

# FCC Part 15C Measurement and Test Report

For

**ShenZhen FreedConn(FDC) Electronics Co., Ltd**

**East Area 4th floor, E building, Hua Chuang Da industry park, No.176**

**HangCheng Road, Xixiang, Baoan, Shenzhen, China**

**FCC ID: 2ACB3-R1**

**FCC Rule(s):** FCC Part 15.247

**Product Description:** Bluetooth wifi recorder

**Tested Model:** R1

**Report No.:** WTX19X12084703W-1

**Sample Receipt Date:** 2019-12-05

**Tested Date:** 2019-12-05 to 2019-12-13

**Issued Date:** 2019-12-13

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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM Test Technology Co., Ltd.

**TABLE OF CONTENTS**

|                                                             |           |
|-------------------------------------------------------------|-----------|
| <b>1. GENERAL INFORMATION.....</b>                          | <b>4</b>  |
| 1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)..... | 4         |
| 1.2 TEST STANDARDS.....                                     | 5         |
| 1.3 TEST METHODOLOGY .....                                  | 5         |
| 1.4 TEST FACILITY .....                                     | 5         |
| 1.5 EUT SETUP AND TEST MODE .....                           | 6         |
| 1.6 MEASUREMENT UNCERTAINTY .....                           | 7         |
| 1.7 TEST EQUIPMENT LIST AND DETAILS .....                   | 8         |
| <b>2. SUMMARY OF TEST RESULTS .....</b>                     | <b>10</b> |
| <b>3. RF EXPOSURE .....</b>                                 | <b>11</b> |
| 3.1 STANDARD APPLICABLE.....                                | 11        |
| 3.2 TEST RESULT.....                                        | 11        |
| <b>4. ANTENNA REQUIREMENT .....</b>                         | <b>12</b> |
| 4.1 STANDARD APPLICABLE.....                                | 12        |
| 4.2 EVALUATION INFORMATION .....                            | 12        |
| <b>5. POWER SPECTRAL DENSITY .....</b>                      | <b>13</b> |
| 5.1 STANDARD APPLICABLE.....                                | 13        |
| 5.2 TEST PROCEDURE.....                                     | 13        |
| 5.3 SUMMARY OF TEST RESULTS/PLOTS .....                     | 13        |
| <b>6. DTS BANDWIDTH.....</b>                                | <b>17</b> |
| 6.1 STANDARD APPLICABLE.....                                | 17        |
| 6.2 TEST PROCEDURE.....                                     | 17        |
| 6.3 SUMMARY OF TEST RESULTS/PLOTS .....                     | 17        |
| <b>7. RF OUTPUT POWER .....</b>                             | <b>21</b> |
| 7.1 STANDARD APPLICABLE.....                                | 21        |
| 7.2 TEST PROCEDURE.....                                     | 21        |
| 7.3 SUMMARY OF TEST RESULTS/PLOTS .....                     | 21        |
| <b>8. FIELD STRENGTH OF SPURIOUS EMISSIONS .....</b>        | <b>26</b> |
| 8.1 STANDARD APPLICABLE.....                                | 26        |
| 8.2 TEST PROCEDURE.....                                     | 26        |
| 8.3 CORRECTED AMPLITUDE & MARGIN CALCULATION.....           | 27        |
| 8.4 SUMMARY OF TEST RESULTS/PLOTS .....                     | 27        |
| <b>9. OUT OF BAND EMISSIONS.....</b>                        | <b>35</b> |
| 9.1 STANDARD APPLICABLE.....                                | 35        |
| 9.2 TEST PROCEDURE.....                                     | 35        |
| 9.3 SUMMARY OF TEST RESULTS/PLOTS .....                     | 36        |
| <b>10. CONDUCTED EMISSIONS .....</b>                        | <b>52</b> |
| 10.1 TEST PROCEDURE.....                                    | 52        |
| 10.2 BASIC TEST SETUP BLOCK DIAGRAM.....                    | 52        |
| 10.3 TEST RECEIVER SETUP .....                              | 52        |
| 10.4 SUMMARY OF TEST RESULTS/PLOTS .....                    | 52        |

**Report version**

| Version No. | Date of issue | Description |
|-------------|---------------|-------------|
| Rev.00      | 2019-12-13    | Original    |
| /           | /             | /           |

## 1. GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

#### Client Information

Applicant: ShenZhen FreedConn(FDC) Electronics Co., Ltd  
Address of applicant: East Area 4th floor, E building,Hua Chuang Da industry park,  
No.176 HangCheng Road, Xixiang, Baoan, Shenzhen, China

Manufacturer: ShenZhen FreedConn(FDC) Electronics Co., Ltd  
Address of manufacturer: East Area 4th floor, E building,Hua Chuang Da industry park,  
No.176 HangCheng Road, Xixiang, Baoan, Shenzhen, China

| General Description of EUT                                                             |                         |
|----------------------------------------------------------------------------------------|-------------------------|
| Product Name:                                                                          | Bluetooth wifi recorder |
| Trade Name:                                                                            | FreedConn               |
| Model No.:                                                                             | R1                      |
| Adding Model(s):                                                                       | R1-PRO,R1-PLUS          |
| Rated Voltage:                                                                         | Battery:DC3.7V          |
| Batter Capacity                                                                        | 1500mAh                 |
| Note: The test data is gathered from a production sample provided by the manufacturer. |                         |

| Technical Characteristics of EUT |                                    |
|----------------------------------|------------------------------------|
| Support Standards:               | 802.11b, 802.11g, 802.11n          |
| Frequency Range:                 | 2412-2462MHz for 802.11b/g/n-HT20  |
| RF Output Power:                 | 9.39dBm (Conducted)                |
| Type of Modulation:              | DBPSK,BPSK,DQPSK,QPSK,16QAM,64QAM  |
| Data Rate:                       | 1-11Mbps, 6-54Mbps, up to 72.2Mbps |
| Quantity of Channels:            | 11 for 802.11b/g/n-HT20            |
| Channel Separation:              | 5MHz                               |
| Type of Antenna:                 | Integral Antenna                   |
| Antenna Gain:                    | 0.5dBi                             |

## 1.2 Test Standards

The tests were performed according to following standards:

**FCC Rules Part 15.247:** Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

**558074 D01 15.247 Meas Guidance v05r02:** Guidance For Compliance Measurements On Digital Transmission System, Frequency Hopping Spread Spectrum System, And Hybrid System Devices Operating Under Section 15.247 Of The Fcc Rules.

**ANSI C63.10-2013:** American National Standard for Testing Unlicensed Wireless Devices.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

## 1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02.

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

## 1.4 Test Facility

### Address of the test laboratory

Laboratory: Shenzhen SEM Test Technology Co., Ltd.

Address: 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C. (518101)

### FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

### Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

## 1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

| Test Mode List |              |                                          |
|----------------|--------------|------------------------------------------|
| Test Mode      | Description  | Remark                                   |
| TM1            | 802.11b      | Low:2412MHz, Middle:2437MHz,High:2462MHz |
| TM2            | 802.11g      | Low:2412MHz, Middle:2437MHz,High:2462MHz |
| TM3            | 802.11n-HT20 | Low:2412MHz, Middle:2437MHz,High:2462MHz |

| Test Conditions    |           |
|--------------------|-----------|
| Temperature:       | 22~25 °C  |
| Relative Humidity: | 50~56 %.  |
| ATM Pressure:      | 1019 mbar |

| EUT Cable List and Details |            |                     |                        |
|----------------------------|------------|---------------------|------------------------|
| Cable Description          | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| USB Cable                  | 1.0        | Unshielded          | Without Ferrite        |

| Accessories Cable List and Details |            |                     |                        |
|------------------------------------|------------|---------------------|------------------------|
| Cable Description                  | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| /                                  | /          | /                   | /                      |

| Auxiliary Equipment List and Details |              |       |               |
|--------------------------------------|--------------|-------|---------------|
| Description                          | Manufacturer | Model | Serial Number |
| Adapter                              | /            | 1408  | /             |

## 1.6 Measurement Uncertainty

| Measurement uncertainty        |            |                                |
|--------------------------------|------------|--------------------------------|
| Parameter                      | Conditions | Uncertainty                    |
| RF Output Power                | Conducted  | $\pm 0.42\text{dB}$            |
| Occupied Bandwidth             | Conducted  | $\pm 1.5\%$                    |
| Power Spectral Density         | Conducted  | $\pm 1.8\text{dB}$             |
| Conducted Spurious Emission    | Conducted  | $\pm 2.17\text{dB}$            |
| Conducted Emissions            | Conducted  | 9-150kHz $\pm 3.74\text{dB}$   |
|                                |            | 0.15-30MHz $\pm 3.34\text{dB}$ |
| Transmitter Spurious Emissions | Radiated   | 30-200MHz $\pm 4.52\text{dB}$  |
|                                |            | 0.2-1GHz $\pm 5.56\text{dB}$   |
|                                |            | 1-6GHz $\pm 3.84\text{dB}$     |
|                                |            | 6-18GHz $\pm 3.92\text{dB}$    |

## 1.7 Test Equipment List and Details

| No.       | Description       | Manufacturer           | Model                 | Serial No.  | Cal Date   | Due Date   |
|-----------|-------------------|------------------------|-----------------------|-------------|------------|------------|
| SEMT-1072 | Spectrum Analyzer | Agilent                | E4407B                | MY41440400  | 2019-04-30 | 2020-04-29 |
| SEMT-1031 | Spectrum Analyzer | Rohde & Schwarz        | FSP30                 | 836079/035  | 2019-04-30 | 2020-04-29 |
| SEMT-1007 | EMI Test Receiver | Rohde & Schwarz        | ESVB                  | 825471/005  | 2019-04-30 | 2020-04-29 |
| SEMT-1008 | Amplifier         | Agilent                | 8447F                 | 3113A06717  | 2019-04-30 | 2020-04-29 |
| SEMT-1043 | Amplifier         | C&D                    | PAP-1G18              | 2002        | 2019-04-30 | 2020-04-29 |
| SEMT-1011 | Broadband Antenna | Schwarz beck           | VULB9163              | 9163-333    | 2019-05-05 | 2021-05-04 |
| SEMT-1042 | Horn Antenna      | ETS                    | 3117                  | 00086197    | 2019-05-05 | 2021-05-04 |
| SEMT-1121 | Horn Antenna      | Schwarzbeck            | BBHA 9170             | BBHA9170582 | 2019-05-05 | 2021-05-04 |
| SEMT-1069 | Loop Antenna      | Schwarz beck           | FMZB 1516             | 9773        | 2019-05-05 | 2021-05-04 |
| SEMT-1001 | EMI Test Receiver | Rohde & Schwarz        | ESPI                  | 101611      | 2019-04-30 | 2020-04-29 |
| SEMT-1003 | L.I.S.N           | Schwarz beck           | NSLK8126              | 8126-224    | 2019-04-30 | 2020-04-29 |
| SEMT-1002 | Pulse Limiter     | Rohde & Schwarz        | ESH3-Z2               | 100911      | 2019-04-30 | 2020-04-29 |
| SEMT-1168 | Pre-amplifier     | Direction Systems Inc. | PAP-0126              | 14141-12838 | 2019-04-30 | 2020-04-29 |
| SEMT-1169 | Pre-amplifier     | Direction Systems Inc. | PAP-2640              | 14145-14153 | 2019-04-30 | 2020-04-29 |
| SEMT-1163 | Spectrum Analyzer | Rohde & Schwarz        | FSP40                 | 100612      | 2019-04-30 | 2020-04-29 |
| SEMT-1170 | DRG Horn Antenna  | A.H. SYSTEMS           | SAS-574               | 571         | 2019-05-05 | 2021-05-04 |
| SEMT-1166 | Power Limiter     | Agilent                | N9356B                | MY45450376  | 2019-04-30 | 2020-04-29 |
| SEMT-1048 | RF Limiter        | ATTEN                  | AT-BSF-2400~2500      | /           | 2019-04-30 | 2020-04-29 |
| SEMT-1076 | RF Switcher       | Top Precision          | RCS03-A2              | /           | 2019-04-30 | 2020-04-29 |
| SEMT-C001 | Cable             | Zheng DI               | LL142-07-07-10M(A)    | /           | 2019-03-18 | 2020-03-17 |
| SEMT-C002 | Cable             | Zheng DI               | ZT40-2.92J-2.92J-6M   | /           | 2019-03-18 | 2020-03-17 |
| SEMT-C003 | Cable             | Zheng DI               | ZT40-2.92J-2.92J-2.5M | /           | 2019-03-18 | 2020-03-17 |
| SEMT-C004 | Cable             | Zheng DI               | 2M0RFC                | /           | 2019-03-18 | 2020-03-17 |
| SEMT-C005 | Cable             | Zheng DI               | 1M0RFC                | /           | 2019-03-18 | 2020-03-17 |
| SEMT-C006 | Cable             | Zheng DI               | 1M0RFC                | /           | 2019-03-18 | 2020-03-17 |

| Software List                              |              |        |         |
|--------------------------------------------|--------------|--------|---------|
| Description                                | Manufacturer | Model  | Version |
| EMI Test Software<br>(Radiated Emission)*  | Farad        | EZ-EMC | RA-03A1 |
| EMI Test Software<br>(Conducted Emission)* | Farad        | EZ-EMC | RA-03A1 |

\*Remark: indicates software version used in the compliance certification testing

## 2. SUMMARY OF TEST RESULTS

| FCC Rules               | Description of Test Item          | Result    |
|-------------------------|-----------------------------------|-----------|
| §2.1093                 | RF Exposure                       | Compliant |
| §15.203;15.247(b)(4)(i) | Antenna Requirement               | Compliant |
| §15.205                 | Restricted Band of Operation      | Compliant |
| §15.207(a)              | Conducted Emission                | Compliant |
| §15.247(e)              | Power Spectral Density            | Compliant |
| §15.247(a)(2)           | DTS Bandwidth                     | Compliant |
| §15.247(b)(3)           | RF Output Power                   | Compliant |
| §15.209(a)              | Radiated Emission                 | Compliant |
| §15.247(d)              | Band Edge (Out of Band Emissions) | Compliant |

N/A: not applicable

### **3. RF Exposure**

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#### **3.1 Standard Applicable**

According to §1.1307 and §2.1093, the portable transmitter must comply the RF exposure requirements.

#### **3.2 Test Result**

This product complied with the requirement of the RF exposure, please see the RF Exposure Report.

## **4. Antenna Requirement**

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### **4.1 Standard Applicable**

According to FCC Part 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.

### **4.2 Evaluation Information**

This product has a PCB antenna, fulfill the requirement of this section.

## 5. Power Spectral Density

### 5.1 Standard Applicable

According to 15.247(a)(1)(iii), for digitally modulated systems, 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.

### 5.2 Test Procedure

According to the KDB 558074 D01 v05r02 Subclause 8.4 and ANSI C63.10-2013 Subclause 11.10.3, such specifications require that the same method as used to determine the conducted output power shall also be used to determine the power spectral density. The test method of power spectral density as below:

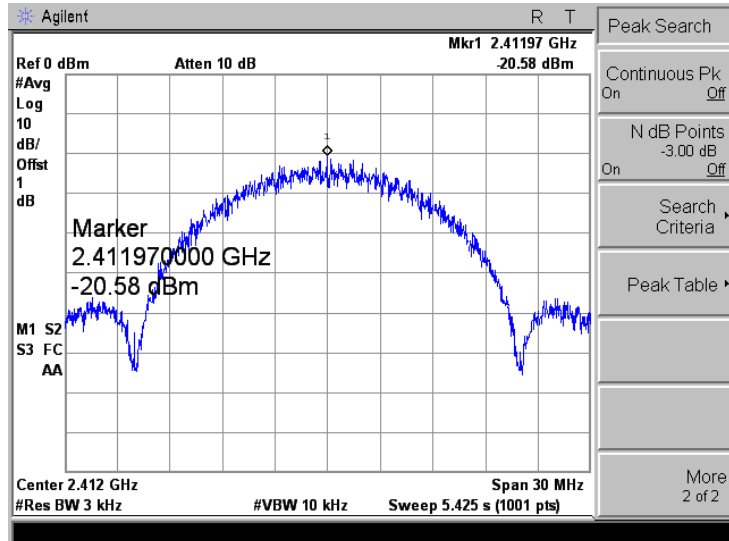
- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- Set VBW  $\geq 3 \times \text{RBW}$ .
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep  $\geq 2 \times \text{span/RBW}$ .
- Sweep time = auto couple.
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.
- If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

### 5.3 Summary of Test Results/Plots

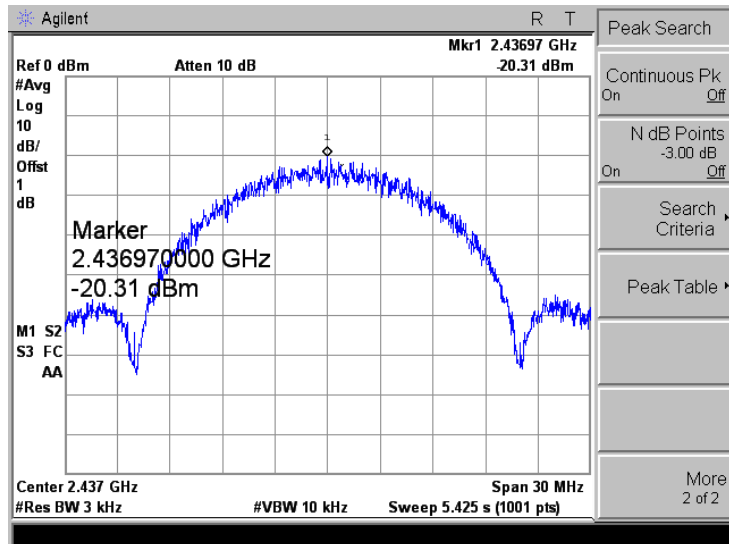
| Test Mode         | Test Channel<br>MHz | Power Spectral Density<br>dBm/3kHz | Limit<br>dBm/3kHz |
|-------------------|---------------------|------------------------------------|-------------------|
| 802.11b_11Mbps    | 2412                | -20.58                             | 8                 |
|                   | 2437                | -20.31                             | 8                 |
|                   | 2462                | -18.82                             | 8                 |
| 802.11g_54Mbps    | 2412                | -24.19                             | 8                 |
|                   | 2437                | -23.77                             | 8                 |
|                   | 2462                | -21.51                             | 8                 |
| 802.11n-HT20_MCS7 | 2412                | -24.47                             | 8                 |
|                   | 2437                | -23.08                             | 8                 |
|                   | 2462                | -21.94                             | 8                 |

Please refer to the following test plots:

