MEASUREMENT REPORT

FCC PART 15.407 WLAN 802.11a/n/ac

FCC ID:	TK4WLE600V5
Applicant:	Compex Systems Pte Ltd.
Application Type:	Certification
Product:	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER
Model No.:	WLE600V5-27
Brand Name:	COMPEX
FCC Classification:	Unlicensed National Information Infrastructure (NII)
FCC Rule Part(s):	Part15 Subpart E (Section 15.407)
Test Procedure(s):	ANSI C63.10-2013
Test Date:	July 31 ~ September 11, 2020

Reviewed By: (Jame Yuan)

Approved By: (Robin Wu)

Revision History

Report No.	Version	Description	Issue Date	Note
2007RSU035-U1	Rev. 01	Initial Report	09-17-2020	Valid

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1. General Information

1.1. Applicant

Compex Systems Pte Ltd

No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651

1.2. Manufacturer

Compex Systems Pte Ltd

No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651

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	
☐	**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:	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER
Model No.:	WLE600V5-27
Serial Model No.:	WLE600V5-27ESD-I
Serial No.:	29449325
Wi-Fi Specification:	802.11a/n/ac, 2*2 MIMO
Rated Voltage:	DC 3.3V
Temperature:	-20 ~ 70°C

Note: The difference between models is sold in different markets.

2.2. Product Specification Subjective to this Report

Frequency Range:	For 802.11a/n-HT20/ac-VHT20: 5180~5240MHz, 5745~5825MHz For 802.11n-HT40/ac-VHT40: 5190~5230MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5775MHz
Modulation Technology:	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

Note: For other features of this EUT, test report will be issued separately.

2.3. Working Frequencies for this Report

802.11a/n-HT20/ac-VHT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	149	5745 MHz	153	5765 MHz
157	5785 MHz	161	5805 MHz	165	5825 MHz

802.11n-HT40/ac-VHT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	151	5755 MHz
159	5795 MHz	--	--	--	--

802.11ac-VHT80

Channel	Frequency	Channel	Frequency	Channel	Frequency
42	5210 MHz	155	5775 MHz	--	--

2.4. Description of Available Antennas

Antenna Type	Frequency Band(GHz)	Model Name	MaxAntennaGain (dBi)	Directional Gain (dBi)	
				ForPower	For PSD
DipoleAntenna	5.15~5.35	KMA5250_7	7.0	7.0	10.01
	5.70 ~5.90	KMA5800_6	6.0	6.0	9.01
Panel Antenna	4.90 ~5.90	FP4959-22DP	22.5	22.5	22.5

Note 1: The EUT 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 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 $N_{ANT} \leq 4$;

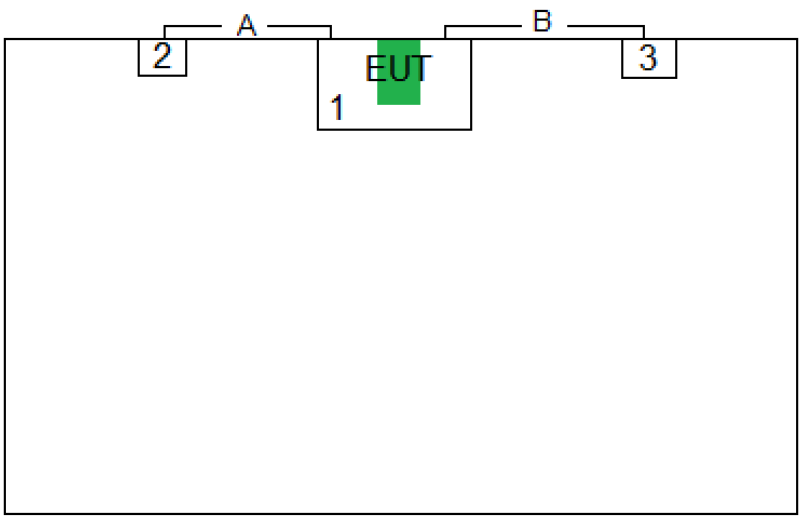
Note 2: Panel antenna support Cross-Polarized design, so directional gain is the gain of an individual antenna.
Note 3: When used with dipole antenna, this device was defined as P-T-MP application and support NII-1 / NII-3 bands. When used with panel antenna, this device was defined as P-T-P application and support NII-3 band.
Note 4: All antenna information (Antenna type and Peak Gain) is provided by the manufacturer.

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. Description of Test Configuration

The measurement proceduresandappropriate EUT setup described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and KDB 789033 were used in the measurement.



Product		Manufacturer	Model No.
1	PCB Board	Compex	C-344JPW
2	AC/DC Adapter	GRT	GRT-240100
3	Notebook	Hewlett-Packard	HP 24-df052wcn

2.7. Description of Test Software

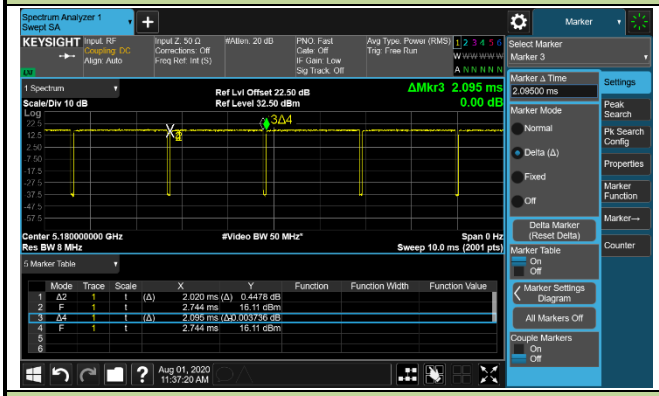
The test utility software used during testing was“ART2-GUI”, and the version was 2.3.
Detail power setting refer to operation description.

2.8. Duty Cycle

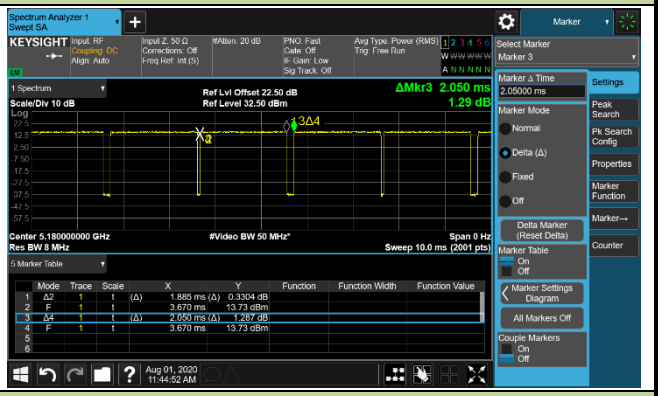
5GHz WLAN (NII) operation was possible in 20MHz, 40MHzand 80MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz. The RBW and VBW were both greater than 50/T, where 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	Transmission Duration (ms)	Duty Cycle (%)
802.11a	2.020	96.42
802.11n-HT20	1.885	91.95
802.11n-HT40	0.927	89.93
802.11ac-VHT20	1.895	93.12
802.11ac-VHT40	0.932	93.14
802.11ac-VHT80	0.250	80.46

