# RF Test Report
## 5 GHz WLAN

| | | |
|---|---|---|
| **Report No.** | : | FCCCMKP-WAY-P23090062-2 |
| **Customer** | : | DAVOLINK Inc. |
| **Address** | : | 112, Beolmal-ro, Dongan-gu Anyang-si, Gyeounggi-do South Korea 14057 |
| **Use of Report** | : | Certification |
| **Model Name** | : | DVW-632 |
| **FCC ID** | : | RZEDVW-632 |
| **Date of Test** | : | 2023.09.06 to 2023.10.06 |
| **Test Method Used** | : | FCC 47 CFR PART 15 Subpart E (Section §15.407)<br>KDB 789033 D02 v02r01<br>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 : Donghwa SHIN (Signature)

Technical Manager

Name : Jungwoo Kim (Signature)

**2023. 10. 10**

**BV CPS ADT Korea Ltd.**

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.

## RELEASE CONTROL RECORD

| REPORT NO. | REASON FOR CHANGE | DATE ISSUED |
|---|---|---|
| FCCCMKP-WAY-P23090062-2 | Original release | 2023.10.10 |
| | | |
| | | |

# Table of Contents

# 1 Summary of Test Results

The EUT has been tested according to the following specifications

| Applied Standard : FCC Part 15, Subpart E 15.407 (indoor access point) | | | | | |
|---|---|---|---|---|---|
| **FCC Part Section(s)** | **Test Description** | **Limit** | **Test Condition** | **Test Result** | **Reference** |
| 15.407(a) | Emission Bandwidth (26 dB Bandwidth) | N/A | Conduted | 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 : < 30.00 dBm<br><br>5250 ~ 5350 & 5470 ~ 5725 MHz : < 250 mW or < 11 + 10 log10(B) dBm, whichever power is less. (B is the 26dB BW.)<br><br>5725 ~ 5850 MHz : < 30 dBm | | PASS | Section 3.4 |
| 15.407(a) | Peak Power Spectral Density | 5150 ~ 5250 MHz : 17 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[Note3] | - |
| 15.407(b) | Undesirable Emissions | 5150 ~ 5725 MHz: < -27 dBm/MHz EIRP<br>5725 ~ 5850 MHz: < -27 dBm/MHz or < 10 dBm/MHz 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 Conduted | PASS | Section 3.8 |
| 15.203 | Antenna Requirement | FCC 15.203 | - | PASS | Section 3.1 |

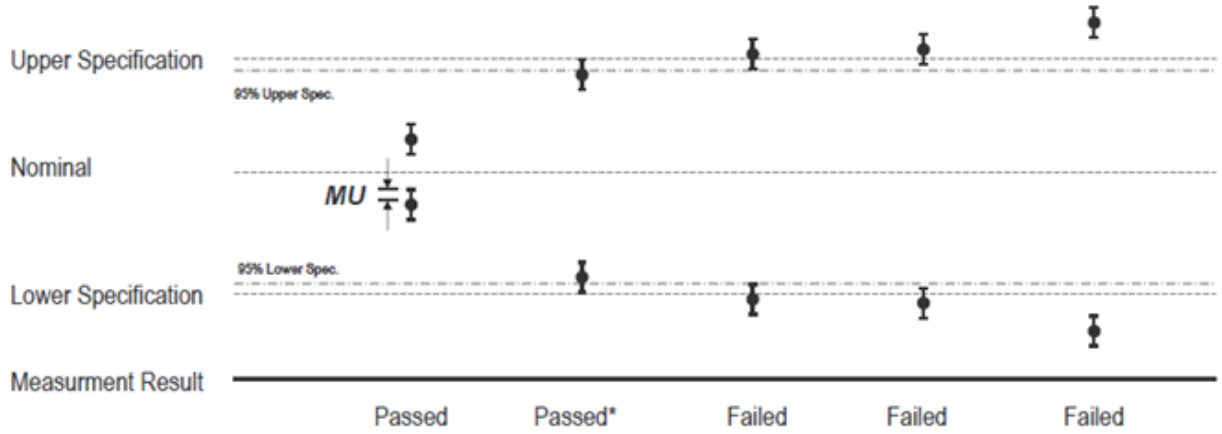
**NOTES**

**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 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 U = *k*Uc (*k* = 2) |
|---|---|---|
| Radiated Spurious Emissions | 9 kHz – 30 MHz | 2.00 |
| | 30 MHz – 1 GHz | 4.22 |
| | 1 GHz – 18 GHz | 5.40 |
| | 18 GHz – 26.5 GHz | 5.08 |
| **Measurement Items** | | **Expanded Uncertainty U = *k*Uc (*k* = 2)** |
| Conducted | Maximum Output Power | 1.20 |
| **Measurement Items** | **Frequency Range** | **Expanded Uncertainty U = *k*Uc (*k* = 2)** |
| AC Conducted Emissions | 150 kHz ~ 30 MHz | 3.10 |

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

| | | | |
|---|---|---|---|
| **Equipment Class** | Unlicensed National Information Infrastructure (NII) | | |
| **Product name** | KEVIN | | |
| **FCC ID** | RZEDVW-632 | | |
| **Model** | DVW-632 | | |
| **Additional model name** | - | | |
| **Power Supply** | DC 12 V | | |
| **Modulation Type** | OFDM : 802.11a/n(HT20, HT40)<br>: 802.11ac(VHT20, VHT40, VTH80)<br>: 802.11ax(HE20, HE40, HE80) | | |
| **Transfer Rate** | 6, 9, 12, 18, 24, 36, 48, 54 Mbps (802.11a) / SISO<br>MCS0 to MCS15 (802.11n) / MIMO(2TX)<br>MCS0 to MCS9 (802.11ac) / MIMO(2TX)<br>MCS0 to MCS11 (802.11ax) / MIMO(2TX) | | |
| **Operating Frequency** | NII 1: 5 180 MHz to 5 240 MHz<br>NII 3: 5 745 MHz to 5 825 MHz | | |
| **Output Power (Conducted Power)** | NII 1: 15.01 dBm<br>NII 3: 20.33 dBm | | |
| **Antenna Type** | PCB Antenna | | |
| **Antenna Gain** | ANT 1 | ANT 2 | Direction gain NOTE3 |
| | NII 1: 5.76 dBi<br>NII 3: 6.58 dBi | NII 1: 6.43 dBi<br>NII 3: 6.55 dBi | NII 1: 6.11 dBi<br>NII 3: 6.57 dBi |
| **H/W Version** | 1.1 | | |
| **S/W Version** | r7331 | | |

**NOTE 1:** For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

**NOTE 2:** For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

**NOTE 3:** Directional gain (completely uncorrelated signal with unequal antenna gain and equal transmit power)
$10 \log [ ( 10^{G1/10} + 10^{G2/10} + \ldots + 10^{GN/10} ) / N^{ANT} ]$ dBi

## 2.2 Tested sample and Tested companion device information

| Type | Model | Note |
|---|---|---|
| Test sample (Conducted) | DVW-632 | S/N: DVW632IA20CDD01007 |
| Test sample (Radiated) | DVW-632 | S/N: DVW632IA20CDD01012 |

## 2.3 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 | 6Mbps |
| **TM 2** Note 1 | 802.11n(HT20) | MCS 8 |
| **TM 2** Note 1 **(Tested)** | 802.11ac(VHT20) | MCS 0 NSS 2 |
| **TM 3** | 802.11ax(HE20) | MCS 0 NSS 2 |
| **TM 4** Note 1 | 802.11n(HT40) | MCS 8 |
| **TM 4** Note 1 **(Tested)** | 802.11ac(VHT40) | MCS 0 NSS 2 |
| **TM 5** | 802.11ax(HE40) | MCS 0 NSS 2 |
| **TM 6** | 802.11ac(VHT80) | MCS 0 NSS 2 |
| **TM 7** | 802.11ax(HE80) | MCS 0 NSS 2 |

Note1: Tested at high output power of 802.11n, 802.11ac.
Note2: 802.11a mode support SISO and other mode support MIMO.

## 2.4 Tested Frequency Information

| 5 GHz Band | Mode | Tested Frequency (MHz) | | |
|---|---|---|---|---|
| NII 1 | 802.11a/n(HT20) ac(VHT20)/ax(HE20) | 5 180 | 5 200 | 5 240 |
| | 802.11n(HT40)/(VHT40) (HE40) | 5 190 | 5 230 | - |
| | 802.11ac(VHT80)/ax(HE80) | 5 210 | - | - |
| NII 3 | 802.11a/n(HT20) ac(VHT20)/ax(HE20) | 5 745 | 5 785 | 5 825 |
| | 802.11n(HT40)/(VHT40) (HE40) | 5 755 | 5 795 | - |
| | 802.11ac(VHT80)/ax(HE80) | 5 775 | - | - |

## 2.4 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.

## 2.5 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 E (§15.407)**
**KDB 789033 D02 General UNII Test Procedures New Rules v02r01**
**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.

| Equipment Name | Manufacturer | Model No. | Serial No. | Next Cal. Date |
|---|---|---|---|---|
| True-RMS Digital Multimeter | Fluke | 177 | 43240434 | 2024-05-25 |
| MXG Vector Signal Generator | Keysight Technologies | N5182B | MY53051310 | 2023-11-22 |
| Signal Generator | R&S | SMB100A | MY41006053 | 2024-05-25 |
| DC Power Supply | Agilent | 6674A | 3637A01457 | 2023-11-22 |
| Active Loop Antenna | R&S | HFH2-Z2E | 100881 | 2025-02-03 |
| Trilog Antenna (with 6 dB ATT.) | Schwarzbeck | VULB 9163 | 1100 | 2025-02-08 |
| Horn Antenna | R&S | HF907 | 102773 | 2023-12-22 |
| BBHA 9170 Broad-Band Horn Antenna | Schwarzbeck | BBHA9170 | 00955 | 2023-11-30 |
| Signal Conditioning Unit | R&S | SCU-18F | 180112 | 2023-11-21 |
| Signal Conditioning Unit | R&S | SCU08F2 | 08400015 | 2023-11-21 |
| Amplifier | L3 Narda-MITEQ | JS44-18004000-33-8P | 2142086 | 2023-11-22 |
| EMI Test Receiver | R&S | ESW8 | 101170 | 2023-11-21 |
| EMI Test Receiver | R&S | ESW44 | 101812 | 2023-11-22 |
| Spectrum Analyzer | R&S | FSW50 | 101403 | 2023-11-22 |
| Signal Analyzer | Keysight Technologies | N9020B | MY62150135 | 2024-05-25 |
| Signal Analyzer | Keysight Technologies | N9030B | MY57142476 | 2023-11-22 |
| Humidity Barometer TEMP Meter | LUTRON | MHB-382SD | AJ.38459 | 2023-11-29 |
| Humidity Barometer TEMP Meter | LUTRON | MHB-382SD | AJ.38482 | 2023-11-22 |
| Attenuator | API inmet | 40AH2W-10 | 2 | 2024-05-26 |
| High Pass Filter | Micro-Tronics | HPM17543 | 28 | 2024-05-25 |
| Open Switch and Control Unit | R&S | OSP120 | 102245 | - |
| MIMO Power Set Master | Keysight Technologies | MP400B | 206625 | 2023-12-02 |
| LISN | R&S | ENV216 | 102437 | 2023-11-22 |
| EMI Test Receiver | R&S | ESR | 102529 | 2023-11-21 |
| EMC 32(CE) | R&S | EMC32 | Version 10.50.40 | - |
| EMC 32(RSE) | R&S | EMC32 | Version 10.35.10 | - |

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# 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 of the EUT is attached to the UFL Type. (FPC Antenna)

**Result**
The EUT complies with the requirement of §15.203

## 3.2 26 dB Bandwidth

### 3.2.1 Test Procedure

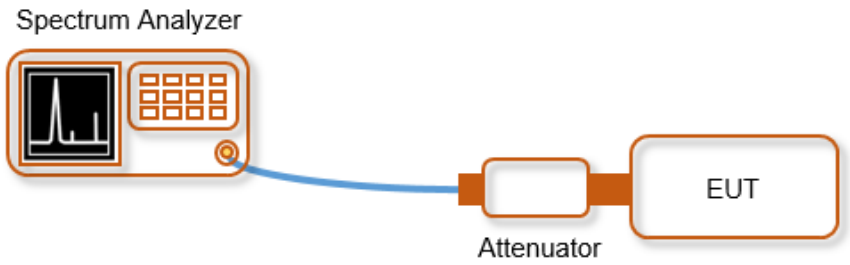
The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies. The 26 dB bandwidth is used to determine the conducted output power limit.

