

# FCC TEST REPORT

for

Meiloon Industrial Co., Ltd.

active loudspeaker

Model Number: Forte

FCC ID: R48FORTE

IC: 7190A-FORTE

Prepared for : Meiloon Industrial Co., Ltd.  
Address : No.99, Xingfu Road, Taoyuan Dist, Taoyuan City, Taiwan

Prepared by : Keyway Testing Technology Co., Ltd.  
Address : Baishun Industrial Zone, Zhangmutou Town,  
Dongguan, Guangdong, China

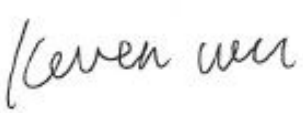
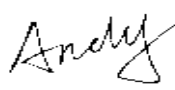
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Report No. : 15KWE093041F  
Date of Test : Sep.7~Sep.15,2015  
Date of Report : Sep.16, 2015

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## Keyway Testing Technology Co., Ltd.

|                                                                                                                                                                                                              |                                                                                                                                                                                             |                                                                                                                                                                                  |                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>Applicant:</b>                                                                                                                                                                                            | Meiloon Industrial Co., Ltd.                                                                                                                                                                |                                                                                                                                                                                  |                   |
| <b>Address:</b>                                                                                                                                                                                              | No.99, Xingfu Road, Taoyuan Dist, Taoyuan City, Taiwan                                                                                                                                      |                                                                                                                                                                                  |                   |
| <b>Manufacturer:</b>                                                                                                                                                                                         | Martin logan LTD                                                                                                                                                                            |                                                                                                                                                                                  |                   |
| <b>Address:</b>                                                                                                                                                                                              | 2101 Delaware Street, Lawrence, KS 66046 USA                                                                                                                                                |                                                                                                                                                                                  |                   |
| <b>Factory:</b>                                                                                                                                                                                              | Dongguan Meiloon Acoustic Equipments Co., Ltd.                                                                                                                                              |                                                                                                                                                                                  |                   |
| <b>Address:</b>                                                                                                                                                                                              | 77, Yuanlin Road Fenghuanggang Ind, Estate, Tangxia Town, 523727 Dongguan City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA.                                                             |                                                                                                                                                                                  |                   |
| <b>E.U.T:</b>                                                                                                                                                                                                | active loudspeaker                                                                                                                                                                          |                                                                                                                                                                                  |                   |
| <b>Model Number:</b>                                                                                                                                                                                         | Forte                                                                                                                                                                                       |                                                                                                                                                                                  |                   |
| <b>Trade Name:</b>                                                                                                                                                                                           | MARTIN LOGAN                                                                                                                                                                                | <b>Serial No.:</b>                                                                                                                                                               | -----             |
| <b>Date of Receipt:</b>                                                                                                                                                                                      | Sep. 6 , 2015                                                                                                                                                                               | <b>Date of Test:</b>                                                                                                                                                             | Sep.7~Sep.15,2015 |
| <b>Test Specification:</b>                                                                                                                                                                                   | FCC Part 15, Subpart 15.407: Oct. 1, 2014<br>ANSI C63.10:2013<br>KDB789033 D02 v01<br>RSS-247 Issue 1 May 2015<br>RSS-Gen Issue 4 November 2014                                             |                                                                                                                                                                                  |                   |
| <b>Test Result:</b>                                                                                                                                                                                          | The equipment under test was found to be compliance with the requirements of the standards applied. <div style="text-align: right; margin-top: 10px;"><b>Issue Date: Sep.16, 2015</b></div> |                                                                                                                                                                                  |                   |
| Tested by:<br><br><br><hr style="width: 150px; margin: 5px auto;"/> Keven Wu / Engineer                                   | Reviewed by:<br><br><br><hr style="width: 150px; margin: 5px auto;"/> Andy Gao/ Supervisor               | Approved by:<br><br><br><hr style="width: 150px; margin: 5px auto;"/> Jade Yang/ Supervisor |                   |
| <b>Other Aspects:</b>                                                                                                                                                                                        | None.                                                                                                                                                                                       |                                                                                                                                                                                  |                   |
| Abbreviations: OK/P=passed    fail/F=failed    n.a/N=not applicable    E.U.T=equipment under tested                                                                                                          |                                                                                                                                                                                             |                                                                                                                                                                                  |                   |
| This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Keyway Testing Technology Co., Ltd. |                                                                                                                                                                                             |                                                                                                                                                                                  |                   |

## 1.TEST SUMMARY

| Test Items                            | Test Requirement                              | Result |
|---------------------------------------|-----------------------------------------------|--------|
| Conducted Emissions                   | 15.207<br>RSS-GEN, Section 8.8                | PASS   |
| Radiated Emissions                    | 15.407(b), 15.209<br>&RSS-Gen §6.13           | PASS   |
| 26dB bandwidth and 99%dB<br>Bandwidth | 15.407 (a)<br>RSS-247 §5.2(1)<br>&RSS-Gen§6.6 | PASS   |
| Power density                         | 15.407 (a)<br>& RSS-247 §6.2.1                | PASS   |
| Maximum Peak Output Power             | 15.407 (a)<br>& RSS-247 §6.2.1                | PASS   |
| Emissions from out of band            | 15.407 (b)<br>& RSS-247 §6.2.1                | PASS   |
| Antenna Requirement                   | 15.203&RSS-Gen§8.3                            | PASS   |

## 2.GENERAL PRODUCT INFORMATION

### 2.1. Product Function

Refer to Technical Construction Form and User Manual.

### 2.2. Description of Device (EUT)

|                            |                                                                                                                                                                                     |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name:              | active loudspeaker                                                                                                                                                                  |
| Model No.:                 | Forte                                                                                                                                                                               |
| Operation Frequency:       | 2412MHz~2462MHz (802.11b/802.11g/802.11n(H20))<br>2422MHz~2452MHz (802.11n(H40))<br>5180-5240 MHz; 5745-5825 MHz(5G 802.11a/n(HT20))<br>5190-5230 MHz; 5755-5795 MHz(802.11n(HT40)) |
| Channel numbers:           | 11 for 802.11b/802.11g/802.11n(H20) ,7 for 802.11n(H40)<br>5channels for 5G 802.11a/n(HT20)<br>4channels for 802.11n(HT40)                                                          |
| Modulation technology:     | Direct Sequence Spread Spectrum (DSSS) for (IEEE 802.11b)<br>Orthogonal Frequency Division Multiplexing(OFDM) for (IEEE 802.11g/802.11n)                                            |
| Data speed (IEEE 802.11b): | 1Mbps, 2Mbps, 5.5Mbps, 11Mbps                                                                                                                                                       |
| Data speed (IEEE 802.11g): | 6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps,<br>36Mbps, 48Mbps,54Mbps                                                                                                                      |
| Data speed (IEEE 802.11n): | Up to 150Mbps                                                                                                                                                                       |
| Antenna Type:              | PIFA                                                                                                                                                                                |
| Antenna gain:              | 3.3dBi                                                                                                                                                                              |
| Power supply:              | AC 120V/60Hz                                                                                                                                                                        |

### 2.3. Test Supporting System

None.

### 2.4. Product Version

|                             |                                                                                                |
|-----------------------------|------------------------------------------------------------------------------------------------|
| Product SW version          | V0.1.3464                                                                                      |
| Product HW version          | V01                                                                                            |
| Radio SW version            | V03                                                                                            |
| Radio HW version            | 1.9.1.009                                                                                      |
| Test SW Version             | V1.2                                                                                           |
| RF power setting in TEST SW | 2.4G:11b 15 dBm;11g 14 dBm;11n(HT20) 13 dBm; 11n(HT40) 11 dBm<br>5G:11n 12.5 dBm; 11a 12.5 dBm |

### 2.5. Independent Operation Modes

The basic operation modes are:

These is Digital Transmission system (DTS) and have modulation OFDM, DSSS, DBPSK, DQPSK, CCK, 16QAM, 64QAM. According exploratory test, EUT will have maximum output power in those data rate (802.11a/n: MCS0), so those data rate were used for all test. The equipment enables high-speed access without wires to network assets. This adapter uses the IEEE 802.11 protocol to enable wireless communications between the host and Wireless router.

For 802.11a/n(HT20):

- 1.lowest channel : 5180MHz (Channel 36)
- 2.middle channel : 5200MHz (Channel 40)
3. highest channel : 5240MHz (Channel 48)

For 802.11n(HT40):

4. For lowest channel : 5190MHz (Channel 38)
5. highest channel : 5230MHz (Channel 46)

For 802.11a/n(HT20):

- 6.lowest channel : 5745MHz (Channel 149)
7. middle channel : 5785MHz (Channel 157)
8. highest channel : 5825MHz (Channel 165)

For 802.11n(HT40):

9. lowest channel : 5755MHz (Channel 151)
10. For highest channel : 5795MHz (Channel 159)

Note: for conducted emission test, we pretest all mode,the worst mode was 802.11a channel 36.

for radiated emissions test, we pretest all mode,the worst mode was 802.11a.

The worst mode's data was recording and show in the test report.

## 2.6. TEST SITES

### 2.6.1. Test Facilities

Lab Qualifications :   Certificated by Industry Canada  
Registration No.: 9868A  
Date of registration: December 8, 2011

Certificated by FCC, USA  
Registration No.: 370994  
Date of registration: February 21, 2012

Certificated by CNAS China  
Registration No.: CNAS L5783  
Date of registration: August 8, 2012

## 2.7. List of Test and Measurement Instruments

### 2.7.1. For conducted emission at the mains terminals test

| Equipment                      | Manufacturer  | Model No. | Serial No. | Last Cal.  | Next Cal.  |
|--------------------------------|---------------|-----------|------------|------------|------------|
| EMI Test Receiver              | Rohde&Schwarz | ESCI      | 101156     | Apr. 27,15 | Apr. 27,16 |
| Artificial Mains Network       | Rohde&Schwarz | ENV216    | 101315     | Apr. 27,15 | Apr. 27,16 |
| Artificial Mains Network (AUX) | Rohde&Schwarz | ENV216    | 101314     | Apr. 27,15 | Apr. 27,16 |
| RF Cable                       | FUJIKURA      | 3D-2W     | 944 Cable  | Apr. 27,15 | Apr. 27,16 |

### 2.7.2. For radiated emission test

| Equipment                             | Manufacturer  | Model No.          | Serial No.           | Last Cal.  | Next Cal.  |
|---------------------------------------|---------------|--------------------|----------------------|------------|------------|
| EMI Test Receiver                     | Rohde&Schwarz | ESCI               | 101156               | Apr. 27,15 | Apr. 27,16 |
| System Simulator                      | Agilent       | E5515C             | GB43130245           | Apr. 27,15 | Apr. 27,16 |
| Power Splitter                        | Weinschel     | 1506A              | NW425                | Apr. 27,15 | Apr. 27,16 |
| Bilog Antenna                         | ETS-LINDGREEN | 3142D              | 135452               | Apr. 27,15 | Apr. 27,16 |
| Spectrum Analyzer                     | Agilent       | E4411B             | MY4511304            | Apr. 27,15 | Apr. 27,16 |
| Spectrum Analyzer                     | R&S           | FSV40              | 132.1.3008K39-100967 | Apr. 27,15 | Apr. 27,16 |
| 3m Semi-anechoic Chamber              | ETS-LINDGREEN | 966                | KW01                 | Apr. 27,15 | Apr. 27,16 |
| Signal Amplifier                      | SONOMA        | 310                | 187016               | Apr. 27,15 | Apr. 27,16 |
| Signal Amplifier                      | Agilent       | 8449B              | 3008A00251           | Apr. 27,15 | Apr. 27,16 |
| RF Cable                              | IMRO          | IMRO-400           | 966 Cable 1#         | N/A        | N/A        |
| MULTI-DEVICE Controller               | ETS-LINDGREEN | 2090               | 126913               | N/A        | N/A        |
| Horn Antenna                          | DAZE          | ZN30701            | 11003                | Apr. 27,15 | Apr. 27,16 |
| Horn Antenna                          | SCHWARZBECK   | BBHA9170           | 9170-068             | Apr. 27,15 | Apr. 27,16 |
| Spectrum Analyzer                     | Agilent       | 8593E              | 3911A04271           | Apr. 27,15 | Apr. 27,16 |
| Spectrum Analyzer                     | Agilent       | E4408B             | MY44211125           | Apr. 27,15 | Apr. 27,16 |
| Signal Amplifier                      | DAZE          | ZN3380C            | 11001                | Apr. 27,15 | Apr. 27,16 |
| High Pass filter                      | Micro         | HPM50111           | 324216               | Apr. 27,15 | Apr. 27,16 |
| Filter                                | COM-MW        | ZBSF-C836.5-25-X   | KW032                | Apr. 27,15 | Apr. 27,16 |
| Filter                                | COM-MW        | ZBSF-C1747.5-75-X2 | KW035                | Apr. 27,15 | Apr. 27,16 |
| Filter                                | COM-MW        | ZBSF-C1880-60-X2   | KW037                | Apr. 27,15 | Apr. 27,16 |
| DC Power Supply                       | LongWei       | PS-305D            | 010964729            | Apr. 27,15 | Apr. 27,16 |
| Constant temperature and humidity box | GF            | GTH-800-40-1P      | MAA9906-005          | Apr. 27,15 | Apr. 27,16 |
| Universal radio communication tester  | Rohde&Schwarz | CMU200             | 3215420              | Apr. 27,15 | Apr. 27,16 |
| Splitter                              | Agilent       | 11636B             | 0025164              | Apr. 27,15 | Apr. 27,16 |

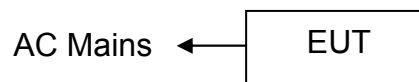
### 3. TEST SET-UP AND OPERATION MODES

#### 3.1. Principle of Configuration Selection

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

#### 3.2. Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators



*(EUT: active loudspeaker)*

#### 3.3. Test Operation Mode and Test Software

None.

#### 3.4. Special Accessories and Auxiliary Equipment

None.

#### 3.5. Countermeasures to Achieve EMC Compliance

None.

## 4. EMISSION TEST RESULTS

### 4.1. Conducted Emission at the Mains Terminals Test

#### 4.1.1. Limit 15.207 limits

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dB $\mu$ V) |          |
|-----------------------------|------------------------------|----------|
|                             | Quasi-peak                   | Average  |
| 0.15-0.5                    | 66 to 56                     | 56 to 46 |
| 0.5-5                       | 56                           | 46       |
| 5-30                        | 60                           | 50       |

#### 4.1.2. Test Setup

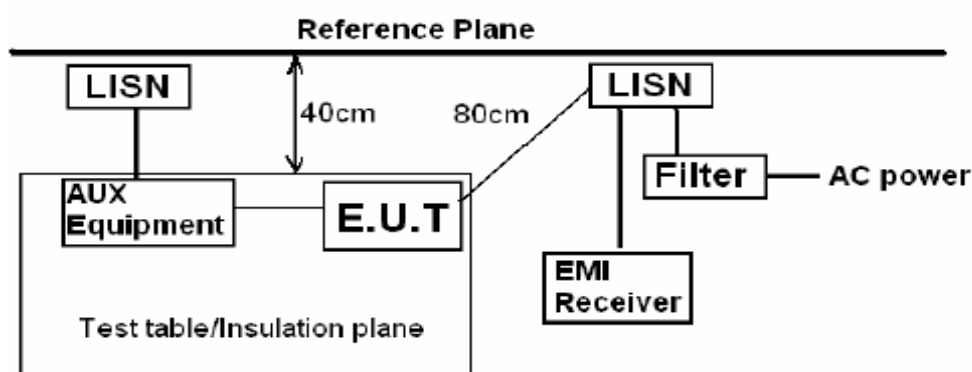
The EUT was put on a wooden table which was 0.8 m high above the ground and connected to the AC mains through the Artificial Mains Network (AMN). Where the mains cable supplied by the manufacture was longer than 0.8 m, the excess was folded back and forth parallel to the cable at the centre so as to form a bundle no longer than 0.4 m.

The EUT was kept 0.4 m from any other earthed conducting surface. Both sides of AC line were checked to find out the maximum conducted emission levels according to the test procedure during the conducted emission test.

The frequency range from 150 kHz to 30 MHz was investigated.

