

FCC Test Report

Report No.: AGC12845221006FE05

FCC ID : 2A9RD-SVBR01CL

APPLICATION PURPOSE : Original Equipment

PRODUCT DESIGNATION: Cleaning Robot

BRAND NAME : Sveabot

MODEL NAME : SVBR01CL

APPLICANT: Sveabot Tek AB

DATE OF ISSUE : Jan. 17, 2023

STANDARD(S)

TEST PROCEDURE(S)

: FCC Part 15.247

REPORT VERSION: V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



Page 2 of 80

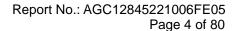
REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes	
V1.0	/	Jan. 17, 2023	Valid	Initial Release	



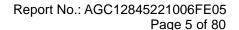
TABLE OF CONTENTS

1. VERIFICATION OF CONFORMITY	5
2. GENERAL INFORMATION	6
2.1. PRODUCT DESCRIPTION	6
2.2. TABLE OF CARRIER FREQUENCYS	
2.3. IEEE 802.11N MODULATION SCHEME	8
2.4. RELATED SUBMITTAL(S) / GRANT (S)	8
2.5. TEST METHODOLOGY	8
2.6. SPECIAL ACCESSORIES	8
2.7. EQUIPMENT MODIFICATIONS	8
2.8. ANTENNA REQUIREMENT	9
3. MEASUREMENT UNCERTAINTY	10
4. DESCRIPTION OF TEST MODES	11
5. SYSTEM TEST CONFIGURATION	12
5.1. CONFIGURATION OF EUT SYSTEM	12
5.2. EQUIPMENT USED IN EUT SYSTEM	12
5.3. SUMMARY OF TEST RESULTS	12
6. TEST FACILITY	13
7. OUTPUT POWER	14
7.1. MEASUREMENT PROCEDURE	14
7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	14
7.3. LIMITS AND MEASUREMENT RESULT	15
8. BANDWIDTH	16
8.1. MEASUREMENT PROCEDURE	16
8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	16
8.3. LIMITS AND MEASUREMENT RESULTS	17
9. CONDUCTED SPURIOUS EMISSION	30
9.1. MEASUREMENT PROCEDURE	30
9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	30
9.3. MEASUREMENT EQUIPMENT USEDJN	30
9.4 LIMITS AND MEASUREMENT RESULT	30





10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY	45
10.1 MEASUREMENT PROCEDURE	45
10.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	45
10.3 MEASUREMENT EQUIPMENT USED	45
10.4 LIMITS AND MEASUREMENT RESULT	45
11. RADIATED EMISSION	52
11.1. MEASUREMENT PROCEDURE	
11.2. TEST SETUP	53
11.3. LIMITS AND MEASUREMENT RESULT	54
11.4. TEST RESULT	54
12. LINE CONDUCTED EMISSION TEST	76
12.1. LIMITS OF LINE CONDUCTED EMISSION TEST	76
12.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST	76
12.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST	77
12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST	77
12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST	78
APPENDIX A: PHOTOGRAPHS OF TEST SETUP	80
APPENDIX B: PHOTOGRAPHS OF EUT	80





1. VERIFICATION OF CONFORMITY

Applicant	Sveabot Tek AB
Address	Hogmossevagen 11, SE-641 39, Katrineholm, Sweden
manufacturer	Sveabot Tek AB
Address	Hogmossevagen 11, SE-641 39, Katrineholm, Sweden
Factory	FJ Dynamics Technology (Fujian) Co., Ltd.
Address	Unit 3, Yimei Zhineng Industrial Park, No. 30 Zhihui Avenue, Nanyu Town, Gaoxin District, Fuzhou City, Fujian Province, China
Product Designation	Cleaning Robot
Brand Name	Sveabot
Test Model	SVBR01CL
Date of receipt of test item	Nov. 17, 2022
Date of test	Nov. 21, 2022 to Jan. 17, 2023
Deviation	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BGN/RF

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.247.

