Audix Technology Corp.
No. 491, Zhongfu Rd., Linkou Dist.,
New Taipei City244,Taiwan

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FCC 15.407
WLAN 6GHz 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)16Z90SP (2)16ZB90SP (3)16ZD90SP (4)16ZG90SP**
Brand		**LG**
FCC ID	:	**BEJNT-16Z90SP**

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

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)16Z90SP (2)16ZB90SP (3)16ZD90SP (4)16ZG90SP
(3) Brand	:	LG
(4) Power Supply	:	(1)DC 20V, 4.5A (2)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: 2023. 12. 22

Reviewed by: Annie Yu (Annie Yu/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	2023. 12. 22	Original Report	EM-F230547

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2. SUMMARY OF TEST RESULTS

FCC Part Section(s)	Description	Results
15.207	Conducted Emission	**PASS**
15.205/15.209 15.407 (b)(6)	Radiated Band Edge and Radiated Spurious Emission	**PASS**
15.407(a)(8)	Maximum Power Spectral Density	**PASS**
15.407(a)(8)	Maximum Conducted Output Power	**PASS**
2.1049 15.407(a)(10)	Emission/Occupied Bandwidth	**PASS**
15.407(b)(6)	Undesirable emission limits: Spurious Emission (Conducted)	**PASS**
15.407(b)(7)	In-Band Emission (Channel Mask)	**PASS**
15.407(d)(6)	Contention Based Protocol	**PASS**
15.203	Antenna Requirement	**PASS**
Note: The uncertainties value is not used in determining the result.		

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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)16Z90SP (2)16ZB90SP (3)16ZD90SP (4)16ZG90SP The difference between all models is different in the sales customers and color difference.
Brand	LG

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3.2. Description of EUT

<table>
<tr><td>Test Model</td><td>16Z90SP</td></tr>
<tr><td>Serial Number</td><td>N/A</td></tr>
<tr><td>Power Rating</td><td>(1)DC 20V, 4.5A (2)DC 20V, 3.25A</td></tr>
<tr><td>Software Version</td><td>XY (X, Y can be 0 to 9 for different SW version not influence RF parameter)</td></tr>
<tr><td>RF Features</td><td>WLAN:802.11 a/b/g/n/ac/ax
Bluetooth: BT and BLE (BT 5.3)</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">U-NII 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>2T2R</td></tr>
</table>
The MIMO is uncorrelated and supported SDM(Spatial Division Multiplexing) mode only. This radio device doesn't support beamforming and Cyclic Delay Diversity (CDD).
</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>Test Sample</td><td>
<table>
<tr><th>Sample No.</th><th>Test Item</th><th>Firmware</th></tr>
<tr><td>01</td><td>AC Conduction, RSE, RF Conducted</td><td>N/A</td></tr>
<tr><td>03</td><td>AC Conduction, RSE</td><td>N/A</td></tr>
</table>
</td></tr>
<tr><td>Sample Status</td><td>Trial sample</td></tr>
<tr><td>Date of Receipt</td><td>2023. 10. 13</td></tr>
<tr><td>Date of Test</td><td>2023. 10. 17 ~ 12. 22</td></tr>
</table>

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Interface Ports of EUT	• One HDMI Port • Two USB Type C Ports • One Earphone Port • Two USB 3.0 Ports
Accessories Supplied	• AC Adapter • USB C Cable • LAN Gender

Note: Pursuant ISO 17025:2017 section 7.8.2, Audix Technology Corp. does not assume responsibility for all EUT's information including RF features, transmit type, antenna information…etc are provided by customer.

3.3. Reference Test Guidance

ANSI C63.10:2013
KDB 789033 D02 v02r01, KDB 662911 D01 v02r01, KDB 987594 D02 v02r01

3.4. Antenna Information

No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain(dBi)	
					Main	AUX
1.	WA-P-LBLB-04-111	INPAQ	Mono-Pole	2400~2500	2.2	2.2
				5150~5350	1.8	1.8
				5470~5725	2.9	2.8
				5725~5850	2.3	3
				5925~6425	3.3	1.8
				6425~6525	2.7	2.5
				6525~6875	1.3	3.3
				6875~7125	1.4	2.9

According to KDB 662911 D01 d) ii), transmit signals are completely uncorrelated, then
Directional gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \ldots + 10^{GN/10})/N_{ANT}]$ dBi
Note 1. 2.4G: Directional gain =
2400~2500MHz: Directional gain = $10 \log[(10^{2.2/10} + 10^{2.2/10})/2] = 2.2$dBi
Note 2. 5G: Directional gain =
5150 ~ 5350MHz: = $10 \log[(10^{1.8/10} + 10^{1.8/10})/2] = 1.8$dBi
Note 3. UNII Band (WLAN 6G):
5925~6425MHz: Directional gain = $10 \log[(10^{3.3/10} + 10^{1.8/10})/2] = 2.61$dBi
6425~6525MHz: Directional gain = $10 \log[(10^{2.7/10} + 10^{2.5/10})/2] = 2.60$dBi
6525~6875MHz: Directional gain = $10 \log[(10^{1.3/10} + 10^{3.3/10})/2] = 2.41$dBi
6875~7125MHz: Directional gain = $10 \log[(10^{1.4/10} + 10^{2.9/10})/2] = 2.21$dBi
We chose the antenna gain corresponding to the frequency listed on the table which is closer to center frequency of WLAN.

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No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain(dBi)	
					Main	AUX
2.	L1LRF015-CS-H	LUXSHARE-ICT	Mono-Pole	2400	3.274	3.014
				2450	5.259	3.268
				2500	4.821	2.995
				5150	2.519	3.072
				5250	2.626	5.155
				5350	3.625	5.209
				5470	5.649	8.101
				5600	5.106	4.679
				5725	3.869	6.457
				5785	4.289	7.035
				5800	4.117	7.058
				5850	2.995	7.414
				5925	3.389	6.086
				6025	3.399	4.822
				6125	1.503	4.233
				6225	1.311	4.310
				6325	-0.913	3.824
				6425	-0.235	2.696
				6525	-0.526	0.877
				6625	-0.481	-0.490
				6725	0.278	-1.049
				6825	0.716	-1.896
				6925	0.701	-2.361
				7025	0.087	-1.759
				7125	-1.074	-4.391

According to KDB 662911 D01 d) ii), transmit signals are completely uncorrelated, then
Directional gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \ldots + 10^{GN/10})/N_{ANT}]$ dBi

Note 1. 2.4G: Directional gain =

2400MHz: Directional gain = $10 \log[(10^{3.274/10} + 10^{3.014/10})/2] = 3.15$dBi

2450MHz: Directional gain = $10 \log[(10^{5.259/10} + 10^{3.268/10})/2] = 4.38$dBi

Note 2. 5G: Directional gain =

5150MHz: = $10 \log[(10^{2.159/10} + 10^{3.072/10})/2] = 2.80$dBi

5250MHz: = $10 \log[(10^{2.626/10} + 10^{5.155/10})/2] = 4.07$dBi

5350MHz: = $10 \log[(10^{3.625/10} + 10^{5.209/10})/2] = 4.49$dBi

We chose the antenna gain corresponding to the frequency listed on the table which is closer to center frequency of WLAN.

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According to KDB 662911 D01 d) ii), transmit signals are completely uncorrelated, then
Directional gain = 10 log[($10^{G1/10}$ + $10^{G2/10}$ + … + $10^{GN/10}$)/N_{ANT}] dBi

Note 3. UNII Band (WLAN 6G):

5925MHz: Directional gain = 10 log[($10^{3.389/10}$ +$10^{6.086/10}$)/2]= 4.94dBi
6025MHz: Directional gain = 10 log[($10^{3.399/10}$ +$10^{4.882/10}$)/2]= 4.17dBi
6125MHz: Directional gain = 10 log[($10^{1.503/10}$ +$10^{4.233/10}$)/2]= 3.08dBi
6225MHz: Directional gain = 10 log[($10^{1.311/10}$ +$104^{4.310/10}$)/2]= 3.06dBi
6325MHz: Directional gain = 10 log[($10^{-0.913/10}$ +$10^{3.824/10}$)/2]= 2.07dBi
6425MHz: Directional gain = 10 log[($10^{-0.235/10}$ +$10^{2.696/10}$)/2]= 1.47dBi
6525MHz: Directional gain = 10 log[($10^{-0.526/10}$ +$10^{0.877/10}$)/2]= 0.23dBi
6625MHz: Directional gain = 10 log[($10^{-0.481/10}$ +$10^{-0.490/10}$)/2]= -0.49dBi
6725MHz: Directional gain = 10 log[($10^{0.278/10}$ +$10^{-1.049/10}$)/2]= -0.34dBi
6825MHz: Directional gain = 10 log[($10^{0.716/10}$ +$10^{-1.896/10}$)/2]= -0.40dBi
6925MHz: Directional gain = 10 log[($10^{0.701/10}$ +$10^{-2.361/10}$)/2]= -0.57dBi
7025MHz: Directional gain = 10 log[($10^{0.087/10}$ +$10^{-1.759/10}$)/2]= -0.74dBi
7125MHz: Directional gain = 10 log[($10^{-1.074/10}$ +$10^{-4.391/10}$)/2]= -2.42dBi

We chose the antenna gain corresponding to the frequency listed on the table which is closer to center frequency of WLAN.