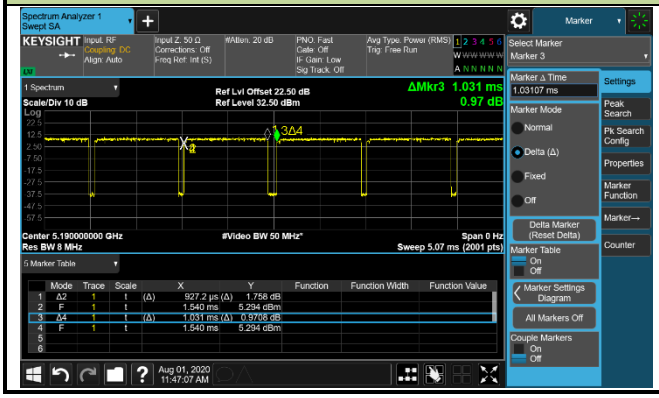
802.11a



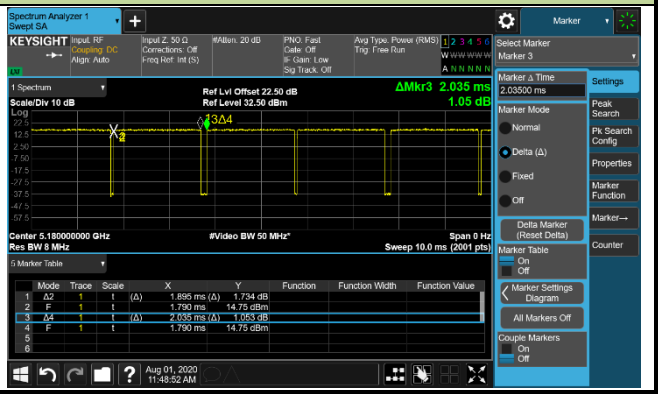
802.11n-HT20

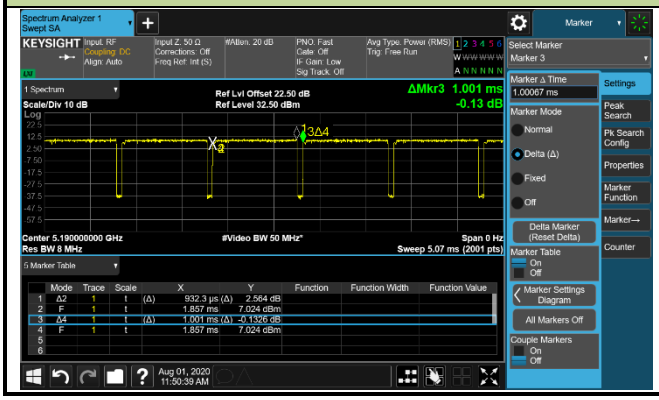
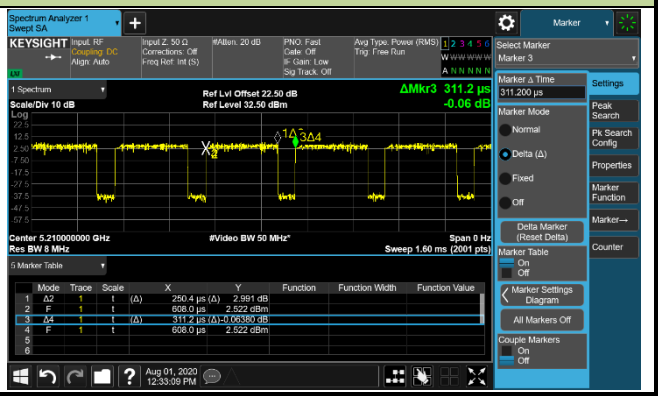


802.11n-HT40



802.11ac-VHT20



802.11ac-VHT40	802.11ac-VHT80
	

2.9. Test Environment Condition

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

2.10. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.11. Applied Standards

KDB 662911 D01v02r01,

KDB 789033 D02v02r01,

ANSI C63.10-2013

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 theresponsible party can be used with the device. The use of a permanently attached antenna or of an antennathat 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 unique MMCX connector.

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	MRTSUE06185	1 year	2021/01/18
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2021/09/09
Thermal Hygrometer	testo	608-H1	MRTSUE06404	1 year	2021/07/26
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	2021/07/02
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2021/09/09
Thermal Hygrometer	testo	608-H1	MRTSUE06621	1 year	2020/12/29

Radiated Emission (WZ-AC1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2021/01/18
PXA Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2021/08/30
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2021/08/08
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2021/09/27
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06597	1 year	2020/12/17
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2021/11/14
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Thermal Hygrometer	testo	608-H1	MRTSUE06403	1 year	2021/07/26
Anechoic Chamber	TDK	Chamber-WZ-AC1	MRTSUE06212	1 year	2021/04/30

Radiated Emission (WZ-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Keysight	N9038A	MRTSUE06125	1 year	2021/07/02
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2021/05/26
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2021/10/25
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06597	1 year	2020/12/17
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2021/11/14
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Thermal Hygrometer	Minggao	ETH529	MRTSUE06170	1 year	2020/12/15
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2021/04/30

Radiated Emission (SIP-AC1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2021/07/02
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2021/07/23
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06645	1 year	2021/08/30
Double Ridged Horn Antenna	R&S	HF907	MRTSUE06610	1 year	2021/08/30
Preamplifier	EMCI	EMC051845SE	MRTSUE06600	1 year	2021/11/09
Thermal Hygrometer	testo	608-H1	MRTSUE06620	1 year	2020/12/29
Anechoic Chamber	RIKEN	SIP-WZ-AC1	MRTSUE06554	1 year	2020/12/25

Radiated Emission (SIP-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2021/07/02
MXA Signal Analyzer	Keysight	N9020B	MRTSUE06604	1 year	2021/09/26
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06646	1 year	2021/08/30
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06648	1 year	2020/12/17
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06599	1 year	2020/12/17
Preamplifier	EMCI	EMC051845SE	MRTSUE06644	1 year	2021/11/09
Preamplifier	EMCI	EMC184045SE	MRTSUE06602	1 year	2021/10/21
Thermal Hygrometer	testo	608-H1	MRTSUE06624	1 year	2020/12/29
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2020/12/25

Radiated Emission (SIP-AC3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2021/07/02
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2021/07/23
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06647	1 year	2021/08/08
Double Ridged Horn Antenna	R&S	HF907	MRTSUE06611	1 year	2021/09/13
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06598	1 year	2020/12/17
Preamplifier	EMCI	EMC012645SE	MRTSUE06642	1 year	2021/01/16
Preamplifier	EMCI	EMC184045SE	MRTSUE06641	1 year	2021/01/16
Thermal Hygrometer	testo	608-H1	MRTSUE06622	1 year	2020/12/29
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2020/12/25

Conducted Test Equipment (WZ-TR3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2021/04/14
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2021/01/08
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2021/04/14
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2021/10/22
USB wideband power sensor	Keysight	U2021XA	MRTSUE06446	1 year	2021/08/30
USB wideband power sensor	Keysight	U2021XA	MRTSUE06447	1 year	2021/08/08
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2021/06/11
Audio Analyzer	Agilent	U8903B	MRTSUE06143	1 year	2021/06/11
Modulation Analyzer	HP	HP8901A	MRTSUE06098	1 year	2021/09/26
Attenuator	MVE	20dB	MRTSUE06547	1 year	2021/05/20
Attenuator	MVE	6dB	MRTSUE06532	1 year	2021/05/20
Attenuator	MVE	10dB	MRTSUE06540	1 year	2021/05/20
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/10/20
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2021/10/21
Thermal Hygrometer	testo	608-H1	MRTSUE06401	1 year	2021/07/26

Conducted Test Equipment (SIP-SR5)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2021/04/14
PXA Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2021/08/30
USB wideband power sensor	Agilent	U2021XA	MRTSUE06595	1 year	2021/09/26
USB wideband power sensor	Agilent	U2021XA	MRTSUE06596	1 year	2021/09/26
Attenuator	MVE	20dB	MRTSUE06547	1 year	2021/05/20
Attenuator	MVE	6dB	MRTSUE06532	1 year	2021/05/20
Attenuator	MVE	10dB	MRTSUE06540	1 year	2021/05/20
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/10/20
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2021/06/11
Temperature Chamber	BAOYT	BYG-408CS	MRTSUE06847	1 year	2021/03/31
Thermal Hygrometer	testo	622	MRTSUE06629	1 year	2020/12/30

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 Disturbance
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 Limit	Test Condition	Test Result	Reference
15.407(a)	26dB Bandwidth	N/A	Conducted	Pass	Section 6.2
15.407(e)	6dB Bandwidth	≥ 500kHz		Pass	Section 6.3
15.407(a)(1)(ii), (1)(iii), (3)	Maximum Conducted Output Power	Refer to Section 6.4		Pass	Section 6.4
15.407(a)(1)(ii), (1)(iii), (3), (12)	Peak Power Spectral Density	Refer to Section 6.6		Pass	Section 6.5
15.407(g)	Frequency Stability	N/A		Pass	Section 6.6
15.407(b)(1), (4)(i)	Undesirable Emissions	Refer to Section 7.8 & 7.9	Radiated	Pass	Section 6.7 & 6.8
15.205, 15.209 15.407(b)(1), (4)(i), (7), (8)	General Field Strength Limits(Restricted Bands andRadiated Emission Limits)			Pass	
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	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 ofthe 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 “Occupied Bandwidth” and “Frequency Stability” test item, only the worst port was performed in the report.
4) Dipole antenna was selected to perform all RF testing that can be obtained maximum power setting, panel antenna was selected to perform radiated spurious emission. High gain antenna power setting will be obtained by calculating fallback refer to difference value of antenna gain.

6.2. 26dB Bandwidth Measurement

6.2.1.Test Limit

N/A

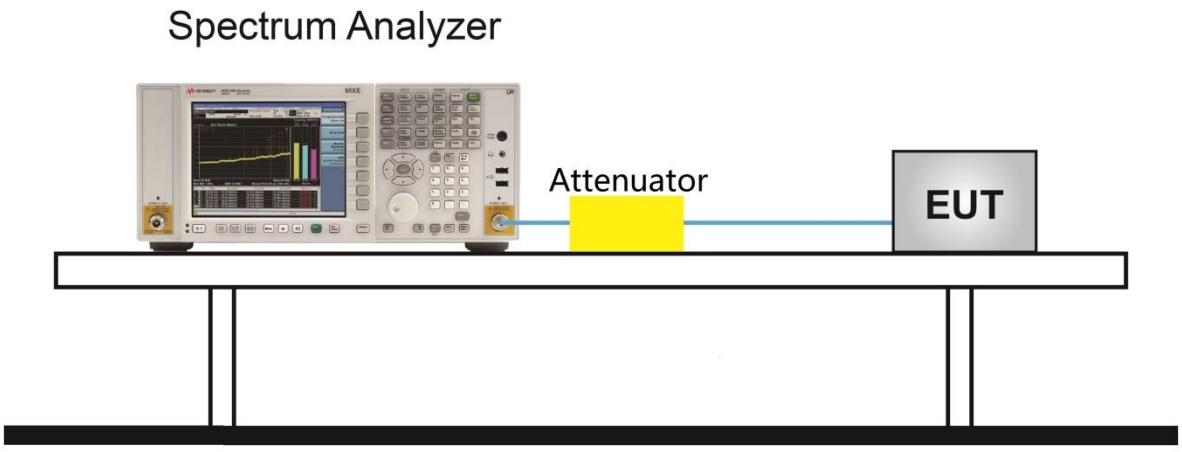
6.2.2.Test Procedure Used

KDB 789033 D02v02r01 -Section C.1

6.2.3.Test Setting

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 ≥ 3×RBW.
4. Detector = Peak.
5. Trace mode = max hold.