Prepared By	Alan Duan	
	Alan Duan (Project Engineer)	Jan. 17, 2023
Reviewed By	Calin Lin	
	Calvin Liu (Reviewer)	Jan. 17, 2023
Approved By	Max Zhang	
_	Max Zhang (Authorized Officer)	Jan. 17, 2023



Page 6 of 80

2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as "Cleaning Robot". It is designed by way of utilizing the DSSS and OFDM technology to achieve the system operation.

A major technical description of EUT is described as following

Equipment Type	WLAN 2.4G			
Frequency Band	2400MHz ~ 2483.5MHz			
Operation Frequency	2412MHz ~ 2462MHz			
Output Power (Average)	IEEE 802.11b:15.93dBm; IEEE 802.11g:13.89dBm;			
Output Fower (Average)	IEEE 802.11n(HT20):13.97dBm; IEEE 802.11n(HT40):12.99dBm			
Output Power (Peak)	IEEE 802.11b:19.16dBm; IEEE 802.11g:21.78dBm;			
Output Fower (Feak)	IEEE 802.11n(HT20):21.80dBm; IEEE 802.11n(HT40):20.24dBm			
Modulation	802.11b:DQPSK, DBPSK, CCK			
Woddiation	802.11g/n: 64-QAM, 16-QAM, QPSK, BPSK			
	802.11b: 1/2/5.5/11Mbps			
Data Rate	802.11g: 6/9/12/18/24/36/48/54Mbps			
	802.11n: up to 300Mbps			
Number of channels	11			
Hardware Version	V1.0			
Software Version	V1.0			
Antenna Designation	FPC antenna (Comply with requirements of the FCC part 15.203)			
Antenna Gain	3.00dBi			
Power Supply	DC 50.4V by battery or DC 58.8V by adapter			



Page 7 of 80

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
	1	2412 MHZ
	2	2417 MHZ
	3	2422 MHZ
	4	2427 MHZ
	5	2432 MHZ
2400~2483.5MHZ	6	2437 MHZ
	7	2442 MHZ
	8	2447 MHZ
	9	2452 MHZ
	10	2457 MHZ
	11	2462 MHZ

Note: For 20MHZ bandwidth system use Channel 1 to Channel 11. For 40MHZ bandwidth system use Channel 3 to Channel 9



Report No.: AGC12845221006FE05 Page 8 of 80

2.3. IEEE 802.11N MODULATION SCHEME

MCS Index	Nss	Modulation R	NBPSC	NCBPS		NDBPS		Data rate(Mbps) 800nsGl		
					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

2.4. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: 2A9RD-SVBR01CL** filing to comply with the FCC Part 15 requirements.

2.5. TEST METHODOLOGY

KDB 558074 D01 15.247 Meas Guidance v05: Guidance for compliance measurements on Digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules

ANSI C63.10:2013: American National Standard for Testing Unlicensed Wireless Devices

2.6. SPECIAL ACCESSORIES

Refer to section 5.2.

2.7. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

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.



Page 9 of 80

2.8. ANTENNA REQUIREMENT

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device. For more information of the antenna, please refer to the APPENDIX B: PHOTOGRAPHS OF EUT.



Page 10 of 80

3. 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	$U_c = \pm 3.1 \text{ dB}$
Uncertainty of Radiated Emission below 1GHz	$U_c = \pm 4.0 \text{ dB}$
Uncertainty of Radiated Emission above 1GHz	$U_c = \pm 4.8 \text{ dB}$
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	$U_c = \pm 2.7 \%$
Uncertainty of Occupied Channel Bandwidth	U _c = ±2 %



4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel transmitting (TX)
2	Middle channel transmitting (TX)
3	High channel transmitting (TX)

Note:

Transmit by 802.11b with Date rate (1/2/5.5/11)

Transmit by 802.11g with Date rate (6/9/12/18/24/36/48/54)

Transmit by 802.11n (20MHz) with Date rate (6.5/13/19.5/26/39/52/58.5/65)

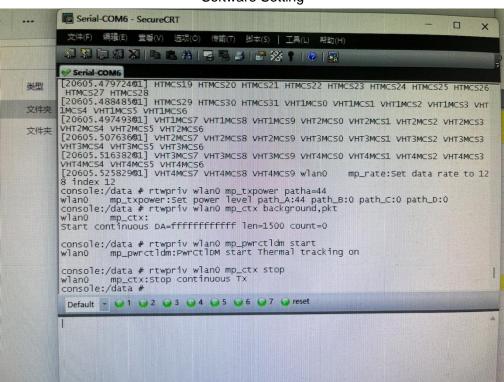
Transmit by 802.11n (40MHz) with Date rate (13.5/27/40.5/54/81/108/121.5/135)

The test channel for 20MHZ bandwidth system is channel 1, 6 and 11.

