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RF Test Report

5 GHz WLAN

Report No. : FCCCBNW-WAY-P23110165-4R1
Customer : Pittasoft Co., Ltd.
Address : A 4th floor, ABN Tower, 331, Pangyo-ro, Bundang-gu
Seongnam-si, Gyeonggi-do South Korea
Use of Report : Certification
Model Name : DR970X Plus
FCC ID : YCK-DR970XP
Date of Test : 2023.11.15 to 2024.01.22
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 : Donghwa SHIN

(Signature)

2024. 02. 05

BV CPS ADT Korea Ltd.

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RELEASE CONTROL RECORD

REPORT NO.	REASON FOR CHANGE	DATE ISSUED
FCCCBNW-WAY-P23110165-4	Original release	2024.01.26
FCCCBNW-WAY-P23110165-4R1	Update test result of 802.11n mode	2024.02.05

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1 Summary of Test Results

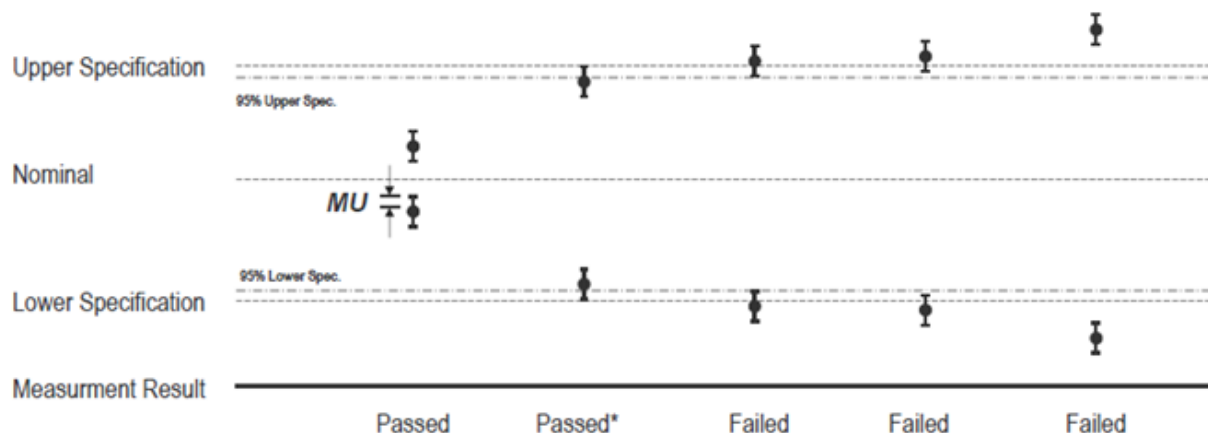
The EUT has been tested according to the following specifications

Applied Standard : FCC Part 15, Subpart E 15.407					
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 ^{Note4}	-
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	NA ^{Note3}	Section 3.8
15.203	Antenna Requirement	FCC 15.203	-	PASS	Section 3.1

NOTES

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

1.1 Decision Rules for Statement of Conformity



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

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

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

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

1.2 Measurement Uncertainty

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

Measurement Items	Frequency Range	Expanded Uncertainty $U = kU_c (k = 2)$
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

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	CAR DASHCAM
FCC ID	YCK-DR970XP
Model	DR970X Plus
Additional model name	DR970X-1CH Plus, DR970X-2CH Plus, DR970X-2CH IR Plus, DR970X-2CH Truck Plus, DR970X-2CH DMS Plus
Power Supply	DC 12 V , DC 24V
Modulation Type	OFDM : 802.11a/n(HT20, HT40) : 802.11ac(VHT20, VHT40, VTH80)
Transfer Rate	6, 9, 12, 18, 24, 36, 48, 54 Mbps (802.11a) / SISO MCS0 to MCS15 (802.11n) / SISO MCS0 to MCS9 (802.11ac) / SISO
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: 4.34 dBm NII 3: 2.26 dBm
Antenna Type	Chip Antenna
Antenna Gain	NII 1: 0.47 dBi NII 3: -0.86 dBi
H/W Version	1.0
S/W Version	1.0

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.

