

# **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:** apperance 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 / Engineer*



**Approved By:** \_\_\_\_\_  
*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: | appereance 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.<br>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<br>256QAM for OFDM in 802.11ac only  |          |              |                               |                       |
| Transition Rate:    | 802.11 a: 6/9/12/18/24/36/48/54 Mbps<br>802.11 n_20MHz: 6.5 – 144.4Mbps<br>802.11 n_40MHz: 13.5 – 300Mbps<br>802.11 ac_20MHz: 6.5 – 173.3 Mbps<br>802.11 ac_40MHz: 27 – 400 Mbps<br>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

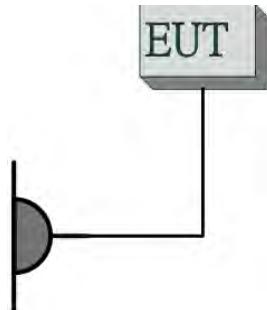
**Fig. 2-1 Radiated Emission Configuration**



**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)<br>§15.407(e)         | RSS-247 §6.2.1~ 4 (1)<br>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<br>§15.209<br>§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<br>§15.407(a)            | RSS- Gen §6.7<br>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,<br>802.11ac VHT20 Mode |           |
|---|-----------|
| Channel                                       | Frequency |
| 36  | 5180      |
| 40  | 5200      |
| 44  | 5220      |
| 48  | 5240      |

| 802.11 n HT40 Mode,<br>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            |
|---|---|---|------------------------------|------------------------------|--|
| <input checked="" type="checkbox"/> 802.11 a  | <input checked="" type="checkbox"/> Ch0 | <input checked="" type="checkbox"/> Ch1 | <input type="checkbox"/> Ch2 | <input type="checkbox"/> Ch3 | <input type="checkbox"/> 2TX             |
| <input checked="" type="checkbox"/> 802.11 n  | <input checked="" type="checkbox"/> Ch0 | <input checked="" type="checkbox"/> Ch1 | <input type="checkbox"/> Ch2 | <input type="checkbox"/> Ch3 | <input checked="" type="checkbox"/> MIMO |
| <input checked="" type="checkbox"/> 802.11 ac | <input checked="" type="checkbox"/> Ch0 | <input checked="" type="checkbox"/> Ch1 | <input type="checkbox"/> Ch2 | <input type="checkbox"/> Ch3 | <input checked="" type="checkbox"/> 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<br>(Polarization : <b>Vertical</b> ) | 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<br>(Polarization : <b>Horizontal</b> ) | 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<br>MHz | Limits<br>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<br>TYPE            | MFR        | MODEL<br>NUMBER | SERIAL<br>NUMBER | LAST<br>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                     | PASTERNACK | 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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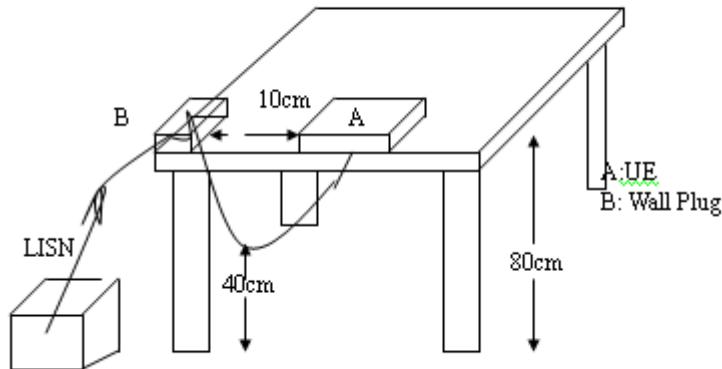
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## 6.4 Test SET-UP



## 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

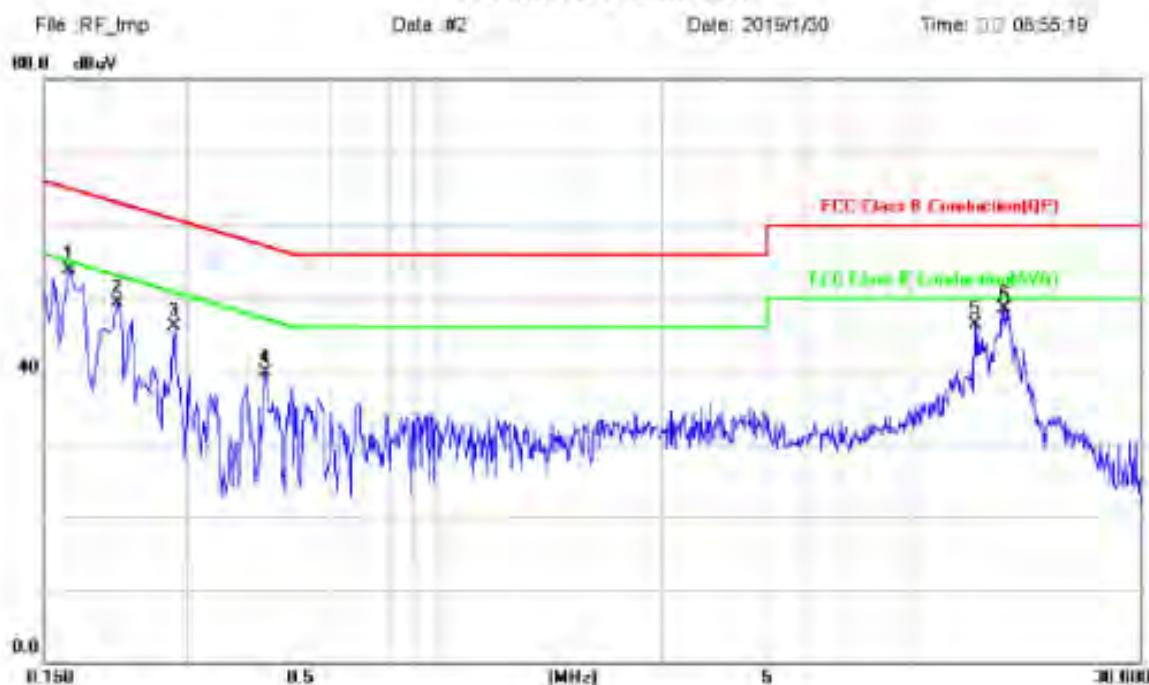
Operation Mode: Operation mode

Test By: Pony

Adapter 1

Site : Conduction Room B      Phase: **L1**      Temperature: 23 °C  
 Limit: FCC Class B Conduction(QP)      Power: AC 120V/60Hz      Humidity: 57 %  
 Mode:  
 Note:

## Conducted Emission



| No. | Mk | Freq    | Reading | Correct | Measure- | Limit | Over   | Detector | Comment |
|-----|----|---------|---------|---------|----------|-------|--------|----------|---------|
|     |    |         | Level   | Factor  | ment     |       |        |          |         |
|     |    | MHz     | dBuV    | dB      | dBuV     | dBuV  | dB     |          |         |
| 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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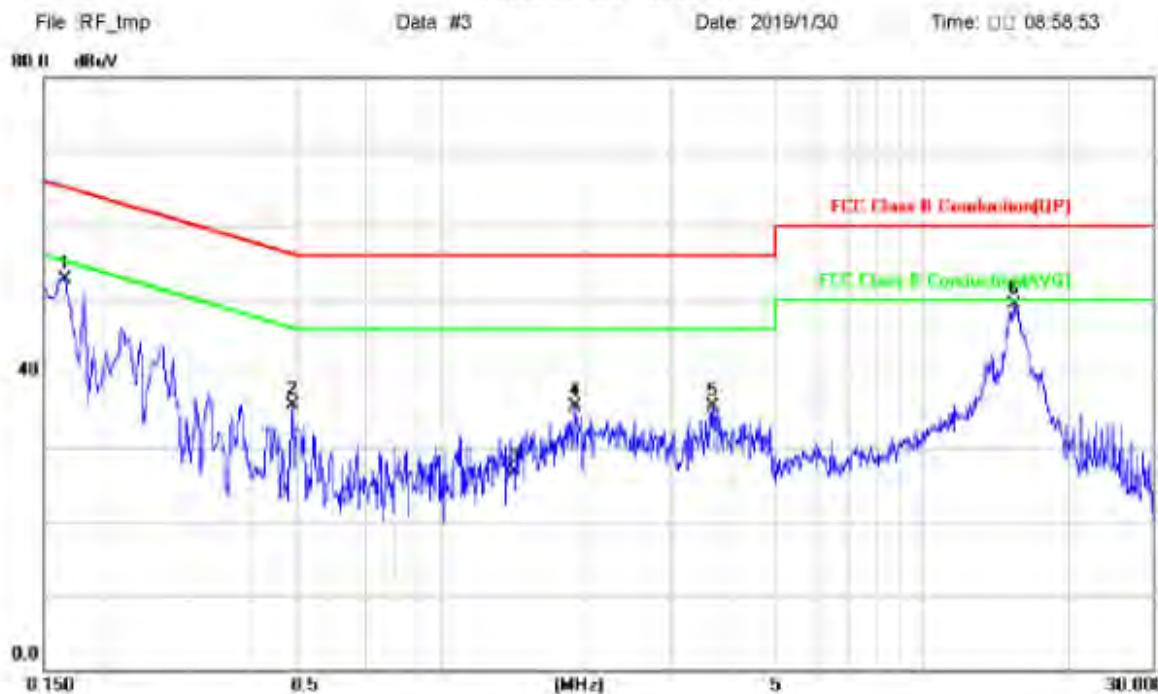
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Site : Conduction Room B      Phase: **N**      Temperature: 23 °C  
 Limit: FCC Class B Conduction(QP)      Power: AC 120V/60Hz      Humidity: 57 %  
 Mode:  
 Note:

### Conducted Emission



| No. | Mk. | Freq.   | Reading | Correct | Measure- | Limit | Over   | Detector | Comment |
|-----|-----|---------|---------|---------|----------|-------|--------|----------|---------|
|     |     |         | Level   | Factor  | ment     |       |        |          |         |
|     |     | MHz     | dBuV    | dB      | dBuV     | dBuV  | dB     |          |         |
| 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   | 35.58    | 56.00 | -20.44 | peak     |         |
| 6 * |     | 15.5100 | 29.25   | 20.01   | 49.26    | 60.00 | -10.74 | peak     |         |

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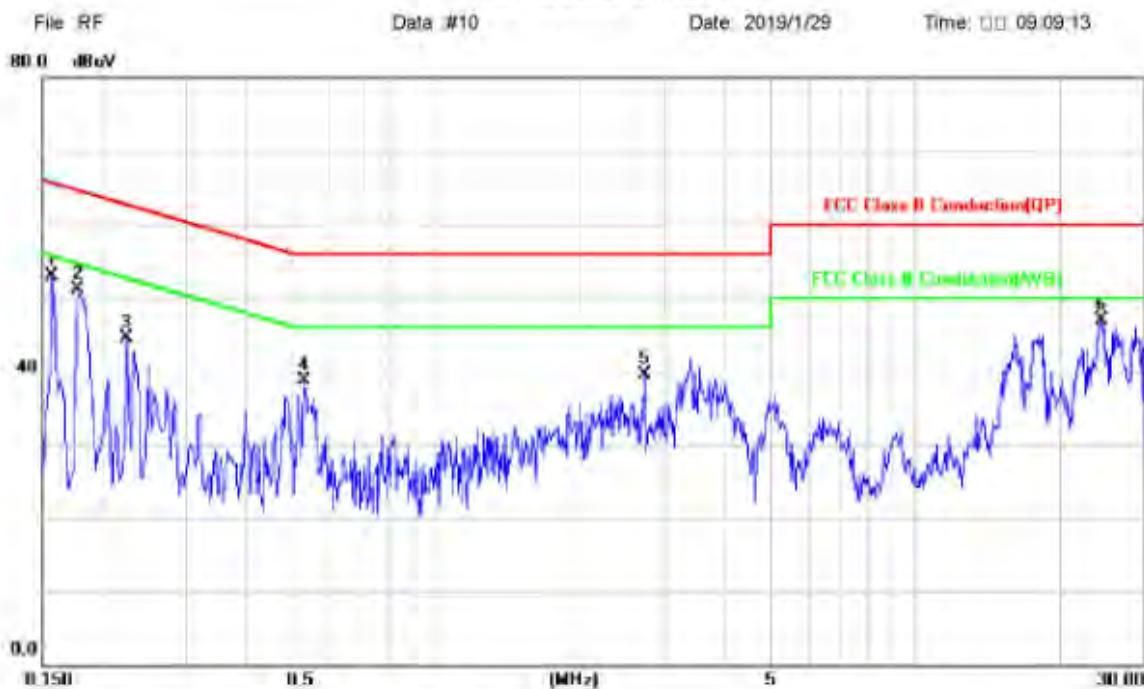
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## Adapter 2

Site : Conduction Room B Phase: **L1** Temperature: 23 °  
 Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 57 %  
 Mode:  
 Note:

## Conducted Emission



| No. | Mk. | Freq.   | Reading | Correct | Measure- | Limit | Over   | Detector | Comment |
|-----|-----|---------|---------|---------|----------|-------|--------|----------|---------|
|     |     |         | Level   | Factor  | ment     |       |        |          |         |
|     |     | MHz     | dBuV    | dB      | 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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Site : Conduction Room B  
Limit: FCC Class B Conduction(QP)  
Mode:  
Note:

## Conducted Emission



| No. | Mk. | Freq.   | Reading | Correct | Measure- | Limit | Over   | Detector | Comment |
|-----|-----|---------|---------|---------|----------|-------|--------|----------|---------|
|     |     |         | Level   | Factor  | ment     |       |        |          |         |
|     |     | MHz     | dBuV    | dB      | 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)<br>=10*log ( 1/Duty Cycle ) | 1/T<br>(kHz) | VBW<br>setting<br>(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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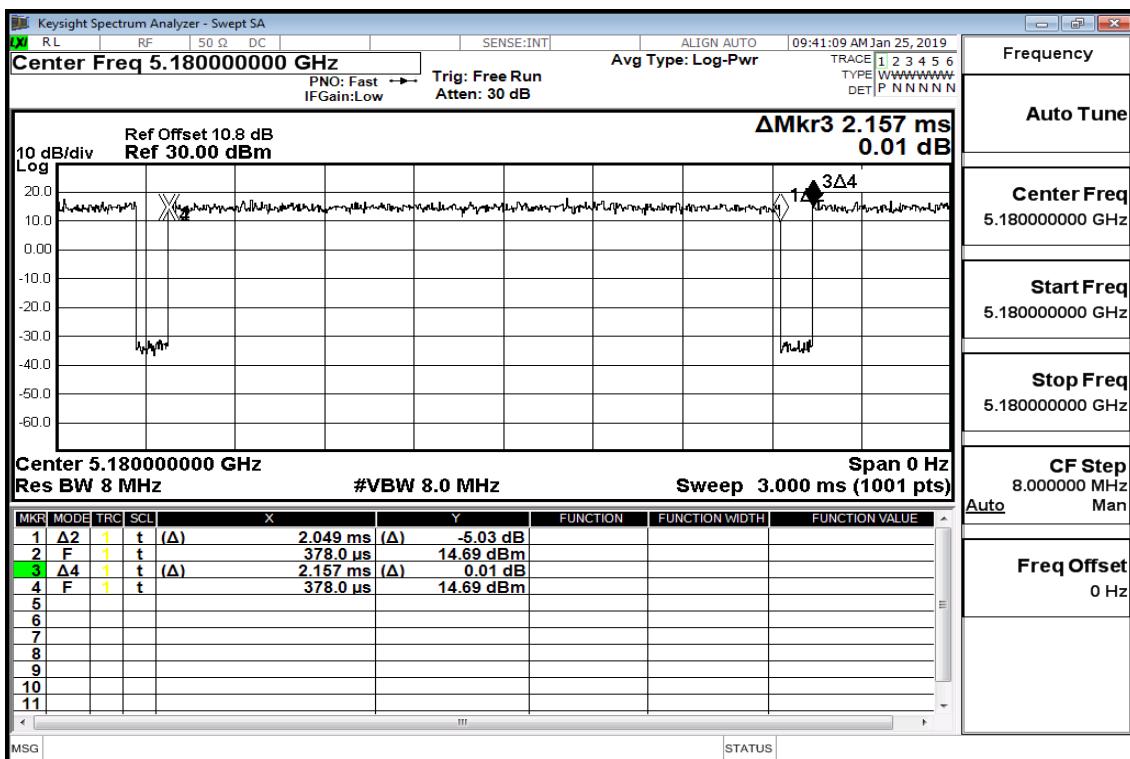
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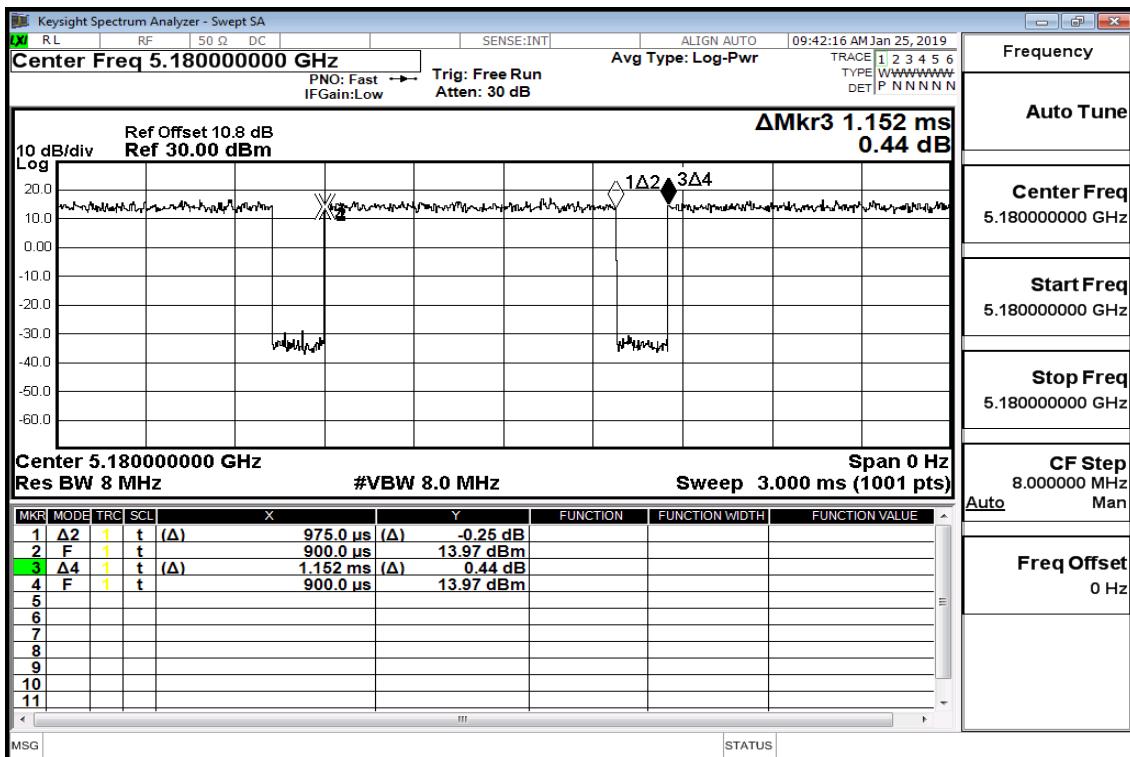
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## DUTY CYCLE TEST SIGNAL Measurement Result 802.11a



## 802.11n HT20



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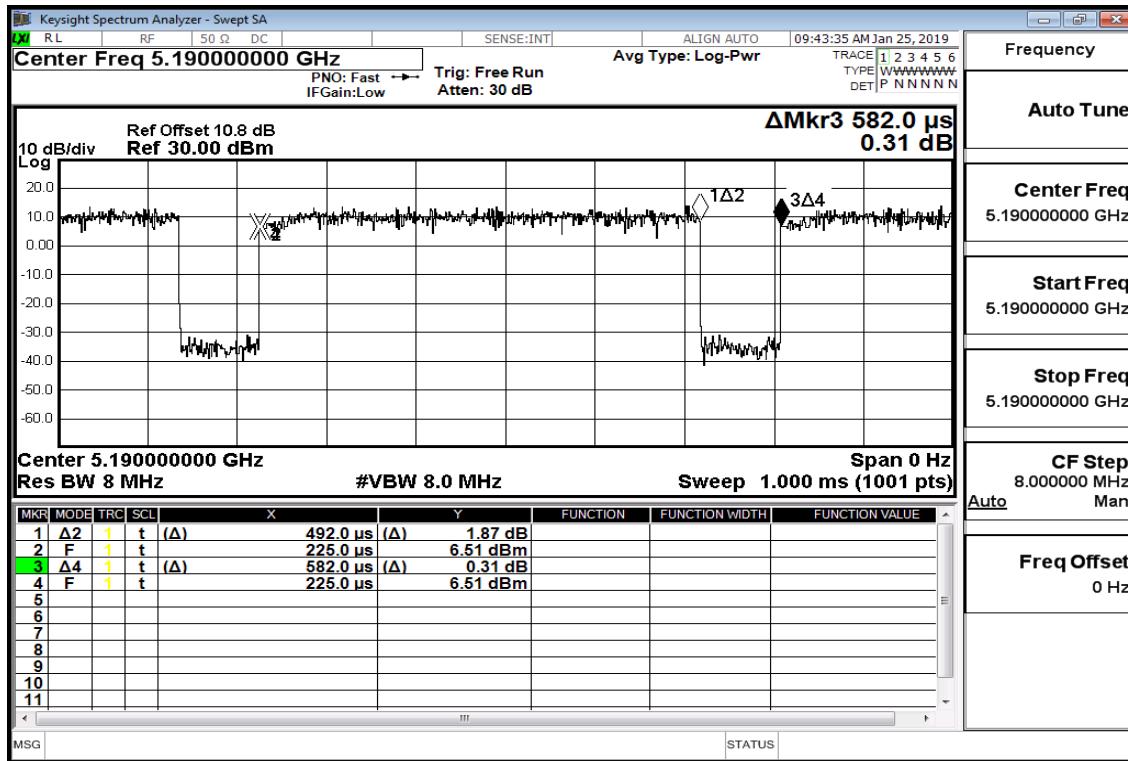
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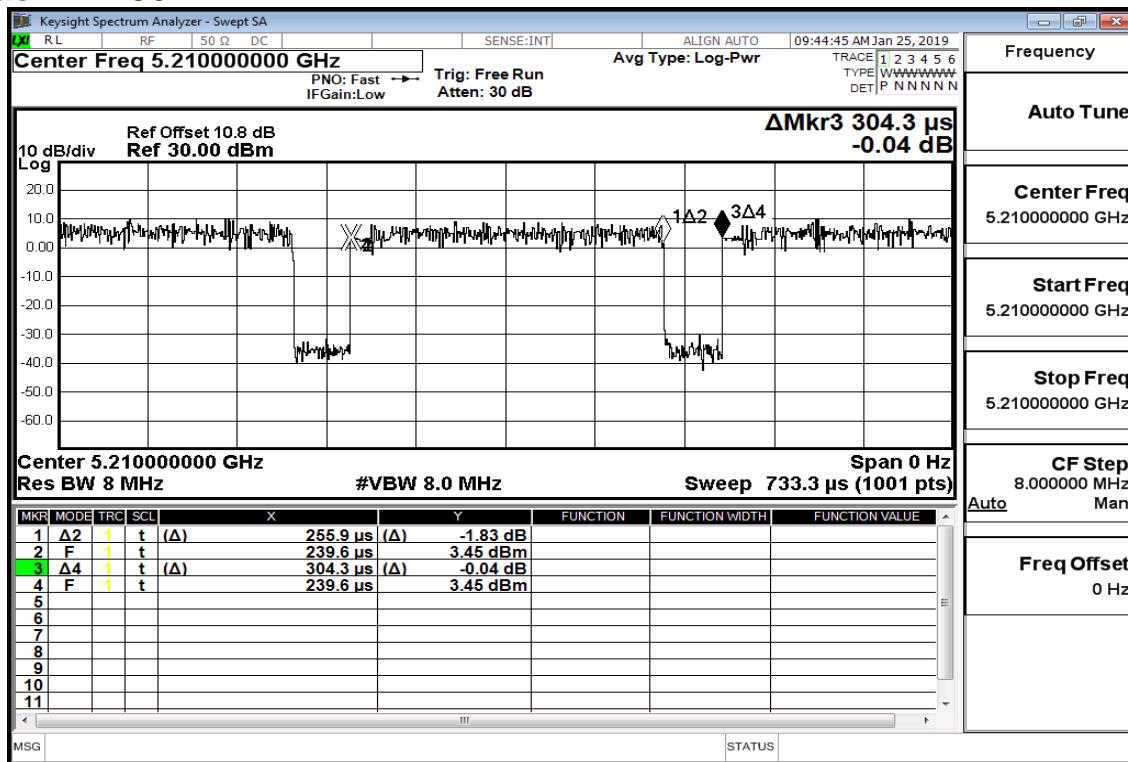
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## 802.11n HT 40



