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# FCC DTS REPORT

## FCC Certification

**Applicant Name:**
LG Electronics MobileComm U.S.A., Inc.

**Address:**
1000 Sylvan Avenue, Englewood Cliffs NJ 07632

**Date of Issue:**
March 27, 2018
**Test Site/Location:**
HCT CO., LTD., 74,Seoicheon-ro 578beon-gil,Majang-myeo,Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
**Report No.:** HCT-RF-1803-FC030

| | |
|---|---|
| **FCC ID** | **: ZNFQ610ZA** |
| **APPLICANT** | **: LG Electronics MobileComm U.S.A., Inc.** |

**According to the Evaluation report, all of the data contained herein is reused from the reference FCC ID : ZNFQ610FA report.**

| | |
|---|---|
| **Model:** | LM-Q610ZA |
| **Additional Model(s):** | LMQ610ZA, Q610ZA, LM-Q610ZAW, LMQ610ZAW, Q610ZAW, LM-Q610ZM, LMQ610ZM, Q610ZM, LM-Q610ZMW, LMQ610ZMW, Q610ZMW |
| **EUT Type:** | GSM/WCDMA/LTE Phone with Bluetooth4.2LE, WIFI802.11 b/g/n |
| **Peak Output Power:** | Wi-Fi 802.11b(21.34 dBm) / Wi-Fi 802.11g (24.87 dBm) / Wi-Fi 802.11n_HT20 (24.75 dBm) |
| **Frequency Range:** | 2412 MHz - 2472 MHz (2.4 GHz Band) |
| **Modulation type:** | CCK/DSSS/OFDM |
| **FCC Classification:** | Digital Transmission System(DTS) |
| **FCC Rule Part(s):** | Part 15.247 |

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

**HCT CO., LTD.** Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

**Report prepared by : Jung Ki Lim**
**Engineer of Telecommunication testing center**

**Approved by : Jong Seok Lee**
**Manager of Telecommunication testing center**

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# Version

| TEST REPORT NO. | DATE | DESCRIPTION |
|---|---|---|
| HCT-RF-1803-FC030 | March 27, 2018 | - First Approval Report |
| | | |
| | | |
| | | |

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# 1. GENERAL INFORMATION

| | |
|---|---|
| **Applicant:** | LG Electronics MobileComm U.S.A., Inc. |
| **Address:** | 1000 Sylvan Avenue, Englewood Cliffs NJ 07632 |
| **FCC ID:** | ZNFQ610ZA |
| **EUT Type:** | GSM/WCDMA/LTE Phone with Bluetooth4.2LE, WIFI802.11 b/g/n |
| **Model:** | LM-Q610ZA |
| **Additional Model(s):** | LMQ610ZA, Q610ZA, LM-Q610ZAW, LMQ610ZAW, Q610ZAW, LM-Q610ZM, LMQ610ZM, Q610ZM, LM-Q610ZMW, LMQ610ZMW, Q610ZMW |
| **Date(s) of Tests:** | February 19, 2018 ~ March 09, 2018 |
| **Place of Tests:** | HCT Co., Ltd.<br>74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea |

# 2. EUT DESCRIPTION

| | | |
|---|---|---|
| **Model** | LM-Q610ZA | |
| **Additional Model(s)** | LMQ610ZA, Q610ZA, LM-Q610ZAW, LMQ610ZAW, Q610ZAW, LM-Q610ZM, LMQ610ZM, Q610ZM, LM-Q610ZMW, LMQ610ZMW, Q610ZMW | |
| **EUT Type** | GSM/WCDMA/LTE Phone with Bluetooth4.2LE, WIFI802.11 b/g/n | |
| **Power Supply** | DC 4.00 V | |
| **Battery Information** | Model: EAC63958401<br>Type: Li-ion Battery | |
| **Frequency Range** | TX: 2412 MHz ~ 2472 MHz<br>RX: 2412 MHz ~ 2472 MHz | |
| **Max. RF Output Power** | Peak | Wi-Fi 802.11b(21.34 dBm) / Wi-Fi 802.11g (24.87 dBm) / Wi-Fi 802.11n_HT20 (24.75 dBm) |
| | Average | Wi-Fi 802.11b(18.40 dBm) / Wi-Fi 802.11g (15.46 dBm) / Wi-Fi 802.11n_HT20 (15.37 dBm) |
| **Modulation Type** | DSSS/CCK(802.11b), OFDM(802.11g, 802.11n) | |
| **Antenna Specification** | Manufacturer: AT&C<br>Antenna type: PIFA<br>Peak Gain : -2.27 dBi | |

# 3. TEST METHODOLOGY

FCC KDB 558074 D01 DTS Meas Guidance v04 dated April 05, 2017 entitled “Guidance for Performing Compliance Measurements on Digital Transmission Systems(DTS) and the measurement procedure described in ANSI C63.10(Version : 2013) ‘the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices’.

## 3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

## 3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

## 3.3 GENERAL TEST PROCEDURES

**Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

**Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3.75 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 of ANSI C63.10. (Version: 2013)

**Conducted Antenna Terminal**

See Section from 9.1 to 9.2.(KDB 558074 v04)

## 3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low, mid and high with highest data rate (worst case) is chosen for full testing.

# 4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.
Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2006).

# 5. FACILITIES AND ACCREDITATIONS

## 5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 07, 2015 (Registration Number: 90661)

## 5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

# 6. ANTENNA REQUIREMENTS

**According to FCC 47 CFR §15.203:**

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antennas of this E.U.T are permanently attached.
*The E.U.T Complies with the requirement of §15.203

# 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

All measurement uncertainty values are shown with a coverage factor of $k$ = 2 to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the $U_{CISPR}$ measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

| Parameter | Expanded Uncertainty (±dB) |
|---|---|
| Conducted Disturbance (150 kHz ~ 30 MHz) | 1.82 |
| Radiated Disturbance (9 kHz ~ 30 MHz) | 3.40 |
| Radiated Disturbance (30 MHz ~ 1 GHz) | 4.80 |
| Radiated Disturbance (1 GHz ~ 18 GHz) | 5.70 |

# 8. SUMMARY TEST OF RESULTS

| Test Description | FCC Part Section(s) | Test Limit | Test Condition | Test Result |
|---|---|---|---|---|
| 6 dB Bandwidth | §15.247(a)(2) | > 500 kHz | CONDUCTED | PASS |
| Conducted Maximum Peak Output Power | §15.247(b)(3) | < 1 Watt | | PASS |
| Power Spectral Density | §15.247(e) | < 8 dBm / 3 kHz Band | | PASS |
| Band Edge(Out of Band Emissions) | §15.247(d) | Conducted > 20 dBc | | PASS |
| AC Power line Conducted Emissions | §15.207 | cf. Section 9.7 | | PASS |
| Radiated Spurious Emissions | §15.205, 15.209 | cf. Section 9.6.1 | RADIATED | PASS |
| Radiated Restricted Band Edge | §15.247(d), 15.205, 15.209 | cf. Section 9.6.2 | | PASS |

# 9. TEST RESULT

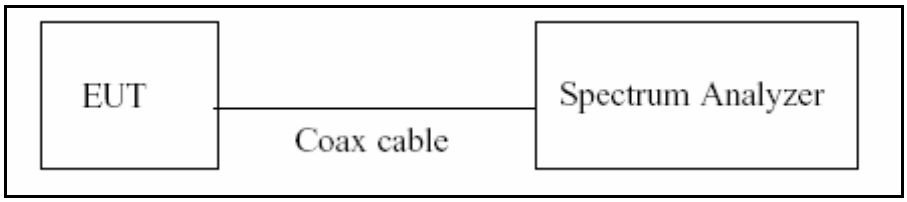
## 9.1 DUTY CYCLE

### ▣ TEST PROCEDURE

According to Section 6.0)b) in KDB 558074 v04

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

### ▣ TEST CONFIGURATION




### ▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. We tested accroding to the zero-span measurement method, 6.0)b) in KDB 558074 v04

The largest availble value of RBW is 8 MHz and VBW is 50 MHz. The zero-span method of measuring duty cycle shall not be used if T ≤ 6.25 microseconds. (50/6.25 = 8)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are > 50/*T*.

1. RBW = 8 MHz (the largest availble value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure $T_{total}$ and $T_{on}$
8. Calculate Duty Cycle = $T_{on}$/ $T_{total}$ and Duty Cycle Factor = 10*log(1/Duty Cycle)

## ▣ Duty Cycle Factor

| Mode | Data Rate | $T_{on}$ (ms) | $T_{total}$ (ms) | Duty Cycle | Duty Cycle Factor (dB) |
|---|---|---|---|---|---|
| b | 1 Mbps | 12.192 | 12.220 | 0.99767600 | 0.010 |
| | 2 Mbps | 6.192 | 6.221 | 0.99534777 | 0.020 |
| | 5.5 Mbps | 2.374 | 2.403 | 0.98801598 | 0.052 |
| | 11 Mbps | 1.283 | 1.312 | 0.97790072 | 0.097 |
| g | 6 Mbps | 2.756 | 2.791 | 0.98741492 | 0.055 |
| | 9 Mbps | 1.844 | 1.880 | 0.98127191 | 0.082 |
| | 12 Mbps | 1.388 | 1.423 | 0.97527048 | 0.109 |
| | 18 Mbps | 0.932 | 0.968 | 0.96292581 | 0.164 |
| | 24 Mbps | 0.704 | 0.740 | 0.95150717 | 0.216 |
| | 36 Mbps | 0.476 | 0.512 | 0.93007616 | 0.315 |
| | 48 Mbps | 0.364 | 0.399 | 0.91228070 | 0.399 |
| | 54 Mbps | 0.324 | 0.360 | 0.90000000 | 0.458 |
| n_HT20 | MCS0_6.5 Mbps | 2.549 | 2.584 | 0.98627322 | 0.060 |
| | MCS1_13 Mbps | 1.288 | 1.324 | 0.97251316 | 0.121 |
| | MCS2_19.5 Mbps | 0.868 | 0.904 | 0.96069067 | 0.174 |
| | MCS3_26 Mbps | 0.656 | 0.692 | 0.94862204 | 0.229 |
| | MCS4_39 Mbps | 0.448 | 0.484 | 0.92617942 | 0.333 |
| | MCS5_52 Mbps | 0.340 | 0.376 | 0.90456070 | 0.436 |
| | MCS6_58.5 Mbps | 0.308 | 0.344 | 0.89648901 | 0.475 |
| | MCS7_65 Mbps | 0.280 | 0.316 | 0.88732488 | 0.519 |

Note : Duty Cycle Factor = 10*log(1/Duty Cycle). where, Duty Cycle = $T_{on}$ / $T_{total}$

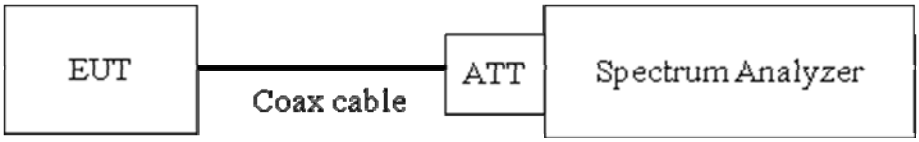
## 9.2 6dB BANDWIDTH

**Test Requirements and limit, §15.247(a)(2)**

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

**The minimum permissible 6dB bandwidth is 500 kHz.**

### ▣ TEST CONFIGURATION




### ▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (Procedure 8.1 in KDB 558074 v04)

RBW = 100 kHz

VBW ≥ 3 x RBW

Detector = Peak

Trace mode = max hold

Sweep = auto couple

Allow the trace to stabilize

Note : We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

## ▣ TEST RESULTS

**Conducted 6dB Bandwidth Measurements for 802.11b**

| 802.11b Mode | | Measured Bandwidth [MHz] | Minimum Bandwidth [MHz] | Pass / Fail |
|---|---|---|---|---|
| Frequency [MHz] | Channel No. | | | |
| 2412 | 1 | 9.598 | 0.500 | Pass |
| 2437 | 6 | 9.572 | 0.500 | Pass |
| 2462 | 11 | 9.597 | 0.500 | Pass |
| 2467 | 12 | 9.615 | 0.500 | Pass |
| 2472 | 13 | 9.096 | 0.500 | Pass |

**Conducted 6dB Bandwidth Measurements for 802.11g**

| 802.11g Mode | | Measured Bandwidth [MHz] | Minimum Bandwidth [MHz] | Pass / Fail |
|---|---|---|---|---|
| Frequency [MHz] | Channel No. | | | |
| 2412 | 1 | 16.09 | 0.5 | Pass |
| 2437 | 6 | 15.13 | 0.5 | Pass |
| 2462 | 11 | 15.75 | 0.5 | Pass |
| 2467 | 12 | 15.79 | 0.5 | Pass |
| 2472 | 13 | 15.14 | 0.5 | Pass |

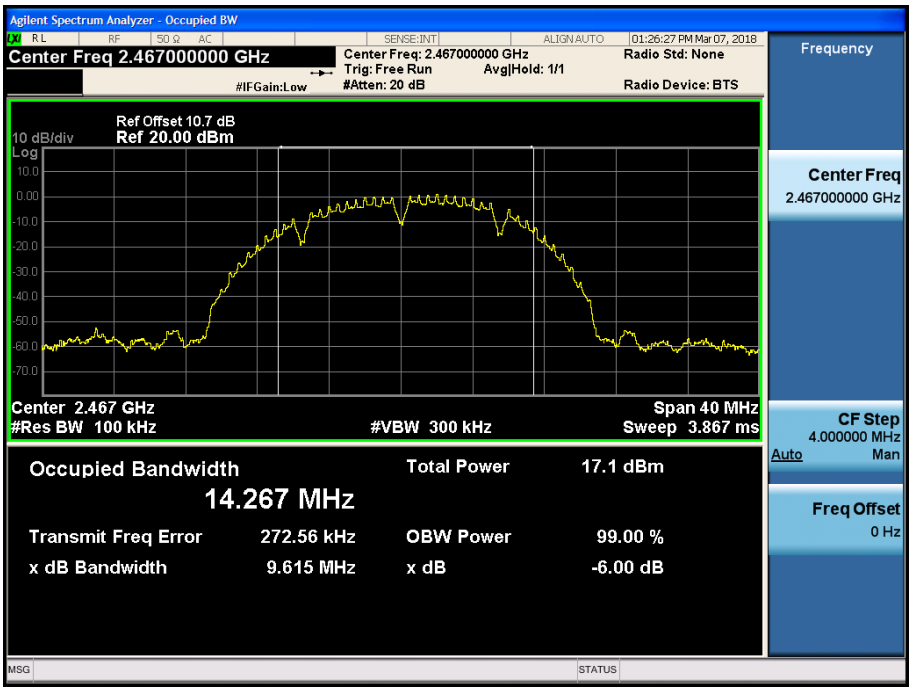
**Conducted 6dB Bandwidth Measurements for 802.11n_HT20**

| 802.11n Mode | | Measured Bandwidth [MHz] | Minimum Bandwidth [MHz] | Pass / Fail |
|---|---|---|---|---|
| Frequency [MHz] | Channel No. | | | |
| 2412 | 1 | 17.05 | 0.5 | Pass |
| 2437 | 6 | 15.10 | 0.5 | Pass |
| 2462 | 11 | 16.34 | 0.5 | Pass |
| 2467 | 12 | 16.38 | 0.5 | Pass |
| 2472 | 13 | 15.44 | 0.5 | Pass |

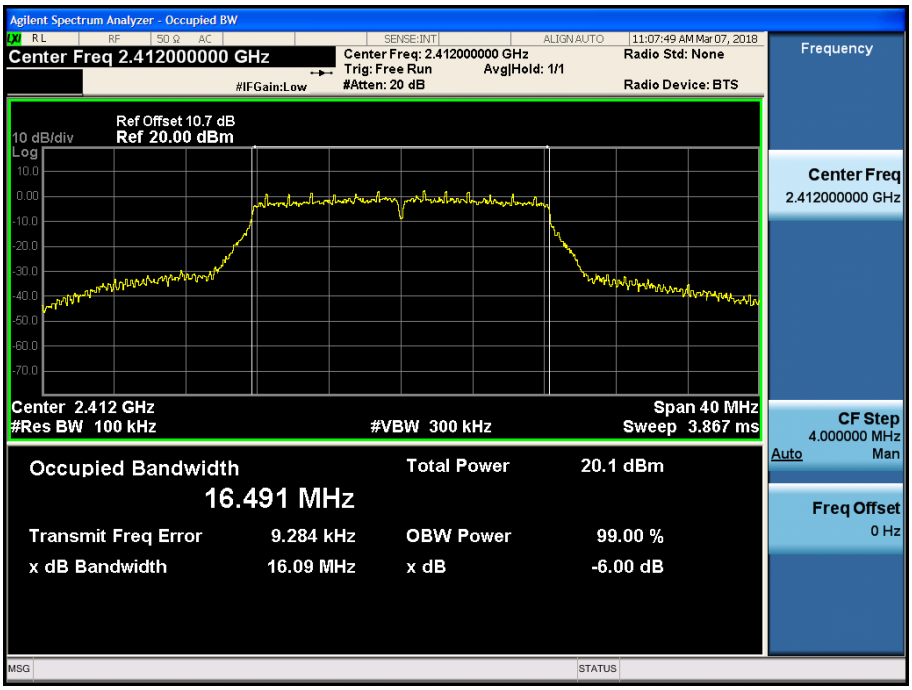
**Note : In order to simplify the report, attached plots were only the most wide 6 dB BW channel.**

