RF Test Report
5 GHz WLAN

Report No.	:	FCCCMKP-WAY-P23090062-2R1
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) 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 : Kwangmin Jung (Signature)

Technical Manager

Name : Jungwoo Kim (Signature)

2023. 11. 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
FCCCMKP-WAY-P23090062-2R1	Update test results of NII 2A/2C bands	2023.11.10

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1 Summary of Test Results

The EUT has been tested according to the following specifications

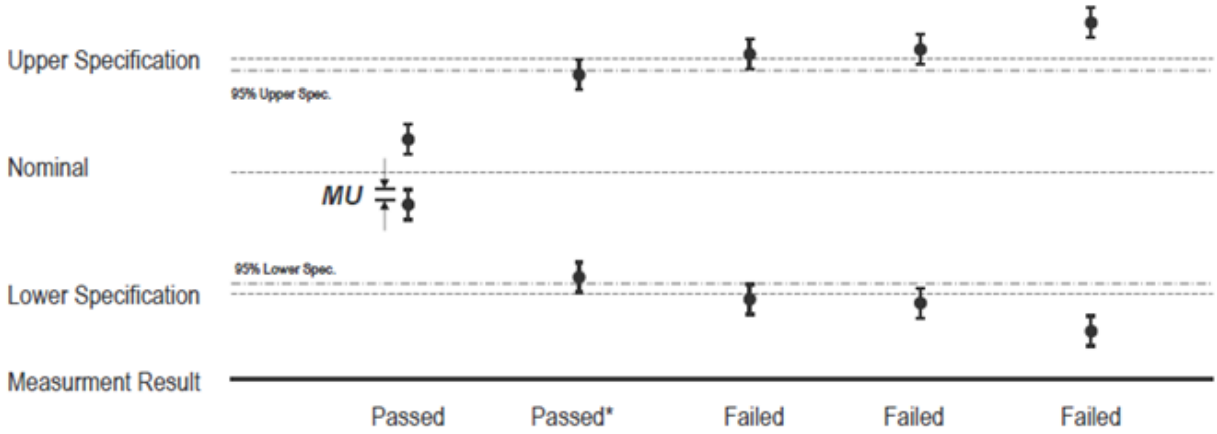
Applied Standard : FCC Part 15, Subpart E 15.407 (indoor access point)					
FCC Part Section(s)	**Test Description**	**Limit**	**Test Condition**	**Test Result**	**Reference**
15.407(a)	Emission Bandwidth (26 dB Bandwidth)	N/A	Conduted	PASS	Section 3.2
15.407(e)	Minimum Emission Bandwidth (6 dB Bandwidth)	> 500 kHz in 5725 ~ 5850 MHz		PASS	Section 3.3
15.407(a)	Maximum Conducted Output Power	5150 ~ 5250 MHz : < 30.00 dBm 5250 ~ 5350 & 5470 ~ 5725 MHz : < 250 mW or < 11 + 10 log10(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)		PASS	Refer to the DFS Report
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 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.

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) : 802.11ac(VHT20, VHT40, VTH80, VHT160) : 802.11ax(HE20, HE40, HE80, HE160)		
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 2A: 5 260 MHz to 5 320 MHz NII 2C: 5 500 MHz to 5 720 MHz NII 3: 5 745 MHz to 5 825 MHz		
Output Power (Conducted Power)	NII 1: 15.01 dBm NII 2A: 18.21 dBm NII 2C: 20.29 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 2A: 6.17 dBi NII 2C: 6.55 dBi NII 3: 6.58 dBi	NII 1: 6.43 dBi NII 2A: 6.63 dBi NII 2C: 6.67 dBi NII 3: 6.55 dBi	NII 1: 6.11 dBi NII 2A: 6.41 dBi NII 2C: 6.61 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)

$10 \log [(10^{G1/10} + 10^{G2/10} + \ldots + 10^{GN/10}) / N^{ANT}]$ 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 (Tested)	802.11n(HT20)	MCS 8
TM 2 Note 1	802.11ac(VHT20)	MCS 0 NSS 2
TM 3	802.11ax(HE20)	MCS 0 NSS 2
TM 4 Note 1 (Tested)	802.11n(HT40)	MCS 8
TM 4 Note 1	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
TM 8	802.11ac(VHT160)	MCS 0 NSS 2
TM 9	802.11ax(HE160)	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	-	-
	802.11ac(VHT160) /ax(HE160)	5 250	-	-
NII 2A	802.11a/n(HT20) ac(VHT20)/ax(HE20)	5 260	5 280	5 320
	802.11n(HT40)/(VHT40) (HE40)	5 270	5 310	-
	802.11ac(VHT80)/ax(HE80)	5 290	-	-
NII 2C	802.11a/n(HT20) ac(VHT20)/ax(HE20)	5 500	5 580	5 720
	802.11n(HT40)/(VHT40) (HE40)	5 510	5 550	5 710
	802.11ac(VHT80)/ax(HE80)	5 530	5 610	5 690
	802.11ac(VHT160) /ax(HE160)	5 570	-	-
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

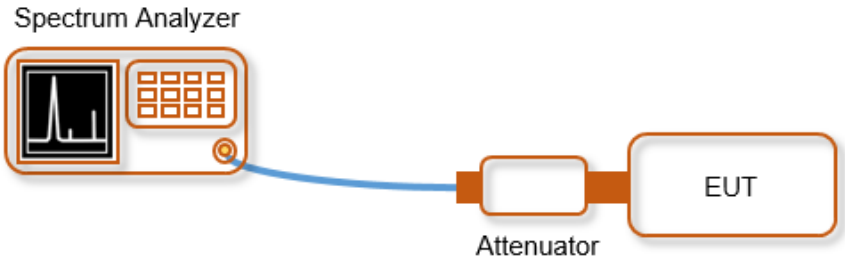
The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies. The 26 dB bandwidth is used to determine the conducted output power limit.

