stability	PASS
15.407(h)(2)	Dynamic Frequency Selection(DFS)	PASS, Please refer to test report No. EM-F240353
15.203	Antenna Requirement	Compliance

Note: The uncertainties value is not used in determining the result.

3. GENERAL INFORMATION

3.1. Description of Application

Applicant	LG Electronics Inc. 222, LG-ro, Jinwi-myeon Pyeongtaek-Si, Gyeonggi-Do, 17709 Republic of Korea
Manufacturer	LG Electronics Inc. 222, LG-ro, Jinwi-myeon Pyeongtaek-Si, Gyeonggi-Do, 17709 Republic of Korea
Factory	LG Electronics Nanjing New Technology Co., Ltd. No.346, Yaoxin Road, Economic & Technical Development Zone, Nanjing, China.
Product	Notebook Computer
Model	(1)16Z90TS (2)16ZD90TS (3)16ZG90TS (4)16ZB90TS The difference between all models is different in the sales customers and color difference.
Brand	LG

3.2. Description of EUT

Test Model	16Z90TS		
Serial Number	N/A		
Power Rating	DC 20V, 3.25A		
Software Version	XY (X, Y can be 0 to 9 for different SW version not influence RF parameter)		
RF Features	WLAN:802.11 a/b/g/n/ac/ax/be Bluetooth: BT and BLE (BT 5.3)		
Transmit Type	2.4 GHz		
	802.11b		1T1R
	802.11g		1T1R
	802.11n-HT20/40		2T2R
	802.11ax-HE20/40		2T2R
	802.11be-EHT20/40		2T2R
	BT/BLE		1T1R
	U-NII Bands		
	802.11a		1T1R
	802.11n-HT20/40		2T2R
	802.11ac-VHT20/40/80/160		2T2R
	802.11ax-HE20/40/80/160		2T2R
	802.11be-EHT20/40/80/160		2T2R
	WLAN 6E Bands		
	802.11ax-HE20/40/80/160		2T2R
802.11be-EHT20/40/80/160/320		2T2R	
The MIMO is uncorrelated and supported SDM(Spatial Division Multiplexing) mode only. This radio device doesn't support beamforming and Cyclic Delay Diversity (CDD).			
Device Category	<input type="checkbox"/> Outdoor Access Point <input type="checkbox"/> Fixed point-to-point Access Point <input type="checkbox"/> Indoor Access Point <input checked="" type="checkbox"/> Mobile and Portable client device		
Test Sample	Sample No.	Test Item	Firmware
	01	AC Conduction, RSE, RF Conducted	N/A
Sample Status	2024. 06. 26		
Date of Receipt	2024. 07. 02 ~ 08. 27		
Date of Test	<ul style="list-style-type: none"> • One HDMI Port • Two USB Type C Ports • One Earphone Port • Two USB 3.0 Ports 		
Interface Ports of EUT	<ul style="list-style-type: none"> • AC Adapter • USB C Cable • LAN Gender 		

3.3. Reference Test Guidance

KDB 789033 D02 General UNII Test Procedures New Rules v02r01
 KDB 291074 D02 EMC Measurement v01
 ANSI C63.10:2013

3.4. Antenna Information

No.	Antenna Part Number	Manufacturer	Antenna Type	Frequency (MHz)	Max Gain(dBi)		Directional Gain
					Aux	Main	
1.	WA-P-LALB-04-011	INPAQ	Mono-Pole	2400-2500	2.0	2.1	2.05
				5150-5895	0.1	2.1	1.21
				5925-7125	3.6	3.3	3.45
According to KDB 662911 D01 d) ii), transmit signals are completely uncorrelated, then Directional gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10})/N_{ANT}]$ dBi Note 1. 2400-2500MHz Directional gain = $10 \log[(10^{2.0/10} + 10^{2.1/10})/2] = 2.05$ dBi Note 2. 5150-5895MHz Directional gain = $10 \log[(10^{0.1/10} + 10^{2.1/10})/2] = 1.21$ dBi Note 3. 5925-7125MHz Directional gain = $10 \log[(10^{3.6/10} + 10^{3.3/10})/2] = 3.45$ dBi							

3.5. EUT Specifications Assessed in Current Report

Mode	U-NII Band	Fundamental Range (MHz)	Channel Number
802.11a	4	5845-5885	3
802.11n-HT20/ 802.11ac-VHT20 802.11ax-HE20 802.11be-EHT20	4	5845-5885	3
802.11n-HT40/ 802.11ac-VHT40 802.11ax-HE40 802.11be-EHT40	4	5845-5885	2
802.11ac-VHT80 802.11ax-HE80 802.11be-EHT80	4	5855	1
802.11ac-VHT160 802.11ax-HE160 802.11be-EHT160	4	5815	1

Mode	Modulation	Data Rate (Mbps)
802.11a	OFDM (BPSK/QPSK/16QAM/64QAM)	Up to 54
802.11n-HT20	OFDM (BPSK/QPSK/16QAM/64QAM)	Up to 144.4
802.11n-HT40		Up to 300
802.11ac-VHT20	OFDM (BPSK/QPSK/16QAM/64QAM/256QAM)	Up to 173.3
802.11ac-VHT40		Up to 400
802.11ac-VHT80		Up to 866.7
802.11ac-VHT160		Up to 1733.3
802.11ax-HE20	OFDMA (BPSK/ QPSK/ 16QAM/ 64QAM/ 256QAM/1024QAM)	Up to 287
802.11ax-HE40		Up to 574
802.11ax-HE80		Up to 1201
802.11ax-HE160		Up to 2402
802.11be-EHT20	OFDMA (BPSK/ QPSK/ 16QAM/ 64QAM/ 256QAM/1024QAM/4096QAM)	Up to 344
802.11be-EHT40		Up to 688
802.11be-EHT80		Up to 1441
802.11be-EHT160		Up to 2882

Channel List					
802.11a/802.11n-HT20/802.11ac-VHT20/ 802.11ax-HE20/802.11be-EHT20			802.11n-HT40/802.11ac-VHT40/ 802.11ax-HE40/802.11be-EHT40		
U-NII Band	Channel Number	Frequency (MHz)	U-NII Band	Channel Number	Frequency (MHz)
4	169	5845	4	167	5835
	173	5865		175	5875
	177	5885			

Channel List					
802.11ac-VHT80/802.11ax-HE80/ 802.11be-EHT80			802.11ac-VHT160/802.11ax-HE160/ 802.11be-EHT80		
U-NII Band	Channel Number	Frequency (MHz)	U-NII Band	Channel Number	Frequency (MHz)
4	171	5855	4	163	5815

Note: Test modes are presented at section 3.7.

