TEST REPORT

Applicant:	CTOUCH Europe B.V.
Address of Applicant:	Achtseweg Zuid 153R, 5651 GW Eindhoven, The Nederlands
Manufacturer/Factory:	CTOUCH Europe B.V.
Address of Manufacturer/Factory:	Achtseweg Zuid 153R, 5651 GW Eindhoven, The Nederlands

Equipment Under Test (EUT)

Product Name:	Wireless AC Module
Model No.:	01WIMRA
Trade Mark:	CTOUCH
FCC ID:	2APQQ-01WIMRA
Applicable standards:	FCC CFR Title 47 Part 15 Subpart E Section 15.407
Date of sample receipt:	March 28,2022
Date of Test:	March 29, 2022-April 2, 2022
Date of report issued:	April 6, 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	*2022-4-6*	*Original*

Prepared By: ***Date:*** *2022-4-6*

Project Engineer

Check By: ***Date:*** *2022-4-6*

Reviewer

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	Not Applicable
Conducted Peak Output Power	15.407(a)(3)	Pass
Channel Bandwidth	15.407(e)	Pass
Power Spectral Density	15.407(a)(3)	Pass
Band Edge	15.407(b)(4)	Pass
Spurious Emission	15.205/15.209/15.407(b)(4)	Pass
Frequency Stability	15.407(g)	Pass

Remarks：

1. *Pass: The EUT complies with the essential requirements in the standard.*
2. *Test according to ANSI C63.10:2013.*

4.1 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	1 x 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 AC Module
Model No.:	01WIMRA
Serial No.:	N/A
Hardware Version:	6PH0914610
Software Version:	MT7663BU_mp1.4.1_202105142505501
Test sample(s) ID:	GTSL202204000115-1
Sample(s) Status:	Engineer sample
Operation Frequency:	802.11a/802.11n(HT20)/802.11n(HT40) /802.11ac(VHT20) /802.11ac(VHT40) /802.11ac(VHT80): 5745MHz ~ 5825MHz
Channel numbers:	802.11a/802.11n(HT20)/802.11ac(VHT20): 5 802.11n(HT40) /802.11ac(VHT40):2 802.11ac(VHT80):1
Channel bandwidth:	802.11a/802.11n(HT20) : 20MHz 802.11n(HT40) /802.11ac(VHT40):40MHz 802.11ac(VHT80): 80MHz
Modulation technology:	802.11a/802.11n(HT20)/802.11n(HT40) /802.11ac(VHT20) /802.11ac(VHT40) /802.11ac(VHT80): Orthogonal Frequency Division Multiplexing (OFDM) MIMO: 802.11n/ac SISO: 802.11a
Antenna Type:	External Antenna
Antenna gain:	ANT1:2.0dBi ANT2:2.0dBi (PSD directional gain=5.01dBi, Power directional gain=5.01dBi)
Power supply:	DC 5V (Powered by USB Port)

Remark: The EUT is only designed to be used in large-screen TVS and other products, not directly connected to a computer

Operation Frequency each of channel					
Channel	Frequency	Channel	Frequency	Channel	Frequency
149	5745MHz	151	5755MHz	153	5765MHz
155	5775MHz	157	5785MHz	159	5795MHz
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)	802.11 n(HT40)	802.11 ac(VHT20)	802.11 ac(VHT40)	802.11 ac(VHT80)
Lowest channel	5745	5745	5755	5745	5755	5775
Middle channel	5785	5785	/	5785	/	/
Highest channel	5825	5825	5795	5825	5795	/

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode

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.

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
n(HT20)	MCS0
n(HT40)	MCS0
ac(VHT20)	MCS0
ac(VHT40)	MCS0
ac(VHT80)	MCS0

5.3 Description of Support Units

Notebook PC Mode Number: 500RSH

Remark: The computer used for auxiliary testing is only used for fixed-frequency control, and the product cannot work normally if directly connected to the computer. USB extension cable is used to connect EUT in the test, and the fixed-frequency computer is placed outside the shielding room.

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	June. 24 2021	June. 23 2022
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 24 2021	June. 23 2022
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 24 2021	June. 23 2022
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 24 2021	June. 23 2022
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 24 2021	June. 23 2022
9	Coaxial Cable	GTS	N/A	GTS211	June. 24 2021	June. 23 2022
10	Coaxial cable	GTS	N/A	GTS210	June. 24 2021	June. 23 2022
11	Coaxial Cable	GTS	N/A	GTS212	June. 24 2021	June. 23 2022
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 24 2021	June. 23 2022
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 24 2021	June. 23 2022
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 24 2021	June. 23 2022
15	Band filter	Amindeon	82346	GTS219	June. 24 2021	June. 23 2022
16	Power Meter	Anritsu	ML2495A	GTS540	June. 24 2021	June. 23 2022
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 24 2021	June. 23 2022
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 24 2021	June. 23 2022
19	Splitter	Agilent	11636B	GTS237	June. 24 2021	June. 23 2022
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 24 2021	June. 23 2022
21	Breitband hornantenne	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. 24 2021	June. 23 2022

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.15 2019	May.14 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 24 2021	June. 23 2022
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 24 2021	June. 23 2022
4	ENV216 2-L-V-NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	GTS226	June. 24 2021	June. 23 2022
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	KTJ	TA328	GTS233	June. 24 2021	June. 23 2022
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 24 2021	June. 23 2022
9	ISN	SCHWARZBECK	NTFM 8158	GTS565	June. 24 2021	June. 23 2022
10	High voltage probe	SCHWARZBECK	TK9420	GTS537	July. 09 2021	July. 08 2022

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	June. 24 2021	June. 23 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 24 2021	June. 23 2022
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 24 2021	June. 23 2022
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 24 2021	June. 23 2022
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 24 2021	June. 23 2022
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 24 2021	June. 23 2022
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 24 2021	June. 23 2022
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 24 2021	June. 23 2022

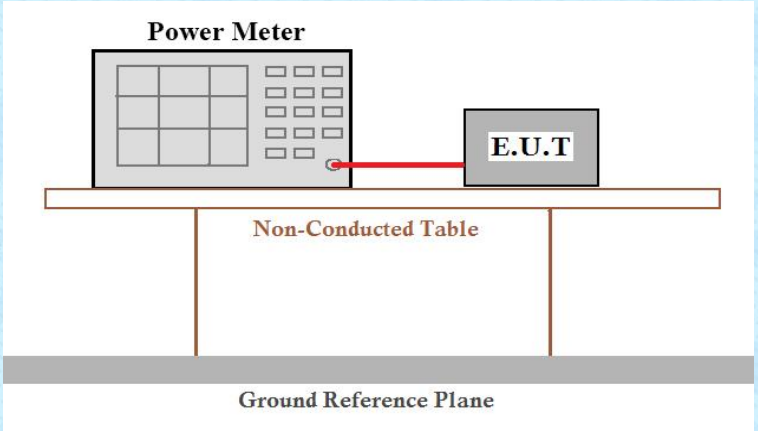
General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 24 2021	June. 23 2022
2	Barometer	ChangChun	DYM3	GTS255	June. 24 2021	June. 23 2022

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
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.*	
E.U.T Antenna:	
The antennas are external antenna, the best case gain of the antennas are 2.0dBi, reference to the appendix II for details	

7.2 Conducted Average Output Power

Test Requirement:	FCC Part15 E Section 15.407(a)(3)
Test Method:	ANSI C63.10:2013 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	97.83	97.8	0.1	0.1
	5785	97.8	97.8	0.1	0.1
	5825	97.83	97.83	0.1	0.1
802.11n(HT20)	5745	97.68	97.68	0.1	0.1
	5785	95.67	95.67	0.19	0.19
	5825	97.7	97.7	0.1	0.1
802.11n(HT40)	5755	95.65	95.65	0.19	0.19
	5795	95.39	95.39	0.2	0.2
802.11ac(VHT20)	5745	95.69	95.69	0.19	0.19
	5785	97.68	97.68	0.1	0.1
	5825	95.71	95.71	0.19	0.19
802.11ac(VHT40)	5755	91.9	91.9	0.37	0.37
	5795	91.34	91.34	0.39	0.39
802.11ac(VHT80)	5775	85.5	85.5	0.68	0.68

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	16.748	16.098	--	0.1	16.848	16.198	--	30	Pass
157	5875	16.624	16.754	--	0.1	16.724	16.854	--		
165	5825	16.485	16.13	--	0.1	16.585	16.23	--		
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	14.431	13.962	17.213	0.1	14.531	14.062	17.313	30	Pass
157	5875	13.268	13.835	16.571	0.1	13.368	13.935	16.671		
165	5825	14.185	14.154	17.18	0.1	14.285	14.254	17.28		
802.11n(HT40) 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		
151	5755	14.62	14.1	17.378	0.19	14.81	14.29	17.568	30	Pass
159	5795	14.09	13.813	16.964	0.2	14.29	14.013	17.164		

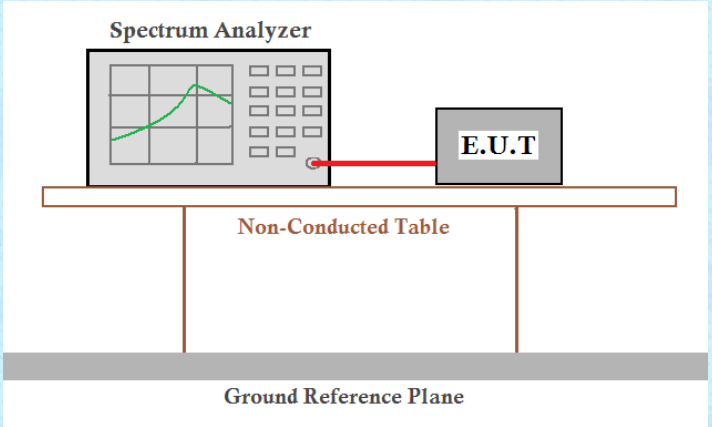
802.11ac(VHT20) mode										
CH No.	Frequency (MHz)	Measured Power (dBm)			Duty Factor	Output Power (dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT 1+2		ANT1	ANT2	ANT 1+2		
149	5745	14.418	13.908	17.181	0.19	16.977	14.098	17.371	30	Pass
157	5875	14.61	14.555	17.593	0.19	14.745	17.783	13.368		
165	5825	14.044	13.889	16.977	0.19	14.234	14.079	17.167		
802.11ac(VHT40) 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		
151	5755	14.416	13.709	17.087	0.37	14.786	14.079	17.457	30	Pass
159	5795	13.963	13.618	16.804	0.39	14.353	14.008	17.194		
802.11ac(VHT80) 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		
155	5775	13.778	13.222	13.222	0.68	14.458	13.902	17.199	30	Pass

Note: Output Power = Measured Power + Duty Factor

Duty Factor = 10 log (1/Duty Cycle)

Remark: “---“is not applicable

7.3 Channel Bandwidth

Test Requirement:	FCC Part15 E Section 15.407(e)
Test Method:	ANSI C63.10:2013 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)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11a		802.11a	
		ANT1	ANT2	ANT1	ANT2
149	5745	16.583	17.203	24.14	29.65
157	5785	16.43	16.489	19.86	19.96
165	5825	16.638	17.688	25.05	29.99

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11n(HT20)		802.11n(HT20)	
		ANT1	ANT2	ANT1	ANT2
149	5745	17.606	17.695	20.47	24.32
157	5785	17.57	17.561	20.05	20.01
165	5825	17.589	17.777	20.30	28.37

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11n(HT40)		802.11n(HT40)	
		ANT1	ANT2	ANT1	ANT2
151	5755	36.053	36.232	44.10	52.65
159	5795	36.134	36.298	41.48	54.14

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11ac(VHT20)		802.11ac(VHT20)	
		ANT1	ANT2	ANT1	ANT2
149	5745	17.586	17.679	20.70	23.37
157	5785	17.653	17.797	20.97	29.79
165	5825	17.604	17.733	23.32	26.63

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11ac(VHT40)		802.11ac(VHT40)	
		ANT1	ANT2	ANT1	ANT2
151	5755	36.011	36.222	41.59	55.07
159	5795	36.027	36.345	40.95	58.06

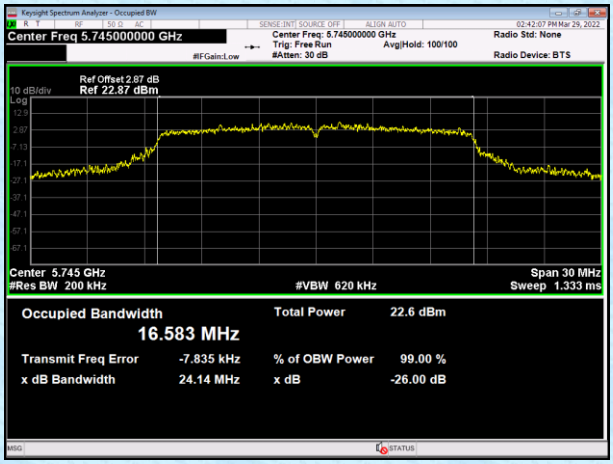
CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11ac(VHT80)		802.11ac(VHT80)	
		ANT1	ANT2	ANT1	ANT2
155	5775	75.469	75.665	91.81	114.8

Remark: “---“is not applicable

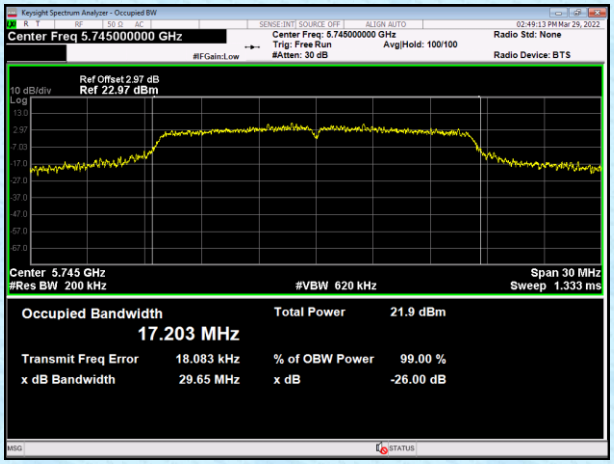
Test plot as follows: Test mode: 802.11a

Lowest channel 5745MHz

Antenna1

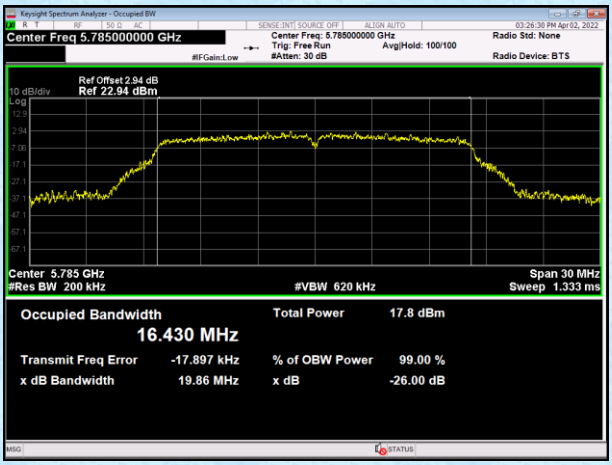


Antenna2

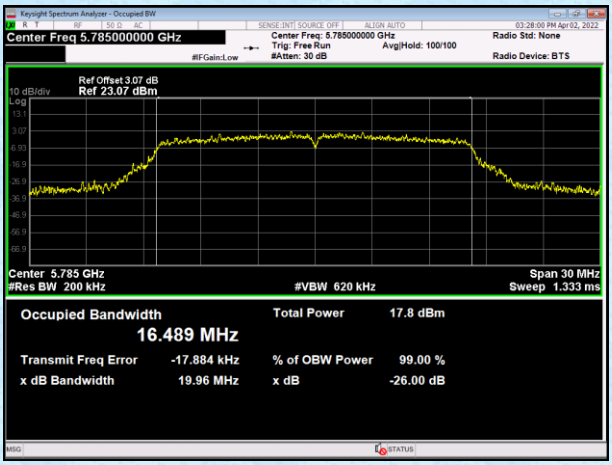


Middle channel 5785MHz

Antenna1

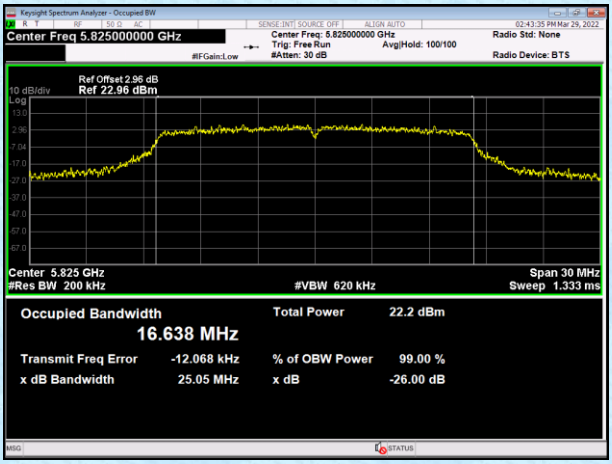


Antenna2

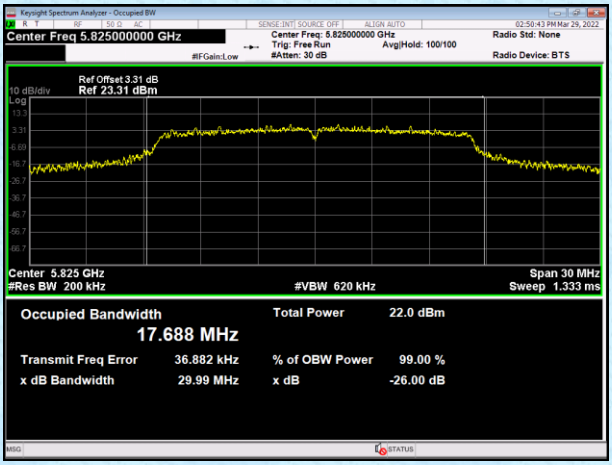


Highest channel 5825MHz

Antenna1



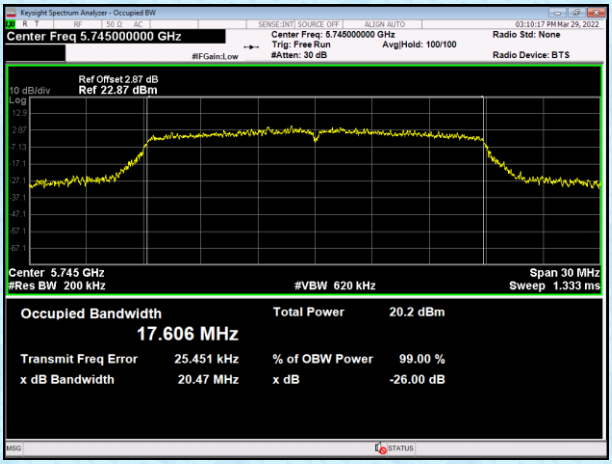
Antenna2



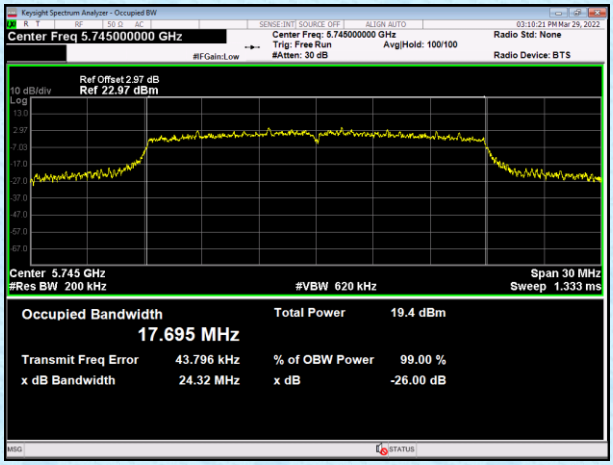
Test mode: 802.11 n(HT20)

