# FCC Part 15C
# Measurement and Test Report

**For**

**Guangzhou Juan Optical & Electronical Tech Joint Stock Co., LTD**

**No. 9, street 3, HengLing industrial zone, Tangdong, tianhe district,**

**Guangzhou, China**

**FCC ID: 2AFPL-WDB-20-JUN**

| | |
|---|---|
| **FCC Rule(s):** | FCC Part 15C |
| **Product Description:** | DOORBELL |
| **Tested Model:** | WDB-20-JUN |
| **Report No.:** | STR18048246I |
| **Sample Receipt Date:** | 2018-03-12 |
| **Tested Date:** | 2018-03-13 to 2018-04-26 |
| **Issued Date:** | 2018-04-27 |
| **Tested By:** | Jason Su / Engineer |
| **Reviewed By:** | Silin Chen / EMC Manager |
| **Approved & Authorized By:** | Jandy So / PSQ Manager |

**Prepared By:**

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# 1. GENERAL INFORMATION

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

**Client Information**

| | |
|---|---|
| Applicant: | Guangzhou Juan Optical & Electronical Tech Joint Stock Co., LTD |
| Address of applicant: | No. 9, street 3, HengLing industrial zone, Tangdong, tianhe district, Guangzhou, China |
| Manufacturer: | Guangzhou Juan Optical & Electronical Tech Joint Stock Co., LTD |
| Address of manufacturer: | No. 9, street 3, HengLing industrial zone, Tangdong, tianhe district, Guangzhou, China |

| **General Description of EUT** | |
|---|---|
| Product Name: | DOORBELL |
| Trade Name: | NIGHT OWL |
| Model No.: | WDB-20-JUN |
| Adding Model(s): | WM-WDB2, CAN-WM-WDB2 |
| Rated Voltage: | Battery:DC 3.7V/USB DC5V/AC12-24V |
| Battery: | 300mAh |
| Software Version: | 2.3.0 |
| Hardware Version: | V105 |
| | |
| *Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model WDB-20-JUN, but the circuit and the electronic construction do not change, declared by the manufacturer.* | |

| **Technical Characteristics of EUT** | |
|---|---|
| Support Standards: | 802.11b, 802.11g, 802.11n |
| Frequency Range: | 2412-2462MHz |
| RF Output Power: | 13.18dBm (Conducted) |
| Type of Modulation: | CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM |
| Data Rate: | 1-11Mbps, 6-54Mbps, up to 150Mbps |
| Quantity of Channels: | 11/7 |
| Channel Separation: | 5MHz |
| Type of Antenna: | Integral |
| Antenna Gain: | 3dBi |
| Lowest Internal Frequency: | 24MHz |

## 1.2 Test Standards

The following report is prepared on behalf of the Guangzhou Juan Optical & Electronical Tech Joint Stock Co., LTD in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

**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, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 558074 D01 v04 for digital transmission systems shall be performed also.

## 1.4 Test Facility

**FCC – Registration No.: 125990**

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). 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 | 2412MHz, 2437MHz, 2462MHz |
| TM2 | 802.11g | 2412MHz, 2437MHz, 2462MHz |
| TM3 | 802.11n-HT20 | 2412MHz, 2437MHz, 2462MHz |
| TM4 | 802.11n-HT40 | 2422MHz, 2437MHz, 2452MHz |
| Note: All test modes (different data rate and different modulation) are performed, but only the worst case is recorded in this report. | | |

| **Accessories Equipment List and Details** | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model No.** | **Serial Number** |
| / | / | / | / |
| **Accessories Cable List and Details** | | | |
| **Cable Description** | **Length (m)** | **Shielded/Unshielded** | **With Core/Without Core** |
| / | / | / | / |
| **EUT Cable List and Details** | | | |
| **Cable Description** | **Length (m)** | **Shielded/Unshielded** | **With Core/Without Core** |
| USB Cable | 0.35 | Unshielded | Without Core |

## 1.6 Measurement Uncertainty

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

## 1.7 Test Equipment List and Details

| No. | Description | Manufacturer | Model | Serial No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| SEMT-1072 | Spectrum Analyzer | Agilent | E4407B | MY41440400 | 2017-06-12 | 2018-06-11 |
| SEMT-1031 | Spectrum Analyzer | Rohde & Schwarz | FSP30 | 836079/035 | 2017-06-12 | 2018-06-11 |
| SEMT-1007 | EMI Test Receiver | Rohde & Schwarz | ESVB | 825471/005 | 2017-06-12 | 2018-06-11 |
| SEMT-1008 | Amplifier | Agilent | 8447F | 3113A06717 | 2017-06-12 | 2018-06-11 |
| SEMT-1043 | Amplifier | C&D | PAP-1G18 | 2002 | 2017-06-12 | 2018-06-11 |
| SEMT-1011 | Broadband Antenna | Schwarz beck | VULB9163 | 9163-333 | 2017-06-08 | 2020-06-07 |
| SEMT-1042 | Horn Antenna | ETS | 3117 | 00086197 | 2017-06-08 | 2020-06-07 |
| SEMT-1121 | Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA9170582 | 2017-06-08 | 2020-06-07 |
| SEMT-1069 | Loop Antenna | Schwarz beck | FMZB 1516 | 9773 | 2017-06-08 | 2020-06-07 |
| SEMT-1001 | EMI Test Receiver | Rohde & Schwarz | ESPI | 101611 | 2017-06-12 | 2018-06-11 |
| SEMT-1003 | L.I.S.N | Schwarz beck | NSLK8126 | 8126-224 | 2017-06-12 | 2018-06-11 |
| SEMT-1002 | Pulse Limiter | Rohde & Schwarz | ESH3-Z2 | 100911 | 2017-06-12 | 2018-06-11 |
| SEMT-1168 | Pre-amplifier | Direction Systems Inc. | PAP-0126 | 14141-12838 | 2017-08-15 | 2018-08-14 |
| SEMT-1169 | Pre-amplifier | Direction Systems Inc. | PAP-2640 | 14145-14153 | 2017-08-15 | 2018-08-14 |
| SEMT-1163 | Spectrum Analyzer | Rohde & Schwarz | FSP40 | 100612 | 2017-06-12 | 2018-06-11 |
| SEMT-1170 | DRG Horn Antenna | A.H. SYSTEMS | SAS-574 | 571 | 2018-03-19 | 2021-03-18 |

# 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) | 6 dB 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

## 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

## 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 an integral 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 v04, 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:

a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5 times the OBW.
c) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz. .
d) Set VBW ≥3 x RBW.
e) Detector = power averaging (RMS) or sample detector (when RMS not available).
f) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g) Sweep time = auto couple.
h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
i) Use the peak marker function to determine the maximum amplitude level.
j) 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 Environmental Conditions

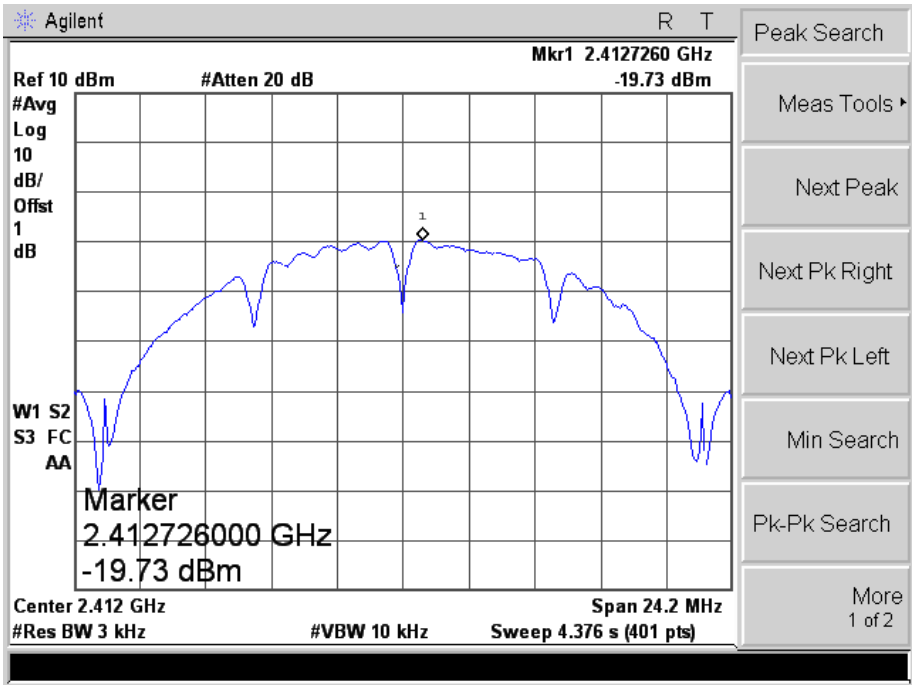
| | |
|---|---|
| Temperature: | 26° C |
| Relative Humidity: | 54% |
| ATM Pressure: | 1011 mbar |

## 5.4 Summary of Test Results/Plots

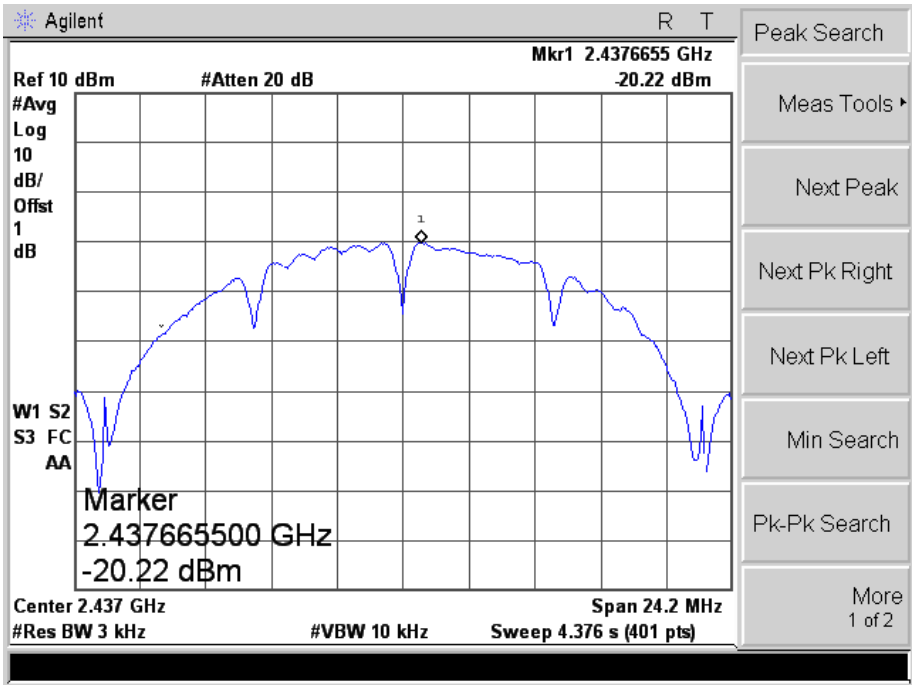
| Test Mode | Test Channel MHz | Power Spectral Density dBm/3kHz | Limit dBm/3kHz |
|---|---|---|---|
| 802.11b | 2412 | -19.73 | 8 |
| | 2437 | -20.22 | 8 |
| | 2462 | -20.62 | 8 |
| 802.11g | 2412 | -25.22 | 8 |
| | 2437 | -25.50 | 8 |
| | 2462 | -25.60 | 8 |
| 802.11n HT20 | 2412 | -25.45 | 8 |
| | 2437 | -25.89 | 8 |
| | 2462 | -25.06 | 8 |
| 802.11n HT40 | 2422 | -30.04 | 8 |
| | 2437 | -30.25 | 8 |
| | 2452 | -30.68 | 8 |

Please refer to the following test plots:

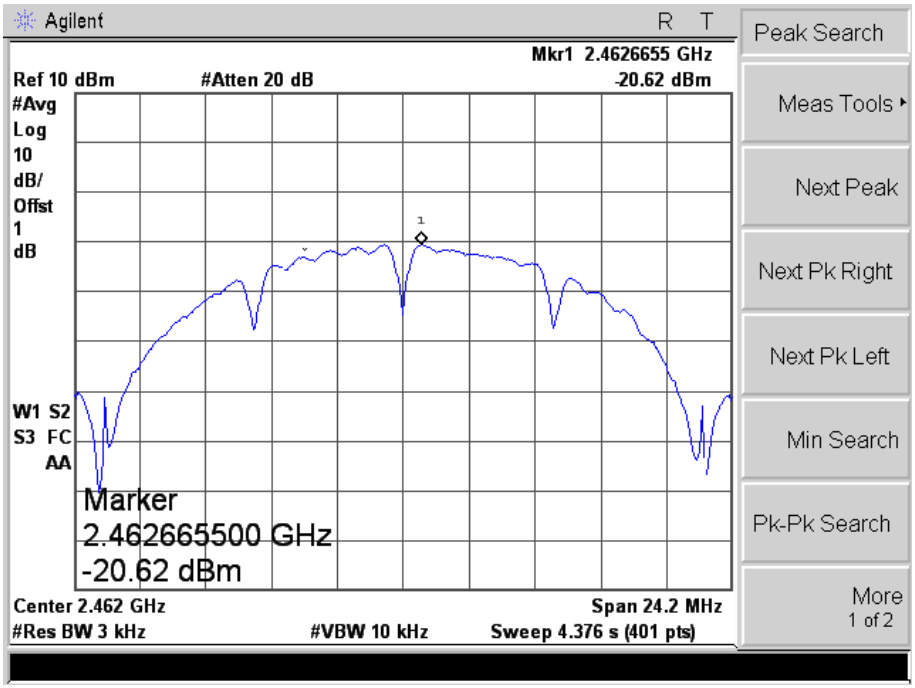
802.11b-Low Channel



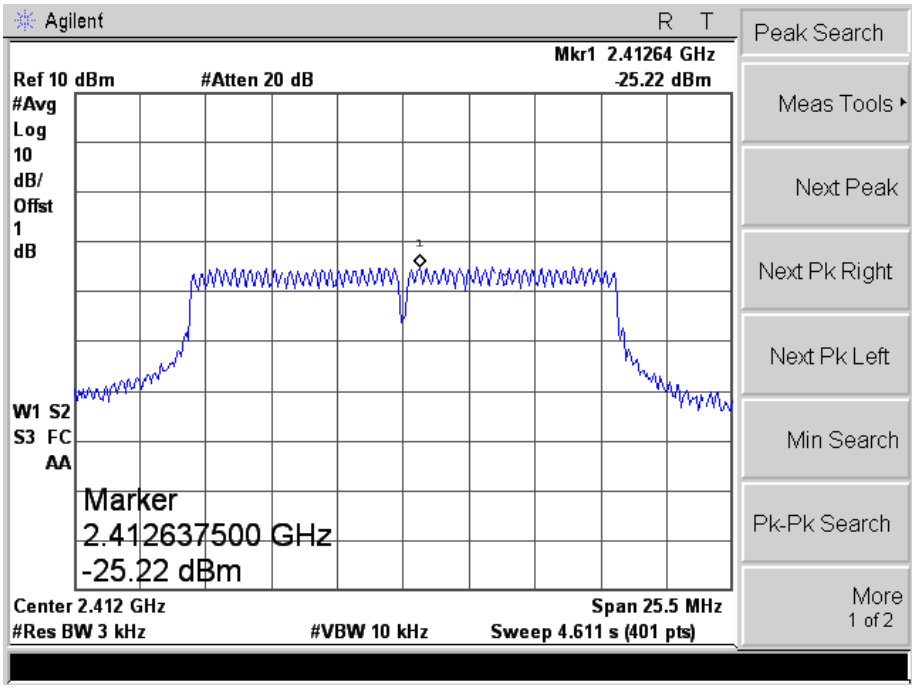

802.11b-Middle Channel



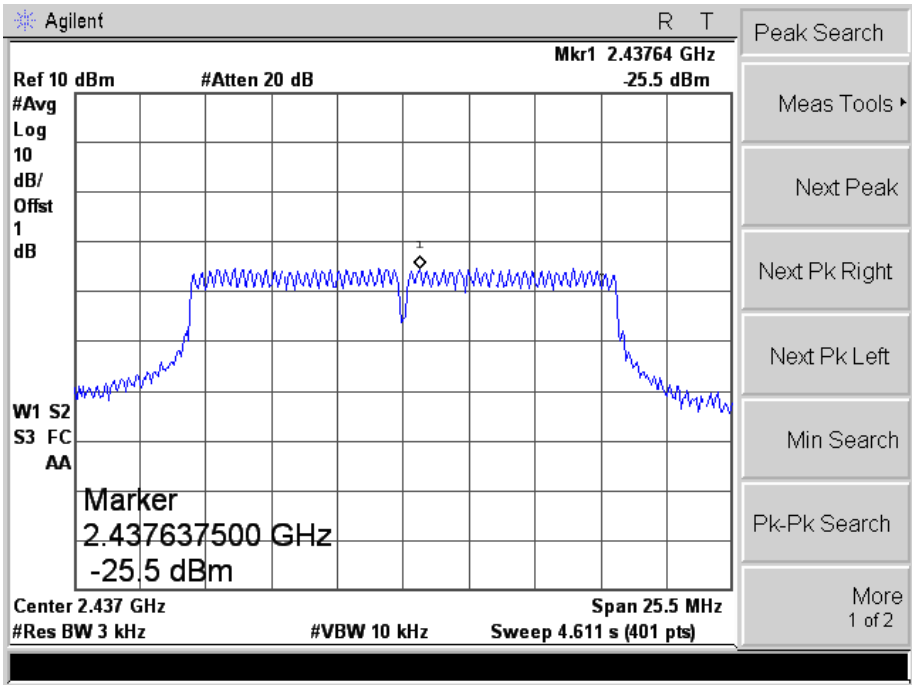
802.11b-High Channel



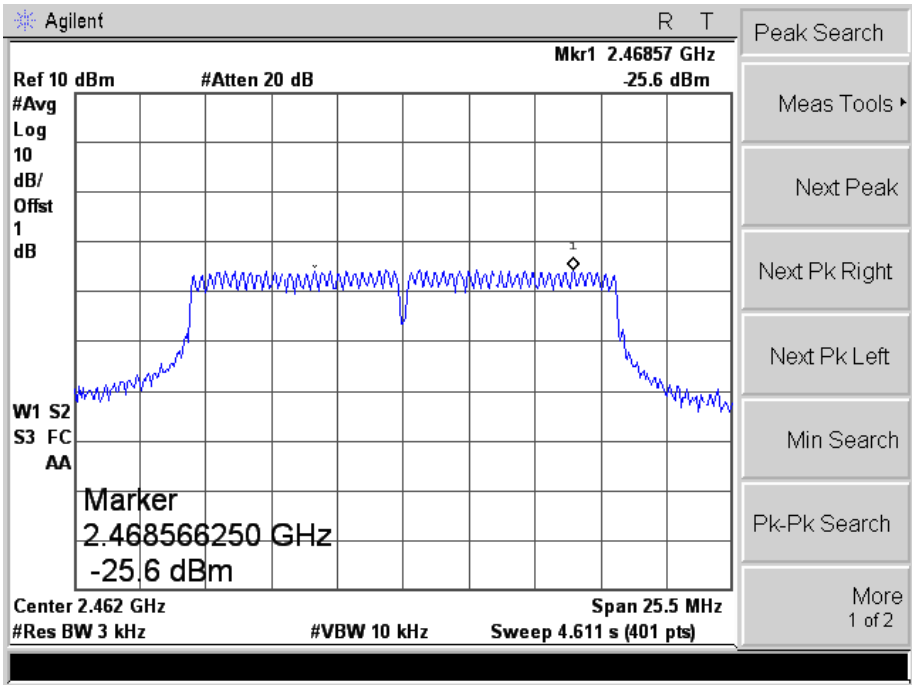

802.11g-Low Channel



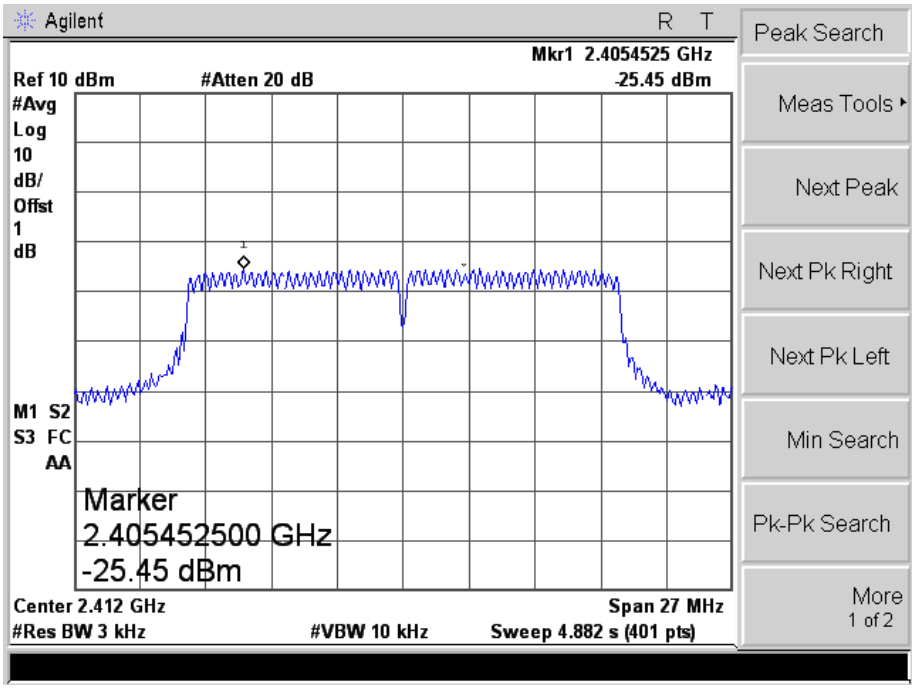
802.11g-Middle Channel



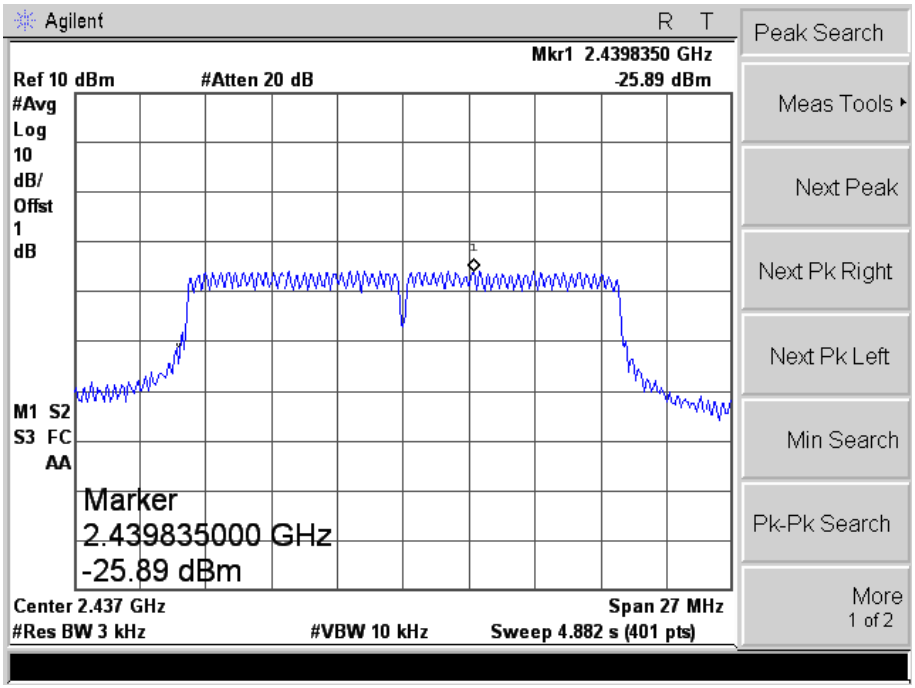

802.11g-High Channel



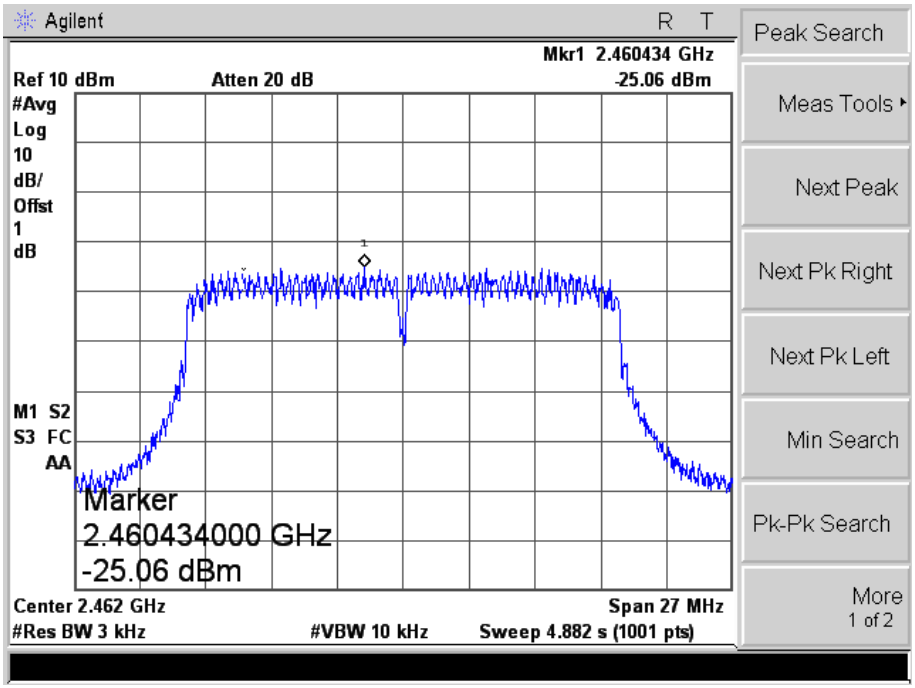
802.11n-HT20-Low Channel



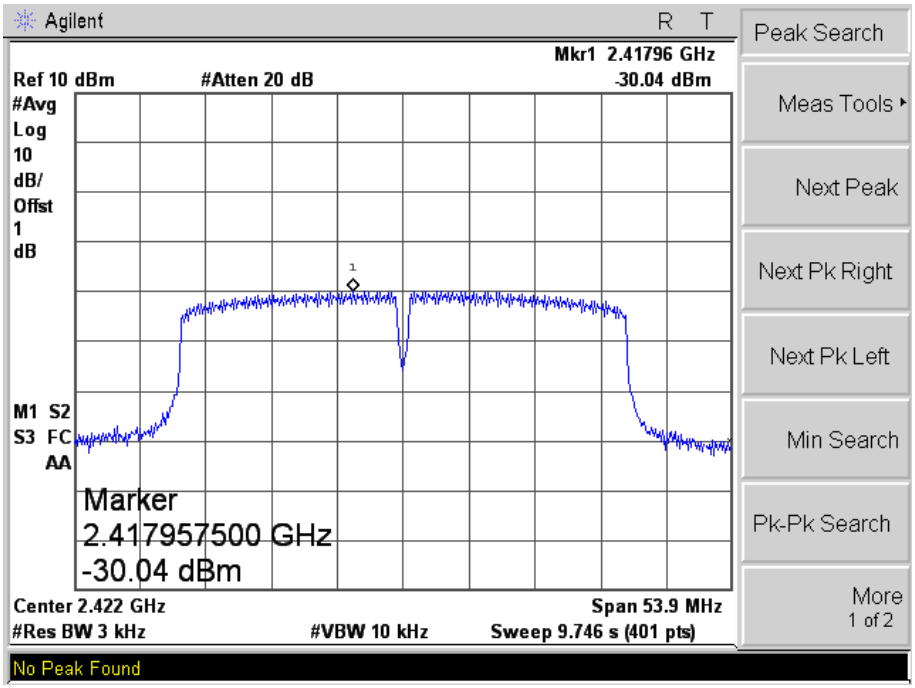

802.11n-HT20-Middle Channel



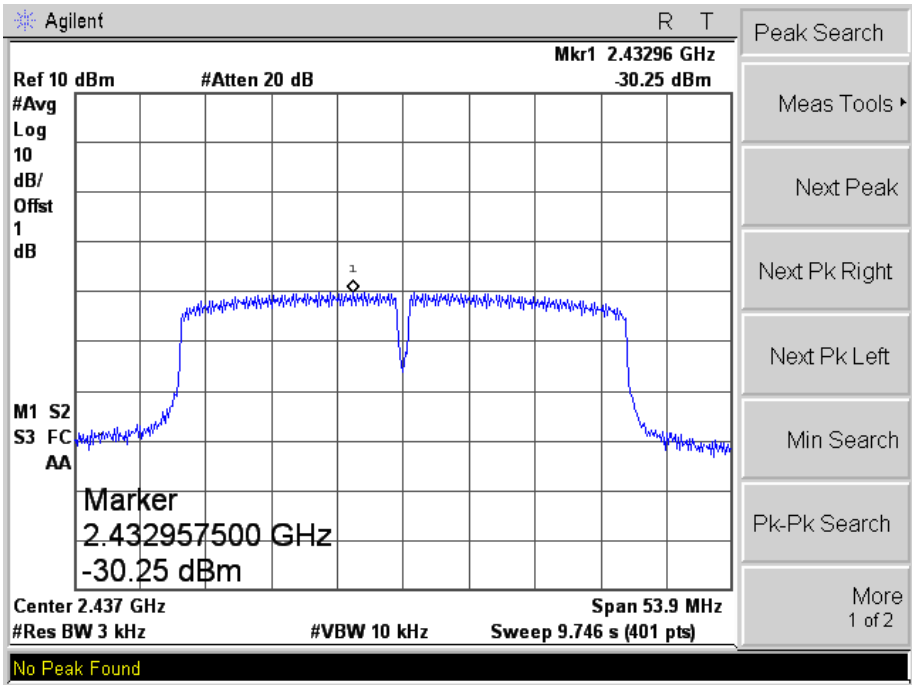
802.11n-HT20-High Channel



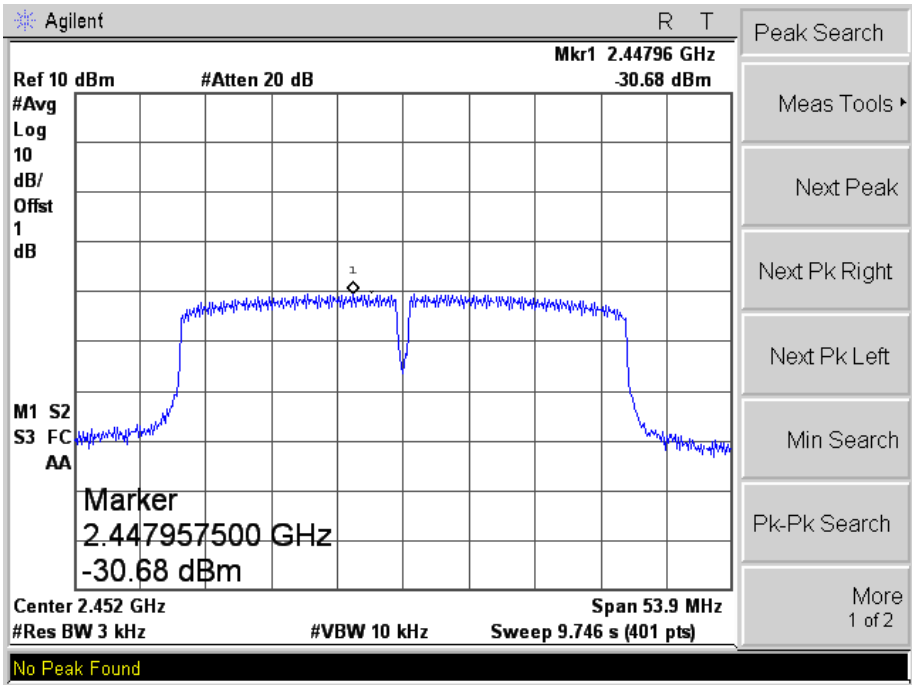

802.11n-HT40-Low Channel



802.11n-HT40-Middle Channel




802.11n-HT40-High Channel



# 6. 6dB 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

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

## 6.3 Environmental Conditions

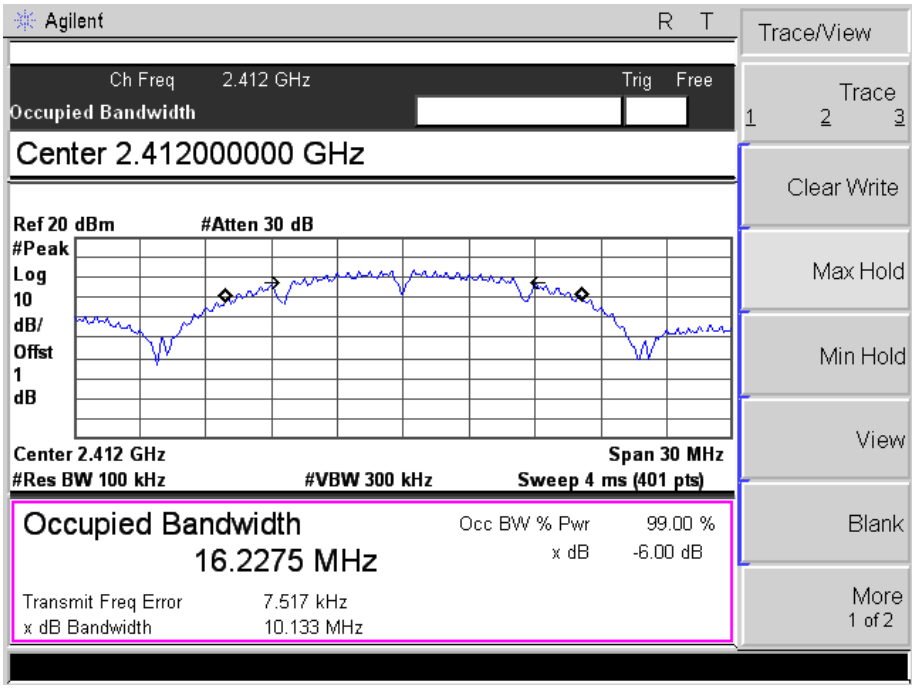
| | |
|---|---|
| Temperature: | 25° C |
| Relative Humidity: | 53% |
| ATM Pressure: | 1018 mbar |

## 6.4 Summary of Test Results/Plots

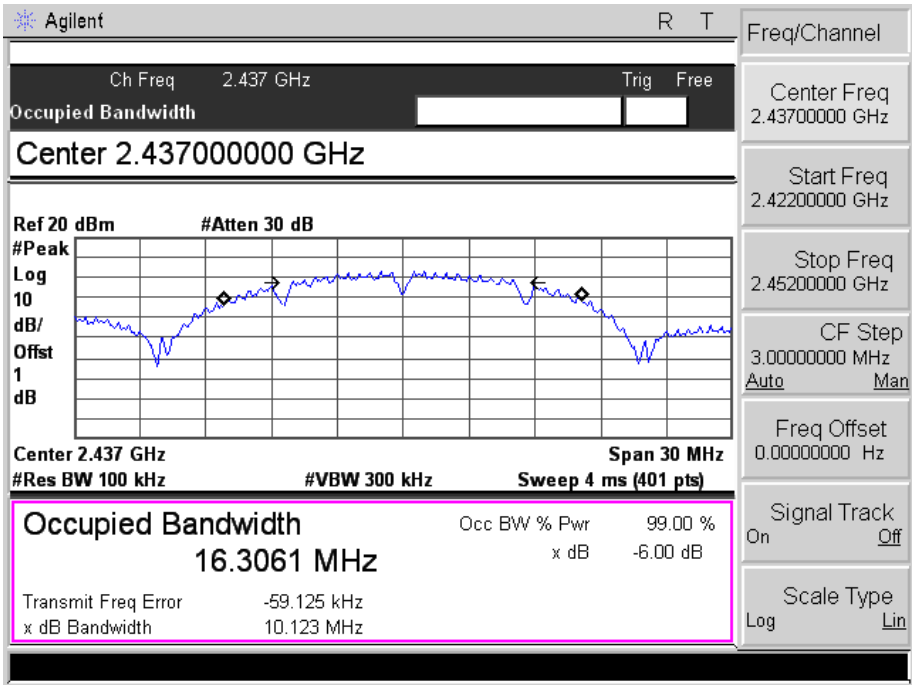
| Test Mode | Test Channel MHz | 6 dB Bandwidth MHz | 99% Bandwidth MHz | Limit kHz |
|---|---|---|---|---|
| 802.11b | 2412 | 10.133 | 16.2275 | ≥500 |
| | 2437 | 10.123 | 16.3061 | ≥500 |
| | 2462 | 10.130 | 16.3430 | ≥500 |
| 802.11g | 2412 | 16.567 | 16.8983 | ≥500 |
| | 2437 | 16.536 | 17.0338 | ≥500 |
| | 2462 | 16.556 | 17.1086 | ≥500 |
| 802.11n-HT20 | 2412 | 17.772 | 18.0407 | ≥500 |
| | 2437 | 17.784 | 18.0626 | ≥500 |
| | 2462 | 17.801 | 18.0450 | ≥500 |
| 802.11n-HT40 | 2422 | 36.337 | 35.8952 | ≥500 |
| | 2437 | 36.277 | 35.9151 | ≥500 |
| | 2452 | 36.334 | 35.9848 | ≥500 |

Please refer to the following test plots:

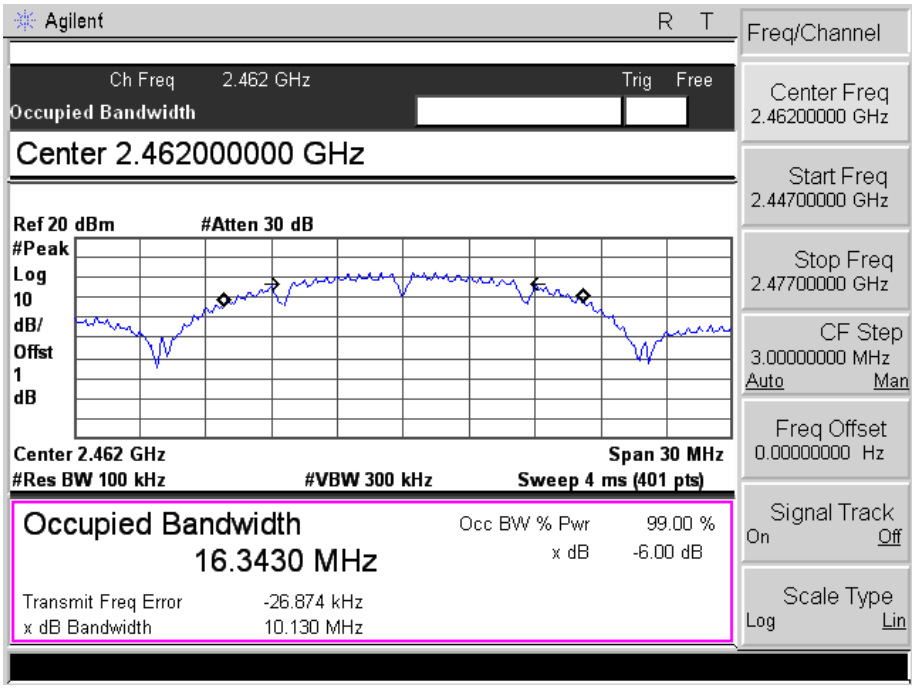
802.11b-Low Channel



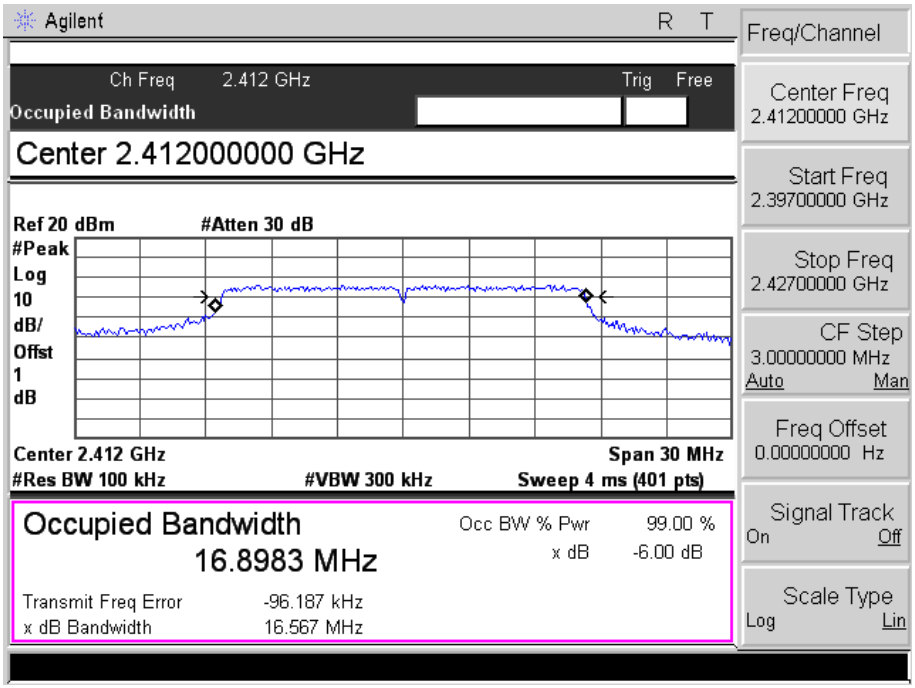

802.11b-Middle Channel



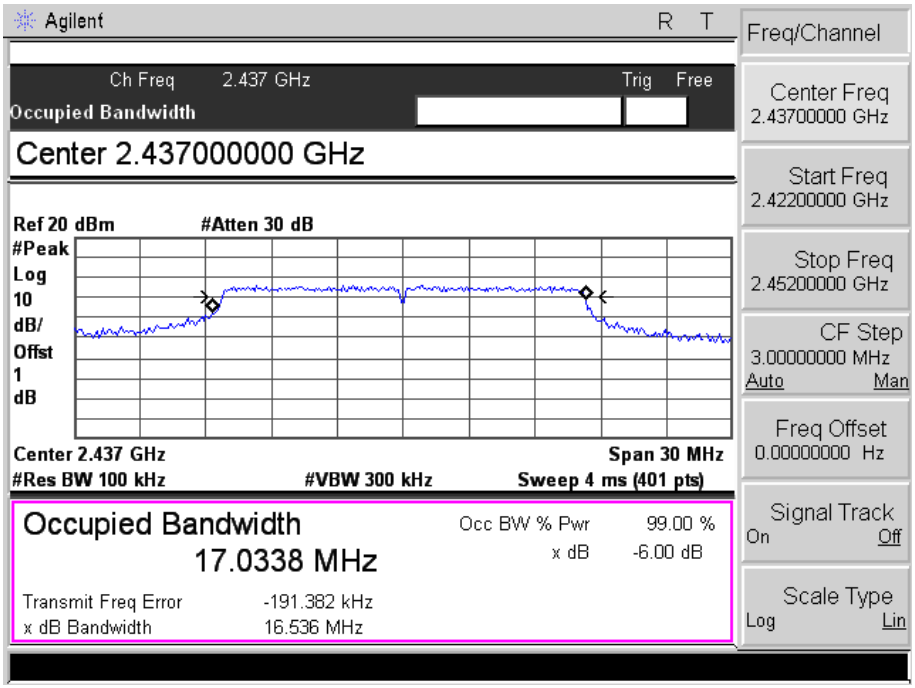
802.11b-High Channel



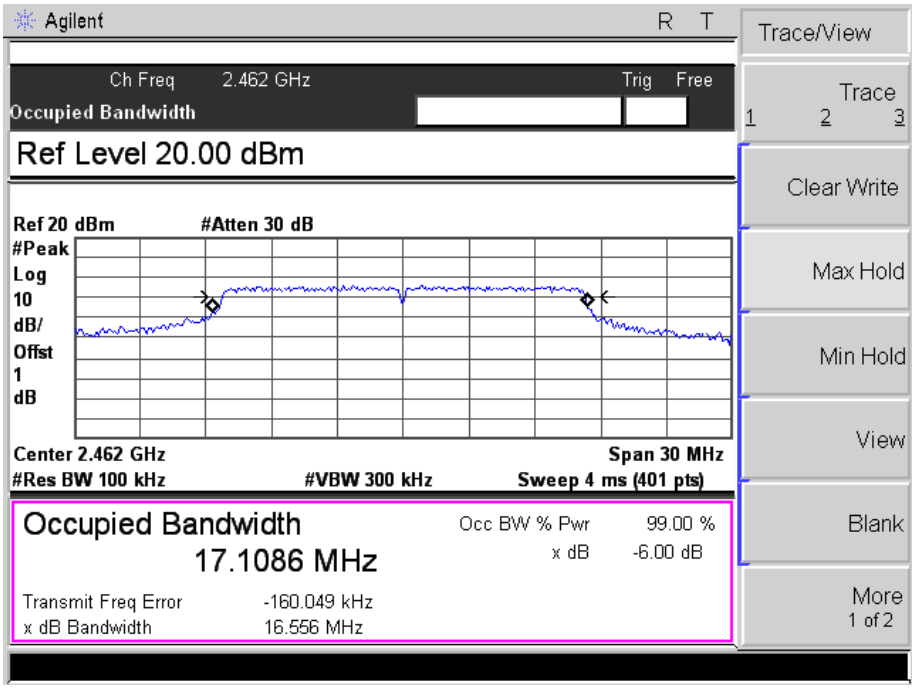

802.11g-Low Channel



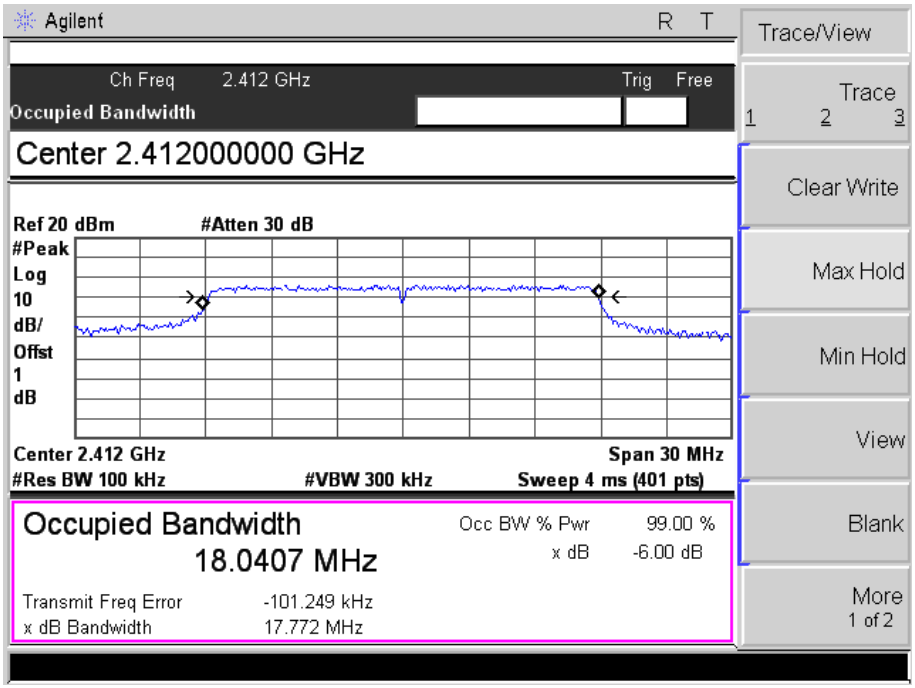
802.11g-Middle Channel



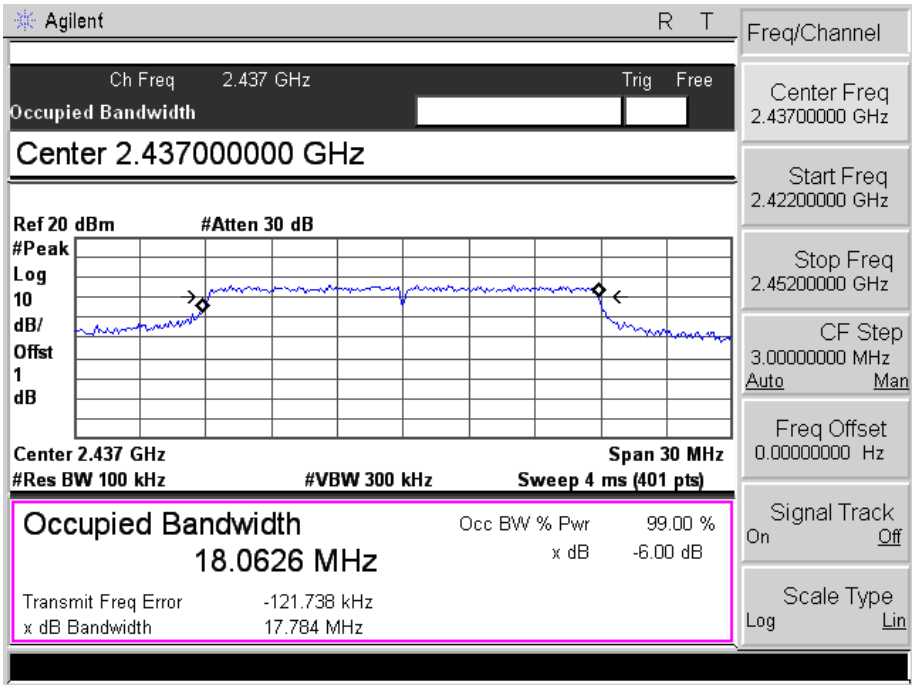

802.11g-High Channel



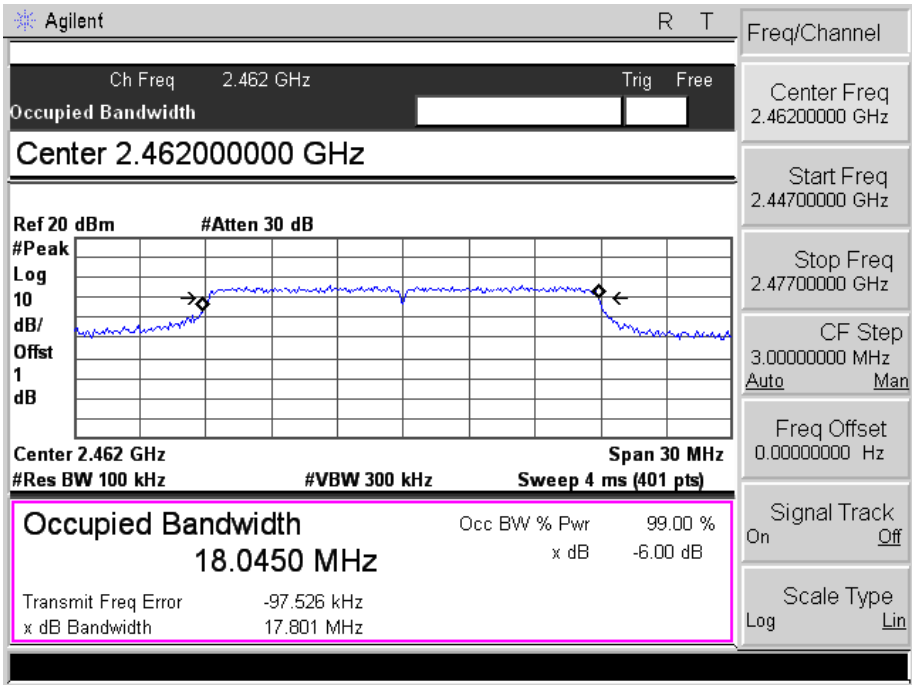
802.11n-HT20-Low Channel



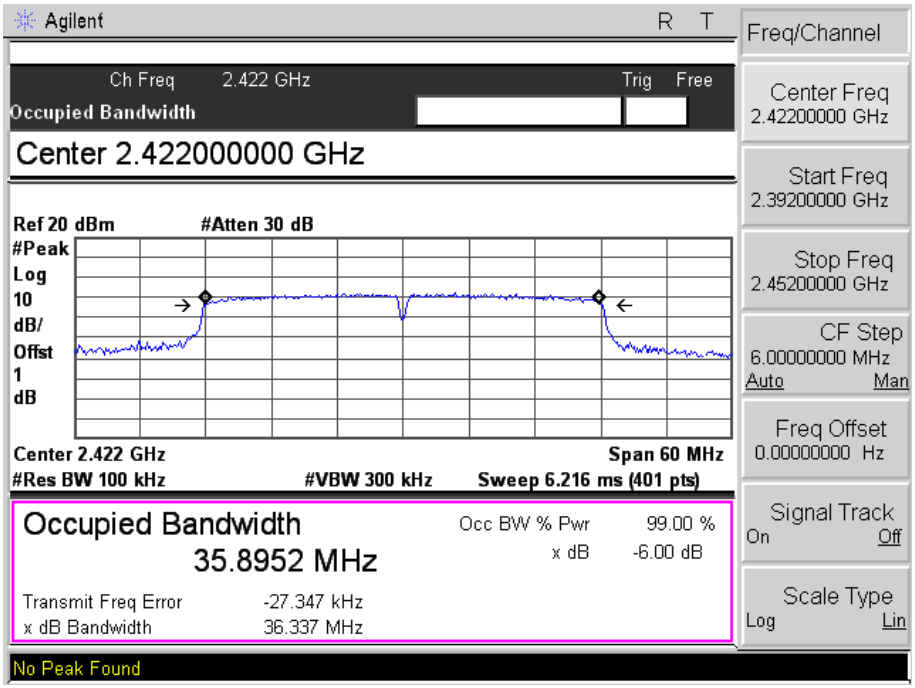

802.11n-HT20-Middle Channel



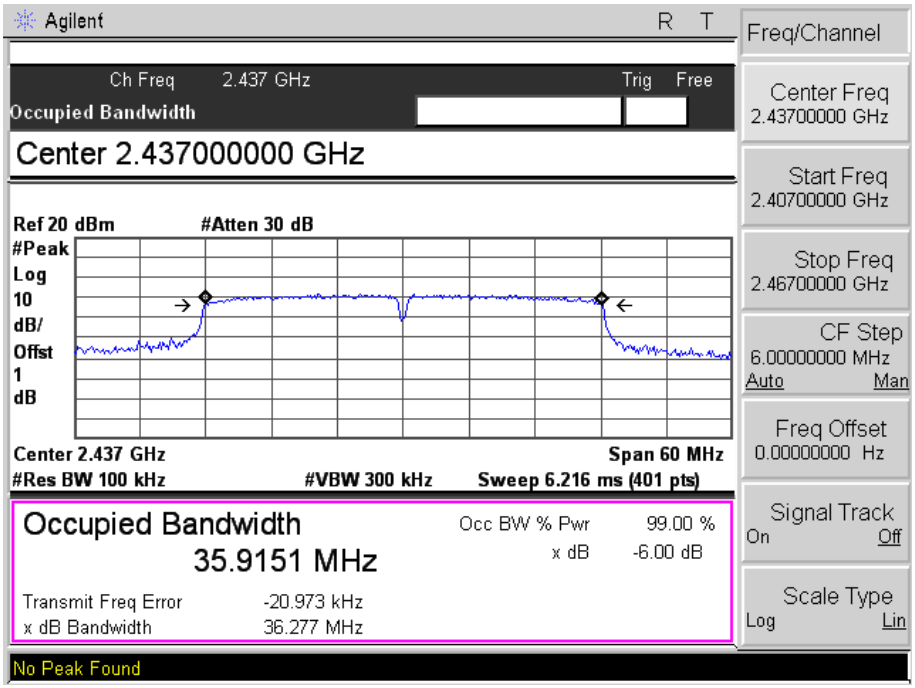
802.11n-HT20-High Channel



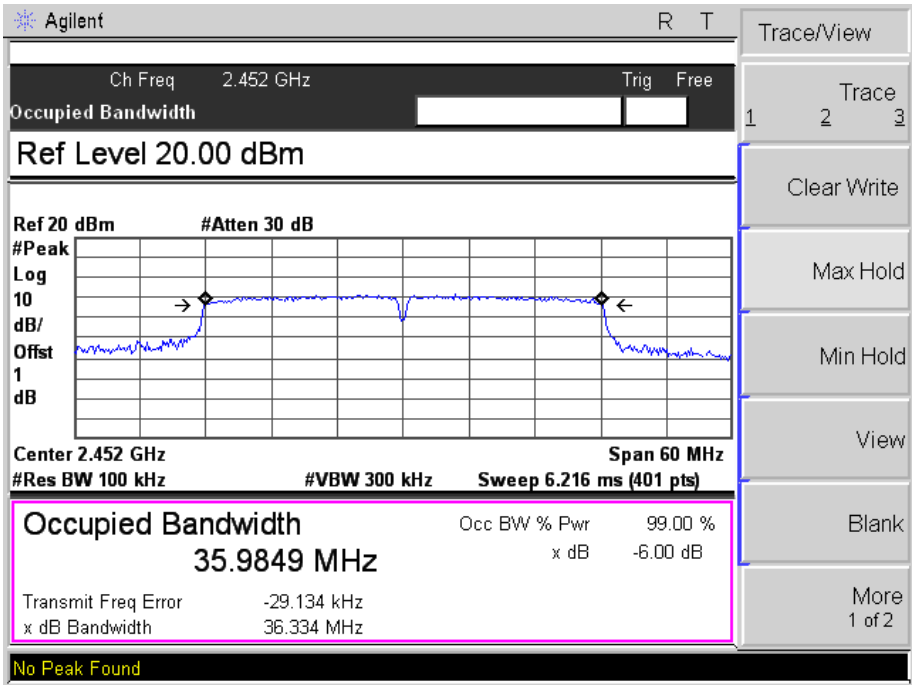

802.11n-HT40-Low Channel



802.11n-HT40-Middle Channel




802.11n-HT40-High Channel



# 7. RF Output Power

## 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 v04, 9.2.2.2, 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 ≥ 3 x RBW.
d) Number of points in sweep ≥ 2 × span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
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 ≥ 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 Environmental Conditions

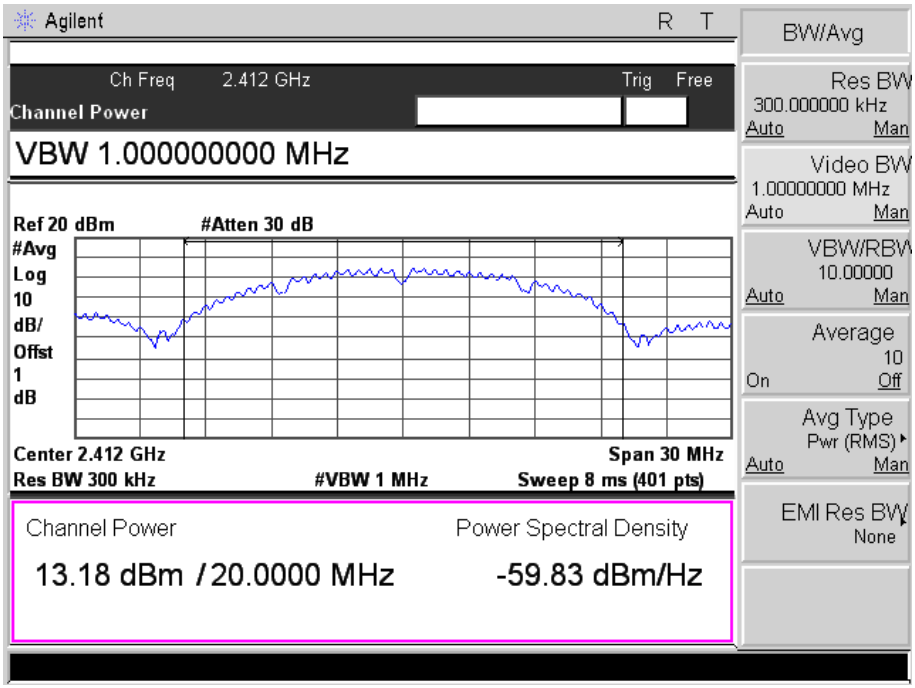
| | |
|---|---|
| Temperature: | 26° C |
| Relative Humidity: | 57% |
| ATM Pressure: | 1011 mbar |

## 7.4 Summary of Test Results/Plots

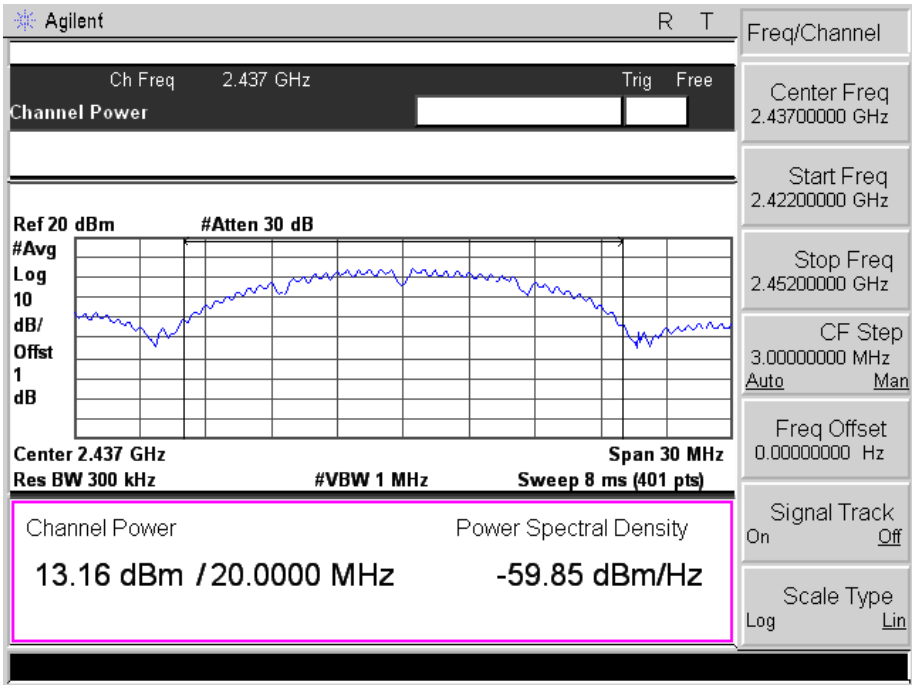
| Test Mode | Frequency MHz | Reading dBm | Output Power mW | Limit mW |
|---|---|---|---|---|
| 802.11b _ 11Mbps | 2412 | 13.18 | 20.80 | 1000 |
| | 2437 | 13.16 | 20.70 | 1000 |
| | 2462 | 12.17 | 16.48 | 1000 |
| 802.11g_54Mbps | 2412 | 9.45 | 8.81 | 1000 |
| | 2437 | 9.44 | 8.79 | 1000 |
| | 2462 | 9.52 | 8.95 | 1000 |
| 802.11n HT20_MCS7 | 2412 | 8.75 | 7.50 | 1000 |
| | 2437 | 9.47 | 8.85 | 1000 |
| | 2462 | 9.10 | 8.13 | 1000 |
| 802.11n HT40_MCS7 | 2422 | 7.33 | 5.41 | 1000 |
| | 2437 | 7.55 | 5.69 | 1000 |
| | 2452 | 7.19 | 5.24 | 1000 |

Please refer to the following test plots:

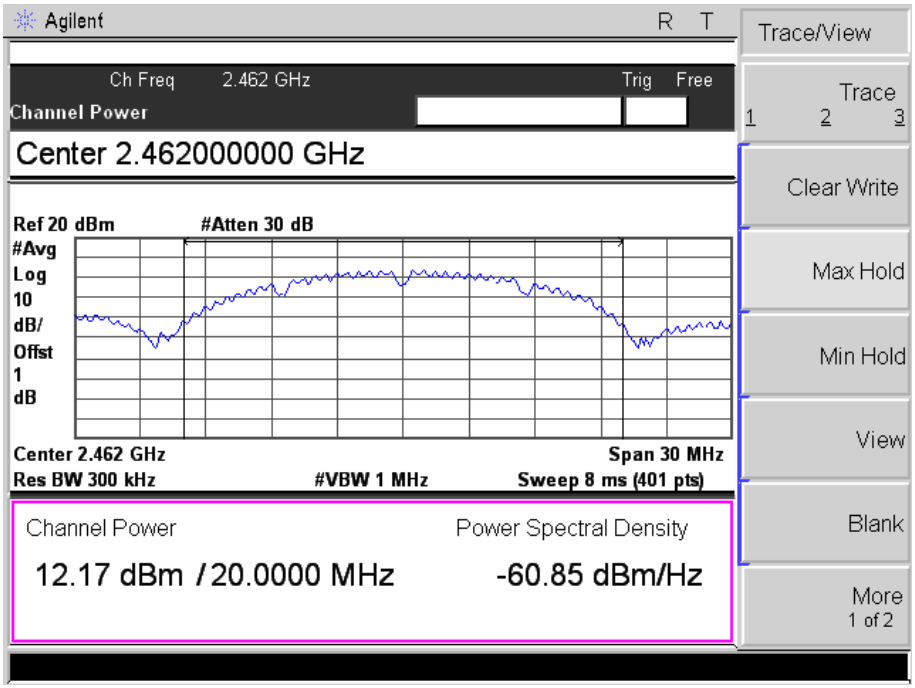
802.11b-11Mbps-Low Channel



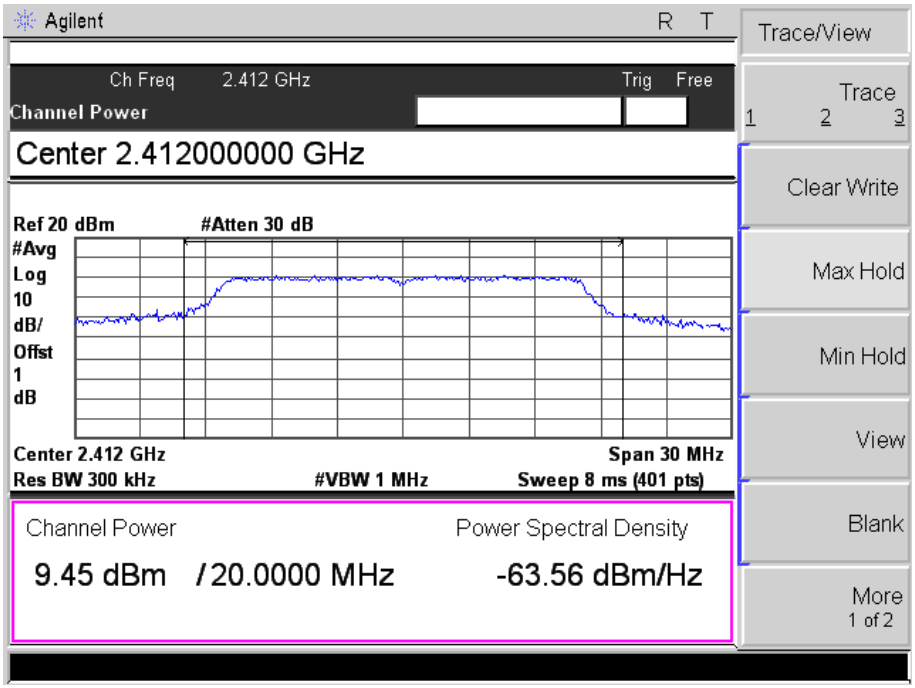

802.11b -11Mbps-Middle Channel



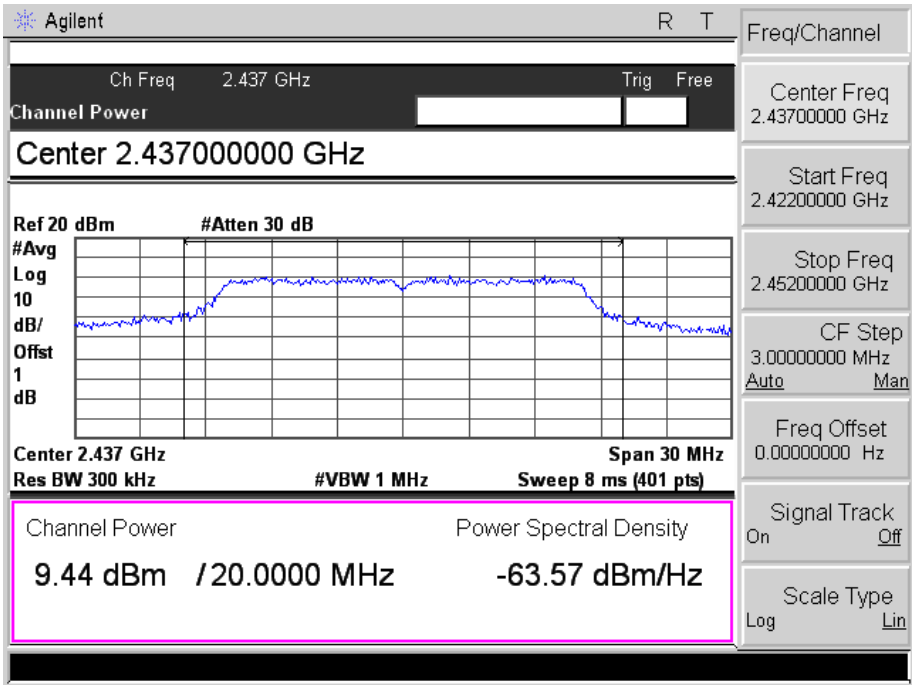
802.11b -11Mpbs-High Channel



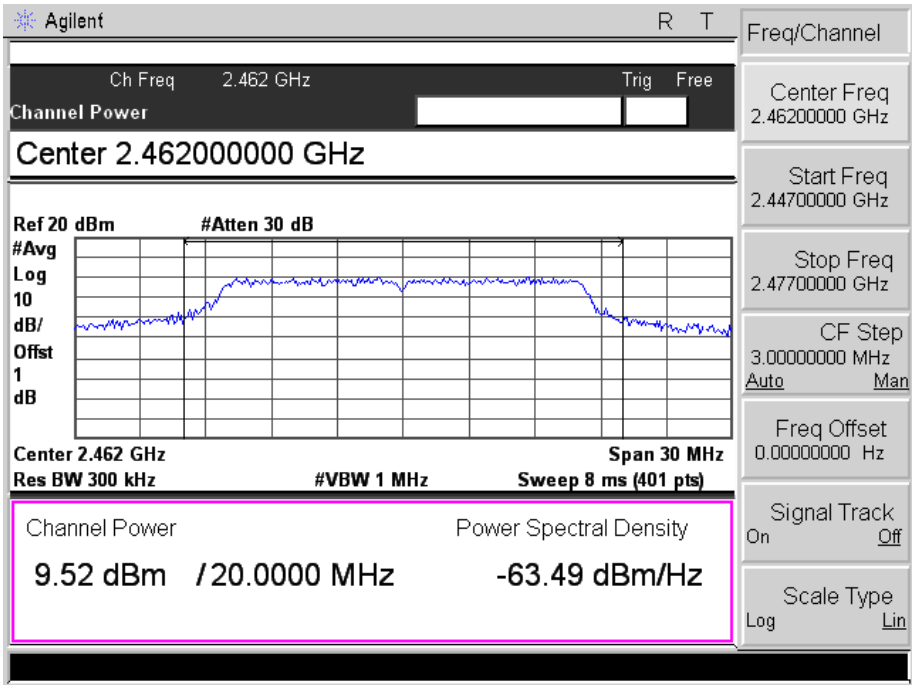

802.11g-54Mbps-Low Channel



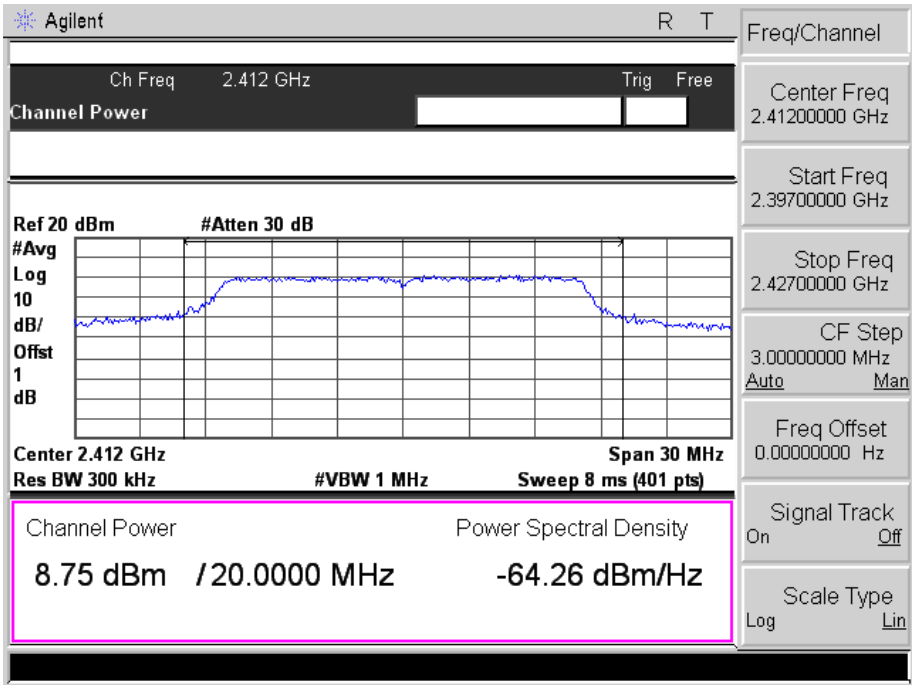
802.11g-54Mbps-Middle Channel



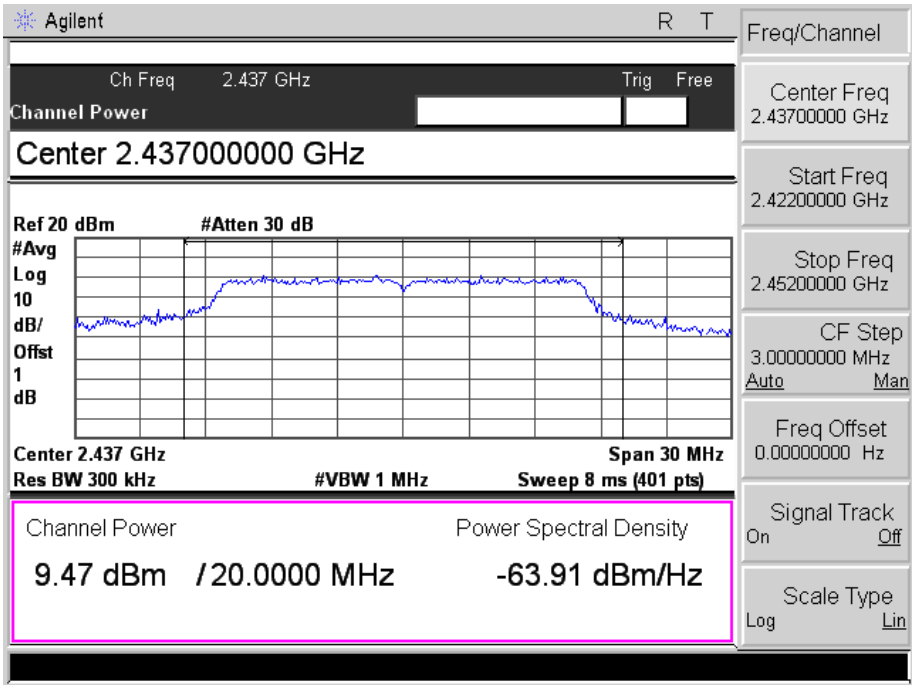

802.11g-54Mpbs-High Channel



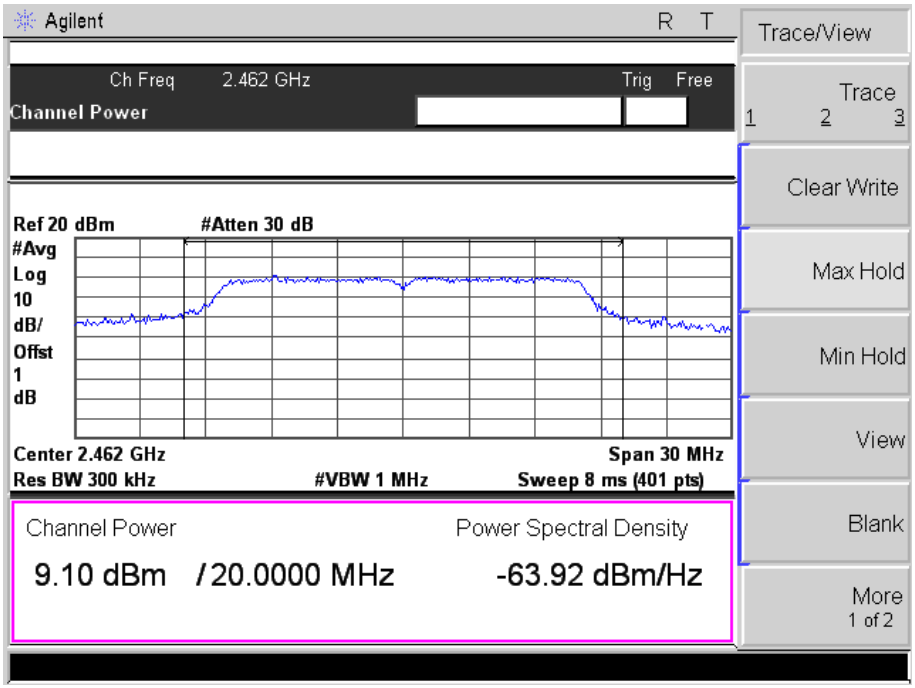
802.11n-HT20-MCS7-Low Channel



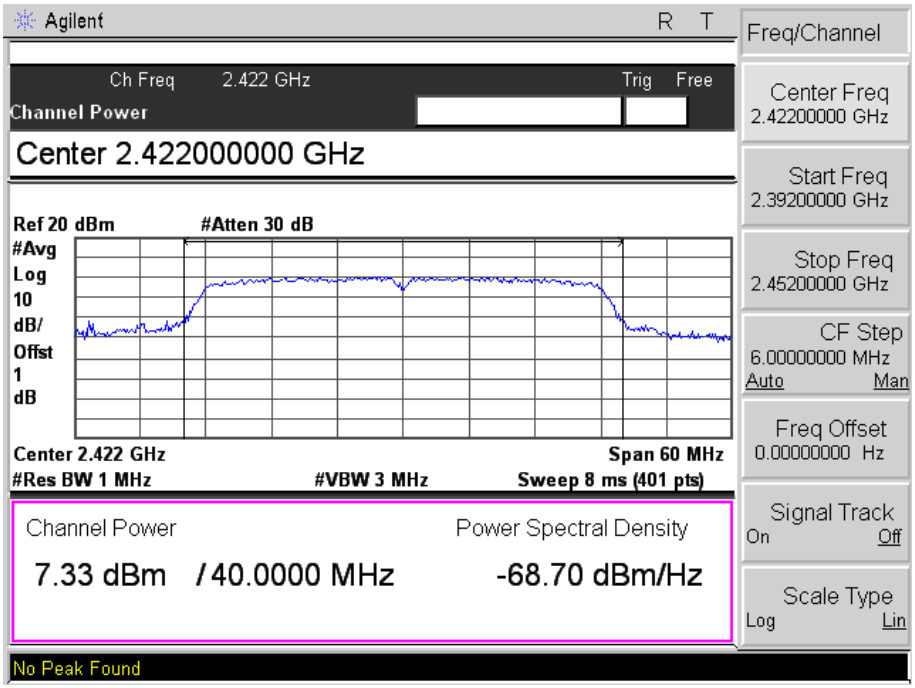

802.11n-HT20-MCS7-Middle Channel



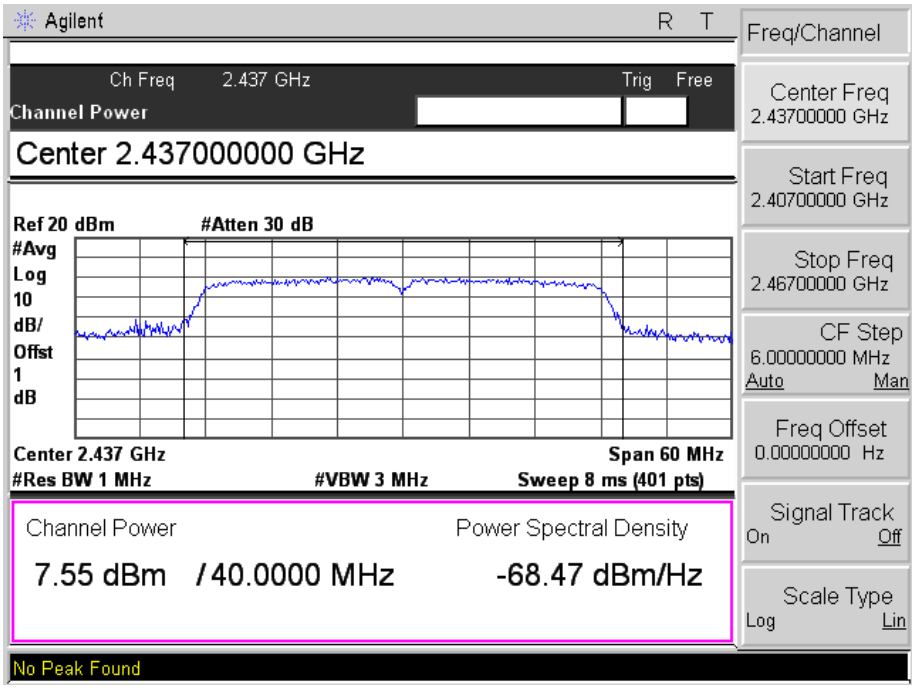
802.11n-HT20-MCS7-High Channel



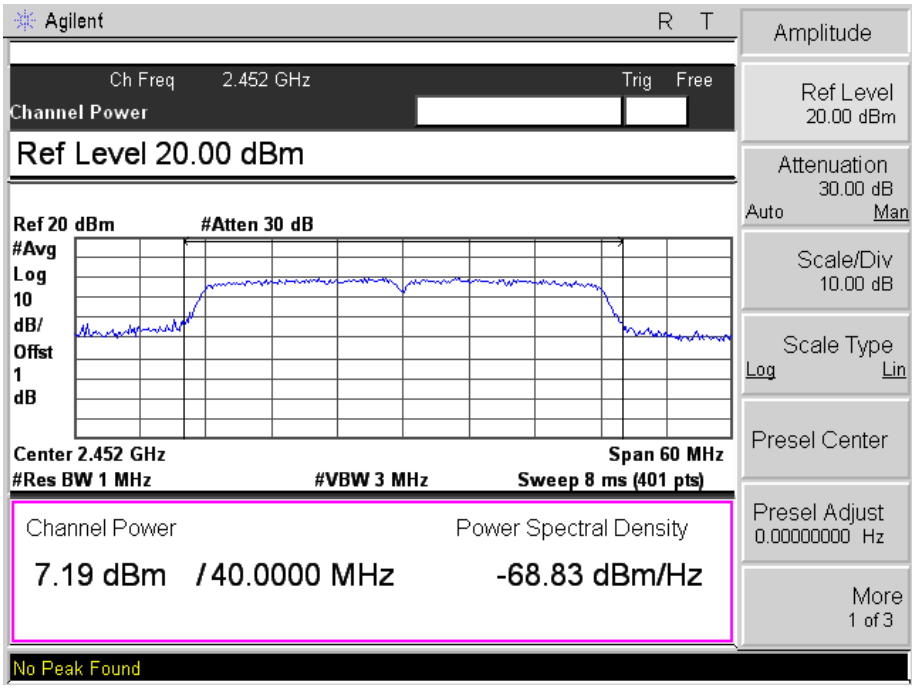

802.11n-HT40-MCS7-Low Channel



802.11n-HT40-MCS7-Middle Channel




802.11n-HT40-MCS7-High Channel



# 8. Field Strength of Spurious Emissions

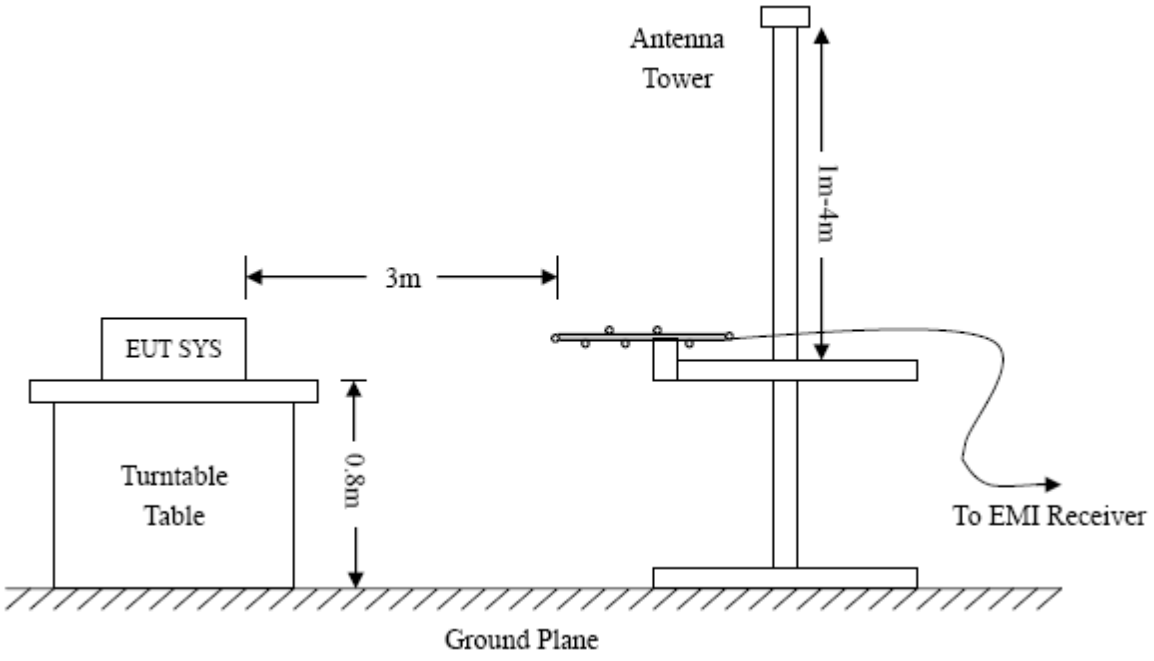
## 8.1 Standard Applicable

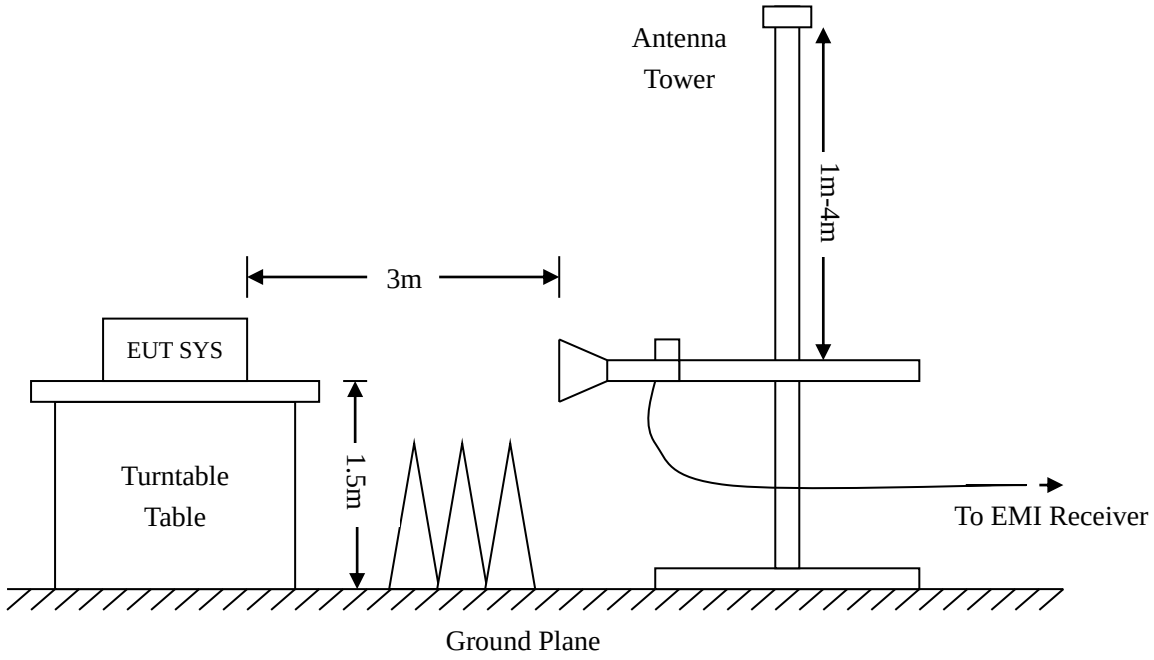
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within 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 | Frequency :30MHz-1GHz | Frequency :Above 1GHz |
| RBW=10KHz, | RBW=120KHz, | RBW=1MHz, |
| VBW =30KHz | VBW=360KHz | VBW=3MHz(Peak), 10Hz(AV) |
| Sweep time= Auto | Sweep time= Auto | Sweep time= Auto |
| Trace = max hold | Trace = max hold | Trace = max hold |
| Detector function = peak | Detector function = peak, QP | 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:

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss – Ampl. Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – FCC Part 15 Limit

## 8.4 Environmental Conditions

| | |
|---|---|
| Temperature: | 25 °C |
| Relative Humidity: | 52% |
| ATM Pressure: | 1012 mbar |

## 8.5 Summary of Test Results/Plots

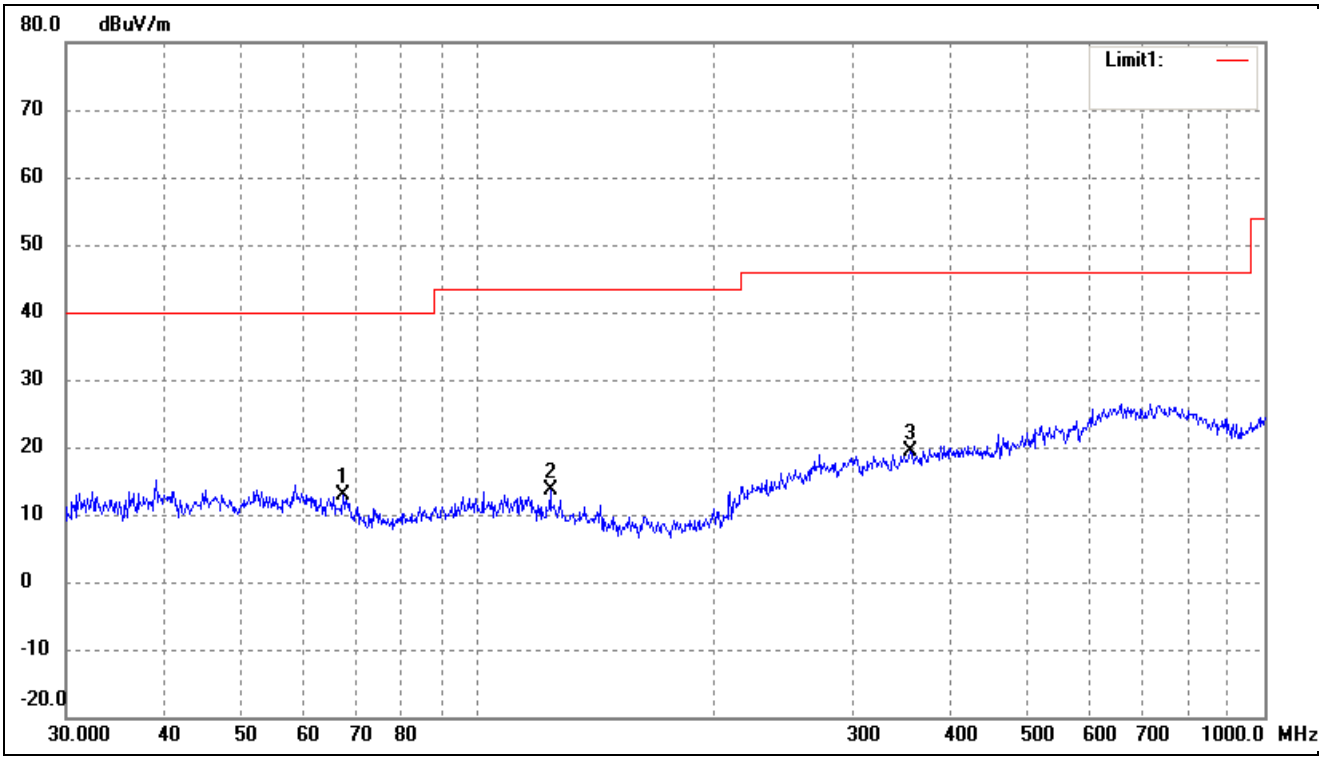
According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst cases:

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

**Plot of Radiated Emissions Test Data (30MHz to 1GHz)**

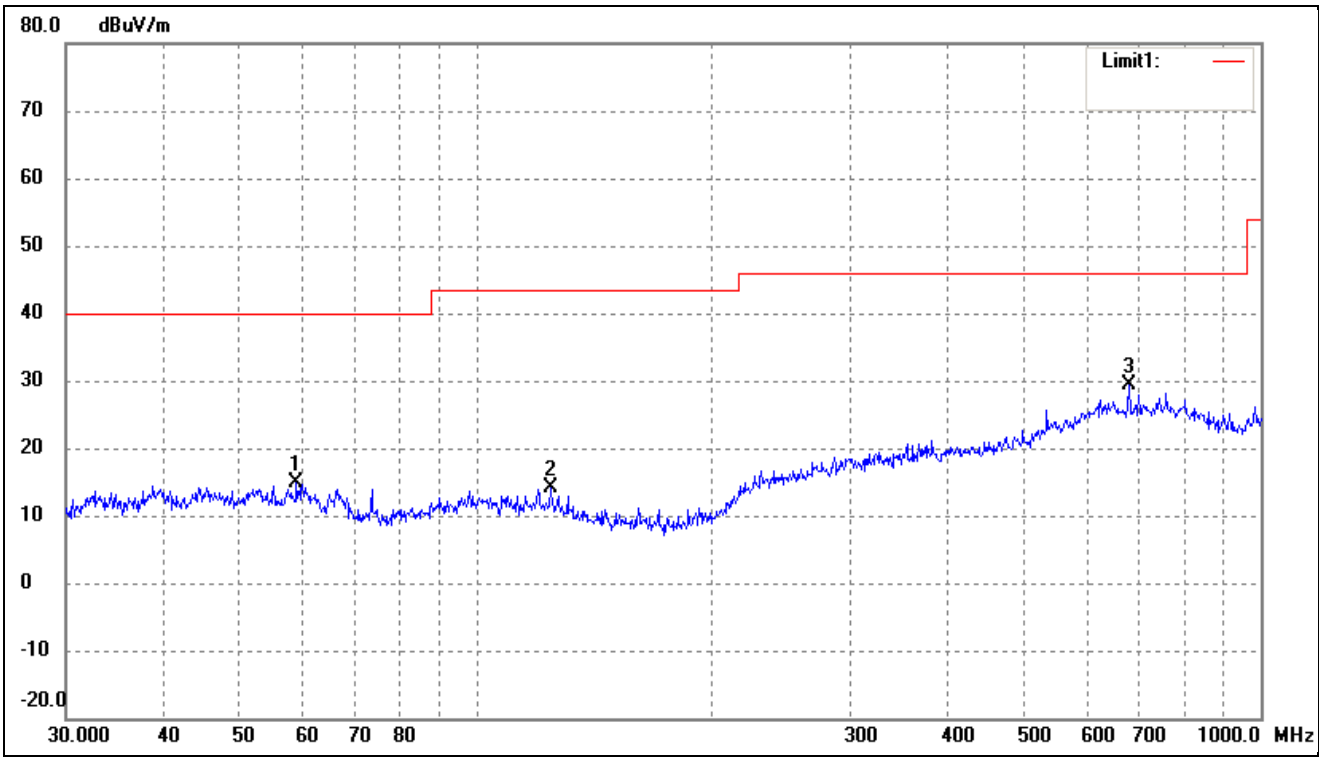
*EUT:* *DOORBELL*
*Tested Model:* *WDB-20-JUN*
*Operating Condition:* *802.11b Transmitting Low Channel-2412MHz(worst case)*
*Comment:* *DC 3.7V*

*Test Specification:* *Horizontal*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ° ) | (cm) | |
| 1 | 67.4382 | 30.93 | -18.14 | 12.79 | 40.00 | -27.21 | 325 | 100 | peak |
| 2 | 123.6985 | 30.50 | -16.97 | 13.53 | 43.50 | -29.97 | 91 | 100 | peak |
| 3 | 354.1831 | 28.55 | -9.12 | 19.43 | 46.00 | -26.57 | 250 | 100 | peak |

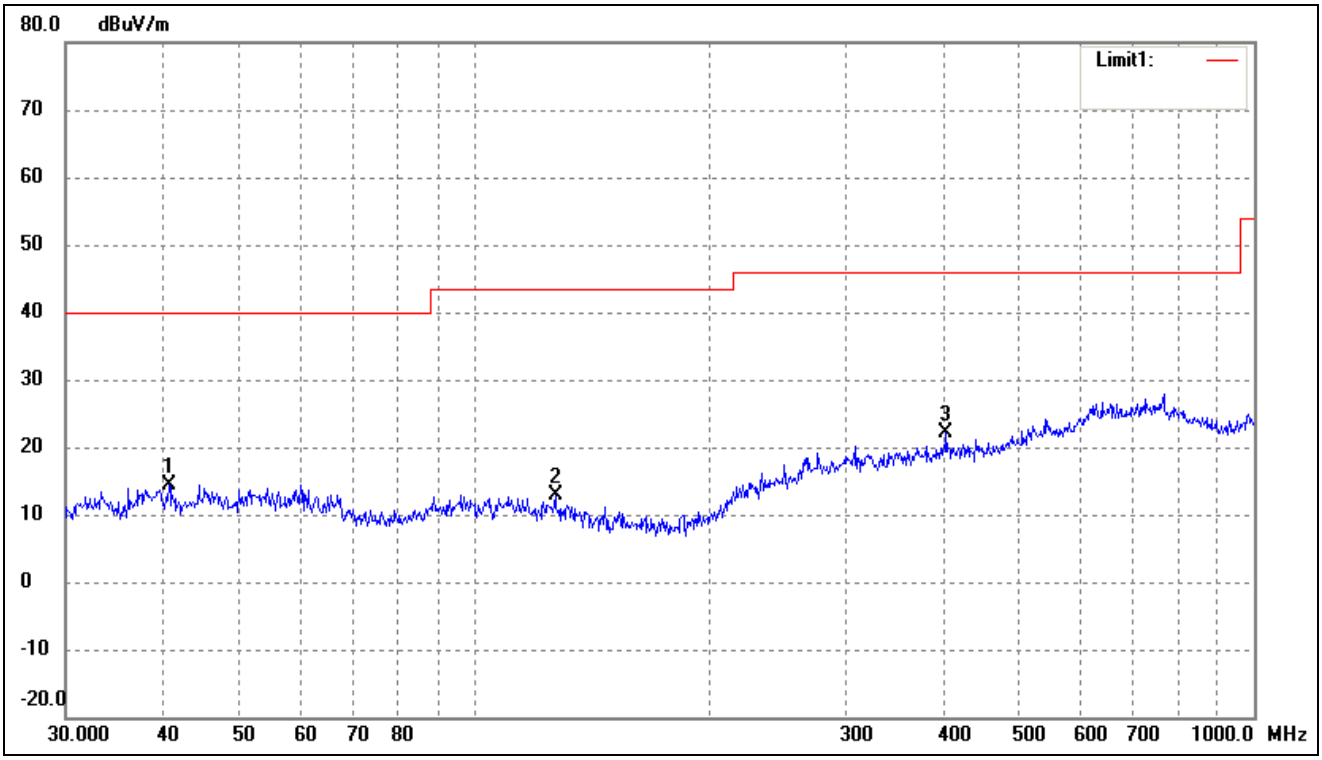
*Test Specification:* *Vertical*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ° ) | (cm) | |
| 1 | 59.0251 | 31.31 | -16.53 | 14.78 | 40.00 | -25.22 | 349 | 100 | peak |
| 2 | 124.5690 | 31.10 | -17.05 | 14.05 | 43.50 | -29.45 | 98 | 100 | peak |
| 3 | 679.9600 | 29.87 | -0.37 | 29.50 | 46.00 | -16.50 | 213 | 100 | peak |

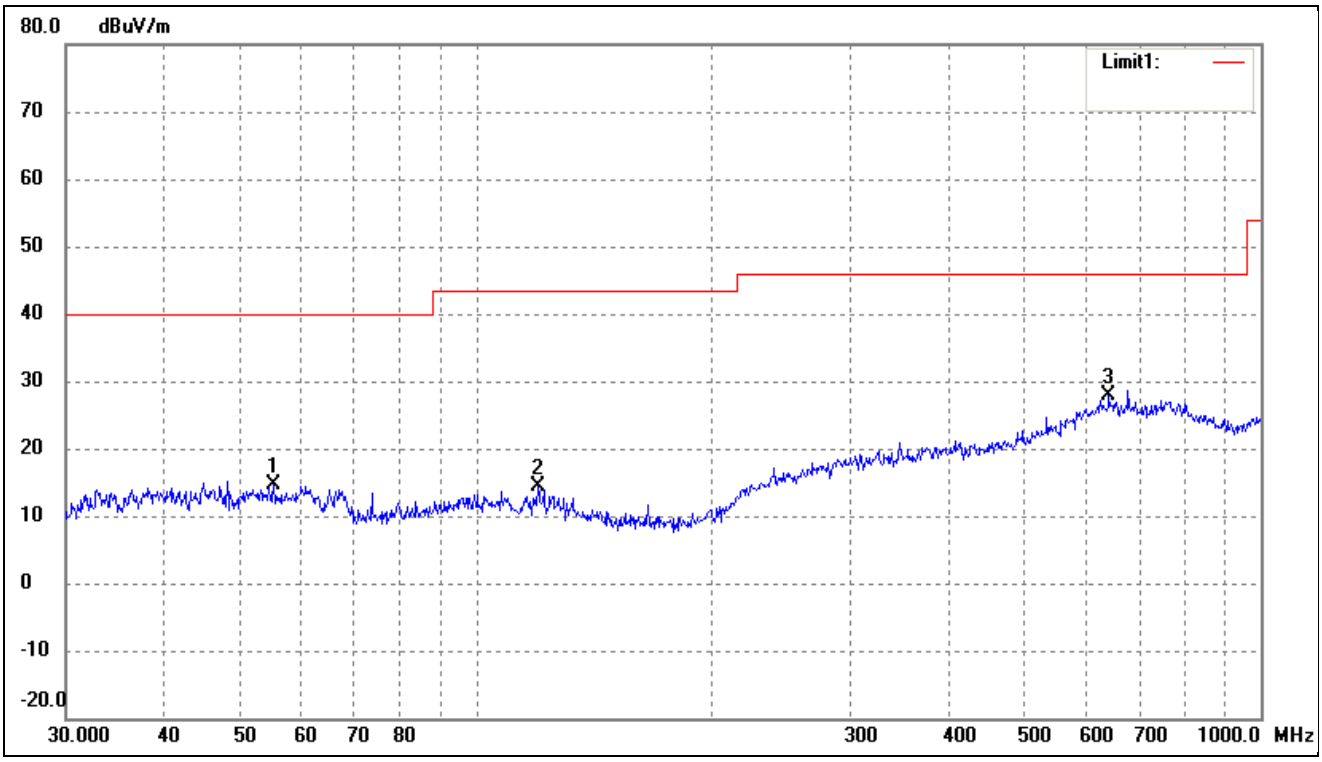
*Operating Condition:* *802.11b Transmitting Middle Channel-2437MHz(worst case)*
*Comment:* *DC 3.7V*

*Test Specification:* *Horizontal*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ° ) | (cm) | |
| 1 | 40.7016 | 30.91 | -16.52 | 14.39 | 40.00 | -25.61 | 114 | 100 | peak |
| 2 | 127.2176 | 30.26 | -17.26 | 13.00 | 43.50 | -30.50 | 182 | 100 | peak |
| 3 | 403.2500 | 29.98 | -7.88 | 22.10 | 46.00 | -23.90 | 206 | 100 | peak |

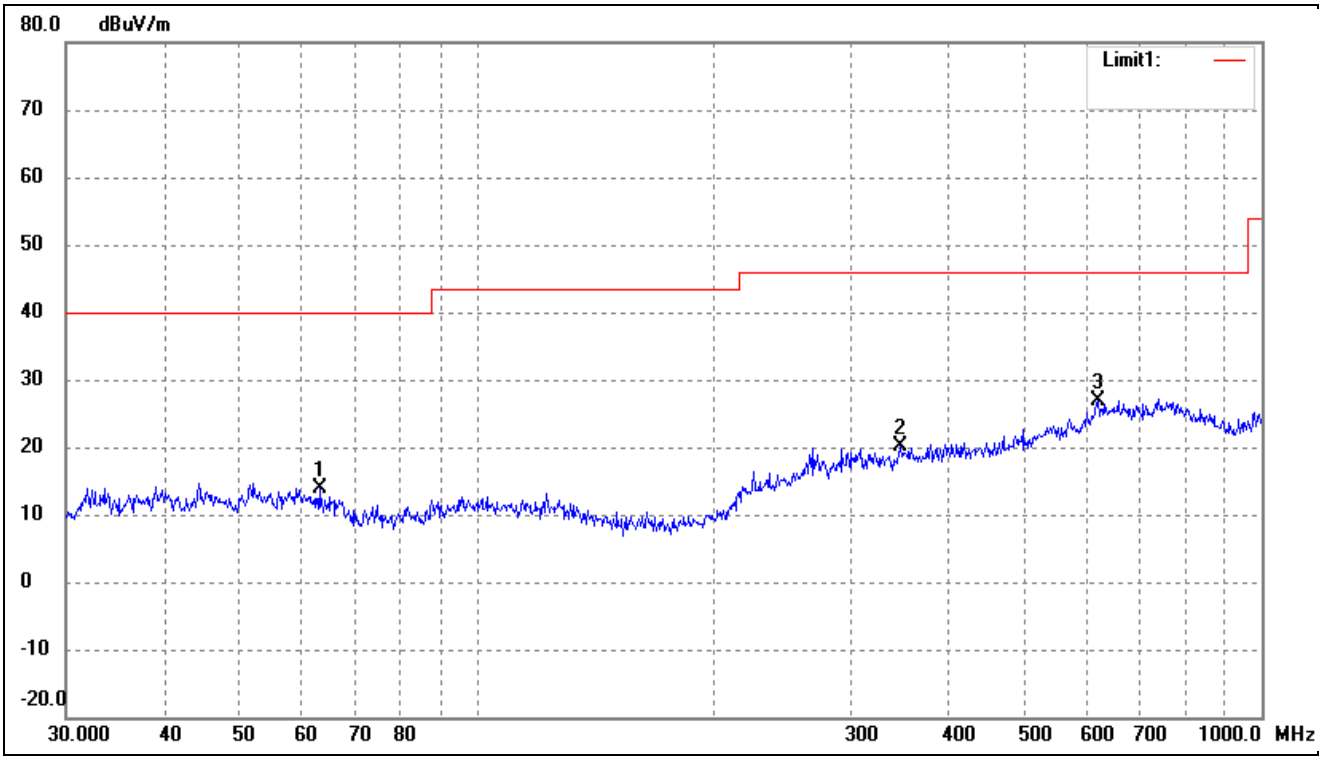
*Test Specification:* *Vertical*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ° ) | (cm) | |
| 1 | 55.2207 | 31.02 | -16.51 | 14.51 | 40.00 | -25.49 | 227 | 100 | peak |
| 2 | 119.8556 | 30.96 | -16.67 | 14.29 | 43.50 | -29.21 | 180 | 100 | peak |
| 3 | 640.6110 | 29.01 | -1.03 | 27.98 | 46.00 | -18.02 | 60 | 100 | peak |