3.6. Description of Key Components

3.6.1. For the All Component Lists

Item	Supplier	Model / Type	Character	
System	Microsoft	Win10 Home / Pro	---	
		Win11 Home / Pro		
Main Board	LG	16Z90TS MAIN B/D PCB	Manufacturer: #1 Hannstar Board Tech (Jiang Yin) Corp.,Ltd. #2 Elec&Eltek Company (MCO) Limited.	
SUB Board	LG	16Z90TS/TP SUB B/D	Manufacturer: #1 HannstarBoardTech(Jiang Yin)Corp.,Ltd. #2 JiangSuHuaShen Electronic co.,ltd (HXF) #3 Elec&Eltek Company (MCO) Limited.	
CPU (Socket: BGA2833)	Intel	Ultra 9 288V (RAM 32GB)	3.3GHz(RAM 32GBLPDDR5x on CPU RAM)	
	Intel	Ultra 7 258V (RAM 32GB)	2.2GHz(RAM 32GB LPDDR5x on CPU RAM)	
	Intel	Ultra 7 256V (RAM 16GB)	2.2GHz(RAM 16GB LPDDR5x on CPU RAM)	
	Intel	Ultra 5 226V (RAM 16GB)	2.1GHz(RAM 16GB LPDDR5x on CPU RAM)	
16" LCD Panel	LG Display	LP160WQ2	Resolution: 2560 x 1600, 144Hz	
Storage (SSD)	SAMSUNG	---	1TB/512GB/256GB	
	SK hynix	---	1TB/512GB/256GB	
Battery Pack	LG	LB3122MM	77Wh, DC 15.52V, 4963mAh	
WLAN Combo Card	Intel	BE201D2W	WLAN and BT, 2x2 PCIe M.2 1216-soldered down module FCC ID: PD9BE201D2 IC: 1000M-BE201D2	
WLAN Combo Antenna	LG (INPAQ)	WA-P-LBLB-04-111	PCB, Mono-pole Type Main: Black, Aux: Gray	
Keyboard	TIC	22L2P	---	
		22L2Q	---	
		22L2R	---	
Touch Pad	LITE-ON	SP8B00B31(SG-A0660-00A)	---	
Web Camera	Luxvisions	ABG213N3A	---	
LAN Gender (Type C to LAN)	SUZHOU MEC ELECTRONICS	80-5946-111	(White) 10/100 Megabit Ethernet	
		80-5946-101	(Black) 10/100 Megabit Ethernet	
	ARIN TECH CO. LTD	GD-08MF-36-WH-LP10	(White) 10/100 Megabit Ethernet	
		GD-08MF-36-BK-LP11	(Black) 10/100 Megabit Ethernet	
	HUIZHOU DEHONG TECHNOLOGY CO.,LTD.	370-50713	(White) 10/100 Megabit Ethernet	
		370-50714	(Black) 10/100 Megabit Ethernet	
	Type C to LAN: Shielded, Undetached			
	ARIN TECH CO. LTD	GD-08MF-50-WH-LP12	(White) 10/100/1000 Megabit Ethernet	
		GD-08MF-50-BK-LP13	(Black) 10/100/1000 Megabit Ethernet	
	Type C to LAN: Shielded, Undetached, 0.12m			
AC Adapter	LG (PI ELECTRONICS)	LP65WFC20P-NJ	(B = Black),(W = White) I/P: AC 100-240V, 1.6A, 50-60Hz O/P:DC 5V,3A(15W) or DC 9V, 3A(27W)or DC 15V,3A (45W) or DC 20V,3.25A (65W) US Type,Wall-Mounted: (2C)	
			#1 Type C Cable (5A) #2 Type C Cable (3A)	

Remark: For more detailed features description, please refer to the manufacturer's specifications or the user manual.

3.6.2. The EUT collocates with following worst components, which are used to establish a basic configuration of system during test:

SKU (Mode)		1	
Main Board	LG, 16Z90TS MAIN B/D PCB	V	
SUB Board	LG, 16Z90TS/TP SUB B/D	V	
CPU	Intel, Ultra 9 288V (RAM 32GB)	V	
16" LCD Panel	LG Display, LP160WQ2	V	
Storage (SSD)	SK hynix, 1TB+256GB	V	
Battery Pack	LG, LB3122MM, 77Wh	V	
Keyboard	TIC, 22L2P	V	
Touch Pad	LITE-ON, SP8B00B31(SG-A0660-00A)	V	
Web Camera	Luxvisions, ABG213N3A	V	
WLAN Combo Card	Intel, BE201D2W	V	
WLAN Combo Antenna	LG (INPAQ), WA-P-LBLB-04-111	V	
Type C #1	AC Adapter	LG (PI ELECTRONICS), LP65WFC20P-NJ	V
Type C #2	Link to LAN Gender	ARIN (Black)	V

3.7. Test Configuration

Mode	TX _{on} (ms)	TX _{on+off} (ms)	Duty Cycle (x)	Duty Cycle Factor [10log(1/x)] (dB)
802.11a	2.090	2.140	0.977	0.101
802.11n-HT20	3.980	4.030	0.988	N/A
802.11n-HT40	3.980	4.030	0.988	N/A
802.11ac-VHT80	3.970	4.020	0.988	N/A
802.11ac-VHT160	2.790	2.840	0.982	N/A
802.11ax-HE20	3.980	4.030	0.988	N/A
802.11ax-HE40	3.980	4.030	0.988	N/A
802.11ax-HE80	3.980	4.030	0.988	N/A
802.11ax-HE160	2.310	2.360	0.979	0.092
802.11be-EHT20	3.990	4.030	0.990	N/A
802.11be-EHT40	3.990	4.040	0.988	N/A
802.11be-EHT80	3.990	4.040	0.988	N/A
802.11be-EHT160	3.990	4.040	0.988	N/A

Note: When duty cycle is less than 98% (0.98) that duty cycle factor 10log(1/x) is needed to add in conducted test items measured in average detector.

Mode	TX _{on} (ms)	T _{on} +T _{off} (ms)
802.11a	<p>Amkr1 2.090 ms 9.15 dB</p>	<p>Amkr1 2.140 ms -0.02 dB</p>
802.11n-HT20	<p>Amkr1 3.980 ms 10.37 dB</p>	<p>Amkr1 4.030 ms 0.13 dB</p>
802.11n-HT40	<p>Amkr1 3.980 ms 23.99 dB</p>	<p>Amkr1 4.030 ms 3.85 dB</p>
802.11ac-VHT80	<p>Amkr1 3.970 ms 32.31 dB</p>	<p>Amkr1 4.020 ms 4.64 dB</p>
802.11ac-VHT160	<p>Amkr1 2.790 ms 16.86 dB</p>	<p>Amkr1 2.840 ms 1.67 dB</p>

Mode	TX _{on} (ms)	T _{on} +T _{off} (ms)
802.11ax-HE20		
802.11ax-HE40		
802.11ax-HE80		
802.11ax-HE160		

Mode	TX _{on} (ms)	T _{on} +T _{off} (ms)
802.11be-EHT20		
802.11be-EHT40		
802.11be-EHT80		
802.11be-EHT160		

