# TEST REPORT
On behalf of

Mettler-Toledo (ChangZhou) Measurement Technology Ltd

Product Name: IND246

Model No.: IND246

FCC ID: 2ALAI23MT105

Prepared For: Mettler-Toledo (ChangZhou) Measurement Technology Ltd
No.111 Taihu West Road Changzhou City, Jiangsu Province, China.

Prepared By: Audix Technology (Shanghai) Co., Ltd.
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TESTING
NVLAP LAB CODE 200371-0

File No. : C1D2311044
Report No. : ACI-F23224
Date of Test : 2023.11.23-12.12
Date of Report : 2023.12.21

The statement is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

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# TEST REPORT

| | | | | |
|---|---|---|---|---|
| Applicant | : | Mettler-Toledo (ChangZhou) Measurement Technology Ltd | | |
| EUT Description | : | IND246 | | |
| | | (A) Model No. | : | Refer to Sec.2.1 |
| | | (B) Power Supply | : | DC 6.5V~9V (From Battery) |
| | | (C) Test Voltage | : | DC 9V |

**Test Procedure Used:**

*FCC RULES AND REGULATIONS PART 15 SUBPART C*
*AND ANSI C63.10-2013*

The device described above is tested by Audix Technology (Shanghai) Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits.

The test results are contained in this test report and Audix Technology (Shanghai) Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. This report also shows that the EUT (M/N: Refer to Sec2.1), which was tested is technically compliance with the FCC limits.

This report applies to above tested Sample only. This report shall not be reproduced in part without written approval of Audix Technology (Shanghai) Co., Ltd.

Date of Test : 2023.11.23-12.12 Date of Report : 2023.12.21

Producer : Huimin Yan
HUIMIN YAN / Assistant

Review : Jarey Lu
JAREY LU / Deputy Assistant Manager

AUDIX® For and on behalf of
Audix Technology (Shanghai) Co., Ltd.

Signatory : Kamp. Chen.
Authorized Signature(s)
KAMP CHEN / Manager

# 1 SUMMARY OF STANDARDS AND RESULTS

## 1.1 Description of Standards and Results

The result is determined according to the decision rules of customer selection in the ASC-403 application service form.
1. According to IEC GUIDE 115 Procedure 2 and ILAC-G8, the uncertainties value is not used in determining the PASS/FAIL results.
2. If the required specification or standard already contains the decision rules, it will be carried out in accordance with the regulations or standard documents or the requirements of the competent units. If the required specification or standard does not contain a decision rule, the same paragraph 1.
3. If your company has a required decision rule, it will be implemented in accordance with the requirements and ISO/IEC Guide 98-4 specifications.

The EUT have been tested according to the applicable standards as referenced below:

| Description / Test Item | Test Standard | Results | Meets Limit |
|---|---|---|---|
| **EMISSION** | | | |
| Conducted Emission | FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013 | N/A | 15.207 |
| Radiated Emission | FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013 | Pass | 15.209(a) 15.205(a)(c) |
| 6 dB Bandwidth Measurement | FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013 | Pass | 15.247(a)(2) |
| Maximum Output Power Measurement | FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013 | Pass | 15.247(b)(3) |
| Emission Limitations Measurement | FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013 | Pass | 15.247(d) |
| Band Edge Measurement | FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013 | Pass | 15.247(d) |
| Power Spectral Density Measurement | FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013 | Pass | 15.247(e) |
| Antenna Requirement | FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013 | Pass | 15.203 |
| N/A is an abbreviation for Not Applicable. | | | |

# 2 GENERAL INFORMATION

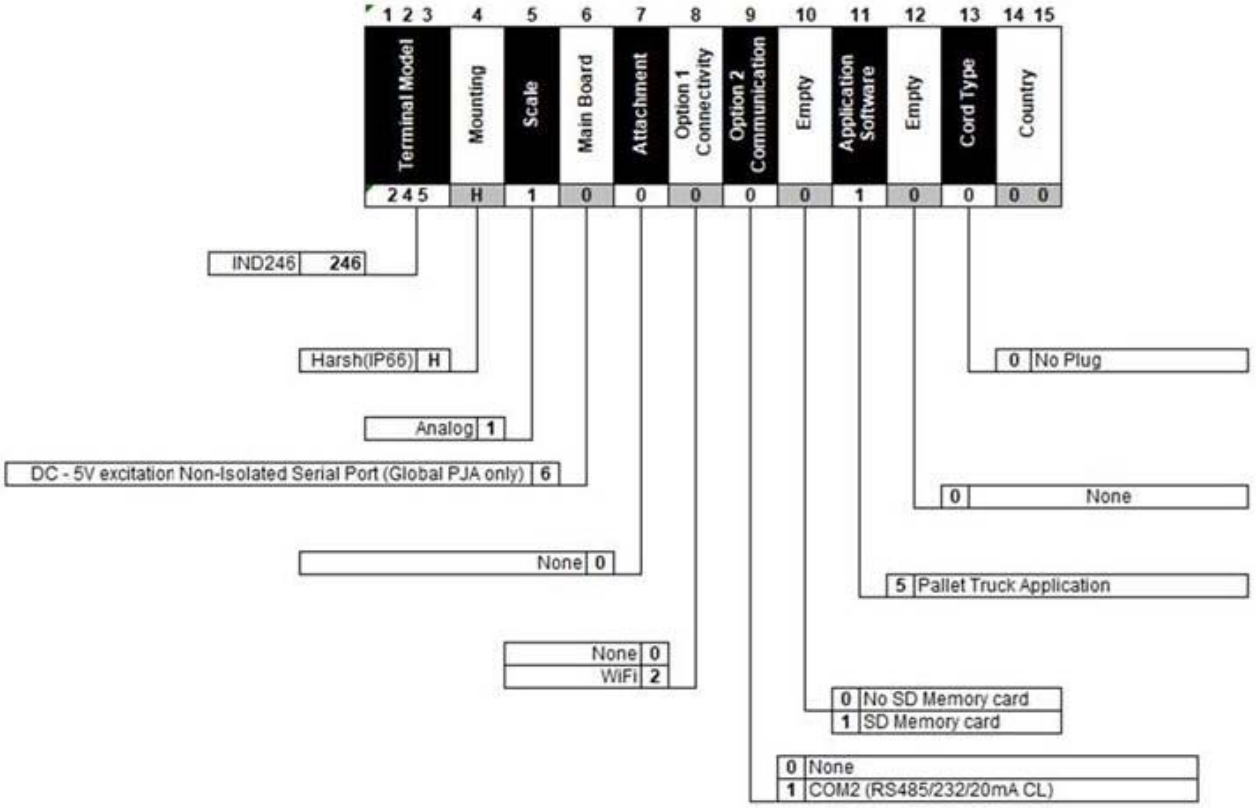
## 2.1 Description of Equipment Under Test

Description : IND246

Type of EUT : ☑ Production ☐ Pre-product ☐ Pro-type

Model Number : IND246

SCK : Defined as below:




Radio Tech : IEEE 802.11 b/g/n.

Channel Freq. : 802.11b/g/n20: 2412MHz-2462MHz;

Modulation : 802.11b: DSSS (CCK, DQPSK, DBPSK);
802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK).

Antenna Info. : Transmit Type: 1T1X;
Antenna use details list as below:

| ANT Port: | ANT1 | ANT2 |
|---|---|---|
| Connector: | IPEX | IPEX |
| Condition: | In use | No use |
| Antenna Type: | Dipole Antenna | N/A |
| Antenna Gain: | 2.5 dBi | N/A |

| | | |
|---|---|---|
| Applicant | : | Mettler-Toledo (ChangZhou) Measurement Technology Ltd<br>No.111 Taihu West Road Changzhou City,<br>Jiangsu Province, China. |
| Manufacturer | : | same as Applicant |

## 2.2 EUT Specifications Assessed in Current Report

| Mode | Modulation | Data Rate(Mbps) |
|---|---|---|
| 802.11b | DS (DQPSK, DBPSK, CCK) | Up to 11 |
| 802.11g | OFDM (64-QAM, 16-QAM, QPSK, BPSK) | Up to 54 |
| 802.11n-HT 20 | OFDM (64-QAM, 16-QAM, QPSK, BPSK) | Up to 72.2 |

| Channel List | | | |
|---|---|---|---|
| Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) |
| 1 | 2412 | 7 | 2442 |
| 2 | 2417 | 8 | 2447 |
| 3 | 2422 | 9 | 2452 |
| 4 | 2427 | 10 | 2457 |
| 5 | 2432 | 11 | 2462 |
| 6 | 2437 | | |

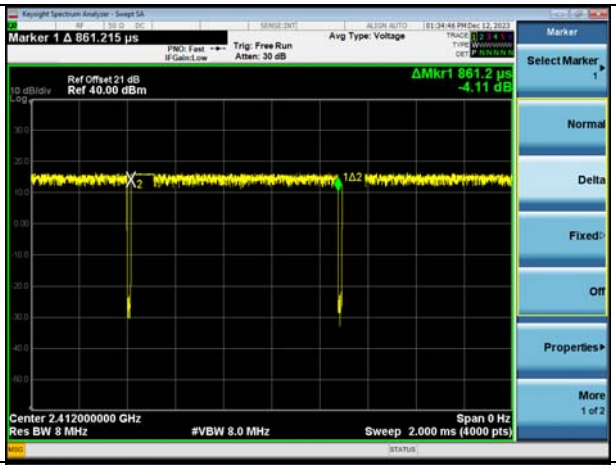
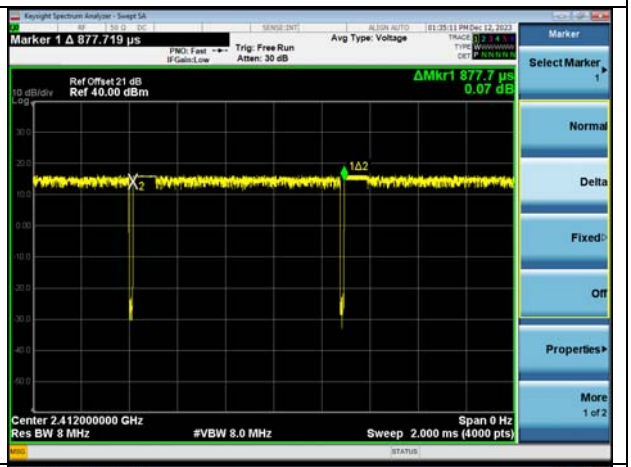
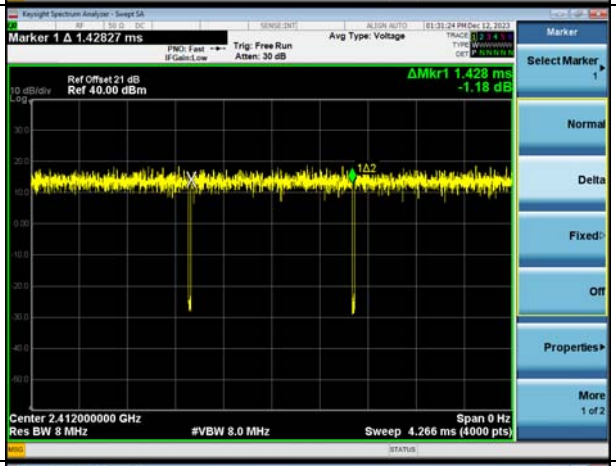
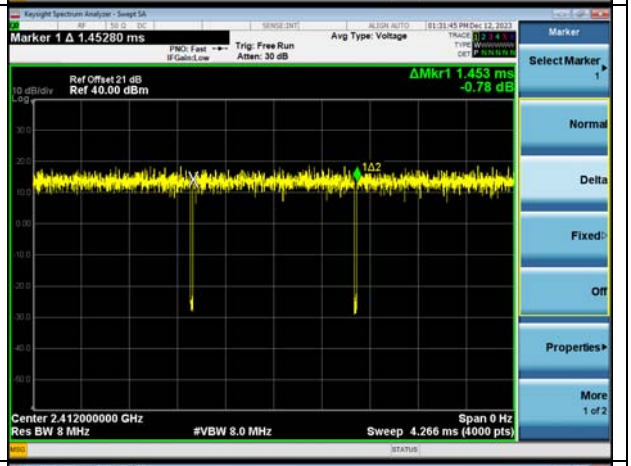
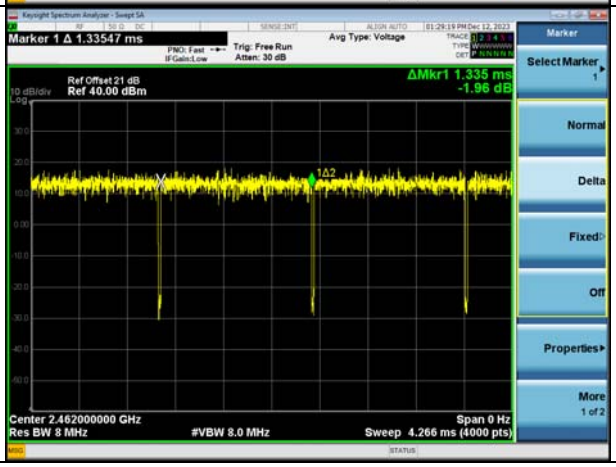
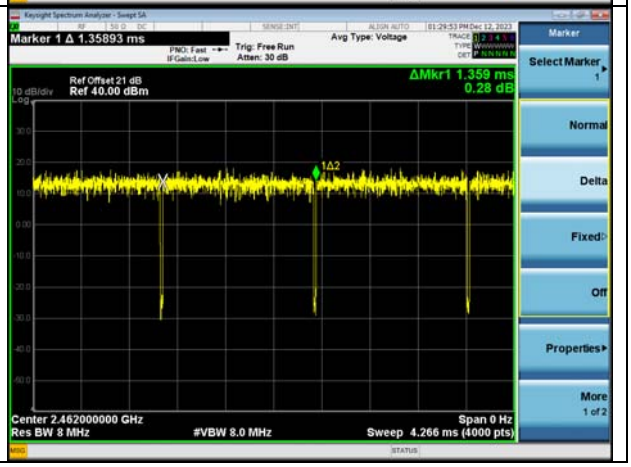
## 2.3 Test Information

The test software "Teraterm.exe" was used to control EUT work in TX mode, Power Index and select test channel.

| Mode | data rate (Mbps) | txpwr1 Setting | Test Channel | | Frequency (MHz) |
|---|---|---|---|---|---|
| 802.11b | 11 | 12 | Low: | 1 | 2412 |
| | | 12 | Middle: | 6 | 2437 |
| | | 12 | High: | 11 | 2462 |
| 802.11g | 6 | 12 | Low: | 1 | 2412 |
| | | 12 | Middle: | 6 | 2437 |
| | | 12 | High: | 11 | 2462 |
| 802.11n20 | MCS0 | 12 | Low: | 1 | 2412 |
| | | 12 | Middle: | 6 | 2437 |
| | | 12 | High: | 11 | 2462 |

## 2.4 Duty Cycle Check

| Mode | Transmission Duration (ms) | Transmission Period (ms) | Duty Cycle (%) | Duty Cycle Correct Factor |
|---|---|---|---|---|
| 802.11b | 0.8612 | 0.8777 | 98.12 | N/A |
| 802.11g | 1.428 | 1.453 | 98.28 | N/A |
| 802.11n20 | 1.335 | 1.359 | 98.23 | N/A |

| Mode | Ton | Ton+off |
|---|---|---|
| 802.11b |  |  |
| 802.11g |  |  |
| 802.11n20 |  |  |

## 2.5 Sample Description

| Test Item | Model Number | Sample Number | SCK Code | Date of receipted |
|---|---|---|---|---|
| Radiated Emission | IND246 | E20231121274-01/01 | 246H16021150000 | 2023.11.21 |
| Conducted RF Test | IND246 | E20231121274-01/01 | 246H16021150000 | 2023.11.21 |

## 2.6 Supported equipment

| | | |
|---|---|---|
| Brand | : | Acer |
| Product Name: | : | Notebook PC |
| Model Name | : | TravelMate P238 series |
| Model Number | : | N15W8 |
| | | |
| Product Name | : | Test Fixture |
| Product Function | : | USB to TTL |

## 2.7 Description of Test Facility

| | | |
|---|---|---|
| Name of Firm | : | Audix Technology (Shanghai) Co., Ltd. |
| Site Location | : | 3F, Building 34, No. 680 Guiping Rd., Caohejing, Hi-Tech Park, Shanghai 200233, China |
| Accredited by NVLAP, Lab Code | : | 200371-0 |
| FCC Designation Number | : | CN5027 |
| Test Firm Registration Number | : | 954668 |

# 3 RADIATED EMISSION TEST

## 3.1 Test Equipment

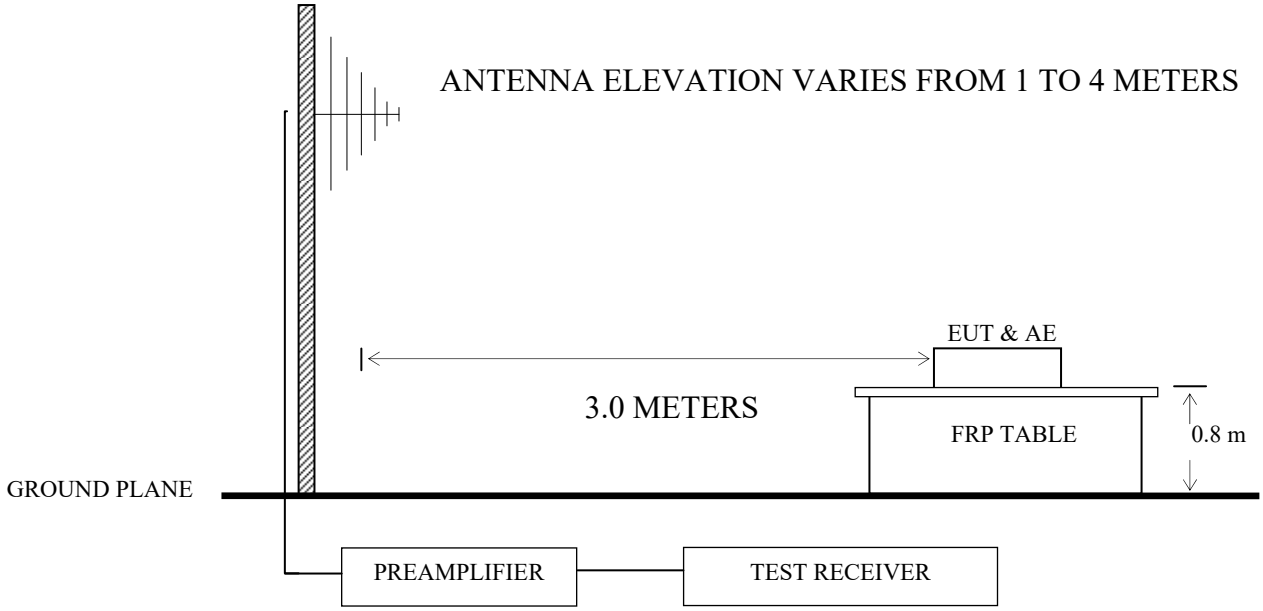
The following test equipment are used during the radiated emission test in a semi-anechoic chamber:

| Item | Type | Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Preamplifier | Agilent | 8447D | 2944A10548 | 2023.02.22 | 1 Year |
| 2. | Preamplifier | HP | 8449B | 3008A00864 | 2023.02.22 | 1 Year |
| 3. | EXA Signal Analyzer | Agilent | N9010A | MY52221182 | 2023.08.09 | 1 Year |
| 4. | Test Receiver | R&S | ESCI | 101303 | 2023.02.22 | 1 Year |
| 5. | Bilog Antenna+6dB Attenuator | Schwarzbeck | VULB 9168+EMCI-N-6-06 | 708+AT-N0638 | 2023.02.07 | 1 Year |
| 6. | Horn Antenna | EMCO | 3115 | 96074878 | 2023.08.02 | 1 Year |
| 7. | Horn Antenna | EMCO | 3116 | 00062643 | 2023.01.30 | 2 Year |
| 8. | Cavity Band Rejection Filter | Microwave | WT-A3882-R 10 | WT200312-1-1 | 2023.02.22 | 1 Year |
| 9. | Coaxial Switch | Anritsu | MP59B | 6200655086 | 2023.02.22 | 1 Year |
| 10. | Coaxial Cable | SCHAFFNER | RG 212U-MIL C 17+N1K50-E W0630-N1K5 0-15m-1 | RE-10m-001/ RE-15m-002 | 2023.02.22 | 1 Year |
| 11. | Software | Audix | e3 | 210616 | -- | -- |

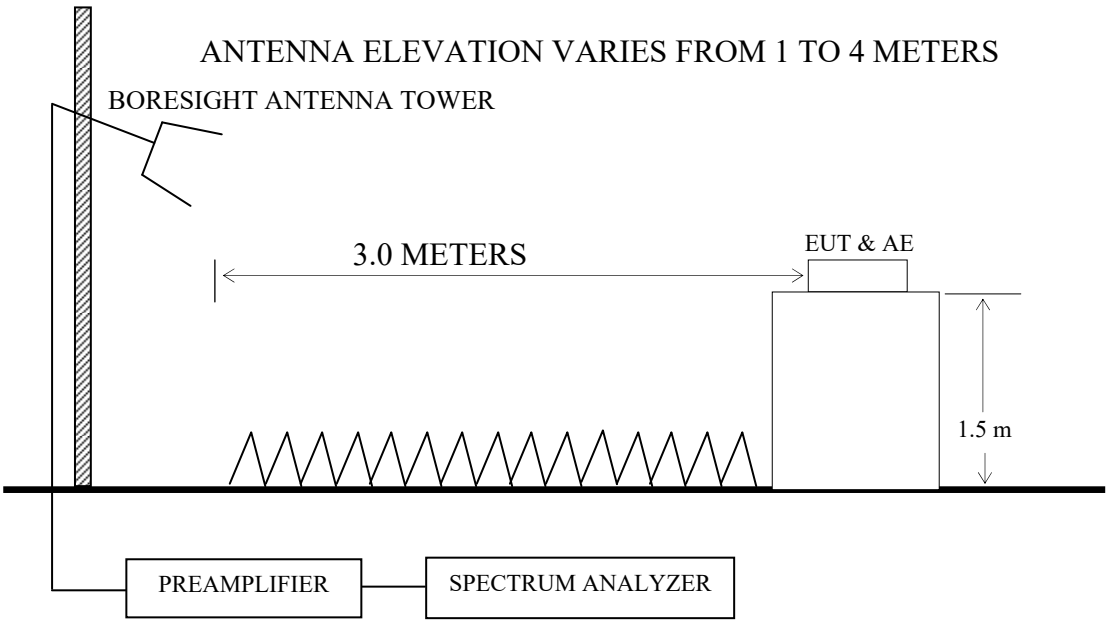
## 3.2 Block Diagram of Test Setup

### 3.2.1 EUT & Peripherals


### 3.2.2 Below 1GHz




### 3.2.3 Above 1GHz



## 3.3 Radiated Emission Limit (§15.209)

| Frequency (MHz) | Distance (m) | Field strength limits (μV/m) | |
|---|---|---|---|
| | | (μV/m) | (μV/m) |
| 30 ~ 88 | 3 | 100 | 40.0 |
| 88 ~ 216 | 3 | 150 | 43.5 |
| 216 ~ 960 | 3 | 200 | 46.0 |
| Above 960 | 3 | 500 | 54.0 |

NOTE 1 - Emission Level dB (μV/m) = 20 log Emission Level (μV/m)
NOTE 2 - The tighter limit applies at the band edges.
NOTE 3 - Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
NOTE 4 - The limits shown are based on Quasi-peak value detector below or equal to 1GHz and Average value detector above 1GHz.
NOTE 5 - Above 1 GHz, the limit on peak emission is 20 dB above the maximum permitted average emission limit applicable to the EUT

## 3.4 Test Configuration

The EUT (listed in Sec.2.1) and the simulators (listed in Sec.2.2) were installed as shown on Sec.4.2 to meet FCC requirements and operating in a manner that tends to maximize its emission level in a normal application.

## 3.5 Operating Condition of EUT

3.5.1 Setup the EUT as shown in Sec. 4.2.

3.5.2 Connect the EUT and the TTL terminal of Test Fixture through three HCI cables of EUT, as follows (TX to RXD, RX to TXD, GND to GND, CTS to CTS, RTS to RTS). Plug the USB terminal of Test Fixture to the USB port of Notebook PC.

3.5.3 Run the software as section 2.3 and turn on the EUT to upload test firmware, use the test command to select the test mode, then disconnect the Test Fixture from EUT, remove the Test Fixture and Notebook PC, then test.

3.5.4 Repeat step 3.5.3 and 3.5.4, until the test of all modes finished.

## 3.6 Test Procedures

Radiated emission test applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. A pre-amp is necessary for this measurement. For measurement above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.

The EUT was placed on a turntable. Below 1 GHz, the table height is 80 cm above the reference ground plane. Above 1 GHz, the table height is 1.5 m. The turntable rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. The antenna moved up and down

between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (Calibrated Bilog Antenna) or Horn antenna was used as receiving antenna. Both horizontal and vertical polarizations of the antenna were set on measurement. In order to find the maximum emission, all of the interference cables were manipulated according to ANSI C63.10: 2013 requirements during radiated emission test.

The bandwidth of Test Receiver R&S ESCI was set at 120 kHz from 30MHz to 1000MHz.

The bandwidth of Agilent N9010A was set at 1MHz for above 1GHz.

The frequency range from 30 MHz to 25 GHz (Up to $10^{th}$ harmonics from fundamental frequency) was checked.

All the test results are listed in Sec.3.7.

## 3.7 Test Results

**<PASS>**

The frequency and amplitude of the highest radiated emission relative the limit is reported. All the emissions not reported below are too low against the FCC limit.

