

# TEST REPORT

of

FCC Part 15 Subpart E §15.407  
IC RSS-247 Issue 2 and RSS-Gen Issue 5

FCC ID: BEJTLHOBDDNN0B  
IC Certification: 2703H-TLHOBDDNN0B

Equipment Under Test : Car Telematics Device  
Model Name : TLHOBDDNN0B2  
Variant Model Name(s) : Refer to the page 3  
Applicant : FCC: LG Electronics USA  
IC: LG ELECTRONICS INC.  
Manufacturer : LG Electronics Inc.  
Date of Receipt : 2021.06.03  
Date of Test(s) : 2021.06.04 ~ 2021.08.03  
Date of Issue : 2021.08.04

In the configuration tested, the EUT complied with the standards specified above. This test report does not assure KOLAS accreditation.

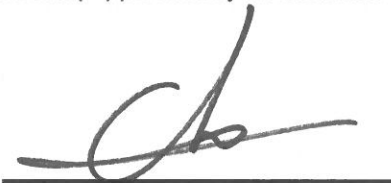
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Tested by:



Jamie Kim

Technical  
Manager:



Jinhyoung Cho

**SGS Korea Co., Ltd. Gunpo Laboratory**

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## 1. General Information

### 1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

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- Designation number: KR0150

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### 1.2. Details of Applicant

FCC Applicant : LG Electronics USA

FCC Address : 111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, United States, 07632

IC Applicant : LG ELECTRONICS INC.

IC Address : 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, Korea (Republic of), 451-713

Contact Person : Kim, Dae-woong

Phone No. : +1 201 266 2215

### 1.3. Details of Manufacturer

Company : LG Electronics Inc.

Address : 10, Magokjungang 10-ro, Gangseo-gu, Seoul, Korea, 07796

### 1.4. Description of EUT

|                             |                                                                                                                                                                                                                                                                                                      |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Kind of Product</b>      | Car Telematics Device                                                                                                                                                                                                                                                                                |
| <b>Model Name</b>           | TLHOBDDNN0B2                                                                                                                                                                                                                                                                                         |
| <b>Variant Model Name</b>   | TLHOBDDNN0B1, TLHOBDDNN0B5                                                                                                                                                                                                                                                                           |
| <b>Serial Number</b>        | 353342700000291, 353342700000309                                                                                                                                                                                                                                                                     |
| <b>Power Supply</b>         | DC 13.2 V                                                                                                                                                                                                                                                                                            |
| <b>Frequency Range</b>      | 5 180 MHz ~ 5 240 MHz (Band 1: 11a/n_HT20, 11ac_VHT20)<br>5 190 MHz ~ 5 230 MHz (Band 1: 11n_HT40, 11ac_VHT40)<br>5 210 MHz (Band 1: 11ac_VHT80)<br>5 745 MHz ~ 5 825 MHz (Band 3: 11a/n_HT20, 11ac_VHT20)<br>5 755 MHz ~ 5 795 MHz (Band 3: 11n_HT40, 11ac_VHT40)<br>5 775 MHz (Band 3: 11ac_VHT80) |
| <b>Modulation Technique</b> | OFDM                                                                                                                                                                                                                                                                                                 |
| <b>Number of Channels</b>   | 4 channels (Band 1: 11a/n_HT20, 11ac_VHT20)<br>2 channels (Band 1: 11n_HT40, 11ac_VHT40)<br>1 channel (Band 1: 11ac_VHT80)<br>5 channels (Band 3: 11a/n_HT20, 11ac_VHT20)<br>2 channels (Band 3: 11n_HT40, 11ac_VHT40)<br>1 channel (Band 3: 11ac_VHT80)                                             |
| <b>Antenna Type</b>         | Planar Inverted F Antenna                                                                                                                                                                                                                                                                            |
| <b>Antenna Gain</b> *       | 5 150 MHz ~ 5 250 MHz: 2.49 dB i<br>5 725 MHz ~ 5 850 MHz: 2.74 dB i                                                                                                                                                                                                                                 |
| <b>H/W Version</b>          | Rev.C1                                                                                                                                                                                                                                                                                               |
| <b>S/W Version</b>          | V3.6_20210526                                                                                                                                                                                                                                                                                        |

## **1.5. Declaration by the Manufacturer**

- The EUT supported transmitter power control (TPC).

## **1.6. Automatically Discontinue Transmission**

### **1.6.1. Limit of Automatically Discontinue Transmission**

The device shall automatically discontinue transmission in case of either absence of information to transmit or operating 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 to describe how this requirement is met.

### **1.6.2. Test Result of Automatically Discontinue Transmission**

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 ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

## 1.7. Test Equipment List

| Equipment                | Manufacturer                | Model                                | S/N                    | Cal. Date     | Cal. Interval | Cal. Due      |
|--------------------------|-----------------------------|--------------------------------------|------------------------|---------------|---------------|---------------|
| Signal Generator         | R&S                         | SMR40                                | 100272                 | Jun. 16, 2021 | Annual        | Jun. 16, 2022 |
| Signal Generator         | R&S                         | SMBV100A                             | 255834                 | May 31, 2021  | Annual        | May 31, 2022  |
| Spectrum Analyzer        | R&S                         | FSV30                                | 103210                 | Dec. 07, 2020 | Annual        | Dec. 07, 2021 |
| Spectrum Analyzer        | Agilent                     | N9020A                               | MY53421758             | Sep. 04, 2020 | Annual        | Sep. 04, 2021 |
| Spectrum Analyzer        | Agilent                     | N9030A                               | US51350132             | Nov. 12, 2020 | Annual        | Nov. 12, 2021 |
| Power Meter              | Anritsu                     | ML2495A                              | 1223004                | Jun. 01, 2021 | Annual        | Jun. 01, 2022 |
| Power Sensor             | Anritsu                     | MA2411B                              | 1207272                | Jun. 01, 2021 | Annual        | Jun. 01, 2022 |
| Attenuator               | AEROFLEX / INMET            | 40AH2W-10                            | 40G-3                  | Jun. 16, 2021 | Annual        | Jun. 16, 2022 |
| Low Pass Filter          | Mini-Circuits               | NLP-1200+                            | V 8979400903-2         | Feb. 08, 2021 | Annual        | Feb. 08, 2022 |
| High Pass Filter         | Wainwright Instrument GmbH  | WHKX6.0/18G-10SS                     | 51                     | Jun. 16, 2021 | Annual        | Jun. 16, 2022 |
| High Pass Filter         | Wainwright Instrument GmbH  | WHNX7.5/26.5G-6SS                    | 15                     | Jun. 16, 2021 | Annual        | Jun. 16, 2022 |
| DC Power Supply          | R&S                         | HMP2020                              | 20089489               | May 14, 2021  | Annual        | May 14, 2022  |
| Preamplifier             | H.P.                        | 8447F                                | 2944A03909             | Aug. 06, 2020 | Annual        | Aug. 06, 2021 |
| Signal Conditioning Unit | R&S                         | SCU-18                               | 10117                  | Jun. 09, 2021 | Annual        | Jun. 09, 2022 |
| Pre Amplifier            | TESTEK                      | TK-PA1840H                           | 130016                 | Jan. 07, 2021 | Annual        | Jan. 07, 2022 |
| Loop Antenna             | Schwarzbeck Mess-Elektronik | FMZB 1519                            | 1519-039               | Aug. 22, 2019 | Biennial      | Aug. 22, 2021 |
| Bilog Antenna            | Schwarzbeck Mess-Elektronik | VULB 9163                            | 01126                  | Dec. 22, 2020 | Biennial      | Dec. 22, 2022 |
| Horn Antenna             | R&S                         | HF906                                | 100326                 | Feb. 04, 2021 | Annual        | Feb. 04, 2022 |
| Horn Antenna             | Schwarzbeck Mess-Elektronik | BBHA 9170                            | 9170-540               | Nov. 26, 2020 | Annual        | Nov. 26, 2021 |
| Test Receiver            | R&S                         | ESU26                                | 100109                 | Feb. 19, 2021 | Annual        | Feb. 19, 2022 |
| Turn Table               | Innco systems GmbH          | DS 1200 S                            | N/A                    | N.C.R.        | N/A           | N.C.R.        |
| Controller               | Innco systems GmbH          | CONTROLLER CO3000-4P                 | CO3000/963/383 30516/L | N.C.R.        | N/A           | N.C.R.        |
| Antenna Mast             | Innco systems GmbH          | MA4640-XP-ET                         | MA4640/536/383 30516/L | N.C.R.        | N/A           | N.C.R.        |
| Anechoic Chamber         | SY Corporation              | L x W x H<br>(9.6 m x 6.4 m x 6.6 m) | N/A                    | N.C.R.        | N/A           | N.C.R.        |
| Coaxial Cable            | RFONE                       | MWX221-NMSNMS<br>(4 m)               | J1023142               | Jul. 05, 2021 | Semi-annual   | Jan. 05, 2022 |
| Coaxial Cable            | RFONE                       | PL520-NMNM-10M<br>(10 m)             | 20200324001            | Jul. 05, 2021 | Semi-annual   | Jan. 05, 2022 |
| Coaxial Cable            | RFONE                       | PL360P-292M292M-1.5M-A               | 20200324002            | Feb. 19, 2021 | Semi-annual   | Aug. 19, 2021 |

### Note;

- For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

## 1.8. Summary of Test Result

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC Part 15 Subpart E, IC RSS-247 Issue 2, RSS-Gen Issue 5           |                                                                                                                                 |                                         |                   |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------|
| Section in FCC                                                                         | Section in IC                                                                                                                   | Test Item(s)                            | Result            |
| 15.205(a)<br>15.209(a)<br>15.407(b)(1)<br>15.407(b)(2)<br>15.407(b)(3)<br>15.407(b)(4) | RSS-Gen Issue 5 8.9<br>RSS-247 Issue 2 6.2.1.2<br>RSS-247 Issue 2 6.2.2.2<br>RSS-247 Issue 2 6.2.3.2<br>RSS-247 Issue 2 6.2.4.2 | Transmitter Radiated Spurious Emissions | Complied          |
| 15.407(a)                                                                              | RSS-Gen Issue 5 6.7                                                                                                             | 26 dB Bandwidth & 99 % Bandwidth        | Complied          |
| 15.407(e)                                                                              | RSS-247 Issue 2 6.2.4.1                                                                                                         | 6 dB Bandwidth                          | Complied          |
| 15.407(a)(1)<br>15.407(a)(2)<br>15.407(a)(3)                                           | RSS-247 Issue 2 6.2.1.1<br>RSS-247 Issue 2 6.2.2.1<br>RSS-247 Issue 2 6.2.3.1<br>RSS-247 Issue 2 6.2.4.1                        | Maximum Conducted Output Power          | Complied          |
| 15.407(a)(1)<br>15.407(a)(2)<br>15.407(a)(3)                                           | RSS-247 Issue 2 6.2.1.1<br>RSS-247 Issue 2 6.2.2.1<br>RSS-247 Issue 2 6.2.3.1<br>RSS-247 Issue 2 6.2.4.1                        | Peak Power Spectral Density             | Complied          |
| 15.207                                                                                 | RSS-Gen Issue 5 8.8                                                                                                             | AC Power Line Conducted Emission        | N/A <sup>1)</sup> |

**Note;**

- 1) The AC power line test was not performed because the EUT use battery power for operation and which do not operate from the AC power lines.

## 1.9. Test Procedure(s)

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 789033 D02 General UNII Test Procedures New Rules v02r01 were used in the measurement of the DUT.

## 1.10. Sample Calculation

Where relevant, the following sample calculation is provided:

### 1.10.1. Conducted Test

Offset value (dB) = Attenuator (dB) + Cable loss (dB)

### 1.10.2. Radiation Test

Field strength level (dB $\mu$ V/m) = Measured level (dB $\mu$ V) + Antenna factor (dB) + Cable loss (dB) - Amplifier gain (dB)  
 + Duty factor (dB)

## 1.11. Test Report Revision

| Revision | Report Number        | Date of Issue | Description |
|----------|----------------------|---------------|-------------|
| 0        | F690501-RF-RTL002423 | 2021.08.04    | Initial     |

## 1.12. Measurement Uncertainty

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

| Parameter                          | Uncertainty     |               |
|------------------------------------|-----------------|---------------|
| RF Output Power                    | $\pm 0.36$ dB   |               |
| Occupied Bandwidth                 | $\pm 13.12$ kHz |               |
| Power Spectral Density             | $\pm 0.63$ dB   |               |
| Radiated Emission, 9 kHz to 30 MHz | H               | $\pm 3.66$ dB |
|                                    | V               | $\pm 3.66$ dB |
| Radiated Emission, below 1 GHz     | H               | $\pm 4.90$ dB |
|                                    | V               | $\pm 4.82$ dB |
| Radiated Emission, above 1 GHz     | H               | $\pm 3.62$ dB |
|                                    | V               | $\pm 3.64$ dB |

All measurement uncertainty values are shown with a coverage factor  $k = 2$  to indicate a 95 % level of confidence.

## 1.13. Information of Variant Model

| Model Name     |              | Description                                                                                                                                   |
|----------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Basic Model    | TLHOBDDNN0B2 | D-Class AMP condition                                                                                                                         |
| Variant Models | TLHOBDDNN0B1 | Same RF module and circuit to basic model, Except below<br>- Buffer AMP condition<br>- De-populated to BUB (Backup battery) part              |
|                | TLHOBDDNN0B5 | Same circuit to basic model, except below<br>- De-populated to Audio Amp part and BUB (Backup battery) part<br>- Model name for Global market |

#### 1.14. Worst- Case Configuration and Mode

| Radiated Emission Test (Below 1 GHz) |              |            |                  |
|--------------------------------------|--------------|------------|------------------|
| Mode                                 | Test Channel | Modulation | Data Rate (Mbps) |
| 11a                                  | 48           | DSSS       | 24               |

| Radiated Emission Test (Above 1 GHz) |                      |            |                  |
|--------------------------------------|----------------------|------------|------------------|
| Mode                                 | Test Channel         | Modulation | Data Rate (Mbps) |
| 11a                                  | 36,44,48,149,157,165 | OFDM       | 24               |
| 11n 20                               | 36,44,48,149,157,165 | OFDM       | MCS0             |
| 11n 40                               | 38                   | OFDM       | MCS5             |
|                                      | 46,151,159           |            | MCS0             |
| 11ac 80                              | 42                   | OFDM       | MCS5             |
|                                      | 155                  |            | MCS0             |

| Conducted Test |                      |            |                  |
|----------------|----------------------|------------|------------------|
| Mode           | Test Channel         | Modulation | Data Rate (Mbps) |
| 11a            | 36,44,48,149,157,165 | OFDM       | 24               |
| 11n 20         | 36,44,48,149,157,165 | OFDM       | MCS0             |
| 11n 40         | 38                   | OFDM       | MCS5             |
|                | 46,151,159           |            | MCS0             |
| 11ac 80        | 42                   | OFDM       | MCS5             |
|                | 155                  |            | MCS0             |

#### Note;

All data rates were investigated and chosen above data rate for worst case and measurement was performed with the EUT set highest output power.

### 1.15. Duty Cycle of EUT

Regarding to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, II.B, the maximum duty cycles of all modes were investigated and set the spectrum analyzer as below.

Set RBW ≥ EBW if possible; otherwise, set RBW to the largest available value, Set VBW ≥ RBW.

Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100.

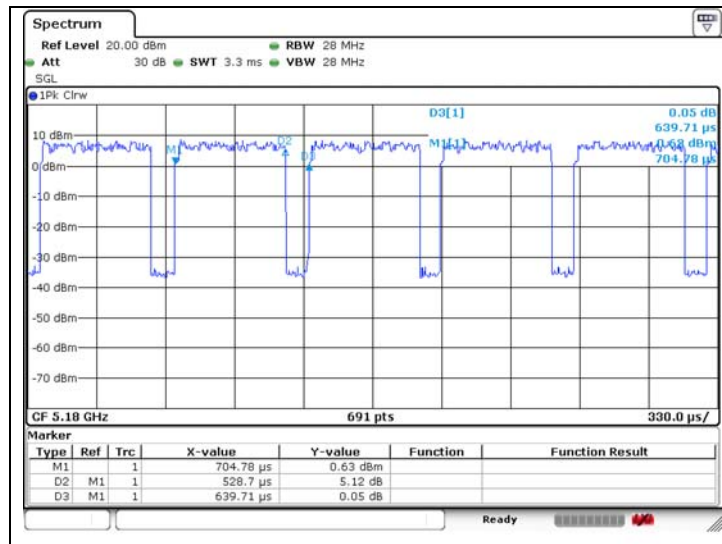
| Mode       | Data Rate (Mbps) | Duty Cycle (%) | Correction Factor (dB) |
|------------|------------------|----------------|------------------------|
| 11a        | 24               | 82.65          | 0.83                   |
| 11n_HT20   | MCS0             | 95.10          | 0.22                   |
| 11n_HT40   | MCS0             | 89.52          | 0.48                   |
|            | MCS5             | 50.00          | 3.01                   |
| 11ac_VHT80 | MCS0             | 82.87          | 0.82                   |
|            | MCS5             | 50.00          | 3.01                   |

#### Remark;

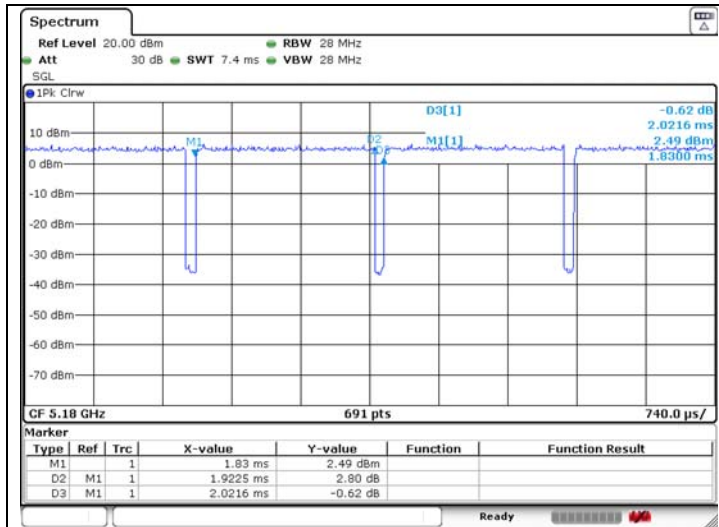
- As measured duty cycles of EUT, all of mode and data rate keep constant period and are converted to log scale (power averaging) to compensate correction factor to result of average test items.
- Duty Cycle (%) = (Tx on time / Tx on + off time) x 100
- Correction Factor (dB) = 10 log (1 / Duty Cycle)