The test channel for 40MHZ bandwidth system is channel 3, 6 and 9.

Note:

- 1. The EUT has been set to operate continuously on the lowest, middle and highest operation frequency Individually, and the EUT is operating at its maximum duty cycle>or equal 98%
- 2. All modes under which configure applicable have been tested and the worst mode test data recording in the test report, if no other mode data.



Software Setting

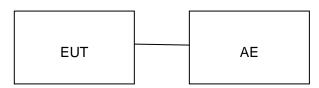


Page 12 of 80

5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Configure:



5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Equipment Model No. ID or Specification		Remark
1	Cleaning Robot	SVBR01CL	2A9RD-SVBR01CL	EUT
2	Bluetooth speaker	SRS-XB01	N/A	AE
3	Xiaomi router	R4A	N/A	AE
4	Adapter	FY58809500	Input: 100-240V, 50/60Hz, 7.5A Output: DC 58.8V, 9.5A	AE

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.247(b)(3)	Output Power	Compliant
§15.247(a)(2)	6 dB Bandwidth	Compliant
§15.247	Conducted Spurious Emission	Compliant
§15.247(e)	Maximum Conducted Output Power Spectral Density	Compliant
§15.209	Radiated Emission	Compliant
§15.247(d)	Band Edges	Compliant
§15.207	Line Conduction Emission	Compliant



Page 13 of 80

6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	Mar. 28, 2022	Mar. 27, 2023
LISN	R&S	ESH2-Z5	100086	Jun. 08, 2022	Jun. 07, 2023
Test software	R&S	ES-K1	Ver V1.71	N/A	N/A

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Mar. 28, 2022	Mar. 27, 2023
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Aug. 04, 2022	Aug. 03, 2023
2.4GHz Fliter	Micro-tronics	087	N/A	N/A	N/A
Attenuator	Weinachel Corp	58-30-33	N/A	Aug. 04, 2022	Aug. 03, 2024
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Oct. 31, 2021	Oct. 30, 2023
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	00034609	Mar. 12, 2022	Mar. 21, 2024
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	Apr. 23, 2021	Apr. 22, 2023
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Aug. 04, 2022	Aug. 03, 2024
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 08, 2021	Jan. 07, 2023
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 05, 2023	Jan. 04, 2025
Test software	Tonscend	JS32-RE	Ver.2.5	N/A	N/A



Page 14 of 80

7. OUTPUT POWER

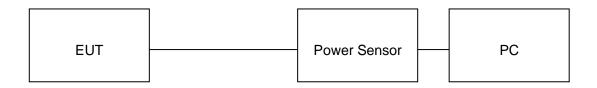
7.1. MEASUREMENT PROCEDURE

For average power test:

- 1. Connect EUT RF output port to power sensor through an RF attenuator.
- 2. Connect the power sensor to the PC.
- 3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 4. Record the maximum power from the software.

Note: The EUT was tested according to ANSI C63.10 (2013) for compliance to FCC 47CFR 15.247 requirements.

7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

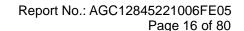




Page 15 of 80

7.3. LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power					
Test Mode	Test Channel (MHz)	Average Power (dBm)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
	2412	15.93	19.16	≤30	Pass
802.11b	2437	15.80	19.10	≤30	Pass
	2462	15.59	18.53	≤30	Pass
	2412	13.80	21.78	≤30	Pass
802.11g	2437	13.89	21.64	≤30	Pass
	2462	13.80	21.33	≤30	Pass
	2412	13.97	21.80	≤30	Pass
802.11n20	2437	13.71	21.67	≤30	Pass
	2462	13.84	21.25	≤30	Pass
802.11n40	2422	12.99	20.24	≤30	Pass
	2437	12.59	20.09	≤30	Pass
	2452	11.86	19.84	≤30	Pass