## ▣ RESULT PLOTS

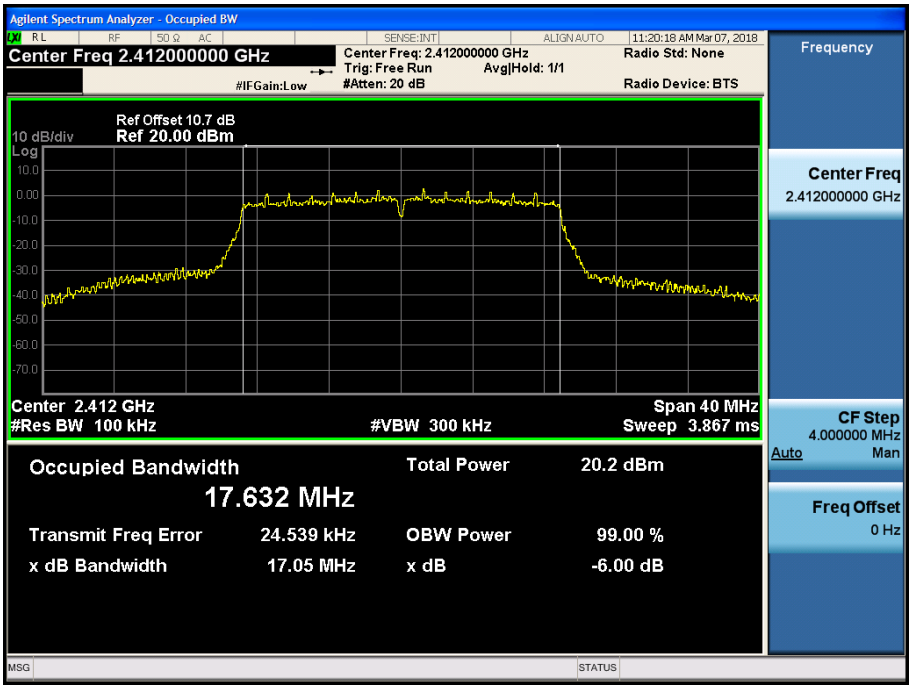
### 6dB Bandwidth plot (802.11b-CH 12)




### 6dB Bandwidth plot (802.11g-CH 1)



## 6dB Bandwidth plot (802.11n_HT20-CH 1)



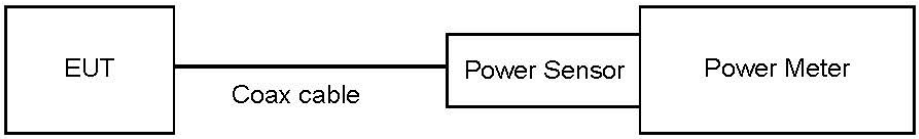
## 9.3 OUTPUT POWER (802.11b/g/n)

**Test Requirements and limit, §15.247(b)(3)**

The transmitter output is connected to the input of an RF power sensor. Measurement is made using a broadband power meter capable of making peak and average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

**The maximum permissible conducted output power is 1 Watt.**

### ▣ TEST CONFIGURATION(20 MHz BW)




### ▣ TEST PROCEDURE(20 MHz BW)

- Peak Power ( Procedure 9.1.2 in KDB 558074 v04)
  1. Measure the peak power of the transmitter.
- Average Power ( Procedure 9.2.3.1 in KDB 558074 v04)
  1. Measure the duty cycle.
  2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
  3. Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Note :

1. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB. So, 10.7 dB is offset for 2.4 GHz Band.
   Actual value of loss for the attenuator and cable combination is below table.

| Band | Frequency[MHz] | Loss[dB] |
|---|---|---|
| 2.4 GHz | 2412 | 10.65 |
| | 2437 | 10.65 |
| | 2462 | 10.66 |

(Actual value of loss for the attenuator and cable combination)

## ▣ TEST RESULTS-Peak

**Conducted Output Power Measurements (802.11b Mode)**

| 802.11b Mode | | Rate [Mbps] | Measured Power[dBm] | Limit [dBm] |
|---|---|---|---|---|
| Frequency[MHz] | Channel No. | | | |
| 2412 | 1 | 1 Mbps | 20.48 | 30 |
| | | 2 Mbps | 20.54 | 30 |
| | | 5.5 Mbps | 20.39 | 30 |
| | | 11 Mbps | 20.42 | 30 |
| 2437 | 6 | 1 Mbps | 21.34 | 30 |
| | | 2 Mbps | 21.28 | 30 |
| | | 5.5 Mbps | 21.17 | 30 |
| | | 11 Mbps | 21.17 | 30 |
| 2462 | 11 | 1 Mbps | 20.80 | 30 |
| | | 2 Mbps | 20.54 | 30 |
| | | 5.5 Mbps | 20.37 | 30 |
| | | 11 Mbps | 20.78 | 30 |
| 2467 | 12 | 1 Mbps | 11.89 | 30 |
| | | 2 Mbps | 11.97 | 30 |
| | | 5.5 Mbps | 11.87 | 30 |
| | | 11 Mbps | 12.03 | 30 |
| 2472 | 13 | 1 Mbps | 11.56 | 30 |
| | | 2 Mbps | 11.65 | 30 |
| | | 5.5 Mbps | 11.55 | 30 |
| | | 11 Mbps | 11.84 | 30 |

**Conducted Output Power Measurements (802.11g Mode)**

| 802.11g Mode | | Rate [Mbps] | Measured Power[dBm] | Limit [dBm] |
|---|---|---|---|---|
| Frequency[MHz] | Channel No. | | | |
| 2412 | 1 | 6 Mbps | 22.63 | 30 |
| | | 9 Mbps | 22.67 | 30 |
| | | 12 Mbps | 23.90 | 30 |
| | | 18 Mbps | 23.40 | 30 |
| | | 24 Mbps | 22.69 | 30 |
| | | 36 Mbps | 22.53 | 30 |
| | | 48 Mbps | 23.76 | 30 |
| | | 54 Mbps | 23.54 | 30 |
| 2437 | 6 | 6 Mbps | 23.62 | 30 |
| | | 9 Mbps | 23.73 | 30 |
| | | 12 Mbps | 24.87 | 30 |
| | | 18 Mbps | 24.65 | 30 |
| | | 24 Mbps | 23.71 | 30 |
| | | 36 Mbps | 23.63 | 30 |
| | | 48 Mbps | 24.81 | 30 |
| | | 54 Mbps | 24.68 | 30 |
| 2462 | 11 | 6 Mbps | 23.06 | 30 |
| | | 9 Mbps | 22.88 | 30 |
| | | 12 Mbps | 24.66 | 30 |
| | | 18 Mbps | 24.67 | 30 |
| | | 24 Mbps | 22.95 | 30 |
| | | 36 Mbps | 22.65 | 30 |
| | | 48 Mbps | 24.73 | 30 |
| | | 54 Mbps | 24.59 | 30 |
| 2467 | 12 | 6 Mbps | 18.09 | 30 |
| | | 9 Mbps | 17.73 | 30 |
| | | 12 Mbps | 19.14 | 30 |
| | | 18 Mbps | 18.20 | 30 |
| | | 24 Mbps | 17.63 | 30 |
| | | 36 Mbps | 17.56 | 30 |
| | | 48 Mbps | 18.31 | 30 |
| | | 54 Mbps | 18.64 | 30 |
| 2472 | 13 | 6 Mbps | 17.64 | 30 |
| | | 9 Mbps | 17.40 | 30 |
| | | 12 Mbps | 17.78 | 30 |
| | | 18 Mbps | 17.79 | 30 |
| | | 24 Mbps | 17.69 | 30 |
| | | 36 Mbps | 17.70 | 30 |
| | | 48 Mbps | 17.88 | 30 |
| | | 54 Mbps | 17.88 | 30 |

**Conducted Output Power Measurements (802.11n_HT20 Mode)**

| 802.11n Mode | | MCS Index | Measured Power[dBm] | Limit [dBm] |
|---|---|---|---|---|
| Frequency [MHz] | Channel No. | | | |
| 2412 | 1 | MCS0_6.5 Mbps | 22.54 | 30 |
| | | MCS1_13 Mbps | 22.90 | 30 |
| | | MCS2_19.5 Mbps | 22.79 | 30 |
| | | MCS3_26 Mbps | 23.10 | 30 |
| | | MCS4_39 Mbps | 22.36 | 30 |
| | | MCS5_52 Mbps | 23.55 | 30 |
| | | MCS6_58.5 Mbps | 23.81 | 30 |
| | | MCS7_65 Mbps | 24.48 | 30 |
| 2437 | 6 | MCS0_6.5 Mbps | 23.84 | 30 |
| | | MCS1_13 Mbps | 23.70 | 30 |
| | | MCS2_19.5 Mbps | 23.59 | 30 |
| | | MCS3_26 Mbps | 23.66 | 30 |
| | | MCS4_39 Mbps | 23.67 | 30 |
| | | MCS5_52 Mbps | 24.67 | 30 |
| | | MCS6_58.5 Mbps | 24.75 | 30 |
| | | MCS7_65 Mbps | 24.65 | 30 |
| 2462 | 11 | MCS0_6.5 Mbps | 22.72 | 30 |
| | | MCS1_13 Mbps | 23.04 | 30 |
| | | MCS2_19.5 Mbps | 22.91 | 30 |
| | | MCS3_26 Mbps | 23.01 | 30 |
| | | MCS4_39 Mbps | 22.68 | 30 |
| | | MCS5_52 Mbps | 24.68 | 30 |
| | | MCS6_58.5 Mbps | 24.72 | 30 |
| | | MCS7_65 Mbps | 24.44 | 30 |
| 2467 | 12 | MCS0_6.5 Mbps | 17.78 | 30 |
| | | MCS1_13 Mbps | 17.61 | 30 |
| | | MCS2_19.5 Mbps | 17.59 | 30 |
| | | MCS3_26 Mbps | 17.72 | 30 |
| | | MCS4_39 Mbps | 17.69 | 30 |
| | | MCS5_52 Mbps | 18.38 | 30 |
| | | MCS6_58.5 Mbps | 18.20 | 30 |
| | | MCS7_65 Mbps | 18.23 | 30 |
| 2472 | 13 | MCS0_6.5 Mbps | 17.41 | 30 |
| | | MCS1_13 Mbps | 16.93 | 30 |
| | | MCS2_19.5 Mbps | 16.98 | 30 |
| | | MCS3_26 Mbps | 16.94 | 30 |
| | | MCS4_39 Mbps | 17.32 | 30 |
| | | MCS5_52 Mbps | 17.62 | 30 |
| | | MCS6_58.5 Mbps | 17.51 | 30 |
| | | MCS7_65 Mbps | 18.38 | 30 |

## ▣ TEST RESULTS-Average

**Conducted Output Power Measurements (802.11b Mode)**

| 802.11b Mode | | Rate [Mbps] | Measured Power[dBm] | Duty Cycle Factor [dB] | Measured Power(dBm) + Duty Cycle Factor[dB] | Limit [dBm] |
|---|---|---|---|---|---|---|
| Frequency [MHz] | Channel No. | | | | | |
| 2412 | 1 | 1 Mbps | 17.47 | 0.010 | 17.48 | 30 |
| | | 2 Mbps | 17.49 | 0.020 | 17.51 | 30 |
| | | 5.5 Mbps | 17.55 | 0.052 | 17.60 | 30 |
| | | 11 Mbps | 17.44 | 0.097 | 17.54 | 30 |
| 2437 | 6 | 1 Mbps | 18.34 | 0.010 | 18.35 | 30 |
| | | 2 Mbps | 18.23 | 0.020 | 18.25 | 30 |
| | | 5.5 Mbps | 18.34 | 0.052 | 18.40 | 30 |
| | | 11 Mbps | 18.19 | 0.097 | 18.28 | 30 |
| 2462 | 11 | 1 Mbps | 17.78 | 0.010 | 17.79 | 30 |
| | | 2 Mbps | 17.46 | 0.020 | 17.48 | 30 |
| | | 5.5 Mbps | 17.56 | 0.052 | 17.61 | 30 |
| | | 11 Mbps | 17.79 | 0.097 | 17.89 | 30 |
| 2467 | 12 | 1 Mbps | 9.45 | 0.010 | 9.46 | 30 |
| | | 2 Mbps | 9.48 | 0.020 | 9.51 | 30 |
| | | 5.5 Mbps | 9.44 | 0.052 | 9.49 | 30 |
| | | 11 Mbps | 9.39 | 0.097 | 9.48 | 30 |
| 2472 | 13 | 1 Mbps | 8.98 | 0.010 | 8.99 | 30 |
| | | 2 Mbps | 8.99 | 0.020 | 9.01 | 30 |
| | | 5.5 Mbps | 8.96 | 0.052 | 9.01 | 30 |
| | | 11 Mbps | 8.90 | 0.097 | 9.00 | 30 |

**Conducted Output Power Measurements (802.11g Mode)**

| 802.11g Mode | | Rate [Mbps] | Measured Power[dBm] | Duty Cycle Factor [dB] | Measured Power(dBm) + Duty Cycle Factor[dB] | Limit [dBm] |
|---|---|---|---|---|---|---|
| Frequency [MHz] | Channel No. | | | | | |
| 2412 | 1 | 6 Mbps | 12.93 | 0.055 | 12.98 | 30 |
| | | 9 Mbps | 12.89 | 0.082 | 12.97 | 30 |
| | | 12 Mbps | 12.88 | 0.109 | 12.98 | 30 |
| | | 18 Mbps | 12.83 | 0.164 | 13.00 | 30 |
| | | 24 Mbps | 12.77 | 0.216 | 12.98 | 30 |
| | | 36 Mbps | 12.66 | 0.315 | 12.98 | 30 |
| | | 48 Mbps | 12.58 | 0.399 | 12.98 | 30 |
| | | 54 Mbps | 12.53 | 0.458 | 12.99 | 30 |
| 2437 | 6 | 6 Mbps | 14.98 | 0.055 | 15.03 | 30 |
| | | 9 Mbps | 15.12 | 0.082 | 15.21 | 30 |
| | | 12 Mbps | 15.32 | 0.109 | 15.43 | 30 |
| | | 18 Mbps | 15.29 | 0.164 | 15.46 | 30 |
| | | 24 Mbps | 14.96 | 0.216 | 15.18 | 30 |
| | | 36 Mbps | 14.87 | 0.315 | 15.19 | 30 |
| | | 48 Mbps | 15.03 | 0.399 | 15.43 | 30 |
| | | 54 Mbps | 15.00 | 0.458 | 15.46 | 30 |
| 2462 | 11 | 6 Mbps | 13.05 | 0.055 | 13.10 | 30 |
| | | 9 Mbps | 13.02 | 0.082 | 13.11 | 30 |
| | | 12 Mbps | 13.12 | 0.109 | 13.23 | 30 |
| | | 18 Mbps | 13.08 | 0.164 | 13.24 | 30 |
| | | 24 Mbps | 12.91 | 0.216 | 13.13 | 30 |
| | | 36 Mbps | 12.83 | 0.315 | 13.14 | 30 |
| | | 48 Mbps | 12.85 | 0.399 | 13.25 | 30 |
| | | 54 Mbps | 12.81 | 0.458 | 13.27 | 30 |
| 2467 | 12 | 6 Mbps | 6.49 | 0.055 | 6.55 | 30 |
| | | 9 Mbps | 6.33 | 0.082 | 6.41 | 30 |
| | | 12 Mbps | 6.62 | 0.109 | 6.73 | 30 |
| | | 18 Mbps | 6.58 | 0.164 | 6.74 | 30 |
| | | 24 Mbps | 6.23 | 0.216 | 6.45 | 30 |
| | | 36 Mbps | 6.18 | 0.315 | 6.50 | 30 |
| | | 48 Mbps | 6.32 | 0.399 | 6.72 | 30 |
| | | 54 Mbps | 6.29 | 0.458 | 6.75 | 30 |
| 2472 | 13 | 6 Mbps | 6.05 | 0.055 | 6.10 | 30 |
| | | 9 Mbps | 6.05 | 0.082 | 6.14 | 30 |
| | | 12 Mbps | 6.24 | 0.109 | 6.35 | 30 |
| | | 18 Mbps | 6.20 | 0.164 | 6.36 | 30 |
| | | 24 Mbps | 6.02 | 0.216 | 6.24 | 30 |
| | | 36 Mbps | 6.00 | 0.315 | 6.32 | 30 |
| | | 48 Mbps | 5.91 | 0.399 | 6.31 | 30 |
| | | 54 Mbps | 5.87 | 0.458 | 6.33 | 30 |