## 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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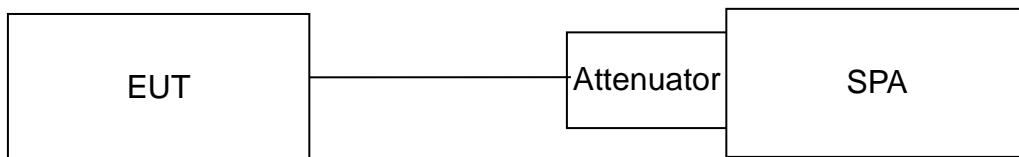
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### 8.3 Measurement Equipment Used

| 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           | PASTERNACK | 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**
**802.11n \_HT40\_Ch1**

| Frequency (MHz) | 26dB BW (MHz) | 10 Log (B) (dB) | Frequency (MHz) | 26dB BW (MHz) | 10 Log (B) (dB) |
|-----------------|---------------|-----------------|-----------------|---------------|-----------------|
| 5190            | 40.460        | 16.070          | 5190            | 41.010        | 16.129          |
| 5230            | 41.580        | 16.189          | 5230            | 40.980        | 16.126          |

**802.11ac \_VHT80\_Ch0**
**802.11ac \_VHT80\_Ch1**

| Frequency (MHz) | 26dB BW (MHz) | 10 Log (B) (dB) | Frequency (MHz) | 26dB BW (MHz) | 10 Log (B) (dB) |
|-----------------|---------------|-----------------|-----------------|---------------|-----------------|
| 5210            | 80.320        | 19.048          | 5210            | 80.280        | 19.046          |

**99% Bandwidth**
**802.11a\_Ch0**
**802.11a\_Ch1**

| Frequency (MHz) | 99% BW (MHz) | 10 Log (B) (dB) | Frequency (MHz) | 99% BW (MHz) | 10 Log (B) (dB) |
|-----------------|--------------|-----------------|-----------------|--------------|-----------------|
| 5180            | 16.563       | 12.191          | 5180            | 16.507       | 12.177          |
| 5220            | 16.566       | 12.192          | 5220            | 16.612       | 12.204          |
| 5240            | 16.632       | 12.209          | 5240            | 16.565       | 12.192          |

**802.11n \_HT20\_Ch0**
**802.11n \_HT20\_Ch1**

| Frequency (MHz) | 99% BW (MHz) | 10 Log (B) (dB) | Frequency (MHz) | 99% BW (MHz) | 10 Log (B) (dB) |
|-----------------|--------------|-----------------|-----------------|--------------|-----------------|
| 5180            | 17.692       | 12.478          | 5180            | 17.686       | 12.476          |
| 5220            | 17.657       | 12.469          | 5220            | 17.700       | 12.480          |
| 5240            | 17.669       | 12.472          | 5240            | 17.650       | 12.467          |

**802.11n \_HT40\_Ch0**
**802.11n \_HT40\_Ch1**

| Frequency (MHz) | 99% BW (MHz) | 10 Log (B) (dB) | Frequency (MHz) | 99% BW (MHz) | 10 Log (B) (dB) |
|-----------------|--------------|-----------------|-----------------|--------------|-----------------|
| 5190            | 36.037       | 15.567          | 5190            | 36.032       | 15.567          |
| 5230            | 36.041       | 15.568          | 5230            | 36.028       | 15.566          |

**802.11ac \_VHT80\_Ch0**
**802.11ac \_VHT80\_Ch1**

| Frequency (MHz) | 99% BW (MHz) | 10 Log (B) (dB) | Frequency (MHz) | 99% BW (MHz) | 10 Log (B) (dB) |
|-----------------|--------------|-----------------|-----------------|--------------|-----------------|
| 5210            | 75.284       | 18.767          | 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\_VHT80\_Ch1

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

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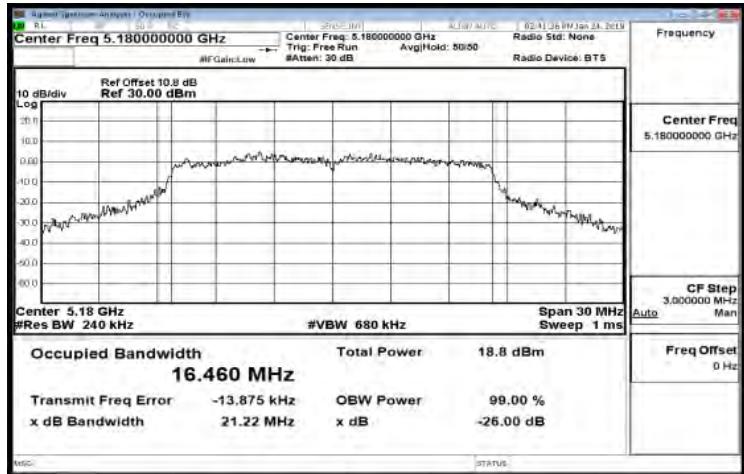
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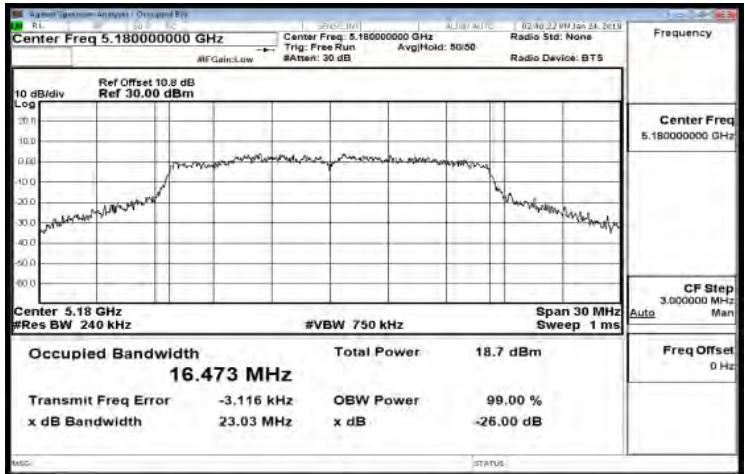
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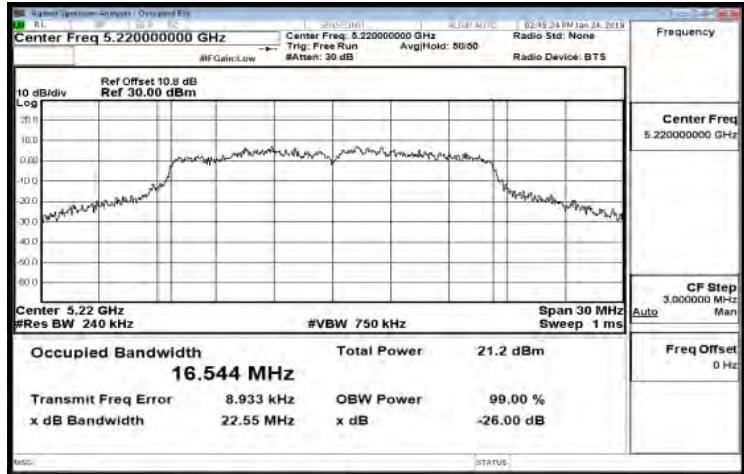
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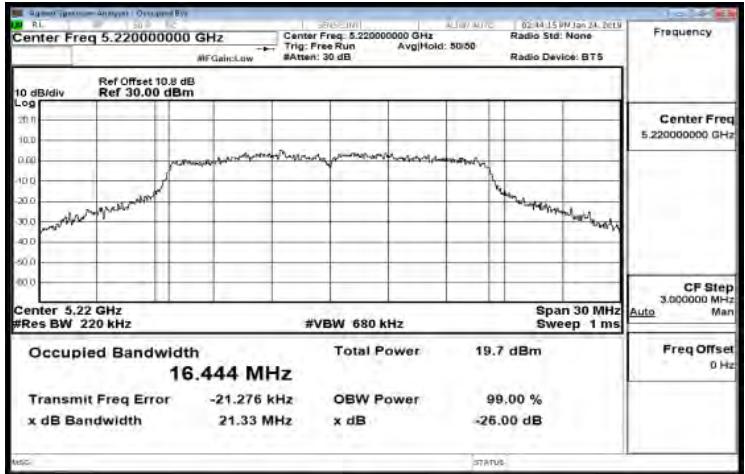
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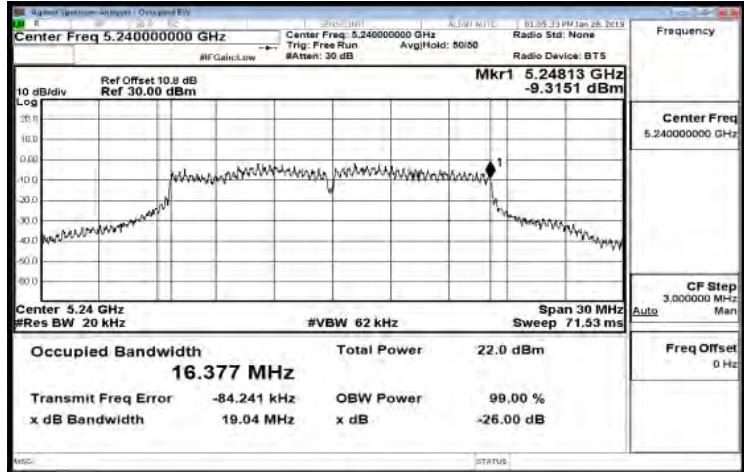
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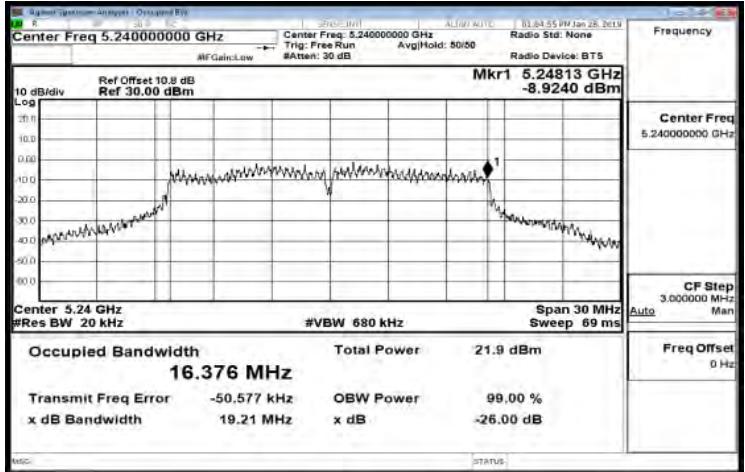
## FCC\_802.11a\_20MHz\_AUX1\_5220MHz



## FCC\_802.11a\_20MHz\_Main\_5240MHz



## FCC\_802.11a\_20MHz\_AUX1\_5240MHz



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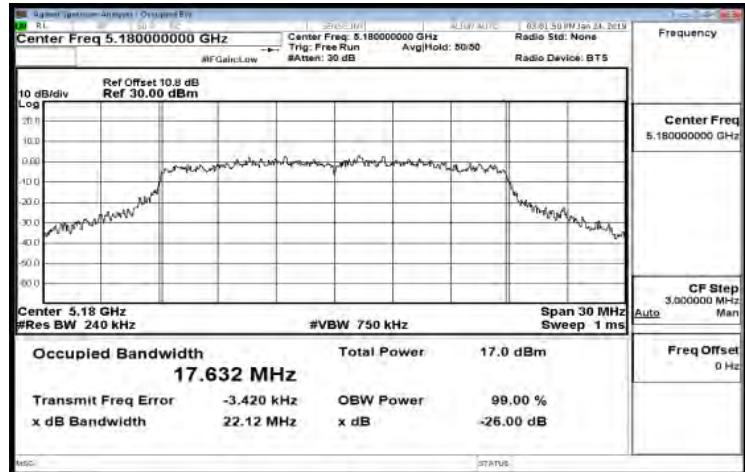
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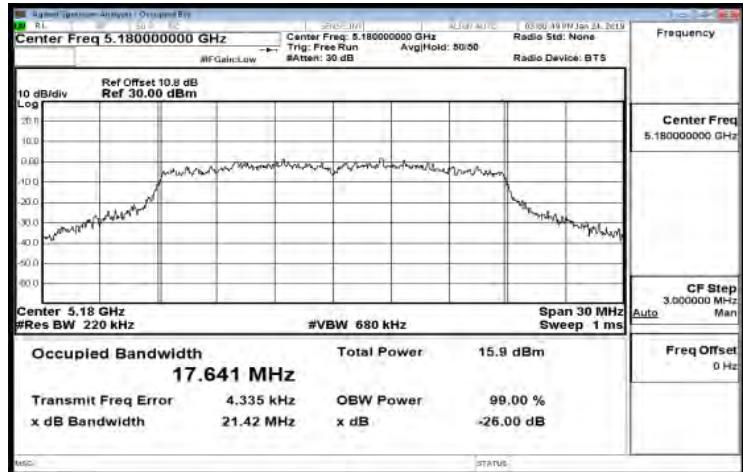
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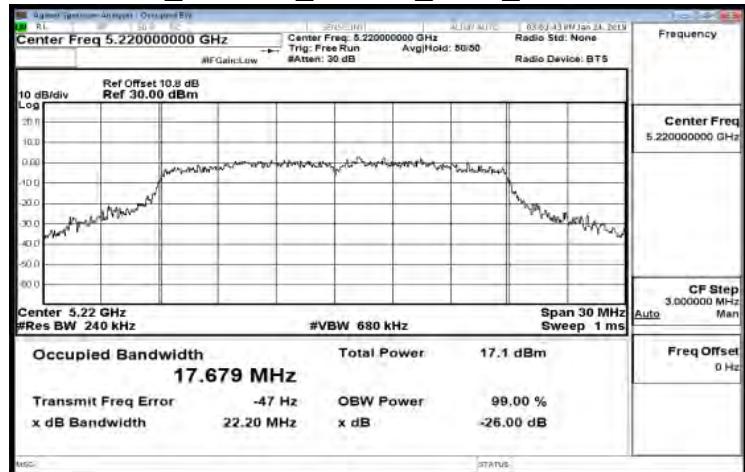
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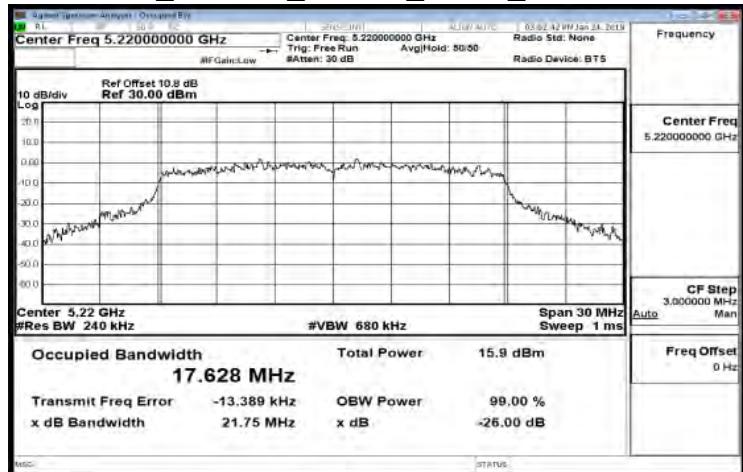
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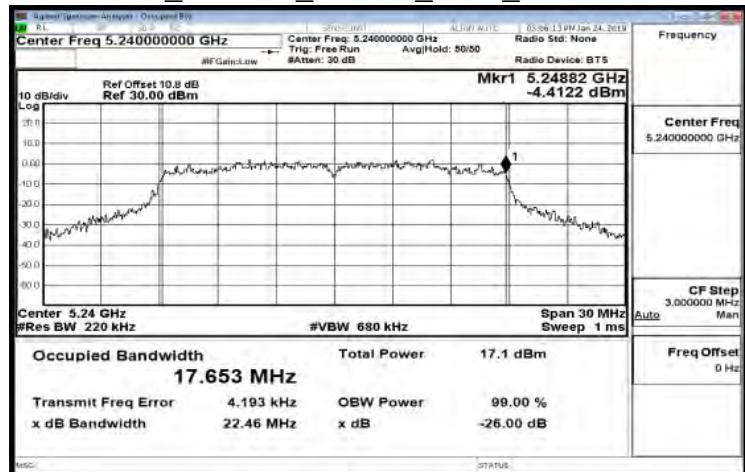
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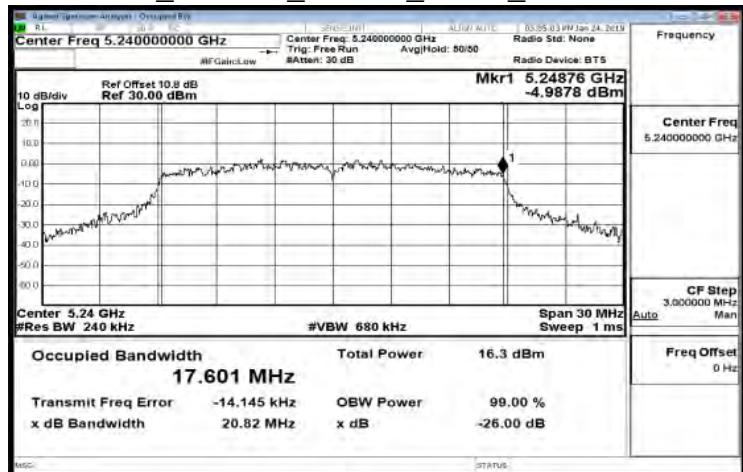
## FCC\_802.11n\_20MHz\_AUX1\_5220MHz



## FCC\_802.11n\_20MHz\_Main\_5240MHz



## FCC\_802.11n\_20MHz\_AUX1\_5240MHz



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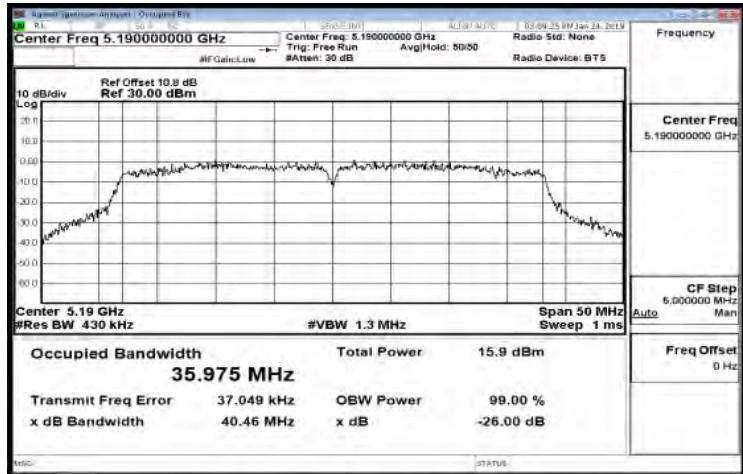
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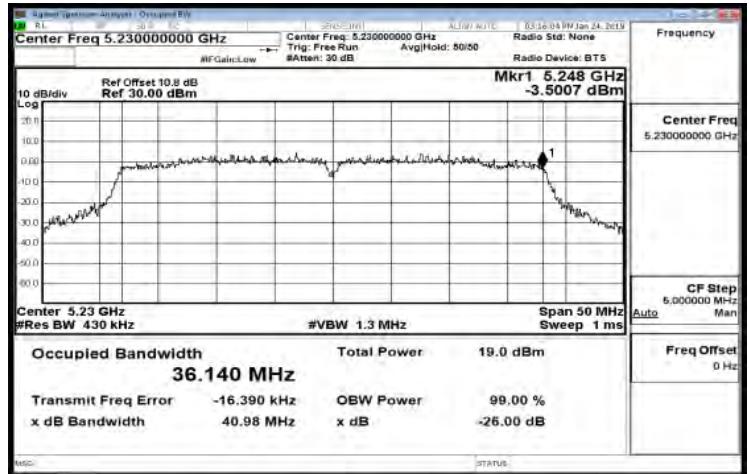
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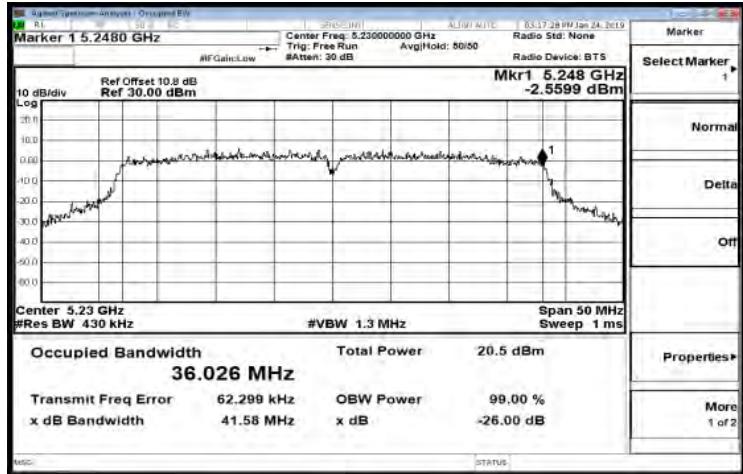
## FCC\_802.11n\_40MHz\_Main\_5190MHz