#### - Test plots

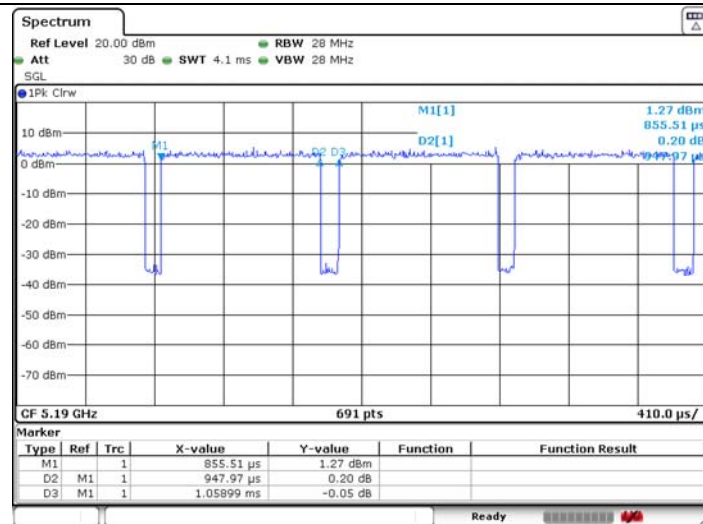
802.11a



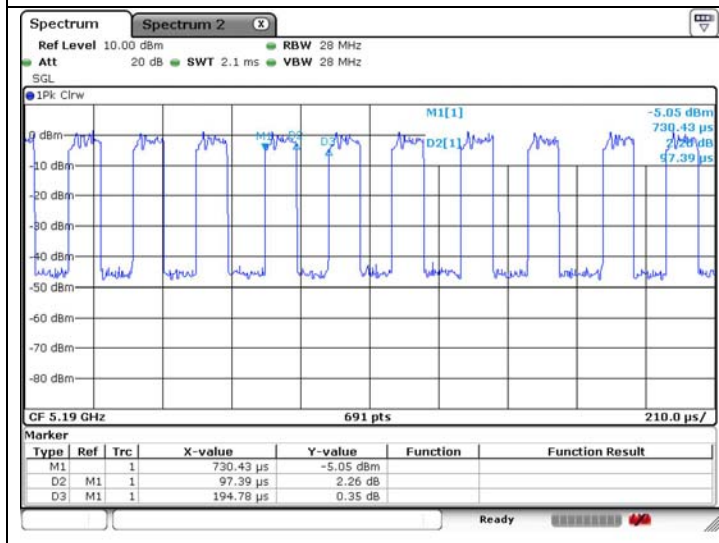
802.11n\_HT20



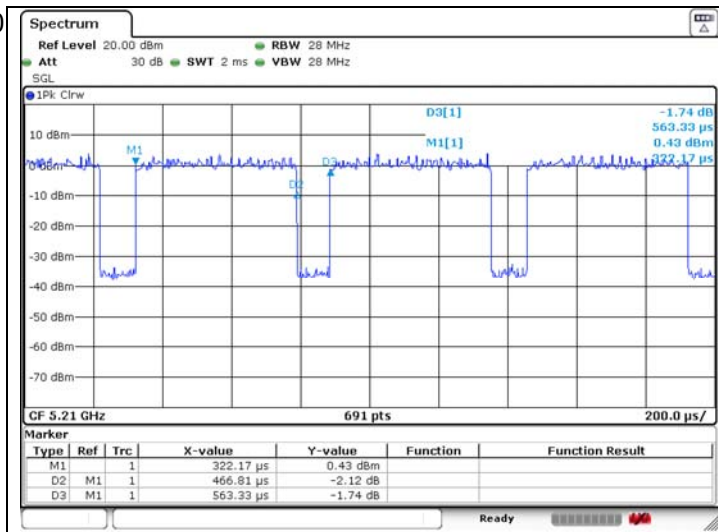
802.11n\_HT40  
MCS0



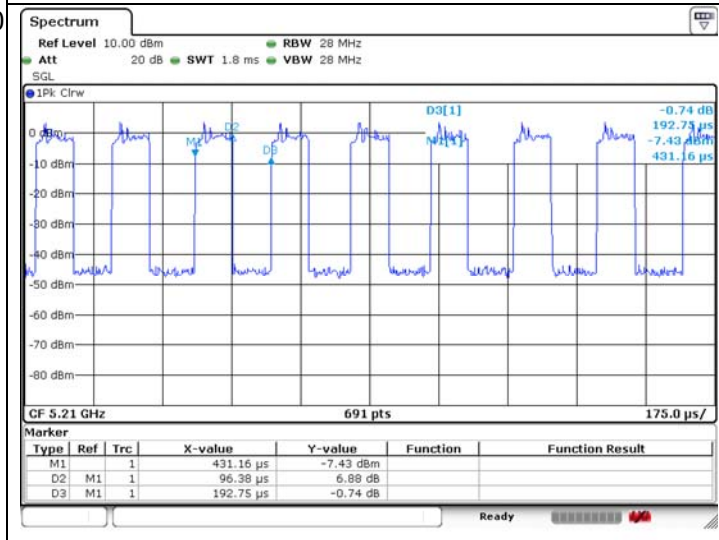
802.11n\_HT40  
MCS5



802.11ac\_VHT80  
MCS0



802.11ac\_VHT80  
MCS5

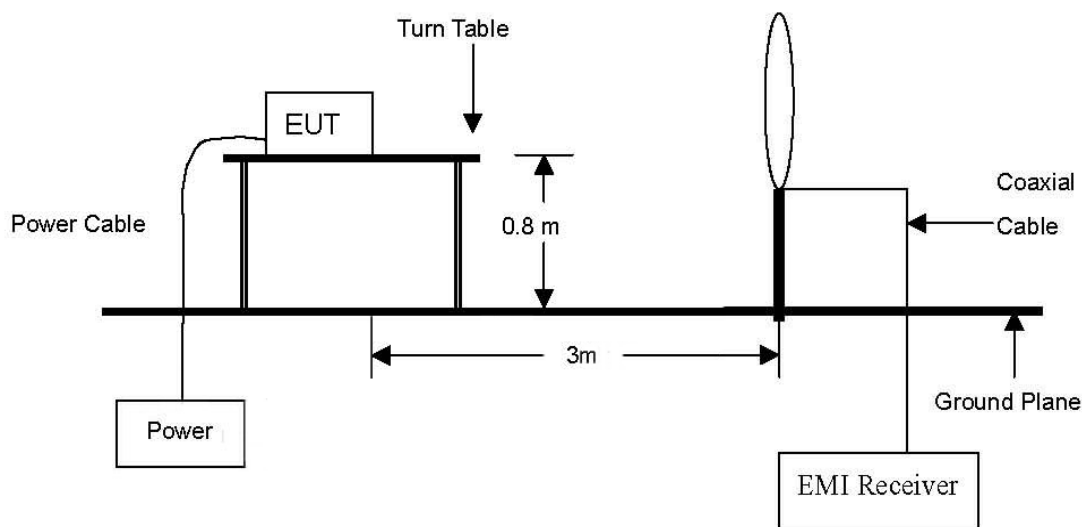


## 2. Transmitter Radiated Spurious Emissions

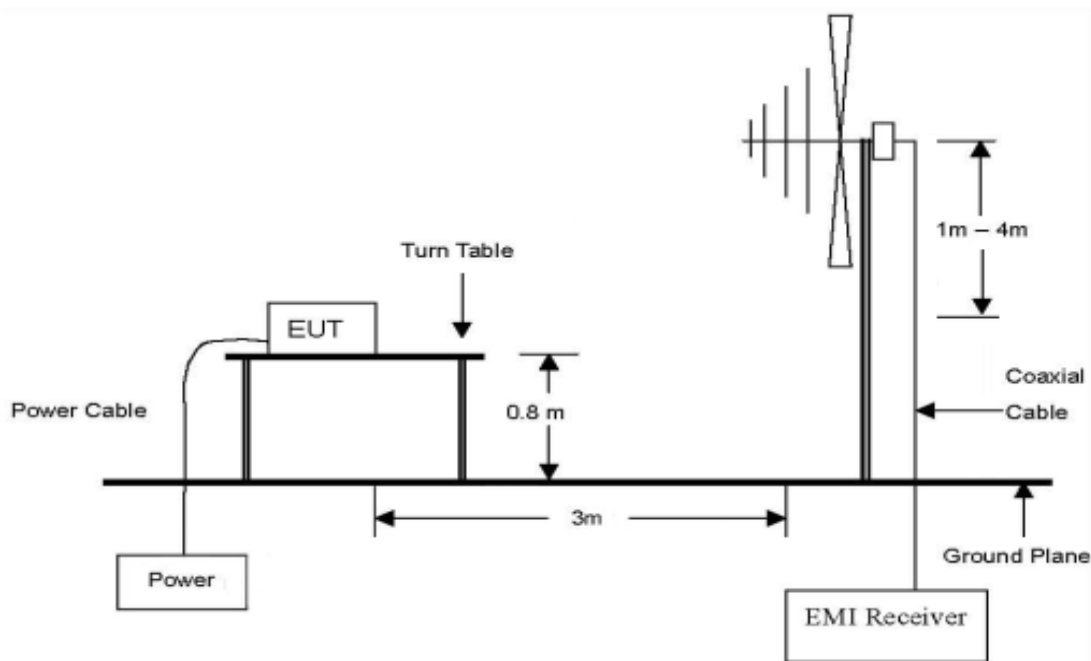
### 2.1. Test Setup

#### 2.1.1. Transmitter radiated spurious emissions

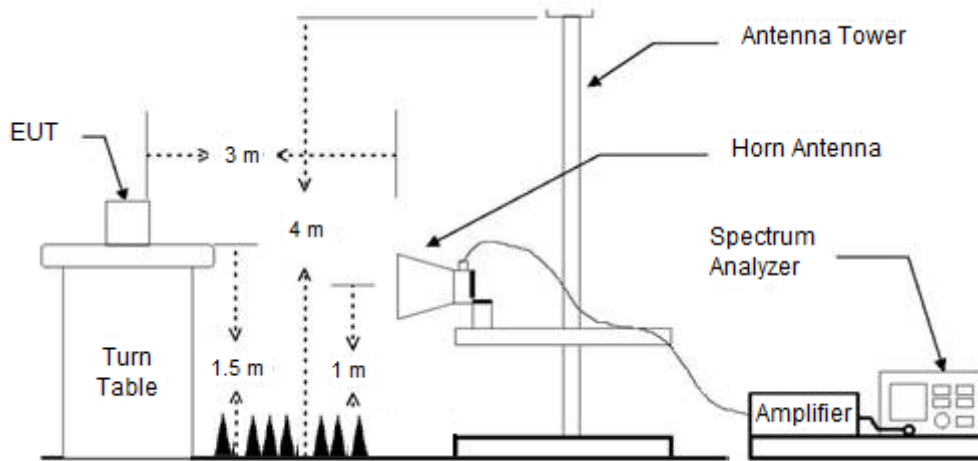
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission. The spurious emissions were investigated from 1 GHz to the 10th harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.



## 2.2. Limit

### 2.2.1. FCC

According to § 15.407(b)

(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 dB m/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of -27 dB m/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dB m/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 dB m/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 dB m/MHz at the band edge.

According to § 15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency<br>(MHz) | Field Strength<br>( $\mu\text{V}/\text{m}$ ) | Measurement Distance<br>(Meters) |
|--------------------|----------------------------------------------|----------------------------------|
| 0.009-0.490        | $2\,400/F(\text{kHz})$                       | 300                              |
| 0.490-1.705        | $24\,000/F(\text{kHz})$                      | 30                               |
| 1.705-30.0         | 30                                           | 30                               |
| 30-88              | 100**                                        | 3                                |
| 88-216             | 150**                                        | 3                                |
| 216-960            | 200**                                        | 3                                |
| Above 960          | 500                                          | 3                                |

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

**2.2.2. IC**

According to RSS-247 Issue 2,

**6.2.1.2 Frequency band 5 150-5 250 MHz**

For transmitters with operating frequencies in the band 5 150-5 250 MHz, all emissions outside the band 5 150-5 350 MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5 250-5 350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5 % of the occupied bandwidth (i.e. 99% bandwidth), above 5 250 MHz. The 26 dB bandwidth may fall into the 5 250-5 350 MHz band; however, if the occupied bandwidth also falls within the 5 250- 5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5 250-5 350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5 250-5 350 MHz band.

**6.2.4.2 Frequency band 5 725-5 850 MHz**

Devices operating in the band 5 725-5 850 MHz with antenna gain greater than 10 dBi can have unwanted emissions that comply with either the limits in this section or in section 5.5 until six (6) months after the publication date of this standard for certification. Certified devices that do not comply with emission limits in this section shall not be manufactured, imported, distributed, leased, offered for sale or sold after April 1, 2018.

Devices operating in the band 5 725-5 850 MHz with antenna gain of 10 dBi or less can have unwanted emissions that comply with either the limits in this section or in section 5.5 until April 1, 2018 for certification. Certified devices that do not comply with emission limits in this section shall not be manufactured, imported, distributed, leased, offered for sale or sold after April 1, 2020.

Devices operating in the band 5 725-5 850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

- a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;
- b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;
- c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and
- d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

## 2.3. Test Procedures

Radiated spurious emissions from the EUT were measured according to the dictates in section G of KDB 789033 D02 General UNII Test Procedures New Rules v02r01 and ANSI C63.10-2013.

### 2.3.1. Test Procedures for emission below 30 MHz

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
3. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
4. The test-receiver system was set to average or quasi peak detect function and Specified Bandwidth with Maximum Hold Mode.

### 2.3.2. Test Procedures for emission from above 30 MHz

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site below 1 GHz and 1.5 meter above the ground at a 3 meter anechoic chamber test site above 1 GHz. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a bi-log antenna, a horn antenna and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

**Note;**

All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

- II.G.4. Unwanted emissions measurements below 1 GHz.

Compliance shall be demonstrated using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

- II.G.5. Unwanted maximum emissions measurements above 1 GHz.

Peak emission levels are measured by setting the analyzer as follows:

Set to RBW = 1 MHz, VBW ≥ 3 MHz, Detector = Peak, Sweep time = auto, Trace mode= Max hold.

- II.G.6. Average unwanted emissions measurements above 1 GHz.

Set to RBW = 1 MHz, VBW ≥ 3 MHz, Detector = power averaging (rms), Averaging type = power averaging (rms), Sweep time = auto, Perform a trace average of at least 100 traces. If the transmission is continuous, If the transmission is not continuous, the number of traces shall be increased by a factor of 1/x, where x is the duty cycle. For example, with 50 % duty cycle, at least 200 traces shall be averaged.

If tests are performed with the EUT transmitting at a duty cycle less than 98 %, a correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 % duty cycle. The correction factor is computed as follows:

- If power averaging (rms) mode was used in II.G.6.c)(iv), the correction factor is  $10 \log (1 / x)$ , where x is the duty cycle. For example, if the transmit duty cycle was 50 %, then 3 dB must be added to the measured emission levels.

- Definition of the test orthogonal plan for EUT was described in the test setup photo.

The test orthogonal plan of EUT is **Z – axis** during radiation test.

## 2.4. Test Result

Ambient temperature : (23 ± 1) °C  
Relative humidity : 47 % R.H.

### 2.4.1. Radiated Spurious Emission below 1 000 MHz

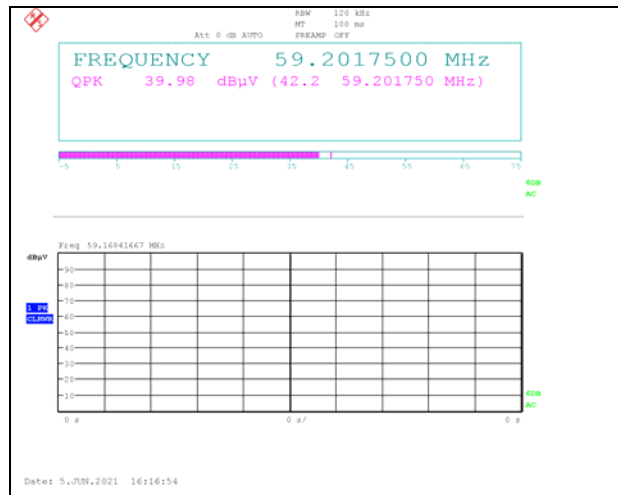
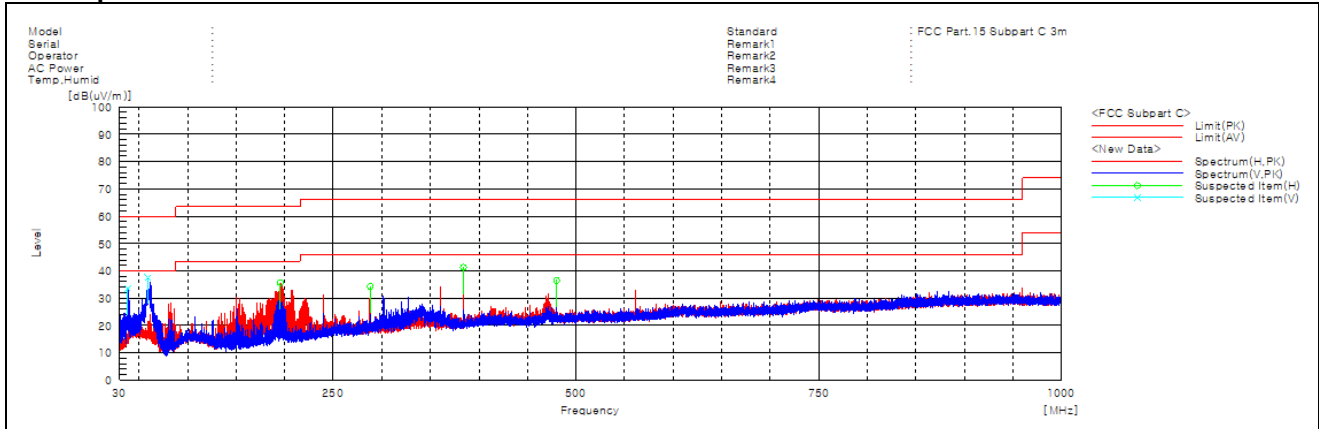
The frequency spectrum from 9 MHz to 1 000 MHz was investigated. All reading values are peak values.

| Radiated Emissions |                |             | Ant. | Correction Factors |               | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|---------------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP + CL (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 38.25              | 43.60          | Peak        | V    | 17.45              | -27.35        | 33.70           | 40.00          | 6.30        |
| 59.20              | 42.20          | Quasi-Peak  | V    | 18.36              | -27.15        | 33.41           | 40.00          | 6.59        |
| 195.59             | 44.70          | Peak        | H    | 16.76              | -25.77        | 35.69           | 43.50          | 7.81        |
| 287.98             | 40.60          | Peak        | H    | 18.76              | -25.15        | 34.21           | 46.00          | 11.79       |
| 384.01             | 45.80          | Peak        | H    | 20.86              | -25.31        | <b>41.35</b>    | 46.00          | 4.65        |
| 480.00             | 39.90          | Peak        | H    | 22.50              | -25.82        | 36.58           | 46.00          | 9.42        |
| Above 500.00       | Not detected   | -           | -    | -                  | -             | -               | -              | -           |

#### Remark;

1. Spurious emissions for all channels and modes were investigated and almost the same below 1 GHz.
2. Reported spurious emissions are in **11a (Band 1) / 24 Mbps / High channel** as worst case among other modes.
3. Radiated spurious emission measurement as below.  
(Actual = Reading + AF + AMP + CL)
4. According to §15.31(o), emission levels are not report much lower than the limits by over 20 dB.

## - Test plots



## 2.4.2. Radiated Spurious Emission above 1 000 MHz

### OFDM: 802.11a (Band 1)\_24 Mbps

#### A. Low Channel (5 180 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| *4 500.00          | 39.57          | Peak        | V    | 31.90              | -31.64      | -       | 39.83           | 74.00          | 34.17       |
| *4 500.00          | 32.15          | Average     | V    | 31.90              | -31.64      | 0.83    | 33.24           | 54.00          | 20.76       |
| *5 148.06          | 51.91          | Peak        | V    | 33.50              | -31.06      | -       | 54.35           | 74.00          | 19.65       |
| *5 148.06          | 42.83          | Average     | V    | 33.50              | -31.06      | 0.83    | 46.10           | 54.00          | 7.90        |
| *5 150.00          | 55.09          | Peak        | V    | 33.50              | -31.06      | -       | 57.53           | 74.00          | 16.47       |
| *5 150.00          | 44.51          | Average     | V    | 33.50              | -31.06      | 0.83    | 47.78           | 54.00          | 6.22        |

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 10 360.50          | 41.74          | Peak        | H    | 37.78              | -26.69      | -       | 52.83           | 68.23          | 15.40       |
| Above 10 400.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

#### B. Middle Channel (5 220 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 10 440.54          | 41.13          | Peak        | H    | 37.70              | -26.70      | -       | 52.13           | 68.23          | 16.10       |
| Above 10 500.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

#### C. High Channel (5 240 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 10 480.32          | 39.50          | Peak        | H    | 37.70              | -27.06      | -       | 50.14           | 68.23          | 18.09       |
| Above 10 500.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

**OFDM: 802.11a (Band 3)\_24 Mbps**

A. Low Channel (5 745 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 5 644.75           | 45.71          | Peak        | H    | 34.00              | -29.92      | 49.79           | 68.23          | 18.44       |
| 5 694.31           | 51.92          | Peak        | H    | 34.00              | -30.07      | 55.85           | 101.02         | 45.17       |
| 5 718.27           | 66.10          | Peak        | H    | 34.00              | -30.06      | 70.04           | 110.34         | 40.30       |
| 5 725.00           | 74.33          | Peak        | H    | 34.00              | -30.04      | 78.29           | 122.23         | 43.94       |

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| *11 487.45         | 43.52          | Peak        | H    | 38.57              | -25.24      | -       | 56.85           | 74.00          | 17.15       |
| *11 491.80         | 32.45          | Peak        | H    | 38.58              | -25.19      | 0.83    | <b>46.67</b>    | 54.00          | 7.33        |
| Above 11 500.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

B. Middle Channel (5 785 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| *11 573.00         | 43.17          | Peak        | H    | 38.70              | -25.77      | -       | 56.10           | 74.00          | 17.90       |
| *11 572.00         | 32.01          | Peak        | H    | 38.70              | -25.77      | 0.83    | 45.77           | 54.00          | 8.23        |
| Above 11 600.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

C. High Channel (5 825 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 5 850.35           | 65.38          | Peak        | H    | 34.20              | -29.54      | 70.04           | 121.43         | 51.39       |
| 5 855.00           | 62.45          | Peak        | H    | 34.22              | -29.52      | 67.15           | 110.83         | 43.68       |
| 5 881.14           | 47.36          | Peak        | H    | 34.32              | -29.55      | 52.13           | 100.68         | 48.55       |
| 5 969.60           | 43.26          | Peak        | H    | 34.58              | -30.25      | 47.59           | 68.45          | 20.86       |

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| *11 651.05         | 39.93          | Peak        | H    | 38.70              | -25.14      | -       | 53.49           | 74.00          | 20.51       |
| Above 11 700.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

**OFDM: 802.11n\_HT20 (Band 1)\_MCS0**

A. Low Channel (5 180 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| *4 500.00          | 39.64          | Peak        | V    | 31.90              | -31.64      | -       | 39.90           | 74.00          | 34.10       |
| *4 500.00          | 32.21          | Average     | V    | 31.90              | -31.64      | 0.22    | 32.69           | 54.00          | 21.31       |
| *5 147.27          | 52.75          | Peak        | V    | 33.49              | -31.06      | -       | 55.18           | 74.00          | 18.82       |
| *5 148.06          | 43.79          | Average     | V    | 33.50              | -31.06      | 0.22    | 46.45           | 54.00          | 7.55        |
| *5 150.00          | 53.64          | Peak        | V    | 33.50              | -31.06      | -       | 56.08           | 74.00          | 17.92       |
| *5 150.00          | 44.51          | Average     | V    | 33.50              | -31.06      | 0.22    | <b>47.17</b>    | 54.00          | 6.83        |

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 10 358.40          | 41.89          | Peak        | H    | 37.78              | -26.66      | -       | 53.01           | 68.23          | 15.22       |
| Above 10 400.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

B. Middle Channel (5 220 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 10 440.72          | 41.08          | Peak        | H    | 37.70              | -26.70      | -       | 52.08           | 68.23          | 16.15       |
| Above 10 500.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

C. High Channel (5 240 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 10 480.14          | 39.57          | Peak        | H    | 37.70              | -27.06      | -       | 50.21           | 68.23          | 18.02       |
| Above 10 500.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

**OFDM: 802.11n\_HT20 (Band 3)\_MCS0**

A. Low Channel (5 745 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 5 642.50           | 45.78          | Peak        | H    | 34.00              | -29.93      | 49.85           | 68.23          | 18.38       |
| 5 700.00           | 57.99          | Peak        | H    | 34.00              | -30.10      | 61.89           | 105.23         | 43.34       |
| 5 719.29           | 66.48          | Peak        | H    | 34.00              | -30.06      | 70.42           | 110.63         | 40.21       |
| 5 721.55           | 67.36          | Peak        | H    | 34.00              | -30.05      | 71.31           | 114.36         | 43.05       |

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| *11 487.90         | 44.16          | Peak        | H    | 38.58              | -25.24      | -       | 57.50           | 74.00          | 16.50       |
| *11 489.95         | 31.49          | Peak        | H    | 38.58              | -25.22      | 0.22    | <b>45.07</b>    | 54.00          | 8.93        |
| Above 11 500.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

B. Middle Channel (5 785 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| *11 568.30         | 44.04          | Peak        | H    | 38.70              | -25.75      | -       | 56.99           | 74.00          | 17.01       |
| *11 568.95         | 31.52          | Peak        | H    | 38.70              | -25.75      | 0.22    | 44.69           | 54.00          | 9.31        |
| Above 11 600.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

C. High Channel (5 825 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 5 851.04           | 65.08          | Peak        | H    | 34.20              | -29.54      | 69.74           | 119.86         | 50.12       |
| 5 856.55           | 62.30          | Peak        | H    | 34.23              | -29.52      | 67.01           | 110.39         | 43.38       |
| 5 877.46           | 51.54          | Peak        | H    | 34.31              | -29.48      | 56.37           | 103.41         | 47.04       |
| 5 952.83           | 42.94          | Peak        | H    | 34.51              | -30.05      | 47.40           | 68.26          | 20.86       |

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| *11 648.25         | 41.38          | Peak        | H    | 38.70              | -25.14      | -       | 54.94           | 74.00          | 19.06       |
| *11 649.25         | 28.94          | Peak        | H    | 38.70              | -25.14      | 0.22    | 42.72           | 54.00          | 11.28       |
| Above 11 700.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

