MEASUREMENT REPORT

FCC PART 15.407 WLAN 802.11a/n/ac

FCC ID:	TV7CPGI52XL
Applicant:	Mikrotikls SIA
Product:	cAP XL ac
Model No.:	RBcAPGi-5acD2nD-XL-US
Brand Name:	MikroTik
FCC Classification:	Unlicensed National Information Infrastructure (NII)
FCC Rule Part(s):	Part15 Subpart E (Section 15.407)
Test Procedure(s):	ANSI C63.10-2013, KDB 662911 D01v02r01, KDB 789033 D02v02r01
Test Date:	August 31 ~ September 14, 2021

Reviewed By: Vincent Yu

Approved By: Robin Wu

Revision History

Report No.	Version	Description	Issue Date	Note
2108RSU082-U1	Rev. 01	Initial Report	09-22-2021	Valid

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Description Page

1. GENERAL INFORMATION

1.1. Applicant

Mikrotikls SIA

Brivibas gatve 214i, Riga, LV-1039, Latvia

1.2. Manufacturer

Mikrotikls SIA

Brivibas gatve 214i, Riga, LV-1039, Latvia

1.3. Testing Facility

☒	**Test Site – MRT Suzhou Laboratory**				
	Laboratory Location (Suzhou - Wuzhong)				
	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China				
	Laboratory Location (Suzhou - SIP)				
	4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China				
	Laboratory Accreditations				
	A2LA: 3628.01		CNAS: L10551		
	FCC: CN1166		ISED: CN0001		
	VCCI:	☐R-20025	☐G-20034	☐C-20020	☐T-20020
		☐R-20141	☐G-20134	☐C-20103	☐T-20104
☐	**Test Site – MRT Shenzhen Laboratory**				
	Laboratory Location (Shenzhen)				
	1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China				
	Laboratory Accreditations				
	A2LA: 3628.02		CNAS: L10551		
	FCC: CN1284		ISED: CN0105		
☐	**Test Site – MRT Taiwan Laboratory**				
	Laboratory Location (Taiwan)				
	No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)				
	Laboratory Accreditations				
	TAF: L3261-190725				
	FCC: 291082, TW3261		ISED: TW3261		

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	cAP XL ac
Model No.	RBcAPGi-5acD2nD-XL-US
Serial No.	For Radiated: E4F30DA8A985/052 For Conducted: E4F30D549481/052
Hardware Version	r4
Software Version	RouterOS 6.48.1
Wi-Fi Specification	802.11a/b/g/n/ac
Antenna Delivery	2*TX + 2*RX
Power Supply	AC/DC Adapter
Operating Environment	Indoor Use
Accessories	
AC/DC Adapter	Model No.: SAW30-240-1200G INPUT: 100-240V ~ 50/60Hz, 0.8A OUTPUT: 24.0V⎓1.2A, 28.8W
Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

2.2. Radio Specification under test

Frequency Range	For 802.11a/n-HT20/ac-VHT20: 5260~5320MHz, 5500~5720MHz For 802.11n-HT40/ac-VHT40: 5270~5310MHz, 5510~5710MHz For 802.11ac-VHT80: 5290MHz, 5530MHz, 5610MHz, 5690MHz
Modulation	802.11a/n/ac: OFDM
Data Rate	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 300Mbps 802.11ac: up to 866.7Mbps
Antenna Infomation	Refer to section 2.4

2.3. Working Frequencies for this Report

802.11a/n-HT20/ac-VHT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
52	5260 MHz	56	5280 MHz	60	5300 MHz
64	5320 MHz	100	5500 MHz	104	5520 MHz
108	5540 MHz	112	5560 MHz	116	5580 MHz
120	5600 MHz	124	5620 MHz	128	5640 MHz
132	5660 MHz	136	5680 MHz	140	5700 MHz
144	5720 MHz	--	--	--	--

802.11n-HT40/ac-VHT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
54	5270 MHz	62	5310 MHz	102	5510 MHz
110	5550 MHz	118	5590 MHz	126	5630 MHz
134	5670 MHz	142	5710 MHz	--	--

802.11ac-VHT80

Channel	Frequency	Channel	Frequency	Channel	Frequency
58	5290 MHz	106	5530 MHz	122	5610 MHz
138	5690 MHz	--	--	--	--

2.4. Description of Available Antennas

Antenna Type	Frequency Band (GHz)	T_X Paths	Max Antenna Gain (dBi)	Directional Gain (dBi)	
				For Power	For PSD
PCB Patch Antenna	5	2	5.5	5.5	8.51

Note: The EUT only supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.

For CDD transmissions, directional gain is calculated as follows, $N_{ANT} = 2$, $N_{SS} = 1$.

If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

- For power spectral density (PSD) measurements on all devices,

  Array Gain = 10 log (N_{ANT}/ N_{SS}) dB = 3.01;

- For power measurements on IEEE 802.11 devices,

  Array Gain = 0 dB for $N_{ANT} \leq 4$;

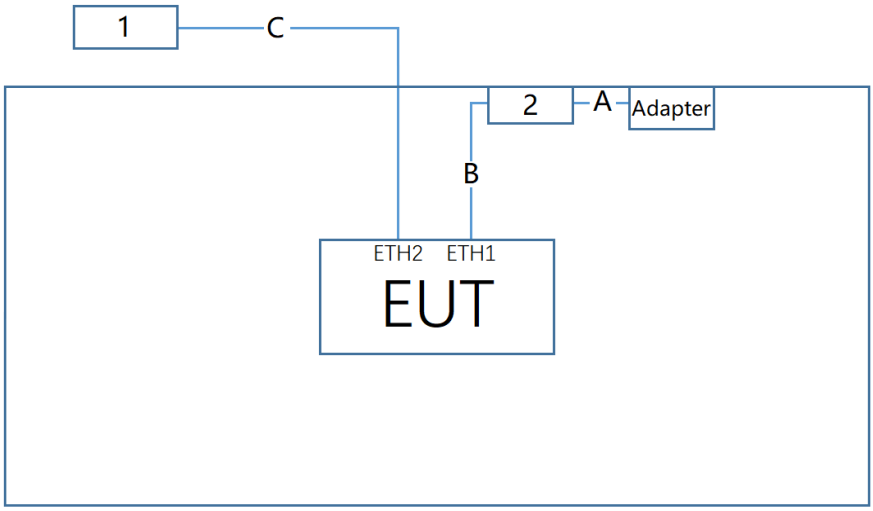
2.5. Test Mode

Test Mode	Mode 1: Transmit by 802.11a (6Mbps)
	Mode 2: Transmit by 802.11n-HT20 (MCS0)
	Mode 3: Transmit by 802.11n-HT40 (MCS0)
	Mode 4: Transmit by 802.11ac-VHT20 (MCS0)
	Mode 5: Transmit by 802.11ac-VHT40 (MCS0)
	Mode 6: Transmit by 802.11ac-VHT80 (MCS0)

2.6. Configuration of Test System

The device was tested per the guidance ANSI C63.10: 2013 was used to reference the appropriate EUT setup for radiated emissions testing and AC line conducted testing.

Connection Diagram - Radiated Emission testing and AC Conducted Emission testing



Cable Type		Cable Description
A	Power Cable	Non shielded, < 2.5m
B	LAN Cable	Non shielded, < 1.0m
C	LAN Cable	Non shielded, > 10m

Product		Manufacturer	Model No.
1	Notebook	Dell	P62G
2	PoE Injector	Gigabit POE	N/A

2.7. Test Software

The test utility software used during testing was “WinBox v3.29”.

Test Mode	Channel No.	Data Rate (Mbps/MCS)	Frequency (MHz)	Power Setting
802.11a	52	6Mbps	5260	19
	60	6Mbps	5300	19
	64	6Mbps	5320	19
	100	6Mbps	5500	19
	116	6Mbps	5580	20
	120	6Mbps	5600	19
	140	6Mbps	5700	19
	144	6Mbps	5720	19
802.11n-HT20	52	MCS0	5260	20
	60	MCS0	5300	20
	64	MCS0	5320	20
	100	MCS0	5500	20
	116	MCS0	5580	20
	120	MCS0	5600	20
	140	MCS0	5700	20
	144	MCS0	5720	20
802.11n-HT40	54	MCS0	5270	default
	62	MCS0	5310	19
	102	MCS0	5510	default
	110	MCS0	5550	default
	118	MCS0	5590	default
	134	MCS0	5670	default
	142	MCS0	5710	default
802.11ac-VHT20	52	MCS0	5260	20
	60	MCS0	5300	19
	64	MCS0	5320	20
	100	MCS0	5500	20
	116	MCS0	5580	20
	120	MCS0	5600	20
	140	MCS0	5700	20
	144	MCS0	5720	20

Test Mode	Channel No.	Data Rate (Mbps/MCS)	Frequency (MHz)	Conducted Power Setting
802.11ac-VHT40	54	MCS0	5270	default
	62	MCS0	5310	19
	102	MCS0	5510	default
	110	MCS0	5550	default
	118	MCS0	5590	default
	134	MCS0	5670	default
	142	MCS0	5710	default
802.11ac-VHT80	58	MCS0	5290	default
	106	MCS0	5530	default
	122	MCS0	5610	default
	138	MCS0	5690	default

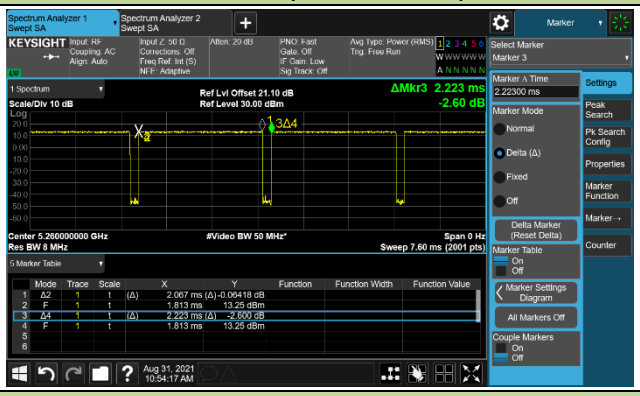
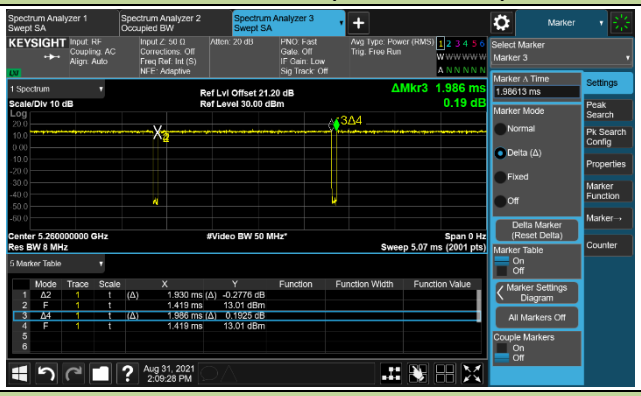
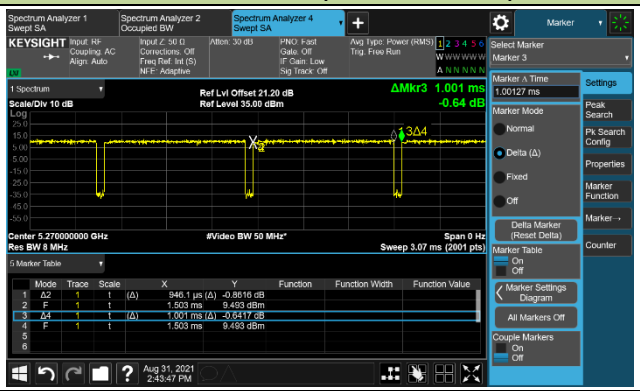
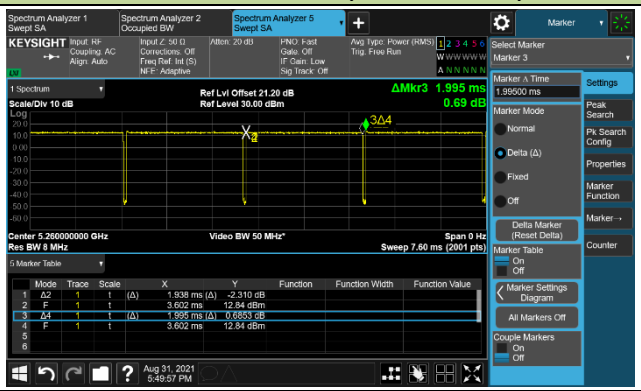
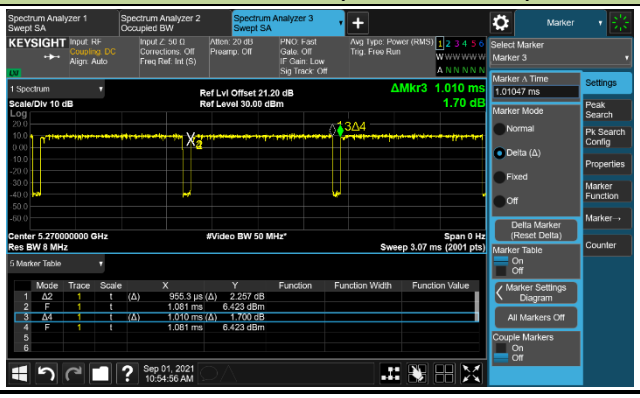
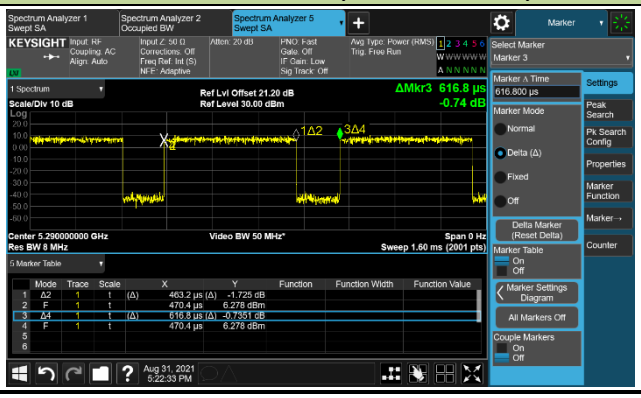
2.8. Test Environment Condition

