RF TEST REPORT

For

FIBRAIN sp. z o.o.
Product Name: GPON ONT
Model(s).: HL-4GMVR

Report Reference No.	:	**POCE230921003RL002**
FCC ID	:	**2AWIZHL4GMVR**
Applicant's Name	:	FIBRAIN sp. z o.o.
Address	:	Poland, Zaczernie 190F, 36-062
Testing Laboratory	:	Shenzhen POCE Technology Co., Ltd.
Address	:	102 Building H1 & 1/F., Building H, Hongfa Science & Technology Park, Tangtou, Shiyan, Bao'an District, Shenzhen, Guangdong, China
Test Specification Standard	:	**47 CFR Part 15E**
Date of Receipt	:	September 21, 2023
Date of Test	:	September 21, 2023 to October 8, 2023
Data of Issue	:	October 8, 2023
Result	:	**Pass**

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Revision History Of Report

Version	Description	REPORT No.	Issue Date
V1.0	Original	POCE230921003RL002	October 8, 2023

NOTE1:
The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

Compiled by:	Supervised by:	Approved by:
Ben Tang	Tom Chen	Machael Mo
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1 TEST SUMMARY

1.1 Test Standards

The tests were performed according to following standards:

47 CFR Part 15E: Unlicensed National Information Infrastructure Devices

1.2 Summary of Test Result

Item	Standard	Method	Requirement	Result
Antenna requirement	47 CFR Part 15E		Part 15.203	Pass
Conducted Emission at AC power line	47 CFR Part 15E	ANSI C63.10-2013 section 6.2	47 CFR Part 15.207(a)	Pass
Duty Cycle	47 CFR Part 15E	ANSI C63.10-2013 section 12.2 (b)		Pass
Maximum conducted output power	47 CFR Part 15E	ANSI C63.10-2013, section 12.3	47 CFR Part 15.407(a)(1)(i) 47 CFR Part 15.407(a)(1)(ii) 47 CFR Part 15.407(a)(1)(iii) 47 CFR Part 15.407(a)(1)(iv) 47 CFR Part 15.407(a)(3)(i)	Pass
Power spectral density	47 CFR Part 15E	ANSI C63.10-2013, section 12.5	47 CFR Part 15.407(a)(1)(i) 47 CFR Part 15.407(a)(1)(ii) 47 CFR Part 15.407(a)(1)(iii) 47 CFR Part 15.407(a)(1)(iv) 47 CFR Part 15.407(a)(3)(i)	Pass
Emission bandwidth and occupied bandwidth	47 CFR Part 15E	ANSI C63.10-2013, section 6.9.3 & 12.4 KDB 789033 D02, Clause C.2	U-NII 1, U-NII 2A, U-NII 2C: No limits, only for report use. 47 CFR Part 15.407(e)	Pass
Band edge emissions (Radiated)	47 CFR Part 15E	ANSI C63.10-2013, section 12.7.4, 12.7.5, 12.7.6	47 CFR Part 15.407(b)(1) 47 CFR Part 15.407(b)(4) 47 CFR Part 15.407(b)(10)	Pass
Undesirable emission limits (below 1GHz)	47 CFR Part 15E	ANSI C63.10-2013, section 12.7.4, 12.7.5, 12.7.6	47 CFR Part 15.407(b)(9)	Pass
Undesirable emission limits (above 1GHz)	47 CFR Part 15E	ANSI C63.10-2013, section 12.7.4, 12.7.5, 12.7.6	47 CFR Part 15.407(b)(1) 47 CFR Part 15.407(b)(4) 47 CFR Part 15.407(b)(10)	Pass

2 GENERAL INFORMATION

2.1 Client Information

Applicant's Name : FIBRAIN sp. z o.o.
Address : Poland, Zaczernie 190F, 36-062

Manufacturer : FIBRAIN sp. z o.o.
Address : Poland, Zaczernie 190F, 36-062

2.2 Description of Device (EUT)

Product Name:	GPON ONT
Model/Type reference:	HL-4GMVR
Series Model:	N/A
Trade Mark:	HALNY
Power Supply:	DC 12V/1.5A from adapter
Power Adaptor:	Adaptor1: MODEL:GS-P120150E664 INPOU:100-240V-50/60Hz 0.6A OUTPUT:DC12V/1.5A Adaptor2: MODEL:MAUS-1201501802 INPOU:100-240V-50/60Hz 0.5A OUTPUT:DC12V/1.5A
Operation Frequency:	802.11a/n(HT20)/ac(HT20): U-NII Band 1: 5180MHz to 5240MHz; U-NII Band 3: 5745MHz to 5825MHz; 802.11n(HT40)/ac(HT40): U-NII Band 1: 5190MHz to 5230MHz; U-NII Band 3: 5755MHz to 5795MHz; 802.11ac(HT80): U-NII Band 1: 5210MHz; U-NII Band 3: 5775MHz
Number of Channels:	802.11a/n(HT20)/ac(HT20): U-NII Band 1: 4; U-NII Band 3: 5; 802.11n(HT40)/ac(HT40): U-NII Band 1: 2; U-NII Band 3: 2; 802.11ac(HT80): U-NII Band 1: 1; U-NII Band 3: 1
Modulation Type:	802.11a: OFDM(BPSK, QPSK, 16QAM, 64QAM); 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM); 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM);
Antenna Type:	External
Antenna Gain:	Antenna1:2dBi;Antenna2:2dBi MIMO Gain:5.01dBi
Hardware Version:	V1.0
Software Version:	V1.0

Note: MIMO Gain=$10*\log[(10^{G1/20}+10^{G2/20}+\ldots)^2 /N_{ant}]$, so MIMO Gain: 5.01 dBi < 6dBi
(Remark:The Antenna Gain is supplied by the customer.POCE is not responsible for this data and the related calculations associated with it)

Operation Frequency each of channel

Band 1					
802.11a/802.11n20		802.11n40		802.11ac	
Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180MHz	39	5190MHz	42	5210MHz
40	5200MHz	45	5230MHz		
44	5220MHz				
48	5240MHz				
Band 4					
802.11a/802.11n20		802.11n40		802.11ac	
Channel	Frequency	Channel	Frequency	Channel	Frequency
149	5745MHz	151	5755MHz	155	5775MHz
153	5765MHz	159	5795MHz		
157	5785MHz				
161	5805MHz				
165	5825MHz				

Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Band 1					
802.11a/802.11n20		802.11n40		802.11ac	
Channel	Frequency	Channel	Frequency	Channel	Frequency
The lowest channel	5180MHz	The lowest channel	5190MHz	The middle channel	5210MHz
The middle channel	5200MHz	The highest channel	5230MHz		
The highest channel	5240MHz				
Band 4					
802.11a/802.11n20		802.11n40		802.11ac	
Channel	Frequency	Channel	Frequency	Channel	Frequency
The lowest channel	5745MHz	The lowest channel	5755MHz	The middle channel	5775MHz
The middle channel	5785MHz	The highest channel	5795MHz		
The highest channel	5825MHz				

2.3 Description of Test Modes

No	Title	Description
TM1	802.11a mode	Keep the EUT in continuously transmitting mode with 802.11a modulation type. All data rates has been tested and found the data rate @ 6Mbps is the worst case. Only the data of worst case is recorded in the report.
TM2	802.11n mode	Keep the EUT in continuously transmitting mode with 802.11n modulation type. All bandwidth and data rates has been tested and found the data rate @ MCS0 is the worst case. Only the data of worst case is recorded in the report.
TM3	802.11ac mode	Keep the EUT in continuously transmitting mode with 802.11ac modulation type. All bandwidth and data rates has been tested and found the data rate @ MCS0 is the worst case. Only the data of worst case is recorded in the report.
Remark:Only the data of the worst mode would be recorded in this report.		

2.4 Description of Support Units

Title	Manufacturer	Model No.	Serial No.
PC	Lenovo	Air 14 Plus	

2.5 Equipments Used During The Test

Conducted Emission at AC power line					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
loop antenna	EVERFINE	LLA-2	80900L-C	2023-02-27	2024-02-26
Power absorbing clamp	SCHWARZ BECK	MESS-ELEKTRONIK	/	2023-02-28	2024-02-27
Electric Network	SCHWARZ BECK	CAT5 8158	CAT5 8158#207	/	/
Cable	SCHWARZ BECK	/	/	2022-12-27	2023-12-27
Pulse Limiter	SCHWARZ BECK	VTSD 9561-F Pulse limiter 10dB Ateennator	561-G071	2023-02-27	2024-02-26
50ΩCoaxial Switch	Anritsu	MP59B	M20531	/	/
Test Receiver	Rohde & Schwarz	ESPI TEST RECEIVER	ID:1164.6607K 03-102109-MH	2023-06-13	2024-06-12
L.I.S.N	R&S	ESH3-Z5	831.5518.52	2022-12-29	2023-12-28

Duty Cycle **Maximum conducted output power** **Power spectral density** **Emission bandwidth and occupied bandwidth**					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
RF Test Software	TACHOY	RTS-01	V2.0.0.0	/	/
High Pass filter	ZHINAN	OQHPF1-M1.5-18G-224	6210075	/	/
Power divider	MIDEWEST	PWD-2533	SMA-79	2023-05-11	2026-05-10
DC power	HP	66311B	38444359	/	/
RF Sensor Unit	Tachoy Information Technology(shenzhen) Co.,Ltd.	TR1029-2	000001	/	/
Wideband radio communication tester	R&S	CMW500	113410	2023-06-13	2024-06-12
Vector signal generator	Keysight	N5181A	MY48180415	2022-12-10	2023-12-09
Signal generator	Keysight	N5182A	MY50143455	2022-12-29	2023-12-28
Spectrum Analyzer	Keysight	N9020A	MY53420323	2022-12-29	2023-12-28

Band edge emissions (Radiated) Undesirable emission limits (below 1GHz) Undesirable emission limits (above 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test software	Farad	EZ -EMC	V1.1.42	/	/
Positioning Controller	/	MF-7802	/	/	/
High Pass filter	ZHINAN	OQHPF1-M1.5-18G-224	6210075	/	/
Amplifier(18-40G)	COM-POWER	AH-1840	10100008-1	2022-04-05	2025-04-04
Horn antenna	COM-POWER	AH-1840 (18-40G)	10100008	2023-04-05	2025-04-04
Loop antenna	ZHINAN	ZN30900C	ZN30900C	2021-07-05	2024-07-04
Cable(LF)#2	Schwarzbeck	/	/	2023-02-27	2024-02-26
Cable(LF)#1	Schwarzbeck	/	/	2023-02-27	2024-02-26
Cable(HF)#2	Schwarzbeck	AK9515E	96250	2023-02-28	2024-02-27
Cable(HF)#1	Schwarzbeck	SYV-50-3-1	/	2023-02-27	2024-02-26
Power amplifier(LF)	Schwarzbeck	BBV9743	9743-151	2023-06-13	2024-06-12
Power amplifier(HF)	Schwarzbeck	BBV9718	9718-282	2023-06-13	2024-06-12
Wideband radio communication tester	R&S	CMW500	113410	2023-06-13	2024-06-12
Spectrum Analyzer	R&S	FSP30	1321.3008K40-101729-jR	2023-06-14	2024-06-13
Horn Antenna	Sunol Sciences	DRH-118	A091114	2023-05-13	2025-05-12
Broadband Antenna	Sunol Sciences	JB6 Antenna	A090414	2023-05-21	2025-05-20
Test Receiver	R&S	ESCI	102109	2023-06-13	2024-06-12

2.6 Statement Of The Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Disturbance (0.15~30MHz)	±3.41dB
Occupied Bandwidth	±3.63%
RF conducted power	±0.733dB
RF power density	±0.234%
Conducted Spurious emissions	±1.98dB
Radiated Emission (Above 1GHz)	±5.46dB
Radiated Emission (Below 1GHz)	±5.79dB
Note: (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

2.7 Identification of Testing Laboratory

Company Name:	Shenzhen POCE Technology Co., Ltd.
Address:	101-102 Building H5 & 1/F., Building H, Hongfa Science & Technology Park, Tangtou, Shiyan, Bao'an District, Shenzhen, Guangdong, China
Phone Number:	+86-13267178997
Fax Number:	86-755-29113252

Identification of the Responsible Testing Location

Company Name:	Shenzhen POCE Technology Co., Ltd.
Address:	101-102 Building H5 & 1/F., Building H, Hongfa Science & Technology Park, Tangtou, Shiyan, Bao'an District, Shenzhen, Guangdong, China
Phone Number:	+86-13267178997
Fax Number:	86-755-29113252
FCC Registration Number:	0032847402
Designation Number:	CN1342
Test Firm Registration Number:	778666
A2LA Certificate Number:	6270.01

2.8 Announcement

(1) The test report reference to the report template version v0.
(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.
(3) The test report is invalid if there is any evidence and/or falsification.
(4) This document may not be altered or revised in any way unless done so by POCE and all revisions are duly noted in the revisions section.
(5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
(6) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

3 Evaluation Results (Evaluation)

3.1 Antenna requirement

Test Requirement:	Refer to 47 CFR Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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 this section.

3.1.1 Conclusion:

4 Radio Spectrum Matter Test Results (RF)

4.1 Conducted Emission at AC power line

Test Requirement:	47 CFR Part 15.207(a)
Test Limit:	

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

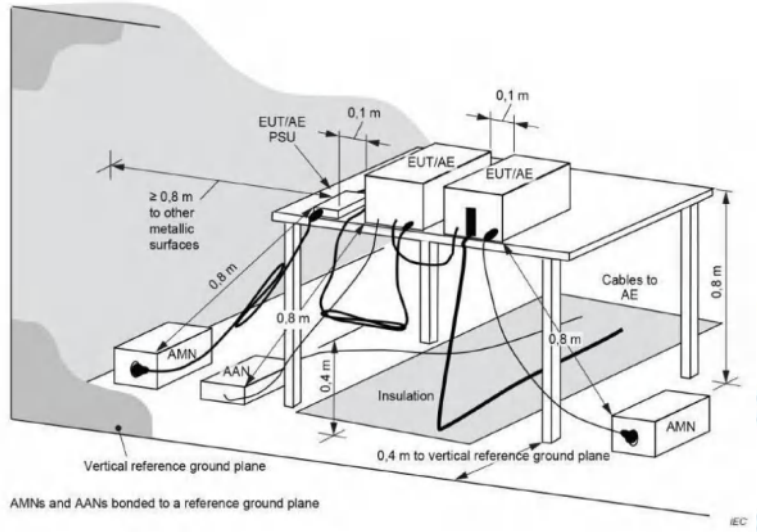
*Decreases with the logarithm of the frequency.

Test Method:	Refer to ANSI C63.10-2013 section 6.2, standard test method for ac power-line conducted emissions from unlicensed wireless devices

4.1.1 E.U.T. Operation:

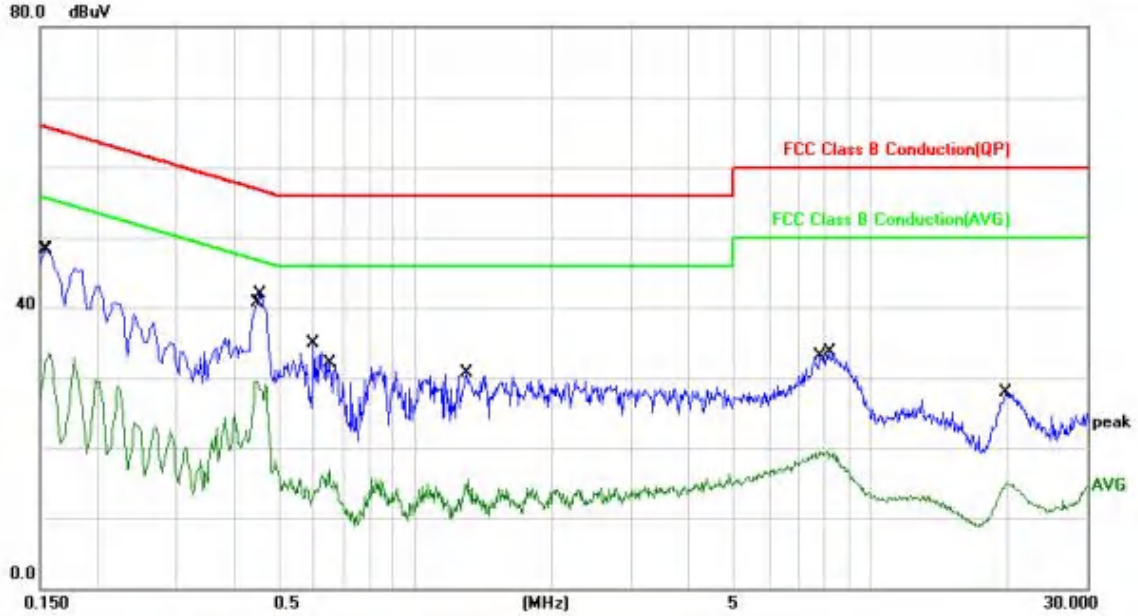
Operating Environment:					
Temperature:	22.4 °C	Humidity:	50.4 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

4.1.2 Test Setup Diagram:



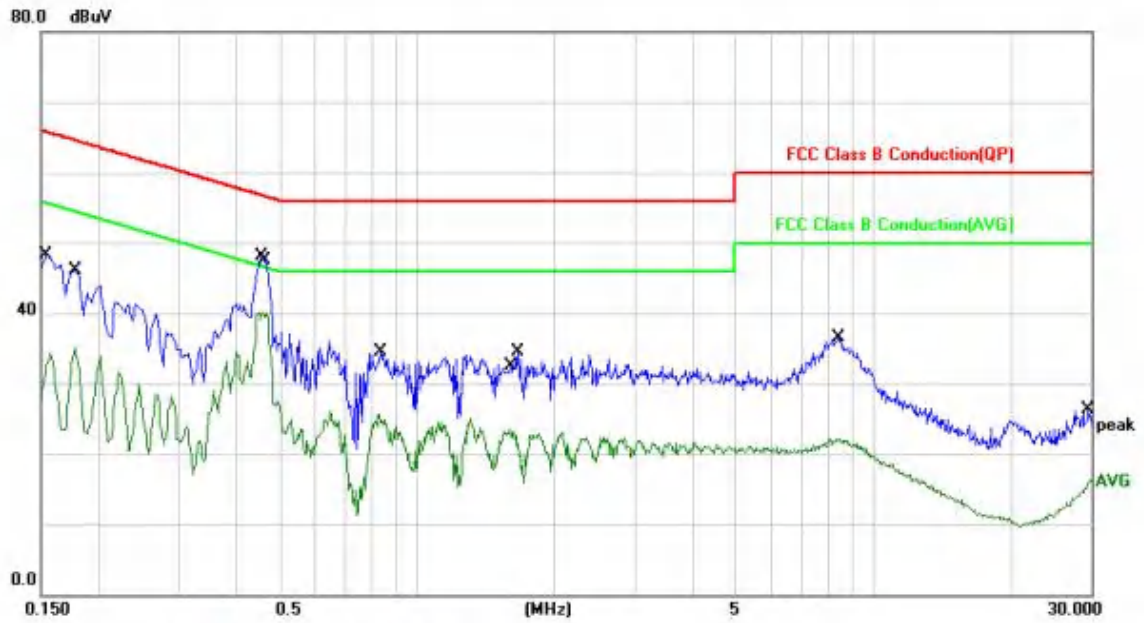
4.1.3 Test Data:

TM1 / Line: Line / Band: 5150-5250 MHz / BW: 20 / CH: L
Power:AC120V60Hz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1539	38.27	10.04	48.31	65.78	-17.47	QP	
2		0.1580	23.49	10.03	33.52	55.56	-22.04	AVG	
3		0.4460	19.48	9.99	29.47	46.95	-17.48	AVG	
4	*	0.4580	31.83	9.99	41.82	56.73	-14.91	QP	
5		0.5980	24.92	9.98	34.90	56.00	-21.10	QP	
6		0.6500	6.87	9.97	16.84	46.00	-29.16	AVG	
7		1.2980	20.70	9.92	30.62	56.00	-25.38	QP	
8		1.3060	5.48	9.92	15.40	46.00	-30.60	AVG	
9		7.7500	9.17	10.29	19.46	50.00	-30.54	AVG	
10		8.1660	23.37	10.31	33.68	60.00	-26.32	QP	
11		19.8460	17.36	10.50	27.86	60.00	-32.14	QP	
12		19.9619	4.66	10.50	15.16	50.00	-34.84	AVG	

TM1 / Line: Neutral / Band: 5150-5250 MHz / BW: 20 / CH: L
Power:AC120V60Hz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1539	38.27	10.04	48.31	65.78	-17.47	QP	
2		0.1780	25.17	10.03	35.20	54.57	-19.37	AVG	
3		0.4580	38.17	9.99	48.16	56.73	-8.57	QP	
4	*	0.4700	30.20	9.98	40.18	46.51	-6.33	AVG	
5		0.8300	15.48	10.21	25.69	46.00	-20.31	AVG	
6		0.8340	24.17	10.25	34.42	56.00	-21.58	QP	
7		1.5940	13.64	9.94	23.58	46.00	-22.42	AVG	
8		1.6660	24.50	9.95	34.45	56.00	-21.55	QP	
9		8.4100	26.17	10.33	36.50	60.00	-23.50	QP	
10		8.4100	11.78	10.33	22.11	50.00	-27.89	AVG	
11		29.6580	15.65	10.67	26.32	60.00	-33.68	QP	
12		29.9740	5.56	10.67	16.23	50.00	-33.77	AVG	

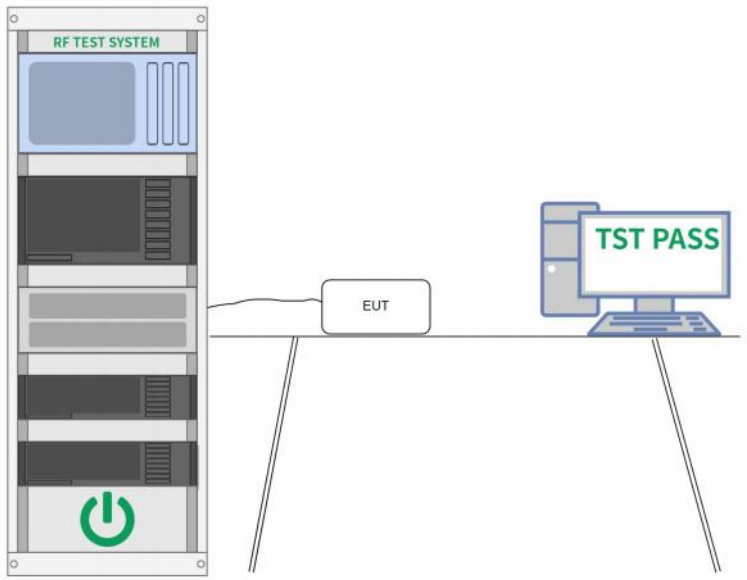
4.2 Duty Cycle

Test Requirement:	All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum-power transmission duration, T, are required for each tested mode of operation.
Test Limit:	No limits, only for report use.
Test Method:	ANSI C63.10-2013 section 12.2 (b)
Procedure:	i) Set the center frequency of the instrument to the center frequency of the transmission. ii) Set RBW >= EBW if possible; otherwise, set RBW to the largest available value. iii) Set VBW >= RBW. iv) Set detector = peak. v) The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T, where T is defined in item a1) of 12.2, and the number of sweep points across duration T exceeds 100.

4.2.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.4 °C	Humidity:	50.4 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.2.2 Test Setup Diagram:



4.2.3 Test Data:

Please Refer to Appendix for Details.

4.3 Maximum conducted output power

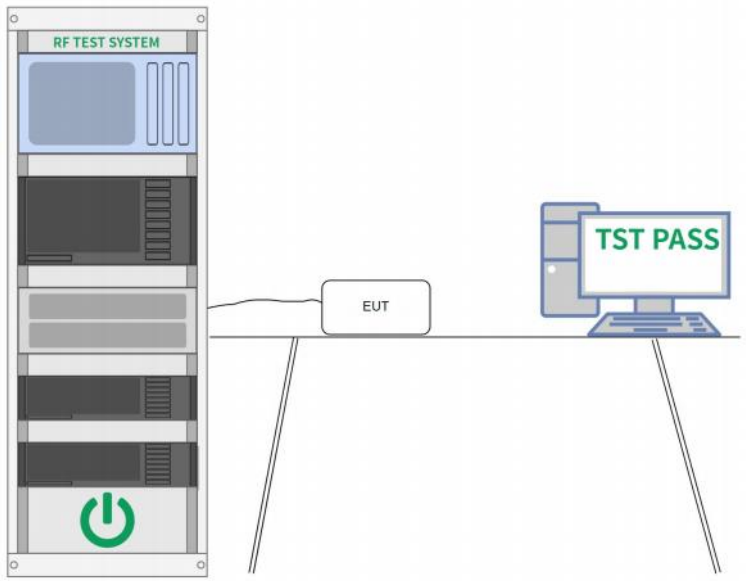
Test Requirement:	47 CFR Part 15.407(a)(1)(i) 47 CFR Part 15.407(a)(1)(ii) 47 CFR Part 15.407(a)(1)(iii) 47 CFR Part 15.407(a)(1)(iv) 47 CFR Part 15.407(a)(3)(i)
Test Limit:	For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of 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, the maximum conducted output power 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). 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, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. 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. 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 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. For 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, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. For the band 5.725-5.850 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, the maximum conducted output power 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.
Test Method:	ANSI C63.10-2013, section 12.3

Procedure:	Method SA-1 a) Set span to encompass the entire 26 dB EBW or 99% OBW of the signal. b) Set RBW = 1 MHz. c) Set VBW >= 3 MHz. d) Number of points in sweep >= [2 × span / RBW]. (This gives bin-to-bin spacing <= RBW / 2, sothat narrowband signals are not lost between frequency bins.) e) Sweep time = auto. f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode. g) If transmit duty cycle < 98%, use a video trigger with the trigger level set to enable triggeringonly on full power pulses. The transmitter shall operate at maximum power control level for theentire duration of every sweep. If the EUT transmits continuously (i.e., with no OFF intervals) orat duty cycle >= 98%, and if each transmission is entirely at the maximum power control level,then the trigger shall be set to “free run.” h) Trace average at least 100 traces in power averaging (rms) mode. i) Compute power by integrating the spectrum across the 26 dB EBW or 99% OBW of the signalusing the instrument’s band power measurement function, with band limits set equal to theEBW or OBW band edges. If the instrument does not have a band power function, then sum thespectrum levels (in power units) at 1 MHz intervals extending across the 26 dB EBW or 99% OBW of the spectrum.

4.3.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.4 °C	Humidity:	50.4 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.3.2 Test Setup Diagram:



4.3.3 Test Data:

Please Refer to Appendix for Details.

4.4 Power spectral density

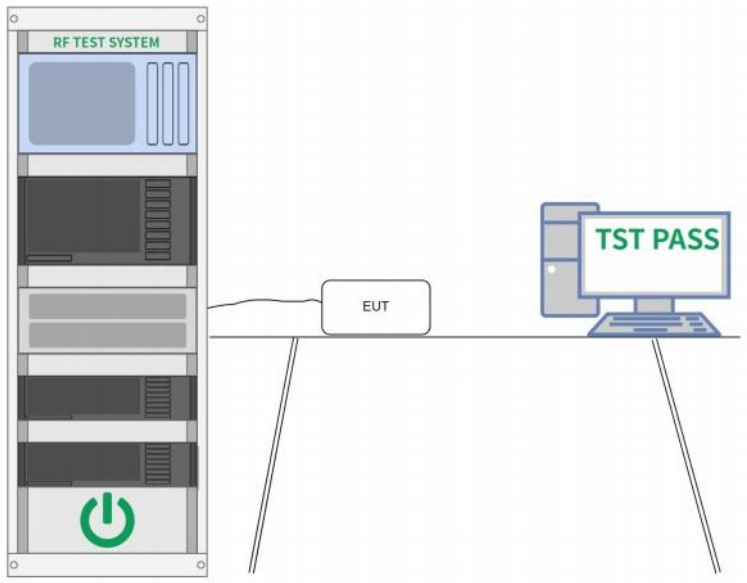
Test Requirement:	47 CFR Part 15.407(a)(1)(i) 47 CFR Part 15.407(a)(1)(ii) 47 CFR Part 15.407(a)(1)(iii) 47 CFR Part 15.407(a)(1)(iv) 47 CFR Part 15.407(a)(3)(i)
Test Limit:	For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. 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 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the 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 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. For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. For the band 5.725-5.850 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, 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.
Test Method:	ANSI C63.10-2013, section 12.5
Procedure:	a) Create an average power spectrum for the EUT operating mode being tested by following theinstructions in 12.3.2 for measuring maximum conducted output power using a spectrumanalyzer or EMI receiver; that is, select the appropriate test method (SA-1, SA-2, SA-3, or theirrespective alternatives) 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 the power meter method PM.) b) Use the peak search function on the instrument to find the peak of the spectrum. c) Make the following adjustments to the peak value of the spectrum, if applicable: 1) If method SA-2 or SA-2A was used, then add [10 log (1 / D)], where D is the duty cycle, to the peak of the spectrum. 2) If method SA-3A was used and the linear mode was used in step h) of 12.3.2.7, add 1 dB to the final result to compensate for the difference between linear averaging and power averaging. d) The result is the PPSD. e) The procedure in item a) through item c) requires the use of 1 MHz resolution bandwidth to satisfy the 1 MHz measurement bandwidth specified by some regulatory authorities.This requirement also permits use of resolution bandwidths less than 1 MHz “provided that the measured power is integrated to show the total power over the measurement bandwidth” (i.e.,1 MHz). If measurements are performed using a reduced resolution bandwidth and integrated over 1 MHz bandwidth, the following adjustments to the procedures apply: 1) Set RBW >= 1 / T, where T is defined in 12.2 a). 2) Set VBW >= [3 × RBW]. 3) Care shall be taken such that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

4.4.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.4 °C	Humidity:	50.4 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.4.2 Test Setup Diagram:



4.4.3 Test Data:

Please Refer to Appendix for Details.