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

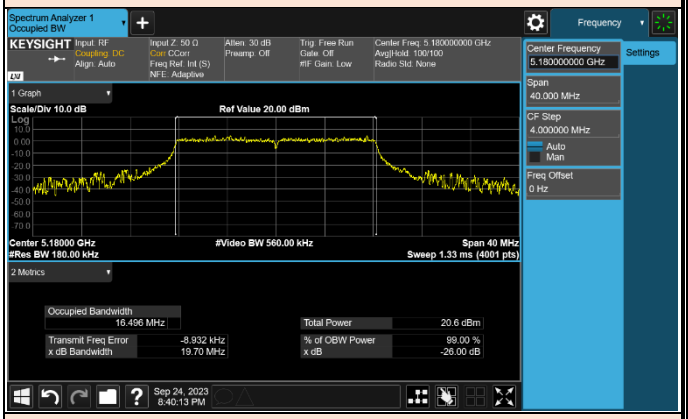
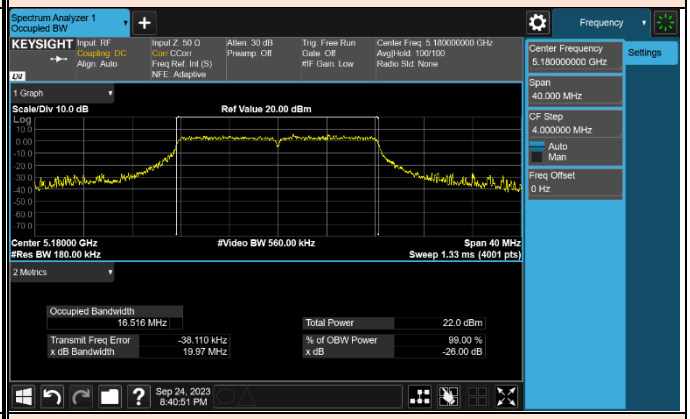
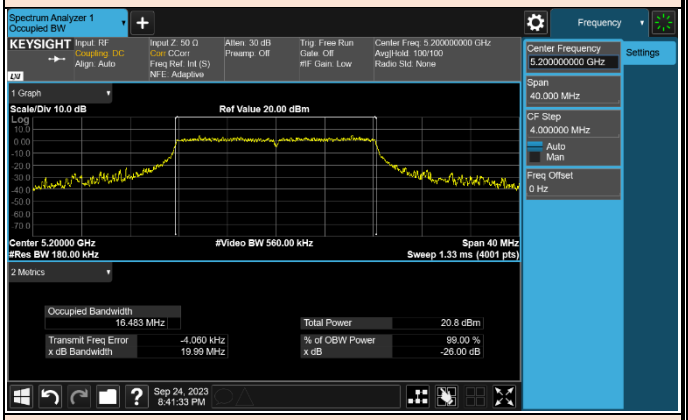
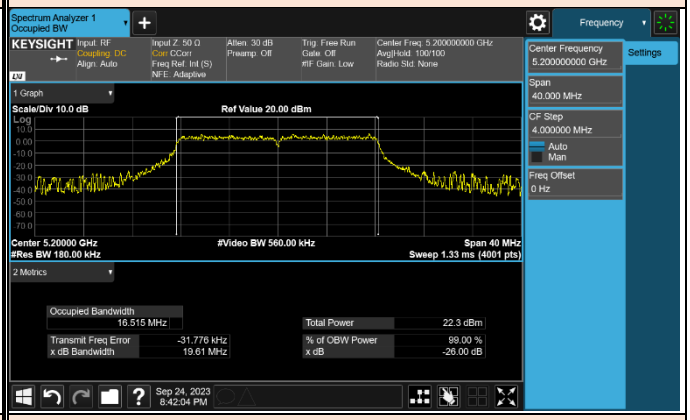
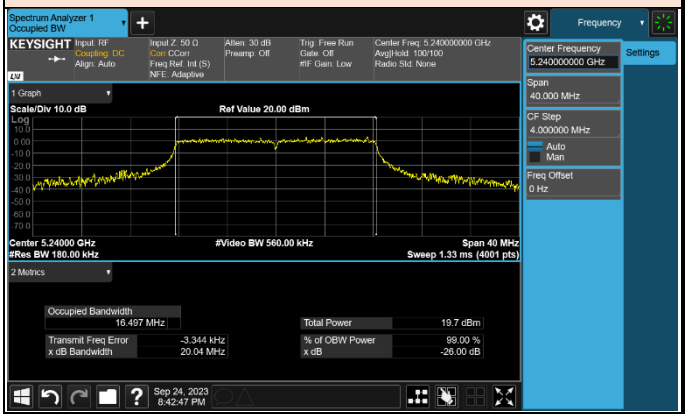
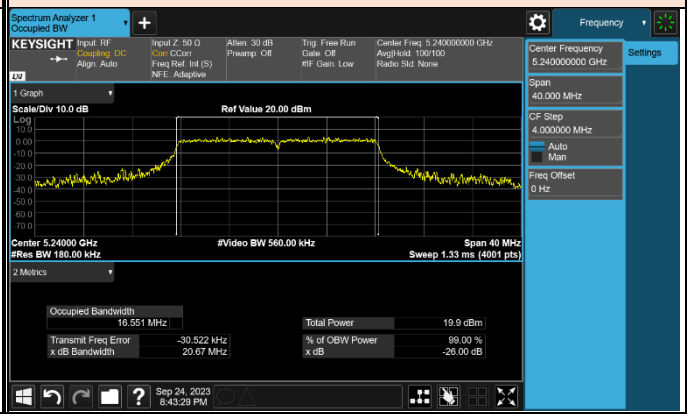


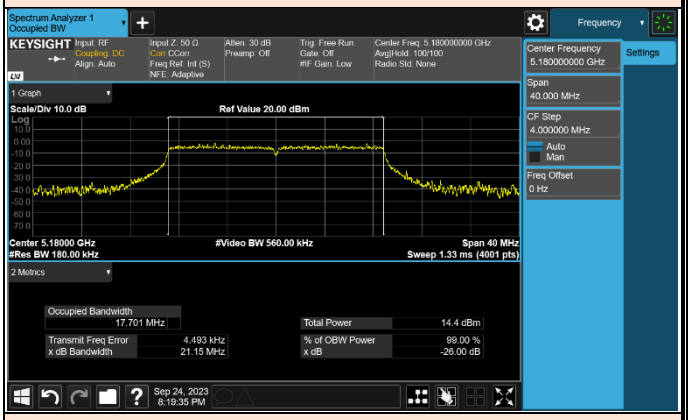
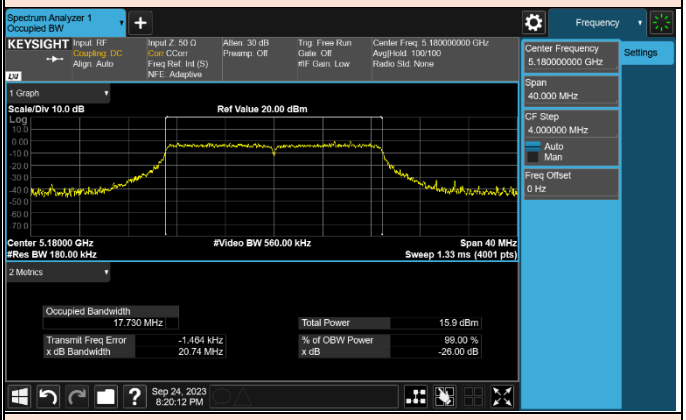
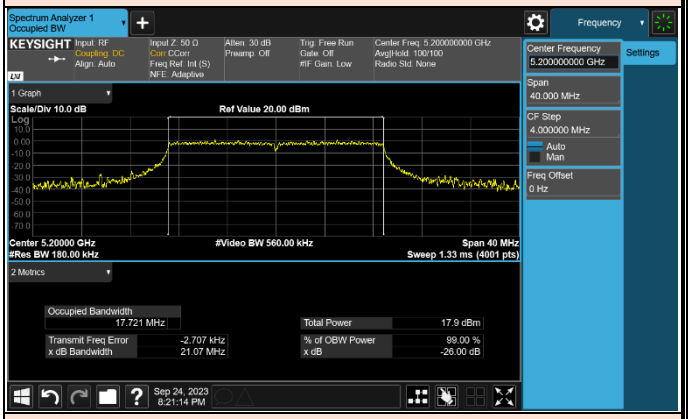
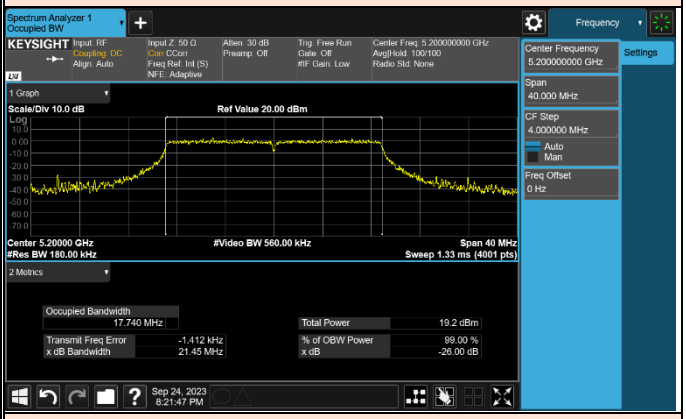
### 3.2.3 Test Result

**[Test Data of 26 dB Bandwidth]**

| Test Mode | Band | Tested Frequency [MHz] | 26 dB Bandwidth [MHz] | |
|---|---|---|---|---|
| | | | ANT1 | ANT2 |
| **TM 1** | NII 1 | 5 180 | 19. 70 | 19. 97 |
| | | 5 200 | 19. 99 | 19. 61 |
| | | 5 240 | 20. 04 | 20. 67 |
| **TM 2** | NII 1 | 5 180 | 21. 15 | 20. 74 |
| | | 5 200 | 21. 07 | 21. 45 |
| | | 5 240 | 20. 88 | 20. 81 |
| **TM 3** | NII 1 | 5 180 | 21. 61 | 22. 09 |
| | | 5 200 | 25. 94 | 21. 78 |
| | | 5 240 | 21. 58 | 21. 55 |
| **TM 4** | NII 1 | 5 190 | 42. 26 | 43. 41 |
| | | 5 230 | 41. 83 | 43. 48 |
| **TM 5** | NII 1 | 5 190 | 42. 06 | 57. 34 |
| | | 5 230 | 43. 99 | 42. 61 |
| **TM 6** | NII 1 | 5 210 | 87. 06 | 87. 20 |
| **TM 7** | NII 1 | 5 210 | 85. 05 | 87. 07 |