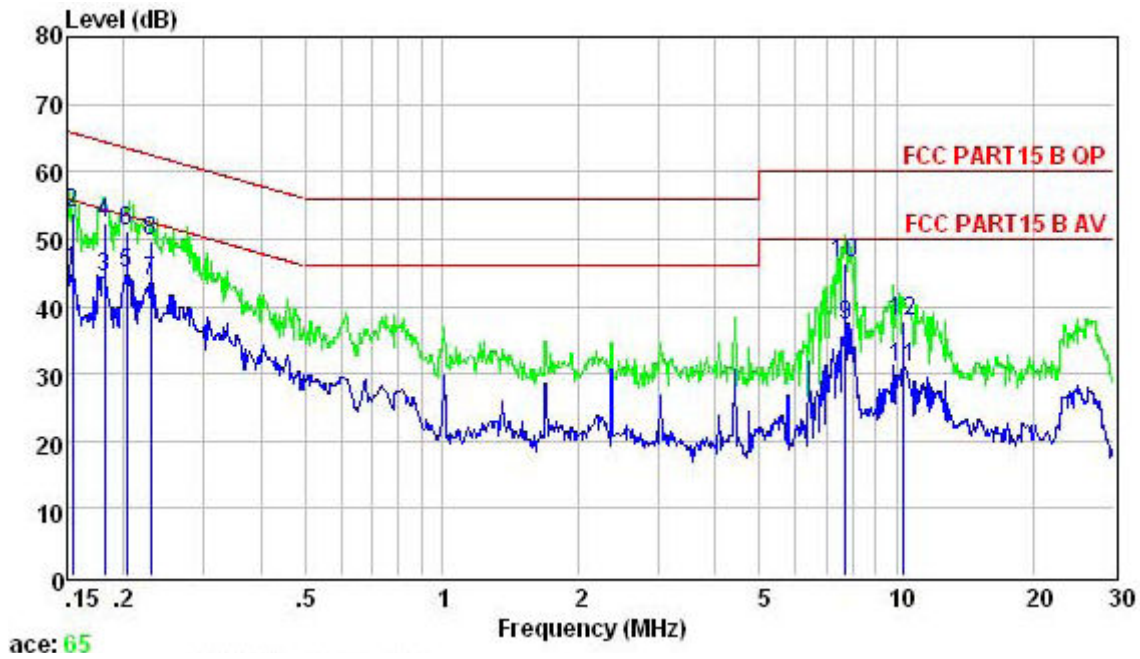
The bandwidth of the test receiver was set at 9 kHz.

Pretest for all mode, The test data of the worst case condition(s) was reported on the following page.



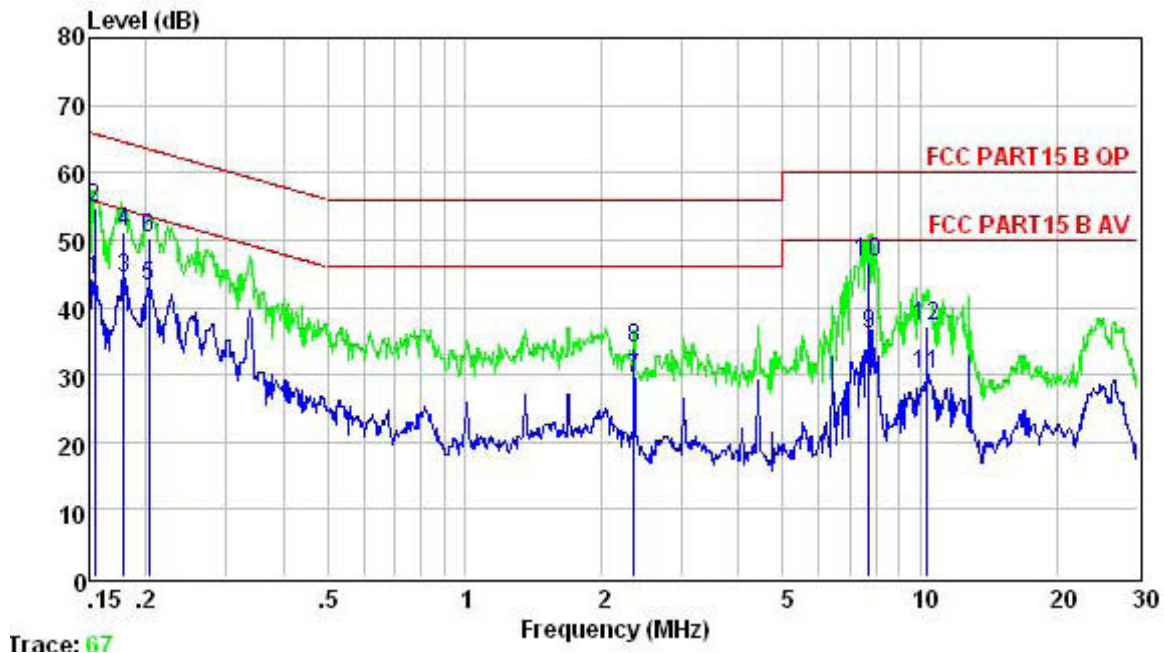
*Remark:*  
E.U.T: Equipment Under Test  
LISN: Line Impedance Stabilization Network  
Test table height=0.8m

Line



|    | Freq   | Level | Limit | Over   |         |
|----|--------|-------|-------|--------|---------|
|    | MHz    | dB    | Line  | Limit  | Remark  |
| 1  | 0.154  | 45.27 | 55.78 | -10.51 | Average |
| 2  | 0.154  | 53.90 | 65.78 | -11.88 | QP      |
| 3  | 0.182  | 44.40 | 54.42 | -10.02 | Average |
| 4  | 0.182  | 52.40 | 64.42 | -12.02 | QP      |
| 5  | 0.203  | 44.85 | 53.49 | -8.64  | Average |
| 6  | 0.203  | 51.10 | 63.49 | -12.39 | QP      |
| 7  | 0.229  | 43.71 | 52.48 | -8.77  | Average |
| 8  | 0.229  | 49.80 | 62.48 | -12.68 | QP      |
| 9  | 7.728  | 37.30 | 50.00 | -12.70 | Average |
| 10 | 7.728  | 46.50 | 60.00 | -13.50 | QP      |
| 11 | 10.342 | 30.89 | 50.00 | -19.11 | Average |
| 12 | 10.342 | 37.70 | 60.00 | -22.30 | QP      |

Neutral



|    | Freq   | Level | Limit | Over   |         |
|----|--------|-------|-------|--------|---------|
|    | MHz    | dB    | Line  | Limit  | Remark  |
| 1  | 0.154  | 44.00 | 55.78 | -11.78 | Average |
| 2  | 0.154  | 54.75 | 65.78 | -11.03 | QP      |
| 3  | 0.179  | 44.29 | 54.55 | -10.26 | Average |
| 4  | 0.179  | 51.30 | 64.55 | -13.25 | QP      |
| 5  | 0.203  | 43.26 | 53.49 | -10.23 | Average |
| 6  | 0.203  | 50.17 | 63.49 | -13.32 | QP      |
| 7  | 2.358  | 29.30 | 46.00 | -16.70 | Average |
| 8  | 2.358  | 33.80 | 56.00 | -22.20 | QP      |
| 9  | 7.728  | 35.96 | 50.00 | -14.04 | Average |
| 10 | 7.728  | 46.70 | 60.00 | -13.30 | QP      |
| 11 | 10.342 | 29.98 | 50.00 | -20.02 | Average |
| 12 | 10.342 | 37.20 | 60.00 | -22.80 | QP      |

## 4.2. Radiated Emission Test

### 4.2.1. Limit 15.209 limits

| FREQUENCY<br>MHz | DISTANCE<br>Meters | FIELD STRENGTHS LIMIT                                                                             |                                   |
|------------------|--------------------|---------------------------------------------------------------------------------------------------|-----------------------------------|
|                  |                    | $\mu\text{V}/\text{m}$                                                                            | $\text{dB}(\mu\text{V})/\text{m}$ |
| 30 ~ 88          | 3                  | 100                                                                                               | 40.0                              |
| 88 ~ 216         | 3                  | 150                                                                                               | 43.5                              |
| 216 ~ 960        | 3                  | 200                                                                                               | 46.0                              |
| 960 ~ 1000       | 3                  | 500                                                                                               | 54.0                              |
| Above 1000       | 3                  | 74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak)<br>54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average) |                                   |

### 4.2.2. Restricted bands of operation

| MHz                        | MHz                   | MHz             | GHz              |
|----------------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110              | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15       |
| <sup>1</sup> 0.495 - 0.505 | 16.69475 - 16.69525   | 608 - 614       | 5.35 - 5.46      |
| 2.1735 - 2.1905            | 16.80425 - 16.80475   | 960 - 1240      | 7.25 - 7.75      |
| 4.125 - 4.128              | 25.5 - 25.67          | 1300 - 1427     | 8.025 - 8.5      |
| 4.17725 - 4.17775          | 37.5 - 38.25          | 1435 - 1626.5   | 9.0 - 9.2        |
| 4.20725 - 4.20775          | 73 - 74.6             | 1645.5 - 1646.5 | 9.3 - 9.5        |
| 6.215 - 6.218              | 74.8 - 75.2           | 1660 - 1710     | 10.6 - 12.7      |
| 6.26775 - 6.26825          | 108 - 121.94          | 1718.8 - 1722.2 | 13.25 - 13.4     |
| 6.31175 - 6.31225          | 123 - 138             | 2200 - 2300     | 14.47 - 14.5     |
| 8.291 - 8.294              | 149.9 - 150.05        | 2310 - 2390     | 15.35 - 16.2     |
| 8.362 - 8.366              | 156.52475 - 156.52525 | 2483.5 - 2500   | 17.7 - 21.4      |
| 8.37625 - 8.38675          | 156.7 - 156.9         | 2690 - 2900     | 22.01 - 23.12    |
| 8.41425 - 8.41475          | 162.0125 - 167.17     | 3260 - 3267     | 23.6 - 24.0      |
| 12.29 - 12.293             | 167.72 - 173.2        | 3332 - 3339     | 31.2 - 31.8      |
| 12.51975 - 12.52025        | 240 - 285             | 3345.8 - 3358   | 36.43 - 36.5     |
| 12.57675 - 12.57725        | 322 - 335.4           | 3600 - 4400     | ( <sup>2</sup> ) |

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

### 4.2.3. Test setup

The EUT was placed on a turn table which was 0.8 m (above 1GHz, the high was 1.5m) above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 m away from the receiving antenna which was mounted on an antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 m to 4 m for both horizontal and vertical polarizations.

The EUT was tested in the Chamber Site. It was pre-scanned with a Peak detector from the spectrum, and all the final readings from the test receiver were measured with the Quasi-Peak detector.

The bandwidth of the EMI test receiver is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz, Both PK and AV measure, PK detector is used.

The frequency range from 30MHz to 10<sup>th</sup> harmonic (25GHz) are checked. and no any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

Notes: 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading-Preamplifier Factor.

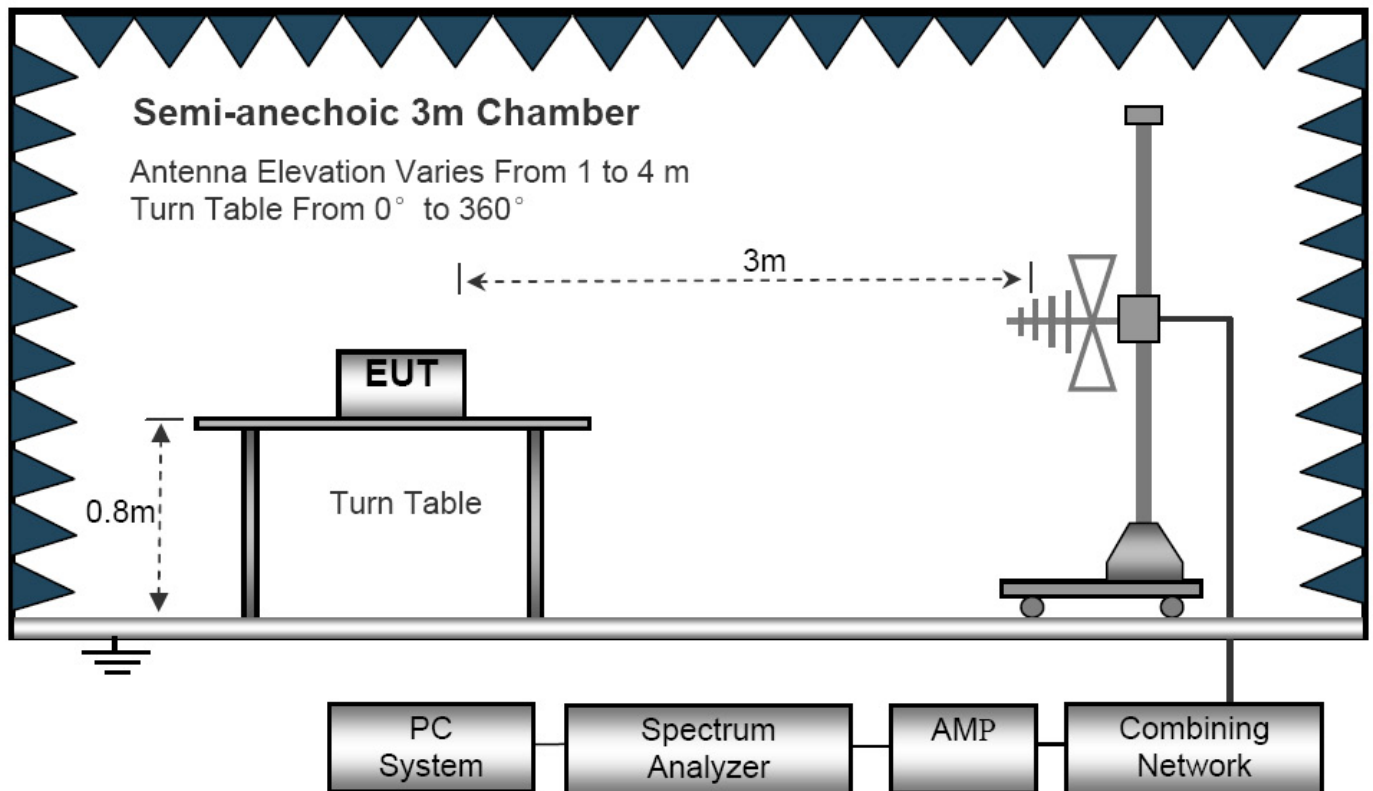
2. Measurement Uncertainty:  $\pm 3.2$  dB at a level of confidence of 95%.

3. For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

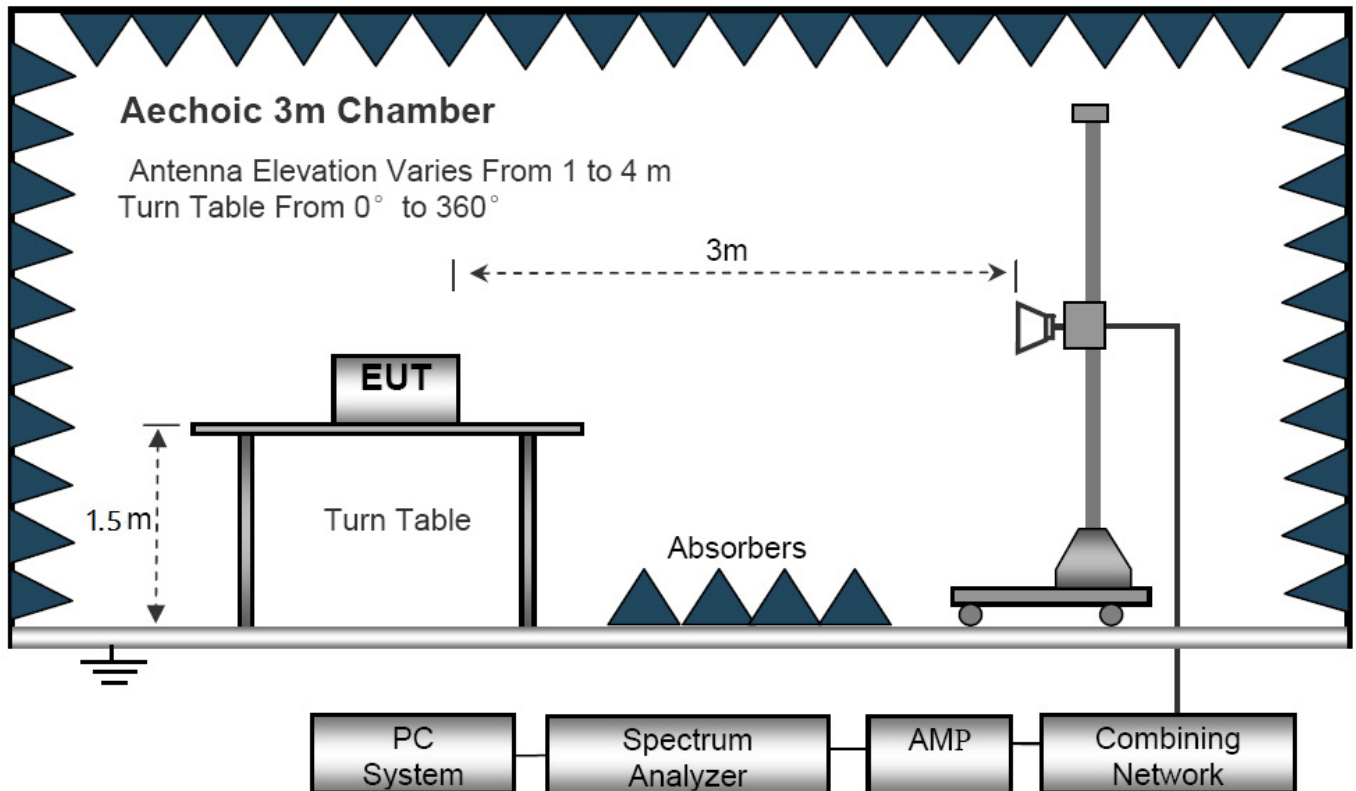
4. For emissions below 1GHz, pretest for all mode, The test data of the worst case condition(s) was reported on the following pages.