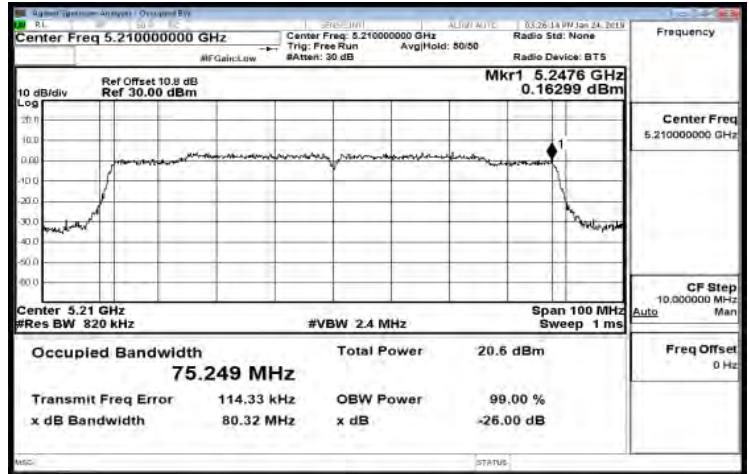
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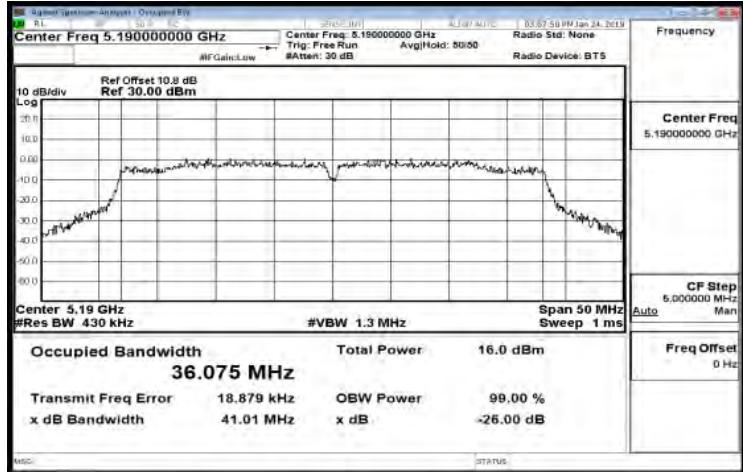
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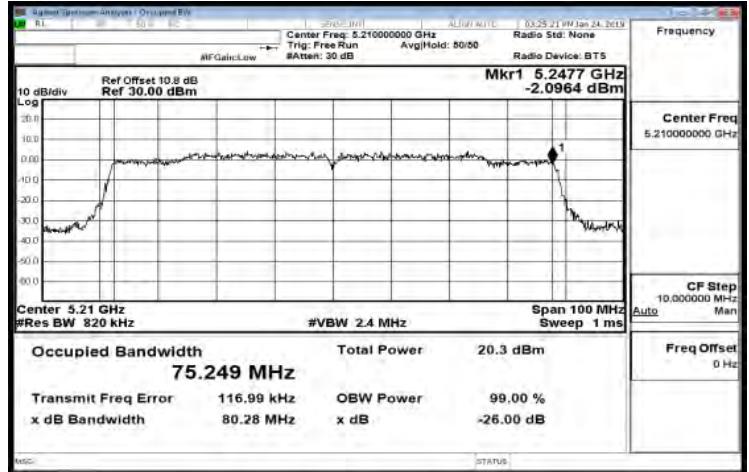
## FCC\_802.11ac\_80MHz\_Main\_5210MHz



## FCC\_802.11n\_40MHz\_AUX1\_5190MHz



## FCC\_802.11ac\_80MHz\_AUX1\_5210MHz



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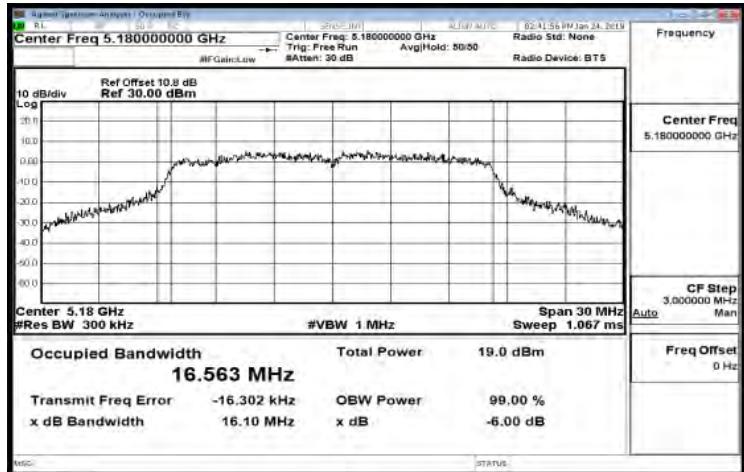
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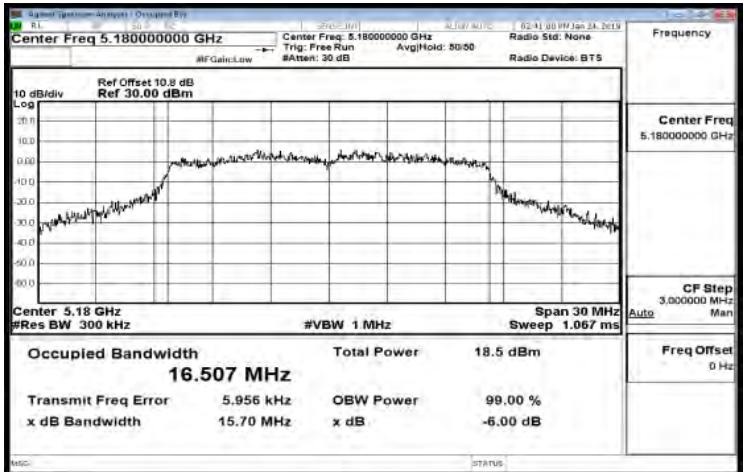
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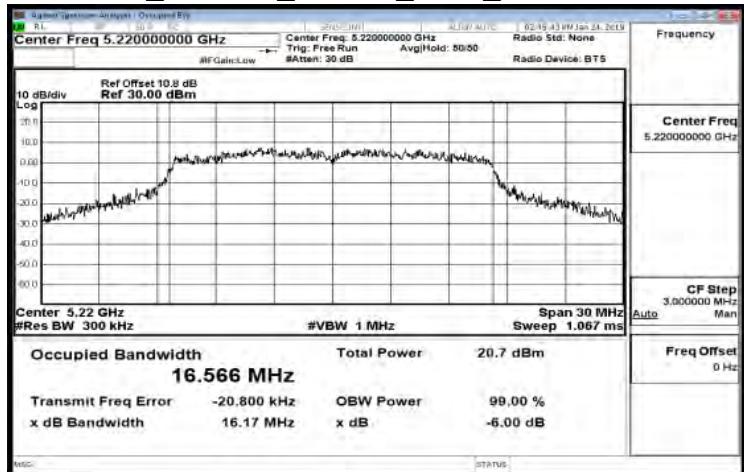
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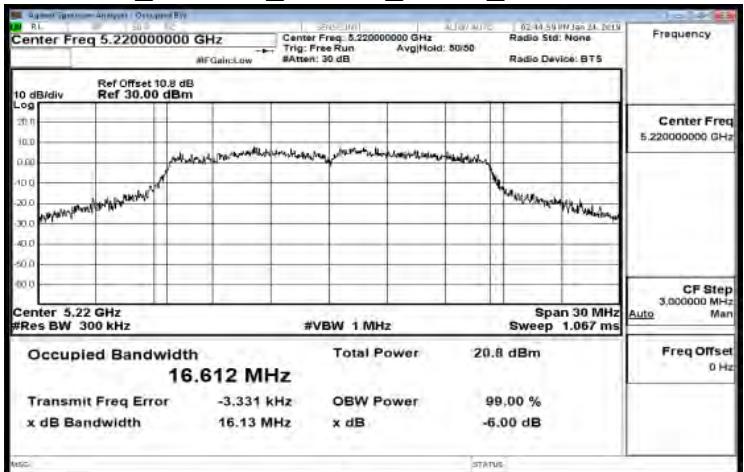
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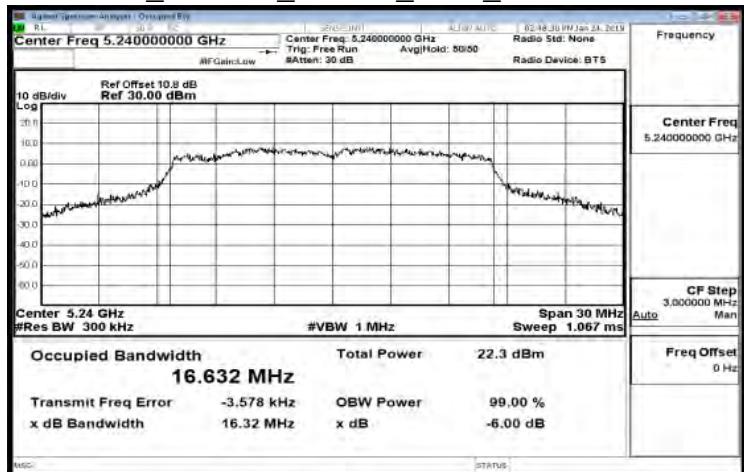
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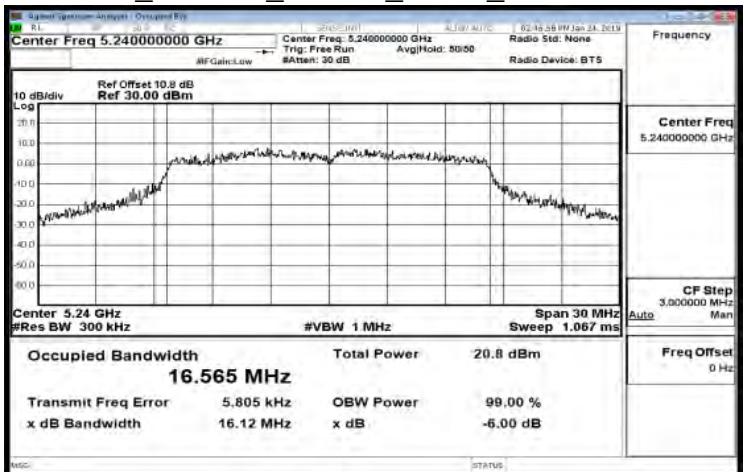
## IC\_802.11a\_20MHz\_AUX1\_5220MHz



## IC\_802.11a\_20MHz\_Main\_5240MHz



## IC\_802.11a\_20MHz\_AUX1\_5240MHz

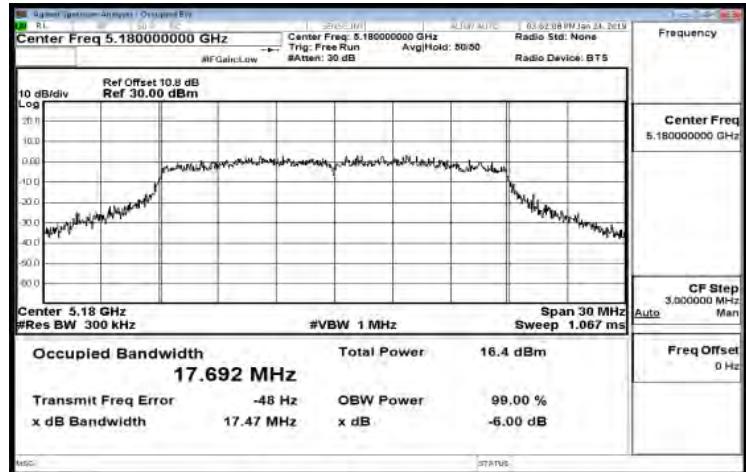


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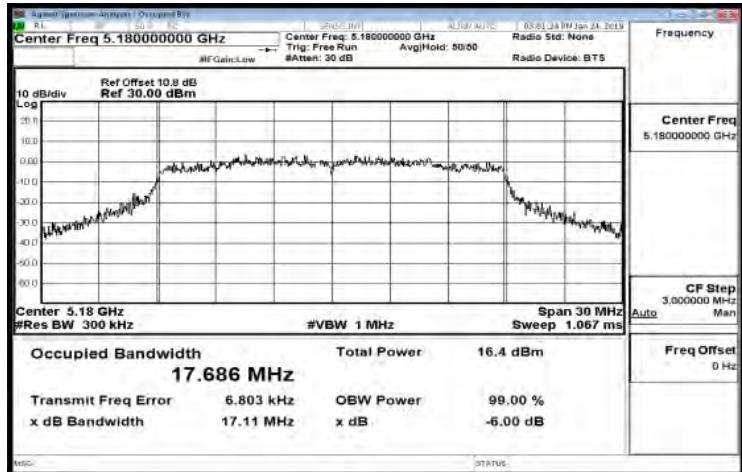
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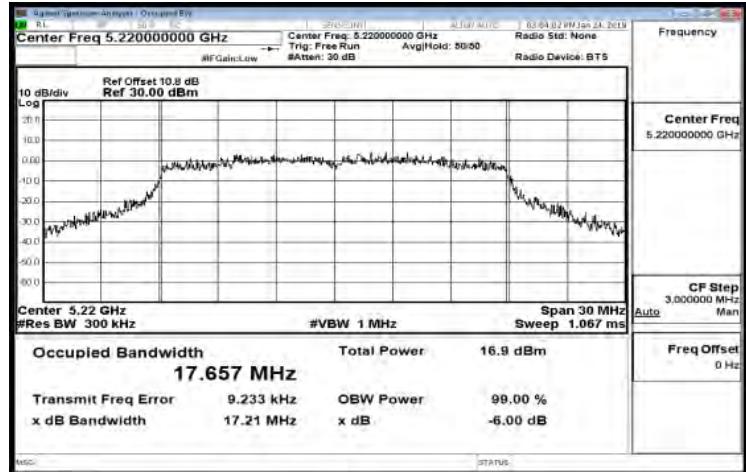
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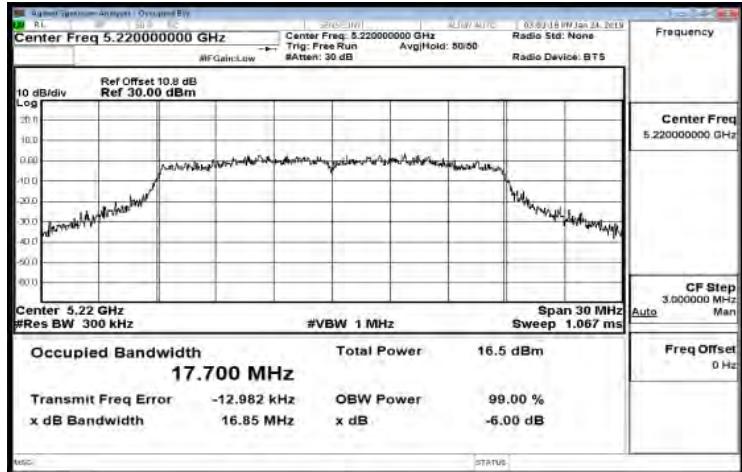
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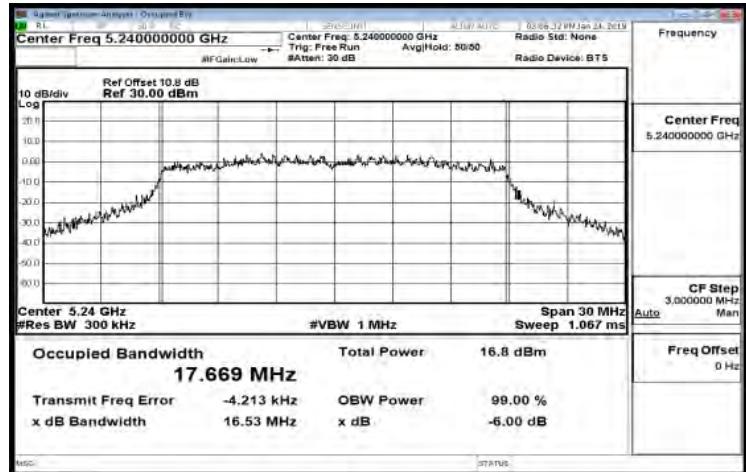
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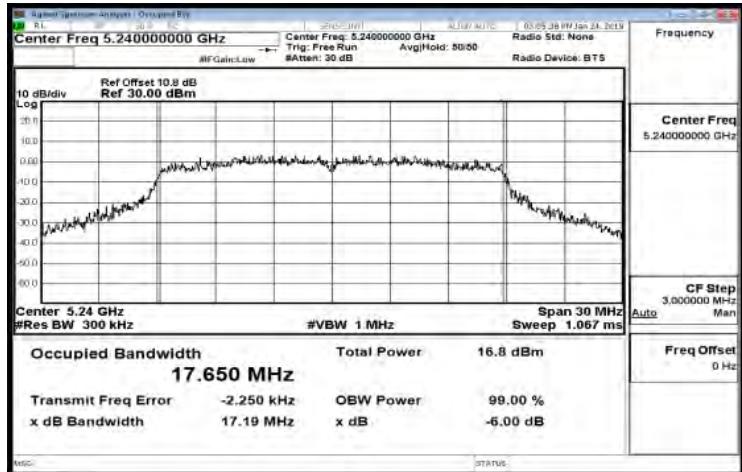
## IC\_802.11n\_20MHz\_AUX1\_5220MHz



## IC\_802.11n\_20MHz\_Main\_5240MHz



## IC\_802.11n\_20MHz\_AUX1\_5240MHz



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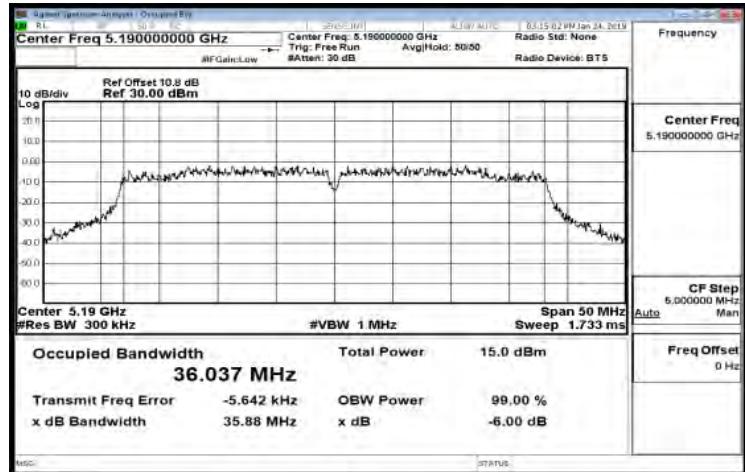
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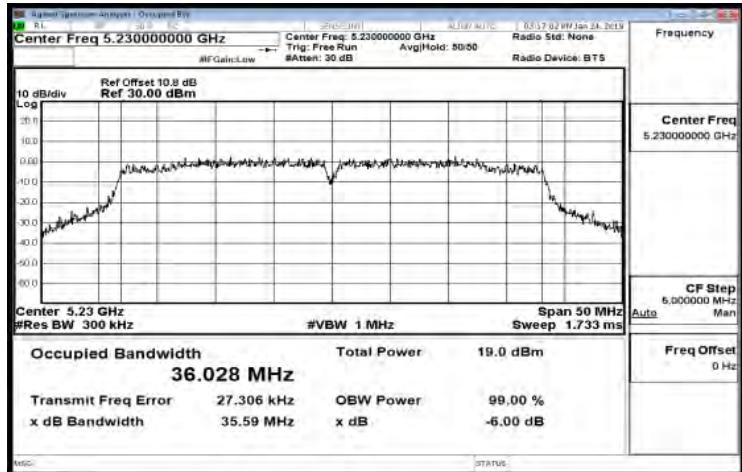
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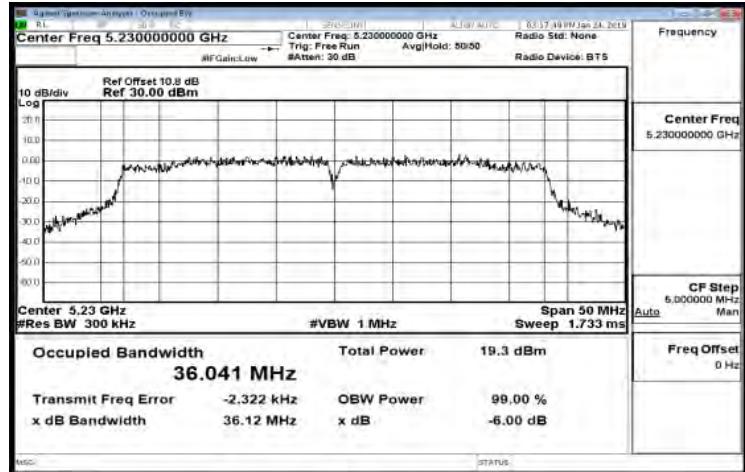
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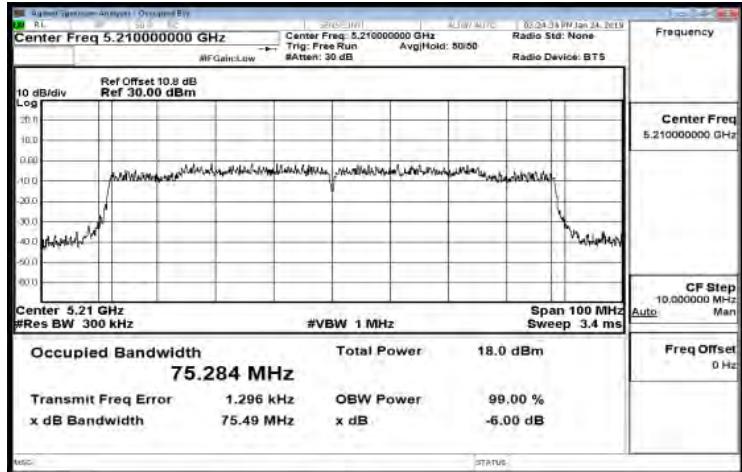
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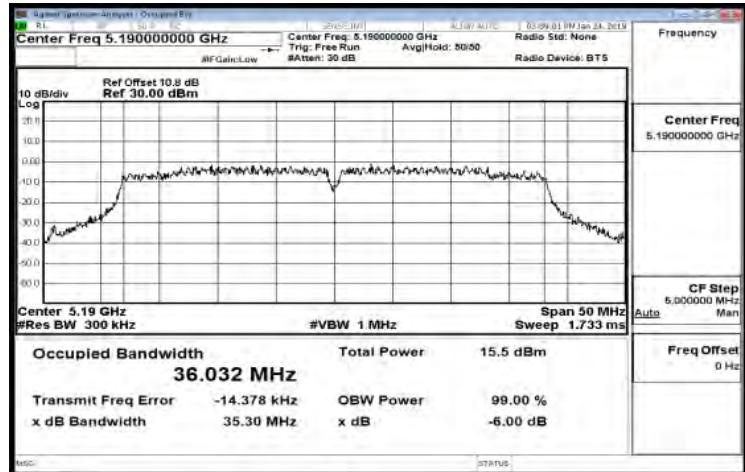
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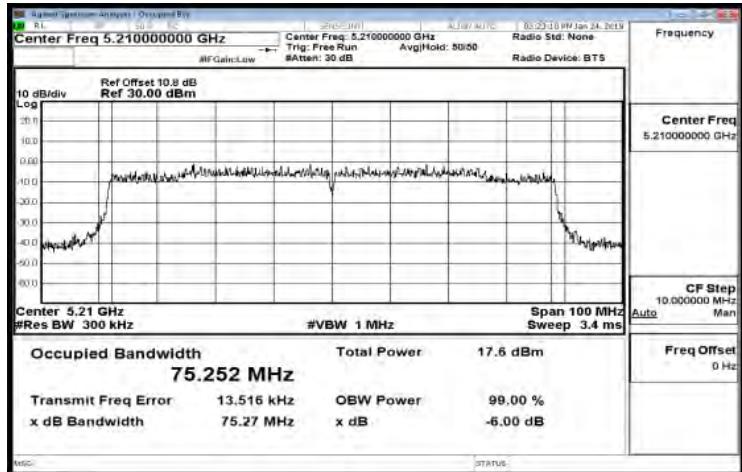
## IC\_802.11ac\_80MHz\_Main\_5210MHz