Frequency range: below 1GHz (Worst case emission)

| No. | Operation | Mode | Channel | Frequency | Data Page |
|---|---|---|---|---|---|
| 1. | Transmitting | 802.11b | 1 | 2412 MHz | P16-17 |

Frequency range: above 1GHz

| No. | Operation | Mode | Channel | Frequency | Data Page |
|---|---|---|---|---|---|
| 1. | Transmitting | 802.11b | 1 | 2412 MHz | P18-19 |
| 2. | | | 6 | 2437 MHz | P20-21 |
| 3. | | | 11 | 2462 MHz | P22-23 |
| 4. | | 802.11g | 1 | 2412 MHz | P24-25 |
| 5. | | 802.11n20 | 1 | 2412 MHz | P26-27 |

Band-Edge and Restricted bands:

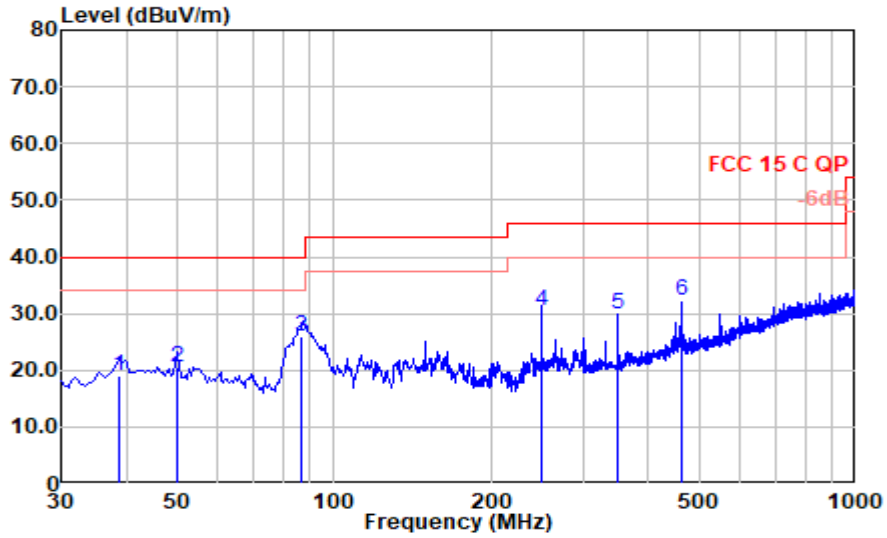
| No. | Operation | Mode | Channel | Frequency | Data Page |
|---|---|---|---|---|---|
| 1. | Transmitting | 802.11b | 1 | 2412 MHz | P28-29 |
| 2. | | | 11 | 2462 MHz | P30-31 |
| 3. | | 802.11g | 1 | 2412 MHz | P32-33 |
| 4. | | | 11 | 2462 MHz | P34-35 |
| 5. | | 802.11n20 | 1 | 2412 MHz | P36-37 |
| 6. | | | 11 | 2462 MHz | P38-39 |

NOTE 1 – Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin = Limits - Emission Level.
NOTE 2 – "QP" means "Quasi-Peak" values
NOTE 3 – 0°was the table front facing the antenna. Degree is calculated from 0°clockwise facing the antenna.
NOTE 4 – The emission levels which not reported are too low against the official limit.
NOTE 5 – The emission levels recorded below is data of EUT configured in Standing direction, for this direction was the maximum emission direction during the test. The data of Side & Lying direction are too low against the official limit to be reported.
NOTE 6 – All reading are Quasi-Peak values below or equal to 1GHz, Peak and Average values above 1GHz.
For above 1GHz test, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.
NOTE 7 – The frequency range 2310-2390MHz & 2483.5-2500MHz were tested for Restricted bands.

## Radiated emission < 1GHz

| Test Date: | 2023.12.10 | Temp./Hum.: | 22℃/51%RH | Test By: | Jarey |
|---|---|---|---|---|---|

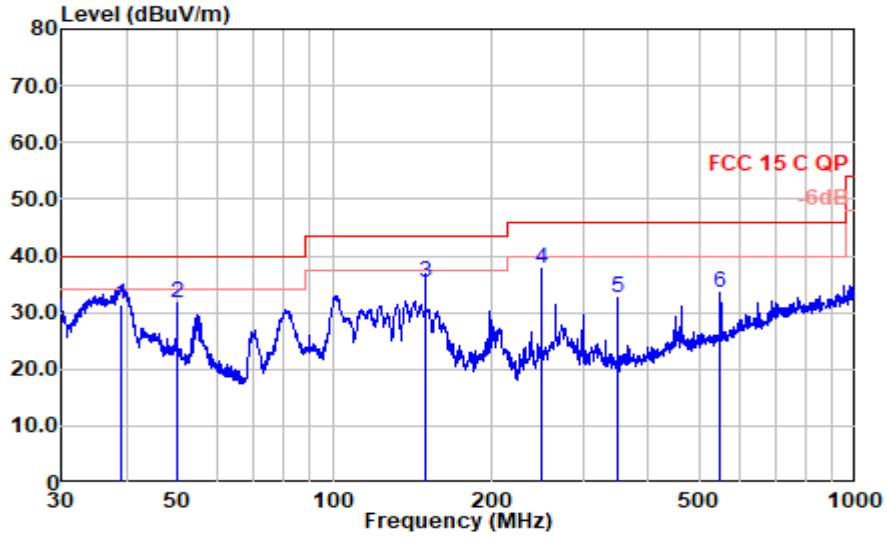
**Mode: 802.11b CH2412MHz**




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 38.730 | 28.77 | 19.37 | 0.68 | 29.90 | 18.93 | 40.00 | 21.07 | QP |
| 49.885 | 29.72 | 19.80 | 0.77 | 29.90 | 20.39 | 40.00 | 19.61 | QP |
| 86.745 | 40.91 | 13.85 | 1.04 | 29.76 | 26.03 | 40.00 | 13.97 | QP |
| 250.020 | 40.26 | 17.70 | 1.73 | 29.15 | 30.54 | 46.00 | 15.46 | QP |
| 350.100 | 36.76 | 20.00 | 2.00 | 28.90 | 29.86 | 46.00 | 16.14 | QP |
| 464.560 | 36.37 | 22.82 | 2.39 | 29.36 | 32.21 | 46.00 | 13.79 | QP |

**Mode: 802.11b CH2412MHz**



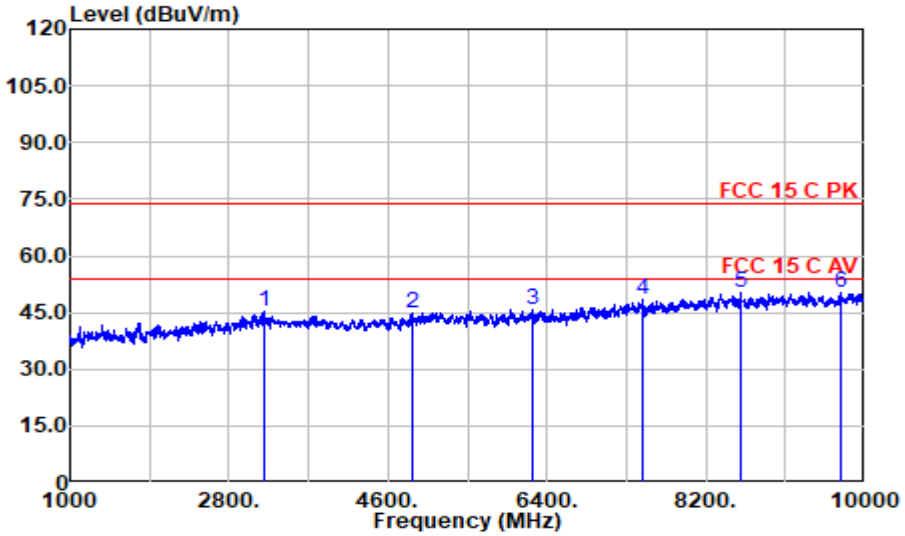

Polarization at Vertical

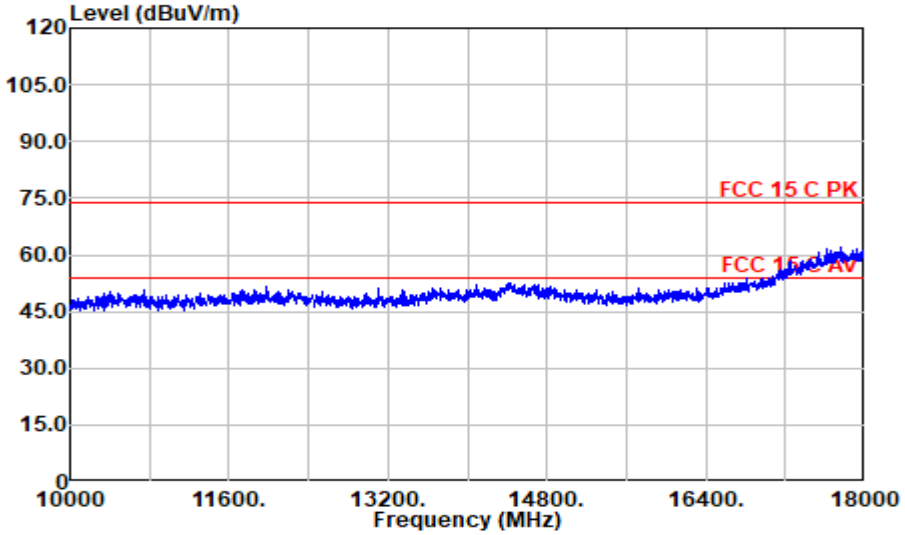
| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 39.024 | 41.13 | 19.40 | 0.68 | 29.90 | 31.31 | 40.00 | 8.69 | QP |
| 49.969 | 41.12 | 19.80 | 0.77 | 29.90 | 31.79 | 40.00 | 8.21 | QP |
| 150.001 | 44.19 | 19.30 | 1.34 | 29.40 | 35.43 | 43.50 | 8.07 | QP |
| 250.301 | 47.57 | 17.71 | 1.73 | 29.15 | 37.86 | 46.00 | 8.14 | QP |
| 350.477 | 39.36 | 20.00 | 2.00 | 28.90 | 32.46 | 46.00 | 13.54 | QP |
| 549.983 | 35.78 | 24.20 | 2.60 | 29.20 | 33.38 | 46.00 | 12.62 | QP |

## Radiated Emission > 1GHz

| Test Date: | 2023. 12.10 | Temp./Hum.: | 22℃/51%RH | Test By: | Jarey |
|---|---|---|---|---|---|

**Mode: 802.11b CH2412MHz**

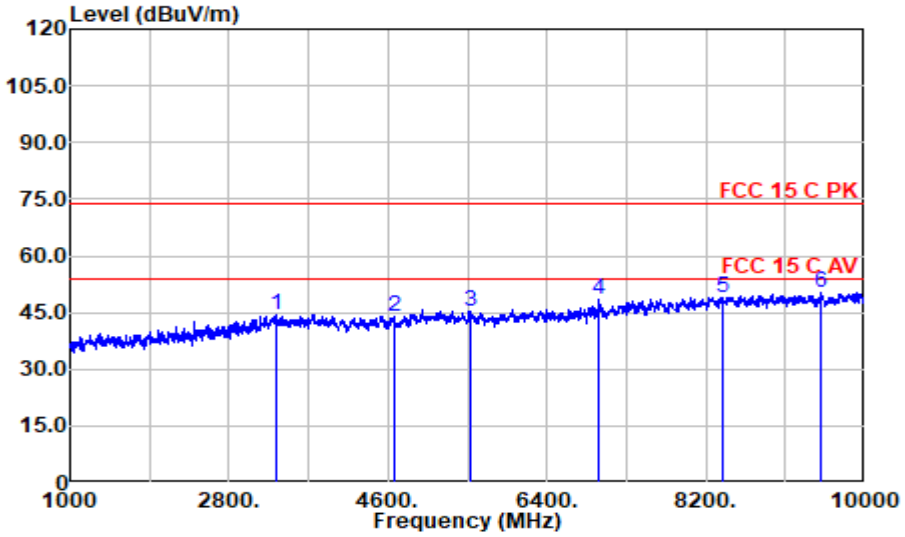


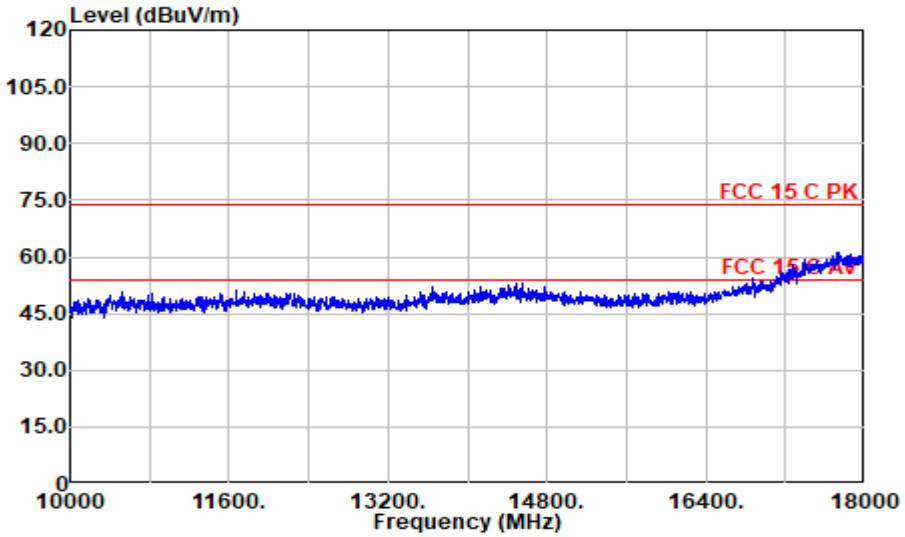




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 3196.000 | 43.54 | 31.08 | 6.06 | 35.31 | 45.38 | 74.00 | 28.62 | Peak |
| 4870.000 | 38.59 | 33.32 | 7.68 | 34.65 | 44.95 | 74.00 | 29.05 | Peak |
| 6233.500 | 37.07 | 34.67 | 8.63 | 34.60 | 45.76 | 74.00 | 28.24 | Peak |
| 7480.000 | 36.61 | 36.84 | 9.78 | 34.75 | 48.48 | 74.00 | 25.52 | Peak |
| 8596.000 | 36.36 | 38.11 | 10.51 | 34.78 | 50.20 | 74.00 | 23.80 | Peak |
| 9734.500 | 35.35 | 38.10 | 11.24 | 34.63 | 50.06 | 74.00 | 23.94 | Peak |

**Mode: 802.11b CH2412MHz**

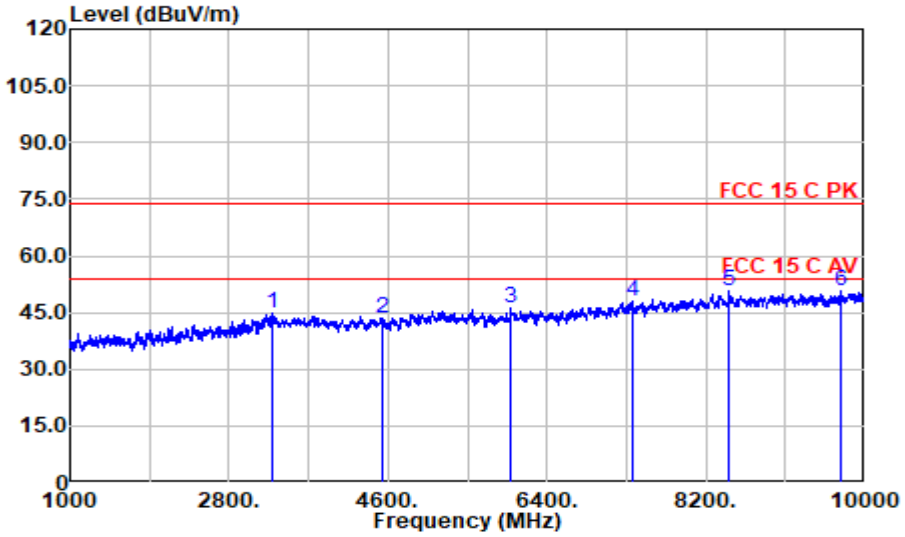


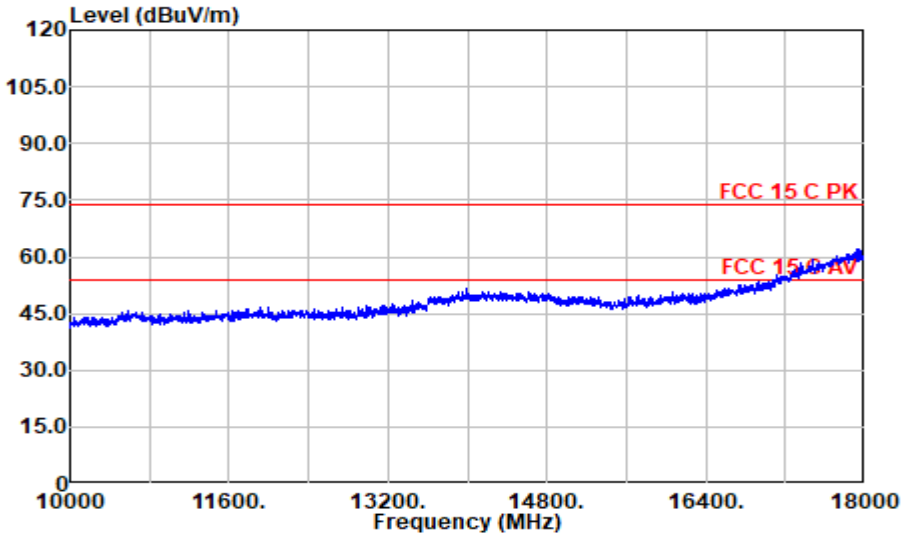




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 3335.500 | 42.02 | 31.40 | 6.19 | 35.25 | 44.37 | 74.00 | 29.63 | Peak |
| 4676.500 | 38.82 | 32.31 | 7.49 | 34.72 | 43.90 | 74.00 | 30.10 | Peak |
| 5545.000 | 37.70 | 34.11 | 8.16 | 34.60 | 45.37 | 74.00 | 28.63 | Peak |
| 6985.000 | 38.12 | 35.60 | 9.24 | 34.60 | 48.36 | 74.00 | 25.64 | Peak |
| 8389.000 | 35.36 | 38.10 | 10.44 | 34.82 | 49.08 | 74.00 | 24.92 | Peak |
| 9500.500 | 35.30 | 38.40 | 11.05 | 34.65 | 50.10 | 74.00 | 23.90 | Peak |

**Mode: 802.11b CH2437MHz**

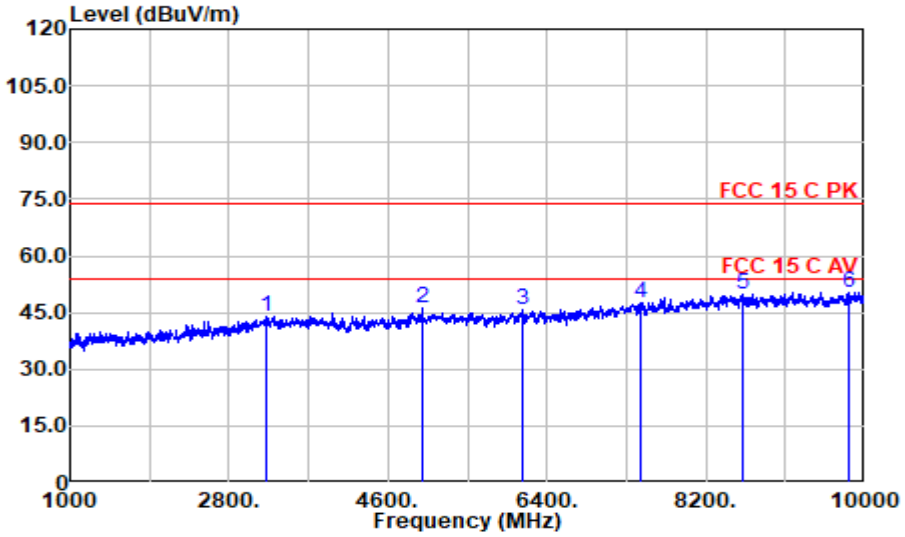


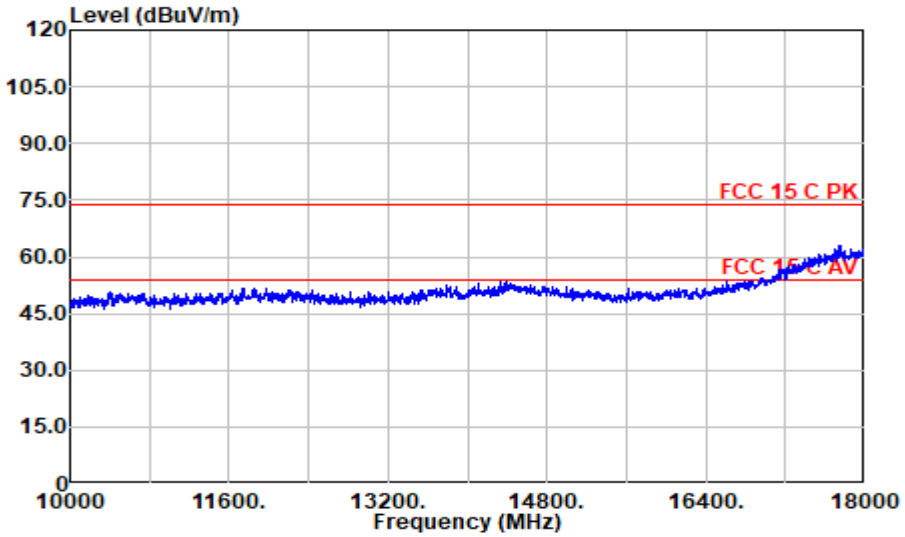




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 3281.500 | 42.45 | 31.29 | 6.14 | 35.28 | 44.61 | 74.00 | 29.39 | Peak |
| 4532.500 | 38.51 | 32.47 | 7.34 | 34.78 | 43.55 | 74.00 | 30.45 | Peak |
| 5986.000 | 38.42 | 34.17 | 8.41 | 34.60 | 46.40 | 74.00 | 27.60 | Peak |
| 7363.000 | 35.94 | 36.90 | 9.65 | 34.71 | 47.77 | 74.00 | 26.23 | Peak |
| 8465.500 | 36.74 | 38.20 | 10.46 | 34.80 | 50.60 | 74.00 | 23.40 | Peak |
| 9721.000 | 35.91 | 38.10 | 11.23 | 34.63 | 50.61 | 74.00 | 23.39 | Peak |

**Mode: 802.11b CH2437MHz**

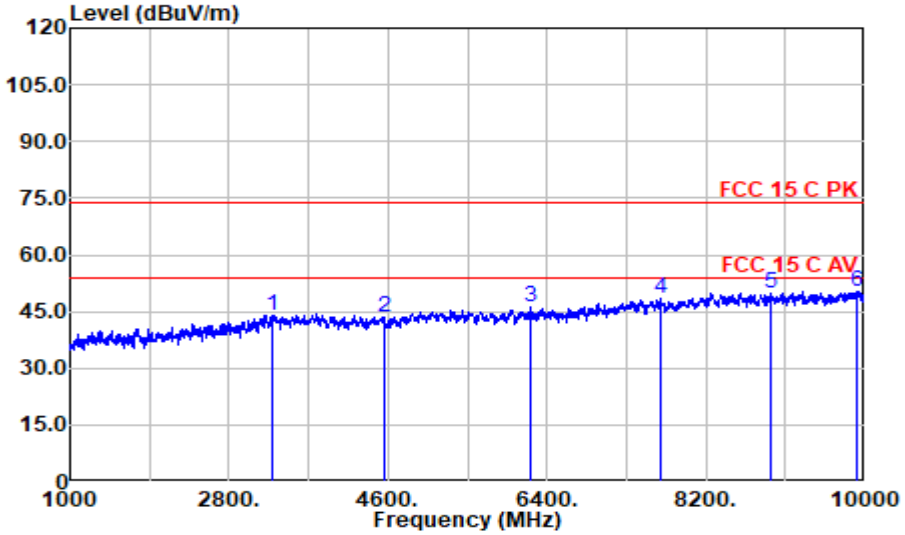


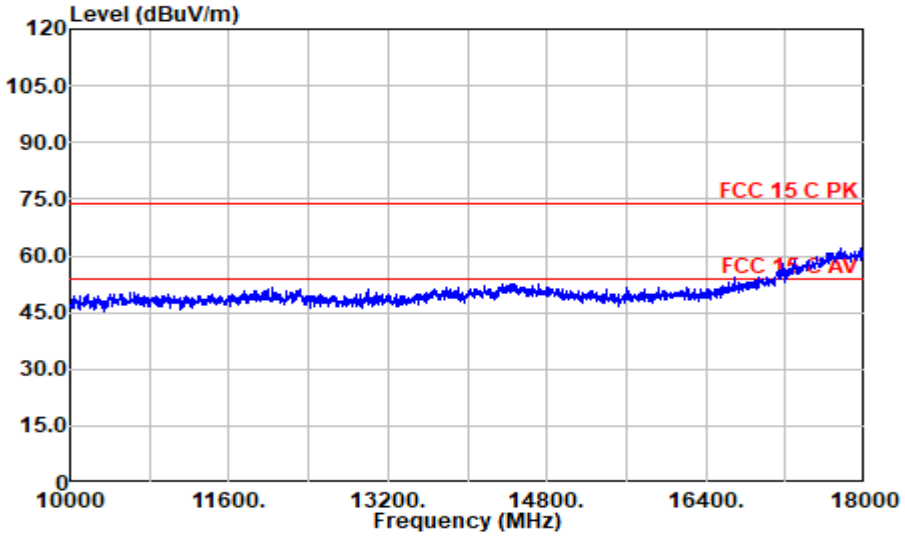




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 3227.500 | 42.17 | 31.10 | 6.09 | 35.30 | 44.06 | 74.00 | 29.94 | Peak |
| 4991.500 | 39.41 | 33.37 | 7.80 | 34.60 | 45.98 | 74.00 | 28.02 | Peak |
| 6125.500 | 37.43 | 34.45 | 8.53 | 34.60 | 45.81 | 74.00 | 28.19 | Peak |
| 7457.500 | 35.82 | 36.88 | 9.75 | 34.74 | 47.71 | 74.00 | 26.29 | Peak |
| 8627.500 | 35.80 | 38.10 | 10.52 | 34.77 | 49.64 | 74.00 | 24.36 | Peak |
| 9815.500 | 35.58 | 38.13 | 11.31 | 34.62 | 50.39 | 74.00 | 23.61 | Peak |