5. For Both PK and AV value above 1GHz, PK detector is used.

## Below 1GHz

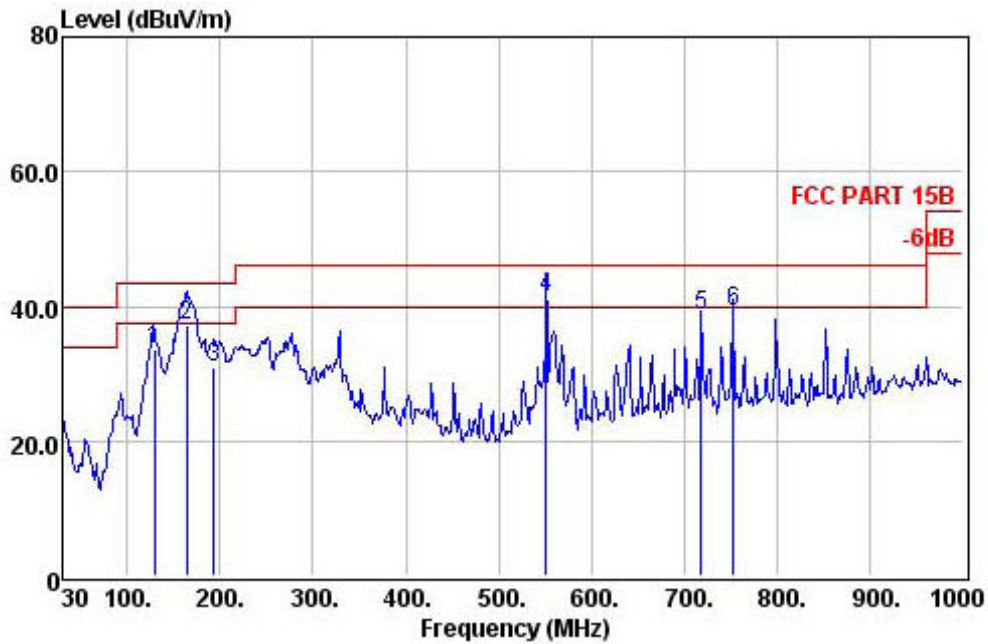


## Above 1GHz



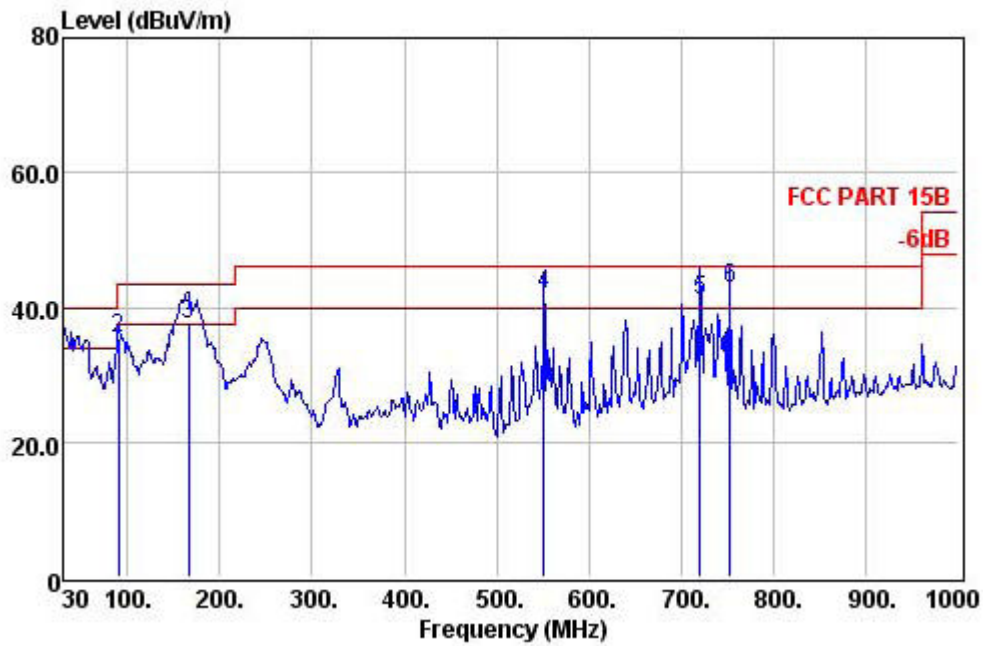
Below 1GHz

Horizontal



|   | Preamp<br>Freq | Factor | Read<br>Level | Cable<br>Loss | Level  | Limit<br>Line | Over<br>Limit | Remark |
|---|----------------|--------|---------------|---------------|--------|---------------|---------------|--------|
|   | MHz            | dB     | dBuV          | dB            | dBuV/m | dBuV/m        | dB            |        |
| 1 | 128.94         | 31.21  | 55.46         | 1.12          | 33.69  | 43.50         | -9.81         | QP     |
| 2 | 163.86         | 31.21  | 57.57         | 1.30          | 37.21  | 43.50         | -6.29         | QP     |
| 3 | 192.96         | 31.12  | 50.34         | 1.46          | 31.05  | 43.50         | -12.45        | QP     |
| 4 | 551.86         | 30.88  | 49.47         | 3.12          | 41.23  | 46.00         | -4.77         | QP     |
| 5 | 718.70         | 30.65  | 42.86         | 3.96          | 38.59  | 46.00         | -7.41         | QP     |
| 6 | 752.65         | 30.67  | 43.10         | 4.12          | 39.34  | 46.00         | -6.66         | QP     |

Vertical



|     |        | Preamp | Read  | Cable |        | Limit  | Over  |        |
|-----|--------|--------|-------|-------|--------|--------|-------|--------|
|     | Freq   | Factor | Level | Loss  | Level  | Line   | Limit | Remark |
|     | MHz    | dB     | dBuV  | dB    | dBuV/m | dBuV/m | dB    |        |
| 1 ! | 30.00  | 31.41  | 47.94 | 0.56  | 35.89  | 40.00  | -4.11 | QP     |
| 2   | 90.14  | 31.35  | 56.56 | 0.94  | 35.26  | 43.50  | -8.24 | QP     |
| 3 ! | 165.80 | 31.21  | 57.72 | 1.30  | 37.53  | 43.50  | -5.97 | QP     |
| 4 ! | 551.86 | 30.88  | 50.10 | 3.12  | 41.86  | 46.00  | -4.14 | QP     |
| 5 ! | 720.64 | 30.65  | 45.30 | 3.96  | 41.09  | 46.00  | -4.91 | QP     |
| 6 ! | 752.65 | 30.67  | 46.65 | 4.12  | 42.89  | 46.00  | -3.11 | QP     |

**Above 1GHz**

| Polar<br>(H/V)            | Frequency | Meter<br>Reading | Factor | Emission<br>Level | Limits   | Margin | Detector<br>Type |
|---------------------------|-----------|------------------|--------|-------------------|----------|--------|------------------|
|                           | (MHz)     | (dBuV)           | (dB)   | (dBuV/m)          | (dBuV/m) | (dB)   |                  |
| Low Channel (5180 MHz)    |           |                  |        |                   |          |        |                  |
| 10360.000                 | 36.97     | 13.09            | 50.55  | 74                | -23.94   | Pk     | Vertical         |
| 15540.000                 | 35.26     | 15.16            | 49.30  | 74                | -23.58   | Pk     | Vertical         |
| 10360.000                 | 36.15     | 13.09            | 49.44  | 74                | -24.76   | Pk     | Horizontal       |
| 15540.000                 | 33.41     | 15.16            | 50.04  | 74                | -25.43   | Pk     | Horizontal       |
| middle Channel (5200 MHz) |           |                  |        |                   |          |        |                  |
| 10400.000                 | 37.45     | 13.11            | 51.76  | 74                | -23.44   | Pk     | Vertical         |
| 15600.000                 | 36.83     | 15.19            | 50.56  | 74                | -21.98   | Pk     | Vertical         |
| 10400.000                 | 35.72     | 13.11            | 47.25  | 74                | -25.17   | Pk     | Horizontal       |
| 15600.000                 | 34.15     | 15.19            | 50.28  | 74                | -24.66   | Pk     | Horizontal       |
| High Channel (5240 MHz)   |           |                  |        |                   |          |        |                  |
| 10480.000                 | 38.68     | 13.19            | 52.44  | 74                | -22.13   | Pk     | Vertical         |
| 15720.00                  | 35.51     | 15.25            | 52.23  | 74                | -23.24   | Pk     | Vertical         |
| 10480.000                 | 34.68     | 13.19            | 46.44  | 74                | -26.13   | Pk     | Horizontal       |
| 15720.00                  | 35.35     | 15.34            | 51.48  | 74                | -23.31   | Pk     | Horizontal       |

Note:"802.11a(5G)" mode is the worst mode. When PK value is lower than the Average value limit,average didn't record.

## 5. BAND EDGE COMPLIANCE TEST

### 5.1. Limits

Band 5.15-5.25GHz:

FCC: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

IC: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

FCC: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

IC: For the band 5725-5825 MHz, emissions within the frequency range from the band edges to 10 MHz above or below the band edges shall not exceed -17 dBm/MHz e.i.r.p. For frequencies more than 10 MHz above or below the band edges, emissions shall not exceed -27 dBm/MHz.

### 5.2. Test setup

Test method: FCC KDB 789033 G)& Parts 15.407(b)(4) & 15.209(a)

Same as Clause 4.2.

### 5.3. Test Data

Please see data as below:

Note: we pretest horizontal and vertical, the worst was horizontal and show in the report.

| Modulation    | Test Frequency (MHz) | Max Level (dBμV/m) | EIRP[dBm] | Limit[dBm] | Result |
|---------------|----------------------|--------------------|-----------|------------|--------|
| 802.11a       | 5180                 | 51.13              | -44.07    | -27.00     | Pass   |
|               | 5240                 | 52.34              | -42.86    | -27.00     | Pass   |
|               | 5745                 | 52.17              | -43.03    | -27.00     | Pass   |
|               | 5825                 | 51.52              | -43.68    | -27.00     | Pass   |
| 802.11n(HT20) | 5180                 | 50.31              | -44.89    | -27.00     | Pass   |
|               | 5240                 | 52.42              | -42.78    | -27.00     | Pass   |
|               | 5745                 | 48.09              | -47.11    | -27.00     | Pass   |
|               | 5825                 | 51.23              | -43.97    | -27.00     | Pass   |
| 802.11n(HT40) | 5190                 | 52.43              | -42.77    | -27.00     | Pass   |
|               | 5230                 | 52.47              | -42.73    | -27.00     | Pass   |
|               | 5745                 | 54.11              | -41.09    | -27.00     | Pass   |
|               | 5825                 | 52.18              | -43.02    | -27.00     | Pass   |

Remark: 1. According to KDB 789033 D02 section H) d) (iii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows:  $EIRP[dBm] = E[dBμV/m] - 95.2$

## 6. 26DB AND 99% BANDWIDTH TEST

### 6.1. Measurement Procedure

The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum power control level, as defined in KDB 789033, at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26 dB bandwidth.

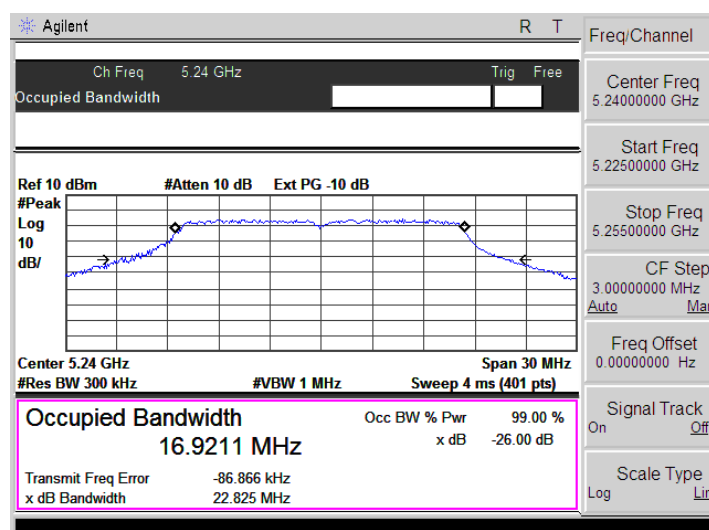
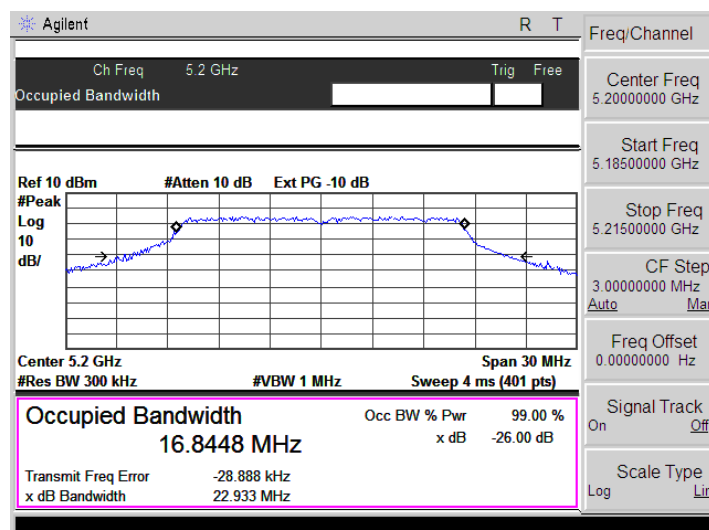
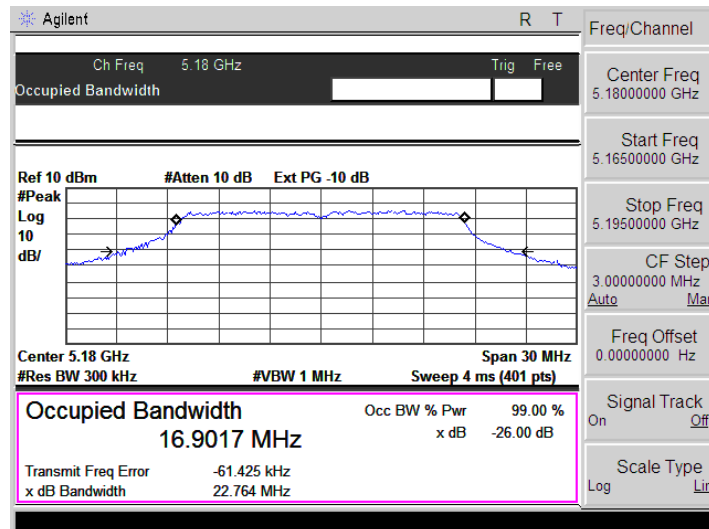
The 26 dB bandwidth is used to determine the conducted power limits.

The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

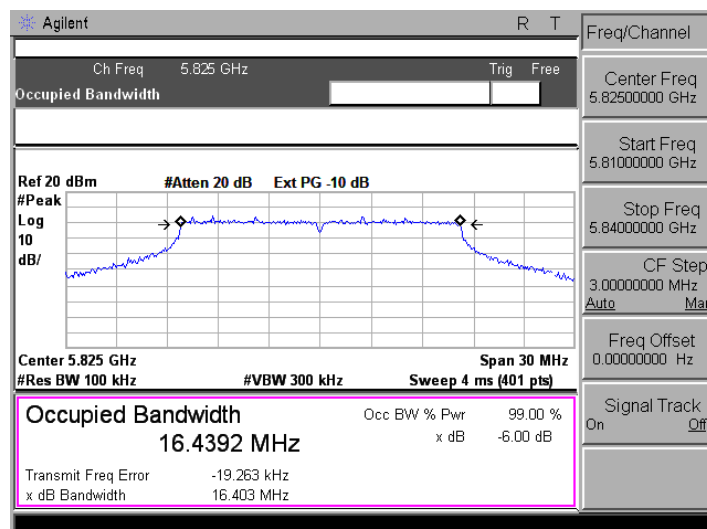
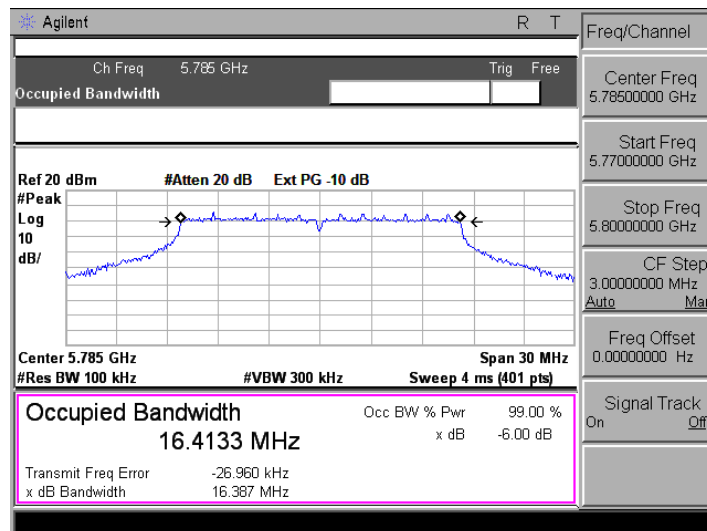
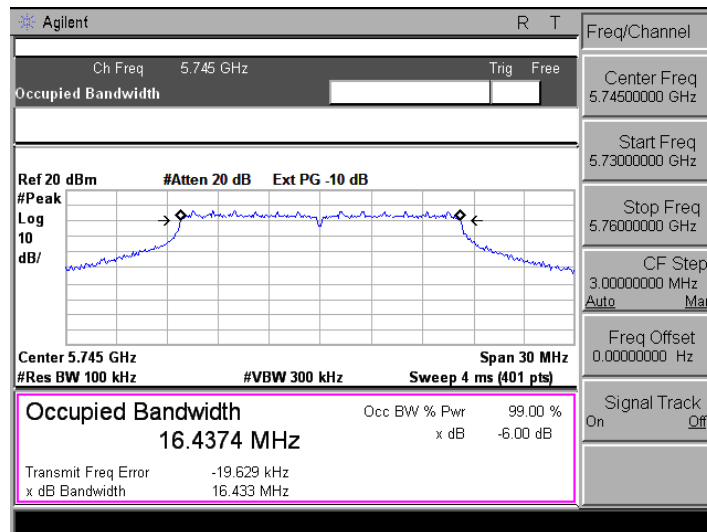
|                | Channel number | Frequency (MHz) | 26dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|----------------|----------------|-----------------|----------------------|---------------------|
| 802.11a        | 36             | 5180            | 22.764               | 16.9017             |
|                | 40             | 5200            | 22.933               | 16.8448             |
|                | 48             | 5240            | 22.825               | 16.9211             |
| 802.11n (HT20) | 36             | 5180            | 23.504               | 17.9837             |
|                | 40             | 5200            | 23.000               | 17.9091             |
|                | 48             | 5240            | 23.294               | 17.9779             |
| 802.11n (HT40) | 38             | 5190            | 42.548               | 36.4643             |
|                | 46             | 5230            | 42.546               | 36.4442             |

|                | Channel number | Frequency (MHz) | 6dB Bandwidth (MHz) | 99% Bandwidth (MHz) | Limit (MHz) |
|----------------|----------------|-----------------|---------------------|---------------------|-------------|
| 802.11a        | 149            | 5745            | 16.433              | 16.4374             | 0.5         |
|                | 157            | 5785            | 16.387              | 16.4133             | 0.5         |
|                | 165            | 5825            | 16.403              | 16.4392             | 0.5         |
| 802.11n (HT20) | 149            | 5745            | 17.603              | 17.6329             | 0.5         |
|                | 157            | 5785            | 17.592              | 17.6454             | 0.5         |
|                | 165            | 5825            | 17.582              | 17.6253             | 0.5         |
| 802.11n (HT40) | 151            | 5755            | 36.061              | 35.9755             | 0.5         |
|                | 159            | 5795            | 35.730              | 36.9982             | 0.5         |

