FCC 47 CFR PART 15 SUBPART E

CERTIFICATION TEST REPORT

For

Outdoor Wireless LAN Access Point

MODEL NUMBER: AP8030DN

FCC ID: QISAP8030DN

REPORT NUMBER: 4788310840.1-3

ISSUE DATE: July 15, 2018

Prepared for

HUAWEI TECHNOLOGIES CO., LTD.
Administration Building, Huawei Technologies Co., Ltd. Bantian, Longgang District, Shenzhen, P.R. China, 518129

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
Rv1	04/26/2018	Initial Issue	
--	07/15/2018	Added 6.4 chapters to upgrade data from sections 6.3 and 6.5	Miller. Ma

Summary of Test Results			
Clause	Test Items	FCC/IC Rules	Test Results
1	6/26db Bandwidth	FCC 15.407 (a)&(e) RSS-247 Clause 6.2	PASS
2	99% Bandwidth	RSS-Gen Clause 6.6	PASS
3	Maximum Conducted Output Power	FCC 15.407 (a) RSS-247 Clause 6.2	PASS
4	Power Spectral Density	FCC 15.407 (a) RSS-247 Clause 6.2	PASS
5	Antenna Conducted Spurious Emission	FCC 15.407 (b) RSS-247 Clause 6.2	PASS
6	Radiated Bandedge and Spurious Emission	FCC 15.407 (a) FCC 15.209 FCC 15.205 RSS-247 Clause 6.2 RSS-GEN Clause 8.9	PASS
7	Conducted Emission Test For AC Power Port	FCC 15.207 RSS-GEN Clause 8.8	PASS
8	Antenna Requirement	FCC 15.203 RSS-GEN Clause 8.3	PASS
9	Frequency Stability	FCC 15.407 (g)	PASS

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: HUAWEI TECHNOLOGIES CO., LTD.

Address: Administration Building, Huawei Technologies Co., Ltd. Bantian, Longgang District, Shenzhen, P.R. China, 518129

Manufacturer Information

Company Name: HUAWEI TECHNOLOGIES CO., LTD.

Address: Administration Building, Huawei Technologies Co., Ltd. Bantian, Longgang District, Shenzhen, P.R. China, 518129

EUT Description

EUT Name:	Outdoor Wireless LAN Access Point
Model:	AP8030DN
Brand Name:	HUAWEI
Sample Status:	Normal
Sample ID:	1358586
Sample Received Date:	January 04, 2018
Date of Tested:	January 04, 2018~ July 15, 2018

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E	PASS

Tested By:

Miller Ma

Miller Ma
Engineer Project Associate

Checked By:

Shawn Wen
Operations Leader

Approved By:

Stephen Guo

Operations Manager

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB 789033 D02, KDB 662911 D01 v02r01, RSS-GEN Issue 4, RSS-247 Issue 2 and KDB414788 D01 Radiated Test Site v01.

3. FACILITIES AND ACCREDITATIO

Accreditation Certificate	**A2LA (Certificate No.: 4102.01)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1187)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Delcaration of Conformity (DoC) and Certification rules **IC(Company No.: 21320)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with Industry Canada. The Company Number is 21320. **VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011

Note 1: All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

Note 2: The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

Note 3: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30MHz had been correlated to measurements performed on an OATS.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognize national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.90dB
Uncertainty for Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	2.2dB
Uncertainty for Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	4.52dB
Uncertainty for Radiation Emission test (1GHz to 40GHz)(include Fundamental emission)	5.04dB(1-6GHz)
	5.30dB (6GHz-18Gz)
	5.23dB (18GHz-26Gz)
	5.64dB (26GHz-40Gz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Equipment	Outdoor Wireless LAN Access Point		
EUT Description	The EUT is an Access Point for outdoor use.		
Model Name	AP8030DN		
Power Supply	Power Adapter	Input	AC 100~240V, 50~60Hz, 1.0A
		Output	DC 48V, 0.65A
Hardware Version	VER.C		
Software Version	V200		

5.2. CHANNEL LIST

20 MHz Bandwidth Channel frequencies		
Band	Channel	Frequency (MHz)
UNII-1	36	5180
	40	5200
	44	5220
	48	5240
UNII-3	149	5745
	153	5765
	157	5785
	161	5805
	165	5825

40 MHz Bandwidth Channel frequencies		
Band	Channel	Frequency (MHz)
UNII-1	38	5190
	46	5230
UNII-3	151	5755
	159	5795

80 MHz Bandwidth Channel frequencies		
Band	Channel	Frequency (MHz)
UNII-1	42	5210
UNII-3	155	5775

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
A	5180-5350	Omni-Directional	11.5
	5745-5825	Omni-Directional	11.5

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
B	5180-5350	Omni-Directional	11.5
	5745-5825	Omni-Directional	11.5

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
C	5180-5350	Omni-Directional	11.5
	5745-5825	Omni-Directional	11.5

Test Mode	Transmit and Receive Mode	Description
802.11a	3TX, 3RX	Antenna A, Antenna B and Antenna C can be used as transmitting/receiving antenna.
802.11n HT20	3TX, 3RX	Antenna A, Antenna B and Antenna C can be can be used as transmitting/receiving antenna.
802.11n HT40	3TX, 3RX	Antenna A, Antenna B and Antenna C can be can be used as transmitting/receiving antenna.
802.11ac HT20	3TX, 3RX	Antenna A, Antenna B and Antenna C can be can be used as transmitting/receiving antenna.
802.11ac HT40	3TX, 3RX	Antenna A, Antenna B and Antenna C can be can be used as transmitting/receiving antenna.
802.11ac HT80	3TX, 3RX	Antenna A, Antenna B and Antenna C can be can be used as transmitting/receiving antenna.

5.4. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	23 ~ 28°C
Voltage :	VL	N/A
	VN	AC 120V/60Hz
	VH	N/A

Note: VL= Lower Extreme Test Voltage
VN= Nominal Voltage
VH= Upper Extreme Test Voltage
TN= Normal Temperature

5.5. WORST-CASE CONFIGURATIONS

IEE Std. 802.11	Modulation Technology	Modulation Type	Data Rate (Mbps)	Worst Case (Mbps)
a	OFDM	BPSK,QPSK,16QAM, 64QAM	54/48/36/24/18/12/9/6	6

802.11n HT20/HT40							
Antenna	MCS	Modulation	HT20 Data Rate(Mbps)		HT40 Data Rate(Mbps)		Worst Case (Mbps)
			GI=800ns	GI=400ns	GI=800ns	GI=400ns	
2x2	8	BPSK	13	14.4	27	30	MCS8
	9	QPSK	26	28.9	54	60	MCS8
	10	QPSK	39	43.3	81	90	MCS8
	11	16-QAM	52	57.8	108	120	MCS8
	12	16-QAM	78	86.7	162	180	MCS8
	13	64-QAM	104	115.6	216	240	MCS8
	14	64-QAM	117	130	243	270	MCS8
	15	64-QAM	130	144.4	270	300	MCS8

802.11ac HT20/HT40/HT80									
Antenna	MCS	Modulation	HT20 Data Rate (Mbps)		HT40 Data Rate (Mbps)		HT80 Data Rate (Mbps)		Worst Case (Mbps)
			GI=800ns	GI=400ns	GI=800ns	GI=400ns	GI=800ns	GI=400ns	
2x2	0	BPSK	13	14.4	27	30	58.5	65	MCS0
	1	QPSK	26	28.9	54	60	117	130	MCS0
	2	QPSK	39	43.3	81	90	175.5	195	MCS0
	3	16-QAM	52	57.8	108	120	234	260	MCS0
	4	16-QAM	78	86.7	162	180	351	390	MCS0
	5	64-QAM	104	115.6	216	240	468	520	MCS0
	6	64-QAM	117	130.3	243	270	526.5	585	MCS0
	7	64-QAM	130	144.4	270	300	585	650	MCS0
	8	256-QAM	156	173.3	324	360	702	780	MCS0
	9	256-QAM	N/A	N/A	360	400	780	866.7	MCS0

802.11n HT20/HT40							
Antenna	MCS	Modulation	HT20 Data Rate(Mbps)		HT40 Data Rate(Mbps)		Worst Case (Mbps)
			GI=800ns	GI=400ns	GI=800ns	GI=400ns	
3x3	16	BPSK	19.5	21.7	40.5	45	MCS16
	17	QPSK	39.0	43.3	81.0	90	MCS16
	18	QPSK	58.5	65.0	121.5	135	MCS16
	19	16-QAM	78.0	86.7	162.0	180	MCS16
	20	16-QAM	117.0	130.0	243.0	270	MCS16
	21	64-QAM	156.0	173.3	324.0	360	MCS16
	22	64-QAM	175.5	195.0	364.5	405	MCS16
	23	64-QAM	195.0	216.7	405.0	450	MCS16

802.11ac HT20/HT40/HT80									
Antenna	MCS	Modulation	HT20 Data Rate (Mbps)		HT40 Data Rate (Mbps)		HT80 Data Rate (Mbps)		Worst Case (Mbps)
			GI=800ns	GI=400ns	GI=800ns	GI=400ns	GI=800ns	GI=400ns	
3x3	0	BPSK	19.5	21.6	40.5	45	87.8	97.5	MCS0
	1	QPSK	39	43.2	81	90	175.5	195	MCS0
	2	QPSK	58.5	65	121.5	135	263.3	292.5	MCS0
	3	16-QAM	78	86.7	162	180	351	390	MCS0
	4	16-QAM	117	130	243	270	526.5	585	MCS0
	5	64-QAM	156	173	324	360	702	780	MCS0
	6	64-QAM	175.5	195	364.5	405	789.9	877.5	MCS0
	7	64-QAM	195	216.6	405	450	877.5	975	MCS0
	8	256-QAM	234	260	486	540	1053	1170	MCS0
	9	256-QAM	260	288.9	540	600	1170	1300	MCS0

Remarks: EUT support for diversity and MIMO Transmission, all modes and antennas are pre-scanned, antenna C is worst for 1TX mode worst case, antenna B&C is worst case for 2TX mode, A&B&C is worst case for 3TX mode.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	Laptop	ThinkPad	T460S	SL10K24796 JS
2	RJ45 to Serial Cable	N/A	N/A	N/A
3	Serial to USB Cable	N/A	N/A	N/A

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	GE0/PoE	RJ45	Unshielded	0.5	N/A
2	GE1	RJ45	Unshielded	0.5	N/A
3	SPF	Fiber Optic	Unshielded	N/A	N/A
4	Console	RJ45	Unshielded	0.5	N/A

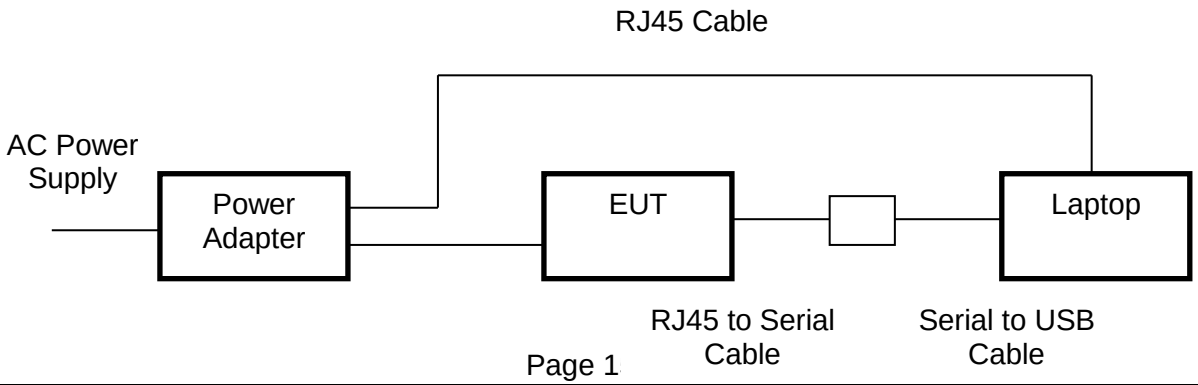
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	Power Adapter	HUAWEI	POE35-54A	Input: AC 100~240, 50/60Hz, 1.0 A Output: DC 54V, 0.65A

TEST SETUP

The EUT can work in engineering mode with software through a Laptop.