## [Test Plot of 26 dB Bandwidth]

| TM 1 _ NII 1 | |
|---|---|
| **ANT 1** | **ANT 2** |
| **5 180 MHz** | **5 180 MHz** |
|  |  |
| **5 200 MHz** | **5 200 MHz** |
|  |  |
| **5 240 MHz** | **5 240 MHz** |
|  |  |

| TM 2 _ NII 1 | |
|---|---|
| **ANT 1** | **ANT 2** |
| **5 180 MHz** | **5 180 MHz** |
|  |  |
| **5 200 MHz** | **5 200 MHz** |
|  |  |
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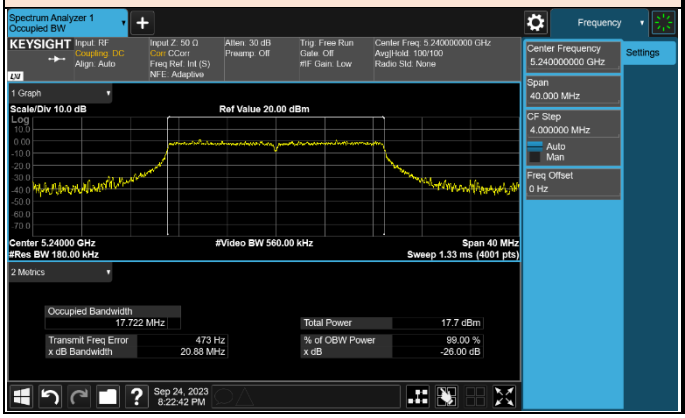
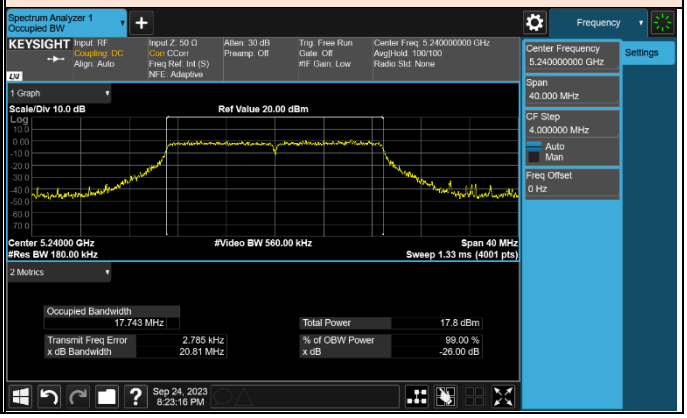
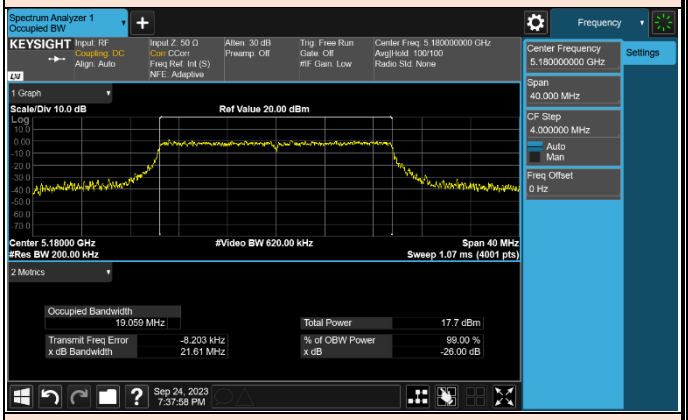
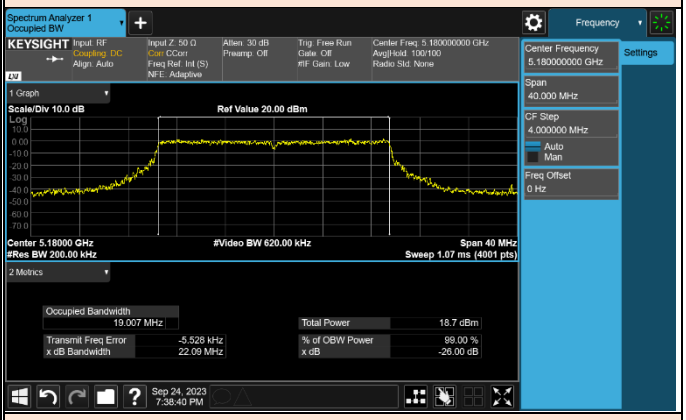
|  |  |

