

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E AND INDUSTRY CANADA RSS 247 REQUIREMENT

OF

Applicant: CYBERNET Manufacturing Inc
5 Holland, Bldg. 201 Irvine. CA92618

Product Name: Cybernet Tablet PC

Brand Name: Cybernet

Model No.: CyberMed Rx, Rugged X10

Model Difference: appearance different

FCC ID: 2AHZW-CYBRXX10

IC: 24472-CYBRXX10

Report Number: E2/2019/10030

FCC Rule Part: §15.407, Cat: NII

IC Rule: RSS-247 issue 2 Feb. 2017

Issue Date: Feb. 25, 2019

Date of Test: Jan. 16, 2019 ~ Jan. 30, 2019

Date of EUT Received: Jan. 09, 2019

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Tested By:

Pony Chen

Pony Chen / Engineer**Approved By:**

Vito Pei

Vito Pei / Sr. Engineer

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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
E2/2019/10030	Rev.00	Initial creation of document	All	Feb. 12, 2019	Karen Huang
E2/2019/10030	Rev.01	Updated model number and measurement data	Page 1,4,11,35~37, 44~45,90~91	Feb. 21, 2019	Karen Huang
E2/2019/10030	Rev.02	Added remark	Page 43~45	Feb. 25, 2019	Karen Huang

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1 GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	Cybernet Tablet PC	
Brand Name:	Cybernet	
Model No.:	CyberMed Rx, Rugged X10	
Model Difference:	apperance different	
Hardware Version:	N/A	
Software Version:	N/A	
Power Supply:	10.8Vdc from Rechargeable Li-polymer Battery or 19Vdc from AC/DC Adapter	
	Battery:	Model No.: CyberMed Rx/Rugged X10, Supplier: FUJI Electronics (Shenzhen) Co., Ltd.
	Adapter:	1. Model No.: FSP065-DBBM1, Supplier: FSP GROUP INC. 2. Model No.: EM10681V, Supplier: EDACPOWER ELEC.

FCC WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Avg. Power (dBm)	Modulation Technology
11a_20	5150~5250	4	15.87	OFDM
11n_HT / ac_VHT 20M	5150~5250	4	HT: 14.56	OFDM
11n_HT / ac_VHT 40M	5150~5250	2	HT: 17.02	OFDM
11ac_VHT80M	5150~5250	1	14.09	OFDM

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IC WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Avg. or EIRP	Rated Power(dBm) (Worst Case)	Modulation Technology
11a	5150~5250	4	EIRP	12.99	OFDM
11n_HT / ac_VHT 20M	5150~5250	4	EIRP	HT: 14.59	OFDM
11n_HT / ac_VHT 40M	5150~5250	2	EIRP	HT: 17.05	OFDM
11ac VHT80M	5150~5250	1	EIRP	14.12	OFDM
Modulation type		64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only			
Transition Rate:		802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300Mbps 802.11 ac_20MHz: 6.5 – 173.3 Mbps 802.11 ac_40MHz: 27 – 400 Mbps 802.11 ac_80MHz: 58.5 – 866.7 Mbps			

Antenna Designation

Antenna Type	Main / Aux	Part Number	Supplier	Peak Gain (dBi)
PIFA	Main	RFA-25-AP238-70B180T	Aristotle	-2.4
PIFA	Aux	RFA-25-AP238-70B-240	Aristotle	-3.6

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

RSS-247 issue 2 Feb. 2017

RSS-Gen. issue 5 Apr. 2018

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd.,
Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Designation Number: TW0002

Canada Registration Number: 4620E-1

1.4 Special Accessories

There are no special accessories used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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2.4 Measurement Results Explanation

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration



Fig.2-3 Conducted Emission (Antenna Port) Configuration



Fig. 2-2 Conducted Emission (AC Power Line) Configuration

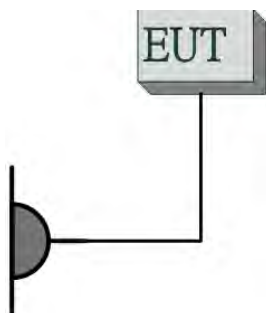


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1	WLAN Test Software	N/A	N/A	N/A	N/A	N/A

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3 SUMMARY OF TEST RESULT

FCC Rules	IC Rules	Description Of Test	Result
§15.207	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.403(i) §15.407(e)	RSS-247 §6.2.1~ 4 (1) RSS-Gen §6.7	26 dB & 6dB & 99% Emission Bandwidth	Compliant
§15.407(a)	RSS-247 §6.2.1~ 4 (1)	Maximum Conducted Output Power	Compliant
§15.407(a)	RSS-247 §6.2.1~ 4 (1)	Power Spectral Density	Compliant
§15.205 §15.209 §15.407(b)	RSS-247 §6.2.1~ 4 (2)	Undesirable Radiated Emissions	Compliant
§15.407(c)	RSS-247 §6.4	Transmission in case of Absence of Information	Compliant
§15.407(g)	RSS-Gen §6.11	Frequency Stability	Compliant
§15.203 §15.407(a)	RSS- Gen §6.7 RSS- Gen §8.3	Antenna Requirement	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 Operated in U-NII Bands

Operated band in 5150 MHz ~5250 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode	
Channel	Frequency
36	5180
40	5200
44	5220
48	5240

802.11 n HT40 Mode, 802.11ac VHT40 Mode	
channel	Frequency
38	5190
46	5230

802.11ac VHT80 Mode	
channel	Frequency
42	5210

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4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case. The given UE is pre-scanned among below modes.

Modulation	Transmission Chain				Multiple Transmission Spatial
☒ 802.11 a	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☐ 2TX
☒ 802.11 n	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☒ MIMO
☒ 802.11 ac	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☒ MIMO

4. Therefore, below summary is the modes of test configuration that yield the highest reading and generate the highest emission chosen to carry out the relevantly mandatory test items. □

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RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	44	OFDM	6	AUX
802.11ac_VHT80	5210	42	42	OFDM	MCS0	MIMO
RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	AUX
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS0	MIMO

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/n/ac WLAN Transmitter for channel Low, Mid and High, the worst case H position was reported.

ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	AUX
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS0	MIMO

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
26dB & 6dB Emission Bandwidth	+/- 123.36 Hz
The Maximum Output Power Measurement	+/- 0.96 dB
Peak Power Spectral Density Measurement	+/- 1.67 dB
Frequency Stability	+/- 123.36 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC=+/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : Vertical)	9kHz-30MHz: +/-2.87dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : Horizontal)	9kHz-30MHz: +/-2.87dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable

Frequency range within 150 kHz to 30 MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

6.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY51440113	06/20/2018	06/19/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/25/2018	12/24/2019
DC Block	PASTERNAK	PE8210	RF29	12/25/2018	12/24/2019

6.3 EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The LISN was connected with 120Vac/60Hz power source.

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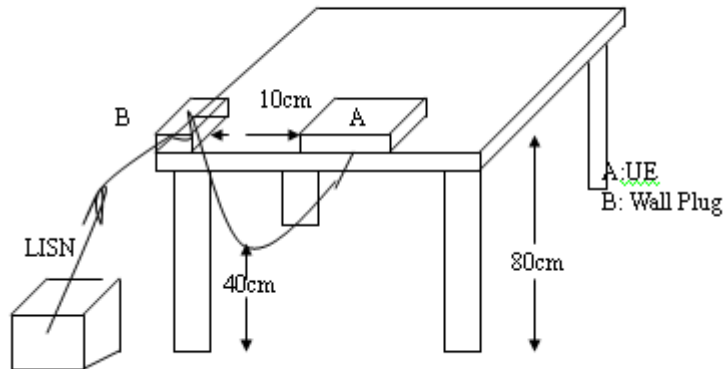
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6.4 Test SET-UP



6.5 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed.

6.6 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit

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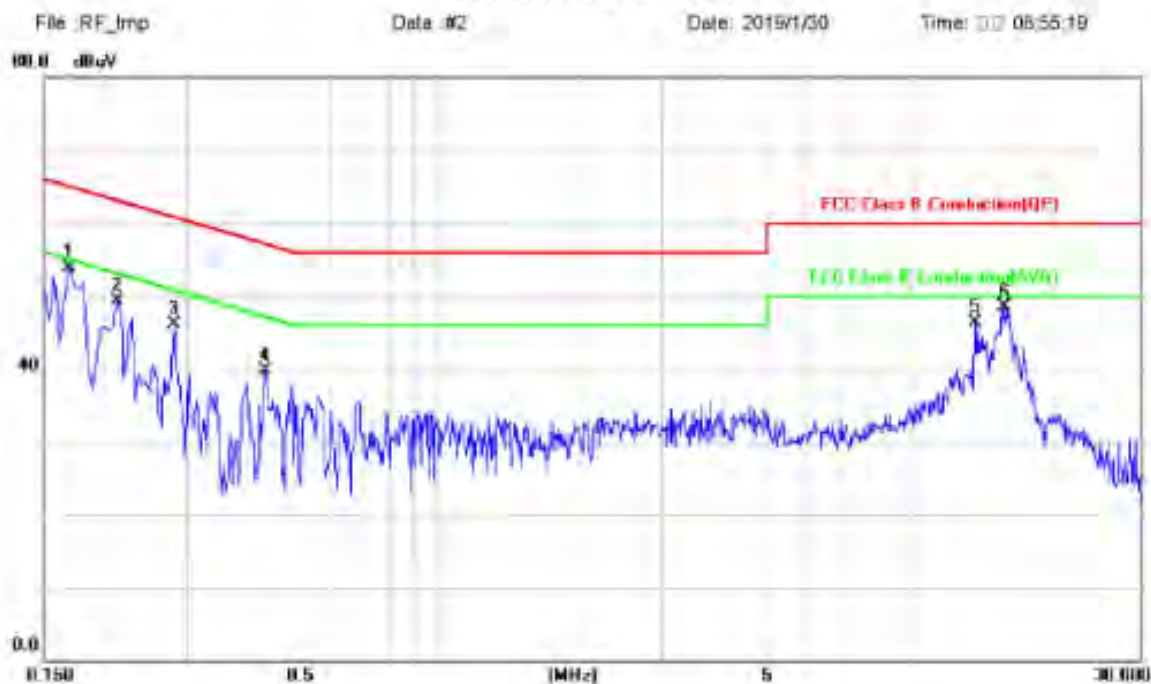
AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode	Test By:	Pony
-----------------	----------------	----------	------

Adapter 1

Site : Conduction Room B Phase: **L1** Temperature: 23.0
 Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 57 %
 Mode:
 Note:

Conducted Emission



No.	Mk	Freq MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.1700	34.25	19.69	53.94	64.96	-11.02	peak	
2		0.2140	29.56	19.76	49.32	63.05	-13.73	peak	
3		0.2820	26.26	19.88	46.14	60.76	-14.62	peak	
4		0.4380	19.57	20.13	39.70	57.10	-17.40	peak	
5		13.5620	26.37	19.97	46.34	60.00	-13.66	peak	
6		15.6060	28.44	19.99	48.43	60.00	-11.57	peak	

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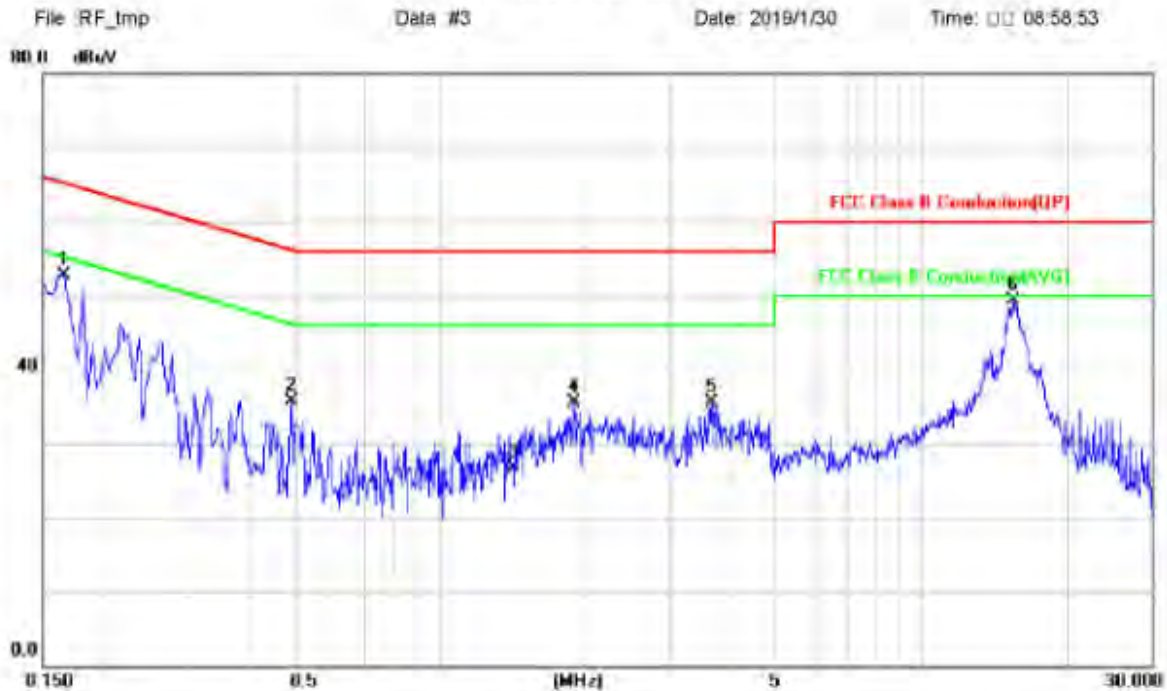
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Site : Conduction Room B
Limit: FCC Class B Conduction(QP)
Mode:
Note:

Phase: **N**
Power: AC 120V/60Hz

Temperature: 23 °C
Humidity: 57 %

Conducted Emission



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1660	33.12	19.66	52.78	65.16	-12.38	peak	
2		0.4940	15.53	20.21	35.74	56.10	-20.36	peak	
3		1.4140	6.58	20.12	26.70	56.00	-29.30	peak	
4		1.9060	15.04	20.47	35.51	56.00	-20.49	peak	
5		3.6700	15.33	20.23	35.56	56.00	-20.44	peak	
6 *		15.5100	29.25	20.01	49.26	60.00	-10.74	peak	

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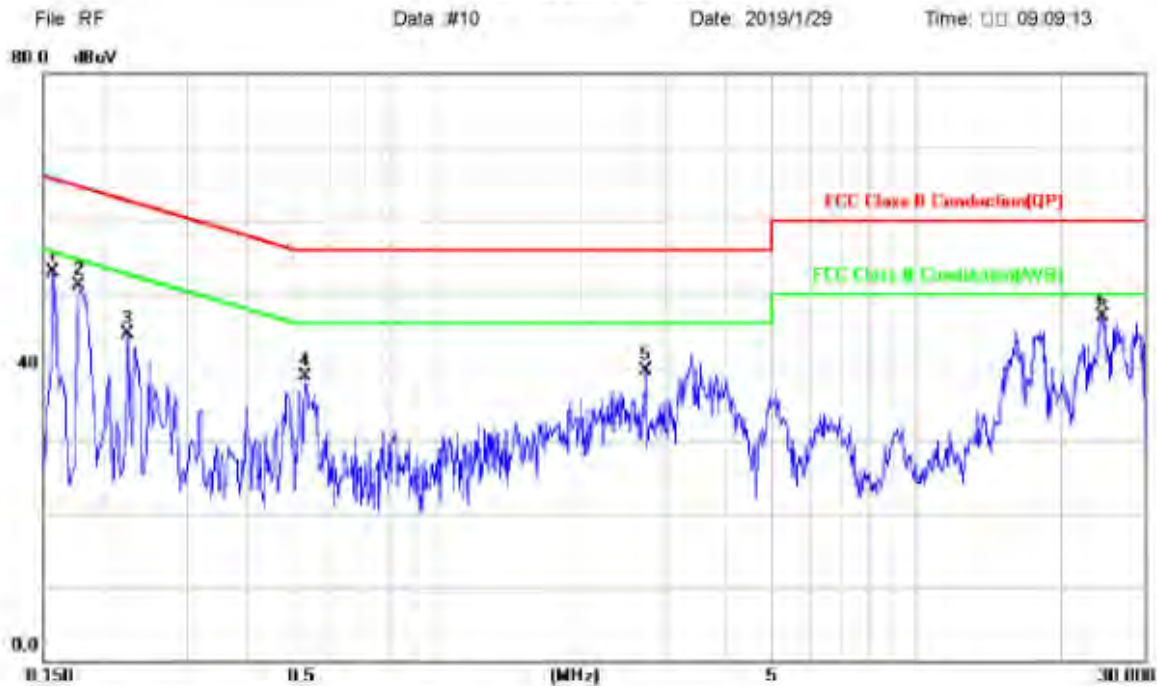
Adapter 2

Site : Conduction Room B
Limit: FCC Class B Conduction(QP)
Mode:
Note:

Phase: **L1**
Power: AC 120V/60Hz

Temperature: 23 °C
Humidity: 57 %

Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.1580	33.22	19.66	52.88	65.57	-12.69	peak	
2		0.1780	31.42	19.69	51.11	64.58	-13.47	peak	
3		0.2260	24.65	19.77	44.42	62.60	-18.18	peak	
4		0.5300	18.60	20.20	38.80	56.00	-17.20	peak	
5		2.7300	19.04	20.40	39.44	56.00	-16.56	peak	
6		24.5940	26.73	20.15	46.88	60.00	-13.12	peak	

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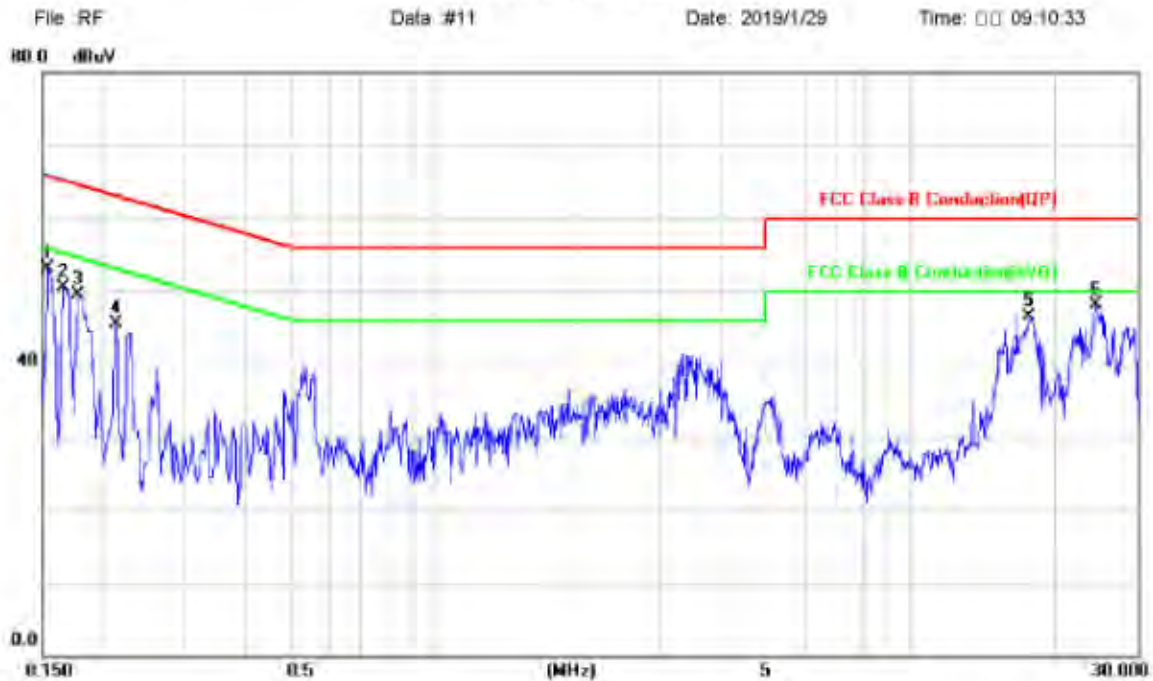
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Site : Conduction Room B
Limit: FCC Class B Conduction(QP)
Mode:
Note:

Phase: **N**
Power: AC 120V/60Hz

Temperature: 23 °C
Humidity: 57 %

Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1540	33.46	19.65	53.11	65.78	-12.67	peak	
2		0.1660	30.75	19.67	50.42	65.16	-14.74	peak	
3		0.1787	29.75	19.69	49.44	64.55	-15.11	peak	
4		0.2140	25.78	19.75	45.53	63.05	-17.52	peak	
5		17.8460	26.54	20.06	46.60	60.00	-13.40	peak	
6 *		24.5700	27.94	20.22	48.16	60.00	-11.84	peak	

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7 DUTY CYCLE TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

Formula:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

Measurement Procedure:

1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

Duty Cycle:

Mode	Duty Cycle (%)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11a	94.99	0.22	2.65	3.00
802.11n_20	84.63	0.72	1.11	2.00
802.11n_40	84.53	0.73	4.44	5.00
802.11ac_80	84.09	0.75	4.17	5.00

$$\text{Duty Cycle Factor: } 10 * \log(1/0.9499) = 0.22$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.8463) = 0.72$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.8453) = 0.73$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.8409) = 0.75$$

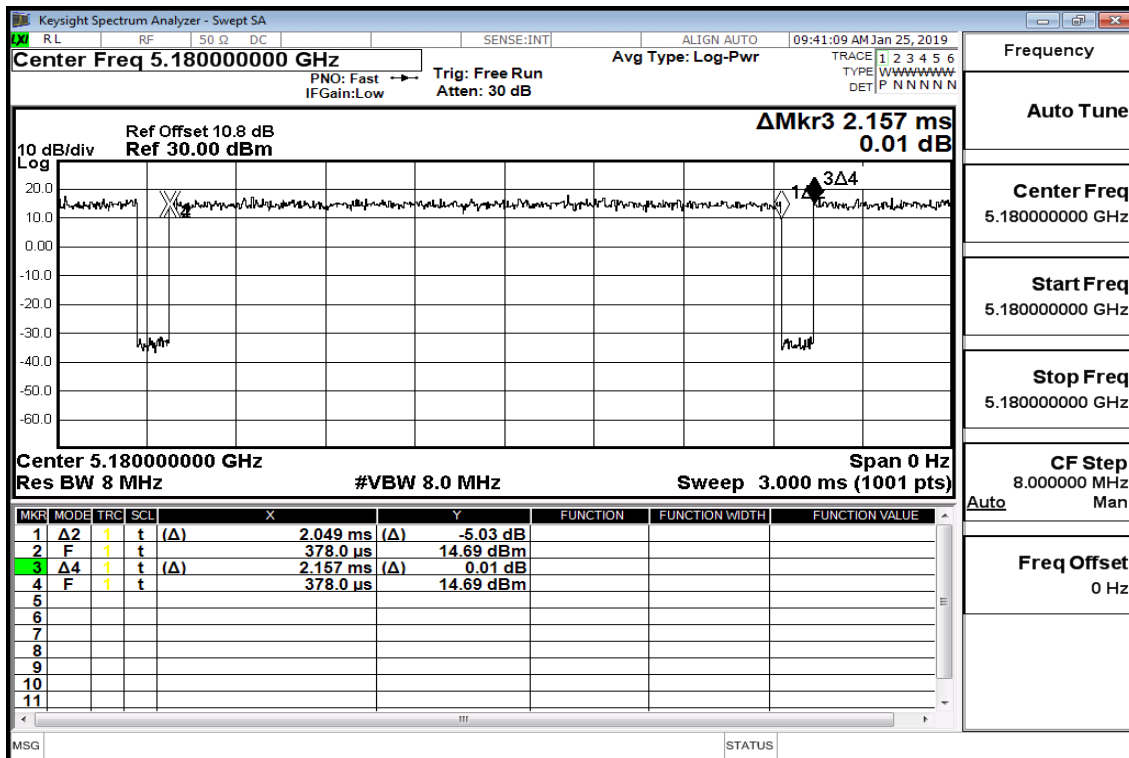
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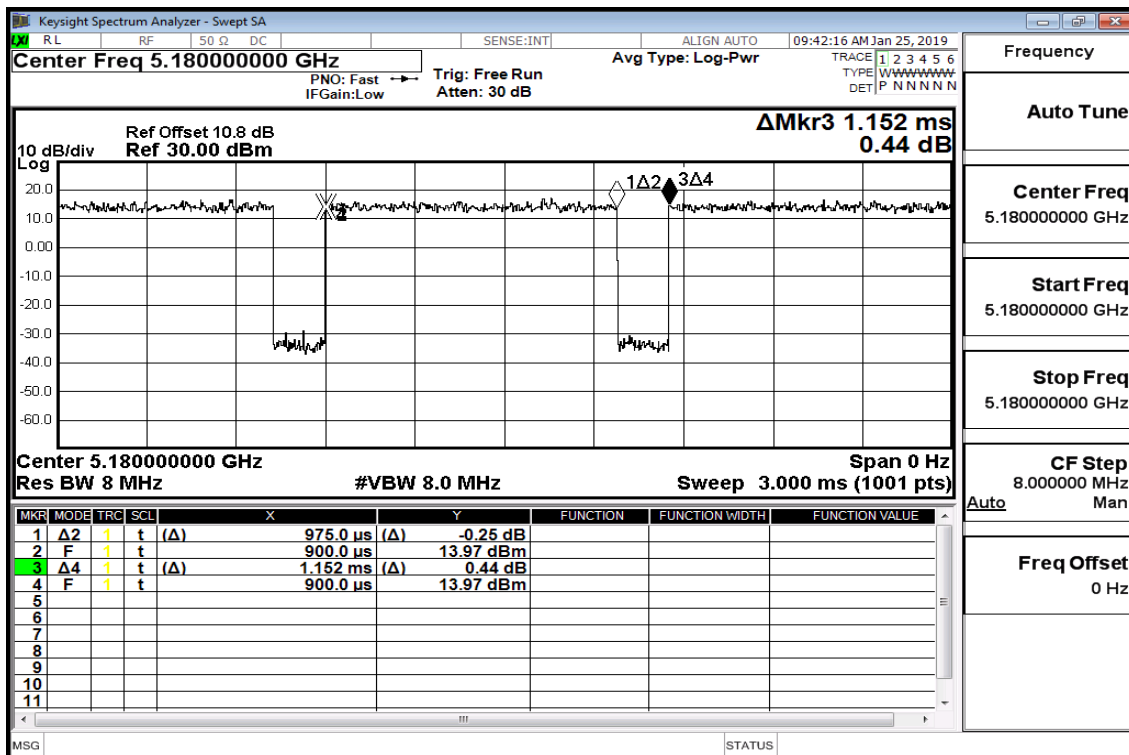
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DUTY CYCLE TEST SIGNAL Measurement Result