SETUP DIAGRAM FOR TESTS



5.7. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	EMI Test Receiver	R&S	ESR3	101961	Dec.12,2017	Dec.11,2018
☑	Two-Line V-Network	R&S	ENV216	101983	Dec.12,2017	Dec.11,2018
Software						
Used	Description		Manufacturer	Name	Version	
☑	Test Software for Conducted disturbance		UL	Antenna port	Ver. 7.2	
Radiated Emissions						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Dec.12,2017	Dec.11,2018
☑	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Jan.09, 2016	Jan.09, 2019
☑	Preamplifier	HP	8447D	2944A09099	Dec.12,2017	Dec.11,2018
☑	EMI Measurement Receiver	R&S	ESR26	101377	Dec.12,2017	Dec.11,2018
☑	Horn Antenna	TDK	HRN-0118	130939	Jan. 09, 2016	Jan. 09, 2019
☑	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	Jan.06, 2016	Jan.06, 2019
☑	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Dec.12,2017	Dec.11,2018
☑	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec.12,2017	Dec.11,2018
☑	Loop antenna	Schwarzbeck	1519B	00008	Mar. 26, 2016	Mar. 26, 2019
Software						
Used	Description		Manufacturer	Name	Version	
☑	Test Software for Radiated disturbance		Farad	EZ-EMC	Ver. UL-3A1	
Other instruments						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	Spectrum Analyzer	Keysight	N9030A	MY55410512	Dec.12,2017	Dec.11,2018
☑	Power Meter	Keysight	N9031A	MY55416024	Dec.12,2017	Dec.11,2018
	Power Sensor	Keysight	N9323A	MY55440013	Dec.12,2017	Dec.11,2018
☑	Power Sensor	Keysight	U2021XA	MY57030004	Dec.12,2017	Dec.11,2018

6. ANTENNA PORT TEST RESULTS

6.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

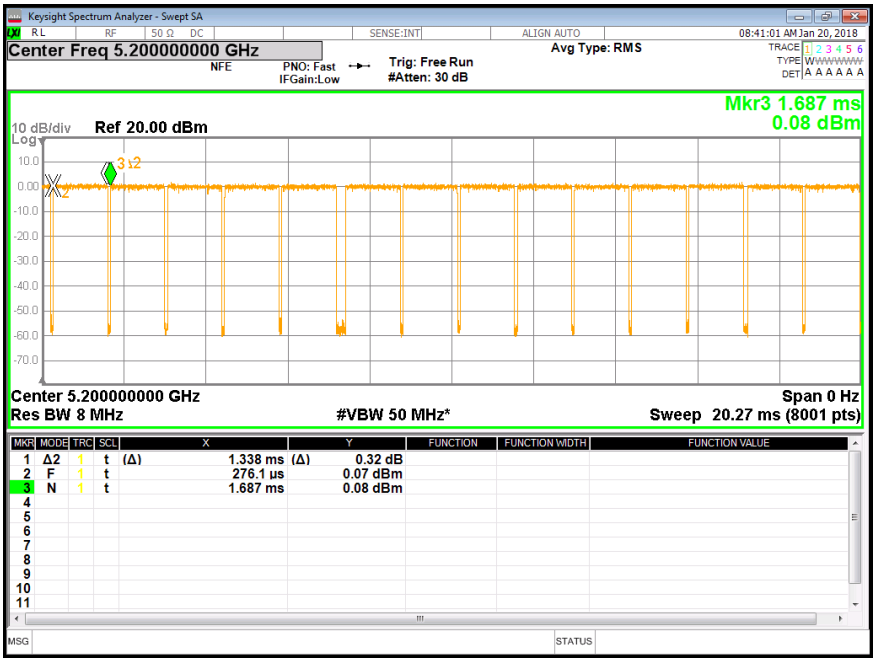
RESULTS

ANTENNA A

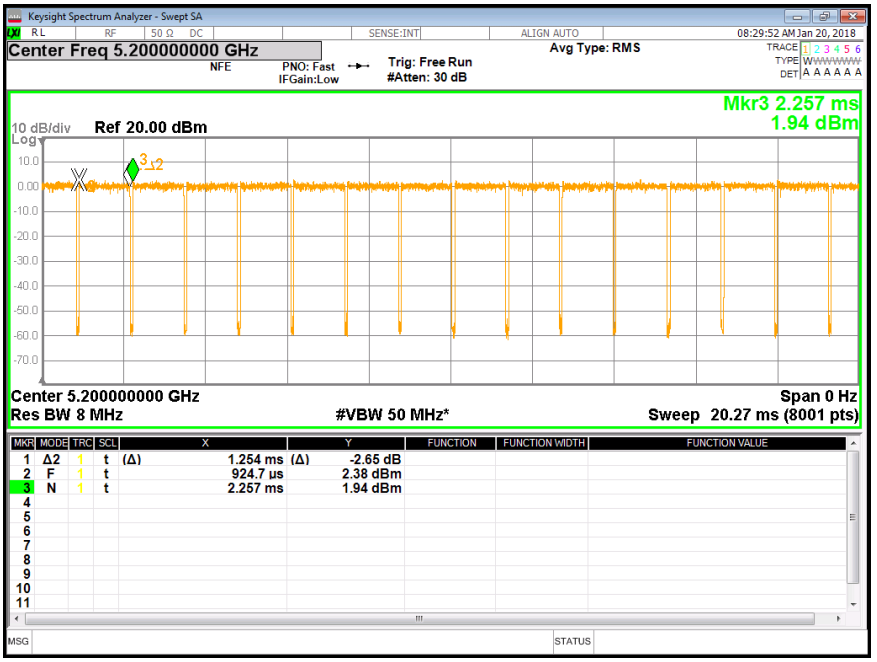
Mode	ON Time (ms)	Period (ms)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (KHz)
11a	1.338	1.4109	0.948	94.79%	0.23	1
11n HT20	1.254	1.3323	0.941	94.11%	0.26	1
11n HT40	0.623	0.6992	0.891	89.13%	0.50	2
11ac HT20	1.262	1.3353	0.945	94.50%	0.25	1
11ac HT40	0.626	0.7017	0.892	89.17%	0.50	2
11ac HT80	0.312	0.3851	0.81	80.92%	0.91	5

Note: Duty Cycle Correction Factor=10log(1/x).
Where: x is Duty Cycle(Linear)
Antenna A, Antenna B and Antenna C has the same duty cycle, only Antenna A data show here.

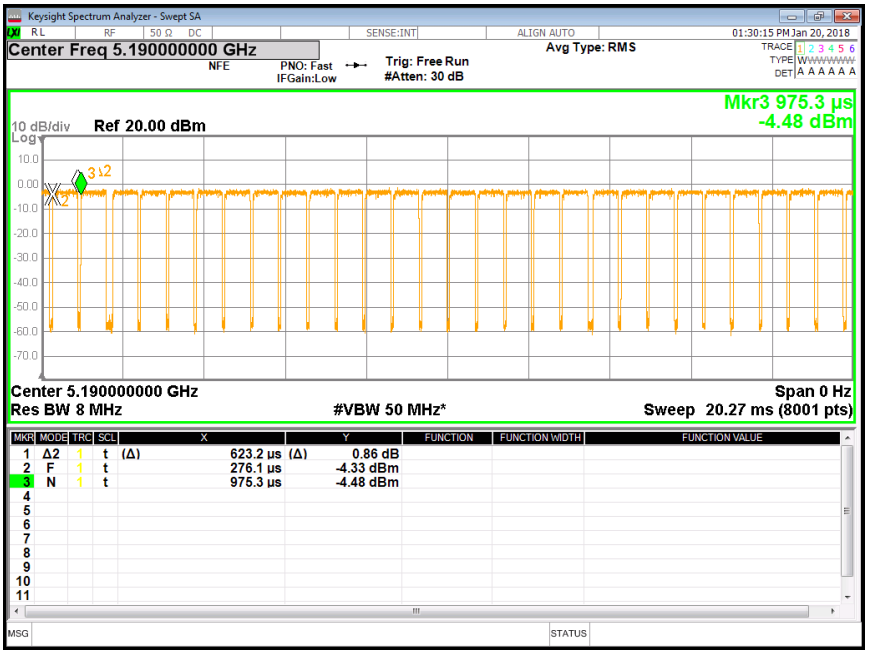
DUTY CYCLE 802.11a MODE



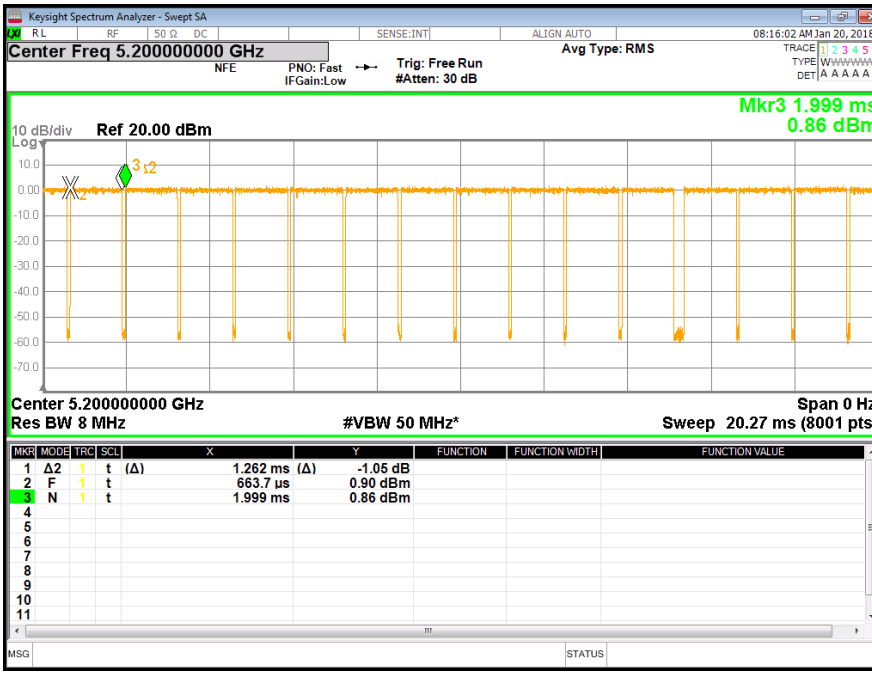
DUTY CYCLE 802.11n HT20 MODE



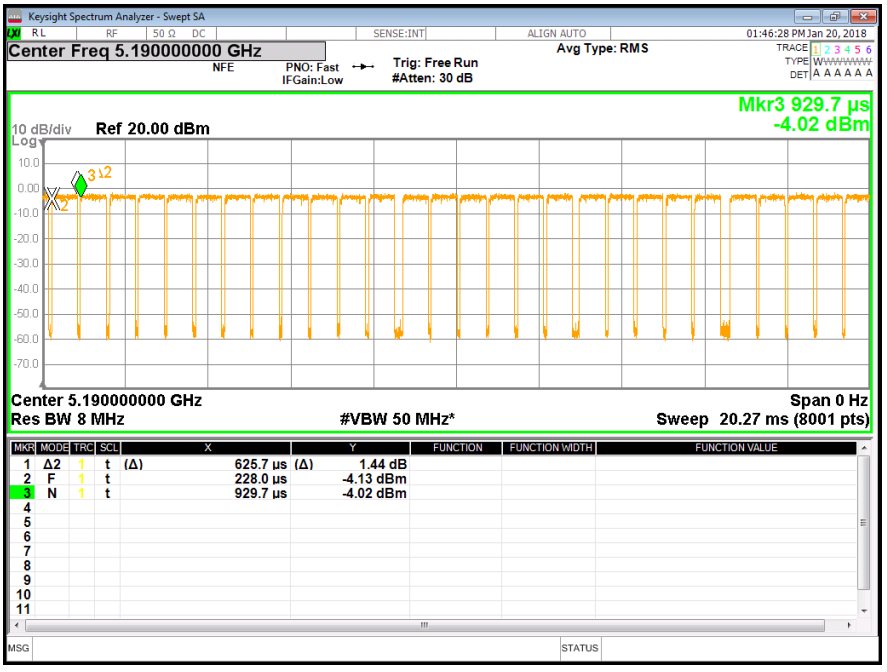
DUTY CYCLE 802.11n HT40 MODE



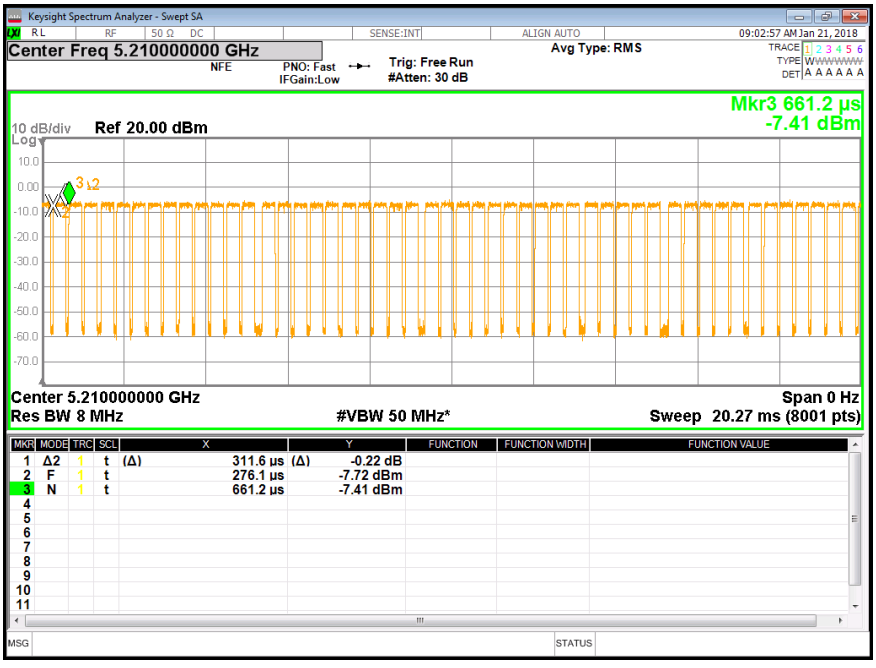
DUTY CYCLE 802.11ac HT20 MODE



DUTY CYCLE 802.11ac HT40 MODE



DUTY CYCLE 802.11ac HT80 MODE



6.2. 6/26/99% dB BANDWIDTH

LIMITS

FCC Part15, Subpart E/ RSS-247		
Test Item	Limit	Frequency Range (MHz)
Bandwidth	26 dB Bandwidth	5150-5250
	26 dB Bandwidth	5250-5350
	26 dB Bandwidth	For FCC:5470-5725 For IC:5470-5600 5650-5725
	Minimum 500kHz 6dB Bandwidth	5725-5850

RSS-247 ISSUE 2			
RSS-Gen Clause 6.6	99% Bandwidth	For reporting purposes only.	2400-2483.5

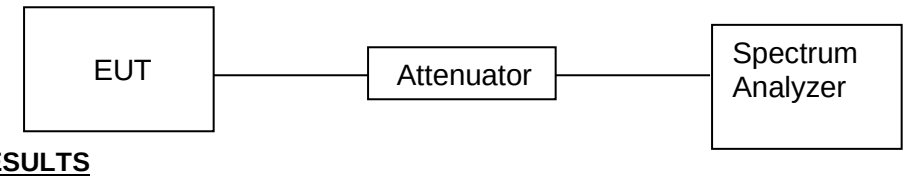
TEST PROCEDUREC

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	For 6dB Bandwidth: RBW=100kHz For 26dB Bandwidth: approximately 1% of the emission bandwidth. For 99dB Bandwidth: approximately 1%~5% of the emission bandwidth.
VBW	For 6dB Bandwidth : VBW=300kHz For 26dB Bandwidth : >3RBW For 99%dB Bandwidth : >3RBW
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and 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 6/26/99% dB relative to the maximum level measured in the fundamental emission.