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



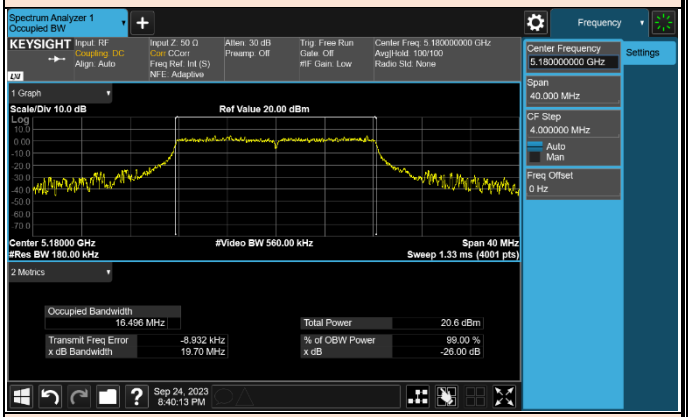
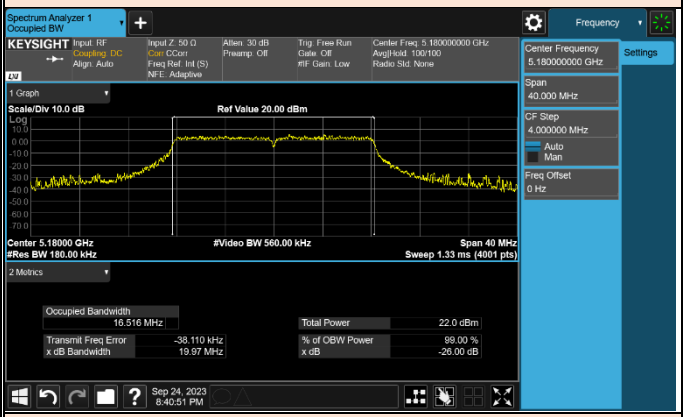
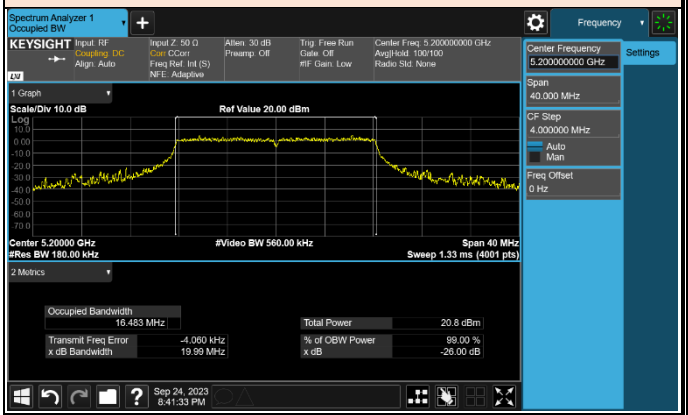
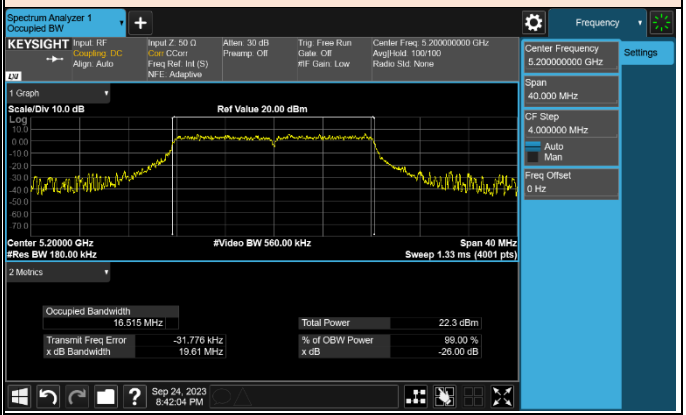
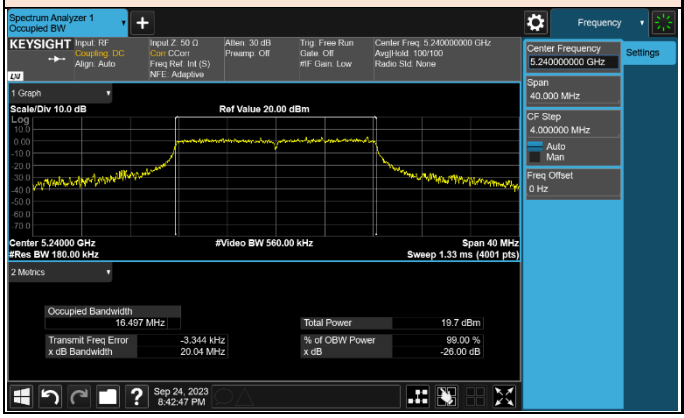
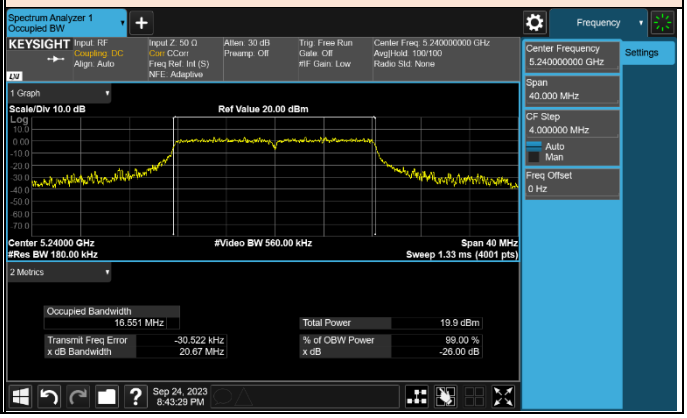
3.2.3 Test Result

[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
	NII 2A	5 260	21. 05	21. 04
		5 280	19. 69	20. 62
		5 320	19. 87	24. 35
	NII 2C	5 500	19. 74	19. 83
		5 580	26. 66	35. 61
		5 720	19. 84	20. 42
TM 2	NII 1	5 180	21. 15	20. 74
		5 200	21. 07	21. 45
		5 240	20. 88	20. 81
	NII 2A	5 260	21. 09	21. 22
		5 280	21. 11	20. 71
		5 320	20. 59	21. 10
	NII 2C	5 500	21. 01	20. 71
		5 580	33. 38	36. 07
		5 720	26. 30	22. 22
TM 3	NII 1	5 180	21. 61	22. 09
		5 200	25. 94	21. 78
		5 240	21. 58	21. 55
	NII 2A	5 260	21. 67	22. 89
		5 280	21. 71	21. 73
		5 320	21. 76	22. 22
	NII 2C	5 500	21. 65	21. 87
		5 580	30. 95	21. 77
		5 720	22. 08	22. 55

Test Mode	Band	Tested Frequency [MHz]	26 dB Bandwidth [MHz]	
			ANT1	ANT2
TM 4	NII 1	5 190	42. 26	43. 41
		5 230	41. 83	43. 48
	NII 2A	5 270	41. 75	58. 15
		5 310	41. 56	43. 73
	NII 2C	5 510	42. 05	43. 54
		5 550	54. 15	67. 42
		5 710	48. 75	45. 22
TM 5	NII 1	5 190	42. 06	57. 34
		5 230	43. 99	42. 61
	NII 2A	5 270	47. 33	51. 80
		5 310	42. 45	43. 41
	NII 2C	5 510	42. 79	47. 16
		5 550	57. 74	73. 59
		5 710	55. 07	55. 30
TM 6	NII 1	5 210	87. 06	87. 20
	NII 2A	5 290	87. 54	89. 27
	NII 2C	5 530	86. 79	87. 30
		5 610	129. 30	113. 80
		5 690	89. 49	86. 63
TM 7	NII 1	5 210	85. 05	87. 07
	NII 2A	5 290	87. 65	84. 52
	NII 2C	5 530	86. 95	84. 57
		5 610	101. 30	87. 05
		5 690	86. 04	85. 79
TM 8	NII 1	5 250	168. 80	168. 40
	NII 2C	5 570	169. 40	183. 70
TM 9	NII 1	5 250	168. 50	167. 70
	NII 2C	5 570	168. 00	167. 00