2.2 Tested sample and Tested companion device information

Type	Model	Note
Test sample (Conducted)	DR970X Plus	S/N: 97XPK3MAE00210
Test sample (Radiated)	DR970X Plus	S/N: 97XPK3MAE00213

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 ^{Note1}	802.11n(HT20)	MCS 0
TM 3 ^{Note1}	802.11n(HT40)	MCS 0
TM 2 ^{Note1} (Tested)	802.11ac(VHT20)	MCS 0
TM 3 ^{Note1} (Tested)	802.11ac(VHT40)	MCS 0
TM 4	802.11ac(VHT80)	MCS 0

Note1: Tested at high output power of 802.11n, 802.11ac.

Note2: This device support SISO.

2.4 Tested Frequency Information

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

2.5 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.

2.6 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.

2.7 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
ANSI C63.10-2013

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

2.8 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
Spectrum Analyzer	R&S	FSW50	101403	2024-11-22
Signal Analyzer	R&S	FSV30	103017	2024-11-22
Signal Analyzer	Keysight Technologies	N9020B	MY62150135	2024-05-25
Signal Analyzer	Keysight Technologies	N9030B	MY57142476	2024-11-22
MXG Vector Signal Generator	Keysight Technologies	N5182B	MY53051310	2024-11-22
Signal Generator	R&S	SMB100A	MY41006053	2024-05-25
DC Power Supply	Keysight Technologies	E3632A	MY62216181	2024-05-25
Attenuator	Aeroflex	40AH2W-10	1	2024-11-22
True-RMS Digital Multimeter	Fluke	177	43240434	2024-05-25
High Pass Filter	Micro-Tronics	HPM17543	28	2024-05-25
High Pass Filter	Wt Microwave	WT-A1698-HS	WT190313-6-4	2024-11-22
Humidity Barometer TEMP Meter	LUTRON	MHB-382SD	AJ.38475	2024-11-21
Humidity Barometer TEMP Meter	LUTRON	MHB-382SD	AJ.38459	2023-11-29
EMI Test Receiver	R&S	ESW8	101170	2024-11-21
EMI Test Receiver	R&S	ESW44	101812	2024-11-22
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	2024-12-05
BBHA 9170 Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	00955	2024-11-27
Signal Conditioning Unit	R&S	SCU-18F	180112	2024-11-21
Signal Conditioning Unit	R&S	SCU08F2	08400015	2024-11-21
Amplifier	L3 Narda-MITEQ	JS44-18004000-33-8P	2142086	2024-11-22
Power Meter	R&S	NRX	103577	2024-11-22
Power Sensor	R&S	NRP-Z211	102377	2024-11-22
EMC 32	R&S	EMC32	1000	-
EMC 32	R&S	EMC32	1040	-

3 Test Results

3.1 Antenna Requirement

Except from §15.203 of the FCC Rules/Regulations:

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

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

Result

The EUT complies with the requirement of §15.203

3.2 26 dB Bandwidth

3.2.1 Test Procedure

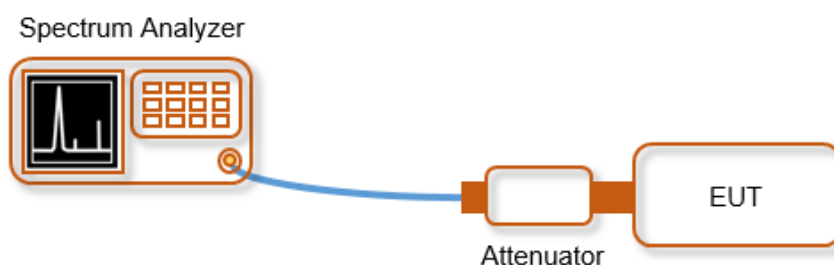
The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies. The 26 dB bandwidth is used to determine the conducted output power limit.