Ambient Temperature	15 ~ 35°C
Relative Humidity	20 ~ 75%RH

2.9. Duty Cycle

5GHz WLAN (U-NII) operation was possible in 20MHz, 40MHz and 80MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Test Mode	Duty Cycle (%)
802.11a	92.98
802.11n-HT20	97.18
802.11n-HT40	94.52
802.11ac-VHT20	97.14
802.11ac-VHT40	94.58
802.11ac-VHT80	75.10

Duty Cycle (T = Transmission Duration)	
802.11a (T = 2.067ms)	802.11n-HT20 (T = 1.930ms)
	
802.11n-HT40 (T = 0.9461ms)	802.11ac-VHT20 (T = 1.938ms)
	
802.11ac-VHT40 (T = 0.9553ms)	802.11ac-VHT80 (T = 0.4632ms)
	

3. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 shall be considered sufficient to comply with theprovisions of this section.”

- The antenna of the device uses one permanently attached antenna.
- There are no provisions for connection to an external antenna.

Conclusion:

This unit complies with the requirement of §15.203.

4. TEST EQUIPMENT CALIBRATION DATE

Conducted Emission (WZ-SR2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06909	1 year	2021/11/22
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2022/06/08
Thermal Hygrometer	testo	608-H1	MRTSUE06404	1 year	2022/06/28
Shielding Room	MIX-BEP	Chamber-SR2	MRTSUE06215	N/A	N/A

Conducted Emission (SIP-SR2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2022/06/24
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2022/06/08
Thermal Hygrometer	testo	608-H1	MRTSUE06621	1 year	2021/12/03

Radiated Emission (WZ-AC1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2022/01/04
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2022/08/05
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2021/09/27
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06597	1 year	2021/12/14
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2021/11/14
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2022/06/09
Thermal Hygrometer	testo	608-H1	MRTSUE06403	1 year	2022/06/28
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2022/04/29

Radiated Emission (WZ-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Keysight	N9038A	MRTSUE06125	1 year	2022/06/24
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2022/05/24
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2021/10/25
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06597	1 year	2021/12/14
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2021/11/14
Thermal Hygrometer	Minggao	ETH529	MRTSUE06170	1 year	2021/12/08
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2022/04/29

Radiated Emission (SIP-AC1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2022/06/24
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2022/06/24
Loop Antenna	Schwarzbeck	FMZB 1519 B	MRTSUE06937	1 year	2022/03/09
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06645	1 year	2022/08/26
Double Ridged Horn Antenna	R&S	HF907	MRTSUE06610	1 year	2022/08/26
Preamplifier	EMCI	EMC051845SE	MRTSUE06600	1 year	2021/11/09
Thermal Hygrometer	testo	608-H1	MRTSUE06620	1 year	2021/12/03
Anechoic Chamber	RIKEN	SIP-AC1	MRTSUE06554	1 year	2021/12/24

Radiated Emission (SIP-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2022/06/24
MXA Signal Analyzer	Keysight	N9020B	MRTSUE06604	1 year	2021/09/26
Loop Antenna	Schwarzbeck	FMZB 1519 B	MRTSUE06937	1 year	2022/03/09
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06646	1 year	2022/08/26
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06648	1 year	2021/11/26
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06599	1 year	2021/11/26
Preamplifier	EMCI	EMC051845SE	MRTSUE06644	1 year	2021/11/09
Preamplifier	EMCI	EMC184045SE	MRTSUE06602	1 year	2021/10/12
Thermal Hygrometer	testo	608-H1	MRTSUE06624	1 year	2021/12/03
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2021/12/24

Radiated Emission (SIP-AC3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2022/06/09
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2022/06/24
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2022/06/24
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06646	1 year	2022/08/26
Double Ridged Horn Antenna	R&S	HF907	MRTSUE06610	1 year	2022/08/05
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06598	1 year	2021/11/26
Preamplifier	EMCI	EMC012645SE	MRTSUE06642	1 year	2022/01/14
Thermal Hygrometer	testo	608-H1	MRTSUE06622	1 year	2021/12/03
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2021/12/24

Conducted Test Equipment (WZ-TR3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2022/04/13
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2022/01/06
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2021/10/22
USB wideband power sensor	Keysight	U2021XA	MRTSUE06446	1 year	2022/06/08
USB wideband power sensor	Keysight	U2021XA	MRTSUE06447	1 year	2022/06/08
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2022/06/08
Modulation Analyzer	HP	HP8901A	MRTSUE06098	1 year	2021/09/26
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2021/10/22
Thermal Hygrometer	testo	608-H1	MRTSUE06401	1 year	2022/06/28

Conducted Test Equipment (SIP-TR1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	KEYSIGHT	N9010B	MRTSUE06603	1 year	2021/11/23
PXA Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2022/08/26
USB wideband power sensor	Agilent	U2021XA	MRTSUE06595	1 year	2021/09/26
USB wideband power sensor	Agilent	U2021XA	MRTSUE06596	1 year	2021/09/26
Temperature Chamber	BAOYT	BYG-408CS	MRTSUE06847	1 year	2022/02/23
Thermal Hygrometer	testo	608-H1	MRTSUE11022	1 year	2021/11/25

Software	Version	Function
EMI Software	V3	EMI Test Software

5. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz~150kHz: 3.74dB 150kHz~30MHz: 3.44dB
Radiated Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Horizontal: 30MHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~40GHz: 6.40dB Vertical: 30MHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.78dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.13dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.15dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%

6. TEST RESULT

6.1. Summary

FCC Section(s)	Test Description	Test Condition	Test Result	Reference
15.407(a)	26dB Bandwidth	Conducted	Pass	Section 6.2
15.407(a)(2)	Maximum Conducted Output Power		Pass	Section 6.3
15.407(h)(1)	Transmit Power Control		Pass	Section 6.4
15.407(a)(2)	Peak Power Spectral Density		Pass	Section 6.5
15.407(g)	Frequency Stability	Conducted	Pass	Section 6.6
15.407(b)(2), (3)	Undesirable Emissions	Radiated	Pass	Section 6.7 & 6.8
15.205, 15.209 15.407(b)(2), (3)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)		Pass	
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	Pass	Section 6.9

Notes:

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.
3) For the item of “26dB Bandwidth”, due to the higher conducted average power of Ant 1 RF port, we only evaluated the Ant 1 RF port.

6.2. 26dB Bandwidth Measurement

6.2.1.Test Limit

N/A

6.2.2.Test Procedure Used

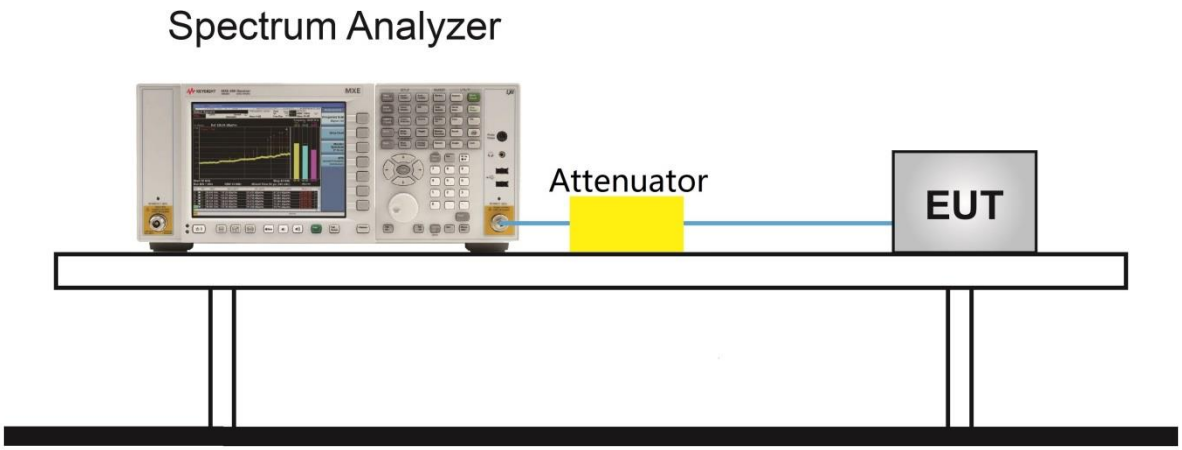
ANSI C63.10-2013 - Section 6.9.2

6.2.3.Test Setting

26dB Bandwidth Measurements

1. The analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 26. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediated power nulls in the fundamental emission.
2. RBW = approximately 1% of the emission bandwidth.
3. VBW > RBW.
4. Detector = Peak.
5. Trace mode = max hold.

6.2.4.Test Setup



6.2.5.Test Result

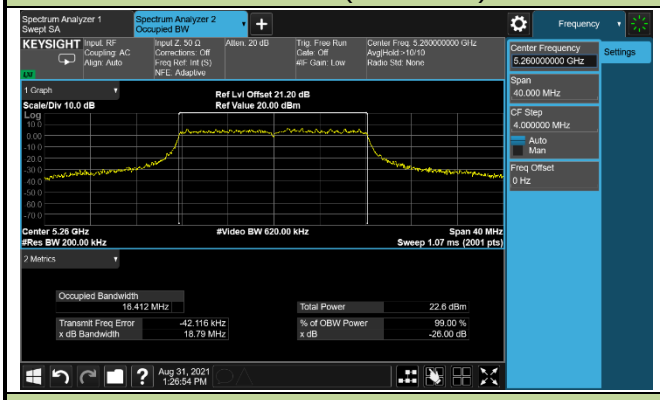
Product	cAP XL ac	Test Engineer	Luis Yang
Test Site	WZ-TR3	Test Date	2021/08/31~2021/09/01

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)
802.11a	6Mbps	52	5260	18.79
802.11a	6Mbps	60	5300	19.20
802.11a	6Mbps	64	5320	19.23
802.11a	6Mbps	100	5500	19.33
802.11a	6Mbps	116	5580	18.79
802.11a	6Mbps	120	5600	18.96
802.11a	6Mbps	140	5700	18.88
802.11a	6Mbps	144	5720	19.19
802.11n-HT20	MCS0	52	5260	20.16
802.11n-HT20	MCS0	60	5300	19.83
802.11n-HT20	MCS0	64	5320	20.00
802.11n-HT20	MCS0	100	5500	19.83
802.11n-HT20	MCS0	116	5580	19.97
802.11n-HT20	MCS0	120	5600	19.95
802.11n-HT20	MCS0	140	5700	20.27
802.11n-HT20	MCS0	144	5720	20.09
802.11n-HT40	MCS0	54	5270	38.99
802.11n-HT40	MCS0	62	5310	39.02
802.11n-HT40	MCS0	102	5510	39.68
802.11n-HT40	MCS0	110	5550	39.44
802.11n-HT40	MCS0	118	5590	39.39
802.11n-HT40	MCS0	134	5670	39.38
802.11n-HT40	MCS0	142	5710	39.07