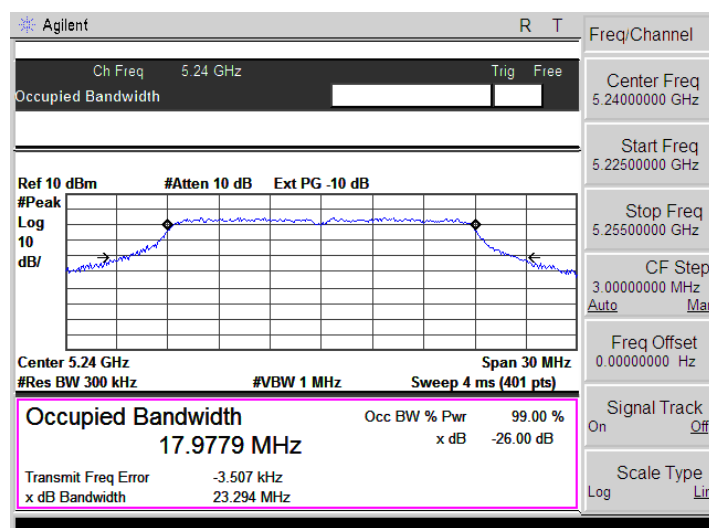
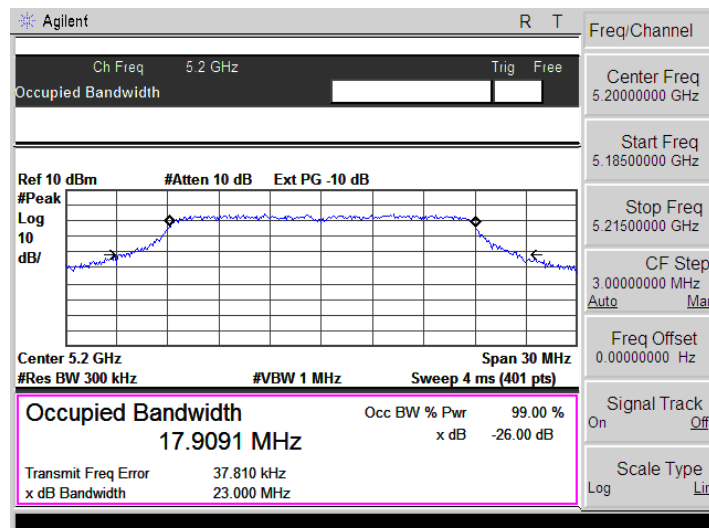
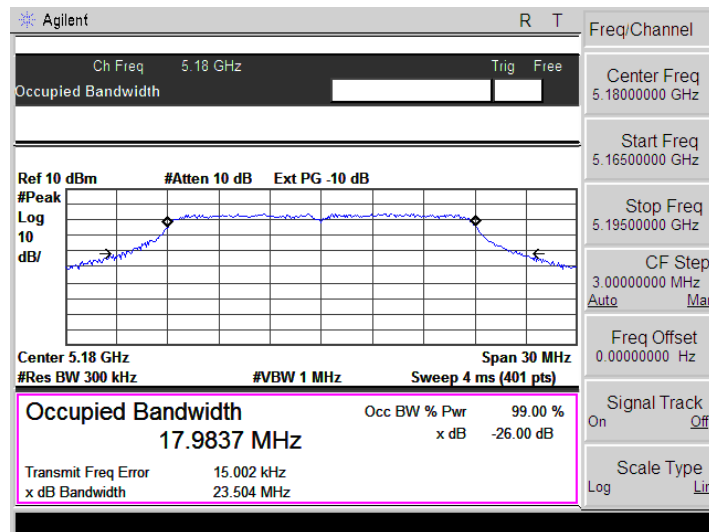
802.11a  
-26dB



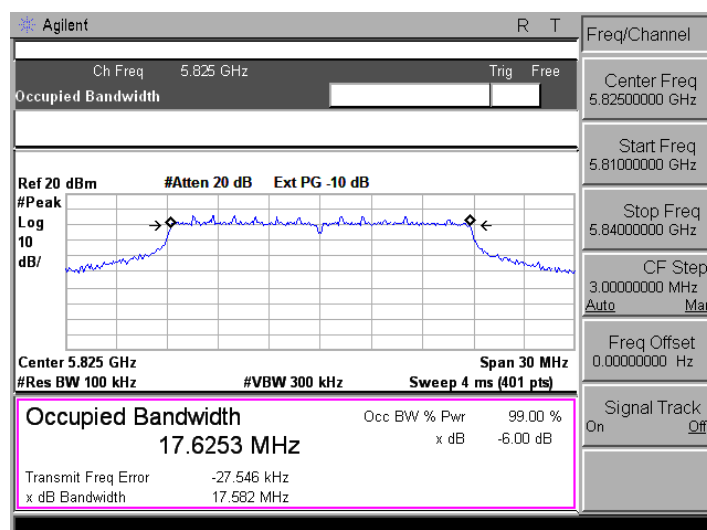
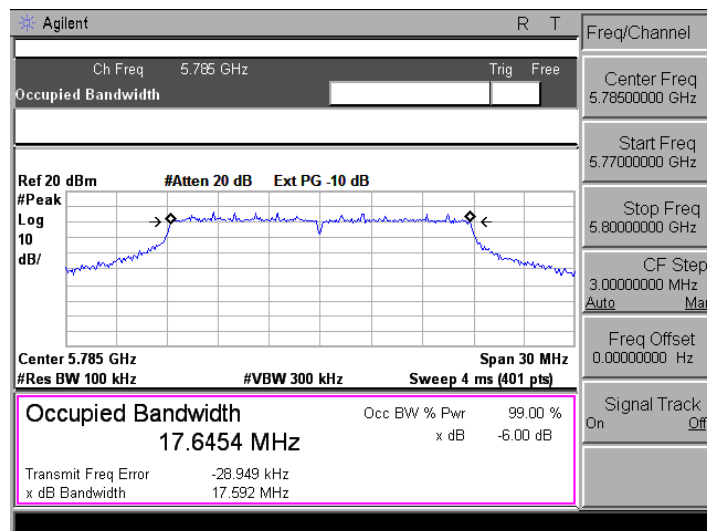
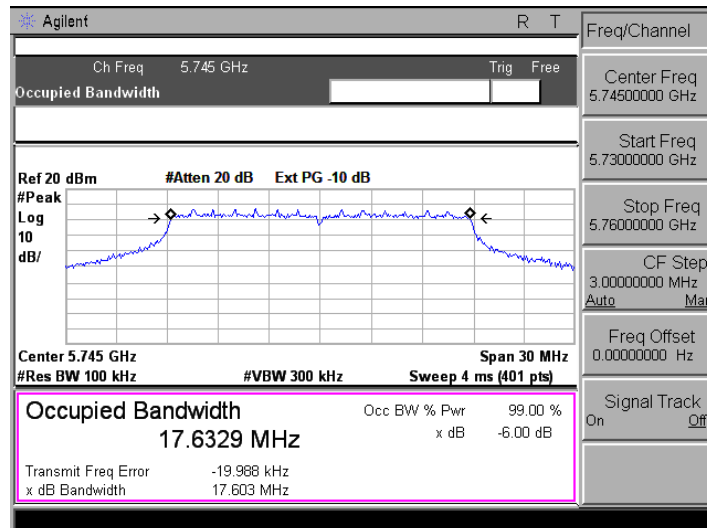
-6dB



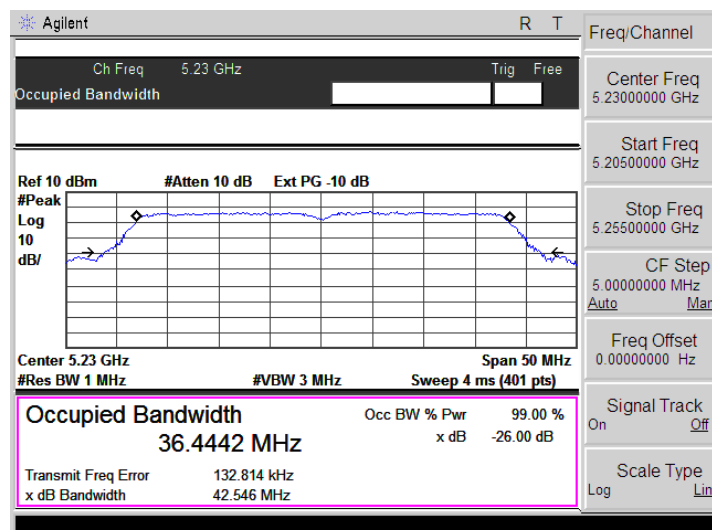
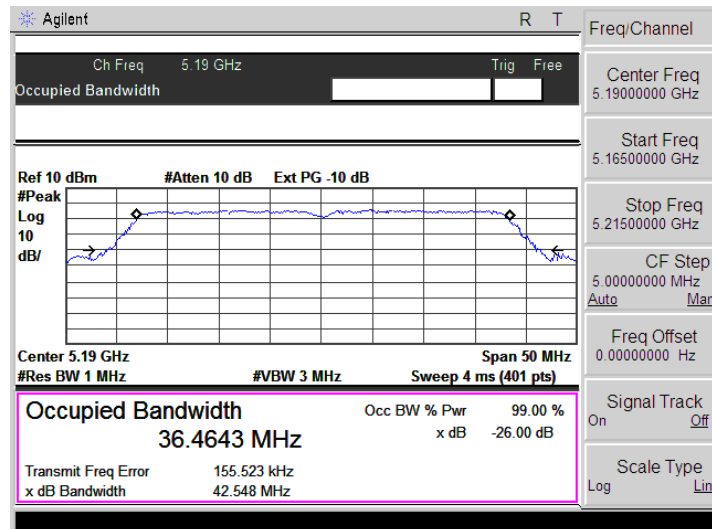
802.11n (HT20)  
-26dB



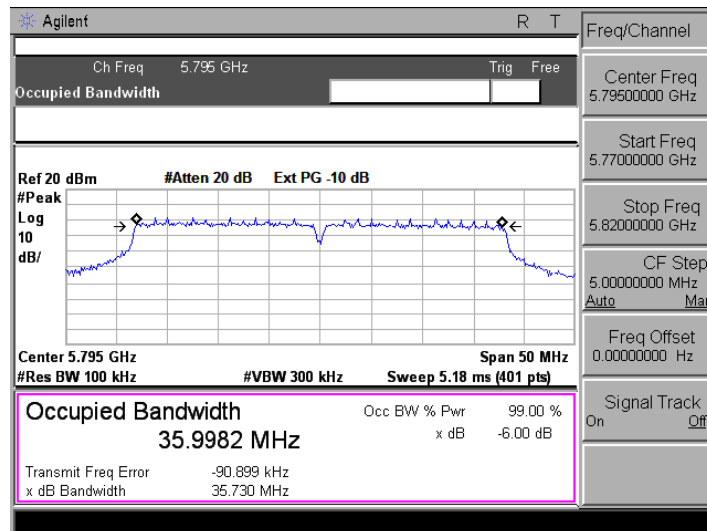
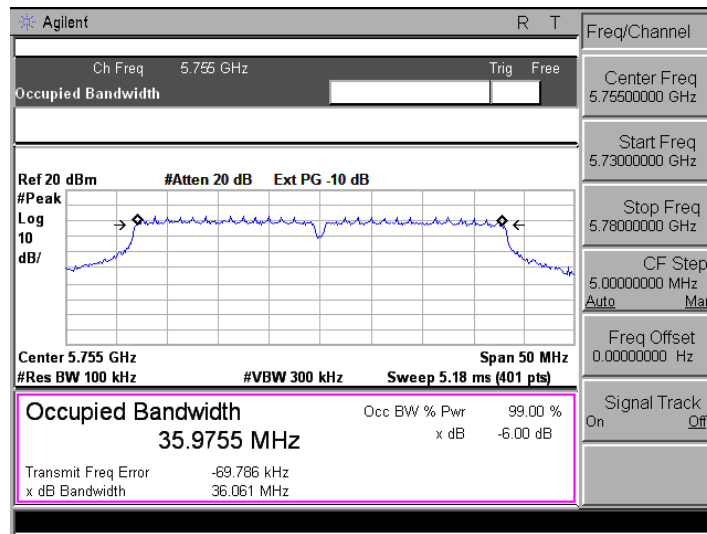
-6dB



802.11n (HT40)  
-26dB



-6dB



## 7. OUTPUT POWER TEST

### 7.1. Limits

Band 5.15-5.25GHz:

FCC: For mobile and portable 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.

IC: The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10\log B$  dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

Band 5.725-5.825GHz:

FCC: For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

IC: The maximum conducted output power shall not exceed 1 W.

### 7.2. Test setup

1. The maximum average conducted output power can be measured using Method PM-G (Measurement using a gated RF average power meter):
2. Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.
  - a. The Transmitter output (antenna port) was connected to the power meter.
  - b. Turn on the EUT and power meter and then record the power value.
  - c. Repeat above procedures on all channels needed to be tested.

### 7.3. Test result

For FCC

|                | Frequency (MHz) | Average Output Power (dBm) | IC Limit (dBm) | FCC Limit (dBm) | Result |
|----------------|-----------------|----------------------------|----------------|-----------------|--------|
| 802.11a        | 5180            | 13.54                      | --             | 24.0            | Pass   |
|                | 5200            | 13.27                      | --             | 24.0            | Pass   |
|                | 5240            | 13.44                      | --             | 24.0            | Pass   |
|                | 5745            | 12.14                      | 30.0           | 30.0            | Pass   |
|                | 5785            | 12.22                      | 30.0           | 30.0            | Pass   |
|                | 5825            | 12.38                      | 30.0           | 30.0            | Pass   |
| 802.11n (HT20) | 5180            | 12.02                      | --             | 24.0            | Pass   |
|                | 5200            | 12.14                      | --             | 24.0            | Pass   |
|                | 5240            | 12.67                      | --             | 24.0            | Pass   |
|                | 5745            | 12.22                      | 30.0           | 30.0            | Pass   |
|                | 5785            | 12.46                      | 30.0           | 30.0            | Pass   |
|                | 5825            | 12.25                      | 30.0           | 30.0            | Pass   |
| 802.11n (HT40) | 5190            | 11.37                      | --             | 24.0            | Pass   |
|                | 5230            | 11.42                      | --             | 24.0            | Pass   |
|                | 5755            | 11.17                      | 30.0           | 30.0            | Pass   |
|                | 5795            | 11.34                      | 30.0           | 30.0            | Pass   |

For IC For 5.15~5.25GHz, the limit=200 mW or 10 +10logB dBm, whichever power is less

For 5.725-5.825GHz, the limit=1 W

EIRP=output power+antenna gain

|                | Frequency (MHz) | Peak Output Power (dBm) | Antenna Gain (dBi) | EIRP(dBm) | IC Limit (dBm) |
|----------------|-----------------|-------------------------|--------------------|-----------|----------------|
| 802.11a        | 5180            | 13.54                   | 3.3                | 16.84     | 22.3           |
|                | 5200            | 13.27                   | 3.3                | 16.57     | 22.3           |
|                | 5240            | 13.44                   | 3.3                | 16.74     | 22.3           |
| 802.11n (HT20) | 5180            | 12.02                   | 3.3                | 15.32     | 22.5           |
|                | 5200            | 12.14                   | 3.3                | 15.44     | 22.5           |
|                | 5240            | 12.67                   | 3.3                | 15.97     | 22.5           |
| 802.11n (HT40) | 5190            | 11.17                   | 3.3                | 14.47     | 23.0           |
|                | 5230            | 11.34                   | 3.3                | 14.64     | 23.0           |

## 8. PEAK POWER SPECTRAL DENSITY TEST

### 8.1. Limits

Band 5.15-5.25GHz:

FCC: In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

IC: The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band..