4.5 Emission bandwidth and occupied bandwidth

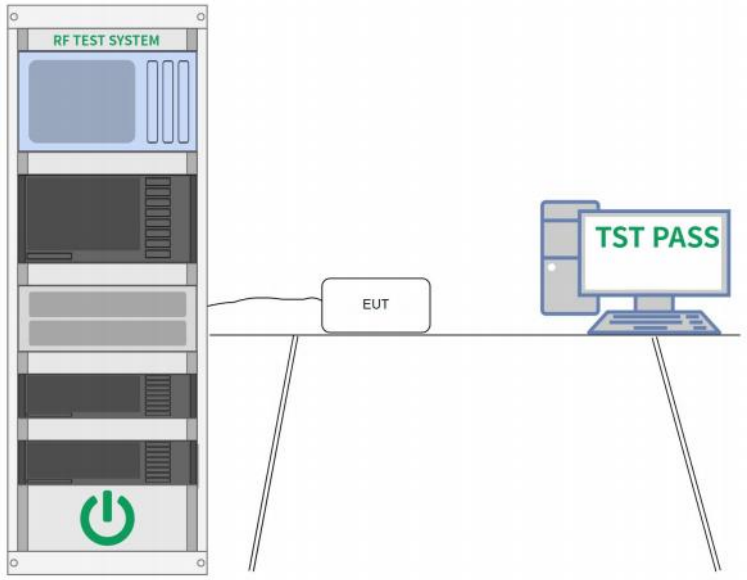
Test Requirement:	U-NII 1, U-NII 2A, U-NII 2C: No limits, only for report use. U-NII 3, U-NII 4: 47 CFR Part 15.407(e)
Test Limit:	U-NII 1, U-NII 2A, U-NII 2C: No limits, only for report use. U-NII 3, U-NII 4: Within the 5.725-5.850 GHz and 5.850-5.895 GHz bands, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.
Test Method:	ANSI C63.10-2013, section 6.9.3 & 12.4 KDB 789033 D02, Clause C.2
Procedure:	Emission bandwidth: a) Set RBW = approximately 1% of the emission bandwidth. b) Set the VBW > RBW. c) Detector = peak. d) Trace mode = max hold. e) 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 instrument. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%. Occupied bandwidth: a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW. b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement. c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2. d) Step a) through step c) might require iteration to adjust within the specified range. e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used. f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth. g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

	h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s). 6 dB emission bandwidth: a) Set RBW = 100 kHz. b) Set the video bandwidth (VBW) ≥ 3 >= RBW. c) Detector = Peak. d) Trace mode = max hold. e) Sweep = auto couple. f) Allow the trace to stabilize. g) 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.

4.5.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.4 °C	Humidity:	50.4 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.5.2 Test Setup Diagram:



4.5.3 Test Data:

Please Refer to Appendix for Details.

4.6 Band edge emissions (Radiated)

Test Requirement:	47 CFR Part 15.407(b)(1) 47 CFR Part 15.407(b)(4) 47 CFR Part 15.407(b)(10)
Test Limit:	For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz. For transmitters operating solely in the 5.725-5.850 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2]Above 38.6

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in § 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in § 15.209shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in § 15.209shall be demonstrated based on the average value of the measured emissions. The provisions in § 15.35apply to these measurements.

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3

	216-960	200 **	3
	Above 960	500	3
Test Method:	ANSI C63.10-2013, section 12.7.4, 12.7.5, 12.7.6		
Procedure:	Above 1GHz: a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak or average method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel, the middle channel, the Highest channel. h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. i. Repeat above procedures until all frequencies measured was complete. Remark: 1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor 2. Scan from 18GHz to 40GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. 3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report. 4. The disturbance above 18GHz were very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.		

4.6.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.4 °C	Humidity:	50.4 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2, TM3				
Final test mode:	TM3				

4.6.2 Test Data:

UNII-1_20M_5180MHz_Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5100	52.50	0.43	52.93	68.2	-15.27	peak	P
2	5150	55.00	0.43	55.43	68.2	-12.77	peak	P
3	5135	57.51	0.43	57.94	68.2	-10.26	peak	P

UNII-1_20M_5180MHz_Vertical

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5300	51.57	0.56	52.13	68.2	-16.07	peak	P
2	5330	51.05	0.58	51.63	68.2	-16.57	peak	P
3	5350	51.76	0.6	52.36	68.2	-15.84	peak	P

UNII-3_20M_5240MHz_Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5100	51.51	0.91	52.42	68.2	-15.78	peak	P
2	5150	53.27	0.91	54.18	68.2	-14.02	peak	P
3	5135	51.38	0.9	52.28	68.2	-15.92	peak	P

UNII-1_20M_5240MHz_Vertical

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5300	57.52	0.91	58.43	68.2	-9.77	peak	P
2	5330	55.28	0.91	56.19	68.2	-12.01	peak	P
3	5350	51.71	0.9	52.61	68.2	-15.59	peak	P

UNII-1_40M_5755MHz_Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5650	51.32	0.79	52.11	68.2	-16.09	peak	P
2	5700	53.59	0.81	54.40	68.2	-13.80	peak	P
3	5720	58.05	0.81	58.86	68.2	-9.34	peak	P

UNII-1_40M_5755MHz_Vertical

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5650	51.67	0.79	52.46	68.2	-15.74	peak	P
2	5700	55.06	0.81	55.87	105.6	-49.73	peak	P
3	5720	58.02	0.81	58.83	110.8	-51.97	peak	P

UNII-1_40M_5795MHz_Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5850	58.98	0.91	59.89	122.2	-62.31	peak	P
2	5875	54.47	0.91	55.38	110.8	-55.42	peak	P
3	5925	52.58	0.9	53.48	68.2	-14.72	peak	P

UNII-1_40M_5795MHz_Vertical

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5850	60.41	0.91	61.32	122.2	-60.88	peak	P
2	5875	55.24	0.91	56.15	110.8	-54.65	peak	P
3	5925	51.86	0.9	52.76	68.2	-15.44	peak	P

UNII-1_80M_5775MHz_Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5720	59.12	0.81	59.93	110.8	-50.87	peak	P
2	5850	58.91	0.91	59.82	122.2	-62.38	peak	P
3	5925	51.25	0.9	52.15	68.2	-16.05	peak	P

UNII-1_80M_5775MHz_Vertical

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5720	58.89	0.81	59.70	110.8	-51.10	peak	P
2	5850	58.14	0.91	59.05	122.2	-63.15	peak	P
3	5925	52.28	0.9	53.18	68.2	-15.02	peak	P

UNII-3_20M_5745MHz_Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5650	53.25	0.91	54.16	68.2	-14.04	peak	P
2	5700	53.80	0.91	54.71	105.2	-50.49	peak	P
3	5720	58.38	0.9	59.28	110.8	-51.52	peak	P

UNII-3_20M_5745MHz_Vertical

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5650	53.33	0.91	54.24	68.2	-13.96	peak	P
2	5700	54.65	0.91	55.56	105.2	-49.64	peak	P
3	5720	60.37	0.9	61.27	110.8	-49.53	peak	P

UNII-3_20M_5825MHz_Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5850	59.93	0.91	60.84	122.2	-61.36	peak	P
2	5875	53.45	0.91	54.36	110.8	-56.44	peak	P
3	5925	52.46	0.9	53.36	68.2	-14.84	peak	P

UNII-3_20M_5825MHz_Vertical

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5850	52.93	0.91	53.84	122.2	-68.36	peak	P
2	5875	51.00	0.91	51.91	110.8	-58.89	peak	P
3	5925	50.17	0.9	51.07	68.2	-17.13	peak	P

UNII-3_40M_5755MHz_Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5650	51.29	0.79	52.08	68.2	-16.12	peak	P
2	5700	54.19	0.81	55.00	105.2	-50.20	peak	P
3	5720	60.12	0.81	60.93	110.8	-49.87	peak	P

UNII-3_40M_5755MHz_Vertical

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5650	52.22	0.79	53.01	68.2	-15.19	peak	P
2	5700	54.47	0.81	55.28	105.2	-49.92	peak	P
3	5720	58.33	0.81	59.14	110.8	-51.66	peak	P

UNII-3_40M_5795MHz_Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5850	59.66	0.91	60.57	122.2	-61.63	peak	P
2	5875	53.32	0.91	54.23	110.8	-56.57	peak	P
3	5925	53.03	0.9	53.93	68.2	-14.27	peak	P

UNII-3_40M_5795MHz_Vertical

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5850	60.57	0.91	61.48	122.2	-60.72	peak	P
2	5875	54.24	0.91	55.15	110.8	-55.65	peak	P
3	5925	53.33	0.9	54.23	68.2	-13.97	peak	P

UNII-3_80M_5775MHz_Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5720	60.58	0.81	61.39	110.8	-49.41	peak	P
2	5850	59.33	0.91	60.24	122.2	-61.96	peak	P
3	5925	52.98	0.9	53.88	68.2	-14.32	peak	P

UNII-3_80M_5775MHz_Vertical

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5720	58.12	0.81	58.93	110.8	-51.87	peak	P
2	5850	59.17	0.91	60.08	122.2	-62.12	peak	P
3	5925	51.69	0.9	52.59	68.2	-15.61	peak	P

4.7 Undesirable emission limits (below 1GHz)

Test Requirement:	47 CFR Part 15.407(b)(9)
Test Limit:	Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3
216-960	200 **	3
Above 960	500	3

Test Method:	ANSI C63.10-2013, section 12.7.4, 12.7.5, 12.7.6
Procedure:	Below 1GHz: a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using quasi-peak method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel, the middle channel, the Highest channel. h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. i. Repeat above procedures until all frequencies measured was complete. Remark: 1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor 2. Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. 3. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. Above 1GHz: a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 meters away from the interference-receiving antenna, which

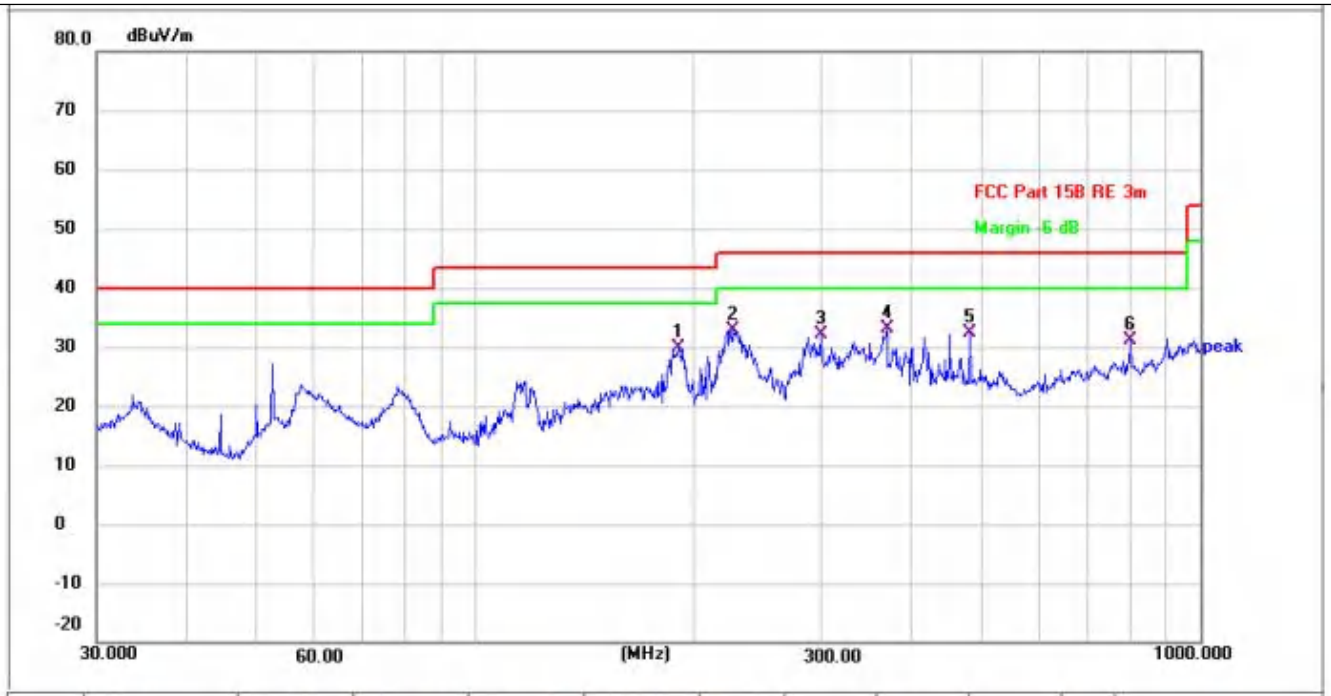
	was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak or average method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel, the middle channel, the Highest channel. h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. i. Repeat above procedures until all frequencies measured was complete. Remark: 1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor 2. Scan from 18GHz to 40GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. 3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report. 4. The disturbance above 18GHz were very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

4.7.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.4 °C	Humidity:	50.4 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2, TM3				
Final test mode:	TM1				

4.7.2 Test Data:

TM1 / Polarization: Horizontal / Band: 5150-5250 MHz / BW: 20 / CH: L



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	190.4050	32.87	-3.03	29.84	43.50	-13.66	QP	100	124	P	
2	226.8936	35.38	-2.50	32.88	46.00	-13.12	QP	100	244	P	
3	299.3158	31.58	0.65	32.23	46.00	-13.77	QP	100	158	P	
4 *	369.4047	31.44	1.62	33.06	46.00	-12.94	QP	100	65	P	
5	480.5276	30.85	1.60	32.45	46.00	-13.55	QP	100	354	P	
6	801.7863	25.19	5.98	31.17	46.00	-14.83	QP	100	147	P	

TM1 / Polarization: Vertical / Band: 5150-5250 MHz / BW: 20 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	52.5753	40.29	-9.64	30.65	40.00	-9.35	QP	100	245	P	
2 *	77.8654	39.93	-7.91	32.02	40.00	-7.98	QP	100	321	P	
3	117.3603	35.55	-4.95	30.60	43.50	-12.90	QP	100	147	P	
4	189.0743	35.95	-3.03	32.92	43.50	-10.58	QP	100	58	P	
5	416.1791	30.03	1.30	31.33	46.00	-14.67	QP	100	42	P	
6	704.2261	27.42	5.13	32.55	46.00	-13.45	QP	100	298	P	

4.8 Undesirable emission limits (above 1GHz)

Test Requirement:	47 CFR Part 15.407(b)(1) 47 CFR Part 15.407(b)(4) 47 CFR Part 15.407(b)(10)
Test Limit:	For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz. For transmitters operating solely in the 5.725-5.850 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2]Above 38.6

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in § 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in § 15.209shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in § 15.209shall be demonstrated based on the average value of the measured emissions. The provisions in § 15.35apply to these measurements.

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

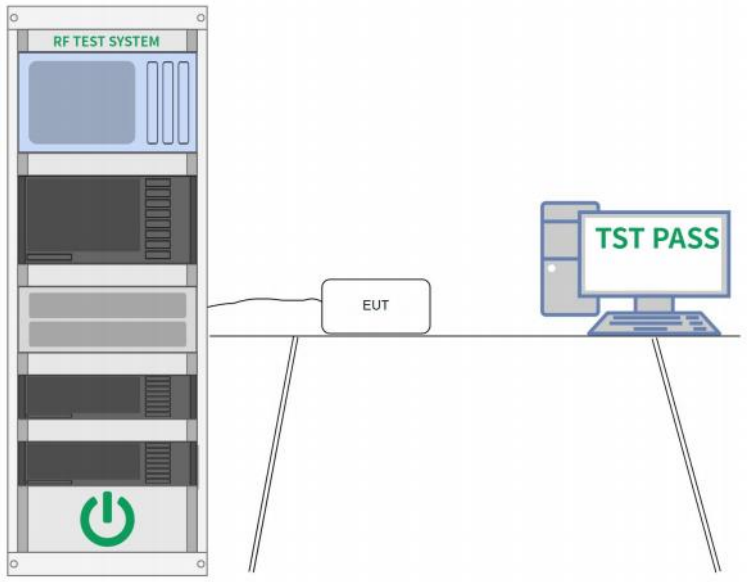
Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3

	216-960	200 **	3
	Above 960	500	3
Test Method:	ANSI C63.10-2013, section 12.7.4, 12.7.5, 12.7.6		
Procedure:	Above 1GHz: a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak or average method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel, the middle channel, the Highest channel. h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. i. Repeat above procedures until all frequencies measured was complete. Remark: 1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor 2. Scan from 18GHz to 40GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. 3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report. 4. The disturbance above 18GHz were very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.		

4.8.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.4 °C	Humidity:	50.4 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2, TM3				
Final test mode:	TM1				

4.8.2 Test Setup Diagram:



4.8.3 Test Data:

TM1 is worse case and only reported

TM1 / Polarization: Horizontal / Band: 5150-5250 MHz / BW: 20 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	7432.622	24.92	4.48	29.40	54.00	-24.60	AVG	100	0	P	
2	7604.867	36.43	4.97	41.40	74.00	-32.60	peak	100	0	P	
3	10364.000	37.72	8.76	46.48	74.00	-27.52	peak	100	0	P	
4	10364.000	24.98	8.76	33.74	54.00	-20.26	AVG	100	0	P	
5	11782.552	38.05	9.86	47.91	74.00	-26.09	peak	100	0	P	
6 *	11963.891	25.83	9.99	35.82	54.00	-18.18	AVG	100	0	P	

TM1 / Polarization: Vertical / Band: 5150-5250 MHz / BW: 20 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	8506.170	35.83	6.79	42.62	74.00	-31.38	peak	100	0	P	
2	8506.170	24.73	6.79	31.52	54.00	-22.48	AVG	100	0	P	
3	10364.000	34.09	8.56	42.65	74.00	-31.35	peak	100	0	P	
4	10364.000	23.57	8.56	32.13	54.00	-21.87	AVG	100	0	P	
5	11963.891	37.99	10.26	48.25	74.00	-25.75	peak	100	0	P	
6 *	11963.891	25.70	10.26	35.96	54.00	-18.04	AVG	100	0	P	

TM1 / Polarization: Horizontal / Band: 5150-5250 MHz / BW: 20 / CH: M

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	8615.126	36.65	7.33	43.98	74.00	-30.02	peak	100	0	P	
2	8659.098	25.13	7.42	32.55	54.00	-21.45	AVG	100	0	P	
3	10400.000	34.96	8.82	43.78	74.00	-30.22	peak	100	0	P	
4	10400.000	24.62	8.82	33.44	54.00	-20.56	AVG	100	0	P	
5	11752.597	37.83	9.83	47.66	74.00	-26.34	peak	100	0	P	
6 *	11963.891	25.78	9.99	35.77	54.00	-18.23	AVG	100	0	P	

TM1 / Polarization: Vertical / Band: 5150-5250 MHz / BW: 20 / CH: M

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	8659.098	35.97	7.05	43.02	74.00	-30.98	peak	100	0	P	
2	8659.098	25.50	7.05	32.55	54.00	-21.45	AVG	100	0	P	
3	10400.000	32.74	8.58	41.32	74.00	-32.68	peak	100	0	P	
4	10400.000	24.86	8.58	33.44	54.00	-20.56	AVG	100	0	P	
5	11963.891	37.11	10.26	47.37	74.00	-26.63	peak	100	0	P	
6 *	11963.891	25.80	10.26	36.06	54.00	-17.94	AVG	100	0	P	

TM1 / Polarization: Horizontal / Band: 5150-5250 MHz / BW: 20 / CH: H

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	8292.376	24.52	6.83	31.35	54.00	-22.65	AVG	100	0	P	
2	8419.999	36.50	7.02	43.52	74.00	-30.48	peak	100	0	P	
3	10480.000	35.60	8.96	44.56	74.00	-29.44	peak	100	0	P	
4	10480.000	25.41	8.96	34.37	54.00	-19.63	AVG	100	0	P	
5 *	11752.597	25.98	9.83	35.81	54.00	-18.19	AVG	100	0	P	
6	11933.475	37.50	9.96	47.46	74.00	-26.54	peak	100	0	P	

TM1 / Polarization: Vertical / Band: 5150-5250 MHz / BW: 20 / CH: H

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	8637.084	36.90	7.02	43.92	74.00	-30.08	peak	100	0	P	
2	8659.098	25.14	7.05	32.19	54.00	-21.81	AVG	100	0	P	
3	10480.000	35.78	8.63	44.41	74.00	-29.59	peak	100	0	P	
4	10480.000	24.94	8.63	33.57	54.00	-20.43	AVG	100	0	P	
5 *	11963.891	25.57	10.26	35.83	54.00	-18.17	AVG	100	0	P	
6	12117.136	36.60	10.52	47.12	74.00	-26.88	peak	100	0	P	

TM1 / Polarization: Horizontal / Band: 5725-5850 MHz / BW: 20 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	8659.098	36.90	7.42	44.32	74.00	-29.68	peak	100	0	P	
2	8681.168	25.16	7.44	32.60	54.00	-21.40	AVG	100	0	P	
3	11490.000	36.08	9.66	45.74	74.00	-28.26	peak	100	0	P	
4	11490.000	25.27	9.66	34.93	54.00	-19.07	AVG	100	0	P	
5	12620.837	36.52	11.22	47.74	74.00	-26.26	peak	100	0	P	
6 *	12653.004	24.54	11.28	35.82	54.00	-18.18	AVG	100	0	P	

TM1 / Polarization: Vertical / Band: 5725-5850 MHz / BW: 20 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	9251.580	24.57	7.77	32.34	54.00	-21.66	AVG	100	0	P	
2	9417.909	37.29	7.89	45.18	74.00	-28.82	peak	100	0	P	
3	11490.000	34.75	9.65	44.40	74.00	-29.60	peak	100	0	P	
4	11490.000	23.84	9.65	33.49	54.00	-20.51	AVG	100	0	P	
5	12685.254	36.61	11.49	48.10	74.00	-25.90	peak	100	0	P	
6 *	12685.254	24.34	11.49	35.83	54.00	-18.17	AVG	100	0	P	

TM1 / Polarization: Horizontal / Band: 5725-5850 MHz / BW: 20 / CH: M

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	9322.501	24.82	8.06	32.88	54.00	-21.12	AVG	100	0	P	
2	9441.913	36.74	8.09	44.83	74.00	-29.17	peak	100	0	P	
3	11570.000	36.50	9.72	46.22	74.00	-27.78	peak	100	0	P	
4	11570.000	25.41	9.72	35.13	54.00	-18.87	AVG	100	0	P	
5	12303.624	36.96	10.62	47.58	74.00	-26.42	peak	100	0	P	
6 *	12685.254	24.44	11.32	35.76	54.00	-18.24	AVG	100	0	P	

TM1 / Polarization: Vertical / Band: 5725-5850 MHz / BW: 20 / CH: M

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	9370.083	37.73	7.85	45.58	74.00	-28.42	peak	100	0	P	
2	9393.966	25.31	7.87	33.18	54.00	-20.82	AVG	100	0	P	
3	11570.000	36.54	9.76	46.30	74.00	-27.70	peak	100	0	P	
4	11570.000	25.06	9.76	34.82	54.00	-19.18	AVG	100	0	P	
5 *	12685.254	24.45	11.49	35.94	54.00	-18.06	AVG	100	0	P	
6	12750.000	35.66	11.61	47.27	74.00	-26.73	peak	100	0	P	

TM1 / Polarization: Horizontal / Band: 5725-5850 MHz / BW: 20 / CH: H

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	9346.262	37.84	8.07	45.91	74.00	-28.09	peak	100	0	P	
2	9393.966	25.68	8.08	33.76	54.00	-20.24	AVG	100	0	P	
3	11650.000	37.39	9.77	47.16	74.00	-26.84	peak	100	0	P	
4	11650.000	24.78	9.77	34.55	54.00	-19.45	AVG	100	0	P	
5 *	12685.254	24.40	11.32	35.72	54.00	-18.28	AVG	100	0	P	
6	12750.000	35.85	11.44	47.29	74.00	-26.71	peak	100	0	P	

TM1 / Polarization: Vertical / Band: 5725-5850 MHz / BW: 20 / CH: H

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	9417.909	36.61	7.89	44.50	74.00	-29.50	peak	100	0	P	
2	9417.909	25.16	7.89	33.05	54.00	-20.95	AVG	100	0	P	
3	11650.000	34.27	9.86	44.13	74.00	-29.87	peak	100	0	P	
4	11650.000	23.49	9.86	33.35	54.00	-20.65	AVG	100	0	P	
5	12524.823	36.18	11.21	47.39	74.00	-26.61	peak	100	0	P	
6 *	12685.254	24.36	11.49	35.85	54.00	-18.15	AVG	100	0	P	

5 TEST SETUP PHOTOS

Please refer to Setup Photo file

6 PHOTOS OF THE EUT

Please refer to external photos file and internal photos file

Appendix--5.2G

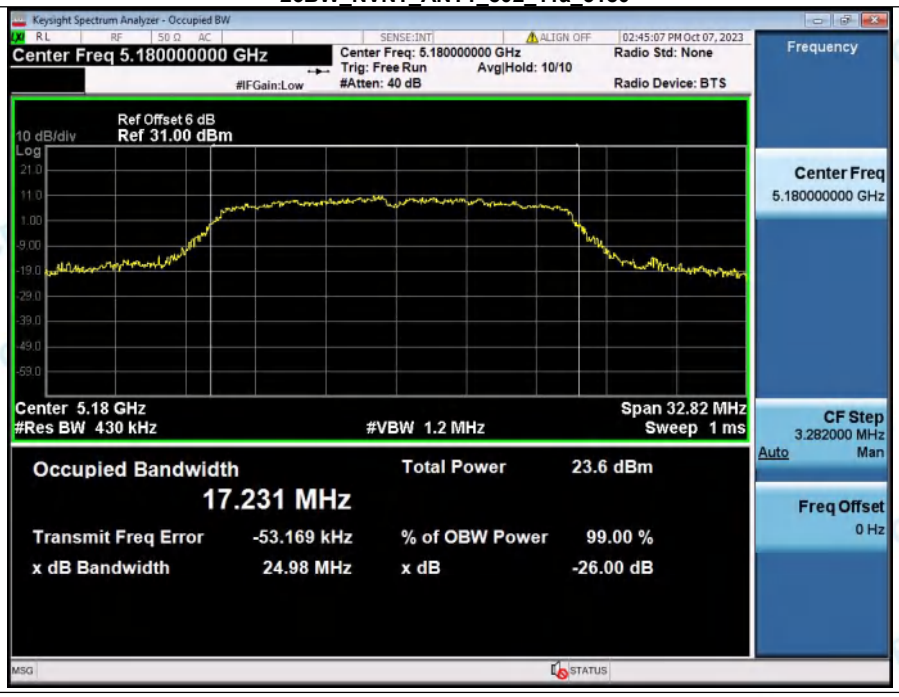
GPON ONT--HL-4GMVR--FCC ID
FCC_5.2G_WIFI (Part15.407) Test Data

1. -26dB and 99% Emission Bandwidth

Condition	Antenna	Modulation	Frequency(MHz)	-26dB_Emission_Bandwidth(MHz)	Occupied Bandwidth(MHz)
NVNT	ANT1	802.11a	5180.00	24.98	16.62
NVNT	ANT2	802.11a	5180.00	32.38	17.78
NVNT	ANT1	802.11a	5200.00	25.61	16.64
NVNT	ANT2	802.11a	5200.00	31.27	17.46
NVNT	ANT1	802.11a	5240.00	28.06	16.67
NVNT	ANT2	802.11a	5240.00	31.54	17.51
NVNT	ANT1	802.11ac(VHT20)	5180.00	20.82	17.59
NVNT	ANT2	802.11ac(VHT20)	5180.00	26.37	17.77
NVNT	ANT1	802.11ac(VHT20)	5200.00	20.79	17.59
NVNT	ANT2	802.11ac(VHT20)	5200.00	23.57	17.76
NVNT	ANT1	802.11ac(VHT20)	5240.00	20.93	17.63
NVNT	ANT2	802.11ac(VHT20)	5240.00	27.27	17.74
NVNT	ANT1	802.11ac(VHT40)	5190.00	40.74	35.95
NVNT	ANT2	802.11ac(VHT40)	5190.00	41.21	35.97
NVNT	ANT1	802.11ac(VHT40)	5230.00	41.84	36.09
NVNT	ANT2	802.11ac(VHT40)	5230.00	56.65	36.13
NVNT	ANT1	802.11ac(VHT80)	5210.00	82.02	75.40
NVNT	ANT2	802.11ac(VHT80)	5210.00	81.65	75.23

99%_OCB_NVNT_ANT1_802_11a_5180

-26BW_NVNT_ANT1_802_11a_5180



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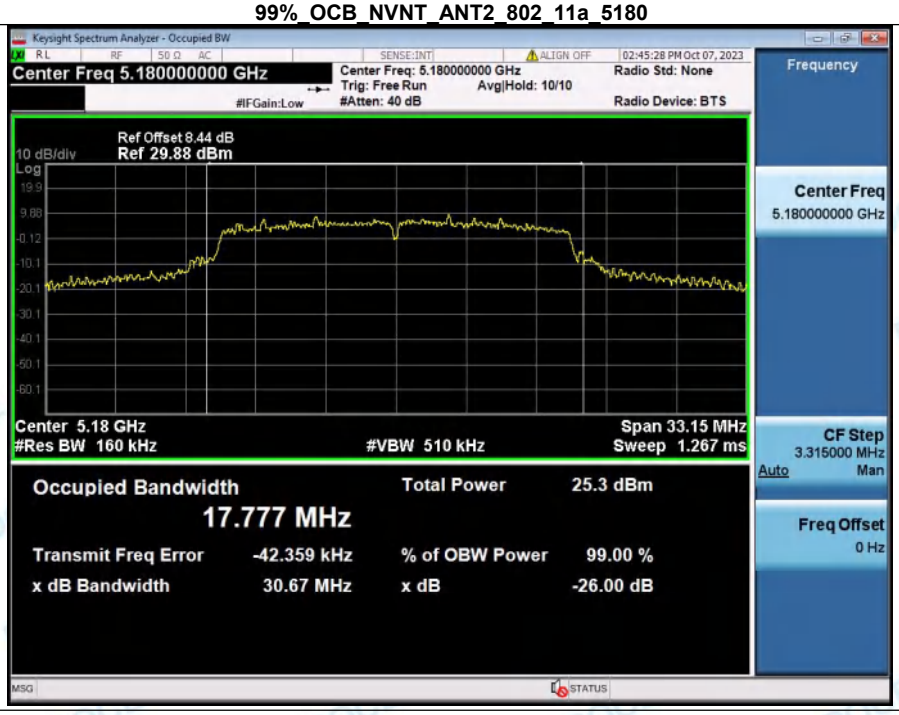