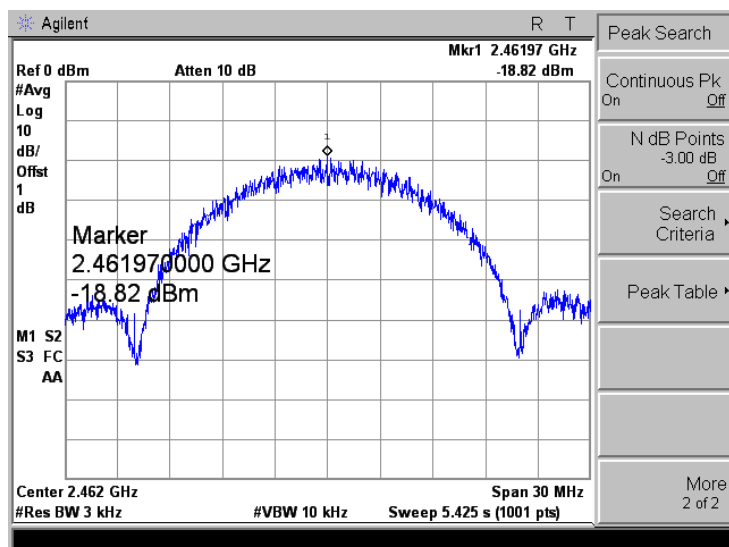
802.11b-Low



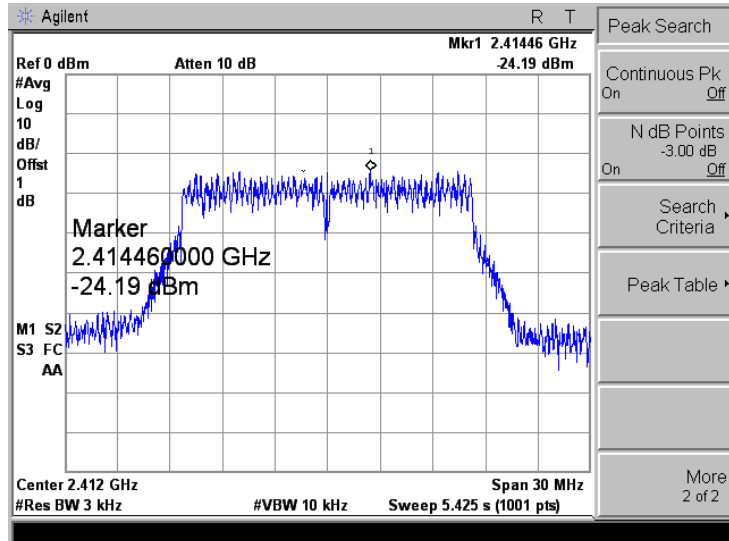
802.11b-Middle



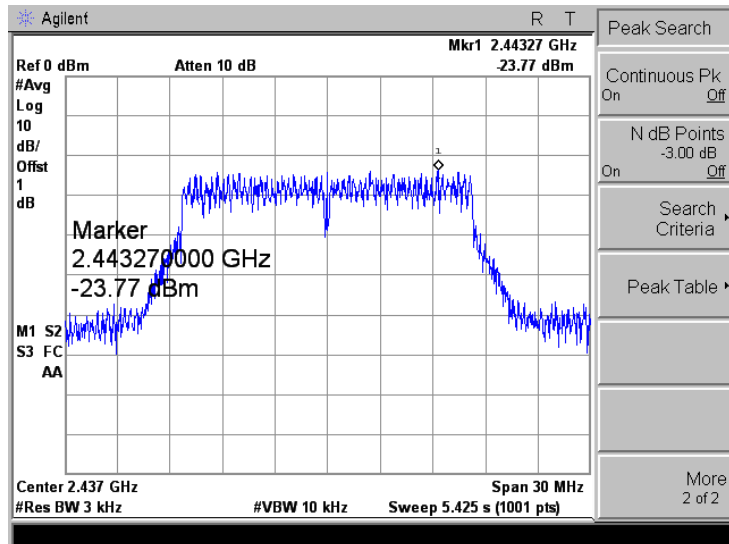
802.11b-High



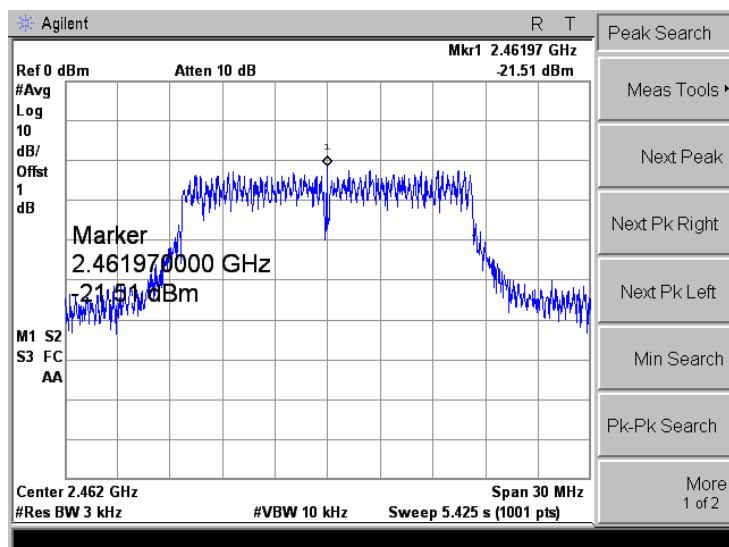
802.11g-Low



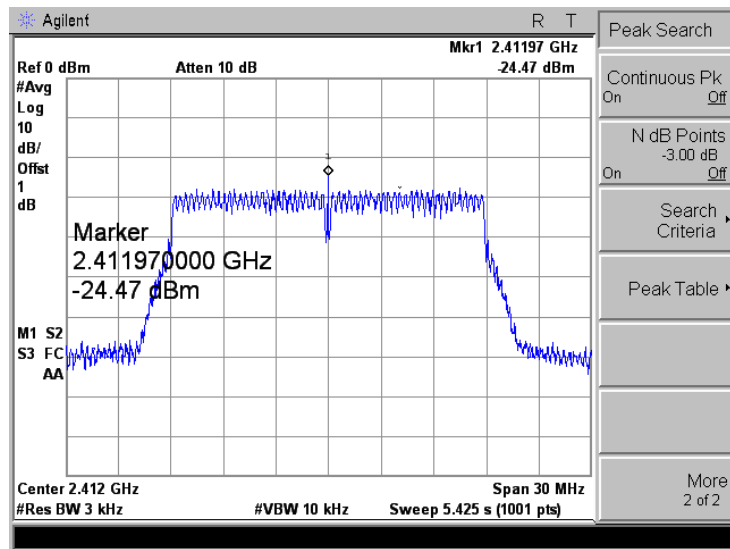
802.11g-Middle



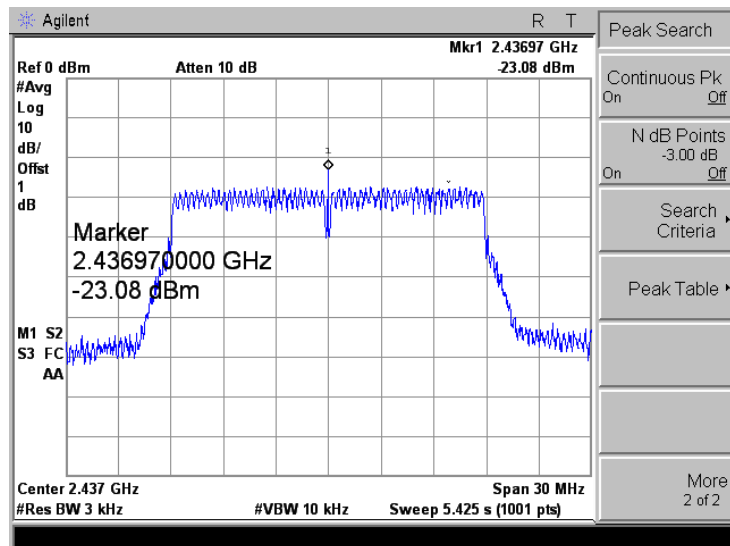
802.11g-High



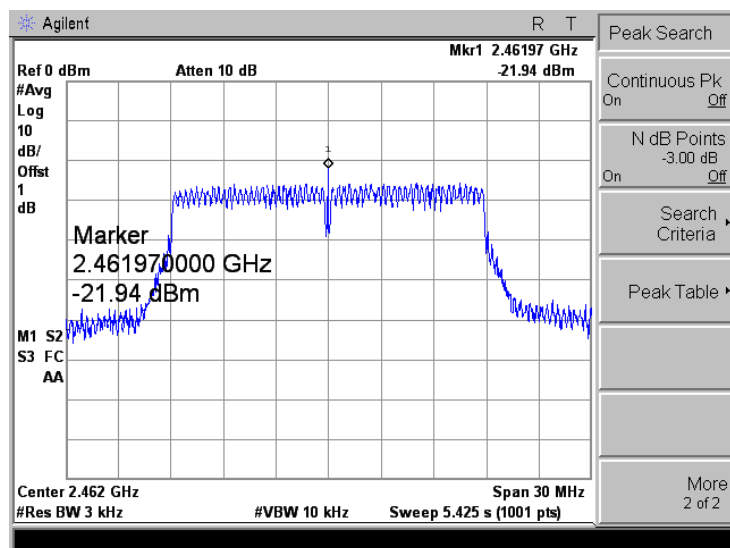
802.11n-HT20-Low



802.11n-HT20-Middle



802.11n-HT20-High



## 6. DTS Bandwidth

### 6.1 Standard Applicable

According to 15.247(a)(2), systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 6.2 Test Procedure

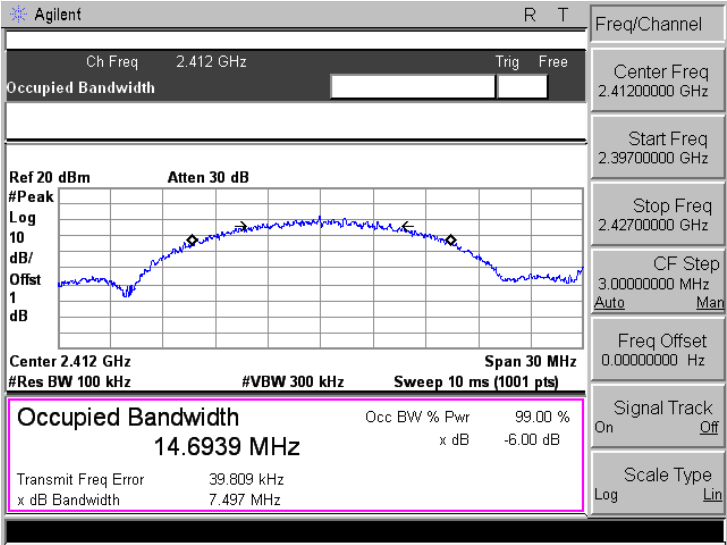
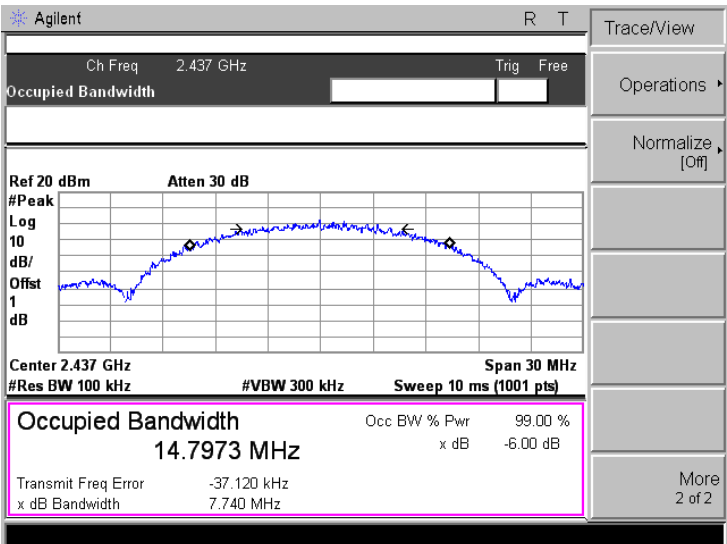
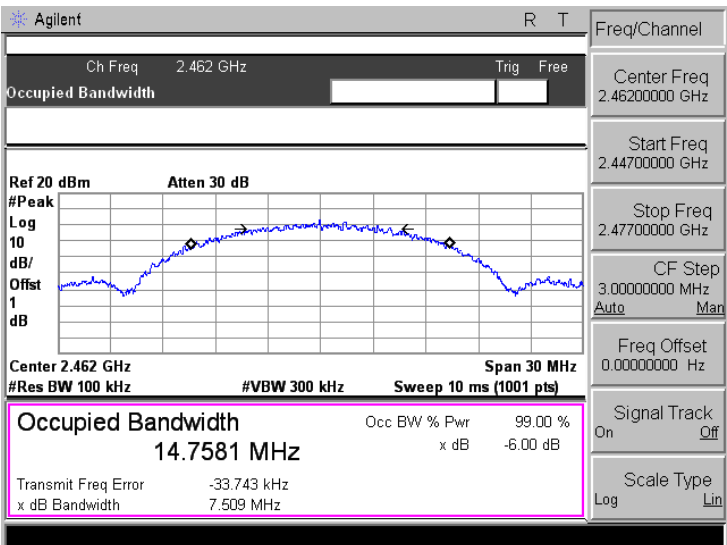
According to the KDB 558074 D01 v05r02 Subclause 8.2 and ANSI C63.10-2013 Subclause 11.8.1, the test method of DTS Bandwidth as below:

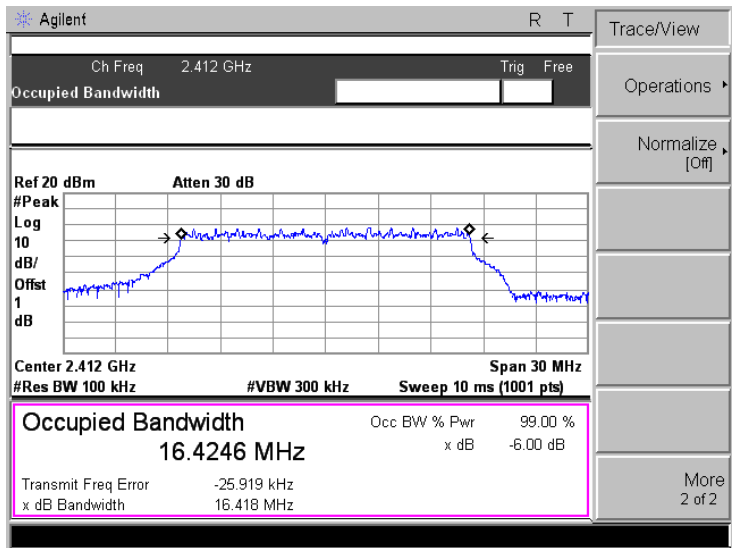
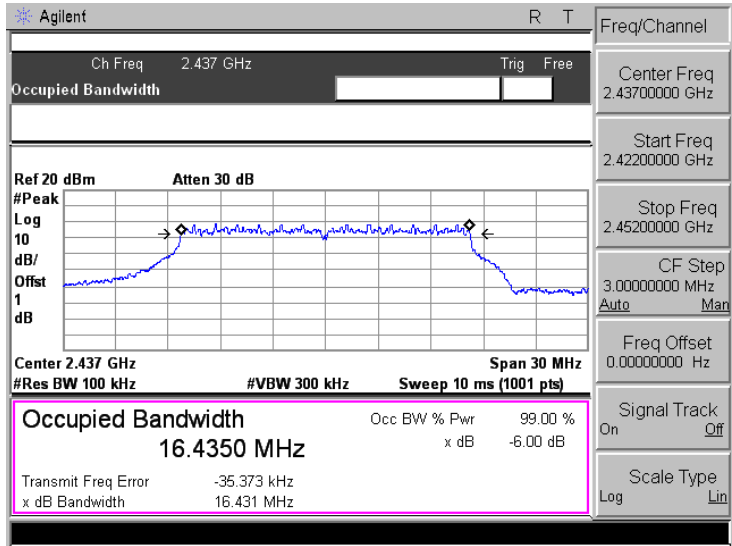
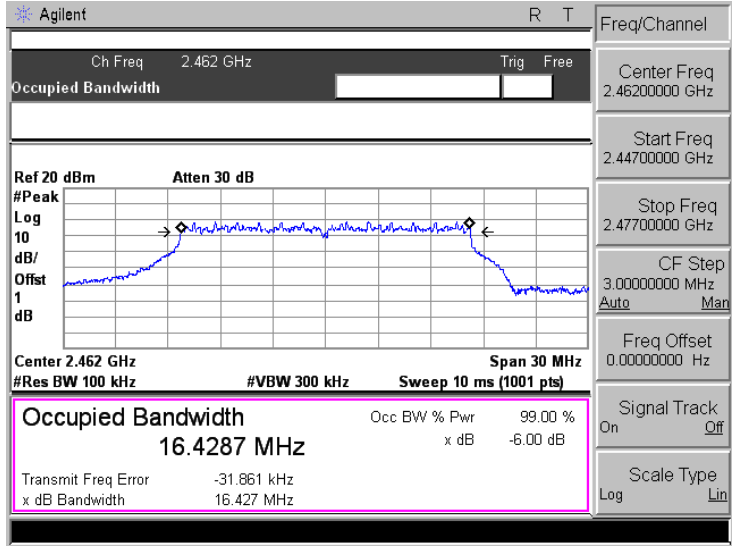
- Set RBW = 100 kHz.
- Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

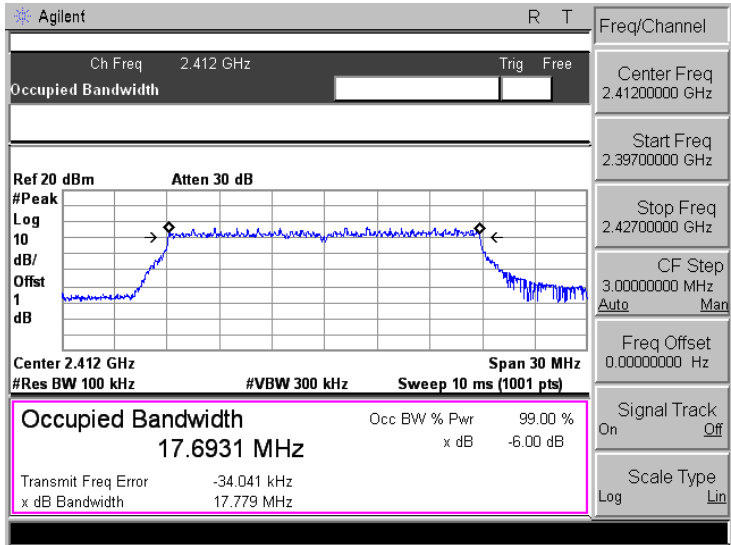
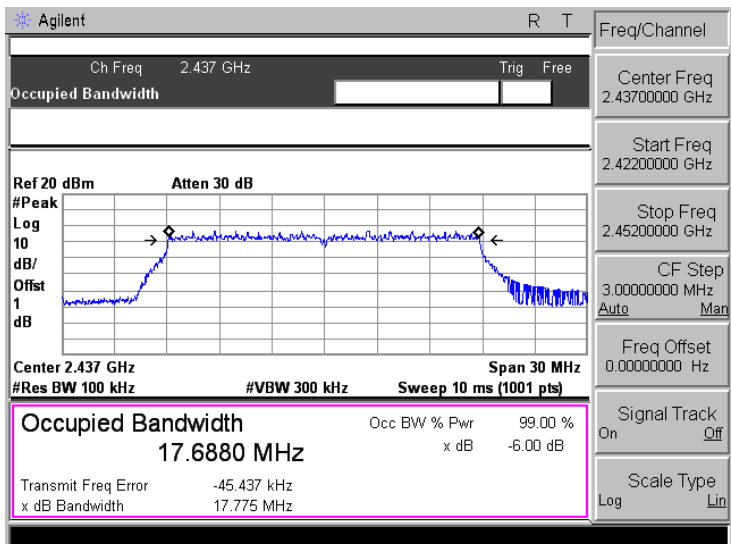
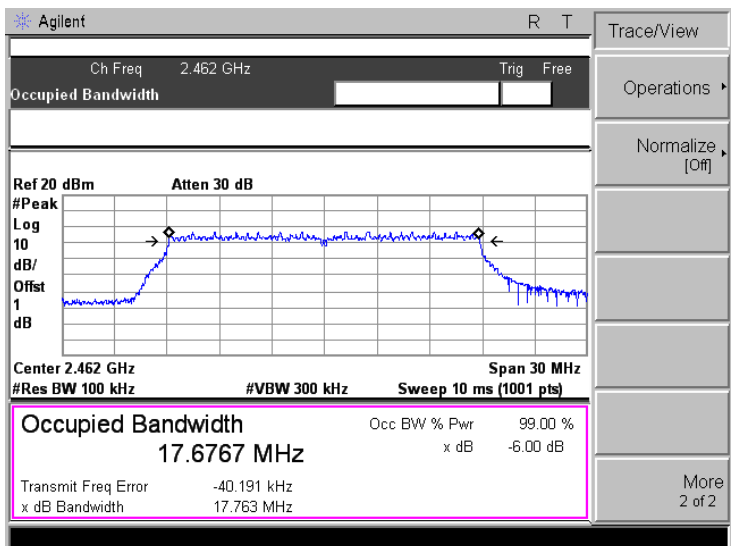
### 6.3 Summary of Test Results/Plots

| Test Mode         | Test Channel<br>MHz | 6 dB Bandwidth<br>MHz | Limit<br>kHz |
|-------------------|---------------------|-----------------------|--------------|
| 802.11b_11Mbps    | 2412                | 7.497                 | $\geq 500$   |
|                   | 2437                | 7.740                 | $\geq 500$   |
|                   | 2462                | 7.509                 | $\geq 500$   |
| 802.11g_54Mbps    | 2412                | 16.418                | $\geq 500$   |
|                   | 2437                | 16.431                | $\geq 500$   |
|                   | 2462                | 16.427                | $\geq 500$   |
| 802.11n-HT20_MCS7 | 2412                | 17.779                | $\geq 500$   |
|                   | 2437                | 17.775                | $\geq 500$   |
|                   | 2462                | 17.763                | $\geq 500$   |

Please refer to the following test plots:

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 802.11b-Low    |  <p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.412 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b><br/>14.6939 MHz</p> <p>Occ BW % Pwr 99.00 %<br/>x dB -6.00 dB</p> <p>Transmit Freq Error 39.809 kHz<br/>x dB Bandwidth 7.497 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.39700000 GHz</p> <p>Stop Freq 2.42700000 GHz</p> <p>CF Step 3.00000000 MHz<br/>Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>    |
| 802.11b-Middle |  <p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.437 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b><br/>14.7973 MHz</p> <p>Occ BW % Pwr 99.00 %<br/>x dB -6.00 dB</p> <p>Transmit Freq Error -37.120 kHz<br/>x dB Bandwidth 7.740 MHz</p> <p>Trace/View</p> <p>Operations</p> <p>Normalize [Off]</p> <p>More 2 of 2</p>                                                                                                                                                                            |
| 802.11b-High   |  <p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.462 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b><br/>14.7581 MHz</p> <p>Occ BW % Pwr 99.00 %<br/>x dB -6.00 dB</p> <p>Transmit Freq Error -33.743 kHz<br/>x dB Bandwidth 7.509 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.46200000 GHz</p> <p>Start Freq 2.44700000 GHz</p> <p>Stop Freq 2.47700000 GHz</p> <p>CF Step 3.00000000 MHz<br/>Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p> |