**OFDM: 802.11n\_HT40 (Band 1)\_MCS0, MCS5**

A. Low Channel\_MCS5 (5 190 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| *4 500.00          | 41.90          | Peak        | V    | 31.90              | -31.64      | -       | 42.16           | 74.00          | 31.84       |
| *4 500.00          | 31.83          | Average     | V    | 31.90              | -31.64      | 3.01    | 35.10           | 54.00          | 18.90       |
| *5 149.15          | 59.50          | Peak        | V    | 33.50              | -31.06      | -       | 61.94           | 74.00          | 12.06       |
| *5 149.94          | 44.51          | Average     | V    | 33.50              | -31.06      | 3.01    | 49.96           | 54.00          | 4.04        |
| *5 150.00          | 58.97          | Peak        | V    | 33.50              | -31.06      | -       | 61.41           | 74.00          | 12.59       |
| *5 150.00          | 44.51          | Average     | V    | 33.50              | -31.06      | 3.01    | <b>49.96</b>    | 54.00          | 4.04        |

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 10 380.75          | 39.98          | Peak        | H    | 37.74              | -26.78      | -       | 50.94           | 68.23          | 17.29       |
| Above 10 400.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

B. High Channel\_MCS0 (5 230 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 10 459.78          | 38.99          | Peak        | H    | 37.70              | -26.90      | -       | 49.79           | 68.23          | 18.44       |
| Above 10 500.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

**OFDM: 802.11n\_HT40 (Band 3)\_MCS0**

**A. Low Channel (5 755 MHz)**

| Radiated Emissions |                |             | Ant. | Correction Factors |             | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 5 640.86           | 54.65          | Peak        | H    | 34.00              | -29.94      | <b>58.71</b>    | 68.23          | 9.52        |
| 5 692.26           | 62.12          | Peak        | H    | 34.00              | -30.07      | 66.05           | 99.50          | 33.45       |
| 5 719.09           | 70.39          | Peak        | H    | 34.00              | -30.06      | 74.33           | 110.57         | 36.24       |
| 5 723.80           | 72.80          | Peak        | H    | 34.00              | -30.05      | 76.75           | 119.49         | 42.74       |

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| *11 511.15         | 40.07          | Peak        | H    | 38.62              | -24.90      | -       | 53.79           | 74.00          | 20.21       |
| Above 11 600.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

**B. High Channel (5 795 MHz)**

| Radiated Emissions |                |             | Ant. | Correction Factors |             | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 5 854.03           | 60.70          | Peak        | H    | 34.22              | -29.53      | 65.39           | 113.04         | 47.65       |
| 5 855.63           | 58.90          | Peak        | H    | 34.22              | -29.52      | 63.60           | 110.65         | 47.05       |
| 5 876.08           | 54.44          | Peak        | H    | 34.30              | -29.46      | 59.28           | 104.43         | 45.15       |
| 5 954.21           | 49.42          | Peak        | H    | 34.52              | -30.07      | 53.87           | 68.28          | 14.41       |

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| *11 589.80         | 39.68          | Peak        | H    | 38.70              | -25.58      | -       | 52.80           | 74.00          | 21.20       |
| Above 11 600.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

**OFDM: 802.11ac\_VHT80 (Band 1)\_MCS5**

A. Middle Channel (5 210 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| *4 500.00          | 41.53          | Peak        | V    | 31.90              | -31.64      | -       | 41.79           | 74.00          | 32.21       |
| *4 500.00          | 31.86          | Average     | V    | 31.90              | -31.64      | 3.01    | 35.13           | 54.00          | 18.87       |
| *5 143.62          | 63.60          | Peak        | V    | 33.49              | -31.05      | -       | 66.04           | 74.00          | 7.96        |
| *5 141.25          | 47.24          | Average     | V    | 33.48              | -31.04      | 3.01    | <b>52.69</b>    | 54.00          | 1.31        |
| *5 150.00          | 62.64          | Peak        | V    | 33.50              | -31.06      | -       | 65.08           | 74.00          | 8.92        |
| *5 150.00          | 46.88          | Average     | V    | 33.50              | -31.06      | 3.01    | 52.33           | 54.00          | 1.67        |

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 10 419.68          | 39.04          | Peak        | H    | 37.70              | -26.52      | -       | 50.22           | 68.23          | 18.01       |
| Above 10 500.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

**OFDM: 802.11ac\_VHT80 (Band 3)\_MCS0**

A. Middle Channel (5 775 MHz)

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 5 638.81           | 56.00          | Peak        | H    | 34.00              | -29.95      |         | <b>60.05</b>    | 68.23          | 8.18        |
| 5 695.33           | 69.22          | Peak        | H    | 34.00              | -30.08      |         | 73.14           | 101.77         | 28.63       |
| 5 718.06           | 71.05          | Peak        | H    | 34.00              | -30.06      |         | 74.99           | 110.28         | 35.29       |
| 5 725.00           | 71.85          | Peak        | H    | 34.00              | -30.04      |         | 75.81           | 122.23         | 46.42       |
| 5 851.27           | 66.40          | Peak        | H    | 34.21              | -29.54      |         | 71.07           | 119.33         | 48.26       |
| 5 860.00           | 63.72          | Peak        | H    | 34.24              | -29.50      |         | 68.46           | 109.43         | 40.97       |
| 5 875.62           | 56.97          | Peak        | H    | 34.30              | -29.45      |         | 61.82           | 104.77         | 42.95       |
| 5 964.09           | 49.91          | Peak        | H    | 34.56              | -30.18      |         | 54.29           | 68.39          | 14.10       |

| Radiated Emissions |                |             | Ant. | Correction Factors |             |         | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|-------------|---------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | DF (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| *11 550.10         | 40.84          | Peak        | H    | 38.70              | -25.65      | -       | 53.89           | 74.00          | 20.11       |
| Above 11 600.00    | Not detected   | -           | -    | -                  | -           | -       | -               | -              | -           |

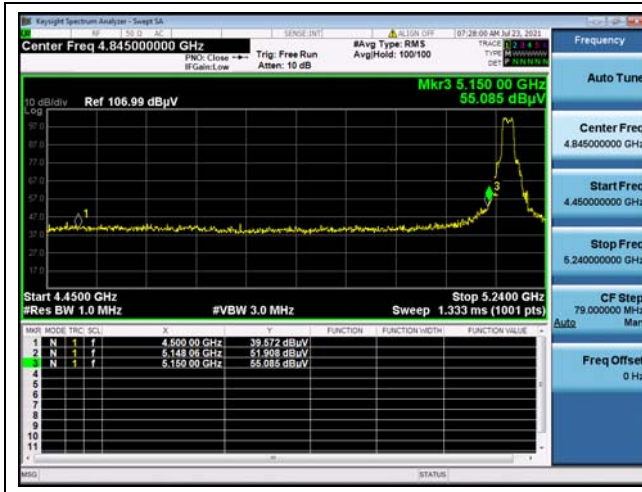
**Remark;**

1. “\*” means the restricted band.
2. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using Peak / average detector mode if frequency was in restricted band. Otherwise the frequency was out of restricted band, only peak detector should be used.
3. Actual = Reading + AF + AMP + CL + (DF).
4. If frequency was out of restricted band, the calculation method for peak limit is same as below.  
 $68.23 \text{ dB}\mu\text{V/m} = \text{EIRP} - 20 \log(d) + 104.77 = -27 - 20 \log(3) + 104.77$
5. In case of the emissions within  $\pm 75 \text{ MHz}$  from band edge of band 3, limit should be adjusted to emission mask of 15.407(4)(i).
6. According to § 15.31(o), emission levels are not reported much lower than the limits by over 20 dB.
7. The maximized peak measured value complies with the average limit, to perform an average measurement is unnecessary.

## - Test plots

### 802.11a (24 Mbps)

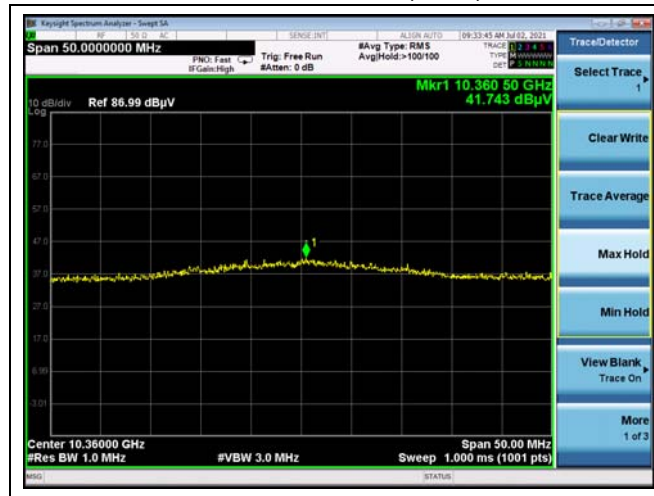
Low channel Band edge (Peak) - Band 1



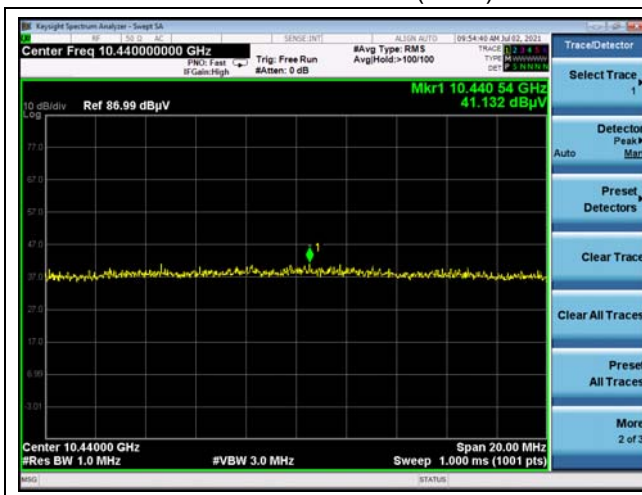
Low channel Band edge (Average) - Band 1



Low channel 2<sup>nd</sup> Harmonic (Peak) - Band 1



Middle channel 2<sup>nd</sup> Harmonic (Peak) - Band 1



High channel 2<sup>nd</sup> Harmonic (Peak) - Band 1



Low channel Band edge (Peak) - Band 3



Low channel Band edge (Average) - Band 3



Low channel 2<sup>nd</sup> Harmonic (Peak) - Band 3



Low channel 2<sup>nd</sup> Harmonic (Average) - Band 3



Middle channel 2<sup>nd</sup> Harmonic (Peak) - Band 3



Middle channel 2<sup>nd</sup> Harmonic (Average) - Band 3

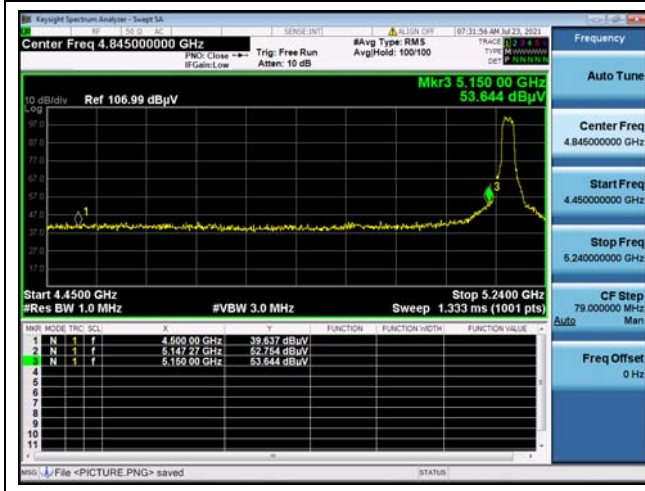


### High channel 2<sup>nd</sup> Harmonic (Peak) - Band 3



### 802.11n\_HT20 (MCS0)

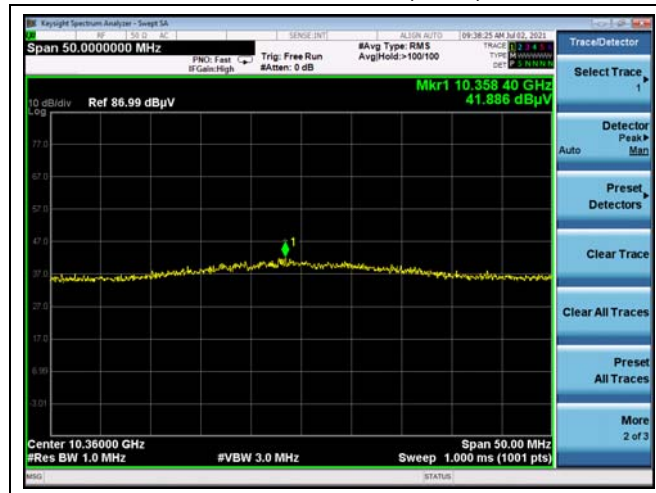
Low channel Band edge (Peak) - Band 1



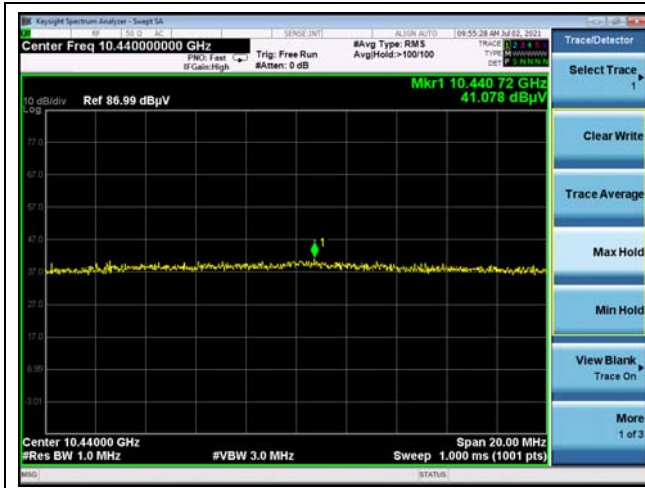
Low channel Band edge (Average) - Band 1



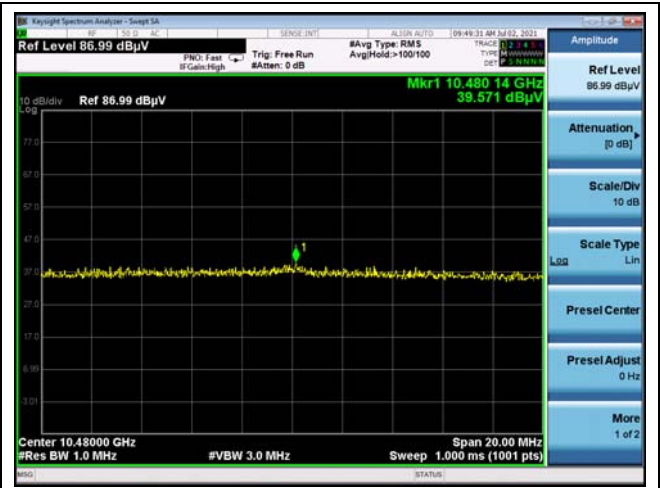
Low channel 2<sup>nd</sup> Harmonic (Peak) - Band 1



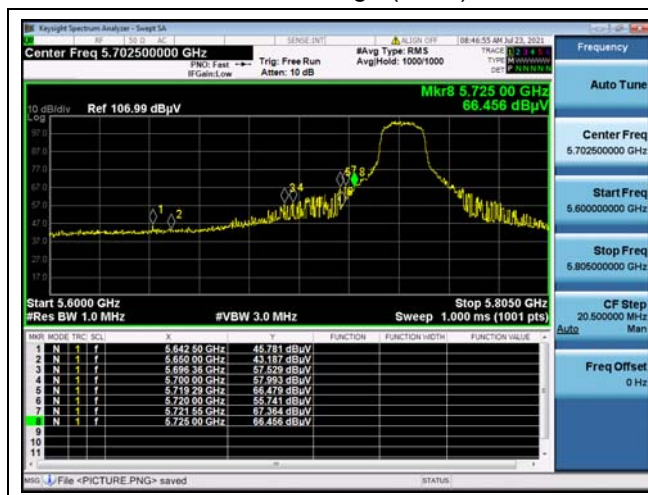
Middle channel 2<sup>nd</sup> Harmonic (Peak) - Band 1



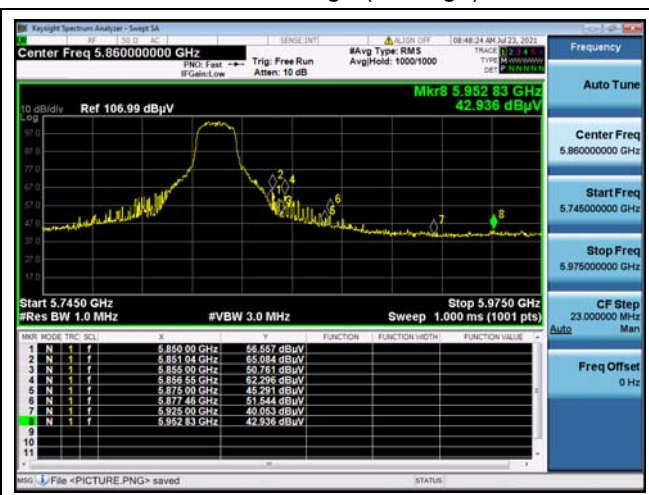
High channel 2<sup>nd</sup> Harmonic (Peak) - Band 1



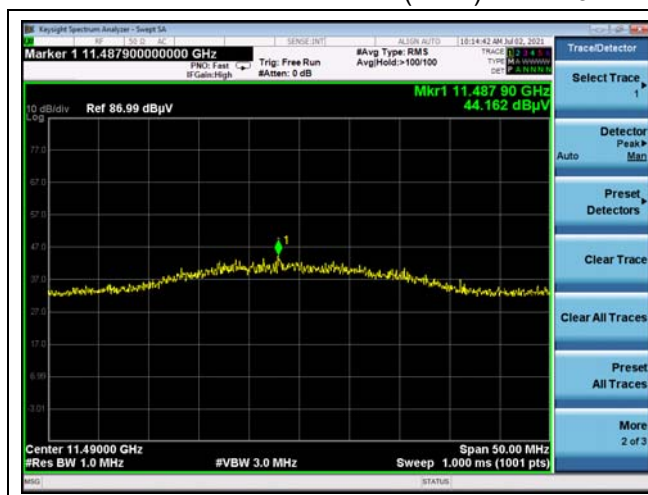
Low channel Band edge (Peak) - Band 3



Low channel Band edge (Average) - Band 3



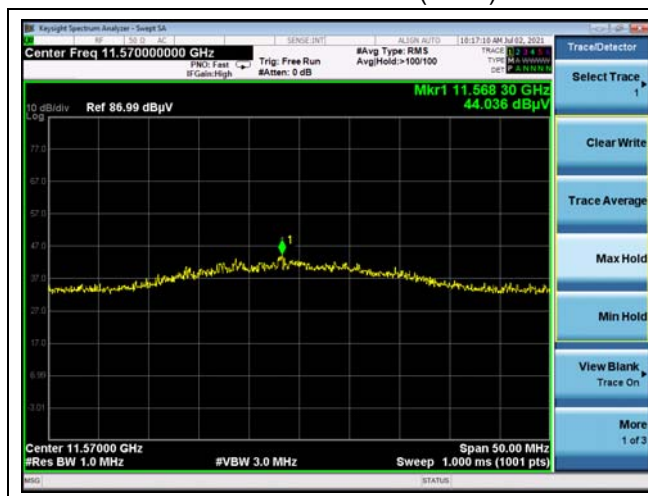
Low channel 2<sup>nd</sup> Harmonic (Peak) - Band 3



Low channel 2<sup>nd</sup> Harmonic (Average) - Band 3



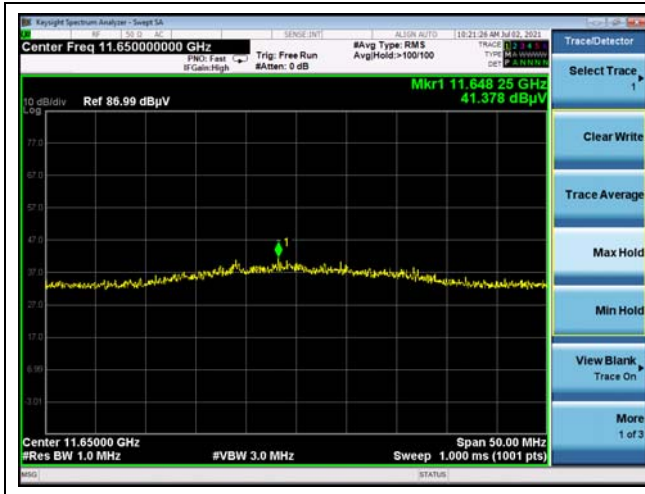
Middle channel 2<sup>nd</sup> Harmonic (Peak) - Band 3



Middle channel 2<sup>nd</sup> Harmonic (Average) - Band 3



High channel 2<sup>nd</sup> Harmonic (Peak) - Band 3



High channel 2<sup>nd</sup> Harmonic (Average) - Band 3

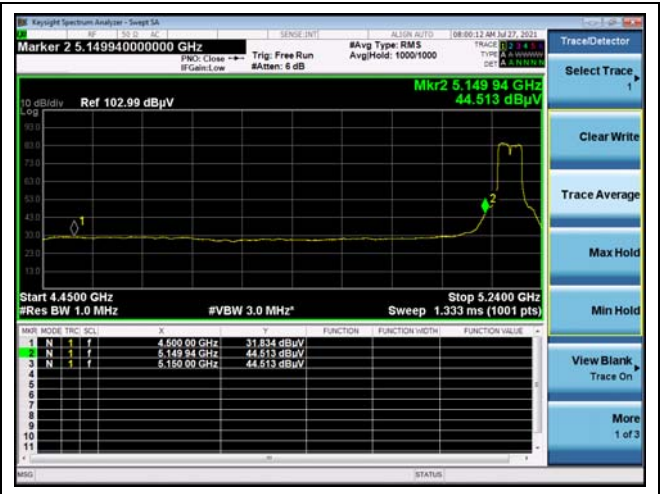


### 802.11n\_HT40 (MCS0, MCS5)

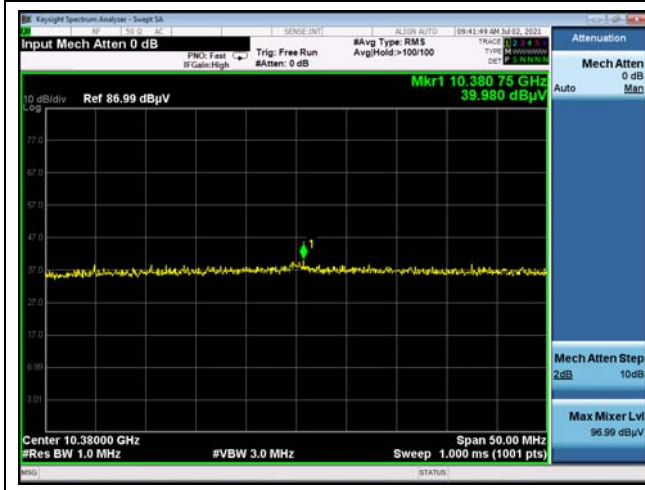
Low channel Band edge (Peak) - Band 1\_MCS5



