

# TEST REPORT

**Applicant:** Gateway Plastic Hardware & Lighting Co., Ltd

**Address of Applicant:** Jingfu Road, Xincheng Industrial Area, Hengli Town, DONGGUAN Guangdong, China

**Manufacturer/Factory:** GATEWAY LIGHTING (VIETNAM) COMPANY LIMITED

**Address of Manufacturer/Factory:** Gia Le Industrial Zone, Dong Xuan Commune, DONG HUNG DISTRICT Thai Binh Province

**Equipment Under Test (EUT)**

**Product Name:** Wifi Controller

**Model No.:** GWWIC02

**Trade Mark:** N/A

**FCC ID:** 2AP9S-GWWIC02

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart C Section 15.247  
ANSI C63.10:2013

**Date of sample receipt:** October 24,2021

**Date of Test:** October 29,2021- October30,2021

**Date of report issued:** November 02,2021

**Test Result :** PASS \*

\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



**Robinson Luo**

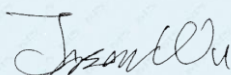
**Laboratory Manager**

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## 2 Version

| Version No. | Date       | Description |
|-------------|------------|-------------|
| 00          | 2021-11-02 | Original    |
|             |            |             |
|             |            |             |
|             |            |             |
|             |            |             |

Prepared By:

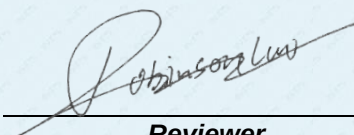


Date:

2021-11-02

Project Engineer

Check By:

  
Reviewer

Date:

2021-11-02

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## 4 Test Summary

| Test Item                                | Section                       | Result |
|------------------------------------------|-------------------------------|--------|
| Antenna requirement                      | FCC part 15.203/15.247 (b)(4) | Pass   |
| AC Power Line Conducted Emission         | FCC part 15.207               | Pass   |
| Conducted Peak Output Power              | FCC part 15.247 (b)(3)        | Pass   |
| Channel Bandwidth & 99% Occupy Bandwidth | FCC part 15.247 (a)(2)        | Pass   |
| Power Spectral Density                   | FCC part 15.247 (e)           | Pass   |
| Band Edge                                | FCC part 15.247(d)            | Pass   |
| Spurious Emission                        | FCC part 15.205/15.209        | Pass   |

*Remark: Test according to ANSI C63.10:2013 and RSS-Gen*

*Pass: The EUT complies with the essential requirements in the standard.*

### Measurement Uncertainty

| No. | Item                             | Measurement Uncertainty  |
|-----|----------------------------------|--------------------------|
| 1   | Radio Frequency                  | $1 \times 10^{-7}$       |
| 2   | Duty cycle                       | 0.37%                    |
| 3   | Occupied Bandwidth               | 2.8dB                    |
| 4   | RF conducted power               | 0.75dB                   |
| 5   | RF power density                 | 3dB                      |
| 6   | Conducted Spurious emissions     | 2.58dB                   |
| 7   | AC Power Line Conducted Emission | 3.44dB (0.15MHz ~ 30MHz) |
| 8   | Radiated Spurious emission test  | 3.1dB (9kHz-30MHz)       |
|     |                                  | 3.8039dB (30MHz-200MHz)  |
|     |                                  | 3.9679dB (200MHz-1GHz)   |
|     |                                  | 4.29dB (1GHz-18GHz)      |
|     |                                  | 3.30dB (18GHz-40GHz)     |

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

## 5 General Information

### 5.1 General Description of EUT

|                        |                                                                                                                               |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Product Name:          | Wifi Controller                                                                                                               |
| Model No.:             | GWWIC02                                                                                                                       |
| Serial No.:            | N/A                                                                                                                           |
| Hardware version:      | V1.0                                                                                                                          |
| Software version:      | V2.3                                                                                                                          |
| Test sample(s) ID:     | GTSL202111000068-1                                                                                                            |
| Sample(s) Status       | Engineer sample                                                                                                               |
| Operation Frequency:   | 802.11b/802.11g/802.11n(HT20): 2412MHz~2462MHz                                                                                |
| Channel numbers:       | 802.11b/802.11g /802.11n(HT20): 11                                                                                            |
| Channel separation:    | 5MHz                                                                                                                          |
| Modulation technology: | 802.11b: Direct Sequence Spread Spectrum (DSSS)<br>802.11g/802.11n(HT20)<br>Orthogonal Frequency Division Multiplexing (OFDM) |
| Antenna Type:          | PCB Antenna                                                                                                                   |
| Antenna gain:          | 1.5dBi                                                                                                                        |
| Power supply:          | DC 12V(Powered by adaptor)                                                                                                    |

| Operation Frequency each of channel |           |         |           |         |           |         |           |
|-------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel                             | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 1                                   | 2412MHz   | 4       | 2427MHz   | 7       | 2442MHz   | 10      | 2457MHz   |
| 2                                   | 2417MHz   | 5       | 2432MHz   | 8       | 2447MHz   | 11      | 2462MHz   |
| 3                                   | 2422MHz   | 6       | 2437MHz   | 9       | 2452MHz   |         |           |

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

| Test channel    | Frequency (MHz)               |
|-----------------|-------------------------------|
|                 | 802.11b/802.11g/802.11n(HT20) |
| Lowest channel  | 2412MHz                       |
| Middle channel  | 2437MHz                       |
| Highest channel | 2462MHz                       |

| Test Item                                 | Software             | Description                                     |
|-------------------------------------------|----------------------|-------------------------------------------------|
| Conducted RF Testing and Radiated testing | WifiTestTool(v1.5.2) | Set the EUT to different modulation and channel |

Output power setting table:

| Test Mode     | Set Tx Output Power | Data Rate |
|---------------|---------------------|-----------|
| 802.11b       | 16dBm               | 1Mbps     |
| 802.11g       | 14 dBm              | 6Mbps     |
| 802.11n(HT20) | 13 dBm              | MCS0      |

## 5.2 Test mode

|                                                                                                                                                                                                                                                                                                          |                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| Transmitting mode                                                                                                                                                                                                                                                                                        | Keep the EUT in continuously transmitting mode |
| <i>Remark: During the test, the dutycycle &gt;98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data. New battery is used during all test.</i> |                                                |

|                                                                                                                                                                                                              |         |         |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------------|
| We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows: |         |         |               |
| Pre-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.                                                                                                         |         |         |               |
| Mode                                                                                                                                                                                                         | 802.11b | 802.11g | 802.11n(HT20) |
| Data rate                                                                                                                                                                                                    | 1Mbps   | 6Mbps   | MCS0          |

## 5.3 Description of Support Units

|                                                         |
|---------------------------------------------------------|
| 1. Note Book manufacturer: Dell Model No.:Latitude 3400 |
| 2. Adaptor manufacturer: BP Model No.:S024D1201500U     |

## 5.4 Deviation from Standards

|       |
|-------|
| None. |
|-------|

## 5.5 Abnormalities from Standard Conditions

|       |
|-------|
| None. |
|-------|

## 5.6 Test Facility

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> <li>● <b>FCC—Registration No.: 381383</b><br/>Designation Number: CN5029<br/>Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and full described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.</li> <li>● <b>IC —Registration No.: 9079A</b><br/>CAB identifier: CN0091<br/>The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing</li> <li>● <b>NVLAP (LAB CODE:600179-0)</b><br/>Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).</li> </ul> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 5.7 Test Location

|                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All tests were performed at:                                                                                                                                                                                                                                  |
| <p>Global United Technology Services Co., Ltd.<br/>Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102<br/>Tel: 0755-27798480<br/>Fax: 0755-27798960</p> |

## 5.8 Additional Instructions

|                   |                                               |
|-------------------|-----------------------------------------------|
| Test Software     | Special test command provided by manufacturer |
| Power level setup | Default                                       |

## 6 Test Instruments list

| Radiated Emission: |                                     |                                |                             |               |                     |                         |
|--------------------|-------------------------------------|--------------------------------|-----------------------------|---------------|---------------------|-------------------------|
| Item               | Test Equipment                      | Manufacturer                   | Model No.                   | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1                  | 3m Semi- Anechoic Chamber           | ZhongYu Electron               | 9.2(L)*6.2(W)* 6.4(H)       | GTS250        | July. 02 2020       | July. 01 2025           |
| 2                  | Control Room                        | ZhongYu Electron               | 6.2(L)*2.5(W)* 2.4(H)       | GTS251        | N/A                 | N/A                     |
| 3                  | EMI Test Receiver                   | Rohde & Schwarz                | ESU26                       | GTS203        | June. 24 2021       | June. 23 2022           |
| 4                  | BiConiLog Antenna                   | SCHWARZBECK<br>MESS-ELEKTRONIK | VULB9163                    | GTS214        | June. 24 2021       | June. 23 2022           |
| 5                  | Double -ridged waveguide horn       | SCHWARZBECK<br>MESS-ELEKTRONIK | BBHA 9120 D                 | GTS208        | June. 24 2021       | June. 23 2022           |
| 6                  | Horn Antenna                        | ETS-LINDGREN                   | 3160                        | GTS217        | June. 24 2021       | June. 23 2022           |
| 7                  | EMI Test Software                   | AUDIX                          | E3                          | N/A           | N/A                 | N/A                     |
| 8                  | Coaxial Cable                       | GTS                            | N/A                         | GTS213        | June. 24 2021       | June. 23 2022           |
| 9                  | Coaxial Cable                       | GTS                            | N/A                         | GTS211        | June. 24 2021       | June. 23 2022           |
| 10                 | Coaxial cable                       | GTS                            | N/A                         | GTS210        | June. 24 2021       | June. 23 2022           |
| 11                 | Coaxial Cable                       | GTS                            | N/A                         | GTS212        | June. 24 2021       | June. 23 2022           |
| 12                 | Amplifier(100kHz-3GHz)              | HP                             | 8347A                       | GTS204        | June. 24 2021       | June. 23 2022           |
| 13                 | Amplifier(2GHz-20GHz)               | HP                             | 84722A                      | GTS206        | June. 24 2021       | June. 23 2022           |
| 14                 | Amplifier (18-26GHz)                | Rohde & Schwarz                | AFS33-18002<br>650-30-8P-44 | GTS218        | June. 24 2021       | June. 23 2022           |
| 15                 | Band filter                         | Amindeon                       | 82346                       | GTS219        | June. 24 2021       | June. 23 2022           |
| 16                 | Power Meter                         | Anritsu                        | ML2495A                     | GTS540        | June. 24 2021       | June. 23 2022           |
| 17                 | Power Sensor                        | Anritsu                        | MA2411B                     | GTS541        | June. 24 2021       | June. 23 2022           |
| 18                 | Wideband Radio Communication Tester | Rohde & Schwarz                | CMW500                      | GTS575        | June. 24 2021       | June. 23 2022           |
| 19                 | Splitter                            | Agilent                        | 11636B                      | GTS237        | June. 24 2021       | June. 23 2022           |
| 20                 | Loop Antenna                        | ZHINAN                         | ZN30900A                    | GTS534        | June. 24 2021       | June. 23 2022           |
| 21                 | Breitband hornantenne               | SCHWARZBECK                    | BBHA 9170                   | GTS579        | Oct. 17 2021        | Oct. 16 2022            |
| 22                 | Amplifier                           | TDK                            | PA-02-02                    | GTS574        | Oct. 17 2021        | Oct. 16 2022            |
| 23                 | Amplifier                           | TDK                            | PA-02-03                    | GTS576        | Oct. 17 2021        | Oct. 16 2022            |
| 24                 | PSA Series Spectrum Analyzer        | Rohde & Schwarz                | FSP                         | GTS578        | June. 24 2021       | June. 23 2022           |