Lowest channel 5745MHz

Antenna1

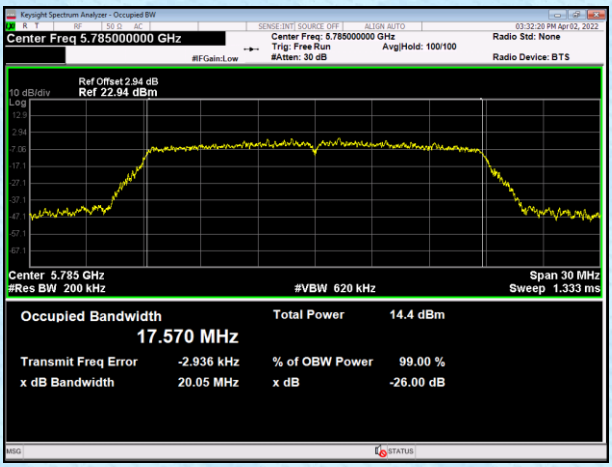


Antenna2

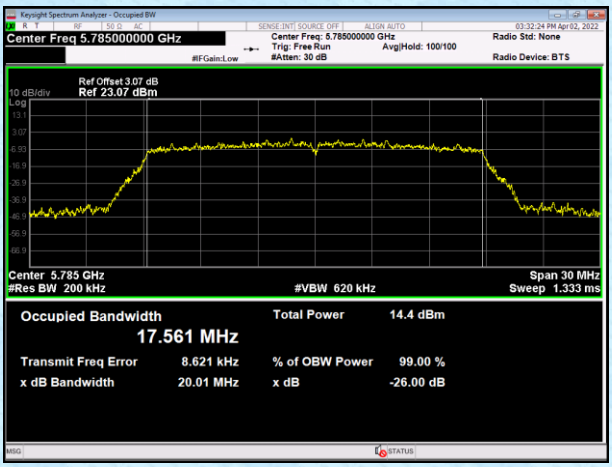


Middle channel 5785MHz

Antenna1

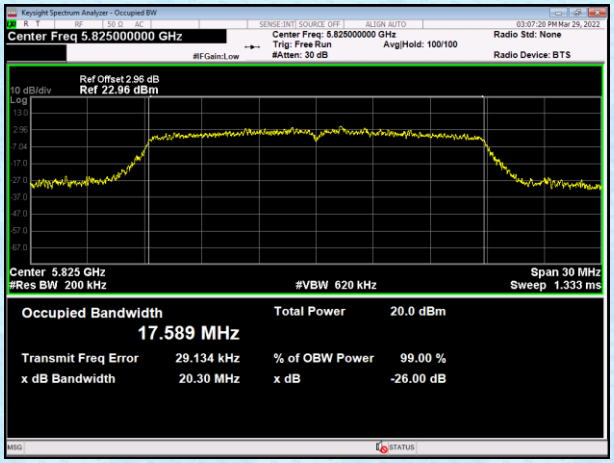


Antenna2

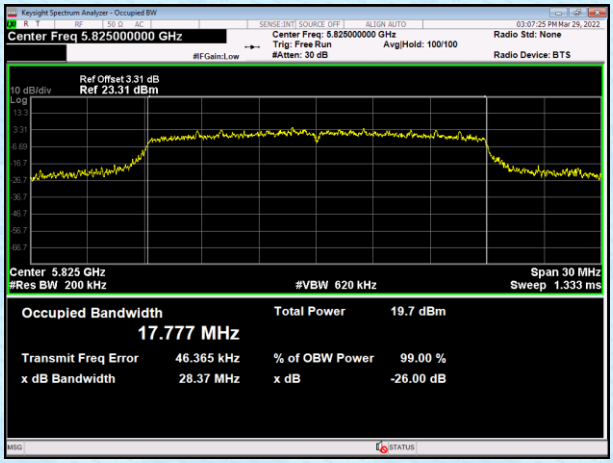


Highest channel 5825MHz

Antenna1



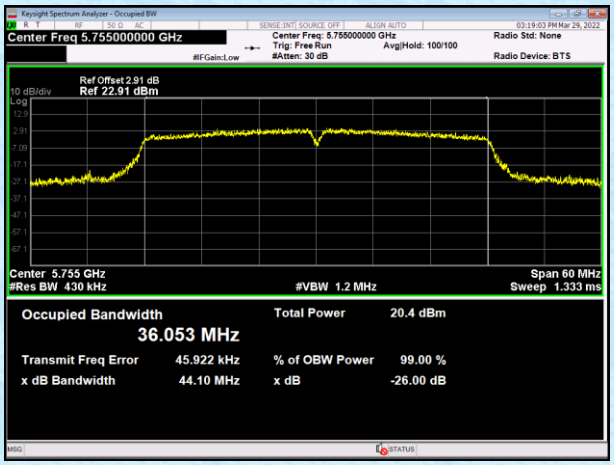
Antenna2



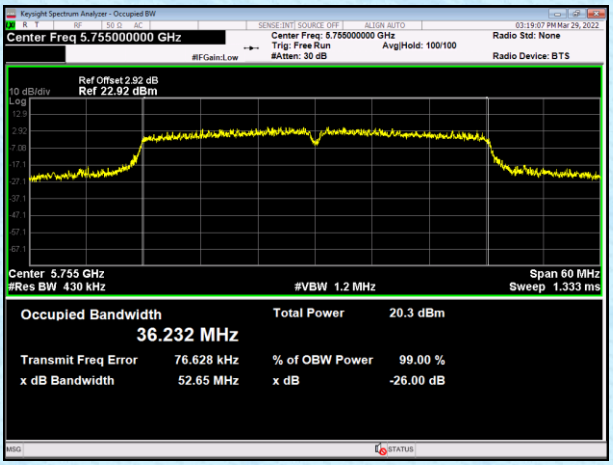
Test mode: 802.11 n(HT40)

Lowest channel 5755MHz

Antenna1

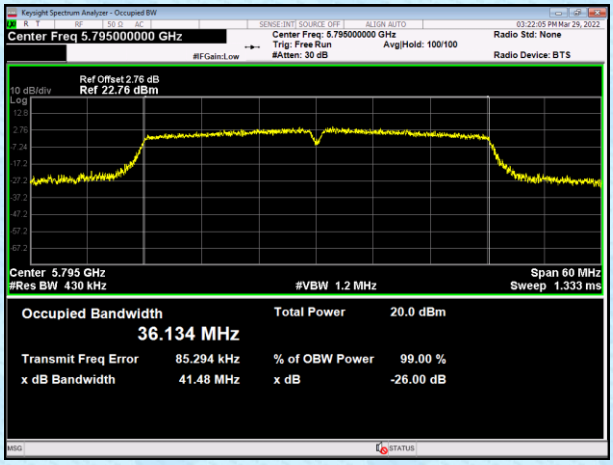


Antenna2

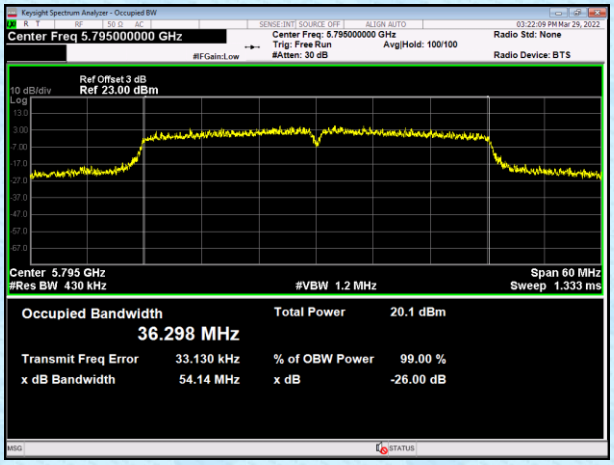


Highest channel 5795MHz

Antenna1



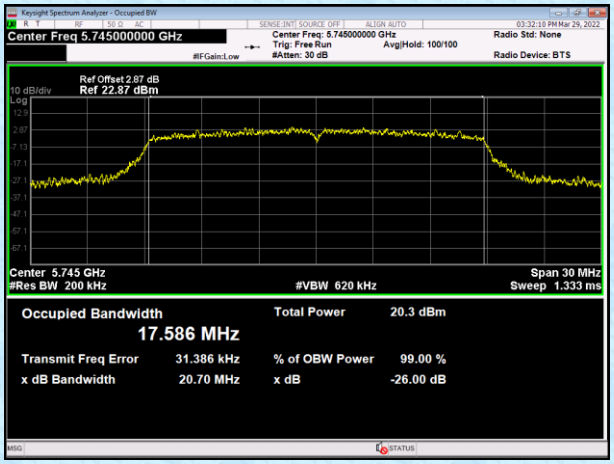
Antenna2



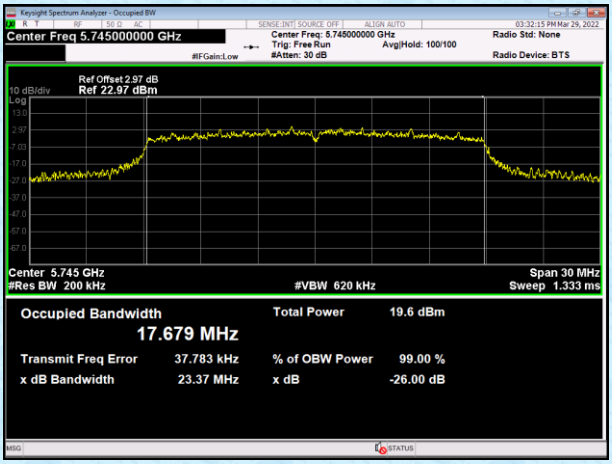
Test mode: 802.11ac(VHT20)

Lowest channel 5745MHz

Antenna1

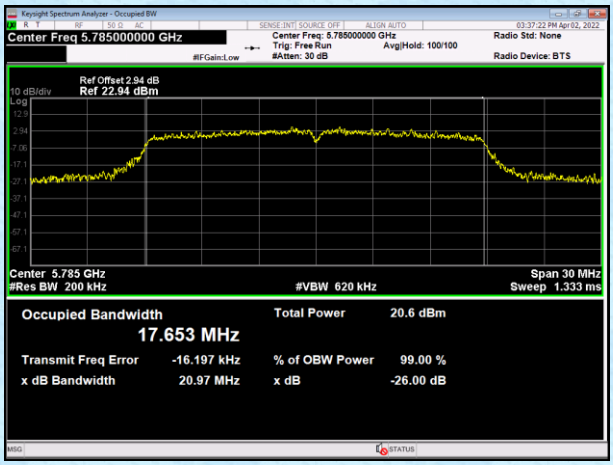


Antenna2

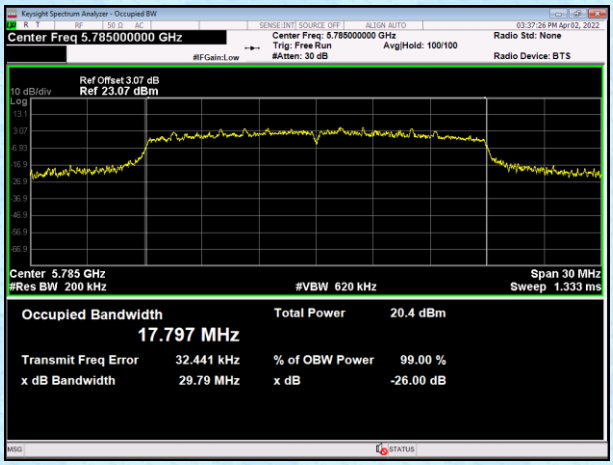


Middle channel 5785MHz

Antenna1

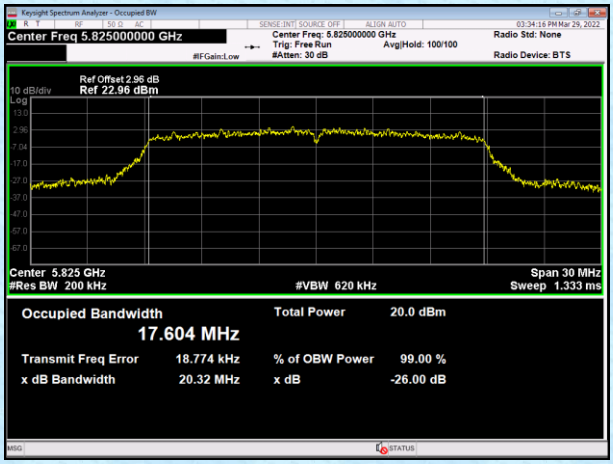


Antenna2

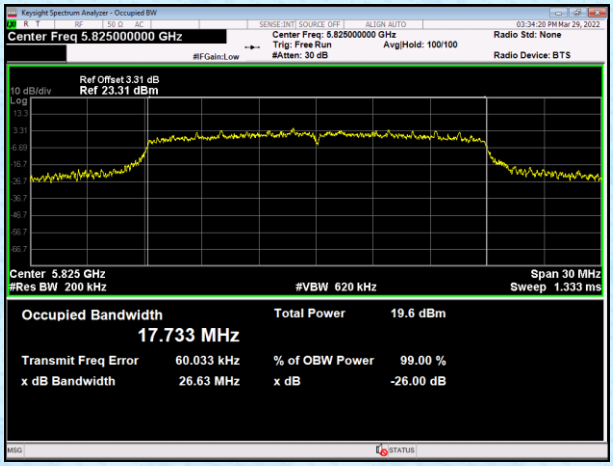


Highest channel 5825MHz

Antenna1



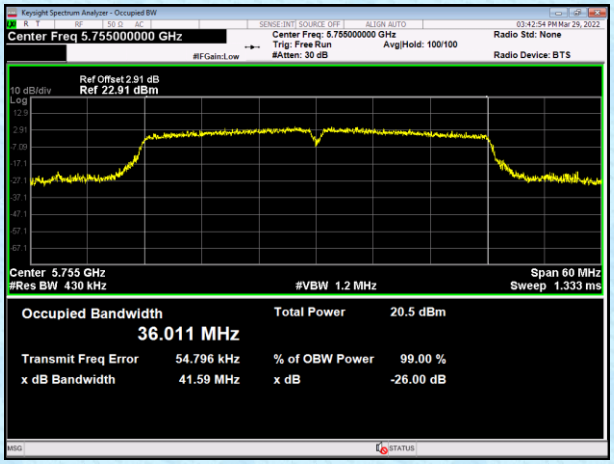
Antenna2



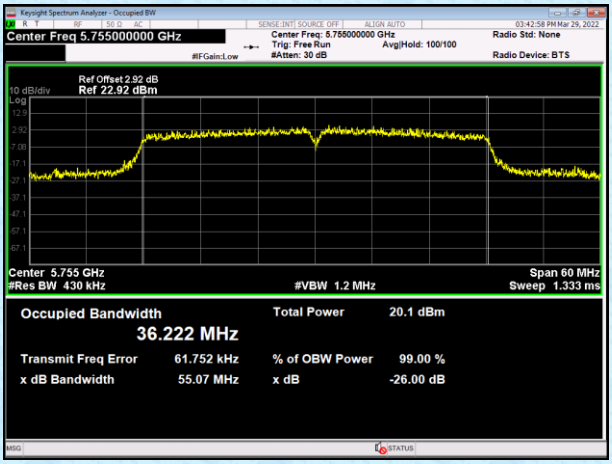
Test mode: 802.11 ac(VHT40)

Lowest channel 5755MHz

Antenna1

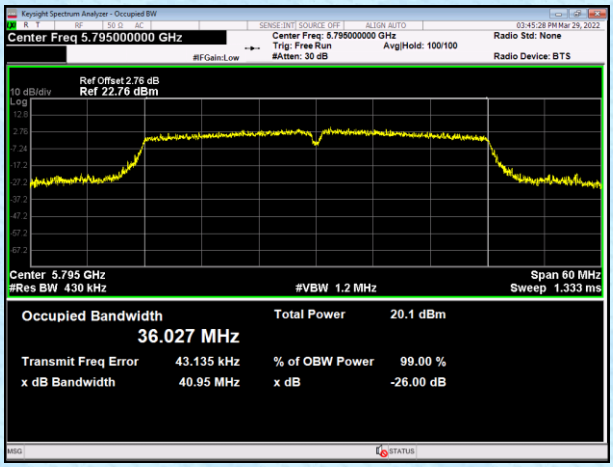


Antenna2

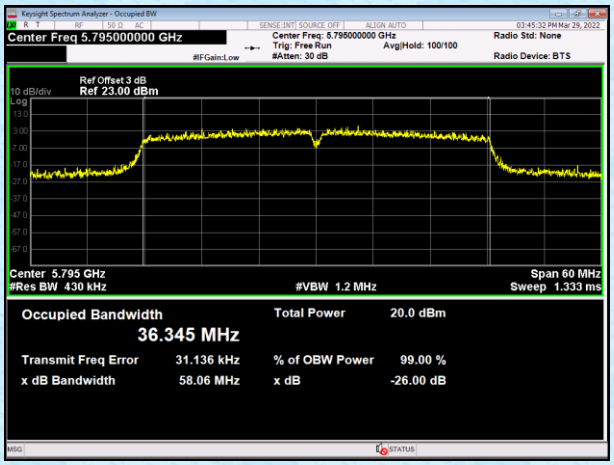


Highest channel 5795MHz

Antenna1



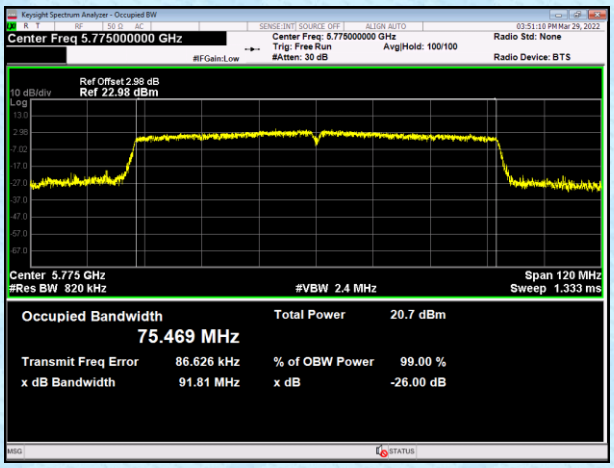
Antenna2



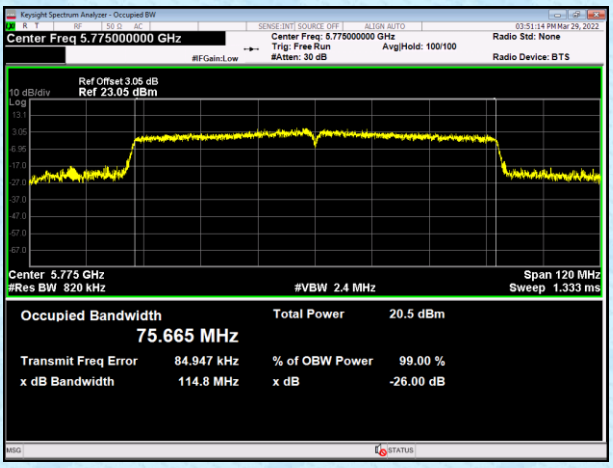
Test mode: 802.11 ac(VHT80)

