

**Guangdong Meijiixin Innovative Technology Co., Ltd.**

# RF TEST REPORT

**Report Type:**

FCC Part 15.407 RF report

**Model:**

MEW4-1

**REPORT NUMBER:**

191201777SHA-002

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**DOCUMENT CONTROL NUMBER:**

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**Manufacturer:** Guangdong Meijiixin Innovative Technology Co., Ltd.  
Xingye South Road, Laimei Industrial Park, Chenghai, Shantou,  
Guangdong, China

**Product Name:** R/C drone

**Type/Model:** MEW4-1

**FCC ID:** 2AHV3KK20

**SUMMARY:**

The equipment complies with the requirements according to the following standard(s) or Specification:

**47CFR Part 15 (2018):** Radio Frequency Devices (Subpart E)

**ANSI C63.10 (2013):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

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## Revision History

| Report No.       | Version | Description             | Issued Date       |
|------------------|---------|-------------------------|-------------------|
| 191201777SHA-002 | Rev. 01 | Initial issue of report | December 30, 2019 |
|                  |         |                         |                   |
|                  |         |                         |                   |

## Measurement result summary

| TEST ITEM                                | FCC REFERENCE                 | RESULT           |
|------------------------------------------|-------------------------------|------------------|
| 26 dB Bandwidth & 99% Occupied Bandwidth | 15.407(a)                     | Pass             |
| Minimum 6dB Bandwidth                    | 15.407(e)                     | Pass             |
| Maximum Conducted Output Power           | 15.407(a)                     | Pass             |
| Power spectral density                   | 15.407(a)                     | Pass             |
| Radiated emission                        | 15.407(b)<br>15.205<br>15.209 | Pass             |
| Power line conducted emission            | 15.407(b)<br>15.207           | NA (See note1,4) |
| Antenna requirement                      | 15.203                        | Pass             |

Notes: 1: NA =Not Applicable

2. Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3. Additions, Deviations and Exclusions from Standards: None.

4. The battery needs to be removed from the EUT when charging, so there is no transmitting when charging

## 1 GENERAL INFORMATION

### 1.1 Description of Equipment Under Test (EUT)

|                       |                                                                                                                                                                                                                                                                                                 |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product name:         | R/C drone                                                                                                                                                                                                                                                                                       |
| Type/Model:           | MEW4-1                                                                                                                                                                                                                                                                                          |
| Trade Mark            |                                                                                                                                                                                                                |
| Add Model:            | B3, B3pro, B7, B9, B10, BX, B12, B14, B16, B18, B19, B20, B22, B23, B25, B2M, B2Pro, B2SE, B3P, B4W, B5W, X103W, X104G, MEW4-1, MEW4-2, MEW4-3, MEW4-4, V6, V7, V8, V9, M2, M3, M4, NY-BG57, V-6, E32HW, HS700D, HS720, DRC-LSX10, SP700 (Refer to Declaration of Difference for more details.) |
| Description of EUT:   | The EUT is an aircraft with general 2.4G and 5G WiFi (11a/11n) technology.                                                                                                                                                                                                                      |
| Rating:               | DC 7.6V (Powered by a 7.6V Battery)                                                                                                                                                                                                                                                             |
| Sample received date: | December 10, 2019                                                                                                                                                                                                                                                                               |
| Date of test:         | December 10, 2019 ~ December 21, 2019                                                                                                                                                                                                                                                           |

### 1.2 Technical Specification

|                     |                                                                      |
|---------------------|----------------------------------------------------------------------|
| Frequency Range:    | 5180MHz ,5745MHz                                                     |
| Support Standards:  | 802.11a, 802.11n (HT20)                                              |
| Type of Modulation: | OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)                              |
| Channel Number:     | For 5150MHz band: Channel 36<br>For 5745 ~ 5850MHz band: Channel 149 |

| Antenna | Model | Antenna type     | Antenna Gain | Note |
|---------|-------|------------------|--------------|------|
| 1       | /     | Internal antenna | 2.0 dBi,     | /    |

| Mode    | Tx/Rx Function | Beamforming function | CDD function |
|---------|----------------|----------------------|--------------|
| 802.11a | 2Tx/2Rx        | NO                   | NO           |
| 802.11n | 2Tx/2Rx        | NO                   | NO           |

### 1.3 Description of Test Facility

|            |                                                                        |
|------------|------------------------------------------------------------------------|
| Name:      | Intertek Testing Services Shanghai                                     |
| Address:   | Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China |
| Telephone: | 86 21 61278200                                                         |
| Telefax:   | 86 21 54262353                                                         |

|                                                                                   |                                                                          |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| The test facility is recognized, certified, or accredited by these organizations: | CNAS Accreditation Lab<br>Registration No. CNAS L0139                    |
|                                                                                   | FCC Accredited Lab<br>Designation Number: CN1175                         |
|                                                                                   | IC Registration Lab<br>Registration code No.: 2042B-1                    |
|                                                                                   | VCCI Registration Lab<br>Registration No.: R-4243, G-845, C-4723, T-2252 |
|                                                                                   | A2LA Accreditation Lab<br>Certificate Number: 3309.02                    |

Tests were sub-contracted.

|            |                                                                                                                            |
|------------|----------------------------------------------------------------------------------------------------------------------------|
| Name:      | Shenzhen UnionTrust Quality and Technology Co., Ltd.                                                                       |
| Address:   | 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China |
| Telephone: | +86 (0) 755 2823 0888                                                                                                      |
| Telefax:   | +86 (0) 755 2823 0886                                                                                                      |

|                                                                                   |                                                                                |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| The test facility is recognized, certified, or accredited by these organizations: | Shenzhen UnionTrust Quality and Technology Co., Ltd.<br>CNAS Accreditation Lab |
|                                                                                   | Registration No. CNAS L9069                                                    |

## 2 TEST SPECIFICATIONS

### 2.1 Standards or specification

47CFR Part 15 (2018)  
ANSI C63.10 (2013)  
KDB 789033 D02 v02r01

### 2.2 Mode of operation during the test

While testing transmitting mode of EUT, the continuously transmission was applied by following software.

| Software name       | Manufacturer | Version     | Supplied by |
|---------------------|--------------|-------------|-------------|
| ETF_GUI_A40.00.0007 | -            | A40.00.0007 | Client      |

The frequency was tested as representatives.

| Frequency Band | Mode           | Frequency (MHz) | Power Setting |
|----------------|----------------|-----------------|---------------|
| 5150~5250      | 802.11a_MIMO   | 5180            | 15            |
|                | 802.11n20_MIMO | 5180            | 11            |
| 5725~5850      | 802.11a_MIMO   | 5745            | 18            |
|                | 802.11n20_MIMO | 5745            | 18            |



After this pre-scan with the RF power, the following data rate was chosen to do the test as the worst case.

| Frequency (MHz) | Mode      | Worst case data rate |
|-----------------|-----------|----------------------|
| 5180            | 802.11a   | 6Mbps                |
|                 | 802.11n20 | MCS0                 |
| 5745            | 802.11a   | 6Mbps                |
|                 | 802.11n20 | MCS0                 |

There have the following test mode:

Radiated test mode:

Mode 1: EUT transmitted signal with internal antenna;

Conducted test mode:

Mode 2: EUT transmitted signal from PCBA RF port connected to SPA directly;

We have verified all test modes and choose the worst mode 1 for radiated test and mode 2 for conducted test as representatively to list the results in this report

## 2.3 Test peripherals list

| Item No.                                                                       | Name     | Band and Model | Description  |
|--------------------------------------------------------------------------------|----------|----------------|--------------|
| 1                                                                              | NoteBook | Lenovo, E450   | AC 120V 60Hz |
| Note: The NoteBook only used for control RF setting, not used during the test. |          |                |              |

## 2.4 Test environment condition:

| Test items                                 | Temperature | Humidity |
|--------------------------------------------|-------------|----------|
| 26 dB Bandwidth & 99% Occupied Bandwidth   | 23°C        | 52% RH   |
| Minimum 6dB Bandwidth                      |             |          |
| Maximum Conducted Output Power             |             |          |
| Power spectral density                     |             |          |
| Radiated Emissions in restricted frequency | 25°C        | 48% RH   |

## 2.5 Instrument list

| Radiated Emission                   |                                  |              |            |              |               |
|-------------------------------------|----------------------------------|--------------|------------|--------------|---------------|
| Used                                | Equipment                        | Manufacturer | Type       | Internal no. | Due date      |
| <input checked="" type="checkbox"/> | 3M Chamber & Accessory Equipment | ETS-LINDGREN | 3M         | N/A          | Dec. 03, 2021 |
| <input checked="" type="checkbox"/> | Receiver                         | R&S          | ESIB26     | UTTTL-E026   | Nov. 23, 2020 |
| <input checked="" type="checkbox"/> | Loop Antenna                     | ETS-LINDGREN | 6502       | UTTTL-E013   | Nov. 15, 2020 |
| <input checked="" type="checkbox"/> | Broadband Antenna                | ETS-LINDGREN | 3142E      | UTTTL-E014   | Nov. 15, 2020 |
| <input checked="" type="checkbox"/> | 6dB Attenuator                   | Talent       | RA6A5-N-18 | UTTTL-E057   | Nov. 23, 2020 |
| <input checked="" type="checkbox"/> | Preamplifier                     | HP           | 8447F      | UTTTL-E043   | Nov. 23, 2020 |
| <input checked="" type="checkbox"/> | Horn Antenna                     | ETS-LINDGREN | 3117       | UTTTL-E016   | Nov. 15, 2020 |
| <input checked="" type="checkbox"/> | Multi device Controller          | ETS-LINDGREN | 7006-001   | N/A          | N/A           |

| Test software | Manufacturer | Version           |
|---------------|--------------|-------------------|
| e3            | Audix        | Software Version: |

| RF test                             |                                         |              |         |              |               |
|-------------------------------------|-----------------------------------------|--------------|---------|--------------|---------------|
| Used                                | Equipment                               | Manufacturer | Type    | Internal no. | Due date      |
| <input type="checkbox"/>            | Temp & Humidity chamber                 | Votisch      | VT4002  | UTTTL-E054   | June 05, 2020 |
| <input checked="" type="checkbox"/> | EXA Spectrum Analyzer                   | KEYSIGHT     | N9010A  | UTTTL-E032   | Nov. 23, 2020 |
| <input type="checkbox"/>            | Receiver                                | R&S          | ESR7    | UTTTL-E005   | Nov. 23, 2020 |
| <input checked="" type="checkbox"/> | USB Wideband Power Sensor               | KEYSIGHT     | U2021XA | UTTTL-E033   | Nov. 23, 2020 |
| <input type="checkbox"/>            | EXG-B RF Analog Signal Generator        | KEYSIGHT     | N5171B  | UTTTL-E030   | Nov. 23, 2020 |
| <input type="checkbox"/>            | MXG X-Series RF Vector Signal Generator | KEYSIGHT     | N5182B  | UTTTL-E031   | Nov. 23, 2020 |
| <input type="checkbox"/>            | Wideband Radio Communication Tester     | R&S          | CMW500  | UTTTL-E049   | July 19, 2020 |