8. BANDWIDTH

8.1. MEASUREMENT PROCEDURE

6dB bandwidth:

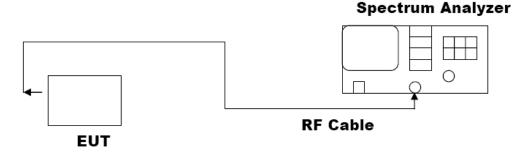
- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 kHz, VBW≥3×RBW.
- 4. Set SPA Trace 1 Max hold, then View.

Occupied bandwidth:

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hoping channel
 The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video
 bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
- 4. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to ANSI C63.10 for compliance to FCC PART 15.247 requirements.

8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)





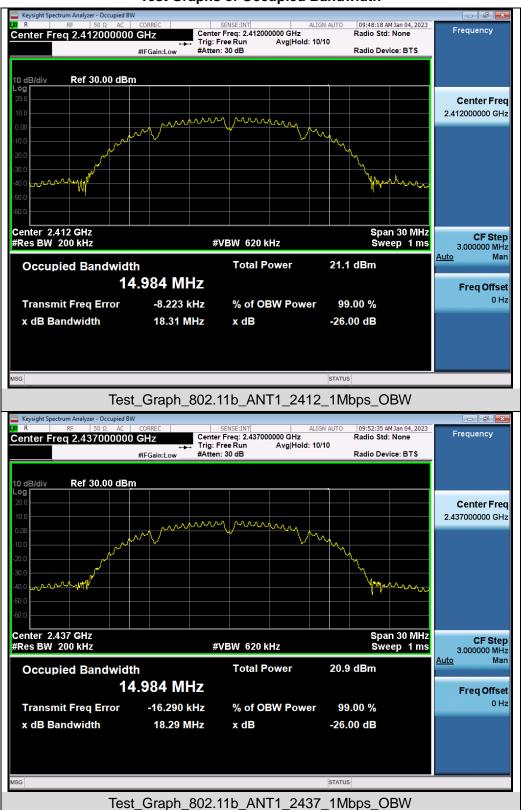
Page 17 of 80

8.3. LIMITS AND MEASUREMENT RESULTS

Test Data of Occupied Bandwidth and DTS Bandwidth					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-6dB Bandwidth (MHz)	Limits (MHz)	Pass or Fail
	2412	14.984	10.08	∌.5	Pass
802.11b	2437	14.984	10.08	₹ 0.5	Pass
	2462	14.980	10.09	₹ 0.5	Pass
	2412	16.614	16.33	₹0.5	Pass
802.11g	2437	16.581	16.34	₹0.5	Pass
	2462	16.558	16.34	₹0.5	Pass
	2412	17.664	17.51	₹0.5	Pass
802.11n20	2437	17.631	17.05	₹ 0.5	Pass
	2462	17.599	17.05	₹ 0.5	Pass
802.11n40	2422	36.173	35.55	₹0.5	Pass
	2437	36.136	35.20	₹0.5	Pass
	2452	36.179	35.36	∌.5	Pass

