Audix Technology Corp.
No. 53-11, Dingfu, Linkou, Dist.,
New Taipei City244,Taiwan
Tel: +886 2 26099301
Fax: +886 2 26099303

RSS-247 Issue 2
5GHz Test Report

for

LG Electronics Inc.

222, LG-roJinwi-myeon, Pyeongtaek-Si, Gyeonggi-Do, 451-713, Korea

Product Name	:	**Notebook Computer**
Model Name	:	**(1)14Z90N (2)14ZB90N (3)14ZD90N (4)14ZG90N (5)14ZC90N**
Brand		**LG**
IC	:	**2703H-14Z90N**

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

Testing Laboratory
1724

TESTING
NVLAP LAB CODE 200077-0

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.

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TEST REPORT CERTIFICATION

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)14Z90N (2)14ZB90N (3)14ZD90N (4)14ZG90N (5)14ZC90N
(3) Brand	:	LG
(4) Power Rating	:	DC 19V, 2.53A

Applicable Standards:

RSS-Gen (Issue 5), April2018
RSS-247 (Issue 2), February2017
ANSI C63.10:2013
KDB 789033 D02 General UNII Test Procedures New Rules v02r01

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: 2019. 10. 23

Reviewed by: Sabrina Wang (Sabrina Wang/Administrator)

Approved by: Johnny Hsueh (Johnny Hsueh/Section Manager)

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1. REVISION RECORD OF TEST REPORT

Edition No	Issued Date	Revision Summary	Report Number
0	2019.10. 23	Original Report	EM-F190366

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2. SUMMARY OF TEST RESULTS

Rule	Description	Data Reused	Results
RSS-Gen §8.8	Conducted Emission	No	**PASS**
RSS-Gen §8.9/RSS-247 §6.2.1.2/6.2.2.2/6.2.3.2/6.2.4.2	Radiated Band Edge and Radiated Spurious Emission	No	**PASS**
RSS-247 §6.2.1.1/6.2.2.1/6.2.3.1/6.2.4.1	OccupiedBandwidth	Yes	**PASS**
RSS-247 §6.2.1.1/6.2.2.1/6.2.3.1/6.2.4.1	Maximum Output	SPOT CHECK Note 2	**PASS**
RSS-247 §6.2.1.2/6.2.2.2/6.2.3.2/6.2.4.2	Conducted Band Edges and Conducted Spurious Emission	Yes	**PASS**
RSS-247 §6.2.1.1/6.2.2.1/6.2.3.1/6.2.4.1	Power Spectral Density	Yes	**PASS**
RSS-Gen §6.8	Antenna Requirement	---	**Compliance**
---	Frequency Stability	Yes	**PASS**

Note: 1. The uncertainties value is not used in determining the result.
2. This device embedded with same radio transmitter with FCC ID: BEJNT-15Z90N, IC: 2703H-15Z90N.According to KDB 484596 D01, we did spot check for output power and all output power values keep identical thus we reuse all results except to E.I.R.P. test items.

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3. GENERAL INFORMATION

3.1. Description of Application

Applicant	LG Electronics Inc. 222, LG-roJinwi-myeon, Pyeongtaek-Si, Gyeonggi-Do, 451-713, Korea
Manufacturer	LG Electronics Inc. 222, LG-roJinwi-myeon, Pyeongtaek-Si, Gyeonggi-Do, 451-713, Korea
Factory	LG Electronics Nanjing New Technology Co., Ltd. No.346,Yaoxin Road, Economic & Technical Development Zone, Nanjing, China.
Product	Notebook Computer The product has two colors (Dark Silver and White).
Model	(1)14Z90N (2)14ZB90N (3)14ZD90N (4)14ZG90N (5)14ZC90N The difference between all models is different in thesales customers.
Brand	LG

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3.2. Description of EUT

<table>
<tr><td>Test Model</td><td>14Z90N</td></tr>
<tr><td>Serial Number</td><td>N/A</td></tr>
<tr><td>Power Rating</td><td>DC 19V, 2.53A</td></tr>
<tr><td>Software Version</td><td>N/A</td></tr>
<tr><td>RF Features</td><td>WLAN:802.11 a/b/g/n/ac/ax
Bluetooth: BT and BLE (BT 5.0)</td></tr>
<tr><td>Transmit Type</td><td>
<table>
<tr><th colspan="2">2.4 GHz</th></tr>
<tr><td>802.11b</td><td>1T1R</td></tr>
<tr><td>802.11g</td><td>1T1R</td></tr>
<tr><td>802.11n-HT20</td><td>2T2R</td></tr>
<tr><td>802.11n-HT40</td><td>2T2R</td></tr>
<tr><td>802.11ax-HE20</td><td>2T2R</td></tr>
<tr><td>802.11ax-HE40</td><td>2T2R</td></tr>
<tr><td>BT/BLE</td><td>1T1R</td></tr>
</table>
<table>
<tr><th colspan="2">UNII Bands</th></tr>
<tr><td>802.11a</td><td>1T1R</td></tr>
<tr><td>802.11n-HT20/802.11ac-VHT20/802.11ax-HE20</td><td>2T2R</td></tr>
<tr><td>802.11n-HT40/802.11ac-VHT40/802.11ax-HE40</td><td>2T2R</td></tr>
<tr><td>802.11ac-VHT80/802.11ax-HE80</td><td>2T2R</td></tr>
<tr><td>802.11ac-VHT160/802.11ax-HE160</td><td>2R2T</td></tr>
</table>
</td></tr>
<tr><td>Device Category</td><td>☐Outdoor Access Point
☐Fixed point-to-point Access Point
☐Indoor Access Point
■Mobile and Portable client device</td></tr>
<tr><td>Sample Status</td><td>Mass production</td></tr>
<tr><td>Date of Receipt</td><td>2019. 09. 16</td></tr>
<tr><td>Date of Test</td><td>2019. 09. 20 ~ 10. 14</td></tr>
<tr><td>Interface Ports of EUT</td><td>• One Micro SD Card Slot
• One Earphone Port
• Two USB 3.0 Ports
• One USB Type C Port
• One HDMI Port
• One DC Input Port</td></tr>
<tr><td>Accessories Supplied</td><td>• AC Adapter
• LAN Gender</td></tr>
</table>

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3.3. Antenna Information

2.4G Antenna					
No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)
1.	WA-P-LBLB-04-069 (Main)	INPAQ	Mono-pole	2400	3.28
				2410	2.63
				2420	2.69
				2430	2.74
				2440	2.96
				2450	3.36
				2460	3.70
				2470	4.12
				2480	**4.29**
				2490	4.28
				2500	4.26
2.	WA-P-LBLB-04-069 (AUX)	INPAQ	Mono-pole	2400	4.52
				2410	3.99
				2420	4.14
				2430	4.55
				2440	4.78
				2450	5.06
				2460	5.23
				2470	**5.32**
				2480	5.13
				2490	4.87
				2500	4.70
3.	L1LRF002-CS-H (Main)	LUXSHARE-ICT	Mono-pole	2400	4.9
				2450	**4.9**
				2500	3.9
4.	L1LRF002-CS-H (AUX)	LUXSHARE-ICT	Mono-pole	2400	3.9
				2450	**4.2**
				2500	4.0

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5G Antenna					
No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)
1.	WA-P-LBLB-04-069 (Main)	INPAQ	Mono-pole	5100	2.48
				5150	2.17
				5200	1.71
				5250	2.69
				5300	3.06
				5350	4.42
				5400	3.73
				5450	3.84
				5500	3.73
				5550	3.17
				5600	3.06
				5650	3.96
				5700	3.69
				5750	4.77
				5800	**4.86**
2.	WA-P-LBLB-04-069 (AUX)	INPAQ	Mono-pole	5100	4.89
				5150	**5.28**
				5200	4.96
				5250	4.08
				5300	3.88
				5350	4.04
				5400	3.69
				5450	3.68
				5500	4.12
				5550	4.59
				5600	4.18
				5650	3.30
				5700	2.56
				5750	1.65
				5800	1.31