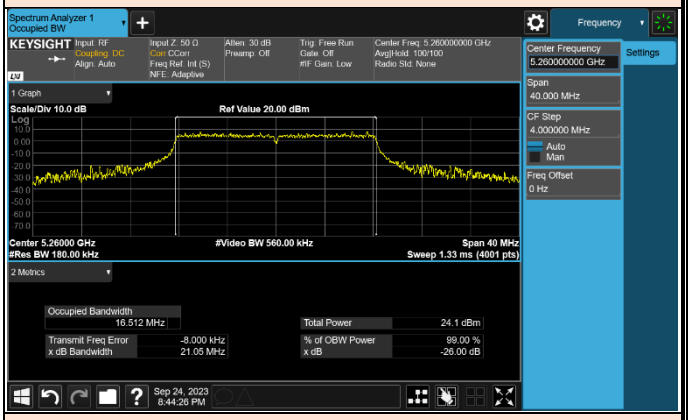
[Test Plot of 26 dB Bandwidth]

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**
	

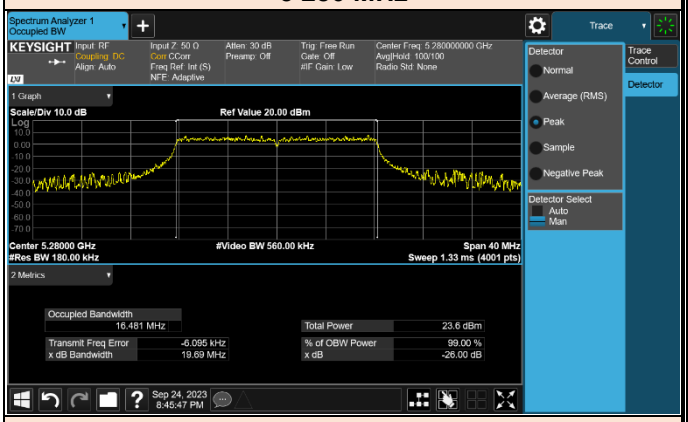
TM 1 _ NII 2A

ANT 1

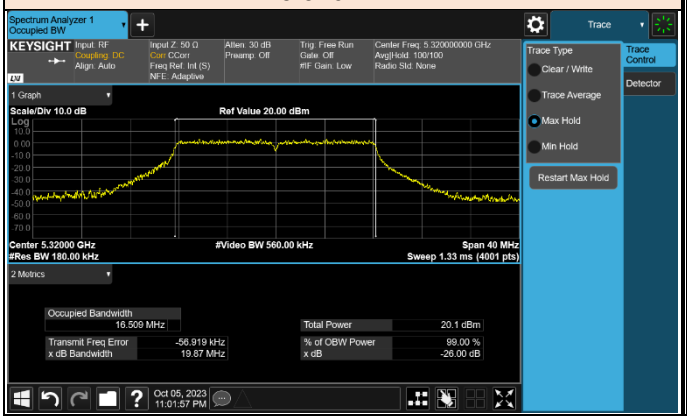
5 260 MHz



5 280 MHz

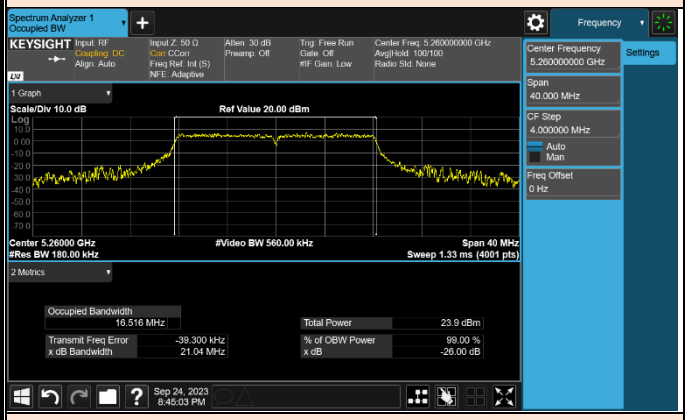


5 320 MHz

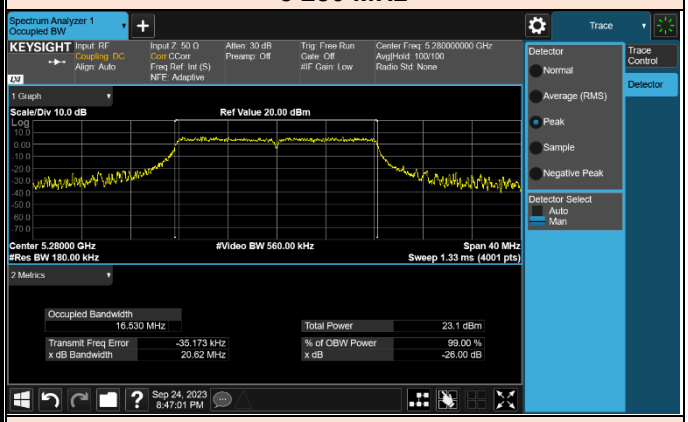


ANT 2

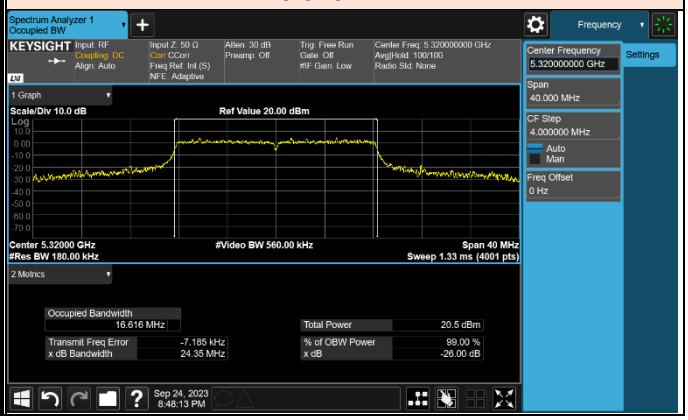
5 260 MHz



5 280 MHz



