

RF Test Report

5 GHz WLAN

Report No. : FCCCMKP-WAY-P23090062-2
Customer : DAVOLINK Inc.
Address : 112, Beolmal-ro, Dongan-gu Anyang-si, Gyeonggi-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)
KDB 789033 D02 v02r01
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.

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RELEASE CONTROL RECORD

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

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1 Summary of Test Results

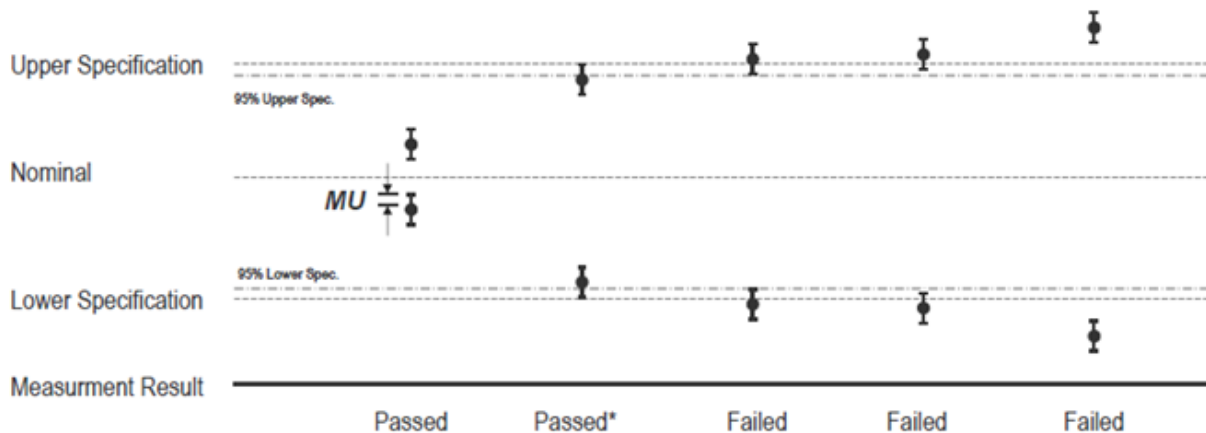
The EUT has been tested according to the following specifications

Applied Standard : FCC Part 15, Subpart 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	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 : < 30.00 dBm 5250 ~ 5350 & 5470 ~ 5725 MHz : < 250 mW or < 11 + 10 log ₁₀ (B) dBm, whichever power is less. (B is the 26dB BW.) 5725 ~ 5850 MHz : < 30 dBm		PASS	Section 3.4
15.407(a)	Peak Power Spectral Density	5150 ~ 5250 MHz : 17 dBm/MHz 5250 ~ 5350 MHz : 11 dBm/MHz 5470 ~ 5725 MHz : 11 dBm/MHz 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 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 15.209 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	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 $U = kU_c (k = 2)$
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 $U = kU_c (k = 2)$
Conducted	Maximum Output Power	1.20
Measurement Items	Frequency Range	Expanded Uncertainty $U = kU_c (k = 2)$
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) : 802.11ac(VHT20, VHT40, VTH80) : 802.11ax(HE20, HE40, HE80)		
Transfer Rate	6, 9, 12, 18, 24, 36, 48, 54 Mbps (802.11a) / SISO MCS0 to MCS15 (802.11n) / MIMO(2TX) MCS0 to MCS9 (802.11ac) / MIMO(2TX) MCS0 to MCS11 (802.11ax) / MIMO(2TX)		
Operating Frequency	NII 1: 5 180 MHz to 5 240 MHz NII 3: 5 745 MHz to 5 825 MHz		
Output Power (Conducted Power)	NII 1: 15.01 dBm NII 3: 20.33 dBm		
Antenna Type	PCB Antenna		
Antenna Gain	ANT 1	ANT 2	Direction gain NOTE3
	NII 1: 5.76 dBi NII 3: 6.58 dBi	NII 1: 6.43 dBi NII 3: 6.55 dBi	NII 1: 6.11 dBi 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)
 $10 \log [(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10}) / N^{ANT}]$ 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	-

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

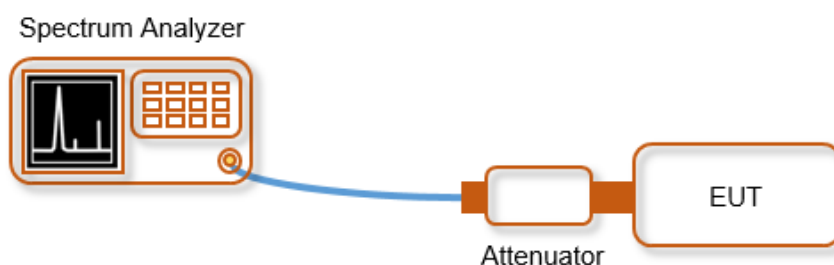
The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies. The 26 dB bandwidth is used to determine the conducted output power limit.

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

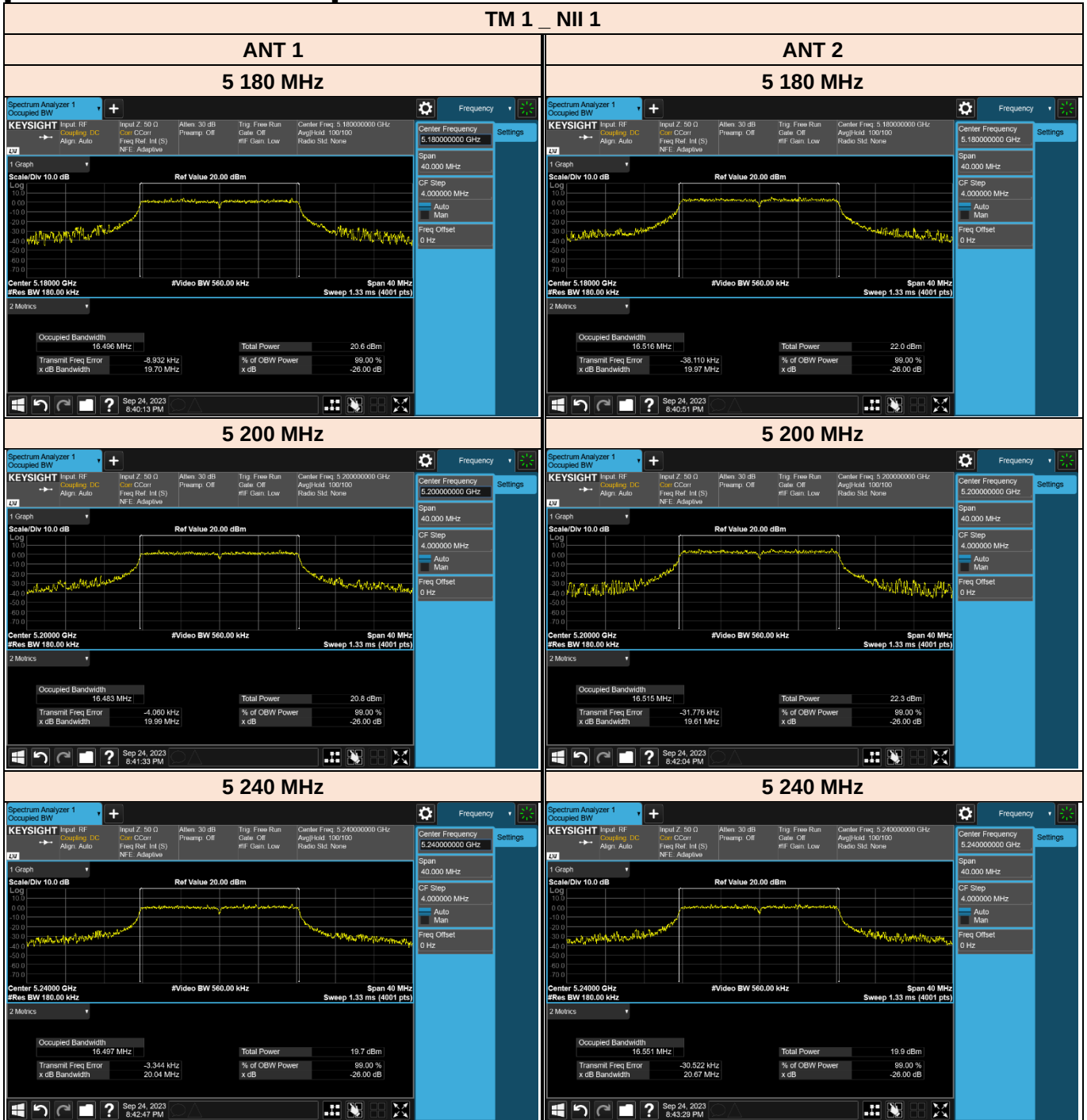
[Test Data of 26 dB Bandwidth]