Lowest channel 5775MHz

Antenna1



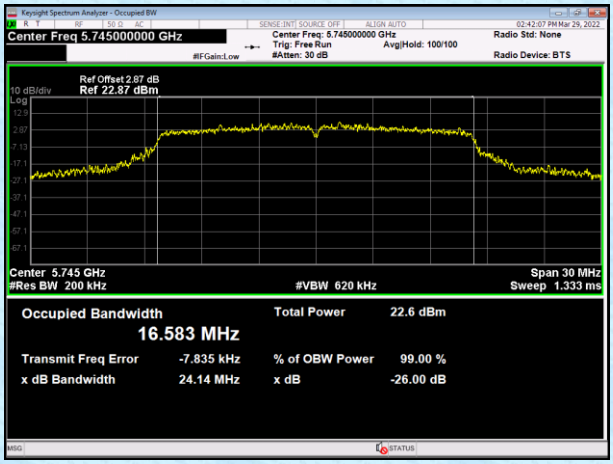
Antenna2



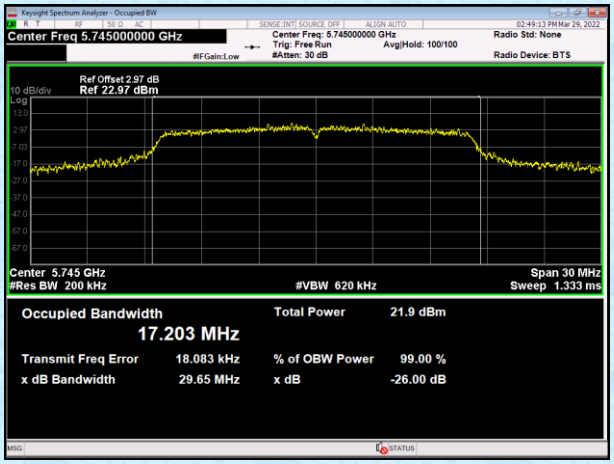
Test plot as follows: Test mode: 802.11a

Lowest channel 5745MHz

Antenna1

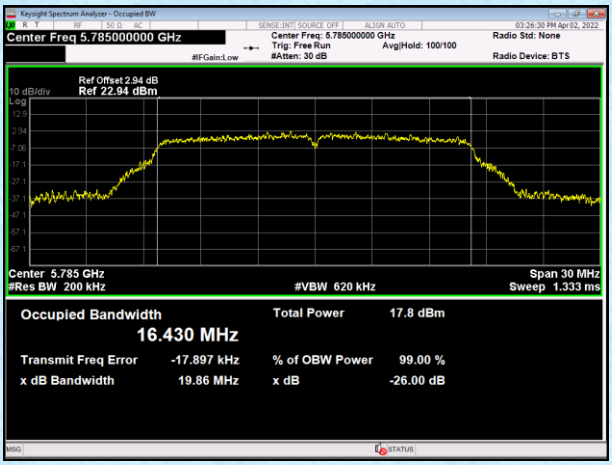


Antenna2

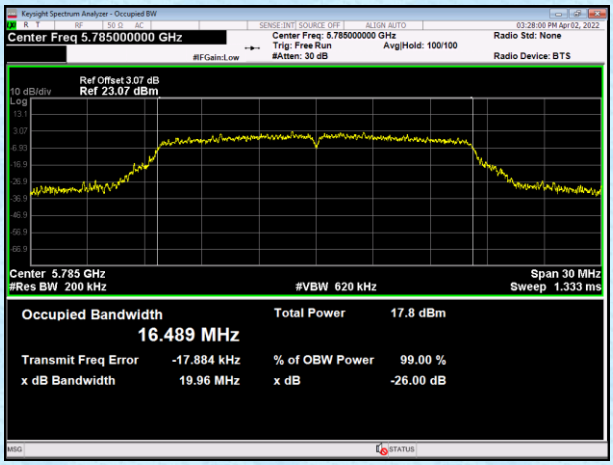


Middle channel 5785MHz

Antenna1

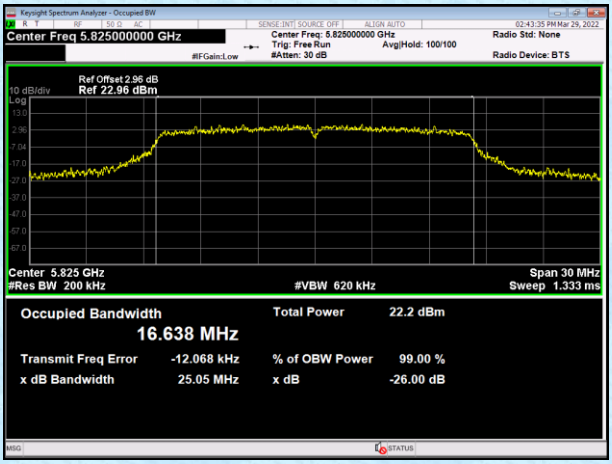


Antenna2

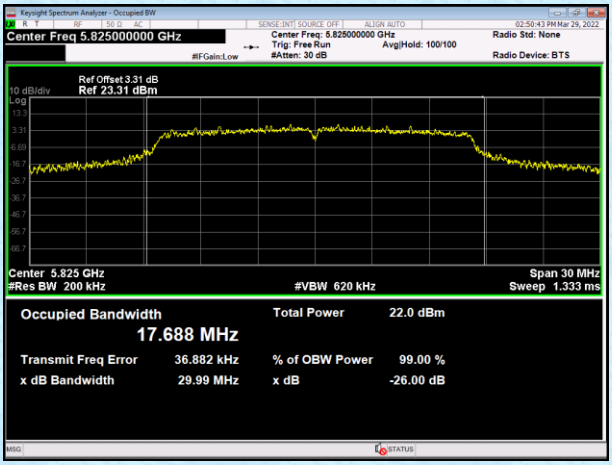


Highest channel 5825MHz

Antenna1



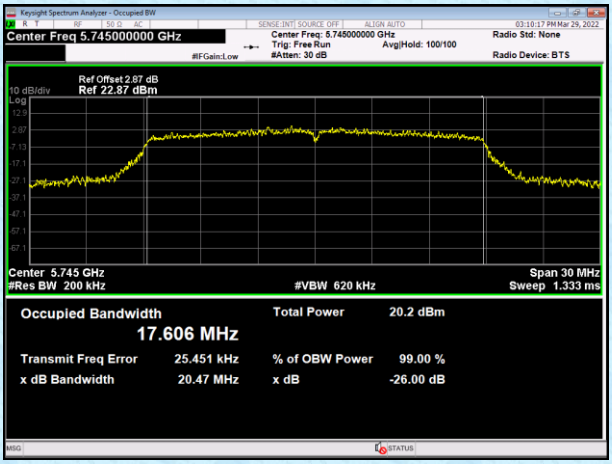
Antenna2



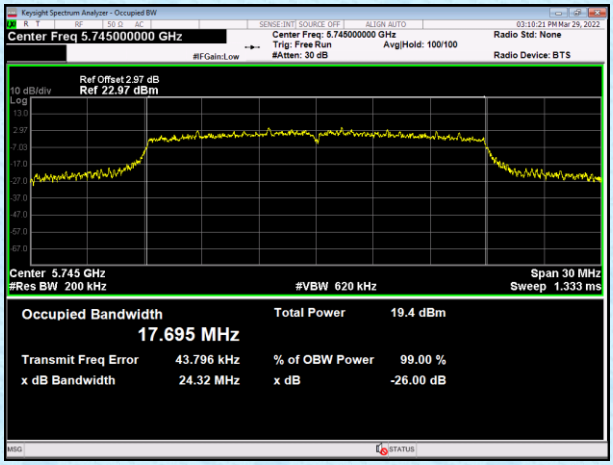
Test mode: 802.11 n(HT20)

Lowest channel 5745MHz

Antenna1

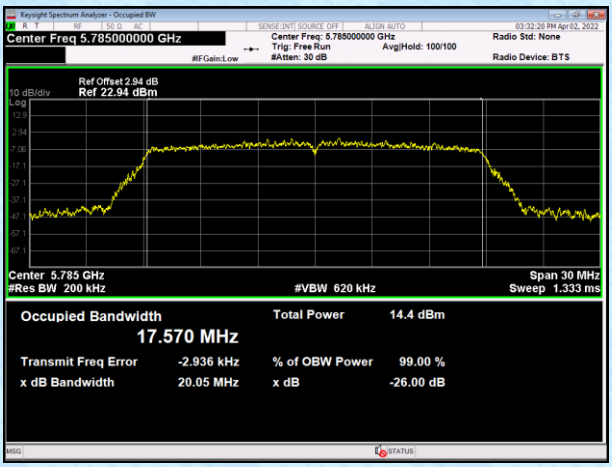


Antenna2

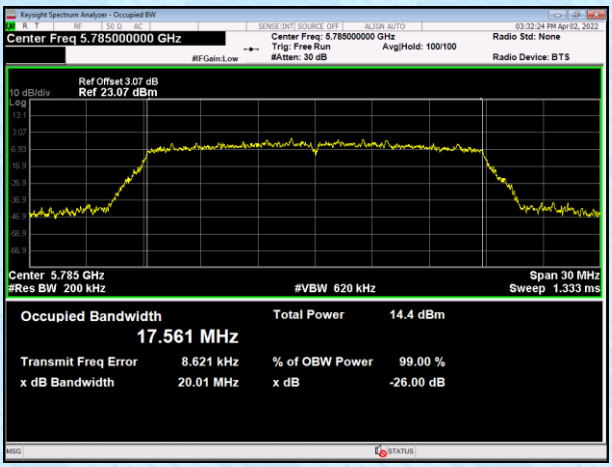


Middle channel 5785MHz

Antenna1

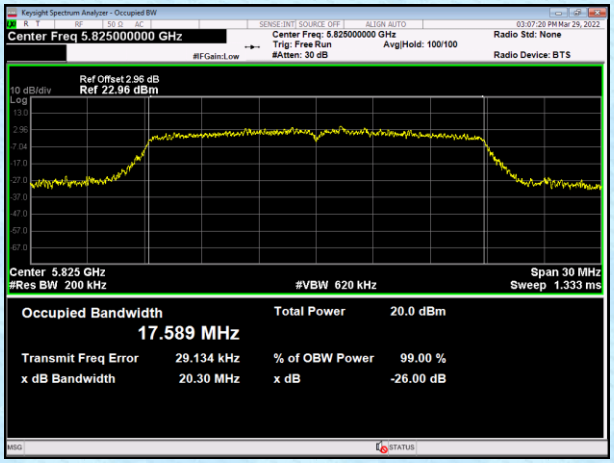


Antenna2

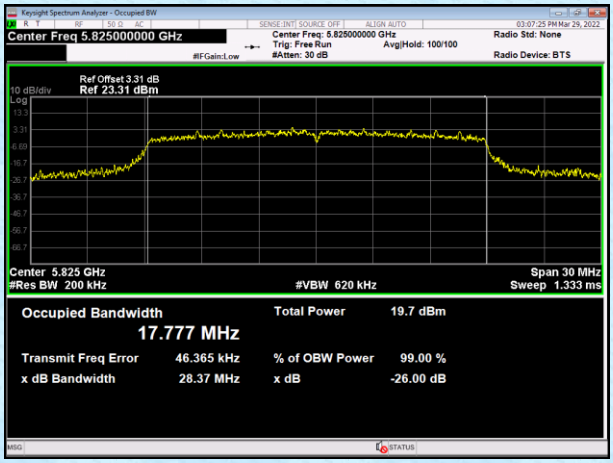


Highest channel 5825MHz

Antenna1



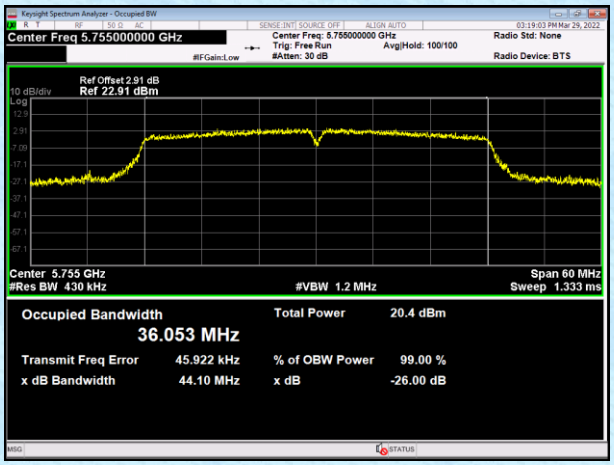
Antenna2



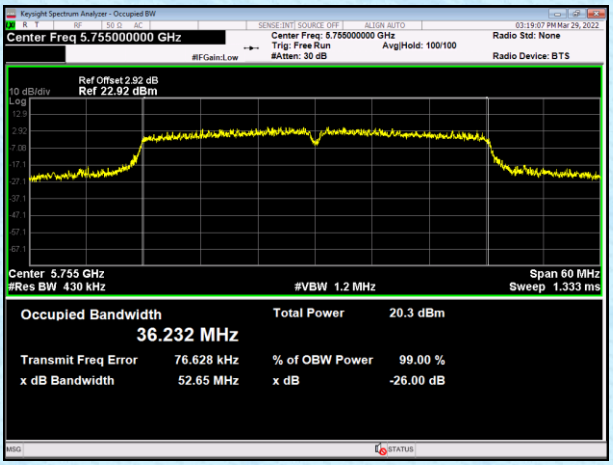
Test mode: 802.11 n(HT40)

Lowest channel 5755MHz

Antenna1

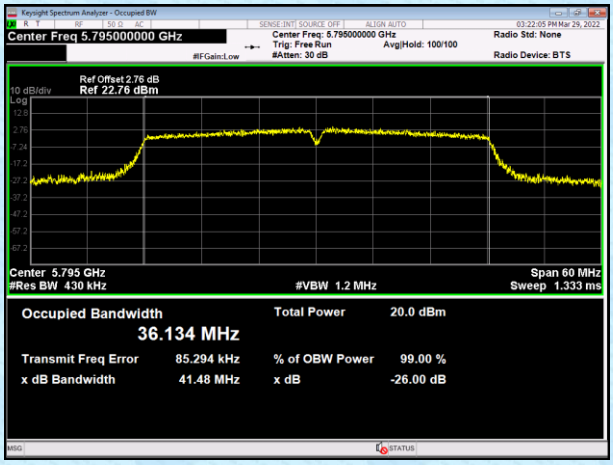


Antenna2

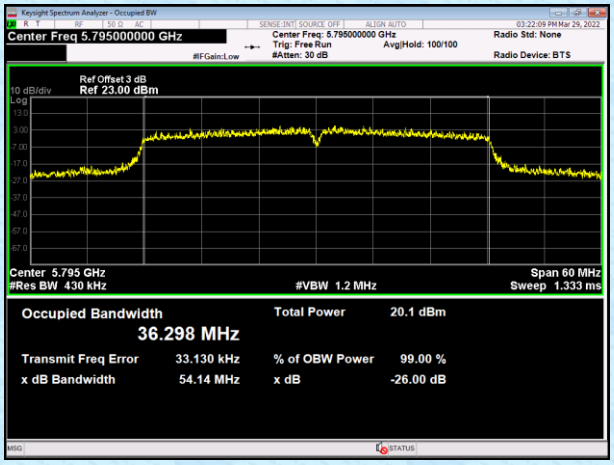


Highest channel 5795MHz

Antenna1



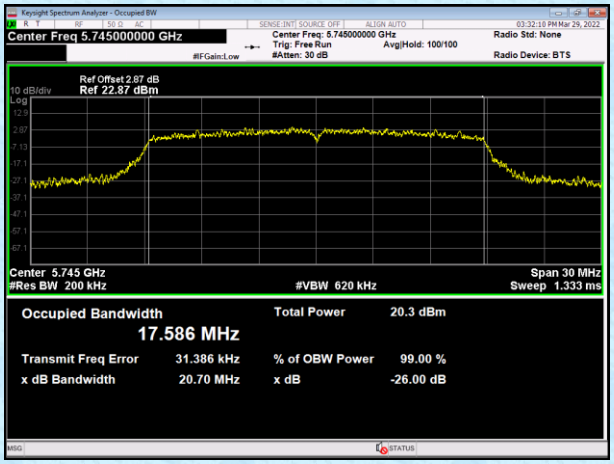
Antenna2



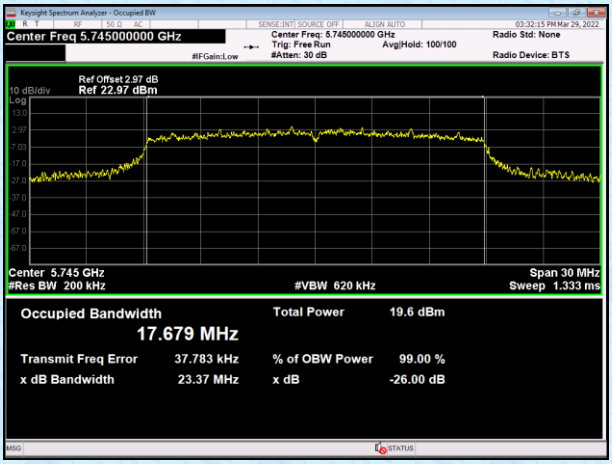
Test mode: 802.11ac(VHT20)