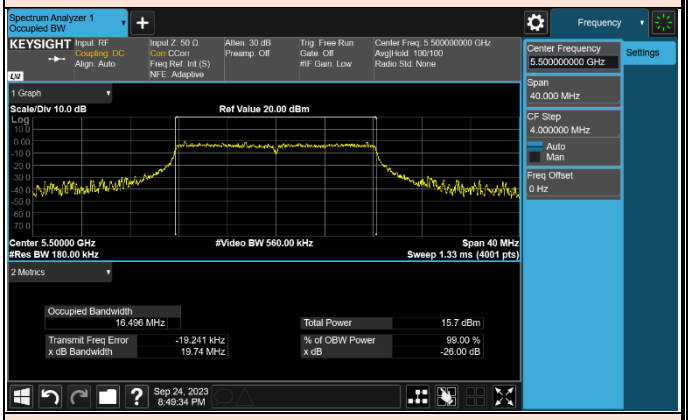
5 320 MHz



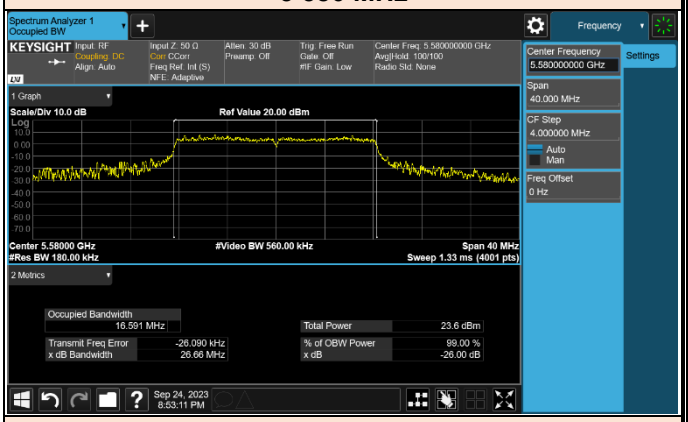
TM 1 _ NII 2C

ANT 1

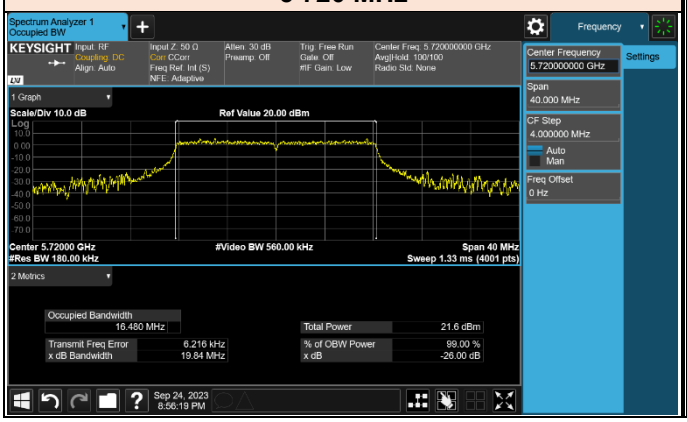
5 500 MHz



5 580 MHz

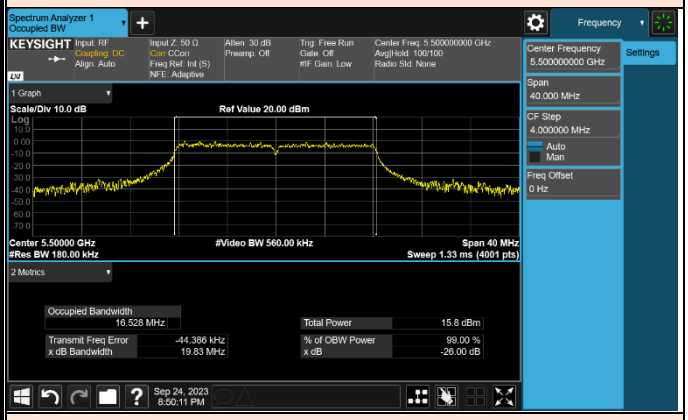


5 720 MHz

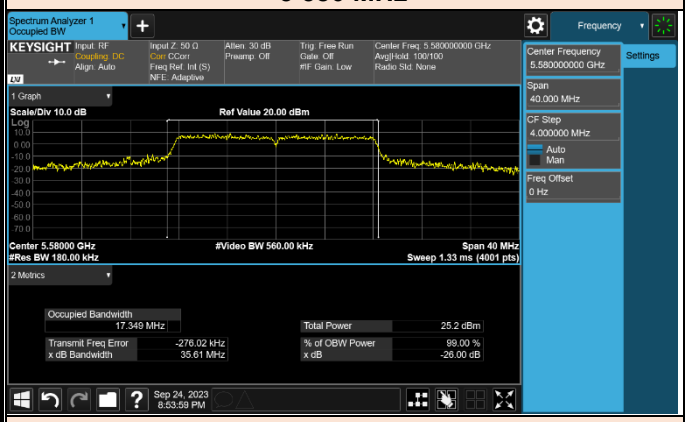


ANT 2

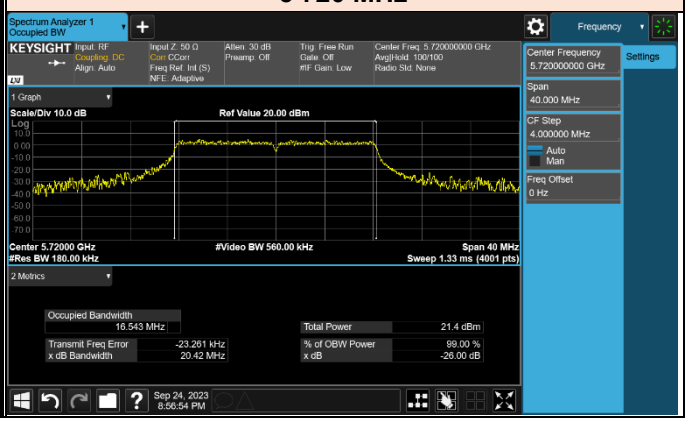
5 500 MHz



5 580 MHz



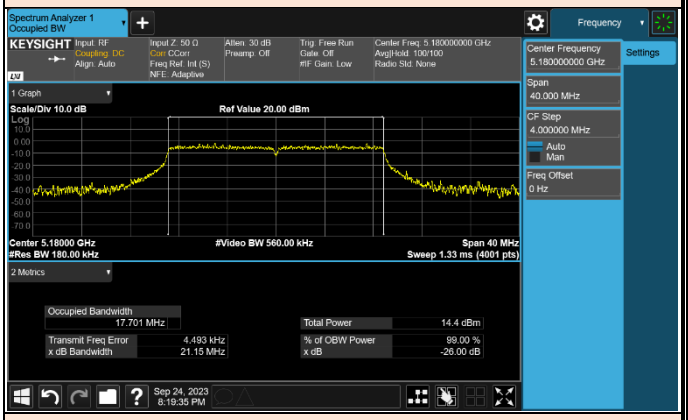
5 720 MHz