Band 5.725-5.825GHz:

FCC: In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

IC: The power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used.

### 8.2. Test setup

Methods refer to FCC KDB 789033

- 1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...".
- 2) Use the peak search function on the instrument to find the peak of the spectrum.
- 3) The result is the PPSD.
- 4) The above procedures make use of 1 MHz resolution bandwidth to satisfy the 1 MHz measurement bandwidth specified in the 15.407(a)(5). That rule section also permits use of resolution bandwidths less than 1 MHz "provided that the measured power is integrated to show the total power over the measurement bandwidth" (i.e., 1 MHz). If measurements are performed using a reduced resolution bandwidth and integrated over 1 MHz bandwidth

### 8.3. Test data

Test data as below

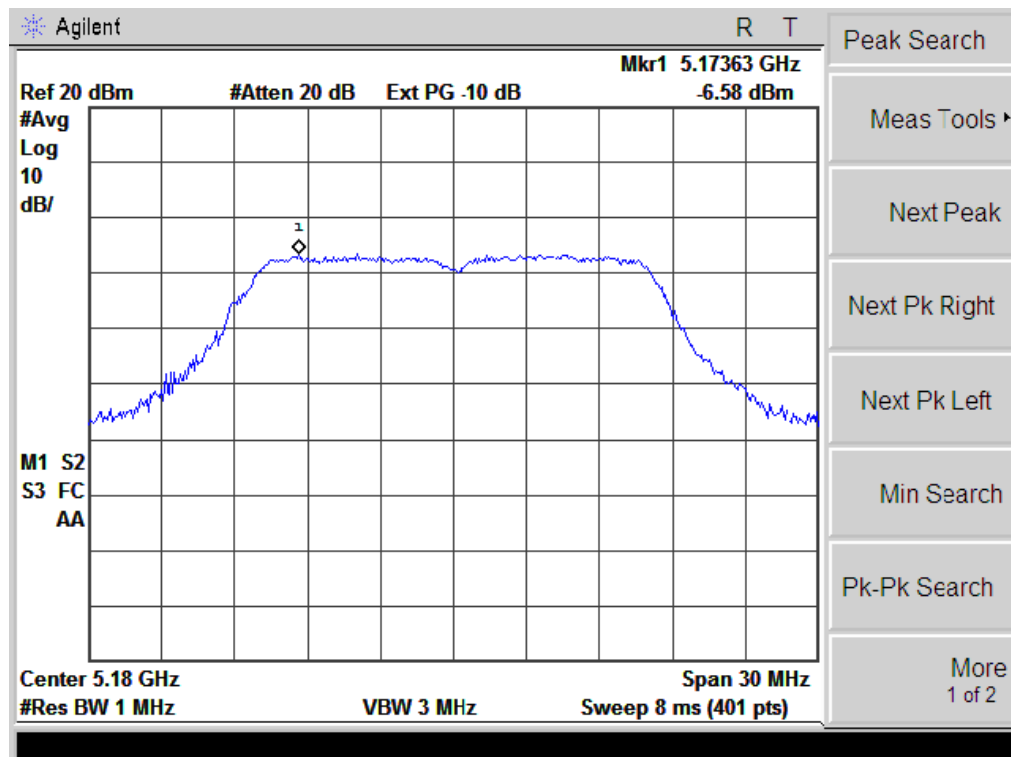
For FCC

|                | Frequency (MHz) | Power Density. Antenna port (dBm) | FCC Limit (dBm) | Result |
|----------------|-----------------|-----------------------------------|-----------------|--------|
| 802.11a        | 5180            | -6.58                             | 11.0            | Pass   |
|                | 5200            | -7.2                              | 11.0            | Pass   |
|                | 5240            | -7.052                            | 11.0            | Pass   |
|                | 5745            | 4.69                              | 30.0            | Pass   |
|                | 5785            | 4.56                              | 30.0            | Pass   |
|                | 5825            | 7.83                              | 30.0            | Pass   |
| 802.11n (HT20) | 5180            | -7.438                            | 11.0            | Pass   |
|                | 5200            | -7.477                            | 11.0            | Pass   |
|                | 5240            | -7.206                            | 11.0            | Pass   |
|                | 5745            | 6.86                              | 30.0            | Pass   |
|                | 5785            | 6.22                              | 30.0            | Pass   |
|                | 5825            | 9.55                              | 30.0            | Pass   |
| 802.11n (HT40) | 5190            | -9.438                            | 11.0            | Pass   |
|                | 5230            | -8.998                            | 11.0            | Pass   |
|                | 5755            | -0.45                             | 30.0            | Pass   |
|                | 5795            | 5.92                              | 30.0            | Pass   |

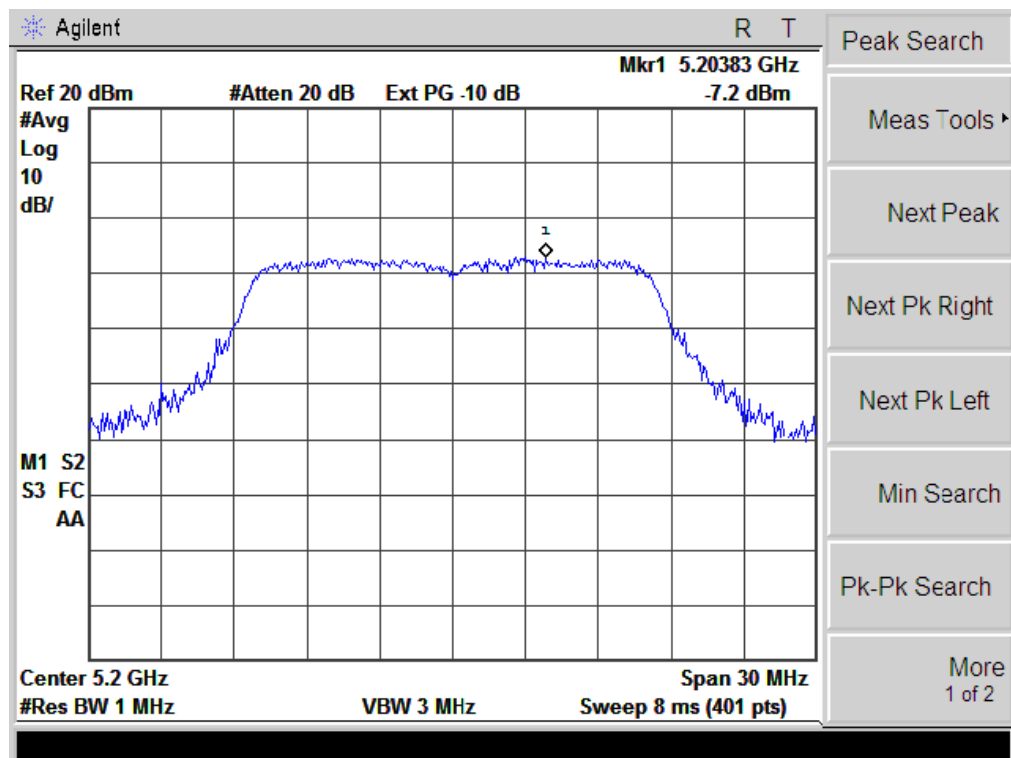
For IC

|                | Frequency (MHz) | Power Density. Antenna port (dBm) | Antenna Gain (dBi) | EIRP(dBm) | IC Limit (dBm) | Result |
|----------------|-----------------|-----------------------------------|--------------------|-----------|----------------|--------|
| 802.11a        | 5180            | -6.58                             | 3.3                | -2.36     | 10.0           | Pass   |
|                | 5200            | -7.2                              | 3.3                | -2.206    | 10.0           | Pass   |
|                | 5240            | -7.052                            | 3.3                | -2.392    | 10.0           | Pass   |
|                | 5745            | 4.69                              | --                 | --        | 30.0           | Pass   |
|                | 5785            | 4.56                              | --                 | --        | 30.0           | Pass   |
|                | 5825            | 7.83                              | --                 | --        | 30.0           | Pass   |
| 802.11n (HT20) | 5180            | -7.438                            | 3.3                | -3.13     | 10.0           | Pass   |
|                | 5200            | -7.477                            | 3.3                | -2.833    | 10.0           | Pass   |
|                | 5240            | -7.206                            | 3.3                | -2.495    | 10.0           | Pass   |
|                | 5745            | 6.86                              | --                 | --        | 30.0           | Pass   |
|                | 5785            | 6.22                              | --                 | --        | 30.0           | Pass   |
|                | 5825            | 9.55                              | --                 | --        | 30.0           | Pass   |
| 802.11n (HT40) | 5190            | -9.438                            | 3.3                | -4.275    | 10.0           | Pass   |
|                | 5230            | -8.998                            | 3.3                | -4.079    | 10.0           | Pass   |
|                | 5755            | -0.45                             | --                 | --        | 30.0           | Pass   |
|                | 5795            | 5.92                              | --                 | --        | 30.0           | Pass   |

