# RF TEST REPORT

SIEMIC
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Report No.: 15070515-FCC-R2

Supersede Report No.: N/A

| | |
|---|---|
| Applicant | Sharetronic Data Technology Co., Ltd |
| Product Name | Virtual Reality |
| Model No. | Uranus One |
| Serial No. | N/A |
| Test Standard | FCC Part 15.247: 2014, ANSI C63.10: 2013 |
| Test Date | August 14, 2015 to January 20, 2016 |
| Issue Date | January 21, 2016 |
| Test Result | ☑ Pass ☐ Fail |
| Equipment complied with the specification | ☑ |
| Equipment did not comply with the specification | ☐ |

| | | |
|---|---|---|
| Winnie. Zhang | David Huang | |
| Winnie Zhang<br>Test Engineer | David Huang<br>Checked By | |

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Test result presented in this test report is applicable to the tested sample only


Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

Zone A, Floor 1, Building 2 Wan Ye Long Technology Park

South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108

Phone: +86 0755 2601 4629801 Email: China@siemic.com.cn

# Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

## Accreditations for Conformity Assessment

| Country/Region | Scope |
| --- | --- |
| USA | EMC, RF/Wireless, SAR, Telecom |
| Canada | EMC, RF/Wireless, SAR, Telecom |
| Taiwan | EMC, RF, Telecom, SAR, Safety |
| Hong Kong | RF/Wireless, SAR, Telecom |
| Australia | EMC, RF, Telecom, SAR, Safety |
| Korea | EMI, EMS, RF, SAR, Telecom, Safety |
| Japan | EMI, RF/Wireless, SAR, Telecom |
| Singapore | EMC, RF, SAR, Telecom |
| Europe | EMC, RF, SAR, Telecom, Safety |

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# 1. Report Revision History

| Report No. | Report Version | Description | Issue Date |
| --- | --- | --- | --- |
| 15070515-FCC-R2 | NONE | Original | January 21, 2016 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# 2. Customer information

| | |
| --- | --- |
| Applicant Name | Sharetronic Data Technology Co., Ltd |
| Applicant Add | Room 1209,12/F, Unit 1,Yaohua Chuangjian Building, Shennan Road, Futian District, Shenzhen, Guangdong. China |
| Manufacturer | Sharetronic Data Technology Co., Ltd. |
| Manufacturer Add | Room 1209,12/F, Unit 1,Yaohua Chuangjian Building, Shennan Road, Futian District, Shenzhen, Guangdong. China |

# 3. Test site information

| | |
| --- | --- |
| Lab performing tests | SIEMIC (Shenzhen-China) LABORATORIES |
| Lab Address | Zone A, Floor 1, Building 2 Wan Ye Long Technology Park<br>South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108 |
| FCC Test Site No. | 718246 |
| IC Test Site No. | 4842E-1 |
| Test Software | Radiated Emission Program-To Shenzhen v2.0 |

# 4. Equipment under Test (EUT) Information

| | |
| --- | --- |
| Description of EUT: | Virtual Reality |
| Main Model: | Uranus One |
| Serial Model: | N/A |
| Date EUT received: | August 13, 2015 |
| Test Date(s): | August 14, 2015 to January 20, 2016 |
| Equipment Category : | DTS |
| Antenna Gain: | WIFI/ Bluetooth: 5 dBi |
| Type of Modulation: | 802.11b/g/n: DSSS, OFDM<br>Bluetooth: GFSK, π /4DQPSK, 8DPSK |
| RF Operating Frequency (ies): | WIFI:802.11b/g/n(20M): 2412-2462 MHz<br>Bluetooth: 2402-2480 MHz |
| Max. Output Power: | 802.11b: 15.32dBm<br>802.11g: 17.92dBm<br>802.11n(20M): 17.12dBm |
| Number of Channels: | WIFI :802.11b/g/n(20M): 11CH<br>Bluetooth: 79CH |
| Port: | USB Port ,TF-Card Port, HDMI Port,Earphone Port |

| | |
| --- | --- |
| Input Power: | Adapter:<br>Model : EP10-050250WUCZ<br>Input : AC100 ~ 240V, 50/60Hz,0.35A Max<br>Output: DC5.0V, 2.5A<br>Battery:<br>Standard: 3.7V,3000mAh |
| Trade Name : | N/A |
| FCC ID: | 2AE6WV002 |

# 5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

| FCC Rules | Description of Test | Result |
| --- | --- | --- |
| §15.203 | Antenna Requirement | Compliance |
| §15.247 (a)(2) | DTS (6 dB&20 dB) CHANNEL BANDWIDTH | Compliance |
| §15.247(b)(3) | Conducted Maximum Output Power | Compliance |
| §15.247(e) | Power Spectral Density | Compliance |
| §15.247(d) | Band-Edge & Unwanted Emissions into Non-Restricted Frequency Bands | Compliance |
| §15.207 (a), | AC Power Line Conducted Emissions | Compliance |
| §15.205, §15.209, §15.247(d) | Radiated Spurious Emissions & Unwanted Emissions into Restricted Frequency Bands | Compliance |

**Measurement Uncertainty**

| Emissions | | |
| --- | --- | --- |
| **Test Item** | **Description** | **Uncertainty** |
| Band Edge and Radiated Spurious Emissions | Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m) | +5.6dB/-4.5dB |
| - | - | - |

# 6. Measurements, Examination And Derived Results

## 6.1 Antenna Requirement

### Applicable Standard

According to § 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.
The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.247 (b), if the 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 6 dBi.

### Antenna Connector Construction

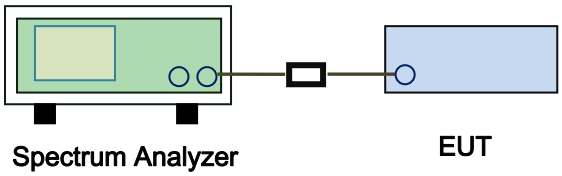
The EUT has 1 antenna:
A permanently attached PIFA antenna for Bluetooth/ WIFI, the gain is 5dBi for Bluetooth/WIFI.

### The antenna meets up with the ANTENNA REQUIREMENT.

**Result:** Compliance.

## 6.2 DTS (6 dB&20 dB) Channel Bandwidth

| | |
|---|---|
| Temperature | 25℃ |
| Relative Humidity | 52% |
| Atmospheric Pressure | 1028mbar |
| Test date : | December 28, 2015 |
| Tested By : | Winnie Zhang |

| Spec | Item | Requirement | Applicable |
|---|---|---|---|
| § 15.247(a)(2) | a) | 6dB BW≥ 500kHz; 20dB BW≥ 500kHz; | ☑ |
| RSS Gen(4.6.1) | b) | 99% BW: For FCC reference only; required by IC. | ☑ |
| Test Setup |   | | |
| Test Procedure | 558074 D01 DTS MEAS Guidance v03r03, 8.1 DTS bandwidth<br>6dB bandwidth<br>a) Set RBW = 100 kHz.<br>b) Set the video bandwidth (VBW) ≥ 3 × RBW.<br>c) Detector = Peak.<br>d) Trace mode = max hold.<br>e) Sweep = auto couple.<br>f) Allow the trace to stabilize.<br>g) Measure the maximum width of the emission that is constrained by the freq uencies associated with the two outermost amplitude points (upper and lower fr equencies) that are attenuated by 6 dB relative to the maximum level measure d in the fundamental emission.<br>20dB bandwidth<br>C63.10 Occupied Bandwidth (OBW=20dB bandwidth)<br>1. Set RBW = 1%-5% OBW.<br>2. Set the video bandwidth (VBW) ≥ 3 x RBW.<br>3. Set the span range between 2 times and 5 times of the OBW.<br>4. Sweep time=Auto, Detector=PK, Trace=Max hold.<br>5. Once the reference level is established, the equipment is conditioned with t ypical modulating signals to produce the worst- | | |

| | |
| --- | --- |
| | case (i.e., the widest) bandwidth. Unless otherwise specified for an unlicensed wireless device, measure the bandwidth at the 20 dB levels with respect to the reference level. |
| Remark | |
| Result | ☑ Pass ☐ Fail |

**Test Data** ☑ Yes ☐ N/A

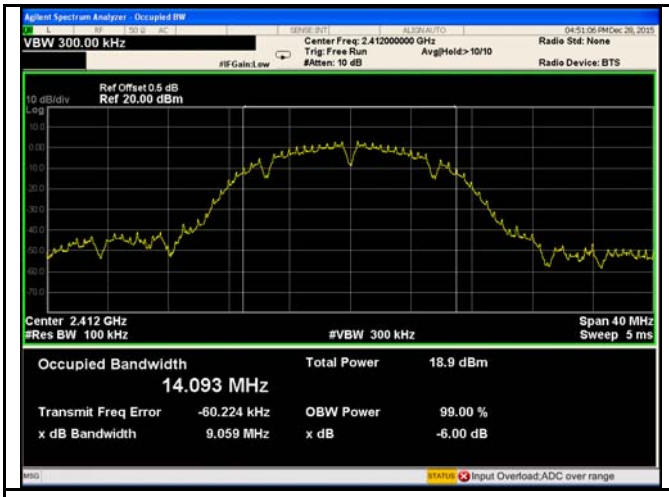
**Test Plot** ☑ Yes (See below) ☐ N/A

**Measurement result**

| Test mode | CH | Freq (MHz) | 6dB Bandwidth (MHz) | 20dB Bandwidth (MHz) | Limit (MHz) |
| --- | --- | --- | --- | --- | --- |
| 802.11b | Low | 2412 | 9.059 | 16.25 | ≥ 0.5 |
| | Mid | 2437 | 9.058 | 16.19 | ≥ 0.5 |
| | High | 2462 | 8.550 | 16.19 | ≥ 0.5 |
| 802.11g | Low | 2412 | 16.31 | 19.39 | ≥ 0.5 |
| | Mid | 2437 | 16.28 | 19.34 | ≥ 0.5 |
| | High | 2462 | 15.92 | 19.29 | ≥ 0.5 |
| 802.11n (20M) | Low | 2412 | 17.53 | 19.56 | ≥ 0.5 |
| | Mid | 2437 | 17.58 | 19.62 | ≥ 0.5 |
| | High | 2462 | 16.57 | 19.52 | ≥ 0.5 |