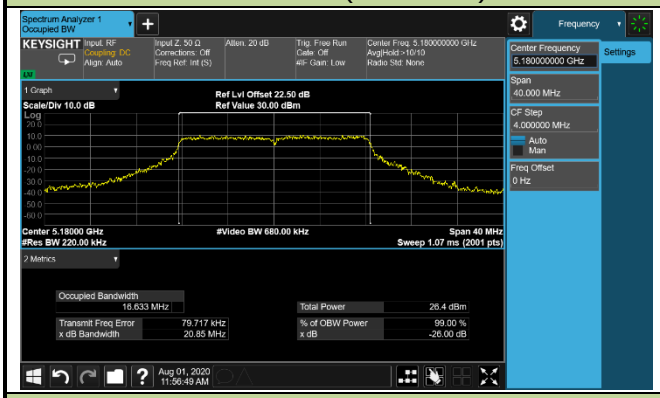
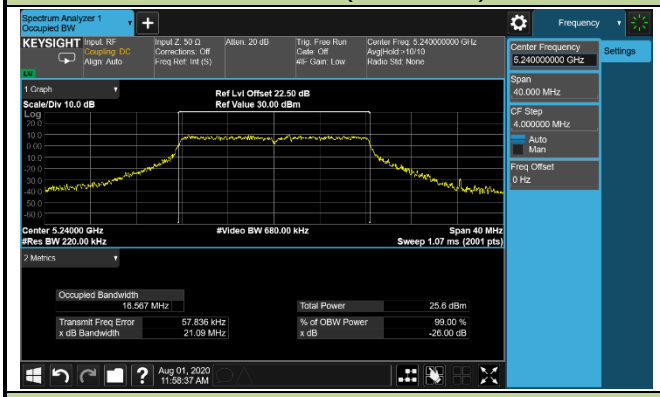
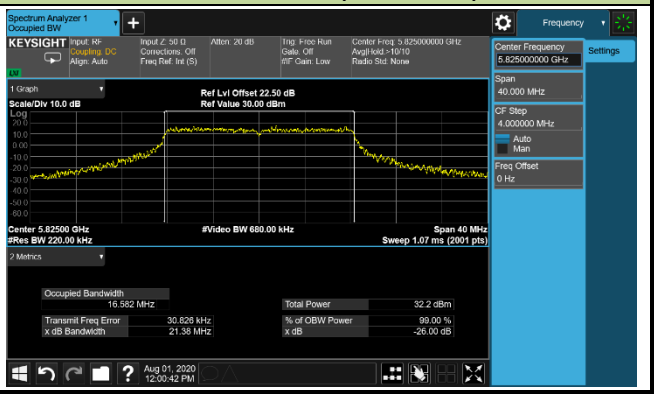
6.2.4.Test Setup

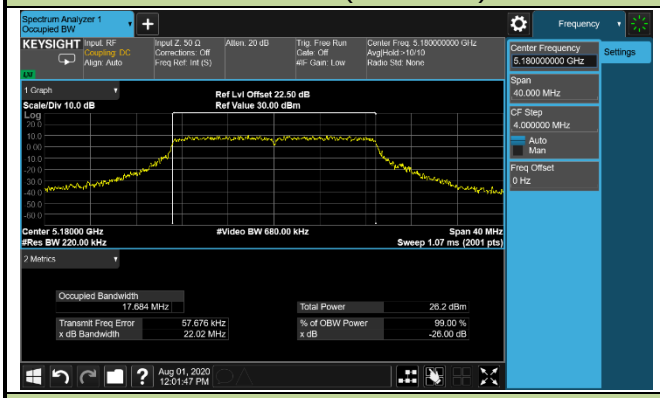
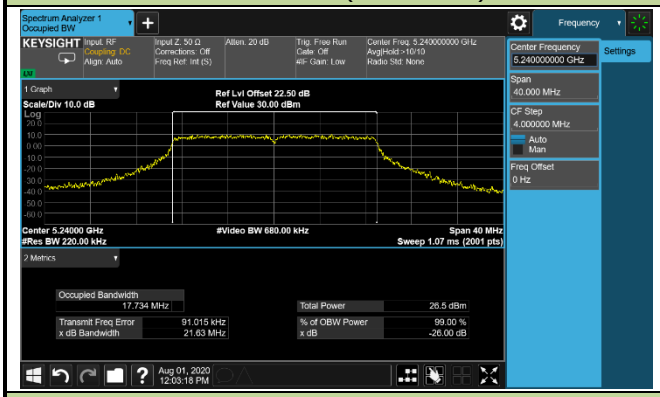
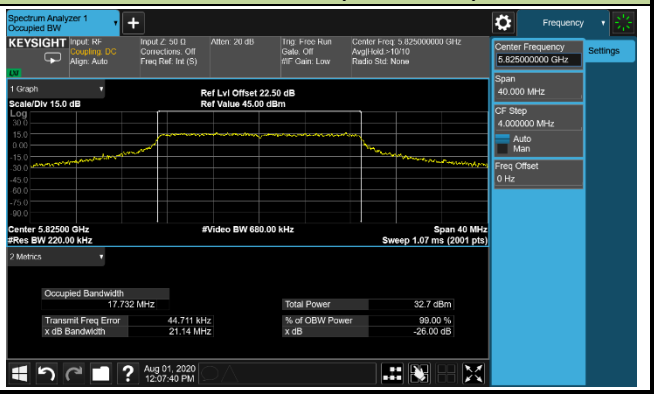


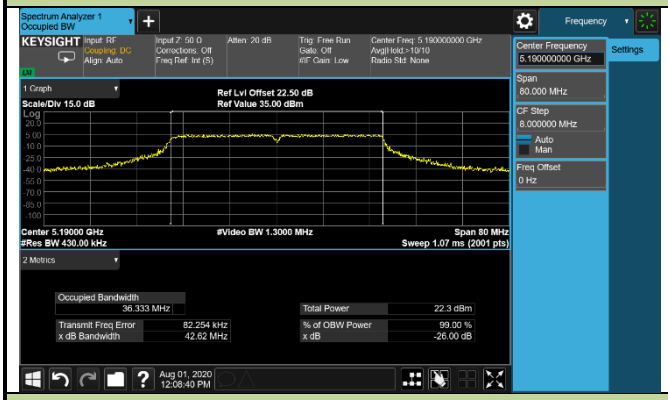
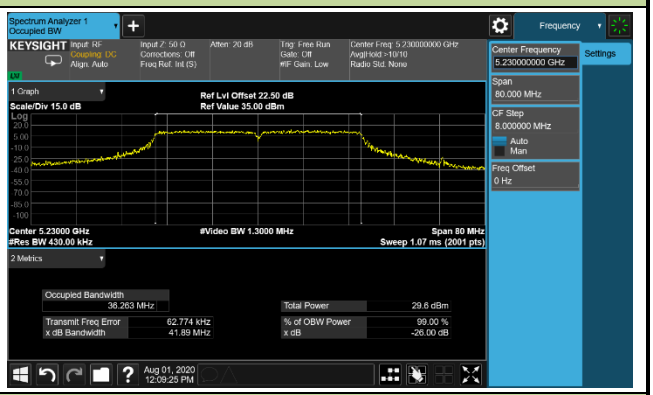
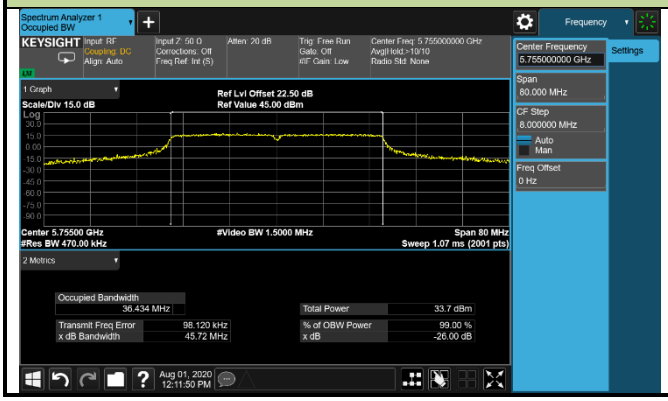
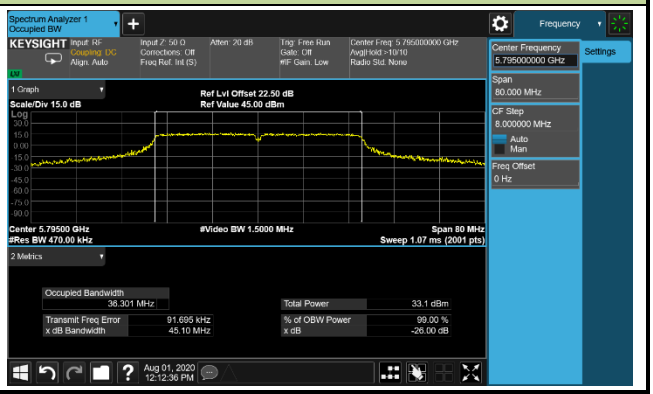
6.2.5.Test Result