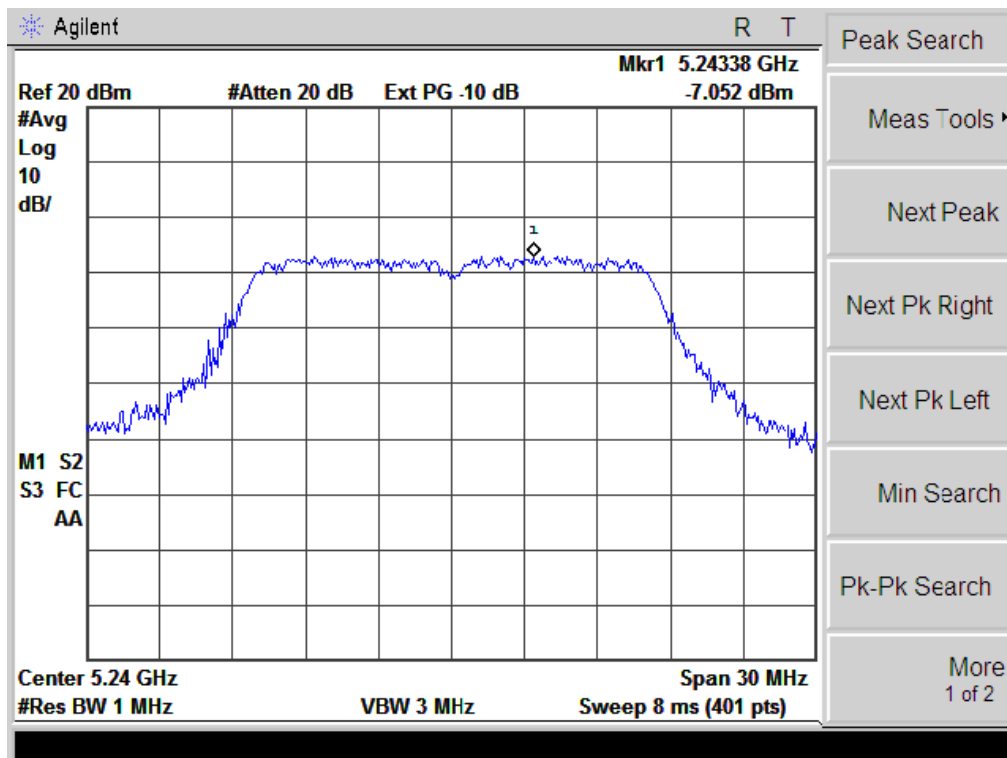
802.11a 5180MHz



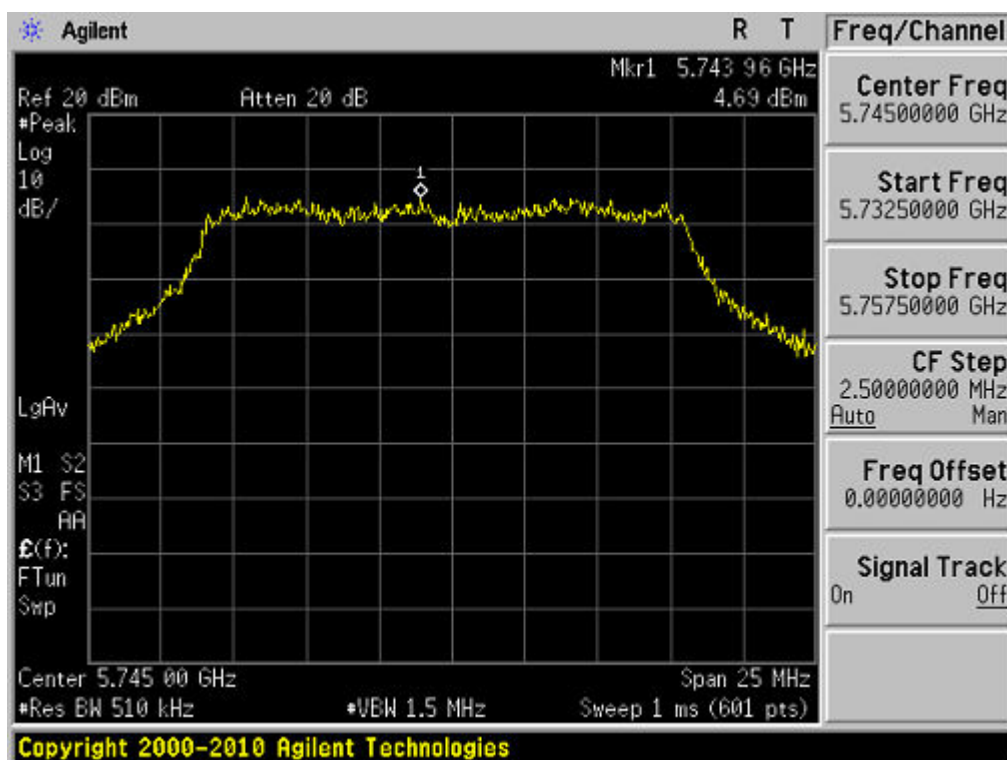
802.11a 5200MHz



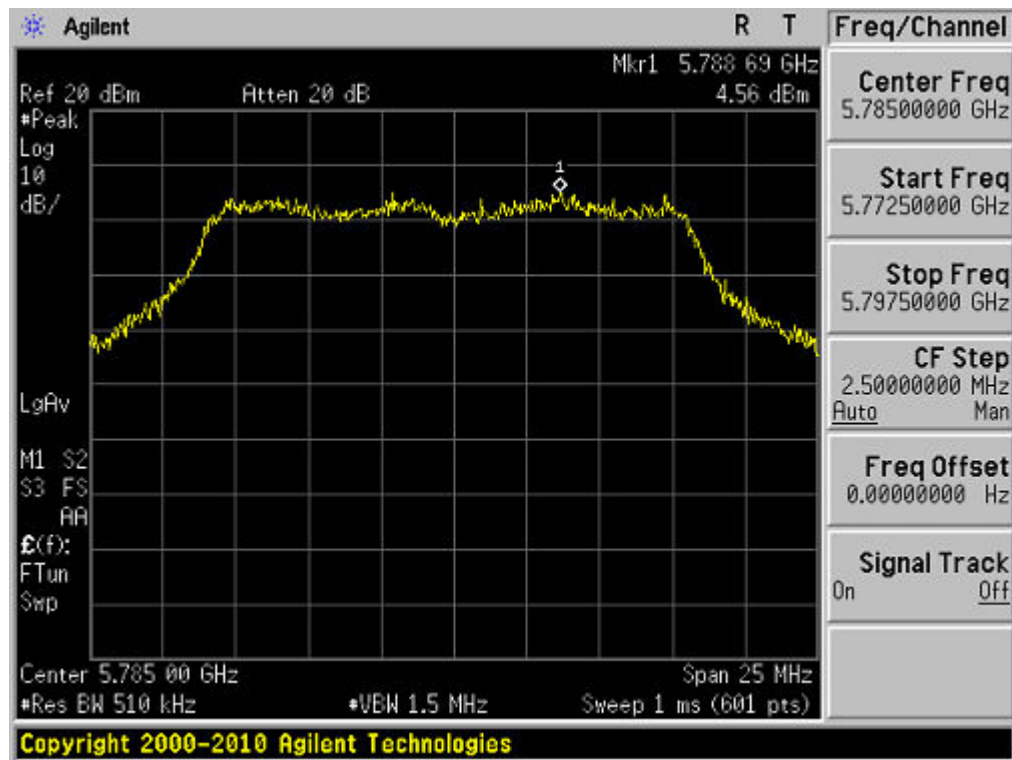
802.11a 5240MHz



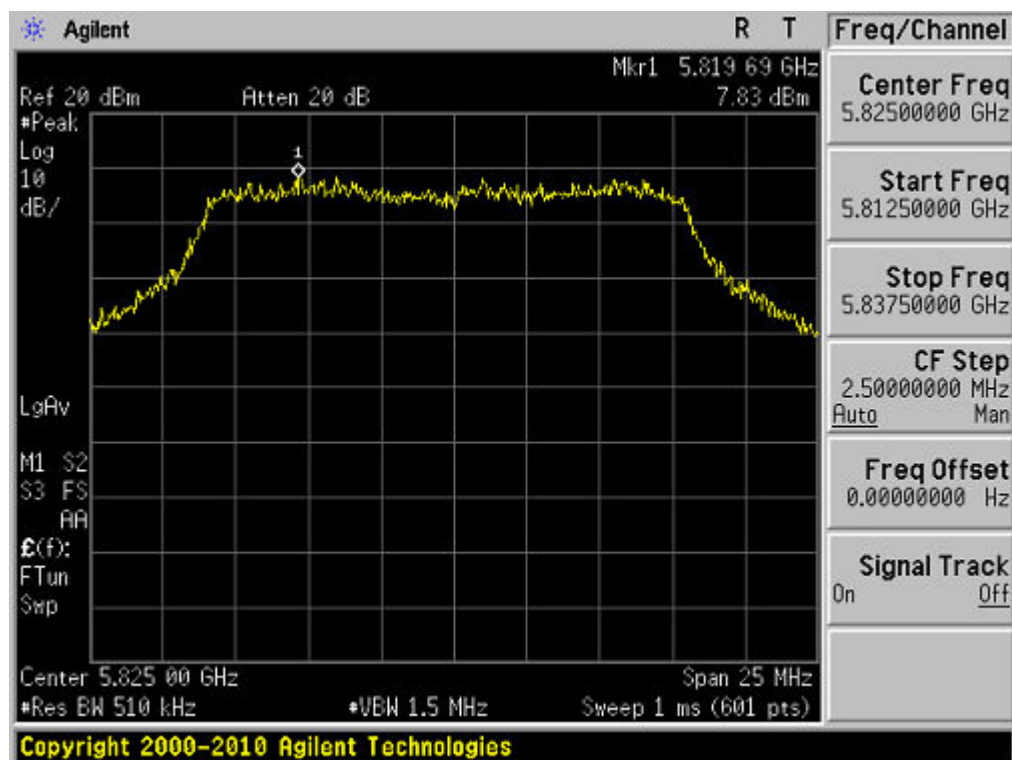
802.11a 5745MHz



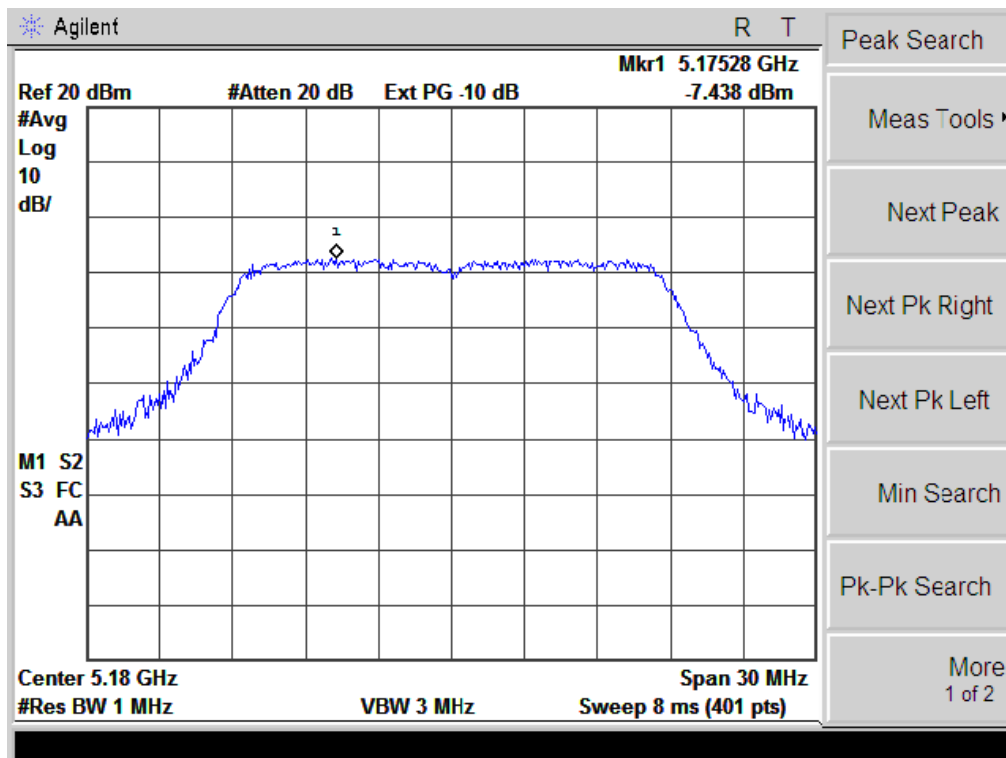
# 802.11a 5785MHz



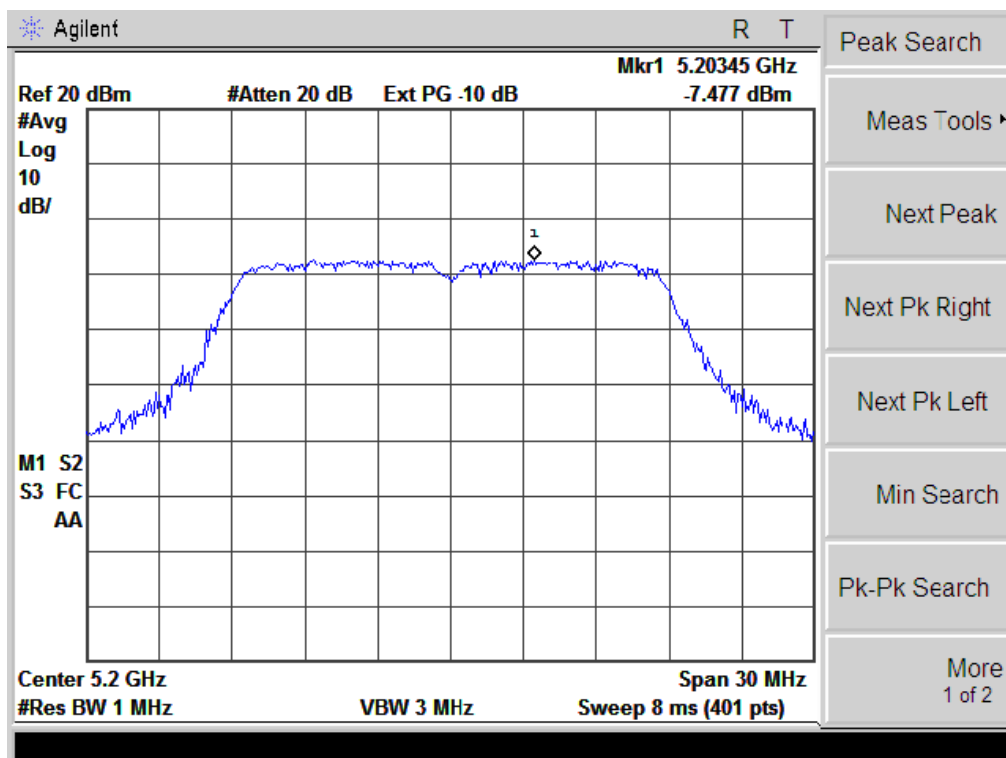
# 802.11a 5825MHz



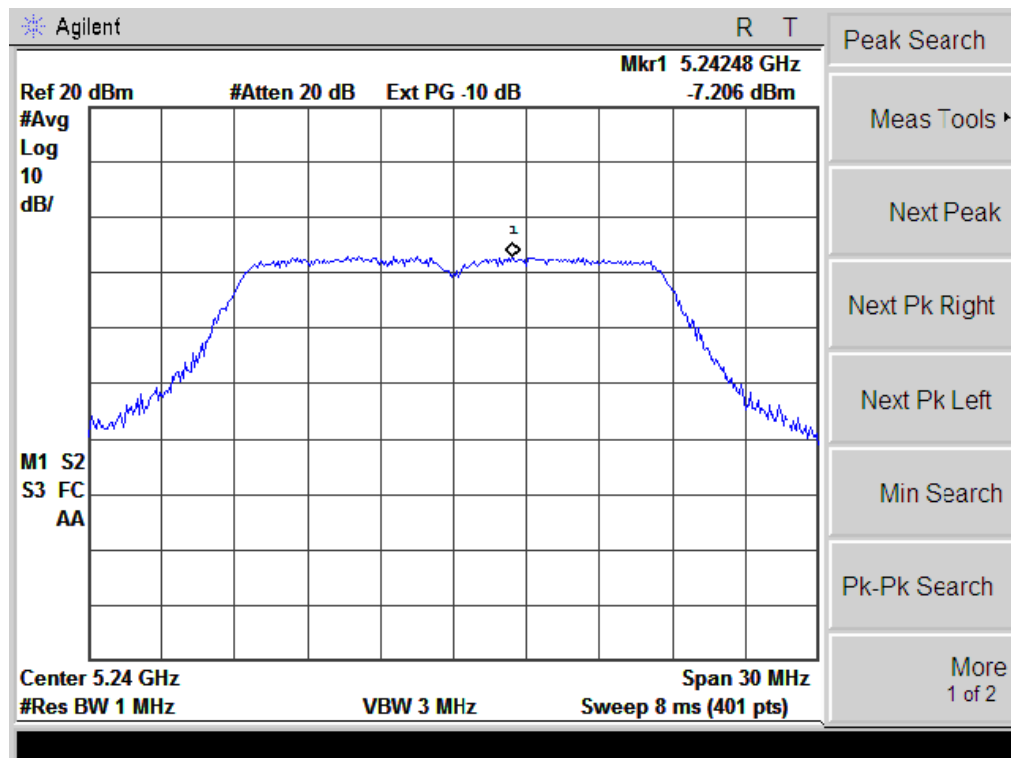
802.11n (HT20) 5180MHz



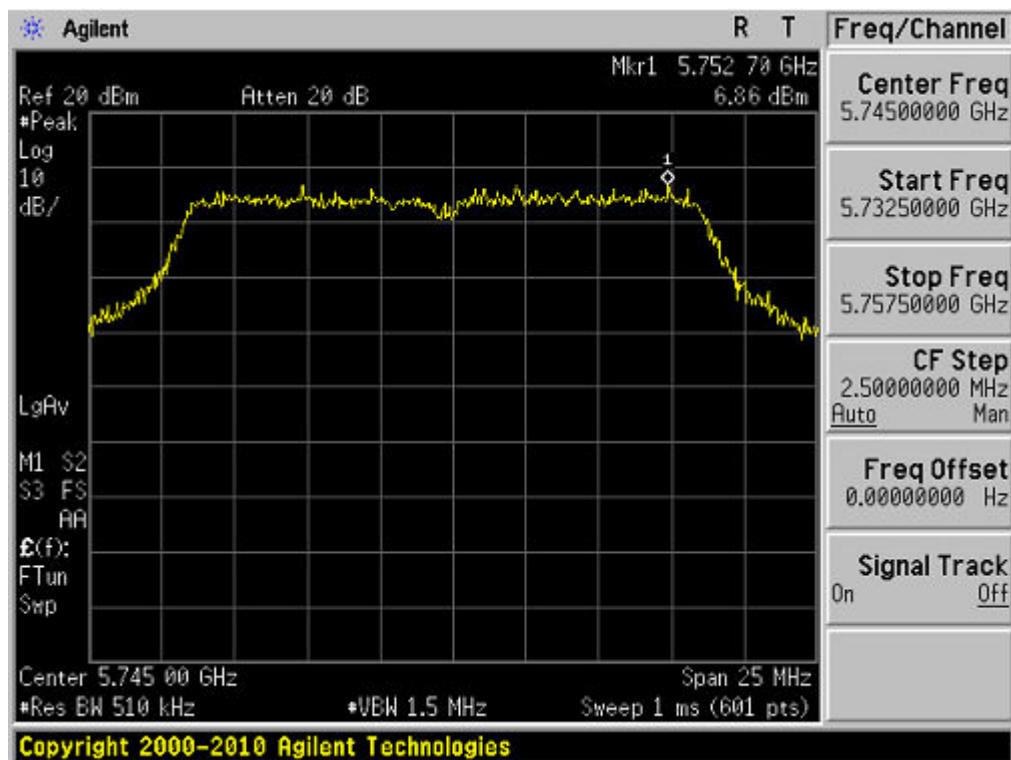
802.11n (HT20) 5200MHz



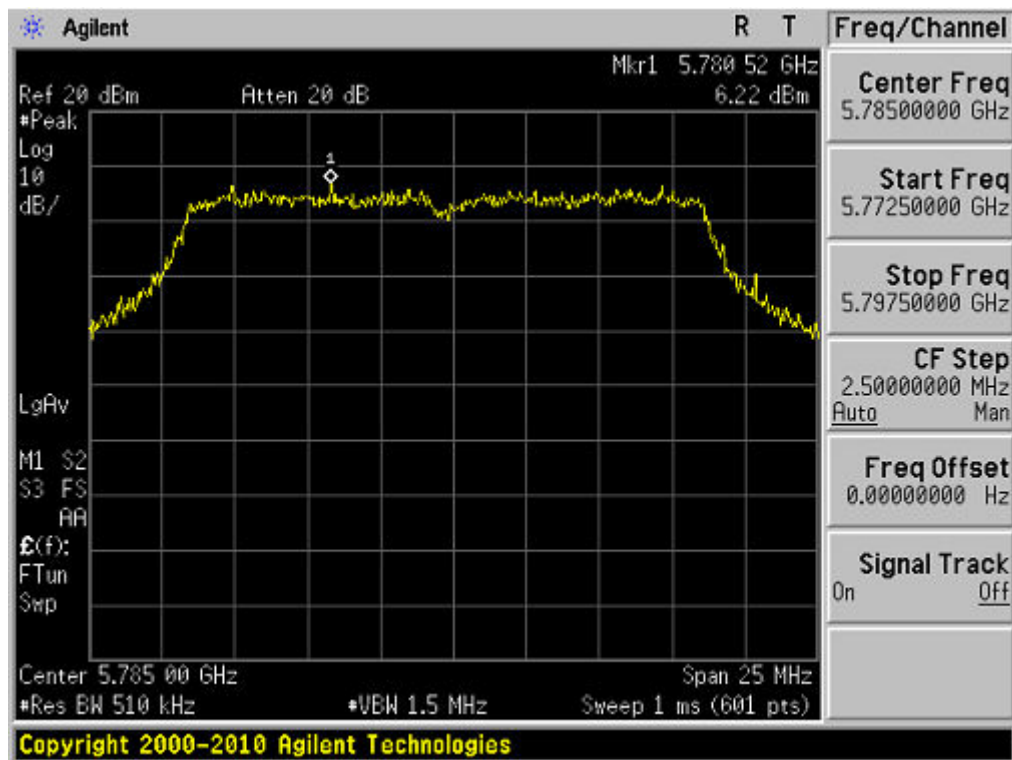
# 802.11n (HT20) 5240MHz



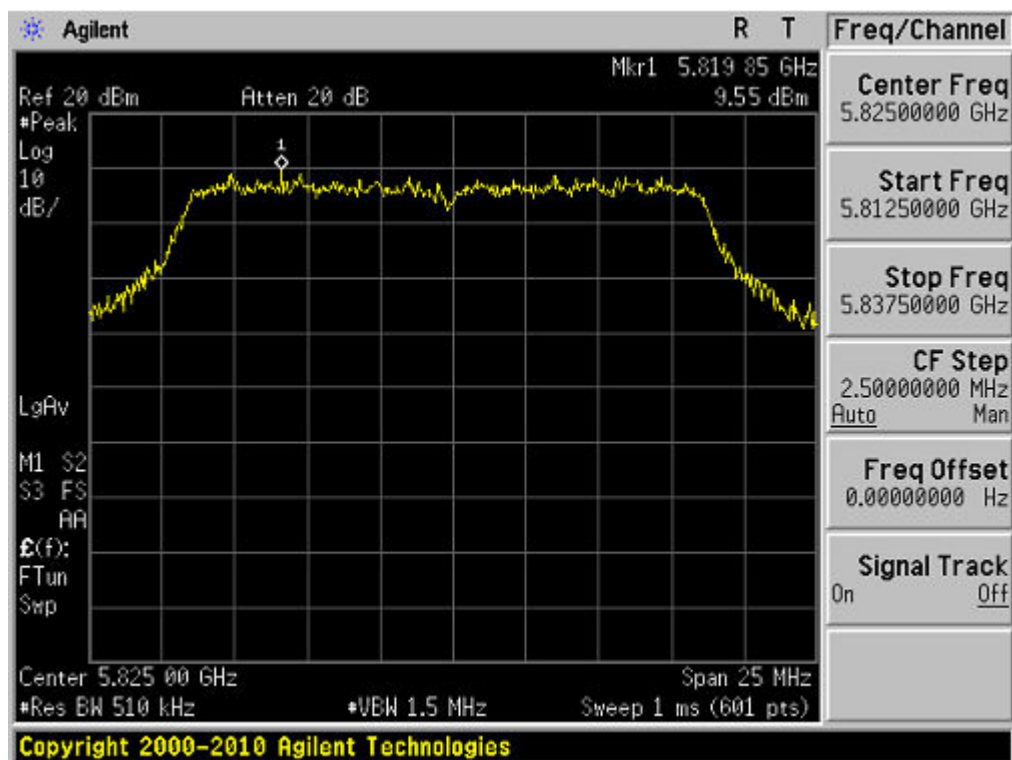