AC Conduction	
Normal operation	

Item	Mode	Data Rate	Test Channel	
Radiated Test Case	Radiated Spurious Emission (30MHz~1GHz)	802.11n-HT40	MCS8	167

Item	Mode	Data Rate	Test Channel	
Radiated Test Case	Radiated Band Edge Note1	802.11a	6 Mbps	177
		802.11n-HT20	MCS8	177
		802.11n-HT40	MCS8	175
		802.11ac-VHT80	MCS0	171
		802.11ac-VHT160	MCS0	163
		802.11ax-HE20	HE0	177
		802.11ax-HE40	HE0	175
		802.11ax-HE80	HE0	171
		802.11ax-HE160	HE0	163
		802.11be-EHT20	EHT0	177
		802.11be-EHT40	EHT0	175
		802.11be-EHT80	EHT0	171
	802.11be-EHT160	EHT0	163	
	Radiated Spurious Emission Note1 & 2	802.11a	6 Mbps	169
		802.11n-HT20	MCS8	169
		802.11n-HT40	MCS8	167
		802.11ac-VHT80	MCS0	171
		802.11ac-VHT160	MCS0	163
		802.11ax-HE20	HE0	169
		802.11ax-HE40	HE0	167
		802.11ax-HE80	HE0	171
		802.11ax-HE160	HE0	163
		802.11be-EHT20	EHT0	169
		802.11be-EHT40	EHT0	167
802.11be-EHT80		EHT0	171	
802.11be-EHT160	EHT0	163		

Item		Mode	Data Rate	Test Channel
Conducted Test Case	Emission/Occupied Bandwidth	802.11a	6 Mbps	169/173/177
		802.11n-HT20	MCS8	169/173/177
		802.11n-HT40	MCS8	167/175
		802.11ac-VHT80	MCS0	171
		802.11ac-VHT160	MCS0	163
		802.11ax-HE20	HE0	169/173/177
		802.11ax-HE40	HE0	167/175
		802.11ax-HE80	HE0	171
		802.11ax-HE160	HE0	163
		802.11be-EHT20	EHT0	169/173/177
		802.11be-EHT40	EHT0	167/175
		802.11be-EHT80	EHT0	171
		802.11be-EHT160	EHT0	163
		Maximum output power	802.11a	6 Mbps
	802.11n-HT20		MCS8	169/173/177
	802.11n-HT40		MCS8	167/175
	802.11ac-VHT80		MCS0	171
	802.11ac-VHT160		MCS0	163
	802.11ax-HE20		HE0	169/173/177
	802.11ax-HE40		HE0	167/175
	802.11ax-HE80		HE0	171
	802.11ax-HE160		HE0	163
	802.11be-EHT20		EHT0	169/173/177
	802.11be-EHT40		EHT0	167/175
	802.11be-EHT80		EHT0	171
	802.11be-EHT160		EHT0	163
	Power spectral density		802.11a	6 Mbps
		802.11n-HT20	MCS8	169/173/177
		802.11n-HT40	MCS8	167/175
		802.11ac-VHT80	MCS0	171
		802.11ac-VHT160	MCS0	163
		802.11ax-HE20	HE0	169/173/177
		802.11ax-HE40	HE0	167/175
		802.11ax-HE80	HE0	171
		802.11ax-HE160	HE0	163
		802.11be-EHT20	EHT0	169/173/177
802.11be-EHT40		EHT0	167/175	
802.11be-EHT80		EHT0	171	
802.11be-EHT160		EHT0	163	

Note 1: Mobile Device Portable Device
 and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow: Lie Side
 Stand

Note 2: Low, mid, and high channels were measured, only the worst channel of each modulation was presented in this report.

Note 3: The modulation and bandwidth are similar for 802.11n mode for HT20/HT40 and 802.11ac mode for VHT20/VHT40, therefore investigated worst case to representative mode in the test report.

Note 4: The data rates were selected based on preliminary testing that identified rate as the worst case for output power.

3.8. Output Power Setting

Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			AUX	Main
802.11a	4	5845	16.000	16.000
		5865	16.000	16.000
		5885	16.000	16.000

Mode	U-NII Band	Centre Frequency (MHz)	Power		Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			AUX	Main				AUX	Main
802.11n-HT20	4	5845	15.750	15.750	802.11ax-HE20	4	5845	15.750	15.750
		5865	15.750	15.750			5865	15.750	15.750
		5885	15.750	15.750			5885	15.750	15.750

Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			AUX	Main
802.11be-EHT20	4	5845	15.750	15.750
		5865	15.750	15.750
		5885	15.750	15.750

Mode	U-NII Band	Centre Frequency (MHz)	Power		Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			AUX	Main				AUX	Main
802.11n-HT40	4	5835	16.000	16.000	802.11ax-HE40	4	5835	16.000	16.000
		5875	16.000	16.000			5875	16.000	16.000

Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			AUX	Main
802.11be-EHT40	4	5835	16.000	16.000
		5875	16.000	16.000

Mode	U-NII Band	Centre Frequency (MHz)	Power		Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			AUX	Main				AUX	Main
802.11ac-VHT80	4	5855	16.000	16.000	802.11ax-HE80	4	5855	16.000	16.000

Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			AUX	Main
802.11be-EHT80	4	5855	16.000	16.000

Mode	U-NII Band	Centre Frequency (MHz)	Power		Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			AUX	Main				AUX	Main
802.11ac-VHT160	4	5815	16.000	16.000	802.11ax-HE160	4	5815	16.000	16.000

Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			AUX	Main
802.11be-EHT160	4	5815	16.000	16.000

3.9. Tested Supporting System List

3.9.1. Support Peripheral Unit

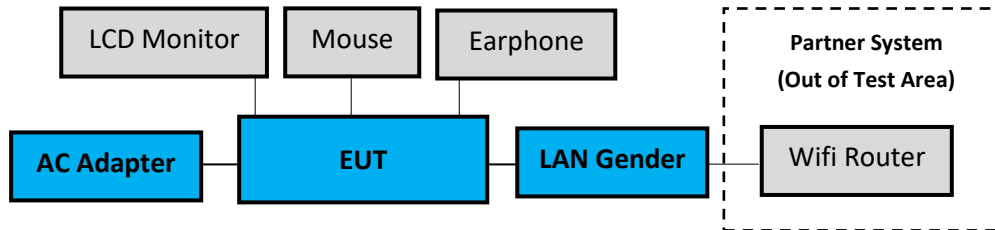
No.	Product	Brand	Model No.	Serial No.	Approval
1.	LCD Monitor	DELL	U2718Qb	CN-0M5R5F-QDC00-99P-04CL	N/A
2.	USB Mouse	Lenovo	SM-8823	8SSM50L24506AVLC99H049R	N/A
3.	Earphone	APPLE	N/A	N/A	N/A
Partner System					
4.	WiFi Router	ASUS	RT-BE96U	RBIG6G200822ZT7	FCC ID: MSQ-RTBE6x00