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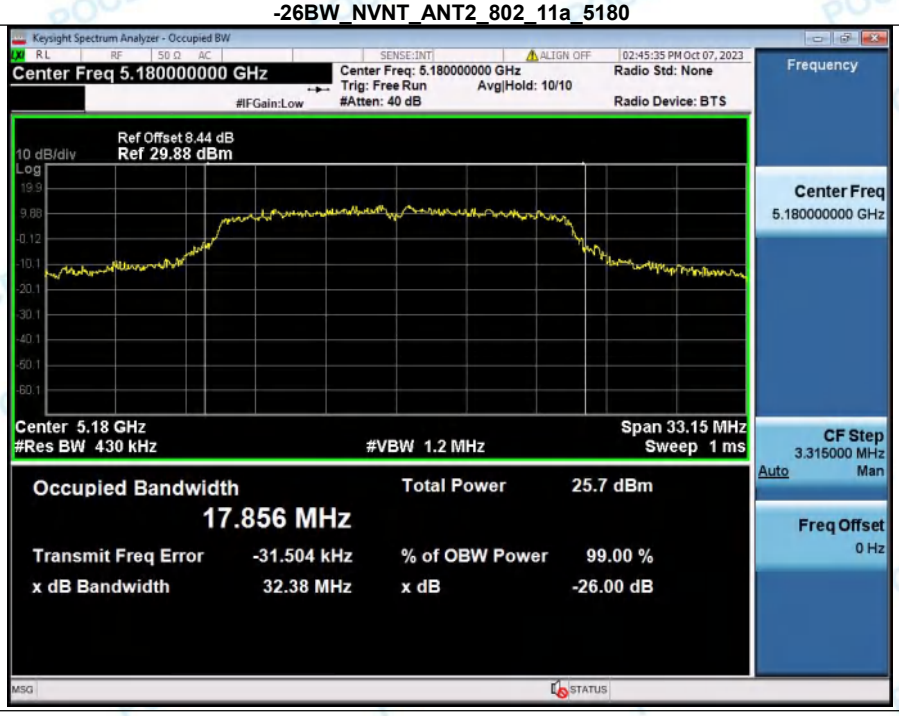

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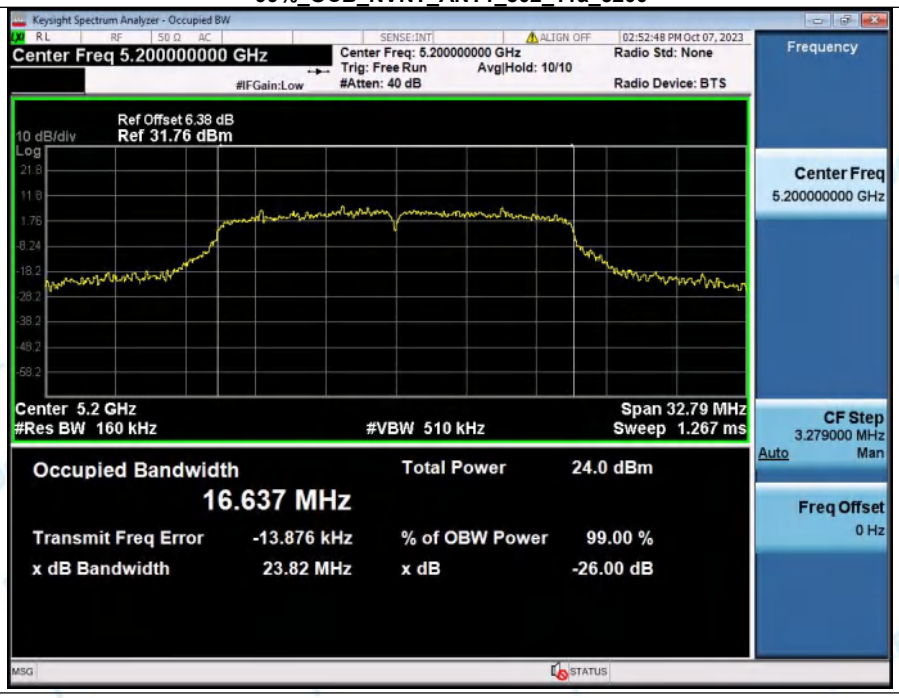

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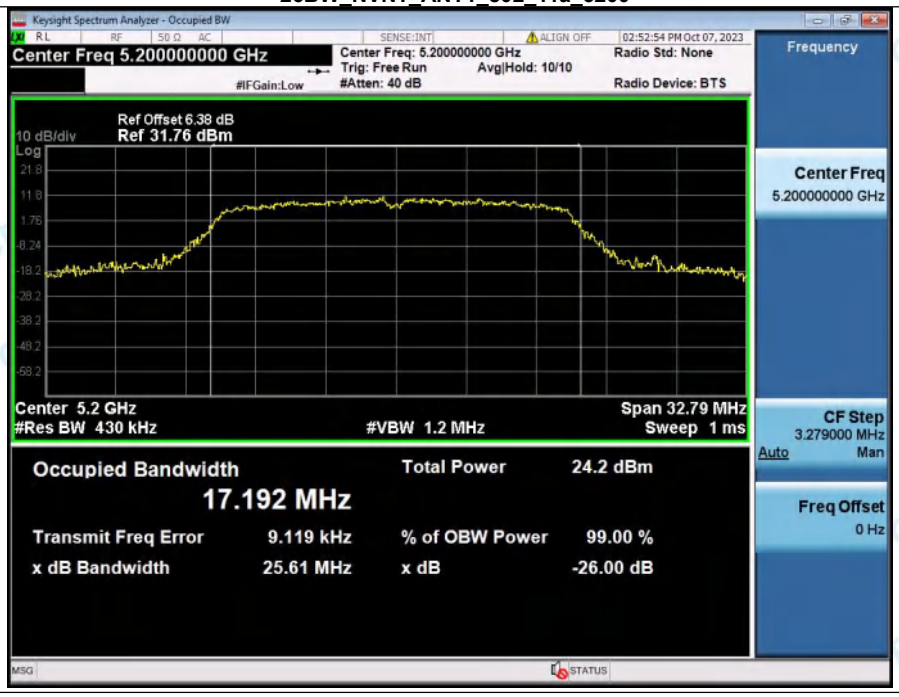

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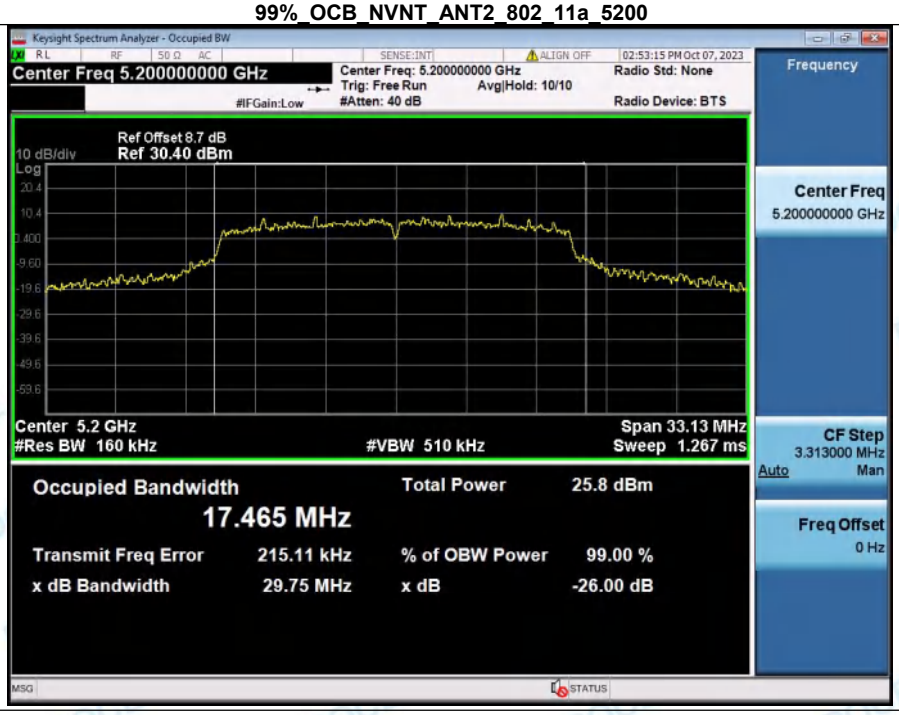

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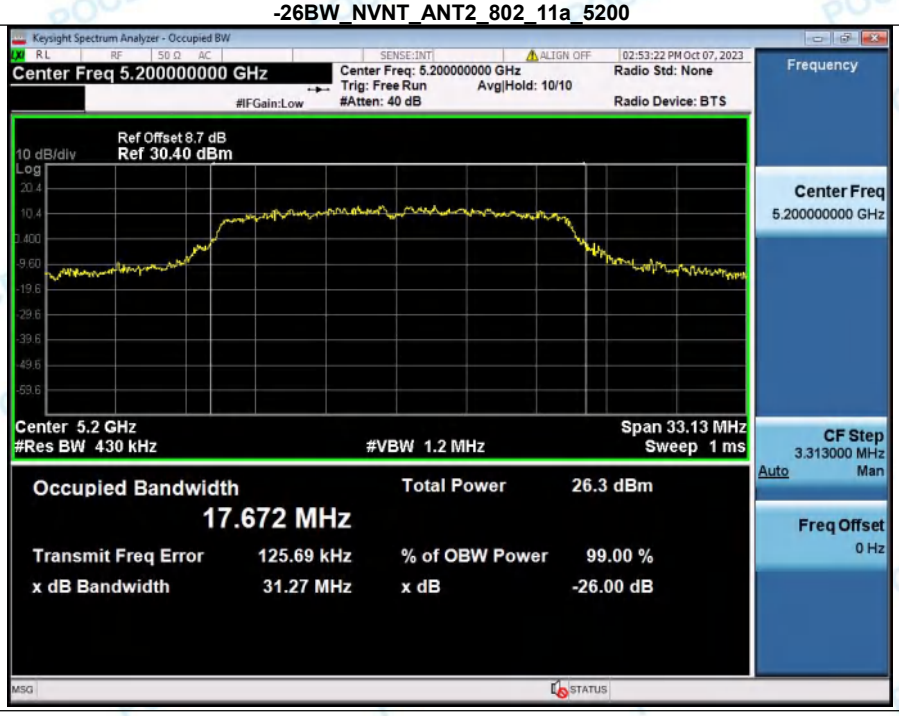

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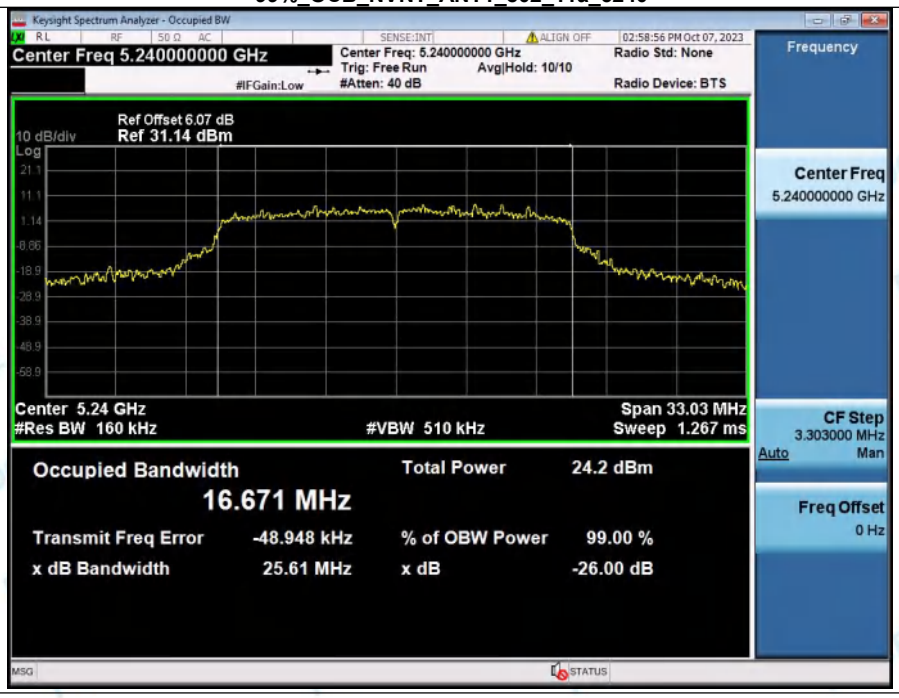

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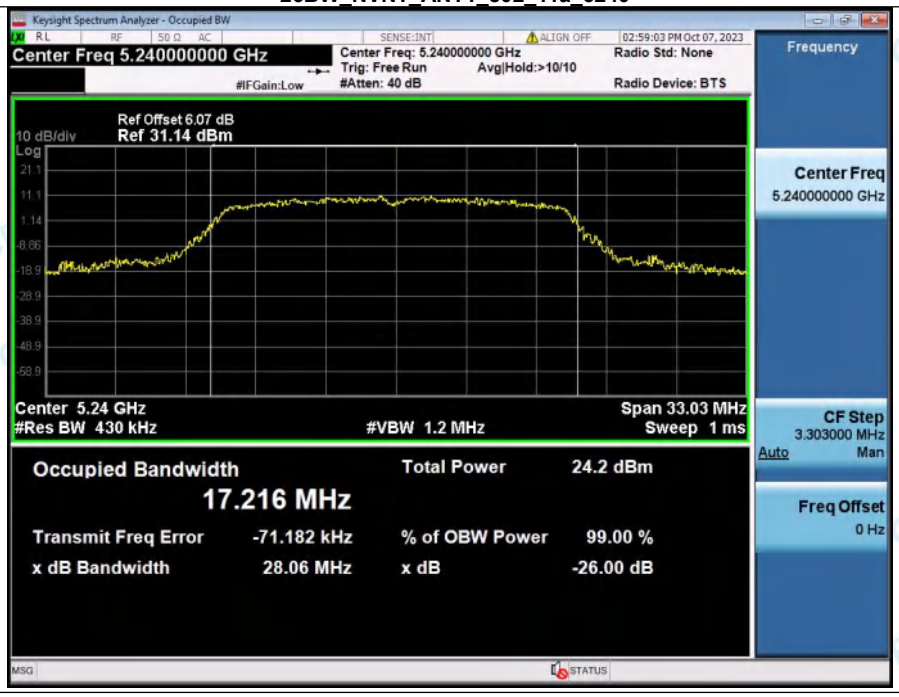

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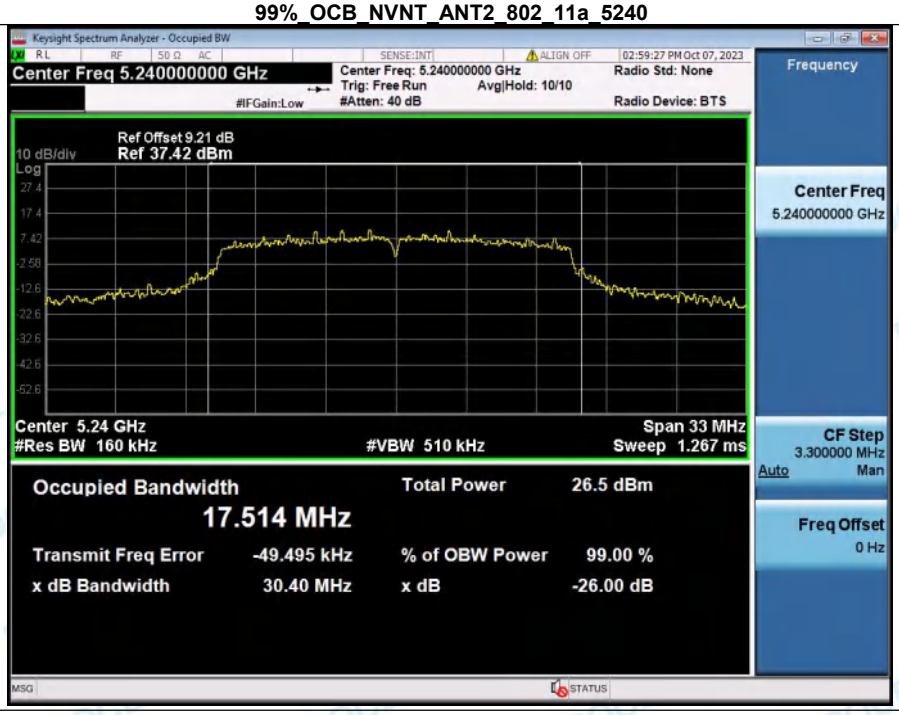

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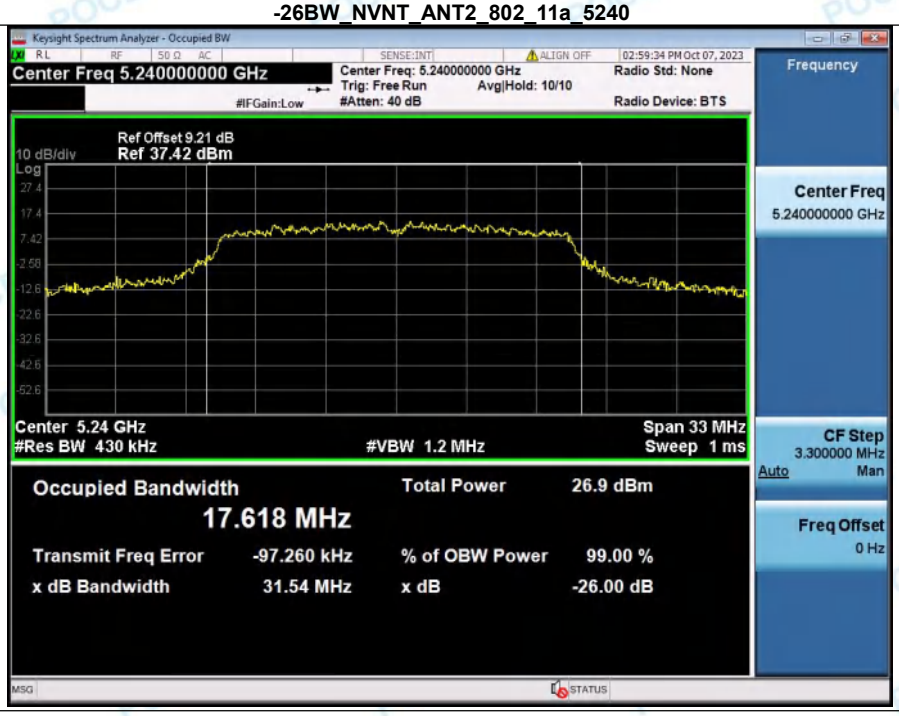

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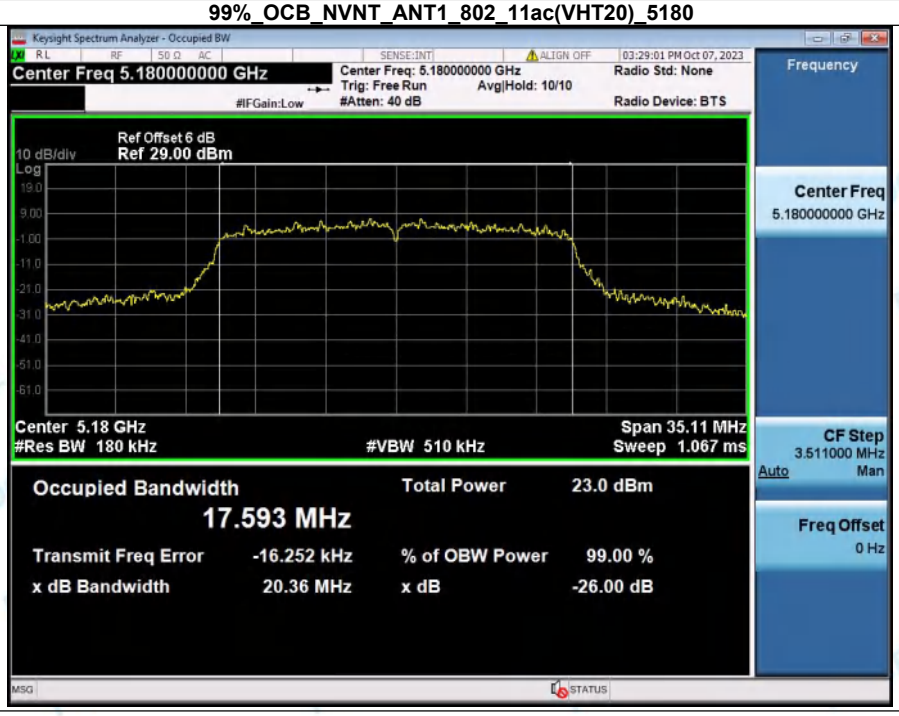

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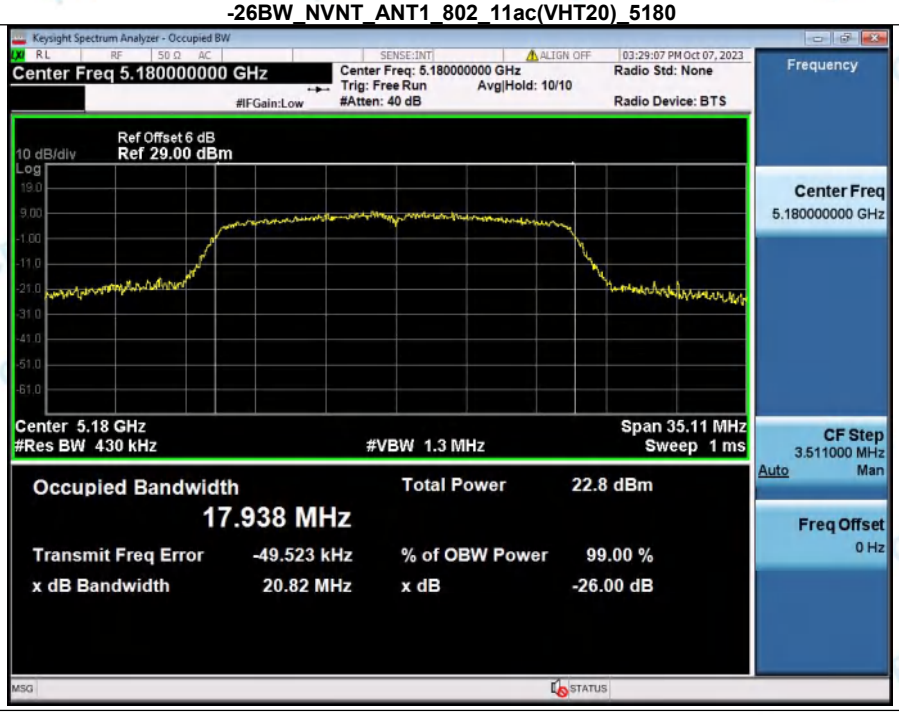

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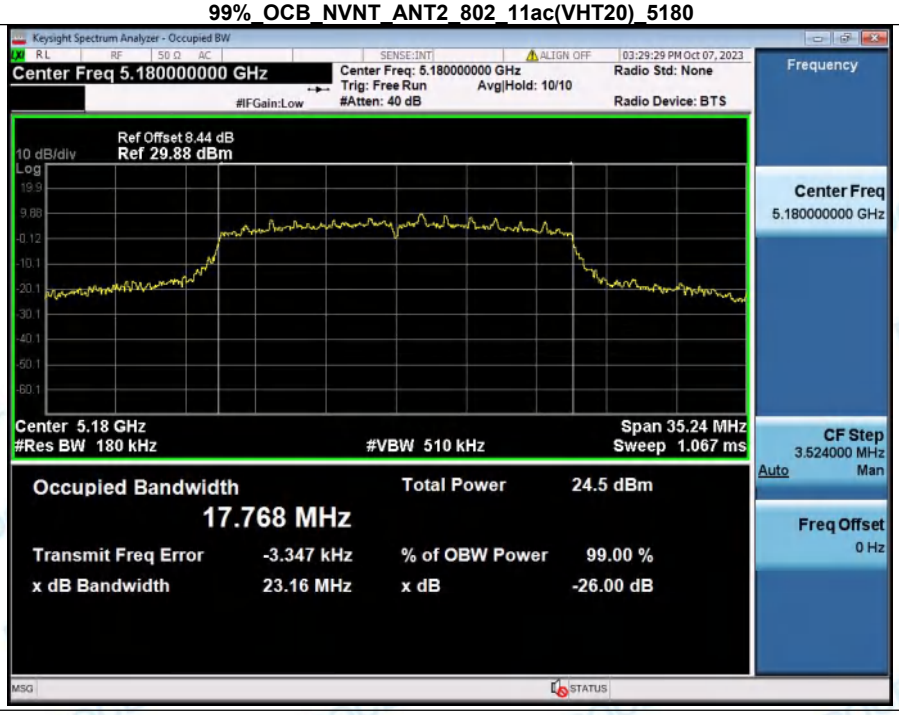

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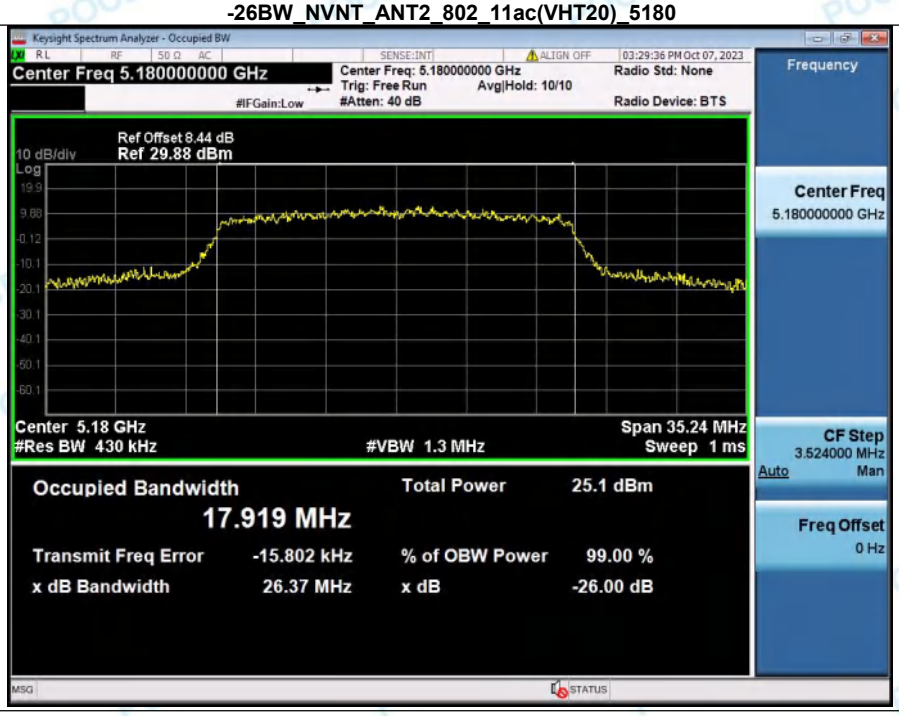

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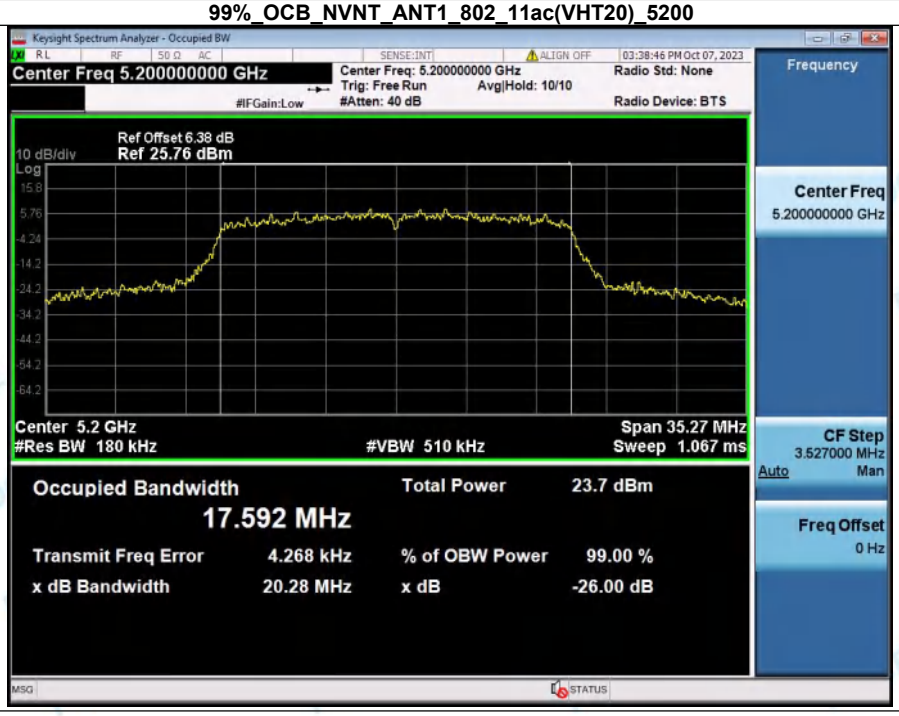

