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# FCC Test Report

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Report No.: AGC00970231205FR03

**FCC ID** : 2AMUU-MWA06

**APPLICATION PURPOSE** : Original Equipment

**PRODUCT DESIGNATION** : Smart Wi-Fi BLE Module

**BRAND NAME** : meross, Refoss, Flysocks, bbsolar

**MODEL NAME** : MR3EB, BSLBWR01, MWA6EB

**APPLICANT** : Chengdu Meross Technology Co., Ltd.

**DATE OF ISSUE** : Jan. 19, 2024

**STANDARD(S)** : FCC Part 15 Subpart C §15.247

**REPORT VERSION** : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



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**Report Revise Record**

| Report Version | Revise Time | Issued Date   | Valid Version | Notes           |
|----------------|-------------|---------------|---------------|-----------------|
| V1.0           | /           | Jan. 19, 2024 | Valid         | Initial Release |

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## 1. General Information

|                              |                                                                                                       |
|------------------------------|-------------------------------------------------------------------------------------------------------|
| Applicant                    | Chengdu Meross Technology Co., Ltd.                                                                   |
| Address                      | Floor 3, Building A5, Shijicheng Road No 1129, Gaoxin, Free Trade Trial Zone, Chengdu, Sichuan, China |
| Manufacturer                 | Chengdu Meross Technology Co., Ltd.                                                                   |
| Address                      | Floor 3, Building A5, Shijicheng Road No 1129, Gaoxin, Free Trade Trial Zone, Chengdu, Sichuan, China |
| Factory                      | N/A                                                                                                   |
| Address                      | N/A                                                                                                   |
| Product Designation          | Smart Wi-Fi BLE Module                                                                                |
| Brand Name                   | meross, Refoss, Flysocks, bbsolar                                                                     |
| Test Model                   | MR3EB                                                                                                 |
| Series Model(s)              | BSLBWR01, MWA6EB                                                                                      |
| Difference Description       | All the same except for the model name and memory size.                                               |
| Date of receipt of test item | Jan. 04, 2024                                                                                         |
| Date of Test                 | Jan. 04, 2024 to Jan. 19, 2024                                                                        |
| Deviation from Standard      | No any deviation from the test method                                                                 |
| Condition of Test Sample     | Normal                                                                                                |
| Test Result                  | Pass                                                                                                  |
| Test Report Form No          | AGCER-FCC-2.4GWLAN-V1                                                                                 |

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

Prepared By



Alan Duan  
(Project Engineer)

Jan. 19, 2024

Reviewed By



Calvin Liu  
(Reviewer)

Jan. 19, 2024

Approved By



Max Zhang  
(Authorized Officer)

Jan. 19, 2024

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## 2. Product Information

### 2.1 Product Technical Description

|                        |                                                                                        |
|------------------------|----------------------------------------------------------------------------------------|
| Equipment Type         | WLAN 2.4G                                                                              |
| Frequency Band         | 2400MHz ~ 2483.5MHz                                                                    |
| Operation Frequency    | 2412MHz ~ 2462MHz                                                                      |
| Output Power (Average) | IEEE 802.11b:13.04dBm; IEEE 802.11g:9.85dBm;<br>IEEE 802.11n(HT20):9.83dBm             |
| Output Power (Peak)    | IEEE 802.11b:15.73dBm; IEEE 802.11g:17.23dBm;<br>IEEE 802.11n(HT20):17.32dBm           |
| Modulation             | 802.11b:(DQPSK, DBPSK, CCK) DSSS<br>802.11g/n:(64-QAM,16-QAM, QPSK, BPSK) OFDM         |
| Data Rate              | 802.11b:1/2/5.5/11Mbps<br>802.11g: 6/9/12/18/24/36/48/54Mbps<br>802.11n: up to 300Mbps |
| Number of channels     | 11                                                                                     |
| Hardware Version       | V8.0                                                                                   |
| Software Version       | V8.0.0                                                                                 |
| Antenna Designation    | PCB Antenna                                                                            |
| Antenna Gain           | 1.62 dBi                                                                               |
| Power Supply           | DC 3.3V                                                                                |

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## 2.2 Table of Carrier Frequency

For 2412-2462MHz:

11 channels are provided for 802.11b/g/n(HT20):

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|---------|-----------|
| 01      | 2412 MHz  | 02      | 2417 MHz  | 03      | 2422 MHz  |
| 04      | 2427 MHz  | 05      | 2432 MHz  | 06      | 2437 MHz  |
| 07      | 2442 MHz  | 08      | 2447 MHz  | 09      | 2452 MHz  |
| 10      | 2457 MHz  | 11      | 2462 MHz  |         |           |

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### 2.3 IEEE 802.11n Modulation Scheme

| MCS Index | Nss | Modulation | R   | N <sub>BPSC</sub> | N <sub>CBPS</sub> |       | N <sub>DBPS</sub> |       | Data Rate(Mbps) |       |
|-----------|-----|------------|-----|-------------------|-------------------|-------|-------------------|-------|-----------------|-------|
|           |     |            |     |                   |                   |       |                   |       | 800nsGI         |       |
|           |     |            |     |                   | 20MHz             | 40MHz | 20MHz             | 40MHz | 20MHz           | 40MHz |
| 0         | 1   | BPSK       | 1/2 | 1                 | 52                | 108   | 26                | 54    | 6.5             | 13.5  |
| 1         | 1   | QPSK       | 1/2 | 2                 | 104               | 216   | 52                | 108   | 13.0            | 27.0  |
| 2         | 1   | QPSK       | 3/4 | 2                 | 104               | 216   | 78                | 162   | 19.5            | 40.5  |
| 3         | 1   | 16-QAM     | 1/2 | 4                 | 208               | 432   | 104               | 216   | 26.0            | 54.0  |
| 4         | 1   | 16-QAM     | 3/4 | 4                 | 208               | 432   | 156               | 324   | 39.0            | 81.0  |
| 5         | 1   | 64-QAM     | 2/3 | 6                 | 312               | 648   | 208               | 432   | 52.0            | 108.0 |
| 6         | 1   | 64-QAM     | 3/4 | 6                 | 312               | 648   | 234               | 489   | 58.5            | 121.5 |
| 7         | 1   | 64-QAM     | 5/6 | 6                 | 312               | 648   | 260               | 540   | 65.0            | 135.0 |

| Symbol | Explanation                             |
|--------|-----------------------------------------|
| NSS    | Number of spatial streams               |
| R      | Code rate                               |
| NBPSC  | Number of coded bits per single carrier |
| NCBPS  | Number of coded bits per symbol         |
| NDBPS  | Number of data bits per symbol          |
| GI     | Guard interval                          |

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## 2.5 Related Submittal(S) / Grant (S)

This submittal(s) (test report) is intended for FCC ID: **2AMUU-MWA06**, filing to comply with Part 2, Part 15 of the Federal Communication Commission rules.

## 2.6 Test Methodology

The tests were performed according to following standards:

| No. | Identity                                         | Document Title                                                                                                                                                                            |
|-----|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | FCC 47 CFR Part 2                                | Frequency allocations and radio treaty matters; general rules and regulations                                                                                                             |
| 2   | FCC 47 CFR Part 15                               | Radio Frequency Devices                                                                                                                                                                   |
| 3   | ANSI C63.10-2013                                 | American National Standard for Testing Unlicensed Wireless Devices                                                                                                                        |
| 4   | KDB 558074<br>D01 15.247 Meas<br>Guidance v05r02 | Guidance for compliance measurements on Digital Transmission Systems, Frequency Hopping Spread Spectrum system, and Hybrid system devices operating under Section 15.247 of the FCC rules |

## 2.7 Special Accessories

Refer to section 4.4.

## 2.8 Equipment Modifications

Not available for this EUT intended for grant.

## 2.9 Antenna Requirement

| Standard Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>15.203 requirement:<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.</p> <p>15.247(b) (4) requirement:<br/> 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</p> <p><b>EUT Antenna:</b><br/> The non-detachable antenna inside the device cannot be replaced by the user at will. The gain of the antenna is 1.62dBi.</p> |

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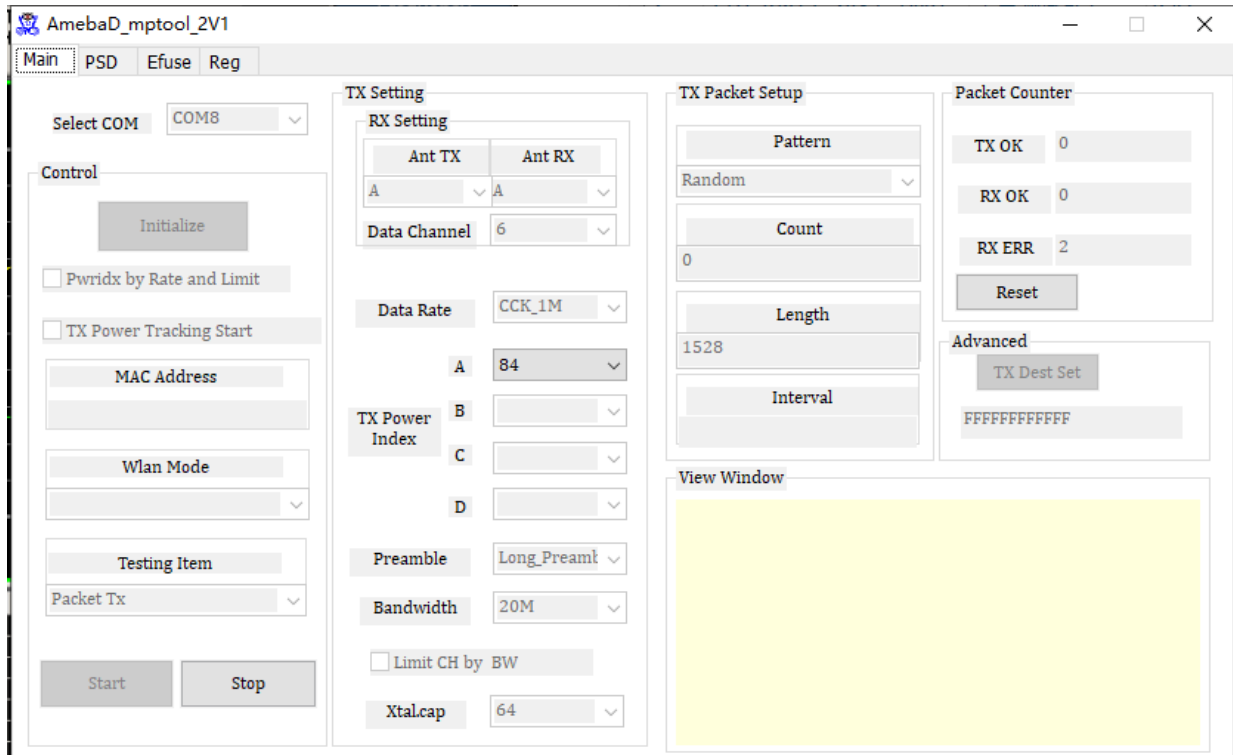
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## 2.11 Description of Test Software

### For IEEE 802.11 mode:

The test utility software used during testing was “UI mptool”, and the version was “V1.0”.

Software Setting Diagram



The screenshot shows the AmebaD\_mptool\_V1 software interface. The 'Main' tab is selected. The 'TX Setting' section includes 'RX Setting' with 'Ant TX' and 'Ant RX' both set to 'A', 'Data Channel' set to '6', 'Data Rate' set to 'CCK\_1M', 'TX Power Index' with options A (84), B, C, and D, 'Preamble' set to 'Long\_Preamt', 'Bandwidth' set to '20M', and 'Xtalcap' set to '64'. The 'TX Packet Setup' section includes 'Pattern' set to 'Random', 'Count' set to '0', 'Length' set to '1528', and 'Interval'. The 'Packet Counter' section shows 'TX OK' as 0, 'RX OK' as 0, and 'RX ERR' as 2, with a 'Reset' button. The 'Advanced' section has a 'TX Dest Set' button and a display showing 'FFFFFFFF'. The 'View Window' is a large yellow area. The 'Control' section has an 'Initialize' button, checkboxes for 'Pwridx by Rate and Limit' and 'TX Power Tracking Start', a 'MAC Address' field, a 'Wlan Mode' dropdown, a 'Testing Item' dropdown set to 'Packet Tx', and 'Start' and 'Stop' buttons.

| Test Mode    | Channel | Power Index |
|--------------|---------|-------------|
|              |         | Chain 1     |
| 802.11b      | L/M/H   | 84          |
| 802.11g      | L/M/H   | 84          |
| 802.11n-HT20 | L/M/H   | 84          |

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### 3. Test Environment

#### 3.1 Address of The Test Laboratory

Laboratory: Attestation of Global Compliance (Shenzhen) Co., Ltd.

Address: 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

#### 3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

##### **CNAS-Lab Code: L5488**

Attestation of Global Compliance (Shenzhen) Co., Ltd. has been assessed and proved to follow CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories).

##### **A2LA-Lab Cert. No.: 5054.02**

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to follow ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

##### **FCC-Registration No.: 975832**

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files with Registration 975832.

##### **IC-Registration No.: 24842 (CAB identifier: CN0063)**

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Certification and Engineering Bureau of Industry Canada. The acceptance letter from the IC is maintained in our files with Registration 24842.

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### 3.3 Environmental Conditions

|                         | Normal Conditions |
|-------------------------|-------------------|
| Temperature range (°C)  | 15 - 35           |
| Relative humidity range | 20 % - 75 %       |
| Pressure range (kPa)    | 86 - 106          |

### 3.4 Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

| Item                                          | Measurement Uncertainty    |
|-----------------------------------------------|----------------------------|
| Uncertainty of Conducted Emission for AC Port | $U_c = \pm 2.9 \text{ dB}$ |
| Uncertainty of Radiated Emission below 1GHz   | $U_c = \pm 3.9 \text{ dB}$ |
| Uncertainty of Radiated Emission above 1GHz   | $U_c = \pm 4.9 \text{ dB}$ |
| Uncertainty of total RF power, conducted      | $U_c = \pm 0.8 \text{ dB}$ |
| Uncertainty of RF power density, conducted    | $U_c = \pm 2.6 \text{ dB}$ |
| Uncertainty of spurious emissions, conducted  | $U_c = \pm 2 \%$           |
| Uncertainty of Occupied Channel Bandwidth     | $U_c = \pm 2 \%$           |

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### 3.5 List of Equipment Used

| ● RF Conducted Test System          |               |                     |              |            |            |                           |                           |
|-------------------------------------|---------------|---------------------|--------------|------------|------------|---------------------------|---------------------------|
| Used                                | Equipment No. | Test Equipment      | Manufacturer | Model No.  | Serial No. | Last Cal. Date (YY-MM-DD) | Next Cal. Date (YY-MM-DD) |
| <input checked="" type="checkbox"/> | AGC-ER-E036   | Spectrum Analyzer   | Agilent      | N9020A     | MY49100060 | 2023-06-01                | 2024-05-31                |
| <input checked="" type="checkbox"/> | AGC-ER-E062   | Power Sensor        | Agilent      | U2021XA    | MY54110007 | 2023-03-03                | 2024-03-02                |
| <input checked="" type="checkbox"/> | AGC-ER-E063   | Power Sensor        | Agilent      | U2021XA    | MY54110009 | 2023-03-03                | 2024-03-02                |
| <input checked="" type="checkbox"/> | AGC-EM-A152   | 6dB Attenuator      | Eeatsheep    | LM-XX-6-5W | N/A        | 2023-06-09                | 2024-06-08                |
| <input checked="" type="checkbox"/> | AGC-ER-E083   | Signal Generator    | Agilent      | E4421B     | US39340815 | 2023-06-01                | 2024-05-31                |
| <input checked="" type="checkbox"/> | N/A           | RF Connection Cable | N/A          | 1#         | N/A        | Each time                 | N/A                       |
| <input checked="" type="checkbox"/> | N/A           | RF Connection Cable | N/A          | 2#         | N/A        | Each time                 | N/A                       |

| ● Radiated Spurious Emission        |               |                               |              |            |            |                           |                           |
|-------------------------------------|---------------|-------------------------------|--------------|------------|------------|---------------------------|---------------------------|
| Used                                | Equipment No. | Test Equipment                | Manufacturer | Model No.  | Serial No. | Last Cal. Date (YY-MM-DD) | Next Cal. Date (YY-MM-DD) |
| <input checked="" type="checkbox"/> | AGC-EM-E046   | EMI Test Receiver             | R&S          | ESCI       | 10096      | 2023-02-18                | 2024-02-17                |
| <input type="checkbox"/>            | AGC-EM-E116   | EMI Test Receiver             | R&S          | ESCI       | 100034     | 2023-06-03                | 2024-06-02                |
| <input checked="" type="checkbox"/> | AGC-EM-E061   | Spectrum Analyzer             | Agilent      | N9010A     | MY53470504 | 2023-06-01                | 2024-05-31                |
| <input checked="" type="checkbox"/> | AGC-EM-E086   | Loop Antenna                  | ZHINAN       | ZN30900C   | 18051      | 2022-03-12                | 2024-03-11                |
| <input checked="" type="checkbox"/> | AGC-EM-E001   | Wideband Antenna              | SCHWARZBECK  | VULB9168   | D69250     | 2023-05-11                | 2025-05-10                |
| <input checked="" type="checkbox"/> | AGC-EM-E029   | Broadband Ridged Horn Antenna | ETS          | 3117       | 00034609   | 2023-03-23                | 2024-03-22                |
| <input checked="" type="checkbox"/> | AGC-EM-E082   | Horn Antenna                  | SCHWARZBECK  | BBHA 9170  | #768       | 2023-09-24                | 2025-09-23                |
| <input checked="" type="checkbox"/> | AGC-EM-E146   | Pre-amplifier                 | ETS          | 3117-PA    | 00246148   | 2022-08-04                | 2024-08-03                |
| <input checked="" type="checkbox"/> | AGC-EM-A119   | 2.4G Filter                   | SongYi       | N/A        | N/A        | 2023-06-01                | 2024-05-31                |
| <input checked="" type="checkbox"/> | AGC-EM-A138   | 6dB Attenuator                | Eeatsheep    | LM-XX-6-5W | N/A        | 2023-06-09                | 2024-06-08                |
| <input type="checkbox"/>            | AGC-EM-A139   | 6dB Attenuator                | Eeatsheep    | LM-XX-6-5W | N/A        | 2023-06-09                | 2024-06-08                |

| ● AC Power Line Conducted Emission  |               |                   |              |            |            |                           |                           |
|-------------------------------------|---------------|-------------------|--------------|------------|------------|---------------------------|---------------------------|
| Used                                | Equipment No. | Test Equipment    | Manufacturer | Model No.  | Serial No. | Last Cal. Date (YY-MM-DD) | Next Cal. Date (YY-MM-DD) |
| <input checked="" type="checkbox"/> | AGC-EM-E045   | EMI Test Receiver | R&S          | ESPI       | 101206     | 2023/06/03                | 2024/06/02                |
| <input checked="" type="checkbox"/> | AGC-EM-A130   | 6dB Attenuator    | Eeatsheep    | LM-XX-6-5W | DC-6GZ     | 2023-06-09                | 2024-06-08                |
| <input checked="" type="checkbox"/> | AGC-EM-E023   | AMN               | R&S          | 100086     | ESH2-Z5    | 2023/06/03                | 2024/06/02                |

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| ● Test Software                     |               |                     |              |                                  |                     |
|-------------------------------------|---------------|---------------------|--------------|----------------------------------|---------------------|
| Used                                | Equipment No. | Test Equipment      | Manufacturer | Model No.                        | Version Information |
| <input checked="" type="checkbox"/> | AGC-EM-S003   | RE Test System      | FARA         | EZ-EMC                           | V.RA-03A            |
| <input checked="" type="checkbox"/> | AGC-EM-S011   | RSE Test System     | Tonscend     | TS <sup>+</sup> Ver2.1(JS36-RSE) | 4.0.0.0             |
| <input checked="" type="checkbox"/> | AGC-EM-S001   | CE Test System      | R&S          | ES-K1                            | V1.71               |
| <input checked="" type="checkbox"/> | AGC-ER-S009   | BT/WIFI Test System | Tonscend     | JS1120-3                         | 2.6.77.0518         |

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## 4. System Test Configuration

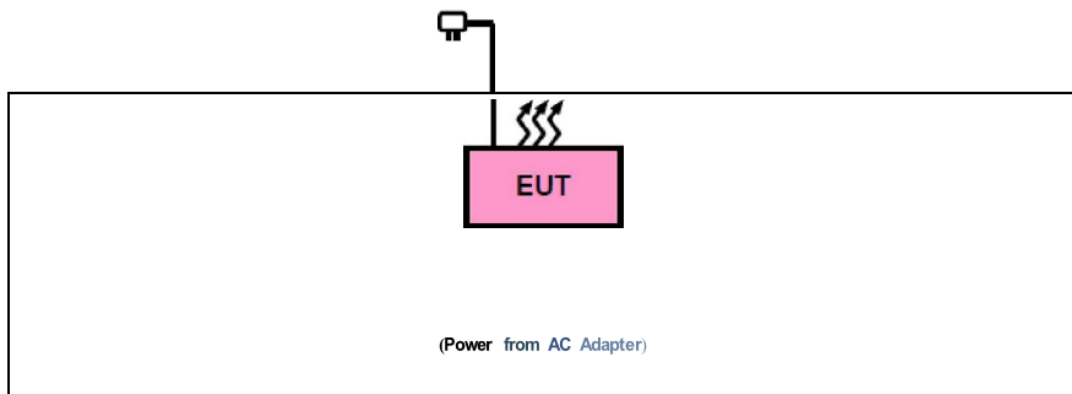
### 4.1 EUT Configuration

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

### 4.2 EUT Exercise

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

### 4.3 Configuration of Tested System



### 4.4 Equipment Used in Tested System

The following peripheral devices and interface cables were connected during the measurement:

☒ Test Accessories Come From The Laboratory

| No. | Equipment        | Model No. | Manufacturer | Specification Information                                                                                | Cable            |
|-----|------------------|-----------|--------------|----------------------------------------------------------------------------------------------------------|------------------|
| 1   | Notebook PC      | Redmi     | XMA2002-AB   | --                                                                                                       | --               |
| 2   | Notebook Adapter | Redmi     | AD100G       | Input: AC100-240V 50/60Hz 1.6A<br>Output: DC 5V/3A; DC 9V/3A; DC 11V/5A; DC 12V/3A; DC 15V/3A; DC 20V/5A | 1.2m, unshielded |

☐ Test Accessories Come From The Manufacturer

| No. | Equipment | Model No. | Manufacturer | Specification Information | Cable |
|-----|-----------|-----------|--------------|---------------------------|-------|
| 1   | --        | --        | --           | --                        | --    |

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#### 4.5 Summary of Test Results

| Item | FCC Rules            | Description of Test                           | Result |
|------|----------------------|-----------------------------------------------|--------|
| 1    | §15.203&15.247(b)(4) | Antenna Equipment                             | Pass   |
| 2    | §15.247 (b)(1)       | RF Output Power                               | Pass   |
| 3    | §15.247 (a)(1)       | 6 dB Bandwidth                                | Pass   |
| 4    | §15.247 (e)          | Power Spectral Density                        | Pass   |
| 5    | §15.247 (d)          | Conducted Band Edge and Out-of-Band Emissions | Pass   |
| 6    | §15.247 (d)&15.209   | Radiated Spurious Emission                    | Pass   |
| 7    | §15.207              | AC Power Line Conducted Emission              | Pass   |

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## 5. Description of Test Modes

| Summary table of Test Cases     |                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Item                       | Data Rate / Modulation                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                 | 2.4G WLAN – 802.11b/g/n (DSSS/OFDM)                                                                                                                                                                                                                                                                                                                                                                                     |
| Radiated & Conducted Test Cases | Mode 1: 802.11b_TX CH01_2412 MHz_1 Mbps<br>Mode 2: 802.11b_TX CH06_2437 MHz_1 Mbps<br>Mode 3: 802.11b_TX CH11_2462 MHz_1 Mbps<br>Mode 4: 802.11g_TX CH01_2412 MHz_6 Mbps<br>Mode 5: 802.11g_TX CH06_2437 MHz_6 Mbps<br>Mode 6: 802.11g_TX CH11_2462 MHz_6 Mbps<br>Mode 7: 802.11n-HT20_TX CH01_2412 MHz_MCS0 Mbps<br>Mode 8: 802.11n-HT20_TX CH06_2437 MHz_MCS0 Mbps<br>Mode 9: 802.11n-HT20_TX CH11_2462 MHz_MCS0 Mbps |
| AC Conducted Emission           | Mode 1: 2.4G WLAN Link + USB Cable (Charging from PC)                                                                                                                                                                                                                                                                                                                                                                   |

### Note:

1. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
2. For Conducted Test method, a temporary antenna connector is provided by the manufacture.
3. Only the result of the worst case was recorded in the report, if no other cases.