## 2.6 Measurement uncertainty

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

| Test item                       | Measurement uncertainty |
|---------------------------------|-------------------------|
| Conducted emission 9KHz-150KHz  | ±3.8 dB                 |
| Conducted emission 150KHz-30MHz | ±3.4 dB                 |
| Radiated emission 9KHz-30MHz    | ±4.9 dB                 |
| Radiated emission 30MHz-1GHz    | ±4.7 dB                 |
| Radiated emission 1GHz-18GHz    | ±5.1 dB                 |
| Radiated emission 18GHz-26GHz   | ±5.2 dB                 |
| Radiated emission 26GHz-40GHz   | ±5.2 dB                 |

### **3 26 dB Bandwidth**

**Test result:** Pass

#### **3.1 Limit**

None

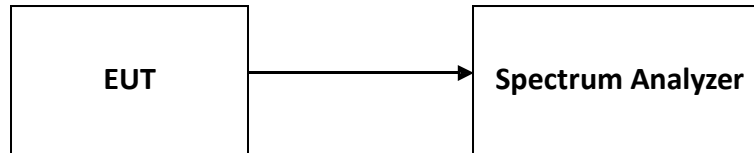
#### **3.2 Measurement Procedure**

The EUT was tested according to test procedure of “KDB789033 D02 General UNII Test Procedures New Rules”

##### **26 dB Bandwidth**

- a) Set RBW = approximately 1% of the emission bandwidth.
- b) Set the 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 maximum 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 Test Configuration

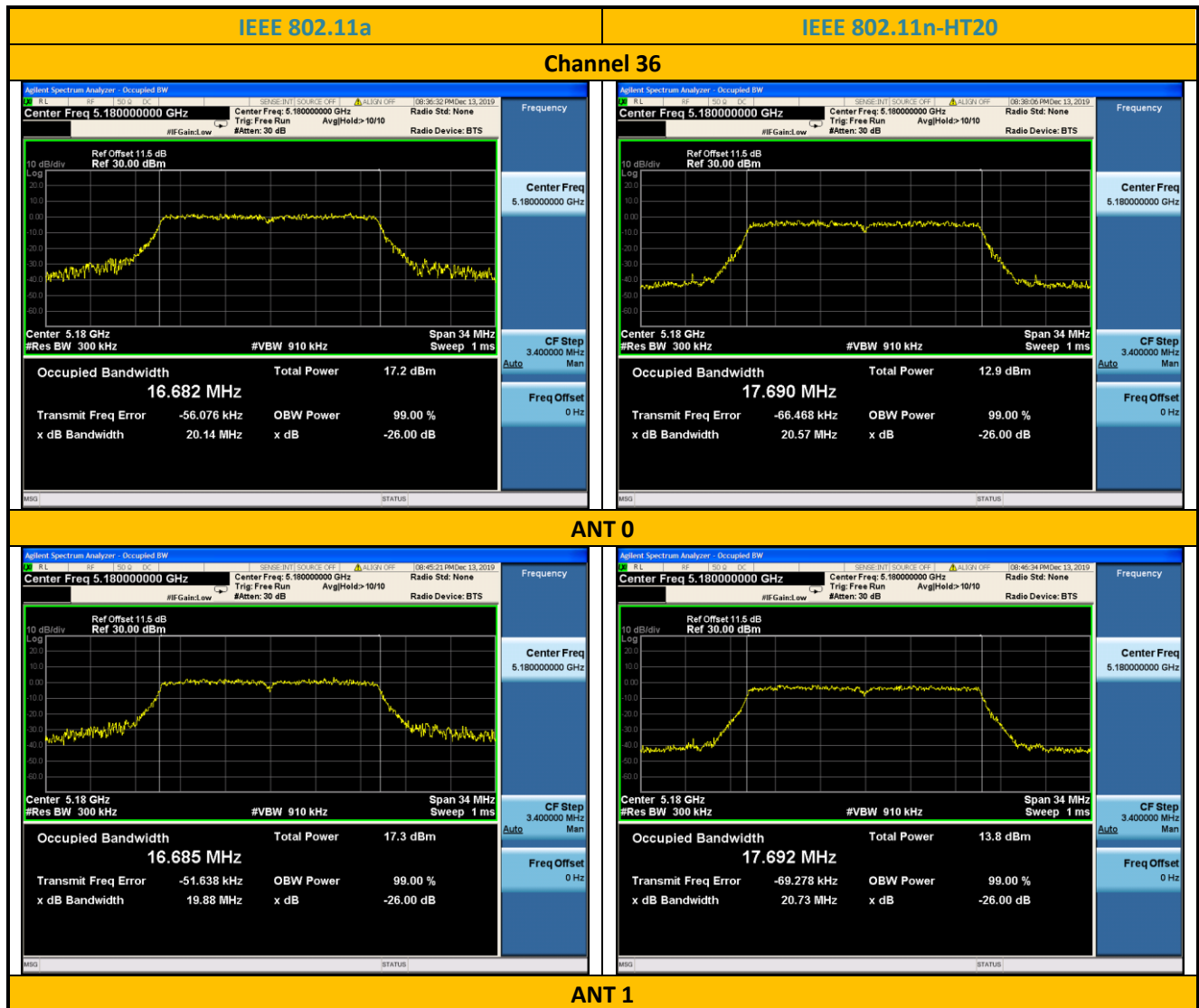


### 3.4 The results of 26 dB Bandwidth

#### Test Data

| Mode              | Channel   | 26 dB Bandwidth (MHz) |       |
|-------------------|-----------|-----------------------|-------|
|                   |           | ANT 0                 | ANT 1 |
| IEEE 802.11a      | 36 (5180) | 20.14                 | 19.88 |
| IEEE 802.11n-HT20 | 36 (5180) | 20.73                 | 20.57 |

Test Plot



## 4 Minimum 6dB Bandwidth

Test result: Pass

### 4.1 Limit

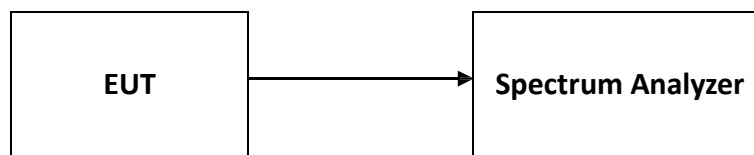
For systems using digital modulation techniques that may operate in the 5725 - 5850 MHz band, the minimum 6 dB bandwidth shall be at least 500 kHz.

### 4.2 Measurement Procedure

The EUT was tested according to test procedure of "KDB789033 D02 General UNII Test Procedures New Rules"

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times$  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. Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

### 4.3 Test Configuration



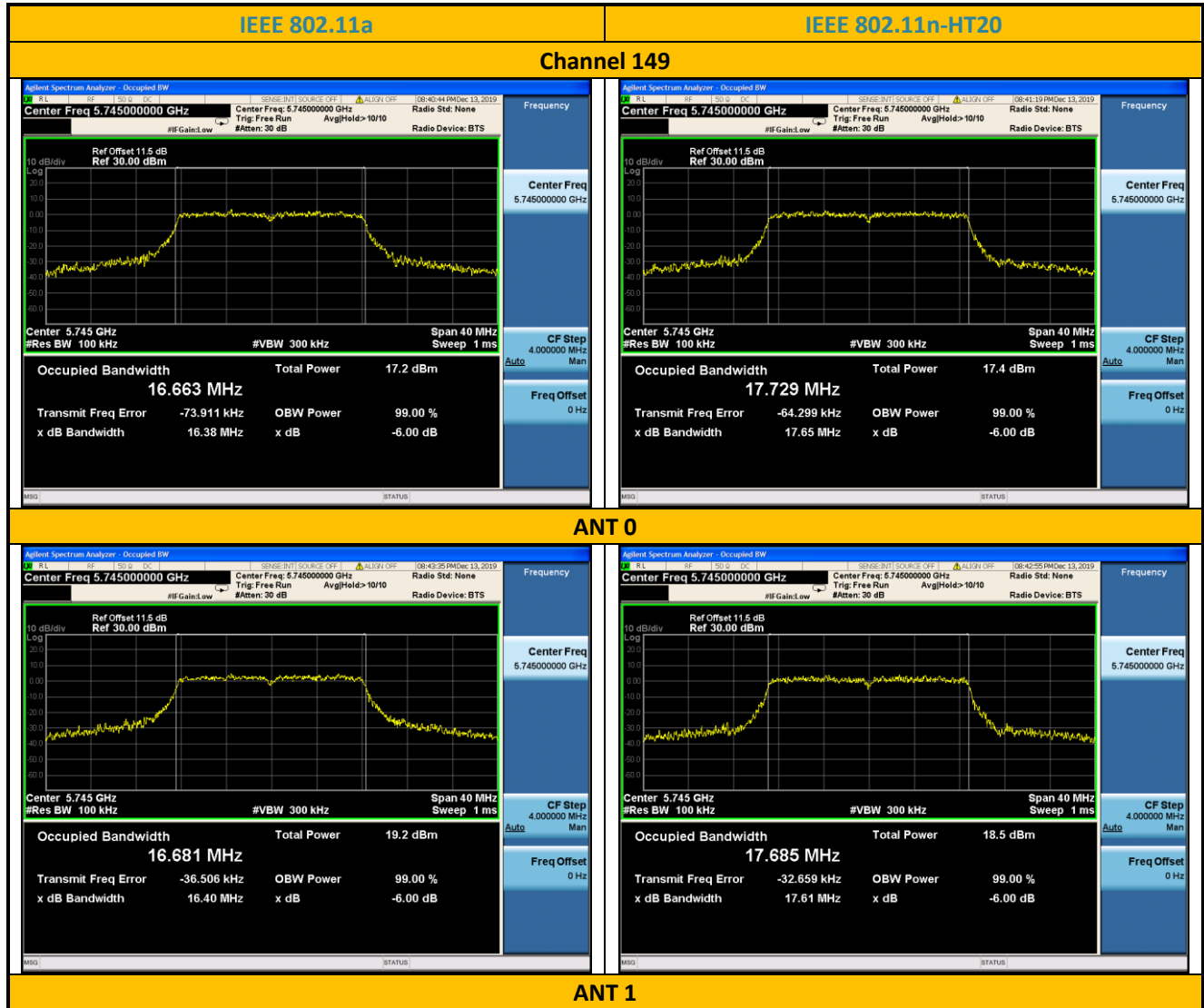
### 4.4 The results of Minimum 6dB Bandwidth