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5G Antenna					
No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)
3.	L1LRF002-CS-H (Main)	LUXSHARE-ICT	Mono-pole	5150	**4.1**
				5250	3.3
				5350	3.8
				5470	3.0
				5600	3.2
				5725	3.6
				5785	3.1
				5800	3.9
				5850	3.8
4.	L1LRF002-CS-H (AUX)	LUXSHARE-ICT	Mono-pole	5150	3.6
				5250	2.9
				5350	3.4
				5470	3.2
				5600	3.4
				5725	**3.7**
				5785	3.0
				5800	3.4
				5850	2.7

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3.4. EUT Specifications Assessed in Current Report

Mode	UNII Band	Fundamental Range (MHz)	Channel Number
802.11a	I	5180-5240	4
	II-2A	5260-5320	4
	II-2C Note	5500-5720	9
	III	5745-5825	5
802.11n-HT20/ 802.11ac-VHT20 802.11ax-HE20	I	5180-5240	4
	II-2A	5260-5320	4
	II-2C Note	5500-5720	9
	III	5745-5825	5
802.11n-HT40/ 802.11ac-VHT40 802.11ax-HE40	I	5190-5230	2
	II-2A	5270-5310	2
	II-2C Note	5510-5710	4
	III	5755-5795	2
802.11ac-VHT80 802.11ax-HE80	I	5210	1
	II-2A	5290	1
	II-2C Note	5530-5690	2
	III	5775	1
802.11ac-VHT160 /802.11ax-HE160	I	5250	1
	II-2A		
	II-2C	5570	1
Remark: UNII Band II and III (DFS Function, Slave/no In service monitor, no Ad-Hoc mode) Note: The band 5600-5650MHz is a restrictive band in Canada.			

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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 173.3
802.11ax-HE40		Up to 400
802.11ax-HE80		Up to 866.7
802.11ax-HE160		Up to 1733.3

Channel List					
802.11a/802.11n-HT20/802.11ac-VHT20/802.11ax-HE20					
UNII Band	Channel Number	Frequency (MHz)	UNII Band	Channel Number	Frequency (MHz)
I	36	5180	III	112	5560
	40	5200		116	5580
	44	5220		132	5660
	48	5240		136	5680
II	52	5260		140	5700
	56	5280		144	5720
	60	5300	IV	149	5745
	64	5320		153	5765
III	100	5500		157	5785
	104	5520		161	5805
	108	5540		165	5825

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Channel List					
802.11n-HT40/802.11ac-VHT40/802.11ax-HE40					
UNII Band	Channel Number	Frequency (MHz)	UNII Band	Channel Number	Frequency (MHz)
I	38	5190	III	110	5550
	46	5230		134	5670
II	54	5270		142	5710
	62	5310	IV	151	5755
III	102	5510		159	5795

Channel List					
802.11ac-VHT80/802.11ax-HE80					
UNII Band	Channel Number	Frequency (MHz)	UNII Band	Channel Number	Frequency (MHz)
I	42	5210	IV	155	5775
II	58	5290			
III	106	5530			
	138	5690			

Channel List					
802.11ac-VHT160/802.11ax-HE160					
UNII Band	Channel Number	Frequency (MHz)	UNII Band	Channel Number	Frequency (MHz)
I	50	5250	II-2C	114	5570
II-2A					

Note: Test modes are presented at section 3.7.

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3.5. Description of Key Components

3.5.1. For the All Component Lists

Item	Supplier	Model / Type	Character
System	Microsoft	Win10 Home	---
		Win10 Pro	---
Main Board	LG	1XZ90N MAIN B/D PCB	Manufacturer: #1 Hannstar Board Tech (Jiang Yin) Corp., Ltd. #2 Elec & Eltek Company (MCO) Limited.
WLAN SUB Board	LG	14Z90N WLAN SUB B/D	Manufacturer: #1 Hannstar Board Tech (Jiang Yin) Corp., Ltd. #2 Elec & Eltek Company (MCO) Limited.
CPU (Socket: FCBGA1526)	Intel	i7-1065G7	1.3GHz, up to 3.9GHz
	Intel	i5-1035G7	1.2GHz, up to 3.7GHz
14” LCD Panel	LG Display	LP140WFA-SPY1	Resolution: 1920X1080, 60Hz FHD IPS (Normal Non touch)
Storage (SSD) (Max. 2 pcs)	Samsung	MZ-VLB5120 (P/N MZVLB512HAJQ-00000)	512GB (M.2)
		MZ-VLB2560 (P/N MZVLB256HAHQ-00000)	256GB (M.2)
Memory (RAM)	Samsung	---	8GB DDR4 3200MHz SODIMM (on Card)
	SK Hynix	---	8GB DDR4 3200MHz SODIMM (on Card)
	Samsung	---	8GB DDR4 (On Board)
Battery Pack	LG	LBS1224E	DC 7.7V, 72Wh, Typ 9450mAh
WLAN Combo Card	Intel	AX201D2W	WLAN and BT, 2x2 CNVi1216 FCC ID: PD9AX201NG IC: 1000M-AX201NG NCC ID: CCAH18LP3410T5
WLAN Combo Antenna	LG (INPAQ)	WA-P-LBLB-04-069	PCB, Mono-pole Type Main: Black, Aux: Gray
	LG (LUXSHARE-ICT)	L1LRF002-CS-H	PCB, Mono-pole Type Main: Black, Aux: Gray
Keyboard	TIC	KT01-18B8	P/N: KT01-18B8BS03USRA000 (White KBD)
		KT01-18B8	P/N: KT01-18B8AS03USRA000 (Black KBD)
	LITE ON	SN3871BL	P/N: SG-91030-XUA (White KBD)
		SN3871BL	P/N: SG-91020-XUA (Black KBD)
Web Camera	Chicony	CKFIH2821005290LH	With two microphones
		CKFIH28-121005290LH	With one microphone
	Luxvisions	7BF109N2DC	With two microphones
		7BF109N2C	With one microphone

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Item	Supplier	Model / Type	Character
LAN Gender (Type C to LAN)	SUZHOU MEC ELECTRONICS	80-5946-200	(White) 10/100/1000 Megabit Ethernet
		80-5946-210	(Black) 10/100/1000 Megabit Ethernet
	Type C to LAN: Shielded, Undetached, 0.13m		
	SUZHOU MEC ELECTRONICS	80-5946-111	(White) 10/100Megabit Ethernet
		80-5946-101	(Black) 10/100 Megabit Ethernet
	Type C to LAN: Shielded, Undetached, 0.12m		
	ARIN TECH CO. LTD	GD-08MF-36-WH-LP10	(White) 10/100Megabit Ethernet
		GD-08MF-36-BK-LP11	(Black) 10/100 Megabit Ethernet
	Type C to LAN: Shielded, Undetached, 0.12m		
AC Adapter (48W)	LG (HONOR)	ADS-48MS-19-2 19048E	I/P: AC 100-240V, 50-60Hz, 1.5A, O/P: DC 19V, 2.53A
	DC Power Cord: Non-Shielded, Undetached, 1.5m AC Power Cord: Non-Shielded, Detached, 1.0m (2C) (For Other Countries) AC Power Cord: Non-Shielded, Detached, 1.55m (2C) (For US, Canada, Mexico)		