3.9.2. Cable Lists

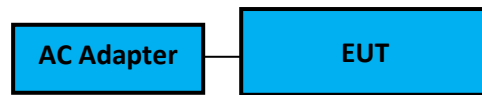
No.	Cable Description Of The Above Support Units
1.	HDMI Cable: Shielded, Detachable, 1.8m AC Power Cord: Unshielded, Detachable, 1.8m
2.	USB Cable: Unshielded, Undetachable, 1.8 m
3.	Earphone Cable: Unshielded, Undetachable, 1.2m
4.	AC adapter: M/N: ADD011, DC Power Cable: Unshielded, Detachable, 1.8m, Bonded two ferrite cores AC Power Cord: Unshielded, Detachable, 1.1m LAN cable: Unshielded, Detachable, 3.0m
5.	LAN cable: Unshielded, Detachable, 1.8m

3.10. Setup Configuration

3.10.1. EUT Configuration for Power Line & Radiated Emission



3.10.2. EUT Configuration for RF Conducted Test Items



3.11. Operating Condition of EUT

Test program “DRTU” is used for enabling EUT WLAN function under continues transmitting and choosing data rate/ channel.

[ANT AUX port (A Button in DRTU) and ANT Main port (B Button in DRTU)].

3.12. Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 491, Zhongfu Rd., Linkou Dist., New Taipei City 244, Taiwan Tel: +886-2-26092133 Fax: +886-2-26099303 Website : www.audixtech.com Contact e-mail: attemc_report@audixtech.com
Accreditations	The laboratory is accredited by following organizations under ISO/IEC 17025:2017 (1) NVLAP(USA) NVLAP Lab Code 200077-0 (2) TAF(Taiwan) No. 1724
Test Facilities	FCC OET Designation Number under APEC MRA by NCC is : TW1724 ISED CAB Identifier Number under APEC TEL MRA by NCC is TW1724 (1) No.8 Shielded Room (2) No.1 3m Semi Anechoic Chamber

3.13. Measurement Uncertainty

The measurement uncertainty levels have been estimated as specified in ETSI TR 100 028-2001

Test Items/Facilities		Frequency Range	Uncertainty
Conduction Test	<input type="checkbox"/>	No. 7 Shielded Room	9kHz-150kHz ±3.6dB
			150kHz-30MHz ±3.3dB
	<input checked="" type="checkbox"/>	No. 8 Shielded Room	9kHz-150kHz ±3.7dB
			150kHz-30MHz ±3.4dB
Radiation Test	<input checked="" type="checkbox"/>	No.1 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal ±3.8dB
			200MHz-1000MHz, 3m, Horizontal ±4.2dB
			30MHz-200MHz, 3m, Vertical ±4.7dB
			200MHz-1000MHz, 3m, Vertical ±4.8dB
			1GHz-6GHz, 3m ±4.8dB
			6GHz-18GHz, 3m ±4.3dB
	<input type="checkbox"/>	No.3 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal ±3.9dB
			200MHz-1000MHz, 3m, Horizontal ±4.2dB
			30MHz-200MHz, 3m, Vertical ±4.7dB
			200MHz-1000MHz, 3m, Vertical ±4.8dB
			1GHz-6GHz, 3m ±4.5dB
			6GHz-18GHz, 3m ±4.0dB
	<input type="checkbox"/>	No.4 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal ±3.9dB
			200MHz-1000MHz, 3m, Horizontal ±4.3dB
			30MHz-200MHz, 3m, Vertical ±4.8dB
			200MHz-1000MHz, 3m, Vertical ±4.9dB
			1GHz-6GHz, 3m ±4.2dB
			6GHz-18GHz, 3m ±3.8dB
	<input type="checkbox"/>	No.5 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal ±3.9dB
			200MHz-1000MHz, 3m, Horizontal ±4.1dB
			30MHz-200MHz, 3m, Vertical ±4.8dB
			200MHz-1000MHz, 3m, Vertical ±4.7dB
			1GHz-6GHz, 3m ±4.8dB
			6GHz-18GHz, 3m ±4.6dB
Radiated emissions (18GHz-40GHz)		18GHz-40GHz, 3m	±3.4dB

Remark : Uncertainty = $ku_c(y)$

Test Items	Uncertainty
Bandwidth	± 0.2kHz
Maximum output power	± 0.33dB
Power spectral density	± 0.13dB

4. MEASUREMENT EQUIPMENT LIST

4.1. Conducted Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Test Receiver	R&S	ESR3	101774	2024.01.09	1 Year
2.	A.M.N.	R&S	ENV4200	100169	2023.11.13	1 Year
3.	FOUR-LINE V-NETWORK	R&S	ENV432	101567	2024.06.07	1 Year
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2023.12.09	1 Year
5.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.8 S/R	2024.04.11	1 Year
6.	Coaxial Cable	Yeida	RG/58AU	CE-08	2023.09.06	1 Year
7.	Test Software	Audix	e3	V9 18621a	N.C.R.	N.C.R.

4.2. Radiated Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2024.08.12	1 Year
2.	Spectrum Analyzer	Agilent	N9010A-526	MY48031076	2024.08.23	1 Year
3.	Test Receiver	R&S	ESCS30	100338	2024.06.18	1 Year
4.	Amplifier	EMCI	EMC9145	980751	2024.07.09	1 Year
5.	Amplifier	HP	8447D	2944A06305	2023.12.20	1 Year
6.	Microwave Preamplifier	HP	8449B	3008A01284	2024.06.11	1 Year
7.	Microwave Amplifier	Keysight	83051A	MY56480113	2023.09.11	1 Year
8.	Loop antenna	Electro-Metrics	EMCI-LPA600	287	2024.07.31	1 Year
9.	Bilog Antenna	TESEQ	CBL6112D	33821	2024.02.17	1 Year
10.	Double-Ridged Waveguide Horn	EMCO	3115	9112-3775	2024.04.30	1 Year
11.	Horn Antenna	COM-POWER	AH-840	101092	2024.01.12	1 Year
12.	5G Notch Filter	Microwave Circuits	N0257881	459776	2022.08.10	1 Year
13.	Coaxial Cable	MIYAZAKI	5D2W	RE-11	2024.01.05	1 Year
14.	Coaxial Cable	HUBER+SUHNER	RG223/U	RE-33	2024.03.01	1 Year
15.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 106	RE-14	2024.01.05	1 Year
16.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.1 3m A/C	2024.04.11	1 Year
17.	Test Software	Audix	e3	V9 18621a	N.C.R.	N.C.R.

