

FCC Test Report

Report No.: AGC02762250301FR01

FCC ID : 2BN3O-CERBERUS

APPLICATION PURPOSE: Original Equipment

PRODUCT DESIGNATION: AI POWERED SPORTS ANALYSIS CAMERA

BRAND NAME : Bepro

MODEL NAME : CERBERUS

APPLICANT: Bepro Group Ltd.

DATE OF ISSUE : Feb. 19, 2025

STANDARD(S) : FCC Part 15 Subpart C §15.247

REPORT VERSION: V1.0

Attestation of Global Conclance (Shenzhen) Co., Ltd



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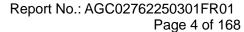
Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Feb. 19, 2025	Valid	Initial Release



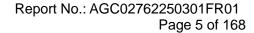
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1. General Information

	,
Applicant	Bepro Group Ltd.
Address	Old Street Works, 205 City Road, London, England EC1V 1JN, United Kingdom
Manufacturer	Bepro Group Ltd.
Address	Old Street Works, 205 City Road, London, England EC1V 1JN, United Kingdom
Factory	Bepro Group Ltd.
Address	Old Street Works, 205 City Road, London, England EC1V 1JN, United Kingdom
Product Designation	AI POWERED SPORTS ANALYSIS CAMERA
Brand Name	Верго
Test Model	CERBERUS
Series Model(s)	N/A
Difference Description	N/A
Date of receipt of test item	Jan. 18, 2025
Date of Test	Jan. 18, 2025 to Feb. 19, 2025
Deviation from Standard	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Test Report Form No	AGCER-FCC-2.4GWLAN-V1

Note: The test results of this report relate only to the tested sample identified in this report

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Approved By	Calvin Liu (Reviewer) Angle Li	Feb. 19, 2025
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	Angela Li (Authorized Officer)	Feb. 19, 2025



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2. Product Information

2.1 Product Technical Description

Equipment Type	WLAN 2.4G			
Frequency Band	2400MHz ~ 2483.5MHz			
Operation Frequency	2412MHz ~ 2462MHz			
	IEEE 802.11b:15.89dBm; IEEE 802.11g:14.01dBm;			
Output Power (Average)	IEEE 802.11n(HT20):13.68dBm; IEEE 802.11n(HT40):10.91dBm			
	IEEE 802.11ax (HE20):13.07dBm; IEEE 802.11ax (HE40):10.44dBm			
	IEEE 802.11b:18.35dBm; IEEE 802.11g:21.48dBm;			
Output Power (Peak)	IEEE 802.11n(HT20):21.05dBm; IEEE 802.11n(HT40):18.64dBm			
	IEEE 802.11ax (HE20):20.44dBm; IEEE 802.11ax (HE40):18.21dBm			
Output Power (MIMO- Average)	IEEE 802.11n(HT20):16.43dBm; IEEE 802.11n(HT40):13.23dBm			
Catpart ever (imme) trerage)	IEEE 802.11ax (HE20):15.33dBm; IEEE 802.11ax (HE40):13.88dBm			
Output Power (MIMO- Peak)	IEEE 802.11n(HT20):23.87dBm; IEEE 802.11n(HT40):20.96dBm			
Catpart over (immer carry	IEEE 802.11ax (HE20):22.77dBm; IEEE 802.11ax (HE40):21.66dBm			
	802.11b:(DQPSK, DBPSK, CCK) DSSS			
Modulation	802.11g/n:(64-QAM,16-QAM, QPSK, BPSK) OFDM			
	802.11ax:(1024-QAM,256-QAM,64-QAM,16-QAM,QPSK,BPSK)OFDMA			
	802.11b:1/2/5.5/11Mbps			
Data Rate	802.11g: 6/9/12/18/24/36/48/54Mbps			
	802.11n: up to 300Mbps			
	802.11ax: up to 574Mbps			
Number of channels	11			
Hardware Version	V1.0			
Software Version	V2.0.17			
Antenna Designation	FPC Antenna			
Antenna Gain	Please refer to report section 2.9 description			
Number of transmit chain	2(802.11b/g/n all used two antennas,802.11b/g/n/ax support MIMO)			
Power Supply	DC 7.2V by battery or DC 20V by adapter			



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2.2 Table of Carrier Frequency

For 2412-2462MHz:

11 channels are provided for 802.11b/g/n(HT20)/ax(HE20):

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	2457 MHz	11	2462 MHz		

7 channels are provided for 802.11n(HT40)/ax(HE40):

Channel	Frequency	Channel	Frequency	Channel	Frequency
01		02		03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10		11			



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2.3 IEEE 802.11n Modulation Scheme

				N _{BPSC}	N _{CBPS}		N _{DBPS}		Data Rate(Mbps)	
MCS Index	Nss	Modulation	R						800nsGI	
шасх					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0
6	1	64-QAM	3/4	6	312	648	234	489	58.5	121.5
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0

Symbol	Explanation	
NSS	Number of spatial streams	
R	Code rate	
NBPSC	Number of coded bits per single carrier	
NCBPS	Number of coded bits per symbol	
NDBPS	Number of data bits per symbol	
GI	Guard interval	



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2.4 Related Submittal(S) / Grant (S)

This submittal(s) (test report) is intended for FCC ID: **2BN30-CERBERUS**, filing to comply with Part 2, Part 15 of the Federal Communication Commission rules.

2.5 Test Methodology

The tests were performed according to following standards:

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 15	Radio Frequency Devices
3	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
4	KDB 662911	KDB 662911 D01 Multiple Transmitter Output v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc)

2.6 Special Accessories

Refer to section 4.4.

2.7 Equipment Modifications

Not available for this EUT intended for grant.

2.8 Antenna Requirement

Standard Requirement

15.203 requirement:

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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi

EUT Antenna:

The non-detachable antenna inside the device cannot be replaced by the user at will. For the antenna gain, please refer to the description in Chapter 2.9 of the report.



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2.9 Description of Available Antennas

Antenna	Frequency	TX	Bandwidth	dwidth Max Peak Gain (dBi)		Max Directional Gain		
Type	Band (MHz)	Paths	(MHz)	Ant 1	Ant 2	(dBi)		
	2.4GWIFI PIFA Antenna List (2.4GHz 2*2 MIMO)							
FPC Antenna	2400~2483.5	2	20, 40	-3.12	-3.12	-0.11		

Note 1: The EUT supports Cyclic Delay Diversity (CDD) technology for 802.11n/ax mode.

Note 2: The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.

If all antennas have the same gain, Gant, Directional gain = Gant + Array Gain, where Array Gain is as follows.

• For power spectral density (PSD) measurements on devices:

Array Gain = $10 \log (N_{ANT}/N_{SS}) dB = 3.01$;

For power measurements on IEEE 802.1devices:

Array Gain = 0 dB for $N_{ANT} \le 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥40 MHz for any Nant;

Array Gain = 5 log(Nant/Nss) dB or 3 dB, whichever is less, for 20 MHz channel widths with Nant ≥ 5.

If antenna gains are not equal, Directional gain may be calculated by using the formulas applicable to equal gain antennas with Gant set equal to the gain of the antenna having the highest gain.

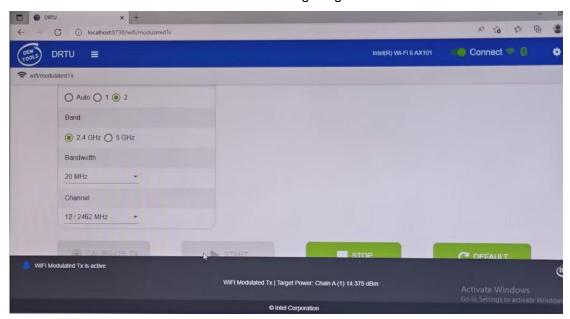


2.10 Description of Test Software

For IEEE 802.11 mode:

The test utility software used during testing was "DRTU".

Software Setting Diagram



Test Mode	Channel	Power Index		
Test Mode	Channel	Chain A	Chain B	
802.11b	L/M	12	12	
802.110	Н	3	5	
902.114	L/M	12	12	
802.11g	Н	3	5	
802.11n-HT20	L/M	12	12	
802.1111-1120	Н	3	5	
802.11ax-HE20	L/M	12	12	
602.11ax-nE20	Н	3	5	
802.11n-HT40	L/M	12	12	
802.1111-H140	Н	3	5	
802.11ax-HE40	L/M	12	12	
002.11ax-nE40	Н	3	5	



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3. Test Environment

3.1 Address of The Test Laboratory

Laboratory: Attestation of Global Compliance (Shenzhen) Co., Ltd.

Address: 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L5488

Attestation of Global Compliance (Shenzhen) Co., Ltd. has been assessed and proved to follow CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories).

A2LA-Lab Cert. No.: 5054.02

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to follow ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 975832

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files with Registration 975832.

IC-Registration No.: 24842 (CAB identifier: CN0063)

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Certification and Engineering Bureau of Industry Canada. The acceptance letter from the IC is maintained in our files with Registration 24842.



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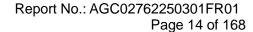
3.3 Environmental Conditions

	Normal Conditions
Temperature range (°C)	15 - 35
Relative humidity range	20 % - 75 %
Pressure range (kPa)	86 - 106

3.4 Measurement Uncertainty

The reported uncertainty of measurement y±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Item	Measurement Uncertainty	
Uncertainty of Conducted Emission for AC Port	$U_c = \pm 2.9 \text{ dB}$	
Uncertainty of Radiated Emission below 1GHz	$U_c = \pm 3.9 \text{ dB}$	
Uncertainty of Radiated Emission above 1GHz	$U_c = \pm 4.9 \text{ dB}$	
Uncertainty of total RF power, conducted	$U_c = \pm 0.8 \text{ dB}$	
Uncertainty of RF power density, conducted	$U_c = \pm 2.6 \text{ dB}$	
Uncertainty of spurious emissions, conducted	$U_c = \pm 2 \%$	
Uncertainty of Occupied Channel Bandwidth	$U_c = \pm 2 \%$	



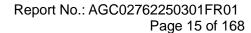


3.5 List of Equipment Used

• F	RF Conducted Test System							
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)	
	AGC-ER-E036	Spectrum Analyzer	Agilent	N9020A	MY49100060	2024-05-24	2025-05-23	
\boxtimes	AGC-ER-E062	Power Sensor	Agilent	U2021XA	MY54110007	2025-01-31	2026-01-30	
\boxtimes	AGC-ER-E063	Power Sensor	Agilent	U2021XA	MY54110009	2025-01-31	2026-01-30	
\boxtimes	AGC-ER-A007	6dB Fixed Attenuator	Mini circuits	BW-S6-2W263A+	N/A	2025-01-30	2026-01-29	
\boxtimes	AGC-ER-E083	Signal Generator	Agilent	E4421B	US39340815	2024-05-23	2025-05-22	
\boxtimes	N/A	RF Connection Cable	N/A	1#	N/A	Each time	N/A	
\boxtimes	N/A	RF Connection Cable	N/A	2#	N/A	Each time	N/A	