TEST SETUP



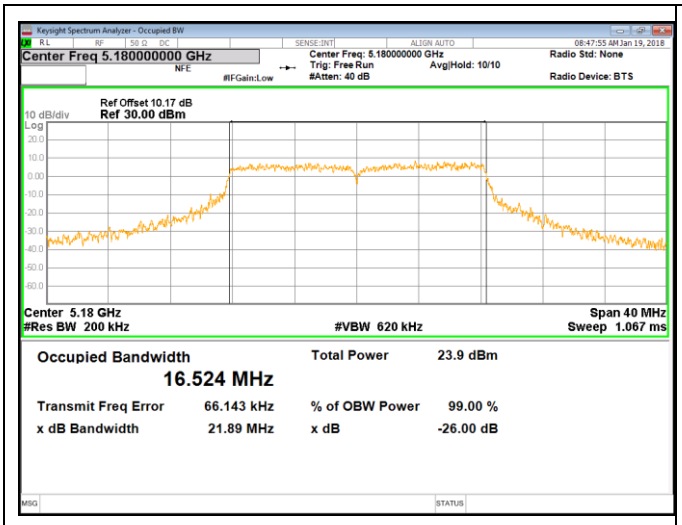
RESULTS

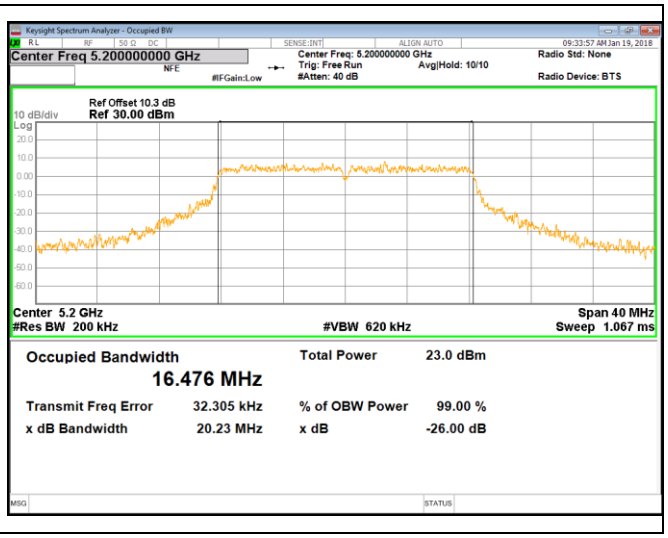
ANTENNA C

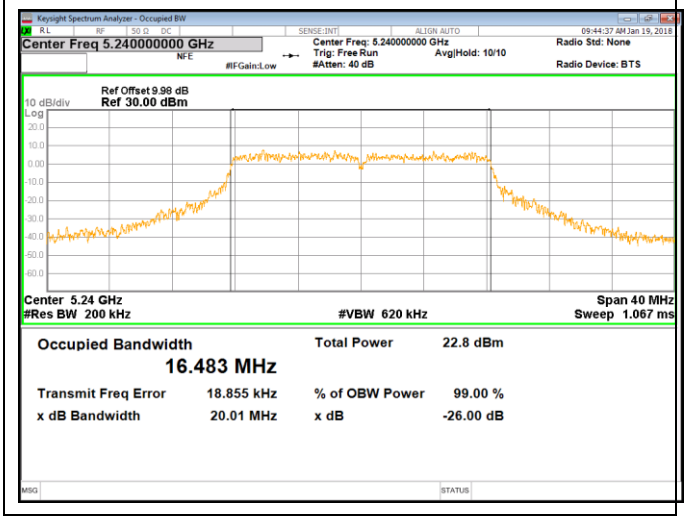
6.2.1. 802.11a 3TX MODE

6.2.1.1. UNII-1 BAND

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5180	21.89	16.524
Mid	5200	20.23	16.476
High	5240	20.01	16.483



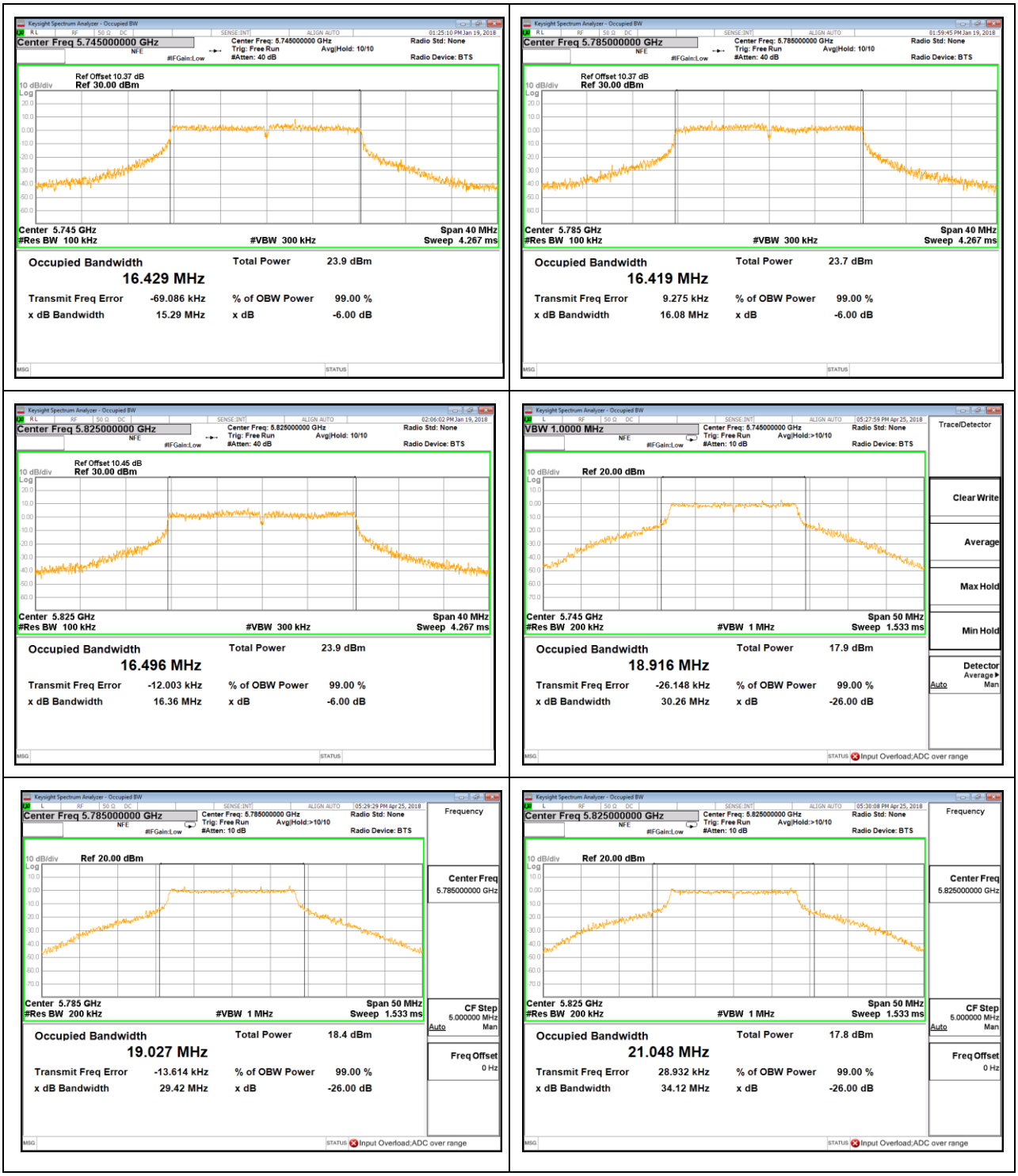




6.2.1.2. UNII-3 BAND

Channel	Frequency (MHz)	6 dB BW (MHz)	Limit (KHz)	Result
Low	5745	15.92	500	PASS
Mid	5785	16.08	500	PASS
High	5825	16.36	500	PASS

Channel	Frequency (MHz)	99% BW (MHz)
Low	5745	18.916
Mid	5785	19.027
High	5825	21.048

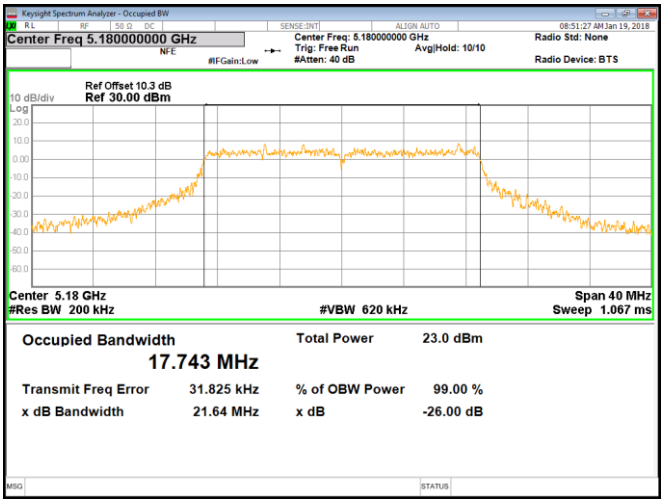


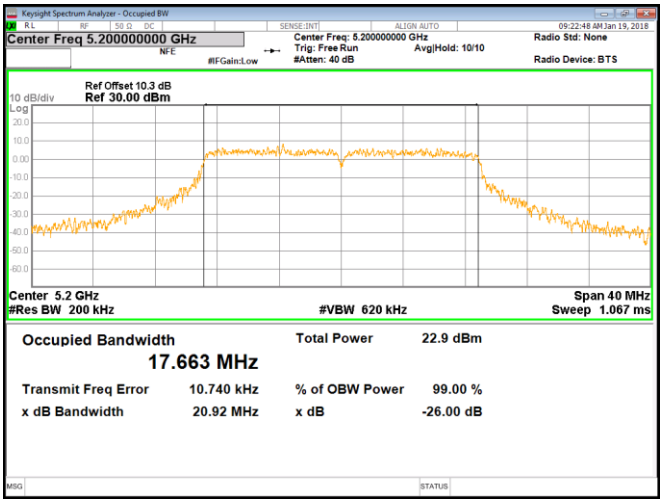
Note: All the modes and antenna ports had been tested, only the worst data recorded in the report.