4.3. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Keysight	N9010B	MY59071380	2024.03.29	1 Year
2.	Power Meter	Anritsu	ML2495A	2127005	2023.11.21	1 Year
2.	Power Meter	Anritsu	ML2495A	2127004	2023.11.30	1 Year
3.	Power Sensor	Anritsu	MA2411B	1911360	2023.11.29	1 Year
4.	Power Sensor	Anritsu	MA2411B	1911356	2023.11.21	1 Year
5.	Digital Thermo-Hygro Meter	iMax	HTC-1	RF-03	2024.04.11	1 Year

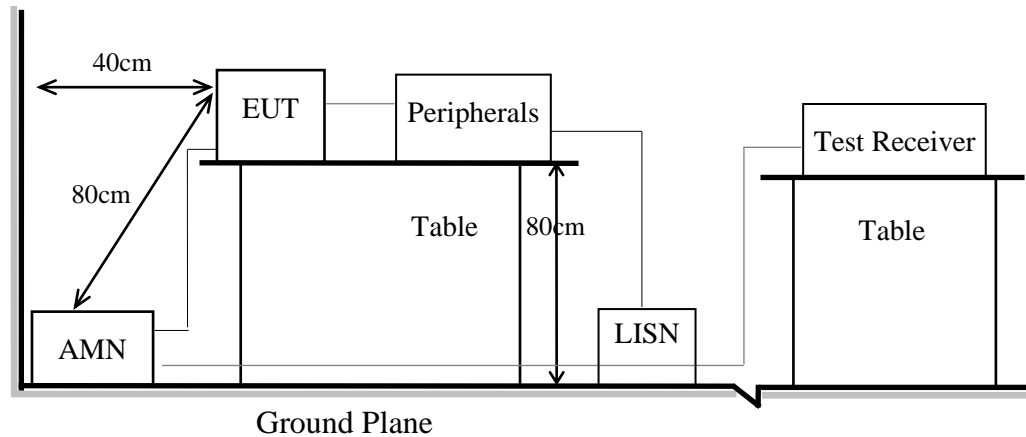
5. CONDUCTED EMISSION

5.1. Block Diagram of Test Setup

5.1.1. Block Diagram of EUT

Indicated as section 3.10

5.1.2. Shielded Room Setup Diagram



5.2. Conducted Emission Limit

Frequency	Conducted Limit	
	Quasi-Peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 dB μ V	56 ~ 46 dB μ V
500kHz ~ 5MHz	56 dB μ V	46 dB μ V
5MHz ~ 30MHz	60 dB μ V	50 dB μ V

Remark1.: If the average limit is met when using a Quasi-Peak detector, the measurement using the average detector is not required.

2.: The lower limit applies to the band edges.

5.3. Test Procedure

- 5.3.1. To set up the EUT as indicated in ANSI C63.10. The EUT was placed on the table which has 80 cm height to the ground and 40 cm distance to the conducting wall.
- 5.3.2. Power supplier of the EUT was connected to the AC mains through an Artificial Mains Network (A.M.N.).
- 5.3.3. The AC power supplies to all peripheral devices must be provided through line impedance stabilization network (L.I.S.N.)
- 5.3.4. Checking frequency range from 150kHz to 30 MHz and record the emission which does not have 20 dB below limit.

5.4. Test Results

Please refer to Appendix A.

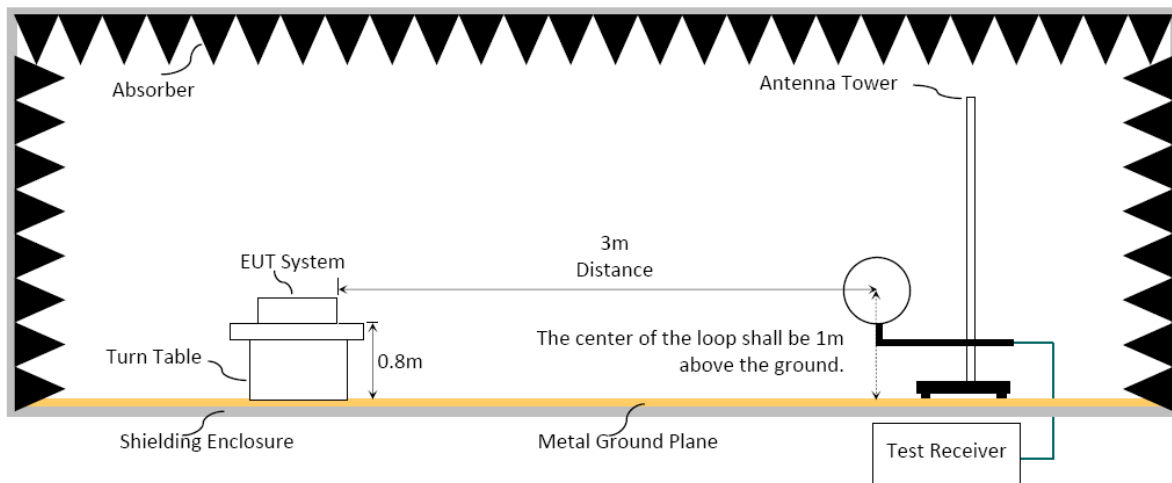
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