| TM 3 _ NII 1 | |
|---|---|
| **ANT 1** | **ANT 2** |
| **5 180 MHz** | **5 180 MHz** |
|  |  |
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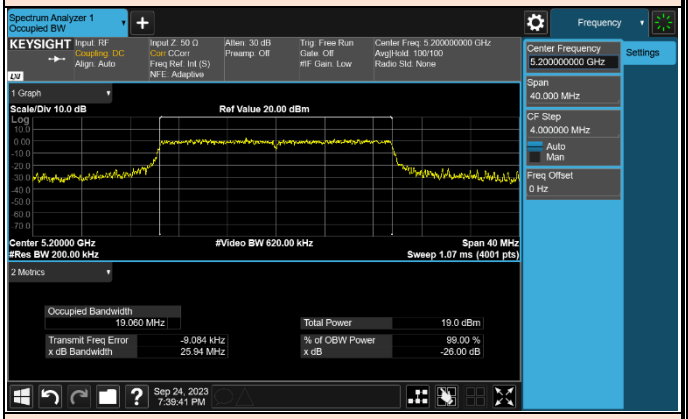
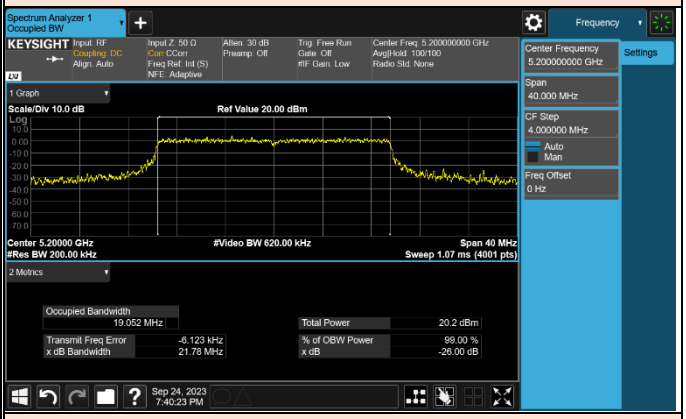
|  |  |
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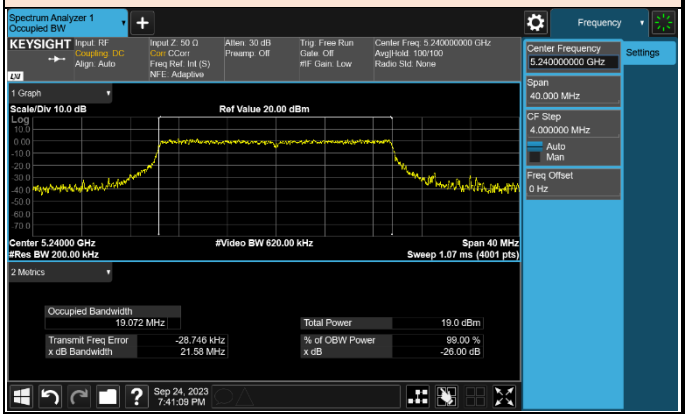
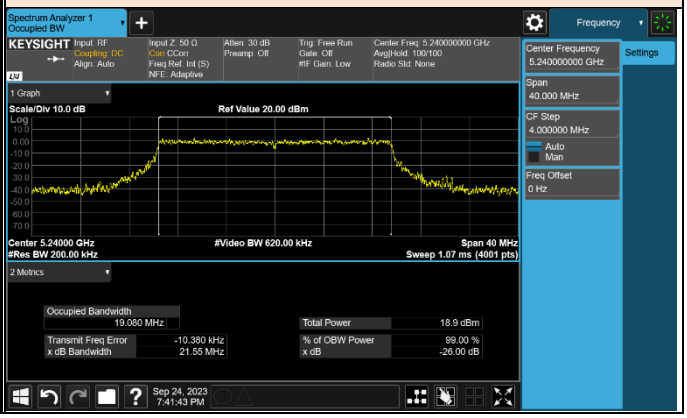
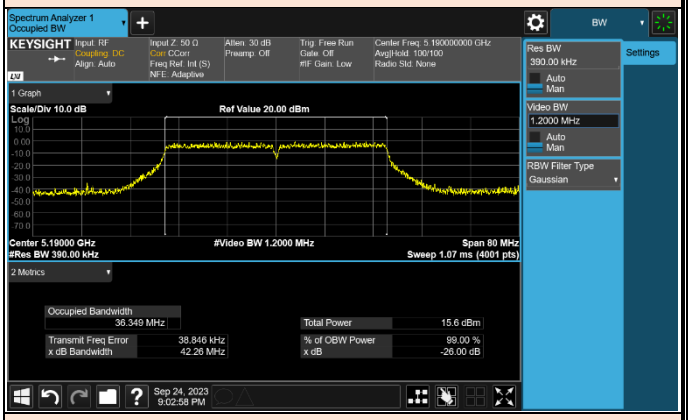
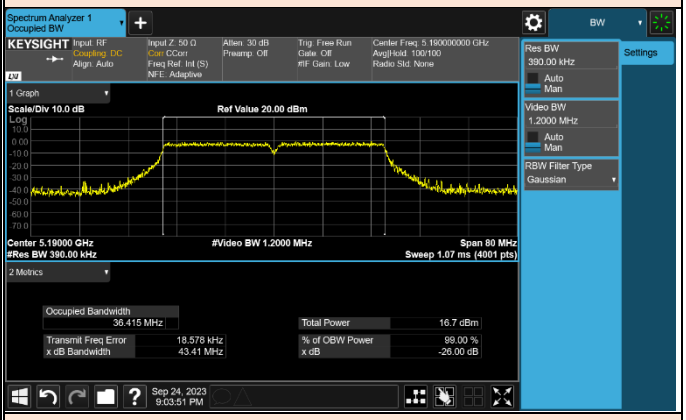
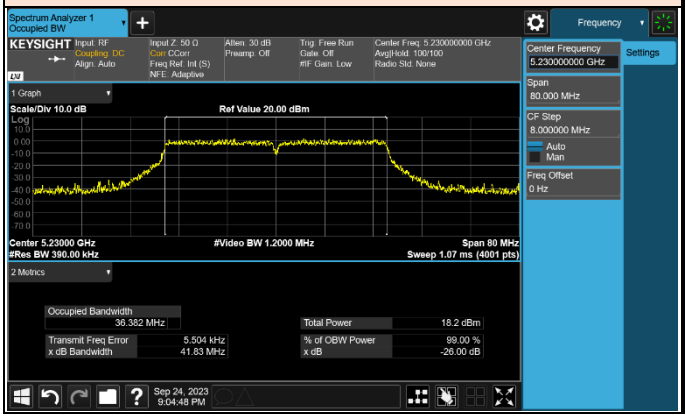
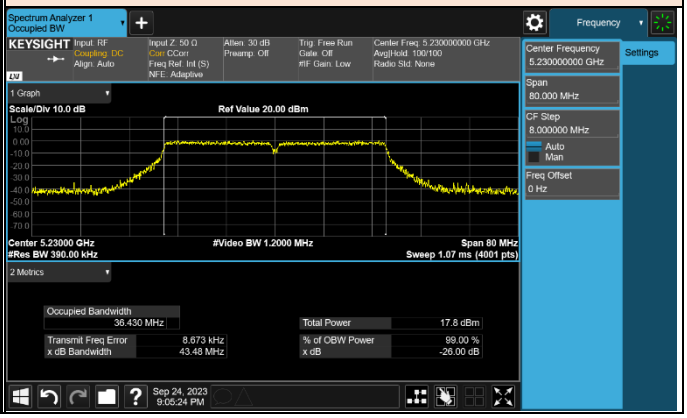
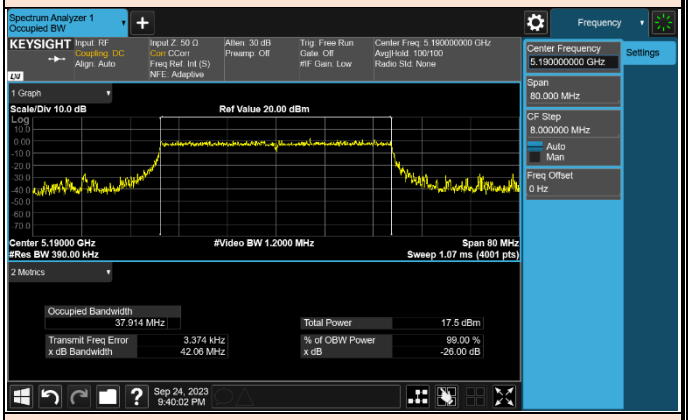
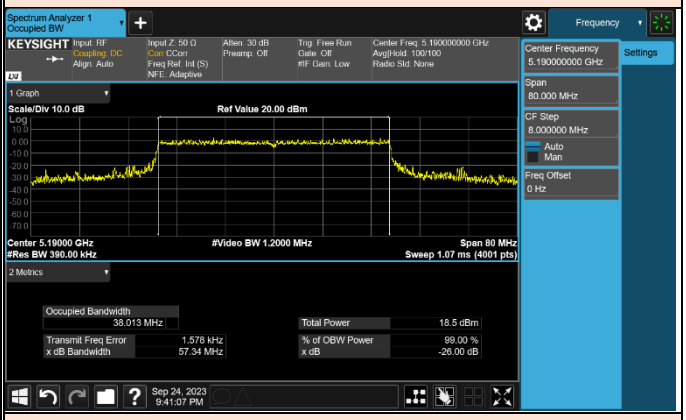
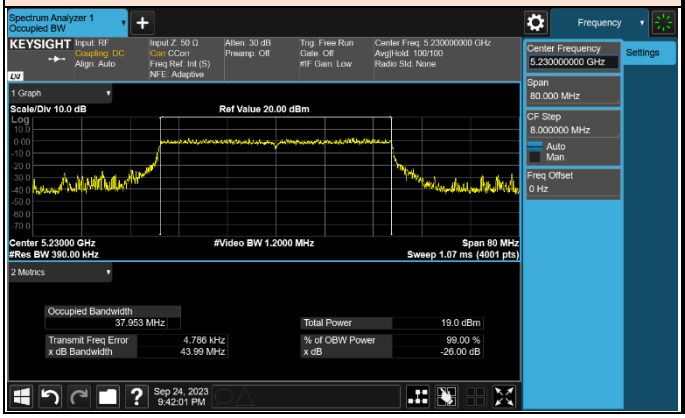
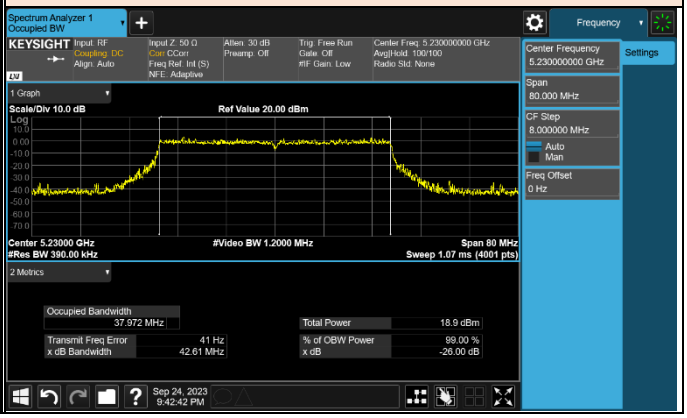
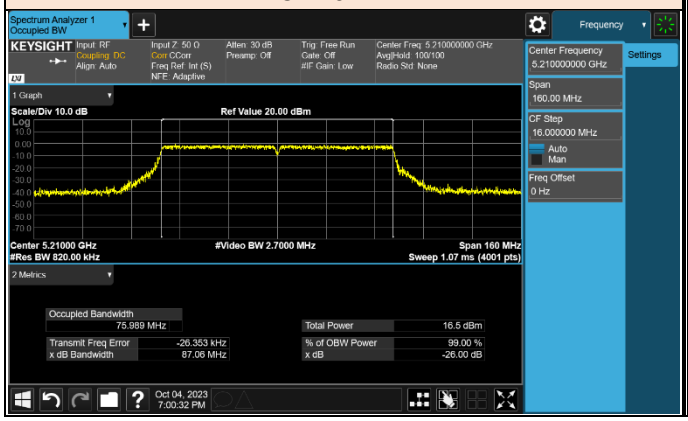
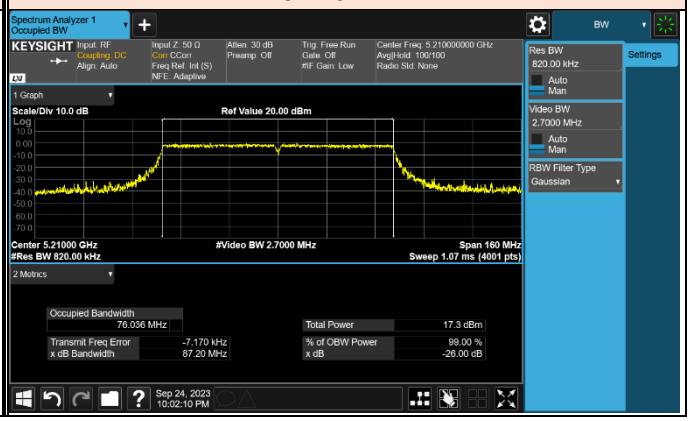
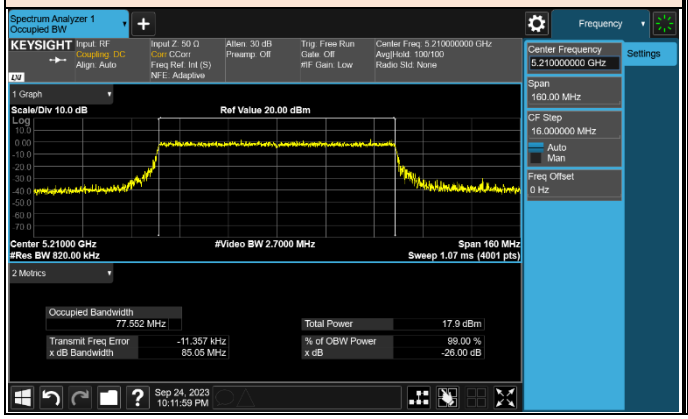
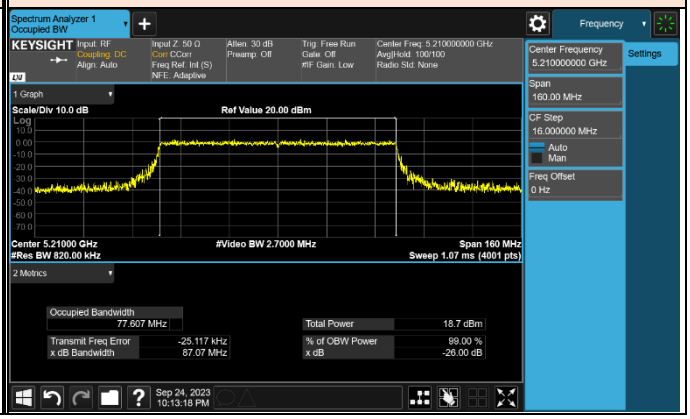
|  |  |

| TM 4 _ NII 1 | |
|---|---|
| **ANT 1** | **ANT 2** |
| **5 190 MHz** | **5 190 MHz** |
|  |  |
| **5 230 MHz** | **5 230 MHz** |
|  |  |

| TM 5 _ NII 1 | |
|---|---|
| **ANT 1** | **ANT 2** |
| **5 190 MHz** | **5 190 MHz** |
|  |  |
| **5 230 MHz** | **5 230 MHz** |
|  |  |

| TM 6 _ NII 1 | |
|---|---|
| ANT 1 | ANT 2 |
| 5 210 MHz | 5 210 MHz |
|  |  |



| TM 7 _ NII 1 | |
|---|---|
| ANT 1 | ANT 2 |
| 5 210 MHz | 5 210 MHz |
|  |  |

## 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.

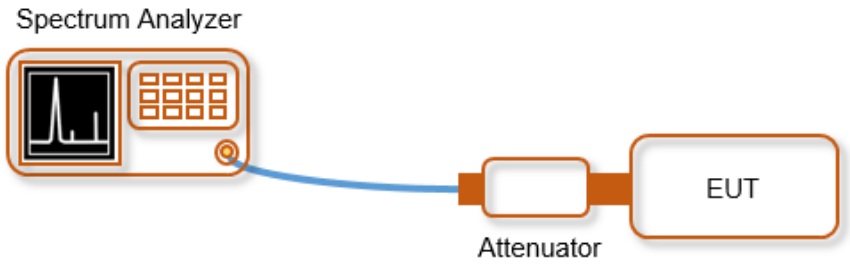
### 3.3.2 Test Procedure

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 ≥ 3 x 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