• F	Radiated Spurious Emission							
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)	
	AGC-EM-E046	EMI Test Receiver	R&S	ESCI	10096	2025-01-31	2026-01-30	
	AGC-EM-E116	EMI Test Receiver	R&S	ESCI	100034	2024-05-24	2025-05-23	
\boxtimes	AGC-EM-E061	Spectrum Analyzer	Agilent	N9010A	MY53470504	2024-05-28	2025-05-27	
	AGC-EM-E086	Loop Antenna	ZHINAN	ZN30900C	18051	2024-03-05	2026-03-04	
\boxtimes	AGC-EM-E001	Wideband Antenna	SCHWARZBECK	VULB9168	D69250	2023-05-11	2025-05-10	
\boxtimes	AGC-EM-E029	Broadband Ridged Horn Antenna	ETS	3117	00034609	2024-03-31	2025-03-30	
	AGC-EM-E029	Broadband Ridged Horn Antenna	ETS	3117	00034609	2025-03-27	2026-03-26	
\boxtimes	AGC-EM-E082	Horn Antenna	SCHWARZBECK	BBHA 9170	#768	2023-09-24	2025-09-23	
\boxtimes	AGC-EM-E146	Pre-amplifier	ETS	3117-PA	00246148	2024-07-24	2026-07-23	
\boxtimes	AGC-EM-A119	2.4G Filter	SongYi	N/A	N/A	2024-05-23	2025-05-22	
\boxtimes	AGC-EM-A138	6dB Attenuator	Eeatsheep	LM-XX-6-5W	N/A	2023-06-09	2025-06-08	
	AGC-EM-A139	6dB Attenuator	Eeatsheep	LM-XX-6-5W	N/A	2023-06-09	2025-06-08	

A	AC Power Line Conducted Emission							
Used	Used Equipment No. Test Equipment Manufacturer Model No. Serial No. Last Cal. Date (YY-MM-DD) (YY-MM-DD)							
	AGC-EM-E045	EMI Test Receiver	R&S	ESPI	101206	2024-05-28	2025-05-27	
	AGC-EM-A130	6dB Attenuator	Eeatsheep	LM-XX-6-5W	DC-6GZ	2023-06-09	2025-06-08	
	AGC-EM-E023	AMN	R&S	100086	ESH2-Z5	2024-05-28	2025-05-27	





• Tes	Test Software						
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Version Information		
\boxtimes	AGC-EM-S001	CE Test System	R&S	ES-K1	V1.71		
\boxtimes	AGC-EM-S003	RE Test System	FARA	EZ-EMC	VRA-03A		
	AGC-EM-S004	RE Test System	Tonscend	TS+Ver2.1(JS32-RE)	4.0.0.0		
\boxtimes	AGC-ER-S012	BT/WIFI Test System	Tonscend	JS1120-2	2.6		
\boxtimes	AGC-EM-S011	RSE Test System	Tonscend	TS+-Ver2.1(JS36-RSE)	4.0.0.0		



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4. System Test Configuration

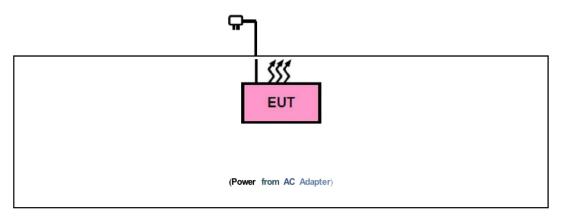
4.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT Exercise

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

4.3 Configuration of Tested System



4.4 Equipment Used in Tested System

The following peripheral devices and interface cables were connected during the measurement:

Test Accessories Come From The Laboratory

No.	Equipment	Manufacturer	Model No.	Specification Information	Cable
1					

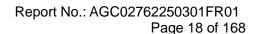
No.	Equipment	Manufacturer	Model No.	Specification Information	Cable
1	Adapter		A2208-2	Input: AC 100-240V 50/60Hz, 1.5A	1.0m Unshielded
2	Battery		CBRS-Battery-001	DC 7.2V 16750mAh	



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4.5 Summary of Test Results

Item	FCC Rules	Description of Test	Result
1	§15.203&15.247(b)(4)	Antenna Equipment	Pass
2	§15.247 (b)(1)	RF Output Power	Pass
3	§15.247 (a)(1)	6 dB Bandwidth	Pass
4	§15.247 (e)	Power Spectral Density	Pass
5	§15.247 (d)	Conducted Band Edge and Out-of-Band Emissions	Pass
6	§15.247 (d)&15.209	Radiated Spurious Emission	Pass
7	§15.207	AC Power Line Conducted Emission	Pass





5. Description of Test Modes

	Summary table of Test Cases
To at Itama	Data Rate / Modulation
Test Item	2.4G WLAN – 802.11b/g/n/ax (DSSS/OFDM/OFDMA)
Radiated & Conducted Test Cases	Mode 1: 802.11b_TX CH01_2412 MHz_1 Mbps(Powered by AC/DC adapter) Mode 2: 802.11b_TX CH06_2437 MHz_1 Mbps(Powered by AC/DC adapter) Mode 3: 802.11b_TX CH11_2462 MHz_1 Mbps(Powered by AC/DC adapter) Mode 4: 802.11g_TX CH01_2412 MHz_6 Mbps(Powered by AC/DC adapter) Mode 5: 802.11g_TX CH06_2437 MHz_6 Mbps(Powered by AC/DC adapter) Mode 6: 802.11g_TX CH01_2412 MHz_6 Mbps (Powered by AC/DC adapter) Mode 7: 802.11n-HT20_TX CH01_2412 MHz_MCS0 Mbps(Powered by AC/DC adapter) Mode 8: 802.11n-HT20_TX CH01_2412 MHz_MCS0 Mbps(Powered by AC/DC adapter) Mode 8: 802.11n-HT20_TX CH06_2437 MHz_ MCS0 Mbps(Powered by AC/DC adapter) Mode 9: 802.11n-HT20_TX CH11_2462 MHz_ MCS0 Mbps(Powered by AC/DC adapter) Mode 10: 802.11ax-HE20_TX CH01_2412 MHz_MCS0 Mbps(Powered by AC/DC adapter) Mode 11: 802.11ax-HE20_TX CH06_2437 MHz_ MCS0 Mbps(Powered by AC/DC adapter) Mode 12: 802.11ax-HE20_TX CH01_2462 MHz_ MCS0 Mbps(Powered by AC/DC adapter) Mode 13: 802.11n-HT40_TX CH03_2422 MHz_ MCS0 Mbps(Powered by AC/DC adapter) Mode 14: 802.11n-HT40_TX CH03_2422 MHz_ MCS0 Mbps(Powered by AC/DC adapter) Mode 15: 802.11n-HT40_TX CH03_2422 MHz_ MCS0 Mbps(Powered by AC/DC adapter) Mode 16: 802.11ax-HE40_TX CH03_2452 MHz_ MCS0 Mbps(Powered by AC/DC adapter) Mode 16: 802.11ax-HE40_TX CH03_2422 MHz_ MCS0 Mbps(Powered by AC/DC adapter) Mode 17: 802.11ax-HE40_TX CH03_2452 MHz_ MCS0 Mbps(Powered by AC/DC adapter) Mode 18: 802.11ax-HE40_TX CH03_2452 MHz_ MCS0 Mbps(Powered by AC/DC adapter) Mode 18: 802.11ax-HE40_TX CH03_2452 MHz_ MCS0 Mbps(Powered by AC/DC adapter)
AC Conducted Emission	Mode 1: 2.4G WLAN Link + USB Cable (Powered by AC/DC Adapter)

Note:

- 1. The 802.11ax mode is only tested and evaluated at Full RU bandwidth.
- 2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
- 3. For Conducted Test method, a temporary antenna connector is provided by the manufacture.
- 4. All modes and antennas in the radiation spurious test are pre-scanned. When there is no MIMO technology mode, antenna 1 is evaluated. When there is MIMO technology mode, antenna 1 + antenna 2 are evaluated as the worst data.



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6. Duty Cycle Measurement

2.4GHz WLAN (DTS) operation is possible in 20MHz, and 40MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = Average. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

ANT 1

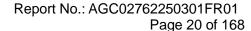
Operating mode	Data rates (Mbps)	Duty Cycle (%)	Duty Cycle Factor (dB)
IEEE 802.11b	1	100	/
IEEE 802.11g	6	97.55	0.11
IEEE 802.11n-HT20	MCS0	97.53	0.11
IEEE 802.11n-HT40	MCS0	94.75	0.23
IEEE 802.11ax-HE20	MCS0	97.53	0.11
IEEE 802.11ax-HE40	MCS0	94.73	0.24

ANT 2

Operating mode	Data rates (Mbps)	Duty Cycle (%)	Duty Cycle Factor (dB)
IEEE 802.11b	1	100	/
IEEE 802.11g	6	97.55	0.11
IEEE 802.11n-HT20	MCS0	97.38	0.12
IEEE 802.11n-HT40	MCS0	94.80	0.23
IEEE 802.11ax-HE20	MCS0	97.38	0.12
IEEE 802.11ax-HE40	MCS0	94.89	0.23

Remark:

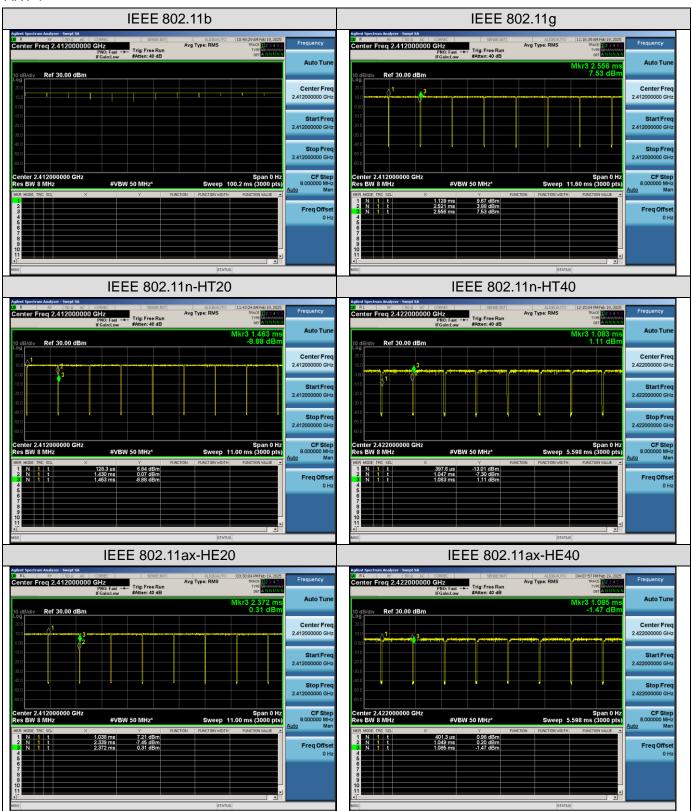
- 1. Duty Cycle factor = 10 * log (1/ Duty cycle)
- 2. The duty cycle of each frequency band mode reflects the determination requirements of the Middle channel measurement value.



