

TEST REPORT

Applicant: Hunan GM Innovation Technology Co., Ltd

Address of Applicant: No 46, Jiefang East Road, Furong District, Changsha, China

Manufacturer/Factory: Hunan GM Innovation Technology Co., Ltd

Address of Manufacturer/Factory: No 46, Jiefang East Road, Furong District, Changsha, China

Equipment Under Test (EUT)

Product Name: Wireless monitor system

Model No.: ATOM A5 MONITOR, ATOM A5 PRO MONITOR

Trade Mark: VAXIS

FCC ID: 2AJOF-ATOMA5MONITOR

Applicable standards: FCC CFR Title 47 Part 15 Subpart E Section 15.407

Date of sample receipt: July 21, 2022

Date of Test: July 26~August 5, 2022

Date of report issued: August 5, 2022

Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Robinson Luo

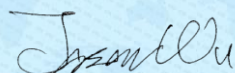
Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	August 5, 2022	Original

Prepared By:

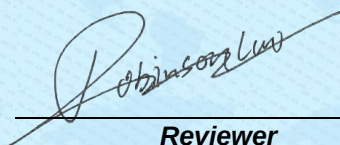


Project Engineer

Date:

August 5, 2022

Check By:



Reviewer

Date:

August 5, 2022

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4 Test Summary

Test Item	Section	Result
Antenna requirement	FCC part 15.203	Pass
AC Power Line Conducted Emission	FCC part 15.207	Pass
Conducted Average Output Power	FCC part 15.407(a)(3)	Pass
Channel Bandwidth and 99% Occupied Bandwidth	FCC part 15.407(e)	Pass
Power Spectral Density	FCC part 15.407(a)(3)	Pass
Band Edge	FCC part 15.407(b)(4)	Pass
Spurious Emission	FCC part 15.205/15.209/15.407(b)(4)	Pass
Frequency Stability	FCC part 15.407(g)	Pass

Remarks:

1. Pass: The EUT complies with the essential requirements in the standard.
2. Test according to ANSI C63.10.
3. Test Method: KDB 662911 D01 Multiple Transmitter Output v02r01

4.1 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	1×10^{-7}
2	Duty cycle	0.37%
3	Occupied Bandwidth	2.8dB
4	RF conducted power	0.75dB
5	RF power density	3dB
6	Conducted Spurious emissions	2.58dB
7	AC Power Line Conducted Emission	3.44dB (0.15MHz ~ 30MHz)
8	Radiated Spurious emission test	3.1dB (9kHz-30MHz)
		3.8039dB (30MHz-200MHz)
		3.9679dB (200MHz-1GHz)
		4.29dB (1GHz-18GHz)
		3.30dB (18GHz-40GHz)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

5 General Information

5.1 General Description of EUT

Product Name:	Wireless monitor system
Model No.:	ATOM A5 MONITOR, ATOM A5 PRO MONITOR
Test Model No.:	ATOM A5 MONITOR
Serial No.:	N/A
Hardware Version:	V1.2
Software Version:	V 0261
Test sample(s) ID:	GTSL202208000154-1
Sample(s) Status:	Engineer sample
Operation Frequency:	802.11a/802.11n(HT20): 5745MHz ~ 5825MHz
Channel numbers:	802.11a/802.11n(HT20): 5
Channel bandwidth:	802.11a/802.11n(HT20) : 20MHz
Modulation technology:	802.11a/802.11n(H20): Orthogonal Frequency Division Multiplexing (OFDM) MIMO: 802.11n SISO: 802.11a
Antenna Type:	External Antenna
Antenna gain:	ANT1:2.5dBi ANT2:2.5dBi MIMO Mode: For power measurement: the direct gain=2.5dBi For Power Spectral Density measurement: the direct gain=5.51dBi
Power supply:	DC 7-17V (Powered By Adaptor or Battery)

Operation Frequency each of channel					
Channel	Frequency	Channel	Frequency	Channel	Frequency
149	5745MHz	153	5765MHz	157	5785MHz
161	5805MHz	165	5825MHz	/	/

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Test channel	Frequency (MHz)	
	802.11 a	802.11 n(HT20)
Lowest channel	5745	5745
Middle channel	5785	5785
Highest channel	5825	5825

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
<i>Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i>	

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:	
Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.	
Mode	Data rate
802.11a	6Mbps
802.11n(HT20)	MCS0

5.3 Description of Support Units

None.

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

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

- **FCC—Registration No.: 381383**

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

- **IC —Registration No.: 9079A**

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

- **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone,
Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July 02, 2020	July 01, 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	April 22, 2022	April 21, 2023
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 21, 2022	March 20, 2023
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June 12, 2022	June 11, 2023
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 23, 2022	June 22, 2023
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	April 22, 2022	April 21, 2023
9	Coaxial Cable	GTS	N/A	GTS211	April 22, 2022	April 21, 2023
10	Coaxial cable	GTS	N/A	GTS210	April 22, 2022	April 21, 2023
11	Coaxial Cable	GTS	N/A	GTS212	April 22, 2022	April 21, 2023
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	April 22, 2022	April 21, 2023
13	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 23, 2022	June 22, 2023
14	Band filter	Amindeon	82346	GTS219	June 23, 2022	June 22, 2023
15	Power Meter	Anritsu	ML2495A	GTS540	June 23, 2022	June 22, 2023
16	Power Sensor	Anritsu	MA2411B	GTS541	June 23, 2022	June 22, 2023
17	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 22, 2022	April 21, 2023
18	Splitter	Agilent	11636B	GTS237	June 23, 2022	June 22, 2023
19	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 30, 2021	Nov. 29, 2022
20	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 22, 2022	April 21, 2023
21	Breitband hornantenna	SCHWARZBECK	BBHA 9170	GTS579	Oct. 17, 2021	Oct. 16, 2022
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 17, 2021	Oct. 16, 2022
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 17, 2021	Oct. 16, 2022
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June 23, 2022	June 22, 2023
25	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 22, 2022	April 21, 2023

Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May 14, 2022	May 13, 2025
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 24, 2022	April 23, 2023
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June 23, 2022	June 22, 2023
4	ENV216 2-L-V-NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	GTS226	April 22, 2022	April 21, 2023
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	JINCHUANG	GSP-8A	GTS639	April 28, 2022	April 27, 2023
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	April 15, 2022	April 14, 2023
9	ISN	SCHWARZBECK	NTFM 8158	GTS565	April 22, 2022	April 21, 2023
10	High voltage probe	SCHWARZBECK	TK9420	GTS537	April 22, 2022	April 21, 2023

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	April 22, 2022	April 21, 2023
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 22, 2022	April 21, 2023
3	Spectrum Analyzer	Agilent	E4440A	GTS536	April 22, 2022	April 21, 2023
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 22, 2022	April 21, 2023
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 22, 2022	April 21, 2023
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 22, 2022	April 21, 2023
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 22, 2022	April 21, 2023
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 22, 2022	April 21, 2023

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	April 25, 2022	April 24, 2023
2	Barometer	KUMAO	SF132	GTS647	July 26, 2022	July 25, 2023

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
<i>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</i>	
E.U.T Antenna:	
<i>The antennas are External Antenna, the best case gain of the antennas are 2.5dBi, reference to the appendix II for details</i>	

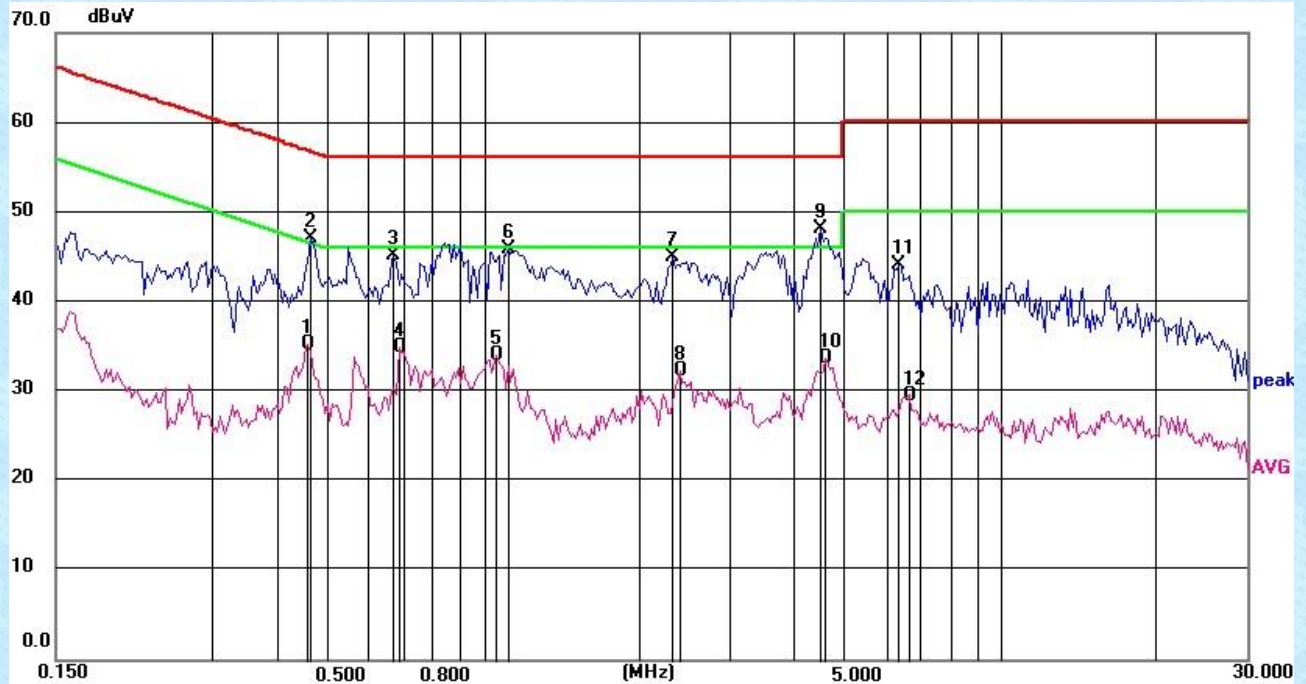
7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207					
Test Method:	ANSI C63.10					
Test Frequency Range:	150KHz to 30MHz					
Class / Severity:	Class B					
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto					
Limit:	Frequency range (MHz)		Limit (dBuV)			
			Quasi-peak		Average	
	0.15-0.5		66 to 56*		56 to 46*	
	0.5-5		56		46	
	5-30		60		50	
* Decreases with the logarithm of the frequency.						
Test setup:	Reference Plane <i>Remark:</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m					
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.					
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	DC 12V (Powered by adaptor)					
Test results:	Pass					

Note: Pre-scan all test modes, found worst case at 802.11n(HT20) 5745MHz, and so only show the test result of 802.11n(HT20) 5745MHz.