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

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

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

3.2.2 Test Setup

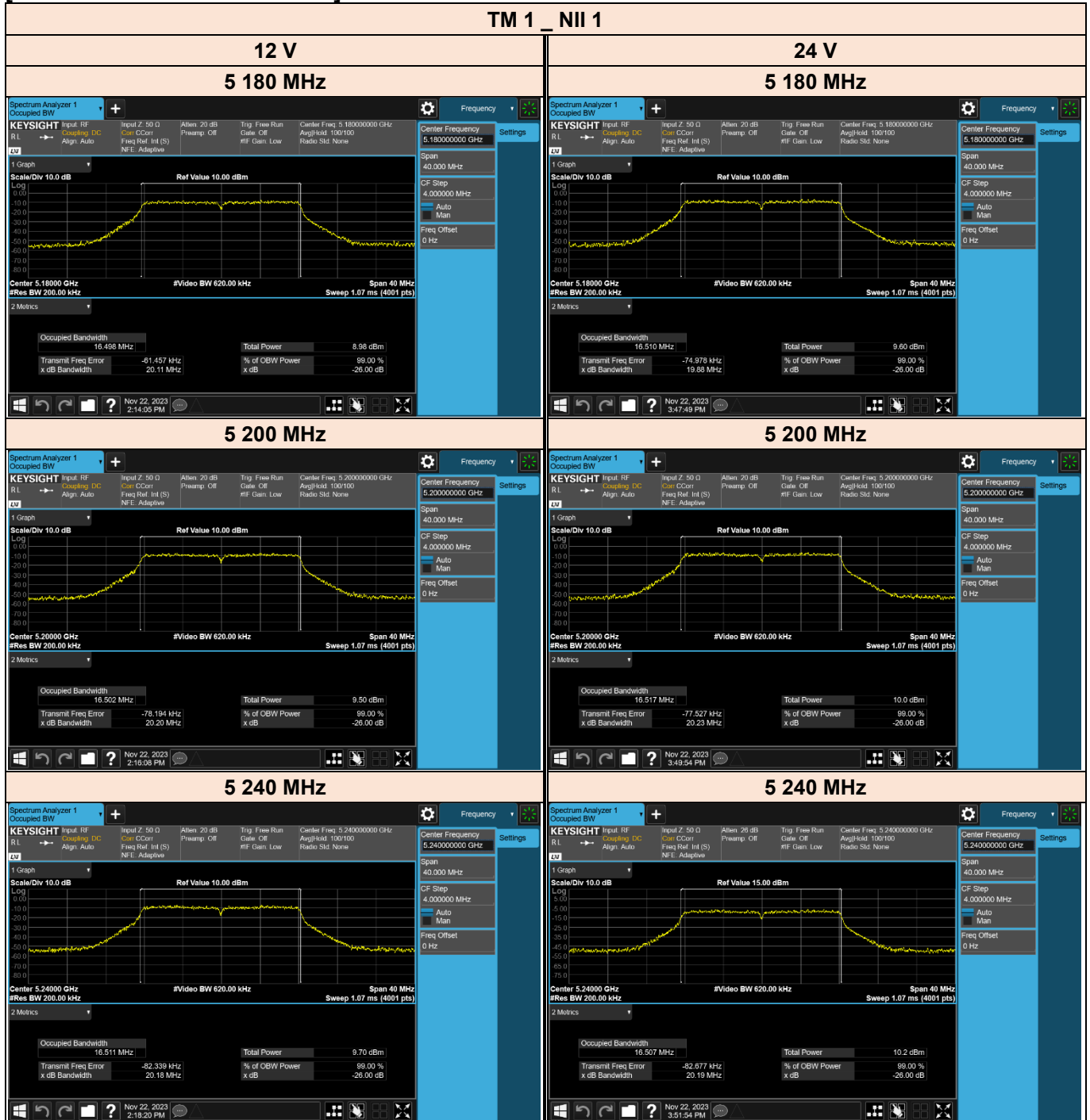


3.2.3 Test Result

[Test Data of 26 dB Bandwidth]

Test Mode	Band	Tested Frequency [MHz]	26 dB Bandwidth [MHz]	
			12 V	24 V
TM 1	NII 1	5 180	20.11	19.88
		5 200	20.20	20.23
		5 240	20.18	20.19
TM 2	NII 1	5 180	21.03	20.79
		5 200	20.87	20.76
		5 240	20.89	20.98
TM 3	NII 1	5 190	41.31	41.52
		5 230	41.56	41.29
TM 4	NII 1	5 210	81.05	81.16

[Test Plot of 26 dB Bandwidth]



