



TEST REPORT

APPLICANT : GREAT TALENT TECHNOLOGY LIMITED

PRODUCT NAME : Android Tablet

MODEL NAME : TEL-TE-U5

BRAND NAME : UMX

FCC ID : 2ALZM-TEL-TE-U5

STANDARD(S) : 47 CFR Part 15 Subpart E

RECEIPT DATE : 2019-05-07

TEST DATE : 2019-05-08 to 2019-05-30

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| Change History | | |
|-----------------------|-------------|--------------------------|
| Version | Date | Reason for change |
| 1.0 | 2019-05-30 | First edition |
| | | |



1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

| | |
|------------------------------|--|
| Applicant: | GREAT TALENT TECHNOLOGY LIMITED |
| Applicant Address: | RM602,T3 Software Park,Nanshan,Shenzhen,China |
| Manufacturer: | SHENZHEN GIEC DIGITAL CO., LTD |
| Manufacturer Address: | 1st&3rd Building, No.26 Puzai Road, Pingdi, Longgang District, Shenzhen, China |

1.2. Equipment Under Test (EUT) Description

| | | |
|-----------------------------------|---|-------------------------------|
| Product Name: | Android Tablet | |
| Serial No: | (N/A, marked #1 by test site) | |
| Hardware Version: | MQ_MPEG_J10F_02G_V1.0 | |
| Software Version: | GK_MJQ1020-user.20190527 | |
| Modulation Type: | OFDM | |
| Modulation Mode: | 802.11a, 802.11n(HT20), 802.11n(HT40) | |
| Operating Frequency Range: | 5.180 GHz- 5.240 GHz; 5.260 GHz -5.320 GHz ; 5.500 GHz -5.720 GHz ; 5.745GHz- 5.825GHz | |
| Antenna Type: | FPC Antenna | |
| Antenna Gain: | 2.1 dBi | |
| Accessory Information: | Battery | |
| | Brand Name: | ENER LONG |
| | Model No.: | EL26140156P |
| | Serial No.: | (N/A, marked #1 by test site) |
| | Capacity: | 6800mAh |
| | Rated Voltage: | 3.7V |
| | Charge Limit: | 4.2 V |
| | AC Adapter | |
| | Brand Name: | TEKA |
| | Model No.: | TEKA012-0502000UK |
| | Serial No.: | (N/A, marked #1 by test site) |
| | Rated Input: | 5V=2A |
| | Rated Output: | 100-240V ~ 50/60Hz 0.35A |



REPORT No.: SZ19040375W04

Note 1: WIFI hotspot does not support U-NII band.

Note 2: During test, the duty cycle of the EUT was setting to 100%.

Note 3: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. The channel number and frequency of EUT

| 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 |
| Frequency Range: 5260MHz-5320MHz | | | | |
| Bandwidth | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 20MHz | 52 | 5260 | 56 | 5280 |
| | 60 | 5300 | 64 | 5320 |
| 40MHz | 54 | 5270 | 62 | 5310 |
| Frequency Range: 5500MHz-5720MHz | | | | |
| Bandwidth | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 20MHz | 100 | 5500 | 105 | 5520 |
| | | | 108 | 5540 |
| | | | 116 | 5580 |
| | | | 120 | 5600 |
| | | | 124 | 5620 |
| | | | 128 | 5640 |
| 40MHz | | | 132 | 5660 |
| | | | 136 | 5680 |
| | | | 140 | 5700 |
| 40MHz | 102 | 5510 | 110 | 5550 |
| | | | 118 | 5590 |
| | | | 134 | 5670 |
| | | 144 | 5720 | |
| 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 |

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



1.4. 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 |
|-----|---------------|--------------------------------|-----------------|---------------|--------|
| 1 | 15.203 | Antenna Requirement | N/A | N/A | PASS |
| 2 | ANSI C63.10 | Duty Cycle of the test signal | May 24, 2019 | Wang Meng | PASS |
| 3 | 15.407(a) (e) | Emission Bandwidth | May 20, 2019 | Wang Meng | PASS |
| 4 | 15.407(a) | Maximum conducted output Power | May 24, 2019 | Wang Meng | PASS |
| 5 | 15.407(a) | Peak Power spectral density | May 24, 2019 | Wang Meng | PASS |
| 6 | 15.407(g) | Frequency Stability | May 24, 2019 | Wang Meng | PASS |
| 7 | 15.207 | Conducted Emission | May 08, 2019 | Wu Zhongwen | PASS |
| 8 | 15.407(b) | Restricted Frequency Bands | May 22&23, 2019 | Wu Zhongwen | PASS |
| 9 | 15.407(b) | Radiated Emission | May 30, 2019 | Wu Zhongwen | PASS |

Note1: The DFS test report was documented in a separate report (Report No.: SZ19040375W05).

Note2: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013.

Note3: These RF tests were performed according to the method of measurements prescribed in KDB789033 D02 General UNII Test Procedures New Rules v01r03.

Note4: The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The ref offset 11.5dB contains two parts that cable loss 1.5dB and Attenuator 10dB.

1.5. 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. 2.1.2 Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

2.2. Duty Cycle of the test signal

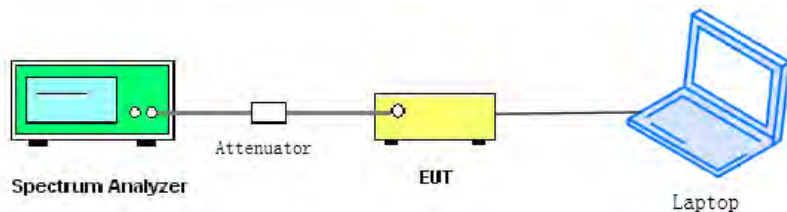
2.2.1. Requirement

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 subclause, 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 $\pm 2\%$; otherwise, the duty cycle is considered to be nonconstant.

2.2.2. Test Description

A. Test Set:



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.