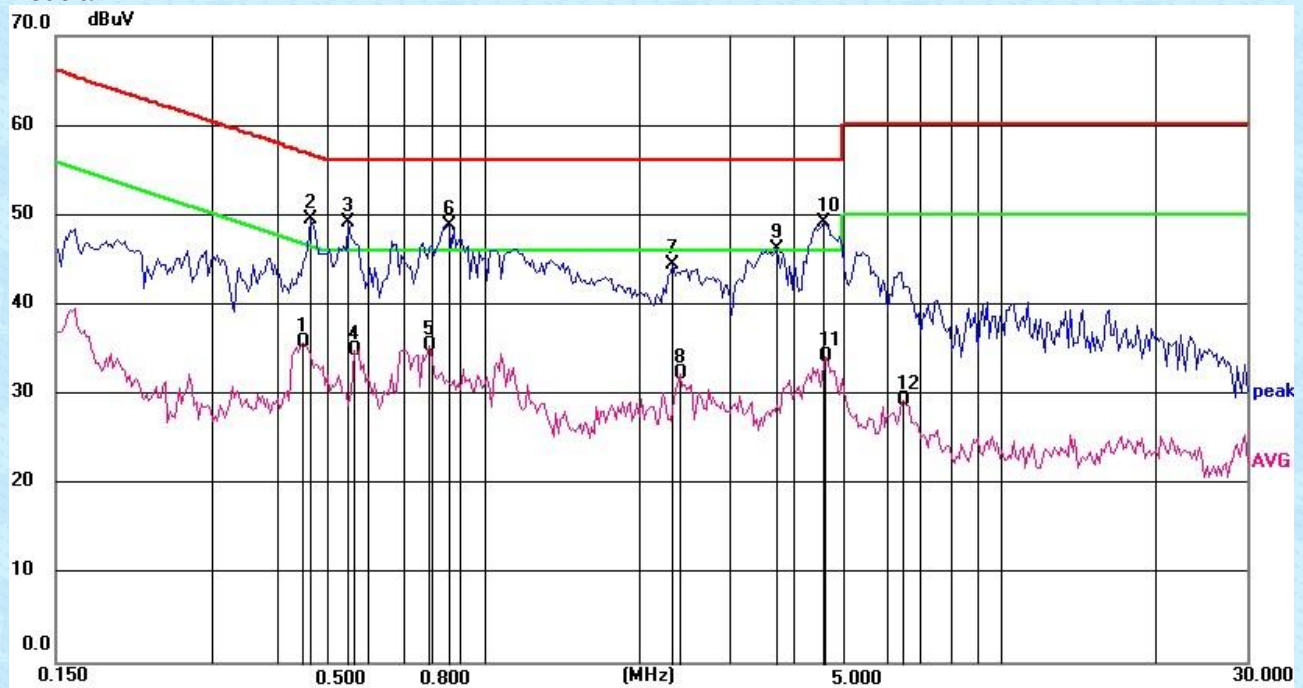
Measurement data

Line:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.4611	25.3	10.06	35.36	46.67	-11.31	AVG
2	0.4661	37.03	10.06	47.09	56.58	-9.49	peak
3	0.6753	35.15	10.07	45.22	56	-10.78	peak
4	0.69	24.98	10.07	35.05	46	-10.95	AVG
5	1.0645	24	10.11	34.11	46	-11.89	AVG
6	1.1229	35.93	10.12	46.05	56	-9.95	peak
7	2.3334	35.05	10.27	45.32	56	-10.68	peak
8	2.4089	22.31	10.29	32.6	46	-13.4	AVG
9	4.5014	38.13	10.54	48.67	56	-7.33	peak
10	4.5978	23.74	10.6	34.34	46	-11.66	AVG
11	6.3856	34.14	10.92	45.06	60	-14.94	peak
12	6.6623	19.56	10.93	30.49	50	-19.51	AVG

Neutral:

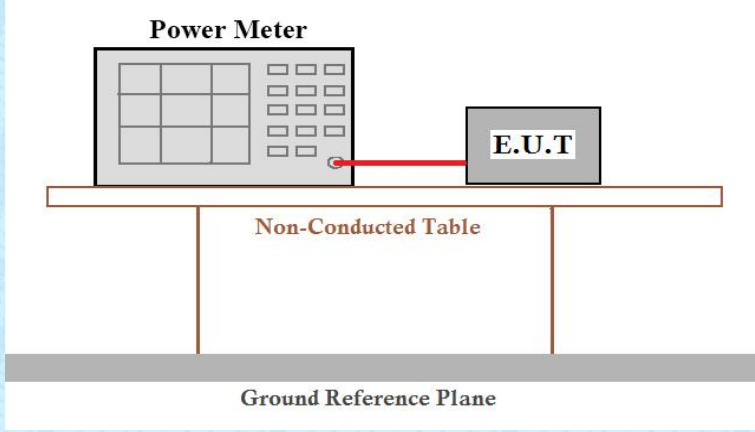


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.4515	25.71	10.05	35.76	46.85	-11.09	AVG
2	0.4661	39.53	10.06	49.59	56.58	-6.99	peak
3	0.5522	39.13	10.06	49.19	56	-6.81	peak
4	0.5635	24.91	10.06	34.97	46	-11.03	AVG
5	0.7913	25.49	10.07	35.56	46	-10.44	AVG
6	0.8618	38.83	10.08	48.91	56	-7.09	peak
7	2.3334	34.55	10.27	44.82	56	-11.18	peak
8	2.4089	22.31	10.29	32.6	46	-13.4	AVG
9	3.7197	36.22	10.36	46.58	56	-9.42	peak
10	4.5494	39.18	10.56	49.74	56	-6.26	peak
11	4.5978	24.24	10.6	34.84	46	-11.16	AVG
12	6.5224	19.37	10.91	30.28	50	-19.72	AVG

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

7.3 Conducted for Average Output Power

Test Requirement:	FCC Part15 E Section 15.407(a)(3)
Test Method:	ANSI C63.10 and KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Modulation	Frequency (MHz)	Duty cycle		Duty Factor	
		Antenna1	Antenna2	Antenna1	Antenna2
802.11a	5745	97.82	97.83	0.1	0.1
	5785	97.81	97.80	0.1	0.1
	5825	97.82	97.83	0.1	0.1
802.11n(HT20)	5745	97.68	97.68	0.1	0.1
	5785	97.86	97.86	0.1	0.1
	5825	97.68	97.68	0.1	0.1

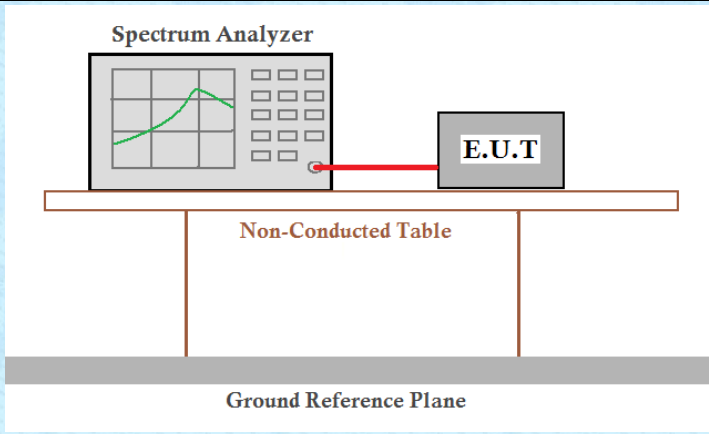
802.11a mode										
CH No.	Frequency (MHz)	Measured Power (dBm)			Duty Factor	Output Power (dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
149	5745	14.923	15.246	--	0.1	15.023	15.346	--	30.00	Pass
157	5785	14.812	16.203		0.1	14.912	16.303			
165	5825	14.031	16.099	--	0.1	14.131	16.199	--		
802.11n(HT20) mode										
CH No.	Frequency (MHz)	Measured Power (dBm)			Duty Factor	Output Power (dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
149	5745	13.229	13.782	16.525	0.1	13.329	13.882	16.625	30.00	Pass
157	5785	12.718	13.973	16.401	0.1	12.818	14.073	16.501		
165	5825	12.371	14.572	16.62	0.1	12.471	14.672	16.72		

