

# TEST REPORT

Product Name : LED bulb  
Model Number : B4001WE1WH-15, MLB-BR40150DW-2  
FCC ID : 2A5Y5-B40XXWE1XX

Prepared for : Xiamen Yiyuanyuan Technology Ltd.  
Address : 3F No.78, Meixi Road Siming Zone, Tongan District,  
Xiamen, Fujian, China

Prepared by : EMTEK (NINGBO) CO., LTD.  
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Report Number : ENB2209190091W00101R  
Date(s) of Tests : September 19, 2022 to September 27, 2022  
Date of Issue : October 13, 2022

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## 1 TEST RESULT CERTIFICATION

Applicant : Xiamen Yiyuanyuan Technology Ltd.  
Address : 3F No.78, Meixi Road Siming Zone, Tongan District, Xiamen, Fujian, China  
Manufacturer : Xiamen Yiyuanyuan Technology Ltd.  
Address : 3F No.78, Meixi Road Siming Zone, Tongan District, Xiamen, Fujian, China  
EUT : LED bulb  
Model Name : B4001WE1WH-15, MLB-BR40150DW-2  
Trademark : N/A

Measurement Procedure Used:

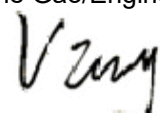
| APPLICABLE STANDARDS                                          |             |
|---------------------------------------------------------------|-------------|
| STANDARD                                                      | TEST RESULT |
| FCC 47 CFR Part 2, Subpart J<br>FCC 47 CFR Part 15, Subpart C | PASS        |

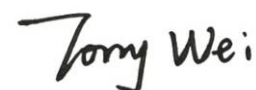
The above equipment was tested by EMTEK (NINGBO) CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 2 and Part 15.247

The test results of this report relate only to the tested sample identified in this report.

Date of Test : September 19, 2022 to September 27, 2022

Prepared by :   
June Gao/Engineer

Reviewer :   
Vinay/Supervisor

Approved & Authorized Signer :   
Tony Wei/Manager



## 2 EUT TECHNICAL DESCRIPTION

| Characteristics                 | Description                                                                                                                                                                                                                                |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product                         | LED bulb                                                                                                                                                                                                                                   |
| Model Number                    | B4001WE1WH-15, MLB-BR40150DW-2<br>(Note: The two models are only named differently, everything else is the same. We select " B4001WE1WH-15" for RF testing.)                                                                               |
| Sample Number                   | 1#                                                                                                                                                                                                                                         |
| IEEE 802.11 WLAN Mode Supported | <input checked="" type="checkbox"/> 802.11b<br><input checked="" type="checkbox"/> 802.11g<br><input checked="" type="checkbox"/> 802.11n(20MHz channel bandwidth)<br><input checked="" type="checkbox"/> 802.11n(40MHz channel bandwidth) |
| Data Rate                       | 802.11 b:1,2,5.5,11Mbps;<br>802.11 g:6,9,12,18,24,36,48,54Mbps;<br>802.11 n: MCS0~7, up to 150Mbps;                                                                                                                                        |
| Modulation                      | DSSS with DBPSK/DQPSK/CCK for 802.11b;<br>OFDM with BPSK/ CCK /16QAM/64QAM for 802.11g/n20;                                                                                                                                                |
| Operating Frequency Range       | <input checked="" type="checkbox"/> 2412-2462MHz for 802.11b/g/n(HT20);<br><input checked="" type="checkbox"/> 2422-2452MHz for 802.11n(HT40);                                                                                             |
| Number of Channels              | <input checked="" type="checkbox"/> 11 channels for 802.11b/g n(HT20);<br><input checked="" type="checkbox"/> 7 Channels for 802.11n(HT40);                                                                                                |
| Transmit Power Max              | 13.66 dBm                                                                                                                                                                                                                                  |
| Smart system                    | <input checked="" type="checkbox"/> SISO for802.11 b/g/n(HT20)/ n(HT40);<br><input type="checkbox"/> MIMO for802.11n(HT20);                                                                                                                |
| Antenna Type                    | Chip Antenna                                                                                                                                                                                                                               |
| Antenna Gain                    | 4.75 dBi                                                                                                                                                                                                                                   |
| Power supply                    | AC 120V/60Hz                                                                                                                                                                                                                               |
| Temperature Range               | -20℃~+60℃                                                                                                                                                                                                                                  |
| Date of Received                | September 19, 2022                                                                                                                                                                                                                         |

**Note:** for more details, please refer to the User's manual of the EUT.

### 3 SUMMARY OF TEST RESULT

| FCC Part Clause     | Test Parameter                                                                                                                                                                                                                                                                                   | Verdict | Remark |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------|
| 15.247(a)(2)        | DTS (6dB) Bandwidth                                                                                                                                                                                                                                                                              | PASS    |        |
| 15.247(b)(3)        | Maximum Peak Conducted Output Power                                                                                                                                                                                                                                                              | PASS    |        |
| 15.247(e)           | Maximum Power Spectral Density Level                                                                                                                                                                                                                                                             | PASS    |        |
| 15.247(d)           | Unwanted Emission Into Non-Restricted Frequency Bands                                                                                                                                                                                                                                            | PASS    |        |
| 15.247(d)<br>15.209 | Unwanted Emission Into Restricted Frequency Bands (conducted)                                                                                                                                                                                                                                    | PASS    |        |
| 15.247(d)<br>15.209 | Radiated Spurious Emission                                                                                                                                                                                                                                                                       | PASS    |        |
| 15.207              | Conducted Emission Test                                                                                                                                                                                                                                                                          | PASS    |        |
| 15.247(b)           | Antenna Application                                                                                                                                                                                                                                                                              | PASS    |        |
|                     | NOTE1:N/A (Not Applicable)<br>NOTE2: According to FCC OET KDB 558074, the report use radiated measurements in the restricted frequency bands. In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits. |         |        |

#### RELATED SUBMITTAL(S) / GRANT(S):

This submittal(s) (test report) is intended for FCC ID: 2A5Y5-B40XXWE1XX filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## 4 TEST METHODOLOGY

### 4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:  
 FCC 47 CFR Part 2, Subpart J  
 FCC 47 CFR Part 15, Subpart C  
 FCC KDB 558074 D01 15.247 Meas Guidance v05r02

### 4.2 MEASUREMENT EQUIPMENT USED

#### 4.2.1 Conducted Emission Test Equipment

| Equ. No. | Equipment         | Manufacturer                      | Model No. | Serial No.       | Last Cal.     | Cal. Interval |
|----------|-------------------|-----------------------------------|-----------|------------------|---------------|---------------|
| ENE-001  | Test Receiver     | Rohde & Schwarz                   | ESCI      | 101108           | July 07, 2022 | 1 Year        |
| ENE-003  | L.I.S.N           | Rohde & Schwarz                   | ENV216    | 101193           | July 07, 2022 | 1 Year        |
| ENE-004  | L.I.S.N           | Schwarzbeck                       | NSLK 8126 | 8126-462         | July 07, 2022 | 1 Year        |
| ENE-006  | Pulse Limiter     | MTS-systemtechnik                 | IMP-136   | 2611115-001-0033 | July 07, 2022 | 1 Year        |
| ENE-005  | RF Switching unit | Compliance Direction Systems Inc. | RSU-M2    | 38400            | July 07, 2022 | 1 Year        |

#### 4.2.2 Radiated Emission Test Equipment

| Equ. No.  | Equipment           | Manufacturer           | Model No.        | Serial No.       | Last Cal.      | Cal. Interval |
|-----------|---------------------|------------------------|------------------|------------------|----------------|---------------|
| ENE-002   | EMI Test Receiver   | Rohde & Schwarz        | ESCI             | 101107           | July 07, 2022  | 1 Year        |
| ENE-009   | Pre-Amplifier       | CD                     | PAP-0203         | 22015            | July 07, 2022  | 1 Year        |
| ENE-010   | Bilog Antenna       | Schwarzbeck            | VULB9163         | 9163-467         | July 11, 2022  | 2 Year        |
| ENE-025-1 | Cable               | Huber + Suhner         | CBL3-NN-0.5M     | 101216-2140500-2 | July 07, 2022  | 1 Year        |
| ENE-025-2 | Cable               | Huber + Suhner         | CBL3-NN-3.0M     | 101216-2143000-2 | July 07, 2022  | 1 Year        |
| ENE-025-3 | Cable               | Huber + Suhner         | CBL3-NN-9.0M     | 101216-2149000   | July 07, 2022  | 1 Year        |
| ENE-170   | EXA Signal Analyzer | KEYSIGHT               | N9010B           | MY60242457       | March 01, 2022 | 1 Year        |
| ENE-090   | Pre-Amplifier       | Connphy Microwave Inc. | GLN-1G40G-4165-K | 0319104          | Nov 22, 2021   | 1 Year        |
| ENE-060   | Horn Antenna        | Schwarzbeck            | BBHA 9120        | 9120D-707        | April 13, 2021 | 2 Year        |
| ENE-101-1 | Cable               | SMAMSMAM               | A50-0.5M         | N/A              | July 07, 2022  | 1 Year        |
| ENE-101-2 | Cable               | SMAMSMAM               | A50-3M           | N/A              | July 07, 2022  | 1 Year        |
| ENE-101-4 | Cable               | SMAMSMAM               | A50-6M           | N/A              | July 07, 2022  | 1 Year        |

#### 4.2.3 Radio Frequency Test Equipment

| Equ. No. | Equipment           | Manufacturer        | Model No.  | Serial No. | Last Cal.      | Cal. Interval |
|----------|---------------------|---------------------|------------|------------|----------------|---------------|
| ENE-170  | EXA Signal Analyzer | KEYSIGHT            | N9010B     | MY60242457 | March 01, 2022 | 1 Year        |
| ENE-095  | Band Reject Filter  | O.M.Jones, Inc. dba | BRM50702-0 | G049       | July 07, 2022  | 1 Year        |



### 4.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition.

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

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Those data rates (☒802.11b:1 Mbps;☒802.11g: 6 Mbps;☒802.11n(HT20): MCS0;☐802.11n(HT40): MCS0) were used for all test.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

☒Frequency and Channel list for 802.11b/g/n (HT20):

| Channel | Frequency<br>(MHz) | Channel | Frequency<br>(MHz) | Channel | Frequency<br>(MHz) |
|---------|--------------------|---------|--------------------|---------|--------------------|
| 1       | 2412               | 6       | 2437               | 11      | 2462               |
| 2       | 2417               | 7       | 2442               |         |                    |
| 3       | 2422               | 8       | 2447               |         |                    |
| 4       | 2427               | 9       | 2452               |         |                    |
| 5       | 2432               | 10      | 2457               |         |                    |

☒Frequency and Channel list for 802.11n (HT40):

| Channel | Frequency<br>(MHz) | Channel | Frequency<br>(MHz) | Channel | Frequency<br>(MHz) |
|---------|--------------------|---------|--------------------|---------|--------------------|
| 3       | 2422               | 6       | 2437               | 9       | 2452               |
| 4       | 2427               | 7       | 2442               |         |                    |
| 5       | 2432               | 8       | 2447               |         |                    |

☒Test Frequency and Channel for 802.11b/g/n (HT20):

| Lowest Frequency |                    | Middle Frequency |                    | Highest Frequency |                    |
|------------------|--------------------|------------------|--------------------|-------------------|--------------------|
| Channel          | Frequency<br>(MHz) | Channel          | Frequency<br>(MHz) | Channel           | Frequency<br>(MHz) |
| 1                | 2412               | 6                | 2437               | 11                | 2462               |

☒Test Frequency and Channel for 802.11n (HT40):

| Lowest Frequency |                    | Middle Frequency |                    | Highest Frequency |                    |
|------------------|--------------------|------------------|--------------------|-------------------|--------------------|
| Channel          | Frequency<br>(MHz) | Channel          | Frequency<br>(MHz) | Channel           | Frequency<br>(MHz) |
| 3                | 2422               | 6                | 2437               | 9                 | 2452               |

#### 4.4 TEST SOFTWARE

| Item               | Software               |
|--------------------|------------------------|
| Radiated Emission: | EMC (Ver. EMEC-3A1)    |
| Conducted Emission | EZ-EMC (Ver. CON-03A1) |



## 5 FACILITIES AND ACCREDITATIONS

### 5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

1F Building 4, 1177#, Lingyun Road, Ningbo National Hi-Tech Zone, Ningbo, Zhejiang, China.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 32.

### 5.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

EMC Lab.

: **Accredited by CNAS**

The Certificate Registration Number is L6666.

The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2018 (identical to ISO/IEC 17025:2017)

**Accredited by FCC**

Designation Number: CN1302

Test Firm Registration Number: 436491

**Accredited by A2LA**

The certificate is valid until May 31, 2023

The Certificate Number is 4321.03.

**Accredited by Industry Canada**

The Certificate Registration Number is CN0114

Company Number: 9469A

Name of Firm

: EMTEK (NINGBO) CO., LTD.

Site Location

: 1F Building 4, 1177#, Lingyun Road, Ningbo National Hi-Tech Zone, Ningbo, Zhejiang, China.

## 6 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

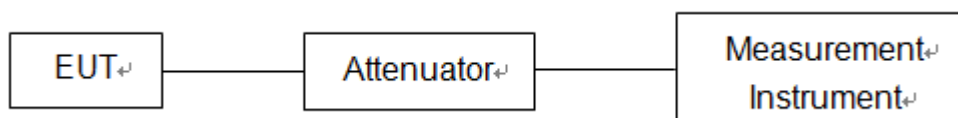
| Parameter                      | Uncertainty            |
|--------------------------------|------------------------|
| Radio Frequency                | $\pm 1 \times 10^{-5}$ |
| Maximum Peak Output Power Test | $\pm 1.0$ dB           |
| Conducted Emissions Test       | $\pm 2.0$ dB           |
| Radiated Emission Test         | $\pm 2.0$ dB           |
| Power Density                  | $\pm 2.0$ dB           |
| Occupied Bandwidth Test        | $\pm 1.0$ dB           |
| Band Edge Test                 | $\pm 3$ dB             |
| All emission, radiated         | $\pm 3$ dB             |
| Antenna Port Emission          | $\pm 3$ dB             |
| Temperature                    | $\pm 0.5$ °C           |
| Humidity                       | $\pm 3$ %              |

Measurement Uncertainty for a level of Confidence of 95%

## 7 SETUP OF EQUIPMENT UNDER TEST

### 7.1 RADIO FREQUENCY TEST SETUP 1

The WLAN component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



### 7.2 RADIO FREQUENCY TEST SETUP 2

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

Below 30MHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antennaplane may also need to be positioned horizontally at the specified distance from the EUT.

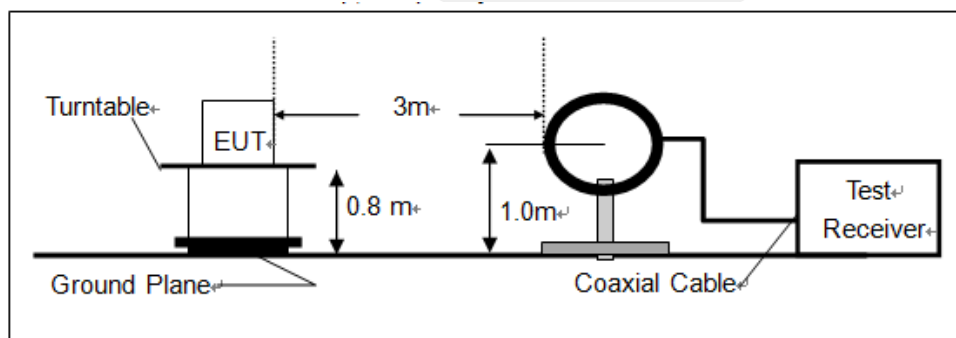
30MHz-1GHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

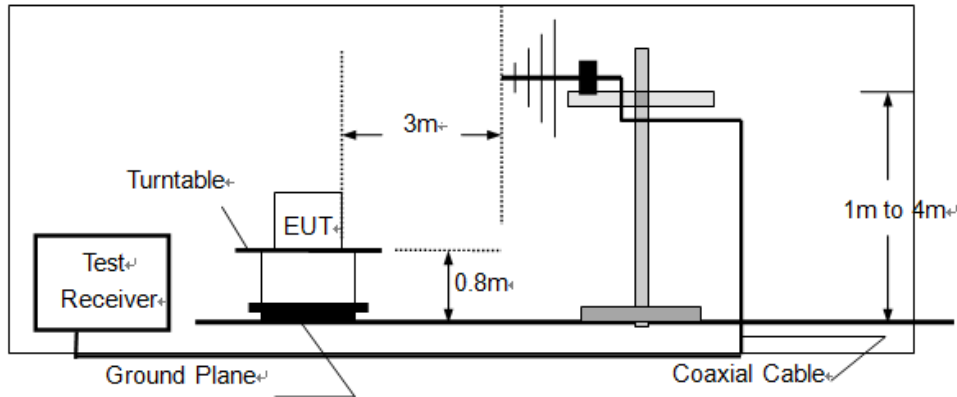
Above 1GHz:

The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

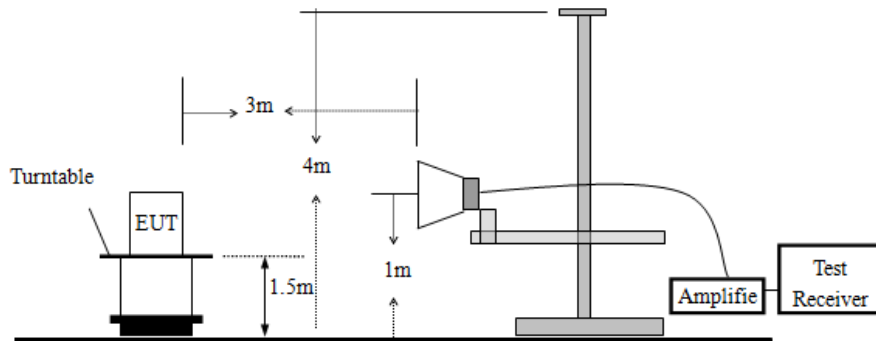
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(c) Radiated Emission Test Set-Up, Frequency above 1000MHz