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3.5. EUT Specifications Assessed in Current Report

Mode	U-NII Band	Fundamental Range (MHz)	Channel Number
802.11ax-HE20	5	5955-6415	24
	6	6435-6515	5
	7	6535-6855	17
	8	6875-7115	13
802.11ax-HE40	5	5965-6405	12
	6	6445-6485	2
	7	6525-6845	9
	8	6885-7085	6
802.11ax-HE80	5	5985-6385	6
	6	6465-6545	2
	7	6625-6785	3
	8	6865-7025	3
802.11ax-HE160	5	6025-6345	3
	6	6505	1
	7	6665-6825	2
	8	6985	1

Mode	Modulation	Data Rate (Mbps)
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

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Channel List								
802.11ax-HE20								
U-NII Band	Channel Number	Freq. (MHz)	U-NII Band	Channel Number	Freq. (MHz)	U-NII Band	Channel Number	Freq. (MHz)
5	2	5955	5	81	6335	7	161	6755
	5	5975		85	6375		165	6775
	9	5995		89	6395		169	6795
	13	6015		93	6415		173	6815
	17	6035	6	97	6435		177	6835
	21	6055		101	6455		181	6855
	25	6075		105	6475	8	185	6875
	29	6095		109	6495		189	6895
	33	6115		113	6515		193	6915
	37	6135	7	117	6535		197	6935
	41	6155		121	6555		201	6955
	45	6175		125	6575		205	6975
	49	6195		129	6595		209	6995
	53	6215		133	6615		213	7015
	57	6235		137	6635		217	7035
	61	6255		141	6655		221	7055
	65	6275		145	6675		225	7075
	69	6295		149	6695		229	7095
	73	6315		153	6715		233	7115
	77	6335		157	6735			

Channel List								
802.11ax-HE40								
U-NII Band	Channel Number	Freq. (MHz)	U-NII Band	Channel Number	Freq. (MHz)	U-NII Band	Channel Number	Freq. (MHz)
5	3	5965	5	83	6365	7	163	6765
	11	6005		91	6405		171	6805
	19	6045	6	99	6445		179	6845
	27	6085		107	6485	8	187	6885
	35	6125	7	115	6525		195	6925
	43	6165		123	6565		203	6965
	51	6205		131	6505		211	7005
	59	6245		139	6645		219	7045
	67	6285		147	6685		227	7085
	75	6325		155	6725			

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Channel List								
802.11ax-HE80								
U-NII Band	Channel Number	Freq. (MHz)	U-NII Band	Channel Number	Freq. (MHz)	U-NII Band	Channel Number	Freq. (MHz)
5	7	5985	5	87	6385	7	167	6785
	23	6065	6	103	6465	8	183	6865
	39	6145		119	6545		199	6945
	55	6225	7	135	6625		215	7025
	71	6305		151	6705			

Channel List					
802.11ax-HE160					
U-NII Band	Channel Number	Frequency (MHz)	U-NII Band	Channel Number	Frequency (MHz)
5	15	6025	7	143	6665
	47	6185	8	175	6825
	79	6345		207	6985
6	111	6505			

Note: Test modes are presented at section 3.7.

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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	1XZ90SP MAIN B/D	PM (With GPU) Manufacturer: #1 Hannstar Board Tech (Jiang Yin) Corp.,Ltd. #2 Elec&Eltek Company (MCO) Limited.
			GM (Without GPU) Manufacturer: #1 Hannstar Board Tech (Jiang Yin) Corp.,Ltd. #2 Elec&Eltek Company (MCO) Limited.
SUB Board	LG	16Z90SP SUB B/D	Manufacturer: #1 HannstarBoardTech(Jiang Yin)Corp.,Ltd. #2 JiangSuHuaShen Electronic co.,ltd (HXF) #3 Elec&Eltek Company (MCO) Limited.
CPU (Socket: BGA2049)	Intel	Ultra 7 155H	3.8GHz
	Intel	Ultra 5 125H	3.6GHz
16” LCD Panel	SAMSUNG	ATNA60CL06-0	Resolution: 2560*1800@120Hz
	LG Display	LP160WQ2	Resolution: 2560 x 1600, 144Hz
Storage (SSD)	SK hynix	---	256GB
		---	512GB
		---	1TB
		---	2TB
	Samsung	---	256GB
		---	512GB
		---	1TB
		---	2TB
Memory (RAM)	Samsung	---	16GB LPDDR5x(On Board)
		---	8GB LPDDR5x(On Board)
		---	32GB LPDDR5x(On Board)
	SK Hynix	---	16GB LPDDR5x(On Board)
		---	8GB LPDDR5x(On Board)
		---	32GB LPDDR5x(On Board)
Battery Pack	LGES	LB3122MM	77Wh, DC 15.52V, 4963mAh For GM Main Board
	LGES	LBY122NM	90Wh, DC 15.52V, 5800mAh For PM Main Board
WLAN Combo Card	Intel	AX211D2W	WLAN and BT, 2x2 PCle M.2 1216 SD adapter card FCC ID: PD9AX211D2 IC: 1000M-AX211D2
WLAN Combo Antenna	LG (INPAQ)	WA-P-LBLB-04-111	PCB, Mono-pole Type Main: Black, Aux: Gray
	LG (Luxshare)	L1LRF015-CS-H	PCB, Mono-pole Type Main: Black, Aux: Gray

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Item	Supplier	Model / Type	Character
Keyboard	TIC	22L2J/ 22B2L	---
Touch Pad	LITE-ON	SP8B00B31(SG-A0660-00A)	---
	ELAN	SD082A-34H0	---
Web Camera	Luxvisions	ABG213N3	---
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		
AC Adapter	LG (HONOR)	LP90DGC20H-WW	I/P: AC 100-240V, 2.0A, 50-60Hz O/P: (PDO) DC 5.0V,3.0A(15W) or DC 9.0V, 3.0A(27W)or DC 15.0V,3.0A (45W) or DC 20.0V,4.5A (90W) (PPS) DC 5.0V~20.0V, 4.5A (Max 90W) (For PM Main Board)
	#1 Type C Cable, Shielded, Undetached (5A) #2 Type C Cable, Shielded, Undetached (3A) AC Power Cord: Non-Shielded, Detached (3C)		
	LG (PI ELECTRONICS)	LP65WFC20P-NJ	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) (For GM Main Board, US Type, Wall-mount)
	#1 Type C Cable, Shielded, Undetached (5A) #2 Type C Cable, Shielded, Undetached,(3A)		

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

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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**	**2**
Main Board		LG, 1XZ90SP MAIN B/D [PM (With GPU)]	V	
		LG, 1XZ90SP MAIN B/D [GM (Without GPU)]		V
SUB Board		LG, 16Z90SP SUB B/D	V	V
CPU		Intel, Ultra 7 155H	V	V
16” LCD Panel		SAMSUNG, ATNA60CL06-0	V	V
Storage (SSD)		Samsung, 2TB	V	V
Memory (RAM)		SK hynix, 32GB	V	V
Battery Pack		LG, 90Wh	V	V
Keyboard		TIC, 22L2J/ 22B2L	V	V
Touch Pad		LITE-ON, SP8B00B31(SG-A0660-00A)	V	V
Web Camera		Luxvisions, ABG213N3A	V	V
WLAN Combo Card		Intel, AX211D2W	V	V
WLAN Combo Antenna		LG (INPAQ), WA-P-LBLB-04-111	V	V
		LG (Luxshare), L1LRF015-CS-H	V	V
Type C #1	AC Adapter	LG (HONOR), LP90DGC20H-WW	V	V
Type C #2	Link to LAN Gender	MEC (White)	V	V

Evaluation method	INPAQ	LUXSHARE-ICT	INPAQ	LUXSHARE-ICT
	SKU #1	SKU #1	SKU #2	SKU #2
6G Band	Full test	Full test	Worst case depend on INPAQ test result	Worst case depend on LUXSHARE-ICT test result

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3.7. Test Configuration

Mode	TX_{on} (ms)	1/ TX_{on} (kHz)	TX_{on+off} (ms)	Duty Cycle (x)	Duty Cycle Factor [10log(1/x)] (dB)
802.11ax-HE20	3.980	0.251	4.030	0.988	N/A
802.11ax-HE40	3.980	0.251	4.030	0.988	N/A
802.11ax-HE80	3.980	0.251	4.030	0.988	N/A
802.11ax-HE160	2.305	0.434	2.350	0.981	N/A
RU (26T)	2.590	0.386	2.630	0.985	N/A
RU (52T)	2.590	0.386	2.630	0.985	N/A
RU (106T)	2.590	0.386	2.630	0.985	N/A
RU (242T)	2.590	0.386	2.640	0.981	N/A
RU (484T)	2.590	0.386	2.630	0.985	N/A
RU (996T)	2.590	0.386	2.630	0.985	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.