Note: Output Power = Measured Power + Duty Factor

Duty Factor = 10 log (1/Duty Cycle)

Remark: "---"is not applicable

7.4 Channel Bandwidth

Test Requirement:	FCC Part15 E Section 15.407(e)
Test Method:	ANSI C63.10 and KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	>500KHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

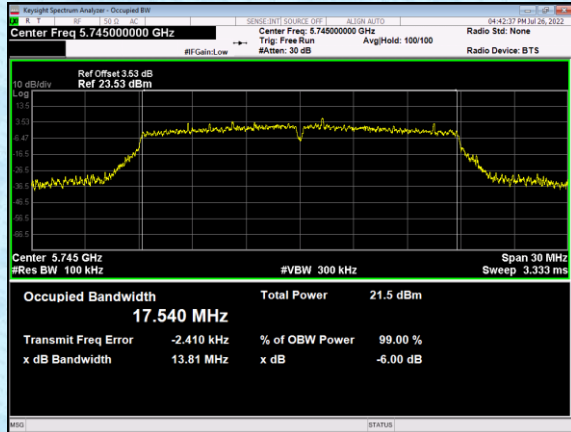
CH. No.	Frequency (MHz)	6dB Occupied Bandwidth (MHz)				
		802.11a		802.11n(HT20)		Limit (MHz)
		ANT1	ANT2	ANT1	ANT2	
149	5745	13.81	13.7	14.96	15.66	>0.5
157	5785	15.02	15.67	15.13	15.09	>0.5
165	5825	13.75	15.11	15.05	15.1	>0.5

Remark: “---“is not applicable

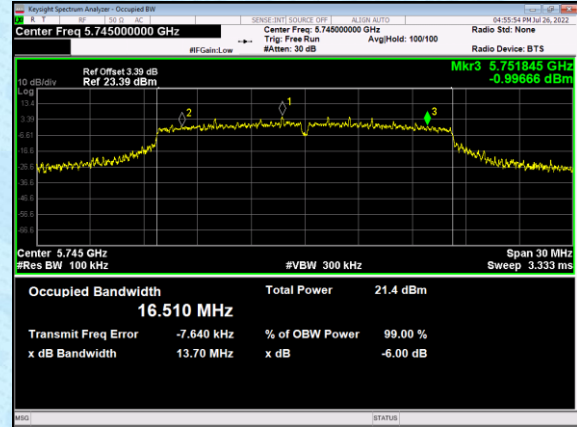
Test plot as follows:

Test mode: 802.11a
Lowest channel 5745MHz

Antenna1

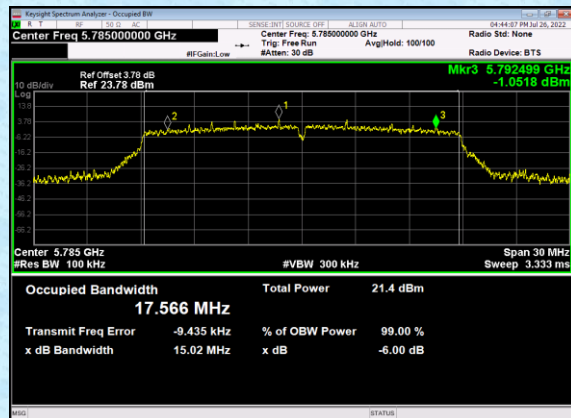


Antenna2

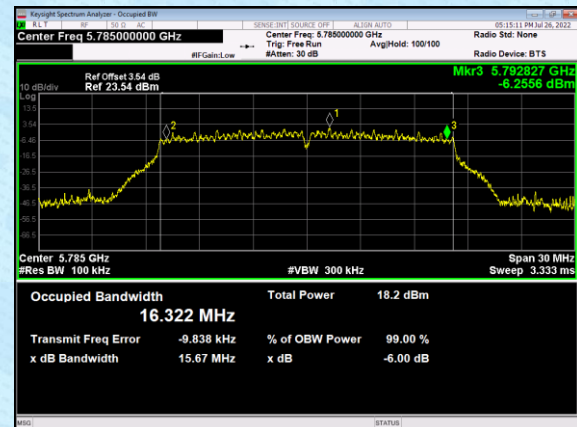


Middle channel 5785MHz

Antenna1

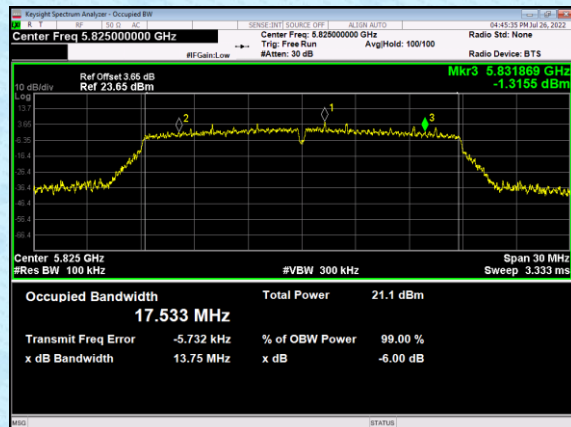


Antenna2

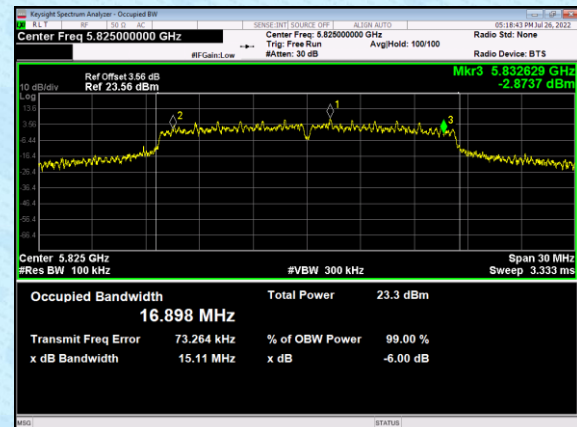


Highest channel 5825MHz

Antenna1



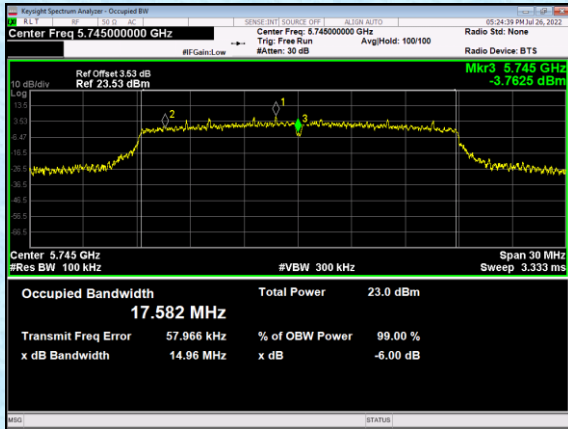
Antenna2



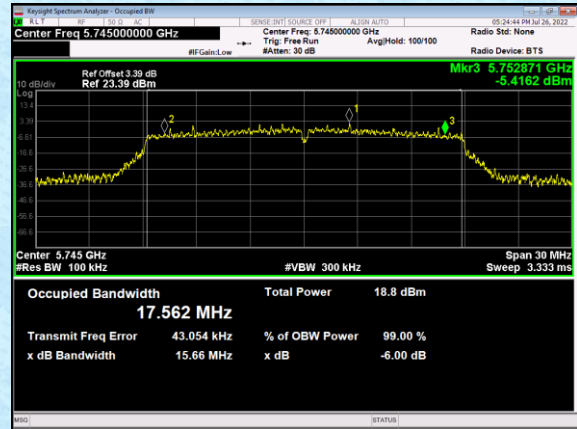
Test mode: 802.11 n(HT20)