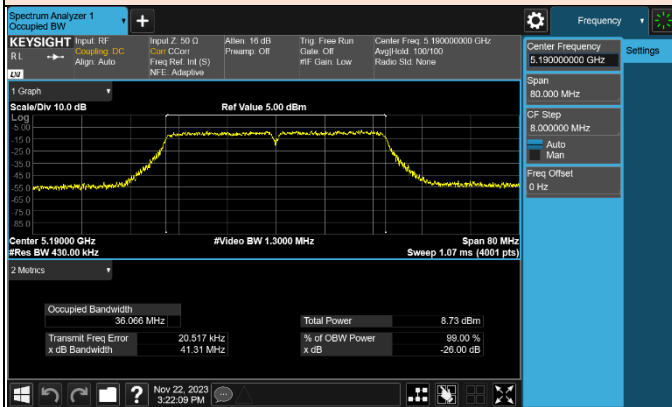


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TM 3 _ NII 1

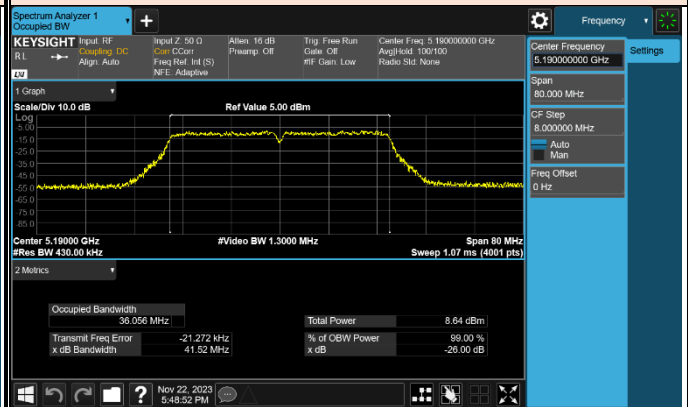
12 V

5 190 MHz

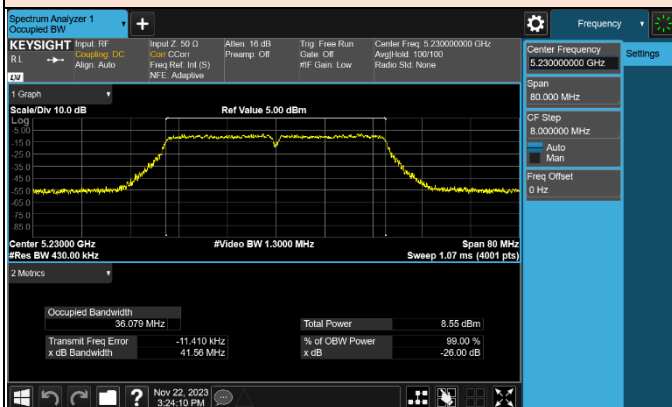


24 V

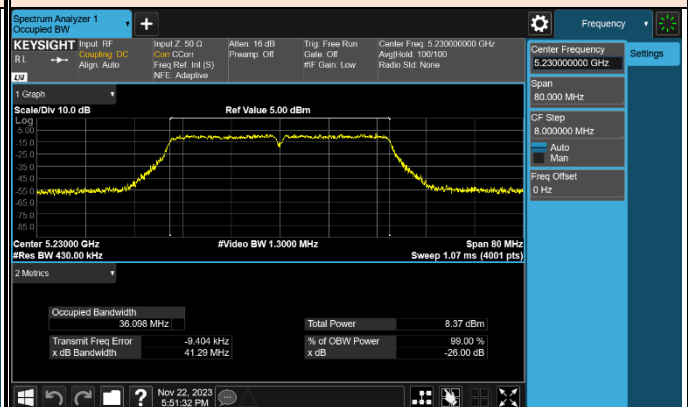
5 190 MHz



5 230 MHz



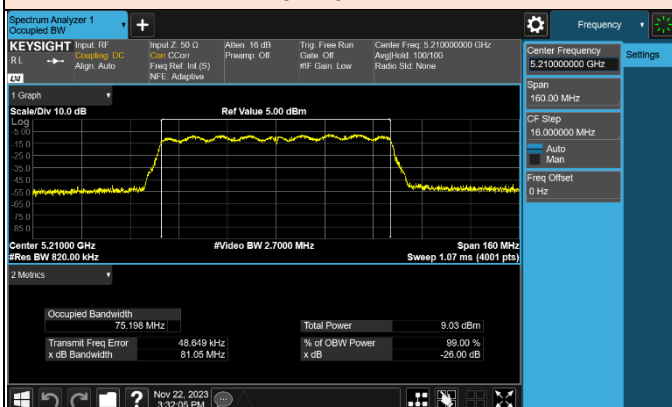
5 230 MHz



TM 4 _ NII 1

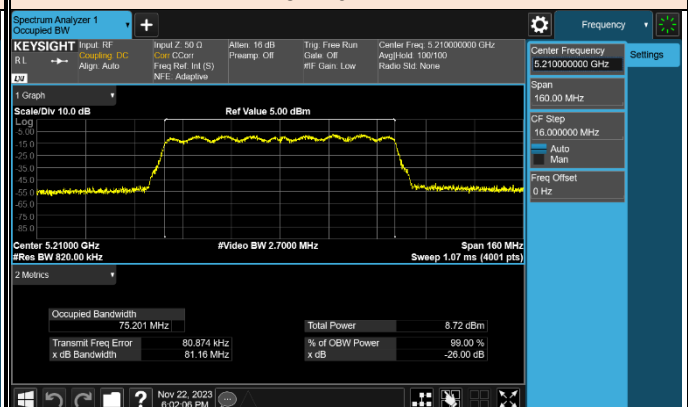
12 V

5 210 MHz



24 V

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.