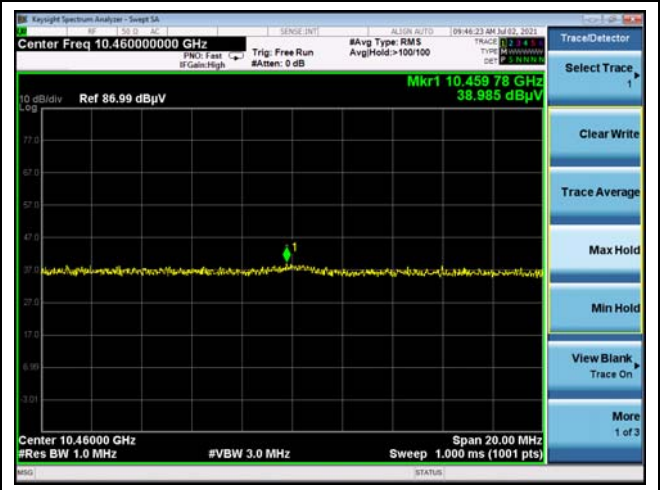
Low channel Band edge (Average) - Band 1\_MCS5



Low channel 2<sup>nd</sup> Harmonic (Peak) - Band 1\_MCS5



High channel 2<sup>nd</sup> Harmonic (Peak) - Band 1\_MCS5



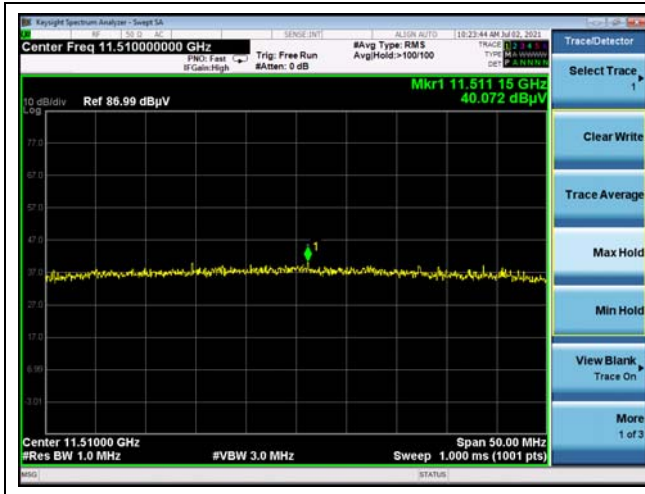
Low channel Band edge (Peak) - Band 3\_MCS0



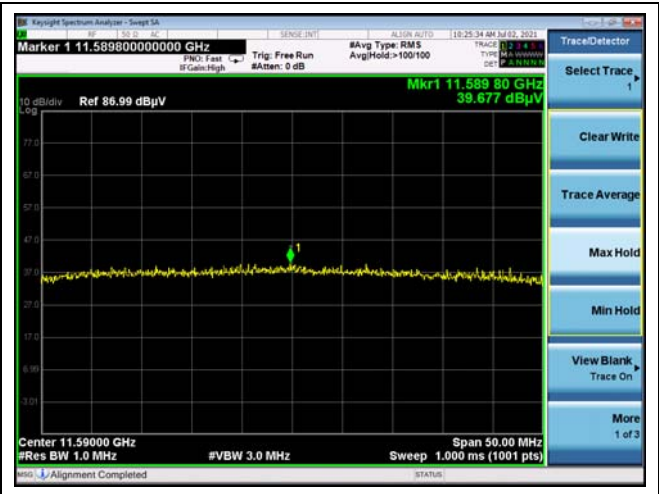
High channel Band edge (Peak) - Band 3\_MCS0



Low channel 2<sup>nd</sup> Harmonic (Peak) - Band 3\_MCS0

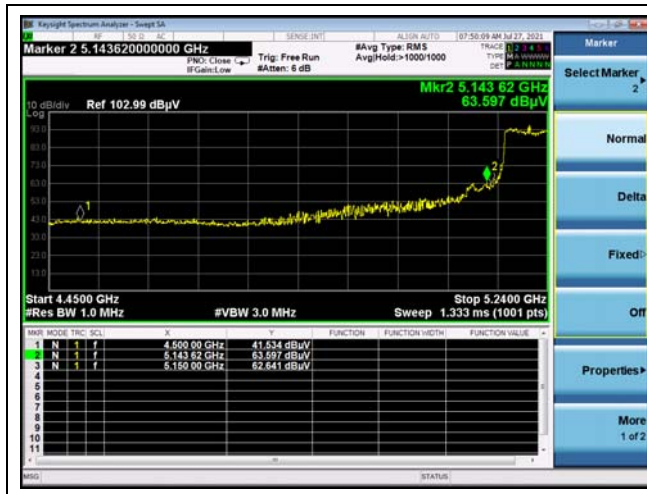


High channel 2<sup>nd</sup> Harmonic (Peak) - Band 3\_MCS0



### 802.11ac\_VHT80 (MCS0, MCS5)

Middle channel Band edge (Peak) - Band 1\_MCS5



Middle channel Band edge (Average) - Band 1\_MCS5



### Middle channel 2<sup>nd</sup> Harmonic (Peak) - Band 1\_MCS5



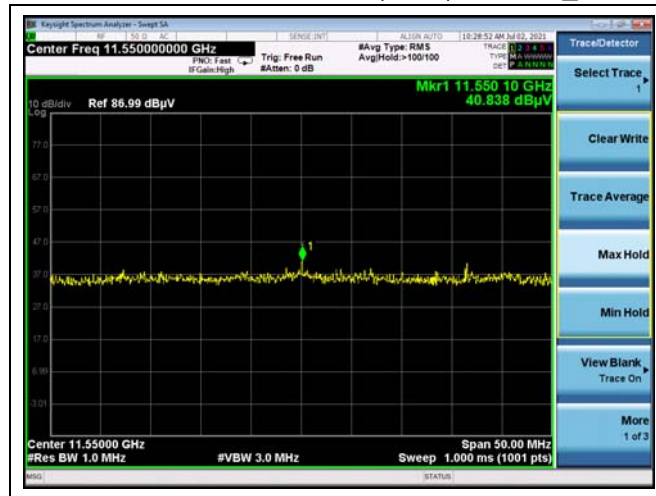
Middle channel Band edge (Peak) - Band 3\_MCS0



Middle channel Band edge (Peak) - Band 3\_MCS0



Middle channel 2<sup>nd</sup> Harmonic (Peak) - Band 3\_MCS0



### 3. 26 dB Bandwidth & 99 % Bandwidth

#### 3.1. Test Setup



#### 3.2. Limit

None; for reporting purpose only.

#### 3.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

##### 3.3.1. 26 dB Bandwidth

1. This measurement settings are specified in section II.C.1 of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set RBW = approximately 1 % of the emission bandwidth.
3. Set the VBW > RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %.

### 3.3.2. 99 % Bandwidth

#### 3.3.2.1 FCC

1. This measurement settings are specified in section II.D of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set center frequency to the nominal EUT channel center frequency.
3. Set span = 1.5 times to 5.0 times the OBW.
4. Set RBW = 1 % to 5 % of the OBW.
5. Set VBW  $\geq 3 \times$  RBW.
6. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
7. Use the 99 % power bandwidth function of the instrument (if available).
8. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99 % occupied bandwidth is the difference between these two frequencies.

In the result,

- DFS requirements are not applicable in the 5 150 MHz ~ 5 250 MHz.

#### 3.3.2.2 IC

- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99 % emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99 % emission bandwidth).

### 3.4. Test Result

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

#### Test mode: 11a

| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | 26 dB Bandwidth (MHz) | 99 % Bandwidth (MHz) |
|---------|-----------------|-----|------------------|-----------------------|----------------------|
| U-NII 1 | 5 180           | 36  | 24               | 20.376                | 16.729               |
|         | 5 220           | 44  |                  | 20.261                | 16.729               |
|         | 5 240           | 48  |                  | 20.839                | 16.787               |
| U-NII 3 | 5 745           | 149 |                  | 20.261                | 16.729               |
|         | 5 785           | 157 |                  | 20.376                | 16.729               |
|         | 5 825           | 165 |                  | 20.666                | 16.729               |

#### Test mode: 11n\_HT20

| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | 26 dB Bandwidth (MHz) | 99 % Bandwidth (MHz) |
|---------|-----------------|-----|------------------|-----------------------|----------------------|
| U-NII 1 | 5 180           | 36  | MCS0             | 20.087                | 17.482               |
|         | 5 220           | 44  |                  | 20.608                | 17.482               |
|         | 5 240           | 48  |                  | 20.434                | 17.482               |
| U-NII 3 | 5 745           | 149 |                  | 20.434                | 17.482               |
|         | 5 785           | 157 |                  | 20.550                | 17.482               |
|         | 5 825           | 165 |                  | 20.550                | 17.482               |

#### Test mode: 11n\_HT40

| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | 26 dB Bandwidth (MHz) | 99 % Bandwidth (MHz) |
|---------|-----------------|-----|------------------|-----------------------|----------------------|
| U-NII 1 | 5 190           | 38  | MCS5             | 44.805                | 36.585               |
|         | 5 230           | 46  | MCS0             | 44.342                | 36.006               |
| U-NII 3 | 5 755           | 151 |                  | 43.531                | 36.006               |
|         | 5 795           | 159 |                  | 44.573                | 36.006               |

#### Test mode: 11ac\_VHT80

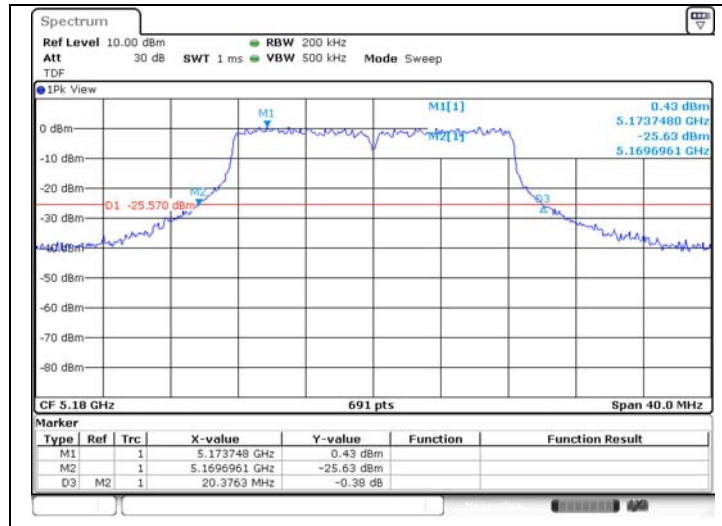
| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | 26 dB Bandwidth (MHz) | 99 % Bandwidth (MHz) |
|---------|-----------------|-----|------------------|-----------------------|----------------------|
| U-NII 1 | 5 210           | 42  | MCS5             | 87.988                | 76.411               |
| U-NII 3 | 5 775           | 155 | MCS0             | 82.663                | 75.022               |

## - Test plots

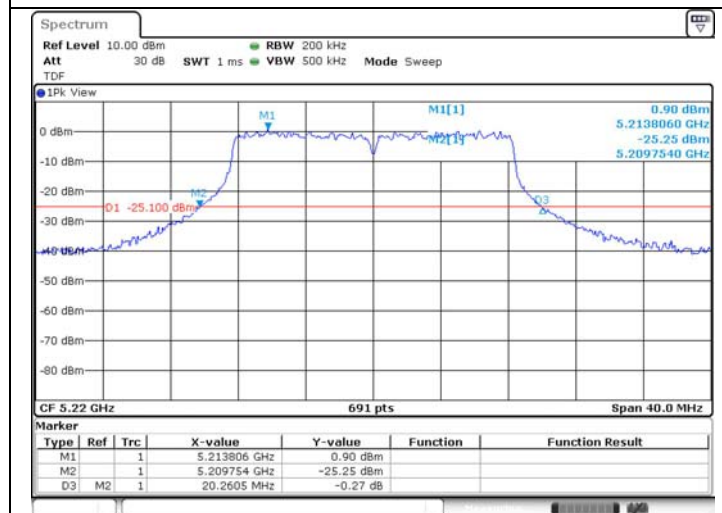
### 26 dB Bandwidth

### 802.11a (Band 1)

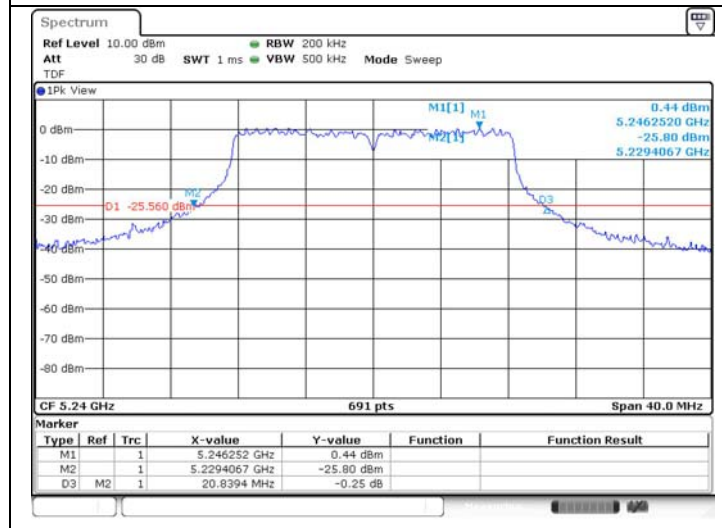
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

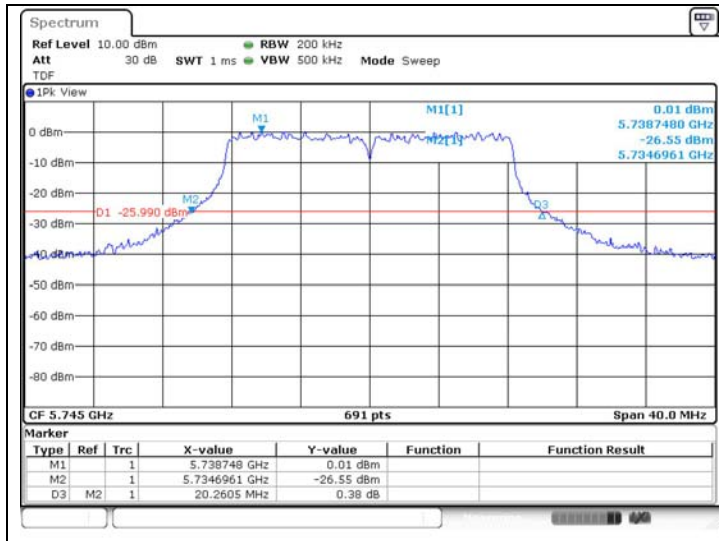


High Channel  
(5 240 MHz)

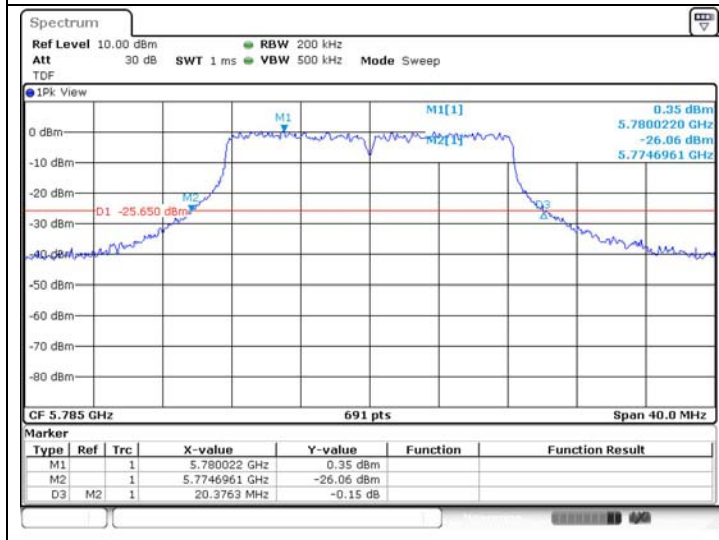


## 802.11a (Band 3)

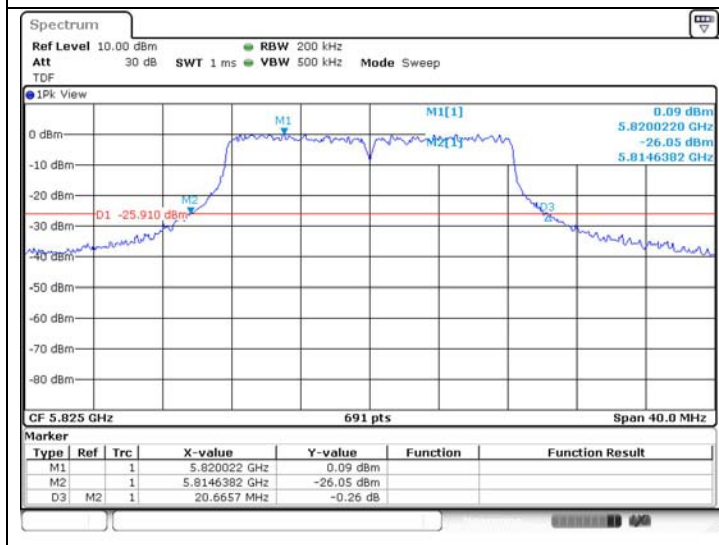
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

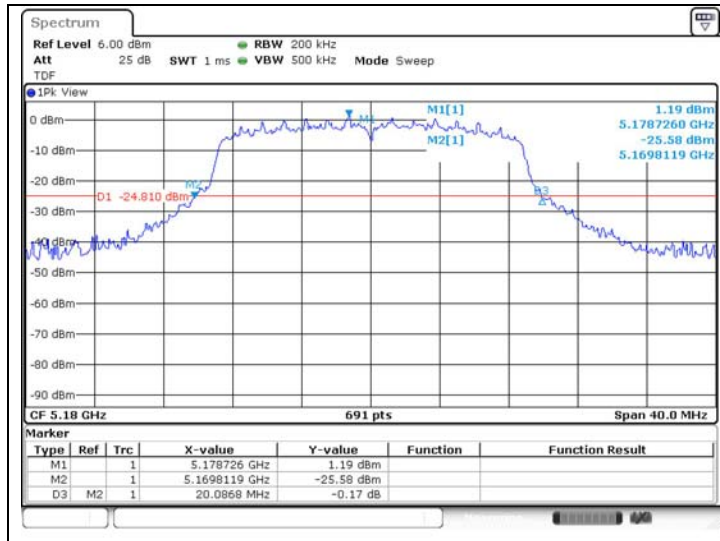


High Channel  
(5 825 MHz)

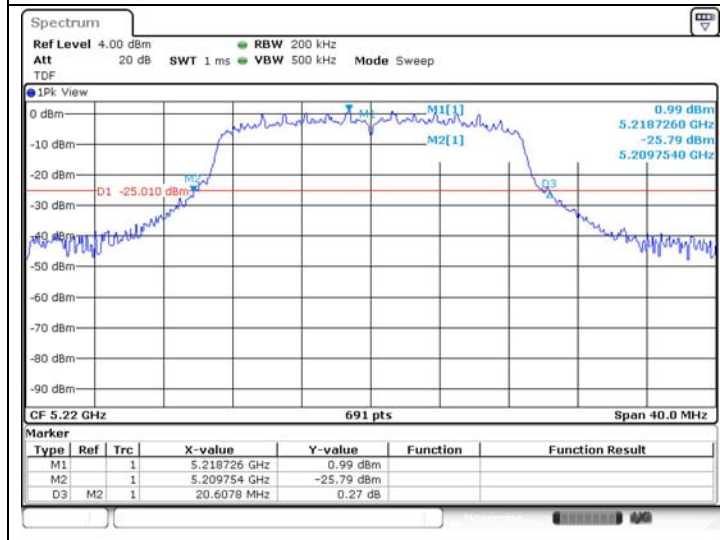


### 802.11n\_HT20 (Band 1)

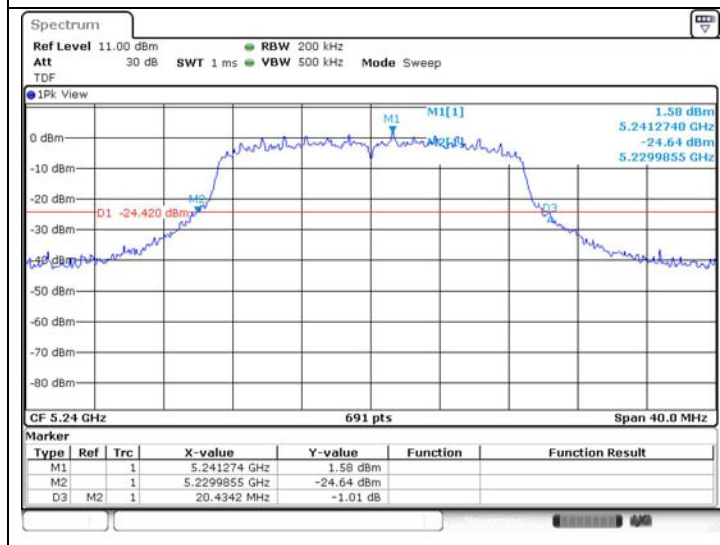
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

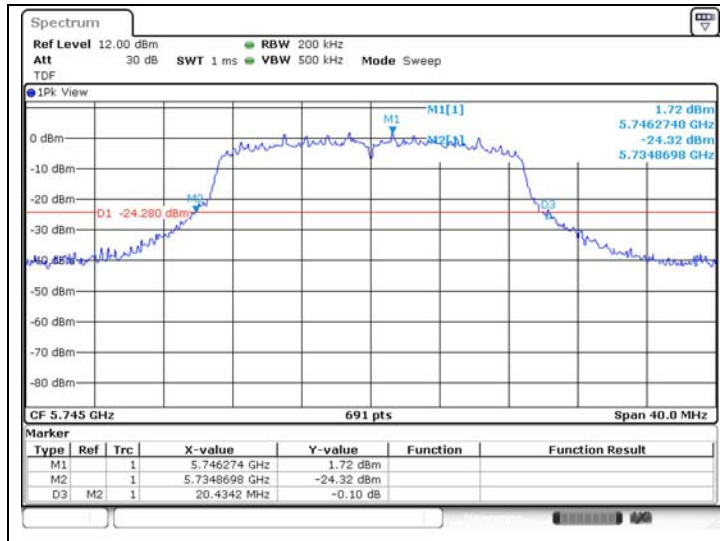


High Channel  
(5 240 MHz)