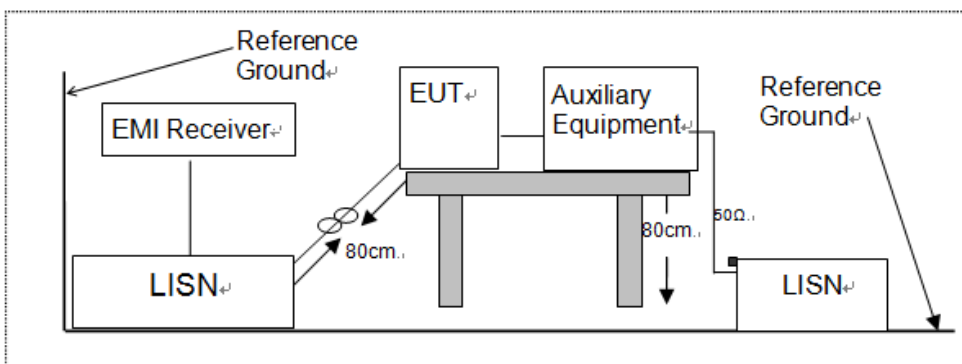


### 7.3 CONDUCTED EMISSION TEST SETUP

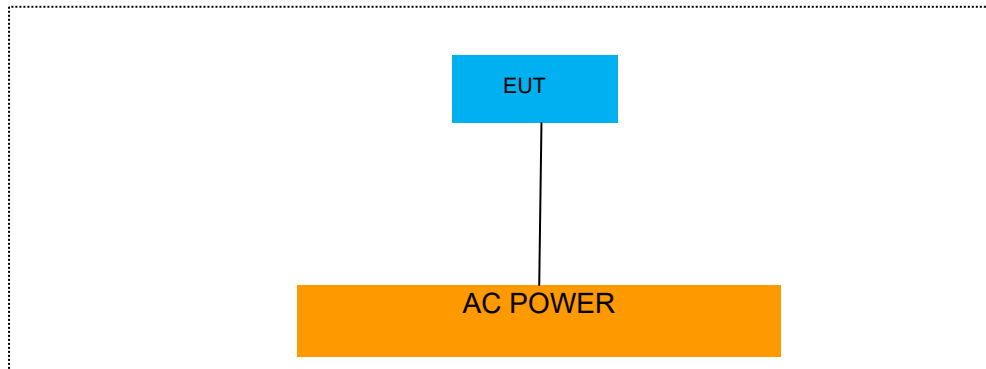
The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



#### 7.4 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM



#### 7.5 SUPPORT EQUIPMENT

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

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

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

##### Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. Unless otherwise denoted as EUT in 『Remark』 column , device(s) used in tested system is a support equipment

## 8 TEST REQUIREMENTS

### 8.1 DTS (6DB) BANDWIDTH

#### 8.1.1 Applicable Standard

According to FCC Part15.247 (a)(2) and KDB 558074 D01 15.247 Meas Guidance v05r02

#### 8.1.2 Conformance Limit

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

#### 8.1.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

#### 8.1.4 Test Procedure

The EUT was operating in IEEE 802.11b/g/n mode and controlled its channel. Printed out the test result from the spectrum by hard copy function.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously

Set RBW = 100 kHz.

Set the video bandwidth (VBW) =300kHz.

Set Span=2 times OBW

Set Detector = Peak.

Set Trace mode = max hold.

Set Sweep = auto couple.

Allow the trace to stabilize.

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Measure and record the results in the test report.

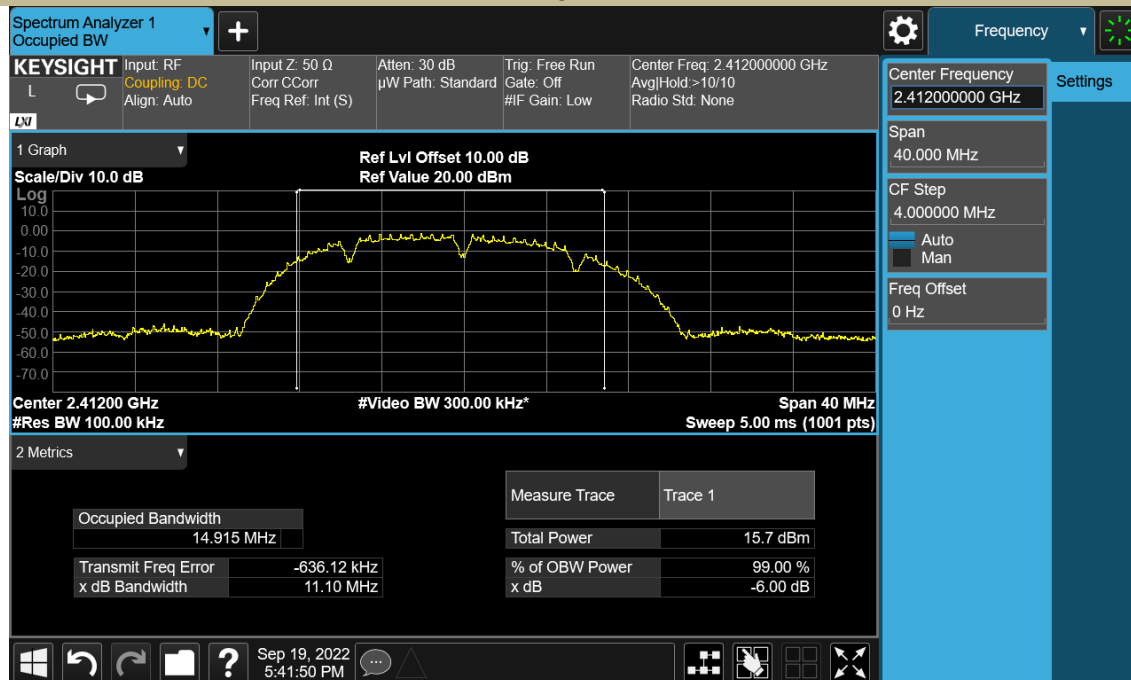
#### 8.1.5 Test Results

|                    |           |
|--------------------|-----------|
| Temperature:       | 23° C     |
| Relative Humidity: | 56%       |
| ATM Pressure:      | 1011 mbar |

| Operation Mode | Channel Number | Channel Frequency (MHz) | Measurement Bandwidth (MHz) | Limit (kHz) | Verdict |
|----------------|----------------|-------------------------|-----------------------------|-------------|---------|
| 802.11b        | 1              | 2412                    | 11.10                       | >500        | PASS    |
|                | 6              | 2437                    | 11.08                       | >500        | PASS    |
|                | 11             | 2462                    | 11.03                       | >500        | PASS    |
| 802.11g        | 1              | 2412                    | 17.23                       | >500        | PASS    |
|                | 6              | 2437                    | 17.16                       | >500        | PASS    |
|                | 11             | 2462                    | 17.15                       | >500        | PASS    |
| 802.11n (HT20) | 1              | 2412                    | 18.34                       | >500        | PASS    |
|                | 6              | 2437                    | 18.31                       | >500        | PASS    |
|                | 11             | 2462                    | 18.23                       | >500        | PASS    |
| 802.11n (HT40) | 3              | 2422                    | 35.09                       | >500        | PASS    |
|                | 6              | 2437                    | 35.35                       | >500        | PASS    |
|                | 9              | 2452                    | 35.28                       | >500        | PASS    |