Lowest channel 5745MHz

Antenna1

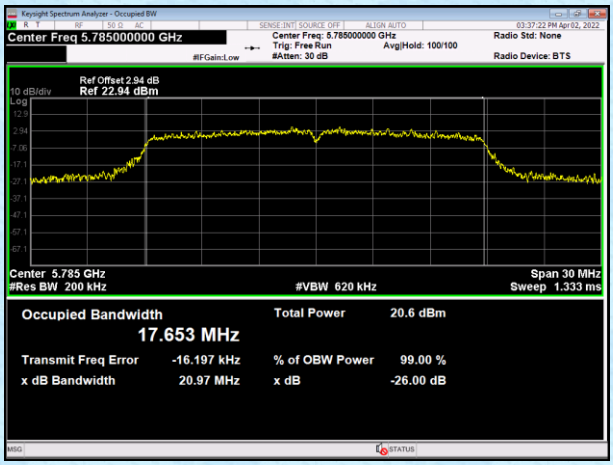


Antenna2

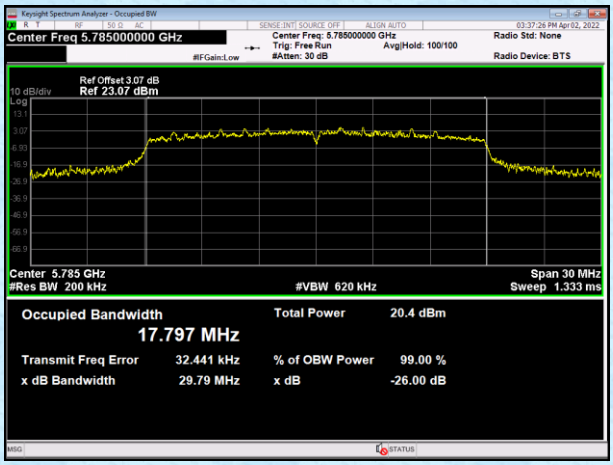


Middle channel 5785MHz

Antenna1

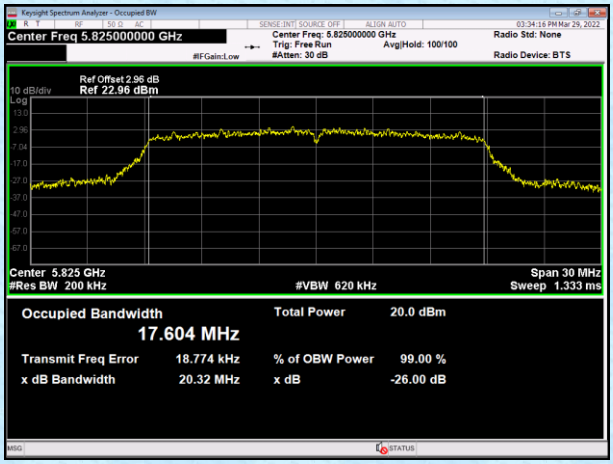


Antenna2

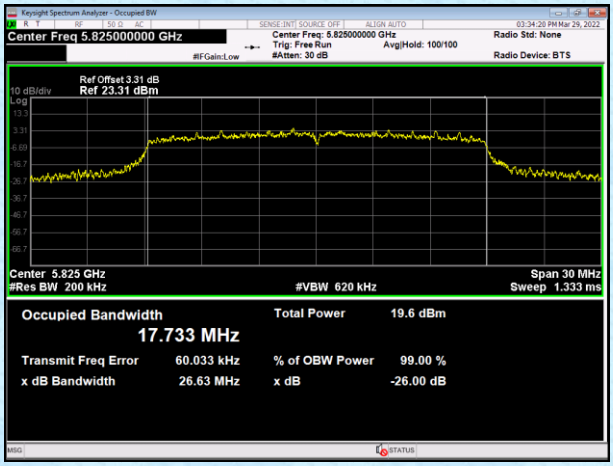


Highest channel 5825MHz

Antenna1



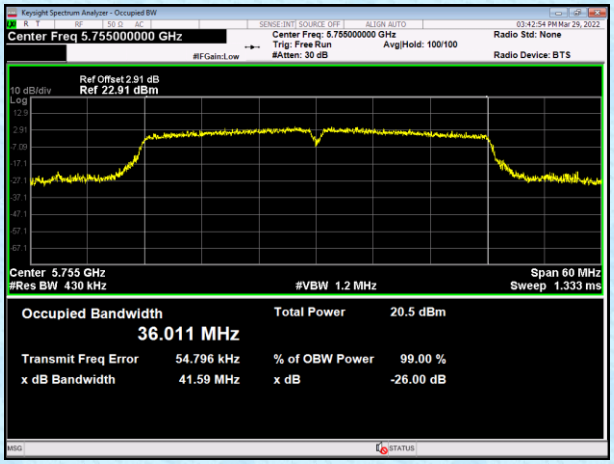
Antenna2



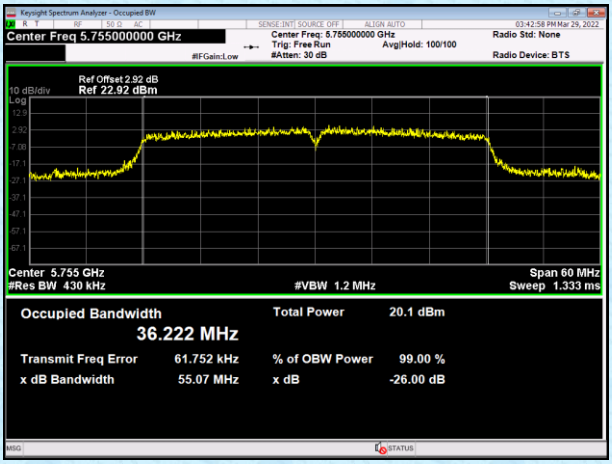
Test mode: 802.11 ac(VHT40)

Lowest channel 5755MHz

Antenna1

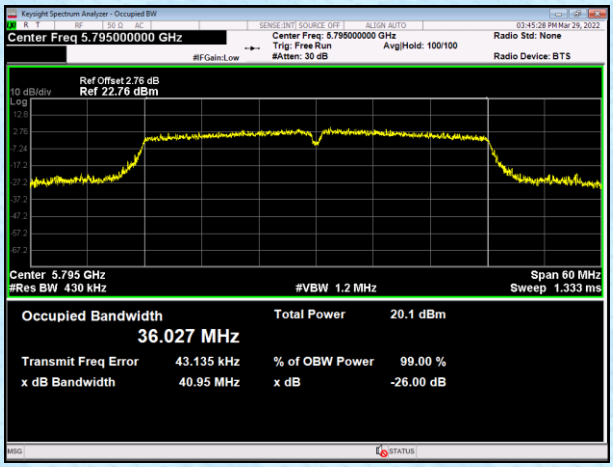


Antenna2

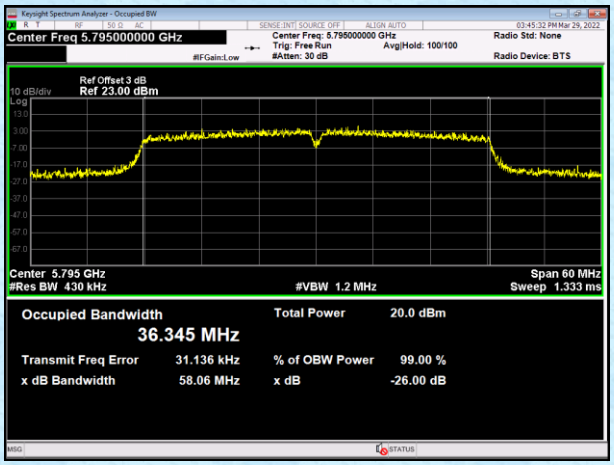


Highest channel 5795MHz

Antenna1



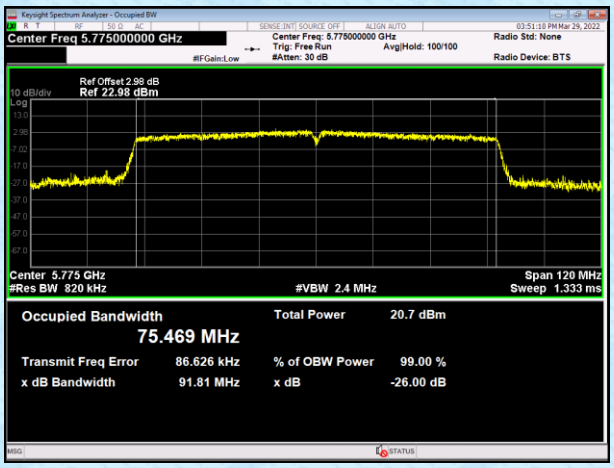
Antenna2



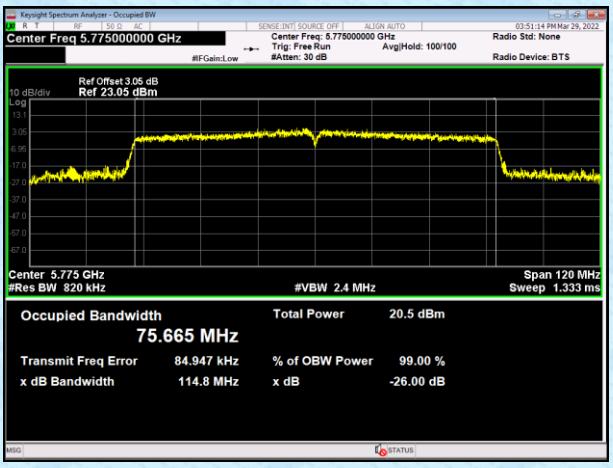
Test mode: 802.11 ac(VHT80)

Lowest channel 5775MHz

Antenna1



Antenna2



CH. No.	Frequency (MHz)	6dB Occupied Bandwidth (MHz)	
		802.11a	
		ANT1	ANT2
149	5745	15.383	14.844
157	5785	15.47	15.09
165	5825	13.832	15.041

CH. No.	Frequency (MHz)	6dB Occupied Bandwidth (MHz)	
		802.11n(HT20)	
		ANT1	ANT2
149	5745	15.083	16.901
157	5785	12.14	16.48
165	5825	15.132	15.076

CH. No.	Frequency (MHz)	6dB Occupied Bandwidth (MHz)	
		802.11n(HT40)	
		ANT1	ANT2
151	5755	35.032	35.049
159	5795	35.105	35.053

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		802.11ac(VHT20)	
		ANT1	ANT2
149	5745	14.98	15.058
157	5785	15.11	15.08
165	5825	15.054	15.085

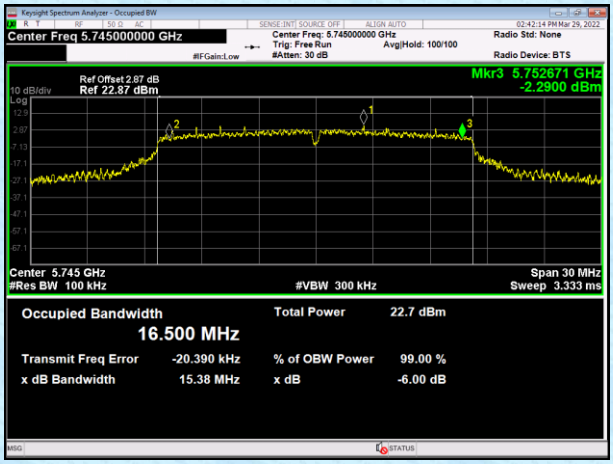
CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		802.11ac(VHT40)	
		ANT1	ANT2
151	5755	35.095	35.063
159	5795	35.065	35.05

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		802.11ac(VHT80)	
		ANT1	ANT2
155	5775	75.074	75.088

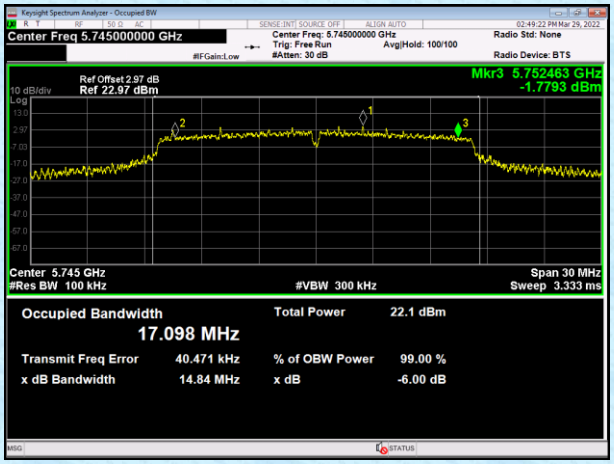
Test plot as follows: Test mode: 802.11a

Lowest channel 5745MHz

Antenna1

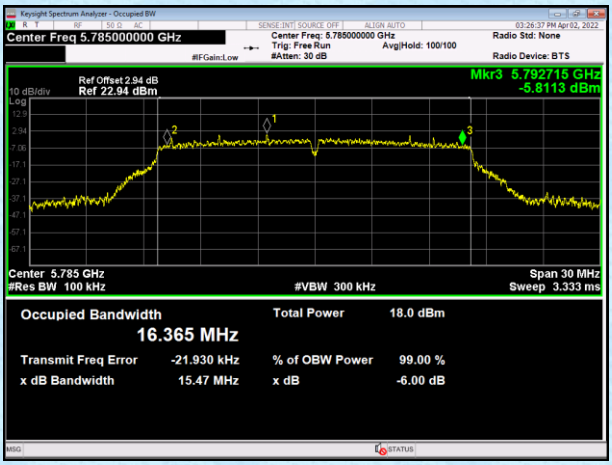


Antenna2

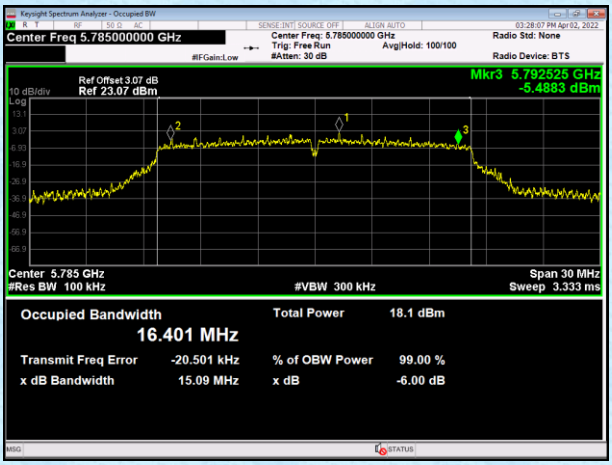


Middle channel 5785MHz

Antenna1

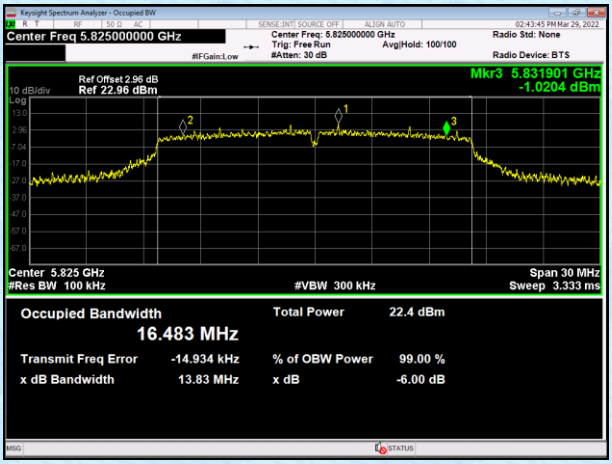


Antenna2

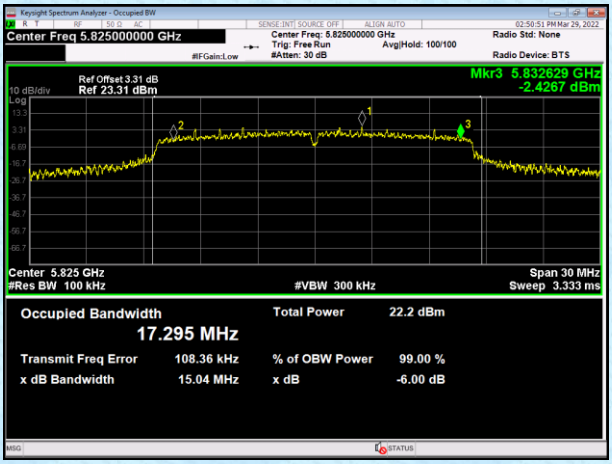


Highest channel 5825MHz

Antenna1



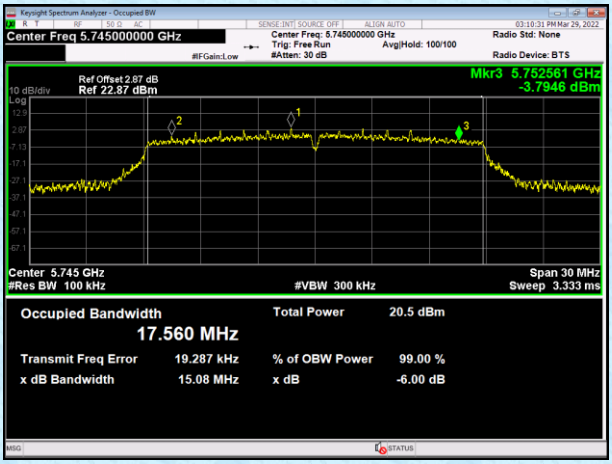
Antenna2



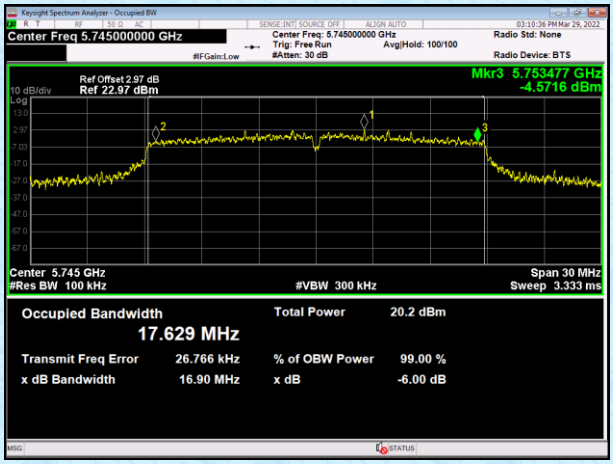
Test mode: 802.11 n(HT20)

Lowest channel 5745MHz

Antenna1

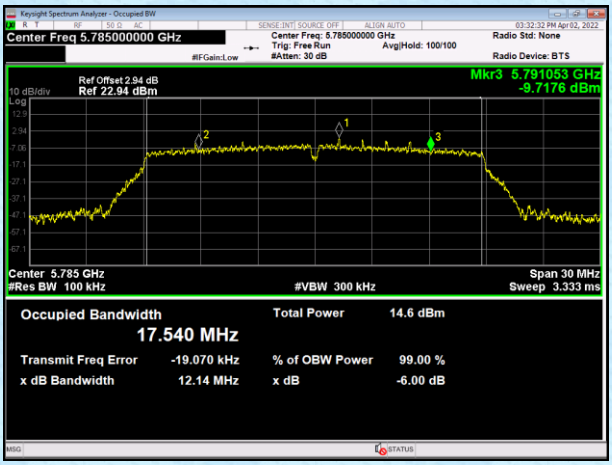


Antenna2

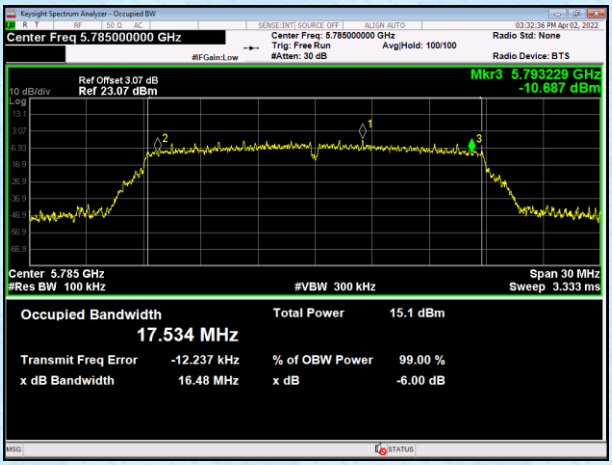


Middle channel 5785MHz

Antenna1

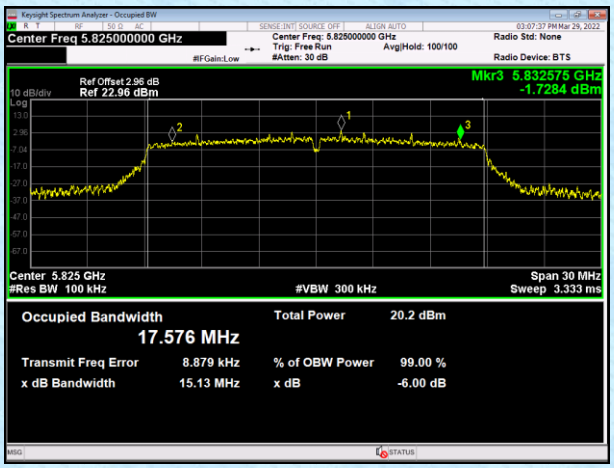


Antenna2

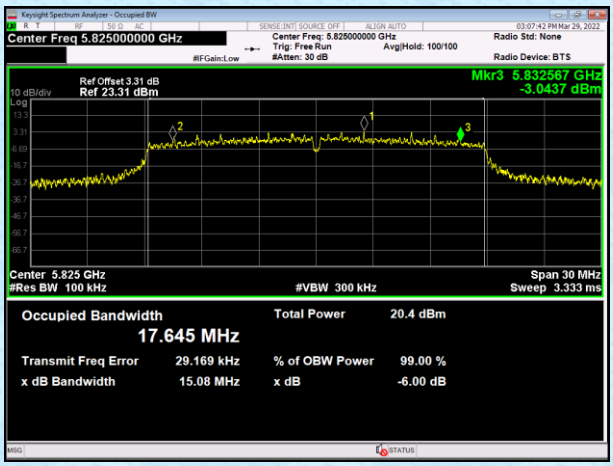


Highest channel 5825MHz

Antenna1



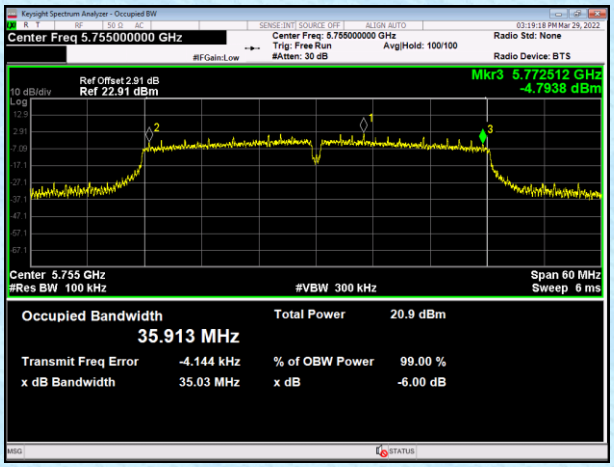
Antenna2



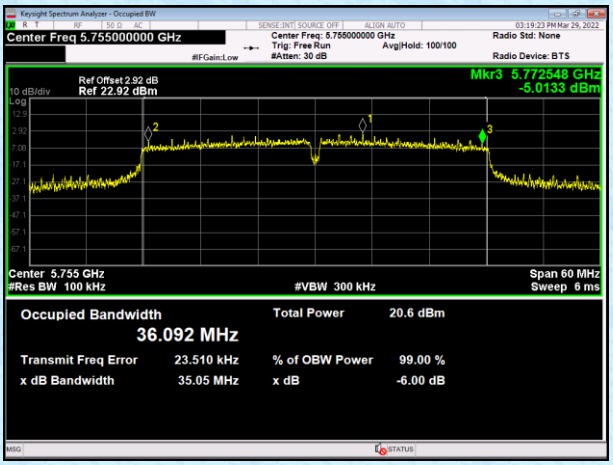
Test mode: 802.11 n(HT40)

