

# RF Test Report

## 5 GHz WLAN

**Report No.** : FCCCBNW-WAY-P22120045-4R1  
**Customer** : Pittasoft Co.,Ltd.  
**Address** : A4th floor, ABN Tower, 331, Pangyo-ro, Bundang-gu,  
Seongnam-si, Gyeonggi-do, Republic of Korea  
**Use of Report** : Certification  
**Model Name** : DR970X  
**FCC ID** : YCK-DR970X  
**Date of Test** : 2022.12.10 to 2023.02.02  
**Test Method Used** : FCC 47 CFR PART 15 Subpart E (Section §15.407)  
KDB55804 D01v05r02, ANSI C63.10-2013  
**Testing Environment** : Refer to the Test Condition

**Test Result** : ☒ Pass ☐ Fail

**ISSUED BY:** BV CPS ADT Korea Ltd., EMC/RF Laboratory

**ADDRESS:** Innoplex No.2 106, Sinwon-ro 306, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, Korea 16675

**TEST LOCATION:** HeungAn-daero 49, DongAn-gu, Anyang-si,  
Gyeonggi-do, Korea, 14119

Tested by

Name : Donghoon Kang

(Signature)

Technical Manager

Name : Jungwoo Kim

(Signature)

**2023. 02. 16**

**BV CPS ADT Korea Ltd.**

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**RELEASE CONTROL RECORD**

| REPORT NO.                | REASON FOR CHANGE | DATE ISSUED |
|---------------------------|-------------------|-------------|
| FCCCBNW-WAY-P22120045-4   | Original release  | 2023.02.03  |
| FCCCBNW-WAY-P22120045-4R1 | Error correction  | 2023.02.16  |
|                           |                   |             |

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## 1 Summary of Test Results

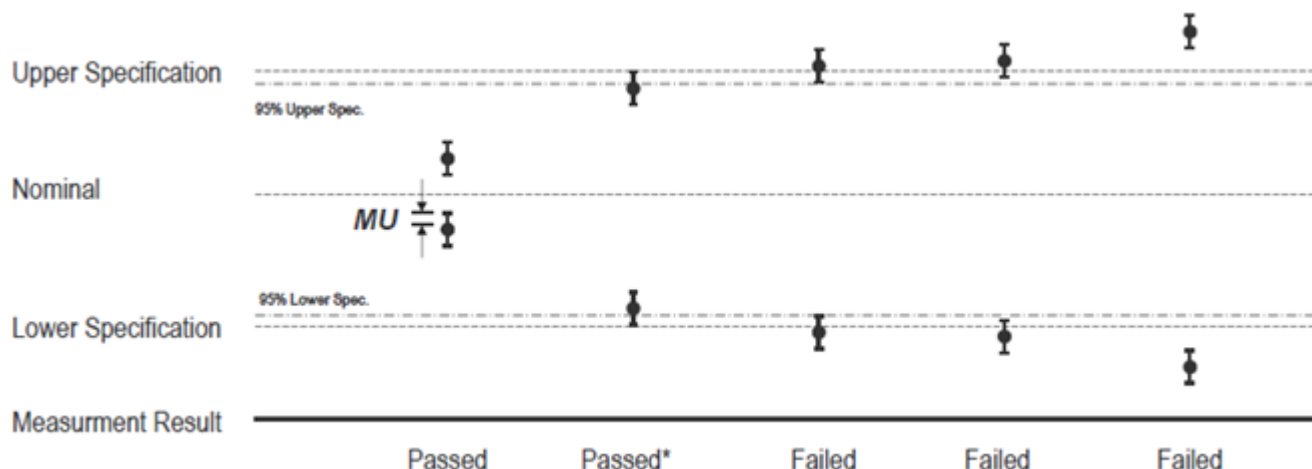
The EUT has been tested according to the following specifications

| Applied Standard : FCC Part 15, Subpart C 15.247 |                                                                               |                                                                                                                                                                                              |                   |                      |             |
|--------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------------|-------------|
| FCC Part Section(s)                              | Test Description                                                              | Limit                                                                                                                                                                                        | Test Condition    | Test Result          | Reference   |
| 15.407(a)                                        | Emission Bandwidth (26 dB Bandwidth)                                          | N/A                                                                                                                                                                                          | Conducted         | PASS                 | Section 3.2 |
| 15.407(e)                                        | Minimum Emission Bandwidth (6 dB Bandwidth)                                   | > 500 kHz in 5725 ~ 5850 MHz                                                                                                                                                                 |                   | PASS                 | Section 3.3 |
| 15.407(a)                                        | Maximum Conducted Output Power                                                | 5150 ~ 5250 MHz : < 23.97 dBm<br>5250 ~ 5350 & 5470 ~ 5725 MHz : < 250 mW or < 11 + 10 log <sub>10</sub> (B) dBm, whichever power is less. (B is the 26dB BW.)<br>5725 ~ 5850 MHz : < 30 dBm |                   | PASS                 | Section 3.4 |
| 15.407(a)                                        | Peak Power Spectral Density                                                   | 5150 ~ 5250 MHz : 11 dBm/MHz<br>5250 ~ 5350 MHz : 11 dBm/MHz<br>5470 ~ 5725 MHz : 11 dBm/MHz<br>5725 ~ 5850 MHz : 30 dBm/500kHz                                                              |                   | PASS                 | Section 3.5 |
| 15.407(h)                                        | Dynamic Frequency Selection                                                   | FCC 15.407(h)                                                                                                                                                                                |                   | NA <sup>Note4</sup>  | -           |
| 15.407(b)                                        | Undesirable Emissions                                                         | 5150 ~ 5725 MHz: < -27 dBm/MHz EIRP<br>5725 ~ 5850 MHz: < -27 dBm/MHz or < 10 dBm/MHz<br>or 15.6 dBm/MHz < 27dBm/MHz EIRP                                                                    | Radiated          | PASS                 | Section 3.7 |
| 15.205<br>15.209<br>15.407(b)                    | General Field Strength Limits (Restricted Bands and Radiated Emission Limits) | Emissions in restricted bands must meet the radiated limits detailed in 15.209                                                                                                               |                   | PASS                 | Section 3.7 |
| 15.207                                           | AC Conducted Emissions (150 kHz – 30 MHz)                                     | < FCC 15.207 limits                                                                                                                                                                          | AC Line Conducted | NA <sup>Note3)</sup> | Section 3.8 |
| 15.203                                           | Antenna Requirement                                                           | FCC 15.203                                                                                                                                                                                   | -                 | PASS                 | Section 3.1 |

### NOTES

- 1) The general test methods used to test on this devices are ANSI C63.10.
- 2) Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- 3) This Devices which only employ battery power for operation.
- 4) This equipment does not use a DFS Band.

## 1.1 Decision Rules for Statement of Conformity



**QUA-52 Decision Rule(QA Document) was applied.**

**Step 1) :** Reference Check, Daily Check, Peripheral device Check

**Step 2) :** Re-test Procedure (Repeat the test maximum 3 times, Different Test Engineer)

- 1) If the original test results are subject to retesting and the judgement is unclear, the retest is carried out.
- 2) If the result of the first retest is the same as the initial test, the judgement is made based on the value.
- 3) If the result of the first retest differ from the results of the initial test, the second re-test is carried out.
- 4) After completion of the second retest, the average of the three test results is determined as the final result. However, if the deviation of the three test values is more than 5 % of the reference value, the technical manager should review the reproducibility of the test from the beginning.