Test Data

| Mode              | Channel    | 6 dB Bandwidth (MHz) |       |
|-------------------|------------|----------------------|-------|
|                   |            | ANT 0                | ANT 1 |
| IEEE 802.11a      | 149 (5745) | 16.38                | 16.40 |
| IEEE 802.11n-HT20 | 149 (5745) | 17.65                | 17.61 |



Test Plot



## 5 Maximum conducted output power and e.i.r.p.

**Test result: Pass**

### 5.1 Limit

- ☐ For an outdoor access point operating in the band 5.15-5.25GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1W provided the maximum antenna gain does not exceed 6dBi.  
The maximum e.i.r.p. at any elevation angle above 30 degrees from the horizon must not exceed 125mW (21 dBm).
- ☐ For an indoor access point operating in the band 5.15-5.25GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6dBi.
- ☐ For fixed point-to-point access points operating in the band 5.15-5.25GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1W.
- ☒ For client devices in the 5.15-5.25GHz 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.
- ☐ For the 5.25-5.35GHz and 5.47-5.725GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250mW or  $11\text{dBm} + 10\log B$ , where B is the 26dB emission bandwidth in megahertz.
- ☒ For the band 5.725-5.85GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1W.

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.

## 5.2 Measurement Procedure

The EUT was tested according to test procedure of “KDB789033 D02 General UNII Test Procedures New Rules”

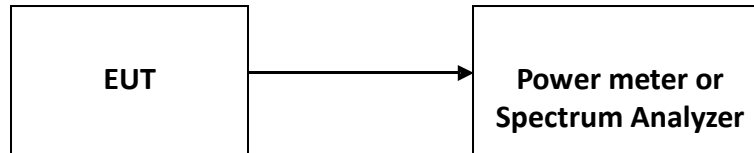
### For 802.11a and 802.11n(HT20) mode:

- (i) 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 constant 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.
- (ii) If the transmitter does not transmit continuously, measure the duty cycle,  $x$ , of the transmitter output signal as described in II.B.
- (iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
- (iv) 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%).

### For 802.11n(HT40) and 802.11ac(VHT80):

- (i) Measure the duty cycle,  $x$ , of the transmitter output signal as described in II.B.
- (ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (iii) Set RBW = 1 MHz.
- (iv) Set VBW  $\geq$  3 MHz.
- (v) Number of points in sweep  $\geq 2 \times \text{span} / \text{RBW}$ . (This ensures that bin-to-bin spacing is  $\leq \text{RBW}/2$ , so that narrowband signals are not lost between frequency bins.)
- (vi) Sweep time = auto.
- (vii) Detector = power averaging (rms), if available. Otherwise, use sample detector mode.
- (viii) Do not use sweep triggering. Allow the sweep to “free run.”
- (ix) Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.
- (x) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (xi) Add  $10 \log (1/x)$ , where  $x$  is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add  $10 \log (1/0.25) = 6 \text{ dB}$  if the duty cycle is 25%.

### 5.3 Test Configuration

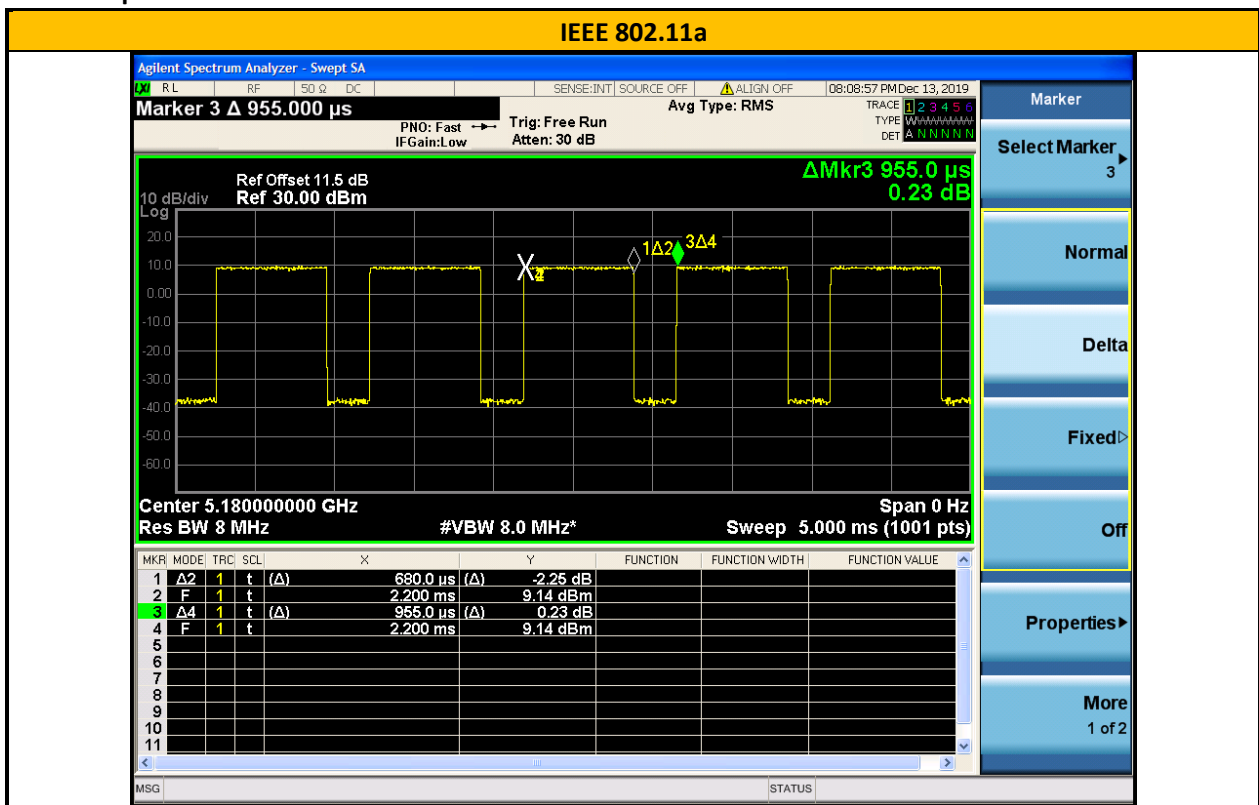


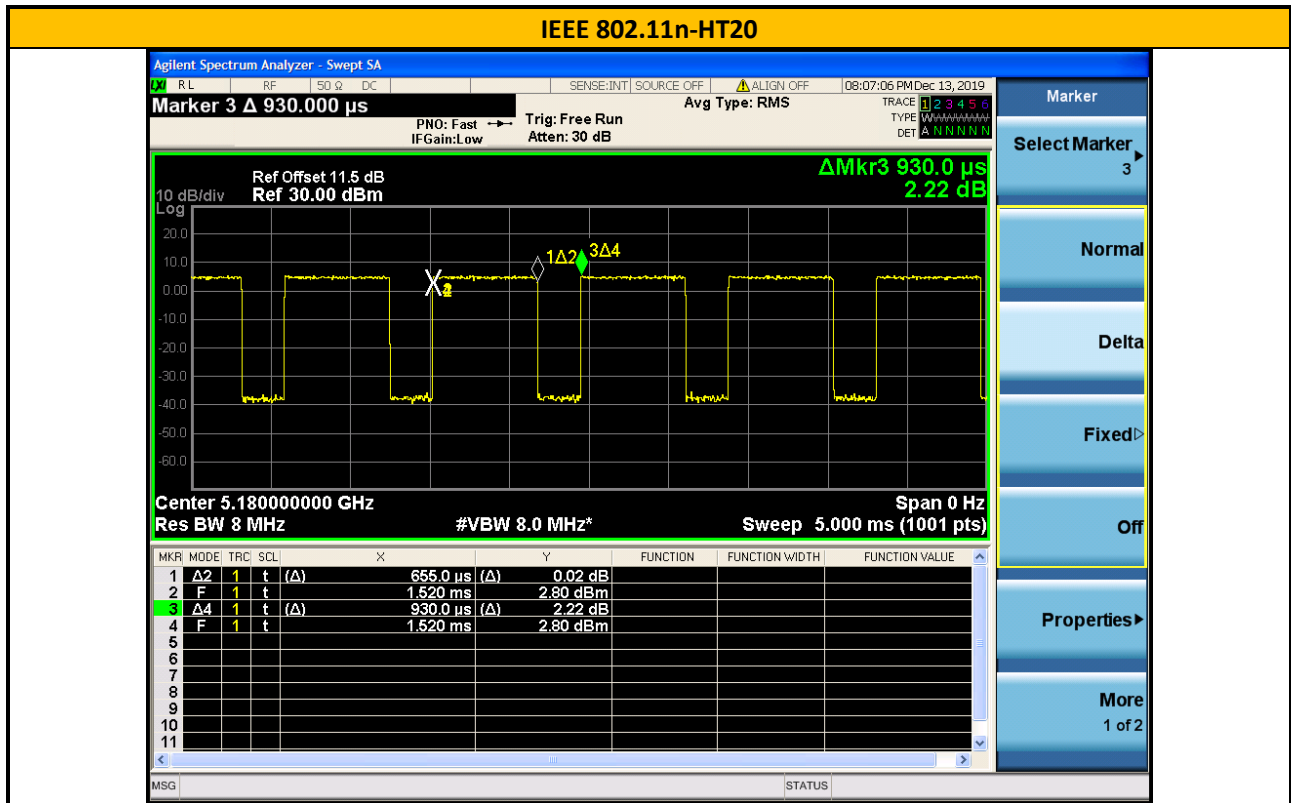
### 5.4 Test Results of Maximum conducted output power and e.i.r.p.