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



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[Test Plot of 26 dB Bandwidth]

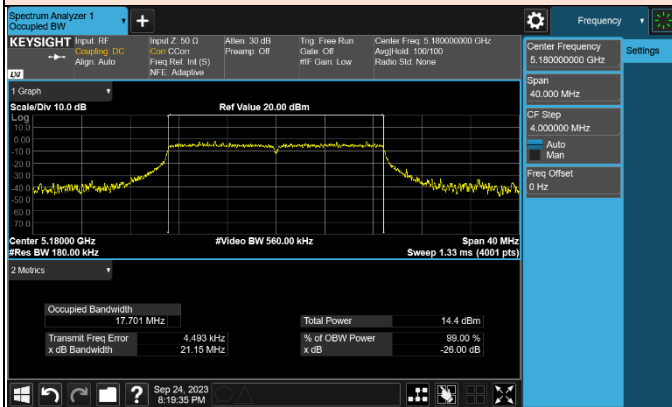




TM 2 NII 1

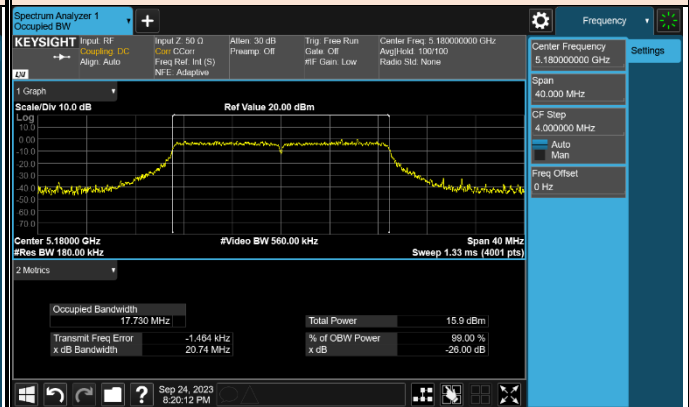
ANT 1

5 180 MHz

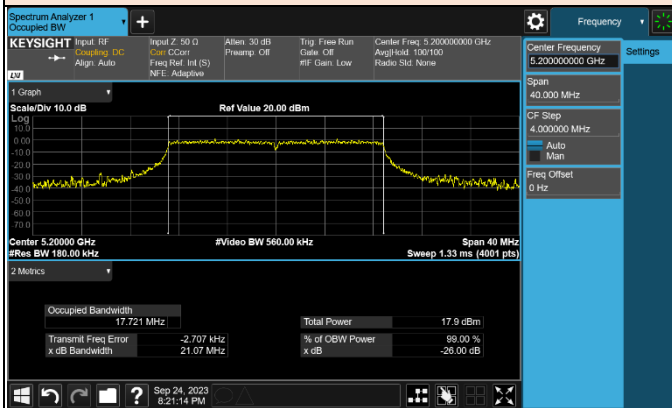


ANT 2

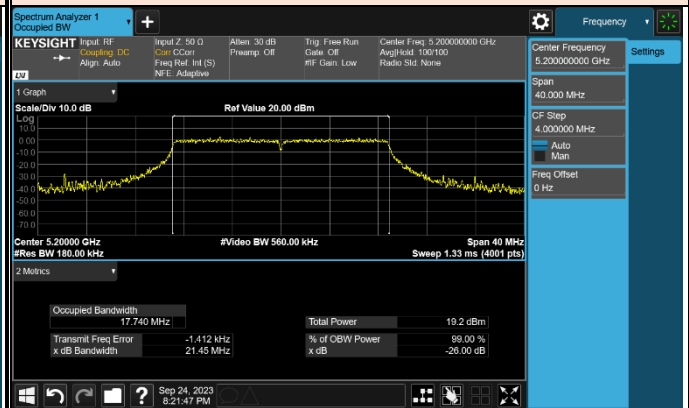
5 180 MHz



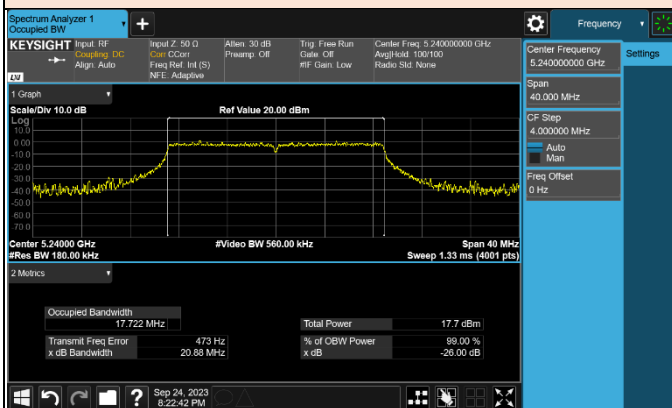
5 200 MHz



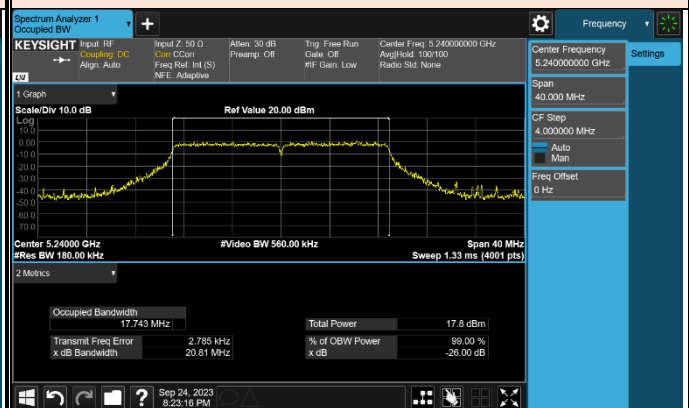
5 200 MHz



5 240 MHz



5 240 MHz

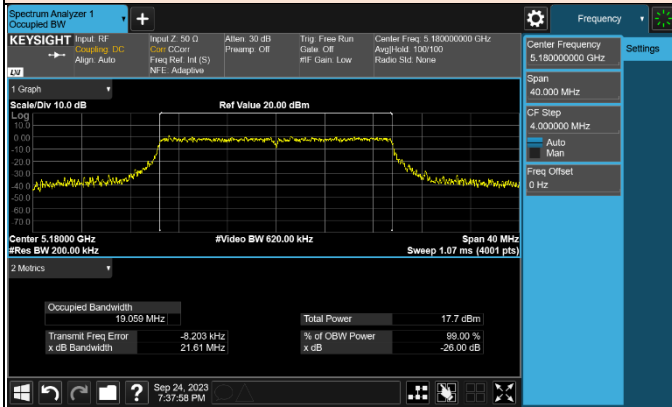




TM 3 NII 1

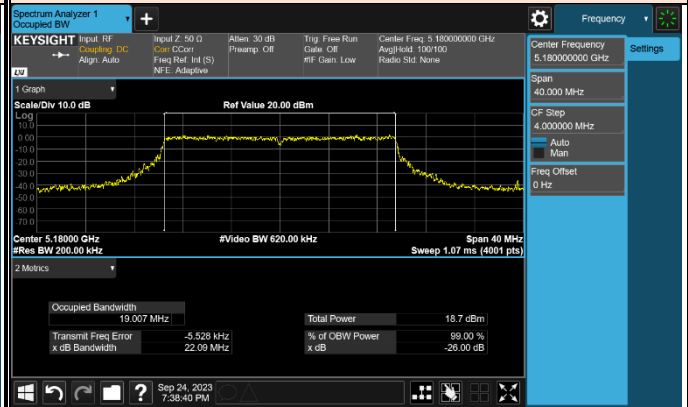
ANT 1

5 180 MHz

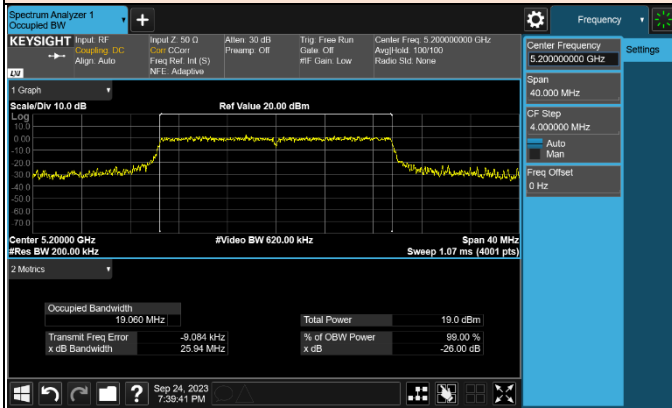


ANT 2

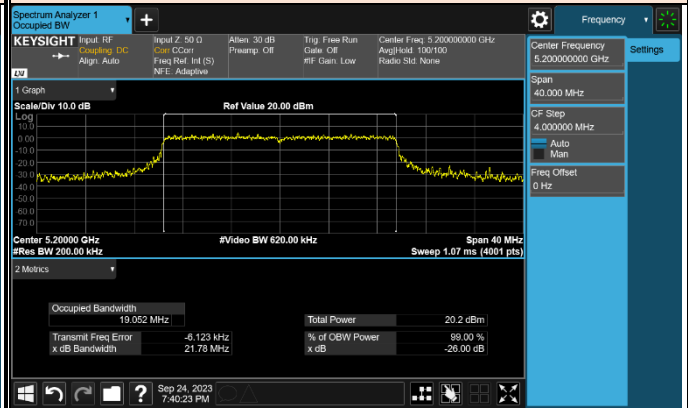
5 180 MHz



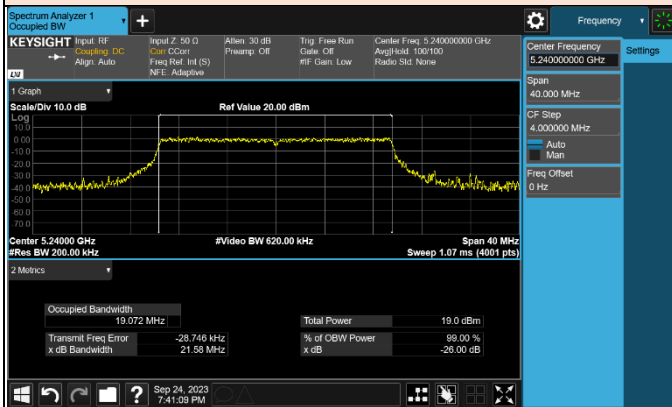
5 200 MHz