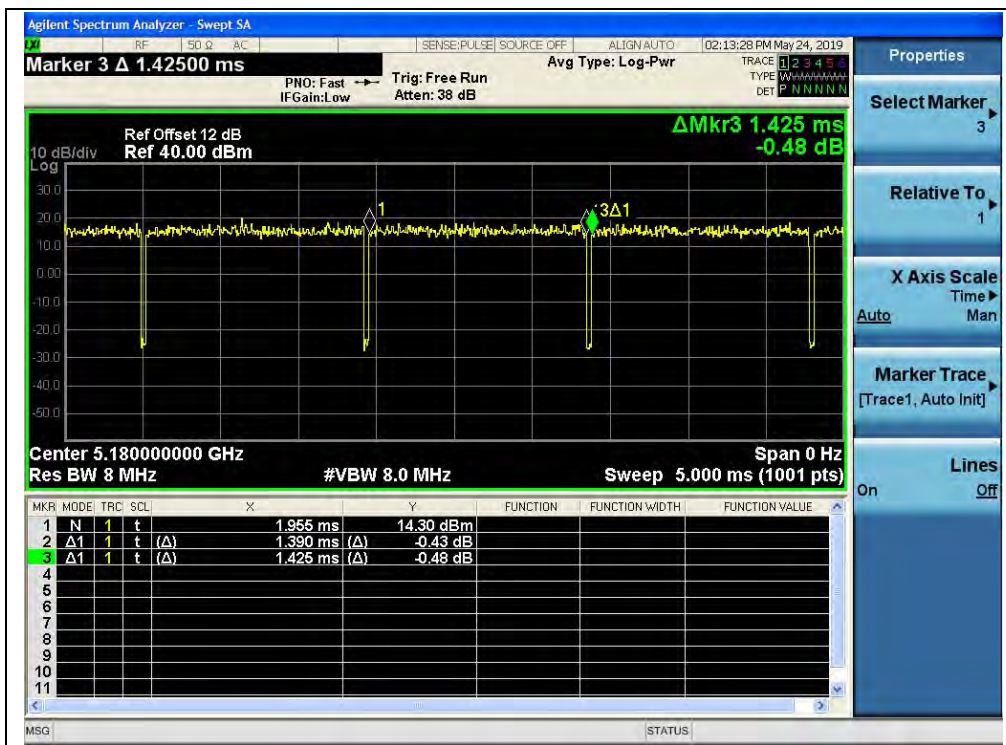


2.2.4. Test Result

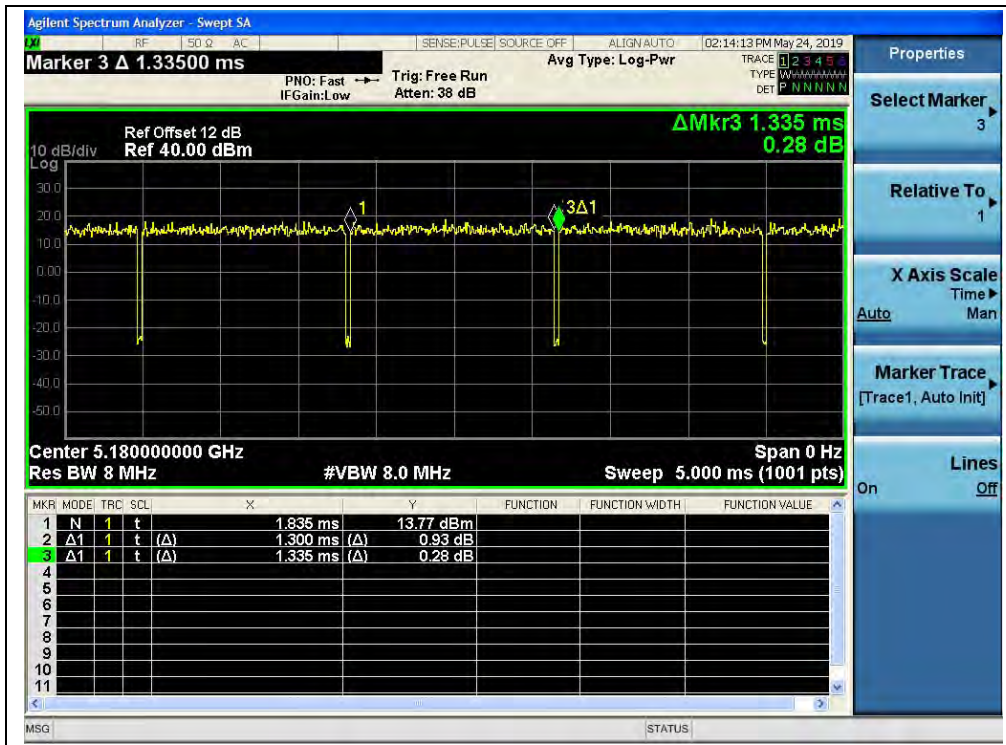
A. Test Verdict:

| Test Mode | Duty Cycle (%) (D) | Duty Factor (10*log[1/D]) |
|---------------|-----------------------|------------------------------|
| 802.11a | 97.54 | 0.11 |
| 802.11n(HT20) | 97.38 | 0.12 |
| 802.11n(HT40) | 94.74 | 0.23 |

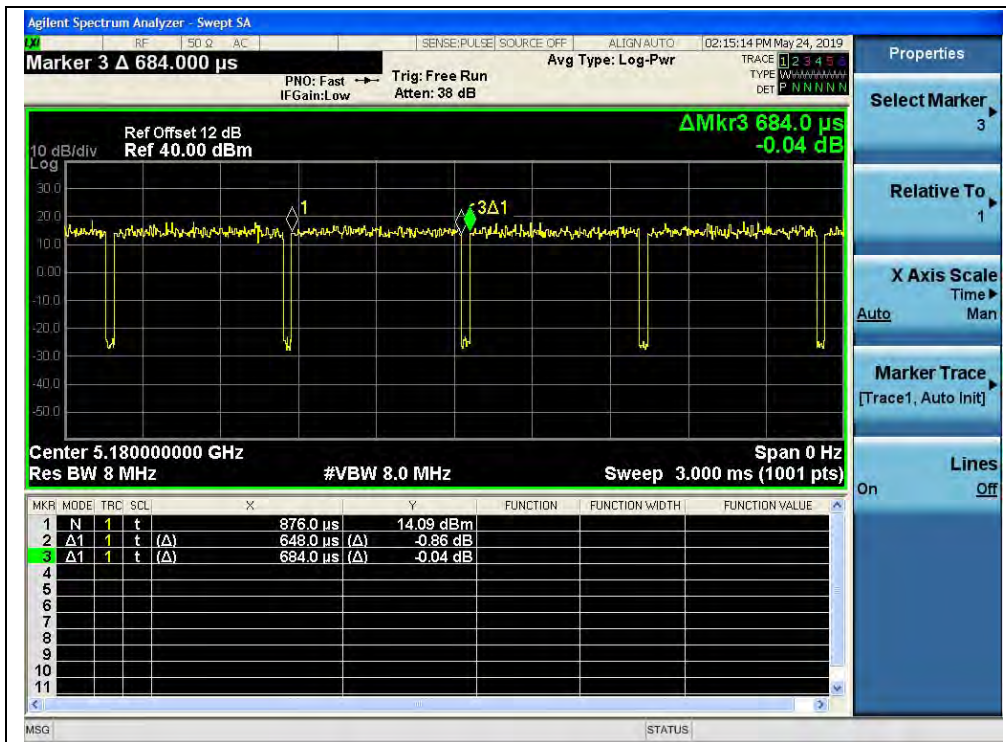
B. Test Plots



(CH36_5180MHz_802.11a)



(CH36_5180MHz_802.11n(HT20))



(CH38_5190MHz_802.11n(HT40))

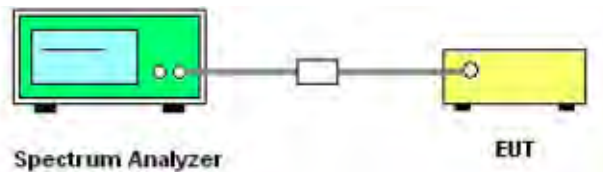
2.3. Emission Bandwidth

2.3.1. 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.

2.3.2. Test Description

A. Test Set:



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

2.3.3. 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 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 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 the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

 - 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.

2.3.4. Test Result

802.11a Test mode

A. Test Verdict:

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---------|-----------------|-----------------------|
| 36 | 5180 | 24.79 |
| 44 | 5220 | 24.16 |
| 48 | 5240 | 23.35 _{Note} |
| 52 | 5260 | 25.19 |
| 60 | 5300 | 24.36 |
| 64 | 5320 | 26.92 |
| 100 | 5500 | 29.14 |
| 120 | 5600 | 29.21 |
| 144 | 5720 | 28.27 |
| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) |
| 144 | 5720 | 15.16 |
| 149 | 5745 | 15.39 |
| 157 | 5785 | 15.09 |
| 165 | 5825 | 15.15 |

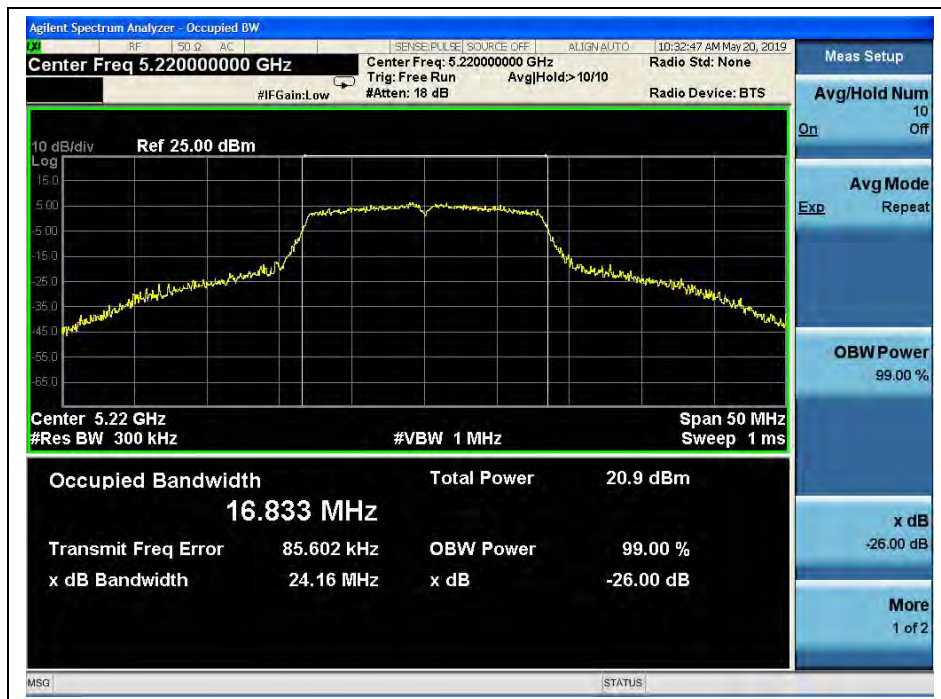
Note: The high frequency of the -26dB is 5250.08MHz which is in the DFS frequency range, so DFS testing is required. Please refer to DFS report (Report No.: SZ19040375W05).