#### 5.4.1 Duty cycle

| Mode              | Data rates (Mbps) | On Time (msec) | Period (msec) | Duty Cycle (linear) | Duty Cycle (%) | Duty Cycle Factor (dB) | 1/ T Minimum VBW (kHz) | Average Factor (dB) |
|-------------------|-------------------|----------------|---------------|---------------------|----------------|------------------------|------------------------|---------------------|
| IEEE 802.11a      | 6                 | 0.680          | 0.955         | 0.71                | 71.20          | 1.47                   | 1.47                   | -2.95               |
| IEEE 802.11n-HT20 | MCS0              | 0.655          | 0.930         | 0.70                | 70.43          | 1.52                   | 1.53                   | -3.04               |

The test plots as follows





#### 5.4.2 Conducted Output Power

| Mode              | Channel/<br>Frequency<br>(MHz) | Maximum Conducted Output Power (dBm) |                 |               |                 |                                      |                 |             |
|-------------------|--------------------------------|--------------------------------------|-----------------|---------------|-----------------|--------------------------------------|-----------------|-------------|
|                   |                                | MIMO                                 |                 |               |                 | Total<br>Power<br>MIMO_<br>Chain 0+1 | Limits<br>(dBm) | Pass / Fail |
|                   |                                | Chain 0                              |                 | Chain 1       |                 |                                      |                 |             |
|                   |                                | Meas<br>Power                        | Corr'd<br>Power | Meas<br>Power | Corr'd<br>Power |                                      |                 |             |
| IEEE 802.11a      | 36 (5180)                      | 10.04                                | 11.51           | 10.69         | 12.21           | 14.88                                | 24              | Pass        |
|                   | 149 (5745)                     | 10.23                                | 11.7            | 12.23         | 13.75           | 15.86                                | 30              | Pass        |
| IEEE 802.11n-HT20 | 36 (5180)                      | 5.75                                 | 7.22            | 6.49          | 8.01            | 10.64                                | 24              | Pass        |
|                   | 149 (5745)                     | 10.11                                | 11.58           | 12.06         | 13.58           | 15.70                                | 30              | Pass        |

Remark:

1. Corr'd Power = Meas Power + Duty Cycle Factor
2. Total (Chain 0+1) =  $10 \cdot \log [(10^{\text{Chain 0}/10}) + (10^{\text{Chain 1}/10})]$

## 6 Power spectrum density

**Test result:** Pass

### 6.1 Limit

- ☐ For an outdoor access point operating in the band 5.15-5.25GHz, the maximum power spectral density shall not exceed 17dBm in any 1 megahertz band.
- ☐ For an indoor access point operating in the band 5.15-5.25GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band.
- ☒ For client devices in the 5.15-5.25GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.
- ☐ For the 5.25-5.35 GHz and 5.47-5.725GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.
- ☒ For the band 5.725-5.85GHz, the maximum power spectral density shall not exceed 30dBm in any 500kHz band.

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the less of original and original + (6 - antenna gain - beamforming gain).

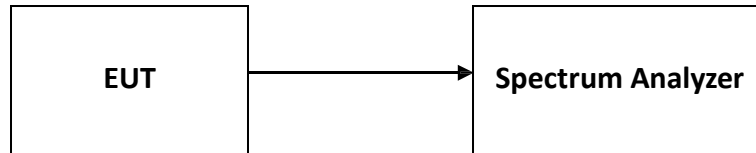
## 6.2 Measurement Procedure

The EUT was tested according to test procedure of “KDB789033 D02 General UNII Test Procedures New Rules”

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in 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.)
2. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
3. 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.
4. The result is the Maximum PSD over 1 MHz reference bandwidth.
5. 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 Section 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 II.B.I.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 ( $< 500$  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 ( $< 1$  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.

Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for steps 5.c) and 5.d) above, since RBW=100 KHZ is available on nearly all spectrum analyzers.

### 6.3 Test Configuration



### 6.4 Test Results of Power spectrum density

| Mode              | Channel/<br>Frequency<br>(MHz) | Maximum Power Spectral Density |                 |               |                 |                                      |                 |             |
|-------------------|--------------------------------|--------------------------------|-----------------|---------------|-----------------|--------------------------------------|-----------------|-------------|
|                   |                                | MIMO                           |                 |               |                 | Total<br>Power<br>MIMO_<br>Chain 0+1 | Limits<br>(dBm) | Pass / Fail |
|                   |                                | Chain 0                        |                 | Chain 1       |                 |                                      |                 |             |
|                   |                                | Meas<br>Power                  | Corr'd<br>Power | Meas<br>Power | Corr'd<br>Power |                                      |                 |             |
| IEEE 802.11a      | 36 (5180)                      | -0.917                         | 0.553           | -0.055        | 1.475           | 4.05                                 | 11              | Pass        |
|                   | 149 (5745)                     | -3.313                         | -1.843          | -0.954        | 0.576           | 2.54                                 | 30              | Pass        |
| IEEE 802.11n-HT20 | 36 (5180)                      | -5.347                         | -3.877          | -4.495        | -2.965          | -0.39                                | 11              | Pass        |
|                   | 149 (5745)                     | -3.68                          | -2.21           | -1.508        | 0.022           | 2.06                                 | 30              | Pass        |

Remark:

1. Corr'd Power = Meas Power + Duty Cycle Factor
2. Total (Chain 0+1) =  $10 \cdot \log[(10^{\text{Chain 0}/10}) + (10^{\text{Chain 1}/10})]$



The test plots as follows:





## 7 Radiated Emissions

**Test result:** Pass

### 7.1 Limit

The radiated emissions which fall in the restricted bands, and the radiated emissions below 1GHz, must comply with the radiated emission limits specified showed as below:

| Frequencies (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 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                             |

The radiated emissions which fall outside the restrict bands, should comply with the EIRP limit as

below: For transmitters operating in the 5.15 - 5.25 / 5.25 - 5.35 / 5.47 - 5.725GHz band:

| Frequency (MHz) | EIRP Limit (dBm) | Equivalent Field Strength (3m) (dBμV/m) |
|-----------------|------------------|-----------------------------------------|
| <5150           | -27              | 68.20                                   |
| >5350           |                  |                                         |
| <5470           |                  |                                         |
| >5725           |                  |                                         |

For transmitters operating in the 5.725 - 5.85GHz band:

| Frequency (MHz) | EIRP Limit (dBm/MHz) | Equivalent Field Strength (3m) (dBμV/m) |
|-----------------|----------------------|-----------------------------------------|
| <5650           | -27                  | 68.20                                   |
| 5650 ~ 5700     | -27 ~ 10             | 68.20 ~ 105.20                          |
| 5700 ~ 5720     | 10 ~ 15.6            | 105.20 ~ 110.80                         |
| 5720 ~ 5725     | 15.6 ~ 27            | 110.80 ~ 122.20                         |
| 5850 ~ 5855     | 27 ~ 15.6            | 122.20 ~ 110.80                         |
| 5855 ~ 5875     | 15.6 ~ 10            | 110.80 ~ 105.20                         |
| 5875 ~ 5925     | 10 ~ -27             | 105.20 ~ 68.20                          |
| >5925           | -27                  | 68.20                                   |

## 7.2 Measurement Procedure

### For Radiated emission below 30MHz:

- a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) Both X and Y axes of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

#### NOTE:

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

### For Radiated emission above 30MHz:

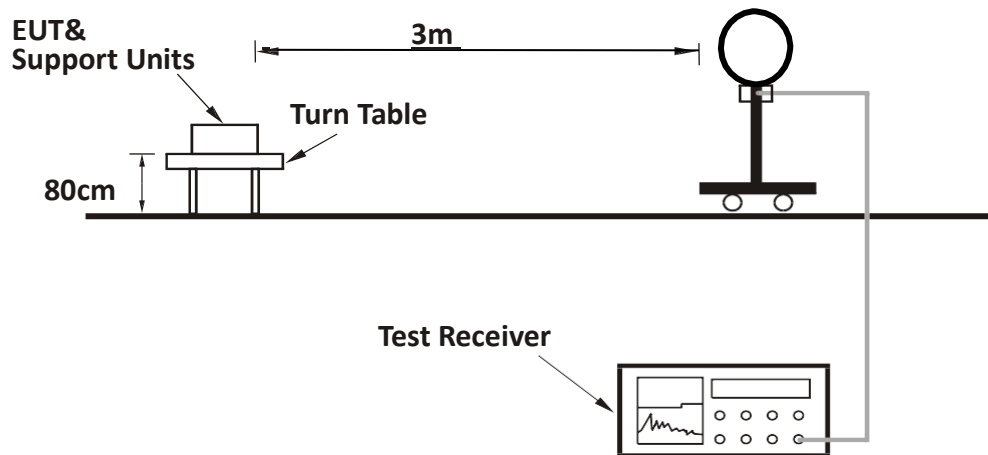
- a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) The height of antenna 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.
- d) 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