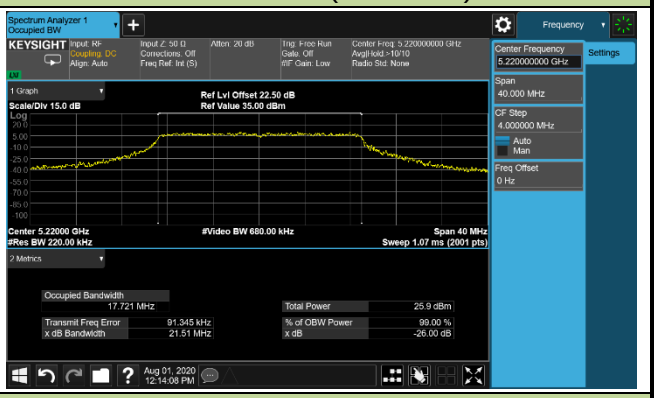
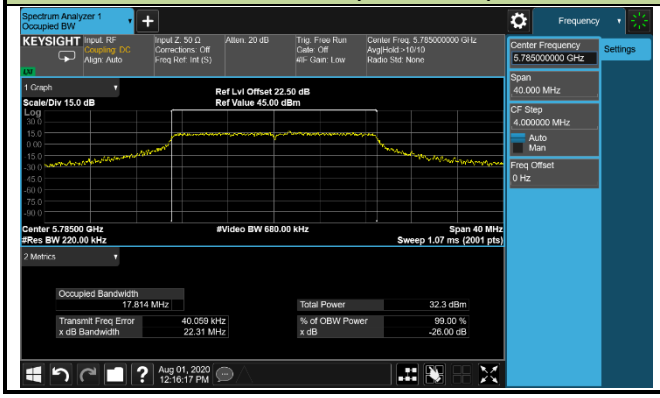
Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Test Site	SIP-SR5
Test Engineer	Alisa Deng	Test Date	2020/08/01

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)
Ant 0 / Ant 0 + 1				
802.11a	6Mbps	36	5180	20.85
802.11a	6Mbps	44	5220	20.67
802.11a	6Mbps	48	5240	21.09
802.11a	6Mbps	149	5745	22.07
802.11a	6Mbps	157	5785	21.71
802.11a	6Mbps	165	5825	21.38
802.11n-HT20	MCS0	36	5180	22.02
802.11n-HT20	MCS0	44	5220	21.91
802.11n-HT20	MCS0	48	5240	21.63
802.11n-HT20	MCS0	149	5745	21.84
802.11n-HT20	MCS0	157	5785	21.87
802.11n-HT20	MCS0	165	5825	21.14
802.11n-HT40	MCS0	38	5190	42.62
802.11n-HT40	MCS0	46	5230	41.89
802.11n-HT40	MCS0	151	5755	45.72
802.11n-HT40	MCS0	159	5795	45.10
802.11ac-VHT20	MCS0	36	5180	22.13
802.11ac-VHT20	MCS0	44	5220	21.51
802.11ac-VHT20	MCS0	48	5240	22.14
802.11ac-VHT20	MCS0	149	5745	21.53
802.11ac-VHT20	MCS0	157	5785	22.31
802.11ac-VHT20	MCS0	165	5825	22.29
802.11ac-VHT40	MCS0	38	5190	43.41
802.11ac-VHT40	MCS0	46	5230	43.17
802.11ac-VHT40	MCS0	151	5755	46.00
802.11ac-VHT40	MCS0	159	5795	44.46
802.11ac-VHT80	MCS0	42	5210	85.57
802.11ac-VHT80	MCS0	155	5775	85.95

802.11a 26dB Bandwidth - Ant 0 / Ant 0 + 1	
Channel 36 (5180MHz)	Channel 44 (5220MHz)
	
Channel 48 (5240MHz)	Channel 149 (5745MHz)
	
Channel 157 (5785MHz)	Channel 165 (5825MHz)
	

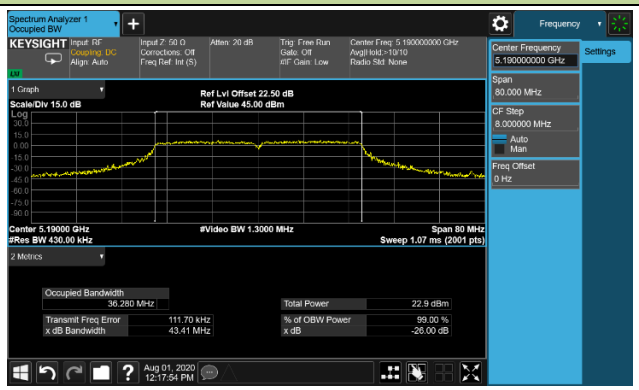
802.11n-HT20 26dB Bandwidth - Ant 0 / Ant 0 + 1	
Channel 36 (5180MHz)	Channel 44 (5220MHz)
	
Channel 48 (5240MHz)	Channel 149 (5745MHz)
	
Channel 157 (5785MHz)	Channel 165 (5825MHz)
	

802.11n-HT40 26dB Bandwidth - Ant 0 / Ant 0 + 1	
Channel 38 (5190MHz)	Channel 46 (5230MHz)
	
Channel 151 (5755MHz)	Channel 159 (5795MHz)
	

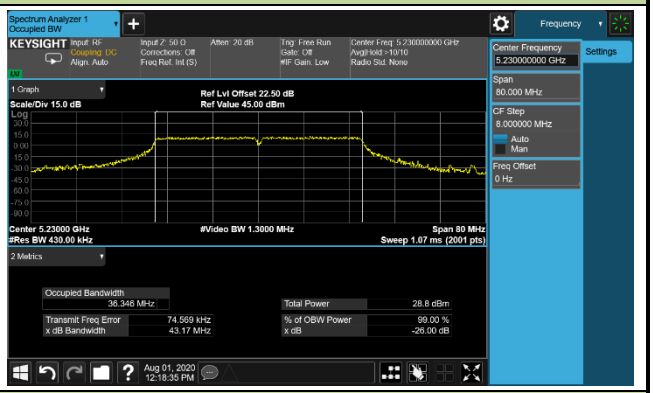
802.11ac-VHT20 26dB Bandwidth - Ant 0 / Ant 0 + 1	
Channel 36 (5180MHz)	Channel 44 (5220MHz)
	
Channel 48 (5240MHz)	Channel 149 (5745MHz)
	
Channel 157 (5785MHz)	Channel 165 (5825MHz)
	

802.11ac-VHT40 26dB Bandwidth - Ant 0 / Ant 0 + 1

Channel 38 (5190MHz)

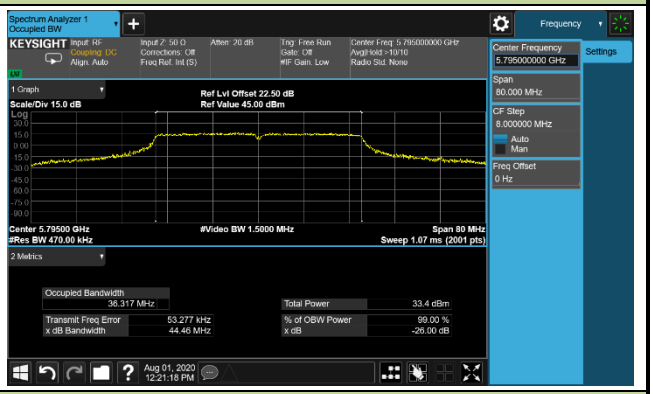


Channel 46 (5230MHz)



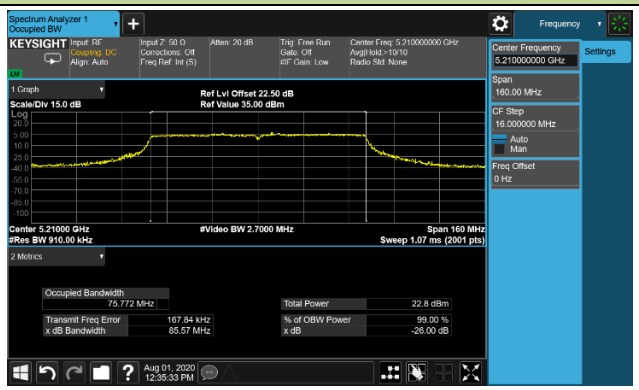
Channel 151 (5755MHz)

Channel 159 (5795MHz)