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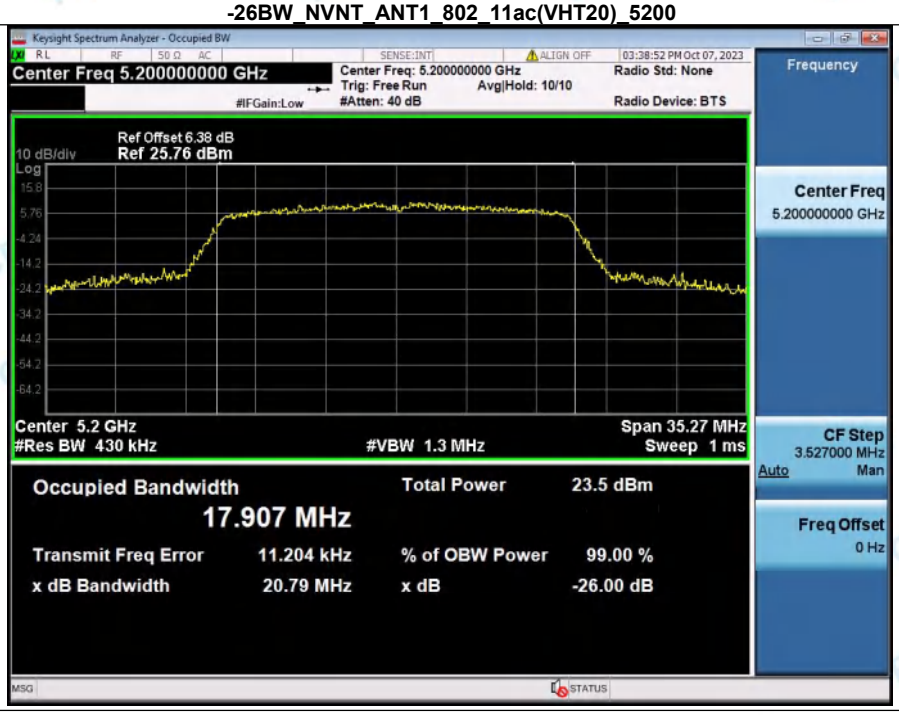

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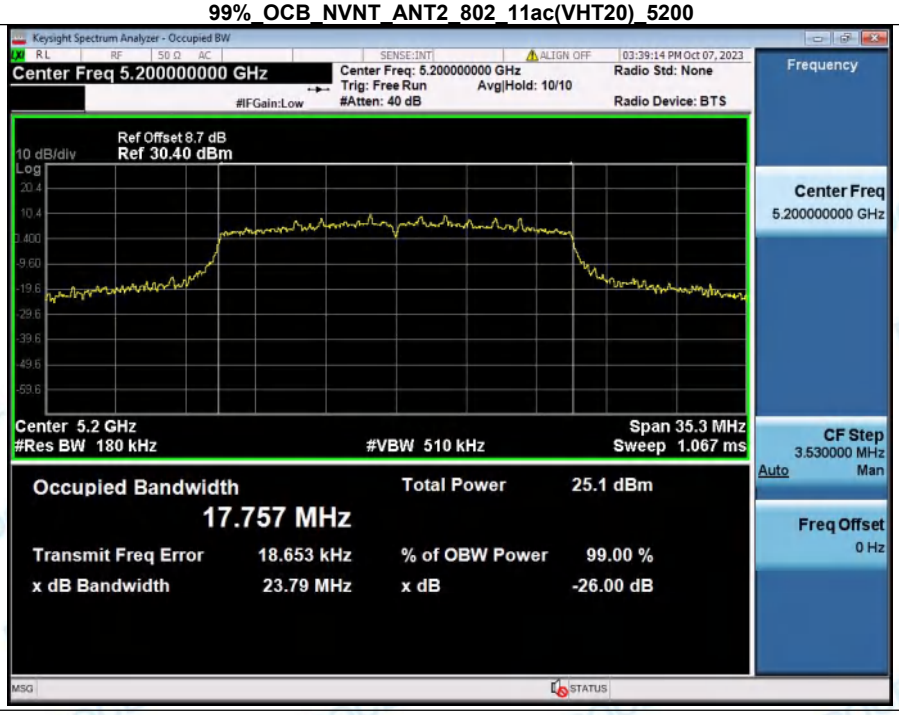

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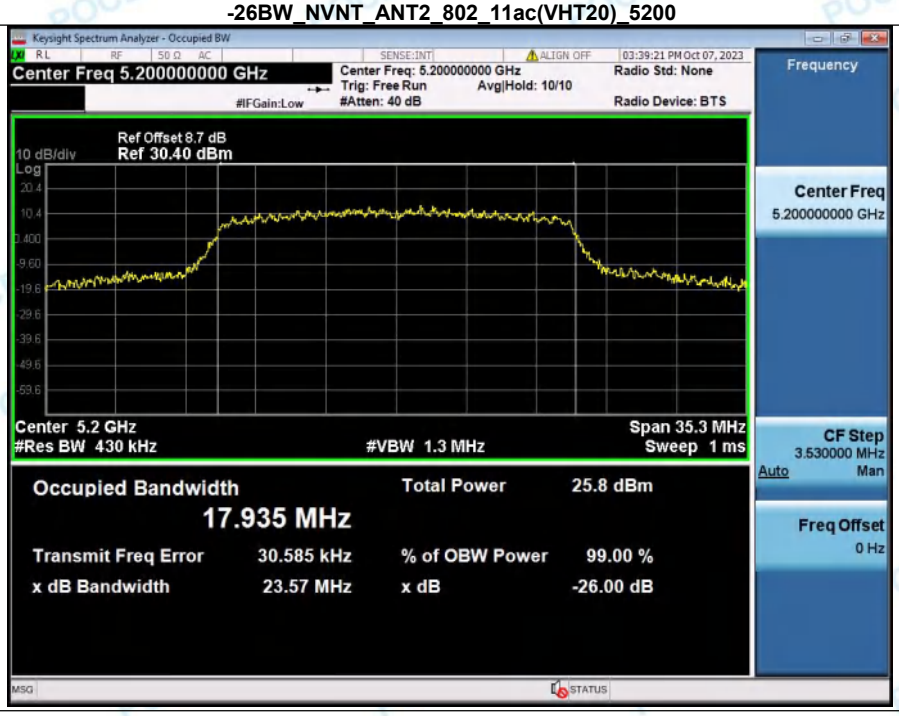

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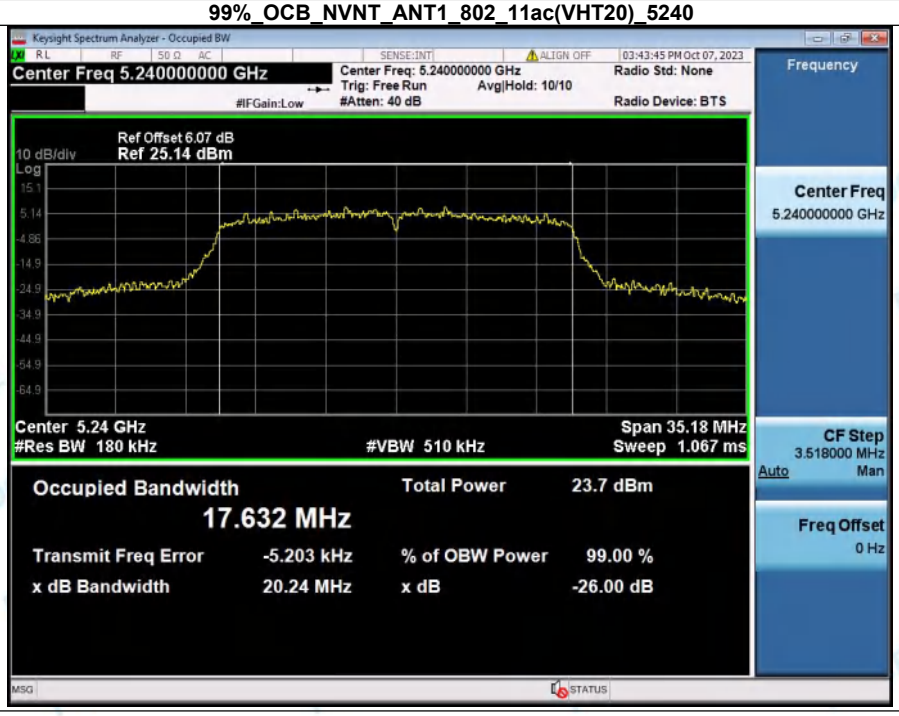

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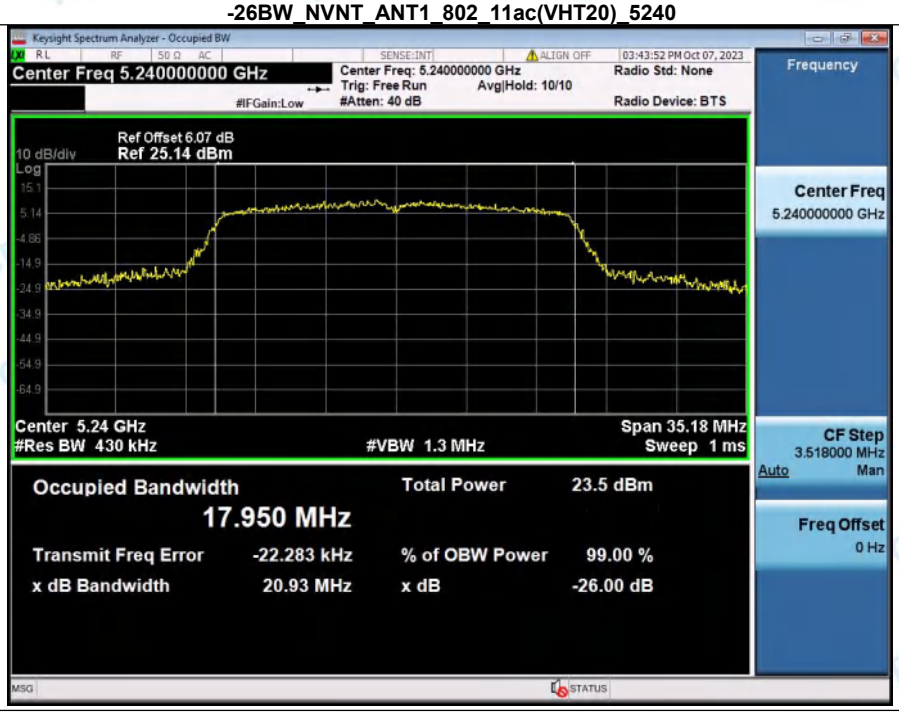

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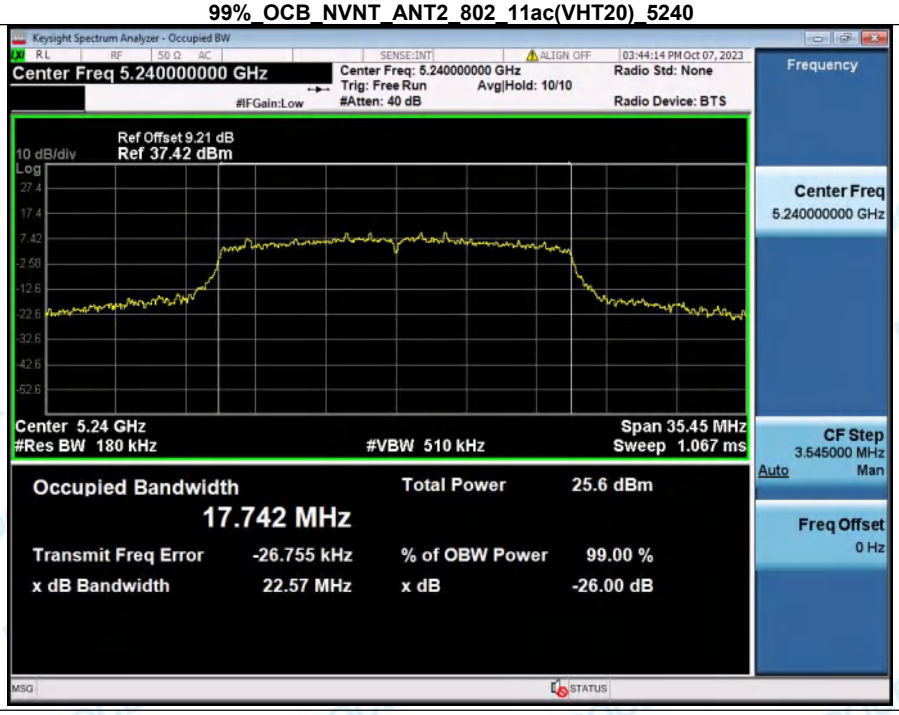

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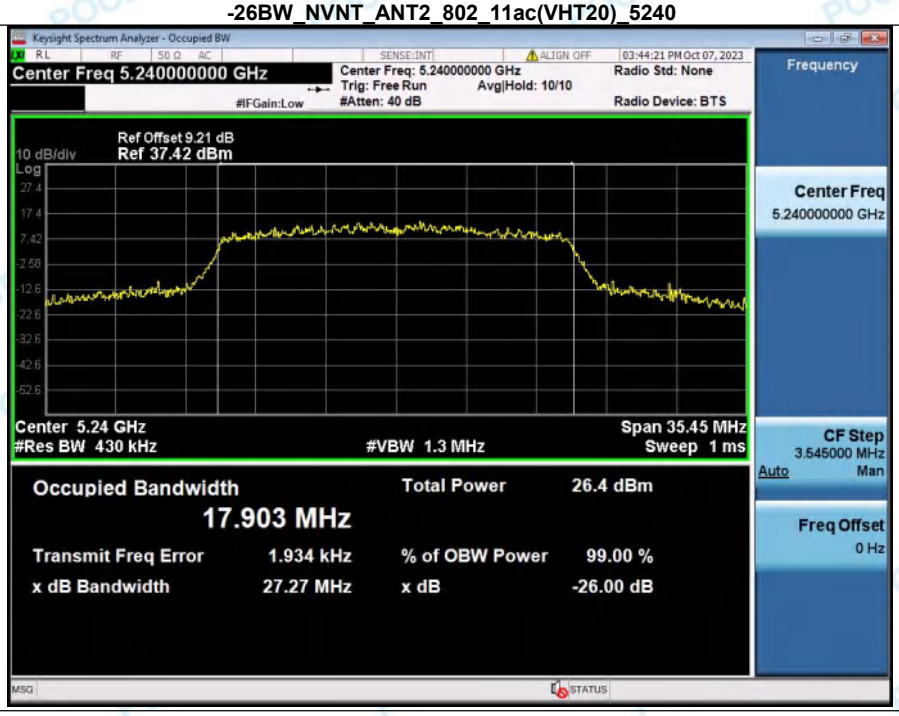

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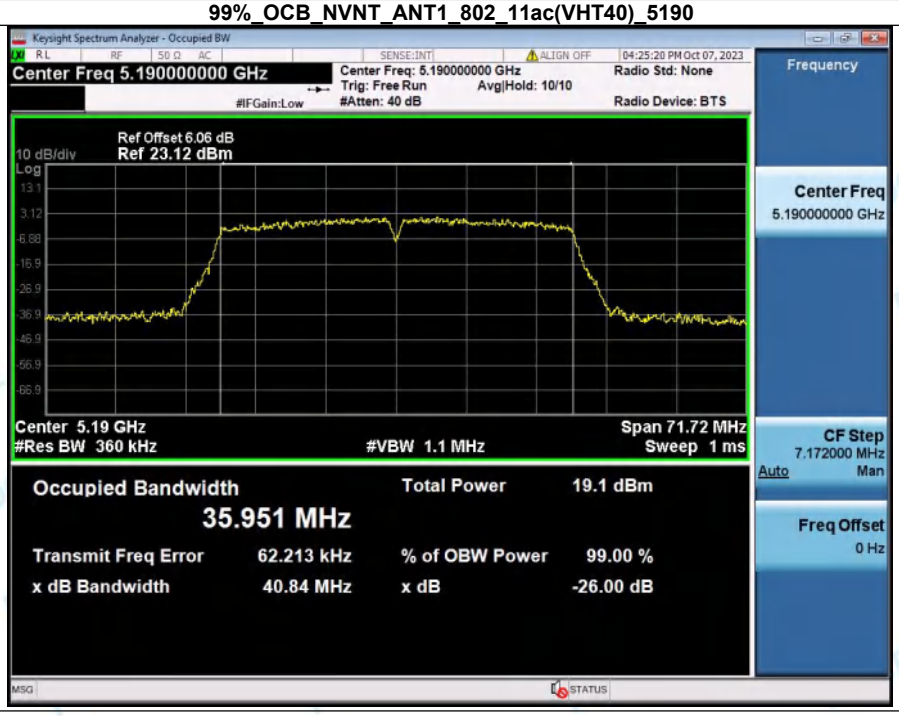

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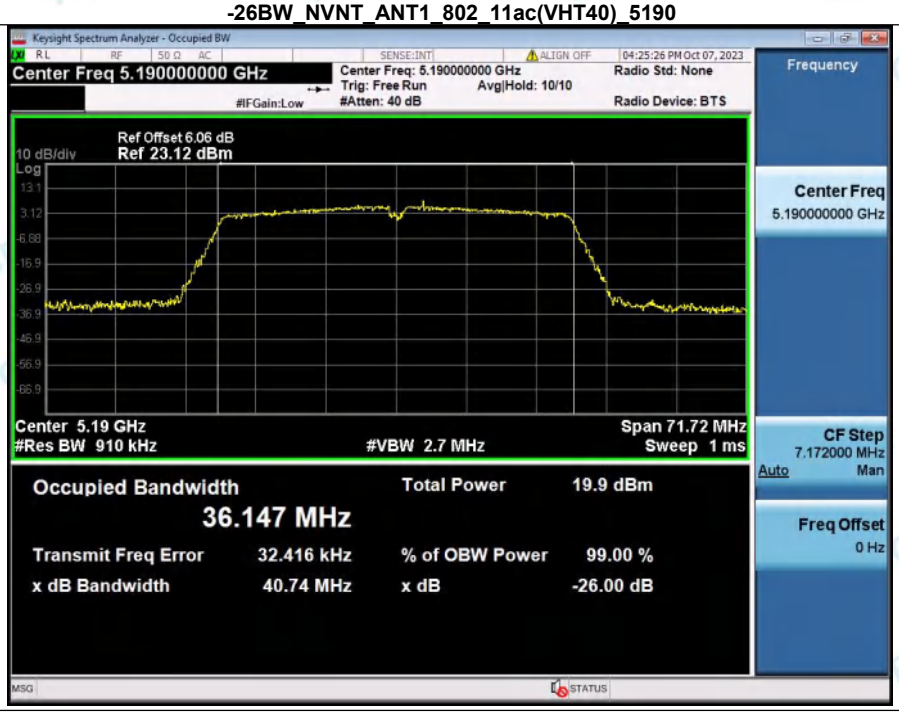

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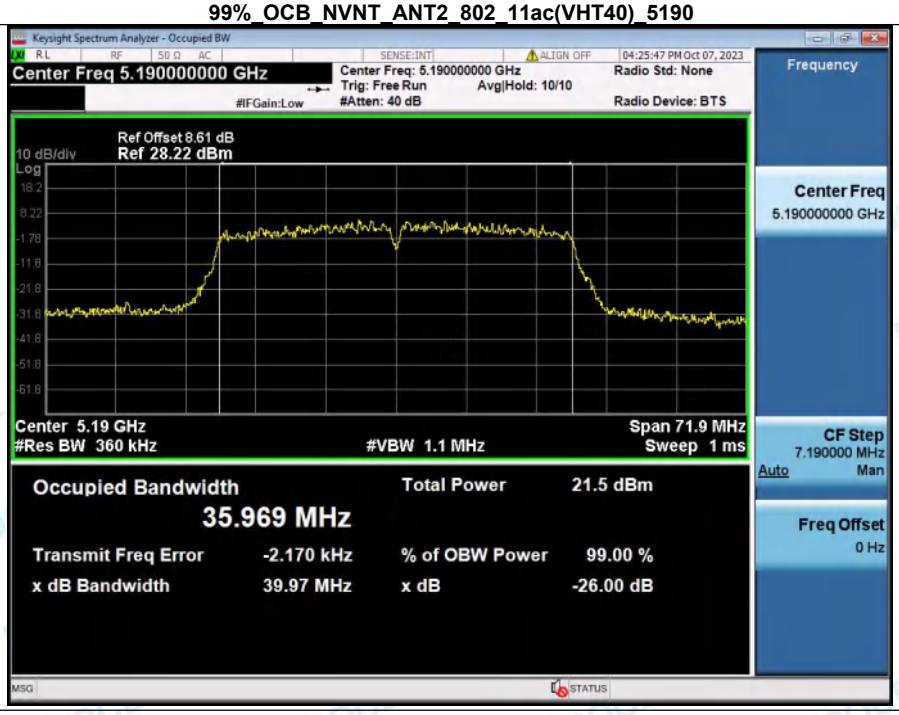

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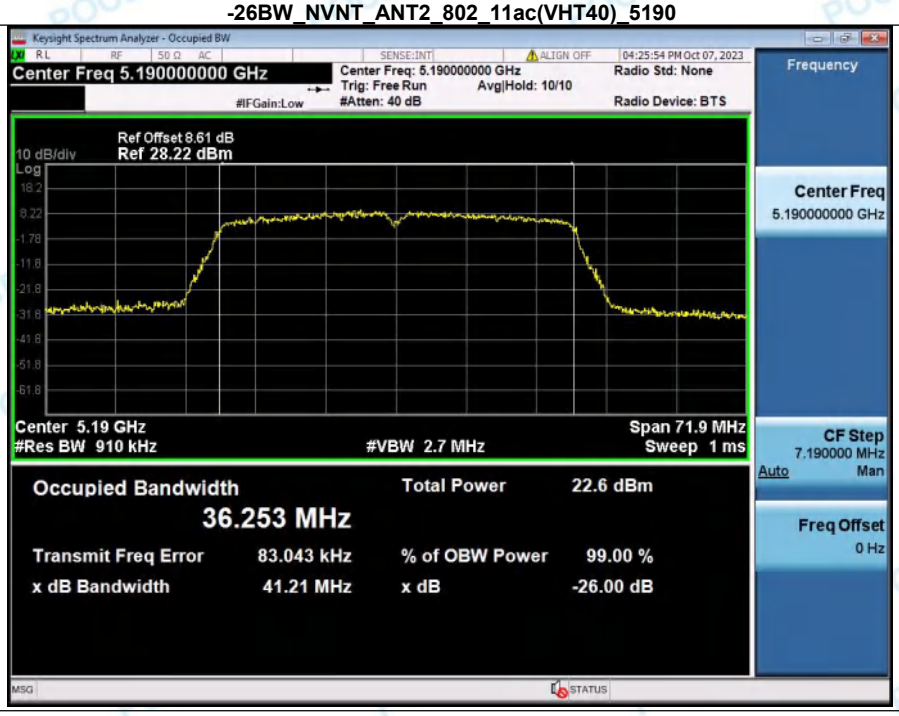

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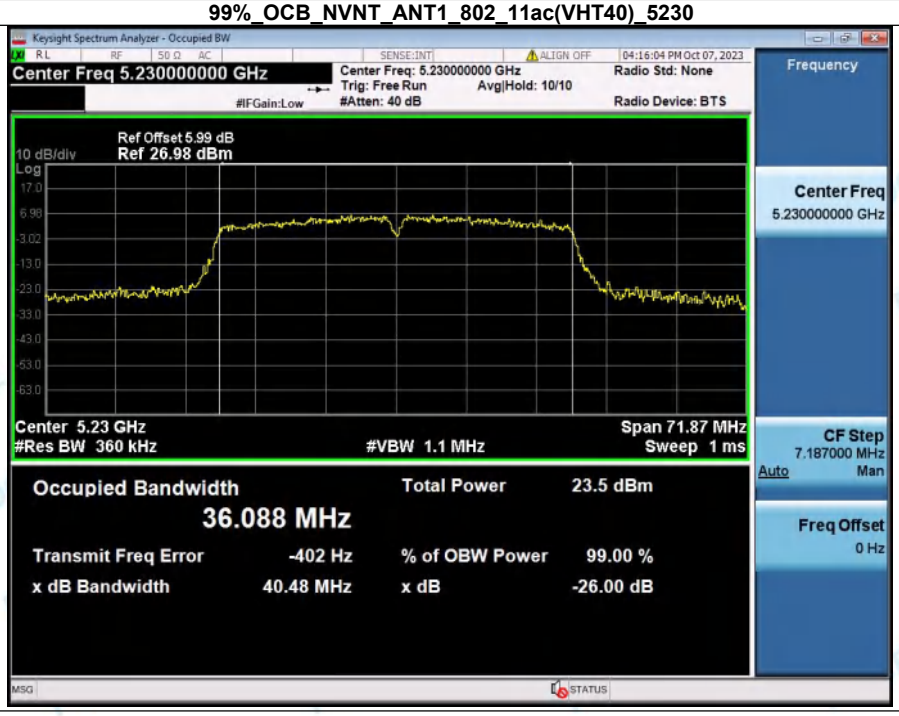

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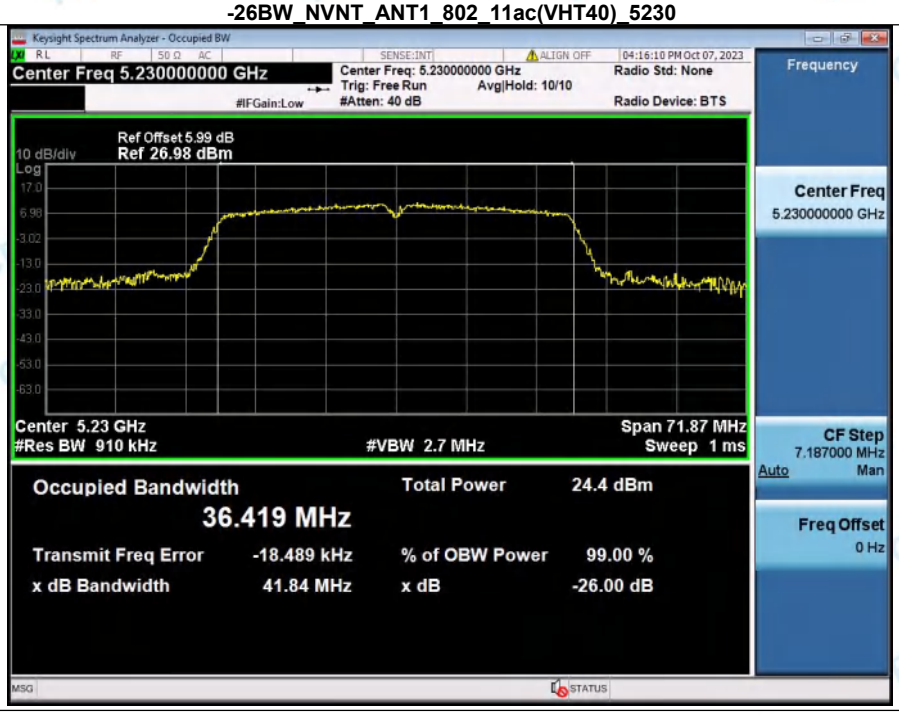

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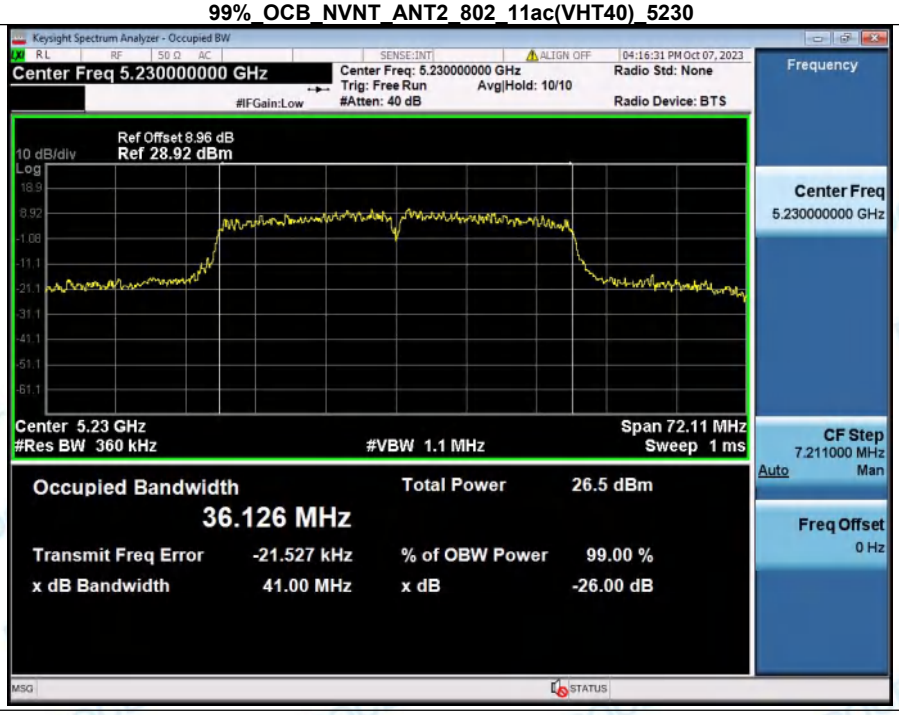