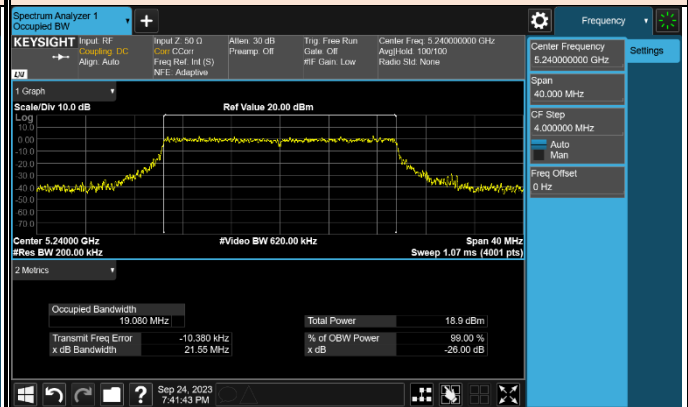
5 200 MHz



5 240 MHz



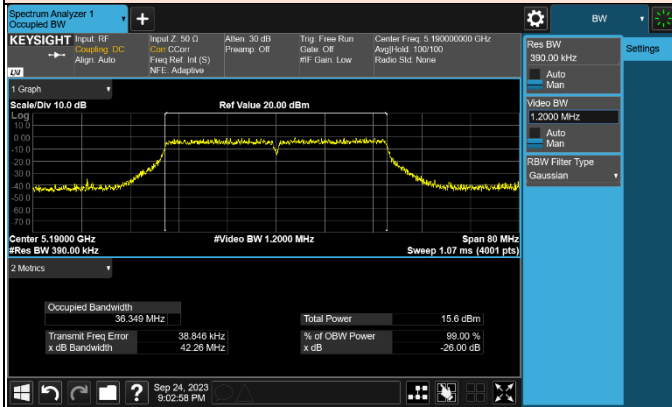
5 240 MHz



TM 4 NII 1

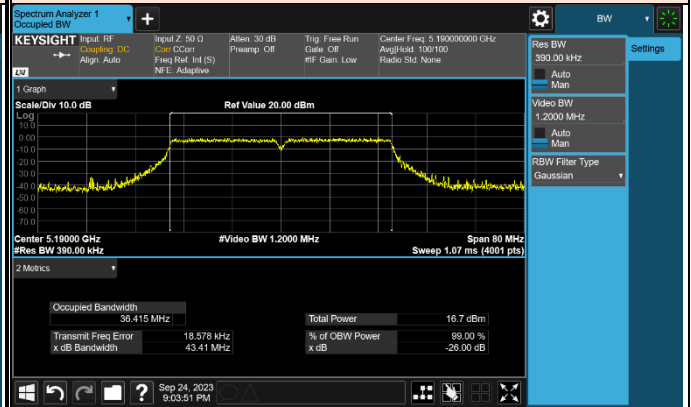
ANT 1

5 190 MHz

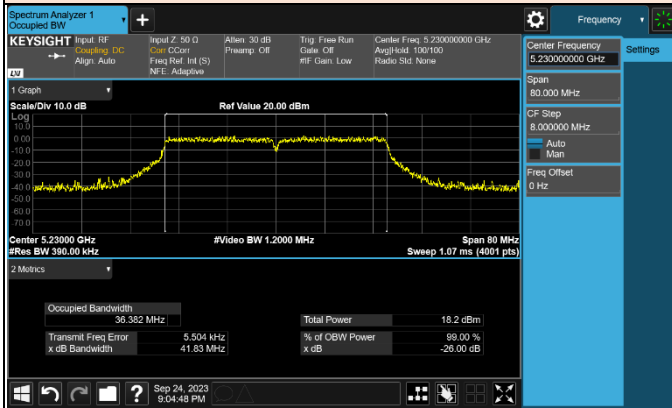


ANT 2

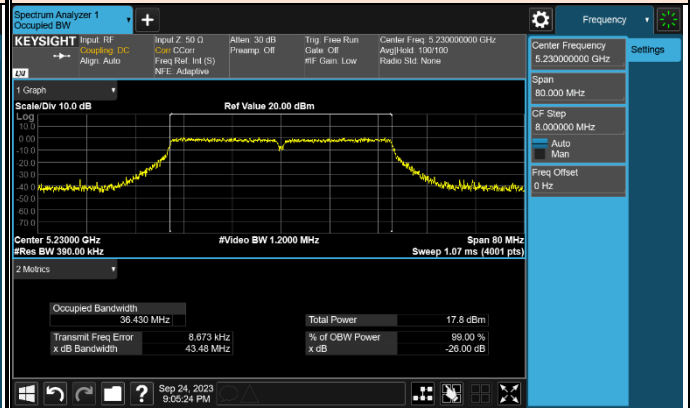
5 190 MHz



5 230 MHz



5 230 MHz



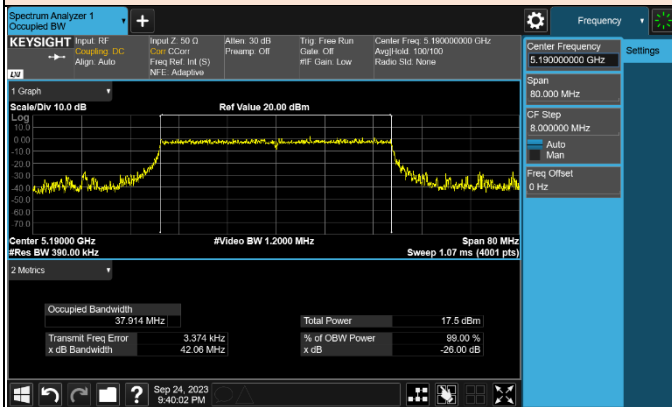


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TM 5 NII 1

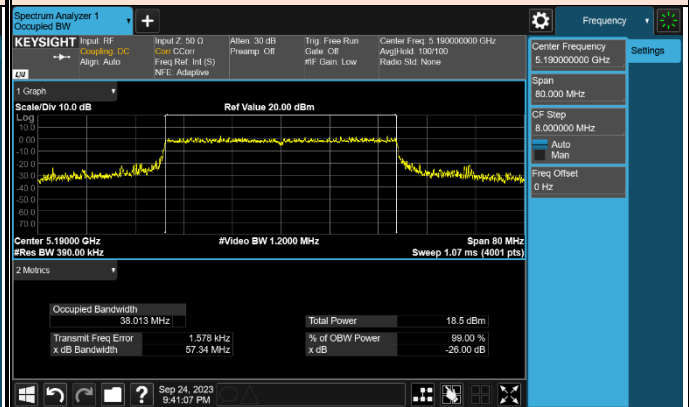
ANT 1

5 190 MHz

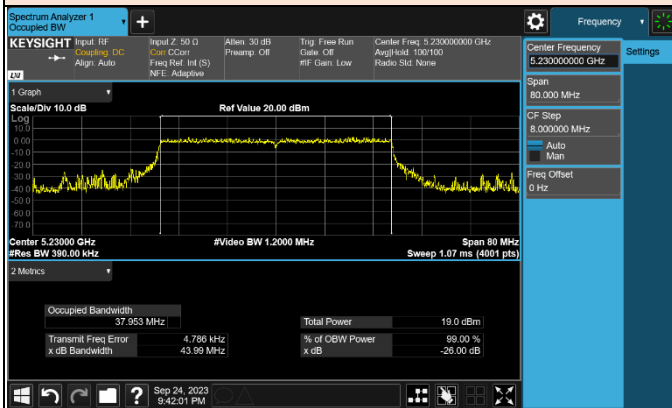


ANT 2

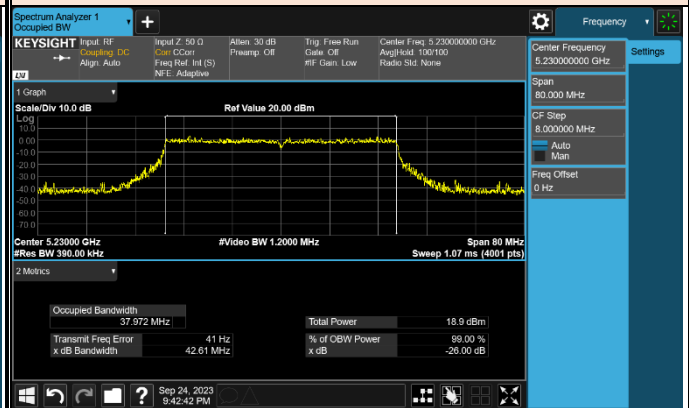
5 190 MHz



5 230 MHz



5 230 MHz



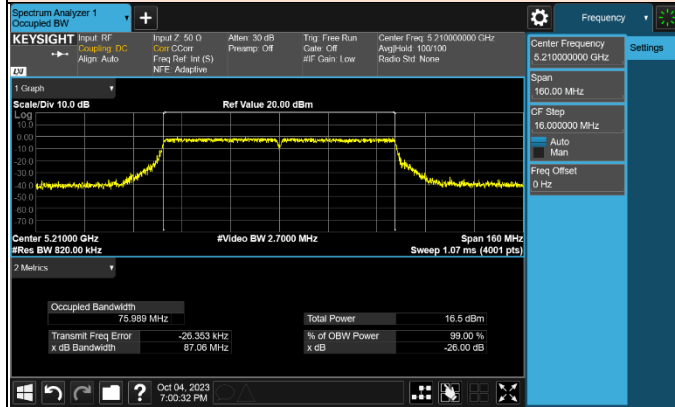


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TM 6 _ NII 1

ANT 1

5 210 MHz



ANT 2

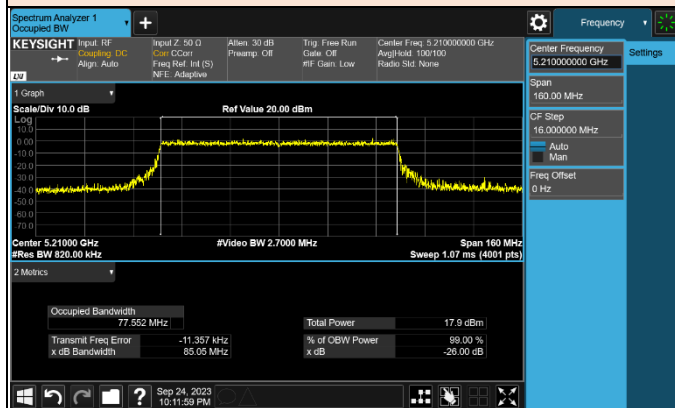
5 210 MHz