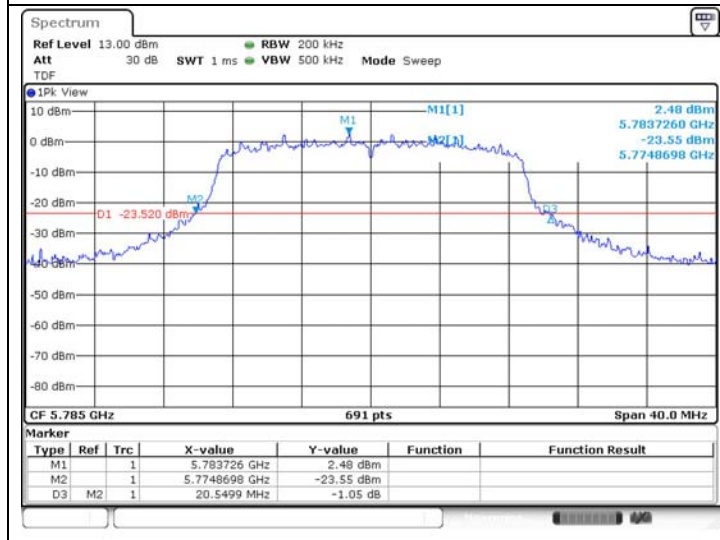


## 802.11n\_HT20 (Band 3)

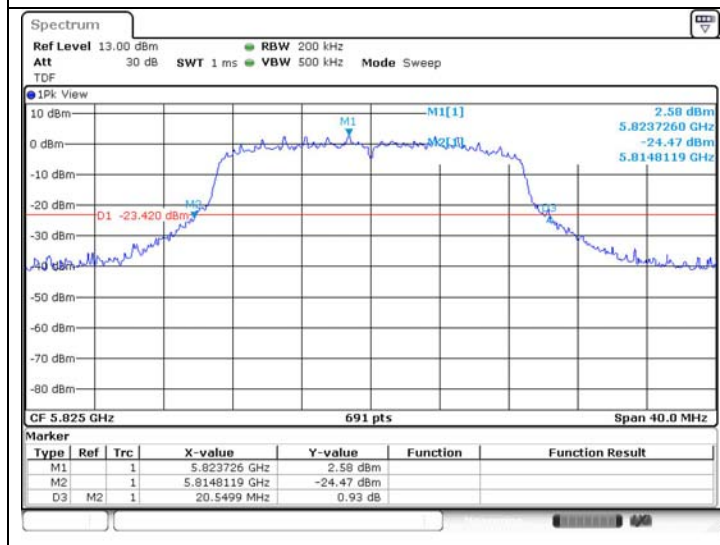
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

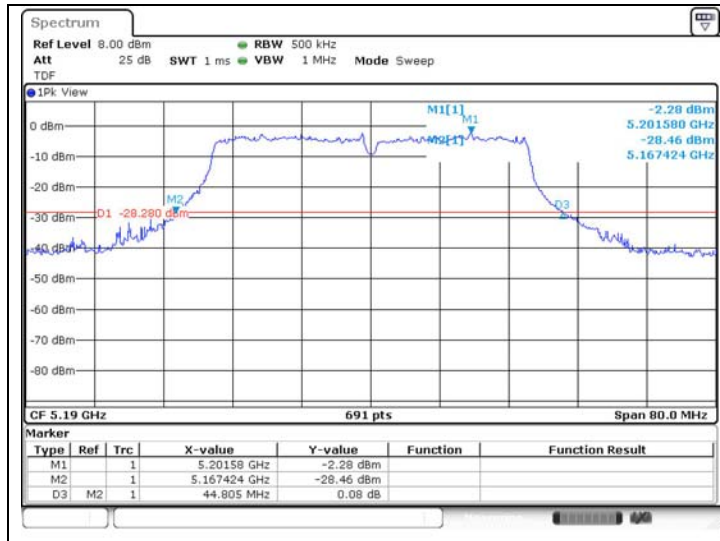


High Channel  
(5 825 MHz)

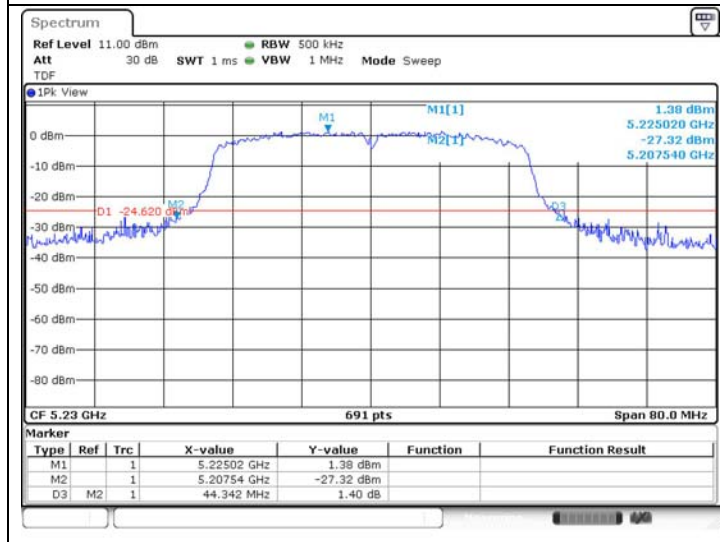


### 802.11n\_HT40 (Band 1)

Low Channel  
 (5 190 MHz)

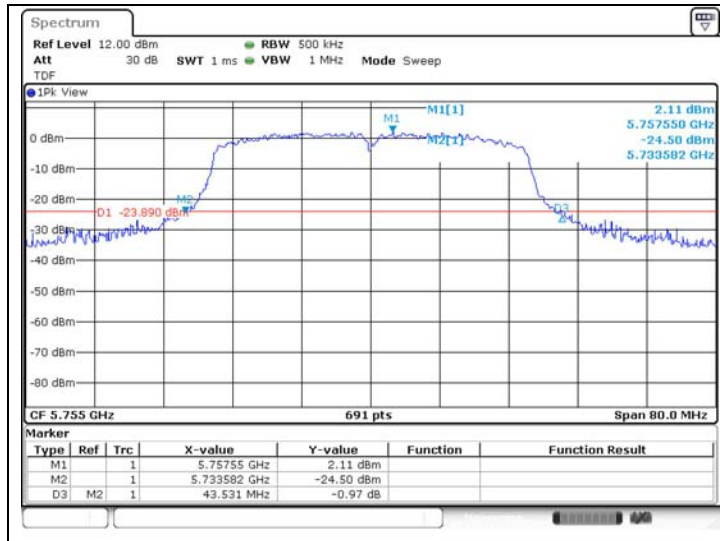


High Channel  
 (5 230 MHz)

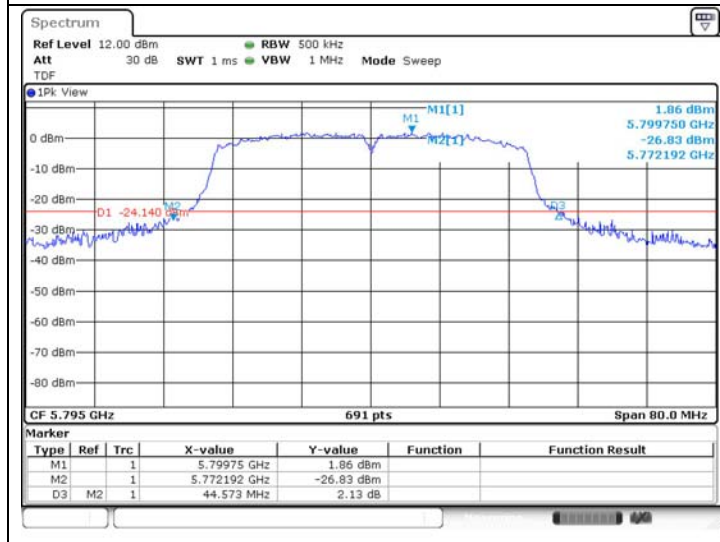


## 802.11n\_HT40 (Band 3)

Low Channel  
(5 755 MHz)

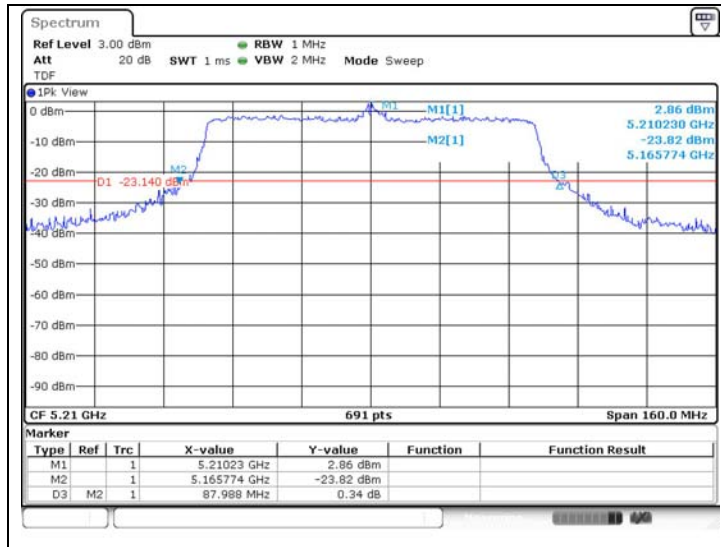


High Channel  
(5 795 MHz)



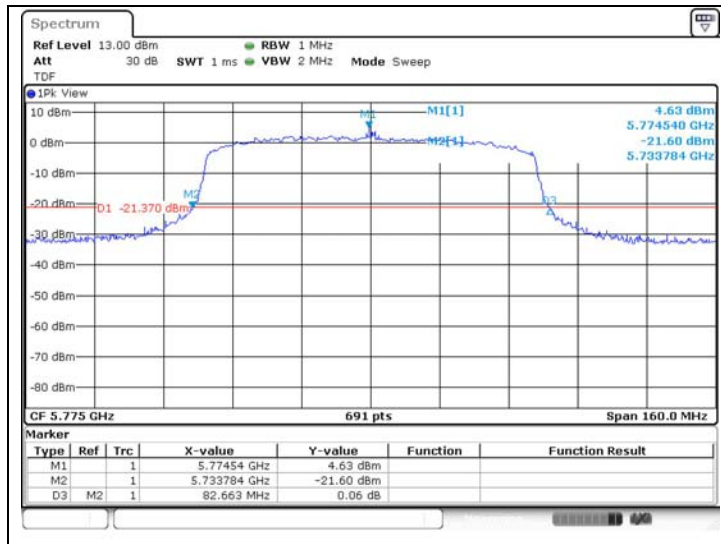
### 802.11ac\_VHT80 (Band 1)

Middle Channel  
 (5 210 MHz)



### 802.11ac\_VHT80 (Band 3)

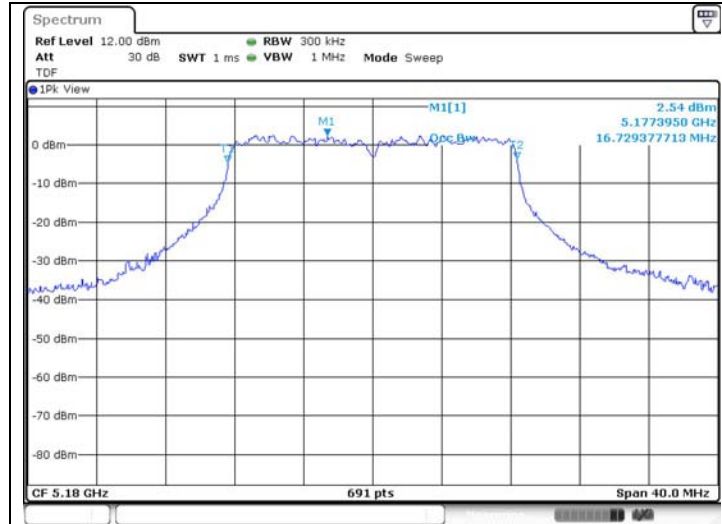
Middle Channel  
 (5 775 MHz)



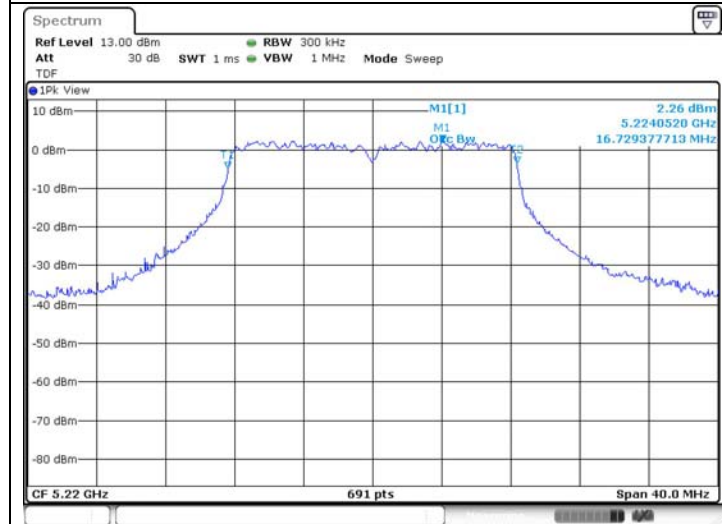
**99 % Bandwidth**

**802.11a (Band 1)**

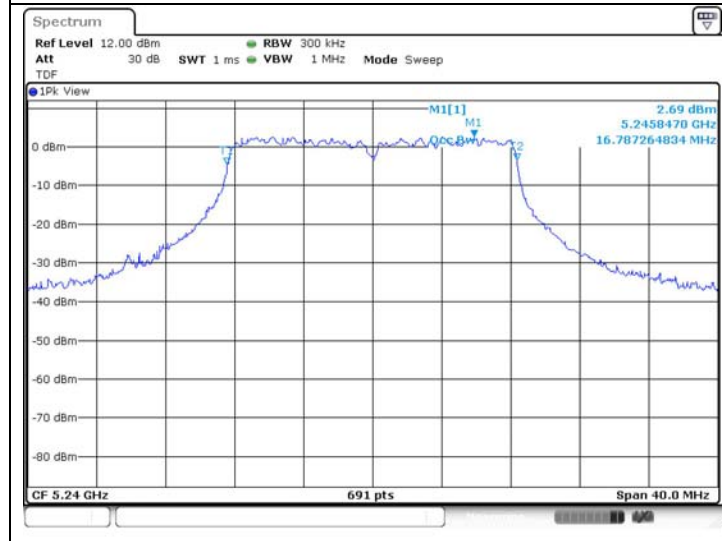
Low Channel  
 (5 180 MHz)



Middle Channel  
 (5 220 MHz)

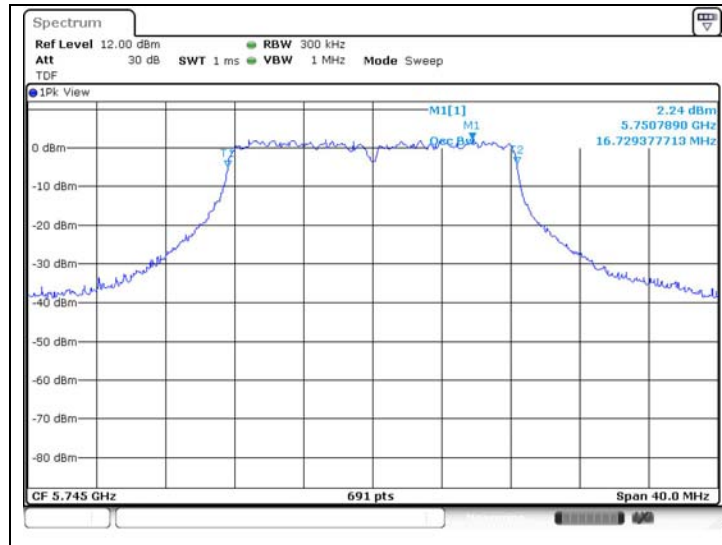


High Channel  
 (5 240 MHz)

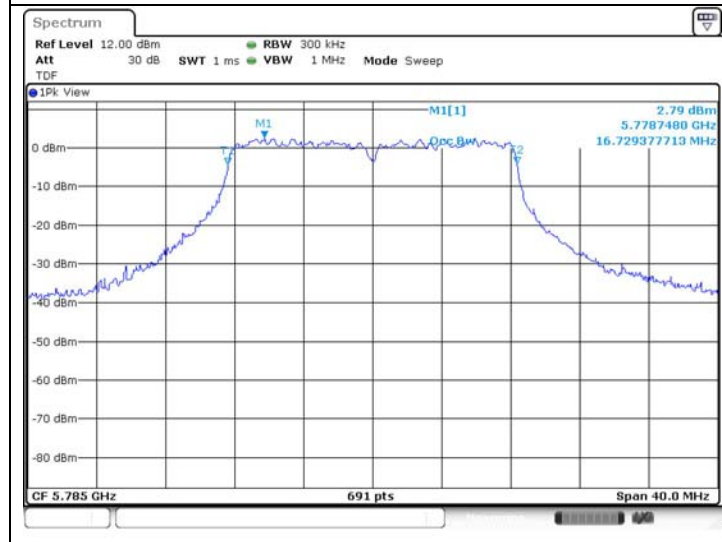


### 802.11a (Band 3)

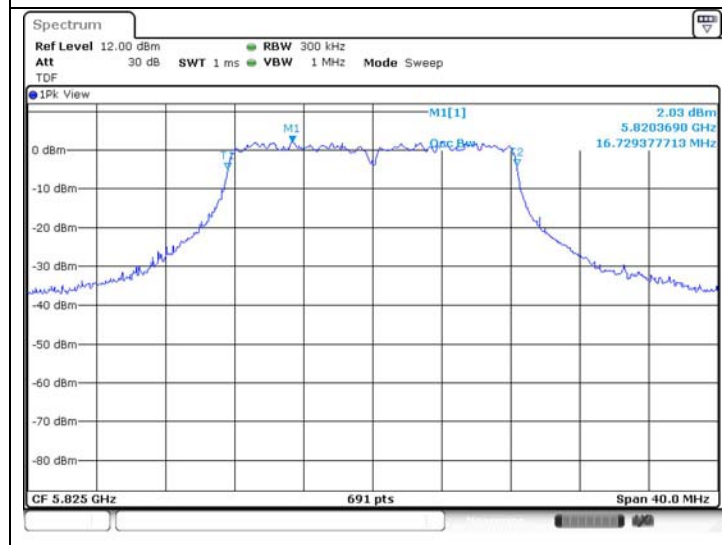
Low Channel  
(5 745 MHz)



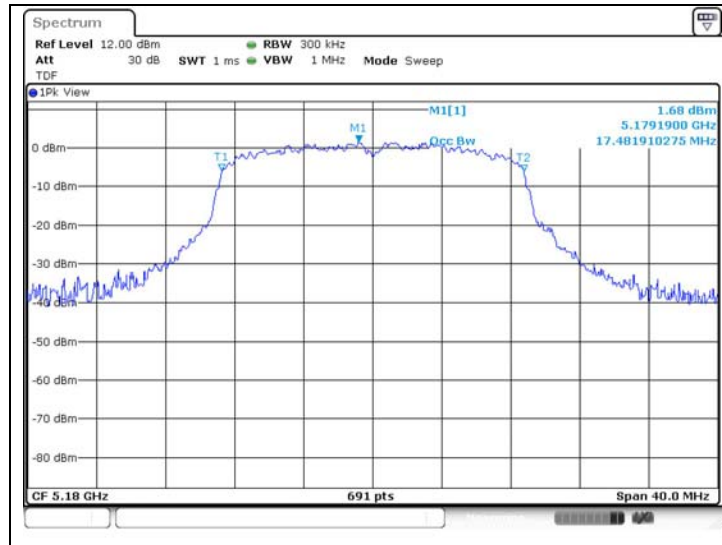
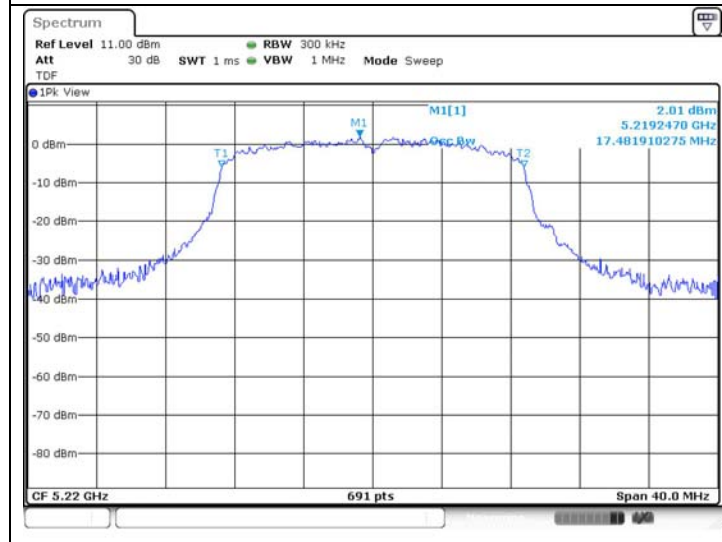
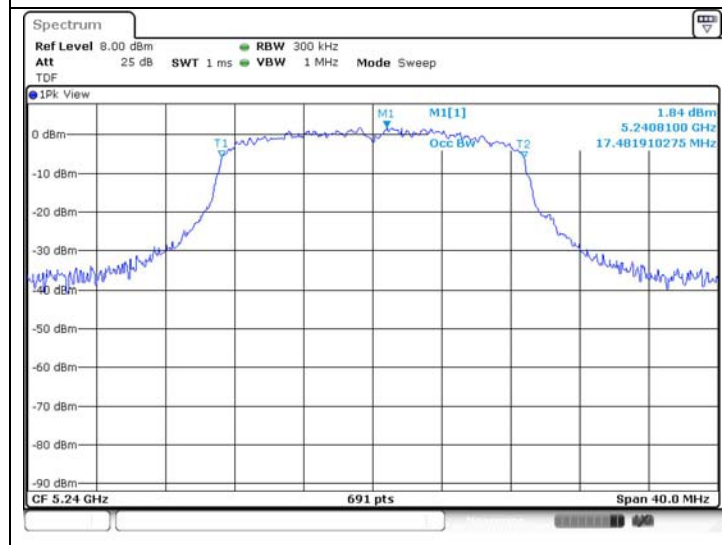
Middle Channel  
(5 785 MHz)