B. Test Plots



(Channel 36, 5180MHz, 802.11a,)



(Channel 44, 5220 MHz, 802.11a,)



(Channel 48, 5240MHz, 802.11a,)



(Channel 48, 5240MHz, fh of -26dB, 802.11a,)



(Channel 52, 5260MHz, 802.11a,)



(Channel 60, 5300 MHz, 802.11a,)



(Channel 64, 5320MHz, 802.11a,)



(Channel 100, 5500MHz, 802.11a,)



(Channel 120, 5600 MHz, 802.11a,)



(Channel 144, 5720MHz, 802.11a,)



(Channel 144, 5720MHz, 802.11a,)



(Channel 149, 5745MHz, 802.11a)



(Channel 157, 5785MHz, 802.11a)



(Channel 165, 5825MHz, 802.11a)



802.11n (HT20) Test mode

A. Test Verdict:

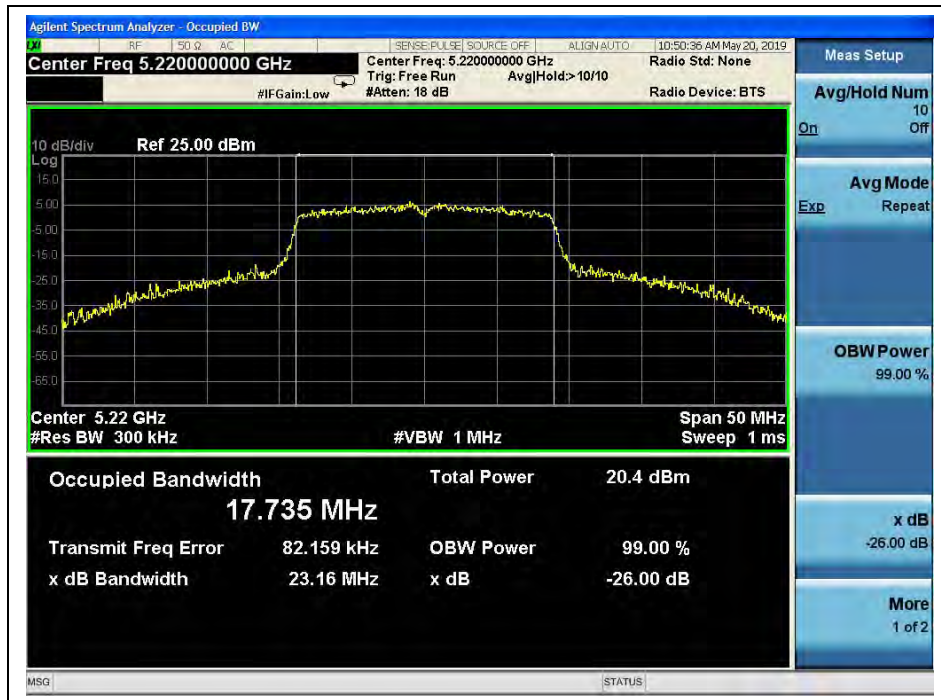
| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---------|-----------------|-----------------------|
| 36 | 5180 | 22.84 |
| 44 | 5220 | 23.16 |
| 48 | 5240 | 22.94 _{Note} |
| 52 | 5260 | 23.26 |
| 60 | 5300 | 26.35 |
| 64 | 5320 | 26.87 |
| 100 | 5500 | 28.42 |
| 120 | 5600 | 28.78 |
| 144 | 5720 | 29.10 |
| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) |
| 144 | 5720 | 16.25 |
| 149 | 5745 | 15.13 |
| 157 | 5785 | 15.73 |
| 165 | 5825 | 15.66 |

Note: The high frequency of the -26dB is 5250.23MHz which is in the DFS frequency range, so DFS testing is required. Please refer to DFS report (Report No.: SZ19040375W05).

B. Test Plots



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



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



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



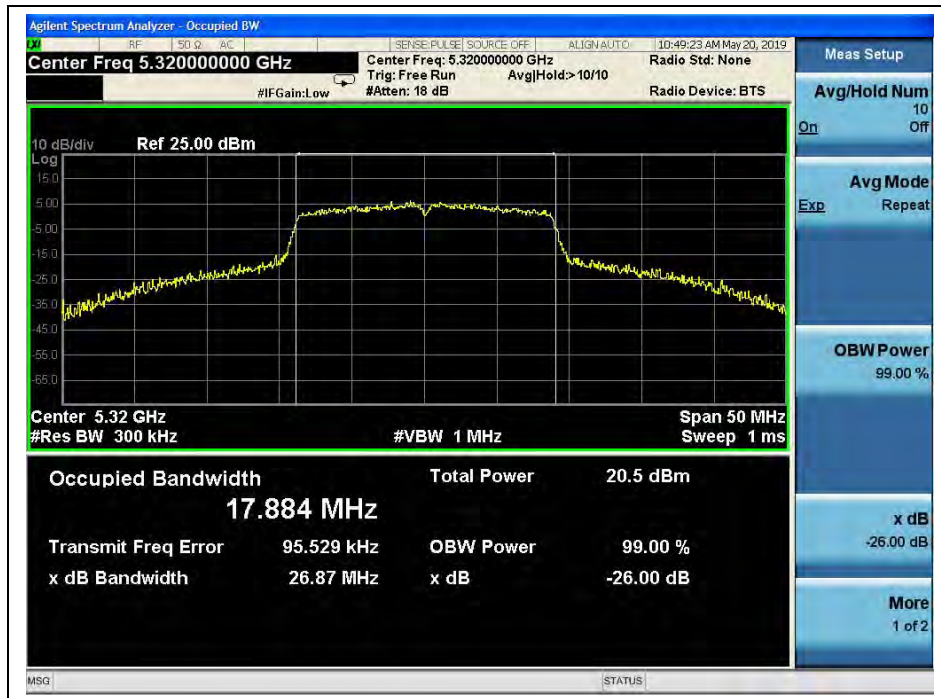
(Channel 48, 5240MHz, fh of -26dB, 802.11 n (HT20))



(Channel 52, 5260MHz, 802.11 n (HT20))



(Channel 60, 5300 MHz, 802.11 n (HT20))



(Channel 64, 5320MHz, 802.11 n (HT20))



(Channel 100, 5500MHz, 802.11 n (HT20))



(Channel 120, 5600 MHz, 802.11 n (HT20))



(Channel 144, 5720MHz, 802.11 n (HT20))



(Channel 144, 5720MHz, 802.11 n (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) Test mode

A. Test Verdict:

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) |
|---------|-----------------|---------------------------|
| 38 | 5190 | 57.92 |
| 46 | 5230 | 56.96 <small>Note</small> |
| 54 | 5270 | 58.89 |
| 62 | 5310 | 59.60 |
| 102 | 5510 | 73.00 |
| 126 | 5630 | 70.58 |
| 142 | 5710 | 74.51 |
| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) |
| 142 | 5710 | 35.21 |
| 151 | 5755 | 35.31 |
| 159 | 5795 | 35.22 |

Note: The high frequency of the -26dB is 5250.34MHz which is in the DFS frequency range, so DFS testing is required. Please refer to DFS report (Report No.: SZ19040375W05).