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 802.11g-Low    |  <p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.412 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b><br/><b>16.4246 MHz</b></p> <p>Occ BW % Pwr 99.00 %<br/>x dB -6.00 dB</p> <p>Transmit Freq Error -25.919 kHz<br/>x dB Bandwidth 16.418 MHz</p> <p>Trace/View<br/>Operations<br/>Normalize [Off]<br/>More 2 of 2</p>                                                                                                                                                             |
| 802.11g-Middle |  <p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.437 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b><br/><b>16.4350 MHz</b></p> <p>Occ BW % Pwr 99.00 %<br/>x dB -6.00 dB</p> <p>Transmit Freq Error -35.373 kHz<br/>x dB Bandwidth 16.431 MHz</p> <p>Freq/Channel<br/>Center Freq 2.43700000 GHz<br/>Start Freq 2.42200000 GHz<br/>Stop Freq 2.45200000 GHz<br/>CF Step 3.00000000 MHz Auto Man<br/>Freq Offset 0.00000000 Hz<br/>Signal Track On Off<br/>Scale Type Log Lin</p>  |
| 802.11g-High   |  <p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.462 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b><br/><b>16.4287 MHz</b></p> <p>Occ BW % Pwr 99.00 %<br/>x dB -6.00 dB</p> <p>Transmit Freq Error -31.861 kHz<br/>x dB Bandwidth 16.427 MHz</p> <p>Freq/Channel<br/>Center Freq 2.46200000 GHz<br/>Start Freq 2.44700000 GHz<br/>Stop Freq 2.47700000 GHz<br/>CF Step 3.00000000 MHz Auto Man<br/>Freq Offset 0.00000000 Hz<br/>Signal Track On Off<br/>Scale Type Log Lin</p> |

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 802.11n-HT20-Low    |  <p>Agilent R T</p> <p>Ch Freq 2.412 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.412 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms</p> <p><b>Occupied Bandwidth</b><br/>17.6931 MHz</p> <p>Occ BW % Pwr 99.00 %<br/>x dB -6.00 dB</p> <p>Transmit Freq Error -34.041 kHz<br/>x dB Bandwidth 17.779 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.41200000 GHz</p> <p>Start Freq 2.39700000 GHz</p> <p>Stop Freq 2.42700000 GHz</p> <p>CF Step 3.00000000 MHz<br/>Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p>             |
| 802.11n-HT20-Middle |  <p>Agilent R T</p> <p>Ch Freq 2.437 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.437 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b><br/>17.6880 MHz</p> <p>Occ BW % Pwr 99.00 %<br/>x dB -6.00 dB</p> <p>Transmit Freq Error -45.437 kHz<br/>x dB Bandwidth 17.775 MHz</p> <p>Freq/Channel</p> <p>Center Freq 2.43700000 GHz</p> <p>Start Freq 2.42200000 GHz</p> <p>Stop Freq 2.45200000 GHz</p> <p>CF Step 3.00000000 MHz<br/>Auto Man</p> <p>Freq Offset 0.00000000 Hz</p> <p>Signal Track On Off</p> <p>Scale Type Log Lin</p> |
| 802.11n-HT20-High   |  <p>Agilent R T</p> <p>Ch Freq 2.462 GHz Trig Free</p> <p>Occupied Bandwidth</p> <p>Ref 20 dBm Atten 30 dB</p> <p>#Peak Log 10 dB/Offset 1 dB</p> <p>Center 2.462 GHz Span 30 MHz</p> <p>#Res BW 100 kHz #VBW 300 kHz Sweep 10 ms (1001 pts)</p> <p><b>Occupied Bandwidth</b><br/>17.6767 MHz</p> <p>Occ BW % Pwr 99.00 %<br/>x dB -6.00 dB</p> <p>Transmit Freq Error -40.191 kHz<br/>x dB Bandwidth 17.763 MHz</p> <p>Trace/View</p> <p>Operations</p> <p>Normalize [Off]</p> <p>More 2 of 2</p>                                                                                                                                                                          |

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## 7. RF Output Power

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### 7.1 Standard Applicable

According to 15.247(b)(3), for systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

### 7.2 Test Procedure

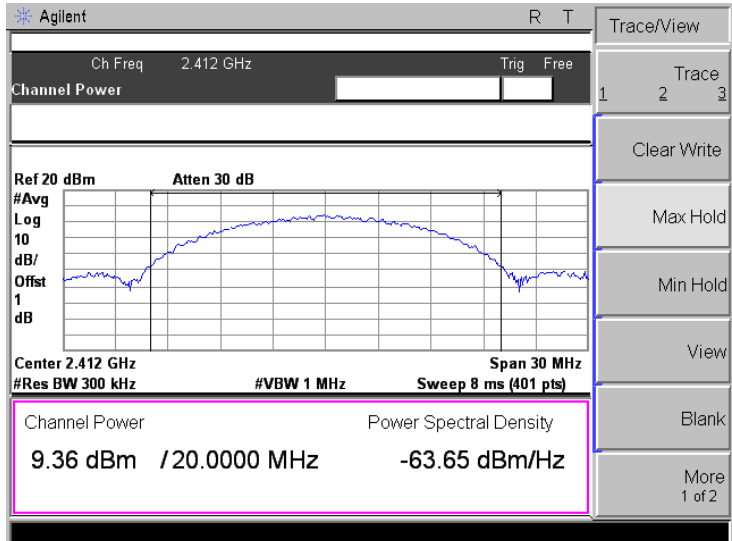
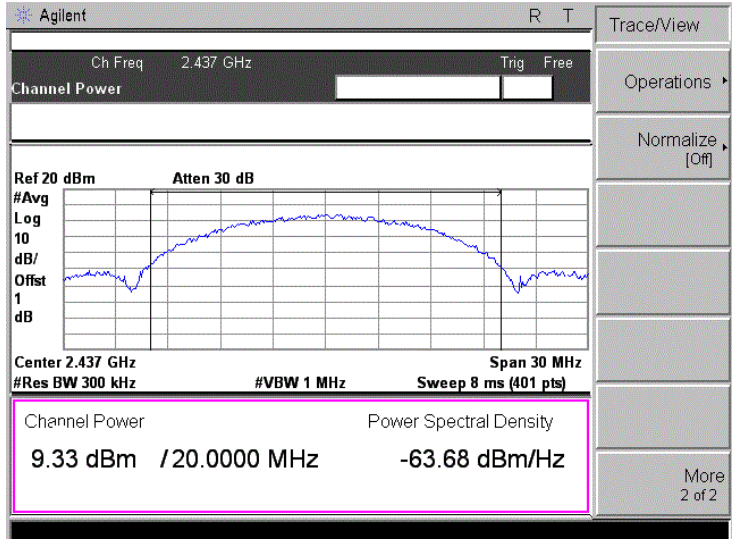
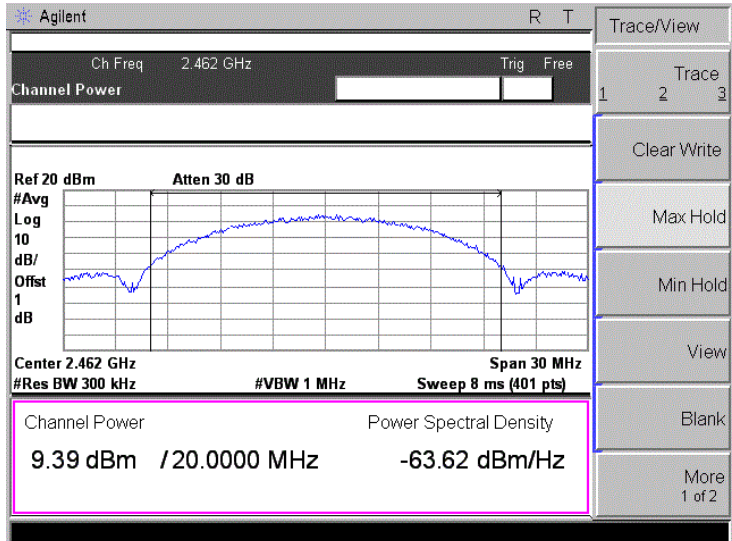
According to the KDB-558074 D01 v05r02 Subclause 8.3.2.2 and ANSI C63.10-2013 Subclause 11.9.2.2, when this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth

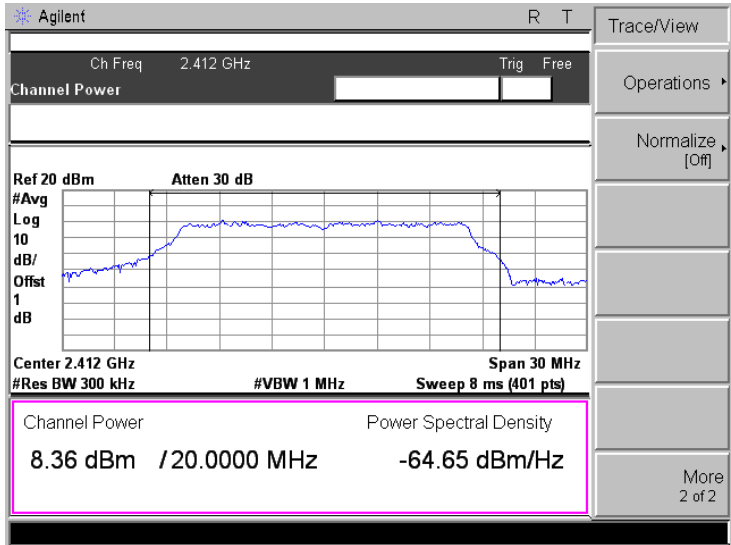
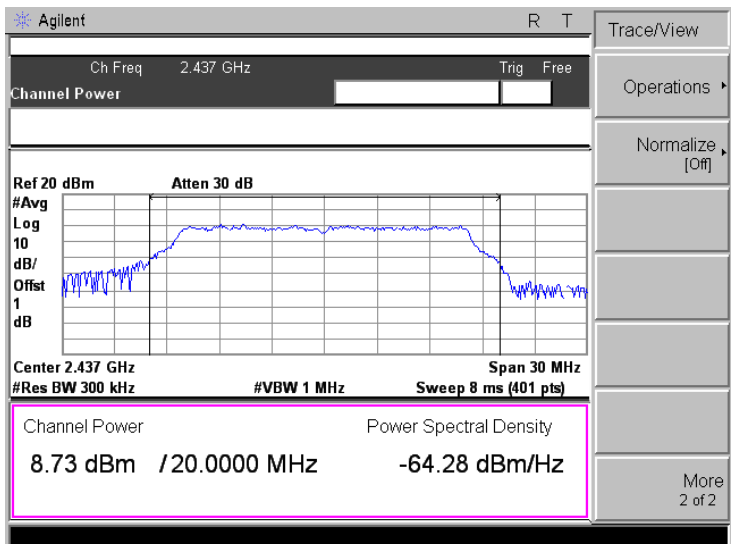
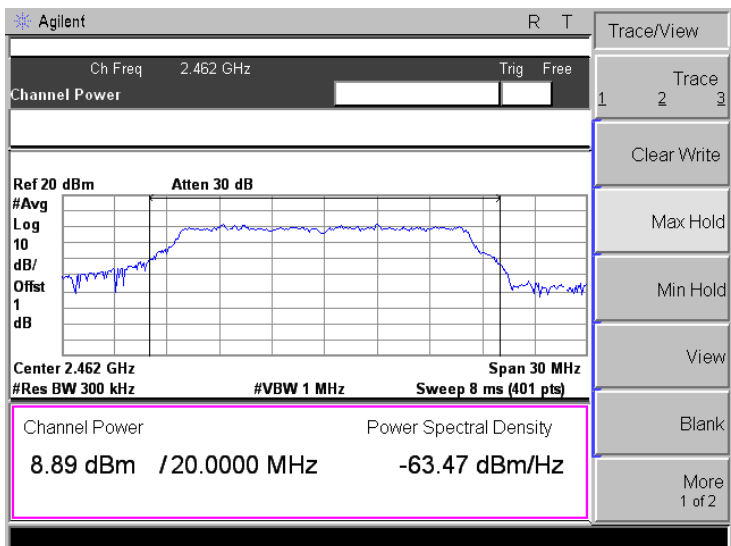
- a) Set span to at least 1.5 times the OBW.
- b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- c) Set VBW  $\geq 3 \times$  RBW.
- d) Number of points in sweep  $\geq 2 \times \text{span} / \text{RBW}$ . (This gives bin-to-bin spacing  $\leq \text{RBW}/2$ , so that narrowband signals are not lost between frequency bins.)
- e) Sweep time = auto.
- f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- 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  $\geq 98$  %, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run” .
- h) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- 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.

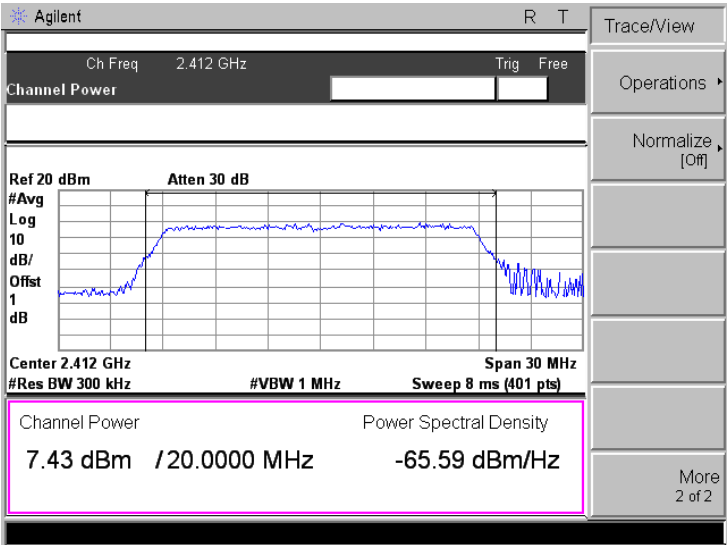
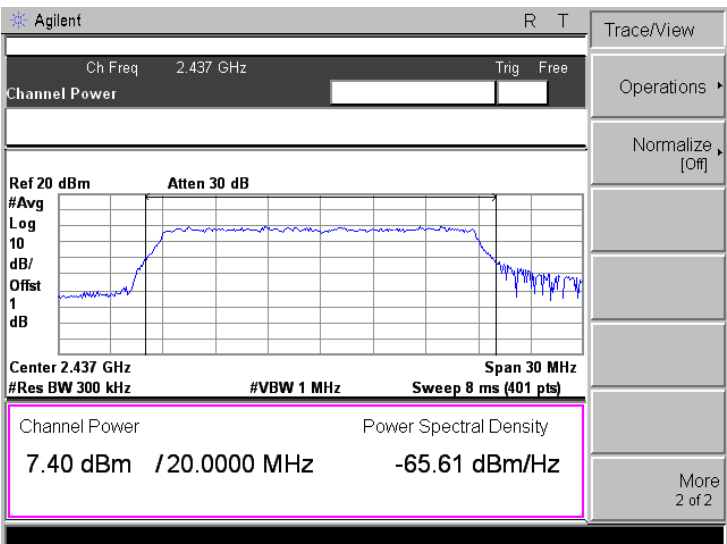
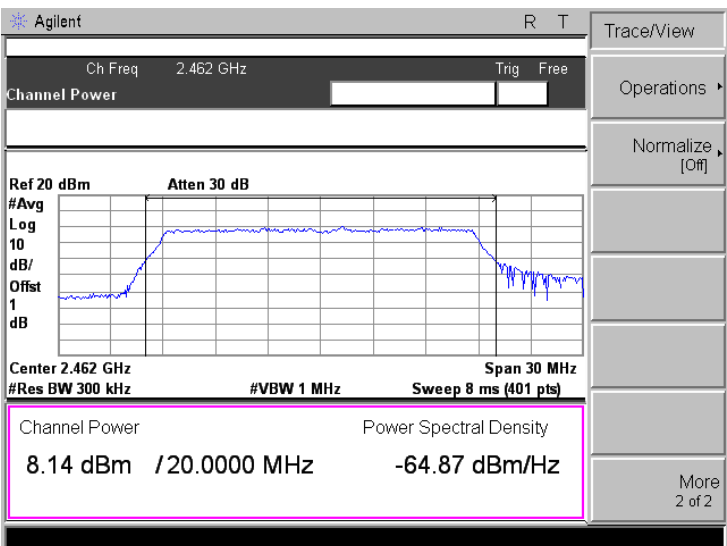
### 7.3 Summary of Test Results/Plots

| Test Mode         | Frequency<br>MHz | Reading<br>dBm | Output Power<br>mW | Limit<br>mW |
|-------------------|------------------|----------------|--------------------|-------------|
| 802.11b _ 11Mbps  | 2412             | 9.36           | 8.63               | 1000        |
|                   | 2437             | 9.33           | 8.57               | 1000        |
|                   | 2462             | 9.39           | 8.69               | 1000        |
| 802.11g_54Mbps    | 2412             | 8.36           | 6.85               | 1000        |
|                   | 2437             | 8.73           | 7.46               | 1000        |
|                   | 2462             | 8.89           | 7.74               | 1000        |
| 802.11n HT20_MCS7 | 2412             | 7.43           | 5.53               | 1000        |
|                   | 2437             | 7.40           | 5.50               | 1000        |
|                   | 2462             | 8.14           | 6.52               | 1000        |

Please refer to the following test plots:

|                                  |                                                                                      |
|----------------------------------|--------------------------------------------------------------------------------------|
| <p>802.11b-Low<br/>11Mbps</p>    |    |
| <p>802.11b-Middle<br/>11Mbps</p> |   |
| <p>802.11b-High<br/>11Mbps</p>   |  |

|                                  |                                                                                      |
|----------------------------------|--------------------------------------------------------------------------------------|
| <p>802.11g-Low<br/>54Mbps</p>    |    |
| <p>802.11g-Middle<br/>54Mbps</p> |   |
| <p>802.11g-High<br/>54Mbps</p>   |  |

|                                     |                                                                                      |
|-------------------------------------|--------------------------------------------------------------------------------------|
| <p>802.11n-HT20-Low<br/>MCS7</p>    |    |
| <p>802.11n-HT20-Middle<br/>MCS7</p> |   |
| <p>802.11n-HT20-High<br/>MCS7</p>   |  |

## 8. Field Strength of Spurious Emissions

### 8.1 Standard Applicable

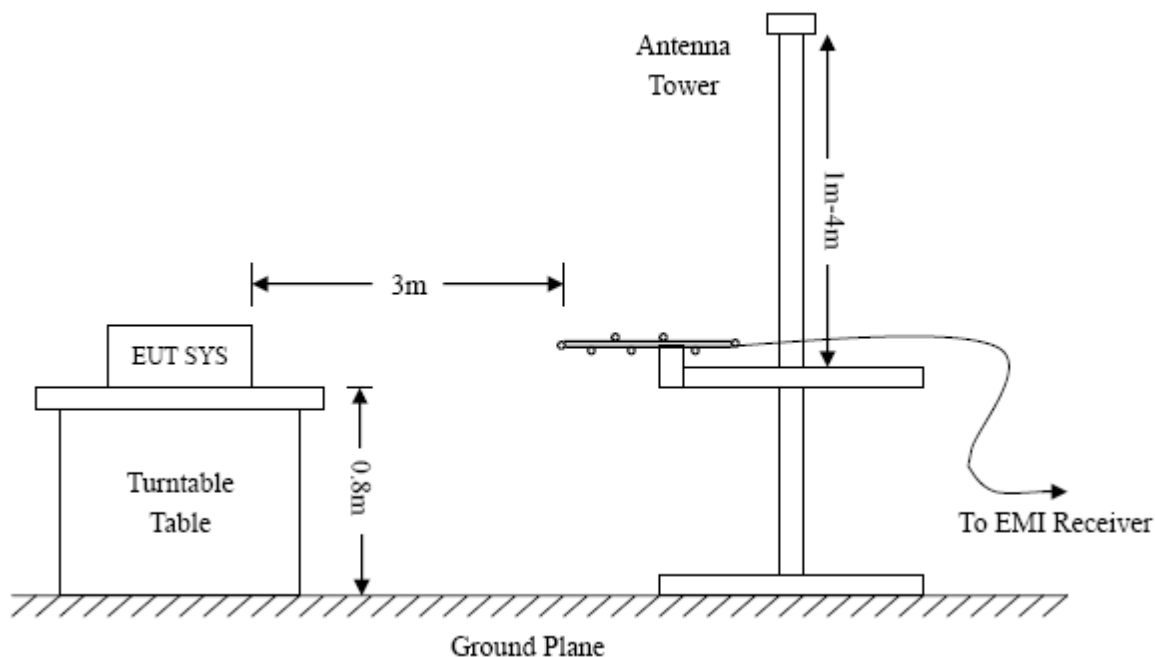
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within 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).