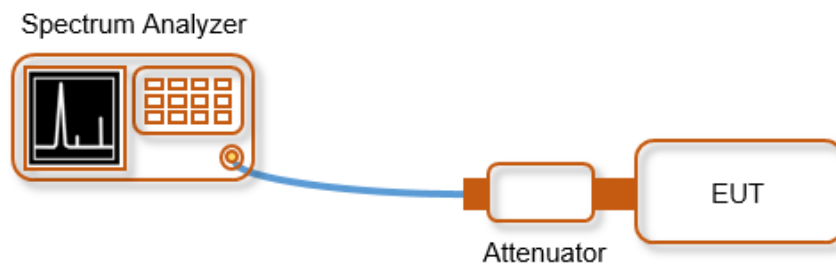
3.3.2 Test Procedure

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]

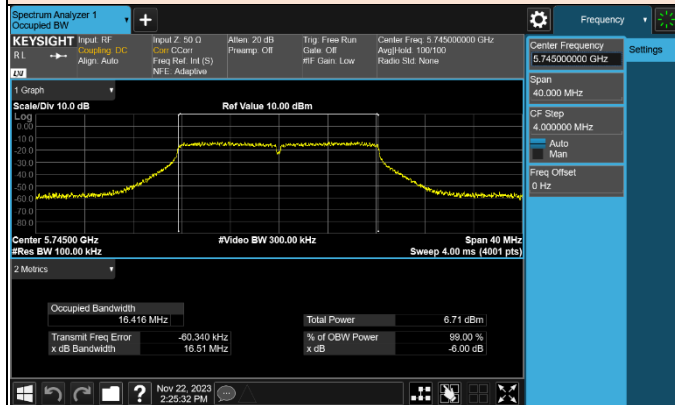
Test Mode	Tested Frequency [MHz]	6 dB Bandwidth [MHz]	
		12 V	24 V
TM 1	5 745	16.51	16.53
	5 785	16.54	16.48
	5 825	16.51	16.54
TM 2	5 745	17.62	17.61
	5 785	17.62	17.62
	5 825	17.60	17.62
TM 3	5 755	36.40	36.39
	5 795	36.39	36.38
TM 4	5 775	76.08	76.07

[Test Plot of 6 dB Bandwidth]