#### Note:

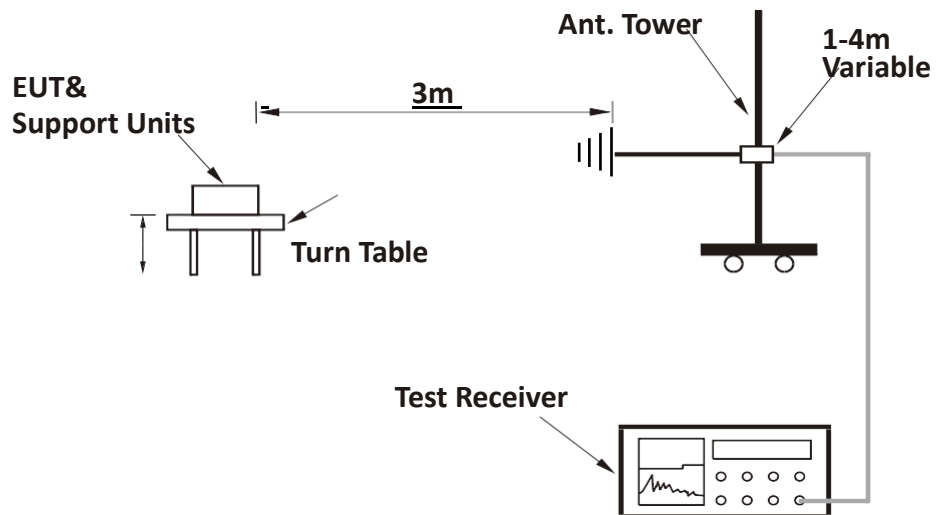
- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle  $< 98\%$ ) or  $3 \times \text{RBW}$  (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
- 4. All modes of operation were investigated and the worst-case emissions are reported

### 7.3 Test Configuration

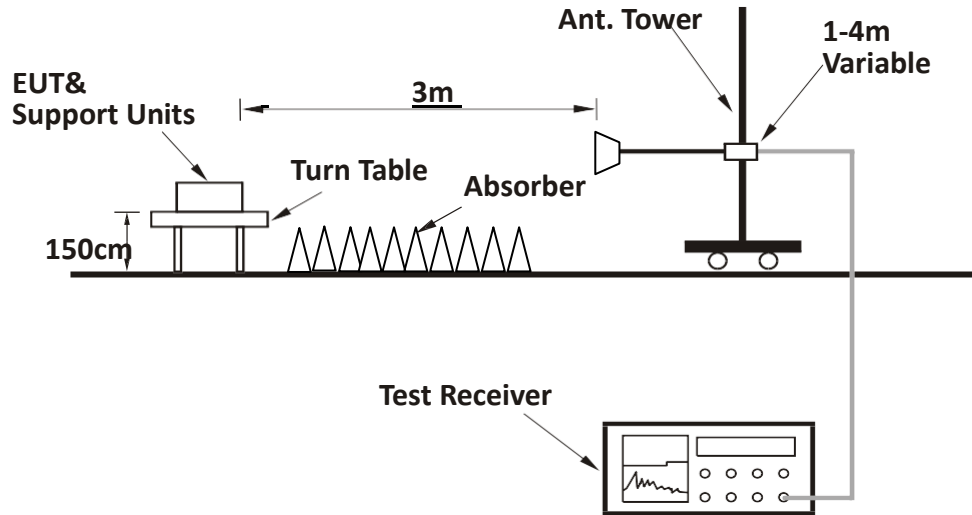
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



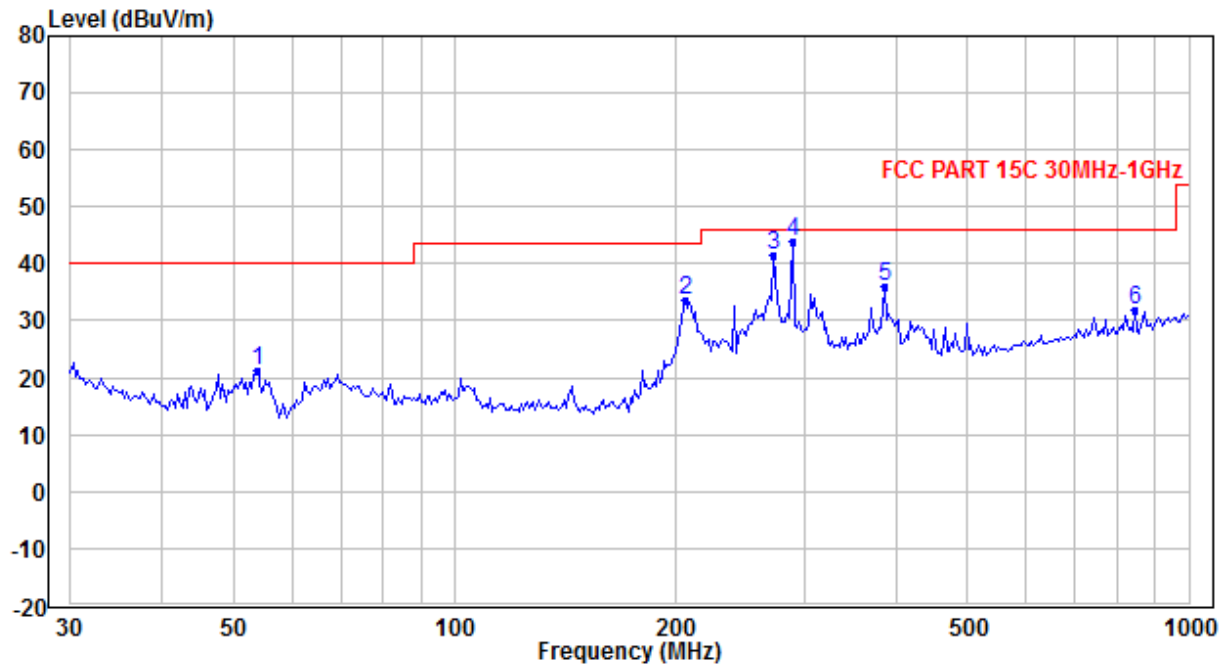
**For Radiated emission above 1GHz:**



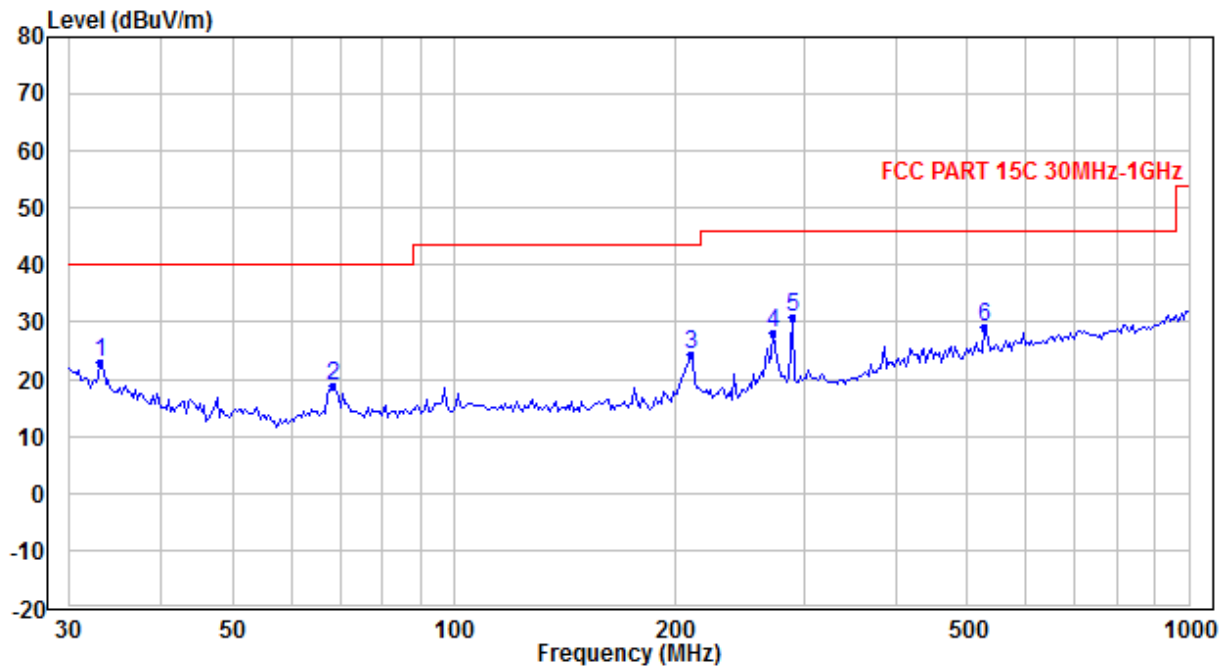
## 7.4 Test Results of Radiated Emissions

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

The worst waveform from 30MHz to 1000MHz is listed as below:



Horizontal



Vertical

**Test data below 1GHz**

| Antenna | Frequency (MHz) | Corrected Reading (dBuV/m) | Correct Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|---------|-----------------|----------------------------|-----------------------|----------------|-------------|----------|
| H       | 53.756          | 21.07                      | -15.38                | 40.00          | 18.93       | PK       |
| H       | 205.746         | 33.49                      | -10.19                | 43.50          | 10.01       | PK       |
| H       | 272.525         | 41.67                      | -6.91                 | 46.00          | 4.33        | PK       |
| H       | 288.284         | 43.79                      | -6.57                 | 46.00          | 2.21        | PK       |
| H       | 384.545         | 36.18                      | -4.60                 | 46.00          | 9.82        | PK       |
| H       | 844.803         | 31.94                      | 3.17                  | 46.00          | 14.06       | PK       |
| V       | 33.101          | 22.80                      | -8.38                 | 40.00          | 17.20       | PK       |
| V       | 68.264          | 18.94                      | -13.66                | 40.00          | 21.06       | PK       |
| V       | 210.129         | 24.38                      | -10.58                | 43.50          | 19.12       | PK       |
| V       | 272.525         | 28.15                      | -6.91                 | 46.00          | 17.85       | PK       |
| V       | 288.284         | 30.93                      | -6.57                 | 46.00          | 15.07       | PK       |
| V       | 527.571         | 28.98                      | -1.27                 | 46.00          | 17.02       | PK       |