## 1.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2

| Measurement Items           | Frequency Range   | Expanded Uncertainty<br>$U = kU_c (k = 2)$ |
|-----------------------------|-------------------|--------------------------------------------|
| Radiated Spurious Emissions | 9 kHz – 30 MHz    | 2.06                                       |
|                             | 30 MHz – 1 GHz    | 4.48                                       |
|                             | 1 GHz – 18 GHz    | 5.24                                       |
|                             | 18 GHz – 26.5 GHz | 5.08                                       |

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of  $k = 2$ .

## 2 General Information

### 2.1 General Description of EUT

|                                    |                                                                         |
|------------------------------------|-------------------------------------------------------------------------|
| <b>Equipment Class</b>             | Unlicensed National Information Infrastructure (UNII)                   |
| <b>Product name</b>                | CAR DASHCAM                                                             |
| <b>FCC ID</b>                      | YCK-DR970X                                                              |
| <b>Model</b>                       | DR970X                                                                  |
| <b>Additional model name</b>       | DR970X-2CH, DR970X-1CH, DR970X-2CH IR, DR970X-2CH Truck, DR970X-2CH DMS |
| <b>Identification No. of EUT</b>   | Radiated: D97XK3LBE00003<br>Conducted: D97XK3LBE00004                   |
| <b>Power Supply</b>                | DC 12 V , DC 24V                                                        |
| <b>Modulation Type (Data Rate)</b> | OFDM                                                                    |
| <b>Operating Frequency</b>         | NII 1: 5 180 MHz to 5 240 MHz<br>NII 3: 5 745 MHz to 5 825 MHz          |
| <b>Output Power</b>                | NII 1: 5.27 dBm<br>NII 3: 5.22 dBm                                      |
| <b>Antenna Type</b>                | Chip Antenna                                                            |
| <b>Antenna Gain</b>                | NII 1: 1.56 dBi<br>NII 3: 1.46 dBi                                      |
| <b>H/W Version</b>                 | 1.0                                                                     |
| <b>S/W Version</b>                 | 1.0                                                                     |

#### NOTES

- 1) The above equipment has been tested by **Bureau Veritas Consumer Products Services ADT Korea**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

#### 2) List of Accessories

| Accessories | Brand | Model | Manufacturer | Specification |
|-------------|-------|-------|--------------|---------------|
| -           | -     | -     | -            | -             |

## 2.2 Description of Test Mode

The EUT has been tested with all modes of operating conditions to determine the worst case emission characteristics.

| Test Mode |                 | Worst case data rate |
|-----------|-----------------|----------------------|
| TM 1      | 802.11a         | 6 Mbps               |
| TM 2      | 802.11ac(VHT20) | MCS 0                |
| TM 3      | 802.11ac(VHT40) | MCS 0                |
| TM 4      | 802.11ac(VHT80) | MCS 0                |

Note. Tested at high output of 802.11n and 802.11ac.

| 5GHz Band | Mode            | Tx frequency (MHz) | Max power(dBm) |
|-----------|-----------------|--------------------|----------------|
| U-NII 1   | 802.11a         | 5180 ~ 5240        | 5.22           |
|           | 802.11n(HT20)   | 5180 ~ 5240        | 5.11           |
|           | 802.11ac(VHT20) | 5180 ~ 5240        | 5.27           |
|           | 802.11n(HT40)   | 5190 ~ 5230        | 3.89           |
|           | 802.11ac(VHT40) | 5190 ~ 5230        | 4.01           |
|           | 802.11ac(VHT80) | 5210               | 3.21           |
| U-NII 3   | 802.11a         | 5745 ~ 5825        | 5.22           |
|           | 802.11n(HT20)   | 5745 ~ 5825        | 4.78           |
|           | 802.11ac(VHT20) | 5745 ~ 5825        | 4.85           |
|           | 802.11n(HT40)   | 5755 ~ 5795        | 3.15           |
|           | 802.11ac(VHT40) | 5755 ~ 5795        | 3.27           |
|           | 802.11ac(VHT80) | 5775               | 3.61           |

### ● Tested Channel

| 5GHz Band | 802.11a/n(HT20)/<br>ac(VHT20) |                 | 802.11n(HT40)/<br>ac(VHT40) |                 | 802.11ac(VHT80) |                 |
|-----------|-------------------------------|-----------------|-----------------------------|-----------------|-----------------|-----------------|
|           | Channel                       | Frequency [MHz] | Channel                     | Frequency [MHz] | Channel         | Frequency [MHz] |
| U-NII 1   | 36                            | 5180            | 38                          | 5190            | 42              | 5210            |
|           | 40                            | 5200            | -                           | -               | -               | -               |
|           | 48                            | 5240            | 46                          | 5230            | -               | -               |
| U-NII 3   | 149                           | 5745            | 151                         | 5755            | 155             | 5775            |
|           | 157                           | 5785            | -                           | -               | -               | -               |
|           | 165                           | 5825            | 159                         | 5795            | -               | -               |

## 2.3 INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

## 2.4 EUT CONFIGURATION

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

## 2.6 General Description of Applied Standards

Generally the tests were performed according to the specifications of the standard, it must comply with the requirements of the following standards.

**FCC CFR 47 Part 15, Subpart C (§15.247)**

**KDB 558074 D01 15.247 Meas Guidance v05r02**

**KDB 662911 D01 Multiple Transmitter Output v02r01**

**ANSI C63.10-2013**

All test items in this test report have been performed and recorded as per the above standards.

## 2.7 Test Equipment

Test Equipment is traceable to the National Institute of Standards and Technology (NIST). Measurement antenna used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

| Manufacturer                    | Model                 | Description       | Serial Number | Cal Date (yyyy.mm.dd) | Cal Due (yyyy.mm.dd) |
|---------------------------------|-----------------------|-------------------|---------------|-----------------------|----------------------|
| EMI Test Receiver               | R&S                   | ESR7              | 102121        | 2022.11.21            | 2023.11.21           |
| Spectrum Analyzer               | R&S                   | FSW50             | 101403        | 2022.11.22            | 2023.11.22           |
| Signal Analyzer                 | Keysight Technologies | N9030B            | MY57142476    | 2022.11.22            | 2023.11.22           |
| Active Loop Antenna             | R&S                   | HFH2-Z2E          | 100881        | 2022.02.18            | 2023.02.18           |
| Trilog Antenna (with 6 dB ATT.) | Schwarzbeck           | VULB 9163         | 01099         | 2022.09.03            | 2023.09.03           |
| Horn Antenna                    | R&S                   | HF907             | 102772        | 2022-12-03            | 2023-12-03           |
| Horn Antenna                    | Steatite Antenna      | QSH-SL-18-26-S-20 | 19926         | 2022.11.23            | 2023.11.23           |
| Signal Conditioning Unit        | R&S                   | SCU08F2           | 08400017      | 2022.11.21            | 2023.11.21           |
| Signal Conditioning Unit        | R&S                   | SCU-18F           | 180112        | 2022.11.21            | 2023.11.21           |
| Signal Conditioning Unit        | R&S                   | SCU-26F           | 260005        | 2022.11.23            | 2023.11.23           |
| High Pass Filter                | Micro-Tronics         | HPM17543          | 028           | 2022.06.03            | 2023.06.03           |
| High Pass Filter                | Wt Microwave          | WT-A1698-HS       | WT190313-6-4  | 2022.11.22            | 2023.11.22           |
| Attenuator                      | API inmet             | 40AH2W-10         | 3             | 2022.06.03            | 2023.06.03           |
| EXG Analog Signal Generator     | Keysight Technologies | N5171B            | MY56200336    | 2022.11.22            | 2023.11.22           |
| Signal Generator                | R&S                   | SMB100A           | MY41006053    | 2022.06.03            | 2023.06.03           |
| MIMO Power Set Master           | Keysight Technologies | MP400B            | NONE          | 2022.12.02            | 2023.12.02           |
| DC Power Supply                 | Keysight Technologies | E3632A            | MY62216181    | 2022.07.12            | 2023.07.12           |