TM 1 _ NII 3

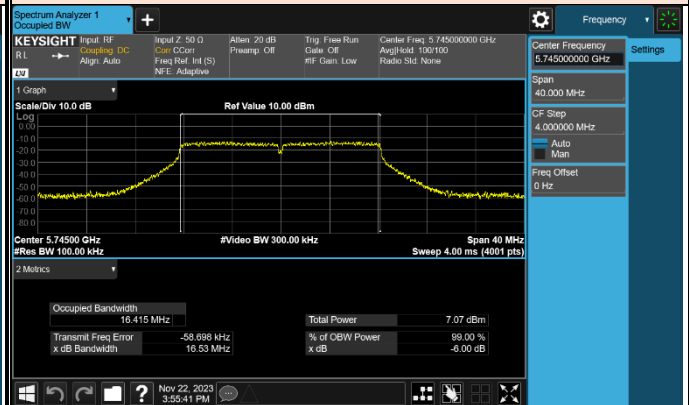
12 V

5 745 MHz

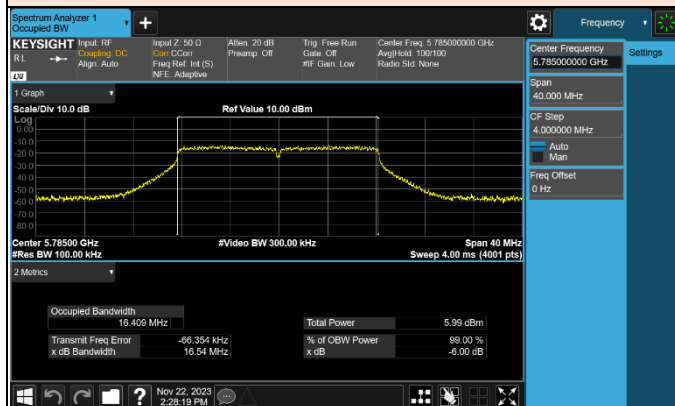


24 V

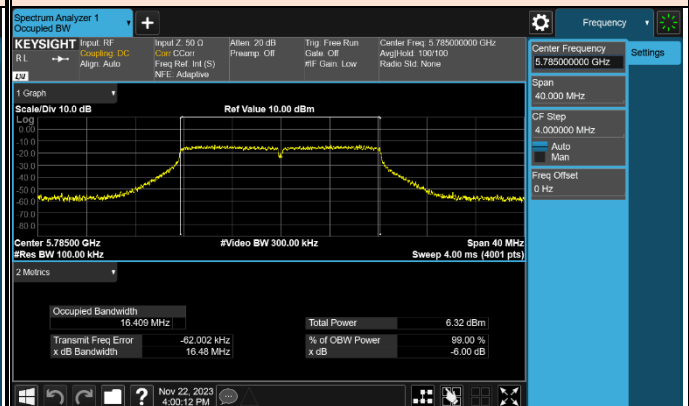
5 745 MHz



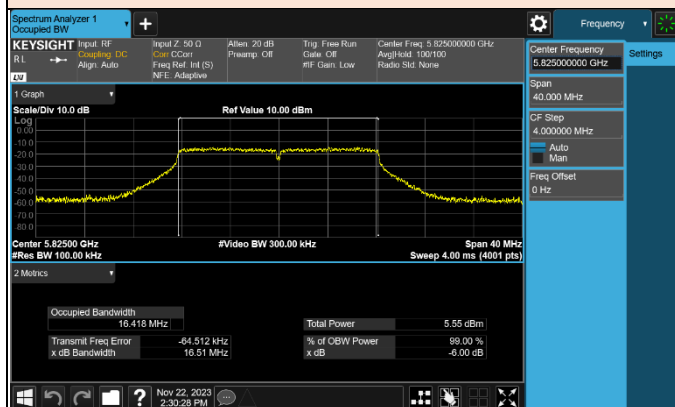
5 785 MHz



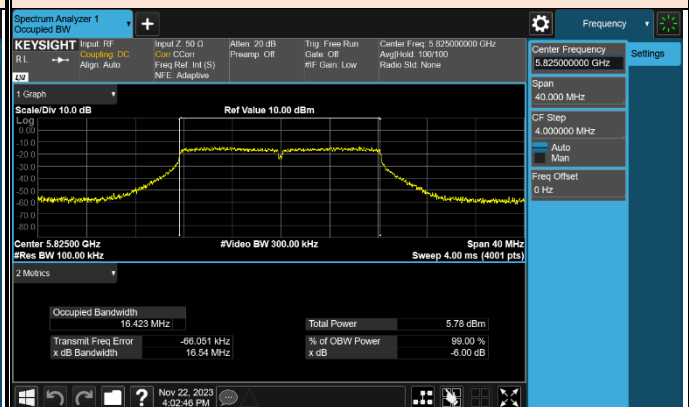
5 785 MHz



5 825 MHz



5 825 MHz