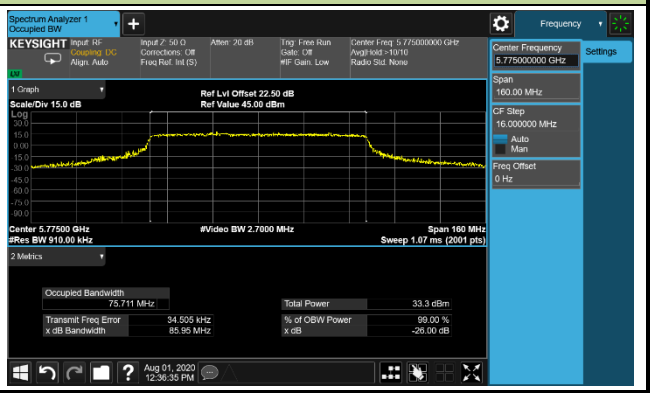


802.11ac-VHT80 26dB Bandwidth - Ant 0 / Ant 0 + 1

Channel 42 (5210MHz)



Channel 155 (5775MHz)



6.3. 6dB Bandwidth Measurement

6.3.1.Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

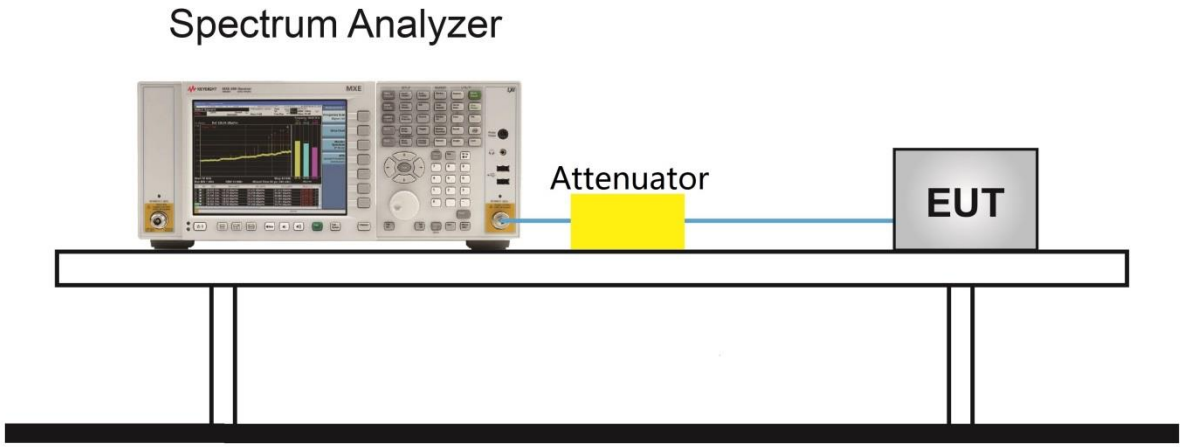
6.3.2.Test Procedure Used

KDB 789033 D02v02r01 - Section C.2

6.3.3.Test Setting

1. Set center frequency to the nominal EUT channel center frequency.
2. RBW = 100 kHz.
3. VBW≥3×RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

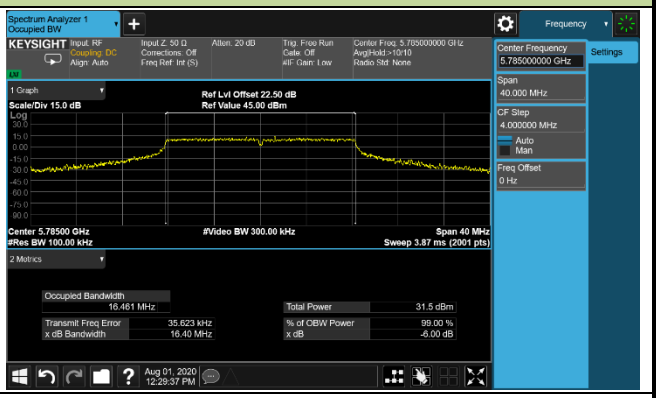
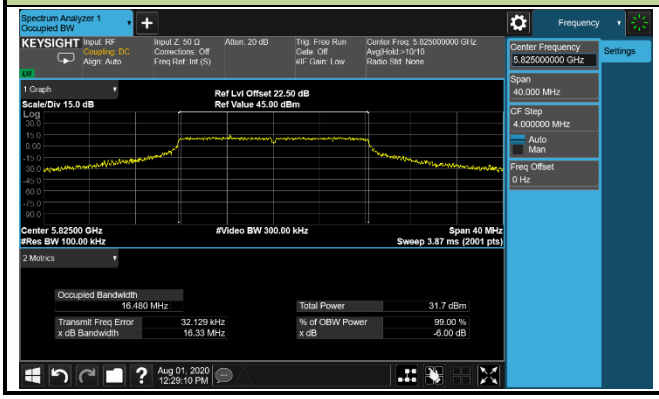
6.3.4.Test Setup



6.3.5.Test Result

Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Test Site	SIP-SR5
Test Engineer	Alisa Deng	Test Date	2020/08/01

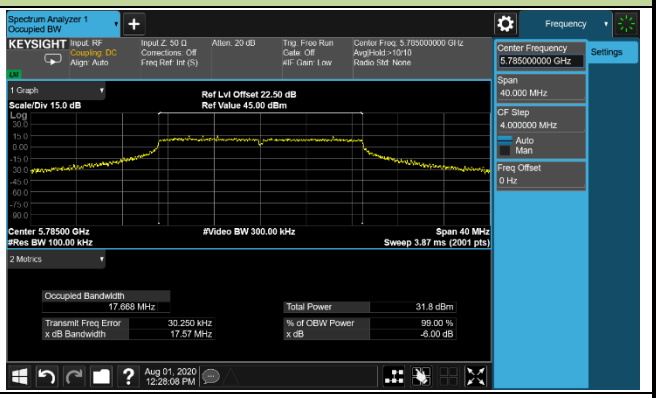
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Ant 0 / Ant 0 + 1						
802.11a	6Mbps	149	5745	16.36	≥ 0.5	Pass
802.11a	6Mbps	157	5785	16.40	≥ 0.5	Pass
802.11a	6Mbps	165	5825	16.33	≥ 0.5	Pass
802.11n-HT20	MCS0	149	5745	17.31	≥ 0.5	Pass
802.11n-HT20	MCS0	157	5785	17.57	≥ 0.5	Pass
802.11n-HT20	MCS0	165	5825	17.30	≥ 0.5	Pass
802.11n-HT40	MCS0	151	5755	35.78	≥ 0.5	Pass
802.11n-HT40	MCS0	159	5795	36.29	≥ 0.5	Pass
802.11ac-VHT20	MCS0	149	5745	17.59	≥ 0.5	Pass
802.11ac-VHT20	MCS0	157	5785	17.57	≥ 0.5	Pass
802.11ac-VHT20	MCS0	165	5825	17.13	≥ 0.5	Pass
802.11ac-VHT40	MCS0	151	5755	35.59	≥ 0.5	Pass
802.11ac-VHT40	MCS0	159	5795	35.92	≥ 0.5	Pass
802.11ac-VHT80	MCS0	155	5775	72.55	≥ 0.5	Pass

802.11a 6dB Bandwidth - Ant 0 / Ant 0 + 1	
Channel 149 (5745MHz)	Channel 157 (5785MHz)
	
Channel 165 (5825MHz)	
	

802.11n-HT20 6dB Bandwidth - Ant 0 / Ant 0 + 1

Channel 149 (5745MHz)

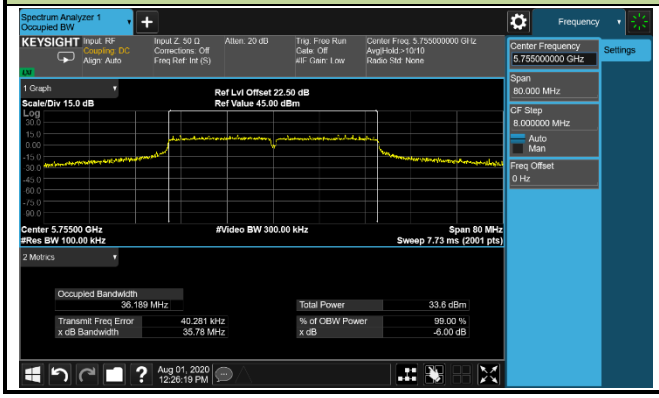
Channel 157 (5785MHz)



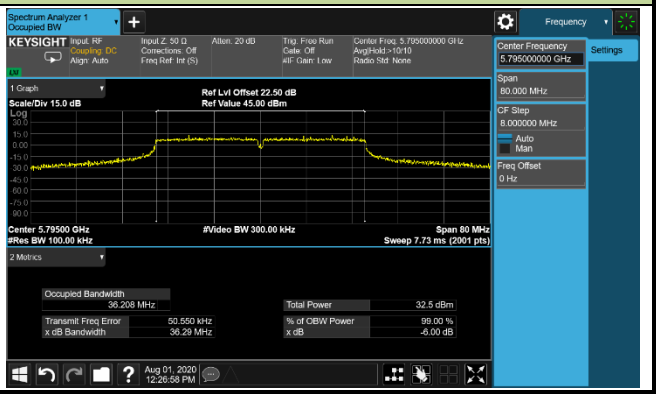
Channel 165 (5825MHz)

