REPORT No. : SZ21060039W03

# TEST REPORT

| | | |
|---|---|---|
| **APPLICANT** | : | ZHEJIANG YONGYUAN TECHNOLOGY CO., LTD |
| **PRODUCT NAME** | : | Automatic Key Cutting Machine |
| **MODEL NAME** | : | XP-005L |
| **BRAND NAME** | : | Xhorse |
| **FCC ID** | : | 2ATSV-XP05L1 |
| **STANDARD(S)** | : | 47 CFR Part 15 Subpart E |
| **RECEIPT DATE** | : | 2021-06-15 |
| **TEST DATE** | : | 2021-06-16 to 2021-07-30 |
| **ISSUE DATE** | : | 2021-08-10 |

Edited by: Peng Mi

Peng Mi (Rapporteur)

Approved by: Shen Junsheng

Shen Junsheng (Supervisor)

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MORLAB

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# DIRECTORY



| Change History | | |
|---|---|---|
| Version | Date | Reason for change |
| 1.0 | 2021-08-10 | First edition |
| | | |

# 1. Technical Information

**Note:** Provide by applicant.

## 1.1. Applicant and Manufacturer Information

| | |
|---|---|
| **Applicant:** | ZHEJIANG YONGYUAN TECHNOLOGY CO., LTD |
| **Applicant Address:** | No.17 SHAODONG ROAD, YUYAO CITY, ZHEJIANG PROVINCE, China |
| **Manufacturer:** | ZHEJIANG YONGYUAN TECHNOLOGY CO., LTD |
| **Manufacturer Address:** | No.17 SHAODONG ROAD, YUYAO CITY, ZHEJIANG PROVINCE, China |

## 1.2. Equipment Under Test (EUT) Description

| | | |
|---|---|---|
| **Product Name:** | Automatic Key Cutting Machine | |
| **Sample No.:** | 2# | |
| **Hardware Version:** | VER.3 | |
| **Software Version:** | V2.2.3 | |
| **Modulation Type:** | OFDM | |
| **Modulation Mode:** | 802.11a, 802.11n (HT20), 802.11n (HT40)<br>802.11ac (VHT20), 802.11ac (VHT40), 802.11ac (VHT80) | |
| **Operating Frequency Range:** | 5180MHz–5240MHz; 5745MHz-5825MHz | |
| **Channel Number:** | Refer to 1.3 | |
| **Antenna Type:** | FPC Antenna | |
| **Antenna Gain:** | 3dBi | |
| **Accessory Information:** | Battery | |
| | Brand Name: | Xhorse |
| | Model No.: | XP005B01 |
| | Serial No.: | (N/A, marked #1 by test site) |
| | Capacity: | 2550mAh |
| | Rated Voltage: | 25.2V |
| | Charge Limit: | 29.4V |
| | Manufacturer: | ZHEJIANG YONGYUAN TECHNOLOGY CO., LTD. |

| | | |
|---|---|---|
| **Accessory Information:** | AC Adapter | |
| | Brand Name: | meanwell |
| | Model No.: | GST160A24 |
| | Serial No.: | (N/A, marked #1 by test site) |
| | Rated Output: | 24V⎓6.67A |
| | Rated Input: | 100-240V～50/60Hz, 2A |
| | Manufacturer: | MEAN WELL Enterprises Co., Ltd. |

**Note 1:** For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

## 1.3. Modulation Type and Data Rate of EUT

| Modulation Technology | Modulation Type | Data Rate (Mbps)Note1 |
|---|---|---|
| OFDM (802.11a) | BPSK | **6**/9 |
| | QPSK | 12/18 |
| | 16QAM | 24/36 |
| | 64QAM | 48/54 |
| OFDM (802.11n) | BPSK | **6.5** |
| | QPSK | 13/19.5 |
| | 16QAM | 26/39 |
| | 64QAM | 52/58.5/65 |
| OFDM (802.11ac) | BPSK | **6.5** |
| | QPSK | 13/19.5 |
| | 16QAM | 26/39 |
| | 64QAM | 52/58.5/65 |
| | 256QAM | 78 |

**Note1:** The worst-case mode(black bold) in all data rates has been determined during the pre-scan, only the test data of the worst-case were recorded in this report.

# 1.4. The Channel Number and Frequency

| **Frequency Range: 5180MHz-5240MHz** | | | | |
|---|---|---|---|---|
| Bandwidth | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 20MHz | **36** | **5180** | 40 | 5200 |
| | **44** | **5220** | **48** | **5240** |
| 40MHz | **38** | **5190** | **46** | **5230** |
| 80MHz | **42** | **5210** | | |
| **Frequency Range: 5745-5825MHz** | | | | |
| Bandwidth | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 20MHz | **149** | **5745** | 153 | 5765 |
| | **157** | **5785** | 161 | 5805 |
| | **165** | **5825** | | |
| 40MHz | **151** | **5775** | **159** | **5795** |
| 80MHz | **155** | **5775** | | |

**Note 1:** The black bold channels were selected for test.

## 1.5. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart E (U-NII band) for the EUT FCC ID Certification:

| No. | Identity | Document Title |
|---|---|---|
| 1 | 47 CFR Part 15(5-1-14 Edition) | Radio Frequency Devices |

Test detailed items/section required by FCC rules and results are as below:

| No. | Section | Description | Test Date | Test Engineer | Result | Method Determination /Remark |
|---|---|---|---|---|---|---|
| 1 | 15.203 | Antenna Requirement | N/A | N/A | PASS | No deviation |
| 2 | ANSI C63.10 | Duty Cycle of the Test Signal | Jul 20, 2021 | Meng Shurui | PASS | No deviation |
| 3 | 15.407(a) | Maximum Conducted Output Power | Jul 20, 2021 | Meng Shurui | PASS | No deviation |
| 4 | 15.407(a) (e) | Emission Bandwidth | Jul 26, 2021 | Meng Shurui | PASS | No deviation |
| 5 | 15.407(a) | Peak Power Spectral Density | Jul 20, 2021 | Meng Shurui | PASS | No deviation |
| 6 | 15.407(g) | Frequency Stability | Jul 27, 2021 | Meng Shurui | PASS | No deviation |
| 7 | 15.207 | Conducted Emission | Jun 16, 2021 | Wu Runfeng | PASS | No deviation |
| 8 | 15.407(b) | Restricted Frequency Bands | Jul 30, 2021 | Gao Jianrou | PASS | No deviation |
| 9 | 15.407(b) | Radiated Emission | Jul 30, 2021 | Gao Jianrou | PASS | No deviation |

**Note 1:** The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.102013.

**Note 2:** These RF tests were performed according to the method of measurements prescribed in KDB789033 D02 v02r01.

**Note 3:** The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The ref offset 12.0dB contains two parts that cable loss 2.0dB and

Attenuator 10dB.
**Note 4:** Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.
**Note 5:** When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

## 1.6. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

| | |
|---|---|
| Temperature (°C): | 15-35 |
| Relative Humidity (%): | 30-60 |
| Atmospheric Pressure (kPa): | 86-106 |

# 2. 47 CFR Part 15E Requirements

## 2.1. Antenna Requirement

### 2.1.1. Applicable Standard

According to FCC 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.

### 2.1.2. Test Result: Compliant

Inside of the EUT has a FPC antenna coupled with the I-PEX connector. Please refer to the EUT internal photos.

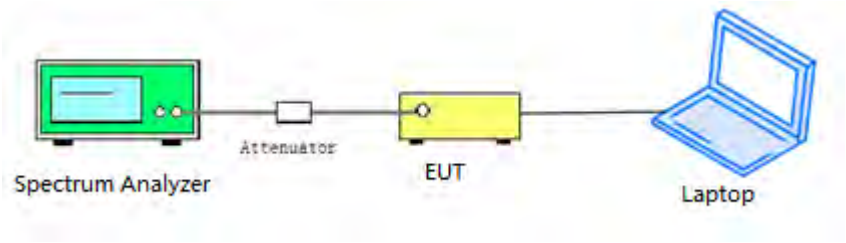
# 2.2. Duty Cycle of the Test Signal

### 2.2.1. Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).
When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this sub clause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than ±2%; otherwise, the duty cycle is considered to be nonconstant.

### 2.2.2. Test Description

**Test Setup:**




The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

### 2.2.3. Test Procedure

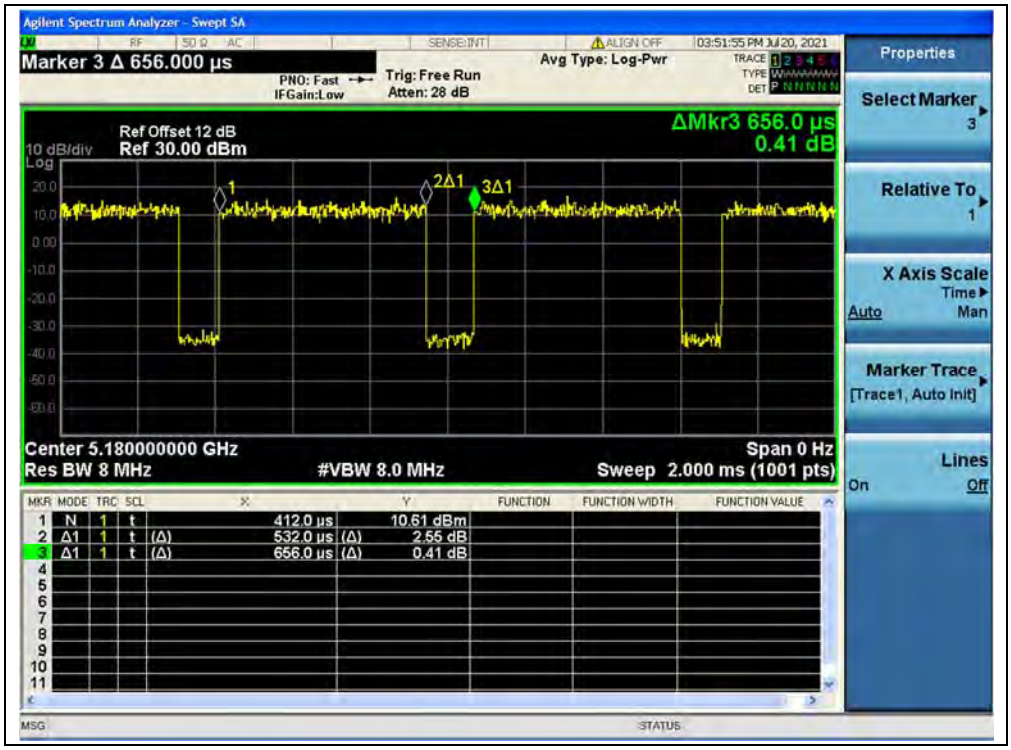
KDB 789033 Section B was used in order to prove compliance.

### 2.2.4. Test Result

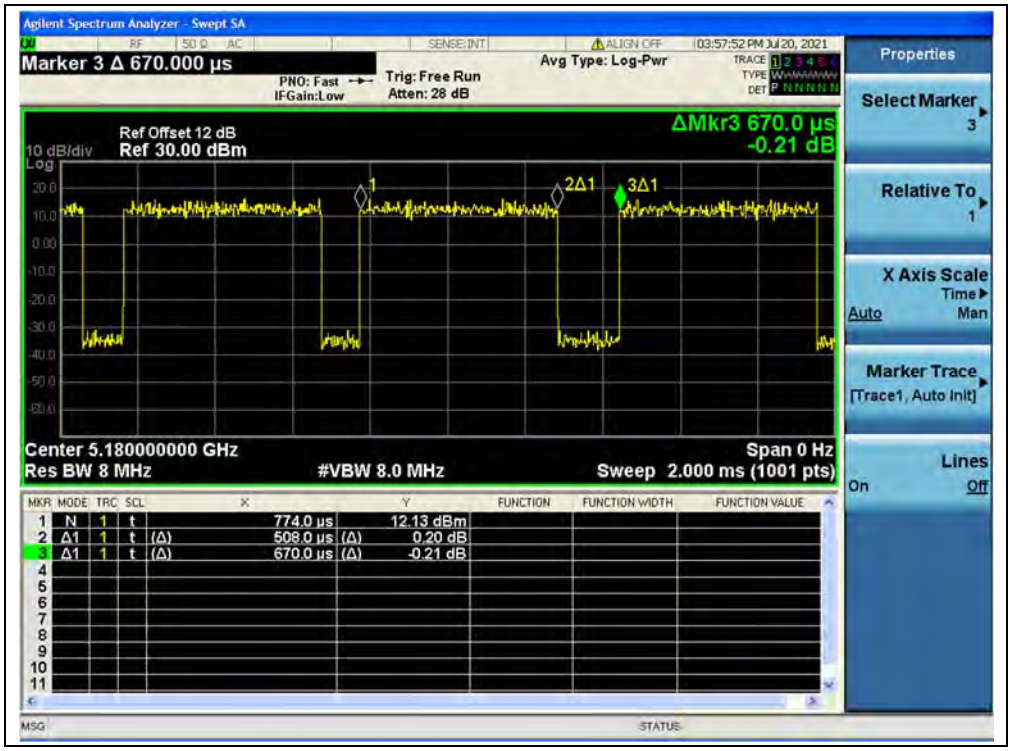
**A.Test Verdict:**

| Test Mode | Duty Cycle (%)<br>(D) | Duty Factor<br>(10*log[1/D]) |
|---|---|---|
| 802.11a | 80.30 | 0.95 |
| 802.11n (HT20) | 76.12 | 1.19 |
| 802.11n (HT40) | 70.27 | 1.53 |
| 802.11ac(VHT20) | 92.82 | 0.32 |
| 802.11ac(VHT40) | 89.62 | 0.48 |
| 802.11ac(VHT80) | 68.66 | 1.63 |

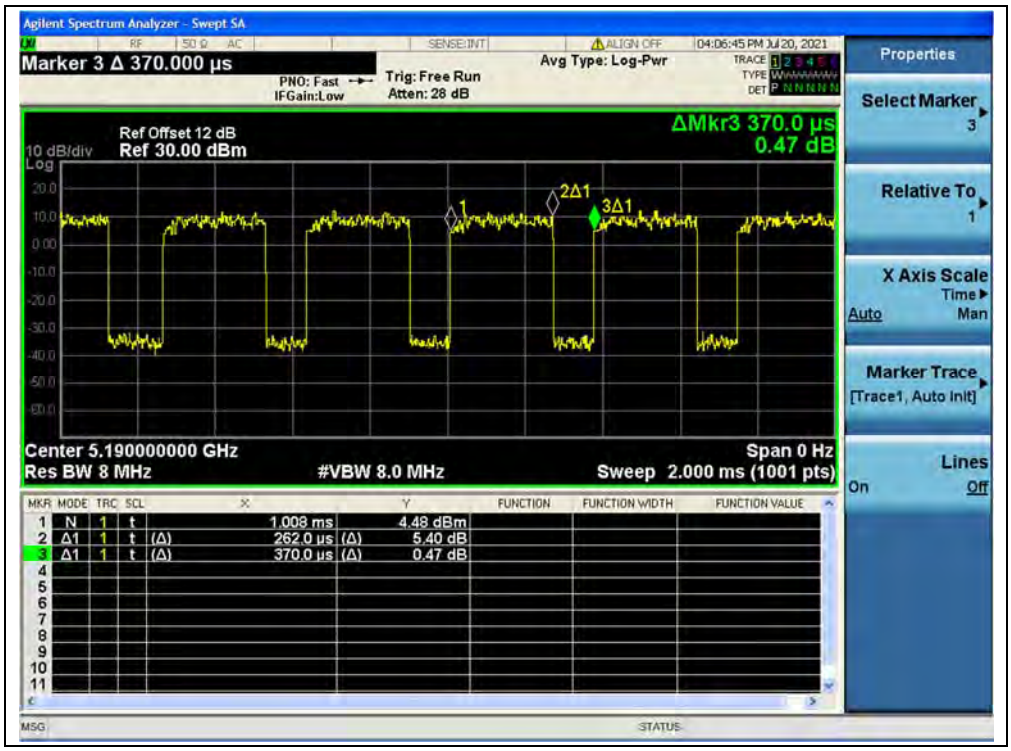
**B.Test Plot:**



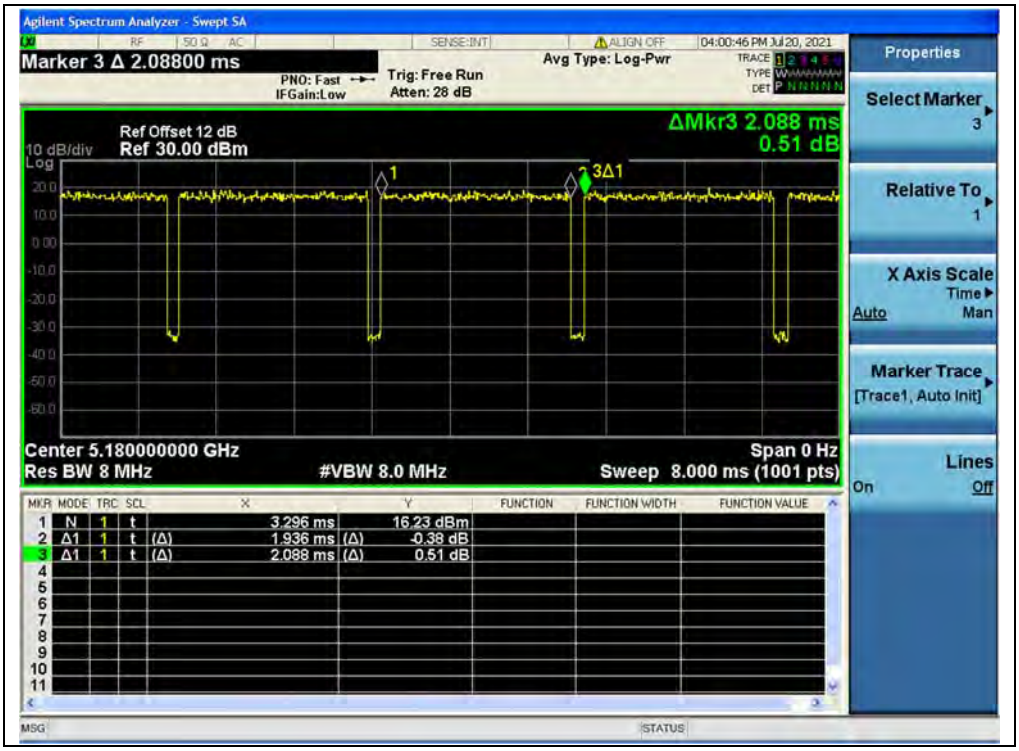

(Channel 36, 5180MHz, 802.11a)