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## 6. Duty Cycle Measurement

2.4GHz WLAN (DTS) operation is possible in 20MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = Peak. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

| Operating mode    | Data rates (Mbps) | Duty Cycle (%) | Duty Cycle Factor (dB) | 1/ T Minimum VBW (kHz) | Average Factor (dB) |
|-------------------|-------------------|----------------|------------------------|------------------------|---------------------|
| IEEE 802.11b      | 1                 | 98.96          | 0.05                   | 0.08                   | -0.09               |
| IEEE 802.11g      | 6                 | 93.99          | 0.27                   | 0.48                   | -0.54               |
| IEEE 802.11n-HT20 | MCS0              | 93.66          | 0.28                   | 0.52                   | -0.57               |

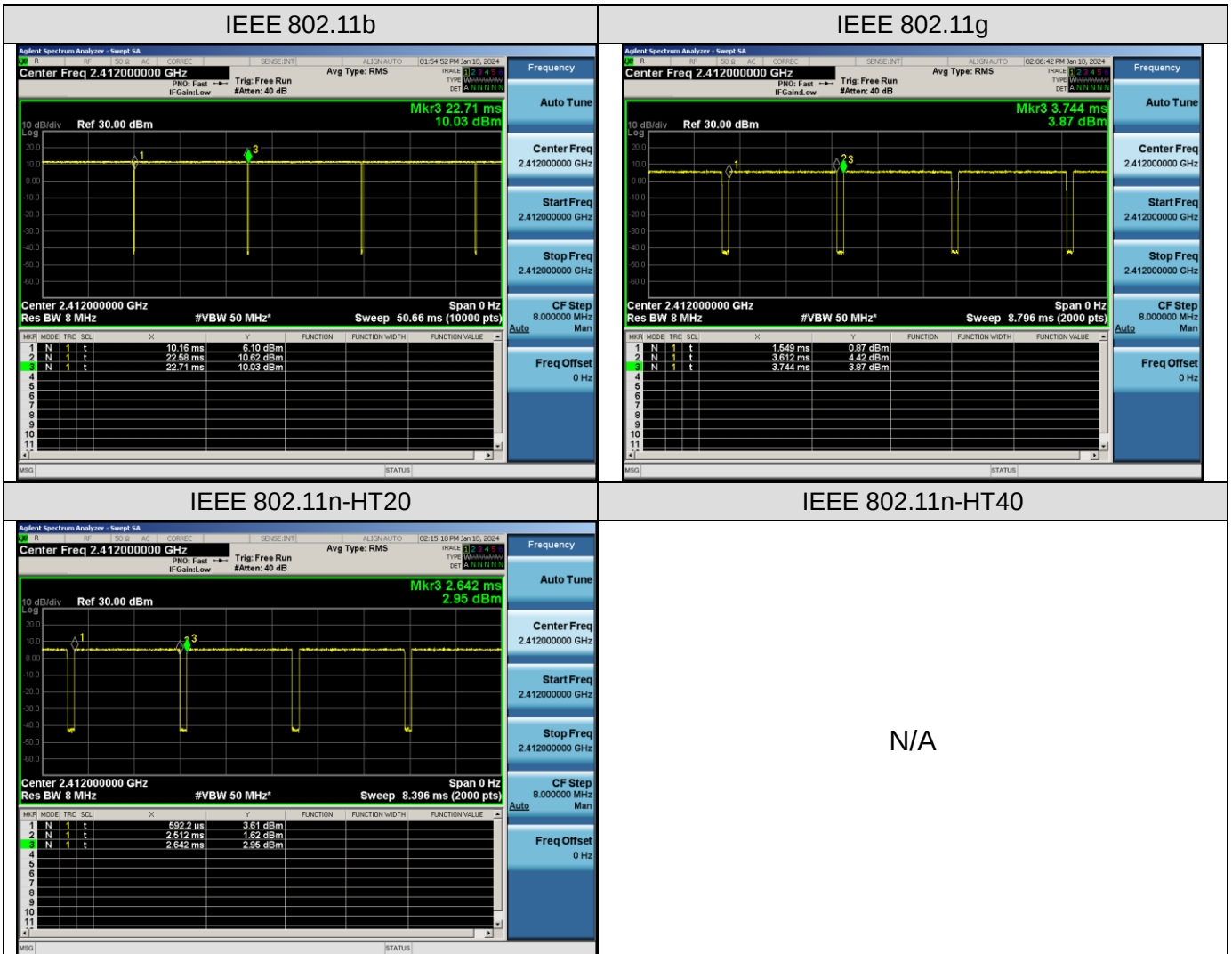
Remark:

1. Duty Cycle factor =  $10 * \log (1/ \text{Duty cycle})$
2. Average factor =  $20 \log_{10} \text{Duty Cycle}$
3. The duty cycle of each frequency band mode reflects the determination requirements of the low channel measurement value.

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The test plots as follows:



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## 7. RF Output Power Measurement

### 7.1 Provisions Applicable

For DTSSs employing digital modulation techniques operating in the bands 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W.

### 7.2 Measurement Procedure

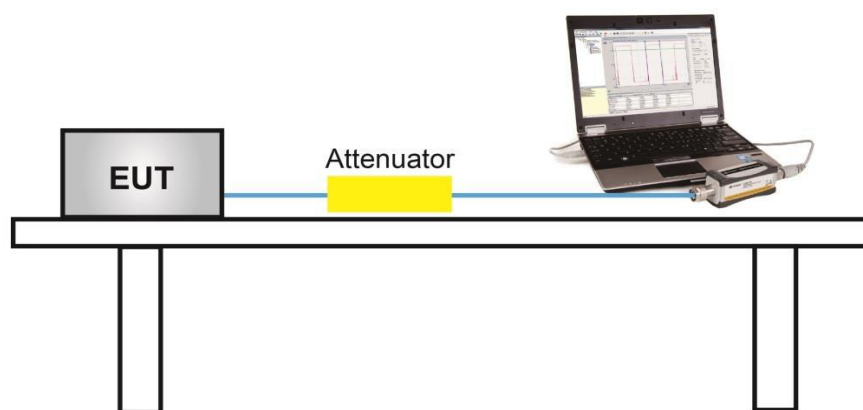
☒ Method PM is Measurement using an RF Peak power meter. The procedure for this method is as follows:

1. The testing follows the ANSI C63.10 Section 11.9.1.3
2. The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

☒ Method PM is Measurement using an RF average power meter. The procedure for this method is as follows:

1. The testing follows the ANSI C63.10 Section 11.9.2.3
2. Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the following conditions are satisfied:
3. The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
4. At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
5. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
6. Determine according to the duty cycle of the equipment: when it is less than 98%, follow the steps below.
7. Measure the average power of the transmitter. This measurement is an average over both the ON and OFF periods of the transmitter.
8. Adjust the measurement in dBm by adding  $[10 \log (1 / D)]$ , where D is the duty cycle {e.g.,  $[10 \log (1 / 0.25)]$ , if the duty cycle is 25%}.
9. Record the test results in the report.

### 7.3 Measurement Setup (Block Diagram of Configuration)



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#### 7.4 Measurement Result

| Test Data of Conducted Output Power |                      |                     |                  |              |              |
|-------------------------------------|----------------------|---------------------|------------------|--------------|--------------|
| Test Mode                           | Test Frequency (MHz) | Average Power (dBm) | Peak Power (dBm) | Limits (dBm) | Pass or Fail |
| 802.11b                             | 2412                 | 12.48               | 15.18            | $\leq 30$    | Pass         |
|                                     | 2437                 | 12.77               | 15.49            | $\leq 30$    | Pass         |
|                                     | 2462                 | 13.04               | 15.73            | $\leq 30$    | Pass         |
| 802.11g                             | 2412                 | 9.18                | 16.63            | $\leq 30$    | Pass         |
|                                     | 2437                 | 9.55                | 17.06            | $\leq 30$    | Pass         |
|                                     | 2462                 | 9.85                | 17.23            | $\leq 30$    | Pass         |
| 802.11n20                           | 2412                 | 9.15                | 16.61            | $\leq 30$    | Pass         |
|                                     | 2437                 | 9.48                | 16.88            | $\leq 30$    | Pass         |
|                                     | 2462                 | 9.83                | 17.32            | $\leq 30$    | Pass         |

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## 8. 6dB Bandwidth Measurement

### 8.1 Provisions Applicable

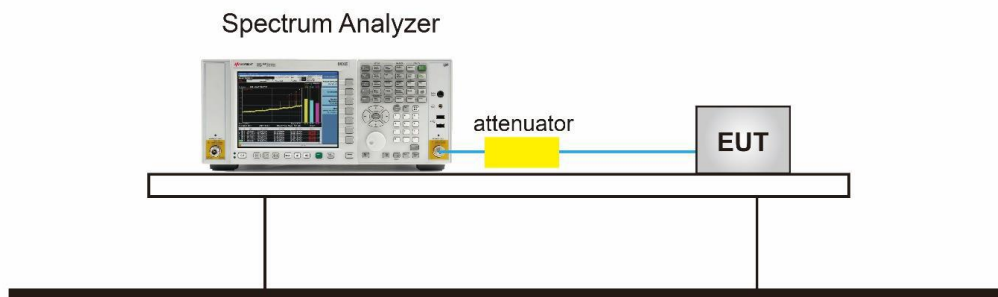
The minimum 6dB bandwidth shall be 500 kHz.

### 8.2 Measurement Procedure

The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).

1. 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.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. For 6dB Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement.
4. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the OBW and set the Video bandwidth (VBW)  $\geq 3 * RBW$ .
5. Detector = peak
6. Trace mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize.
9. Measure and record the results in the test report.

### 8.3 Measurement Setup (Block Diagram of Configuration)



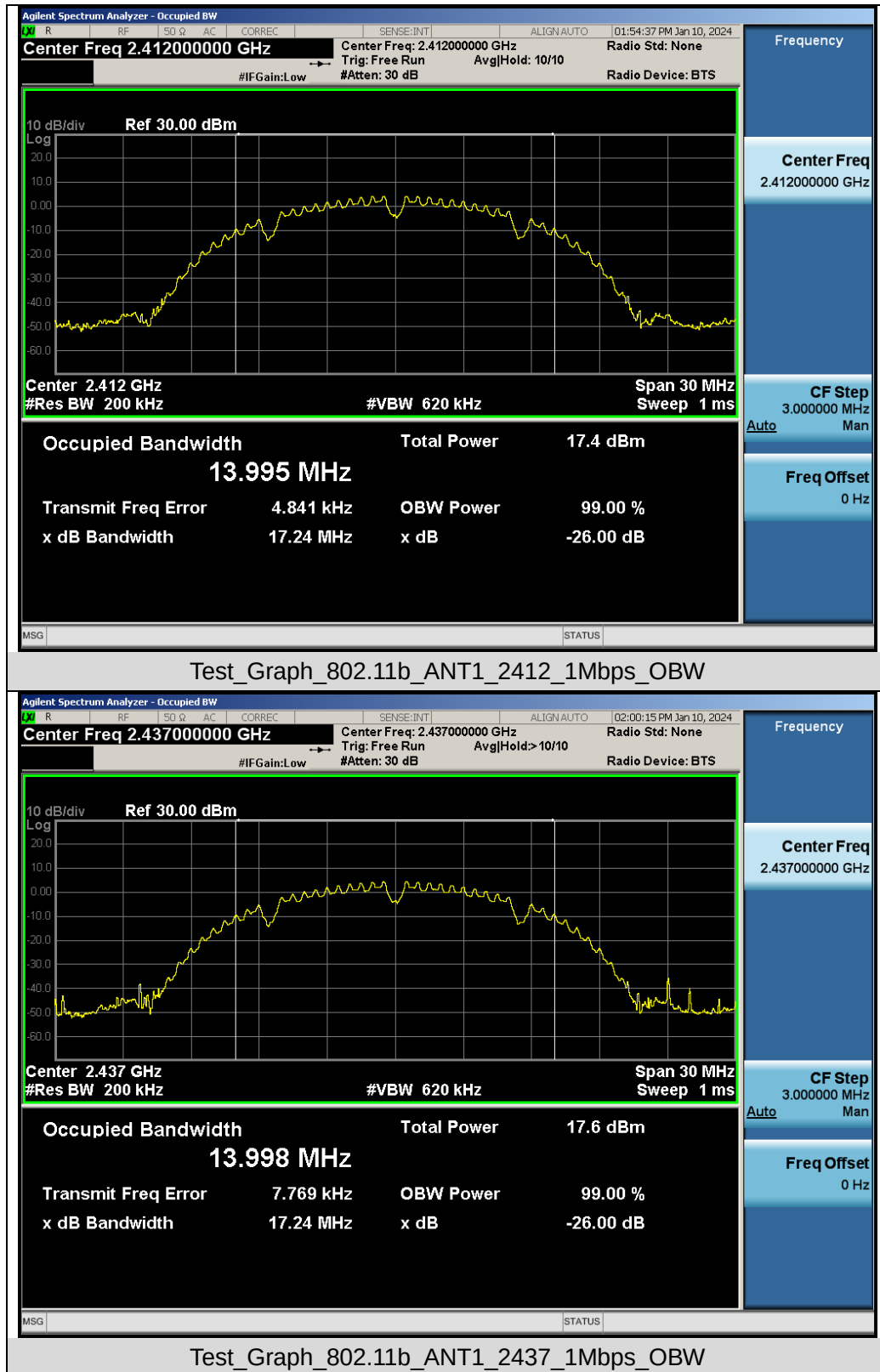
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#### 8.4 Measurement Result

| Test Data of Occupied Bandwidth and DTS Bandwidth |                      |                              |                     |                            |              |
|---------------------------------------------------|----------------------|------------------------------|---------------------|----------------------------|--------------|
| Test Mode                                         | Test Frequency (MHz) | 99% Occupied Bandwidth (MHz) | DTS Bandwidth (MHz) | DTS Bandwidth Limits (MHz) | Pass or Fail |
| 802.11b                                           | 2412                 | 13.995                       | 9.036               | $\geq 0.5$                 | Pass         |
|                                                   | 2437                 | 13.998                       | 9.035               | $\geq 0.5$                 | Pass         |
|                                                   | 2462                 | 14.000                       | 9.064               | $\geq 0.5$                 | Pass         |
| 802.11g                                           | 2412                 | 16.679                       | 16.339              | $\geq 0.5$                 | Pass         |
|                                                   | 2437                 | 16.649                       | 16.356              | $\geq 0.5$                 | Pass         |
|                                                   | 2462                 | 16.583                       | 16.351              | $\geq 0.5$                 | Pass         |
| 802.11n20                                         | 2412                 | 17.745                       | 17.576              | $\geq 0.5$                 | Pass         |
|                                                   | 2437                 | 17.875                       | 17.036              | $\geq 0.5$                 | Pass         |
|                                                   | 2462                 | 17.754                       | 17.560              | $\geq 0.5$                 | Pass         |

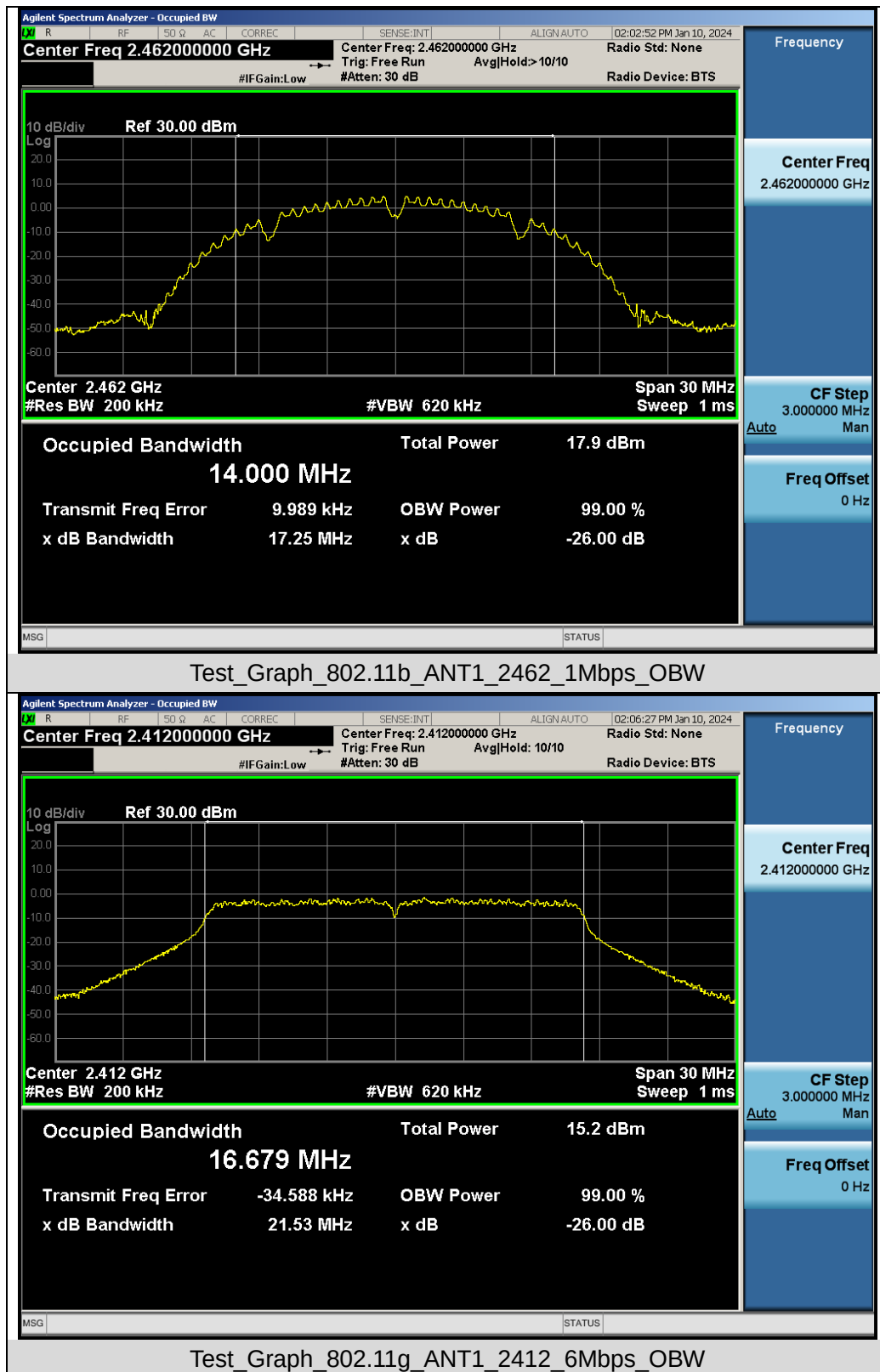
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### Test Graphs of Occupied Bandwidth

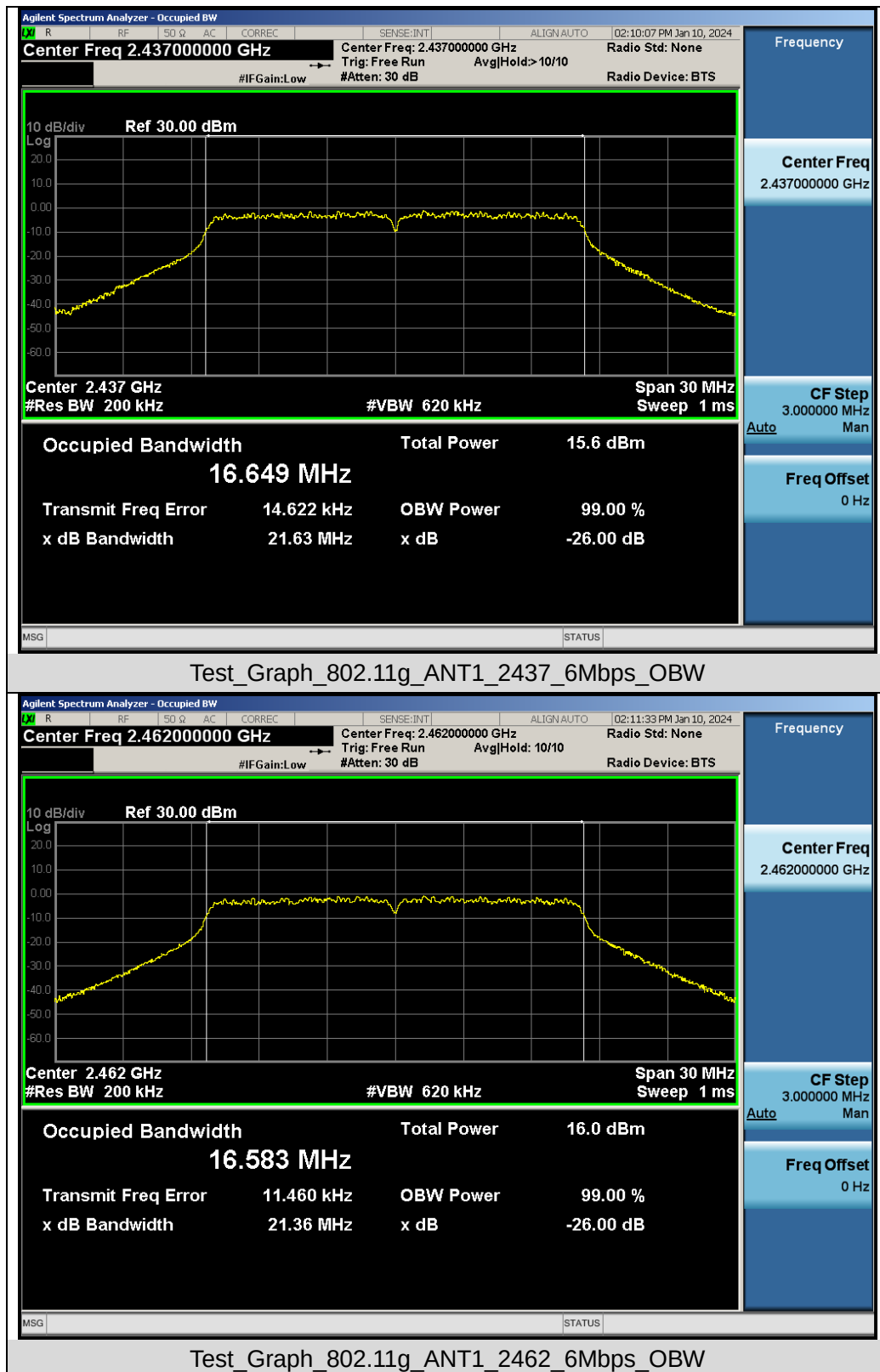


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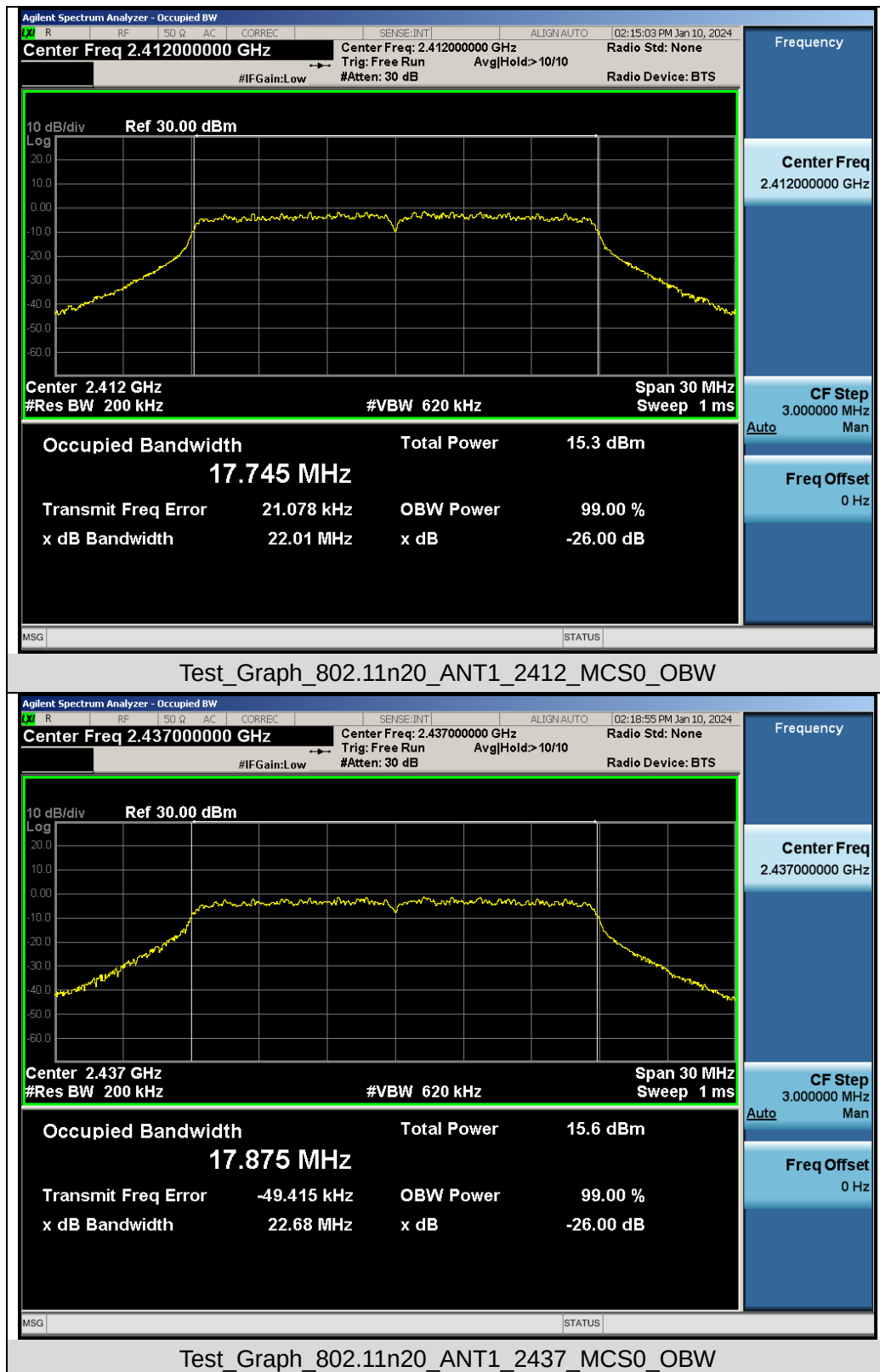