### 3 Test Results

#### 3.1 Antenna Requirement

##### Except from §15.203 of the FCC Rules/Regulations:

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of the section.

- The antenna(s) of the EUT are Permanently attached.
- There are no provisions for connection to an external antenna.

##### Result

The EUT complies with the requirement of §15.203

## 3.2 26 dB Bandwidth

### 3.2.1 Test Procedure

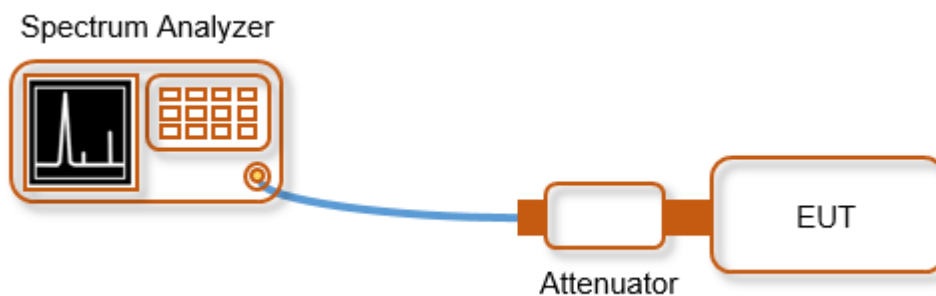
The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies. The 26 dB bandwidth is used to determine the conducted output power limit.

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of KDB789033

1. Set resolution bandwidth (RBW) = approximately 1 % of the EBW.
2. Set the video bandwidth (VBW) > RBW.
3. Detector = Peak.
4. Trace mode = max hold.

Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

### 3.2.2 Test Setup



### 3.2.3 Test Result

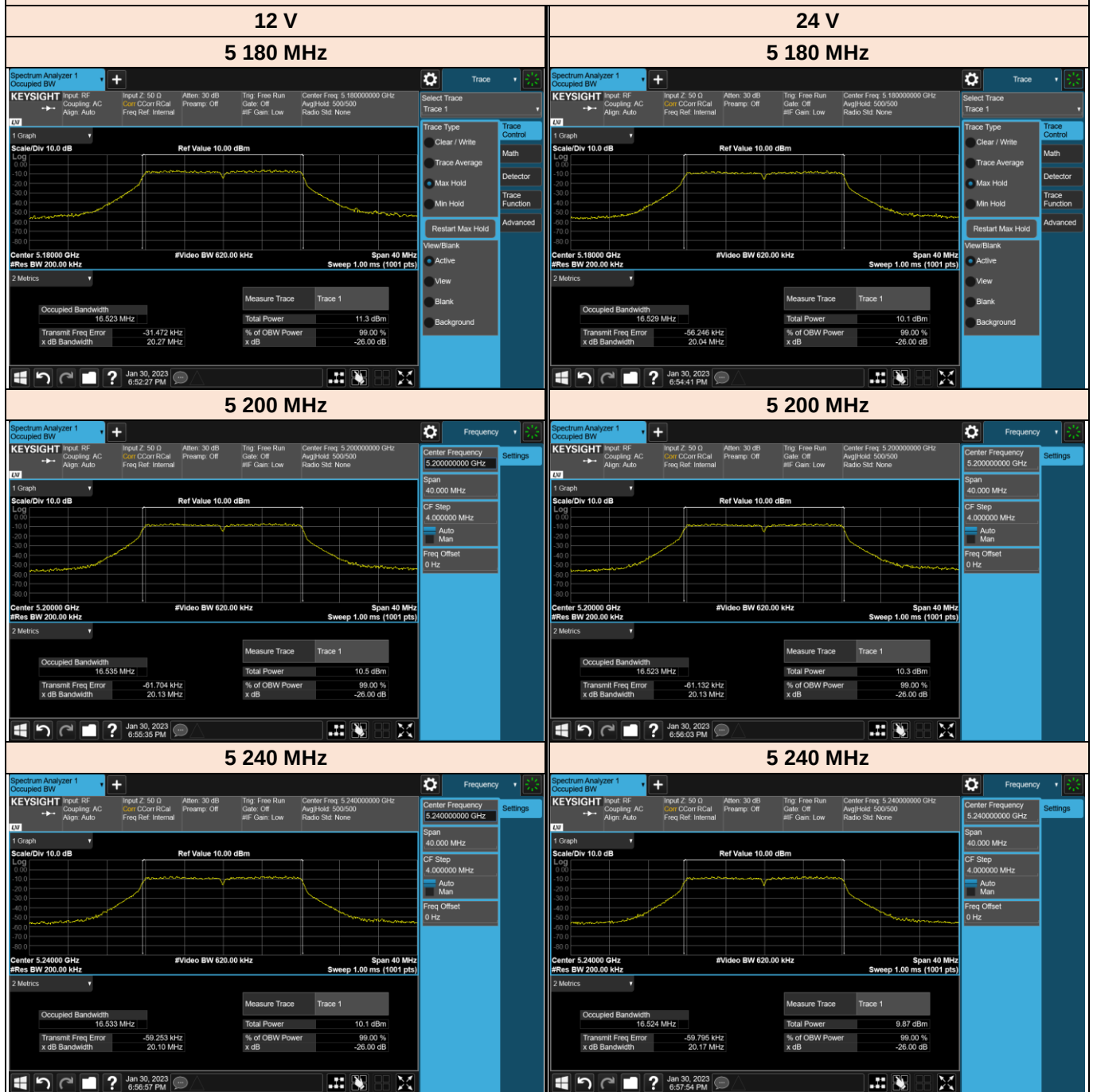
[Test Data of 26 dB Bandwidth]

| Test Mode | Tested Frequency [MHz] | 26 dB Bandwidth [MHz] |        |
|-----------|------------------------|-----------------------|--------|
|           |                        | 12 V                  | 24 V   |
| TM1       | 5 180                  | 20. 27                | 20. 04 |
|           | 5 200                  | 20. 13                | 20. 13 |
|           | 5 240                  | 20. 10                | 20. 17 |
| TM2       | 5 180                  | 20. 89                | 20. 87 |
|           | 5 200                  | 21. 06                | 20. 93 |
|           | 5 240                  | 20. 98                | 20. 89 |
| TM3       | 5 190                  | 41. 12                | 41. 77 |
|           | 5 230                  | 41. 64                | 41. 85 |
| TM4       | 5 210                  | 81. 00                | 81. 69 |