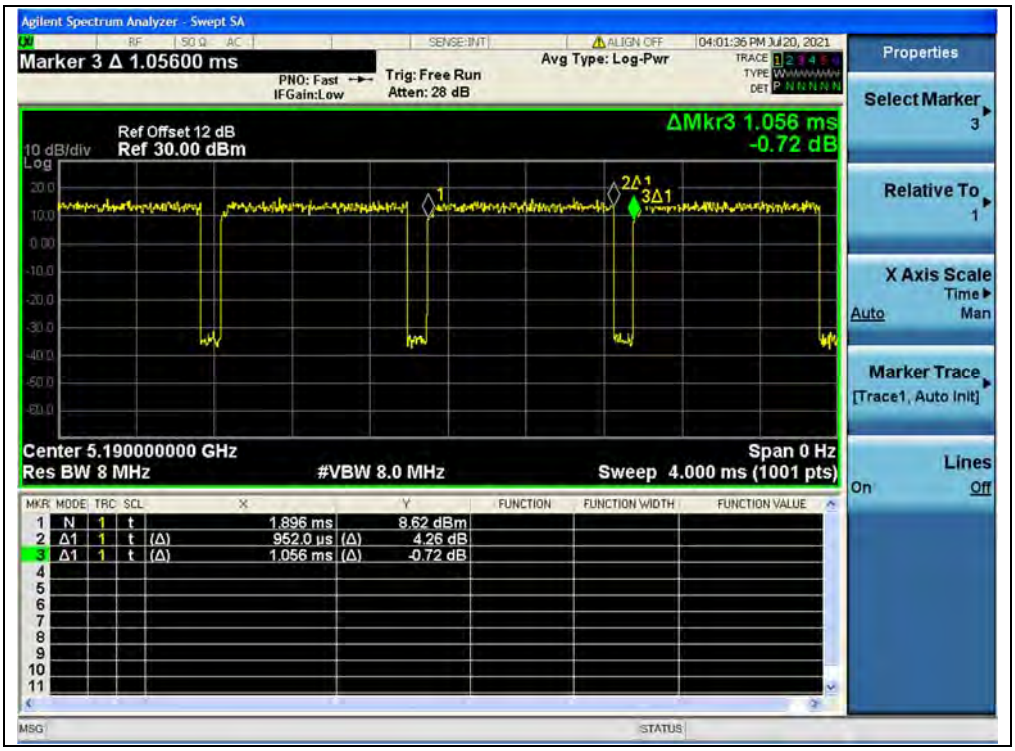

(Channel 36, 5180MHz, 802.11n (HT20))



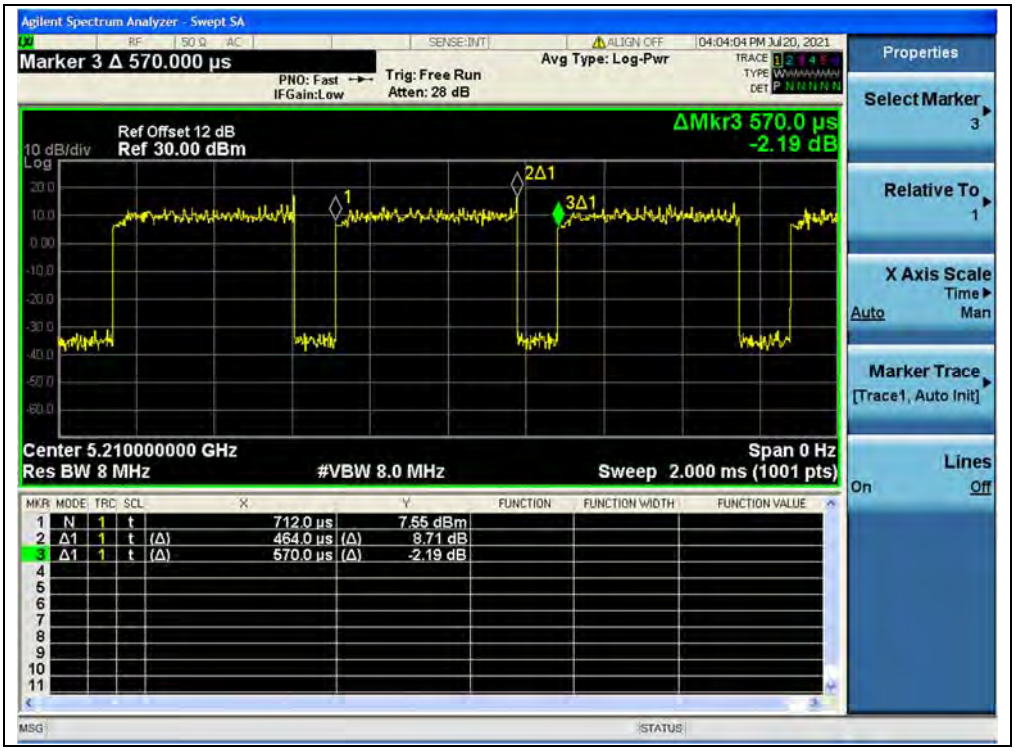

(Channel 38, 5190MHz, 802.11n (HT40))




(CH36_5180MHz _802.11ac (VHT20))




(CH38_5190MHz _802.11ac (VHT40))




(CH42_5210MHz _802.11ac (VHT80))

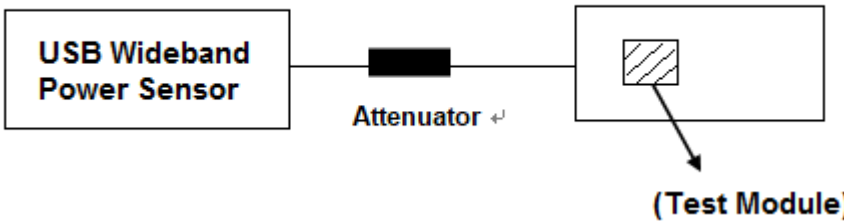
# 2.3. Maximum Conducted Output Power

### 2.3.1. Requirement

(1) 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 250mW provided the maximum antenna gain does not exceed 6dBi.
(2)For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250mW or 11dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.
(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.
If transmitting antennas of directional gain greater than 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.
(4) According to KDB662911D01Measure-and-sum technique, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in units that are directly proportional to power.
(5) According to KDB 662911 D01, the directional gain = $G_{ANT}$ +10log($N_{ANT}$)dBi, where $G_{ANT}$ is the antenna gain in dBi, $N_{ANT}$ is the number of outputs.

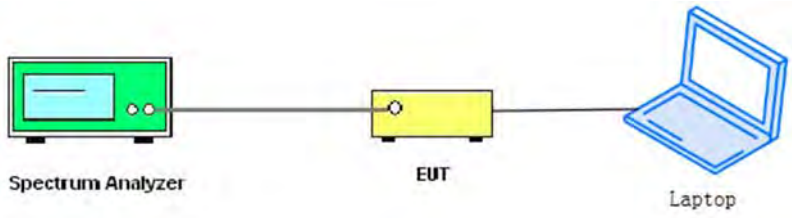
### 2.3.2. Test Description

Section E) 3) of KDB 789033 defines a methodology using a USB Wideband Power Sensor.
**Test Setup:**




The EUT (Equipment under the test) which is coupled to the USB Wideband Power Sensor; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading, all test result in USB Wideband Power Sensor.

**For ac (VHT80) mode power**




The EUT (Equipment under the test) is coupled to the Spectrum analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading, all test result in Spectrum analyzer.

### 2.3.3. Test Result

**Maximum Average Conducted Output Power**

**802.11a Mode**

| Channel | Frequency (MHz) | Average Power (dBm) | | | | Limit (dBm) | | Verdict |
|---|---|---|---|---|---|---|---|---|
| | | Measured | Duty Factor | Duty Factor Calculated | | | | |
| | | dBm | | dBm | W | dBm | W | |
| 36 | 5180 | 13.22 | 0.95 | 14.17 | 0.026 | 24 | 0.25 | PASS |
| 44 | 5220 | 12.72 | | 13.67 | 0.023 | | | |
| 48 | 5240 | 12.29 | | 13.24 | 0.021 | | | |
| 149 | 5745 | 10.98 | | 11.93 | 0.016 | 30 | 1 | |
| 157 | 5785 | 11.67 | | 12.62 | 0.018 | | | |
| 165 | 5825 | 11.87 | | 12.82 | 0.019 | | | |

**802.11n (HT20) Mode**

| Channel | Frequency (MHz) | Average Power (dBm) | | | | Limit (dBm) | | Verdict |
|---|---|---|---|---|---|---|---|---|
| | | Measured | Duty Factor | Duty Factor Calculated | | | | |
| | | dBm | | dBm | W | dBm | W | |
| 36 | 5180 | 13.12 | 1.19 | 14.31 | 0.027 | 24 | 0.25 | PASS |
| 44 | 5220 | 12.94 | | 14.13 | 0.026 | | | |
| 48 | 5240 | 12.51 | | 13.70 | 0.023 | | | |
| 149 | 5745 | 13.65 | | **14.84** | **0.030** | 30 | 1 | |
| 157 | 5785 | 12.93 | | 14.12 | 0.026 | | | |
| 165 | 5825 | 12.51 | | 13.70 | 0.023 | | | |

**802.11n (HT40) Mode**

| Channel | Frequency (MHz) | Average Power | | | | Limit (dBm) | | Verdict |
|---|---|---|---|---|---|---|---|---|
| | | Measured | Duty Factor | Duty Factor Calculated | | | | |
| | | dBm | | dBm | W | dBm | W | |
| 38 | 5190 | 12.78 | 1.53 | 14.31 | 0.027 | 24 | 0.25 | PASS |
| 46 | 5230 | 12.33 | | 13.86 | 0.024 | | | |
| 151 | 5755 | 13.07 | | 14.60 | 0.029 | 30 | 1 | |
| 159 | 5795 | 12.38 | | 13.91 | 0.025 | | | |

**802.11ac (VHT20) Mode**

| Channel | Frequency (MHz) | Average Power (dBm) | | | | Limit (dBm) | | Verdict |
|---|---|---|---|---|---|---|---|---|
| | | Measured | Duty Factor | Duty Factor Calculated | | | | |
| | | dBm | | dBm | W | dBm | W | |
| 36 | 5180 | 13.39 | 0.32 | 13.71 | 0.023 | 24 | 0.25 | PASS |
| 44 | 5220 | 13.17 | | 13.49 | 0.022 | | | |
| 48 | 5240 | 12.87 | | 13.19 | 0.021 | | | |
| 149 | 5745 | 14.53 | | **14.85** | **0.031** | 30 | 1 | |
| 157 | 5785 | 13.36 | | 13.68 | 0.023 | | | |
| 165 | 5825 | 12.93 | | 13.25 | 0.021 | | | |

**802.11ac (VHT40) Mode**

| Channel | Frequency (MHz) | Average Power | | | | Limit (dBm) | | Verdict |
|---|---|---|---|---|---|---|---|---|
| | | Measured | Duty Factor | Duty Factor Calculated | | | | |
| | | dBm | | dBm | W | dBm | W | |
| 38 | 5190 | 13.36 | 0.48 | 13.84 | 0.024 | 24 | 0.25 | PASS |
| 46 | 5230 | 12.88 | | 13.36 | 0.022 | | | |
| 151 | 5755 | 14.00 | | 14.48 | 0.028 | 30 | 1 | |
| 159 | 5795 | 13.38 | | 13.86 | 0.024 | | | |

**802.11ac (VHT80) Mode**

| Channel | Frequency (MHz) | Average Power | | | | Limit (dBm) | | Verdict |
|---|---|---|---|---|---|---|---|---|
| | | Measured | Duty Factor | Duty Factor Calculated | | | | |
| | | dBm | | dBm | W | dBm | W | |
| 42 | 5210 | 11.95 | 1.63 | 13.58 | 0.023 | 24 | 0.25 | PASS |
| 155 | 5775 | 12.37 | | 14.00 | 0.025 | 30 | 1 | |

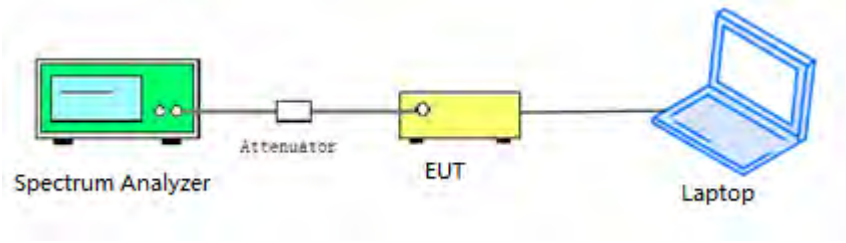
# 2.4. Emission Bandwidth

### 2.4.1. Requirement

For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement. Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### 2.4.2. Test Description

**Test Setup:**




The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

### 2.4.3. Test Procedure

1. KDB 789033 Section C) 1) Emission Bandwidth was used in order to prove compliance
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) 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%.
2. KDB 789033 Section C) 2) minimum emission bandwidth for the band 5.725-5.85GHz was used in order to prove compliance.
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for theband5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

a) Set RBW = 100 kHz.
b) Set video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) 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.

### 2.4.4. Test Result

**802.11a Mode**

**A.Test Verdict:**

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---|---|---|
| 36 | 5180 | 38.56 |
| 44 | 5220 | 39.22 |
| 48 | 5240 | 37.19 |
| **Channel** | **Frequency (MHz)** | **6 dB Bandwidth (MHz)** |
| 149 | 5745 | 16.46 |
| 157 | 5785 | 16.45 |
| 165 | 5825 | 16.46 |

**B.Test Plot:**


(Channel 36, 5180MHz, 802.11a)


(Channel 44, 5220 MHz, 802.11a)


(Channel 48, 5240MHz, 802.11a)


(Channel 149,5745MHz, 802.11a)


(Channel 157,5785MHz, 802.11a)


(Channel 165, 5825MHz, 802.11a)

**802.11n (HT20) Mode**

**A.Test Verdict:**

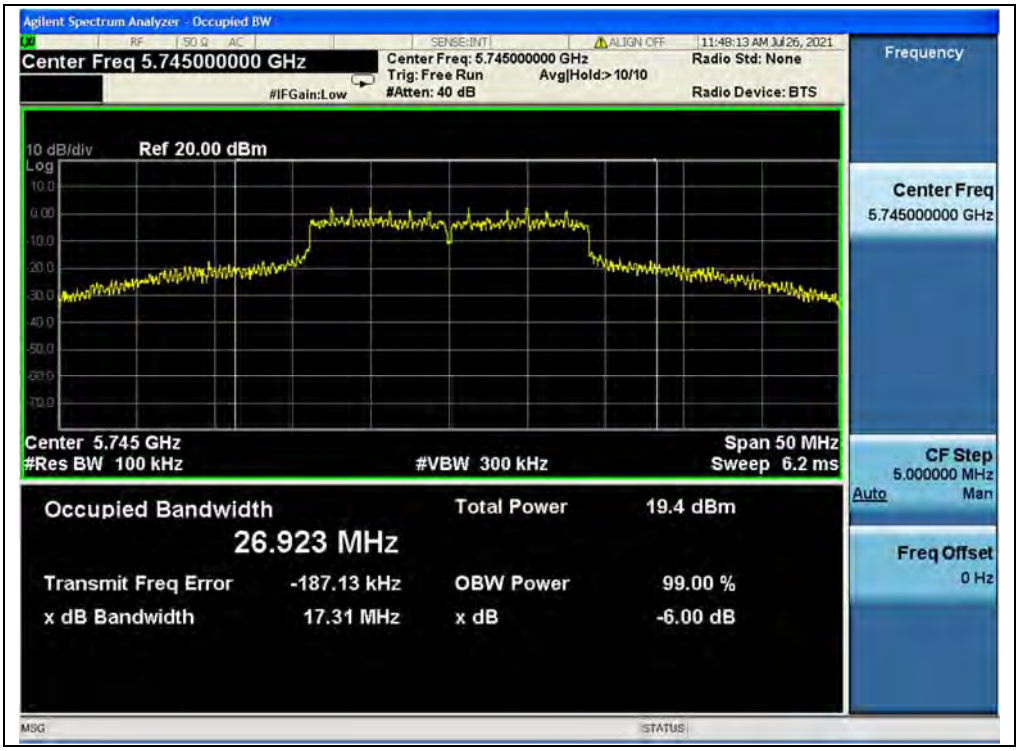
| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---|---|---|
| 36 | 5180 | 38.49 |
| 44 | 5220 | 45.08 |
| 48 | 5240 | 37.58 |
| **Channel** | **Frequency (MHz)** | **6 dB Bandwidth (MHz)** |
| 149 | 5745 | 17.31 |
| 157 | 5785 | 17.67 |
| 165 | 5825 | 17.43 |

**B.Test Plot:**


(Channel 36, 5180MHz, 802.11n (HT20))


(Channel 44, 5220MHz, 802.11n (HT20))


(Channel 48, 5240MHz, 802.11n (HT20))




(Channel 149, 5745MHz, 802.11 n (HT20))


(Channel 157, 5785MHz, 802.11 n (HT20))


(Channel 165, 5825MHz, 802.11 n (HT20))

**802.11n (HT40) Mode**

**A.Test Verdict:**

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---|---|---|
| 38 | 5190 | 85.70 |
| 46 | 5230 | 86.78 |
| **Channel** | **Frequency (MHz)** | **6 dB Bandwidth (MHz)** |
| 151 | 5755 | 36.50 |
| 159 | 5795 | 36.46 |

**B.Test Plot:**


(Channel 38, 5190MHz, 802.11n (HT40))


(Channel 46, 5230MHz, 802.11n (HT40))


(Channel 151, 5755MHz, 802.11n (HT40))


(Channel 159, 5795MHz, 802.11n (HT40))

**802.11ac (VHT20) Mode**

**A.Test Verdict:**

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---|---|---|
| 36 | 5180 | 21.41 |
| 44 | 5220 | 22.84 |
| 48 | 5240 | 21.33 |
| **Channel** | **Frequency (MHz)** | **6dB Bandwidth (MHz)** |
| 149 | 5745 | 15.70 |
| 157 | 5785 | 15.11 |
| 165 | 5825 | 14.41 |

**B.Test Plot:**


(Channel 36, 5180MHz, 802.11ac (VHT20))


(Channel 44, 5220 MHz, 802.11ac (VHT20))


(Channel 48, 5240MHz, 802.11ac (VHT20))


(Channel 149, 5745MHz, 802.11ac (VHT20))


(Channel 157, 5785MHz, 802.11ac (VHT20))