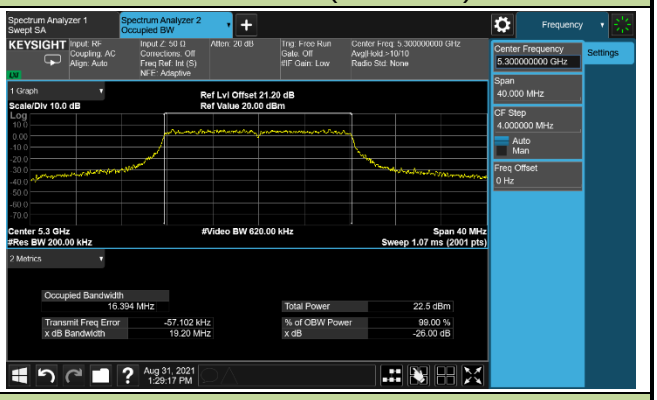
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)
802.11ac-VHT20	MCS0	52	5260	20.26
802.11ac-VHT20	MCS0	60	5300	19.54
802.11ac-VHT20	MCS0	64	5320	19.39
802.11ac-VHT20	MCS0	100	5500	19.59
802.11ac-VHT20	MCS0	116	5580	20.22
802.11ac-VHT20	MCS0	120	5600	19.91
802.11ac-VHT20	MCS0	140	5700	20.05
802.11ac-VHT20	MCS0	144	5720	19.56
802.11ac-VHT40	MCS0	54	5270	38.86
802.11ac-VHT40	MCS0	62	5310	38.73
802.11ac-VHT40	MCS0	102	5510	38.96
802.11ac-VHT40	MCS0	110	5550	39.00
802.11ac-VHT40	MCS0	118	5590	38.69
802.11ac-VHT40	MCS0	134	5670	38.84
802.11ac-VHT40	MCS0	142	5710	38.85
802.11ac-VHT80	MCS0	58	5290	83.20
802.11ac-VHT80	MCS0	106	5530	84.89
802.11ac-VHT80	MCS0	122	5610	84.72
802.11ac-VHT80	MCS0	138	5690	83.44

802.11a 26dB Bandwidth

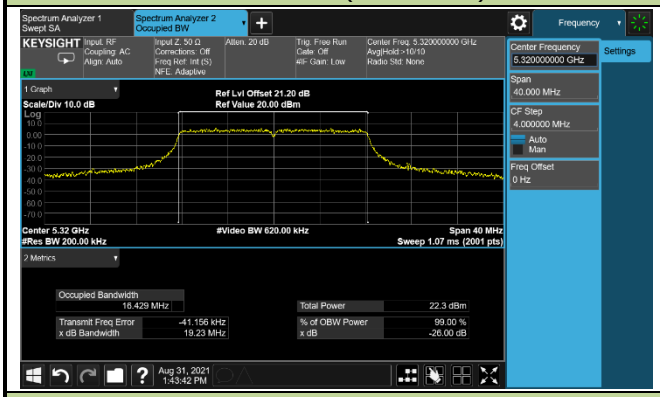
Channel 52 (5260MHz)



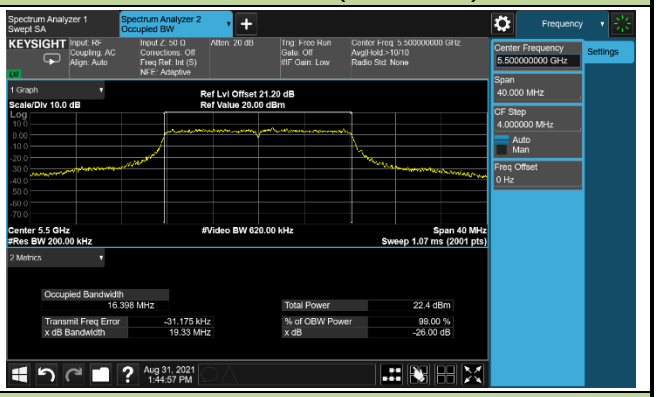
Channel 60 (5300MHz)



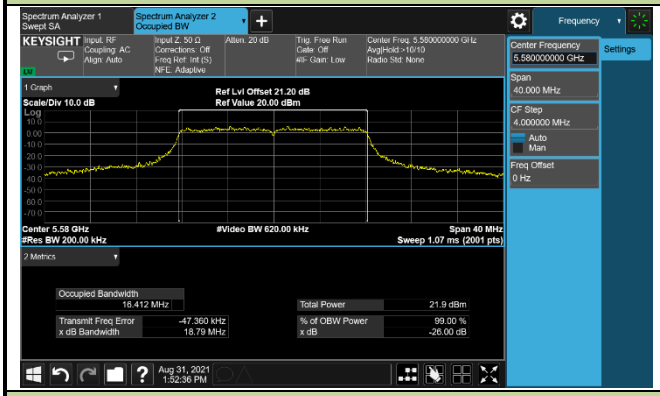
Channel 64 (5320MHz)



Channel 100 (5500MHz)

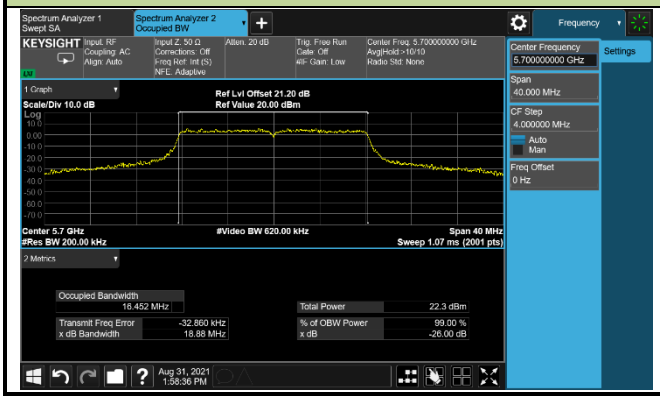


Channel 116 (5580MHz)

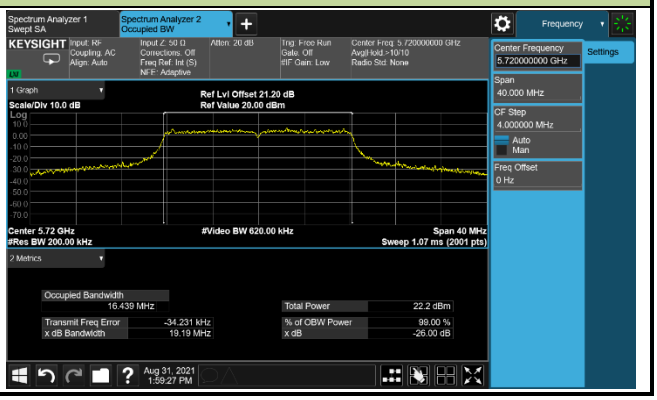


Channel 120 (5600MHz)

Channel 140 (5700MHz)

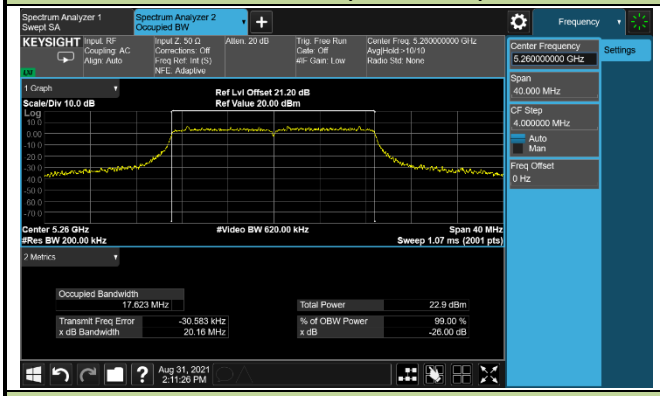


Channel 144 (5720MHz)

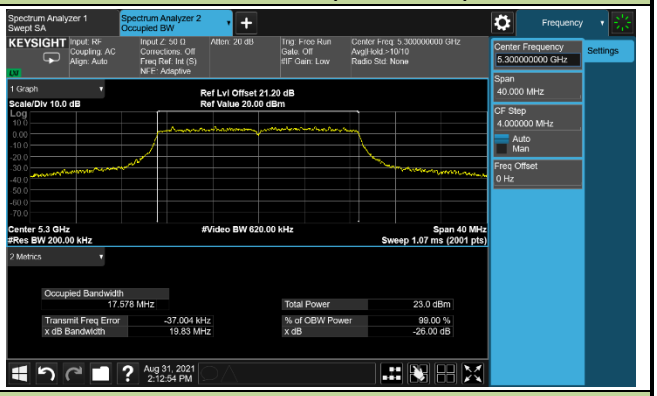


802.11n-HT20 26dB Bandwidth

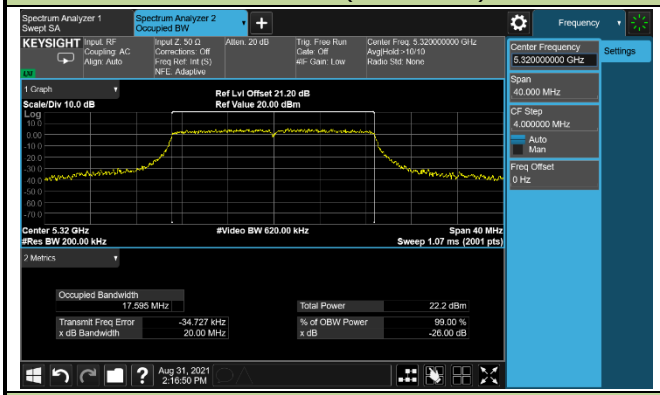
Channel 52 (5260MHz)



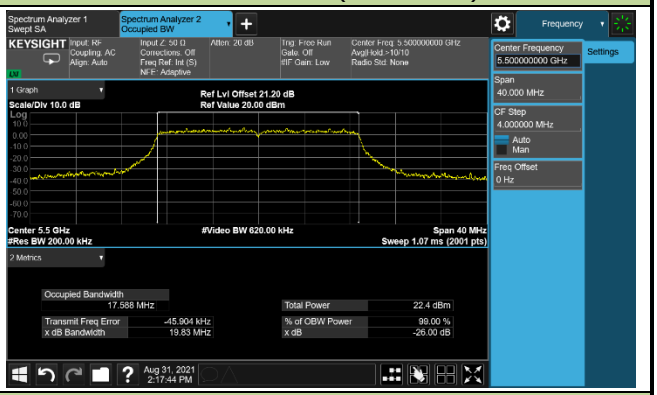
Channel 60 (5300MHz)



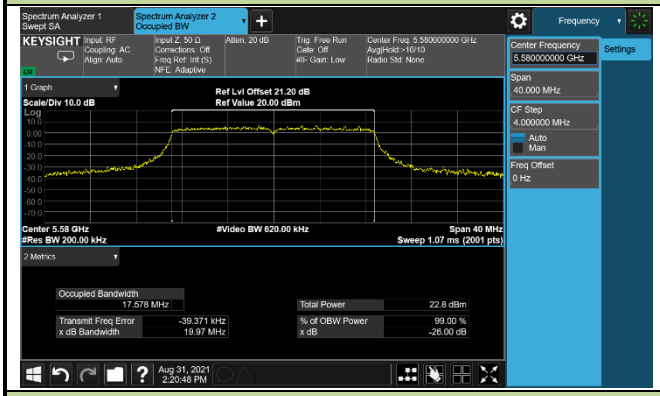
Channel 64 (5320MHz)



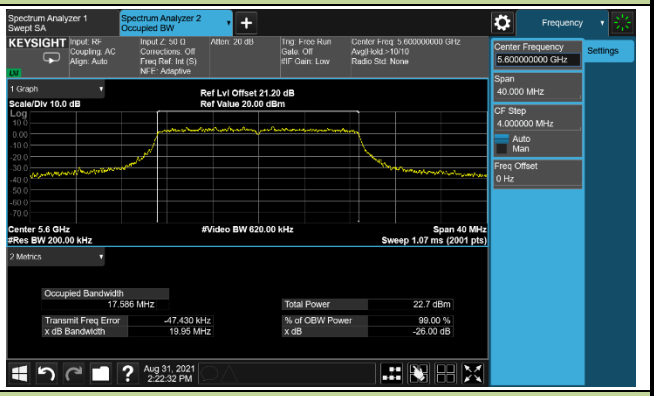
Channel 100 (5500MHz)



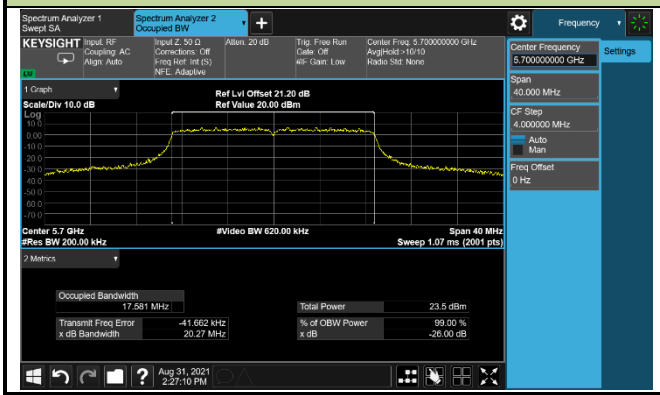
Channel 116 (5580MHz)