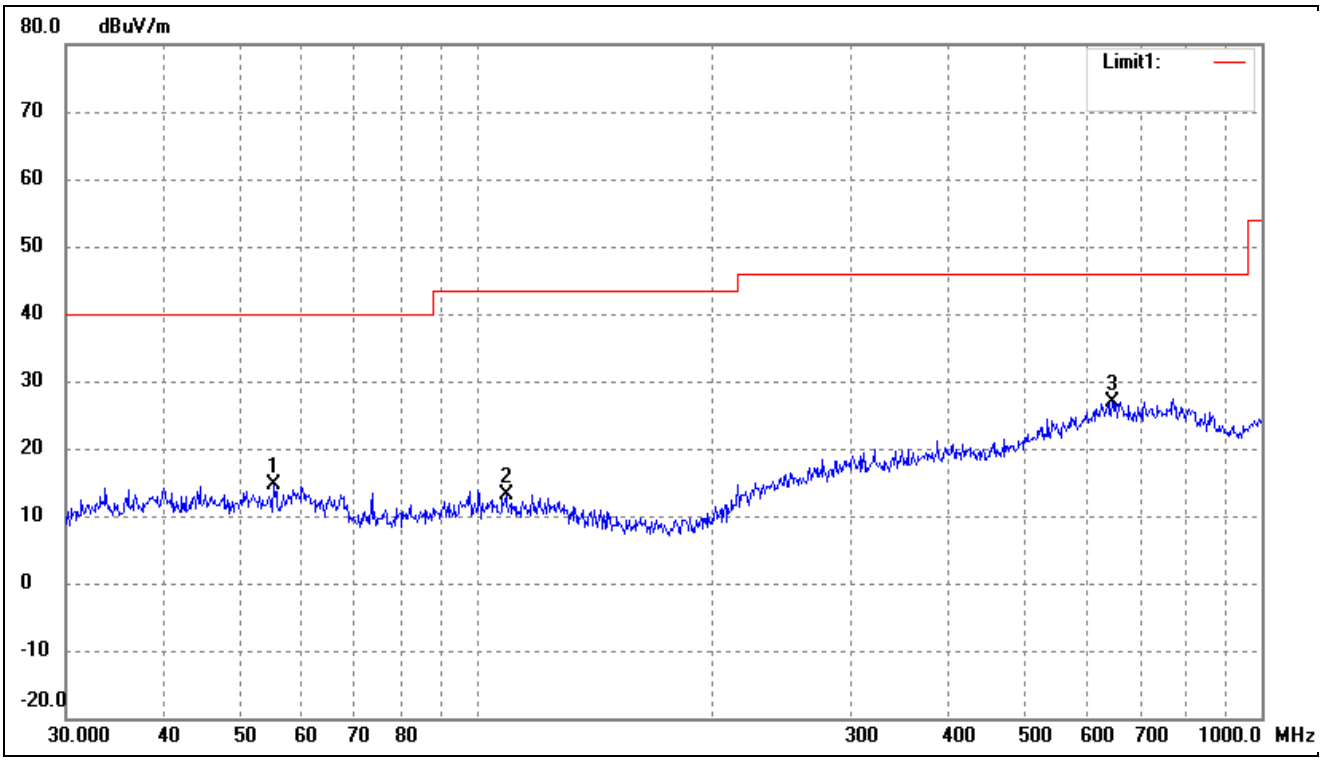
*Operating Condition:* *802.11b Transmitting High Channel-2462MHz(worst case)*
*Comment:* *DC 3.7V*

*Test Specification:* *Horizontal*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ° ) | (cm) | |
| 1 | 63.0916 | 31.02 | -17.16 | 13.86 | 40.00 | -26.14 | 136 | 100 | peak |
| 2 | 346.8092 | 29.45 | -9.40 | 20.05 | 46.00 | -25.95 | 157 | 100 | peak |
| 3 | 618.5369 | 28.50 | -1.58 | 26.92 | 46.00 | -19.08 | 104 | 100 | peak |

*Test Specification:* *Vertical*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ° ) | (cm) | |
| 1 | 55.2207 | 31.22 | -16.51 | 14.71 | 40.00 | -25.29 | 211 | 100 | peak |
| 2 | 109.0286 | 29.70 | -16.62 | 13.08 | 43.50 | -30.42 | 194 | 100 | peak |
| 3 | 645.1195 | 27.96 | -1.15 | 26.81 | 46.00 | -19.19 | 104 | 100 | peak |

*Spurious Emissions Above 1GHz*

*Test Mode: 802.11b (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 | 61.64 | -3.86 | 57.78 | 74 | -16.22 | H | PK |
| 4824.000 | 40.34 | -3.86 | 36.48 | 54 | -17.52 | H | AV |
| 7236.000 | 59.94 | 1.1 | 61.04 | 74 | -12.96 | H | PK |
| 7236.000 | 38.12 | 1.1 | 39.22 | 54 | -14.78 | H | AV |
| 4824.000 | 60.23 | -3.86 | 56.37 | 74 | -17.63 | V | PK |
| 4824.000 | 39.66 | -3.86 | 35.8 | 54 | -18.2 | V | AV |
| 7236.000 | 58.93 | 1.1 | 60.03 | 74 | -13.97 | V | PK |
| 7236.000 | 38.66 | 1.1 | 39.76 | 54 | -14.24 | V | AV |
| Middle Channel-2437MHz | | | | | | | |
| 4874.000 | 59 | -3.74 | 55.26 | 74 | -18.74 | H | PK |
| 4874.000 | 40.88 | -3.74 | 37.14 | 54 | -16.86 | H | AV |
| 7311.000 | 61.87 | 1.47 | 63.34 | 74 | -10.66 | H | PK |
| 7311.000 | 39.46 | 1.47 | 40.93 | 54 | -13.07 | H | AV |
| 4874.000 | 59.85 | -3.74 | 56.11 | 74 | -17.89 | V | PK |
| 4874.000 | 39.43 | -3.74 | 35.69 | 54 | -18.31 | V | AV |
| 7311.000 | 60 | 1.47 | 61.47 | 74 | -12.53 | V | PK |
| 7311.000 | 38.4 | 1.47 | 39.87 | 54 | -14.13 | V | AV |
| High Channel-2462MHz | | | | | | | |
| 4924.000 | 60.22 | -3.63 | 56.59 | 74 | -17.41 | H | PK |
| 4924.000 | 40.79 | -3.63 | 37.16 | 54 | -16.84 | H | AV |
| 7386.000 | 61.95 | 1.62 | 63.57 | 74 | -10.43 | H | PK |
| 7386.000 | 39.04 | 1.62 | 40.66 | 54 | -13.34 | H | AV |
| 4924.000 | 59 | -3.63 | 55.37 | 74 | -18.63 | V | PK |
| 4924.000 | 41.3 | -3.63 | 37.67 | 54 | -16.33 | V | AV |
| 7386.000 | 61.15 | 1.62 | 62.77 | 74 | -11.23 | V | PK |
| 7386.000 | 38.78 | 1.62 | 40.4 | 54 | -13.6 | 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.*

# 9. Out of Band Emissions

## 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 558074D01 v04, the band-edge radiated test method as follows:

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.

According to the KDB 558074 D01 v04, the conducted spurious emissions test method as follows:
1. Set start frequency to DTS channel edge frequency.
2. Set stop frequency so as to encompass the spectrum to be examined.
3. Set RBW = 100 kHz.
4. Set VBW ≥ 300 kHz.
5. Detector = peak.
6. Trace Mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize (this may take some time, depending on the extent of the span).
9. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

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.

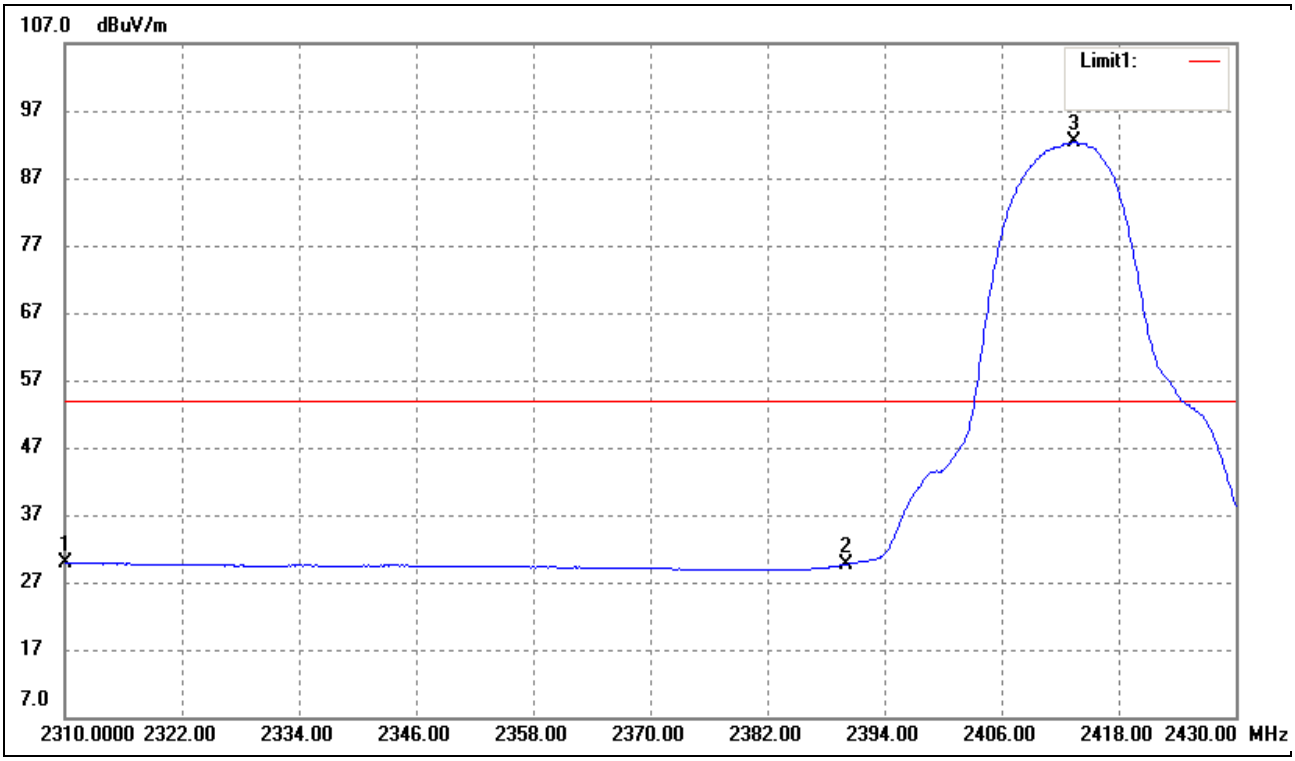
## 9.3 Environmental Conditions

| | |
|---|---|
| Temperature: | 23°C |
| Relative Humidity: | 54% |
| ATM Pressure: | 1011 mbar |

## 9.4 Summary of Test Results/Plots

802.11b-Lowest Bandedge

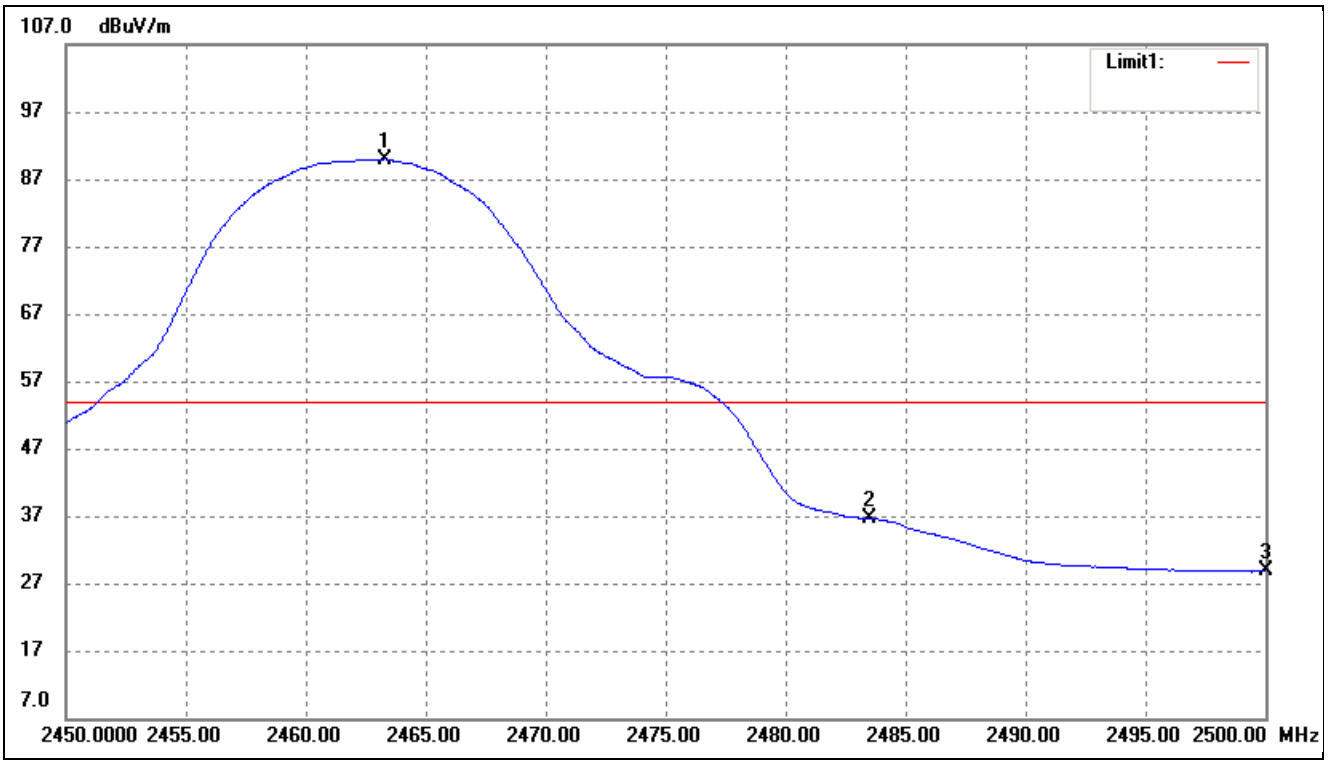
Vertical (Worst case)




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 2310.000 | 36.22 | -6.38 | 29.84 | 54.00 | -24.16 | Average Detector |
| | 2310.000 | 50.93 | -6.38 | 44.55 | 74.00 | -29.45 | Peak Detector |
| 2 | 2390.000 | 36.95 | -7.26 | 29.69 | 54.00 | -24.31 | Average Detector |
| | 2390.000 | 50.71 | -7.26 | 43.45 | 74.00 | -30.55 | Peak Detector |
| 3 | 2413.440 | 99.80 | -7.40 | 92.40 | / | / | Average Detector |
| | 2413.320 | 108.49 | -7.40 | 101.09 | / | / | Peak Detector |

802.11b-Highest Bandedge

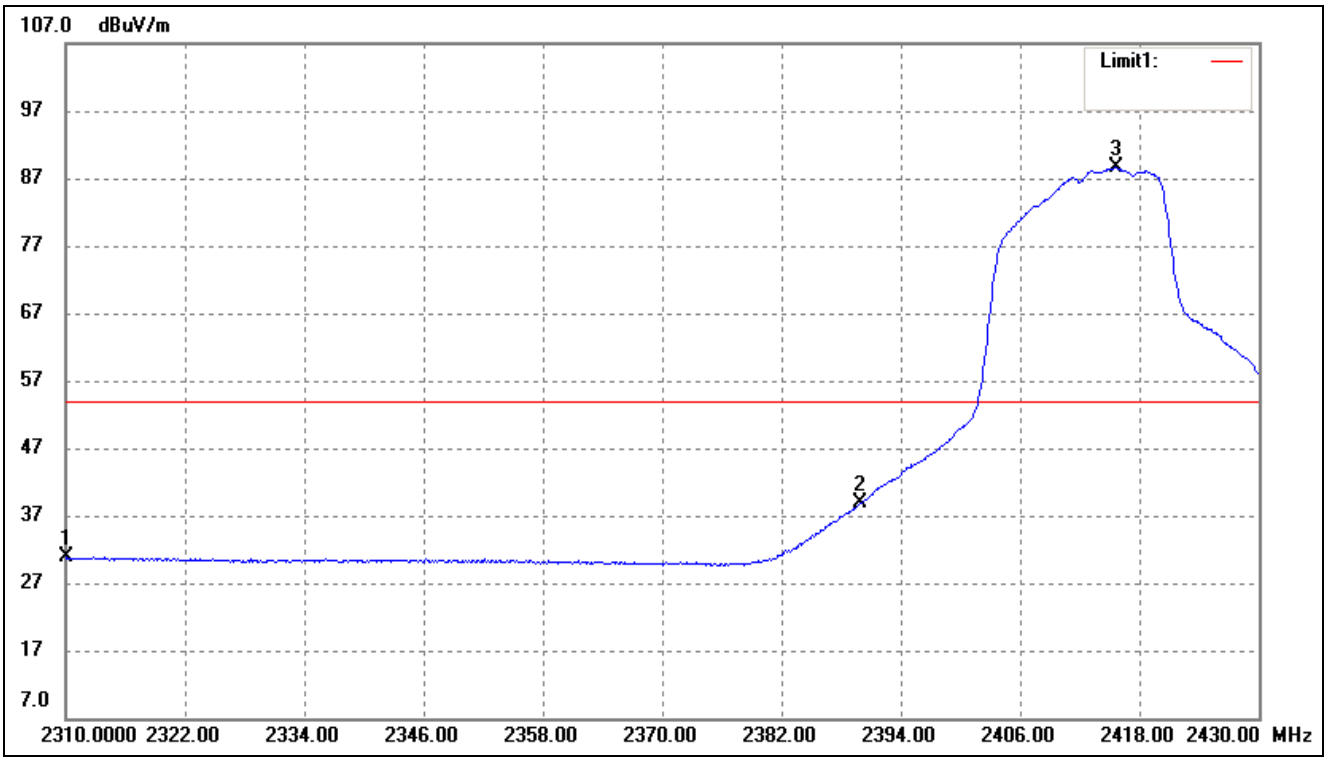
Vertical (Worst case)




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | Factor(dB) | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 2463.300 | 97.31 | -7.31 | 90.00 | / | / | Average Detector |
| | 2463.250 | 106.16 | -7.31 | 98.85 | / | / | Peak Detector |
| 2 | 2483.500 | 43.93 | -7.28 | 36.65 | 54.00 | -17.35 | Average Detector |
| | 2483.500 | 56.84 | -7.28 | 49.56 | 74.00 | -24.44 | Peak Detector |
| 3 | 2500.000 | 36.05 | -7.25 | 28.80 | 54.00 | -25.20 | Average Detector |
| | 2500.000 | 48.62 | -7.25 | 41.37 | 74.00 | -32.63 | Peak Detector |

802.11g-Lowest Bandedge

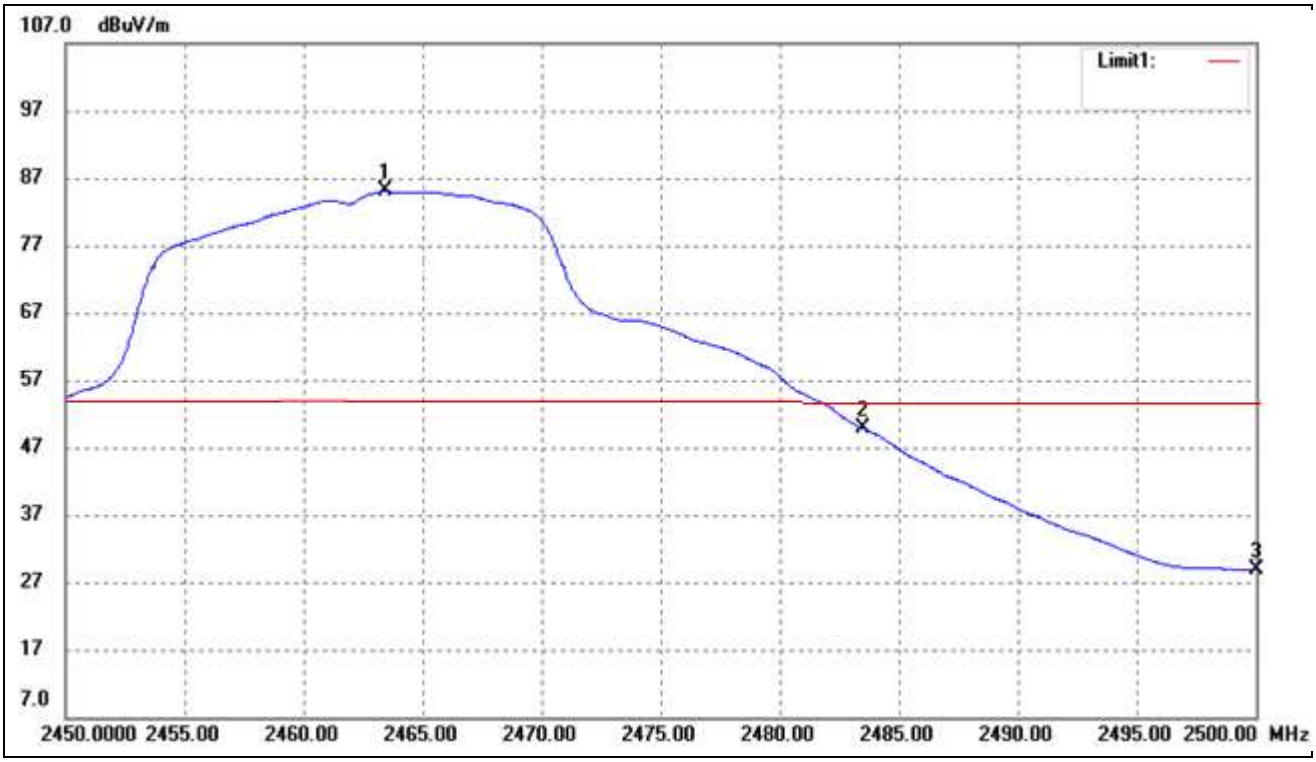
Vertical (Worst case)




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 2310.000 | 37.17 | -6.38 | 30.79 | 54.00 | -23.21 | Average Detector |
| | 2310.000 | 49.75 | -6.38 | 43.37 | 74.00 | -30.63 | Peak Detector |
| 2 | 2390.000 | 46.08 | -7.26 | 38.82 | 54.00 | -15.18 | Average Detector |
| | 2390.000 | 66.56 | -7.26 | 59.30 | 74.00 | -14.70 | Peak Detector |
| 3 | 2415.600 | 95.98 | -7.40 | 88.58 | / | / | Average Detector |
| | 2414.880 | 104.75 | -7.40 | 97.35 | / | / | Peak Detector |

802.11g-Highest Bandedge

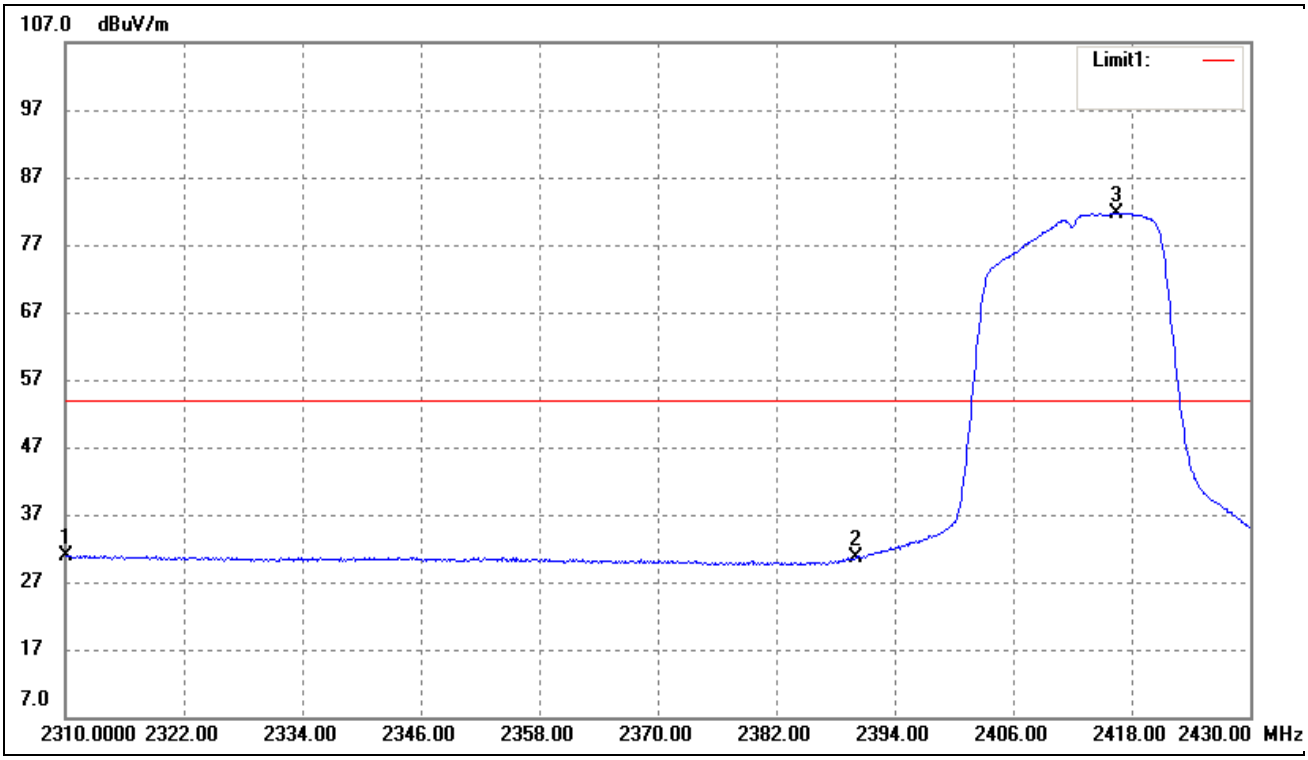
Vertical (Worst case)