B. Test Plots



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



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



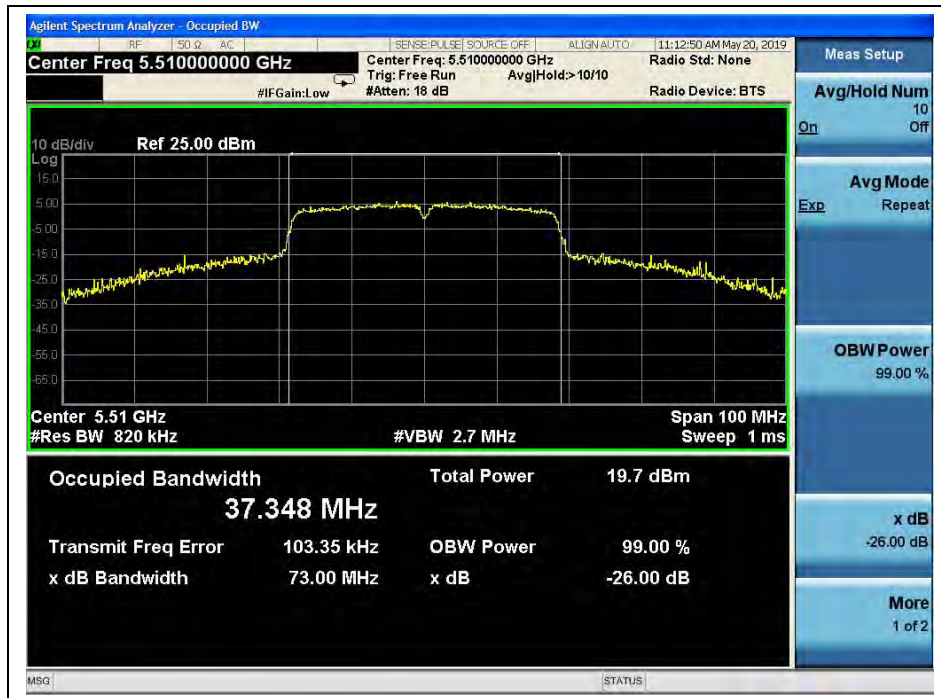
(Channel 46, 5230 MHz, fh of -26dB, 802.11n (HT40))



(Channel 54, 5270MHz, 802.11n (HT40))



(Channel 62, 5310 MHz, 802.11n (HT40))



(Channel 102, 5510MHz, 802.11n (HT40))



(Channel 126, 5630 MHz, 802.11n (HT40))



(Channel 142, 5710MHz, 802.11n (HT40))



(Channel 142, 5710MHz, 802.11n (HT40))



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



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

2.4. Maximum conducted output power

2.4.1. 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 250 mW provided the maximum antenna gain does not exceed 6 dBi.

(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 250 mW or $11 \text{ dBm} + 10 \log B$, 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 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

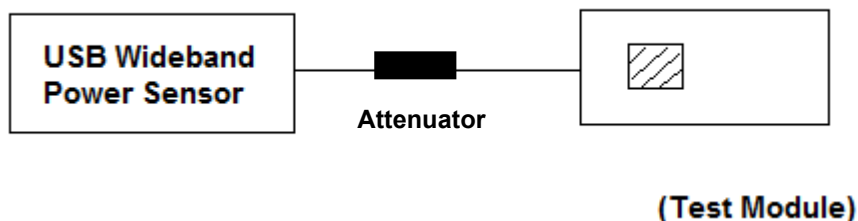
(4) According to KDB662911D01 Measure-and-sum technique, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in units that are directly proportional to power.

(5) According to KDB 662911 D01, the directional gain = $G_{\text{ANT}} + 10 \log(N_{\text{ANT}})$ dBi, where G_{ANT} is the antenna gain in dBi, N_{ANT} is the number of outputs.

2.4.2. Test Description

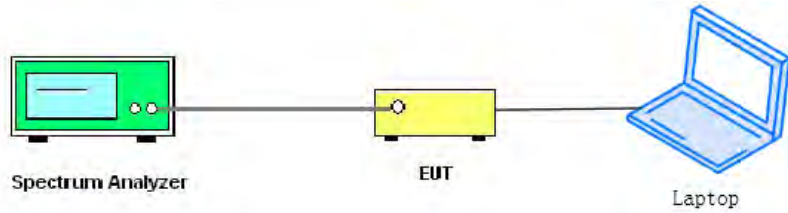
Section E) 3) of KDB 789033 defines a methodology using a USB Wideband Power Sensor.

A. 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.

2.4.3. Limits

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 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

| Mode | Band | Channel (MHz) | 26dB BW (MHz) | 11+10log(26dB BW) | Limits (dBm) |
|------|---------|---------------|---------------|-------------------|--------------|
| a | UNII-2a | 5260 | 25.19 | 25.01 | 24.00 |
| | | 5300 | 24.36 | 24.87 | 24.00 |
| | | 5320 | 26.92 | 25.30 | 24.00 |
| | UNII-2c | 5500 | 29.14 | 25.64 | 24.00 |
| | | 5600 | 29.21 | 25.66 | 24.00 |
| | | 5720 | 28.27 | 25.51 | 24.00 |
| n20 | UNII-2a | 5260 | 23.26 | 24.67 | 24.00 |
| | | 5300 | 26.35 | 25.21 | 24.00 |
| | | 5320 | 26.87 | 25.29 | 24.00 |
| | UNII-2c | 5500 | 28.42 | 25.54 | 24.00 |
| | | 5600 | 28.78 | 25.59 | 24.00 |
| | | 5720 | 29.10 | 25.64 | 24.00 |



2.4.4. Test Result

802.11a Test mode

| Channel | Frequency (MHz) | Measured Peak Power (dBm) | | Limit (dBm) | Verdict |
|---------|-----------------|---------------------------|------------------------|-------------|---------|
| 36 | 5180 | 22.58 | | 24 | PASS |
| 44 | 5220 | 22.65 | | | |
| 48 | 5240 | 22.31 | | | |
| 52 | 5260 | 22.25 | | | |
| 60 | 5300 | 21.94 | | | |
| 64 | 5320 | 21.90 | | | |
| 100 | 5500 | 21.00 | | | |
| 120 | 5600 | 20.82 | | | |
| 144 | 5720 | 20.27 | | | |
| 149 | 5745 | 21.02 | | | |
| 157 | 5785 | 20.89 | | | |
| 165 | 5825 | 20.57 | | | |
| Channel | Frequency (MHz) | Average Power (dBm) | | Limit (dBm) | Verdict |
| | | Measured | Duty factor Calculated | | |
| 36 | 5180 | 12.74 | 12.85 | 24 | PASS |
| 44 | 5220 | 12.72 | 12.83 | | |
| 48 | 5240 | 12.59 | 12.70 | | |
| 52 | 5260 | 12.4 | 12.51 | | |
| 60 | 5300 | 12.17 | 12.28 | | |
| 64 | 5320 | 12.03 | 12.14 | | |
| 100 | 5500 | 11.73 | 11.84 | | |
| 120 | 5600 | 11.64 | 11.75 | | |
| 144 | 5720 | 11.39 | 11.50 | | |
| 149 | 5745 | 12.23 | 12.34 | | |
| 157 | 5785 | 12.18 | 12.29 | | |
| 165 | 5825 | 12.05 | 12.16 | | |