## 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

| OPERATION 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 directional gain of the antenna exceeds 6 dBi. |                                     |                                   |

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| OPERATION 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 $11 + 10 \log_{10} B$<br>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 $11 + 10 \log_{10} B$<br>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 <b>5725-5850 MHz</b> , 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 G<sub>1</sub>, G<sub>2</sub>, ..., G<sub>N</sub> 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 grater 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  $10 \log(1/\text{duty cycle})$ .
6. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.

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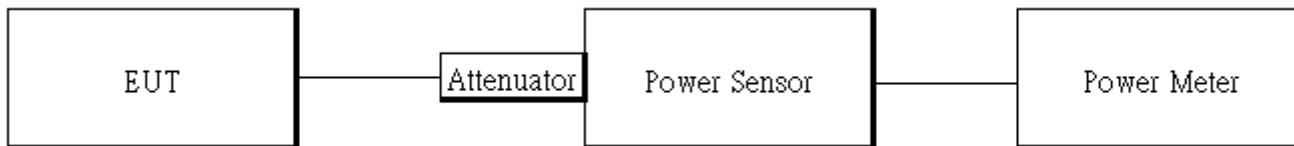
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### 9.3 Measurement Equipment Used

| 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         | <b>15.87</b>      | 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      | <b>14.38</b>      | 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 | <b>14.56</b>      | 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      | <b>16.07</b>      | 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 | <b>17.02</b>      | 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      | <b>13.28</b>      | 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 | <b>14.09</b>      | 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 $10+10\log(B)=$ 22.19 | PASS   |
| 44 | 5220            | 15.38             | -2.400             | 12.98        | 19.849        | 23.01 or $10+10\log(B)=$ 22.19 | PASS   |
| 48 | 5240            | <b>15.39</b>      | -2.400             | <b>12.99</b> | <b>19.895</b> | 23.01 or $10+10\log(B)=$ 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 $10+10\log(B)=$ 22.18 | PASS   |
| 44 | 5220            | 15.86             | -3.600             | 12.26        | 16.816        | 23.01 or $10+10\log(B)=$ 22.20 | PASS   |
| 48 | 5240            | <b>15.87</b>      | -3.600             | <b>12.27</b> | <b>16.855</b> | 23.01 or $10+10\log(B)=$ 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 $10+10\log(B)=$ 22.48 | PASS   |
| 44 | 5220            | 14.06             | -2.400             | 11.66        | 14.642        | 23.01 or $10+10\log(B)=$ 22.47 | PASS   |
| 48 | 5240            | <b>14.31</b>      | -2.400             | <b>11.91</b> | <b>15.510</b> | 23.01 or $10+10\log(B)=$ 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 $10+10\log(B)=$ 22.48 | PASS   |
| 44 | 5220            | 14.26             | -3.600             | 10.66        | 11.631        | 23.01 or $10+10\log(B)=$ 22.48 | PASS   |
| 48 | 5240            | <b>14.38</b>      | -3.600             | <b>10.78</b> | <b>11.956</b> | 23.01 or $10+10\log(B)=$ 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            | <b>14.56</b>      | 0.031              | <b>14.59</b> | <b>28.761</b> | 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            | <b>15.96</b>      | -2.400             | <b>13.56</b> | <b>22.706</b> | 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            | <b>16.07</b>      | -3.600             | <b>12.47</b> | <b>17.666</b> | 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            | <b>17.02</b>      | 0.031              | <b>17.05</b> | <b>50.724</b> | 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            | <b>13.15</b>      | -2.400             | <b>10.75</b> | <b>11.877</b> | 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            | <b>13.28</b>      | -3.600             | <b>9.68</b> | <b>9.284</b> | 23.01 or 10+10log(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            | <b>14.09</b>      | 0.031              | <b>14.12</b> | <b>25.847</b> | 23.01 or 10+10log(B)= 28.77 | PASS   |

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## 10 MAXIMUM POWER SPECTRAL DENSITY

### 10.1 Standard Applicable

#### FCC

| OPERATION<br>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

| OPERATION<br>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  $G_1, G_2, \dots, G_N$  dBi.

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

$$= 10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{\text{ANT}}] \text{ dBi}$$

[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 grater 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 $\geq$  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. User the cursor on spectrum to peak search the highest level of trace
6. Record the max. reading and add  $10 \log(1/\text{duty cycle})$ .
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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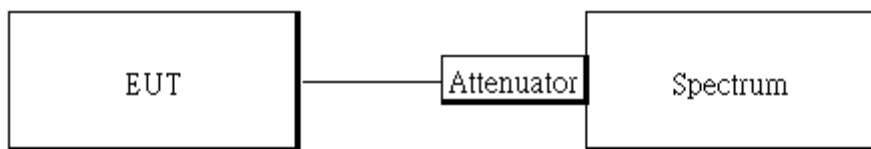
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### 10.3 Measurement Equipment Used

| 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           | PASTERNACK | 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.<br>(MHz)                                 | PSD<br>(dBm) | Ant.<br>Gain<br>(dBi) | EIRP<br>SD<br>(dBm) | Limit<br>(dBm) | Margin<br>(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.<br>(MHz)                                   | PSD<br>(dBm) | Ant.<br>Gain<br>(dBi) | EIRP<br>SD<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
| 5210   | -4.86        | 0.03                  | -4.83               | 10             | -14.83         |

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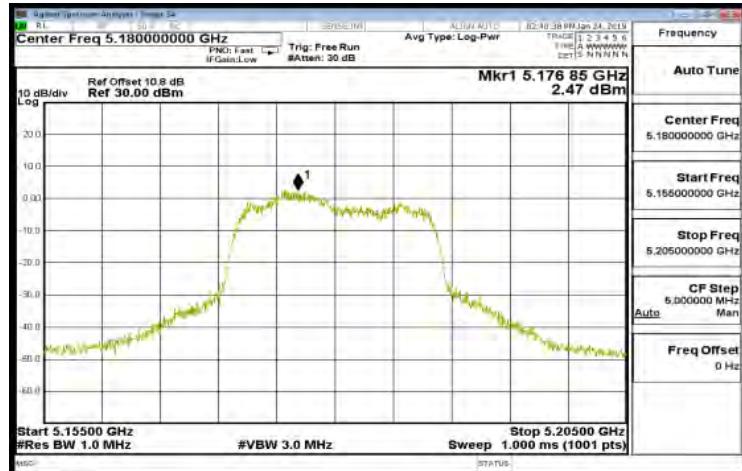
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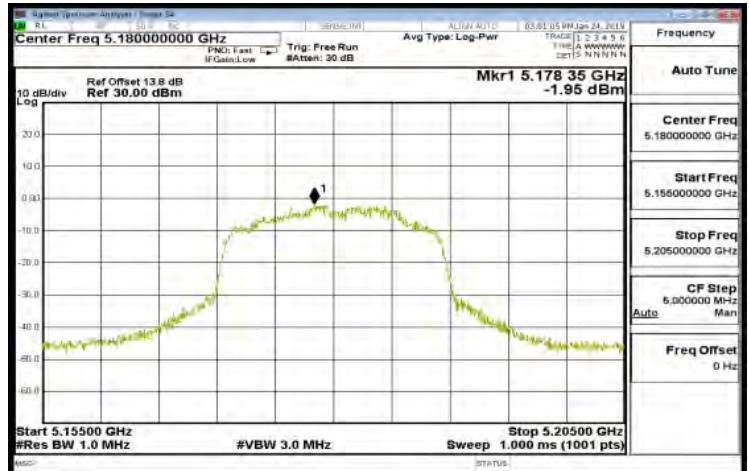
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802.11a\_20MHz\_5180MHz



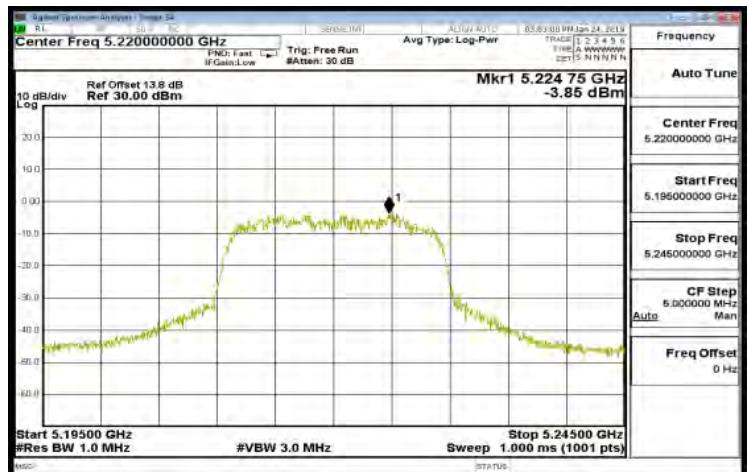
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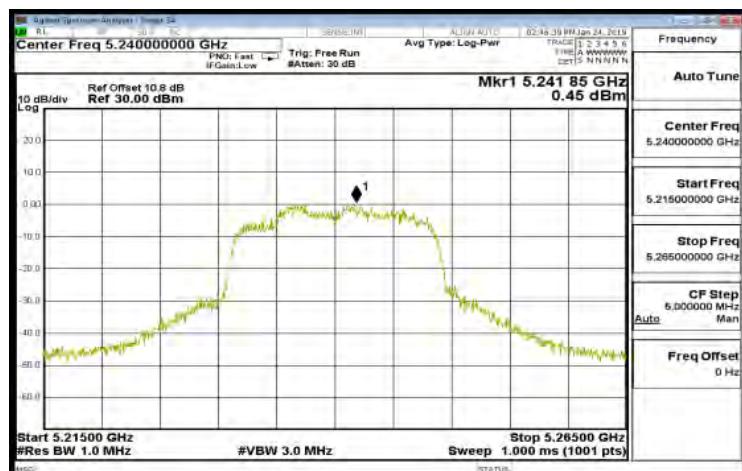
802.11a\_20MHz\_5220MHz



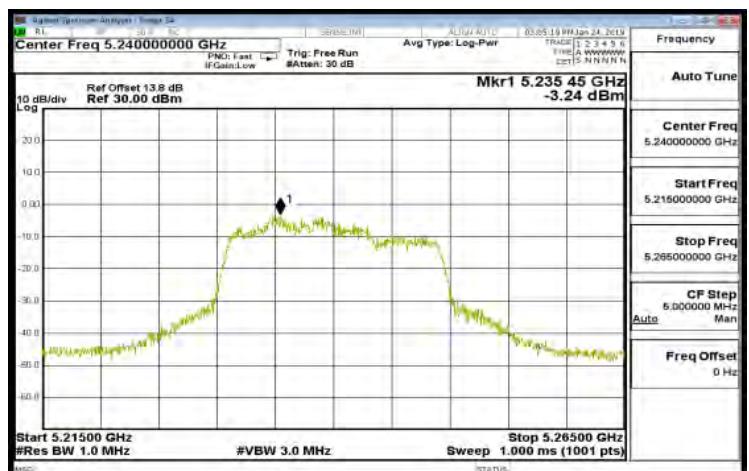
802.11n\_20MHz\_5220MHz



802.11a\_20MHz\_5240MHz



802.11n\_20MHz\_5240MHz



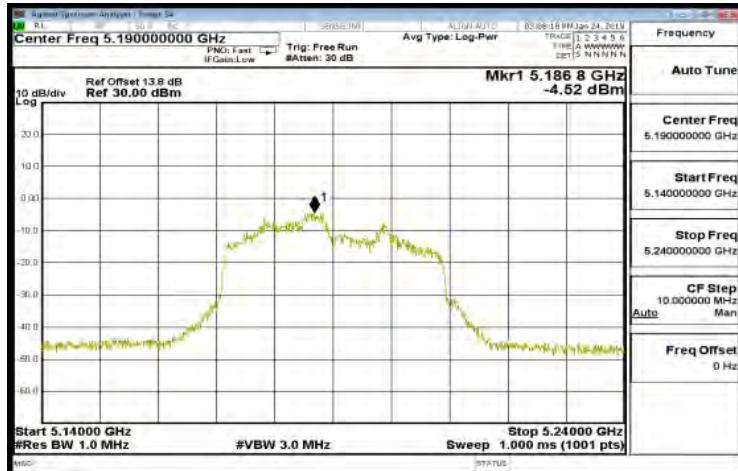
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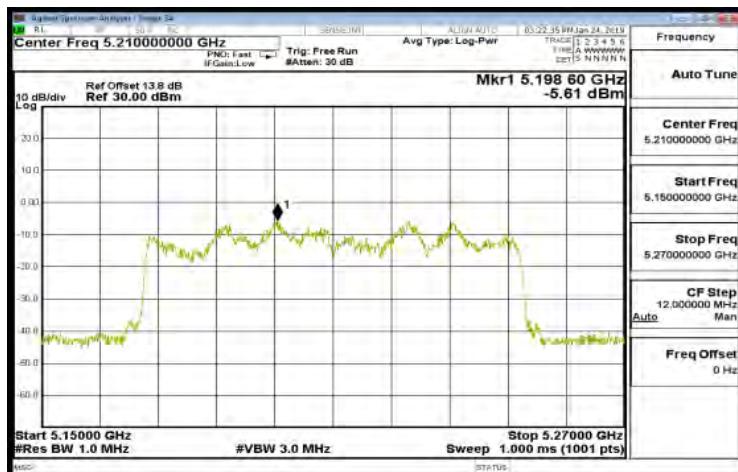
### 802.11n\_40MHz\_5190MHz



### 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 (dB $\mu$ V/m)   | AV 54 (dB $\mu$ V/m)  |
| APPLICABLE TO   | EIRP LIMIT  | FIELD STRENGTH AT 3m  |
| 15.407(b)(1)<br>RSS-247 6.2.1.2                           | PK: -27 (dBm/MHz)   | PK: 68.3 (dB $\mu$ V/m)   |
| 15.407(b)(2)<br>RSS-247 6.2.2.2                           |   |   |
| 15.407(b)(3)<br>RSS-247 6.2.3.2                           |   |   |
| 15.407(b)(4)(i)<br>RSS-247 6.2.4.2                        | PK:-27 (dBm/MHz) *1<br>PK:10 (dBm/MHz) *2<br>PK:15.6 (dBm/MHz) *3<br>PK:27 (dBm/MHz) *4 | PK: 68.2(dB $\mu$ V/m) *1<br>PK:105.2 (dB $\mu$ V/m) *2<br>PK: 110.8(dB $\mu$ V/m) *3<br>PK:122.2 (dB $\mu$ V/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\*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 (dB $\mu$ V/m) = 20 log Emission level (dB $\mu$ V/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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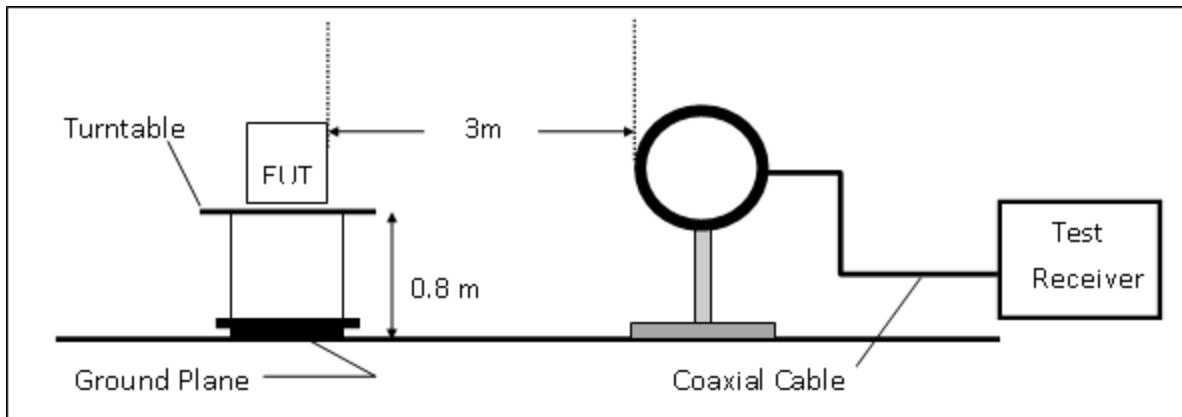
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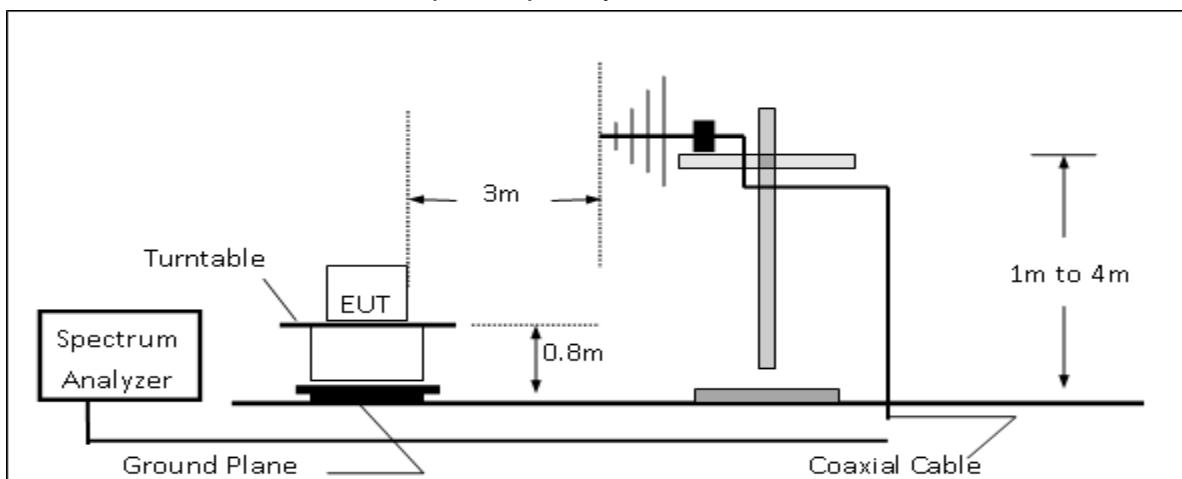
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### 11.3 Test SET-UP

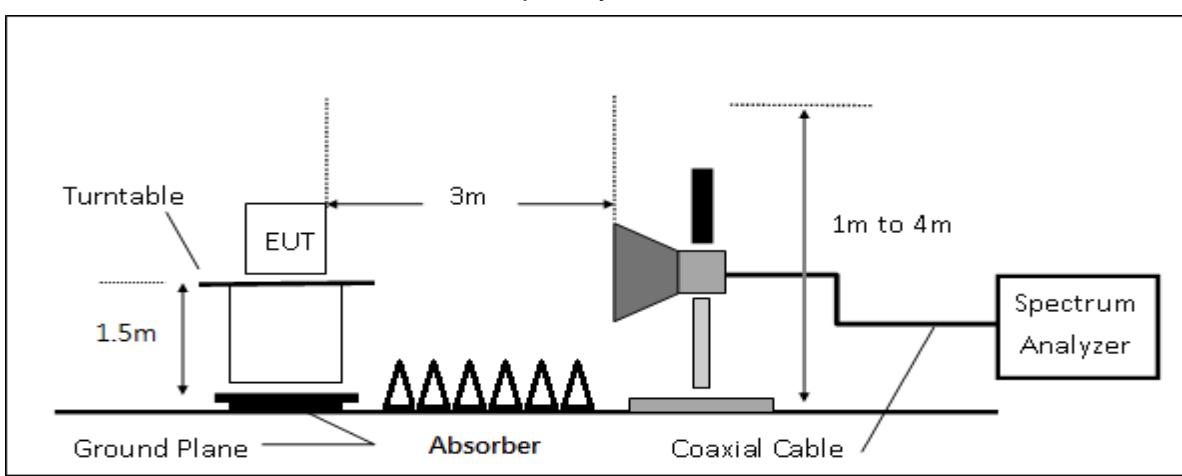
#### (A) Radiated Emission Test Set-UP Frequency Below 30MHz.