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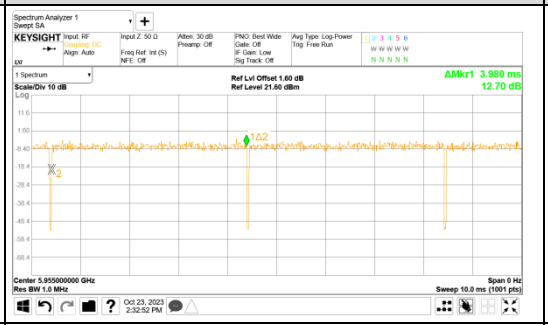
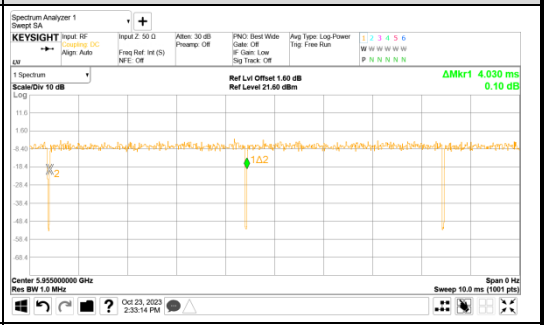
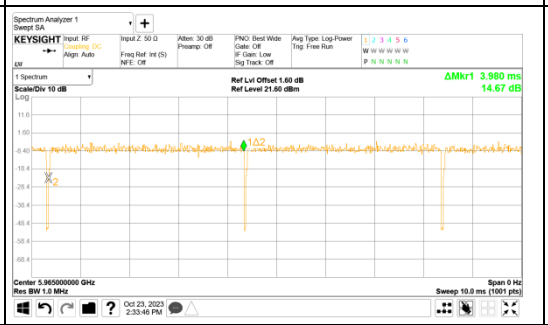
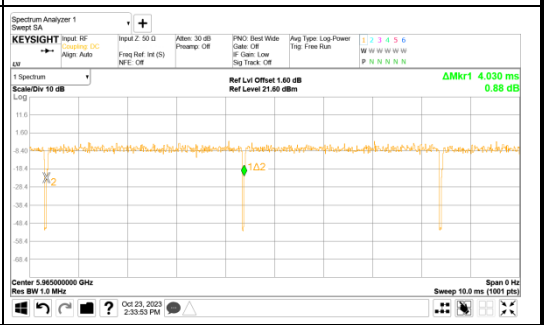
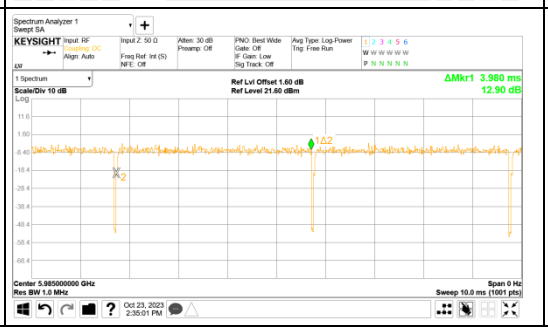
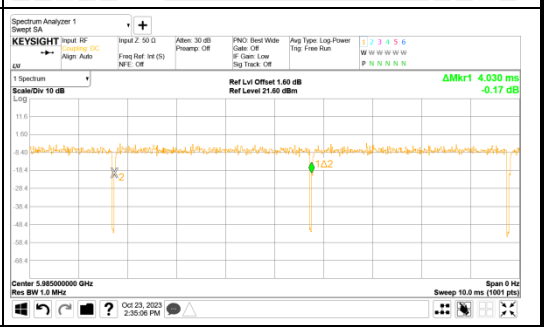
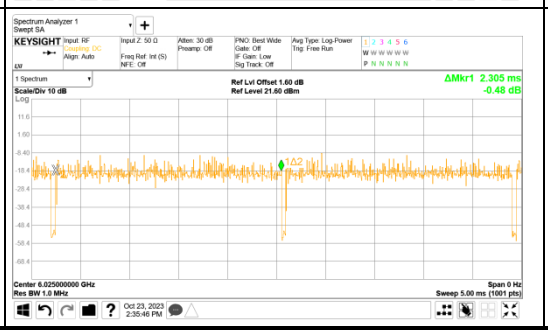
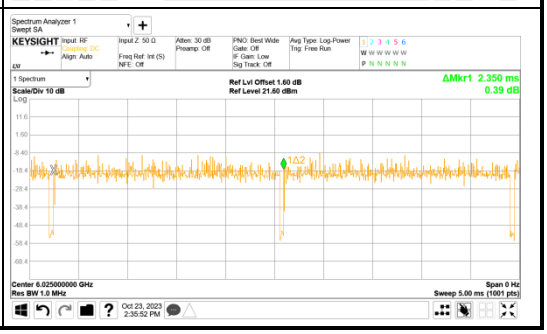
Mode	TX_{on} (ms)	$T_{on}+T_{off}$(ms)
802.11ax-HE20		
802.11ax-HE40		
802.11ax-HE80		
802.11ax-HE160		

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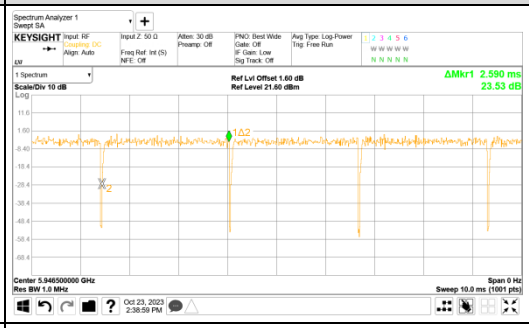
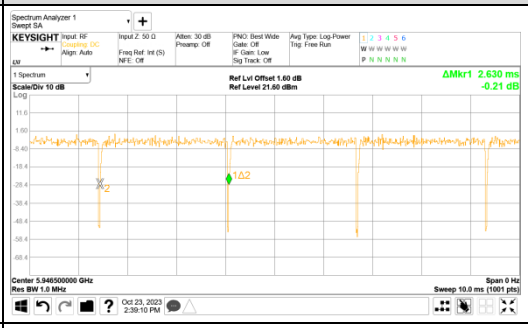
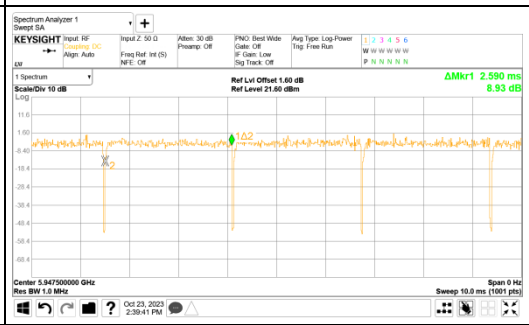
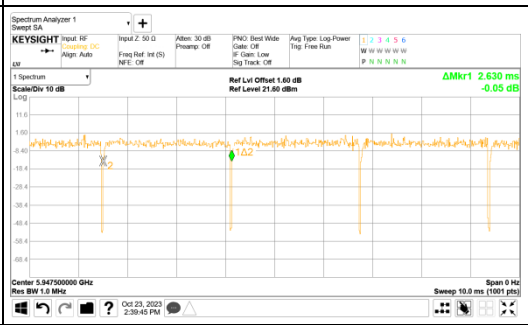
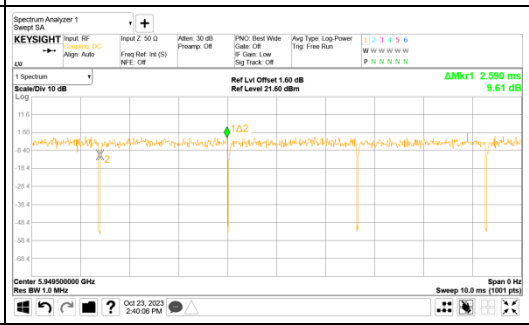
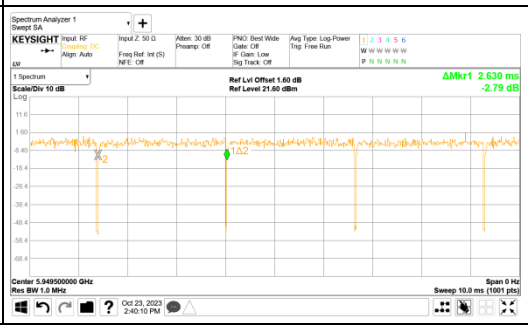
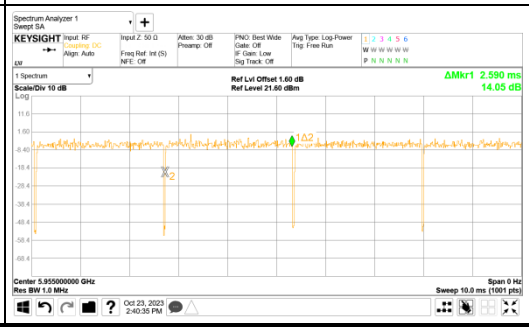
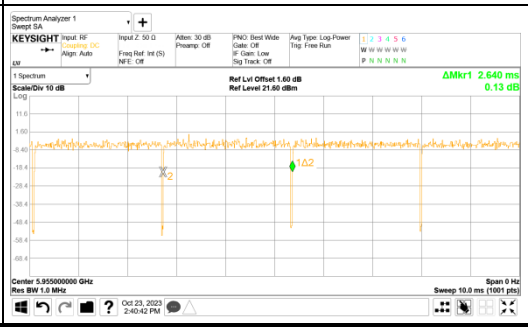
Mode	TX_{on} (ms)	$T_{on}+T_{off}$(ms)
RU (26T)		
RU (52T)		
RU (106T)		
RU (242T)		