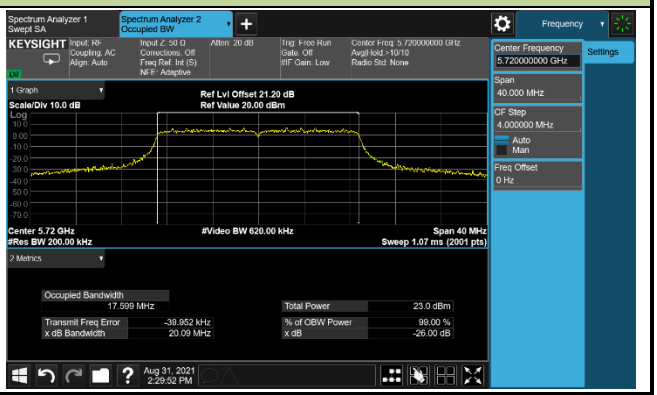
Channel 120 (5600MHz)



Channel 140 (5700MHz)

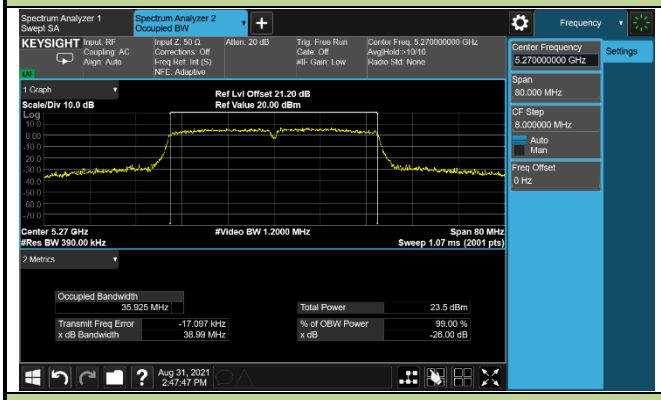


Channel 144 (5720MHz)

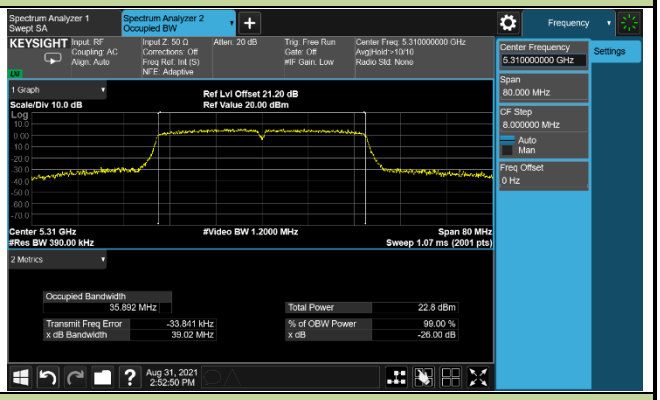


802.11n-HT40 26dB Bandwidth

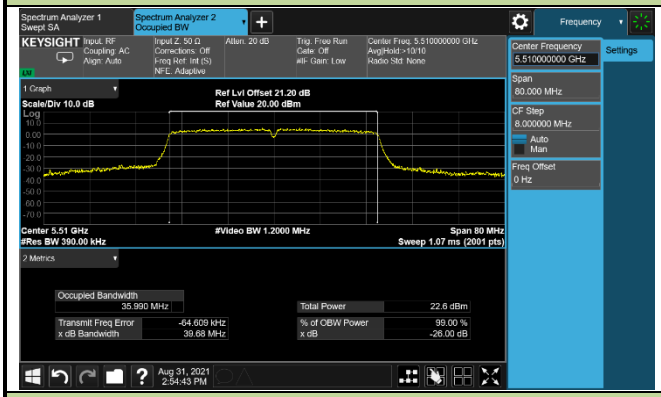
Channel 54 (5270MHz)



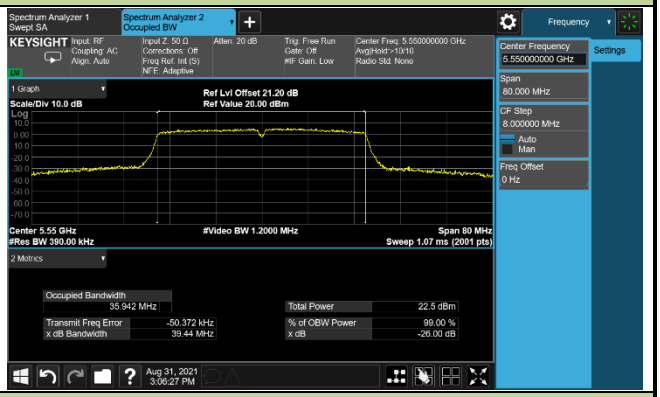
Channel 62 (5310MHz)



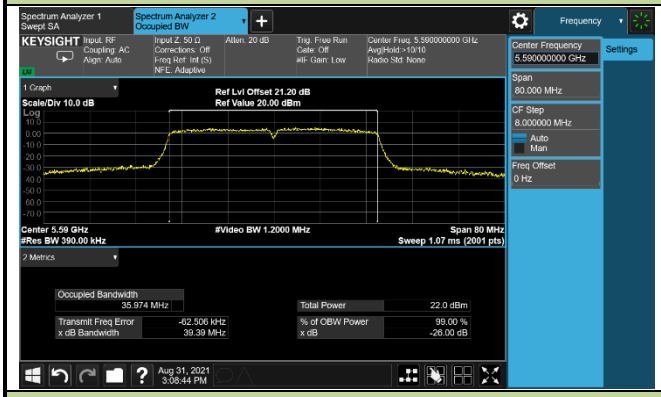
Channel 102 (5510MHz)



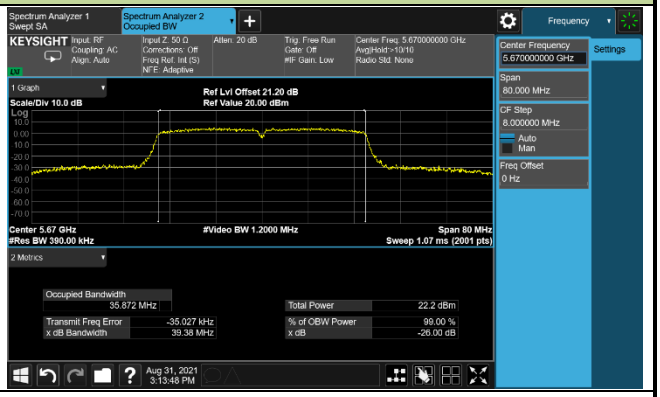
Channel 110 (5550MHz)



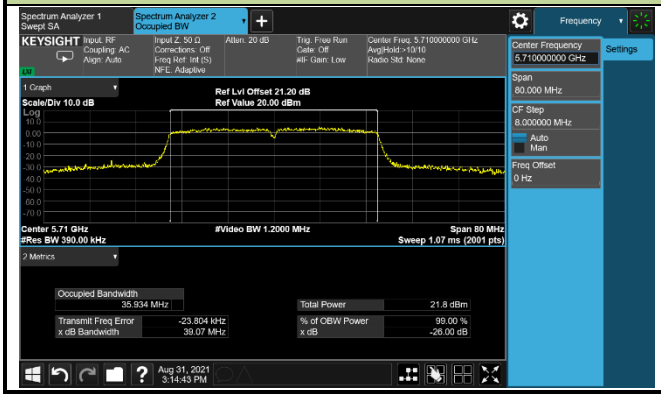
Channel 118 (5590MHz)



Channel 134 (5670MHz)

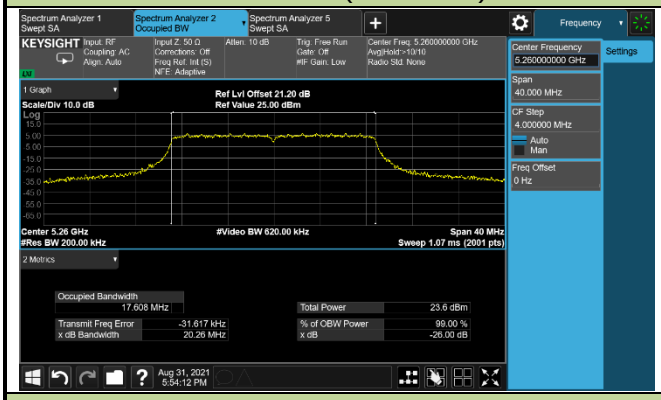


Channel 142 (5710MHz)

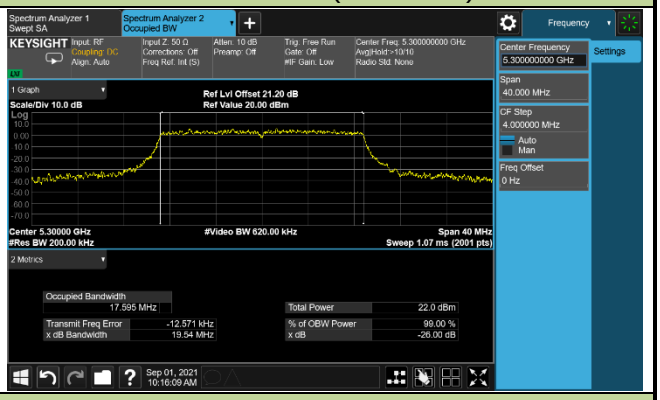


802.11ac-VHT20 26dB Bandwidth

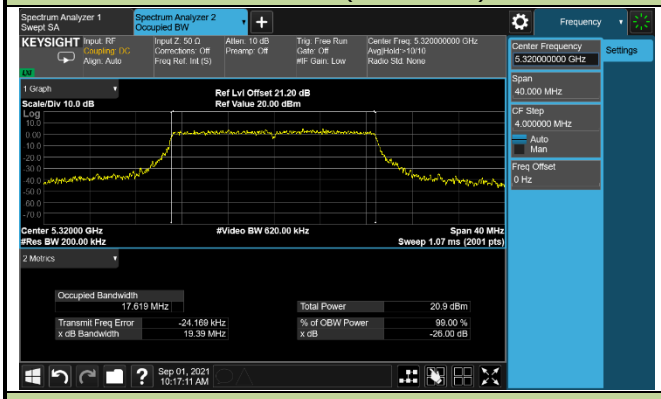
Channel 52 (5260MHz)



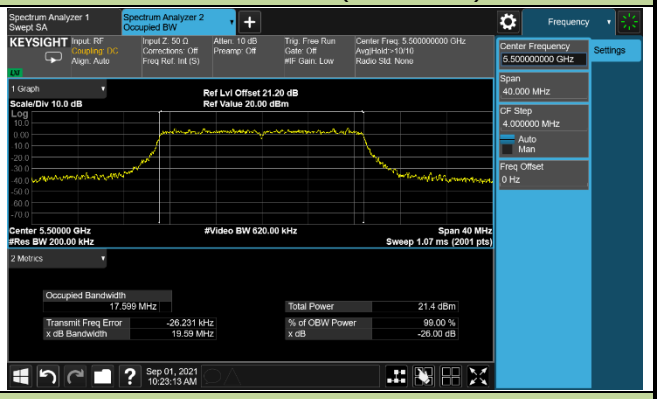
Channel 60 (5300MHz)



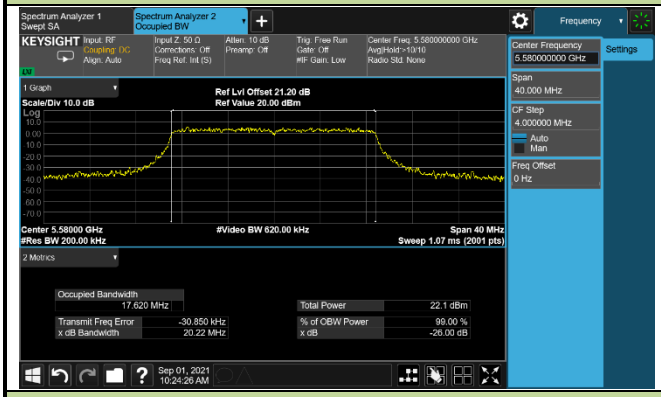
Channel 64 (5320MHz)



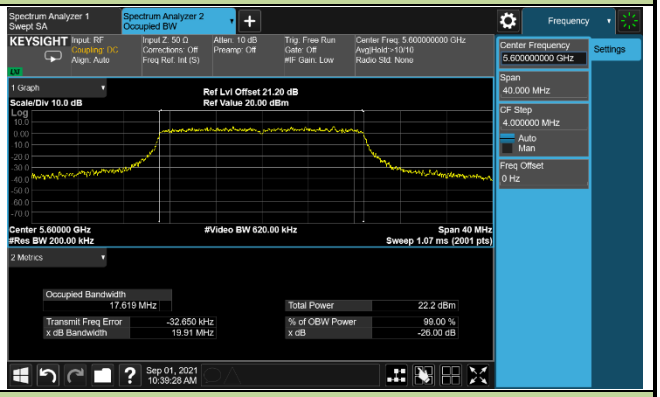
Channel 100 (5500MHz)