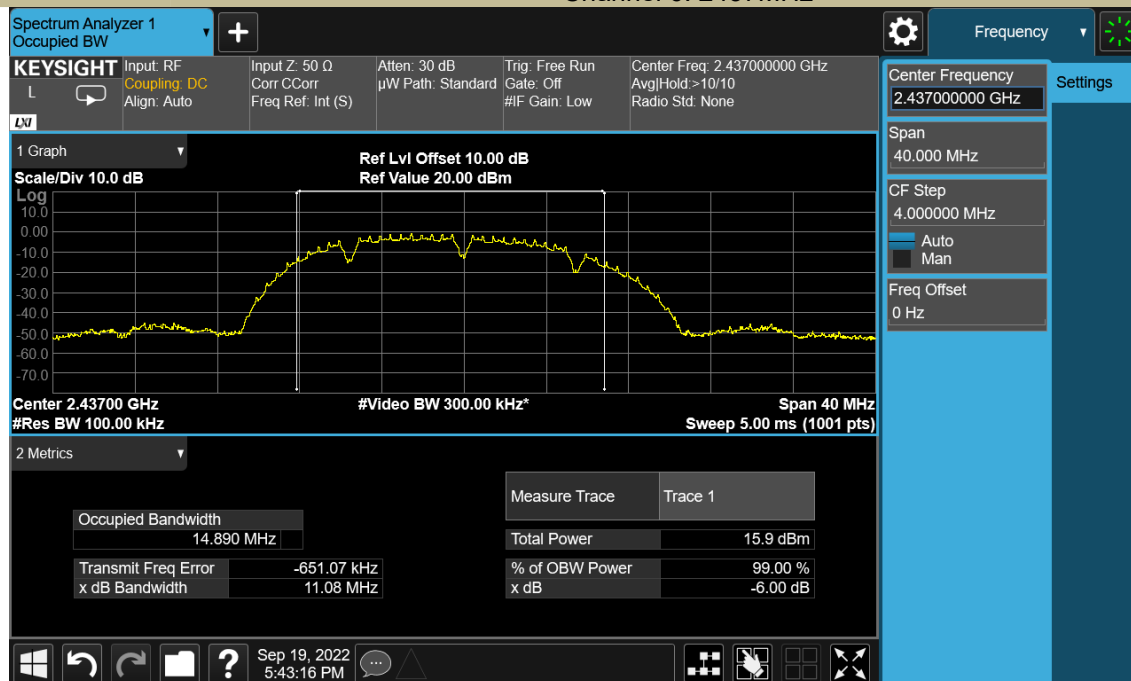
Test Model

DTS (6dB) Bandwidth  
802.11b  
Channel 1: 2412MHz



Test Model

DTS (6dB) Bandwidth  
802.11b  
Channel 6: 2437MHz

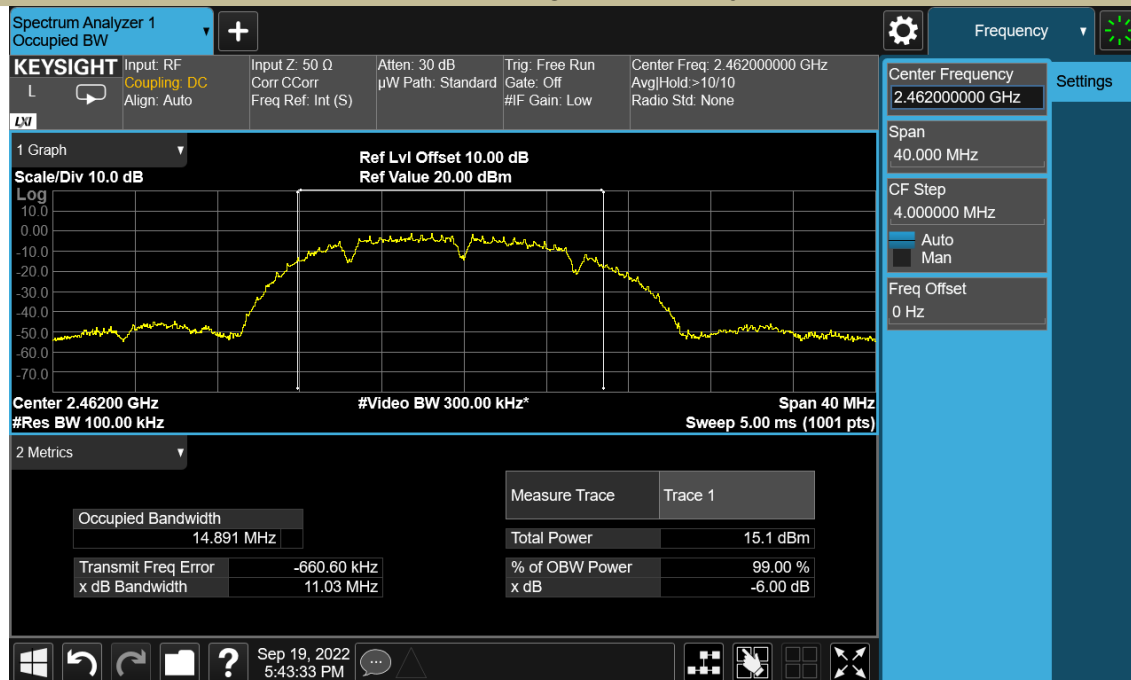


Test Model

DTS (6dB) Bandwidth

802.11b

Channel 11: 2462MHz

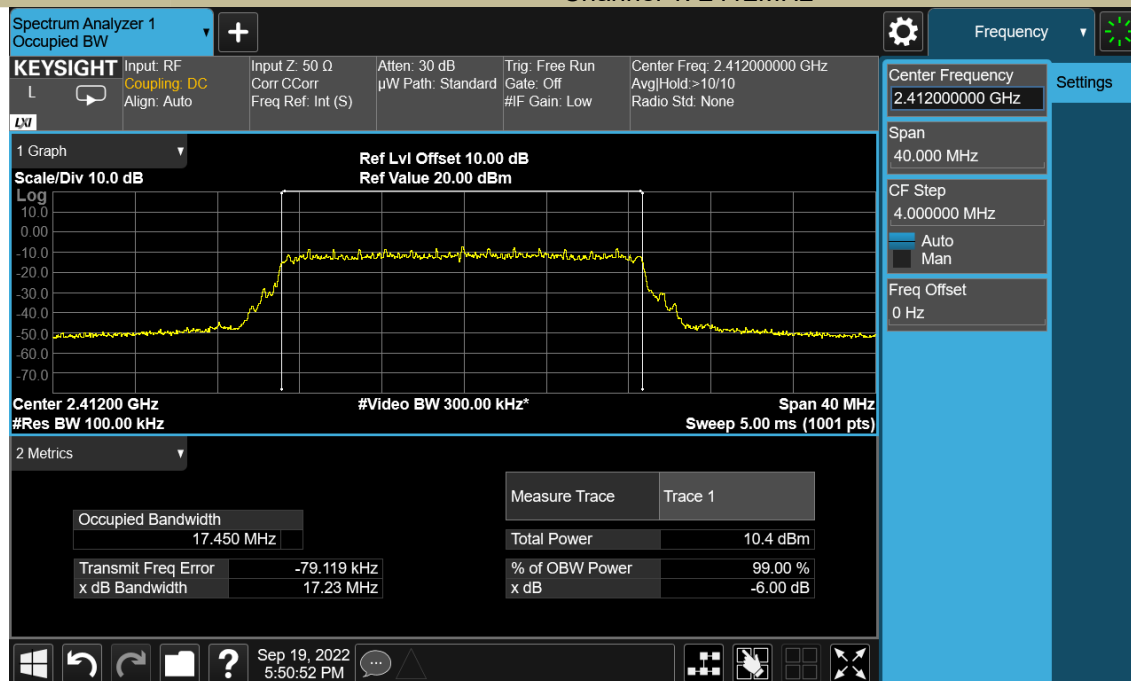


Test Model

DTS (6dB) Bandwidth

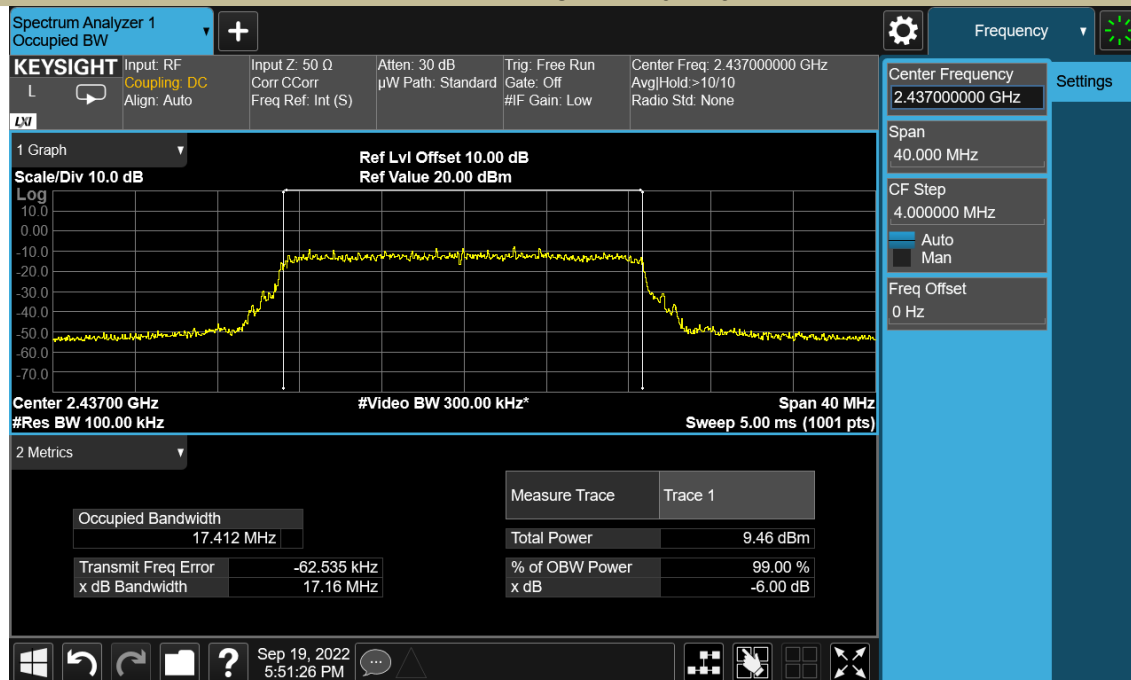
802.11g

Channel 1: 2412MHz



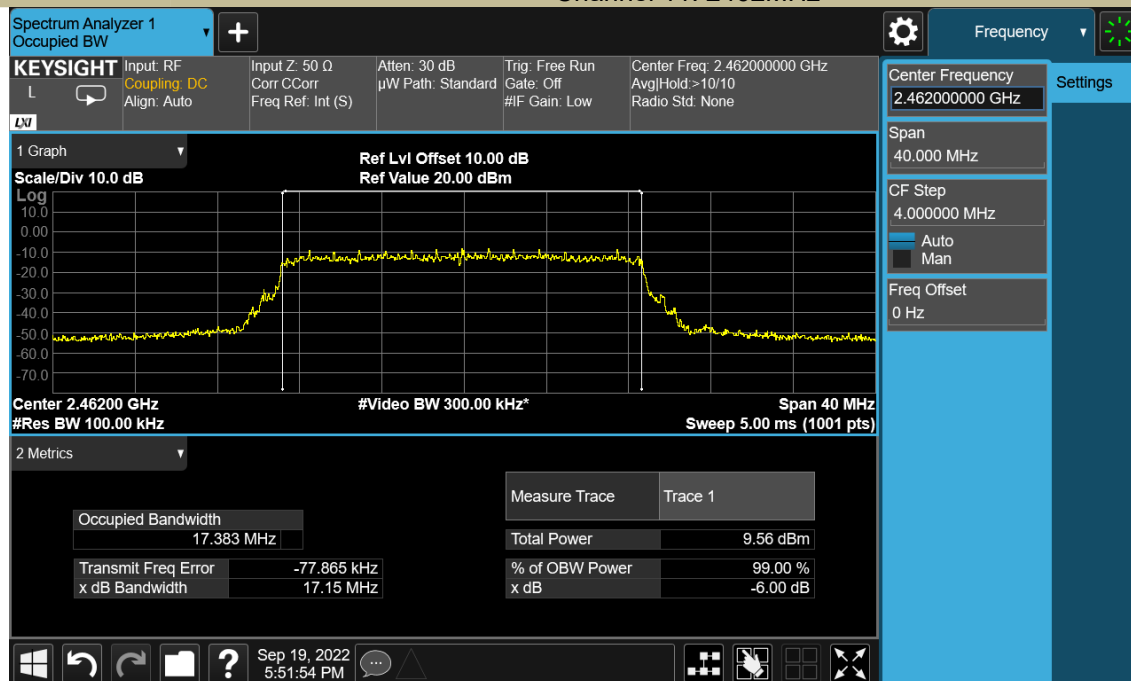
Test Model

DTS (6dB) Bandwidth  
802.11g  
Channel 6: 2437MHz



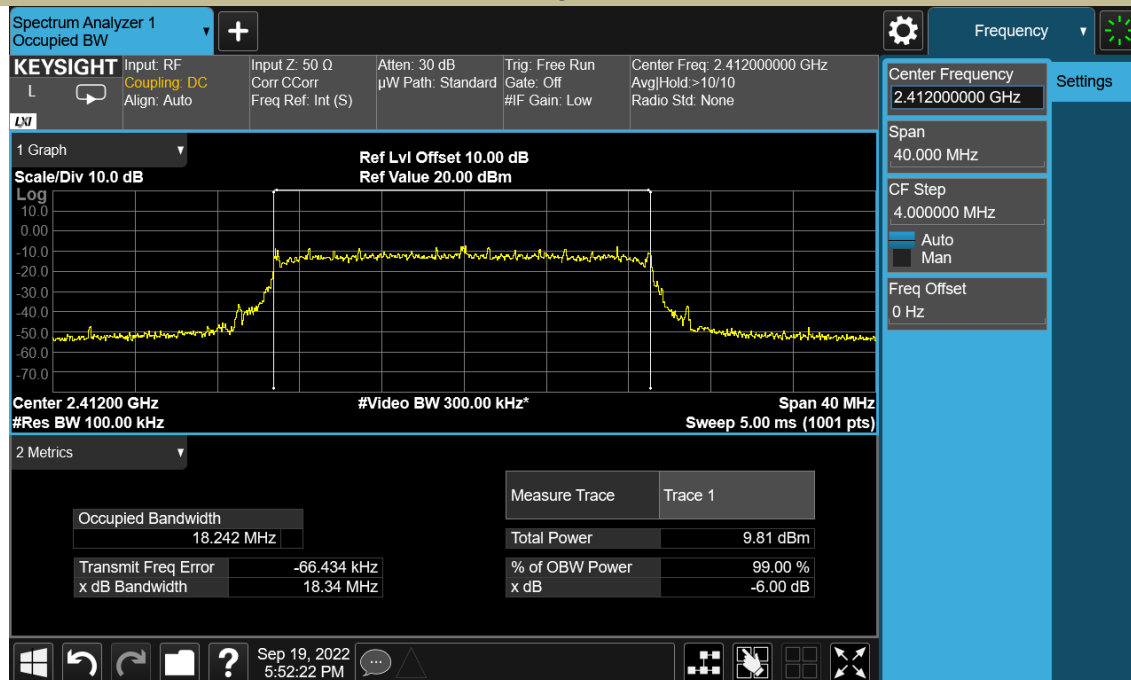
Test Model

DTS (6dB) Bandwidth  
802.11g  
Channel 11: 2462MHz



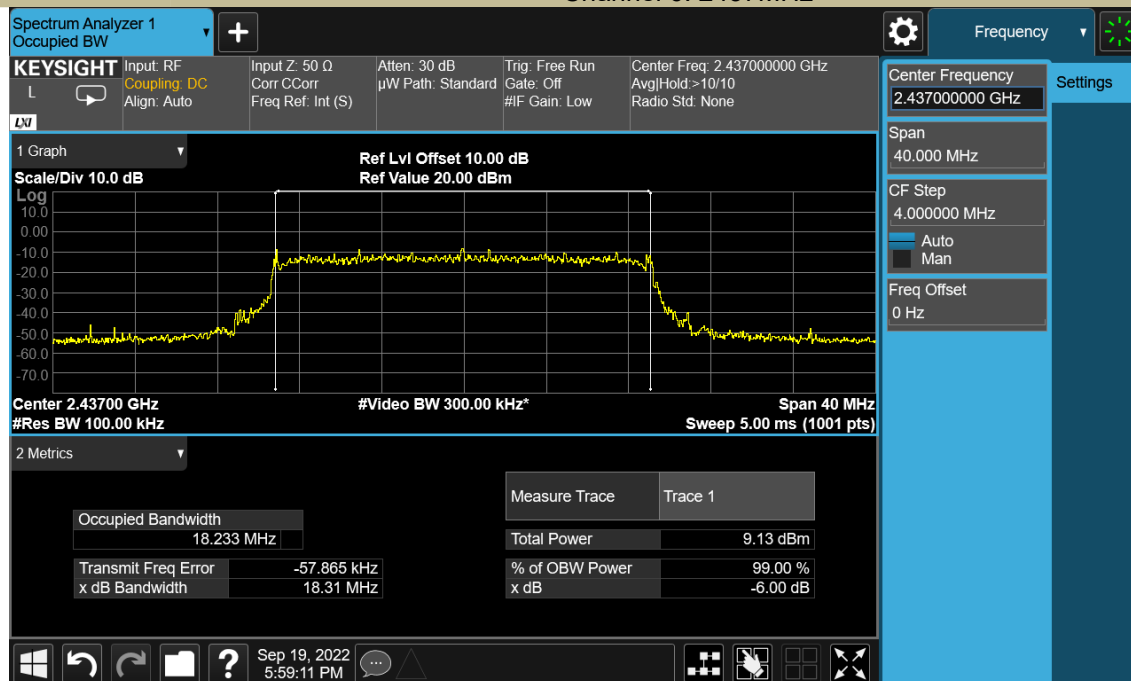
Test Model

DTS (6dB) Bandwidth  
802.11n (HT20)  
Channel 1: 2412MHz



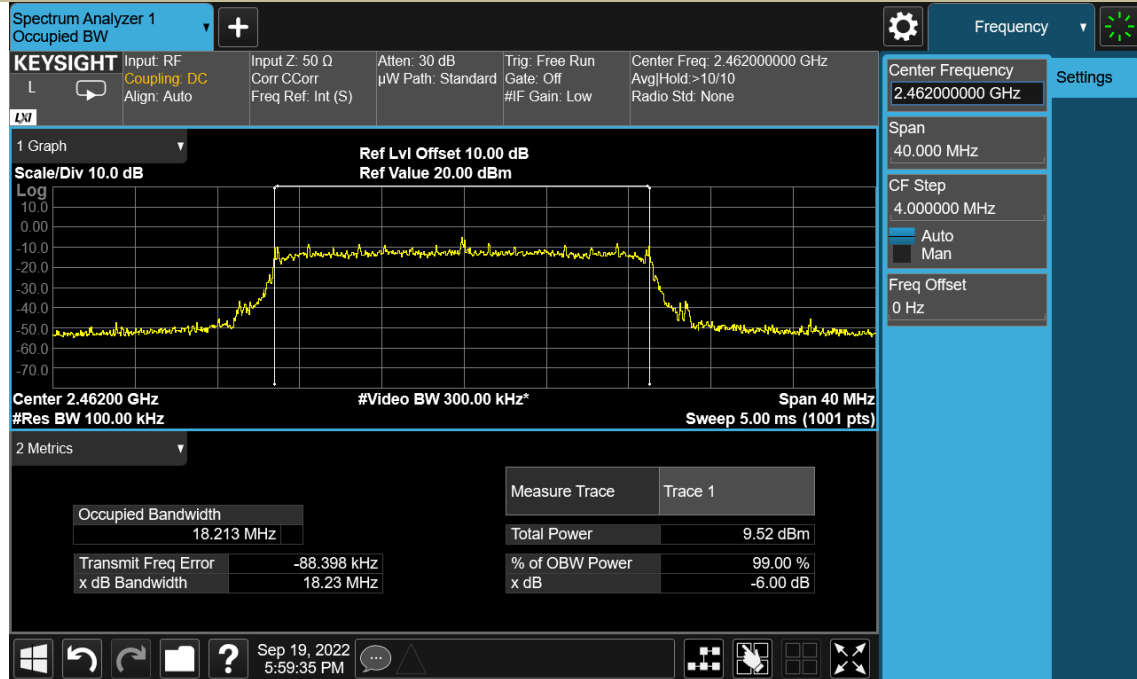
Test Model

DTS (6dB) Bandwidth  
802.11n (HT20)  
Channel 6: 2437MHz



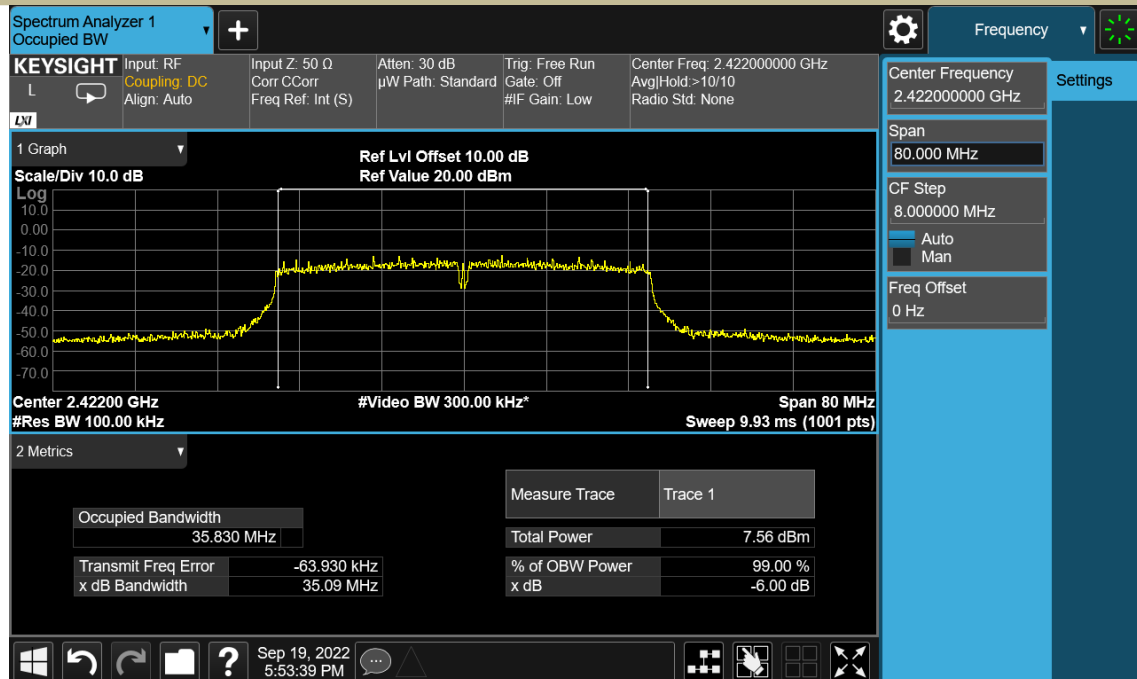
Test Model

DTS (6dB) Bandwidth  
802.11n (HT20)  
Channel 11: 2462MHz



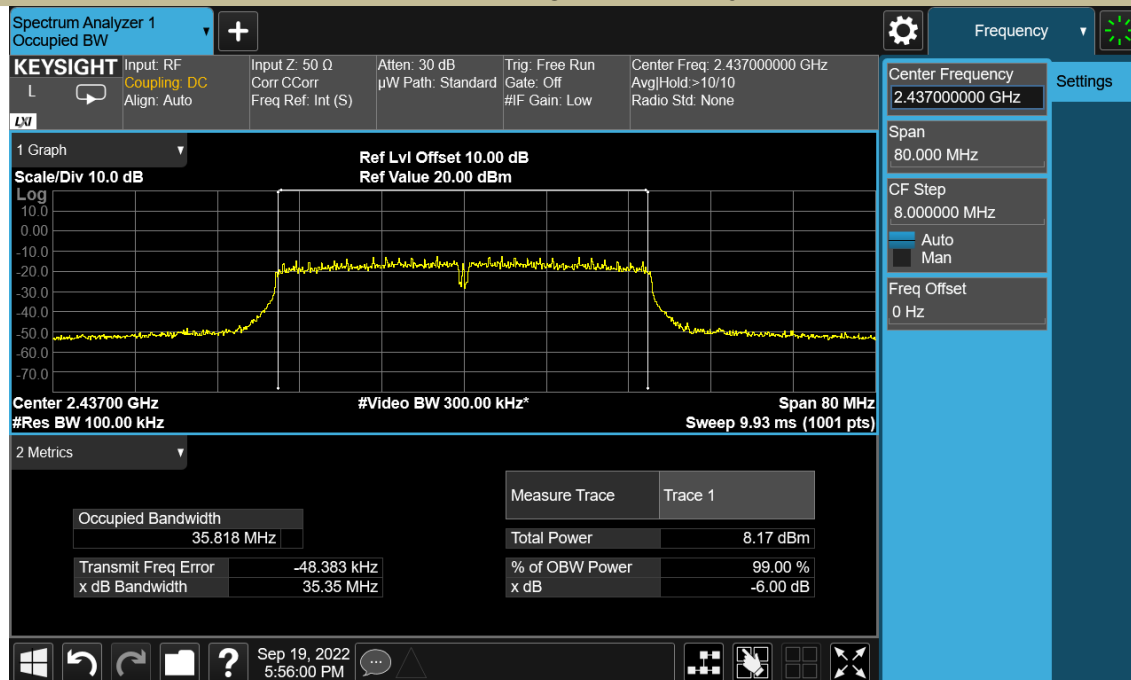
Test Model

DTS (6dB) Bandwidth  
802.11n (HT40)  
Channel 11: 2422MHz



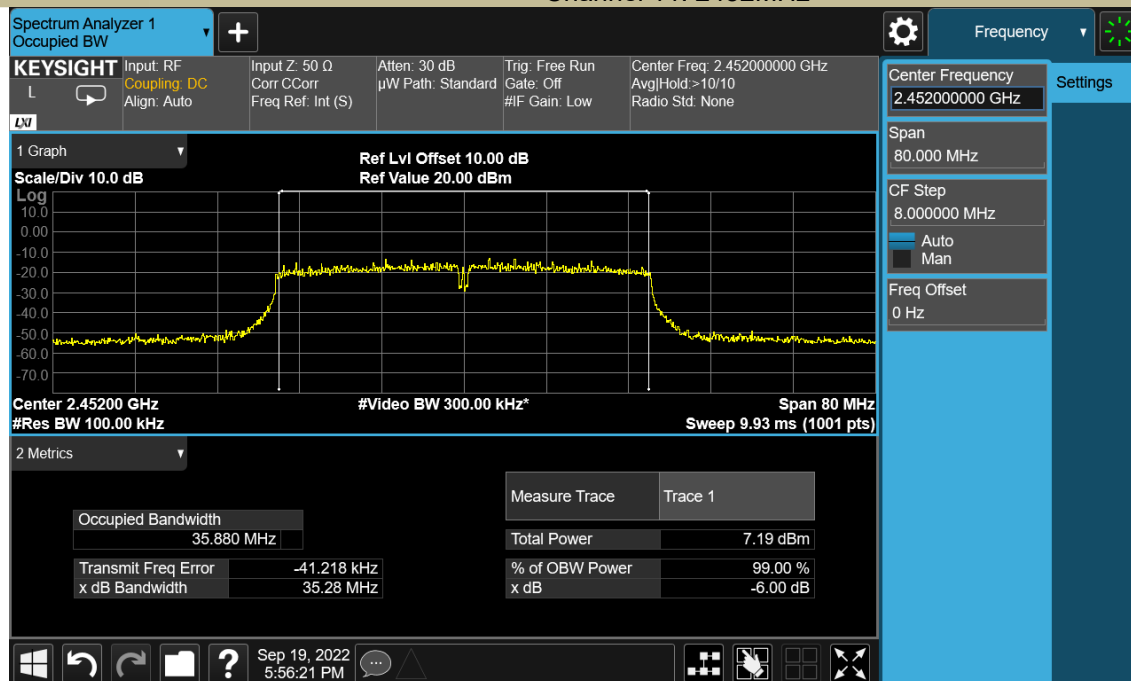
Test Model

DTS (6dB) Bandwidth  
802.11n (HT40)  
Channel 11: 2437MHz



Test Model

DTS (6dB) Bandwidth  
802.11n (HT40)  
Channel 11: 2452MHz



## 8.2 MAXIMUM CONDUCTED (AVERAGE) OUTPUT POWER

### 8.2.1 Applicable Standard

According to FCC Part15.247 (b)(3) and KDB 558074 D01 15.247 Meas Guidance v05r02

### 8.2.2 Conformance Limit

The maximum peak conducted output power of the intentional radiator for systems using digital modulation in the 2400 - 2483.5 MHz bands shall not exceed: 1 Watt (30dBm).