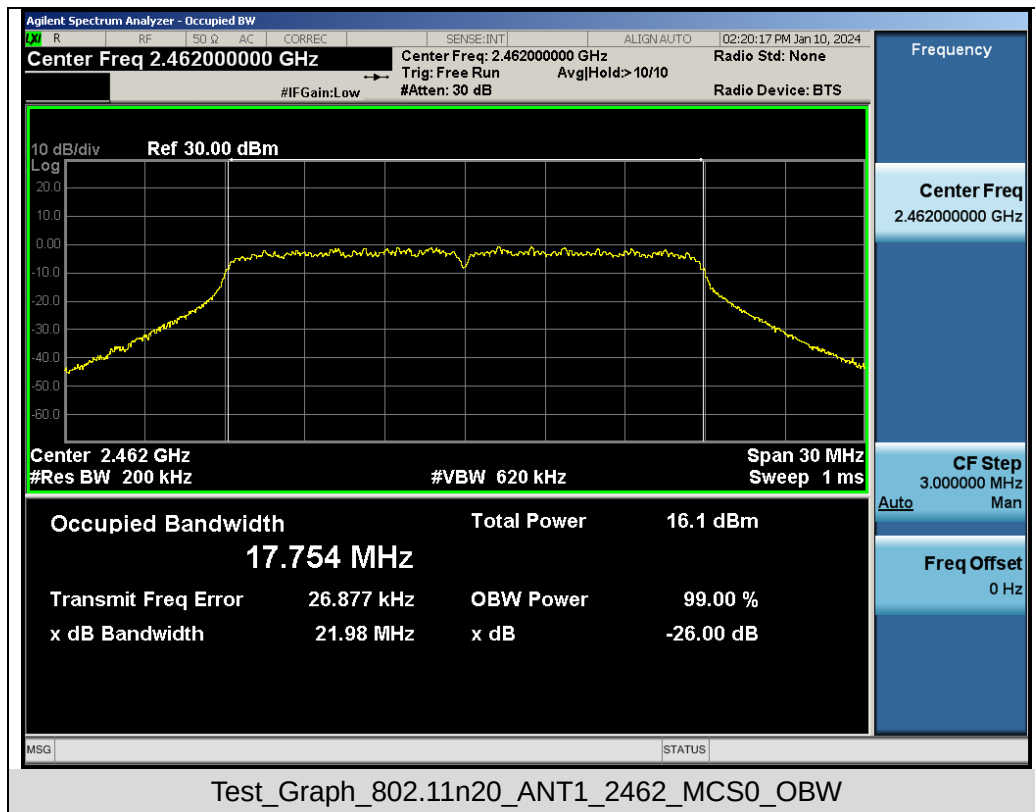
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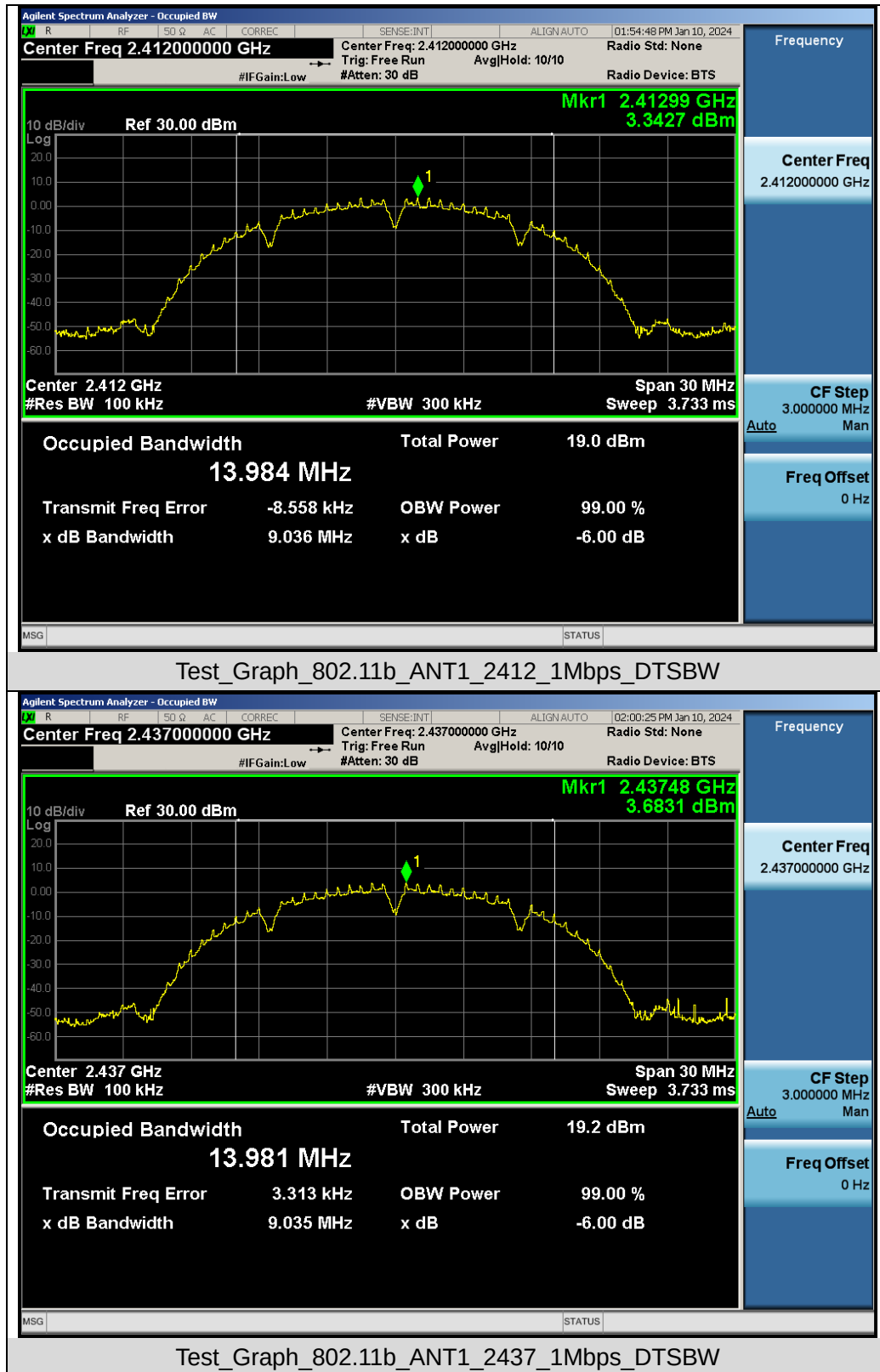
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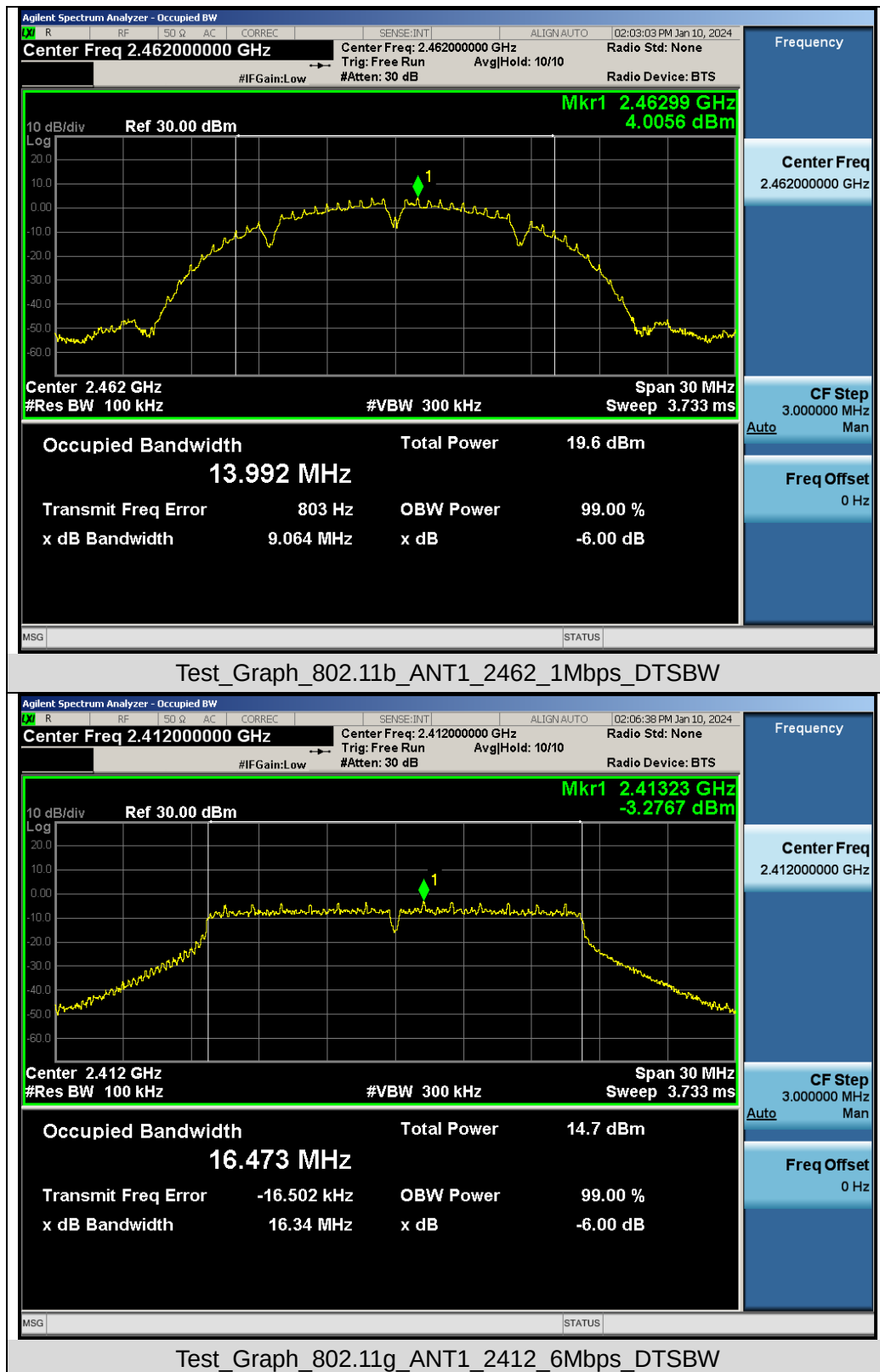
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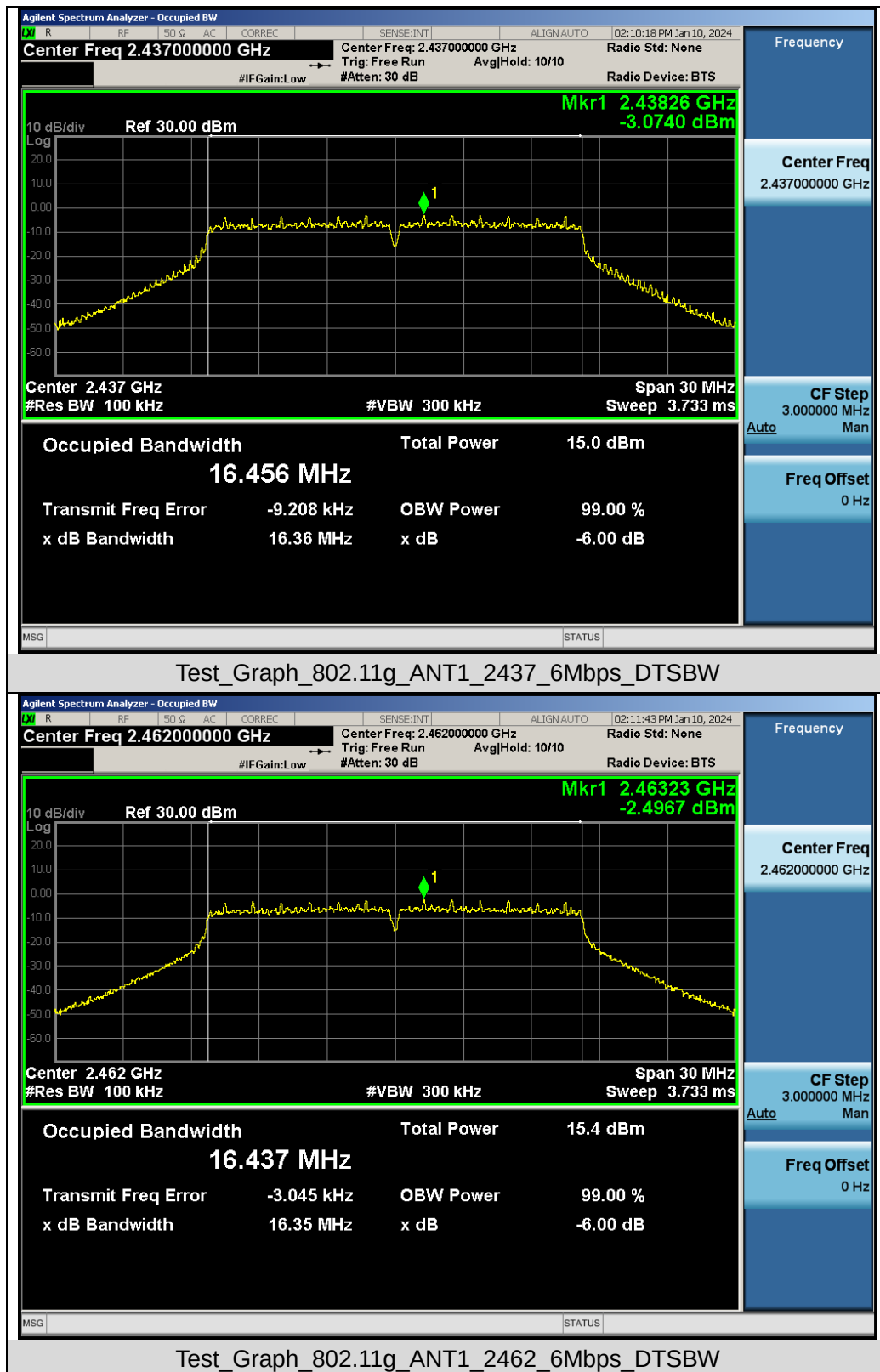
### Test Graphs of DTS Bandwidth



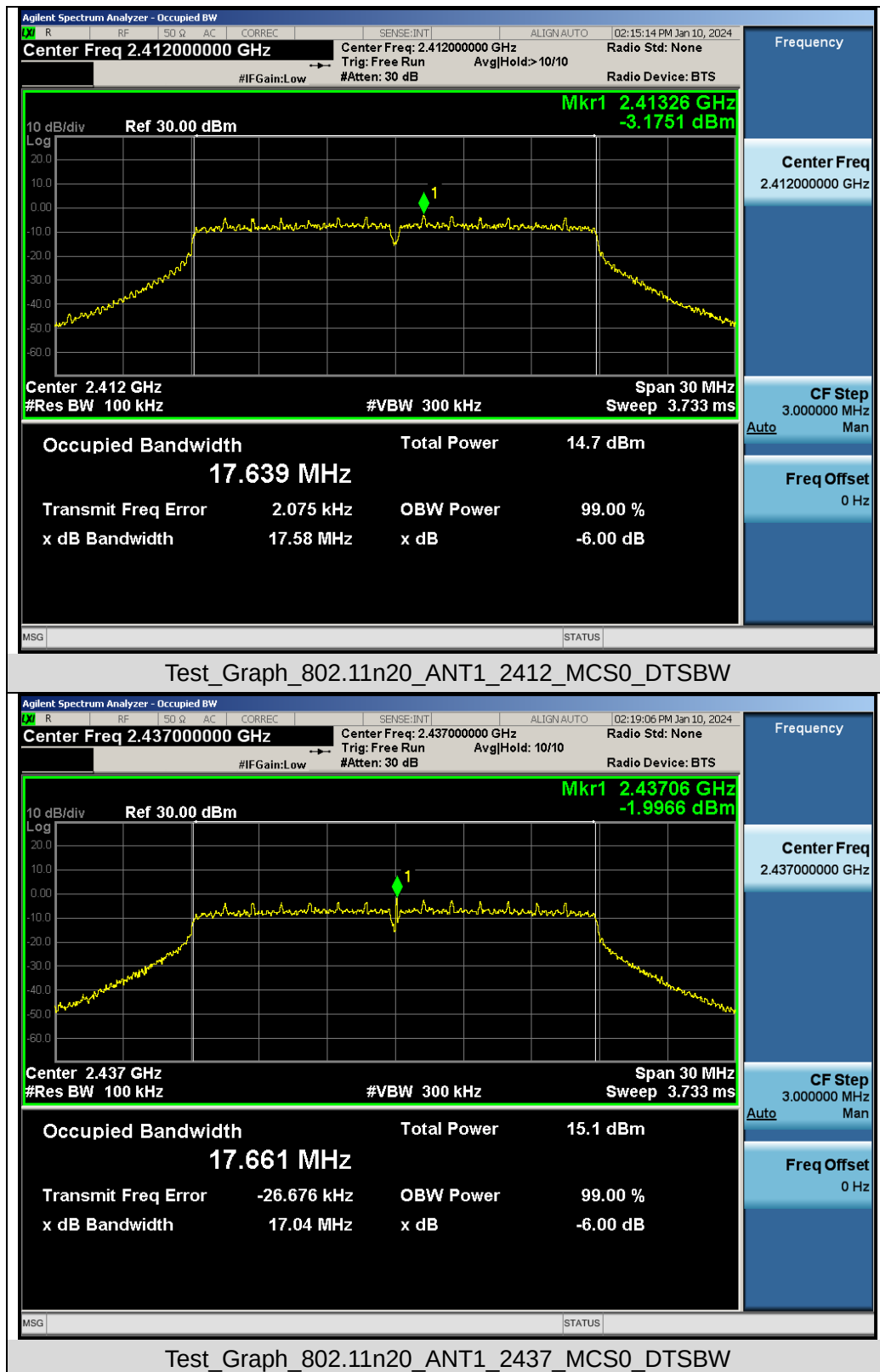
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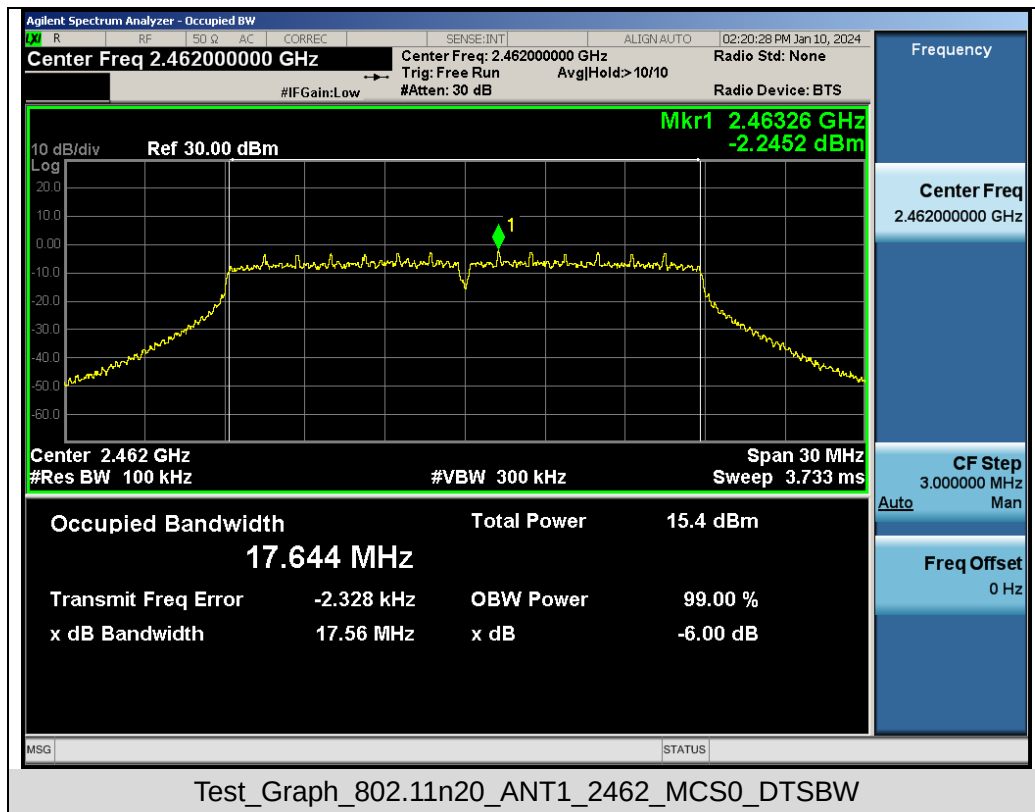


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## 9. Power Spectral Density Measurement

### 9.1 Provisions Applicable

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.

### 9.2 Measurement Procedure

☒ For Peak power spectral density test:

1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the RBW = 20 kHz.
4. Set the VBW  $\geq [3 \times \text{RBW}]$ .
5. Set the Span  $\geq [1.5 \times \text{DTS bandwidth}]$ .
6. Sweep time=Auto couple.
7. Detector function=Peak.
8. Trace Mode=Max hold.
9. When the measurement bandwidth of Maximum PSD is specified in 3 kHz, add a constant factor  $10 \times \log(3\text{kHz}/20\text{kHz}) = -8.239 \text{ dB}$  to the measured result.
10. Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.
11. The indicated level is the peak output power, after any corrections for external attenuators and cables.

☒ For Average power spectral density test:

1. The testing follows the ANSI C63.10 Section 11.10.5 Method AVPSD.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
3. Set Span to at least 1.5 times the OBW.
4. Set RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
5. Set  $\text{VBW} \geq [3 \times \text{RBW}]$ .
6. Sweep Time=Auto couple.
7. Detector function=RMS (i.e., power averaging).
8. Trace average at least 100 traces in power averaging (rms) mode.
9. When the measurement bandwidth of Maximum PSD is specified in 3 kHz, add a constant factor  $10 \times \log(3\text{kHz}/20\text{kHz}) = -8.239 \text{ dB}$  to the measured result.
10. Determine according to the duty cycle of the equipment: when it is less than 98%, follow the steps below.
11. Add  $[10 \log (1 / D)]$ , where D is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the ON and OFF times of the transmission). For example, add  $[10 \log (1/0.25)] = 6 \text{ dB}$  if the duty cycle is 25%.
12. Record the test results in the report.