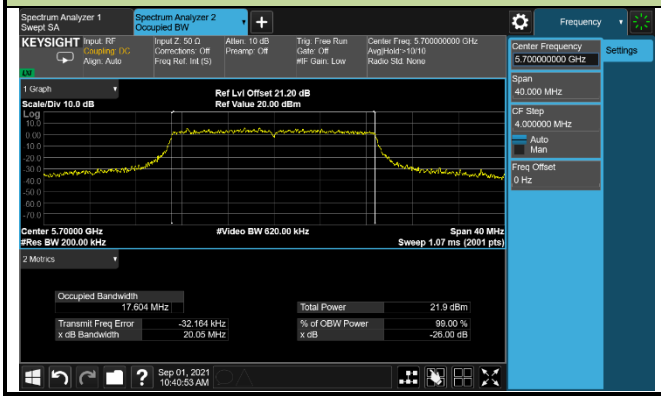
Channel 116 (5580MHz)



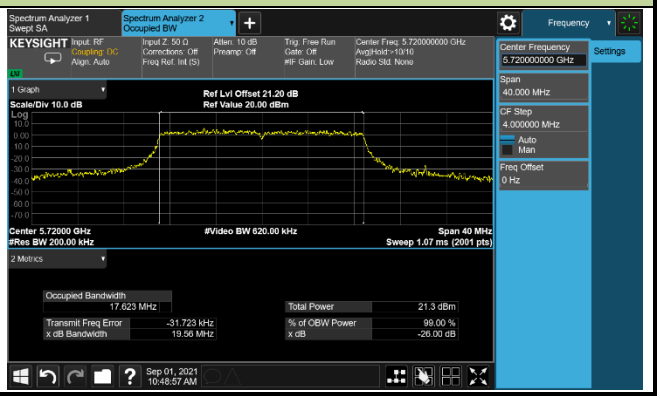
Channel 120 (5600MHz)



Channel 140 (5700MHz)

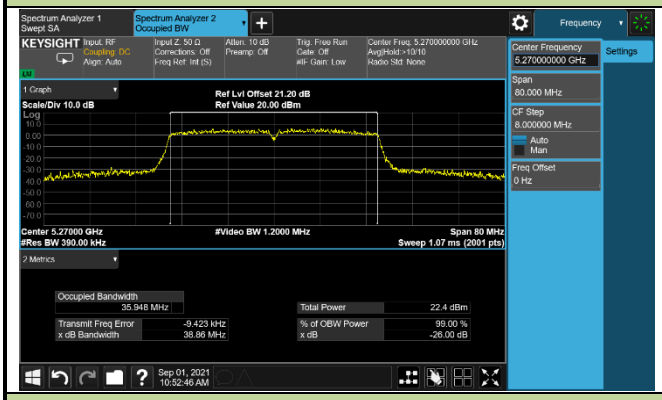


Channel 144 (5720MHz)

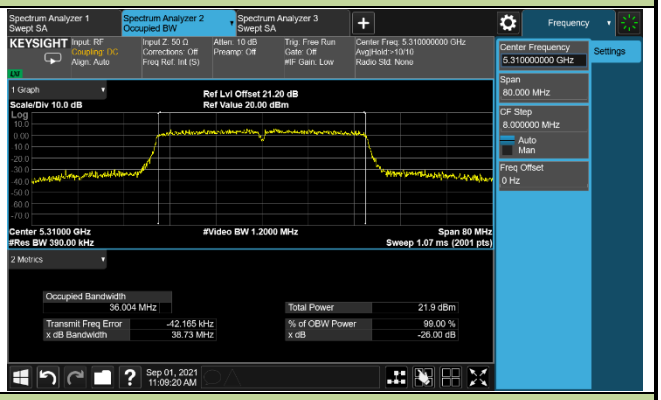


802.11ac-VHT40 26dB Bandwidth

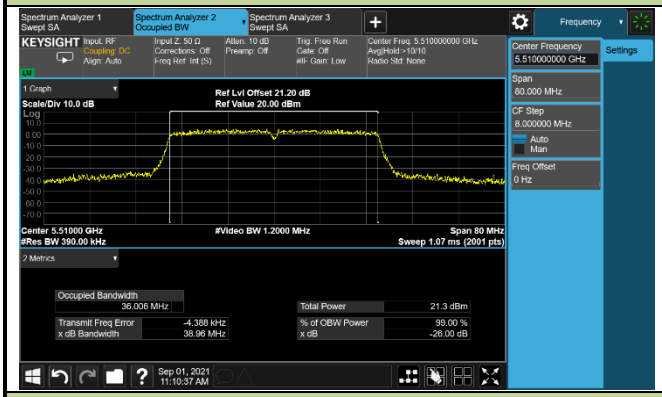
Channel 54 (5270MHz)



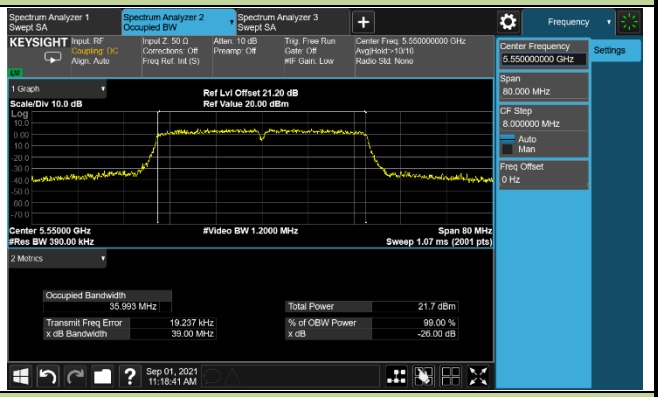
Channel 62 (5310MHz)



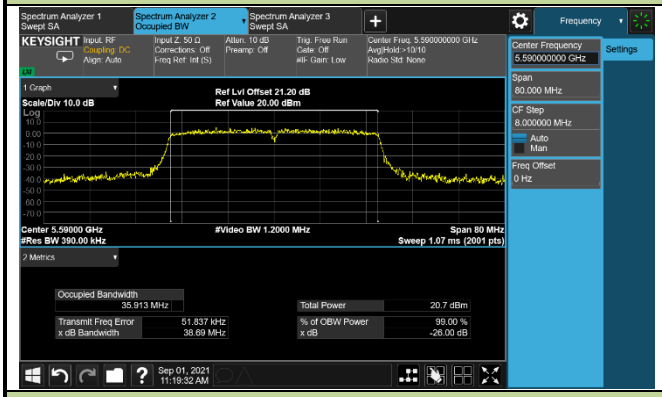
Channel 102 (5510MHz)



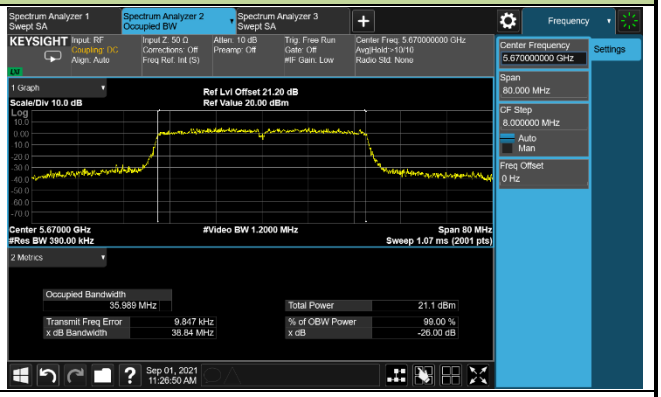
Channel 110 (5550MHz)



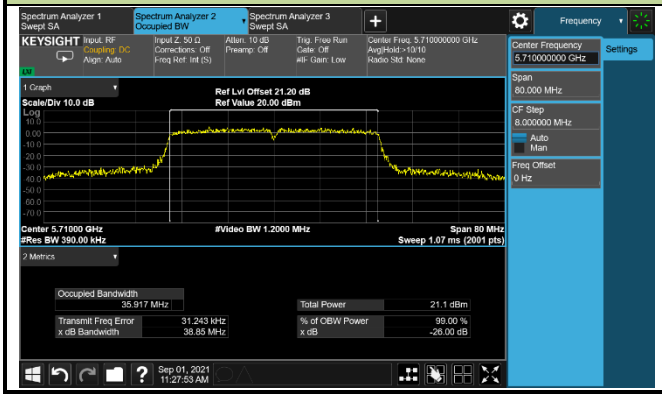
Channel 118 (5590MHz)

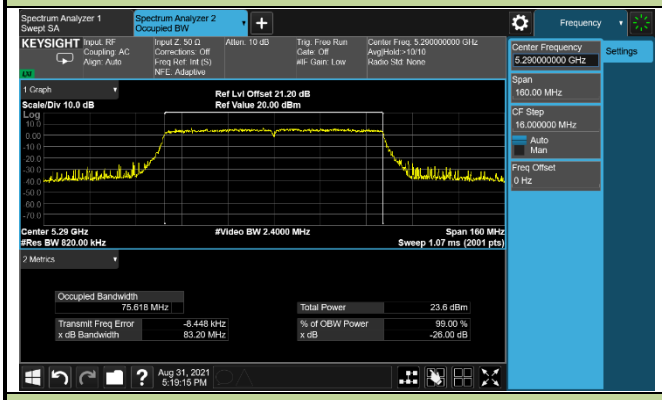
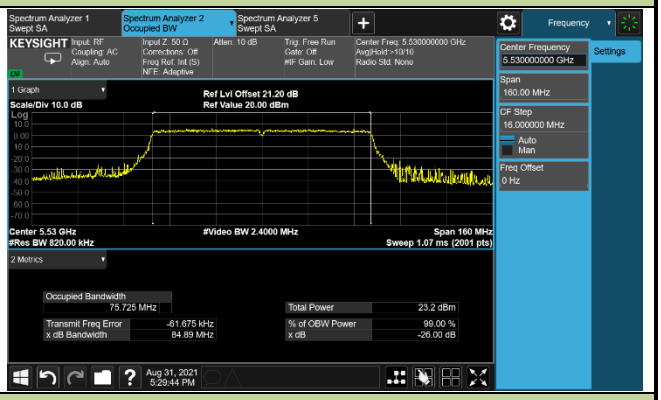
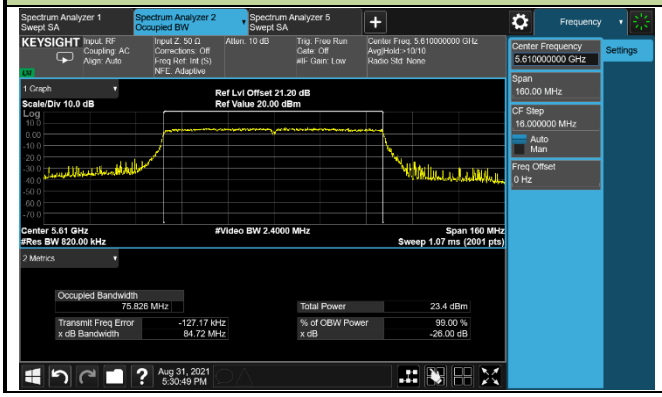
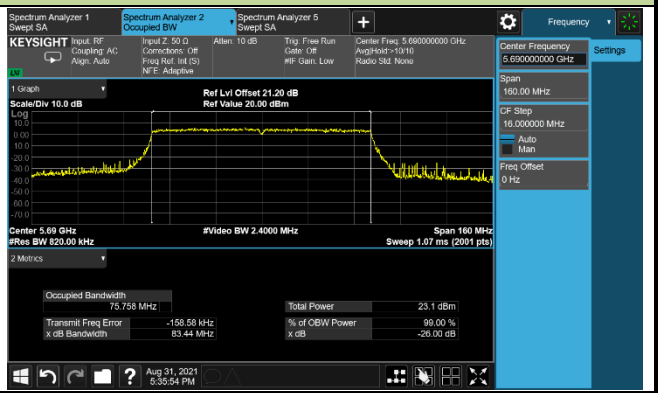


Channel 134 (5670MHz)



Channel 142 (5710MHz)



802.11ac-VHT80 26dB Bandwidth	
Channel 58 (5290MHz)	Channel 106 (5530MHz)
	
Channel 122 (5610MHz)	Channel 138 (5690MHz)
	

6.3. Output Power Measurement

6.3.1.Test Limit

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW (23.98dBm) or 11dBm +10 log (26dB BW).