**Conducted Output Power Measurements (802.11n_HT20 Mode)**

| 802.11n Mode | | MCS Index | Measured Power[dBm] | Duty Cycle Factor [dB] | Measured Power(dBm) + Duty Cycle Factor[dB] | Limit [dBm] |
|---|---|---|---|---|---|---|
| Frequency [MHz] | Channel No. | | | | | |
| 2412 | 1 | MCS0_6.5 Mbps | 12.92 | 0.060 | 12.98 | 30 |
| | | MCS1_13 Mbps | 12.87 | 0.121 | 13.00 | 30 |
| | | MCS2_19.5 Mbps | 12.83 | 0.174 | 13.00 | 30 |
| | | MCS3_26 Mbps | 12.77 | 0.229 | 13.00 | 30 |
| | | MCS4_39 Mbps | 12.68 | 0.333 | 13.01 | 30 |
| | | MCS5_52 Mbps | 12.56 | 0.436 | 13.00 | 30 |
| | | MCS6_58.5 Mbps | 12.55 | 0.475 | 13.02 | 30 |
| | | MCS7_65 Mbps | 12.50 | 0.519 | 13.01 | 30 |
| 2437 | 6 | MCS0_6.5 Mbps | 15.02 | 0.060 | 15.08 | 30 |
| | | MCS1_13 Mbps | 14.95 | 0.121 | 15.07 | 30 |
| | | MCS2_19.5 Mbps | 14.90 | 0.174 | 15.07 | 30 |
| | | MCS3_26 Mbps | 14.85 | 0.229 | 15.08 | 30 |
| | | MCS4_39 Mbps | 14.76 | 0.333 | 15.09 | 30 |
| | | MCS5_52 Mbps | 14.91 | 0.436 | 15.35 | 30 |
| | | MCS6_58.5 Mbps | 14.89 | 0.475 | 15.36 | 30 |
| | | MCS7_65 Mbps | 14.85 | 0.519 | 15.37 | 30 |
| 2462 | 11 | MCS0_6.5 Mbps | 13.09 | 0.060 | 13.15 | 30 |
| | | MCS1_13 Mbps | 13.05 | 0.121 | 13.17 | 30 |
| | | MCS2_19.5 Mbps | 13.00 | 0.174 | 13.17 | 30 |
| | | MCS3_26 Mbps | 12.94 | 0.229 | 13.17 | 30 |
| | | MCS4_39 Mbps | 12.85 | 0.333 | 13.18 | 30 |
| | | MCS5_52 Mbps | 12.85 | 0.436 | 13.28 | 30 |
| | | MCS6_58.5 Mbps | 12.80 | 0.475 | 13.28 | 30 |
| | | MCS7_65 Mbps | 12.79 | 0.519 | 13.31 | 30 |
| 2467 | 12 | MCS0_6.5 Mbps | 6.54 | 0.060 | 6.60 | 30 |
| | | MCS1_13 Mbps | 6.48 | 0.121 | 6.60 | 30 |
| | | MCS2_19.5 Mbps | 6.47 | 0.174 | 6.64 | 30 |
| | | MCS3_26 Mbps | 6.38 | 0.229 | 6.61 | 30 |
| | | MCS4_39 Mbps | 6.29 | 0.333 | 6.62 | 30 |
| | | MCS5_52 Mbps | 6.27 | 0.436 | 6.71 | 30 |
| | | MCS6_58.5 Mbps | 6.25 | 0.475 | 6.72 | 30 |
| | | MCS7_65 Mbps | 6.21 | 0.519 | 6.73 | 30 |
| 2472 | 13 | MCS0_6.5 Mbps | 6.03 | 0.060 | 6.09 | 30 |
| | | MCS1_13 Mbps | 5.99 | 0.121 | 6.11 | 30 |
| | | MCS2_19.5 Mbps | 5.94 | 0.174 | 6.11 | 30 |
| | | MCS3_26 Mbps | 5.88 | 0.229 | 6.11 | 30 |
| | | MCS4_39 Mbps | 5.80 | 0.333 | 6.14 | 30 |
| | | MCS5_52 Mbps | 5.72 | 0.436 | 6.16 | 30 |
| | | MCS6_58.5 Mbps | 5.69 | 0.475 | 6.17 | 30 |
| | | MCS7_65 Mbps | 5.65 | 0.519 | 6.17 | 30 |

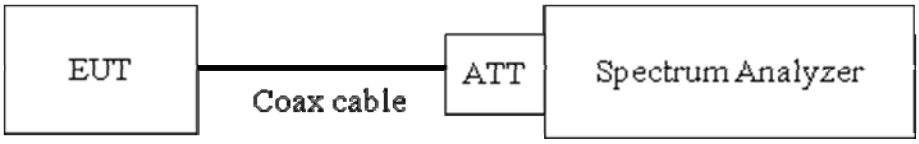
## 9.4 POWER SPECTRAL DENSITY (802.11b/g/n)

**Test Requirements and limit, §15.247(e)**

The peak power spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

**Minimum Standard – 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 CONFIGURATION




### ▣ TEST PROCEDURE

We tested according to Procedure 10.2 in KDB 558074 v04

The spectrum analyzer is set to :

Set analyzer center frequency to DTS channel center frequency.

Span = 1.5 times the DTS channel bandwidth.

RBW = 3 kHz ≤ RBW ≤ 100 kHz.

VBW ≥ 3 x RBW.

Sweep = auto couple

Detector = peak

Trace Mode = max hold

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### ▣ Sample Calculation

PSD = Reading Value + ATT loss + Cable loss(1 ea)

Output Power = -5 dBm + 10 dB + 0.8 dB = 5.8 dBm

Note :

1. Spectrum reading values are not plot data. The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss

3. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB. So, 10.7 dB is offset for 2.4 GHz Band.
   Actual value of loss for the attenuator and cable combination is below table.

| Band | Frequency(MHz) | Loss(dB) |
|---|---|---|
| 2.4 GHz | 2412 | 10.65 |
| | 2437 | 10.65 |
| | 2462 | 10.66 |

(Actual value of loss for the attenuator and cable combination)

## ▣ TEST RESULTS

**Conducted Power Density Measurements**

| Frequency [MHz] | Channel No. | Mode | Test Result | | |
|---|---|---|---|---|---|
| | | | PSD [dBm] | Limit [dBm] | Pass/Fail |
| 2412 | 1 | 802.11b | -5.809 | 8 | Pass |
| 2437 | 6 | | -1.974 | 8 | Pass |
| 2462 | 11 | | -5.538 | 8 | Pass |
| 2467 | 12 | | -13.173 | 8 | Pass |
| 2472 | 13 | | -13.908 | 8 | Pass |
| 2412 | 1 | 802.11g | -11.829 | 8 | Pass |
| 2437 | 6 | | -8.540 | 8 | Pass |
| 2462 | 11 | | -11.689 | 8 | Pass |
| 2467 | 12 | | -17.822 | 8 | Pass |
| 2472 | 13 | | -18.256 | 8 | Pass |
| 2412 | 1 | 802.11n _HT20 | -11.256 | 8 | Pass |
| 2437 | 6 | | -9.382 | 8 | Pass |
| 2462 | 11 | | -12.013 | 8 | Pass |
| 2467 | 12 | | -17.692 | 8 | Pass |
| 2472 | 13 | | -17.761 | 8 | Pass |

**Note : In order to simplify the report, attached plots were only the highest PSD channel.**

## ▣ RESULT PLOTS

### Power Spectral Density (802.11b-CH 6)

### Power Spectral Density (802.11g-CH 6)

## Power Spectral Density (802.11n_HT20 -CH 6)

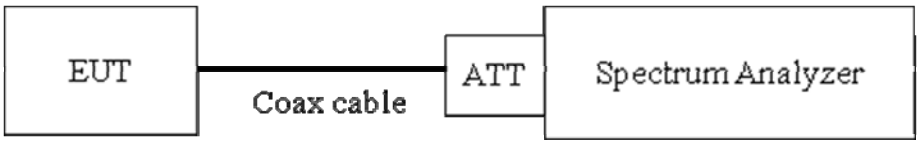
**9.5 OUT OF BAND EMISSIONS AT THE BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS**

**Test Requirements and limit, §15.247(d)**

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

**Limit : 20 dBc**

**▣ TEST CONFIGURATION**




**▣ TEST PROCEDURE**

The transmitter output is connected to the spectrum analyzer. (Procedure 11.0 in KDB 558074 v04)

RBW = 100 kHz

VBW ≥ 3 x RBW

Set span to encompass the spectrum to be examined

Detector = Peak

Trace Mode = max hold

Sweep time = auto couple

Ensure that the number of measurement points ≥ Span/RBW

Allow trace to fully stabilize.

Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 10th harmonic range with the transmitter set to the lowest, middle, and highest channels.

Note :

1. The maximum peak conducted output power procedure was used to demonstrate compliance as described in 9.1(KDB558074 v04), so the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band

peak PSD level in 100 kHz (i.e., 20 dBc).

2. The band edge results in plot is already including the actual values of loss for the attenuator and cable combination.
3. Spectrum offset = Attenuator loss + Cable loss
4. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB. So, 10.7 dB is offset for 2.4 GHz Band. Actual value of loss for the attenuator and cable combination is below table.

| Band | Frequency(MHz) | Loss(dB) |
|---|---|---|
| 2.4 GHz | 2412 | 10.65 |
| | 2437 | 10.65 |
| | 2462 | 10.66 |

(Actual value of loss for the attenuator and cable combination)

5. In case of conducted spurious emissions test, please check factors blow table.
6. In order to simplify the report, attached plots were only the worst case channel.

## ▣ FACTORS FOR FREQUENCY

| Freq(MHz) | Factor(dB) |
|---|---|
| 30 | 11.30 |
| 100 | 9.83 |
| 200 | 10.19 |
| 300 | 10.13 |
| 400 | 10.23 |
| 500 | 10.25 |
| 600 | 10.32 |
| 700 | 10.35 |
| 800 | 10.35 |
| 900 | 10.34 |
| 1000 | 10.39 |
| 2000 | 10.64 |
| 2400* | 10.65 |
| 2500* | 10.67 |
| 3000 | 10.68 |
| 4000 | 10.89 |
| 5000 | 11.07 |
| 6000 | 11.06 |
| 7000 | 11.35 |

| | |
|---|---|
| 8000 | 11.32 |
| 9000 | 11.48 |
| 10000 | 11.56 |
| 11000 | 11.56 |
| 12000 | 11.68 |
| 13000 | 11.83 |
| 14000 | 11.90 |
| 15000 | 11.98 |
| 16000 | 12.04 |
| 17000 | 12.02 |
| 18000 | 12.08 |
| 19000 | 12.07 |
| 20000 | 12.14 |
| 21000 | 12.17 |
| 22000 | 12.31 |
| 23000 | 12.60 |
| 24000 | 12.34 |
| 25000 | 12.53 |

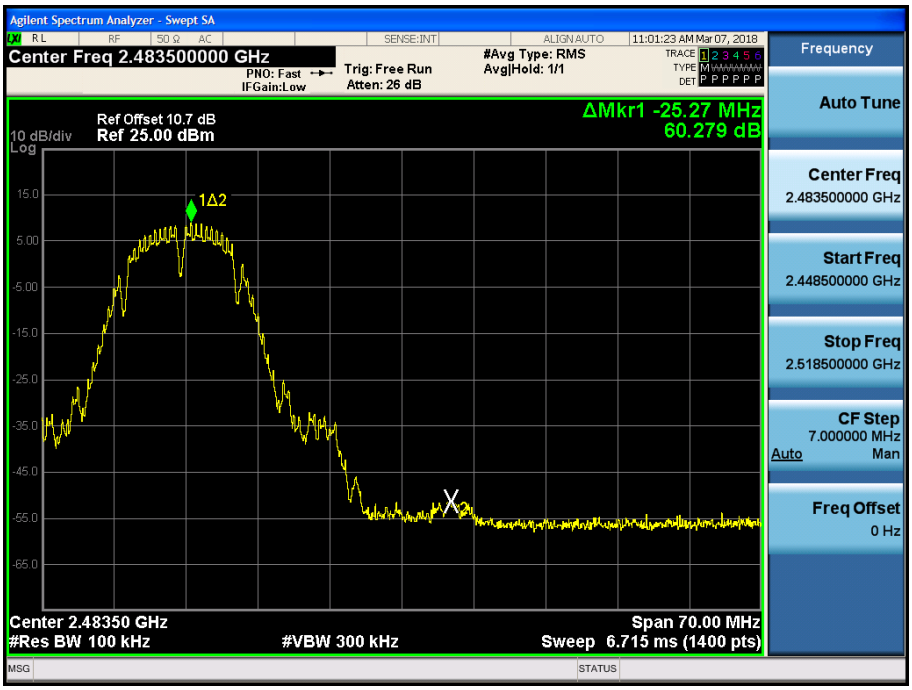
Note : 1. '*' is fundamental frequency range.

2. Factor = Cable loss + Attenuator loss

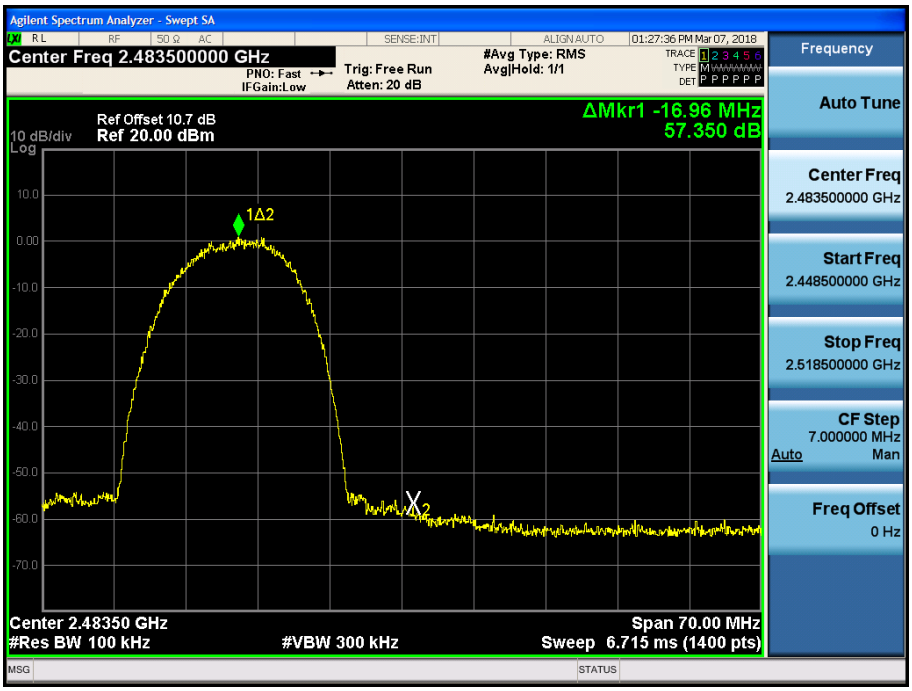
## ▣ RESULT PLOTS

### Band Edge (802.11b-CH1)

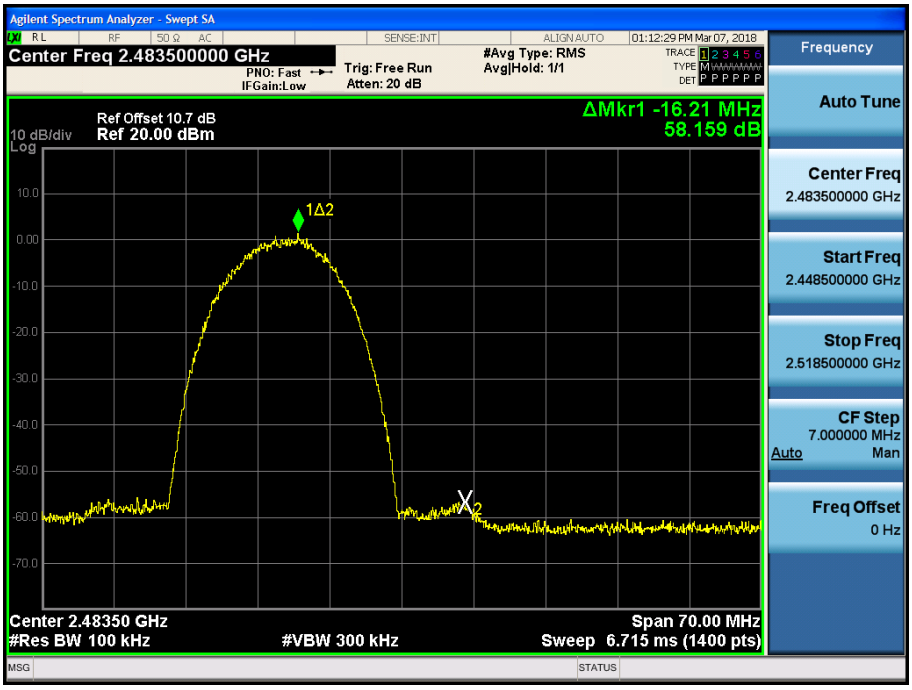
### Band Edge (802.11b-CH11)



## Band Edge (802.11b-CH12)



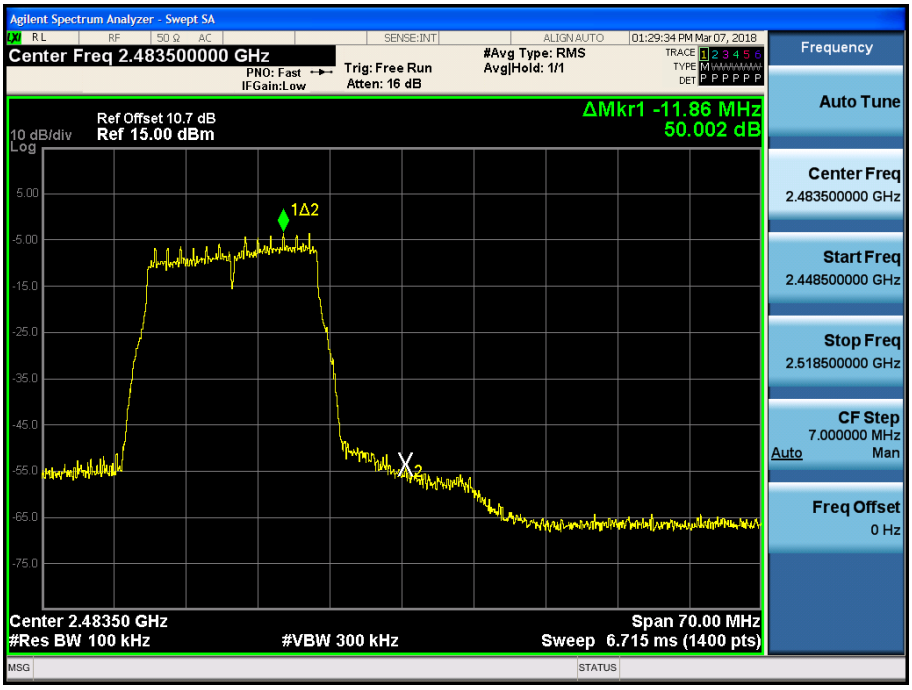

## Band Edge (802.11b-CH13)



## Band Edge (802.11g-CH1)

## Band Edge (802.11g-CH11)

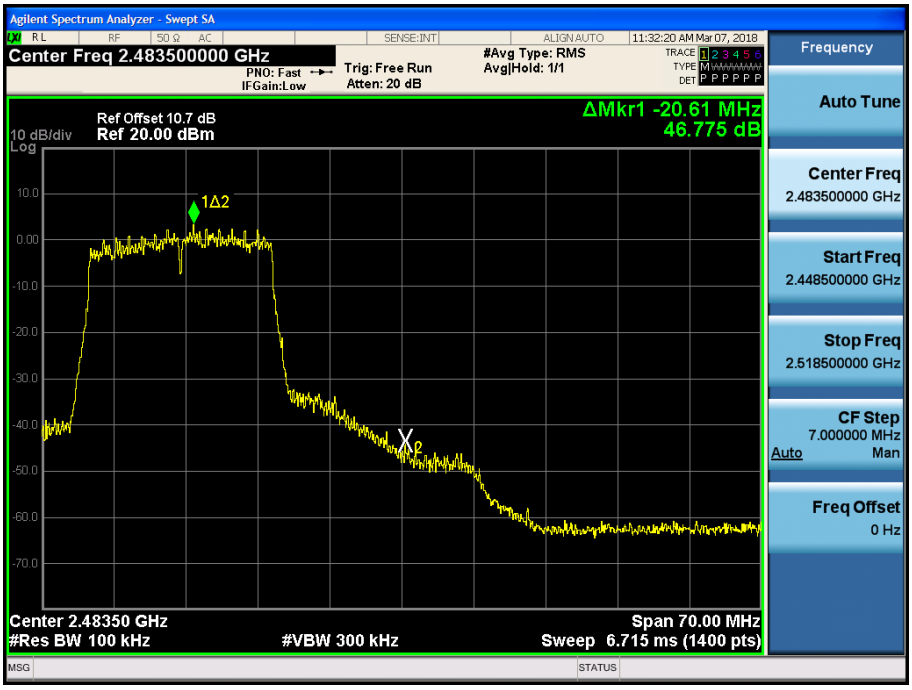
## Band Edge (802.11g-CH12)