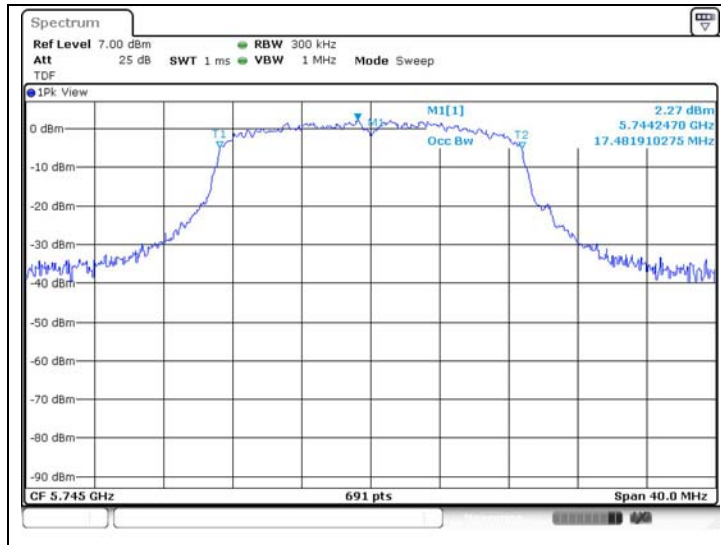
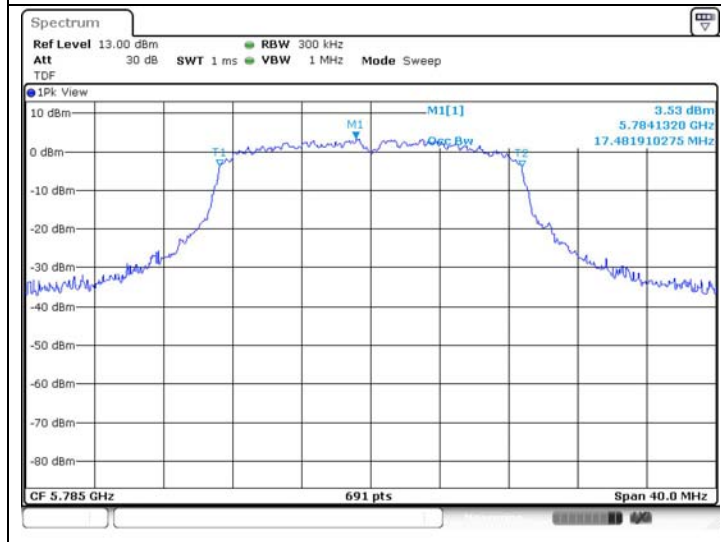
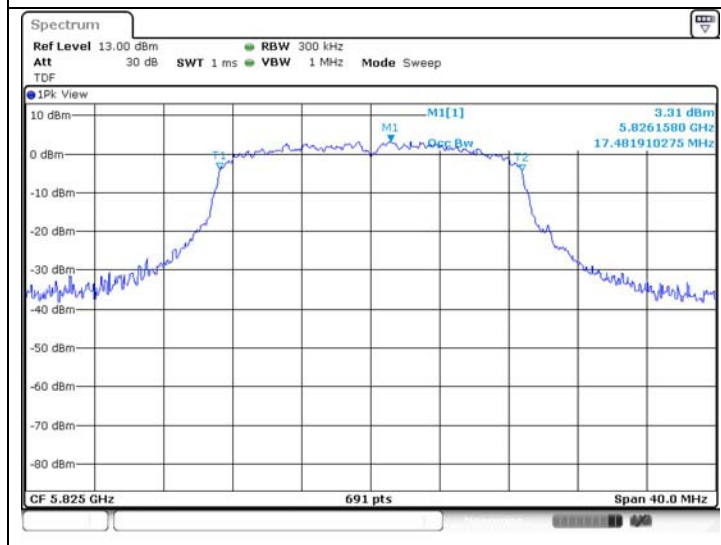
High Channel  
(5 825 MHz)



**802.11n\_HT20 (Band 1)**

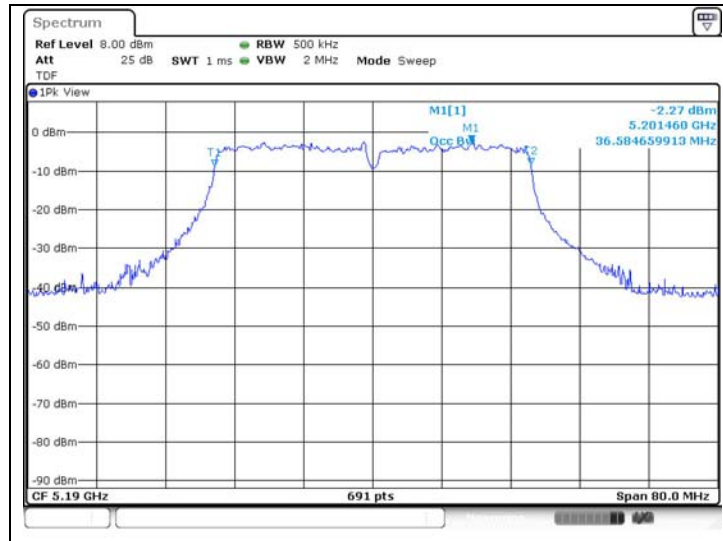
Low Channel  
(5 180 MHz)

Middle Channel  
(5 220 MHz)

High Channel  
(5 240 MHz)


**802.11n\_HT20 (Band 3)**

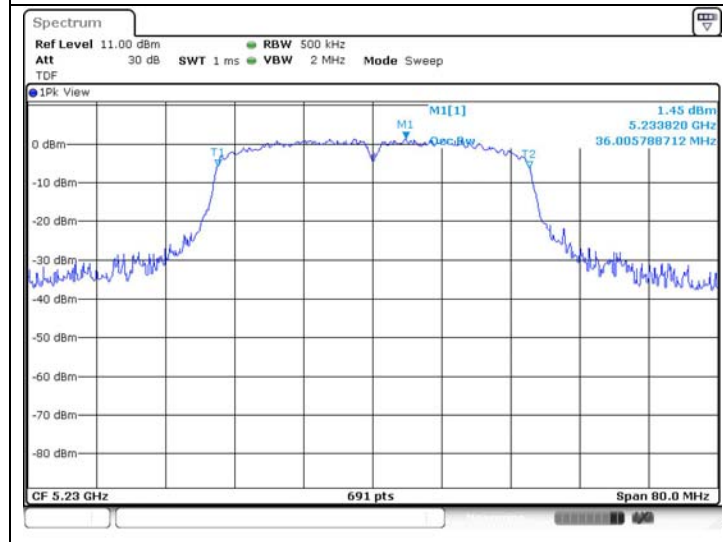
Low Channel  
(5 745 MHz)

Middle Channel  
(5 785 MHz)

High Channel  
(5 825 MHz)


### 802.11n\_HT40 (Band 1)

Low Channel  
 (5 190 MHz)

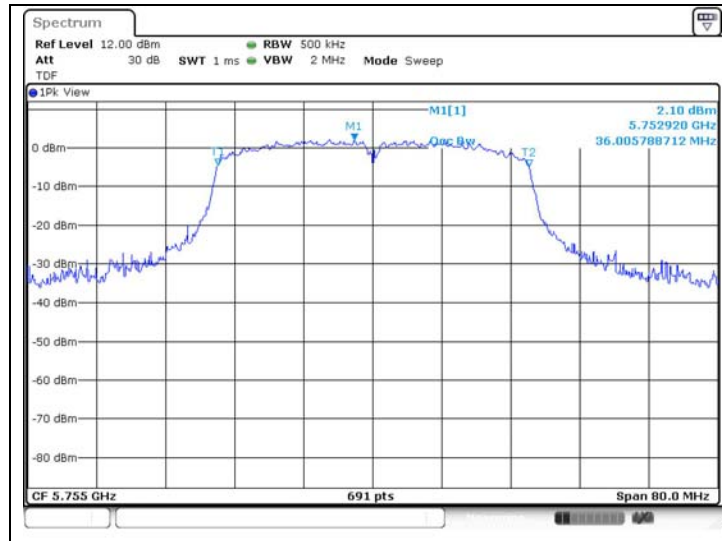


High Channel  
 (5 230 MHz)

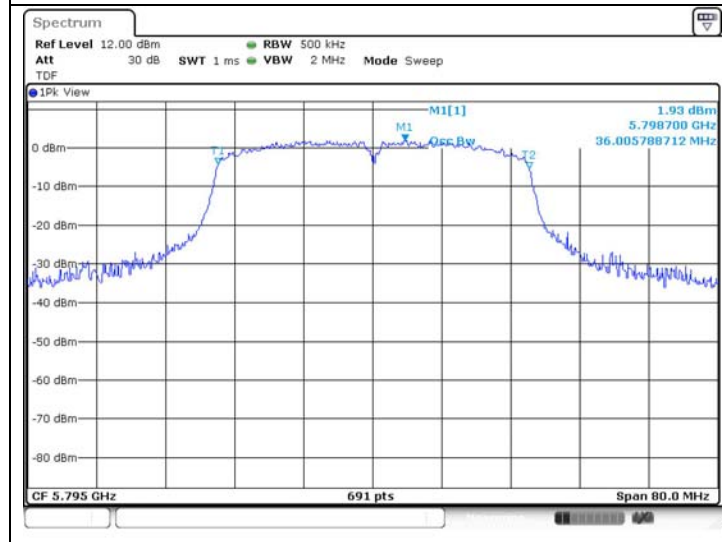


### 802.11n\_HT40 (Band 3)

Low Channel  
 (5 755 MHz)

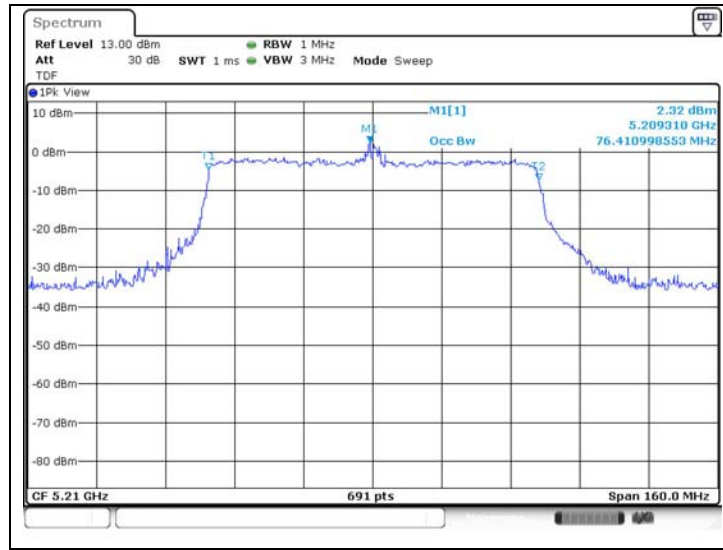


High Channel  
 (5 795 MHz)



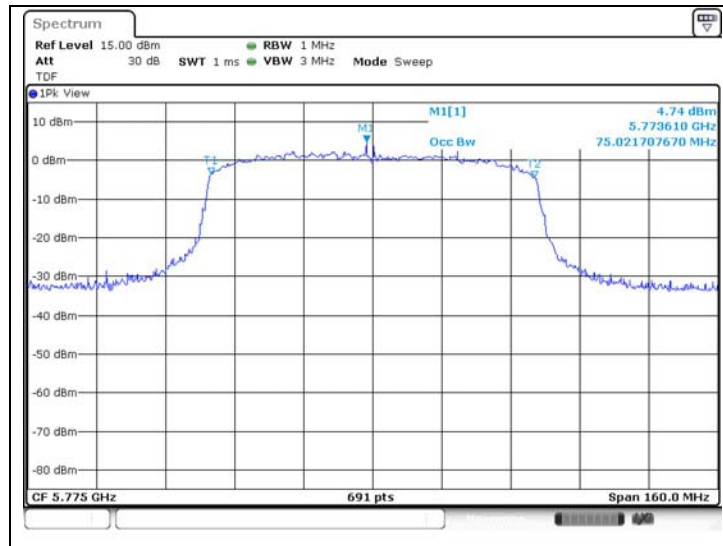
### 802.11ac\_VHT80 (Band 1)

Middle Channel  
 (5 210 MHz)



### 802.11ac\_VHT80 (Band 3)

Middle Channel  
 (5 775 MHz)



## 4. 6 dB Bandwidth

### 4.1. Test Setup



### 4.2. Limit

#### 4.2.1. FCC

According to §15.407(e), within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

#### 4.2.2. IC

According to RSS-247 Issue 2, 6.2.4.1, the minimum -6 dB Bandwidth shall be at least 500 kHz.

### 4.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

1. This measurement settings are specified in section II.C.2 of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set RBW = 100 kHz.
3. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### 4.4. Test Result

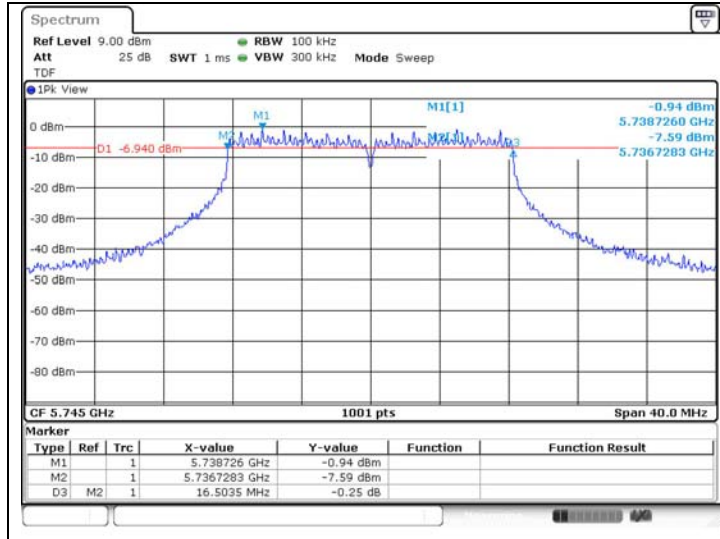
Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

| Band    | Mode       | Frequency<br>(MHz) | Ch. | Data Rate<br>(Mbps) | 6 dB Bandwidth<br>(MHz) | Minimum Bandwidth<br>(kHz) |
|---------|------------|--------------------|-----|---------------------|-------------------------|----------------------------|
| U-NII 3 | 11a        | 5 745              | 149 | 24                  | 16.504                  | 500                        |
|         |            | 5 785              | 157 |                     | 16.504                  |                            |
|         |            | 5 825              | 165 |                     | 16.504                  |                            |
|         | 11n_HT20   | 5 745              | 149 | MCS0                | 15.225                  |                            |
|         |            | 5 785              | 157 |                     | 14.106                  |                            |
|         |            | 5 825              | 165 |                     | 15.185                  |                            |
|         | 11n_HT40   | 5 755              | 151 | MCS0                | 35.165                  |                            |
|         |            | 5 795              | 159 |                     | 35.165                  |                            |
|         | 11ac_VHT80 | 5 775              | 155 | MCS0                | 72.887                  |                            |

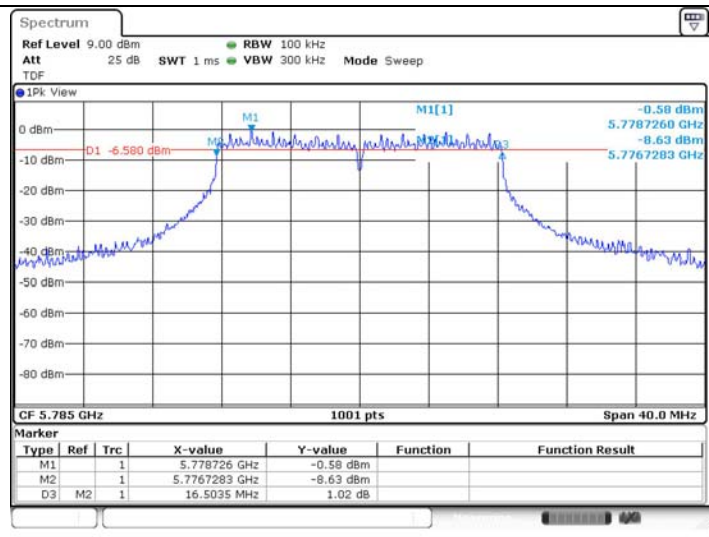
## - Test plots

### 802.11a (Band 3)

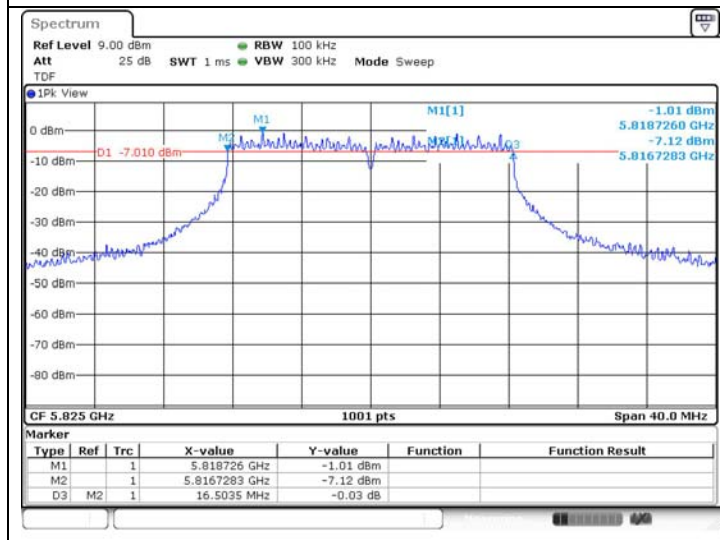
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

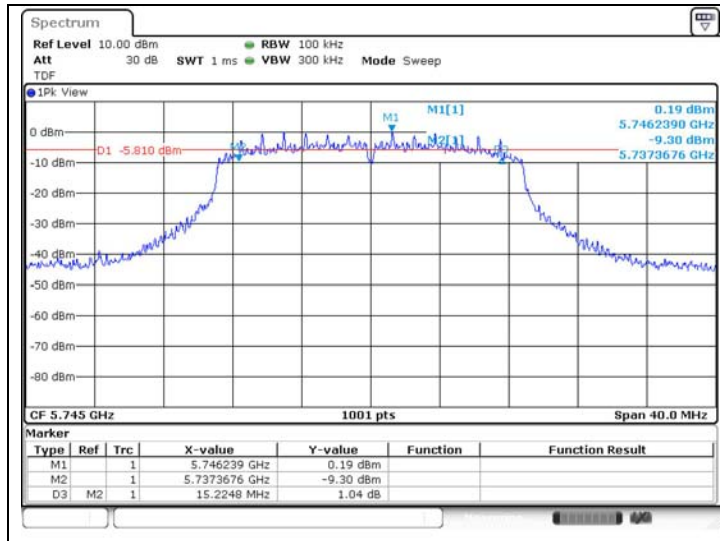


High Channel  
(5 825 MHz)

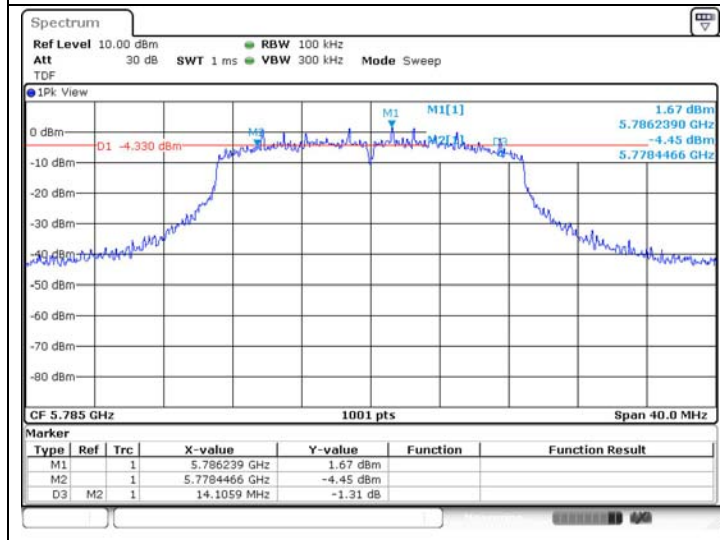


### 802.11n\_HT20 (Band 3)

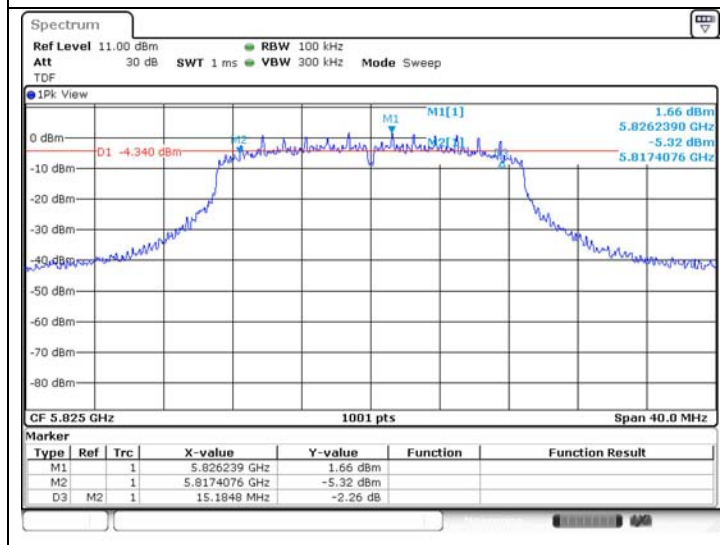
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

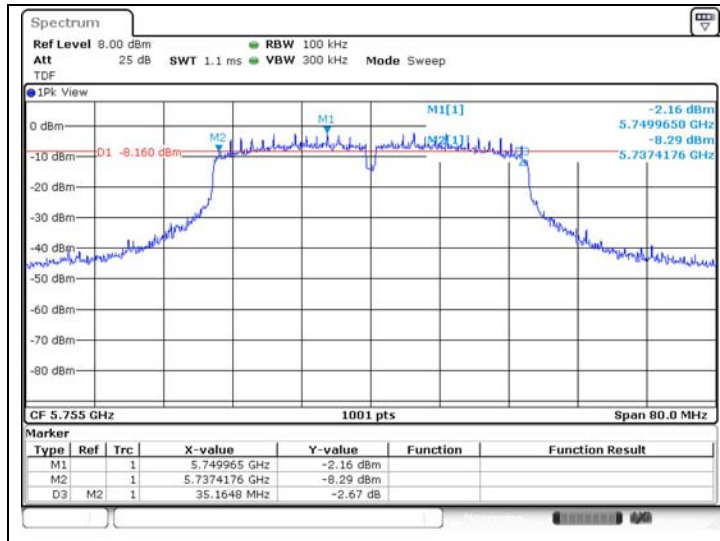


High Channel  
(5 825 MHz)

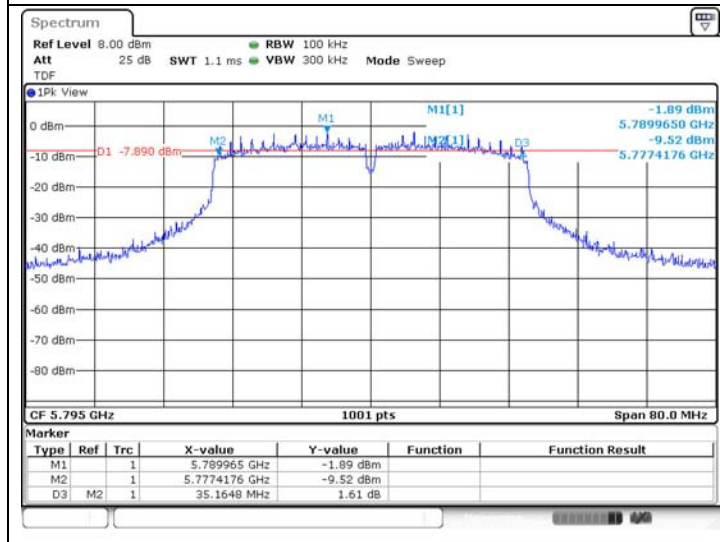


## 802.11n\_HT40 (Band 3)

Low Channel  
(5 755 MHz)

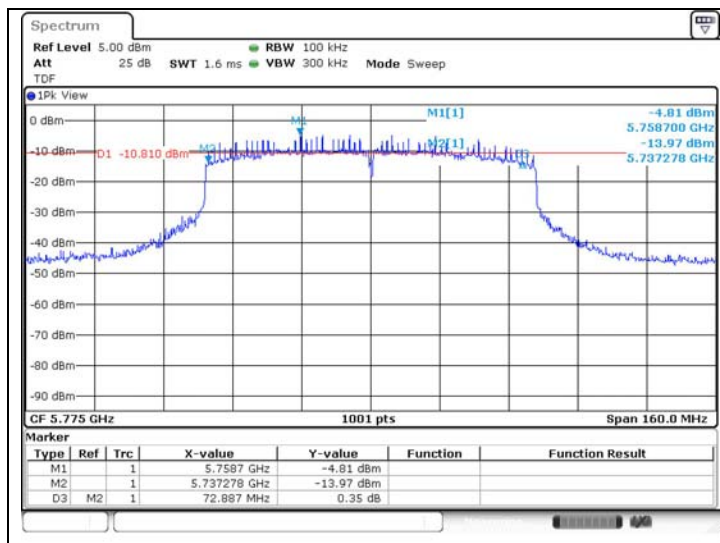


High Channel  
(5 795 MHz)



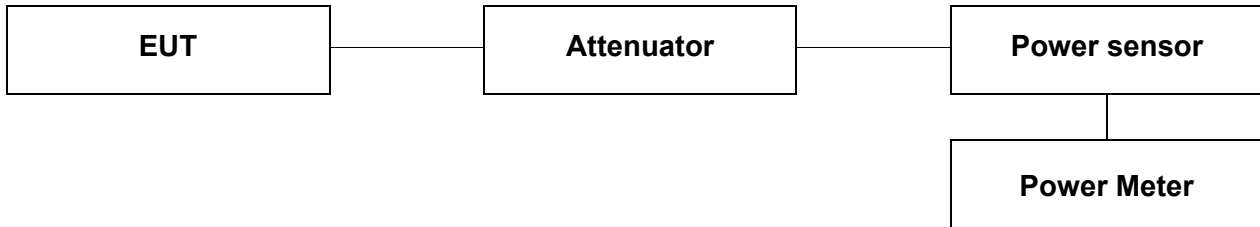
## 802.11ac\_VHT80 (Band 3)

Middle Channel  
(5 775 MHz)



## 5. Maximum Conducted Output Power

### 5.1. Test Setup



### 5.2. Limit

#### 5.2.1. FCC

According to 15.407(a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dB i. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i 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 dB i.