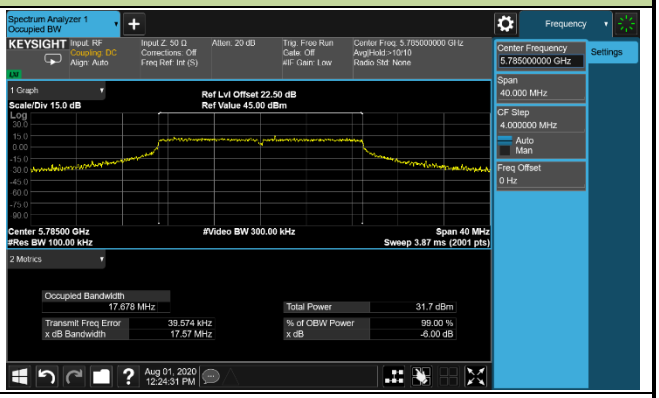
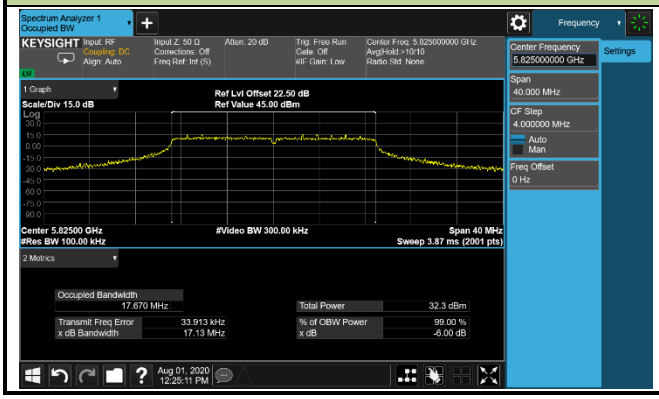
802.11n-HT40 6dB Bandwidth - Ant 0 / Ant 0 + 1

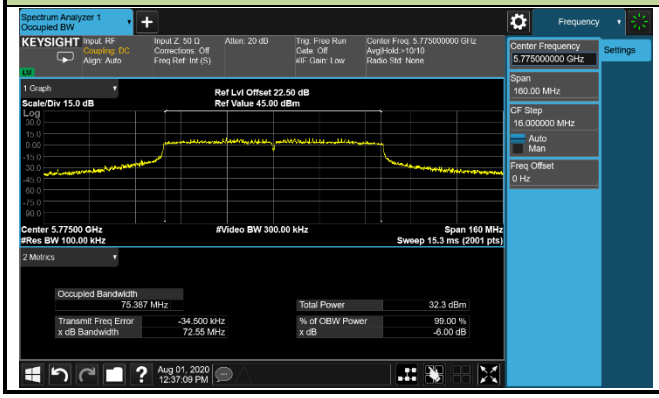
Channel 151 (5755MHz)



Channel 159 (5795MHz)



802.11ac-VHT20 6dB Bandwidth - Ant 0 / Ant 0 + 1	
Channel 149 (5745MHz)	Channel 157 (5785MHz)
	
Channel 165 (5825MHz)	
	

802.11ac-VHT40 6dB Bandwidth - Ant 0 / Ant 0 + 1	
Channel 151 (5755MHz)	Channel 159 (5795MHz)
	
802.11ac-VHT80 6dB Bandwidth - Ant 0 / Ant 0 + 1	
Channel 155 (5775MHz)	
	

6.4. Output Power Measurement

6.4.1.Test Limit

For an indoor access point operating in the band 5.15-5.25 GHz, the maximumconducted output power over the frequency band of operation shall not exceed 1 Wprovided the maximum antenna gain does not exceed 6 dBi.If transmitting antennas of directional gain greater than 6dBi are used, the maximumconducted output power shall be reduced by the amount in dB that the directional gain of theantenna exceeds 6dBi.

For fixed point-to-point access points operating in the band 5.15-5.25 GHz, themaximum conducted output power over the frequency band of operation shall not exceed1 W. Fixed point-to-point U-NII devices may employ antennas with directionalgain up to 23 dBi without any corresponding reduction in the maximum conducted outputpower

For the band 5.725-5.85 GHz, the maximum conducted output power over thefrequency band of operation shall not exceed 1 W. If transmitting antennas ofdirectional gain greater than 6 dBi are used, the maximum conducted output powershall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.

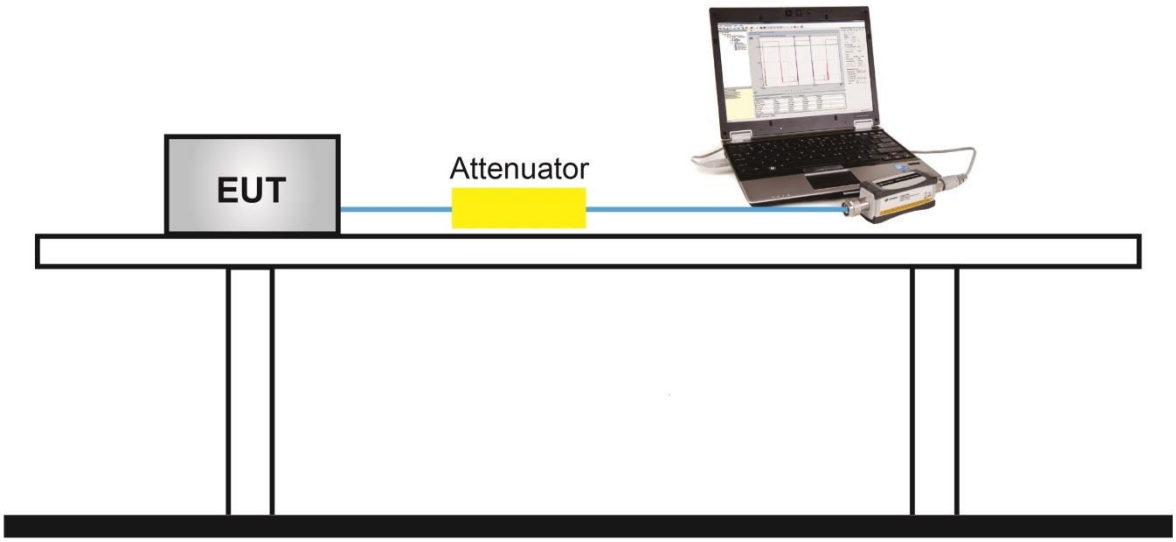
6.4.2.Test Procedure Used

KDB 789033D02v02r01- Section E)3)b) Method PM-G

6.4.3.Test Setting

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

6.4.4.Test Setup



6.4.5.Test Result

Output power test was verified over all data rates of each mode shown as below table, and then choose the maximum outputpower (gray marker) for final test of each channel.

Ant 0/ Ant 0 + 1 - 802.11a - Channel 36 (5180MHz)			
Date Rate(Mbps)	6	24	54
Power (dBm)	14.02	13.85	13.54

Ant 0/ Ant 0 + 1 - 802.11n-HT20 - Channel 36 (5180MHz)			
Date Rate(MCS)	MCS0	MCS3	MCS7
Power (dBm)	13.42	13.22	13.01

Ant 0/ Ant 0 + 1 - 802.11n-HT40 - Channel 38 (5190MHz)			
Date Rate(MCS)	MCS0	MCS3	MCS7
Power (dBm)	14.84	14.62	14.39

Ant 0/ Ant 0 + 1 - 802.11ac-VHT20 - Channel 36 (5180MHz)			
Date Rate(MCS)	MCS0	MCS4	MCS8
Power (dBm)	14.10	13.88	13.71

Ant 0/ Ant 0 + 1 - 802.11ac-VHT40 - Channel 38 (5190MHz)			
Date Rate(MCS)	MCS0	MCS5	MCS9
Power (dBm)	15.02	14.74	14.51

Ant 0/ Ant 0 + 1 - 802.11ac-VHT80 - Channel 42 (5210MHz)			
Date Rate(MCS)	MCS0	MCS5	MCS9
Power (dBm)	13.21	12.95	12.84

Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Test Site	SIP-SR5
Test Engineer	Alisa Deng	Test Date	2020/08/01~2020/08/31
Antenna Type	Dipole Antenna(P-T-MP Access Point Operation)		