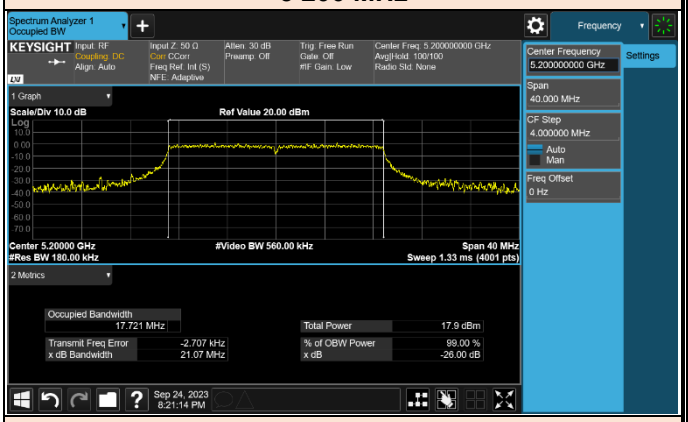
TM 2 _ NII 1

ANT 1

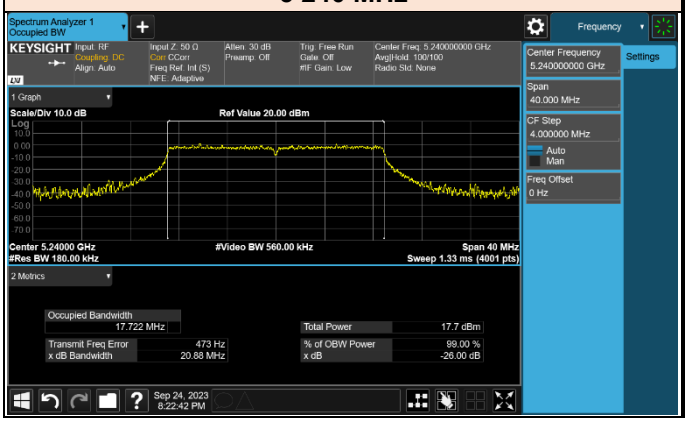
5 180 MHz



5 200 MHz

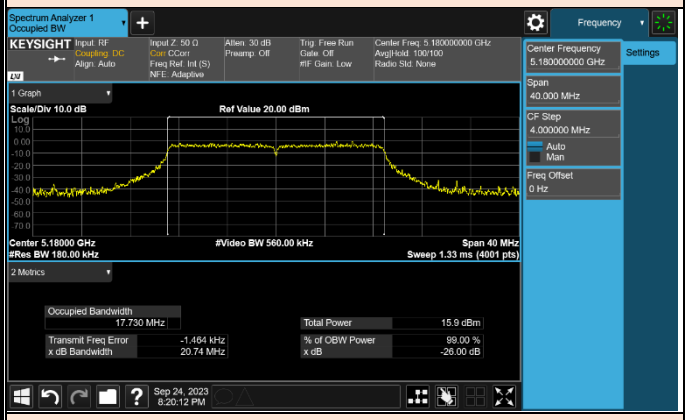


5 240 MHz

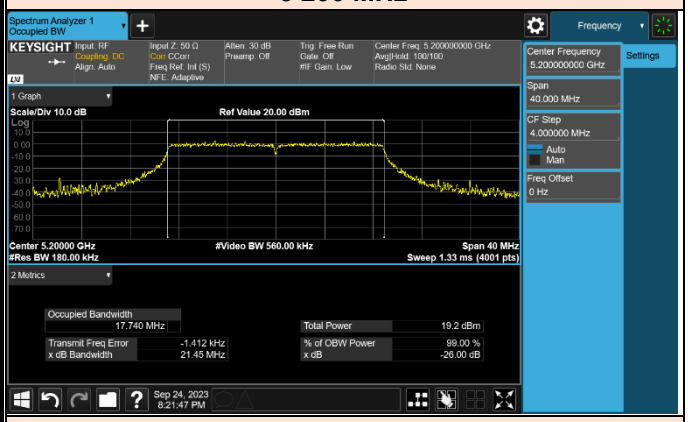


ANT 2

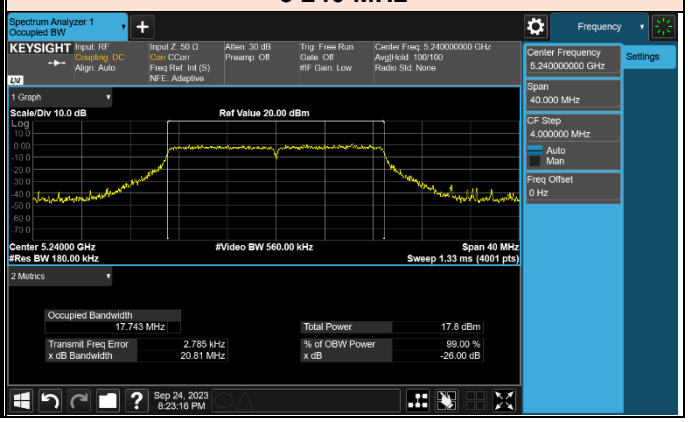
5 180 MHz



5 200 MHz



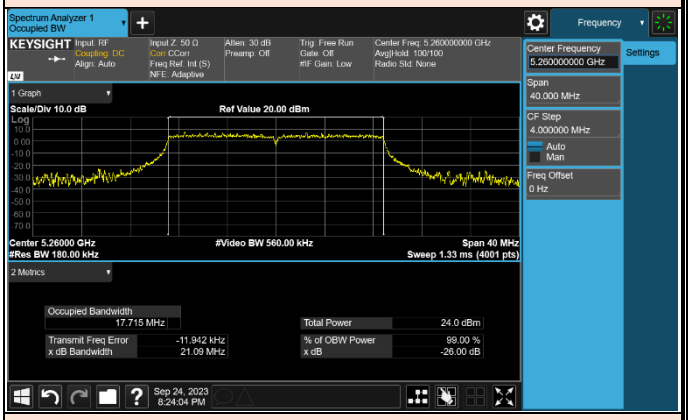
5 240 MHz



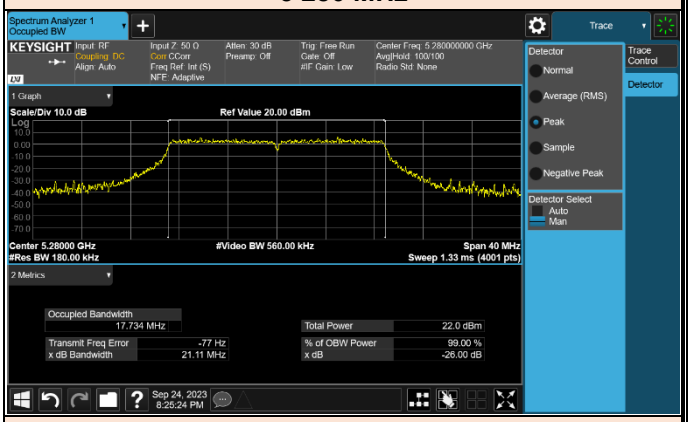
TM 2 _ NII 2A

ANT 1

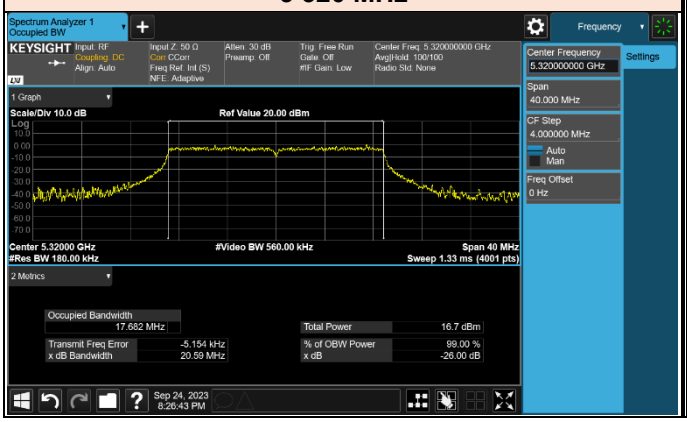