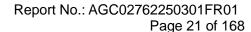


The test plots as follows:

ANT 1

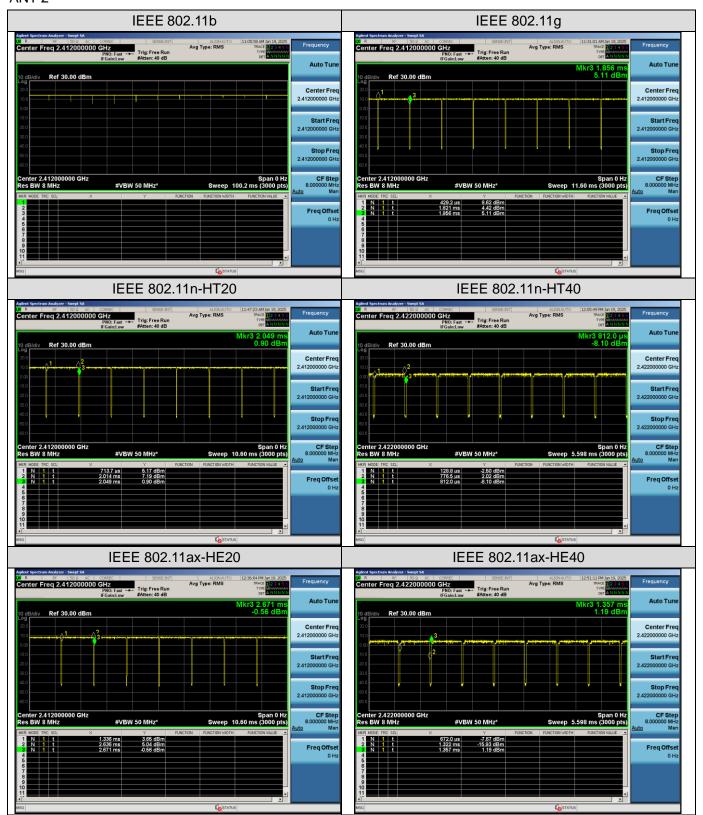


Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.





ANT 2





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7. RF Output Power Measurement

7.1 Provisions Applicable

For DTSs employing digital modulation techniques operating in the bands 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W.

7.2 Measurement Procedure

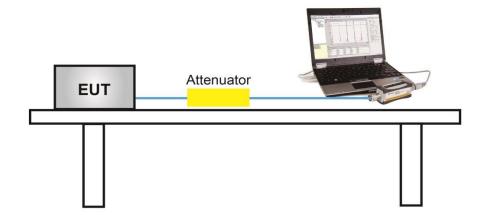
Method PM is Measurement using an RF Peak power meter. The procedure for this method is as follows:

- 1. The testing follows the ANSI C63.10 Section 11.9.1.3
- 2. The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

Method PM is Measurement using an RF average power meter. The procedure for this method is as follows:

- 1. The testing follows the ANSI C63.10 Section 11.9.2.3
- 2. Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the following conditions are satisfied:
- 3. The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
- 4. At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
- 5. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
- 6. Determine according to the duty cycle of the equipment: when it is less than 98%, follow the steps below.
- 7. Measure the average power of the transmitter. This measurement is an average over both the ON and OFF periods of the transmitter.
- 8. Adjust the measurement in dBm by adding [10 log (1 / D)], where D is the duty cycle {e.g., [10 log (1 / 0.25)], if the duty cycle is 25%}.
- 9. Record the test results in the report.

7.3 Measurement Setup (Block Diagram of Configuration)

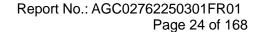




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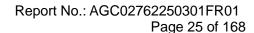
7.4 Measurement Result

Test Data of Conducted Output Power-ANT 1					
Test Mode	Test Frequency (MHz)	Average Power (dBm)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
	2412	15.83	18.17	≤30	Pass
802.11b	2437	15.89	18.35	≤30	Pass
	2462	4.98	7.49	≤30	Pass
	2412	13.33	20.81	≤30	Pass
802.11g	2437	14.01	21.48	≤30	Pass
	2462	4.92	12.61	≤30	Pass
	2412	13.07	20.51	≤30	Pass
802.11n20	2437	13.68	21.05	≤30	Pass
	2462	-5.12	3.46	≤30	Pass
	2422	10.40	18.17	≤30	Pass
802.11n40	2437	10.91	18.64	≤30	Pass
	2452	5.22	12.96	≤30	Pass
	2412	12.58	20.17	≤30	Pass
802.11ax20	2437	13.07	20.44	≤30	Pass
	2462	4.85	12.39	≤30	Pass
	2422	10.33	18.10	≤30	Pass
802.11ax40	2437	10.44	18.21	≤30	Pass
	2452	5.22	12.92	≤30	Pass





Test Data of Conducted Output Power-ANT 2					
Test Mode	Test Frequency (MHz)	Average Power (dBm)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
	2412	15.29	17.95	≤30	Pass
802.11b	2437	15.48	17.89	≤30	Pass
	2462	7.39	9.85	≤30	Pass
	2412	12.87	20.38	≤30	Pass
802.11g	2437	13.34	20.84	≤30	Pass
	2462	5.67	13.26	≤30	Pass
	2412	12.62	20.05	≤30	Pass
802.11n20	2437	13.14	20.66	≤30	Pass
	2462	5.46	13.08	≤30	Pass
	2422	9.06	16.85	≤30	Pass
802.11n40	2437	9.39	17.13	≤30	Pass
	2452	4.02	11.72	≤30	Pass
	2412	11.02	18.49	≤30	Pass
802.11ax20	2437	11.42	18.96	≤30	Pass
	2462	5.54	13.07	≤30	Pass
802.11ax40	2422	10.30	18.02	≤30	Pass
	2437	11.26	19.05	≤30	Pass
	2452	6.27	14.01	≤30	Pass





Test Data of Conducted Output Power-MIMO					
Test Mode	Test Frequency (MHz)	Average Power (dBm)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
	2412	15.86	23.30	≤30	Pass
802.11n20	2437	16.43	23.87	≤30	Pass
	2462	5.82	13.53	≤30	Pass
	2422	12.79	20.57	≤30	Pass
802.11n40	2437	13.23	20.96	≤30	Pass
	2452	7.67	15.39	≤30	Pass
802.11ax20	2412	14.88	22.42	≤30	Pass
	2437	15.33	22.77	≤30	Pass
	2462	8.22	15.75	≤30	Pass
802.11ax40	2422	13.33	21.07	≤30	Pass
	2437	13.88	21.66	≤30	Pass
	2452	8.79	16.51	≤30	Pass

Note:

The Total Average Conducted Output Power (dBm) = $10*\log\{10^{(Ant1\ AVG\ /10)} + 10^{(Ant2\ AVG\ /10)}\}$. The Total Peak Conducted Output Power (dBm) = $10*\log\{10^{(Ant1\ PK\ /10)} + 10^{(Ant2\ PK\ /10)}\}$. 1.



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8. 6dB Bandwidth Measurement

8.1 Provisions Applicable

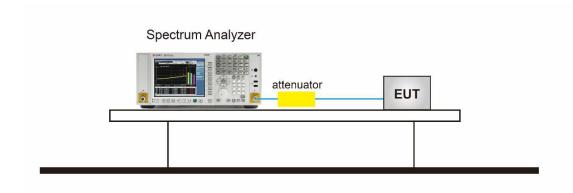
The minimum 6dB bandwidth shall be 500 kHz.

8.2 Measurement Procedure

The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).

- The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss
 was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously.
- 3. For 6dB Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement.
- For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the OBW and set the Video bandwidth (VBW) ≥ 3 * RBW.
- 5. Detector = peak
- 6. Trace mode = max hold.
- 7. Sweep = auto couple.
- 8. Allow the trace to stabilize.
- 9. Measure and record the results in the test report.

8.3 Measurement Setup (Block Diagram of Configuration)

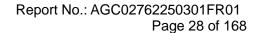




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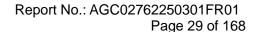
8.4 Measurement Result

Test Data of Occupied Bandwidth and DTS Bandwidth-ANT 1					
Test Mode	Test Frequency (MHz)	99% Occupied Bandwidth (MHz)	DTS Bandwidth (MHz)	DTS Bandwidth Limits (MHz)	Pass or Fail
	2412	13.104	8.126	≥0.5	Pass
802.11b	2437	13.402	8.591	≥0.5	Pass
	2462	12.654	8.096	≥0.5	Pass
	2412	16.474	15.152	≥0.5	Pass
802.11g	2437	16.584	15.352	≥0.5	Pass
	2462	16.511	15.154	≥0.5	Pass
	2412	17.516	15.145	≥0.5	Pass
802.11n20	2437	17.611	15.148	≥0.5	Pass
	2462	17.508	15.441	≥0.5	Pass
	2422	36.020	35.168	≥0.5	Pass
802.11n40	2437	36.091	35.190	≥0.5	Pass
	2452	35.630	33.789	≥0.5	Pass
	2412	17.528	15.159	≥0.5	Pass
802.11ax20	2437	17.605	15.159	≥0.5	Pass
	2462	17.499	15.149	≥0.5	Pass
	2422	36.031	35.169	≥0.5	Pass
802.11ax40	2437	36.107	35.188	≥0.5	Pass
	2452	35.671	33.785	≥0.5	Pass



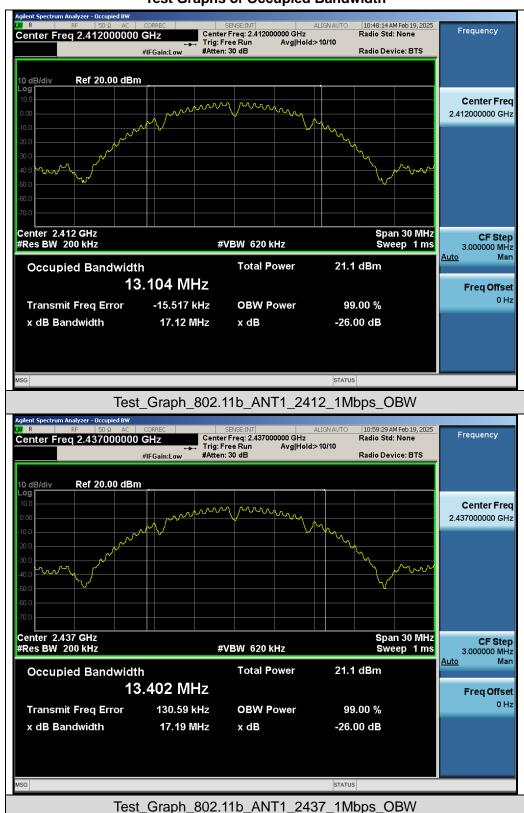


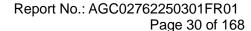
Test Data of Occupied Bandwidth and DTS Bandwidth-ANT 2					
Test Mode	Test Frequency (MHz)	99% Occupied Bandwidth (MHz)	DTS Bandwidth (MHz)	DTS Bandwidth Limits (MHz)	Pass or Fail
	2412	13.096	8.552	≥0.5	Pass
802.11b	2437	13.477	8.590	≥0.5	Pass
	2462	12.654	8.098	≥0.5	Pass
	2412	16.456	15.146	≥0.5	Pass
802.11g	2437	16.593	15.497	≥0.5	Pass
	2462	16.508	15.156	≥0.5	Pass
	2412	17.511	15.132	≥0.5	Pass
802.11n20	2437	17.617	15.966	≥0.5	Pass
	2462	17.504	15.449	≥0.5	Pass
	2422	36.028	35.157	≥0.5	Pass
802.11n40	2437	36.128	35.211	≥0.5	Pass
	2452	35.645	32.558	≥0.5	Pass
	2412	17.487	15.128	≥0.5	Pass
802.11ax20	2437	17.590	15.971	≥0.5	Pass
	2462	17.509	15.449	≥0.5	Pass
	2422	35.993	35.168	≥0.5	Pass
802.11ax40	2437	36.152	35.196	≥0.5	Pass
	2452	35.632	33.839	≥0.5	Pass