802.11a



802.11n HT20

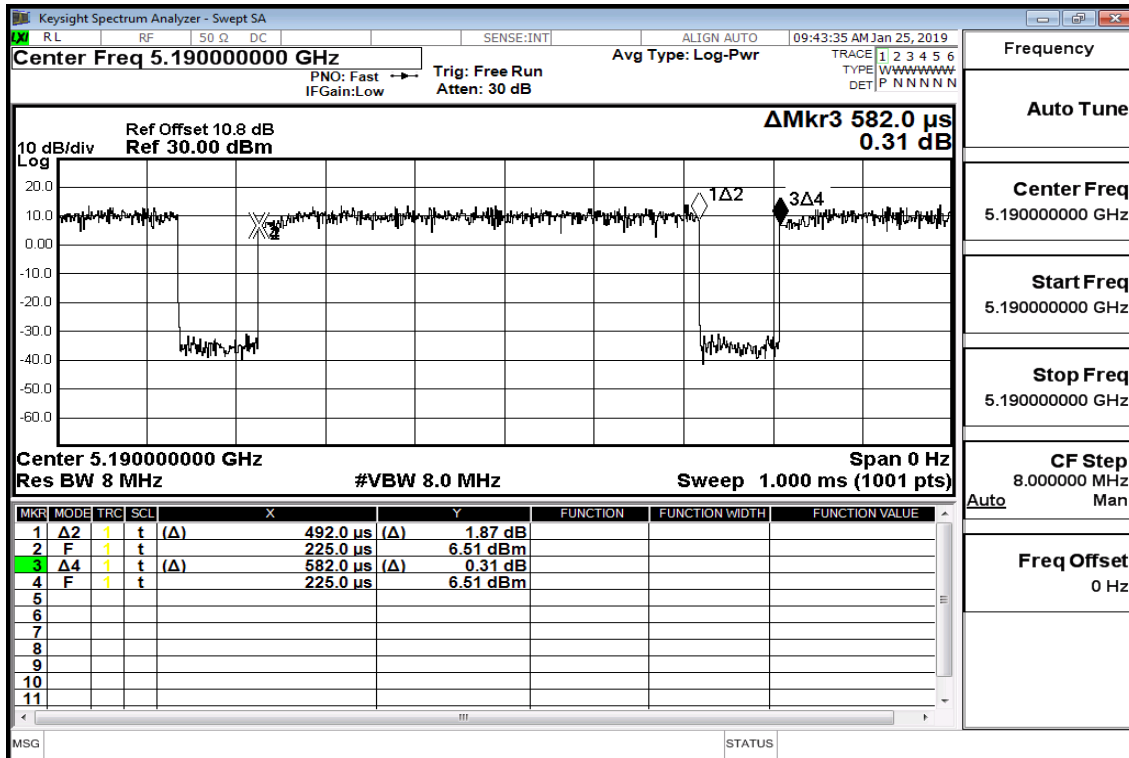


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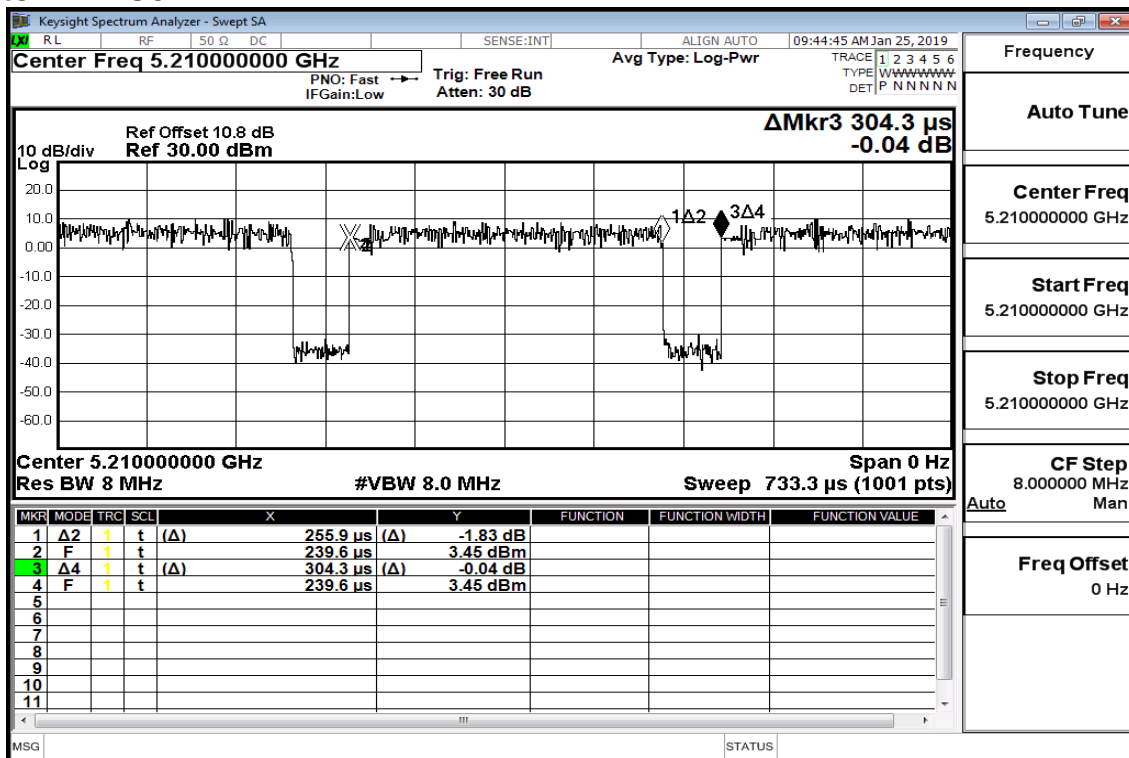
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802.11n HT 40



802.11 ac VHT 80



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8 26DB & 6DB EMISSION BANDWIDTH MEASUREMENT

8.1 Standard Applicable

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C.

The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

8.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the Antenna port to the spectrum analyzer.
 - a. 26dB Band width Measurement: Set the spectrum analyzer as 1% of emission BW Sweep=auto, Detector = Peak, Trace Mode = Max Hold, Manually readjust RBW until the RBW/EBW ratio is 1% based on EBW as observed on the result of pre-sequence measurement.
 - b. Mark the peak frequency and -26dB (upper and lower) frequency.
4. Repeat the procedures as list above until all test default channels (low, middle, and high) are completed.
5. Minimum Emission Bandwidth for the band 5.725-5.850GHz.
 - a. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3*RBW, Span = 30M/50MHz, Detector=Peak, Sweep=auto
 - b. Mark the peak frequency and -6dB (upper and lower) frequency.
6. For 99% Bandwidth:

Set the spectrum analyzer as RBW=1%, VBW = 3*RBW, Span = 30M/50MHz, Detector=Sample, Sweep=auto.
7. Turn on the 99% bandwidth function, max reading.
8. Repeat above procedures until all frequency of interest measured was complete.

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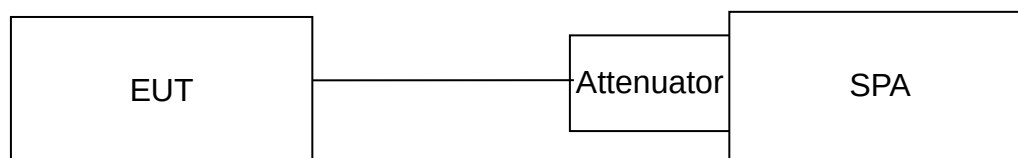
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8.3 Measurement Equipment Used

SGS Conducted Room					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY51440113	06/20/2018	06/19/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/25/2018	12/24/2019
DC Block	PASTERNAK	PE8210	RF29	12/25/2018	12/24/2019

8.4 Test Set-up



8.5 Measurement Result

26dB and 6dB Bandwidth

802.11a_Ch0

802.11a_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	21.220	13.267	5180	23.030	13.623
5220	22.550	13.531	5220	21.330	13.290
5240	19.040	12.797	5240	19.210	12.835

802.11n_HT20_Ch0

802.11n_HT20_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	22.120	13.448	5180	21.420	13.308
5220	22.200	13.464	5220	21.750	13.375
5240	22.460	13.514	5240	20.820	13.185

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802.11n_HT40_Ch0

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	40.460	16.070
5230	41.580	16.189

802.11n_HT40_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	41.010	16.129
5230	40.980	16.126

802.11ac_VHT80_Ch0

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	80.320	19.048

802.11ac_VHT80_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	80.280	19.046

99% Bandwidth

802.11a_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	16.563	12.191
5220	16.566	12.192
5240	16.632	12.209

802.11a_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	16.507	12.177
5220	16.612	12.204
5240	16.565	12.192

802.11n_HT20_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	17.692	12.478
5220	17.657	12.469
5240	17.669	12.472

802.11n_HT20_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	17.686	12.476
5220	17.700	12.480
5240	17.650	12.467

802.11n_HT40_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5190	36.037	15.567
5230	36.041	15.568

802.11n_HT40_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5190	36.032	15.567
5230	36.028	15.566

802.11ac_VHT80_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5210	75.284	18.767

802.11ac_VHT80_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5210	75.252	18.765

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99% BW verification for DFS function

802.11a_Ch0

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.13	< 5250

802.11a_Ch1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.13	< 5250

802.11n_HT20_Ch0

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.82	< 5250

802.11n_HT20_Ch1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.76	< 5250

802.11n_HT40_Ch0

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5230	5248.00	< 5250

802.11n_HT40_Ch1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5230	5248.00	< 5250

802.11ac_VHT80_Ch0

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5210	5247.6	< 5250

802.11n_HT80_Ch1

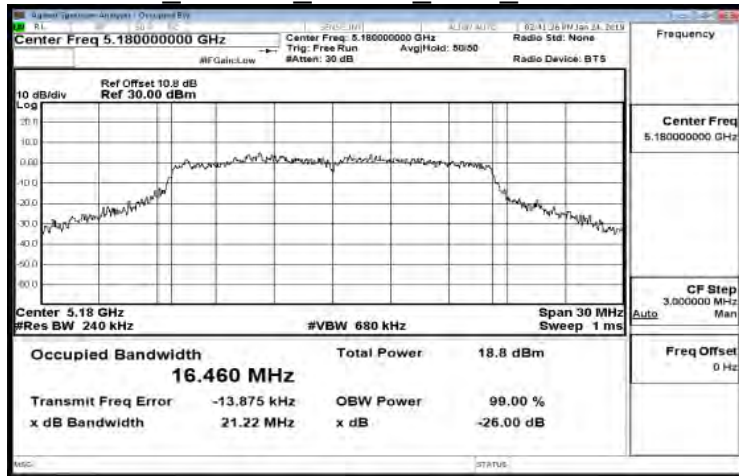
Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5210	5247.7	< 5250

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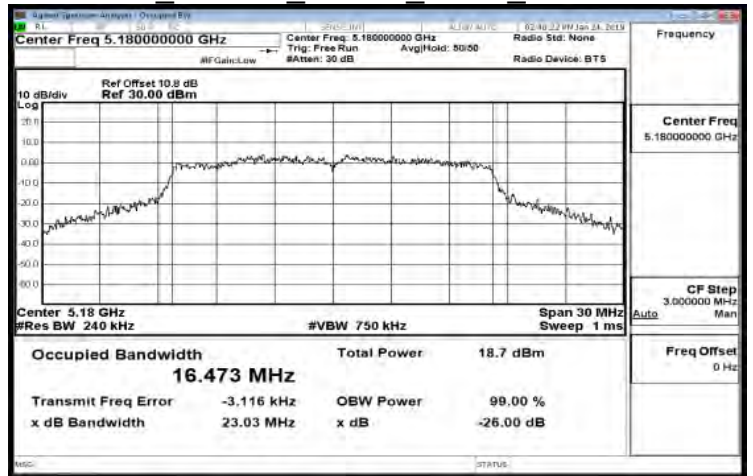
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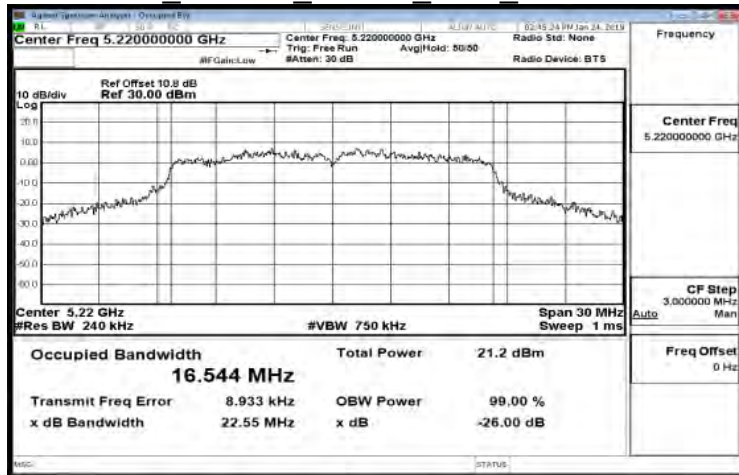
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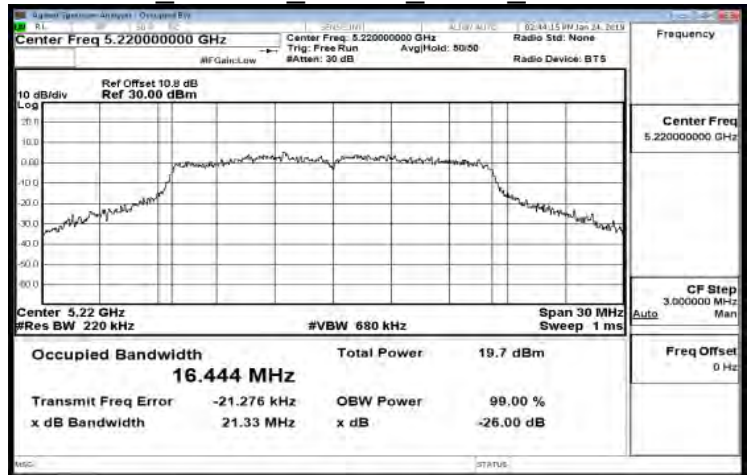
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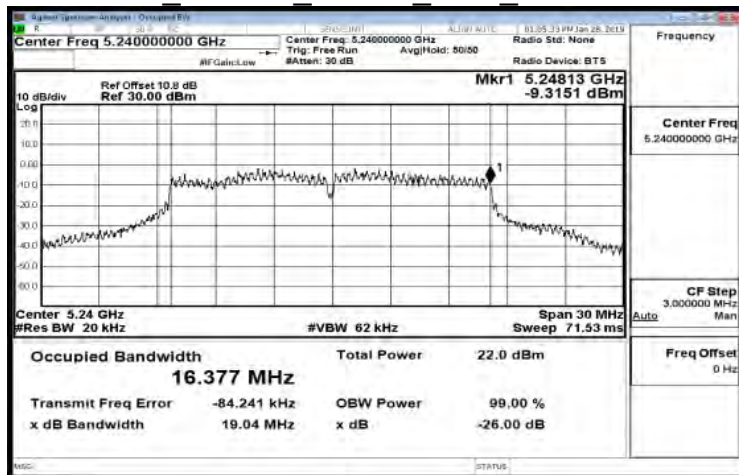
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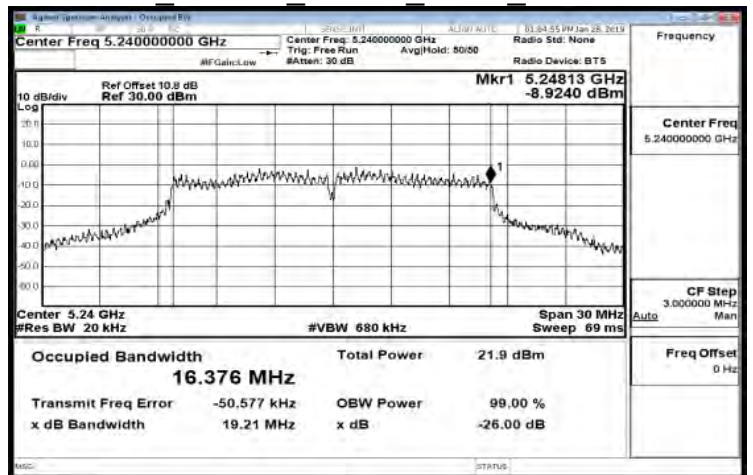
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FCC 802.11a 20MHz Main 5240MHz



FCC 802.11a 20MHz AUX1 5240MHz

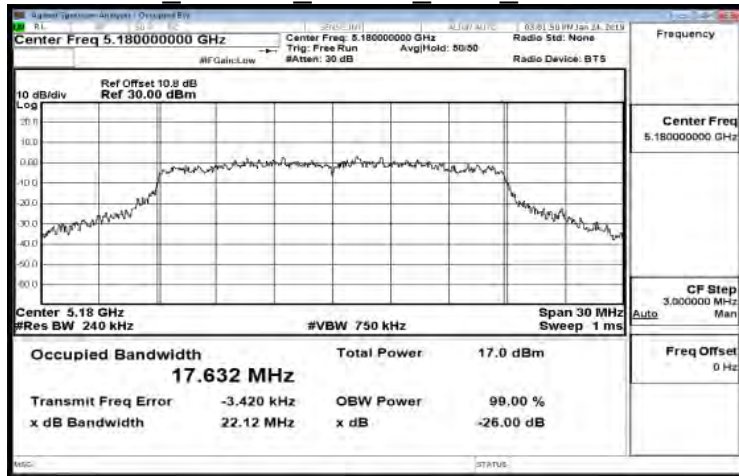


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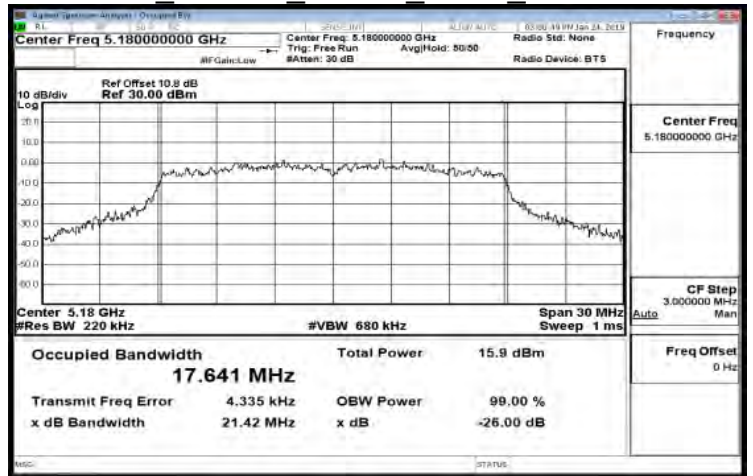
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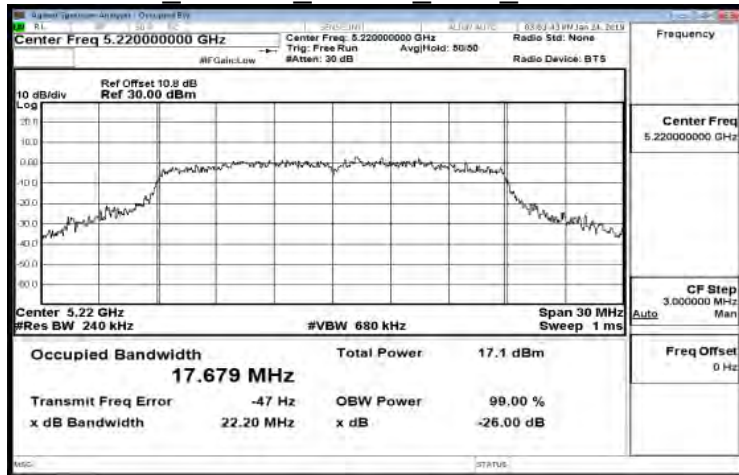
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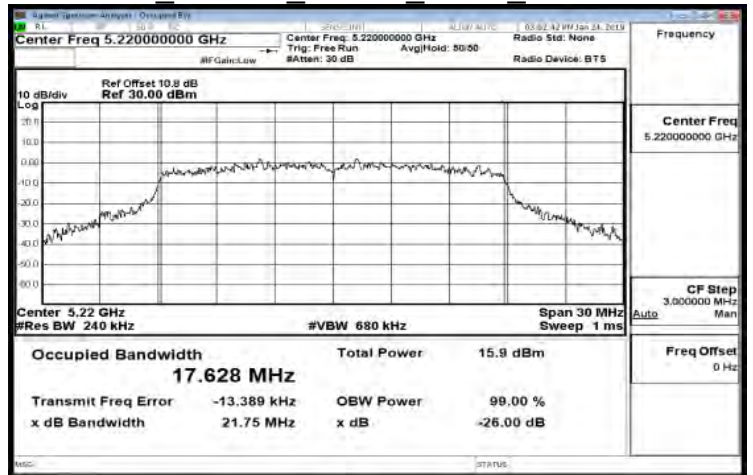
FCC 802.11n 20MHz AUX1 5180MHz



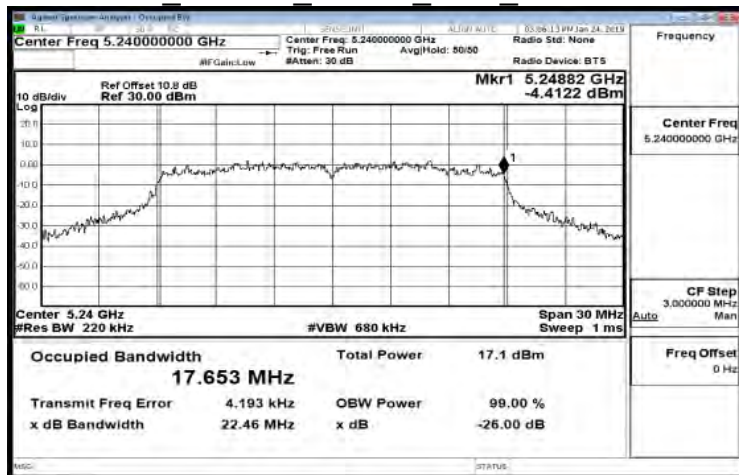
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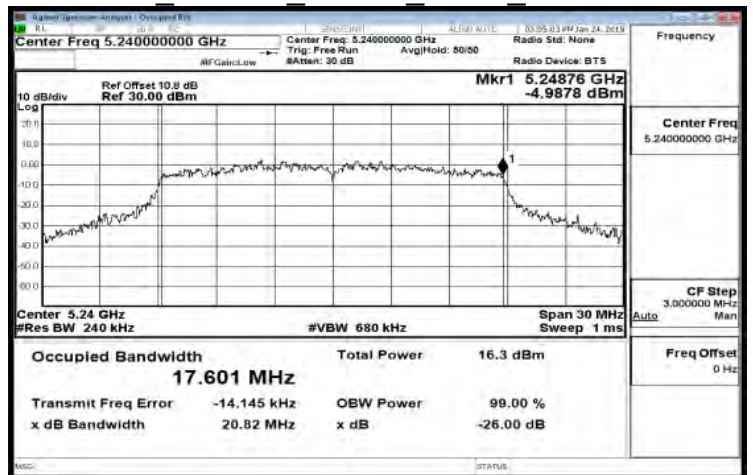
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FCC 802.11n 20MHz Main 5240MHz