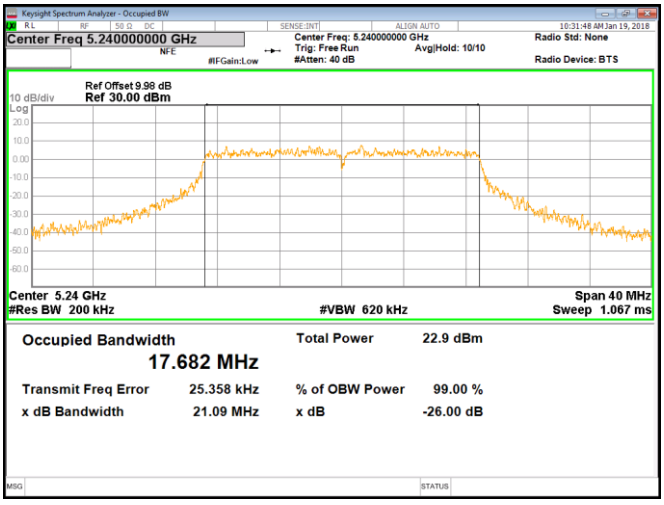
6.2.2. 802.11n HT20 3TX MODE

6.2.2.1. UNII-1 BAND

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5180	21.64	17.743
Mid	5200	20.92	17.663
High	5240	21.09	17.682



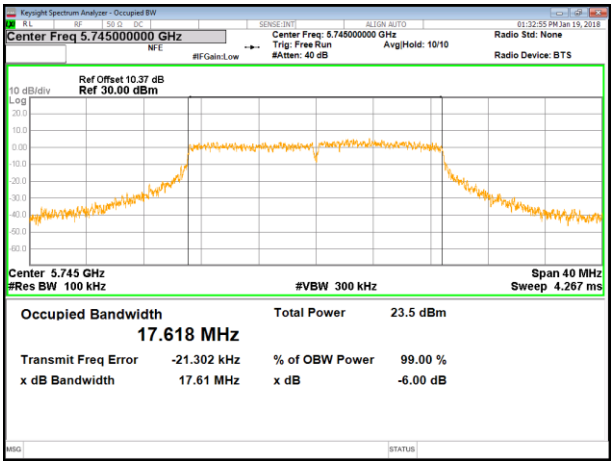


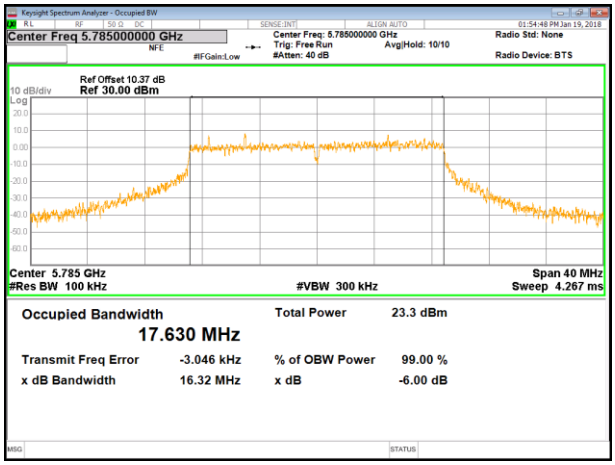


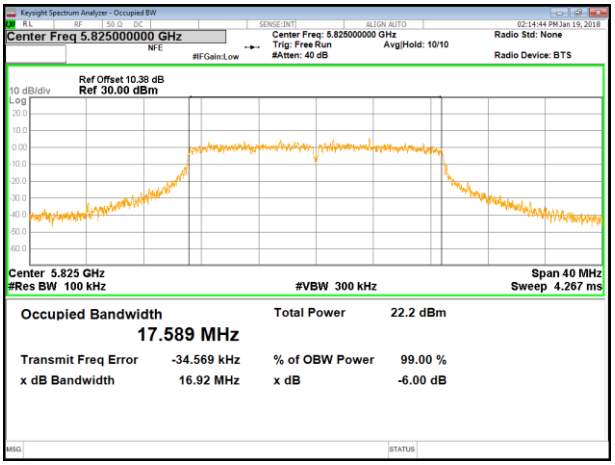
6.2.2.2. UNII-3 BAND

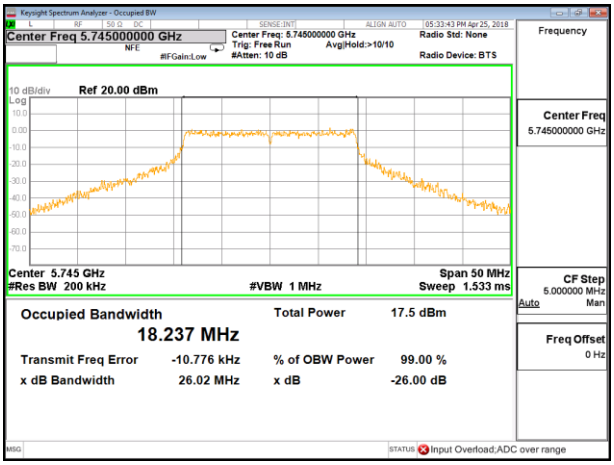
Channel	Frequency (MHz)	6 dB BW (MHz)	Limit (KHz)	Result
Low	5745	17.61	500	PASS
Mid	5785	16.32	500	PASS
High	5825	16.92	500	PASS

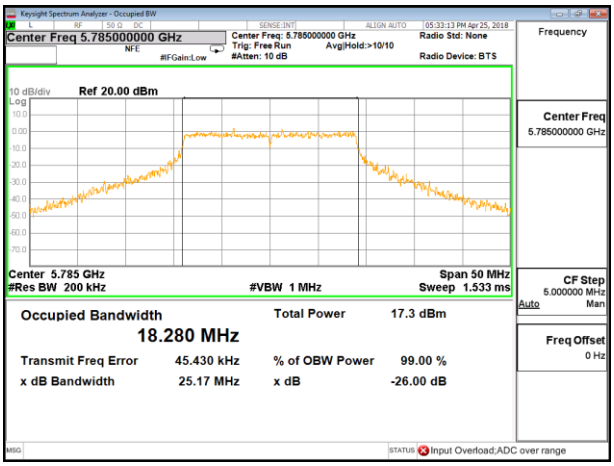
Channel	Frequency (MHz)	99% BW (MHz)
Low	5745	18.237
Mid	5785	18.280
High	5825	18.551

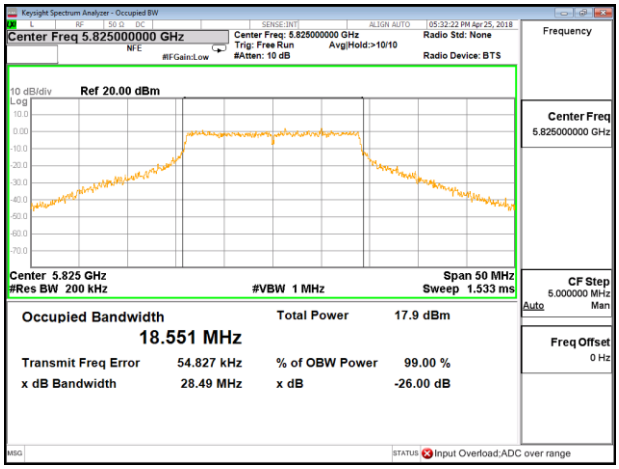










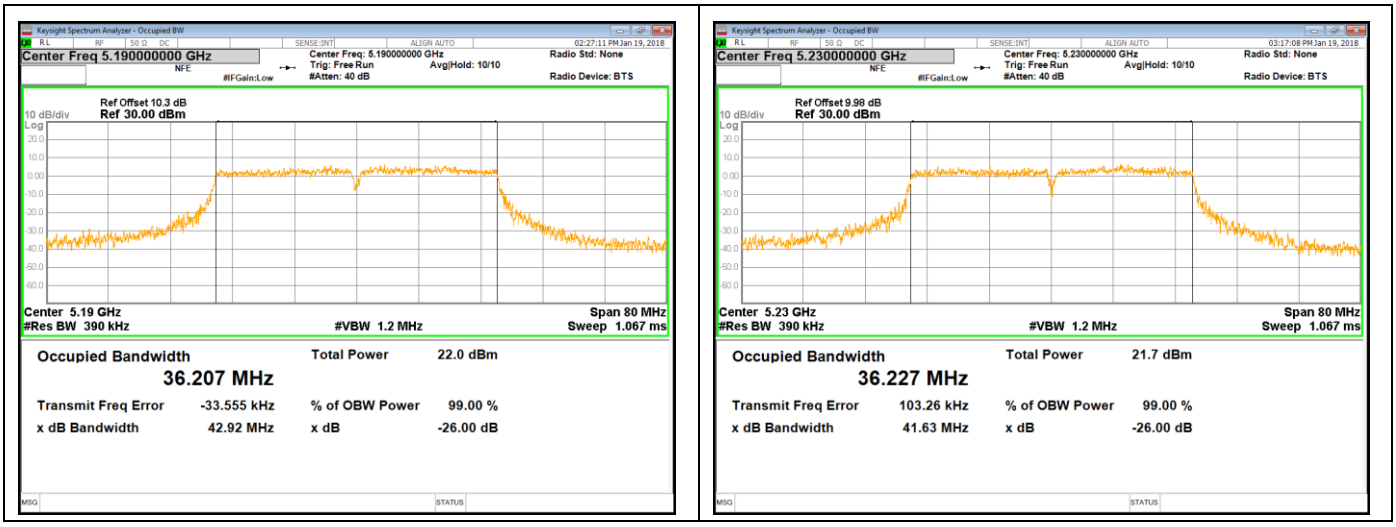


Note: All the modes and antenna ports had been tested, only the worst data recorded in the report.

6.2.3. 802.11n HT40 3TX MODE

6.2.3.1. UNII-1 BAND

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5190	42.92	36.207
High	5230	41.63	36.227



6.2.3.2. UNII-3 BAND

Channel	Frequency (MHz)	6 dB BW (MHz)	Limit (KHz)	Result
Low	5755	35.65	500	PASS
High	5795	35.62	500	PASS

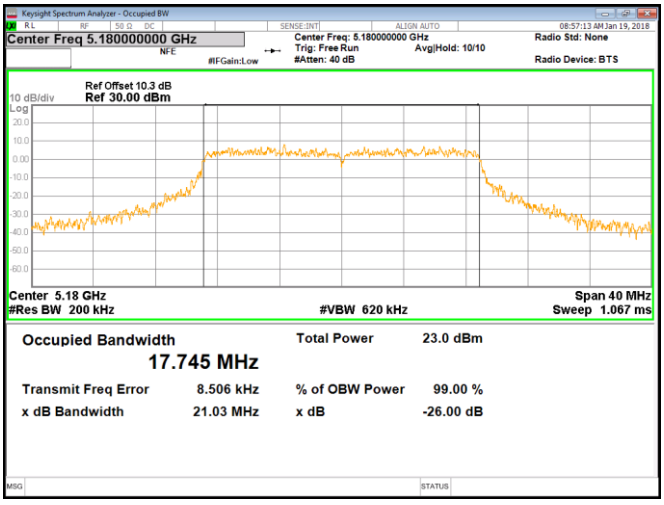
Channel	Frequency (MHz)	99% BW (MHz)
Low	5755	41.204
High	5795	41.331

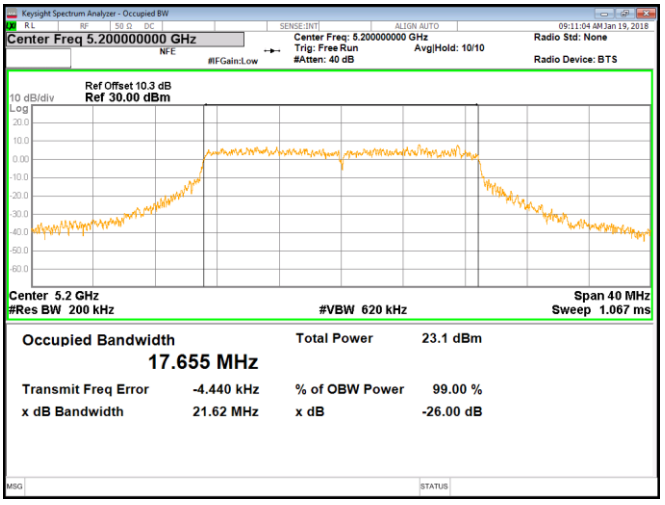
Note: All the modes and antenna ports had been tested, only the worst data recorded in the report.

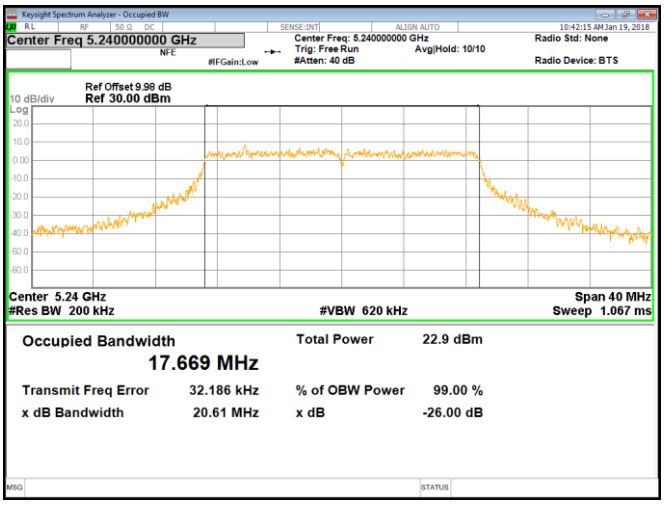
6.2.4. 802.11ac HT20 3TX MODE

6.2.4.1. UNII-1 BAND

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5180	21.03	17.745
Mid	5200	21.62	17.655
High	5240	20.61	17.669