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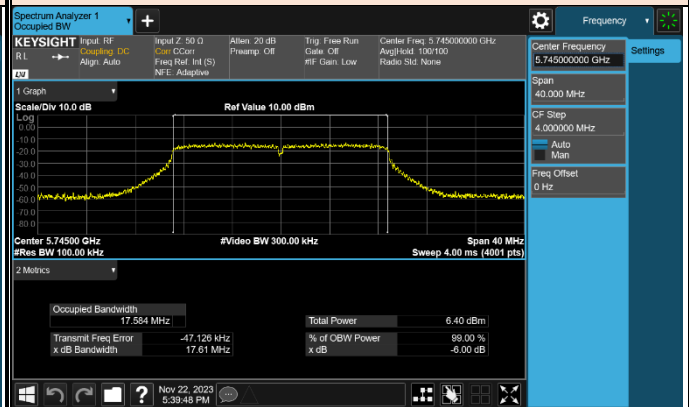
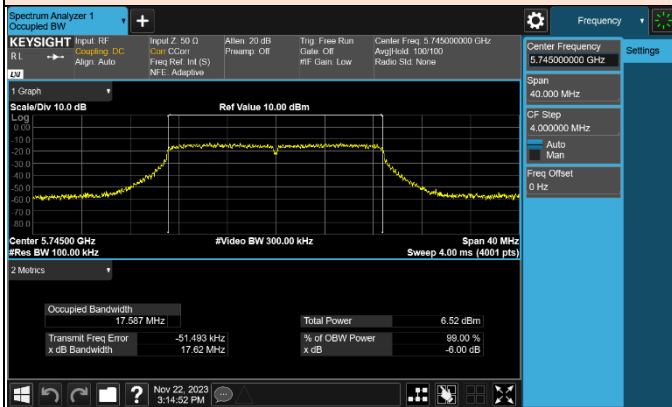
TM 2 _ NII 3

12 V

24 V

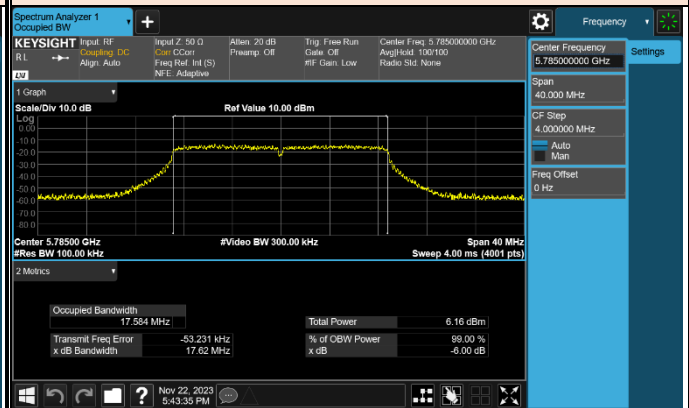
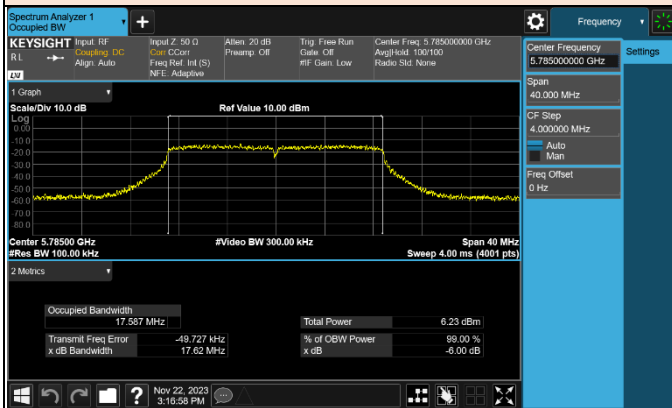
5 745 MHz

5 745 MHz



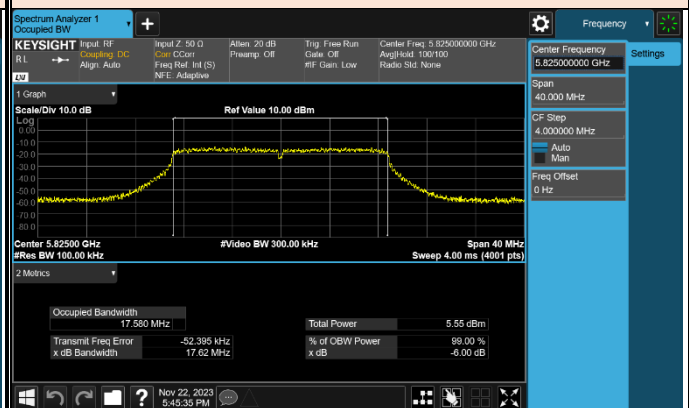
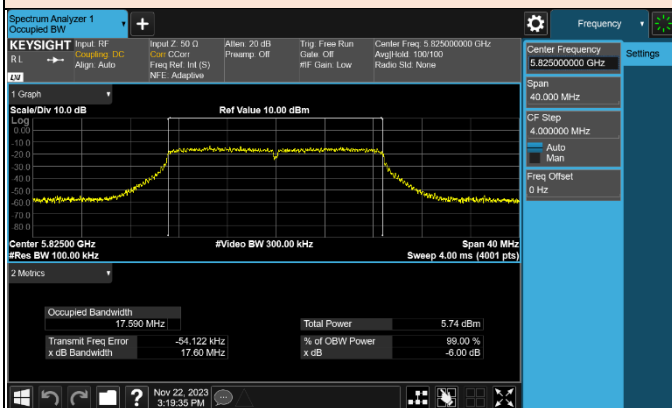
5 785 MHz