## Band Edge (802.11g-CH13)

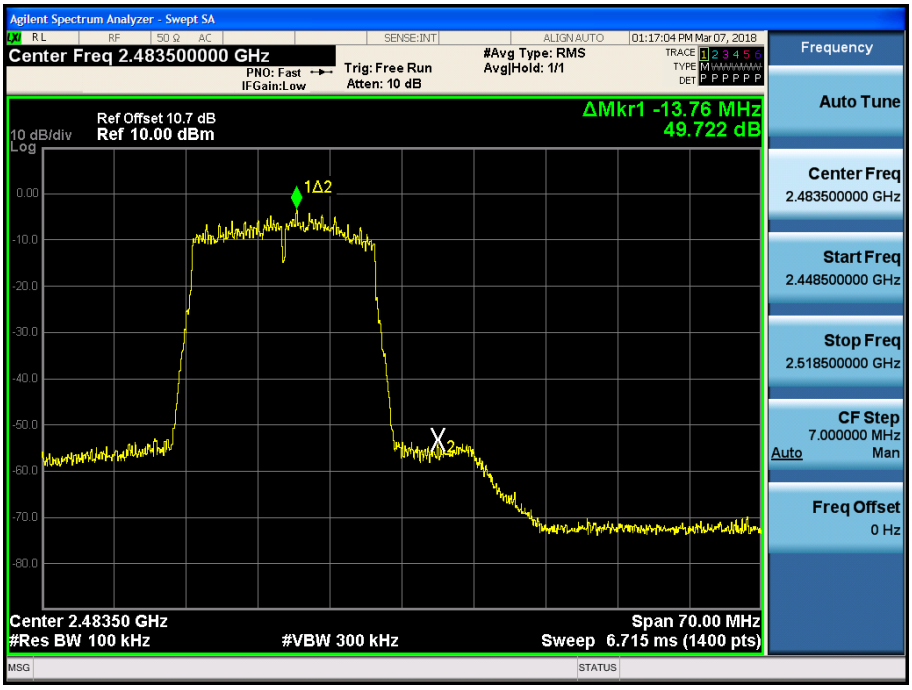
## Band Edge (802.11n_HT20-CH1)

## Band Edge (802.11n_HT20-CH11)



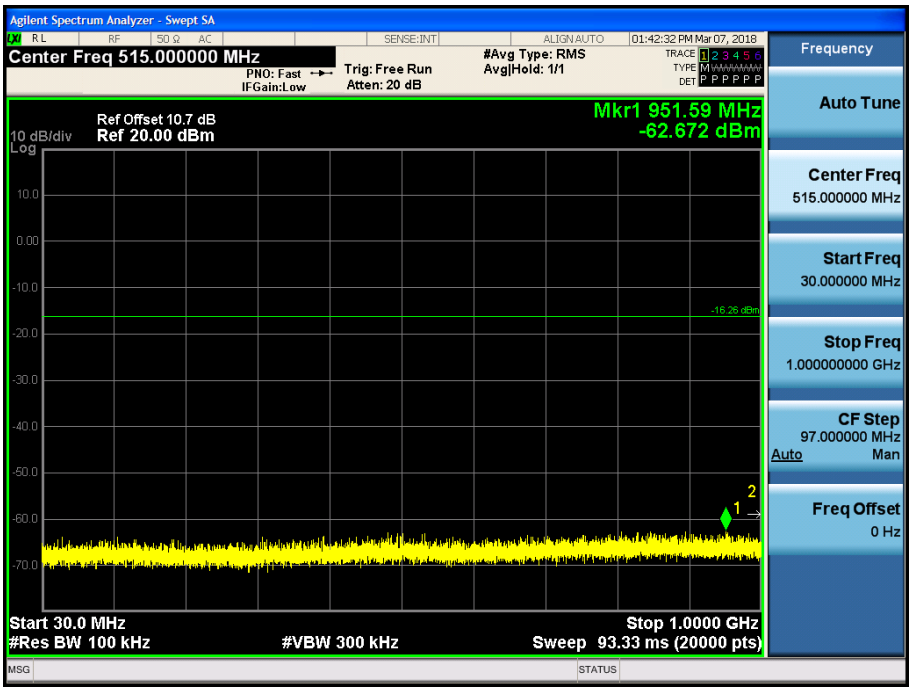
## Band Edge (802.11n_HT20-CH12)