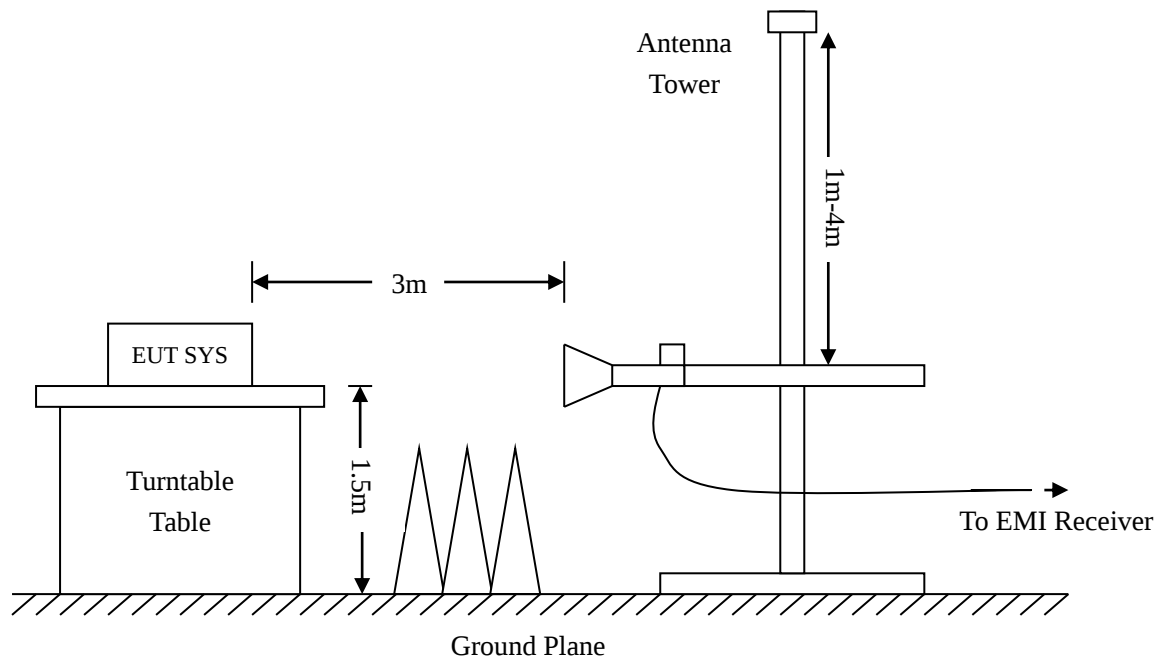
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

### 8.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.





Frequency :9kHz-30MHz

RBW=10KHz,

VBW =30KHz

Sweep time= Auto

Trace = max hold

Detector function = peak

Frequency :30MHz-1GHz

RBW=120KHz,

VBW=360KHz

Sweep time= Auto

Trace = max hold

Detector function = peak, QP

Frequency :Above 1GHz

RBW=1MHz,

VBW=3MHz(Peak), 10Hz(AV)

Sweep time= Auto

Trace = max hold

Detector function = peak, AV

### 8.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB $\mu$ V means the emission is 6dB $\mu$ V below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

### 8.4 Summary of Test Results/Plots

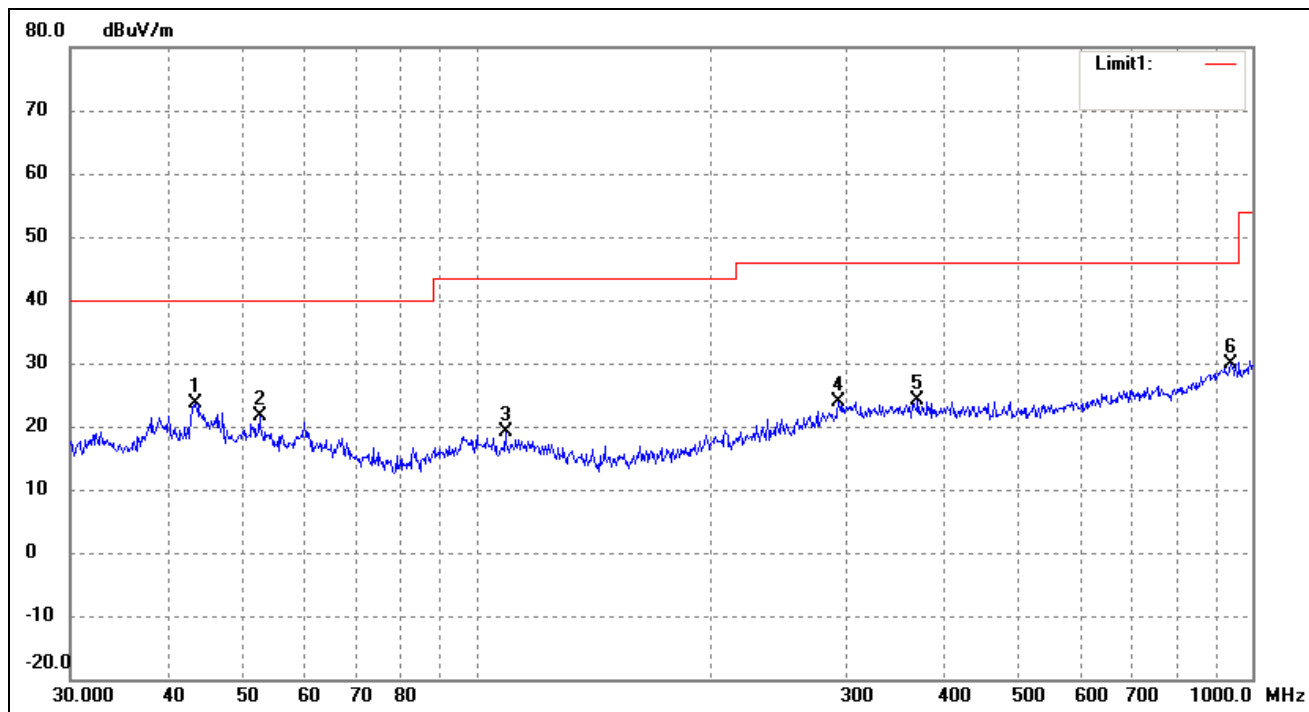
*Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

*All test modes (different data rate and different modulation) are performed, but only the worst case*

*(802.11b\_11Mbps) is recorded in this report.*

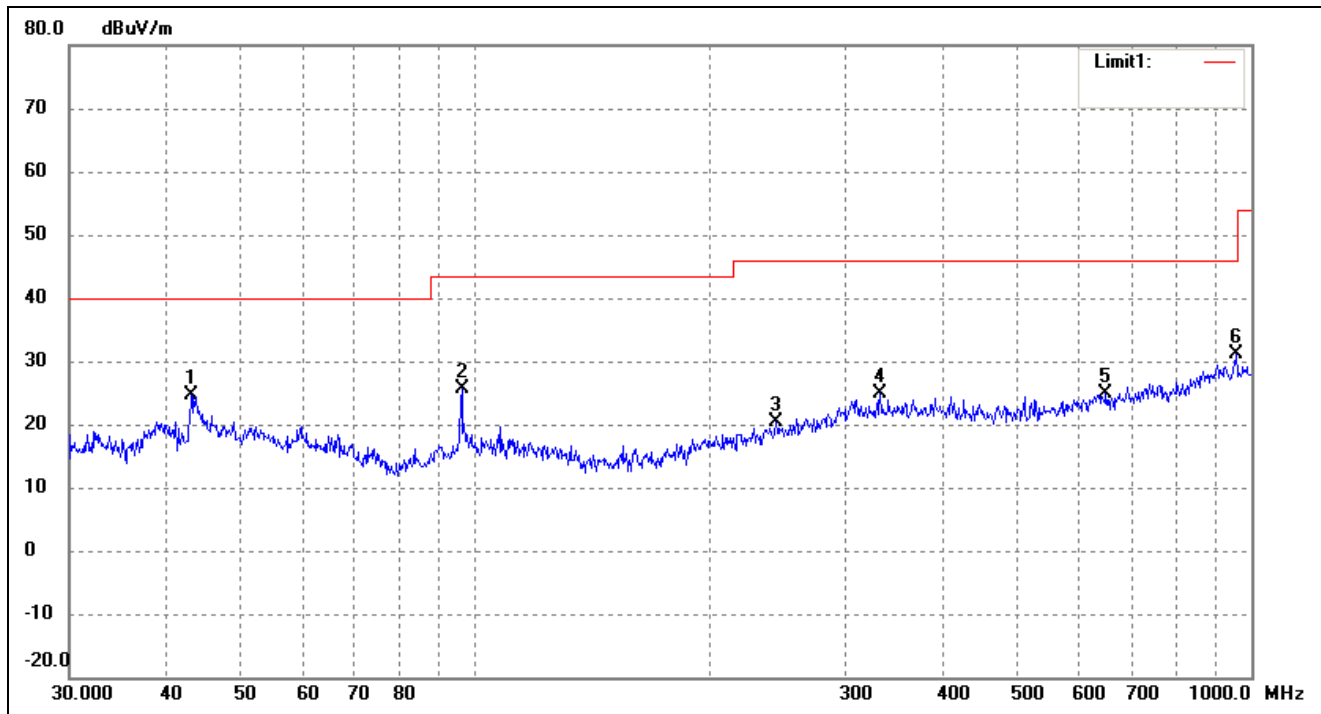
## ➤ Spurious Emissions Below 1GHz

|                |     |           |            |
|----------------|-----|-----------|------------|
| 802.11b_11Mbps |     |           |            |
| Test Channel   | Low | Polarity: | Horizontal |



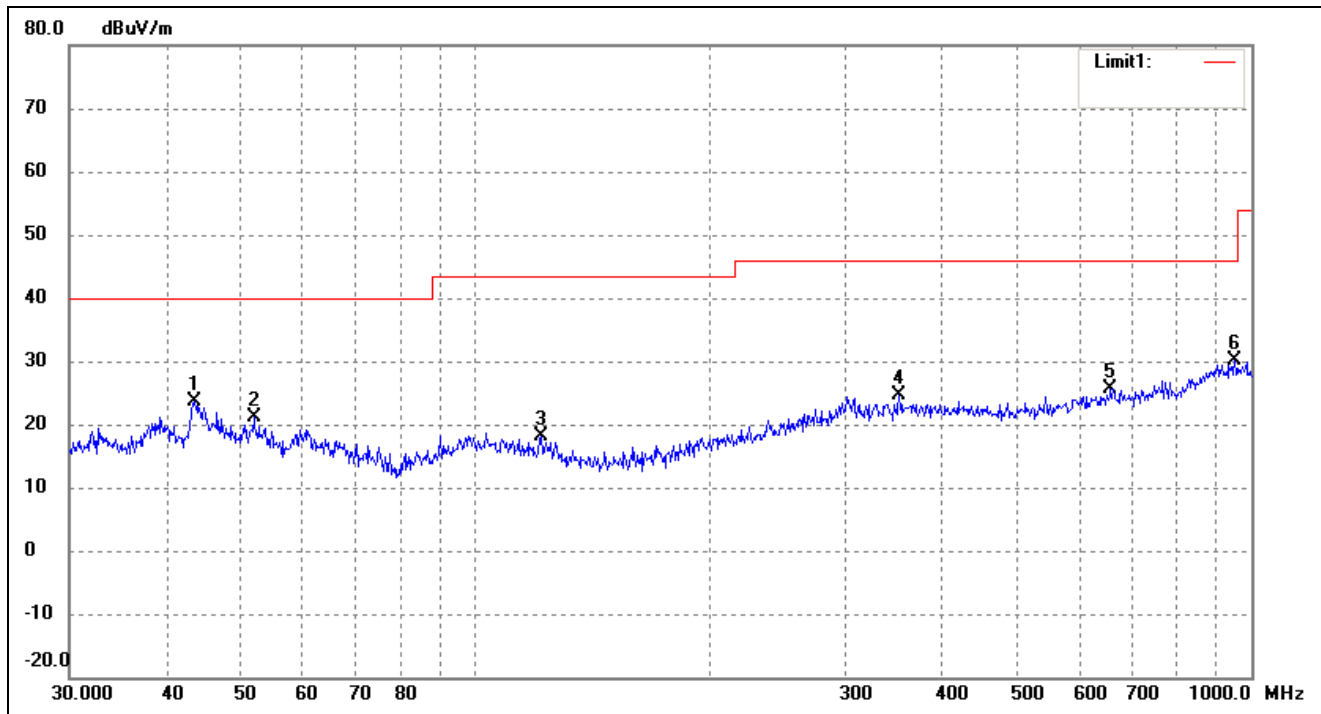
| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>dB/m | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Degree<br>( ) | Height<br>(cm) | Remark |
|-----|--------------------|---------------------|-----------------|--------------------|-------------------|----------------|---------------|----------------|--------|
| 1   | 43.5057            | 37.75               | -14.00          | 23.75              | 40.00             | -16.25         | 58            | 100            | peak   |
| 2   | 52.5753            | 35.93               | -14.37          | 21.56              | 40.00             | -18.44         | 174           | 100            | peak   |
| 3   | 109.0286           | 33.84               | -14.79          | 19.05              | 43.50             | -24.45         | 53            | 100            | peak   |
| 4   | 293.0842           | 32.34               | -8.42           | 23.92              | 46.00             | -22.08         | 150           | 100            | peak   |
| 5   | 370.7023           | 32.13               | -7.90           | 24.23              | 46.00             | -21.77         | 180           | 100            | peak   |
| 6   | 938.8326           | 30.87               | -0.99           | 29.88              | 46.00             | -16.12         | 233           | 100            | peak   |

|                |     |           |          |
|----------------|-----|-----------|----------|
| 802.11b_11Mbps |     |           |          |
| Test Channel   | Low | Polarity: | Vertical |



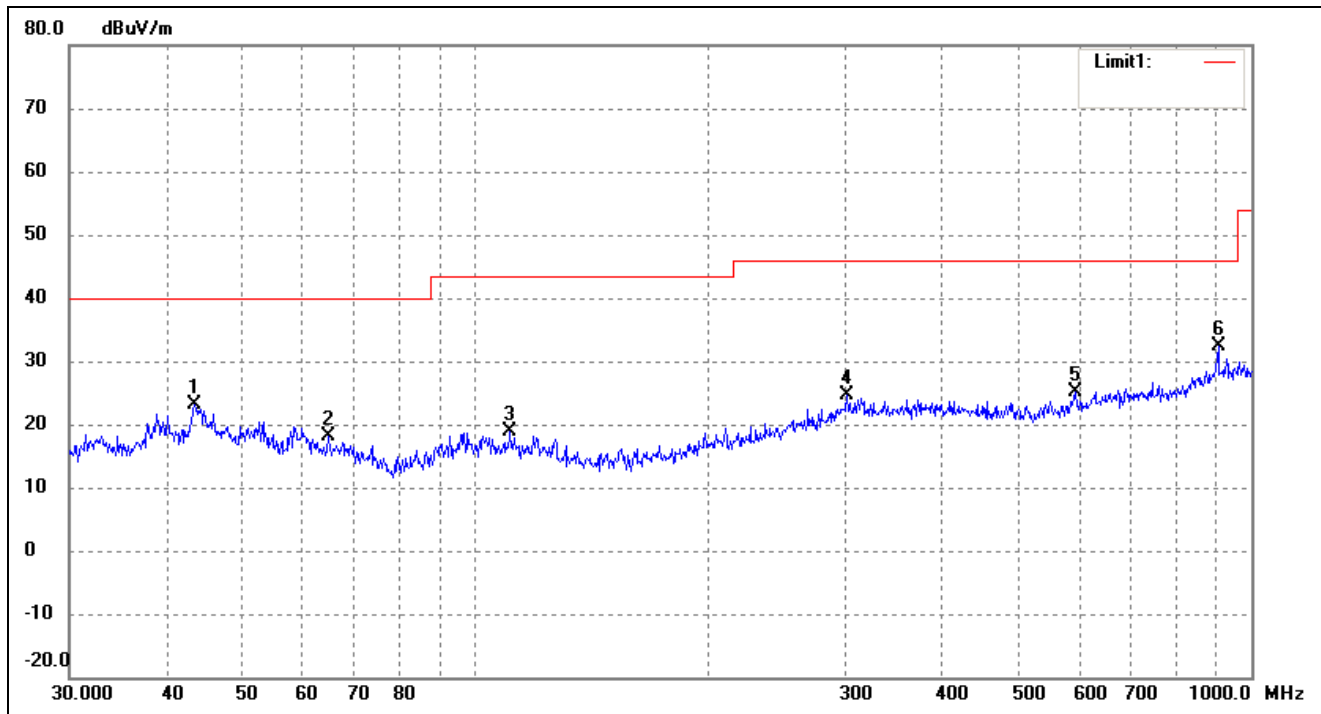
| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>dB/m | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Degree<br>( ) | Height<br>(cm) | Remark |
|-----|--------------------|---------------------|-----------------|--------------------|-------------------|----------------|---------------|----------------|--------|
| 1   | 43.0505            | 38.77               | -14.02          | 24.75              | 40.00             | -15.25         | 267           | 100            | peak   |
| 2   | 96.0986            | 41.40               | -15.70          | 25.70              | 43.50             | -17.80         | 282           | 100            | peak   |
| 3   | 244.2321           | 31.23               | -10.87          | 20.36              | 46.00             | -25.64         | 52            | 100            | peak   |
| 4   | 332.5187           | 33.19               | -8.22           | 24.97              | 46.00             | -21.03         | 290           | 100            | peak   |
| 5   | 649.6597           | 30.90               | -5.92           | 24.98              | 46.00             | -21.02         | 69            | 100            | peak   |
| 6   | 955.4381           | 32.16               | -1.12           | 31.04              | 46.00             | -14.96         | 154           | 100            | peak   |

|                |        |           |            |
|----------------|--------|-----------|------------|
| 802.11b_11Mbps |        |           |            |
| Test Channel   | Middle | Polarity: | Horizontal |



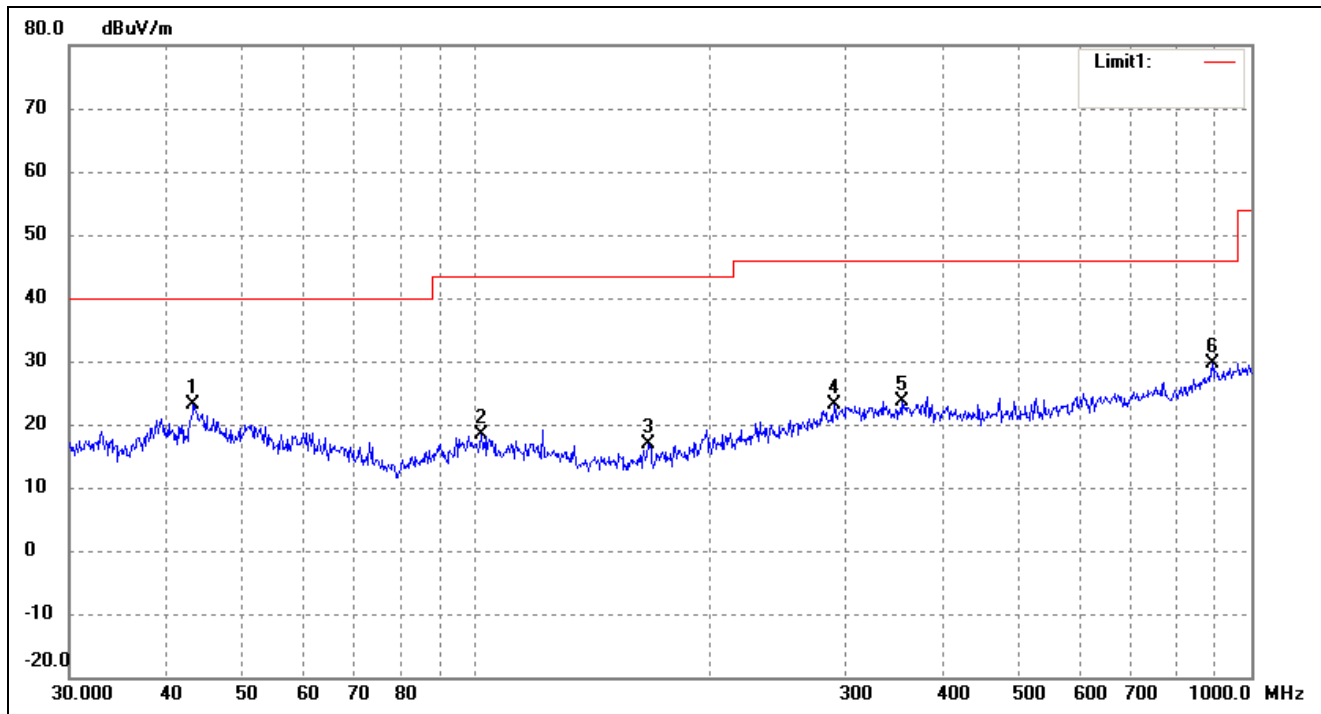
| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>dB/m | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Degree<br>( ) | Height<br>(cm) | Remark |
|-----|--------------------|---------------------|-----------------|--------------------|-------------------|----------------|---------------|----------------|--------|
| 1   | 43.5057            | 37.59               | -14.00          | 23.59              | 40.00             | -16.41         | 348           | 100            | peak   |
| 2   | 51.8430            | 35.17               | -14.16          | 21.01              | 40.00             | -18.99         | 96            | 100            | peak   |
| 3   | 121.5486           | 34.05               | -16.02          | 18.03              | 43.50             | -25.47         | 180           | 100            | peak   |
| 4   | 351.7079           | 32.32               | -7.60           | 24.72              | 46.00             | -21.28         | 121           | 100            | peak   |
| 5   | 658.8362           | 31.39               | -5.72           | 25.67              | 46.00             | -20.33         | 265           | 100            | peak   |
| 6   | 952.0937           | 31.20               | -1.14           | 30.06              | 46.00             | -15.94         | 346           | 100            | peak   |

|                |        |           |          |
|----------------|--------|-----------|----------|
| 802.11b_11Mbps |        |           |          |
| Test Channel   | Middle | Polarity: | Vertical |