If transmitting antennas of directional gain greater than 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

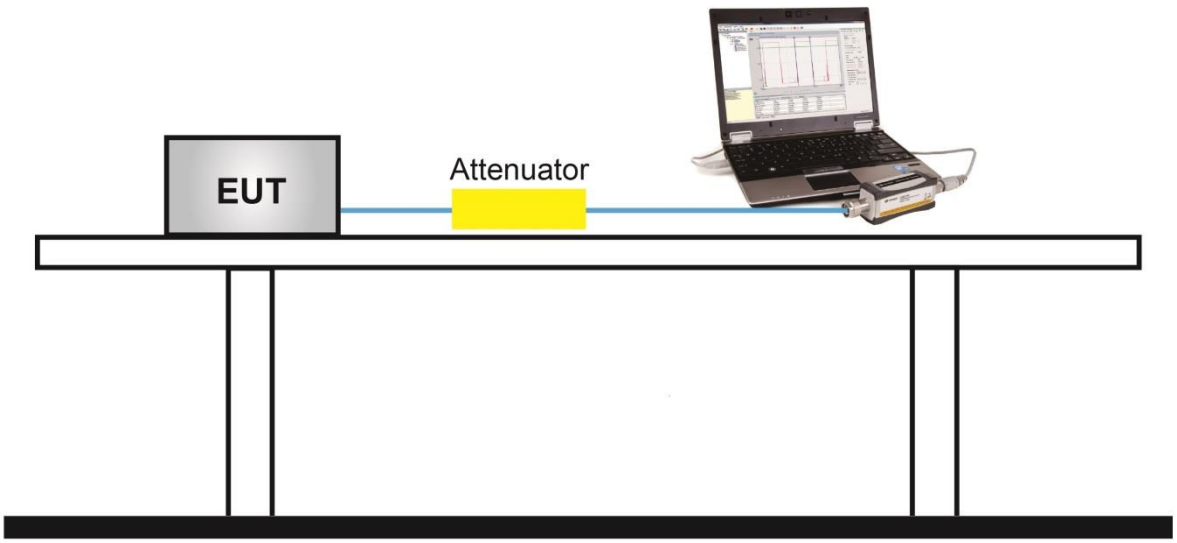
6.3.2.Test Procedure Used

ANSI C63.10-2013 - Section 12.3.3.2 Method PM-G

6.3.3.Test Setting

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a wideband gated RF power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

6.3.4.Test Setup



6.3.5.Test Result

Product	cAP XL ac	Test Engineer	Luis Yang
Test Site	WZ-TR3	Test Date	2021/08/31~2021/09/07

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Ant 0 Average Power (dBm)	Ant 1 Average Power (dBm)	Total Average Power (dBm)	Average Power Limit (dBm)	Result
802.11a	6Mbps	52	5260	15.78	16.53	19.18	≤ 23.74	Pass
802.11a	6Mbps	60	5300	15.92	16.40	19.18	≤ 23.74	Pass
802.11a	6Mbps	64	5320	15.33	15.55	18.45	≤ 23.74	Pass
802.11a	6Mbps	100	5500	15.23	15.50	18.38	≤ 23.74	Pass
802.11a	6Mbps	116	5580	15.24	16.53	18.94	≤ 23.74	Pass
802.11a	6Mbps	120	5600	15.19	15.35	18.28	≤ 23.74	Pass
802.11a	6Mbps	140	5700	15.22	16.29	18.80	≤ 23.74	Pass
802.11a	6Mbps	144	5720	15.13	15.27	18.21	≤ 23.74	Pass
802.11n-HT20	MCS0	52	5260	15.99	17.12	19.60	≤ 23.97	Pass
802.11n-HT20	MCS0	60	5300	16.46	17.23	19.87	≤ 23.97	Pass
802.11n-HT20	MCS0	64	5320	16.30	16.79	19.56	≤ 23.97	Pass
802.11n-HT20	MCS0	100	5500	16.77	16.28	19.54	≤ 23.97	Pass
802.11n-HT20	MCS0	116	5580	16.27	16.53	19.41	≤ 23.97	Pass
802.11n-HT20	MCS0	120	5600	16.26	16.62	19.45	≤ 23.97	Pass
802.11n-HT20	MCS0	140	5700	16.28	16.99	19.66	≤ 23.97	Pass
802.11n-HT20	MCS0	144	5720	16.08	16.66	19.39	≤ 23.97	Pass
802.11n-HT40	MCS0	54	5270	15.80	16.61	19.23	≤ 23.98	Pass
802.11n-HT40	MCS0	62	5310	15.33	15.73	18.54	≤ 23.98	Pass
802.11n-HT40	MCS0	102	5510	15.51	15.75	18.64	≤ 23.98	Pass
802.11n-HT40	MCS0	110	5550	15.12	15.95	18.57	≤ 23.98	Pass
802.11n-HT40	MCS0	118	5590	14.86	15.69	18.31	≤ 23.98	Pass
802.11n-HT40	MCS0	134	5670	15.11	16.10	18.64	≤ 23.98	Pass
802.11n-HT40	MCS0	142	5710	15.40	15.88	18.66	≤ 23.98	Pass

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Ant 0 Average Power (dBm)	Ant 1 Average Power (dBm)	Total Average Power (dBm)	Average Power Limit (dBm)	Result
802.11ac-VHT20	MCS0	52	5260	16.32	17.09	19.73	≤ 23.88	Pass
802.11ac-VHT20	MCS0	60	5300	15.63	16.40	19.04	≤ 23.88	Pass
802.11ac-VHT20	MCS0	64	5320	16.25	16.81	19.55	≤ 23.88	Pass
802.11ac-VHT20	MCS0	100	5500	16.47	16.41	19.45	≤ 23.88	Pass
802.11ac-VHT20	MCS0	116	5580	15.80	16.35	19.09	≤ 23.88	Pass
802.11ac-VHT20	MCS0	120	5600	15.33	16.58	19.01	≤ 23.88	Pass
802.11ac-VHT20	MCS0	140	5700	16.29	16.66	19.49	≤ 23.88	Pass
802.11ac-VHT20	MCS0	144	5720	16.30	16.90	19.62	≤ 23.88	Pass
802.11ac-VHT40	MCS0	54	5270	15.91	16.51	19.23	≤ 23.98	Pass
802.11ac-VHT40	MCS0	62	5310	14.92	15.02	17.98	≤ 23.98	Pass
802.11ac-VHT40	MCS0	102	5510	15.94	15.92	18.94	≤ 23.98	Pass
802.11ac-VHT40	MCS0	110	5550	15.99	15.82	18.92	≤ 23.98	Pass
802.11ac-VHT40	MCS0	118	5590	15.35	15.92	18.65	≤ 23.98	Pass
802.11ac-VHT40	MCS0	134	5670	15.55	15.99	18.79	≤ 23.98	Pass
802.11ac-VHT40	MCS0	142	5710	15.43	15.98	18.72	≤ 23.98	Pass
802.11ac-VHT80	MCS0	58	5290	15.70	16.02	18.87	≤ 23.98	Pass
802.11ac-VHT80	MCS0	106	5530	15.12	15.56	18.36	≤ 23.98	Pass
802.11ac-VHT80	MCS0	122	5610	14.26	15.88	18.16	≤ 23.98	Pass
802.11ac-VHT80	MCS0	138	5690	15.11	15.62	18.38	≤ 23.98	Pass

Note 1: Total Average Power (dBm) = $10*\log\{10^{(\text{Ant 0 Average Power}/10)} + 10^{(\text{Ant 1 Average Power}/10)}\}$ (dBm).

Note 2: Average Power Limit Calculation as below:

802.11a: $11 + 10\log_{10}(18.79\text{MHz}) = 23.74\text{dBm} < 23.98\text{dBm}$;

802.11n-HT20: $11 + 10\log_{10}(19.83\text{MHz}) = 23.97\text{dBm} < 23.98\text{dBm}$;

802.11ac-VHT20: $11 + 10\log_{10}(19.39\text{MHz}) = 23.88\text{dBm} < 23.98\text{dBm}$;

6.4. Transmit Power Control

6.4.1.Test Limit

The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm.

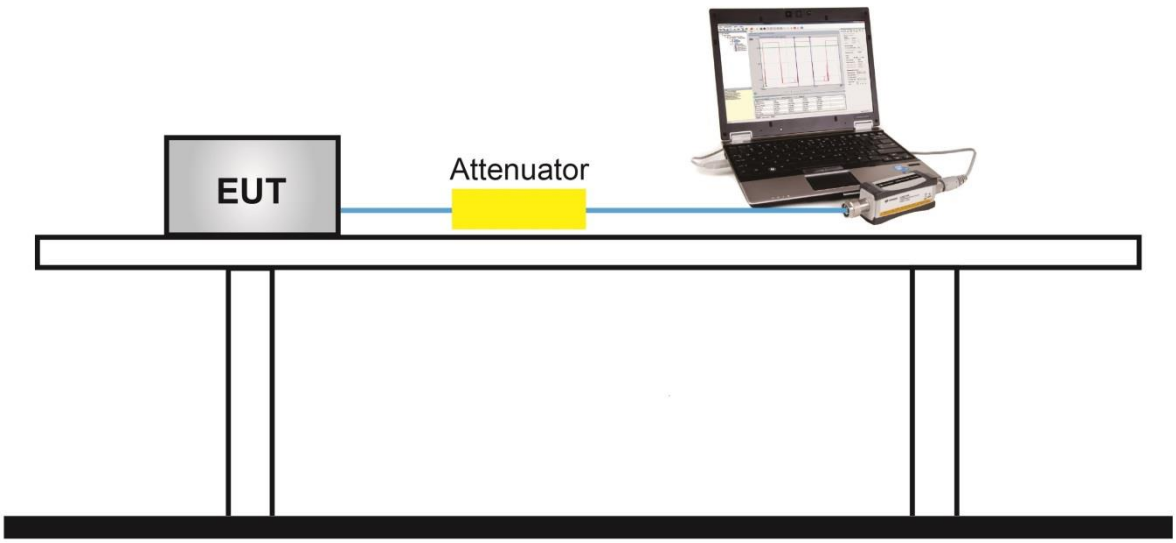
6.4.2.Test Procedure Used

ANSI C63.10-2013 - Section 12.3.3.2 Method PM-G

6.4.3.Test Setting

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a wideband gated RF power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

6.4.4.Test Setup



6.4.5.Test Result

A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

6.5. Power Spectral Density Measurement

6.5.1.Test Limit

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

If transmitting antennas of directional gain greater than 6dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

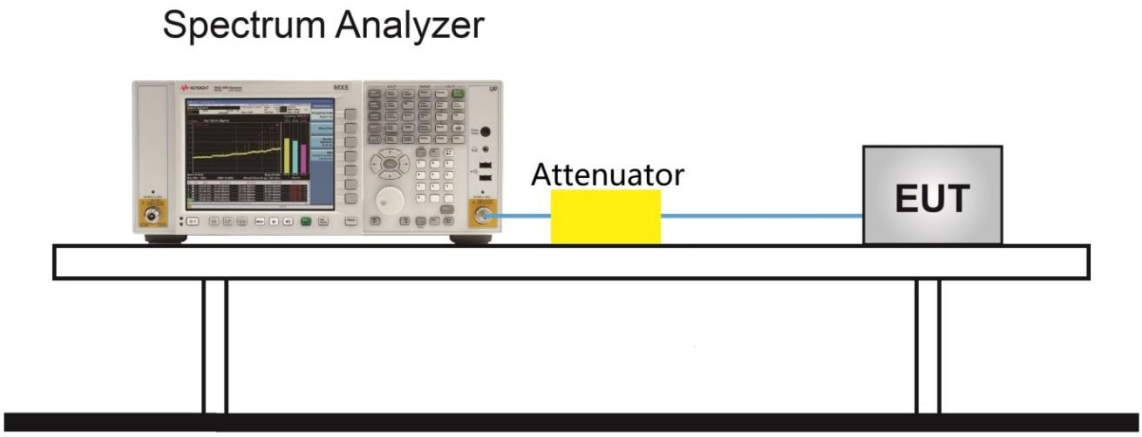
6.5.2.Test Procedure Used

ANSI C63.10-2013 - Section 12.5

6.5.3.Test Setting

1. Analyzer was set to the center frequency of the U-NII channel under investigation
2. Span was set to encompass the entire 26dB EBW of the signal
3. RBW = 1MHz, VBW ≥ 3*RBW
4. Number of sweep points ≥ 2 × (span / RBW)
5. Detector = power averaging (Average)
6. Sweep time = auto
7. Trigger = free run
8. Trace average at least 100 traces in power averaging (rms) mode
9. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
10. Add 10*log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add 10*log (1/0.25) = 6 dB if the duty cycle is 25 percent.