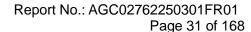
Test Graphs of Occupied Bandwidth



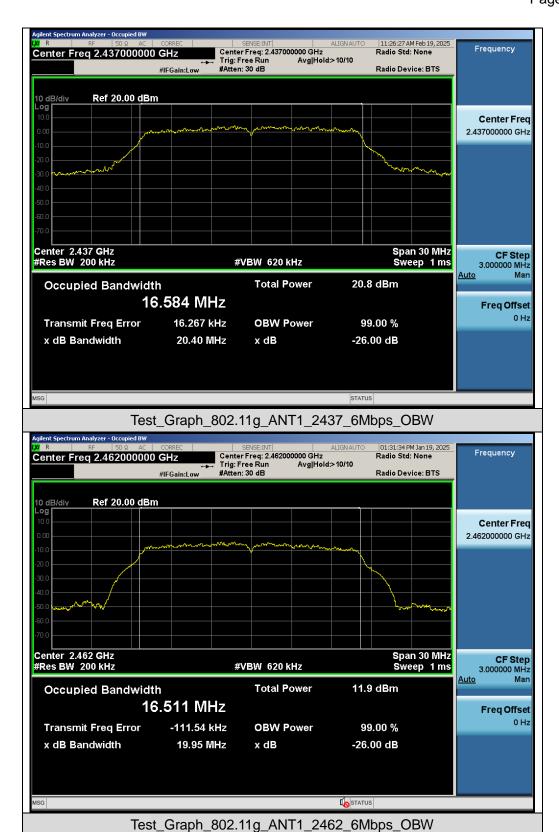


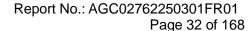




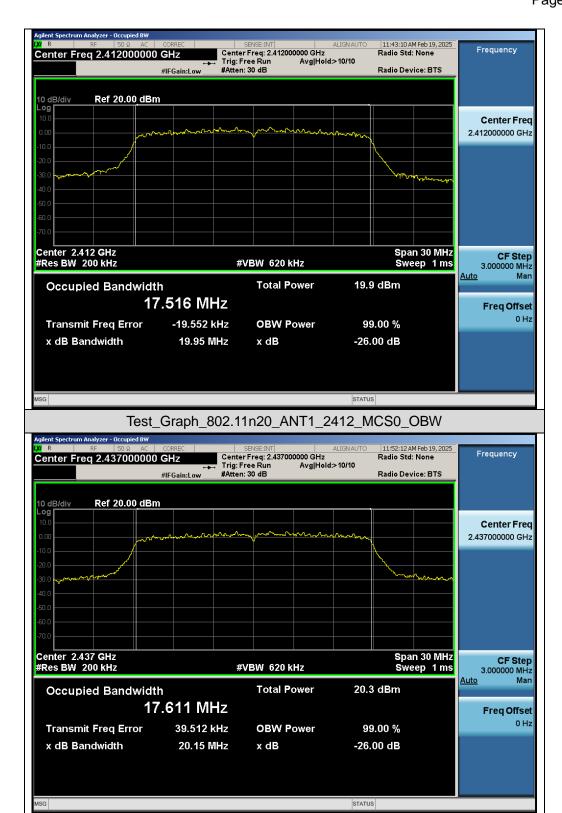




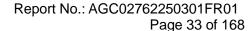




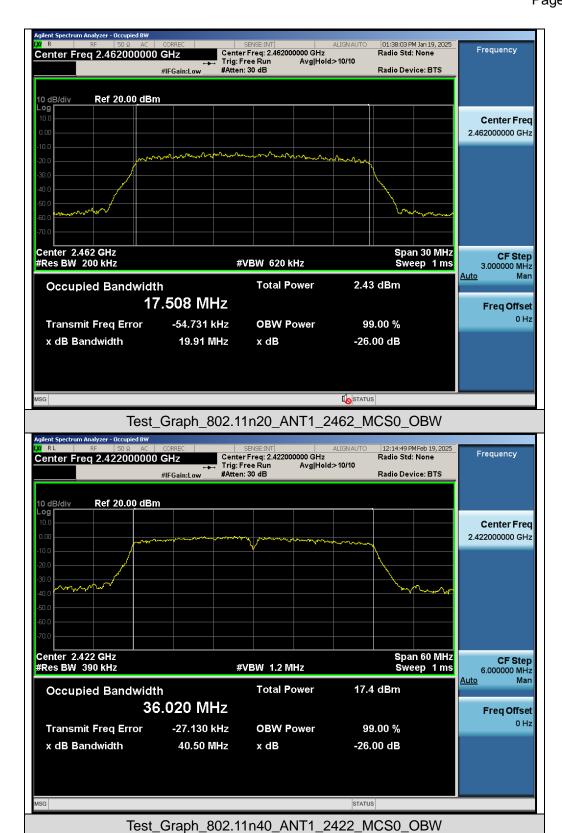


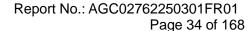


Test_Graph_802.11n20_ANT1_2437_MCS0_OBW

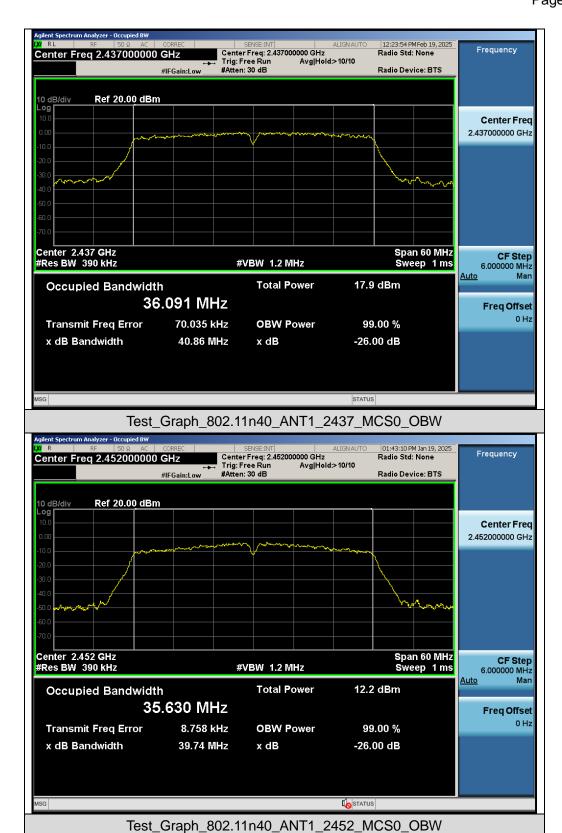


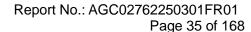




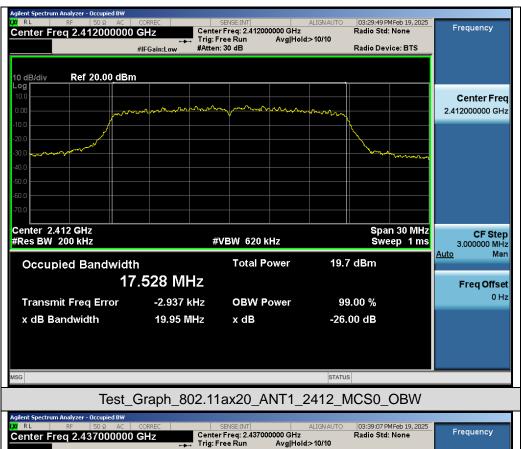


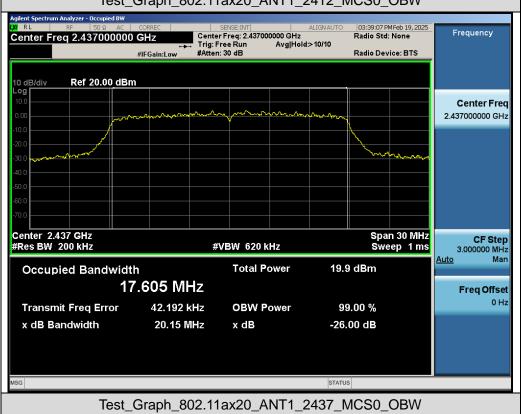


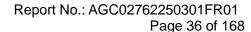




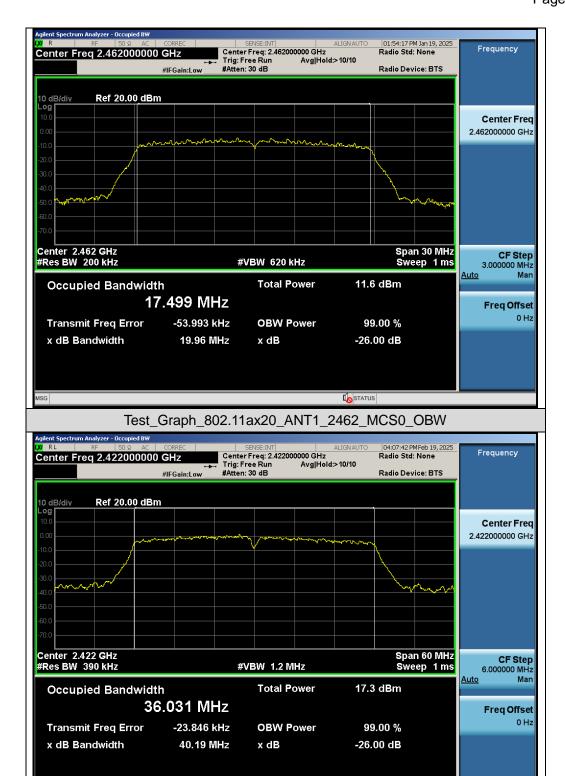




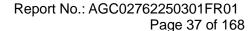




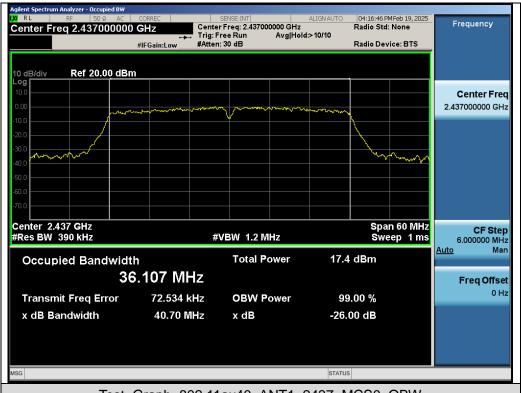




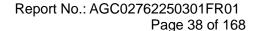
Test_Graph_802.11ax40_ANT1_2422_MCS0_OBW