5 260 MHz



5 280 MHz

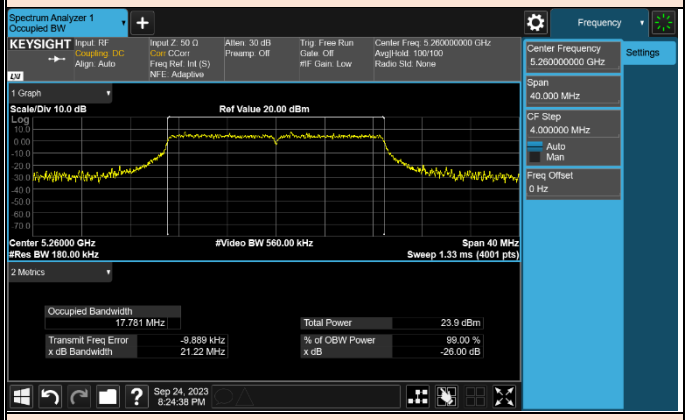


5 320 MHz

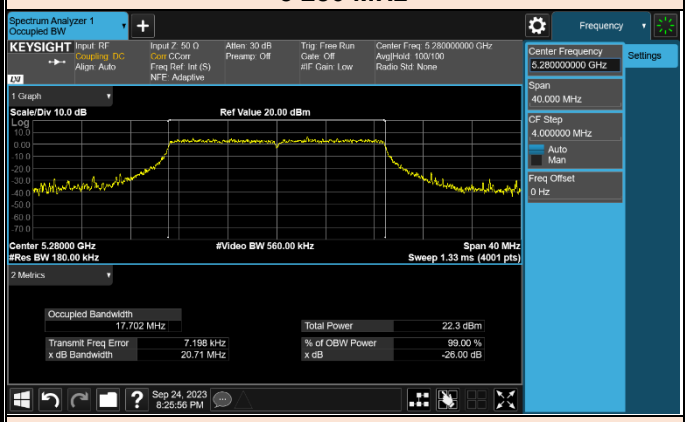


ANT 2

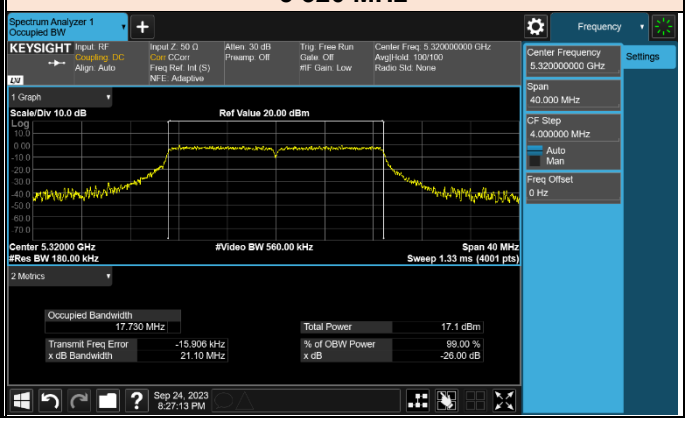
5 260 MHz



5 280 MHz



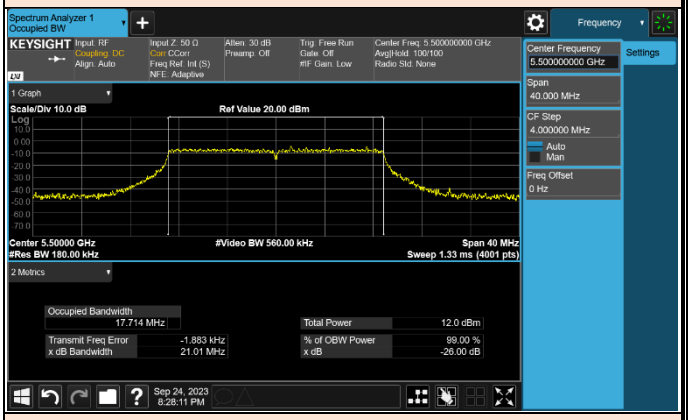
5 320 MHz



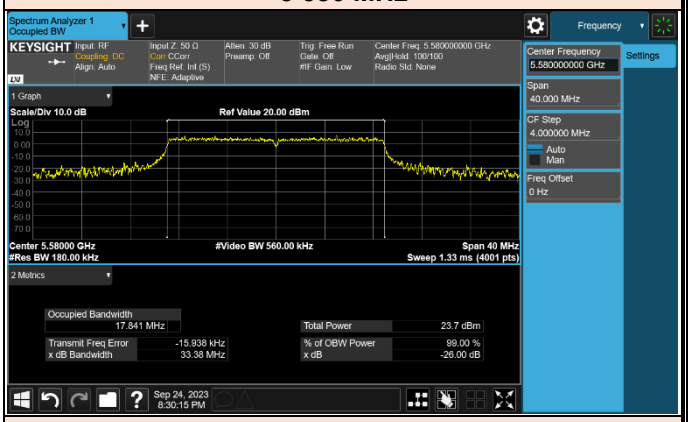
TM 2 _ NII 2C

ANT 1

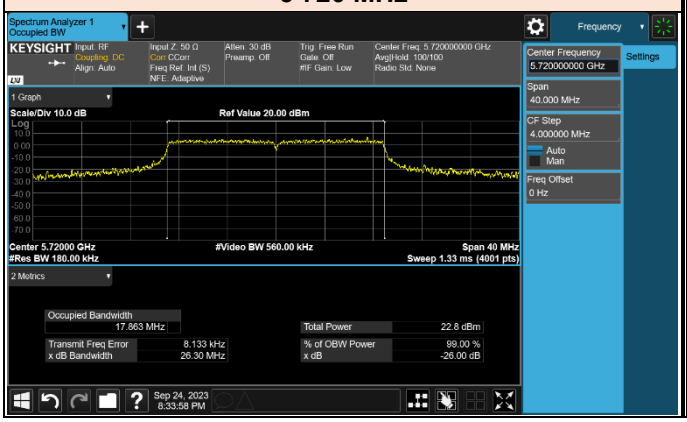
5 500 MHz



5 580 MHz

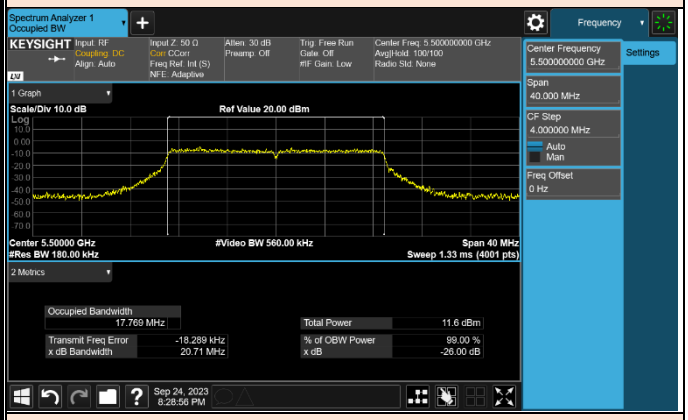