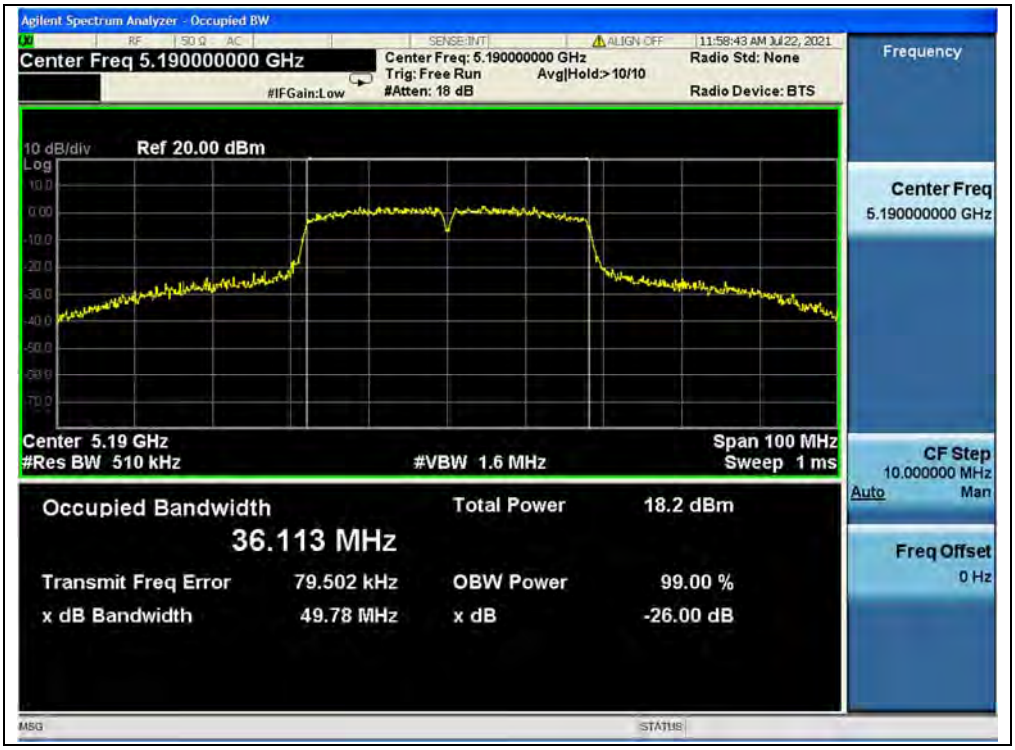

(Channel 165, 5825MHz, 802.11ac (VHT20))

**802.11 ac (VHT40) Mode**

**A.Test Verdict:**

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---|---|---|
| 38 | 5190 | 49.78 |
| 46 | 5230 | 48.84 |
| **Channel** | **Frequency (MHz)** | **6dB Bandwidth (MHz)** |
| 151 | 5755 | 32.61 |
| 159 | 5795 | 32.00 |

**B.Test Plot:**




(Channel 38, 5190MHz, 802.11ac (VHT40))


(Channel 46, 5230 MHz, 802.11ac (VHT40))


(Channel 151, 5755 MHz, 802.11ac (VHT40))


(Channel 159, 5795MHz, 802.11ac (VHT40))

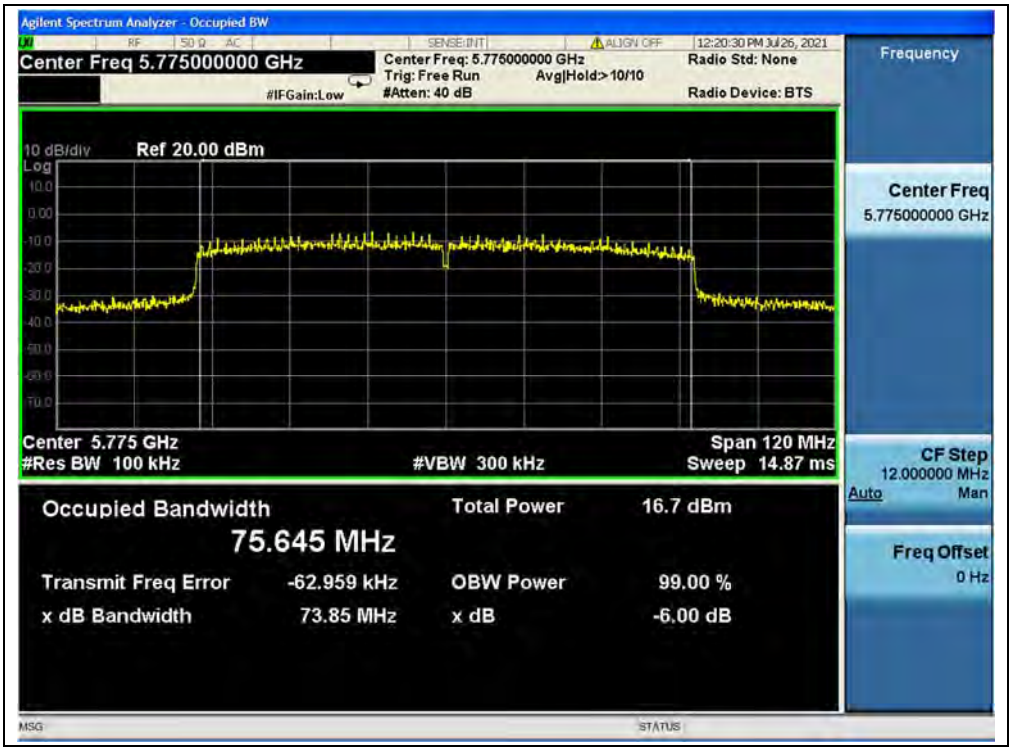
**802.11 ac (VHT80) Mode**

**A.Test Verdict:**

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---|---|---|
| 42 | 5210 | 98.82 |
| **Channel** | **Frequency (MHz)** | **6dB Bandwidth (MHz)** |
| 155 | 5775 | 73.85 |

**B.Test Plot:**


(Channel 42, 5210MHz, 802.11ac (VHT80))




(Channel 155, 5775 MHz, 802.11ac (VHT80))

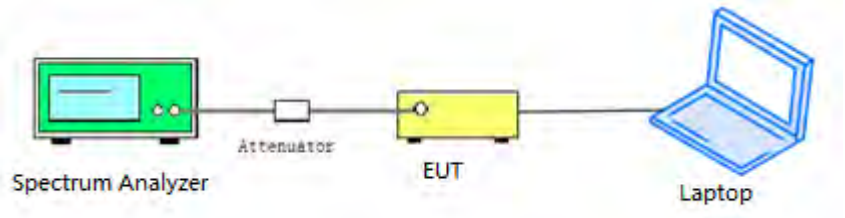
# 2.5. Peak Power Spectral Density

### 2.5.1. Requirement

(1)For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band.
(2)For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band.
(3) For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30dBm in any 500kHz band.
If transmitting antennas of directional gain greater than 6dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.
(4) According to KDB662911D01Measure-and-sum technique, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in units that are directly proportional to power.
(5) According to KDB 662911 D01, the directional gain = $G_{ANT}$ +10log($N_{ANT}$) dBi, where $G_{ANT}$ is the antenna gain in dBi, $N_{ANT}$ is the number of outputs.

### 2.5.2. Test Description

**Test Setup:**




The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

### 2.5.3. Test Procedure

KDB 789033 Section F) Maximum Power Spectral Density (PSD) Method SA-1 was used in order to prove compliance

1) Set span to encompass the entire 26-dB emission bandwidth
2) Set RBW = 1MHz. Set VBW ≥ 3MHz
3) Number of points in sweep ≥ 2 Span / RBW. Sweep time = auto
4) Detector = Average
5) Trace mode=Max hold
6) Record the max value

### 2.5.4. Test Result

**802.11a Mode**

**A.Test Verdict:**

| Channel | Frequency (MHz) | Measured PPSD (dBm/MHz) | Duty Factor | Corrected PPSD (dBm/MHz) | Limit (dBm/MHz) | Verdict |
|---|---|---|---|---|---|---|
| 36 | 5180 | 2.24 | 0.95 | **3.19** | 11 | PASS |
| 44 | 5220 | 2.14 | | 3.09 | | |
| 48 | 5240 | 1.75 | | 2.70 | | |
| Channel | Frequency (MHz) | Measured PPSD (dBm/500KHz) | Duty Factor | Corrected PPSD (dBm/500KHz) | Limit (dBm/500KHz) | Verdict |
| 149 | 5745 | 0.99 | 0.95 | 1.94 | 30 | PASS |
| 157 | 5785 | -0.05 | | 0.90 | | |
| 165 | 5825 | -0.39 | | 0.56 | | |

**B.Test Plot:**


(Channel 36, 5180MHz, 802.11)


(Channel 44, 5220MHz, 802.11a)


(Channel 48, 5240MHz, 802.11a)


(Channel 149, 5745MHz, 802.11a)


(Channel 157, 5785MHz, 802.11a)


(Channel 165, 5825MHz, 802.11a)

**802.11n (HT20) Mode**

**A.Test Verdict:**

| Channel | Frequency (MHz) | Measured PPSD (dBm/MHz) | Duty Factor | Corrected PPSD (dBm/MHz) | Limit (dBm/MHz) | Verdict |
|---|---|---|---|---|---|---|
| 36 | 5180 | 2.75 | 1.19 | 3.94 | 11 | PASS |
| 44 | 5220 | 2.80 | | **3.99** | | |
| 48 | 5240 | 2.33 | | 3.52 | | |
| Channel | Frequency (MHz) | Measured PPSD (dBm/500KHz) | Duty Factor | Corrected PPSD (dBm/500KHz) | Limit (dBm/500KHz) | Verdict |
| 149 | 5745 | 0.69 | 1.19 | 1.88 | 30 | PASS |
| 157 | 5785 | -0.25 | | 0.94 | | |
| 165 | 5825 | -0.80 | | 0.39 | | |

**B.Test Plot:**


(Channel 36, 5180MHz, 802.11n (HT20))


(Channel 44, 5220MHz, 802.11n (HT20))


(Channel 48, 5240MHz, 802.11n (HT20))


(Channel 149, 5745MHz, 802.11n (HT20))


(Channel 157, 5785MHz, 802.11n (HT20))


(Channel 165, 5825MHz, 802.11n (HT20))

**802.11n (HT40) Mode**

**A.Test Verdict:**

| Channel | Frequency (MHz) | Measured PPSD (dBm/MHz) | Duty Factor | Corrected PPSD (dBm/MHz) | Limit (dBm/MHz) | Verdict |
|---|---|---|---|---|---|---|
| 38 | 5190 | -0.87 | 1.53 | 0.66 | 11 | PASS |
| 46 | 5230 | -0.89 | | 0.64 | | |
| Channel | Frequency (MHz) | Measured PPSD (dBm/500KHz) | Duty Factor | Corrected (dBm/500KHz) | Limit (dBm/500KHz) | Verdict |
| 151 | 5755 | -2.79 | 1.53 | -1.26 | 30 | PASS |
| 159 | 5795 | -3.63 | | -2.10 | | |

**B.Test Plot:**


(Channel 38, 5190MHz, 802.11n (HT40))


(Channel 46, 5230MHz, 802.11n (HT40))


(Channel 151, 5755MHz, 802.11n (HT40))


(Channel 159, 5795MHz, 802.11n (HT40))

**802.11ac (VHT20) Mode**

**A.Test Verdict:**

| Channel | Frequency (MHz) | Measured PPSD (dBm/MHz) | Duty Factor | Corrected PPSD (dBm/MHz) | Limit (dBm/MHz) | Verdict |
|---|---|---|---|---|---|---|
| 36 | 5180 | 2.85 | 0.32 | 3.17 | 11 | PASS |
| 44 | 5220 | 2.69 | | 3.01 | | |
| 48 | 5240 | 2.29 | | 2.61 | | |
| Channel | Frequency (MHz) | Measured PPSD (dBm/500KHz) | Duty Factor | Corrected PPSD (dBm/500KHz) | Limit (dBm/500KHz) | Verdict |
| 149 | 5745 | 1.06 | 0.32 | 1.38 | 30 | PASS |
| 157 | 5785 | -0.18 | | 0.14 | | |
| 165 | 5825 | -0.72 | | -0.40 | | |

**B.Test Plot:**


(Channel 36, 5180MHz, 802.11ac (VHT20))


(Channel 44, 5220 MHz, 802.11ac (VHT20))


(Channel 48, 5240MHz, 802.11ac (VHT20))


(Channel 149, 5745MHz, 802.11ac (VHT20))


(Channel 157, 5785MHz, 802.11ac (VHT20))


(Channel 165, 5825MHz, 802.11ac (VHT20))

**802.11ac (VHT40) Mode**

**A.Test Verdict:**

| Channel | Frequency (MHz) | Measured PPSD (dBm/MHz) | Duty Factor | Corrected PPSD (dBm/MHz) | Limit (dBm/MHz) | Verdict |
|---|---|---|---|---|---|---|
| 38 | 5190 | -0.98 | 0.48 | -0.50 | 11 | PASS |
| 46 | 5230 | -1.45 | | -0.97 | | |
| Channel | Frequency (MHz) | Measured PPSD (dBm/500KHz) | Duty Factor | Corrected PPSD (dBm/500KHz) | Limit (dBm/500KHz) | Verdict |
| 151 | 5755 | -2.64 | 0.48 | -2.16 | 30 | PASS |
| 159 | 5795 | -3.20 | | -2.72 | | |

**B.Test Plot:**


(Channel 38, 5190MHz, 802.11ac (VHT40))


(Channel 46, 5230 MHz, 802.11ac (VHT40))


(Channel 151, 5755MHz, 802.11ac (VHT40))


(Channel 159, 5795MHz, 802.11ac (VHT40))

**802.11ac (VHT80) Mode**

**A.Test Verdict:**

| Channel | Frequency (MHz) | Measured PPSD (dBm/MHz) | Duty Factor | Corrected PPSD (dBm/MHz) | Limit (dBm/MHz) | Verdict |
|---|---|---|---|---|---|---|
| 42 | 5210 | -5.35 | 1.63 | -3.72 | 11 | PASS |
| Channel | Frequency (MHz) | Measured PPSD (dBm/500KHz) | Duty Factor | Corrected (dBm/500KHz) | Limit (dBm/500KHz) | Verdict |
| 155 | 5775 | -7.21 | 1.63 | -5.58 | 30 | PASS |

**B.Test Plot:**


(Channel 42, 5210MHz, 802.11ac (VHT80))


(Channel 155, 5775MHz, 802.11ac (VHT80))

# 2.6. Frequency Stability

### 2.6.1. Requirement

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

### 2.6.2. Test Procedure

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between 5°Cto 40°C. The temperature was incremented by 10º intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded. Data for the worst case channel is shown below.

### 2.6.3. Test Result

| U-NII-1 (Ch. 36)<br>5180MHz | | | | |
|---|---|---|---|---|
| Voltage<br>(%) | Power<br>(VDC) | Temp<br>(°C) | Fre. Dev.<br>(kHz) | Deviation<br>(ppm) |
| 100% | 5.00 | +20(Ref) | 21 | 4.054 |
| 100% | | -30 | 25 | 4.826 |
| 100% | | -20 | 30 | 5.792 |
| 100% | | -10 | 29 | 5.598 |
| 100% | | 0 | 22 | 4.247 |
| 100% | | +10 | 19 | 3.668 |
| 100% | | +20 | 23 | 4.440 |
| 100% | | +30 | 32 | 6.178 |
| 100% | | +40 | 35 | 6.757 |
| 100% | | +50 | 25 | 4.826 |
| 85% | 4.25 | +20 | 27 | 5.212 |
| 115% | 5.75 | +20 | 30 | 5.792 |

| U-NII-3 (Ch. 149)<br>5745MHz | | | | |
|---|---|---|---|---|
| Voltage<br>(%) | Power<br>(VDC) | Temp<br>(°C) | Fre. Dev.<br>(kHz) | Deviation<br>(ppm) |
| 100% | 5.00 | +20(Ref) | 18 | 3.133 |
| 100% | | -30 | 22 | 3.829 |
| 100% | | -20 | 25 | 4.352 |
| 100% | | -10 | 27 | 4.700 |
| 100% | | 0 | 19 | 3.307 |
| 100% | | +10 | 17 | 2.959 |
| 100% | | +20 | 21 | 3.655 |
| 100% | | +30 | 26 | 4.526 |
| 100% | | +40 | 30 | 5.222 |
| 100% | | +50 | 25 | 4.352 |
| 85% | 4.25 | +20 | 19 | 3.307 |
| 115% | 5.75 | +20 | 21 | 3.655 |

# 2.7. Conducted Emission

### 2.7.1. Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

| Frequency Range (MHz) | Conducted Limit (dBμV) | |
|---|---|---|
| | Quai-peak | Average |
| 0.15 - 0.50 | 66 to 56 | 56 to 46 |
| 0.50 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |

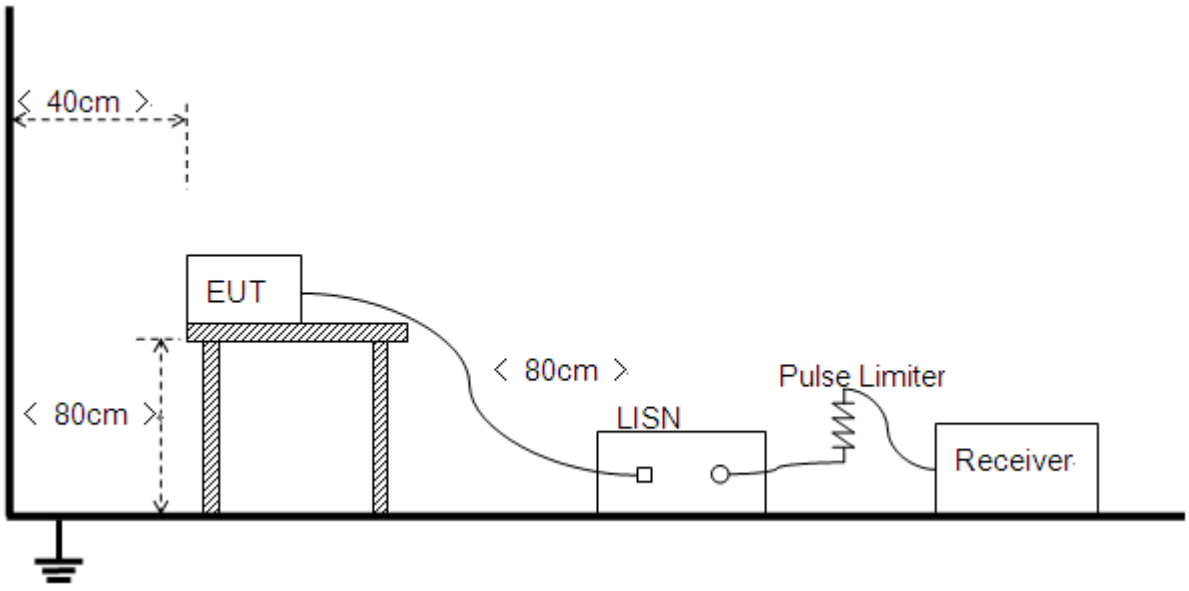
**Note:**

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

### 2.7.2. Test Description

**Test Setup:**




The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2013.