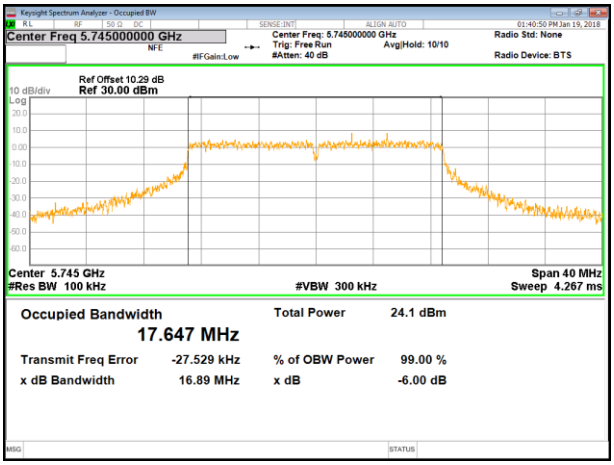


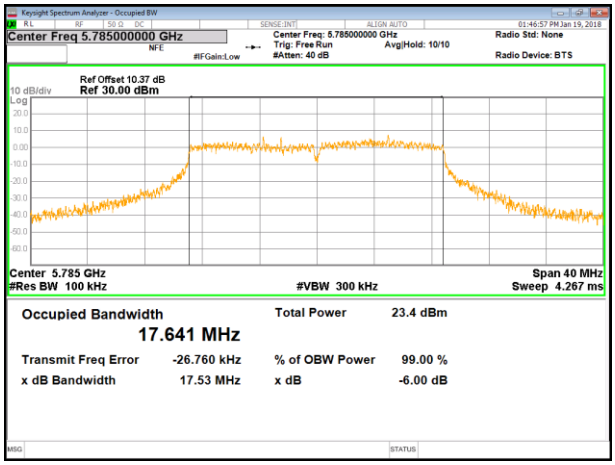


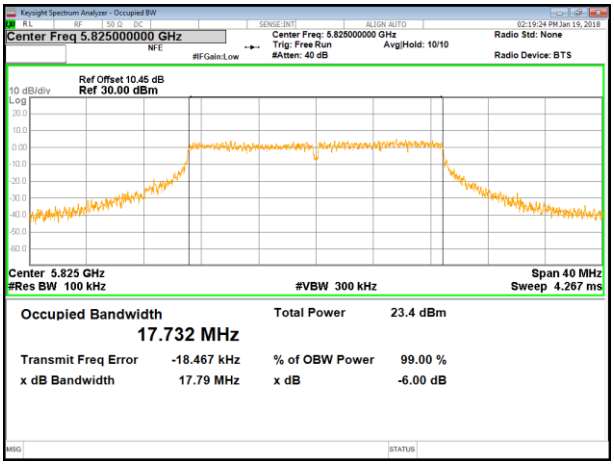
6.2.4.2. UNII-3 BAND

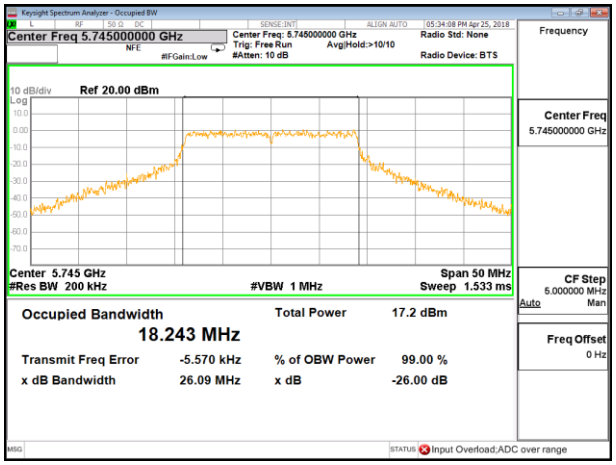
Channel	Frequency (MHz)	6 dB BW (MHz)	Limit (KHz)	Result
Low	5745	16.89	500	PASS
Mid	5785	17.53	500	PASS
High	5825	17.79	500	PASS

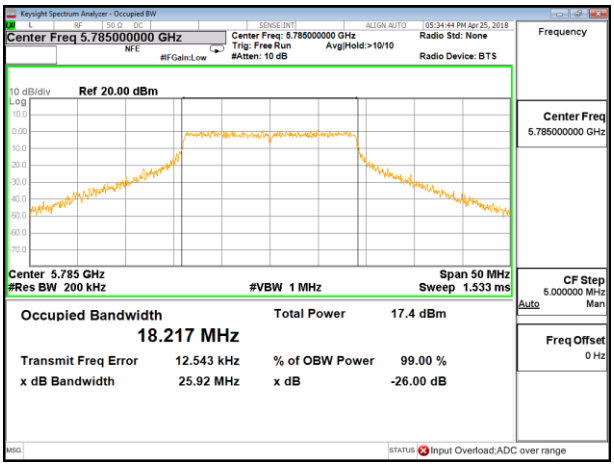
Channel	Frequency (MHz)	99% BW (MHz)
Low	5745	18.243
Mid	5785	18.217
High	5825	18.797

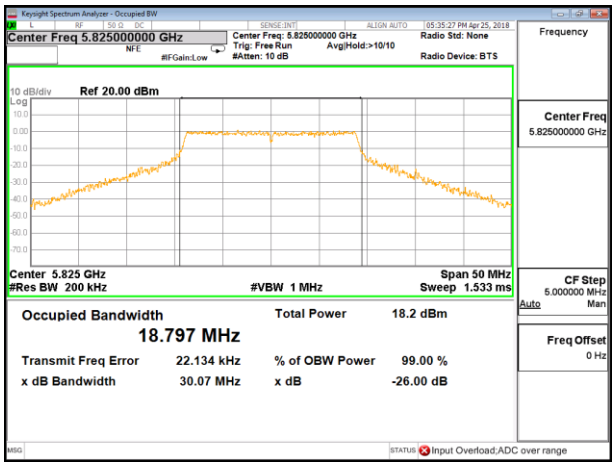










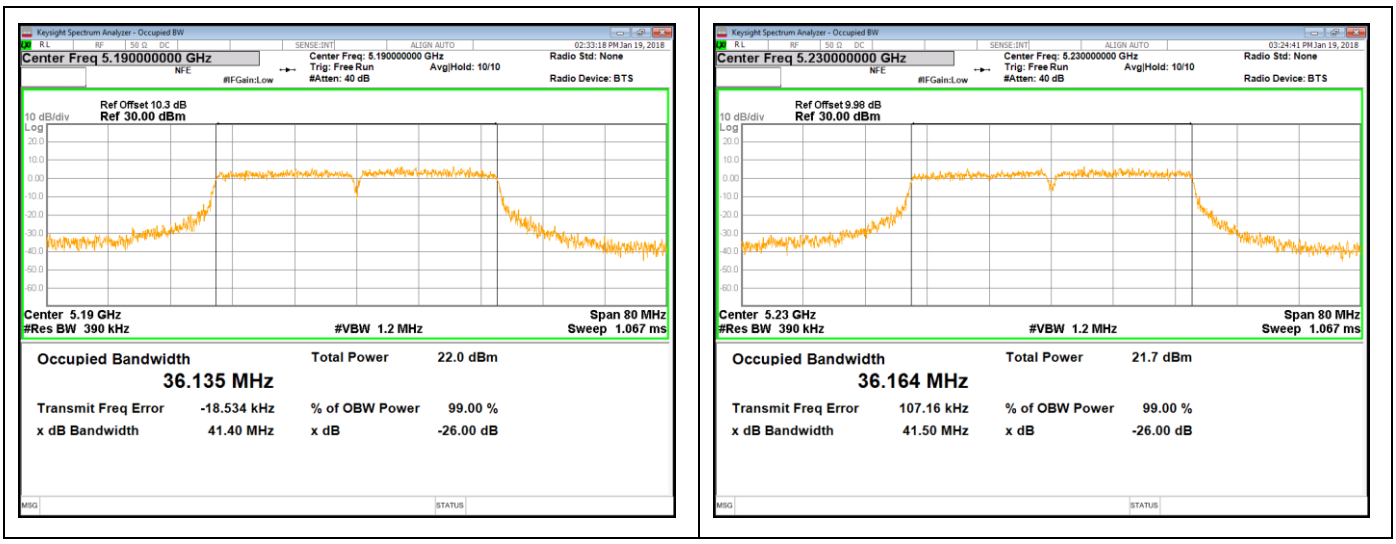


Note: All the modes and antenna ports had been tested, only the worst data recorded in the report.

6.2.5. 802.11ac HT40 3TX MODE

6.2.5.1. UNII-1 BAND

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5190	41.40	36.135
High	5230	41.50	36.164



6.2.5.2. UNII-3 BAND

Channel	Frequency (MHz)	6 dB BW (MHz)	Limit (KHz)	Result
Low	5755	35.70	500	PASS
High	5795	33.23	500	PASS

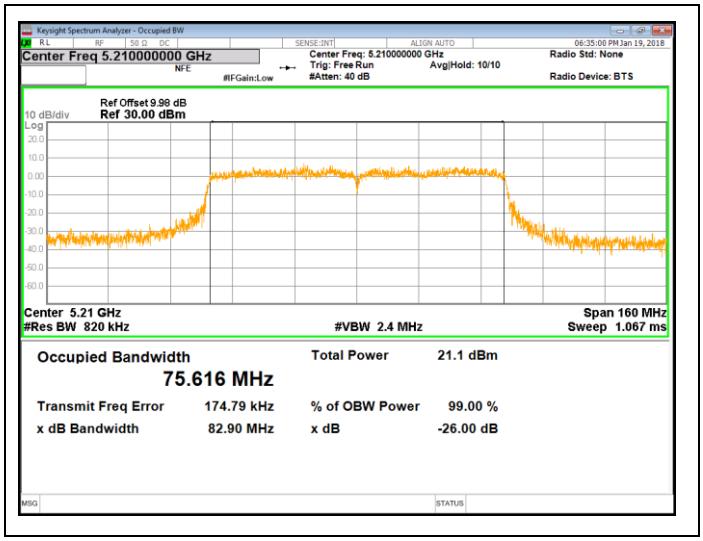
Channel	Frequency (MHz)	99% BW
Low	5755	40.779
High	5795	40.044

Note: All the modes and antenna ports had been tested, only the worst data recorded in the report.

6.2.6. 802.11ac HT80 3TX MODE

6.2.6.1. UNII-1 BAND

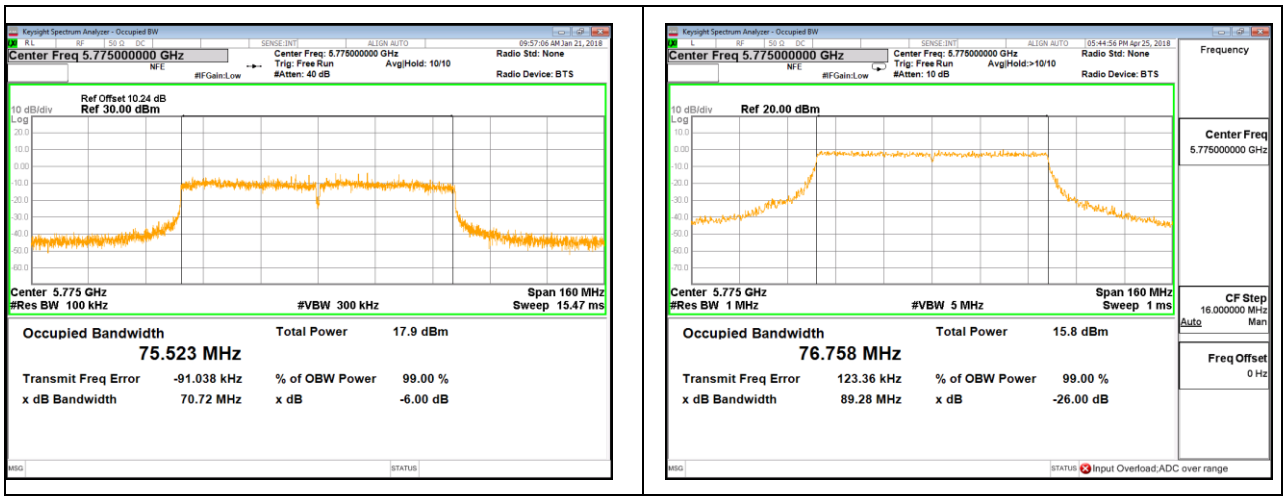
Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5210	82.90	75.616



6.2.6.2. UNII-3 BAND

Channel	Frequency (MHz)	6 dB BW	Limit	Result
Low	5775	70.72	500	PASS

Channel	Frequency (MHz)	99% BW
Low	5775	76.758



Note: All the modes and antenna ports had been tested, only the worst data recorded in the report.

6.3. MAXIMUM CONDUCTED OUTPUT POWER

LIMITS

FCC Part15, Subpart E/ RSS-247		
Test Item	Limit	Frequency Range (MHz)
Conducted Output Power	For FCC outdoor access point:1W (30dBm)	5150-5250
	For RSS:e.i.r.p. power: not exceed 200 mW(23dBm) or 10 + 10 log10 B	
	250mW (24dBm)	5250-5350
	250mW (24dBm)	For FCC:5470-5725 For IC:5470-5600 5650-5725
	1 Watt (30dBm)	5725-5850

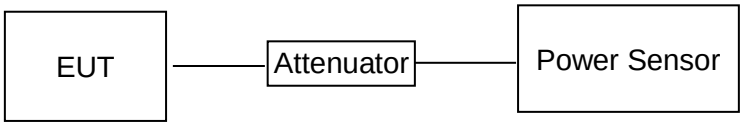
Note: 1. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. Directional gain = G_{ANT} + 10 log(N_{ANT}) dBi, where NANT is the number of outputs, G_{ANT} is the Antenna gain.

TEST PROCEDURE

Refer to KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Connect the EUT to the a broadband gated RF average power meter, the power meter shall have a video bandwidth that is greater than or equal to the bandwidth and shall utilize a fast-responding diode detector.