Lowest channel 5755MHz

Antenna1

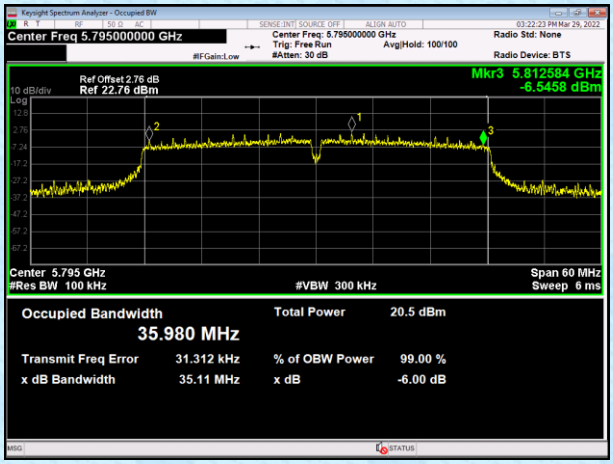


Antenna2

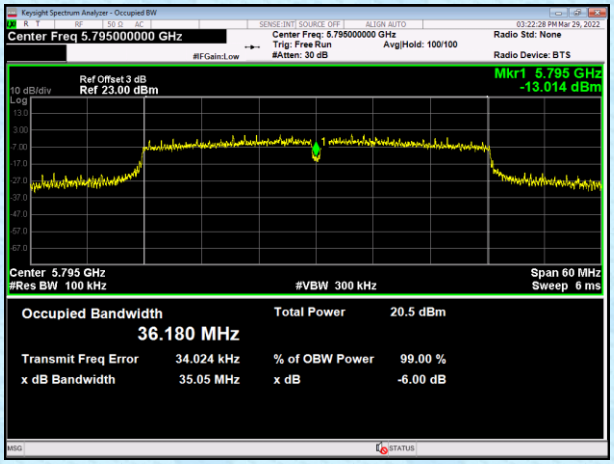


Highest channel 5795MHz

Antenna1



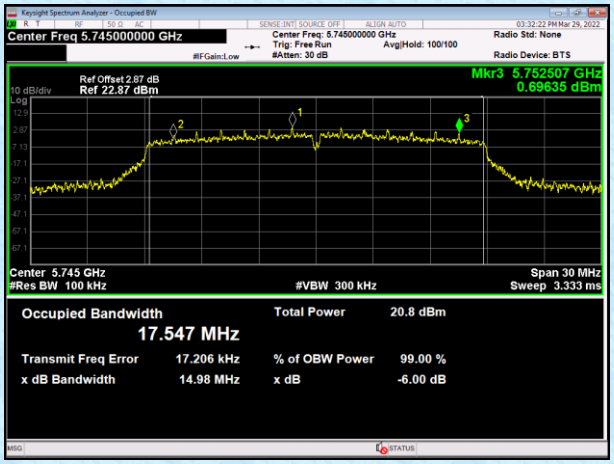
Antenna2



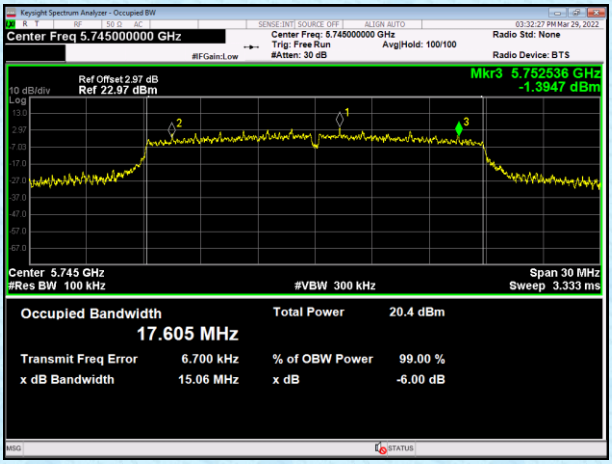
Test mode: 802.11ac(VHT20)

Lowest channel 5745MHz

Antenna1

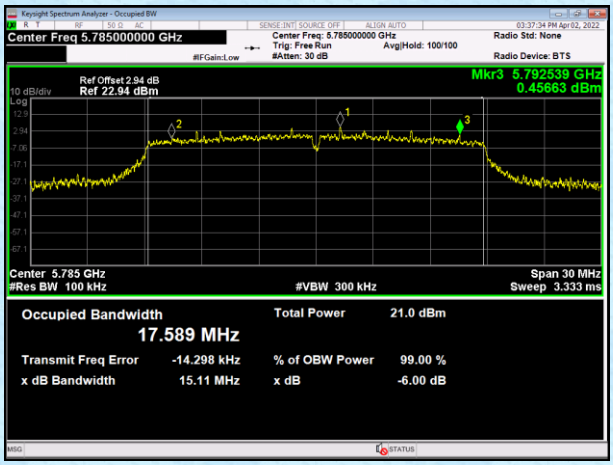


Antenna2

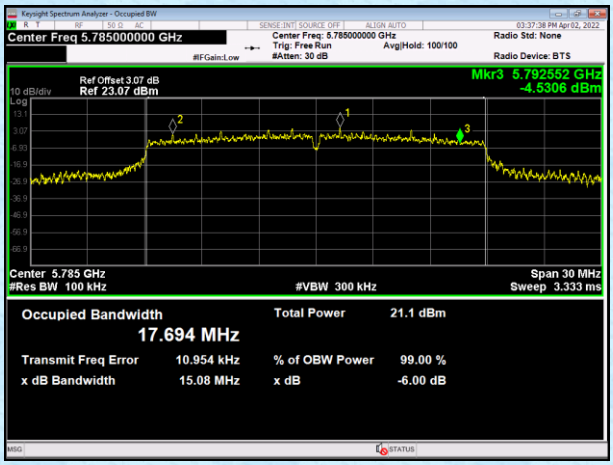


Middle channel 5785MHz

Antenna1

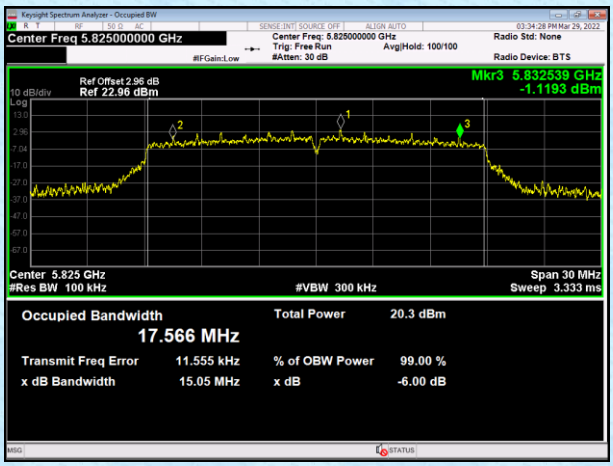


Antenna2

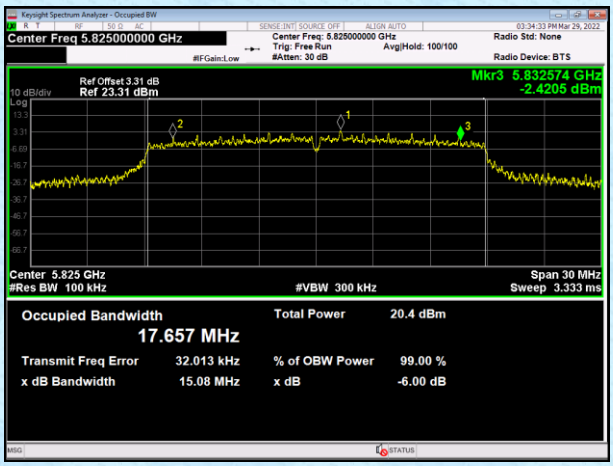


Highest channel 5825MHz

Antenna1



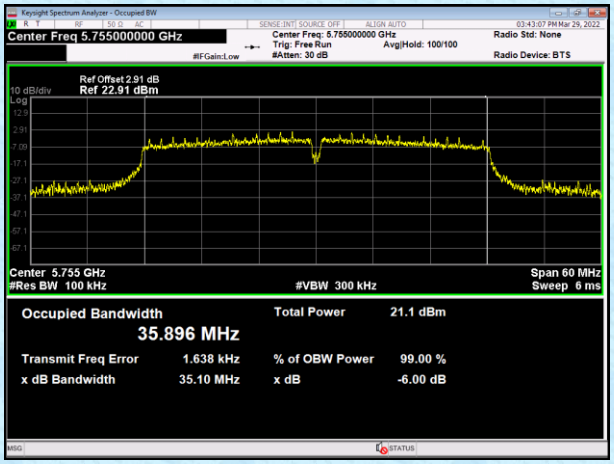
Antenna2



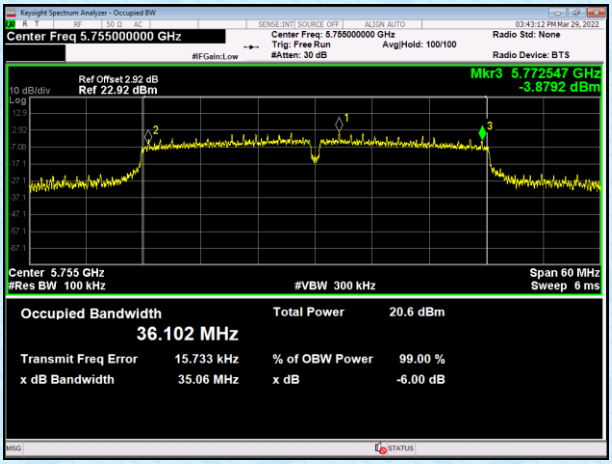
Test mode: 802.11 ac(VHT40)

Lowest channel 5755MHz

Antenna1

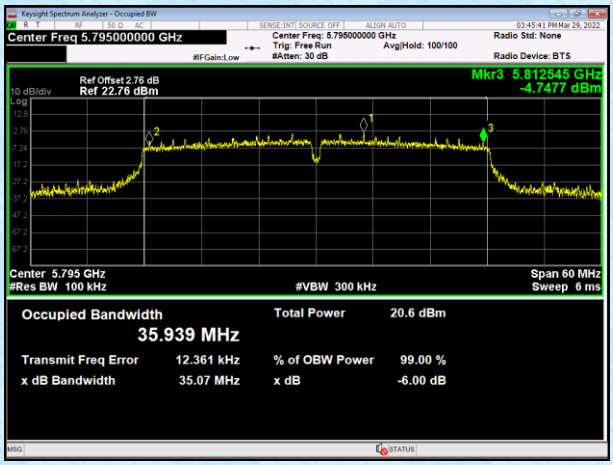


Antenna2

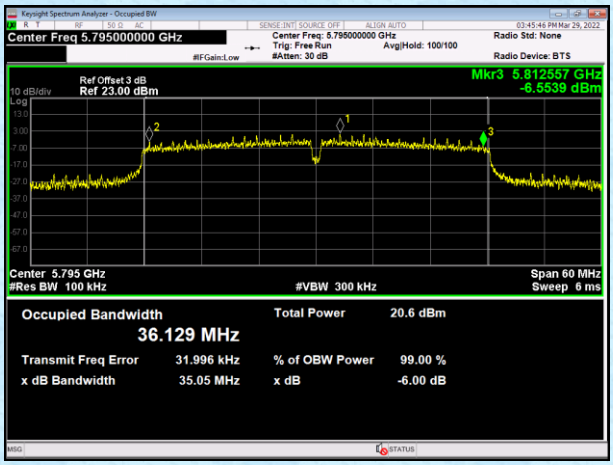


Highest channel 5795MHz

Antenna1



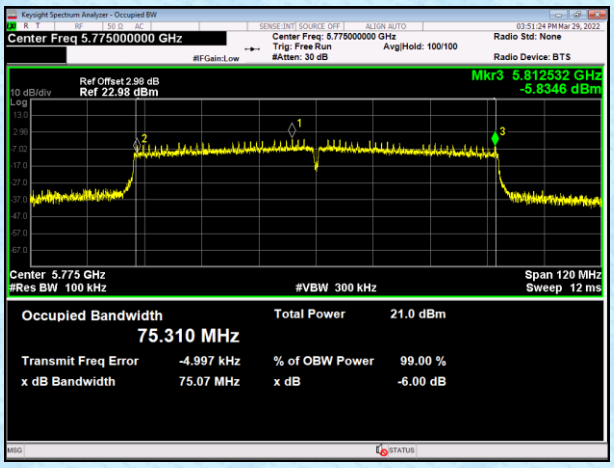
Antenna2



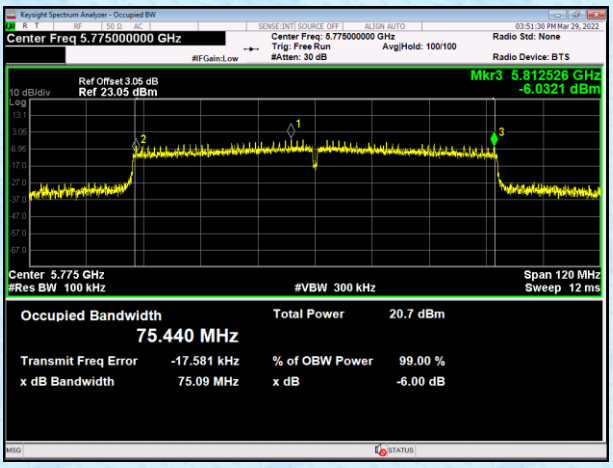
Test mode: 802.11 ac(VHT80)

Lowest channel 5775MHz

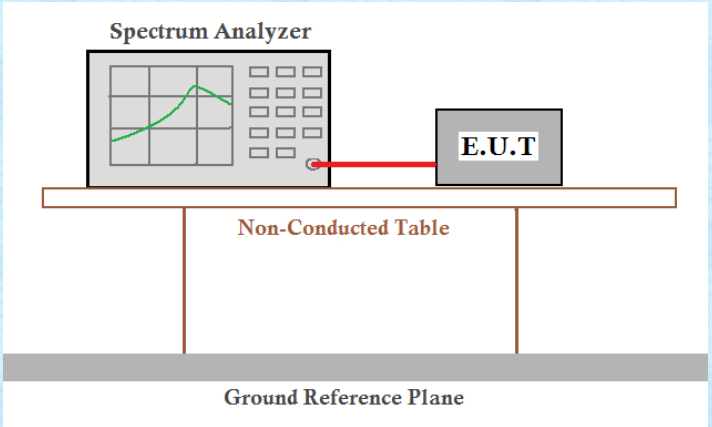
Antenna1



Antenna2



7.4 Power Spectral Density

Test Requirement:	FCC Part15 E Section 15.407(a)(3)
Test Method:	ANSI C63.10:2013 and KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	30dBm/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

Test CH	Power Spectral Density (dBm)			Limit (dBm/500kHz)	Result
	802.11a				
	Antenna 1	Antenna 2	Antenna 1+2		
149	4.116	3.747	----	30.00	Pass
165	4.049	3.401	----		

Test CH	Power Spectral Density (dBm)			Limit (dBm/500kHz)	Result
	802.11n(HT20)				
	Antenna 1	Antenna 2	Antenna 1+2		
149	1.542	1.202	4.386	30.00	Pass
165	1.259	1.278	4.279		

Test CH	Power Spectral Density (dBm)			Limit (dBm/500kHz)	Result
	802.11n(HT40)				
	Antenna 1	Antenna 2	Antenna 1+2		
151	-1.064	-1.97	1.517	30.00	Pass
159	-1.695	-1.487	1.421		

Test CH	Power Spectral Density (dBm)			Limit (dBm/500kHz)	Result
	802.11ac(VHT20)				
	Antenna 1	Antenna 2	Antenna 1+2		
149	1.762	0.969	4.394	30.00	Pass
165	1.317	1.412	4.375		

Test CH	Power Spectral Density (dBm)			Limit (dBm/500kHz)	Result
	802.11ac(VHT40)				
	Antenna 1	Antenna 2	Antenna 1+2		
151	-1.319	-1.988	1.37	30.00	Pass
159	-1.966	-2.232	0.913		

Test CH	Power Spectral Density (dBm)			Limit (dBm/500kHz)	Result
	802.11ac(VHT40)				
	Antenna 1	Antenna 2	Antenna 1+2		
155	-4.737	-5.111	-1.91	30.00	Pass

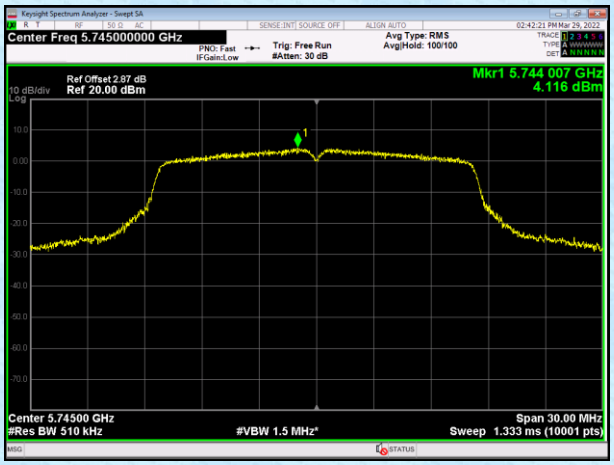
Remark: “---“is not applicable

Test plot as follows:

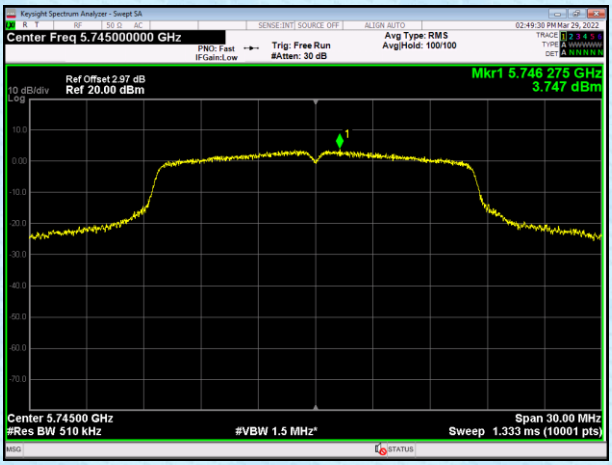
Test mode: 802.11a

Lowest channel 5745MHz

Antenna1

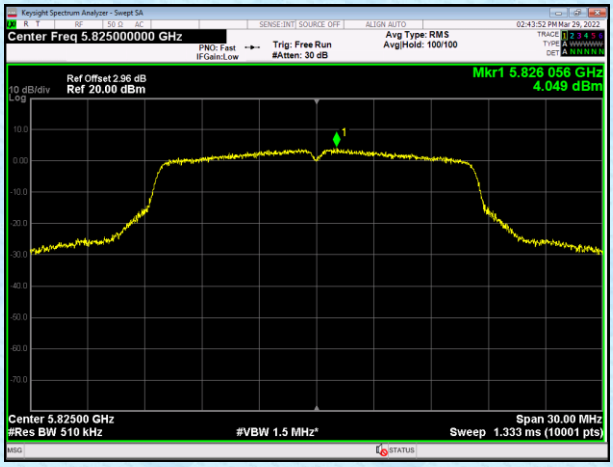


Antenna2

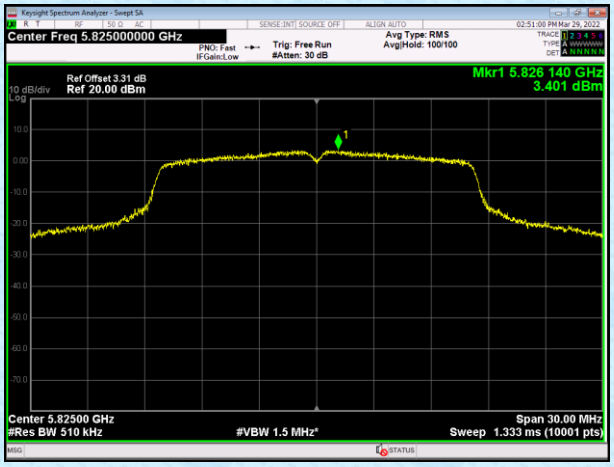


Highest channel 5825MHz

Antenna1



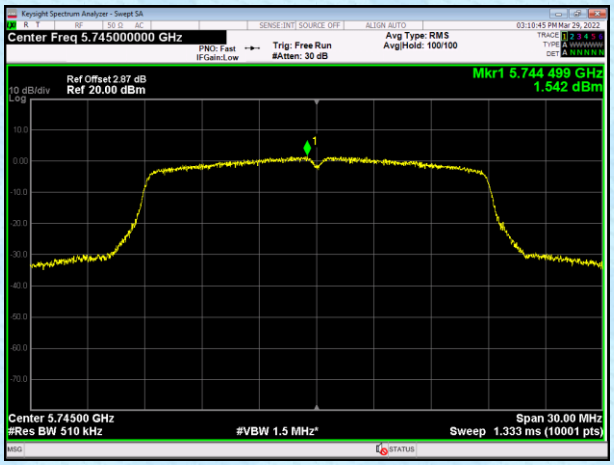
Antenna2



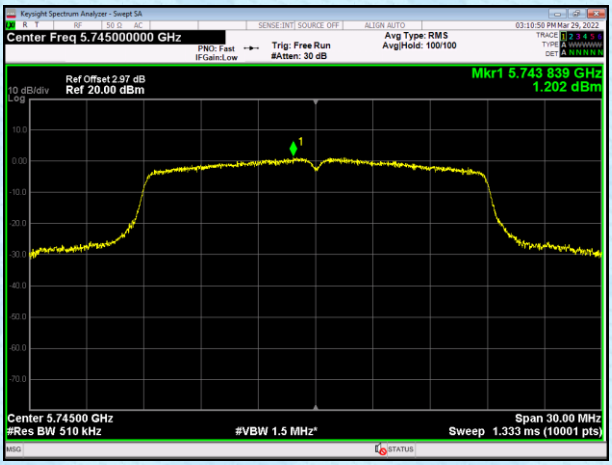
Test mode: 802.11 n(HT20)

Lowest channel 5745MHz

Antenna1

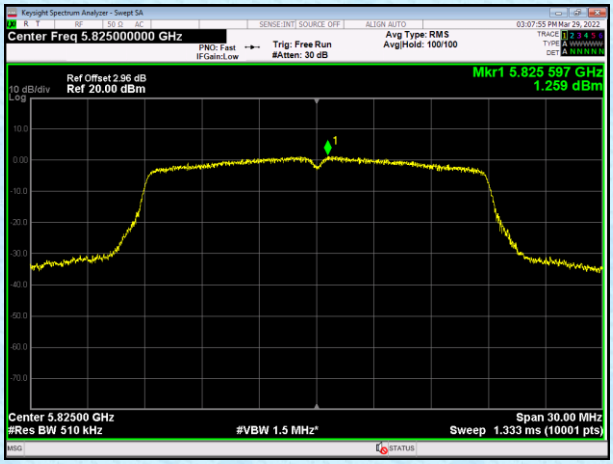


Antenna2

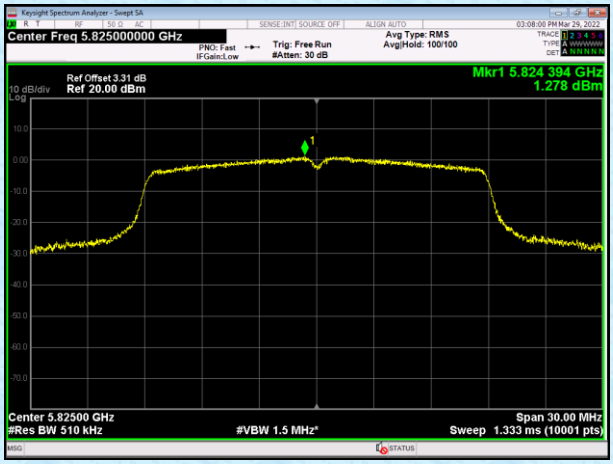


Highest channel 5825MHz

Antenna1



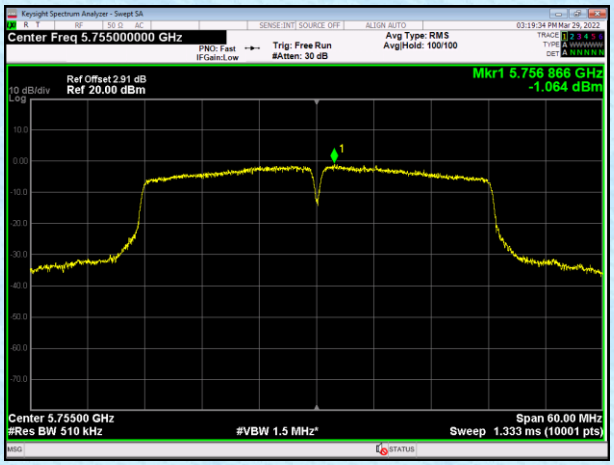
Antenna2



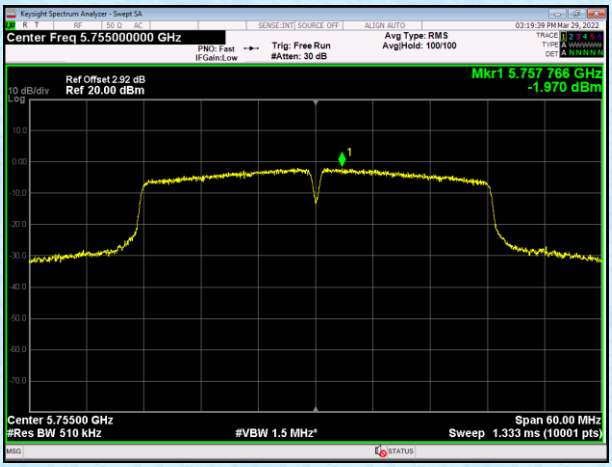
Test mode: 802.11 n(HT40)

Lowest channel 5755MHz

Antenna1

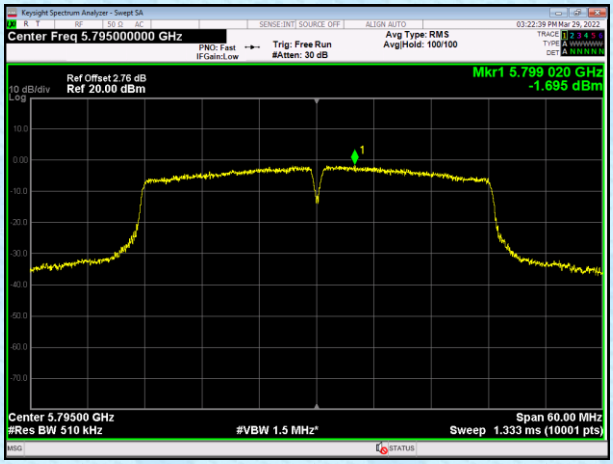


Antenna2

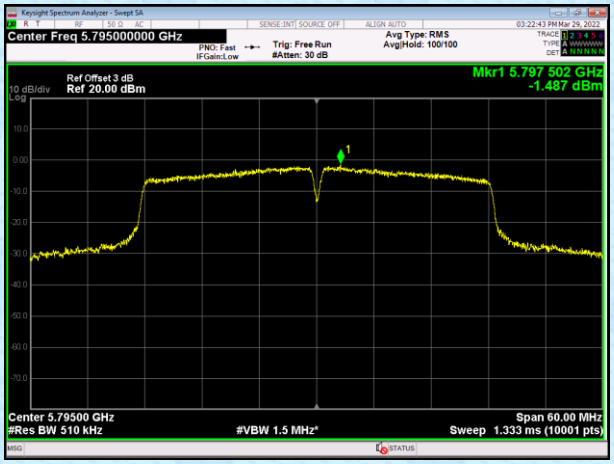


Highest channel 5795MHz

Antenna1



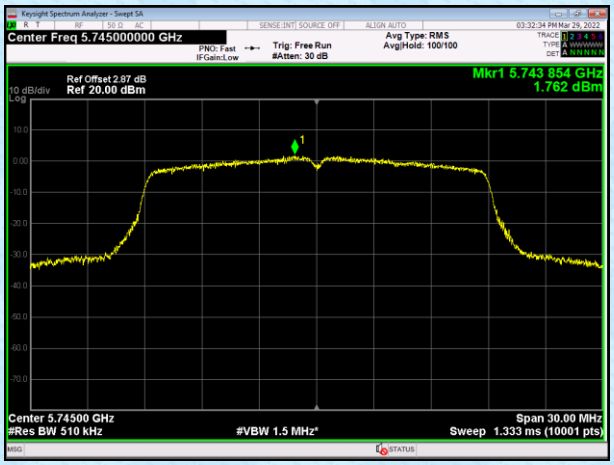
Antenna2



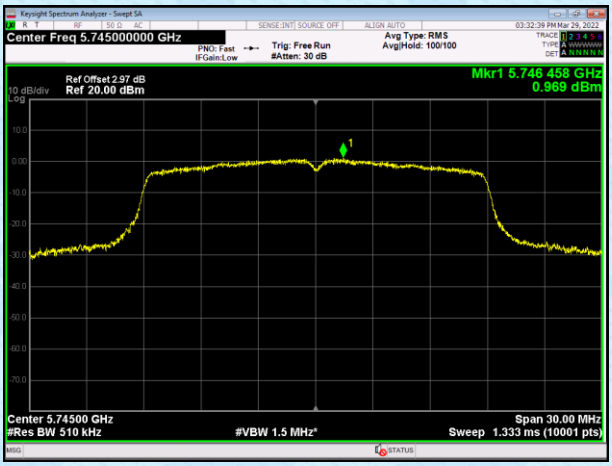
Test mode: 802.11 ac(VHT20)

Lowest channel 5745MHz

Antenna1

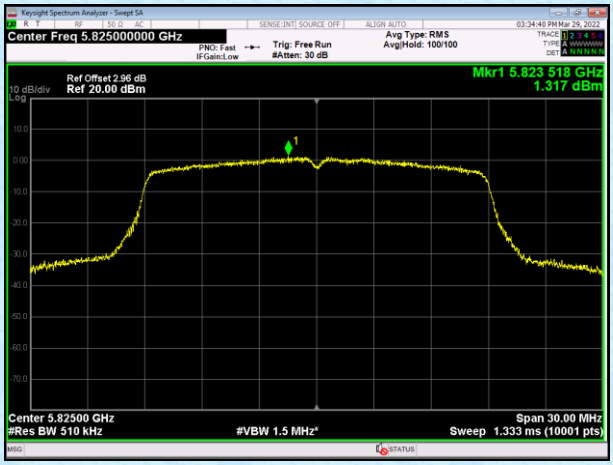


Antenna2

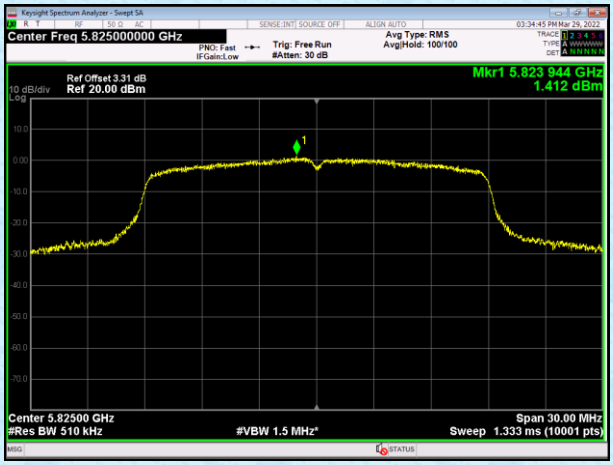


Highest channel 5825MHz

Antenna1



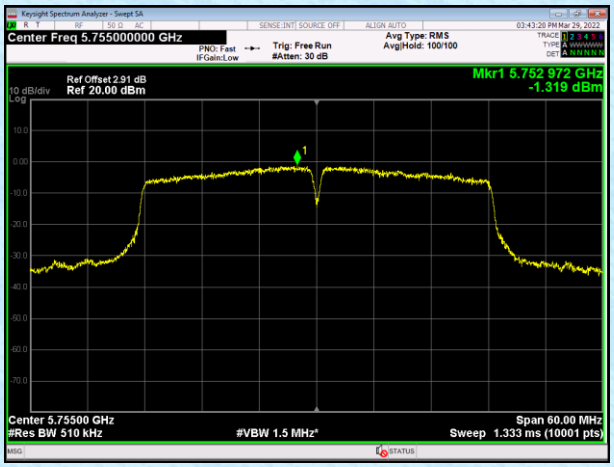
Antenna2



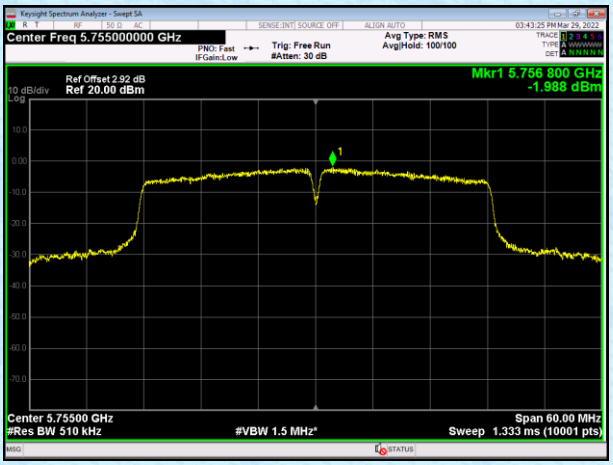
Test mode: 802.11 ac(VHT40)

Lowest channel 5755MHz

Antenna1

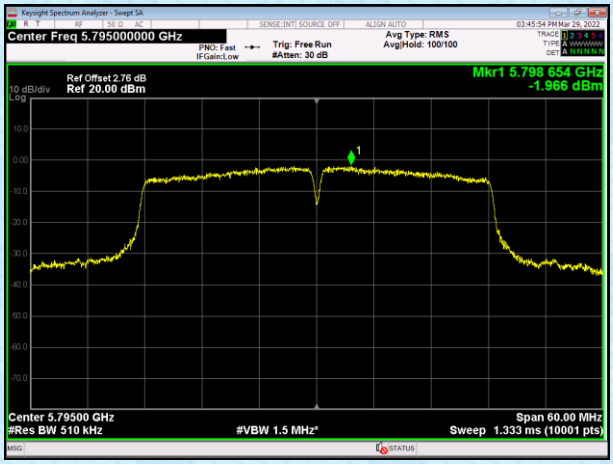


Antenna2

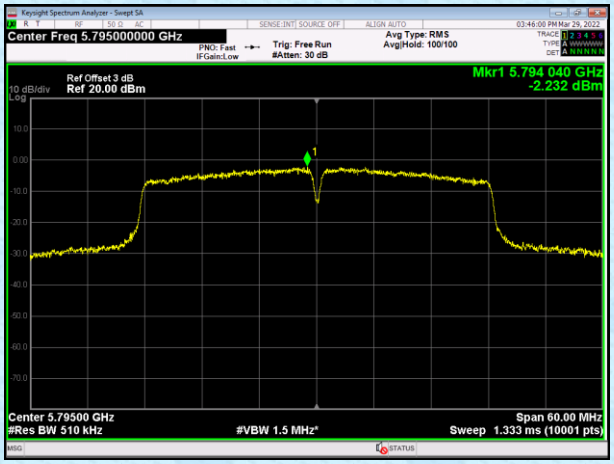


Highest channel 5795MHz

Antenna1



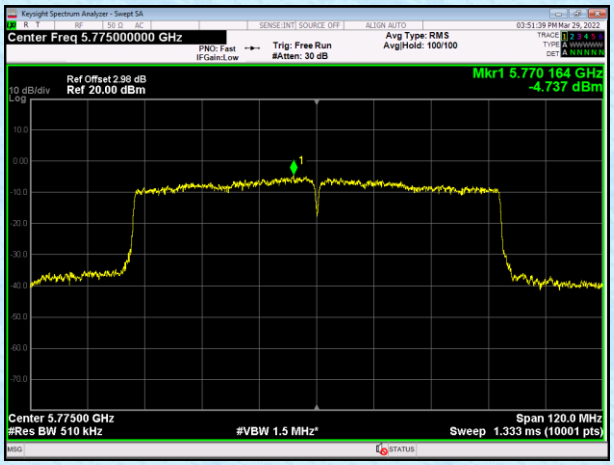
Antenna2



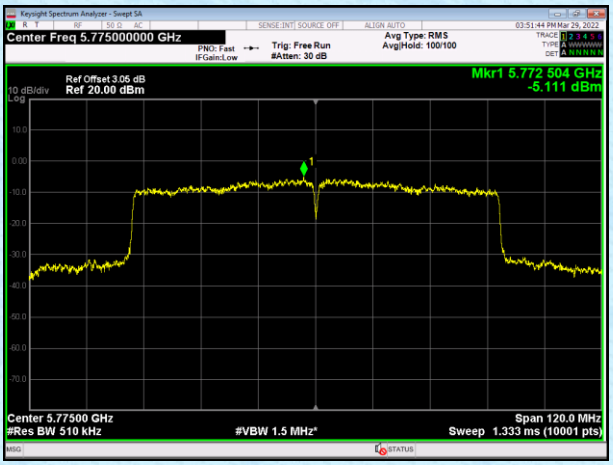
Test mode: 802.11 ac(VHT80)

Lowest channel 5775MHz

Antenna1



Antenna2

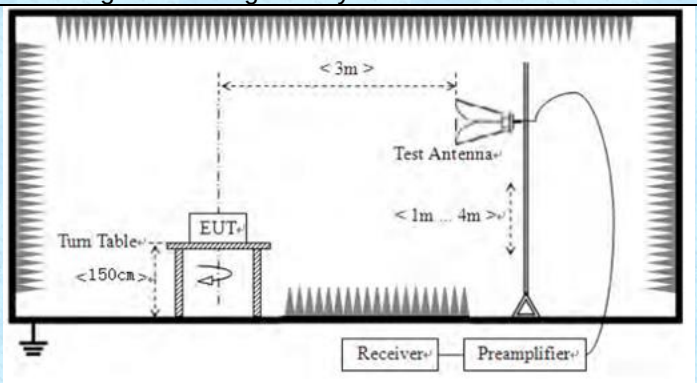


7.5 Band edge

7.5.1 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10: 2013
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[dBuV/m] = EIRP[dBm] + 95.2;

   E[dBuV/m] = -27 + 95.2 = 68.2dBuV/m.