FCC 802.11n 20MHz AUX1 5240MHz



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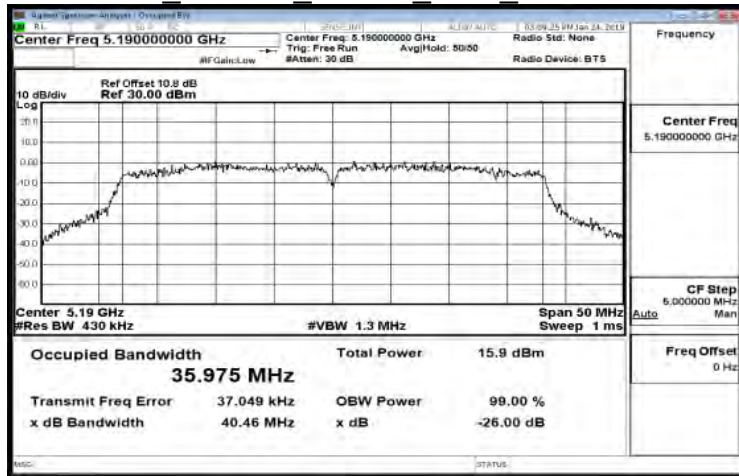
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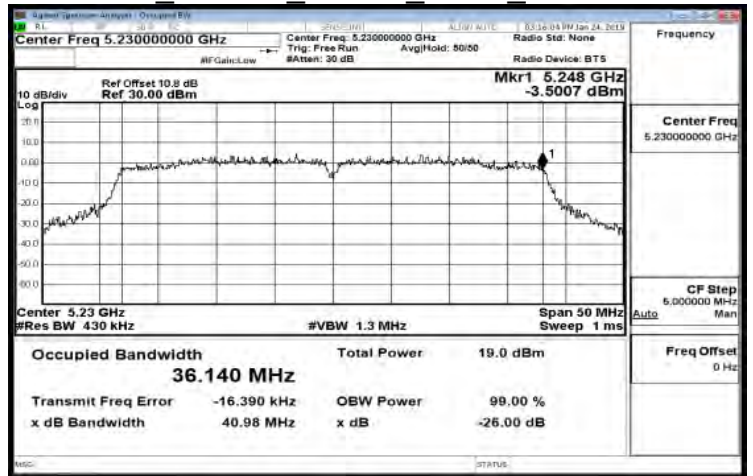
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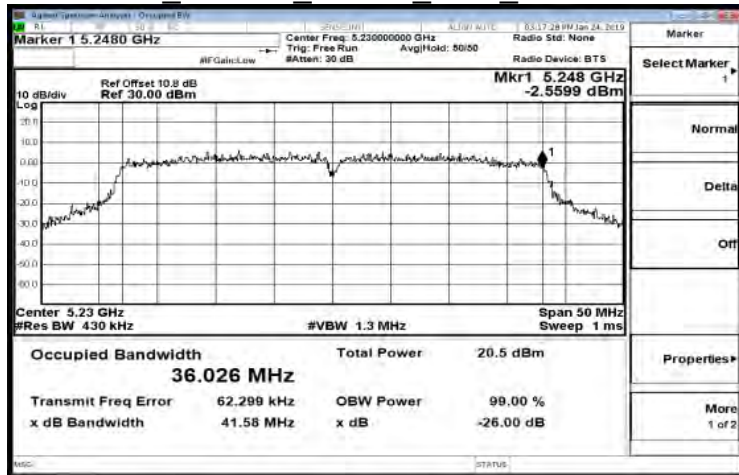
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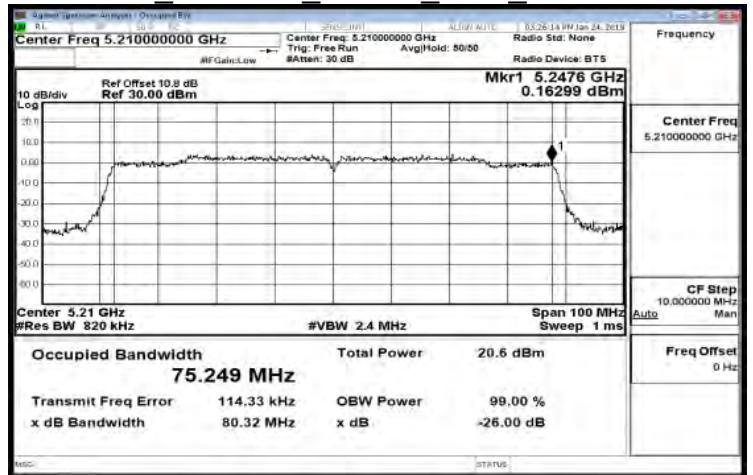
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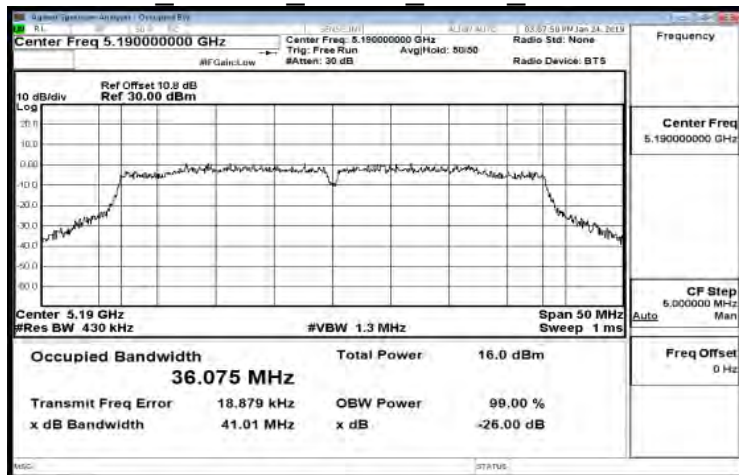
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FCC 802.11ac 80MHz Main 5210MHz



FCC 802.11n 40MHz AUX1 5190MHz



FCC 802.11ac 80MHz AUX1 5210MHz



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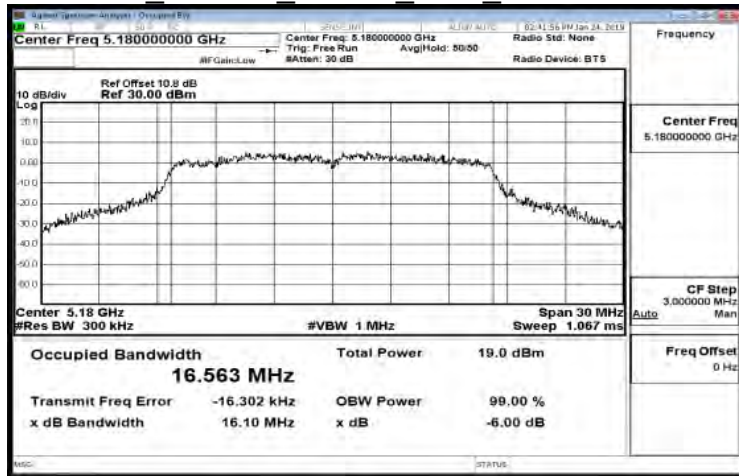
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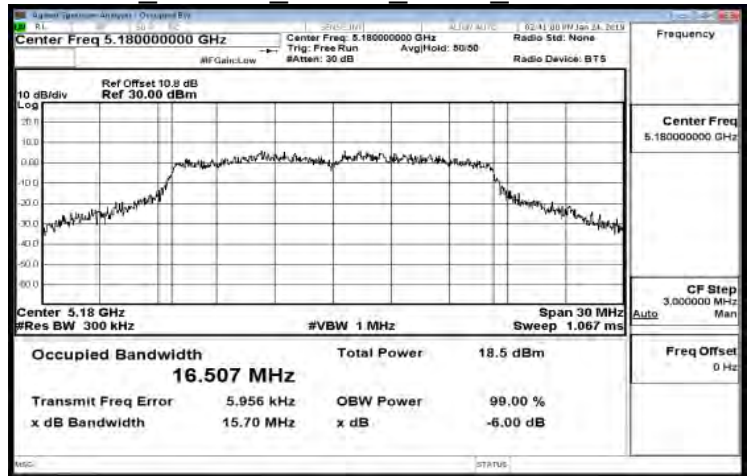
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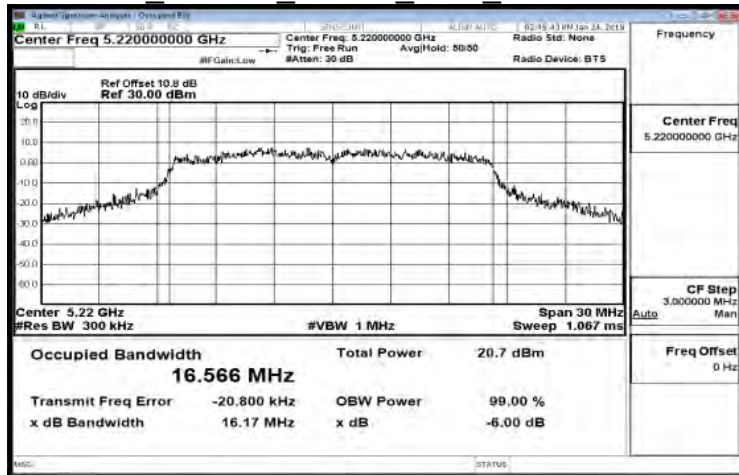
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IC 802.11a 20MHz AUX1 5180MHz



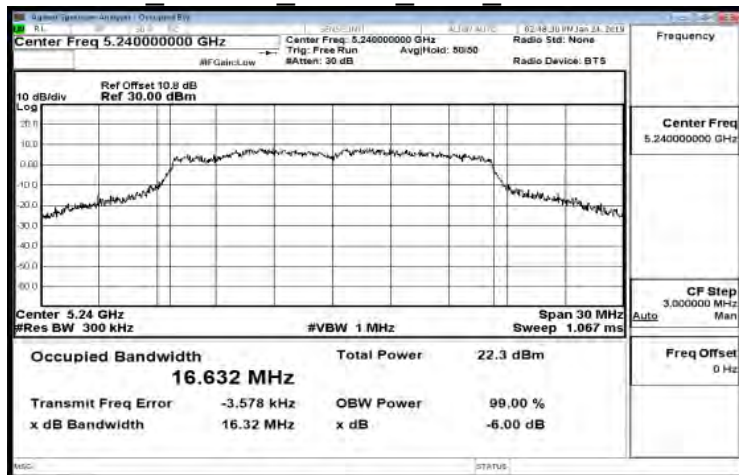
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IC 802.11a 20MHz AUX1 5220MHz



IC 802.11a 20MHz Main 5240MHz



IC 802.11a 20MHz AUX1 5240MHz

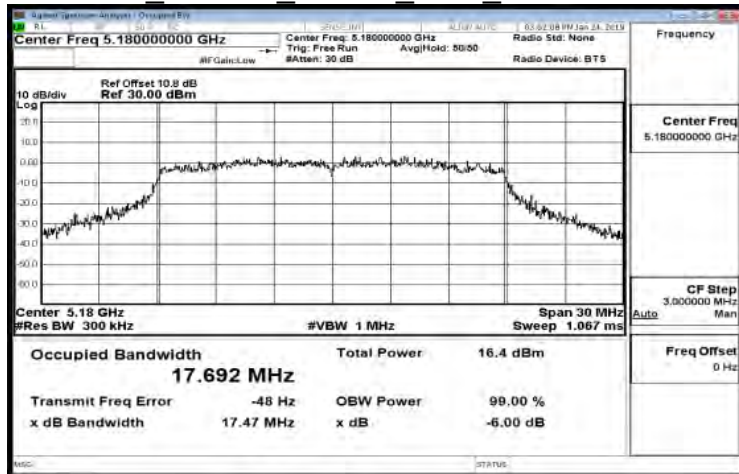


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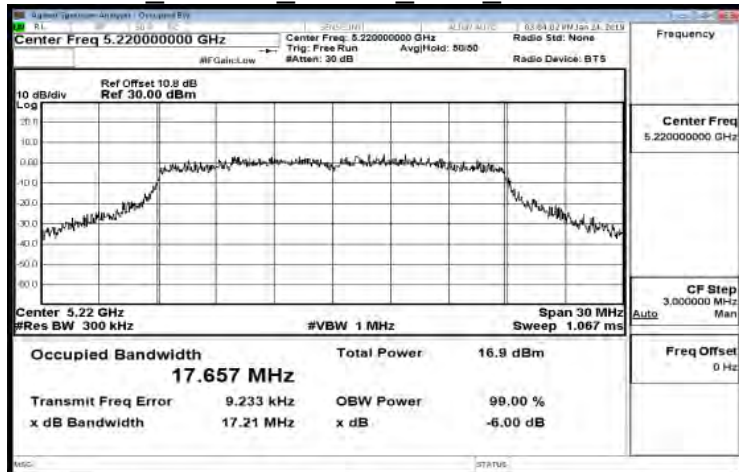
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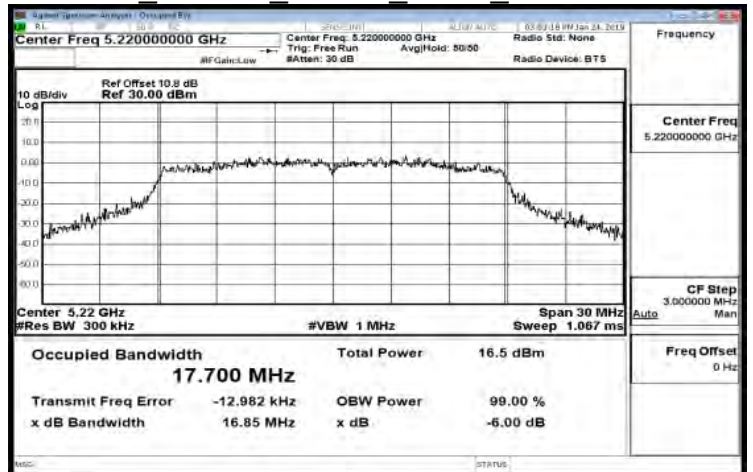
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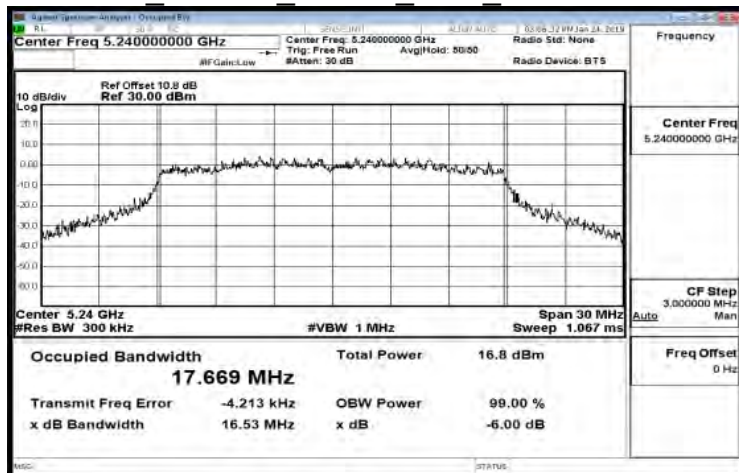
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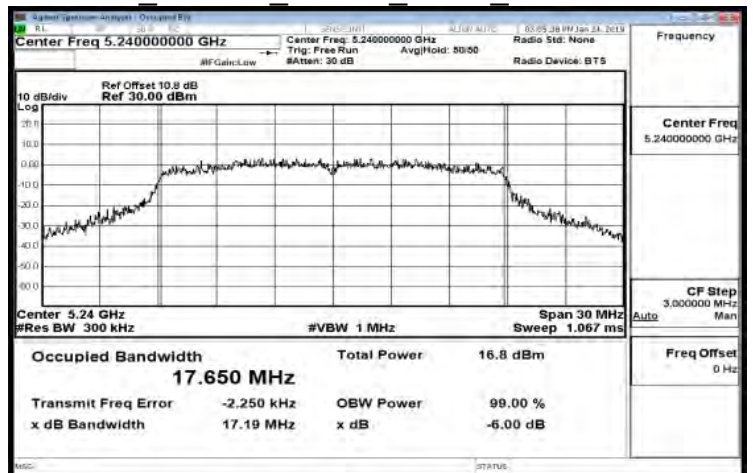
IC 802.11n 20MHz AUX1 5220MHz



IC 802.11n 20MHz Main 5240MHz



IC 802.11n 20MHz AUX1 5240MHz

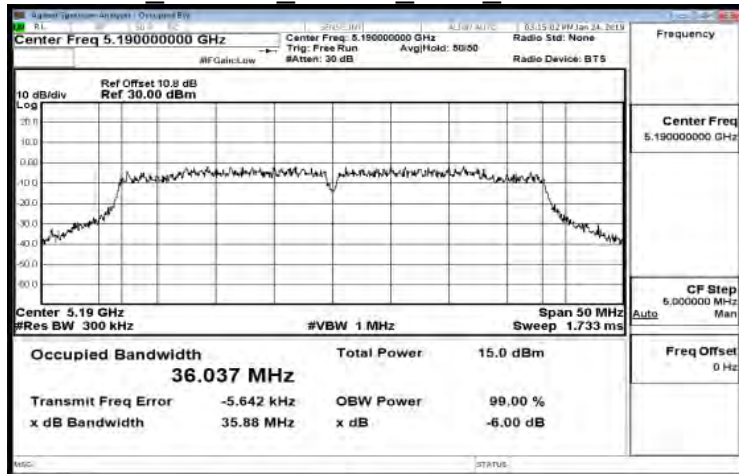


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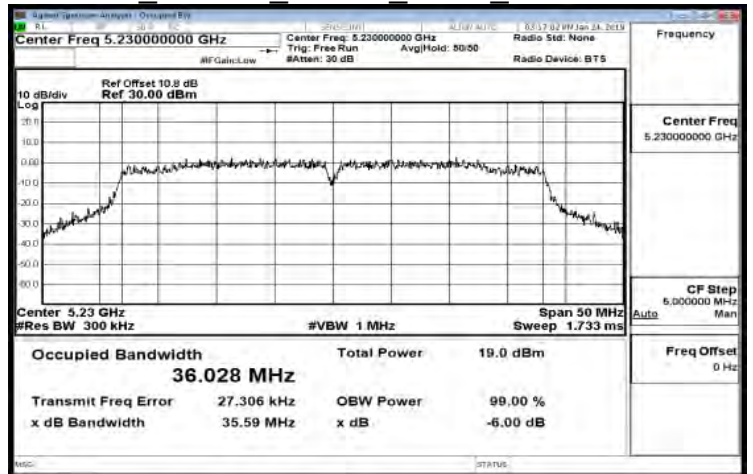
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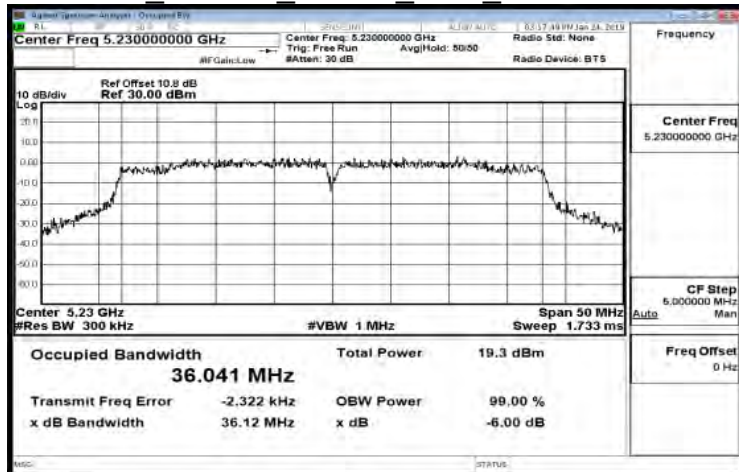
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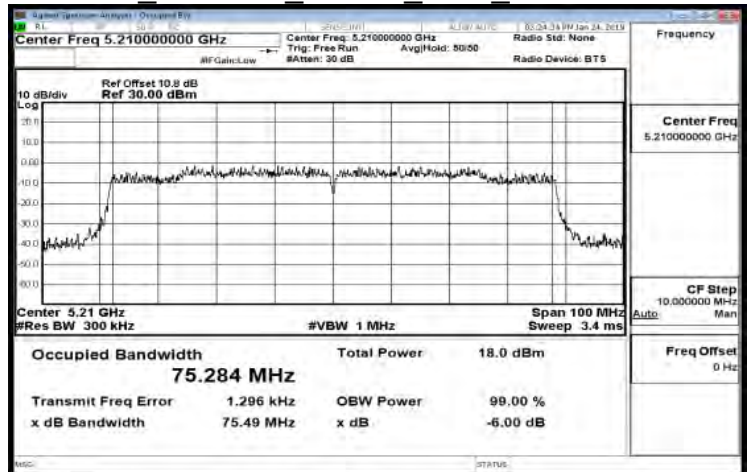
IC 802.11n 40MHz AUX1 5230MHz



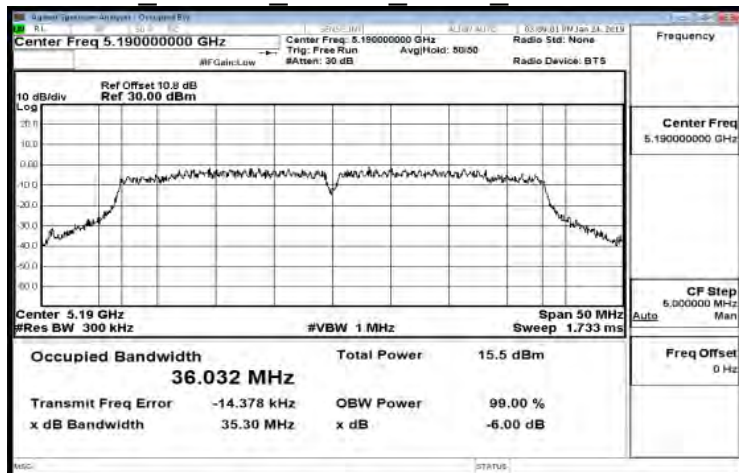
IC 802.11n 40MHz Main 5230MHz



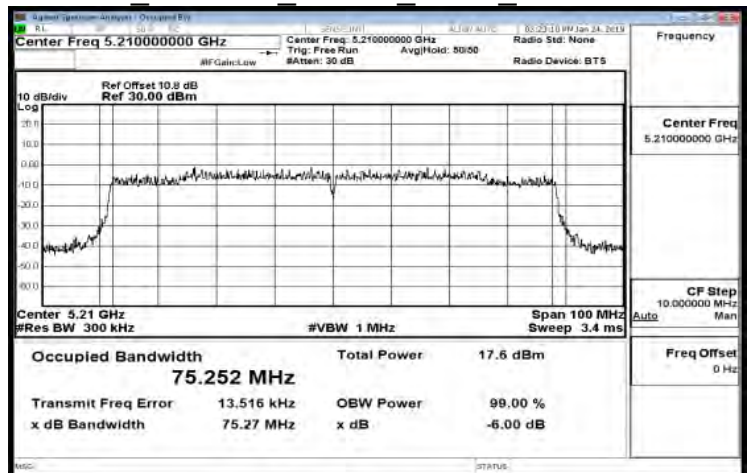
IC 802.11ac 80MHz Main 5210MHz



IC 802.11n 40MHz AUX1 5190MHz



IC 802.11ac 80MHz AUX1 5210MHz



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9 MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

9.1 Standard Applicable

FCC

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1		Access Point (Master device)	1 Watt(30dBm)
		Fixed point-to-point Access Ponit	1 Watt(30dBm)
	√	Mobile and portable client device	250mW(23.98dBm)
U-NII-2A			250mW(23.98dBm) or 11dBm+10 log B
U-NII-2C			250mW(23.98dBm) or 11dBm+10 log B
U-NII-3			1 Watt(30dBm)
If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum transmit power shall be reduced by the amount in dB that the direction-al gain of the antenna exceeds 6 dBi.			

ISED

OPERZTION FREQUENCY BAND	LIMIT
5150~5250 MHz	EIRP shall not exceed 200 mW or $10 + 10 \log_{10} B$, dBm
5250~5350 MHz	Conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$ EIRP shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm
5470-5600 MHz and 5650-5725 MHz	Conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$ EIRP shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm
5725~5850 MHz	Conducted output power shall not exceed 1 W
For equipment operating in the band 5725-5850 MHz, If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum transmit power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	

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Note:

As per FCC KDB 662911 D01

Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, ..., GN dBi.

(i) If transmit signals are correlated, then Directional gain

$$= 10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] \text{ dBi}$$

[Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

The antenna gain is not greater than 6 dBi. Therefore, reduction of power is not required.

9.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
4. Power Meter is used as the auxiliary test equipment to conduct the output power measurement.
5. Record the max. reading and add 10 log(1/duty cycle).
6. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.