### 2.7.3. Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Set RBW=9kHz, VBW=30kHz. Refer to recorded points and plots below.

**Note:** Both of the test voltage AC 120V/60Hz and AC 230V/50Hzwere considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

**A.Test Setup:**

Test Mode: EUT+ADAPTER + WIFI TX

Test Voltage: AC 120V/60Hz

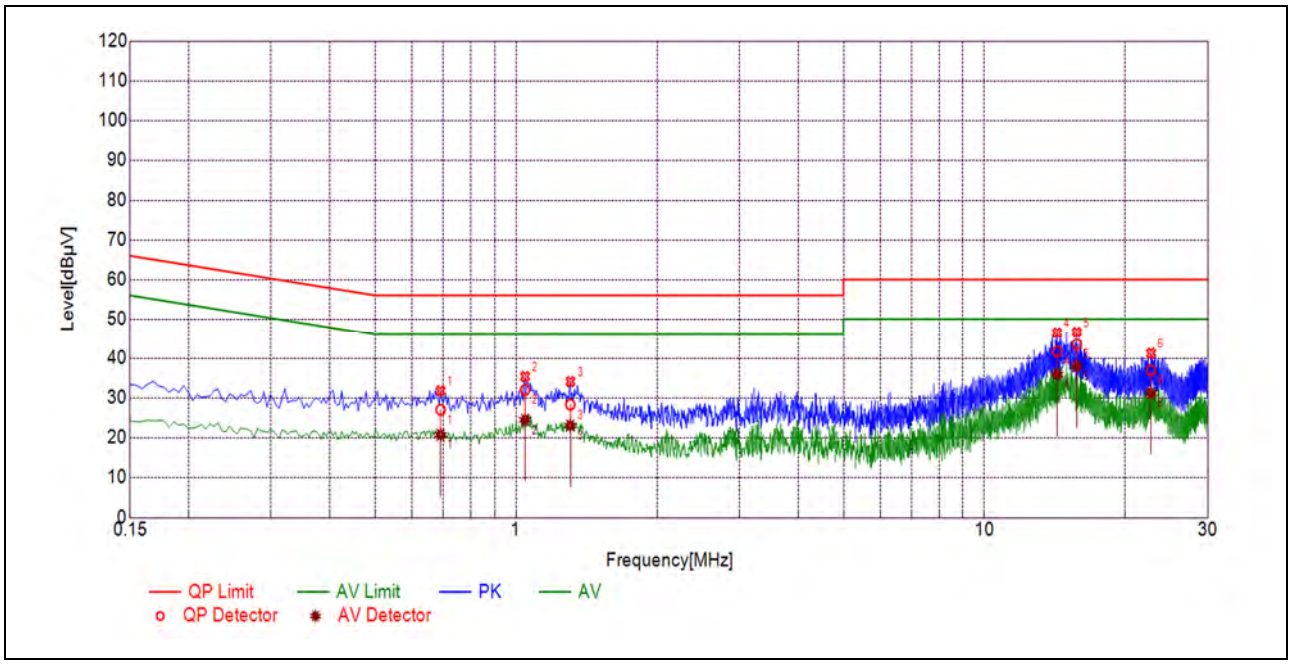
The measurement results are obtained as below:

$E\ [dB\mu V] = U_R + L_{Cable\ loss}\ [dB] + A_{Factor}$

$U_R$: Receiver Reading

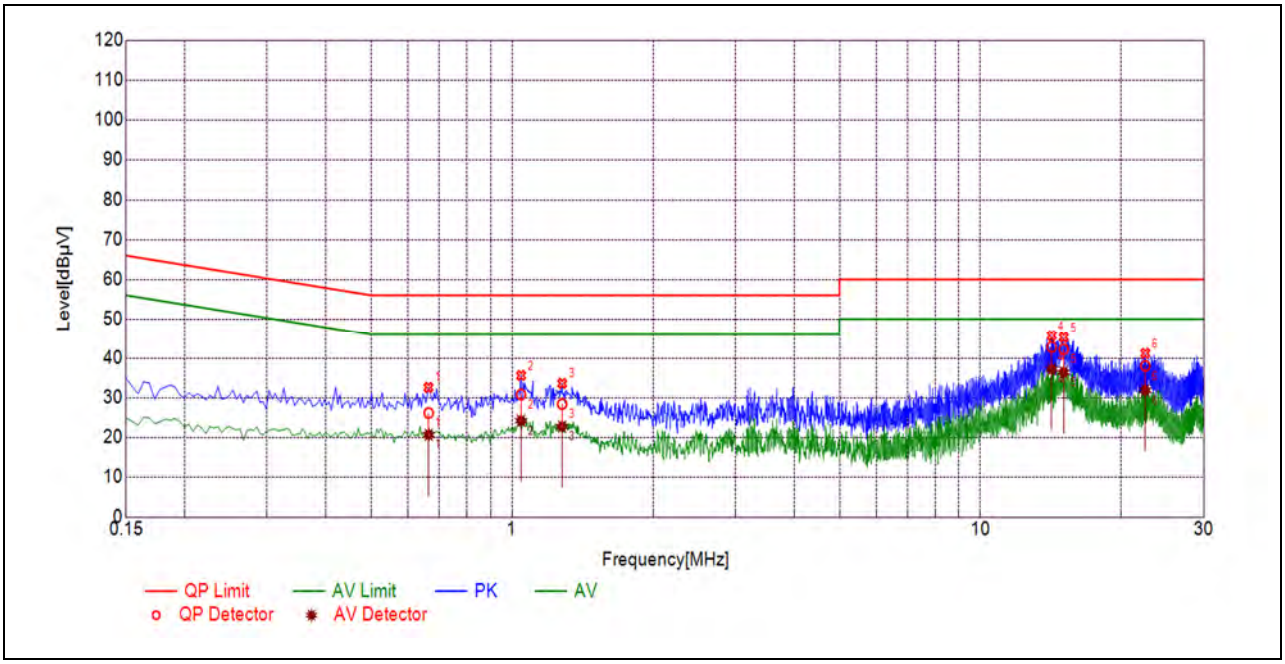
$A_{Factor}$: Voltage division factor of LISN

**B.Test Plot:**




(L Phase)

| No. | Fre. (MHz) | Emission Level (dBµV) | | Limit (dBµV) | | Power-line | Verdict |
|---|---|---|---|---|---|---|---|
| | | Quai-peak | Average | Quai-peak | Average | | |
| 1 | 0.6900 | 26.97 | 20.69 | 56.00 | 46.00 | Line | PASS |
| 2 | 1.0451 | 31.96 | 24.44 | 56.00 | 46.00 | | PASS |
| 3 | 1.3056 | 28.28 | 23.03 | 56.00 | 46.00 | | PASS |
| 4 | 14.2907 | 41.66 | 35.84 | 60.00 | 50.00 | | PASS |
| 5 | 15.7480 | 43.44 | 37.91 | 60.00 | 50.00 | | PASS |
| 6 | 22.6841 | 36.90 | 31.15 | 60.00 | 50.00 | | PASS |




(N Phase)

| No. | Fre. (MHz) | Emission Level (dBµV) | | Limit (dBµV) | | Power-line | Verdict |
|---|---|---|---|---|---|---|---|
| | | Quai-peak | Average | Quai-peak | Average | | |
| 1 | 0.6636 | 26.12 | 20.61 | 56.00 | 46.00 | Neutral | PASS |
| 2 | 1.0449 | 30.80 | 24.17 | 56.00 | 46.00 | | PASS |
| 3 | 1.2787 | 28.38 | 22.70 | 56.00 | 46.00 | | PASS |
| 4 | 14.1946 | 42.79 | 37.19 | 60.00 | 50.00 | | PASS |
| 5 | 15.0558 | 42.21 | 36.39 | 60.00 | 50.00 | | PASS |
| 6 | 22.4933 | 38.01 | 31.84 | 60.00 | 50.00 | | PASS |

# 2.8. Restricted Frequency Bands

### 2.8.1. Requirement

The peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
(2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
(3) For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27dBm/MHz.
(4) For transmitters operating in the 5.725-5.85 GHz band:
(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
The following formula is used to convert the equipment isotropic radiated power(e.i.r.p.) to field strength (dBμV/m);

$$E = 1000000 \times \sqrt{30P} / 3 \ \mu V/m$$

where P is the EIRP in Watts

Therefore: -27 dBm/MHz = 68.23 dBuV/m

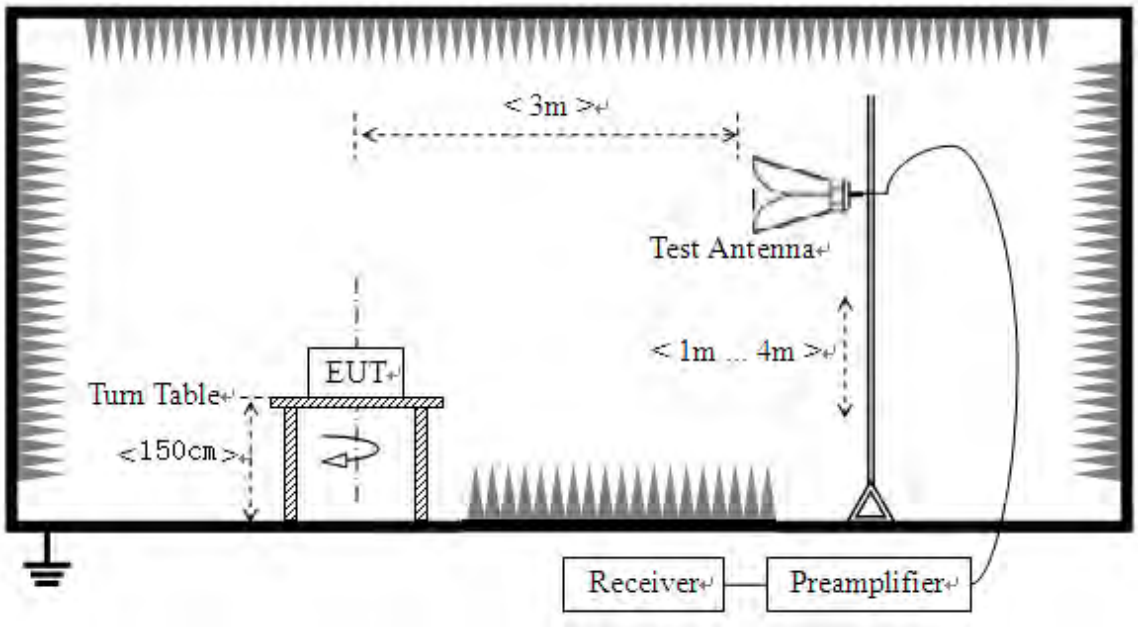
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (μV/m) | Measurement Distance (m) |
|---|---|---|
| 0.009 - 0.490 | 2400/F(kHz) | 300 |
| 0.490 - 1.705 | 24000/F(kHz) | 30 |
| 1.705 - 30.0 | 30 | 30 |
| 30 - 88 | 100 | 3 |
| 88 - 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table).

### 2.8.2. Test Description

**Test Setup**



The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.
KDB 789033 Section H) 3)5)6(d)) was used in order to prove compliance
For the Test Antenna:
Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

### 2.8.3. Test Result

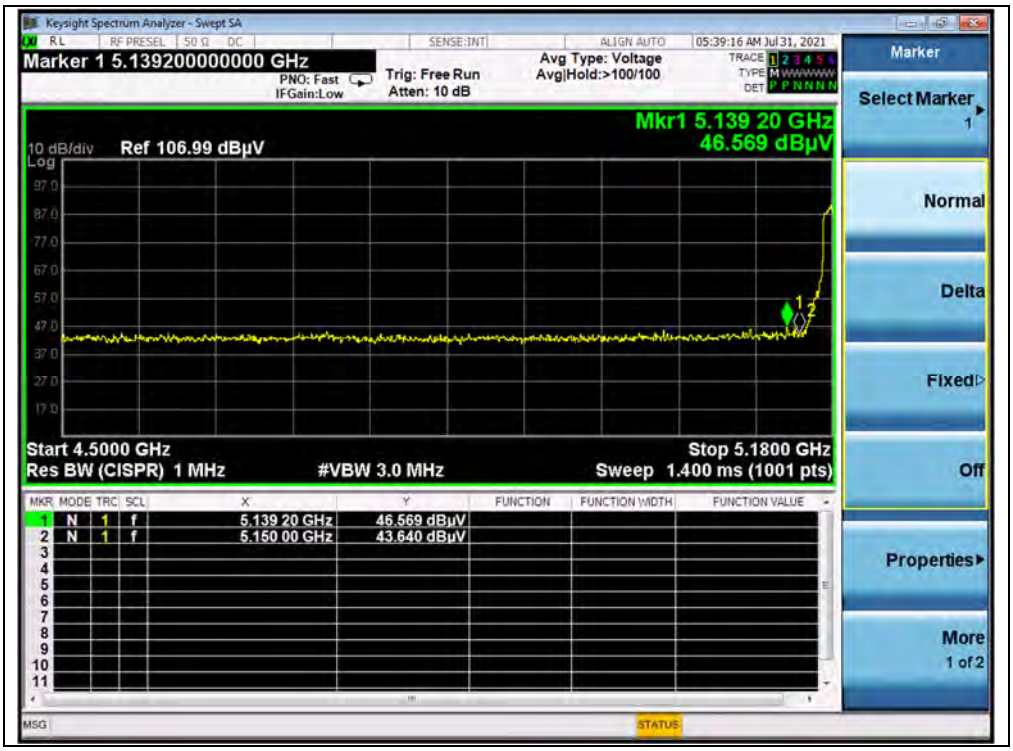
The lowest and highest channels are tested to verify Restricted Frequency Bands.
The measurement results are obtained as below:
E [dBμV/m] =$U_R$ + $A_T$ + $A_{Factor}$ [dB]; $A_T$ =$L_{Cable\ loss}$ [dB]-$G_{preamp}$ [dB]
$A_T$: Total correction Factor except Antenna; $U_R$: Receiver Reading
$G_{preamp}$: Preamplifier Gain; $A_{Factor}$: Antenna Factor at 3m
**Note 1:** Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.
**Note 2** All test modes and bandwidth were considered and evaluated respectively by performing full test, only the worst data were recorded for each bandwidth.

**802.11a Mode**

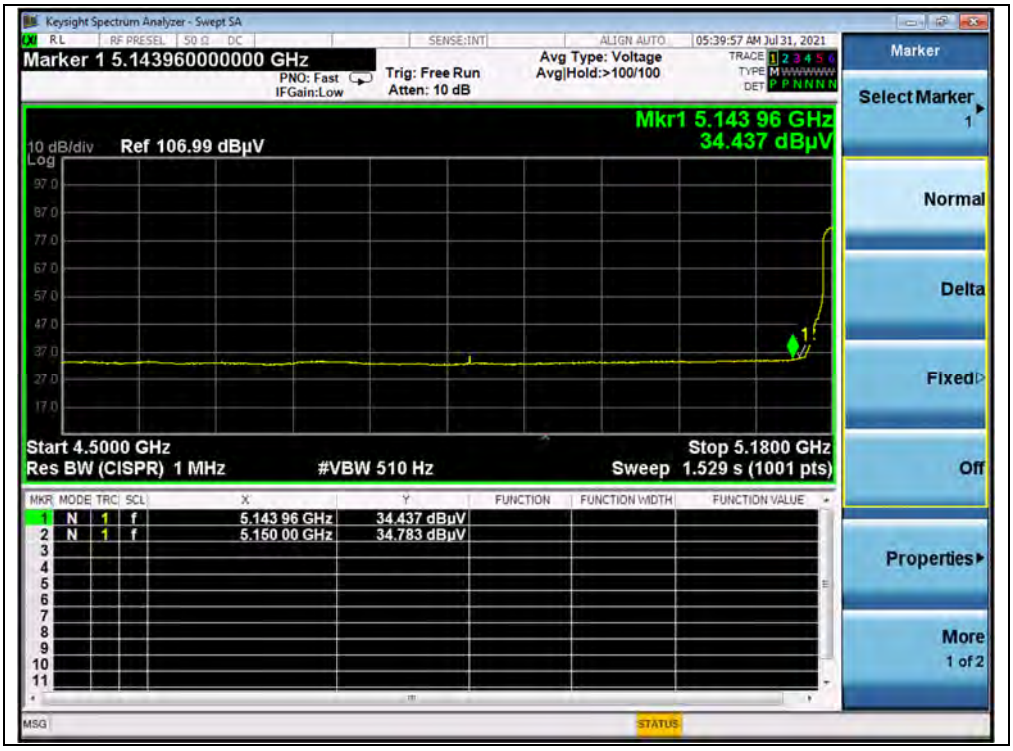
**A.Test Verdict:**

| Channel | Frequency (MHz) | Detector | Receiver Reading $U_R$ (dBμV) | $A_T$ (dB) | $A_{Factor}$ (dB@3m) | Max. Emission E (dBμV/m) | Limit (dBμV/m) | Verdict |
|---|---|---|---|---|---|---|---|---|
| | | PK/ AV | | | | | | |
| 36 | 5139.20 | PK | 46.57 | -19.54 | 32.20 | 59.23 | 74 | PASS |
| 36 | 5150.00 | AV | 34.78 | -19.54 | 32.20 | 47.44 | 54 | PASS |
| 48 | 5361.88 | PK | 43.14 | -19.54 | 32.20 | 55.80 | 74 | PASS |
| 48 | 5350.00 | AV | 31.69 | -19.54 | 32.20 | 44.35 | 54 | PASS |
| 149 | 5725.00 | PK | 51.14 | -19.01 | 32.20 | 64.33 | 122.23 | PASS |
| 165 | 5855.00 | PK | 43.28 | -19.01 | 32.20 | 56.47 | 110.83 | PASS |