5 785 MHz



5 825 MHz

5 825 MHz



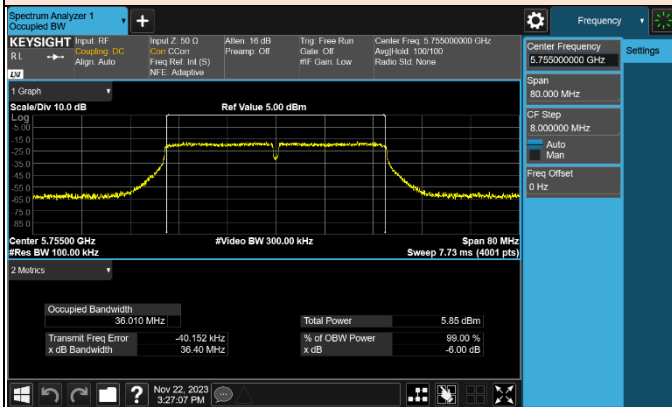


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TM 3 _ NII 3

12 V

5 755 MHz

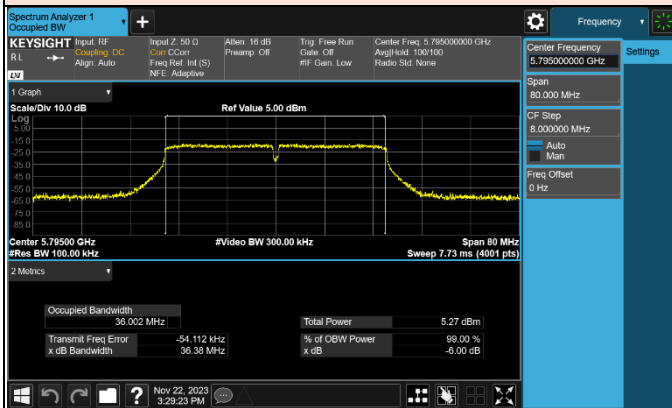


24 V

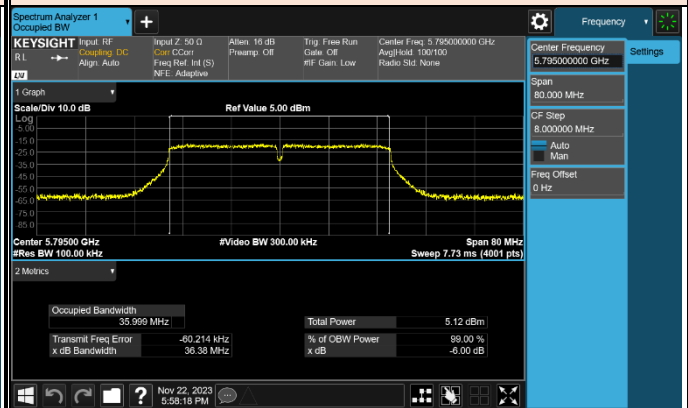
5 755 MHz



5 795 MHz



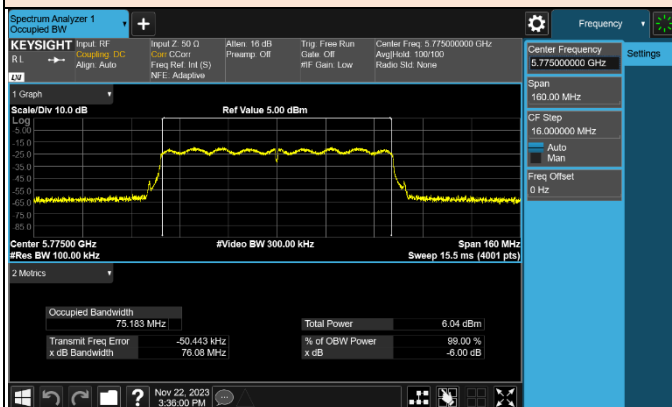
5 795 MHz



TM 4 _ NII 3

12 V

5 775 MHz



24 V

5 775 MHz