## Band Edge (802.11n_HT20-CH13)



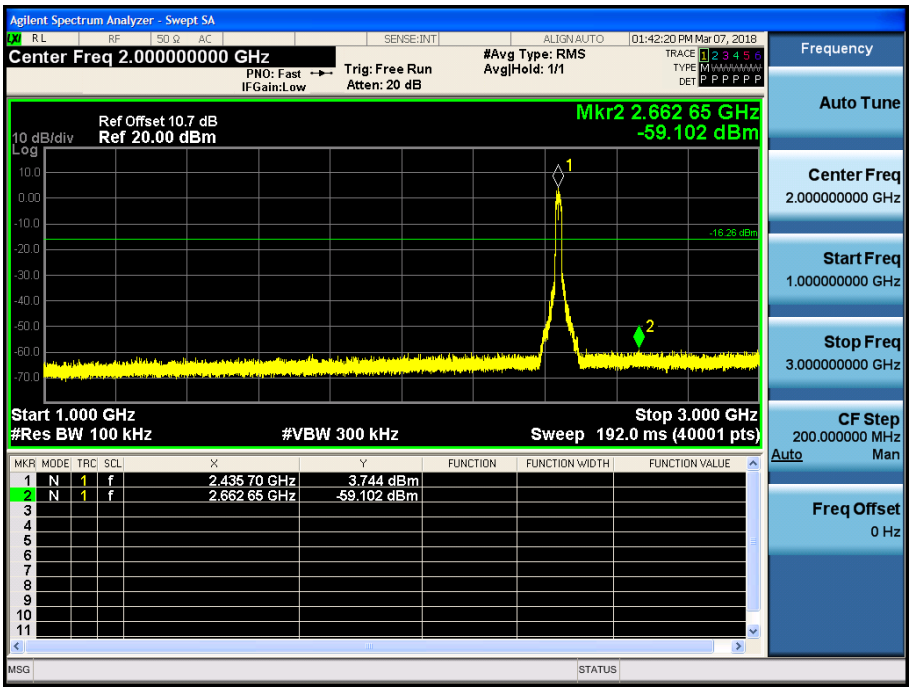
**30 MHz ~ 1 GHz**

**Conducted Spurious Emission (802.11g_Ch.06_12 Mbps)**



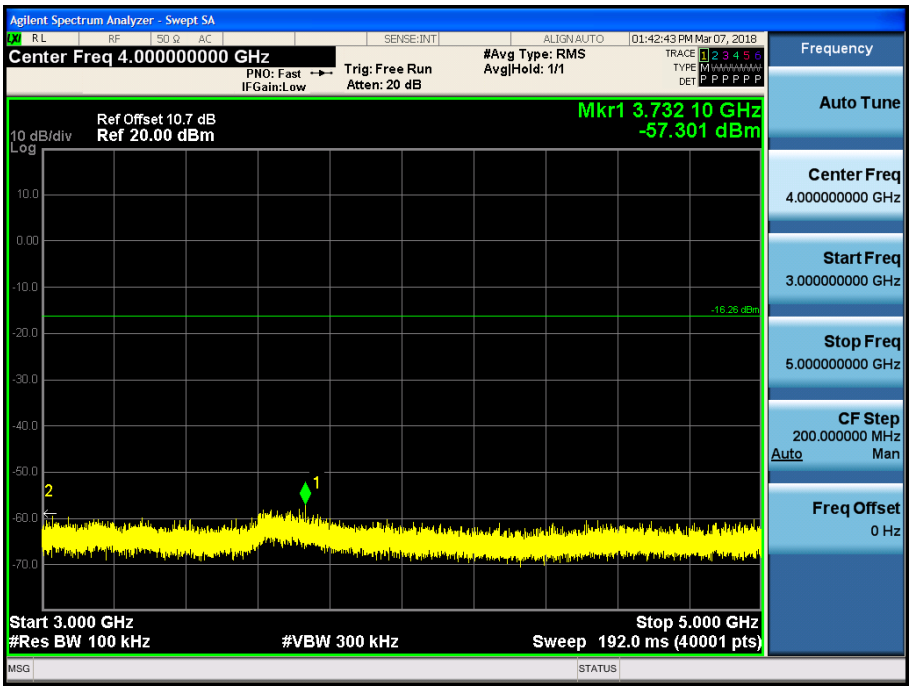

**1 GHz ~ 3 GHz**

**Conducted Spurious Emission (802.11g_Ch.06_12 Mbps)**



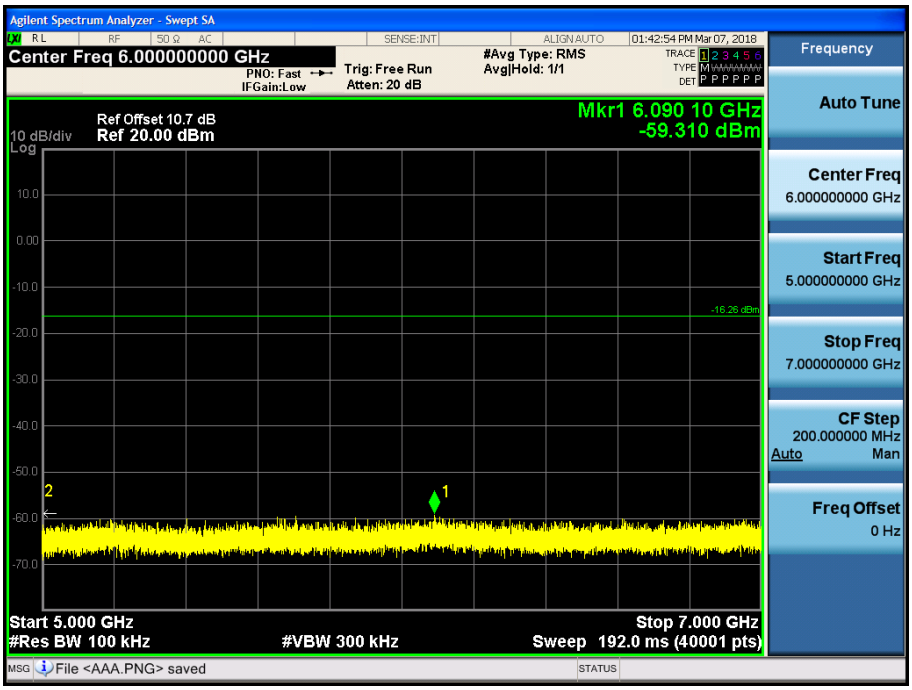
**3 GHz ~ 5 GHz**

**Conducted Spurious Emission (802.11g_Ch.06_12 Mbps)**



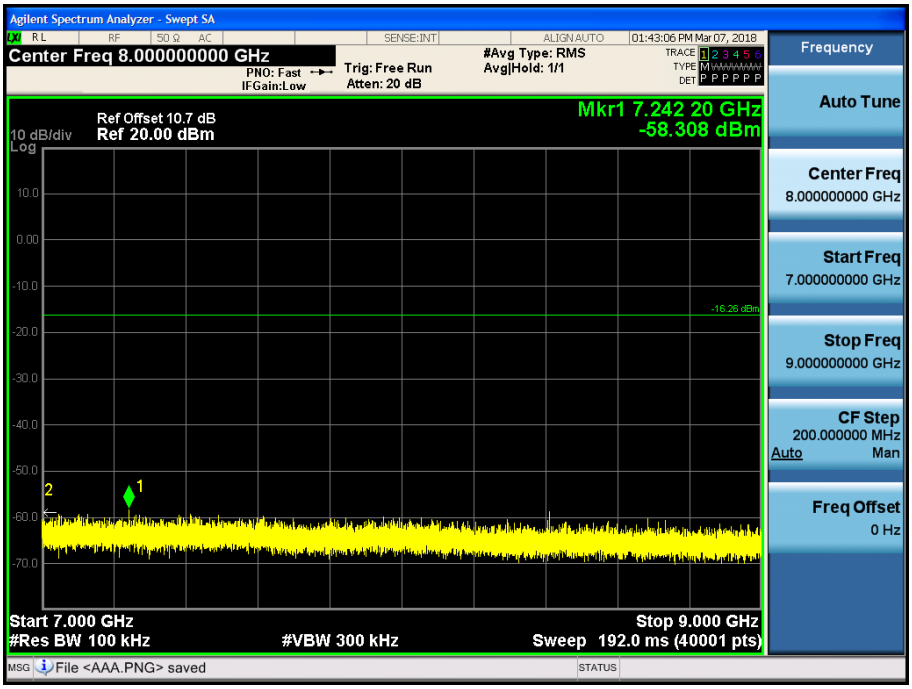

**5 GHz ~ 7 GHz**

**Conducted Spurious Emission (802.11g_Ch.06_12 Mbps)**



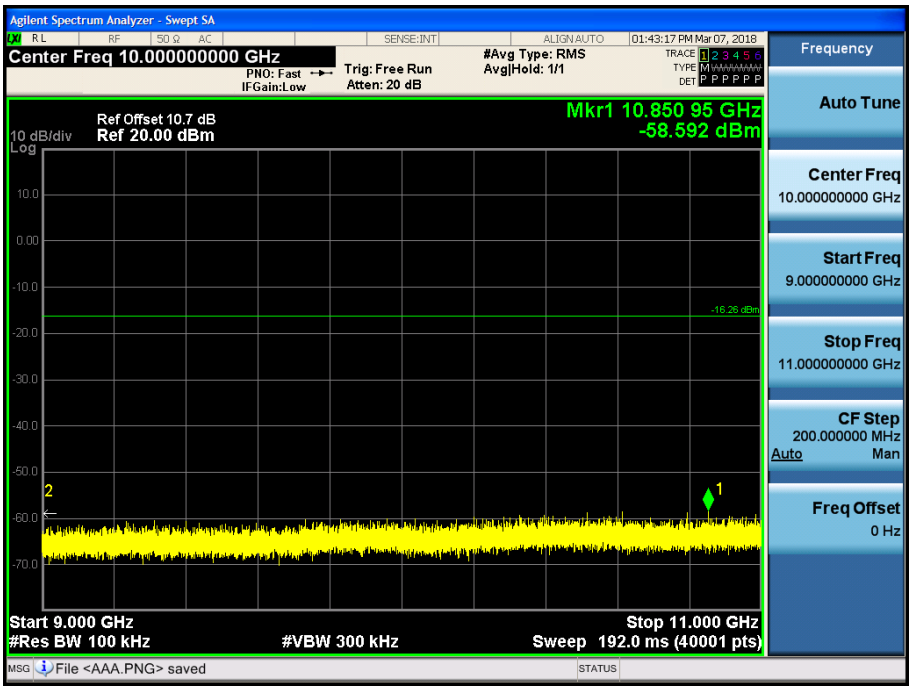
**7 GHz ~ 9 GHz**

**Conducted Spurious Emission (802.11g_Ch.06_12 Mbps)**



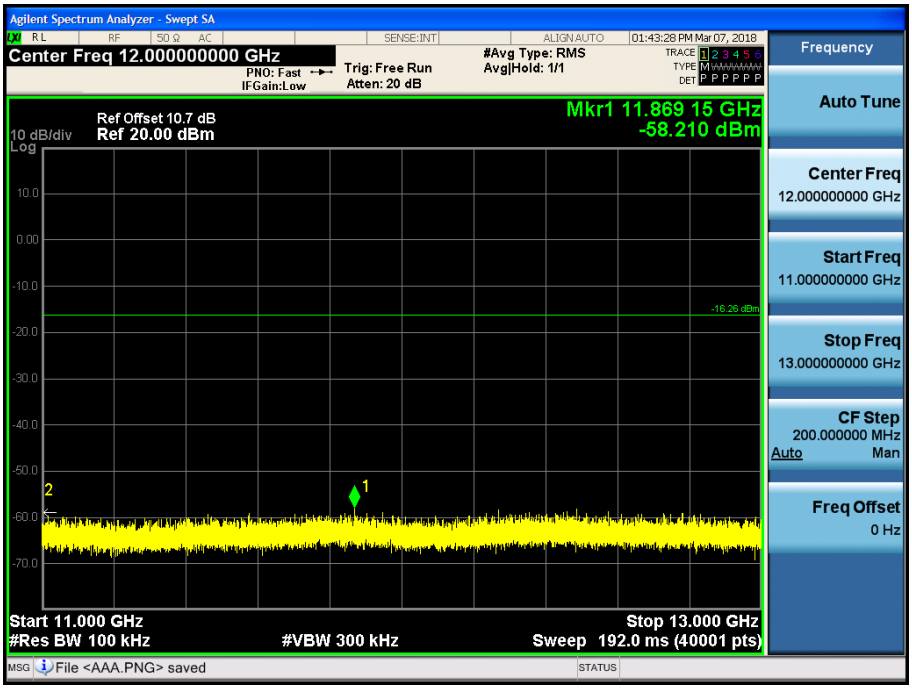

**9 GHz ~ 11 GHz**

**Conducted Spurious Emission (802.11g_Ch.06_12 Mbps)**



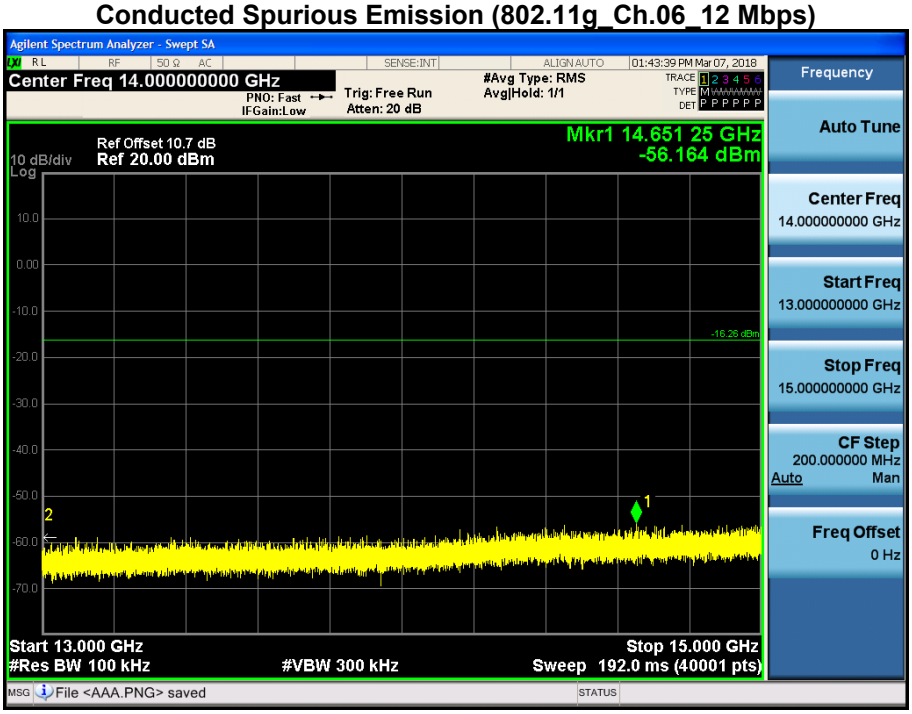
**11 GHz ~ 13 GHz**

**Conducted Spurious Emission (802.11g_Ch.06_12 Mbps)**



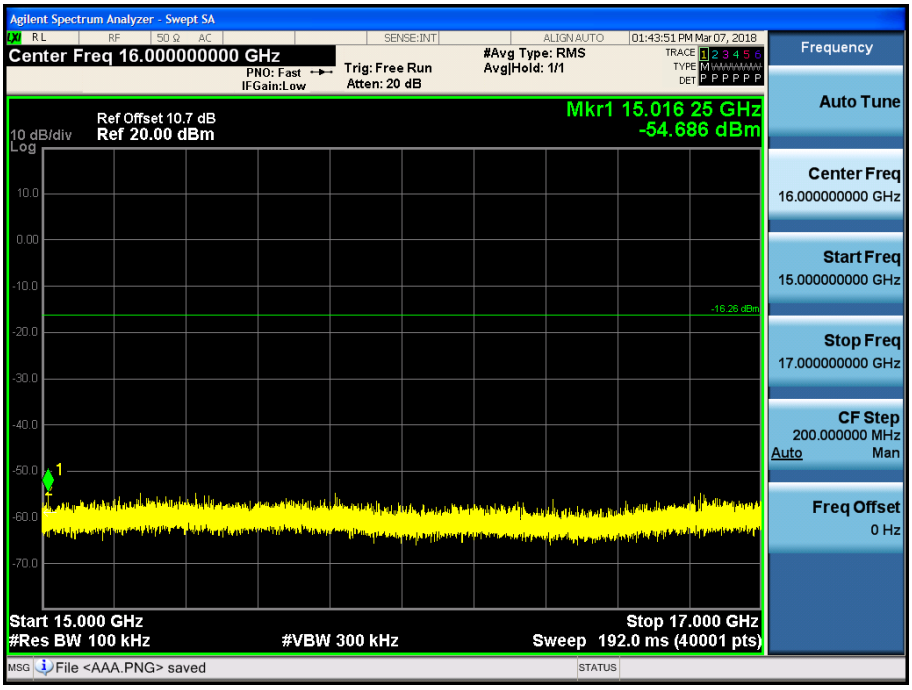

**13 GHz ~ 15 GHz**

**Conducted Spurious Emission (802.11g_Ch.06_12 Mbps)**



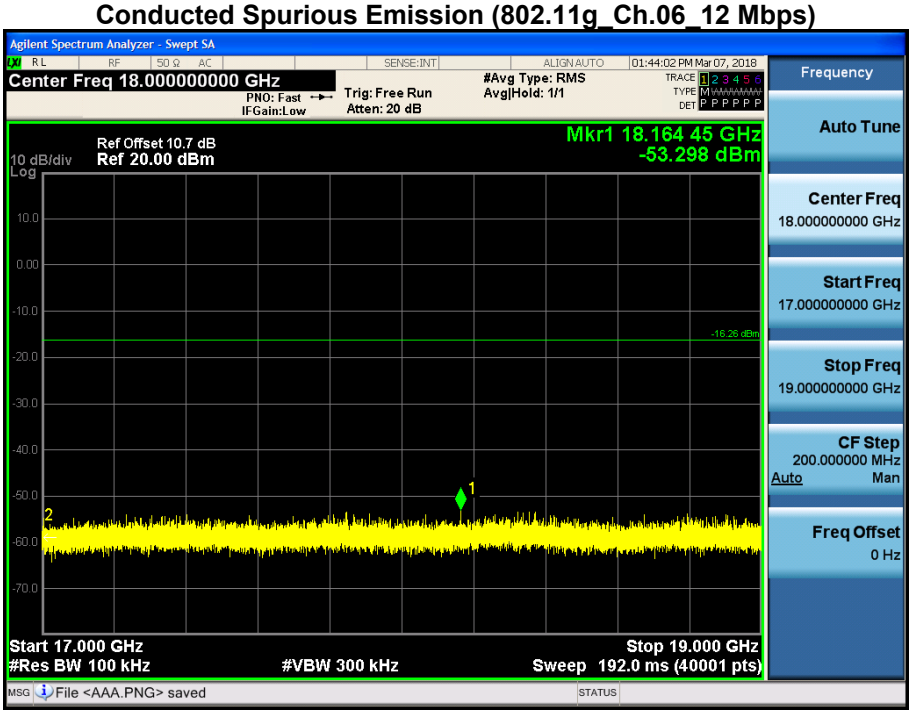
**15 GHz ~ 17 GHz**

**Conducted Spurious Emission (802.11g_Ch.06_12 Mbps)**



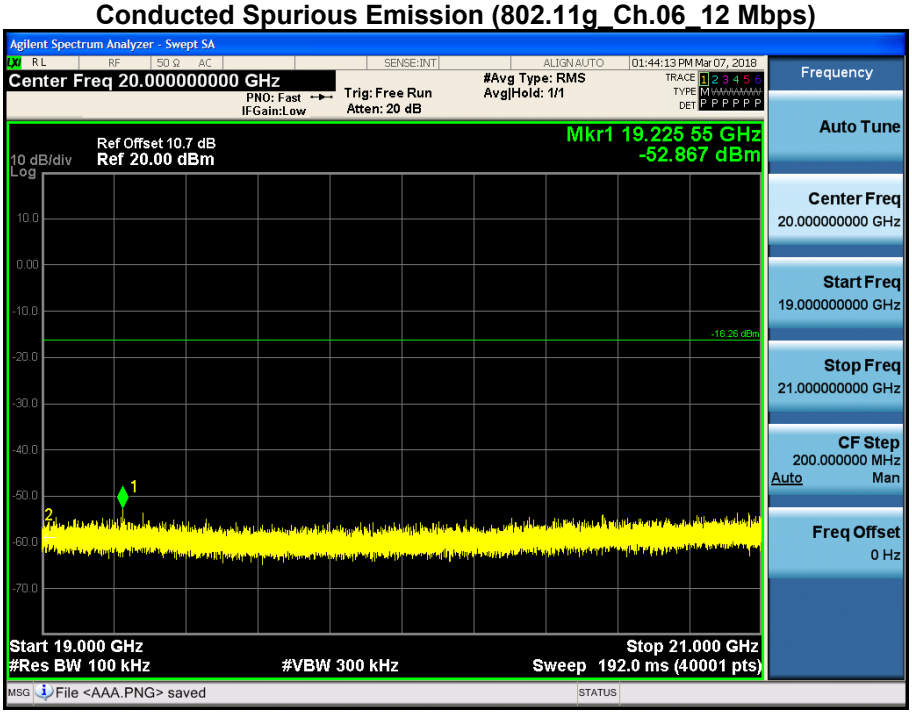

**17 GHz ~ 19 GHz**

**Conducted Spurious Emission (802.11g_Ch.06_12 Mbps)**



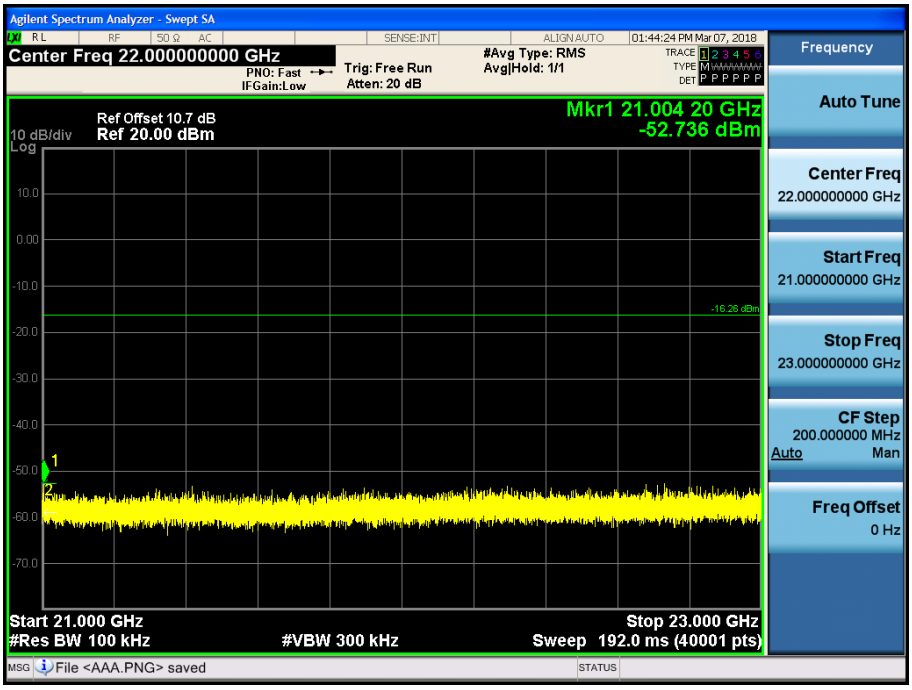
**19 GHz ~ 21 GHz**

**Conducted Spurious Emission (802.11g_Ch.06_12 Mbps)**



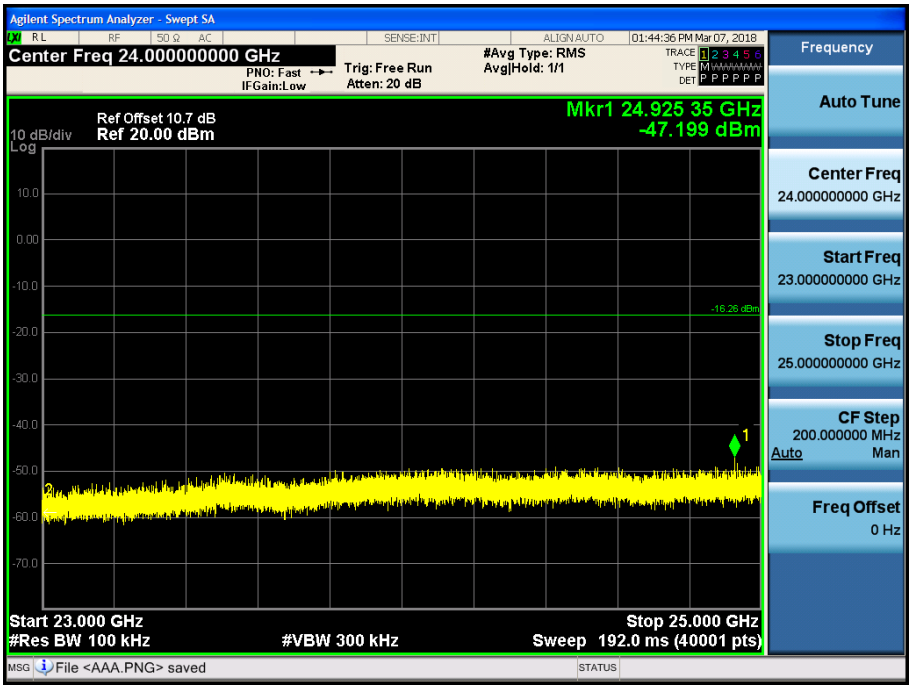

**21 GHz ~ 23 GHz**

**Conducted Spurious Emission (802.11g_Ch.06_12 Mbps)**



**23 GHz ~ 25 GHz**

**Conducted Spurious Emission (802.11g_Ch.06_12 Mbps)**



## 9.6 RADIATED MEASUREMENT.

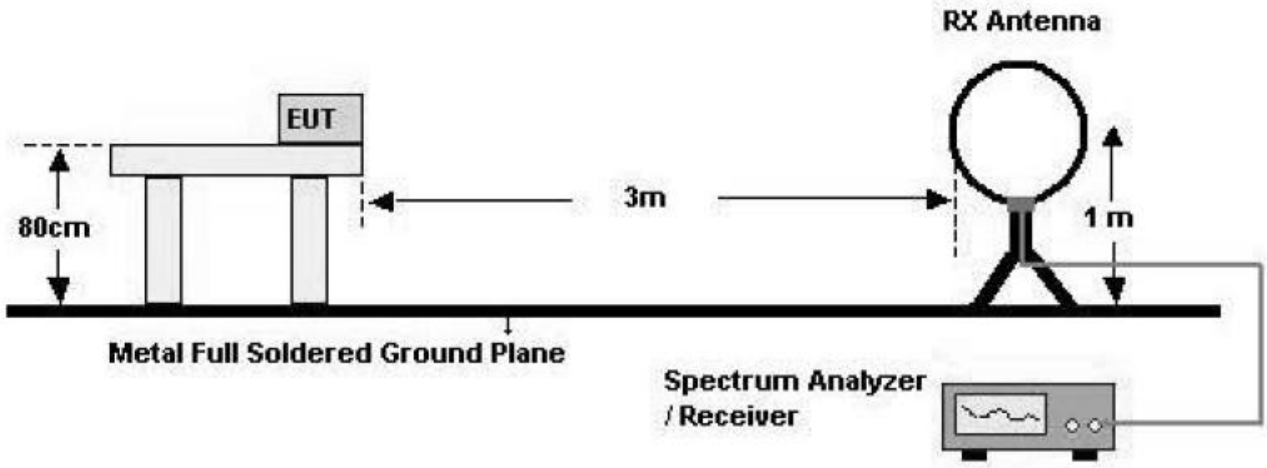
### 9.6.1 RADIATED SPURIOUS EMISSIONS.