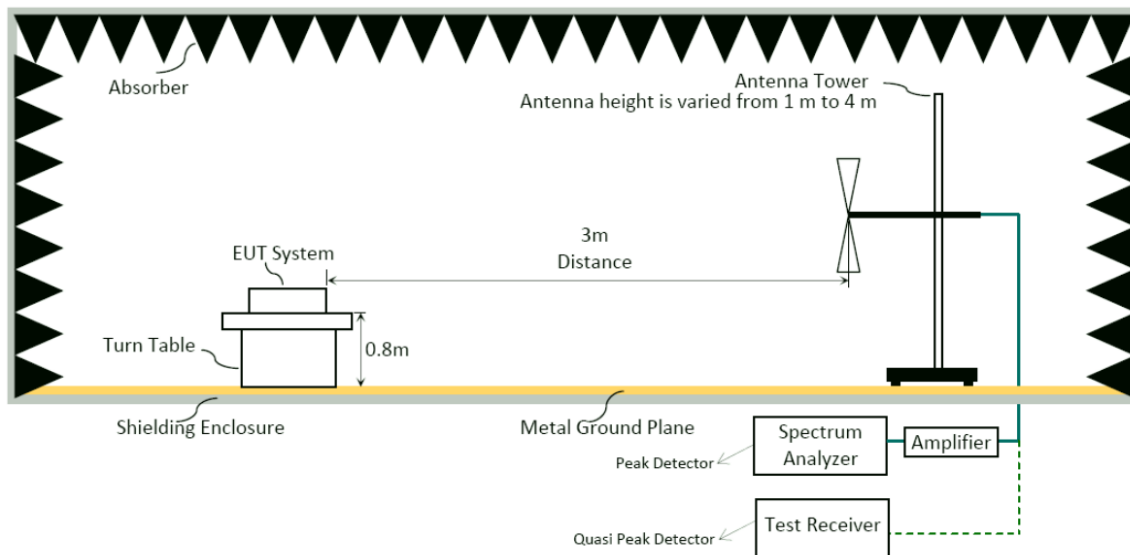
6.1.1. Block Diagram of EUT

Indicated as section 3.10

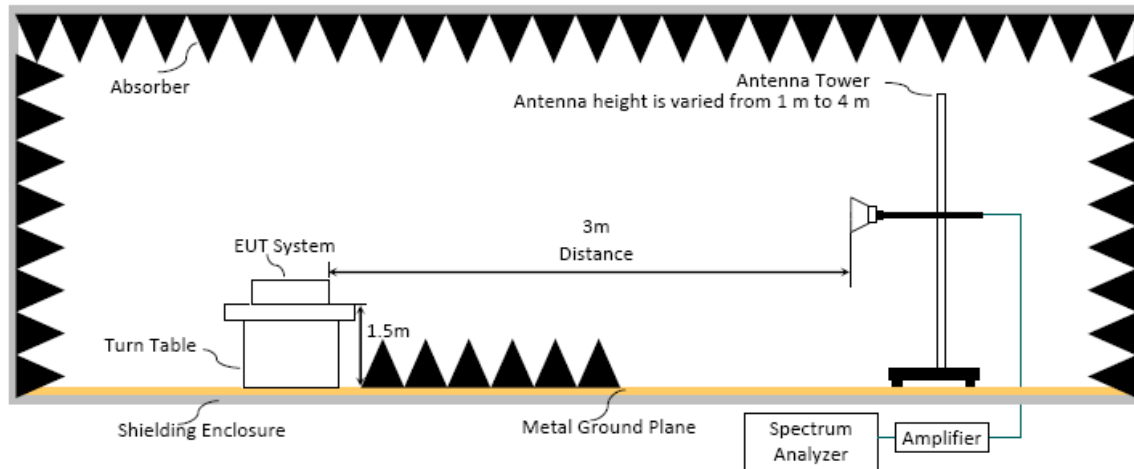
6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000MHz



6.1.4. Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

Radiated emissions fall in restricted bands, as defined in Section 15.205 must be in compliance with the radiated emission limits specified in 15.209 as below.

6.2.1. General Limit

Frequency (MHz)	Distance(m)	Limits	
		dB μ V/m	μ V/m
0.009 - 0.490	300	67.6-20 log f(kHz)	2400/f kHz
0.490 - 1.705	30	87.6-20 log f(kHz)	24000/f kHz
1.705 - 30	30	29.5	30
30 - 88	3	40.0	100
88- 216	3	43.5	150
216- 960	3	46.0	200
Above 960	3	54.0	500
Above 1000	3	74.0 dB μ V/m (Peak) 54.0 dB μ V/m (Average)	

Remark : (1) dB μ V/m = 20 log (μ V/m)

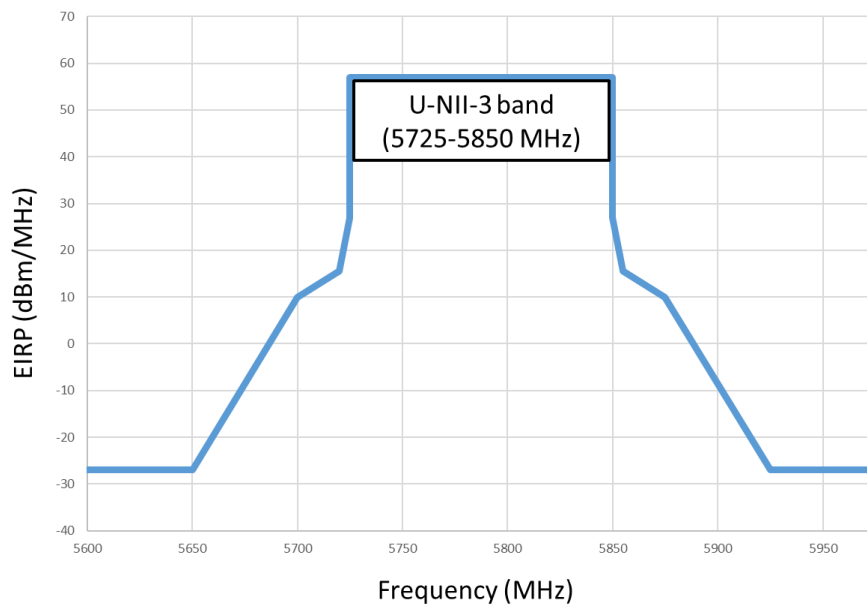
- (2) The tighter limit applies to the edge between two frequency bands.
- (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- (4) Fundamental and emission fall within operation band are exempted from this section.
- (5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

6.2.2. Limit for non-restricted frequency above 1 GHz

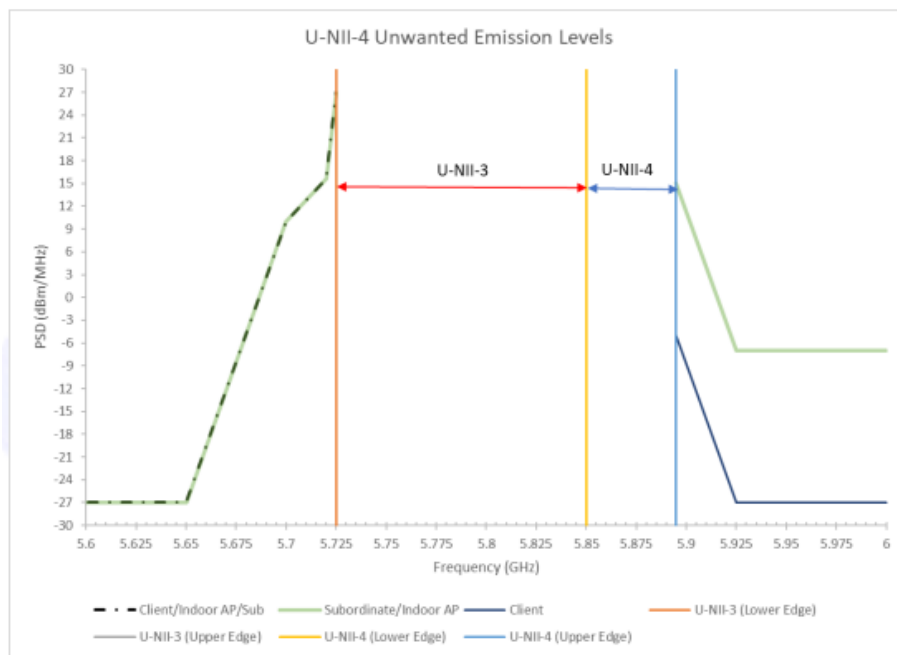
Frequency Band (MHz)	E.I.R.P. Limit	Field Strength Limit at 3 m
5150 to 5250	-27 dBm	68.2 dB μ V/m
5250 to 5350		68.2 dB μ V/m
5470 to 5725		68.2 dB μ V/m

Note: Field Strength at 3 m = E.I.R.P. + 95.2 dB

Frequency Band (MHz)	Field Strength Limit at 3 m
5725 to 5850	<input checked="" type="checkbox"/> 15.407(b)(4)(i) All emissions shall be limited to a level of 68.2 dB μ V/m at 75 MHz or more above or below the band edge increasing linearly to 105.2 dB μ V/m at 25 MHz above or below the band edge increasing linearly to a level of 110.8 dB μ V/m at 5 MHz above or below the band edge increasing linearly to a level of 122.2 dB μ V/m at the band edge.
	<input type="checkbox"/> 15.407(b)(4)(ii), compliance with the emission limits in § 15.247(d) shall be at least 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c))