Lowest channel 5745MHz

Antenna1

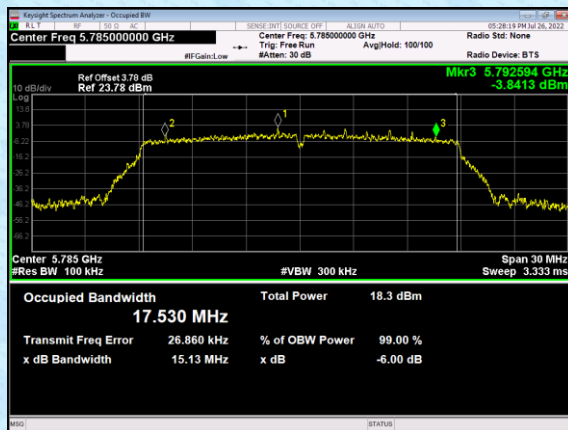


Antenna2

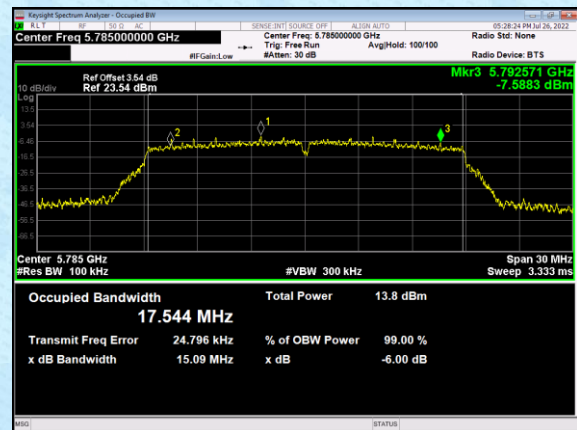


Middle channel 5785MHz

Antenna1

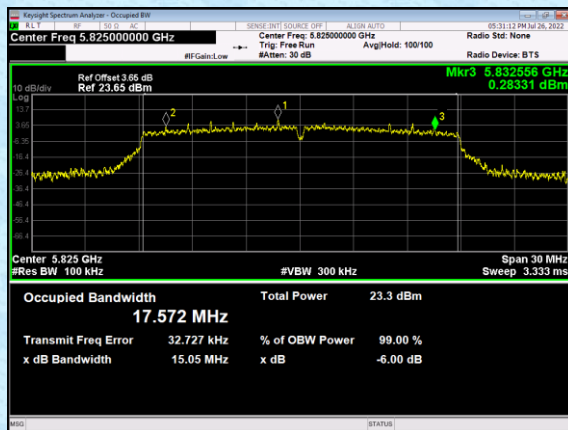


Antenna2

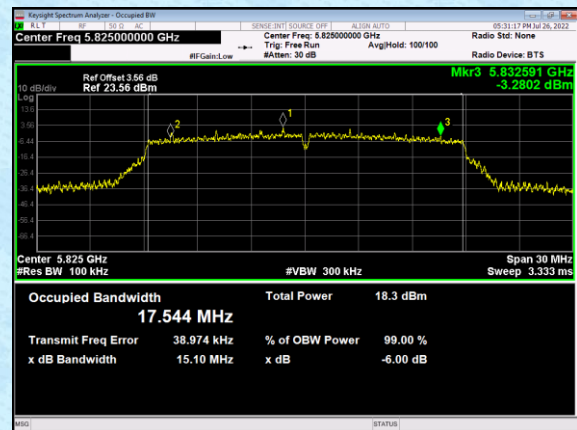


Highest channel 5825MHz

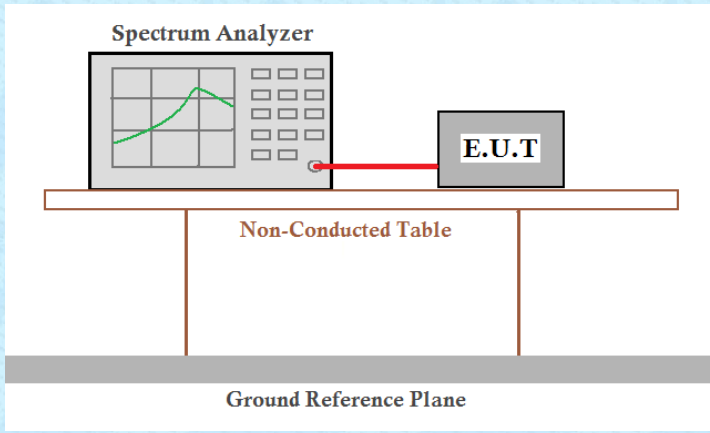
Antenna1



Antenna2



7.5 Power Spectral Density

Test Requirement:	FCC Part15 E Section 15.407(a)(3)
Test Method:	ANSI C63.10 and KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	30dBm/500kHz
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Modulation	Frequency (MHz)	Duty cycle		Duty Factor	
		Antenna1	Antenna2	Antenna1	Antenna2
802.11n(HT20)	5745	97.68	97.68	0.1	0.1
	5785	97.86	97.86	0.1	0.1
	5825	97.68	97.68	0.1	0.1

Test CH	Power Spectral Density (dBm)						Limit (dBm/500kHz)	Result
	802.11a			802.11n(HT20)				
	Antenna 1	Antenna 2	Antenna 1+2	Antenna 1	Antenna 2	Antenna 1+2		
149	4.826	4.107	----	5.934	1.374	7.337	30.00	Pass
157	2.714	-1.618	----	-0.485	-4.908	0.954		
165	3.881	5.793	----	5.623	1.097	7.035		

Remark: “---“is not applicable

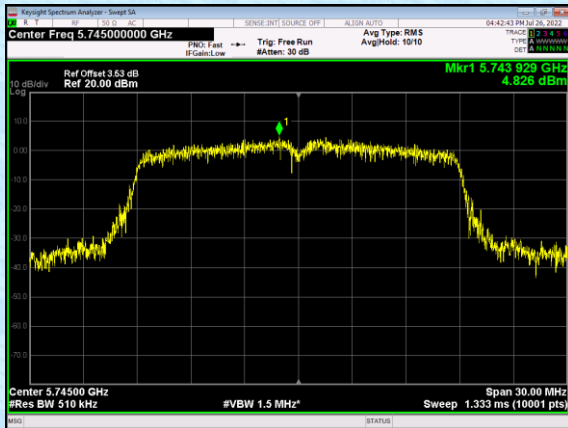
The total PSD(Antenna 1+2) resulting calculation includes duty factor

Duty Factor = 10 log (1/Duty Cycle)

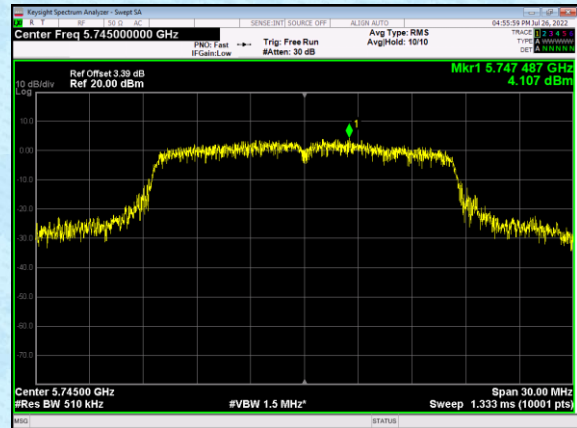
Test plot as follows:

Test mode: 802.11a
Lowest channel149 5745MHz

Antenna1

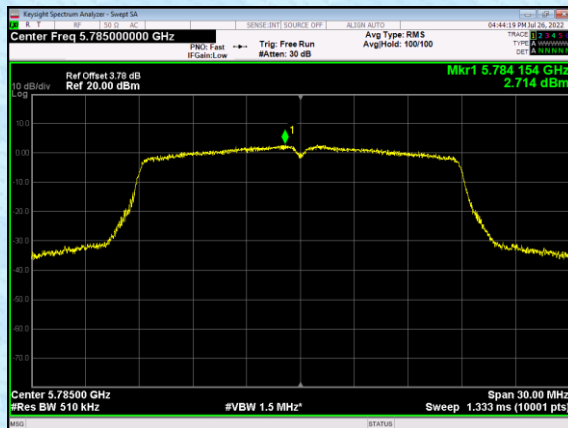


Antenna2



Middle channel157 5785MHz

Antenna1

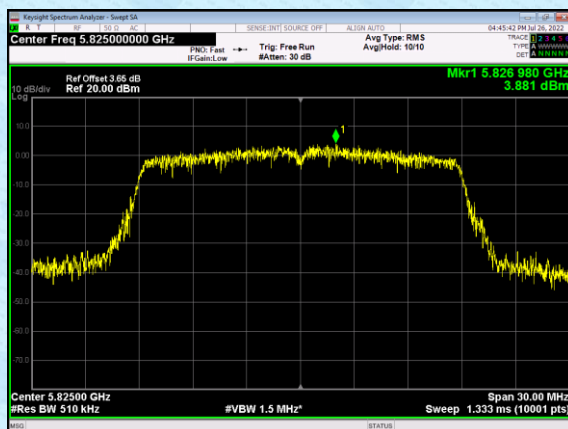


Antenna2

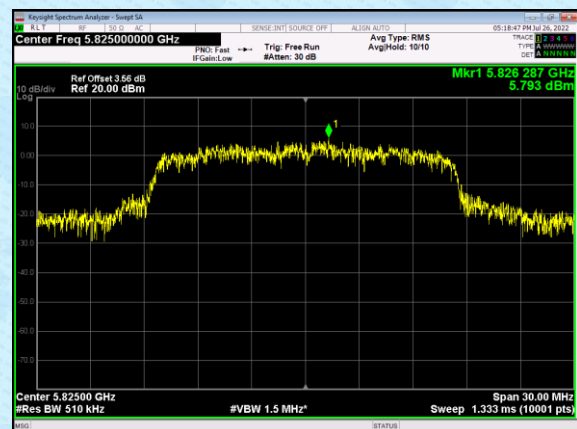


Highest channel165 5825MHz

Antenna1

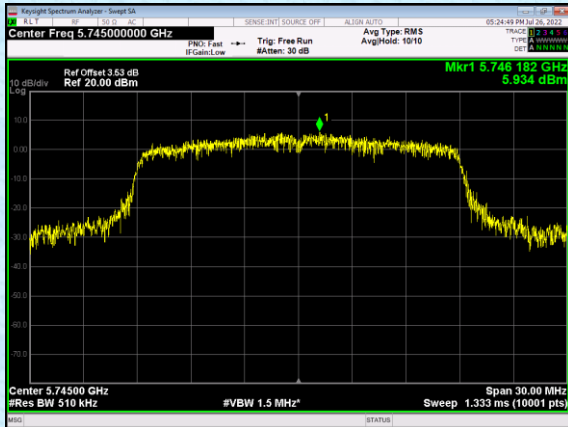


Antenna2



Test mode: 802.11 n(HT20)
Lowest channel149 5745MHz

Antenna1

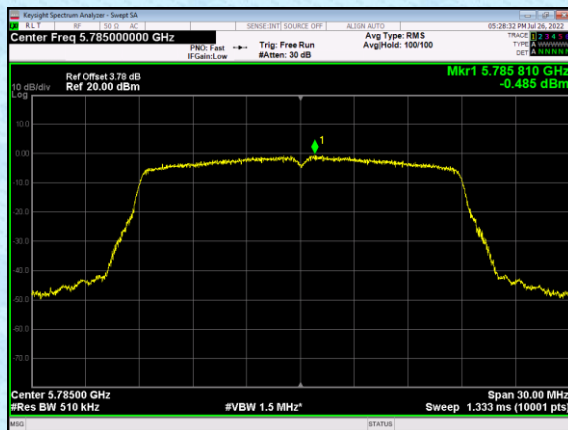


Antenna2



Middle channel157 5785MHz

Antenna1

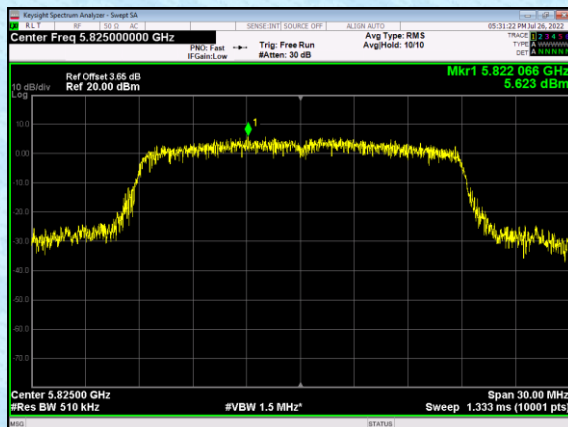


Antenna2

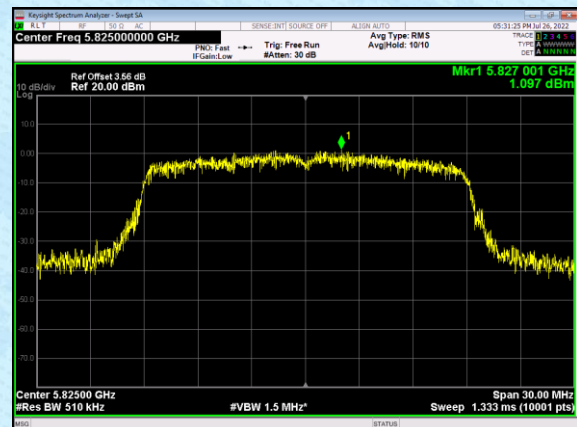


Highest channel165 5825MHz

Antenna1

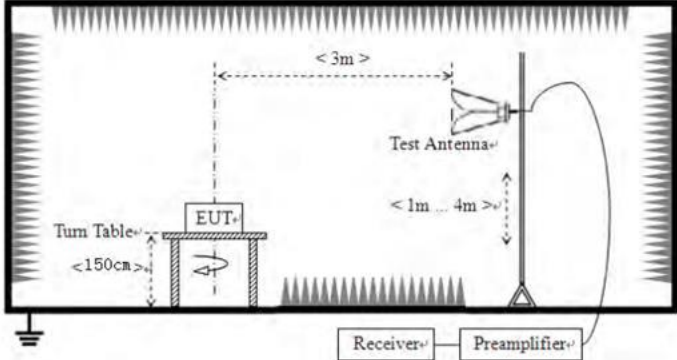


Antenna2



7.6 Band edge

7.6.1 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10				
Test Frequency Range:	9kHz to 40GHz, only worse case is reported				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	Above 1GHz	Peak	1MHz	3MHz	Peak
		RMS	1MHz	3MHz	RMS
Limit:	All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.				
Test setup:					
Test Procedure:	1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. 7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.				

Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Remarks:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.*
4. *According to KDB 789033 D02v02r01 section G) 1) d), for measurements above 1000 MHz @3m distance, the limit of field strength is computed as follows:*

$$E[\text{dBuV/m}] = \text{EIRP}[\text{dBm}] + 95.2;$$

$$E[\text{dBuV/m}] = -27 + 95.2 = 68.2\text{dBuV/m}.$$

$$E[\text{dBuV/m}] = 10 + 95.2 = 105.2\text{dBuV/m}.$$

$$E[\text{dBuV/m}] = 15.6 + 95.2 = 110.8\text{dBuV/m}.$$

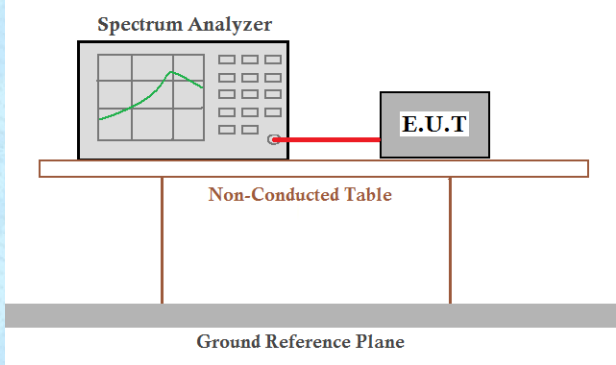
$$E[\text{dBuV/m}] = 27 + 95.2 = 122.2\text{dBuV/m}$$

Measurement data:

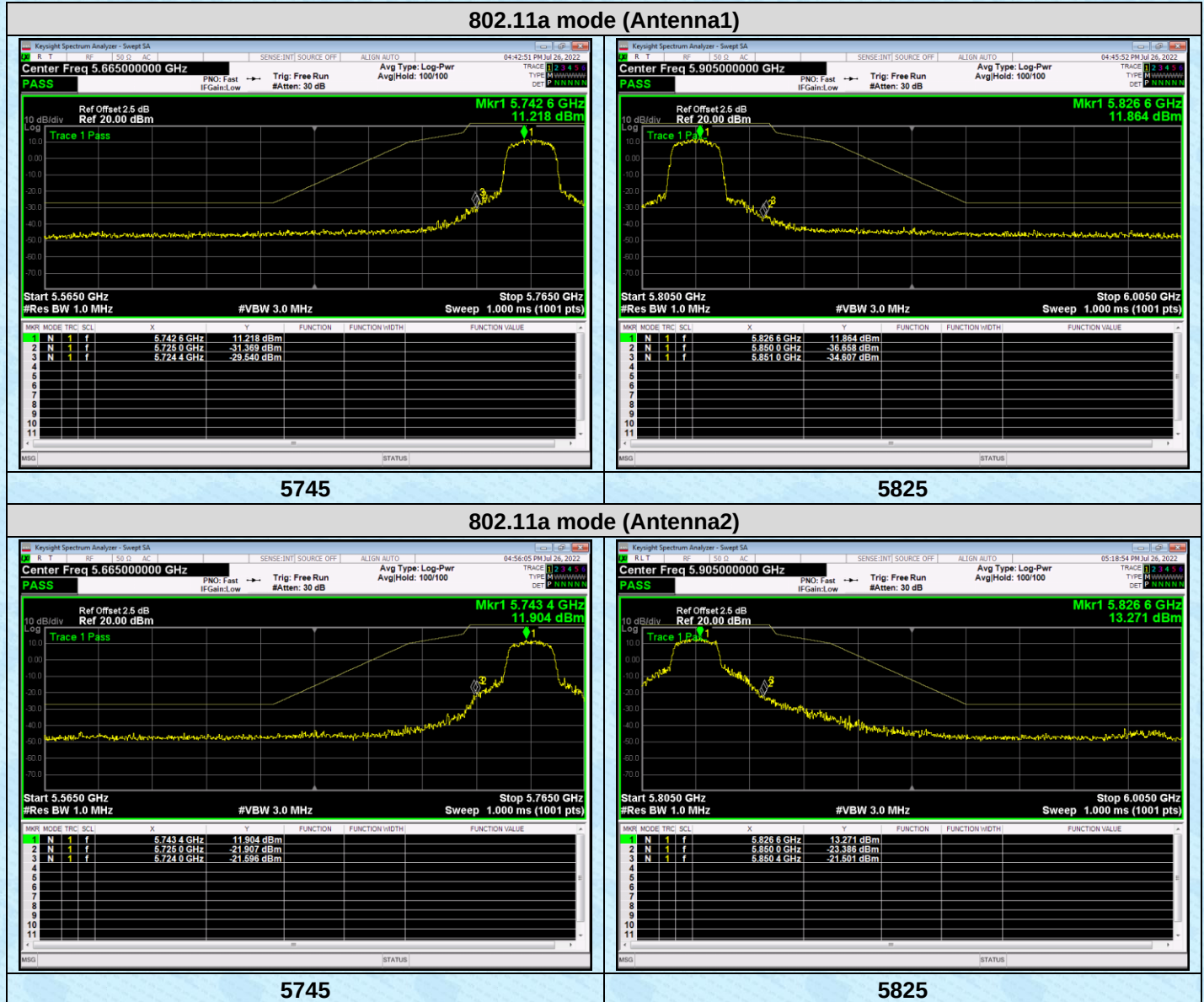
IEEE 802.11a (Worst case:antenna1)								
Peak value:								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5650	28.47	32.36	9.72	23.83	46.72	68.2	-21.48	Horizontal
5700	29.1	32.5	9.79	23.84	47.55	105.2	-57.65	Horizontal
5720	31.18	32.53	9.81	23.85	49.67	110.8	-61.13	Horizontal
5725	32.85	32.53	9.83	23.86	51.35	122.2	-70.85	Horizontal
5850	30.19	32.7	9.99	23.87	49.01	122.2	-73.19	Horizontal
5855	27.92	32.72	9.99	23.88	46.75	110.8	-64.05	Horizontal
5875	26.4	32.74	10.04	23.89	45.29	105.2	-59.91	Horizontal
5925	26.56	32.8	10.11	23.9	45.57	68.2	-22.63	Horizontal
5650	26.37	32.36	9.72	23.83	44.62	68.2	-23.58	Vertical
5700	25.35	32.5	9.79	23.84	43.8	105.2	-61.4	Vertical
5720	29.87	32.53	9.81	23.85	48.36	110.8	-62.44	Vertical
5725	30.77	32.53	9.83	23.86	49.27	122.2	-72.93	Vertical
5850	28.52	32.7	9.99	23.87	47.34	122.2	-74.86	Vertical
5855	27.88	32.72	9.99	23.88	46.71	110.8	-64.09	Vertical
5875	26.28	32.74	10.04	23.89	45.17	105.2	-60.03	Vertical
5925	26.54	32.8	10.11	23.9	45.55	68.2	-22.65	Vertical