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

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

SKU			#1	#2
Main Board		LG, 1XZ90N Main B/D PCB	V	V
SUB Board		LG, 14Z90N WLAN SUB B/D	V	V
CPU		i7-1065G7	V	
		i5-1035G7		V
14" LCD Panel		LG Display, LP140WFA-SPY1	V	V
Storage (SSD) (Max. 2 pcs)		Samsung, 512GB NVMe	V	V
		Samsung, 512GB NVMe	V	V
Memory (RAM)		SK Hynix, 8GB (On Card)	V	V
		Samsung, 8GB (On Board)	V	V
Battery Pack		LG, LBS1224E	V	V
WLAN Combo Card		Intel, AX201D2W	V	V
WLAN Combo Antenna		LG (INPAQ), WA-P-LBLB-04-069	V	
		LG (LUXSHARE-ICT), L1LRF002-CS-H		V
Keyboard		TIC, KT01-18B8 (White)	V	V
Web Camera		Chicony, CKFIH2821005290LH	V	V
AC Adapter		LG (HONOR), ADS-48MS-19-2 19048E	V	V
Type C	Link to LAN Gender	SUZHOU MEC ELECTRONICS, 80-5946-200 (White)	V	V

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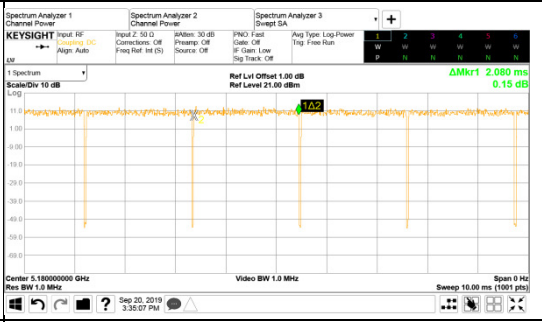
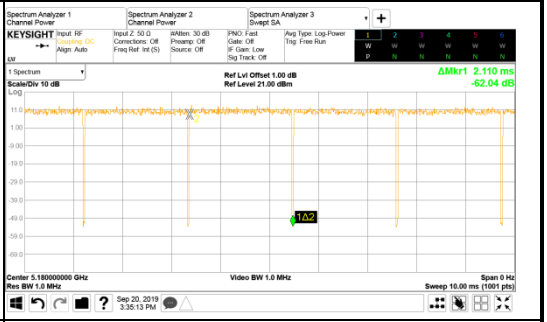
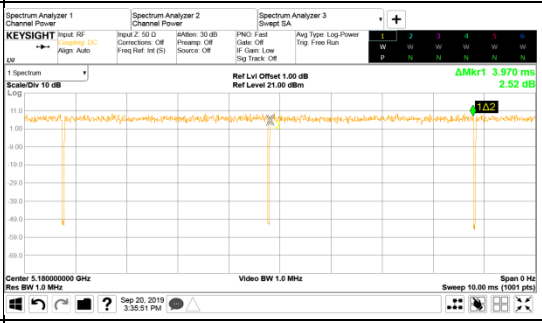
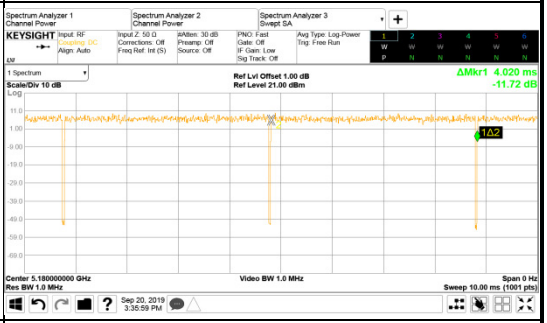
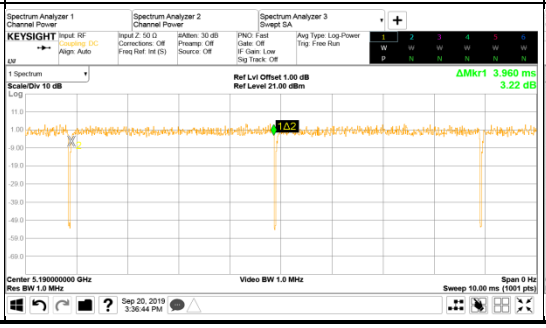
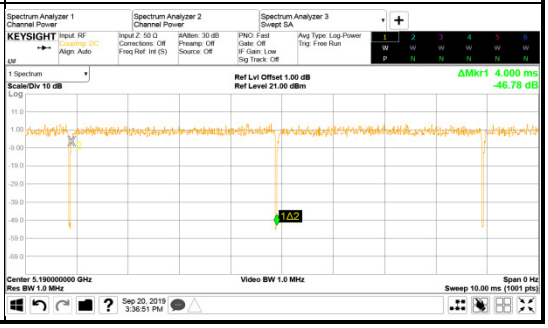
3.6. Test Configuration

Mode	TX_{on} (ms)	1/ TX_{on} (kHz)	Duty Cycle (x)	Duty Cycle Factor [10log(1/x)] (dB)
802.11a	2.080	0.481	0.986	N/A
802.11n-HT20	3.970	0.252	0.988	N/A
802.11n-HT40	3.960	0.253	0.990	N/A
802.11ac-VHT80	3.960	0.253	0.990	N/A
802.11ac-VHT160	2.780	0.360	0.986	N/A
802.11ax-HE20	3.960	0.253	0.990	N/A
802.11ax-HE40	3.940	0.254	0.985	N/A
802.11ax-HE80	3.950	0.253	0.985	N/A
802.11ax-HE160	2.280	0.439	0.982	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		
802.11n-HT20		
802.11n-HT40		