**Mode: 802.11b CH2462MHz**

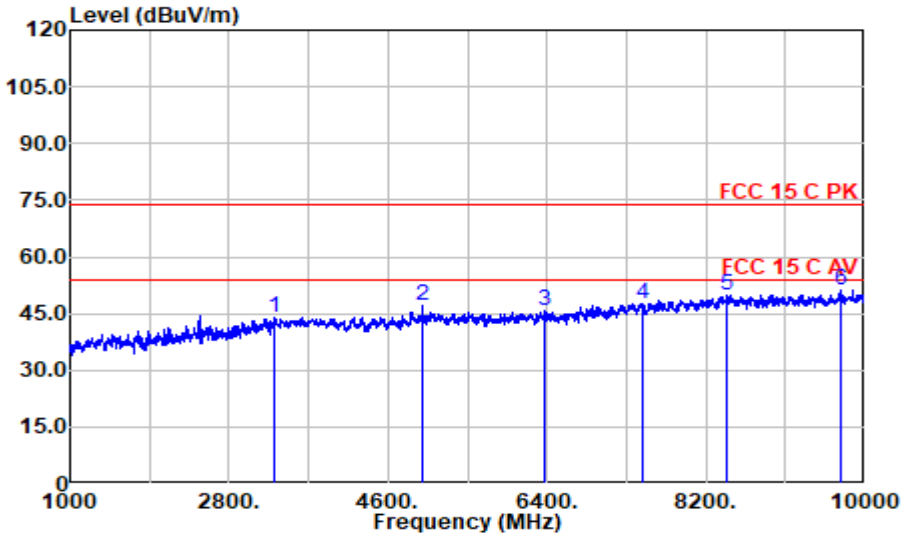


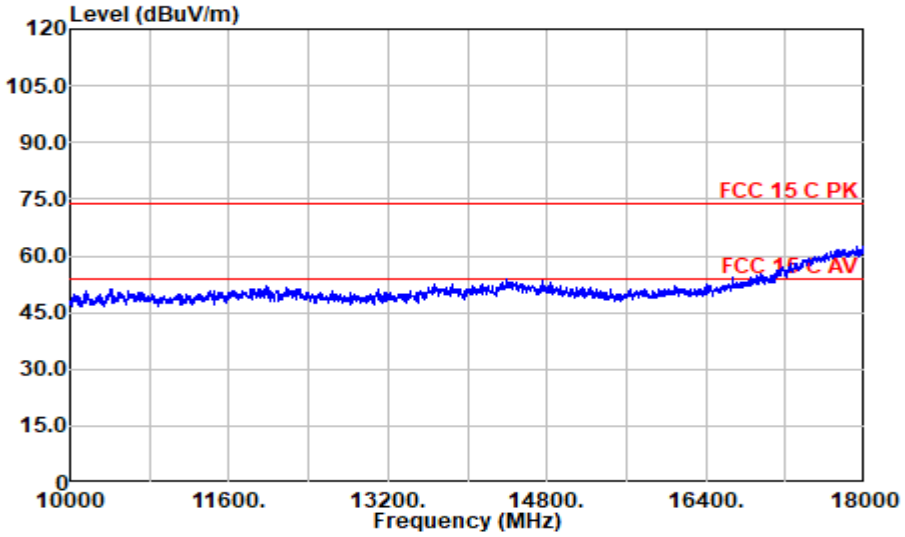




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 3290.500 | 41.90 | 31.34 | 6.15 | 35.27 | 44.13 | 74.00 | 29.87 | Peak |
| 4555.000 | 38.58 | 32.39 | 7.37 | 34.77 | 43.57 | 74.00 | 30.43 | Peak |
| 6215.500 | 37.42 | 34.63 | 8.61 | 34.60 | 46.06 | 74.00 | 27.94 | Peak |
| 7687.000 | 36.31 | 36.80 | 9.99 | 34.81 | 48.29 | 74.00 | 25.71 | Peak |
| 8924.500 | 35.79 | 38.05 | 10.61 | 34.71 | 49.74 | 74.00 | 24.26 | Peak |
| 9910.000 | 34.98 | 38.40 | 11.38 | 34.61 | 50.15 | 74.00 | 23.85 | Peak |

**Mode: 802.11b CH2462MHz**

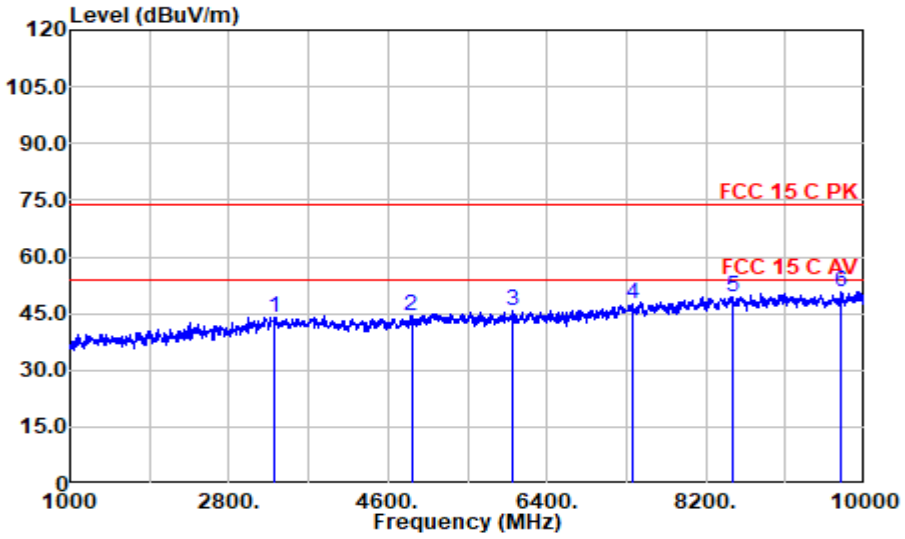


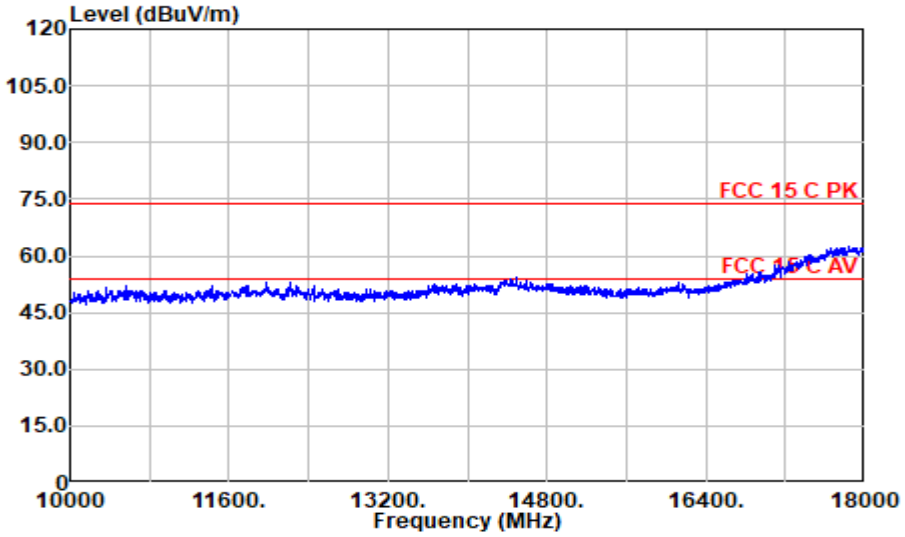




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 3322.000 | 41.45 | 31.40 | 6.18 | 35.26 | 43.77 | 74.00 | 30.23 | Peak |
| 4987.000 | 40.67 | 33.35 | 7.80 | 34.60 | 47.21 | 74.00 | 26.79 | Peak |
| 6373.000 | 36.89 | 34.61 | 8.74 | 34.60 | 45.64 | 74.00 | 28.36 | Peak |
| 7475.500 | 35.83 | 36.85 | 9.77 | 34.75 | 47.71 | 74.00 | 26.29 | Peak |
| 8443.000 | 35.84 | 38.19 | 10.46 | 34.81 | 49.67 | 74.00 | 24.33 | Peak |
| 9721.000 | 36.36 | 38.10 | 11.23 | 34.63 | 51.07 | 74.00 | 22.93 | Peak |

**Mode: 802.11g CH2412MHz**

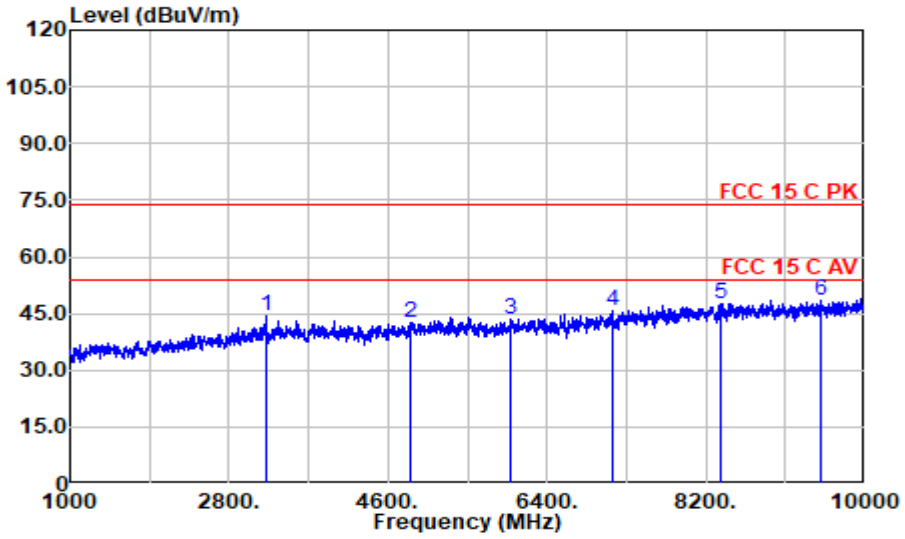


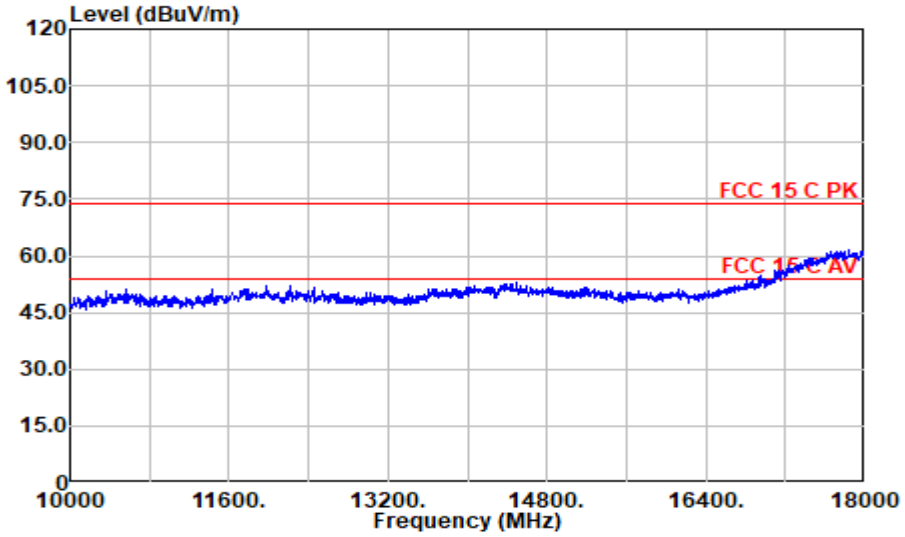




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 3322.000 | 41.69 | 31.40 | 6.18 | 35.26 | 44.01 | 74.00 | 29.99 | Peak |
| 4865.500 | 38.16 | 33.29 | 7.68 | 34.65 | 44.48 | 74.00 | 29.52 | Peak |
| 6004.000 | 37.64 | 34.22 | 8.42 | 34.60 | 45.68 | 74.00 | 28.32 | Peak |
| 7367.500 | 35.51 | 36.90 | 9.66 | 34.71 | 47.36 | 74.00 | 26.64 | Peak |
| 8515.000 | 35.60 | 38.20 | 10.48 | 34.79 | 49.48 | 74.00 | 24.52 | Peak |
| 9730.000 | 35.96 | 38.10 | 11.24 | 34.63 | 50.67 | 74.00 | 23.33 | Peak |

**Mode: 802.11g CH2412MHz**

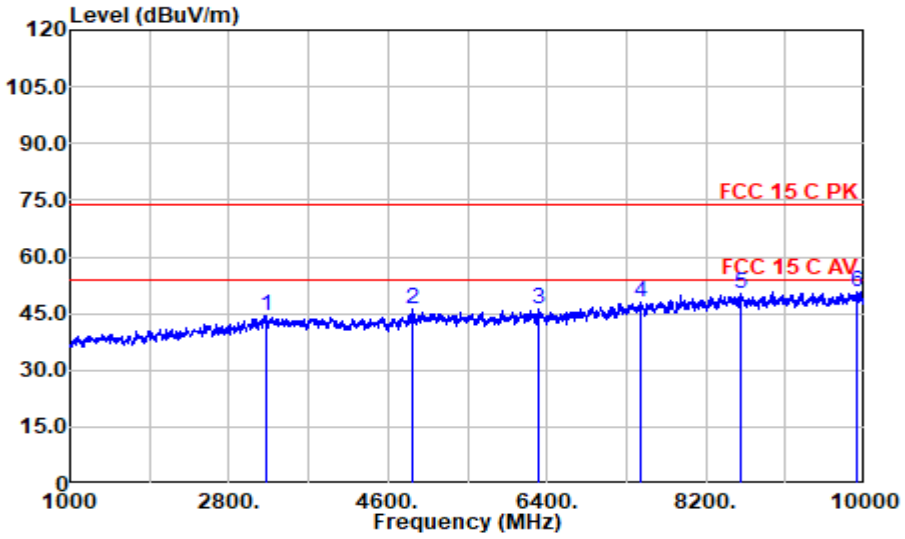


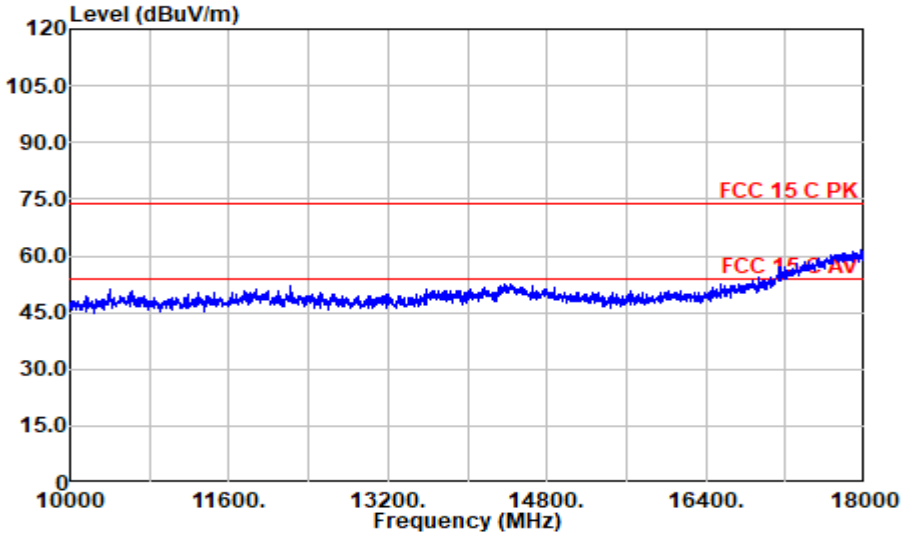




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 3214.000 | 42.34 | 31.10 | 6.08 | 35.30 | 44.22 | 74.00 | 29.78 | Peak |
| 4861.000 | 36.34 | 33.27 | 7.68 | 34.65 | 42.63 | 74.00 | 31.37 | Peak |
| 5981.500 | 35.68 | 34.16 | 8.41 | 34.60 | 43.65 | 74.00 | 30.35 | Peak |
| 7133.500 | 35.23 | 35.93 | 9.40 | 34.64 | 45.93 | 74.00 | 28.07 | Peak |
| 8371.000 | 33.99 | 38.10 | 10.43 | 34.82 | 47.71 | 74.00 | 26.30 | Peak |
| 9500.500 | 33.85 | 38.40 | 11.05 | 34.65 | 48.66 | 74.00 | 25.34 | Peak |

**Mode: 802.11n CH2412MHz**

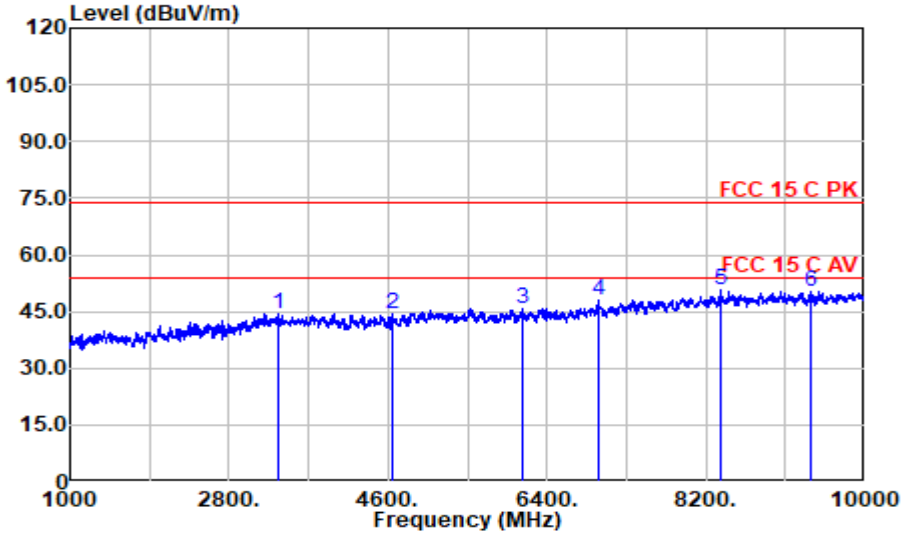


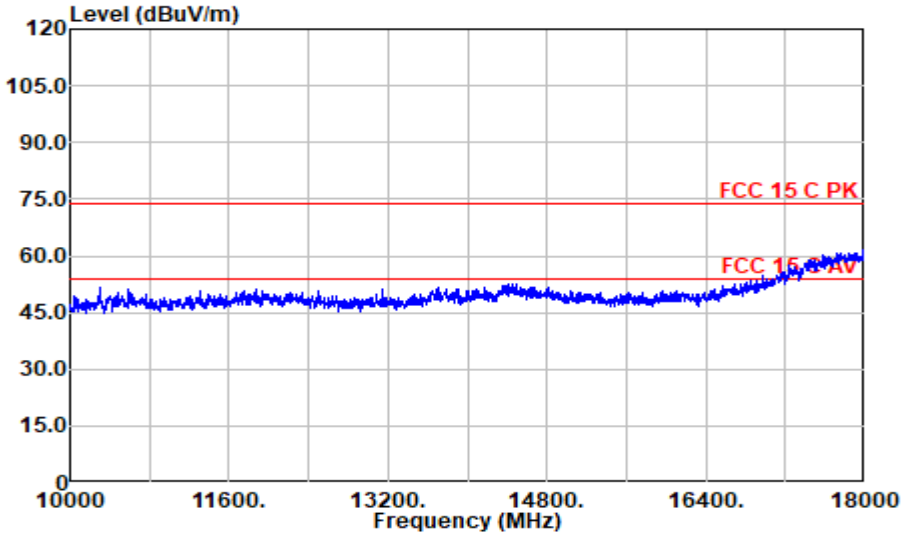




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 3232.000 | 42.48 | 31.10 | 6.10 | 35.30 | 44.38 | 74.00 | 29.62 | Peak |
| 4879.000 | 39.66 | 33.37 | 7.69 | 34.64 | 46.09 | 74.00 | 27.91 | Peak |
| 6310.000 | 37.36 | 34.70 | 8.69 | 34.60 | 46.15 | 74.00 | 27.85 | Peak |
| 7457.500 | 36.16 | 36.88 | 9.75 | 34.74 | 48.05 | 74.00 | 25.95 | Peak |
| 8600.500 | 36.24 | 38.10 | 10.51 | 34.78 | 50.07 | 74.00 | 23.93 | Peak |
| 9910.000 | 35.58 | 38.40 | 11.38 | 34.61 | 50.75 | 74.00 | 23.25 | Peak |

**Mode: 802.11n CH2412MHz**



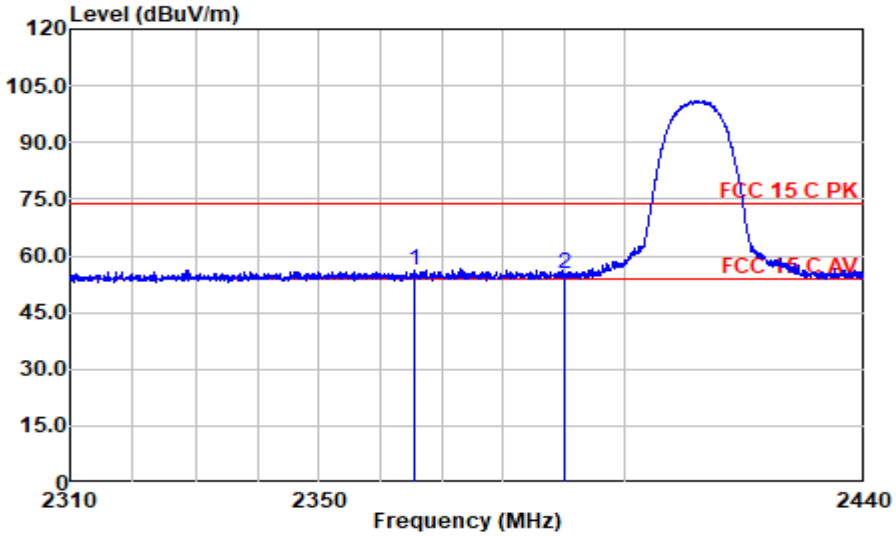

Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 3349.000 | 42.10 | 31.40 | 6.21 | 35.25 | 44.46 | 74.00 | 29.54 | Peak |
| 4649.500 | 39.62 | 32.20 | 7.46 | 34.73 | 44.56 | 74.00 | 29.44 | Peak |
| 6121.000 | 37.20 | 34.46 | 8.53 | 34.60 | 45.59 | 74.00 | 28.41 | Peak |
| 6976.000 | 37.83 | 35.60 | 9.23 | 34.60 | 48.06 | 74.00 | 25.94 | Peak |
| 8375.500 | 37.15 | 38.10 | 10.43 | 34.82 | 50.87 | 74.00 | 23.13 | Peak |
| 9379.000 | 35.93 | 38.12 | 10.95 | 34.66 | 50.34 | 74.00 | 23.66 | Peak |

## Band-Edge and Restricted bands:

| Test Date: | 2023.11.23-12.10 | Temp./Hum.: | 22°C/51%RH | Test By: | Jarey |
|---|---|---|---|---|---|

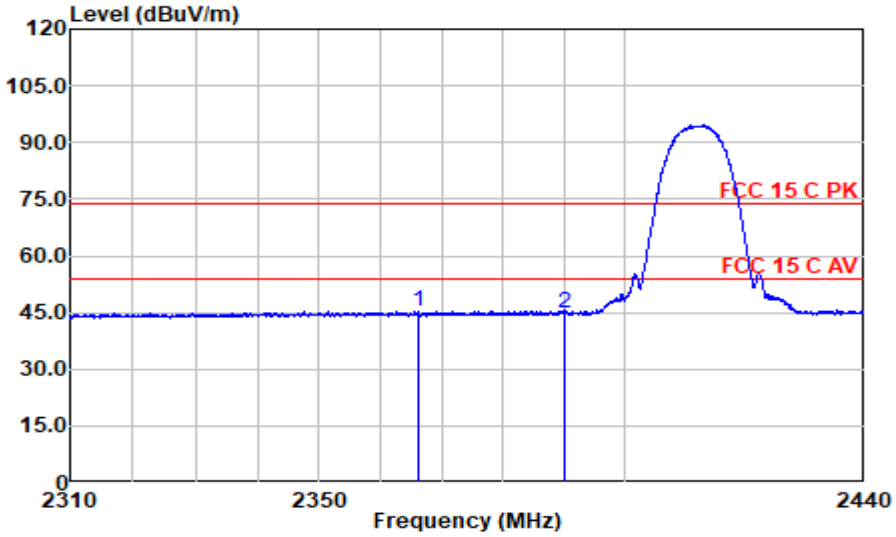
**Mode: 802.11b CH2412MHz**




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2365.575 | 58.30 | 28.46 | 5.37 | 36.04 | 56.08 | 74.00 | 17.92 | Peak |
| 2390.000 | 57.23 | 28.56 | 5.39 | 36.02 | 55.17 | 74.00 | 18.83 | Peak |

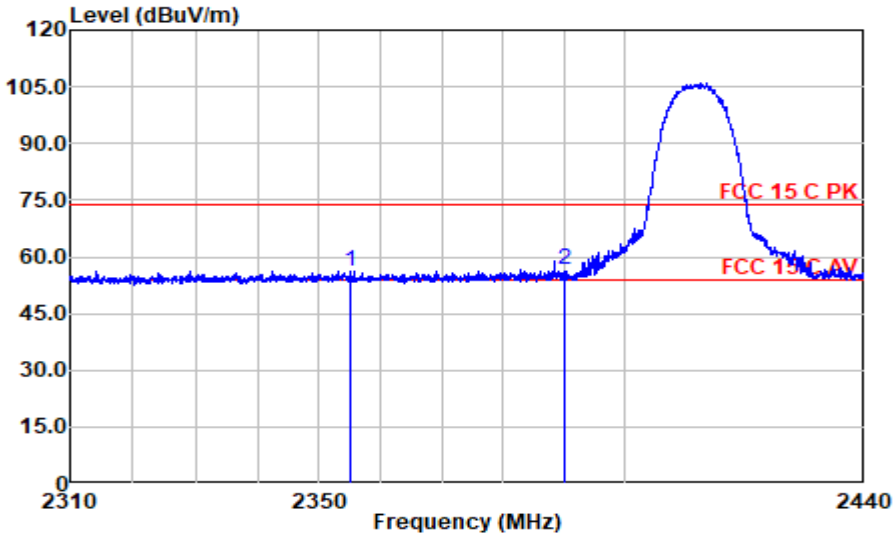
**Mode: 802.11b CH2412MHz**




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2366.225 | 47.59 | 28.47 | 5.37 | 36.04 | 45.38 | 54.00 | 8.62 | Average |
| 2390.000 | 46.86 | 28.56 | 5.39 | 36.02 | 44.80 | 54.00 | 9.20 | Average |