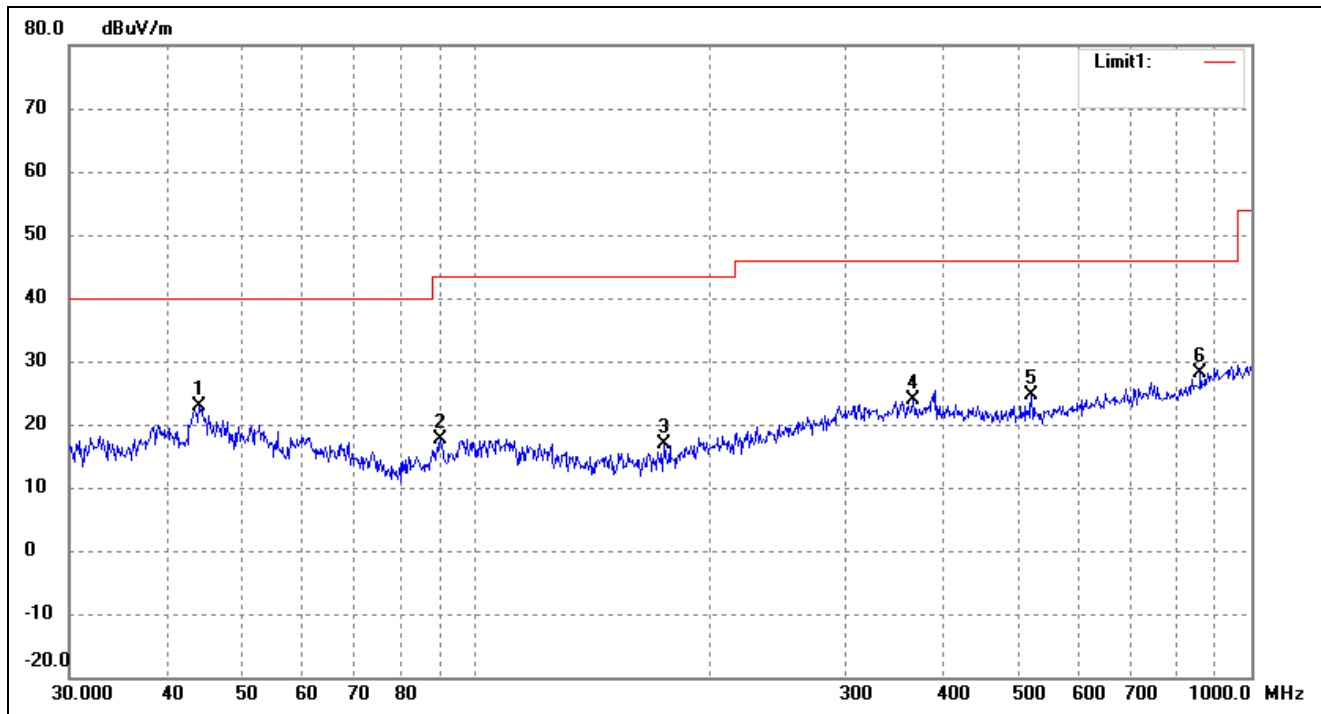
| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>dB/m | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Degree<br>( ) | Height<br>(cm) | Remark |
|-----|--------------------|---------------------|-----------------|--------------------|-------------------|----------------|---------------|----------------|--------|
| 1   | 43.5057            | 37.02               | -14.00          | 23.02              | 40.00             | -16.98         | 56            | 100            | peak   |
| 2   | 64.6594            | 34.09               | -16.07          | 18.02              | 40.00             | -21.98         | 144           | 100            | peak   |
| 3   | 110.9571           | 33.86               | -14.86          | 19.00              | 43.50             | -24.50         | 117           | 100            | peak   |
| 4   | 301.4224           | 32.56               | -7.86           | 24.70              | 46.00             | -21.30         | 93            | 100            | peak   |
| 5   | 593.0497           | 31.01               | -5.79           | 25.22              | 46.00             | -20.78         | 276           | 100            | peak   |
| 6   | 906.4824           | 33.58               | -1.10           | 32.48              | 46.00             | -13.52         | 239           | 100            | peak   |

|                |      |           |            |
|----------------|------|-----------|------------|
| 802.11b_11Mbps |      |           |            |
| Test Channel   | High | Polarity: | Horizontal |



| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>dB/m | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Degree<br>( ) | Height<br>(cm) | Remark |
|-----|--------------------|---------------------|-----------------|--------------------|-------------------|----------------|---------------|----------------|--------|
| 1   | 43.3534            | 37.24               | -14.01          | 23.23              | 40.00             | -16.77         | 211           | 100            | peak   |
| 2   | 102.0014           | 33.28               | -14.89          | 18.39              | 43.50             | -25.11         | 200           | 100            | peak   |
| 3   | 167.2368           | 32.67               | -15.86          | 16.81              | 43.50             | -26.69         | 67            | 100            | peak   |
| 4   | 290.0172           | 31.73               | -8.69           | 23.04              | 46.00             | -22.96         | 128           | 100            | peak   |
| 5   | 354.1831           | 31.38               | -7.65           | 23.73              | 46.00             | -22.27         | 182           | 100            | peak   |
| 6   | 890.7278           | 31.26               | -1.61           | 29.65              | 46.00             | -16.35         | 314           | 100            | peak   |

|                |      |           |          |
|----------------|------|-----------|----------|
| 802.11b_11Mbps |      |           |          |
| Test Channel   | High | Polarity: | Vertical |



| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>dB/m | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Degree<br>( ) | Height<br>(cm) | Remark |
|-----|--------------------|---------------------|-----------------|--------------------|-------------------|----------------|---------------|----------------|--------|
| 1   | 44.1202            | 36.78               | -13.98          | 22.80              | 40.00             | -17.20         | 277           | 100            | peak   |
| 2   | 90.2205            | 34.61               | -16.86          | 17.75              | 43.50             | -25.75         | 100           | 100            | peak   |
| 3   | 175.0368           | 32.17               | -15.25          | 16.92              | 43.50             | -26.58         | 281           | 100            | peak   |
| 4   | 366.8231           | 31.82               | -7.84           | 23.98              | 46.00             | -22.02         | 96            | 100            | peak   |
| 5   | 520.8882           | 32.74               | -8.00           | 24.74              | 46.00             | -21.26         | 187           | 100            | peak   |
| 6   | 860.0352           | 30.70               | -2.52           | 28.18              | 46.00             | -17.82         | 182           | 100            | peak   |

- Spurious Emissions Above 1GHz
- Test Mode: 802.11b\_11Mbps (worst case)

| Frequency              | Reading  | Correct | Result   | Limit    | Margin | Polar | Detector |
|------------------------|----------|---------|----------|----------|--------|-------|----------|
| (MHz)                  | (dBuV/m) | dB      | (dBuV/m) | (dBuV/m) | (dB)   | H/V   |          |
| Low Channel-2412MHz    |          |         |          |          |        |       |          |
| 4824.000               | 61.41    | -3.86   | 57.55    | 74       | -16.45 | H     | PK       |
| 4824.000               | 44.38    | -3.86   | 40.52    | 54       | -13.48 | H     | AV       |
| 7236.000               | 54.90    | 1.10    | 56.00    | 74       | -18.00 | H     | PK       |
| 7236.000               | 37.93    | 1.10    | 39.03    | 54       | -14.97 | H     | AV       |
| 4824.000               | 62.66    | -3.86   | 58.80    | 74       | -15.20 | V     | PK       |
| 4824.000               | 41.81    | -3.86   | 37.95    | 54       | -16.05 | V     | AV       |
| 7236.000               | 54.85    | 1.10    | 55.95    | 74       | -18.05 | V     | PK       |
| 7236.000               | 39.61    | 1.10    | 40.71    | 54       | -13.29 | V     | AV       |
| Middle Channel-2437MHz |          |         |          |          |        |       |          |
| 4874.000               | 58.91    | -3.74   | 55.17    | 74       | -18.83 | H     | PK       |
| 4874.000               | 44.34    | -3.74   | 40.60    | 54       | -13.40 | H     | AV       |
| 7311.000               | 54.32    | 1.47    | 55.79    | 74       | -18.21 | H     | PK       |
| 7311.000               | 39.72    | 1.47    | 41.19    | 54       | -12.81 | H     | AV       |
| 4874.000               | 61.22    | -3.74   | 57.48    | 74       | -16.52 | V     | PK       |
| 4874.000               | 43.69    | -3.74   | 39.95    | 54       | -14.05 | V     | AV       |
| 7311.000               | 54.47    | 1.47    | 55.94    | 74       | -18.06 | V     | PK       |
| 7311.000               | 38.37    | 1.47    | 39.84    | 54       | -14.16 | V     | AV       |
| High Channel-2462MHz   |          |         |          |          |        |       |          |
| 4924.000               | 59.59    | -3.63   | 55.96    | 74       | -18.04 | H     | PK       |
| 4924.000               | 43.95    | -3.63   | 40.32    | 54       | -13.68 | H     | AV       |
| 7386.000               | 54.79    | 1.62    | 56.41    | 74       | -17.59 | H     | PK       |
| 7386.000               | 38.63    | 1.62    | 40.25    | 54       | -13.75 | H     | AV       |
| 4924.000               | 60.66    | -3.63   | 57.03    | 74       | -16.97 | V     | PK       |
| 4924.000               | 43.69    | -3.63   | 40.06    | 54       | -13.94 | V     | AV       |
| 7386.000               | 56.30    | 1.62    | 57.92    | 74       | -16.08 | V     | PK       |
| 7386.000               | 39.41    | 1.62    | 41.03    | 54       | -12.97 | V     | AV       |

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

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## 9. Out of Band Emissions

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### 9.1 Standard Applicable

According to §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).

### 9.2 Test Procedure

According to the KDB 558074 D01 v05r02 Subclause 8.4 and ANSI C63.10-2013 Subclause 11.11, the emissions in nonrestricted frequency bands test method as follows:

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW  $\geq [3 \times \text{RBW}]$ .
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

According to the KDB 558074 D01 v05r02 Subclause 8.5 and ANSI C63.10-2013 Subclause 11.12, the emissions in restricted frequency bands test method as follows:

#### A. Radiated emission measurements:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)

RBW = 1MHz, VBW = 1MHz for peak value measured

RBW = 1MHz, VBW = 10Hz for average value measured

Sweep = auto; Detector function = peak/average; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement KDB publication number: 913591 may be used for the radiated bandedge measurements.

**B. Antenna-port conducted measurements**

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

- a) RBW = as specified in Table 9/
- b)  $VBW \geq [3 \times RBW]$ .
- c) Detector = peak.
- d) Sweep time = auto.
- e) Trace mode = max hold.
- f) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be lengthened for low-duty-cycle applications.)

**Table 9—RBW as a function of frequency**

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

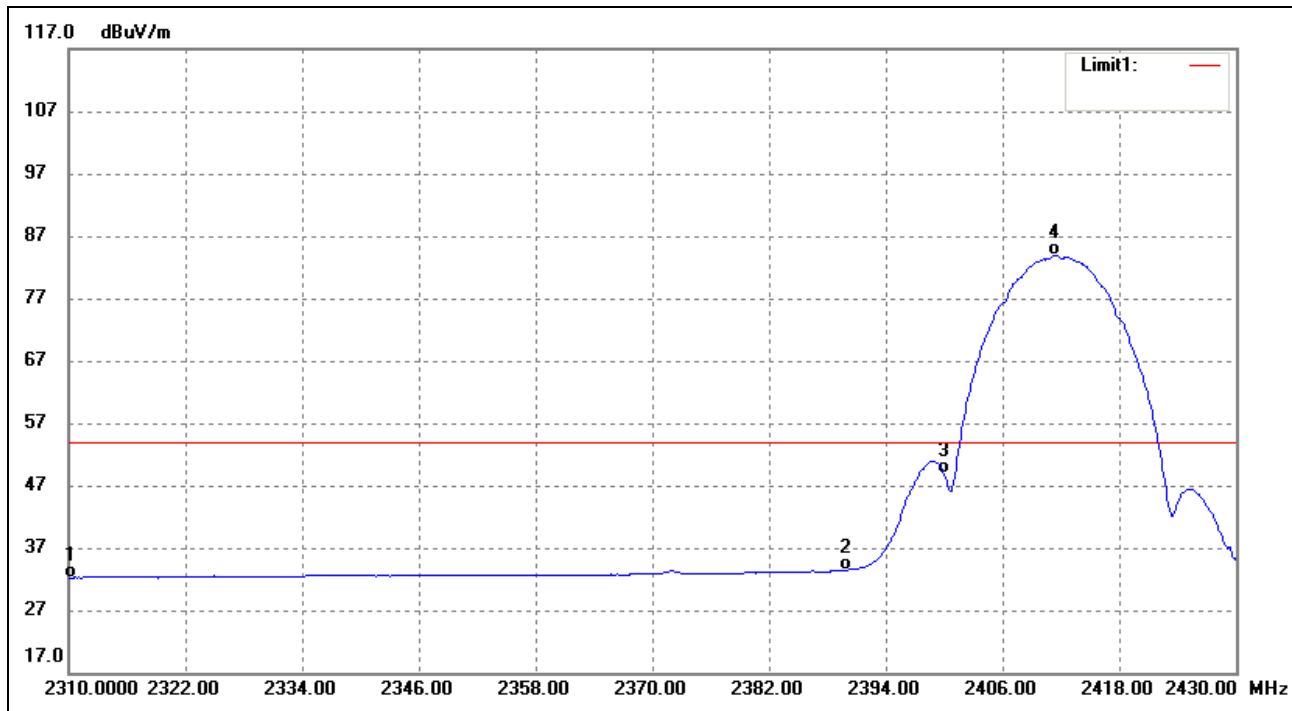
If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in section 8.1. Report the three highest emissions relative to the limit.

**9.3 Summary of Test Results/Plots**

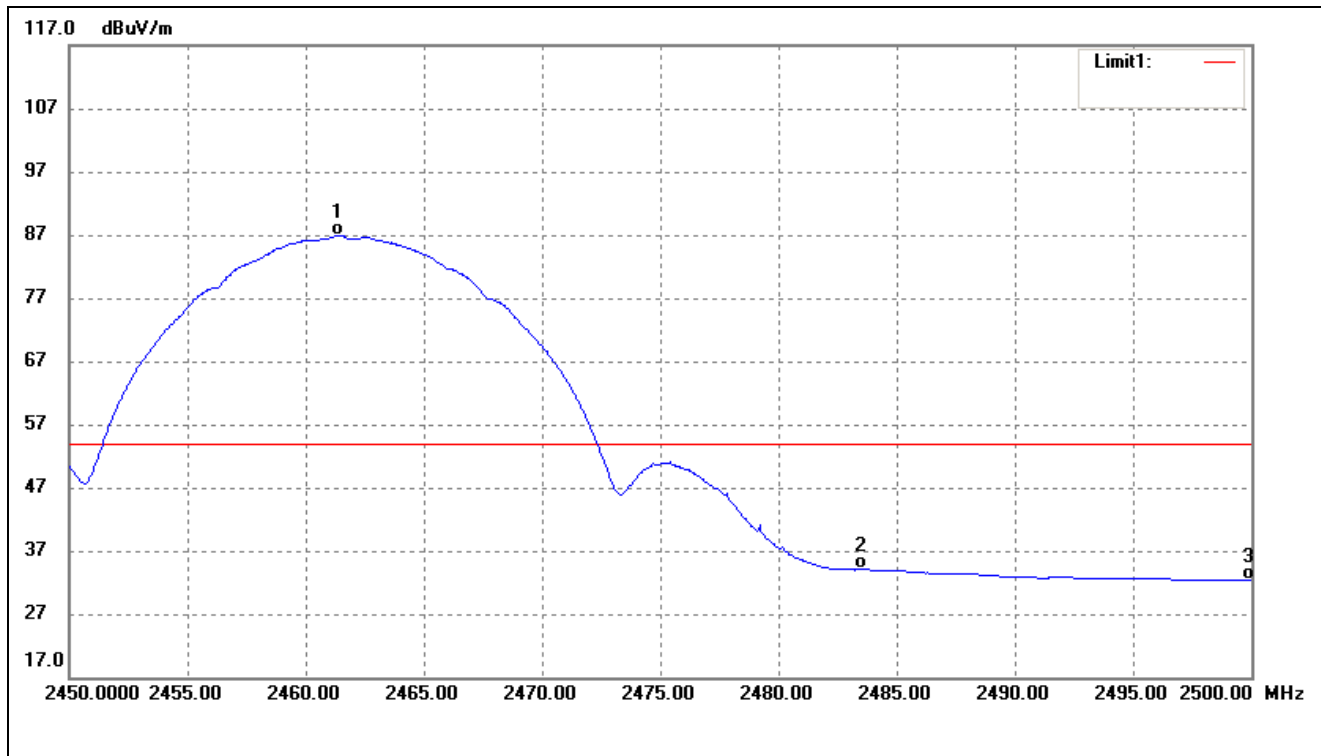
## ➤ Radiated test

|                |     |           |                      |
|----------------|-----|-----------|----------------------|
| 802.11b_11Mbps |     |           |                      |
| Test Channel   | Low | Polarity: | Vertical(worst case) |



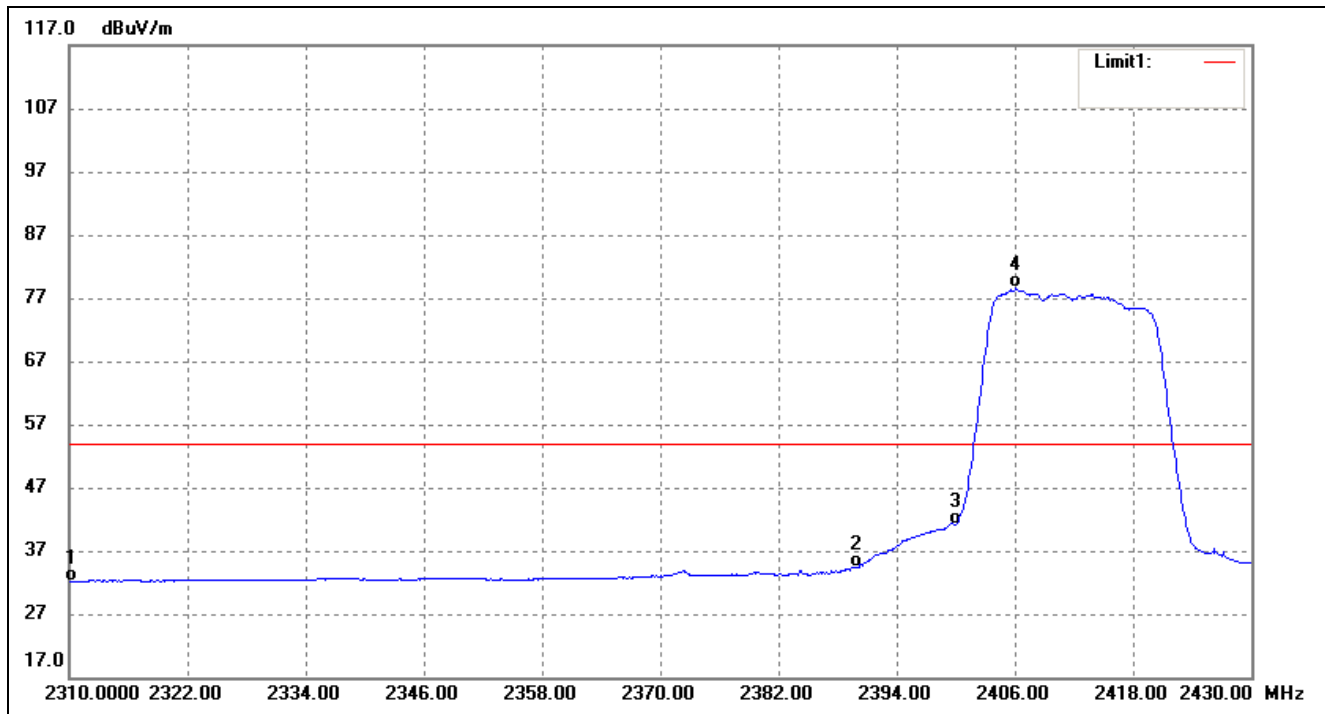
| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>dB/m | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark           |
|-----|--------------------|---------------------|-----------------|--------------------|-------------------|----------------|------------------|
| 1   | 2310.000           | 41.87               | -9.66           | 32.21              | 54.00             | -21.79         | Average Detector |
|     | 2310.000           | 55.50               | -9.66           | 45.84              | 74.00             | -28.16         | Peak Detector    |
| 2   | 2390.000           | 42.99               | -9.50           | 33.49              | 54.00             | -20.51         | Average Detector |
|     | 2390.000           | 64.41               | -9.50           | 54.91              | 74.00             | -19.09         | Peak Detector    |
| 3   | 2400.000           | 58.26               | -9.48           | 48.78              | Delta=35.12dB     |                | Average Detector |
| 4   | 2411.400           | 93.36               | -9.46           | 83.90              |                   |                | Average Detector |

|                |      |           |                      |
|----------------|------|-----------|----------------------|
| 802.11b_11Mbps |      |           |                      |
| Test Channel   | High | Polarity: | Vertical(worst case) |