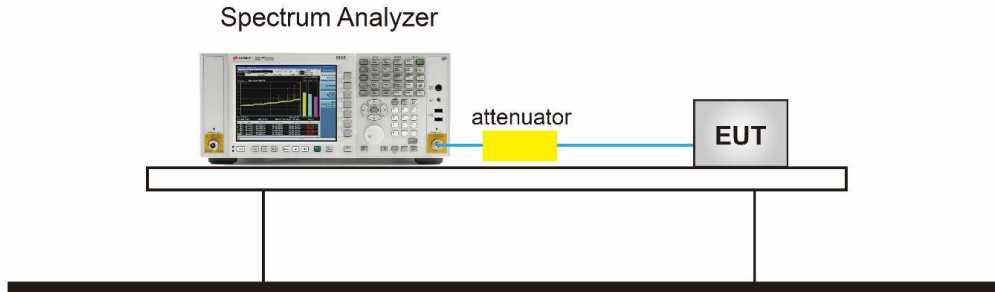
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### 9.3 Measurement Setup (Block Diagram of Configuration)



### 9.4 Measurement Result

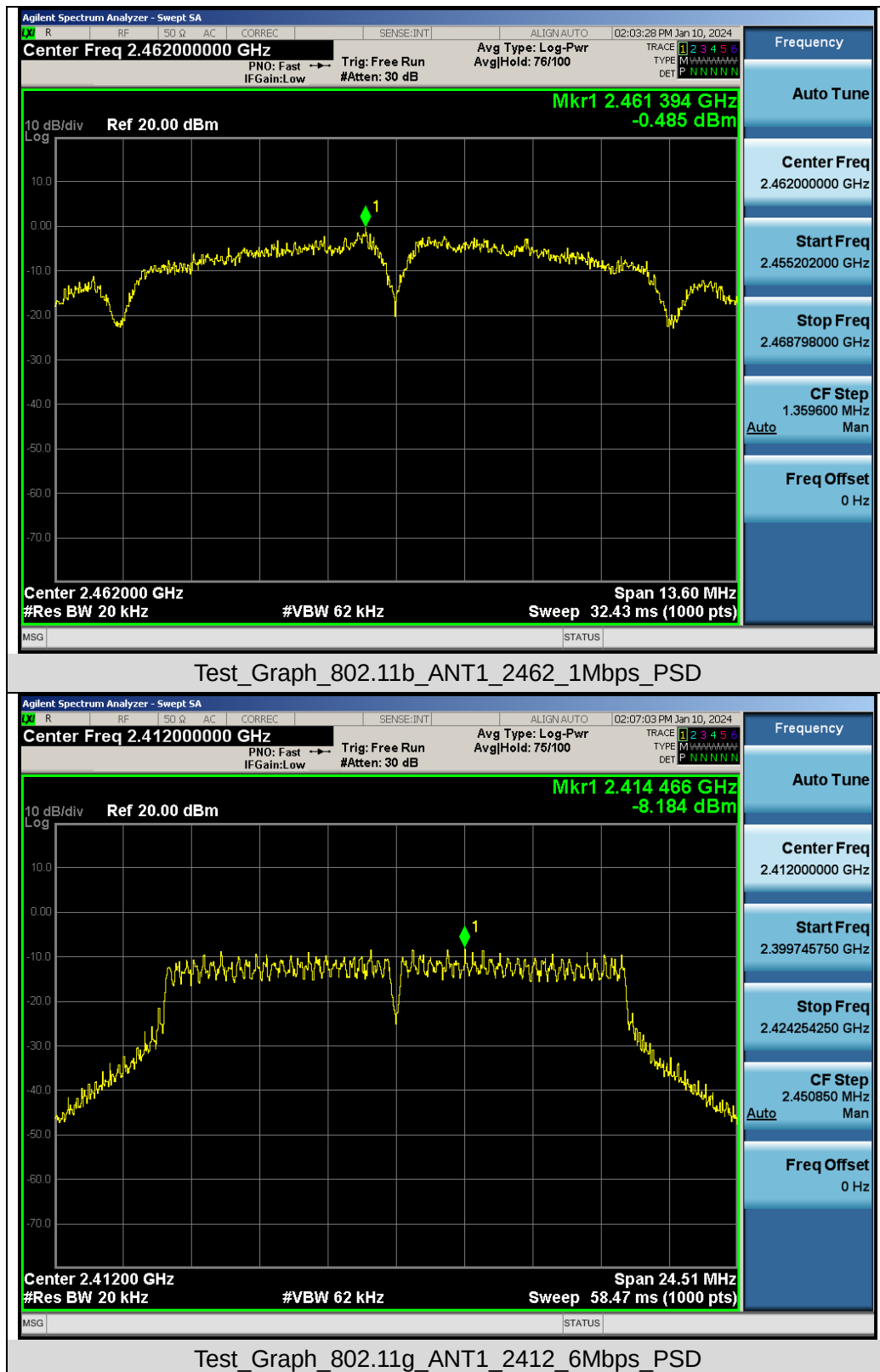
| Test Data of Conducted Output Power Spectral Density |                      |                                    |                                   |                  |              |
|------------------------------------------------------|----------------------|------------------------------------|-----------------------------------|------------------|--------------|
| Test Mode                                            | Test Frequency (MHz) | Power Spectral density (dBm/20kHz) | Power Spectral density (dBm/3kHz) | Limit (dBm/3kHz) | Pass or Fail |
| 802.11b                                              | 2412                 | -1.293                             | -9.532                            | $\leq 8$         | Pass         |
|                                                      | 2437                 | -0.817                             | -9.056                            | $\leq 8$         | Pass         |
|                                                      | 2462                 | -0.485                             | -8.724                            | $\leq 8$         | Pass         |
| 802.11g                                              | 2412                 | -8.184                             | -16.423                           | $\leq 8$         | Pass         |
|                                                      | 2437                 | -7.844                             | -16.083                           | $\leq 8$         | Pass         |
|                                                      | 2462                 | -7.559                             | -15.798                           | $\leq 8$         | Pass         |
| 802.11n20                                            | 2412                 | -8.113                             | -16.352                           | $\leq 8$         | Pass         |
|                                                      | 2437                 | -8.223                             | -16.462                           | $\leq 8$         | Pass         |
|                                                      | 2462                 | -8.031                             | -16.27                            | $\leq 8$         | Pass         |

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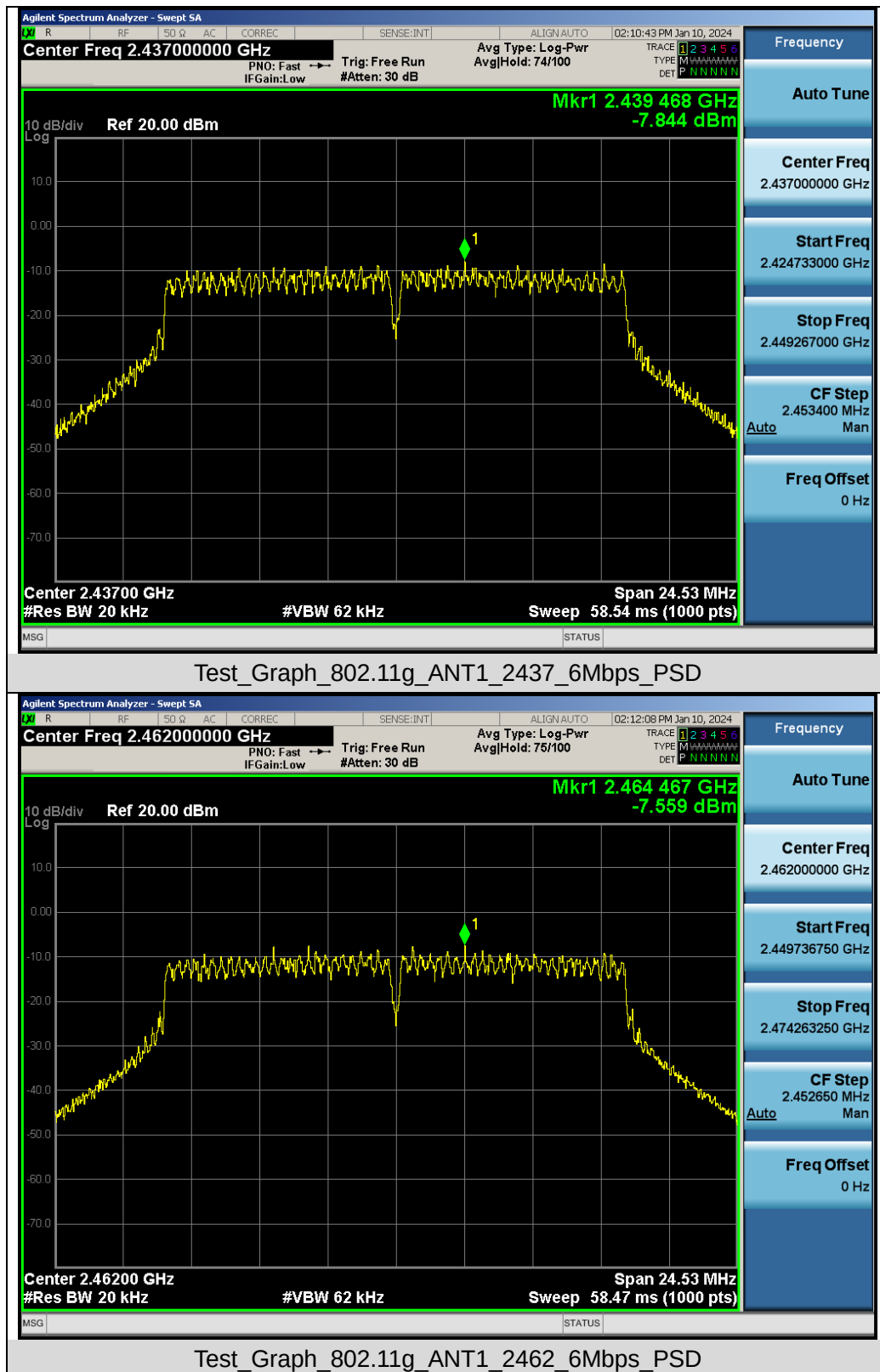
### Test Graphs of Conducted Output Power Spectral Density



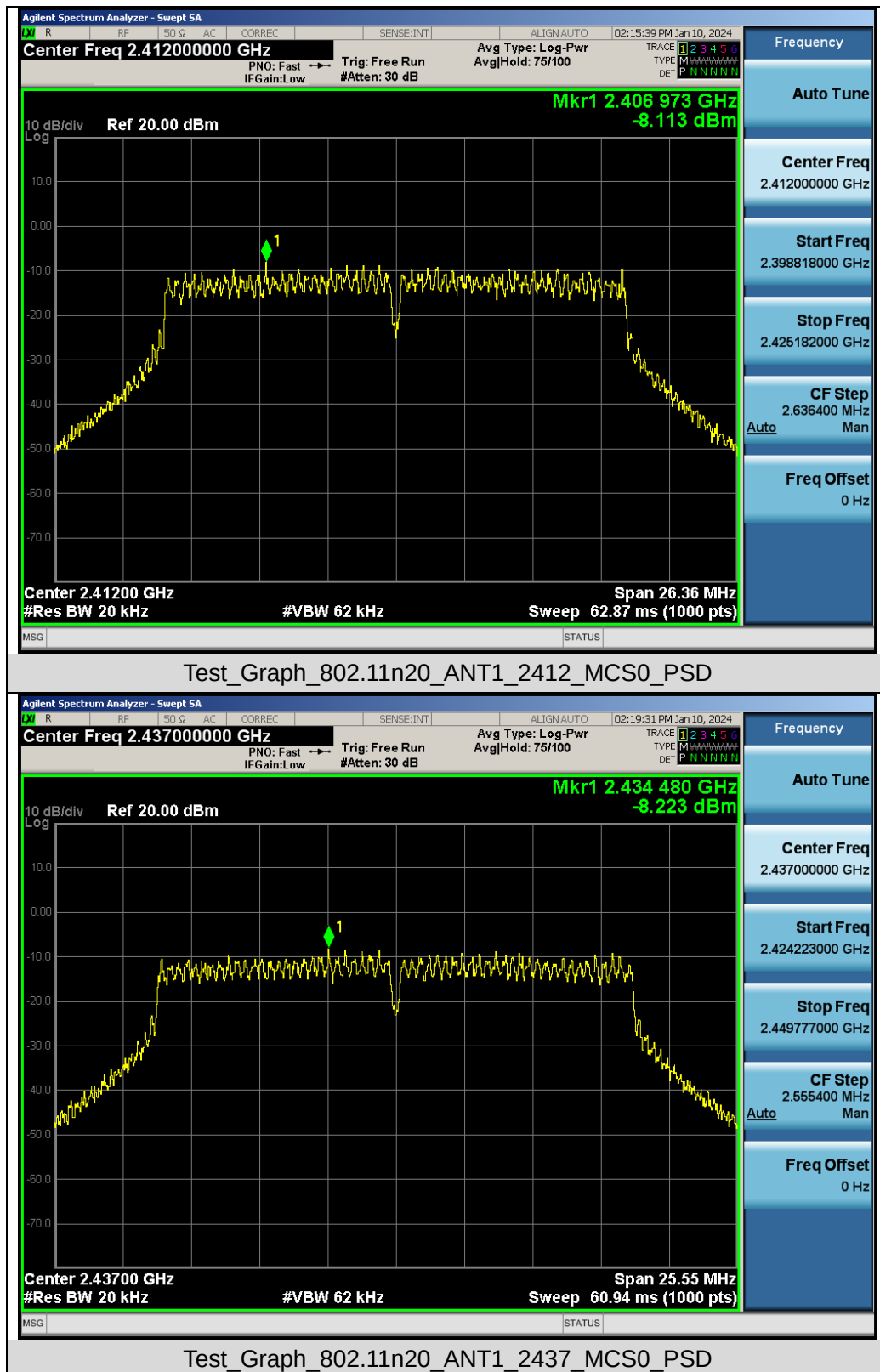
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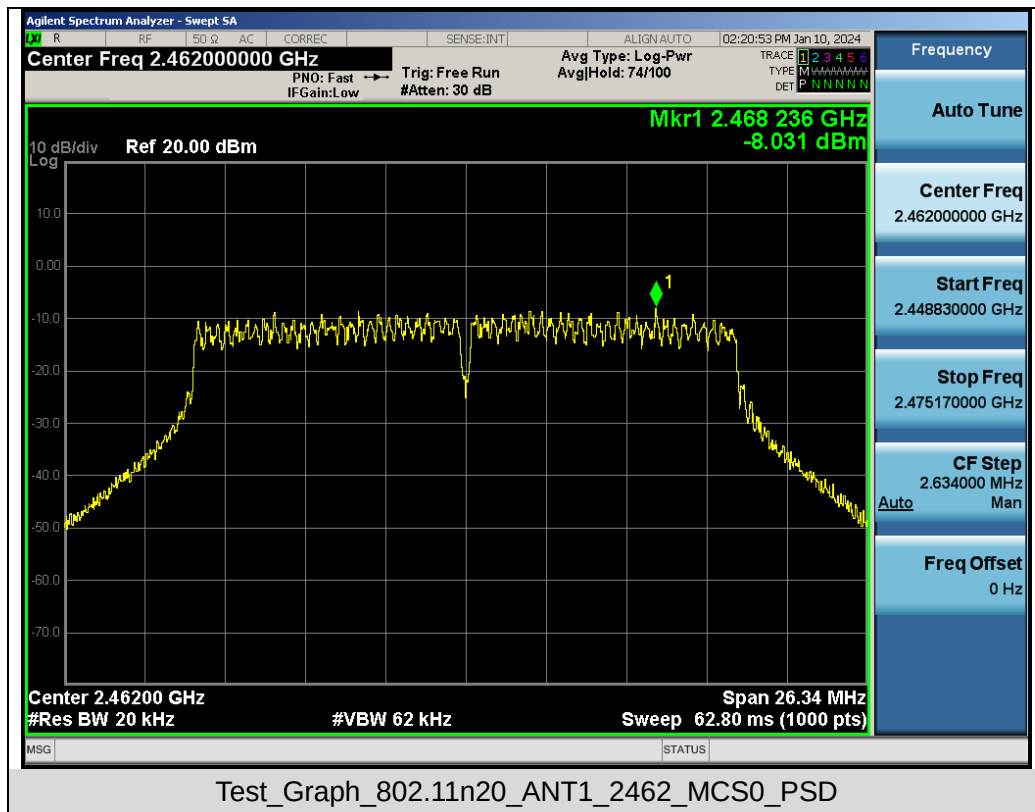
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## 10. Conducted Band Edge and Out-of-Band Emissions

### 10.1 Provisions Applicable

In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

### 10.2 Measurement Procedure

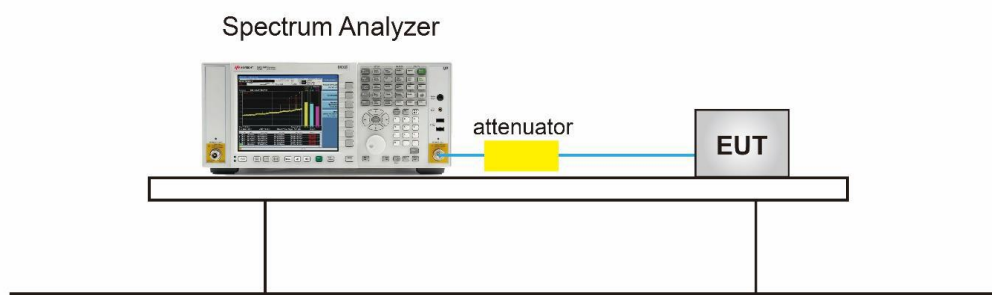
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Use the following spectrum analyzer settings:

- Step 1: Measurement Procedure In-Band Reference Level
  1. Set instrument center frequency to DTS channel center frequency.
  2. Set the span to  $\geq 1.5$  times the DTS bandwidth.
  3. Set the RBW = 100 kHz.
  4. Set the VBW  $\geq 3 \times$  RBW.
  5. Detector = peak.
  6. Sweep time = auto couple.
  7. Trace mode = max hold.
  8. Allow trace to fully stabilize.
  9. Use the peak marker function to determine the maximum PSD level.
  10. Note that the channel found to contain the maximum PSD level can be used to establish the reference level.
- Step 2: Measurement Procedure Out of Band Emission
  1. Set RBW = 100 kHz.
  2. Set VBW  $\geq 300$  kHz.
  3. Detector = peak.
  4. Sweep = auto couple.
  5. Trace Mode = max hold.
  6. Allow trace to fully stabilize.
  7. Use the peak marker function to determine the maximum amplitude level.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

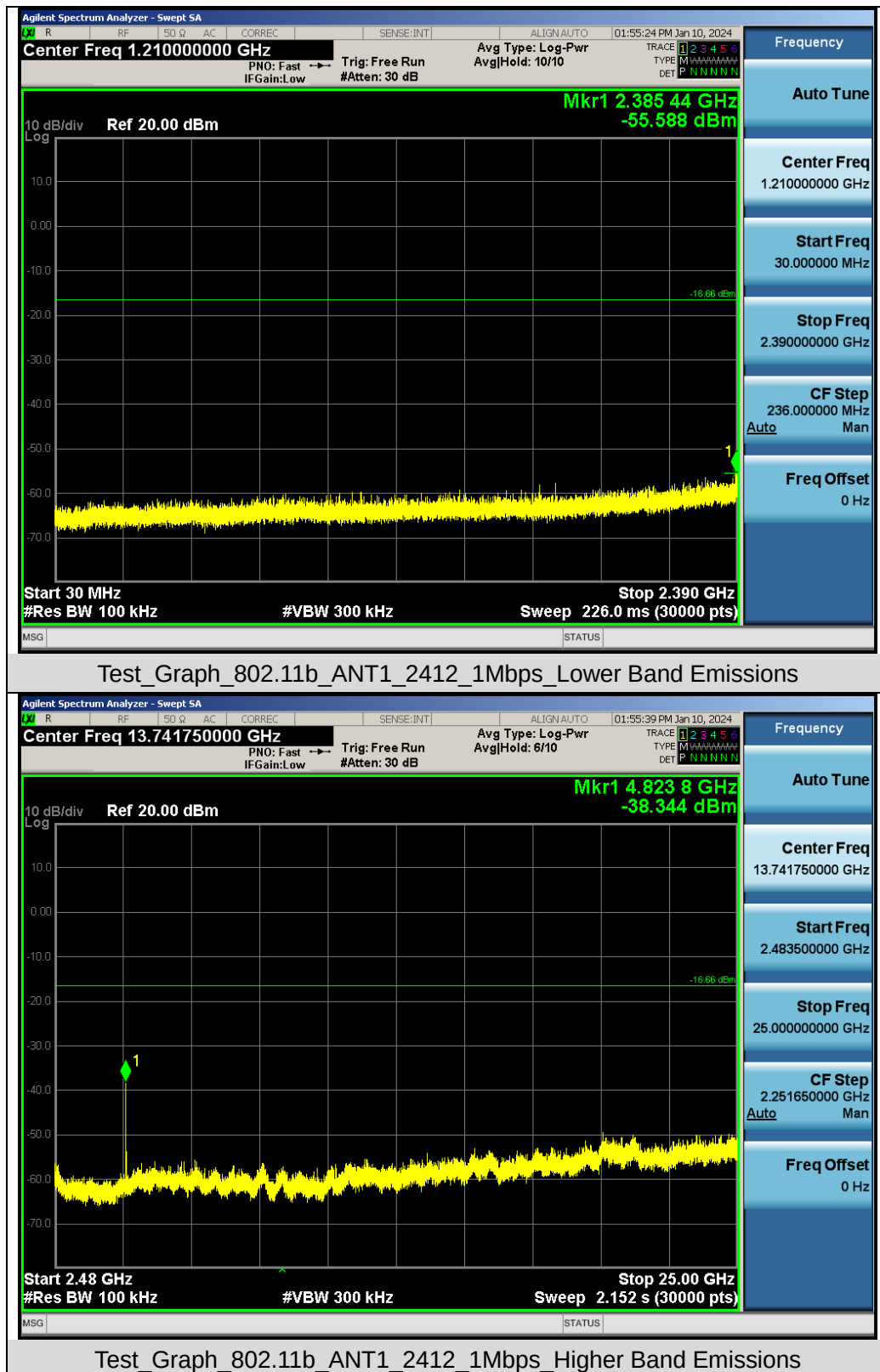
### 10.3 Measurement Setup (Block Diagram of Configuration)



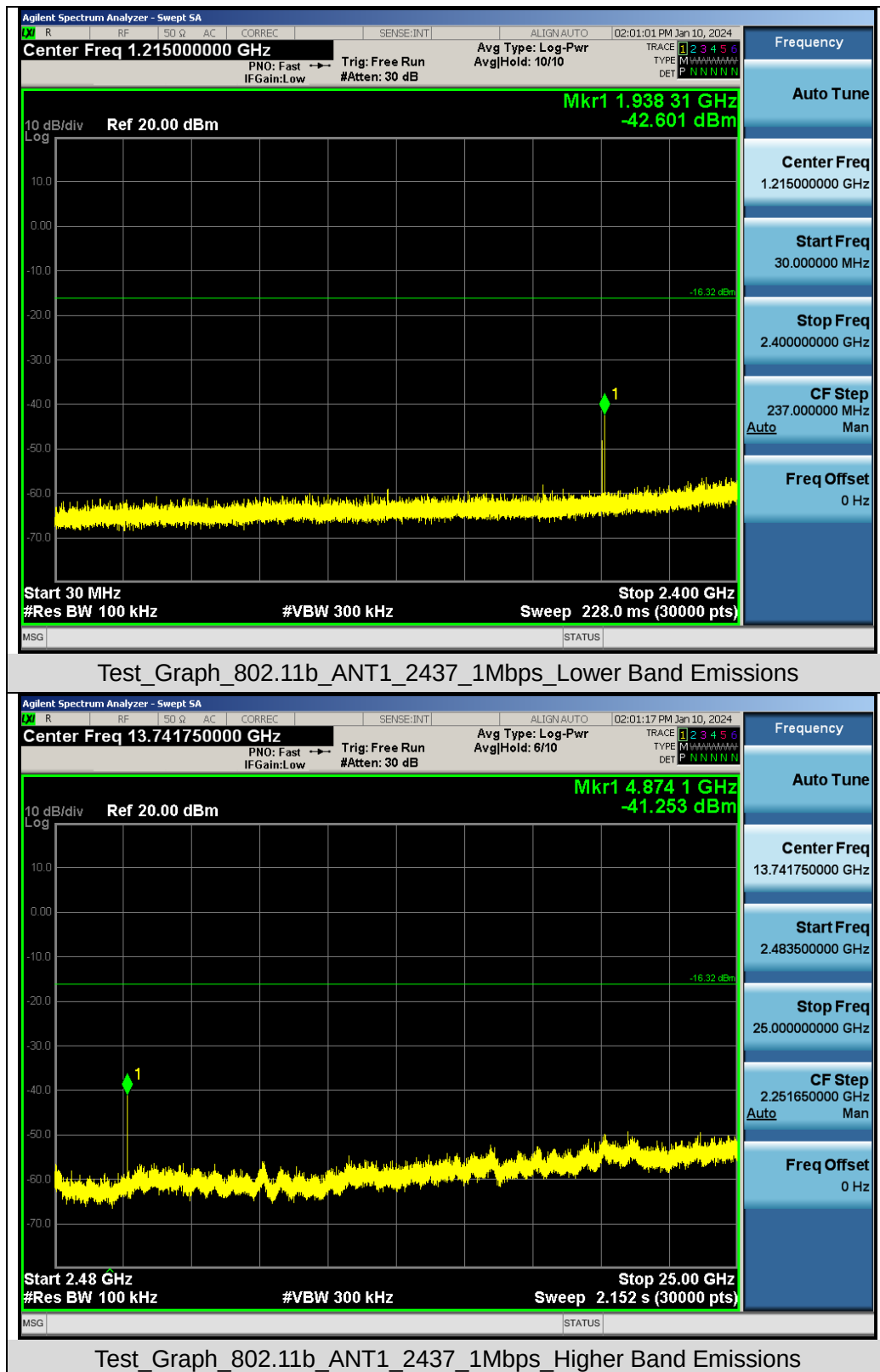
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## 10.4 Measurement Result