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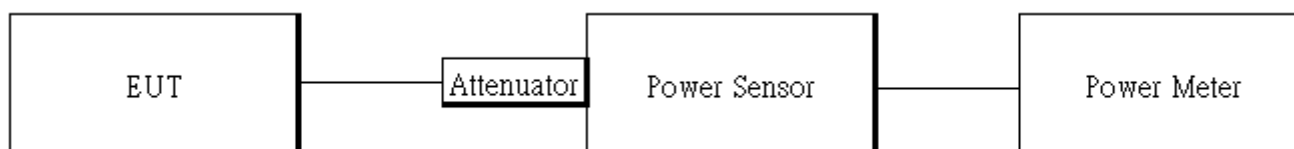
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9.3 Measurement Equipment Used

SGS Conducted Room					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1326001	08/09/2018	08/02/2019
Power Sensor	Anritsu	MA2411B	1315048	08/09/2018	08/02/2019
Power Sensor	Anritsu	MA2411B	1315049	08/09/2018	08/02/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/25/2018	12/24/2019

9.4 Test Set-up



9.5 Measurement Result

Conducted output power (FCC)

802.11a_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	6	13.70	23.428	23.98	PASS
44	5220	6	15.38	34.493	23.98	PASS
48	5240	6	15.39	34.573	23.98	PASS

802.11a_Ch1

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	6	13.90	24.532	23.98	PASS
44	5220	6	15.86	38.524	23.98	PASS
48	5240	6	15.87	38.613	23.98	PASS

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802.11n_HT20_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	MCS0	14.02	25.212	23.98	PASS
44	5220	MCS0	14.06	25.445	23.98	PASS
48	5240	MCS0	14.31	26.953	23.98	PASS

802.11n_HT20_Ch1

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	MCS0	14.10	25.680	23.98	PASS
44	5220	MCS0	14.26	26.644	23.98	PASS
48	5240	MCS0	14.38	27.391	23.98	PASS

802.11n_HT20_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
36	5180	MCS8	10.4	10.7	14.43	27.757	23.98	PASS
44	5220	MCS8	10.5	10.6	14.40	27.521	23.98	PASS
48	5240	MCS8	10.6	10.8	14.56	28.556	23.98	PASS

802.11n_HT40_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
38	5190	MCS0	11.56	14.327	23.98	PASS
46	5230	MCS0	15.96	39.459	23.98	PASS

802.11n_HT40_Ch1

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
38	5190	MCS0	12.96	19.776	23.98	PASS
46	5230	MCS0	16.07	40.471	23.98	PASS

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802.11n_HT40_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
38	5190	MCS8	8.25	9.11	12.44	17.551	23.98	PASS
46	5230	MCS8	13.1	13.5	17.02	50.363	23.98	PASS

802.11ac_VHT80_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
42	5210	MCS0	13.15	20.641	23.98	PASS

802.11ac_VHT80_Ch1

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
42	5210	MCS0	13.28	21.268	23.98	PASS

802.11ac_VHT80_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
42	5210	MCS0	10.3	10.4	14.09	25.663	23.98	PASS

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EIRP

802.11a_Ch0

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	13.70	-2.400	11.30	13.481	23.01 or 10+10log(B)= 22.19	PASS
44	5220	15.38	-2.400	12.98	19.849	23.01 or 10+10log(B)= 22.19	PASS
48	5240	15.39	-2.400	12.99	19.895	23.01 or 10+10log(B)= 22.21	PASS

802.11a_Ch1

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	13.90	-3.600	10.30	10.709	23.01 or 10+10log(B)= 22.18	PASS
44	5220	15.86	-3.600	12.26	16.816	23.01 or 10+10log(B)= 22.20	PASS
48	5240	15.87	-3.600	12.27	16.855	23.01 or 10+10log(B)= 22.19	PASS

802.11n_HT20_Ch0

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	14.02	-2.400	11.62	14.508	23.01 or 10+10log(B)= 22.48	PASS
44	5220	14.06	-2.400	11.66	14.642	23.01 or 10+10log(B)= 22.47	PASS
48	5240	14.31	-2.400	11.91	15.510	23.01 or 10+10log(B)= 22.47	PASS

802.11n_HT20_Ch1

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	14.10	-3.600	10.50	11.210	23.01 or 10+10log(B)= 22.48	PASS
44	5220	14.26	-3.600	10.66	11.631	23.01 or 10+10log(B)= 22.48	PASS
48	5240	14.38	-3.600	10.78	11.956	23.01 or 10+10log(B)= 22.47	PASS

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802.11n_HT20_MIMO

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	14.43	0.031	14.46	27.956	23.01 or 10+10log(B)= 22.48	PASS
44	5220	14.40	0.031	14.43	27.718	23.01 or 10+10log(B)= 22.47	PASS
48	5240	14.56	0.031	14.59	28.761	23.01 or 10+10log(B)= 22.47	PASS

802.11n_HT40_Ch0

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
38	5190	11.56	-2.400	9.16	8.244	23.01 or 10+10log(B)= 25.57	PASS
46	5230	15.96	-2.400	13.56	22.706	23.01 or 10+10log(B)= 25.57	PASS

802.11n_HT40_Ch1

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
38	5190	12.96	-3.600	9.36	8.633	23.01 or 10+10log(B)= 25.57	PASS
46	5230	16.07	-3.600	12.47	17.666	23.01 or 10+10log(B)= 25.57	PASS

802.11n_HT40_MIMO

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
38	5190	12.44	0.031	12.47	17.677	23.01 or 10+10log(B)= 25.57	PASS
46	5230	17.02	0.031	17.05	50.724	23.01 or 10+10log(B)= 25.57	PASS

802.11ac_VHT80_Ch0

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
42	5210	13.15	-2.400	10.75	11.877	23.01 or 10+10log(B)= 28.77	PASS

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802.11ac_VHT80_Ch1

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
42	5210	13.28	-3.600	9.68	9.284	23.01 or $10+10\log(B)= 28.77$	PASS

802.11ac_VHT80_MIMO

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
42	5210	14.09	0.031	14.12	25.847	23.01 or $10+10\log(B)= 28.77$	PASS

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10 MAXIMUM POWER SPECTRAL DENSITY

10.1 Standard Applicable

FCC

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1		Access Point (Master device)	17dBm/ MHz
		Fixed point-to-point Access Ponit	
	√	Mobile and portable client device	11dBm/ MHz
U-NII-2A			11dBm/ MHz
U-NII-2C			11dBm/ MHz
U-NII-3			30dBm/ 500kHz
If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.			

ISED

OPERZTION FREQUENCY BAND	LIMIT
5150~5250 MHz	EIRP spectral density 10 dBm / MHz
5250~5350 MHz	11dBm / MHz
5470-5600 MHz and 5650-5725 MHz	11dBm / MHz
5725~5850 MHz	30dBm / 500 kHz
For equipment operating in the band 5725-5850 MHz, If transmitting antennas of directional gain greater than 6 dBi are used, the Maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	

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Note:

As per FCC KDB 662911 D01

Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, ..., GN dBi.

(i) If transmit signals are correlated, then Directional gain

$$= 10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] \text{ dBi}$$

[Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

The antenna gain is not greater than 6 dBi. Therefore, reduction of power is not required.

10.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
4. **For U-NII1, U-NII-2A, U-NII-2C Band:**
Set RBW=1MHz, VBW=3MHz, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
For U-NII-3 Band:
Set RBW=500 kHz, VBW≥ 3RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
5. Use the cursor on spectrum to peak search the highest level of trace
6. Record the max. reading and add 10 log(1/duty cycle).
7. Repeat above procedures until all default test channel (low, middle, and high) was complete.
8. 802.11n MIMO mode: offset is set following “measure and add 10 Log (N)” on spectrum to measure the PSD for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna. N=2 for this given application.

Note: For the test of PSD at MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported on this report after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. The MIMO transmitting mode produces higher value of outcome

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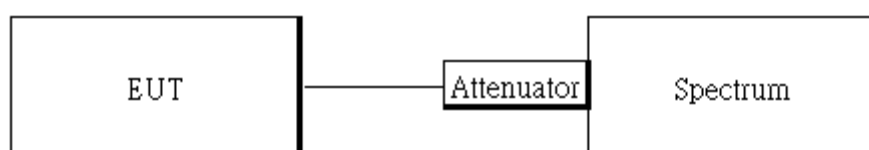
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10.3 Measurement Equipment Used

SGS Conducted Room					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY51440113	06/20/2018	06/19/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/25/2018	12/24/2019
DC Block	PASTERNAK	PE8210	RF29	12/25/2018	12/24/2019

10.4 Test Set-up



10.5 Measurement Result

For FCC

POWER DENSITY 802.11a MODE					
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5180	2.47	0.22	2.69	11	-14.31
5220	4.93	0.22	5.15	11	-11.85
5240	0.45	0.22	0.67	11	-16.33

POWER DENSITY 802.11n HT20 MODE (MIMO)					
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5180	-1.95	0.72	-1.23	11	-18.23
5220	-3.85	0.72	-3.13	11	-20.13
5240	-3.24	0.72	-2.52	11	-19.52

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POWER DENSITY 802.11n HT40 MODE (MIMO)					
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5190	-4.52	0.73	-3.79	11	-20.79
5230	-1.43	0.73	-0.70	11	-17.70

POWER DENSITY 802.11ac VHT80 MODE (MIMO)					
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5210	-5.61	0.75	-4.86	11	-21.86

For IC

EIRP spectral density 802.11a MODE					
Freq. (MHz)	PSD (dBm)	Ant. Gain (dBi)	EIRP SD (dBm)	Limit (dBm)	Margin (dB)
5180	2.69	-2.40	0.29	10	-9.71
5220	5.15	-2.40	2.75	10	-7.25
5240	0.67	-2.40	-1.73	10	-11.73

EIRP spectral density 802.11n HT20 MODE (MIMO)					
Freq. (MHz)	PSD (dBm)	Ant. Gain (dBi)	EIRP SD (dBm)	Limit (dBm)	Margin (dB)
5180	-1.23	0.03	-1.19	10	-11.19
5220	-3.13	0.03	-3.09	10	-13.09
5240	-2.52	0.03	-2.48	10	-12.48

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EIRP spectral density 802.11n HT40 MODE (MIMO)					
Freq. (MHz)	PSD (dBm)	Ant. Gain (dBi)	EIRP SD (dBm)	Limit (dBm)	Margin (dB)
5180	-3.79	0.03	-3.76	10	-13.76
5220	-0.70	0.03	-0.67	10	-10.67

EIRP spectral density 802.11ac VHT80 MODE (MIMO)					
Freq. (MHz)	PSD (dBm)	Ant. Gain (dBi)	EIRP SD (dBm)	Limit (dBm)	Margin (dB)
5210	-4.86	0.03	-4.83	10	-14.83

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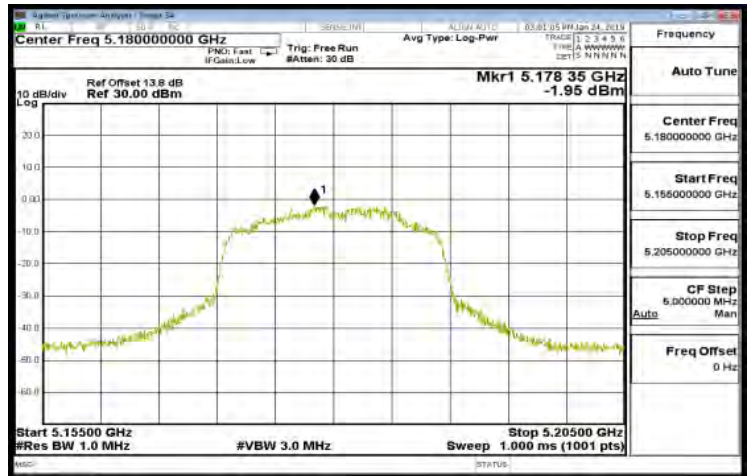
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802.11a_20MHz_5180MHz



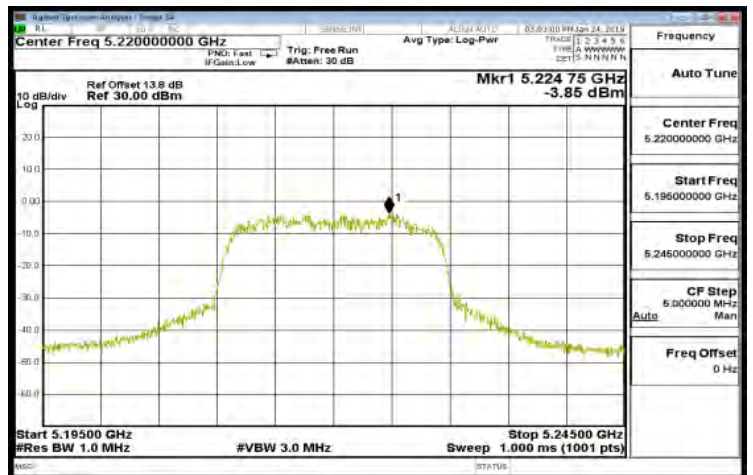
802.11n_20MHz_5180MHz



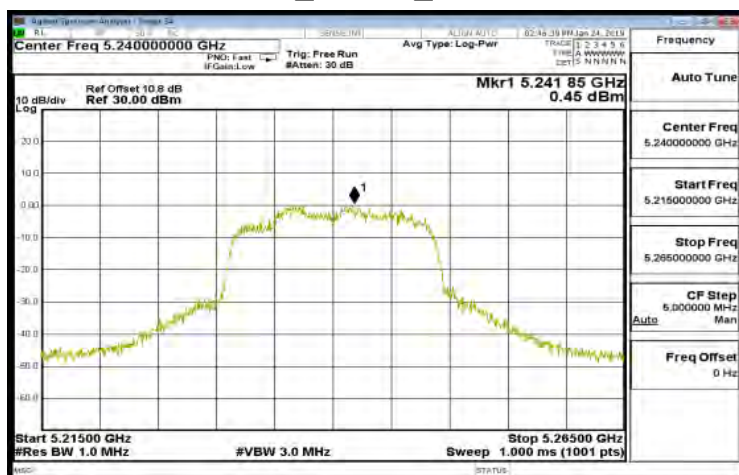
802.11a_20MHz_5220MHz



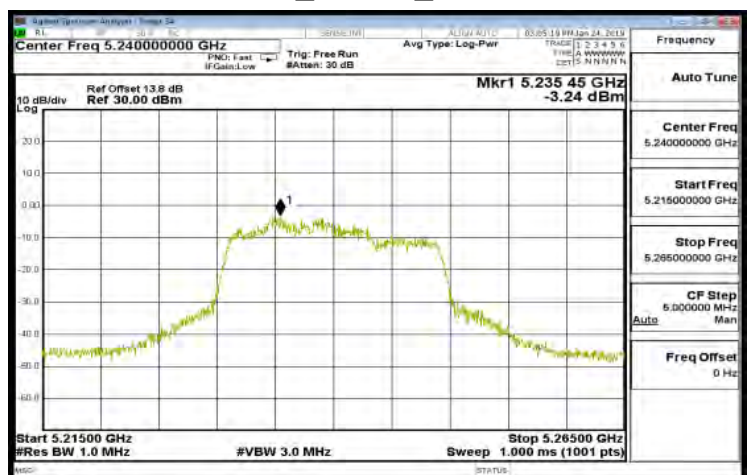
802.11n_20MHz_5220MHz



802.11a_20MHz_5240MHz



802.11n_20MHz_5240MHz

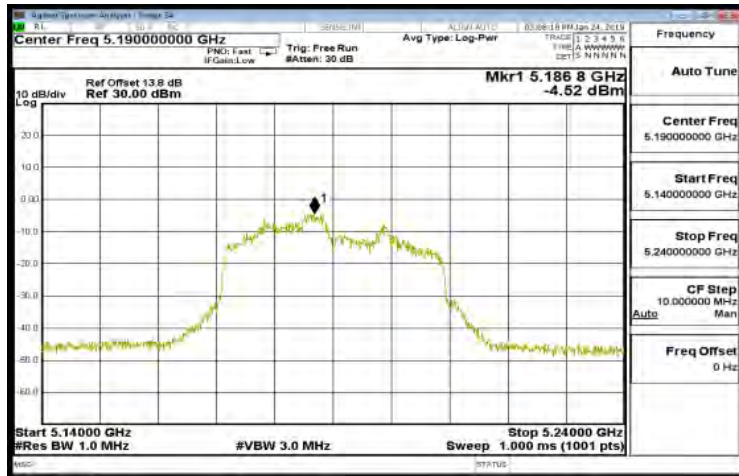


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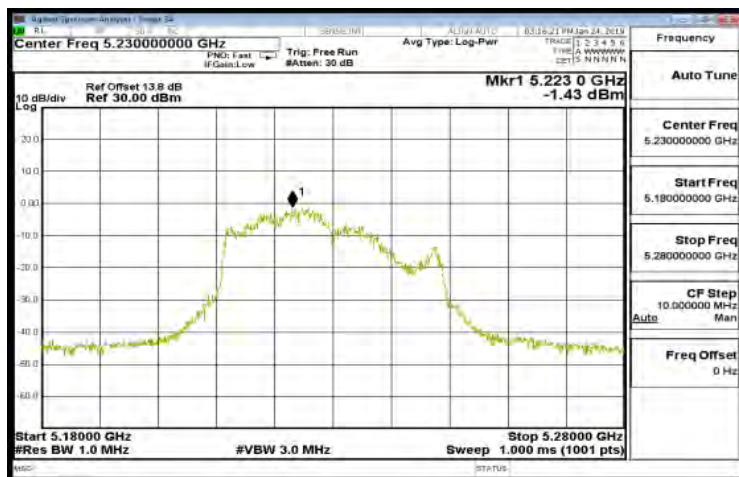
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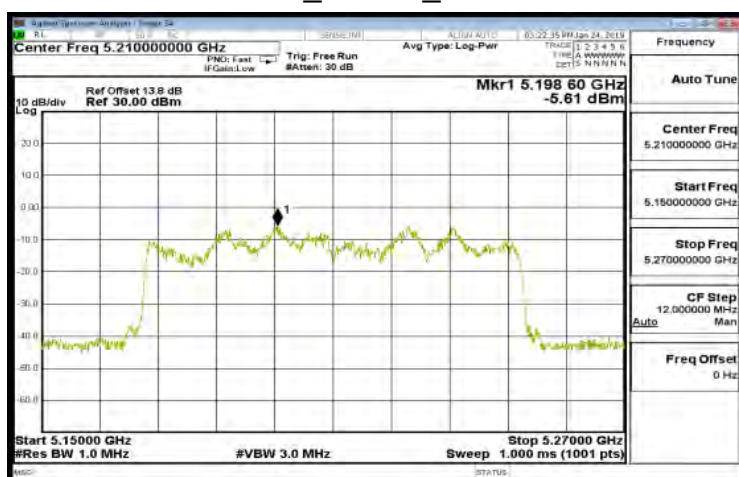
802.11n_40MHz_5190MHz



802.11n_40MHz_5230MHz



802.11ac_80MHz_5210MHz



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11 UNDESIRABLE RADIATED EMISSION MEASUREMENT

11.1 Standard Applicable

The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

1. For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
2. For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

APPLICABLE TO	LIMIT	
FCC KDB 789033 D02 General UNII Test Procedures New Rules	FIELD STRENGTH AT 3m	
	PK: 74 (dBμV/m)	AV 54 (dBμV/m)
APPLICABLE TO	EIRP LIMIT	FIELD STRENGTH AT 3m
15.407(b)(1) RSS-247 6.2.1.2	PK: -27 (dBm/MHz)	PK: 68.3 (dBμV/m)
15.407(b)(2) RSS-247 6.2.2.2		
15.407(b)(3) RSS-247 6.2.3.2		
15.407(b)(4)(i) RSS-247 6.2.4.2	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBμV/m) *1 PK:105.2 (dBμV/m) *2 PK: 110.8(dBμV/m) *3 PK:122.2 (dBμV/m) *4
*1 beyond 75 MHz or more above of the bandedge. *2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		

$EIRP = (E \cdot d)^2 / 30$, where E is the field in V/m, d is the measurement distance (3m), EIRP is the equivalent isotropically radiated power in Watts.

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Unwanted spurious emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table:

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(KHz)	300
0.490-1.705	24000/F(KHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (dBμV/m)

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11.2 Measurement Equipment Used

SGS SAC-III					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	TESEQ	CBL 6112D	35243	2018/10/30	2019/10/29
Horn Antenna	Schwarzbeck	BBHA9120D	1187	2019/01/09	2020/1/8
Horn Antenna	SCHWAZBECK	BBHA9170	185	2018/08/02	2019/8/1
Loop Antenna	ETS.LINDGREN	6502	148045	2018/04/19	2019/4/18
EMI Test Receiver	R&S	ESU 40	100363	2018/04/11	2019/4/10
Pre-Amplifier	EMC Instruments	EMC330	980096	2018/12/25	2019/12/24
Pre-Amplifier	EMC Instruments	EMC0011830	980199	2018/12/25	2019/12/24
Pre-Amplifier	EMC Instruments	EMC184045B	980135	2018/12/25	2019/12/24
Attenuator	Marvelous	WATT-218FS-10	RF246	2018/12/25	2019/12/24
Band Rejection Filter	Micro-Tronics	G015	RF100	2018/12/25	2019/12/24
Band Rejection Filter	Micro-Tronics	G016	RF101	2018/12/25	2019/12/24
Band Rejection Filter	Micro-Tronics	G021	RF102	2018/12/25	2019/12/24
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	2018/12/25	2019/12/24
Coaxial Cable	Huber Suhner	EMC106-SM-SM-7200	150703	2018/12/25	2019/12/24
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	2018/12/25	2019/12/24

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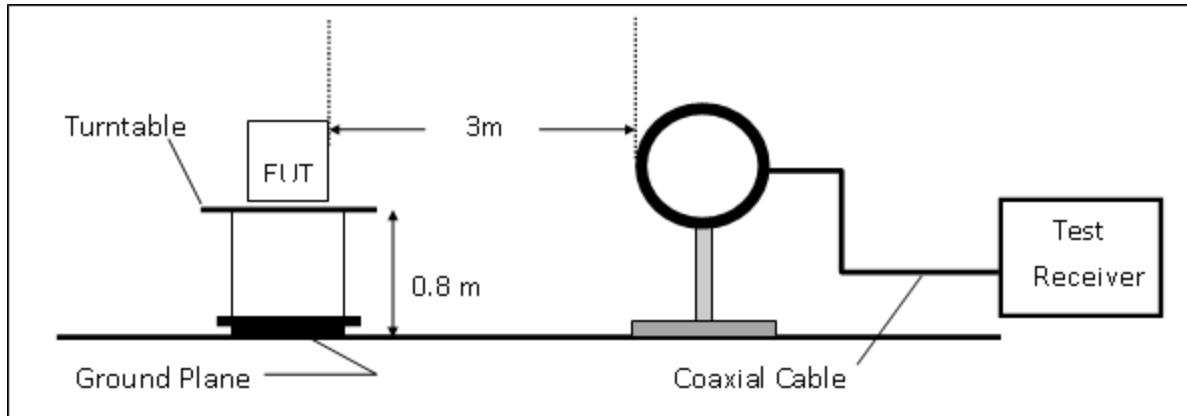
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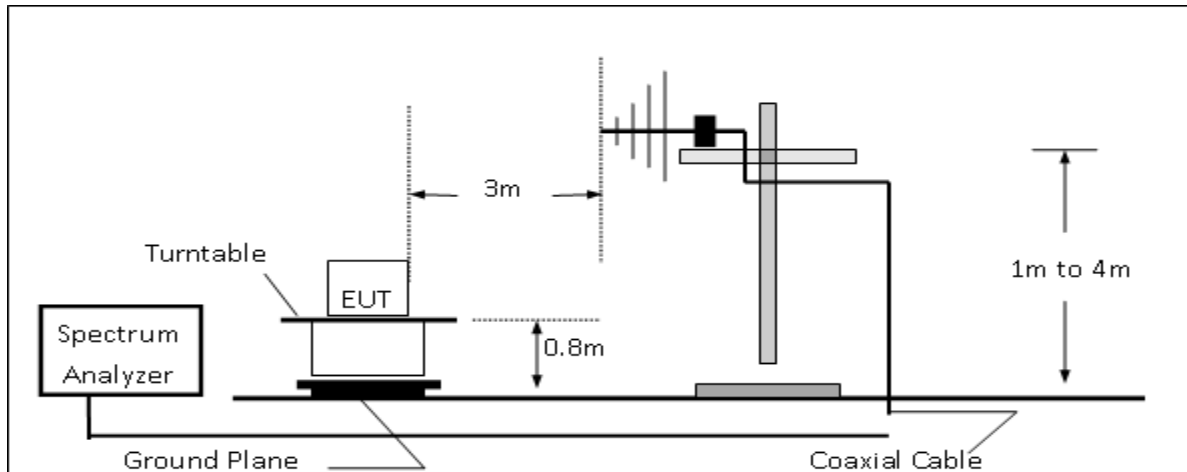
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11.3 Test SET-UP

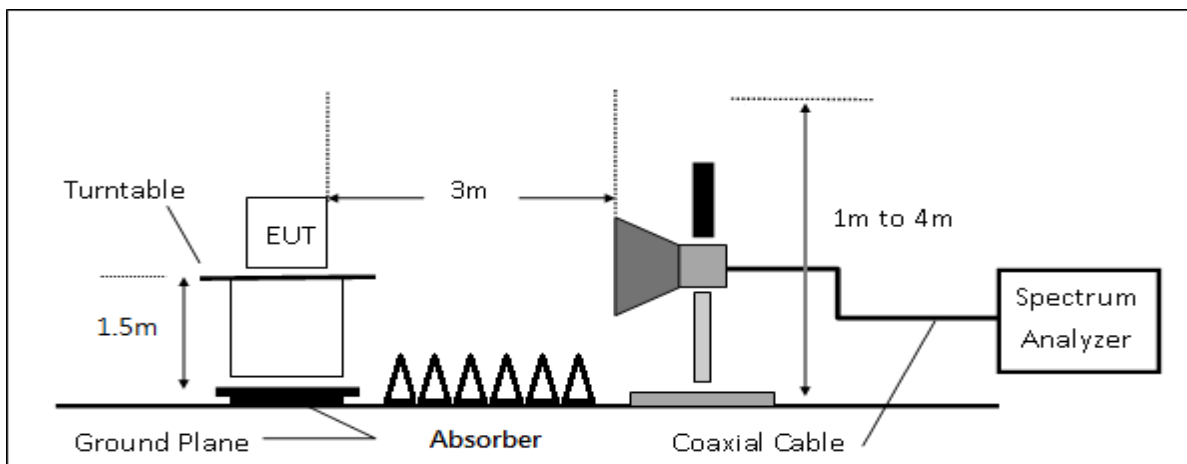
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-UP, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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11.4 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
4. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
5. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
11. Repeat above procedures until all frequency measured were complete.