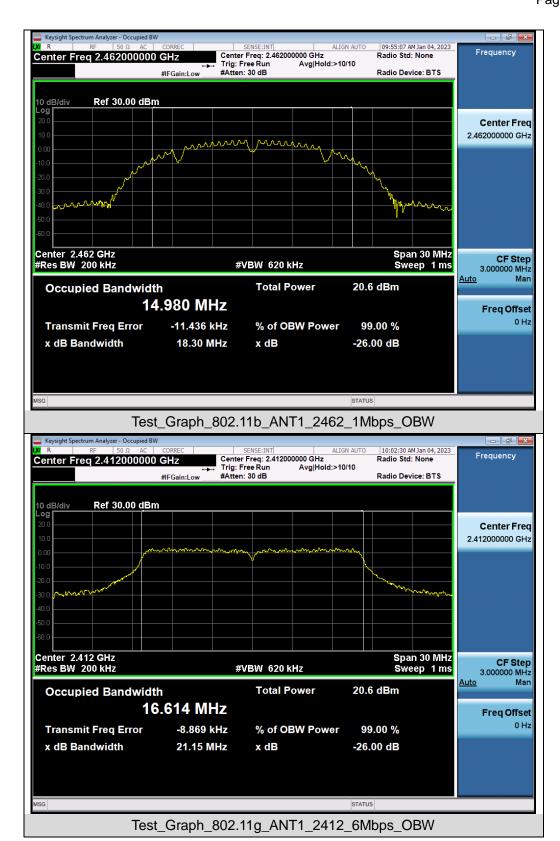


Test Graphs of Occupied Bandwidth

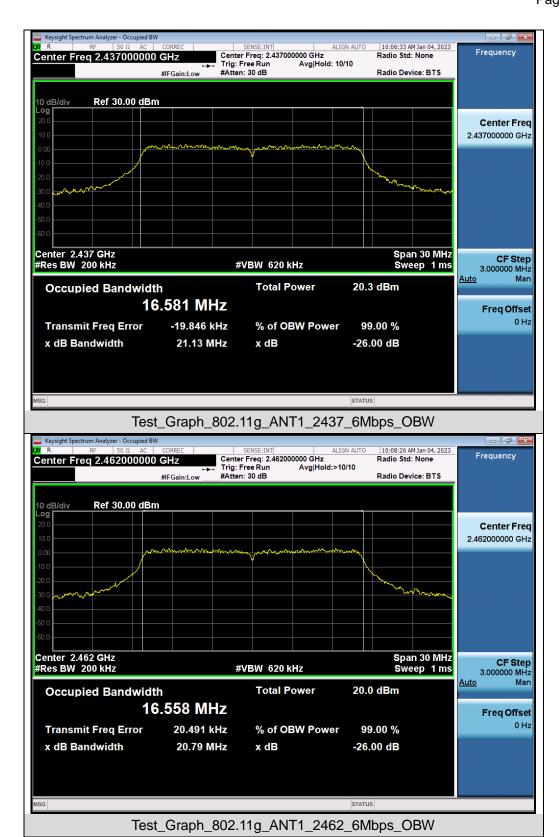


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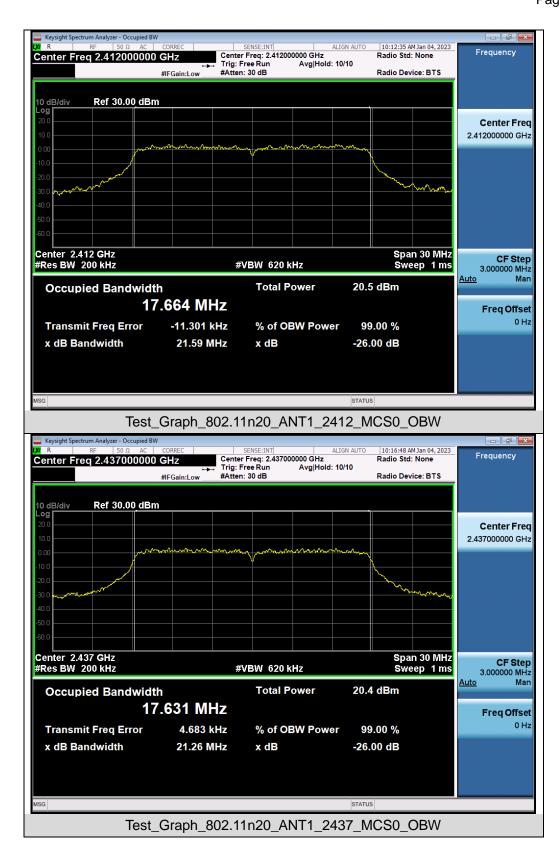