IEEE 802.11n HT20(Worst case:MIMO)								
Peak value:								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5650	27.94	32.36	9.72	23.83	46.19	68.2	-22.01	Horizontal
5700	29.21	32.5	9.79	23.84	47.66	105.2	-57.54	Horizontal
5720	31.38	32.53	9.81	23.85	49.87	110.8	-60.93	Horizontal
5725	33.02	32.53	9.83	23.86	51.52	122.2	-70.68	Horizontal
5850	30.61	32.7	9.99	23.87	49.43	122.2	-72.77	Horizontal
5855	28.35	32.72	9.99	23.88	47.18	110.8	-63.62	Horizontal
5875	26.09	32.74	10.04	23.89	44.98	105.2	-60.22	Horizontal
5925	26.37	32.8	10.11	23.9	45.38	68.2	-22.82	Horizontal
5650	27.19	32.36	9.72	23.83	45.44	68.2	-22.76	Vertical
5700	26.56	32.5	9.79	23.84	45.01	105.2	-60.19	Vertical
5720	29.89	32.53	9.81	23.85	48.38	110.8	-62.42	Vertical
5725	30.97	32.53	9.83	23.86	49.47	122.2	-72.73	Vertical
5850	29.49	32.7	9.99	23.87	48.31	122.2	-73.89	Vertical
5855	27.69	32.72	9.99	23.88	46.52	110.8	-64.28	Vertical
5875	25.57	32.74	10.04	23.89	44.46	105.2	-60.74	Vertical
5925	25.87	32.8	10.11	23.9	44.88	68.2	-23.32	Vertical

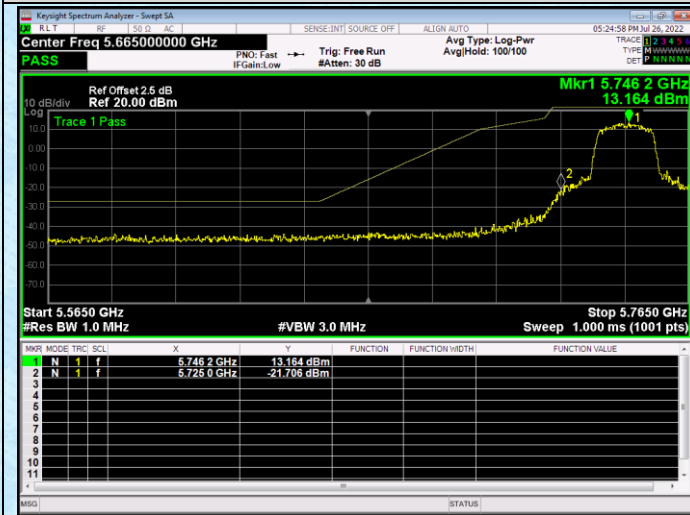
7.6.2 Conducted Emission Method

Test Requirement:	FCC Part15 E Section 15.407 and 15.205
Test Method:	ANSI C63.10
Receiver setup:	RBW=1MHz, VBW=3MHz, Detector=Peak
Limit:	All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

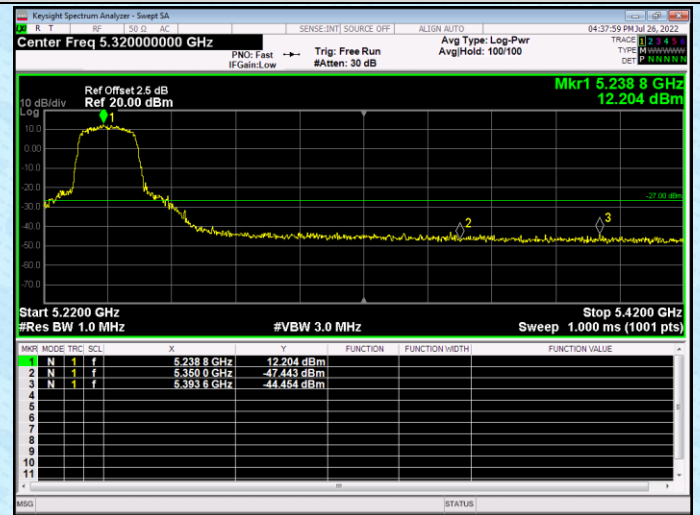
Test plot as follows:



802.11n(HT20) mode (Antenna1)

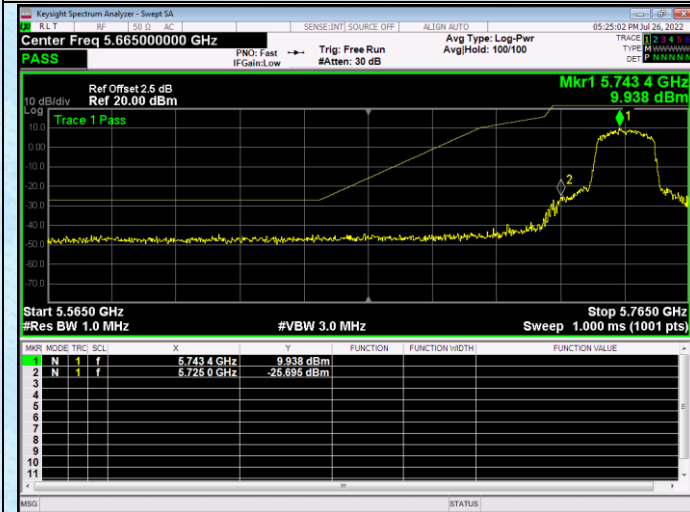


5745



5825

802.11n(HT20) mode (Antenna2)



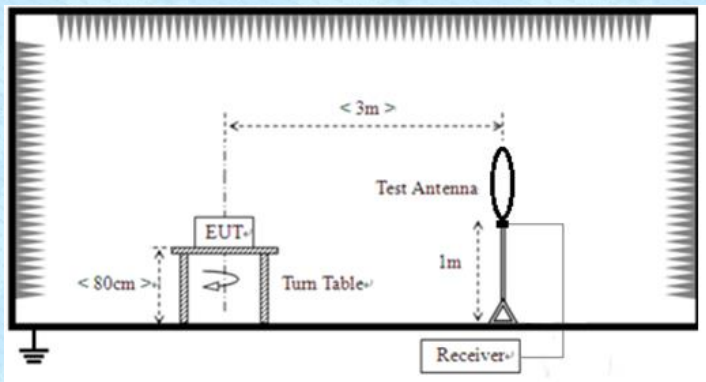
5745

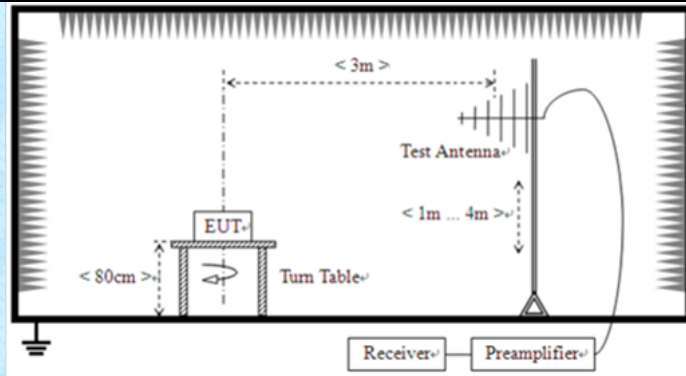


5825

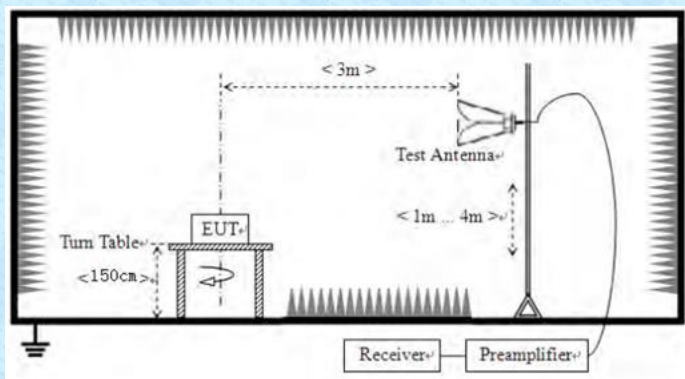
7.7 Spurious Emission

7.7.1 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209, 15.205,Part 15E Section 15.407(b)(4)				
Test Method:	ANSI C63.10				
Test Frequency Range:	9kHz to 40GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9kHz-150KHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value
	150kHz-30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		AV	1MHz	3MHz	Average Value
Limit:	Frequency		Limit (uV/m)	Value	Measurement Distance
	0.009MHz-0.490MHz		2400/F(KHz)	QP	300m
	0.490MHz-1.705MHz		24000/F(KHz)	QP	300m
	1.705MHz-30MHz		30	QP	30m
	30MHz-88MHz		100	QP	3m
	88MHz-216MHz		150	QP	
	216MHz-960MHz		200	QP	
	960MHz-1GHz		500	QP	
	Frequency		Limit (dBuV/m)	Remark	
	Above 1GHz		68.20	Peak Value	
			54.00	Average Value	
Test setup:	For radiated emissions from 9kHz to 30MHz				
					