TM 7 _ NII 1

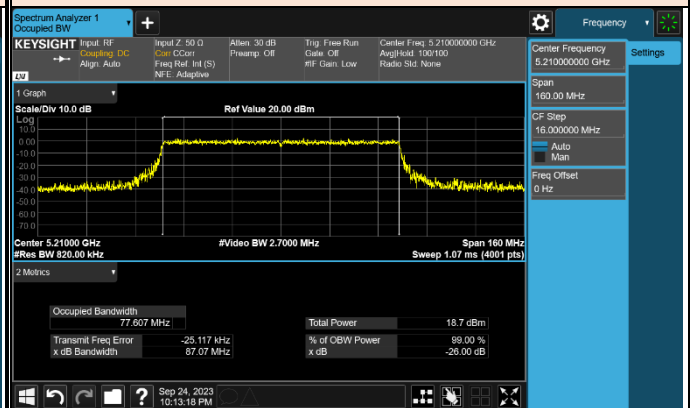
ANT 1

5 210 MHz



ANT 2

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.

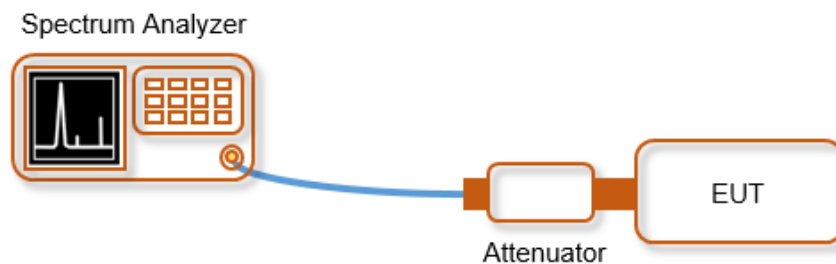
3.3.2 Test Procedure

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 $\geq 3 \times$ 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



3.3.4 Test Result

[Test Data of 6 dB Bandwidth]

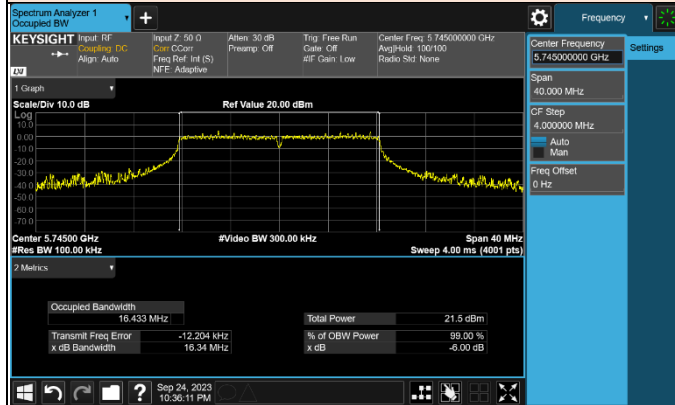
Test Mode	Tested Frequency [MHz]	6 dB Bandwidth [MHz]	
		ANT 1	ANT 2
TM1	5 745	16.34	16.34
	5 785	16.37	16.33
	5 825	16.34	16.35
TM2	5 745	17.62	17.61
	5 785	17.62	17.62
	5 825	17.70	17.60
TM3	5 745	19.00	18.98
	5 785	18.97	19.08
	5 825	18.91	18.86
TM4	5 755	36.39	36.35
	5 795	36.39	36.36
TM5	5 755	37.85	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