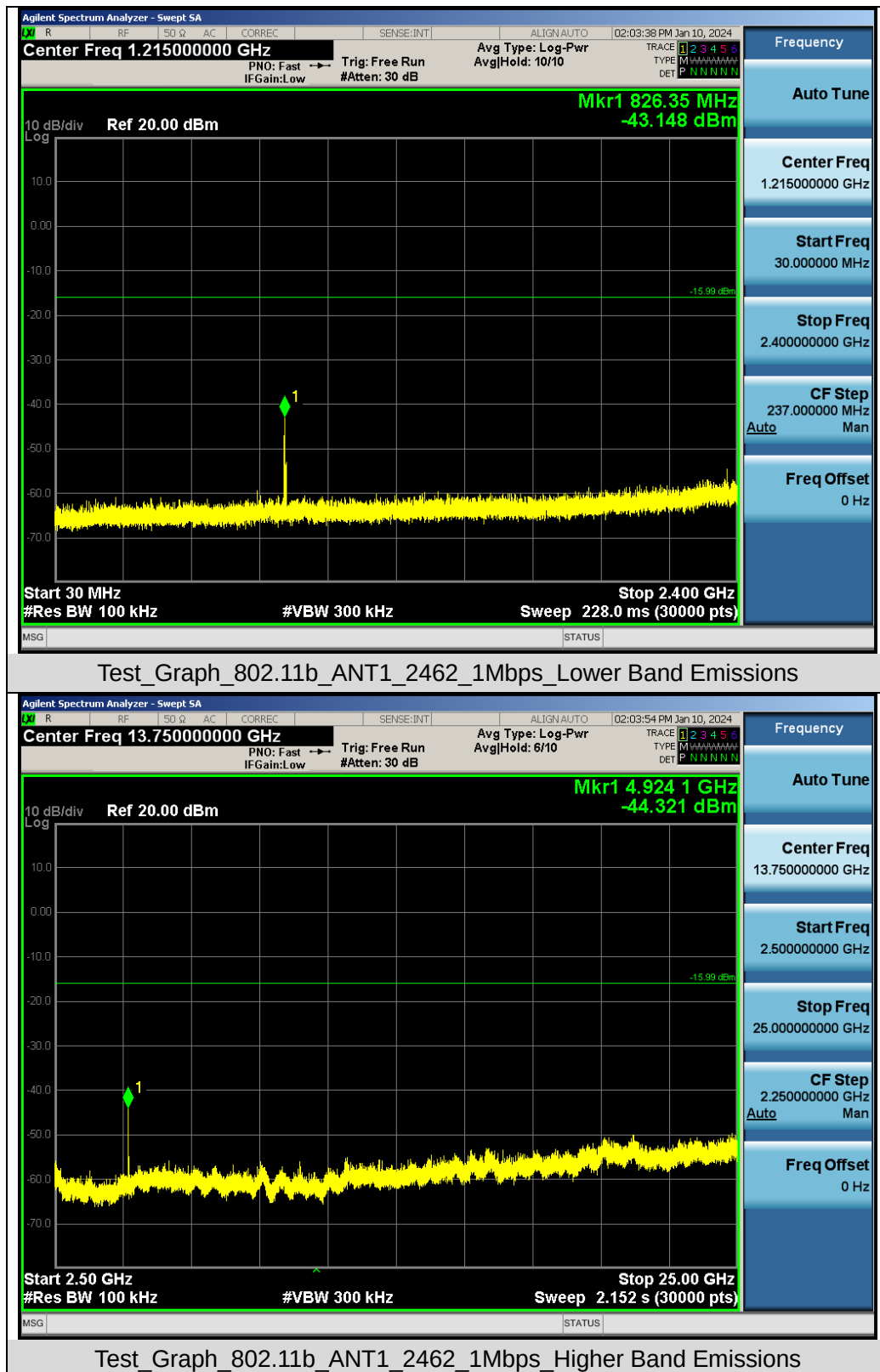
### Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands



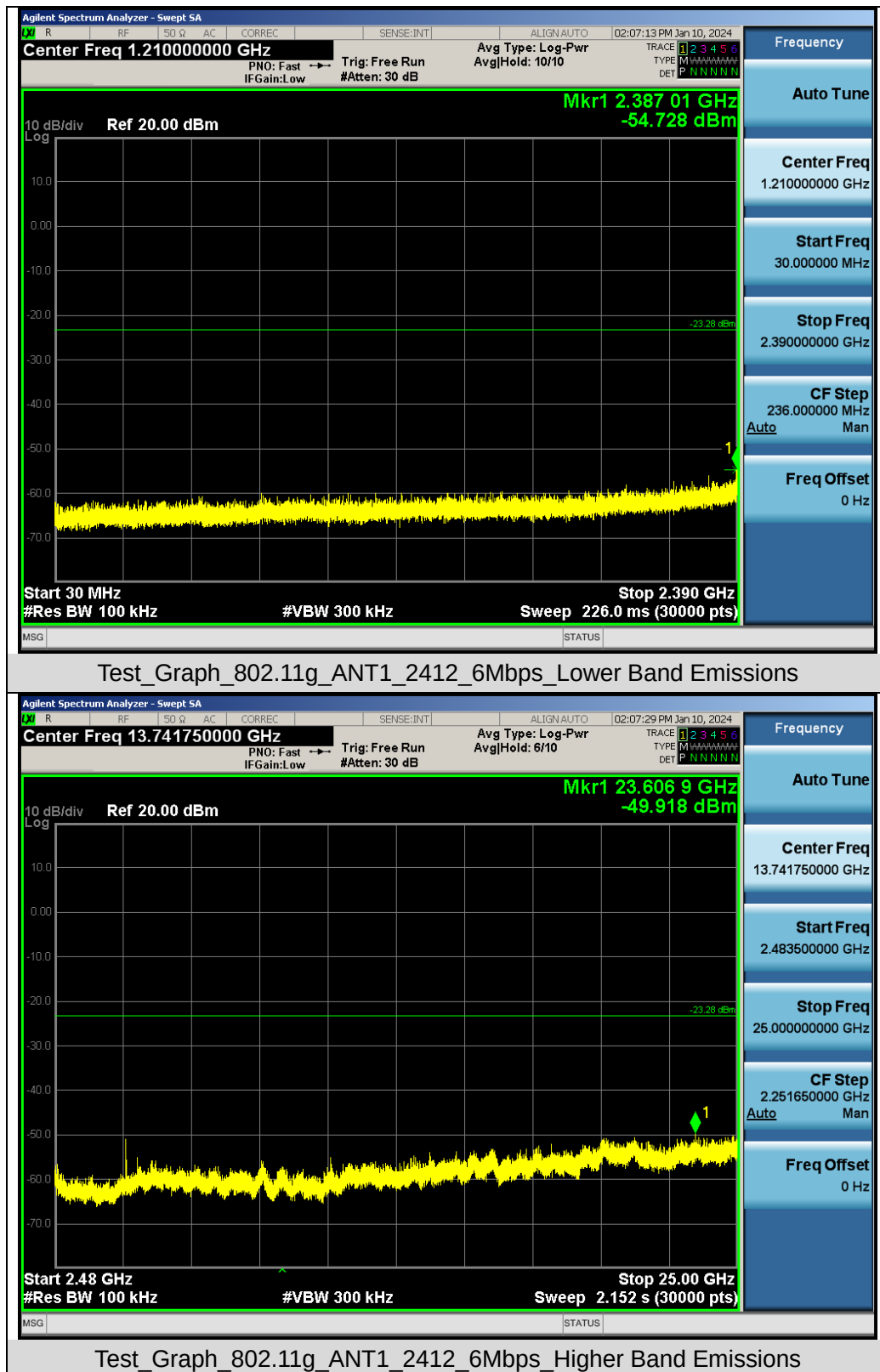
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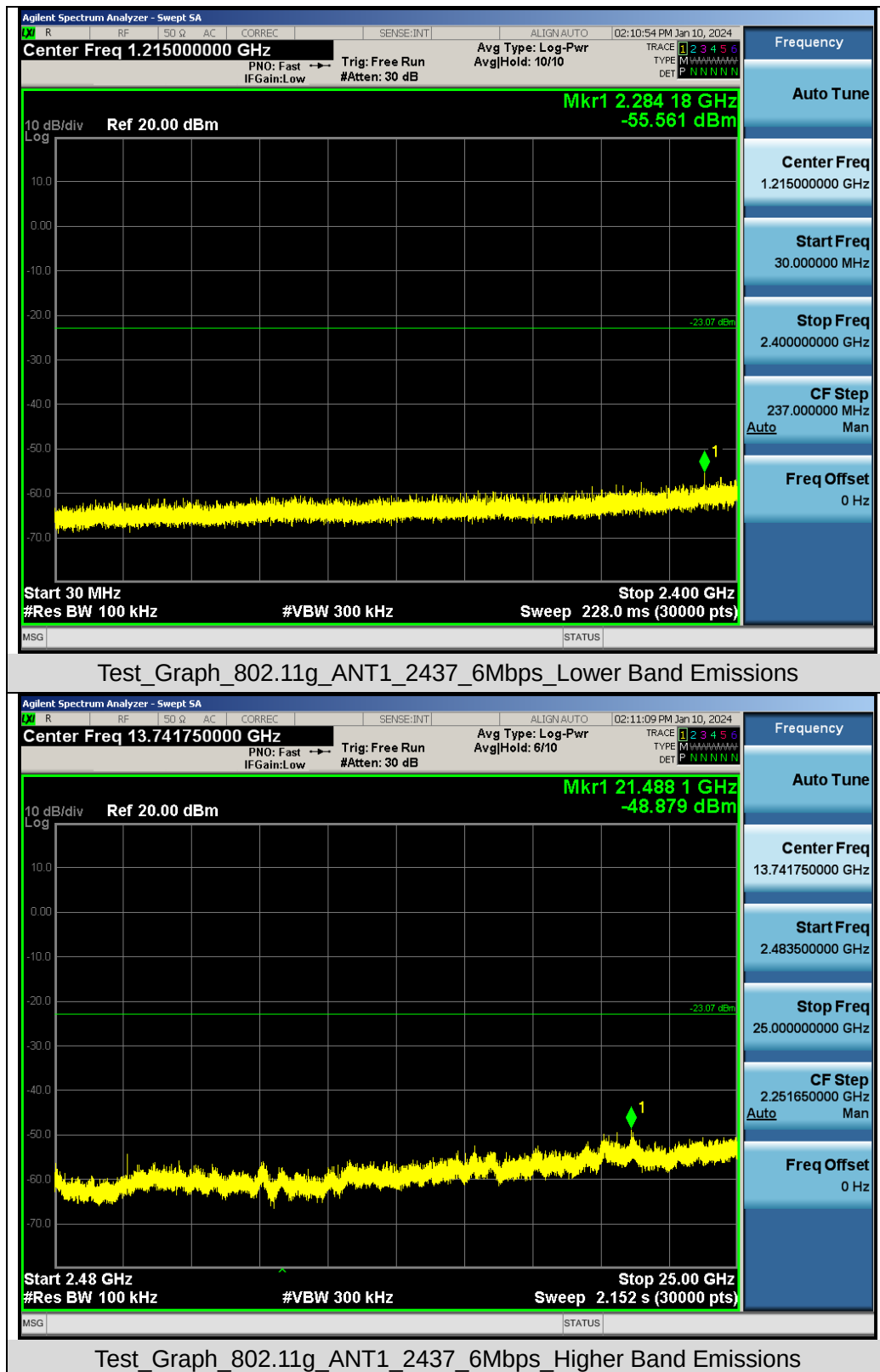
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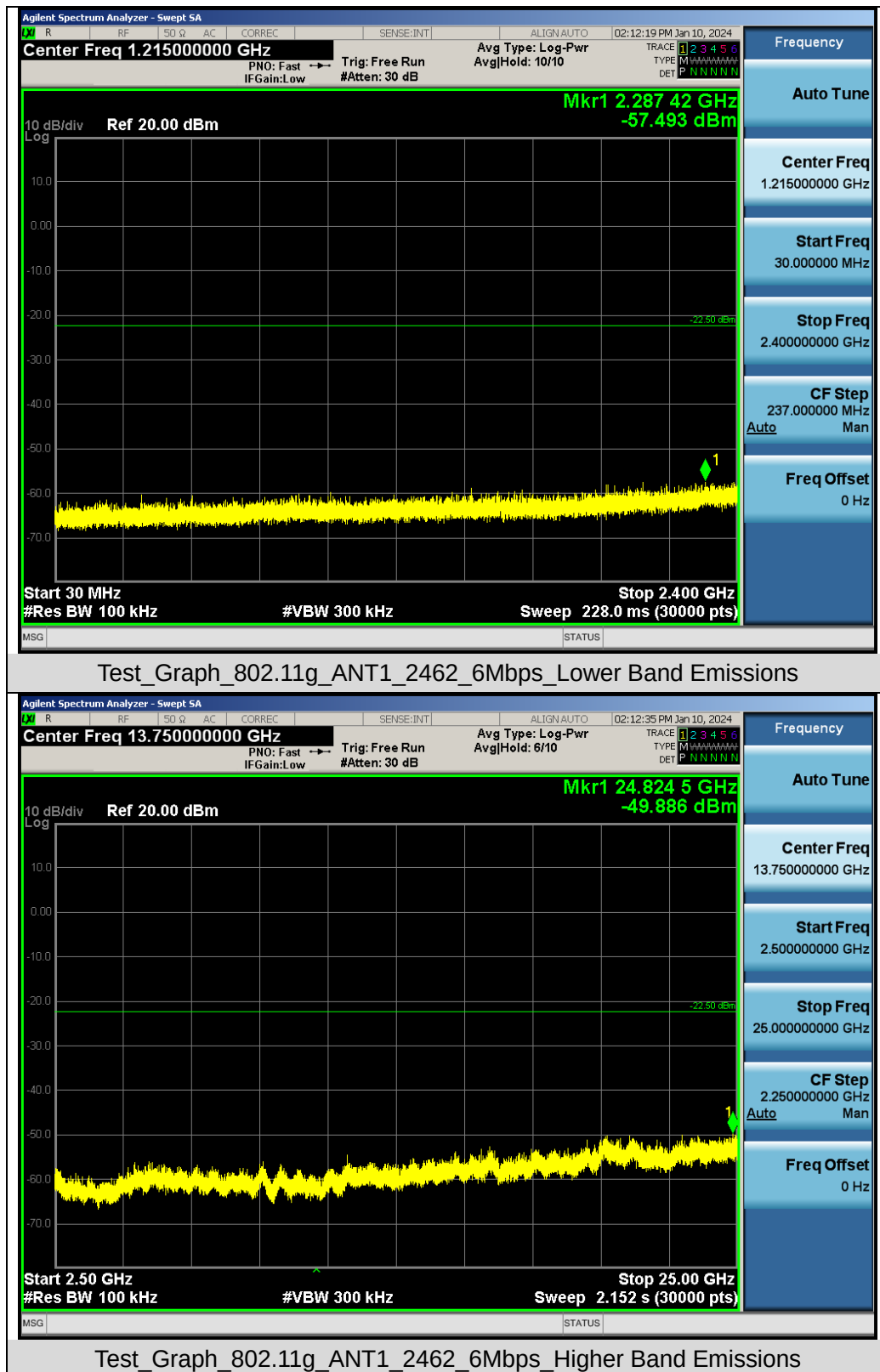
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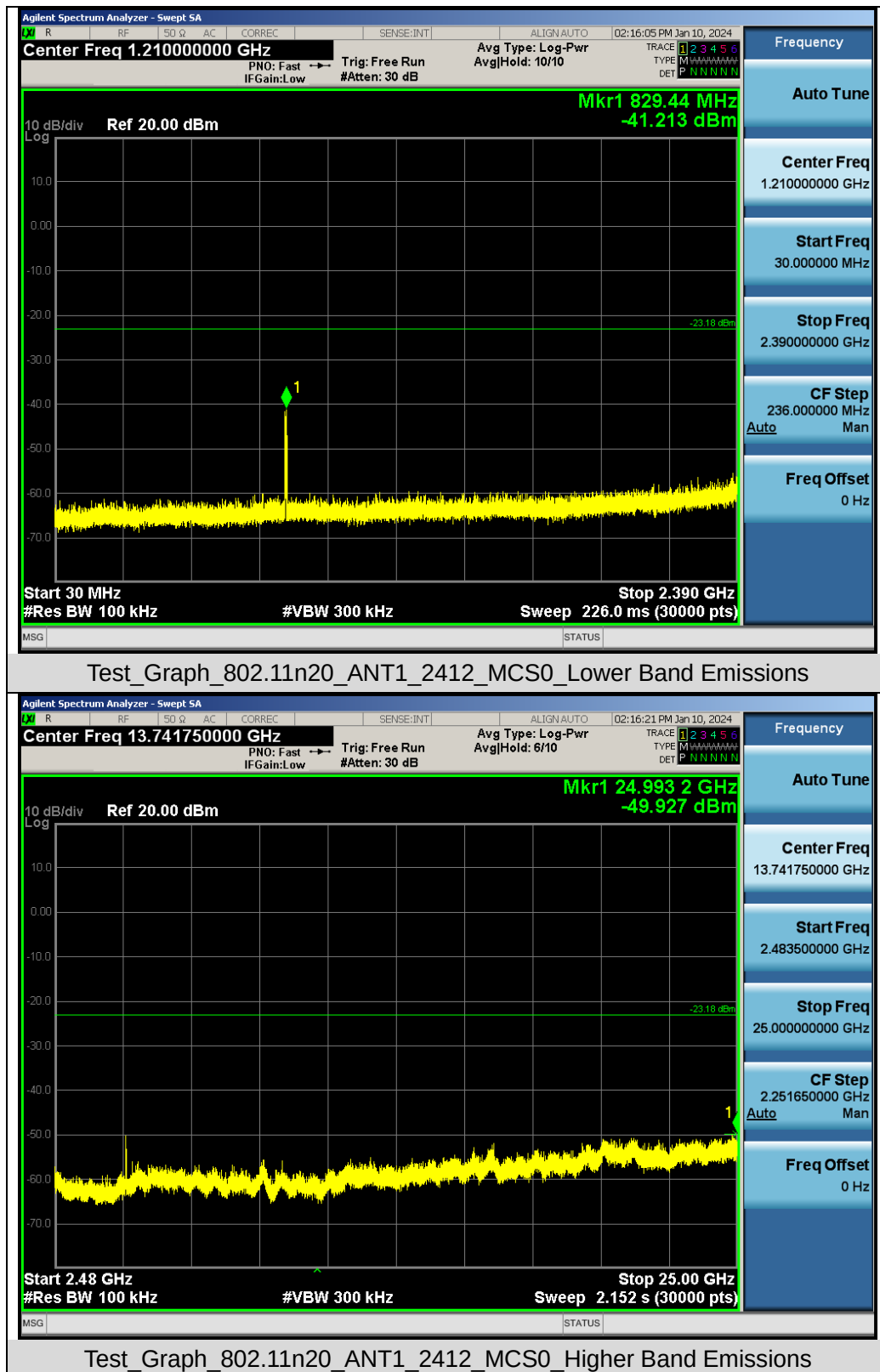


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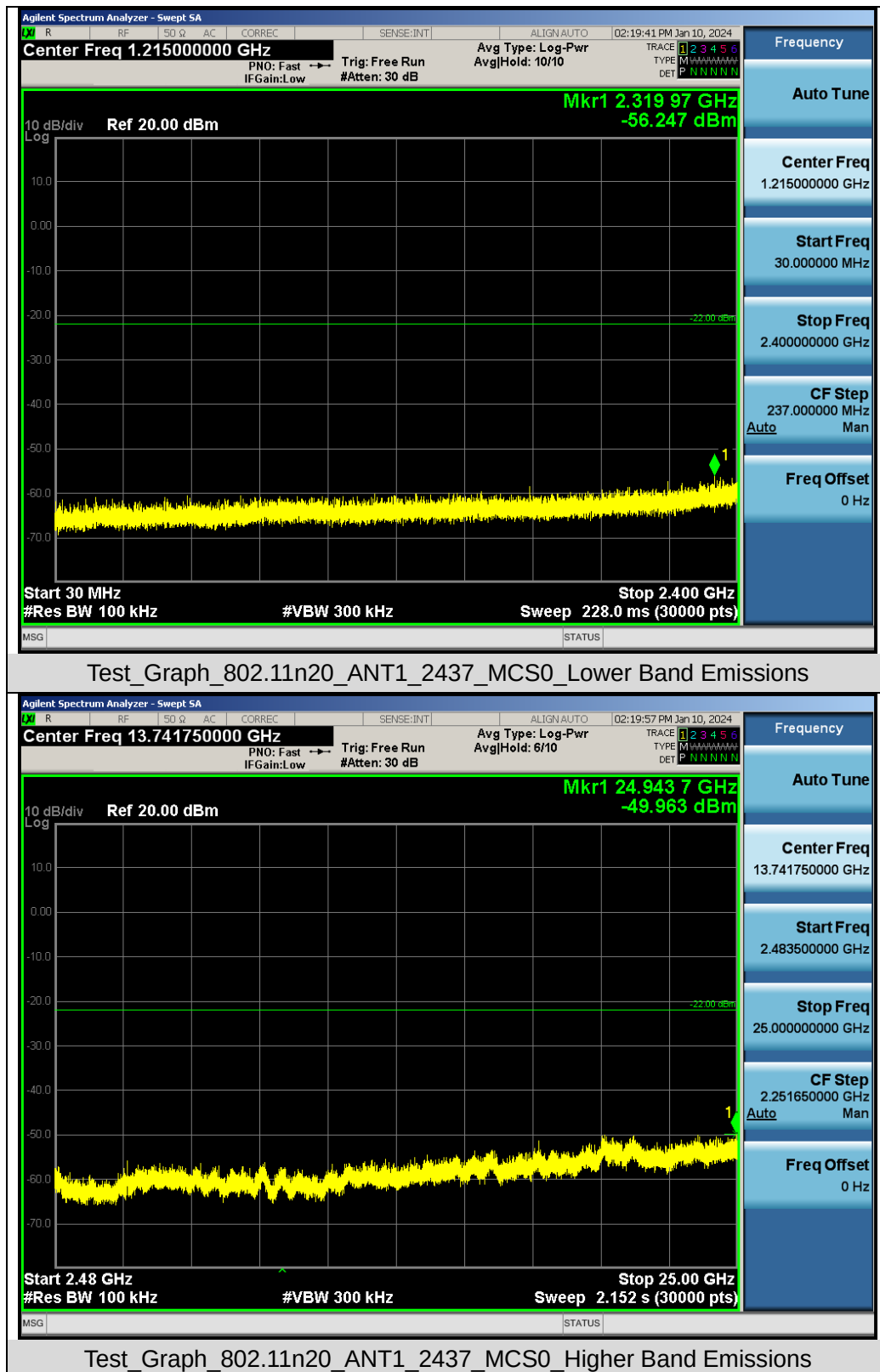
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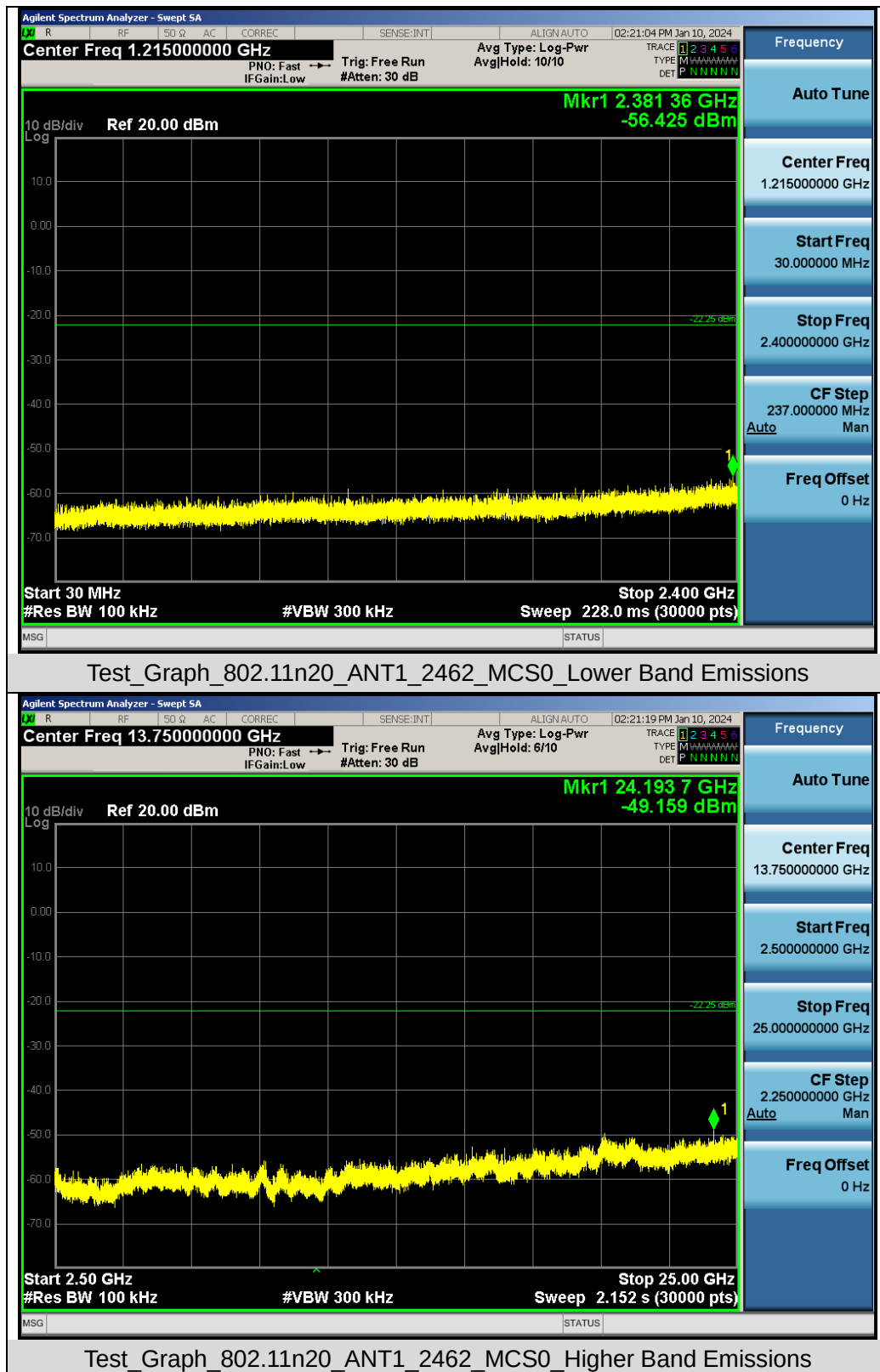