| Conducted Emission |                           |                         |                      |               |                     |                         |
|--------------------|---------------------------|-------------------------|----------------------|---------------|---------------------|-------------------------|
| Item               | Test Equipment            | Manufacturer            | Model No.            | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1                  | Shielding Room            | ZhongYu Electron        | 7.3(L)x3.1(W)x2.9(H) | GTS252        | May.15 2019         | May.14 2022             |
| 2                  | EMI Test Receiver         | R&S                     | ESCI 7               | GTS552        | June. 24 2021       | June. 23 2022           |
| 3                  | Coaxial Switch            | ANRITSU CORP            | MP59B                | GTS225        | June. 24 2021       | June. 23 2022           |
| 4                  | ENV216 2-L-V-NETZNACHB.DE | ROHDE&SCHWARZ           | ENV216               | GTS226        | June. 24 2021       | June. 23 2022           |
| 5                  | Coaxial Cable             | GTS                     | N/A                  | GTS227        | N/A                 | N/A                     |
| 6                  | EMI Test Software         | AUDIX                   | E3                   | N/A           | N/A                 | N/A                     |
| 7                  | Thermo meter              | KTJ                     | TA328                | GTS233        | June. 24 2021       | June. 23 2022           |
| 8                  | Absorbing clamp           | Elektronik-Feinmechanik | MDS21                | GTS229        | June. 24 2021       | June. 23 2022           |
| 9                  | ISN                       | SCHWARZBECK             | NTFM 8158            | GTS565        | June. 24 2021       | June. 23 2022           |
| 10                 | High voltage probe        | SCHWARZBECK             | TK9420               | GTS537        | July. 09 2021       | July. 08 2022           |

| RF Conducted Test: |                                                |              |                  |            |                     |                         |
|--------------------|------------------------------------------------|--------------|------------------|------------|---------------------|-------------------------|
| Item               | Test Equipment                                 | Manufacturer | Model No.        | Serial No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1                  | MXA Signal Analyzer                            | Agilent      | N9020A           | GTS566     | June. 24 2021       | June. 23 2022           |
| 2                  | EMI Test Receiver                              | R&S          | ESCI 7           | GTS552     | June. 24 2021       | June. 23 2022           |
| 3                  | Spectrum Analyzer                              | Agilent      | E4440A           | GTS533     | June. 24 2021       | June. 23 2022           |
| 4                  | MXG vector Signal Generator                    | Agilent      | N5182A           | GTS567     | June. 24 2021       | June. 23 2022           |
| 5                  | ESG Analog Signal Generator                    | Agilent      | E4428C           | GTS568     | June. 24 2021       | June. 23 2022           |
| 6                  | USB RF Power Sensor                            | DARE         | RPR3006W         | GTS569     | June. 24 2021       | June. 23 2022           |
| 7                  | RF Switch Box                                  | Shongyi      | RFSW3003328      | GTS571     | June. 24 2021       | June. 23 2022           |
| 8                  | Programmable Constant Temp & Humi Test Chamber | WEWON        | WHTH-150L-40-880 | GTS572     | June. 24 2021       | June. 23 2022           |

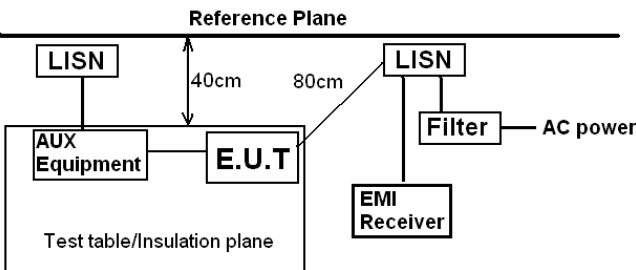
| General used equipment: |                                 |              |           |               |                     |                         |
|-------------------------|---------------------------------|--------------|-----------|---------------|---------------------|-------------------------|
| Item                    | Test Equipment                  | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1                       | Humidity/ Temperature Indicator | KTJ          | TA328     | GTS243        | June. 24 2021       | June. 23 2022           |
| 2                       | Barometer                       | ChangChun    | DYM3      | GTS255        | June. 24 2021       | June. 23 2022           |

## 7 Test results and Measurement Data

### 7.1 Antenna requirement

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| <b>Standard requirement:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | FCC Part15 C Section 15.203 /247(b) (4) |
| <b>15.203 requirement:</b><br>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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.                                                                                                         |                                         |
| <b>15.247(b)(4) requirement:</b><br>(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi. |                                         |
| <b>EUT Antenna:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                         |
| <i>The antenna is PCB Antenna, the best case gain of the antenna is 1.5dBi, reference to the appendix II for details</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                         |

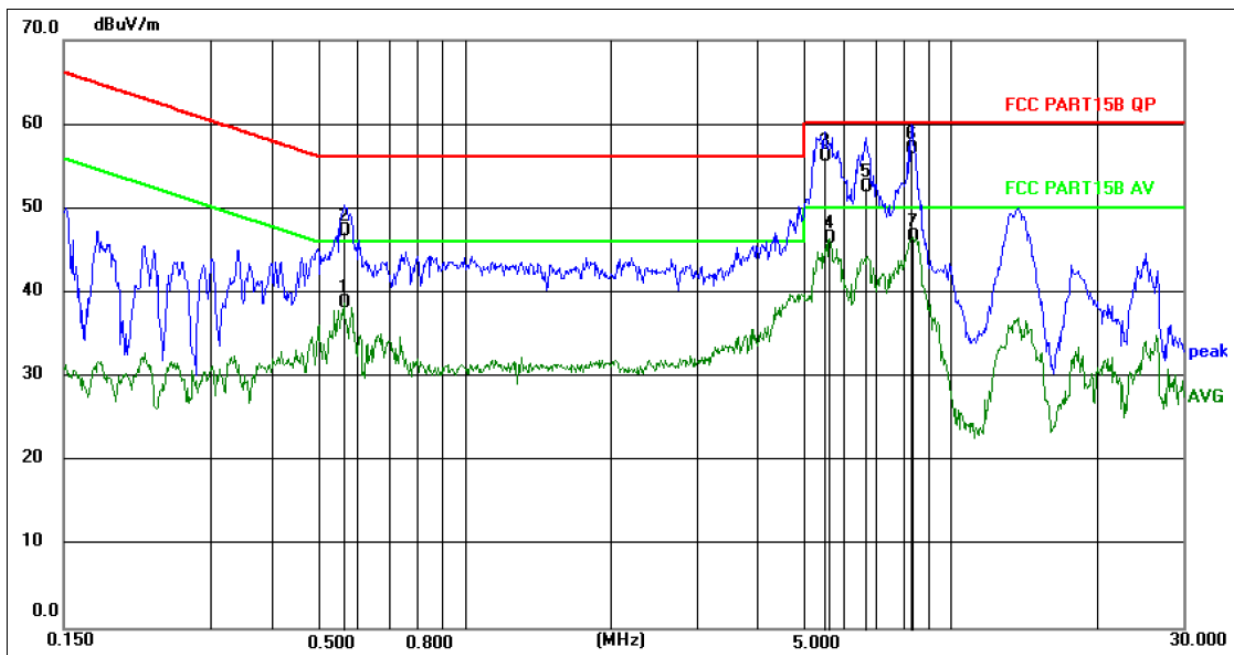
## 7.2 Conducted Emissions

|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |              |     |           |          |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------|-----|-----------|----------|
| Test Requirement:                                | FCC Part15 C Section 15.207                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |              |     |           |          |
| Test Method:                                     | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |              |     |           |          |
| Test Frequency Range:                            | 150KHz to 30MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |              |     |           |          |
| Receiver setup:                                  | RBW=9KHz, VBW=30KHz, Sweep time=auto                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |              |     |           |          |
| Limit:                                           | Frequency range (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       | Limit (dBuV) |     |           |          |
|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       | Quasi-peak   |     | Average   |          |
|                                                  | 0.15-0.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       | 66 to 56*    |     | 56 to 46* |          |
|                                                  | 0.5-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       | 56           |     | 46        |          |
|                                                  | 5-30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       | 60           |     | 50        |          |
| * Decreases with the logarithm of the frequency. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |              |     |           |          |
| Test setup:                                      | <div><p style="text-align: center;"><b>Reference Plane</b></p><p><i>Remark:<br/>E.U.T: Equipment Under Test<br/>LISN: Line Impedance Stabilization Network<br/>Test table height=0.8m</i></p></div>                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |              |     |           |          |
| Test procedure:                                  | <div><div>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</div><div>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</div><div>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</div></div> |       |              |     |           |          |
| Test Instruments:                                | Refer to section 6.0 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |              |     |           |          |
| Test mode:                                       | Refer to section 5.2 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |              |     |           |          |
| Test environment:                                | Temp.:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 26 °C | Humid.:      | 52% | Press.:   | 1001mbar |
| Test voltage:                                    | DC 12V(Powered by adaptor)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |       |              |     |           |          |
| Test results:                                    | Pass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |              |     |           |          |

Remark: N/A

## Measurement data

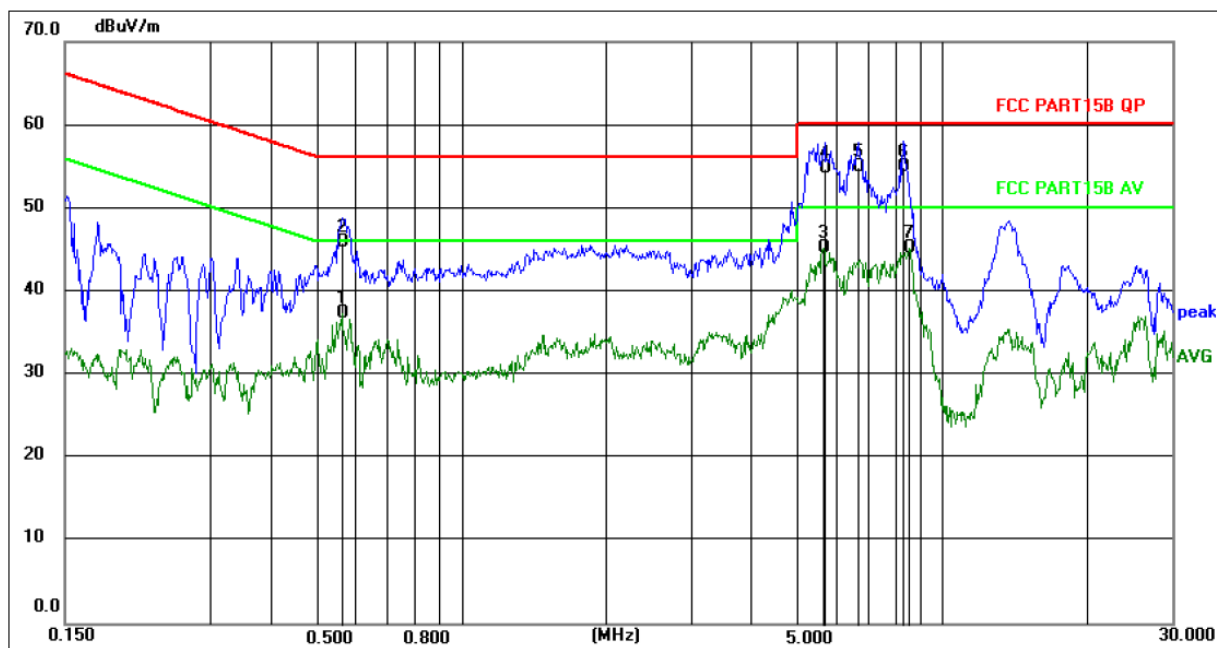
Line:



|        |                 |                |                      |
|--------|-----------------|----------------|----------------------|
| Site:  |                 | Antenna::L1    | Temperature(C):26(C) |
| Limit: | FCC PART15B QP  |                | Humidity(%):52%      |
| EUT:   | Wifi Controller | Test Time:     | 2021/10/30 18:22:14  |
| M/N.:  | GWVIC02         | Power Rating:  | AC 120V/60Hz         |
| Mode:  | ON WITH WIFI    | Test Engineer: |                      |
| Note:  | Gateway         |                |                      |