11.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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11.6 Test Results of Radiated Spurious Emissions form 9 KHz to 30 MHz

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

11.7 Measurement Result

Refer to next page for tabular data sheets.

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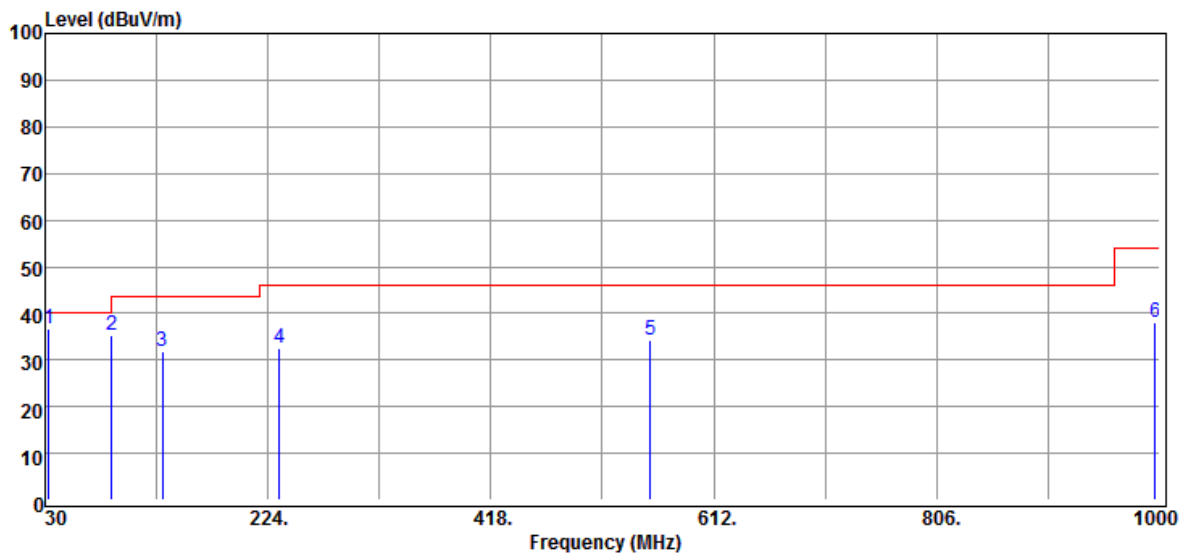
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Radiated Spurious Emission Measurement Result

Below 1GHz Worst-Case Data:

802.11a 5150~5250 MHz

Operation Mode	:802.11a / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH MID	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5220 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
32.91	Peak	40.62	-3.88	36.74	40.00	-3.26
88.20	Peak	52.20	-16.82	35.38	43.50	-8.12
131.85	Peak	44.24	-12.29	31.95	43.50	-11.55
233.70	Peak	45.07	-12.61	32.46	46.00	-13.54
556.71	Peak	37.47	-3.28	34.19	46.00	-11.81
996.12	Peak	34.38	3.55	37.93	54.00	-16.07

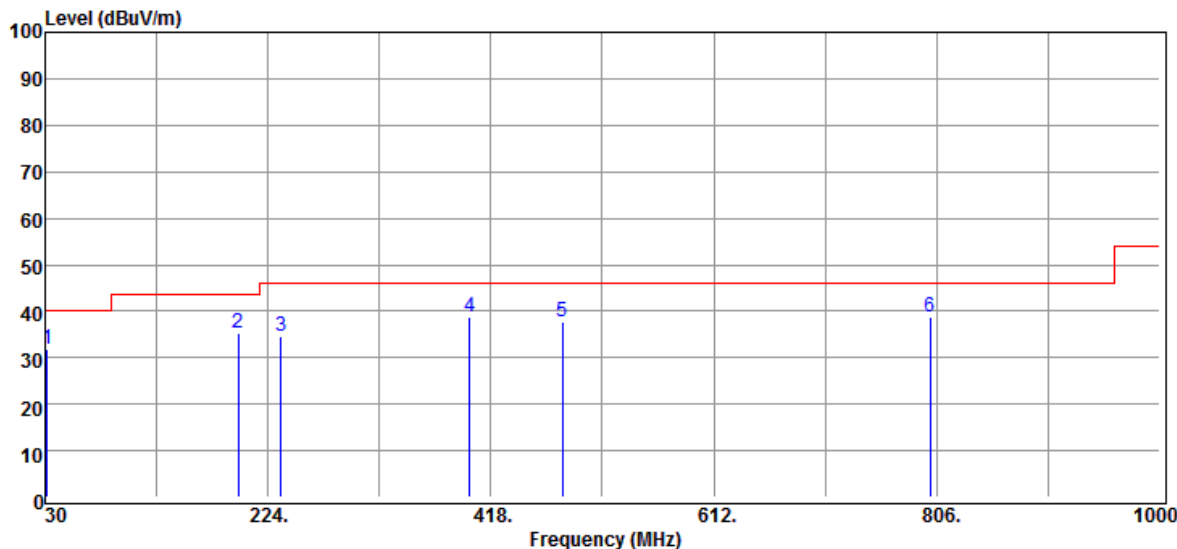
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Operation Mode :802.11a / Band 1
 Test Mode :TX CH MID
 EUT Pol :H Plan
 Test Channel :5220 MHz

Test Date :2019-01-28
 Temp./Humi. :25/60
 Antenna Pol. :HORIZONTAL
 Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
31.94	Peak	34.87	-3.13	31.74	40.00	-8.26
197.81	Peak	49.57	-14.37	35.20	43.50	-8.30
235.64	Peak	47.12	-12.41	34.71	46.00	-11.29
399.57	Peak	44.79	-6.09	38.70	46.00	-7.30
480.08	Peak	42.53	-4.96	37.57	46.00	-8.43
800.18	Peak	38.74	-0.11	38.63	46.00	-7.37

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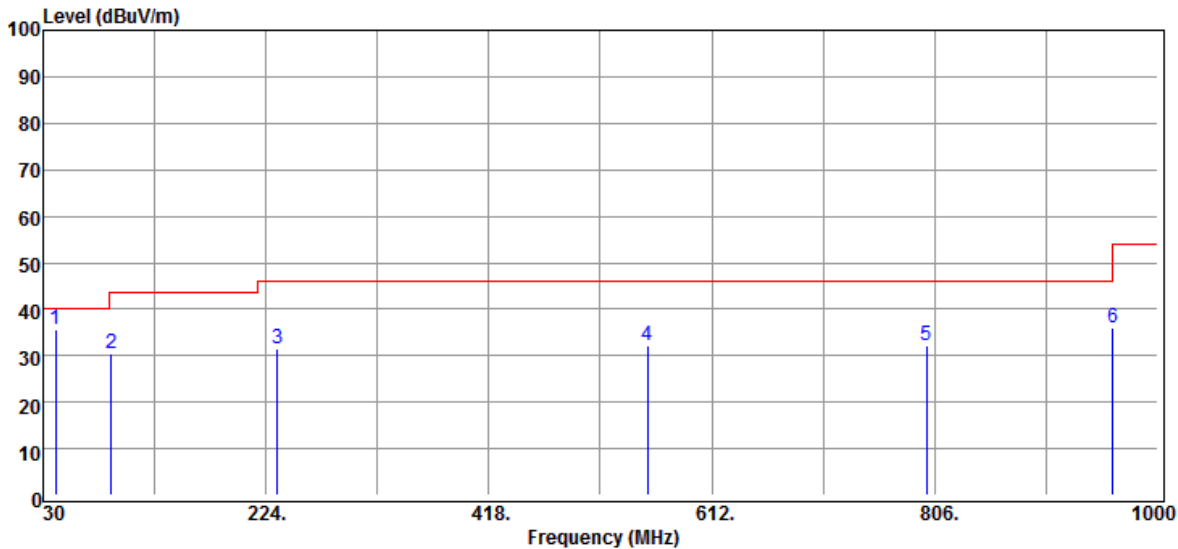
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Operation Mode	:802.11ac80 / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5210MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
40.67	Peak	44.38	-8.57	35.81	40.00	-4.19
89.17	Peak	47.32	-16.71	30.61	43.50	-12.89
233.70	Peak	44.02	-12.61	31.41	46.00	-14.59
555.74	Peak	35.48	-3.32	32.16	46.00	-13.84
799.21	Peak	32.23	-0.07	32.16	46.00	-13.84
961.20	Peak	32.55	3.41	35.96	54.00	-18.04

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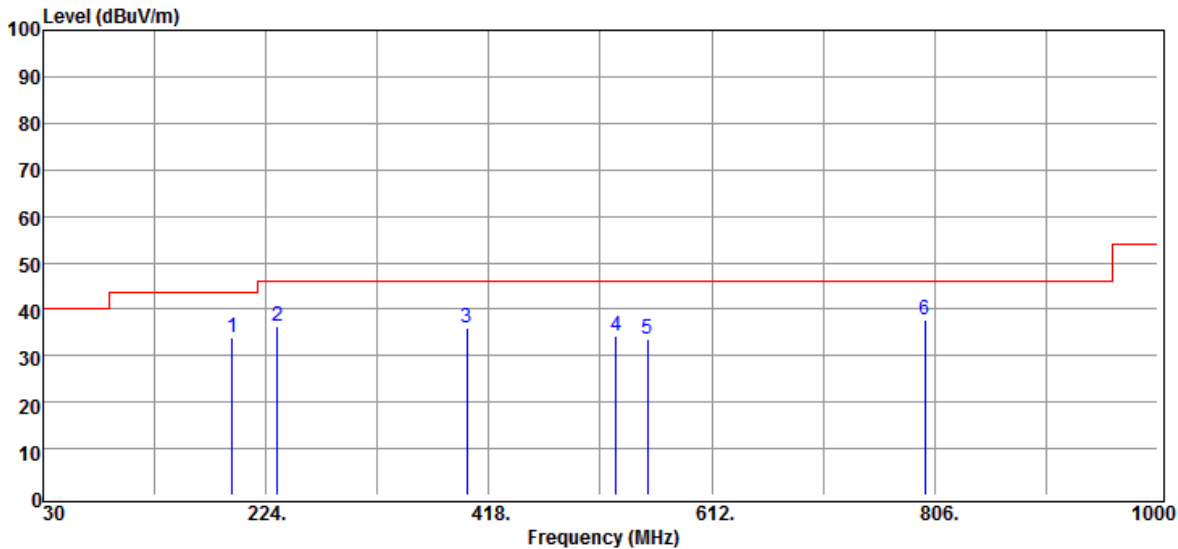
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Operation Mode :802.11ac80 / Band 1
 Test Mode :TX CH LOW
 EUT Pol :H Plan
 Test Channel :5210MHz

Test Date :2019-01-28
 Temp./Humi. :25/60
 Antenna Pol. :HORIZONTAL
 Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
194.90	Peak	48.66	-14.66	34.00	43.50	-9.50
233.70	Peak	49.09	-12.61	36.48	46.00	-9.52
398.60	Peak	42.11	-6.19	35.92	46.00	-10.08
528.58	Peak	38.39	-4.13	34.26	46.00	-11.74
555.74	Peak	36.88	-3.32	33.56	46.00	-12.44
797.27	Peak	37.65	0.00	37.65	46.00	-8.35

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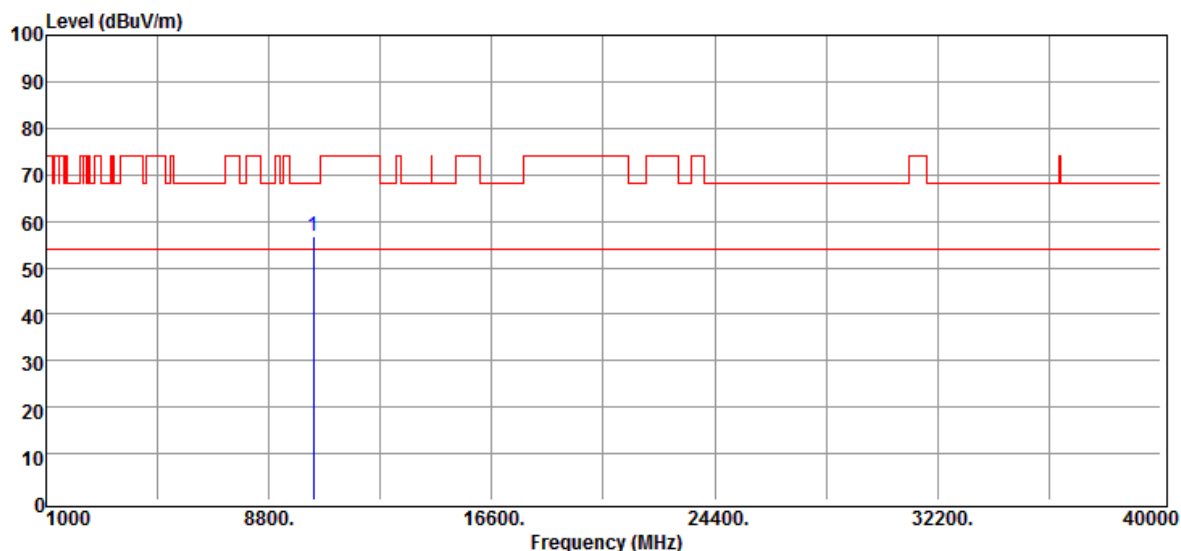
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Above 1GHz Worst-Case Data:**Radiated Spurious Emission Measurement Result 802.11a, 5150~5250 MHz**

Operation Mode	:802.11a / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5180 MHz	Engineer	:Ashton



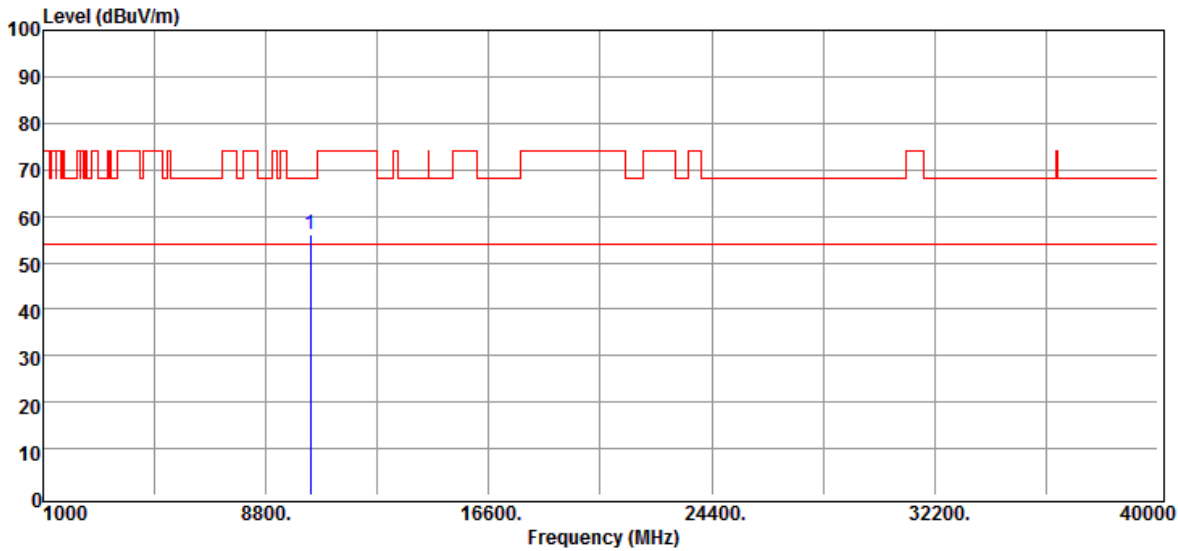
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10360.00	Peak	31.78	25.11	56.89	68.20	-11.31

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Operation Mode	:802.11a / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5180 MHz	Engineer	:Ashton



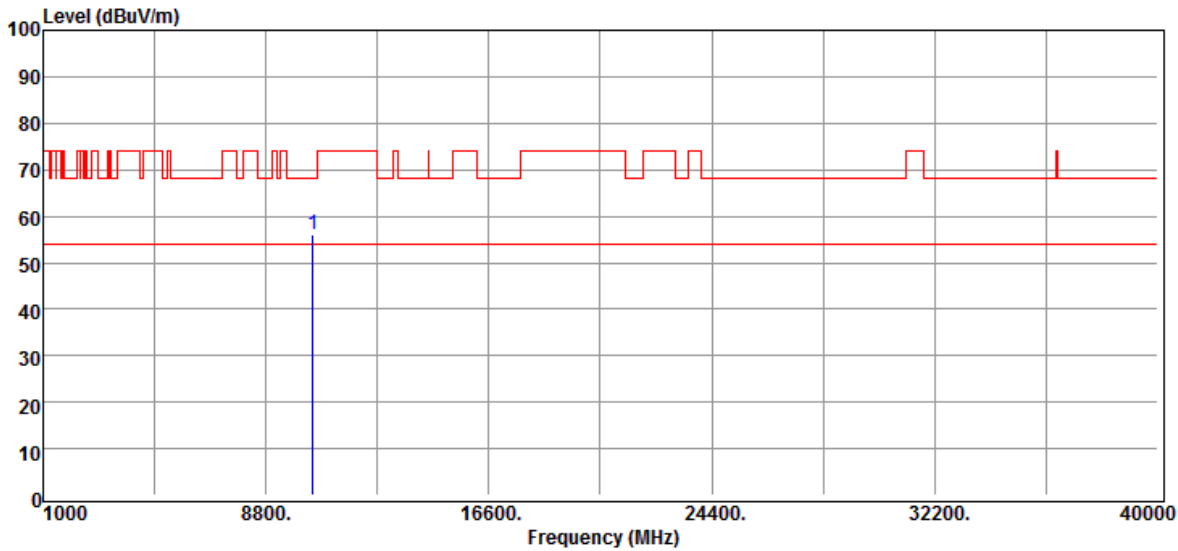
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10360.00	Peak	30.78	25.11	55.89	68.20	-12.31

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Operation Mode	:802.11a / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH MID	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5220 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10440.00	Peak	31.07	25.08	56.15	68.20	-12.05

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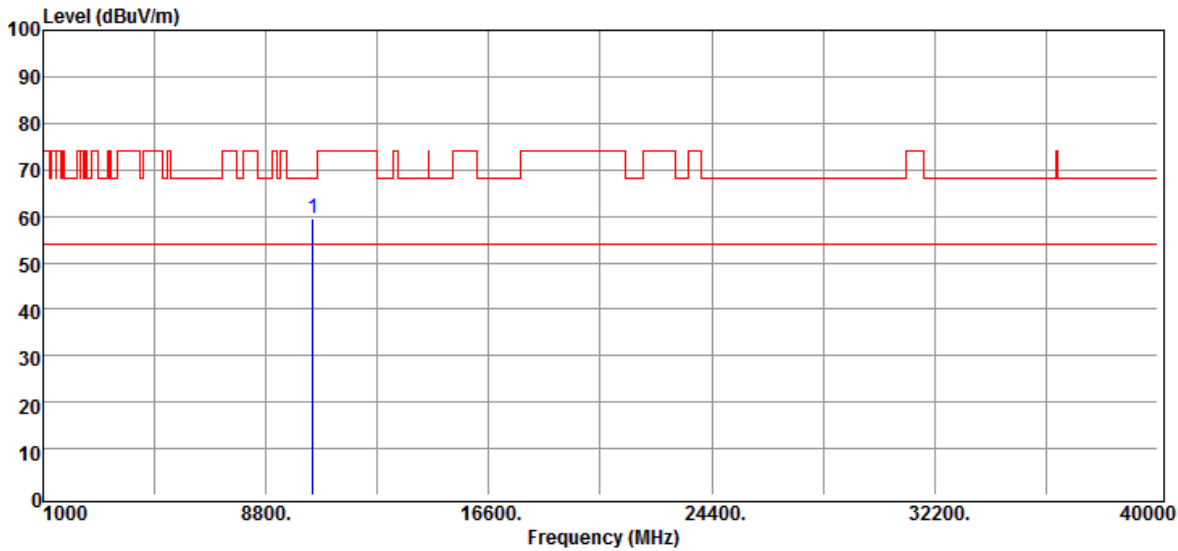
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Operation Mode	:802.11a / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH MID	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5220 MHz	Engineer	:Ashton



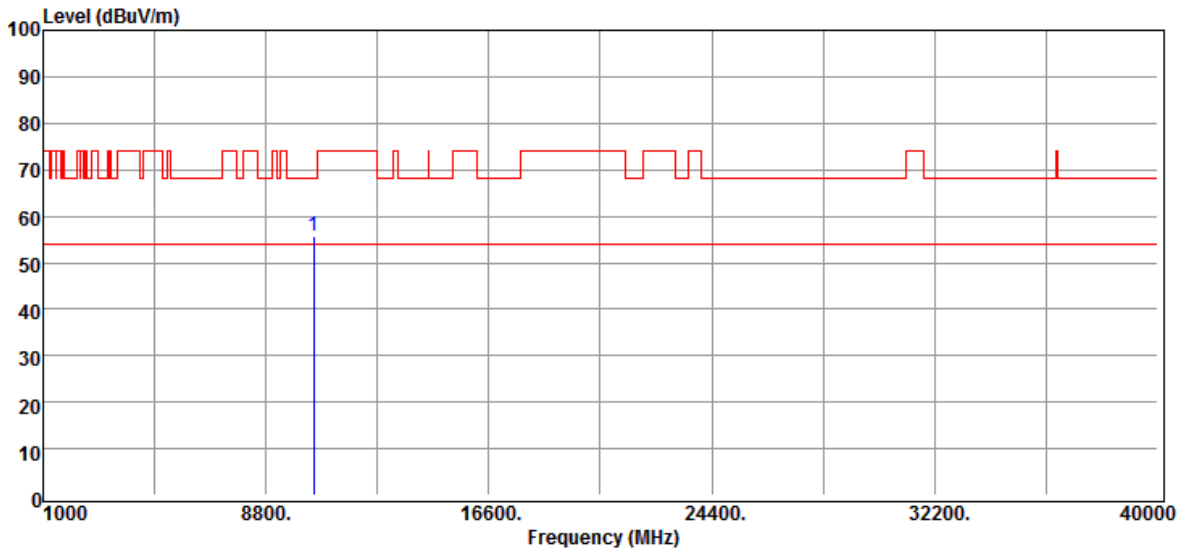
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
10440.00	Peak	34.54	25.08	59.62	68.20	-8.58

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Operation Mode	:802.11a / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH HIGH	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5240 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10480.00	Peak	30.89	24.96	55.85	68.20	-12.35