TEST SETUP



RESULTS

6.3.1.1. 1TX Mode

Mode	Channel	Antenna	Setting Value	CONDUCTED POWER	Limit
a	5180	C	10	9.01	24.5
	5200	C	9.5	9.25	24.5
	5240	C	10	9.26	24.5
	5745	C	21	20.37	24.5
	5785	C	21	19.93	24.5
	5825	C	21	20.92	24.5
n20	5180	C	10	9.2	24.5
	5200	C	9.5	9.24	24.5
	5240	C	10	9.3	24.5
	5745	C	19	18.55	24.5
	5785	C	19	18.01	24.5
	5825	C	19	18.92	24.5
ac20	5180	C	10	9.00	24.5
	5200	C	9.5	9.31	24.5
	5240	C	10	9.37	24.5
	5745	C	19	18.55	24.5
	5785	C	19	18.09	24.5
	5825	C	19	18.83	24.5
n40	5190	C	10	9.10	24.5
	5230	C	10.5	9.12	24.5
	5755	C	18	16.85	24.5
	5795	C	18	16.86	24.5
ac40	5190	C	10	9.16	24.5
	5230	C	10.5	9.1	24.5
	5755	C	18	16.98	24.5
	5795	C	18	16.95	24.5
ac80	5210	C	11	9.32	24.5
	5775	C	17	15.33	24.5

Note: 1. All the antennas ports had been tested, but only the worst data recorded in the report.
2. The setting value means the power setting level in the software and these values will use for all the tests in the report.

6.3.1.2. 2TX Mode

Mode	Channel	Antenna	Setting Value	CONDUCTED POWER		Limit
				Single	Total	
a	5180	B	4	2.73	5.93	21.5
		C		3.11		21.5
	5200	B	3.5	3.19	6.24	21.5
		C		3.26		21.5
	5240	B	3.5	3.07	6.05	21.5
		C		3.01		21.5
	5745	B	15.5	15.31	21.4	21.5
		C		16.12		21.5
	5785	B	15.5	15.71	20.6	21.5
		C		15.65		21.5
	5825	B	15.5	15.31	21.11	21.5
		C		16.12		21.5

n20	5180	B	4	2.97	6.15	21.5
		C		3.31		21.5
	5200	B	3.5	3.17	6.32	21.5
		C		3.45		21.5
	5240	B	3.5	3.06	6	21.5
		C		2.91		21.5
	5745	B	18.5	18.53	21.43	21.5
		C		18.3		21.5
	5785	B	18.5	16.52	20.14	21.5
		C		17.66		21.5
	5825	B	18.5	16.98	21.09	21.5
		C		18.96		21.5

ac20	5180	B	4	3	6.13	21.5
		C		3.23		21.5
	5200	B	3.5	3.21	6.26	21.5
		C		3.29		21.5
	5240	B	3.5	3.08	6.01	21.5
		C		2.91		21.5
	5745	B	18.5	18.44	21.41	21.5
		C		18.36		21.5
	5785	B	18.5	16.91	20.41	21.5
		C		17.84		21.5
	5825	B	18.5	17	21.03	21.5
		C		18.85		21.5
n40	5190	B	4	3.04	6.20	21.5
		C		3.33		21.5
	5230	B	4	3.13	6.11	21.5
		C		3.07		21.5
	5755	B	18	17.18	20.11	21.5
		C		17.01		21.5
	5795	B	18	16.12	19.61	21.5
		C		17.03		21.5
ac40	5190	B	4	3	6.24	21.5
		C		3.44		21.5
	5230	B	4	3.06	6.02	21.5
		C		2.95		21.5
	5755	B	18	17.26	20.19	21.5
		C		17.1		21.5
	5795	B	18	15.97	19.5	21.5
		C		16.96		21.5

AC80	5210	B	5	3.25	6.41	21.5
		C		3.54		21.5
	5775	B	17	15.12	18.28	21.5
		C		15.41		21.5

Note: 1. All the antennas ports had been tested, but only the worst data recorded in the report.
2. The setting value means the power setting level in the software and these values will use for all the tests in the report.

6.3.1.3. 3TX Mode

Mode	Channel	Antenna	Setting Value	CONDUCTED POWER		Limit
				Single	Total	
a	5180	A	0.5	-0.84	4.08	19.5
		B		-0.77		19.5
		C		-0.46		19.5
	5200	A	-0.5	-1.06	4	19.5
		B		-0.8		19.5
		C		-0.47		19.5
	5240	A	-0.5	-0.82	4.07	19.5
		B		-0.63		19.5
		C		-0.67		19.5
	5745	A	14.5	14.27	19	19.5
		B		14.49		19.5
		C		13.92		19.5
	5785	A	14.5	13.76	18.4	19.5
		B		13.35		19.5
		C		13.77		19.5
	5825	A	14.5	14.61	18.93	19.5
		B		13.07		19.5
		C		14.62		19.5

n20	5180	A	0.5	-0.87	4.02	19.5
		B		-0.84		19.5
		C		-0.55		19.5
	5200	A	-0.5	-0.82	4.2	19.5
		B		-0.5		19.5
		C		-0.4		19.5
	5240	A	-0.5	-0.95	3.88	19.5
		B		-0.83		19.5
		C		-0.88		19.5
	5745	A	14.5	14.02	18.89	19.5
		B		14.39		19.5
		C		13.94		19.5
	5785	A	14.5	13.64	18.23	19.5
		B		13.1		19.5
		C		13.62		19.5
	5825	A	14.5	14.36	18.79	19.5
		B		12.87		19.5
		C		14.62		19.5

ac20	5180	A	0.5	-0.82	4.08	19.5
		B		-0.83		19.5
		C		-0.44		19.5
	5200	A	-0.5	-0.76	4.20	19.5
		B		-0.55		19.5
		C		-0.42		19.5
	5240	A	-0.5	-0.95	4.01	19.5
		B		-0.57		19.5
		C		-0.78		19.5
	5745	A	14.5	13.84	19.04	19.5
		B		14.52		19.5
		C		14.41		19.5
	5785	A	14.5	13.75	18.22	19.5
		B		13.04		19.5
		C		13.52		19.5
	5825	A	14.5	14.5	18.77	19.5
		B		12.69		19.5
		C		14.56		19.5

n40	5190	A	0.5	-0.72	4.67	19.5
		B		0.46		19.5
		C		-0.12		19.5
	5230	A	0.5	-0.69	4.21	19.5
		B		-0.36		19.5
		C		-0.64		19.5
	5755	A	14.5	13.36	18.15	19.5
		B		13.69		19.5
		C		13.06		19.5
	5795	A	14.5	13.72	18.03	19.5
		B		12.65		19.5
		C		13.33		19.5

ac40	5190	A	0.5	-0.69	4.27	19.5
		B		-0.59		19.5
		C		-0.23		19.5
	5230	A	0.5	-0.66	4.18	19.5
		B		-0.53		19.5
		C		-0.57		19.5
	5755	A	14.5	13.29	18.25	19.5
		B		13.95		19.5
		C		13.17		19.5
	5795	A	14.5	14.14	18.18	19.5
		B		12.74		19.5
		C		13.24		19.5

AC80	5210	A	1.5	-0.39	4.63	19.5
		B		-0.06		19.5
		C		0.03		19.5
	5775	A	14.5	12.58	17.38	19.5
		B		12.63		19.5
		C		12.61		19.5

Note: 1. All the antennas ports had been tested, but only the worst data recorded in the report.
2. The setting value means the power setting level in the software and these values will use for all the tests in the report.

6.4. Maximum e.i.r.p. at any elevation angle above 30 degrees

In addition to the emission limits specified in Section 15.407(a)(1)(i), if the access point is an outdoor Point-to-Multipoint device operating in the band 5.15−5.25 GHz, the rules require that the maximum EIRP at Any condensation angle above 30° not exceed 125 mW (21 dBm) as measured from the horizon.

1TX Mode	FREQUENCY	MAXIMUM CONDUCTED OUTPUT POWER（dBm）	MAX DIRECTION GAIN（dBi）	MAX EIRP（dBm）	EIRP LIMIT (dBm)	RESULT
Configuration IEEE 802.11a	5180	9.01	11.5	20.51	21	PASS
	5200	9.25	11.5	20.75	21	PASS
	5240	9.26	11.5	20.76	21	PASS
Configuration IEEE 802.11n_HT20	5180	9.20	11.5	20.70	21	PASS
	5200	9.24	11.5	20.74	21	PASS
	5240	9.30	11.5	20.80	21	PASS
Configuration IEEE 802.11ac_HT20	5180	9.00	11.5	20.50	21	PASS
	5200	9.31	11.5	20.81	21	PASS
	5240	9.37	11.5	20.87	21	PASS
Configuration IEEE 802.11n_HT40	5190	9.10	11.5	20.6	21	PASS
	5230	9.12	11.5	20.62	21	PASS
Configuration IEEE 802.11ac_HT40	5190	9.16	11.5	20.66	21	PASS
	5230	9.10	11.5	20.6	21	PASS
Configuration IEEE 802.11ac_HT80	5210	9.32	11.5	20.82	21	PASS

Remarks: EIRP= Conducted Out Power + Direction G_{ANT}

Directional gain= G_{ANT} + 10 log(N_{ANT})dBi, where N_{ANT} is the number of outputs, G_{ANT} is the Antenna gain.

2TX Mode	FREQUENCY	MAXIMUM CONDUCTED OUTPUT POWER (dBm) (Total)	MAX DIRECTION GAIN (dBi)	MAX EIRP (dBm)	EIRP LIMIT (dBm)	RESULT
Configuration IEEE 802.11a	5180	5.69	14.5	20.19	21	PASS
	5200	6.24	14.5	20.74	21	PASS
	5240	6.05	14.5	20.55	21	PASS
Configuration IEEE 802.11n_HT20	5180	6.15	14.5	20.65	21	PASS
	5200	6.32	14.5	20.82	21	PASS
	5240	6.00	14.5	20.5	21	PASS
Configuration IEEE 802.11ac_HT20	5180	6.13	14.5	20.63	21	PASS
	5200	6.26	14.5	20.76	21	PASS
	5240	6.01	14.5	20.51	21	PASS
Configuration IEEE 802.11n_HT40	5190	6.2	14.5	20.7	21	PASS
	5230	6.11	14.5	20.61	21	PASS
Configuration IEEE 802.11ac_HT40	5190	6.24	14.5	20.74	21	PASS
	5230	6.02	14.5	20.52	21	PASS
Configuration IEEE 802.11ac_HT80	5210	6.41	14.5	20.91	21	PASS

Remarks: EIRP= Conducted Out Power + Direction G_{ANT}
Directional gain= G_{ANT} + 10 log(N_{ANT})dBi, where N_{ANT} is the number of outputs, G_{ANT} is the Antenna gain.

3TX Mode	FREQUENCY	MAXIMUM CONDUCTED OUTPUT POWER (dBm) (Total)	MAX DIRECTION GAIN (dBi)	MAX EIRP (dBm)	EIRP LIMIT (dBm)	RESULT
Configuration IEEE 802.11a	5180	4.08	16.28	20.36	21	PASS
	5200	4.00	16.28	20.28	21	PASS
	5240	4.07	16.28	20.35	21	PASS
Configuration IEEE 802.11n_HT20	5180	4.02	16.28	20.3	21	PASS
	5200	4.2	16.28	20.48	21	PASS
	5240	3.88	16.28	20.16	21	PASS
Configuration IEEE 802.11ac_HT20	5180	4.08	16.28	20.36	21	PASS
	5200	4.2	16.28	20.48	21	PASS
	5240	4.01	16.28	20.29	21	PASS
Configuration IEEE 802.11n_HT40	5190	4.67	16.28	20.95	21	PASS
	5230	4.21	16.28	20.49	21	PASS
Configuration IEEE 802.11ac_HT40	5190	4.27	16.28	20.55	21	PASS
	5230	4.18	16.28	20.46	21	PASS
Configuration IEEE 802.11ac_HT80	5210	4.63	16.28	20.91	21	PASS

Remarks: EIRP= Conducted Out Power+ G_{ANT}
Directional gain= G_{ANT} + 10 log(N_{ANT})dBi, where N_{ANT} is the number of outputs, G_{ANT} is the Antenna gain.

6.5. POWER SPECTRAL DENSITY

LIMITS

FCC Part15, Subpart E/ RSS-247		
Test Item	Limit	Frequency Range (MHz)
Power Spectral Density	For FCC: Other than Mobile and portable:17dBm/MHz Mobile and portable:11dBm/MHz	5150-5250
	For RSS:10dBm/MHz	
	11dBm/MHz	5250-5350
	11dBm/MHz	For FCC:5470-5725 For IC:5470-5600 5650-5725
	30dBm/500kHz	5725-5850

Note: If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. Directional gain = G_{ANT} + 10 log(N_{ANT}) dBi, where N_{ANT} is the number of outputs, G_{ANT} is the Antenna gain.

TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

For U-NII-1, U-NII-2A and U-NII-2C band:

Center Frequency	The center frequency of the channel under test
Detector	RMS
RBW	1MHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

For U-NII-3:

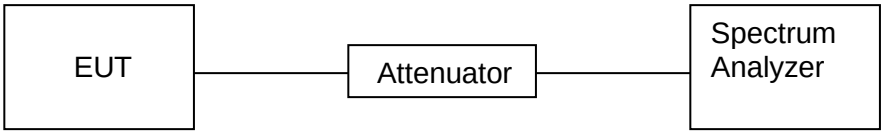
Center Frequency	The center frequency of the channel under test
Detector	RMS
RBW	500KHz

VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

Note:
1. For UNII-3, according to KDB publication 789033 General UNII Test Procedures New Rules v01, section II.F.5., it is acceptable to set RBW at 1MHz and VBW at 3MHz if the spectrum analyzer does not have 500kHz RBW.
2. The value measured with RBW=1MHz is to be added with 10log(500kHz/1MHz) which is - 3dB. For example, if the measured value is +10dBm using RBW=1MHz (that is +10dBm/MHz), then the converted value will be +7dBm/500kHz.