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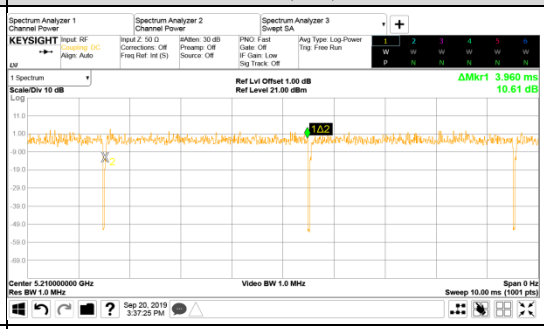
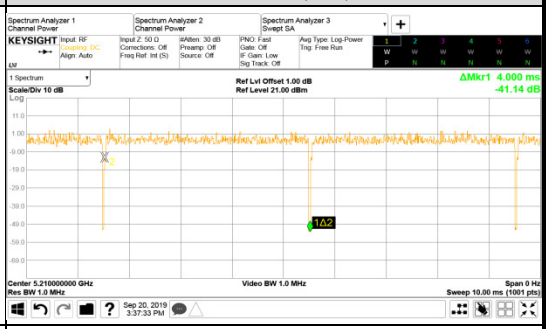
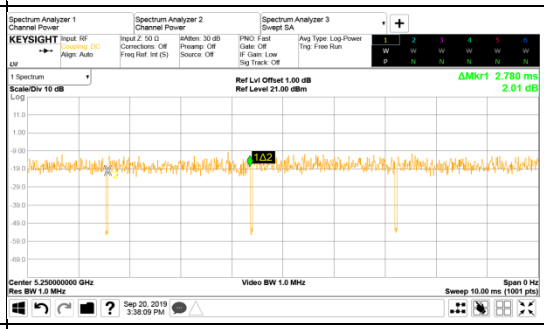
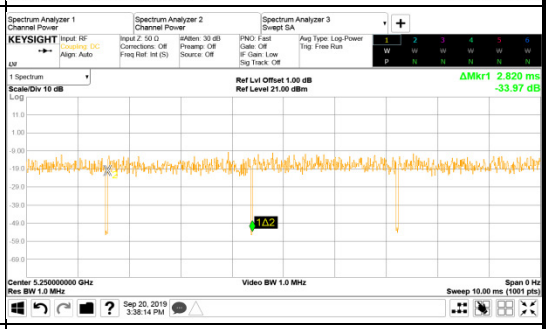
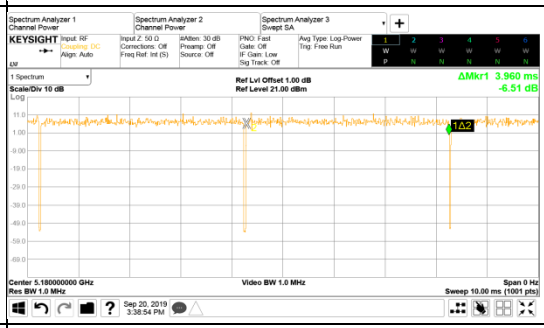
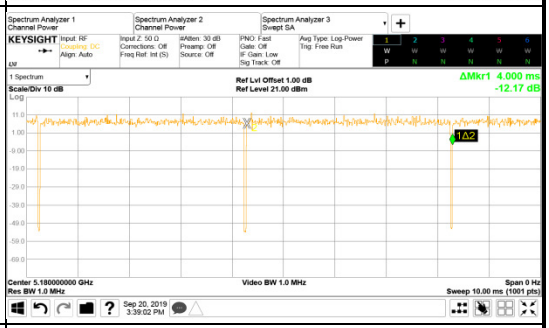
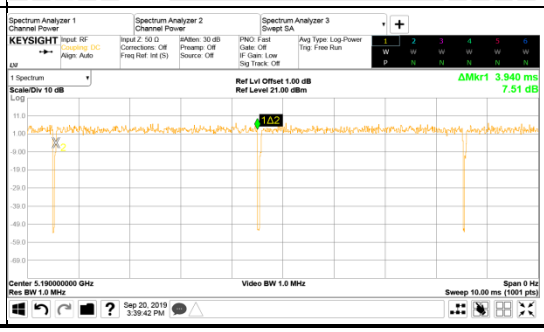
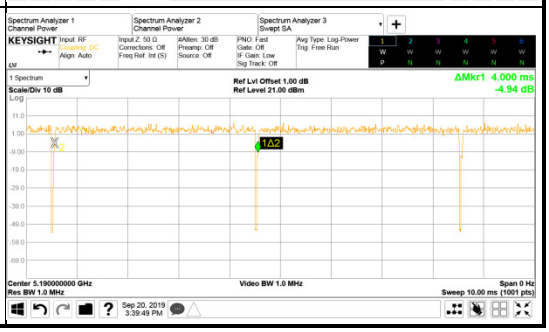
Mode	TX_{on} (ms)	$T_{on}+T_{off}$(ms)
802.11ac-VHT80		
802.11ac-VHT160		
802.11ax-HE20		
802.11ax-HE40		

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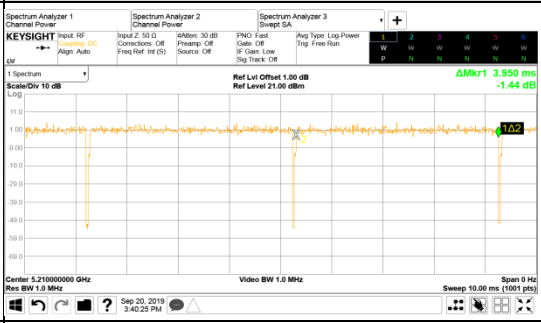
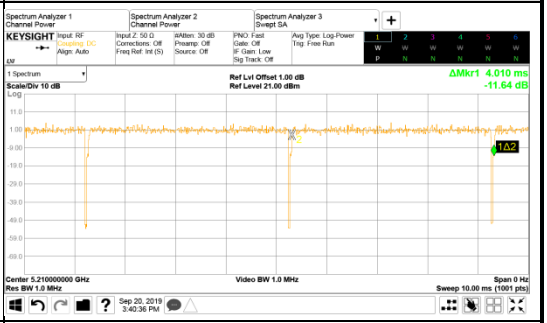
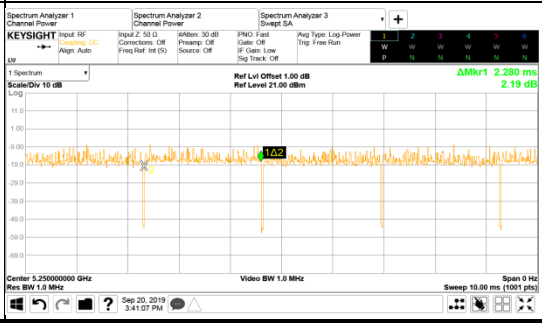
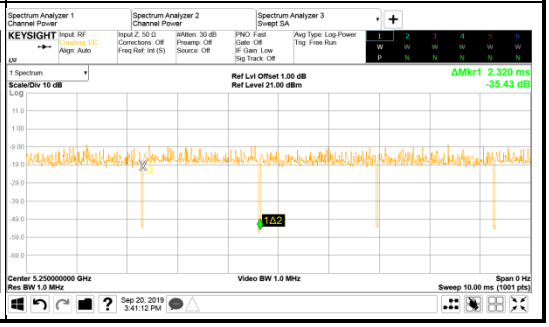
Mode	TX_{on} (ms)	$T_{on}+T_{off}$(ms)
802.11ax-HE80		
802.11ax-HE160		

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Fax: +886 2 26099303

AC Conduction	
SKU #1	Normal operation
SKU #2	Normal operation

SKU	Item		Mode	Data Rate	Test Channel
#1	Radiated Test Case	Radiated Band Edge Note1	802.11a	6 Mbps	36/64/100/140/144
			802.11n-HT20	MCS8	36/64/100/140/144
			802.11n-HT40	MCS8	38/62/102/134/142
			802.11ac-VHT80	MCS0	42/58/106/122/138
			802.11ac-VHT160	MCS0	50/114
			802.11ax-HE20	HE0	36/64/100/140/144
			802.11ax-HE40	HE0	38/62/102/134/142
			802.11ax-HE80	HE0	42/58/106/122/138
			802.11ax-HE160	HE0	50/114
		Radiated Spurious Emission Note1& 2	802.11a	6 Mbps	48/52/116/144/149
			802.11n-HT20	MCS8	48/52/116/144/157
			802.11n-HT40	MCS8	46/54/134/142/159
			802.11ac-VHT80	MCS0	42/58/122/138/155
			802.11ac-VHT160	MCS0	50/114
			802.11ax-HE20	HE0	48/52/116/144/157
			802.11ax-HE40	HE0	46/54/134/142/159
			802.11ax-HE80	HE0	42/58/122/138/155
			802.11ax-HE160	HE0	50/114
#2	Radiated Test Case	Radiated Spurious Emission Note1	802.11ac-VHT80	MCS0	138

SKU	Item		Mode	Data Rate	RU Configuration	Test Channel
#1	Radiated Test Case	Radiated Band Edge Note1	802.11ax-HE20	HE0	26/0	36/100
					52/37	
					106/53	
				HE0	26/8	64/140
					52/40	
					106/54	
			802.11ax-HE40	HE0	242/61	38/102
				HE0	242/62	62/134
			802.11ax-HE80	HE0	484/65	42/106
				HE0	484/66	58/122
			802.11ax-HE160	HE0	996/67	50/114
				HE0	996/S67	50/114