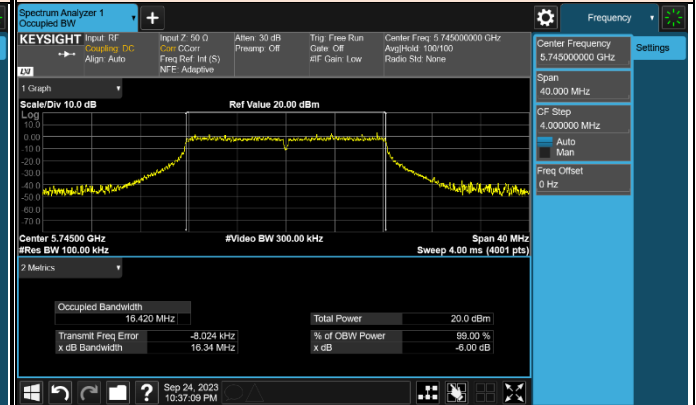
ANT 1

5 745 MHz

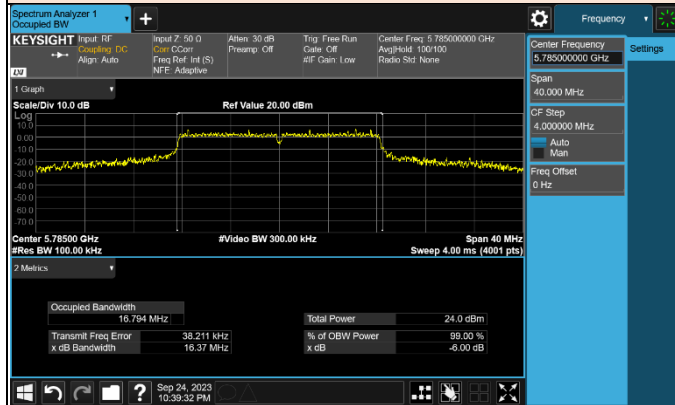


ANT 2

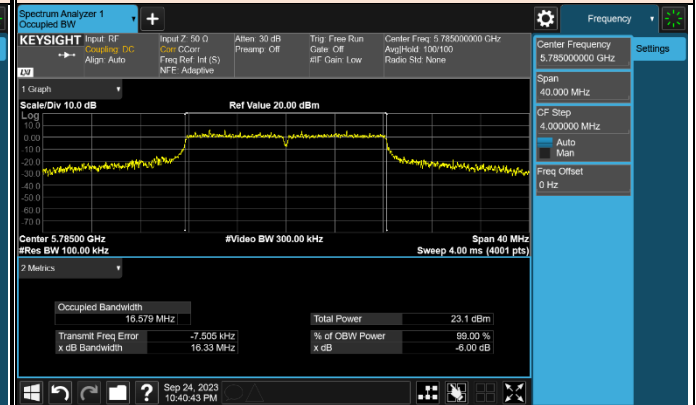
5 745 MHz



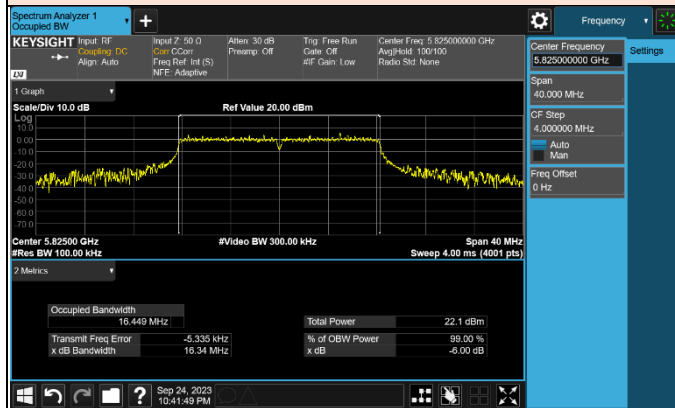
5 785 MHz



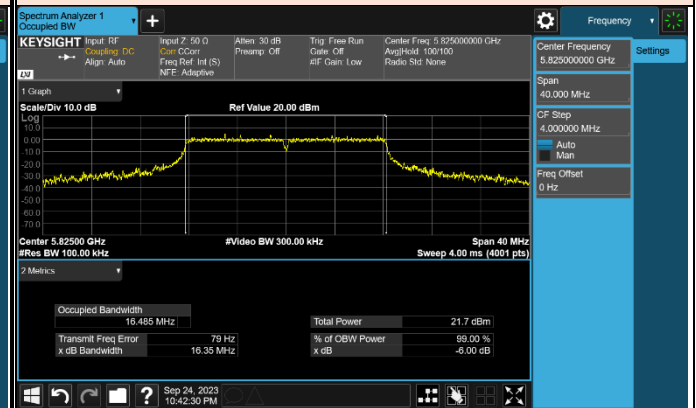
5 785 MHz



5 825 MHz



5 825 MHz



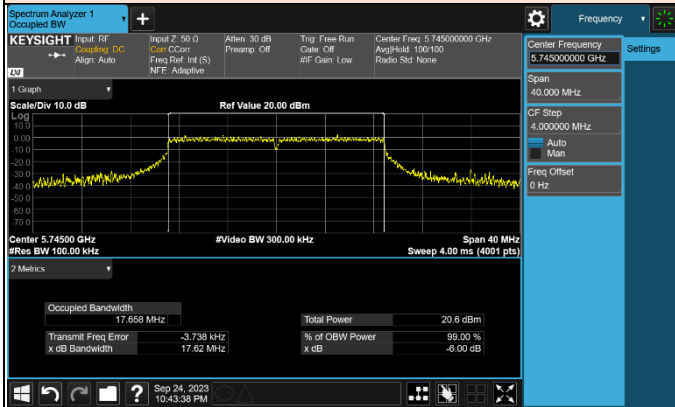


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TM 2 NII 3

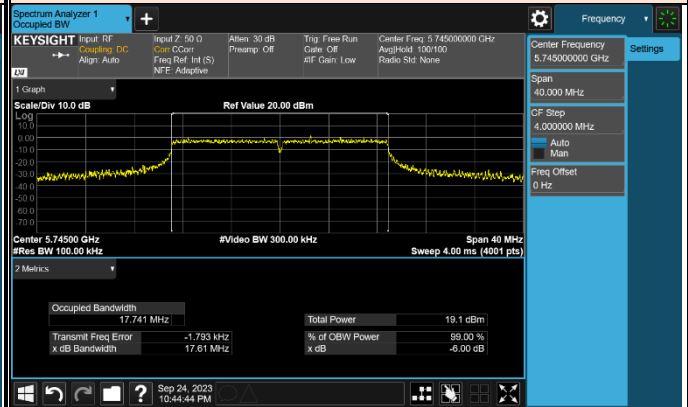
ANT 1

5 745 MHz

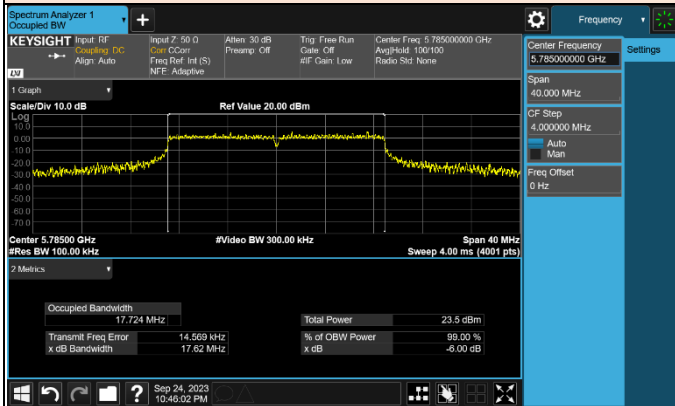


ANT 2

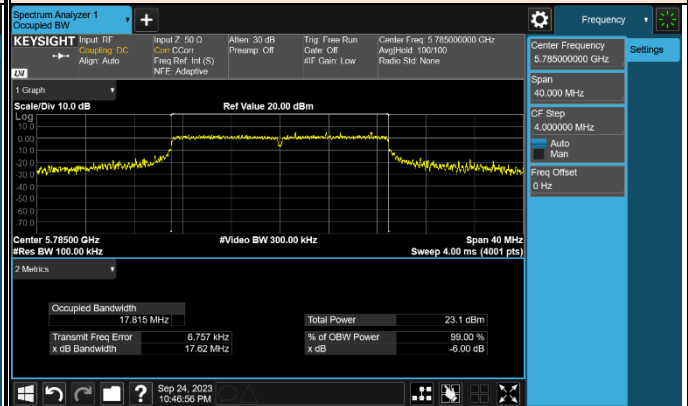
5 745 MHz



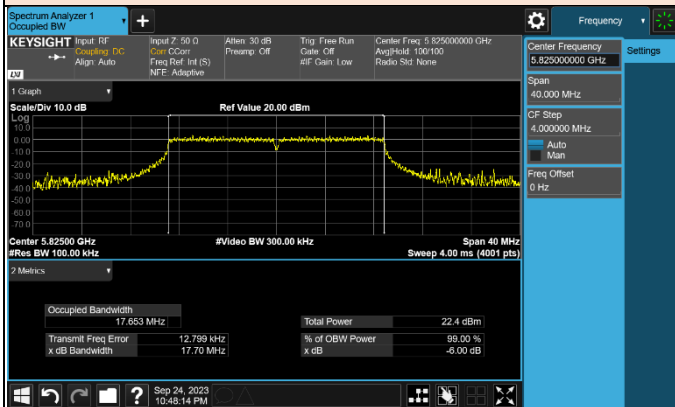
5 785 MHz



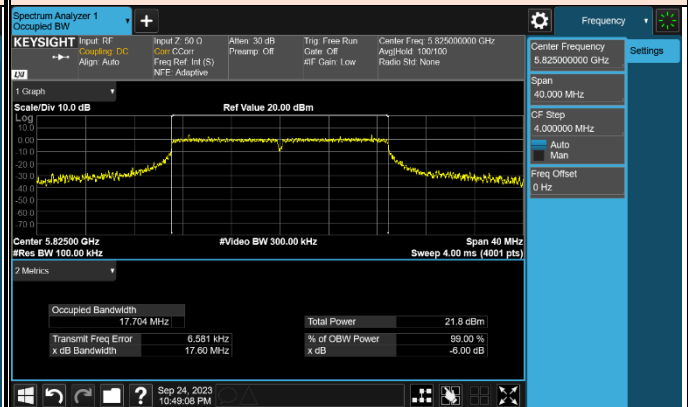
5 785 MHz



5 825 MHz