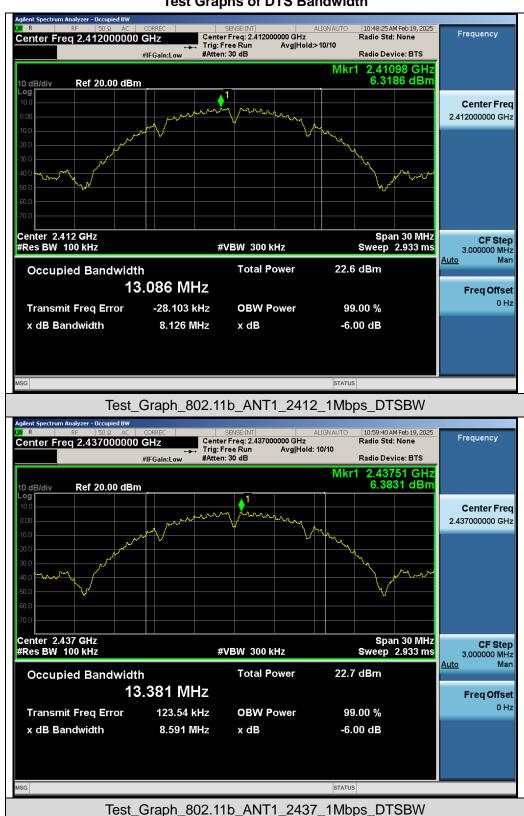


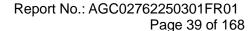




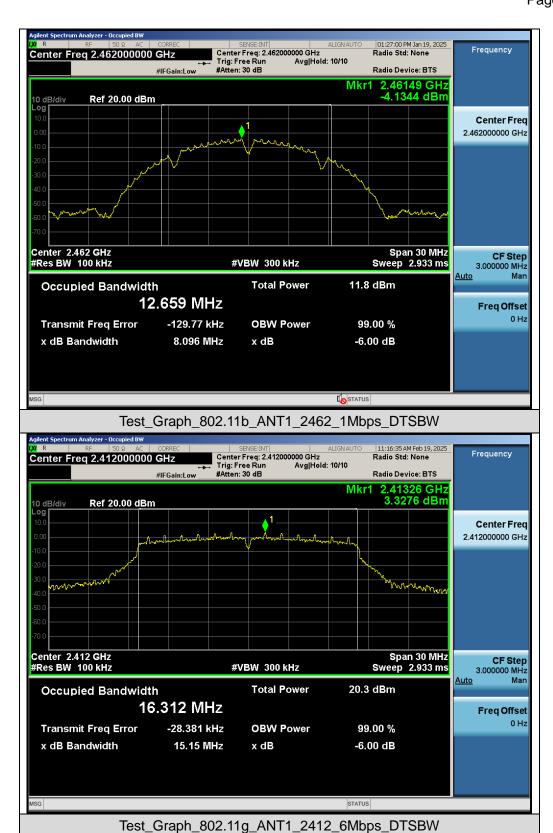


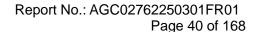
Test Graphs of DTS Bandwidth



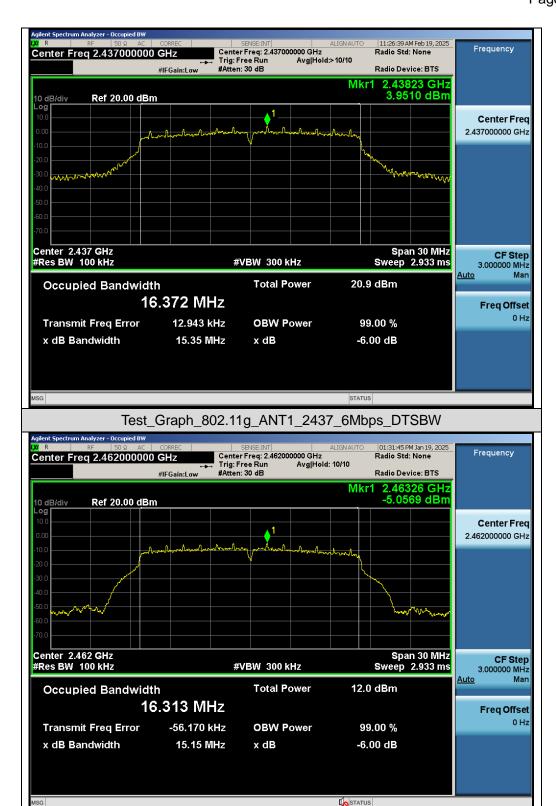




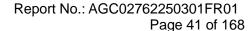




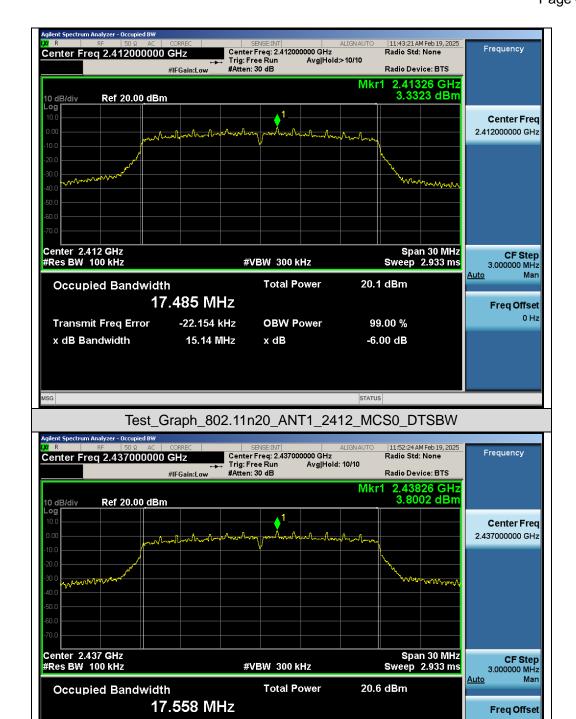




Test_Graph_802.11g_ANT1_2462_6Mbps_DTSBW







Test_Graph_802.11n20_ANT1_2437_MCS0_DTSBW

OBW Power

x dB

99.00 %

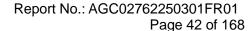
-6.00 dB

Transmit Freq Error

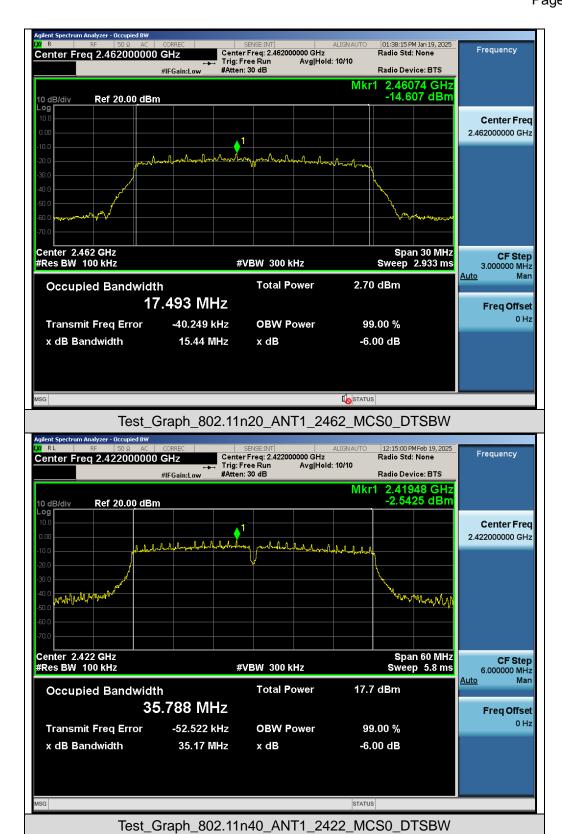
x dB Bandwidth

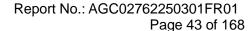
23.713 kHz

15.15 MHz

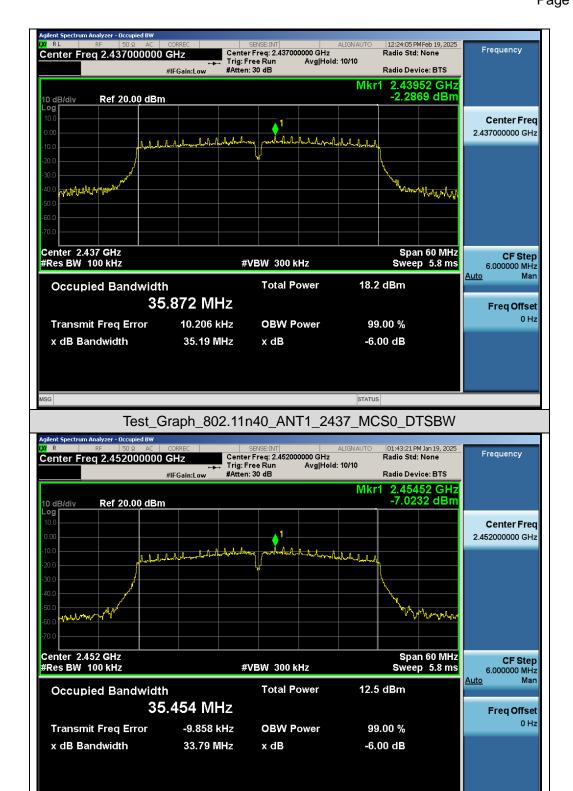






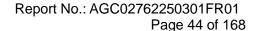






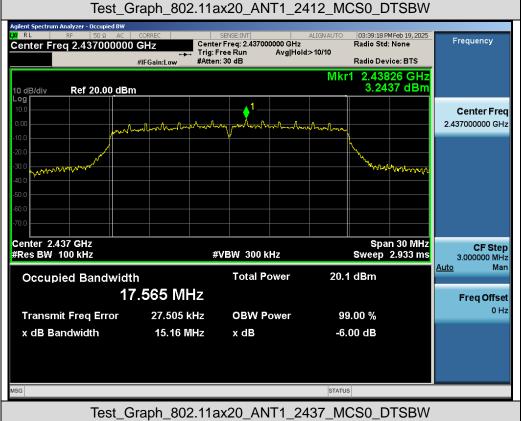
Test_Graph_802.11n40_ANT1_2452_MCS0_DTSBW