According to 15.407(a)(3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dB m in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dB i 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 dB i. However, fixed point-to point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dB i without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

**5.2.2. IC**

According to RSS-247 Issue 2,

**6.2.1.1 Frequency band 5 150-5 250 MHz**

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or  $1.76 + 10 \log_{10} B$ , dB m, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

For other devices, the maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dB m, whichever power is less. B is the 99 % emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dB m in any 1.0 MHz band.

**6.2.4.1 Frequency band 5 725-5 850 MHz**

For equipment operating in the band 5 725-5 850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz. The maximum conducted output power shall not exceed 1 W. The output power spectral density shall not exceed 30 dB m in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the output power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dB i without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint<sup>3</sup> systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

### 5.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

1. This measurement settings are specified in section II.E.3.a of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied:
  - The EUT is configured to transmit continuously or to transmit with a consistent duty cycle.
  - At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
  - The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
3. If the transmitter does not transmit continuously, measure the duty cycle,  $x$ , of the transmitter output signal as described in section II.B.
4. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
5. Adjust the measurement in dBm by adding  $10 \log (1/x)$  where  $x$  is the duty cycle (e.g.,  $10 \log (1/0.25)$  if the duty cycle is 25 %).

## 5.4. Test Result

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

### Test mode: 11a

| Band    | Frequency (MHz) | Data Rate (Mbps) | Average Power (dB m) | Duty Cycle Correction Factor (dB) | Average Power Result (dB m) |
|---------|-----------------|------------------|----------------------|-----------------------------------|-----------------------------|
| U-NII 1 | 5 180           | 24               | 10.06                | 0.83                              | 10.89                       |
|         | 5 220           |                  | 9.77                 |                                   | 10.60                       |
|         | 5 240           |                  | 10.11                |                                   | 10.94                       |
| U-NII 3 | 5 745           |                  | 9.47                 |                                   | 10.30                       |
|         | 5 785           |                  | 9.64                 |                                   | 10.47                       |
|         | 5 825           |                  | 9.37                 |                                   | 10.20                       |

| Band    | Frequency (MHz) | Data Rate (Mbps) | Average Power Result (dB m) | Antenna Gain (dB i) | E.I.R.P. (dB m) |
|---------|-----------------|------------------|-----------------------------|---------------------|-----------------|
| U-NII 1 | 5 180           | 24               | 10.89                       | 2.49                | 13.38           |
|         | 5 220           |                  | 10.60                       |                     | 13.09           |
|         | 5 240           |                  | 10.94                       |                     | 13.43           |

| Band    | FCC Limit          |                       |                   |                     |                        |                 |
|---------|--------------------|-----------------------|-------------------|---------------------|------------------------|-----------------|
|         | Frequency<br>(MHz) | Fixed Limit<br>(dB m) | 26 dB BW<br>(MHz) | 11+10LogB<br>(dB m) | Antenna Gain<br>(dB i) | Limit<br>(dB m) |
| U-NII 1 | 5 180              | 23.98                 |                   |                     | 2.49                   | 23.98           |
|         | 5 220              |                       |                   |                     |                        |                 |
|         | 5 240              |                       |                   |                     |                        |                 |
| U-NII 3 | 5 745              | 30                    |                   |                     | 2.74                   | 30              |
|         | 5 785              |                       |                   |                     |                        |                 |
|         | 5 825              |                       |                   |                     |                        |                 |

| Band    | IC Limit           |                       |                  |                       |                        |                 |
|---------|--------------------|-----------------------|------------------|-----------------------|------------------------|-----------------|
|         | Frequency<br>(MHz) | Fixed Limit<br>(dB m) | 99 % BW<br>(MHz) | 1.76+10LogB<br>(dB m) | Antenna Gain<br>(dB i) | Limit<br>(dB m) |
| U-NII 1 | 5 180              | 14.77                 | 16.729           | 13.99                 | 2.49                   | 13.99           |
|         | 5 220              |                       | 16.729           | 13.99                 |                        | 13.99           |
|         | 5 240              |                       | 16.787           | 14.01                 |                        | 14.01           |

| Band    | IC Limit           |                       |                  |                     |                        |                 |
|---------|--------------------|-----------------------|------------------|---------------------|------------------------|-----------------|
|         | Frequency<br>(MHz) | Fixed Limit<br>(dB m) | 99 % BW<br>(MHz) | 11+10LogB<br>(dB m) | Antenna Gain<br>(dB i) | Limit<br>(dB m) |
| U-NII 3 | 5 745              | 30                    |                  |                     | 2.74                   | 30              |
|         | 5 785              |                       |                  |                     |                        |                 |
|         | 5 825              |                       |                  |                     |                        |                 |

### Remark;

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)
2. E.I.R.P. (dB m) = Average Power Result (dB m) + Antenna Gain (dB i)

**Test mode: 11n HT20**

| Band    | Frequency (MHz) | Data Rate (Mbps) | Average Power (dB m) | Duty Cycle Correction Factor (dB) | Average Power Result (dB m) |
|---------|-----------------|------------------|----------------------|-----------------------------------|-----------------------------|
| U-NII 1 | 5 180           | MCS0             | 9.65                 | 0.22                              | 9.87                        |
|         | 5 220           |                  | 9.48                 |                                   | 9.70                        |
|         | 5 240           |                  | 9.72                 |                                   | 9.94                        |
| U-NII 3 | 5 745           |                  | 10.33                |                                   | 10.55                       |
|         | 5 785           |                  | 10.65                |                                   | 10.87                       |
|         | 5 825           |                  | 10.25                |                                   | 10.47                       |

| Band    | Frequency (MHz) | Data Rate (Mbps) | Average Power Result (dB m) | Antenna Gain (dB i) | E.I.R.P. (dB m) |
|---------|-----------------|------------------|-----------------------------|---------------------|-----------------|
| U-NII 1 | 5 180           | MCS0             | 9.87                        | 2.49                | 12.36           |
|         | 5 220           |                  | 9.70                        |                     | 12.19           |
|         | 5 240           |                  | 9.94                        |                     | 12.43           |

| Band    | FCC Limit          |                       |                   |                     |                        |                 |
|---------|--------------------|-----------------------|-------------------|---------------------|------------------------|-----------------|
|         | Frequency<br>(MHz) | Fixed Limit<br>(dB m) | 26 dB BW<br>(MHz) | 11+10LogB<br>(dB m) | Antenna Gain<br>(dB i) | Limit<br>(dB m) |
| U-NII 1 | 5 180              | 23.98                 |                   |                     | 2.49                   | 23.98           |
|         | 5 220              |                       |                   |                     |                        |                 |
|         | 5 240              |                       |                   |                     |                        |                 |
| U-NII 3 | 5 745              | 30                    |                   |                     | 2.74                   | 30              |
|         | 5 785              |                       |                   |                     |                        |                 |
|         | 5 825              |                       |                   |                     |                        |                 |

| Band    | IC Limit           |                       |                  |                       |                        |                 |
|---------|--------------------|-----------------------|------------------|-----------------------|------------------------|-----------------|
|         | Frequency<br>(MHz) | Fixed Limit<br>(dB m) | 99 % BW<br>(MHz) | 1.76+10LogB<br>(dB m) | Antenna Gain<br>(dB i) | Limit<br>(dB m) |
| U-NII 1 | 5 180              | 14.77                 | 17.482           | 14.19                 | 2.49                   | 14.19           |
|         | 5 220              |                       | 17.482           | 14.19                 |                        | 14.19           |
|         | 5 240              |                       | 17.482           | 14.19                 |                        | 14.19           |

| Band    | IC Limit           |                       |                  |                     |                        |                 |
|---------|--------------------|-----------------------|------------------|---------------------|------------------------|-----------------|
|         | Frequency<br>(MHz) | Fixed Limit<br>(dB m) | 99 % BW<br>(MHz) | 11+10LogB<br>(dB m) | Antenna Gain<br>(dB i) | Limit<br>(dB m) |
| U-NII 3 | 5 745              | 30                    |                  |                     | 2.74                   | 30              |
|         | 5 785              |                       |                  |                     |                        |                 |
|         | 5 825              |                       |                  |                     |                        |                 |

**Remark;**

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)
2. E.I.R.P. (dB m) = Average Power Result (dB m) + Antenna Gain (dB i)

**Test mode: 11n HT40**

| Band    | Frequency (MHz) | Data Rate (Mbps) | Average Power (dB m) | Duty Cycle Correction Factor (dB) | Average Power Result (dB m) |
|---------|-----------------|------------------|----------------------|-----------------------------------|-----------------------------|
| U-NII 1 | 5 190           | MCS5             | 4.24                 | 3.01                              | 7.25                        |
|         | 5 230           | MCS0             | 9.95                 | 0.48                              | 10.43                       |
| U-NII 3 | 5 755           |                  | 9.81                 |                                   | 10.29                       |
|         | 5 795           |                  | 9.97                 |                                   | 10.45                       |

| Band    | Frequency (MHz) | Data Rate (Mbps) | Average Power Result (dB m) | Antenna Gain (dB i) | E.I.R.P. (dB m) |
|---------|-----------------|------------------|-----------------------------|---------------------|-----------------|
| U-NII 1 | 5 190           | MCS5             | 7.25                        | 2.49                | 9.74            |
|         | 5 230           | MCS0             | 10.43                       |                     | 12.92           |

| Band    | FCC Limit       |                    |                |                  |                     |              |
|---------|-----------------|--------------------|----------------|------------------|---------------------|--------------|
|         | Frequency (MHz) | Fixed Limit (dB m) | 26 dB BW (MHz) | 11+10LogB (dB m) | Antenna Gain (dB i) | Limit (dB m) |
| U-NII 1 | 5 190           | 23.98              |                |                  | 2.49                | 23.98        |
|         | 5 230           |                    |                |                  |                     |              |
| U-NII 3 | 5 755           | 30                 |                |                  | 2.74                | 30           |
|         | 5 795           |                    |                |                  |                     |              |

| Band    | IC Limit        |                    |               |                    |                     |              |
|---------|-----------------|--------------------|---------------|--------------------|---------------------|--------------|
|         | Frequency (MHz) | Fixed Limit (dB m) | 99 % BW (MHz) | 1.76+10LogB (dB m) | Antenna Gain (dB i) | Limit (dB m) |
| U-NII 1 | 5 190           | 14.77              | 36.585        | 17.39              | 2.49                | 14.77        |
|         | 5 230           |                    | 36.006        | 17.32              |                     |              |

| Band    | IC Limit        |                    |               |                  |                     |              |
|---------|-----------------|--------------------|---------------|------------------|---------------------|--------------|
|         | Frequency (MHz) | Fixed Limit (dB m) | 99 % BW (MHz) | 11+10LogB (dB m) | Antenna Gain (dB i) | Limit (dB m) |
| U-NII 3 | 5 755           | 30                 |               |                  | 2.74                | 30           |
|         | 5 795           |                    |               |                  |                     |              |

**Remark;**

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)
2. E.I.R.P. (dB m) = Average Power Result (dB m) + Antenna Gain (dB i)

**Test mode: 11ac\_VHT80**

| Band    | Frequency (MHz) | Data Rate (Mbps) | Average Power (dB m) | Duty Cycle Correction Factor (dB) | Average Power Result (dB m) |
|---------|-----------------|------------------|----------------------|-----------------------------------|-----------------------------|
| U-NII 1 | 5 210           | MCS5             | 4.28                 | 3.01                              | 7.29                        |
| U-NII 3 | 5 775           | MCS0             | 8.98                 | 0.82                              | 9.80                        |

| Band    | Frequency (MHz) | Data Rate (Mbps) | Average Power Result (dB m) | Antenna Gain (dB i) | E.I.R.P. (dB m) |
|---------|-----------------|------------------|-----------------------------|---------------------|-----------------|
| U-NII 1 | 5 210           | MCS5             | 7.29                        | 2.49                | 9.78            |

| Band    | FCC Limit       |                    |                |                  |                     |
|---------|-----------------|--------------------|----------------|------------------|---------------------|
|         | Frequency (MHz) | Fixed Limit (dB m) | 26 dB BW (MHz) | 11+10LogB (dB m) | Antenna Gain (dB i) |
| U-NII 1 | 5 210           | 23.98              |                |                  | 2.49                |
| U-NII 3 | 5 775           | 30                 |                |                  | 2.74                |

| Band    | IC Limit        |                    |               |                    |                     |
|---------|-----------------|--------------------|---------------|--------------------|---------------------|
|         | Frequency (MHz) | Fixed Limit (dB m) | 99 % BW (MHz) | 1.76+10LogB (dB m) | Antenna Gain (dB i) |
| U-NII 1 | 5 210           | 14.77              | 76.411        | 20.59              | 2.49                |

| Band    | IC Limit        |                    |               |                  |                     |
|---------|-----------------|--------------------|---------------|------------------|---------------------|
|         | Frequency (MHz) | Fixed Limit (dB m) | 99 % BW (MHz) | 11+10LogB (dB m) | Antenna Gain (dB i) |
| U-NII 3 | 5 775           | 30                 |               |                  | 2.74                |

**Remark;**

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)
2. E.I.R.P. (dB m) = Average Power Result (dB m) + Antenna Gain (dB i)

## 6. Peak Power Spectral Density

### 6.1. Test Setup



### 6.2. Limit

#### 6.2.1. FCC

According to 15.407(a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. 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.

According to 15.407(a)(3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple colocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

**6.2.2. IC**

According to RSS-247 Issue 2,

**6.2.1.1 Frequency band 5 150-5 250 MHz**

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or  $1.76 + 10 \log_{10} B$ , dB m, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

For other devices, the maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dB m, whichever power is less. B is the 99 % emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dB m in any 1.0 MHz band.

**6.2.4.1 Frequency band 5 725-5 850 MHz**

For equipment operating in the band 5 725-5 850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz. The maximum conducted output power shall not exceed 1 W. The output power spectral density shall not exceed 30 dB m in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the output power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dB i without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint<sup>3</sup> systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

### 6.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

1. This measurement settings are specified in section II.F of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
3. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
4. Make the following adjustments to the peak value of the spectrum, if applicable:
  - a) **If Method SA-2 or SA-2 Alternative was used, add  $10 \log(1/x)$ , where  $x$  is the duty cycle, to the peak of the spectrum.**
  - b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
5. The result is the Maximum PSD over 1 MHz reference bandwidth.
6. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (*i.e.*, 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth ( $< 1$  MHz, or  $< 500$  kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
  - a) Set  $RBW \geq 1/T$ , where  $T$  is defined in section II.B.1.a).
  - b) Set  $VBW \geq 3$  RBW.
  - c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10 \log(500 \text{ kHz}/RBW)$  to the measured result, whereas  $RBW (< 500 \text{ kHz})$  is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
  - d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10 \log(1 \text{ MHz}/RBW)$  to the measured result, whereas  $RBW (< 1 \text{ MHz})$  is the reduced resolution bandwidth of spectrum analyzer set during measurement.
  - e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

## 6.4. Test Result

Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

### Test mode: 11a

| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | Measured PPSP (dB m) | Duty Cycle Correction Factor (dB) | Final PPSP (dB m) | Limit (dB m/1 MHz)   |
|---------|-----------------|-----|------------------|----------------------|-----------------------------------|-------------------|----------------------|
| U-NII 1 | 5 180           | 36  | 24               | -0.74                | 0.83                              | 0.09              | 11                   |
|         | 5 220           | 44  |                  | -1.42                |                                   | -0.59             |                      |
|         | 5 240           | 48  |                  | -1.10                |                                   | -0.27             |                      |
| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | Measured PPSP (dB m) | Duty Cycle Correction Factor (dB) | Final PPSP (dB m) | Limit (dB m/500 kHz) |
| U-NII 3 | 5 745           | 149 | 24               | -4.21                | 0.83                              | -3.38             | 30                   |
|         | 5 785           | 157 |                  | -4.01                |                                   | -3.18             |                      |
|         | 5 825           | 165 |                  | -4.58                |                                   | -3.75             |                      |

| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | Final PPSP (dB m) | Antenna Gain (dB i) | E.I.R.P. PPSP (dB m) | IC Limit (dB m/1 MHz) |
|---------|-----------------|-----|------------------|-------------------|---------------------|----------------------|-----------------------|
| U-NII 1 | 5 180           | 36  | 24               | 0.09              | 2.49                | 2.58                 | 10                    |
|         | 5 220           | 44  |                  | -0.59             |                     | 1.90                 |                       |
|         | 5 240           | 48  |                  | -0.27             |                     | 2.22                 |                       |

### Remark;

- Final PPSP (dB m) = Measured PPSP (dB m) + Duty Cycle Correction Factor (dB)
- E.I.R.P. PPSP (dB m) = Final PPSP (dB m) + Antenna Gain (dB i)

**Test mode: 11n\_HT20**

| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | Measured PPSD (dB m) | Duty Cycle Correction Factor (dB) | Final PPSD (dB m) | Limit (dB m/1 MHz)   |
|---------|-----------------|-----|------------------|----------------------|-----------------------------------|-------------------|----------------------|
| U-NII 1 | 5 180           | 36  | MCS0             | -1.73                | 0.22                              | -1.51             | 11                   |
|         | 5 220           | 44  |                  | -1.92                |                                   | -1.70             |                      |
|         | 5 240           | 48  |                  | -1.74                |                                   | -1.52             |                      |
| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | Measured PPSD (dB m) | Duty Cycle Correction Factor (dB) | Final PPSD (dB m) | Limit (dB m/500 kHz) |
| U-NII 3 | 5 745           | 149 | MCS0             | -3.27                | 0.22                              | -3.05             | 30                   |
|         | 5 785           | 157 |                  | -3.52                |                                   | -3.30             |                      |
|         | 5 825           | 165 |                  | -3.26                |                                   | -3.04             |                      |

| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | Final PPSD (dB m) | Antenna Gain (dB i) | E.I.R.P. PPSD (dB m) | IC Limit (dB m/1 MHz) |
|---------|-----------------|-----|------------------|-------------------|---------------------|----------------------|-----------------------|
| U-NII 1 | 5 180           | 36  | MCS0             | -1.51             | 2.49                | 0.98                 | 10                    |
|         | 5 220           | 44  |                  | -1.70             |                     | 0.79                 |                       |
|         | 5 240           | 48  |                  | -1.52             |                     | 0.97                 |                       |

**Remark;**

- Final PPSD (dB m) = Measured PPSD (dB m) + Duty Cycle Correction Factor (dB)
- E.I.R.P. PPSD (dB m) = Final PPSD (dB m) + Antenna Gain (dB i)

**Test mode: 11n\_HT40**

| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | Measured PPSD (dB m) | Duty Cycle Correction Factor (dB) | Final PPSD (dB m) | Limit (dB m/1 MHz)   |
|---------|-----------------|-----|------------------|----------------------|-----------------------------------|-------------------|----------------------|
| U-NII 1 | 5 190           | 38  | MCS5             | -9.73                | 3.01                              | -6.72             | 11                   |
|         | 5 230           | 46  | MCS0             | -3.95                | 0.48                              | -3.47             |                      |
| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | Measured PPSD (dB m) | Duty Cycle Correction Factor (dB) | Final PPSD (dB m) | Limit (dB m/500 kHz) |
| U-NII 3 | 5 755           | 151 | MCS0             | -6.98                | 0.48                              | -6.50             | 30                   |
|         | 5 795           | 159 |                  | -6.83                |                                   | -6.35             |                      |

| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | Final PPSD (dB m) | Antenna Gain (dB i) | E.I.R.P. PPSD (dB m) | IC Limit (dB m/1 MHz) |
|---------|-----------------|-----|------------------|-------------------|---------------------|----------------------|-----------------------|
| U-NII 1 | 5 190           | 38  | MCS5             | -6.72             | 2.49                | -4.23                | 10                    |
|         | 5 230           | 46  | MCS0             | -3.47             |                     | -0.98                |                       |

**Remark;**

- Final PPSD (dB m) = Measured PPSD (dB m) + Duty Cycle Correction Factor (dB)
- E.I.R.P. PPSD (dB m) = Final PPSD (dB m) + Antenna Gain (dB i)