   E[dBuV/m] = 10 + 95.2 = 105.2dBuV/m.

   E[dBuV/m] = 15.6 + 95.2 = 110.8dBuV/m.

   E[dBuV/m] = 27 + 95.2 = 122.2dBuV/m.

Measurement data:

IEEE 802.11a								
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
5650	33.98	32.36	9.72	23.83	52.23	68.2	-15.97	Horizontal
5700	32.13	32.5	9.79	23.84	50.58	105.2	-54.62	Horizontal
5720	28.4	32.53	9.81	23.85	46.89	110.8	-63.91	Horizontal
5725	31.69	32.53	9.83	23.86	50.19	122.2	-72.01	Horizontal
5850	33.3	32.7	9.99	23.87	52.12	122.2	-70.08	Horizontal
5855	29.76	32.72	9.99	23.88	48.59	110.8	-62.21	Horizontal
5875	32.12	32.74	10.04	23.89	51.01	105.2	-54.19	Horizontal
5925	30	32.8	10.11	23.9	49.01	68.2	-19.19	Horizontal
5650	30.62	32.36	9.72	23.83	48.87	68.2	-19.33	Vertical
5700	27.04	32.5	9.79	23.84	45.49	105.2	-59.71	Vertical
5720	30.72	32.53	9.81	23.85	49.21	110.8	-61.59	Vertical
5725	31.82	32.53	9.83	23.86	50.32	122.2	-71.88	Vertical
5850	28.02	32.7	9.99	23.87	46.84	122.2	-75.36	Vertical
5855	33.08	32.72	9.99	23.88	51.91	110.8	-58.89	Vertical
5875	29.26	32.74	10.04	23.89	48.15	105.2	-57.05	Vertical
5925	30.6	32.8	10.11	23.9	49.61	68.2	-18.59	Vertical

IEEE 802.11n HT20								
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
5650	29.53	32.36	9.72	23.83	47.78	68.2	-20.42	Horizontal
5700	30.33	32.5	9.79	23.84	48.78	105.2	-56.42	Horizontal
5720	31.31	32.53	9.81	23.85	49.8	110.8	-61	Horizontal
5725	31.71	32.53	9.83	23.86	50.21	122.2	-71.99	Horizontal
5850	35.31	32.7	9.99	23.87	54.13	122.2	-68.07	Horizontal
5855	31.06	32.72	9.99	23.88	49.89	110.8	-60.91	Horizontal
5875	35.23	32.74	10.04	23.89	54.12	105.2	-51.08	Horizontal
5925	35.93	32.8	10.11	23.9	54.94	68.2	-13.26	Horizontal
5650	34.33	32.36	9.72	23.83	52.58	68.2	-15.62	Vertical
5700	34.58	32.5	9.79	23.84	53.03	105.2	-52.17	Vertical
5720	34.95	32.53	9.81	23.85	53.44	110.8	-57.36	Vertical
5725	31.21	32.53	9.83	23.86	49.71	122.2	-72.49	Vertical
5850	34.16	32.7	9.99	23.87	52.98	122.2	-69.22	Vertical
5855	35.68	32.72	9.99	23.88	54.51	110.8	-56.29	Vertical
5875	30.43	32.74	10.04	23.89	49.32	105.2	-55.88	Vertical
5925	35.92	32.8	10.11	23.9	54.93	68.2	-13.27	Vertical

IEEE 802.11ac HT20								
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
5650	34.41	32.36	9.72	23.83	52.66	68.2	-15.54	Horizontal
5700	35.32	32.5	9.79	23.84	53.77	105.2	-51.43	Horizontal
5720	35.61	32.53	9.81	23.85	54.1	110.8	-56.7	Horizontal
5725	35.76	32.53	9.83	23.86	54.26	122.2	-67.94	Horizontal
5850	32.37	32.7	9.99	23.87	51.19	122.2	-71.01	Horizontal
5855	36.1	32.72	9.99	23.88	54.93	110.8	-55.87	Horizontal
5875	33.73	32.74	10.04	23.89	52.62	105.2	-52.58	Horizontal
5925	33.23	32.8	10.11	23.9	52.24	68.2	-15.96	Horizontal
5650	35.28	32.36	9.72	23.83	53.53	68.2	-14.67	Vertical
5700	34.74	32.5	9.79	23.84	53.19	105.2	-52.01	Vertical
5720	33.61	32.53	9.81	23.85	52.1	110.8	-58.7	Vertical
5725	35.12	32.53	9.83	23.86	53.62	122.2	-68.58	Vertical
5850	37.32	32.7	9.99	23.87	56.14	122.2	-66.06	Vertical
5855	33.51	32.72	9.99	23.88	52.34	110.8	-58.46	Vertical
5875	34.05	32.74	10.04	23.89	52.94	105.2	-52.26	Vertical
5925	37.29	32.8	10.11	23.9	56.3	68.2	-11.9	Vertical

IEEE 802.11n HT40								
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
5650	34.5	32.36	9.72	23.83	52.75	68.2	-15.45	Horizontal
5700	36.52	32.5	9.79	23.84	54.97	105.2	-50.23	Horizontal
5720	36.16	32.53	9.81	23.85	54.65	110.8	-56.15	Horizontal
5725	36.82	32.53	9.83	23.86	55.32	122.2	-66.88	Horizontal
5850	35.11	32.7	9.99	23.87	53.93	122.2	-68.27	Horizontal
5855	35.83	32.72	9.99	23.88	54.66	110.8	-56.14	Horizontal
5875	37.18	32.74	10.04	23.89	56.07	105.2	-49.13	Horizontal
5925	34.94	32.8	10.11	23.9	53.95	68.2	-14.25	Horizontal
5650	34.36	32.36	9.72	23.83	52.61	68.2	-15.59	Vertical
5700	31.62	32.5	9.79	23.84	50.07	105.2	-55.13	Vertical
5720	33.47	32.53	9.81	23.85	51.96	110.8	-58.84	Vertical
5725	36.18	32.53	9.83	23.86	54.68	122.2	-67.52	Vertical
5850	32.52	32.7	9.99	23.87	51.34	122.2	-70.86	Vertical
5855	31.38	32.72	9.99	23.88	50.21	110.8	-60.59	Vertical
5875	37.22	32.74	10.04	23.89	56.11	105.2	-49.09	Vertical
5925	35.87	32.8	10.11	23.9	54.88	68.2	-13.32	Vertical

IEEE 802.11ac HT40								
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
5650	34.83	32.36	9.72	23.83	53.08	68.2	-15.12	Horizontal
5700	35.72	32.5	9.79	23.84	54.17	105.2	-51.03	Horizontal
5720	33.19	32.53	9.81	23.85	51.68	110.8	-59.12	Horizontal
5725	31.53	32.53	9.83	23.86	50.03	122.2	-72.17	Horizontal
5850	36.23	32.7	9.99	23.87	55.05	122.2	-67.15	Horizontal
5855	32.31	32.72	9.99	23.88	51.14	110.8	-59.66	Horizontal
5875	29.2	32.74	10.04	23.89	48.09	105.2	-57.11	Horizontal
5925	30.32	32.8	10.11	23.9	49.33	68.2	-18.87	Horizontal
5650	30.02	32.36	9.72	23.83	48.27	68.2	-19.93	Vertical
5700	34.37	32.5	9.79	23.84	52.82	105.2	-52.38	Vertical
5720	32.02	32.53	9.81	23.85	50.51	110.8	-60.29	Vertical
5725	35.27	32.53	9.83	23.86	53.77	122.2	-68.43	Vertical
5850	31.17	32.7	9.99	23.87	49.99	122.2	-72.21	Vertical
5855	34.62	32.72	9.99	23.88	53.45	110.8	-57.35	Vertical
5875	33.72	32.74	10.04	23.89	52.61	105.2	-52.59	Vertical
5925	31.44	32.8	10.11	23.9	50.45	68.2	-17.75	Vertical

IEEE 802.11ac HT80								
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
5650	37.59	32.36	9.72	23.83	55.84	68.2	-12.36	Horizontal
5700	30.26	32.5	9.79	23.84	48.71	105.2	-56.49	Horizontal
5720	37.12	32.53	9.81	23.85	55.61	110.8	-55.19	Horizontal
5725	31.27	32.53	9.83	23.86	49.77	122.2	-72.43	Horizontal
5850	35.54	32.7	9.99	23.87	54.36	122.2	-67.84	Horizontal
5855	31.8	32.72	9.99	23.88	50.63	110.8	-60.17	Horizontal
5875	31.47	32.74	10.04	23.89	50.36	105.2	-54.84	Horizontal
5925	35.27	32.8	10.11	23.9	54.28	68.2	-13.92	Horizontal
5650	30.65	32.36	9.72	23.83	48.9	68.2	-19.3	Vertical
5700	35.76	32.5	9.79	23.84	54.21	105.2	-50.99	Vertical
5720	37.1	32.53	9.81	23.85	55.59	110.8	-55.21	Vertical
5725	34.75	32.53	9.83	23.86	53.25	122.2	-68.95	Vertical
5850	36.02	32.7	9.99	23.87	54.84	122.2	-67.36	Vertical
5855	33.69	32.72	9.99	23.88	52.52	110.8	-58.28	Vertical
5875	31.74	32.74	10.04	23.89	50.63	105.2	-54.57	Vertical
5925	32.75	32.8	10.11	23.9	51.76	68.2	-16.44	Vertical

7.6 Spurious Emission

7.6.1 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209, 15.205, Part 15E Section 15.407(b)(4)
Test Method:	ANSI C63.10:2013
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

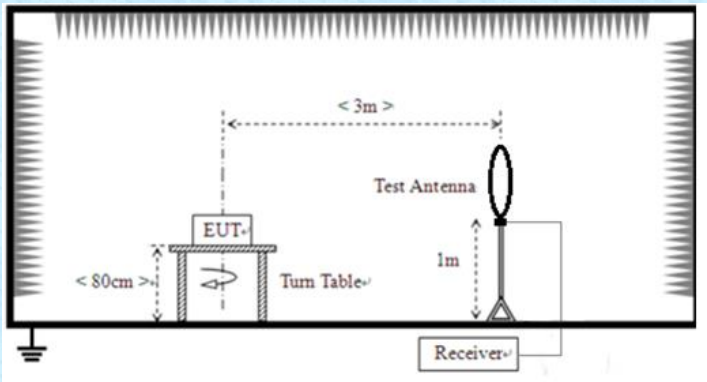
Limit:

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

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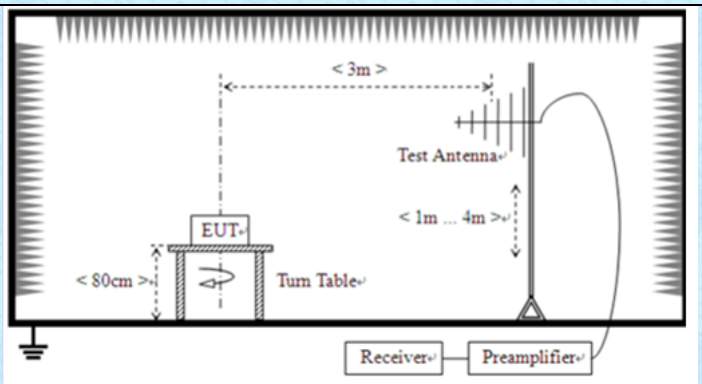
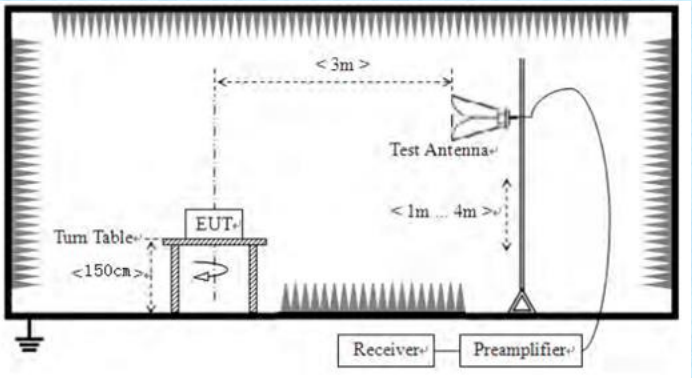


For radiated emissions above 1GHz



</td>
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<tr>
<td>Test Procedure:</td>
<td>
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.
</td>
</tr>
</table>

	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.*
2. all were test, For 802.11b only the ANT A test result recorded in the report. For 802.11n/ac only the MIMO test result recorded in the report.

Measurement Data:

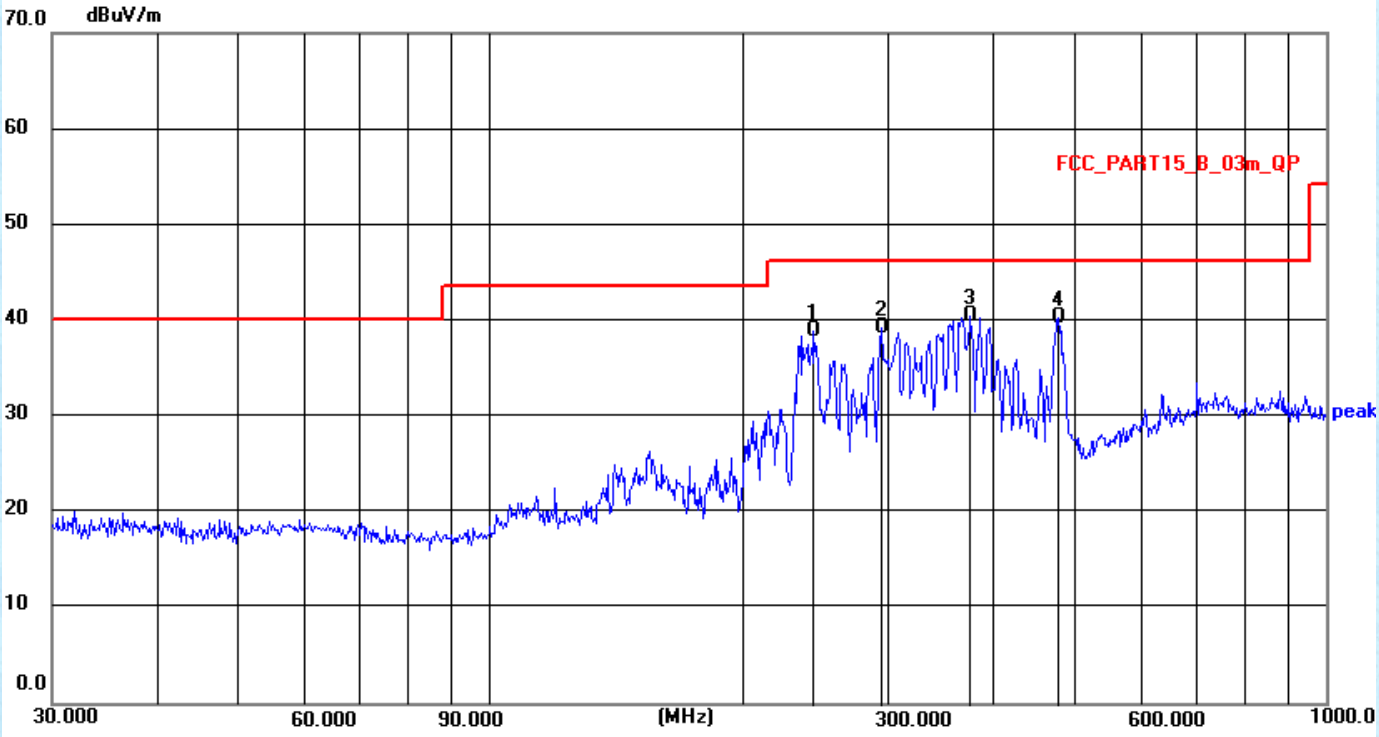
9 kHz ~ 30 MHz

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

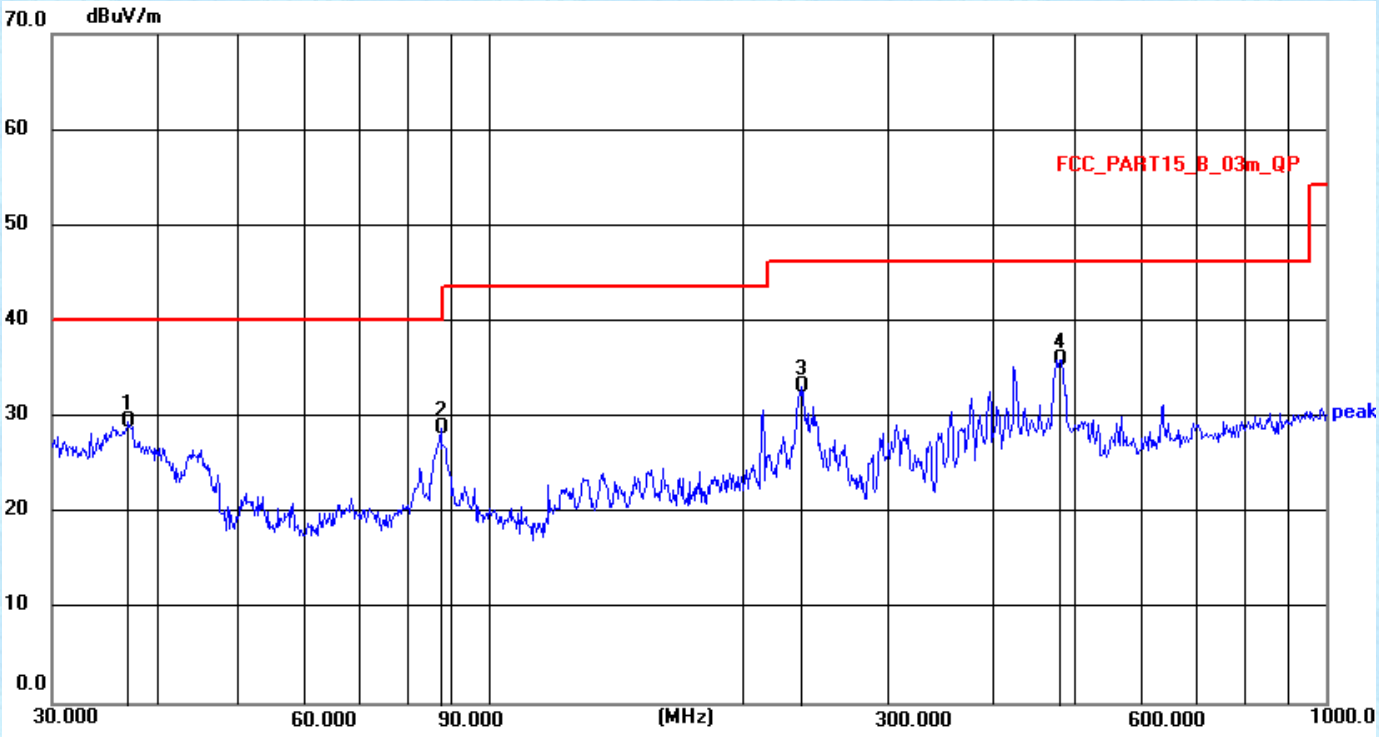
Pre-scan all test modes, found worst case at 802.11n(HT20) 5745MHz of MIMO, and so only show the test result of 802.11n(HT20) 5745MHz of MIMO.