**Test Requirements and limit, §15.205, §15.209**

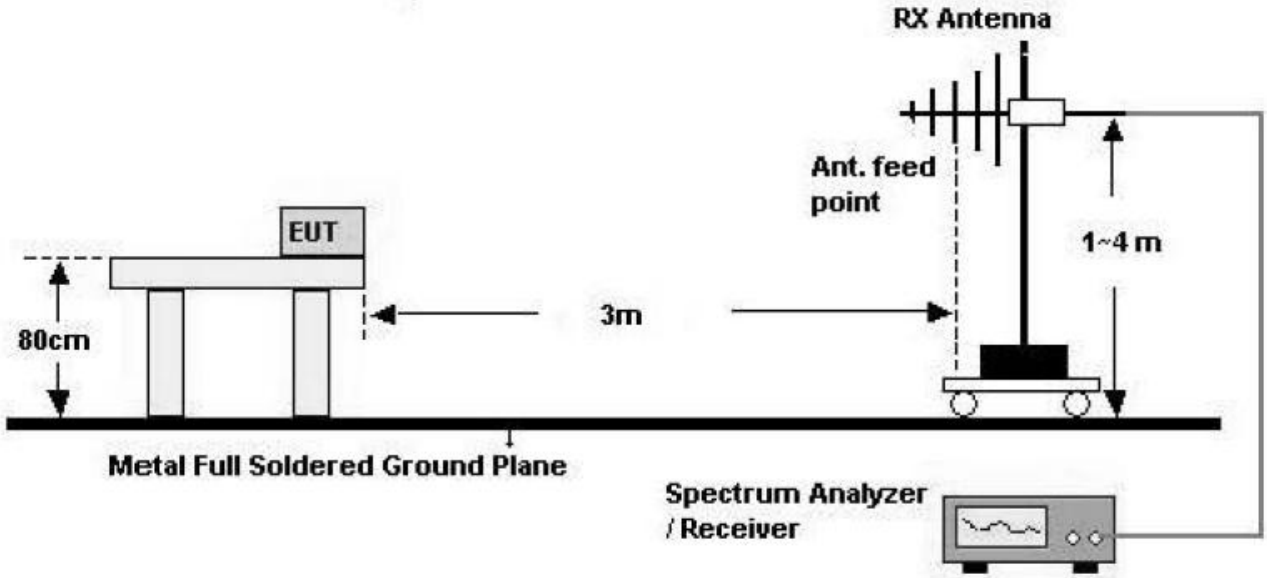
| Frequency (MHz) | Field Strength (uV/m) | Measurement Distance (m) |
|---|---|---|
| 0.009 – 0.490 | 2400/F(kHz) | 300 |
| 0.490 – 1.705 | 24000/F(kHz) | 30 |
| 1.705 – 30 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

**Test Configuration**

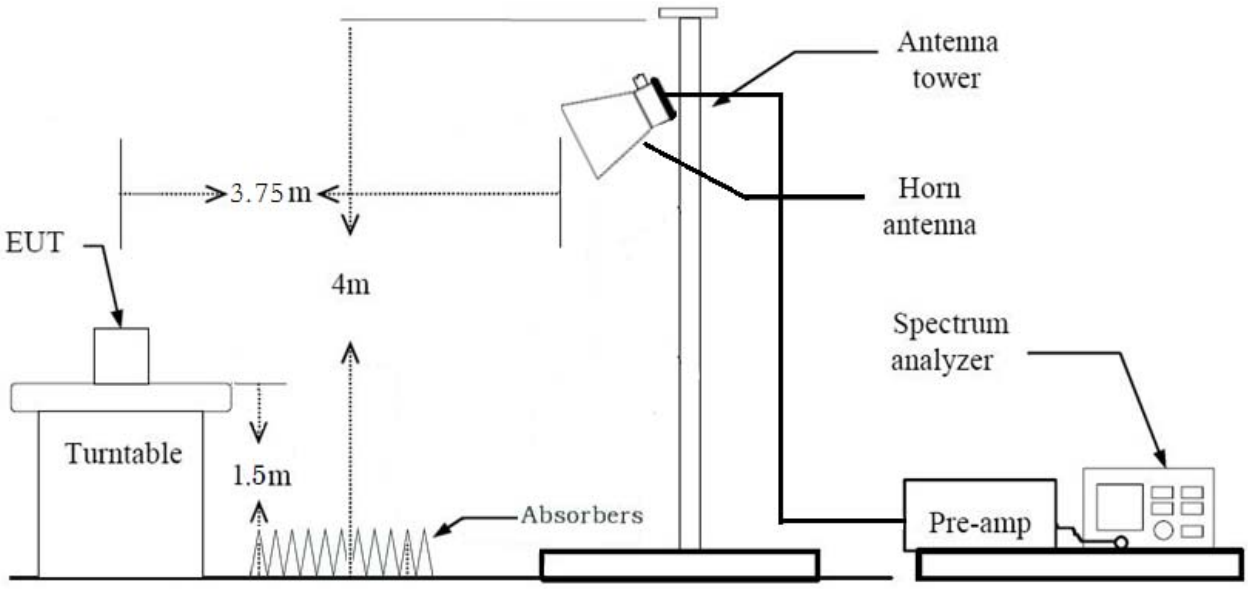
**Below 30 MHz**




**30 MHz - 1 GHz**



**Above 1 GHz**




**TEST PROCEDURE USED**

Method 12.1 in KDB 558074 v04

Spectrum Setting

- Peak

Peak emission levels are measured by setting the instrument as follows:

RBW = cf. Table 1.

VBW ≥ 3 x RBW.

Detector = Peak.

Sweep time = auto.

Trace mode = max hold.

Allow sweeps to continue until the trace stabilizes.

(Note that the required measurement time may be longer for low duty cycle applications).

**Table 1 —RBW as a function of frequency**

| Frequency | RBW |
|---|---|
| 9-150 kHz | 200-300 Hz |
| 0.15-30 MHz | 9-10 kHz |
| 30-1000 MHz | 100-120 kHz |
| > 1000 MHz | 1 MHz |

- Average (duty cycle ≥ 98%)

Set RBW = 1 MHz

Set VBW ≥ 3 x RBW

Detector = RMS

Averaging type = power (*i.e.*, RMS).

Sweep time = auto.

Trace mode = average (at least 100 traces).

- Average (duty cycle < 98%, duty cycle variations are less than ±2%)

Set RBW = 1 MHz

Set VBW ≥ 3 x RBW

Detector = RMS.

Averaging type = power (*i.e.*, RMS).

Sweep time = auto.

Trace mode = average (at least 100 traces).

A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.

**Note :**

1. We are performed the RSE and radiated band edge using standard radiated method(RMS).
2. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor( reference distance : 3 m).
3. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
4. The duty cycle factor for 802.11 b/g/n_HT20

| Mode | Worst Data rate (Mbps) | $T_{on}$ (ms) | $T_{total}$ (ms) | Duty Cycle (%) | Duty Cycle Factor (dB) |
|---|---|---|---|---|---|
| b | 1 | 12.192 | 12.220 | 99.77 | 0.010 |
| g | 6 | 2.756 | 2.791 | 98.74 | 0.055 |
| n_HT20 | MCS0_6.5 Mbps | 2.549 | 2.584 | 98.63 | 0.060 |

**TEST RESULTS**

**9 kHz – 30MHz**

**Operation Mode:** Normal Mode

| Frequency | Reading | Ant. factor | Cable loss | Ant. POL | Total | Limit | Margin |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBm/m | dBm | (H/V) | dBuV/m | dBuV/m | dB |
| No Critical peaks found | | | | | | | |

**Notes:**

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
4. Limit line = specific Limits (dBuV) + Distance extrapolation factor
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

**TEST RESULTS**

**Below 1 GHz**

**Operation Mode:** Normal Mode

| Frequency | Reading | Ant. factor | Cable loss | Ant. POL | Total | Limit | Margin |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBm/m | dBm | (H/V) | dBuV/m | dBuV/m | dB |
| No Critical peaks found | | | | | | | |

**Notes:**

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

**Above 1 GHz**

| | |
|---|---|
| Operation Mode: | 802.11 b |
| Transfer Rate: | 1 Mbps |
| Operating Frequency | 2412 |
| Channel No. | 01 Ch |

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4824 | 49.14 | 1.45 | V | 50.59 | 73.98 | 23.39 | PK |
| 4824 | 38.45 | 1.45 | V | 39.90 | 53.98 | 14.08 | AV |
| 7236 | 45.25 | 11.43 | V | 56.68 | 73.98 | 17.30 | PK |
| 7236 | 33.61 | 11.43 | V | 45.04 | 53.98 | 8.94 | AV |
| 4824 | 50.04 | 1.45 | H | 51.49 | 73.98 | 22.49 | PK |
| 4824 | 39.32 | 1.45 | H | 40.77 | 53.98 | 13.21 | AV |
| 7236 | 45.58 | 11.43 | H | 57.01 | 73.98 | 16.97 | PK |
| 7236 | 33.67 | 11.43 | H | 45.10 | 53.98 | 8.88 | AV |

| | |
|---|---|
| Operation Mode: | 802.11 g |
| Transfer Rate: | 6 Mbps |
| Operating Frequency | 2412 |
| Channel No. | 01 Ch |

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4824 | 48.42 | 1.45 | V | 49.87 | 73.98 | 24.11 | PK |
| 4824 | 36.84 | 1.45 | V | 38.29 | 53.98 | 15.69 | AV |
| 7236 | 45.41 | 11.43 | V | 56.84 | 73.98 | 17.14 | PK |
| 7236 | 33.53 | 11.43 | V | 44.96 | 53.98 | 9.02 | AV |
| 4824 | 49.10 | 1.45 | H | 50.55 | 73.98 | 23.43 | PK |
| 4824 | 36.90 | 1.45 | H | 38.35 | 53.98 | 15.63 | AV |
| 7236 | 44.89 | 11.43 | H | 56.32 | 73.98 | 17.66 | PK |
| 7236 | 33.51 | 11.43 | H | 44.94 | 53.98 | 9.04 | AV |

| | |
|---|---|
| Operation Mode: | 802.11 n_HT20 |
| Transfer MCS Index: | 0 |
| Operating Frequency | 2412 |
| Channel No. | 01 Ch |

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4824 | 48.36 | 1.45 | V | 49.81 | 73.98 | 24.17 | PK |
| 4824 | 36.83 | 1.45 | V | 38.28 | 53.98 | 15.70 | AV |
| 7236 | 45.36 | 11.43 | V | 56.79 | 73.98 | 17.19 | PK |
| 7236 | 33.60 | 11.43 | V | 45.03 | 53.98 | 8.95 | AV |
| 4824 | 48.65 | 1.45 | H | 50.10 | 73.98 | 23.88 | PK |
| 4824 | 36.76 | 1.45 | H | 38.21 | 53.98 | 15.77 | AV |
| 7236 | 45.51 | 11.43 | H | 56.94 | 73.98 | 17.04 | PK |
| 7236 | 33.57 | 11.43 | H | 45.00 | 53.98 | 8.98 | AV |

*A.F. : Antenna Factor / C.L. : Cable Loss / A.G. : Amplifier Gain / D.F. : Distance Factor

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + Distance Factor
5. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
6. We have done 802.11b/g/n/ac mode and all data rate. Worst data rate is the lowest data of each mode.
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
8. Duty cycle factor applies only below 98%.
   Therefore, test result did not apply the duty cycle factor.

Operation Mode: 802.11 b
Transfer Rate: 1 Mbps
Operating Frequency 2437
Channel No. 06 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4874 | 50.31 | 1.66 | V | 51.97 | 73.98 | 22.01 | PK |
| 4874 | 38.02 | 1.66 | V | 39.68 | 53.98 | 14.30 | AV |
| 7311 | 45.64 | 10.10 | V | 55.74 | 73.98 | 18.24 | PK |
| 7311 | 33.58 | 10.10 | V | 43.68 | 53.98 | 10.30 | AV |
| 4874 | 49.99 | 1.66 | H | 51.65 | 73.98 | 22.33 | PK |
| 4874 | 37.86 | 1.66 | H | 39.52 | 53.98 | 14.46 | AV |
| 7311 | 46.30 | 10.10 | H | 56.40 | 73.98 | 17.58 | PK |
| 7311 | 33.66 | 10.10 | H | 43.76 | 53.98 | 10.22 | AV |

Operation Mode: 802.11 g
Transfer Rate: 6 Mbps
Operating Frequency 2437
Channel No. 06 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4874 | 50.12 | 1.66 | V | 51.78 | 73.98 | 22.20 | PK |
| 4874 | 37.99 | 1.66 | V | 39.65 | 53.98 | 14.33 | AV |
| 7311 | 45.55 | 10.10 | V | 55.65 | 73.98 | 18.33 | PK |
| 7311 | 33.53 | 10.10 | V | 43.63 | 53.98 | 10.35 | AV |
| 4874 | 49.95 | 1.66 | H | 51.61 | 73.98 | 22.37 | PK |
| 4874 | 37.21 | 1.66 | H | 38.87 | 53.98 | 15.11 | AV |
| 7311 | 45.68 | 10.10 | H | 55.78 | 73.98 | 18.20 | PK |
| 7311 | 33.62 | 10.10 | H | 43.72 | 53.98 | 10.26 | AV |

| | |
|---|---|
| Operation Mode: | 802.11 n_HT20 |
| Transfer MCS Index: | 0 |
| Operating Frequency | 2437 |
| Channel No. | 06 Ch |

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4874 | 50.12 | 1.66 | V | 51.78 | 73.98 | 22.20 | PK |
| 4874 | 37.88 | 1.66 | V | 39.54 | 53.98 | 14.44 | AV |
| 7311 | 45.21 | 10.10 | V | 55.31 | 73.98 | 18.67 | PK |
| 7311 | 33.53 | 10.10 | V | 43.63 | 53.98 | 10.35 | AV |
| 4874 | 50.79 | 1.66 | H | 52.45 | 73.98 | 21.53 | PK |
| 4874 | 37.96 | 1.66 | H | 39.62 | 53.98 | 14.36 | AV |
| 7311 | 44.94 | 10.10 | H | 55.04 | 73.98 | 18.94 | PK |
| 7311 | 33.59 | 10.10 | H | 43.69 | 53.98 | 10.29 | AV |

*A.F. : Antenna Factor / C.L. : Cable Loss / A.G. : Amplifier Gain / D.F. : Distance Factor

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + Distance Factor
5. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
6. We have done 802.11b/g/n/ac mode and all data rate. Worst data rate is the lowest data of each mode.
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
8. Duty cycle factor applies only below 98%.
   Therefore, test result did not apply the duty cycle factor.

Operation Mode: 802.11 b
Transfer Rate: 1 Mbps
Operating Frequency 2462
Channel No. 11 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4924 | 48.50 | 1.00 | V | 49.50 | 73.98 | 24.48 | PK |
| 4924 | 36.77 | 1.00 | V | 37.77 | 53.98 | 16.21 | AV |
| 7386 | 45.63 | 11.10 | V | 56.73 | 73.98 | 17.25 | PK |
| 7386 | 33.28 | 11.10 | V | 44.38 | 53.98 | 9.60 | AV |
| 4924 | 48.52 | 1.00 | H | 49.52 | 73.98 | 24.46 | PK |
| 4924 | 36.75 | 1.00 | H | 37.75 | 53.98 | 16.23 | AV |
| 7386 | 45.99 | 11.10 | H | 57.09 | 73.98 | 16.89 | PK |
| 7386 | 33.32 | 11.10 | H | 44.42 | 53.98 | 9.56 | AV |

Operation Mode: 802.11 g
Transfer Rate: 6 Mbps
Operating Frequency 2462
Channel No. 11 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4924 | 49.16 | 1.00 | V | 50.16 | 73.98 | 23.82 | PK |
| 4924 | 36.78 | 1.00 | V | 37.78 | 53.98 | 16.20 | AV |
| 7386 | 45.12 | 11.10 | V | 56.22 | 73.98 | 17.76 | PK |
| 7386 | 33.19 | 11.10 | V | 44.29 | 53.98 | 9.69 | AV |
| 4924 | 49.63 | 1.00 | H | 50.63 | 73.98 | 23.35 | PK |
| 4924 | 36.84 | 1.00 | H | 37.84 | 53.98 | 16.14 | AV |
| 7386 | 44.85 | 11.10 | H | 55.95 | 73.98 | 18.03 | PK |
| 7386 | 33.25 | 11.10 | H | 44.35 | 53.98 | 9.63 | AV |

| | |
|---|---|
| Operation Mode: | 802.11 n_HT20 |
| Transfer MCS Index: | 0 |
| Operating Frequency | 2462 |
| Channel No. | 11 Ch |

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4924 | 49.67 | 1.00 | V | 50.67 | 73.98 | 23.31 | PK |
| 4924 | 36.86 | 1.00 | V | 37.86 | 53.98 | 16.12 | AV |
| 7386 | 44.61 | 11.10 | V | 55.71 | 73.98 | 18.27 | PK |
| 7386 | 33.18 | 11.10 | V | 44.28 | 53.98 | 9.70 | AV |
| 4924 | 48.98 | 1.00 | H | 49.98 | 73.98 | 24.00 | PK |
| 4924 | 36.76 | 1.00 | H | 37.76 | 53.98 | 16.22 | AV |
| 7386 | 44.74 | 11.10 | H | 55.84 | 73.98 | 18.14 | PK |
| 7386 | 33.28 | 11.10 | H | 44.38 | 53.98 | 9.60 | AV |

*A.F. : Antenna Factor / C.L. : Cable Loss / A.G. : Amplifier Gain / D.F. : Distance Factor

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + Distance Factor
5. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
6. We have done 802.11b/g/n/ac mode and all data rate. Worst data rate is the lowest data of each mode.
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
8. Duty cycle factor applies only below 98%.
   Therefore, test result did not apply the duty cycle factor.

Operation Mode: 802.11 b
Transfer Rate: 1 Mbps
Operating Frequency 2467
Channel No. 12 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4934 | 48.26 | 1.21 | V | 49.47 | 73.98 | 24.51 | PK |
| 4934 | 36.27 | 1.21 | V | 37.48 | 53.98 | 16.50 | AV |
| 7401 | 45.27 | 10.24 | V | 55.51 | 73.98 | 18.47 | PK |
| 7401 | 33.40 | 10.24 | V | 43.64 | 53.98 | 10.34 | AV |
| 4934 | 48.50 | 1.21 | H | 49.71 | 73.98 | 24.27 | PK |
| 4934 | 36.33 | 1.21 | H | 37.54 | 53.98 | 16.44 | AV |
| 7401 | 45.63 | 10.24 | H | 55.87 | 73.98 | 18.11 | PK |
| 7401 | 33.46 | 10.24 | H | 43.70 | 53.98 | 10.28 | AV |

Operation Mode: 802.11 g
Transfer Rate: 6 Mbps
Operating Frequency 2467
Channel No. 12 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4934 | 47.28 | 1.21 | V | 48.49 | 73.98 | 25.49 | PK |
| 4934 | 36.21 | 1.21 | V | 37.42 | 53.98 | 16.56 | AV |
| 7401 | 45.19 | 10.24 | V | 55.43 | 73.98 | 18.55 | PK |
| 7401 | 33.36 | 10.24 | V | 43.60 | 53.98 | 10.38 | AV |
| 4934 | 47.41 | 1.21 | H | 48.62 | 73.98 | 25.36 | PK |
| 4934 | 36.28 | 1.21 | H | 37.49 | 53.98 | 16.49 | AV |
| 7401 | 45.41 | 10.24 | H | 55.65 | 73.98 | 18.33 | PK |
| 7401 | 33.38 | 10.24 | H | 43.62 | 53.98 | 10.36 | AV |

| | |
|---|---|
| Operation Mode: | 802.11 n_HT20 |
| Transfer MCS Index: | 6.5 Mbps |
| Operating Frequency | 2467 |
| Channel No. | 12 Ch |

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4934 | 47.62 | 1.21 | V | 48.83 | 73.98 | 25.15 | PK |
| 4934 | 36.25 | 1.21 | V | 37.46 | 53.98 | 16.52 | AV |
| 7401 | 44.51 | 10.24 | V | 54.75 | 73.98 | 19.23 | PK |
| 7401 | 33.28 | 10.24 | V | 43.52 | 53.98 | 10.46 | AV |
| 4934 | 48.34 | 1.21 | H | 49.55 | 73.98 | 24.43 | PK |
| 4934 | 36.29 | 1.21 | H | 37.50 | 53.98 | 16.48 | AV |
| 7401 | 45.37 | 10.24 | H | 55.61 | 73.98 | 18.37 | PK |
| 7401 | 33.31 | 10.24 | H | 43.55 | 53.98 | 10.43 | AV |

*A.F. : Antenna Factor / C.L. : Cable Loss / A.G. : Amplifier Gain / D.F. : Distance Factor

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + Distance Factor
5. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
6. We have done 802.11b/g/n/ac mode and all data rate. Worst data rate is the lowest data of each mode.
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
8. Duty cycle factor applies only below 98%.
   Therefore, test result did not apply the duty cycle factor.