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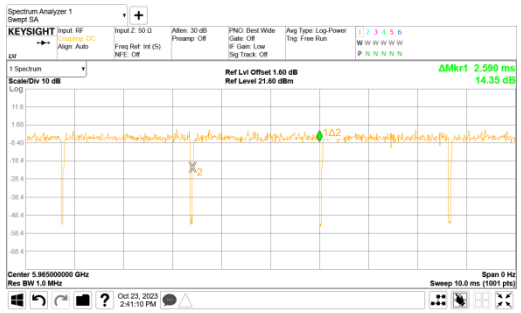
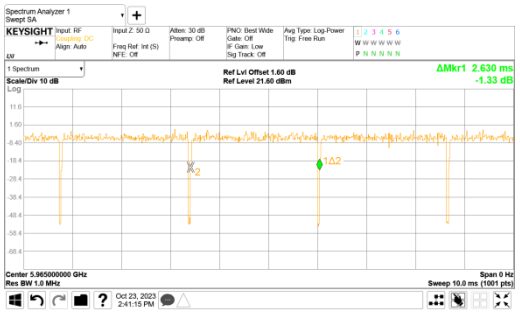
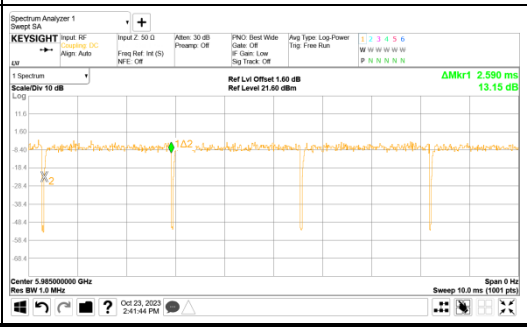
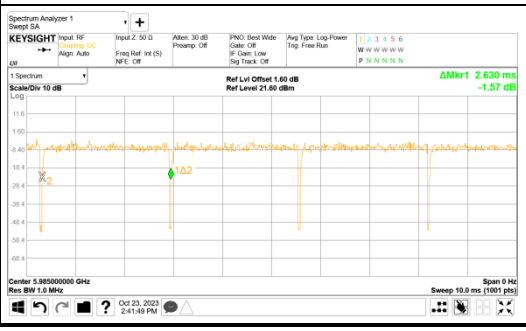
Mode	TX_{on} (ms)	$T_{on}+T_{off}$(ms)
RU (484T)		
RU (996T)		

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AC Conduction	
SKU #1(with INPOAQ ANT)	Normal operation
SKU #2(with LUXSHARE-ICT ANT)	Normal operation

Item			Mode	Data Rate	Test Channel
Radiated Test Case	SKU #1 (with INPAQ ANT)	Radiated Spurious Emission (30MHz~1GHz)	802.11ax-HE160	HE0	111
	SKU #1 (with LUXSHARE-ICT ANT)		802.11ax-HE160	HE0	111

- OFDM Modulation

Item			Mode	Data Rate	Test Channel
Radiated Test Case	SKU #1 (with INPAQ ANT)	Radiated Spurious Emission (Above 1GHz)	802.11ax-HE20	HE0	2/113/117/201
			802.11ax-HE40	HE0	3/107/115/227
			802.11ax-HE80	HE0	87/103/151/199
			802.11ax-HE160	HE0	47/111/143/207
		Band Edge	802.11ax-HE20	HE0	2
			802.11ax-HE40	HE0	3/227
			802.11ax-HE80	HE0	7/215
			802.11ax-HE160	HE0	15/207
		Band Edge-Marker Delta	802.11ax-HE20	HE0	233
	SKU #1 (with LUXSHARE-ICT ANT)	Radiated Spurious Emission (Above 1GHz)	802.11ax-HE20	HE0	2/97/117/185
			802.11ax-HE40	HE0	3/99/115/211
			802.11ax-HE80	HE0	7/103/151/199
			802.11ax-HE160	HE0	15/111/143/207
		Band Edge	802.11ax-HE20	HE0	2
			802.11ax-HE40	HE0	3/227
			802.11ax-HE80	HE0	7/215
			802.11ax-HE160	HE0	15/207
		Band Edge-Marker Delta	802.11ax-HE20	HE0	233

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Item			Mode	Data Rate	Test Channel
Conducted Test Case	SKU #1 Note 7	Maximum Power Spectral Density/ Maximum Conducted Output power/ Emission/Occupied Bandwidth	802.11ax-HE20	HE0	2/45/93/97/105/113/117/149/181/185/209/233
			802.11ax-HE40	HE0	3/43/91/99/107/115/147/179/187/211/227
			802.11ax-HE80	HE0	7/39/87/103/119/135/151/167/183/199/215
			802.11ax-HE160	HE0	15/47/79/111/143/175/207
		Band Edge	802.11ax-HE20	HE0	2/233
			802.11ax-HE40	HE0	3/227
			802.11ax-HE80	HE0	7/215
			802.11ax-HE160	HE0	15/207
		Spurious Emission	802.11ax-HE20	HE0	2/113/117/185
			802.11ax-HE40	HE0	3/107/115/227
			802.11ax-HE80	HE0	87/119/135/215
			802.11ax-HE160	HE0	79/111/143/207

Item			Mode	Data Rate	Test Channel
Conducted Test Case	SKU #1 Note 7	In-Band Emission (Channel Mask)	802.11ax-HE20	HE0	2/45/93/97/105/113/117/149/181/185/209/233
			802.11ax-HE40	HE0	3/43/91/99/107/115/147/179/187/211/227
			802.11ax-HE80	HE0	7/39/87/103/119/135/151/167/183/199/215
			802.11ax-HE160	HE0	15/47/79/111/143/175/207
		Contention Based Protocol	802.11ax-HE20	HE0	45/105/149/209
			802.11ax-HE160	HE0	47/111/143/207

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- OFDMA Modulation

Item			Tones	RU Index	Mode	Data Rate	Test Channel
Radiated Test Case	SKU #1 (with INPAQ ANT)	Radiated Spurious Emission (Above 1GHz) Note 4	26T	18	802.11ax-HE80	HE0	7
			52T	39	802.11ax-HE20	HE0	2
			106T	53	802.11ax-HE40	HE0	3
			242T	62	802.11ax-HE160	HE0	15
			484T	S66	802.11ax-HE160	HE0	15
			996T	67	802.11ax-HE80	HE0	87
		Band Edge Note 5	26T	0	802.11ax-HE20	HE0	2
				17	802.11ax-HE40	HE0	227
			52T	37	802.11ax-HE20	HE0	2
				44	802.11ax-HE40	HE0	227
			106T	53	802.11ax-HE20	HE0	2
				53	802.11ax-HE40	HE0	3
				54	802.11ax-HE40	HE0	227
			242T	61	802.11ax-HE160	HE0	15
				62	802.11ax-HE40	HE0	227
			484T	65	802.11ax-HE80	HE0	7
				65	802.11ax-HE40	HE0	227
			996T	67	802.11ax-HE160	HE0	15
				67	802.11ax-HE80	HE0	215
		Band Edge- Marker Delta	26T	8	802.11ax-HE20	HE0	233
			52T	40	802.11ax-HE20	HE0	233
			106T	54	802.11ax-HE20	HE0	233
	SKU #1 (with LUXSHARE-ICT ANT)	Radiated Spurious Emission (Above 1GHz) Note 4	26T	4	802.11ax-HE20	HE0	2
			52T	39	802.11ax-HE20	HE0	2
			106T	53	802.11ax-HE40	HE0	3
			242T	61	802.11ax-HE20	HE0	2
			484T	65	802.11ax-HE40	HE0	3
			996T	67	802.11ax-HE80	HE0	7
		Band Edge Note 5	26T	0	802.11ax-HE20	HE0	2
				36	802.11ax-HE80	HE0	215
			52T	37	802.11ax-HE20	HE0	2
				52	802.11ax-HE80	HE0	215
			106T	53	802.11ax-HE20	HE0	2
				60	802.11ax-HE80	HE0	215
			242T	61	802.11ax-HE20	HE0	2
				64	802.11ax-HE80	HE0	215
			484T	65	802.11ax-HE40	HE0	3
				S66	802.11ax-HE160	HE0	207
			996T	67	802.11ax-HE80	HE0	7
				67	802.11ax-HE80	HE0	215
		Band Edge- Marker Delta	26T	8	802.11ax-HE20	HE0	233
			52T	40	802.11ax-HE20	HE0	233
			106T	54	802.11ax-HE20	HE0	233