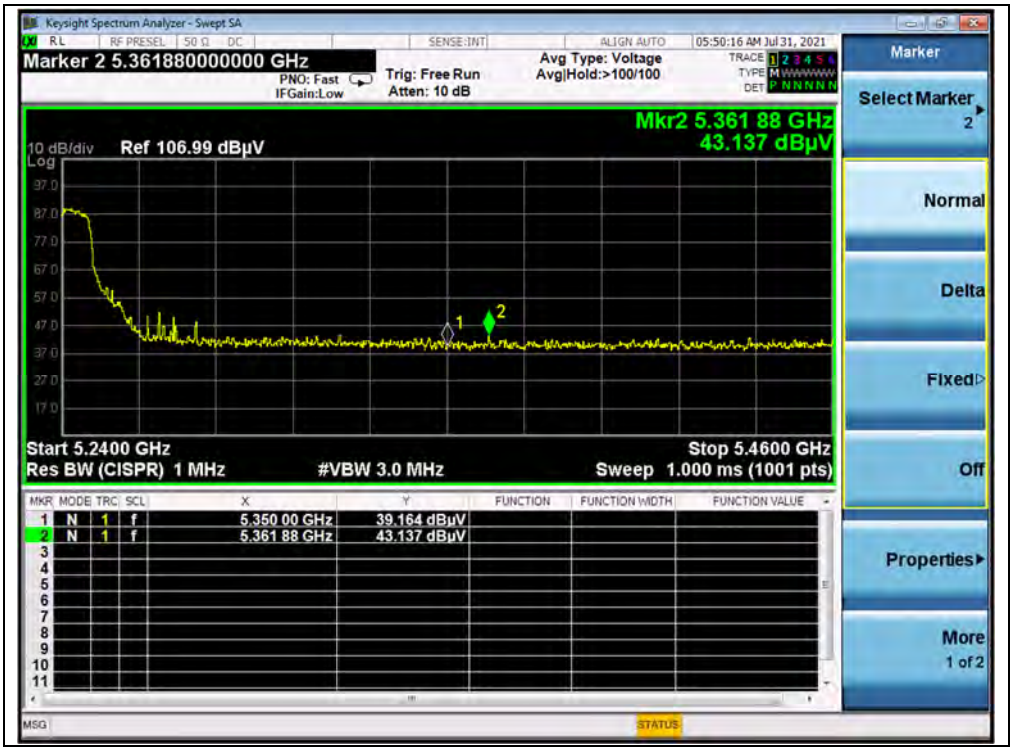
**B.Test Plot:**



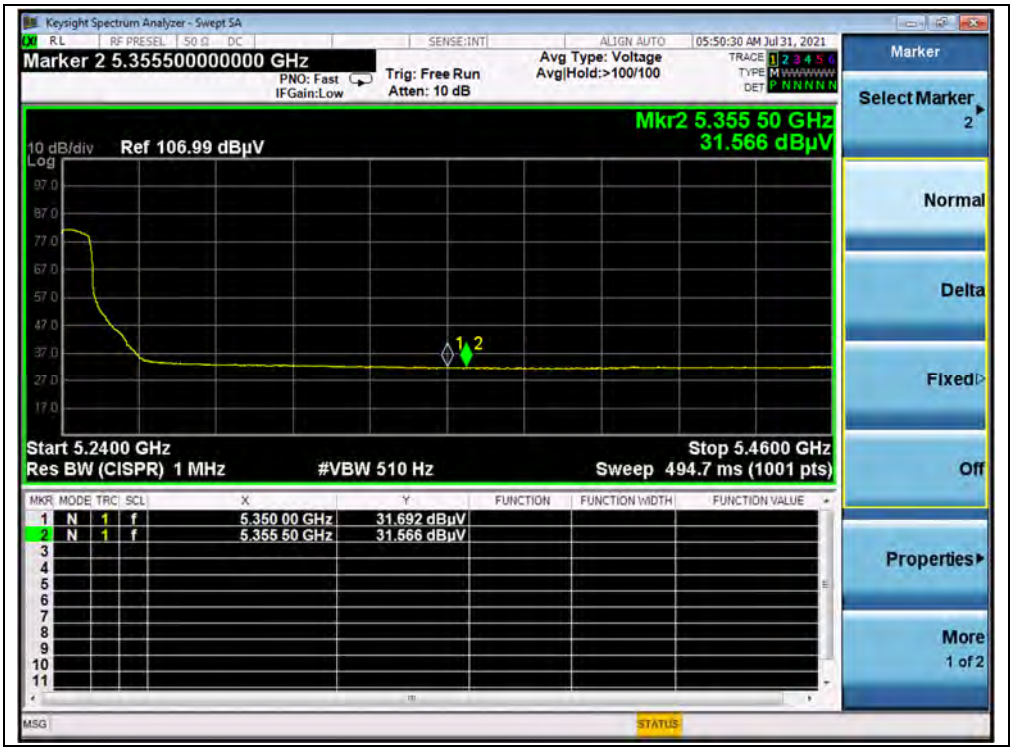

(PEAK, Channel 36, 802.11a)



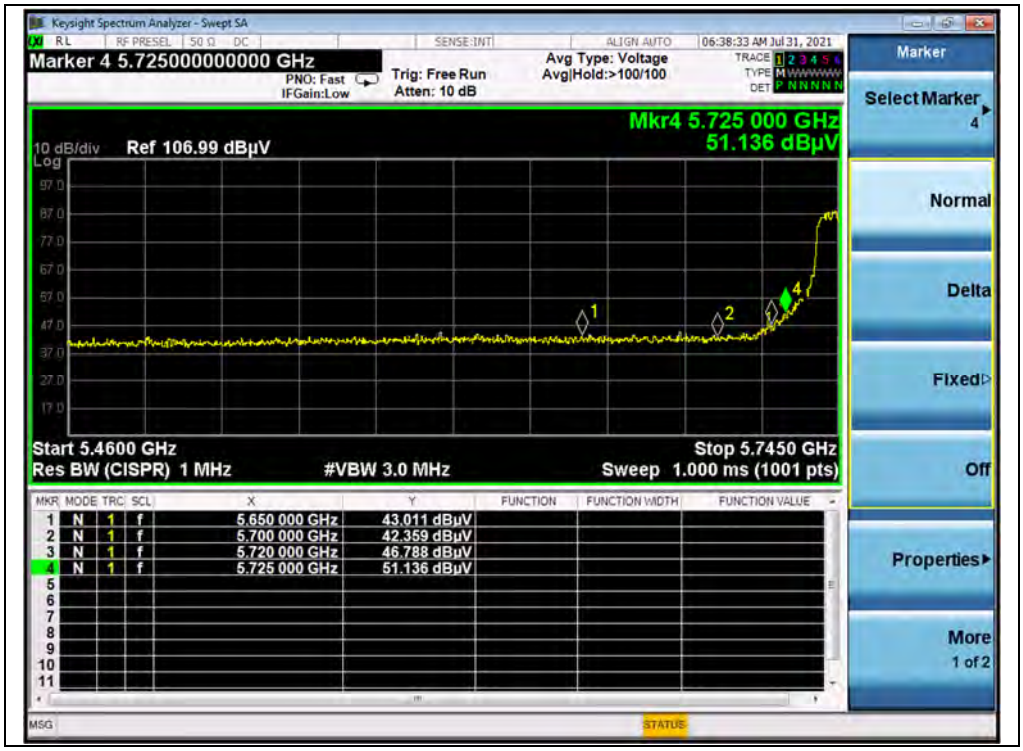

(AVERAGE, Channel 36, 802.11a)




(PEAK, Channel 48, 802.11a)




(AVERAGE, Channel 48, 802.11a)




(PEAK, Channel 149, 802.11a)

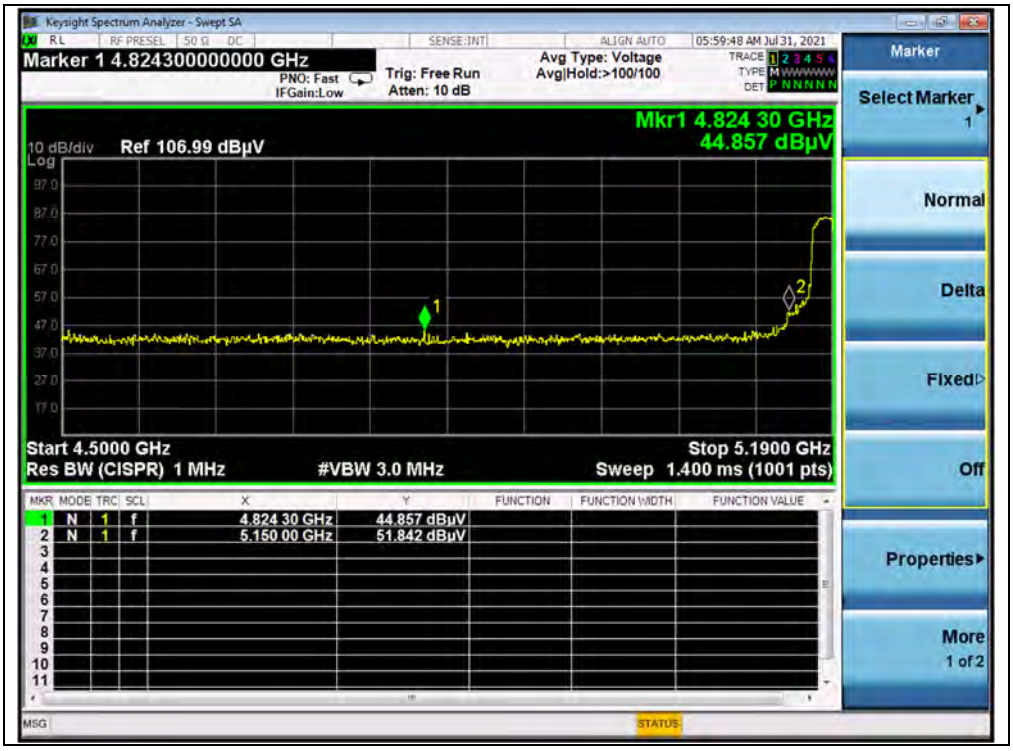

(PEAK, Channel 165, 802.11a)

**802.11n (HT40) Mode**

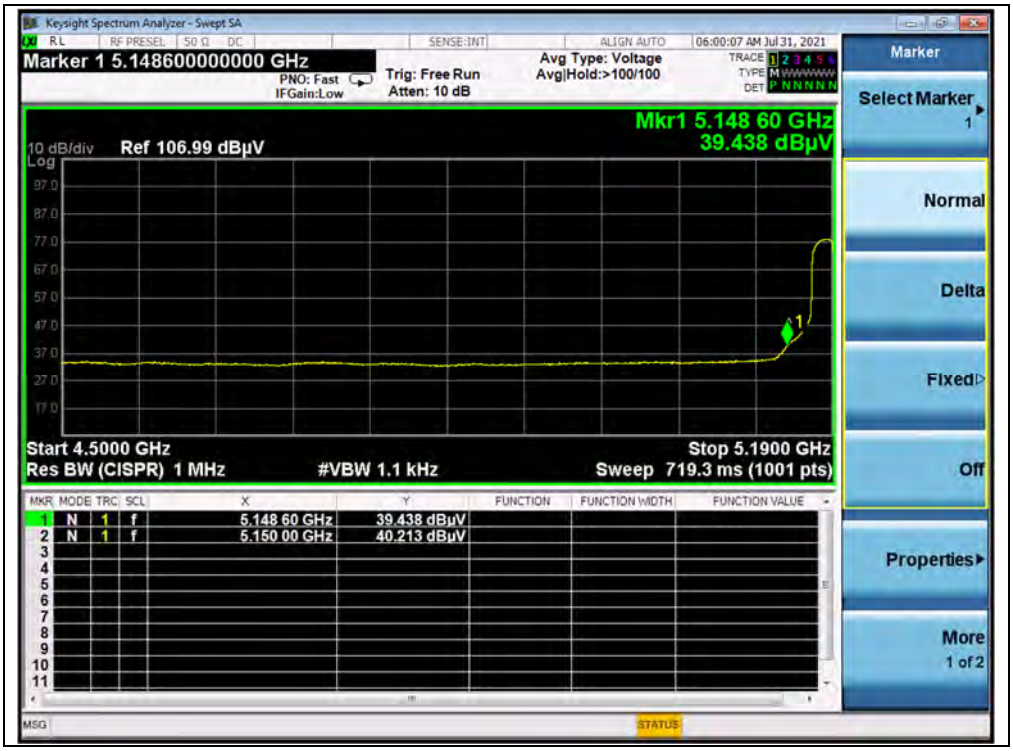
**A.Test Verdict:**

| Channel | Frequency (MHz) | Detector | Receiver Reading $U_R$ (dBμV) | $A_T$ (dB) | $A_{Factor}$ (dB@3m) | Max. Emission E (dBμV/m) | Limit (dBμV/m) | Verdict |
|---|---|---|---|---|---|---|---|---|
| | | PK/ AV | | | | | | |
| 38 | 5150.00 | PK | 51.84 | -19.54 | 32.20 | 64.50 | 74 | PASS |
| 38 | 5150.00 | AV | 40.21 | -19.54 | 32.20 | 52.87 | 54 | PASS |
| 48 | 5431.84 | PK | 43.47 | -19.54 | 32.20 | 56.13 | 74 | PASS |
| 48 | 5350.00 | AV | 31.78 | -19.54 | 32.20 | 44.44 | 54 | PASS |
| 151 | 5725.00 | PK | 55.49 | -19.01 | 32.20 | 68.68 | 122.23 | PASS |
| 159 | 5850.00 | PK | 41.91 | -19.01 | 32.20 | 55.10 | 122.23 | PASS |

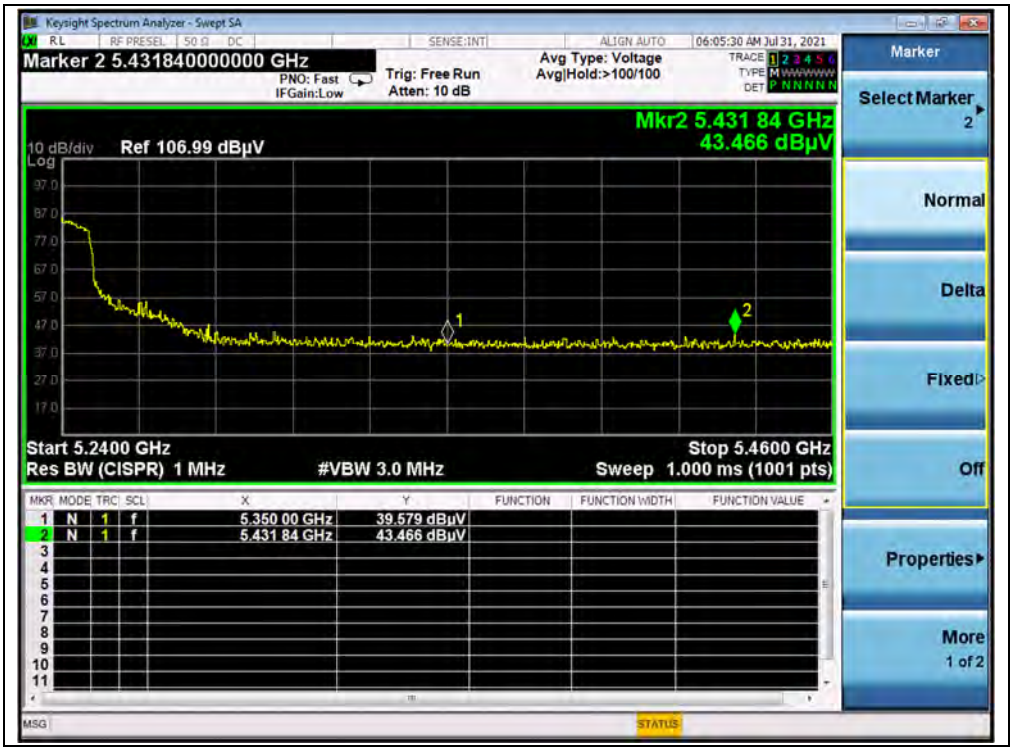
**B.Test Plot:**



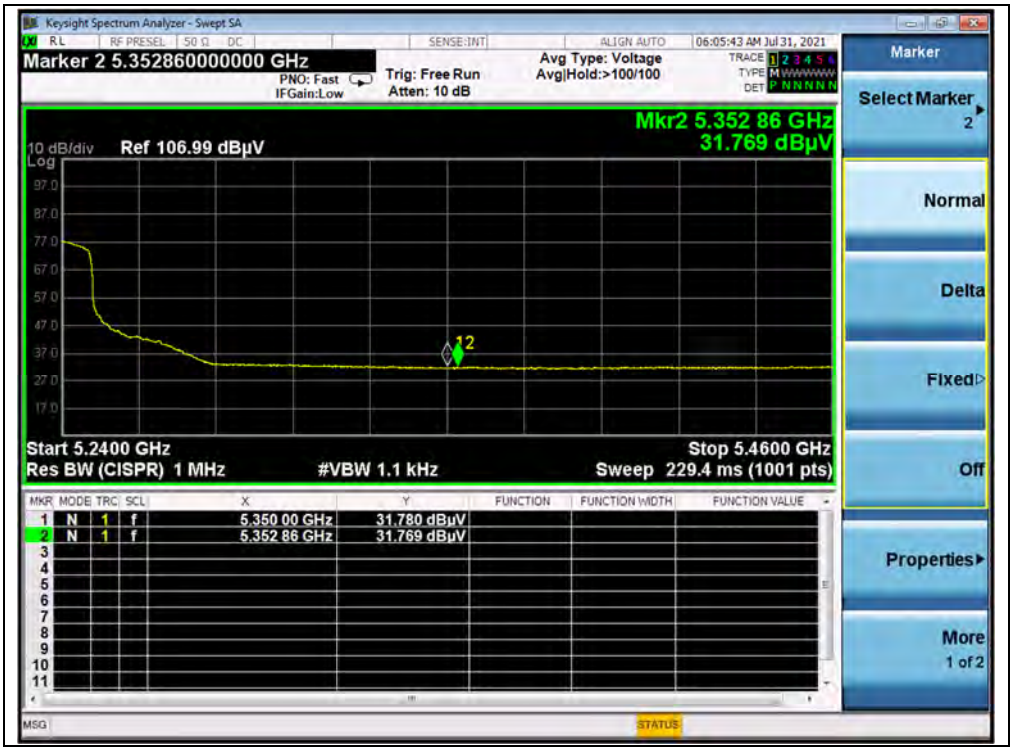

(PEAK, Channel 38, 802.11n (HT40))




(AVERAGE, Channel 38, 802.11n (HT40))




(PEAK, Channel 48, 802.11n (HT40))




(AVERAGE, Channel 48, 802.11n (HT40))


(PEAK, Channel 151, 802.11n (HT40))