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 2463.450 | 92.35 | -7.31 | 85.04 | / | / | Average Detector |
| | 2465.000 | 102.77 | -7.31 | 95.46 | / | / | Peak Detector |
| 2 | 2483.500 | 57.13 | -7.28 | 49.85 | 54.00 | -4.15 | Average Detector |
| | 2483.500 | 67.29 | -7.28 | 60.01 | 74.00 | -13.99 | Peak Detector |
| 3 | 2500.000 | 36.19 | -7.25 | 28.94 | 54.00 | -25.06 | Average Detector |
| | 2500.000 | 47.98 | -7.25 | 40.73 | 74.00 | -33.27 | Peak Detector |

802.11n-HT20-Lowest Bandedge

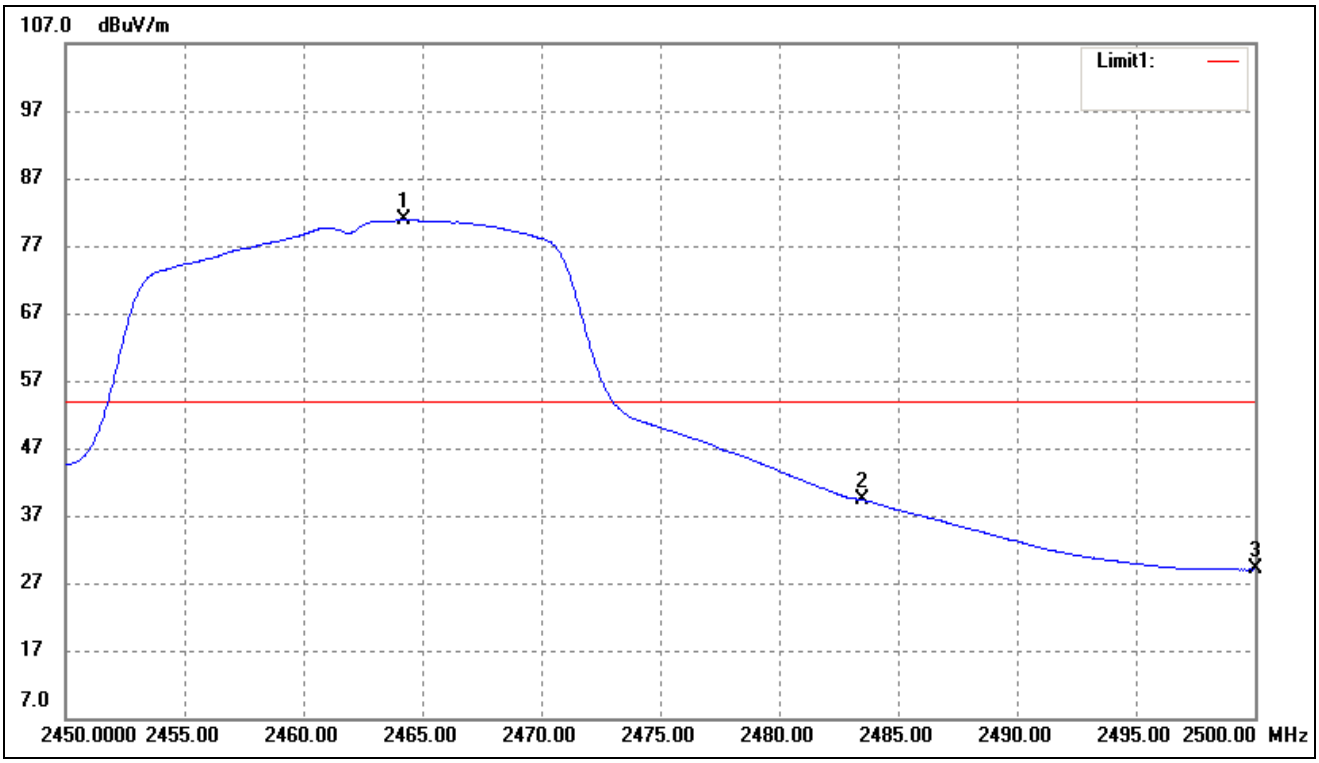
Vertical (Worst case)




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 2310.000 | 37.22 | -6.38 | 30.84 | 54.00 | -23.16 | Average Detector |
| | 2310.000 | 50.38 | -6.38 | 44.00 | 74.00 | -30.00 | Peak Detector |
| 2 | 2390.000 | 37.78 | -7.26 | 30.52 | 54.00 | -23.48 | Average Detector |
| | 2390.000 | 52.19 | -7.26 | 44.93 | 74.00 | -29.07 | Peak Detector |
| 3 | 2416.440 | 89.05 | -7.39 | 81.66 | / | / | Average Detector |
| | 2416.320 | 100.54 | -7.39 | 93.15 | / | / | Peak Detector |

802.11n-HT20-Highest Bandedge

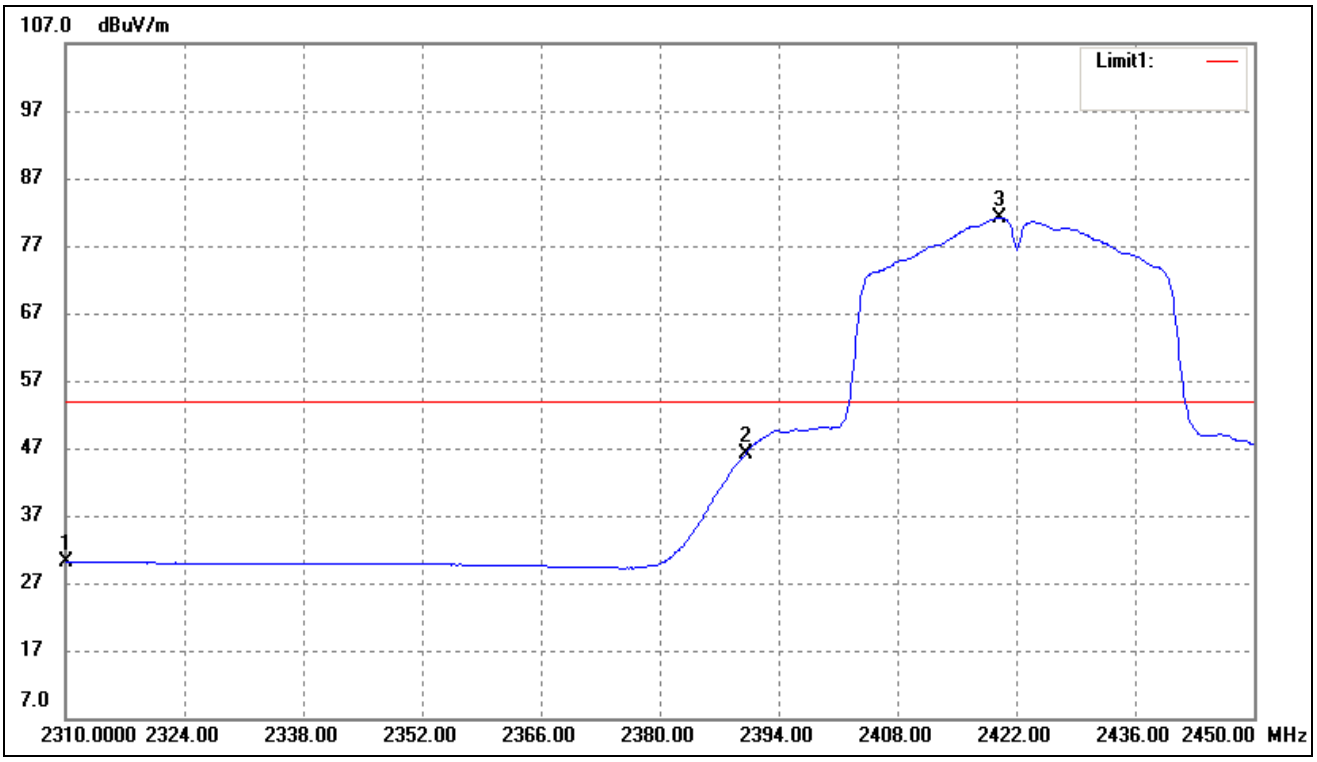
Vertical (Worst case)




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 2464.200 | 88.09 | -7.31 | 80.78 | / | / | Average Detector |
| | 2466.200 | 99.31 | -7.30 | 92.01 | / | / | Peak Detector |
| 2 | 2483.500 | 46.58 | -7.28 | 39.30 | 54.00 | -14.70 | Average Detector |
| | 2483.500 | 67.40 | -7.28 | 60.12 | 74.00 | -13.88 | Peak Detector |
| 3 | 2500.000 | 36.26 | -7.25 | 29.01 | 54.00 | -24.99 | Average Detector |
| | 2500.000 | 48.44 | -7.25 | 41.19 | 74.00 | -32.81 | Peak Detector |

802.11n-HT40-Lowest Bandedge

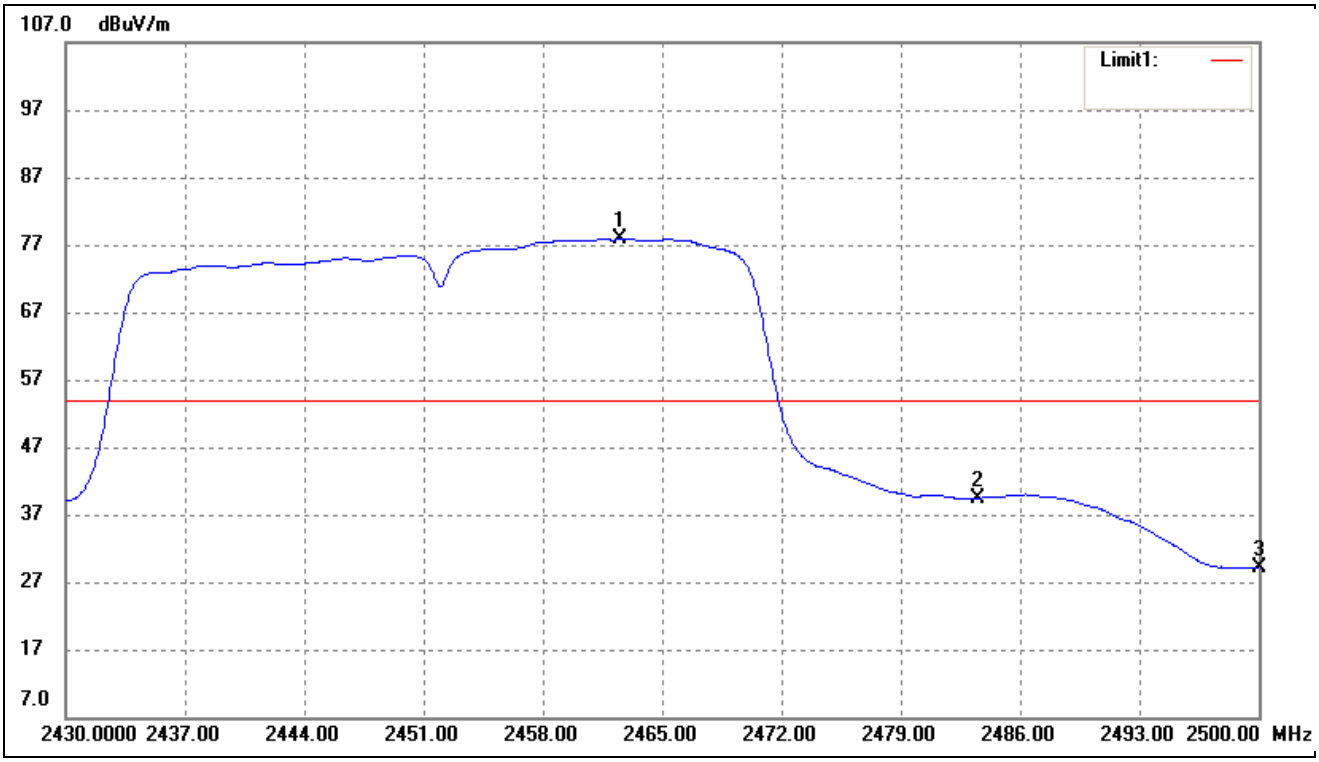
Vertical (Worst case)




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 2310.000 | 36.63 | -6.38 | 30.25 | 54.00 | -23.75 | Average Detector |
| | 2310.000 | 49.69 | -6.38 | 43.31 | 74.00 | -30.69 | Peak Detector |
| 2 | 2390.000 | 53.45 | -7.26 | 46.19 | 54.00 | -7.81 | Average Detector |
| | 2390.000 | 70.72 | -7.26 | 63.46 | 74.00 | -10.54 | Peak Detector |
| 3 | 2420.040 | 88.55 | -7.39 | 81.16 | / | / | Average Detector |
| | 2419.900 | 100.01 | -7.39 | 92.62 | / | / | Peak Detector |

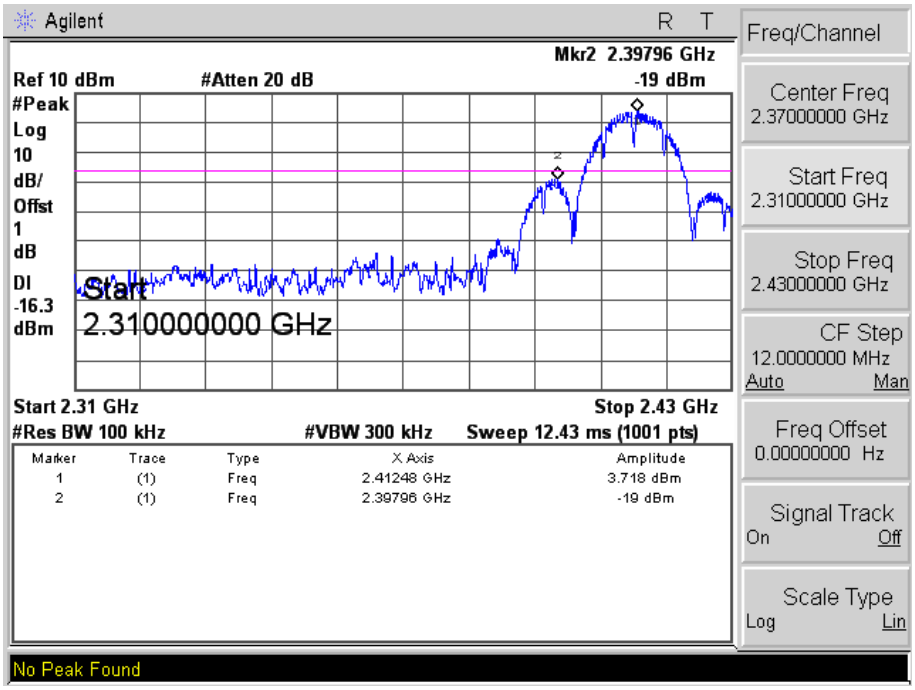
802.11n-HT40-Highest Bandedge

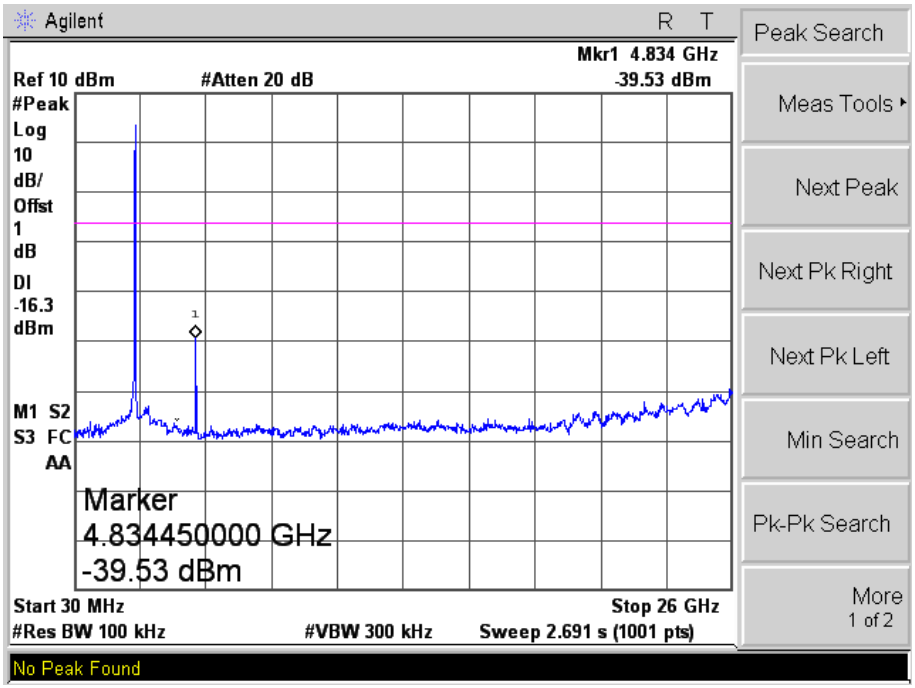
Vertical (Worst case)



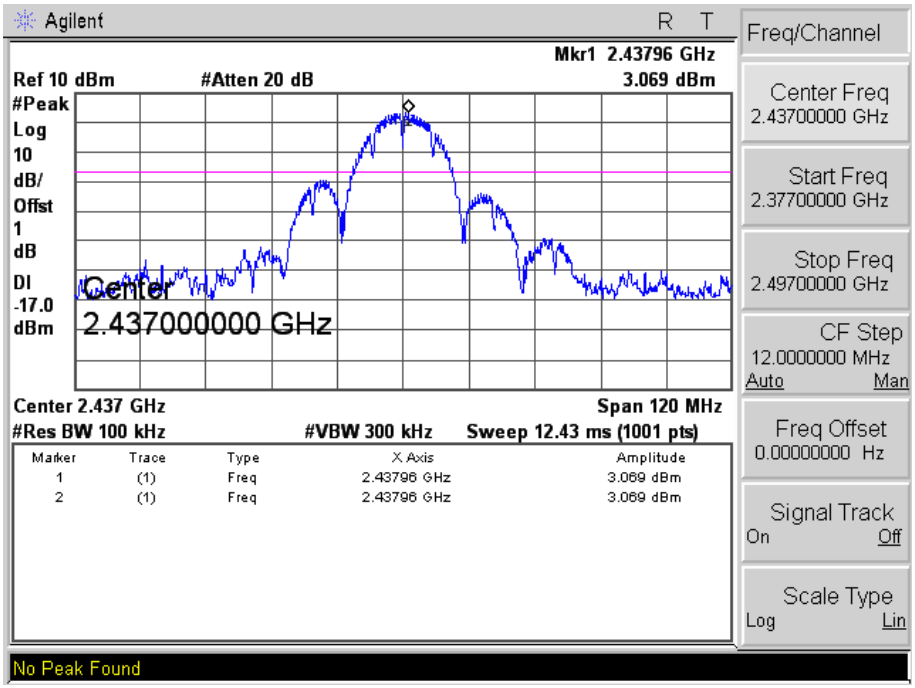

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 2462.550 | 85.19 | -7.31 | 77.88 | / | / | Average Detector |
| | 2459.260 | 96.83 | -7.33 | 89.50 | / | / | Peak Detector |
| 2 | 2483.500 | 46.77 | -7.28 | 39.49 | 54.00 | -14.51 | Average Detector |
| | 2483.500 | 66.89 | -7.28 | 59.61 | 74.00 | -14.39 | Peak Detector |
| 3 | 2500.000 | 36.35 | -7.25 | 29.10 | 54.00 | -24.90 | Average Detector |
| | 2500.000 | 48.95 | -7.25 | 41.70 | 74.00 | -32.30 | Peak Detector |

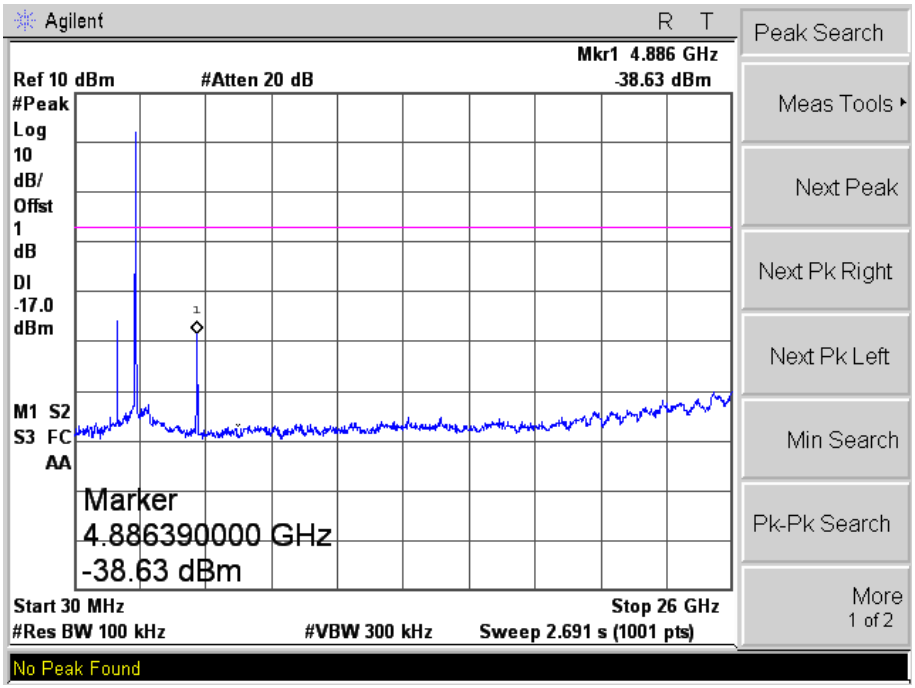
Spurious (Conducted)
802.11b-Lowest
Lowest



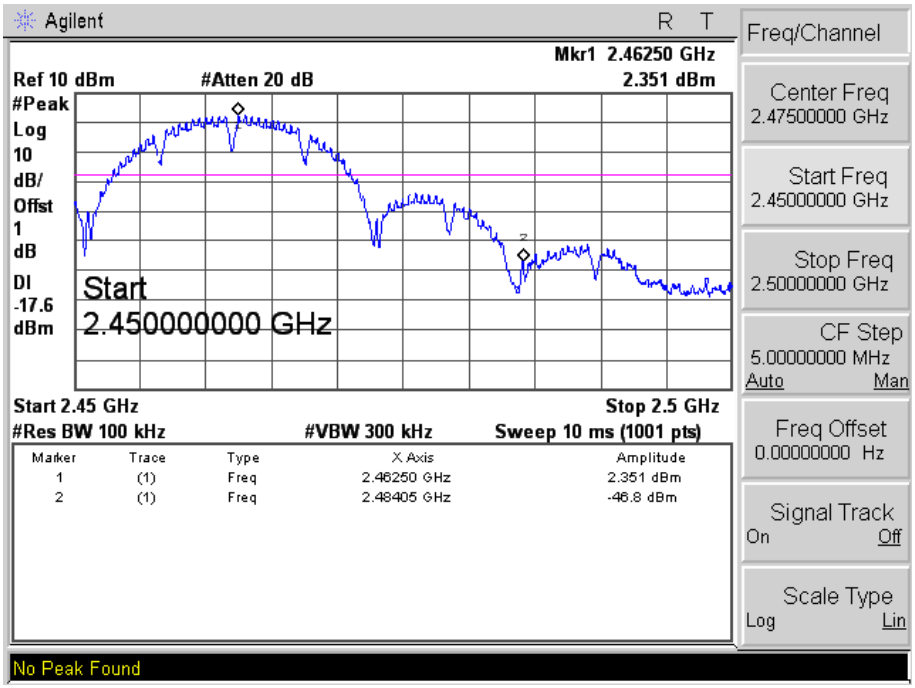



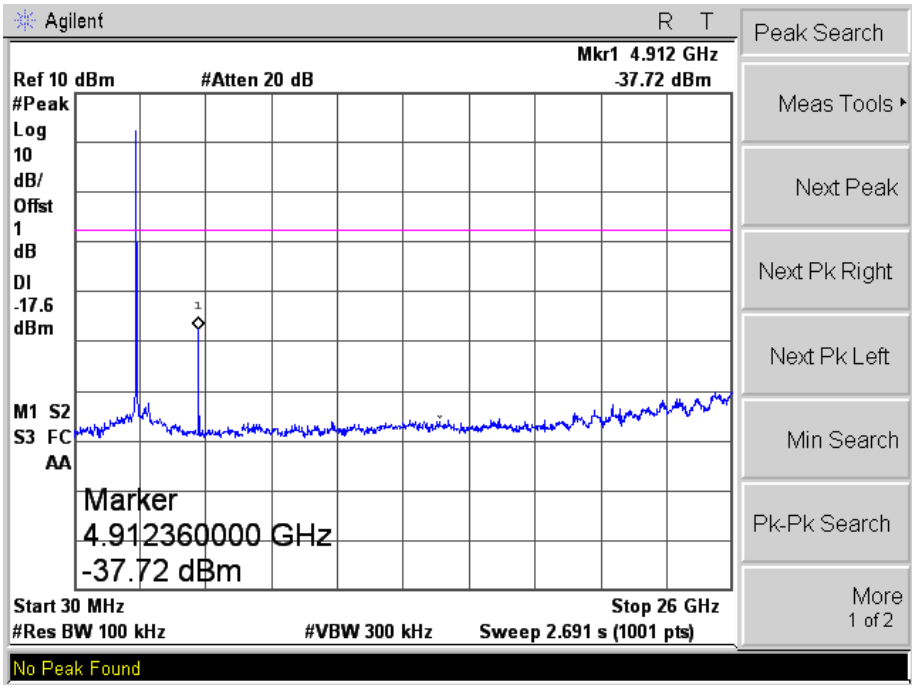
Middle


Agilent
R T
Mkr1 2.43796 GHz
Ref 10 dBm
#Atten 20 dB
3.069 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.0
dBm
Center
2.437000000 GHz
Center 2.437 GHz
Span 120 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 12.43 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.43796 GHz 3.069 dBm
2 (1) Freq 2.43796 GHz 3.069 dBm
No Peak Found
Freq/Channel
Center Freq
2.43700000 GHz
Start Freq
2.37700000 GHz
Stop Freq
2.49700000 GHz
CF Step
12.0000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