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Item			Tones	RU Index	Mode	Data Rate	Test Channel
Conducted Test Case	SKU #1 Note 7	Maximum Power Spectral Density/ In-Band Emission (Channel Mask)	26T	18	802.11ax-HE80	HE0	7
			52T	44	802.11ax-HE80	HE0	7
			106T	56	802.11ax-HE80	HE0	7
			242T	62	802.11ax-HE80	HE0	7
			484T	65	802.11ax-HE40	HE0	3
			996T	67	802.11ax-HE160	HE0	79
		Maximum Conducted Output power Note 3	26T	0/4/8	802.11ax-HE20	HE0	2/45/93/97/105/ 113/117/149/ 181/185/209/ 233
			52T	37/39/40			
			106T	53/54			
			242T	61			
			26T	0/8/17	802.11ax-HE40	HE0	3/43/91/99/107/ 115/147/179/ 187/211/227
			52T	37/40/44			
			106T	53/54/56			
			242T	61/62			
			484T	65			
			26T	0/18/36	802.11ax-HE80	HE0	7/39/87/103/119 /135/151/167/18 3/199/215
			52T	37/44/52			
			106T	53/56/60			
			242T	61/62/64			
			484T	65/66			
			996T	67			
			26T	0/18/36 S0/S18/S36	802.11ax-HE160	HE0	15/47/79/111/ 143/175/207
			52T	37/44/52 S37/S44/S52			
			106T	53/56/60 S53/S56/S60			
			242T	61/62/64 S61/S62/S64			
			484T	65/66 S65/S66			
			996T	65/S67			

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Spot Check [Note 6]

Item			Mode	Data Rate	Test Channel
Radiated Test Case	SKU #2 (with INPAQ ANT)	Radiated Spurious Emission (30MHz~1GHz)	802.11ax-HE160	HE0	111
	SKU #2 (with LUXSHARE-ICT ANT)		802.11ax-HE160	HE0	111

Item			Mode	Data Rate	Test Channel
Radiated Test Case	SKU #2 (with INPAQ ANT)	Radiated Spurious Emission (Above 1GHz)	802.11ax-HE20	HE0	209
Radiated Test Case	SKU #2 (with LUXSHARE-ICT ANT)	Radiated Spurious Emission (Above 1GHz)	802.11ax-HE20	HE0	117

Item			Tones	RU Index	Mode	Data Rate	Test Channel
Radiated Test Case	SKU #2 (with INPAQ ANT)	Band Edge-Marker Delta	26T	8	802.11ax-HE20	HE0	233
	SKU #2 (with LUXSHARE-ICT ANT)	Band Edge-Marker Delta	52T	40	802.11ax-HE20	HE0	233

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

Note 4: After preliminary test, we present worst case with maximum power of each RU type.

Note 5: We present worst case (max. power, closest band-edge channel or both) in the report.

Note 6: The spot check worst case was depended on SKU # 1 (with INPAQ ANT and with LUXSHARE-ICT ANT).

Note 7: We used SKU #1 measured all conducted test

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3.8. Output Power Setting

Mode	U-NII Band	Centre Frequency (MHz)	Power Setting		Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			AUX	Main				AUX	Main
802.11ax -HE20	5	5955	1.50	1.50	802.11ax -HE20	7	6535	0.75	0.75
		6175	1.50	1.50			6695	0.75	0.75
		6415	1.50	1.50			6855	0.75	0.75
	6	6435	1.50	1.50		8	6875	0.75	0.75
		6475	1.50	1.50			6995	0.75	0.75
		6515	1.50	1.50			7115	-3.00	-3.00

Mode	U-NII Band	Centre Frequency (MHz)	Power Setting		Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			AUX	Main				AUX	Main
802.11ax -HE40	5	5965	4.75	4.75	802.11ax -HE40	7	6525	4.75	4.75
		6165	4.75	4.75			6685	4.00	4.00
		6405	4.75	4.75			6845	4.00	4.00
	6	6445	4.75	4.75		8	6885	4.00	4.00
		6485	4.75	4.75			7005	4.00	4.00
							7085	4.00	4.00

Mode	U-NII Band	Centre Frequency (MHz)	Power Setting		Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			AUX	Main				AUX	Main
802.11ax -HE80	5	5985	7.25	7.25	802.11ax -HE80	7	6625	7.25	7.25
		6145	7.25	7.25			6705	6.50	6.50
		6385	7.25	7.25			6785	6.50	6.50
	6	6465	7.25	7.25		8	6865	6.50	6.50
		6545	7.25	7.25			6945	6.50	6.50
							7025	6.50	6.50

Mode	U-NII Band	Centre Frequency (MHz)	Power Setting		Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			AUX	Main				AUX	Main
802.11ax -HE160	5	6025	10.00	10.00	802.11ax-HE160	7	6665	9.25	9.25
		6185	10.00	10.00			6825	9.25	9.25
		6345	10.00	10.00		8	6985	9.25	9.25
	6	6505	10.00	10.00					

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3.9. Tested Supporting System List

3.9.1. Support Peripheral Unit

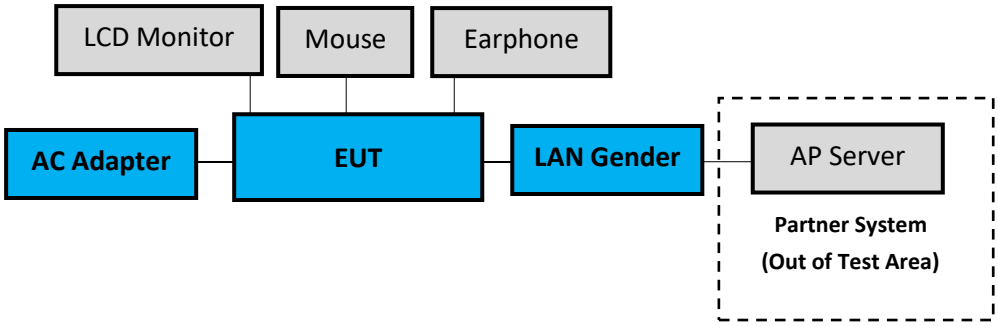
No.	Product	Brand	Model No.	Serial No.	Approval
1.	LCD Monitor	DELL	U2718Qb	CN-0M5R5F-QD C00-99P-04CL	N/A
2.	USB Mouse	Lenovo	SM-8823	8SSM50L24506A VLC99H049R	N/A
3.	Earphone	APPLE	N/A	N/A	N/A
Partner System					
4.	AP Server	ASUS	RT-AX88U	N/A	FCC ID: MSQ-RTAXHP00 IC: 3568A-RTAXHP00

3.9.2. Cable Lists

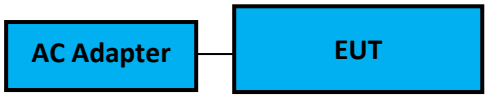
No.	Cable Description Of The Above Support Units
1.	HDMI Cable: Shielded, Detachable, 1.8 AC Power Cord: Unshielded, Detachable, 1.8m
2.	USB Cable: Unshielded, Undetachable, 1.8
3.	Earphone Cable: Unshielded, Undetachable, 1.2m
4.	AC adapter: M/N:WA-30B12, Cable: Unshielded, Detachable, 1.2m LAN cable: 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



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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), 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

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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	☐	No. 7 Shielded Room	9kHz-150kHz	±3.7dB
			150kHz-30MHz	±3.4dB
	☒	No. 8 Shielded Room	9kHz-150kHz	±3.7dB
			150kHz-30MHz	±3.5dB
Radiation Test	☒	No.1 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±3.6dB
			200MHz-1000MHz, 3m, Horizontal	±4.3dB
			30MHz-200MHz, 3m, Vertical	±4.4dB
			200MHz-1000MHz, 3m, Vertical	±4.8dB
			1GHz-6GHz, 3m	±4.8dB
			6GHz-18GHz, 3m	±4.5dB
	☐	No.3 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.0dB
			200MHz-1000MHz, 3m, Horizontal	±4.4dB
			30MHz-200MHz, 3m, Vertical	±4.7dB
			200MHz-1000MHz, 3m, Vertical	±4.5dB
			1GHz-6GHz, 3m	±4.8dB
			6GHz-18GHz, 3m	±4.5dB
	☐	No.4 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.3dB
			200MHz-1000MHz, 3m, Horizontal	±4.2dB
			30MHz-200MHz, 3m, Vertical	±4.8dB
			200MHz-1000MHz, 3m, Vertical	±4.7dB
			1GHz-6GHz, 3m	±4.6dB
			6GHz-18GHz, 3m	±4.4dB
	☐	No.5 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.6dB
			200MHz-1000MHz, 3m, Horizontal	±4.4dB
			30MHz-200MHz, 3m, Vertical	±4.5dB
			200MHz-1000MHz, 3m, Vertical	±4.9dB
			1GHz-6GHz, 3m	±4.9dB
			6GHz-18GHz, 3m	±4.6dB
	Radiated emissions (18GHz-40GHz)		18GHz-40GHz, 3m	±3.4dB

Remark：Uncertainty = $ku_c(y)$

Test Items	Uncertainty
Maximum Power Spectral Density	± 0.52dB
Maximum Conducted Output Power	± 0.72dB
Emission Bandwidth	± 0.38%
Contention Based Protocol	± 2%

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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	2023. 01. 11	1 Year
2.	A.M.N.	R&S	ENV432	101567	2023. 06. 02	1 Year
3.	L.I.S.N.	Kyoritsu	KNW-407	8-855-9	2022. 12. 19	1 Year
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2022. 12. 14	1 Year
5.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.8 S/R	2023. 04. 13	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.