[Test Plot of 26 dB Bandwidth]

TM1\_802.11a



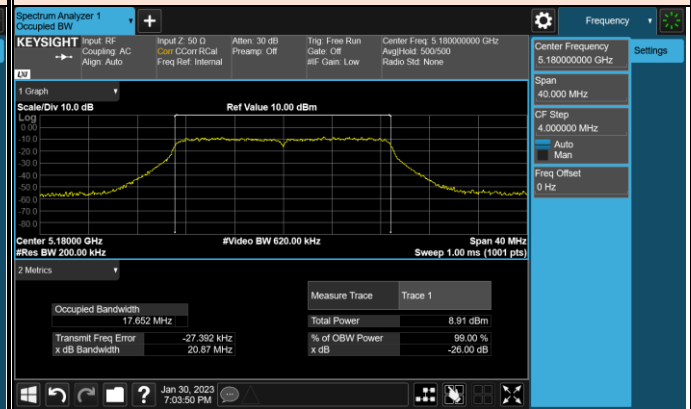
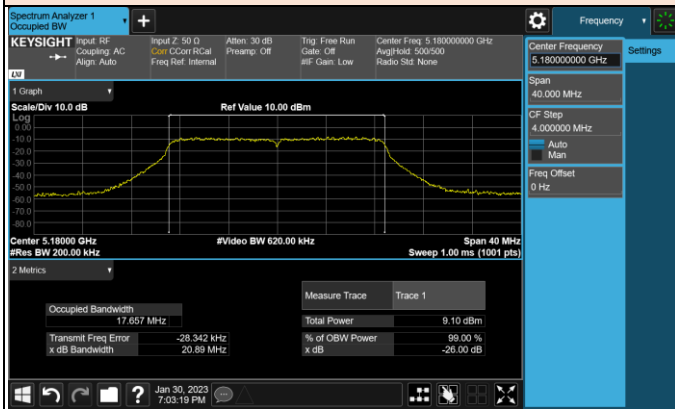
# TM2\_ 802.11ac(VHT20)

12 V

24 V

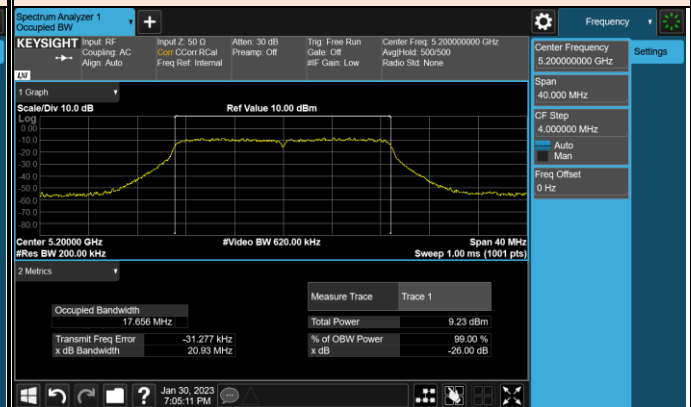
5 180 MHz

5 180 MHz



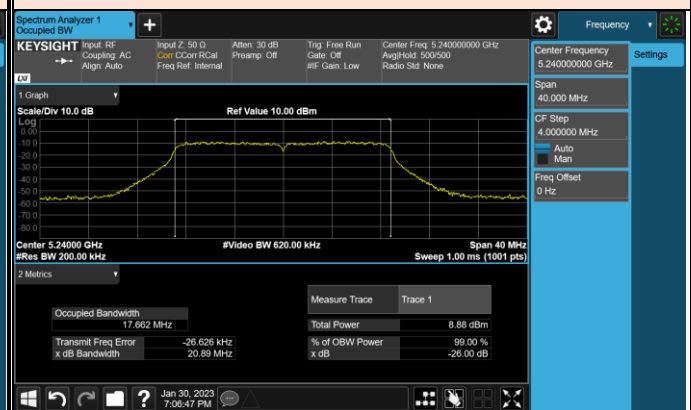
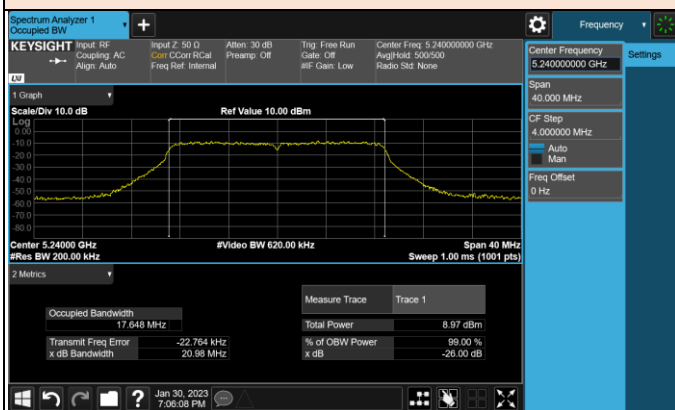
5 200 MHz