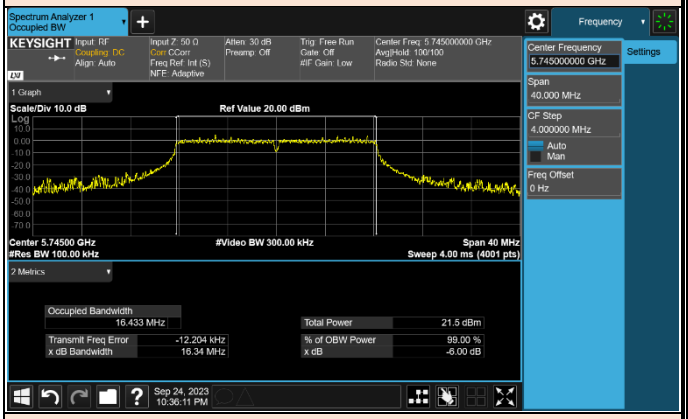
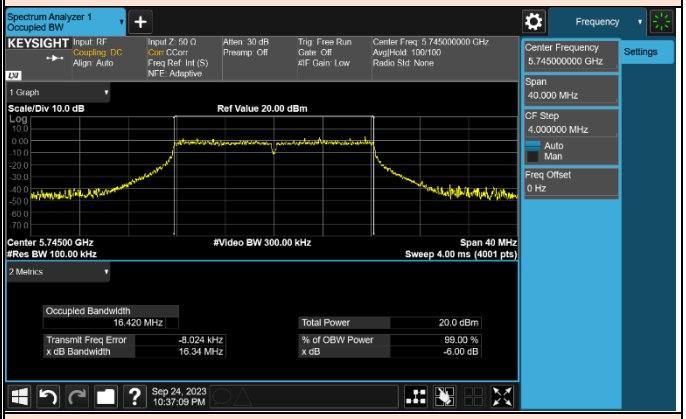
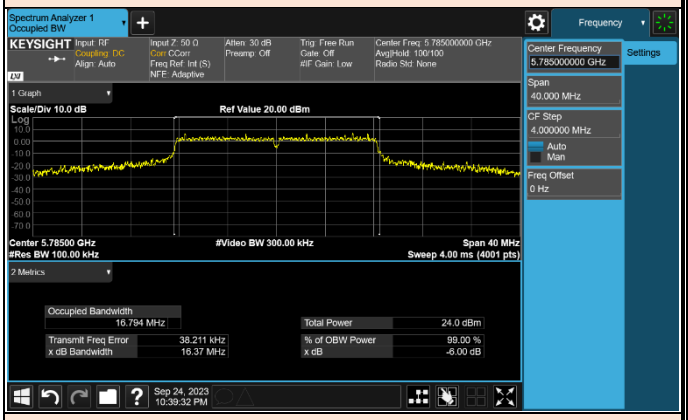
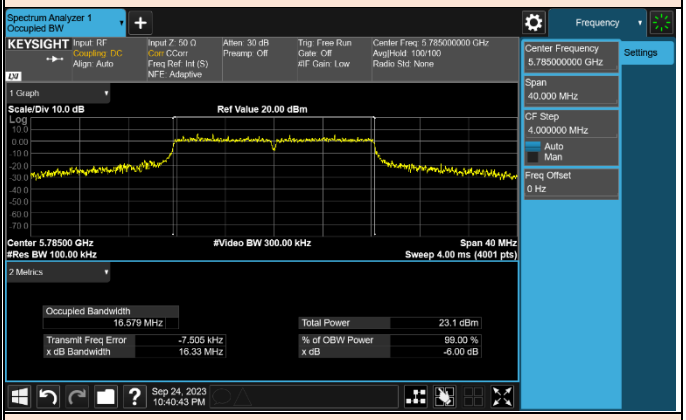
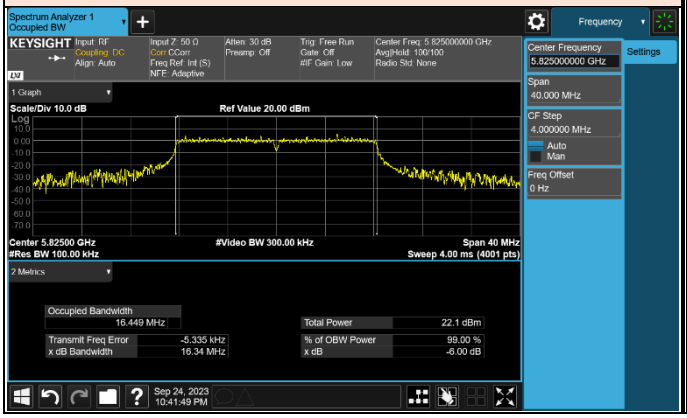
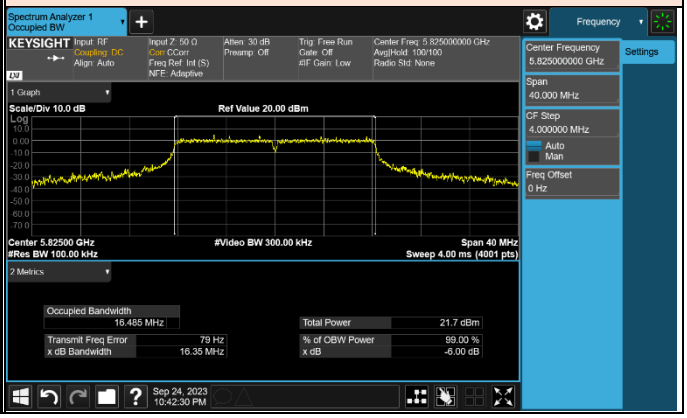


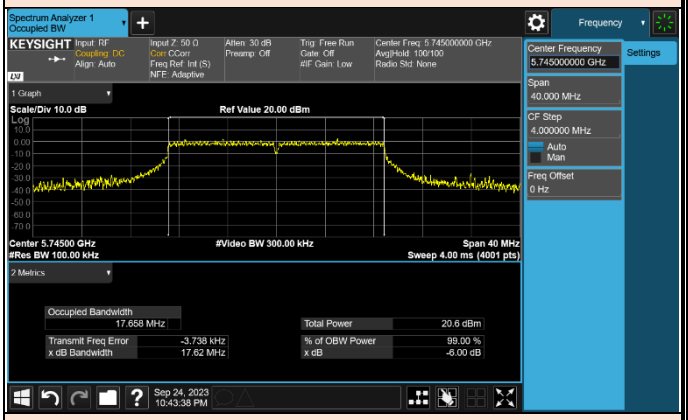
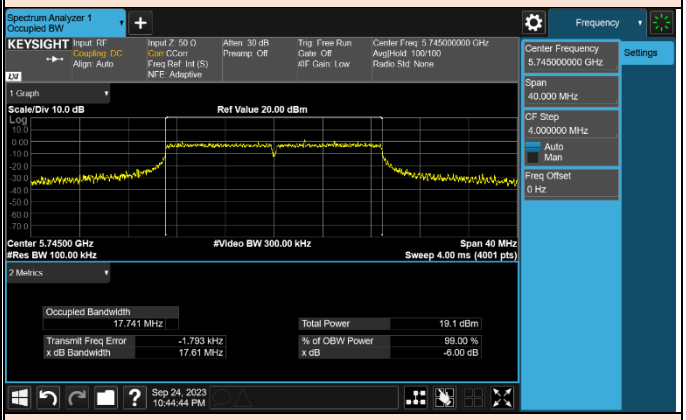
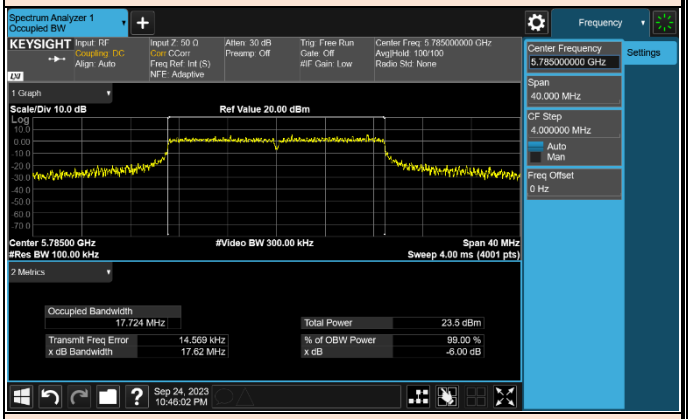
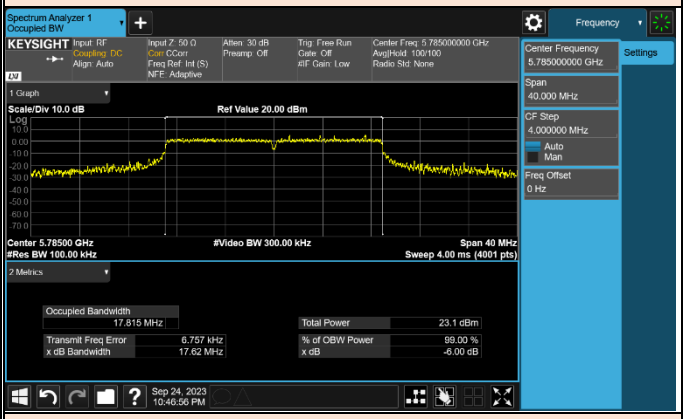
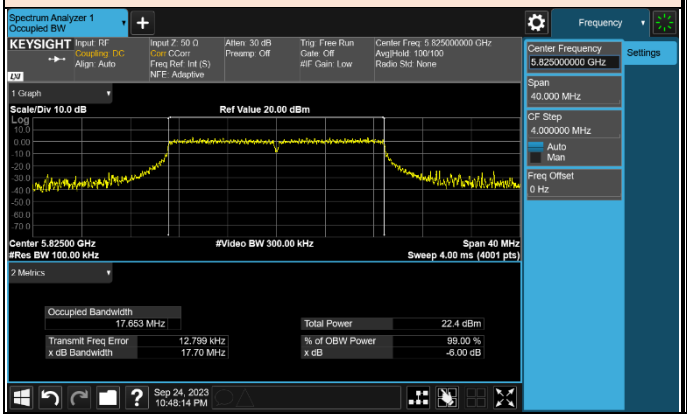
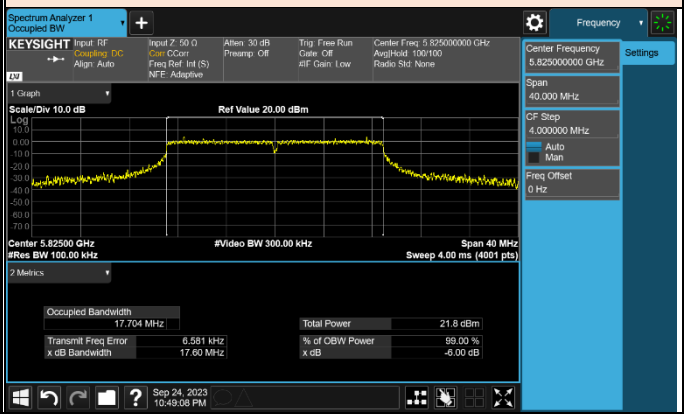
### 3.3.4 Test Result