6.5.4.Test Setup



6.5.5.Test Result

Product	cAP XL ac	Test Engineer	Luis Yang
Test Site	WZ-TR3	Test Date	2021/08/31~2021/09/07

Test Mode	Data Rate/ MCS	Ch. No.	Freq. (MHz)	Ant 0 PSD (dBm/ MHz)	Ant 1 PSD (dBm/ MHz)	Duty Cycle (%)	Total PSD (dBm/MHz)	PSD Limit (dBm/MHz)	Result
802.11a	6Mbps	52	5260	4.71	5.36	92.98	8.37	≤ 8.49	Pass
802.11a	6Mbps	60	5300	4.60	5.48	92.98	8.39	≤ 8.49	Pass
802.11a	6Mbps	64	5320	4.60	4.94	92.98	8.10	≤ 8.49	Pass
802.11a	6Mbps	100	5500	4.61	4.92	92.98	8.09	≤ 8.49	Pass
802.11a	6Mbps	116	5580	4.24	5.44	92.98	8.21	≤ 8.49	Pass
802.11a	6Mbps	120	5600	4.34	4.89	92.98	7.95	≤ 8.49	Pass
802.11a	6Mbps	140	5700	4.80	5.27	92.98	8.36	≤ 8.49	Pass
802.11a	6Mbps	144	5720	4.68	4.86	92.98	8.10	≤ 8.49	Pass
802.11n-HT20	MCS0	52	5260	4.80	5.41	97.18	8.25	≤ 8.49	Pass
802.11n-HT20	MCS0	60	5300	4.49	5.71	97.18	8.27	≤ 8.49	Pass
802.11n-HT20	MCS0	64	5320	4.69	5.34	97.18	8.16	≤ 8.49	Pass
802.11n-HT20	MCS0	100	5500	5.13	5.36	97.18	8.38	≤ 8.49	Pass
802.11n-HT20	MCS0	116	5580	5.26	5.00	97.18	8.27	≤ 8.49	Pass
802.11n-HT20	MCS0	120	5600	5.07	5.13	97.18	8.23	≤ 8.49	Pass
802.11n-HT20	MCS0	140	5700	4.83	5.64	97.18	8.39	≤ 8.49	Pass
802.11n-HT20	MCS0	144	5720	4.86	5.56	97.18	8.36	≤ 8.49	Pass
802.11n-HT40	MCS0	54	5270	2.05	2.14	94.52	5.35	≤ 8.49	Pass
802.11n-HT40	MCS0	62	5310	0.20	0.97	94.52	3.85	≤ 8.49	Pass
802.11n-HT40	MCS0	102	5510	1.43	1.58	94.52	4.76	≤ 8.49	Pass
802.11n-HT40	MCS0	110	5550	1.32	1.27	94.52	4.55	≤ 8.49	Pass
802.11n-HT40	MCS0	118	5590	0.94	1.60	94.52	4.54	≤ 8.49	Pass
802.11n-HT40	MCS0	134	5670	1.17	2.31	94.52	5.03	≤ 8.49	Pass
802.11n-HT40	MCS0	142	5710	1.38	1.74	94.52	4.82	≤ 8.49	Pass

Test Mode	Data Rate/ MCS	Ch. No.	Freq. (MHz)	Ant 0 PSD (dBm/ MHz)	Ant 1 PSD (dBm/ MHz)	Duty Cycle (%)	Total PSD (dBm/MHz)	PSD Limit (dBm/MHz)	Result
11ac-VHT20	MCS0	52	5260	4.70	5.55	97.14	8.28	≤ 8.49	Pass
11ac-VHT20	MCS0	60	5300	4.57	5.14	97.14	8.00	≤ 8.49	Pass
11ac-VHT20	MCS0	64	5320	4.98	5.45	97.14	8.36	≤ 8.49	Pass
11ac-VHT20	MCS0	100	5500	4.37	5.18	97.14	7.93	≤ 8.49	Pass
11ac-VHT20	MCS0	116	5580	4.62	5.25	97.14	8.08	≤ 8.49	Pass
11ac-VHT20	MCS0	120	5600	5.12	5.21	97.14	8.31	≤ 8.49	Pass
11ac-VHT20	MCS0	140	5700	4.52	5.84	97.14	8.36	≤ 8.49	Pass
11ac-VHT20	MCS0	144	5720	4.57	5.63	97.14	8.27	≤ 8.49	Pass
11ac-VHT40	MCS0	54	5270	1.72	2.32	94.58	5.28	≤ 8.49	Pass
11ac-VHT40	MCS0	62	5310	1.87	1.80	94.58	5.09	≤ 8.49	Pass
11ac-VHT40	MCS0	102	5510	-0.09	0.36	94.58	3.39	≤ 8.49	Pass
11ac-VHT40	MCS0	110	5550	1.21	1.45	94.58	4.59	≤ 8.49	Pass
11ac-VHT40	MCS0	118	5590	1.05	1.18	94.58	4.37	≤ 8.49	Pass
11ac-VHT40	MCS0	134	5670	0.84	1.33	94.58	4.34	≤ 8.49	Pass
11ac-VHT40	MCS0	142	5710	1.26	1.50	94.58	4.64	≤ 8.49	Pass
11ac-VHT80	MCS0	58	5290	-2.16	-1.35	75.10	2.52	≤ 8.49	Pass
11ac-VHT80	MCS0	106	5530	-2.68	-2.15	75.10	1.85	≤ 8.49	Pass
11ac-VHT80	MCS0	122	5610	-2.64	-1.87	75.10	2.02	≤ 8.49	Pass
11ac-VHT80	MCS0	138	5690	-2.52	-1.84	75.10	2.09	≤ 8.49	Pass

Note 1: When EUT duty cycle ≥ 98%, Total PSD (dBm/MHz) = 10*log $\{10^{(\text{Ant 0 PSD}/10)} + 10^{(\text{Ant 1 PSD}/10)}\}$ (dBm/MHz).

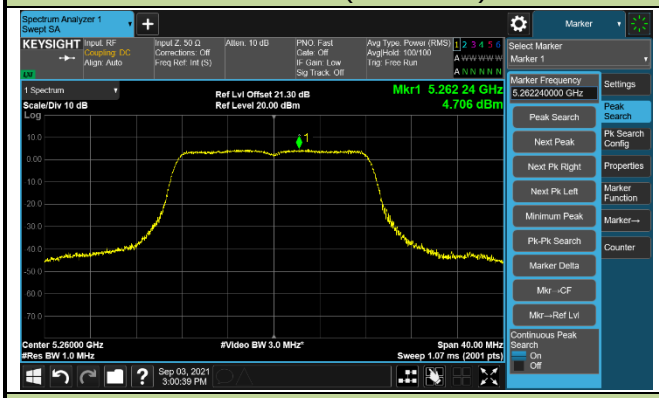
Note 2: When EUT duty cycle < 98%, Total PSD (dBm/MHz) = 10*log $\{10^{(\text{Ant 0 PSD}/10)} + 10^{(\text{Ant 1 PSD}/10)}\}$ (dBm/MHz) + 10*log (1/Duty Cycle).

Note 3: PSD Limit Calculation as below:

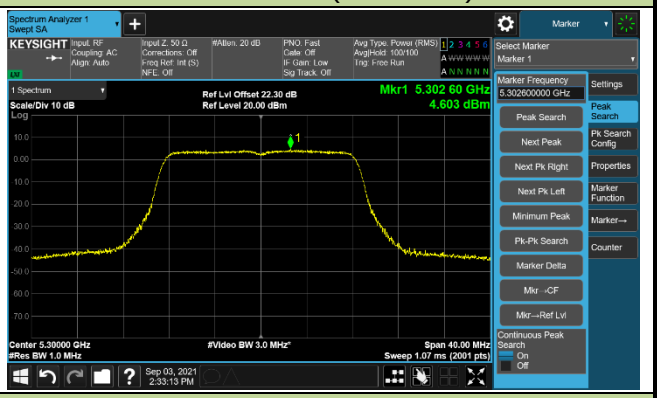
PSD Limit = 11dBm/MHz - (8.51dBi - 6dBi) = 8.49dBm/MHz.

802.11a Power Spectral Density - Ant 0

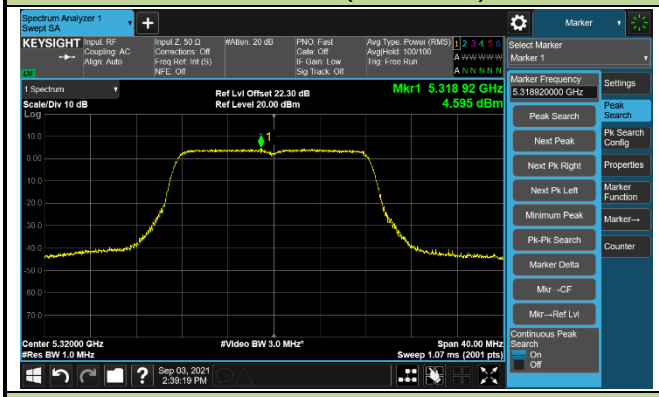
Channel 52 (5260MHz)



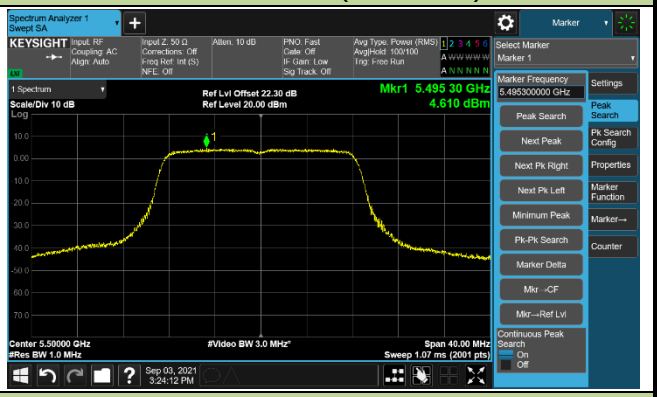
Channel 60 (5300MHz)



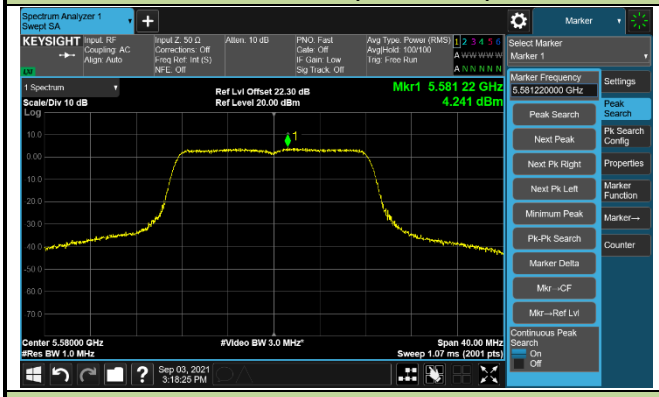
Channel 64 (5320MHz)



Channel 100 (5500MHz)

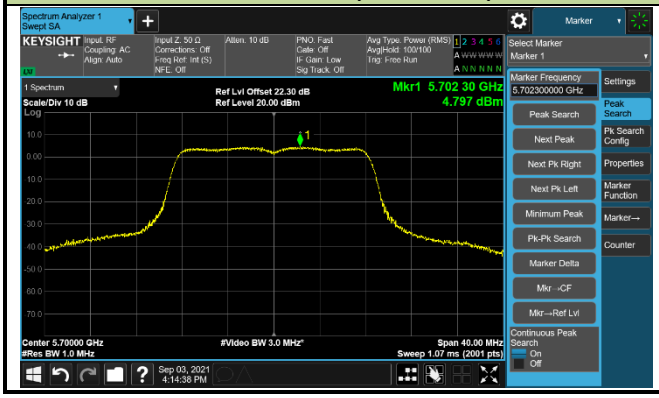


Channel 116 (5580MHz)

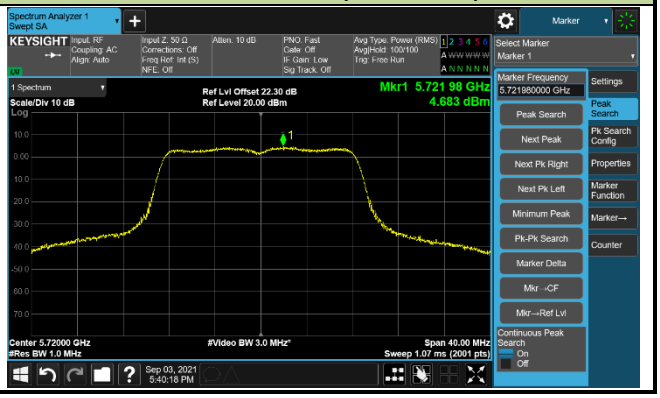


Channel 120 (5600MHz)

Channel 140 (5700MHz)

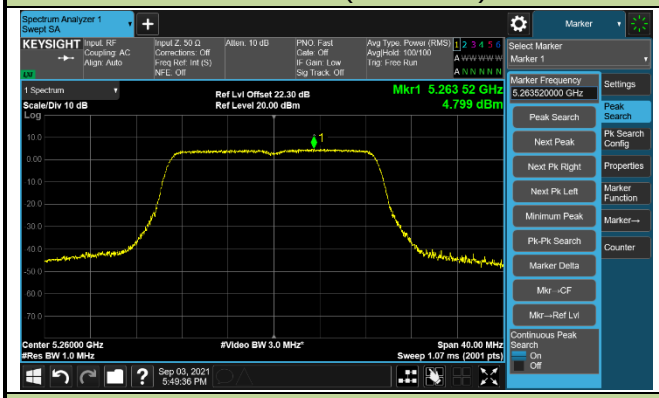


Channel 144 (5720MHz)