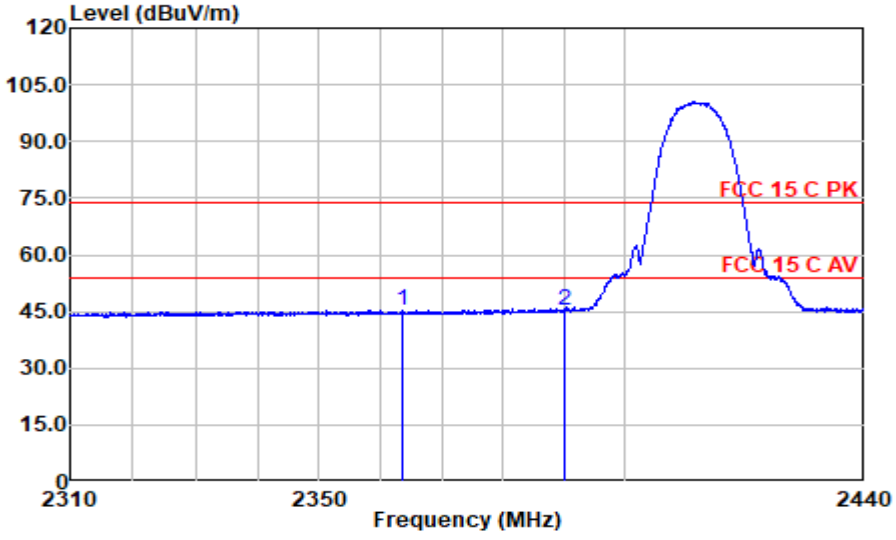
**Mode: 802.11b CH2412MHz**




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2354.915 | 58.52 | 28.42 | 5.36 | 36.06 | 56.24 | 74.00 | 17.76 | Peak |
| 2390.000 | 58.49 | 28.56 | 5.39 | 36.02 | 56.42 | 74.00 | 17.58 | Peak |

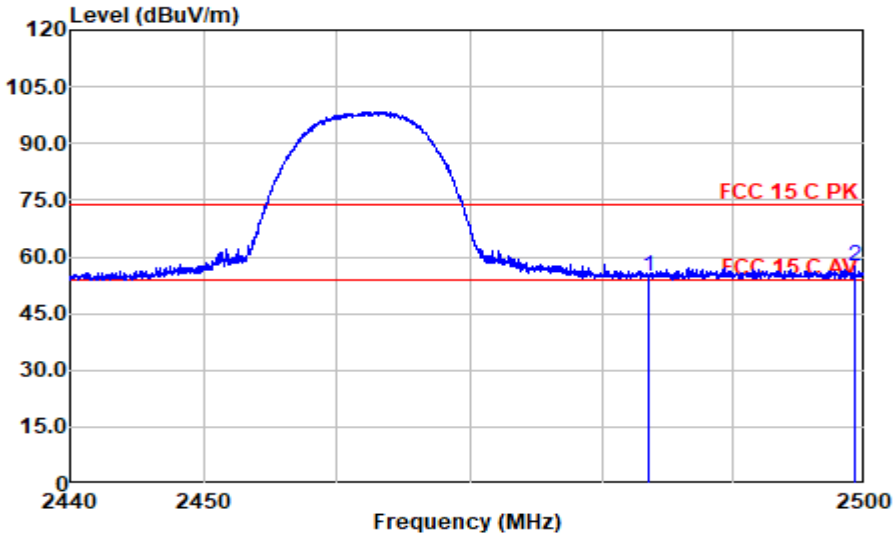
**Mode: 802.11b CH2412MHz**




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2363.625 | 47.53 | 28.45 | 5.36 | 36.05 | 45.30 | 54.00 | 8.70 | Average |
| 2390.000 | 47.34 | 28.56 | 5.39 | 36.02 | 45.27 | 54.00 | 8.73 | Average |

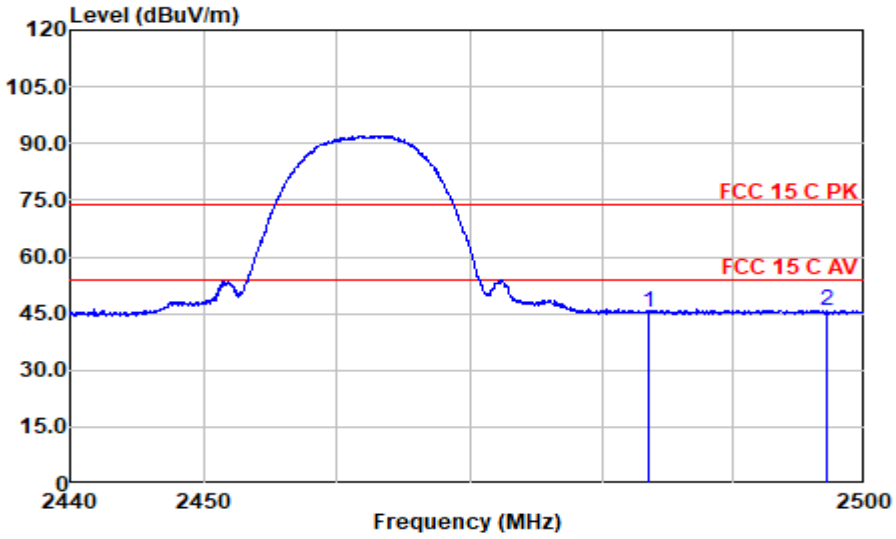
**Mode: 802.11b CH2462MHz**




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2483.500 | 56.75 | 28.63 | 5.47 | 35.91 | 54.94 | 74.00 | 19.06 | Peak |
| 2499.250 | 59.01 | 28.70 | 5.48 | 35.90 | 57.29 | 74.00 | 16.71 | Peak |

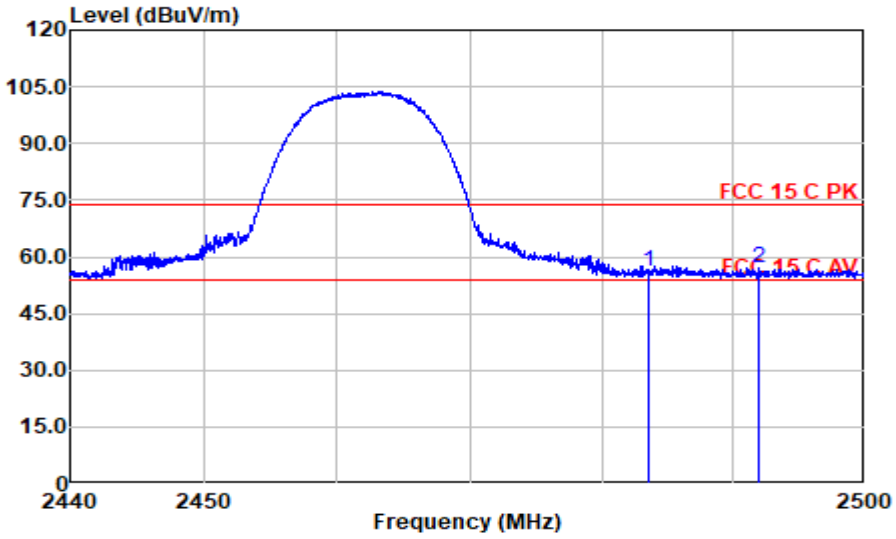
**Mode: 802.11b CH2462MHz**




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2483.500 | 47.24 | 28.63 | 5.47 | 35.91 | 45.43 | 54.00 | 8.57 | Average |
| 2497.150 | 47.69 | 28.69 | 5.48 | 35.90 | 45.96 | 54.00 | 8.04 | Average |

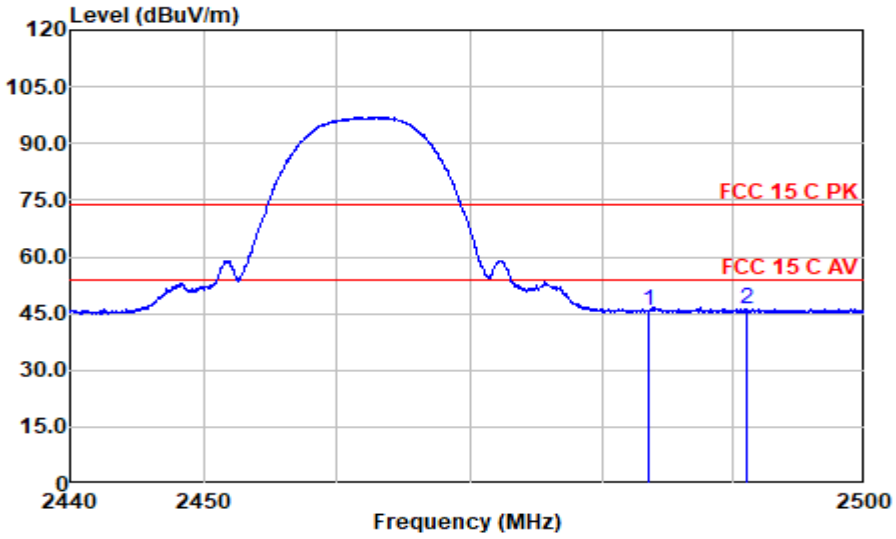
**Mode: 802.11b CH2462MHz**




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2483.500 | 58.06 | 28.63 | 5.47 | 35.91 | 56.25 | 74.00 | 17.75 | Peak |
| 2491.900 | 58.83 | 28.67 | 5.48 | 35.90 | 57.07 | 74.00 | 16.93 | Peak |

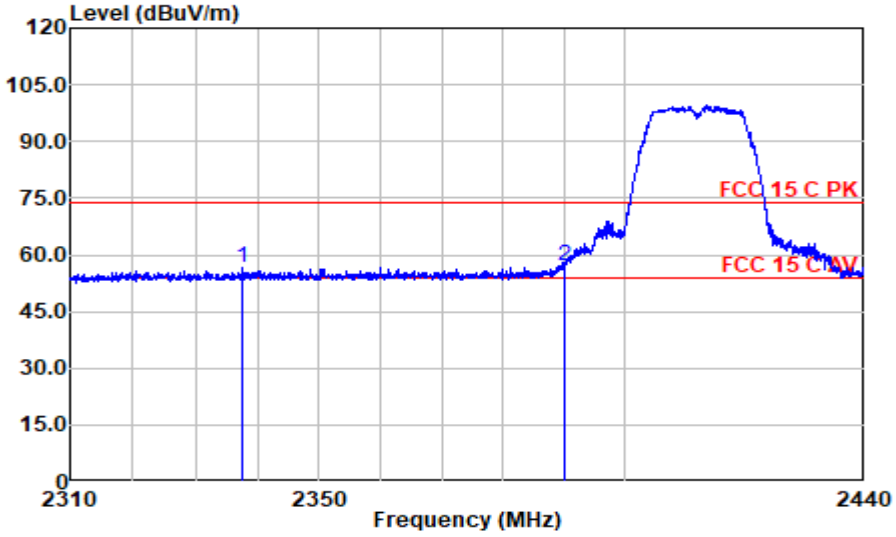
**Mode: 802.11b CH2462MHz**




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2483.500 | 47.72 | 28.63 | 5.47 | 35.91 | 45.91 | 54.00 | 8.09 | Average |
| 2491.030 | 48.16 | 28.66 | 5.48 | 35.90 | 46.40 | 54.00 | 7.60 | Average |

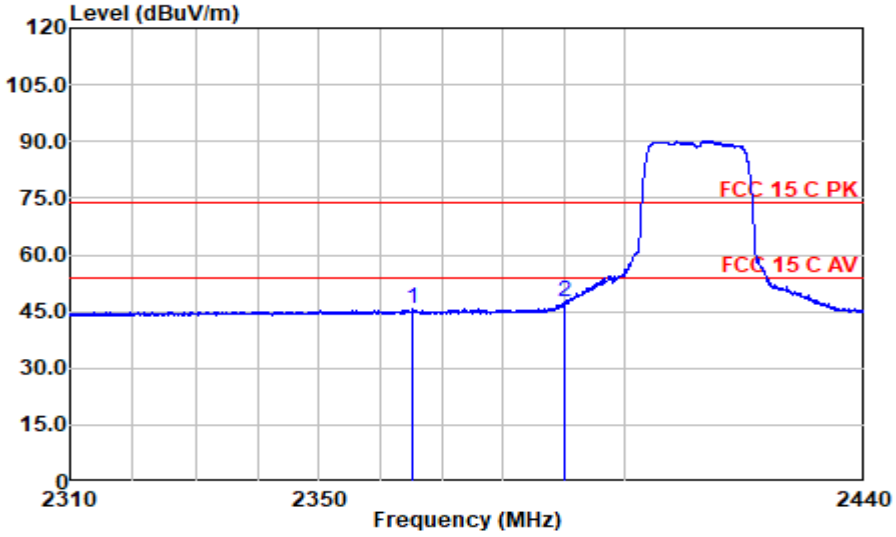
**Mode: 802.11g CH2412MHz**




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2337.625 | 58.84 | 28.30 | 5.34 | 36.08 | 56.41 | 74.00 | 17.59 | Peak |
| 2390.000 | 59.27 | 28.56 | 5.39 | 36.02 | 57.20 | 74.00 | 16.80 | Peak |

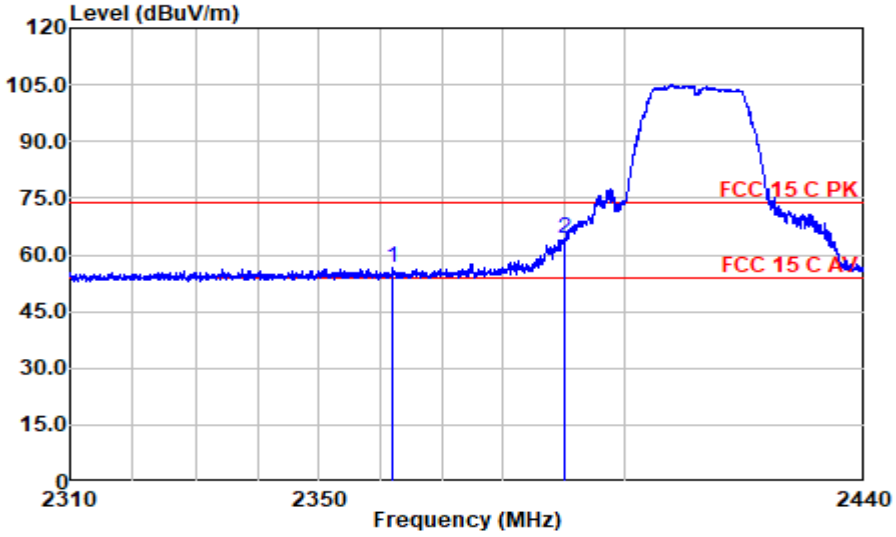
**Mode: 802.11g CH2412MHz**




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2365.250 | 47.85 | 28.46 | 5.37 | 36.04 | 45.64 | 54.00 | 8.36 | Average |
| 2390.000 | 49.70 | 28.56 | 5.39 | 36.02 | 47.63 | 54.00 | 6.37 | Average |

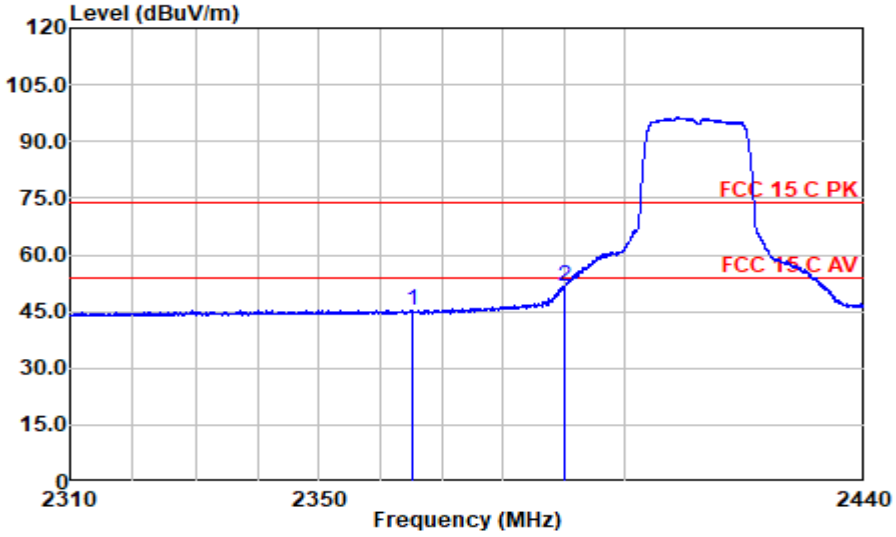
**Mode: 802.11g CH2412MHz**




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2362.000 | 58.91 | 28.45 | 5.36 | 36.05 | 56.67 | 74.00 | 17.33 | Peak |
| 2390.000 | 66.20 | 28.56 | 5.39 | 36.02 | 64.13 | 74.00 | 9.87 | Peak |

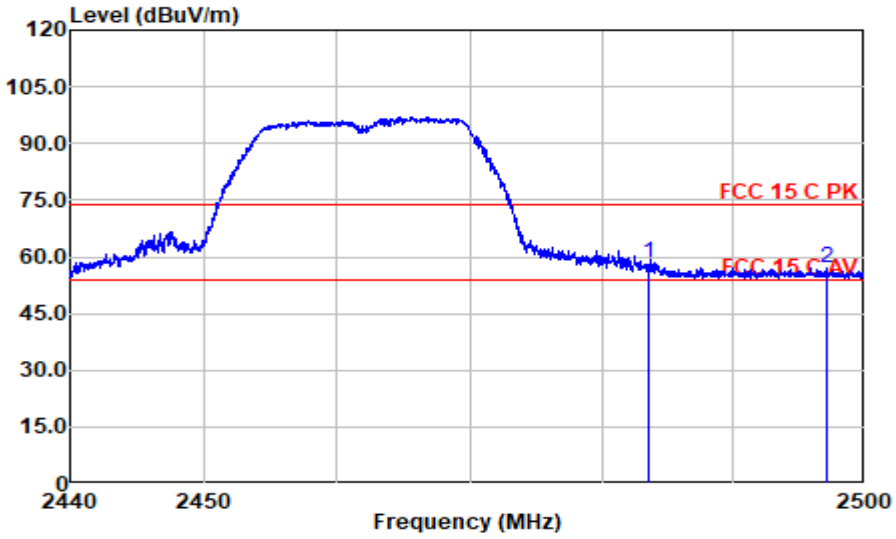
**Mode: 802.11g CH2412MHz**




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2364.990 | 47.49 | 28.46 | 5.37 | 36.05 | 45.28 | 54.00 | 8.72 | Average |
| 2390.000 | 53.86 | 28.56 | 5.39 | 36.02 | 51.79 | 54.00 | 2.21 | Average |

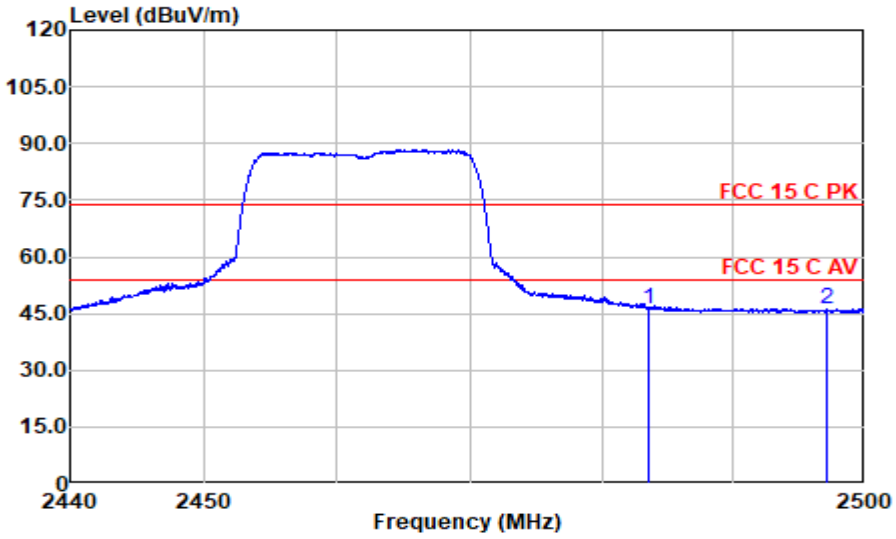
**Mode: 802.11g CH2462MHz**




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2483.500 | 60.32 | 28.63 | 5.47 | 35.91 | 58.52 | 74.00 | 15.48 | Peak |
| 2497.090 | 58.90 | 28.69 | 5.48 | 35.90 | 57.17 | 74.00 | 16.83 | Peak |

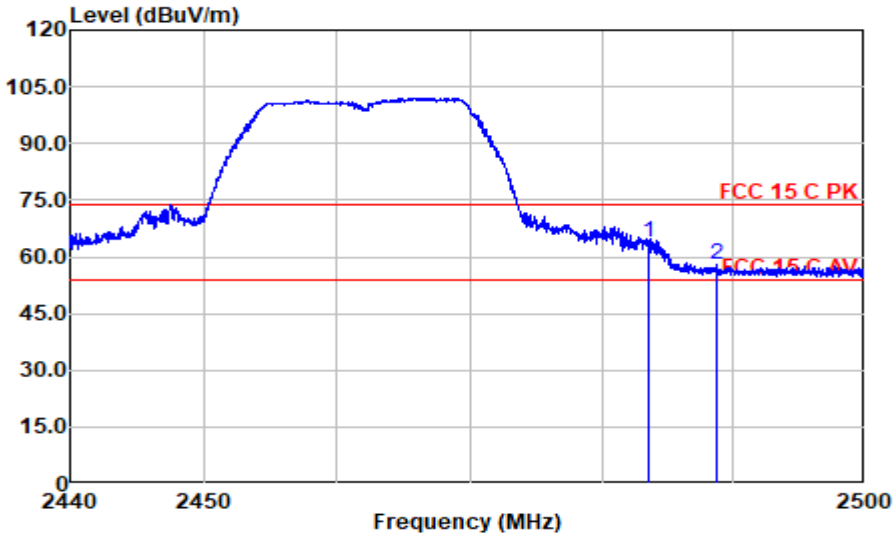
**Mode: 802.11g CH2462MHz**




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2483.500 | 48.19 | 28.63 | 5.47 | 35.91 | 46.38 | 54.00 | 7.62 | Average |
| 2497.030 | 48.12 | 28.69 | 5.48 | 35.90 | 46.40 | 54.00 | 7.60 | Average |

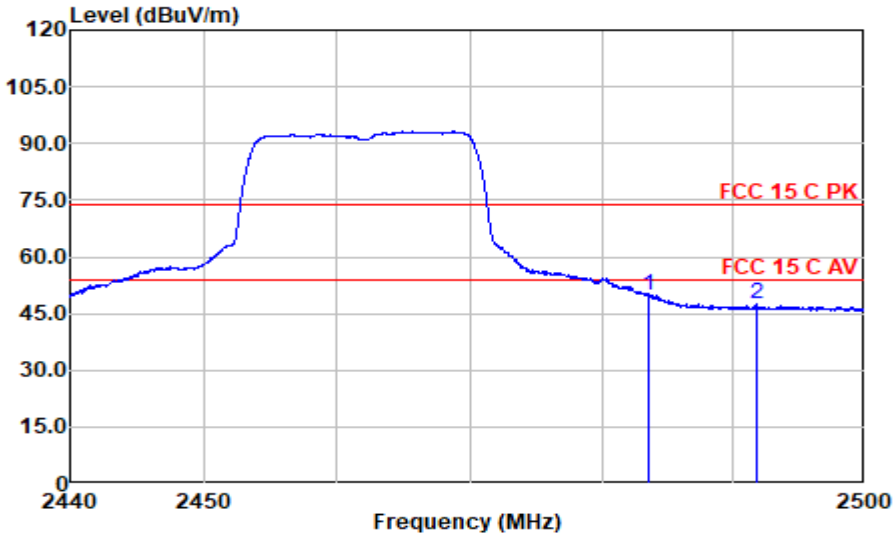
**Mode: 802.11g CH2462MHz**




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2483.500 | 65.73 | 28.63 | 5.47 | 35.91 | 63.93 | 74.00 | 10.07 | Peak |
| 2488.720 | 59.87 | 28.66 | 5.47 | 35.91 | 58.10 | 74.00 | 15.90 | Peak |

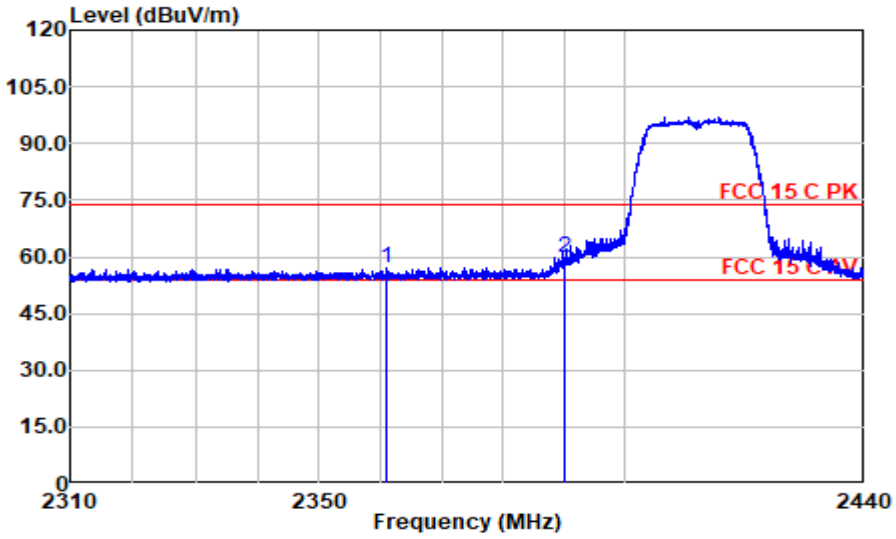
**Mode: 802.11g CH2462MHz**




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2483.500 | 51.67 | 28.63 | 5.47 | 35.91 | 49.86 | 54.00 | 4.14 | Average |
| 2491.720 | 49.36 | 28.67 | 5.48 | 35.90 | 47.60 | 54.00 | 6.40 | Average |

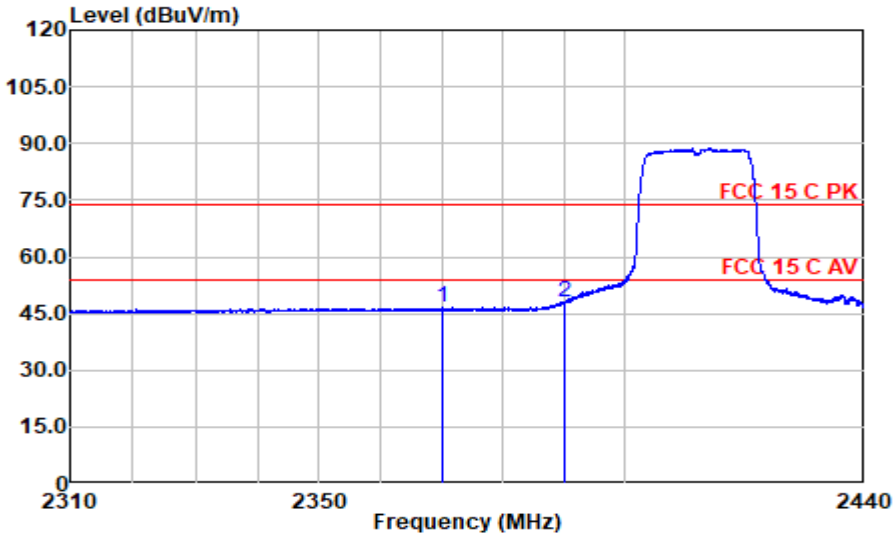
**Mode: 802.11n CH2412MHz**




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2360.798 | 59.43 | 28.44 | 5.36 | 36.05 | 57.18 | 74.00 | 16.82 | Peak |
| 2390.000 | 61.86 | 28.56 | 5.39 | 36.02 | 59.79 | 74.00 | 14.21 | Peak |