**Test result above 1GHz:**

The emission was conducted from 1GHz to 40GHz

| MIMO_Chain 0+1_IEEE 802.11a_Channel 36 |                 |                            |                       |                |             |          |
|----------------------------------------|-----------------|----------------------------|-----------------------|----------------|-------------|----------|
| Antenna                                | Frequency (MHz) | Corrected Reading (dBuV/m) | Correct Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Detector |
| H                                      | 10360.00        | 51.99                      | 11.11                 | 74.00          | 22.01       | PK       |
| H                                      | 15540.00        | 51.69                      | 10.76                 | 74.00          | 22.31       | PK       |
| V                                      | 10360.00        | 53.86                      | 9.39                  | 74.00          | 20.14       | PK       |
| V                                      | 15540.00        | 52.59                      | 11.59                 | 74.00          | 21.41       | PK       |

| MIMO_Chain 0+1_IEEE 802.11a_Channel 149 |                 |                            |                       |                |             |          |
|-----------------------------------------|-----------------|----------------------------|-----------------------|----------------|-------------|----------|
| Antenna                                 | Frequency (MHz) | Corrected Reading (dBuV/m) | Correct Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Detector |
| H                                       | 11490.00        | 51.77                      | 9.78                  | 74.00          | 22.23       | PK       |
| H                                       | 17235.00        | 54.22                      | 13.98                 | 74.00          | 19.78       | PK       |
| H                                       | 17235.00        | 41.80                      | 13.98                 | 54.00          | 12.20       | AV       |
| V                                       | 11490.00        | 51.38                      | 8.27                  | 74.00          | 22.62       | PK       |
| V                                       | 17235.00        | 53.39                      | 13.24                 | 74.00          | 20.61       | PK       |

**MIMO\_Chain 0+1\_IEEE 802.11n-HT20\_Channel 36**

| Antenna | Frequency (MHz) | Corrected Reading (dBuV/m) | Correct Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|---------|-----------------|----------------------------|-----------------------|----------------|-------------|----------|
| H       | 10360.00        | 51.77                      | 9.39                  | 74.00          | 22.23       | PK       |
| H       | 15540.00        | 49.05                      | 11.59                 | 74.00          | 24.95       | PK       |
| V       | 10360.00        | 46.59                      | 9.39                  | 74.00          | 27.41       | PK       |
| V       | 15540.00        | 50.04                      | 11.59                 | 74.00          | 23.96       | PK       |

**MIMO\_Chain 0+1\_IEEE 802.11 n-HT20\_Channel 149**

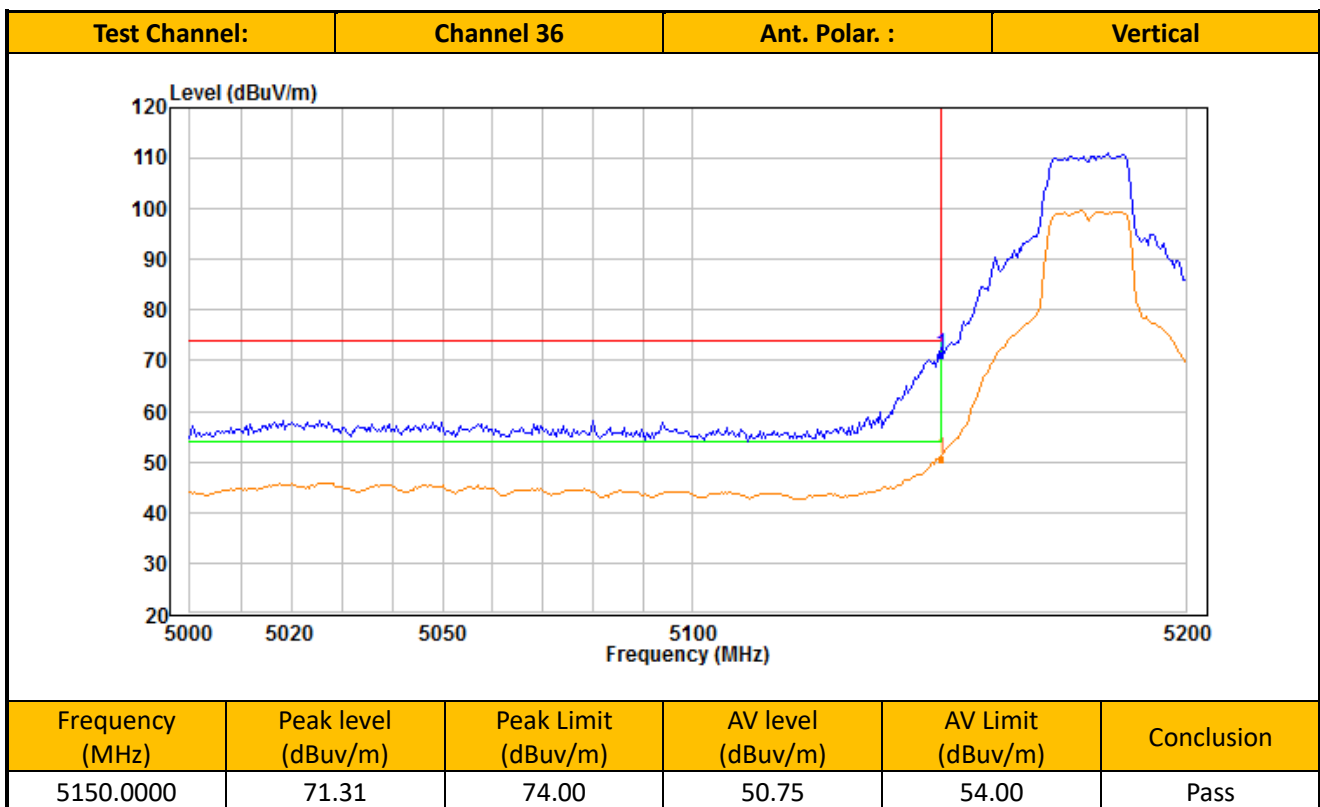
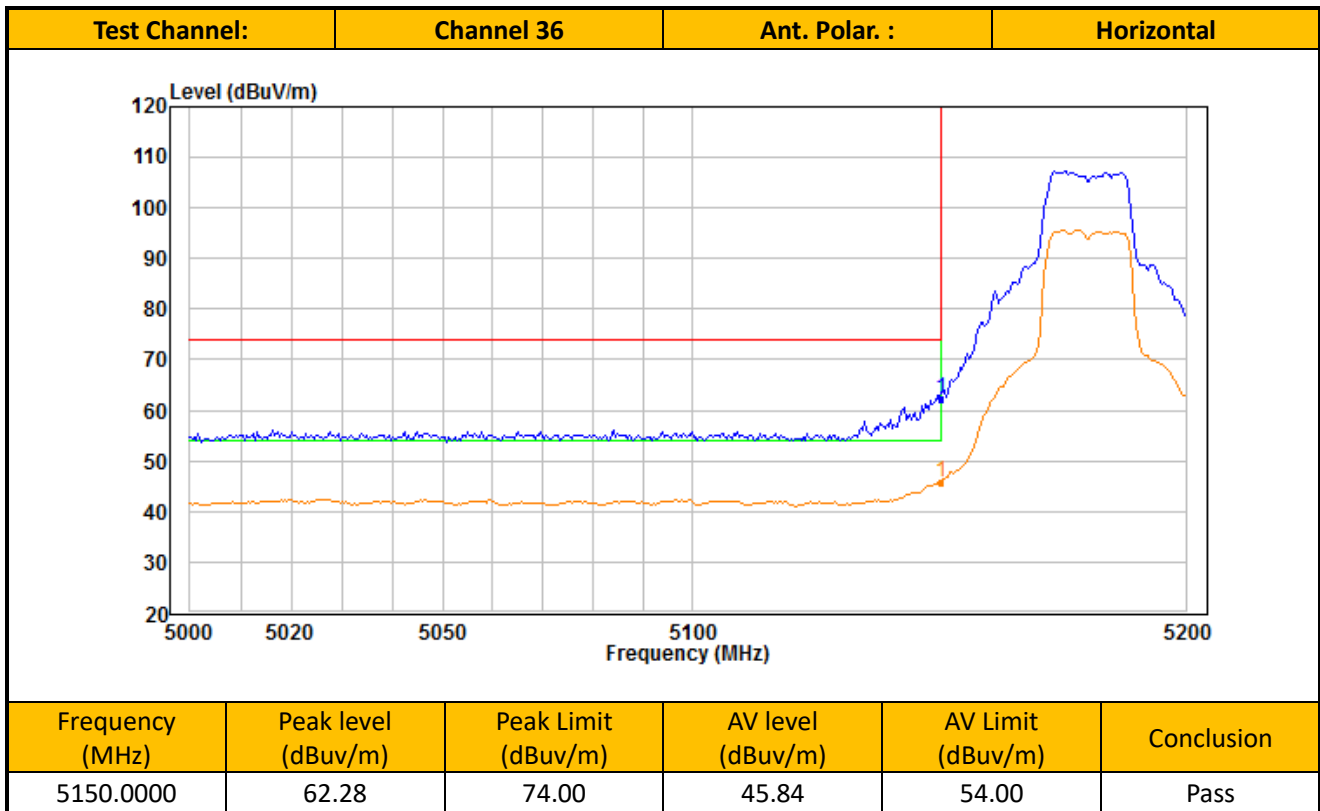
| Antenna | Frequency (MHz) | Corrected Reading (dBuV/m) | Correct Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|---------|-----------------|----------------------------|-----------------------|----------------|-------------|----------|
| H       | 11490.00        | 51.62                      | 11.11                 | 74.00          | 22.38       | PK       |
| H       | 17235.00        | 53.28                      | 10.76                 | 74.00          | 20.72       | PK       |
| V       | 11490.00        | 49.05                      | 8.27                  | 74.00          | 24.95       | PK       |
| V       | 17235.00        | 53.28                      | 13.24                 | 74.00          | 20.72       | PK       |