## Test Plots

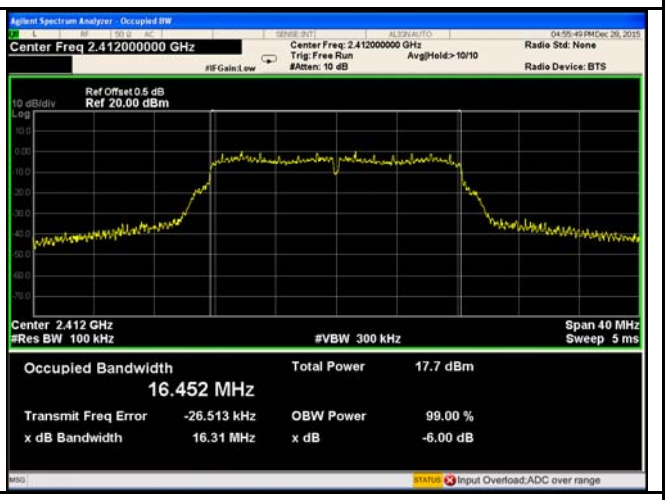
### 6dB Bandwidth measurement result



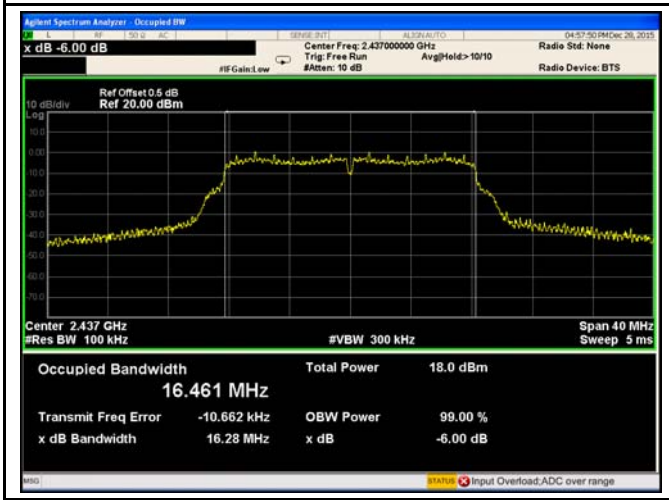

802.11b 6dB Bandwidth - Low CH 2412

802.11b 6dB Bandwidth - Mid CH 2437

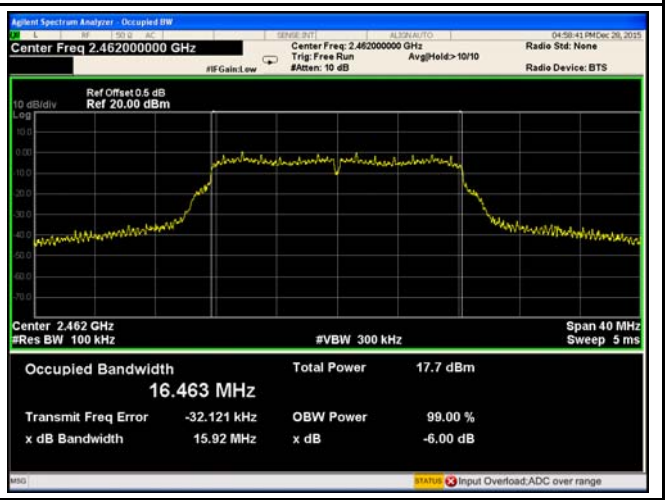
802.11b 6dB Bandwidth - High CH 2462



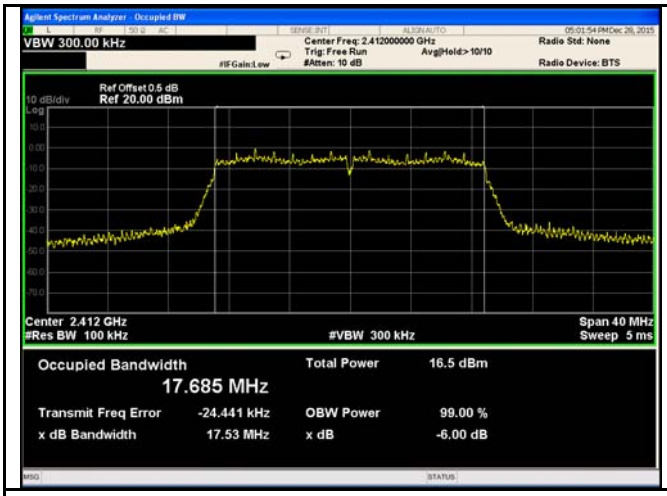

802.11g 6dB Bandwidth - Low CH 2412



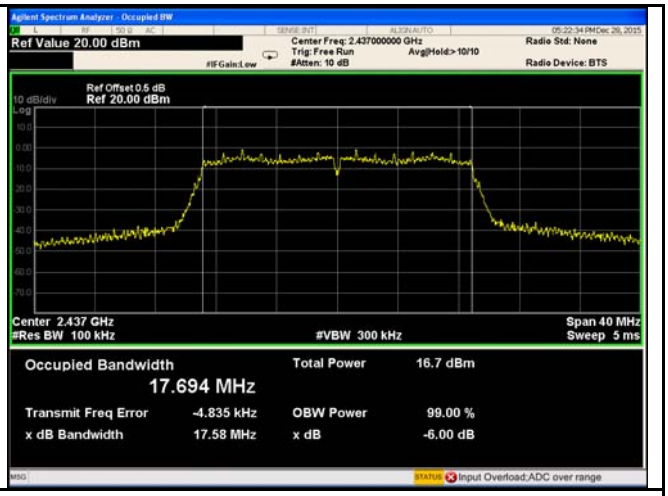

802.11g 6dB Bandwidth - Mid CH 2437



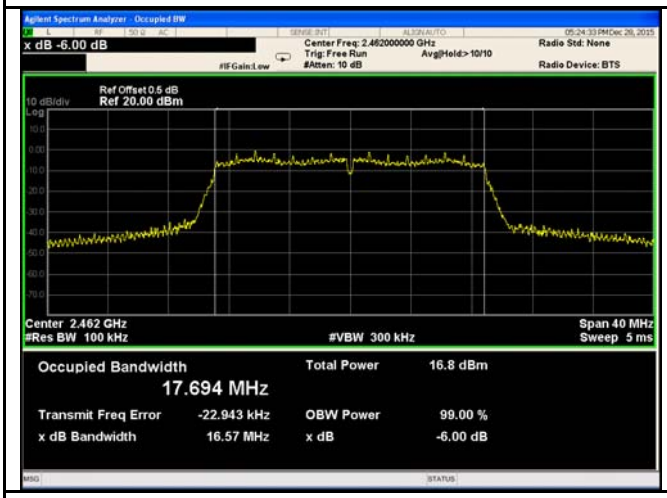

802.11g 6dB Bandwidth - High CH 2462




802.11n20 6dB Bandwidth - Low CH 2412

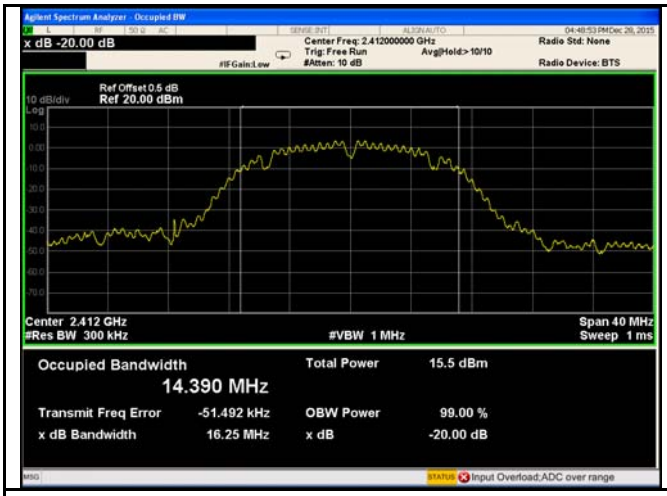



802.11n20 6dB Bandwidth - Mid CH 2437



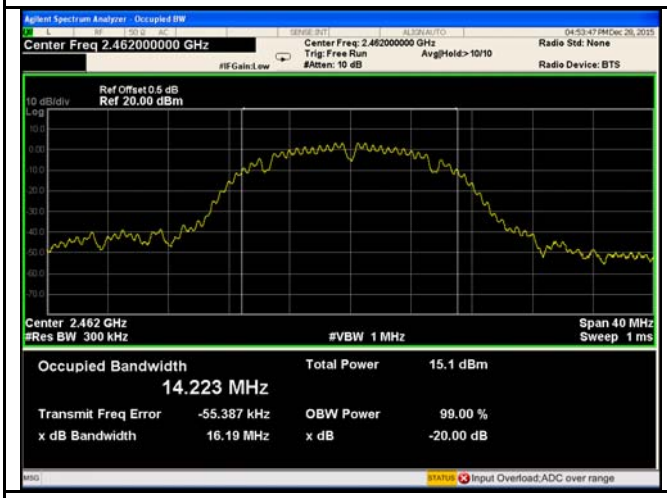

802.11n20 6dB Bandwidth - High CH 2462

## 20 dB Bandwidth measurement result

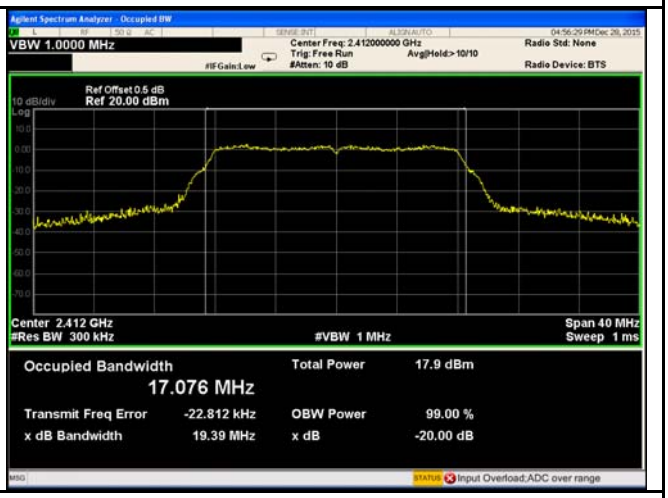



802.11b 20dB Bandwidth - Low CH 2412

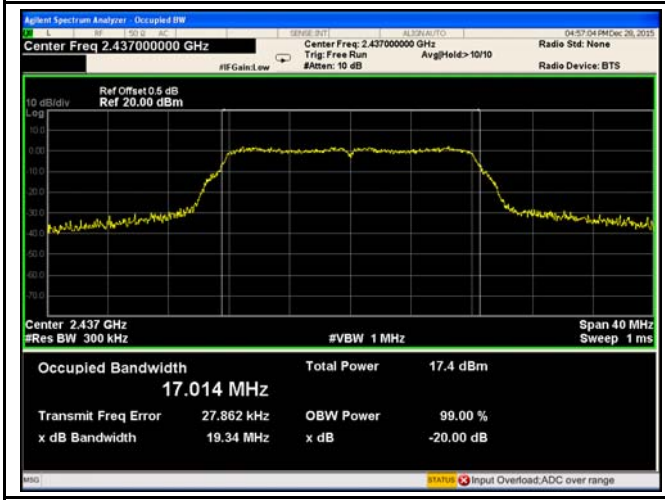
802.11b 20dB Bandwidth - Mid CH 2437



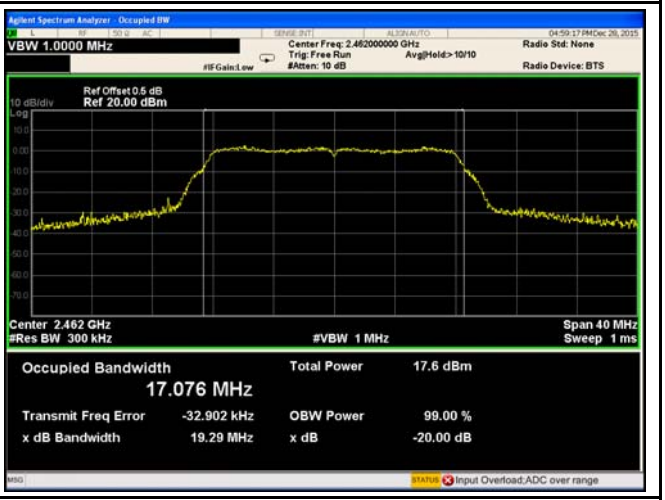

802.11b 20dB Bandwidth - High CH 2462



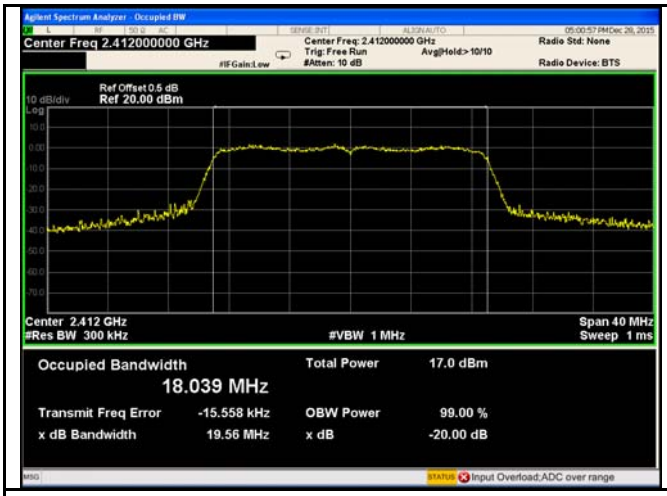

802.11g 20dB Bandwidth - Low CH 2412



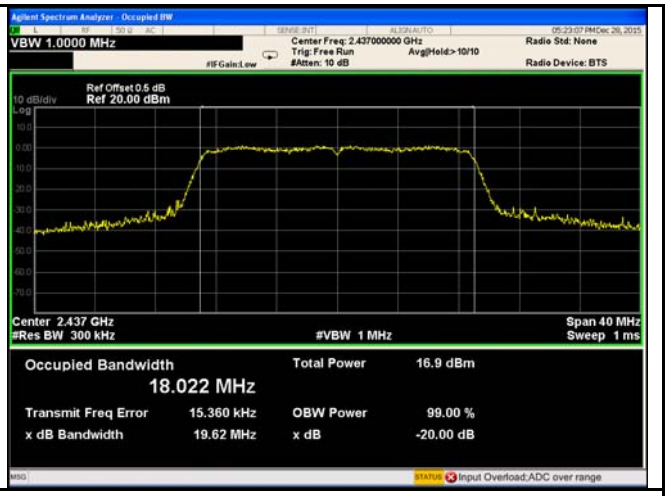

802.11g 20dB Bandwidth - Mid CH 2437



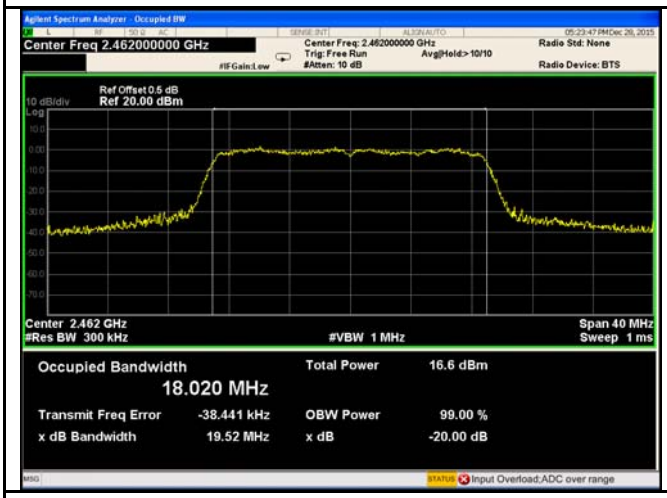

802.11g 20dB Bandwidth - High CH 2462




802.11n20 20dB Bandwidth - Low CH 2412




802.11n20 20dB Bandwidth - Mid CH 2437

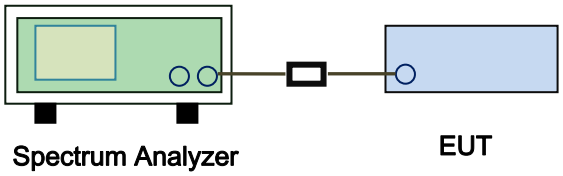



802.11n20 20dB Bandwidth - High CH 2462

## 6.3 Maximum Output Power

| | |
|---|---|
| Temperature | 25℃ |
| Relative Humidity | 52% |
| Atmospheric Pressure | 1028mbar |
| Test date : | December 28, 2015 |
| Tested By : | Winnie Zhang |

**Requirement(s):**

| Spec | Item | Requirement | Applicable |
|---|---|---|---|
| §15.247(b)(3),RSS210(A8.4) | a) | FHSS in 2400-2483.5MHz with ≥ 75 channels: ≤ 1 Watt | ☐ |
| | b) | FHSS in 5725-5850MHz: ≤ 1 Watt | ☐ |
| | c) | For all other FHSS in the 2400-2483.5MHz band: ≤ 0.125 Watt. | ☐ |
| | d) | FHSS in 902-928MHz with ≥ 50 channels: ≤ 1 Watt | ☐ |
| | e) | FHSS in 902-928MHz with ≥ 25 & <50 channels: ≤ 0.25 Watt | ☐ |
| | f) | DTS in 902-928MHz, 2400-2483.5MHz: ≤ 1 Watt | ☑ |
| Test Setup |   | | |
| Test Procedure | 558074 D01 DTS MEAS Guidance v03r03, 9.1.2 Integrated band power method<br>Maximum output power measurement procedure<br>- a) Set span to at least 1.5 times the OBW.<br>- b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.<br>- c) Set VBW ≥ 3 x RBW.<br>- d) Number of points in sweep ≥ 2 × span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)<br>- e) Sweep time = auto.<br>- f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.<br>- g) If transmit duty cycle < 98 %, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum | | |

| | |
|---|---|
| | power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 %, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to " free run" .<br>- h) Trace average at least 100 traces in power averaging (i.e., RMS) mode.<br>- i) Compute power by integrating the spectrum across the OBW of the signal using the instrument' s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum. |
| Remark | |
| Result | ☑ Pass ☐ Fail |

**Test Data** ☑ Yes ☐ N/A

**Test Plot** ☑ Yes (See below) ☐ N/A

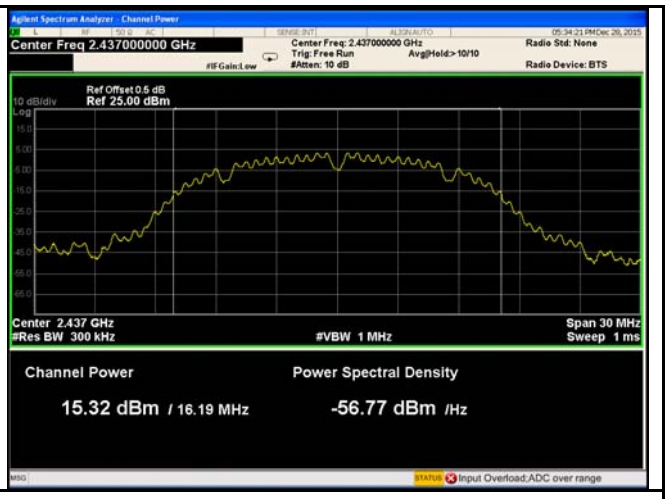
**Output Power measurement result**

| Type | Test mode | CH | Freq (MHz) | Conducted Power (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|---|---|
| Output power | 802.11b | Low | 2412 | 15.29 | 30 | Pass |
| | | Mid | 2437 | **15.32** | 30 | Pass |
| | | High | 2462 | 15.17 | 30 | Pass |
| | 802.11g | Low | 2412 | 17.76 | 30 | Pass |
| | | Mid | 2437 | **17.92** | 30 | Pass |
| | | High | 2462 | 17.80 | 30 | Pass |
| | 802.11n (20M) | Low | 2412 | 16.97 | 30 | Pass |
| | | Mid | 2437 | 17.04 | 30 | Pass |
| | | High | 2462 | **17.12** | 30 | Pass |