802.11n (HT20) Test mode

| Channel | Frequency (MHz) | Measured Peak Power (dBm) | | Limit (dBm) | Verdict |
|---------|-----------------|------------------------------|------------------------|-------------|---------|
| 36 | 5180 | 22.69 | | 24 | PASS |
| 44 | 5220 | 22.51 | | | |
| 48 | 5240 | 22.39 | | | |
| 52 | 5260 | 22.25 | | | |
| 60 | 5300 | 21.94 | | | |
| 64 | 5320 | 21.62 | | | |
| 100 | 5500 | 21.03 | | | |
| 120 | 5600 | 20.65 | | | |
| 144 | 5720 | 20.26 | | | |
| 149 | 5745 | 20.91 | | | |
| 157 | 5785 | 20.75 | | | |
| 165 | 5825 | 20.44 | | | |
| Channel | Frequency (MHz) | Measured Average Power (dBm) | | Limit (dBm) | Verdict |
| | | Measured | Duty factor Calculated | | |
| 36 | 5180 | 12.80 | 12.92 | 24 | PASS |
| 44 | 5220 | 12.70 | 12.82 | | |
| 48 | 5240 | 12.56 | 12.68 | | |
| 52 | 5260 | 12.35 | 12.47 | | |
| 60 | 5300 | 12.14 | 12.26 | | |
| 64 | 5320 | 11.46 | 11.58 | | |
| 100 | 5500 | 11.71 | 11.83 | | |
| 120 | 5600 | 11.62 | 11.74 | | |
| 144 | 5720 | 11.36 | 11.48 | | |
| 149 | 5745 | 12.19 | 12.31 | | |
| 157 | 5785 | 12.12 | 12.24 | | |
| 165 | 5825 | 11.98 | 12.10 | | |



802.11n (HT40) Test mode

| Channel | Frequency (MHz) | Measured Peak Power (dBm) | | Limit (dBm) | Verdict |
|---------|-----------------|------------------------------|------------------------|-------------|---------|
| 38 | 5190 | 22.84 | | 24 | PASS |
| 46 | 5230 | 22.50 | | | |
| 54 | 5270 | 22.62 | | | |
| 62 | 5310 | 22.07 | | | |
| 102 | 5510 | 21.47 | | | |
| 126 | 5630 | 21.06 | | | |
| 142 | 5710 | 20.60 | | | |
| 151 | 5755 | 21.66 | | 30 | |
| 159 | 5795 | 21.39 | | | |
| Channel | Frequency (MHz) | Measured Average Power (dBm) | | Limit (dBm) | Verdict |
| | | Measured | Duty factor Calculated | | |
| 38 | 5190 | 11.71 | 11.94 | 24 | PASS |
| 46 | 5230 | 11.35 | 11.58 | | |
| 54 | 5270 | 11.55 | 11.78 | | |
| 62 | 5310 | 11.03 | 11.26 | | |
| 102 | 5510 | 11.12 | 11.35 | | |
| 126 | 5630 | 10.97 | 11.20 | | |
| 142 | 5710 | 10.35 | 10.58 | | |
| 151 | 5755 | 12.29 | 12.52 | 30 | |
| 159 | 5795 | 12.07 | 12.30 | | |

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 11 dBm 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 11 dBm in any 1 megahertz band.

(3) For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500KHz band.

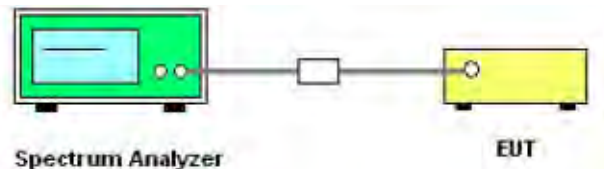
If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(4) According to KDB662911D01 Measure-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 = $G_{ANT} + 10\log(N_{ANT})$ dBi, where G_{ANT} is the antenna gain in dBi, N_{ANT} is the number of outputs.

2.5.2. Test Description

A. Test Set:



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 = 1 MHz. Set VBW \geq 3 MHz.
- 3) Number of points in sweep \geq 2 Span / RBW. Sweep time = auto.
- 4) Detector = Peak
- 5) Trace mode=Max hold
- 6) Record the max value

2.5.4. Test Result**802.11a Test mode****A. Test Verdict:**

| Channel | Frequency (MHz) | Measured PPSD (dBm/MHz) | Limit (dBm/MHz) | Verdict |
|---------|-----------------|----------------------------|--------------------|---------|
| 36 | 5180 | 10.09 | 11 | PASS |
| 44 | 5220 | 10.08 | | |
| 48 | 5240 | 9.66 | | |
| 52 | 5260 | 9.96 | | |
| 60 | 5300 | 9.85 | | |
| 64 | 5320 | 9.57 | | |
| 100 | 5500 | 8.29 | | |
| 120 | 5600 | 7.58 | | |
| 144 | 5720 | 7.62 | | |
| Channel | Frequency (MHz) | Measured PPSD (dBm/500KHz) | Limit (dBm/500KHz) | Verdict |
| 144 | 5720 | 4.25 | 30 | PASS |
| 149 | 5745 | 8.06 | | |
| 157 | 5785 | 7.75 | | |
| 165 | 5825 | 7.80 | | |



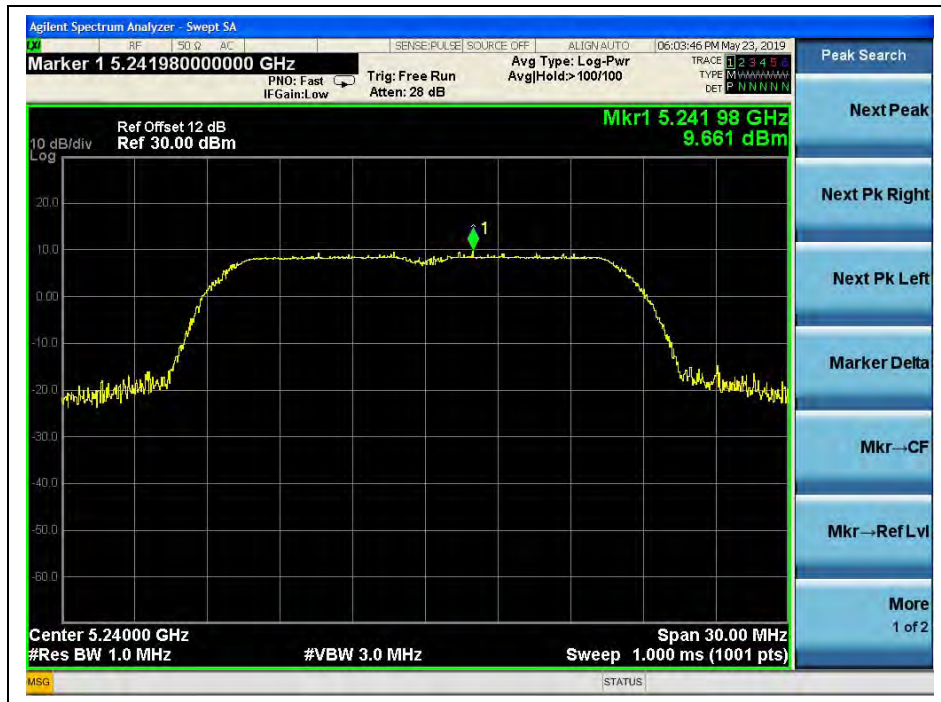
B. Test Plots



(Channel 36, 5180MHz, 802.11a,)



(Channel 44, 5220 MHz, 802.11a,)



(Channel 48, 5240MHz, 802.11a,)



(Channel 52, 5260MHz, 802.11a,)



(Channel 60, 5300 MHz, 802.11a,)



(Channel 64, 5320MHz, 802.11a,)



(Channel 100, 5500MHz, 802.11a,)



(Channel 120, 5600 MHz, 802.11a,)



(Channel 144, 5720MHz, 802.11a,)



(Channel 144, 5720MHz, 802.11a,)



(Channel 149, 5745MHz, 802.11a)



(Channel 157, 5785MHz, 802.11a)



(Channel 165, 5825MHz, 802.11a)