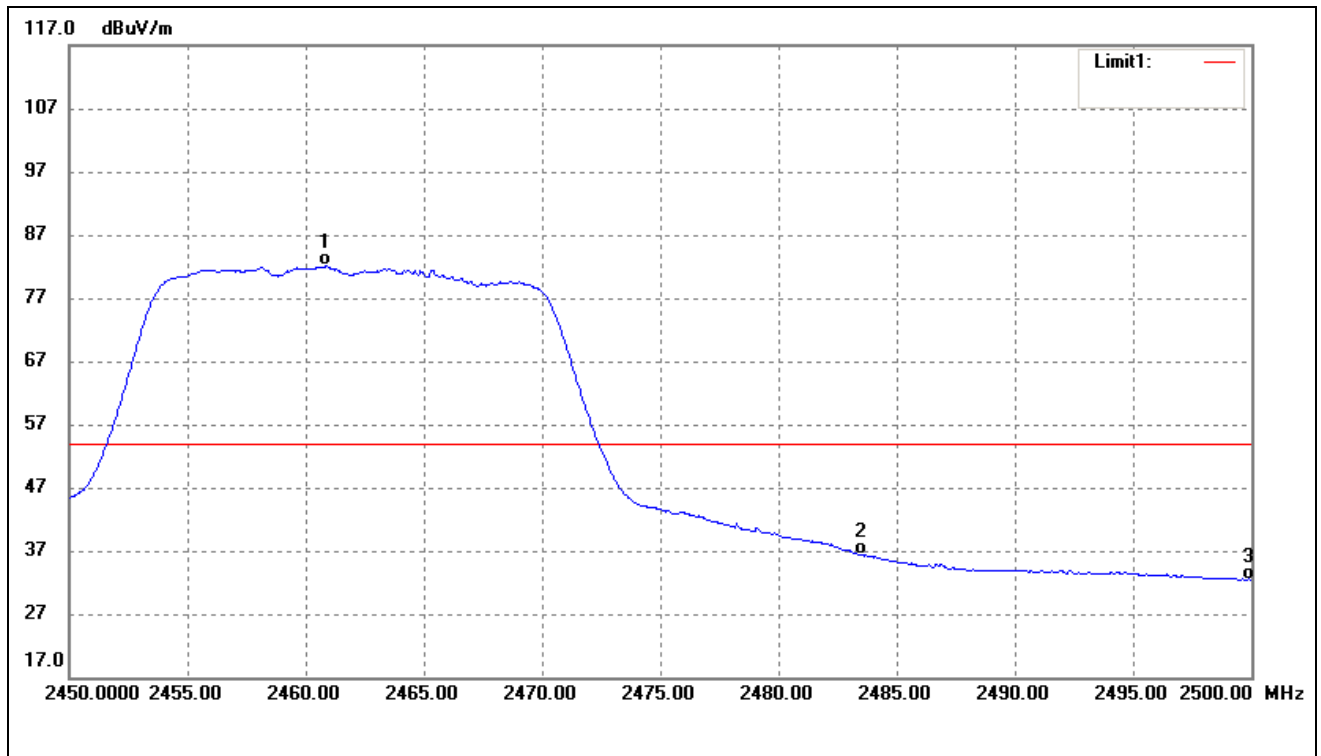
| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>Factor(dB) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark           |
|-----|--------------------|---------------------|-----------------------|--------------------|-------------------|----------------|------------------|
| 1   | 2461.350           | 96.23               | -9.36                 | 86.87              | /                 | /              | Average Detector |
|     | 2461.700           | 106.79              | -9.36                 | 97.43              | /                 | /              | Peak Detector    |
| 2   | 2483.500           | 43.34               | -9.31                 | 34.03              | 54.00             | -19.97         | Average Detector |
|     | 2483.500           | 67.67               | -9.31                 | 58.36              | 74.00             | -15.64         | Peak Detector    |
| 3   | 2500.000           | 41.69               | -9.28                 | 32.41              | 54.00             | -21.59         | Average Detector |
|     | 2500.000           | 59.01               | -9.28                 | 49.73              | 74.00             | -24.27         | Peak Detector    |

|                |     |           |                      |
|----------------|-----|-----------|----------------------|
| 802.11g_54Mbps |     |           |                      |
| Test Channel   | Low | Polarity: | Vertical(worst case) |



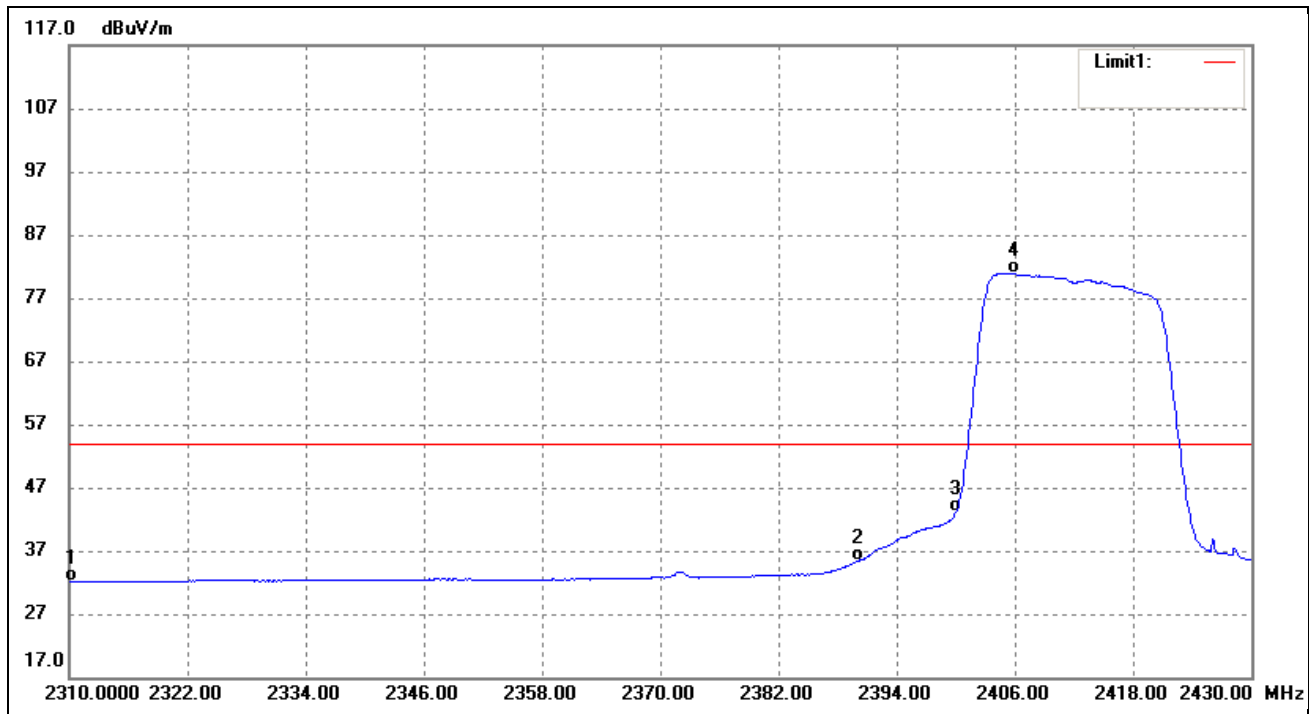
| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>dB/m | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark           |
|-----|--------------------|---------------------|-----------------|--------------------|-------------------|----------------|------------------|
| 1   | 2310.000           | 41.86               | -9.66           | 32.20              | 54.00             | -21.80         | Average Detector |
|     | 2310.000           | 53.97               | -9.66           | 44.31              | 74.00             | -29.69         | Peak Detector    |
| 2   | 2390.000           | 43.76               | -9.50           | 34.26              | 54.00             | -19.74         | Average Detector |
|     | 2390.000           | 69.22               | -9.50           | 59.72              | 74.00             | -14.28         | Peak Detector    |
| 3   | 2400.000           | 50.54               | -9.48           | 41.06              | Delta=37.60dB     |                | Average Detector |
| 4   | 2406.120           | 88.13               | -9.47           | 78.66              |                   |                | Average Detector |

|                |      |           |                      |
|----------------|------|-----------|----------------------|
| 802.11g_54Mbps |      |           |                      |
| Test Channel   | High | Polarity: | Vertical(worst case) |



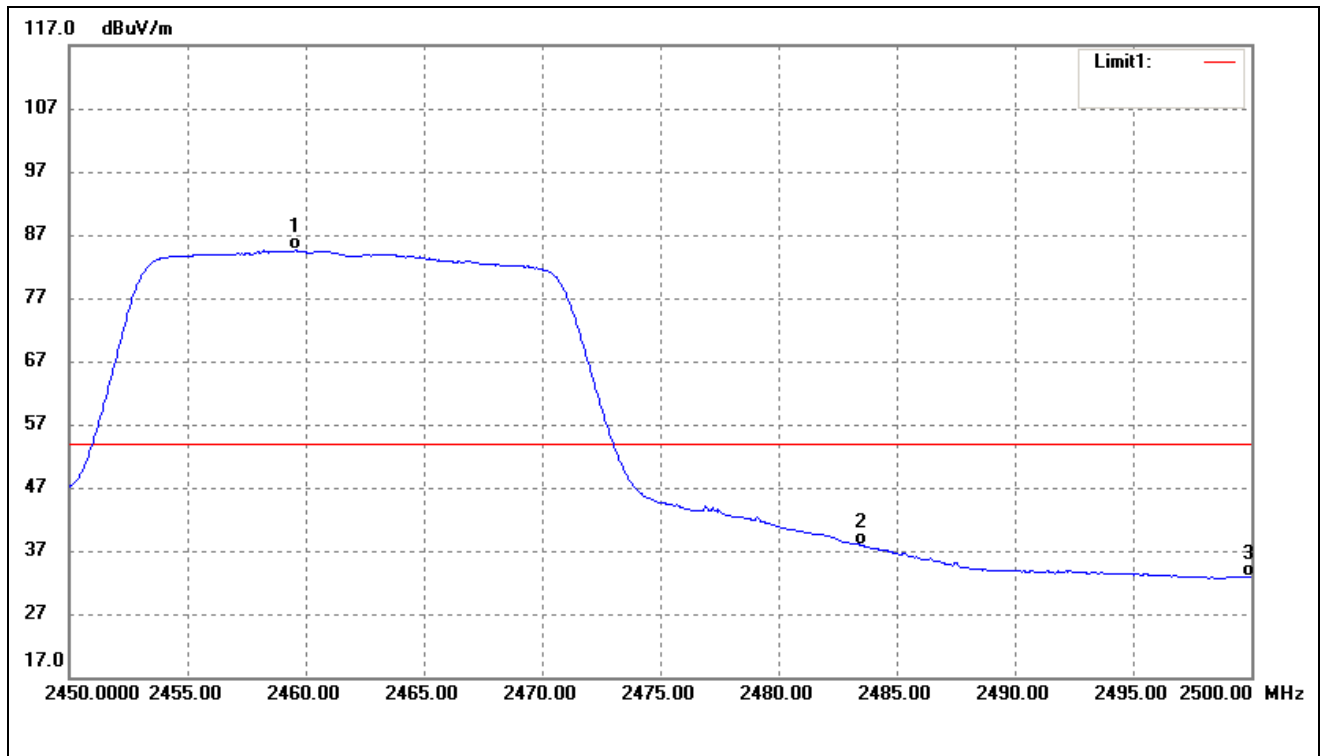
| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>dB/m | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark           |
|-----|--------------------|---------------------|-----------------|--------------------|-------------------|----------------|------------------|
| 1   | 2460.850           | 91.44               | -9.36           | 82.08              | /                 | /              | Average Detector |
|     | 2458.250           | 106.36              | -9.36           | 97.00              | /                 | /              | Peak Detector    |
| 2   | 2483.500           | 45.62               | -9.31           | 36.31              | 54.00             | -17.69         | Average Detector |
|     | 2483.500           | 70.62               | -9.31           | 61.31              | 74.00             | -12.69         | Peak Detector    |
| 3   | 2500.000           | 41.70               | -9.28           | 32.42              | 54.00             | -21.58         | Average Detector |
|     | 2500.000           | 61.08               | -9.28           | 51.80              | 74.00             | -22.20         | Peak Detector    |

|                   |     |           |                      |
|-------------------|-----|-----------|----------------------|
| 802.11n-HT20_MCS7 |     |           |                      |
| Test Channel      | Low | Polarity: | Vertical(worst case) |



| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>dB/m | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark           |
|-----|--------------------|---------------------|-----------------|--------------------|-------------------|----------------|------------------|
| 1   | 2310.000           | 41.75               | -9.66           | 32.09              | 54.00             | -21.91         | Average Detector |
|     | 2310.000           | 55.89               | -9.66           | 46.23              | 74.00             | -27.77         | Peak Detector    |
| 2   | 2390.000           | 44.90               | -9.50           | 35.40              | 54.00             | -18.60         | Average Detector |
|     | 2390.000           | 62.40               | -9.50           | 52.90              | 74.00             | -21.10         | Peak Detector    |
| 3   | 2400.000           | 52.51               | -9.48           | 43.03              | Delta=37.92dB     |                | Average Detector |
| 4   | 2405.880           | 90.42               | -9.47           | 80.95              |                   |                | Average Detector |

|                   |      |           |                      |
|-------------------|------|-----------|----------------------|
| 802.11n-HT20_MCS7 |      |           |                      |
| Test Channel      | High | Polarity: | Vertical(worst case) |

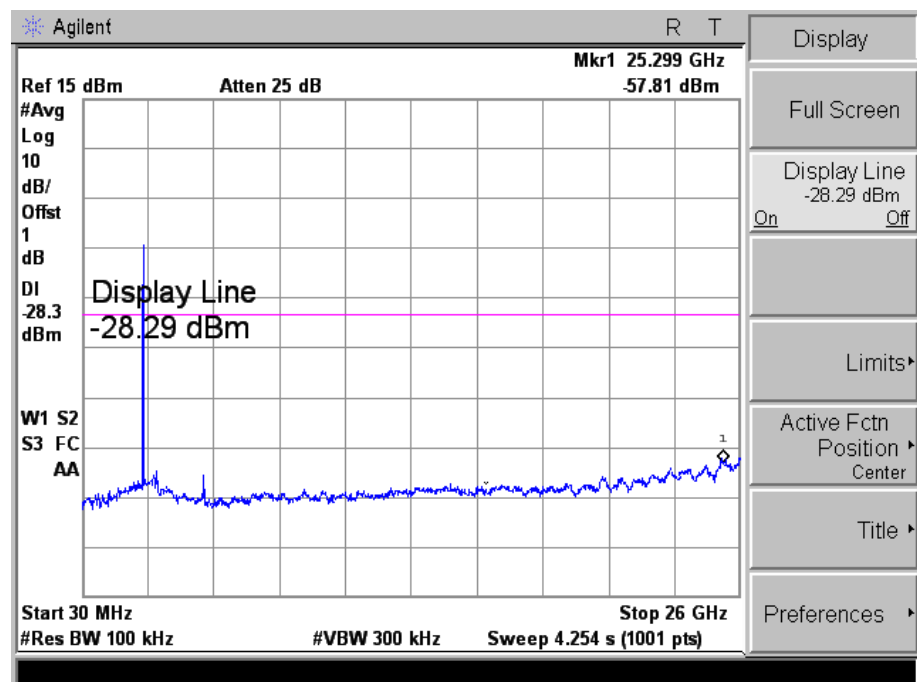
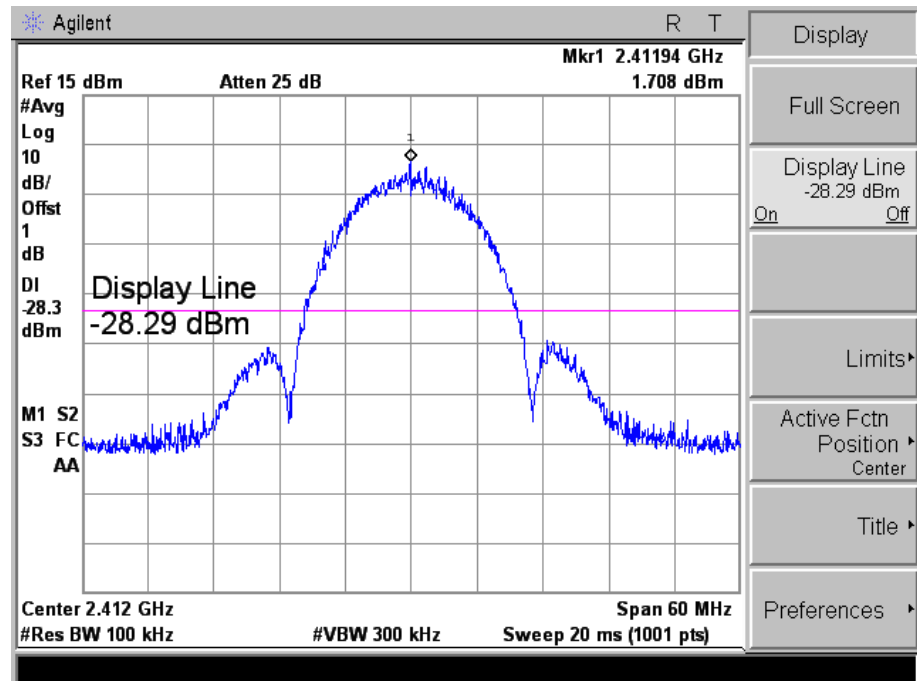


| No. | Frequency<br>(MHz) | Reading<br>(dBuV/m) | Correct<br>dB/m | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark           |
|-----|--------------------|---------------------|-----------------|--------------------|-------------------|----------------|------------------|
| 1   | 2459.550           | 93.88               | -9.36           | 84.52              | /                 | /              | Average Detector |
|     | 2458.850           | 106.49              | -9.36           | 97.13              | /                 | /              | Peak Detector    |
| 2   | 2483.500           | 47.18               | -9.31           | 37.87              | 54.00             | -16.13         | Average Detector |
|     | 2483.500           | 65.10               | -9.31           | 55.79              | 74.00             | -18.21         | Peak Detector    |
| 3   | 2500.000           | 42.07               | -9.28           | 32.79              | 54.00             | -21.21         | Average Detector |
|     | 2500.000           | 54.93               | -9.28           | 45.65              | 74.00             | -28.35         | Peak Detector    |