## Test Plots

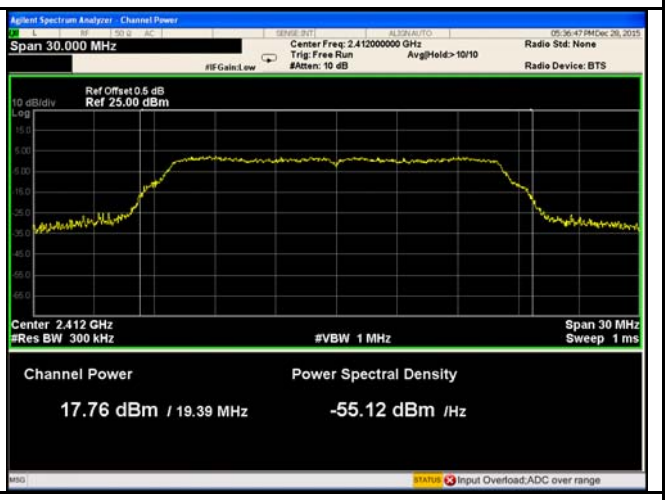
### The Average Power

802.11b - AV Output power - Low CH 2412



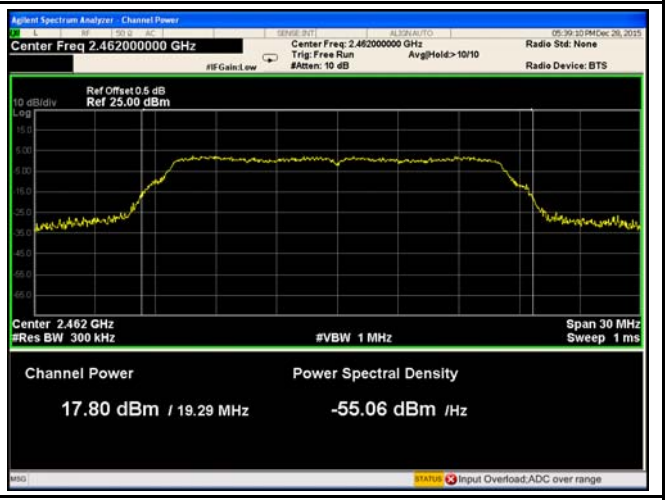

802.11b - AV Output power - Mid CH 2437

802.11b - AV Output power - High CH 2462

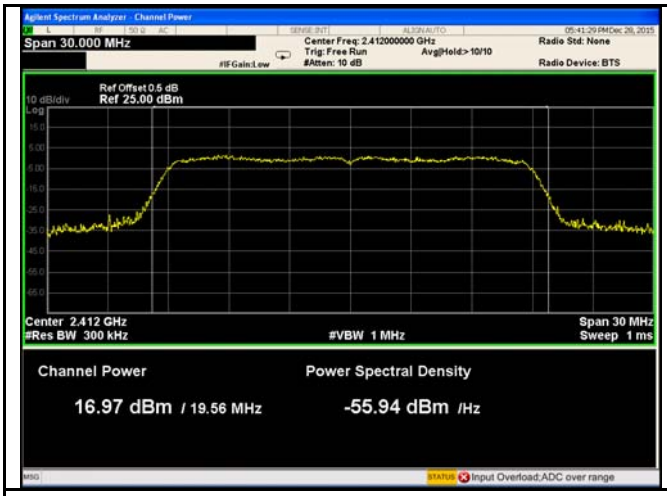



802.11g - AV Output power - Low CH 2412

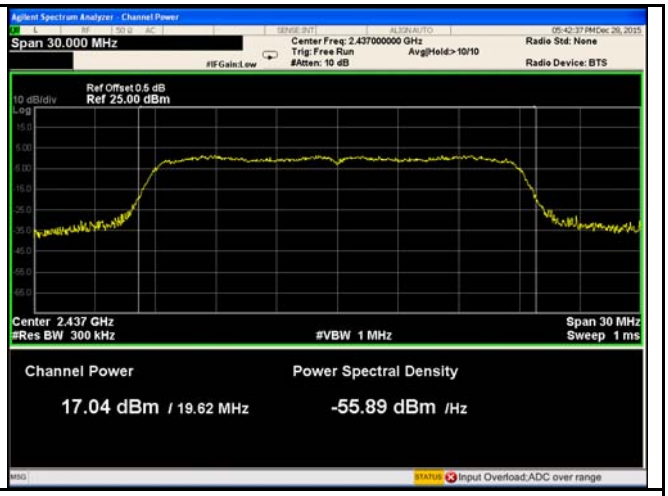
802.11g - AV Output power - Mid CH 2437




802.11g - AV Output power - High CH 2462




802.11n20 - AV Output power - Low CH 2412

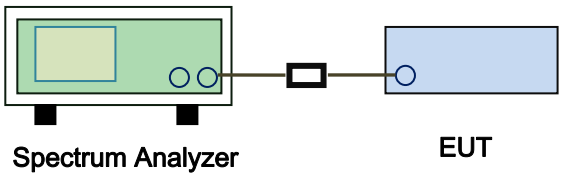



802.11n20 - AV Output power - Mid CH 2437

802.11n20 - AV Output power - High CH 2462

## 6.4 Power Spectral Density

| | |
|---|---|
| Temperature | 22℃ |
| Relative Humidity | 53% |
| Atmospheric Pressure | 1029mbar |
| Test date : | December 29, 2015 |
| Tested By : | Winnie Zhang |

| Spec | Item | Requirement | Applicable |
|---|---|---|---|
| §15.247(e) | a) | The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. | ☑ |
| Test Setup |   | | |
| Test Procedure | 558074 D01 DTS MEAS Guidance v03r03, 10.2 power spectral density method power spectral density measurement procedure<br>- a) Set analyzer center frequency to DTS channel center frequency.<br>- b) Set the span to 1.5 times the DTS bandwidth.<br>- c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.<br>- d) Set the VBW ≥ 3 × RBW.<br>- e) Detector = peak.<br>- f) Sweep time = auto couple.<br>- g) Trace mode = max hold.<br>- h) Allow trace to fully stabilize.<br>- i) Use the peak marker function to determine the maximum amplitude level within the RBW.<br>- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat. | | |
| Remark | | | |
| Result | ☑ Pass ☐ Fail | | |

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Power Spectral Density measurement result

| Type | Test mode | CH | Freq (MHz) | Reading (dBm) | Factor (dB) | Result (dBm) | Limit (dBm) | Result |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| PSD | 802.11b | Low | 2412 | 1.544 | -10 | -8.456 | 8 | Pass |
| | | Mid | 2437 | 2.316 | -10 | -7.684 | 8 | Pass |
| | | High | 2462 | -0.683 | -10 | -10.683 | 8 | Pass |
| | 802.11g | Low | 2412 | -4.306 | -10 | -14.306 | 8 | Pass |
| | | Mid | 2437 | -4.717 | -10 | -14.717 | 8 | Pass |
| | | High | 2462 | -4.499 | -10 | -14.499 | 8 | Pass |
| | 802.11n (20M) | Low | 2412 | -5.342 | -10 | -15.342 | 8 | Pass |
| | | Mid | 2437 | -5.518 | -10 | -15.518 | 8 | Pass |
| | | High | 2462 | -5.895 | -10 | -15.895 | 8 | Pass |

Note: Factor= 10log(3/30)dB= -10.0 dB (b, g, n20 mode);

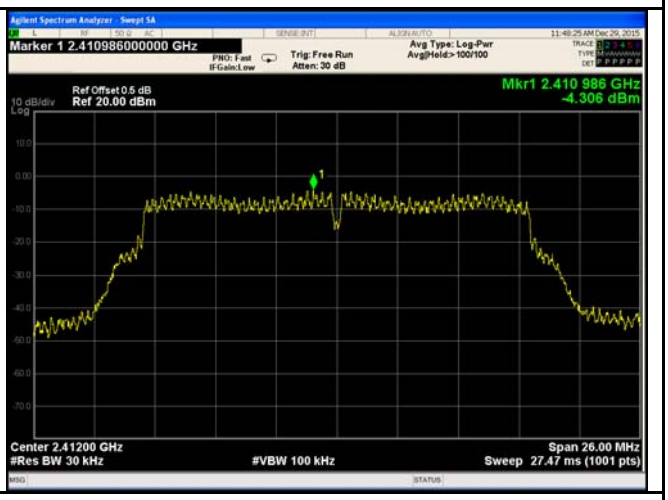
## Test Plots

### Power Spectral Density measurement result

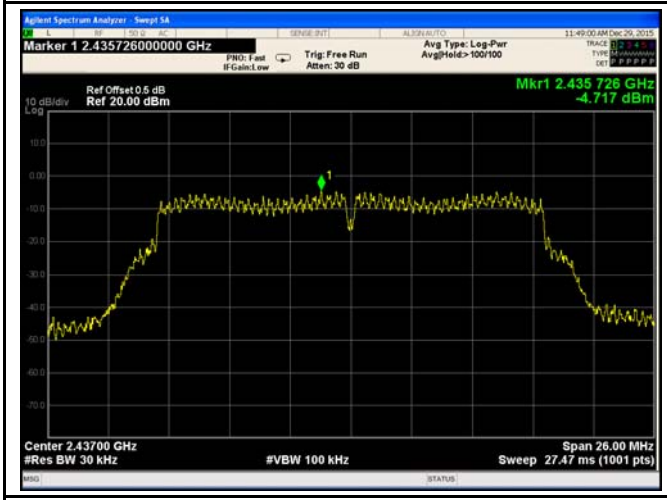
PSD - Low CH 2412 - 802.11b

PSD - Mid CH 2437 – 802.11b

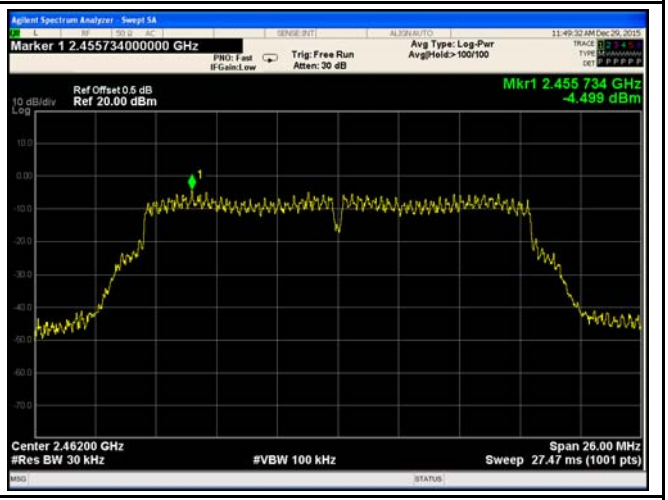
PSD - High CH 2462 - 802.11b



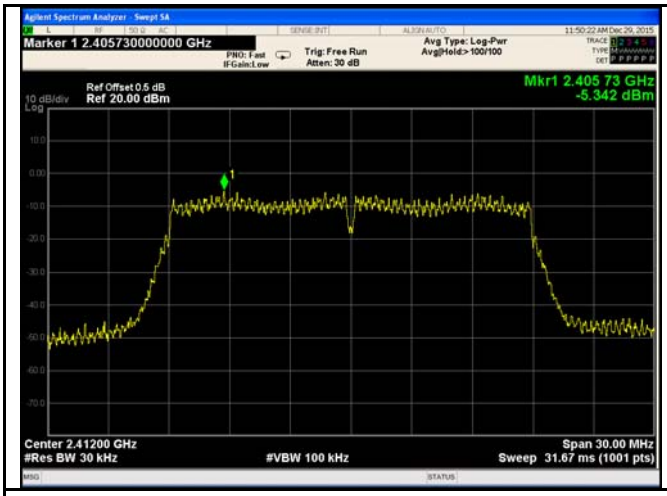

PSD - Low CH 2412 -802.11g



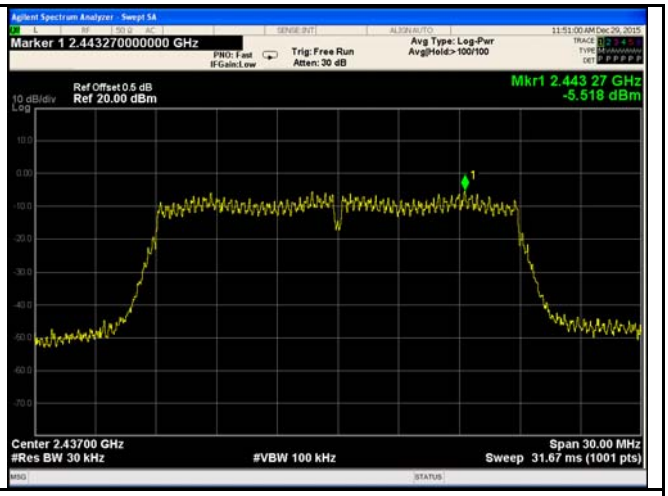

PSD - Mid CH 2437 – 802.11g



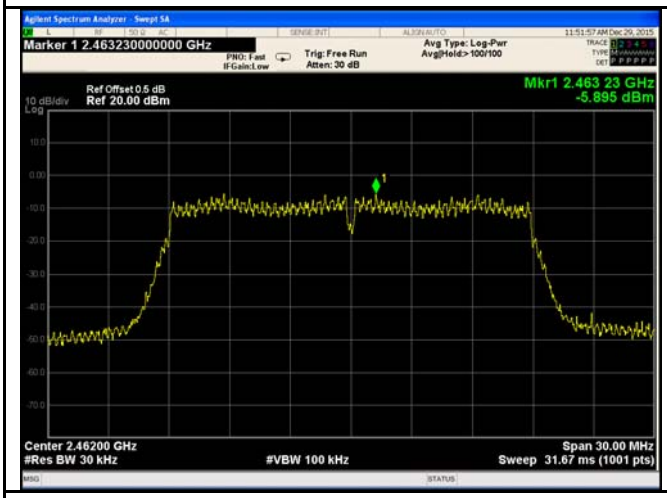

PSD - High CH 2462 - 802.11g




PSD - Low CH 2412 - 802.11n20




PSD - Mid CH 2437 – 802.11n20

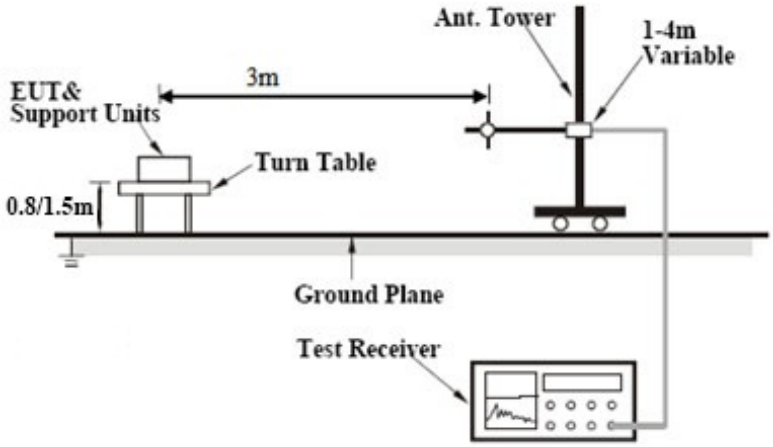



PSD - High CH 2462 - 802.11n20

## 6.5 Band-Edge & Unwanted Emissions into Non-Restricted Frequency Bands

| | |
|---|---|
| Temperature | 23℃ |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1006mbar |
| Test date : | January 06, 2016 |
| Tested By : | Winnie Zhang |

**Requirement(s):**

| Spec | Item | Requirement | Applicable |
|---|---|---|---|
| §15.247(d) | a) | In any 100 kHz 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 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 the transmitter demonstrates compliance with the peak conducted power limits. | ☑ |
| Test Setup |  | | |
| Test Procedure | Radiated Method Only<br>- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.<br>- 2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range. | | |

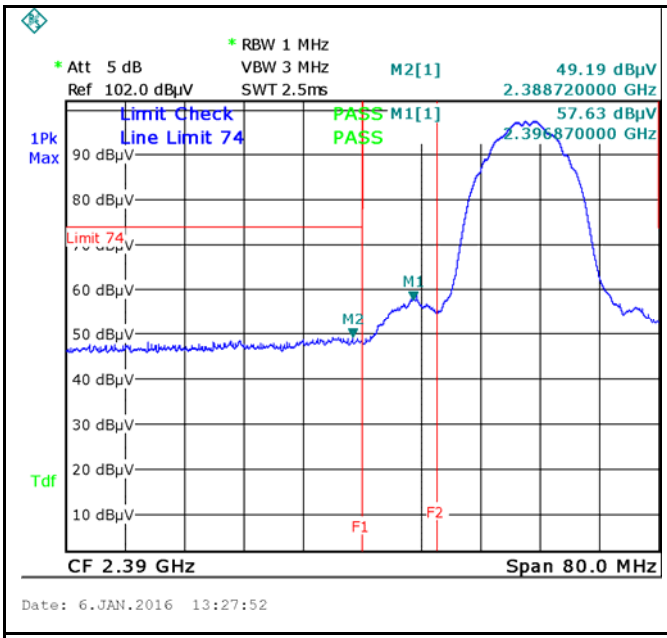
| | |
| --- | --- |
| | - 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below:<br>a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.<br>b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.<br>c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.<br>- 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.<br>- 5. Repeat above procedures until all measured frequencies were complete. |
| Remark | |
| Result | ☑ Pass ☐ Fail |