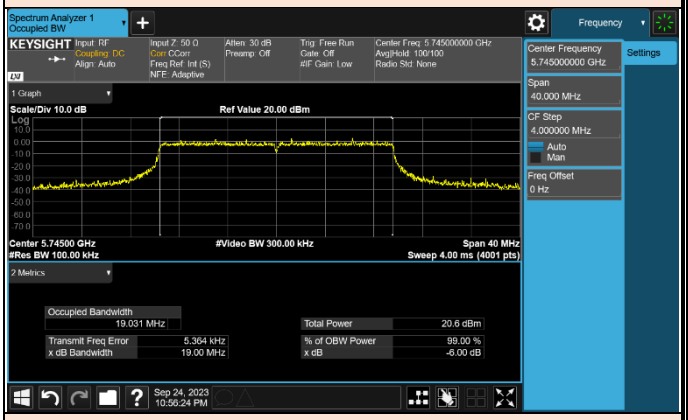
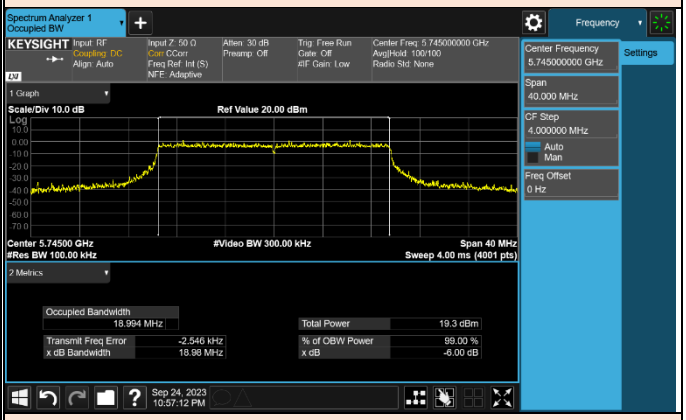
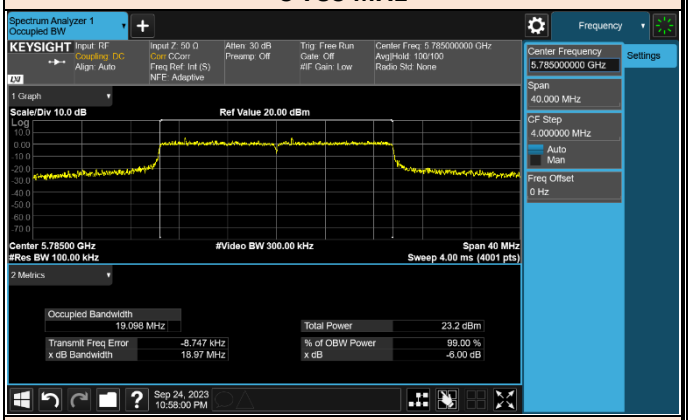
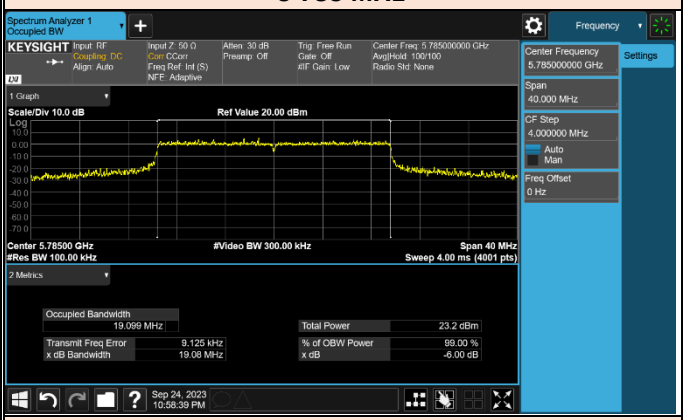
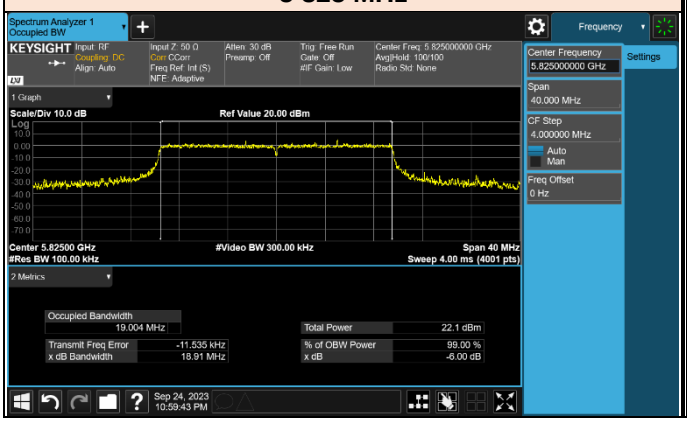
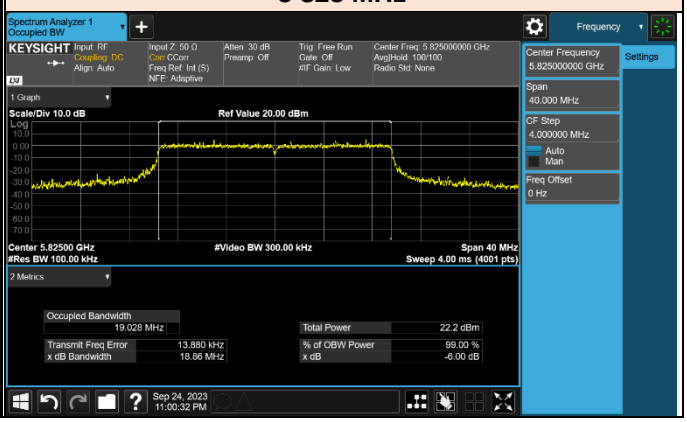
**[Test Data of 6 dB Bandwidth]**

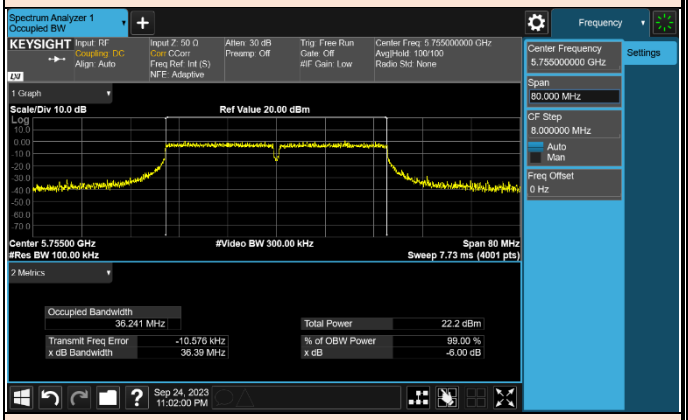
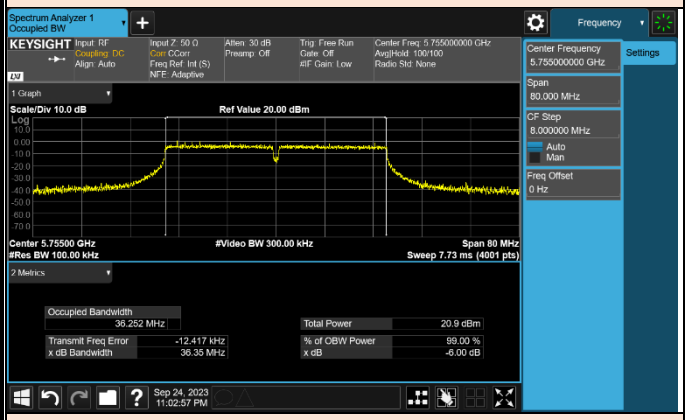
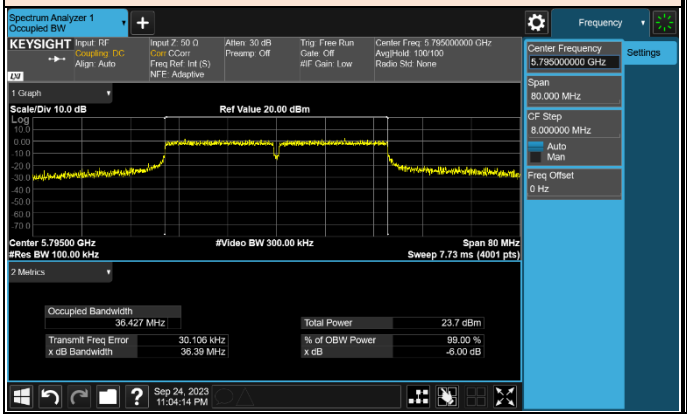
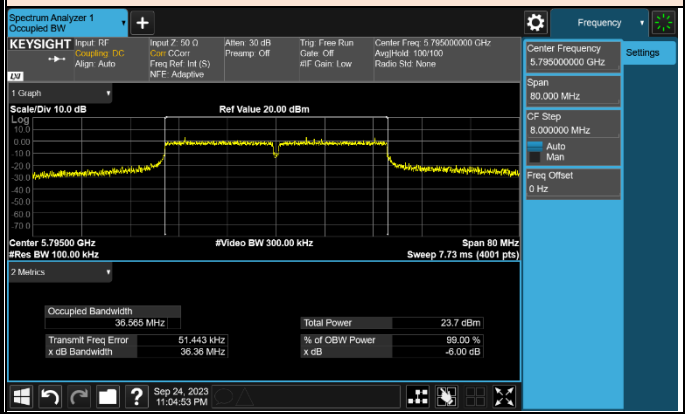
| Test Mode | Tested Frequency [MHz] | 6 dB Bandwidth [MHz] | |
|---|---|---|---|
| | | ANT 1 | ANT 2 |
| TM1 | 5 745 | 16.34 | 16.34 |
| | 5 785 | 16.37 | 16.33 |
| | 5 825 | 16.34 | 16.35 |
| TM2 | 5 745 | 17.62 | 17.61 |
| | 5 785 | 17.62 | 17.62 |
| | 5 825 | 17.70 | 17.60 |
| TM3 | 5 745 | 19.00 | 18.98 |
| | 5 785 | 18.97 | 19.08 |
| | 5 825 | 18.91 | 18.86 |
| TM4 | 5 755 | 36.39 | 36.35 |
| | 5 795 | 36.39 | 36.36 |
| TM5 | 5 755 | 37.85 | 38.15 |
| | 5 795 | 38.03 | 38.00 |
| TM6 | 5 775 | 76.37 | 76.38 |
| TM7 | 5 775 | 77.86 | 78.09 |

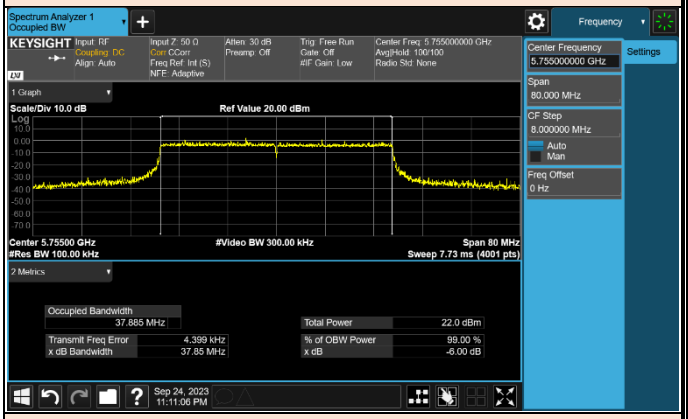
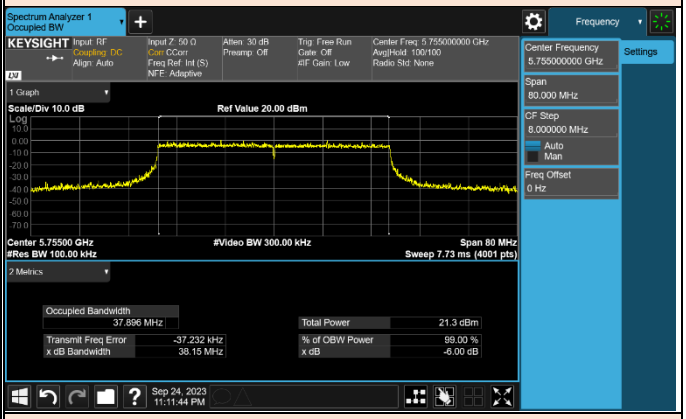
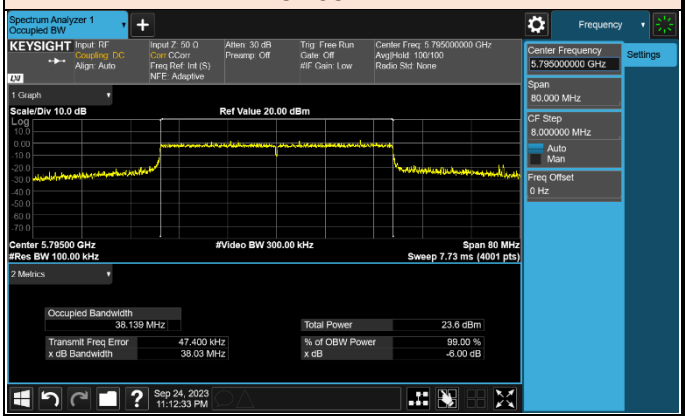
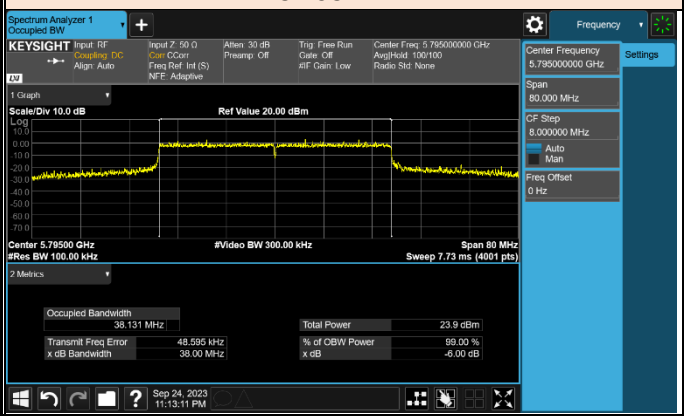
## [Test Plot of 6 dB Bandwidth]