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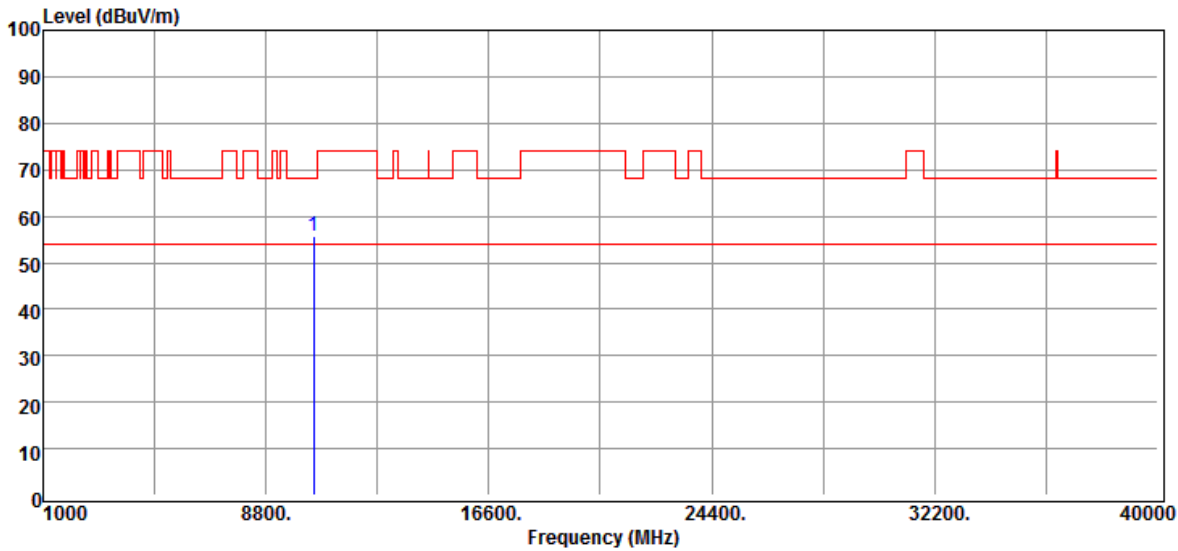
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Operation Mode	:802.11a / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH HIGH	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5240 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
10480.00	Peak	30.61	24.96	55.57	68.20	-12.63

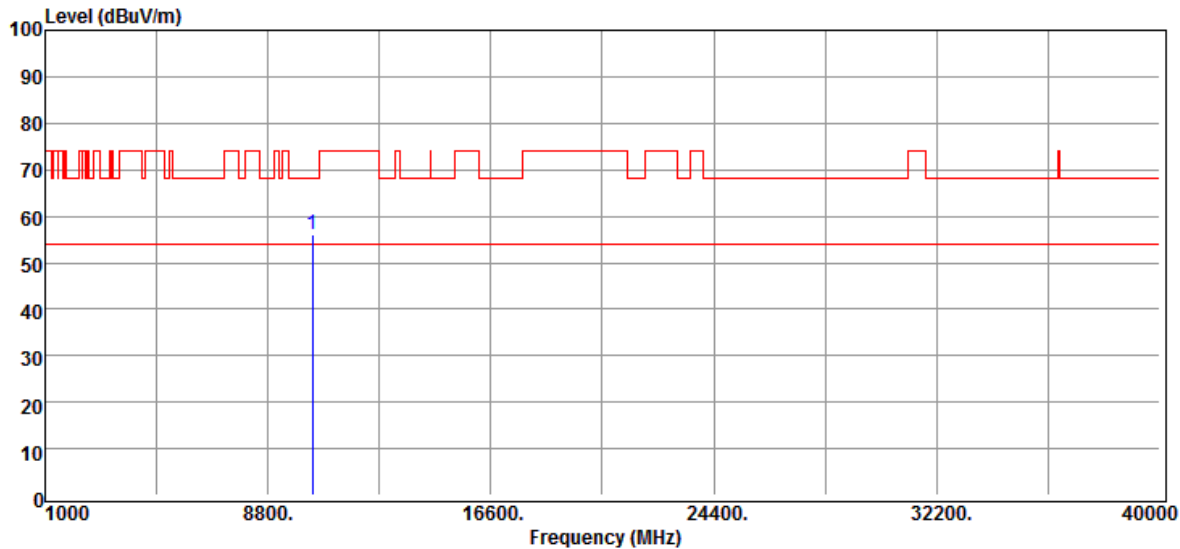
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Radiated Spurious Emission Measurement Result 802.11n HT20, 5150~5250 MHz

Operation Mode	:802.11n20 / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5180 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
10360.00	Peak	30.90	25.11	56.01	68.20	-12.19

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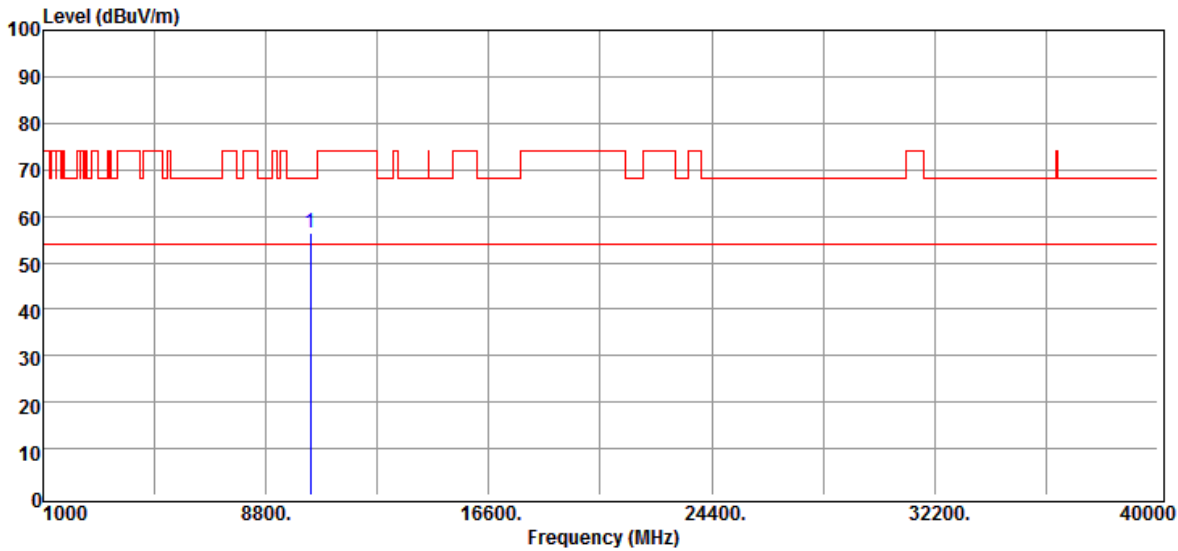
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Operation Mode	:802.11n20 / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5180 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10360.00	Peak	31.28	25.11	56.39	68.20	-11.81

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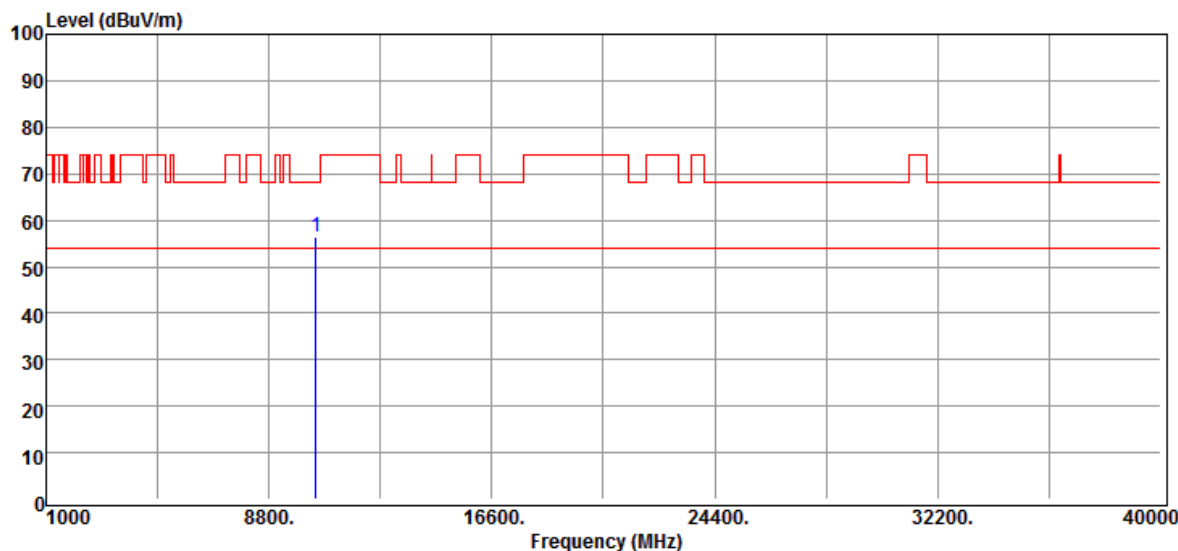
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Operation Mode :802.11n20 / Band 1
Test Mode :TX CH MID
EUT Pol :H Plan
Test Channel :5220 MHz

Test Date :2019-01-28
Temp./Humi. :25/60
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
10440.00	Peak	31.35	25.08	56.43	68.20	-11.77

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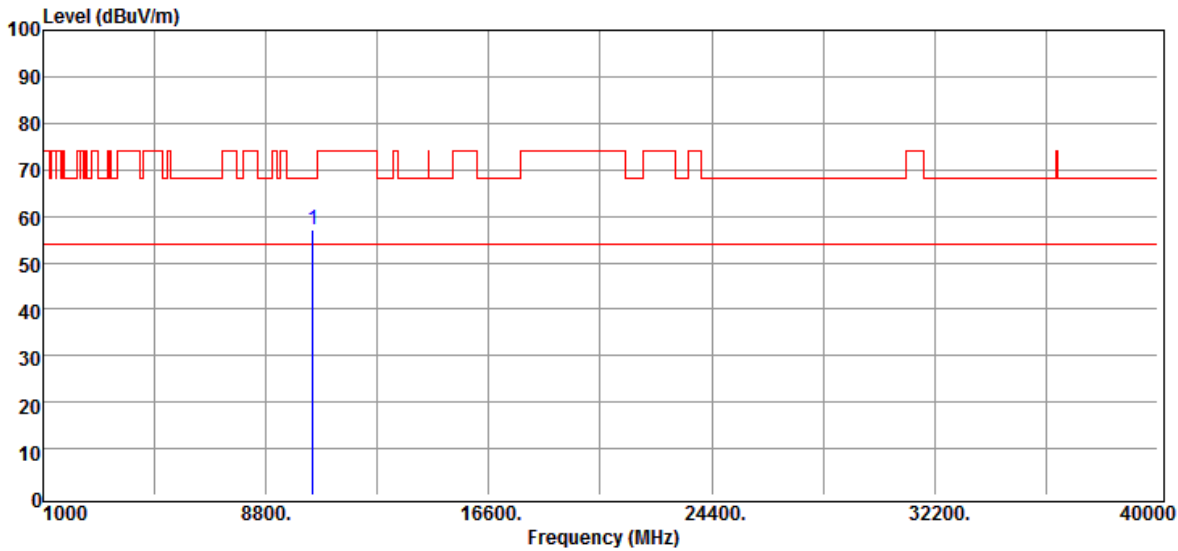
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Operation Mode	:802.11n20 / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH MID	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5220 MHz	Engineer	:Ashton



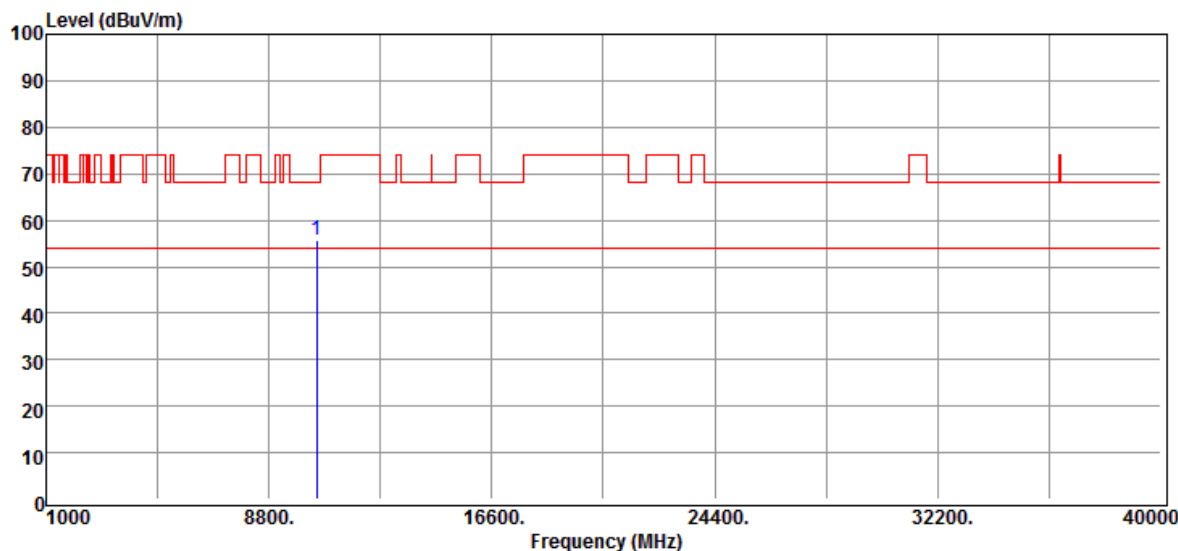
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10440.00	Peak	31.88	25.08	56.96	68.20	-11.24

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Operation Mode	:802.11n20 / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH HIGH	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5240 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10480.00	Peak	30.67	24.96	55.63	68.20	-12.57

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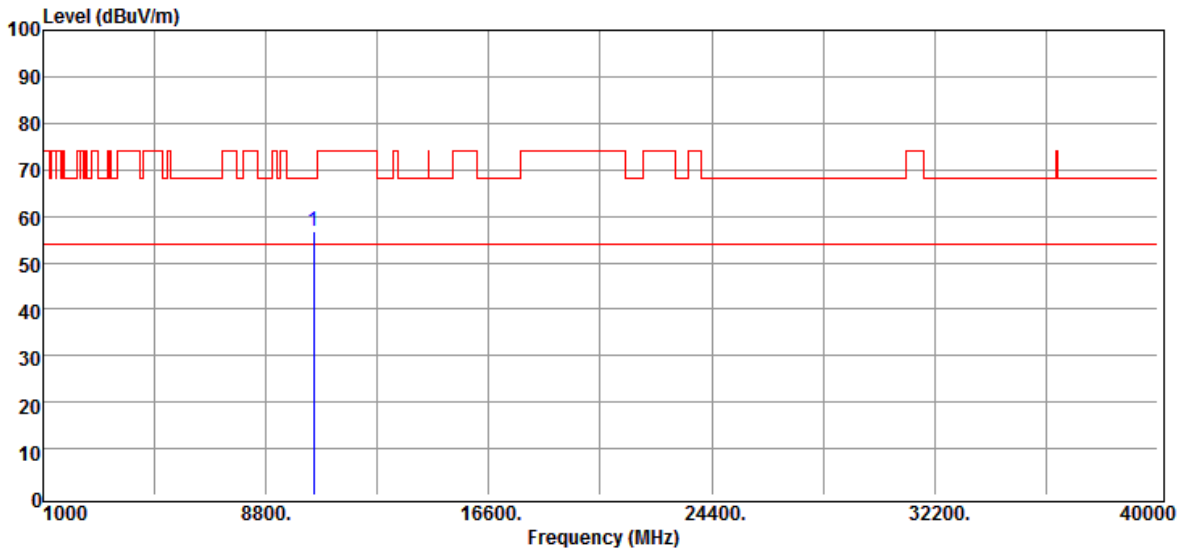
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Operation Mode	:802.11n20 / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH HIGH	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5240 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10480.00	Peak	31.65	24.96	56.61	68.20	-11.59

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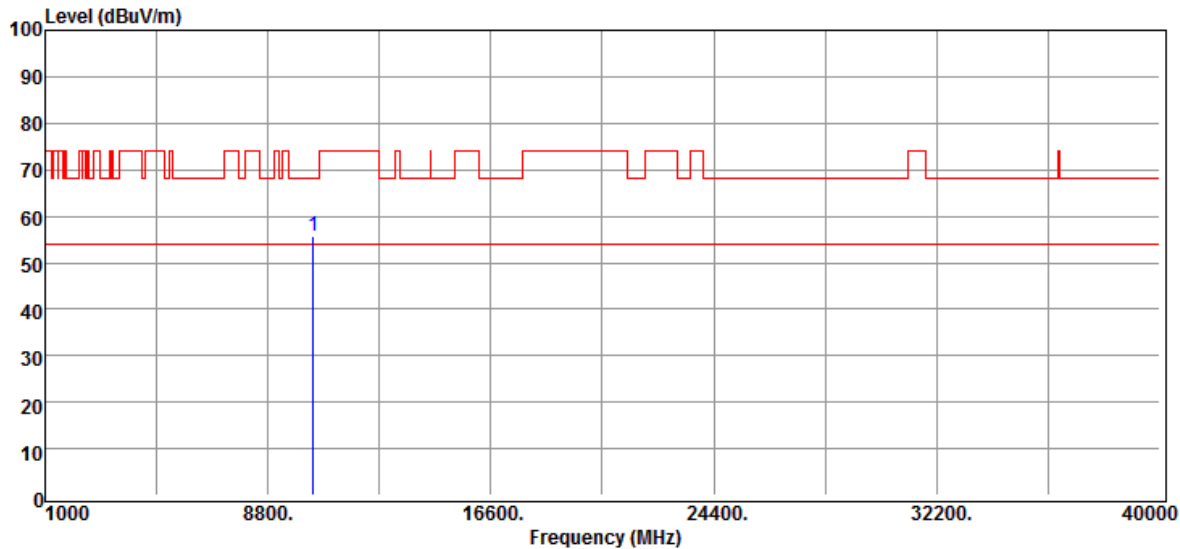
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Radiated Spurious Emission Measurement Result 802.11n HT40, 5150~5250 MHz

Operation Mode	:802.11n40 / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5190 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10380.00	Peak	30.67	25.16	55.83	68.20	-12.37

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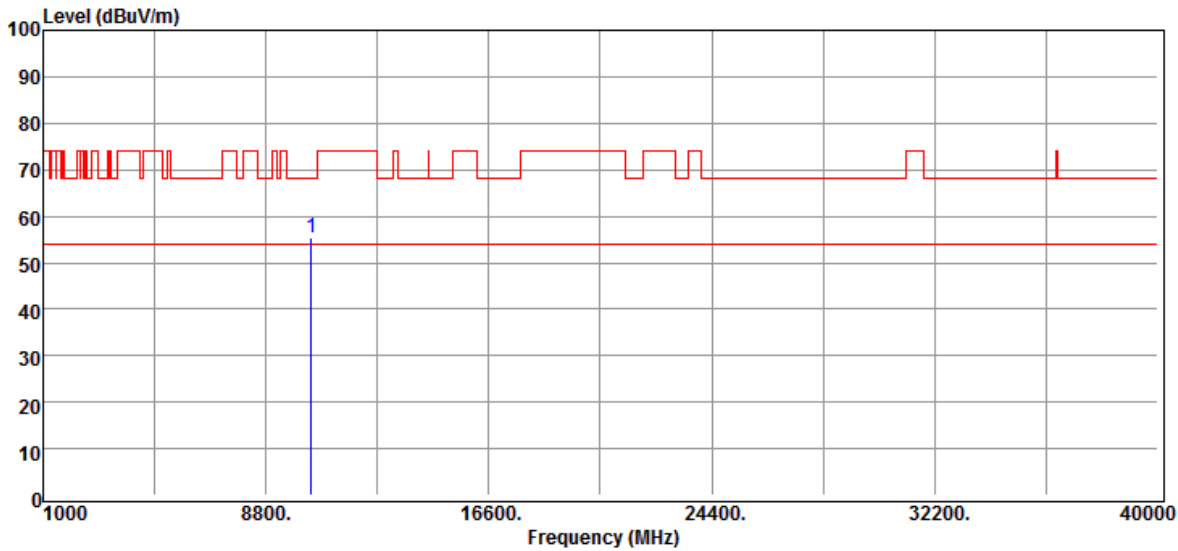
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Operation Mode	:802.11n40 / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5190 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10380.00	Peak	30.29	25.16	55.45	68.20	-12.75

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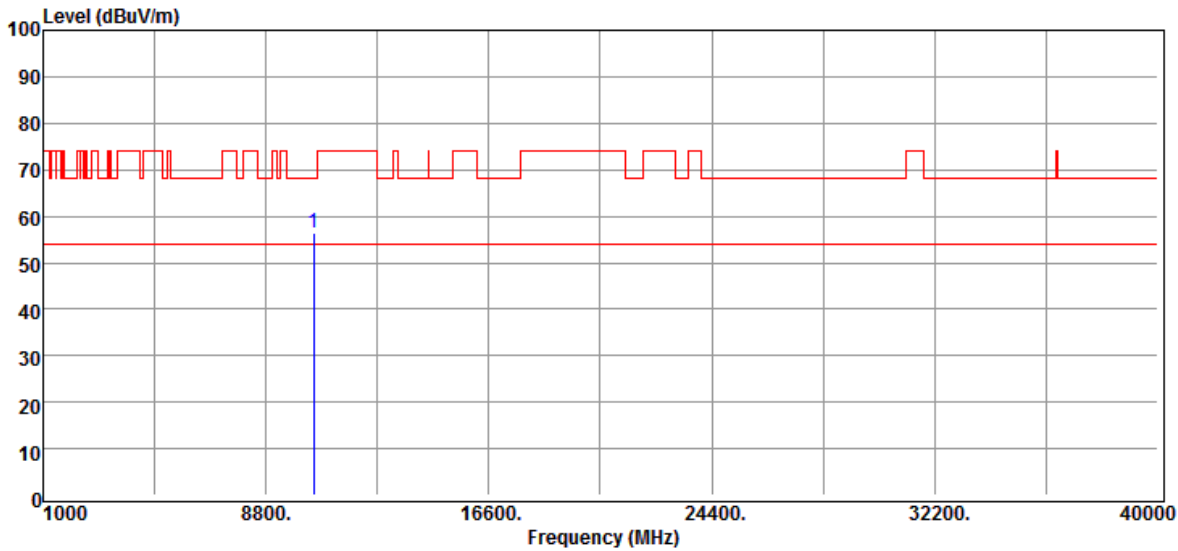
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Operation Mode	:802.11n40 / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH HIGH	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5230 MHz	Engineer	:Ashton



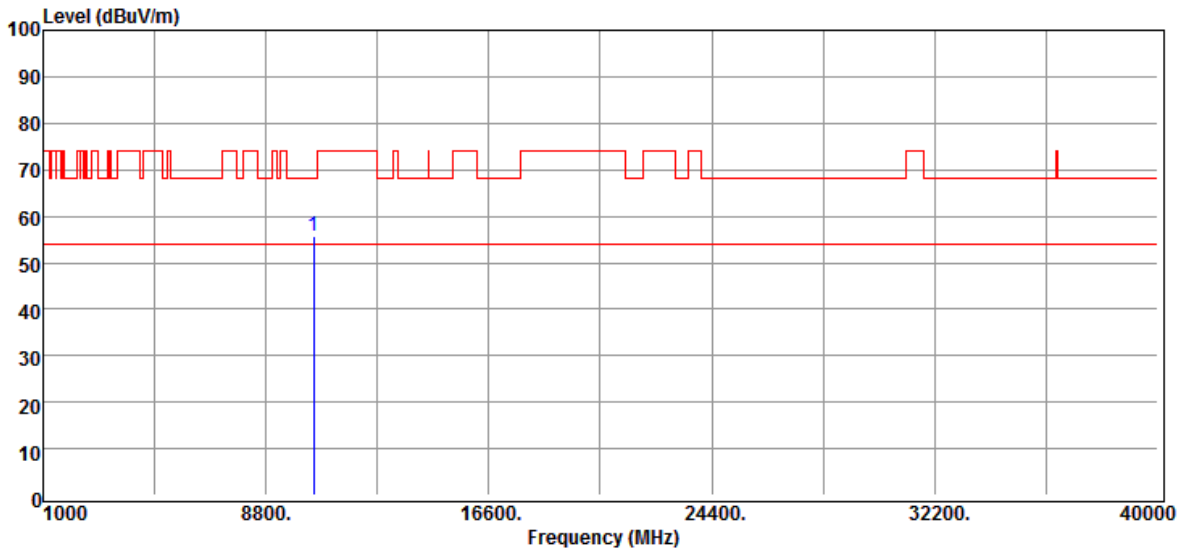
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10460.00	Peak	31.52	25.02	56.54	68.20	-11.66

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Operation Mode	:802.11n40 / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH HIGH	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5230 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
10460.00	Peak	30.65	25.02	55.67	68.20	-12.53

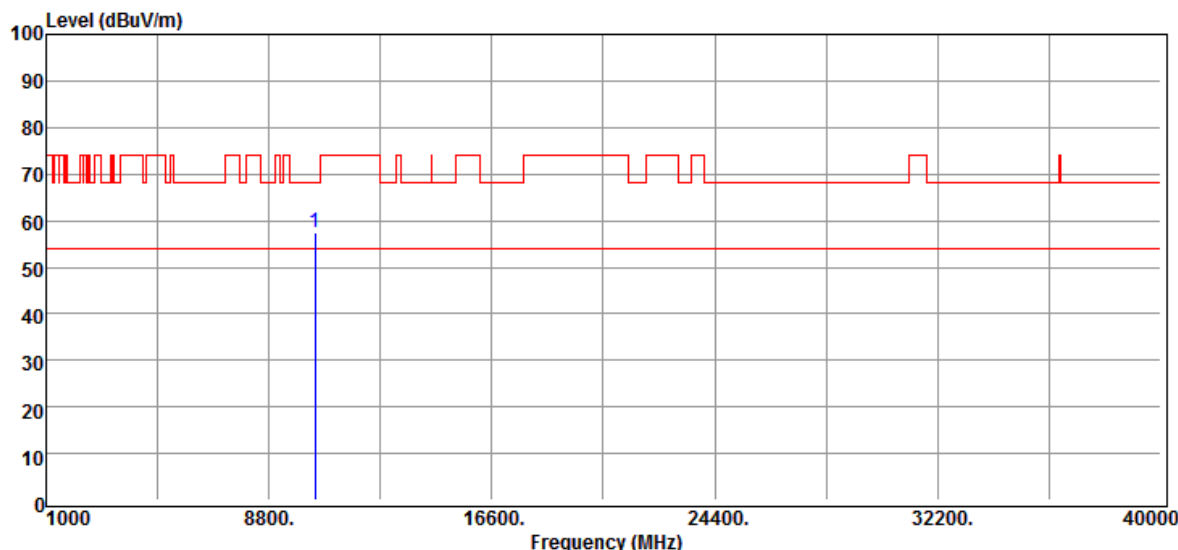
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Radiated Spurious Emission Measurement Result 802.11ac VHT80, 5150~5250 MHz