Operation Mode: 802.11 b
Transfer Rate: 1 Mbps
Operating Frequency 2472
Channel No. 13 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4944 | 48.68 | 1.72 | V | 50.40 | 73.98 | 23.58 | PK |
| 4944 | 36.81 | 1.72 | V | 38.53 | 53.98 | 15.45 | AV |
| 7416 | 45.38 | 10.10 | V | 55.48 | 73.98 | 18.50 | PK |
| 7416 | 33.35 | 10.10 | V | 43.45 | 53.98 | 10.53 | AV |
| 4944 | 49.03 | 1.72 | H | 50.75 | 73.98 | 23.23 | PK |
| 7416 | 37.02 | 1.72 | H | 38.74 | 53.98 | 15.24 | AV |
| 7416 | 45.74 | 10.10 | H | 55.84 | 73.98 | 18.14 | PK |
| 9888 | 33.40 | 10.10 | H | 43.50 | 53.98 | 10.48 | AV |

Operation Mode: 802.11 g
Transfer Rate: 6 Mbps
Operating Frequency 2472
Channel No. 13 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4944 | 48.35 | 1.72 | V | 50.07 | 73.98 | 23.91 | PK |
| 4944 | 36.85 | 1.72 | V | 38.57 | 53.98 | 15.41 | AV |
| 7416 | 45.61 | 10.10 | V | 55.71 | 73.98 | 18.27 | PK |
| 7416 | 33.31 | 10.10 | V | 43.41 | 53.98 | 10.57 | AV |
| 4944 | 48.67 | 1.72 | H | 50.39 | 73.98 | 23.59 | PK |
| 7416 | 36.98 | 1.72 | H | 38.70 | 53.98 | 15.28 | AV |
| 7416 | 45.71 | 10.10 | H | 55.81 | 73.98 | 18.17 | PK |
| 9888 | 33.37 | 10.10 | H | 43.47 | 53.98 | 10.51 | AV |

| | |
|---|---|
| Operation Mode: | 802.11 n_HT20 |
| Transfer MCS Index: | 6.5 Mbps |
| Operating Frequency | 2472 |
| Channel No. | 13 Ch |

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.-A.G+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4944 | 48.24 | 1.72 | V | 49.96 | 73.98 | 24.02 | PK |
| 4944 | 36.79 | 1.72 | V | 38.51 | 53.98 | 15.47 | AV |
| 7416 | 44.61 | 10.10 | V | 54.71 | 73.98 | 19.27 | PK |
| 7416 | 33.25 | 10.10 | V | 43.35 | 53.98 | 10.63 | AV |
| 4944 | 48.55 | 1.72 | H | 50.27 | 73.98 | 23.71 | PK |
| 7416 | 36.95 | 1.72 | H | 38.67 | 53.98 | 15.31 | AV |
| 7416 | 45.17 | 10.10 | H | 55.27 | 73.98 | 18.71 | PK |
| 9888 | 33.28 | 10.10 | H | 43.38 | 53.98 | 10.60 | AV |

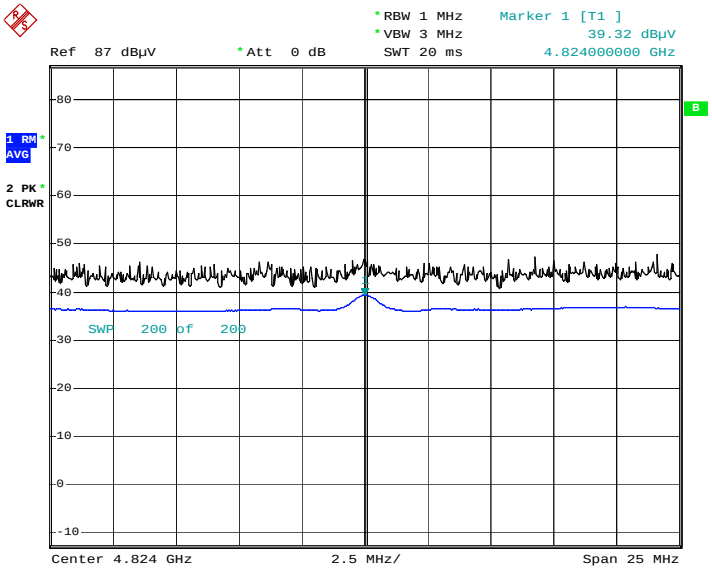
*A.F. : Antenna Factor / C.L. : Cable Loss / A.G. : Amplifier Gain / D.F. : Distance Factor

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + Distance Factor
5. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
6. We have done 802.11b/g/n/ac mode and all data rate. Worst data rate is the lowest data of each mode.
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
8. Duty cycle factor applies only below 98%.
   Therefore, test result did not apply the duty cycle factor.

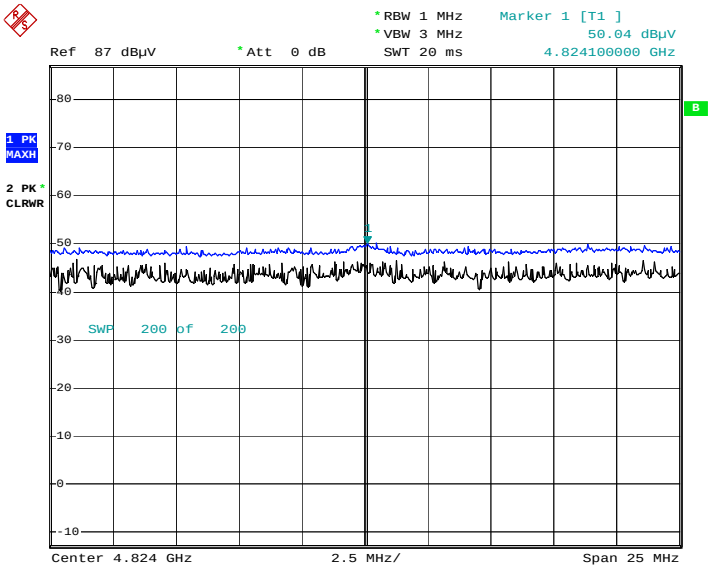
## ▣ RESULT PLOTS (Worst case :X-H)

### Radiated Spurious Emissions plot – Average Reading (802.11b, Ch.1 2nd Harmonic)



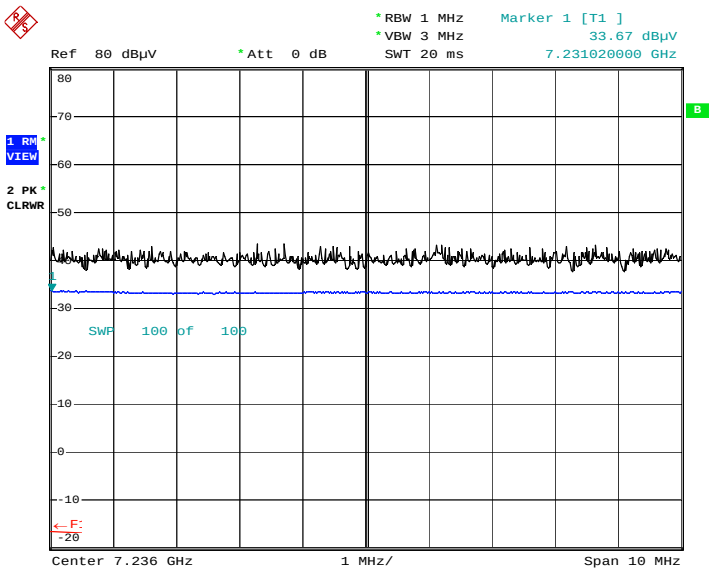

Date: 6.MAR.2018 14:23:54

### Radiated Spurious Emissions plot – Peak Reading (802.11b, Ch.1 2nd Harmonic)



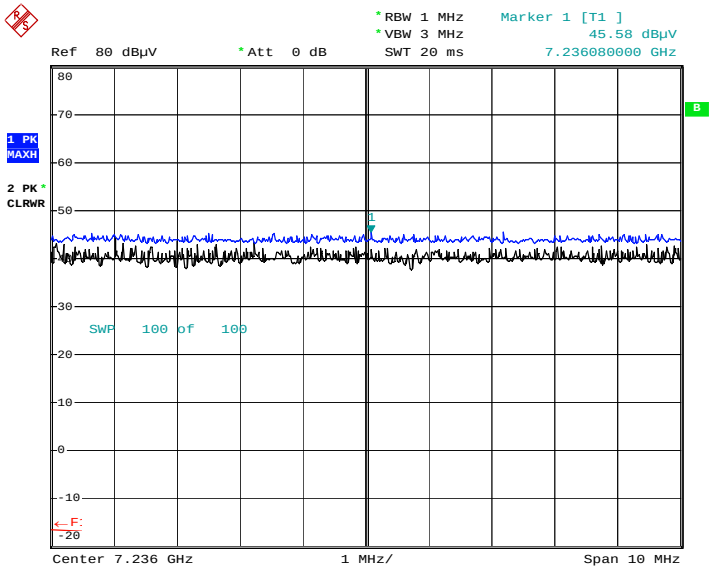

Date: 6.MAR.2018 14:22:00

## Radiated Spurious Emissions plot – Average Reading (802.11b, Ch.1 3rd Harmonic)




Date: 7.MAR.2018 13:03:13

## Radiated Spurious Emissions plot – Peak Reading (802.11b, Ch.1 3rd Harmonic)




Date: 7.MAR.2018 13:03:58

**Note : Only the worst case plots for Radiated Spurious Emissions.**

## 9.6.2 RADIATED RESTRICTED BAND EDGES

**Test Requirements and limit, §15.247(d) §15.205, §15.209**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c)).

| | |
|---|---|
| Operation Mode: | 802.11b |
| Transfer Rate: | 1 Mbps |
| Operating Frequency | 2412 MHz, 2462 MHz |
| Channel No. | 01 Ch, 11 Ch |

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 2390.0 | 50.98 | 1.14 | H | 52.12 | 73.98 | 21.86 | PK |
| 2390.0 | 40.51 | 1.14 | H | 41.65 | 53.98 | 12.33 | AV |
| 2390.0 | 51.66 | 1.14 | V | 52.80 | 73.98 | 21.18 | PK |
| 2390.0 | 40.33 | 1.14 | V | 41.47 | 53.98 | 12.51 | AV |
| 2483.5 | 51.42 | 0.78 | H | 52.20 | 73.98 | 21.78 | PK |
| 2483.5 | 40.60 | 0.78 | H | 41.38 | 53.98 | 12.60 | AV |
| 2483.5 | 52.42 | 0.78 | V | 53.20 | 73.98 | 20.78 | PK |
| 2483.5 | 40.79 | 0.78 | V | 41.57 | 53.98 | 12.41 | AV |

*A.F. : Antenna Factor / C.L. : Cable Loss / D.F. : Distance Factor

Operation Mode: 802.11g
Transfer Rate: 6 Mbps
Operating Frequency 2412 MHz, 2462 MHz
Channel No. 01 Ch, 11 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 2390.0 | 54.52 | 1.14 | H | 55.66 | 73.98 | 18.32 | PK |
| 2390.0 | 41.56 | 1.14 | H | 42.70 | 53.98 | 11.28 | AV |
| 2390.0 | 53.49 | 1.14 | V | 54.63 | 73.98 | 19.35 | PK |
| 2390.0 | 41.26 | 1.14 | V | 42.40 | 53.98 | 11.58 | AV |
| 2483.5 | 57.78 | 0.78 | H | 58.56 | 73.98 | 15.42 | PK |
| 2483.5 | 41.73 | 0.78 | H | 42.51 | 53.98 | 11.47 | AV |
| 2483.5 | 54.20 | 0.78 | V | 54.98 | 73.98 | 19.00 | PK |
| 2483.5 | 41.09 | 0.78 | V | 41.87 | 53.98 | 12.11 | AV |

Operation Mode: 802.11n_HT20
Transfer MCS Index: 0
Operating Frequency 2412 MHz, 2462 MHz
Channel No. 01 Ch, 11 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 2390.0 | 60.90 | 1.14 | H | 62.04 | 73.98 | 11.94 | PK |
| 2390.0 | 42.36 | 1.14 | H | 43.50 | 53.98 | 10.48 | AV |
| 2390.0 | 51.68 | 1.14 | V | 52.82 | 73.98 | 21.16 | PK |
| 2390.0 | 39.88 | 1.14 | V | 41.02 | 53.98 | 12.96 | AV |
| 2483.5 | 61.14 | 0.78 | H | 61.92 | 73.98 | 12.06 | PK |
| 2483.5 | 42.80 | 0.78 | H | 43.58 | 53.98 | 10.40 | AV |
| 2483.5 | 58.77 | 0.78 | V | 59.55 | 73.98 | 14.43 | PK |
| 2483.5 | 41.94 | 0.78 | V | 42.72 | 53.98 | 11.26 | AV |

Operation Mode: 802.11b
Transfer Rate: 1 Mbps
Operating Frequency 2467 MHz
Channel No. 12 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 2483.5 | 51.65 | 0.78 | H | 52.43 | 73.98 | 21.55 | PK |
| 2483.5 | 40.33 | 0.78 | H | 41.11 | 53.98 | 12.87 | AV |
| 2483.5 | 51.10 | 0.78 | V | 51.88 | 73.98 | 22.10 | PK |
| 2483.5 | 40.02 | 0.78 | V | 40.80 | 53.98 | 13.18 | AV |

Operation Mode: 802.11g
Transfer MCS Index: 6 Mbps
Operating Frequency 2467 MHz
Channel No. 12 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 2483.5 | 51.91 | 0.78 | H | 52.69 | 73.98 | 21.29 | PK |
| 2483.5 | 40.10 | 0.78 | H | 40.88 | 53.98 | 13.10 | AV |
| 2483.5 | 51.30 | 0.78 | V | 52.08 | 73.98 | 21.90 | PK |
| 2483.5 | 39.95 | 0.78 | V | 40.73 | 53.98 | 13.25 | AV |

Operation Mode: 802.11n_HT20
Transfer MCS Index: 6.5 Mbps
Operating Frequency 2467 MHz
Channel No. 12 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 2483.5 | 51.93 | 0.78 | H | 52.71 | 73.98 | 21.27 | PK |
| 2483.5 | 40.04 | 0.78 | H | 40.82 | 53.98 | 13.16 | AV |
| 2483.5 | 51.08 | 0.78 | V | 51.86 | 73.98 | 22.12 | PK |
| 2483.5 | 40.06 | 0.78 | V | 40.84 | 53.98 | 13.14 | AV |

Operation Mode: 802.11b
Transfer Rate: 1 Mbps
Operating Frequency 2472 MHz
Channel No. 13 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 2483.5 | 51.63 | 0.78 | H | 52.41 | 73.98 | 21.57 | PK |
| 2483.5 | 41.19 | 0.78 | H | 41.97 | 53.98 | 12.01 | AV |
| 2483.5 | 51.69 | 0.78 | V | 52.47 | 73.98 | 21.51 | PK |
| 2483.5 | 40.81 | 0.78 | V | 41.59 | 53.98 | 12.39 | AV |

Operation Mode: 802.11g
Transfer MCS Index: 6 Mbps
Operating Frequency 2472 MHz
Channel No. 13 Ch

| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 2483.5 | 55.83 | 0.78 | H | 56.61 | 73.98 | 17.37 | PK |
| 2483.5 | 42.94 | 0.78 | H | 43.72 | 53.98 | 10.26 | AV |
| 2483.5 | 54.73 | 0.78 | V | 55.51 | 73.98 | 18.47 | PK |
| 2483.5 | 41.94 | 0.78 | V | 42.72 | 53.98 | 11.26 | AV |

Operation Mode: 802.11n_HT20
Transfer MCS Index: 6.5 Mbps
Operating Frequency 2472 MHz
Channel No. 13 Ch

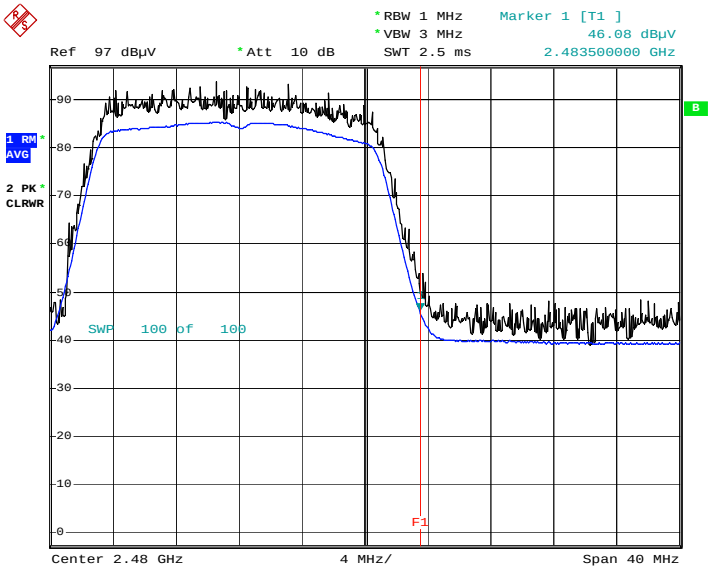
| Frequency [MHz] | Reading [dBuV] | A.F.+C.L.+D.F. [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 2483.5 | 58.71 | 0.78 | H | 59.49 | 73.98 | 14.49 | PK |
| 2483.5 | 46.08 | 0.78 | H | 46.86 | 53.98 | 7.12 | AV |
| 2483.5 | 57.12 | 0.78 | V | 57.90 | 73.98 | 16.08 | PK |
| 2483.5 | 44.96 | 0.78 | V | 45.74 | 53.98 | 8.24 | AV |

**Notes:**

1. Total = Reading Value + Antenna Factor + Cable Loss + Distance Factor
2. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
3. We have done 802.11b/g/n mode and all data rate. Worst data rate is the lowest data of each mode.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. Duty cycle factor applies only below 98%.
   Therefore, test result did not apply the duty cycle factor.