**Test mode: 11ac\_VHT80**

| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | Measured PPSD (dB m) | Duty Cycle Correction Factor (dB) | Final PPSD (dB m) | Limit (dB m/1 MHz)   |
|---------|-----------------|-----|------------------|----------------------|-----------------------------------|-------------------|----------------------|
| U-NII 1 | 5 210           | 42  | MCS5             | -12.61               | 3.01                              | -9.60             | 11                   |
| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | Measured PPSD (dB m) | Duty Cycle Correction Factor (dB) | Final PPSD (dB m) | Limit (dB m/500 kHz) |
| U-NII 3 | 5 775           | 155 | MCS0             | -10.13               | 0.82                              | -9.31             | 30                   |

| Band    | Frequency (MHz) | Ch. | Data Rate (Mbps) | Final PPSD (dB m) | Antenna Gain (dB i) | E.I.R.P. PPSD (dB m) | IC Limit (dB m/1 MHz) |
|---------|-----------------|-----|------------------|-------------------|---------------------|----------------------|-----------------------|
| U-NII 1 | 5 210           | 42  | MCS5             | -9.60             | 2.49                | -7.11                | 10                    |

**Remark;**

1. Final PPSD (dB m) = Measured PPSD (dB m) + Duty Cycle Correction Factor (dB)
2. E.I.R.P. PPSD (dB m) = Final PPSD (dB m) + Antenna Gain (dB i)

## - Test plots

### 802.11a (Band 1)

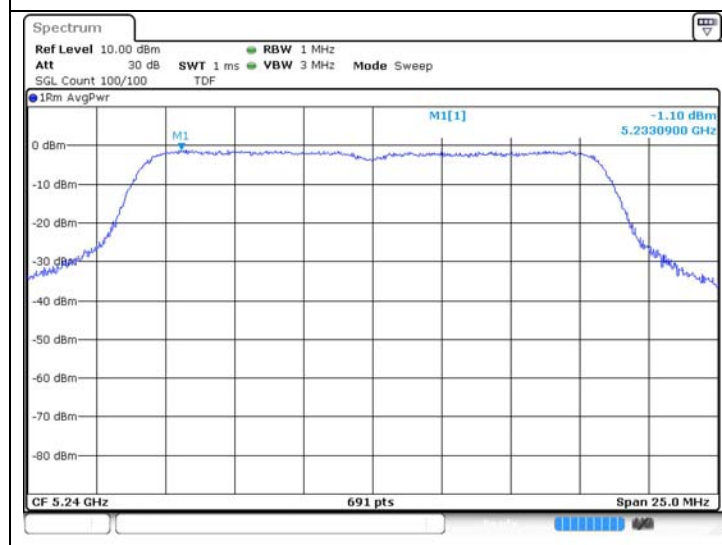
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

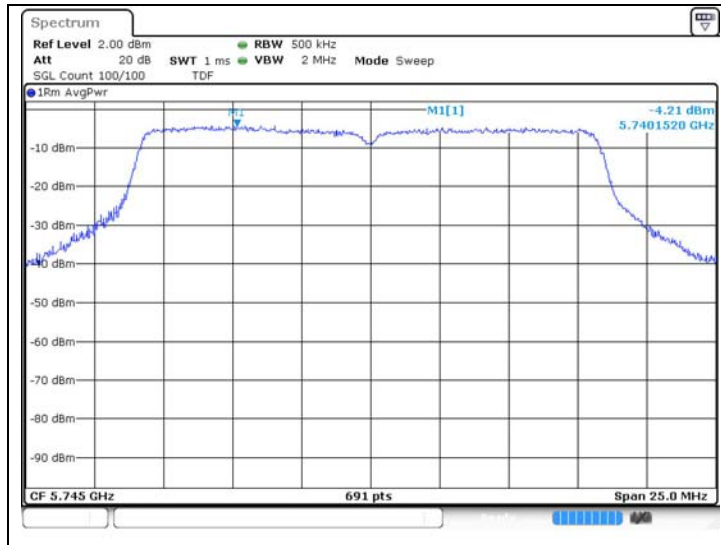


High Channel  
(5 240 MHz)

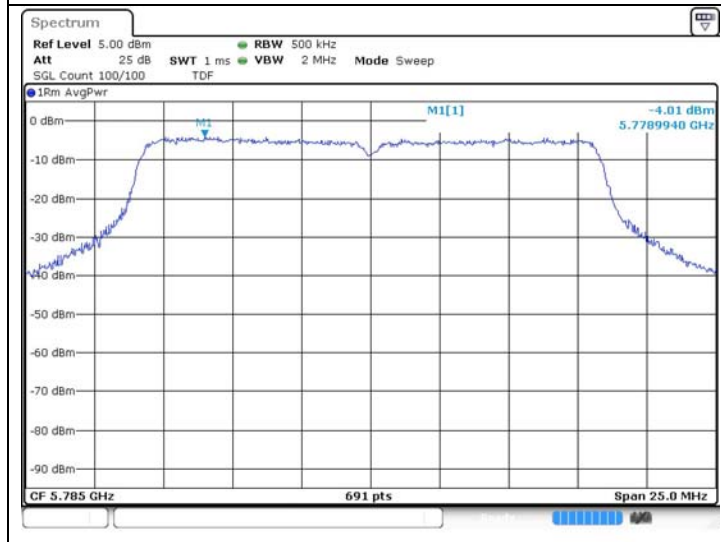


### 802.11a (Band 3)

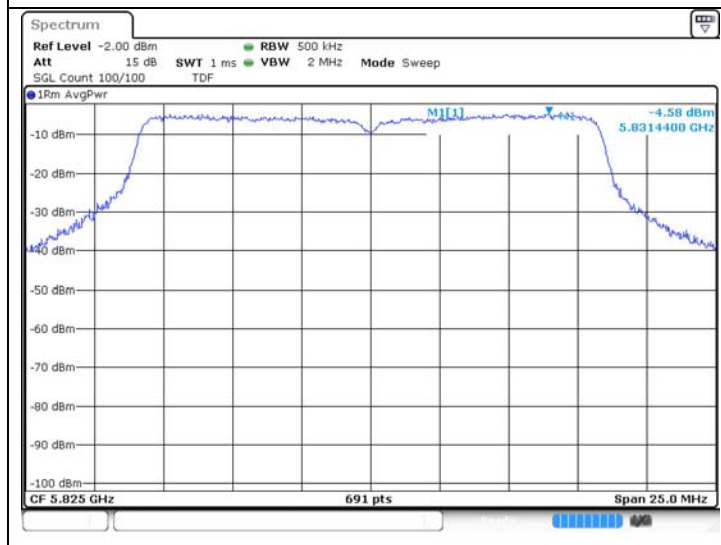
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

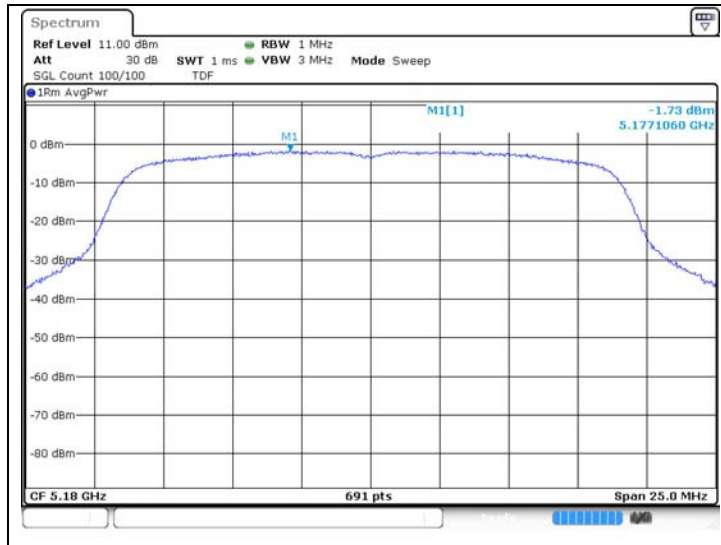


High Channel  
(5 825 MHz)

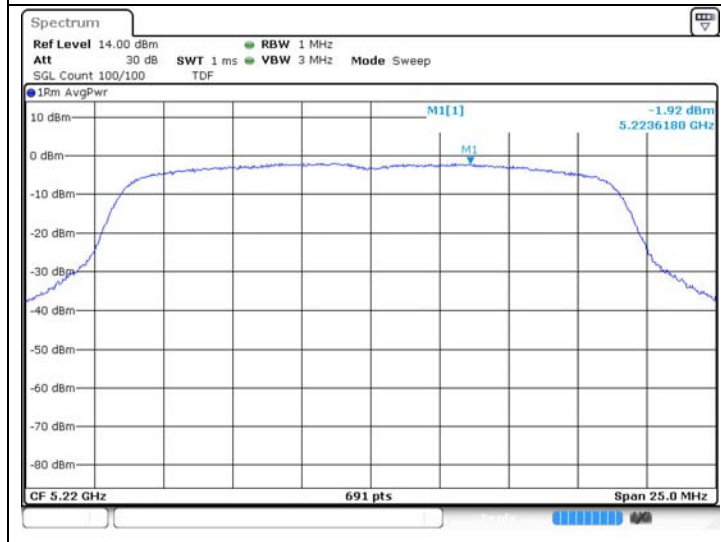


### 802.11n\_HT20 (Band 1)

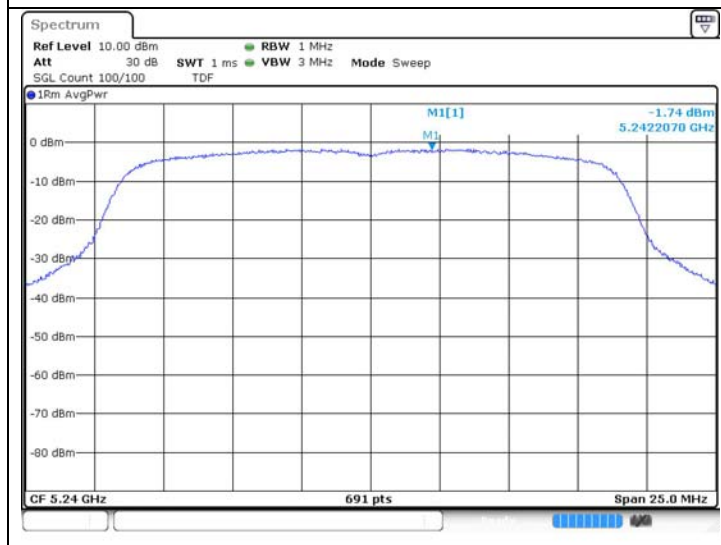
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

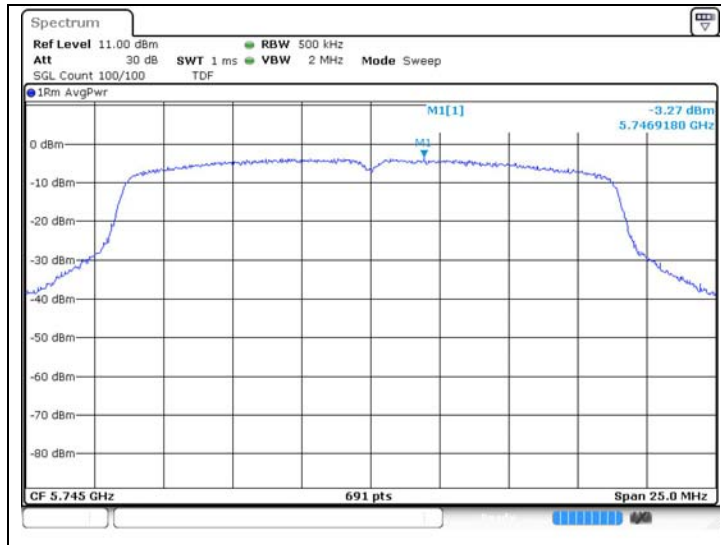


High Channel  
(5 240 MHz)

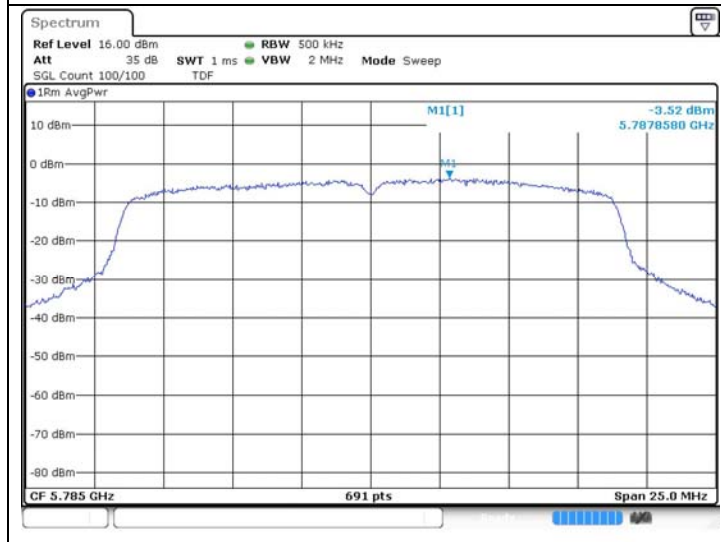


### 802.11n\_HT20 (Band 3)

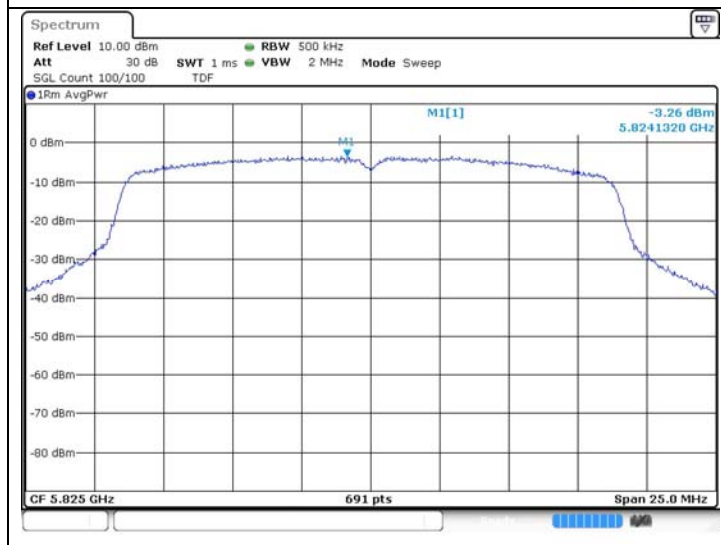
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

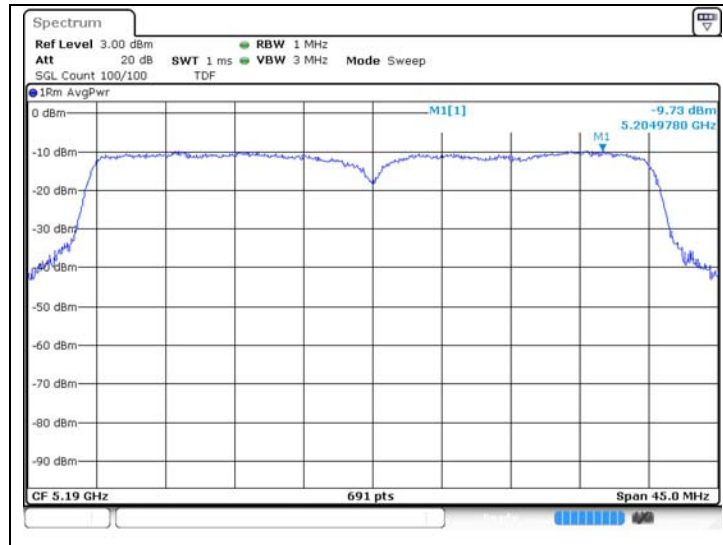


High Channel  
(5 825 MHz)

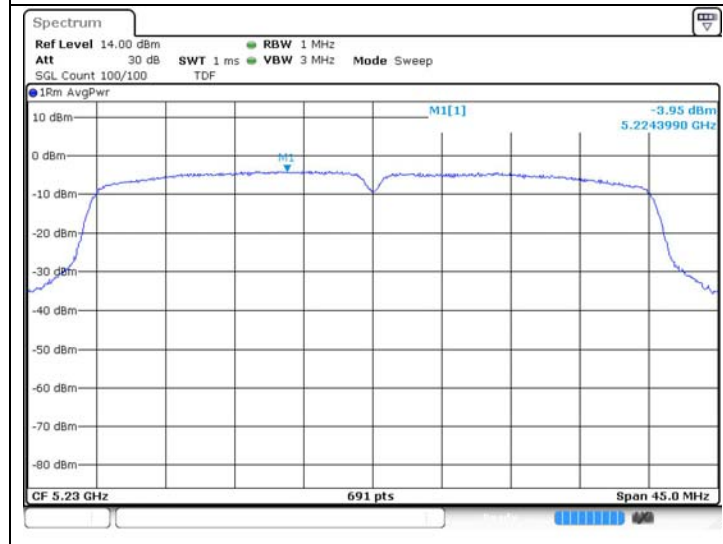


**802.11n\_HT40 (Band 1)**

Low Channel  
 (5 190 MHz)

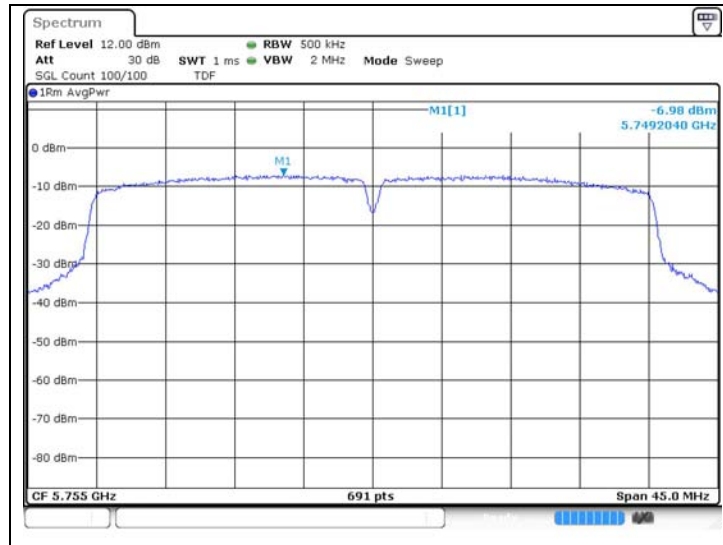


High Channel  
 (5 230 MHz)

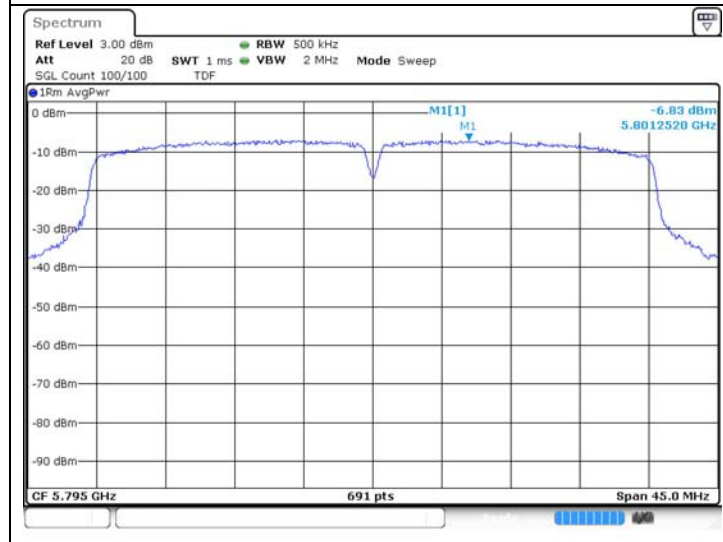


### 802.11n\_HT40 (Band 3)

Low Channel  
 (5 755 MHz)

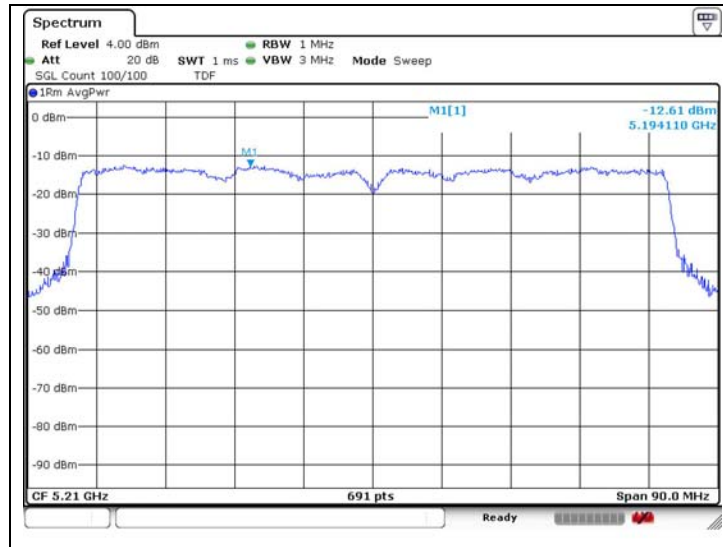


High Channel  
 (5 795 MHz)



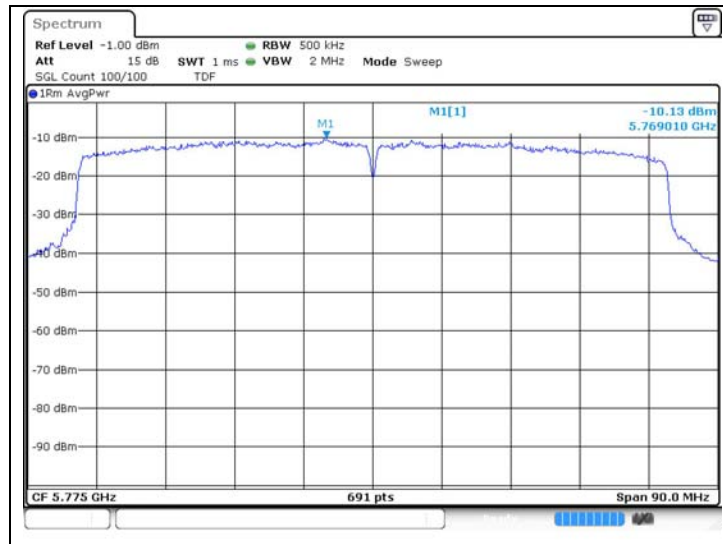
### 802.11ac\_VHT80 (Band 1)

Middle Channel  
 (5 210 MHz)



### 802.11ac\_VHT80 (Band 3)

Middle Channel  
 (5 775 MHz)



## 7. Antenna Requirement

### 7.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. And according to FCC 47 CFR Section §15.407(b) if transmitting antennas of directional gain greater than 6 dB i are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dB i.

### 7.2. Antenna Connected Construction

Antenna used in this product is Pattern antenna and peak max gain of antenna as below.

| Band | 5 150 MHz ~ 5 250 MHz                      | 5 725 MHz ~ 5 850 MHz |
|------|--------------------------------------------|-----------------------|
| Mode | 11a/n_HT20, HT40, 11ac_VHT20, VHT40, VHT80 |                       |
| Gain | 2.49 dB i                                  | 2.74 dB i             |

**- End of the Test Report -**