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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	2023.08.16	1 Year
2.	Spectrum Analyzer	Keysight	N9010B-544	MY55460198	2023.03.29	1 Year
3.	Test Receiver	R&S	ESCS30	100338	2023.06.20	1 Year
4.	Amplifier	HP	8447D	2944A06305	2022.12.29	1 Year
5.	Microwave Amplifier	Keysight	83051A	MY56480113	2023.09.11	1 Year
6.	Microwave Amplifier	Agilent	8449B	3008A02678	2023.02.17	1 Year
7.	Loop Antenna	TESEQ	HLA 6121	60478	2023.02.21	1 Year
8.	Bilog Antenna	TESEQ	CBL6112D	33821	2023.06.30	1 Year
9.	Horn Antenna	EMCO	3115	9112-3775	2023.05.04	1 Year
10.	Horn Antenna	COM-POWER	AH-840	101092	2022.12.30	1 Year
11.	Notch Filter	Warison	WFIL-N5925-6425F	WR61CFWC4B1	2023. 01. 13	Notch Filter
12.	Notch Filter	Warison	WFIL-N6425-6525F	WR61CFWC6B1	2023. 01. 13	Notch Filter
13.	Notch Filter	Warison	WFIL-N6525-6875F	WR61CFWC8B1	2023. 01. 13	Notch Filter
14.	Notch Filter	Warison	WFIL-N6875-7125F	WR61CFWC2B1	2023. 01. 13	Notch Filter
15.	Coaxial Cable	MIYAZAKI	5D2W	RE-11	2023.01.07	1 Year
16.	Coaxial Cable	HUBER+SUHNER	RG223/U	RE-33	2023.03.02	1 Year
17.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 106	RE-14	2023.01.07	1 Year
18.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	RE-30	2023.08.21	1 Year
19.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.1 3m A/C	2023.04.13	1 Year

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4.3. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Keysight	N9020B-544	MY57120357	2023. 02. 22	1 Year
2.	Power Meter	Anritsu	ML2495A	2127005	2022. 12. 01	1 Year
3.	Power Meter	Anritsu	ML2495A	2127004	2022. 12. 07	1 Year
4.	Power Sensor	Anritsu	MA2411B	1911360	2022. 12. 07	1 Year
5.	Power Sensor	Anritsu	MA2411B	1911356	2022. 12. 01	1 Year
6.	Digital Thermo-Hygro Meter	iMax	HTC-1	RF-03	2023. 04. 13	1 Year

4.4. Contention Based Protocol Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Keysight	N9030B	MY61330403	2023. 12. 05	1 Year
2.	Spectrum Analyzer	Keysight	N9010B	MY59071380	2023. 03. 02	1 Year
3.	MXG RF Vector Signal Generator	Agilent	N5182B	MY53050409	2023. 11.16	1 Year
4.	Frequency Extender	KEYSIGHT	N5182BX07	MY59362533	2023. 11.16	1 Year
5.	Digital Thermo-Hygro Meter	iMax	HTC-1	RF-03	2023. 04. 13	1 Year
6.	Power Splitter	minicircuit	ZFRSC-183-S^{+}	SF688901703	2023. 03. 30	1 Year
7.	Atteuator (10dB) X2	Worken	WK0602-10	0120A02208001S	N.C.R	N.C.R
8.	Atteuator (30dB) X1	Worken	WK0602-30	0120A02208002S	N.C.R	N.C.R
9.	Power Divider	EMEC	EM-MPD-0.5/8-2SS	22072002-17	2023. 03. 30	1 Year

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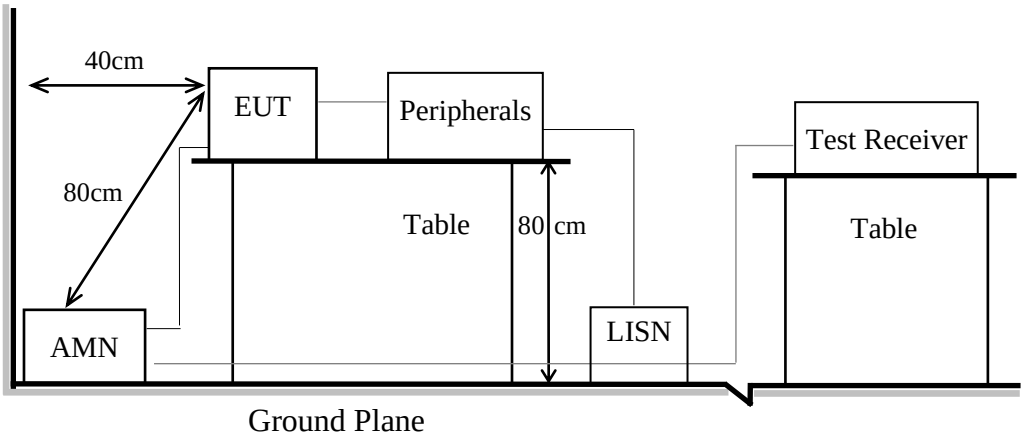
5. CONDUCTED EMISSION

5.1. Block Diagram of Test Setup

5.1.1. Block Diagram of EUT

Indicated as section 3.10

5.1.2. Shielded Room Setup Diagram



5.2. Conducted Emission Limit

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

Remark 1.: 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 150 kHz to 30 MHz and record the emission which does not have 20 dB below limit.

5.4. Test Results

Please refer to Appendix A.

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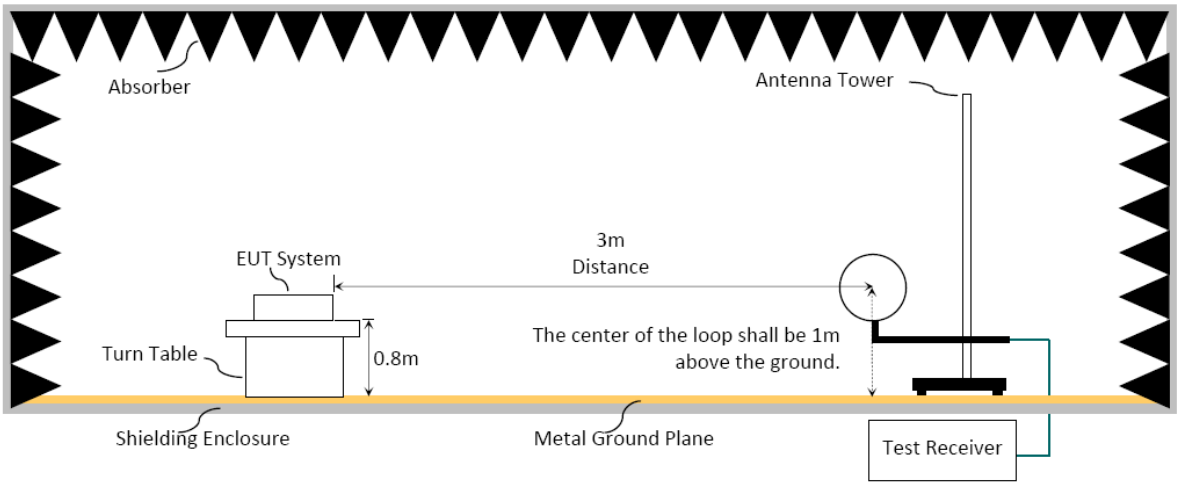
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