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.
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

TEST SETUP



RESULTS

6.5.1. 1TX MODE

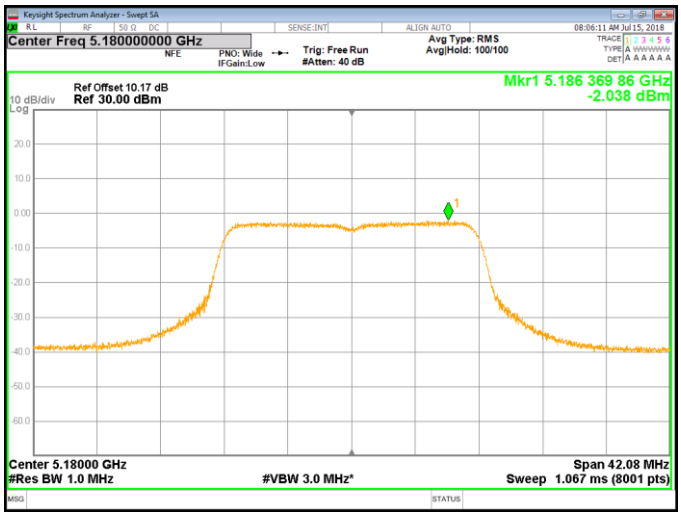
Mode	Channel	Antenna	PSD	Limit
a	5180	C	-1.798	11.5
	5200	C	-1.808	11.5
	5240	C	-1.525	11.5
	5745	C	6.55	24.5
	5785	C	6.16	24.5
	5825	C	7.07	24.5
n20	5180	C	-1.76	11.5
	5200	C	-1.782	11.5
	5240	C	-1.742	11.5
	5745	C	4.84	24.5
	5785	C	4.20	24.5
	5825	C	5.02	24.5
ac20	5180	C	-1.825	11.5
	5200	C	-1.94	11.5
	5240	C	-1.714	11.5
	5745	C	4.77	24.5
	5785	C	4.26	24.5
	5825	C	4.98	24.5
n40	5190	C	-4.712	11.5
	5230	C	-4.505	11.5
	5755	C	-0.09	24.5
	5795	C	-0.14	24.5
ac40	5190	C	-4.587	11.5
	5230	C	-4.243	11.5
	5755	C	0.008	24.5
	5795	C	-0.054	24.5
ac80	5210	C	-7.461	11.5
	5775	C	-3.89	24.5

Note: All the antenna ports had been tested, but only the worst data recorded in the report.