Horizontal:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	244.2321	25.54	13.43	38.97	46.00	7.03	QP
2	294.1136	24.66	14.62	39.28	46.00	6.72	QP
3	375.9384	24.11	16.35	40.46	46.00	5.54	QP
4	478.8455	21.91	18.34	40.25	46.00	5.75	QP

Vertical:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	37.0248	16.04	13.44	29.48	40.00	10.52	QP
2	87.4175	17.81	11.00	28.81	40.00	11.19	QP
3	236.6447	19.89	13.22	33.11	46.00	12.89	QP
4	480.5276	17.60	18.37	35.97	46.00	10.03	QP

Above 1GHz:

802.11a					Test Frequency: 5745MHz			
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	-27.02	Horizontal
17235	29.63	41	11.37	36.28	45.72	68.2	-22.48	Horizontal
11490	31.39	39.4	8.73	36.3	43.22	68.2	-24.98	Vertical
17235	28.41	41	11.37	36.28	44.5	68.2	-23.7	Vertical

802.11a					Test Frequency: 5785MHz			
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	-28.87	Horizontal
17355	30.97	41.52	11.48	36.26	47.71	68.2	-20.11	Horizontal
11570	31.43	39.28	8.77	36.29	43.19	68.2	-24.02	Vertical
17355	25.93	41.52	11.48	36.26	42.67	68.2	-25.43	Vertical

802.11a					Test Frequency: 5825MHz			
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	-25.02	Horizontal
17475	26.57	42.3	11.58	36.25	44.2	68.2	-23.44	Horizontal
11650	29.78	39.16	8.79	36.27	41.46	68.2	-26.39	Vertical
17475	26.41	42.3	11.58	36.25	44.04	68.2	-24.12	Vertical

802.11n(HT20)					Test Frequency: 5745MHz			
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	-23.26	Horizontal
17235	29.73	41	11.37	36.28	45.82	68.2	-22.3	Horizontal
11490	27.38	39.4	8.73	36.3	39.21	68.2	-28.95	Vertical
17235	30.9	41	11.37	36.28	46.99	68.2	-21.16	Vertical

802.11n(HT20)					Test Frequency: 5785MHz			
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	-22.73	Horizontal
17355	30.04	41.52	11.48	36.26	46.78	68.2	-20.74	Horizontal
11570	33.37	39.28	8.77	36.29	45.13	68.2	-22.51	Vertical
17355	26	41.52	11.48	36.26	42.74	68.2	-24.57	Vertical

802.11n(HT20)					Test Frequency: 5825MHz			
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	-23.48	Horizontal
17475	30.31	42.3	11.58	36.25	47.94	68.2	-20.27	Horizontal
11650	30.31	39.16	8.79	36.27	41.99	68.2	-25.64	Vertical
17475	29.87	42.3	11.58	36.25	47.5	68.2	-20.54	Vertical

802.11n(HT40)					Test Frequency: 5755MHz			
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
11510	28.09	39.4	8.74	36.3	39.93	68.2	-27.59	Horizontal
17265	27.74	41.26	11.4	36.27	44.13	68.2	-23.78	Horizontal
11510	31.03	39.4	8.74	36.3	42.87	68.2	-24.81	Vertical
17265	25.59	41.26	11.4	36.27	41.98	68.2	-25.53	Vertical

802.11n(HT40)					Test Frequency: 5795MHz			
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
11590	30.88	39.22	8.77	36.28	42.59	68.2	-24.93	Horizontal
17385	27.69	41.78	11.51	36.26	44.72	68.2	-23.08	Horizontal
11590	30.27	39.22	8.77	36.28	41.98	68.2	-25.66	Vertical
17385	29.13	41.78	11.51	36.26	46.16	68.2	-21.45	Vertical

802.11ac(HT20)					Test Frequency: 5745MHz			
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	30.52	39.4	8.73	36.3	42.35	68.2	-25.4	Horizontal
17235	27.58	41	11.37	36.28	43.67	68.2	-24.18	Horizontal
11490	29.82	39.4	8.73	36.3	41.65	68.2	-26.01	Vertical
17235	30.61	41	11.37	36.28	46.7	68.2	-21.46	Vertical

802.11ac(HT20)					Test Frequency: 5785MHz			
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	30.14	39.28	8.77	36.29	41.9	68.2	-25.71	Horizontal
17355	27.71	41.52	11.48	36.26	44.45	68.2	-23.34	Horizontal
11570	27.6	39.28	8.77	36.29	39.36	68.2	-28.61	Vertical
17355	30.78	41.52	11.48	36.26	47.52	68.2	-20.89	Vertical

802.11ac(HT20)					Test Frequency: 5825MHz			
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	31.06	39.16	8.79	36.27	42.74	68.2	-25.43	Horizontal
17475	28.94	42.3	11.58	36.25	46.57	68.2	-21.49	Horizontal
11650	27.73	39.16	8.79	36.27	39.41	68.2	-28.42	Vertical
17475	25.85	42.3	11.58	36.25	43.48	68.2	-23.99	Vertical

802.11ac(HT40)					Test Frequency: 5755MHz			
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
11510	27.21	39.4	8.74	36.3	39.05	68.2	-28.51	Horizontal
17265	29.87	41.26	11.4	36.27	46.26	68.2	-21.15	Horizontal
11510	33.02	39.4	8.74	36.3	44.86	68.2	-22.55	Vertical
17265	30.54	41.26	11.4	36.27	46.93	68.2	-20.83	Vertical

802.11ac(HT40)					Test Frequency: 5795MHz			
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
11590	33.58	39.22	8.77	36.28	45.29	68.2	-22.14	Horizontal
17385	25.53	41.78	11.51	36.26	42.56	68.2	-25.48	Horizontal
11590	30.64	39.22	8.77	36.28	42.35	68.2	-25.14	Vertical
17385	26.67	41.78	11.51	36.26	43.7	68.2	-24.28	Vertical

802.11ac(HT80)					Test Frequency: 5775MHz			
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
11550	28.36	39.34	8.76	36.29	40.17	68.2	-27.37	Horizontal
17325	27.74	41.52	11.45	36.26	44.45	68.2	-22.79	Horizontal
11550	27.71	39.34	8.76	36.29	39.52	68.2	-28.37	Vertical
17325	25.7	41.52	11.45	36.26	42.41	68.2	-25.3	Vertical

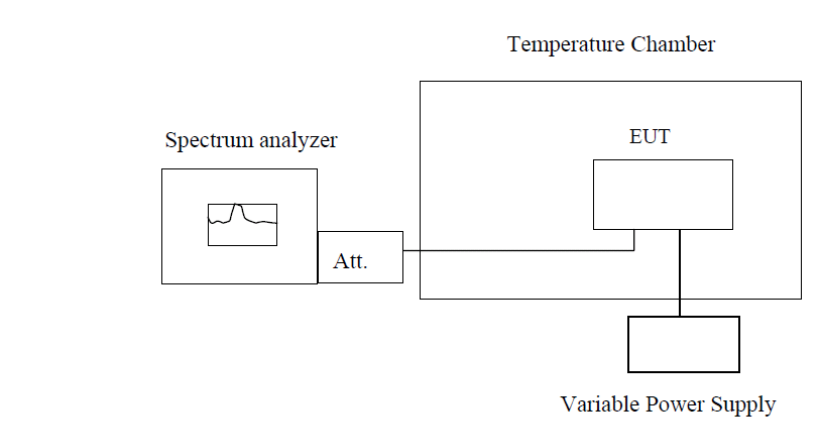
Notes:

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.

7.7 Frequency stability

Test Requirement:	FCC Part15 C Section 15.407(g)
Test Method:	ANSI C63.10:2013, 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)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F
-30	5	5745.009	1.57	P	5745.0198	3.45	P	5745.0146	2.54	P	5744.9828	-2.99	P
-20	5	5744.986	-2.44	P	5744.9849	-2.63	P	5744.9933	-1.17	P	5744.9918	-1.43	P
-10	5	5744.9815	-3.22	P	5744.9767	-4.06	P	5744.9771	-3.99	P	5744.9824	-3.06	P
0	5	5745.024	4.18	P	5745.0192	3.34	P	5745.0224	3.9	P	5745.0176	3.06	P
10	5	5744.9562	-7.62	P	5744.954	-8.01	P	5744.9556	-7.73	P	5744.9525	-8.27	P
20	5	5744.9453	-9.52	P	5744.9464	-9.33	P	5744.9433	-9.87	P	5744.9482	-9.02	P
30	5	5745.0186	3.24	P	5745.0231	4.02	P	5745.0245	4.26	P	5745.0229	3.99	P
40	5	5745.0078	1.36	P	5745.0105	1.83	P	5744.9947	-0.92	P	5745.0013	0.23	P
50	5	5744.9785	-3.74	P	5744.9714	-4.98	P	5744.974	-4.53	P	5744.9791	-3.64	P

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)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F
25	4.25	5745.0364	6.34	P	5745	0	P	5745.0201	3.5	P	5745.0115	2	P
25	5	5744.9936	-1.11	P	5744.9908	-1.6	P	5744.9891	-1.9	P	5744.9849	-2.63	P
25	5.75	5744.9724	-4.8	P	5744.9867	-2.32	P	5744.977	-4	P	5744.9737	-4.58	P

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)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F
-30	5	5785.0119	2.06	P	5785.0066	1.14	P	5785.0059	1.02	P	5785.0134	2.32	P
-20	5	5784.9828	-2.97	P	5784.9828	-2.97	P	5784.994	-1.04	P	5784.9876	-2.14	P
-10	5	5784.9743	-4.44	P	5784.9804	-3.39	P	5784.9727	-4.72	P	5784.9771	-3.96	P
0	5	5785.02	3.46	P	5785.023	3.98	P	5785.0266	4.6	P	5785.0258	4.46	P
10	5	5784.9586	-7.16	P	5784.9489	-8.83	P	5784.9483	-8.94	P	5784.9577	-7.31	P
20	5	5784.943	-9.85	P	5784.9442	-9.65	P	5784.9475	-9.08	P	5784.9466	-9.23	P
30	5	5785.0269	4.65	P	5785.0263	4.55	P	5785.0192	3.32	P	5785.0279	4.82	P
40	5	5785.0088	1.52	P	5785.0046	0.8	P	5784.9991	-0.16	P	5785.0025	0.43	P
50	5	5784.9759	-4.17	P	5784.981	-3.28	P	5784.9715	-4.93	P	5784.976	-4.15	P

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)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F
25	4.25	5784.974	-4.49	P	5784.9729	-4.68	P	5785	0	P	5784.9752	-4.29	P
25	5	5785.0222	3.84	P	5785.0179	3.09	P	5785.027	4.67	P	5785.027	4.67	P
25	5.75	5785.0115	1.99	P	5785.0043	0.74	P	5785.0007	0.12	P	5784.9969	-0.54	P

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)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F
-30	5	5825.0263	4.52	P	5825.0143	2.45	P	5825.0202	3.47	P	5825.0223	3.83	P
-20	5	5824.9878	-2.09	P	5824.9941	-1.01	P	5824.9886	-1.96	P	5824.9838	-2.78	P
-10	5	5824.9713	-4.93	P	5824.9777	-3.83	P	5824.9729	-4.65	P	5824.9729	-4.65	P
0	5	5825.0287	4.93	P	5825.0205	3.52	P	5825.0274	4.7	P	5825.0241	4.14	P
10	5	5824.9503	-8.53	P	5824.9546	-7.79	P	5824.9582	-7.18	P	5824.9492	-8.72	P
20	5	5824.944	-9.61	P	5824.9434	-9.72	P	5824.9465	-9.18	P	5824.9454	-9.37	P
30	5	5825.0209	3.59	P	5825.021	3.61	P	5825.019	3.26	P	5825.0287	4.93	P
40	5	5825.0045	0.77	P	5825.0093	1.6	P	5825.0018	0.31	P	5824.9961	-0.67	P
50	5	5824.9776	-3.85	P	5824.9777	-3.83	P	5824.9713	-4.93	P	5824.9814	-3.19	P

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)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F
25	4.25	5824.9786	-3.67	P	5824.9828	-2.95	P	5824.971	-4.98	P	5824.9857	-2.45	P
25	5	5825.0188	3.23	P	5825.0195	3.35	P	5825.0284	4.88	P	5825.0186	3.19	P
25	5.75	5825	0	P	5824.9956	-0.76	P	5825.003	0.52	P	5825.0099	1.7	P

Frequency stability versus Temp.													
Worst Case Operating Frequency：5755MHz													
Temp. (°C)	Power Supply(VDC)	0 minute			2 minute			5 minute			10 minute		
		Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F
-30	5	5755.0275	4.78	P	5755.0175	3.04	P	5755.0263	4.57	P	5755.0273	4.74	P
-20	5	5754.9932	-1.18	P	5754.9879	-2.1	P	5754.9932	-1.18	P	5754.9854	-2.54	P
-10	5	5754.9759	-4.19	P	5754.9801	-3.46	P	5754.9754	-4.27	P	5754.9776	-3.89	P
0	5	5755.0225	3.91	P	5755.028	4.87	P	5755.0184	3.2	P	5755.0266	4.62	P
10	5	5754.9565	-7.56	P	5754.959	-7.12	P	5754.9584	-7.23	P	5754.9527	-8.22	P
20	5	5754.9433	-9.85	P	5754.9433	-9.85	P	5754.9453	-9.5	P	5754.9427	-9.96	P
30	5	5755.0174	3.02	P	5755.0222	3.86	P	5755.0176	3.06	P	5755.0223	3.87	P
40	5	5755.0055	0.96	P	5754.9997	-0.05	P	5754.999	-0.17	P	5755.0061	1.06	P
50	5	5754.9778	-3.86	P	5754.9799	-3.49	P	5754.9782	-3.79	P	5754.9721	-4.85	P

Frequency stability versus Voltage.													
Worst Case Operating Frequency：5755MHz													
Temp. (°C)	Power Supply(VDC)	0 minute			2 minute			5 minute			10 minute		
		Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F
25	4.25	5754.9817	-3.18	P	5754.9837	-2.83	P	5754.9739	-4.54	P	5754.9807	-3.35	P
25	5	5755.0232	4.03	P	5755.0237	4.12	P	5755.0222	3.86	P	5755.0188	3.27	P
25	5.75	5754.998	-0.35	P	5754.9948	-0.9	P	5754.9973	-0.47	P	5755.0069	1.2	P

Frequency stability versus Temp.													
Worst Case Operating Frequency：5795MHz													
Temp. (°C)	Power Supply(VDC)	0 minute			2 minute			5 minute			10 minute		
		Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F
-30	5	5795.0156	2.69	P	5795.018	3.11	P	5795.0227	3.92	P	5795.0152	2.62	P
-20	5	5794.9937	-1.09	P	5794.9849	-2.61	P	5794.9921	-1.36	P	5794.9896	-1.79	P
-10	5	5794.9785	-3.71	P	5794.9757	-4.19	P	5794.9782	-3.76	P	5794.9742	-4.45	P
0	5	5795.0259	4.47	P	5795.023	3.97	P	5795.0243	4.19	P	5795.0239	4.12	P
10	5	5794.9538	-7.97	P	5794.9534	-8.04	P	5794.9511	-8.44	P	5794.9585	-7.16	P
20	5	5794.943	-9.84	P	5794.9435	-9.75	P	5794.9461	-9.3	P	5794.9473	-9.09	P
30	5	5795.0249	4.3	P	5795.0193	3.33	P	5795.0267	4.61	P	5795.0192	3.31	P
40	5	5794.9988	-0.21	P	5795.0031	0.53	P	5795.002	0.35	P	5795.0106	1.83	P
50	5	5794.9771	-3.95	P	5794.9726	-4.73	P	5794.9782	-3.76	P	5794.9787	-3.68	P

Frequency stability versus Voltage.													
Worst Case Operating Frequency：5795MHz													
Temp. (°C)	Power Supply(VDC)	0 minute			2 minute			5 minute			10 minute		
		Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F
25	4.25	5794.9822	-3.07	P	5794.9869	-2.26	P	5794.9728	-4.69	P	5794.9836	-2.83	P
25	5	5795.0191	3.3	P	5795.0227	3.92	P	5795.0187	3.23	P	5795.0257	4.43	P
25	5.75	5795.0024	0.41	P	5795.01	1.73	P	5795.0102	1.76	P	5795.0005	0.09	P

Frequency stability versus Temp.													
Worst Case Operating Frequency：5775MHz													
Temp. (°C)	Power Supply(VDC)	0 minute			2 minute			5 minute			10 minute		
		Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F
-30	5	5775.0122	2.11	P	5775.0267	4.62	P	5775.0266	4.61	P	5775.0263	4.55	P
-20	5	5774.9839	-2.79	P	5774.9866	-2.32	P	5774.9923	-1.33	P	5774.9923	-1.33	P
-10	5	5774.9717	-4.9	P	5774.9811	-3.27	P	5774.9778	-3.84	P	5774.9739	-4.52	P
0	5	5775.0234	4.05	P	5775.0192	3.32	P	5775.0243	4.21	P	5775.0251	4.35	P
10	5	5774.9556	-7.69	P	5774.9535	-8.05	P	5774.9555	-7.71	P	5774.9514	-8.42	P
20	5	5774.9442	-9.66	P	5774.9429	-9.89	P	5774.9441	-9.68	P	5774.9475	-9.09	P
30	5	5775.0215	3.72	P	5775.0216	3.74	P	5775.0259	4.48	P	5775.0239	4.14	P
40	5	5775.0012	0.21	P	5775.003	0.52	P	5775.0038	0.66	P	5775.0105	1.82	P
50	5	5774.9767	-4.03	P	5774.9743	-4.45	P	5774.9716	-4.92	P	5774.9755	-4.24	P

Frequency stability versus Voltage.													
Worst Case Operating Frequency：5775MHz													
Temp. (°C)	Power Supply(VDC)	0 minute			2 minute			5 minute			10 minute		
		Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F	Measured Frequency (MHz)	Frequency Error (ppm)	P/F
25	4.25	5774.9748	-4.36	P	5774.9766	-4.05	P	5774.985	-2.6	P	5774.9834	-2.87	P
25	5	5775.0285	4.94	P	5775.02	3.46	P	5775.0233	4.03	P	5775.0219	3.79	P
25	5.75	5775.0064	1.11	P	5775.007	1.21	P	5774.9971	-0.5	P	5775.0038	0.66	P

Note: P for PASS and F for Fail.

8 Test Setup Photo

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

9 EUT Constructional Details

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

------END------