### 8.2.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

### 8.2.4 Test Procedure

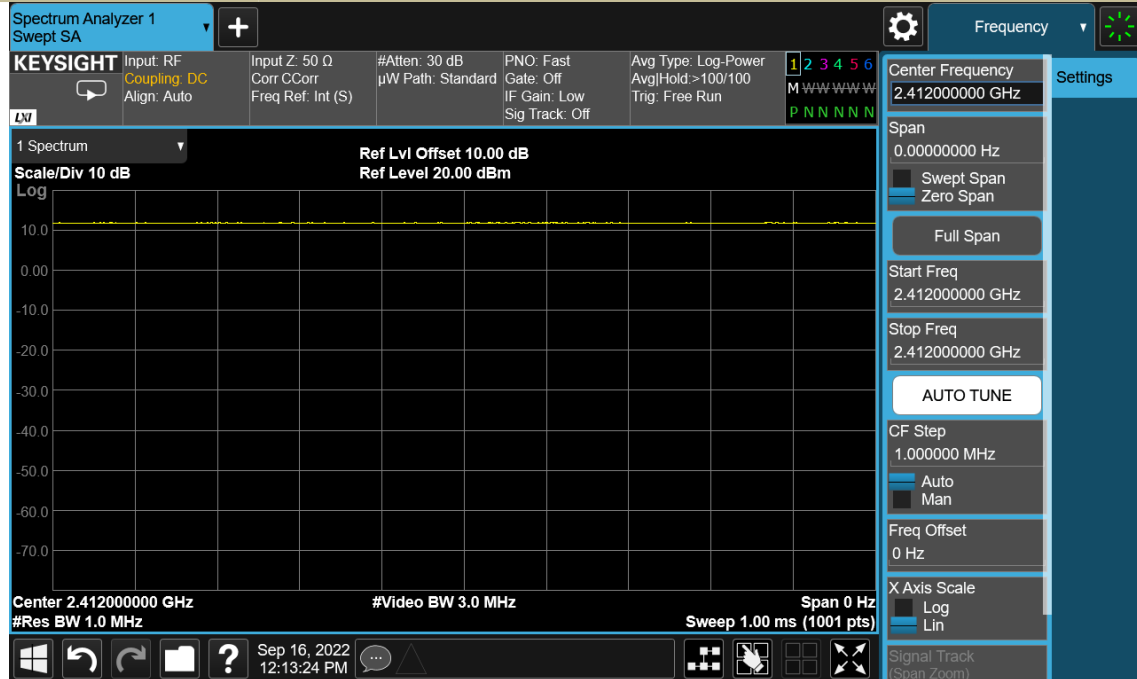
- Set span to at least 1.5 times the OBW.
- Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- Set VBW  $\geq 3 \times$  RBW.
- Number of points in sweep  $\geq 2 \times \text{span} / \text{RBW}$ . (This gives bin-to-bin spacing  $\leq \text{RBW}/2$ , so that narrowband signals are not lost between frequency bins.)
- Sweep time = auto.
- Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- If transmit duty cycle < 98 %, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle  $\geq 98$  %, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.
- Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

### 8.2.5 Test Results

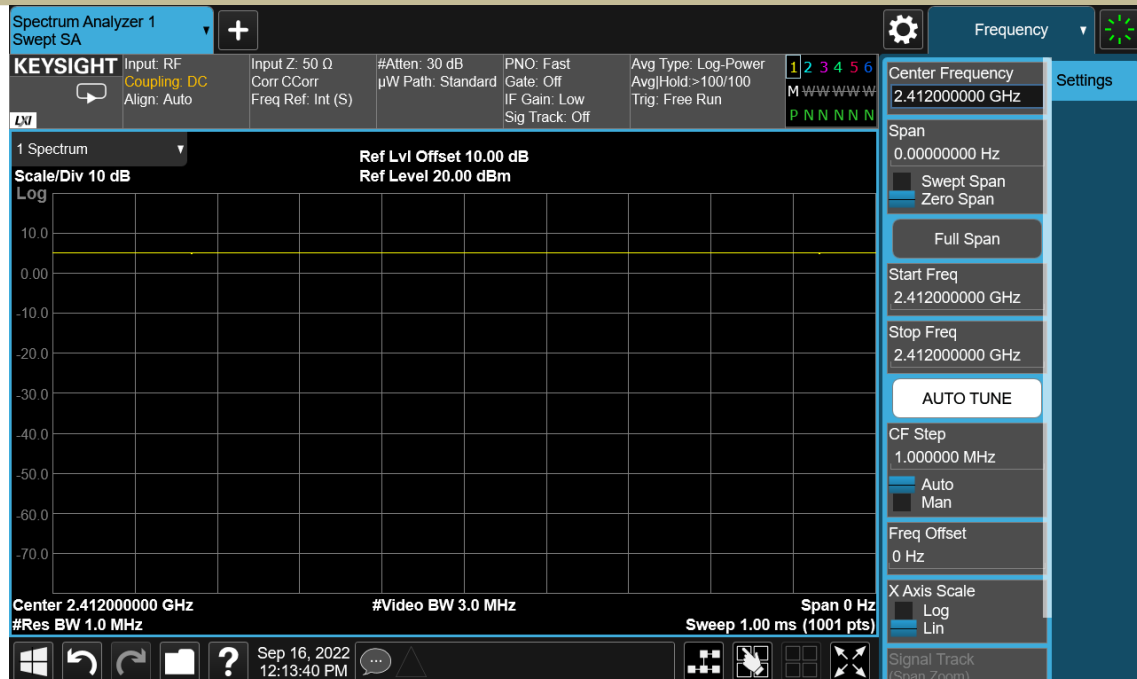
|                    |           |
|--------------------|-----------|
| Temperature:       | 23° C     |
| Relative Humidity: | 56%       |
| ATM Pressure:      | 1011 mbar |

| Operation Mode | Channel Number | Channel Frequency (MHz) | Measurement Level (dBm) | Limit (dBm) | Verdict |
|----------------|----------------|-------------------------|-------------------------|-------------|---------|
| 802.11b        | 1              | 2412                    | 13.66                   | 30          | PASS    |
|                | 6              | 2437                    | 13.47                   | 30          | PASS    |
|                | 11             | 2462                    | 13.16                   | 30          | PASS    |
| 802.11g        | 1              | 2412                    | 11.62                   | 30          | PASS    |
|                | 6              | 2437                    | 11.05                   | 30          | PASS    |
|                | 11             | 2462                    | 10.85                   | 30          | PASS    |
| 802.11n (HT20) | 1              | 2412                    | 11.02                   | 30          | PASS    |
|                | 6              | 2437                    | 11.05                   | 30          | PASS    |
|                | 11             | 2462                    | 10.68                   | 30          | PASS    |
| 802.11n (HT40) | 3              | 2422                    | 8.99                    | 30          | PASS    |
|                | 6              | 2437                    | 8.41                    | 30          | PASS    |
|                | 9              | 2452                    | 8.25                    | 30          | PASS    |

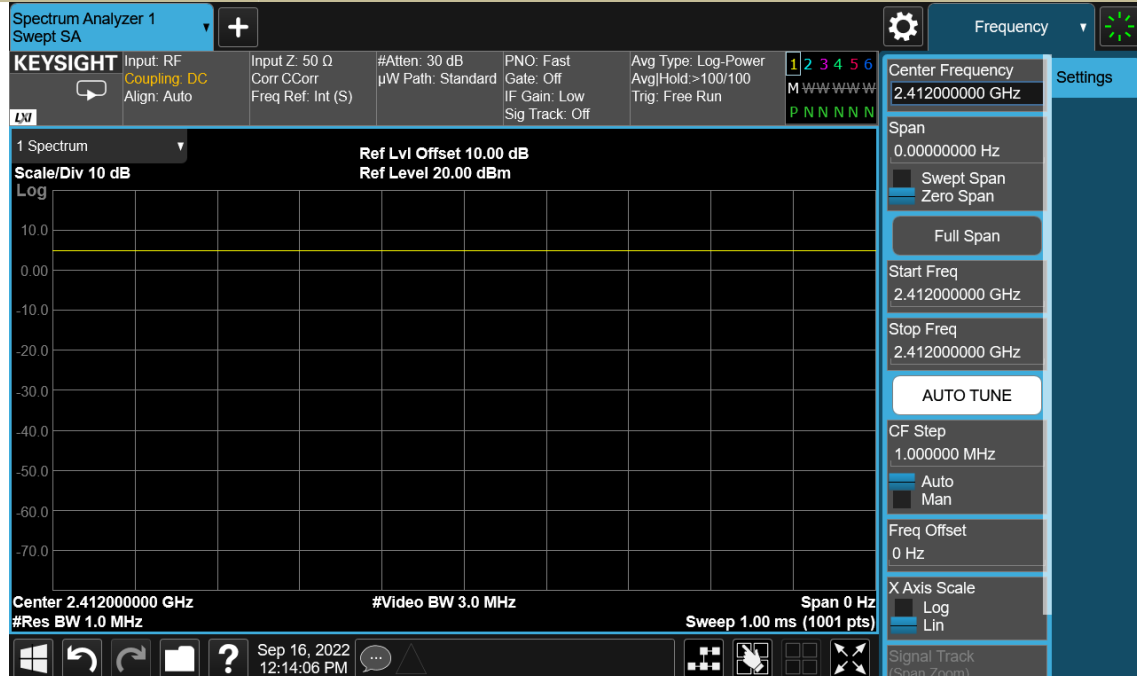
|            |                                             |
|------------|---------------------------------------------|
| Test Model | Duty cycle<br>802.11b<br>Channel 1: 2412MHz |
|------------|---------------------------------------------|



|            |                                             |
|------------|---------------------------------------------|
| Test Model | Duty cycle<br>802.11g<br>Channel 1: 2412MHz |
|------------|---------------------------------------------|



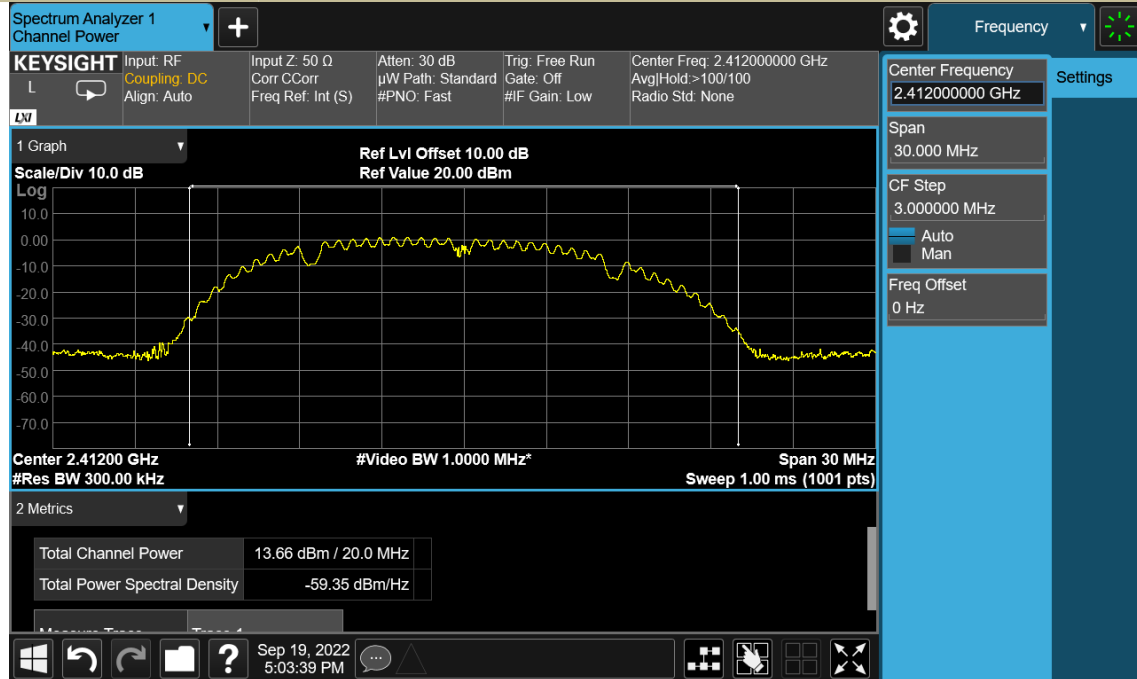
|            |                                                   |
|------------|---------------------------------------------------|
| Test Model | Duty cycle<br>802.11n(HT20)<br>Channel 1: 2412MHz |
|------------|---------------------------------------------------|



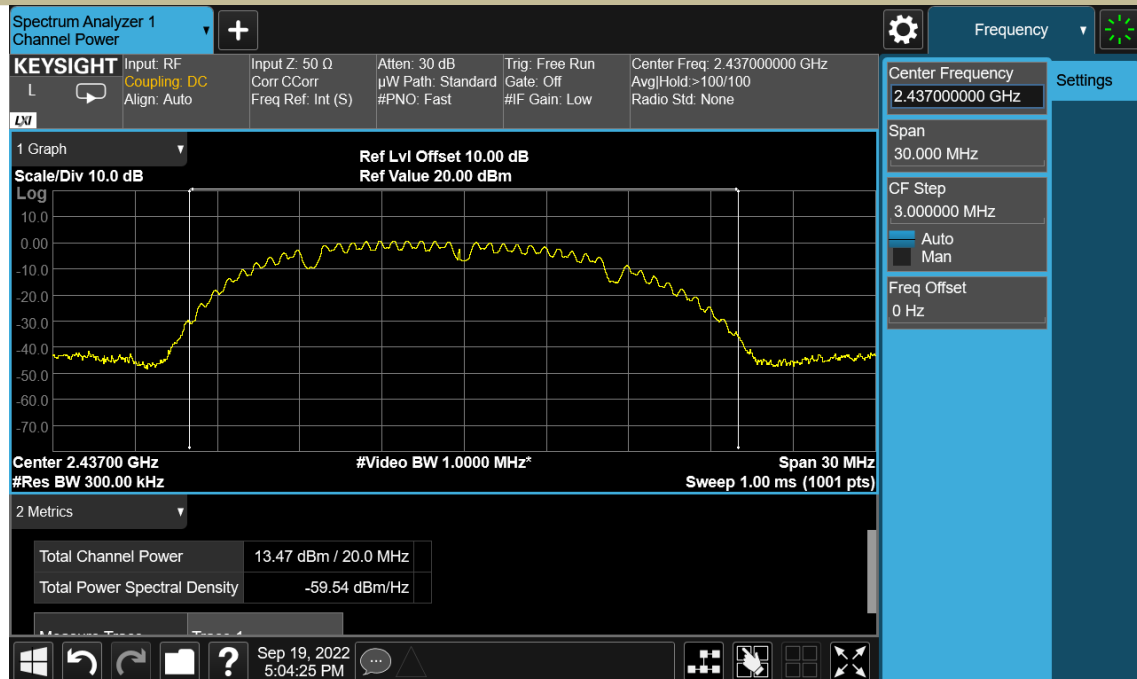
|            |                                                   |
|------------|---------------------------------------------------|
| Test Model | Duty cycle<br>802.11n(HT40)<br>Channel 1: 2422MHz |
|------------|---------------------------------------------------|