	For radiated emissions from 30MHz to1GHz				



For radiated emissions above 1GHz



Test Procedure:

1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test

	worst case mode is recorded in the report.					
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	DC 12V Powered by adaptor)					
Test results:	Pass					

Remarks:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

Measurement Data:

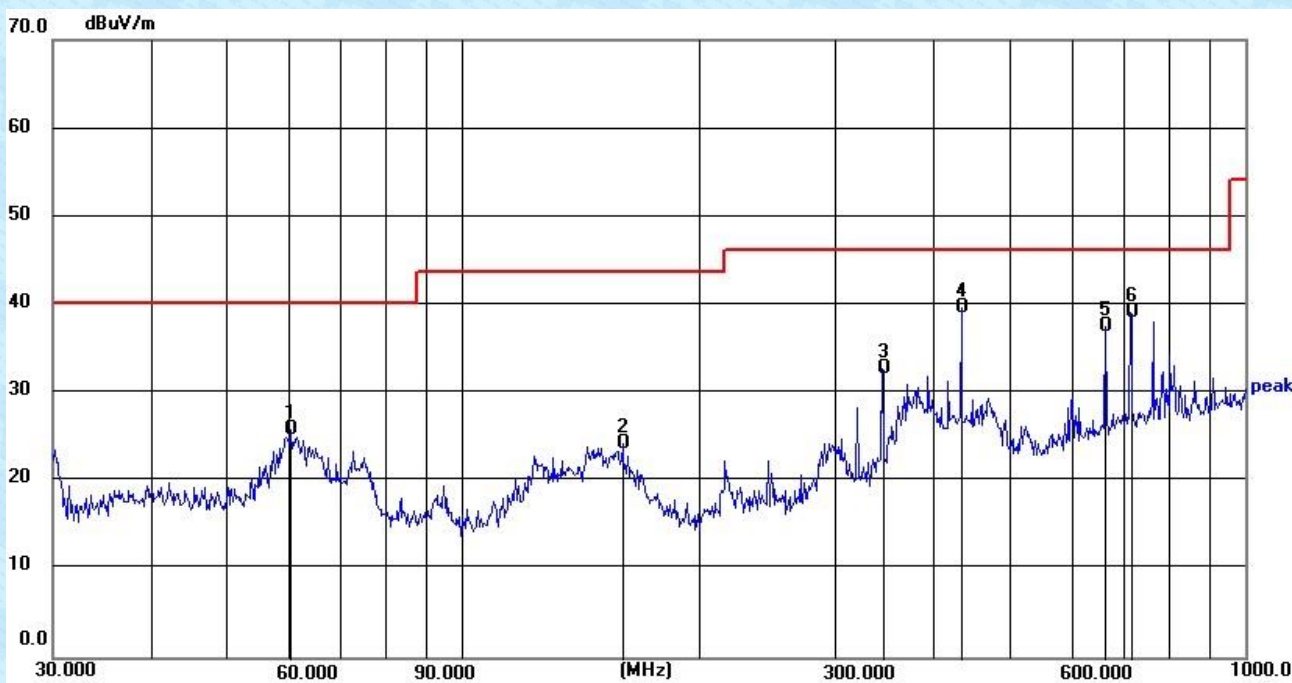
9 kHz ~ 30 MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Below 1GHz

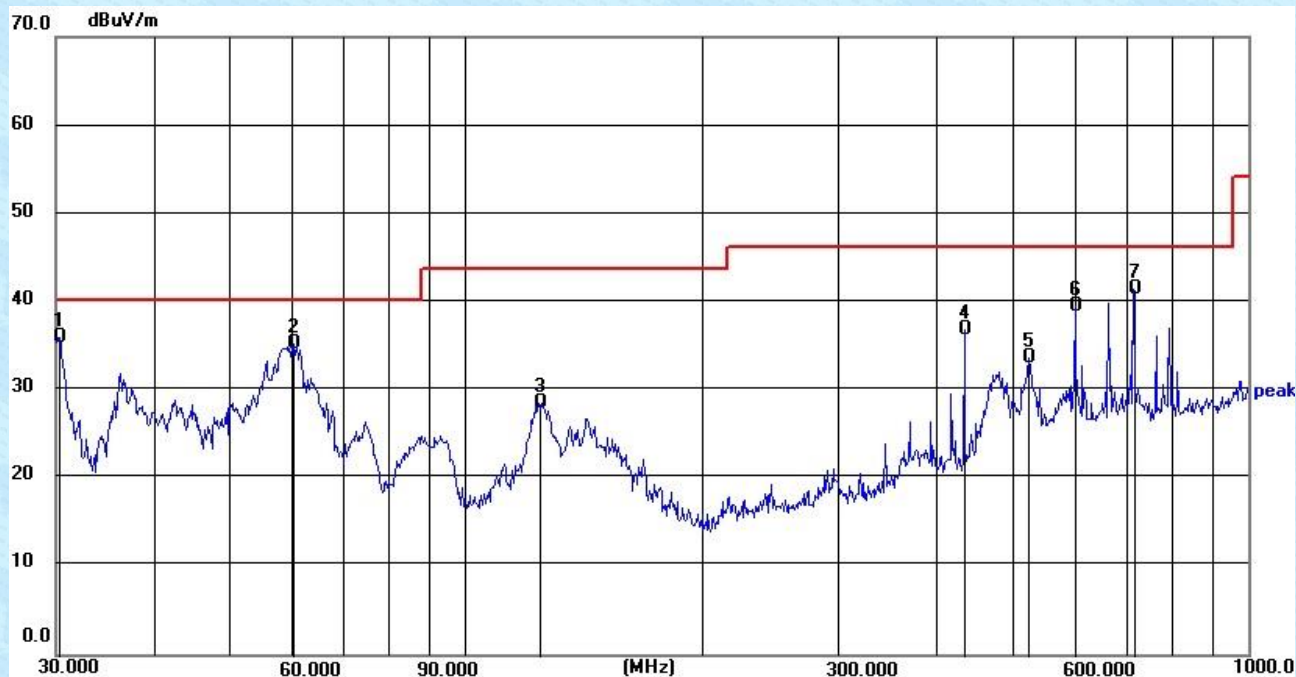
Pre-scan all test modes, found worst case at 802.11n(HT20) 5745MHz, and so only show the test result of 802.11n(HT20) 5745MHz.

Horizontal:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	60.2801	12.00	13.86	25.86	40.00	-14.14	QP
2	160.3456	8.33	15.96	24.29	43.50	-19.21	QP
3	344.3855	17.10	15.73	32.83	46.00	-13.17	QP
4	434.0651	21.99	17.65	39.64	46.00	-6.36	QP
5	663.4728	15.81	21.70	37.51	46.00	-8.49	QP
6	714.1734	17.10	22.10	39.20	46.00	-6.80	QP

Vertical:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.2111	23.17	12.88	36.05	40.00	-3.95	QP
2	60.2801	21.44	13.86	35.30	40.00	-4.70	QP
3	124.1330	14.28	14.29	28.57	43.50	-14.93	QP
4	434.0651	19.17	17.65	36.82	46.00	-9.18	QP
5	524.5538	14.61	19.07	33.68	46.00	-12.32	QP
6	601.4265	18.96	20.54	39.50	46.00	-6.50	QP
7	714.1734	19.37	22.10	41.47	46.00	-4.53	QP

Above 1GHz:

802.11a 5745MHz (worst case: Antenna1)

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
11490	29.35	39.4	8.73	36.3	41.18	68.2	-20.7	Horizontal
17235	29.63	41	11.37	36.28	45.72	68.2	-22.43	Horizontal
11490	31.39	39.4	8.73	36.3	43.22	68.2	-22.74	Vertical
17235	28.41	41	11.37	36.28	44.5	68.2	-24.28	Vertical

802.11a 5785MHz (worst case: Antenna1)

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
11570	27.28	39.28	8.77	36.29	39.04	68.2	-21.55	Horizontal
17355	30.97	41.52	11.48	36.26	47.71	68.2	-22.33	Horizontal
11570	31.43	39.28	8.77	36.29	43.19	68.2	-25.24	Vertical
17355	25.93	41.52	11.48	36.26	42.67	68.2	-24.75	Vertical

802.11a 5825MHz (worst case: Antenna1)

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
11650	30.99	39.16	8.79	36.27	42.67	68.2	-23.07	Horizontal
17475	26.57	42.3	11.58	36.25	44.2	68.2	-21.82	Horizontal
11650	29.78	39.16	8.79	36.27	41.46	68.2	-25.9	Vertical
17475	26.41	42.3	11.58	36.25	44.04	68.2	-24.15	Vertical