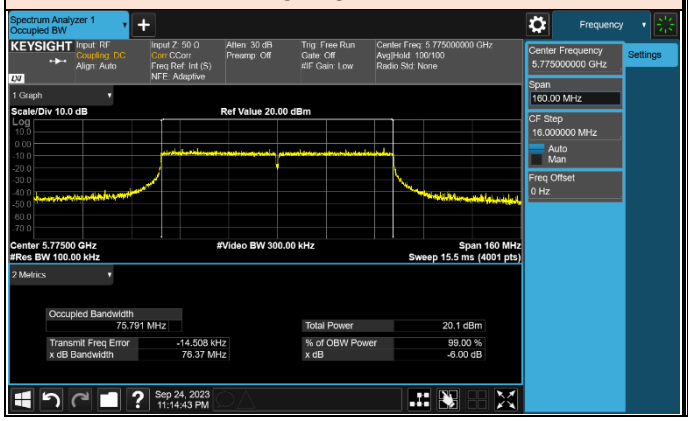
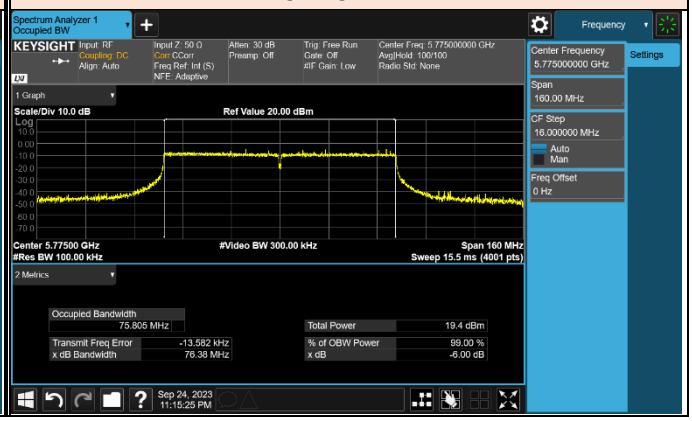
| TM 1 _ NII 3 | |
|---|---|
| **ANT 1** | **ANT 2** |
| **5 745 MHz** | **5 745 MHz** |
|  |  |
| **5 785 MHz** | **5 785 MHz** |
|  |  |
| **5 825 MHz** | **5 825 MHz** |
|  |  |

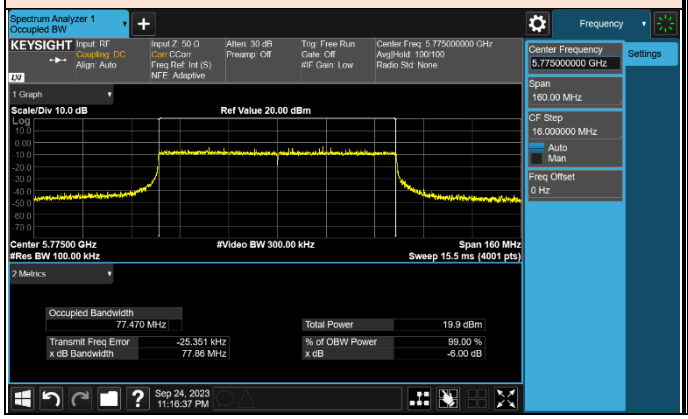
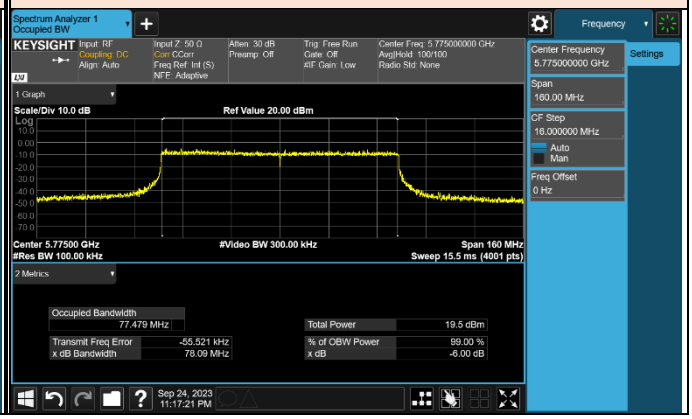
| TM 2 _ NII 3 | |
|---|---|
| **ANT 1** | **ANT 2** |
| **5 745 MHz** | **5 745 MHz** |
|  |  |
| **5 785 MHz** | **5 785 MHz** |
|  |  |
| **5 825 MHz** | **5 825 MHz** |
|  |  |

| TM 3 _ NII 3 | |
|---|---|
| **ANT 1** | **ANT 2** |
| **5 745 MHz** | **5 745 MHz** |
|  |  |
| **5 785 MHz** | **5 785 MHz** |
|  |  |
| **5 825 MHz** | **5 825 MHz** |
|  |  |

| TM 4 _ NII 3 | |
|---|---|
| **ANT 1** | **ANT 2** |
| **5 755 MHz** | **5 755 MHz** |
|  |  |
| **5 795 MHz** | **5 795 MHz** |
|  |  |

| TM 5 _ NII 3 | |
|---|---|
| **ANT 1** | **ANT 2** |
| **5 755 MHz** | **5 755 MHz** |
|  |  |
| **5 795 MHz** | **5 795 MHz** |
|  |  |

| TM 6 _ NII 3 | |
|---|---|
| **ANT 1** | **ANT 2** |
| **5 775 MHz** | **5 775 MHz** |
|  |  |

| TM 7 _ NII 3 | |
|---|---|
| **ANT 1** | **ANT 2** |
| **5 775 MHz** | **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 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**.

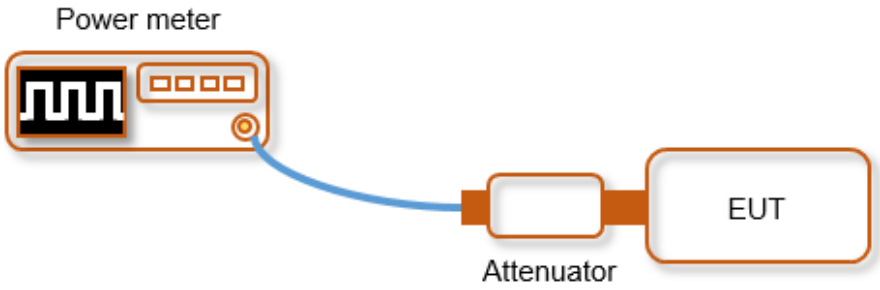
(3) **For the band 5.725 - 5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced 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:**

| 5 GHz Band | Power Limit [mW] | Calculated Limit [dBm] | Direction gain [dBi] | Conducted Limit [dBm] |
|---|---|---|---|---|
| NII 1 | 1000 | 30.00 | 6.11 | **29.89** |
| NII 3 | 1000 | 30.00 | 6.57 | **29.43** |

Note1: B is the 26 dB emission bandwidth in megahertz.

| Test Mode | Band | Tested Frequency [MHz] | Measured Power [dBm] | | |
|---|---|---|---|---|---|
| | | | ANT1 | ANT2 | MIMO |
| 802.11a | NII 1 | 5 180 | 11. 43 | 10. 94 | NA |
| | | 5 200 | 11. 28 | 10. 45 | |
| | | 5 240 | 11. 16 | 12. 01 | |
| | NII 3 | 5 745 | 19. 57 | 18. 49 | |
| | | 5 785 | 19. 07 | 19. 47 | |
| | | 5 825 | 19. 26 | 19. 58 | |
| 802.11n(HT20) | NII 1 | 5 180 | 10. 31 | 8. 51 | 12. 51 |
| | | 5 200 | 11. 21 | 10. 87 | 14. 05 |
| | | 5 240 | 11. 17 | 11. 98 | 14. 60 |
| | NII 3 | 5 745 | 15. 69 | 16. 92 | 19. 36 |
| | | 5 785 | 16. 78 | 17. 01 | 19. 91 |
| | | 5 825 | 16. 35 | 16. 17 | 19. 27 |
| 802.11ac(VHT20) | NII 1 | 5 180 | 10. 27 | 8. 50 | 12. 48 |
| | | 5 200 | 11. 25 | 10. 98 | 14. 13 |
| | | 5 240 | 11. 31 | 12. 01 | 14. 68 |
| | NII 3 | 5 745 | 15. 74 | 16. 67 | 19. 24 |
| | | 5 785 | 16. 70 | 17. 03 | 19. 88 |
| | | 5 825 | 16. 44 | 16. 06 | 19. 26 |
| 802.11ax(HE20) | NII 1 | 5 180 | 12. 32 | 10. 61 | 14. 56 |
| | | 5 200 | 11. 43 | 11. 04 | 14. 25 |
| | | 5 240 | 10. 47 | 11. 15 | 13. 83 |
| | NII 3 | 5 745 | 15. 71 | 16. 68 | 19. 23 |
| | | 5 785 | 17. 30 | 17. 34 | 20. 33 |
| | | 5 825 | 16. 53 | 16. 07 | 19. 32 |

| Test Mode | Band | Tested Frequency [MHz] | Measured Power [dBm] | | |
|---|---|---|---|---|---|
| | | | ANT1 | ANT2 | MIMO |
| 802.11n(HT40) | NII 1 | 5 190 | 10. 13 | 8. 51 | 12. 41 |
| | | 5 230 | 11. 26 | 12. 41 | 14. 88 |
| | NII 3 | 5 755 | 16. 30 | 16. 89 | 19. 62 |
| | | 5 795 | 16. 98 | 17. 21 | 20. 11 |
| 802.11ac(VHT40) | NII 1 | 5 190 | 10. 19 | 8. 52 | 12. 45 |
| | | 5 230 | 11. 27 | 12. 63 | 15. 01 |
| | NII 3 | 5 755 | 16. 26 | 16. 66 | 19. 47 |
| | | 5 795 | 16. 93 | 17. 09 | 20. 02 |
| 802.11ax(HE40) | NII 1 | 5 190 | 10. 98 | 9. 58 | 13. 35 |
| | | 5 230 | 11. 27 | 12. 57 | 14. 98 |
| | NII 3 | 5 755 | 14. 16 | 13. 84 | 17. 01 |
| | | 5 795 | 16. 95 | 17. 12 | 20. 05 |
| 802.11ac(VHT80) | NII 1 | 5 210 | 9. 33 | 7. 89 | 11. 68 |
| | NII 3 | 5 775 | 13. 68 | 13. 22 | 16. 47 |
| 802.11ax(HE80) | NII 1 | 5 210 | 10. 60 | 9. 34 | 13. 03 |
| | NII 3 | 5 775 | 13. 82 | 13. 38 | 16. 62 |