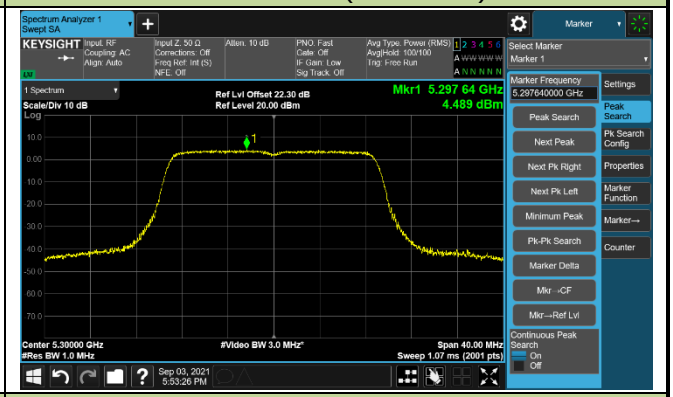


802.11n-HT20 Power Spectral Density - Ant 0

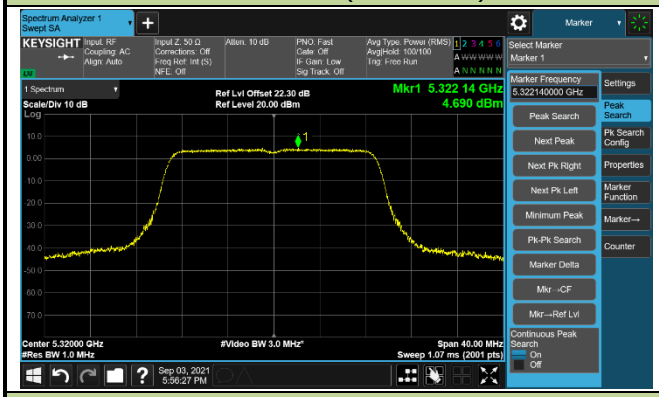
Channel 52 (5260MHz)



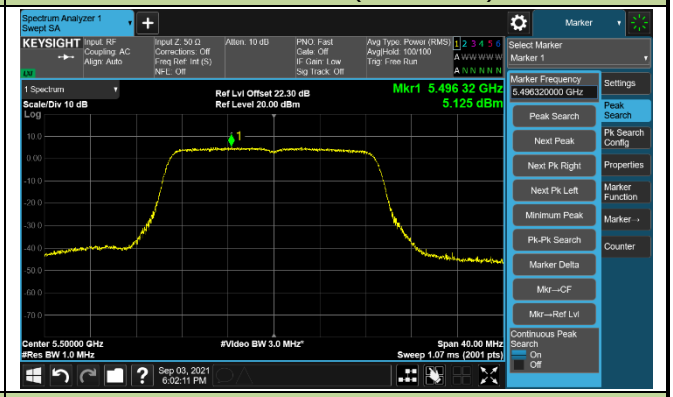
Channel 60 (5300MHz)



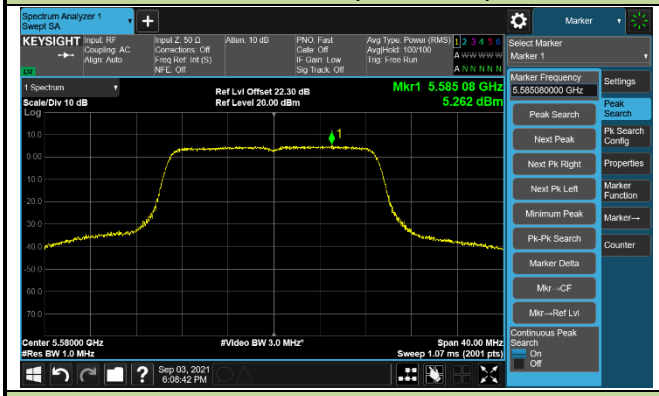
Channel 64 (5320MHz)



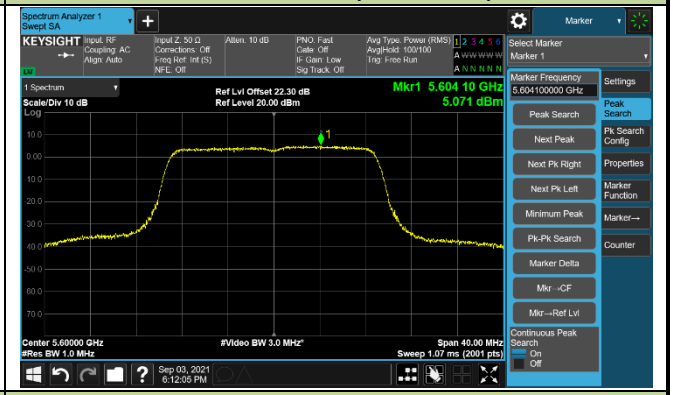
Channel 100 (5500MHz)



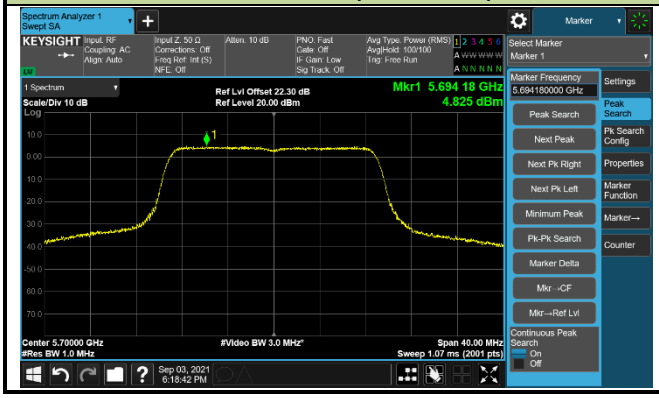
Channel 116 (5580MHz)



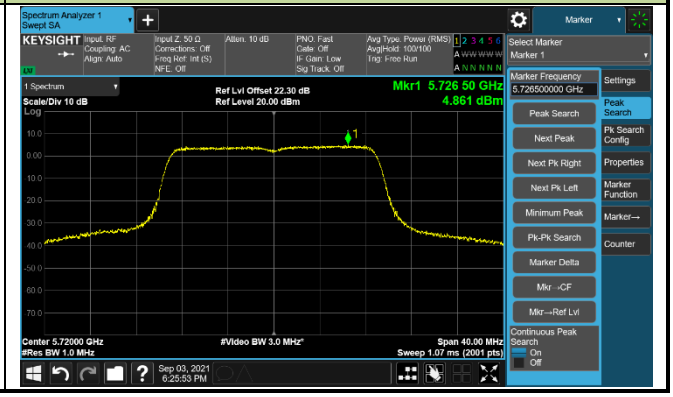
Channel 120 (5600MHz)



Channel 140 (5700MHz)

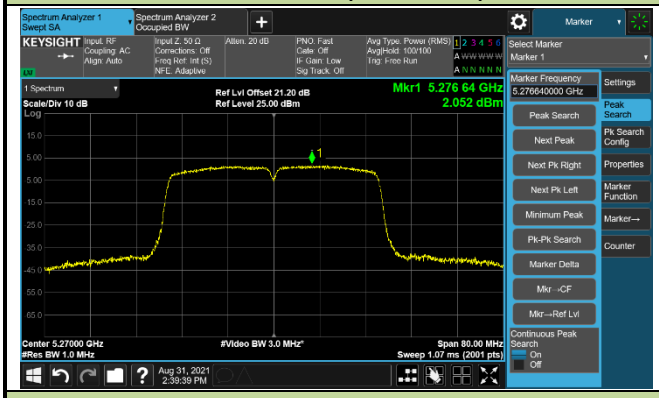


Channel 144 (5720MHz)

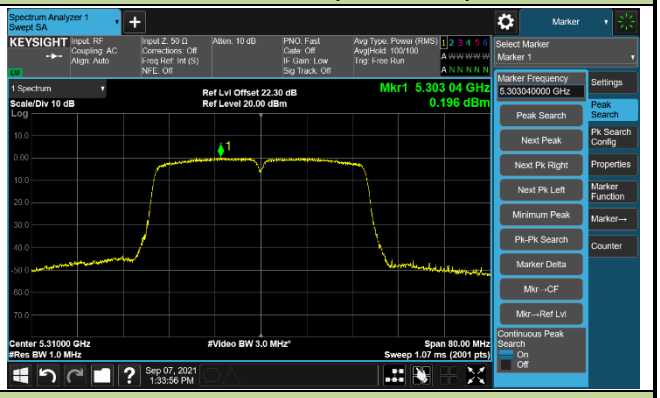


802.11n-HT40 Power Spectral Density - Ant 0

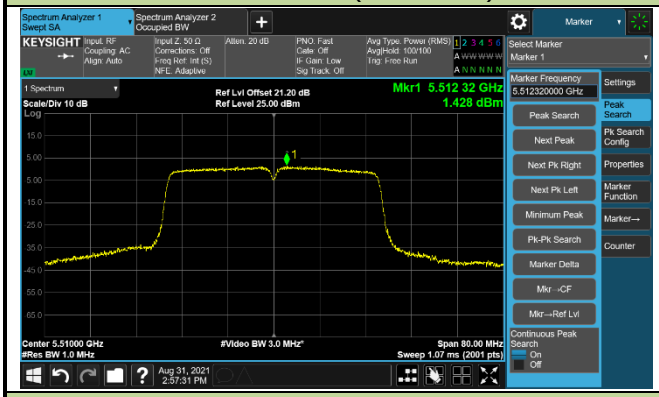
Channel 54 (5270MHz)



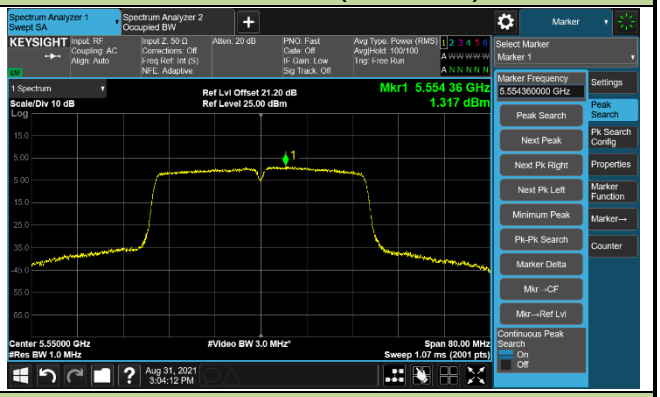
Channel 62 (5310MHz)



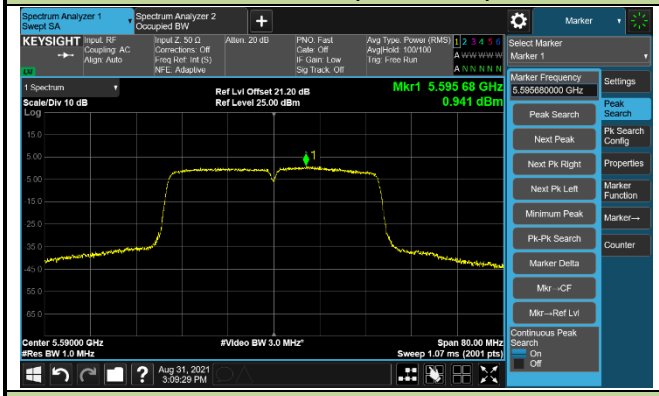
Channel 102 (5510MHz)



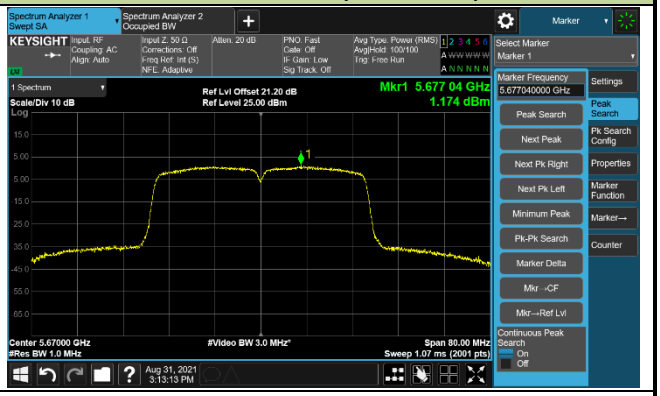
Channel 110 (5550MHz)



Channel 118 (5590MHz)



Channel 134 (5670MHz)



Channel 142 (5710MHz)