➤ Conducted test

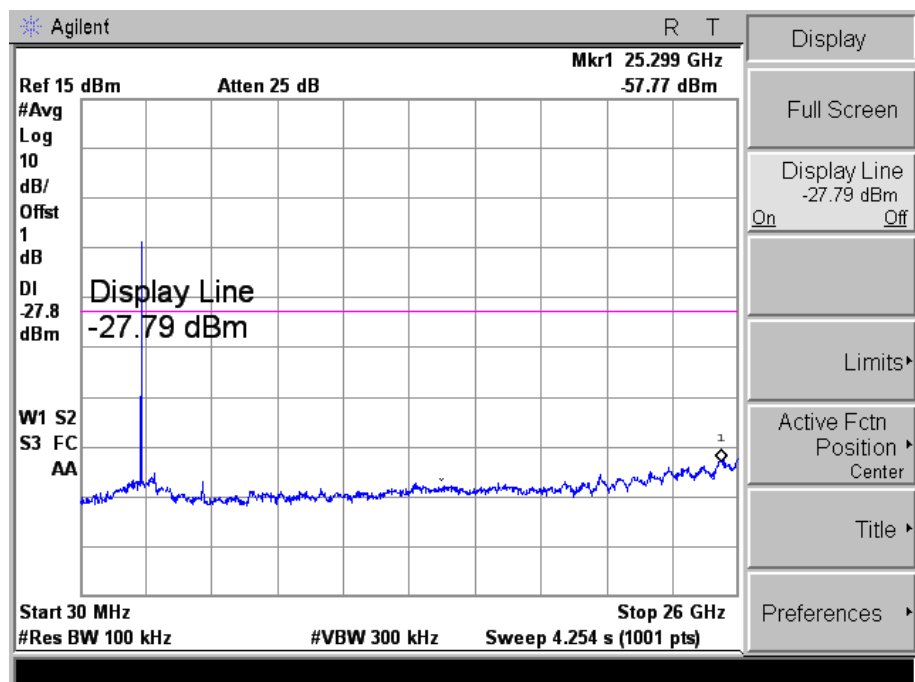
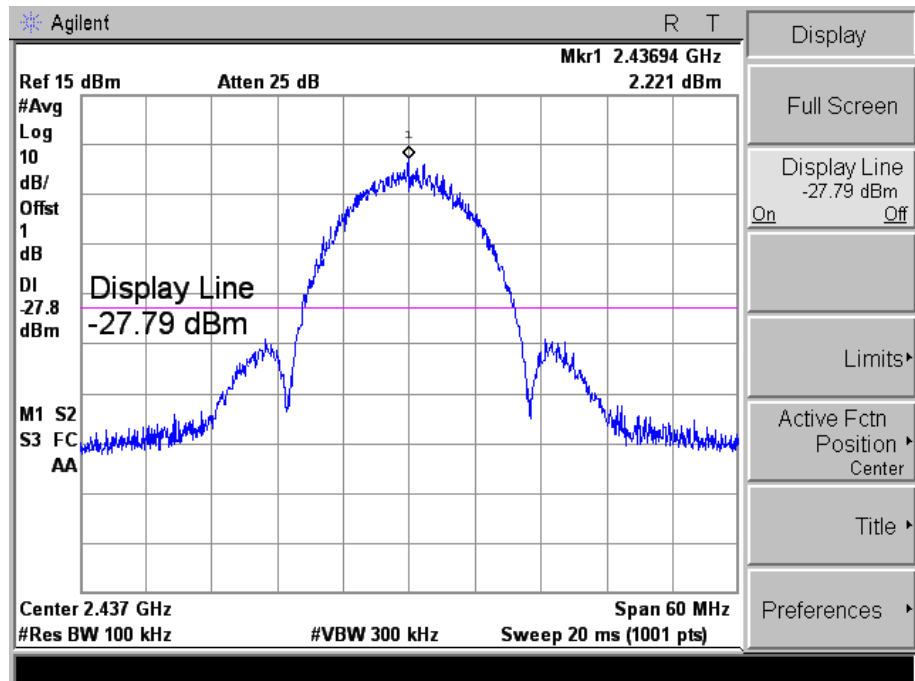
802.11b\_11Mbps

Low



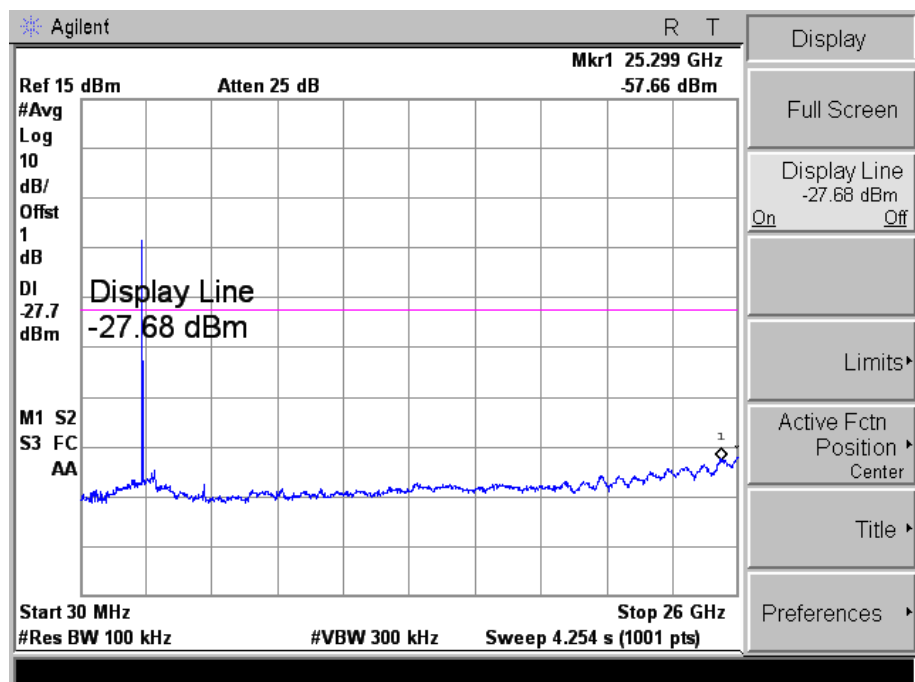
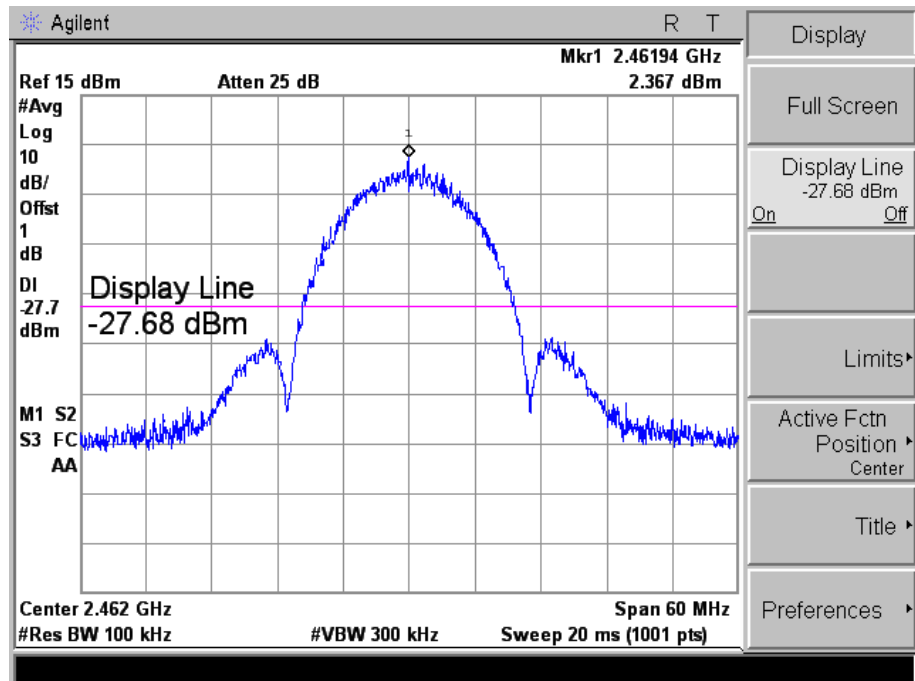
802.11b\_11Mbps

Middle



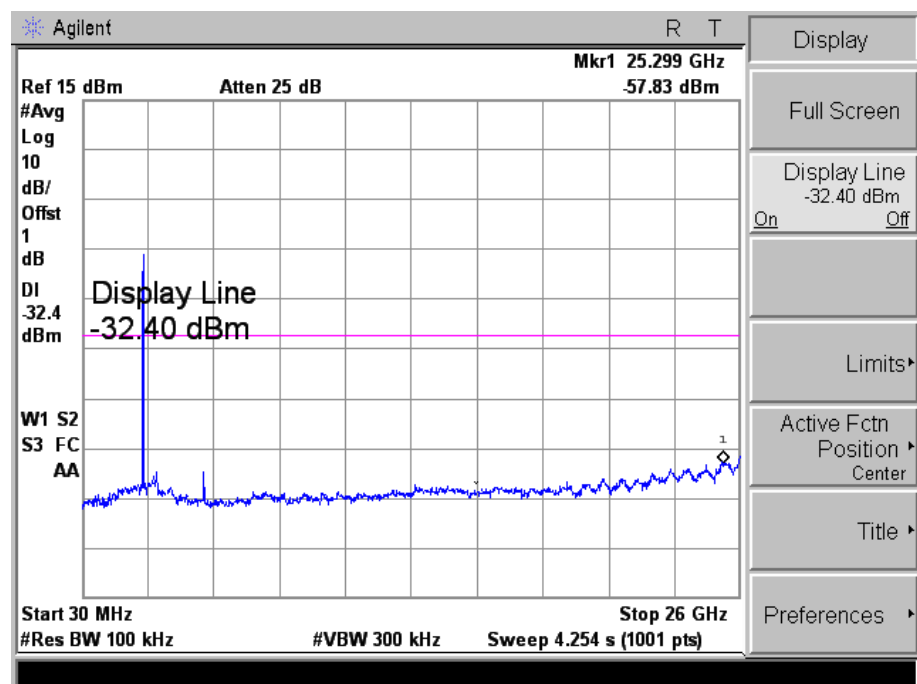
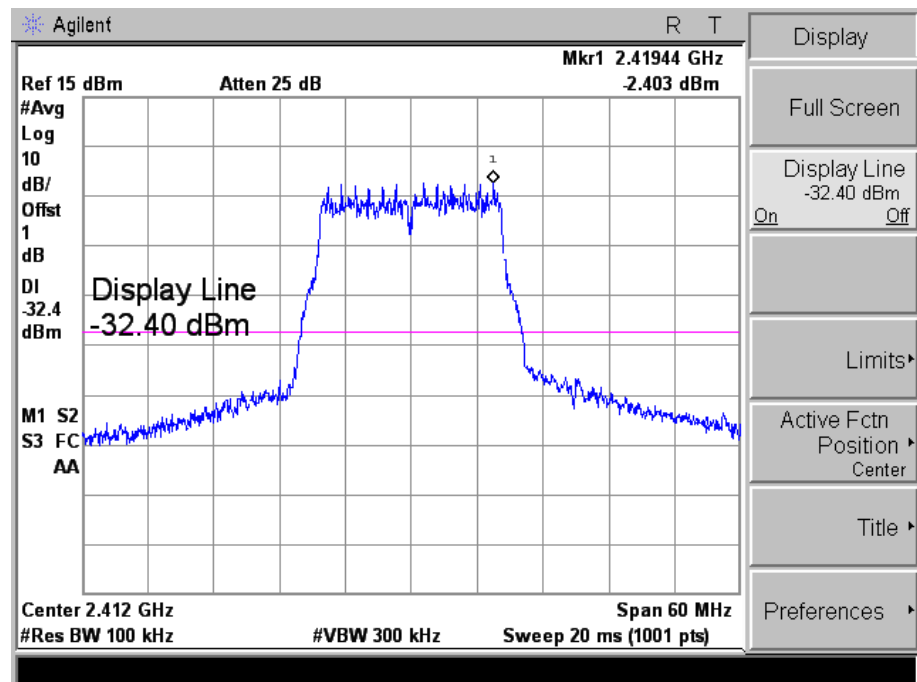
802.11b\_11Mbps

High



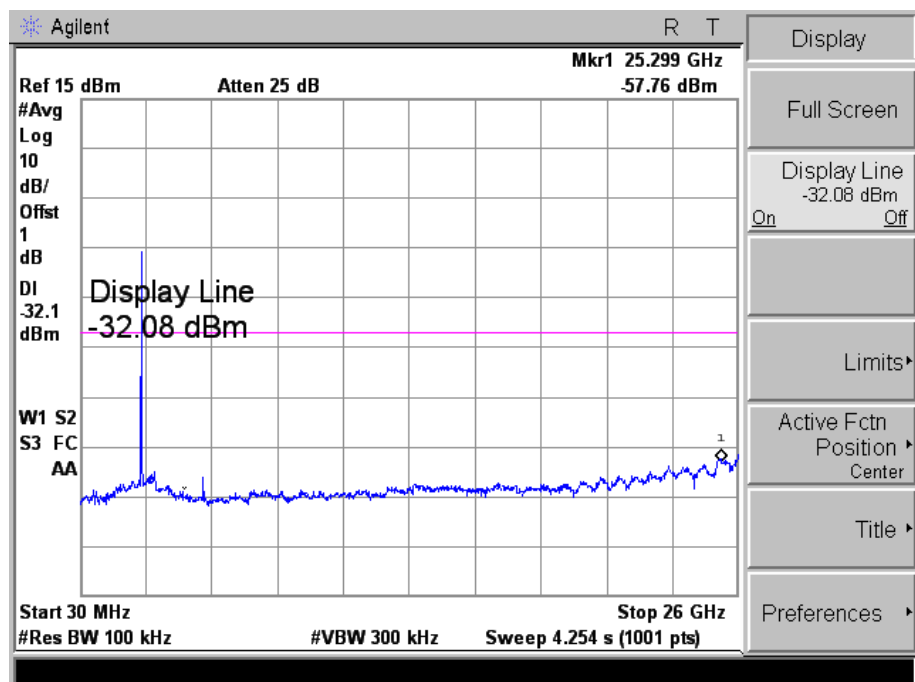
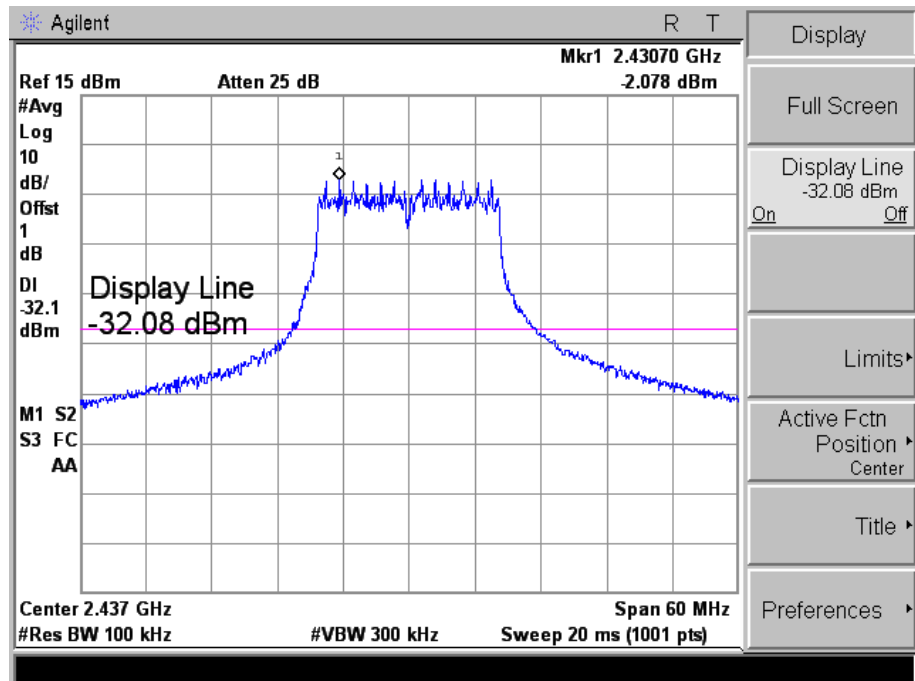
802.11g\_54Mbps

Low



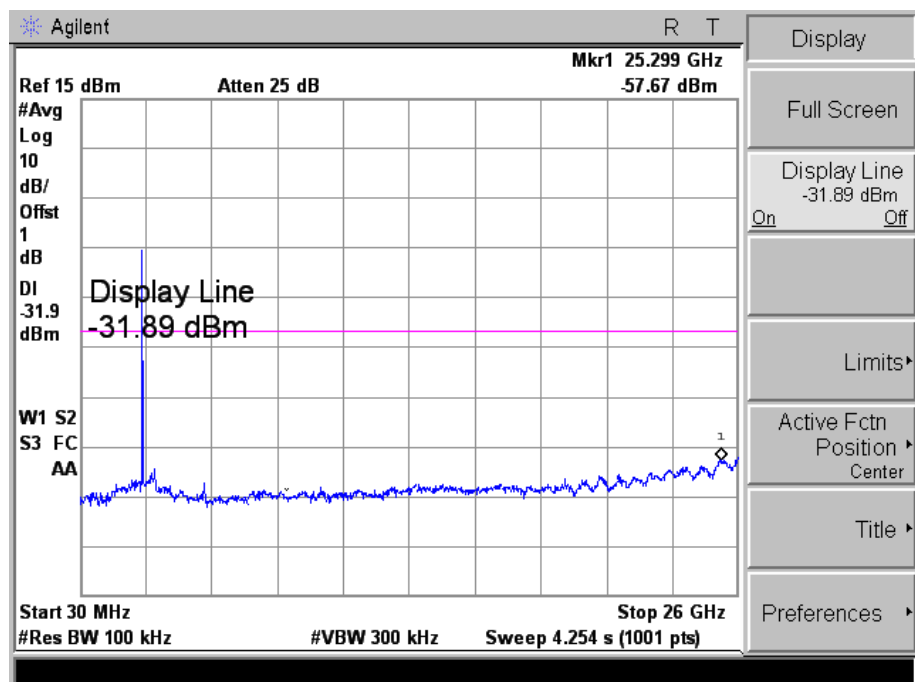
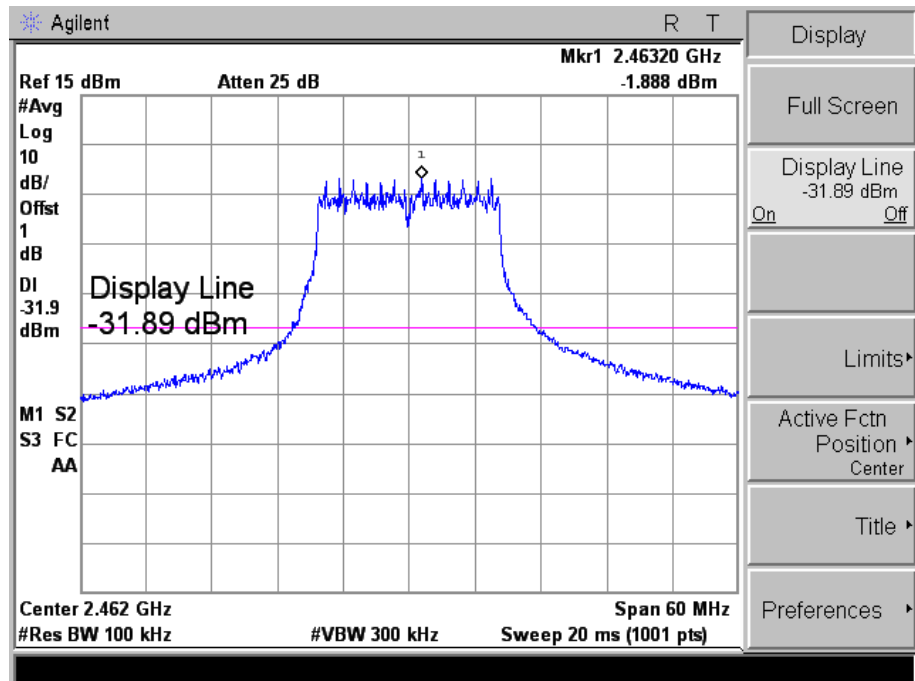
802.11g\_54Mbps

Middle



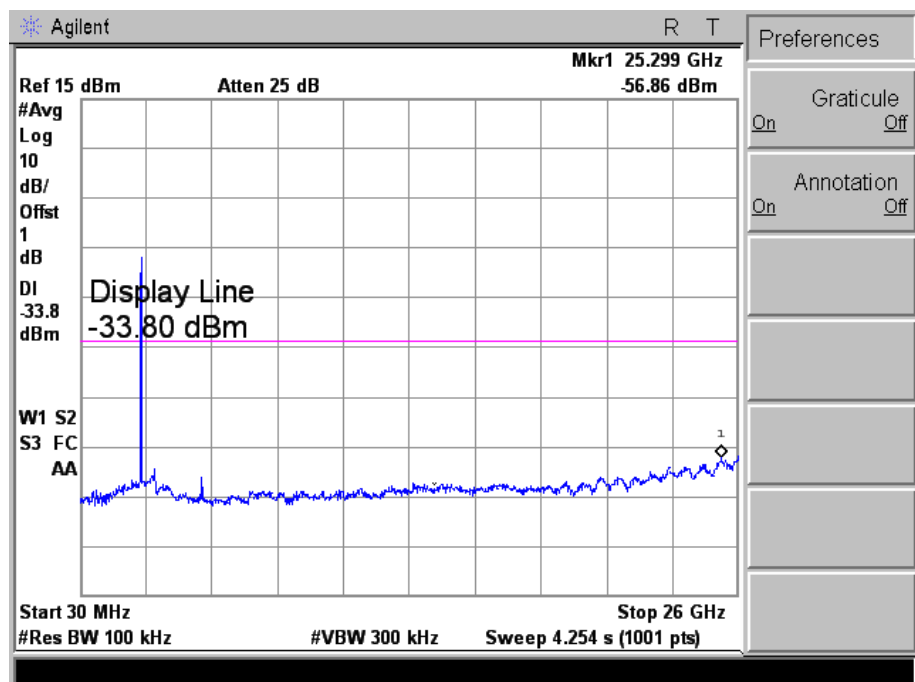
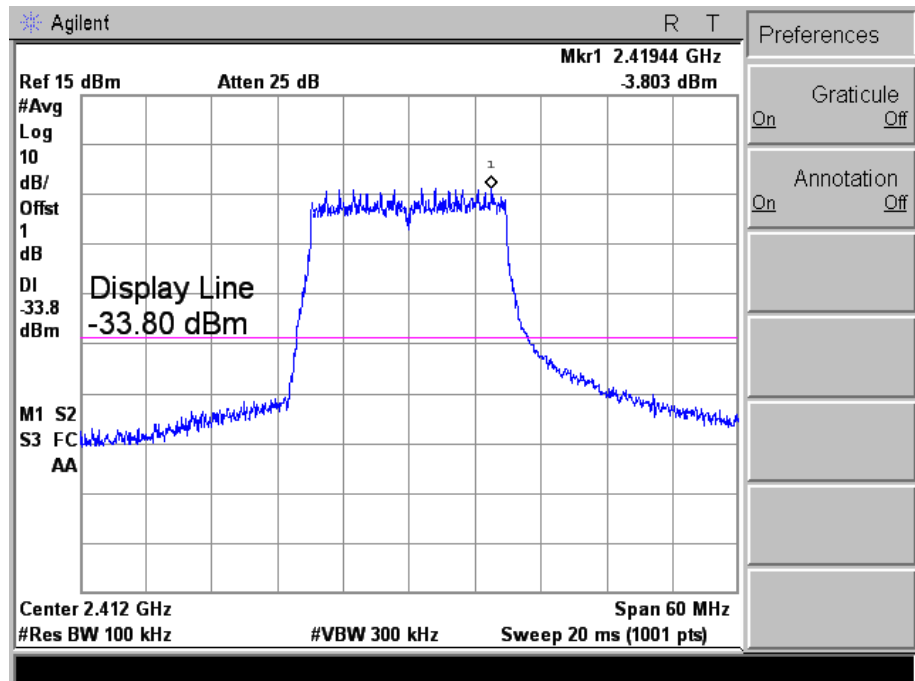
802.11g\_54Mbps