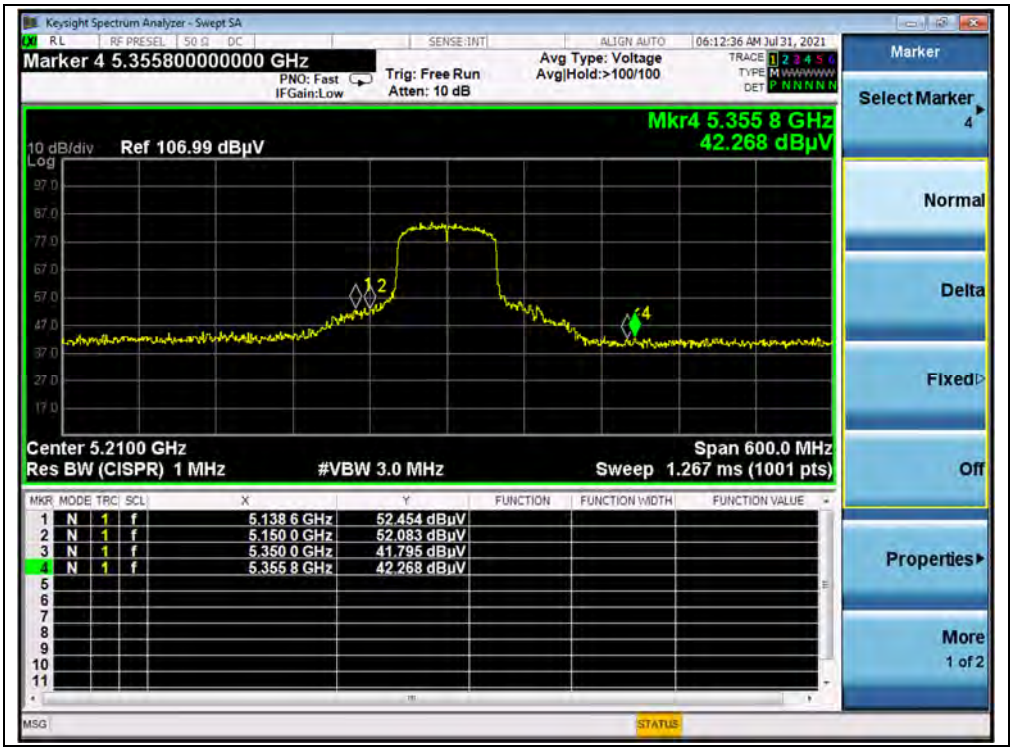

(PEAK, Channel 159, 802.11n (HT40))

**802.11 ac (VHT80) Mode**

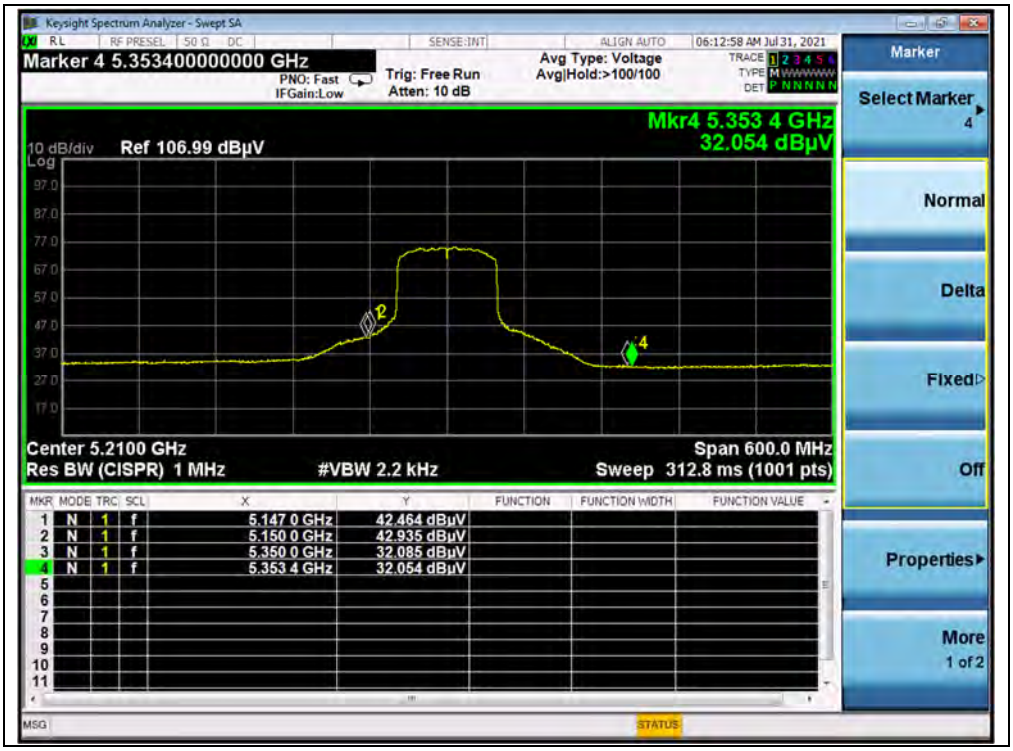
**A.Test Verdict:**

| Channel | Frequency (MHz) | Detector | Receiver Reading $U_R$ (dBuV) | $A_T$ (dB) | $A_{Factor}$ (dB@3m) | Max. Emission E (dBμV/m) | Limit (dBμV/m) | Verdict |
|---|---|---|---|---|---|---|---|---|
| | | PK/ AV | | | | | | |
| 42 | 5138.60 | PK | 52.45 | -19.54 | 32.20 | 65.11 | 74 | PASS |
| 42 | 5150.00 | AV | 42.94 | -19.54 | 32.20 | 55.6 | 54 | PASS |
| 42 | 5355.80 | PK | 42.27 | -19.54 | 32.20 | 54.93 | 74 | PASS |
| 42 | 5350.00 | AV | 32.09 | -19.54 | 32.20 | 44.75 | 54 | PASS |
| 155 | 5725.00 | PK | 56.21 | -19.01 | 32.20 | 69.40 | 110.83 | PASS |
| 155 | 5850.00 | PK | 51.28 | -19.01 | 32.20 | 64.47 | 122.23 | PASS |

**B.Test Plot:**




(Channel 42, PEAK, 802.11ac (VHT80))




(Channel 42, AVG, 802.11ac (VHT80))


(Channel 155, PEAK, 802.11ac (VHT80))

# 2.9. Radiated Emission

### 2.9.1. Requirement

The peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
(2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
(3) For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27dBm/MHz.
(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.
The following formula is used to convert the equipment isotropic radiated power(e.i.r.p.) to field strength (dBμV/m);

$$E = 1000000 \times \sqrt{30P} / 3 \ \mu V/m$$

where P is the EIRP in Watts

Therefore: -27 dBm/MHz = 68.23 dBuV/m

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. According to FCC section 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:

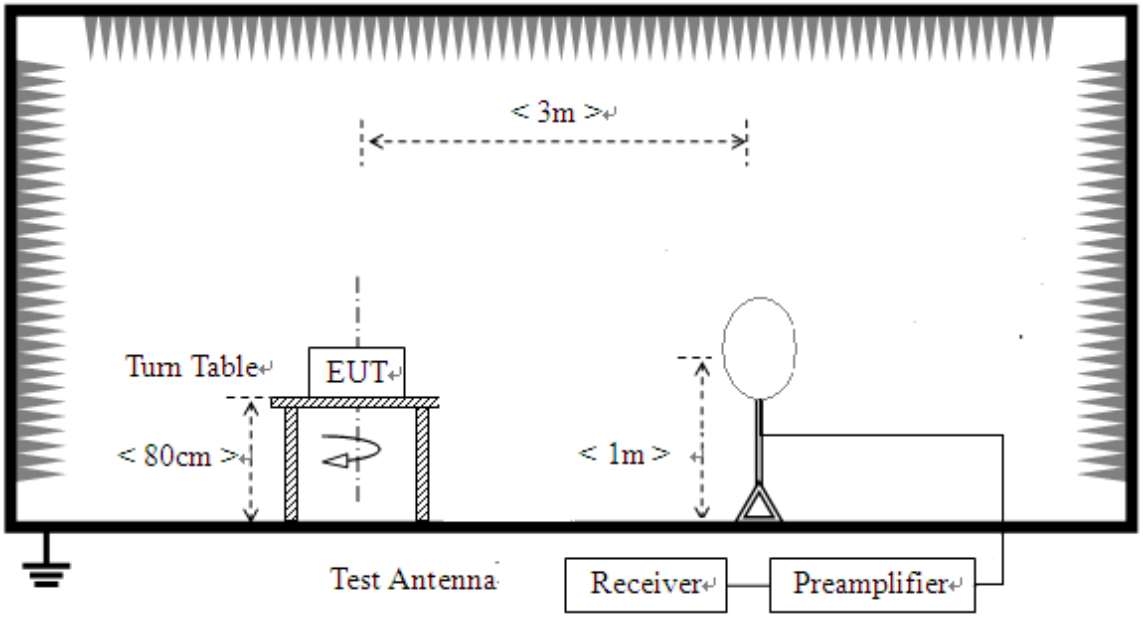
| Frequency (MHz) | Field Strength (μV/m) | Measurement Distance (m) |
|---|---|---|
| 0.009 - 0.490 | 2400/F(kHz) | 300 |
| 0.490 - 1.705 | 24000/F(kHz) | 30 |
| 1.705 - 30.0 | 30 | 30 |
| 30 - 88 | 100 | 3 |
| 88 - 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table).

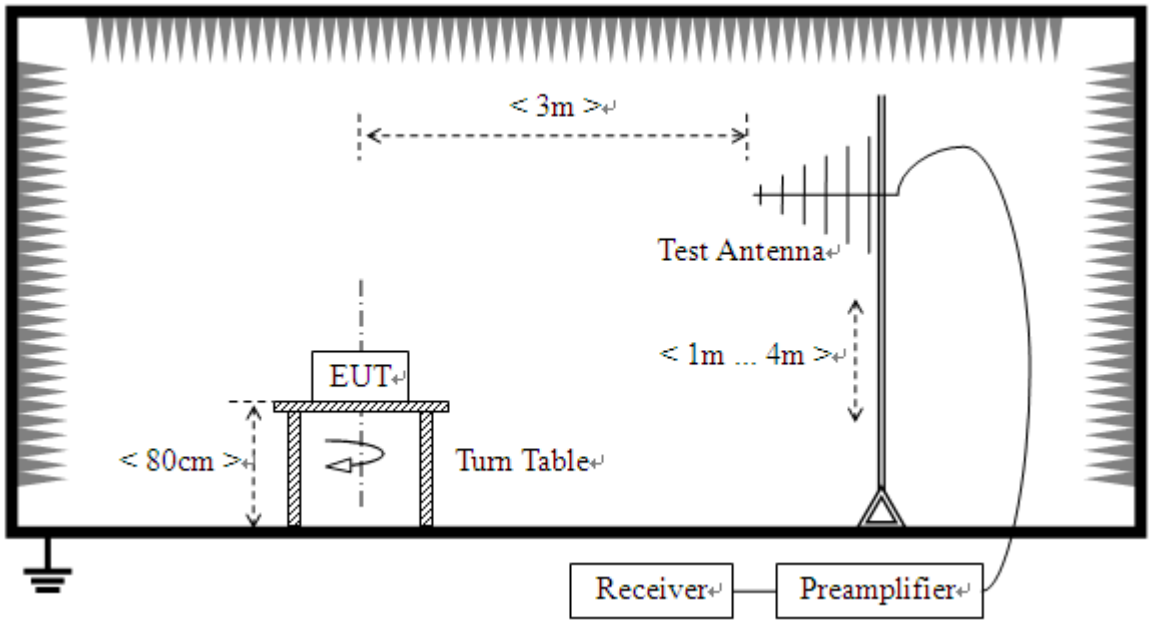
### 2.9.2. Test Description

**Test Setup:**

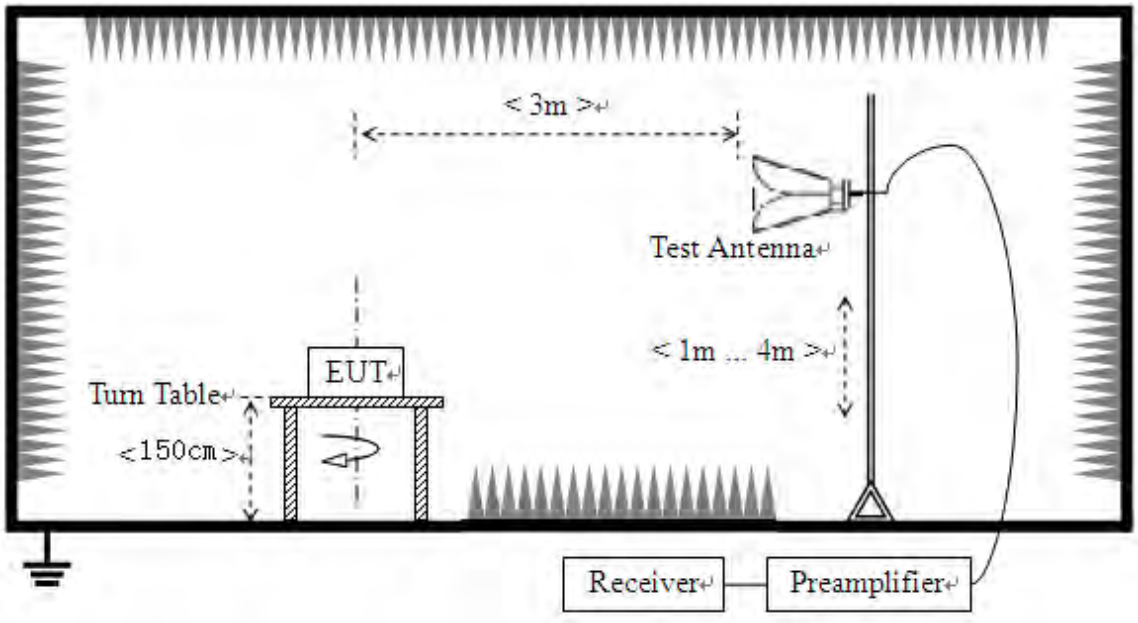
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz




3) For radiated emissions above 1GHz




The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz.The antenna to EUT distance is 3meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 30MHz, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz-90 kHz, 110kHz-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements and as applicable for average measurements.

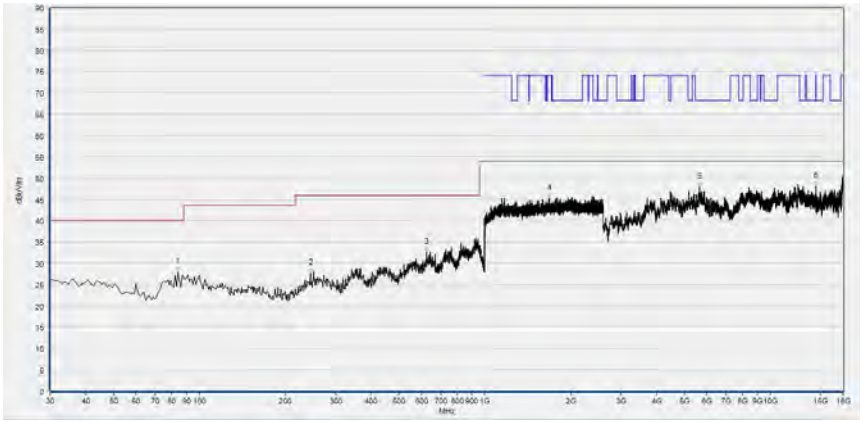
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

### 2.9.3. Test Result

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak (or average) limit, it is unnecessary to perform an quasi-peak measurement (or average).
The measurement results are obtained as below:
$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$
$A_T$: Total correction Factor except Antenna
$U_R$: Receiver Reading
$G_{preamp}$: Preamplifier Gain
$A_{Factor}$: Antenna Factor at 3m
During the test, the total correction Factor $A_T$ and $A_{Factor}$ were built in test software.
**Note 1:** All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.
**Note 2:** For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.
**Note 3:** For the frequency, which started from 18GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.
**Note 4:** All test modes and bandwidth were considered and evaluated respectively by performing full test, only the worst data were recorded for each bandwidth.

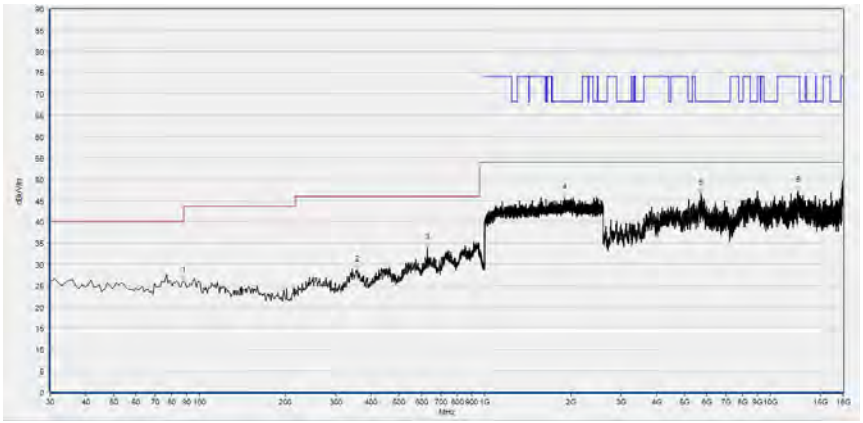
**802.11a Mode**

Plot for Channel 36



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 84.320 | 27.95 | N/A | N/A | N/A | 40.00 | N/A | Horizontal | PASS |
| 245.340 | 27.59 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 625.580 | 32.57 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 1684.800 | 45.20 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5649.200 | 47.95 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 14424.120 | 48.13 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |

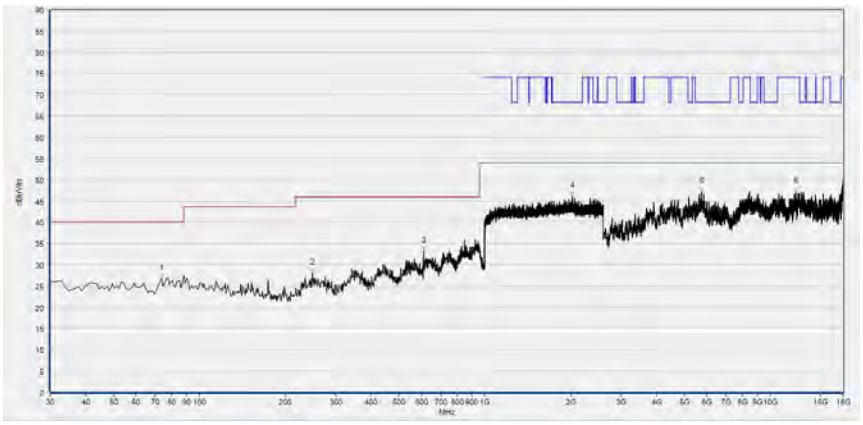
(Antenna Horizontal, 30MHz to 18GHz)



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 88.200 | 26.08 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 356.890 | 28.74 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 627.520 | 33.80 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 1897.067 | 45.59 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 5723.120 | 46.56 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 12551.480 | 47.21 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

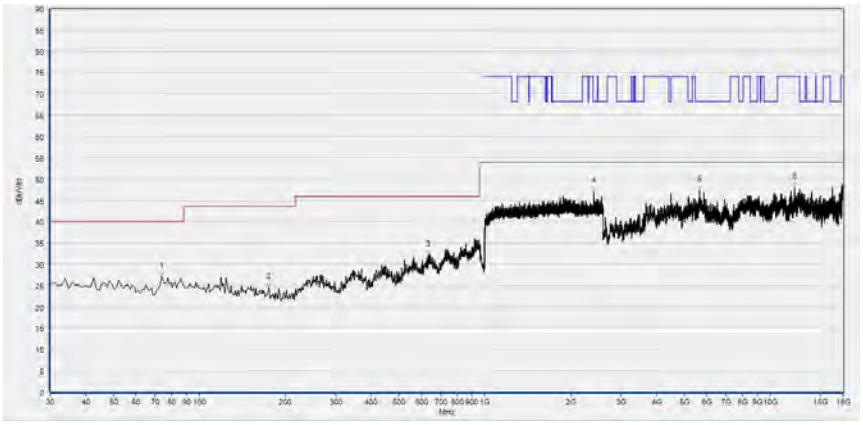
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 44