5 200 MHz



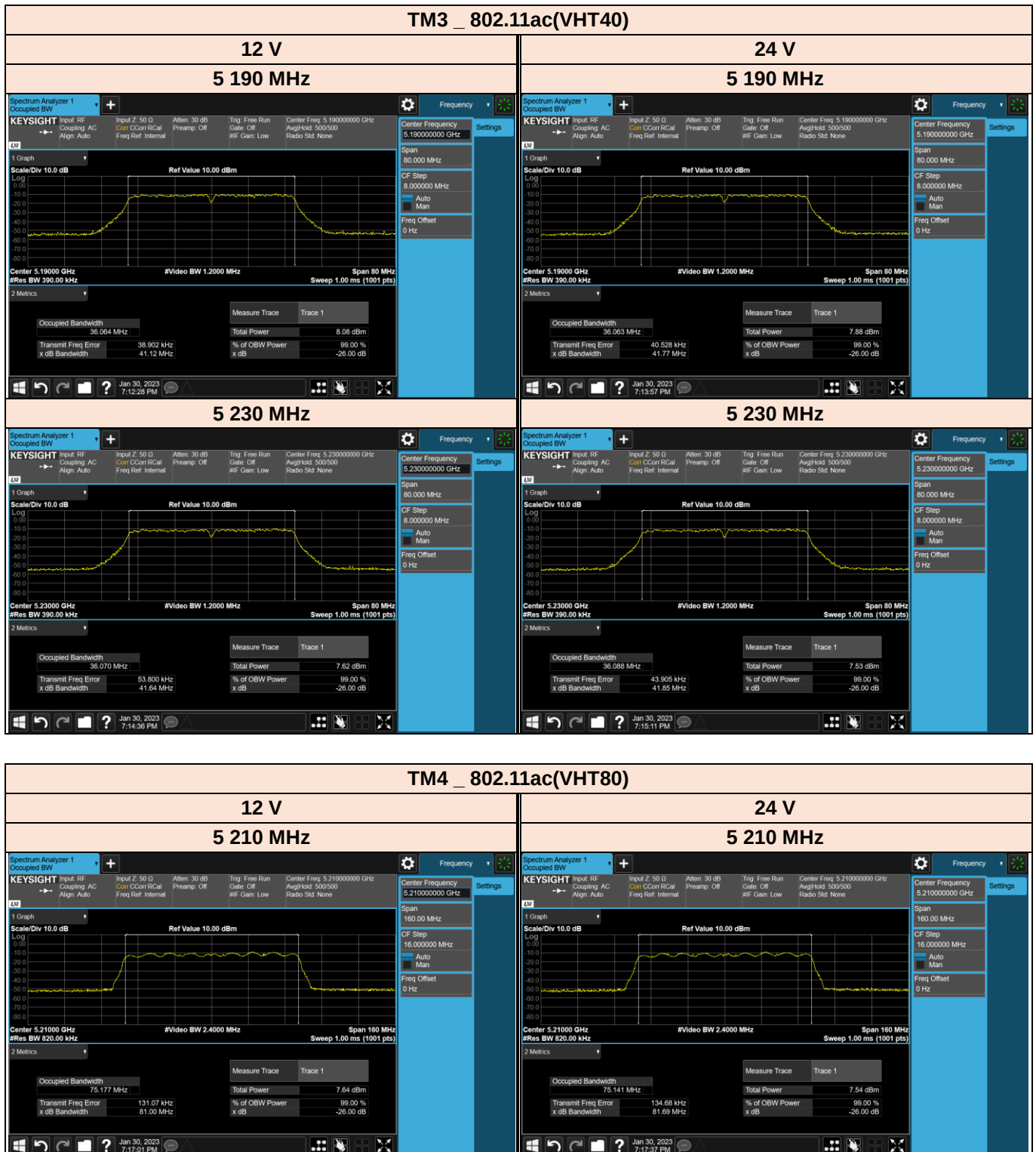
5 240 MHz

5 240 MHz





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### 3.3 6 dB Bandwidth

#### 3.3.1 Regulation

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

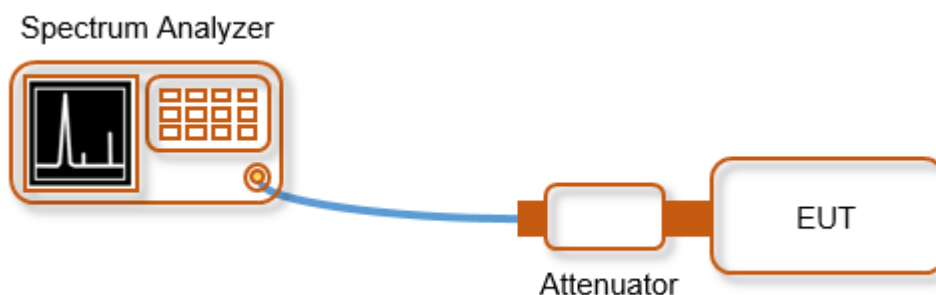
#### 3.3.2 Test Procedure

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of KDB789033

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth  $\geq 3 \times$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.

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

#### 3.3.3 Test Setup



### 3.2.3 Test Result

[Test Data of 6 dB Bandwidth]

| Test Mode | Tested Frequency [MHz] | 6 dB Bandwidth [MHz] |       |
|-----------|------------------------|----------------------|-------|
|           |                        | 12 V                 | 24 V  |
| TM1       | 5 745                  | 16.55                | 16.52 |
|           | 5 785                  | 16.53                | 16.55 |
|           | 5 825                  | 16.56                | 16.56 |
| TM2       | 5 745                  | 17.68                | 17.67 |
|           | 5 785                  | 17.69                | 17.68 |
|           | 5 825                  | 17.66                | 17.67 |
| TM3       | 5 755                  | 36.45                | 36.47 |
|           | 5 795                  | 36.47                | 36.48 |
| TM4       | 5 775                  | 75.76                | 75.78 |

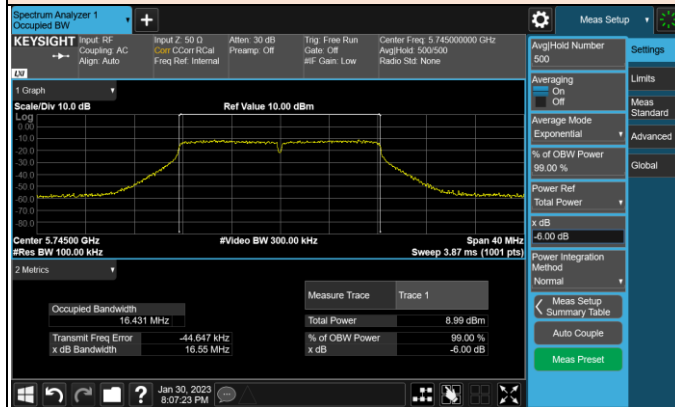


[Test Plot of 6 dB Bandwidth]