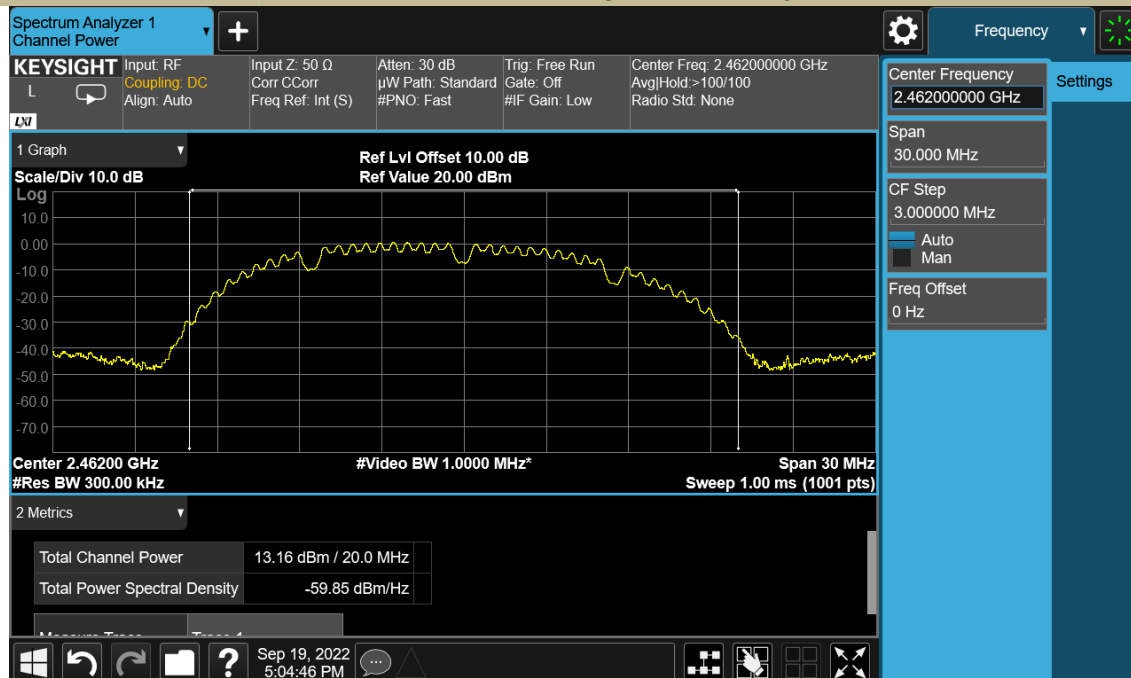
|            |                                                                          |
|------------|--------------------------------------------------------------------------|
| Test Model | MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER<br>802.11b<br>Channel 1: 2412MHz |
|------------|--------------------------------------------------------------------------|



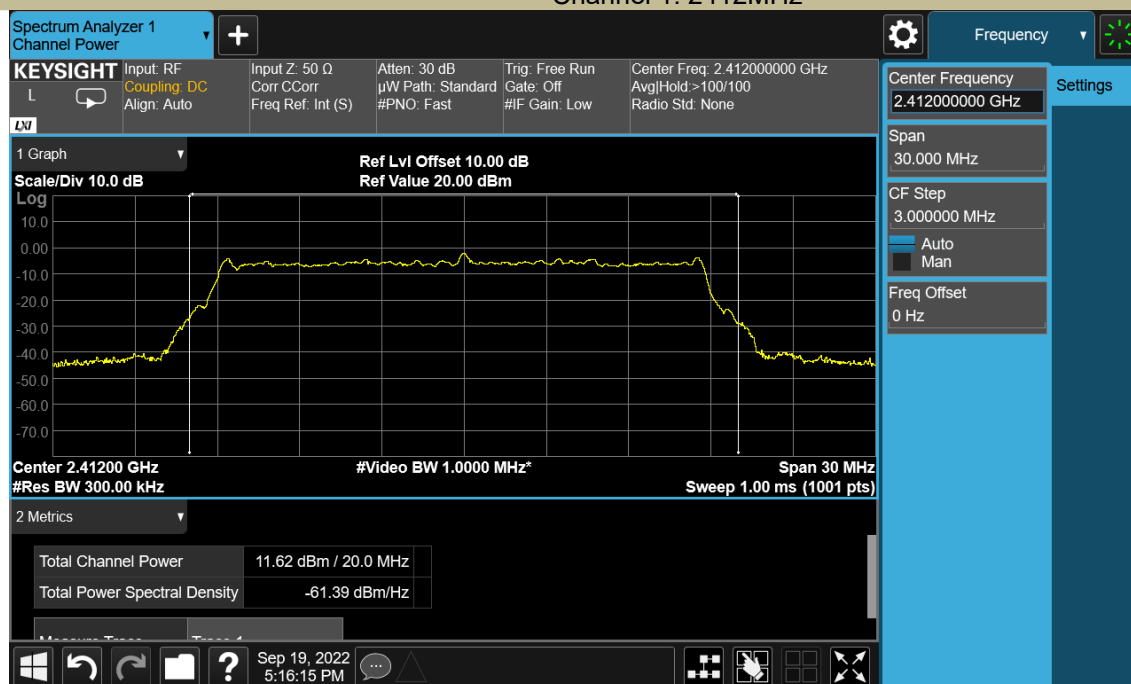
|            |                                                                          |
|------------|--------------------------------------------------------------------------|
| Test Model | MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER<br>802.11b<br>Channel 6: 2437MHz |
|------------|--------------------------------------------------------------------------|



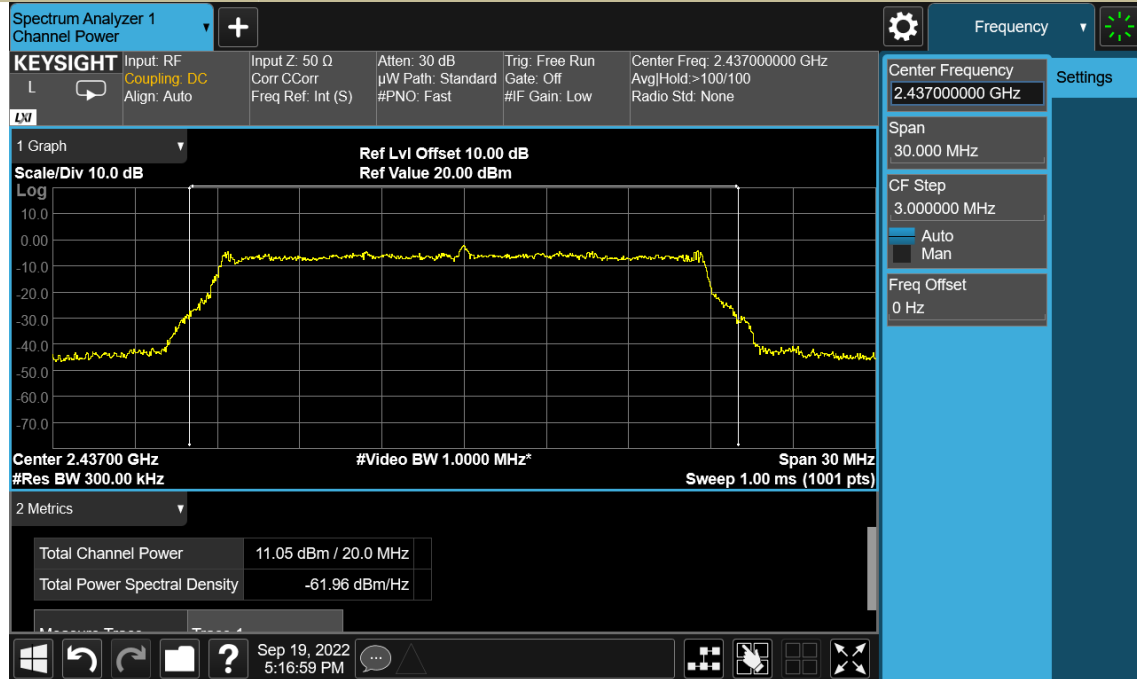
|            |                                                                           |
|------------|---------------------------------------------------------------------------|
| Test Model | MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER<br>802.11b<br>Channel 11: 2462MHz |
|------------|---------------------------------------------------------------------------|



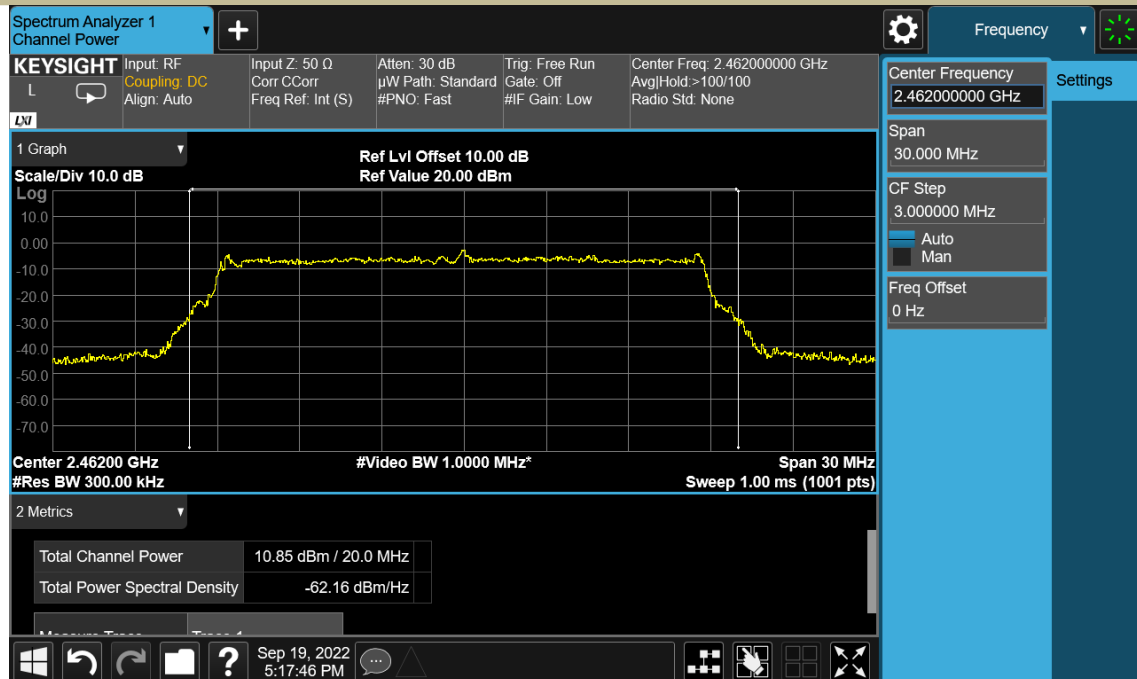
|            |                                                                          |
|------------|--------------------------------------------------------------------------|
| Test Model | MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER<br>802.11g<br>Channel 1: 2412MHz |
|------------|--------------------------------------------------------------------------|



|            |                                                                          |
|------------|--------------------------------------------------------------------------|
| Test Model | MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER<br>802.11g<br>Channel 6: 2437MHz |
|------------|--------------------------------------------------------------------------|

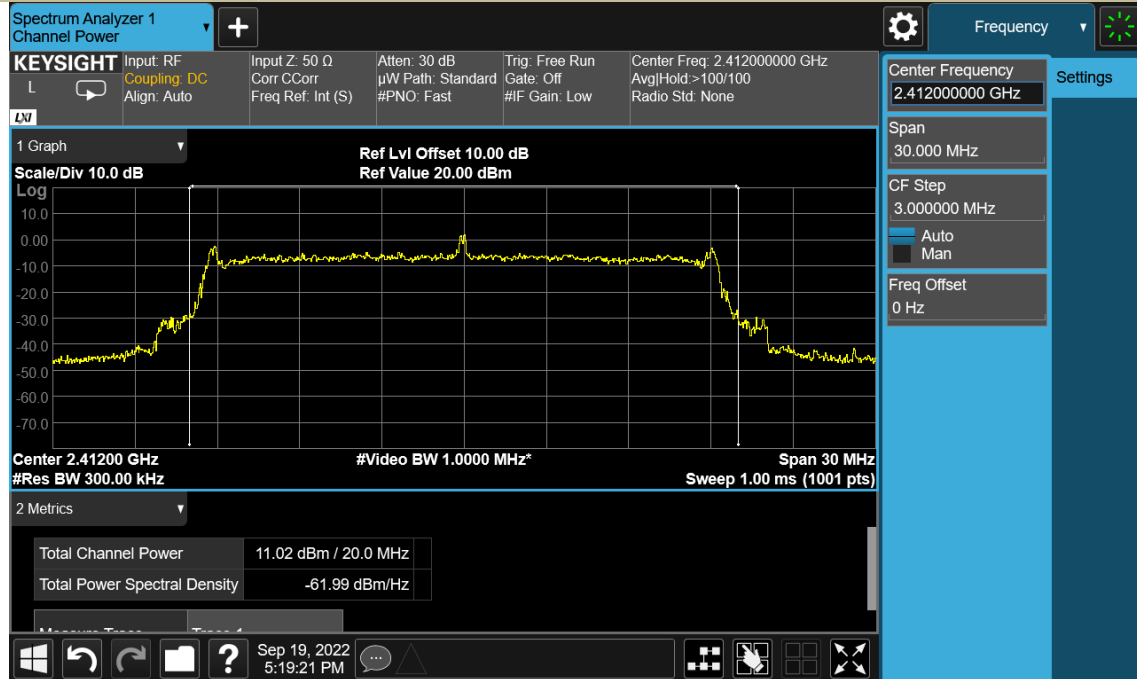


|            |                                                                           |
|------------|---------------------------------------------------------------------------|
| Test Model | MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER<br>802.11g<br>Channel 11: 2462MHz |
|------------|---------------------------------------------------------------------------|



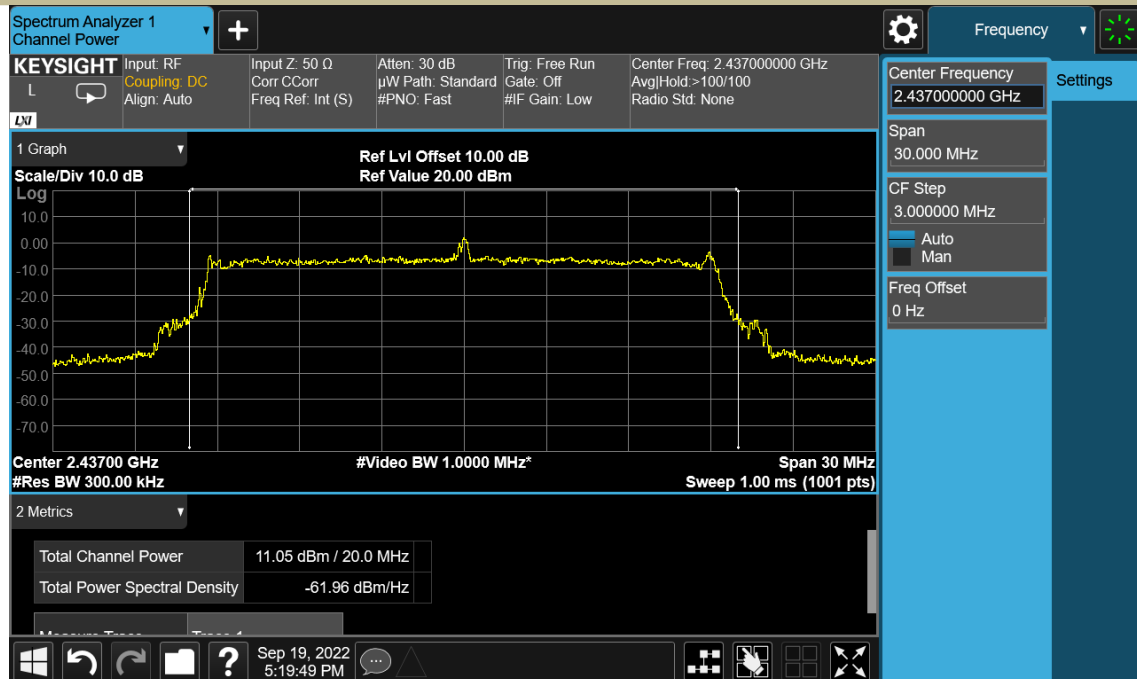
Test Model

MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER  
802.11n(HT20)  
Channel 1: 2412MHz



Test Model

MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER  
802.11n(HT20)  
Channel 6: 2437MHz