802.11n (HT20) Test mode

A. Test Verdict:

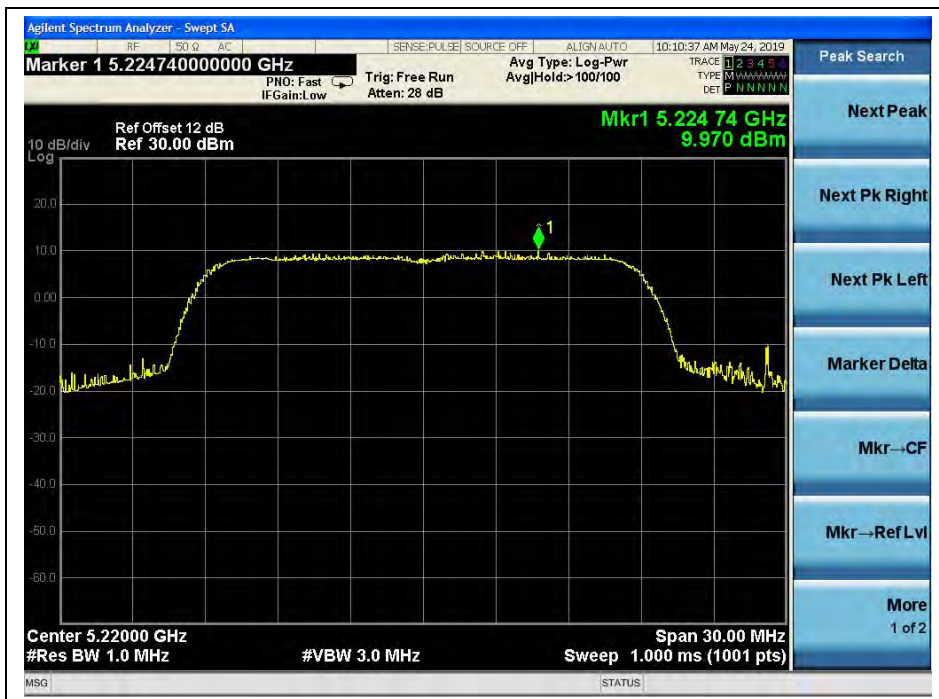
| Channel | Frequency (MHz) | Measured PPSD (dBm/MHz) | Limit (dBm/MHz) | Verdict |
|---------|-----------------|----------------------------|-----------------|---------|
| 36 | 5180 | 9.97 | 11 | PASS |
| 44 | 5220 | 9.97 | | |
| 48 | 5240 | 8.57 | | |
| 52 | 5260 | 9.30 | | |
| 60 | 5300 | 9.14 | | |
| 64 | 5320 | 8.77 | | |
| 100 | 5500 | 9.04 | | |
| 116 | 5600 | 8.46 | | |
| 144 | 5720 | 8.04 | | |
| Channel | Frequency (MHz) | Measured PPSD (dBm/500KHz) | | |
| 144 | 5720 | 4.14 | 30 | PASS |
| 149 | 5745 | 8.08 | | |
| 157 | 5785 | 8.14 | | |
| 165 | 5825 | 8.38 | | |



B. Test Plots



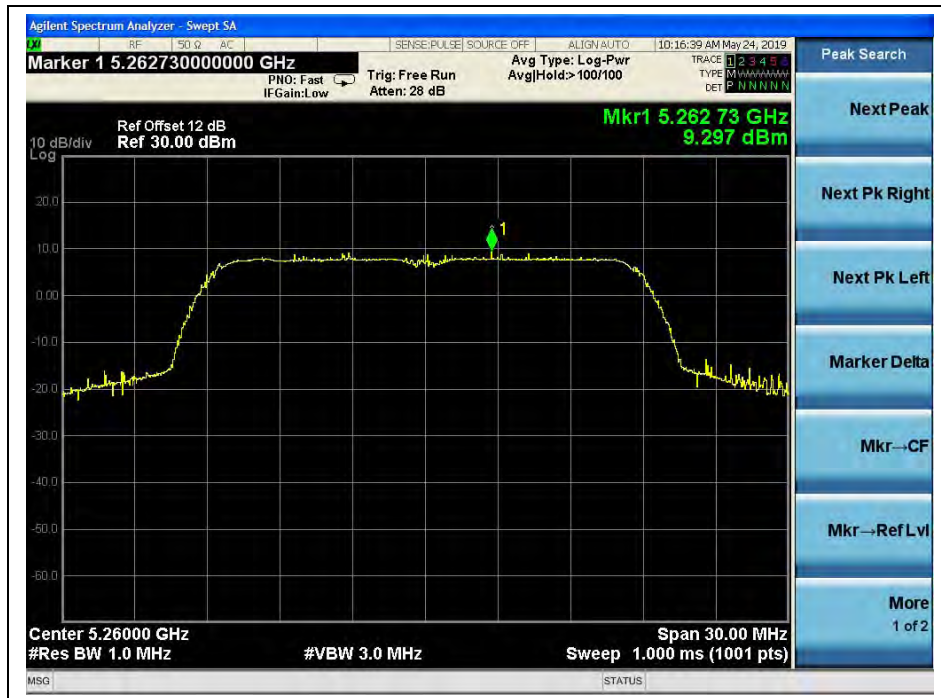
(Channel 36, 5180MHz, 802.11 n (HT20))



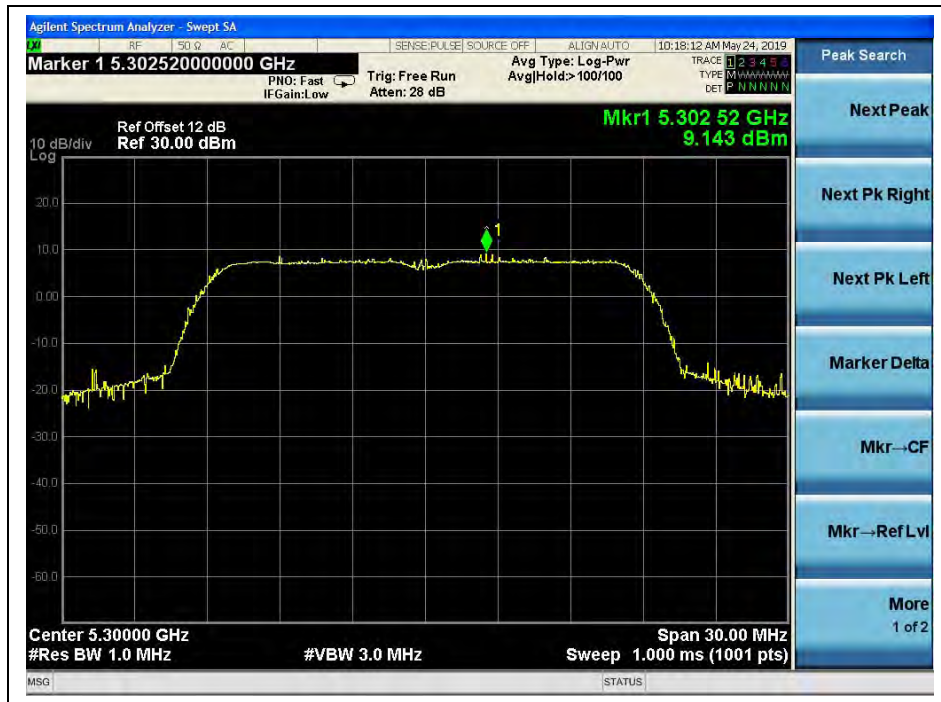
(Channel 44, 5220 MHz, 802.11 n (HT20))



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



(Channel 52, 5260MHz, 802.11 n (HT20))



(Channel 60, 5300 MHz, 802.11 n (HT20))



(Channel 64, 5320MHz, 802.11 n (HT20))



(Channel 100, 5500MHz, 802.11 n (HT20))



(Channel 120, 5600 MHz, 802.11 n (HT20))



(Channel 144, 5720MHz, 802.11 n (HT20))



(Channel 144, 5720MHz, 802.11 n (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) Test mode

A. Test Verdict:

| Channel | Frequency (MHz) | Measured PPSD (dBm/MHz) | Limit (dBm/MHz) | Verdict |
|---------|-----------------|----------------------------|--------------------|---------|
| 38 | 5190 | 9.61 | 11 | PASS |
| 46 | 5230 | 9.92 | | |
| 54 | 5270 | 9.67 | | |
| 62 | 5310 | 9.19 | | |
| 102 | 5510 | 9.15 | | |
| 126 | 5630 | 8.12 | | |
| 142 | 5710 | 8.35 | | |
| Channel | Frequency (MHz) | Measured PPSD (dBm/500KHz) | Limit (dBm/500KHz) | Verdict |
| 142 | 5710 | 5.00 | 30 | PASS |
| 151 | 5755 | 5.50 | | |
| 159 | 5795 | 5.21 | | |