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. | Remark |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|------|--------|
| 1   | 0.5635          | 28.71          | 10.06         | 38.77          | 46.00          | 7.23        | AVG  |        |
| 2   | 0.5664          | 37.27          | 10.06         | 47.33          | 56.00          | 8.67        | QP   |        |
| 3   | 5.5053          | 45.59          | 10.59         | 56.18          | 60.00          | 3.82        | QP   |        |
| 4   | 5.6233          | 35.76          | 10.60         | 46.36          | 50.00          | 3.64        | AVG  |        |
| 5   | 6.6623          | 41.77          | 10.71         | 52.48          | 60.00          | 7.52        | QP   |        |
| 6 * | 8.2788          | 46.14          | 10.88         | 57.02          | 60.00          | 2.98        | QP   |        |
| 7   | 8.3670          | 35.69          | 10.89         | 46.58          | 50.00          | 3.42        | AVG  |        |

Neutral:



|        |                 |                |                      |
|--------|-----------------|----------------|----------------------|
| Site:  |                 | Antenna::N     | Temperature(C):26(C) |
| Limit: | FCC PART15B QP  |                | Humidity(%):52%      |
| EUT:   | Wifi Controller | Test Time:     | 2021/10/30 18:26:11  |
| M/N.:  | GWVIC02         | Power Rating:  | AC 120V/60Hz         |
| Mode:  | ON WITH WIFI    | Test Engineer: |                      |
| Note:  | Gateway         |                |                      |

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. | Remark |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|------|--------|
| 1   | 0.5635          | 27.21          | 10.06         | 37.27          | 46.00          | 8.73        | AVG  |        |
| 2   | 0.5664          | 35.77          | 10.06         | 45.83          | 56.00          | 10.17       | QP   |        |
| 3 * | 5.6531          | 34.56          | 10.60         | 45.16          | 50.00          | 4.84        | AVG  |        |
| 4   | 5.6832          | 44.23          | 10.61         | 54.84          | 60.00          | 5.16        | QP   |        |
| 5   | 6.6623          | 44.27          | 10.71         | 54.98          | 60.00          | 5.02        | QP   |        |
| 6   | 8.2788          | 44.14          | 10.88         | 55.02          | 60.00          | 4.98        | QP   |        |
| 7   | 8.5007          | 34.22          | 10.91         | 45.13          | 50.00          | 4.87        | AVG  |        |

Notes:

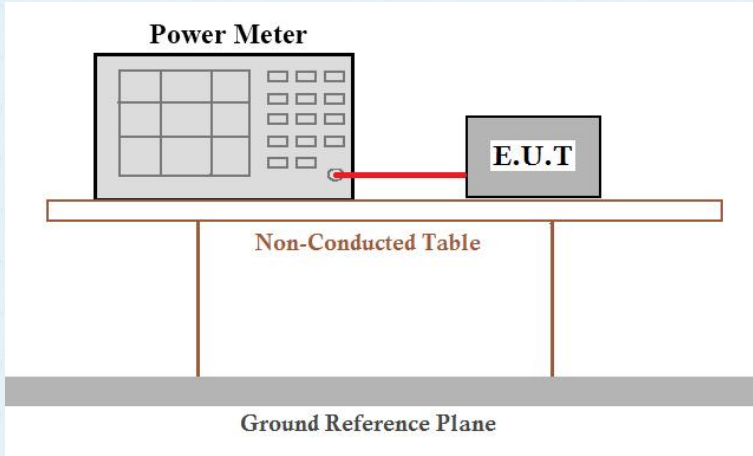
1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

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## 7.3 Conducted Peak Output Power

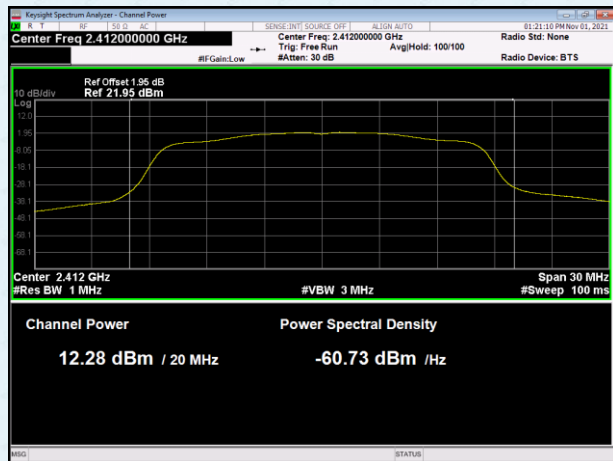
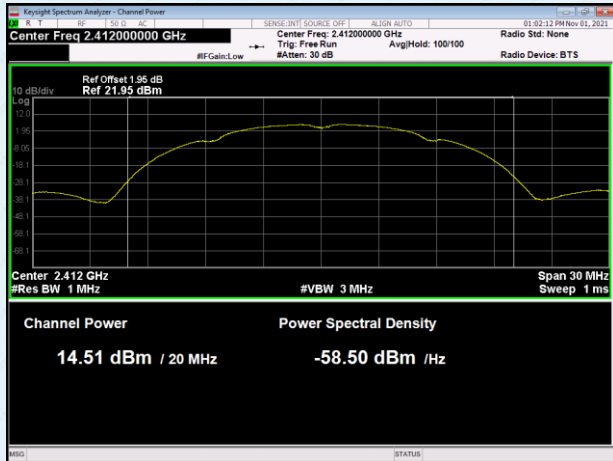
|                    |                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement : | FCC Part15 C Section 15.247 (b)(3)                                                                                                                                                                                                                                                                                                           |
| Test Method :      | ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02                                                                                                                                                                                                                                                                               |
| Limit:             | 30dBm                                                                                                                                                                                                                                                                                                                                        |
| Test setup:        |  <p>The diagram illustrates the test setup. A Power Meter is connected to an E.U.T (Equipment Under Test) via a red cable. Both the Power Meter and the E.U.T are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p> |
| Test Instruments:  | Refer to section 6.0 for details                                                                                                                                                                                                                                                                                                             |
| Test mode:         | Refer to section 5.2 for details                                                                                                                                                                                                                                                                                                             |
| Test results:      | Pass                                                                                                                                                                                                                                                                                                                                         |

### Measurement Data

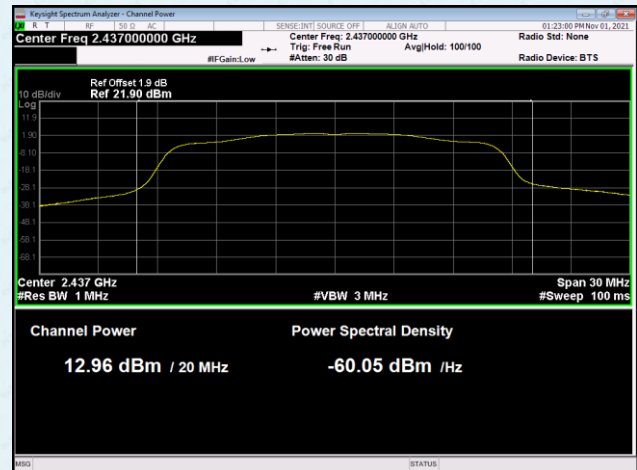
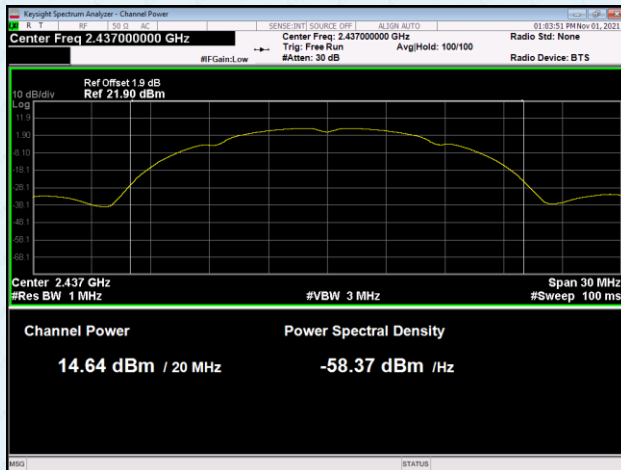
| Modulation    | Frequency (MHz) | Conducted Power (dBm) | Duty Factor (dB) | Total Power (dBm) | Limit (dBm) | Verdict |
|---------------|-----------------|-----------------------|------------------|-------------------|-------------|---------|
| 802.11b       | 2412            | 14.507                | 0                | 14.507            | 30          | Pass    |
|               | 2437            | 14.64                 | 0                | 14.64             | 30          | Pass    |
|               | 2462            | 15.37                 | 0                | 15.37             | 30          | Pass    |
| 802.11g       | 2412            | 12.281                | 0                | 12.281            | 30          | Pass    |
|               | 2437            | 12.958                | 0                | 12.958            | 30          | Pass    |
|               | 2462            | 13.696                | 0                | 13.696            | 30          | Pass    |
| 802.11n(HT20) | 2412            | 10.15                 | 0                | 10.15             | 30          | Pass    |
|               | 2437            | 10.74                 | 0.01             | 10.75             | 30          | Pass    |
|               | 2462            | 12.38                 | 0                | 12.38             | 30          | Pass    |

Test plot as follows:

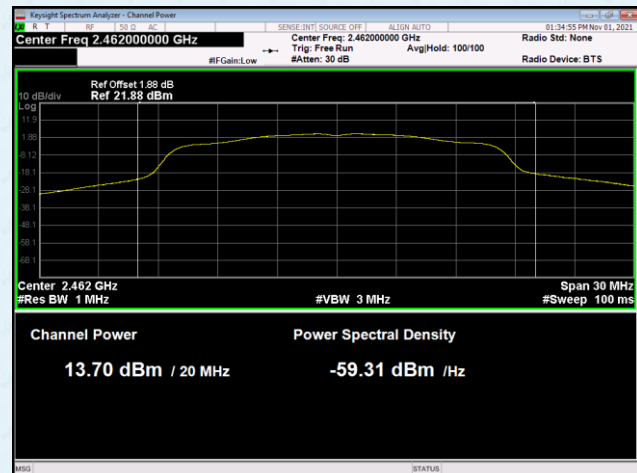
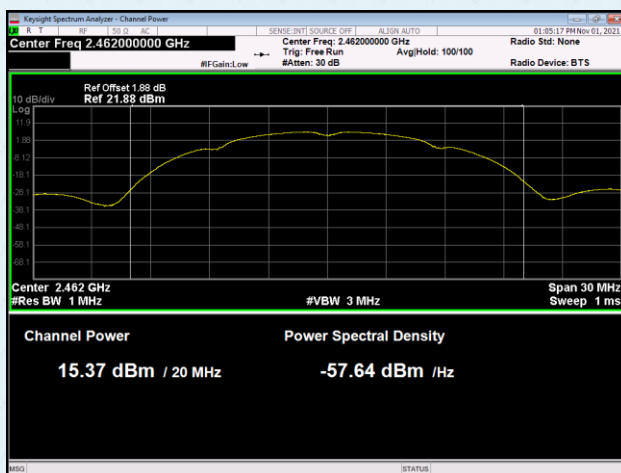
|            |         |            |         |
|------------|---------|------------|---------|
| Test mode: | 802.11b | Test mode: | 802.11g |
|------------|---------|------------|---------|



Lowest channel

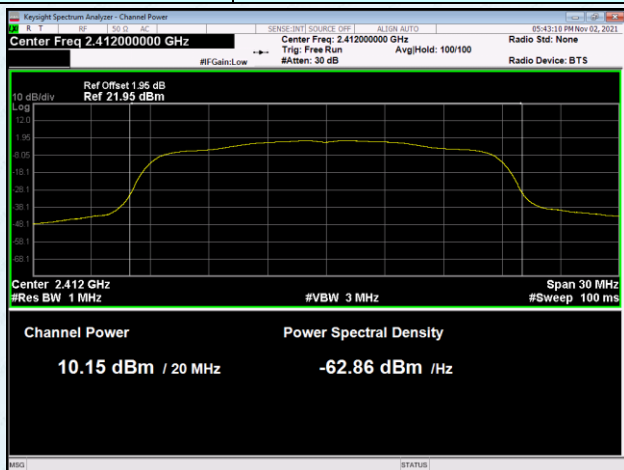


Mid channel

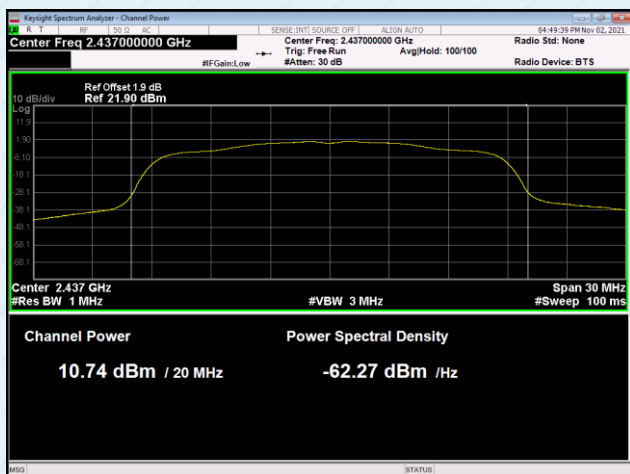


Highest channel

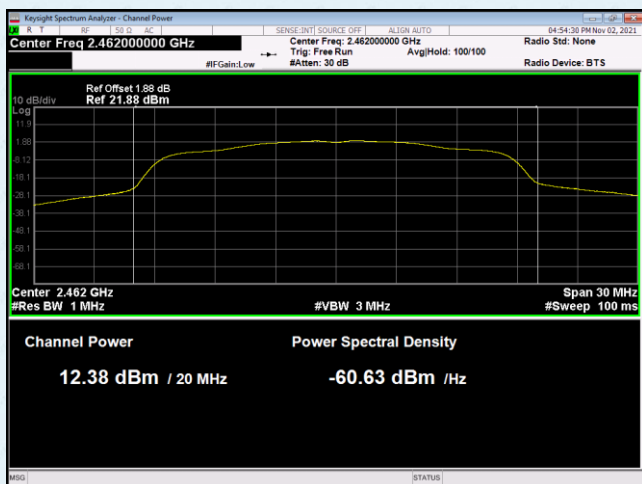
|            |               |            |   |
|------------|---------------|------------|---|
| Test mode: | 802.11n(HT20) | Test mode: | / |
|------------|---------------|------------|---|



Lowest channel

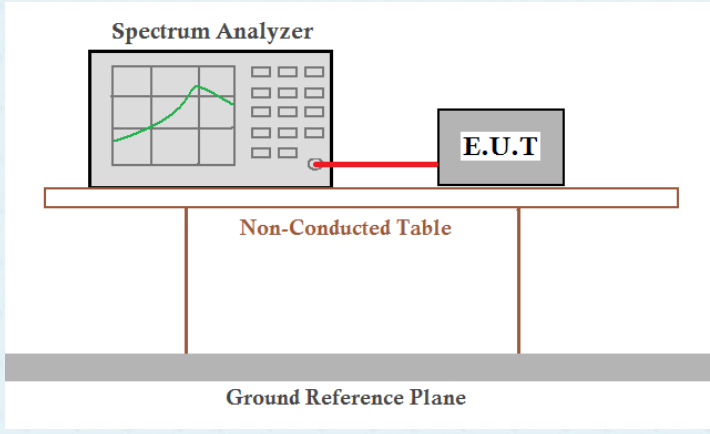


Mid channel



Highest channel

## 7.4 Channel Bandwidth &99% Occupy Bandwidth

|                    |                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement : | FCC Part15 C Section 15.247 (a)(2)                                                                                                                                                                                                                                                                                                                                                         |
| Test Method :      | ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02                                                                                                                                                                                                                                                                                                                             |
| Limit:             | >500KHz                                                                                                                                                                                                                                                                                                                                                                                    |
| Test setup:        |  <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane. The Spectrum Analyzer screen shows a frequency spectrum with a peak.</p> |
| Test Instruments:  | Refer to section 6.0 for details                                                                                                                                                                                                                                                                                                                                                           |
| Test mode:         | Refer to section 5.2 for details                                                                                                                                                                                                                                                                                                                                                           |
| Test results:      | Pass                                                                                                                                                                                                                                                                                                                                                                                       |

### Measurement Data

| Test Channel | Channel Bandwidth (MHz) |         |               | Limit(KHz) | Result |
|--------------|-------------------------|---------|---------------|------------|--------|
|              | 802.11b                 | 802.11g | 802.11n(HT20) |            |        |
| Lowest       | 10.026                  | 13.815  | 13.81         | >500       | Pass   |
| Middle       | 10.025                  | 13.815  | 13.804        |            |        |
| Highest      | 9.081                   | 13.809  | 12.584        |            |        |

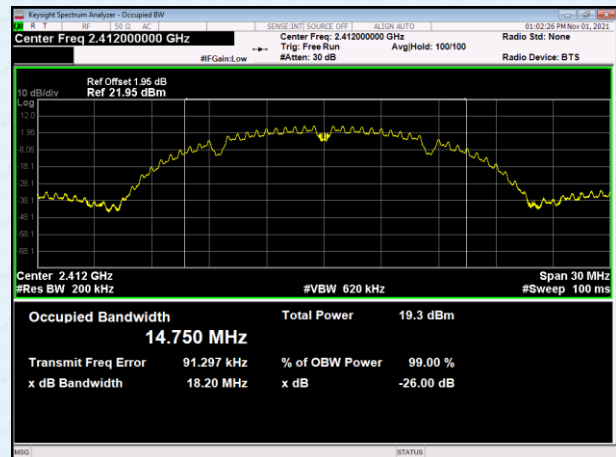
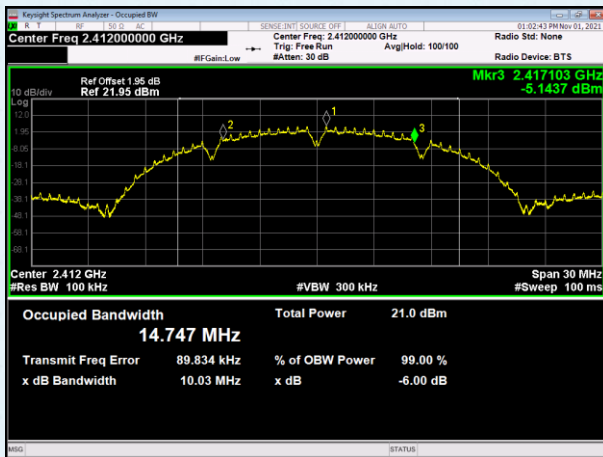
| Test Channel | 99% Occupy Bandwidth (MHz) |         |               | Result |
|--------------|----------------------------|---------|---------------|--------|
|              | 802.11b                    | 802.11g | 802.11n(HT20) |        |
| Lowest       | 14.750                     | 15.984  | 16.894        | Pass   |
| Middle       | 14.778                     | 16.057  | 16.957        |        |
| Highest      | 14.802                     | 16.519  | 17.473        |        |

Test plot as follows:

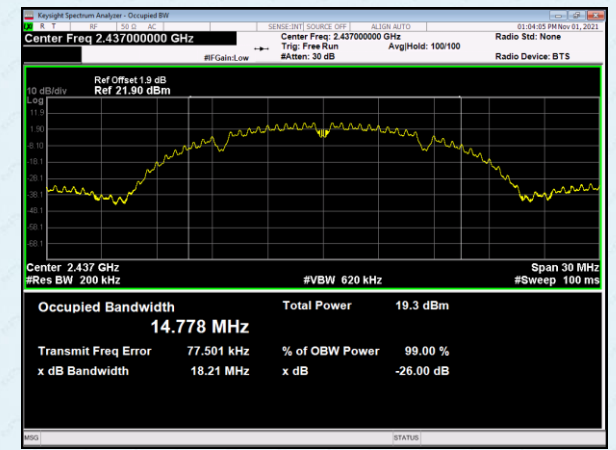
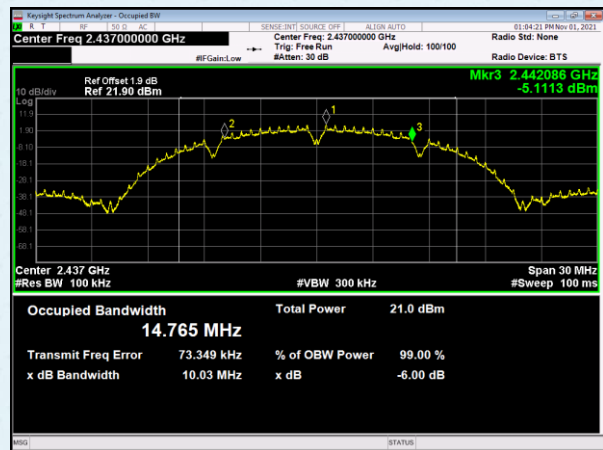
-6dB BW:

%99BW

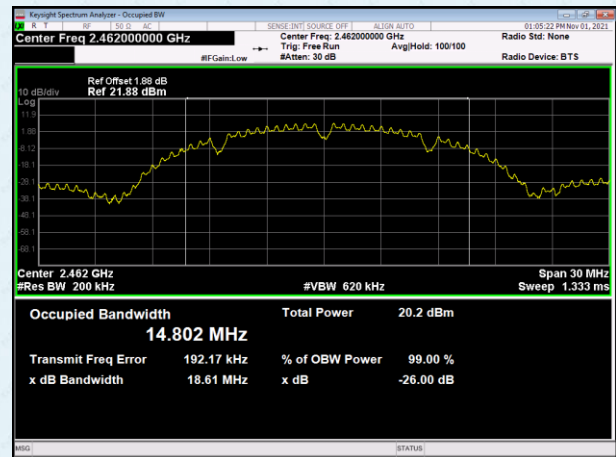
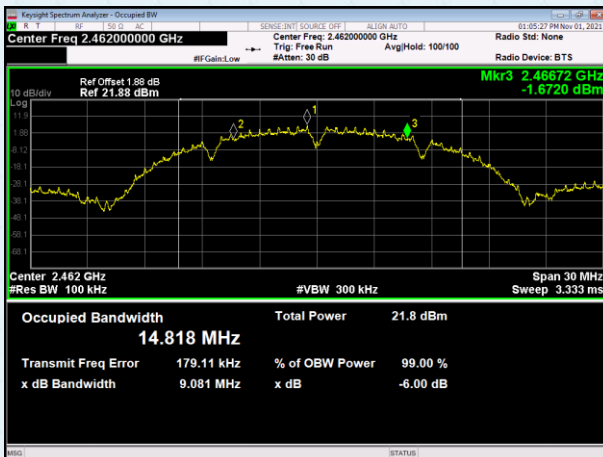
|            |         |            |         |
|------------|---------|------------|---------|
| Test mode: | 802.11b | Test mode: | 802.11b |
|------------|---------|------------|---------|



Lowest channel

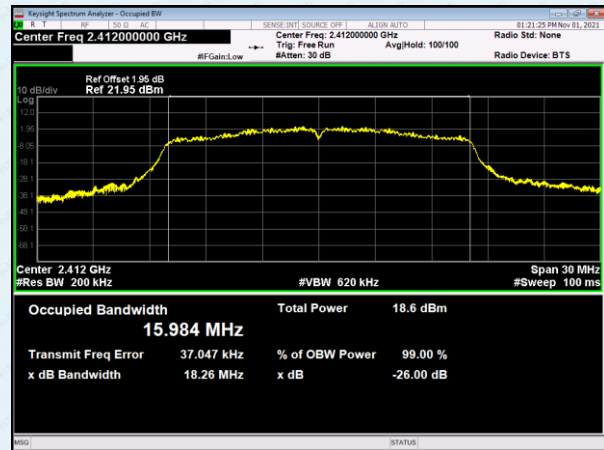
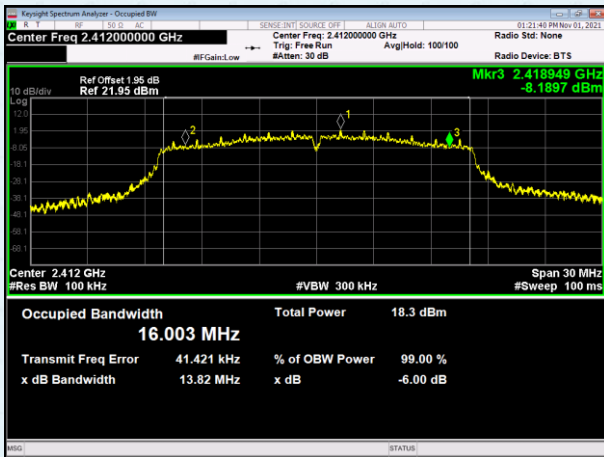


Middle channel

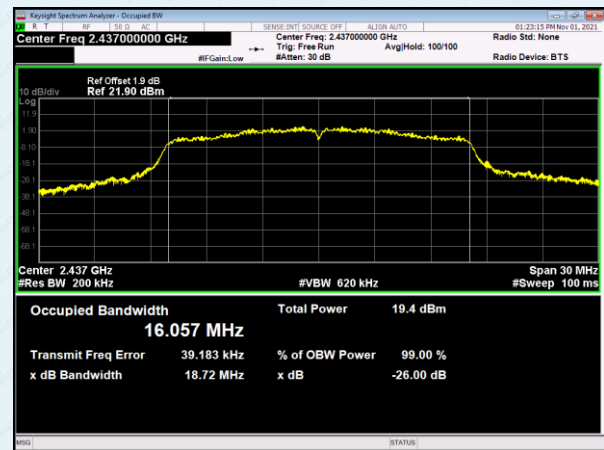
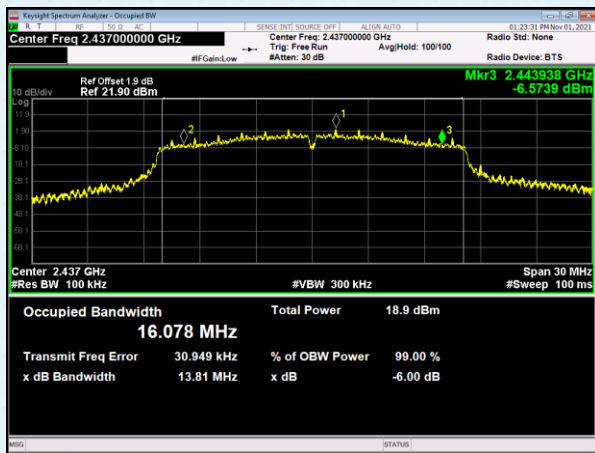


Highest channel

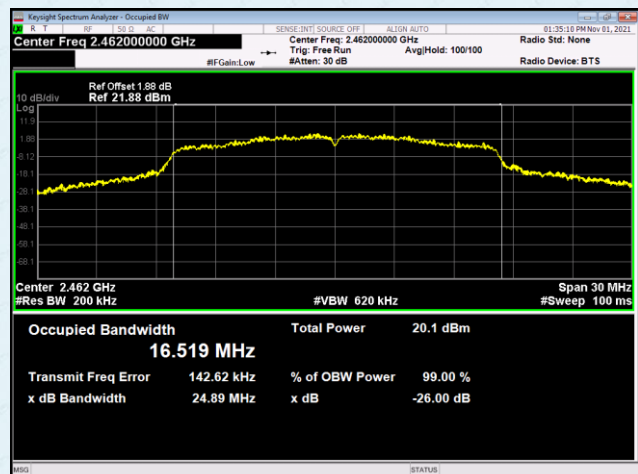
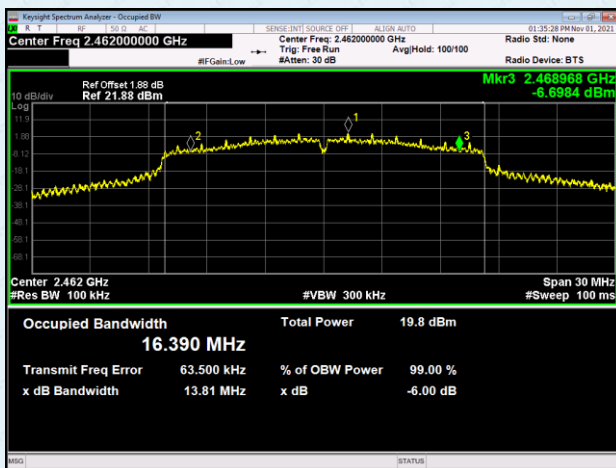
|            |         |            |         |
|------------|---------|------------|---------|
| Test mode: | 802.11g | Test mode: | 802.11g |
|------------|---------|------------|---------|



Lowest channel

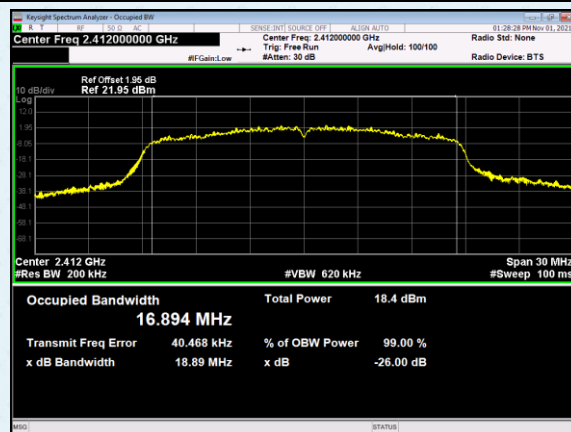
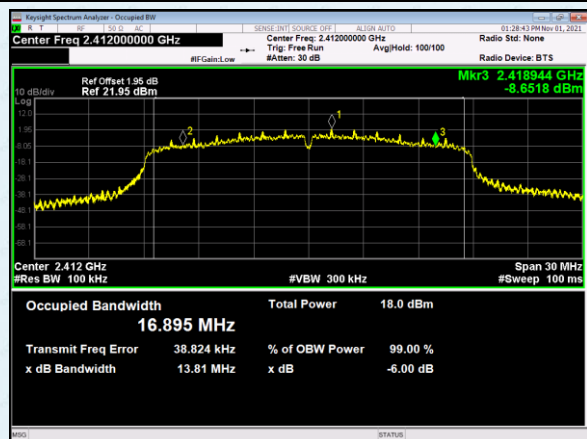


Middle channel

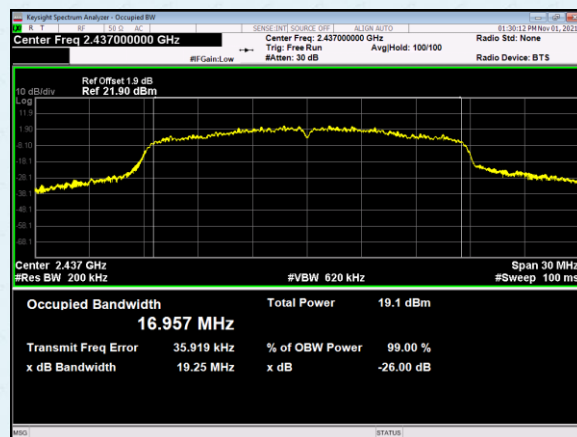
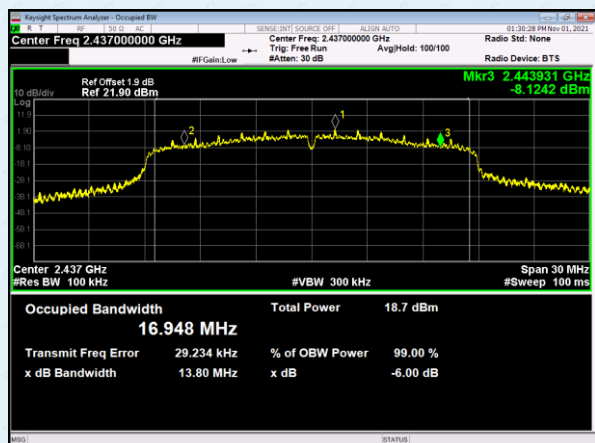