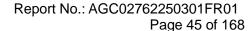
STATUS



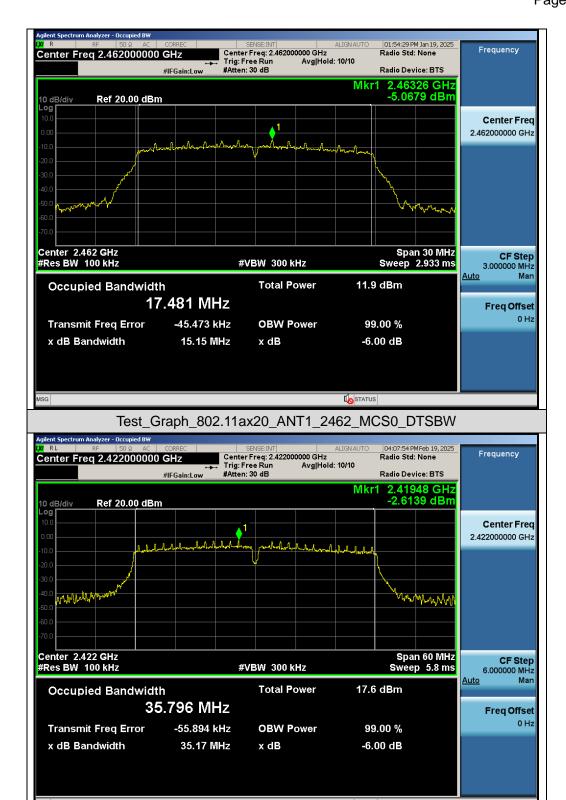




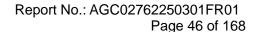




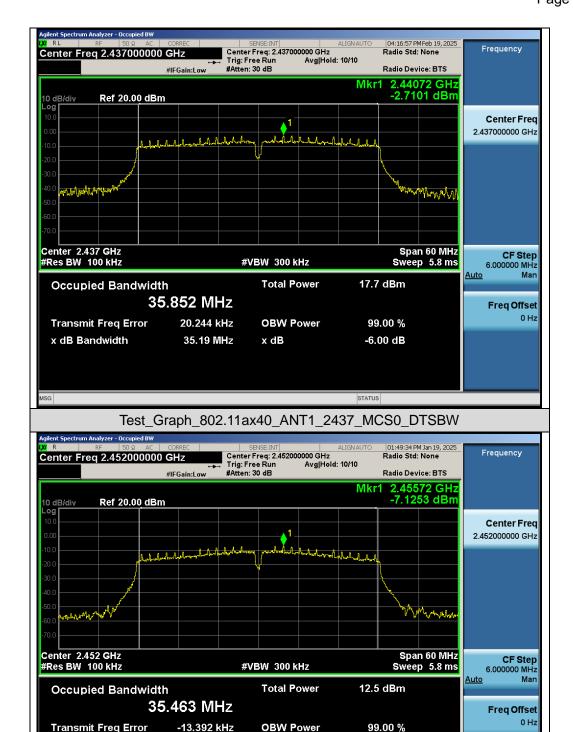




Test_Graph_802.11ax40_ANT1_2422_MCS0_DTSBW







Test_Graph_802.11ax40_ANT1_2452_MCS0_DTSBW

x dB

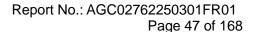
-6.00 dB

STATUS

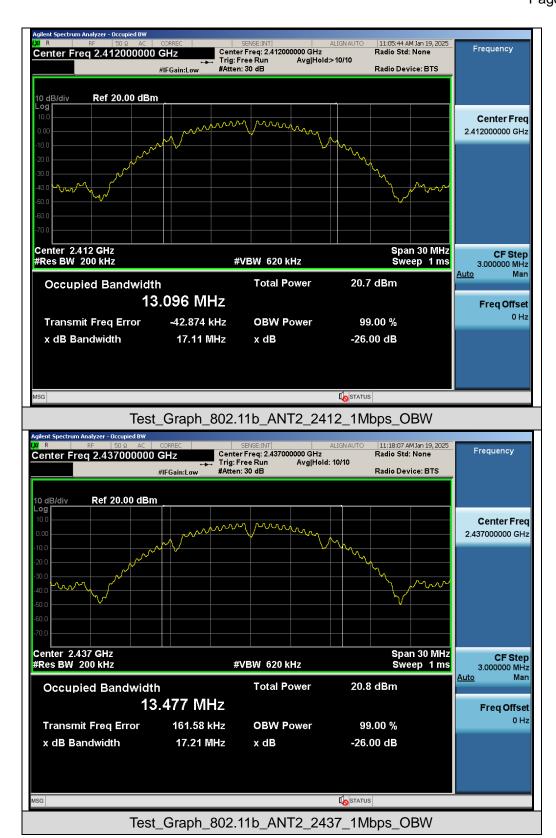
x dB Bandwidth

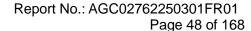
Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: http://www.agccert.com/