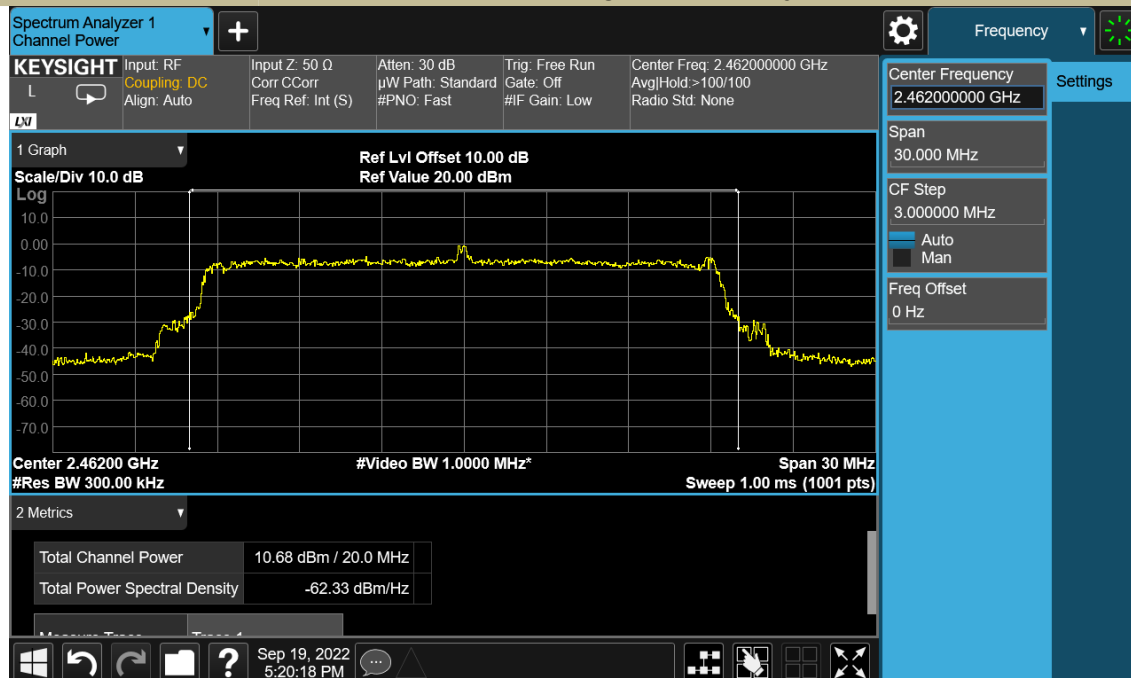


## Test Model

### MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER

#### 802.11n(HT20)

#### Channel 11: 2462MHz

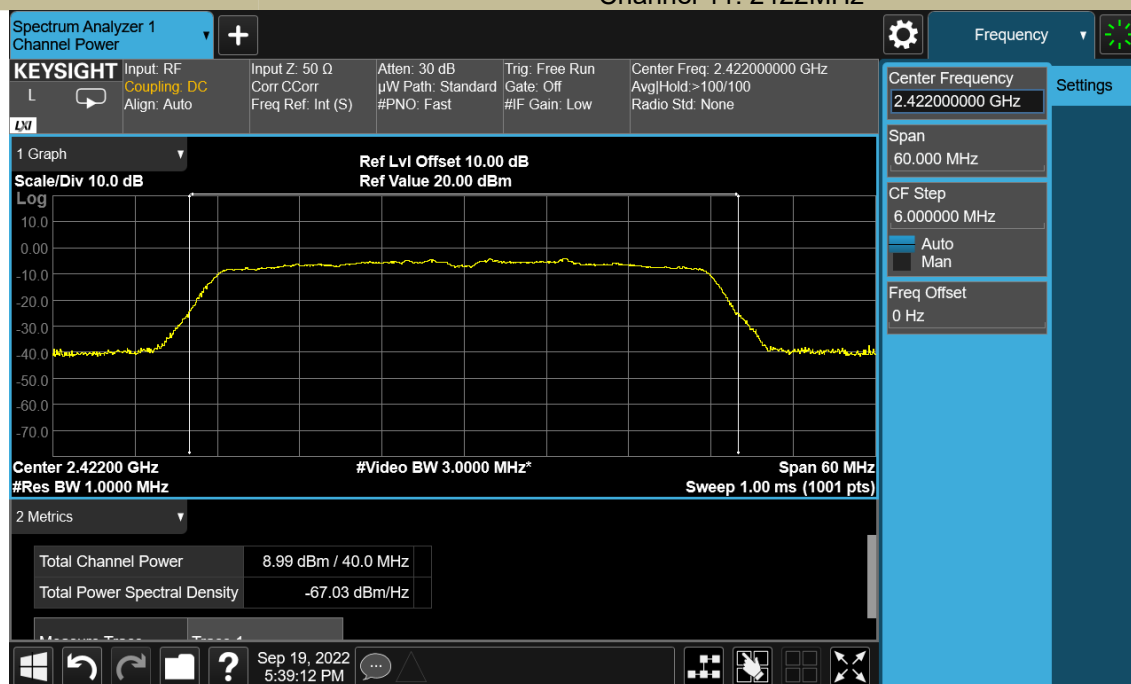


## Test Model

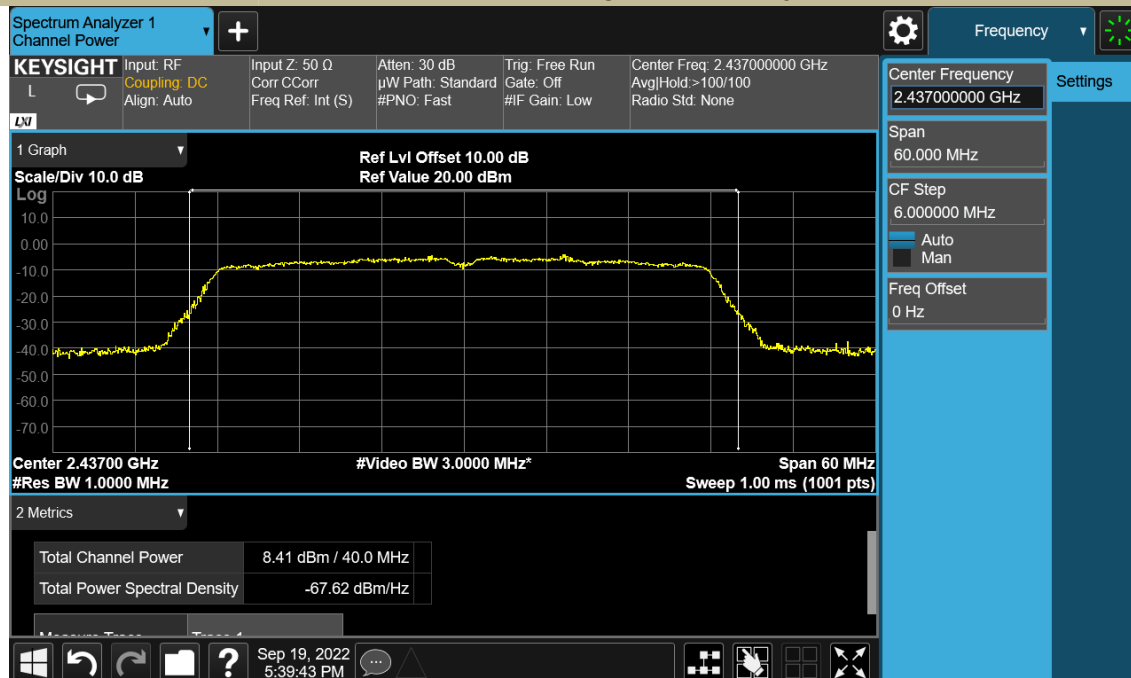
### MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER

#### 802.11n(HT40)

#### Channel 11: 2422MHz



|            |                                                                                 |
|------------|---------------------------------------------------------------------------------|
| Test Model | MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER<br>802.11n(HT40)<br>Channel 11: 2437MHz |
|------------|---------------------------------------------------------------------------------|



|            |                                                                                 |
|------------|---------------------------------------------------------------------------------|
| Test Model | MAXIMUM CONDUCTED(AVERAGE) OUTPUT POWER<br>802.11n(HT40)<br>Channel 11: 2452MHz |
|------------|---------------------------------------------------------------------------------|



### 8.3 MAXIMUM POWER SPECTRAL DENSITY

#### 8.3.1 Applicable Standard

According to FCC Part15.247(e) and KDB 558074 D01 15.247 Meas Guidance v05r02

#### 8.3.2 Conformance Limit

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

#### 8.3.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

#### 8.3.4 Test Procedure

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance

The transmitter output (antenna port) was connected to the spectrum analyzer

Set analyzer center frequency to DTS channel center frequency.

Set the span to 1.5 times the DTS bandwidth.

Set the RBW to: 3 kHz

Set the VBW to:10 kHz.

Set Detector = peak.

Set Sweep time = auto couple.

Set Trace mode = max hold.

Allow trace to fully stabilize.

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

Note: If antenna Gain exceeds 6 dBi, then PSD Limit=8-(Gain- 6)

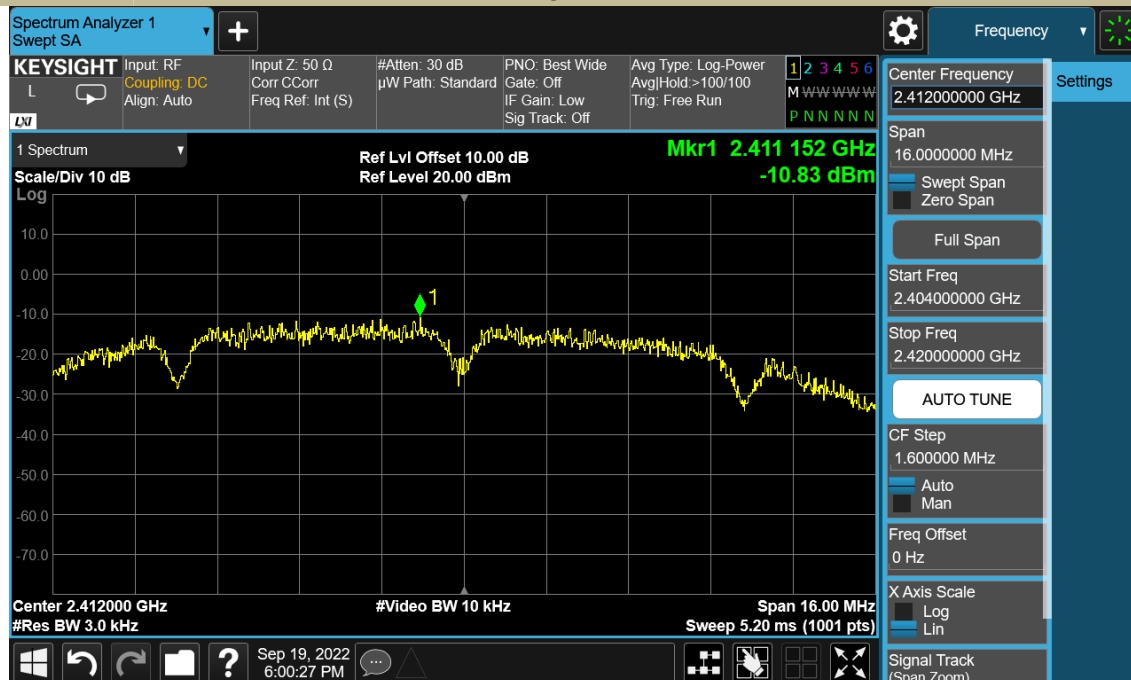
#### 8.3.5 Test Results

|                    |           |
|--------------------|-----------|
| Temperature:       | 23° C     |
| Relative Humidity: | 56%       |
| ATM Pressure:      | 1011 mbar |

| Operation Mode | Channel Number | Channel Frequency (MHz) | Measurement Level (dBm/3kHz) | Limit (dBm/3kHz) | Verdict |
|----------------|----------------|-------------------------|------------------------------|------------------|---------|
| 802.11b        | 1              | 2412                    | -10.83                       | 8                | PASS    |
|                | 6              | 2437                    | -13.89                       | 8                | PASS    |
|                | 11             | 2462                    | -14.13                       | 8                | PASS    |
| 802.11g        | 1              | 2412                    | -19.30                       | 8                | PASS    |
|                | 6              | 2437                    | -19.22                       | 8                | PASS    |
|                | 11             | 2462                    | -19.68                       | 8                | PASS    |
| 802.11n (HT20) | 1              | 2412                    | -17.79                       | 8                | PASS    |
|                | 6              | 2437                    | -17.68                       | 8                | PASS    |
|                | 11             | 2462                    | -18.60                       | 8                | PASS    |
| 802.11n (HT40) | 3              | 2422                    | -16.74                       | 8                | PASS    |
|                | 6              | 2437                    | -17.65                       | 8                | PASS    |
|                | 9              | 2452                    | -17.45                       | 8                | PASS    |

## Test Model

### Power Spectral Density 802.11b Channel 1: 2412MHz



## Test Model

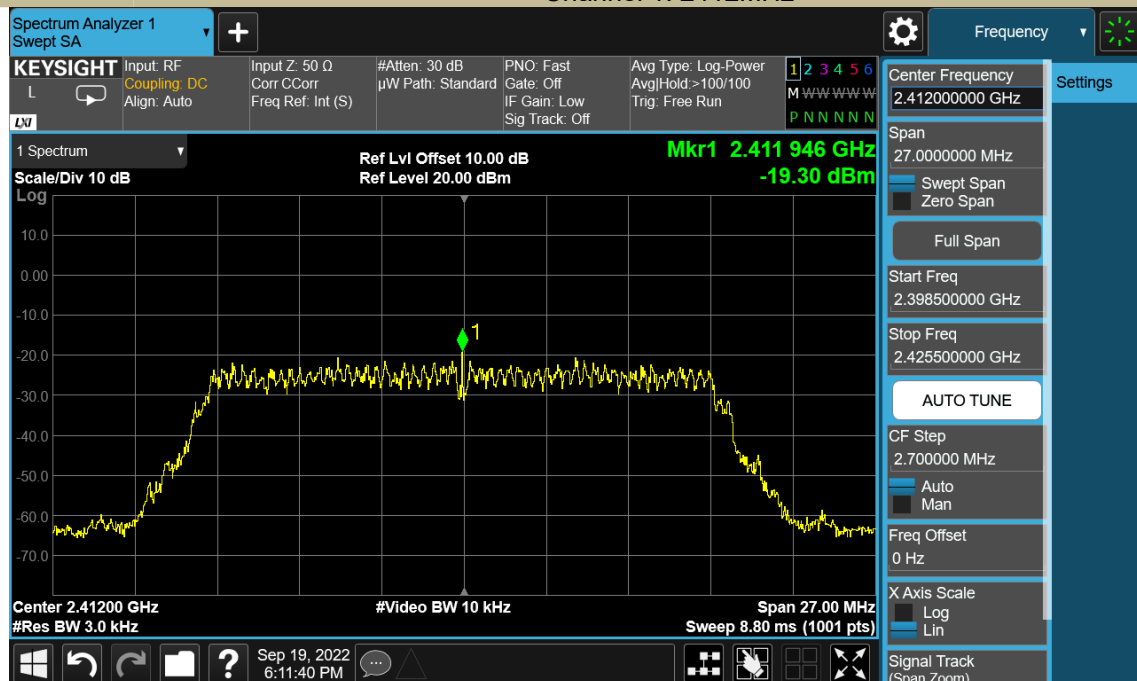
### Power Spectral Density 802.11b Channel 6: 2437MHz



|            |                                                          |
|------------|----------------------------------------------------------|
| Test Model | Power Spectral Density<br>802.11b<br>Channel 11: 2462MHz |
|------------|----------------------------------------------------------|

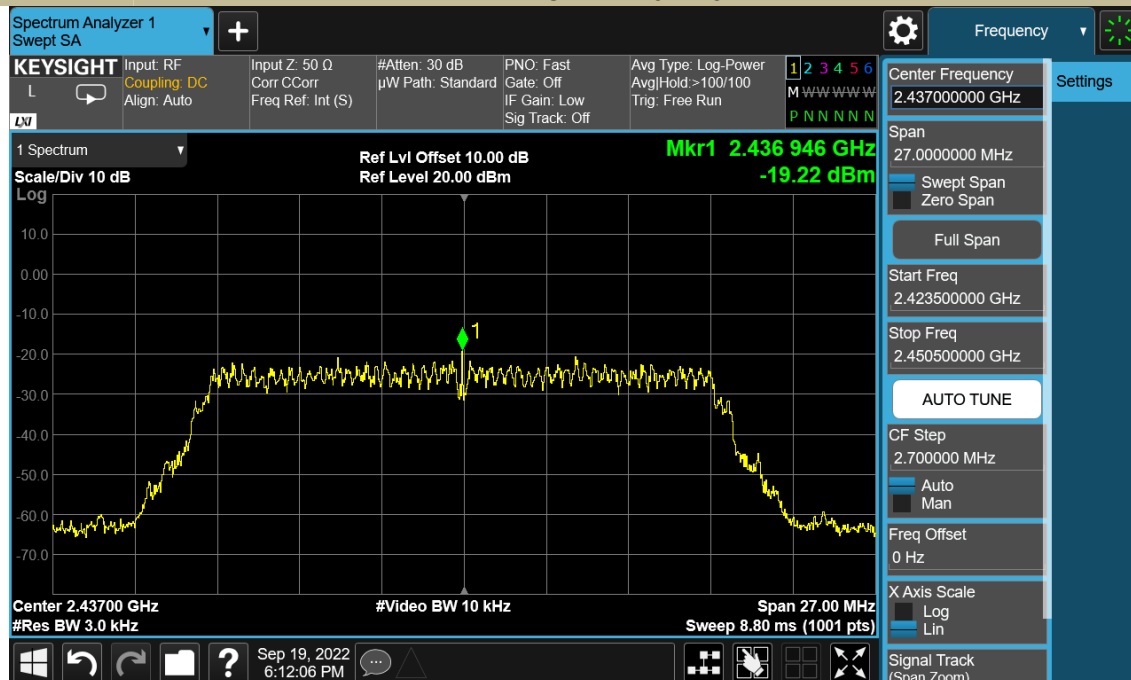


|            |                                                         |
|------------|---------------------------------------------------------|
| Test Model | Power Spectral Density<br>802.11g<br>Channel 1: 2412MHz |
|------------|---------------------------------------------------------|