Operation Mode	:802.11ac80 / Band 1	Test Date	:2019-01-28
Test Mode	:TX CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5210 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10420.00	Peak	32.26	25.14	57.40	68.20	-10.80

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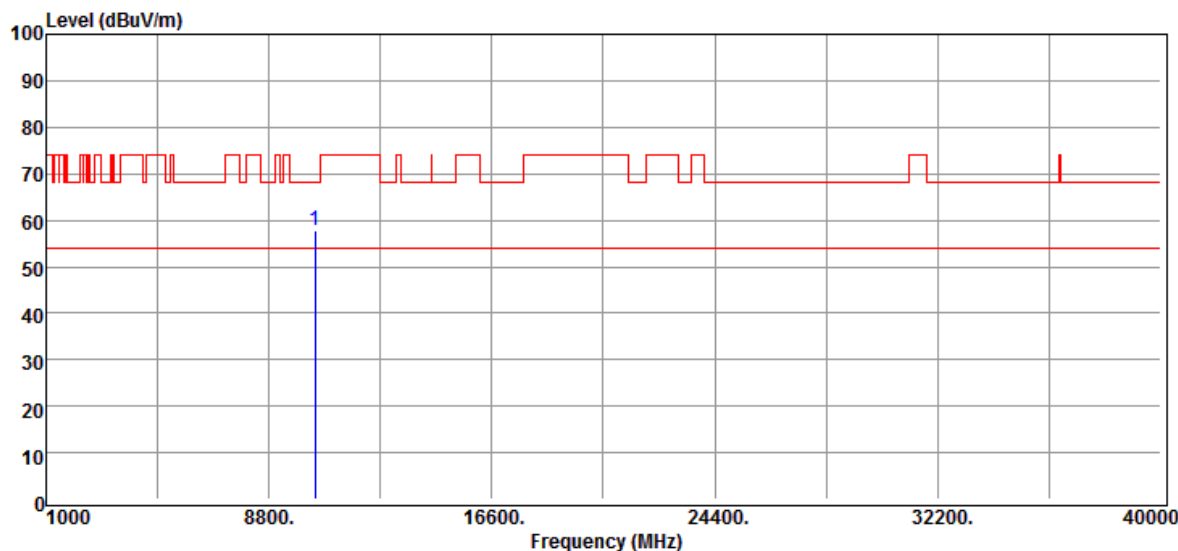
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Operation Mode :802.11ac80 / Band 1
 Test Mode :TX CH LOW
 EUT Pol :H Plan
 Test Channel :5210 MHz

Test Date :2019-01-28
 Temp./Humi. :25/60
 Antenna Pol. :HORIZONTAL
 Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
10420.00	Peak	32.59	25.14	57.73	68.20	-10.47

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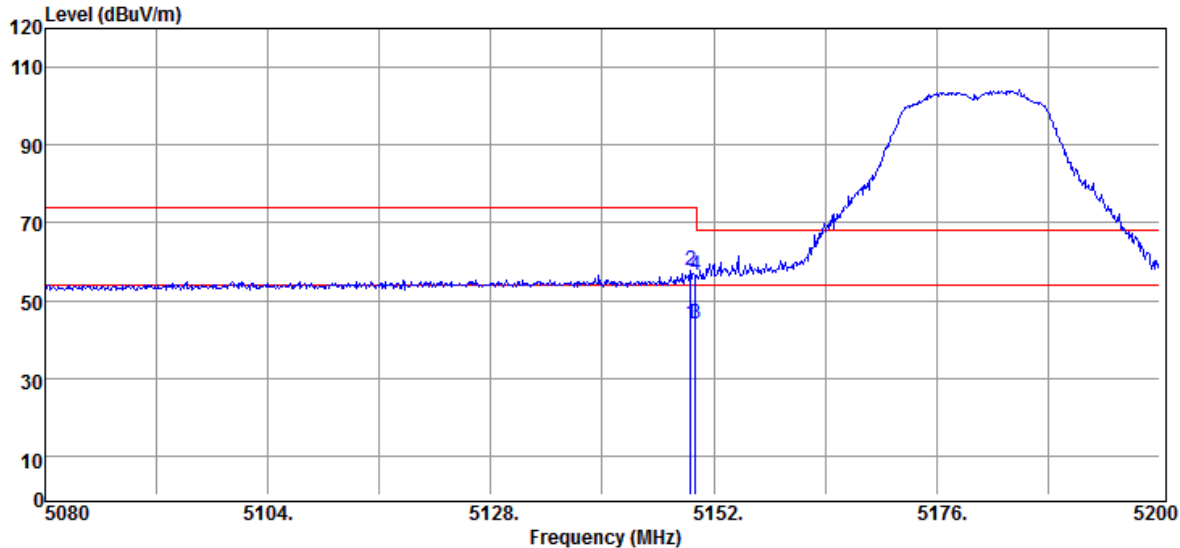
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Band edge falling to restricted band

802.11a mode

Operation Mode	:802.11a / Band 1	Test Date	:2019-01-28
Test Mode	:BE CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5180 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
5149.48	Average	32.20	11.83	44.03	54.00	-9.97
5149.48	Peak	46.09	11.83	57.92	74.00	-16.08
5150.00	Average	32.28	11.84	44.12	54.00	-9.88
5150.00	Peak	44.77	11.84	56.61	74.00	-17.39

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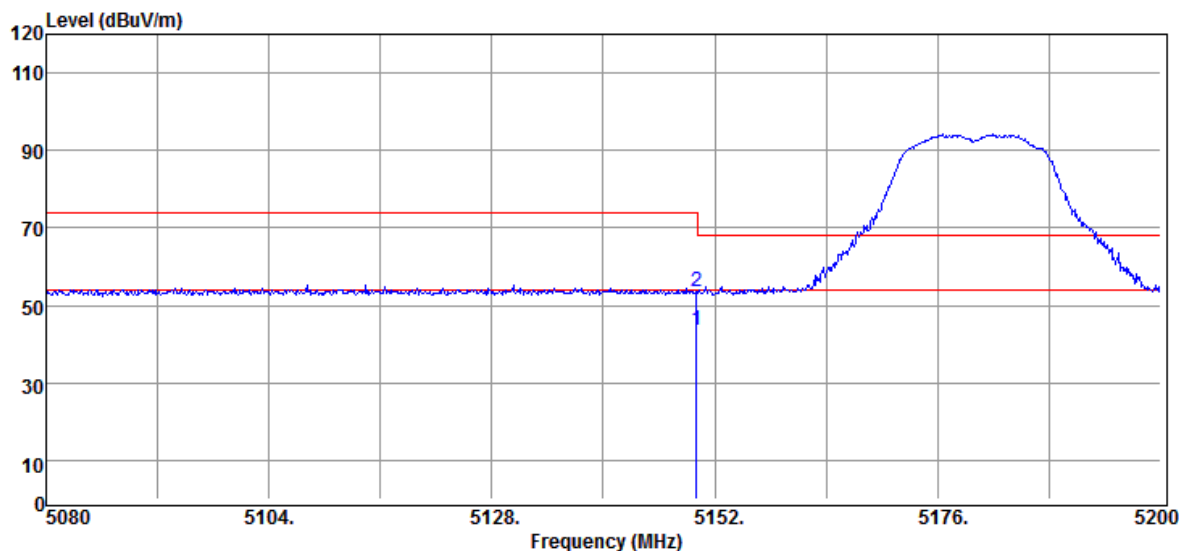
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Operation Mode :802.11a / Band 1
Test Mode :BE CH LOW
EUT Pol :H Plan
Test Channel :5180 MHz

Test Date :2019-01-28
Temp./Humi. :25/60
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBUV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
5150.00	Average	31.66	11.84	43.50	54.00	-10.50
5150.00	Peak	41.52	11.84	53.36	74.00	-20.64

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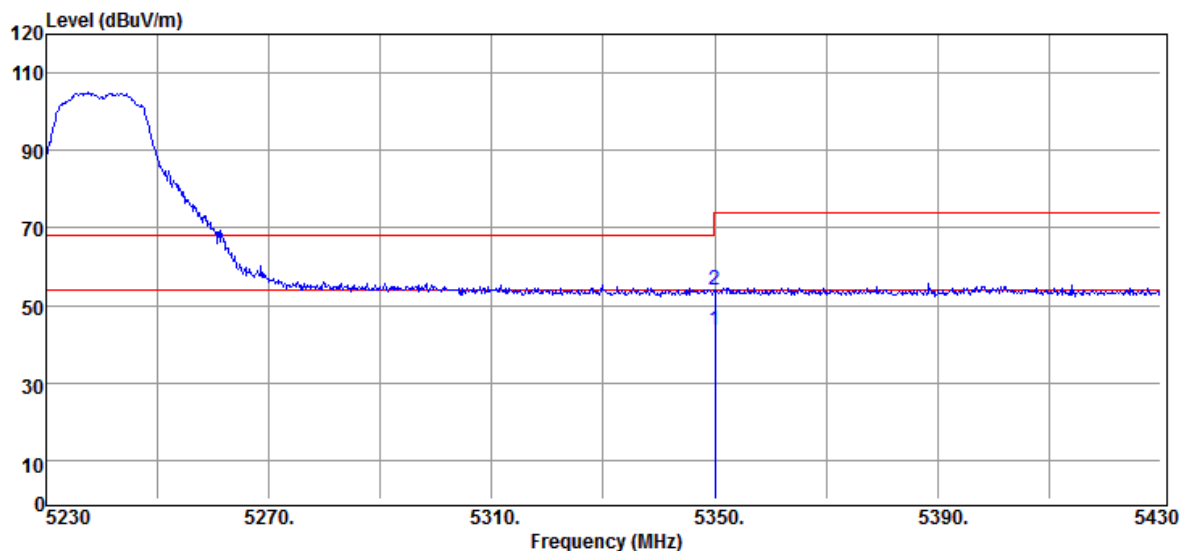
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Operation Mode :802.11a / Band 1
Test Mode :BE CH HIGH
EUT Pol :H Plan
Test Channel :5240 MHz

Test Date :2019-01-28
Temp./Humi. :25/60
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	Average	31.88	11.81	43.69	54.00	-10.31
5350.00	Peak	42.15	11.81	53.96	74.00	-20.04

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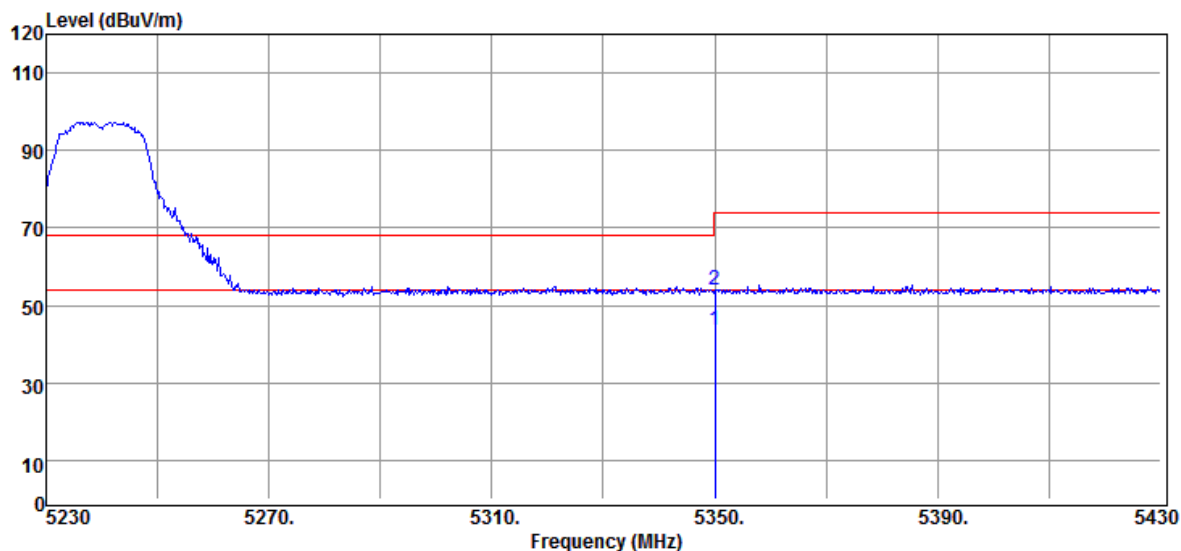
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Operation Mode :802.11a / Band 1
 Test Mode :BE CH HIGH
 EUT Pol :H Plan
 Test Channel :5240 MHz

Test Date :2019-01-28
 Temp./Humi. :25/60
 Antenna Pol. :HORIZONTAL
 Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	Average	31.79	11.81	43.60	54.00	-10.40
5350.00	Peak	42.32	11.81	54.13	74.00	-19.87

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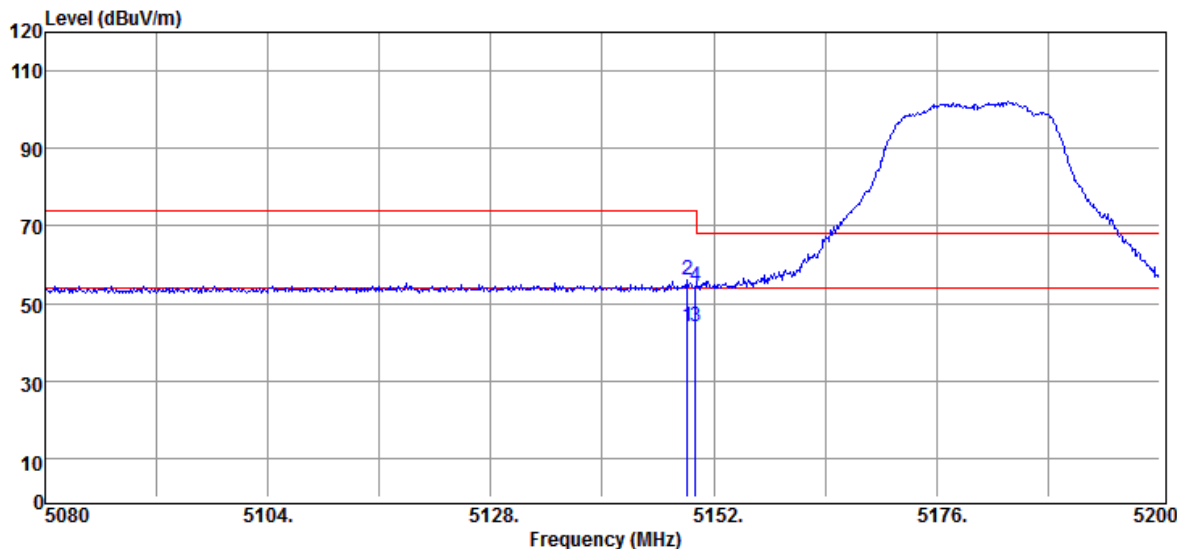
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Operation Mode :802.11n20 / Band 1
Test Mode :BE CH LOW
EUT Pol :H Plan
Test Channel :5180 MHz

Test Date :2019-01-28
Temp./Humi. :25/60
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5149.12	Average	32.06	11.83	43.89	54.00	-10.11
5149.12	Peak	44.24	11.83	56.07	74.00	-17.93
5150.00	Average	32.07	11.84	43.91	54.00	-10.09
5150.00	Peak	42.59	11.84	54.43	74.00	-19.57

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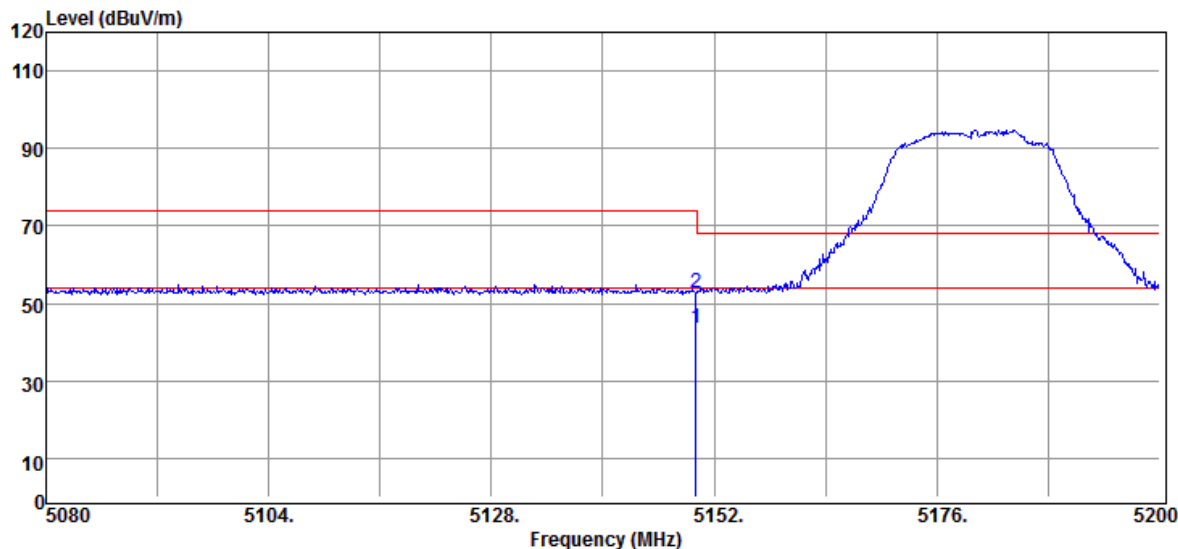
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802.11n20 HT mode

Operation Mode :802.11n20 / Band 1
Test Mode :BE CH LOW
EUT Pol :H Plan
Test Channel :5180 MHz

Test Date :2019-01-28
Temp./Humi. :25/60
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5150.00	Average	31.61	11.84	43.45	54.00	-10.55
5150.00	Peak	40.99	11.84	52.83	74.00	-21.17

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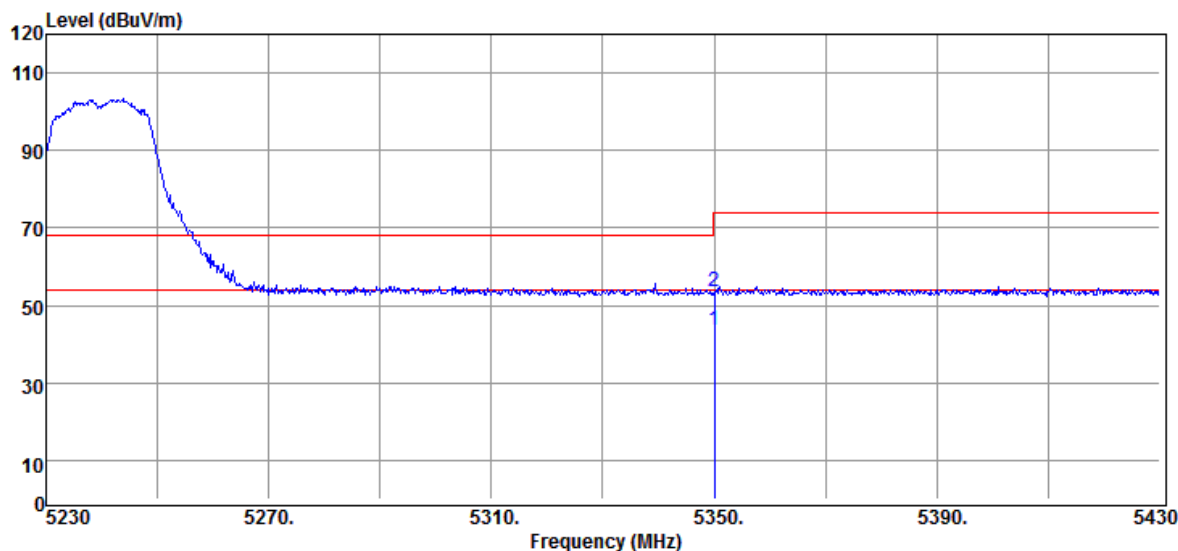
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Operation Mode	:802.11n20 / Band 1	Test Date	:2019-01-28
Test Mode	:BE CH HIGH	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5240 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	Average	31.97	11.81	43.78	54.00	-10.22
5350.00	Peak	41.80	11.81	53.61	74.00	-20.39

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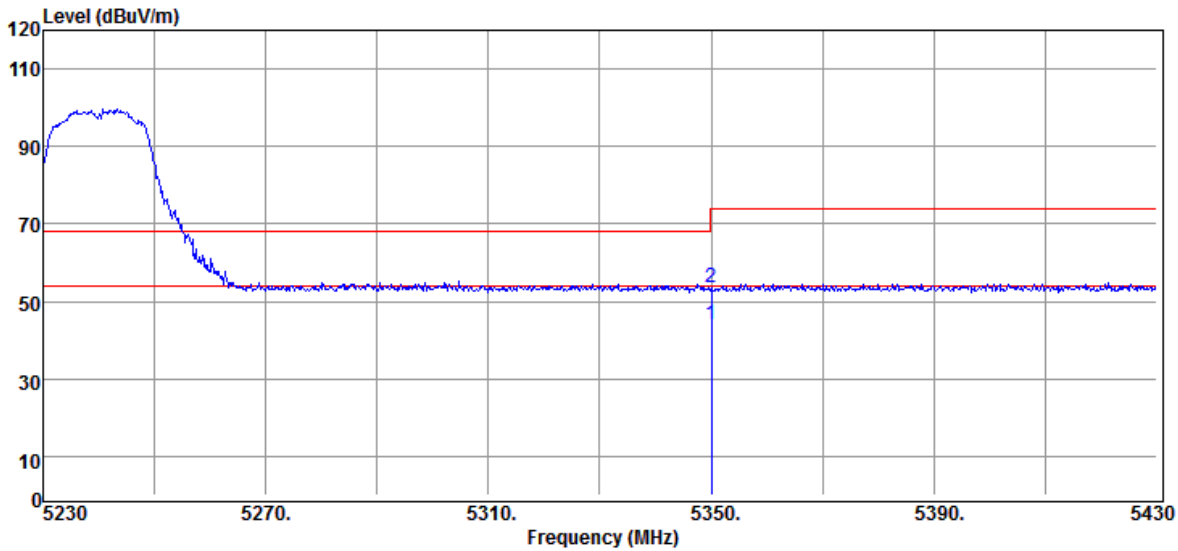
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Operation Mode	:802.11n20 / Band 1	Test Date	:2019-01-28
Test Mode	:BE CH HIGH	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5240 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	Average	32.04	11.81	43.85	54.00	-10.15
5350.00	Peak	41.78	11.81	53.59	74.00	-20.41

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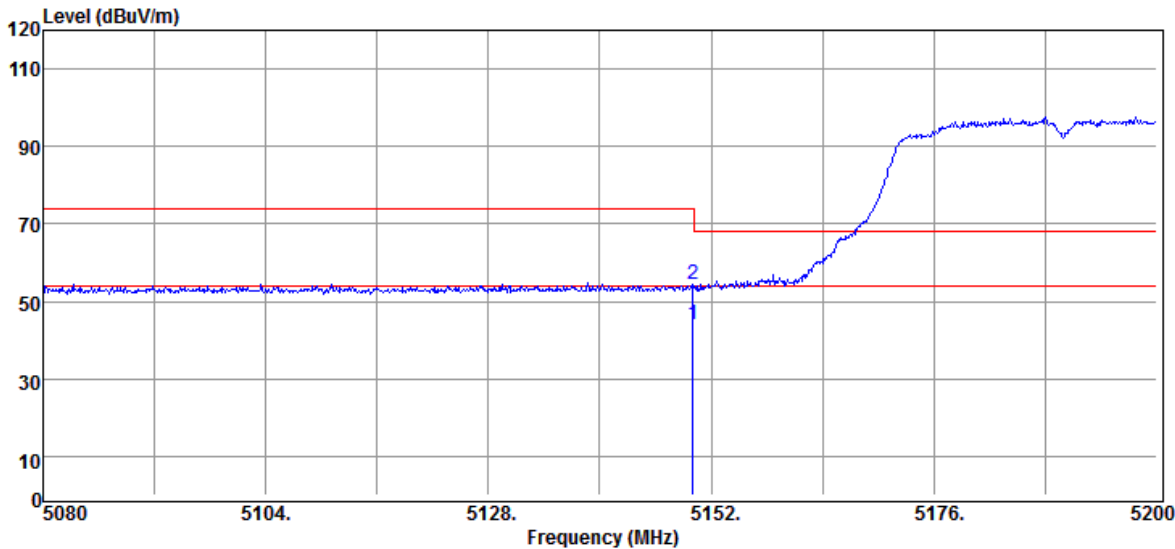
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802.11n40 HT mode