Frequency Band (MHz)	Field Strength Limit at 3 m	
5850 to 5895	<input type="checkbox"/>	15.407(b)(5)(i) For an indoor access point or subordinate device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of 15 dBm/MHz and shall decrease linearly to an e.i.r.p. of -7 dBm/MHz at or above 5.925 GHz.
	<input checked="" type="checkbox"/>	15.407(b)(5)(ii) , For a client device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of -5 dBm/MHz and shall decrease linearly to an e.i.r.p. of -27 dBm/MHz at or above 5.925 GHz.
	<input checked="" type="checkbox"/>	15.407(b)(5)(iii) , For a client device or indoor access point or subordinate device, all emissions below 5.725 GHz shall not exceed an e.i.r.p. of -27 dBm/MHz at 5.65 GHz increasing linearly to 10 dBm/MHz at 5.7 GHz, and from 5.7 GHz increasing linearly to a level of 15.6 dBm/MHz at 5.72 GHz, and from 5.72 GHz increasing linearly to a level of 27 dBm/MHz at 5.725 GHz.



6.3. Test Procedure

Frequency Range 9kHz~30MHz:

The EUT setup on the turntable which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

- (1) RBW = 9kHz with peak and average detector.
- (2) Detector: average and peak (9kHz-490kHz)
Q.P. (490kHz-30MHz)

Frequency Range 30MHz ~ 40GHz:

The EUT setup on the turn table which has 80cm (for 30-1000MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

Frequency below 1GHz:

Spectrum Analyzer is used for pre-testing with following setting:

- (1)RBW = 120kHz
- (2)VBW $\geq 3 \times$ RBW.
- (3)Detector = Peak.
- (4)Sweep time = auto.
- (5)Trace mode = max hold.
- (6)Allow sweeps to continue until the trace stabilizes.

Note 1: When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required, otherwise using Q.P. for final measurement.

Note 2: When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

Frequency above 1GHz to 10th harmonic(up to 40 GHz):

Peak Detector:

- (1)RBW = 1MHz
- (2)VBW $\geq 3 \times$ RBW.
- (3)Detector = Peak.
- (4)Sweep time = auto.
- (5)Trace mode = max hold.
- (6)Allow sweeps to continue until the trace stabilizes.

Note: When peak-detected value is lower than limit that the measurement using the average detector is not required, otherwise using average detector for final measurement.

Average Detector:**■ Option 1:**

(1) RBW = 1MHz

(2) VBW $\geq 1/T$. (Duty Cycle < 98%, when duty cycle presented in section 3.7)

Mode	VBW Setting
802.11a	510Hz
802.11ac-VHT160	470Hz

VBW = set VBW \leq RBW / 100, but not less than 10Hz (Duty Cycle \geq 98%, when duty cycle presented in section 3.7)

Mode	VBW Setting
802.11n-HT20	10Hz
802.11n-HT40	10Hz
802.11ac-VHT80	10Hz
802.11ac-VHT160	10Hz
802.11ax-HE20	10Hz
802.11ax-HE40	10Hz
802.11ax-HE80	10Hz
802.11be-EHT20	10Hz
802.11be-EHT40	10Hz
802.11be-EHT80	10Hz
802.11be-EHT160	10Hz
802.11ax-HE20 (RU Config 26)	10Hz
802.11ax-HE20 (RU Config 52)	10Hz
802.11ax-HE20 (RU Config 106)	10Hz
802.11ax-HE40 (RU Config 242)	10Hz
802.11ax-HE80 (RU Config 484)	10Hz
802.11ax-HE160 (RU Config 996)	10Hz
802.11be-EHT20 (RU Config 26)	10Hz
802.11be-EHT20 (RU Config 52)	10Hz
802.11be-EHT20 (RU Config 106)	10Hz
802.11be-EHT40 (RU Config 242)	10Hz
802.11be-EHT80 (RU Config 484)	10Hz
802.11be-EHT160 (RU Config 996)	10Hz

(4) Detector = Peak.

(5) Sweep time = auto.

(6) Trace mode = max hold.

(7) Allow sweeps to continue until the trace stabilizes.

□ Option 2:Average Emission Level(dB μ V/m) = Peak Emission Level(dB μ V/m) + DCCF(dB).

6.4. Measurement Result Explanation

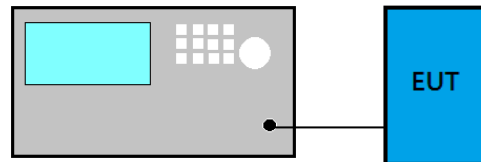
- Peak Emission Level(dB μ V/m)=Antenna Factor(dB/m) + Cable Loss (dB)– Preamp Gain (dB)+ Reading(dB μ V).
- Average Emission Level(dB μ V/m)= Antenna Factor(dB/m) + Cable Loss (dB)– Preamp Gain (dB)+ Reading(dB μ V).
- Average Emission Level(dB μ V/m)= Peak Emission Level(dB μ V/m)+ DCCF(dB)
Duty Cycle Correction Factor (DCCF)(dB)= 20log(TX_{on}/TX_{on+off}) presented in section 3.7.
- ERP(dBm)= Peak Emission Level(dB μ V/m) -95.2dB-2.14dB

6.5. Test Results

Please refer to Appendix A.

7. EMISSION/OCCUPIED BANDWIDTH

7.1. Block Diagram of Test Setup



7.2. Specification Limits

Frequency Band (MHz)	Limit
5150 to 5250	Reference only
5250 to 5350	
5470 to 5725	
5725 to 5895	≥ 500kHz

7.3. Test Procedure

Following measurement procedure is reference to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 and KDB 291074 D02 EMC Measurement v01:

For Emission Bandwidth

■ Applicable to all bands except to 5725 MHz –5895 MHz.

- (1) Set RBW= 1% of the emission bandwidth
- (2) Set VBW > RBW
- (3) Detector = Peak
- (4) Trace mode = max hold
- (5) Setting channel bandwidth function x dB to -26 dB to record the final bandwidth.

■ **Minimum Emission Bandwidth for the band 5725 MHz –5895 MHz.**

- (1) Set RBW = 100 kHz.
- (2) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Trace mode = max hold.
- (5) Sweep = auto couple.
- (6) Allow the trace to stabilize.
- (7) Setting channel bandwidth function x dB to -6 dB to record the final bandwidth.