**Test Data** ☑ Yes ☐ N/A

**Test Plot** ☑ Yes (See below) ☐ N/A

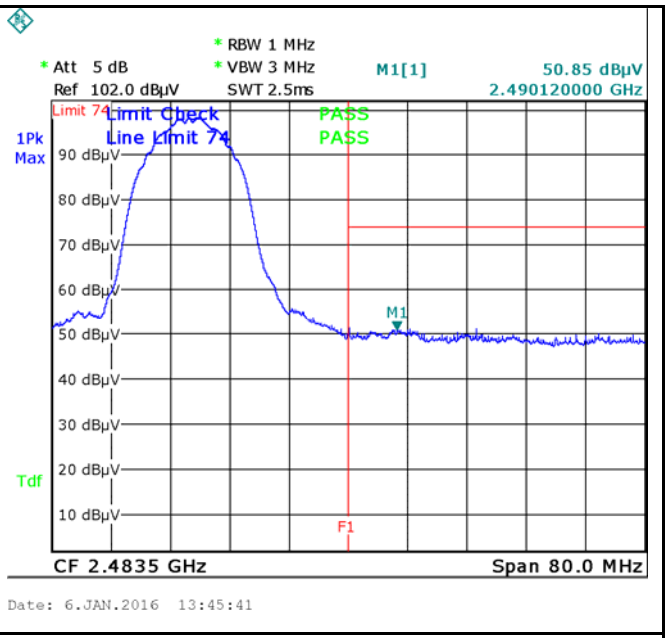
## Test Plots

### Band Edge measurement result



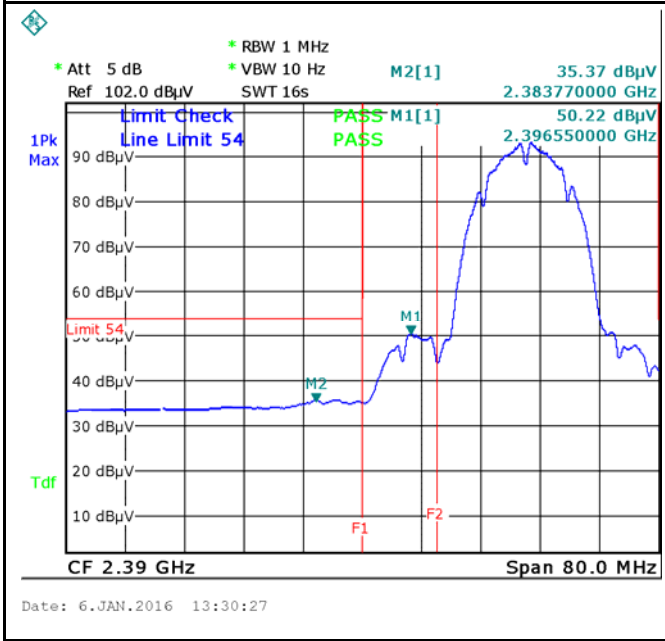

Band Edge, Left Side (Peak) - 802.11b

**Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz**




Band Edge, Right Side (Peak) - 802.11b

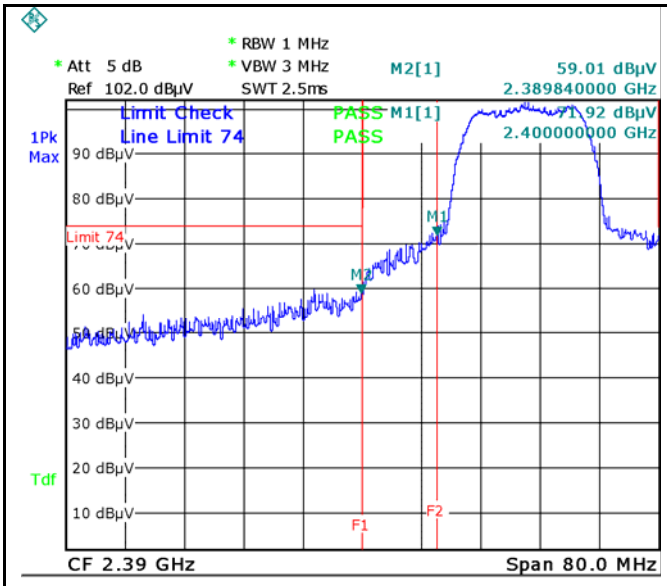
**Note: F1 is frequency 2483.5MHz**




Band Edge, Left Side (Average) - 802.11b

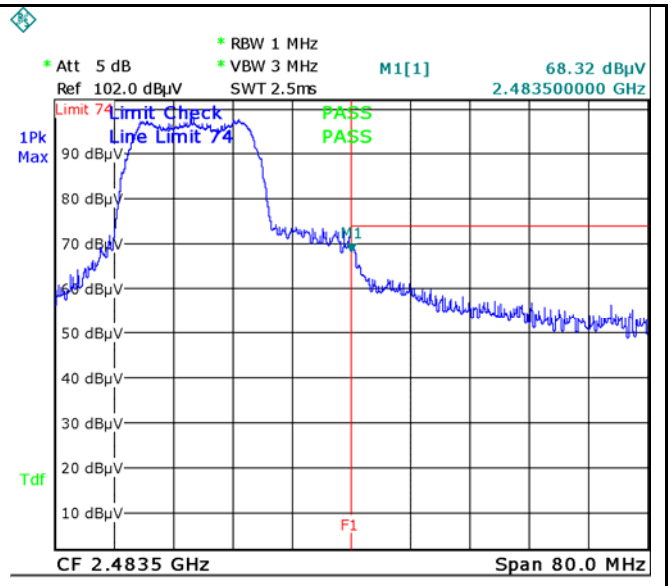
Note: (no need if PK value less than the AV limit)

Band Edge, Right Side (Average) - 802.11b



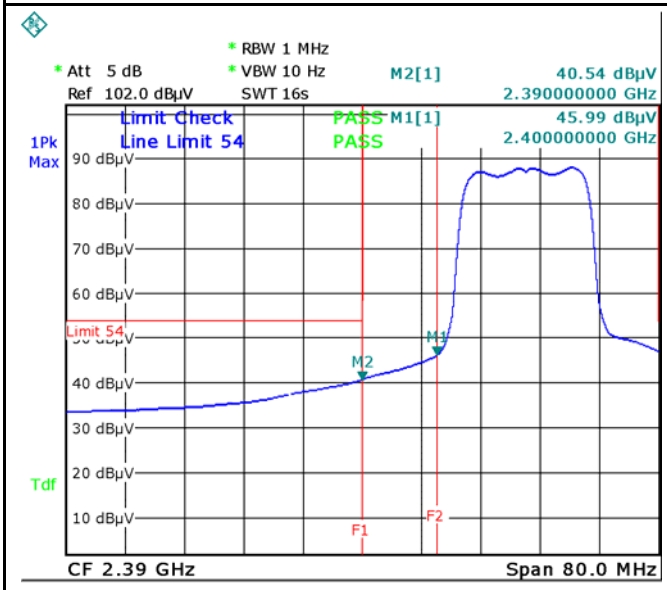

Band Edge, Left Side (Peak) - 802.11g

**Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz**



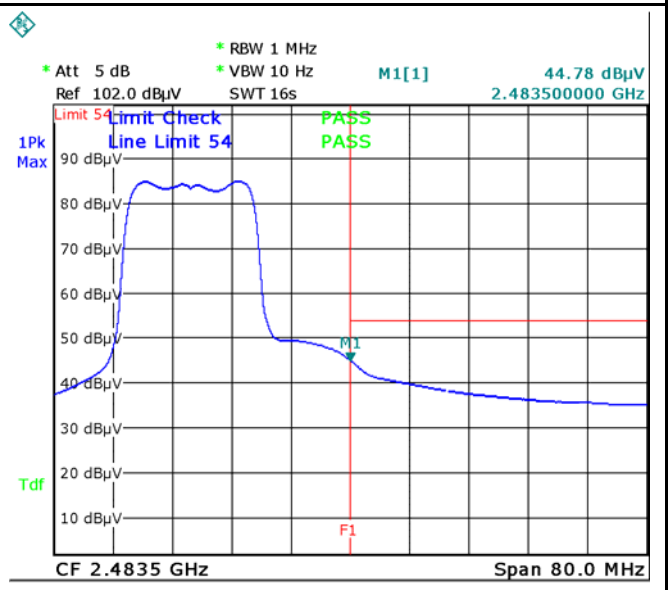

Band Edge, Right Side (Peak) - 802.11g

**Note: F1 is frequency 2483.5MHz**



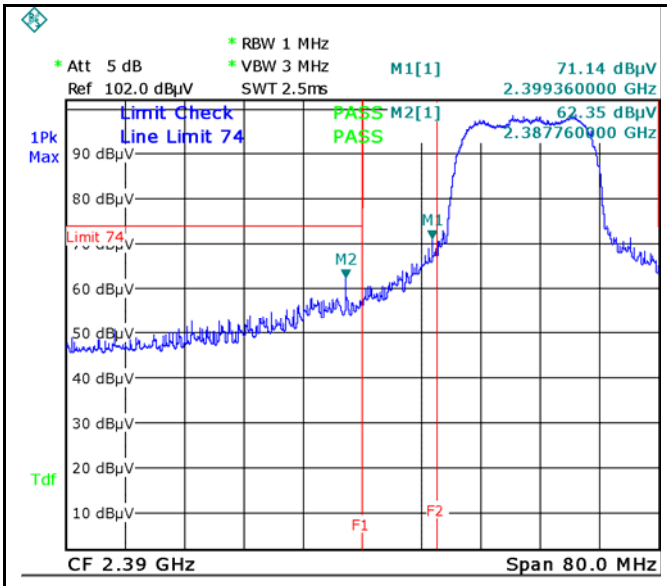

Band Edge, Left Side (Average) - 802.11g

**Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz**



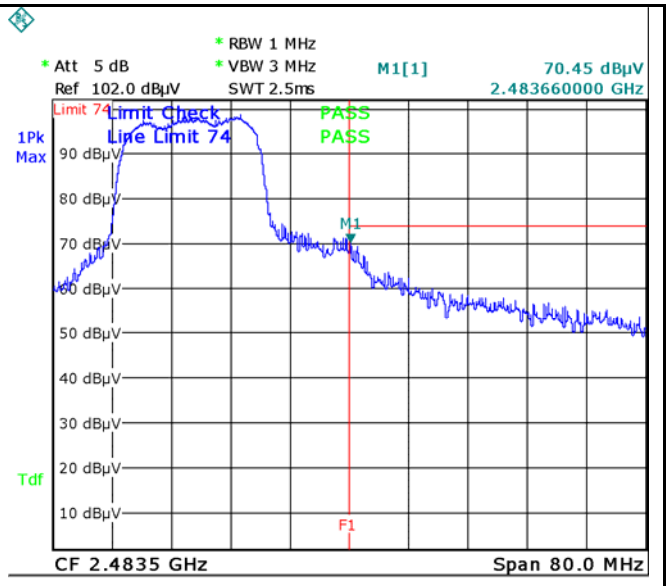

Band Edge, Right Side (Average) - 802.11g

**Note: F1 is frequency 2483.5MHz**



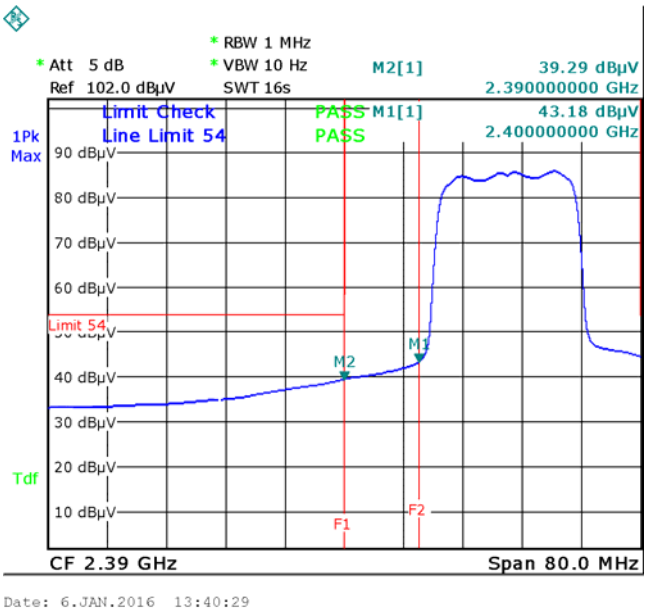

Band Edge, Left Side (Peak) - 802.11n20

**Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz**



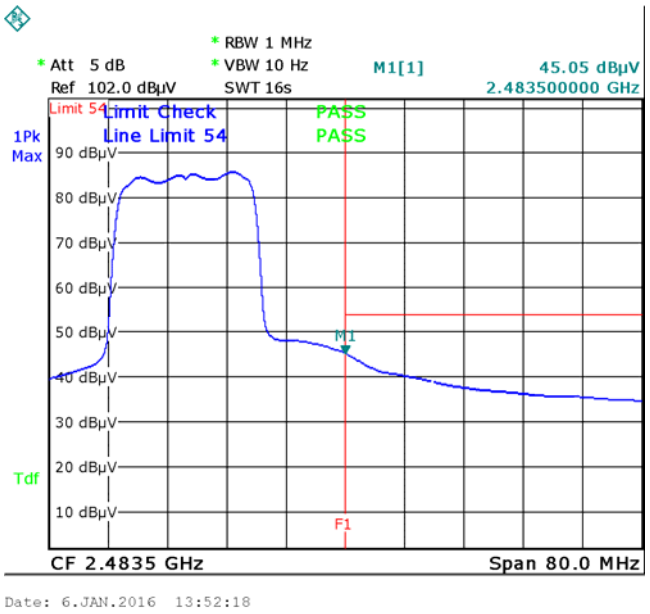

Band Edge, Right Side (Peak) - 802.11n20

**Note: F1 is frequency 2483.5MHz**




Band Edge, Left Side (Average) - 802.11n20

**Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz**



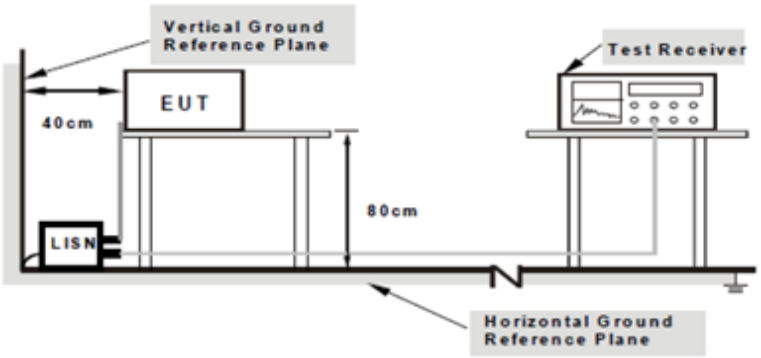

Band Edge, Right Side (Average) - 802.11n20

**Note: F1 is frequency 2483.5MHz**

## 6.6 AC Power Line Conducted Emissions

| | |
|---|---|
| Temperature | 23℃ |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1006mbar |
| Test date : | January 06, 2016 |
| Tested By : | Winnie Zhang |

**Requirement(s):**

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47CFR§15.207, RSS210 (A8.1)</td><td>a)</td><td>For Low-power radio-frequency devices 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 or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu] H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.
<table>
<tr><th rowspan="2">Frequency ranges (MHz)</th><th colspan="2">Limit (dBμV)</th></tr>
<tr><th>QP</th><th>Average</th></tr>
<tr><td>0.15 ~ 0.5</td><td>66 – 56</td><td>56 – 46</td></tr>
<tr><td>0.5 ~ 5</td><td>56</td><td>46</td></tr>
<tr><td>5 ~ 30</td><td>60</td><td>50</td></tr>
</table></td><td>☑</td></tr>
<tr><td>Test Setup</td><td colspan="3"> 