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 73.650 | 26.62 | N/A | N/A | N/A | 40.00 | N/A | Horizontal | PASS |
| 249.220 | 28.05 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 610.060 | 33.23 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 2031.467 | 46.14 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 5763.160 | 47.02 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 12305.080 | 47.08 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

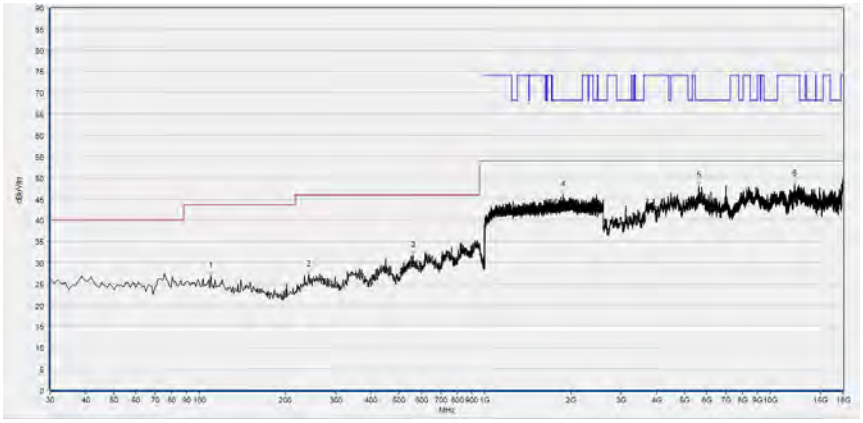
(Antenna Horizontal, 30MHz to 18GHz)



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 73.650 | 27.20 | N/A | N/A | N/A | 40.00 | N/A | Vertical | PASS |
| 174.530 | 24.70 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 633.340 | 32.26 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 2410.133 | 47.04 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 5661.520 | 47.50 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 12157.240 | 48.04 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

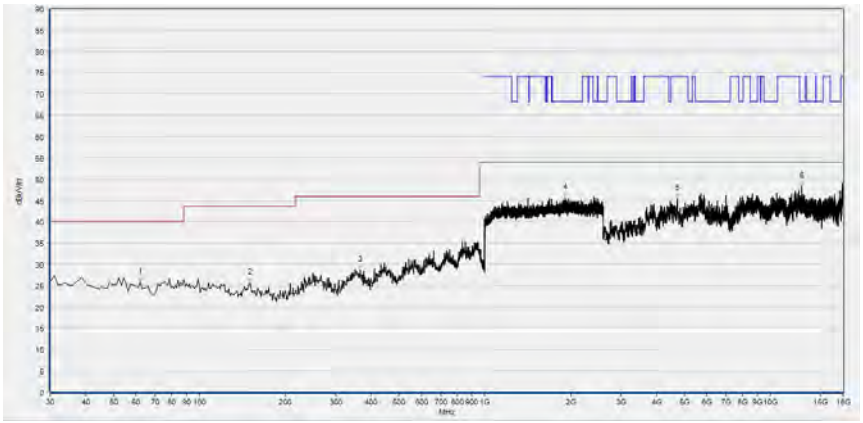
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 48



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 109.540 | 26.83 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 241.460 | 27.08 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 559.620 | 31.66 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 1884.267 | 45.95 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 5624.560 | 48.02 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 12157.240 | 48.41 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

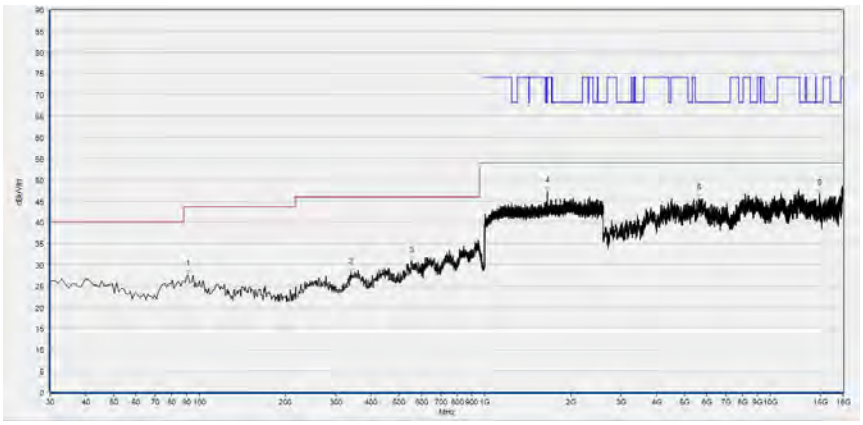
(Antenna Horizontal, 30MHz to 18GHz)



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 62.010 | 25.87 | N/A | N/A | N/A | 40.00 | N/A | Vertical | PASS |
| 150.280 | 25.57 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 366.590 | 28.58 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 1916.267 | 45.50 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 4715.960 | 45.43 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 12887.200 | 48.23 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |

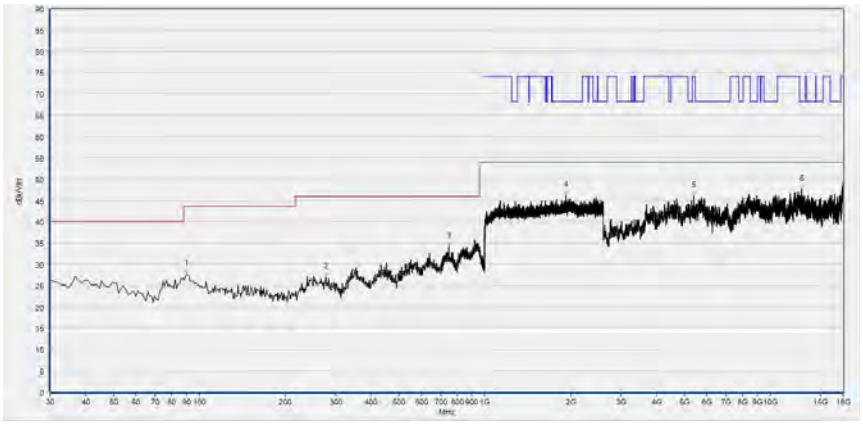
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 149



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 91.110 | 27.67 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 339.430 | 28.21 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 553.800 | 30.85 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 1657.067 | 47.23 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 5627.640 | 45.62 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 14867.640 | 46.80 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |

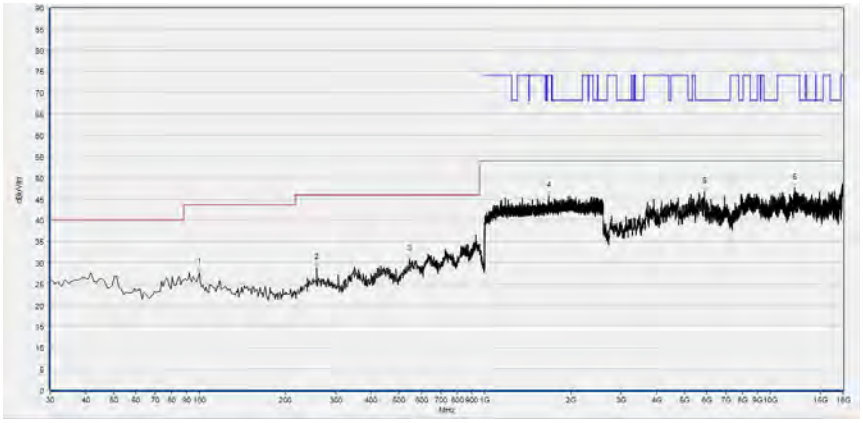
(Antenna Horizontal, 30MHz to 18GHz)



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 90.140 | 27.61 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 277.350 | 26.93 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 746.830 | 34.19 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 1924.267 | 46.29 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 5405.880 | 46.12 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 12893.360 | 47.59 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |

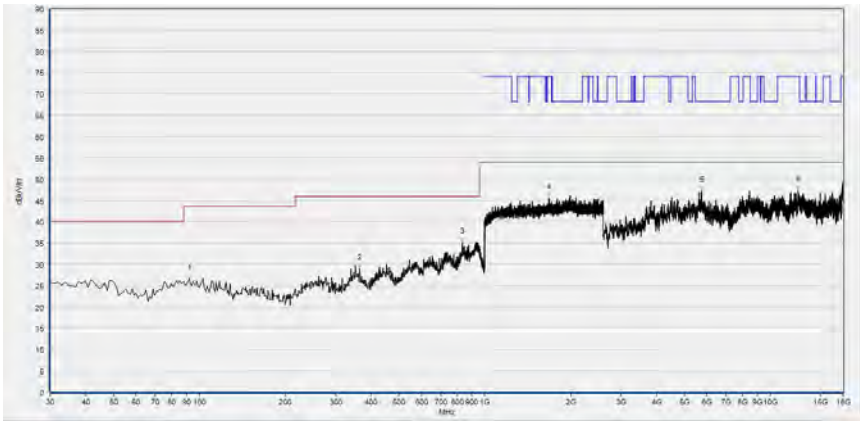
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 157



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 99.840 | 27.60 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 257.950 | 28.74 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 545.070 | 30.76 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 1678.400 | 45.84 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5886.360 | 46.71 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 12148.000 | 47.63 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

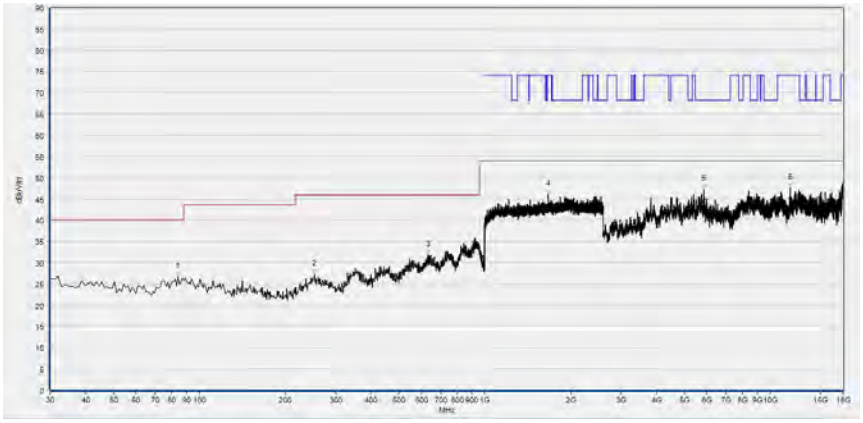
(Antenna Horizontal, 30MHz to 18GHz)



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 92.080 | 26.64 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 364.650 | 28.97 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 833.160 | 35.28 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 1674.133 | 45.67 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 5760.080 | 47.20 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 12514.520 | 47.38 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

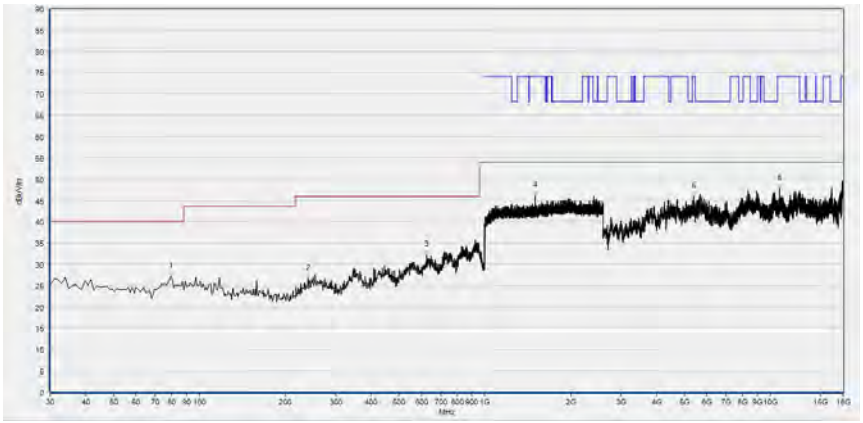
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 165



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 84.320 | 26.64 | N/A | N/A | N/A | 40.00 | N/A | Horizontal | PASS |
| 253.100 | 27.34 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 633.340 | 31.87 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 1670.400 | 46.02 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5858.640 | 47.30 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 11735.280 | 47.62 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

(Antenna Horizontal, 30MHz to 18GHz)

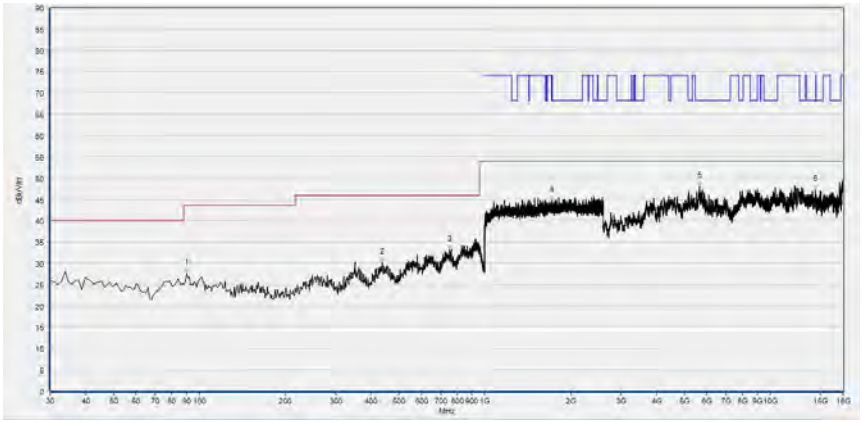


| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 79.470 | 27.09 | N/A | N/A | N/A | 40.00 | N/A | Vertical | PASS |
| 240.490 | 26.65 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 624.610 | 32.11 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 1497.600 | 46.03 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 5402.800 | 45.92 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 10762.000 | 47.76 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

(Antenna Vertical, 30MHz to 18GHz)

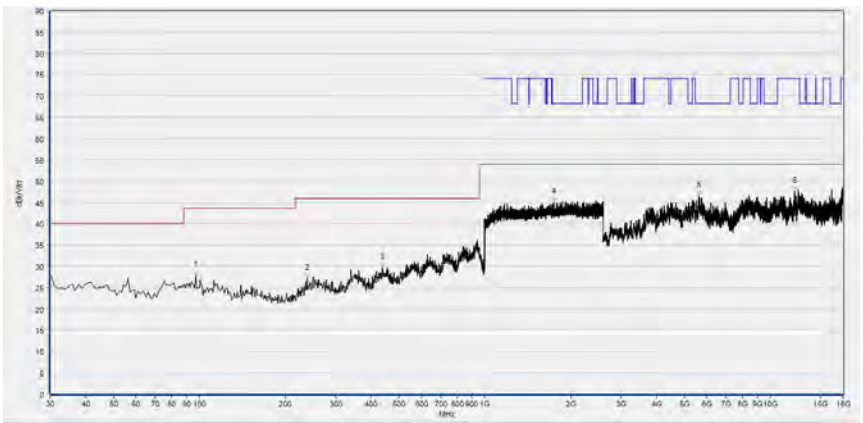
**802.11n (HT40) Mode**

Plot for Channel 38



| Fre. (MHz) | PK (dBµV/m) | QP (dBµV/m) | AV (dBµV/m) | Limit-PK (dBµV/m) | Limit-QP (dBµV/m) | Limit-AV (dBµV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 90.140 | 27.70 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 437.400 | 30.10 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 751.680 | 33.18 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 1716.267 | 44.74 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 5652.280 | 48.09 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 14405.640 | 47.34 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |

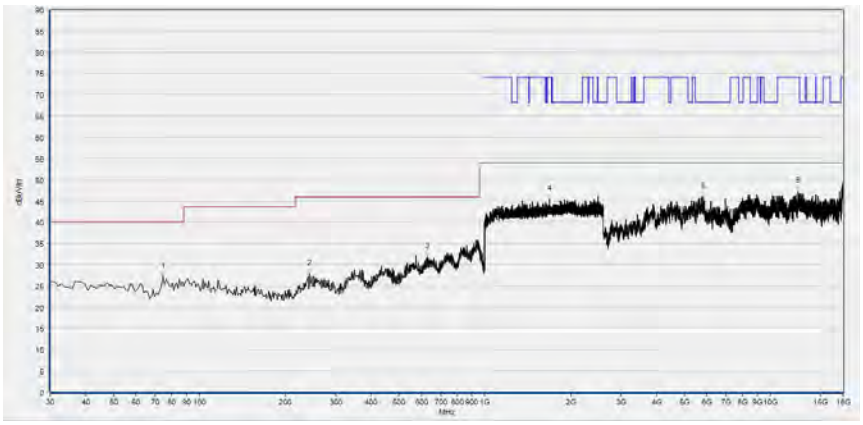
(Antenna Horizontal, 30MHz to 18GHz)



| Fre. (MHz) | PK (dBµV/m) | QP (dBµV/m) | AV (dBµV/m) | Limit-PK (dBµV/m) | Limit-QP (dBµV/m) | Limit-AV (dBµV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 96.930 | 27.87 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 239.520 | 27.21 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 436.430 | 29.67 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 1741.333 | 45.08 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 5630.720 | 46.51 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 12157.240 | 47.59 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

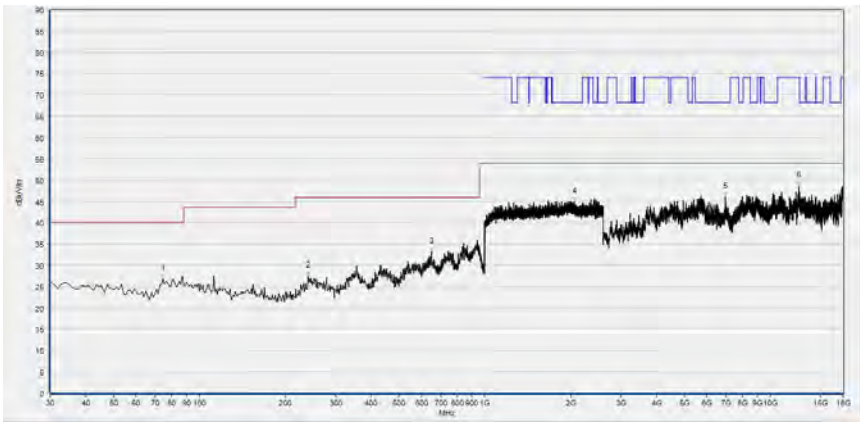
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 46