For 99% Occupied Bandwidth

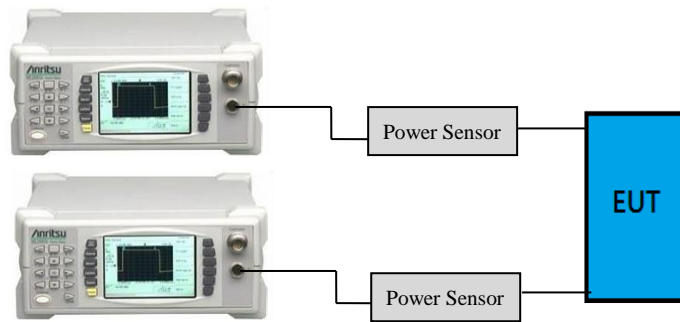
- (1) Set Span range 1.5~5 times the OBW
- (2) Set RBW close to 1% to 5% of OBW.
- (3) Set $VBW \geq 3 \times RBW$.
- (4) Detector = Peak.
- (5) Trace mode = Max hold
- (6) Sweep = Auto couple.
- (7) Allow the trace to stabilize.

7.4. Test Results

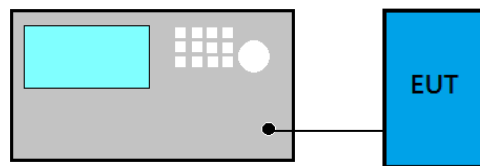
Please refer to Appendix A

8. MAXIMUM OUTPUT POWER

8.1. Block Diagram of Test Setup



- For 802.11ac-VHT80/160, 802.11ax-HE160 modes only



8.2. Specification Limits

Frequency Band (MHz)	Category	Limit
5150 to 5250	Outdoor Access Point	1 W(30 dBm)/ Max e.i.r.p. ≤125 mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon
	Fixed point-to-point Access Point	1 W(30 dBm)
	Indoor Access Point	1 W(30 dBm)
	Mobile and Portable client device	250 mW(24 dBm)
5250 to 5350	N/A	250 mW or 11 dBm + 10 log B ^{Note1}
5470 to 5725		250 mW or 11 dBm + 10 log B ^{Note1}
5725 to 5850	N/A	1 W(30 dBm)
5850 to 5895	indoor access point	4 W (36 dBm) (e.i.r.p.)
	client devices	1 W (30 dBm) (e.i.r.p.)
	subordinate device	4 W (36 dBm) (e.i.r.p.)

Note 1: B is the 26 dB emission bandwidth, which presented in section 7 and appendix A.1.

8.3. Test Procedure

Following measurement procedure is reference to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 and KDB 291074 D02 EMC Measurement v01:

■ **Method AVGPM (Measurement using an RF average power meter):**

EUT is connected to power sensor and record the maximum average output power and duty cycle factor is added when duty cycle presented in section 3.7 is < 98%.

■ **Method AVGSA-2 (Spectrum channel power) for 802.11ac-VHT80/160, 802.11ax-HE80/160 modes only**

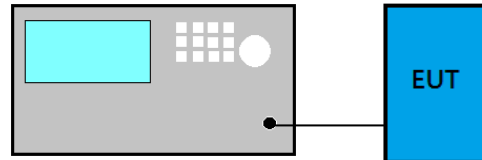
- (1) Set span to at least 1.5 times the OBW
- (2) Set RBW = 1 MHz
- (3) Set the video bandwidth (VBW) \geq 3 MHz.
- (4) Detector = RMS.
- (5) Trace mode = trace average at least 100 traces
- (6) Sweep = auto couple.
- (7) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges.
- (8) Duty cycle factor is added when duty cycle presented in section 3.7 is < 98%.

8.4. Test Results

Please refer to Appendix A

9. POWER SPECTRAL DENSITY

9.1. Block Diagram of Test Setup



9.2. Specification Limits

Frequency Band (MHz)	Category	Limit
5150 to 5250	Outdoor Access Point	17dBm/MHz
	Fixed point-to-point Access Point	
	Indoor Access Point	
	Mobile and Portable client device	11 dBm/MHz
5250 to 5350	N/A	11 dBm/MHz
5470 to 5725		11 dBm/MHz
5725 to 5850		30 dBm/500kHz
5850 to 5895	indoor access point	20dBm/MHz(e.i.r.p.)
	client devices	14dBm/MHz(e.i.r.p.)
	subordinate device	20dBm/MHz(e.i.r.p.)

9.3. Test Procedure

Following measurement procedure is reference to KDB 789033 D02 General UNII Test Procedures New Rules v02r01:

■ Method AVGSA-2

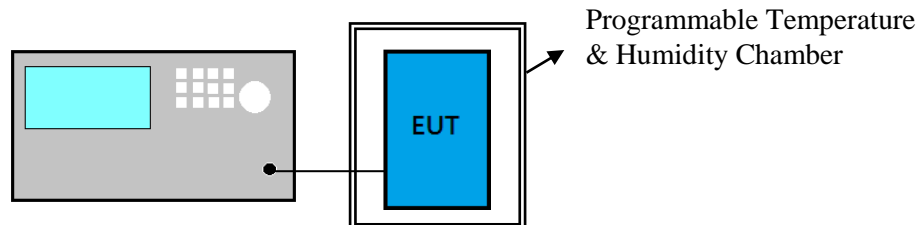
- (1) Set span to encompass the EBW (or 99% OBW) of the signal.
- (2) Set RBW = 1 MHz (Applicable to all bands except to 5725 MHz- 5850 MHz) / Set RBW=100 KHz(when EUT operate at 5725 MHz- 5850 MHz)
- (3) Set the video bandwidth (VBW) ≥ 3 RBW.
- (4) Detector = RMS.
- (5) Trace mode = trace average at least 100 traces
- (6) Sweep = auto couple.
- (7) Use peak search function to find out the maximum power density.
- (8) Duty cycle factor is added when duty cycle presented in section 3.7 is $< 98\%$.
- (9) Offset BWCF (7dB) when EUT operate at 5725 MHz –5850 MHz.

9.4. Test Results

Please refer to Appendix A

10. FREQUENCY STABILITY

10.1. Block Diagram of Test Setup



10.2. Specification Limits

NONE

10.3. Test Procedure

- (1) Frequency: Test frequency.
- (2) Span: enough to cover the complete power envelope
- (3) RBW: 1MHz(modulation ON) ; 10KHz(CW)
- (4) VBW: 1MHz(modulation ON) ; 10KHz(CW)
- (5) Detector Mode: Positive Peak
- (6) Indication mode: Max hold
- (7) Find the peak frequency and take calculate by the formula:
(Measurement Value-declaration frequency)/ declaration frequency)

10.4. Test Results

Please refer to Appendix A

11. DEVIATION TO TEST SPECIFICATIONS

【NONE】



APPDNDIX A

TEST DATA AND PLOTS

(Model: 16Z90TS)



Audix Technology Corp.
No. 491, Zhongfu Rd., Linkou Dist.,
New Taipei City 244, Taiwan

Tel: +886 2 26099301
Fax: +886 2 26099303

APPDNDIX B

TEST PHOTOGRAPHS

(Model: 16Z90TS)