High



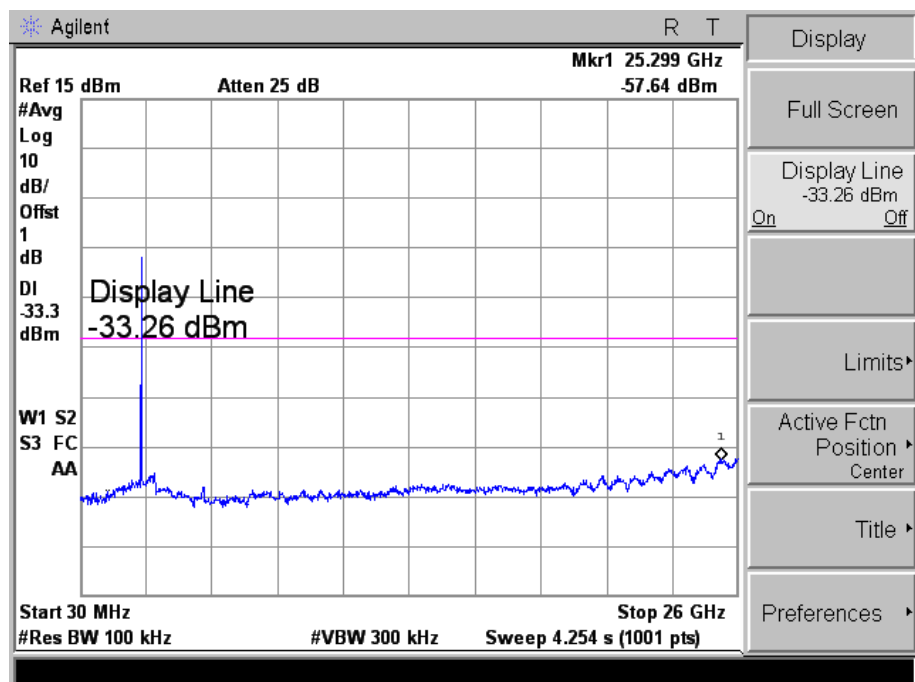
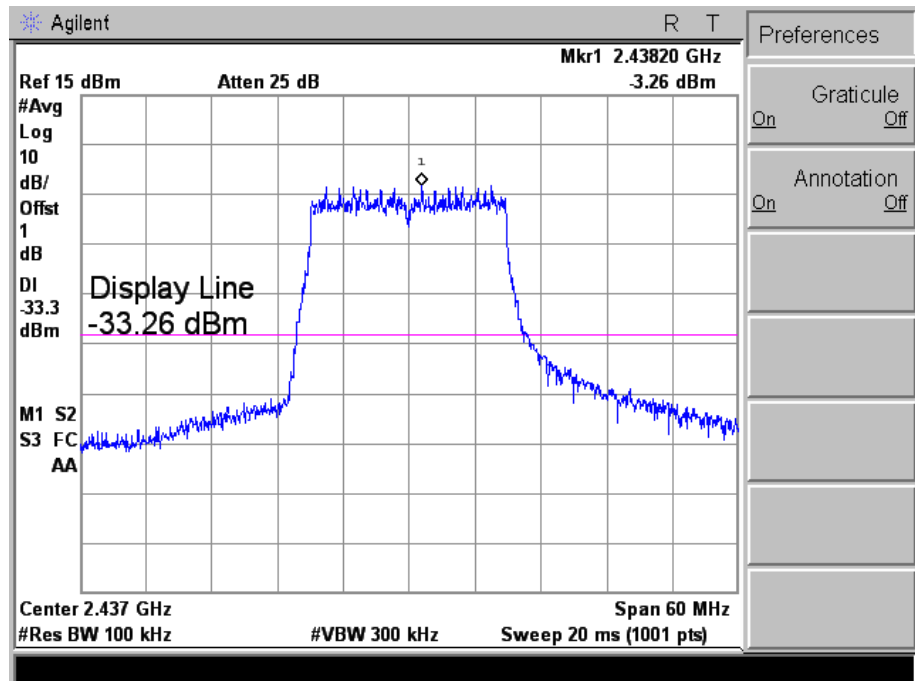
802.11n-HT20\_MCS7

Low



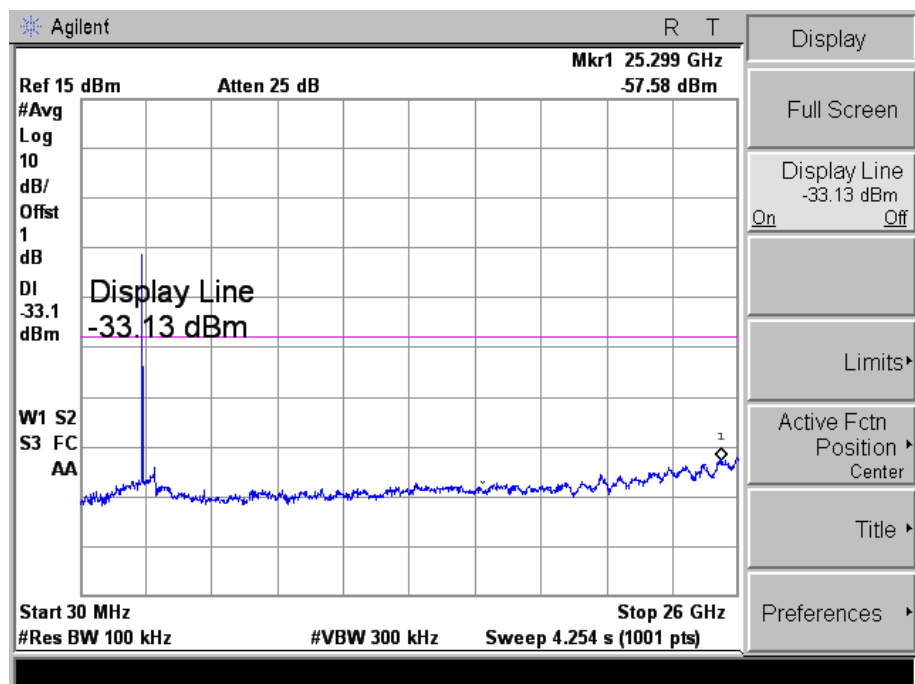
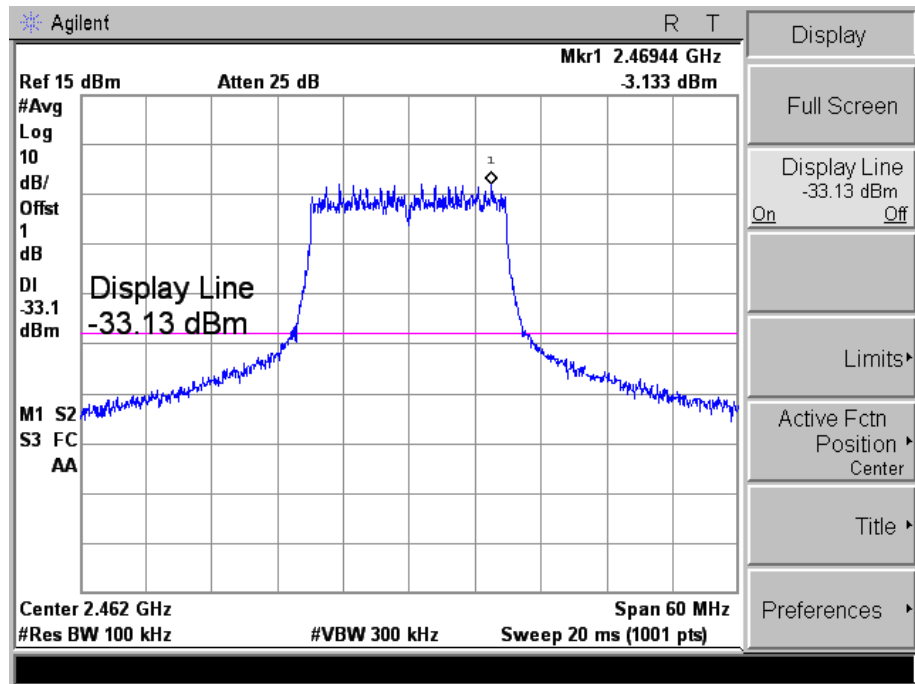
802.11n-HT20\_MCS7

Middle



802.11n-HT20\_MCS7

High



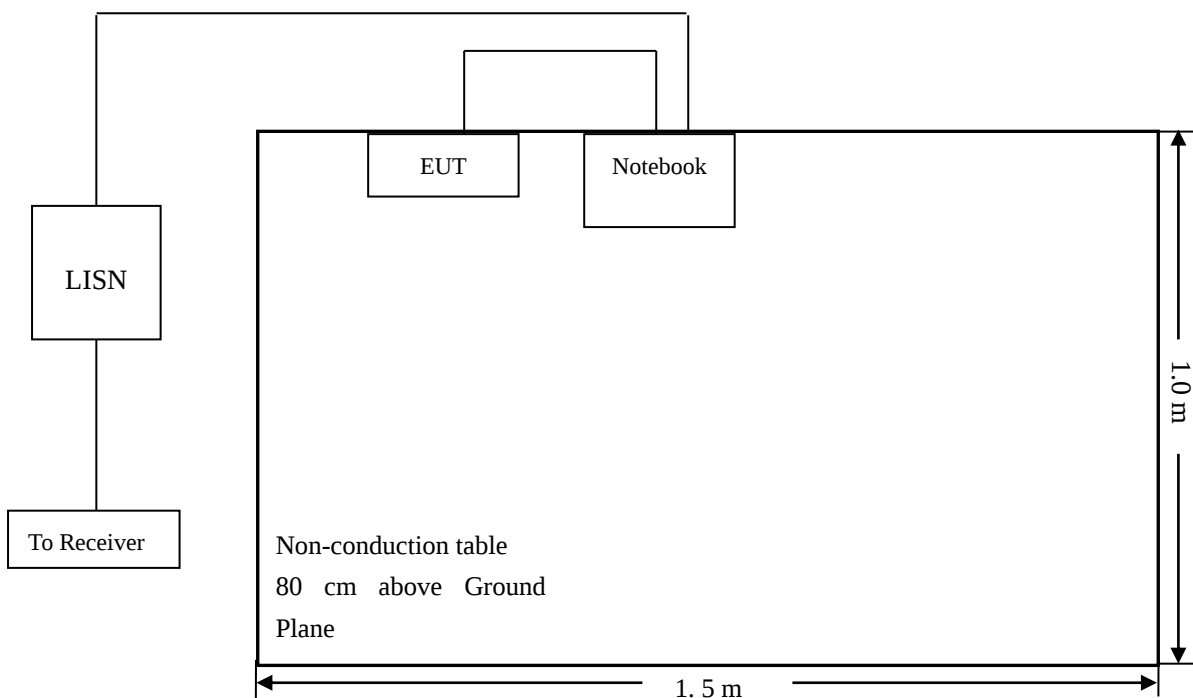
## 10. Conducted Emissions

### 10.1 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

### 10.2 Basic Test Setup Block Diagram



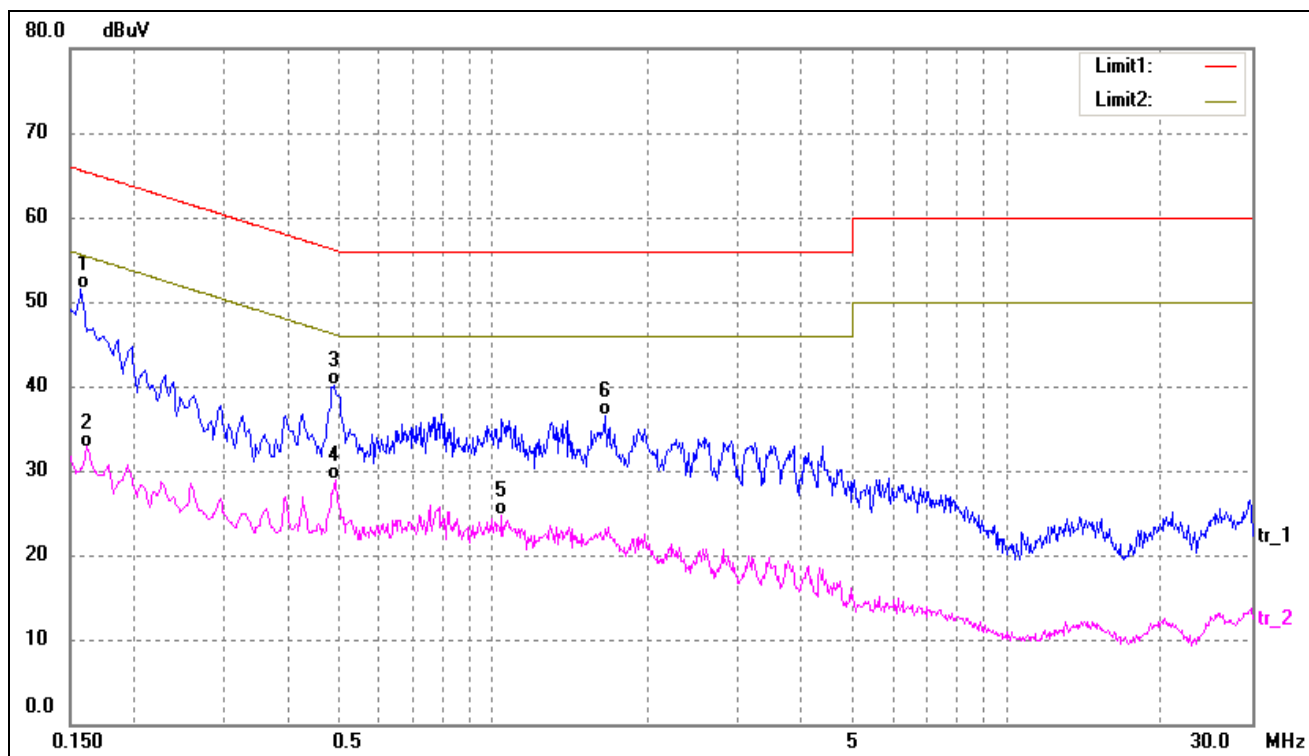
### 10.3 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency ..... 150 kHz  
 Stop Frequency ..... 30 MHz  
 Sweep Speed ..... Auto  
 IF Bandwidth..... 10 kHz  
 Quasi-Peak Adapter Bandwidth ..... 9 kHz  
 Quasi-Peak Adapter Mode ..... Normal

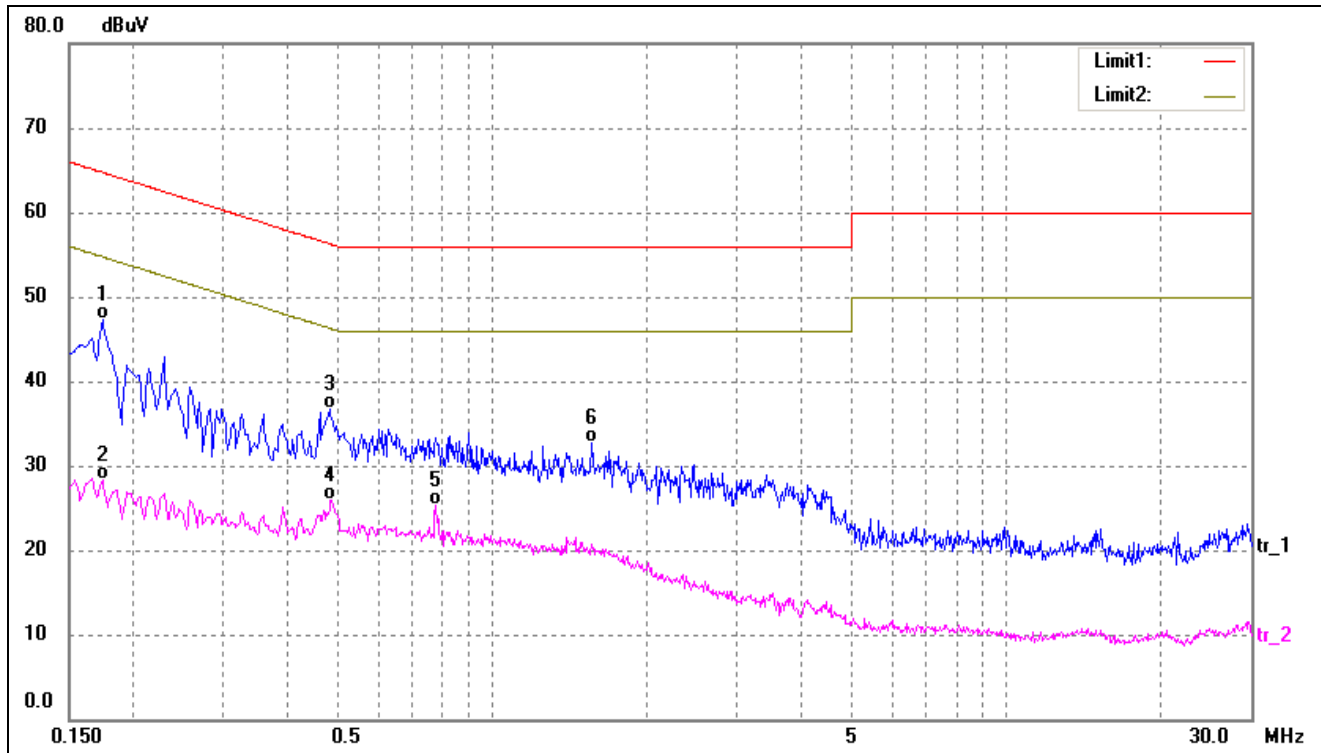
### 10.4 Summary of Test Results/Plots

|           |               |             |           |         |
|-----------|---------------|-------------|-----------|---------|
| Test Mode | Communication | AC120V 60Hz | Polarity: | Neutral |
|-----------|---------------|-------------|-----------|---------|



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>(dB/m) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Detector |
|-----|--------------------|-------------------|-------------------|------------------|-----------------|----------------|----------|
| 1*  | 0.1580             | 41.51             | 9.95              | 51.46            | 65.56           | -14.10         | QP       |
| 2   | 0.1620             | 22.85             | 9.95              | 32.80            | 55.36           | -22.56         | AVG      |
| 3   | 0.4900             | 30.13             | 10.02             | 40.15            | 56.17           | -16.02         | QP       |
| 4   | 0.4940             | 18.79             | 10.02             | 28.81            | 46.10           | -17.29         | AVG      |
| 5   | 1.0420             | 14.38             | 10.37             | 24.75            | 46.00           | -21.25         | AVG      |
| 6   | 1.6460             | 26.10             | 10.37             | 36.47            | 56.00           | -19.53         | QP       |

|           |               |             |           |      |
|-----------|---------------|-------------|-----------|------|
| Test Mode | Communication | AC120V 60Hz | Polarity: | Line |
|-----------|---------------|-------------|-----------|------|



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>(dB/m) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Detector |
|-----|--------------------|-------------------|-------------------|------------------|-----------------|----------------|----------|
| 1*  | 0.1740             | 37.43             | 9.95              | 47.38            | 64.77           | -17.39         | QP       |
| 2   | 0.1740             | 18.38             | 9.95              | 28.33            | 54.77           | -26.44         | AVG      |
| 3   | 0.4820             | 26.68             | 10.02             | 36.70            | 56.30           | -19.60         | QP       |
| 4   | 0.4860             | 15.87             | 10.02             | 25.89            | 46.24           | -20.35         | AVG      |
| 5   | 0.7780             | 15.21             | 10.15             | 25.36            | 46.00           | -20.64         | AVG      |
| 6   | 1.5620             | 22.36             | 10.37             | 32.73            | 56.00           | -23.27         | QP       |

\*\*\*\*\* END OF REPORT \*\*\*\*\*