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Item		Mode	Data Rate	Test Channel
Conducted Test Case	Occupied Bandwidth	802.11a	6 Mbps	36/40/48/52/60/64/100/116/140/144/149/157/165
		802.11n-HT20	MCS8	36/40/48/52/60/64/100/116/140/144/149/157/165
		802.11n-HT40	MCS8	38/46/54/62/102/110/134/142/151/159
		802.11ac-VHT80	MCS0	42/58/106/122/138/155
		802.11ac-VHT160	MCS0	50/114
		802.11ax-HE20	HE0	36/40/48/52/60/64/100/116/140/144/149/157/165
		802.11ax-HE40	HE0	38/46/54/62/102/110/134/142/151/159
		802.11ax-HE80	HE0	42/58/106/122/138/155
		802.11ax-HE160	HE0	50/114
	Maximum output power	802.11a	6 Mbps	36/40/48/52/60/64/100/116/140/144/149/157/165
		802.11n-HT20	MCS8	36/40/48/52/60/64/100/116/140/144/149/157/165
		802.11n-HT40	MCS8	38/46/54/62/102/110/134/142/151/159
		802.11ac-VHT80	MCS0	42/58/106/122/138/155
		802.11ac-VHT160	MCS0	50/114
		802.11ax-HE20	HE0	36/40/48/52/60/64/100/116/140/144/149/157/165
		802.11ax-HE40	HE0	38/46/54/62/102/110/134/142/151/159
		802.11ax-HE80	HE0	42/58/106/122/138/155
		802.11ax-HE160	HE0	50/114

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Item		Mode	Data Rate	Test Channel
Conducted Test Case	Conducted Band Edges	802.11a	6 Mbps	149/165
		802.11n-HT20	MCS8	149/165
		802.11n-HT40	MCS8	151/159
		802.11ac-VHT80	HE0	155
		802.11ax-HE20	HE0	149/165
		802.11ax-HE40	HE0	151/159
		802.11ax-HE80	HE0	155
	Power spectral density	802.11a	6 Mbps	36/40/48/52/60/64/100/116/140/144/149/157/165
		802.11n-HT20	MCS8	36/40/48/52/60/64/100/116/140/144/149/157/165
		802.11n-HT40	MCS8	38/46/54/62/102/110/134/142/151/159
		802.11ac-VHT80	MCS0	42/58/106/122/138/155
		802.11ac-VHT160	MCS0	50/114
		802.11ax-HE20	HE0	36/40/48/52/60/64/100/116/140/144/149/157/165
		802.11ax-HE40	HE0	38/46/54/62/102/110/134/142/151/159
		802.11ax-HE80	HE0	42/58/106/122/138/155
		802.11ax-HE160	HE0	50/114

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Item		Mode	Data Rate	RU Configuration	Test Channel
Conducted Test Case	Occupied Bandwidth	802.11ax-HE20	HE0	26/0	36/100/149
				52/37	
				106/53	
			HE0	26/8	64/140/165
				52/40	
				106/54	
		802.11ax-HE40	HE0	242/61	38/102/151
			HE0	242/62	62/134/159
		802.11ax-HE80	HE0	484/65	42/106/155
			HE0	484/66	58/122/155
		802.11ax-HE160	HE0	996/67	50/114
			HE0	996/S67	50/114
	Maximum output power	802.11ax-HE20	HE0	26/0	36/100/149
				52/37	
				106/53	
			HE0	26/8	64/140/165
				52/40	
				106/5	
		802.11ax-HE40	HE0	242/61	38/102/151
			HE0	242/62	62/134/159
		802.11ax-HE80	HE0	484/65	42/106/155
			HE0	484/66	58/122/155
		802.11ax-HE160	HE0	996/67	50/114
			HE0	996/S67	50/114
	Conducted Band Edges	802.11ax-HE20	HE0	26/0	149
				52/37	
				106/53	
			HE0	26/8	165
				52/40	
				106/54	
		802.11ax-HE40	HE0	242/61	151
			HE0	242/62	159
		802.11ax-HE80	HE0	484/65	155
				484/66	

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Item		Mode	Data Rate	RU Configuration	Test Channel
Conducted Test Case	Power spectral density	802.11ax-HE20	HE0	26/0	36/100/149
				52/37	
				106/53	
			HE0	26/8	64/140/165
				52/40	
				106/54	
		802.11ax-HE40	HE0	242/61	38/102/151
			HE0	242/62	62/134/159
		802.11ax-HE80	HE0	484/65	42/106/155
			HE0	484/66	58/122/155
		802.11ax-HE160	HE0	996/67	50/114
			HE0	996/S67	50/114

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: Both of the antennas are the same type, and we presented the worst case in the report. The max-gain condition with SISO (main port) and MIMO is SKU #1. The MIMO is uncorrelated and supported SDM mode only.

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

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3.7. Tested Supporting System List

3.7.1. Support Peripheral Unit

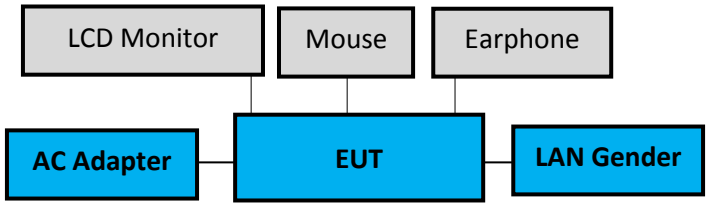
No.	Product	Brand	Model No.	Serial No.	Approval
1.	LCD Monitor	LG	22LK330-DB	N/A	N/A
2.	USB Mouse	acer	MOBVUO	N/A	FCC By DoC
3.	Earphone	APPLE	N/A	N/A	N/A

3.7.2. Cable Lists

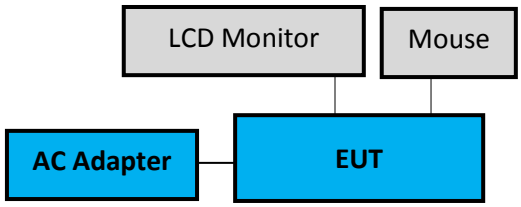
No.	Cable Description Of The Above Support Units
1.	HDMI Cable: Shielded, Detachable, 1.8m AC Power Cord: Unshielded, Detachable, 1.8m
2.	USB Cable: Unshielded, Undetachable, 1.8m
3.	Earphone Cable: Unshielded, Undetachable, 0.9m

3.8. Setup Configuration

3.8.1. EUT Configuration for Power Line & Radiated Emission



3.8.2. EUT Configuration for RF Conducted Test Items



3.9. Operating Condition of EUT

Test program "DRTU" is used for enabling EUT WLAN function under continues transmitting and choosing data rate/ channel.
[Chain 0 is aux port (A Button in DRTU) Chain 1 is main port (B Button in DRTU)].

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Fax: +886 2 26099303

3.10.Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 53-11, Dingfu, 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 17025:2005 (1) NVLAP(USA) NVLAP Lab Code 200077-0 (2) TAF(Taiwan) No. 1724
Test Facilities	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) Fully Anechoic Chamber

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3.11.Measurement Uncertainty

Test Items/Facilities		Frequency Range	Uncertainty
Conduction Test		150kHz~30MHz	±3.50dB
Radiation Test	No.1 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±3.9dB
		200MHz-1000MHz, 3m, Horizontal	±4.3dB
		30MHz-200MHz, 3m, Vertical	±4.5dB
		200MHz-1000MHz, 3m, Vertical	±4.1dB
		1GHz-6GHz, 3m	±5.1dB
		6GHz-18GHz, 3m	±5.5dB
	No.3 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.7dB
		200MHz-1000MHz, 3m, Horizontal	±4.5dB
		30MHz-200MHz, 3m, Vertical	±4.3dB
		200MHz-1000MHz, 3m, Vertical	±4.1dB
	No.4 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.1dB
		200MHz-1000MHz, 3m, Horizontal	±4.4dB
		30MHz-200MHz, 3m, Vertical	±4.2dB
		200MHz-1000MHz, 3m, Vertical	±5.0dB
		1GHz-6GHz, 3m	±4.4dB
		6GHz-18GHz, 3m	±4.1dB
	No.5 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.0dB
		200MHz-1000MHz, 3m, Horizontal	±4.0dB
		30MHz-200MHz, 3m, Vertical	±4.2dB
		200MHz-1000MHz, 3m, Vertical	±4.4dB
		1GHz-6GHz, 3m	±4.3dB
		6GHz-18GHz, 3m	±4.6dB
	Fully Anechoic Chamber	30MHz~1000MHz	±4.7dB
		1GHz~18GHz	±5.3dB