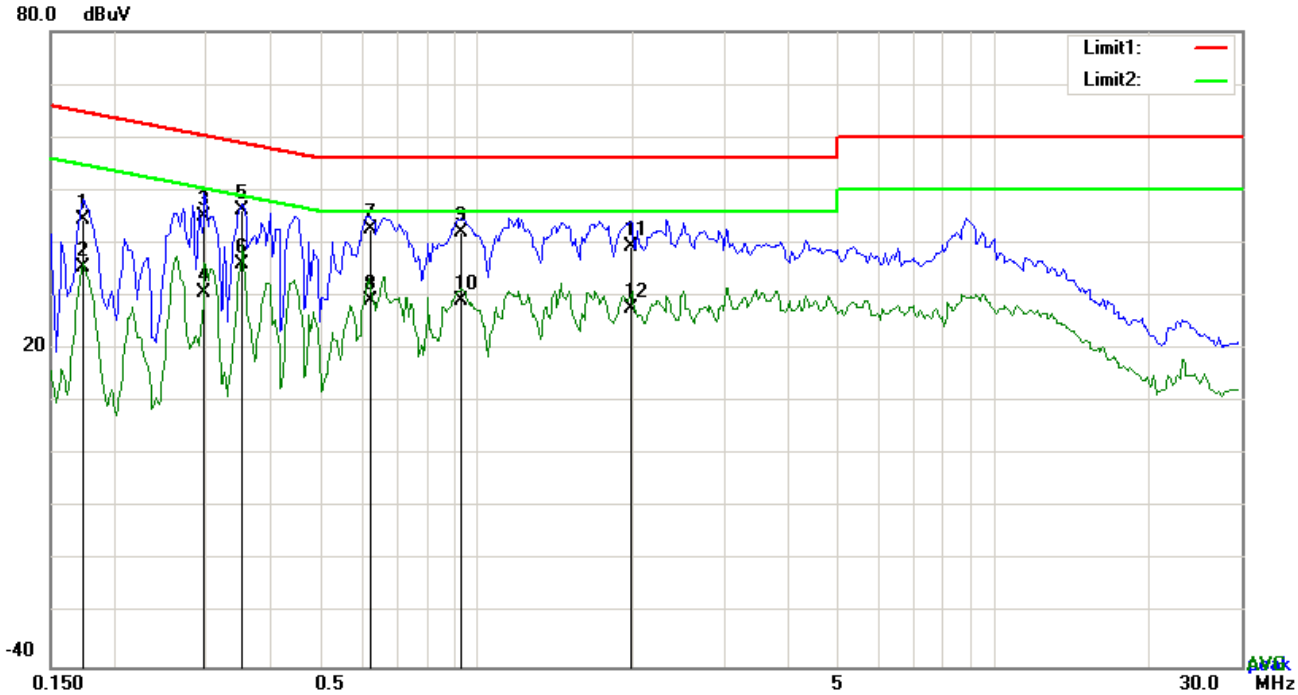
Note: 1.Support units were connected to second LISN.<br>2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</td></tr>
<tr><td>Procedure</td><td colspan="3">1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.<br>2. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.<br>3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss</td></tr>
</table>

| | |
| --- | --- |
| | coaxial cable.<br>4. All other supporting equipment were powered separately from another main supply.<br>5. The EUT was switched on and allowed to warm up to its normal operating condition.<br>6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.<br>7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz.<br>8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power). |
| Remark | |
| Result | ☑ Pass ☐ Fail |

**Test Data** ☑ Yes ☐ N/A

**Test Plot** ☑ Yes (See below) ☐ N/A

| Test Mode: | WIFI Mode |
|---|---|

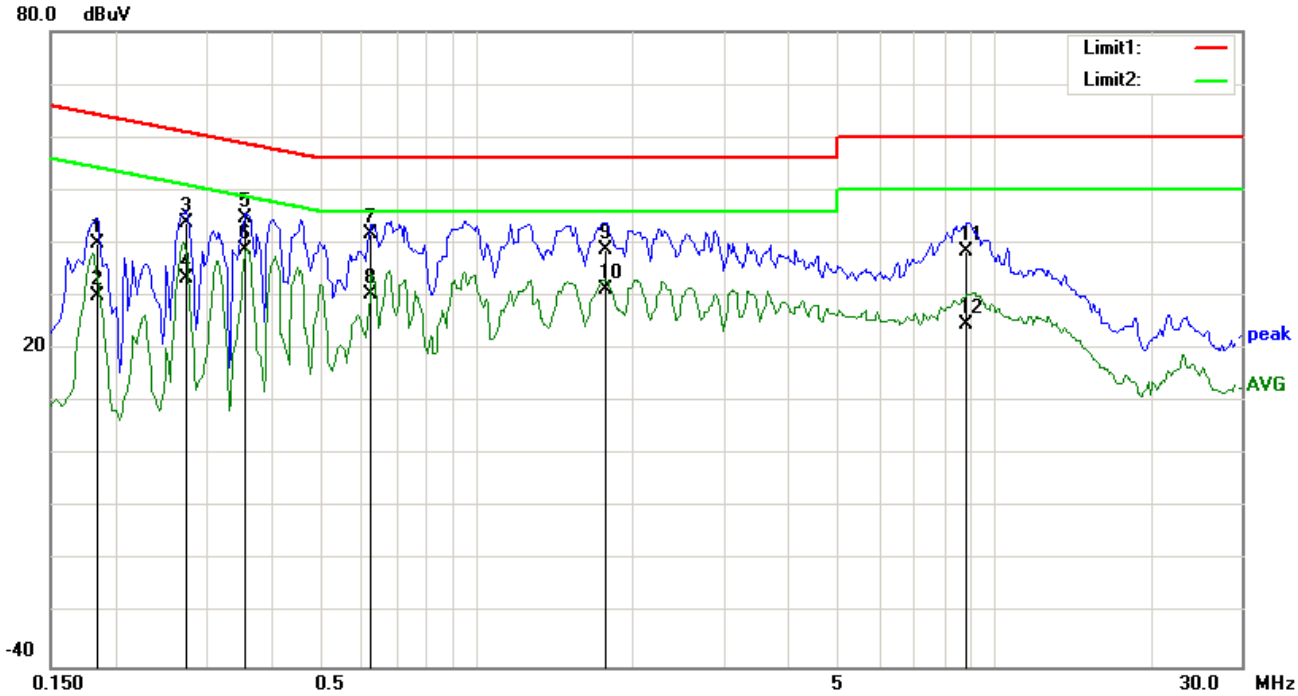



*Test Data*

Phase Line Plot at 120Vac, 60Hz

| No. | P/L | Frequency (MHz) | Reading (dBµV) | Detector | Corrected (dB) | Result (dBµV) | Limit (dBµV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | L1 | 0.1734 | 34.37 | QP | 10.03 | 44.40 | 64.80 | -20.40 |
| 2 | L1 | 0.1734 | 25.42 | AVG | 10.03 | 35.45 | 54.80 | -19.35 |
| 3 | L1 | 0.2982 | 34.94 | QP | 10.03 | 44.97 | 60.29 | -15.32 |
| 4 | L1 | 0.2982 | 20.60 | AVG | 10.03 | 30.63 | 50.29 | -19.66 |
| 5 | L1 | 0.3528 | 36.21 | QP | 10.03 | 46.24 | 58.90 | -12.66 |
| 6 | L1 | 0.3528 | 26.04 | AVG | 10.03 | 36.07 | 48.90 | -12.83 |
| 7 | L1 | 0.6219 | 32.60 | QP | 10.03 | 42.63 | 56.00 | -13.37 |
| 8 | L1 | 0.6219 | 19.10 | AVG | 10.03 | 29.13 | 46.00 | -16.87 |
| 9 | L1 | 0.9300 | 32.04 | QP | 10.03 | 42.07 | 56.00 | -13.93 |
| 10 | L1 | 0.9300 | 19.02 | AVG | 10.03 | 29.05 | 46.00 | -16.95 |
| 11 | L1 | 1.9830 | 29.17 | QP | 10.04 | 39.21 | 56.00 | -16.79 |
| 12 | L1 | 1.9830 | 17.50 | AVG | 10.04 | 27.54 | 46.00 | -18.46 |

| Test Mode: | WIFI Mode |
|---|---|

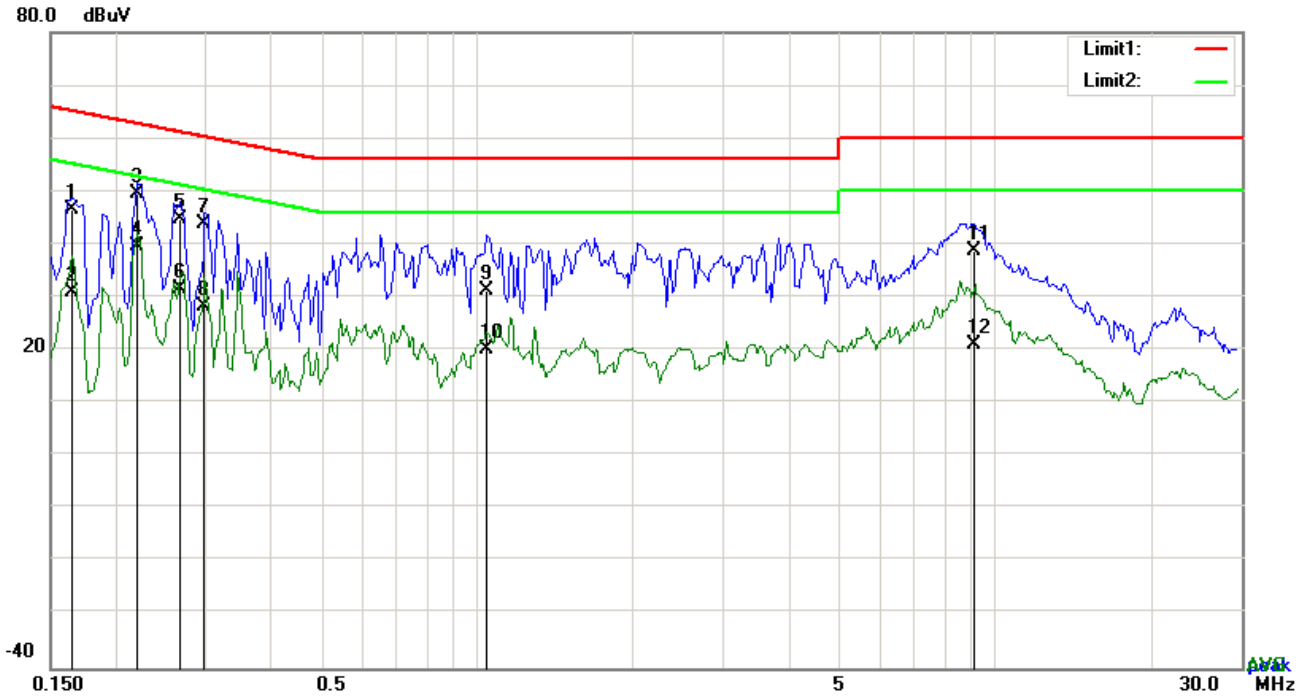



*Test Data*

Phase Neutral Plot at 120Vac, 60Hz

| No. | P/L | Frequency (MHz) | Reading (dBµV) | Detector | Corrected (dB) | Result (dBµV) | Limit (dBµV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 0.1851 | 29.84 | QP | 10.02 | 39.86 | 64.25 | -24.39 |
| 2 | N | 0.1851 | 20.18 | AVG | 10.02 | 30.20 | 54.25 | -24.05 |
| 3 | N | 0.2748 | 33.92 | QP | 10.02 | 43.94 | 60.97 | -17.03 |
| 4 | N | 0.2748 | 23.32 | AVG | 10.02 | 33.34 | 50.97 | -17.63 |
| 5 | N | 0.3567 | 34.83 | QP | 10.02 | 44.85 | 58.80 | -13.95 |
| 6 | N | 0.3567 | 28.60 | AVG | 10.02 | 38.62 | 48.80 | -10.18 |
| 7 | N | 0.6258 | 31.67 | QP | 10.02 | 41.69 | 56.00 | -14.31 |
| 8 | N | 0.6258 | 20.45 | AVG | 10.02 | 30.47 | 46.00 | -15.53 |
| 9 | N | 1.7763 | 28.60 | QP | 10.04 | 38.64 | 56.00 | -17.36 |
| 10 | N | 1.7763 | 21.12 | AVG | 10.04 | 31.16 | 46.00 | -14.84 |
| 11 | N | 8.8539 | 28.35 | QP | 10.12 | 38.47 | 60.00 | -21.53 |
| 12 | N | 8.8539 | 14.67 | AVG | 10.12 | 24.79 | 50.00 | -25.21 |

| Test Mode: | WIFI Mode |
|---|---|

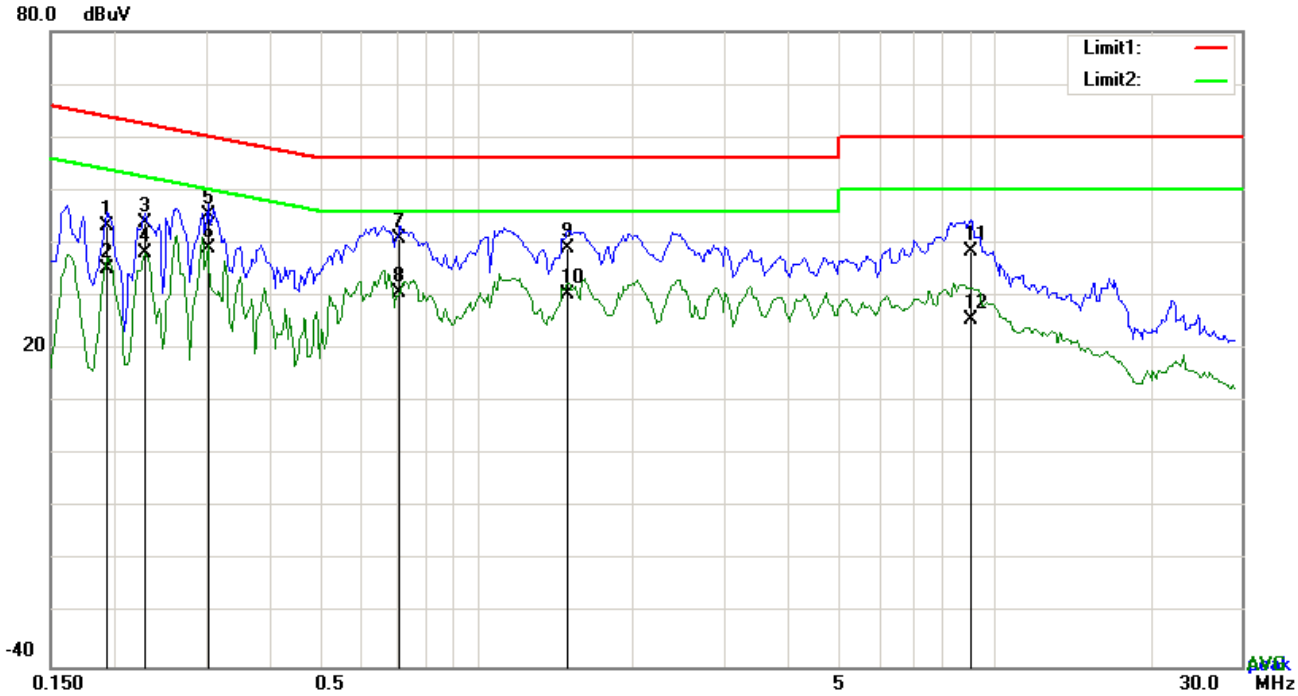



*Test Data*

Phase Line Plot at 240Vac, 60Hz

| No. | P/L | Frequency (MHz) | Reading (dBµV) | Detector | Corrected (dB) | Result (dBµV) | Limit (dBµV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | L1 | 0.1656 | 36.57 | QP | 10.03 | 46.60 | 65.18 | -18.58 |
| 2 | L1 | 0.1656 | 20.91 | AVG | 10.03 | 30.94 | 55.18 | -24.24 |
| 3 | L1 | 0.2202 | 39.57 | QP | 10.03 | 49.60 | 62.81 | -13.21 |
| 4 | L1 | 0.2202 | 29.67 | AVG | 10.03 | 39.70 | 52.81 | -13.11 |
| 5 | L1 | 0.2670 | 34.65 | QP | 10.03 | 44.68 | 61.21 | -16.53 |
| 6 | L1 | 0.2670 | 21.43 | AVG | 10.03 | 31.46 | 51.21 | -19.75 |
| 7 | L1 | 0.2982 | 33.90 | QP | 10.03 | 43.93 | 60.29 | -16.36 |
| 8 | L1 | 0.2982 | 18.28 | AVG | 10.03 | 28.31 | 50.29 | -21.98 |
| 9 | L1 | 1.0470 | 21.31 | QP | 10.03 | 31.34 | 56.00 | -24.66 |
| 10 | L1 | 1.0470 | 10.07 | AVG | 10.03 | 20.10 | 46.00 | -25.90 |
| 11 | L1 | 9.1073 | 28.58 | QP | 10.14 | 38.72 | 60.00 | -21.28 |
| 12 | L1 | 9.1073 | 10.84 | AVG | 10.14 | 20.98 | 50.00 | -29.02 |

| Test Mode: | WIFI Mode |
|---|---|




*Test Data*

Phase Neutral Plot at 240Vac, 60Hz

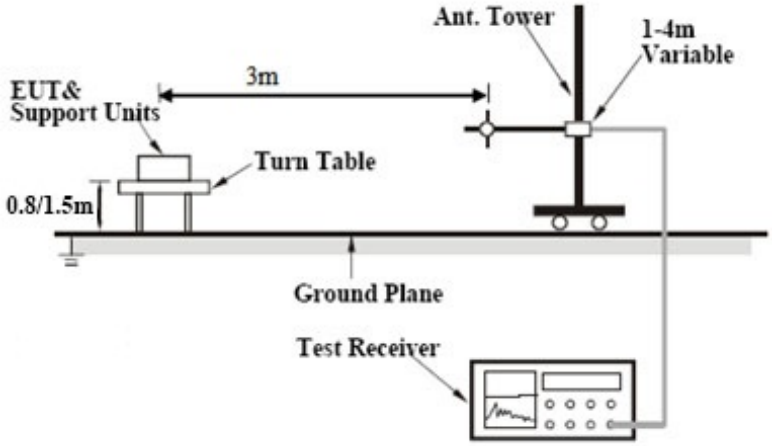
| No. | P/L | Frequency (MHz) | Reading (dBµV) | Detector | Corrected (dB) | Result (dBµV) | Limit (dBµV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 0.1929 | 33.38 | QP | 10.02 | 43.40 | 63.91 | -20.51 |
| 2 | N | 0.1929 | 25.28 | AVG | 10.02 | 35.30 | 53.91 | -18.61 |
| 3 | N | 0.2280 | 33.89 | QP | 10.02 | 43.91 | 62.52 | -18.61 |
| 4 | N | 0.2280 | 28.07 | AVG | 10.02 | 38.09 | 52.52 | -14.43 |
| 5 | N | 0.3021 | 35.19 | QP | 10.02 | 45.21 | 60.18 | -14.97 |
| 6 | N | 0.3021 | 29.04 | AVG | 10.02 | 39.06 | 50.18 | -11.12 |
| 7 | N | 0.7116 | 30.89 | QP | 10.02 | 40.91 | 56.00 | -15.09 |
| 8 | N | 0.7116 | 20.73 | AVG | 10.02 | 30.75 | 46.00 | -15.25 |
| 9 | N | 1.4994 | 29.00 | QP | 10.03 | 39.03 | 56.00 | -16.97 |
| 10 | N | 1.4994 | 20.40 | AVG | 10.03 | 30.43 | 46.00 | -15.57 |
| 11 | N | 8.9748 | 28.47 | QP | 10.13 | 38.60 | 60.00 | -21.40 |
| 12 | N | 8.9748 | 15.39 | AVG | 10.13 | 25.52 | 50.00 | -24.48 |