TM1\_802.11a

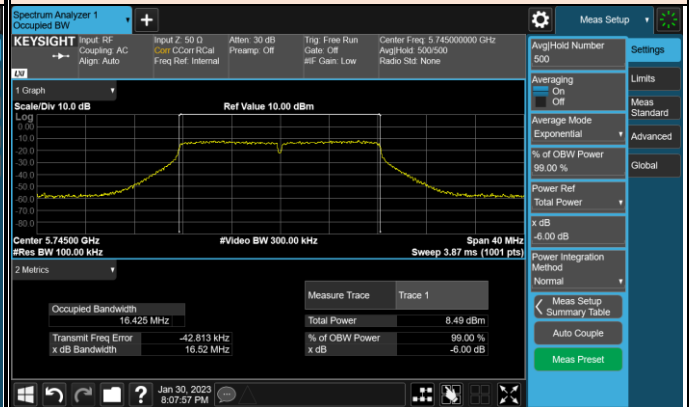
12 V

5 745 MHz

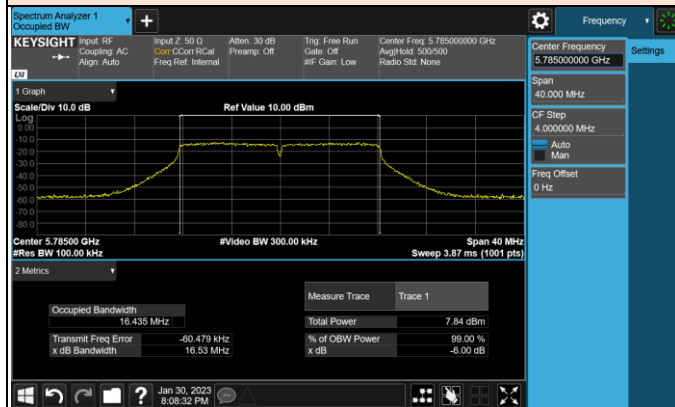


24 V

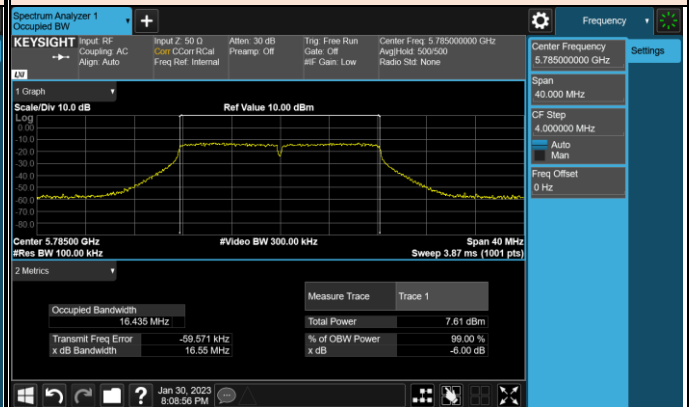
5 745 MHz



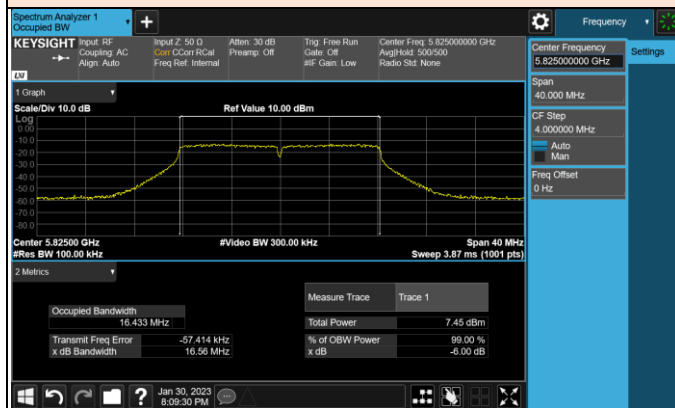
5 785 MHz



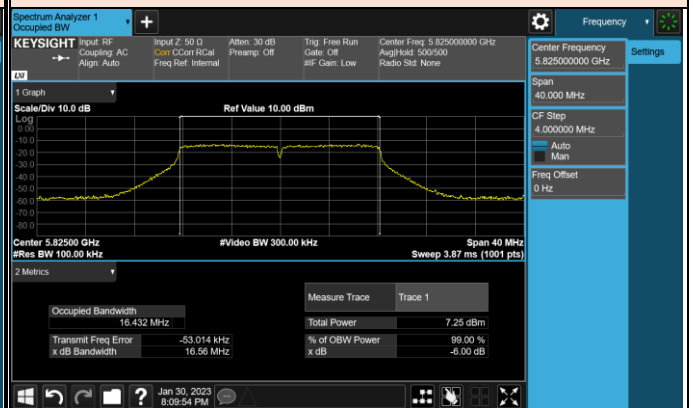
5 785 MHz



5 825 MHz



5 825 MHz





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VERITAS

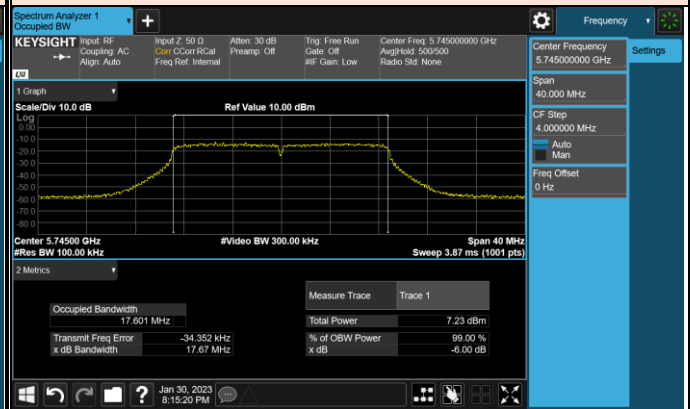
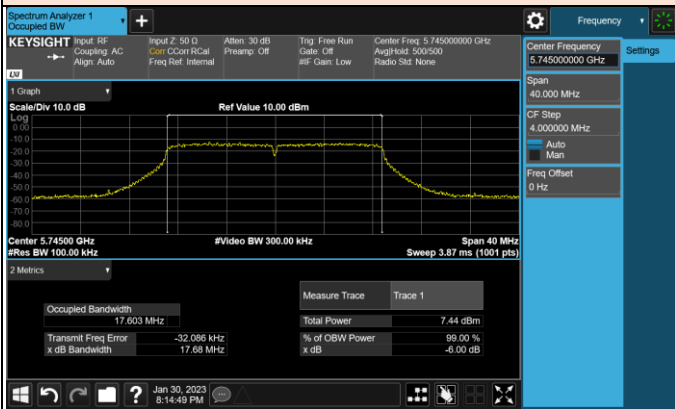
## TM2\_ 802.11ac(VHT20)