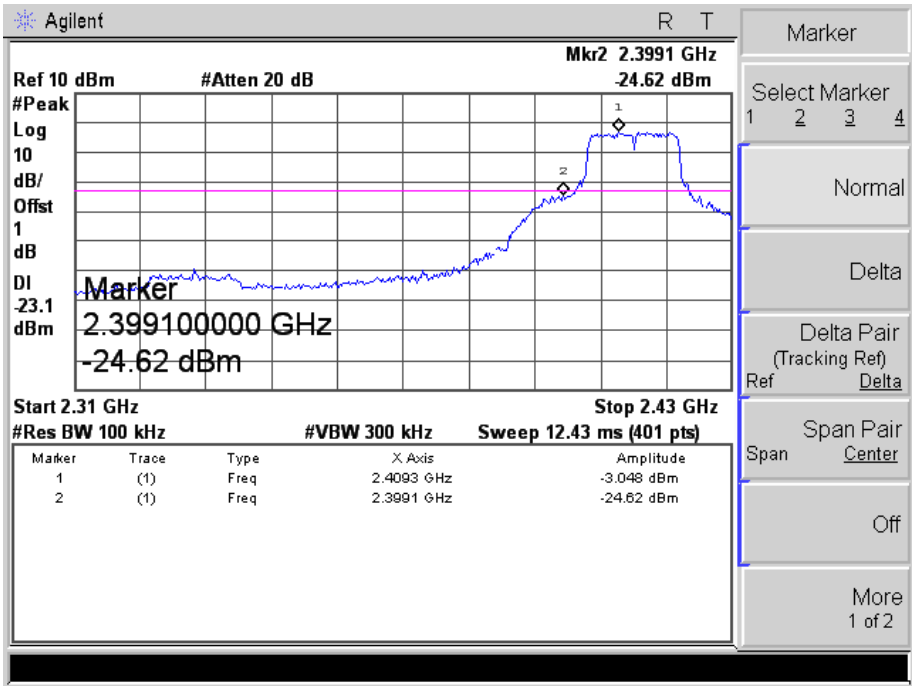

Agilent
R T
Mkr1 4.886 GHz
Ref 10 dBm
#Atten 20 dB
-38.63 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.0
dBm
M1 S2
S3 FC
AA
Marker
4.886390000 GHz
-38.63 dBm
Start 30 MHz
Stop 26 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.691 s (1001 pts)
No Peak Found
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

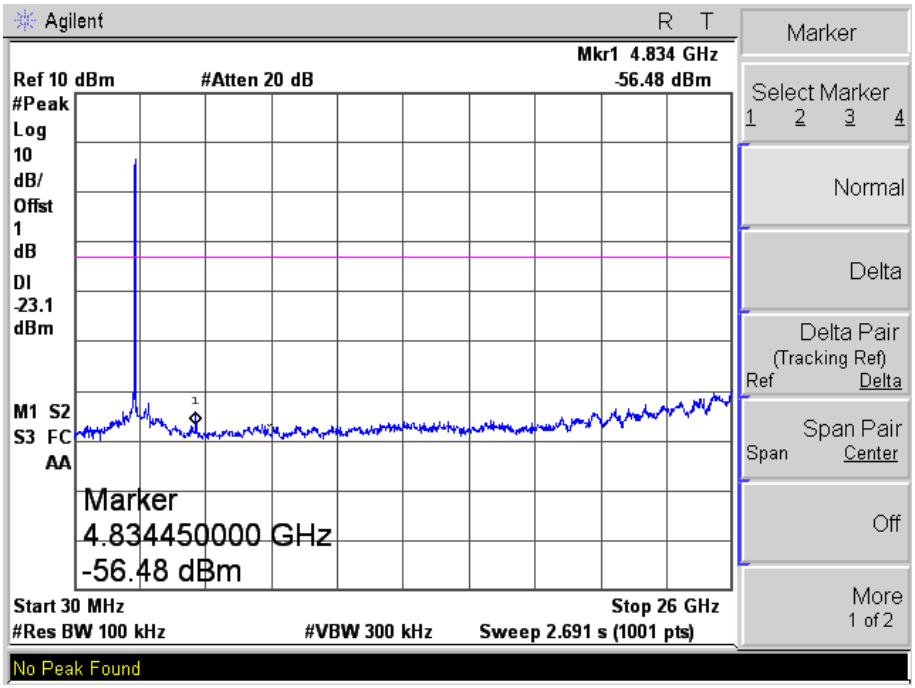
Highest


Agilent
R T
Mkr1 2.46250 GHz
Ref 10 dBm
#Atten 20 dB
2.351 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.6
dBm
Start
2.450000000 GHz
Start 2.45 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.5 GHz
Sweep 10 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.46250 GHz 2.351 dBm
2 (1) Freq 2.48405 GHz -46.8 dBm
No Peak Found
Freq/Channel
Center Freq
2.47500000 GHz
Start Freq
2.45000000 GHz
Stop Freq
2.50000000 GHz
CF Step
5.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

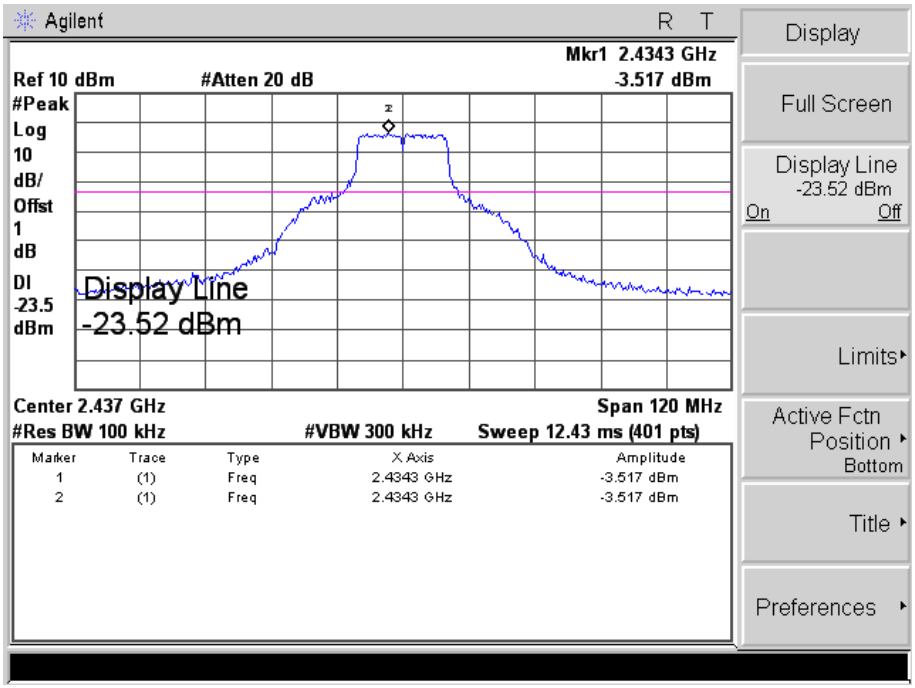

Agilent
R T
Mkr1 4.912 GHz
Ref 10 dBm
#Atten 20 dB
-37.72 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.6
dBm
M1 S2
S3 FC
AA
Marker
4.912360000 GHz
-37.72 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26 GHz
Sweep 2.691 s (1001 pts)
No Peak Found
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

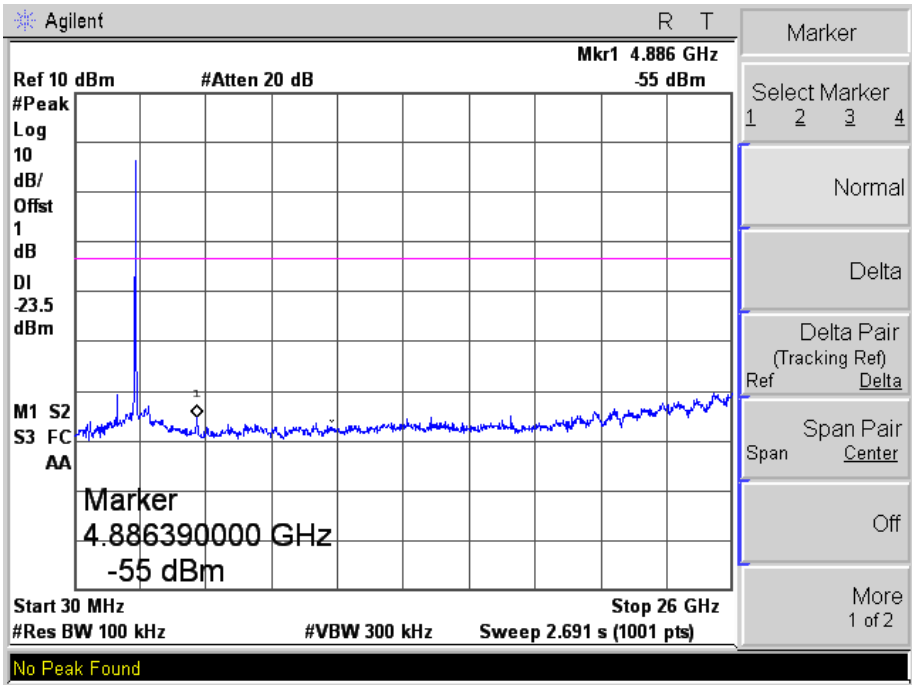
Spurious (Conducted)
802.11g-Lowest
Lowest



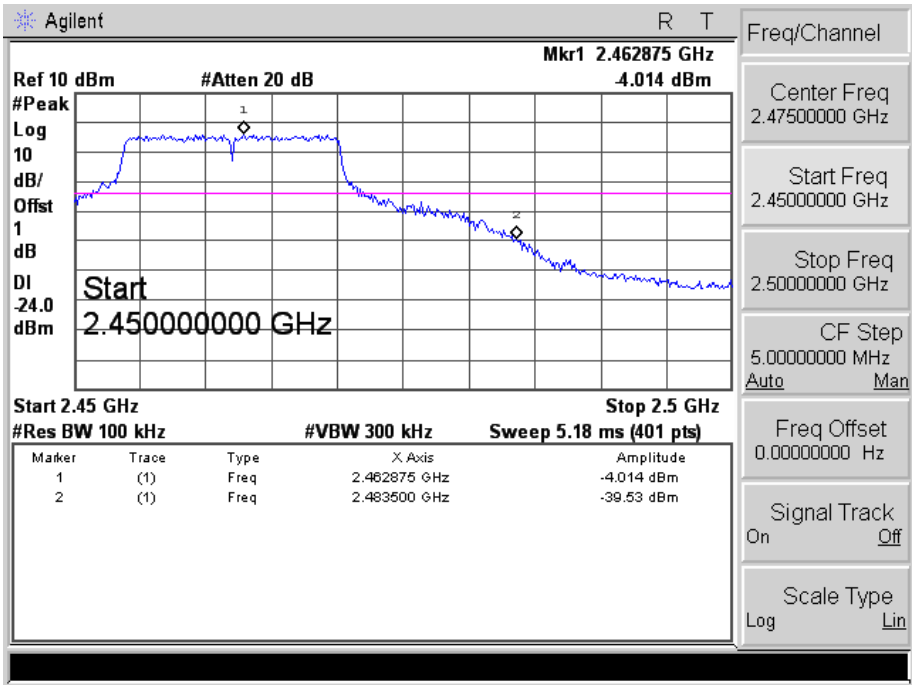



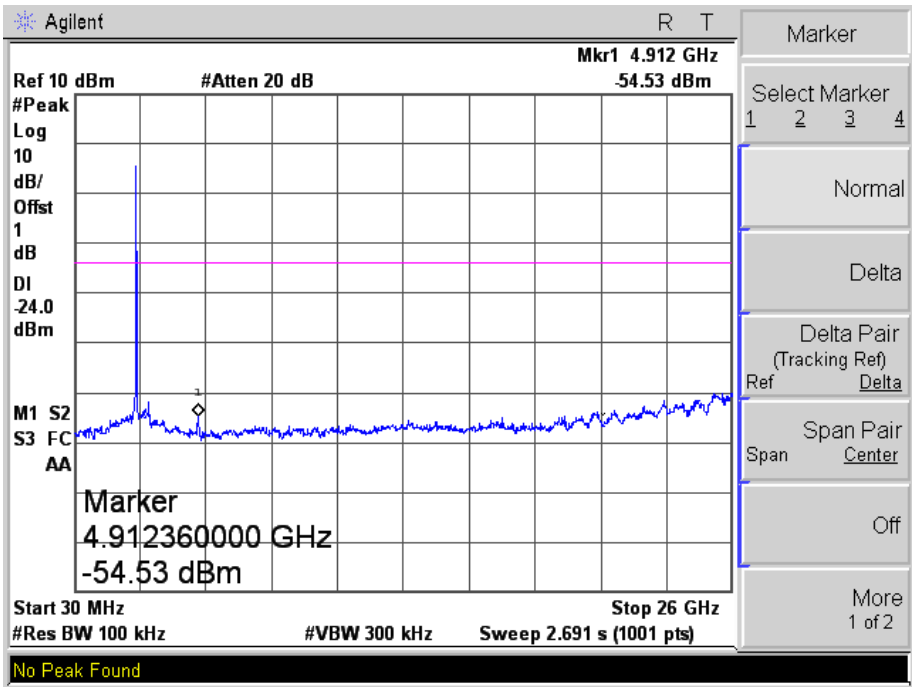
Middle


Agilent
R T
Mkr1 2.4343 GHz
Ref 10 dBm
#Atten 20 dB
-3.517 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-23.5
dBm
Display Line
-23.52 dBm
Center 2.437 GHz
Span 120 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 12.43 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.4343 GHz -3.517 dBm
2 (1) Freq 2.4343 GHz -3.517 dBm
Display
Full Screen
Display Line
-23.52 dBm
On Off
Limits
Active Fctn
Position
Bottom
Title
Preferences

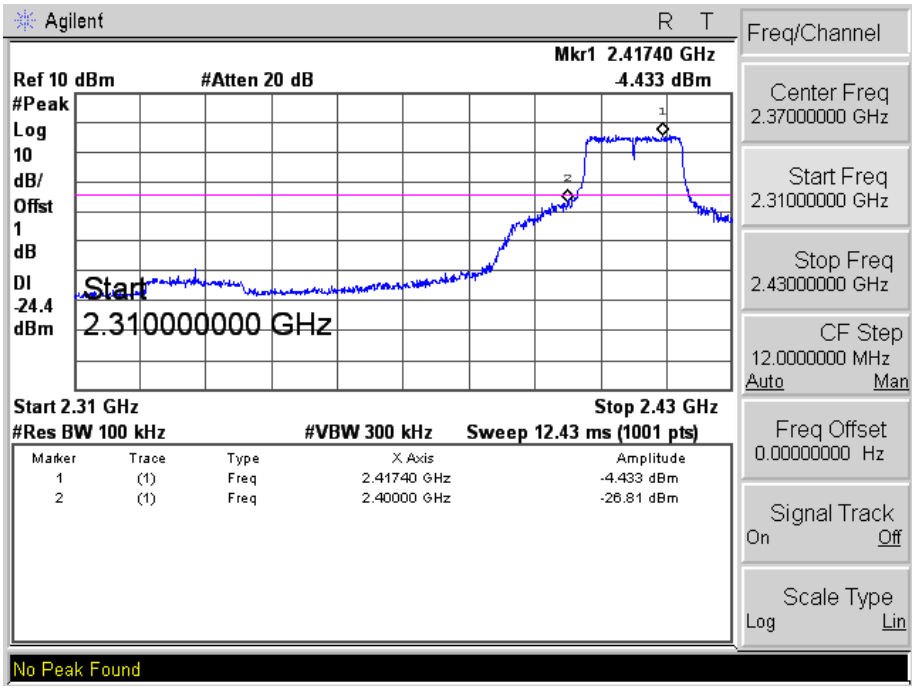

Agilent
R T
Mkr1 4.886 GHz
Ref 10 dBm
#Atten 20 dB
-55 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-23.5
dBm
M1 S2
S3 FC
AA
Marker
4.886390000 GHz
-55 dBm
Start 30 MHz
Stop 26 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.691 s (1001 pts)
No Peak Found
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

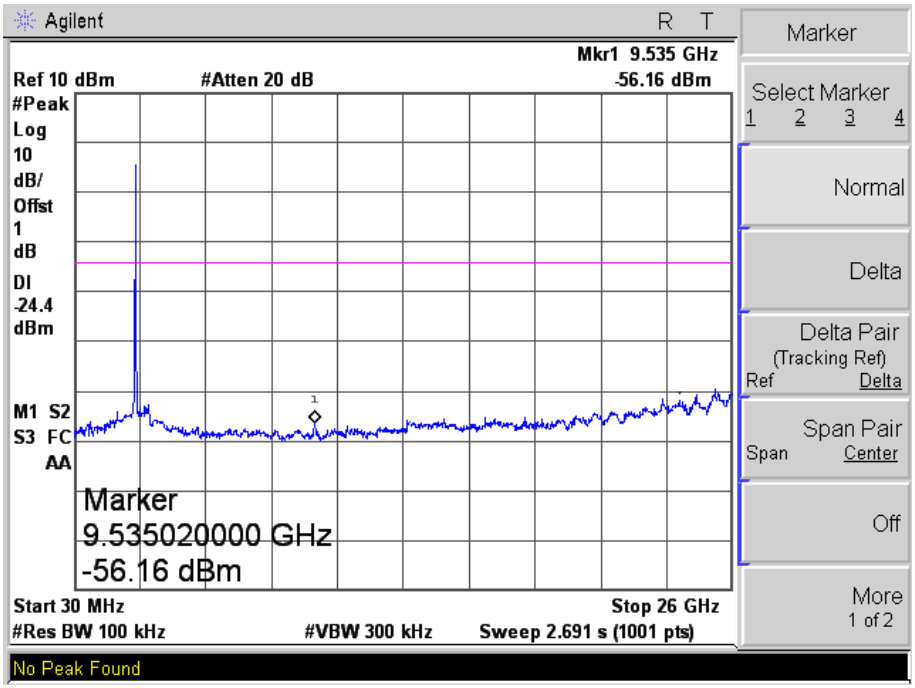
Highest


Agilent
R T
Mkr1 2.462875 GHz
Ref 10 dBm
#Atten 20 dB
-4.014 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-24.0
dBm
Start
2.450000000 GHz
Start 2.45 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.5 GHz
Sweep 5.18 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.462875 GHz -4.014 dBm
2 (1) Freq 2.483500 GHz -39.53 dBm
Freq/Channel
Center Freq
2.47500000 GHz
Start Freq
2.45000000 GHz
Stop Freq
2.50000000 GHz
CF Step
5.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

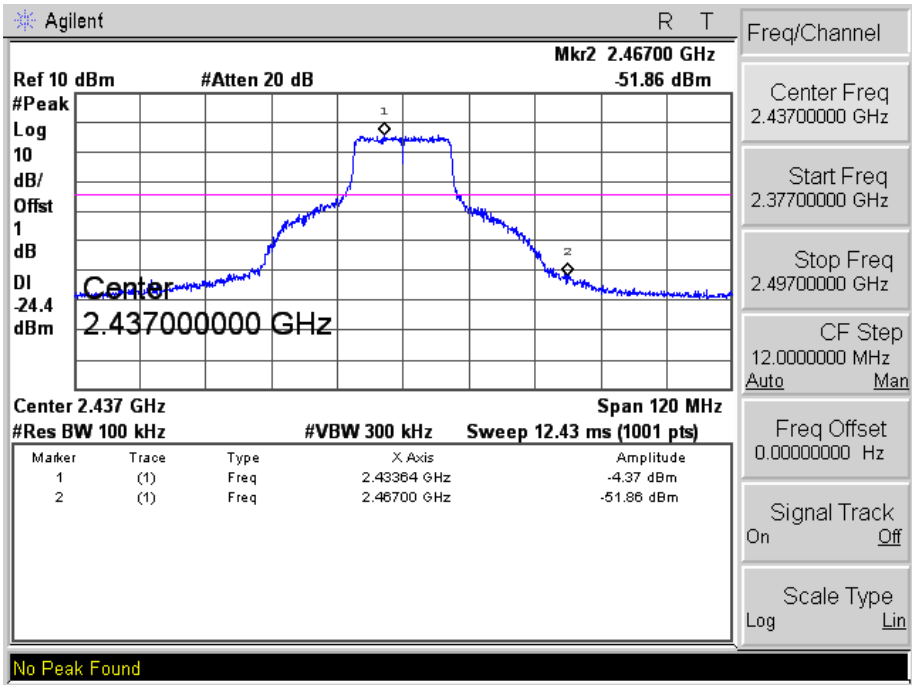

Agilent
R T
Mkr1 4.912 GHz
Ref 10 dBm
#Atten 20 dB
-54.53 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-24.0
dBm
M1 S2
S3 FC
AA
Marker
4.912360000 GHz
-54.53 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26 GHz
Sweep 2.691 s (1001 pts)
No Peak Found
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

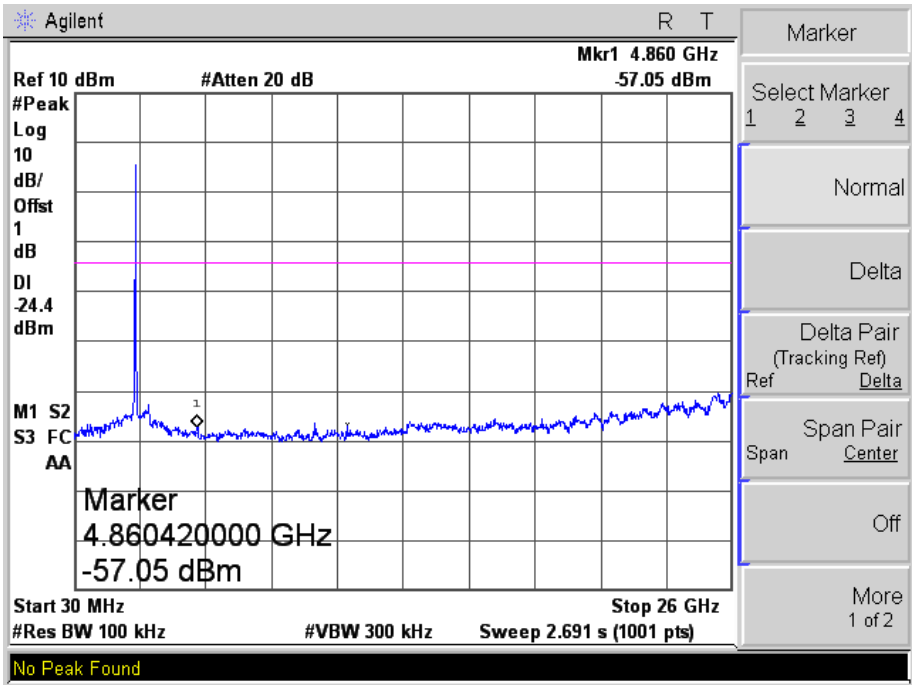
Spurious (Conducted)
802.11n-HT20-Lowest
Lowest



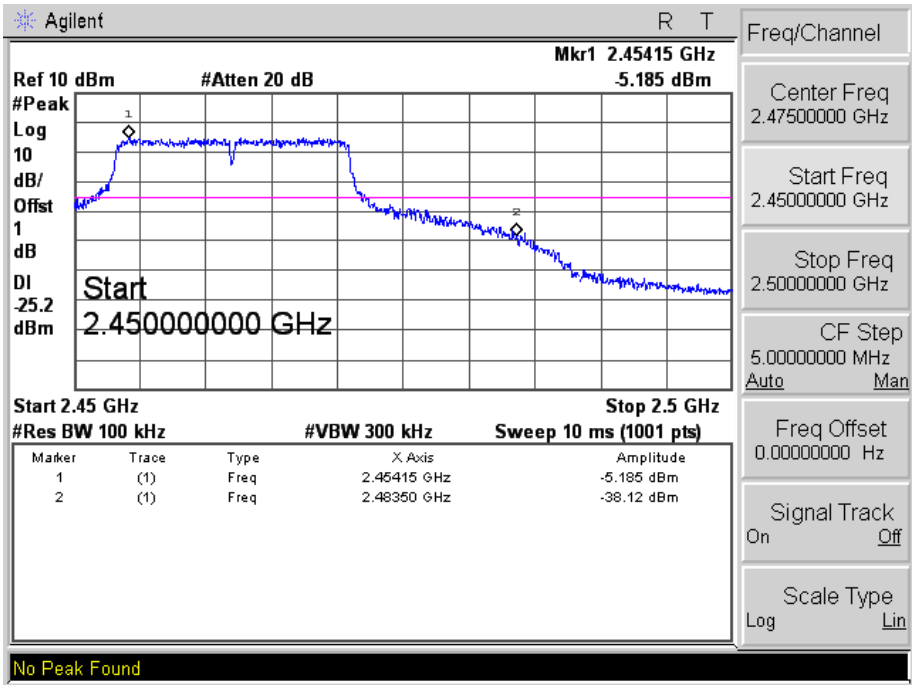



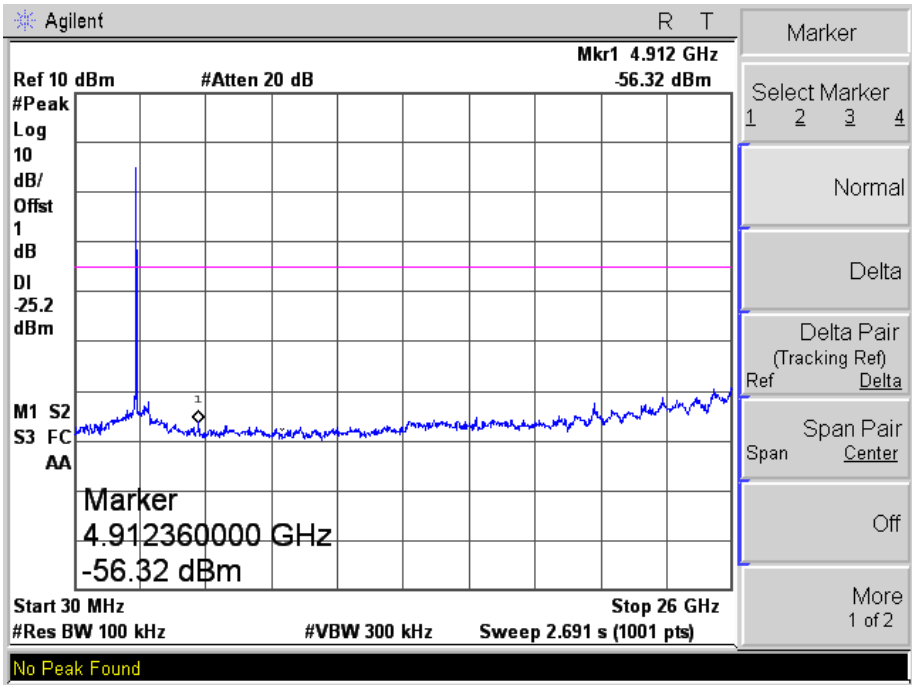
Middle


Agilent
R T
Mkr2 2.46700 GHz
Ref 10 dBm
#Atten 20 dB
-51.86 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-24.4
dBm
Center
2.437000000 GHz
Center 2.437 GHz
Span 120 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 12.43 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.43364 GHz -4.37 dBm
2 (1) Freq 2.46700 GHz -51.86 dBm
No Peak Found
Freq/Channel
Center Freq
2.43700000 GHz
Start Freq
2.37700000 GHz
Stop Freq
2.49700000 GHz
CF Step
12.0000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