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Ant0 Average Power (dBm)	Ant1 Average Power (dBm)	Total Average Power (dBm)	Average Power Limit (dBm)	Result
11a	6Mbps	36	5180	20.36	19.83	23.11	≤29.00	Pass
11a	6Mbps	44	5220	20.24	19.69	22.98	≤29.00	Pass
11a	6Mbps	48	5240	20.20	19.60	22.92	≤29.00	Pass
11a	6Mbps	149	5745	26.97	26.14	29.59	≤30.00	Pass
11a	6Mbps	157	5785	26.91	26.58	29.76	≤30.00	Pass
11a	6Mbps	165	5825	26.02	26.66	29.36	≤30.00	Pass
11n-HT20	MCS0	36	5180	20.53	20.02	23.29	≤29.00	Pass
11n-HT20	MCS0	44	5220	20.97	20.13	23.58	≤29.00	Pass
11n-HT20	MCS0	48	5240	21.13	20.10	23.66	≤29.00	Pass
11n-HT20	MCS0	149	5745	26.99	26.24	29.64	≤30.00	Pass
11n-HT20	MCS0	157	5785	27.00	26.44	29.74	≤30.00	Pass
11n-HT20	MCS0	165	5825	26.03	26.51	29.29	≤30.00	Pass
11n-HT40	MCS0	38	5190	16.46	16.23	19.36	≤29.00	Pass
11n-HT40	MCS0	46	5230	23.45	23.21	26.34	≤29.00	Pass
11n-HT40	MCS0	151	5755	26.97	26.67	29.83	≤30.00	Pass
11n-HT40	MCS0	159	5795	26.71	26.47	29.60	≤30.00	Pass
11ac-VHT20	MCS0	36	5180	20.31	20.07	23.20	≤29.00	Pass
11ac-VHT20	MCS0	44	5220	20.67	20.13	23.42	≤29.00	Pass
11ac-VHT20	MCS0	48	5240	20.83	20.04	23.46	≤29.00	Pass
11ac-VHT20	MCS0	149	5745	26.96	26.41	29.70	≤30.00	Pass
11ac-VHT20	MCS0	157	5785	26.73	26.15	29.46	≤30.00	Pass
11ac-VHT20	MCS0	165	5825	26.03	26.55	29.31	≤30.00	Pass
11ac-VHT40	MCS0	38	5190	16.96	16.39	19.69	≤29.00	Pass
11ac-VHT40	MCS0	46	5230	22.94	22.38	25.68	≤29.00	Pass
11ac-VHT40	MCS0	151	5755	26.90	26.35	29.64	≤30.00	Pass
11ac-VHT40	MCS0	159	5795	26.97	26.28	29.65	≤30.00	Pass
11ac-VHT80	MCS0	42	5210	15.40	14.41	17.94	≤29.00	Pass
11ac-VHT80	MCS0	155	5775	25.37	24.73	28.07	≤30.00	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: For NII-1 band, Limit = 30 dBm - (7 dBi – 6 dBi) = 29 dBm.

For NII-3 band, Limit = 30 dBm - (6 dBi – 6 dBi) = 30 dBm.

Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Test Site	SIP-SR5
Test Engineer	Alisa Deng	Test Date	2020/08/01~2020/08/31
Antenna Type	Panel Antenna (P-T-P Access Point Operation)		

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Ant0 Average Power (dBm)	Ant1 Average Power (dBm)	Total Average Power (dBm)	Average Power Limit (dBm)	Result
11a	6Mbps	36	5180	5.88	6.16	9.03	≤30.00	Pass
11a	6Mbps	44	5220	7.20	7.43	10.33	≤30.00	Pass
11a	6Mbps	48	5240	7.34	7.22	10.29	≤30.00	Pass
11a	6Mbps	149	5745	9.22	8.91	12.08	≤30.00	Pass
11a	6Mbps	157	5785	8.09	8.70	11.42	≤30.00	Pass
11a	6Mbps	165	5825	14.10	15.77	18.03	≤30.00	Pass
11n-HT20	MCS0	36	5180	7.63	8.16	10.91	≤30.00	Pass
11n-HT20	MCS0	44	5220	7.61	7.49	10.56	≤30.00	Pass
11n-HT20	MCS0	48	5240	7.16	7.33	10.26	≤30.00	Pass
11n-HT20	MCS0	149	5745	9.43	9.32	12.39	≤30.00	Pass
11n-HT20	MCS0	157	5785	8.23	9.14	11.72	≤30.00	Pass
11n-HT20	MCS0	165	5825	15.56	17.11	19.41	≤30.00	Pass
11n-HT40	MCS0	38	5190	4.58	4.77	7.69	≤30.00	Pass
11n-HT40	MCS0	46	5230	5.89	5.84	8.88	≤30.00	Pass
11n-HT40	MCS0	151	5755	13.05	13.16	16.12	≤30.00	Pass
11n-HT40	MCS0	159	5795	18.98	20.15	22.61	≤30.00	Pass
11ac-VHT20	MCS0	36	5180	6.20	6.45	9.34	≤30.00	Pass
11ac-VHT20	MCS0	44	5220	7.76	7.64	10.71	≤30.00	Pass
11ac-VHT20	MCS0	48	5240	7.44	7.26	10.36	≤30.00	Pass
11ac-VHT20	MCS0	149	5745	10.53	10.96	13.76	≤30.00	Pass
11ac-VHT20	MCS0	157	5785	9.38	10.71	13.11	≤30.00	Pass
11ac-VHT20	MCS0	165	5825	14.90	16.65	18.87	≤30.00	Pass
11ac-VHT40	MCS0	38	5190	4.76	5.15	7.97	≤30.00	Pass
11ac-VHT40	MCS0	46	5230	6.48	6.89	9.70	≤30.00	Pass
11ac-VHT40	MCS0	151	5755	12.84	12.93	15.90	≤30.00	Pass
11ac-VHT40	MCS0	159	5795	14.87	15.70	18.32	≤30.00	Pass
11ac-VHT80	MCS0	42	5210	7.96	8.11	11.05	≤30.00	Pass
11ac-VHT80	MCS0	155	5775	11.10	11.97	14.57	≤30.00	Pass

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

6.5. Power Spectral Density Measurement

6.5.1.Test Limit

For an indoor access point operating in the band 5.15-5.25 GHz, the maximumpower spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmittingantennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount indB that the directional gain of the antenna exceeds 6 dBi.

For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1megahertz band. Fixed point-to-point U-NII devices may employ antennas with directionalgain up to 23 dBi without any corresponding reduction in the maximum power spectral density.

For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz 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 theantenna exceeds 6dBi.However, fixed point-to-point U-NII devicesoperating in this band may employ transmitting antennas with directional gain greater than6 dBi without any corresponding reduction in transmitter conducted power.

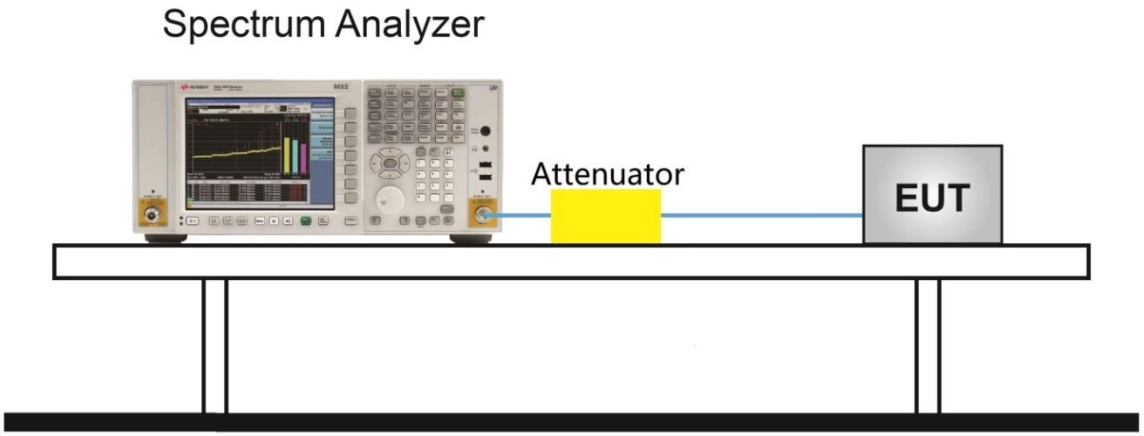
6.5.2.Test Procedure Used

KDB 789033 D02v02r01 - Section F

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, if measurement bandwidth of Maximum PSD is specified in 500 kHz, RBW = 510 kHz
4. VBW = 3MHz
5. Number of sweep points ≥ 2 × (span / RBW)
6. Detector = power averaging (Average)
7. Sweep time = auto
8. Trigger = free run
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	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Test Date	2020/07/31~2020/08/29
Test Engineer	Alisa Deng	Antenna Type	Dipole Antenna
Test Item	Power Spectral Density (NII-1Band)		

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
11a	6Mbps	36	5180	9.83	9.46	96.42	12.82	≤ 12.99	Pass
11a	6Mbps	44	5220	9.85	8.88	96.42	12.56	≤ 12.99	Pass
11a	6Mbps	48	5240	9.59	9.20	96.42	12.57	≤ 12.99	Pass
11n-HT20	MCS0	36	5180	9.47	8.83	91.95	12.54	≤ 12.99	Pass
11n-HT20	MCS0	44	5220	9.55	9.07	91.95	12.69	≤ 12.99	Pass
11n-HT20	MCS0	48	5240	9.59	9.27	91.95	12.81	≤ 12.99	Pass
11n-HT40	MCS0	38	5190	2.48	1.99	89.93	5.71	≤ 12.99	Pass
11n-HT40	MCS0	46	5230	9.28	8.91	89.93	12.57	≤ 12.99	Pass
11ac-VHT20	MCS0	36	5180	9.40	8.97	93.12	12.51	≤ 12.99	Pass
11ac-VHT20	MCS0	44	5220	9.97	9.20	93.12	12.92	≤ 12.99	Pass
11ac-VHT20	MCS0	48	5240	9.75	9.28	93.12	12.84	≤ 12.99	Pass
11ac-VHT40	MCS0	38	5190	2.78	2.76	93.14	6.09	≤ 12.99	Pass
11ac-VHT40	MCS0	46	5230	9.34	9.50	93.14	12.74	≤ 12.99	Pass
11ac-VHT80	MCS0	42	5210	-2.47	-2.86	80.46	1.30	≤ 12.99	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: For NII-1 Band: PSD Limit = 17dBm/MHz - (10.01dBi - 6dBi) = 12.99dBm/MHz.