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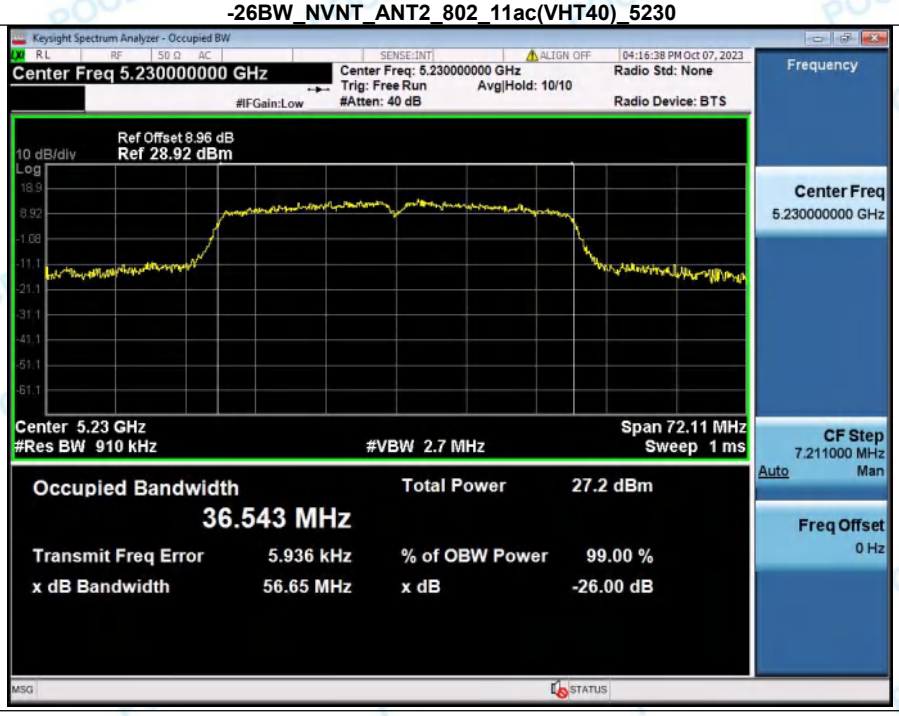
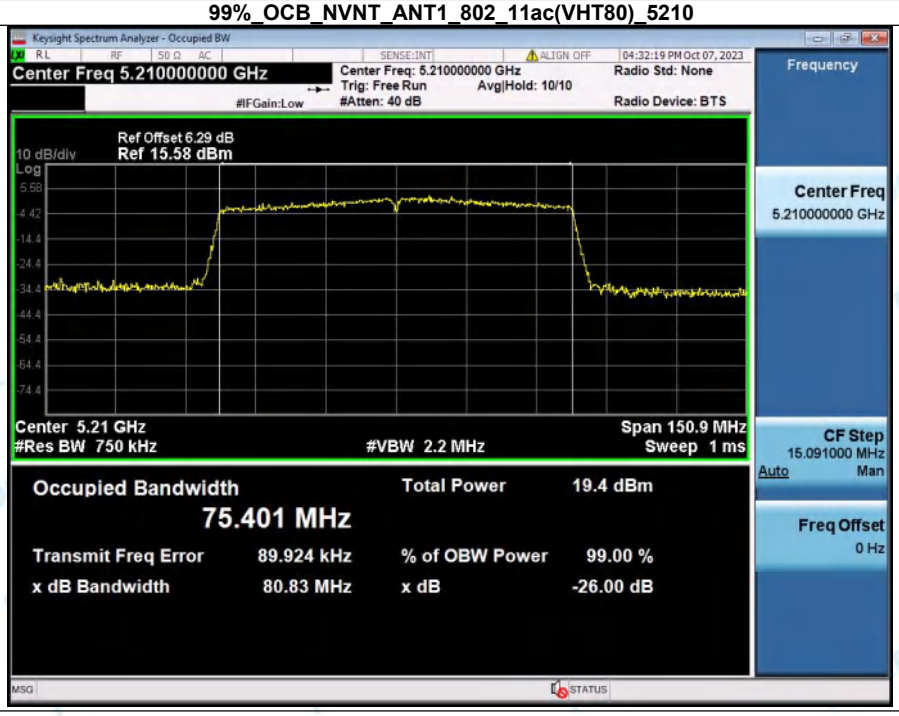


99%_OCB_NVNT_ANT1_802_11ac(VHT80)_5210



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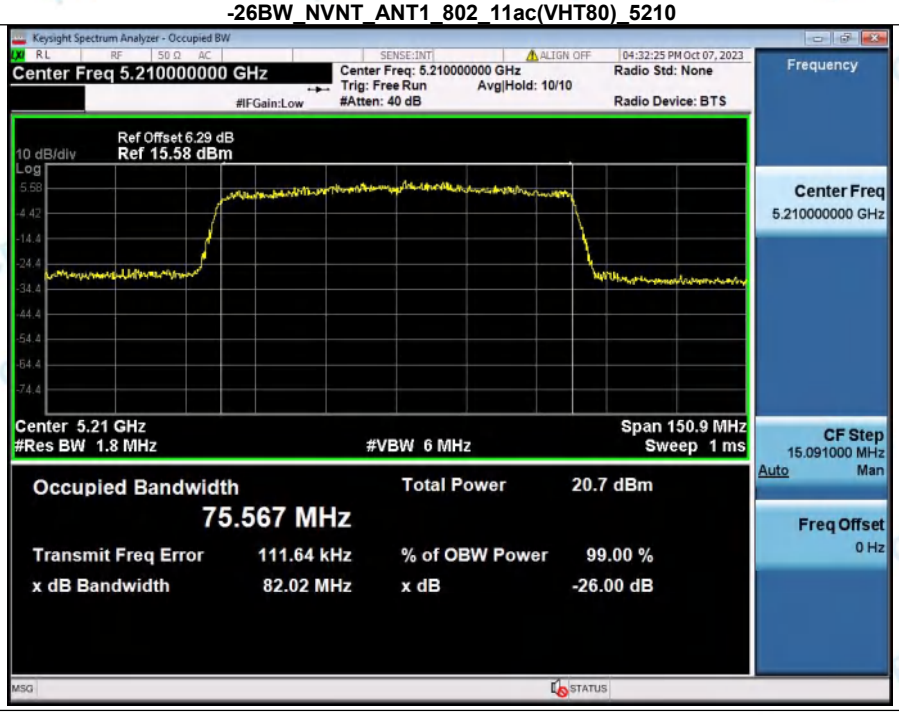

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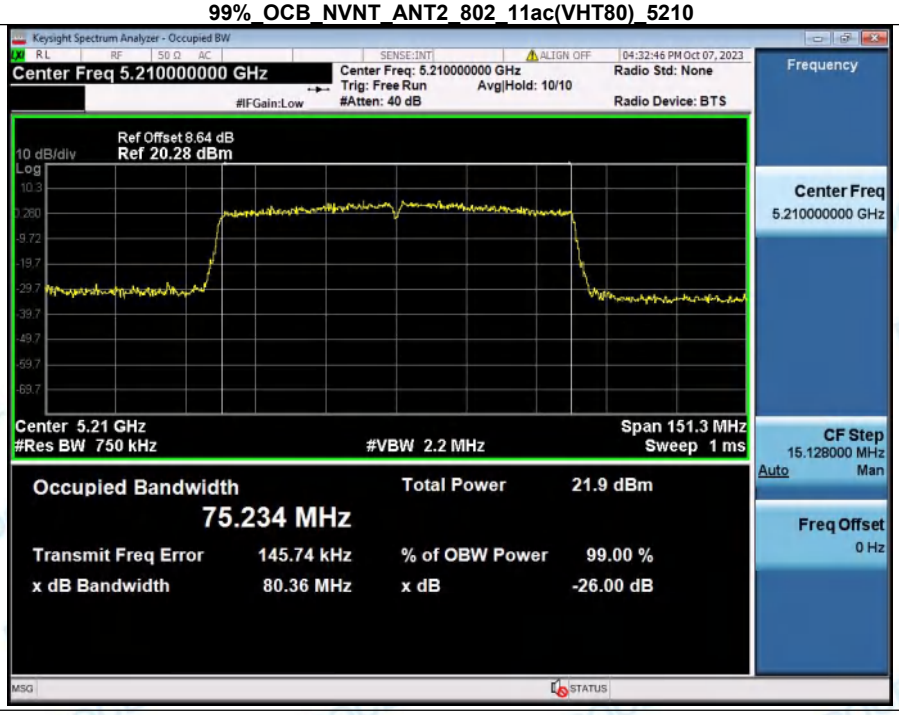

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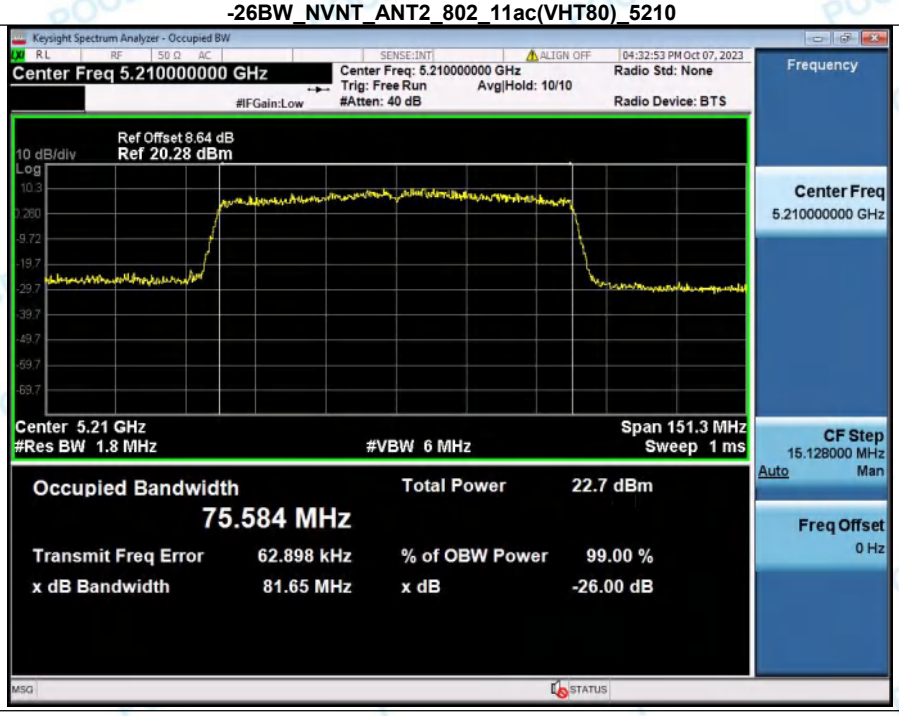
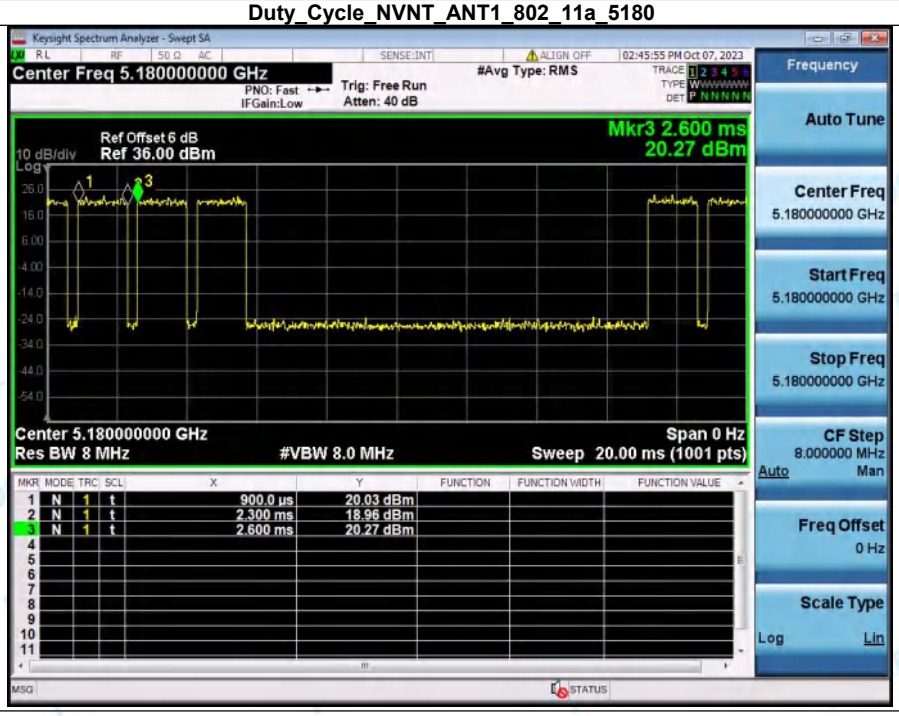


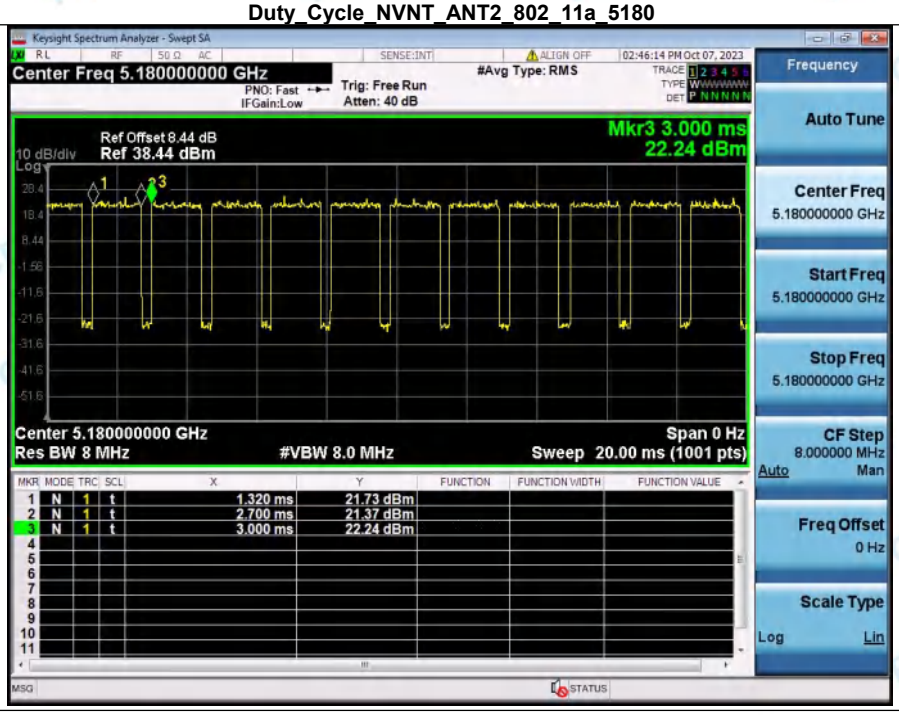
2. Duty Cycle

Condition	Antenna	Modulation	Frequency (MHz)	Duty cycle(%)	Duty_factor
NVNT	ANT1	802.11a	5180.00	82.35	0.84
NVNT	ANT2	802.11a	5180.00	82.14	0.85
NVNT	ANT1	802.11a	5200.00	82.35	0.84
NVNT	ANT2	802.11a	5200.00	82.35	0.84
NVNT	ANT1	802.11a	5240.00	81.18	0.91
NVNT	ANT2	802.11a	5240.00	82.35	0.84
NVNT	ANT1	802.11ac(VHT20)	5180.00	80.49	0.94
NVNT	ANT2	802.11ac(VHT20)	5180.00	82.50	0.84
NVNT	ANT1	802.11ac(VHT20)	5200.00	80.49	0.94
NVNT	ANT2	802.11ac(VHT20)	5200.00	80.49	0.94
NVNT	ANT1	802.11ac(VHT20)	5240.00	81.48	0.89
NVNT	ANT2	802.11ac(VHT20)	5240.00	80.25	0.96
NVNT	ANT1	802.11ac(VHT40)	5190.00	68.75	1.63
NVNT	ANT2	802.11ac(VHT40)	5190.00	70.21	1.54
NVNT	ANT1	802.11ac(VHT40)	5230.00	67.35	1.72
NVNT	ANT2	802.11ac(VHT40)	5230.00	67.35	1.72
NVNT	ANT1	802.11ac(VHT80)	5210.00	53.13	2.75
NVNT	ANT2	802.11ac(VHT80)	5210.00	50.00	3.01

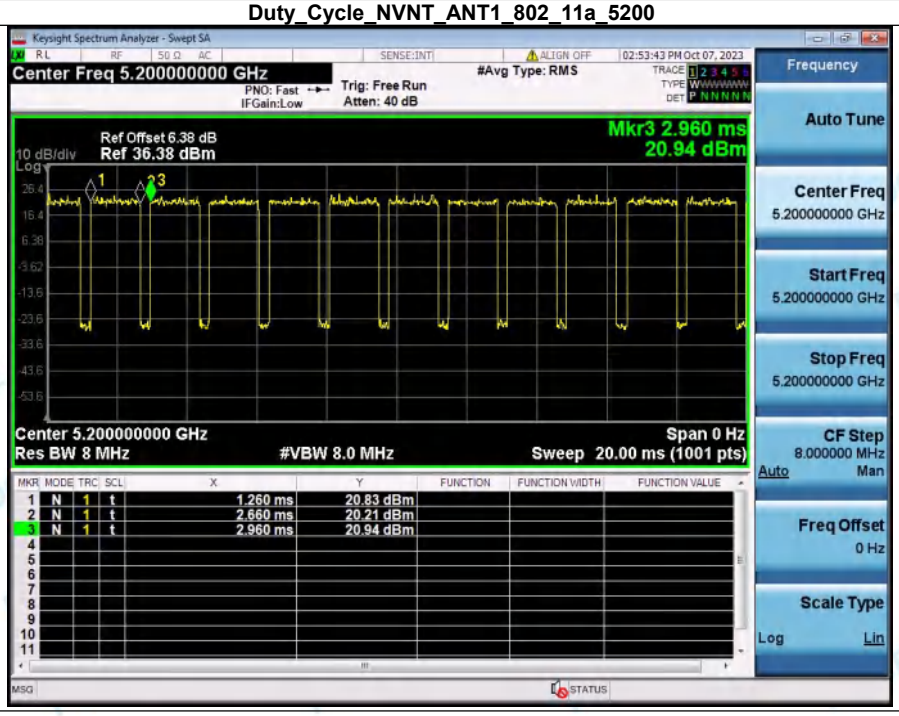
Duty_Cycle_NVNT_ANT1_802_11a_5180



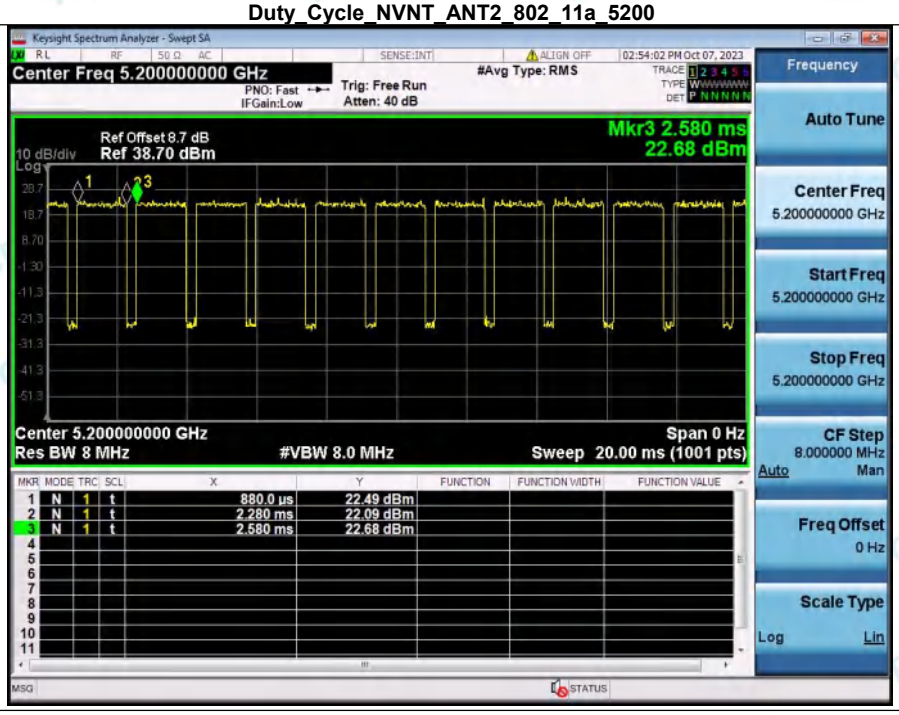
Duty_Cycle_NVNT_ANT2_802_11a_5180



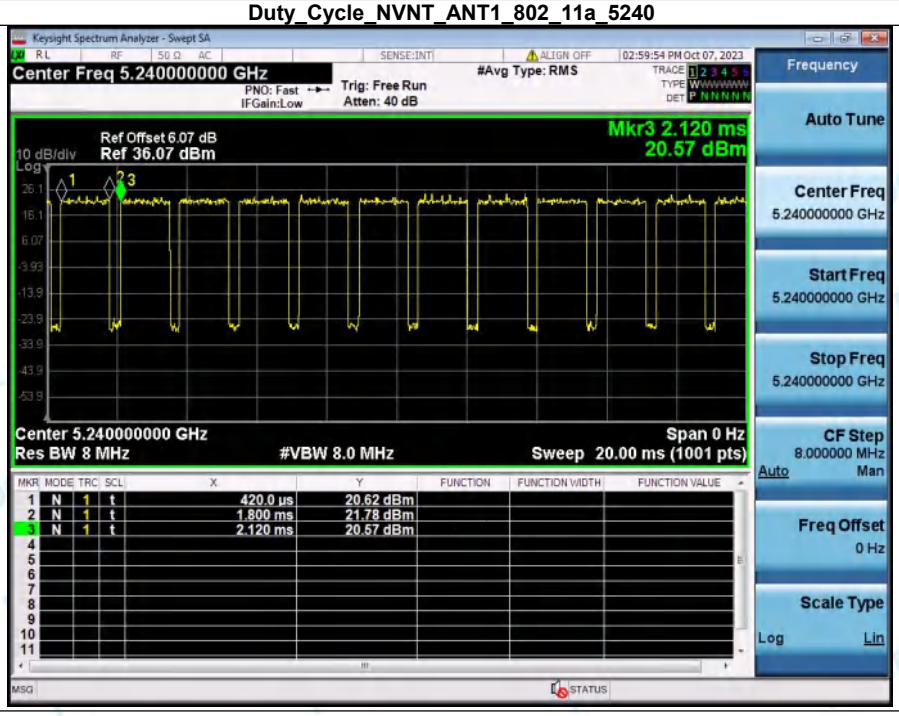
Duty_Cycle_NVNT_ANT1_802_11a_5200



Duty_Cycle_NVNT_ANT2_802_11a_5200



Duty_Cycle_NVNT_ANT1_802_11a_5240



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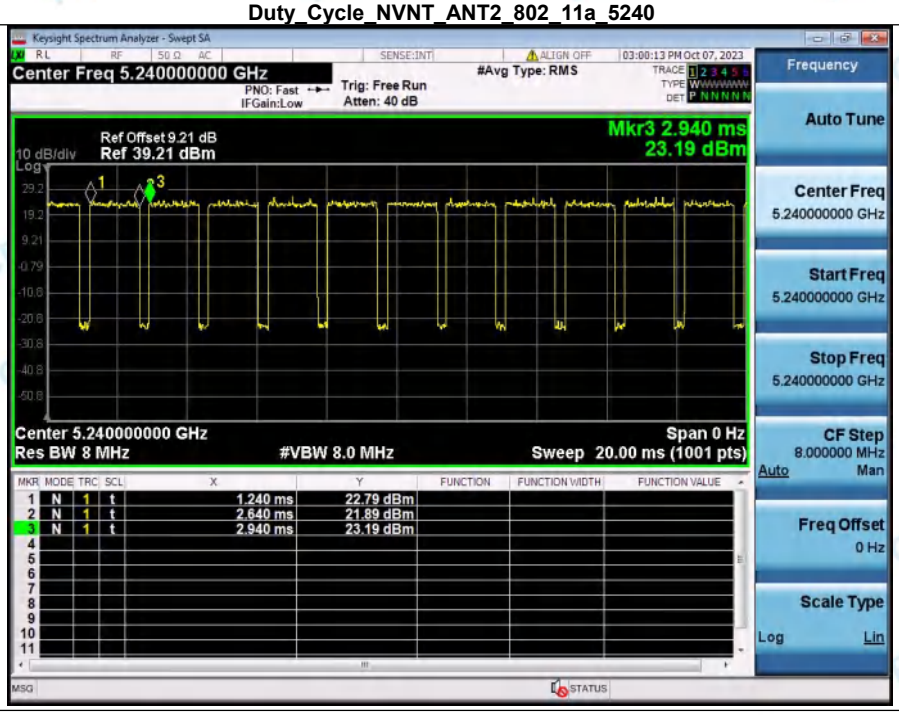
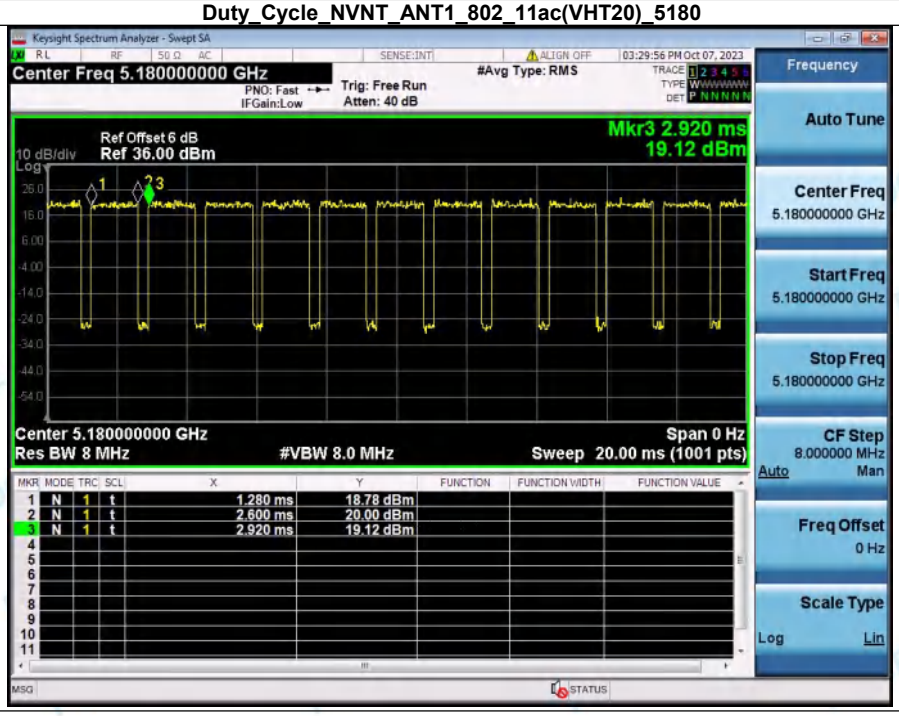


Duty_Cycle_NVNT_ANT1_802_11ac(VHT20)_5180



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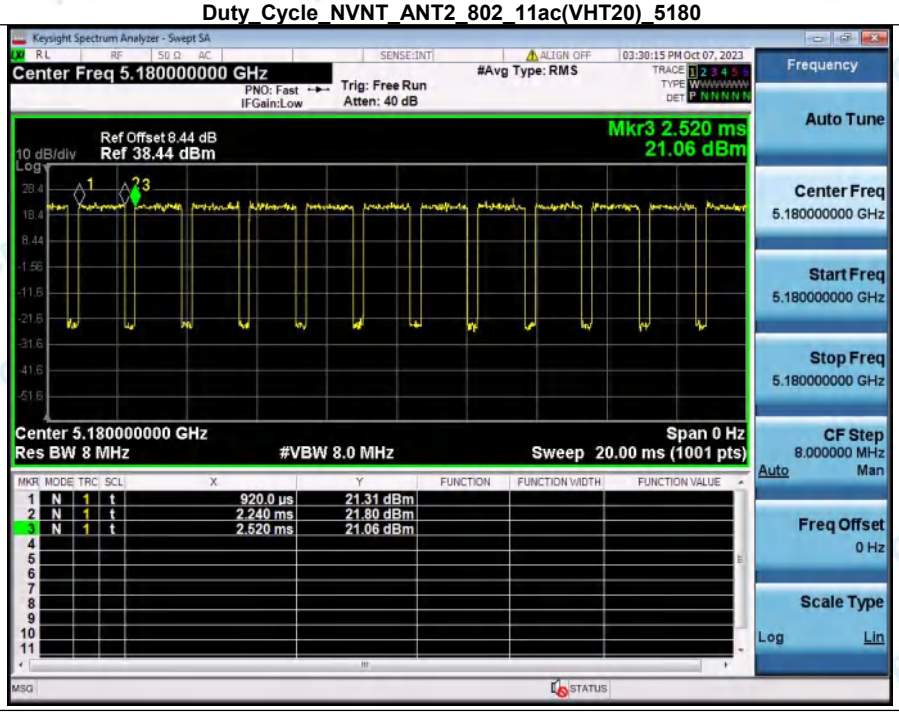