12 V

24 V

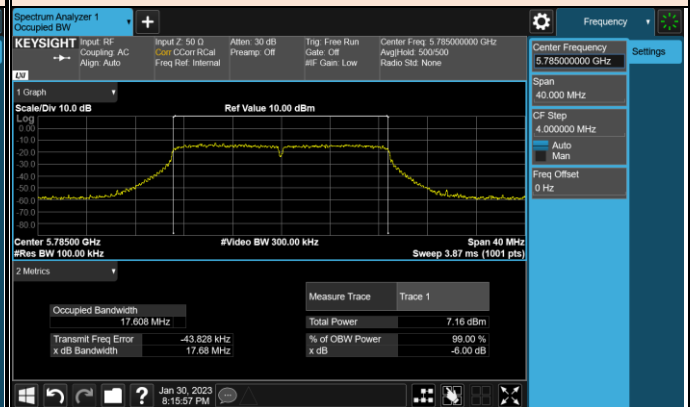
5 745 MHz

5 745 MHz



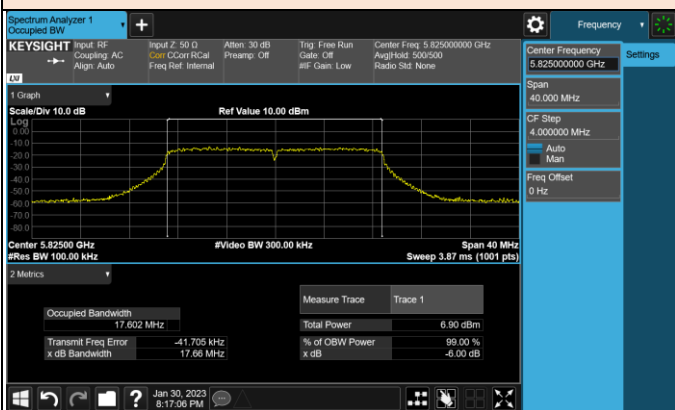
5 785 MHz

5 785 MHz



5 825 MHz

5 825 MHz



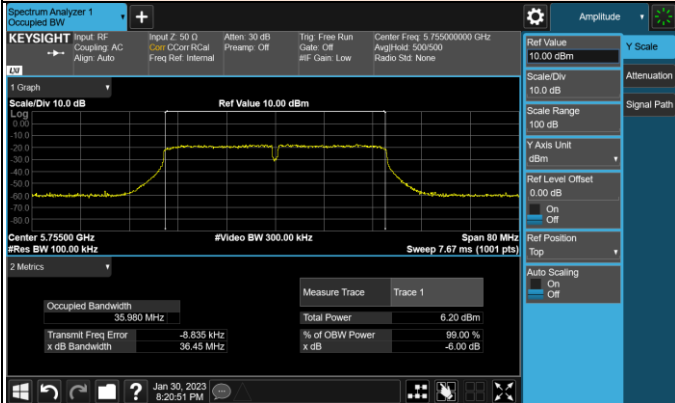


BUREAU  
VERITAS

### TM3\_ 802.11ac(VHT40)

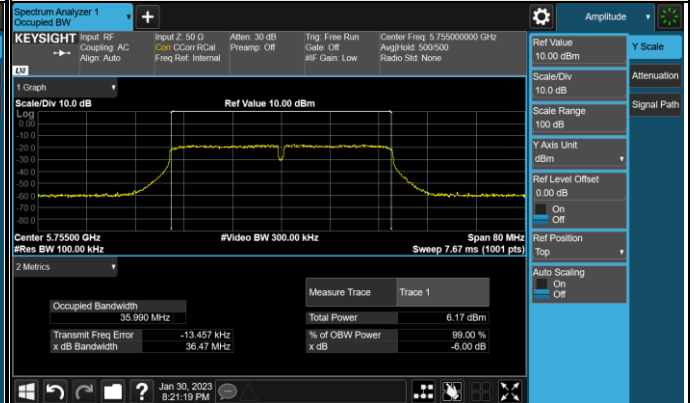
12 V

5 755 MHz

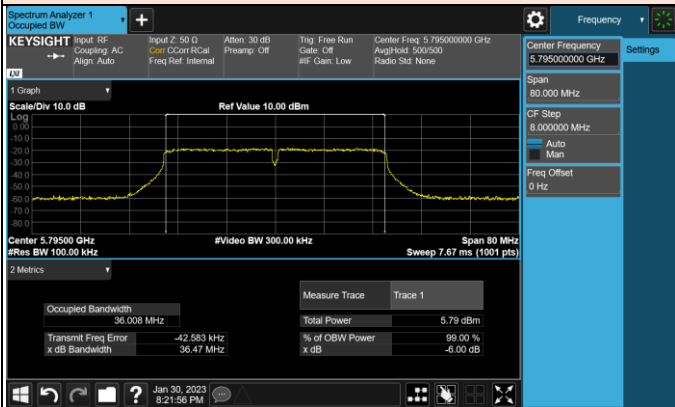


24 V

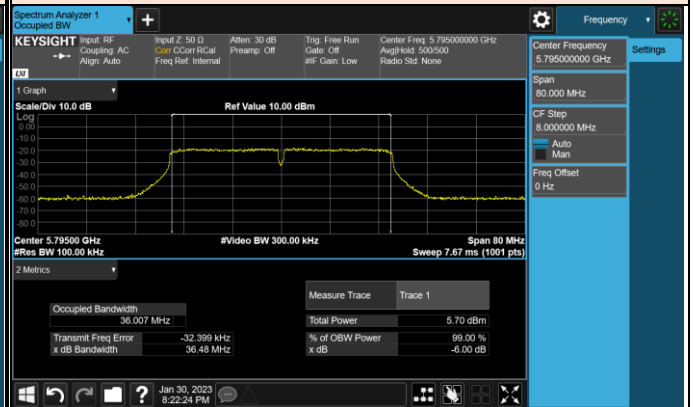
5 755 MHz



5 795 MHz



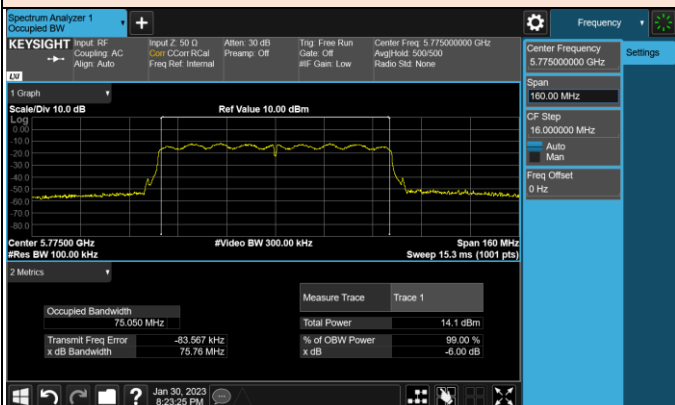
5 795 MHz



### TM4\_ 802.11ac(VHT80)

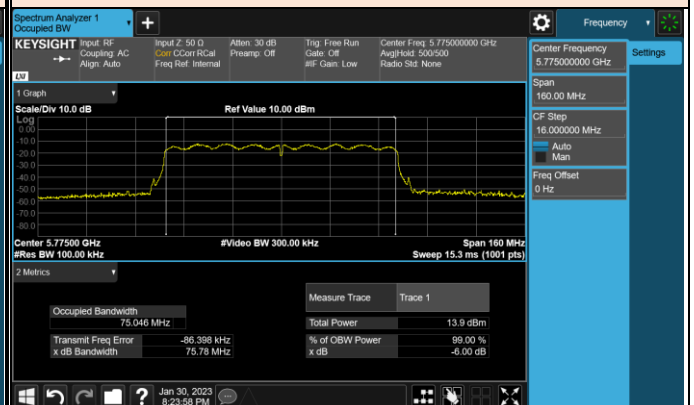
12 V

5 775 MHz



24 V

5 775 MHz



## 3.4 Maximum Conducted Output Power

### 3.4.1 Regulation

Part. 15.407(a)

(1) For the band 5.15 - 5.25 GHz.

(i) For an outdoor access point operating in the band 5.15 - 5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15 - 5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15 - 5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15 - 5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25 - 5.35 GHz and 5.47 - 5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725 - 5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in

transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

### 3.4.2 Test Procedure

#### Method PM-G of KDB789033

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

### 3.4.3 Test Setup



### 3.4.4 Test Result

#### [Test Result of Maximum Conducted Output Power]

Limit:

| Band  | Power Limit [mW] | Calculated Limit [dBm] | Antenna Gain (Worst case) [dBi] | Determined Limit [dBm] |
|-------|------------------|------------------------|---------------------------------|------------------------|
| NII 1 | 250              | 23.97                  | 1.56                            | <b>23.97</b>           |
| NII 3 | 1000             | 30.00                  | 1.46                            | <b>30.00</b>           |

| Test Mode | Band  | Tested Frequency | Measured Power [dBm] |        |         |        |
|-----------|-------|------------------|----------------------|--------|---------|--------|
|           |       |                  | 12 V                 |        | 24 V    |        |
|           |       |                  | Average              | Result | Average | Result |
| TM1       | NII 1 | 5 180            | 4.60                 | 4.60   | 4.56    | 4.56   |
|           |       | 5 200            | 5.22                 | 5.22   | 5.15    | 5.15   |
|           |       | 5 240            | 5.12                 | 5.12   | 5.16    | 5.16   |
|           | NII 3 | 5 745            | 5.22                 | 5.22   | 5.21    | 5.21   |
|           |       | 5 785            | 4.91                 | 4.91   | 5.04    | 5.04   |
|           |       | 5 825            | 4.82                 | 4.82   | 4.94    | 4.94   |
| TM2       | NII 1 | 5 180            | 4.77                 | 4.77   | 4.76    | 4.76   |
|           |       | 5 200            | 5.16                 | 5.16   | 5.27    | 5.27   |
|           |       | 5 240            | 5.06                 | 5.06   | 5.11    | 5.11   |
|           | NII 3 | 5 745            | 4.71                 | 4.71   | 4.85    | 4.85   |
|           |       | 5 785            | 4.76                 | 4.76   | 4.77    | 4.77   |
|           |       | 5 825            | 4.61                 | 4.61   | 4.56    | 4.56   |
| TM3       | NII 1 | 5 190            | 3.84                 | 3.84   | 4.01    | 4.01   |
|           |       | 5 230            | 3.74                 | 3.74   | 3.86    | 3.86   |
|           | NII 3 | 5 755            | 3.15                 | 3.15   | 3.20    | 3.20   |
|           |       | 5 795            | 3.11                 | 3.11   | 3.27    | 3.27   |
| TM4       | NII 1 | 5 210            | 3.18                 | 3.18   | 3.21    | 3.21   |
|           | NII 3 | 5 775            | 3.55                 | 3.55   | 3.61    | 3.61   |

Note1: The intent is to test at 100 % duty cycle.