Product	WIRELESS-AC 2X2 27DBM NETWORK MINI PCIE ADAPTER	Test Site	SIP-SR5
Test Engineer	Alisa Deng	Test Date	2020/07/31~2020/08/01
Test Item	Power Spectral Density (NII-3 Band)	Antenna Type	Dipole Antenna

Test Mode	Data Rate/ MCS	Ch. No.	Freq. (MHz)	Ant 0 PSD (dBm/ 510kHz)	Ant 1 PSD (dBm/ 510kHz)	Duty Cycle (%)	Total PSD(dBm/ 510kHz)	PSD Limit (dBm/ 500kHz)	Result
11a	6Mbps	149	5745	13.42	12.72	96.42	16.25	≤26.99	Pass
11a	6Mbps	157	5785	13.26	13.12	96.42	16.36	≤26.99	Pass
11a	6Mbps	165	5825	13.20	15.10	96.42	17.42	≤26.99	Pass
11n-HT20	MCS0	149	5745	13.03	12.75	91.95	16.27	≤26.99	Pass
11n-HT20	MCS0	157	5785	12.26	12.39	91.95	15.70	≤26.99	Pass
11n-HT20	MCS0	165	5825	12.35	12.12	91.95	15.61	≤26.99	Pass
11n-HT40	MCS0	151	5755	9.29	9.15	89.93	12.69	≤26.99	Pass
11n-HT40	MCS0	159	5795	9.68	8.76	89.93	12.71	≤26.99	Pass
11ac-VHT20	MCS0	149	5745	13.24	12.65	93.12	16.27	≤26.99	Pass
11ac-VHT20	MCS0	157	5785	13.03	12.71	93.12	16.19	≤26.99	Pass
11ac-VHT20	MCS0	165	5825	12.13	13.03	93.12	15.93	≤26.99	Pass
11ac-VHT40	MCS0	151	5755	10.23	9.57	93.14	13.23	≤26.99	Pass
11ac-VHT40	MCS0	159	5795	9.58	9.83	93.14	13.02	≤26.99	Pass
11ac-VHT80	MCS0	155	5775	6.02	5.74	80.46	9.84	≤26.99	Pass

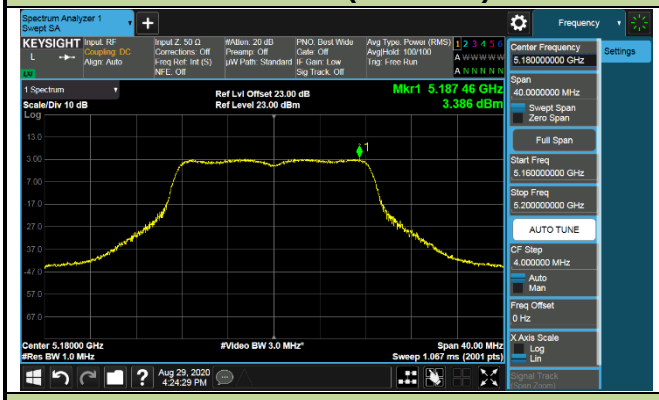
Note 1: When EUT duty cycle ≥ 98%, Total PSD (dBm/510kHz) = 10*log $\{10^{(\text{Ant 0 PSD}/10)} + 10^{(\text{Ant 1 PSD}/10))}\}$ (dBm/510kHz).

Note 2: When EUT duty cycle < 98%, Total PSD (dBm/510kHz) = 10*log $\{10^{(\text{Ant 0 PSD}/10)} + 10^{(\text{Ant 1 PSD}/10)}\}$ (dBm/510kHz)+ 10*log (1/Duty Cycle).

Note 3: PSD Limit = 30dBm/500kHz - (9.01dBi - 6dBi) = 26.99dBm/500kHz.

802.11a Power Spectral Density - Ant 0 / Ant 0 + 1

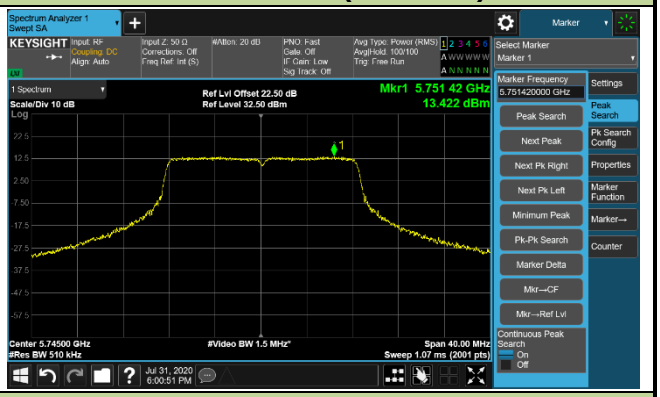
Channel 36 (5180MHz)



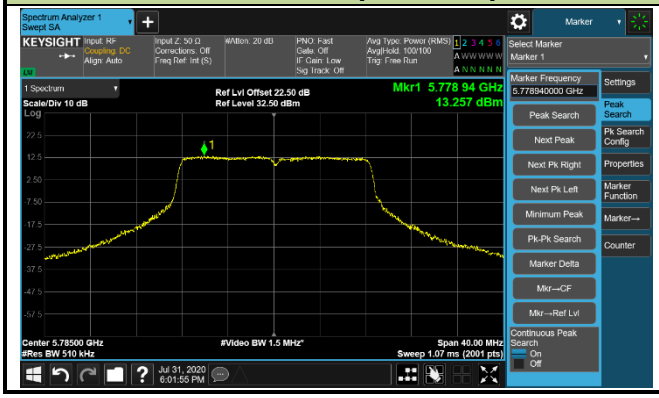
Channel 44 (5220MHz)

Channel 48 (5240MHz)

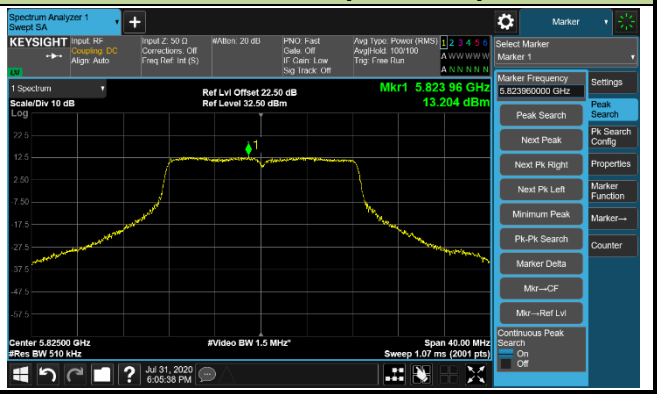
Channel 149 (5745MHz)



Channel 157 (5785MHz)



Channel 165 (5825MHz)



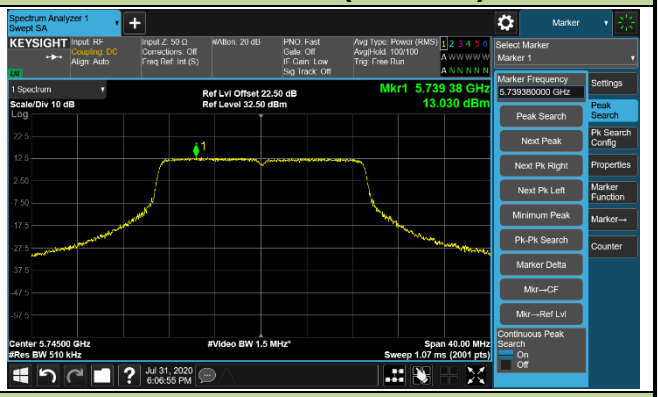
802.11n-HT20 Power Spectral Density - Ant 0 / Ant 0 + 1

Channel 36 (5180MHz)

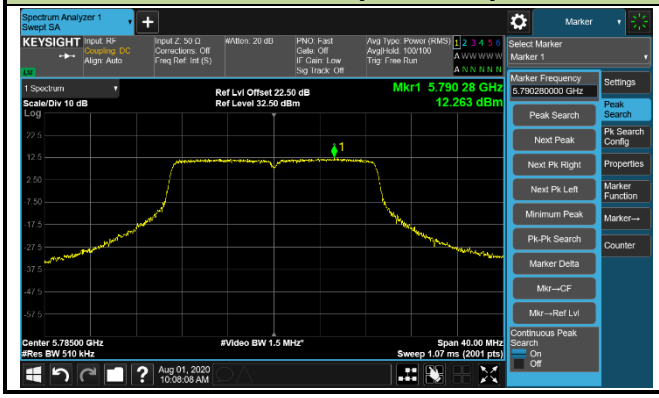
Channel 44 (5220MHz)

Channel 48 (5240MHz)

Channel 149 (5745MHz)



Channel 157 (5785MHz)



Channel 165 (5825MHz)