# 802.11n (HT20) 5745MHz



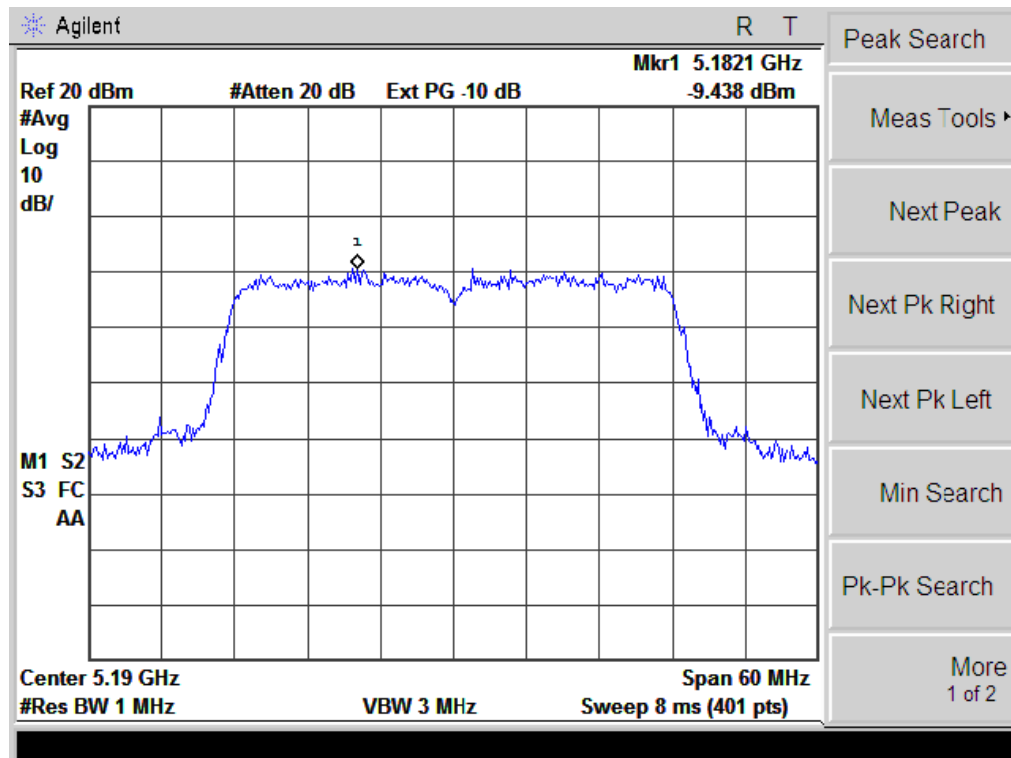
# 802.11n (HT20) 5785MHz



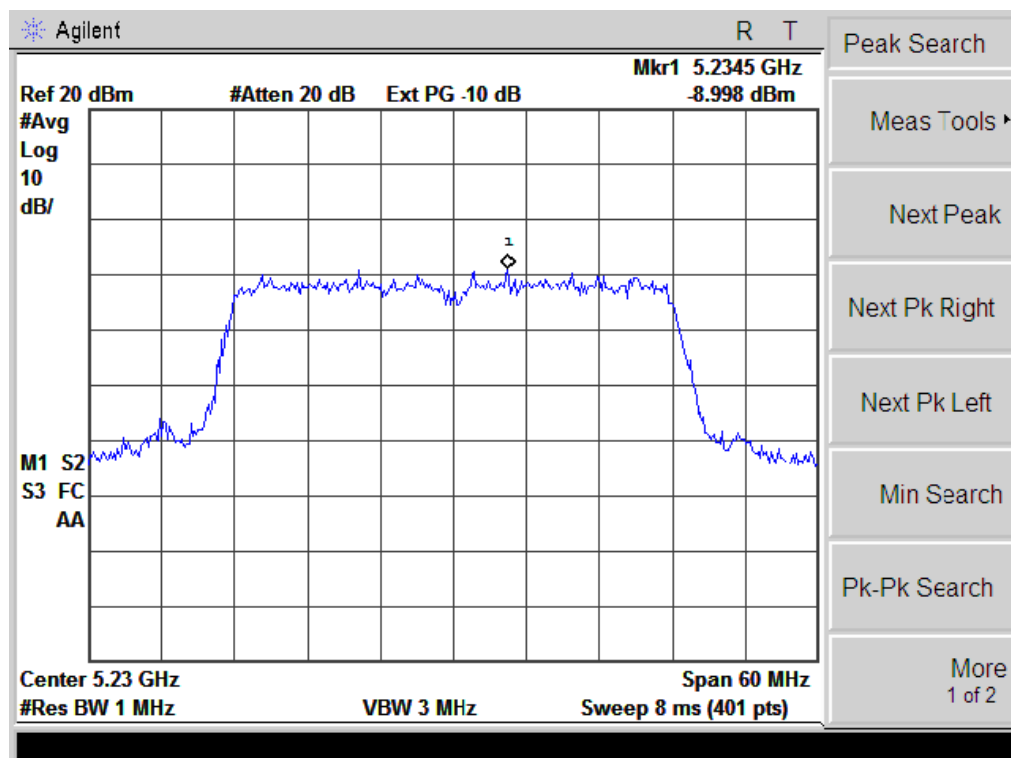
# 802.11n (HT20) 5825MHz



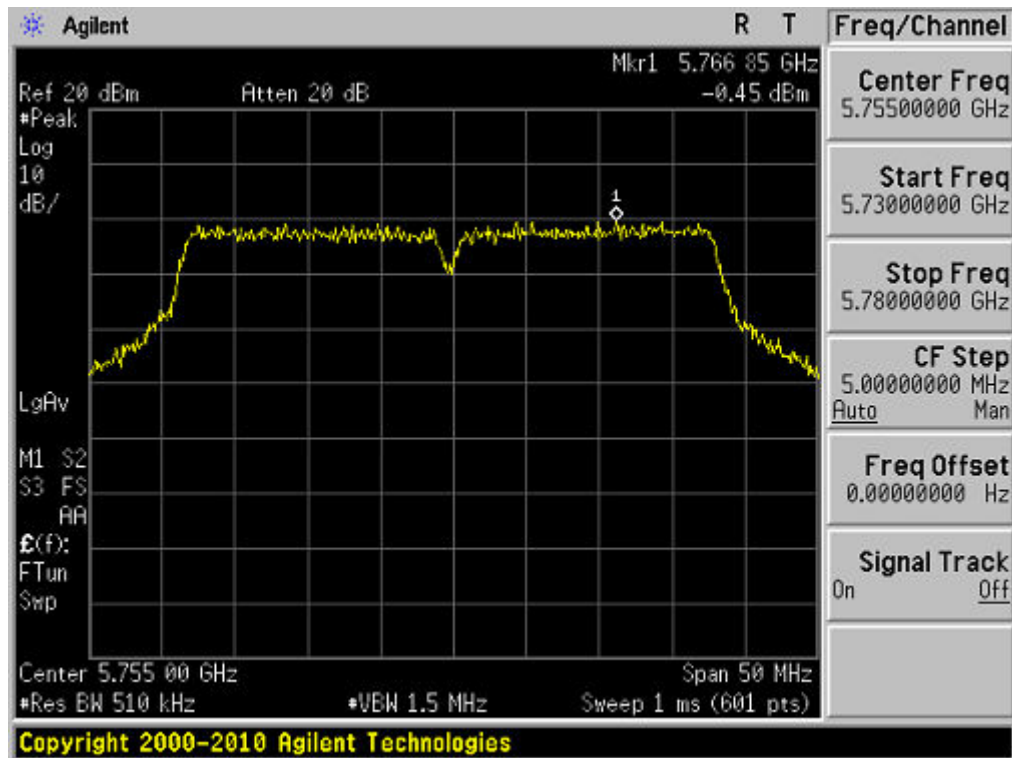
802.11 n (HT40) 5190MHz



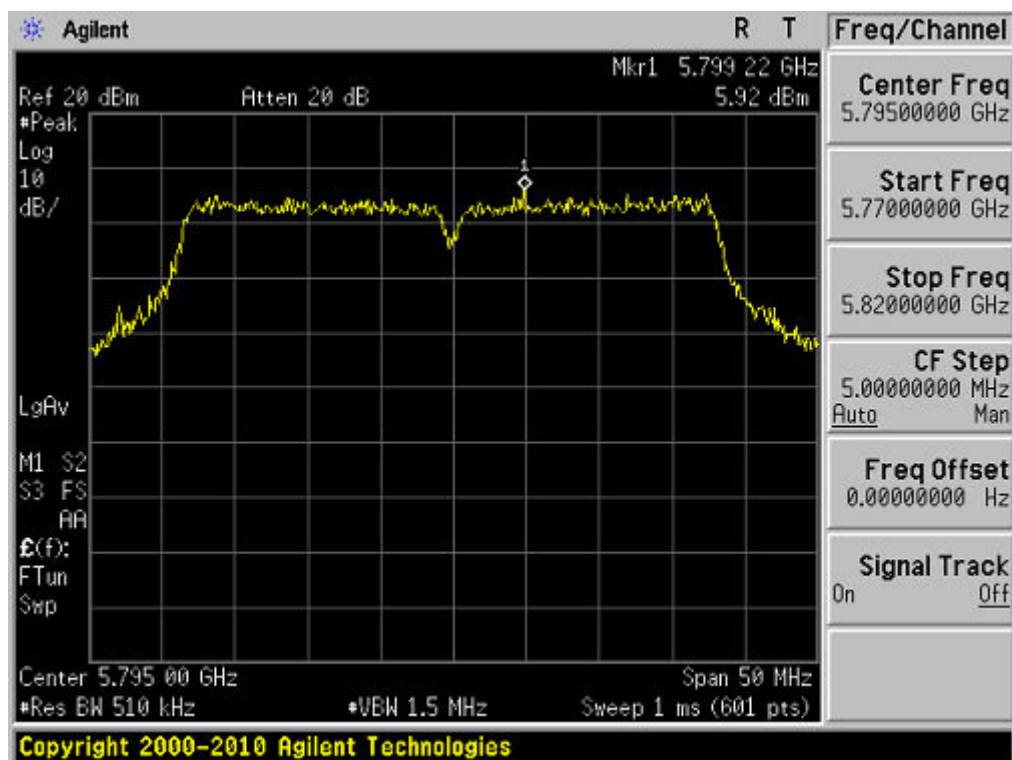
802.11 n (HT40) 5230MHz



# 802.11 n (HT40) 5755MHz



# 802.11 n (HT40) 5795MHz



## 9. ANTENNA REQUIREMENTS

### 9.1. Limits

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### 9.2. Result

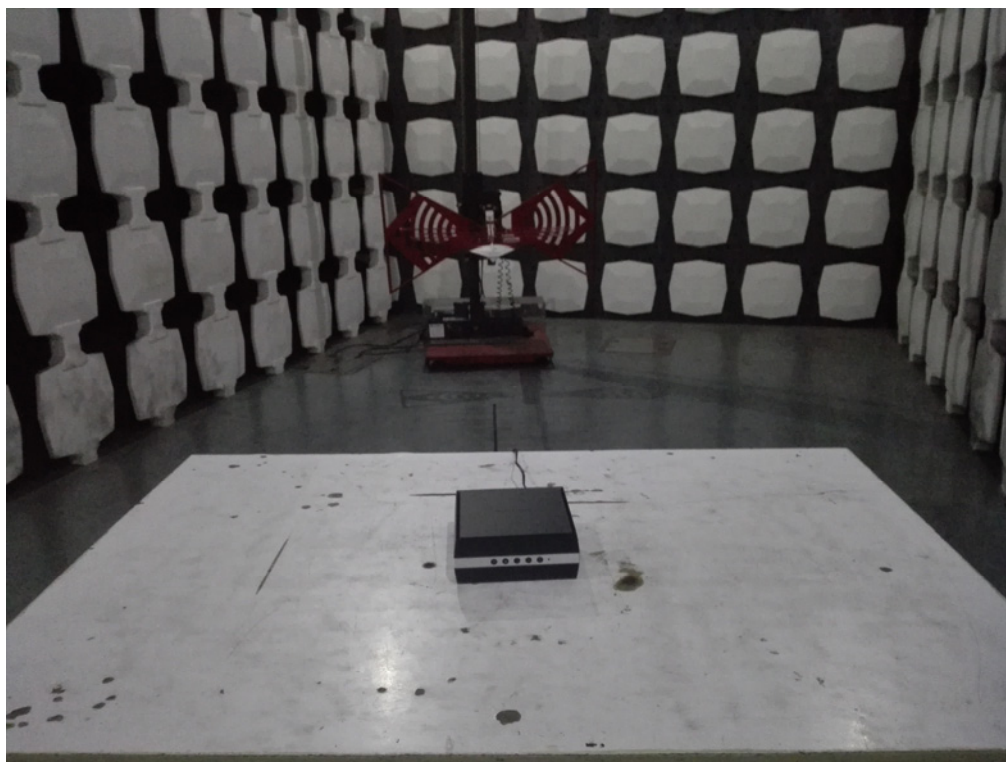
The antennas used for this product are external antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 3.2dBi.