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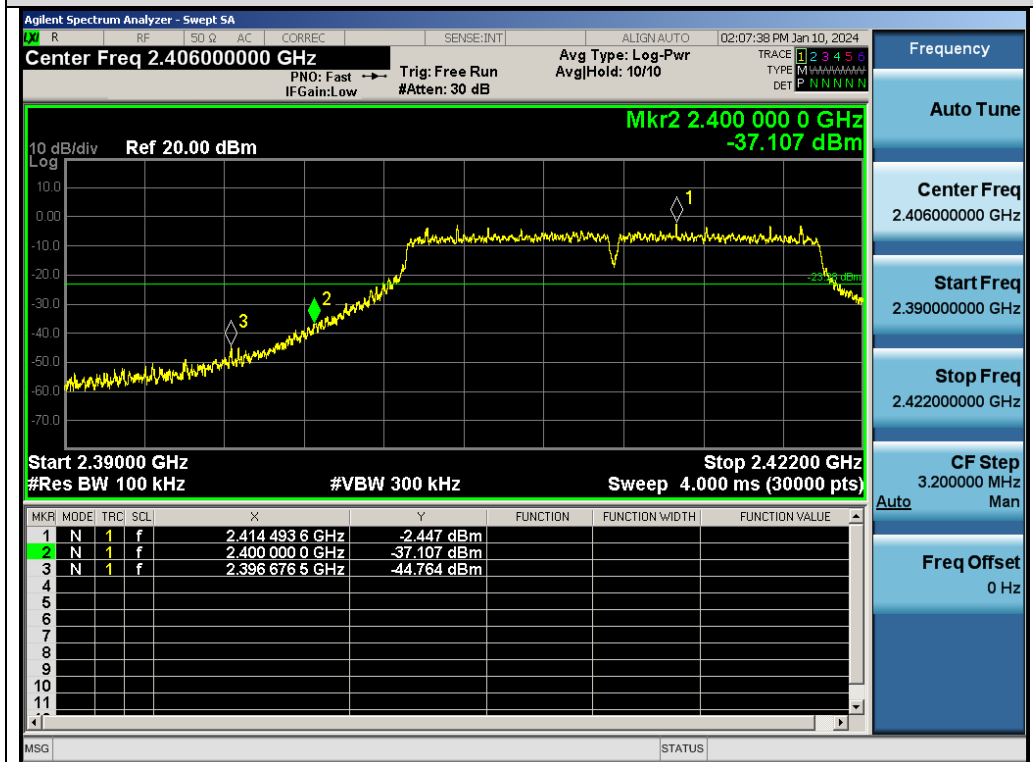


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### Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands

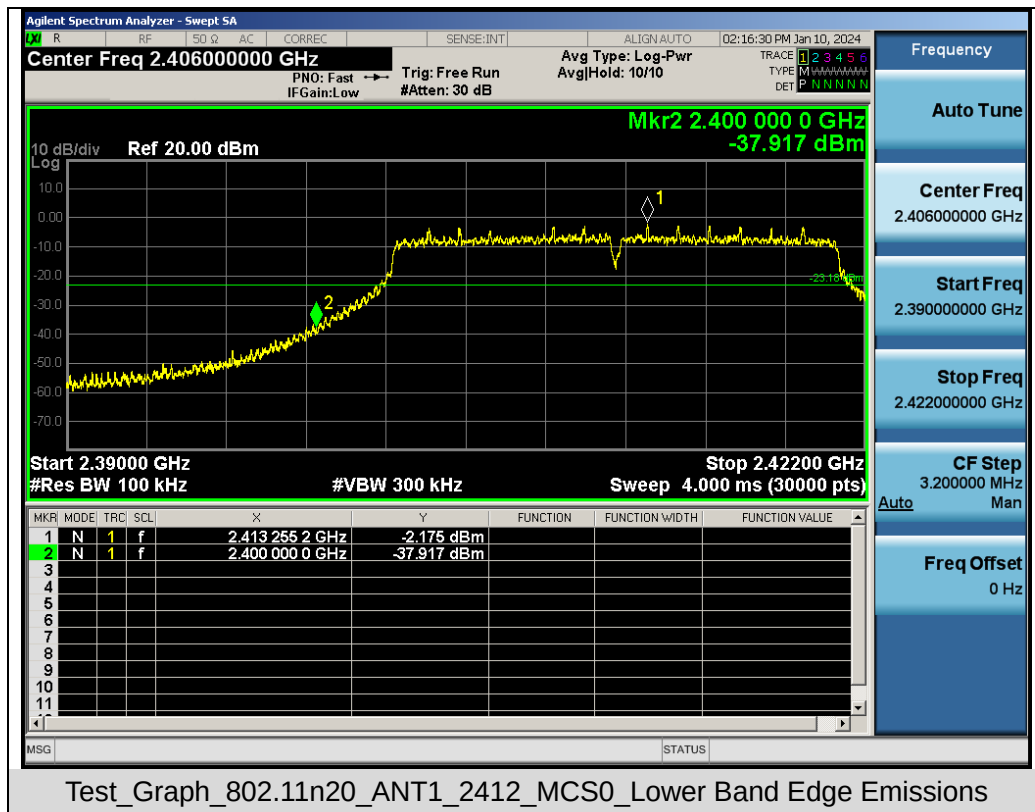


Test\_Graph\_802.11b\_ANT1\_2412\_1Mbps\_Lower Band Edge Emissions



Test\_Graph\_802.11g\_ANT1\_2412\_6Mbps\_Lower Band Edge Emissions

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Note: Emissions from 2483.5-2500MHz which fall in the restricted bands had been considered with the radiated emission limits specified.

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## 11. Radiated Spurious Emission

### 11.1 Measurement Limits

15.209(a) Limit in the below table has to be followed

| Frequencies<br>(MHz) | Field Strength<br>(microvolts/meter) | Measurement Distance<br>(meters) |
|----------------------|--------------------------------------|----------------------------------|
| 0.009~0.490          | 2400/F(kHz)                          | 300                              |
| 0.490~1.705          | 24000/F(kHz)                         | 30                               |
| 1.705~30.0           | 30                                   | 30                               |
| 30~88                | 100                                  | 3                                |
| 88~216               | 150                                  | 3                                |
| 216~960              | 200                                  | 3                                |
| Above 960            | 500                                  | 3                                |

Note: All modes were tested for restricted band radiated emission, the test records reported below are the worst result compared to other modes.

### 11.2 Measurement Procedure

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the

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pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.

8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

◆ The following table is the setting of spectrum analyzer and receiver.

| Spectrum Parameter    | Setting                                                   |
|-----------------------|-----------------------------------------------------------|
| Start ~Stop Frequency | 9KHz~150KHz/RB 200Hz for QP                               |
| Start ~Stop Frequency | 150KHz~30MHz/RB 9KHz for QP                               |
| Start ~Stop Frequency | 30MHz~1000MHz/RB 120KHz for QP                            |
| Start ~Stop Frequency | 1GHz~26.5GHz<br>1MHz/3MHz for Peak, 1MHz/3MHz for Average |

| Receiver Parameter    | Setting                        |
|-----------------------|--------------------------------|
| Start ~Stop Frequency | 9KHz~150KHz/RB 200Hz for QP    |
| Start ~Stop Frequency | 150KHz~30MHz/RB 9KHz for QP    |
| Start ~Stop Frequency | 30MHz~1000MHz/RB 120KHz for QP |

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- **Quasi-Peak Measurements below 1GHz**

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as shown in the table above
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

- **Peak Measurements above 1GHz**

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

- **Average Measurements above 1GHz (Method VB)**

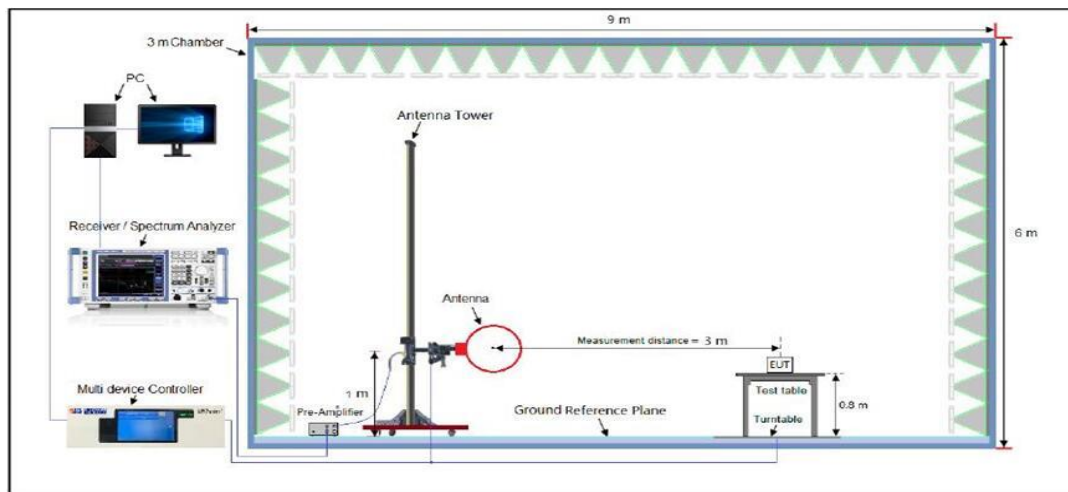
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW setting requirements are as follows:
4. If the EUT is configured to transmit with duty cycle  $\geq 98\%$ , set VBW = 10 Hz.
5. If the EUT duty cycle is  $< 98\%$ , set VBW  $\geq 1/T$ . T is the minimum transmission duration.
6. Detector = Peak
7. Sweep time = auto
8. Trace mode = max hold

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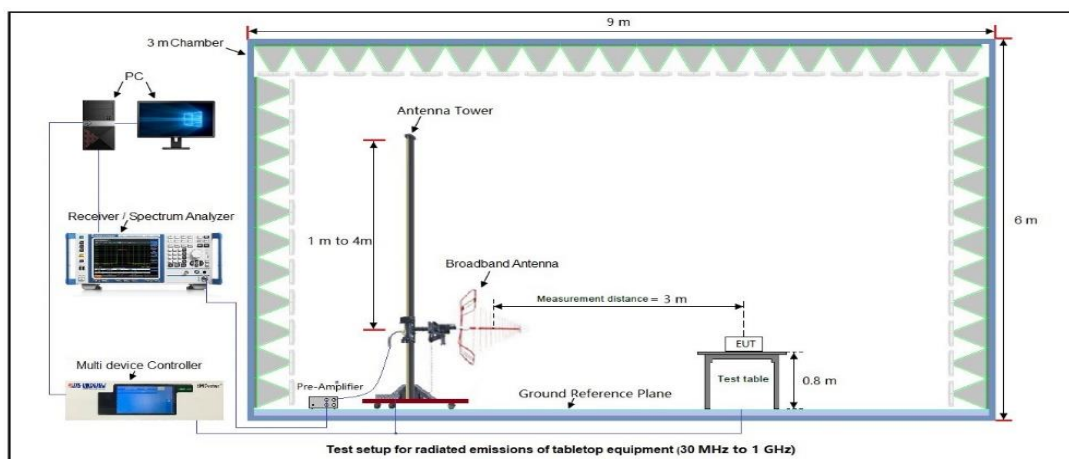


### 11.3 Measurement Setup (Block Diagram of Configuration)

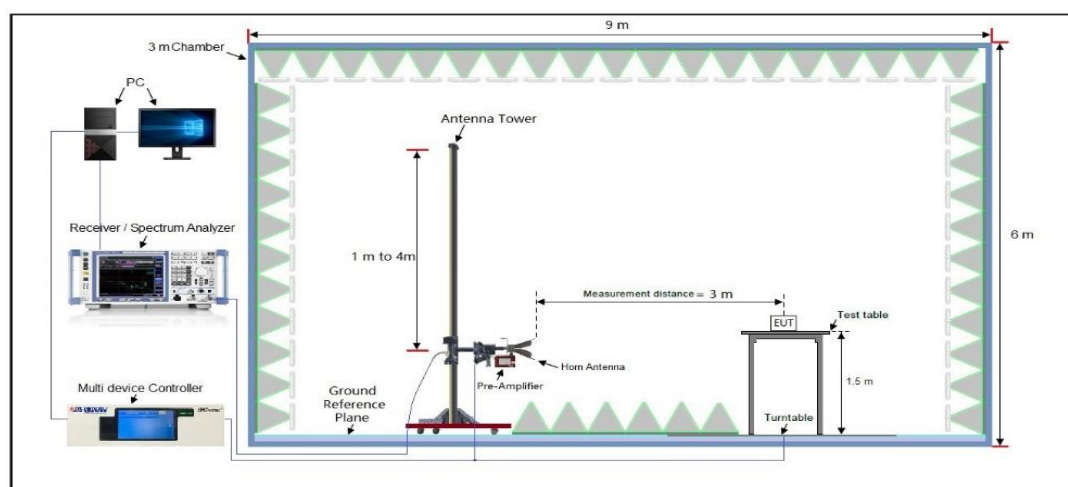
Radiated Emission Test Setup 9kHz-30MHz



Radiated Emission Test Setup 30MHz-1000MHz



Radiated Emission Test Setup Above 1000MHz



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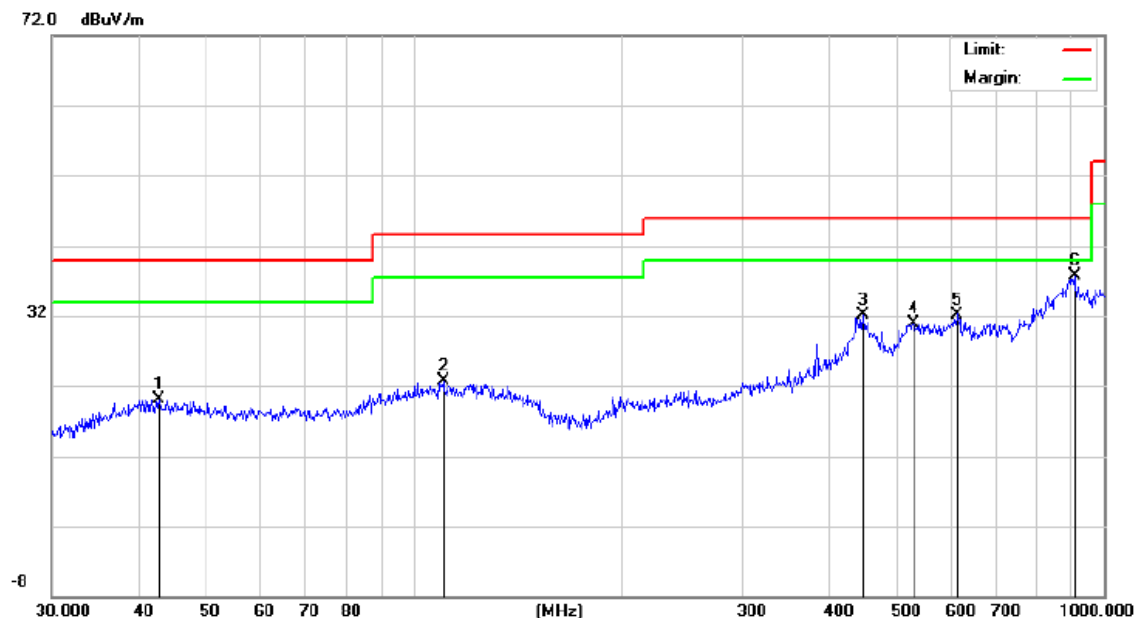
## 11.4 Measurement Result

### Radiated Emission at 9kHz-30MHz

The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.

**Radiated Emission Test Results at 30MHz-1GHz**

|                    |                        |                          |            |
|--------------------|------------------------|--------------------------|------------|
| <b>EUT Name</b>    | Smart Wi-Fi BLE Module | <b>Model Name</b>        | MR3EB      |
| <b>Temperature</b> | 22.7°C                 | <b>Relative Humidity</b> | 60.2%      |
| <b>Pressure</b>    | 960hPa                 | <b>Test Voltage</b>      | DC 3.3V    |
| <b>Test Mode</b>   | Mode 3                 | <b>Antenna Polarity</b>  | Horizontal |

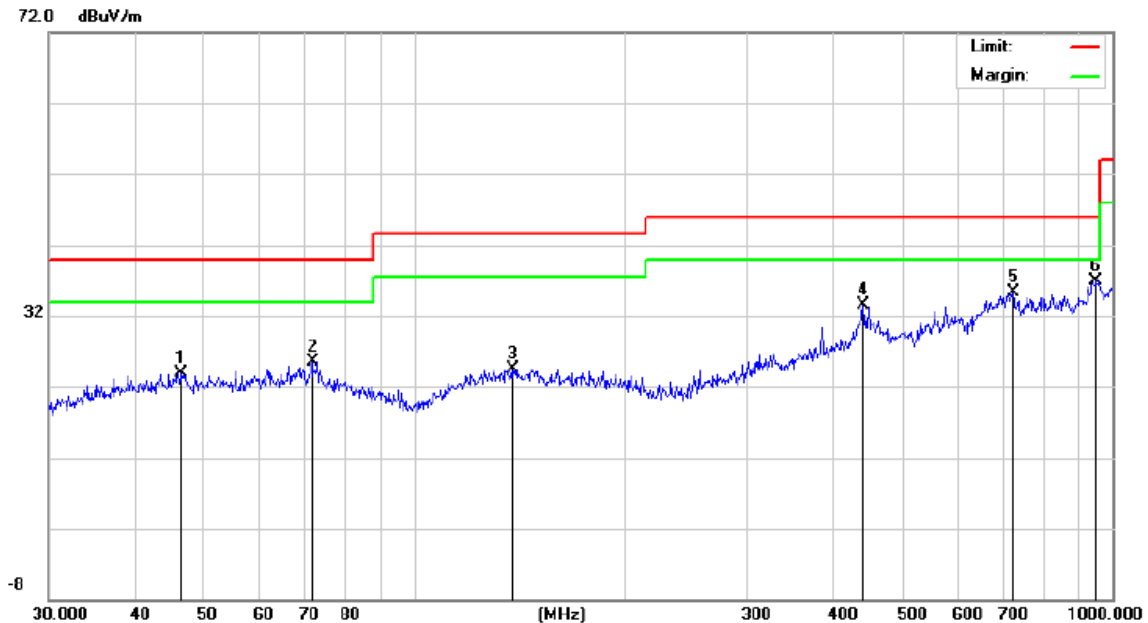


| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dB/m | Over<br>dB | Detector |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|---------------|------------|----------|
| 1   |     | 42.8998      | 6.37                     | 13.70                   | 20.07                      | 40.00         | -19.93     | peak     |
| 2   |     | 110.5687     | 6.31                     | 16.31                   | 22.62                      | 43.50         | -20.88     | peak     |
| 3   |     | 447.9822     | 7.28                     | 24.82                   | 32.10                      | 46.00         | -13.90     | peak     |
| 4   |     | 530.1014     | 6.43                     | 24.54                   | 30.97                      | 46.00         | -15.03     | peak     |
| 5   |     | 614.2142     | 7.03                     | 25.17                   | 32.20                      | 46.00         | -13.80     | peak     |
| 6   | *   | 906.4824     | 6.85                     | 30.89                   | 37.74                      | 46.00         | -8.26      | peak     |

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### Radiated Emission Test Results at 30MHz-1GHz

|                    |                        |                          |          |
|--------------------|------------------------|--------------------------|----------|
| <b>EUT Name</b>    | Smart Wi-Fi BLE Module | <b>Model Name</b>        | MR3EB    |
| <b>Temperature</b> | 22.7°C                 | <b>Relative Humidity</b> | 60.2%    |
| <b>Pressure</b>    | 960hPa                 | <b>Test Voltage</b>      | DC 3.3V  |
| <b>Test Mode</b>   | Mode 3                 | <b>Antenna Polarity</b>  | Vertical |



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dB/m | Over<br>dB | Detector |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|---------------|------------|----------|
| 1   |     | 46.5030      | 6.90                     | 16.96                   | 23.86                      | 40.00         | -16.14     | peak     |
| 2   |     | 71.5806      | 8.52                     | 16.98                   | 25.50                      | 40.00         | -14.50     | peak     |
| 3   |     | 138.3873     | 6.28                     | 18.16                   | 24.44                      | 43.50         | -19.06     | peak     |
| 4   |     | 440.1963     | 7.39                     | 26.09                   | 33.48                      | 46.00         | -12.52     | peak     |
| 5   |     | 721.7259     | 6.61                     | 28.64                   | 35.25                      | 46.00         | -10.75     | peak     |
| 6   | *   | 948.7609     | 6.28                     | 30.65                   | 36.93                      | 46.00         | -9.07      | peak     |

### RESULT: Pass

**Note:** 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. All test modes had been pre-tested. The mode 3 is the worst case and recorded in the report.