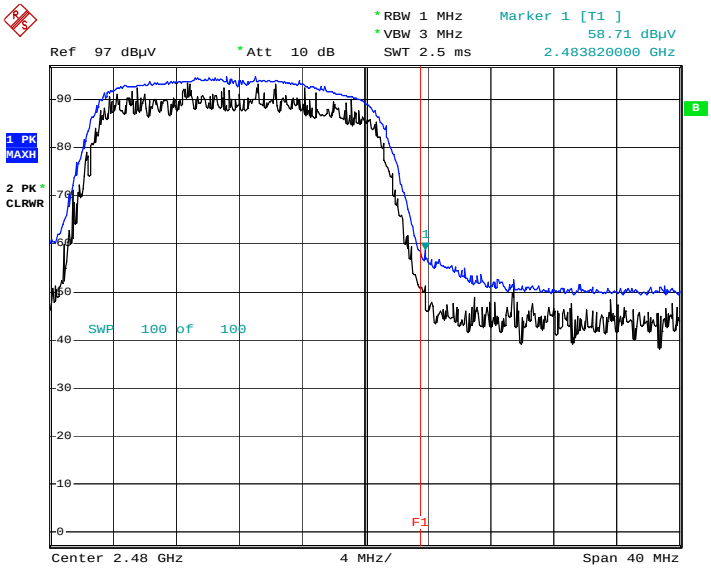
## ▣ RESULT PLOTS

### Radiated Restricted Band Edges plot – Average Reading (802.11n_HT20, Ch.13, Y-H)




Date: 7.MAR.2018 11:03:29

### Radiated Restricted Band Edges plot – Peak Reading (802.11n_HT20, Ch.13, Y-H)




Date: 7.MAR.2018 11:06:42

**Note : Only the worst case plots for Radiated Restricted Band Edges.**

## 9.7 POWERLINE CONDUCTED EMISSIONS

**Test Requirements and limit, §15.207**

For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

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

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

**Test Configuration**

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

**TEST PROCEDURE**

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.
5. We are performed the AC Power Line Conducted Emission test for worst data rate, channel, operation mode.

**Sample Calculation**

Quasi-peak(Final Result) = Reading Value + Correction Factor

## ▣ RESULT PLOTS

**Conducted Emissions (Line 1)**

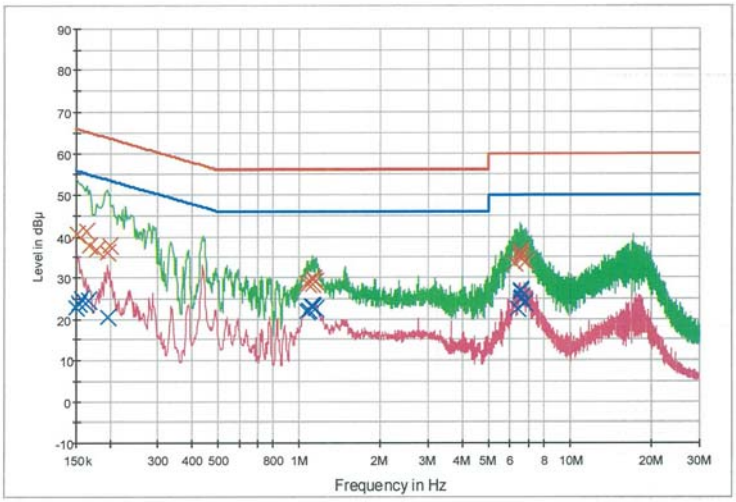
WLAN 2.4GHz MODE N 1 / 2

# HCT TEST Report

### Common Information

| | |
|---|---|
| EUT: | LM-Q610FAW |
| Manufacturer: | LG |
| Test Site: | SHIELD ROOM |
| Operating Conditions: | WLAN 2.4GHz MODE |

FCC CLASS B_Exten Cable




FCC CLASS B_QP
Preview Result 2-AVG
FCC CLASS B_AV
Final Result 1-QPK
Preview Result 1-PK+
Final Result 2-CAV

### Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|
| 0.152000 | 40.5 | 9.000 | Off | N | 9.7 | 25.4 | 65.9 |
| 0.164000 | 41.2 | 9.000 | Off | N | 9.7 | 24.1 | 65.3 |
| 0.168000 | 37.9 | 9.000 | Off | N | 9.7 | 27.1 | 65.1 |
| 0.178000 | 36.7 | 9.000 | Off | N | 9.7 | 27.9 | 64.6 |
| 0.196000 | 36.2 | 9.000 | Off | N | 9.7 | 27.6 | 63.8 |
| 0.200000 | 37.7 | 9.000 | Off | N | 9.7 | 25.9 | 63.6 |
| 1.076000 | 28.6 | 9.000 | Off | N | 9.8 | 27.4 | 56.0 |
| 1.082000 | 28.2 | 9.000 | Off | N | 9.8 | 27.8 | 56.0 |
| 1.120000 | 28.4 | 9.000 | Off | N | 9.8 | 27.6 | 56.0 |
| 1.126000 | 29.6 | 9.000 | Off | N | 9.8 | 26.4 | 56.0 |
| 1.140000 | 29.7 | 9.000 | Off | N | 9.8 | 26.3 | 56.0 |
| 1.154000 | 29.1 | 9.000 | Off | N | 9.8 | 26.9 | 56.0 |
| 6.292000 | 33.4 | 9.000 | Off | N | 10.1 | 26.6 | 60.0 |
| 6.534000 | 36.3 | 9.000 | Off | N | 10.1 | 23.7 | 60.0 |
| 6.572000 | 35.7 | 9.000 | Off | N | 10.1 | 24.3 | 60.0 |
| 6.590000 | 34.9 | 9.000 | Off | N | 10.1 | 25.1 | 60.0 |
| 6.598000 | 34.5 | 9.000 | Off | N | 10.1 | 25.5 | 60.0 |
| 6.844000 | 33.6 | 9.000 | Off | N | 10.1 | 26.4 | 60.0 |

### Final Result 2

2018-02-20 오후 8:36:28

WLAN 2.4GHz MODE N 2 / 2

| Frequency (MHz) | CAverage (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|
| 0.150000 | 22.9 | 9.000 | Off | N | 9.7 | 33.1 | 56.0 |
| 0.154000 | 24.1 | 9.000 | Off | N | 9.7 | 31.7 | 55.8 |
| 0.158000 | 24.8 | 9.000 | Off | N | 9.7 | 30.7 | 55.6 |
| 0.162000 | 24.0 | 9.000 | Off | N | 9.7 | 31.4 | 55.4 |
| 0.166000 | 24.4 | 9.000 | Off | N | 9.7 | 30.7 | 55.2 |
| 0.196000 | 20.3 | 9.000 | Off | N | 9.7 | 33.4 | 53.8 |
| 1.076000 | 22.0 | 9.000 | Off | N | 9.8 | 24.0 | 46.0 |
| 1.086000 | 22.3 | 9.000 | Off | N | 9.8 | 23.7 | 46.0 |
| 1.110000 | 23.2 | 9.000 | Off | N | 9.8 | 22.8 | 46.0 |
| 1.120000 | 22.9 | 9.000 | Off | N | 9.8 | 23.1 | 46.0 |
| 1.126000 | 23.4 | 9.000 | Off | N | 9.8 | 22.6 | 46.0 |
| 1.152000 | 22.5 | 9.000 | Off | N | 9.8 | 23.5 | 46.0 |
| 6.416000 | 22.4 | 9.000 | Off | N | 10.1 | 27.6 | 50.0 |
| 6.534000 | 26.7 | 9.000 | Off | N | 10.1 | 23.3 | 50.0 |
| 6.572000 | 26.9 | 9.000 | Off | N | 10.1 | 23.2 | 50.0 |
| 6.590000 | 25.1 | 9.000 | Off | N | 10.1 | 24.9 | 50.0 |
| 6.598000 | 25.3 | 9.000 | Off | N | 10.1 | 24.7 | 50.0 |
| 6.754000 | 23.8 | 9.000 | Off | N | 10.1 | 26.2 | 50.0 |

2018-02-20 오후 8:36:28

**Conducted Emissions (Line 2)**

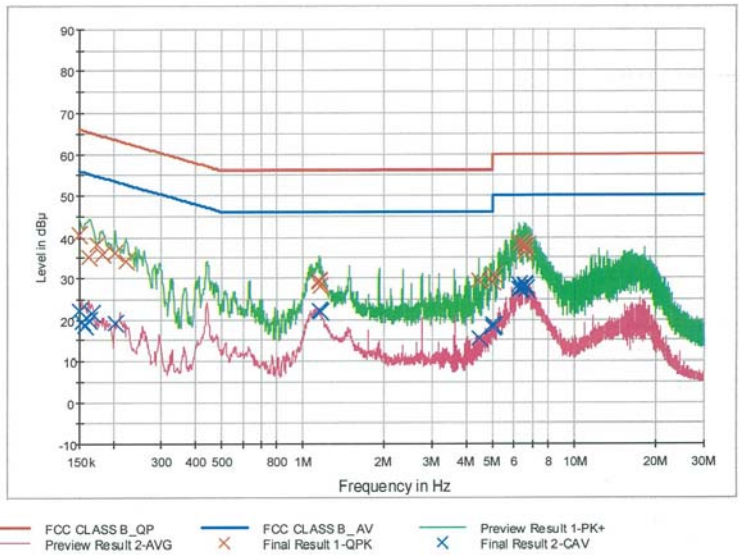
WLAN 2.4GHz MODE L1 1 / 2

# HCT TEST Report

## Common Information

| | |
|---|---|
| EUT: | LM-Q610FAW |
| Manufacturer: | LG |
| Test Site: | SHIELD ROOM |
| Operating Conditions: | WLAN 2.4GHz MODE |

FCC CLASS B_Exten Cable




## Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|
| 0.150000 | 40.4 | 9.000 | Off | L1 | 9.7 | 25.6 | 66.0 |
| 0.162000 | 35.2 | 9.000 | Off | L1 | 9.7 | 30.2 | 65.4 |
| 0.174000 | 38.1 | 9.000 | Off | L1 | 9.7 | 26.7 | 64.8 |
| 0.182000 | 35.7 | 9.000 | Off | L1 | 9.7 | 28.7 | 64.4 |
| 0.204000 | 36.0 | 9.000 | Off | L1 | 9.7 | 27.4 | 63.4 |
| 0.222000 | 34.1 | 9.000 | Off | L1 | 9.7 | 28.6 | 62.7 |
| 1.144000 | 29.3 | 9.000 | Off | L1 | 9.8 | 26.7 | 56.0 |
| 1.148000 | 28.8 | 9.000 | Off | L1 | 9.8 | 27.2 | 56.0 |
| 1.160000 | 28.0 | 9.000 | Off | L1 | 9.8 | 28.0 | 56.0 |
| 4.454000 | 29.4 | 9.000 | Off | L1 | 10.0 | 26.6 | 56.0 |
| 4.994000 | 28.9 | 9.000 | Off | L1 | 10.0 | 27.1 | 56.0 |
| 5.074000 | 30.6 | 9.000 | Off | L1 | 10.0 | 29.4 | 60.0 |
| 6.258000 | 38.3 | 9.000 | Off | L1 | 10.0 | 21.7 | 60.0 |
| 6.288000 | 38.3 | 9.000 | Off | L1 | 10.0 | 21.7 | 60.0 |
| 6.524000 | 36.2 | 9.000 | Off | L1 | 10.0 | 23.8 | 60.0 |
| 6.574000 | 37.4 | 9.000 | Off | L1 | 10.1 | 22.6 | 60.0 |
| 6.588000 | 38.5 | 9.000 | Off | L1 | 10.1 | 21.5 | 60.0 |
| 6.674000 | 37.4 | 9.000 | Off | L1 | 10.1 | 22.6 | 60.0 |

## Final Result 2

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| Frequency (MHz) | CAverage (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|
| 0.150000 | 22.1 | 9.000 | Off | L1 | 9.7 | 33.9 | 56.0 |
| 0.154000 | 19.4 | 9.000 | Off | L1 | 9.7 | 36.4 | 55.8 |
| 0.158000 | 18.4 | 9.000 | Off | L1 | 9.7 | 37.2 | 55.6 |
| 0.162000 | 19.8 | 9.000 | Off | L1 | 9.7 | 35.5 | 55.4 |
| 0.166000 | 21.4 | 9.000 | Off | L1 | 9.7 | 33.8 | 55.2 |
| 0.204000 | 19.2 | 9.000 | Off | L1 | 9.7 | 34.3 | 53.4 |
| 1.144000 | 22.2 | 9.000 | Off | L1 | 9.8 | 23.8 | 46.0 |
| 1.160000 | 22.0 | 9.000 | Off | L1 | 9.8 | 24.0 | 46.0 |
| 4.454000 | 15.3 | 9.000 | Off | L1 | 10.0 | 30.7 | 46.0 |
| 4.996000 | 18.1 | 9.000 | Off | L1 | 10.0 | 27.9 | 46.0 |
| 5.038000 | 18.8 | 9.000 | Off | L1 | 10.0 | 31.2 | 50.0 |
| 5.074000 | 18.6 | 9.000 | Off | L1 | 10.0 | 31.4 | 50.0 |
| 6.258000 | 28.4 | 9.000 | Off | L1 | 10.0 | 21.6 | 50.0 |
| 6.288000 | 27.1 | 9.000 | Off | L1 | 10.0 | 22.9 | 50.0 |
| 6.328000 | 27.1 | 9.000 | Off | L1 | 10.0 | 22.9 | 50.0 |
| 6.564000 | 28.3 | 9.000 | Off | L1 | 10.1 | 21.7 | 50.0 |
| 6.588000 | 27.9 | 9.000 | Off | L1 | 10.1 | 22.1 | 50.0 |
| 6.674000 | 27.4 | 9.000 | Off | L1 | 10.1 | 22.6 | 50.0 |

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# 10. LIST OF TEST EQUIPMENT

## 10.1 LIST OF TEST EQUIPMENT(Conducted Test)

| Manufacturer | Model / Equipment | Calibration Date | Calibration Interval | Serial No. |
|---|---|---|---|---|
| Rohde & Schwarz | ENV216 / LISN | 12/20/2017 | Annual | 102245 |
| Rohde & Schwarz | ESCI / Test Receiver | 06/27/2017 | Annual | 100033 |
| ESPAC | SU-642 /Temperature Chamber | 03/31/2017 | Annual | 0093008124 |
| Agilent | N9020A / Signal Analyzer | 06/13/2017 | Annual | MY51110085 |
| Agilent | N9030A / Signal Analyzer | 11/22/2017 | Annual | MY49431210 |
| Agilent | N1911A / Power Meter | 04/17/2017 | Annual | MY45100523 |
| Agilent | N1921A / Power Sensor | 04/17/2017 | Annual | MY52260025 |
| Hewlett Packard | 11667B / Power Splitter | 06/12/2017 | Annual | 05001 |
| Hewlett Packard | E3632A / DC Power Supply | 06/30/2017 | Annual | KR75303960 |
| Agilent | 8493C / Attenuator(10 dB) | 07/10/2017 | Annual | 07560 |
| Rohde & Schwarz | EMC32 / Software | N/A | N/A | N/A |
| HCT CO., LTD. | FCC WLAN&BT&BLE Conducted Test Software v3.0 | N/A | N/A | N/A |

## 10.2 LIST OF TEST EQUIPMENT(Radiated Test)

| Manufacturer | Model / Equipment | Calibration Date | Calibration Interval | Serial No. |
|---|---|---|---|---|
| Innco system | CO3000 / Controller(Antenna mast) | N/A | N/A | CO3000-4p |
| Innco system | MA4000-EP / Antenna Position Tower | N/A | N/A | N/A |
| Audix | EM1000 / Controller | N/A | N/A | 060520 |
| Audix | Turn Table | N/A | N/A | N/A |
| Rohde & Schwarz | Loop Antenna | 04/19/2017 | Biennial | 1513-175 |
| Schwarzbeck | VULB 9168 / Hybrid Antenna | 04/06/2017 | Biennial | 760 |
| Schwarzbeck | BBHA 9120D / Horn Antenna | 05/02/2017 | Biennial | 9120D-937 |
| Schwarzbeck | BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz) | 12/04/2017 | Biennial | BBHA9170541 |
| Rohde & Schwarz | FSP(9 kHz ~ 30 GHz) / Spectrum Analyzer | 09/06/2017 | Annual | 100688 |
| Rohde & Schwarz | FSV40-N / Spectrum Analyzer | 09/27/2017 | Annual | 101068-SZ |
| Wainwright Instruments | WHK3.0/18G-10EF / High Pass Filter | 06/12/2017 | Annual | 8 |
| Wainwright Instruments | WHFX7.0/18G-8SS / High Pass Filter | 05/15/2017 | Annual | 29 |
| Wainwright Instruments | WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter | 06/30/2017 | Annual | 2 |
| Wainwright Instruments | WRCJV5100/5850-40/50-8EEK / Band Reject Filter | 01/03/2018 | Annual | 2 |
| Api tech. | 18B-03 / Attenuator (3 dB) | 06/12/2017 | Annual | 1 |
| Agilent | 8493C-10 / Attenuator(10 dB) | 07/19/2017 | Annual | 08285 |
| CERNEX | CBLU1183540 / Power Amplifier | 07/11/2017 | Annual | 22964 |
| CERNEX | CBL06185030 / Power Amplifier | 07/11/2017 | Annual | 22965 |
| CERNEX | CBL18265035 / Power Amplifier | 01/10/2018 | Annual | 22966 |
| CERNEX | CBL26405040 / Power Amplifier | 06/30/2017 | Annual | 25956 |