Highest channel

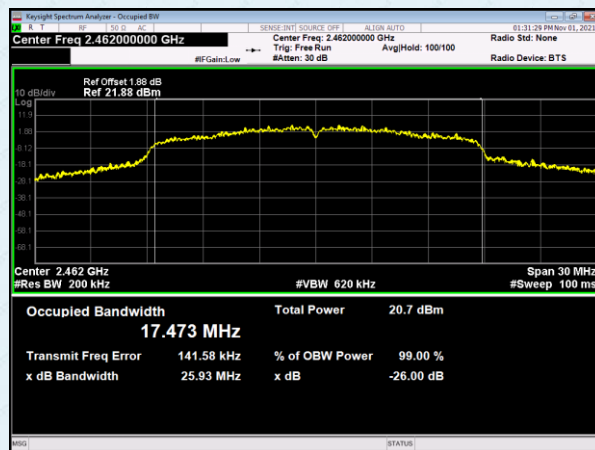
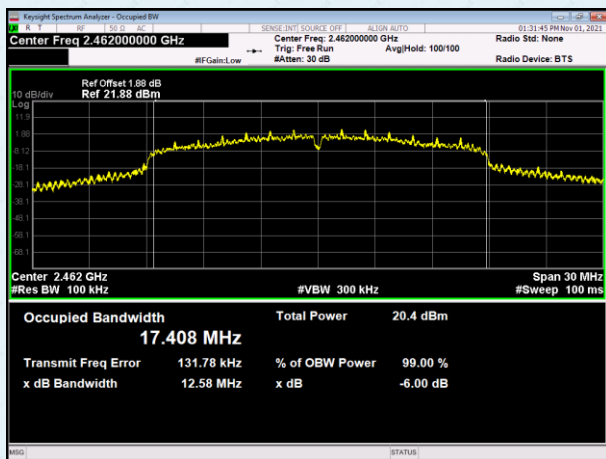
|            |               |            |               |
|------------|---------------|------------|---------------|
| Test mode: | 802.11n(HT20) | Test mode: | 802.11n(HT20) |
|------------|---------------|------------|---------------|



Lowest channel

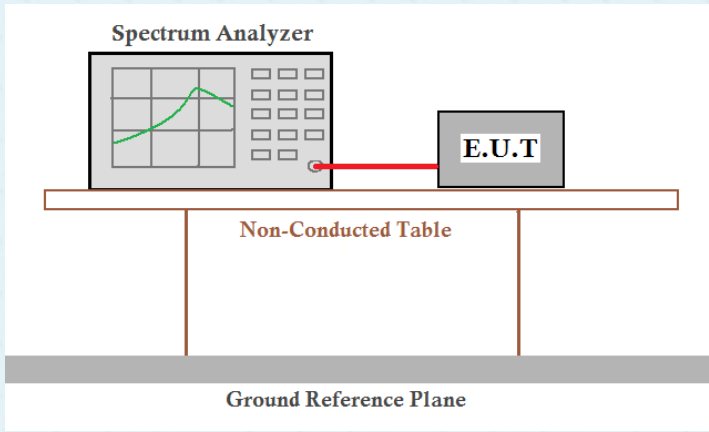


Middle channel



Highest channel

## 7.5 Power Spectral Density

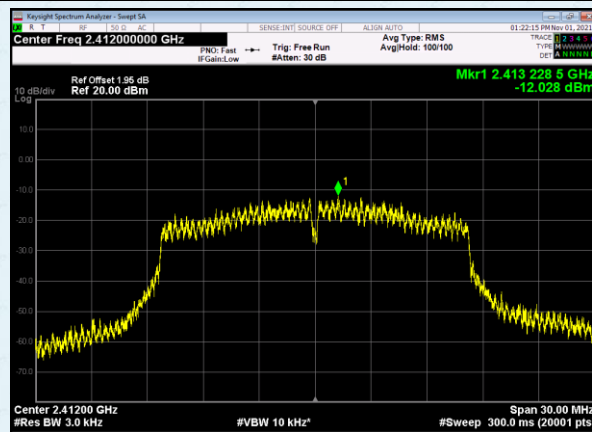
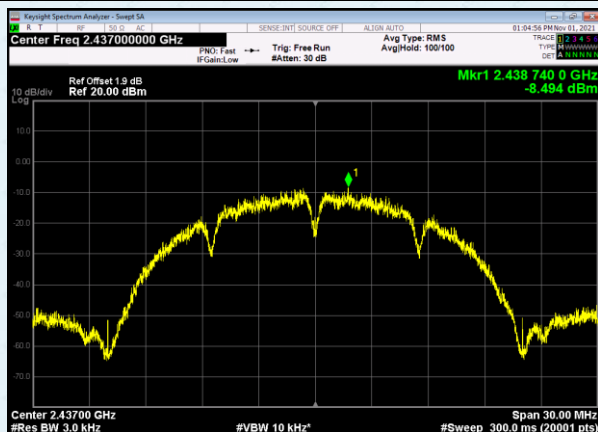
|                   |                                                                                    |
|-------------------|------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (e)                                                    |
| Test Method:      | ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02                     |
| Limit:            | 8dBm/3kHz                                                                          |
| Test setup:       |  |
| Test Instruments: | Refer to section 6.0 for details                                                   |
| Test mode:        | Refer to section 5.2 for details                                                   |
| Test results:     | Pass                                                                               |

### Measurement Data

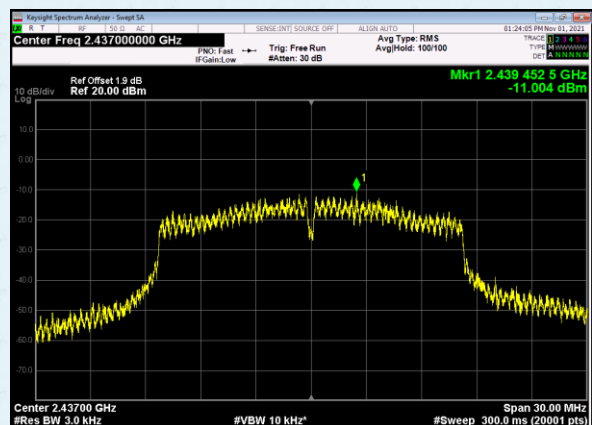
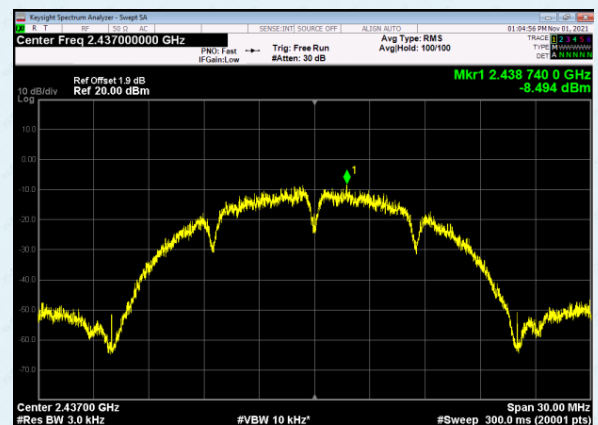
| Test CH | Power Spectral Density (dBm/3kHz) |         |               | Limit<br>(dBm/3kHz) | Result |
|---------|-----------------------------------|---------|---------------|---------------------|--------|
|         | 802.11b                           | 802.11g | 802.11n(HT20) |                     |        |
| Lowest  | -8.451                            | -12.028 | -13.671       | 8.00                | Pass   |
| Middle  | -8.494                            | -11.004 | -13.024       |                     |        |
| Highest | -7.162                            | -10.205 | -11.542       |                     |        |

Test plot as follows:

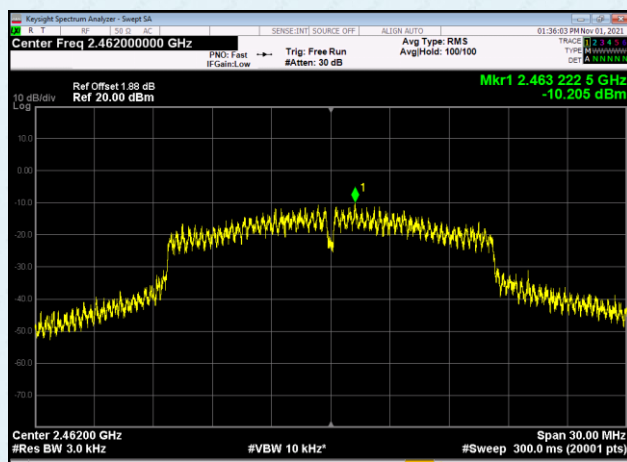
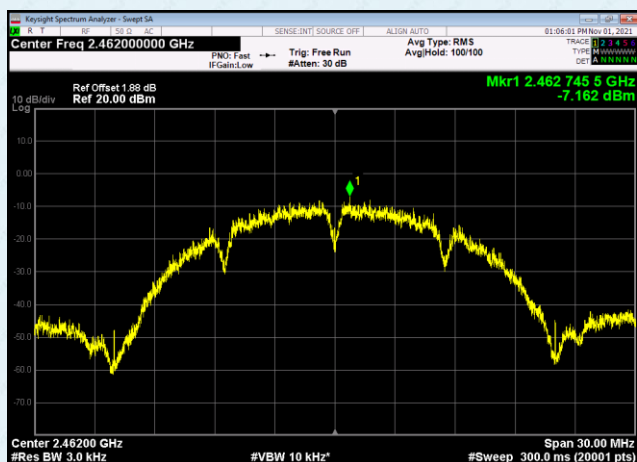
|            |         |            |         |
|------------|---------|------------|---------|
| Test mode: | 802.11b | Test mode: | 802.11g |
|------------|---------|------------|---------|



Lowest channel

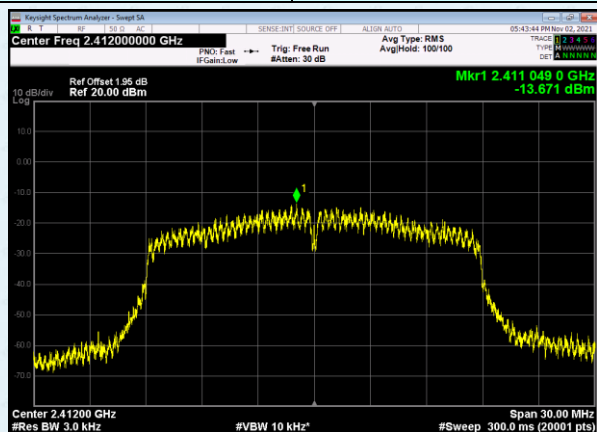


Middle channel

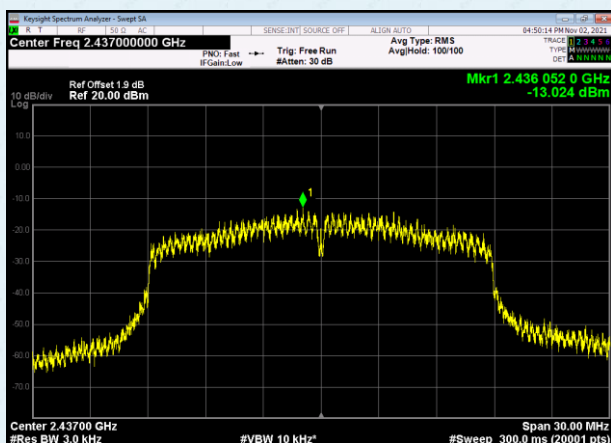


Highest channel

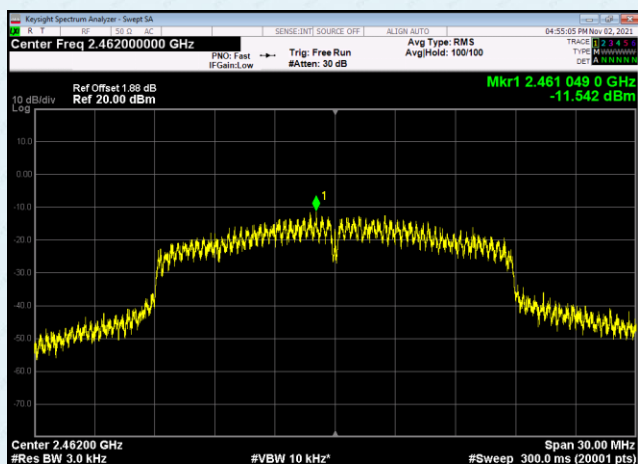
|            |               |            |   |
|------------|---------------|------------|---|
| Test mode: | 802.11n(HT20) | Test mode: | / |
|------------|---------------|------------|---|