## 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.

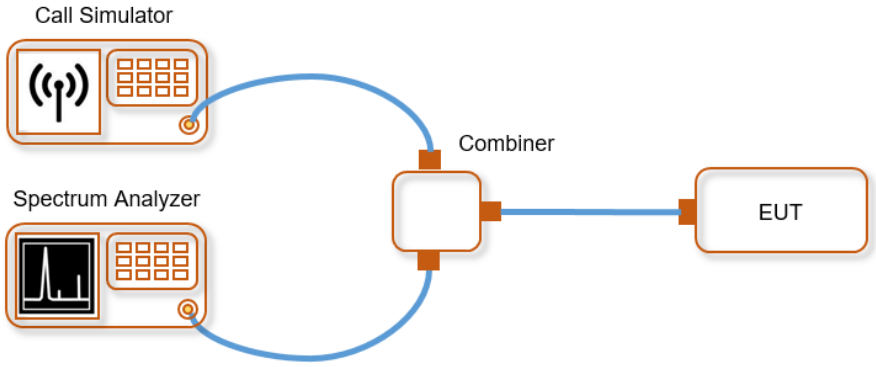
4) The result is the Maximum PSD over 1 MHz reference bandwidth.

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 ≥ 1 / T, where T is defined in section II.B.1.a). (Refer to Appendix II)
b) Set VBW ≥ 3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log(500 kHz / RBW) to the measured result, whereas RBW (< 500 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 MHz / RBW) to the measured result, whereas RBW (< 1 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 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]**

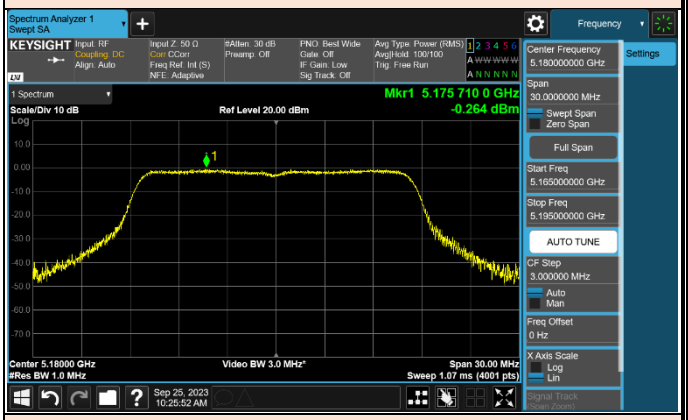
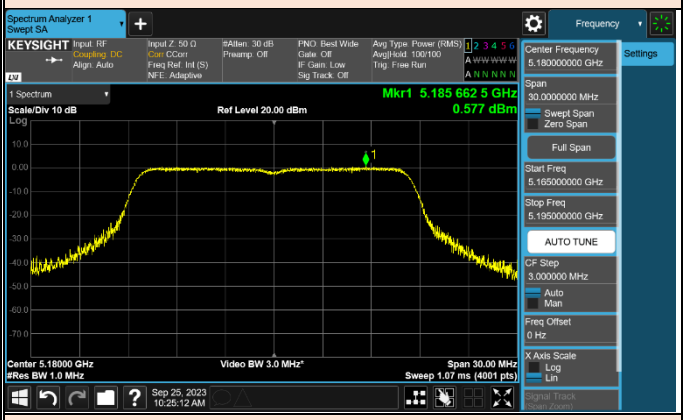
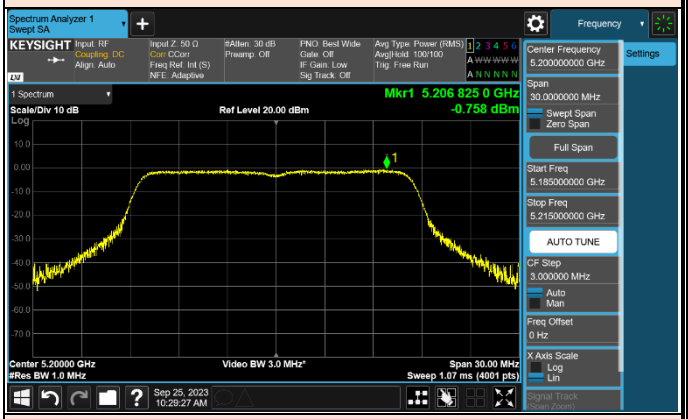
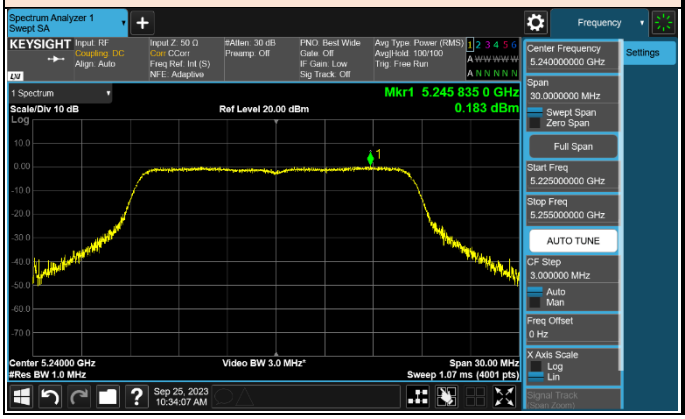
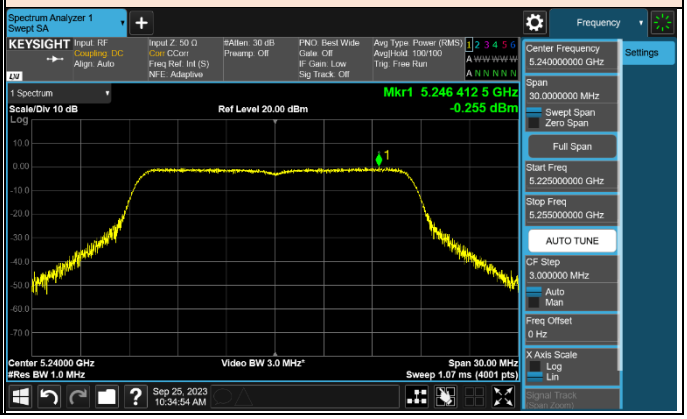
**Limit**

| Band | Limit [dBm] | Antenna Gain (Worst case) [dBi] | Determined Limit [dBm] |
|---|---|---|---|
| NII 1 | 17.00 | 6.11 | **16.89** |
| NII 3 | 30.00 | 6.57 | **29.43** |

| Test Mode | Band | Tested Frequency [MHz] | Measured Power [dBm] | | | T.F | Result Power [dBm] | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | ANT1 | ANT2 | MIMO | | ANT1 | ANT2 | MIMO |
| TM 1 | NII 1 | 5 180 | -0.26 | 0.58 | - | 0.00 | -0.26 | 0.58 | - |
| | | 5 200 | -0.76 | 0.56 | | | -0.76 | 0.56 | |
| | | 5 240 | 0.18 | -0.26 | | | 0.18 | -0.26 | |
| | NII 3 | 5 745 | -0.77 | -2.26 | | 6.99 | 6.22 | 4.73 | |
| | | 5 785 | 1.61 | -0.26 | | | 8.60 | 6.73 | |
| | | 5 825 | 1.50 | -0.48 | | | 8.49 | 6.51 | |
| TM 2 | NII 1 | 5 180 | -1.88 | -0.56 | 1.84 | 0.00 | -1.88 | -0.56 | 1.84 |
| | | 5 200 | -0.28 | 0.77 | 3.29 | | -0.28 | 0.77 | 3.29 |
| | | 5 240 | 0.04 | -0.43 | 2.82 | | 0.04 | -0.43 | 2.82 |
| | NII 3 | 5 745 | -2.25 | -3.16 | 0.33 | 6.99 | 4.74 | 3.83 | 7.32 |
| | | 5 785 | -1.30 | -0.99 | 1.87 | | 5.69 | 6.00 | 8.86 |
| | | 5 825 | -1.95 | -2.19 | 0.94 | | 5.04 | 4.80 | 7.93 |
| TM 3 | NII 1 | 5 180 | -0.66 | 0.55 | 3.00 | 0.00 | -0.66 | 0.55 | 3.00 |
| | | 5 200 | -0.85 | 0.63 | 2.96 | | -0.85 | 0.63 | 2.96 |
| | | 5 240 | 0.33 | 0.10 | 3.23 | | 0.33 | 0.10 | 3.23 |
| | NII 3 | 5 745 | -3.47 | -4.21 | -0.82 | 6.99 | 3.52 | 2.78 | 6.17 |
| | | 5 785 | -2.33 | -2.39 | 0.65 | | 4.66 | 4.60 | 7.64 |
| | | 5 825 | -3.07 | -3.43 | -0.23 | | 3.92 | 3.56 | 6.76 |
| TM 4 | NII 1 | 5 190 | -4.75 | -3.25 | -0.92 | 0.00 | -4.75 | -3.25 | -0.92 |
| | | 5 230 | -1.84 | -2.07 | 1.06 | | -1.84 | -2.07 | 1.06 |
| | NII 3 | 5 755 | -4.97 | -5.52 | -2.23 | 6.99 | 2.02 | 1.47 | 4.76 |
| | | 5 795 | -4.40 | -4.05 | -1.21 | | 2.59 | 2.94 | 5.78 |
| TM 5 | NII 1 | 5 190 | -3.64 | -2.45 | 0.01 | 0.00 | -3.64 | -2.45 | 0.01 |
| | | 5 230 | -2.54 | -2.56 | 0.46 | | -2.54 | -2.56 | 0.46 |
| | NII 3 | 5 755 | -10.26 | -10.82 | -7.52 | 6.99 | -3.27 | -3.83 | -0.53 |
| | | 5 795 | -6.02 | -5.19 | -2.57 | | 0.97 | 1.80 | 4.42 |
| TM 6 | NII 1 | 5 210 | -8.51 | -7.30 | -4.85 | 0.00 | -8.51 | -7.30 | -4.85 |
| | NII 3 | 5 775 | -12.64 | -13.07 | -9.84 | 6.99 | -5.65 | -6.08 | -2.85 |
| TM 7 | NII 1 | 5 210 | -6.95 | -5.94 | -3.40 | 0.00 | -6.95 | -5.94 | -3.40 |
| | NII 3 | 5 775 | -13.76 | -13.99 | -10.86 | 6.99 | -6.77 | -7.00 | -3.87 |

**Note1: NII 3 [T.F] = 10*LOG(500kHz/100kHz) + DCCF"**
**Note2: Test Result = Measurement Data + T.F**

## [Test Plot of Maximum Power Spectral Density]

| TM 1 _ NII 1 | |
|---|---|
| **ANT 1** | **ANT 2** |
| **5 180 MHz** | **5 180 MHz** |
|  |  |
| **5 200 MHz** | **5 200 MHz** |
|  |  |
| **5 240 MHz** | **5 240 MHz** |
|  |  |