## 6.7 Radiated Spurious Emissions

| | |
|---|---|
| Temperature | 23℃ |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1006mbar |
| Test date : | January 06, 2016 |
| Tested By : | Winnie Zhang |

**Requirement(s):**

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td rowspan="3">47CFR§15.247(d), RSS210 (A8.5)</td><td>a)</td><td>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges
<table>
<tr><th>Frequency range (MHz)</th><th>Field Strength (μV/m)</th></tr>
<tr><td>30 – 88</td><td>100</td></tr>
<tr><td>88 – 216</td><td>150</td></tr>
<tr><td>216 960</td><td>200</td></tr>
<tr><td>Above 960</td><td>500</td></tr>
</table></td><td>☑</td></tr>
<tr><td>b)</td><td>For non-restricted band, In any 100 kHz 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 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required<br>☒ 20 dB down ☐ 30 dB down</td><td>☑</td></tr>
<tr><td>c)</td><td>or restricted band, emission must also comply with the radiated emission limits specified in 15.209</td><td>☑</td></tr>
</table>

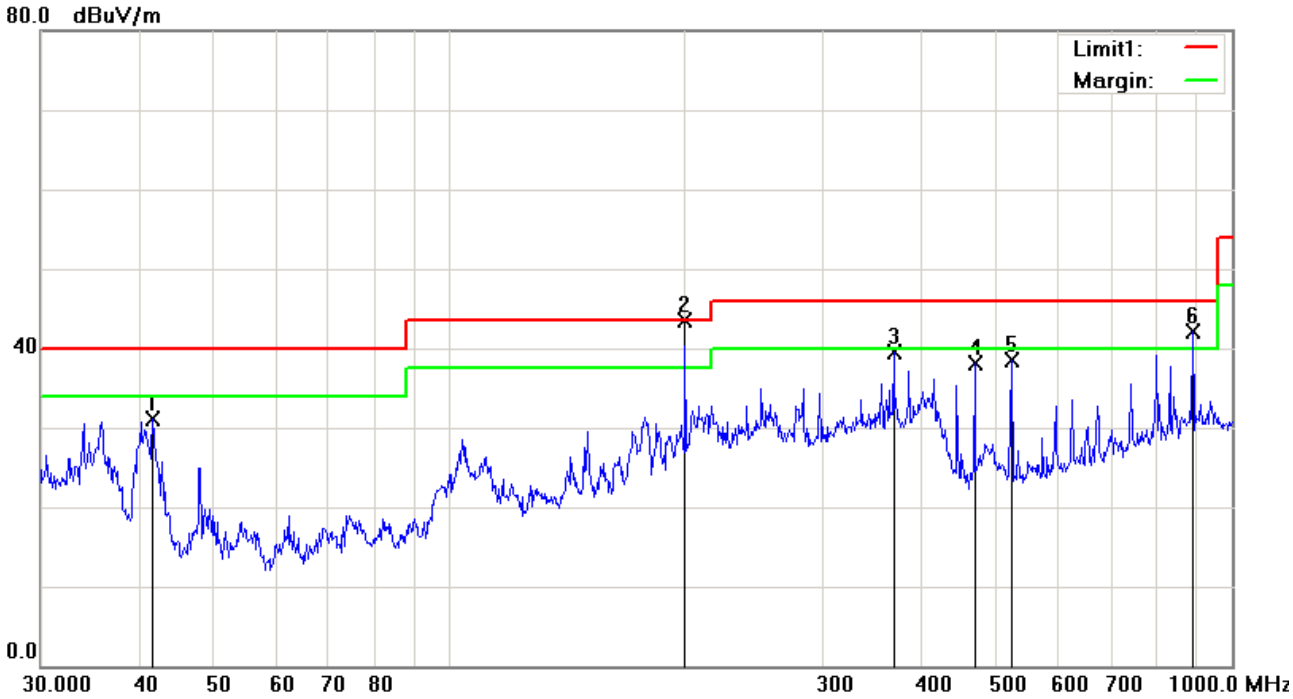
| | |
| --- | --- |
| Test Setup |  |
| Procedure | 1. The EUT was switched on and allowed to warm up to its normal operating condition.<br>2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:<br>a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.<br>b. The EUT was then rotated to the direction that gave the maximum emission.<br>c. Finally, the antenna height was adjusted to the height that gave the maximum emission.<br>3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.<br>4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.<br>The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.<br>5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured. |
| Remark | Different RF configuration has been evaluated but not much difference was found. The data presented here is the worst case data with EUT under 802.11n – HT20-2437MHz mode. |
| Result | ☑ Pass ☐ Fail |

**Test Data** ☑ Yes ☐ N/A

**Test Plot** ☑ Yes (See below) ☐ N/A

| Test Mode: | WIFI Mode |
|---|---|

(Below 1GHz)

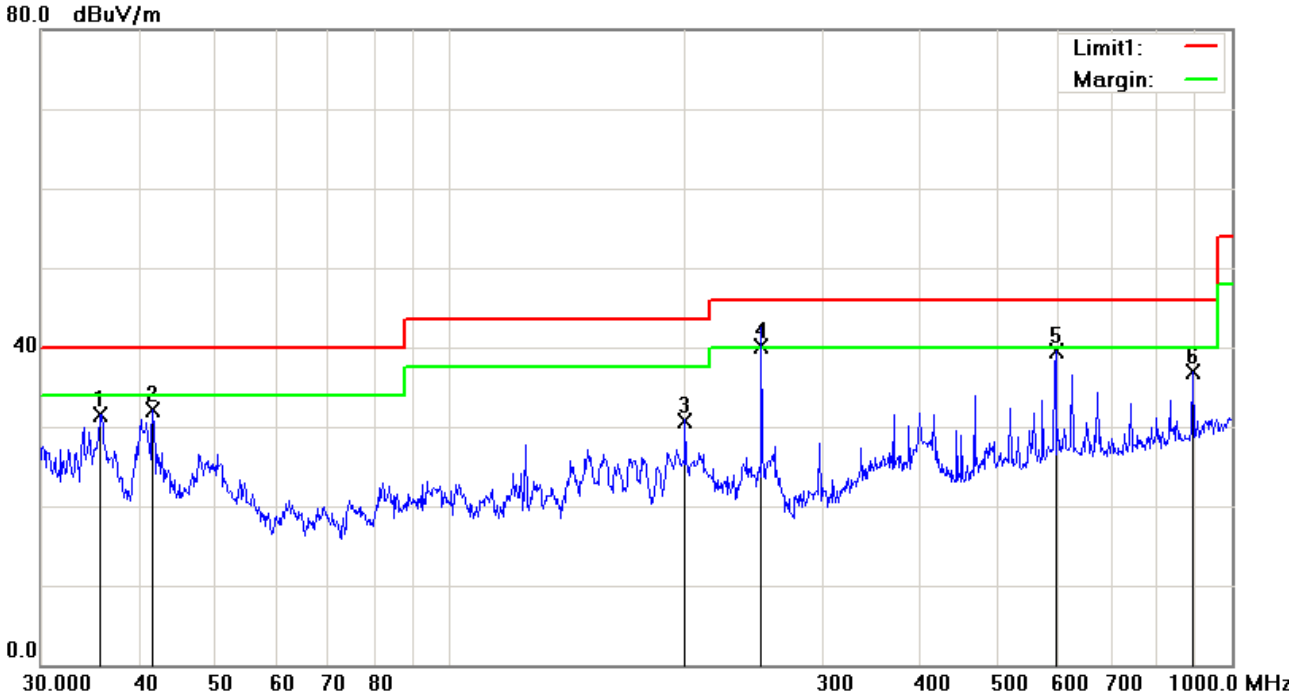



*Test Data*

Vertical Polarity Plot @3m

| No | P/L | Frequency (MHz) | Reading (dBμV) | Detector | Corrected (dB) | Result (dBμV) | Limit (dBμV) | Margin (dB) | Height | Degree |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | V | 41.7130 | 39.84 | peak | -8.73 | 31.11 | 40.00 | -8.89 | 100 | 52 |
| 2 | V | 199.9976 | 52.16 | QP | -8.74 | 43.42 | 43.50 | -0.08 | 100 | 165 |
| 3 | V | 369.4047 | 44.55 | peak | -5.01 | 39.54 | 46.00 | -6.46 | 100 | 289 |
| 4 | V | 468.8762 | 40.64 | peak | -2.55 | 38.09 | 46.00 | -7.91 | 100 | 274 |
| 5 | V | 522.7180 | 39.87 | peak | -1.29 | 38.58 | 46.00 | -7.42 | 100 | 157 |
| 6 | V | 890.1046 | 37.63 | QP | 4.51 | 42.14 | 46.00 | -3.86 | 100 | 165 |

(Below 1GHz)




*Test Data*

Horizontal Polarity Plot @3m

| No | P/L | Frequency (MHz) | Reading (dBμV) | Detector | Corrected (dB) | Result (dBμV) | Limit (dBμV) | Margin (dB) | Height | Degree |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H | 35.7491 | 36.03 | peak | -4.49 | 31.54 | 40.00 | -8.46 | 100 | 65 |
| 2 | H | 41.7130 | 40.82 | peak | -8.73 | 32.09 | 40.00 | -7.91 | 100 | 342 |
| 3 | H | 199.9856 | 39.54 | peak | -8.74 | 30.80 | 43.50 | -12.70 | 100 | 133 |
| 4 | H | 249.9955 | 49.25 | QP | -9.19 | 40.06 | 46.00 | -5.94 | 100 | 192 |
| 5 | H | 595.1329 | 39.49 | peak | -0.07 | 39.42 | 46.00 | -6.58 | 100 | 308 |
| 6 | H | 890.7278 | 32.43 | peak | 4.52 | 36.95 | 46.00 | -9.05 | 100 | 245 |

# Above 1GHz

| Test Mode: | WIFI Mode |
|---|---|

Low Channel (2412 MHz)

| Frequency (MHz) | S.A. Reading (dBμV) | Detector (PK/AV) | Polarity (H/V) | Ant. Factor (dB/m) | Cable Loss (dB) | Pre-Amp. Gain (dB) | Cord Amp. (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 4824 | 38.66 | AV | V | 34 | 6.86 | 31.72 | 47.8 | 54 | -6.20 |
| 4824 | 38.12 | AV | H | 33.8 | 6.86 | 31.72 | 47.06 | 54 | -6.94 |
| 4824 | 46.75 | PK | V | 34 | 6.86 | 31.72 | 55.89 | 74 | -18.11 |
| 4824 | 46.44 | PK | H | 33.8 | 6.86 | 31.72 | 55.38 | 74 | -18.62 |

Middle Channel (2437 MHz)

| Frequency (MHz) | S.A. Reading (dBμV) | Detector (PK/AV) | Polarity (H/V) | Ant. Factor (dB/m) | Cable Loss (dB) | Pre-Amp. Gain (dB) | Cord Amp. (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 4874 | 38.71 | AV | V | 33.6 | 6.82 | 31.82 | 47.31 | 54 | -6.69 |
| 4874 | 38.15 | AV | H | 33.8 | 6.82 | 31.82 | 46.95 | 54 | -7.05 |
| 4874 | 46.68 | PK | V | 33.6 | 6.82 | 31.82 | 55.28 | 74 | -18.72 |
| 4874 | 46.39 | PK | H | 33.8 | 6.82 | 31.82 | 55.19 | 74 | -18.81 |

High Channel (2462 MHz)

| Frequency (MHz) | S.A. Reading (dBμV) | Detector (PK/AV) | Polarity (H/V) | Ant. Factor (dB/m) | Cable Loss (dB) | Pre-Amp. Gain (dB) | Cord Amp. (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 4924 | 38.69 | AV | V | 34.6 | 6.76 | 31.92 | 48.13 | 54 | -5.87 |
| 4924 | 38.42 | AV | H | 34.7 | 6.76 | 31.92 | 47.96 | 54 | -6.04 |
| 4924 | 46.66 | PK | V | 34.6 | 6.76 | 31.92 | 56.1 | 74 | -17.9 |
| 4924 | 46.35 | PK | H | 34.7 | 6.76 | 31.92 | 55.89 | 74 | -18.11 |

Note:

*1, The testing has been conformed to 10*2480MHz=24,800MHz*
*2, All other emissions more than 30 dB below the limit*

# Annex A. TEST INSTRUMENT

| Instrument | Model | Serial # | Cal Date | Cal Due | In use |
| --- | --- | --- | --- | --- | --- |
| **AC Line Conducted** | | | | | |
| EMI test receiver | ESCS30 | 8471241027 | 09/17/2015 | 09/16/2016 | ☑ |
| Line Impedance | LI-125A | 191106 | 09/25/2015 | 09/24/2016 | ☑ |
| Line Impedance | LI-125A | 191107 | 09/25/2015 | 09/24/2016 | ☑ |
| LISN | ISN T800 | 34373 | 09/25/2015 | 09/24/2016 | ☑ |
| Double Ridge Horn Antenna (1 ~18GHz) | AH-118 | 71283 | 09/24/2015 | 09/23/2016 | ☑ |
| Transient Limiter | LIT-153 | 531118 | 09/01/2015 | 08/31/2016 | ☑ |
| **RF conducted test** | | | | | |
| Agilent ESA-E SERIES | E4407B | MY45108319 | 09/17/2015 | 09/16/2016 | ☑ |
| Power Splitter | 1# | 1# | 09/01/2015 | 08/31/2016 | ☑ |
| DC Power Supply | E3640A | MY40004013 | 09/17/2015 | 09/16/2016 | ☑ |
| **Radiated Emissions** | | | | | |
| EMI test receiver | ESL6 | 100262 | 09/17/2015 | 09/16/2016 | ☑ |
| Positioning Controller | UC3000 | MF780208282 | 11/19/2015 | 11/18/2016 | ☑ |
| OPT 010 AMPLIFIER (0.1-1300MHz) | 8447E | 2727A02430 | 09/01/2015 | 08/31/2016 | ☑ |
| Microwave Preamplifier (1 ~ 26.5GHz) | 8449B | 3008A02402 | 03/25/2015 | 03/24/2016 | ☑ |
| Bilog Antenna (30MHz~6GHz) | JB6 | A110712 | 09/21/2015 | 09/20/2016 | ☑ |
| Double Ridge Horn Antenna (1 ~18GHz) | AH-118 | 71283 | 09/24/2015 | 09/23/2016 | ☑ |
| Universal Radio Communication Tester | CMU200 | 121393 | 09/25/2015 | 09/24/2016 | ☑ |