Lowest channel



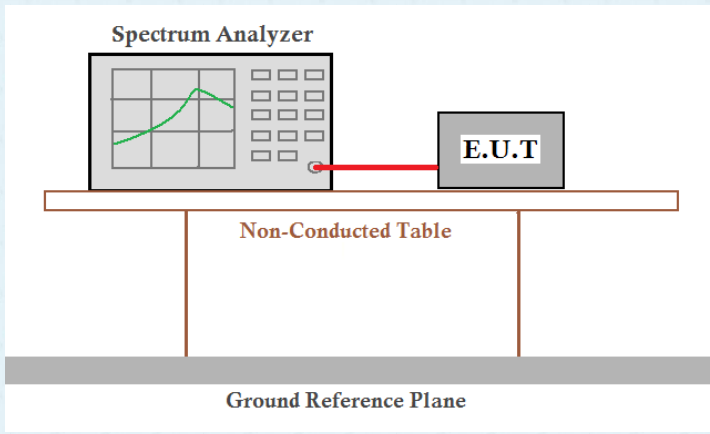
Middle channel



Highest channel

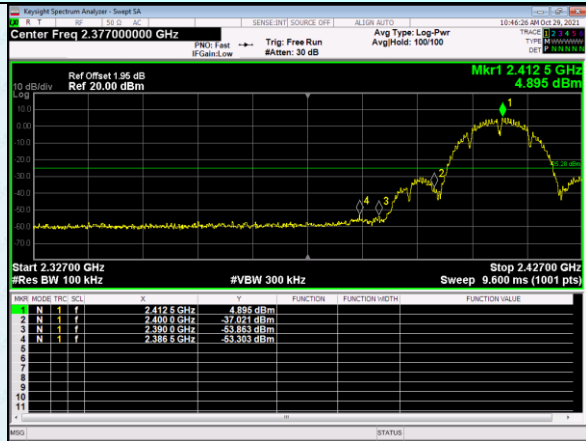
## 7.6 Band edges

### 7.6.1 Conducted Emission Method

|                   |                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (d)                                                                                                                                                                                                                                                                                                                                                           |
| Test Method:      | ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02                                                                                                                                                                                                                                                                                                                            |
| Limit:            | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.   |
| Test setup:       |  <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by two vertical legs and sits on a Ground Reference Plane.</p> |
| Test Instruments: | Refer to section 6.0 for details                                                                                                                                                                                                                                                                                                                                                          |
| Test mode:        | Refer to section 5.2 for details                                                                                                                                                                                                                                                                                                                                                          |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                                                                      |

Test plot as follows:

Test mode: 802.11b

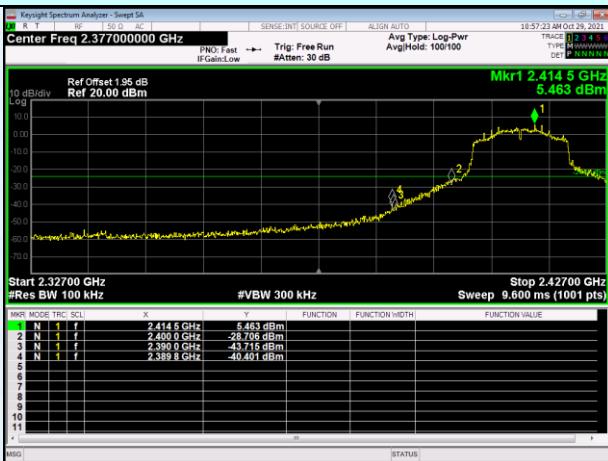


Lowest channel

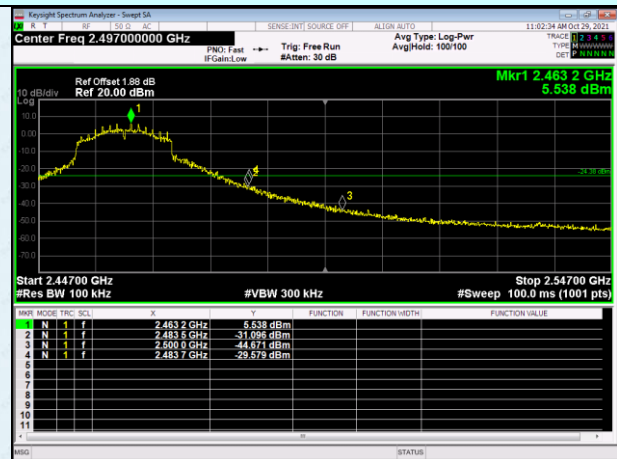


Highest channel

Test mode: 802.11g

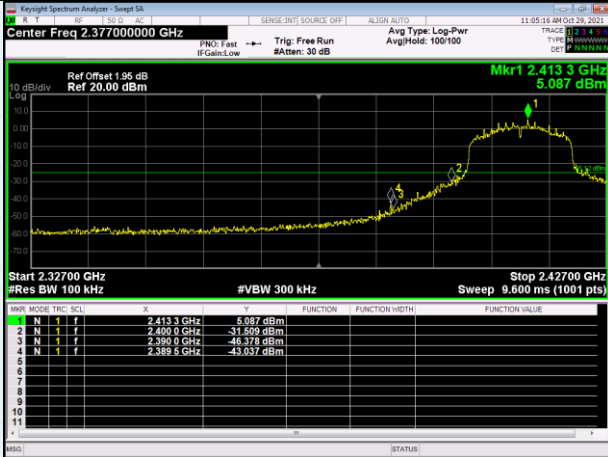


Lowest channel

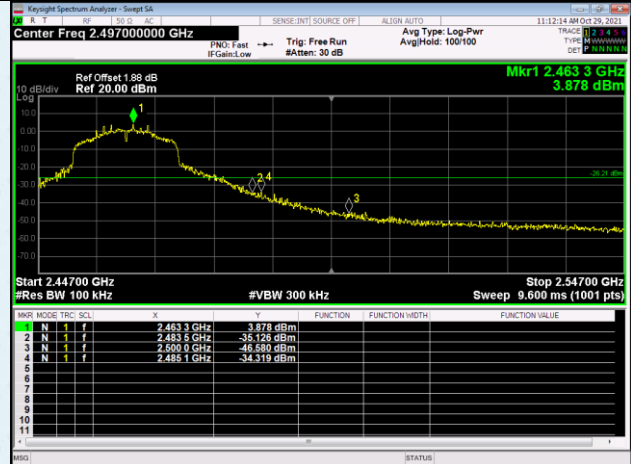


Highest channel

Test mode: 802.11n(HT20)

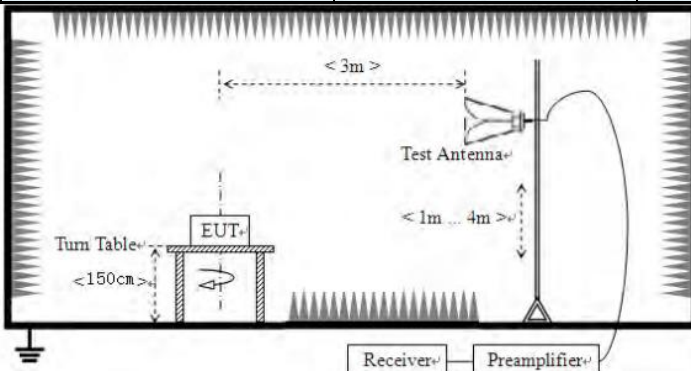


Lowest channel



Highest channel

## 7.6.2 Radiated Emission Method

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                    |      |         |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------|------|---------|
| Test Requirement:     | FCC Part15 C Section 15.209 and 15.205                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |          |                    |      |         |
| Test Method:          | ANSI C63.10: 2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |                    |      |         |
| Test Frequency Range: | All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |                    |      |         |
| Test site:            | Measurement Distance: 3m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |                    |      |         |
| Receiver setup:       | Frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Detector | RBW                | VBW  | Value   |
|                       | Above 1GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Peak     | 1MHz               | 3MHz | Peak    |
|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Average  | 1MHz               | 3MHz | Average |
| Limit:                | Frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          | Limit (dBuV/m @3m) |      | Value   |
|                       | Above 1GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          | 54.00              |      | Average |
|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          | 74.00              |      | Peak    |
| Test setup:           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |                    |      |         |
| Test Procedure:       | <ol style="list-style-type: none"><li>1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li><li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li><li>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li><li>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</li><li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li><li>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li><li>7. The radiation measurements are performed in X, Y, Z axis positioning. And found the Y axis positioning which it is worse case, only the test worst case mode is recorded in the report.</li></ol> |          |                    |      |         |
| Test Instruments:     | Refer to section 6.0 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |          |                    |      |         |
| Test mode:            | Refer to section 5.2 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |          |                    |      |         |
| Test results:         | Pass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |          |                    |      |         |

**Measurement data:**

|            |         |               |        |
|------------|---------|---------------|--------|
| Test mode: | 802.11b | Test channel: | Lowest |
|------------|---------|---------------|--------|

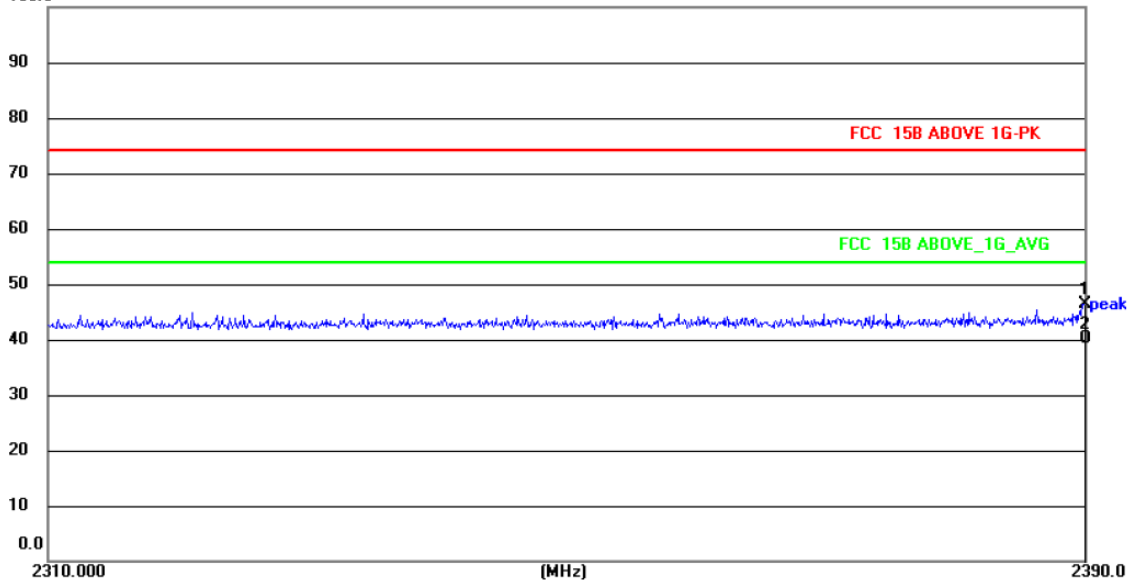
**Radiated Emission Measurement**

File :Gateway

Data :#97

Date: 2021/10/29

100.0 dBuV/m



Site 966 Chamber

Polarization: **Horizontal**

Temperature: 26(C)