5 825 MHz



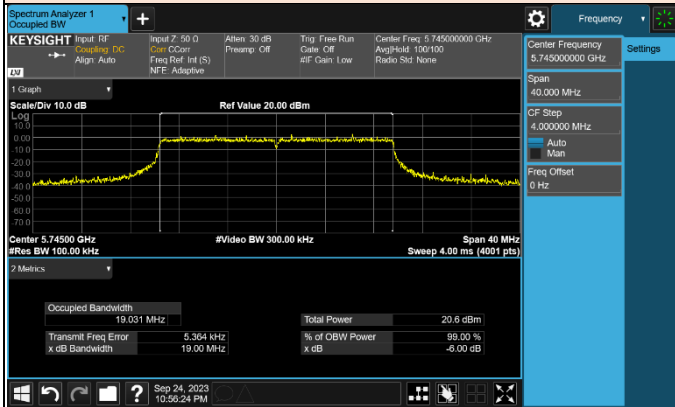


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VERITAS

TM 3 NII 3

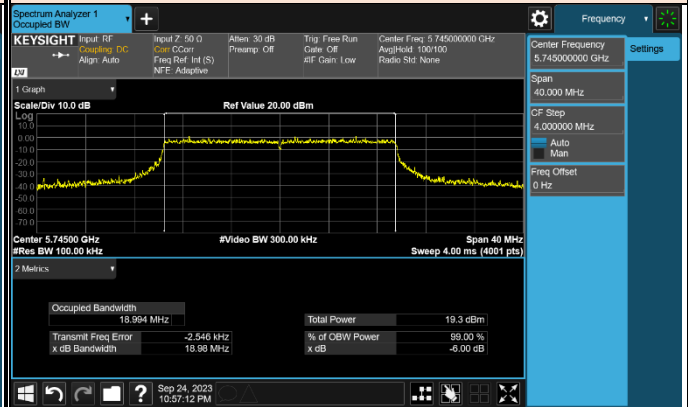
ANT 1

5 745 MHz

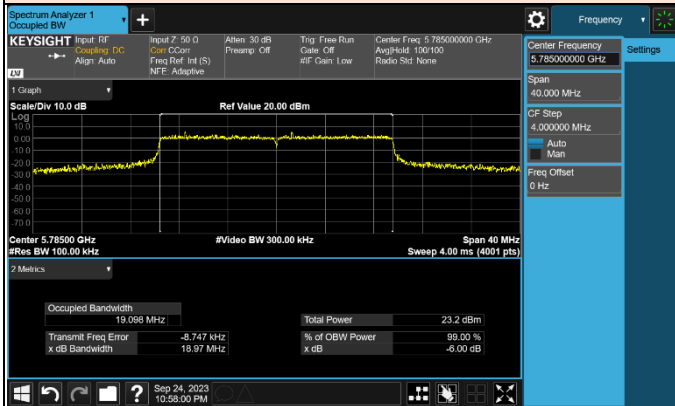


ANT 2

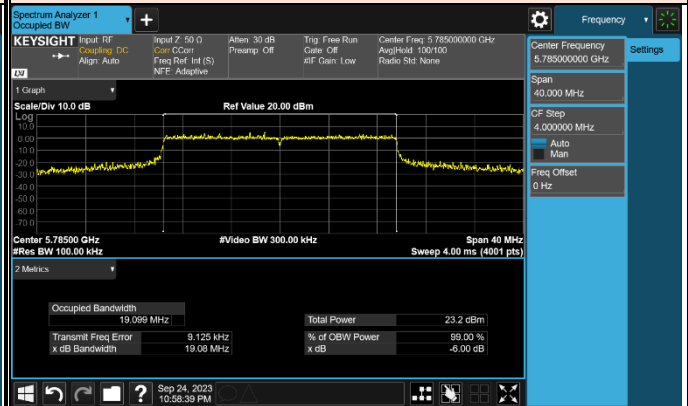
5 745 MHz



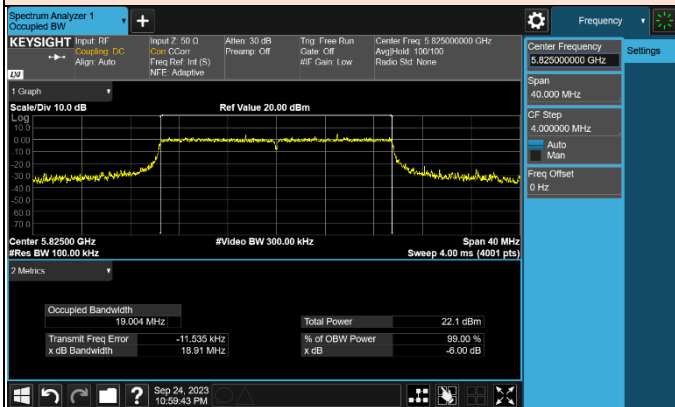
5 785 MHz



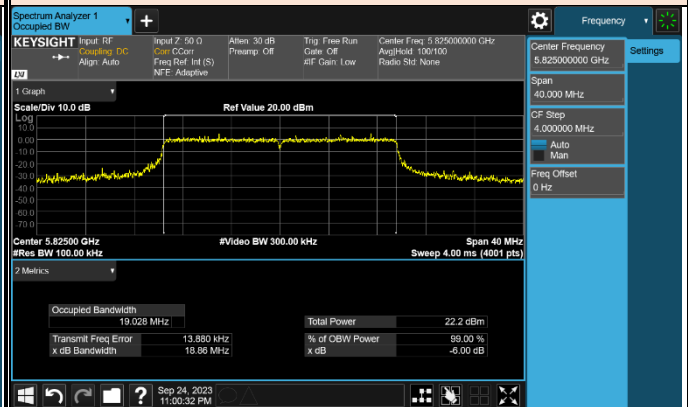
5 785 MHz



5 825 MHz



5 825 MHz



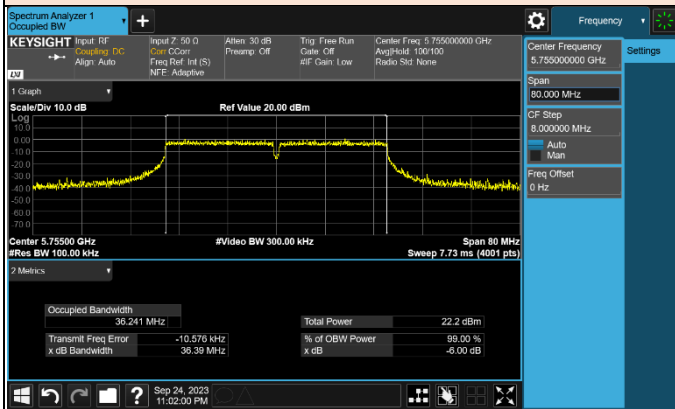


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VERITAS

TM 4 NII 3

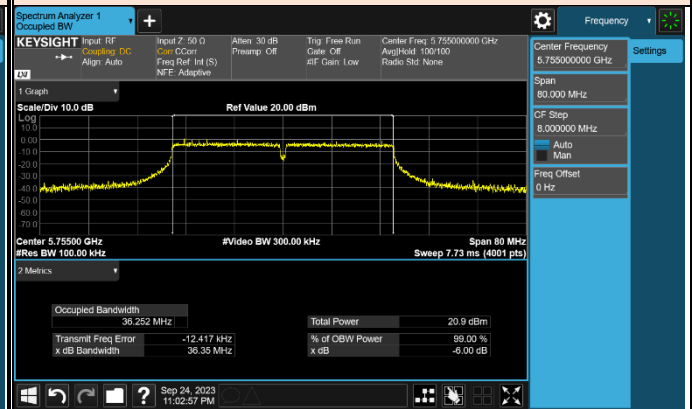
ANT 1

5 755 MHz

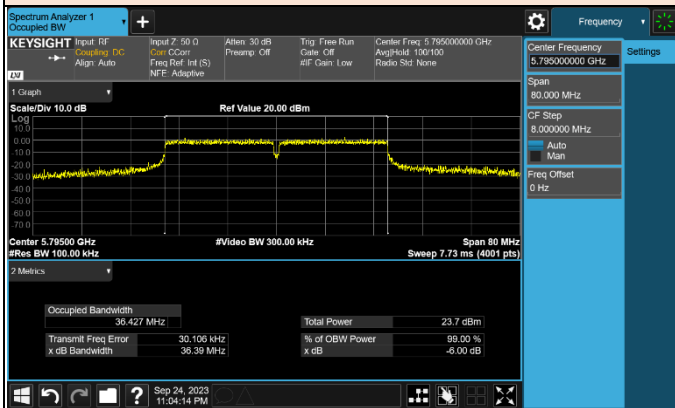


ANT 2

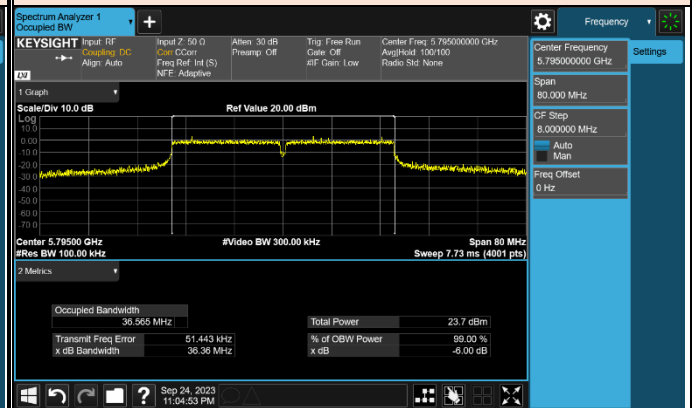