Operation Mode	:802.11n40 / Band 1	Test Date	:2019-01-28
Test Mode	:BE CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5190 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBUV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
5150.00	Average	32.23	11.84	44.07	54.00	-9.93
5150.00	Peak	42.50	11.84	54.34	74.00	-19.66

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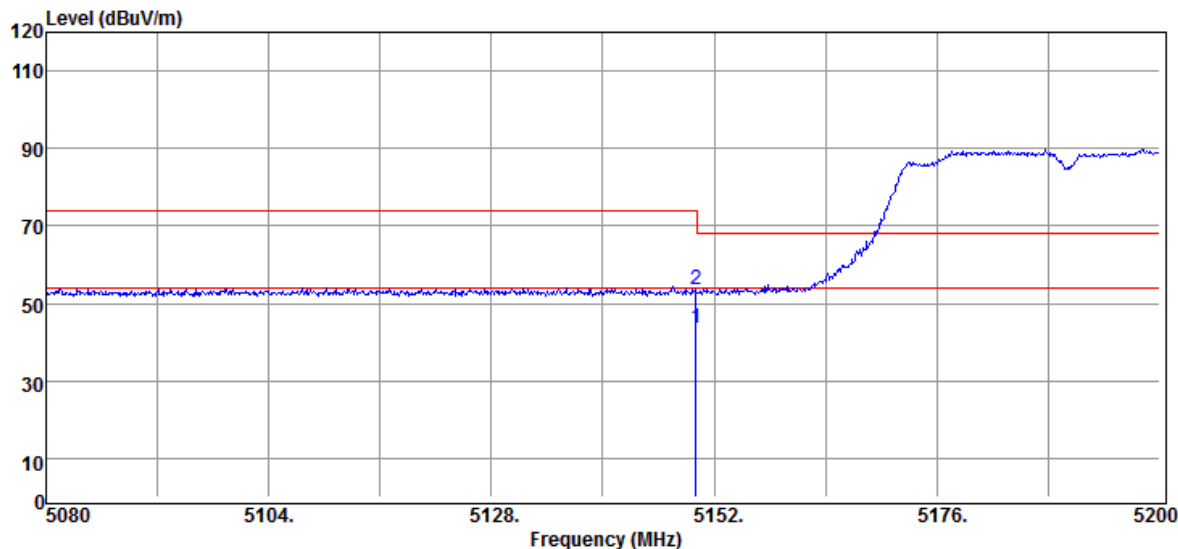
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Operation Mode	:802.11n40 / Band 1	Test Date	:2019-01-28
Test Mode	:BE CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:5190 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBUV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
5150.00	Average	31.86	11.84	43.70	54.00	-10.30
5150.00	Peak	41.82	11.84	53.66	74.00	-20.34

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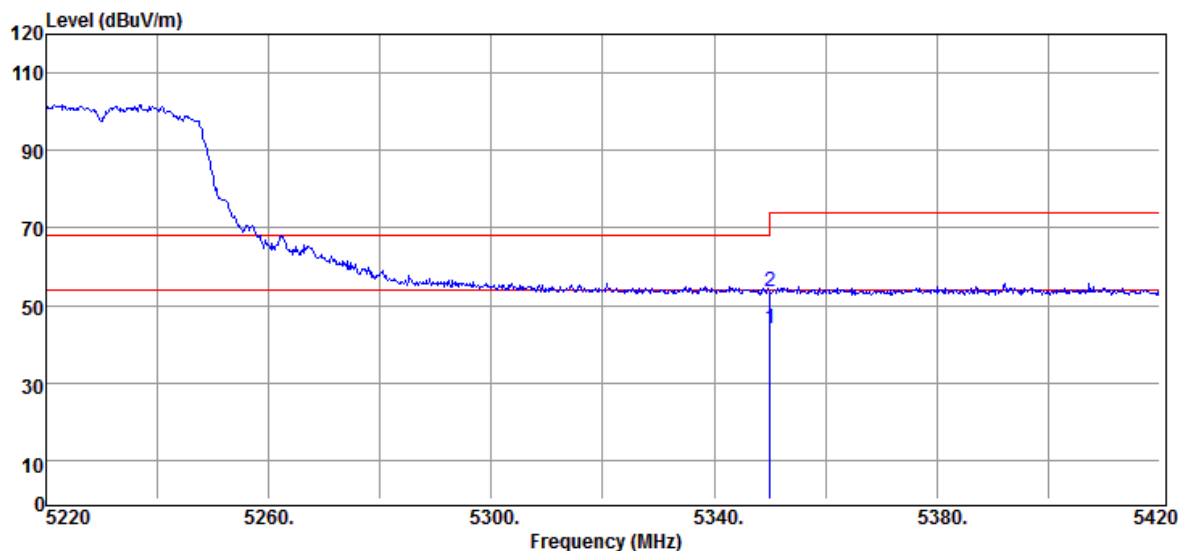
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Operation Mode	:802.11n40 / Band 1	Test Date	:2019-01-28
Test Mode	:BE CH HIGH	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5230 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	Average	32.24	11.81	44.05	54.00	-9.95
5350.00	Peak	41.93	11.81	53.74	74.00	-20.26

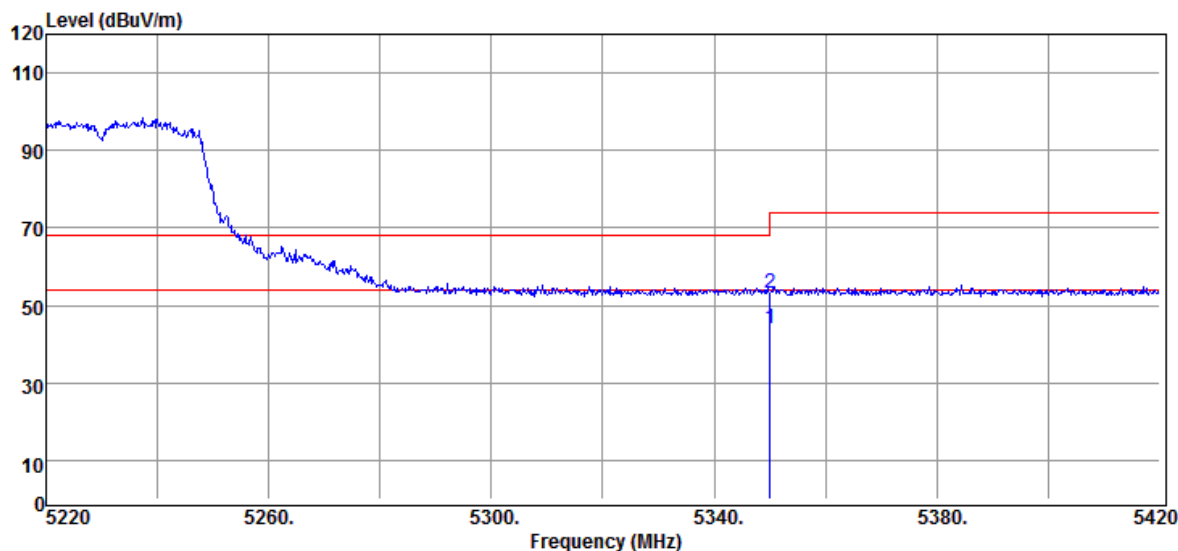
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Operation Mode :802.11n40 / Band 1
 Test Mode :BE CH HIGH
 EUT Pol :H Plan
 Test Channel :5230 MHz

Test Date :2019-01-28
 Temp./Humi. :25/60
 Antenna Pol. :HORIZONTAL
 Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
5350.00	Average	32.12	11.81	43.93	54.00	-10.07
5350.00	Peak	41.35	11.81	53.16	74.00	-20.84

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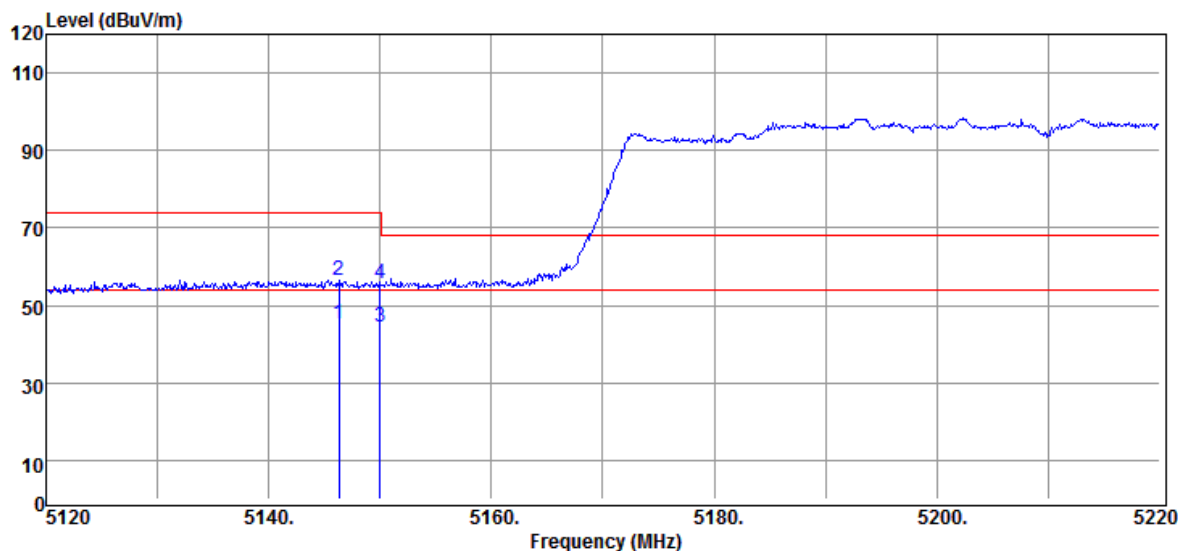
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802.11ac80 VHT mode

Operation Mode :802.11ac80 / Band 1
Test Mode :BE CH LOW
EUT Pol :H Plan
Test Channel :5210 MHz

Test Date :2019-01-28
Temp./Humi. :25/60
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5146.30	Average	33.42	11.84	45.26	54.00	-8.74
5146.30	Peak	44.69	11.84	56.53	74.00	-17.47
5150.00	Average	32.39	11.84	44.23	54.00	-9.77
5150.00	Peak	43.88	11.84	55.72	74.00	-18.28

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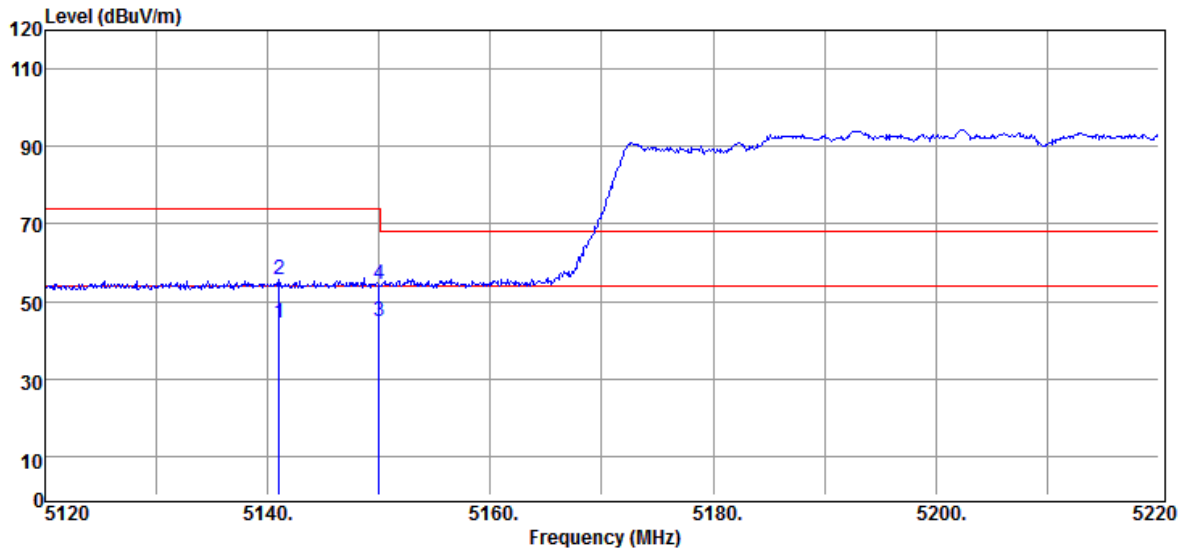
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Operation Mode :802.11ac80 / Band 1
 Test Mode :BE CH LOW
 EUT Pol :H Plan
 Test Channel :5210 MHz

Test Date :2019-01-28
 Temp./Humi. :25/60
 Antenna Pol. :HORIZONTAL
 Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5141.00	Average	32.60	11.83	44.43	54.00	-9.57
5141.00	Peak	43.91	11.83	55.74	74.00	-18.26
5150.00	Average	32.85	11.84	44.69	54.00	-9.31
5150.00	Peak	42.47	11.84	54.31	74.00	-19.69

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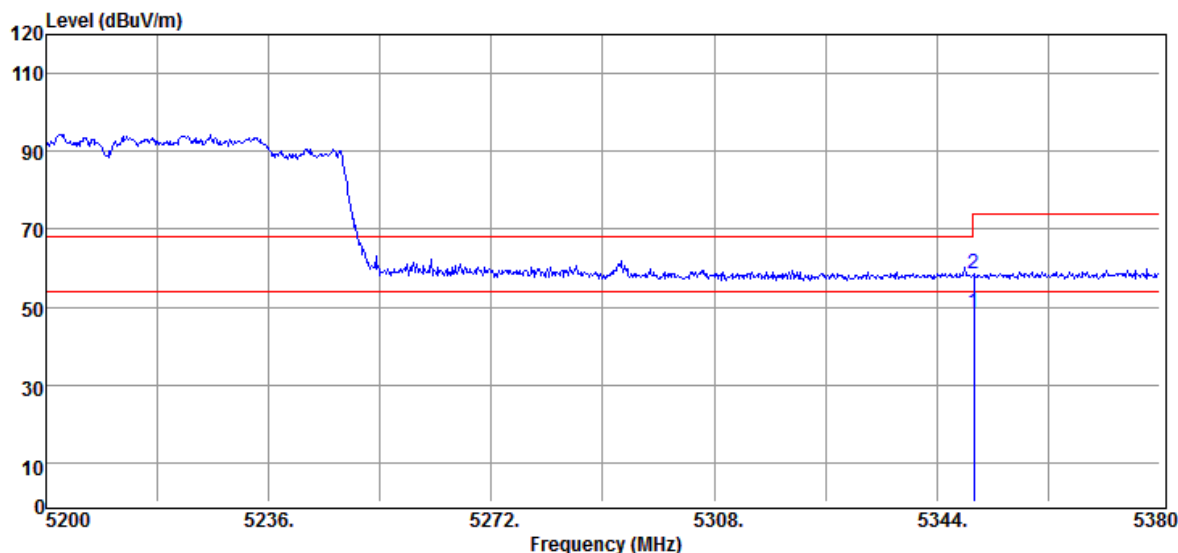
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Operation Mode	:802.11ac80 / Band 1	Test Date	:2019-02-20
Test Mode	:BE CH HIGH	Temp./Humi.	:21/57
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5210 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	Average	36.76	11.81	48.57	54.00	-5.43
5350.00	Peak	46.55	11.81	58.36	74.00	-15.64

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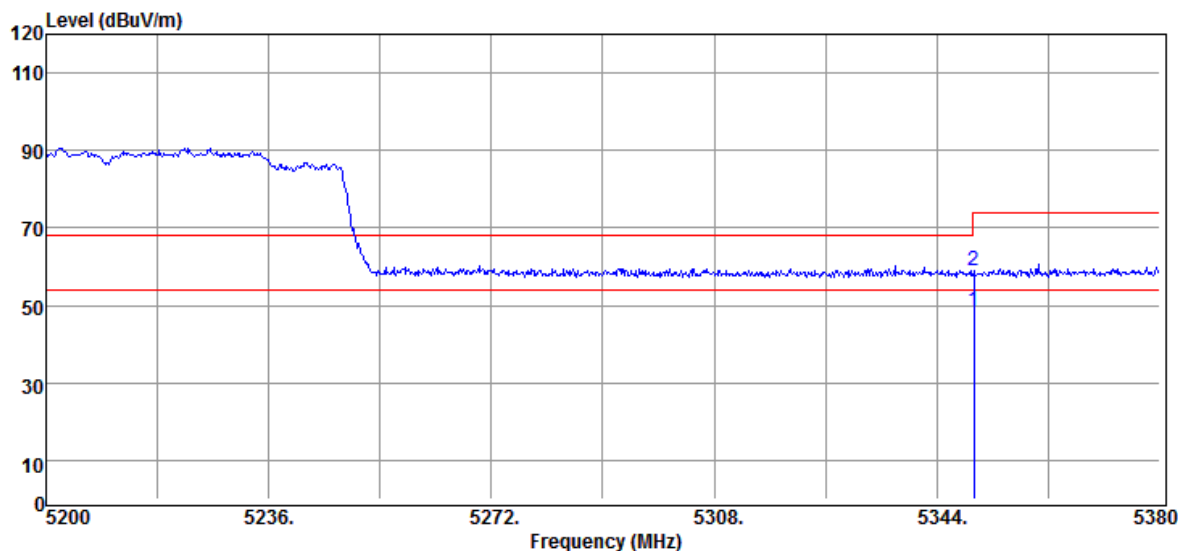
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Operation Mode :802.11ac80 / Band 1
 Test Mode :BE CH HIGH
 EUT Pol :H Plan
 Test Channel :5210 MHz

Test Date :2019-02-20
 Temp./Humi. :21/57
 Antenna Pol. :HORIZONTAL
 Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
5350.00	Average	36.95	11.81	48.76	54.00	-5.24
5350.00	Peak	46.99	11.81	58.80	74.00	-15.20

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12 TRANSMISSION IN THE ABSENCE OF DATA

12.1 Standard Applicable

According to §15.407(c)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

12.2 Result

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ASK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

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13 FREQUENCY STABILITY

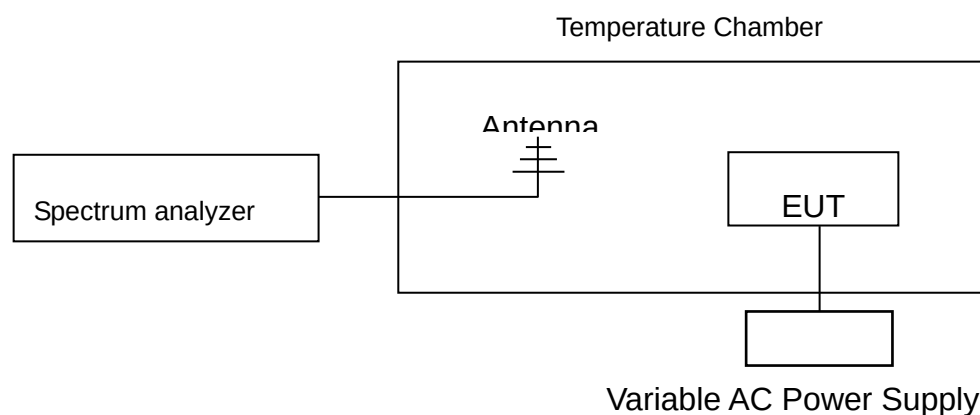
13.1 Standard Applicable

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

13.2 Measurement Procedure

1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.
2. Set EUT as normal operation.
3. Turn the EUT on and couple its output to spectrum.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.
6. Repeat step with the temperature chamber set to the lowest temperature.

13.3 Test SET-UP



13.4 Measurement Equipment Used:

SGS Conducted Room					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY51440113	06/20/2018	06/19/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/25/2018	12/24/2019
DC Block	PASTERNAK	PE8210	RF29	12/25/2018	12/24/2019

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13.5 Measurement Result

Startup:

Operation Mode	802.11 a	Test Date	2019.01.28
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	20.9	36	5180	5,179.95491	0.00000870
		44	5220	5,219.90970	0.00001730
		48	5240	5,239.93293	0.00001280
	17.1	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
25	19	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
40	20.9	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
	17.1	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081

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Operation Mode	802.11 n_HT40	Test Date	2019.01.28
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	20.9	38	5190	5,189.98612	0.00000267
		46	5230	5,229.94138	0.00001121
	17.1	38	5190	5,189.98228	0.00000341
		46	5230	5,229.99509	0.00000094
25	19	38	5190	5,189.91342	0.00001668
		46	5230	5,229.97996	0.00000383
40	20.9	38	5190	5,189.94805	0.00001001
		46	5230	5,229.91974	0.00001535
	17.1	38	5190	5,189.92819	0.00001384
		46	5230	5,229.95118	0.00000933

Operation Mode	802.11 ac_VHT80	Test Date	2019.01.28
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	20.9	42	5210	5,209.93120	0.00001321
	17.1	42	5210	5,209.92709	0.00001399
25	19	42	5210	5,209.93831	0.00001184
40	20.9	42	5210	5,209.96005	0.00000767
	17.1	42	5210	5,209.95822	0.00000802

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2 Minutes:

Operation Mode	802.11 a	Test Date	2019.01.28
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	20.9	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
	17.1	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
25	19	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
40	20.9	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
	17.1	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081

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Operation Mode	802.11 n_HT40	Test Date	2019.01.28
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	20.9	38	5190	5,189.92326	0.00001479
		46	5230	5,229.90132	0.00001887
	17.1	38	5190	5,189.93175	0.00001315
		46	5230	5,229.93670	0.00001210
25	19	38	5190	5,189.94693	0.00001023
		46	5230	5,229.96436	0.00000681
40	20.9	38	5190	5,189.90265	0.00001876
		46	5230	5,229.93980	0.00001151
	17.1	38	5190	5,189.96976	0.00000583
		46	5230	5,229.91420	0.00001641

Operation Mode	802.11 ac_VHT80	Test Date	2019.01.28
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	20.9	42	5210	5,209.99800	0.00000038
	17.1	42	5210	5,209.93934	0.00001164
25	19	42	5210	5,209.95220	0.00000917
40	20.9	42	5210	5,209.92469	0.00001445
	17.1	42	5210	5,209.98991	0.00000194

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5 Minutes:

Operation Mode	802.11 a	Test Date	2019.01.28
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	20.9	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
	17.1	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
25	19	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
40	20.9	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
	17.1	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081

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Operation Mode	802.11 n_HT40	Test Date	2019.01.28
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	20.9	38	5190	5,189.99407	0.00000114
		46	5230	5,229.91056	0.00001710
	17.1	38	5190	5,189.92433	0.00001458
		46	5230	5,229.98523	0.00000282
25	19	38	5190	5,189.94876	0.00000987
		46	5230	5,229.99727	0.00000052
40	20.9	38	5190	5,189.95471	0.00000873
		46	5230	5,229.96509	0.00000667
	17.1	38	5190	5,189.98928	0.00000207
		46	5230	5,229.95479	0.00000864

Operation Mode	802.11 ac_VHT80	Test Date	2019.01.28
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	20.9	42	5210	5,209.97111	0.00000555
	17.1	42	5210	5,209.97355	0.00000508
25	19	42	5210	5,209.90021	0.00001915
40	20.9	42	5210	5,209.92919	0.00001359
	17.1	42	5210	5,209.97740	0.00000434

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10 Minutes:

Operation Mode	802.11 a	Test Date	2019.01.28
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	20.9	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
	17.1	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
25	19	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
40	20.9	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081
	17.1	36	5180	5,179.95516	0.00000866
		44	5220	5,219.98659	0.00000257
		48	5240	5,239.99578	0.00000081

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Operation Mode	802.11 n_HT40	Test Date	2019.01.28
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	20.9	38	5190	5,189.96797	0.00000617
		46	5230	5,229.99313	0.00000131
	17.1	38	5190	5,189.98502	0.00000289
		46	5230	5,229.99293	0.00000135
25	19	38	5190	5,189.97194	0.00000541
		46	5230	5,229.98170	0.00000350
40	20.9	38	5190	5,189.91052	0.00001724
		46	5230	5,229.97355	0.00000506
	17.1	38	5190	5,189.92502	0.00001445
		46	5230	5,229.98658	0.00000257

Operation Mode	802.11 ac_VHT80	Test Date	2019.01.28
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	20.9	42	5210	5,209.95367	0.00000889
	17.1	42	5210	5,209.98943	0.00000203
25	19	42	5210	5,209.90615	0.00001801
40	20.9	42	5210	5,209.98709	0.00000248
	17.1	42	5210	5,209.97695	0.00000442

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14 ANTENNA REQUIREMENT

14.1 Standard Applicable

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

According to §15.407, 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 6 dBi.

14.2 Antenna Connected Construction

The antenna is designed as permanently attached and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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