Remark：Uncertainty = $ku_c(y)$

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

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4. MEASUREMENT EQUIPMENTLIST

4.1. Conducted Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Test Receiver	R&S	ESR3	101774	2019. 01. 23	1 Year
2.	A.M.N.	R&S	ENV4200	100169	2018. 11. 04	1 Year
3.	L.I.S.N.	Kyoritsu	KNW-407	8-855-9	2018. 12. 19	1 Year
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2019. 01. 12	1 Year
5.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.8 S/R	2019. 04. 20	1 Year
6.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

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4.2. Radiated Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2019. 09. 11	1 Year
2.	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2019. 01. 30	1 Year
3.	Test Receiver	R & S	ESCS30	100338	2019. 06. 12	1 Year
4.	Amplifier	HP	8447D	2944A06305	2019. 01. 30	1 Year
5.	Amplifier	HP	8449B	3008A02678	2019. 03. 07	1 Year
6.	Amplifier	Keysight	83051A	MY53010042	2019. 08. 08	1 Year
7.	Bilog Antenna	TESEQ	CBL6112D	33821	2019. 01. 19	1 Year
8.	Loop Antenna	R&S	HFH2-Z2	891847/27	2017.12. 18	2 Years
9	Double-Ridged Waveguide Horn	ETS-Lindgren	3117	00135902	2019. 03. 13	1 Year
10.	Horn Antenna	COM-POWER	AH-840	101092	2019 .05. 14	1 Year
11.	5G Notch Filter	Microware Circuits	N0452502	459775	2019. 05. 07	1 Year
12.	5G Notch Filter	Microware Circuits	N0555983	459481	2019. 05. 07	1 Year
13.	5G Notch Filter	Microware Circuits	N0257881	459776	2019. 08. 21	1 Year
14.	Coaxial Cable	MIYAZAKI	5D2W	RE-11	2019. 02. 01	1 Year
15.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 104	RF CABLE-01	2019. 09. 20	1 Year
16.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	MY1493/2	2019. 09. 20	1 Year
17.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.1 3m A/C	2019. 04. 20	1 Year
18.	Digital Thermo-Hygro Meter	EVERY DAY	E-512	RF-02	2019. 04. 20	1 Year
19.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.
20.	Test Software	Audix	e3	V6.110601	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-544	MY55460198	2019. 05. 06	1 Year
2.	Power Meter	Anritsu	ML2495A	1145008	2018. 11. 07	1 Year
3.	Power Sensor	Anritsu	MA2411B	1126096	2018. 11. 07	1 Year
4.	Digital Thermo-Hygro Meter	Shenzhen Datronn Electronics	KT-905	RF	2019. 04. 20	1 Year

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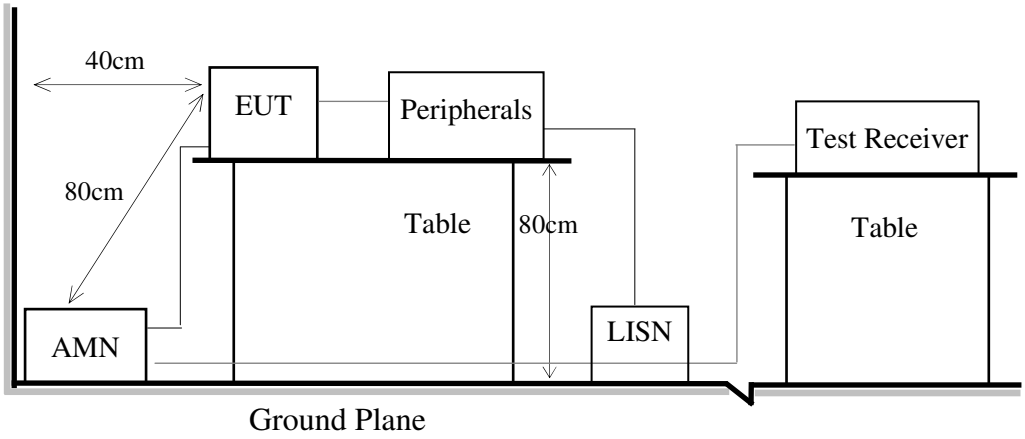
5. CONDUCTED EMISSION

5.1. Block Diagram of Test Setup

5.1.1. Block Diagram of EUT

Indicated as section 3.8

5.1.2. Shielded Room Setup Diagram



5.2. Conducted Emission Limit

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

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 C 63.10. 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.

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5.4. Test Results

Please refer to Appendix A.

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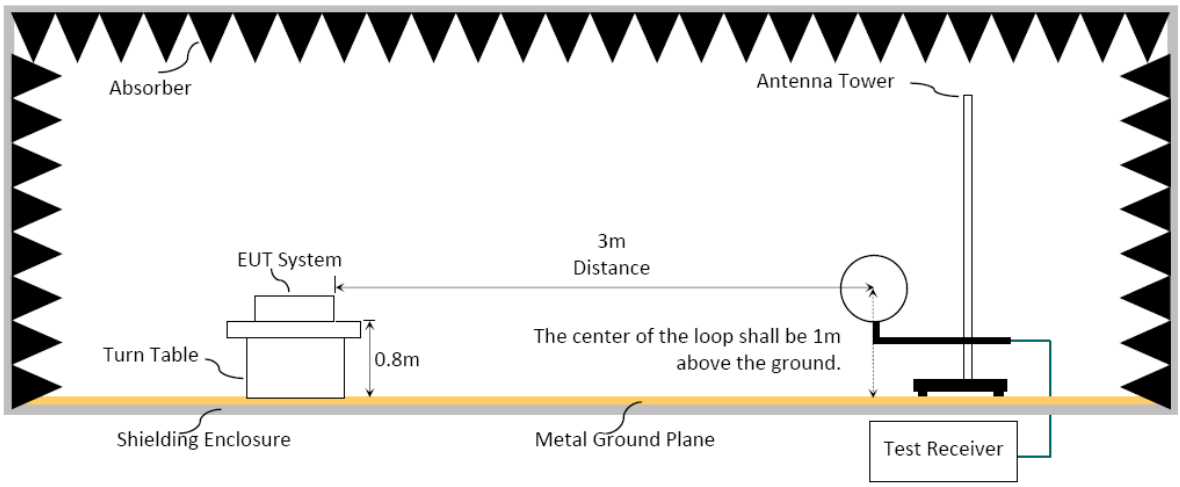
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