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 74.620 | 27.10 | N/A | N/A | N/A | 40.00 | N/A | Horizontal | PASS |
| 243.400 | 27.79 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 628.490 | 31.80 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 1683.200 | 45.47 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5812.440 | 45.88 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 12529.920 | 47.33 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

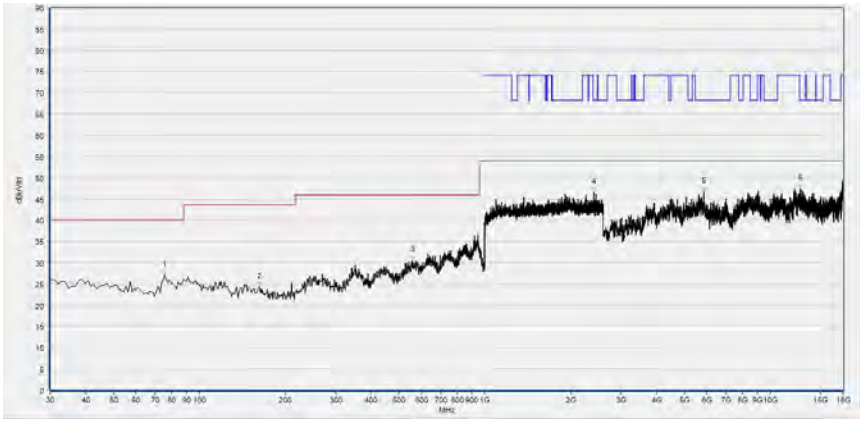
(Antenna Horizontal, 30MHz to 18GHz)



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 74.620 | 26.87 | N/A | N/A | N/A | 40.00 | N/A | Vertical | PASS |
| 240.490 | 27.47 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 649.830 | 33.21 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 2058.133 | 44.94 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 6973.600 | 46.01 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 12625.400 | 48.67 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

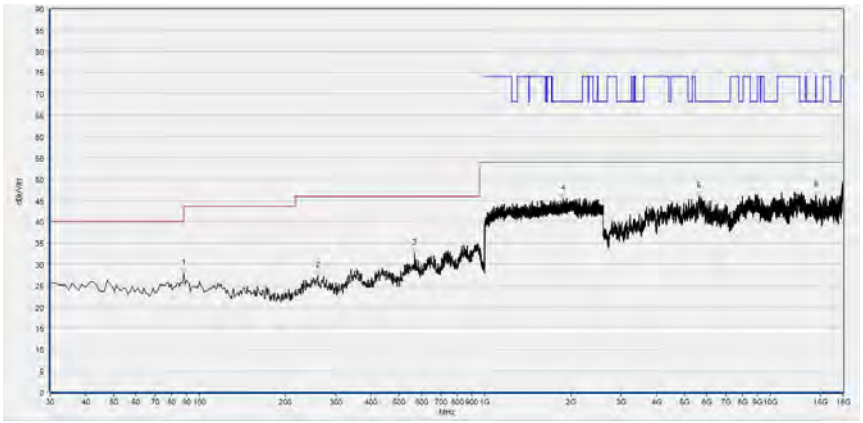
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 151



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 75.590 | 27.15 | N/A | N/A | N/A | 40.00 | N/A | Horizontal | PASS |
| 161.920 | 24.33 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 556.710 | 30.43 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 2412.800 | 46.65 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 5855.560 | 46.77 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 12702.400 | 47.51 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |

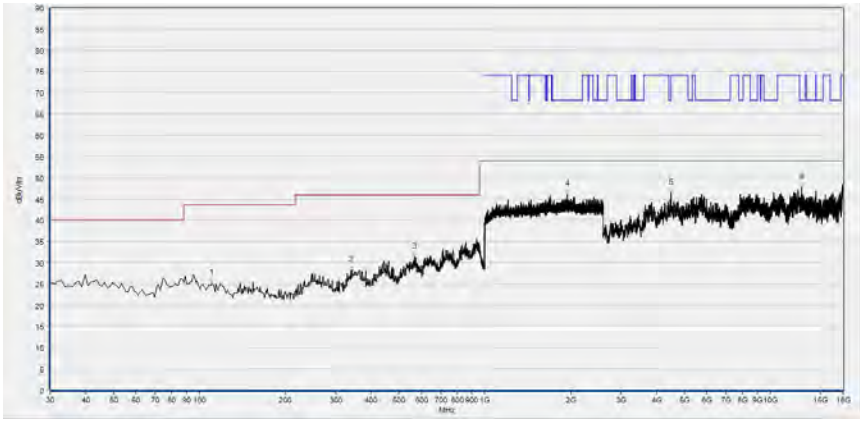
(Antenna Horizontal, 30MHz to 18GHz)



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 88.200 | 27.75 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 259.890 | 27.33 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 568.350 | 32.45 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 1883.733 | 45.37 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 5633.800 | 45.89 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 14427.200 | 46.33 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |

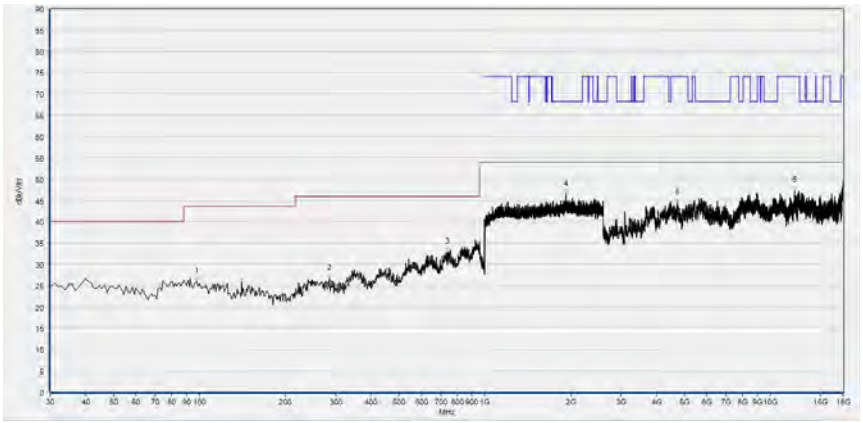
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 159



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 110.510 | 25.13 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 339.430 | 28.20 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 567.380 | 31.37 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 1948.267 | 46.12 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 4497.280 | 46.47 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 12896.440 | 47.80 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |

(Antenna Horizontal, 30MHz to 18GHz)

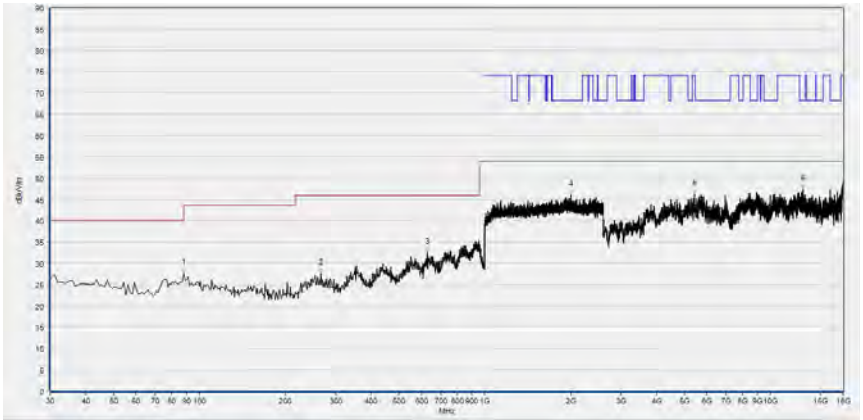


| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 97.900 | 26.03 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 286.080 | 26.57 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 741.010 | 32.90 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 1929.067 | 46.38 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 4719.040 | 44.36 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 12166.480 | 47.21 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

(Antenna Vertical, 30MHz to 18GHz)

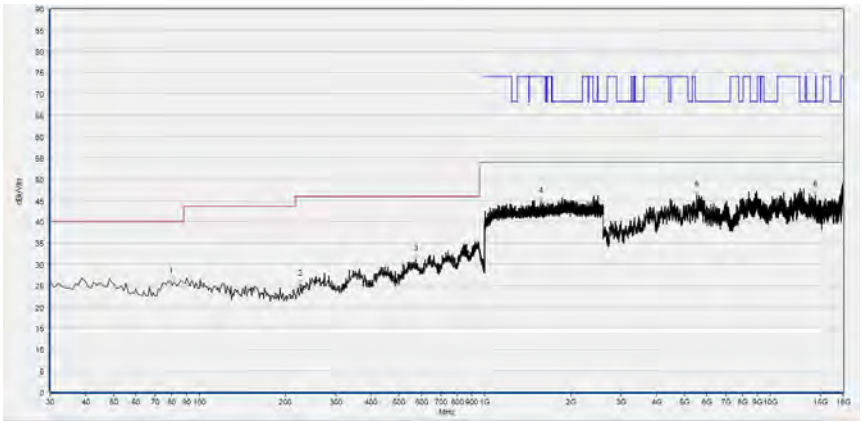
**802.11ac (VHT80) Mode**

Plot for Channel 42



| Fre. (MHz) | Pk (dBµV/m) | QP (dBµV/m) | AV (dBµV/m) | Limit-PK (dBµV/m) | Limit-QP (dBµV/m) | Limit-AV (dBµV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 88.200 | 27.63 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 266.680 | 27.70 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 627.520 | 32.46 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 2000.533 | 46.04 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 5436.680 | 46.32 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 13059.680 | 47.41 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |

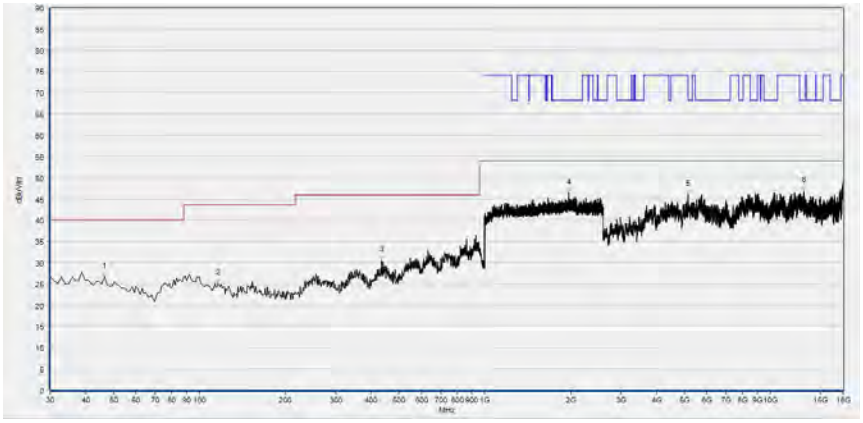
(Antenna Horizontal, 30MHz to 18GHz)



| Fre. (MHz) | Pk (dBµV/m) | QP (dBµV/m) | AV (dBµV/m) | Limit-PK (dBµV/m) | Limit-QP (dBµV/m) | Limit-AV (dBµV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 79.470 | 25.92 | N/A | N/A | N/A | 40.00 | N/A | Vertical | PASS |
| 225.940 | 25.33 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 575.140 | 31.25 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 1569.067 | 44.73 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 5538.320 | 46.25 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 14402.560 | 46.31 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |

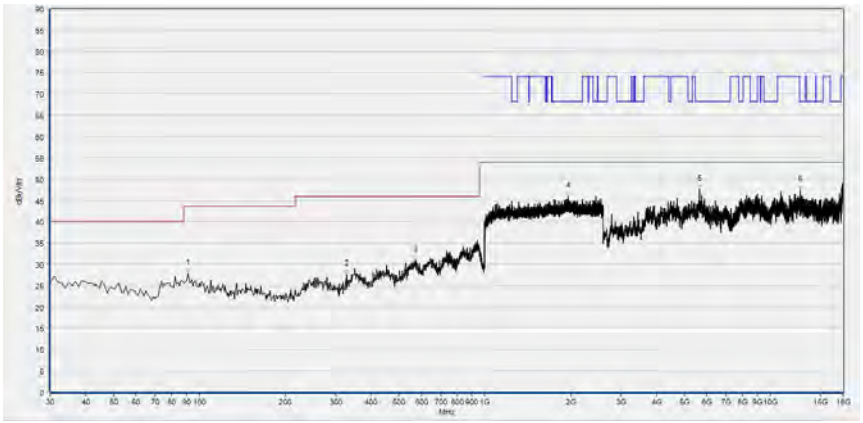
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 155



| Fre. (MHz) | Pk (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 46.490 | 26.68 | N/A | N/A | N/A | 40.00 | N/A | Horizontal | PASS |
| 116.330 | 25.16 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 434.490 | 30.46 | N/A | N/A | N/A | 46.00 | N/A | Horizontal | PASS |
| 1964.800 | 46.48 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 5162.560 | 46.08 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |
| 13093.560 | 47.01 | N/A | N/A | 68.23 | N/A | N/A | Horizontal | PASS |

(Antenna Horizontal, 30MHz to 18GHz)



| Fre. (MHz) | Pk (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 91.110 | 27.82 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 328.760 | 27.59 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 569.320 | 30.85 | N/A | N/A | N/A | 46.00 | N/A | Vertical | PASS |
| 1960.533 | 45.95 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 5643.040 | 47.62 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |
| 12739.360 | 47.41 | N/A | N/A | 68.23 | N/A | N/A | Vertical | PASS |

(Antenna Vertical, 30MHz to 18GHz)

# Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

| Test Items | Uncertainty |
|---|---|
| Peak Output Power | ±2.22dB |
| Power Spectral Density | ±2.22dB |
| Bandwidth | ±5% |
| Restricted Frequency Bands | ±5% |
| Radiated Emission | ±2.95dB |
| Conducted Emission | ±2.44dB |

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

# Annex B Testing Laboratory Information

## 1. Identification of the Responsible Testing Laboratory

| | |
|---|---|
| **Laboratory Name:** | Shenzhen Morlab Communications Technology Co., Ltd. |
| **Laboratory Address:** | FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China |
| **Telephone:** | +86 755 36698555 |
| **Facsimile:** | +86 755 36698525 |

## 2. Identification of the Responsible Testing Location

| | |
|---|---|
| **Name:** | Shenzhen Morlab Communications Technology Co., Ltd. |
| **Address:** | FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China |

## 3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.

## 4. Test Equipments Utilized

### 4.1 Conducted Test Equipments

| Equipment | Serial No. | Type | Manufacturer | Cal. Date | Due Date |
|---|---|---|---|---|---|
| Attenuator 1 | N/A | 10dB | Resnet | N/A | N/A |
| EXA Signal Analzyer | MY53470836 | N9010A | Agilent | 2021.03.25 | 2022.03.24 |
| USB Wideband Power Sensor | MY54210011 | U2021XA | Agilent | 2021.03.25 | 2022.03.24 |
| RF Cable (30MHz-26GHz) | CB01 | RF01 | Morlab | N/A | N/A |
| Coaxial Cable | CB02 | RF02 | Morlab | N/A | N/A |
| SMA Connector | CN01 | RF03 | HUBER-SUHNER | N/A | N/A |
| Temperature Chamber | 12108015 | DTL-003S101 | YOMA | 2020.10.26 | 2021.10.25 |

### 4.2 Conducted Emission Test Equipments

| Equipment Name | Serial No. | Type | Manufacturer | Cal. Date | Due Date |
|---|---|---|---|---|---|
| Receiver | MY56400093 | N9038A | KEYSIGHT | 2021.03.09 | 2022.03.08 |
| LISN | 812744 | NSLK 8127 | Schwarzbeck | 2021.03.09 | 2022.03.08 |
| Pulse Limiter (10dB) | VTSD 9561 F-B #206 | VTSD 9561-F | Schwarzbeck | 2020.07.24 | 2021.07.23 |
| | | | | 2021.07.21 | 2022.07.20 |
| Coaxial Cable(BNC) (30MHz-26GHz) | CB01 | EMC01 | Morlab | N/A | N/A |

### 4.3 List of Software Used

| Description | Manufacturer | Software Version |
|---|---|---|
| Test System | Tonscend | V2.6 |
| Power Panel | Agilent | V3.8 |
| MORLAB EMCR V1.2 | MORLAB | V1.0 |
| TS+ -[JS32-CE] | Tonscend | V2.5.0.0 |

**4.4Radiated Test Equipments**

| Equipment Name | Serial No. | Type | Manufacturer | Cal. Date | Due Date |
|---|---|---|---|---|---|
| Receiver | MY54130016 | N9038A | Agilent | 2020.07.21 | 2021.07.20 |
| | | | | 2021.07.16 | 2022.07.15 |
| Test Antenna - Bi-Log | 9163-519 | VULB 9163 | Schwarzbeck | 2019.05.24 | 2022.05.23 |
| Test Antenna - Horn | BBHA9170 #774 | BBHA 9170 | Schwarzbeck | 2019.07.26 | 2022.07.25 |
| Test Antenna - Loop | 1519-022 | FMZB1519 | Schwarzbeck | 2019.02.14 | 2022.02.13 |
| Test Antenna - Horn | 01774 | BBHA 9120D | Schwarzbeck | 2019.07.26 | 2022.07.25 |
| Coaxial Cable (N male) (9KHz-30MHz) | CB04 | EMC04 | Morlab | N/A | N/A |
| Coaxial Cable (N male) (30MHz-26GHz) | CB02 | EMC02 | Morlab | N/A | N/A |
| Coaxial Cable (N male) (30MHz-26GHz) | CB03 | EMC03 | Morlab | N/A | N/A |
| Coaxial Cable (N male) (30MHz-40GHz) | CB05 | EMC05 | Morlab | N/A | N/A |
| 1-18GHz pre-Amplifier | 61171/61172 | S020180L3203 | Tonscend | 2020.07.21 | 2021.07.20 |
| | | | | 2021.07.15 | 2022.07.14 |
| 26-40GHz pre-Amplifier | 56774 | S40M400L4002 | Tonscend | 2020.07.21 | 2021.07.20 |
| | | | | 2021.07.15 | 2022.07.14 |
| 18-26.5GHz pre-Amplifier | 46732 | S10M100L3802 | Tonscend | 2020.07.21 | 2021.07.20 |
| | | | | 2021.07.15 | 2022.07.14 |
| Notch Filter | N/A | WRCG-5150-5350 | Wainwright | 2020.07.21 | 2021.07.20 |
| | | | | 2021.07.15 | 2022.07.14 |
| Notch Filter | N/A | WRCG-5470-5725 | Wainwright | 2020.07.21 | 2021.07.20 |
| | | | | 2021.07.15 | 2022.07.14 |
| Notch Filter | N/A | WRCG-5725-5850 | Wainwright | 2020.07.21 | 2021.07.20 |
| | | | | 2021.07.15 | 2022.07.14 |

| Equipment Name | Serial No. | Type | Manufacturer | Cal. Date | Due Date |
|---|---|---|---|---|---|
| Anechoic Chamber | N/A | 9m*6m*6m | CRT | 2020.01.06 | 2023.01.05 |

END OF REPORT