Limit: FCC 15B ABOVE 1G-PK

Power: DC 12V(Powered by

Humidity: 54 %

EUT: Wifi Controller

Distance: 3m

M/N: GWWIC02

Mode: WIFI 2412MHz b

Note: Gateway

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|-------------|----------------|-----|--------|
| 1   | 2389.947        | 16.22          | 30.09         | 46.31          | 74.00          | 27.69       | peak     | 105         | 143            | P   |        |
| 2 * | 2389.947        | 10.09          | 30.09         | 40.18          | 54.00          | 13.82       | AVG      | 113         | 208            | P   |        |

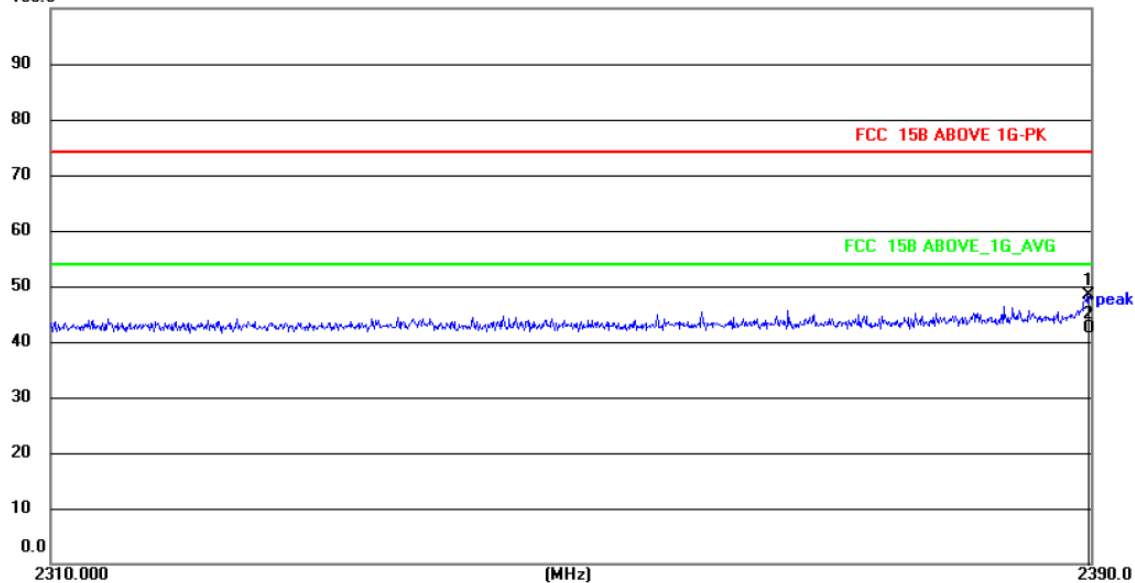
## Radiated Emission Measurement

File :Gateway

Data :#98

Date: 2021/10/29

100.0 dBuV/m



Site 966 Chamber

Polarization: **Vertical**

Temperature: 26(C)

Limit: FCC 15B ABOVE 1G-PK

Power: DC 12V(Powered by adaptor)

Humidity: 54 %

EUT: Wifi Controller

Distance: 3m

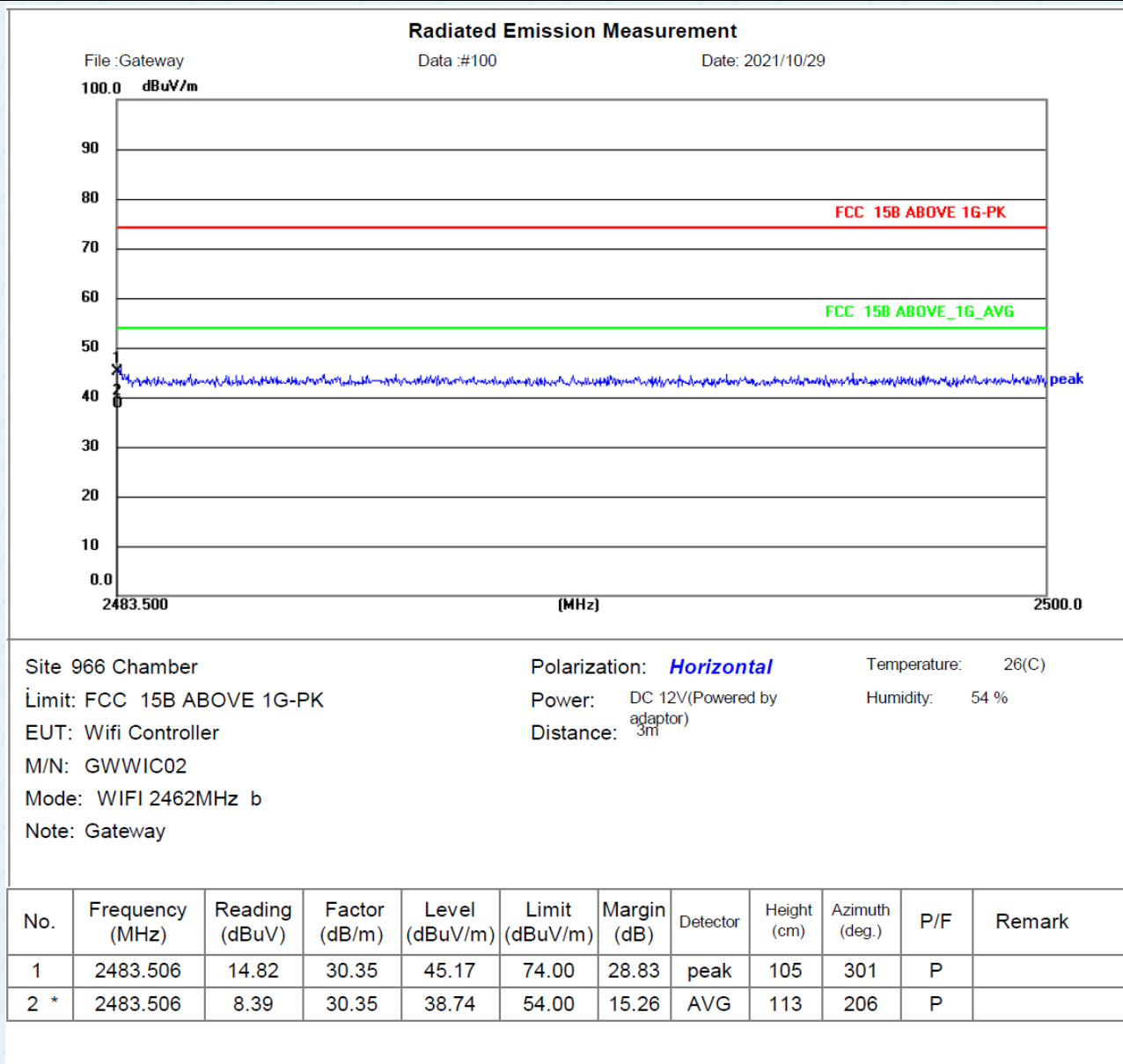
M/N: GWWIC02

Mode: WIFI 2412MHz b

Note: Gateway

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|-------------|----------------|-----|--------|
| 1   | 2389.787        | 18.36          | 30.09         | 48.45          | 74.00          | 25.55       | peak     | 122         | 157            | P   |        |
| 2 * | 2389.787        | 12.33          | 30.09         | 42.42          | 54.00          | 11.58       | AVG      | 131         | 335            | P   |        |

|            |         |               |         |
|------------|---------|---------------|---------|
| Test mode: | 802.11b | Test channel: | Highest |
|------------|---------|---------------|---------|

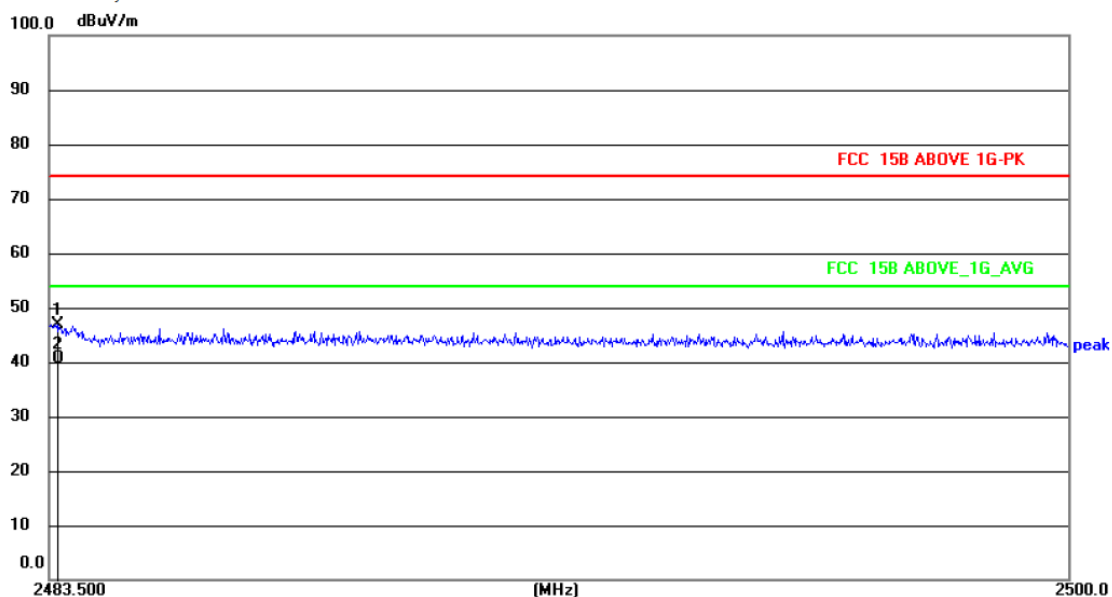


## Radiated Emission Measurement

File :Gateway

Data :#99

Date: 2021/10/29



Site 966 Chamber

Polarization: **Vertical**

Temperature: 26(C)

Limit: FCC 15B ABOVE 1G-PK

Power: DC 12V(Powered by

Humidity: 54 %

EUT: Wifi Controller

Distance: 3m  
adaptor)

M/N: GWWIC02

Mode: WIFI 2462MHz b

Note: Gateway

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|-------------|----------------|-----|--------|
| 1   | 2483.632        | 16.61          | 30.35         | 46.96          | 74.00          | 27.04       | peak     | 140         | 112            | P   |        |
| 2 * | 2483.632        | 10.23          | 30.35         | 40.58          | 54.00          | 13.42       | AVG      | 139         | 204            | P   |        |