# Annex B. EUT and Test Setup Photographs

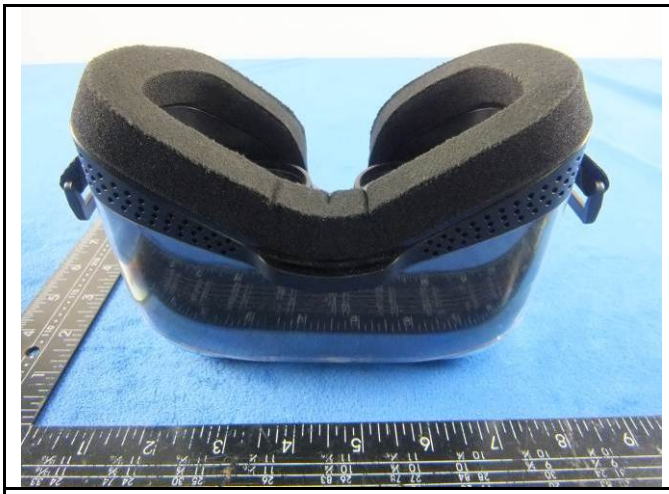
## Annex B.i. Photograph: EUT External Photo

Whole package - Front View

Adapter - Front View

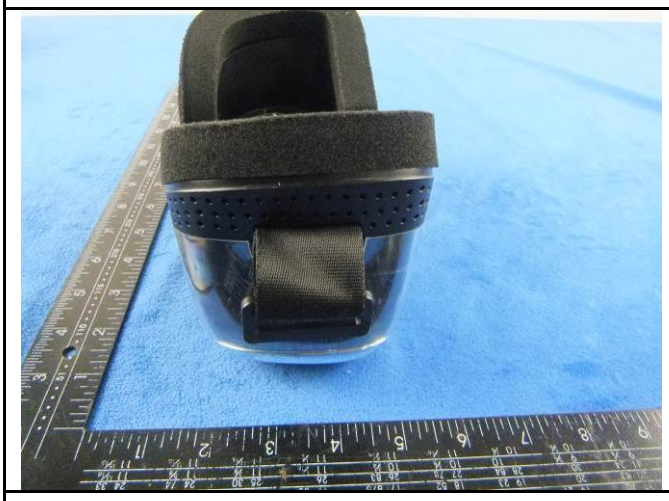
EUT - Front View

EUT - Rear View

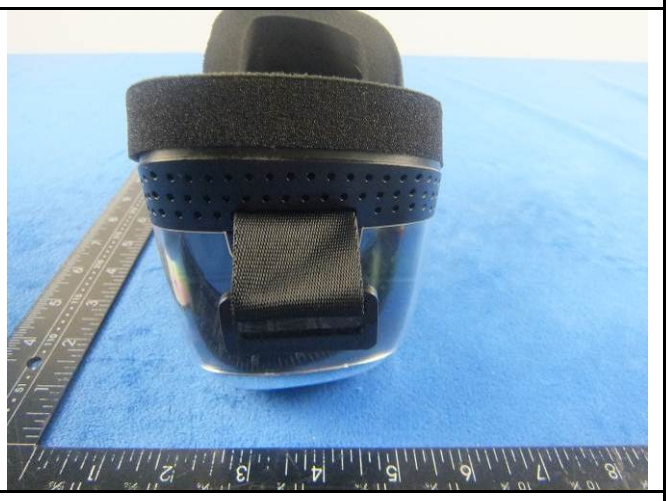


EUT - Top View

EUT - Bottom View



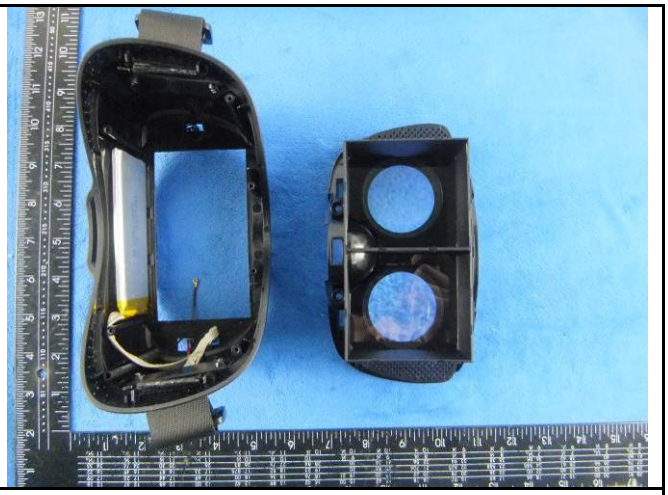
EUT - Left View



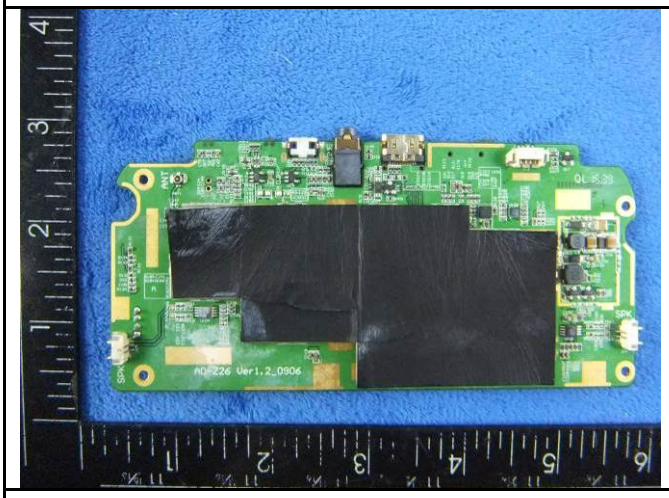
EUT - Right View

## Annex B.ii. Photograph: EUT Internal Photo

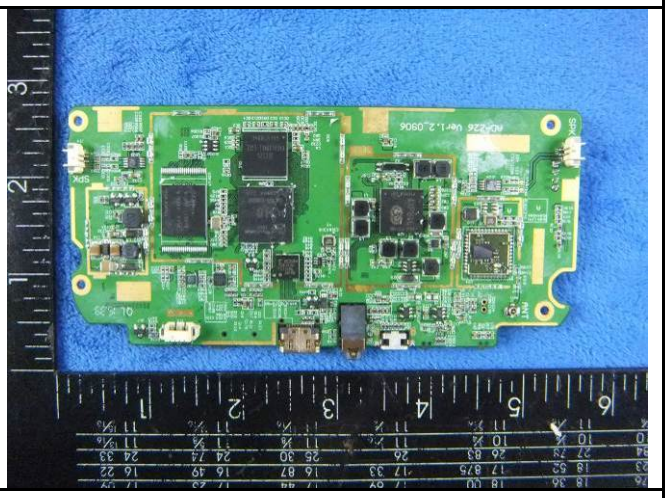
EUT - Uncover Front View 1



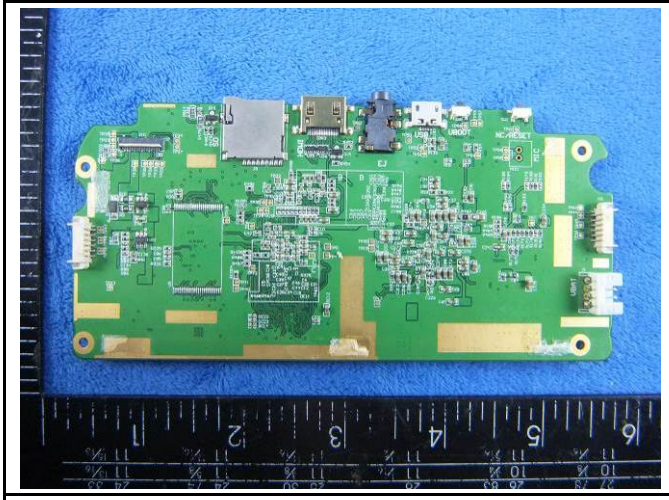
EUT - Uncover Front View 2



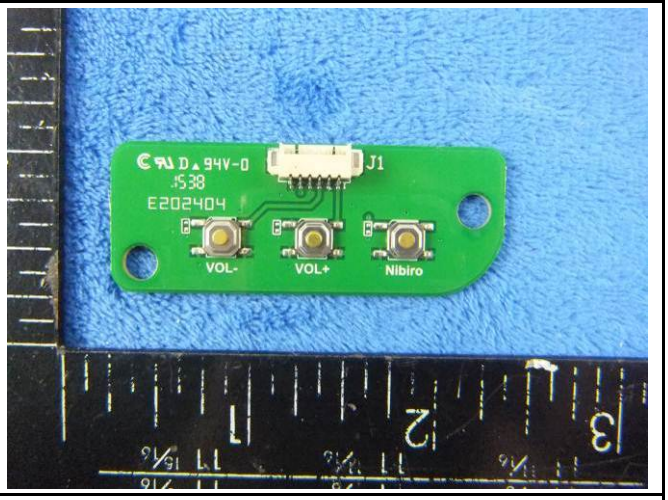
Mainboard with Shielding - Front View



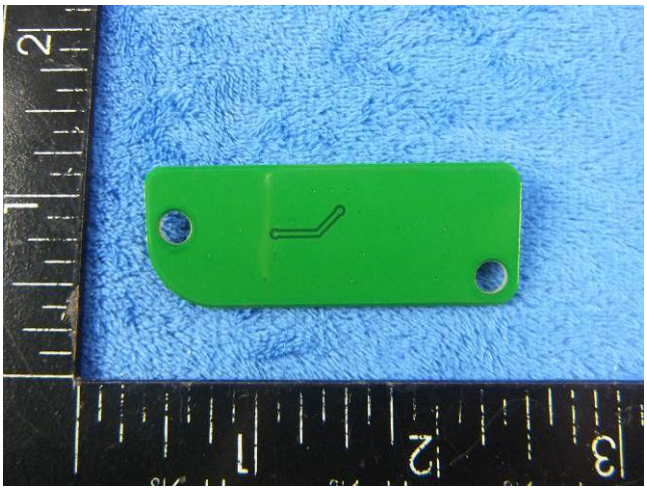
Mainboard without Shielding - Front View



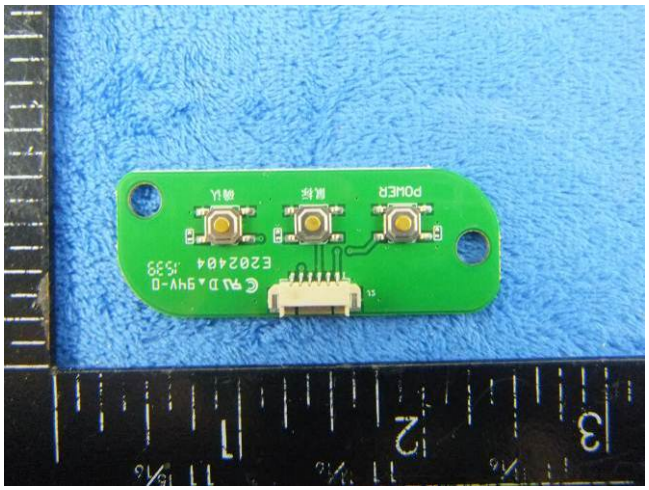
Mainboard - Rear View



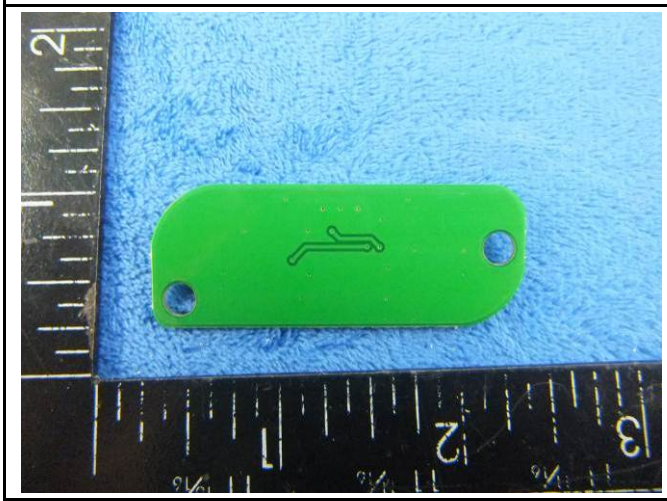

Mini Mainboard 1 - Front View



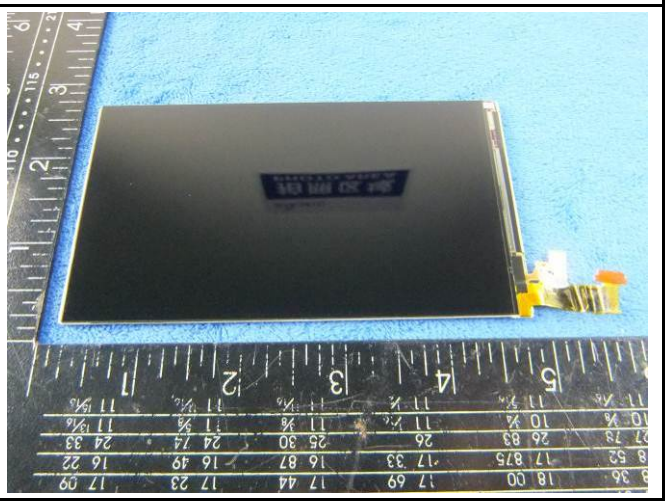
Mini Mainboard 1 -Rear View



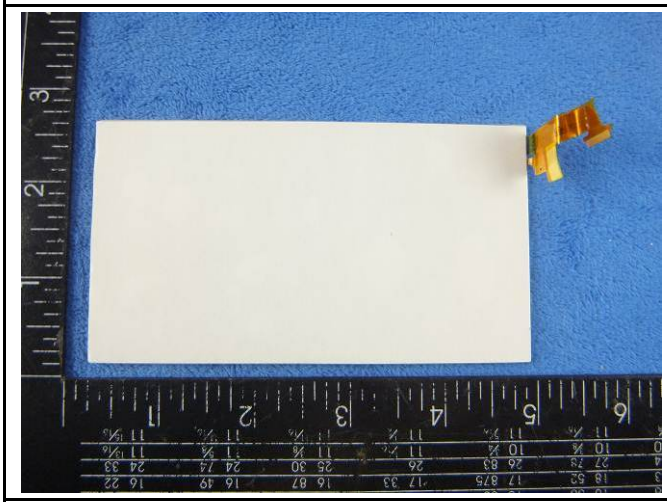

Mini Mainboard 2 - Front View



Mini Mainboard 2 -Rear View

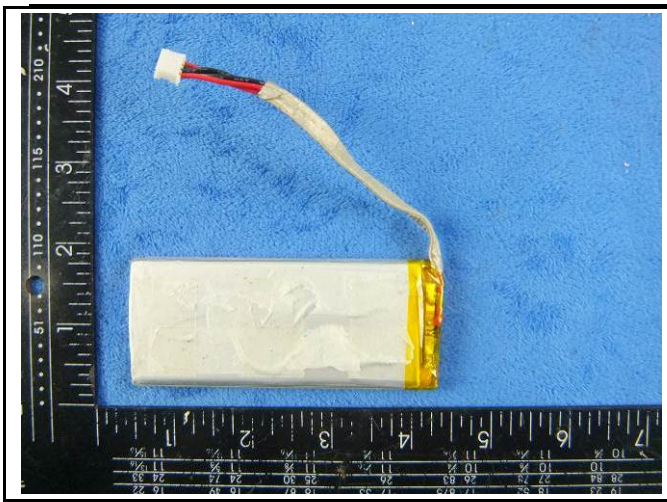
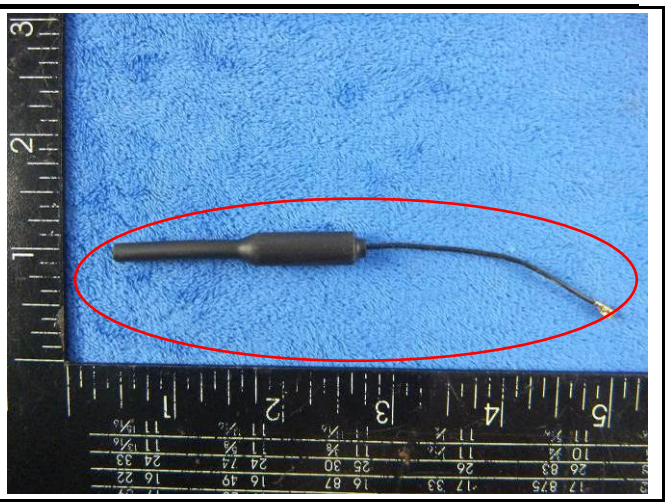