#### (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  $\geq$  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(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

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## 11.6 Test Results of Radiated Spurious Emissions from 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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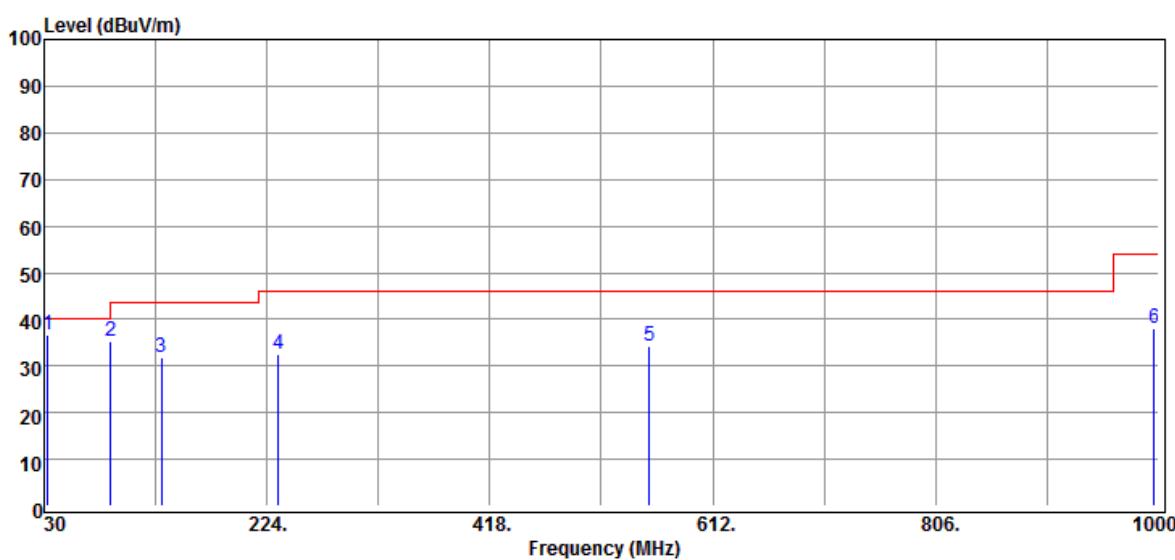
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## Radiated Spurious Emission Measurement Result

## 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.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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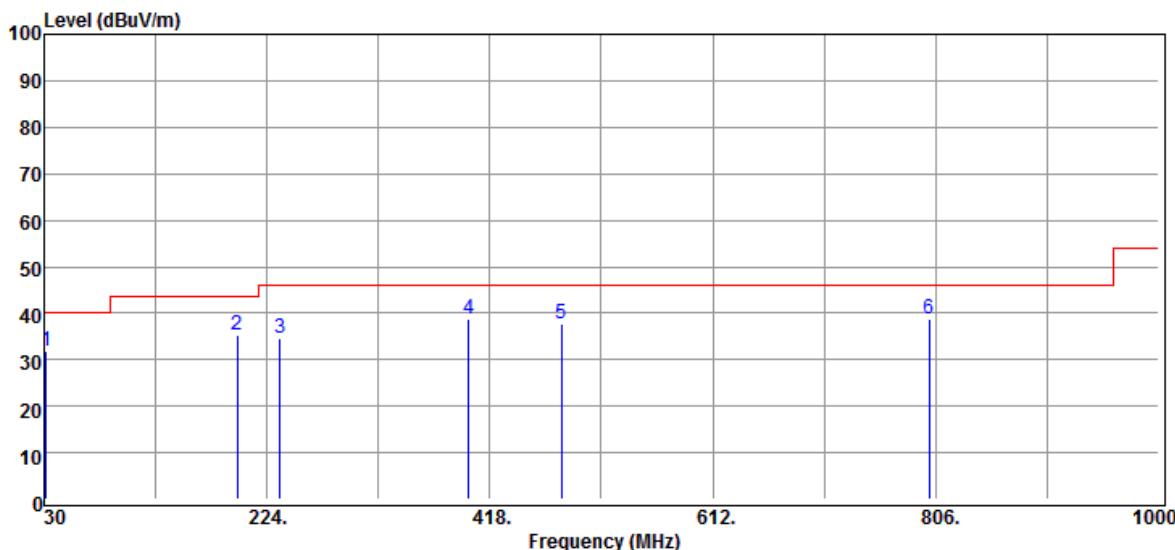
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Operation Mode :802.11a / Band 1  
 Test Mode :TX CH MID  
 EUT Pol :H Plan  
 Test Channel :5220 MHz

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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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        |

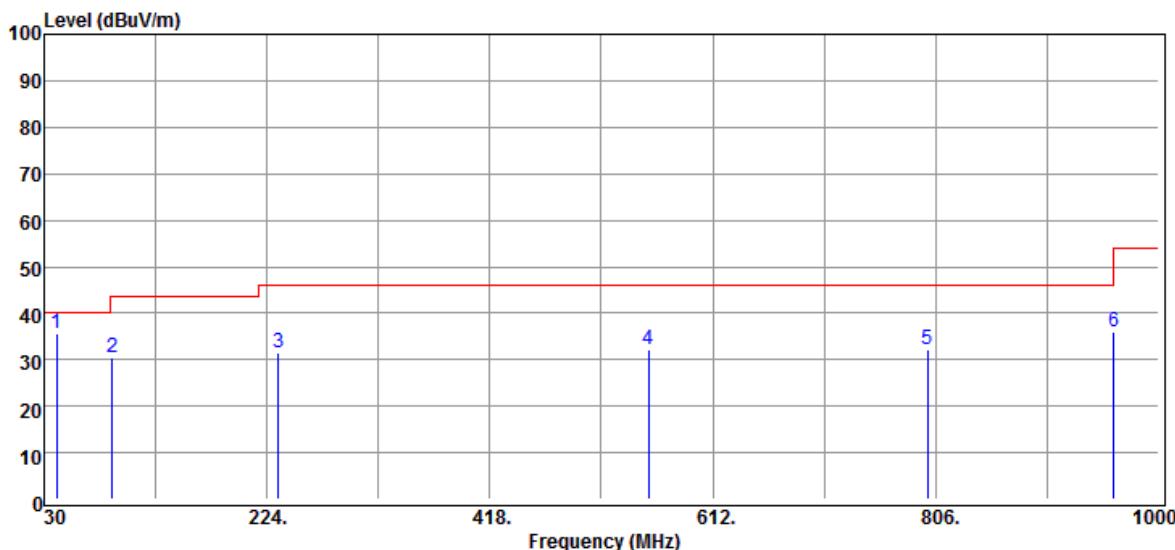
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Operation Mode :802.11ac80 / Band 1  
 Test Mode :TX CH LOW  
 EUT Pol :H Plan  
 Test Channel :5210MHz  
 Test Date :2019-01-28  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Ashton



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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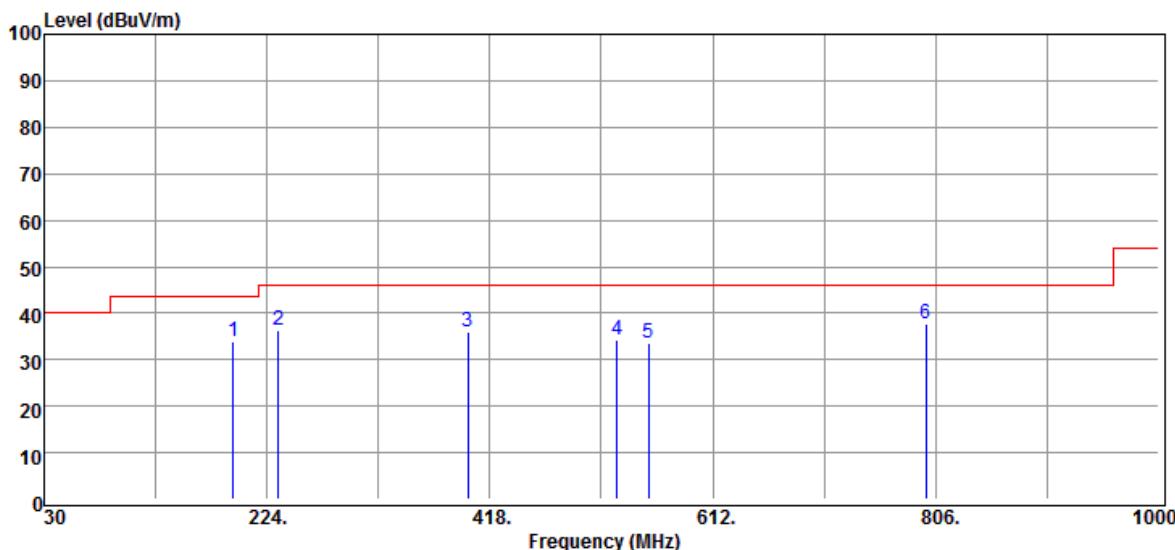
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Operation Mode :802.11ac80 / Band 1  
 Test Mode :TX CH LOW  
 EUT Pol :H Plan  
 Test Channel :5210MHz

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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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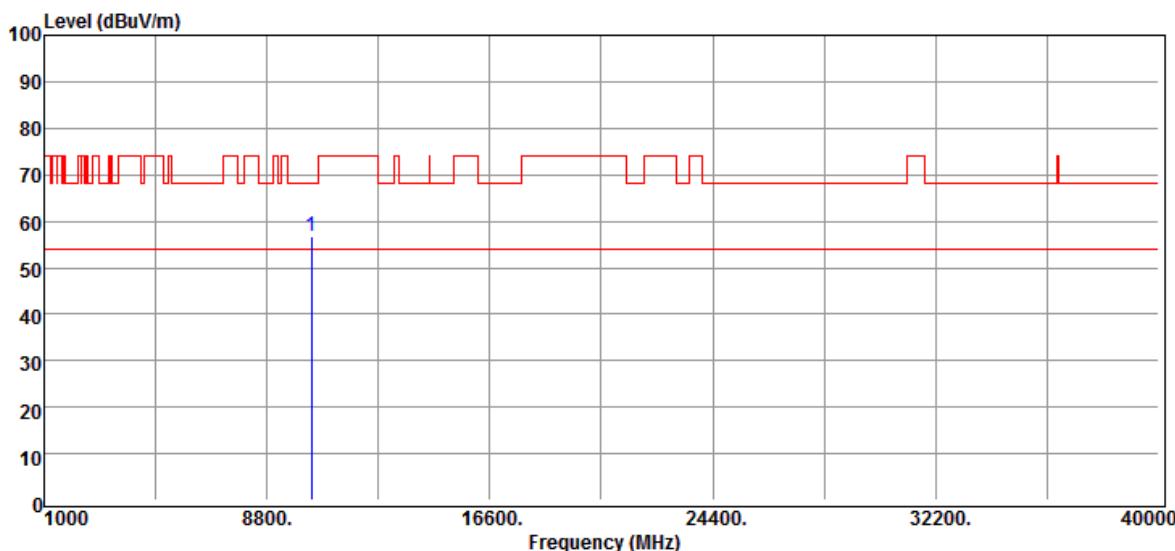
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**Above 1GHz Worst-Case Data:****Radiated Spurious Emission Measurement Result 802.11a, 5150~5250 MHz**

|                |                   |              |             |
|----------------|-------------------|--------------|-------------|
| 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.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading<br>Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|--|--------------|------------------------------|------------------------------|--------------|
| 10360.00     | Peak                         | 31.78                                      | 25.11        | 56.89                        | 68.20                        | -11.31       |

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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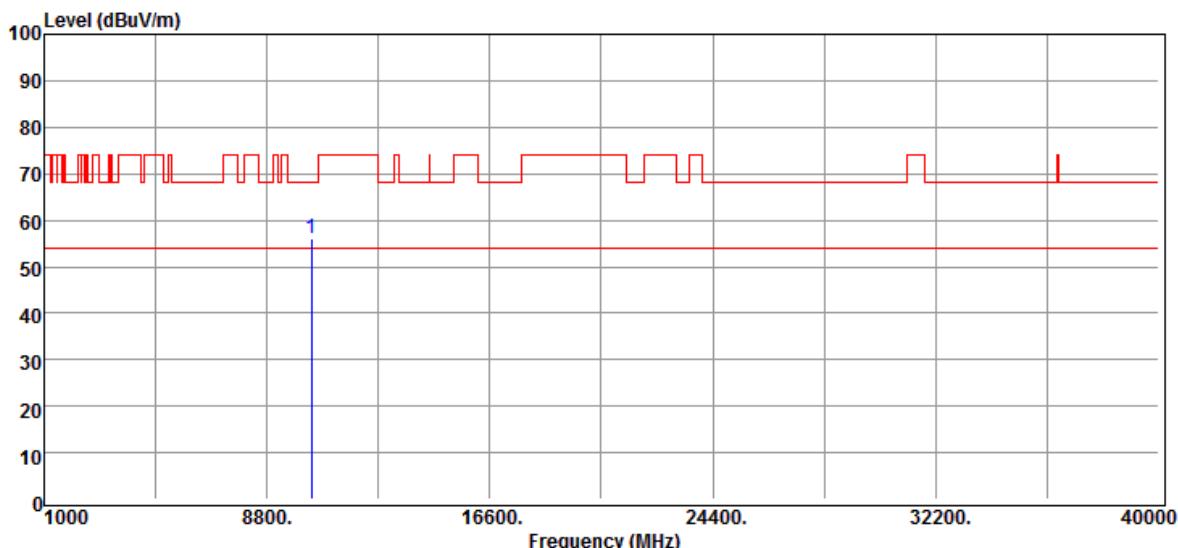
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|                |                   |              |             |
|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :TX CH LOW        | Temp./Humi.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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10360.00     | Peak                         | 30.78                                   | 25.11        | 55.89                        | 68.20                        | -12.31       |

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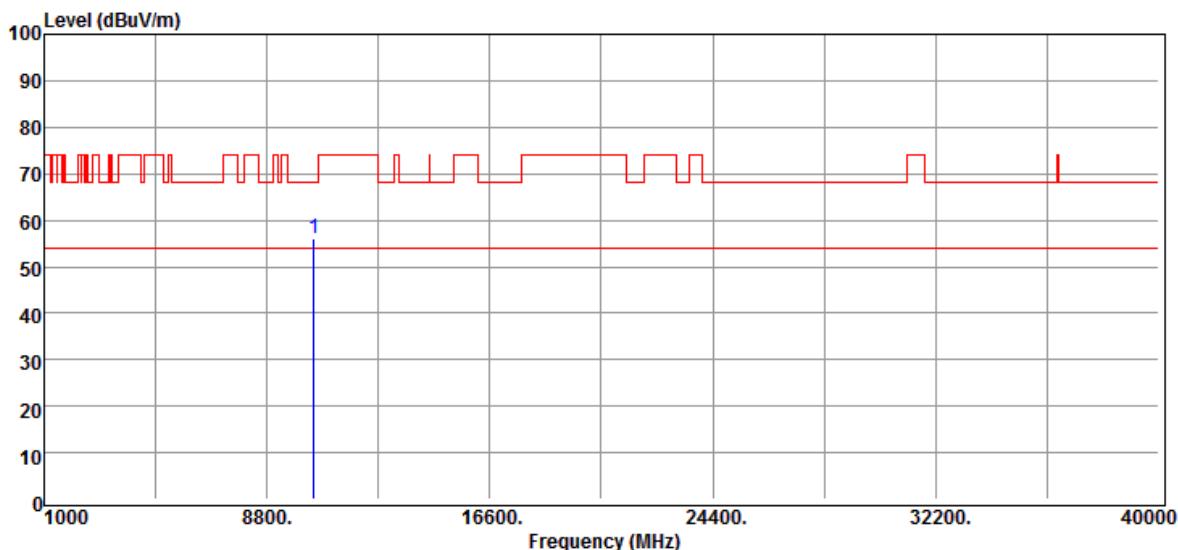
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|                |                   |              |             |
|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :TX CH MID        | Temp./Humi.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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10440.00     | Peak                         | 31.07                                   | 25.08        | 56.15                        | 68.20                        | -12.05       |

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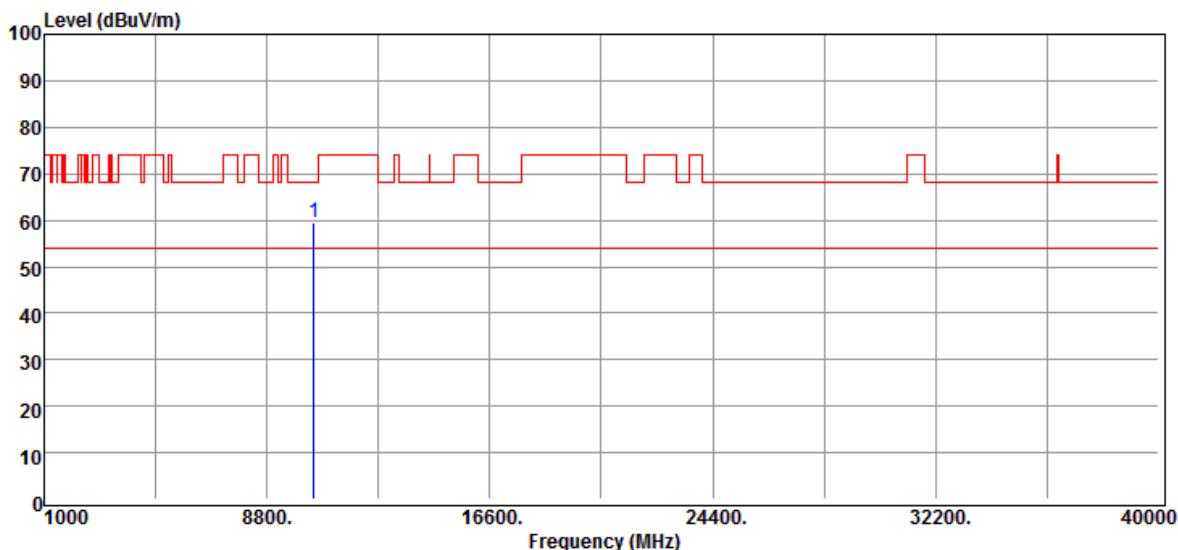
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|                |                   |              |             |
|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :TX CH MID        | Temp./Humi.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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10440.00     | Peak                         | 34.54                                   | 25.08        | 59.62                        | 68.20                        | -8.58        |

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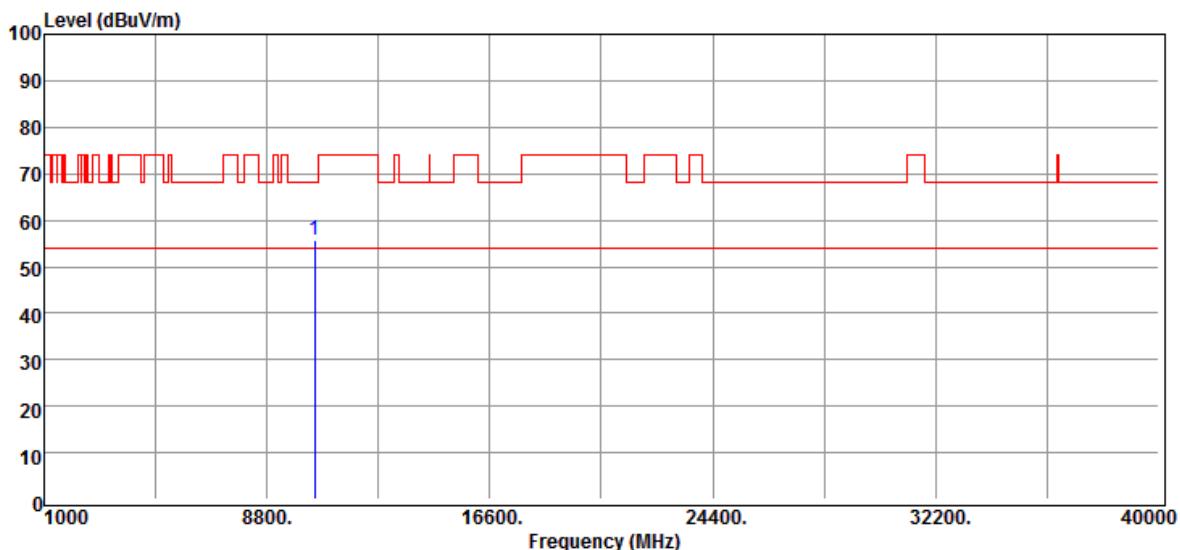
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|                |                   |              |             |
|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :TX CH HIGH       | Temp./Humi.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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10480.00     | Peak                         | 30.89                                   | 24.96        | 55.85                        | 68.20                        | -12.35       |

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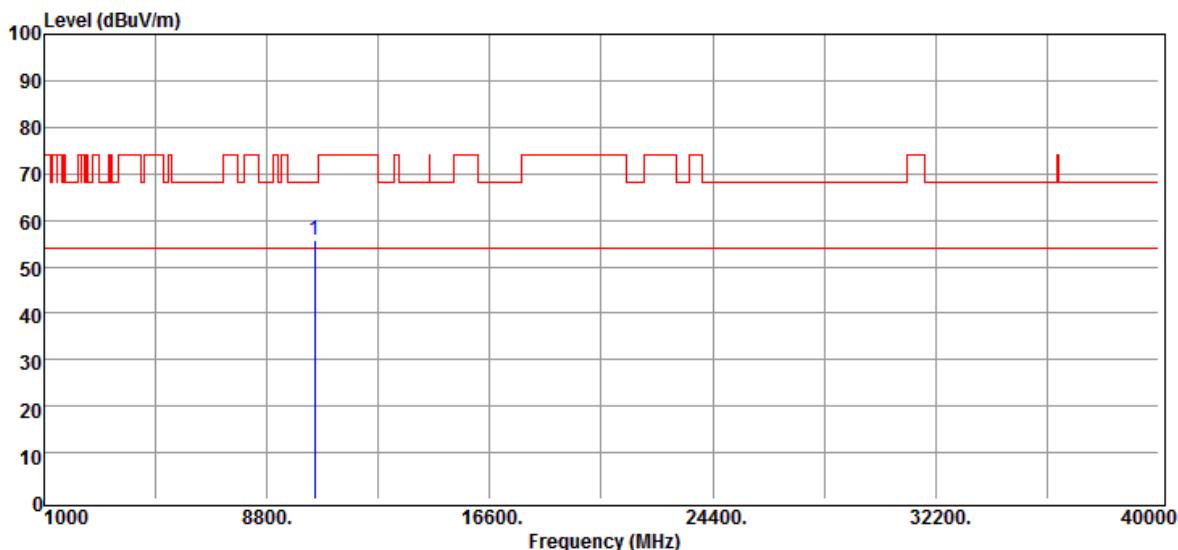
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|                |                   |              |             |
|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :TX CH HIGH       | Temp./Humi.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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10480.00     | Peak                         | 30.61                                   | 24.96        | 55.57                        | 68.20                        | -12.63       |