802.11n(HT20) 5745MHz (worst case: MIMO)

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
11490	32.49	39.4	8.73	36.3	44.32	68.2	-22.73	Horizontal
17235	29.73	41	11.37	36.28	45.82	68.2	-21.19	Horizontal
11490	27.38	39.4	8.73	36.3	39.21	68.2	-25.05	Vertical
17235	30.9	41	11.37	36.28	46.99	68.2	-23.93	Vertical

802.11n(HT20) 5785MHz (worst case: MIMO)

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
11570	33.57	39.28	8.77	36.29	45.33	68.2	-20.7	Horizontal
17355	30.04	41.52	11.48	36.26	46.78	68.2	-20.95	Horizontal
11570	33.37	39.28	8.77	36.29	45.13	68.2	-25.13	Vertical
17355	26	41.52	11.48	36.26	42.74	68.2	-24.14	Vertical

802.11n(HT20) 5825MHz (worst case: MIMO)

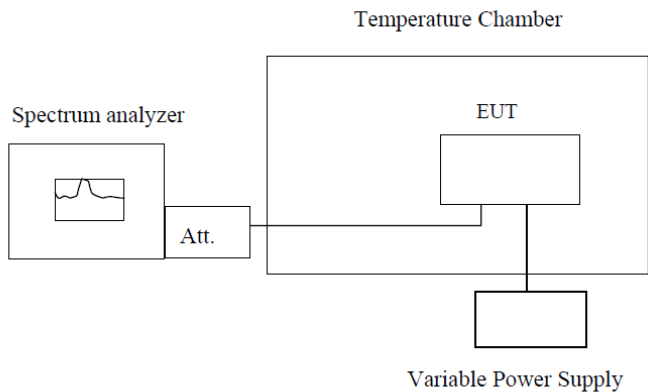
Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
11650	32.88	39.16	8.79	36.27	44.56	68.2	-20.35	Horizontal
17475	30.31	42.3	11.58	36.25	47.94	68.2	-20.13	Horizontal
11650	30.31	39.16	8.79	36.27	41.99	68.2	-21.86	Vertical
17475	29.87	42.3	11.58	36.25	47.5	68.2	-20.81	Vertical

Notes:

1. Level = Read Level + Antenna Factor+ Cable loss- Preamp Factor.
2. The test trace is same as the ambient noise (the test frequency range: 18GHz~40GHz), therefore no data appear in the report.
3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

7.8 Frequency stability

Test Requirement:	FCC Part15 C Section 15.407(g)
Test Method:	ANSI C63.10, FCC Part 2.1055
Limit:	Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified
Test Procedure:	The EUT was setup to ANSI C63.4, 2003; tested to 2.1055 for compliance to FCC Part 15.407(g) requirements.
Test setup:	 Note : Measurement setup for testing on Antenna connector
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:
Frequency stability versus Temp.
Worst Case Operating Frequency: 5745MHz

Temp. (°C)	Power Supply (VDC)	0 minute			2 minute			5 minute			10 minute		
		Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail
-30	12.0	5745.0138	2.4	P	5745.0202	3.52	P	5745.0186	3.24	P	5745.0186	3.24	Pass
-20	12.0	5744.9901	-1.72	P	5744.9868	-2.3	P	5744.9844	-2.72	P	5744.9841	-2.77	Pass
-10	12.0	5744.9728	-4.73	P	5744.9825	-3.05	P	5744.981	-3.31	P	5744.9792	-3.62	Pass
0	12.0	5745.0286	4.98	P	5745.0252	4.39	P	5745.0175	3.05	P	5745.026	4.53	Pass
10	12.0	5744.9501	-8.69	P	5744.9486	-8.95	P	5744.9581	-7.29	P	5744.9558	-7.69	Pass
20	12.0	5744.9466	-9.3	P	5744.944	-9.75	P	5744.9428	-9.96	P	5744.9482	-9.02	Pass
30	12.0	5745.0261	4.54	P	5745.0272	4.73	P	5745.0273	4.75	P	5745.0195	3.39	Pass
40	12.0	5745.0104	1.81	P	5745.0084	1.46	P	5744.9962	-0.66	P	5744.9989	-0.19	Pass
50	12.0	5744.972	-4.87	P	5744.981	-3.31	P	5744.9817	-3.19	P	5744.972	-4.87	Pass

Frequency stability versus Voltage.
Worst Case Operating Frequency: 5745MHz

Temp. (°C)	Power Supply (VDC)	0 minute			2 minute			5 minute			10 minute		
		Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail
25	6.3	5745.0146	2.54	P	5745.0206	3.59	P	5745.0115	2	P	5745.0203	3.53	Pass
25	12.0	5744.9938	-1.08	P	5744.9845	-2.7	P	5744.9855	-2.52	P	5744.9834	-2.89	Pass
25	18.7	5744.9771	-3.99	P	5744.9716	-4.94	P	5744.9802	-3.45	P	5744.9783	-3.78	Pass

Frequency stability versus Temp.
Worst Case Operating Frequency: 5785MHz

Temp. (°C)	Power Supply (VDC)	0 minute			2 minute			5 minute			10 minute		
		Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail
-30	12.0	5785.0133	2.3	P	5785.0159	2.75	P	5785.006	1.04	P	5785.0091	1.57	Pass
-20	12.0	5784.9828	-2.97	P	5784.9828	-2.97	P	5784.9942	-1	P	5784.9869	-2.26	Pass
-10	12.0	5784.9723	-4.79	P	5784.978	-3.8	P	5784.9757	-4.2	P	5784.9728	-4.7	Pass
0	12.0	5785.0237	4.1	P	5785.0246	4.25	P	5785.0208	3.6	P	5785.0239	4.13	Pass
10	12.0	5784.9595	-7	P	5784.9595	-7	P	5784.9527	-8.18	P	5784.953	-8.12	Pass
20	12.0	5784.9478	-9.02	P	5784.9455	-9.42	P	5784.9433	-9.8	P	5784.9455	-9.42	Pass
30	12.0	5785.0219	3.79	P	5785.0204	3.53	P	5785.0235	4.06	P	5785.0211	3.65	Pass
40	12.0	5784.9974	-0.45	P	5785.0061	1.05	P	5785.001	0.17	P	5785.0041	0.71	Pass
50	12.0	5784.9715	-4.93	P	5784.9715	-4.93	P	5784.9783	-3.75	P	5784.9784	-3.73	Pass

Frequency stability versus Voltage.
Worst Case Operating Frequency: 5785MHz

Temp. (°C)	Power Supply (VDC)	0 minute			2 minute			5 minute			10 minute		
		Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail
25	6.3	5784.9722	-4.81	P	5784.9723	-4.79	P	5784.9758	-4.18	P	5784.9722	-4.81	Pass
25	12.0	5785.0187	3.23	P	5785.0205	3.54	P	5785.0246	4.25	P	5785.0204	3.53	Pass
25	18.7	5785.0067	1.16	P	5784.9972	-0.48	P	5785.0107	1.85	P	5785.0011	0.19	Pass

Frequency stability versus Temp.
Worst Case Operating Frequency: 5825MHz

Temp. (°C)	Power Supply (VDC)	0 minute			2 minute			5 minute			10 minute		
		Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass / Fail
-30	12.0	5825.0178	3.06	P	5825.0163	2.8	P	5825.019	3.26	P	5825.0278	4.77	Pass
-20	12.0	5824.9936	-1.1	P	5824.9906	-1.61	P	5824.989	-1.89	P	5824.9878	-2.09	Pass
-10	12.0	5824.977	-3.95	P	5824.9787	-3.66	P	5824.9756	-4.19	P	5824.9804	-3.36	Pass
0	12.0	5825.0226	3.88	P	5825.0278	4.77	P	5825.0195	3.35	P	5825.0206	3.54	Pass
10	12.0	5824.9538	-7.93	P	5824.9583	-7.16	P	5824.9553	-7.67	P	5824.9528	-8.1	Pass
20	12.0	5824.9448	-9.48	P	5824.9438	-9.65	P	5824.9469	-9.12	P	5824.9437	-9.67	Pass
30	12.0	5825.0239	4.1	P	5825.0182	3.12	P	5825.0264	4.53	P	5825.0252	4.33	Pass
40	12.0	5824.9962	-0.65	P	5825.0092	1.58	P	5825.0086	1.48	P	5824.9949	-0.88	Pass
50	12.0	5824.9713	-4.93	P	5824.9765	-4.03	P	5824.9759	-4.14	P	5824.9755	-4.21	Pass

Frequency stability versus Voltage.

Worst Case Operating Frequency: 5825MHz

Temp. (°C)	Power Supply (VDC)	0 minute			2 minute			5 minute			10 minute		
		Measured Frequency (MHz)	Frequency Error (ppm)	Pass /Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass /Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass /Fail	Measured Frequency (MHz)	Frequency Error (ppm)	Pass /Fail
25	6.3	5824.9714	-4.91	P	5824.9762	-4.09	P	5824.9804	-3.36	P	5824.9769	-3.97	Pass
25	12.0	5825.0223	3.83	P	5825.0259	4.45	P	5825.0284	4.88	P	5825.0197	3.38	Pass
25	18.7	5824.9973	-0.46	P	5825.006	1.03	P	5825.0038	0.65	P	5825.0092	1.58	Pass

8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the **appendix II** for details.

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