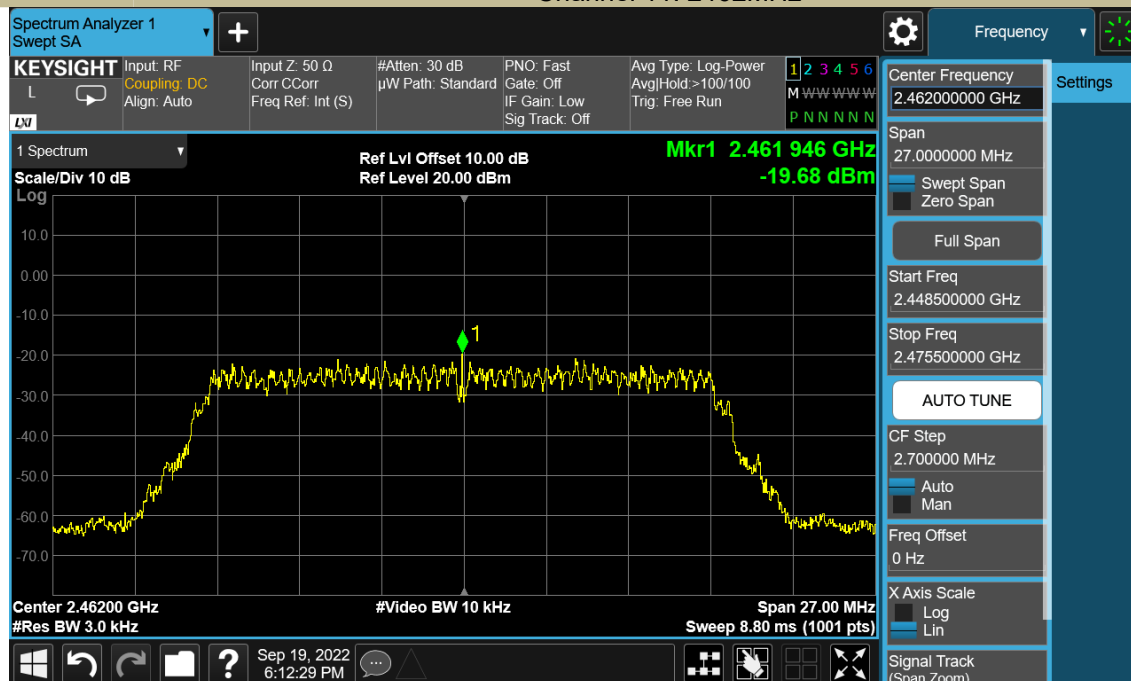
## Test Model

### Power Spectral Density 802.11g Channel 6: 2437MHz



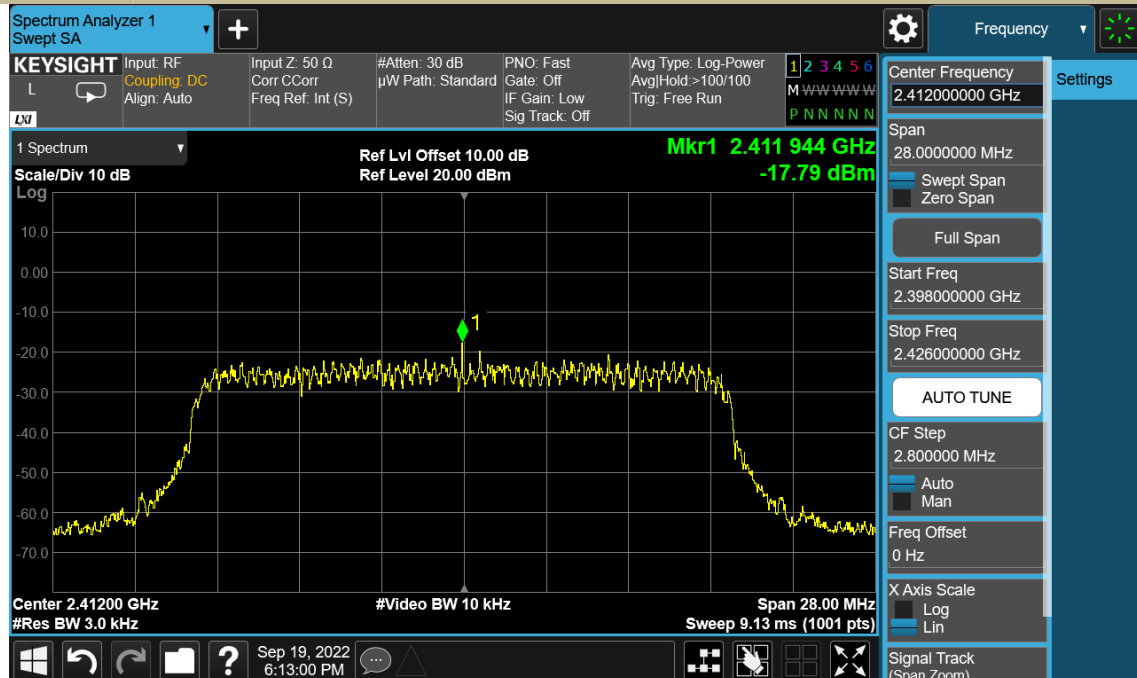
## Test Model

### Power Spectral Density 802.11g Channel 11: 2462MHz



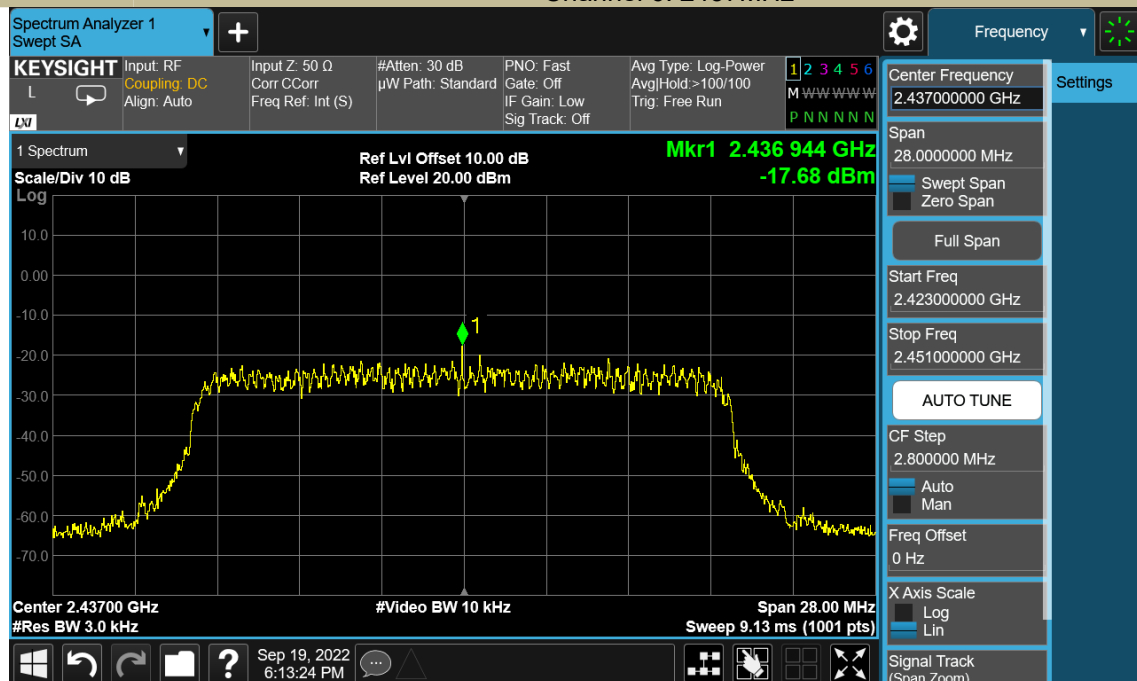
Test Model

Power Spectral Density  
802.11n (HT20)  
Channel 1: 2412MHz



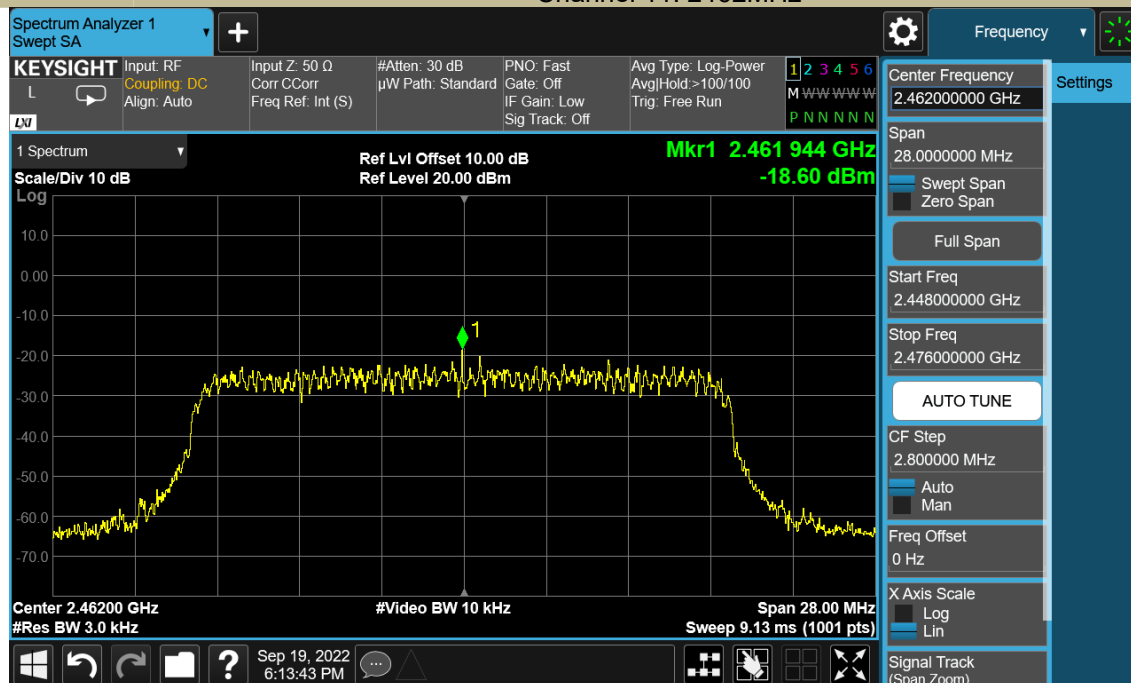
Test Model

Power Spectral Density  
802.11n (HT20)  
Channel 6: 2437MHz



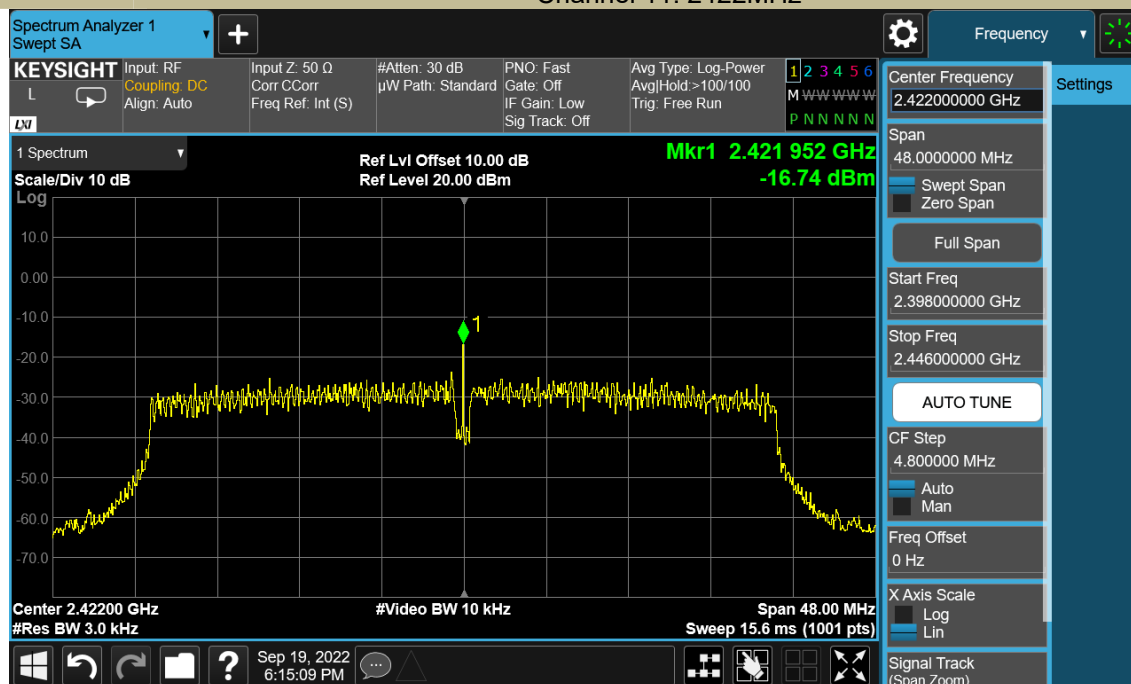
Test Model

Power Spectral Density  
802.11n (HT20)  
Channel 11: 2462MHz

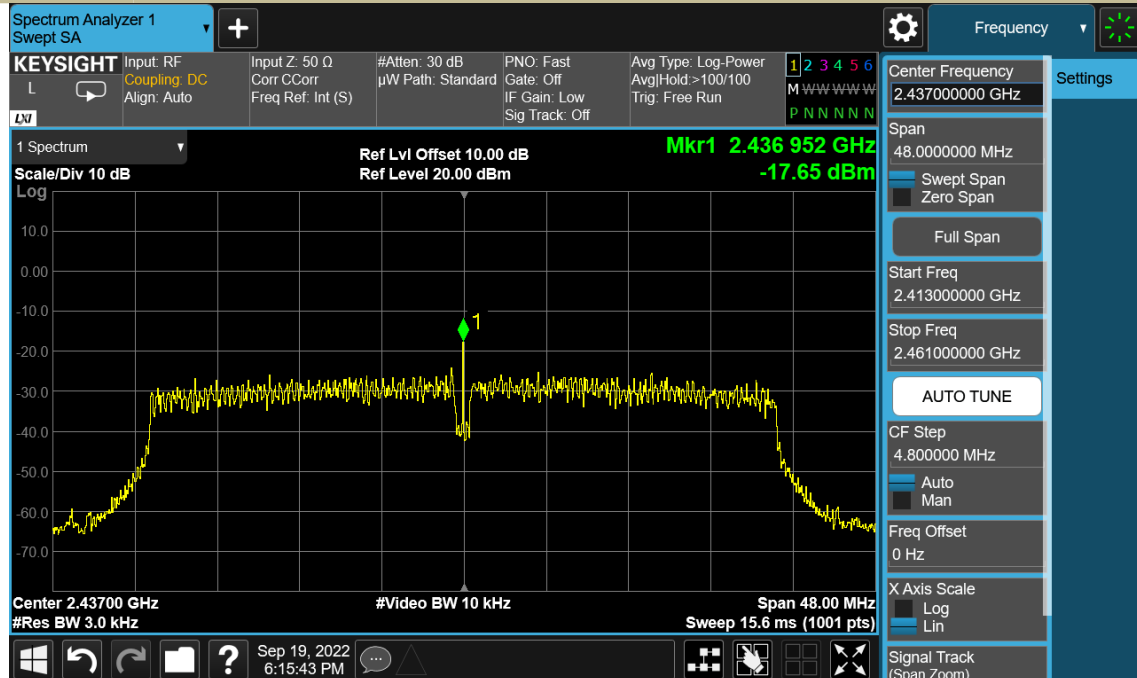


Test Model

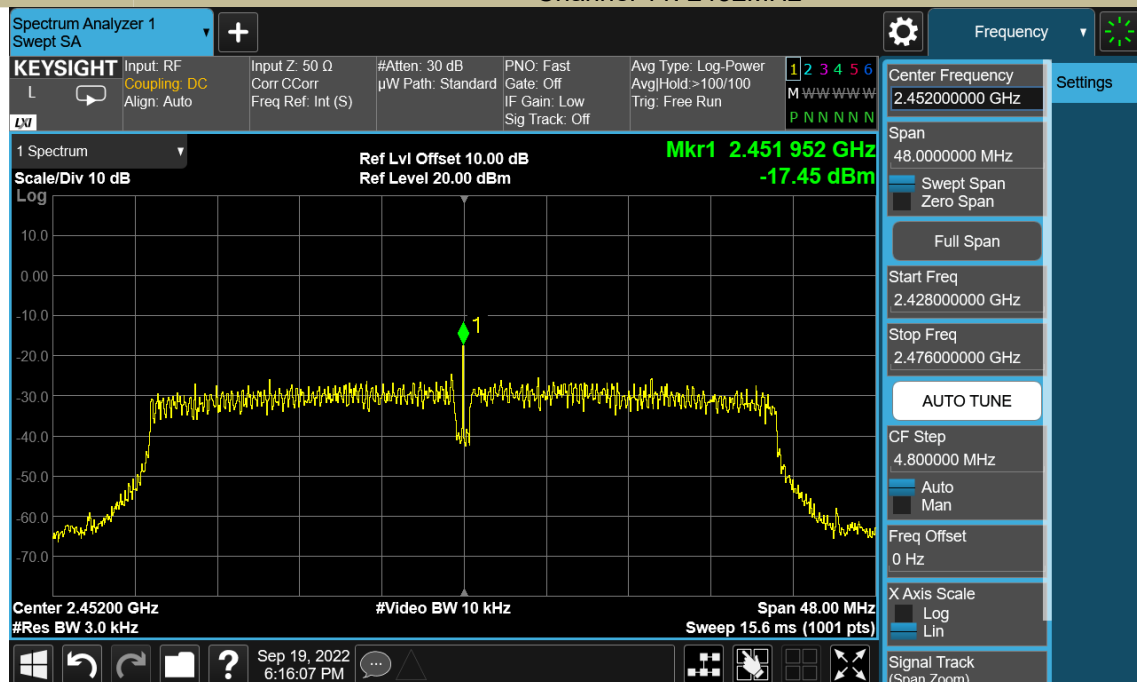
Power Spectral Density  
802.11n (HT40)  
Channel 11: 2422MHz



|            |                                                                 |
|------------|-----------------------------------------------------------------|
| Test Model | Power Spectral Density<br>802.11n (HT40)<br>Channel 11: 2437MHz |
|------------|-----------------------------------------------------------------|



|            |                                                                 |
|------------|-----------------------------------------------------------------|
| Test Model | Power Spectral Density<br>802.11n (HT40)<br>Channel 11: 2452MHz |
|------------|-----------------------------------------------------------------|



## 8.4 UNWANTED EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS

### 8.4.1 Applicable Standard

According to FCC Part 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02

### 8.4.2 Conformance Limit

According to FCC Part 15.247(d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

### 8.4.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

### 8.4.4 Test Procedure

The transmitter output (antenna port) was connected to the spectrum analyzer

#### ■ Reference level measurement

Establish a reference level by using the following procedure:

Set instrument center frequency to DTS channel center frequency.

Set the span to  $\geq 1.5$  times the DTS bandwidth.

Set the RBW = 100 kHz.

Set the VBW  $\geq 3 \times$  RBW.

Set Detector = peak.