33.79 MHz

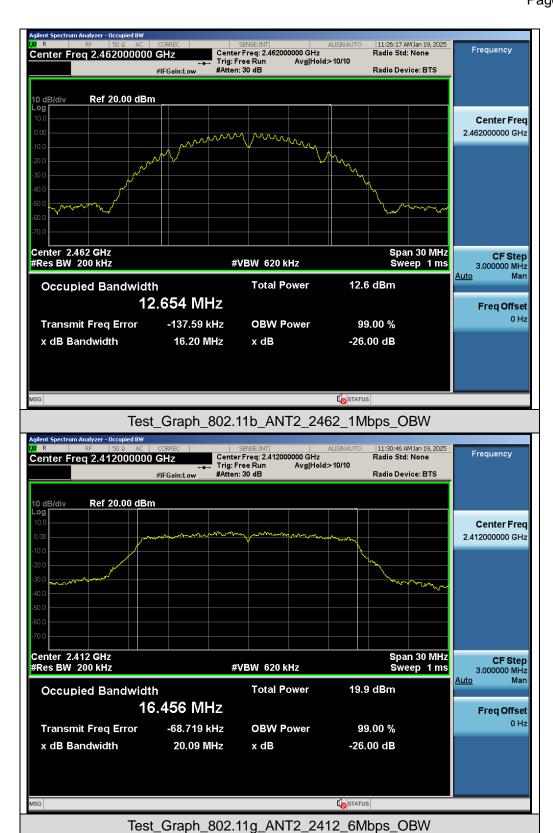


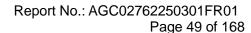




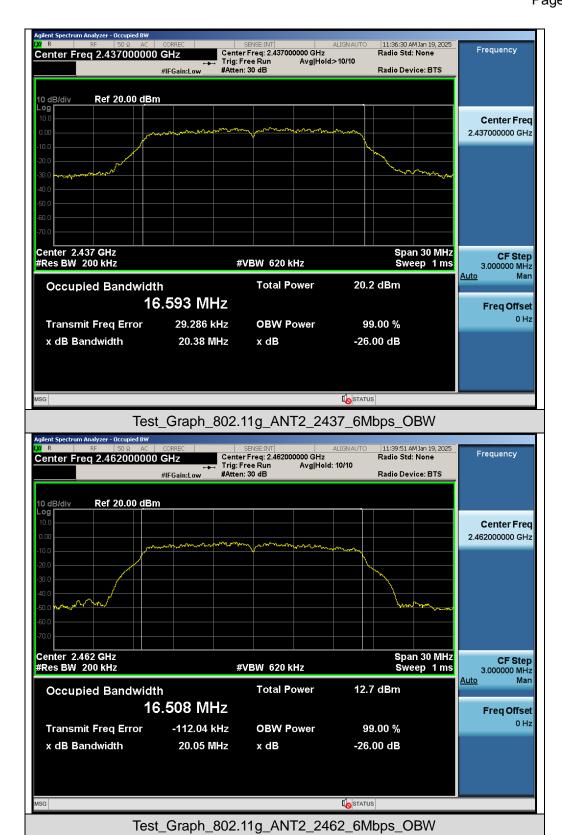


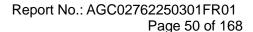




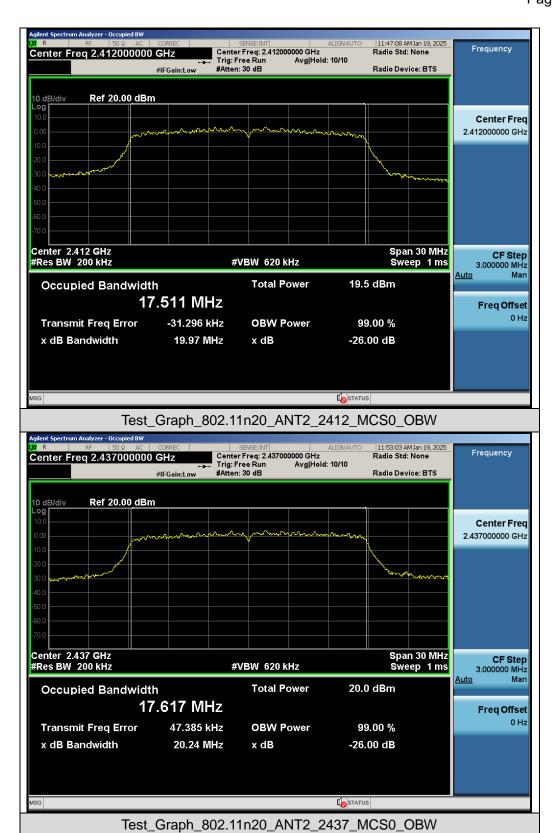


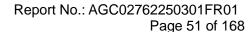








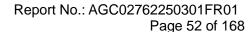




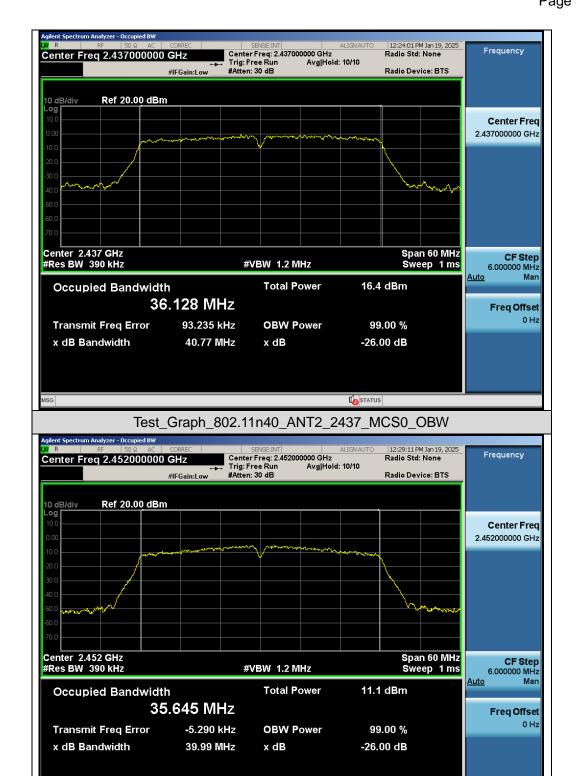




Test_Graph_802.11n40_ANT2_2422_MCS0_OBW

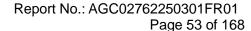




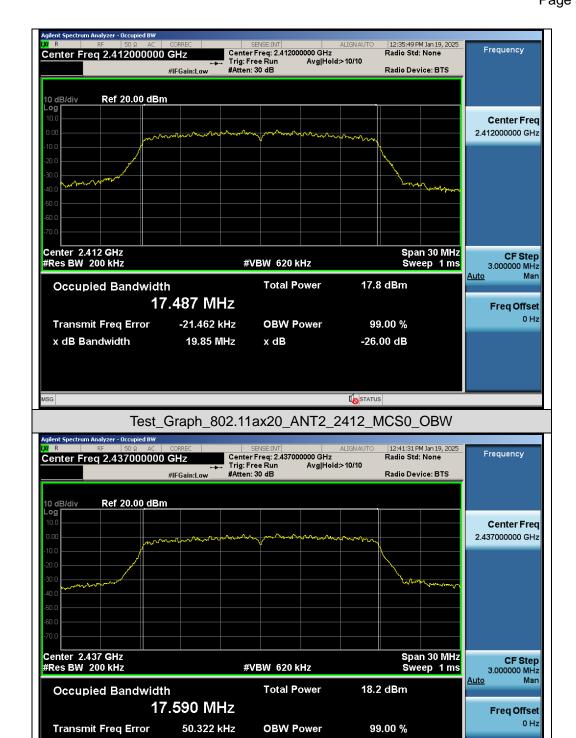


Test_Graph_802.11n40_ANT2_2452_MCS0_OBW

STATUS







Test_Graph_802.11ax20_ANT2_2437_MCS0_OBW

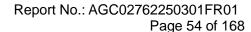
x dB

-26.00 dB

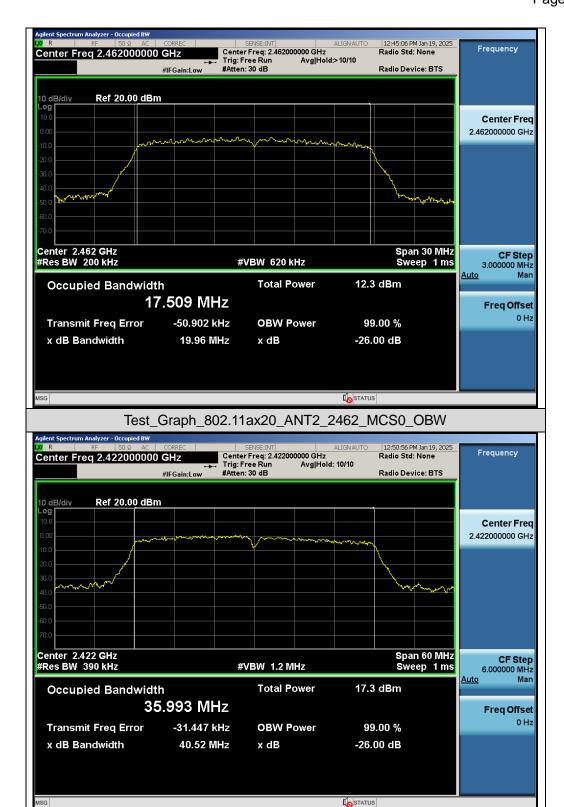
STATUS

20.11 MHz

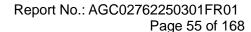
x dB Bandwidth







Test_Graph_802.11ax40_ANT2_2422_MCS0_OBW

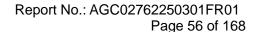






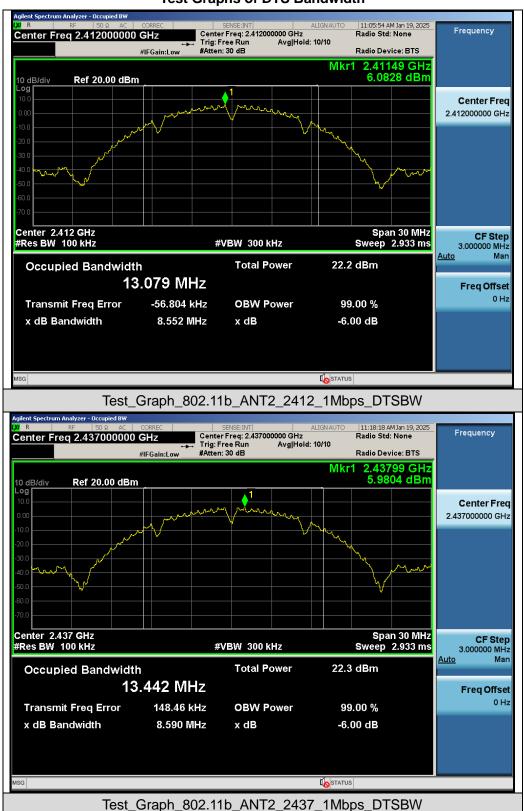
Test_Graph_802.11ax40_ANT2_2452_MCS0_OBW

STATUS

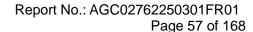




Test Graphs of DTS Bandwidth



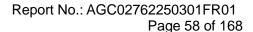
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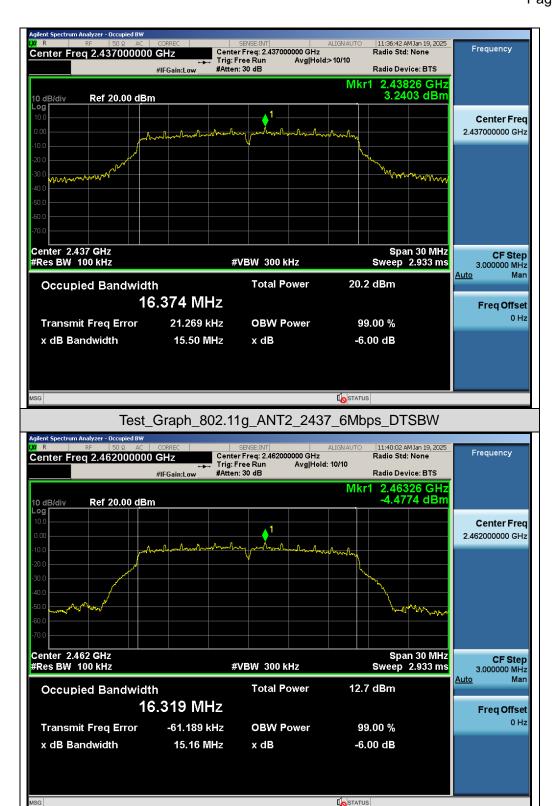




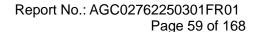
Test_Graph_802.11g_ANT2_2412_6Mbps_DTSBW



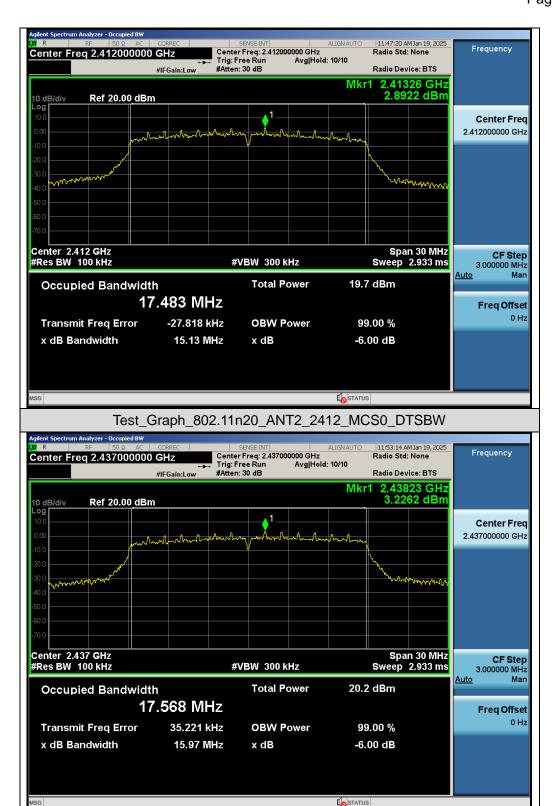




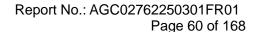
Test_Graph_802.11g_ANT2_2462_6Mbps_DTSBW







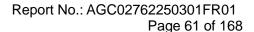
Test_Graph_802.11n20_ANT2_2437_MCS0_DTSBW



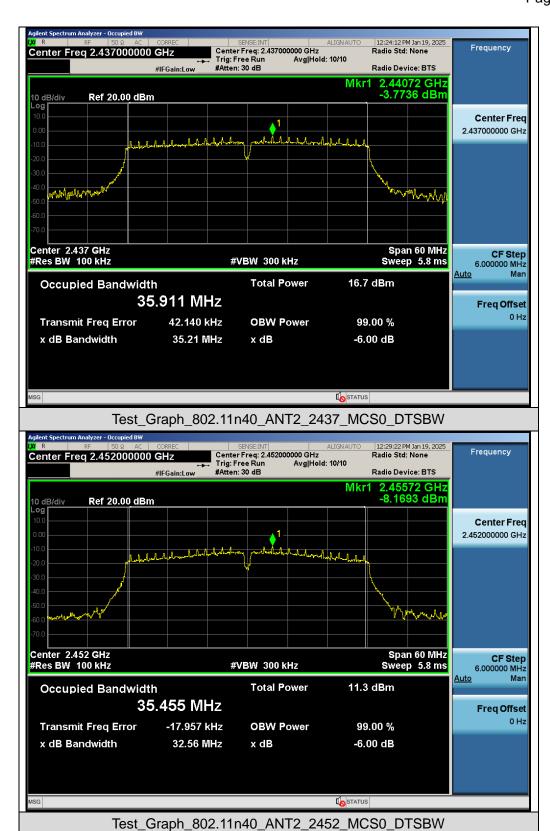


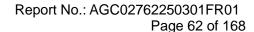


Test_Graph_802.11n40_ANT2_2422_MCS0_DTSBW

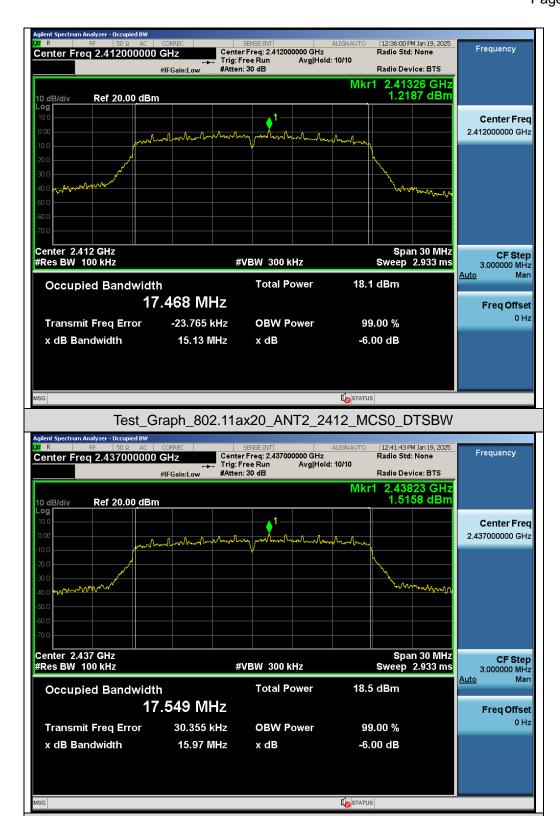




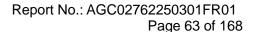




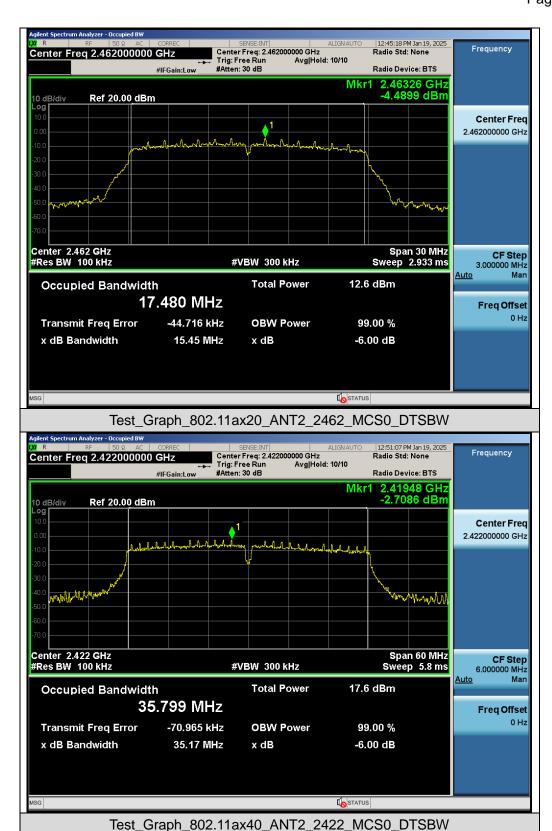


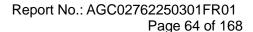


Test_Graph_802.11ax20_ANT2_2437_MCS0_DTSBW

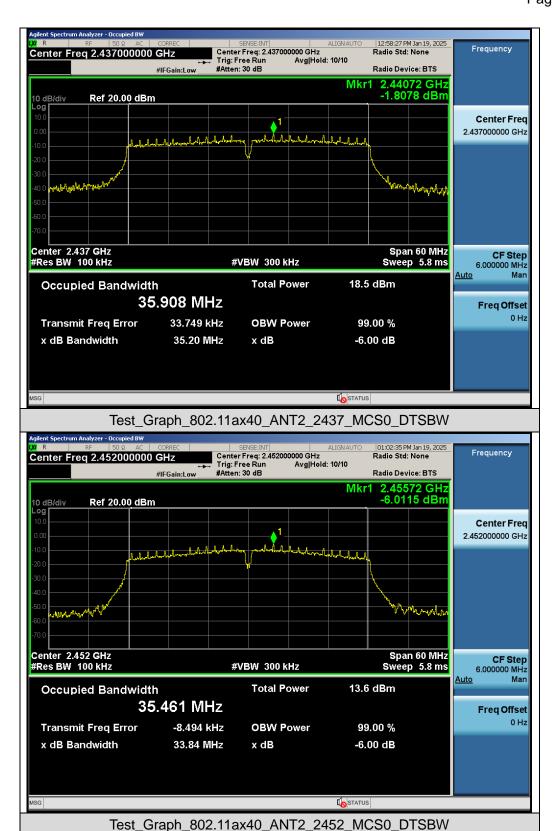














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9. Power Spectral Density Measurement

9.1 Provisions Applicable

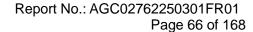
The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

9.2 Measurement Procedure

- 1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
- 2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 3. Set the RBW = 20 kHz.
- 4. Set the VBW ≥ [3 × RBW].
- 5. Set the Span ≥ [1.5 × DTS bandwidth].
- 6. Sweep time=Auto couple.
- 7. Detector function=Peak.
- 8. Trace Mode=Max hold.
- 9. When the measurement bandwidth of the maximum PSD is 3 kHz, a constant factor of 10*log(3kHz/20kHz) = -8.23 dB is added to the measurement result.
- 10. Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.
- 11. The indicated level is the peak output power, after any corrections for external attenuators and cables.