5 720 MHz

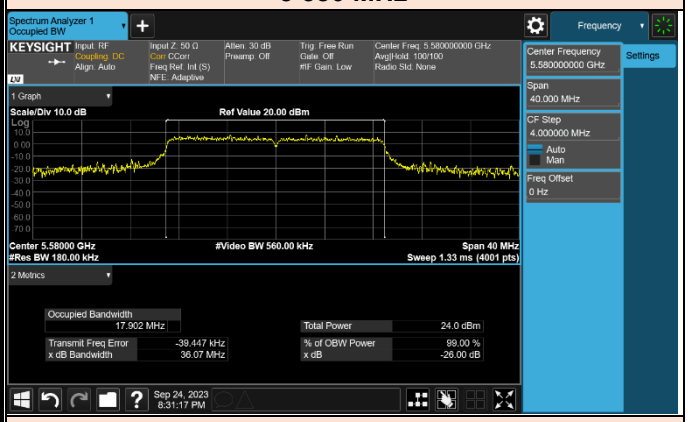


ANT 2

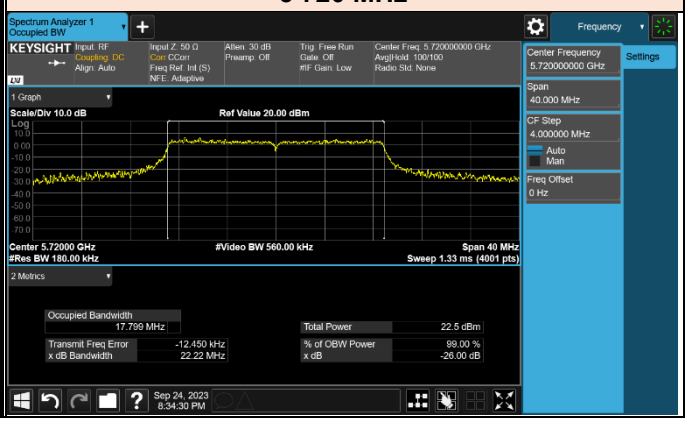
5 500 MHz



5 580 MHz



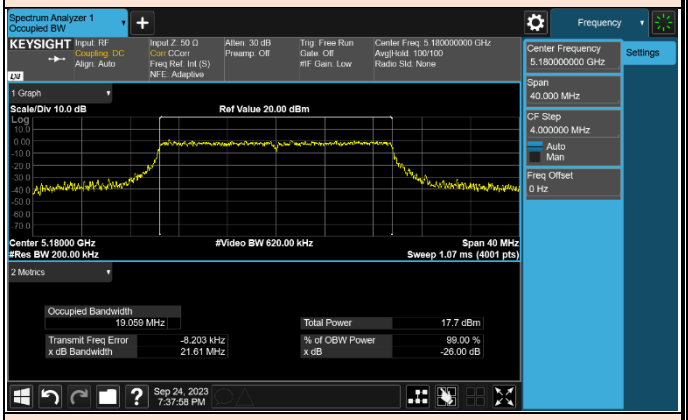
5 720 MHz



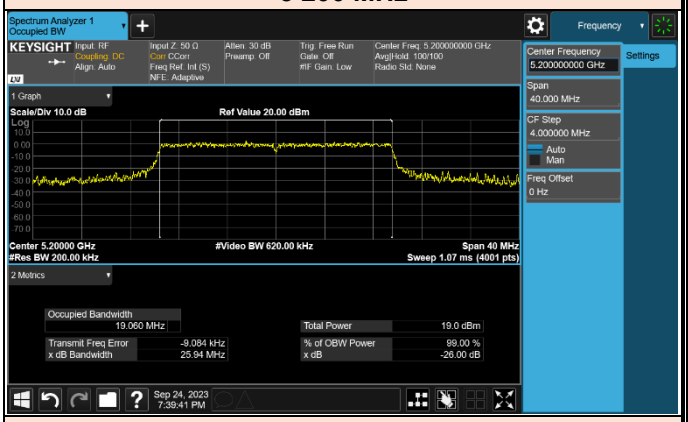
TM 3 _ NII 1

ANT 1

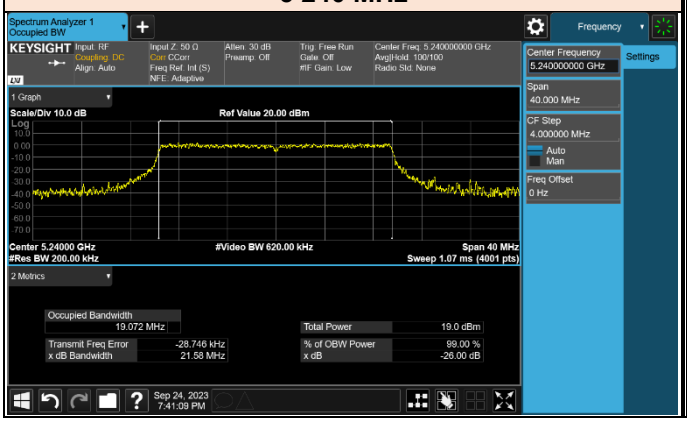
5 180 MHz



5 200 MHz

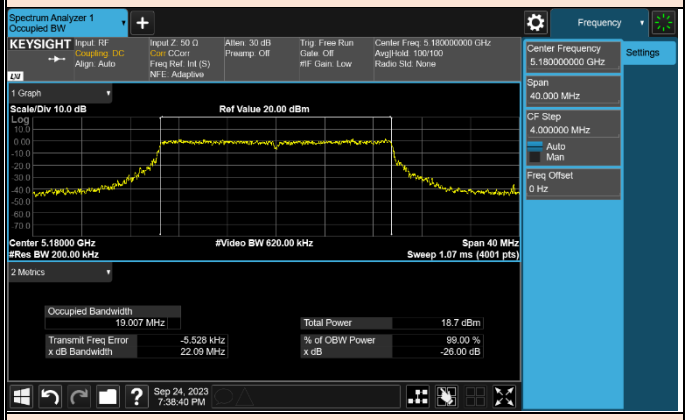


5 240 MHz

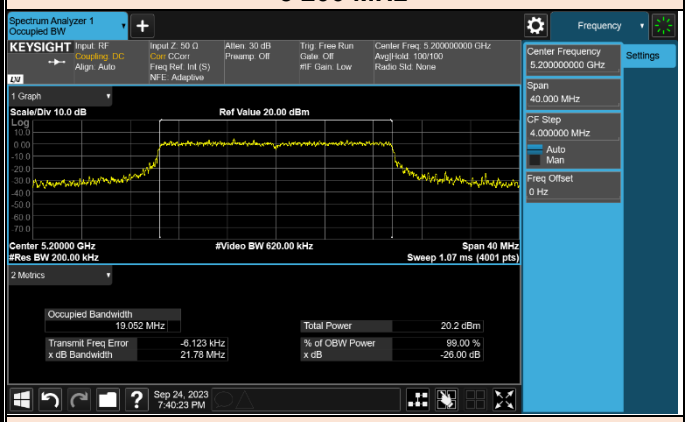


ANT 2