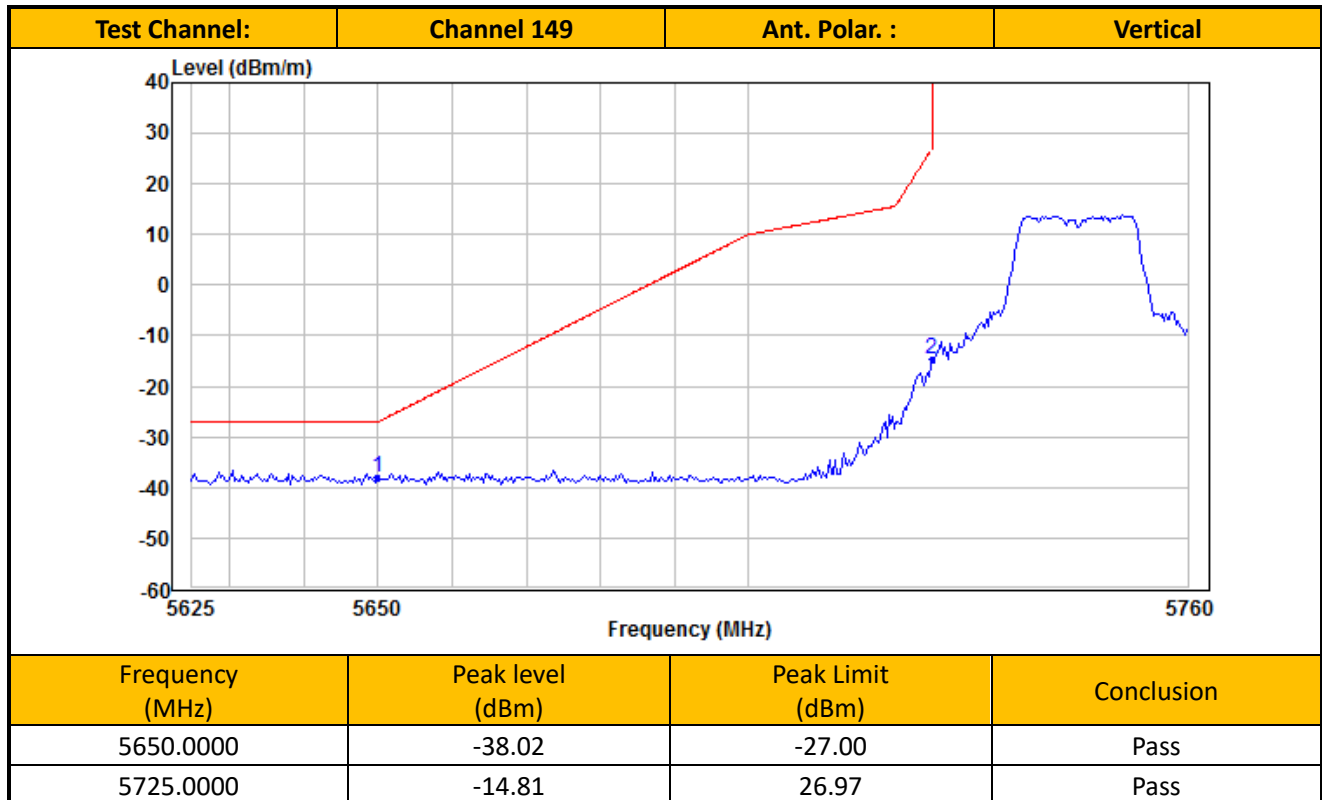
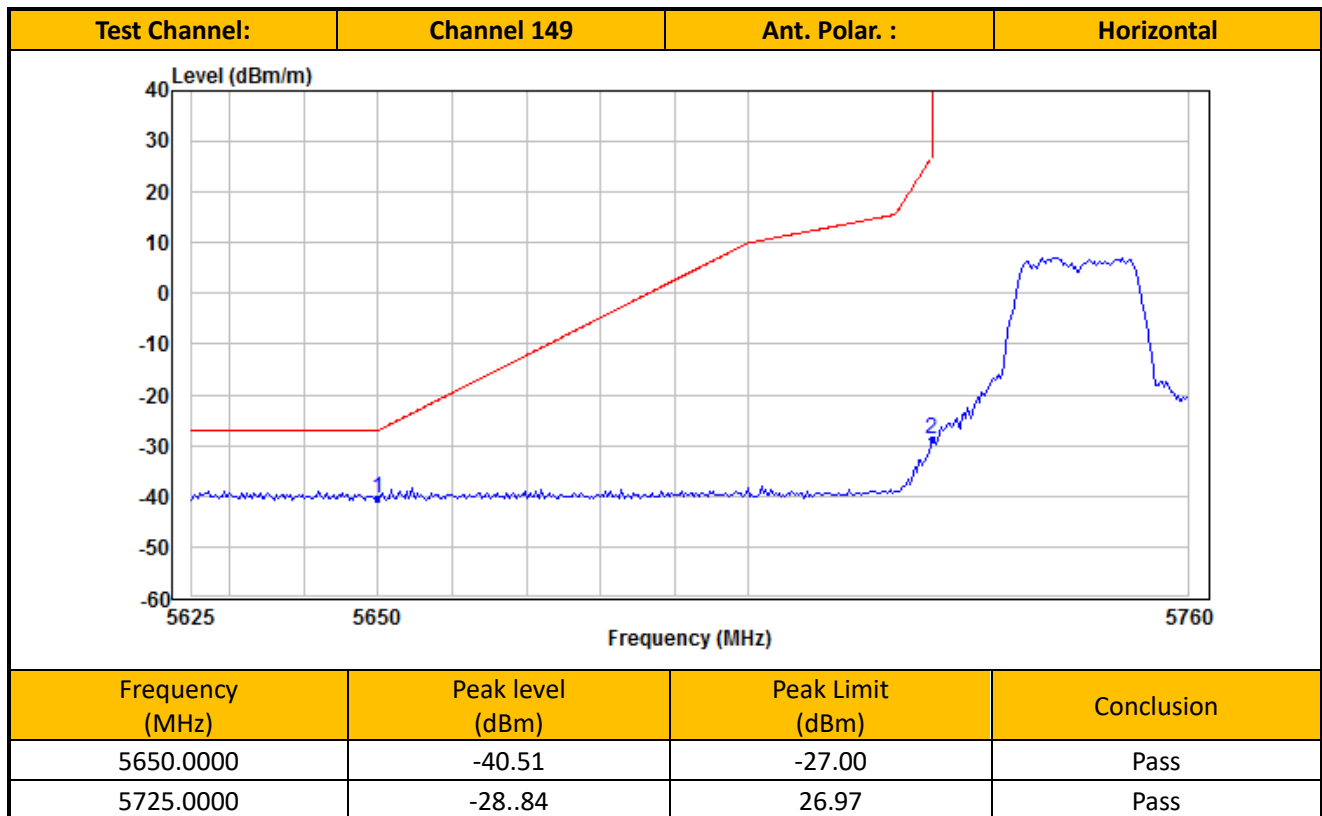
- Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.  
2. Corrected Reading = Original Receiver Reading + Correct Factor  
3. Margin = Limit - Corrected Reading  
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,  
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,  
Limit = 40.00dBuV/m.  
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;  
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;  
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

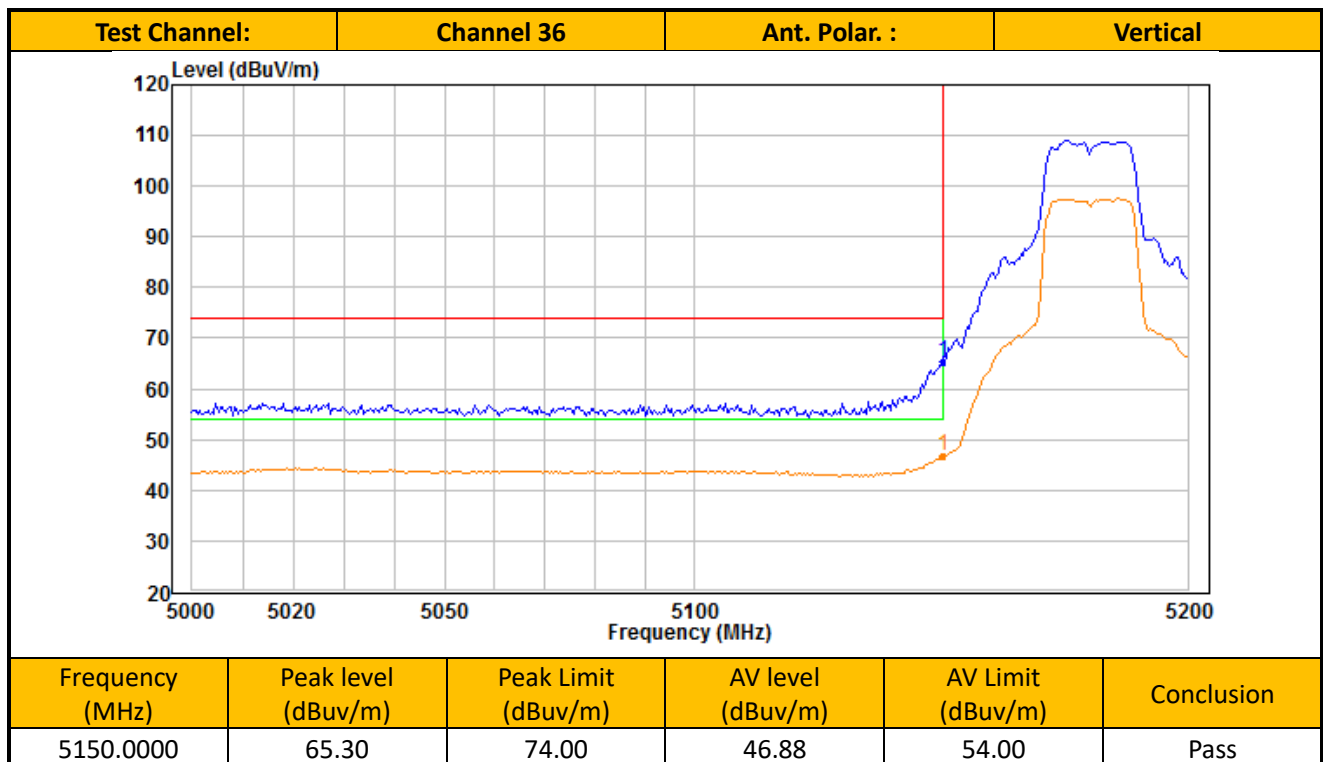
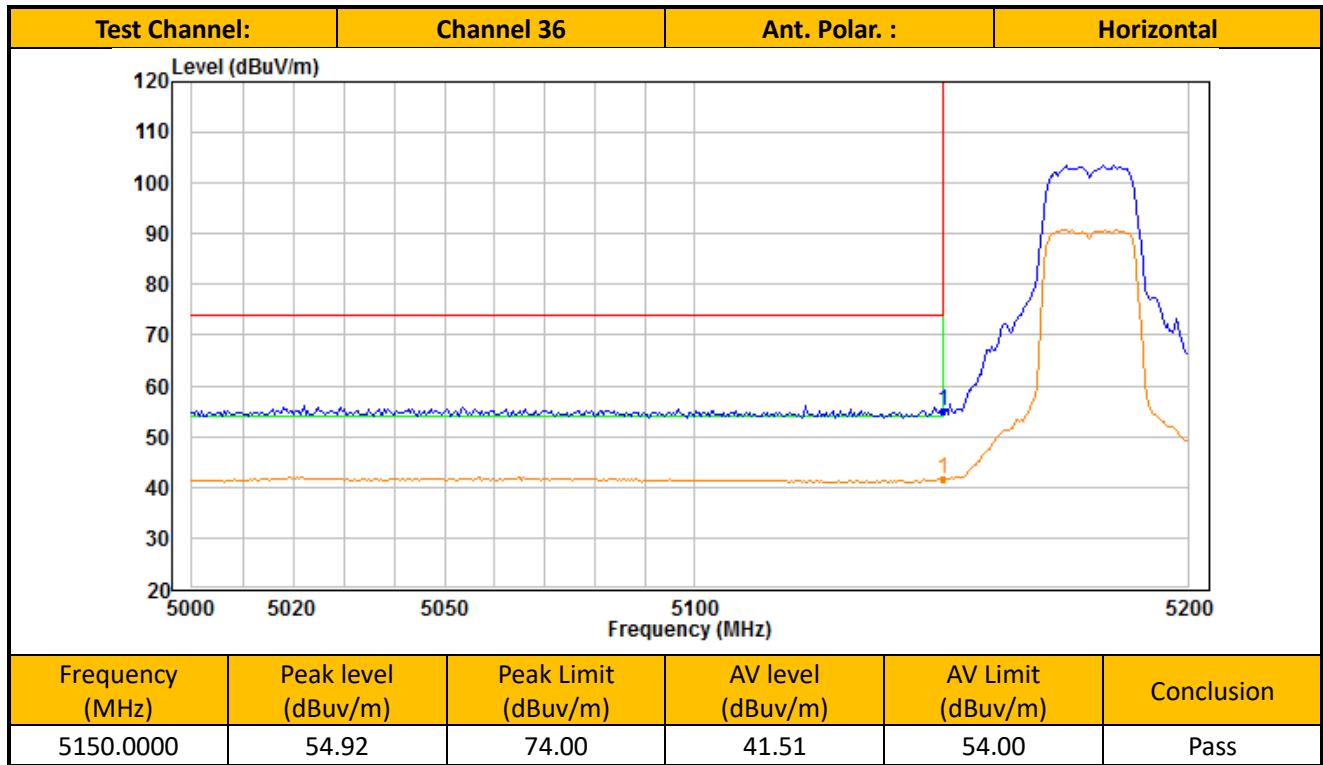
**Band Edge Measurements (Radiated)**