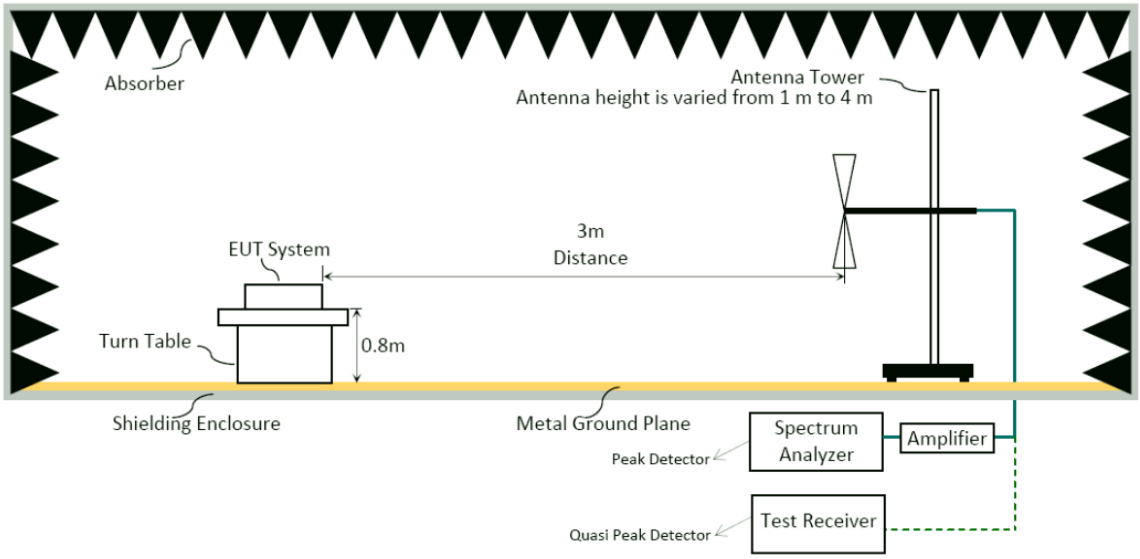
6.1.1. Block Diagram of EUT

Indicated as section 3.10

6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000MHz



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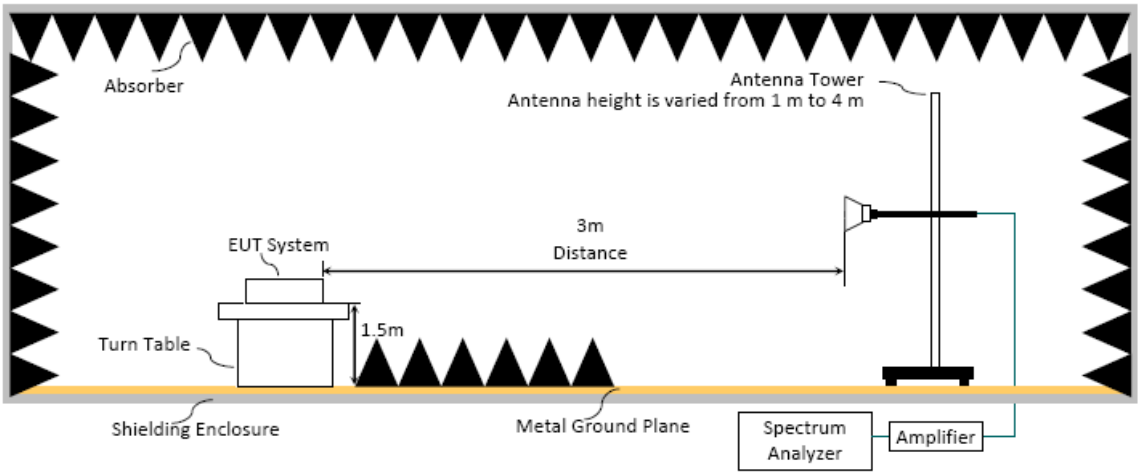
6.1.4. Setup Diagram for above 1GHz



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6.2. Radiated Emission Limits

Radiated emissions fall in restricted bands, as defined in FCC Section 15.205/RSS-Gen Section 8.10 table 7 must be in compliance with the radiated emission limits specified in FCC Section 15.209/RSS-Gen Section 8.9 table 6 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.

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
Out of 5925 to 7125	-27 dBm/MHz	68.2 dBμV/m

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

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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 C63.10-2013 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.

6.3.1. Radiated measurement Spectrum Analyzer Setting

6.3.1.1 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 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.

6.3.1.2 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. (Duty Cycle < 98%, when duty cycle presented in section 3.7)
(3)VBW = set VBW≤ RBW / 100, but not less than 10Hz (Duty Cycle ≥ 98%, when duty cycle presented in section 3.7)

Mode	VBW Setting
802.11ax-HE20	10Hz
802.11ax-HE40	10Hz
802.11ax-HE80	10Hz
802.11ax-HE160	10Hz
RU (26T)	10Hz
RU (52T)	10Hz
RU (106T)	10Hz
RU (242T)	10Hz
RU (484T)	10Hz
RU (996T)	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= Peak Emission Level+ D.C.C.F.

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6.3.2. Radiated band edge measurement Spectrum Analyzer Setting

For <u>without</u> 99% OBW edge within 2 MHz of the authorized band edge:
The spectrum analyzer setting, please refer to section 6.3.1.2

For <u>with</u> 99% OBW edge within 2 MHz of the authorized band edge:
Per KDB 789033 Section G.3.d and ANSI C63.10 -2013 6.10.4, SA setting as below:

a. Fundamental field strength of SA setting:
The spectrum analyzer setting, please refer to section 6.3.1.2

b. Delta of SA setting:
(1) RBW = 1% SPAN but no less than 30 KHz
(In this case, RBW = 500 KHz)
(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.

Correction Factor(Via delta, dB)= Fundamental Emission Level(dBμV/m)@RBW 500KHz- Band Edge Emission Level(dBμV/m)@RBW 500kHz

Band Edge Emission Level (dBμV/m) =
Fundamental Emission Level (dBμV/m)@RBW 1MHz – Marker Delta (dB)

6.4. Measurement Result Explanation

■Peak Emission Level (dBμV/m) =Antenna Factor (dB/m) + Cable Loss (dB) + Meter Reading (dBμV) (including Preamp factor if test used)
■Average Emission Level (dBμV/m) =Antenna Factor (dB/m) + Cable Loss (dB) + Meter Reading (dBμV) (including Preamp factor if test used)
□Average Emission Level (dBμV/m)= Peak Emission Level (dBμV/m)+ DCCF(dB)
Duty Cycle Correction Factor (DCCF)= 20log(TX_{on}/TX_{on+off}) presented in section 3.7.
□ERP= Peak Emission Level (dBμV/m) -95.2dB-2.14dB
□Band Edge Emission Level (dBμV/m) = Fundamental Emission Level (dBμV/m) – Maker-Delta (dB)

6.5. Test Results

Please refer to Appendix A.

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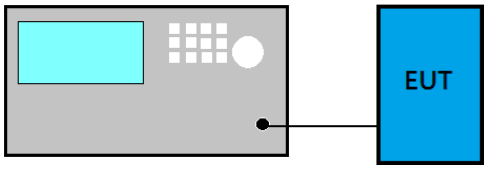
7. MAXIMUM POWER SPECTRAL DENSITY

7.1. Block Diagram of Test Setup



7.2. Specification Limits

For client devices operating under the control of an indoor access point in the 5.925-7.125 GHz bands, the maximum power spectral density must not exceed -1dBm e.i.r.p. in any 1-megahertz band

7.3. 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%.

For power density emission measurements from multiple outputs of a transmitter or from multiple transmitters: Please refer to KDB 662911 E 2) c).

7.4. Test Results

Please refer to Appendix A

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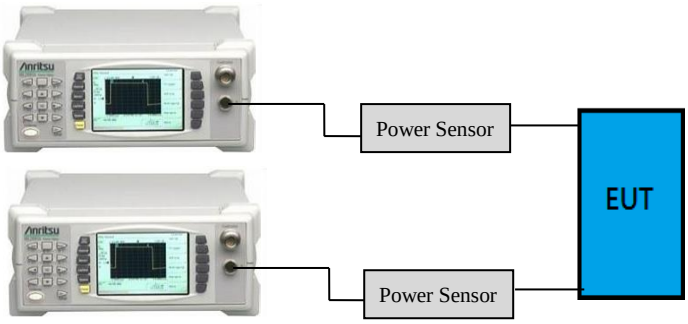
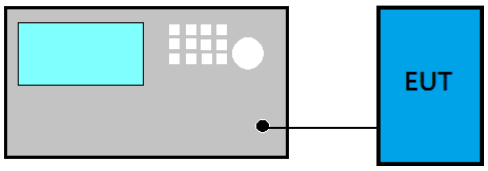
8. MAXIMUM CONDUCTED OUTPUT POWER

8.1. Block Diagram of Test Setup



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



8.2. Specification Limits

For client devices operating under the control of an indoor access point in the 5.925-7.125 GHz bands, the maximum e.i.r.p. over the frequency band of operation must not exceed 24 dBm.

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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 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) ≥ 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

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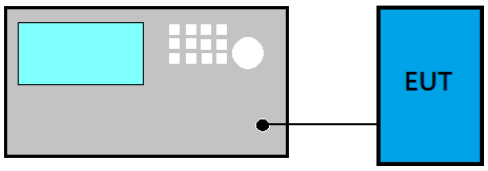
9. EMISSION/OCCUPIED BANDWIDTH

9.1. Block Diagram of Test Setup



9.2. Specification Limits

The maximum transmitter channel bandwidth for U-NII devices in the 5.925-7.125 GHz band is 320 megahertz

9.3. Test Procedure

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

(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.

9.4. Test Results

Please refer to Appendix A

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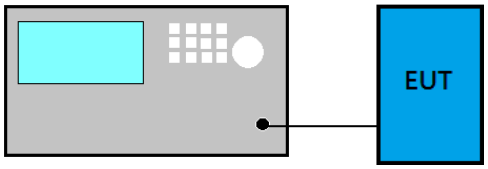
10. UNDERSIRABLE EMISSIONS LIMITS: SPURIOUS EMISSION (CONDUCTED)

10.1.Block Diagram of Test Setup



10.2.Spurious Emission Specification Limits

For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925- 7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz.
Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see FCC Part §§ 15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level

10.3.Test Procedure

Please refer to KDB 789033 D02 v02r01 G5

For spurious emission measurements from multiple outputs of a transmitter or from multiple transmitters: Please refer to KDB 662911 E 3) a) (iii).