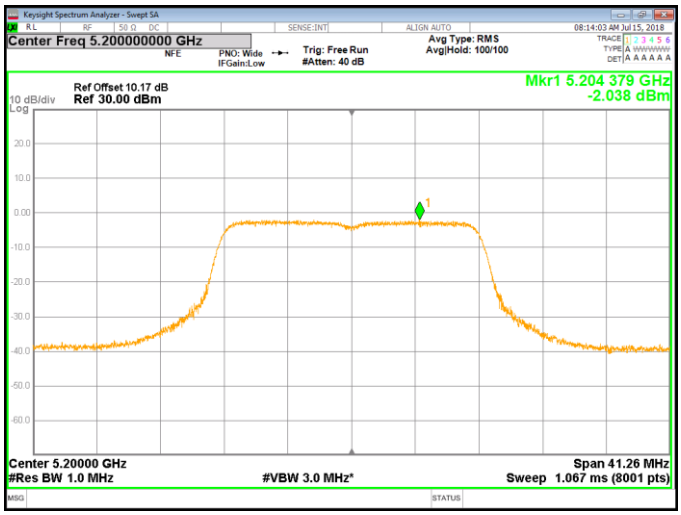
TEST PLOT FOR ANTENNA C

802.11a Mode

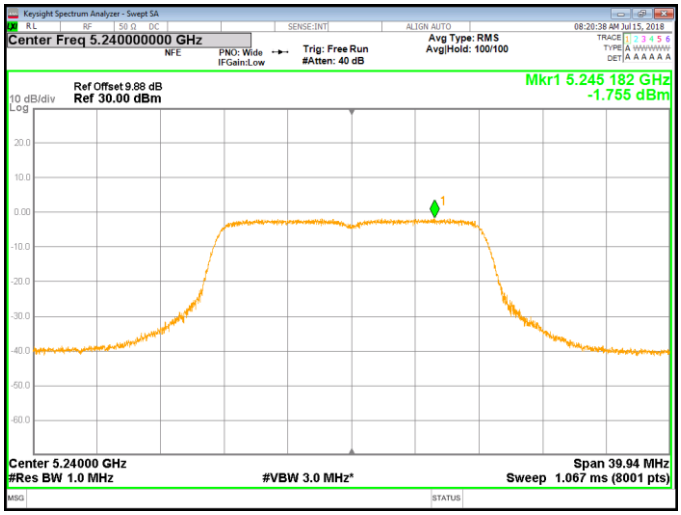
5180MHz



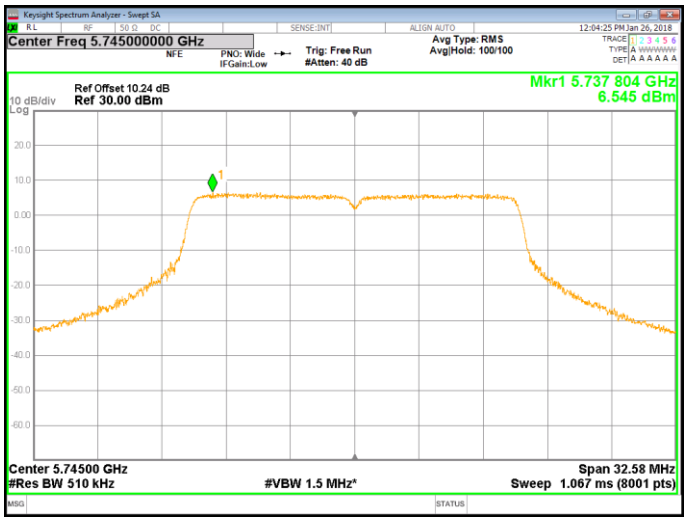
5200MHz



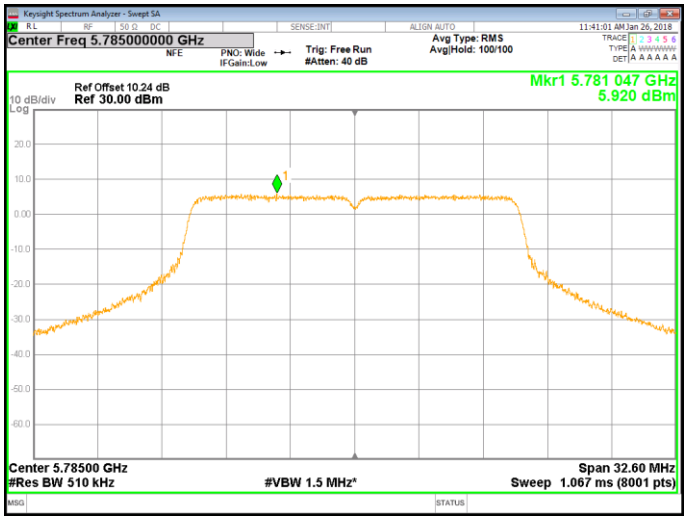
5240MHz



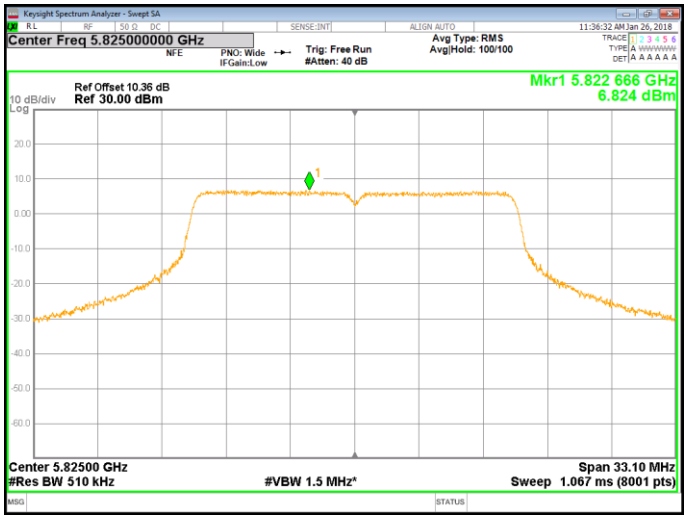
5745MHz



5785MHz

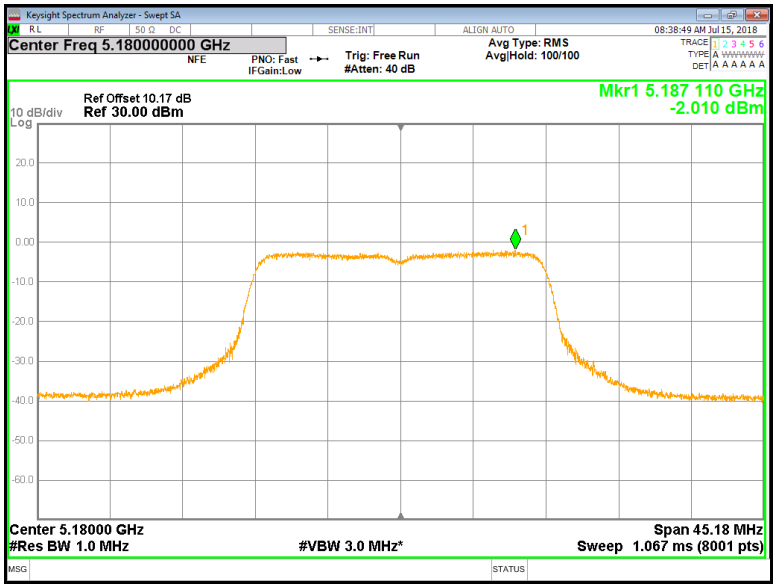


5825MHz

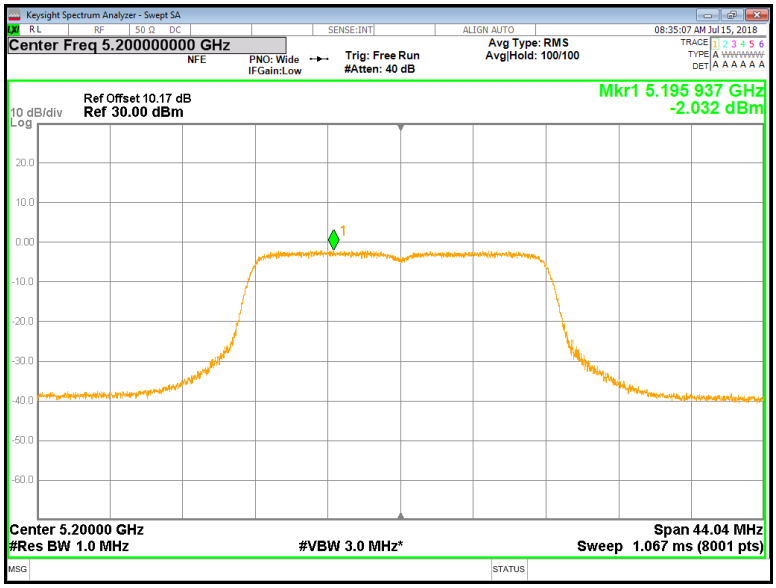


802.11 n20 Mode

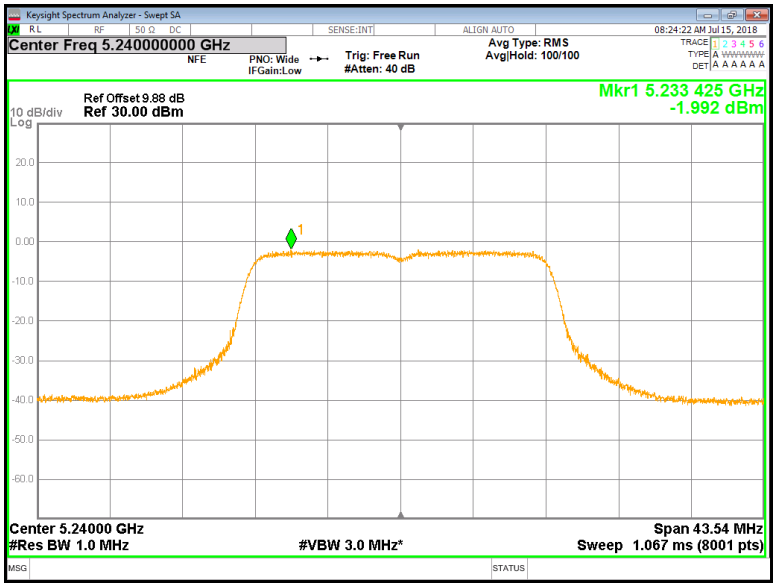
5180MHz



5200MHz

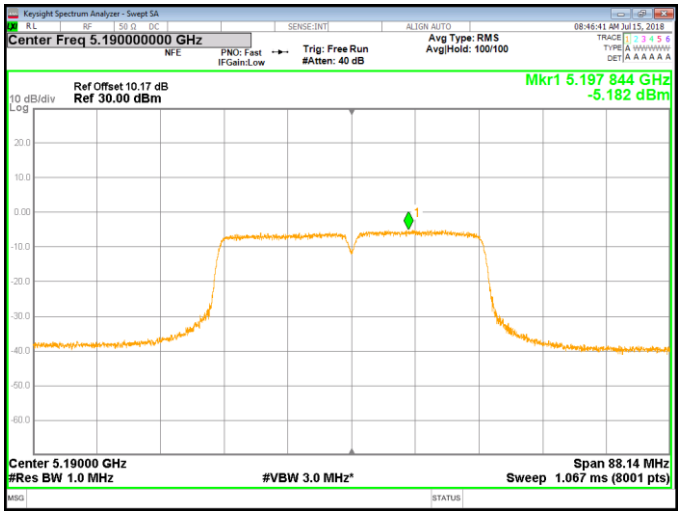


5240MHz

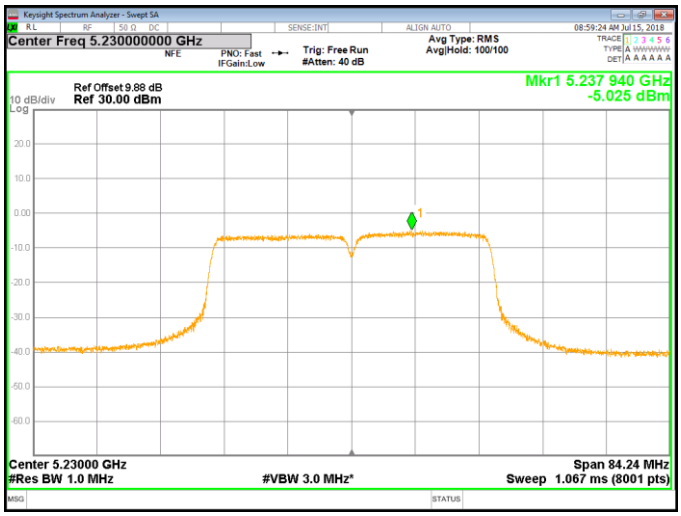


802.11n40 Mode

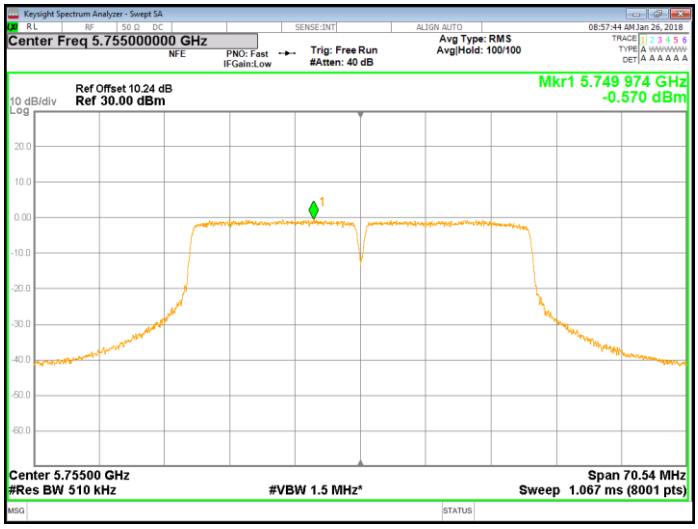
5190MHz



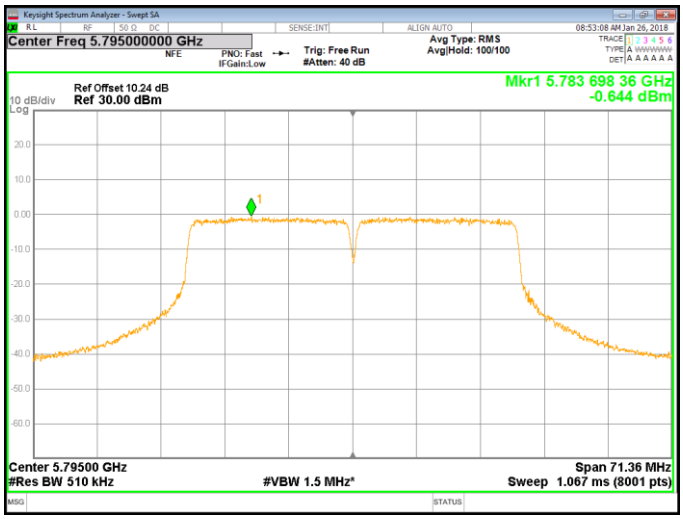
5230MHz



5755MHz

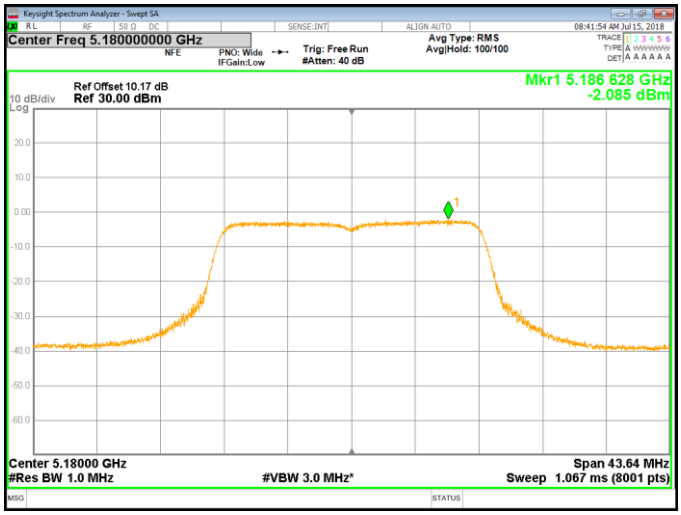


5795MHz

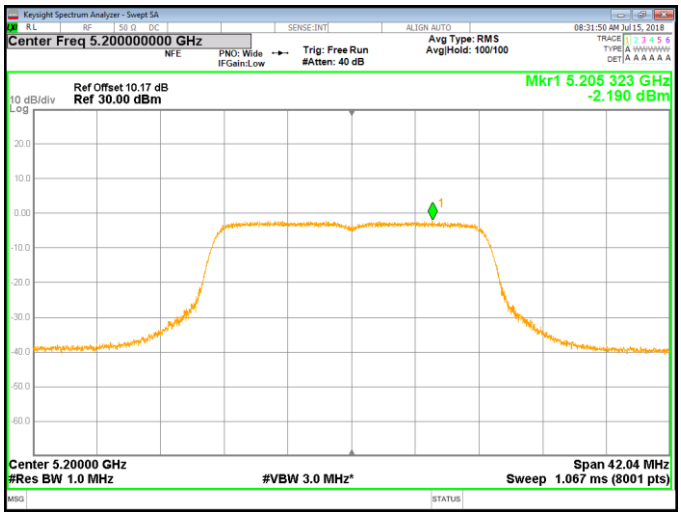


802.11 ac20 Mode

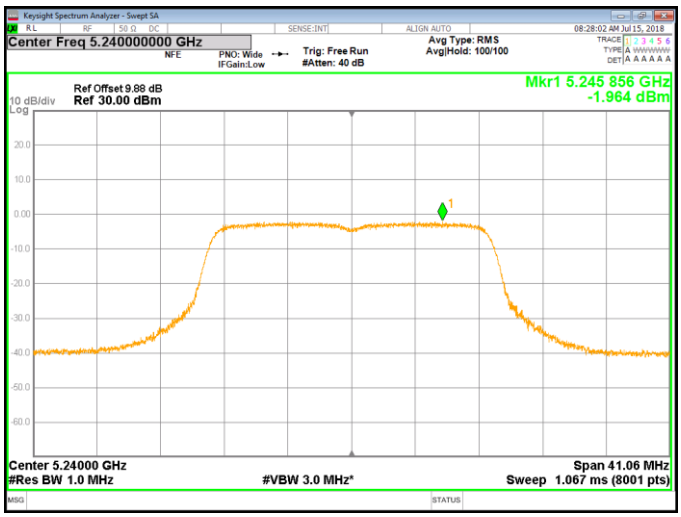
5180MHz



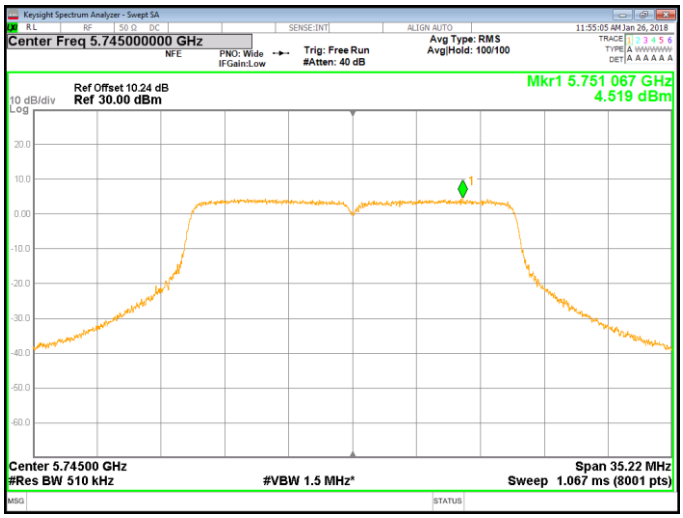
5200MHz



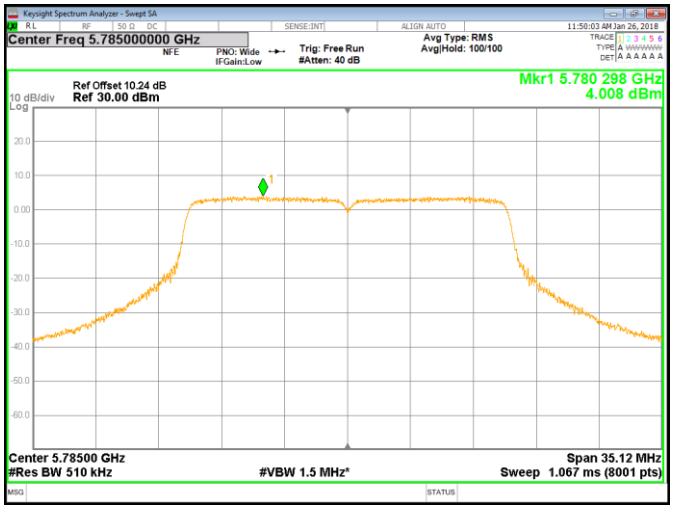
5240MHz



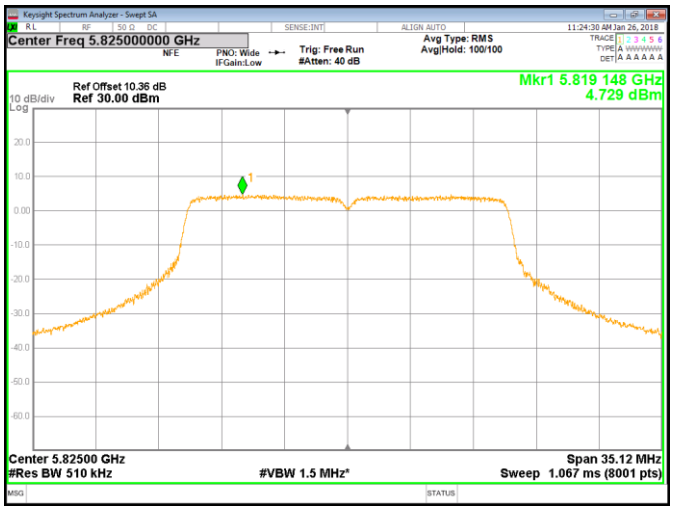
5745MHz



5785MHz

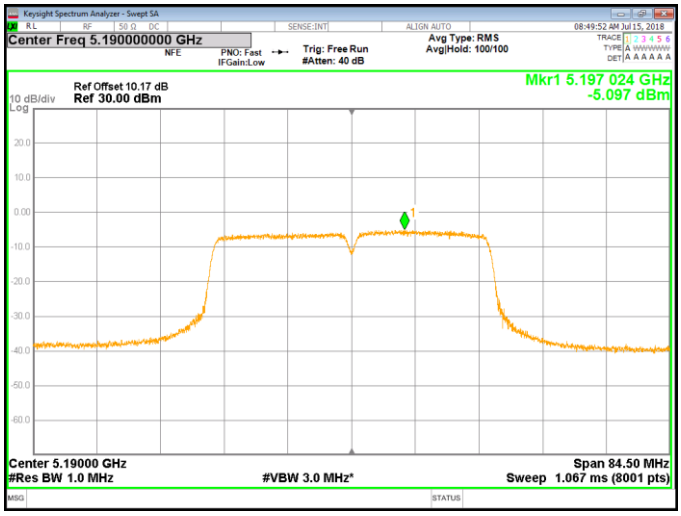


5825MHz



802.11ac40 Mode

5190MHz



5230MHz