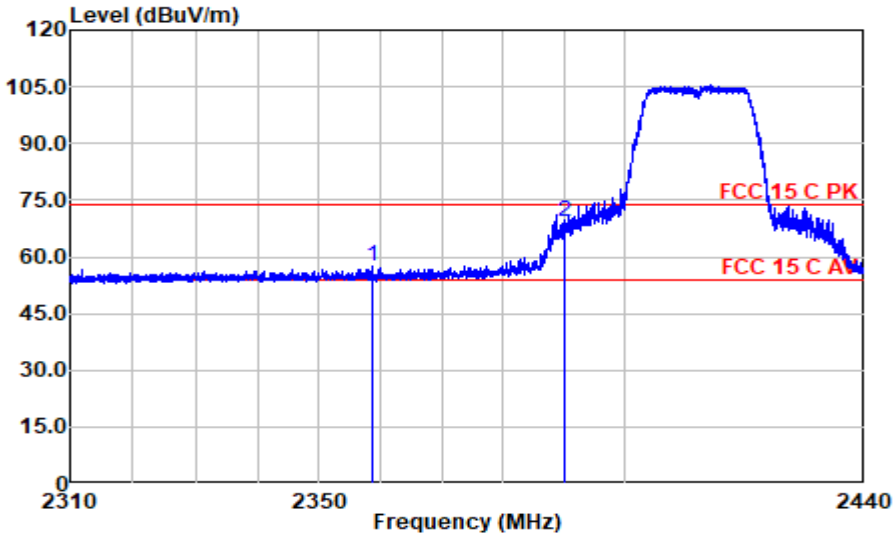
**Mode: 802.11n CH2412MHz**




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2369.930 | 48.69 | 28.48 | 5.37 | 36.04 | 46.50 | 54.00 | 7.50 | Average |
| 2390.000 | 49.90 | 28.56 | 5.39 | 36.02 | 47.83 | 54.00 | 6.17 | Average |

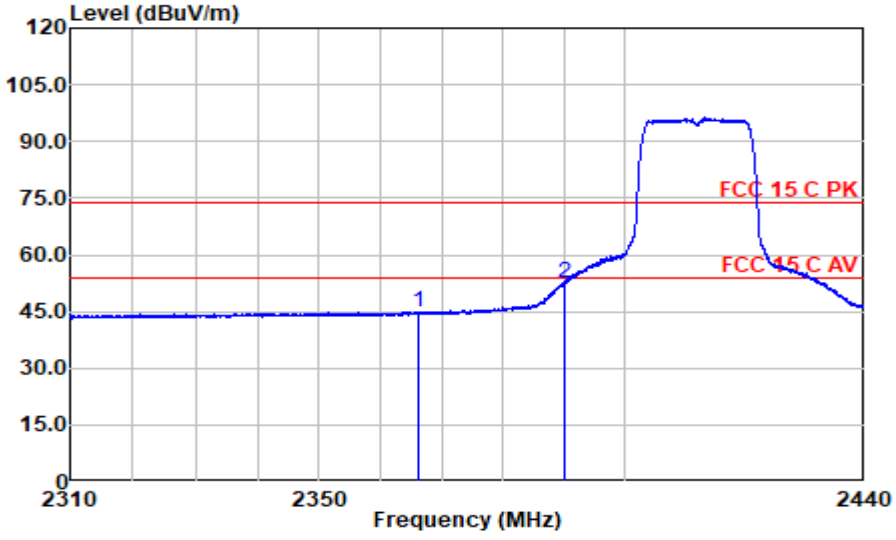
**Mode: 802.11n CH2412MHz**




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2358.490 | 59.77 | 28.43 | 5.36 | 36.05 | 57.52 | 74.00 | 16.48 | Peak |
| 2390.000 | 71.23 | 28.56 | 5.39 | 36.02 | 69.16 | 74.00 | 4.84 | Peak |

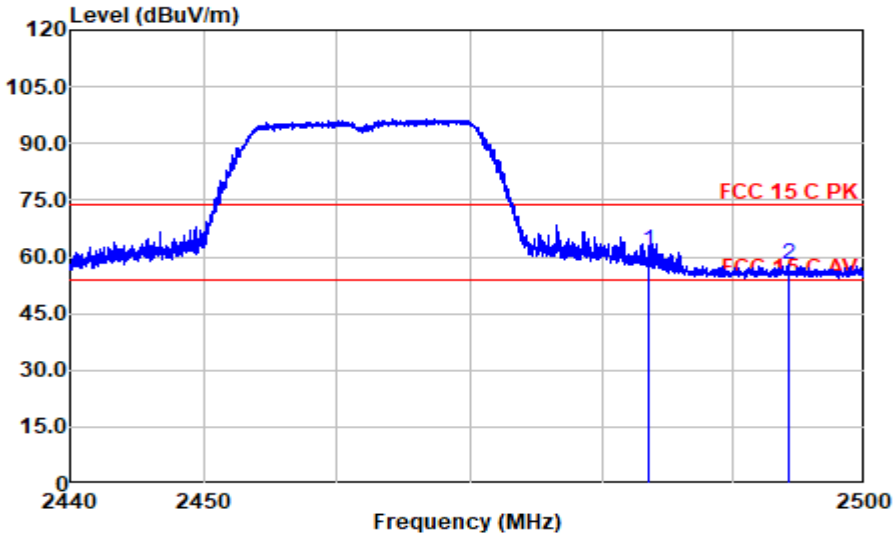
**Mode: 802.11n CH2412MHz**




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2366.127 | 47.20 | 28.46 | 5.37 | 36.04 | 44.99 | 54.00 | 9.01 | Average |
| 2390.000 | 54.80 | 28.56 | 5.39 | 36.02 | 52.73 | 54.00 | 1.27 | Average |

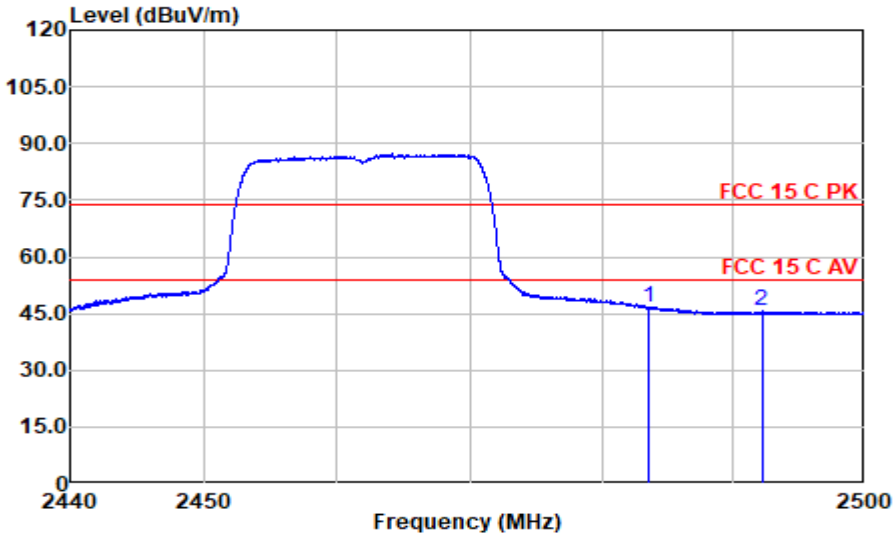
**Mode: 802.11n CH2462MHz**




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2483.500 | 63.47 | 28.63 | 5.47 | 35.91 | 61.66 | 74.00 | 12.34 | Peak |
| 2494.150 | 59.86 | 28.68 | 5.48 | 35.90 | 58.11 | 74.00 | 15.89 | Peak |

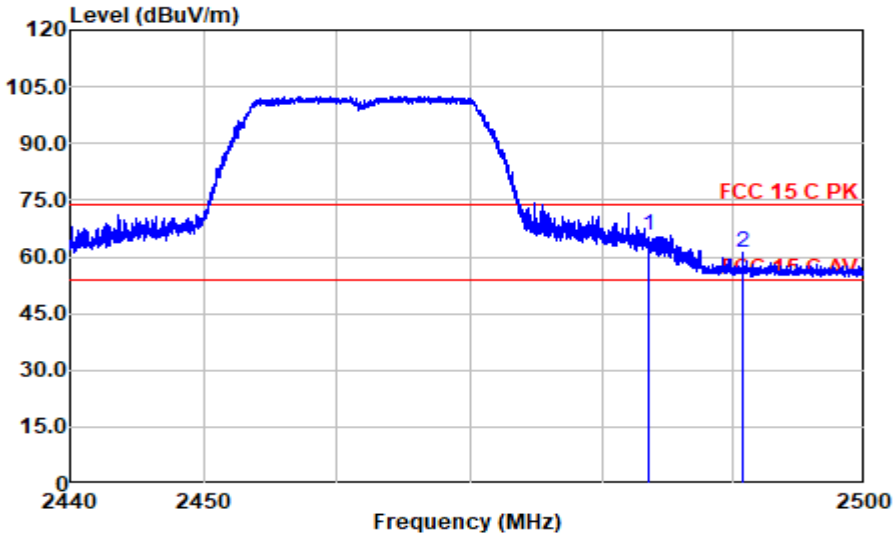
**Mode: 802.11n CH2462MHz**




Polarization at Horizontal

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2483.500 | 48.46 | 28.63 | 5.47 | 35.91 | 46.65 | 54.00 | 7.35 | Average |
| 2492.140 | 47.33 | 28.67 | 5.48 | 35.90 | 45.57 | 54.00 | 8.43 | Average |

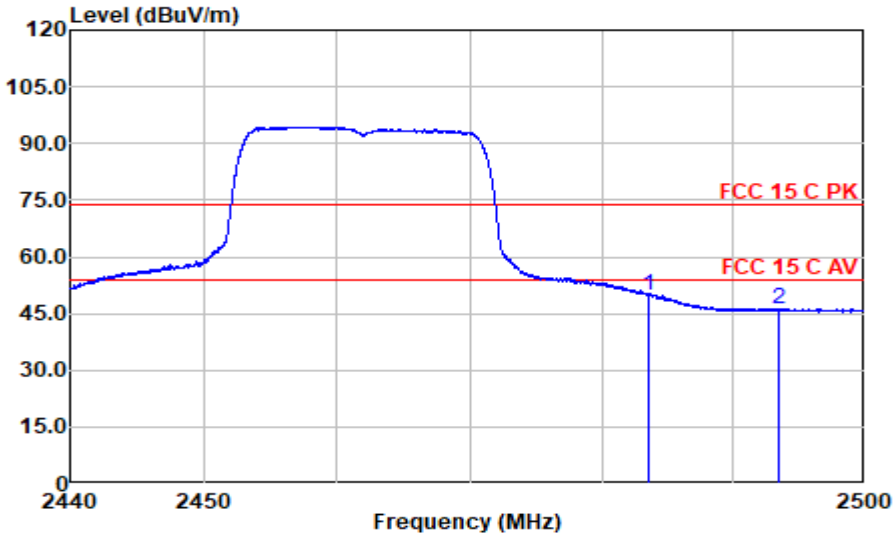
**Mode: 802.11n CH2462MHz**




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2483.500 | 67.54 | 28.63 | 5.47 | 35.91 | 65.73 | 74.00 | 8.27 | Peak |
| 2490.730 | 63.10 | 28.66 | 5.48 | 35.90 | 61.33 | 74.00 | 12.67 | Peak |

**Mode: 802.11n CH2462MHz**




Polarization at Vertical

| Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 2483.500 | 51.83 | 28.63 | 5.47 | 35.91 | 50.02 | 54.00 | 3.98 | Average |
| 2493.415 | 48.11 | 28.67 | 5.48 | 35.90 | 46.36 | 54.00 | 7.64 | Average |

# 4 99% OCCUPIED BANDWIDTH MEASUREMENT

## 4.1 Test Equipment

The following test equipment was used during the Emission Bandwidth measurement:

| Item | Type | Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | Agilent | N9010A | MY52221182 | 2023.08.09 | 1 Year |
| 2. | RF Cable | Mini-Circuits | FLC-3FT-SM SM+ | 22022838 | 2023.08.09 | 1 Year |
| 3. | 20 dB Attenuator | Mini-Circuits | BW-S20W2+ | 001 | 2023.09.21 | 1 Year |

## 4.2 Block Diagram of Test Setup


## 4.3 Operating Condition of EUT

The software as section 2.3 was used to enable the EUT to change the test mode one by one.

## 4.4 Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of 99% power bandwidth was measure by spectrum analyzer with settings: Span = between 1.5 times and 5.0 times of the OBW, RBW = 1% to 5% of the OBW, VBW ≥ 3 × RBW, Detector = Peak, Trace = Max Hold.
Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

The test procedure is defined in ANSI C63.10-2013 (the 6.9.3 Measurement Procedure “Occupied bandwidth—power bandwidth (99%) measurement procedure” was used).

## 4.5 Test Results

**PASSED.**

All the test results are attached in next pages.

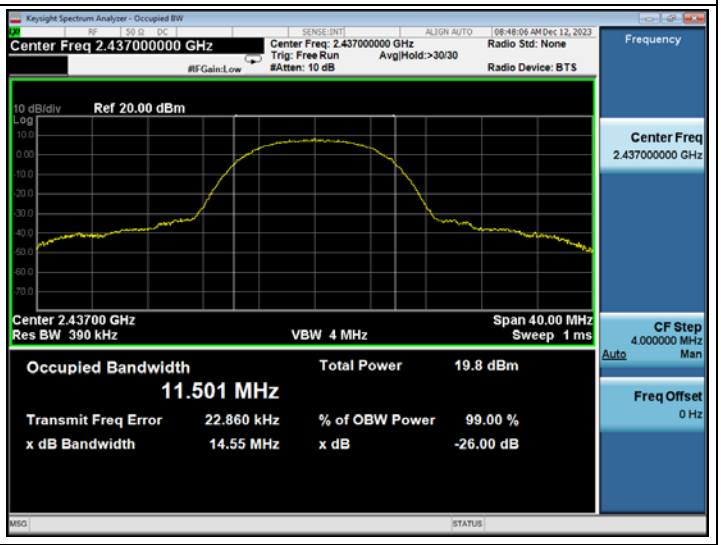
(Test Date: 2023.12.12 Temperature: 23℃ Humidity: 51 %)

| Mode | Channel | Frequency (MHz) | **99% Bandwidth (MHz)** |
|---|---|---|---|
| 802.11b | 1 | 2412 | **11.51** |
| | 6 | 2437 | **11.501** |
| | 11 | 2462 | **11.492** |
| 802.11g | 1 | 2412 | **17.495** |
| | 6 | 2437 | **17.49** |
| | 11 | 2462 | **17.493** |
| 802.11n20 | 1 | 2412 | **18.583** |
| | 6 | 2437 | **18.626** |
| | 11 | 2462 | **18.523** |

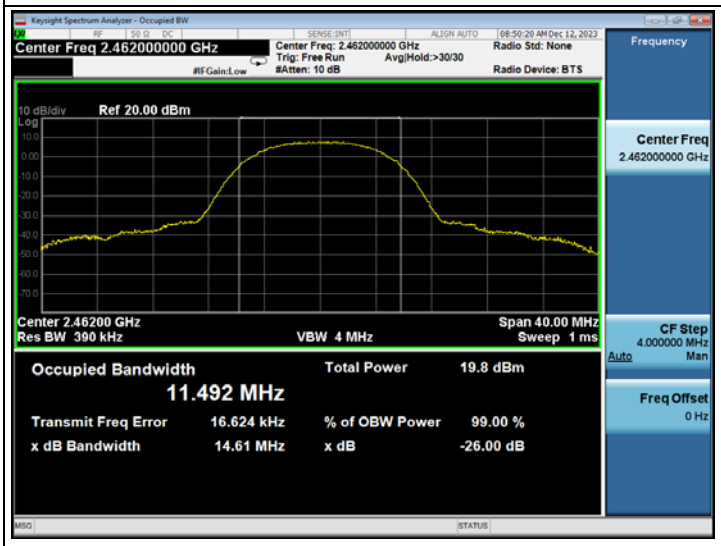
**802.11b**

CH2412


CH2437

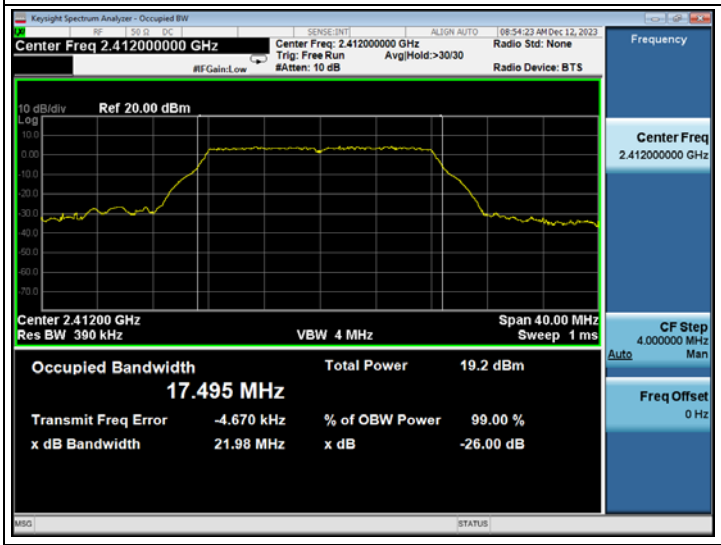



CH2462

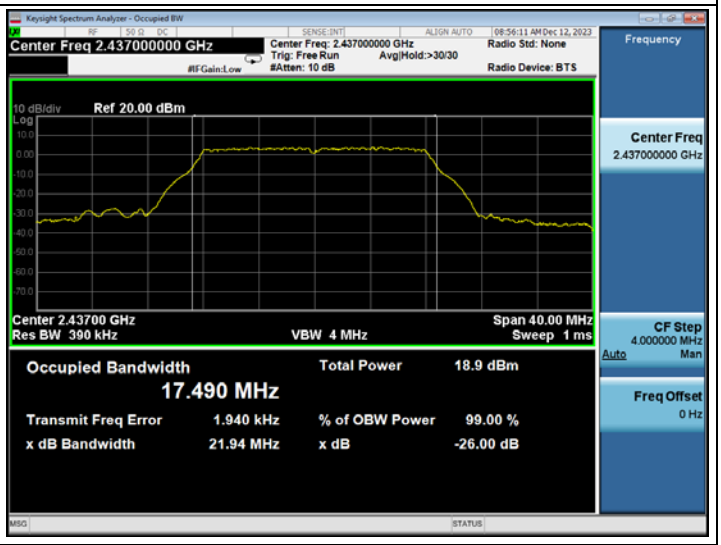


**802.11g**

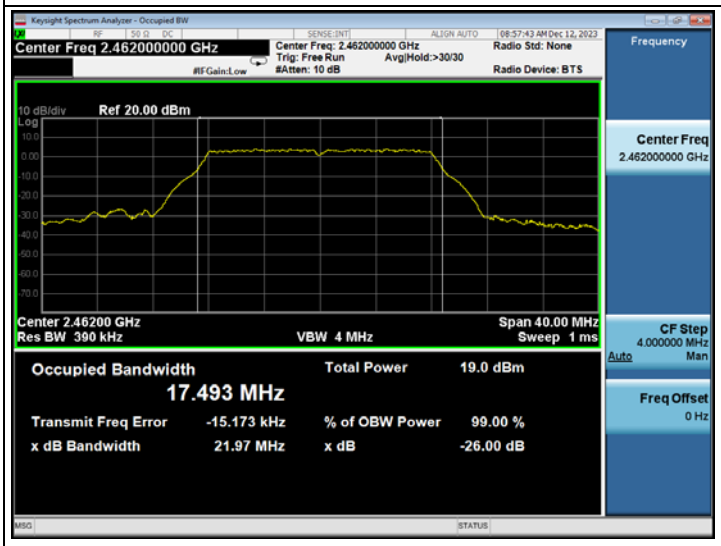
CH2412




CH2437

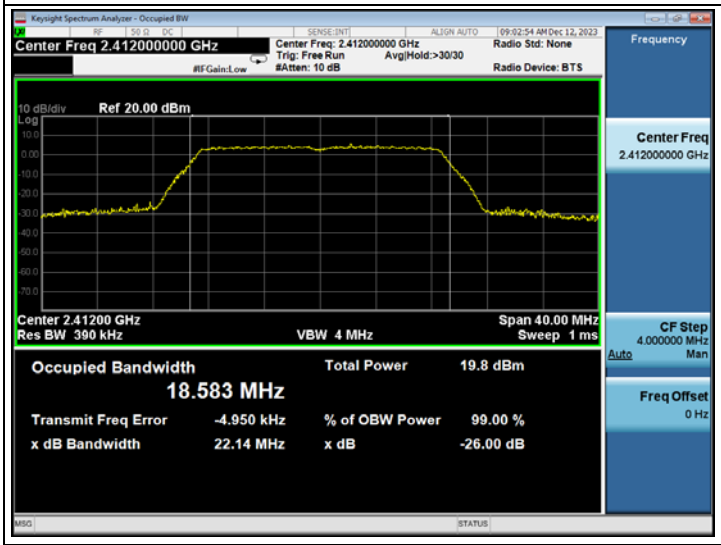



CH2462

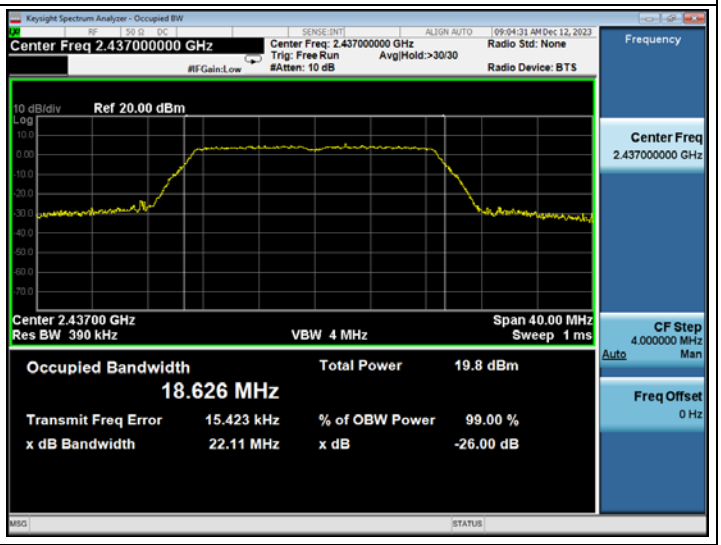


**802.11n20**

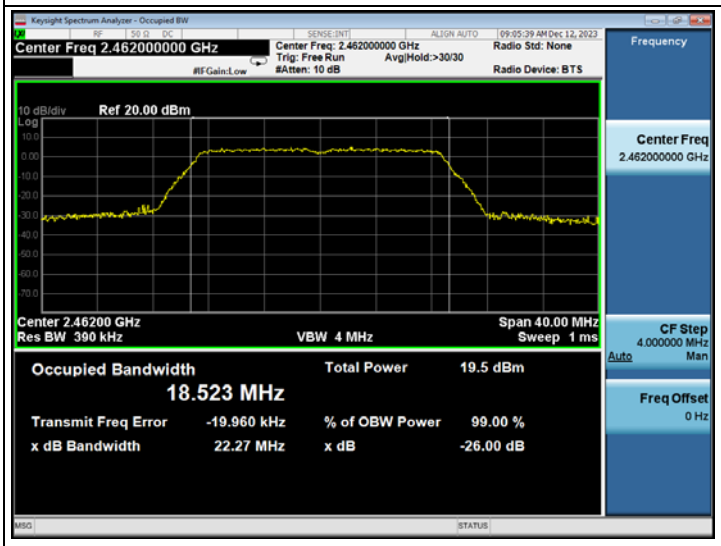
CH2412




CH2437




CH2462



# 5 6 dB BANDWIDTH MEASUREMENT

## 5.1 Test Equipment

The following test equipment was used during the Emission Bandwidth measurement:

| Item | Type | Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | Agilent | N9010A | MY52221182 | 2023.08.09 | 1 Year |
| 2. | RF Cable | Mini-Circuits | FLC-3FT-SM SM+ | 22022838 | 2023.08.09 | 1 Year |
| 3. | 20 dB Attenuator | Mini-Circuits | BW-S20W2+ | 001 | 2023.09.21 | 1 Year |

## 5.2 Block Diagram of Test Setup

The Same as Section. 5.2.

## 5.3 Specification Limits (§15.247(a)(2))

The minimum 6 dB bandwidth shall be at least 500 kHz.

## 5.4 Operating Condition of EUT

The software as section 2.3 was used to enable the EUT to change the test mode one by one.

## 5.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with settings: RBW = 100kHz, VBW ≥ 3 × RBW.

The 6 dB bandwidth is defined as the total spectrum the power of which is lower than peak power minus 6 dB .

The test procedure is defined in ANSI C63.10-2013 (the 11.8.2 Measurement Procedure “Option 2” was used).

## 5.6 Test Results

**PASSED.**

All the test results are attached in next pages.