Set Sweep time = auto couple.

Set Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

#### ■ Emission level measurement

Set the center frequency and span to encompass frequency range to be measured.

Set the RBW = 100 kHz.

Set the VBW = 300 kHz.

Set Detector = peak

Sweep time = auto couple.

Trace mode = max hold.

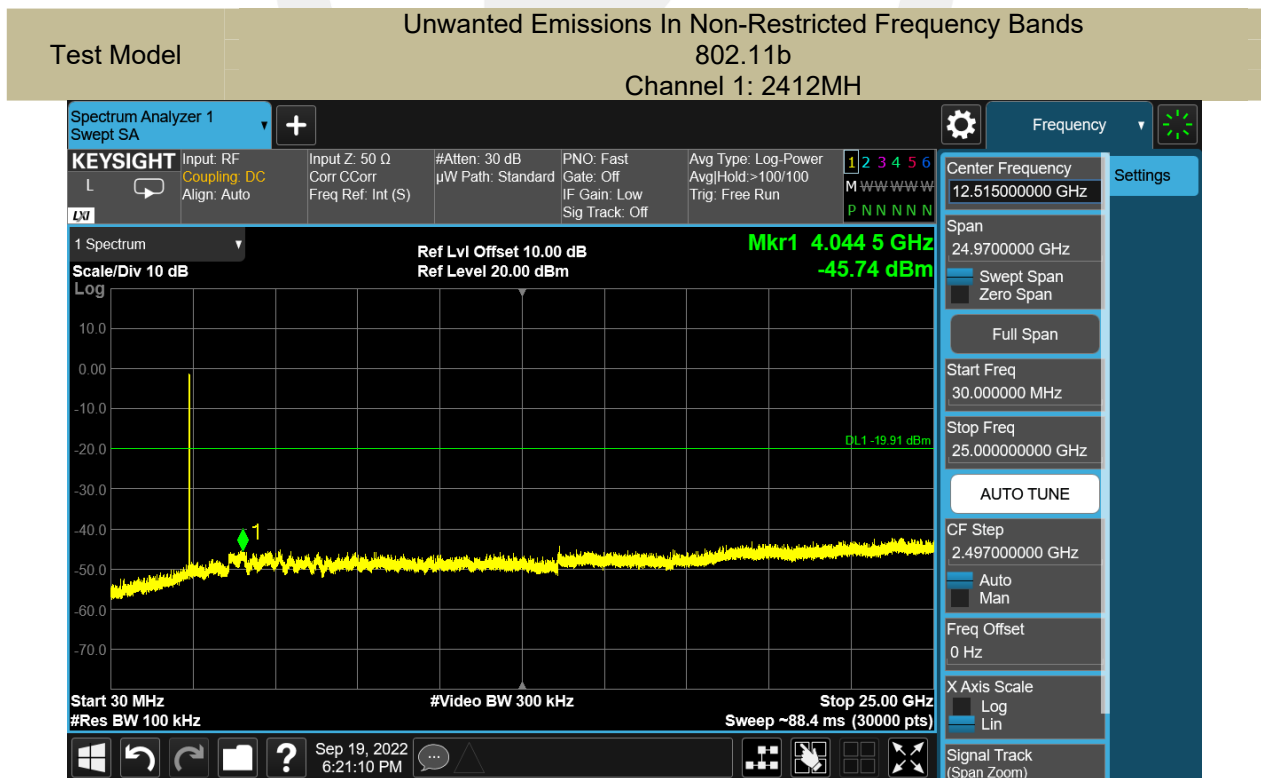
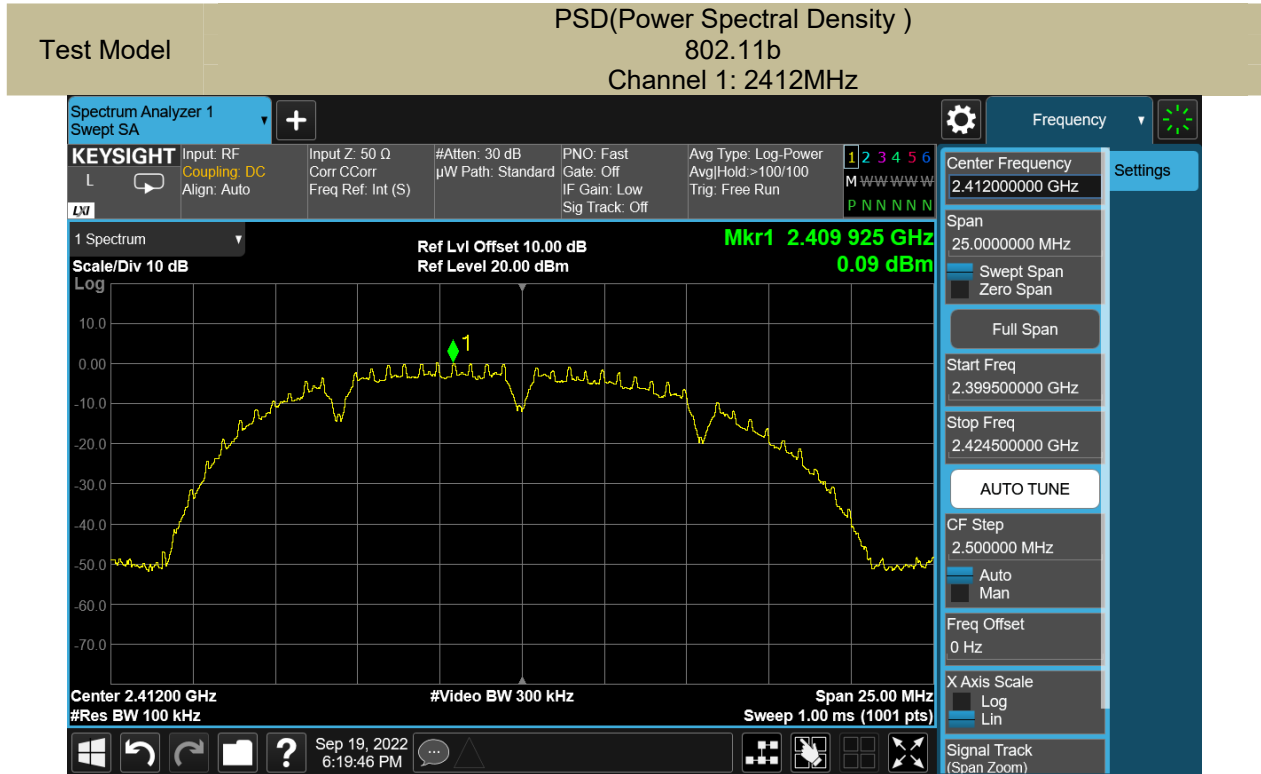
Allow trace to fully stabilize.

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

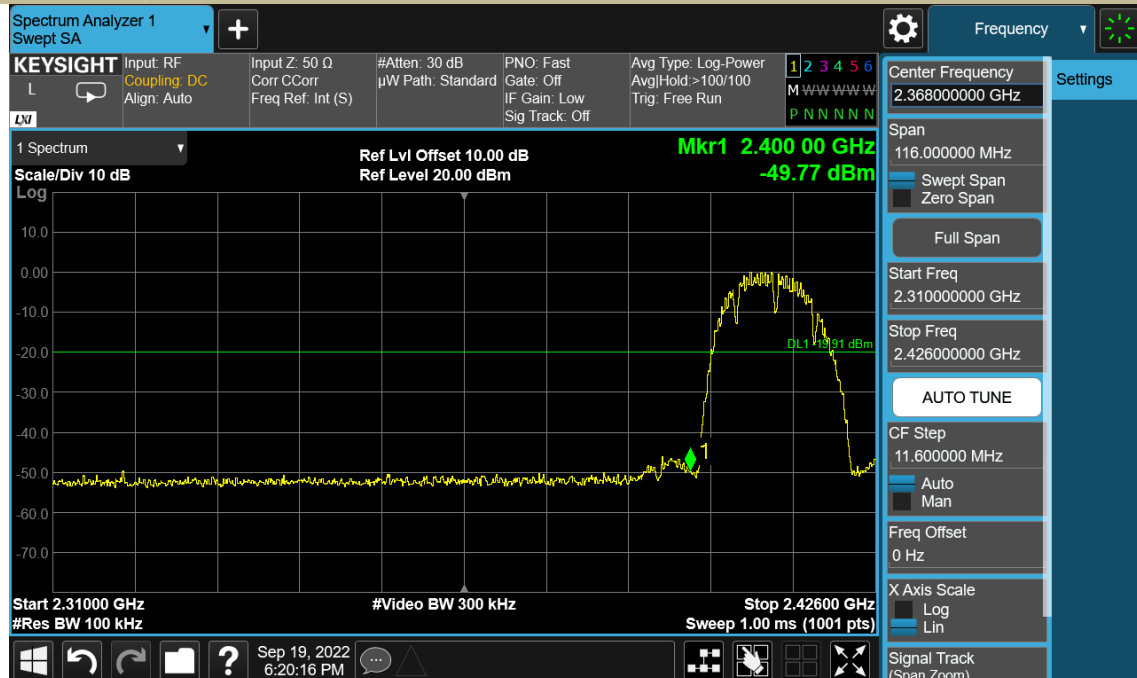
Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements. Report the three highest emissions relative to the limit.

### 8.4.5 Test Results

All modes 2.4G 802.11b/g/n have been tested, and the worst result 802.11b recorded was report as below:



|            |                                                                      |
|------------|----------------------------------------------------------------------|
| Test Model | <div>Band edge</div> <div>802.11b</div> <div>Channel 1: 2412MH</div> |
|------------|----------------------------------------------------------------------|



|            |                                                                                          |
|------------|------------------------------------------------------------------------------------------|
| Test Model | <div>PSD(Power Spectral Density )</div> <div>802.11b</div> <div>Channel 6: 2437MHz</div> |
|------------|------------------------------------------------------------------------------------------|

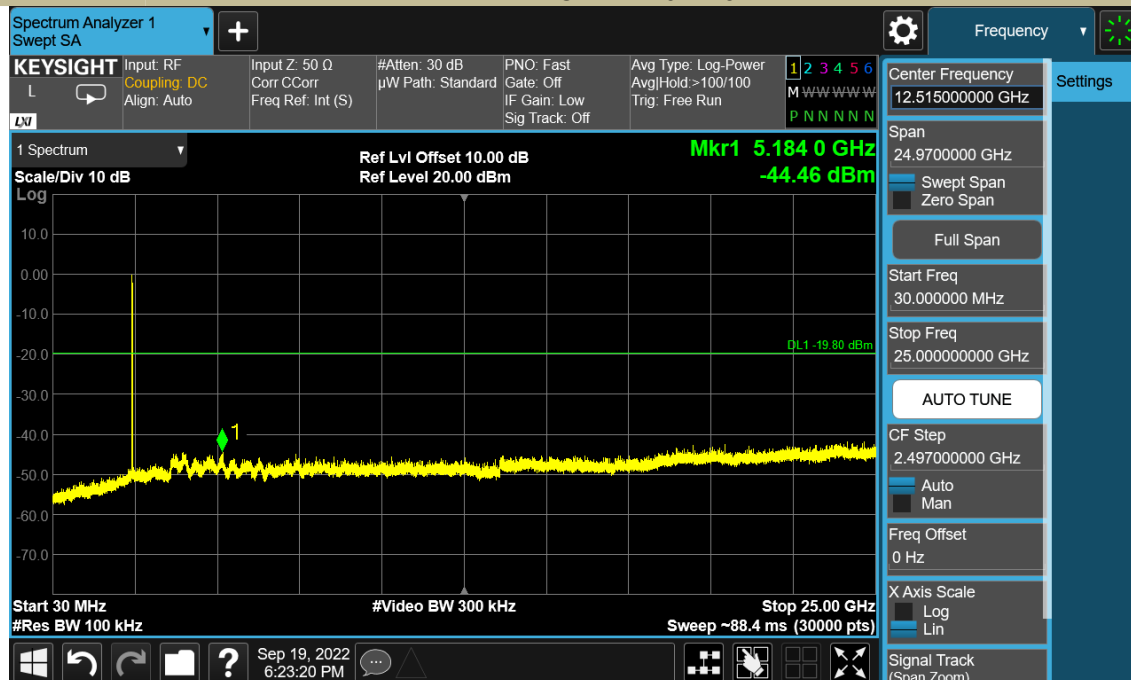


Test Model

Unwanted Emissions In Non-Restricted Frequency Bands

802.11b

Channel 6: 2437MH

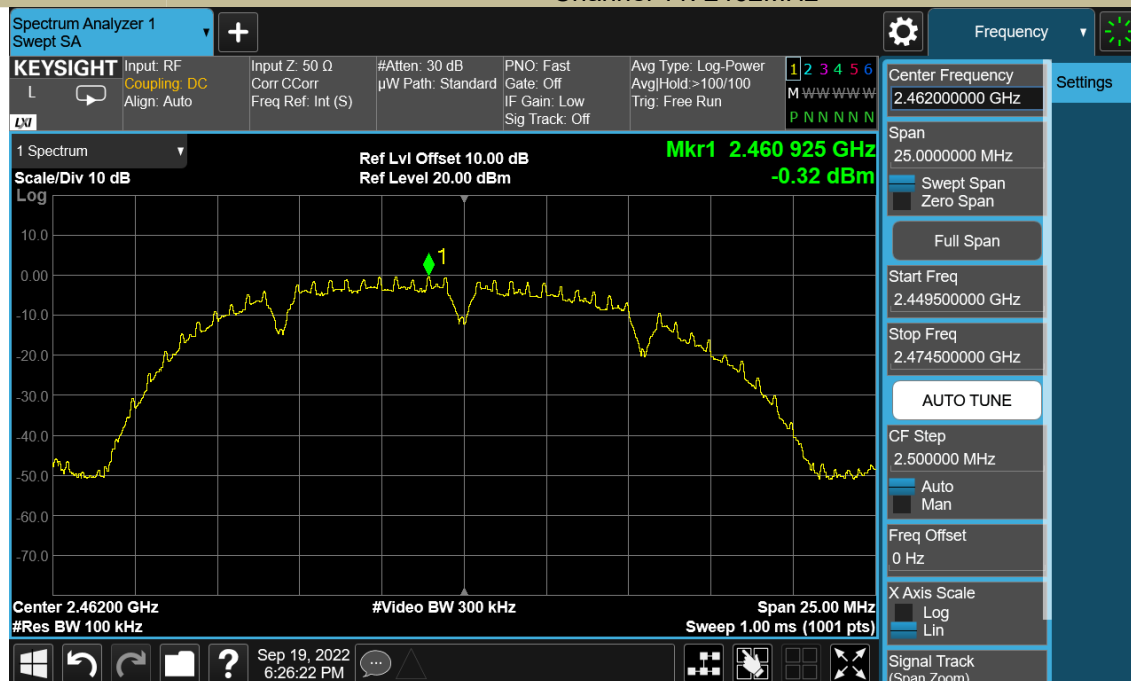


Test Model

PSD(Power Spectral Density )

802.11b

Channel 11: 2462MHz

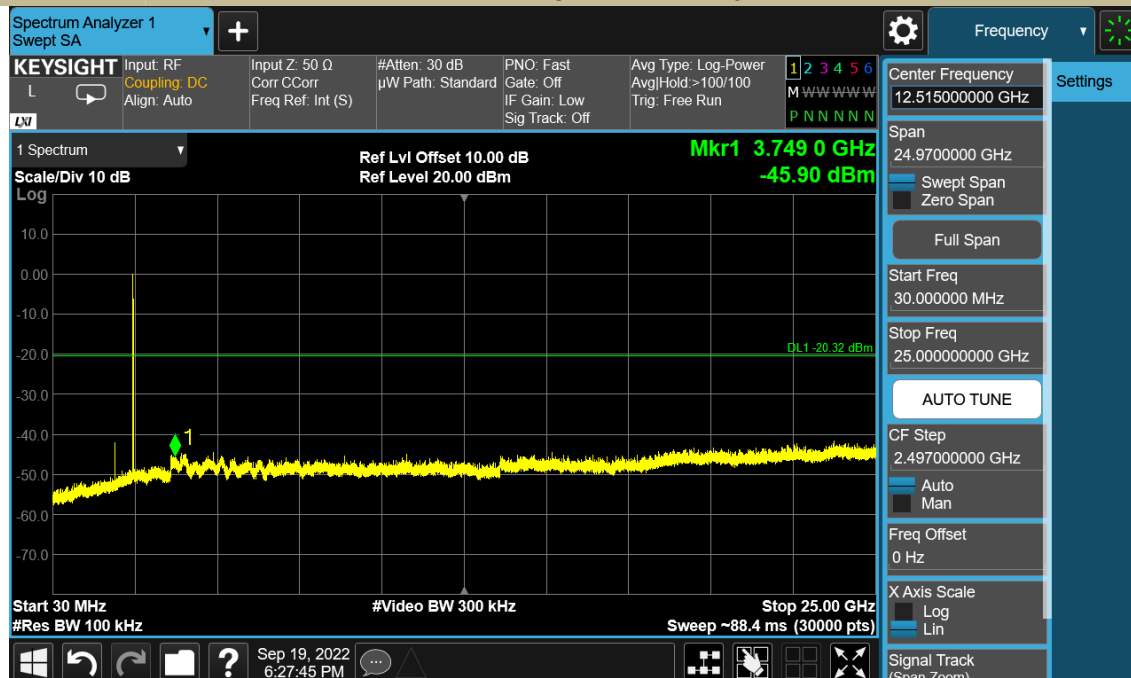


Test Model

Unwanted Emissions In Non-Restricted Frequency Bands

802.11b

Channel 11: 2462MH



Test Model

Band edge

802.11b

Channel 11: 2462MH