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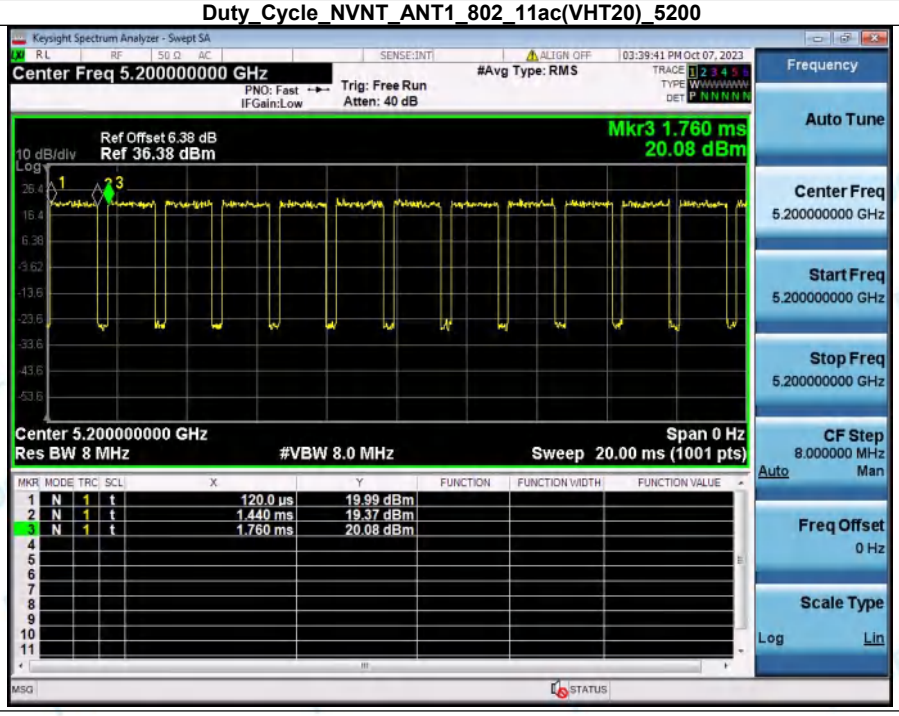
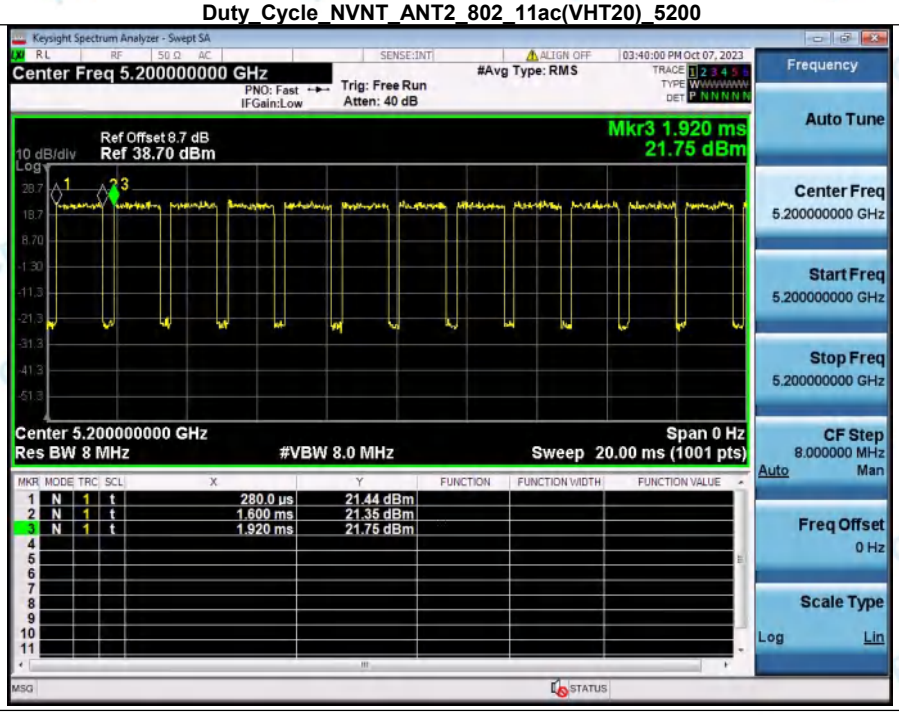
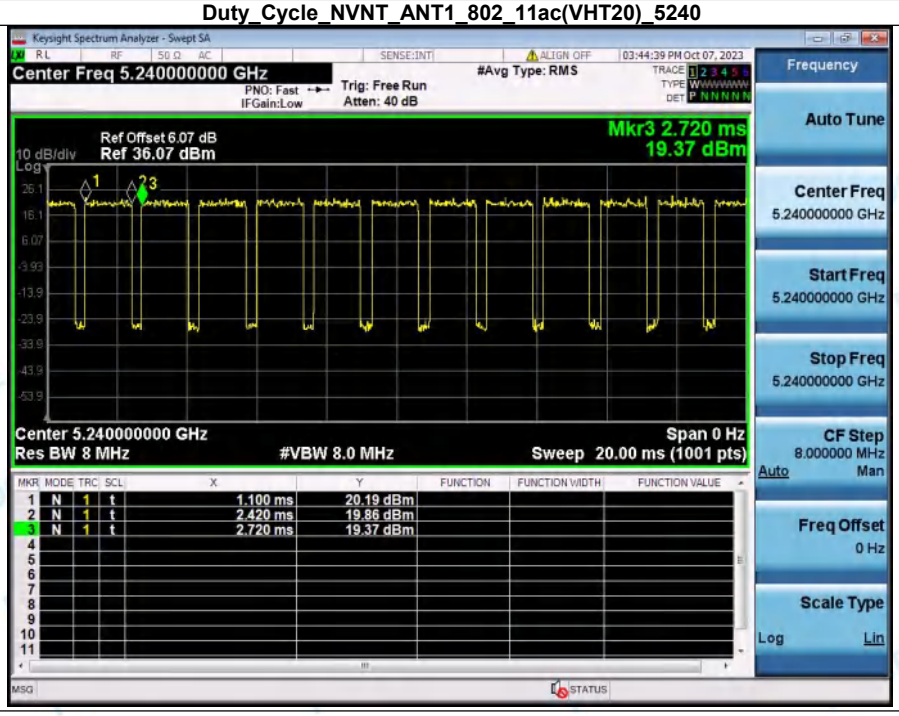


Duty_Cycle_NVNT_ANT2_802_11ac(VHT20)_5200



Duty_Cycle_NVNT_ANT1_802_11ac(VHT20)_5240



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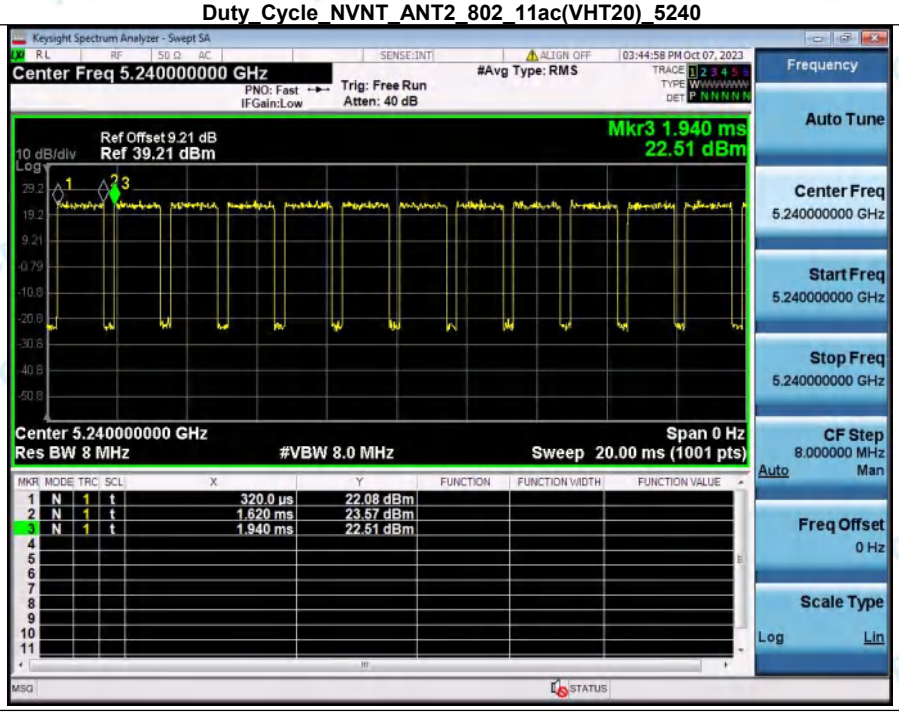
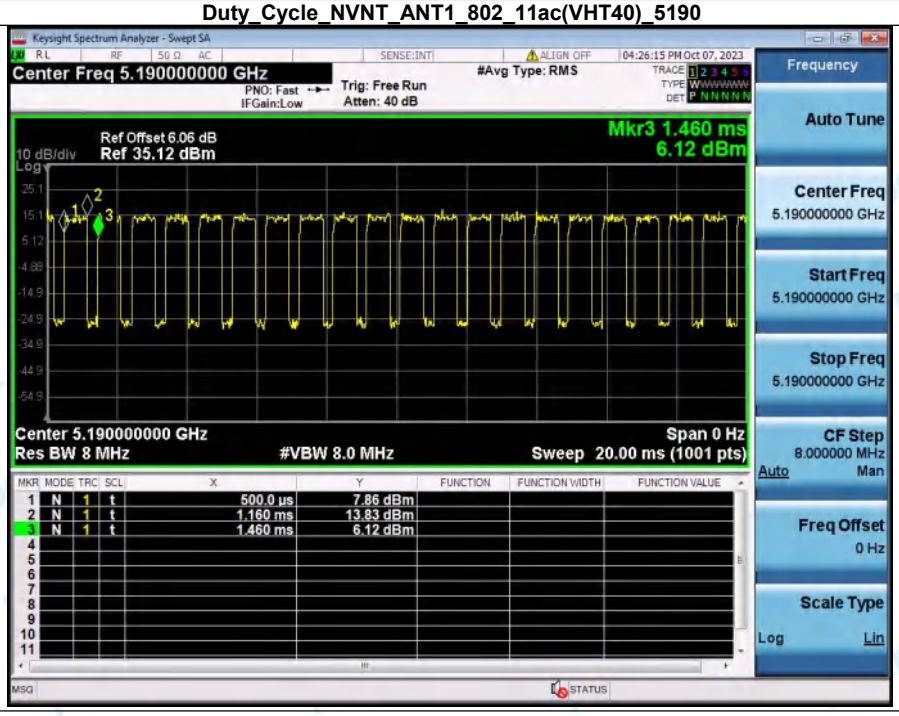


Duty_Cycle_NVNT_ANT1_802_11ac(VHT40)_5190



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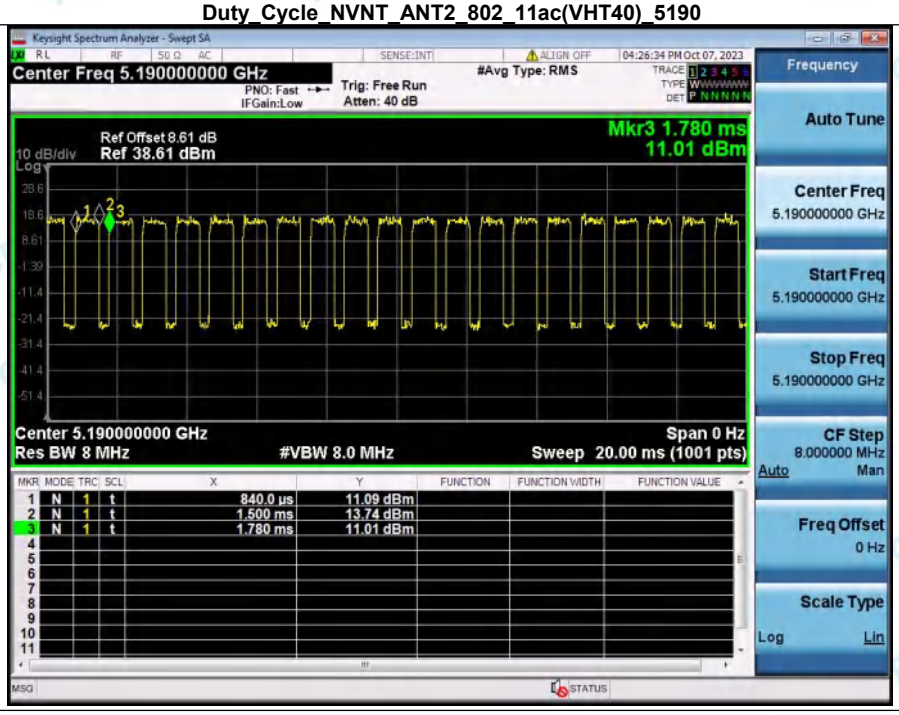

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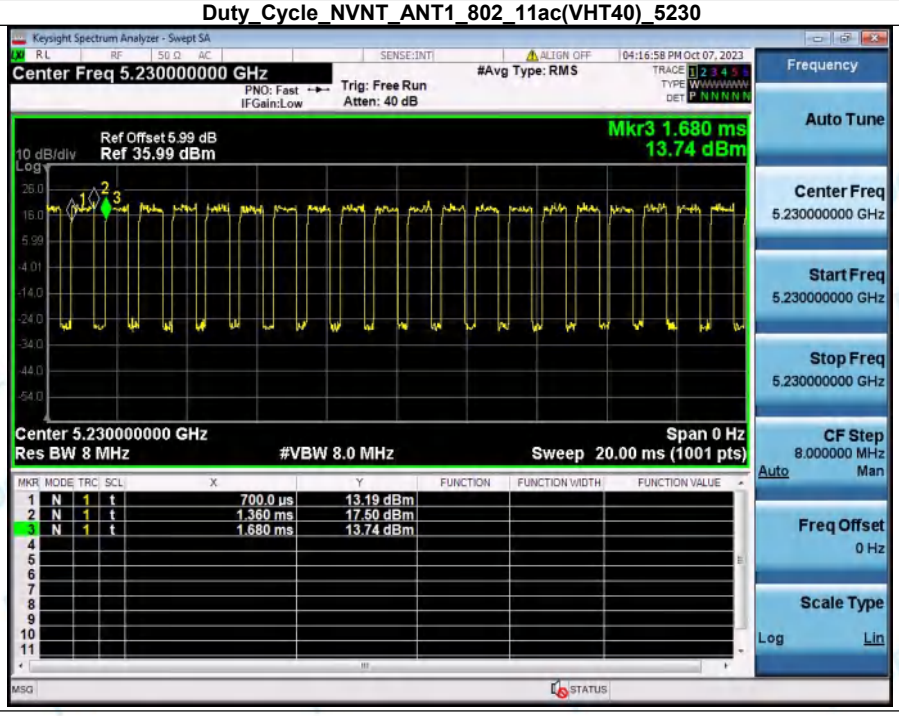
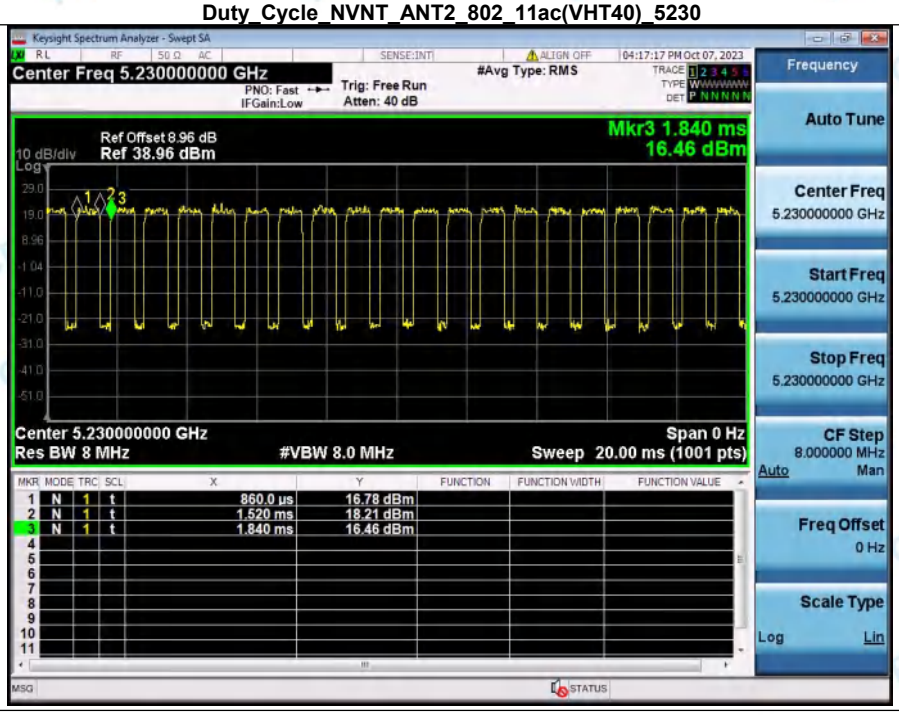
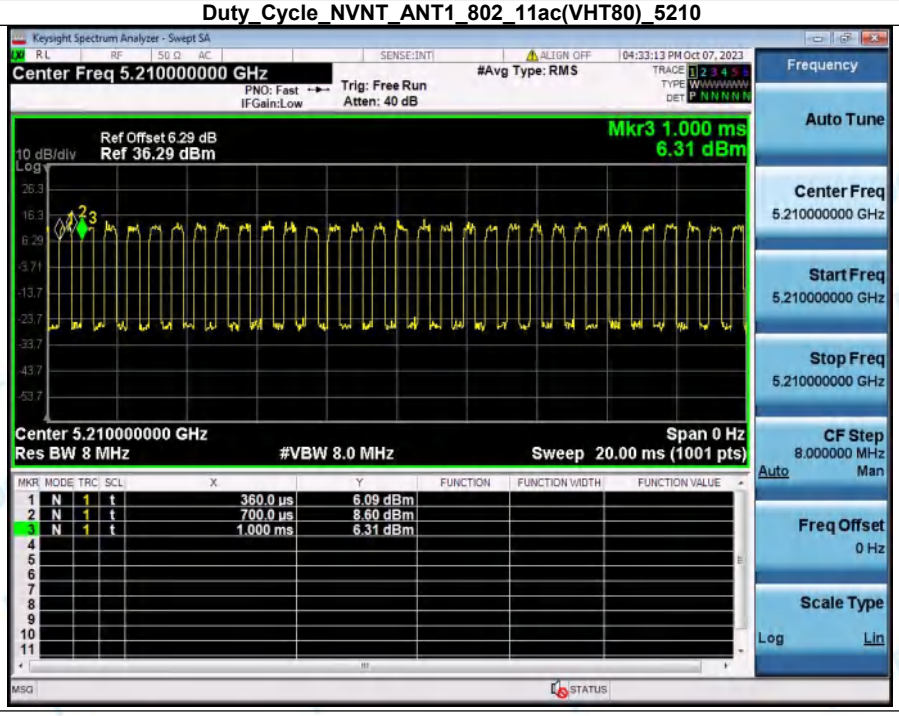


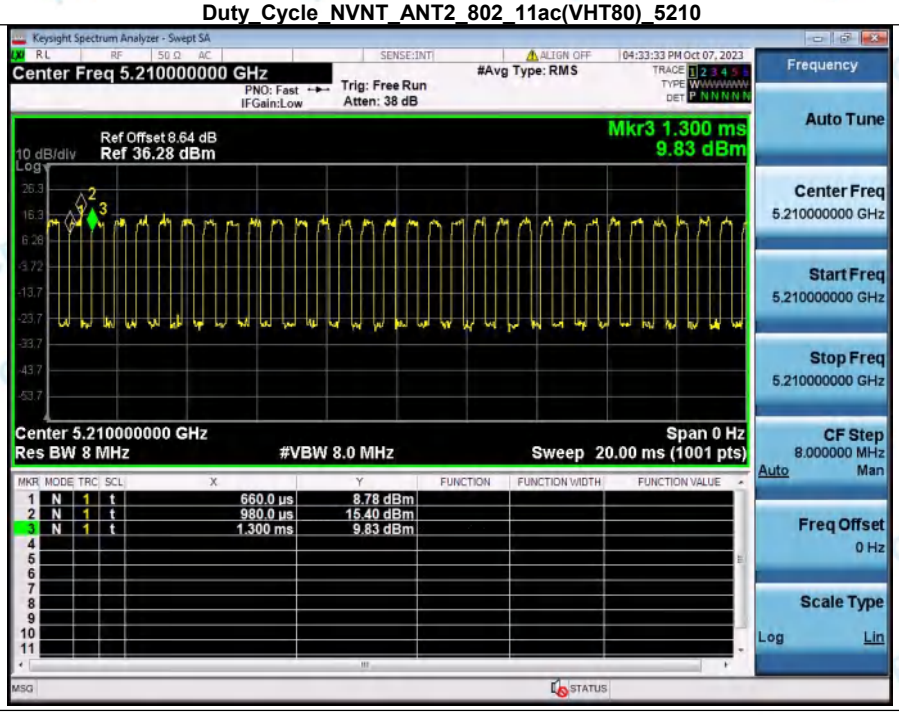
Duty_Cycle_NVNT_ANT2_802_11ac(VHT40)_5230



Duty_Cycle_NVNT_ANT1_802_11ac(VHT80)_5210



Duty_Cycle_NVNT_ANT2_802_11ac(VHT80)_5210



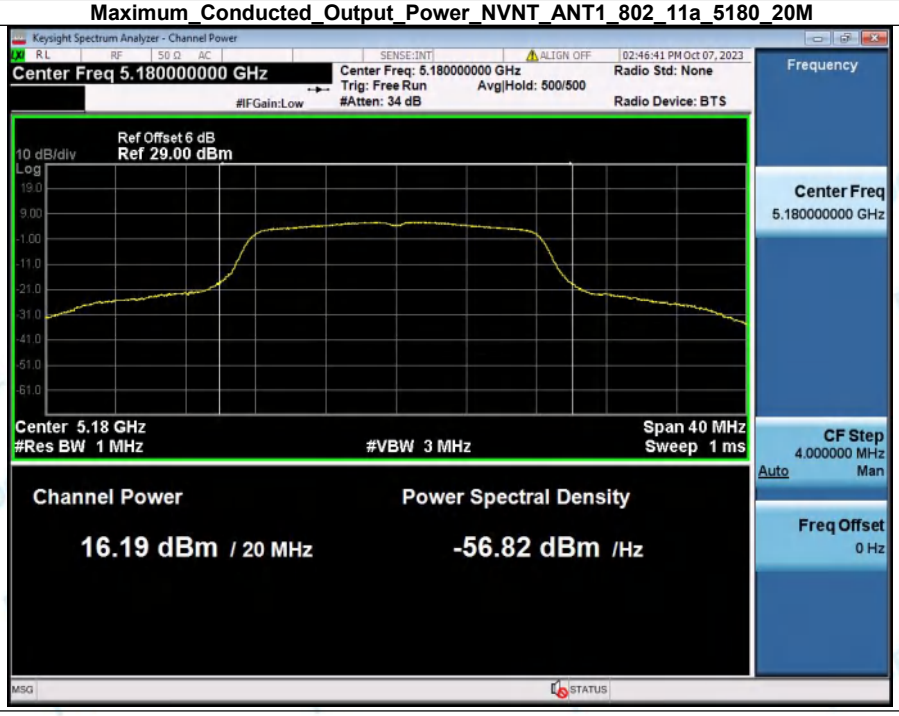
3. Maximum Conducted Output Power

Condition	Antenna	Modulation	Frequency (MHz)	Conducted Power(dBm)	Duty factor(dB)	Total Power(dBm)	limit(dBm)	Result
NVNT	ANT1	802.11a	5180.00	16.19	0.84	17.03	30	Pass
NVNT	ANT2	802.11a	5180.00	17.98	0.85	18.83	30	Pass
NVNT	ANT1	802.11a	5200.00	16.97	0.84	17.81	30	Pass
NVNT	ANT2	802.11a	5200.00	18.49	0.84	19.33	30	Pass
NVNT	ANT1	802.11a	5240.00	17.11	0.91	18.02	30	Pass
NVNT	ANT2	802.11a	5240.00	19.21	0.84	20.05	30	Pass
NVNT	ANT1	802.11ac(VHT20)	5180.00	15.34	0.94	16.28	30	Pass
NVNT	ANT2	802.11ac(VHT20)	5180.00	17.19	0.84	18.03	30	Pass
NVNT	ANT1	802.11ac(VHT20)	5200.00	15.96	0.94	16.90	30	Pass
NVNT	ANT2	802.11ac(VHT20)	5200.00	17.72	0.94	18.66	30	Pass
NVNT	ANT1	802.11ac(VHT20)	5240.00	16.09	0.89	16.98	30	Pass
NVNT	ANT2	802.11ac(VHT20)	5240.00	18.43	0.96	19.39	30	Pass
NVNT	ANT1	802.11ac(VHT40)	5190.00	10.90	1.63	12.53	30	Pass
NVNT	ANT2	802.11ac(VHT40)	5190.00	13.15	1.54	14.69	30	Pass
NVNT	ANT1	802.11ac(VHT40)	5230.00	15.31	1.72	17.03	30	Pass
NVNT	ANT2	802.11ac(VHT40)	5230.00	17.65	1.72	19.37	30	Pass
NVNT	ANT1	802.11ac(VHT80)	5210.00	9.65	2.75	12.40	30	Pass
NVNT	ANT2	802.11ac(VHT80)	5210.00	11.69	3.01	14.70	30	Pass

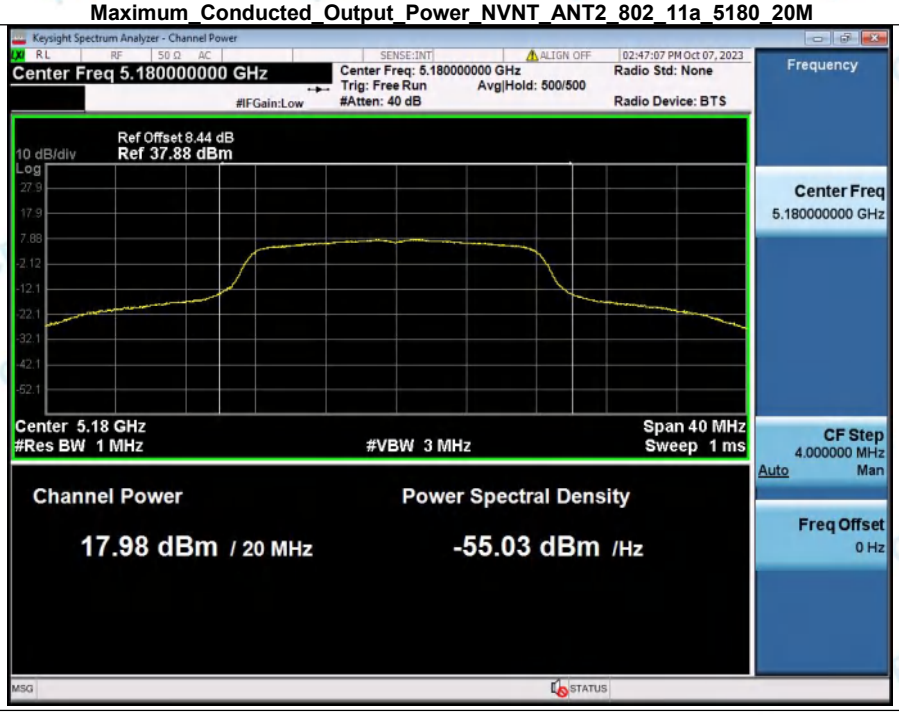
Condition	Antenna	Mode	Frequency(MHz)	MIMO_Conducted_Power(dBm)	Limit(dBm)	Result
NVNT	MIMO_TX	802.11ac(VHT20)	5180.00	19.37	30	Pass
NVNT	MIMO_TX	802.11ac(VHT20)	5200.00	19.94	30	Pass
NVNT	MIMO_TX	802.11ac(VHT20)	5240.00	20.43	30	Pass
NVNT	MIMO_TX	802.11ac(VHT40)	5190.00	15.18	30	Pass
NVNT	MIMO_TX	802.11ac(VHT40)	5230.00	19.64	30	Pass
NVNT	MIMO_TX	802.11ac(VHT80)	5210.00	13.80	30	Pass

P_{ant1} (MW) $= 10^{dBm/10}$, P_{ant2} (MW) $= 10^{dBm/10}$; P_{MIMO} (dBm) $=10*\log(P_{ant1}$ (MW) + P_{ant2} (MW))

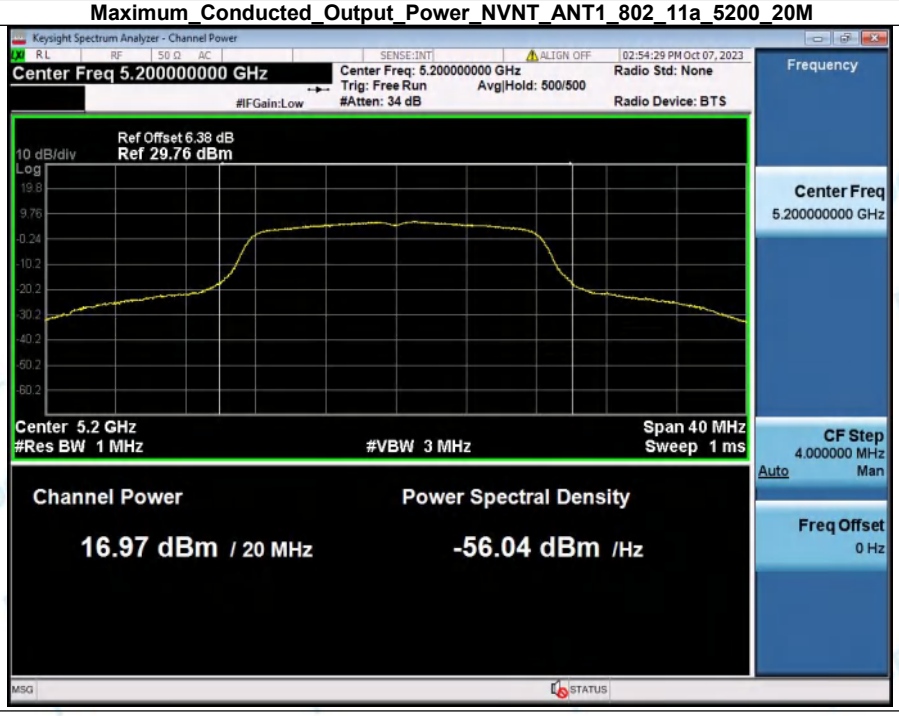
Maximum_Conducted_Output_Power_NVNT_ANT1_802_11a_5180_20M