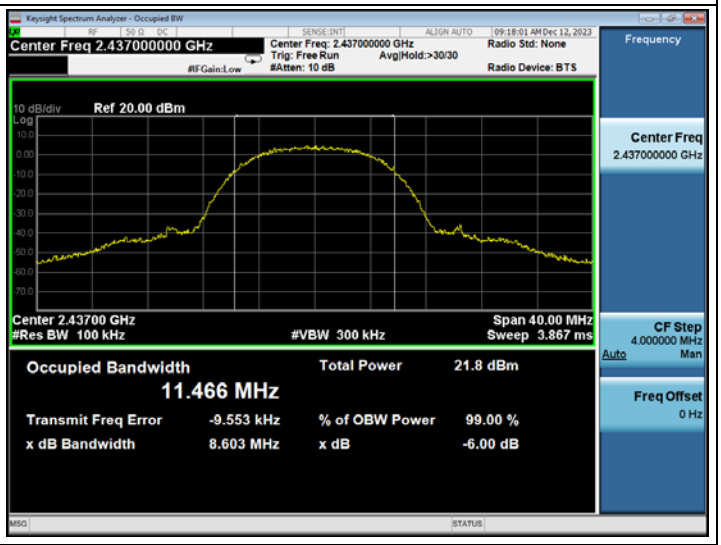
(Test Date: 2023.12.12 Temperature: 23℃ Humidity: 51 %)

| Mode | Channel | Frequency (MHz) | **6dB Bandwidth (MHz)** | Limit |
|---|---|---|---|---|
| 802.11b | 1 | 2412 | **8.628** | 500 kHz |
| | 6 | 2437 | **8.603** | 500 kHz |
| | 11 | 2462 | **8.871** | 500 kHz |
| 802.11g | 1 | 2412 | **16.39** | 500 kHz |
| | 6 | 2437 | **16.39** | 500 kHz |
| | 11 | 2462 | **16.39** | 500 kHz |
| 802.11n20 | 1 | 2412 | **17.65** | 500 kHz |
| | 6 | 2437 | **17.63** | 500 kHz |
| | 11 | 2462 | **17.64** | 500 kHz |

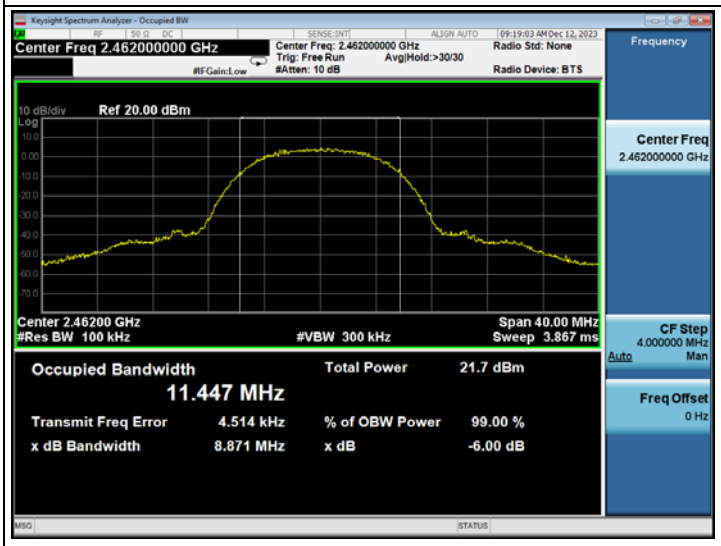
**802.11b**

CH2412


CH2437



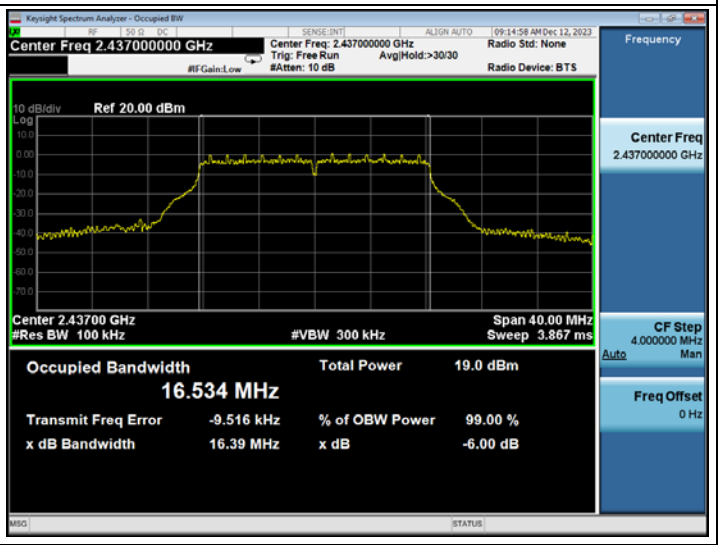

CH2462



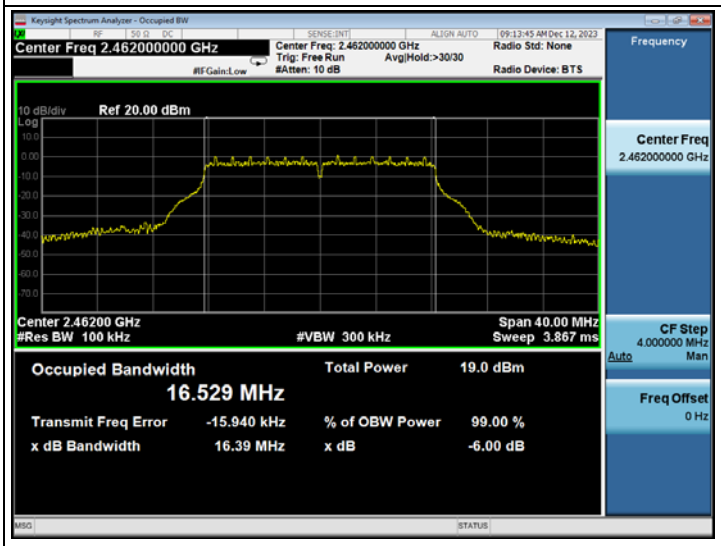
**802.11g**

CH2412


CH2437

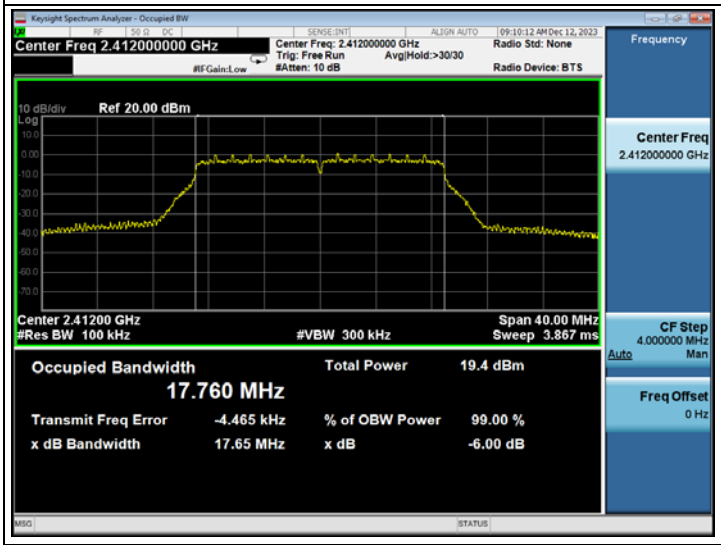



CH2462

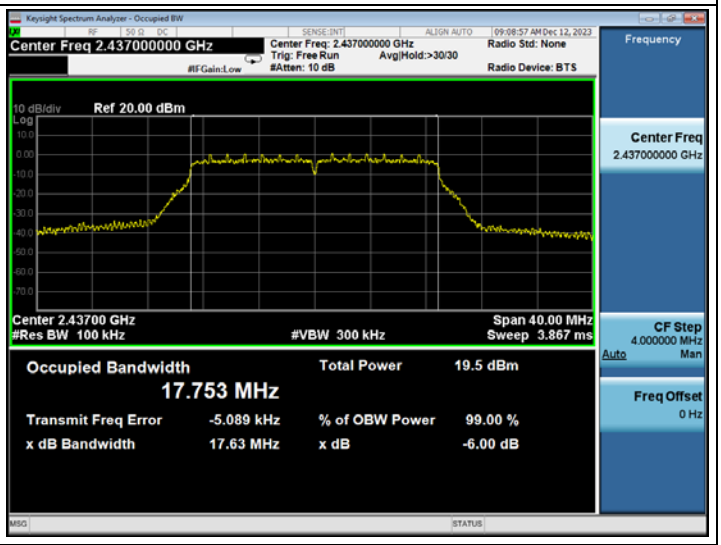


**802.11n20**

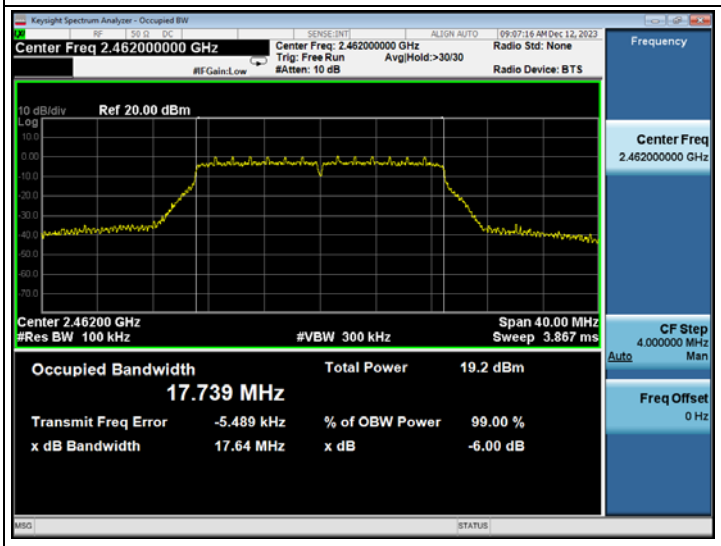
CH2412




CH2437




CH2462



# 6 MAXIMUM OUTPUT POWER MEASUREMENT

## 6.1 Test Equipment

The following test equipment was used during the maximum peak output power measurement:

| Item | Type | Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | Agilent | N9010A | MY52221182 | 2023.08.09 | 1 Year |
| 2. | RF Cable | Mini-Circuits | FLC-3FT-SM SM+ | 22022838 | 2023.08.09 | 1 Year |
| 3. | 20 dB Attenuator | Mini-Circuits | BW-S20W2+ | 001 | 2023.09.21 | 1 Year |

## 6.2 Block Diagram of Test Setup

The Same as Section. 5.2.

## 6.3 Specification Limits ((§15.247(b)(3))

The Limits of maximum Peak Output Power for digital modulation in 2400-2483.5 MHz is: 1 Watt. (30 dBm)

## 6.4 Operating Condition of EUT

The software as section 2.3 was used to enable the EUT to change the test mode one by one.

## 6.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.

Method AVGSA-1 uses trace averaging with the EUT transmitting at full power throughout each sweep.
The procedure for this method is as follows:
a) Set span to at least 1.5 times the OBW.
b) Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.
c) Set VBW ≥ [3 × 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 the 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 (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.

The test procedure is defined in ANSI C63.10-2013 ( 11.9.2.2.2 Measurement Procedure " Method AVGSA-1" was used).

## 6.6 Test Results

**PASSED.**

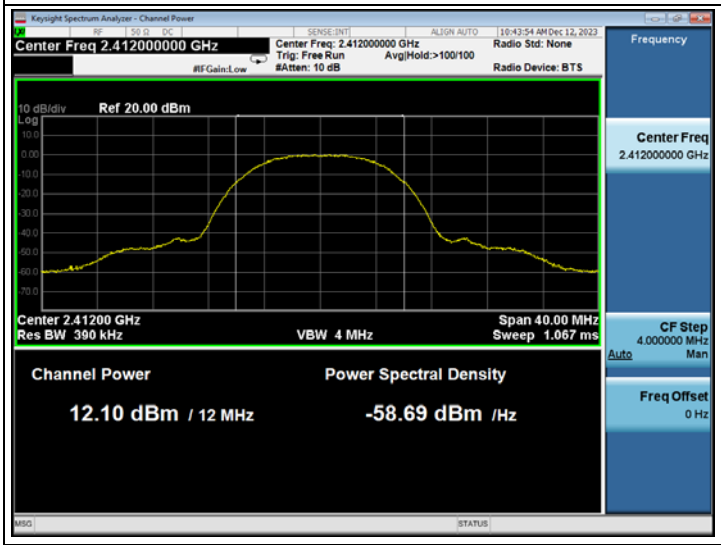
All the test results are listed below.

(Test Date: 2023.12.12 Temperature: 23℃ Humidity: 51 %)

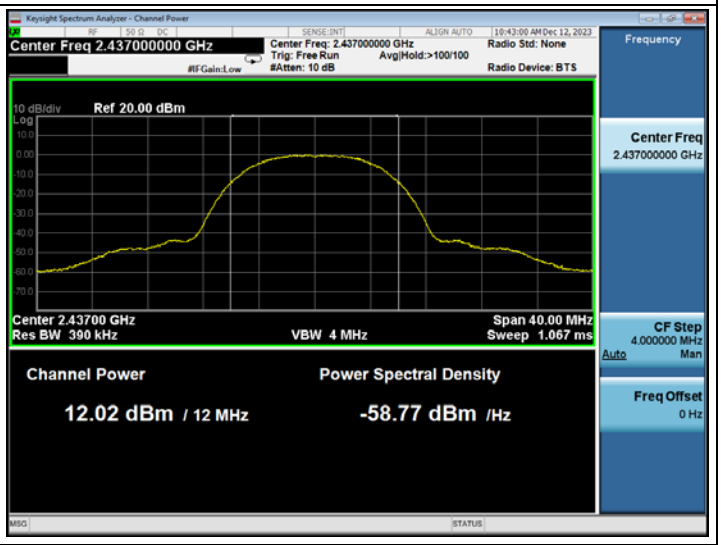
| Mode | Channel | Frequency (MHz) | **Maximum conducted (average) Output Power (dBm)** | Limit |
|---|---|---|---|---|
| 802.11b | 1 | 2412 | **12.1** | 30 dBm |
| | 6 | 2437 | **12.02** | 30 dBm |
| | 11 | 2462 | **12.06** | 30 dBm |
| 802.11g | 1 | 2412 | **11.84** | 30 dBm |
| | 6 | 2437 | **11.77** | 30 dBm |
| | 11 | 2462 | **11.7** | 30 dBm |
| 802.11n20 | 1 | 2412 | **11.81** | 30 dBm |
| | 6 | 2437 | **11.66** | 30 dBm |
| | 11 | 2462 | **11.76** | 30 dBm |

**802.11b**

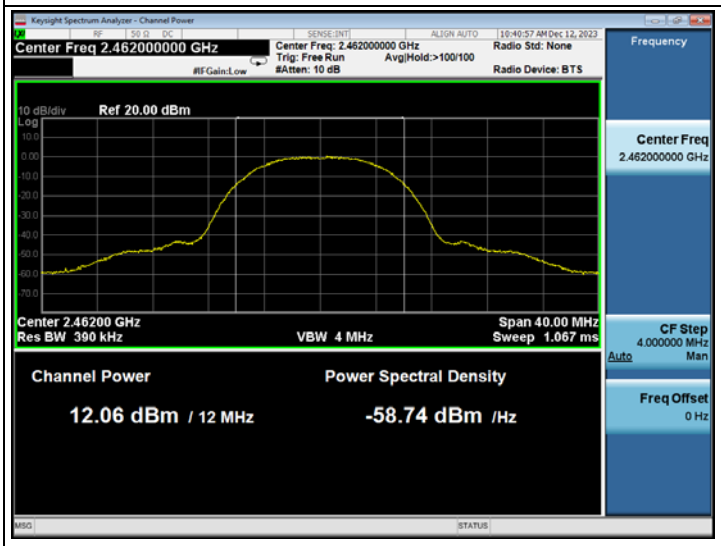
CH2412




CH2437

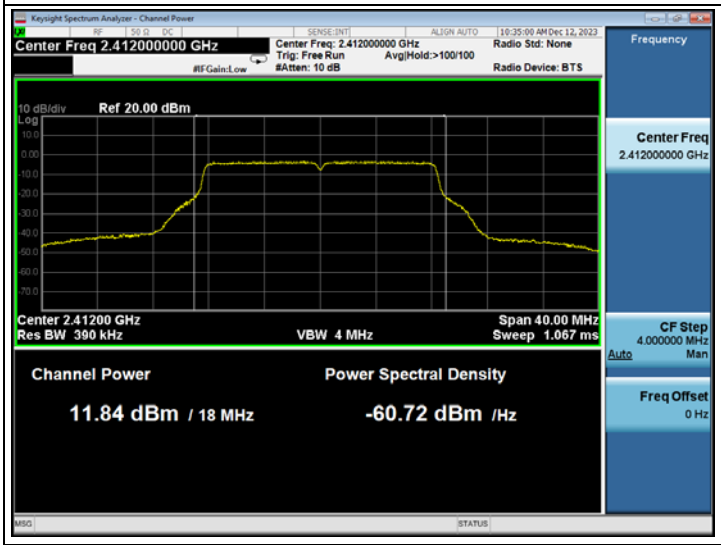



CH2462

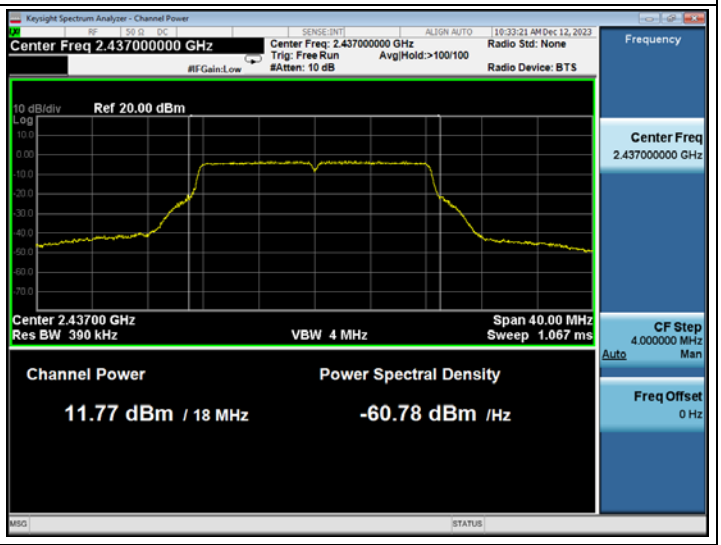


**802.11g**

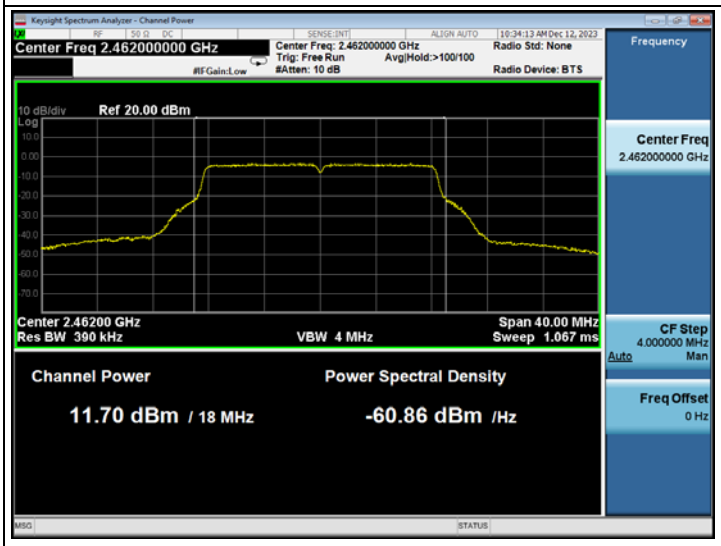
CH2412




CH2437

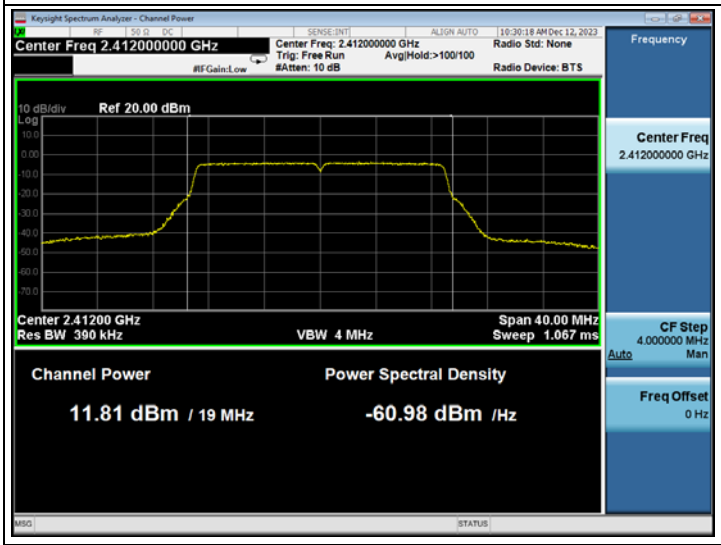



CH2462

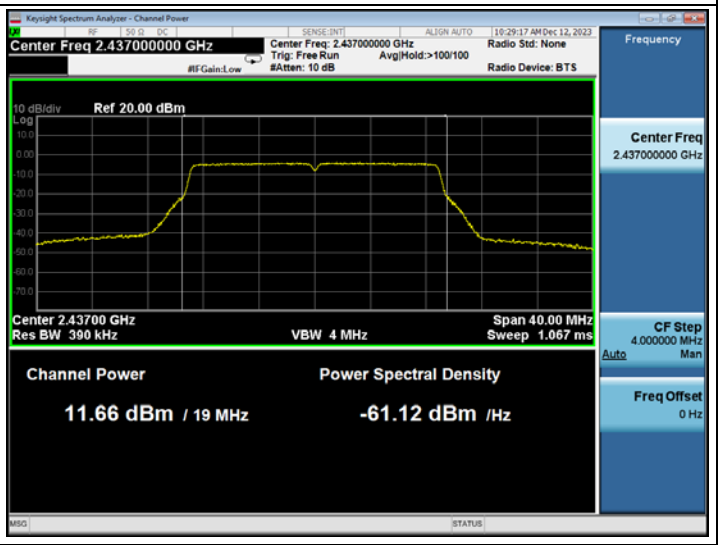


**802.11n20**

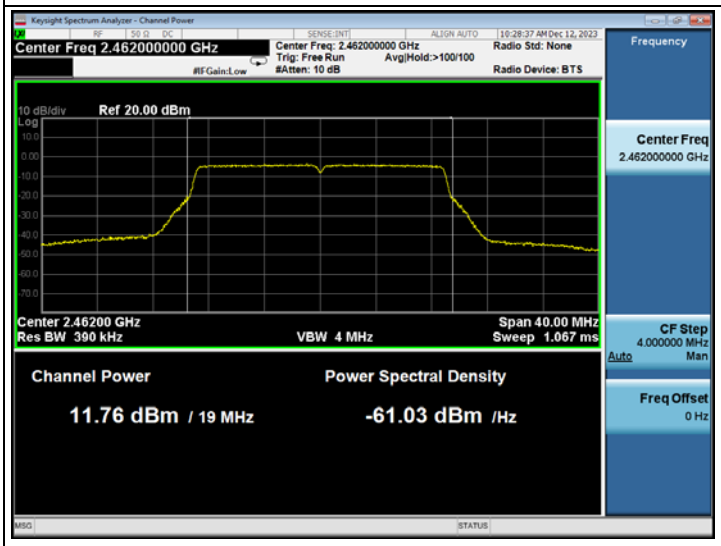
CH2412




CH2437




CH2462



# 7 EMISSION LIMITATIONS MEASUREMENT

## 7.1 Test Equipment

The following test equipment was used during the emission limitations test:

| Item | Type | Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | Agilent | N9010A | MY52221182 | 2023.08.09 | 1 Year |
| 2. | RF Cable | Mini-Circuits | FLC-3FT-SM SM+ | 22022838 | 2023.08.09 | 1 Year |
| 3. | 20 dB Attenuator | Mini-Circuits | BW-S20W2+ | 001 | 2023.09.21 | 1 Year |

## 7.2 Block Diagram of Test Setup

The Same as Section. 5.2.

## 7.3 Specification Limits (§15.247(d))

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)). (※This test result attaching to Section. 4.7)

## 7.4 Operating Condition of EUT

The software as section 2.3 was used to enable the EUT to change the test mode one by one.

## 7.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.

Establish a reference level by using the following procedure:
a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ [3 × RBW].
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.
Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

Establish an emission level by using the following procedure:
a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ [3 × 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.
Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

Scan up through $10^{th}$ harmonic.

The test procedure is defined in ANSI C63.10-2013 (11.11.2 Reference level measurement and 11.11.3 Emission level measurement was used).