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### Radiated Emissions Test Results above 1 GHz

|                    |                        |                          |            |
|--------------------|------------------------|--------------------------|------------|
| <b>EUT Name</b>    | Smart Wi-Fi BLE Module | <b>Model Name</b>        | MR3EB      |
| <b>Temperature</b> | 22.7℃                  | <b>Relative Humidity</b> | 60.2%      |
| <b>Pressure</b>    | 960hPa                 | <b>Test Voltage</b>      | DC 3.3V    |
| <b>Test Mode</b>   | Mode 1                 | <b>Antenna Polarity</b>  | Horizontal |

| Frequency<br>(MHz) | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Value Type |
|--------------------|-------------------------|----------------|----------------------------|--------------------|----------------|------------|
| 4824.000           | 46.53                   | 0.08           | 46.61                      | 74                 | -27.39         | peak       |
| 4824.000           | 37.42                   | 0.08           | 37.5                       | 54                 | -16.5          | AVG        |
| 7236.000           | 41.35                   | 2.21           | 43.56                      | 74                 | -30.44         | peak       |
| 7206.000           | 32.44                   | 2.21           | 34.65                      | 54                 | -19.35         | AVG        |
|                    |                         |                |                            |                    |                |            |
|                    |                         |                |                            |                    |                |            |

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

|                    |                        |                          |          |
|--------------------|------------------------|--------------------------|----------|
| <b>EUT Name</b>    | Smart Wi-Fi BLE Module | <b>Model Name</b>        | MR3EB    |
| <b>Temperature</b> | 22.7℃                  | <b>Relative Humidity</b> | 60.2%    |
| <b>Pressure</b>    | 960hPa                 | <b>Test Voltage</b>      | DC 3.3V  |
| <b>Test Mode</b>   | Mode 1                 | <b>Antenna Polarity</b>  | Vertical |

| Frequency<br>(MHz) | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Value Type |
|--------------------|-------------------------|----------------|----------------------------|--------------------|----------------|------------|
| 4824.000           | 46.25                   | 0.08           | 46.33                      | 74                 | -27.67         | peak       |
| 4824.000           | 37.42                   | 0.08           | 37.5                       | 54                 | -16.5          | AVG        |
| 7236.000           | 41.35                   | 2.21           | 43.56                      | 74                 | -30.44         | peak       |
| 7206.000           | 32.16                   | 2.21           | 34.37                      | 54                 | -19.63         | AVG        |
|                    |                         |                |                            |                    |                |            |
|                    |                         |                |                            |                    |                |            |

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

### RESULT: Pass

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### Radiated Emissions Test Results above 1GHz

|                    |                        |                          |            |
|--------------------|------------------------|--------------------------|------------|
| <b>EUT Name</b>    | Smart Wi-Fi BLE Module | <b>Model Name</b>        | MR3EB      |
| <b>Temperature</b> | 22.7°C                 | <b>Relative Humidity</b> | 60.2%      |
| <b>Pressure</b>    | 960hPa                 | <b>Test Voltage</b>      | DC 3.3V    |
| <b>Test Mode</b>   | Mode 2                 | <b>Antenna Polarity</b>  | Horizontal |

| Frequency<br>(MHz) | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Value Type |
|--------------------|-------------------------|----------------|----------------------------|--------------------|----------------|------------|
| 4874.000           | 45.89                   | 0.14           | 46.03                      | 74                 | -27.97         | peak       |
| 4874.000           | 38.19                   | 0.14           | 38.33                      | 54                 | -15.67         | AVG        |
| 7311.000           | 41.34                   | 2.36           | 43.7                       | 74                 | -30.3          | peak       |
| 7311.000           | 34.25                   | 2.36           | 36.61                      | 54                 | -17.39         | AVG        |
|                    |                         |                |                            |                    |                |            |
|                    |                         |                |                            |                    |                |            |

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

|                    |                        |                          |          |
|--------------------|------------------------|--------------------------|----------|
| <b>EUT Name</b>    | Smart Wi-Fi BLE Module | <b>Model Name</b>        | MR3EB    |
| <b>Temperature</b> | 22.7°C                 | <b>Relative Humidity</b> | 60.2%    |
| <b>Pressure</b>    | 960hPa                 | <b>Test Voltage</b>      | DC 3.3V  |
| <b>Test Mode</b>   | Mode 2                 | <b>Antenna Polarity</b>  | Vertical |

| Frequency<br>(MHz) | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Value Type |
|--------------------|-------------------------|----------------|----------------------------|--------------------|----------------|------------|
| 4874.000           | 45.11                   | 0.14           | 45.25                      | 74                 | -28.75         | peak       |
| 4874.000           | 37.62                   | 0.14           | 37.76                      | 54                 | -16.24         | AVG        |
| 7311.000           | 40.95                   | 2.36           | 43.31                      | 74                 | -30.69         | peak       |
| 7311.000           | 33.79                   | 2.36           | 36.15                      | 54                 | -17.85         | AVG        |
|                    |                         |                |                            |                    |                |            |
|                    |                         |                |                            |                    |                |            |

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

### **RESULT: Pass**

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### Radiated Emissions Test Results above 1GHz

|                    |                        |                          |            |
|--------------------|------------------------|--------------------------|------------|
| <b>EUT Name</b>    | Smart Wi-Fi BLE Module | <b>Model Name</b>        | MR3EB      |
| <b>Temperature</b> | 22.7℃                  | <b>Relative Humidity</b> | 60.2%      |
| <b>Pressure</b>    | 960hPa                 | <b>Test Voltage</b>      | DC 3.3V    |
| <b>Test Mode</b>   | Mode 3                 | <b>Antenna Polarity</b>  | Horizontal |

| Frequency<br>(MHz) | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Value Type |
|--------------------|-------------------------|----------------|----------------------------|--------------------|----------------|------------|
| 4924.000           | 46.64                   | 0.22           | 46.86                      | 74                 | -27.14         | peak       |
| 4924.000           | 38.43                   | 0.22           | 38.65                      | 54                 | -15.35         | AVG        |
| 7386.000           | 41.27                   | 2.64           | 43.91                      | 74                 | -30.09         | peak       |
| 7386.000           | 32.86                   | 2.64           | 35.5                       | 54                 | -18.5          | AVG        |
|                    |                         |                |                            |                    |                |            |
|                    |                         |                |                            |                    |                |            |

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

|                    |                        |                          |          |
|--------------------|------------------------|--------------------------|----------|
| <b>EUT Name</b>    | Smart Wi-Fi BLE Module | <b>Model Name</b>        | MR3EB    |
| <b>Temperature</b> | 22.7℃                  | <b>Relative Humidity</b> | 60.2%    |
| <b>Pressure</b>    | 960hPa                 | <b>Test Voltage</b>      | DC 3.3V  |
| <b>Test Mode</b>   | Mode 3                 | <b>Antenna Polarity</b>  | Vertical |

| Frequency<br>(MHz) | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Value Type |
|--------------------|-------------------------|----------------|----------------------------|--------------------|----------------|------------|
| 4924.000           | 46.12                   | 0.22           | 46.34                      | 74                 | -27.66         | peak       |
| 4924.000           | 38.54                   | 0.22           | 38.76                      | 54                 | -15.24         | AVG        |
| 7386.000           | 40.79                   | 2.64           | 43.43                      | 74                 | -30.57         | peak       |
| 7386.000           | 31.95                   | 2.64           | 34.59                      | 54                 | -19.41         | AVG        |
|                    |                         |                |                            |                    |                |            |
|                    |                         |                |                            |                    |                |            |

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

### RESULT: Pass

#### Note:

- The amplitude of other spurious emissions from 1G to 25 GHz which are attenuated more than 20 dB below the permissible value need not be reported.
- Factor = Antenna Factor + Cable loss – Pre-amplifier gain, Margin =Emission Level-Limit.
- The “Factor” value can be calculated automatically by software of measurement system.
- All test modes had been tested. The 802.11b modulation is the worst case and recorded in the report.

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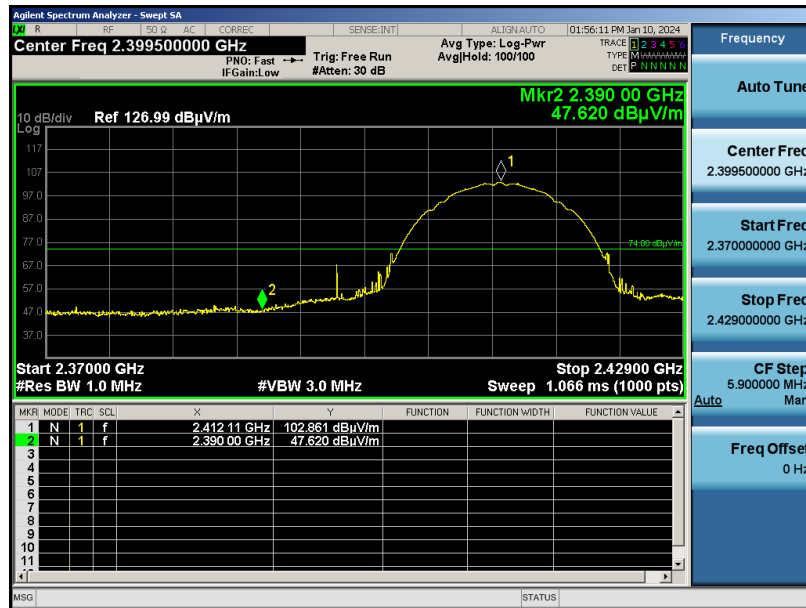
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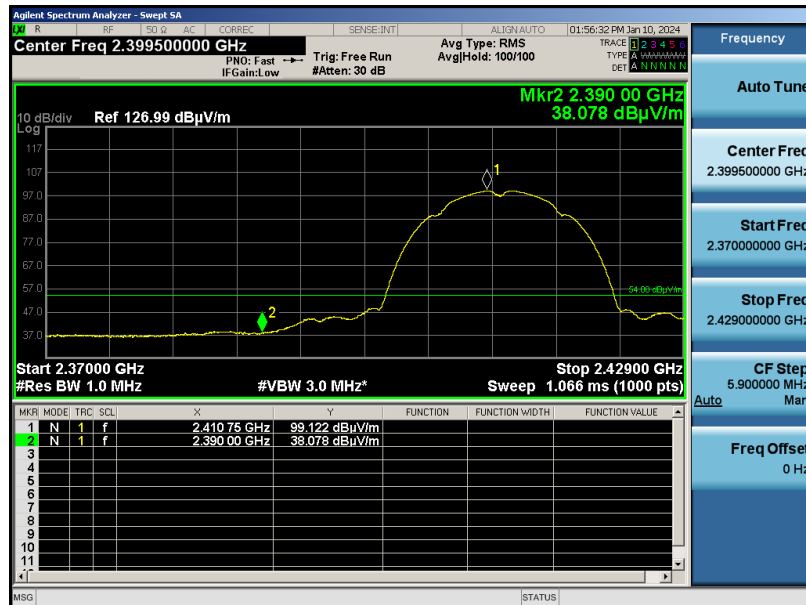
### Band Edge Emission Test Results for Restricted Bands

|             |                        |                   |            |
|-------------|------------------------|-------------------|------------|
| EUT Name    | Smart Wi-Fi BLE Module | Model Name        | MR3EB      |
| Temperature | 25°C                   | Relative Humidity | 55.4%      |
| Pressure    | 960hPa                 | Test Voltage      | DC 3.3V    |
| Test Mode   | Mode 1                 | Antenna Polarity  | Horizontal |

Test Graph for Peak Measurement



Test Graph for Average Measurement



### RESULT: Pass

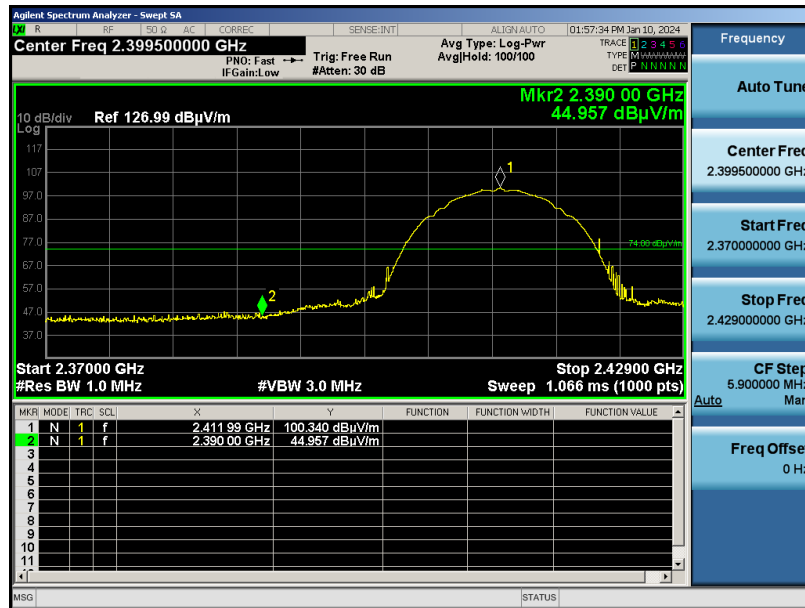
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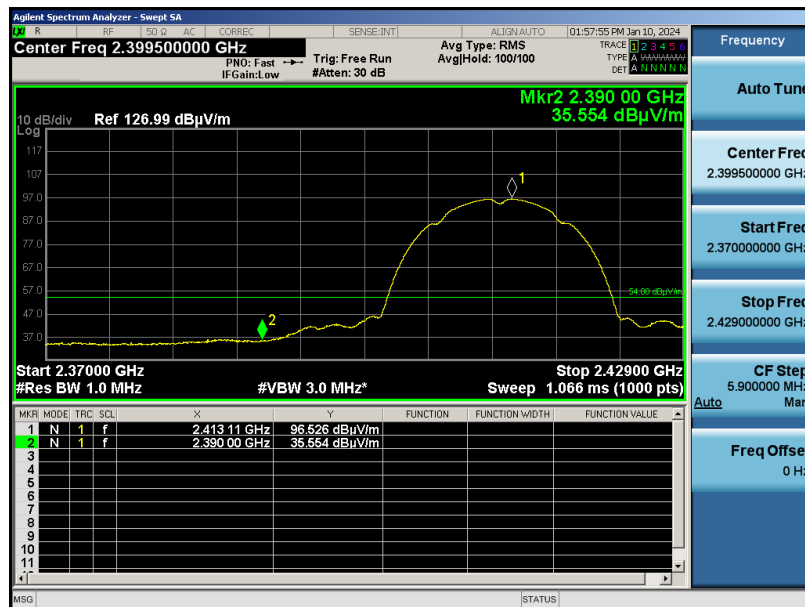
### Band Edge Emission Test Results for Restricted Bands

|             |                        |                   |          |
|-------------|------------------------|-------------------|----------|
| EUT Name    | Smart Wi-Fi BLE Module | Model Name        | MR3EB    |
| Temperature | 25°C                   | Relative Humidity | 55.4%    |
| Pressure    | 960hPa                 | Test Voltage      | DC 3.3V  |
| Test Mode   | Mode 1                 | Antenna Polarity  | Vertical |

Test Graph for Peak Measurement



Test Graph for Average Measurement



### RESULT: Pass

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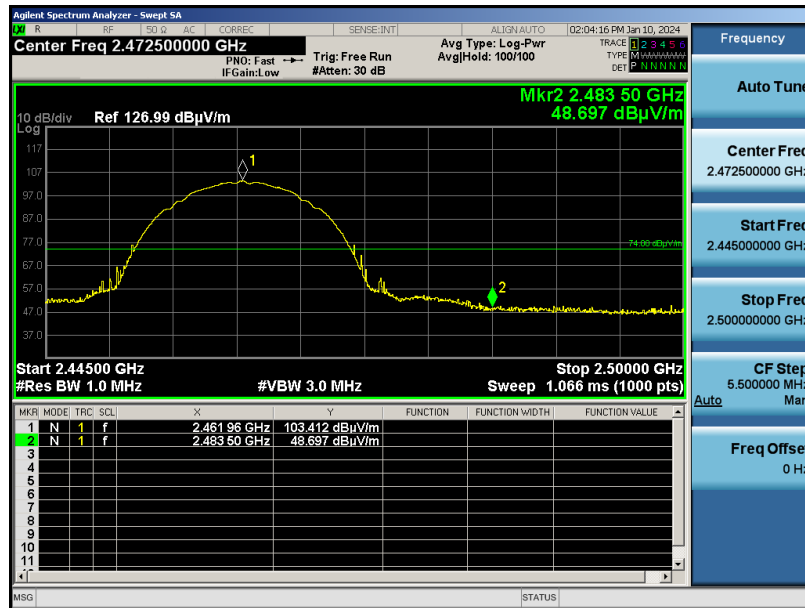
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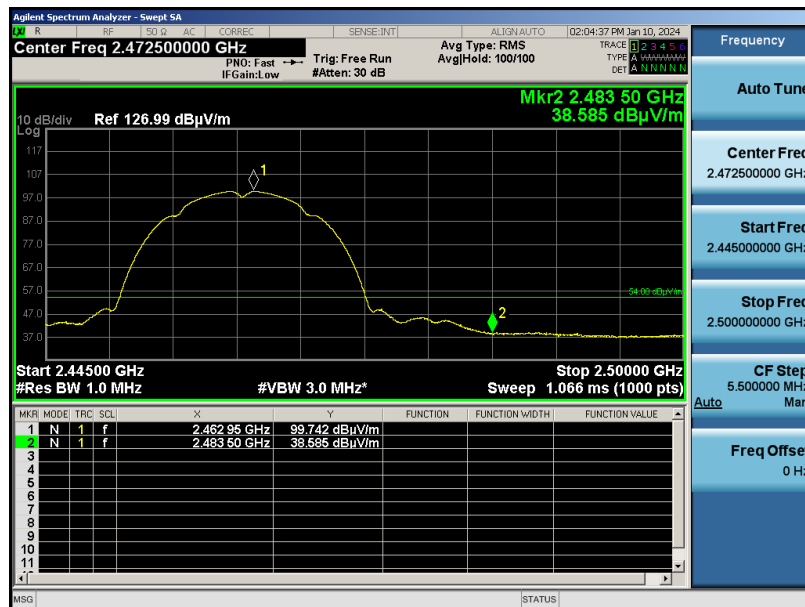
### Band Edge Emission Test Results for Restricted Bands

|             |                        |                   |            |
|-------------|------------------------|-------------------|------------|
| EUT Name    | Smart Wi-Fi BLE Module | Model Name        | MR3EB      |
| Temperature | 25°C                   | Relative Humidity | 55.4%      |
| Pressure    | 960hPa                 | Test Voltage      | DC 3.3V    |
| Test Mode   | Mode 3                 | Antenna Polarity  | Horizontal |

Test Graph for Peak Measurement



Test Graph for Average Measurement



### RESULT: Pass

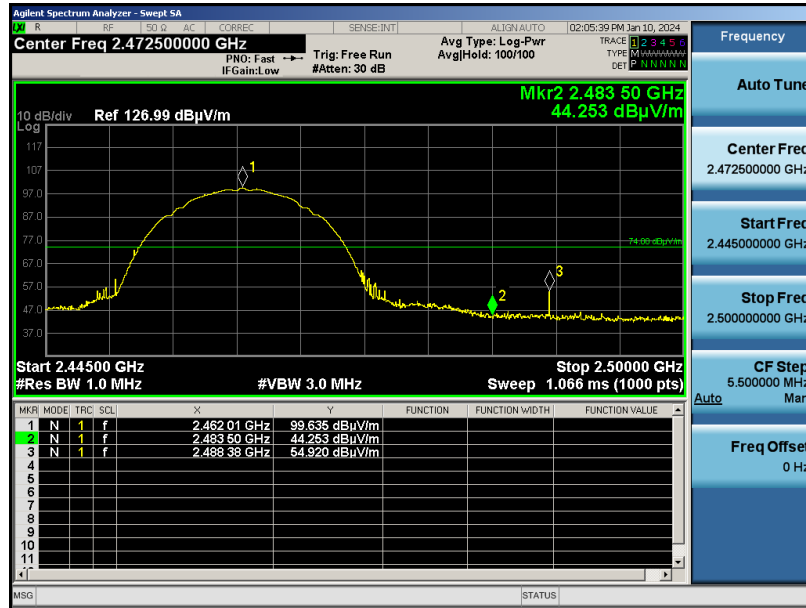
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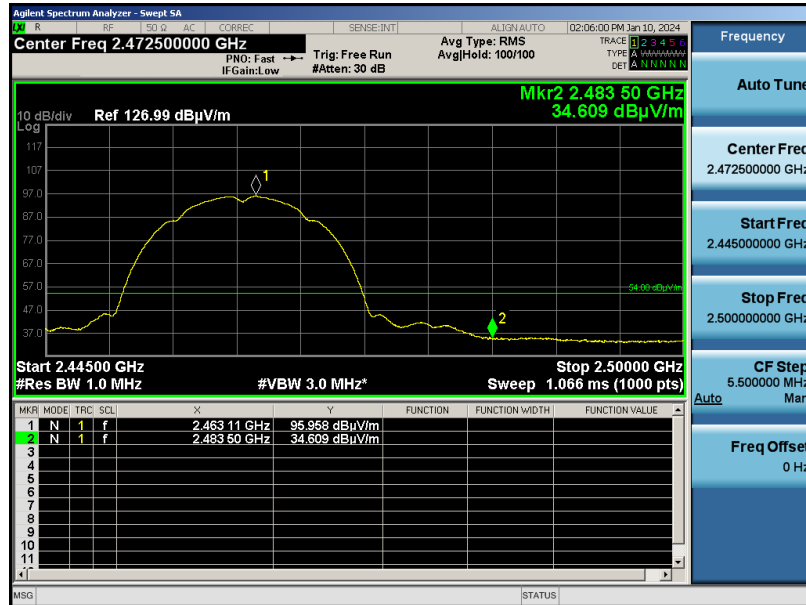
### Band Edge Emission Test Results for Restricted Bands

|             |                        |                   |          |
|-------------|------------------------|-------------------|----------|
| EUT Name    | Smart Wi-Fi BLE Module | Model Name        | MR3EB    |
| Temperature | 25°C                   | Relative Humidity | 55.4%    |
| Pressure    | 960hPa                 | Test Voltage      | DC 3.3V  |
| Test Mode   | Mode 3                 | Antenna Polarity  | Vertical |

Test Graph for Peak Measurement



Test Graph for Average Measurement



### RESULT: Pass

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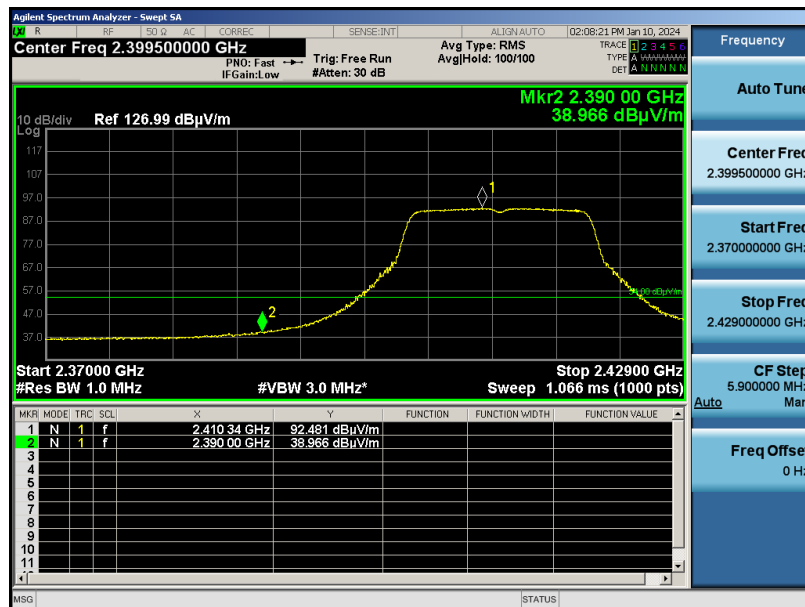
### Band Edge Emission Test Results for Restricted Bands

|             |                        |                   |            |
|-------------|------------------------|-------------------|------------|
| EUT Name    | Smart Wi-Fi BLE Module | Model Name        | MR3EB      |
| Temperature | 25°C                   | Relative Humidity | 55.4%      |
| Pressure    | 960hPa                 | Test Voltage      | DC 3.3V    |
| Test Mode   | Mode 4                 | Antenna Polarity  | Horizontal |

Test Graph for Peak Measurement



Test Graph for Average Measurement



### RESULT: Pass

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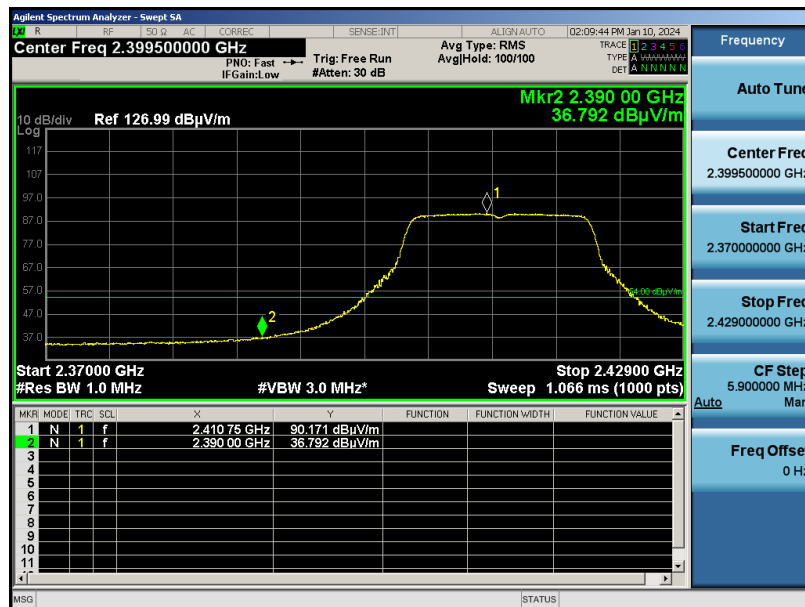
### Band Edge Emission Test Results for Restricted Bands

|             |                        |                   |          |
|-------------|------------------------|-------------------|----------|
| EUT Name    | Smart Wi-Fi BLE Module | Model Name        | MR3EB    |
| Temperature | 25°C                   | Relative Humidity | 55.4%    |
| Pressure    | 960hPa                 | Test Voltage      | DC 3.3V  |
| Test Mode   | Mode 4                 | Antenna Polarity  | Vertical |