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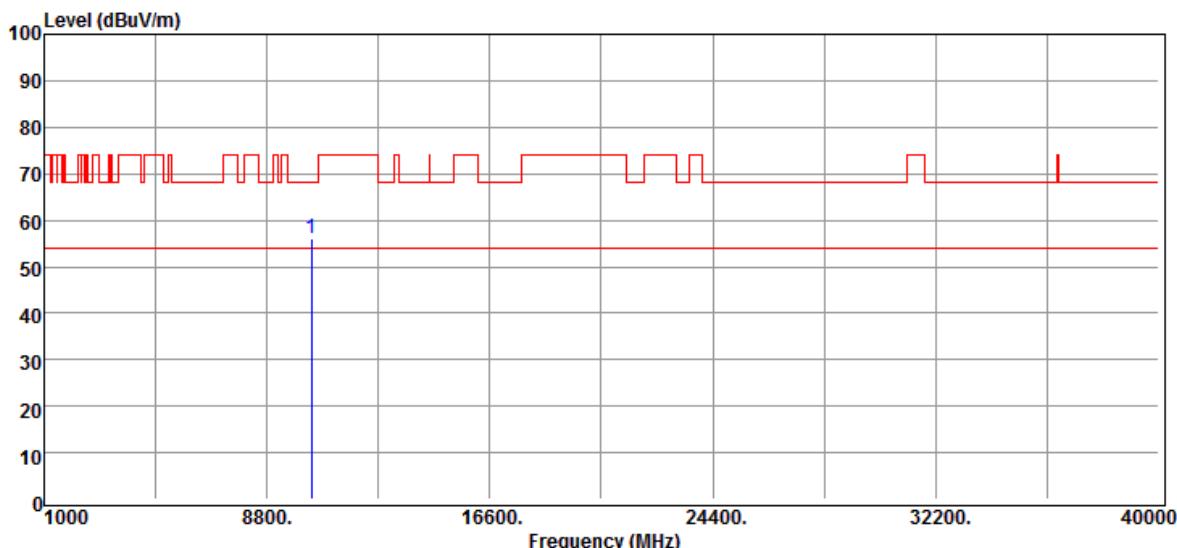
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## Radiated Spurious Emission Measurement Result 802.11n HT20, 5150~5250 MHz

|                |                     |              |             |
|----------------|---------------------|--------------|-------------|
| 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.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10360.00     | Peak                         | 30.90                                   | 25.11        | 56.01                        | 68.20                        | -12.19       |

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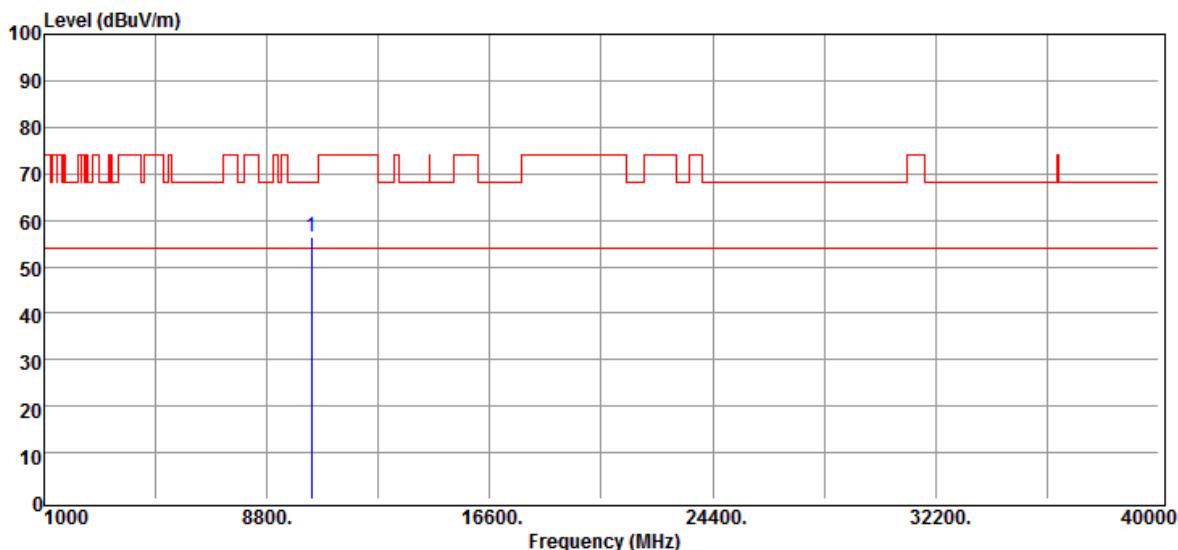
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Operation Mode :802.11n20 / Band 1  
Test Mode :TX CH LOW  
EUT Pol :H Plan  
Test Channel :5180 MHz

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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10360.00     | Peak                         | 31.28                                   | 25.11        | 56.39                        | 68.20                        | -11.81       |

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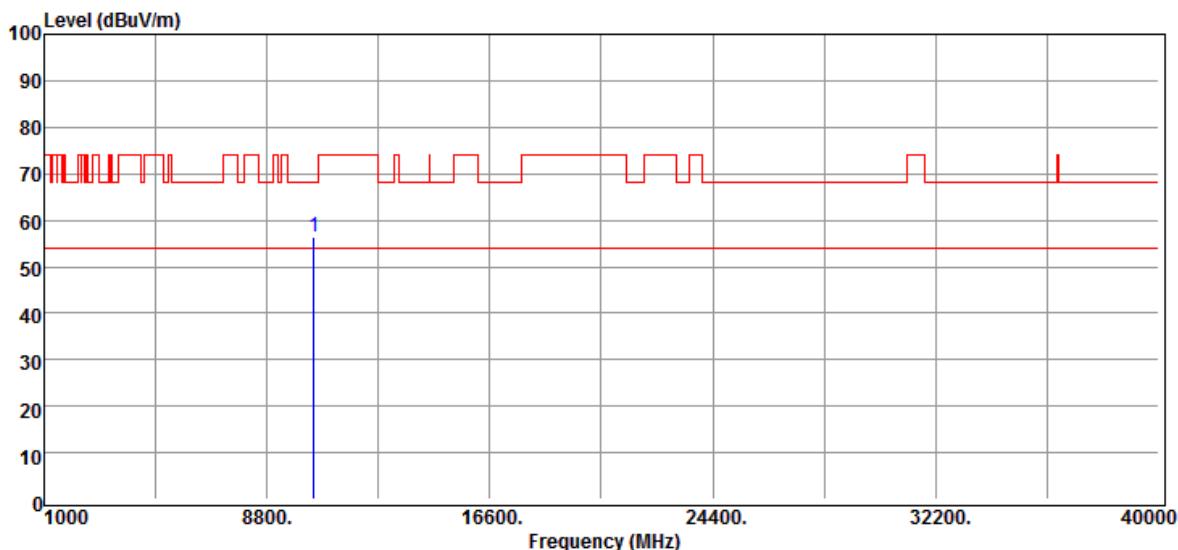
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Operation Mode :802.11n20 / Band 1  
 Test Mode :TX CH MID  
 EUT Pol :H Plan  
 Test Channel :5220 MHz  
 Test Date :2019-01-28  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Ashton



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10440.00     | Peak                         | 31.35                                   | 25.08        | 56.43                        | 68.20                        | -11.77       |

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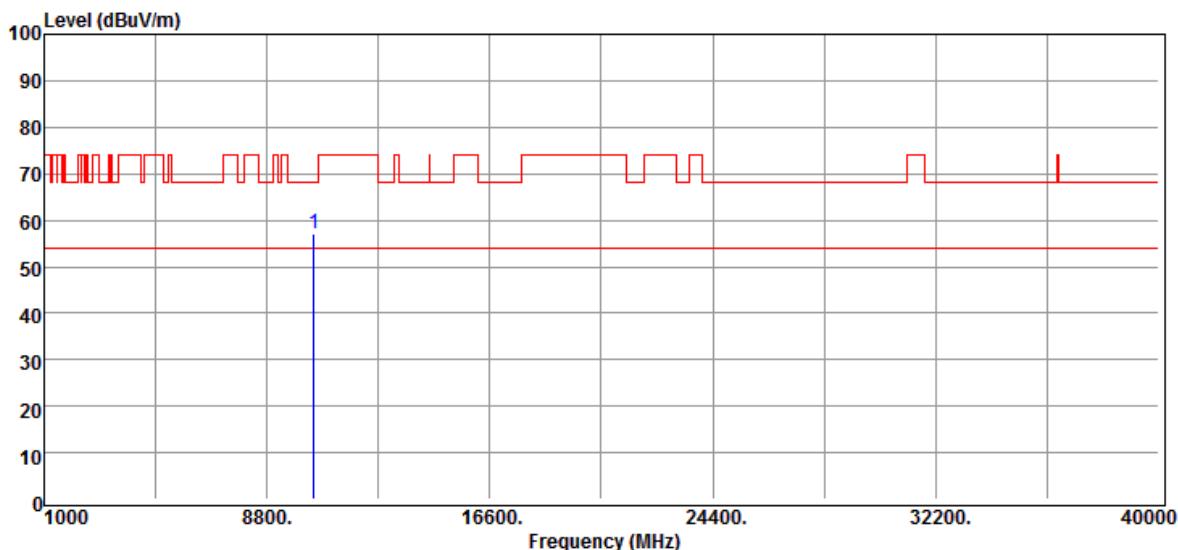
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|                |                     |              |             |
|----------------|---------------------|--------------|-------------|
| Operation Mode | :802.11n20 / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :TX CH MID        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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10440.00     | Peak                         | 31.88                                   | 25.08        | 56.96                        | 68.20                        | -11.24       |

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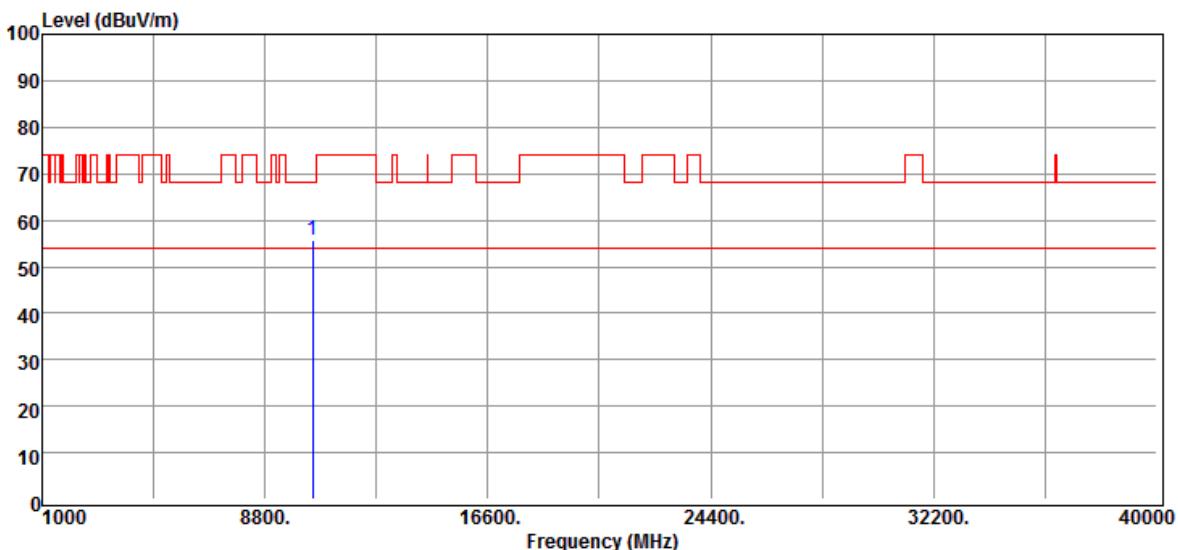
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Operation Mode :802.11n20 / Band 1  
Test Mode :TX CH HIGH  
EUT Pol :H Plan  
Test Channel :5240 MHz  
Test Date :2019-01-28  
Temp./Humi. :25/60  
Antenna Pol. :VERTICAL  
Engineer :Ashton



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10480.00     | Peak                         | 30.67                                   | 24.96        | 55.63                        | 68.20                        | -12.57       |

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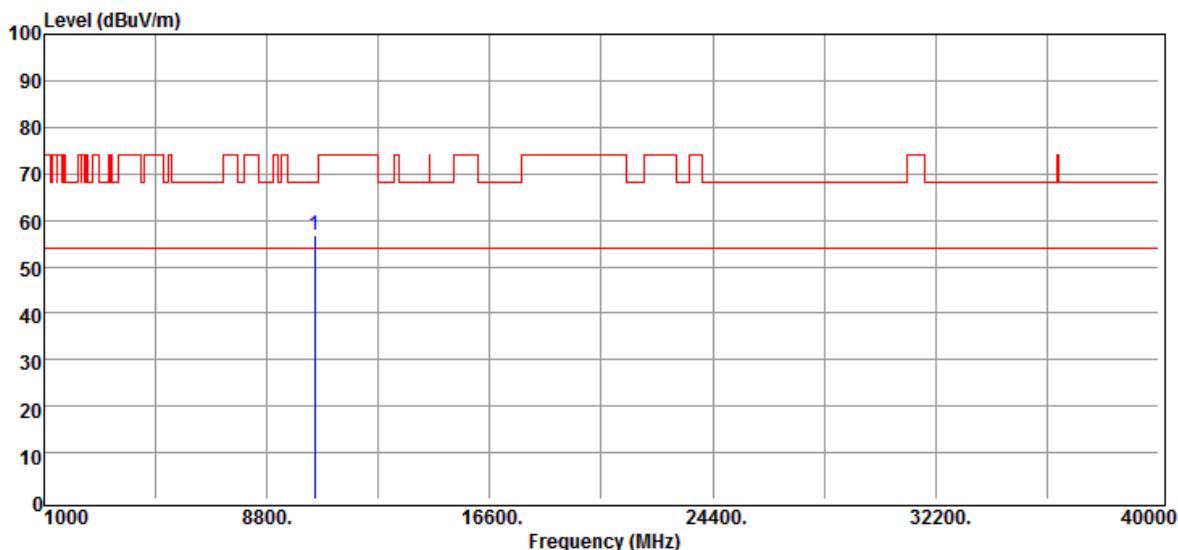
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|                |                     |              |             |
|----------------|---------------------|--------------|-------------|
| Operation Mode | :802.11n20 / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :TX CH HIGH       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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10480.00     | Peak                         | 31.65                                   | 24.96        | 56.61                        | 68.20                        | -11.59       |

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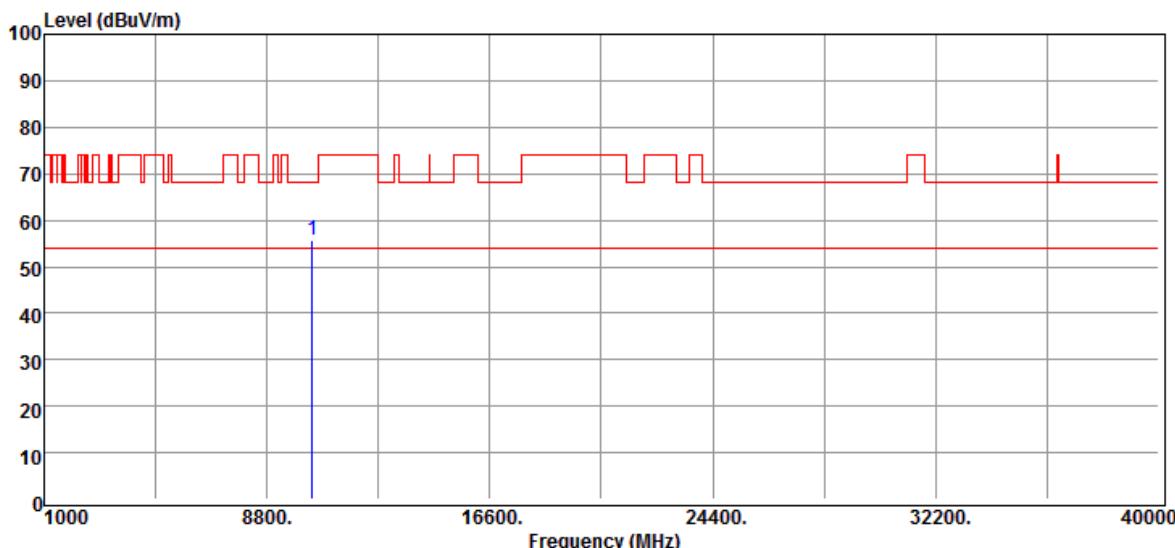
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## Radiated Spurious Emission Measurement Result 802.11n HT40, 5150~5250 MHz

|                |                     |              |             |
|----------------|---------------------|--------------|-------------|
| 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.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10380.00     | Peak                         | 30.67                                   | 25.16        | 55.83                        | 68.20                        | -12.37       |

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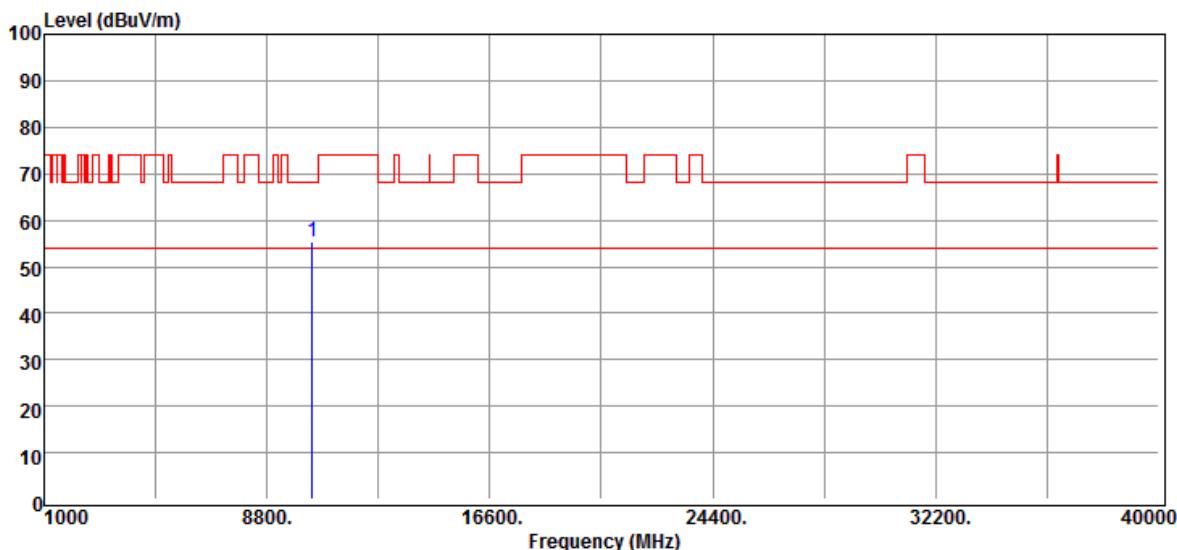
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Operation Mode :802.11n40 / Band 1  
Test Mode :TX CH LOW  
EUT Pol :H Plan  
Test Channel :5190 MHz  
Test Date :2019-01-28  
Temp./Humi. :25/60  
Antenna Pol. :HORIZONTAL  
Engineer :Ashton



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10380.00     | Peak                         | 30.29                                   | 25.16        | 55.45                        | 68.20                        | -12.75       |

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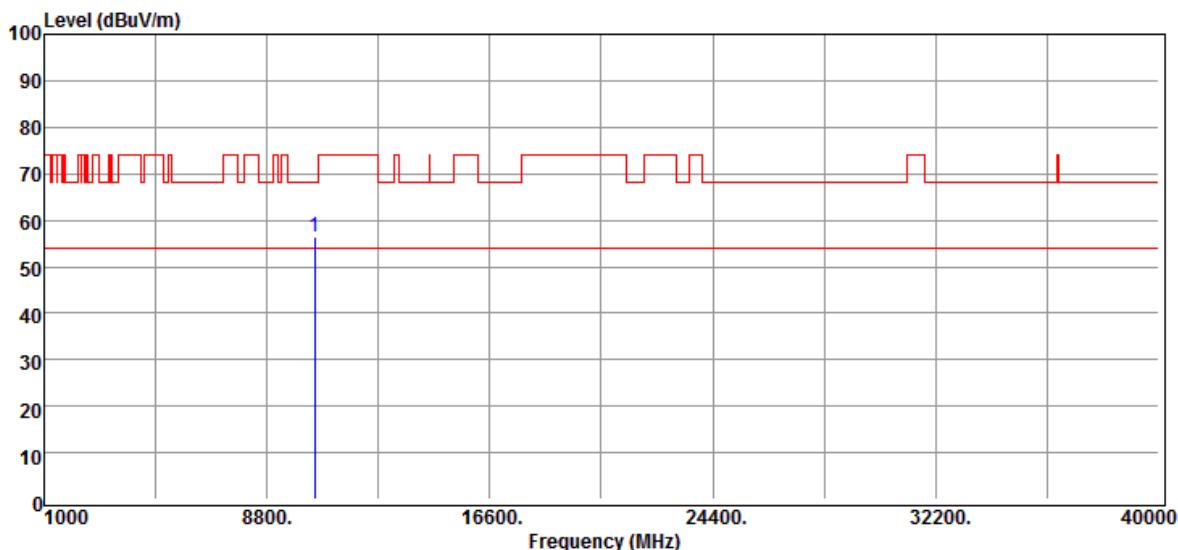
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Operation Mode :802.11n40 / Band 1  
Test Mode :TX CH HIGH  
EUT Pol :H Plan  
Test Channel :5230 MHz

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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10460.00     | Peak                         | 31.52                                   | 25.02        | 56.54                        | 68.20                        | -11.66       |