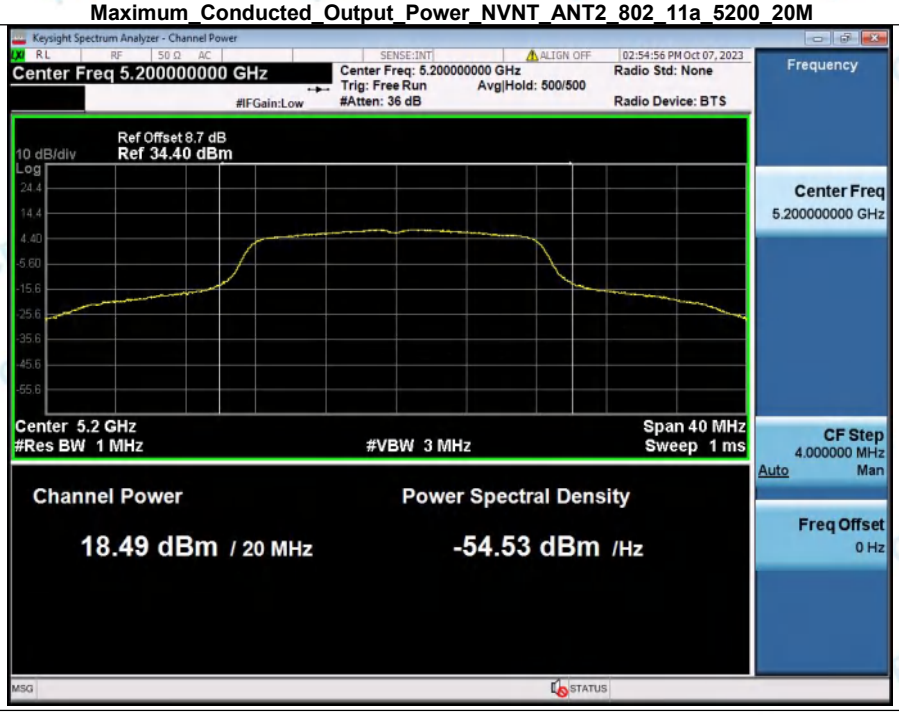
Maximum_Conducted_Output_Power_NVNT_ANT2_802_11a_5180_20M



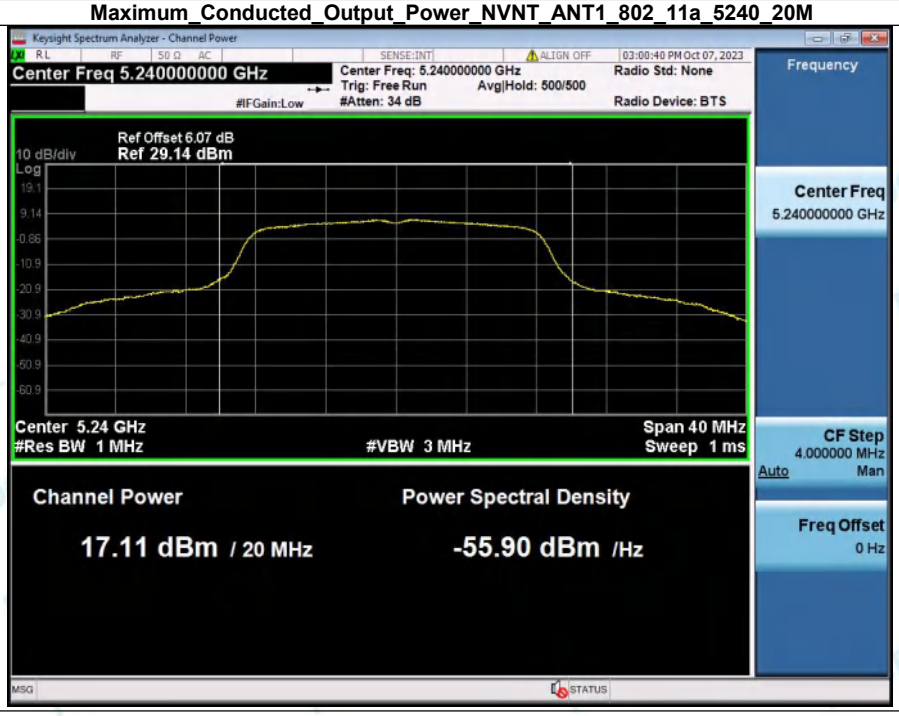
Maximum_Conducted_Output_Power_NVNT_ANT1_802_11a_5200_20M



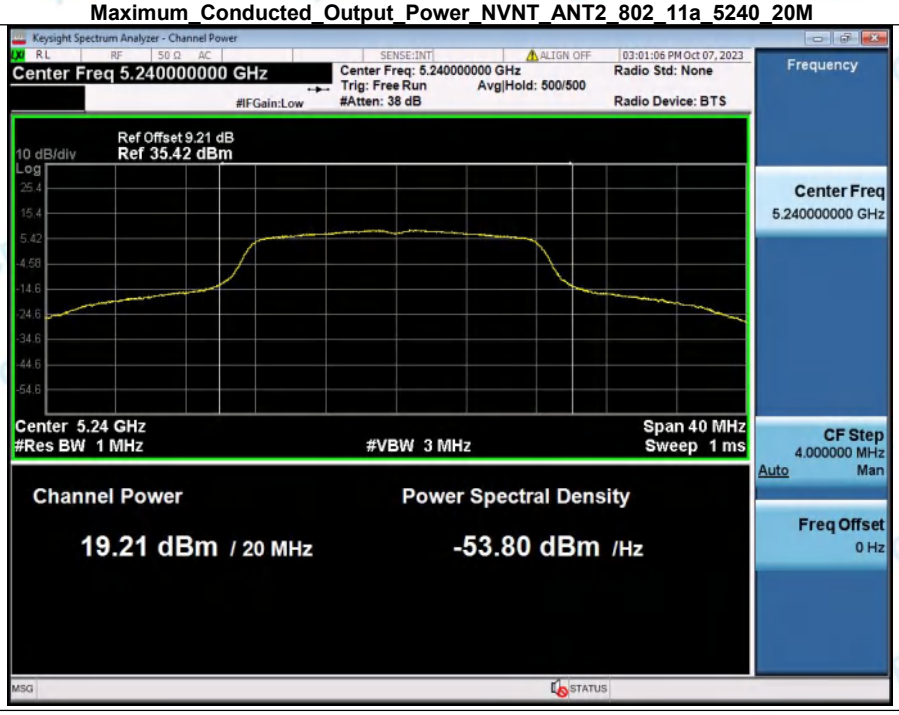
Maximum_Conducted_Output_Power_NVNT_ANT2_802_11a_5200_20M



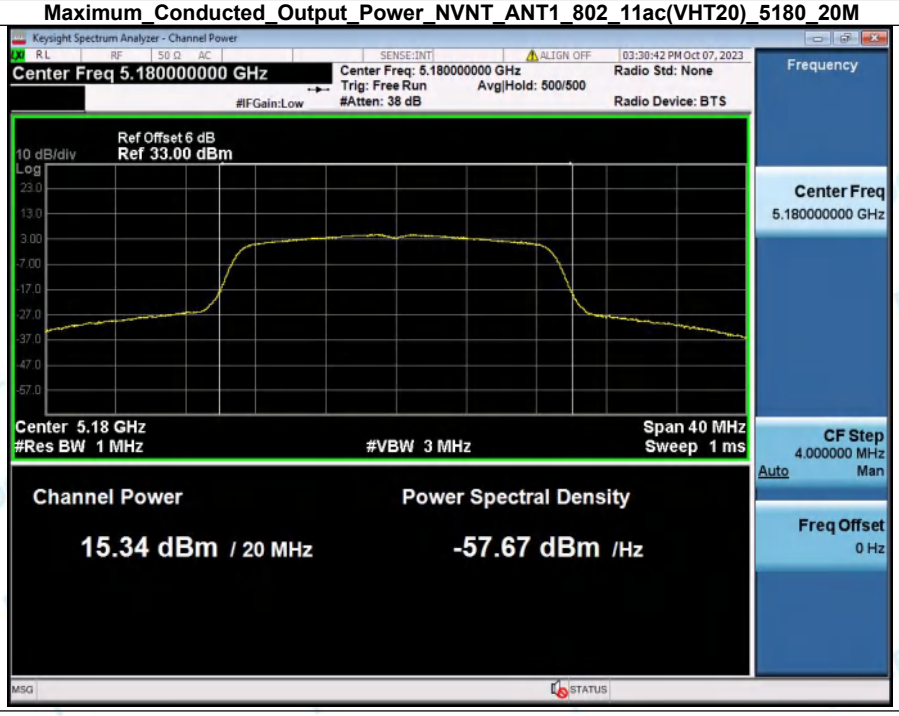
Maximum_Conducted_Output_Power_NVNT_ANT1_802_11a_5240_20M



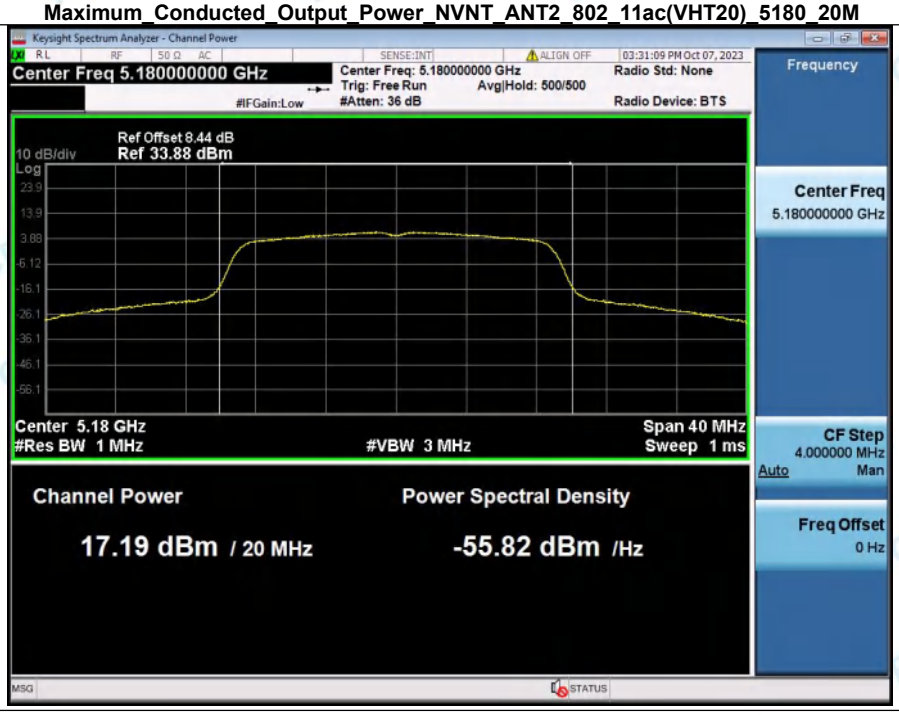
Maximum_Conducted_Output_Power_NVNT_ANT2_802_11a_5240_20M



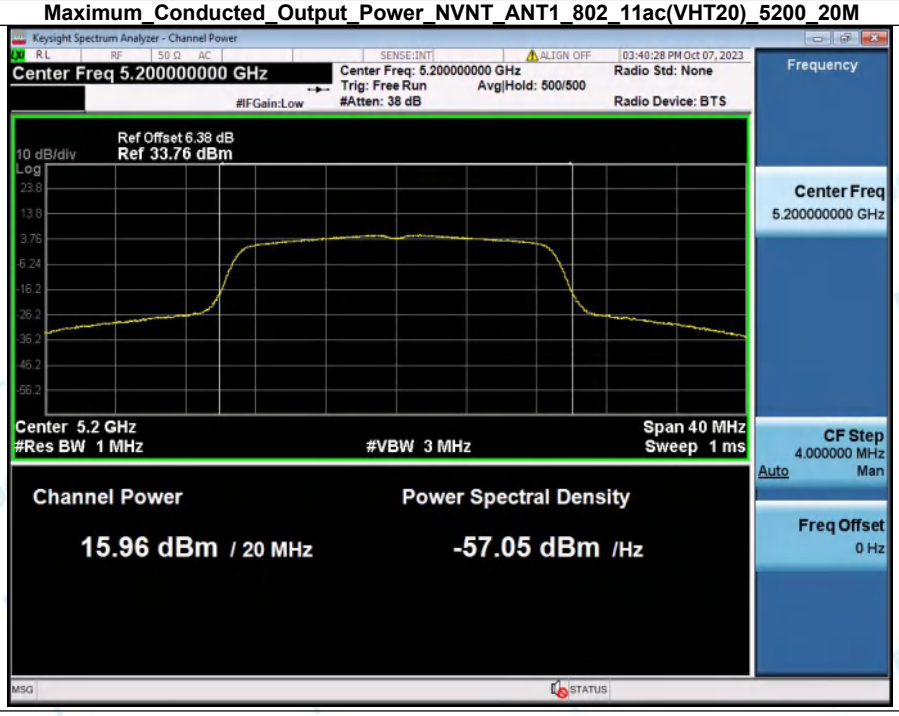
Maximum_Conducted_Output_Power_NVNT_ANT1_802_11ac(VHT20)_5180_20M



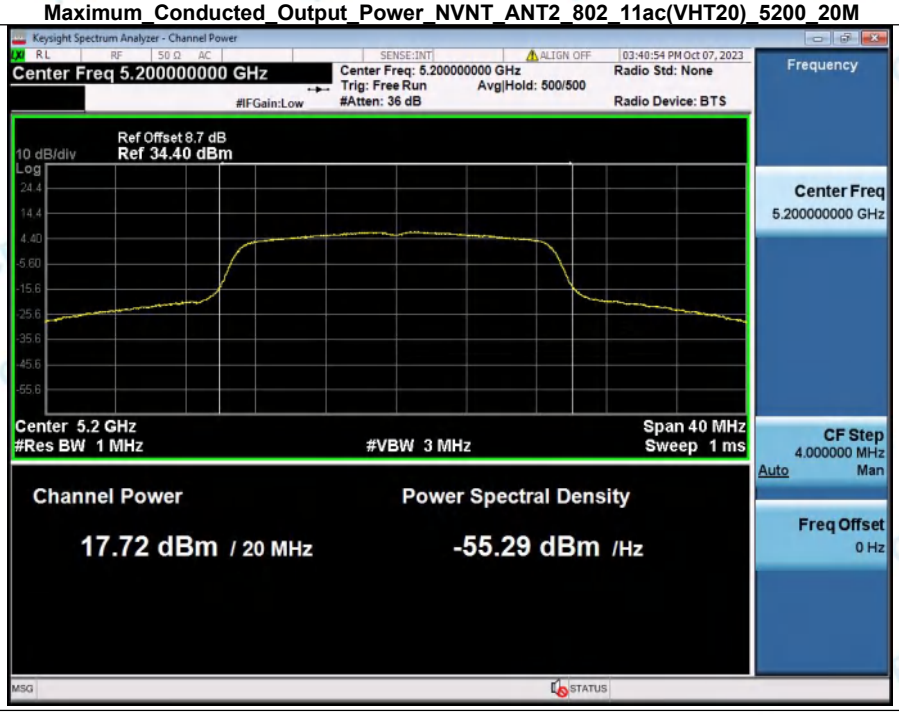
Maximum_Conducted_Output_Power_NVNT_ANT2_802_11ac(VHT20)_5180_20M



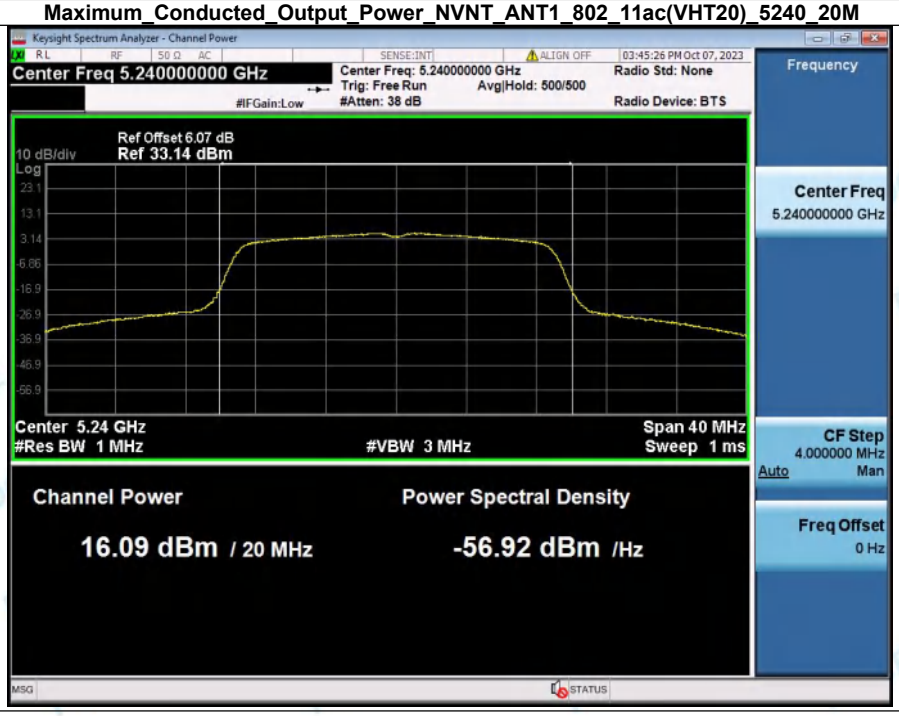
Maximum_Conducted_Output_Power_NVNT_ANT1_802_11ac(VHT20)_5200_20M



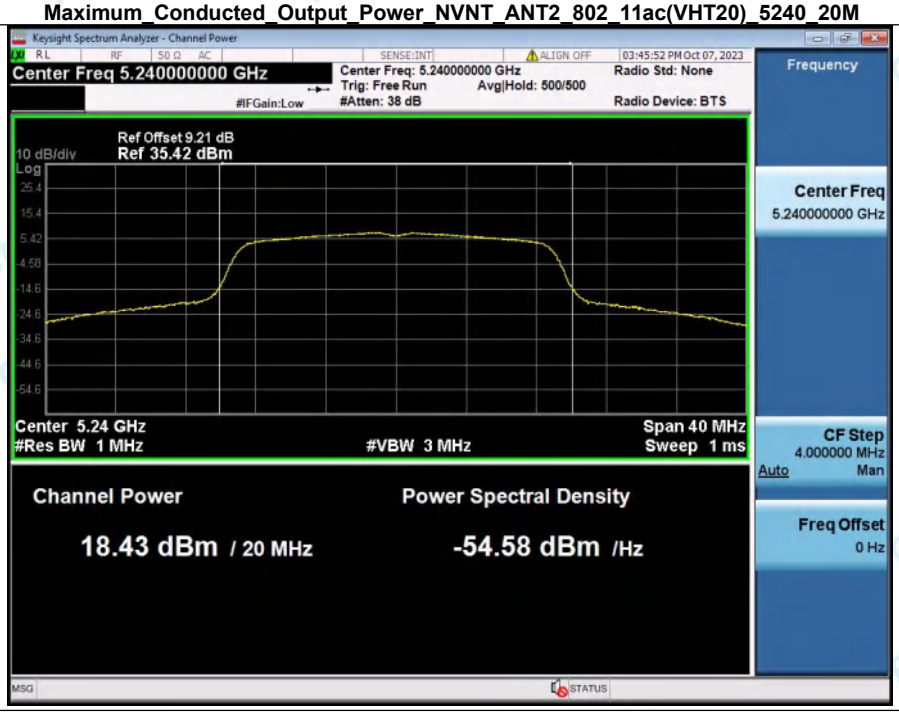
Maximum_Conducted_Output_Power_NVNT_ANT2_802_11ac(VHT20)_5200_20M



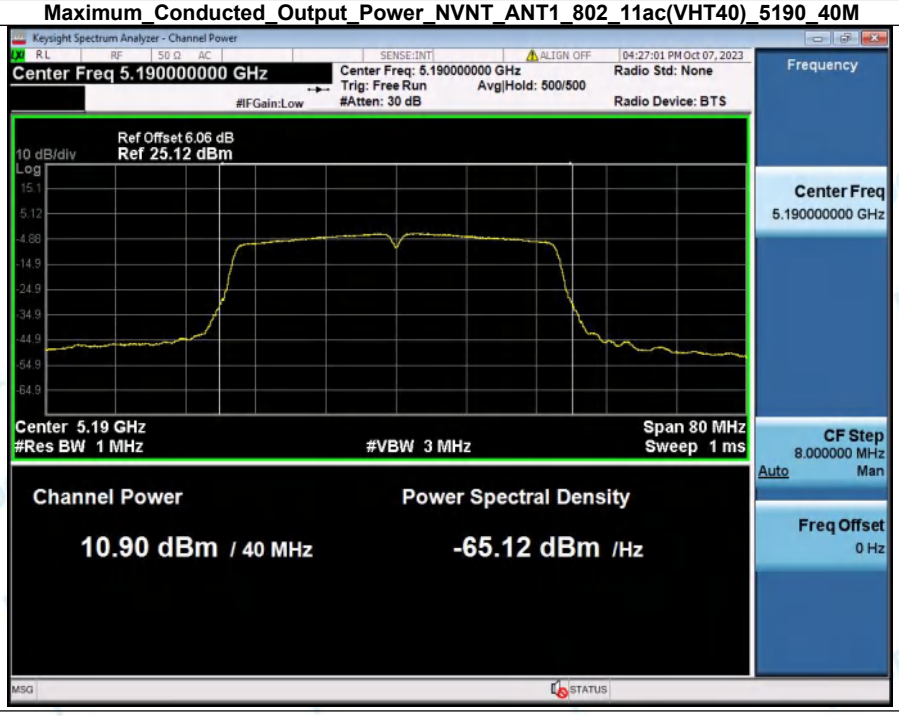
Maximum_Conducted_Output_Power_NVNT_ANT1_802_11ac(VHT20)_5240_20M



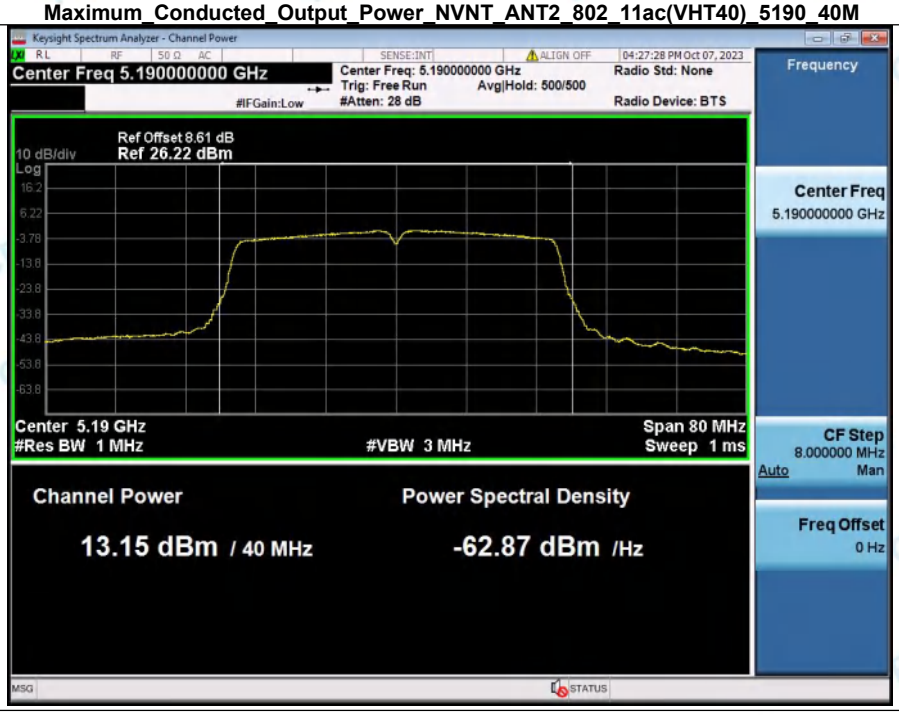
Maximum_Conducted_Output_Power_NVNT_ANT2_802_11ac(VHT20)_5240_20M



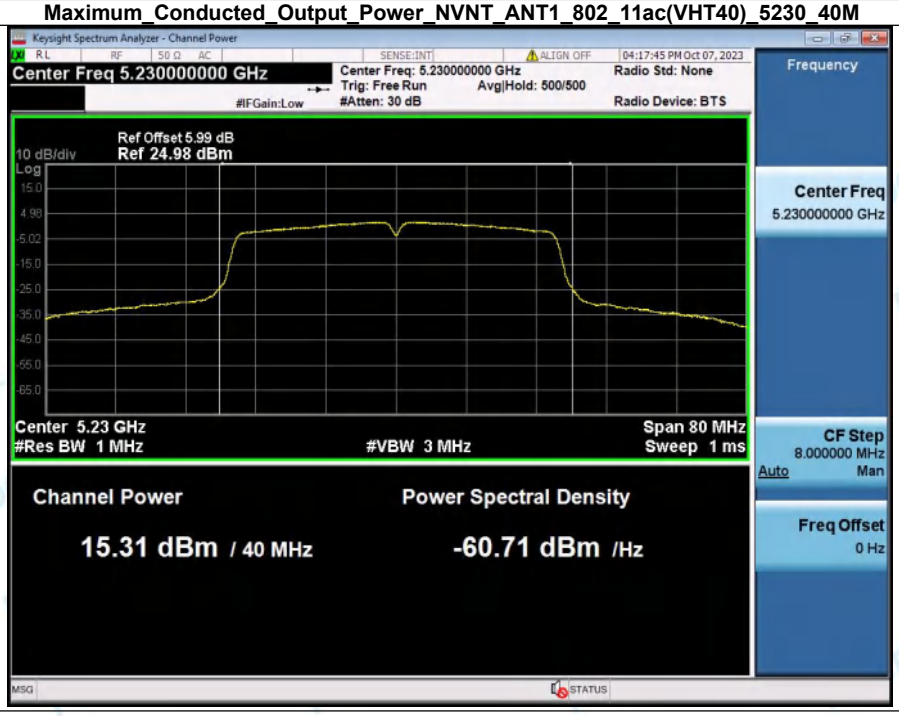
Maximum_Conducted_Output_Power_NVNT_ANT1_802_11ac(VHT40)_5190_40M



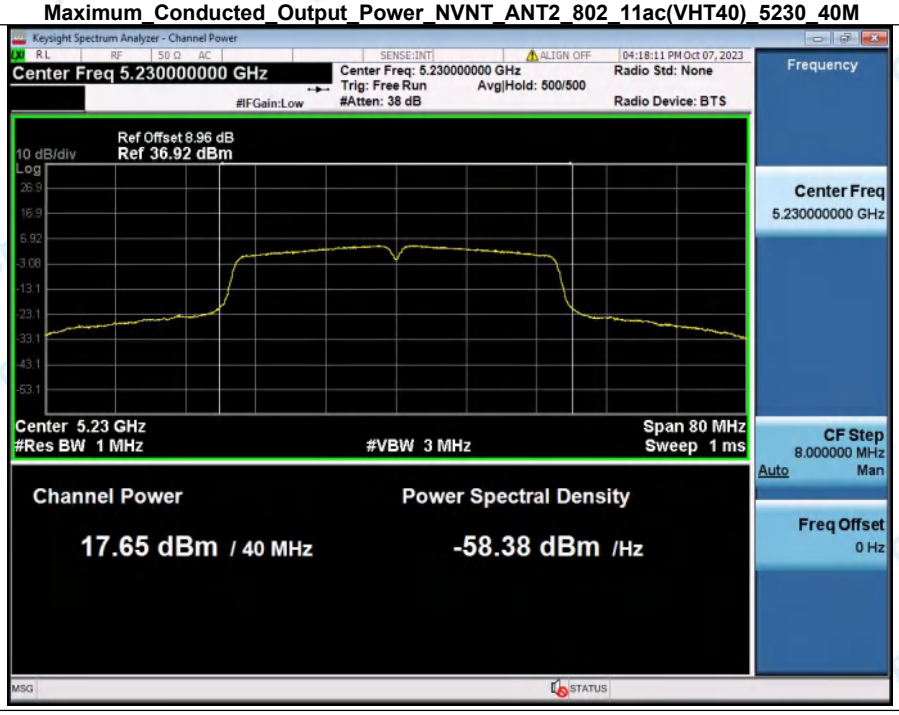
Maximum_Conducted_Output_Power_NVNT_ANT2_802_11ac(VHT40)_5190_40M



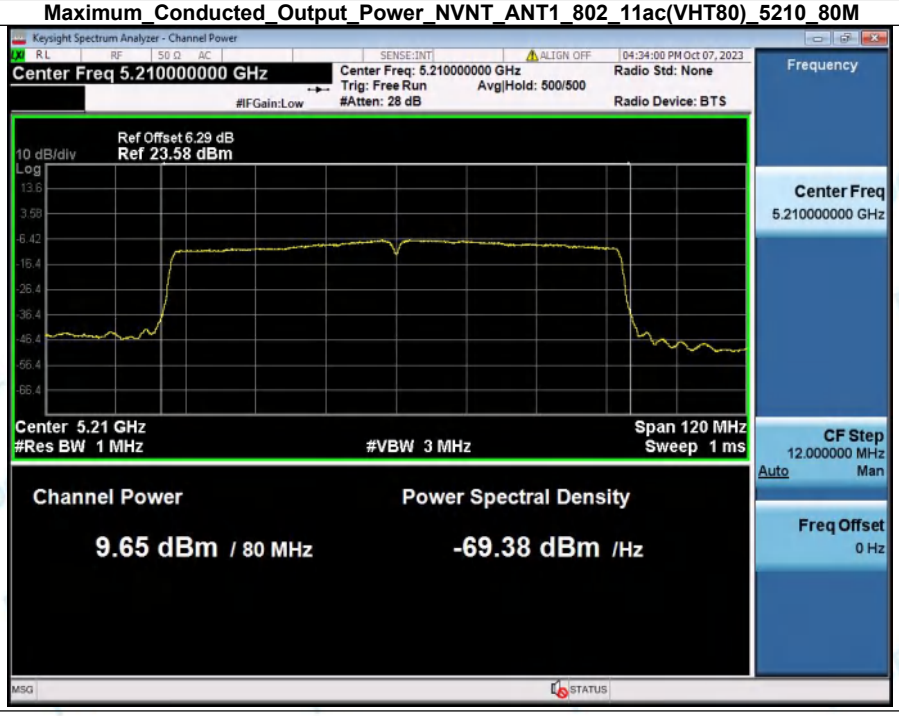
Maximum_Conducted_Output_Power_NVNT_ANT1_802_11ac(VHT40)_5230_40M