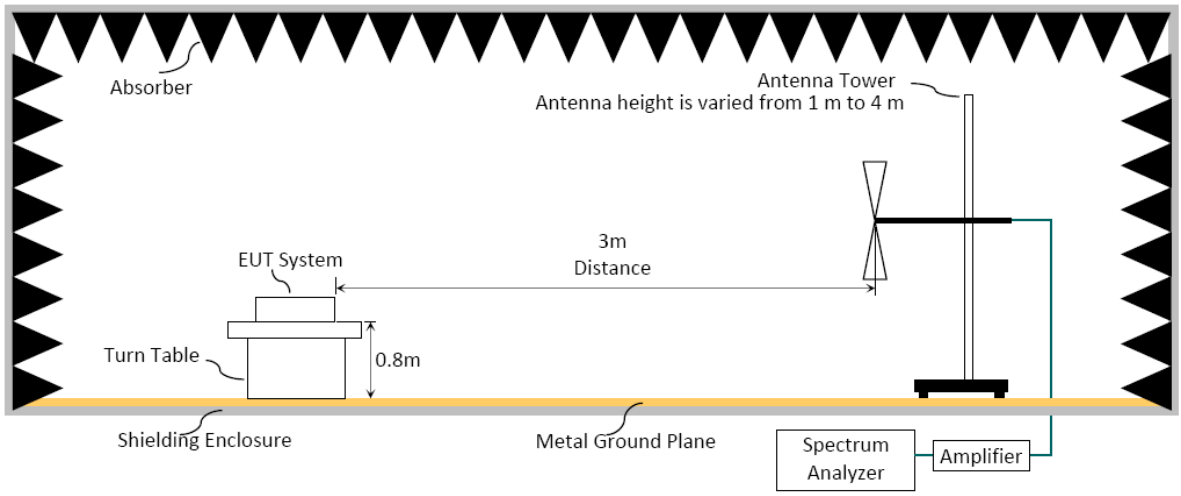
6.1.1. Block Diagram of EUT

Indicated as section 3.8

6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000MHz



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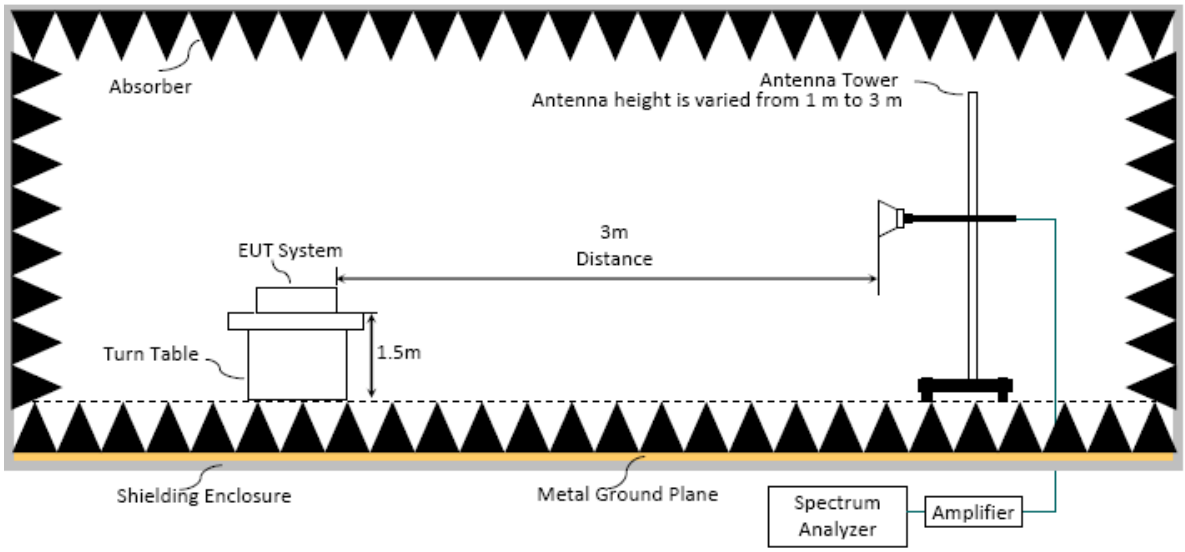
6.1.4. Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

Radiated emissions fall in restricted bands, as defined in RSS-Gen table 6 must be in compliance with the radiated emission limits specified in RSS-Gen table 4 as below.

6.2.1. General Limit

Frequency (MHz)	Distance(m)	Limits	
		dBμV/m	μV/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 dBμV/m (Peak) 54.0 dBμV/m (Average)	

Remark：(1) dBμV/m = 20 log (μV/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.

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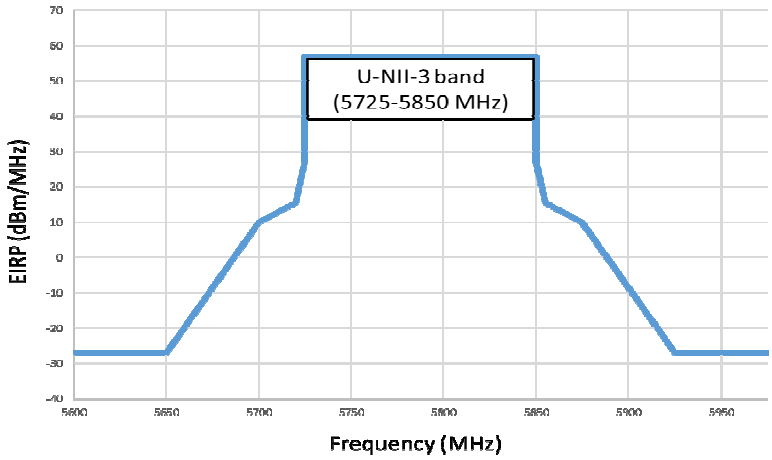
6.2.2. Limit for non-restricted frequency above 1 GHz

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

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	☒	RSS-247 Section 6.2.4.2 a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges; b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges; c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.
	☐	RSS-247 Section 6.2.4.2,compliance with the emission limits in RSS-247 Section 5.5 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 RSS-Gen Section 8.9 table 4 is not required. In addition,radiated emissions which fall in the restricted bands, as defined in RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified in RSS-Gen Section 8.9 table 4



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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 C63.10-2013regulation.

(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 (for 30-1000MHz) or antenna varied from 1 m to 3 m (for above 1GHz) tofind 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 C63.10-2013regulation.

Frequency below 1GHz:
Spectrum Analyzer is used for pre-testing with following setting:
(1)RBW = 120KHz
(2)VBW ≥ 3 x 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 theQ.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 ≥ 3 x 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.

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Average Detector:

■Option 1:

(1)RBW = 1MHz
(2)VBW ≥ 1/ T.

Modulation Type	T (ms)	1/ T (kHz)	VBW Setting(Hz)
802.11a	2.080	0.481	10Hz
802.11n-HT20	3.970	0.252	10Hz
802.11n-HT40	3.960	0.253	10Hz
802.11ac-VHT80	3.960	0.253	10Hz
802.11ac-VHT160	2.780	0.360	10Hz
802.11ax-HE20	3.960	0.253	10Hz
802.11ax-HE40	3.940	0.254	10Hz
802.11ax-HE80	3.950	0.253	10Hz
802.11ax-HE160	2.280	0.439	10Hz

N/A: 1/ T is not implemented when duty cycle presented in section 3.6 is ≥98%.
(1)Detector = Peak.
(2)Sweep time = auto.
(3)Trace mode = max hold.
(4)Allow sweeps to continue until the trace stabilizes.

□Option 2:

Average Emission Level= Peak Emission Level+ D.C.C.F.

6.4. Measurement Result Explanation

■Peak Emission Level=Antenna Factor + Cable Loss + Meter Reading (including Preamp factor if test used)

■Average Emission Level l=Antenna Factor + Cable Loss + Meter Reading (including Preamp factor if test used)

□Average Emission Level= Peak Emission Level+ DCCF
Duty Cycle Correction Factor (DCCF)= 20log(TX_{on}/TX_{on+off}) presented in section 3.6.

□ERP= Peak Emission Level-95.2dB-2.14dB

6.5. Test Results

Please refer to Appendix A.

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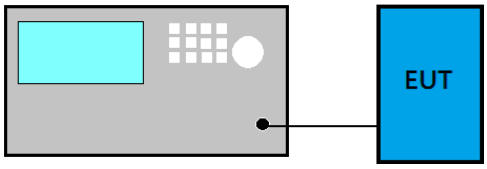
7. OCCUPIED BANDWIDTH

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 5850	≥ 500kHz

7.3. Test Procedure

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

■ Applicable to all bands except to 5725 MHz- 5850 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 or 99% power to record the final bandwidth.