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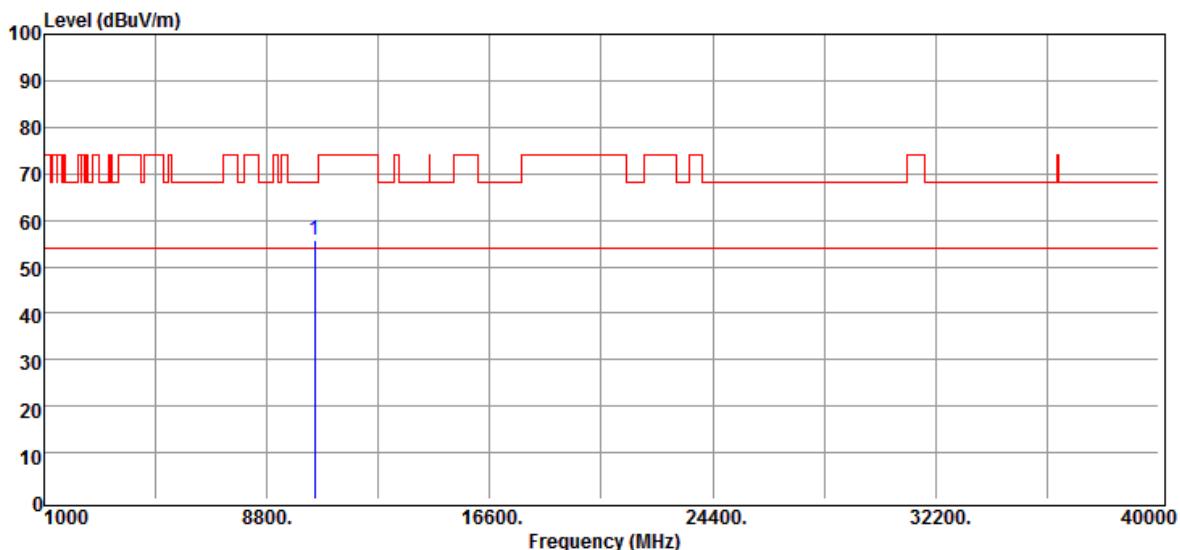
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Operation Mode :802.11n40 / Band 1  
Test Mode :TX CH HIGH  
EUT Pol :H Plan  
Test Channel :5230 MHz

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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10460.00     | Peak                         | 30.65                                   | 25.02        | 55.67                        | 68.20                        | -12.53       |

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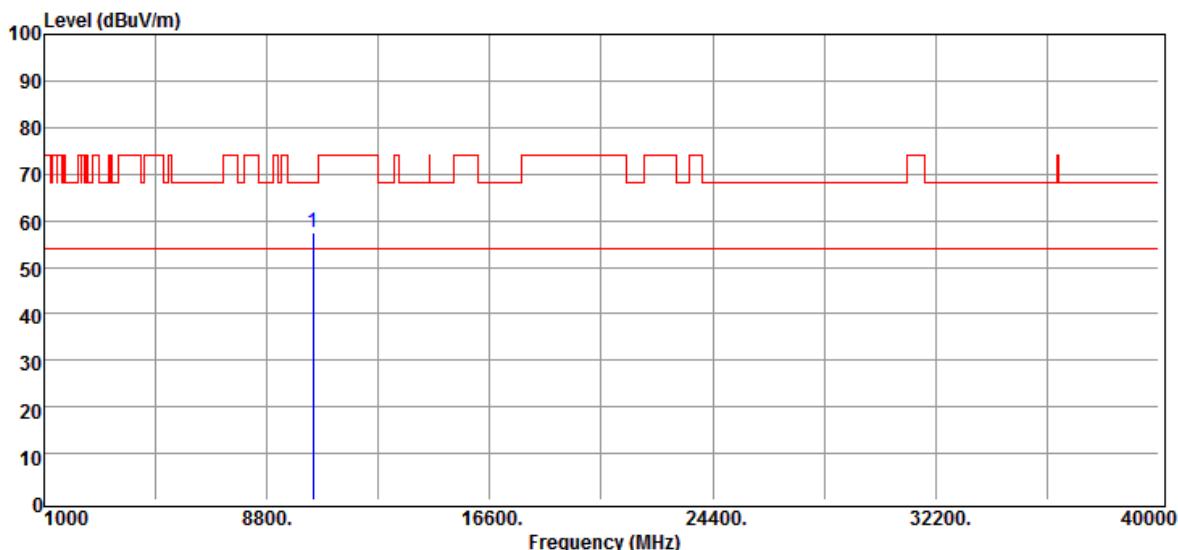
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## Radiated Spurious Emission Measurement Result 802.11ac VHT80, 5150~5250 MHz

|                |                      |              |             |
|----------------|----------------------|--------------|-------------|
| 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.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10420.00     | Peak                         | 32.26                                   | 25.14        | 57.40                        | 68.20                        | -10.80       |

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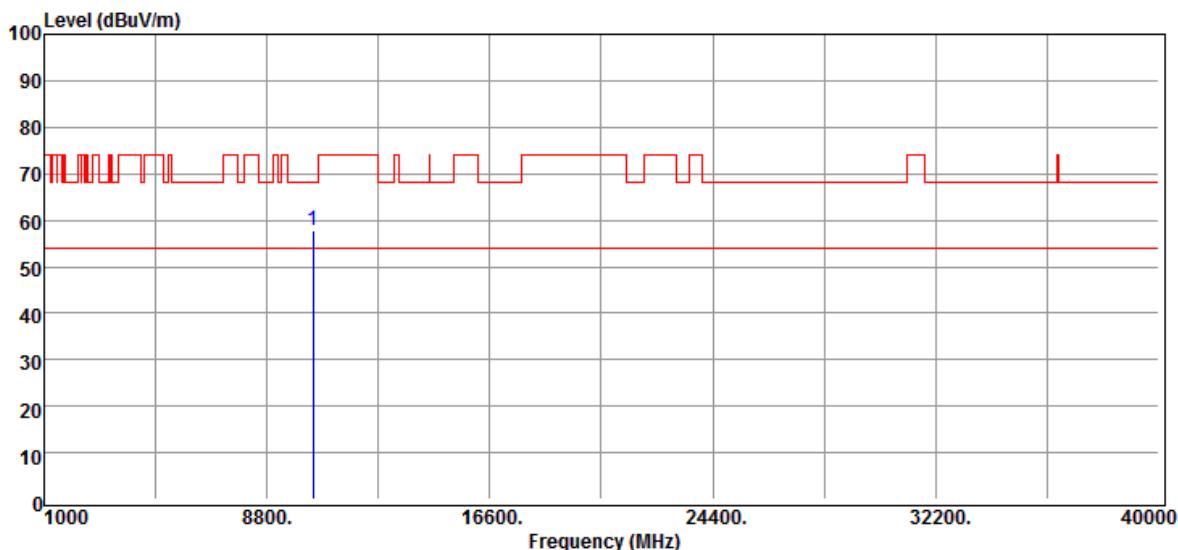
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Operation Mode :802.11ac80 / Band 1  
 Test Mode :TX CH LOW  
 EUT Pol :H Plan  
 Test Channel :5210 MHz

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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10420.00     | Peak                         | 32.59                                   | 25.14        | 57.73                        | 68.20                        | -10.47       |

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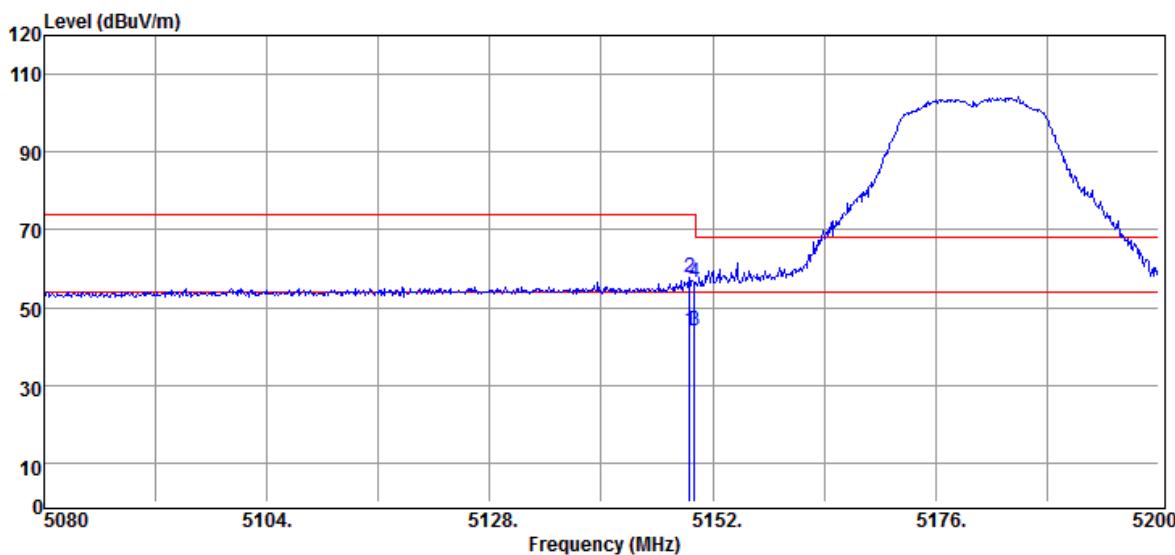
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## Band edge falling to restricted band

## 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.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading<br>Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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       |

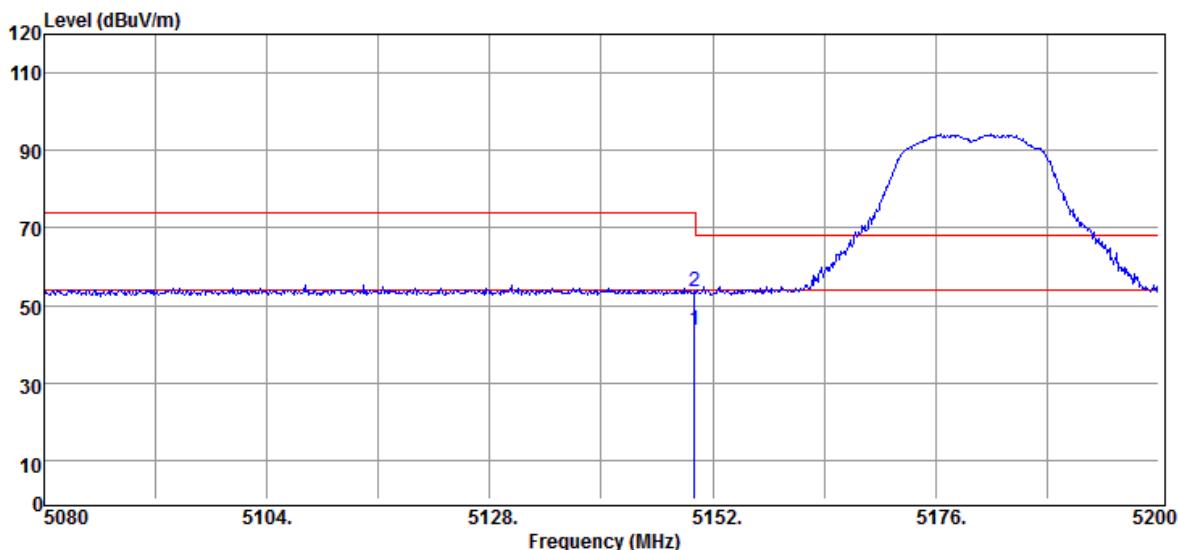
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|                |                   |              |             |
|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :BE CH LOW        | Temp./Humi.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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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       |

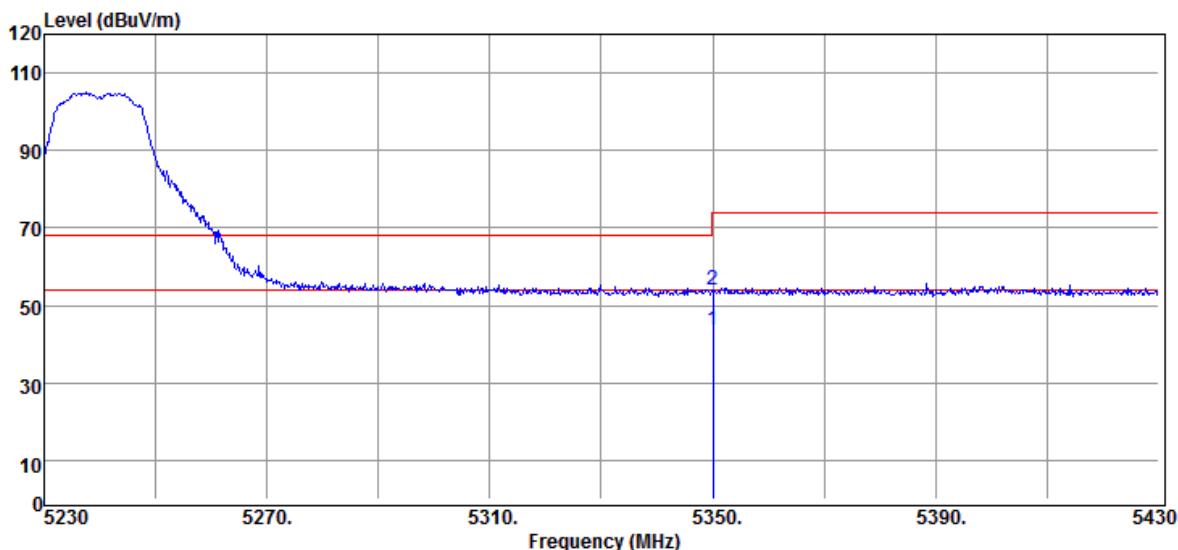
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|                |                   |              |             |
|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :BE CH HIGH       | Temp./Humi.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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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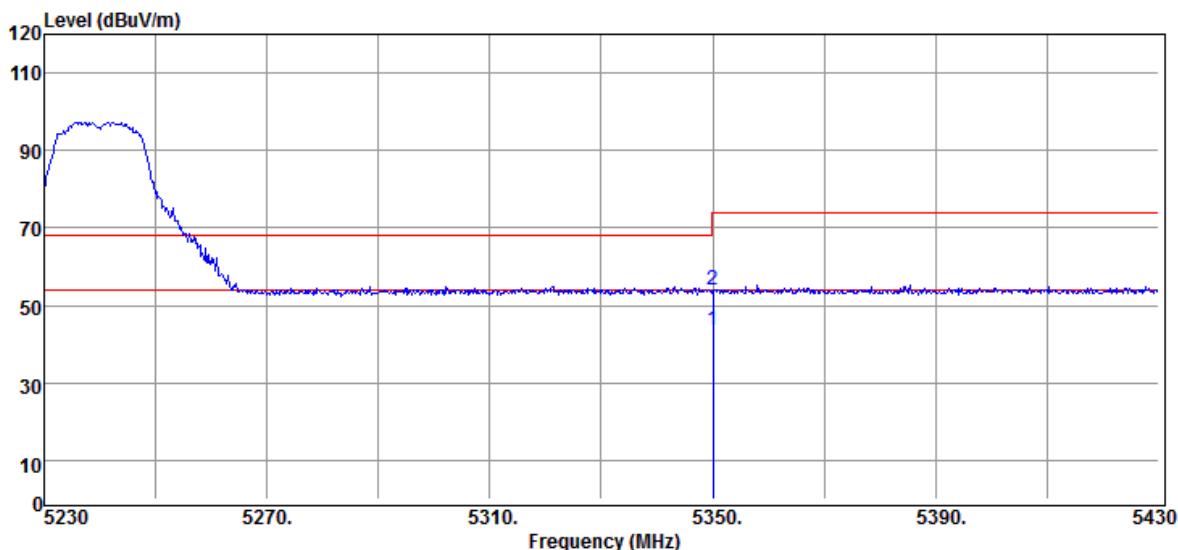
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|                |                   |              |             |
|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :BE CH HIGH       | Temp./Humi.  | :25/60      |
| EUT Pol        | :H Plan           | Antenna Pol. | :HORIZONTAL |
| Test Channel   | :5240 MHz         | Engineer     | :Ashton     |



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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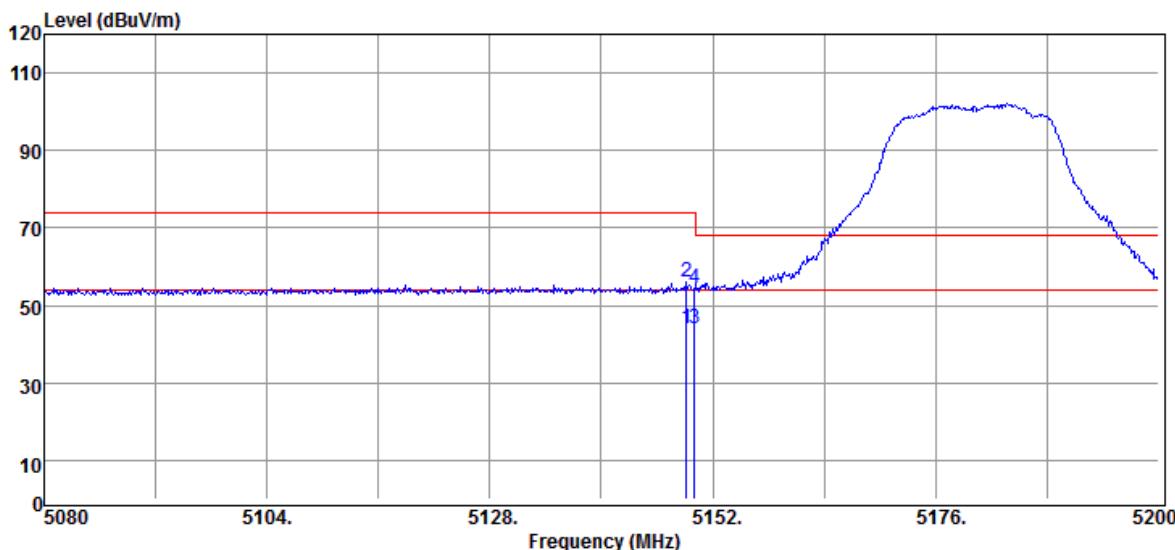
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Operation Mode :802.11n20 / Band 1  
 Test Mode :BE CH LOW  
 EUT Pol :H Plan  
 Test Channel :5180 MHz

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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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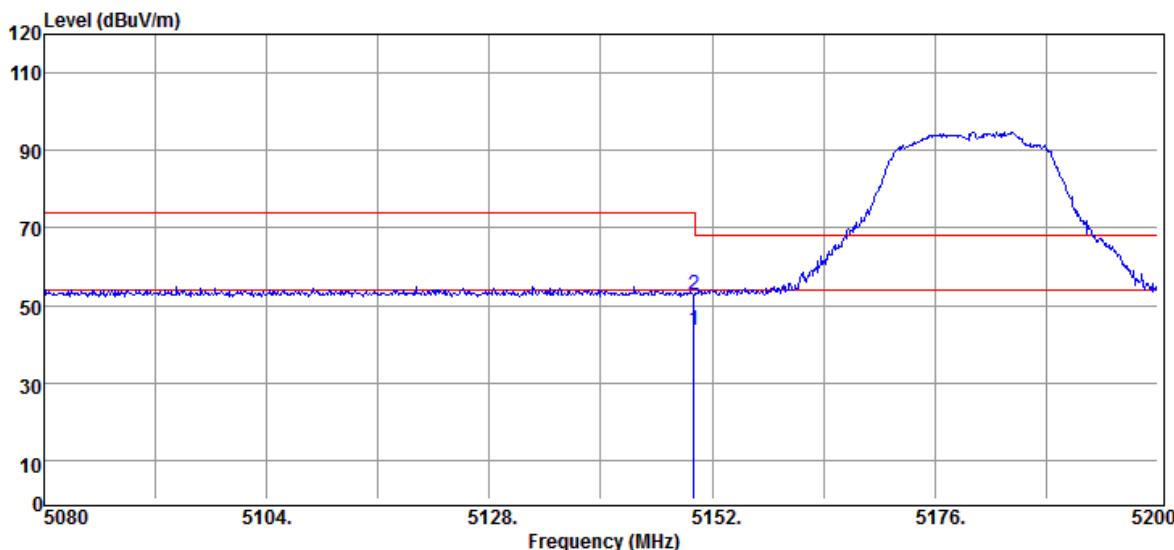
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## 802.11n20 HT mode

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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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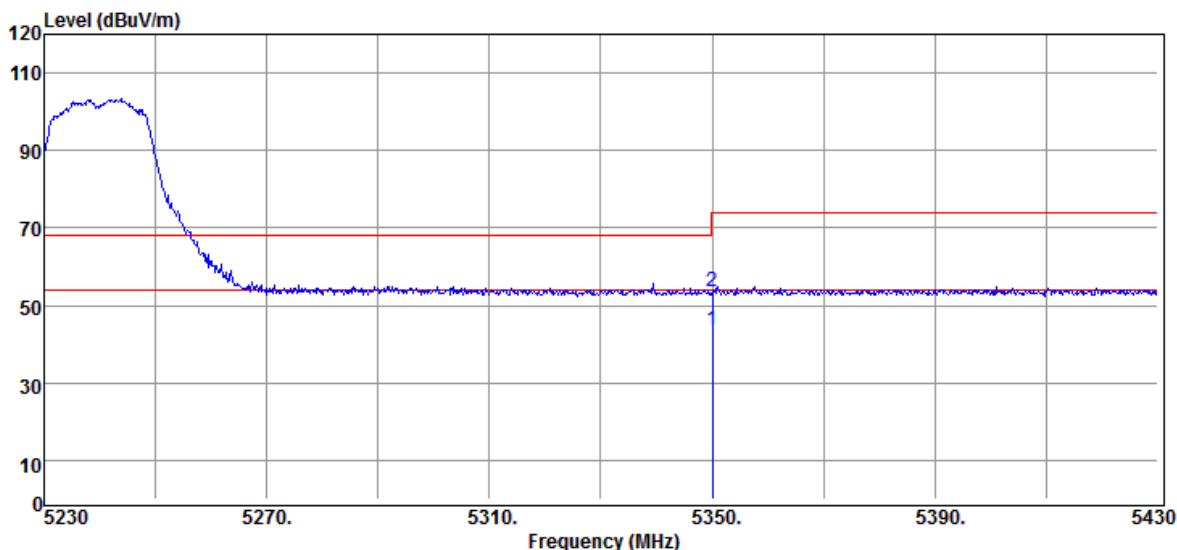
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Operation Mode :802.11n20 / Band 1  
 Test Mode :BE CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5240 MHz