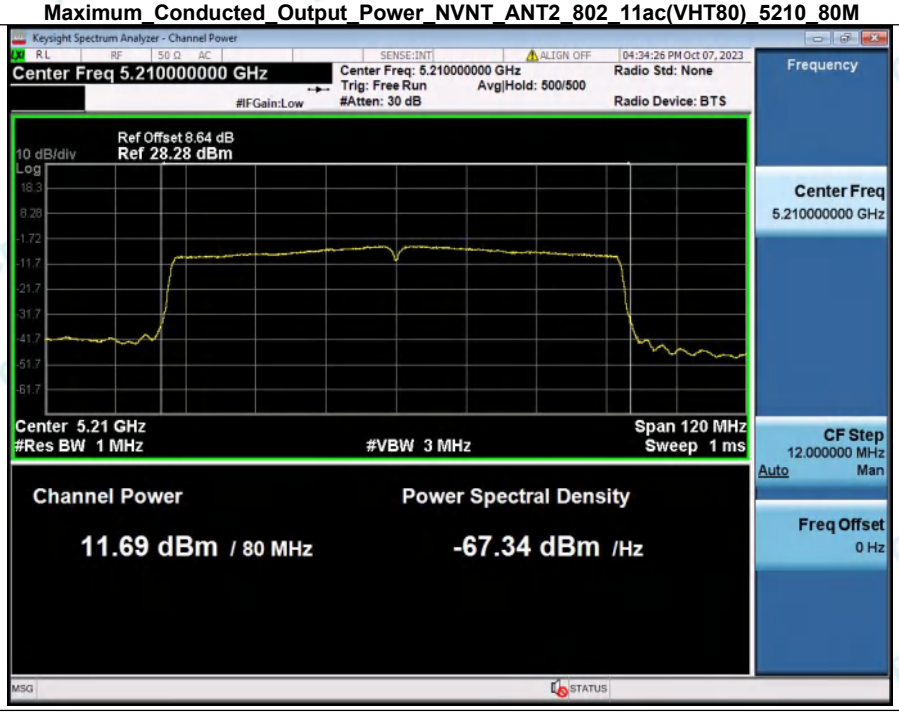
Maximum_Conducted_Output_Power_NVNT_ANT2_802_11ac(VHT40)_5230_40M



Maximum_Conducted_Output_Power_NVNT_ANT1_802_11ac(VHT80)_5210_80M



Maximum_Conducted_Output_Power_NVNT_ANT2_802_11ac(VHT80)_5210_80M



4. Power Spectral Density

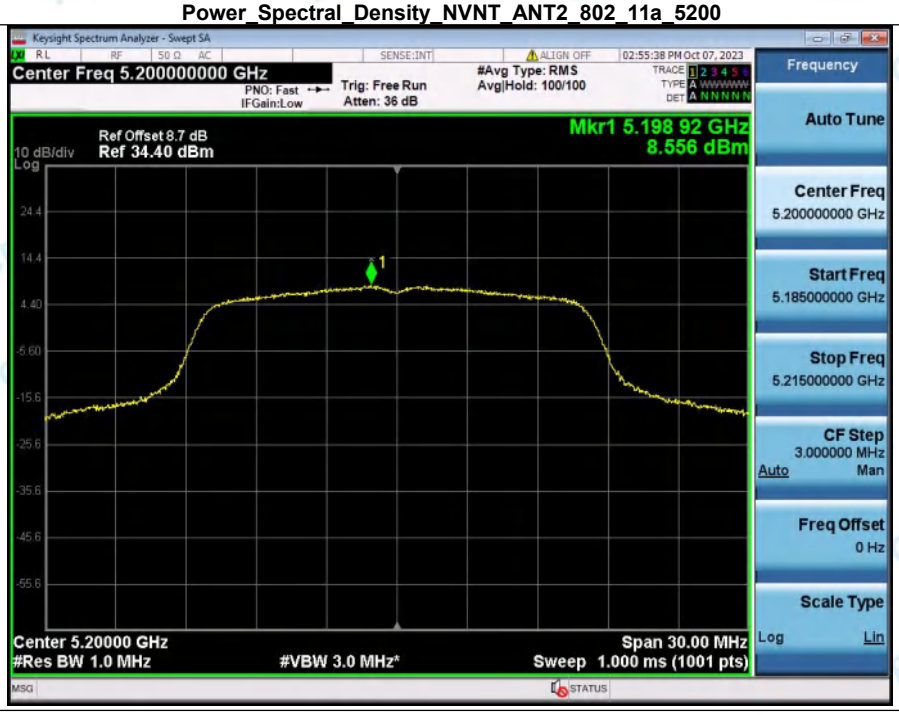
Condition	Antenna	Modulation	Frequency (MHz)	PSD(dBm/MHz)	Duty factor(dB)	Total PSD(dBm/MHz)	limit(dBm)	Result
NVNT	ANT1	802.11a	5180.00	5.97	0.84	6.81	11	Pass
NVNT	ANT2	802.11a	5180.00	8.00	0.85	8.85	11	Pass
NVNT	ANT1	802.11a	5200.00	6.87	0.84	7.71	11	Pass
NVNT	ANT2	802.11a	5200.00	8.56	0.84	9.40	11	Pass
NVNT	ANT1	802.11a	5240.00	7.10	0.91	8.01	11	Pass
NVNT	ANT2	802.11a	5240.00	9.54	0.84	10.38	11	Pass
NVNT	ANT1	802.11ac(VHT20)	5180.00	5.16	0.94	6.10	11	Pass
NVNT	ANT2	802.11ac(VHT20)	5180.00	6.89	0.84	7.73	11	Pass
NVNT	ANT1	802.11ac(VHT20)	5200.00	5.77	0.94	6.71	11	Pass
NVNT	ANT2	802.11ac(VHT20)	5200.00	7.49	0.94	8.43	11	Pass
NVNT	ANT1	802.11ac(VHT20)	5240.00	5.64	0.89	6.53	11	Pass
NVNT	ANT2	802.11ac(VHT20)	5240.00	8.10	0.96	9.06	11	Pass
NVNT	ANT1	802.11ac(VHT40)	5190.00	-2.88	1.63	-1.25	11	Pass
NVNT	ANT2	802.11ac(VHT40)	5190.00	-0.52	1.54	1.02	11	Pass
NVNT	ANT1	802.11ac(VHT40)	5230.00	2.29	1.72	4.00	11	Pass
NVNT	ANT2	802.11ac(VHT40)	5230.00	4.34	1.72	6.06	11	Pass
NVNT	ANT1	802.11ac(VHT80)	5210.00	-6.54	2.75	-3.79	11	Pass
NVNT	ANT2	802.11ac(VHT80)	5210.00	-4.36	3.01	-1.35	11	Pass

Power_Spectral_Density_NVNT_ANT1_802_11a_5180

Power_Spectral_Density_NVNT_ANT2_802_11a_5180

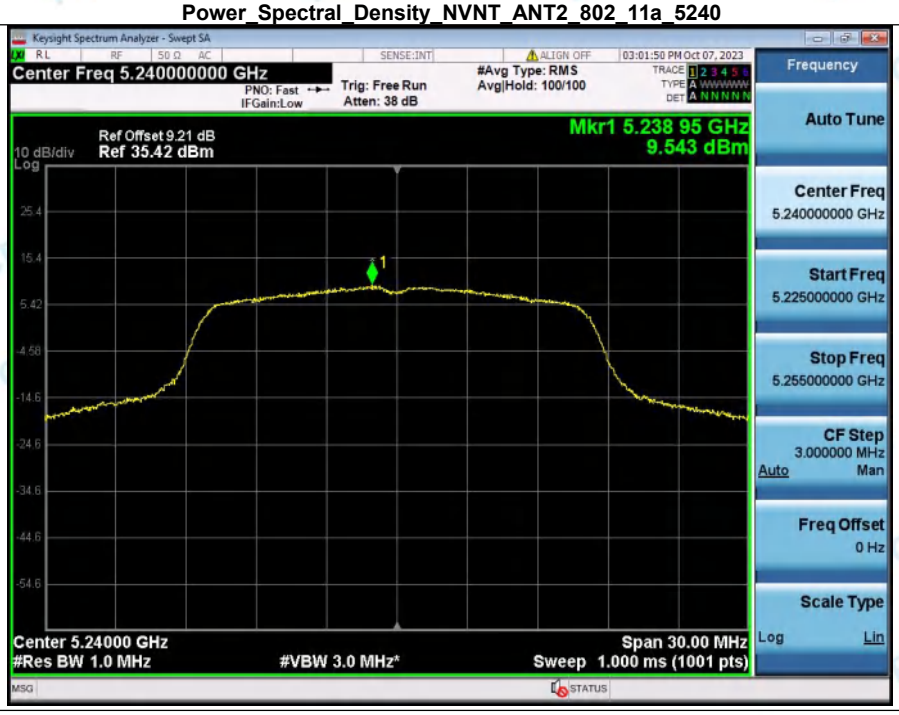
Power_Spectral_Density_NVNT_ANT1_802_11a_5200

Power_Spectral_Density_NVNT_ANT2_802_11a_5200



Power_Spectral_Density_NVNT_ANT1_802_11a_5240

Power_Spectral_Density_NVNT_ANT2_802_11a_5240



Power_Spectral_Density_NVNT_ANT1_802_11ac(VHT20)_5180

Power_Spectral_Density_NVNT_ANT2_802_11ac(VHT20)_5180

Power_Spectral_Density_NVNT_ANT1_802_11ac(VHT20)_5200

Power_Spectral_Density_NVNT_ANT2_802_11ac(VHT20)_5200

Power_Spectral_Density_NVNT_ANT1_802_11ac(VHT20)_5240

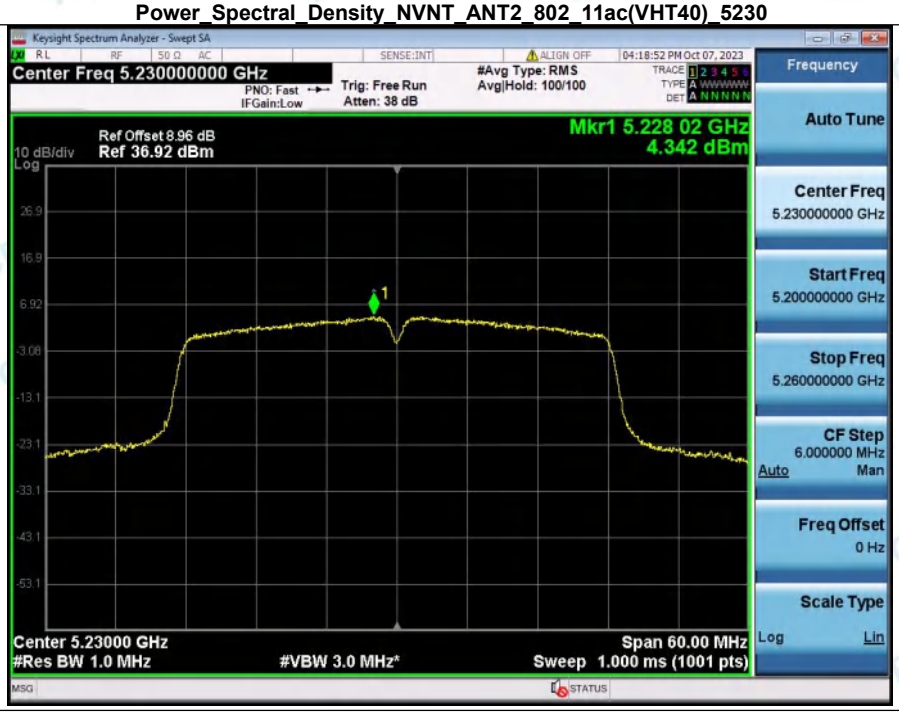
Power_Spectral_Density_NVNT_ANT2_802_11ac(VHT20)_5240

Power_Spectral_Density_NVNT_ANT1_802_11ac(VHT40)_5190

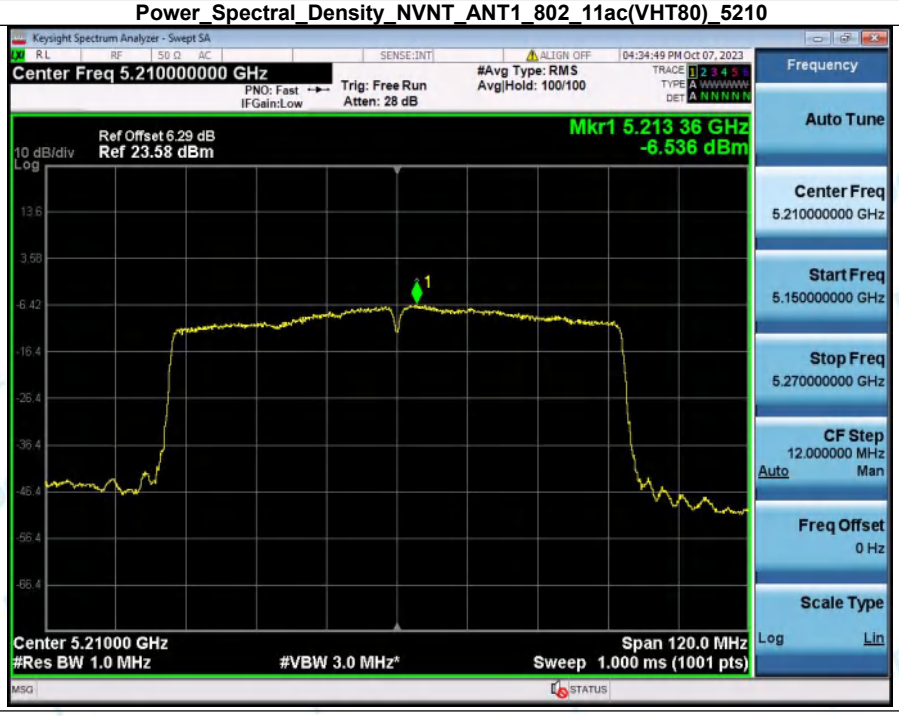
Power_Spectral_Density_NVNT_ANT2_802_11ac(VHT40)_5190

Power_Spectral_Density_NVNT_ANT1_802_11ac(VHT40)_5230

Power_Spectral_Density_NVNT_ANT2_802_11ac(VHT40)_5230



Power_Spectral_Density_NVNT_ANT1_802_11ac(VHT80)_5210

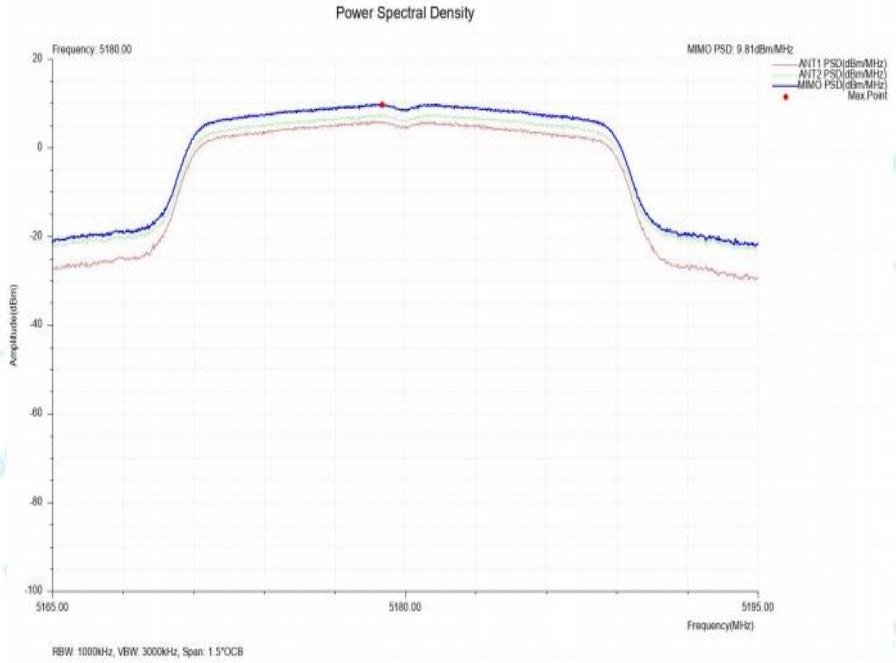


Power_Spectral_Density_NVNT_ANT2_802_11ac(VHT80)_5210

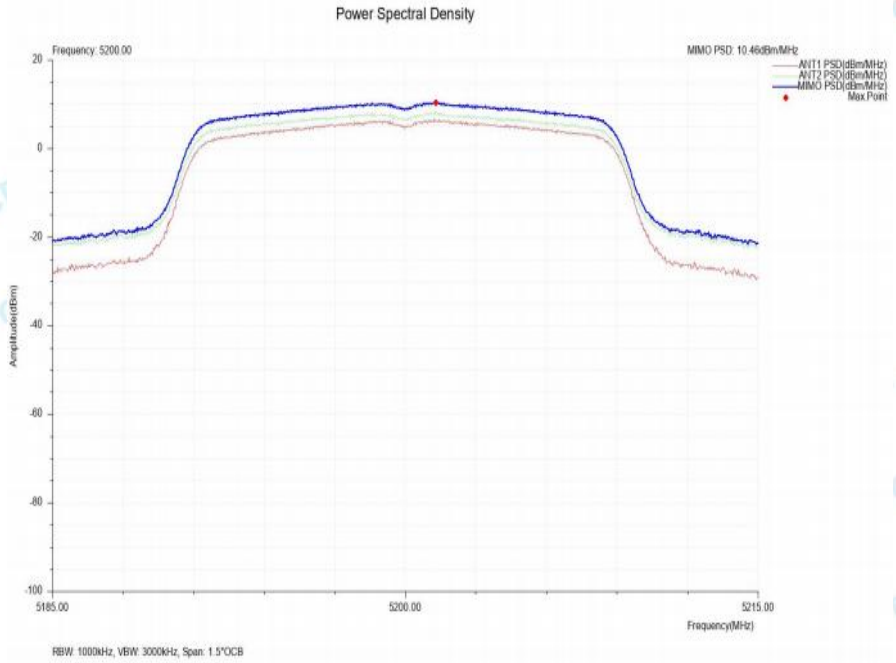
Condition	Antenna	Mode	Frequency (MHz)	MIMO PSD(dBm/MHz)	Limit(dBm/MHz)	Result
NVNT	MIMO_TX	802.11ac(VHT20)	5180.00	9.81	11	Pass
NVNT	MIMO_TX	802.11ac(VHT20)	5200.00	10.46	11	Pass
NVNT	MIMO_TX	802.11ac(VHT20)	5240.00	10.86	11	Pass
NVNT	MIMO_TX	802.11ac(VHT40)	5190.00	2.93	11	Pass
NVNT	MIMO_TX	802.11ac(VHT40)	5230.00	8.00	11	Pass
NVNT	MIMO_TX	802.11ac(VHT80)	5210.00	0.53	11	Pass

P_{ant1} (MW) $= 10^{dBm/10}$; P_{ant2} (MW) $= 10^{dBm/10}$; P_{MIMO} (dBm) $=10*\log(P_{ant1}$ (MW) + P_{ant2} (MW))

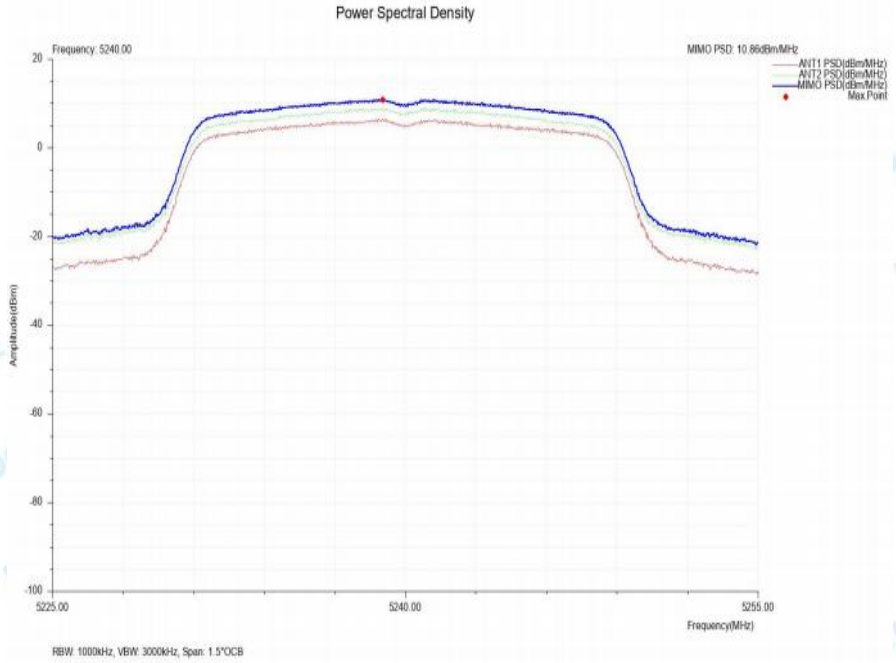
NVNT_MIMO_TX_802_11ac(VHT20)_Power_Spectral_Density_5180



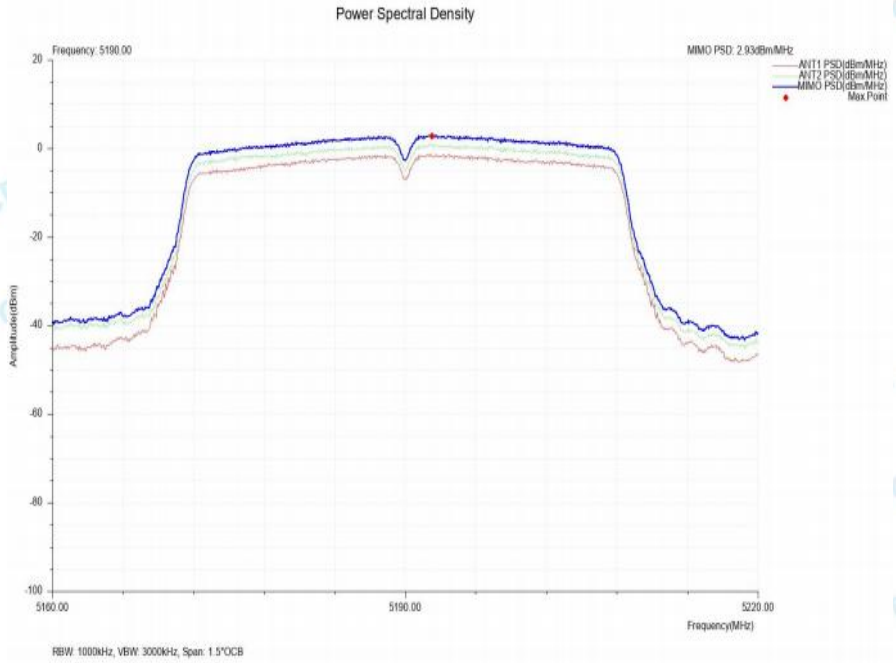
NVNT_MIMO_TX_802_11ac(VHT20)_Power_Spectral_Density_5200



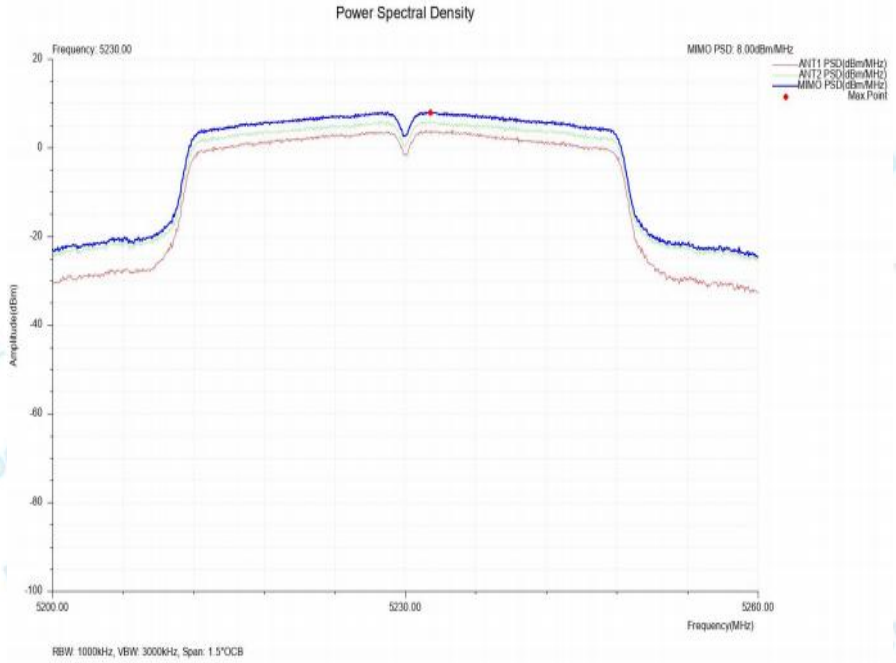
NVNT_MIMO_TX_802_11ac(VHT20)_Power_Spectral_Density_5240



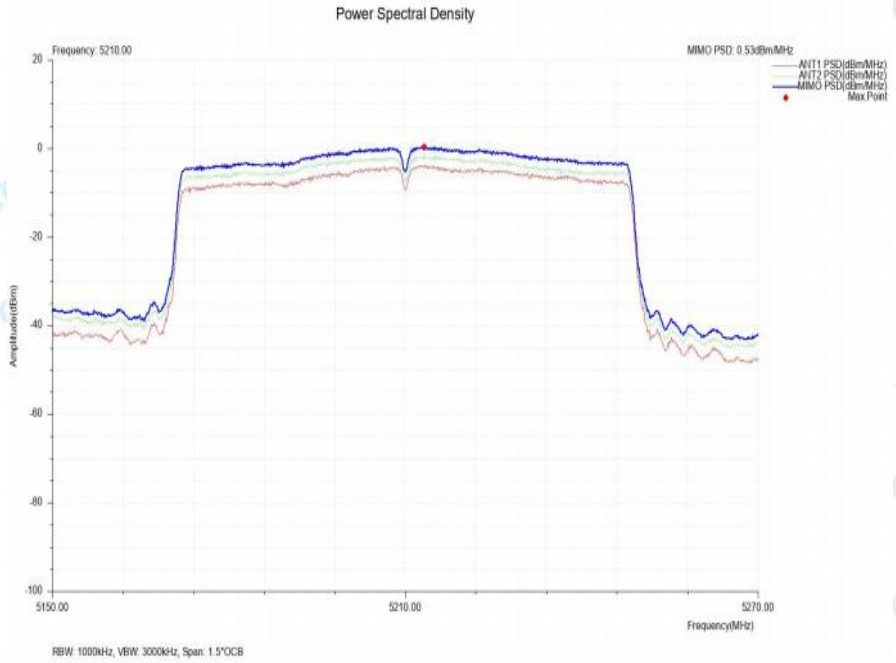
NVNT_MIMO_TX_802_11ac(VHT40)_Power_Spectral_Density_5190



NVNT_MIMO_TX_802_11ac(VHT40)_Power_Spectral_Density_5230



NVNT_MIMO_TX_802_11ac(VHT80)_Power_Spectral_Density_5210



5. Bandedge

Condition	Antenna	Modulation	TX_Frequency (MHz)	Max. Mark Frequency(MHz)	Spurious level(dBm)	limit(dBm)	Result
NVNT	ANT1	802.11a	5180.00	5148.40	-32.96	-27	Pass
NVNT	ANT2	802.11a	5180.00	5148.00	-27.38	-27	Pass
NVNT	ANT1	802.11a	5240.00	5378.40	-41.34	-27	Pass
NVNT	ANT2	802.11a	5240.00	5361.60	-38.10	-27	Pass
NVNT	ANT1	802.11ac(VHT20)	5180.00	5149.60	-32.62	-27	Pass
NVNT	ANT2	802.11ac(VHT20)	5180.00	5149.60	-27.21	-27	Pass
NVNT	ANT1	802.11ac(VHT20)	5240.00	5364.80	-41.36	-27	Pass
NVNT	ANT2	802.11ac(VHT20)	5240.00	5407.00	-38.46	-27	Pass
NVNT	ANT1	802.11ac(VHT40)	5190.00	5149.73	-34.66	-27	Pass
NVNT	ANT2	802.11ac(VHT40)	5190.00	5148.47	-31.47	-27	Pass
NVNT	ANT1	802.11ac(VHT40)	5230.00	5361.20	-41.97	-27	Pass
NVNT	ANT2	802.11ac(VHT40)	5230.00	5375.06	-38.57	-27	Pass
NVNT	ANT1	802.11ac(VHT80)	5210.00	5116.34	-30.94	-27	Pass
NVNT	ANT1	802.11ac(VHT80)	5210.00	5390.60	-41.70	-27	Pass
NVNT	ANT2	802.11ac(VHT80)	5210.00	5149.94	-27.90	-27	Pass
NVNT	ANT2	802.11ac(VHT80)	5210.00	5361.20	-39.08	-27	Pass

Bandedge_NVNT_ANT1_802_11a_5180

Bandedge_NVNT_ANT2_802_11a_5180

Bandedge_NVNT_ANT1_802_11a_5240

Bandedge_NVNT_ANT2_802_11a_5240

Bandedge_NVNT_ANT1_802_11ac(VHT20)_5180

Bandedge_NVNT_ANT2_802_11ac(VHT20)_5180

Bandedge_NVNT_ANT1_802_11ac(VHT20)_5240

Bandedge_NVNT_ANT2_802_11ac(VHT20)_5240