5 755 MHz



5 795 MHz



5 795 MHz

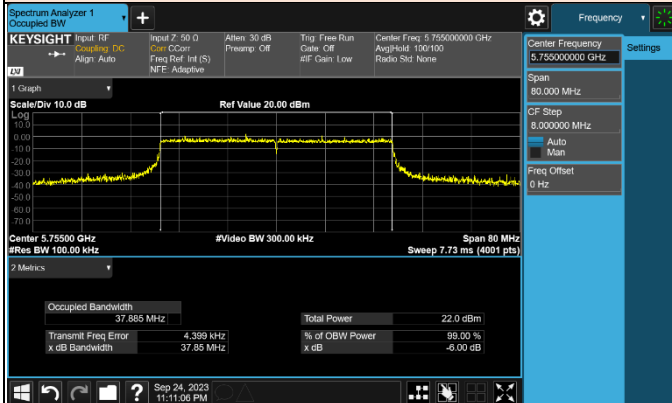




TM 5 _ NII 3

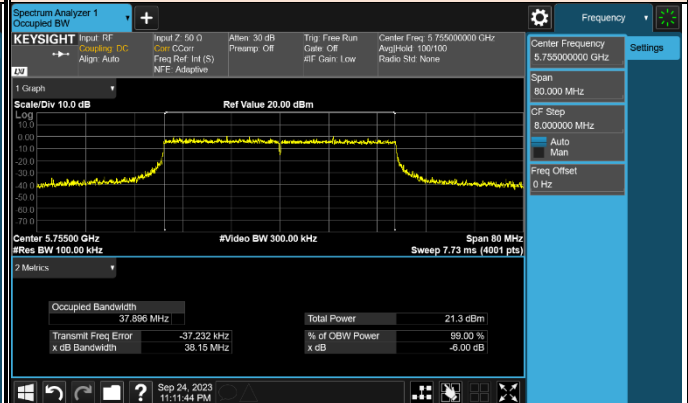
ANT 1

5 755 MHz

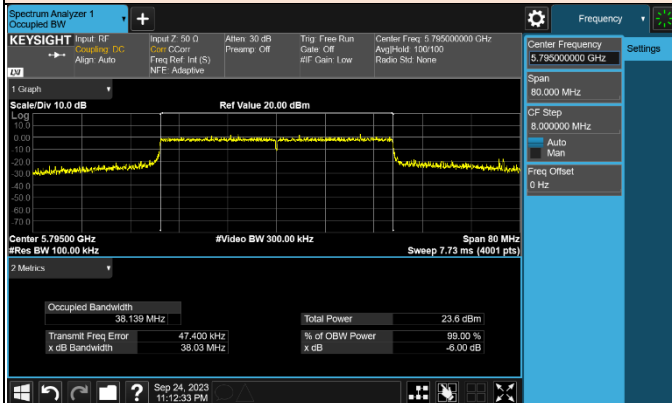


ANT 2

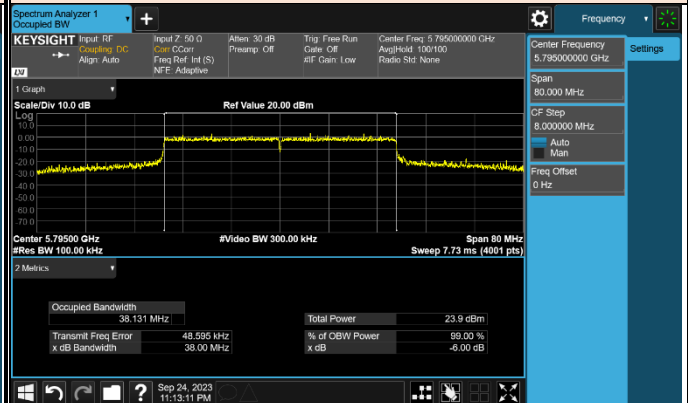
5 755 MHz



5 795 MHz



5 795 MHz

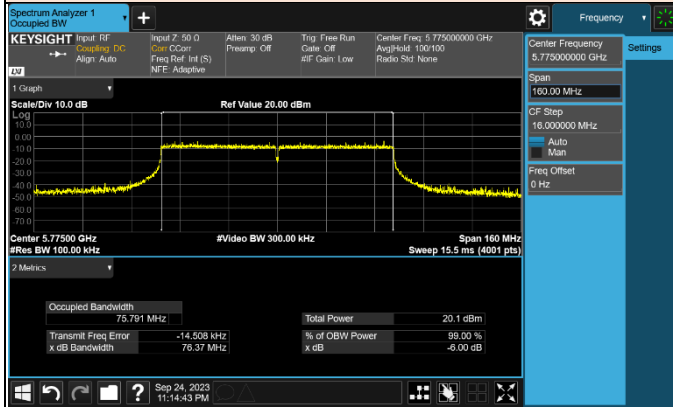




TM 6 _ NII 3

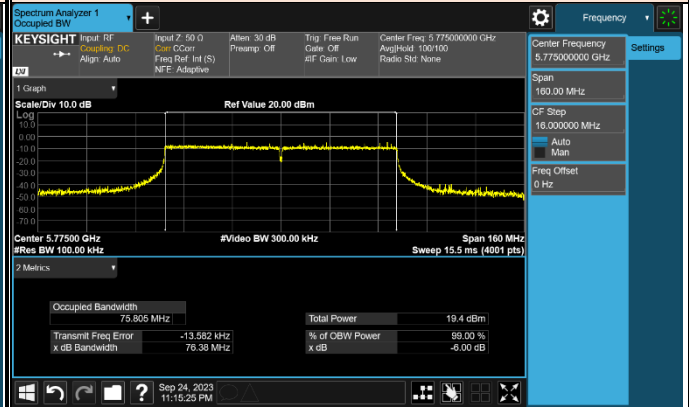
ANT 1

5 775 MHz



ANT 2

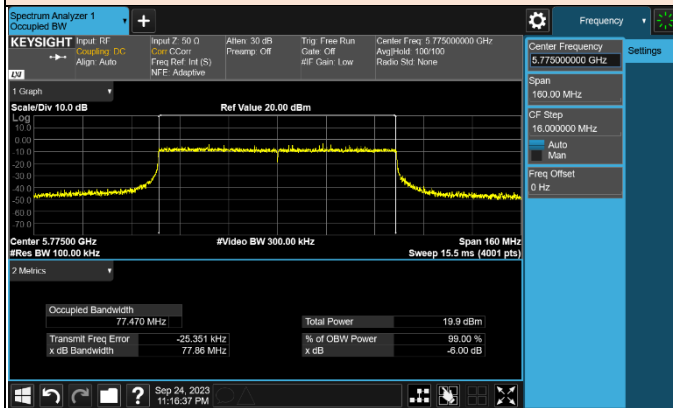
5 775 MHz



TM 7 _ NII 3

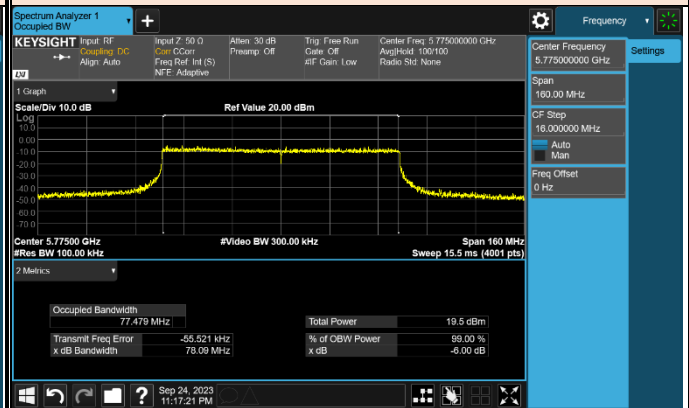
ANT 1

5 775 MHz



ANT 2

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 colocated 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.