B. Test Plots



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



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



(Channel 54, 5270MHz, 802.11n (HT40))



(Channel 62, 5310 MHz, 802.11n (HT40))



(Channel 102, 5510MHz, 802.11n (HT40))



(Channel 126, 5630 MHz, 802.11n (HT40))



(Channel 142, 5710MHz, 802.11n (HT40))



(Channel 142, 5710MHz, 802.11n (HT40))



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



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



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°C to 40°C. The temperature was incremented by 10° 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) 5180MHz | | | | |
|-----------------------------|-------------|-----------|----------------|-----------------|
| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | Freq Dev. (Hz) | Deviation (ppm) |
| 100% | 5.00 | +20(Ref) | 25 | 0.005 |
| 100% | | -30 | 47 | 0.009 |
| 100% | | -20 | 50 | 0.010 |
| 100% | | -10 | 39 | 0.008 |
| 100% | | 0 | 31 | 0.006 |
| 100% | | +10 | 25 | 0.005 |
| 100% | | +20 | 27 | 0.005 |
| 100% | | +30 | 35 | 0.007 |
| 100% | | +40 | 44 | 0.008 |
| 100% | | +50 | 49 | 0.009 |
| 85% | | 4.25 | +20 | 52 |
| 115% | 5.57 | +20 | 43 | 0.008 |



| U-NII-2A (Ch. 52) | | | | |
|-------------------|-------------|-----------|----------------|-----------------|
| 5260MHz | | | | |
| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | Freq Dev. (Hz) | Deviation (ppm) |
| 100% | 5.00 | +20(Ref) | 30 | 0.006 |
| 100% | | -30 | 53 | 0.010 |
| 100% | | -20 | 46 | 0.009 |
| 100% | | -10 | 39 | 0.007 |
| 100% | | 0 | 32 | 0.006 |
| 100% | | +10 | 33 | 0.006 |
| 100% | | +20 | 37 | 0.007 |
| 100% | | +30 | 45 | 0.009 |
| 100% | | +40 | 49 | 0.009 |
| 100% | | +50 | 56 | 0.011 |
| 85% | 4.25 | +20 | 28 | 0.005 |
| 115% | 5.57 | +20 | 31 | 0.006 |

| U-NII-2C (Ch. 100) | | | | |
|--------------------|-------------|-----------|----------------|-----------------|
| 5500MHz | | | | |
| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | Freq Dev. (Hz) | Deviation (ppm) |
| 100% | 5.00 | +20(Ref) | 19 | 0.003 |
| 100% | | -30 | 48 | 0.009 |
| 100% | | -20 | 37 | 0.007 |
| 100% | | -10 | 29 | 0.005 |
| 100% | | 0 | 20 | 0.004 |
| 100% | | +10 | 18 | 0.003 |
| 100% | | +20 | 23 | 0.004 |
| 100% | | +30 | 27 | 0.005 |
| 100% | | +40 | 34 | 0.006 |
| 100% | | +50 | 44 | 0.008 |
| 85% | 4.25 | +20 | 26 | 0.005 |
| 115% | 5.57 | +20 | 35 | 0.006 |



| U-NII-3 (Ch. 149) | | | | |
|--------------------------|--------------------|------------------|-----------------------|------------------------|
| 5745MHz | | | | |
| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | Freq Dev. (Hz) | Deviation (ppm) |
| 100% | 5.00 | +20(Ref) | 24 | 0.004 |
| 100% | | -30 | 50 | 0.009 |
| 100% | | -20 | 46 | 0.008 |
| 100% | | -10 | 38 | 0.007 |
| 100% | | 0 | 30 | 0.005 |
| 100% | | +10 | 22 | 0.004 |
| 100% | | +20 | 29 | 0.005 |
| 100% | | +30 | 24 | 0.004 |
| 100% | | +40 | 37 | 0.006 |
| 100% | | +50 | 43 | 0.007 |
| 85% | 4.25 | +20 | 49 | 0.009 |
| 115% | 5.57 | +20 | 37 | 0.006 |

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).

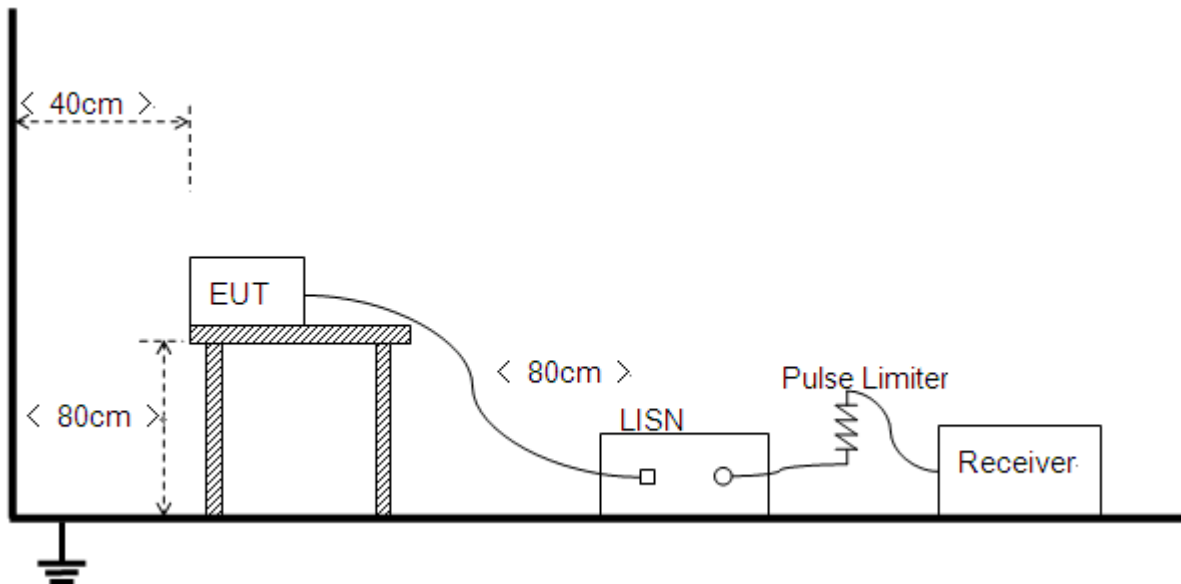
| Frequency range (MHz) | Conducted Limit (dBμV) | |
|-----------------------|------------------------|----------|
| | Quai-peak | Average |
| 0.15 - 0.50 | 66 to 56 | 56 to 46 |
| 0.50 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |

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

A. 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. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were 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

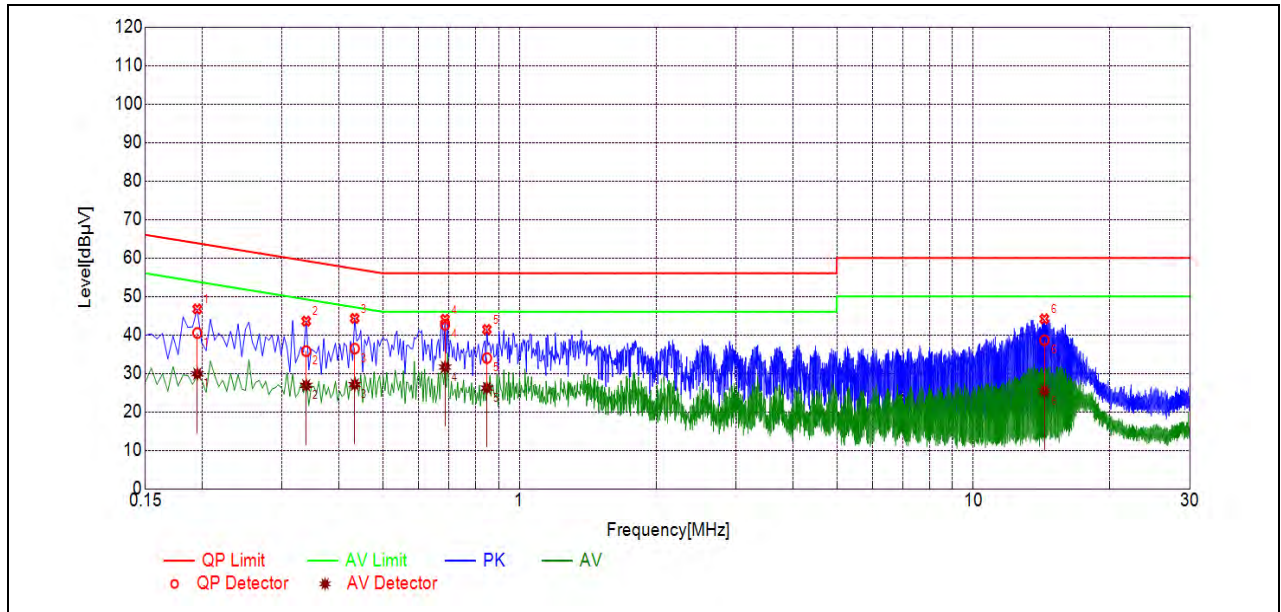
The measurement results are obtained as below:

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

U_R : Receiver Reading

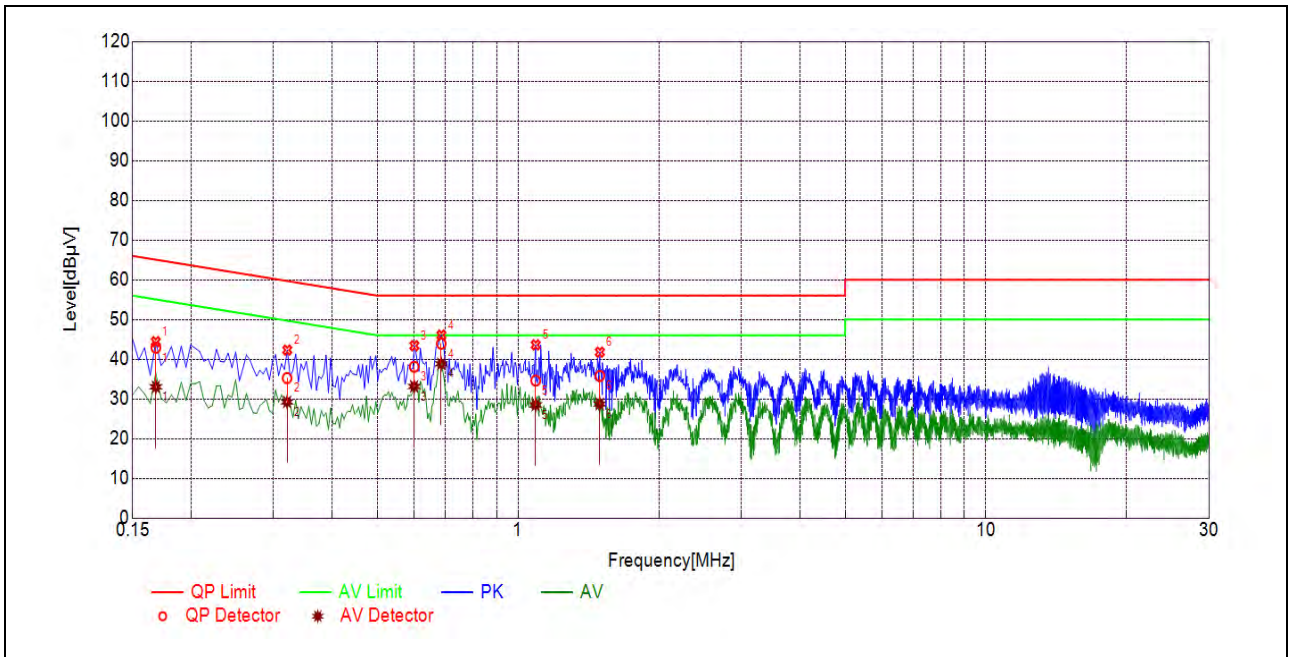
A_{Factor} : Voltage division factor of LISN

B. Test Plots:



(L Phase)

| NO. | Fre. (MHz) | Emission Level (dBµV) | | Limit (dBµV) | | Power-line | Verdict |
|-----|------------|-----------------------|---------|--------------|---------|------------|---------|
| | | Quai-peak | Average | Quai-peak | Average | | |
| 1 | 0.1951 | 40.49 | 29.88 | 63.82 | 53.82 | Line | PASS |
| 2 | 0.3389 | 35.78 | 26.88 | 59.23 | 49.23 | | PASS |
| 3 | 0.4336 | 36.44 | 27.08 | 57.18 | 47.18 | | PASS |
| 4 | 0.6854 | 42.66 | 31.62 | 56.00 | 46.00 | | PASS |
| 5 | 0.8477 | 33.97 | 26.19 | 56.00 | 46.00 | | PASS |
| 6 | 14.3335 | 38.62 | 25.47 | 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 | 0.1681 | 42.90 | 33.04 | 65.05 | 55.05 | Neutral | PASS |
| 2 | 0.3207 | 35.26 | 29.24 | 59.69 | 49.69 | | PASS |
| 3 | 0.5994 | 38.10 | 33.13 | 56.00 | 46.00 | | PASS |
| 4 | 0.6849 | 43.91 | 38.84 | 56.00 | 46.00 | | PASS |
| 5 | 1.0901 | 34.62 | 28.48 | 56.00 | 46.00 | | PASS |
| 6 | 1.4947 | 35.79 | 28.72 | 56.00 | 46.00 | | PASS |

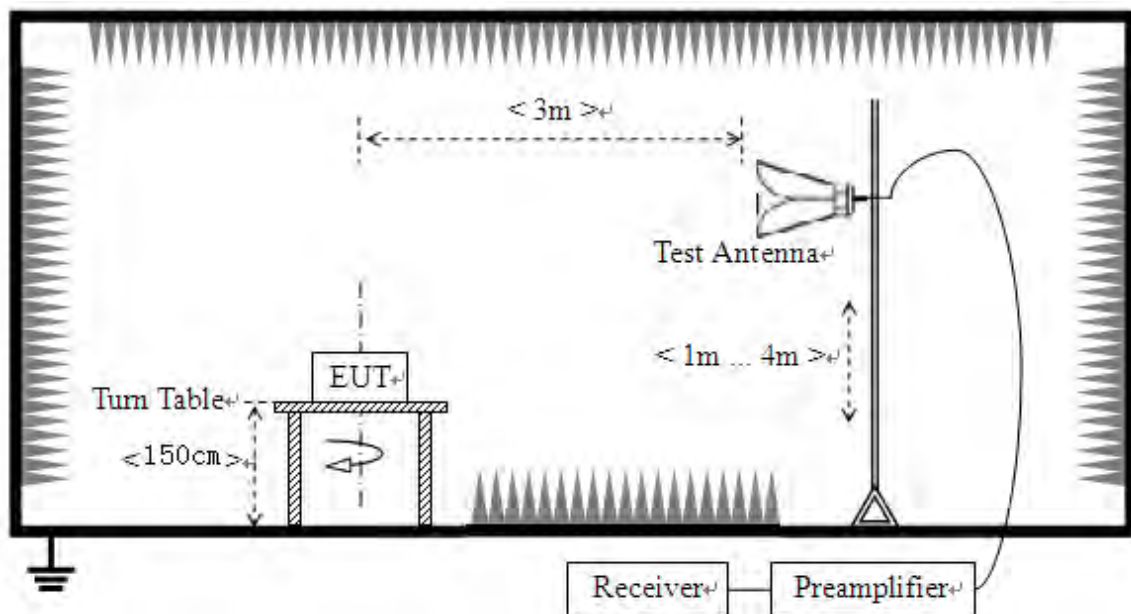
2.8. Restricted Frequency Bands

2.8.1. Requirement

According to FCC section 15.407(b)(7), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

2.8.2. Test Description

A. Test Setup



The Module 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.