■ 5725 MHz- 5850 MHz

(1) Set RBW = 100 kHz.
(2) Set the video bandwidth (VBW) ≥ 3 × 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 or 99% power to record the final bandwidth.

7.4. Test Results

Please refer to Appendix A

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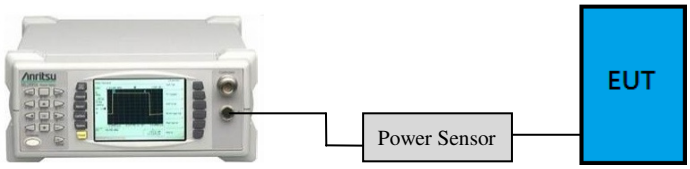
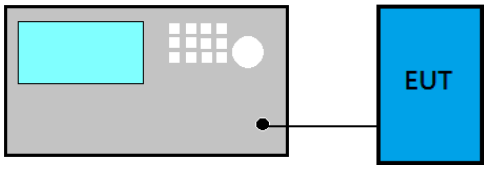
8. MAXIMUM OUTPUT POWER

8.1. Block Diagram of Test Setup



- **For 802.11ac-VHT80/160, 802.11ax-HE80/160 modes only**



8.2. Specification Limits

Frequency Band (MHz)	Limit	
5150 to 5250	E.I.R.P.	200 mW or 11 dBm + 10 log B[Note1]
5250 to 5350	Maximum output power	250 mW or 11 dBm + 10 log B[Note1]
	E.I.R.P.	1.0 W or 17dBm + 10 log B[Note1]
5470 to 5725	Maximum output power	250 mW or 11 dBm + 10 log B[Note1]
	E.I.R.P.	1.0 W or 17dBm + 10 log B[Note1]
5725 to 5850	Maximum output power	1 W(30 dBm)

Note 1: B is the 99% emission bandwidth, which presented in section 7 and appendix A.1.

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8.3. Test Procedure

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

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

EUT is connected to power sensor and record the maximum average outputpower and duty cycle factor is added when duty cycle presented in section 3.6 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) ≥ 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 signalusing 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

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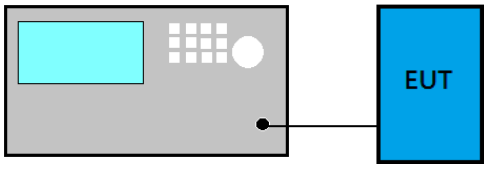
9. EMISSION LIMITATIONS

9.1. Block Diagram of Test Setup



9.2. Specification Limits

Frequency Band (MHz)	E.I.R.P. Limit
5150 to 5250	-27 dBm
5250 to 5350	
5470 to 5725	

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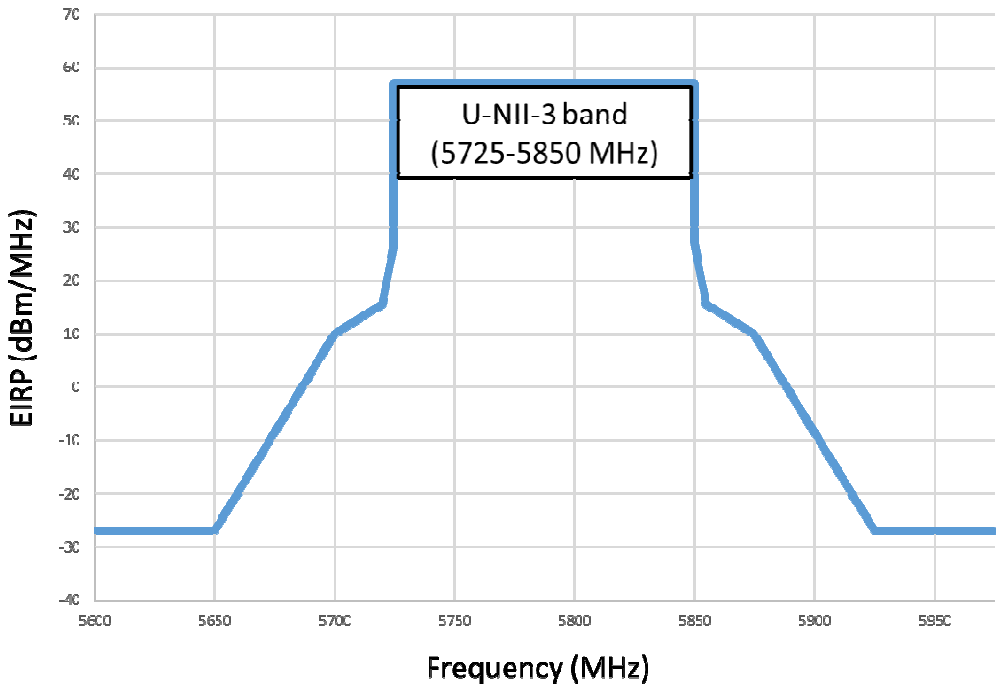
Frequency Band (MHz)	E.I.R.P. Limit	
5725 to 5850	☒	RSS-247 Section 6.2.4.2 a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges; b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges; c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.
	☐	RSS-247 Section 6.2.4.2,compliance with the emission limits in RSS-247 Section 5.5 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 RSS-Gen Section 8.9 table 4 is not required. In addition,radiated emissions which fall in the restricted bands, as defined in RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified in RSS-Gen Section 8.9 table 4



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9.3. Test Procedure

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

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

9.4. Test Results

Please refer to Appendix A

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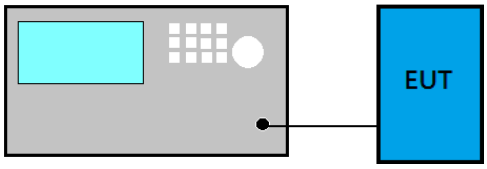
10. POWER SPECTRAL DENSITY

10.1. Block Diagram of Test Setup



10.2. Specification Limits

Frequency Band (MHz)	Limit
5150 to 5250	10 dBm/MHz
5250 to 5350	11 dBm/MHz
5470 to 5725	11 dBm/MHz
5725 to 5850	30dBm/500 kHz

10.3. Test Procedure

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

■Method AVGSA-2 (Spectrum channel power)

(1) Set span to at least 1.5 times the OBW
(2) Set RBW = 1 MHz
(3) Set the video bandwidth (VBW) ≥ 3 MHz.
(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%.

10.4. Test Results

Please refer to Appendix A

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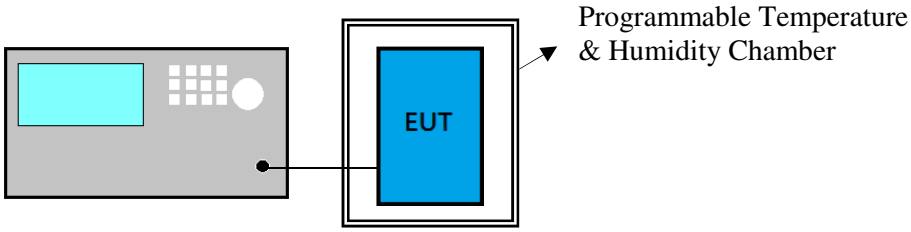
Audix Technology Corp.
No. 53-11, Dingfu, Linkou, Dist.,
New Taipei City244,Taiwan
Tel: +886 2 26099301
Fax: +886 2 26099303

11. FREQUENCY STABILITY

11.1. Block Diagram of Test Setup



11.2. Specification Limits

NONE

11.3. 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)

11.4. Test Results

Please refer to Appendix A

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12. DEVIATION TO TEST SPECIFICATIONS

【NONE】

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

APPDNDIX A

TEST DATA AND PLOTS

(Model: 14Z90N)

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APPDNDIX B

TEST PHOTOGRAPHS

(Model: 14Z90N)

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