Test Graph for Peak Measurement



Test Graph for Average Measurement



### RESULT: Pass

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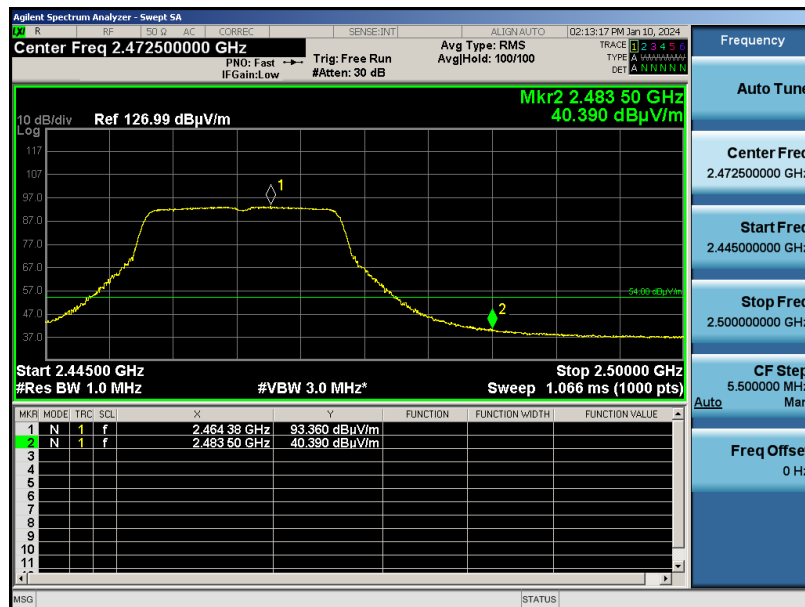
### Band Edge Emission Test Results for Restricted Bands

|             |                        |                   |            |
|-------------|------------------------|-------------------|------------|
| EUT Name    | Smart Wi-Fi BLE Module | Model Name        | MR3EB      |
| Temperature | 25°C                   | Relative Humidity | 55.4%      |
| Pressure    | 960hPa                 | Test Voltage      | DC 3.3V    |
| Test Mode   | Mode 6                 | Antenna Polarity  | Horizontal |

Test Graph for Peak Measurement



Test Graph for Average Measurement



### RESULT: Pass

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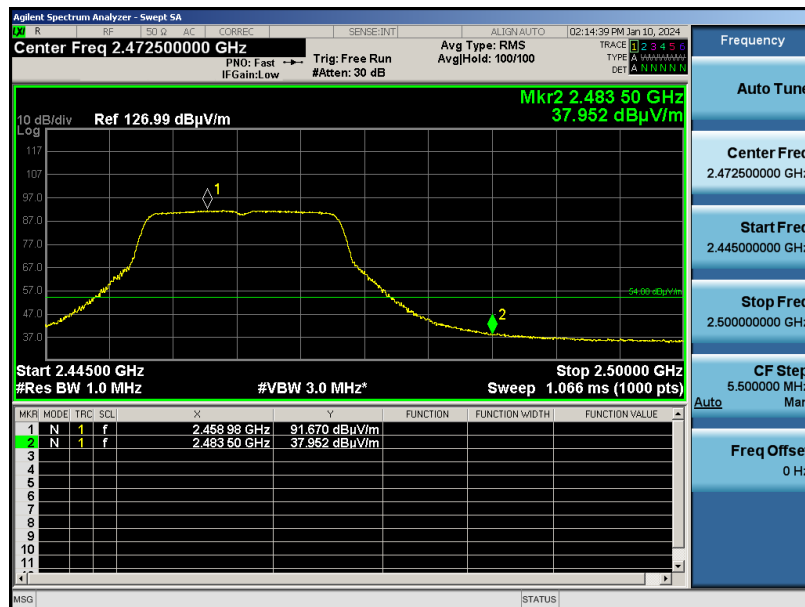
### Band Edge Emission Test Results for Restricted Bands

|             |                        |                   |          |
|-------------|------------------------|-------------------|----------|
| EUT Name    | Smart Wi-Fi BLE Module | Model Name        | MR3EB    |
| Temperature | 25°C                   | Relative Humidity | 55.4%    |
| Pressure    | 960hPa                 | Test Voltage      | DC 3.3V  |
| Test Mode   | Mode 6                 | Antenna Polarity  | Vertical |

Test Graph for Peak Measurement



Test Graph for Average Measurement



### RESULT: Pass

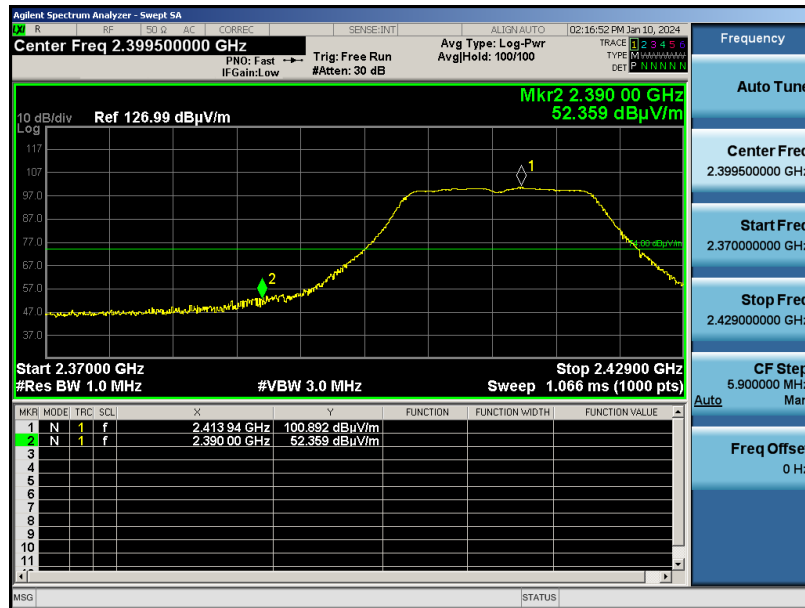
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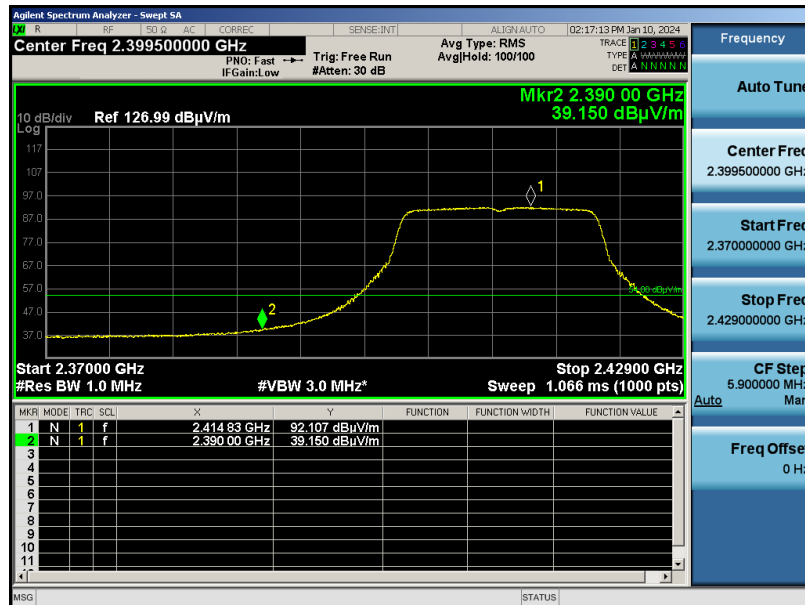
### Band Edge Emission Test Results for Restricted Bands

|             |                        |                   |            |
|-------------|------------------------|-------------------|------------|
| EUT Name    | Smart Wi-Fi BLE Module | Model Name        | MR3EB      |
| Temperature | 25°C                   | Relative Humidity | 55.4%      |
| Pressure    | 960hPa                 | Test Voltage      | DC 3.3V    |
| Test Mode   | Mode 7                 | Antenna Polarity  | Horizontal |

Test Graph for Peak Measurement



Test Graph for Average Measurement



### RESULT: Pass

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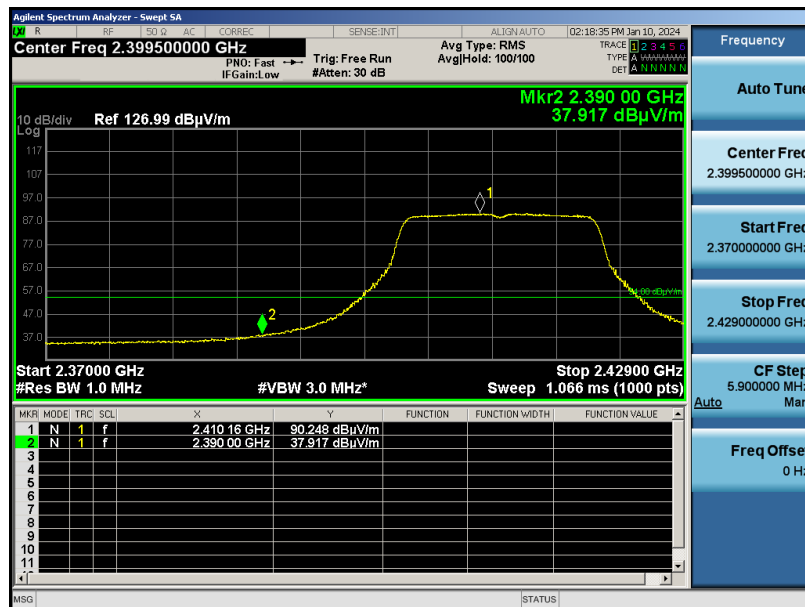
### Band Edge Emission Test Results for Restricted Bands

|             |                        |                   |          |
|-------------|------------------------|-------------------|----------|
| EUT Name    | Smart Wi-Fi BLE Module | Model Name        | MR3EB    |
| Temperature | 25°C                   | Relative Humidity | 55.4%    |
| Pressure    | 960hPa                 | Test Voltage      | DC 3.3V  |
| Test Mode   | Mode 7                 | Antenna Polarity  | Vertical |

Test Graph for Peak Measurement



Test Graph for Average Measurement



### RESULT: Pass

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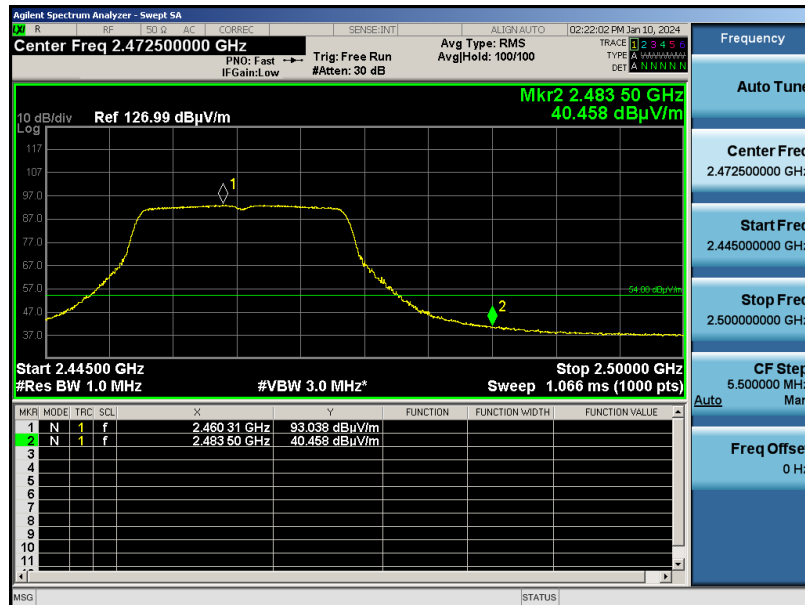
### Band Edge Emission Test Results for Restricted Bands

|             |                        |                   |            |
|-------------|------------------------|-------------------|------------|
| EUT Name    | Smart Wi-Fi BLE Module | Model Name        | MR3EB      |
| Temperature | 25°C                   | Relative Humidity | 55.4%      |
| Pressure    | 960hPa                 | Test Voltage      | DC 3.3V    |
| Test Mode   | Mode 9                 | Antenna Polarity  | Horizontal |

Test Graph for Peak Measurement



Test Graph for Average Measurement



### RESULT: Pass

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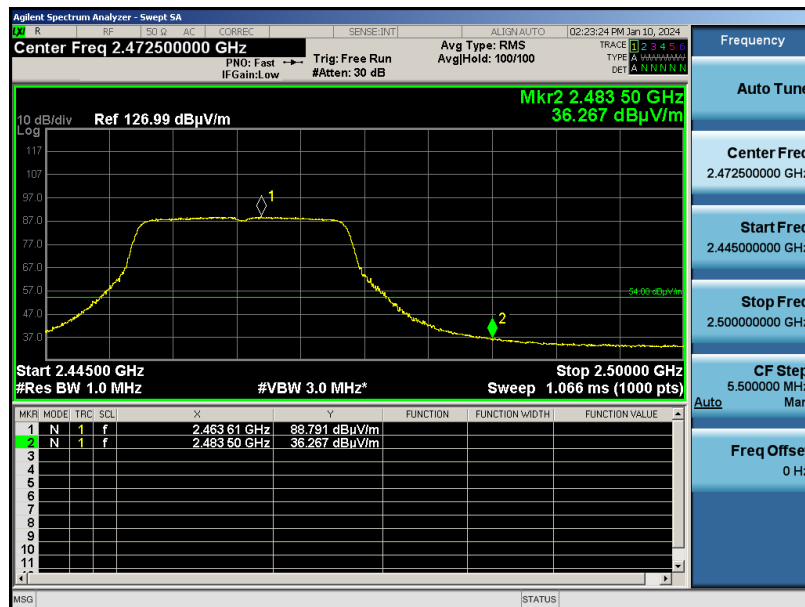
### Band Edge Emission Test Results for Restricted Bands

|             |                        |                   |          |
|-------------|------------------------|-------------------|----------|
| EUT Name    | Smart Wi-Fi BLE Module | Model Name        | MR3EB    |
| Temperature | 25°C                   | Relative Humidity | 55.4%    |
| Pressure    | 960hPa                 | Test Voltage      | DC 3.3V  |
| Test Mode   | Mode 9                 | Antenna Polarity  | Vertical |

Test Graph for Peak Measurement



Test Graph for Average Measurement



### RESULT: Pass

Note: The factor had been edited in the “Input Correction” of the Spectrum Analyzer.

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## 12. AC Power Line Conducted Emission

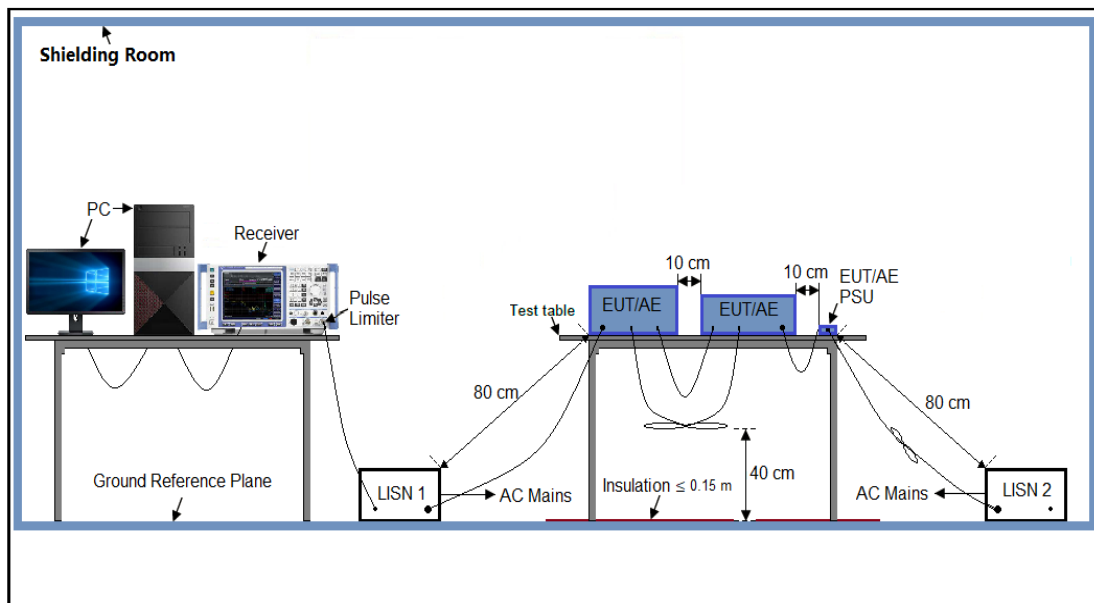
## 12.1 Measurement Limits

| Frequency     | Maximum RF Line Voltage |                |
|---------------|-------------------------|----------------|
|               | Q.P (dBμV)              | Average (dBμV) |
| 150kHz~500kHz | 66-56                   | 56-46          |
| 500kHz~5MHz   | 56                      | 46             |
| 5MHz~30MHz    | 60                      | 50             |

Note:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

## 12.2 Block Diagram of Line Conducted Emission Test



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### 12.3 Preliminary Procedure of Line Conducted Emission Test

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipment received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC 5V power from adapter which received AC120V/60Hz power from a LISN.
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 Ohm load; the second scan had Line 1 connected to a 50 Ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

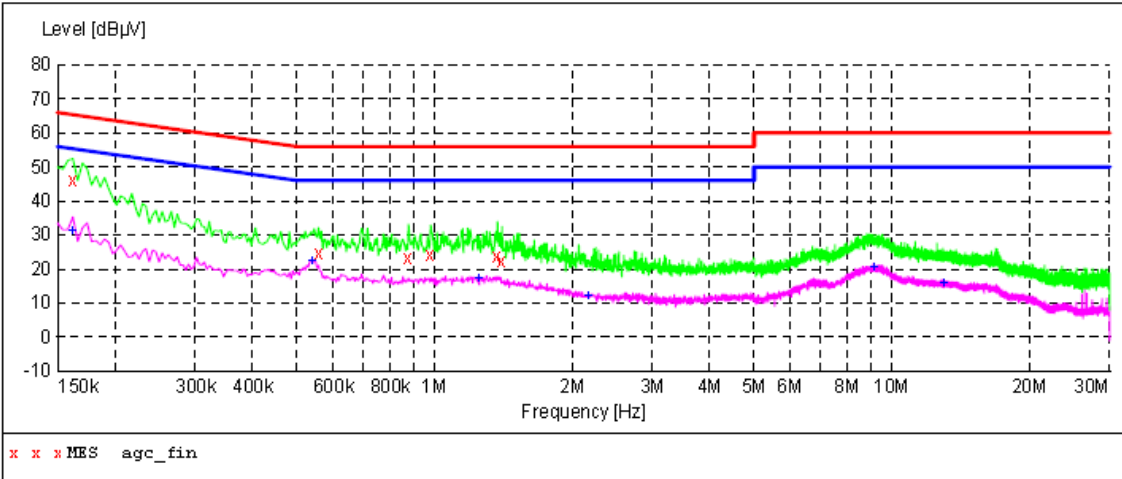
### 12.4 Final Procedure of Line Conducted Emission Test

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less – 2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case was reported on the Summary Data page.

## 12.5 Test Result of Line Conducted Emission Test

| AC Power Line Conducted Emission Test |        |           |          |
|---------------------------------------|--------|-----------|----------|
| Test Mode                             | Mode 1 | LISN Line | Hot Side |



The graph displays the measured emission level in dBμV against frequency in Hz. The y-axis ranges from -10 to 80 dBμV, and the x-axis ranges from 150k to 30M Hz. A red line represents the limit, a blue line represents the reference, and a green line shows the measured signal. The signal is generally below the limit, with some peaks around 10M Hz. Red 'x' marks indicate specific measurement points.

**MEASUREMENT RESULT: "agc\_fin"**

2024/1/17 14:54

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line |
|------------------|---------------|--------------|---------------|--------------|----------|------|
| 0.162000         | 46.30         | 6.1          | 65            | 19.1         | QP       | L1   |
| 0.558000         | 24.60         | 6.2          | 56            | 31.4         | QP       | L1   |
| 0.878000         | 23.10         | 6.2          | 56            | 32.9         | QP       | L1   |
| 0.982000         | 24.00         | 6.2          | 56            | 32.0         | QP       | L1   |
| 1.374000         | 23.60         | 6.2          | 56            | 32.4         | QP       | L1   |
| 1.406000         | 22.50         | 6.2          | 56            | 33.5         | QP       | L1   |

**MEASUREMENT RESULT: "agc\_fin2"**

2024/1/17 14:54

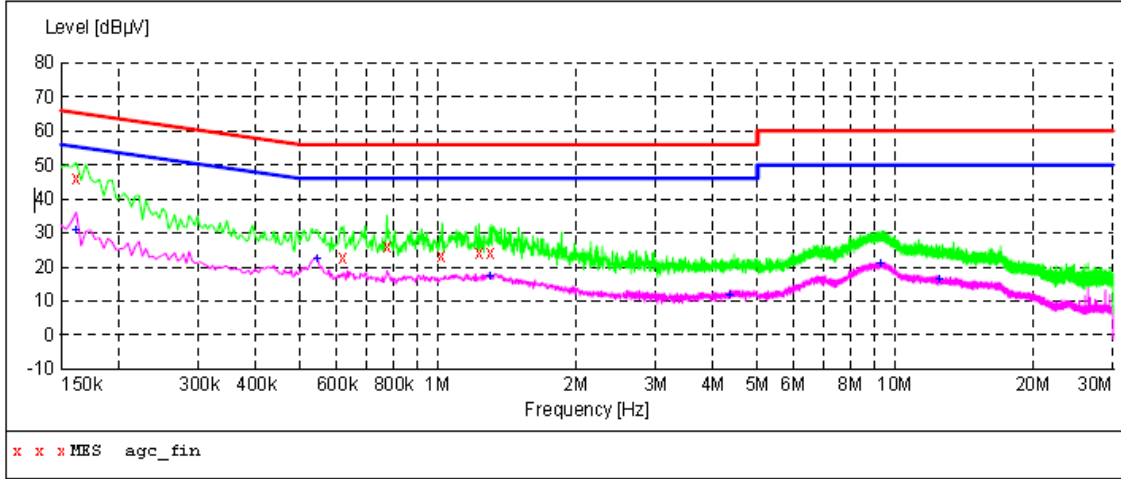
| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line |
|------------------|---------------|--------------|---------------|--------------|----------|------|
| 0.162000         | 31.00         | 6.1          | 55            | 24.4         | AV       | L1   |
| 0.538000         | 22.30         | 6.2          | 46            | 23.7         | AV       | L1   |
| 1.250000         | 17.00         | 6.2          | 46            | 29.0         | AV       | L1   |
| 2.170000         | 12.10         | 6.3          | 46            | 33.9         | AV       | L1   |
| 9.134000         | 20.60         | 6.6          | 50            | 29.4         | AV       | L1   |
| 12.962000        | 15.60         | 6.8          | 50            | 34.4         | AV       | L1   |

**RESULT: Pass**

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### AC Power Line Conducted Emission Test

|           |        |           |              |
|-----------|--------|-----------|--------------|
| Test Mode | Mode 1 | LISN Line | Neutral Side |
|-----------|--------|-----------|--------------|



#### MEASUREMENT RESULT: "agc\_fin"

2024/1/17 14:57

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line |
|------------------|---------------|--------------|---------------|--------------|----------|------|
| 0.162000         | 45.90         | 6.1          | 65            | 19.5         | QP       | N    |
| 0.622000         | 22.70         | 6.2          | 56            | 33.3         | QP       | N    |
| 0.774000         | 26.10         | 6.2          | 56            | 29.9         | QP       | N    |
| 1.022000         | 23.30         | 6.2          | 56            | 32.7         | QP       | N    |
| 1.230000         | 24.00         | 6.2          | 56            | 32.0         | QP       | N    |
| 1.310000         | 24.00         | 6.2          | 56            | 32.0         | QP       | N    |

#### MEASUREMENT RESULT: "agc\_fin2"

2024/1/17 14:57

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line |
|------------------|---------------|--------------|---------------|--------------|----------|------|
| 0.162000         | 30.90         | 6.1          | 55            | 24.5         | AV       | N    |
| 0.542000         | 22.40         | 6.2          | 46            | 23.6         | AV       | N    |
| 1.298000         | 17.10         | 6.2          | 46            | 28.9         | AV       | N    |
| 4.350000         | 11.80         | 6.3          | 46            | 34.2         | AV       | N    |
| 9.318000         | 20.70         | 6.6          | 50            | 29.3         | AV       | N    |
| 12.450000        | 16.10         | 6.8          | 50            | 33.9         | AV       | N    |

**RESULT: Pass**

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### **Appendix I: Photographs of Test Setup**

Refer to the Report No.: AGC00970231205AP01

### **Appendix II: Photographs of Test EUT**

Refer to the Report No.: AGC00970231205AP02

**-----End of Report-----**

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3. The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.
4. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.
5. Samples submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.
6. The Company will not be liable for or accept responsibility for any loss or damage however arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.
7. Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.
8. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.
9. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

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