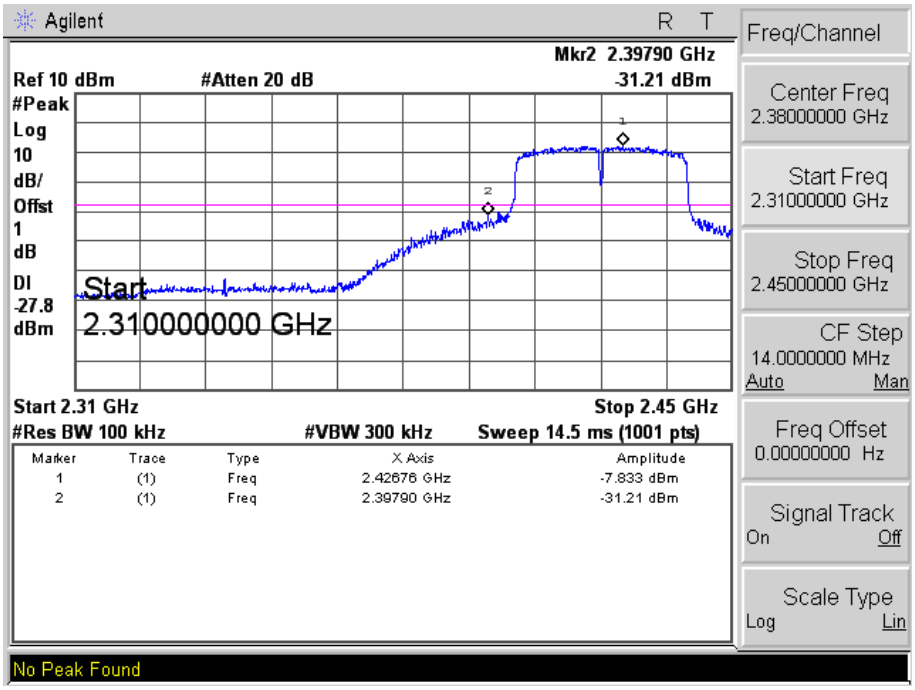

Agilent
R T
Mkr1 4.860 GHz
Ref 10 dBm
#Atten 20 dB
-57.05 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-24.4
dBm
M1 S2
S3 FC
AA
Marker
4.860420000 GHz
-57.05 dBm
Start 30 MHz
Stop 26 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.691 s (1001 pts)
No Peak Found
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

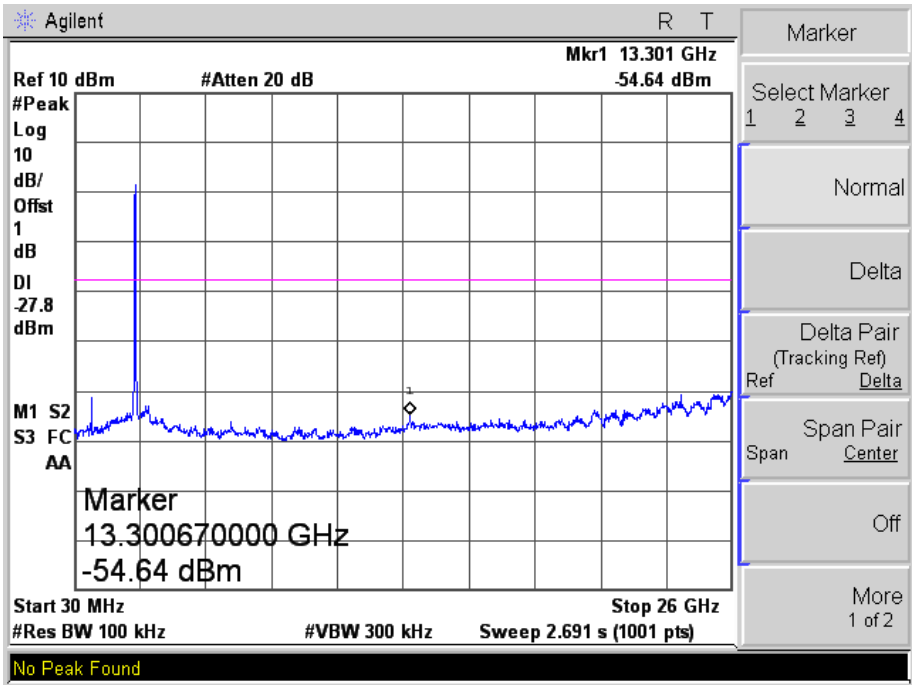
Highest


Agilent
R T
Mkr1 2.45415 GHz
Ref 10 dBm
#Atten 20 dB
-5.185 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-25.2
dBm
Start
2.450000000 GHz
Start 2.45 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.5 GHz
Sweep 10 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.45415 GHz -5.185 dBm
2 (1) Freq 2.48350 GHz -38.12 dBm
No Peak Found
Freq/Channel
Center Freq
2.47500000 GHz
Start Freq
2.45000000 GHz
Stop Freq
2.50000000 GHz
CF Step
5.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

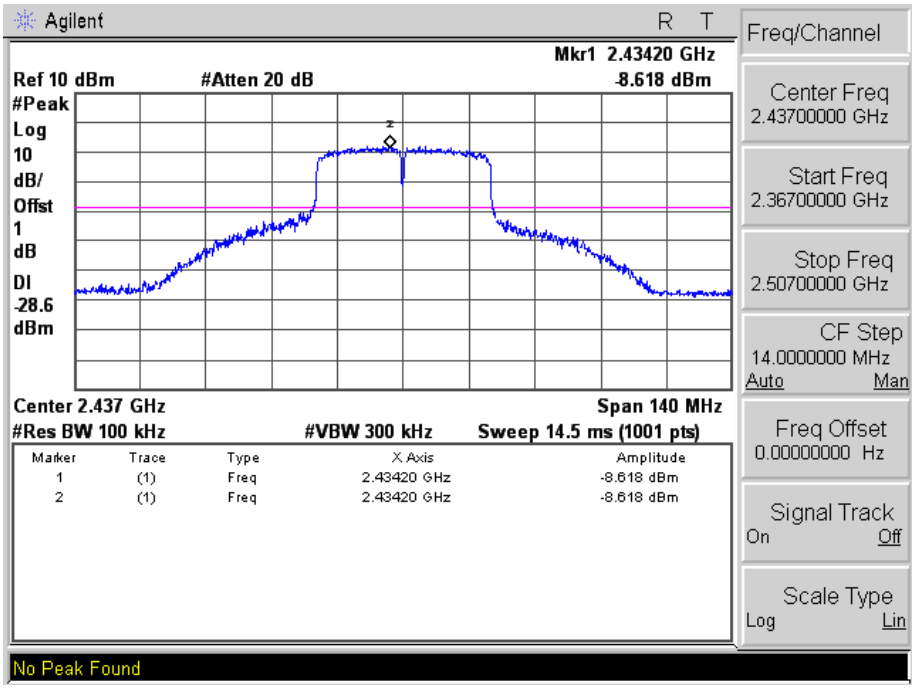

Agilent
R T
Mkr1 4.912 GHz
Ref 10 dBm
#Atten 20 dB
-56.32 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-25.2
dBm
M1 S2
S3 FC
AA
Marker
4.912360000 GHz
-56.32 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26 GHz
Sweep 2.691 s (1001 pts)
No Peak Found
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

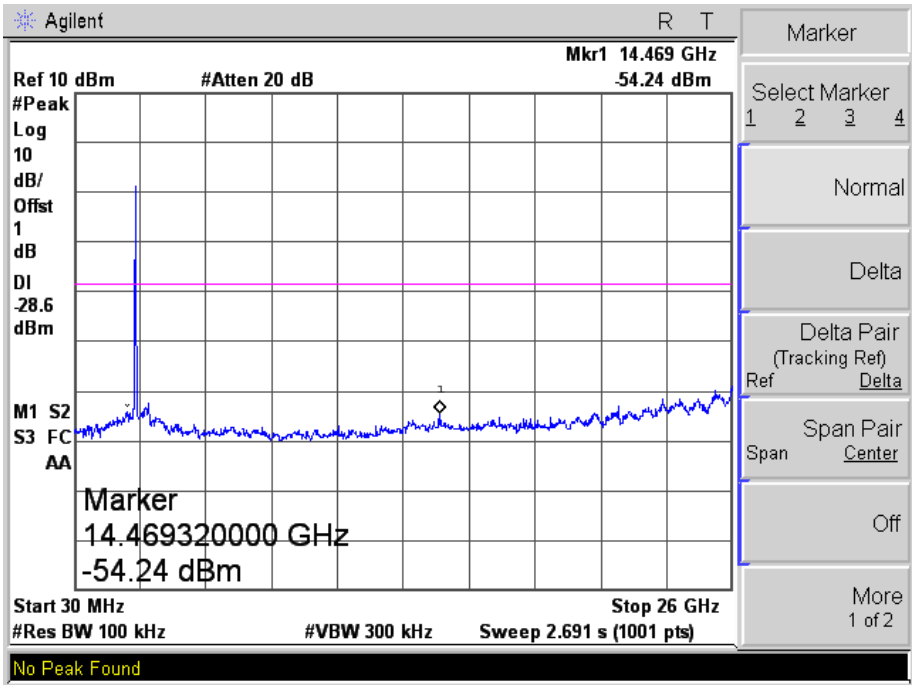
Spurious (Conducted)
802.11n-HT40-Lowest
Lowest



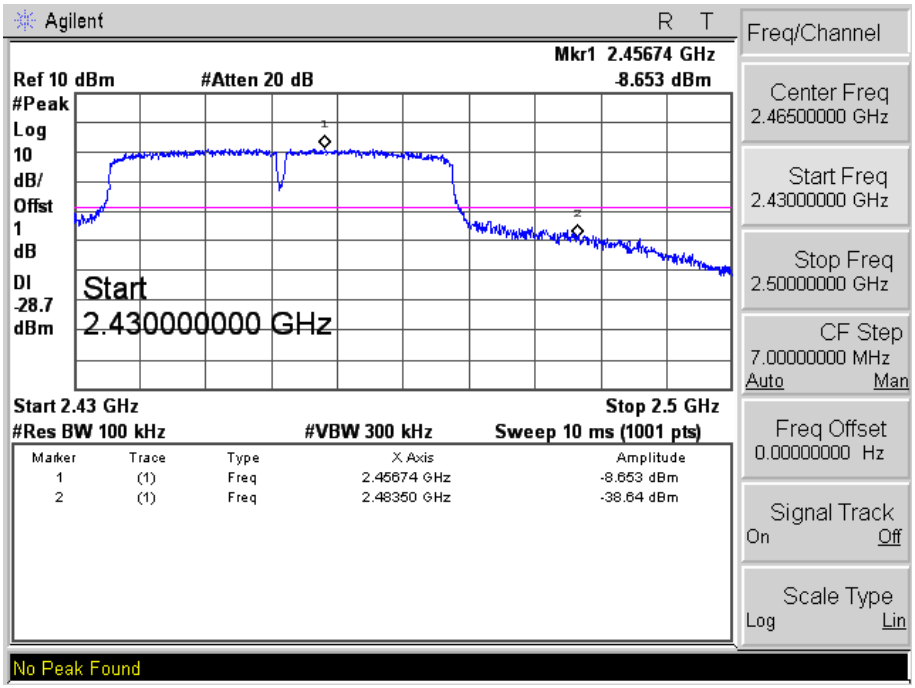



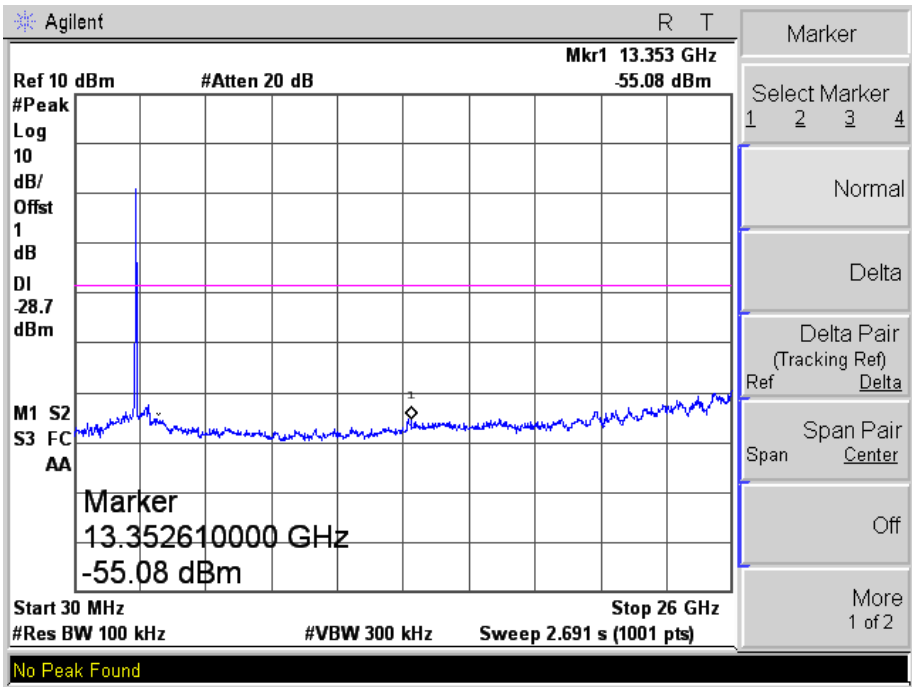
Middle


Agilent
R T
Mkr1 2.43420 GHz
Ref 10 dBm
#Atten 20 dB
-8.618 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-28.6
dBm
Center 2.437 GHz
Span 140 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 14.5 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.43420 GHz -8.618 dBm
2 (1) Freq 2.43420 GHz -8.618 dBm
No Peak Found
Freq/Channel
Center Freq
2.43700000 GHz
Start Freq
2.36700000 GHz
Stop Freq
2.50700000 GHz
CF Step
14.0000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin


Agilent
R T
Mkr1 14.469 GHz
Ref 10 dBm
#Atten 20 dB
-54.24 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-28.6
dBm
M1 S2
S3 FC
AA
Marker
14.469320000 GHz
-54.24 dBm
Start 30 MHz
Stop 26 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.691 s (1001 pts)
No Peak Found
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

Highest


Agilent
R T
Mkr1 2.45674 GHz
Ref 10 dBm
#Atten 20 dB
-8.653 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-28.7
dBm
Start
2.430000000 GHz
Start 2.43 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.5 GHz
Sweep 10 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.45674 GHz -8.653 dBm
2 (1) Freq 2.48350 GHz -38.64 dBm
No Peak Found
Freq/Channel
Center Freq
2.46500000 GHz
Start Freq
2.43000000 GHz
Stop Freq
2.50000000 GHz
CF Step
7.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

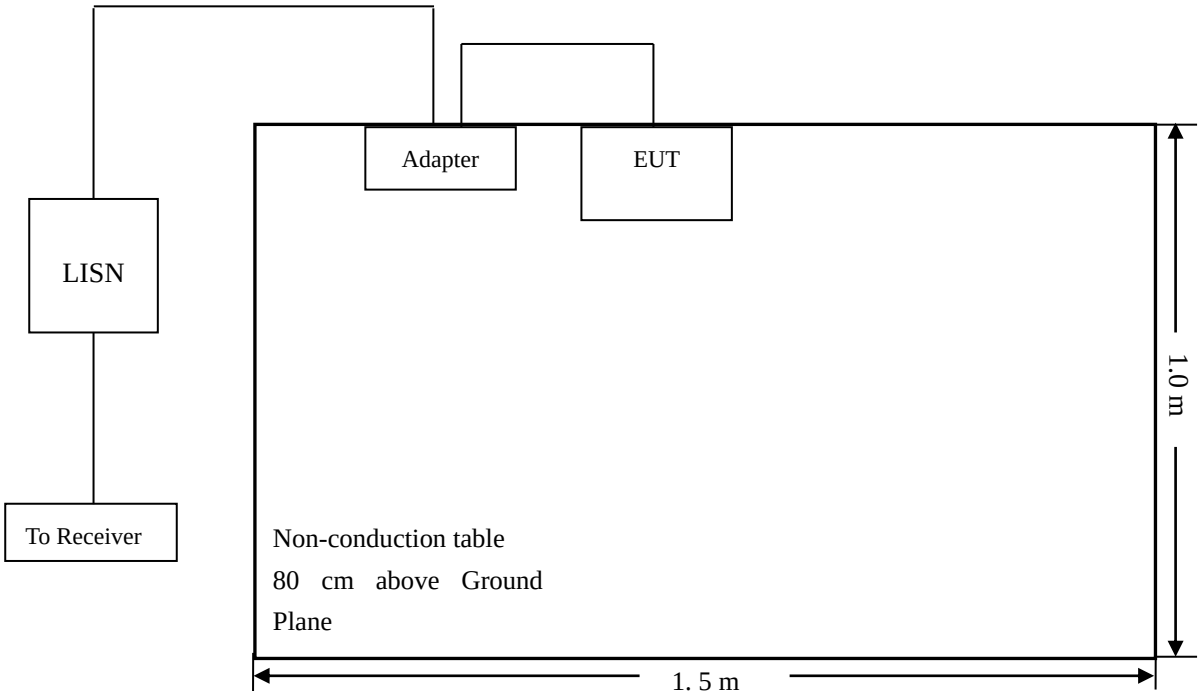

Agilent
R T
Mkr1 13.353 GHz
Ref 10 dBm
#Atten 20 dB
-55.08 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-28.7
dBm
M1 S2
S3 FC
AA
Marker
13.352610000 GHz
-55.08 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26 GHz
Sweep 2.691 s (1001 pts)
No Peak Found
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

# 10. Conducted Emissions

## 10.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 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 Environmental Conditions

| | |
|---|---|
| Temperature: | 25 °C |
| Relative Humidity: | 52% |
| ATM Pressure: | 1012 mbar |

## 10.4 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

## 10.5 Summary of Test Results/Plots

According to the data in section 10.6, the EUT complied with the FCC Part 15.207 Conducted margin for this device, with the *worst* margin reading of:

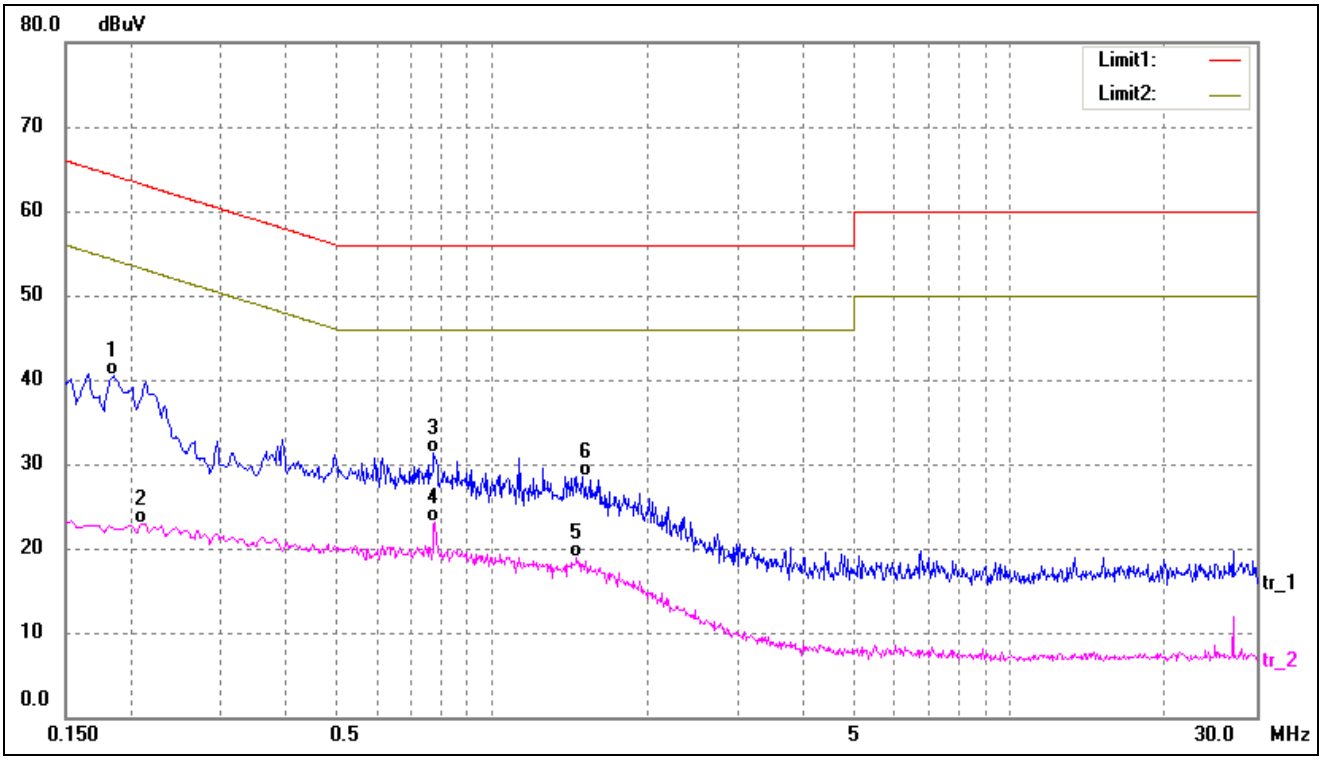
**-22.82 dB at 0.7780 MHz** in the **Neutral** mode**, AVG** detector, **0.15-30MHz**

## 10.6 Conducted Emissions Test Data

**Plot of Conducted Emissions Test Data**

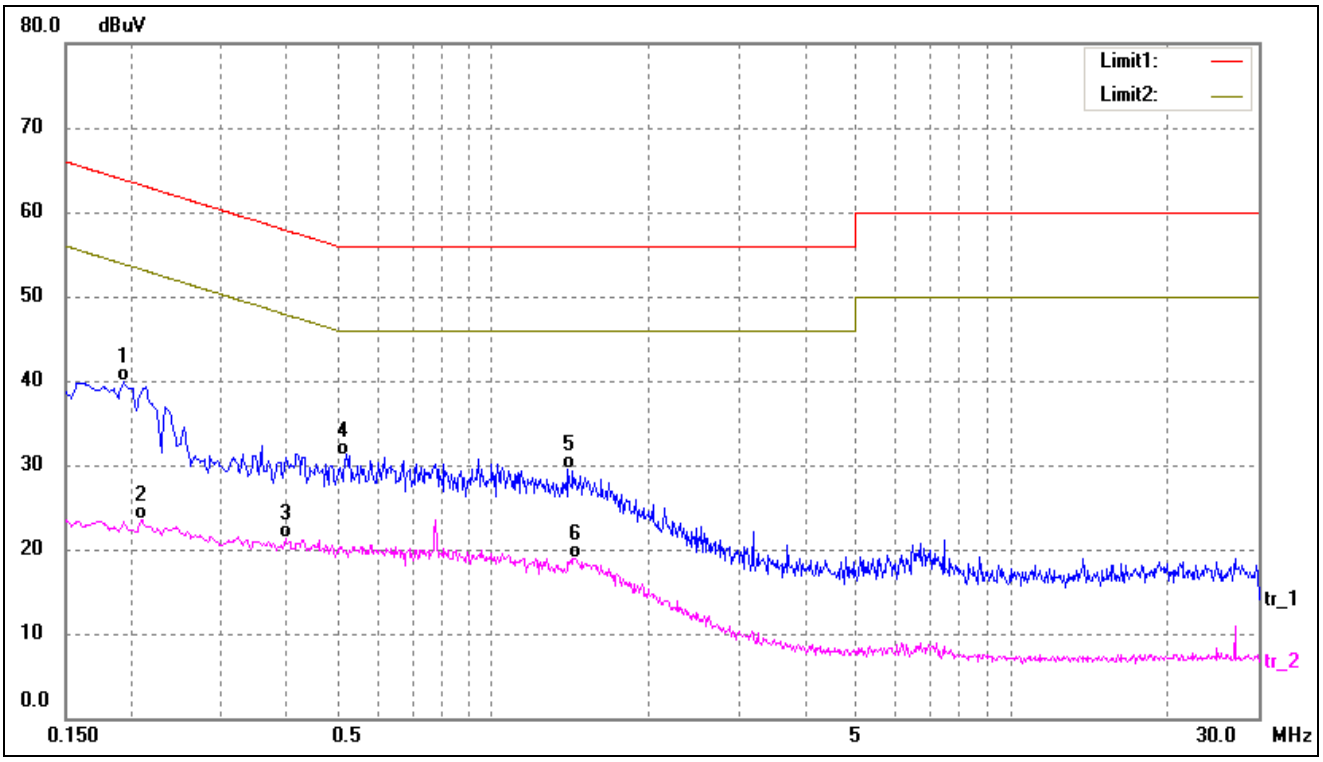
*EUT:* *DOORBELL*
*Tested Model:* *WDB-20-JUN*
*Operating Condition:* *Transmitting(Wi-Fi)*
*Comment:* *AC 120V/60Hz;*

*Test Specification:* *Neutral*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Detector |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dB/m) | (dBuV) | (dBuV) | (dB) | |
| 1 | 0.1860 | 30.71 | 9.81 | 40.52 | 64.21 | -23.69 | QP |
| 2 | 0.2100 | 13.04 | 9.80 | 22.84 | 53.20 | -30.36 | AVG |
| 3 | 0.7740 | 21.53 | 9.78 | 31.31 | 56.00 | -24.69 | QP |
| 4* | 0.7780 | 13.40 | 9.78 | 23.18 | 46.00 | -22.82 | AVG |
| 5 | 1.4620 | 9.08 | 9.75 | 18.83 | 46.00 | -27.17 | AVG |
| 6 | 1.4980 | 18.84 | 9.75 | 28.59 | 56.00 | -27.41 | QP |

*Test Specification:* *Live*




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Detector |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dB/m) | (dBuV) | (dBuV) | (dB) | |
| 1* | 0.1940 | 30.07 | 9.81 | 39.88 | 63.86 | -23.98 | QP |
| 2 | 0.2100 | 13.73 | 9.80 | 23.53 | 53.21 | -29.68 | AVG |
| 3 | 0.3980 | 11.43 | 9.80 | 21.23 | 47.90 | -26.67 | AVG |
| 4 | 0.5220 | 21.40 | 9.80 | 31.20 | 56.00 | -24.80 | QP |
| 5 | 1.4020 | 19.69 | 9.75 | 29.44 | 56.00 | -26.56 | QP |
| 6 | 1.4460 | 9.22 | 9.75 | 18.97 | 46.00 | -27.03 | AVG |

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