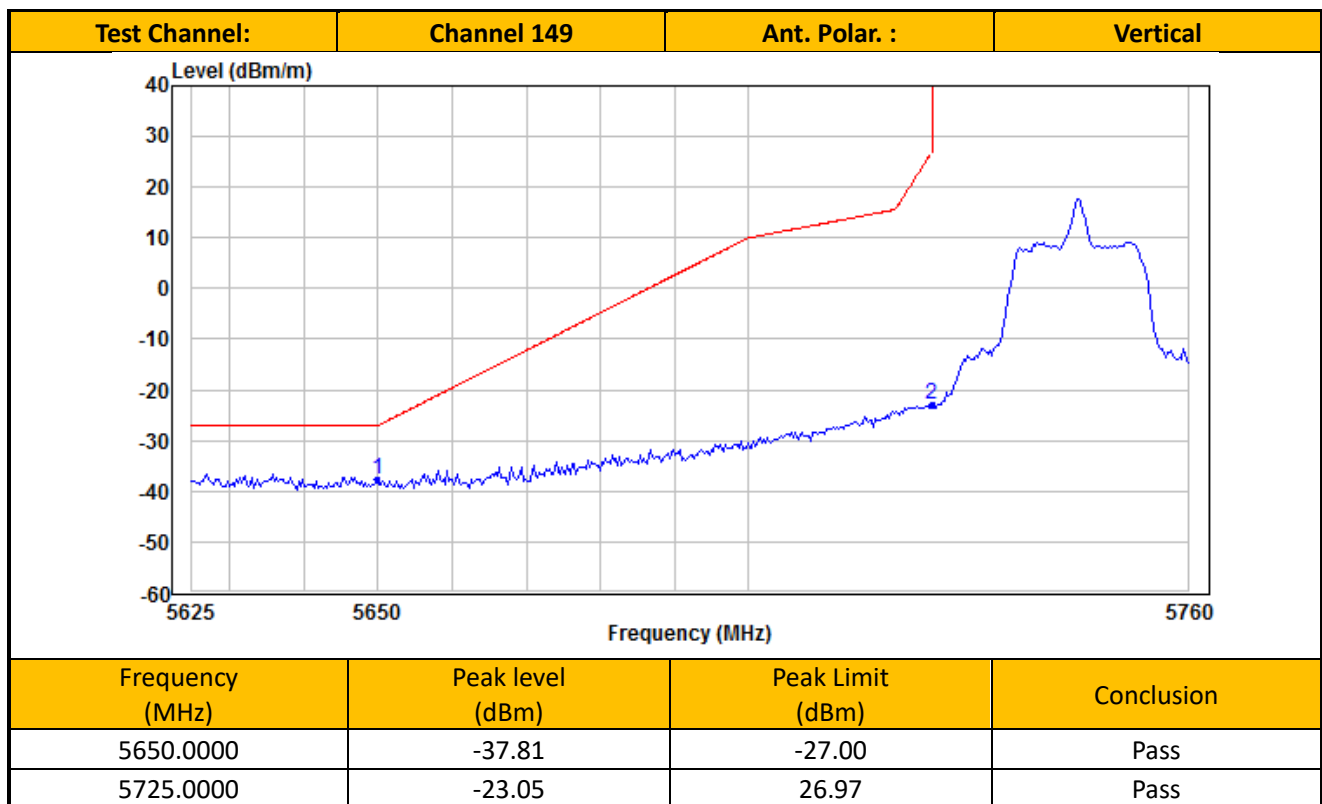
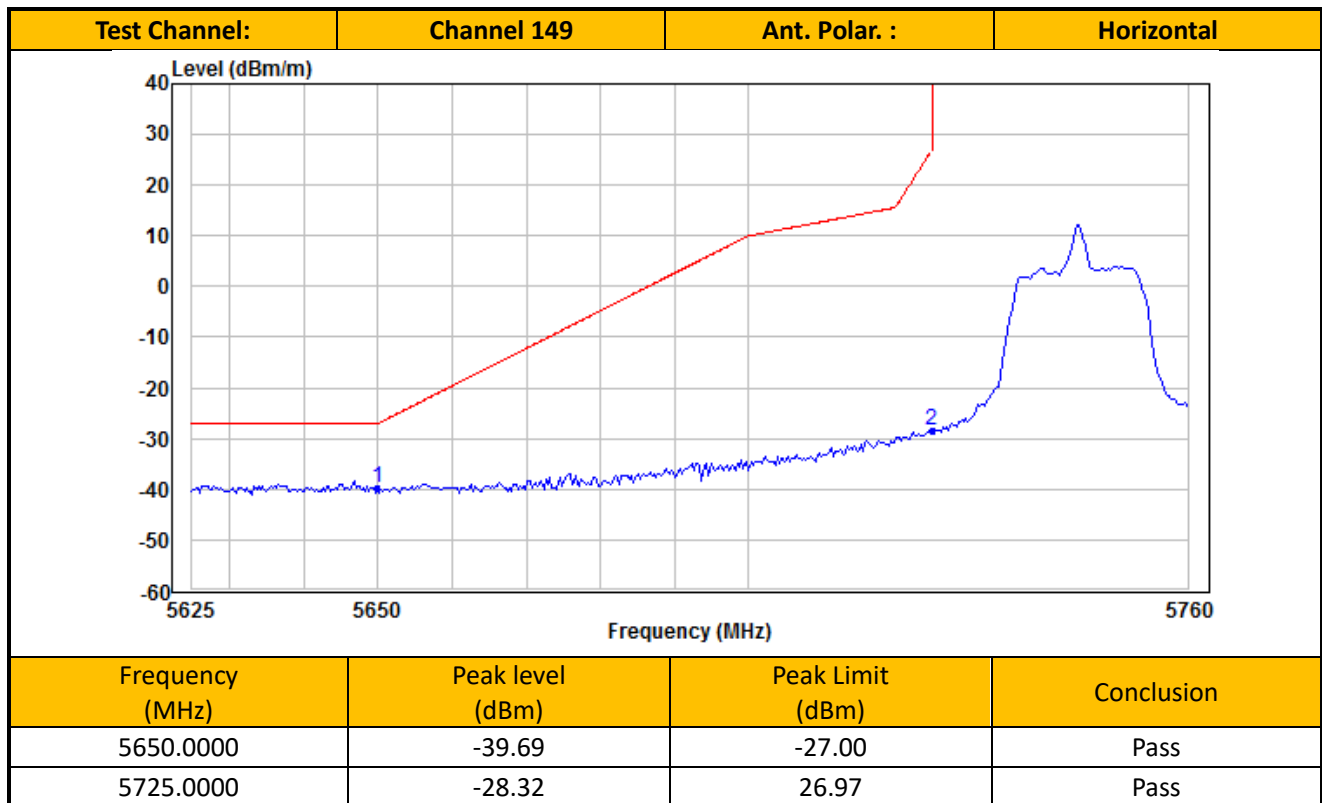
**MIMO\_ IEEE 802.11a**





## MIMO\_ IEEE 802.11n-HT20





## 8 Antenna requirement

**Requirement:**

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.

**Result:**

EUT uses used a permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

## Appendix I: Photograph of test setup

Refer to Appendix for Photograph of test setup

## Appendix II: Photograph of equipment under test

Refer to Appendix for EUT external and internal photographs.

\*\*\*\*\* END \*\*\*\*\*