## 10. PHOTOGRAPHS OF TEST SET-UP

Conducted Emission



## Radiated Emission Test

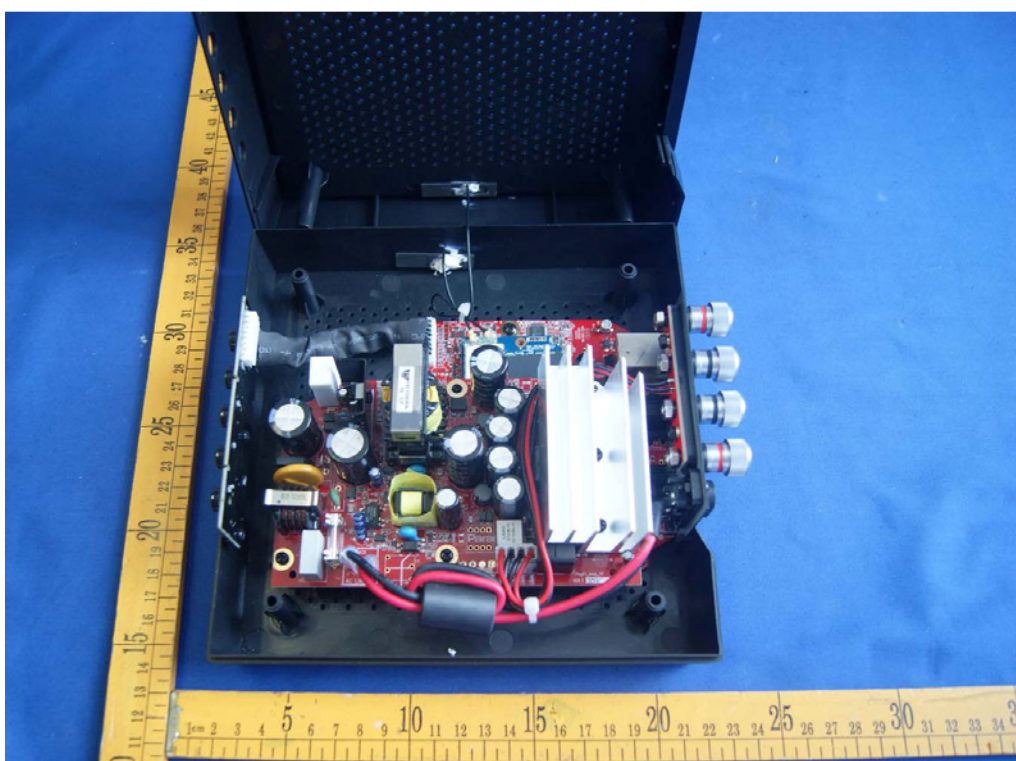


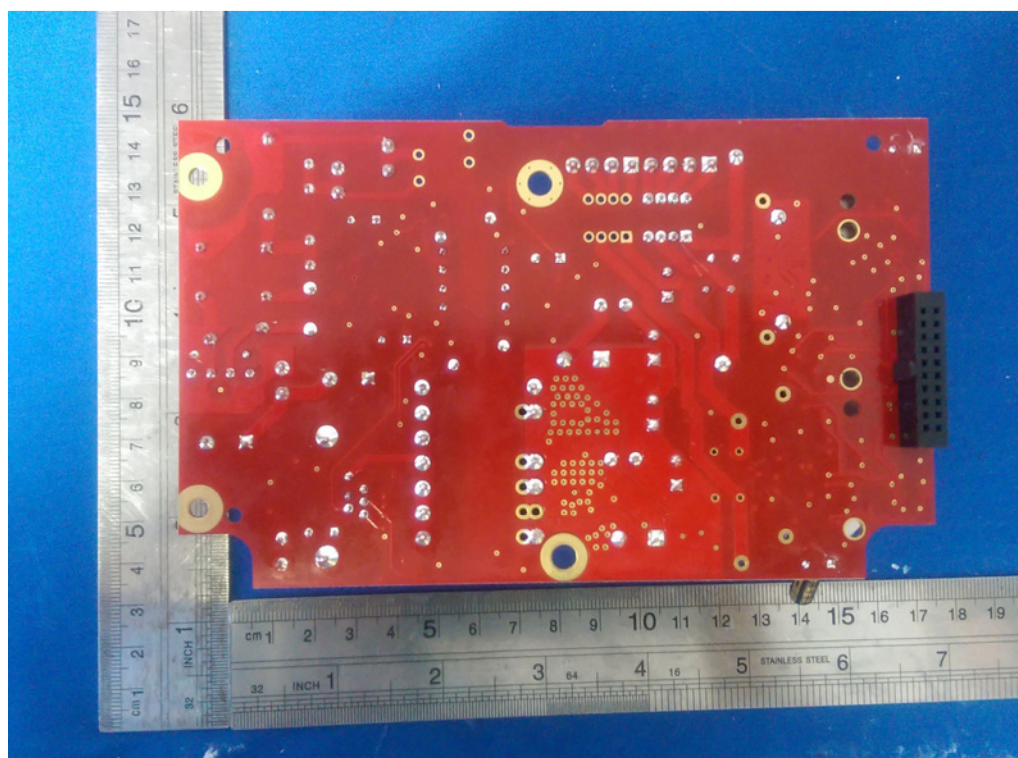
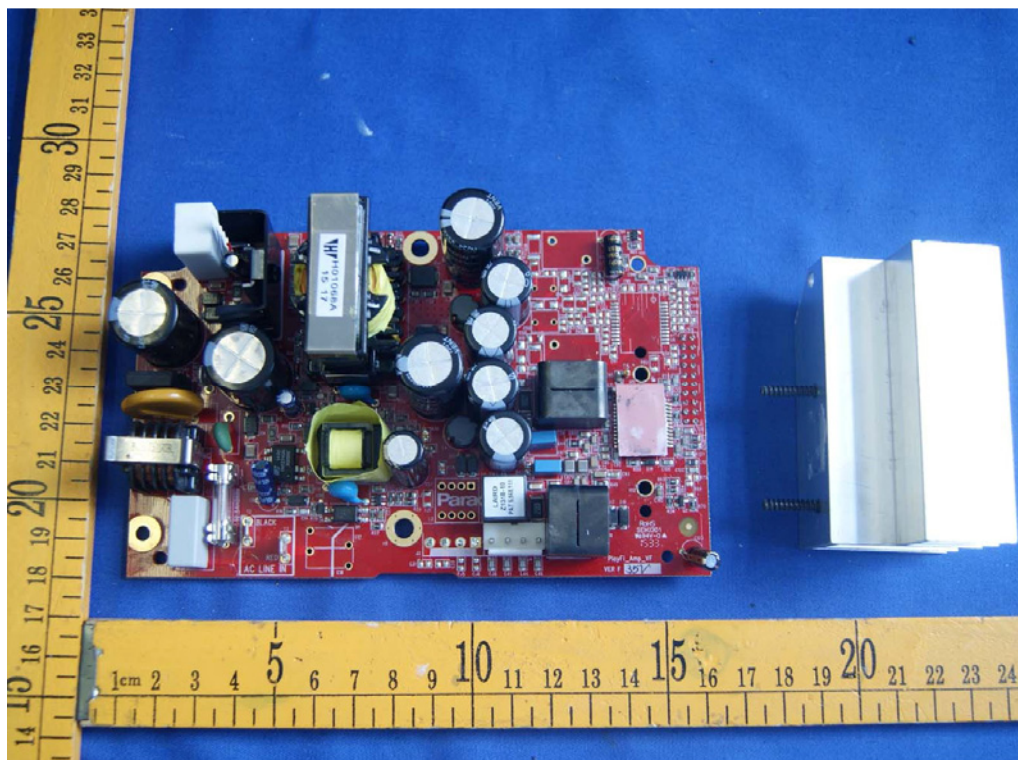
## 11. PHOTOGRAPHS OF THE EUT

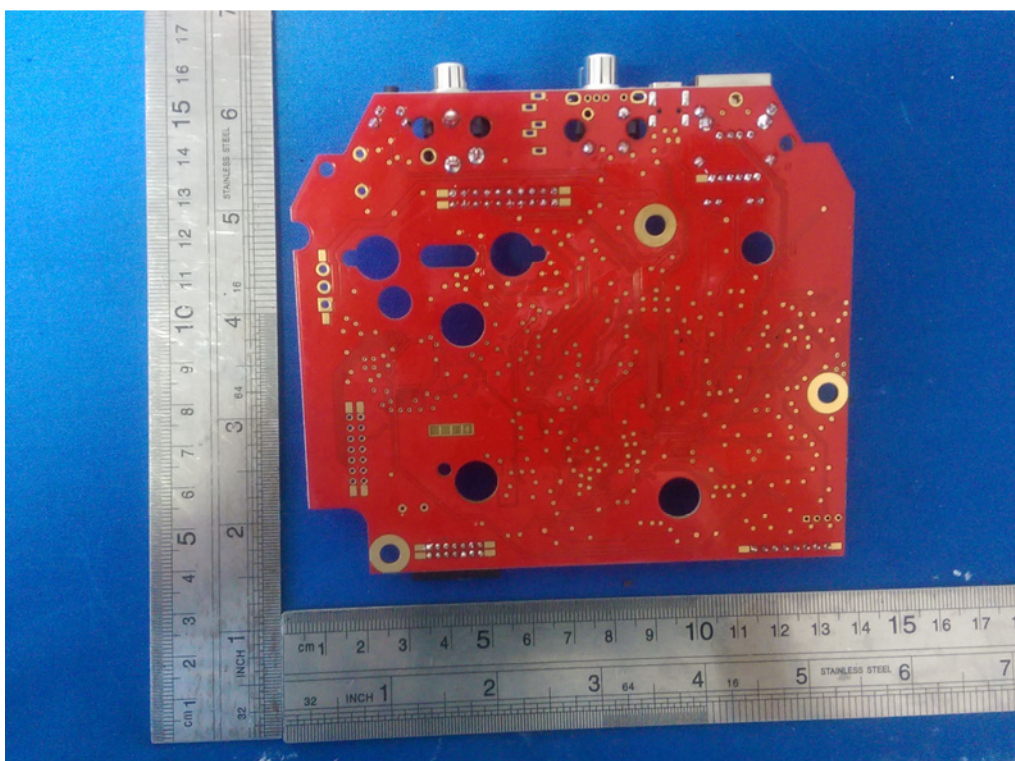
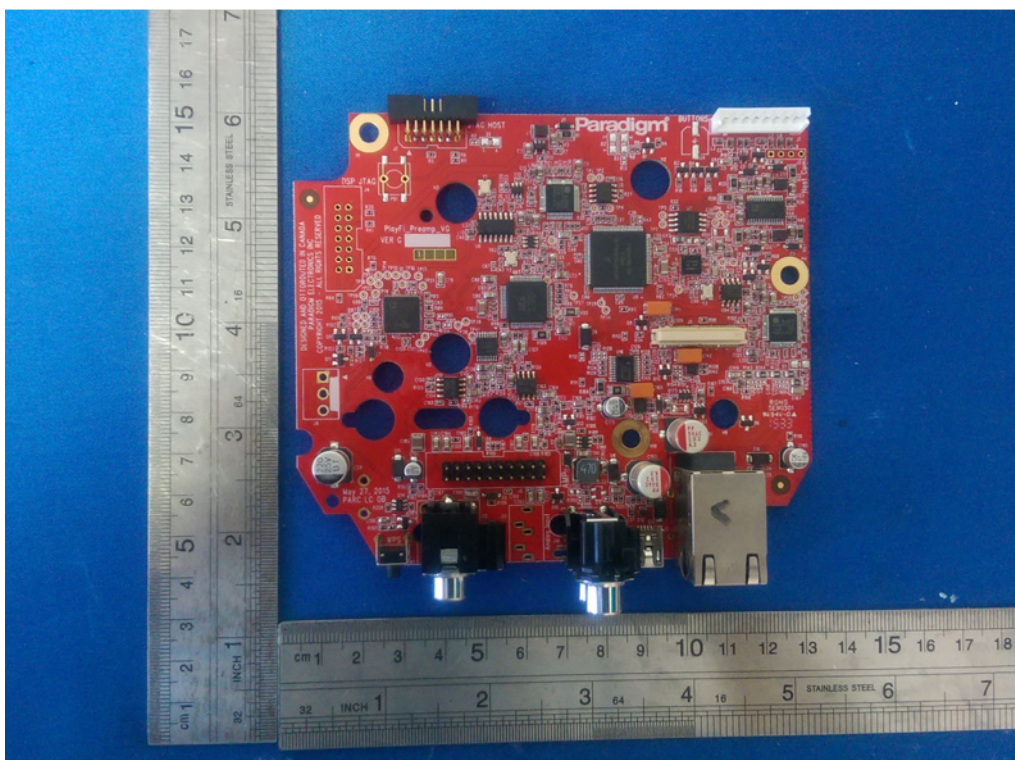


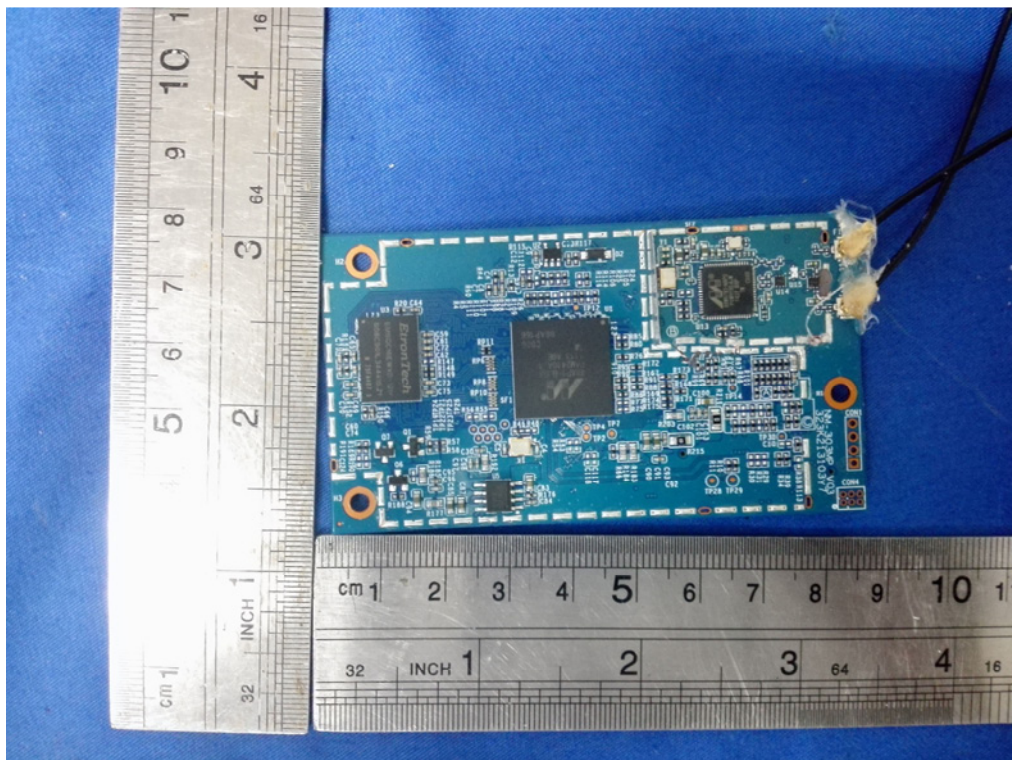
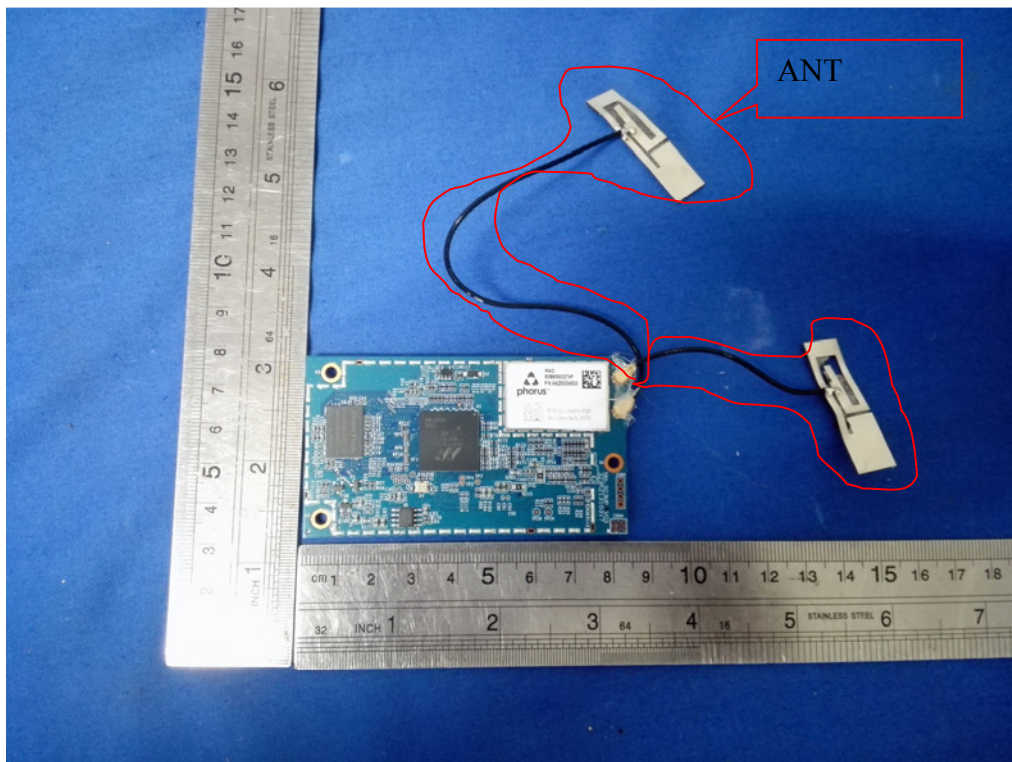


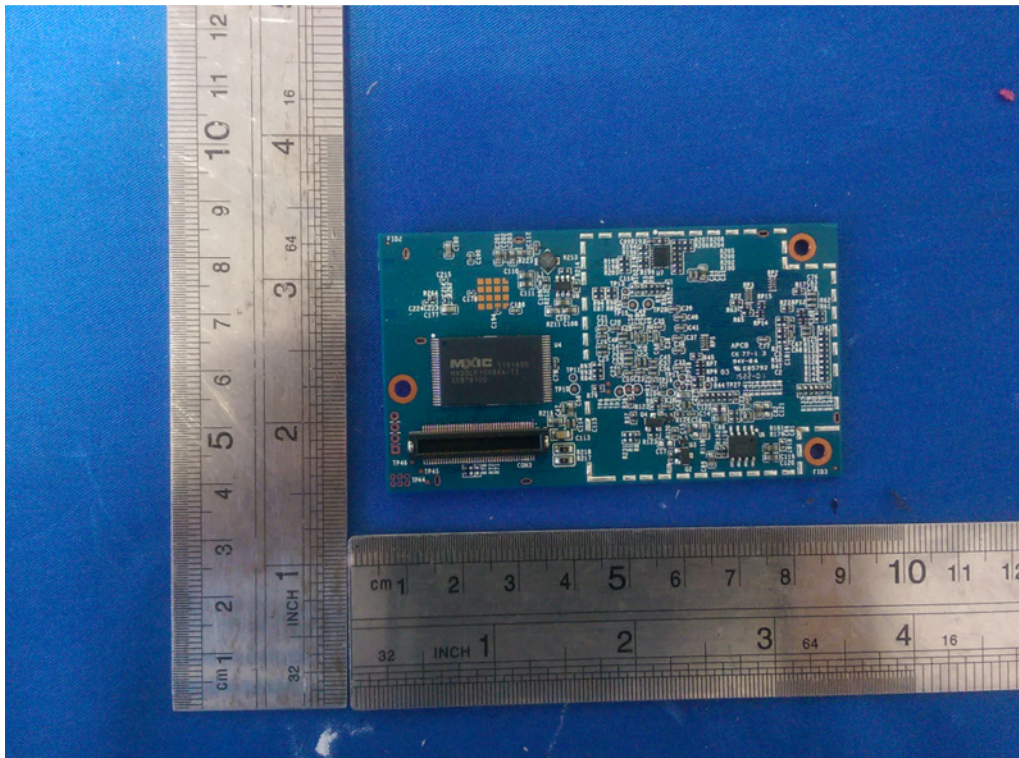












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