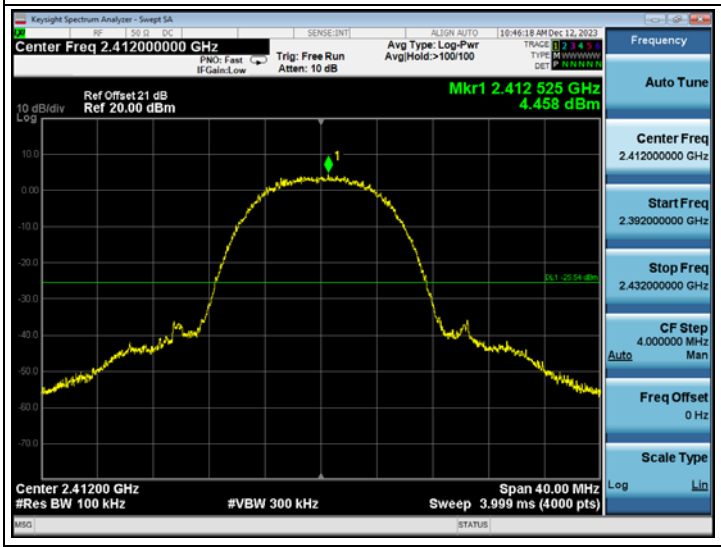
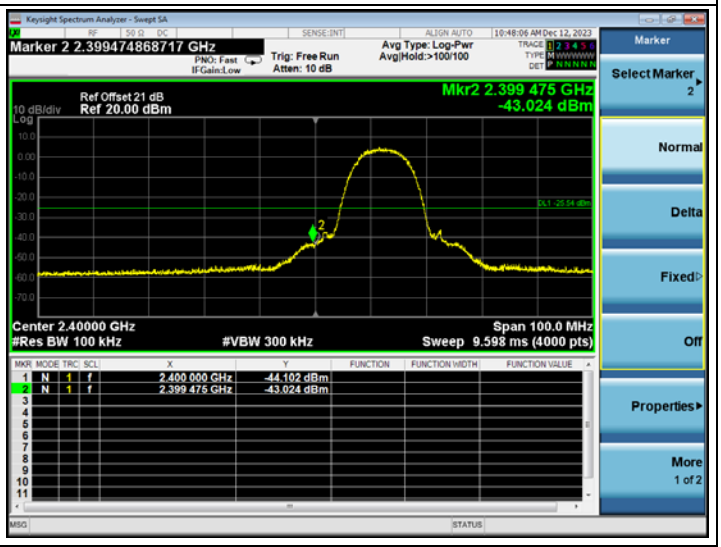
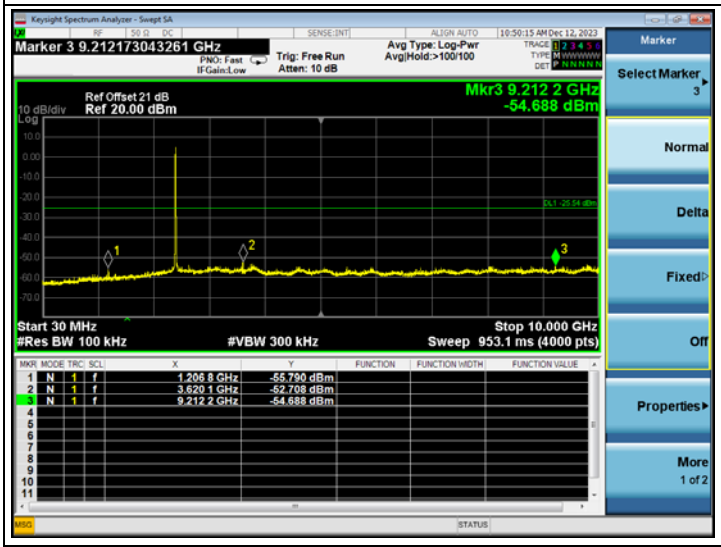
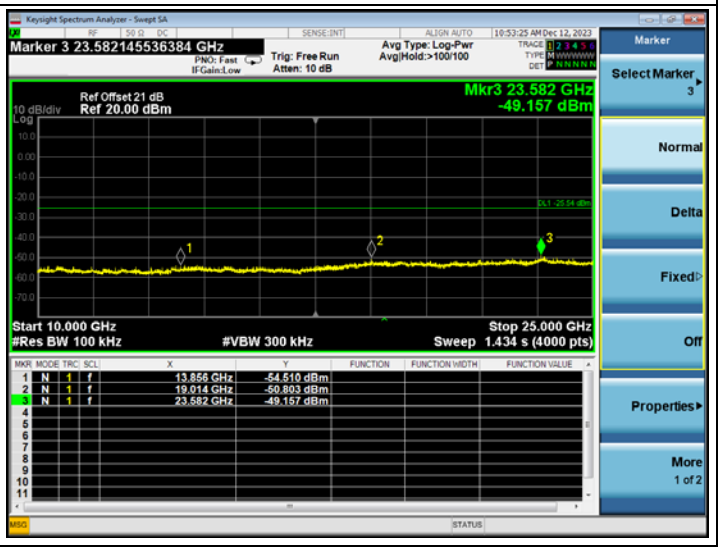
## 7.6 Test Results

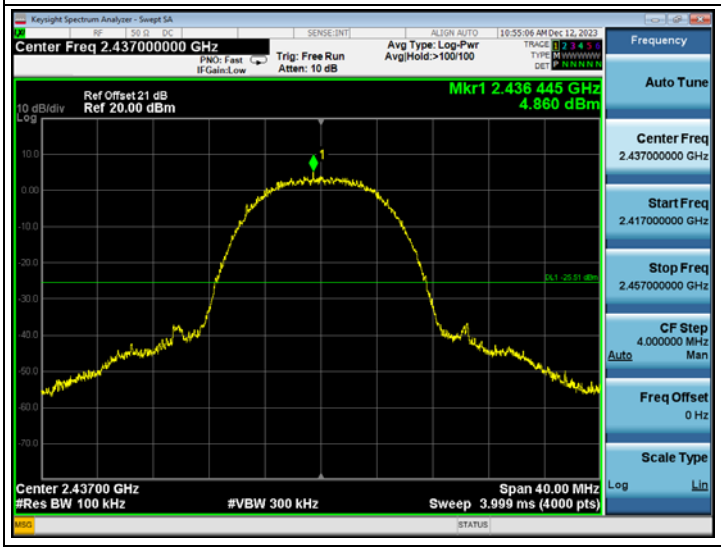
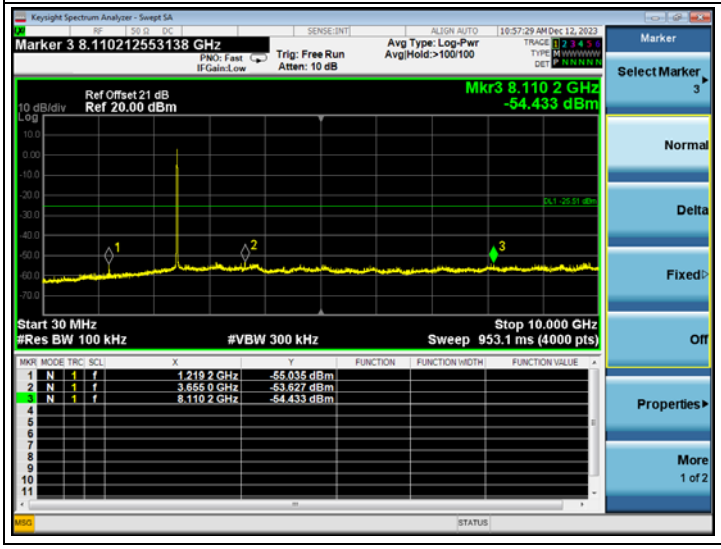
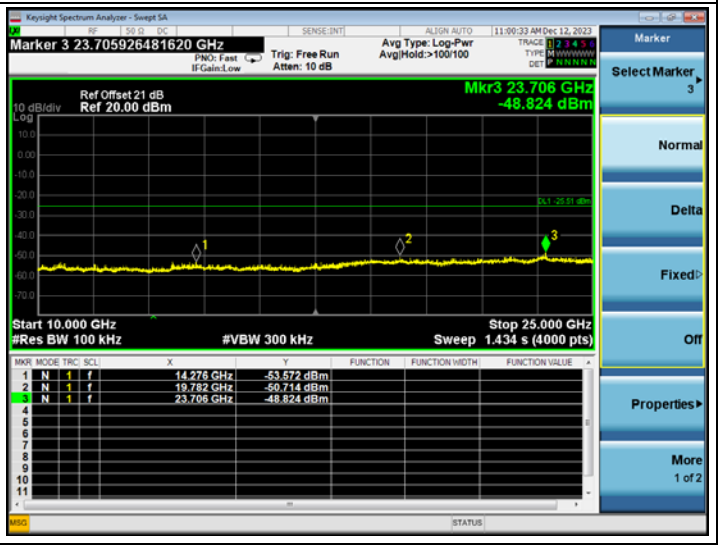
**PASSED**.

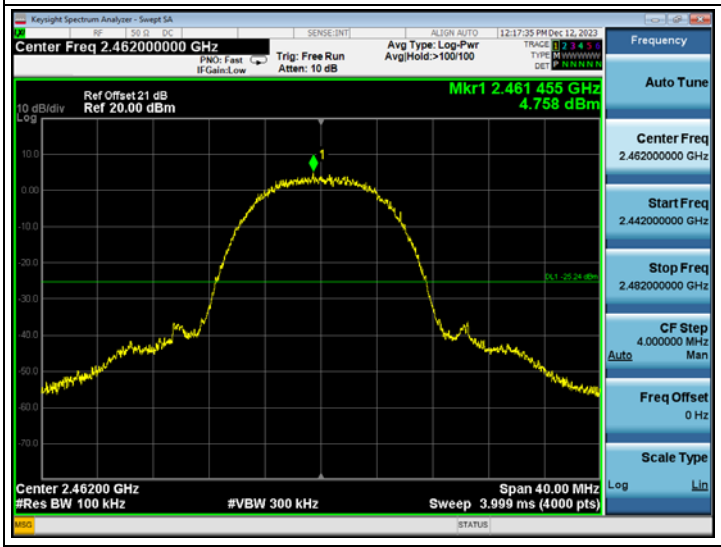
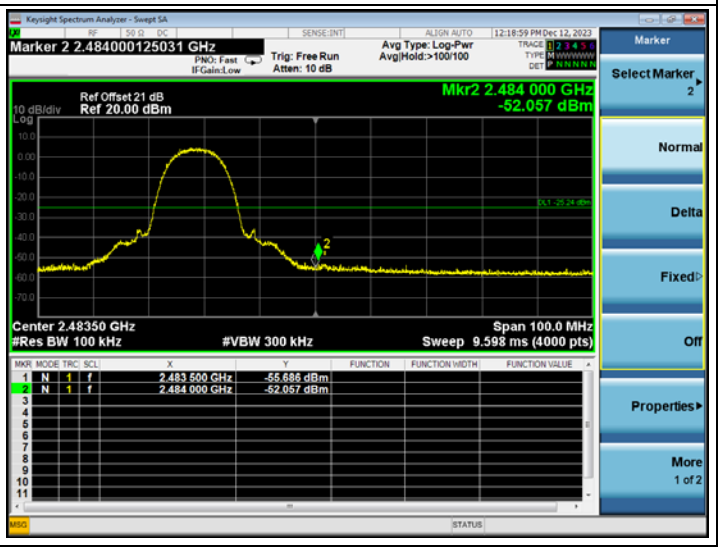
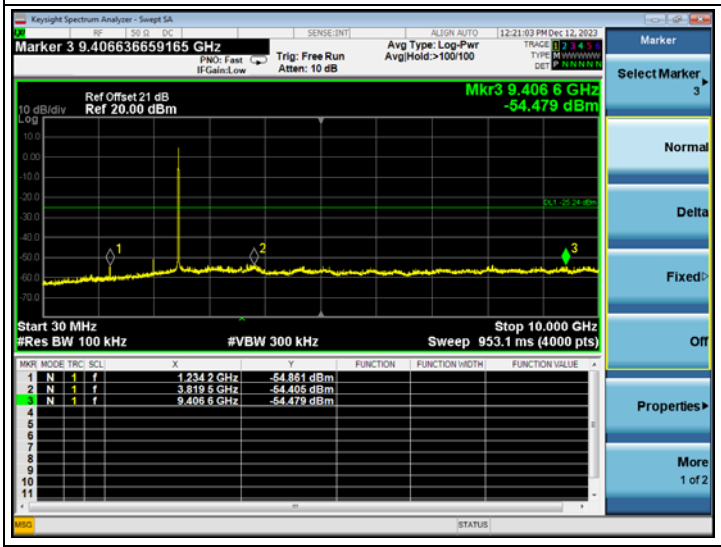
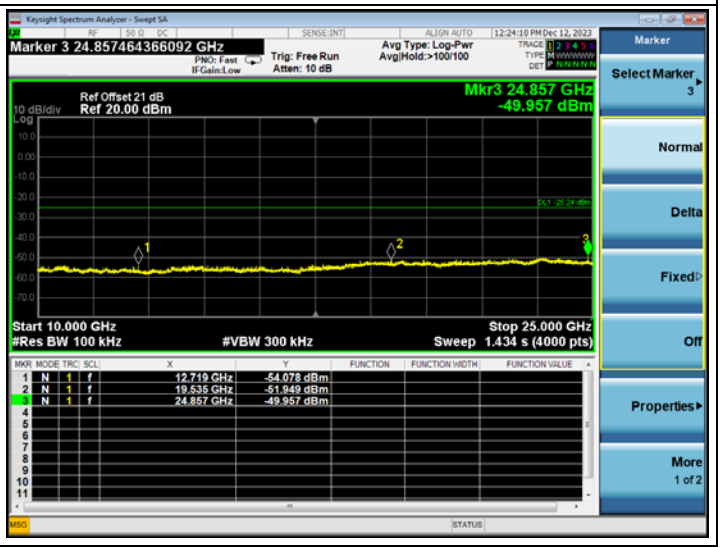
The test data was attached in the next pages.

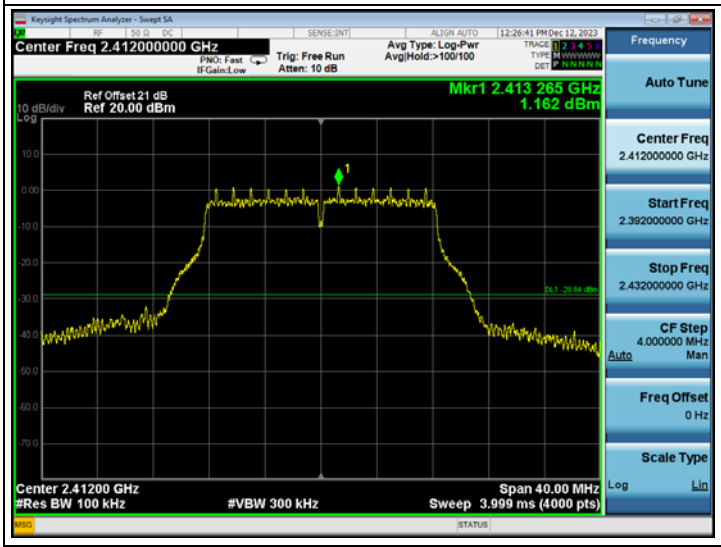
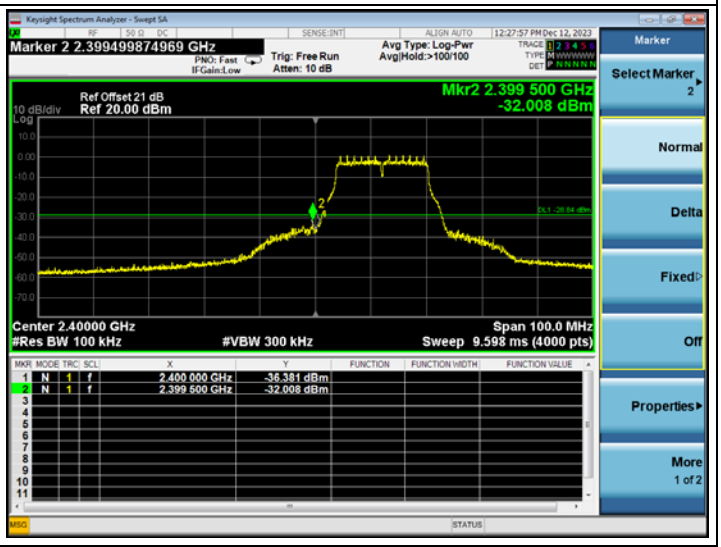
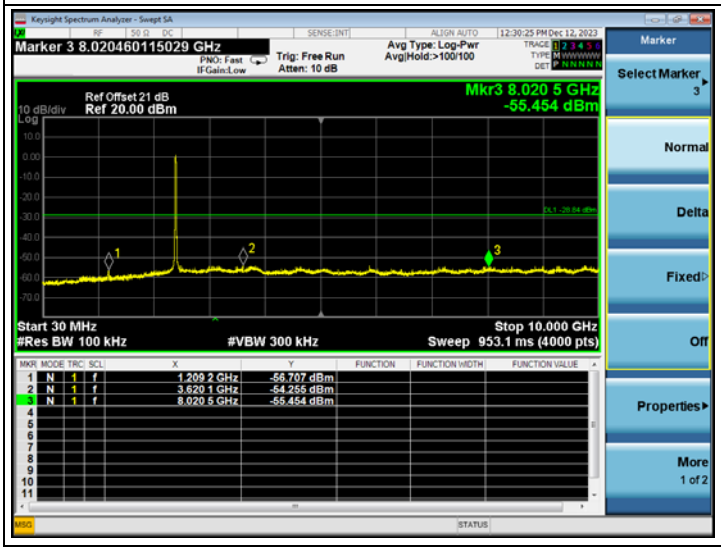
(Test Date: 2023.12.12 Temperature: 23℃ Humidity: 51 %)

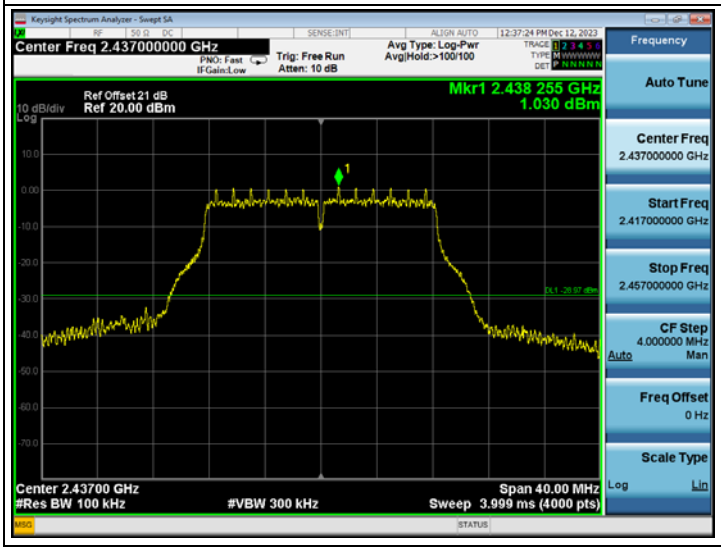
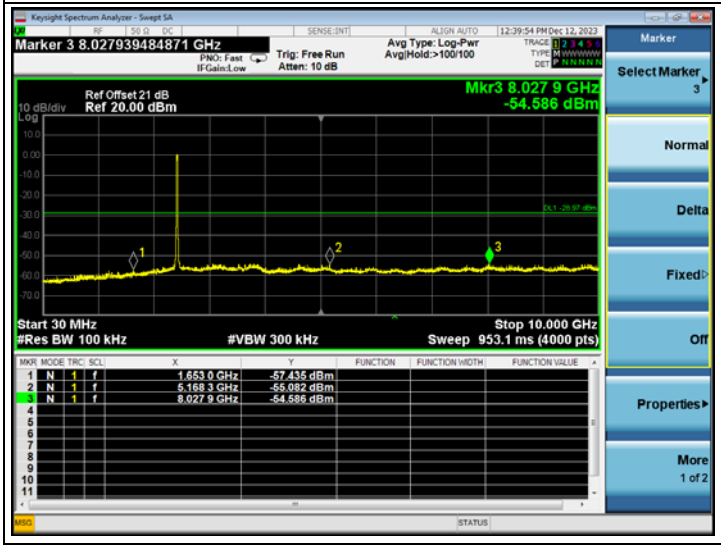
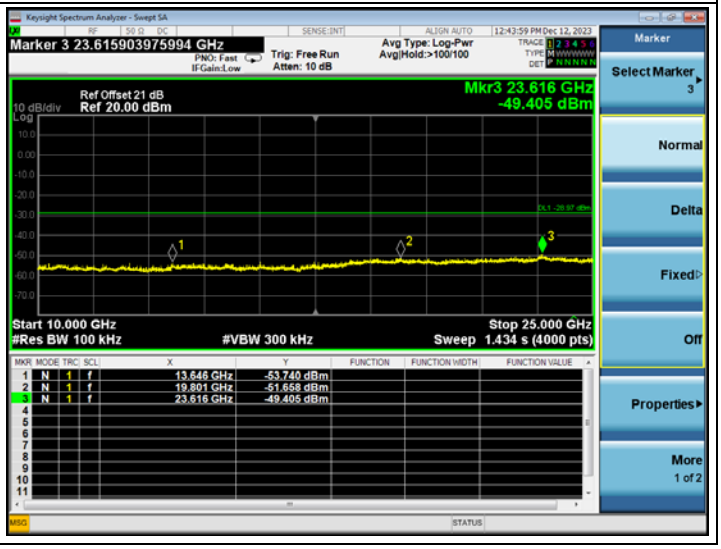
| Mode | Channel | Frequency (MHz) | Data Page |
|---|---|---|---|
| 802.11b | 1 | 2412 | P59 |
| | 6 | 2437 | P60 |
| | 11 | 2462 | P61 |
| 802.11g | 1 | 2412 | P62 |
| | 6 | 2437 | P63 |
| | 11 | 2462 | P64 |
| 802.11n20 | 1 | 2412 | P65 |
| | 6 | 2437 | P66 |
| | 11 | 2462 | P67 |

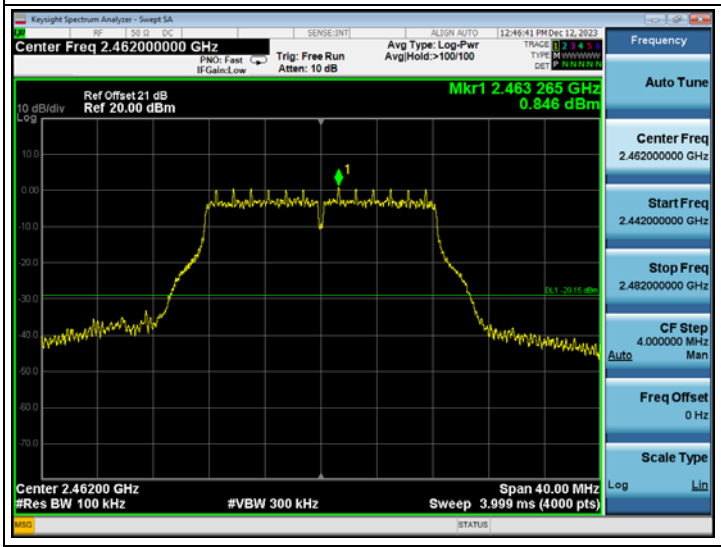
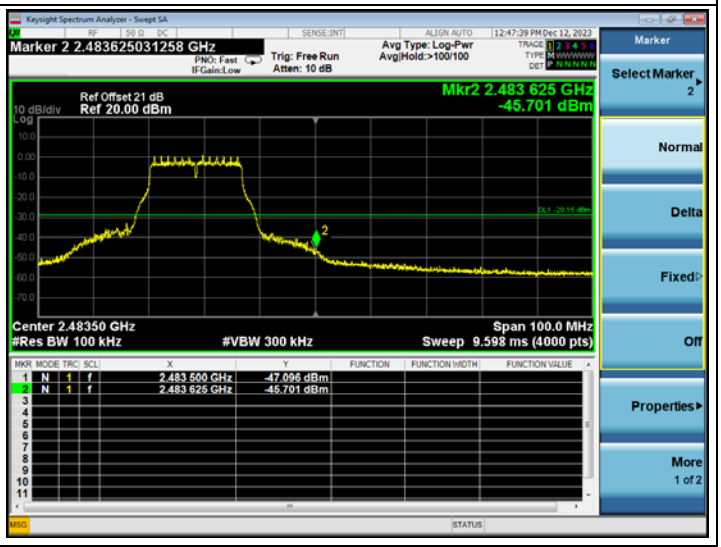
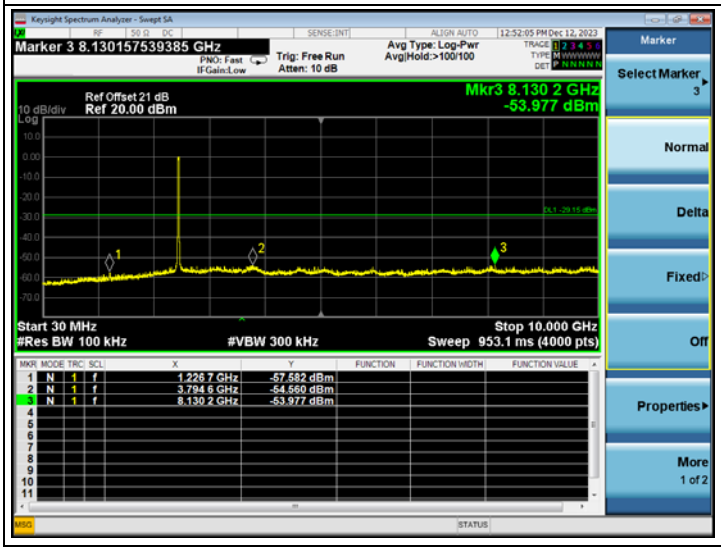
| **802.11b** | |
|---|---|
| CH2412 | |
| Reference Level | Lower Edge |
|  |  |
| Emission Level | |
|  |  |

| **802.11b** | |
|---|---|
| CH2437 | |
| Reference Level | |
|  | |
| Emission Level | |
|  |  |

| **802.11b** | |
|---|---|
| CH2462 | |
| Reference Level | Higher Edge |
|  |  |
| Emission Level | |
|  |  |

| **802.11g** | |
|---|---|
| CH2412 | |
| Reference Level | Lower Edge |
|  |  |
| Emission Level | |
|  |  |

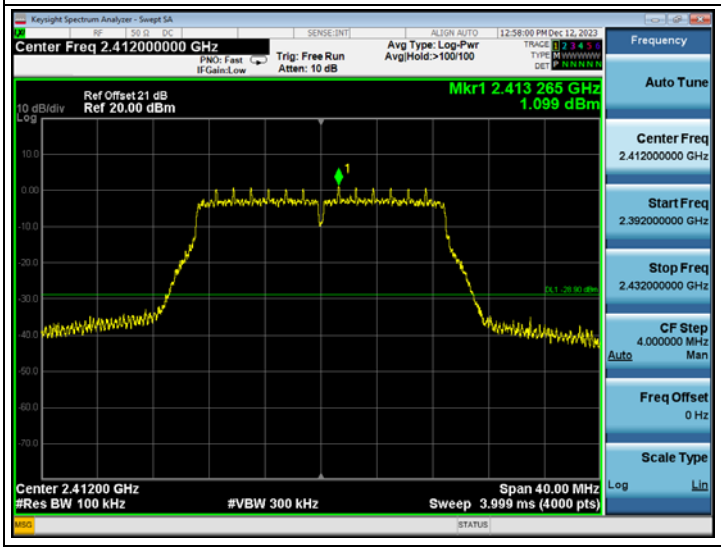
| **802.11g** | |
|---|---|
| CH2437 | |
| Reference Level | |
|  | |
| Emission Level | |
|  |  |

| **802.11g** | |
|---|---|
| CH2462 | |
| Reference Level | Higher Edge |
|  |  |
| Emission Level | |
|  |  |