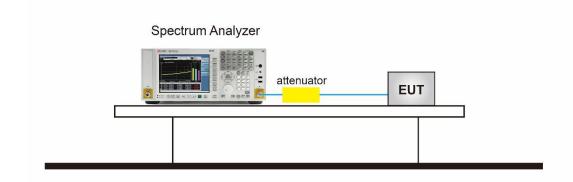
For Average power spectral density test:

- 1. The testing follows the ANSI C63.10 Section 11.10.5 Method AVPSD.
- 2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
- 3. Set Span to at least 1.5 times the OBW.
- 4. Set RBW to:3 kHz ≤ RBW ≤ 100 kHz.
- 5. Set VBW≥[3×RBW].
- 6. Sweep Time=Auto couple.
- 7. Detector function=RMS (i.e., power averaging).
- 8. Trace average at least 100 traces in power averaging (rms) mode.
- 9. When the measurement bandwidth of the maximum PSD is 3 kHz, a constant factor of 10*log(3kHz/20kHz) = -8.23 dB is added to the measurement result.
- 10. Determine according to the duty cycle of the equipment: when it is less than 98%, follow the steps below.
- 11. Add [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the ON and OFF times of the transmission). For example, add [10 log (1/0.25)] = 6 dB if the duty cycle is 25%.
- 12. Record the test results in the report.



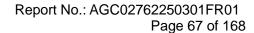


9.3 Measurement Setup (Block Diagram of Configuration)



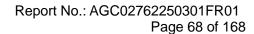
9.4 Measurement Result

Test Data of Conducted Output Power Spectral Density-ANT 1						
Test Mode	Test Frequency (MHz)	Power Spectral density (dBm/20kHz)	Power Spectral density (dBm/3kHz)	Limit (dBm/3kHz)	Pass or Fail	
	2412	0.369	-7.87	≪8	Pass	
802.11b	2437	0.011	-8.228	≪8	Pass	
	2462	-10.414	-18.653	≪8	Pass	
802.11g	2412	-3.993	-12.232	≪8	Pass	
	2437	-3.516	-11.755	≪8	Pass	
	2462	-12.973	-21.212	≪8	Pass	
802.11n20	2412	-3.325	-11.564	≪8	Pass	
	2437	-2.786	-11.025	≪8	Pass	
	2462	-20.056	-28.295	≪8	Pass	
802.11n40	2422	-9.661	-17.9	≪8	Pass	
	2437	-9.443	-17.682	≪8	Pass	
	2452	-12.986	-21.225	≪8	Pass	
802.11ax20	2412	-3.248	-11.487	≪8	Pass	
	2437	-3.257	-11.496	≪8	Pass	
	2462	-11.534	-19.773	≤8	Pass	
802.11ax40	2422	-9.461	-17.70	≪8	Pass	
	2437	-8.438	-16.677	≤8	Pass	
	2452	-14.092	-22.331	≤8	Pass	





Test Data of Conducted Output Power Spectral Density-ANT 2						
Test Mode	Test Frequency (MHz)	Power Spectral density (dBm/20kHz)	Power Spectral density (dBm/3kHz)	Limit (dBm/3kHz)	Pass or Fail	
	2412	-1.275	-9.514	≤8	Pass	
802.11b	2437	0.145	-8.094	≤8	Pass	
	2462	-9.005	-17.244	≤8	Pass	
	2412	-4.242	-12.481	≤8	Pass	
802.11g	2437	-3.937	-12.176	≤8	Pass	
	2462	-10.776	-19.015	≤8	Pass	
802.11n20	2412	-3.580	-11.819	≤8	Pass	
	2437	-3.323	-11.562	≤8	Pass	
	2462	-10.410	-18.649	≤8	Pass	
	2422	-10.509	-18.748	≤8	Pass	
802.11n40	2437	-10.498	-18.737	≤8	Pass	
	2452	-14.982	-23.221	≤8	Pass	
	2412	-4.993	-13.232	≤8	Pass	
802.11ax20	2437	-5.264	-13.503	≤8	Pass	
	2462	-10.355	-18.594	≤8	Pass	
802.11ax40	2422	-9.561	-17.80	≤8	Pass	
	2437	-8.489	-16.728	≤8	Pass	
	2452	-12.604	-20.843	≤8	Pass	

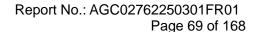




Test Data of Conducted Output Power Spectral Density-MIMO						
Test Mode	Test Frequency (MHz)	Power Spectral density (dBm/20kHz)	Power Spectral density (dBm/3kHz)	Limit (dBm/3kHz)	Pass or Fail	
802.11n20	2412	-0.44	-8.68	≤8	Pass	
	2437	-0.04	-8.27	≪8	Pass	
	2462	-9.96	-18.20	≪8	Pass	
802.11n40	2422	-7.05	-15.29	≪8	Pass	
	2437	-6.93	-15.17	≪8	Pass	
	2452	-10.86	-19.10	≪8	Pass	
802.11ax20	2412	-1.02	-9.26	≪8	Pass	
	2437	-1.14	-9.37	≪8	Pass	
	2462	-7.89	-16.13	≪8	Pass	
802.11ax40	2422	-6.50	-14.74	≪8	Pass	
	2437	-5.45	-13.69	≪8	Pass	
	2452	-10.27	-18.51	≪8	Pass	

Note:

^{1.} The Total Power Spectral Density (dBm) = $10*\log \{10^{(Ant1 PSD/10)} + 10^{(Ant2 PSD/10)}\}$.



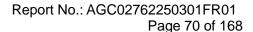


Test Graphs of Conducted Output Power Spectral Density

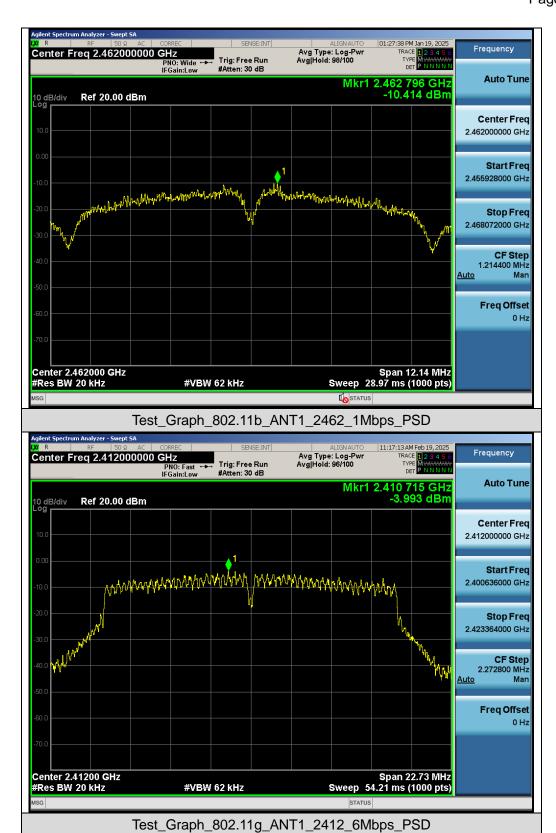


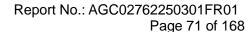
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Test_Graph_802.11b_ANT1_2437_1Mbps_PSD









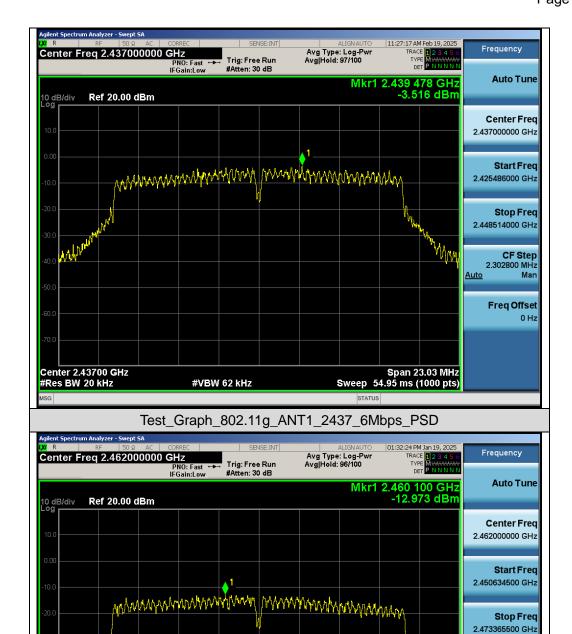
CF Step 2.273100 MHz Man

Freq Offset

<u>Auto</u>

Span 22.73 MHz Sweep 54.21 ms (1000 pts)



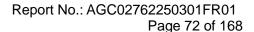


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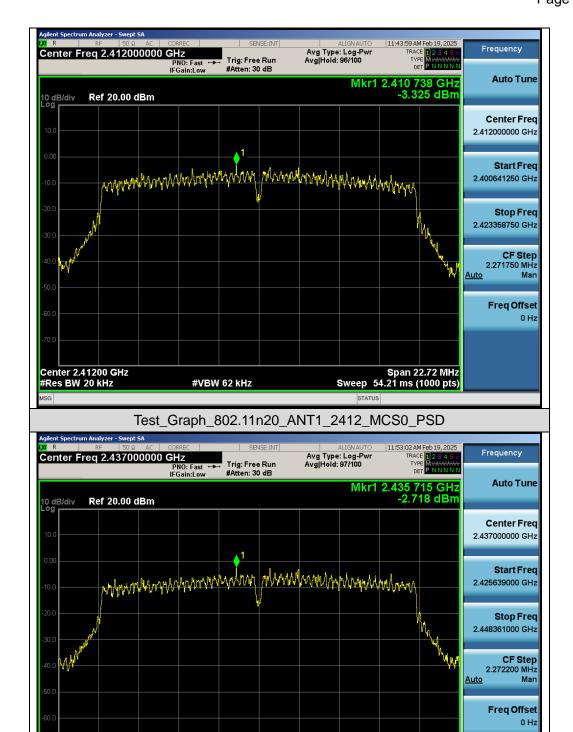
Test_Graph_802.11g_ANT1_2462_6Mbps_PSD

#VBW 62 kHz

Center 2.46200 GHz #Res BW 20 kHz







Test_Graph_802.11n20_ANT1_2437_MCS0_PSD

#VBW 62 kHz

Span 22.72 MHz Sweep 54.21 ms (1000 pts)

Center 2.43700 GHz #Res BW 20 kHz