10.4.Test Results

Please refer to Appendix A

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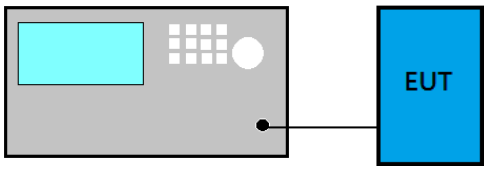
11. IN-BAND EMISSION (CHANNEL MASK)

11.1. Block Diagram of Test Setup



11.2. Specification Limits

For transmitters operating within the 5.925-7.125 GHz bands: Power spectral density must be suppressed by 20 dB at 1 MHz outside of channel edge, by 28 dB at one channel bandwidth from the channel center, and by 40 dB at one- and one-half times the channel bandwidth away from channel center. At frequencies between one megahertz outside an unlicensed device's channel edge and one channel bandwidth from the center of the channel, the limits must be linearly interpolated between 20 dB and 28 dB suppression, and at frequencies between one and one- and one-half times an unlicensed device's channel bandwidth, the limits must be linearly interpolated between 28 dB and 40 dB suppression. Emissions removed from the channel center by more than one- and one-half times the channel bandwidth must be suppressed by at least 40 dB.

11.3. Test Procedure

Following measurement procedure is reference to KDB 987594 D02 U-NII 6GHz EMC Measurement v01v01:

Measure the power spectral density (which will be used for emissions mask reference) using the following procedure:

(a) Set the span to encompass the entire 26 dB EBW of the signal.
(b) Set RBW = same RBW used for 26 dB EBW measurement.
(c) Set VBW ≥ 3 X RBW
(d) Number of points in sweep ≥ (2 X span / RBW).
(e) Sweep time = auto.
(f) Detector = RMS (i.e., power averaging)
(g) Trace average at least 100 traces in power averaging (rms) mode.
(h) Use the peak search function on the instrument to find the peak of the spectrum.

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(1) Using the measuring equipment limit line function, develop the emissions mask based on the following requirements. The emissions power spectral density must be reduced below the peak power spectral density (in dB) as follows:
   (a) Suppressed by 20 dB at 1 MHz outside of the channel edge.
   (b) Suppressed by 28 dB at one channel bandwidth from the channel center.
   (c) Suppressed by 40 dB at one- and one-half times the channel bandwidth from the channel center.
(2) Adjust the span to encompass the entire mask as necessary.
(3) Clear trace.
(4) Trace average at least 100 traces in power averaging (rms) mode.
(5) Adjust the reference level as necessary so that the crest of the channel touches the top of the emission mask.

11.4. Test Results

Please refer to Appendix A

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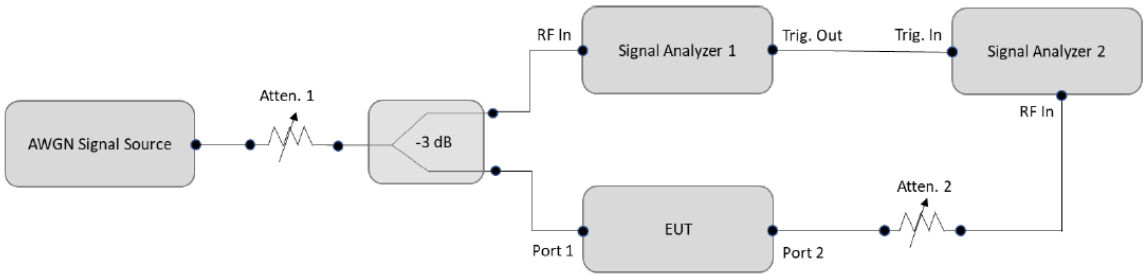
12. CONTENTION BASED PROTOCOL

12.1. Block Diagram of Test Setup



12.2. Specification Limits

Indoor access points, subordinate devices and client devices operating in the 5.925-7.125 GHz band must employ a contention-based protocol

FCC KDB 987594 D02 U-NII 6GHz EMC Measurement v01v01
Unlicensed low-power indoor devices must detect co-channel radio frequency power that is at least -62 dBm or lower. Upon detection of energy in the band, unlicensed low power indoor devices must vacate the channel (in which incumbent signal is transmitted) and stay off the incumbent channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm)1. The -62 dBm (or lower) threshold is referenced to a 0 dBi antenna gain

To ensure incumbent operations are reliably detected in the band, low power indoor devices must detect RF energy throughout their intended operating channel. For example, an 802.11 device that plans to transmit a 40 MHz- wide signal (on a primary 20 MHz channel and a secondary 20 MHz channel) must detect energy throughout the entire 40 MHz channel. Additionally, low-power indoor devices must detect co-channel energy with 90% or greater certainty.

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Table 1. Criteria to determine number of times detection threshold test may be performed

If	Number of Tests	Placement of Incumbent Transmission
$BW_{EUT} \leq BW_{Inc}$	One	Tune incumbent and EUT transmission ($f_{c1}=f_{c2}$)
$BW_{Inc} < BW_{EUT} \leq 2BW_{Inc}$	One	Incumbent transmission is contained within BW_{EUT}
$2BW_{Inc} < BW_{EUT} \leq 4BW_{Inc}$	Twice. Incumbent transmission is contained within BW_{EUT}	Incumbent transmission is located as closely as possible to the lower edge and upper edge, respectively, of the EUT channel
$BW_{EUT} > 4BW_{Inc}$	Three times	Incumbent transmission is located as closely as possible to the lower edge of the EUT channel, in the middle of EUT channel, and as closely as possible to the upper edge of the EUT channel

Where:

BW_{EUT} : Transmission bandwidth of EUT signal
BW_{Inc} : Transmission bandwidth of the simulated incumbent signal (10 MHz wide AWGN signal)
f_{c1}: Center frequency of EUT transmission
f_{c2}: Center frequency of simulated incumbent signal

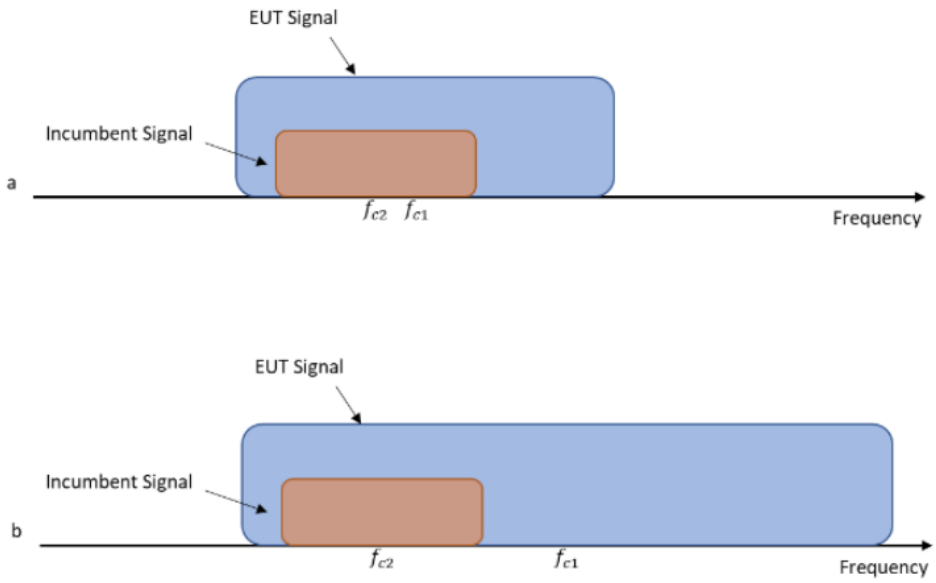

Figure 1. Two possible scenarios where a) center frequency of EUT transmission falls within incumbent's bandwidth, or b) outside of it

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12.3.Test Procedure

Following measurement procedure is reference to KDB 987594 D02 U-NII 6GHz EMC Measurement v01v01:

(1) To ensure EUT reliably detects an incumbent signal in both scenarios shown in Figure 1, the detection threshold test may be repeated more than once with the incumbent signal (having center frequency f_{c2}) tuned to different center frequencies within the EUT transmission bandwidth. The criteria specified in Table 1 determines how many times the detection threshold test must be performed

(2) Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.

(3) Monitor the signal analyzer to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.

(4) (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.

(5) Refer to Table 1 to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step 2, choose a different center frequency for the AWGN signal and repeat the process.

(6) The test tool is "LAN test" to let the EUT to transmit with a constant duty cycle.

12.4.Test Results

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13. DEVIATION TO TEST SPECIFICATIONS

【NONE】

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APPENDIX A

TEST DATA AND PLOTS

(Model: 16Z90SP)

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APPENDIX B

TEST PHOTOGRAPHS

(Model: 16Z90SP)

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