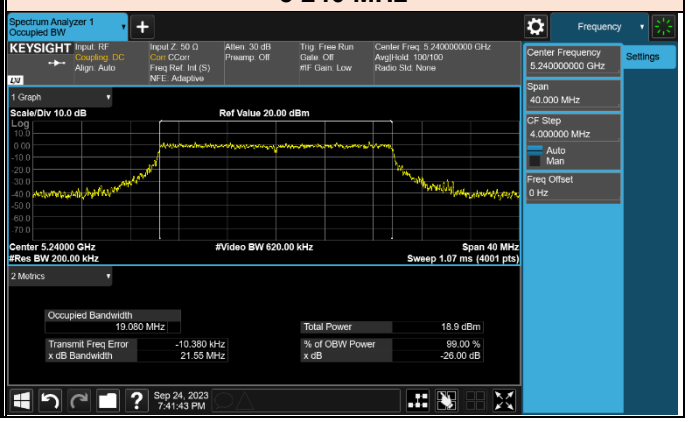
5 180 MHz



5 200 MHz



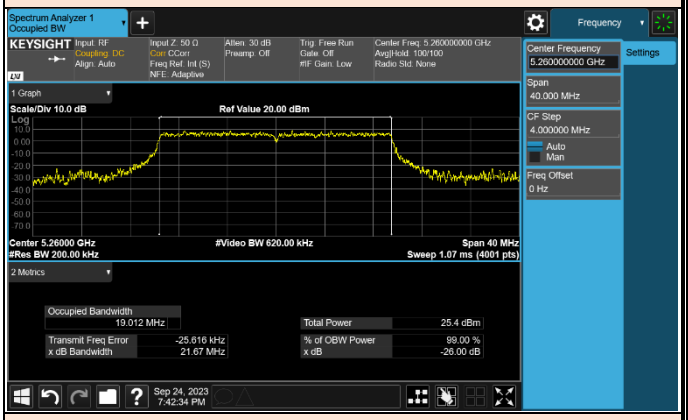
5 240 MHz



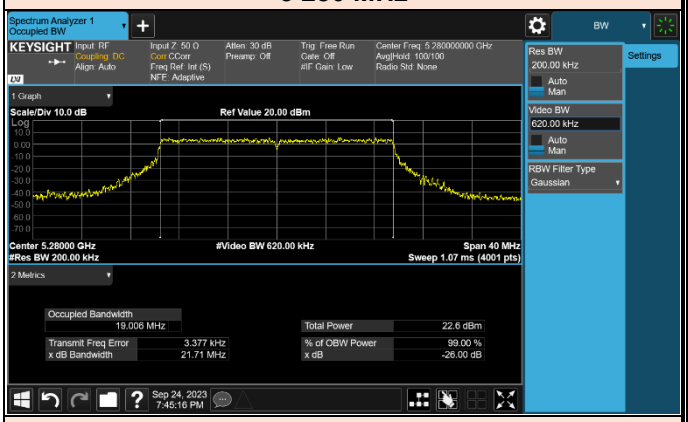
TM 3 _ NII 2A

ANT 1

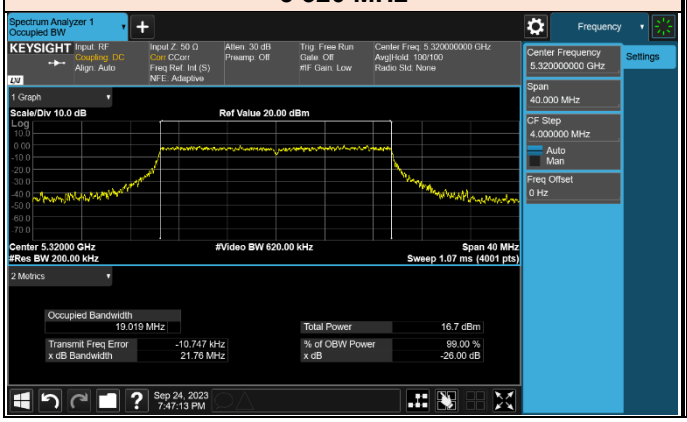
5 260 MHz



5 280 MHz

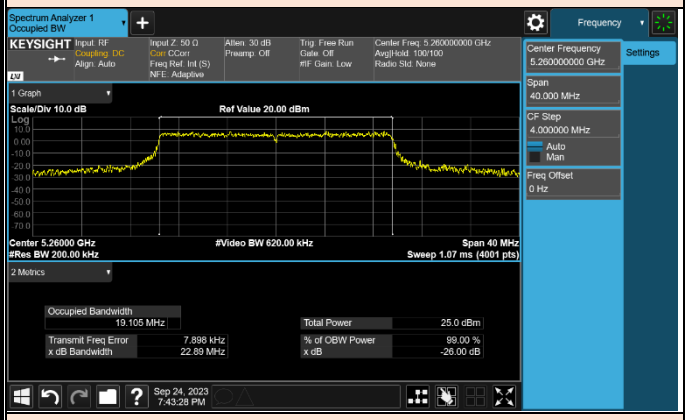


5 320 MHz

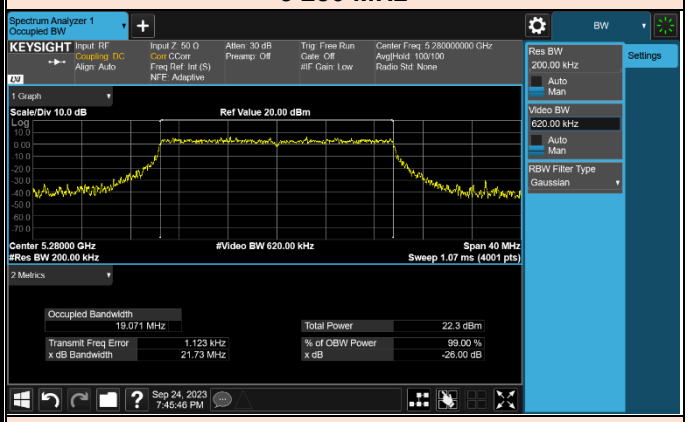
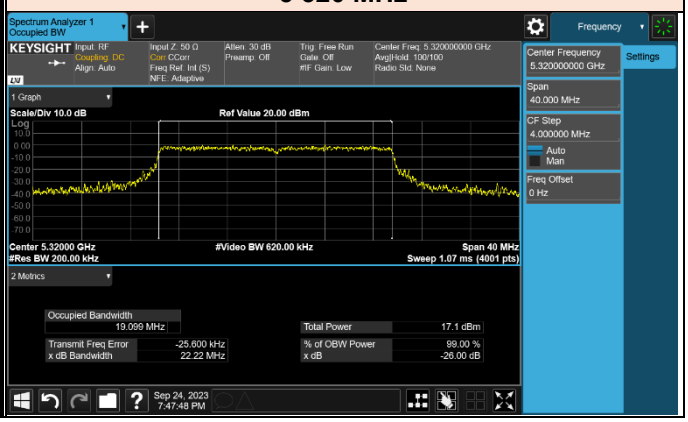


ANT 2

5 260 MHz



5 280 MHz



5 320 MHz