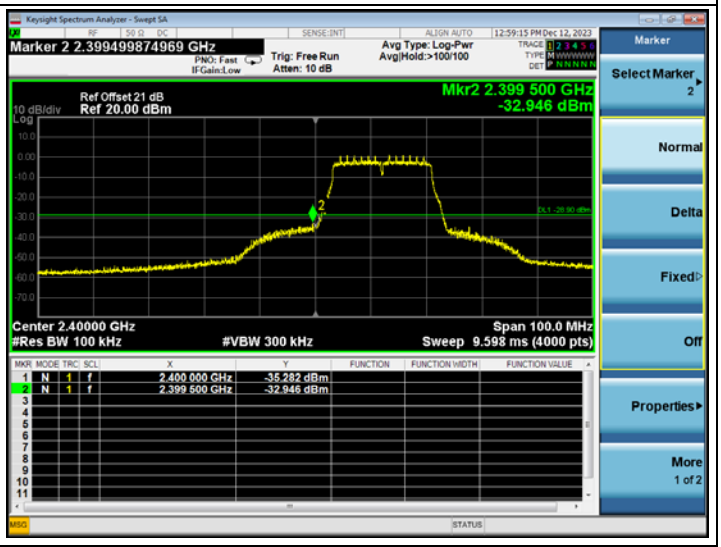
**802.11n20**

CH2412

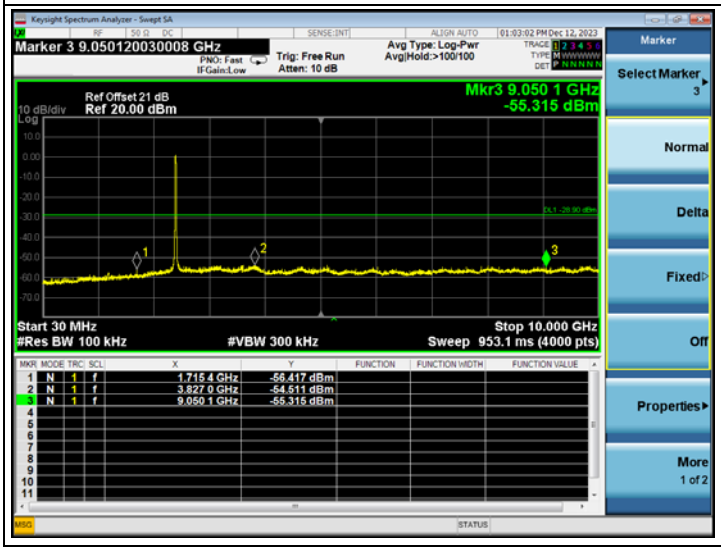
Reference Level

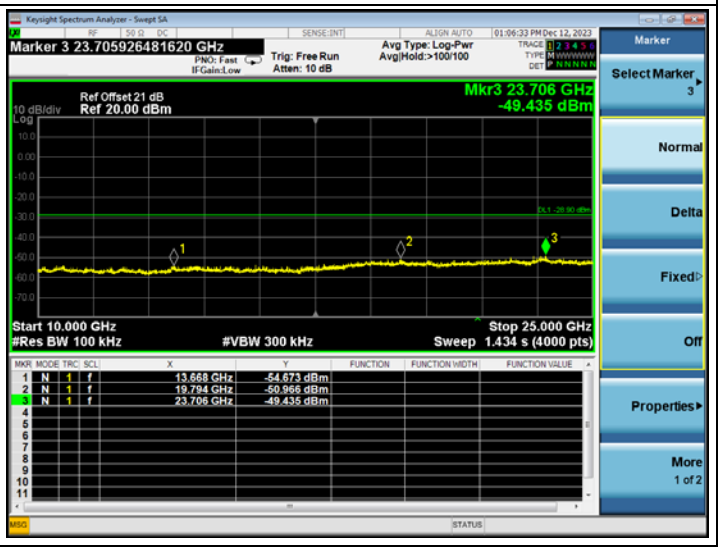


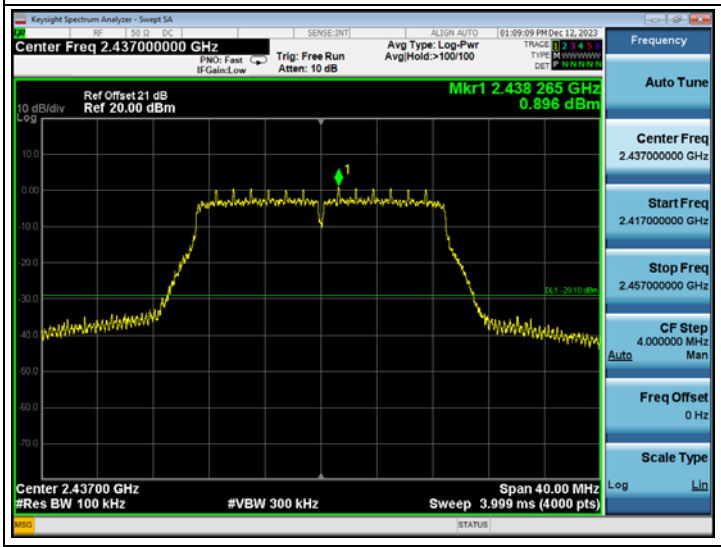
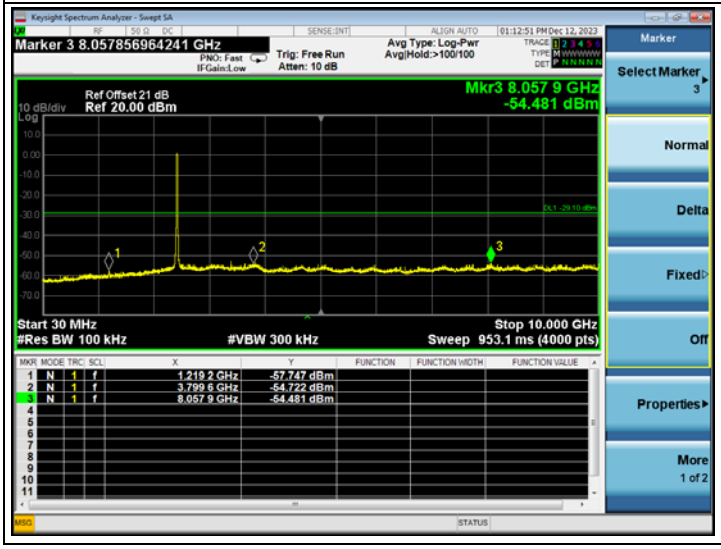
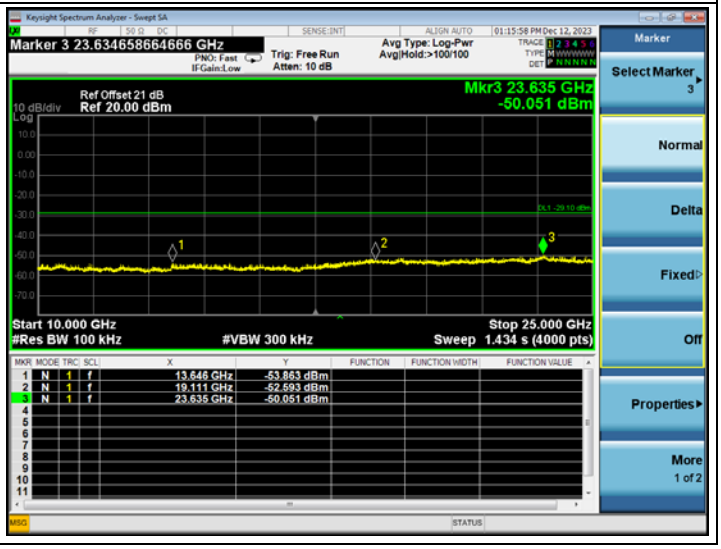

Lower Edge

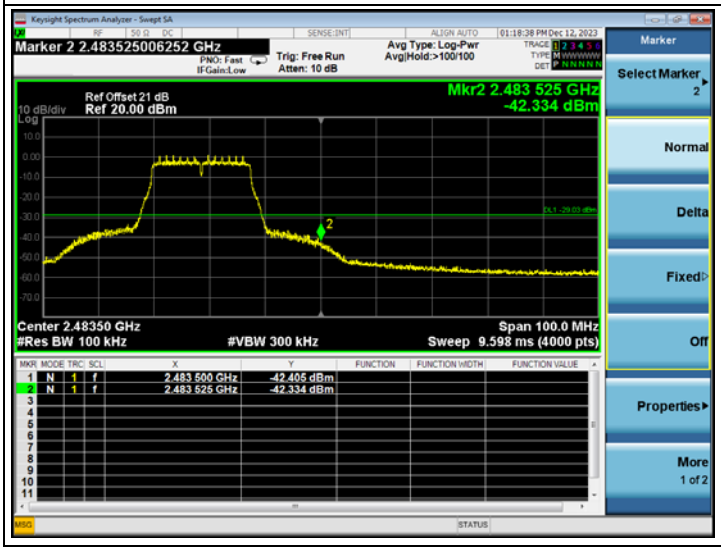
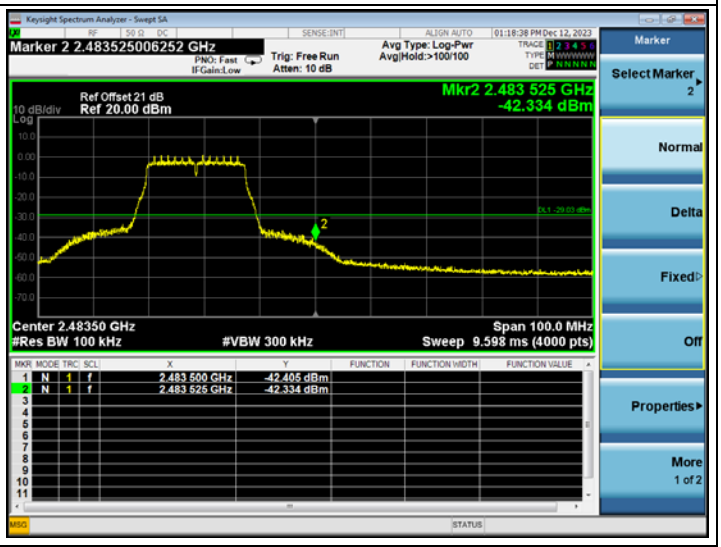
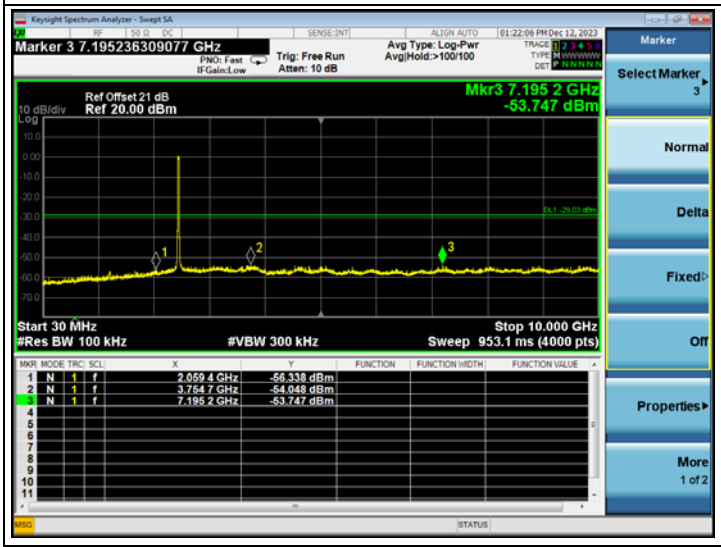



Emission Level



| **802.11n20** | |
|---|---|
| CH2437 | |
| Reference Level | |
|  | |
| Emission Level | |
|  |  |

| **802.11n20** | |
|---|---|
| CH2462 | |
| Reference Level | Higher Edge |
|  |  |
| Emission Level | |
|  |  |

# 8 POWER SPECTRAL DENSITY MEASUREMENT

## 8.1 Test Equipment

The following test equipment was used during the power spectral density measurement:

| Item | Type | Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | Agilent | N9010A | MY52221182 | 2023.08.09 | 1 Year |
| 2. | RF Cable | Mini-Circuits | FLC-3FT-SM SM+ | 22022838 | 2023.08.09 | 1 Year |
| 3. | 20 dB Attenuator | Mini-Circuits | BW-S20W2+ | 001 | 2023.09.21 | 1 Year |

## 8.2 Block Diagram of Test Setup

The Same as section 5.2.

## 8.3 Specification Limits (§15.247(e))

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band. The same method of determining the conducted output power shall be used to determine the power spectral density.

## 8.4 Operating Condition of EUT

The software as section 2.3 was used to enable the EUT to change the test mode one by one.

## 8.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.

Method AVGPSD-1 uses trace averaging with EUT transmitting at full power throughout each sweep.
The following procedure may be used when the maximum (average) conducted output power was used to determine compliance to the fundamental output power limit. This is the baseline method for determining the maximum (average) conducted PSD level. If the instrument has a power averaging (rms) detector, then it must be used; otherwise, use the sample detector. The EUT must be configured to transmit continuously (D ≥ 98%), or else sweep triggering/signal gating must be implemented to ensure that measurements are made only when the EUT is transmitting at its maximum power control level (no transmitter OFF time to be considered):
a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to at least 1.5 times the OBW.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ [3 × 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 × 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 the measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

The test procedure is defined in ANSI C63.10-2013 ( 11.10.5 Measurement Procedure “Method AVGPSD-1” was used).

## 8.6 Test Results

**PASSED**.

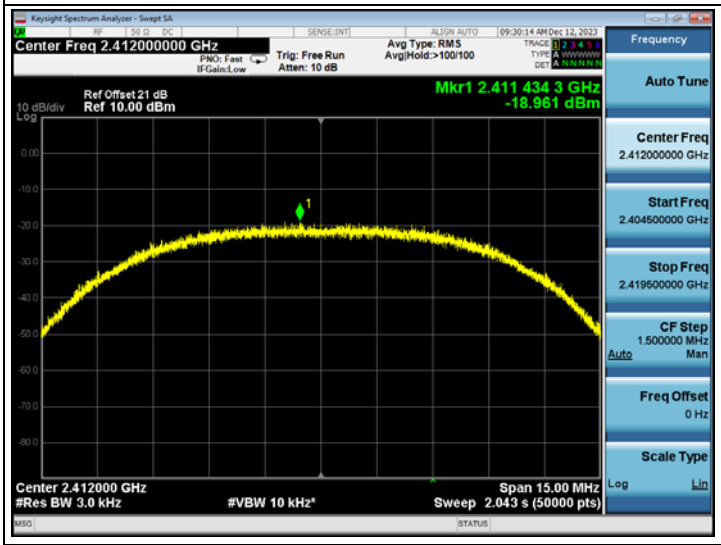
All the test results are attached in next pages.

(Test Date: 2023.12.12 Temperature: 23℃ Humidity: 51 %)

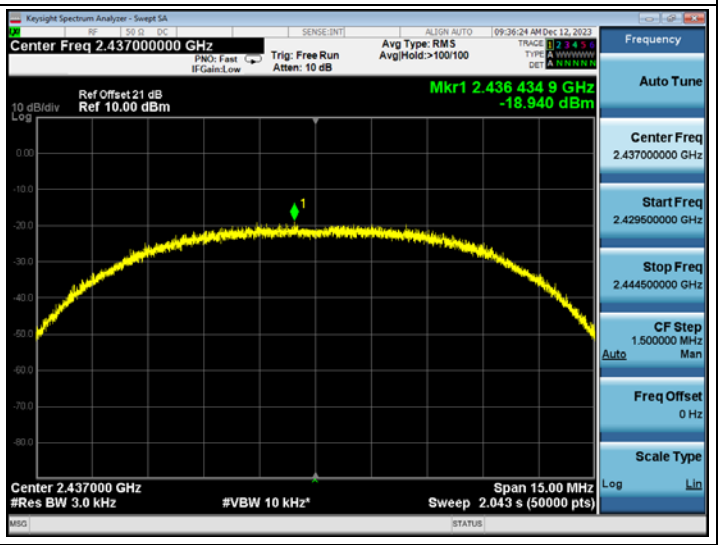
| Mode | Channel | Frequency (MHz) | **Power Spectral Density (dBm)** | Limit |
|---|---|---|---|---|
| 802.11b | 1 | 2412 | **-18.961** | 8 dBm |
| | 6 | 2437 | **-18.94** | 8 dBm |
| | 11 | 2462 | **-18.868** | 8 dBm |
| 802.11g | 1 | 2412 | **-18.801** | 8 dBm |
| | 6 | 2437 | **-18.668** | 8 dBm |
| | 11 | 2462 | **-18.856** | 8 dBm |
| 802.11n20 | 1 | 2412 | **-21.934** | 8 dBm |
| | 6 | 2437 | **-22.007** | 8 dBm |
| | 11 | 2462 | **-22.2** | 8 dBm |

**802.11b**

CH2412




CH2437

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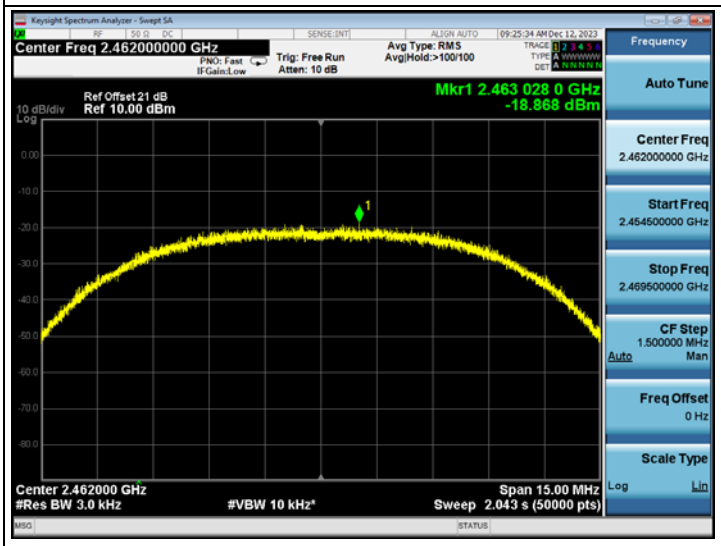
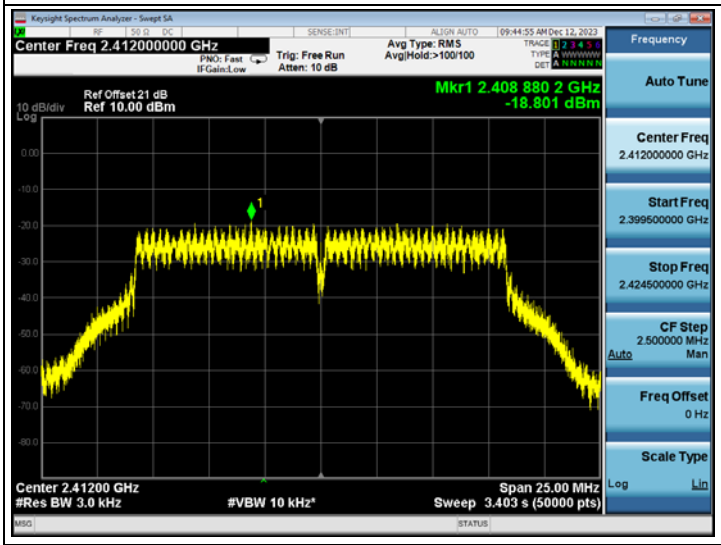


**802.11g**

CH2412

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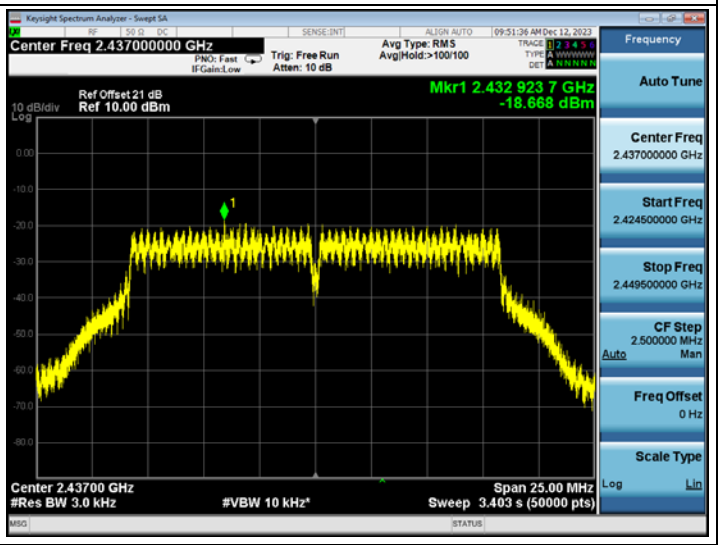


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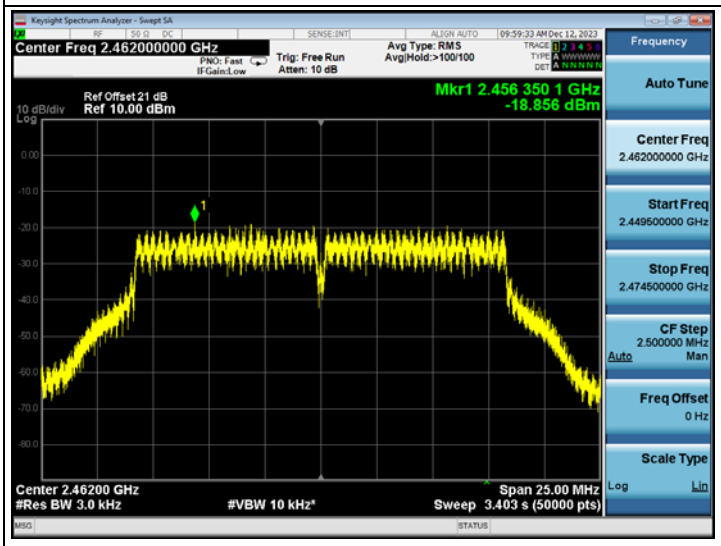
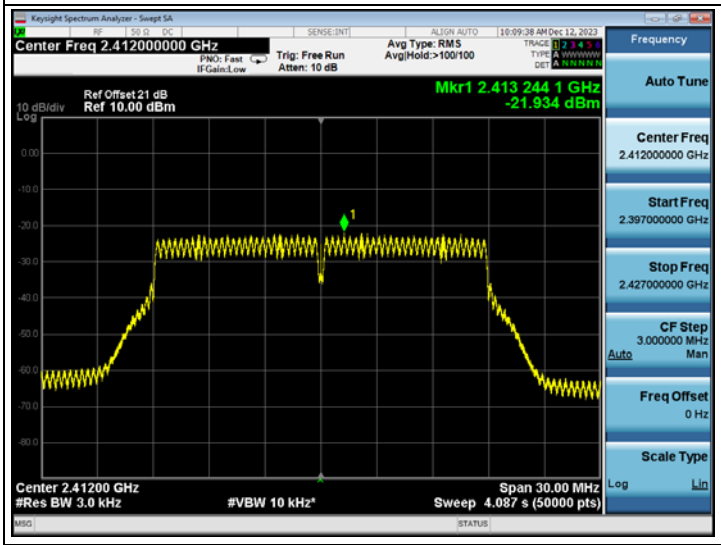


**802.11n20**

CH2412

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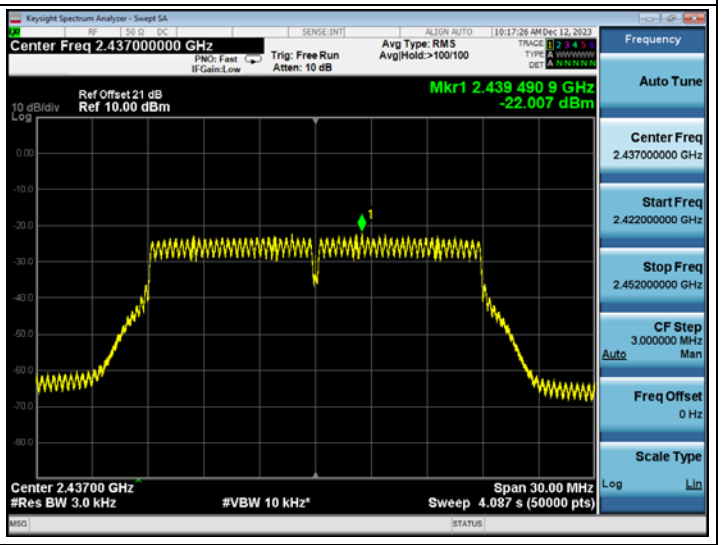


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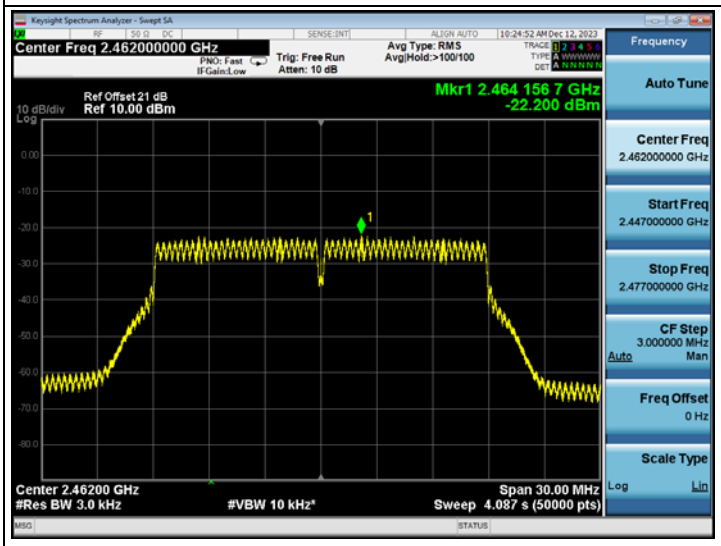

# 9 ANTENNA REQUIREMENT

## 9.1 Specification Limits (§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.

## 9.2 Result

| |
|---|
| According to KDB 353028 D1, the following describes the three ways that can be used to demonstrate compliance to Section 15.203:<br>a) Antenna permanently attached.<br>b) Unique (non-standard) antenna connector.<br>c) Professional installation. |
| For this product, the antenna is:<br>☐ Antenna permanently attached<br>☑ Unique (non-standard) antenna connector<br>☐ Professional installation<br>☐ not meet any of ways list above<br>that<br>☑ compliant<br>☐ not compliant<br>with the requirement of Section 15.203. |

# 10 MEASUREMENT UNCERTAINTY LIST

The measurement uncertainty was estimated for test on the EUT according to CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage of K=2.
The uncertainties value is not used in determining the PASS/FAIL results.

| Test Items/Facilities | Frequency/Equipment/Unit | Uncertainty |
|---|---|---|
| Conducted Emission No.1 Shielded Room | 9kHz~150kHz | ±3.1 dB |
| | 150kHz~30MHz | ±2.6 dB |
| Conducted Emission No.3 Shielded Room | 9kHz~150kHz | ±3.1 dB |
| | 150kHz~30MHz | ±2.6 dB |
| Radiated Emission | 30MHz~200MHz, Horizontal | ±3.8 dB |
| | 30MHz~200MHz, Vertical | ±4.1 dB |
| | 200MHz~1000MHz, Horizontal | ±3.6 dB |
| | 200MHz~1000MHz, Vertical | ±5.1 dB |
| | 1GHz~6GHz | ±5.3 dB |
| | 6GHz~18GHz | ±5.3 dB |
| | 18GHz~40GHz | ±3.5 dB |
| Output Power Test | 50MHz~18GHz | 0.77 dB |
| Power Density Test | 9kHz~6GHz | 1.08 dB |
| RF Frequency Test | 9kHz~40GHz | $6*10^{-4}$ |
| Bandwidth Test | 9kHz~6GHz | $1.5*10^{-3}$ |
| RF Radiated Power Test | 30MHz~1000MHz | 3.06 dB |
| Conducted Output Power Test | 50MHz~18GHz | 0.83 dB |
| AC Voltage(<10kHz) Test | 120V~230V | 0.04 % |
| DC Power Test | 0V~30V | 0.4 % |
| Temperature | -40℃~+100℃ | 0.52 ℃ |
| Humidity | 30%~95% | 2.6 % |