LCD - Front View



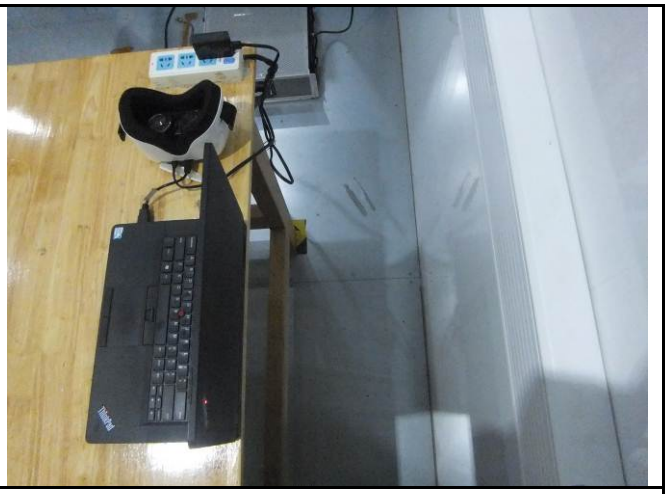
LCD – Rear View

Battery - Front View

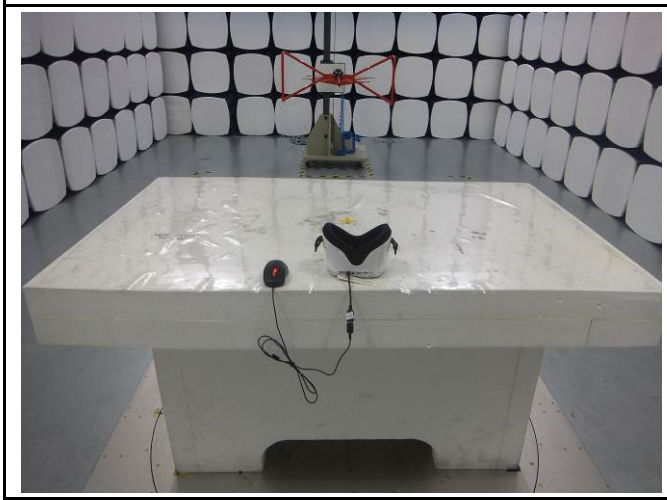
| | |
|---|---|
|  |  |
| Battery - Rear View | BT/BLE/WIFI Antenna View |

## Annex B.iii. Photograph: Test Setup Photo

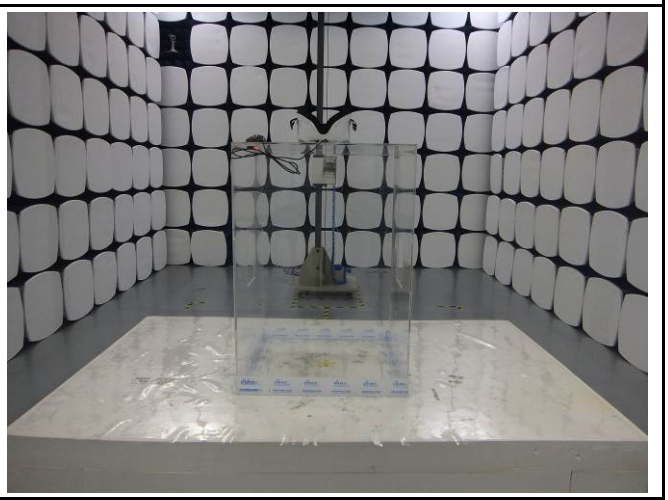
Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz

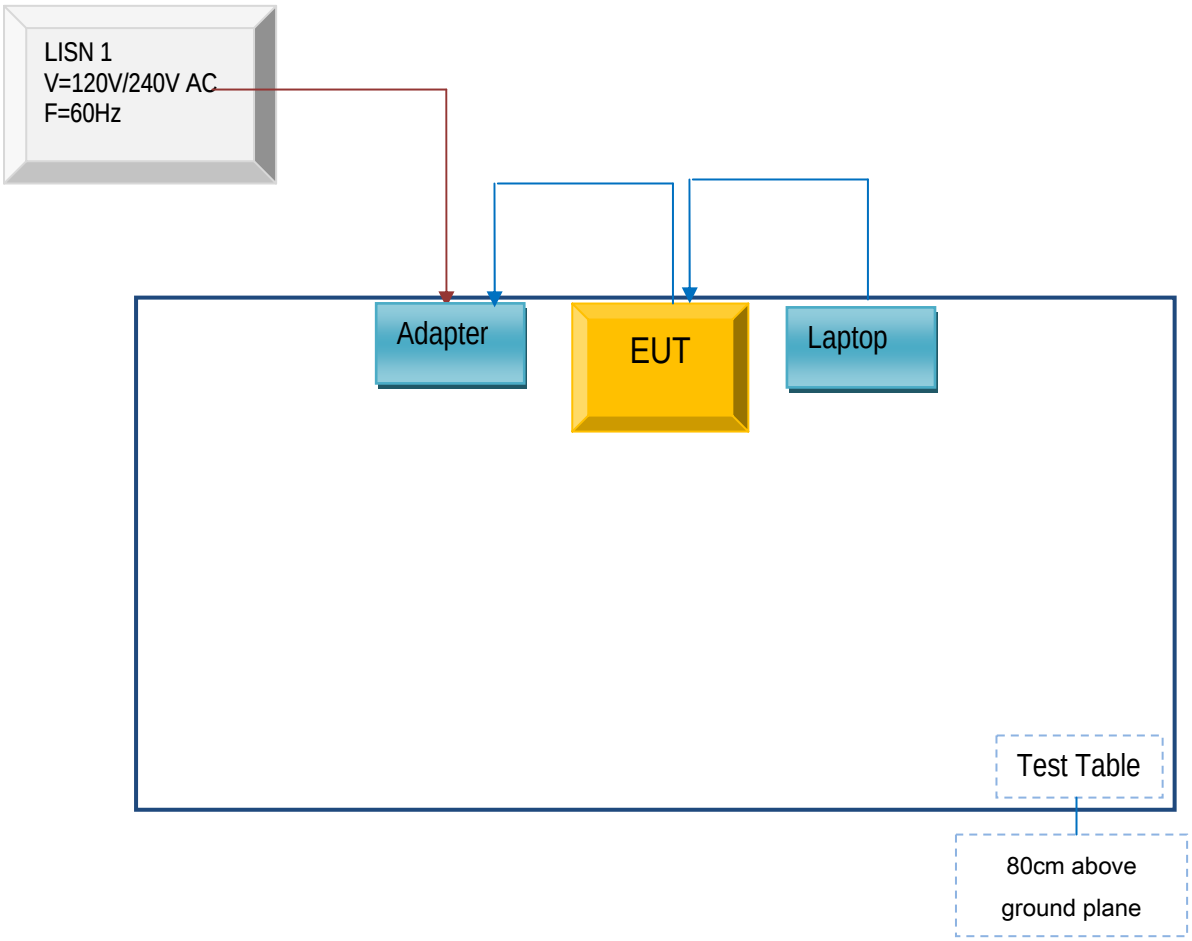


Radiated Spurious Emissions Test Setup Above 1GHz

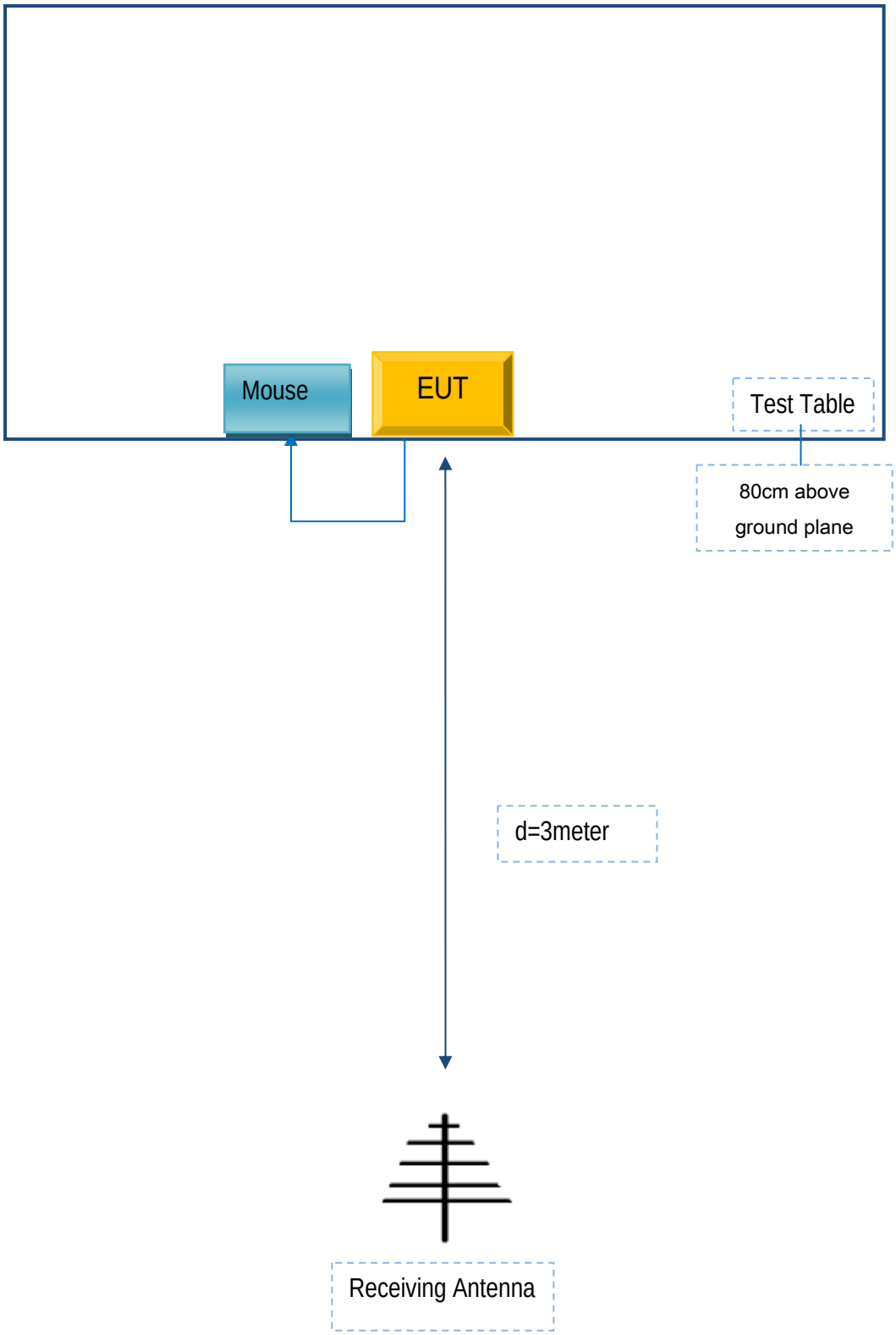
# Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

## Annex C.ii. TEST SET UP BLOCK

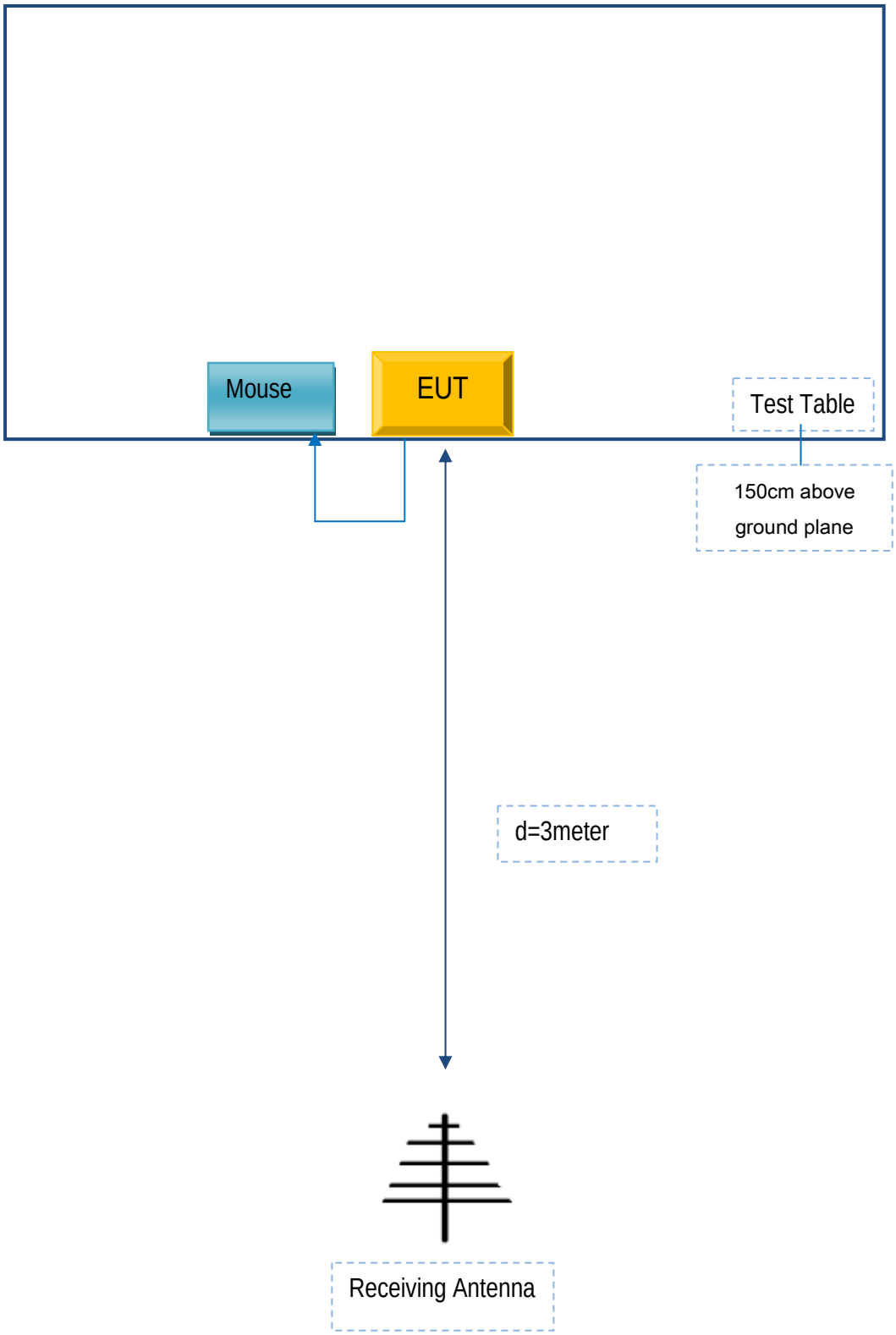
### Block Configuration Diagram for AC Line Conducted Emissions



Block Configuration Diagram for Radiated Emissions （Below 1GHz）.



Block Configuration Diagram for Radiated Emissions （Above 1GHz）.



## Annex C. il. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

### Supporting Equipment:

| Manufacturer | Equipment Description | Model | Serial No |
| --- | --- | --- | --- |
| Lenovo | Lenovo Laptop | E40 | CY1121013521 |
| Sharetronic Data Technology Co., Ltd | Adapter | EP10-050250WUCZ | JT11003 |

### Supporting Cable:

| Cable type | Shield Type | Ferrite Core | Length | Serial No |
| --- | --- | --- | --- | --- |
| USB Cable | Un-shielding | No | 0.8m | JT11003 |

# Annex D. User Manual / Block Diagram / Schematics / Partlist

N/A

# Annex E. DECLARATION OF SIMILARITY

N/A