Note2: Result = Average Power + Dudy cycle factor

## 3.5 Maximum Power Spectral Density

### 3.5.1 Regulation

Part. 15.407(a)

(1) For the band 5.15 - 5.25 GHz.

(i) For an outdoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band. note1

(ii) For an indoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band. note1

(iii) For fixed point-to-point access points operating in the band 5.15 - 5.25 GHz, transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

(iv) For mobile and portable client devices in the 5.15 - 5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band. note1

(2) For the 5.25 - 5.35 GHz and 5.47 - 5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. note1

(3) For the band 5.725 - 5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500 kHz band. note1,note2

Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note2: Fixed point - to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

### 3.5.2 Test Procedure

Maximum Power Spectral Density is measured using Measurement Procedure of KDB789033 D02v02r01

1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA - 1, SA - 2, SA - 3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)

2) Use the peak search function on the instrument to find the peak of the spectrum and record its value.

3) Make the following adjustments to the peak value of the spectrum, if applicable:

a) If Method SA - 2 or SA - 2 Alternative was used, add  $10 \log(1 / x)$ , where x is the duty cycle, to the peak of the spectrum.

b) If Method SA - 3 Alternative was used and the linear mode was used in step II.E.2.g (viii), add 1 dB

to the final result to compensate for the difference between linear averaging and power averaging.

4) The result is the Maximum PSD over 1 MHz reference bandwidth.

5) For devices operating in the bands 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, and 5.47 - 5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in §15.407(a)(5). For devices operating in the band 5.725 - 5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

a) Set  $RBW \geq 1 / T$ , where T is defined in section II.B.1.a). (Refer to Appendix II)

b) Set  $VBW \geq 3 RBW$ .

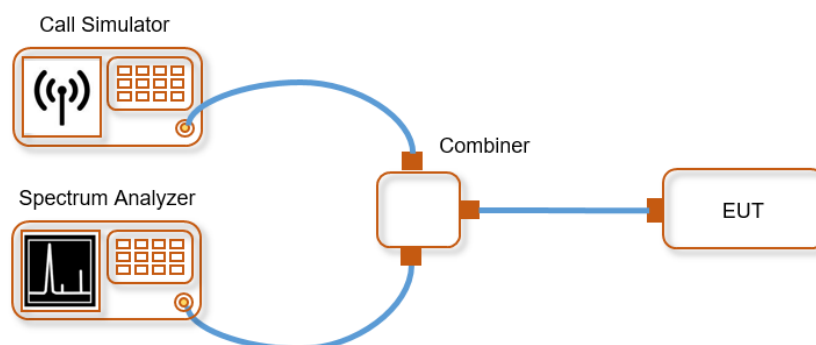
c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10 \log(500 \text{ kHz} / RBW)$  to the measured result, whereas  $RBW (< 500 \text{ kHz})$  is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10 \log(1 \text{ MHz} / RBW)$  to the measured result, whereas  $RBW (< 1 \text{ MHz})$  is the reduced resolution bandwidth of spectrum analyzer set during measurement.

e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since  $RBW = 100 \text{ kHz}$  is available on nearly all spectrum analyzers.

### 3.5.3 Test Setup



### 3.5.4 Test Result

#### [Test Result of Maximum Power Spectral Density]

##### Limit

| Band  | Limit [dBm] | Antenna Gain (Worst case) [dBi] | Determined Limit [dBm] |
|-------|-------------|---------------------------------|------------------------|
| NII 1 | 11.00       | 1.56                            | <b>11.00</b>           |
| NII 3 | 30.00       | 1.46                            | <b>30.00</b>           |

| Test Mode | Band  | Tested Frequency | Measured Power [dBm] |      |        |         |      |        |
|-----------|-------|------------------|----------------------|------|--------|---------|------|--------|
|           |       |                  | 12 V                 |      |        | 24 V    |      |        |
|           |       |                  | Reading              | T.F  | Result | Reading | T.F  | Result |
| TM1       | NII 1 | 5 180            | -8.97                | NA   | -8.97  | -8.99   | NA   | -8.99  |
|           |       | 5 200            | -8.49                |      | -8.49  | -8.60   |      | -8.60  |
|           |       | 5 240            | -8.69                |      | -8.69  | -8.76   |      | -8.76  |
|           | NII 3 | 5 745            | -18.75               | 6.99 | -11.76 | -18.84  | 6.99 | -11.85 |
|           |       | 5 785            | -19.50               |      | -12.51 | -19.72  |      | -12.73 |
|           |       | 5 825            | -19.72               |      | -12.73 | -19.71  |      | -12.72 |
| TM2       | NII 1 | 5 180            | -9.04                | NA   | -9.04  | -9.23   | NA   | -9.23  |
|           |       | 5 200            | -8.71                |      | -8.71  | -8.80   |      | -8.80  |
|           |       | 5 240            | -8.84                |      | -8.84  | -9.03   |      | -9.03  |
|           | NII 3 | 5 745            | -19.65               | 6.99 | -12.66 | -19.59  | 6.99 | -12.60 |
|           |       | 5 785            | -19.82               |      | -12.83 | -19.84  |      | -12.85 |
|           |       | 5 825            | -20.02               |      | -13.03 | -20.07  |      | -13.08 |
| TM3       | NII 1 | 5 190            | -13.32               | NA   | -13.32 | -13.28  | NA   | -13.28 |
|           |       | 5 230            | -13.42               |      | -13.42 | -13.62  |      | -13.62 |
|           | NII 3 | 5 755            | -23.60               | 6.99 | -16.61 | -23.79  | 6.99 | -16.80 |
|           |       | 5 795            | -24.38               |      | -17.39 | -24.46  |      | -17.47 |
| TM4       | NII 1 | 5 210            | -15.72               | NA   | -15.72 | -15.82  | NA   | -15.82 |
|           | NII 3 | 5 775            | -26.03               | 6.99 | -19.04 | -26.11  | 6.99 | -19.12 |

Note1: The intent is to test at 100 % duty cycle.

Note2: NII 3 [T.F] =  $10 \cdot \log(500\text{kHz}/100\text{kHz}) + \text{DCCF}$

Note3: Test Result = Measurement Data + T.F