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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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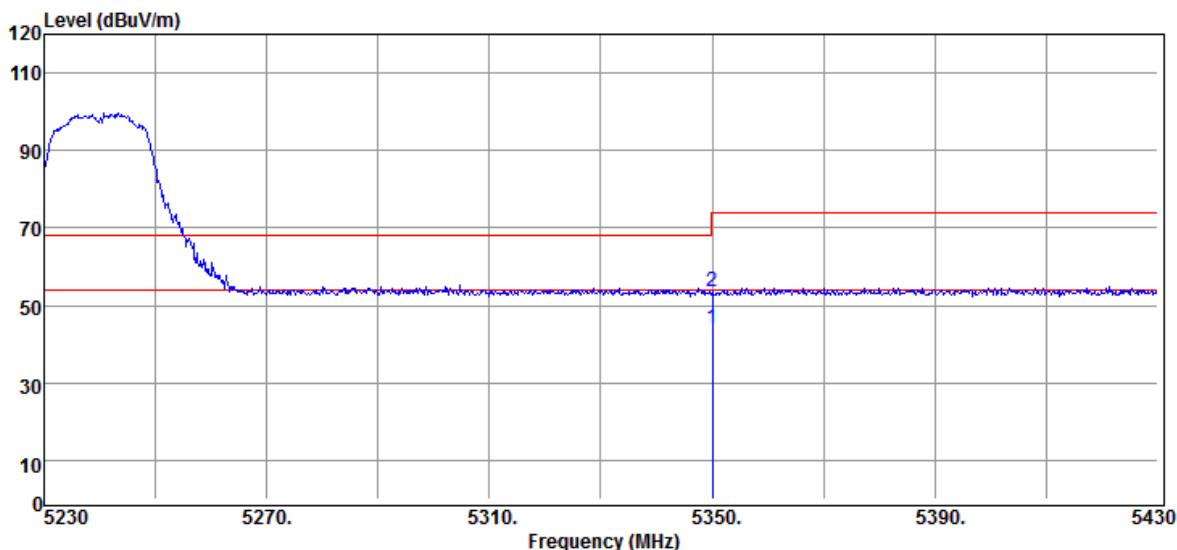
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|----------------|---------------------|--------------|-------------|
| Operation Mode | :802.11n20 / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :BE CH HIGH         | Temp./Humi.  | :25/60      |
| EUT Pol        | :H Plan             | Antenna Pol. | :HORIZONTAL |
| Test Channel   | :5240 MHz           | Engineer     | :Ashton     |



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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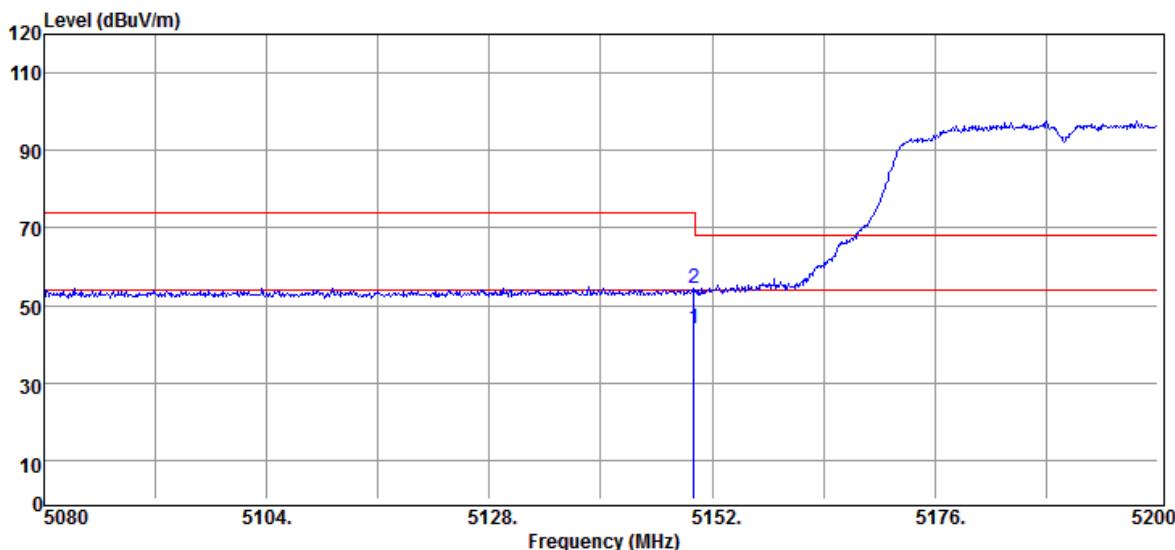
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## 802.11n40 HT mode

|                |                     |              |             |
|----------------|---------------------|--------------|-------------|
| 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.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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       |

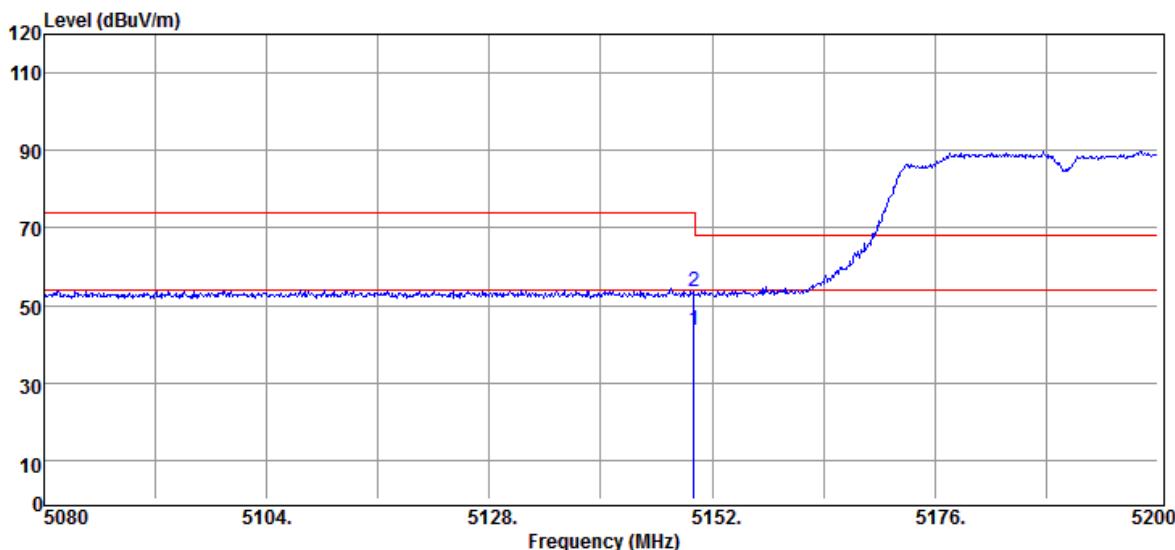
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|                |                     |              |             |
|----------------|---------------------|--------------|-------------|
| Operation Mode | :802.11n40 / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :BE CH LOW        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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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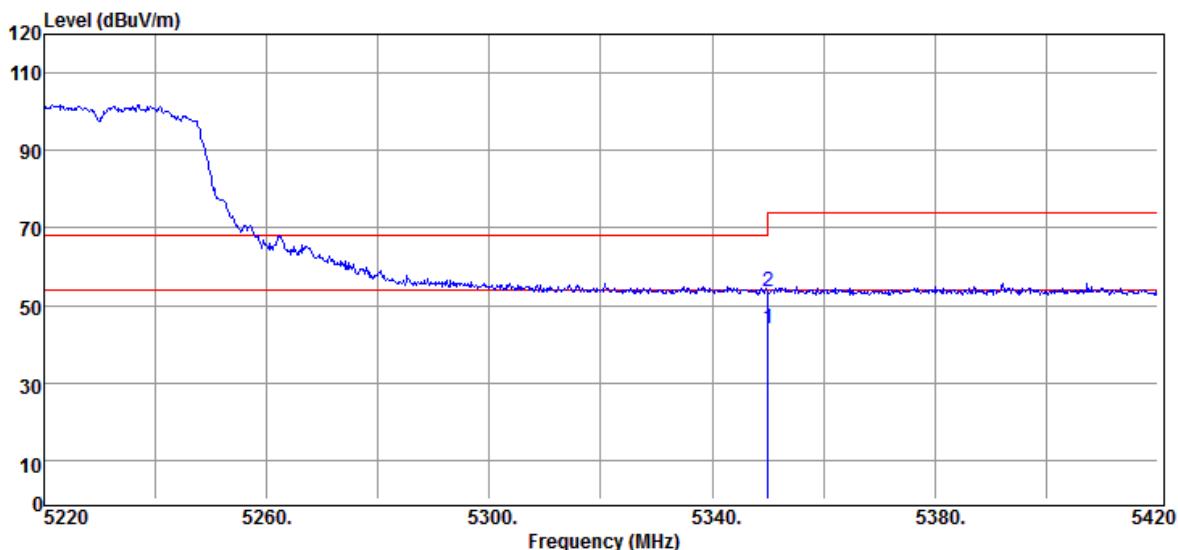
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|----------------|---------------------|--------------|-------------|
| Operation Mode | :802.11n40 / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :BE CH HIGH         | Temp./Humi.  | :25/60      |
| EUT Pol        | :H Plan             | Antenna Pol. | :VERTICAL   |
| Test Channel   | :5230 MHz           | Engineer     | :Ashton     |



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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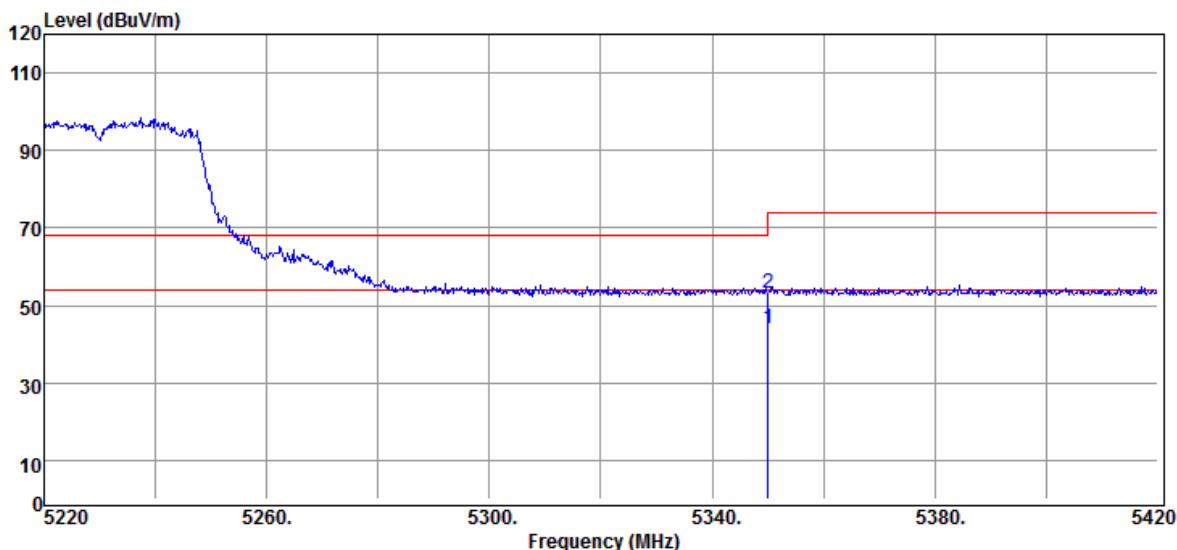
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|                |                     |              |             |
|----------------|---------------------|--------------|-------------|
| Operation Mode | :802.11n40 / Band 1 | Test Date    | :2019-01-28 |
| Test Mode      | :BE CH HIGH         | Temp./Humi.  | :25/60      |
| EUT Pol        | :H Plan             | Antenna Pol. | :HORIZONTAL |
| Test Channel   | :5230 MHz           | Engineer     | :Ashton     |



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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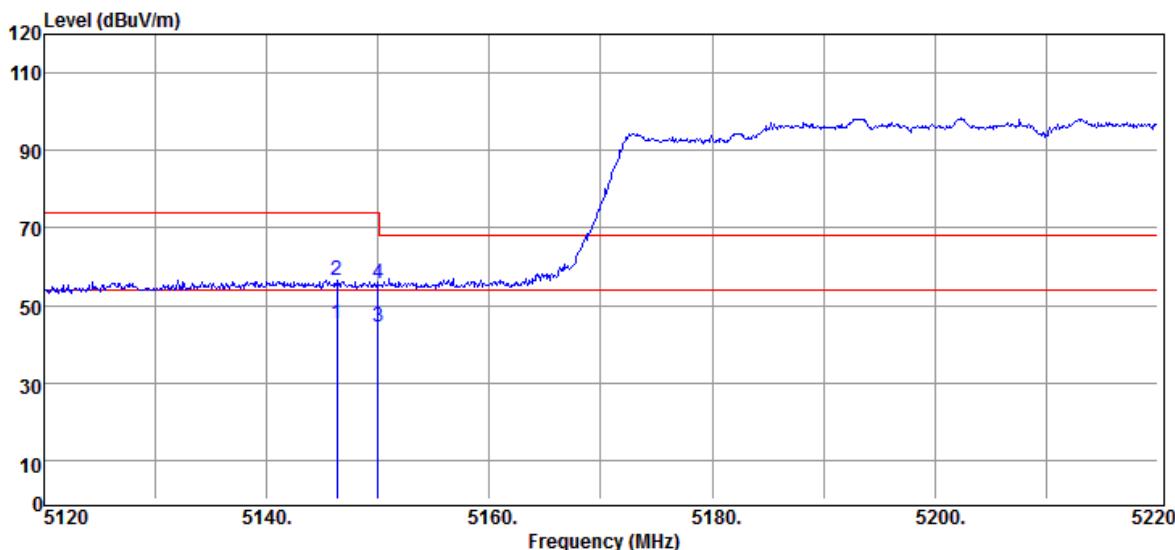
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## 802.11ac80 VHT mode

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.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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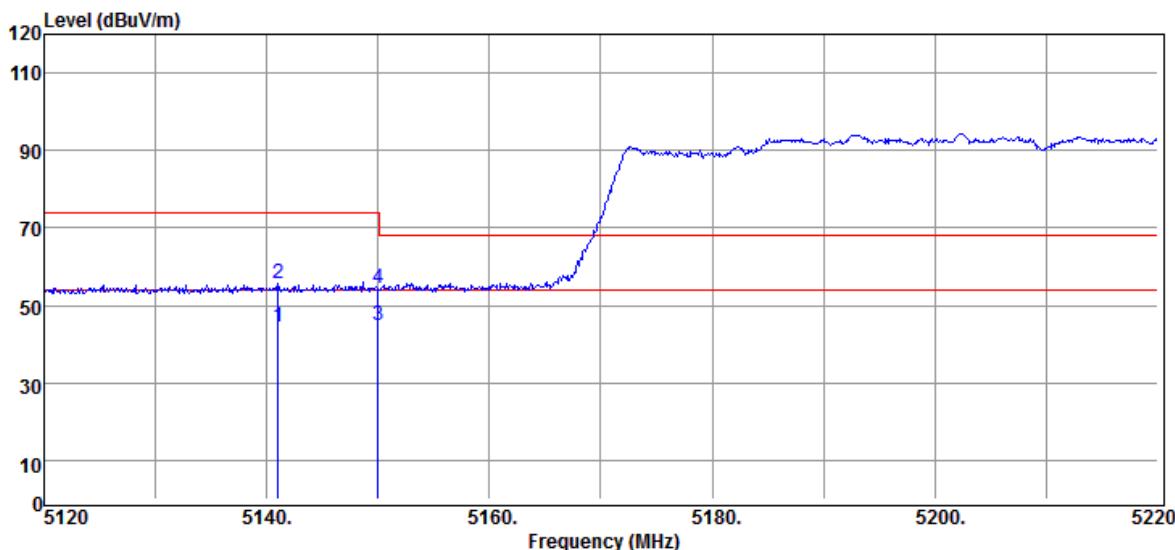
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Operation Mode :802.11ac80 / Band 1  
 Test Mode :BE CH LOW  
 EUT Pol :H Plan  
 Test Channel :5210 MHz

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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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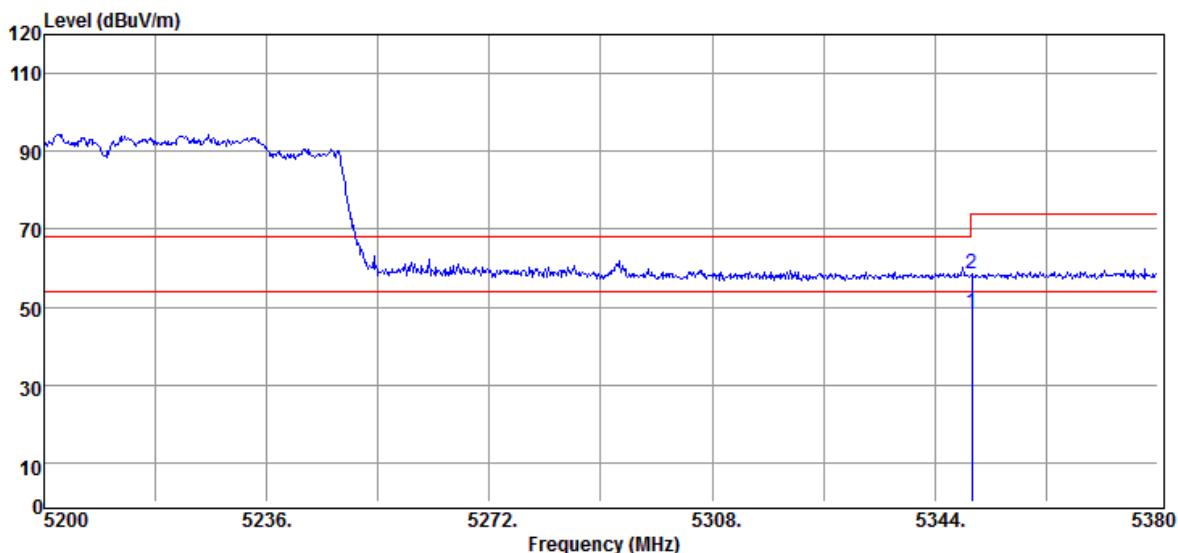
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Operation Mode :802.11ac80 / Band 1  
 Test Mode :BE CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5210 MHz

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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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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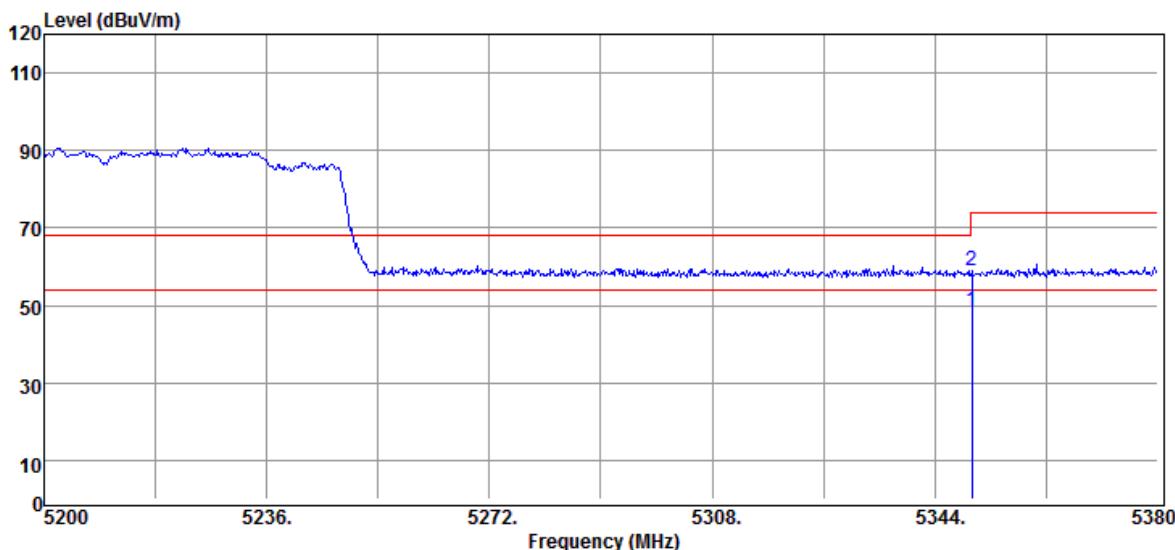
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Operation Mode :802.11ac80 / Band 1  
 Test Mode :BE CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5210 MHz

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



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>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

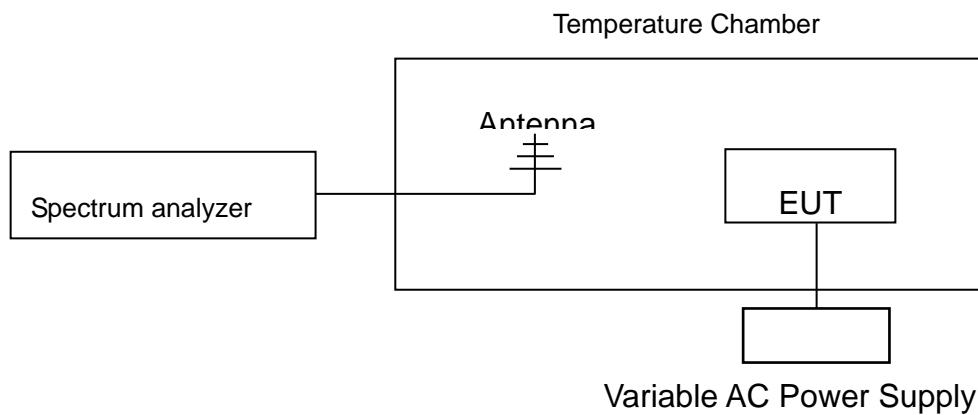
### 13.1 Standard Applicable

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           | PASTERNACK | 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       |
|                | 20.9            | 36      | 5180                     | 5,179.95516              | 0.00000866       |
|                |                 | 44      | 5220                     | 5,219.98659              | 0.00000257       |
|                |                 | 48      | 5240                     | 5,239.99578              | 0.00000081       |
| 40             | 17.1            | 36      | 5180                     | 5,179.95516              | 0.00000866       |
|                |                 | 44      | 5220                     | 5,219.98659              | 0.00000257       |
|                |                 | 48      | 5240                     | 5,239.99578              | 0.00000081       |
|                | 20.9            | 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       |
|                |                 | 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       |
|                |                 | 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       |
|                | 20.9            | 38      | 5190                     | 5,189.91052              | 0.00001724       |
|                |                 | 46      | 5230                     | 5,229.97355              | 0.00000506       |
| 40             | 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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