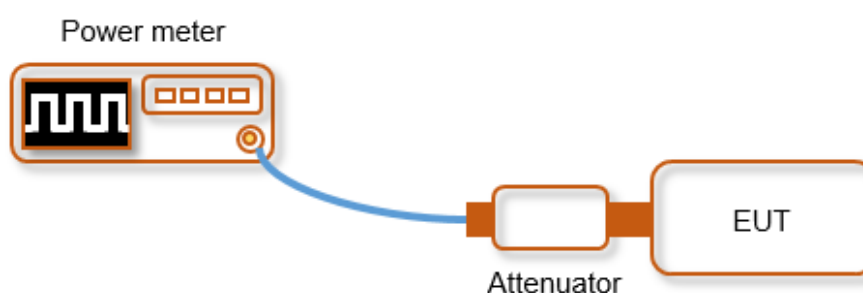
(3) For the band 5.725 - 5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by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

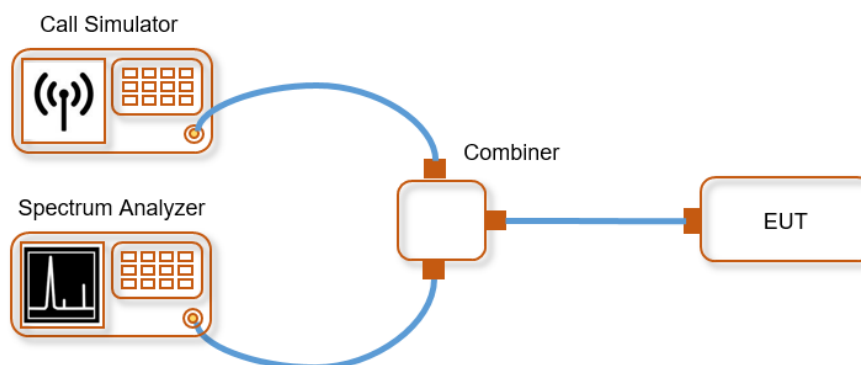
5) For devices operating in the bands 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, and 5.47 - 5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in §15.407(a)(5). For devices operating in the band 5.725 - 5.85 GHz, the rules specify a measurement bandwidth 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 $RBW \geq 1 / T$, 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 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 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] = $10 \cdot \text{LOG}(500\text{kHz}/100\text{kHz}) + \text{DCCF}$

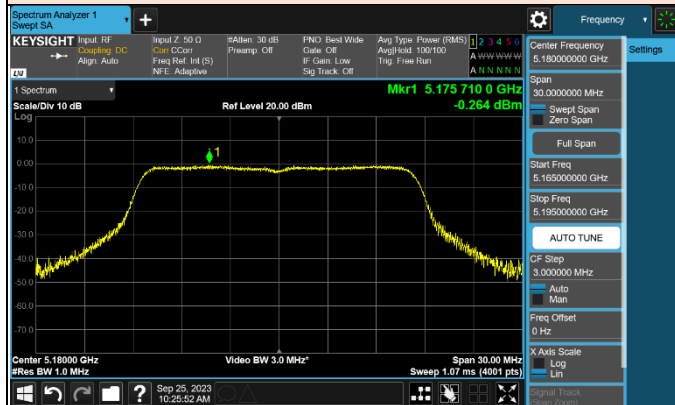
Note2: Test Result = Measurement Data + T.F

[Test Plot of Maximum Power Spectral Density]

TM 1 _ NII 1

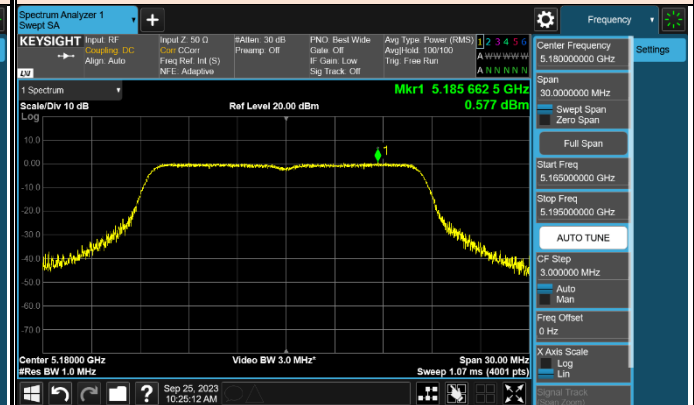
ANT 1

5 180 MHz

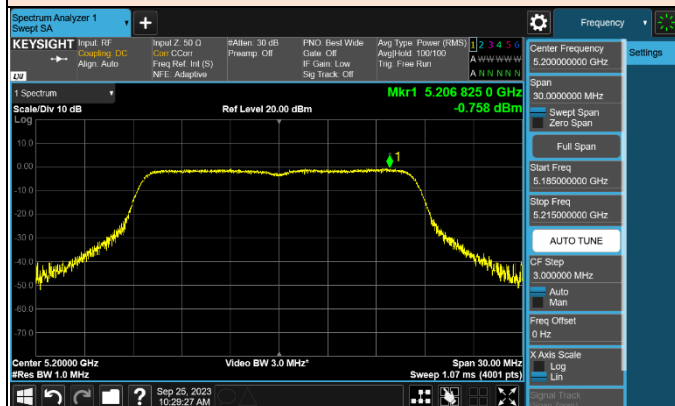


ANT 2

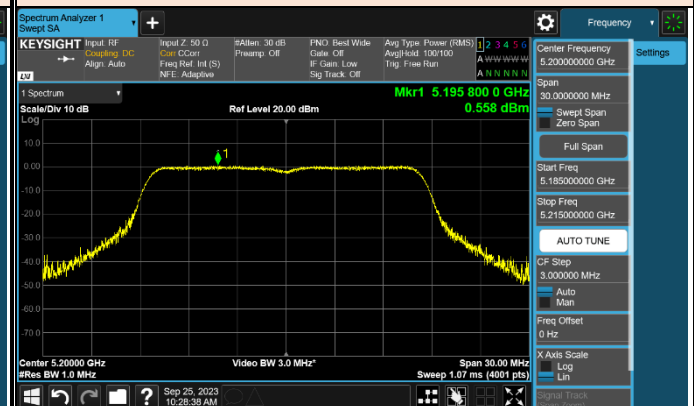
5 180 MHz



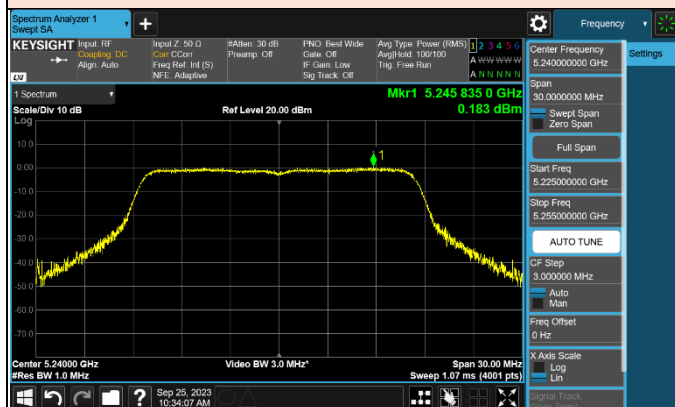
5 200 MHz



5 200 MHz



5 240 MHz



5 240 MHz