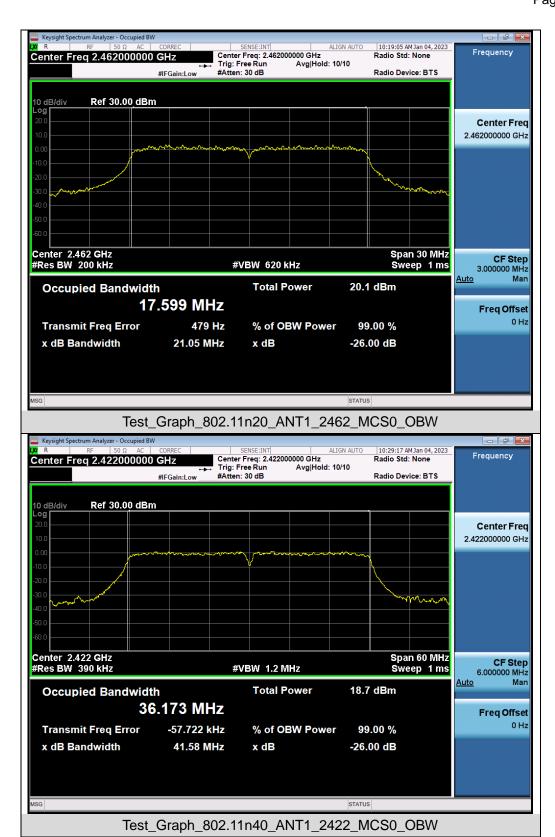




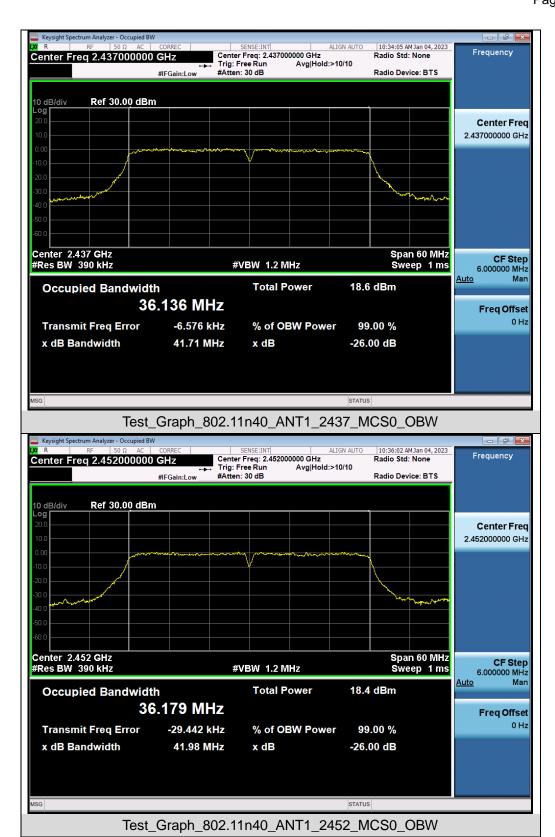






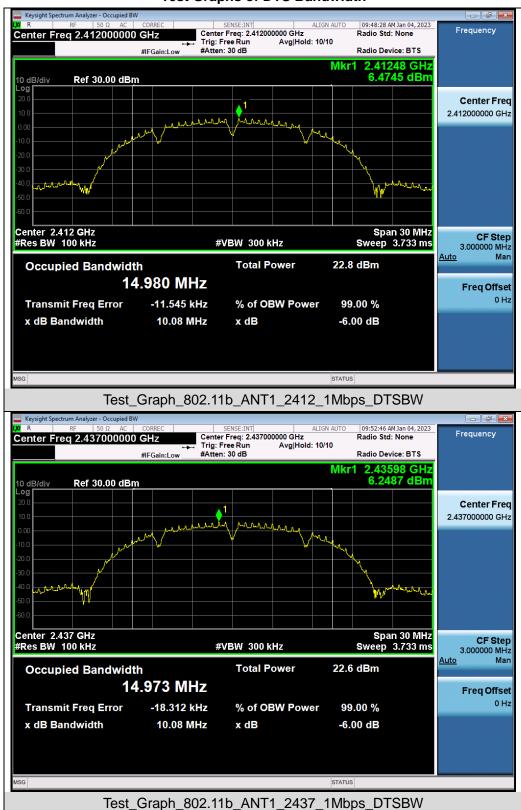






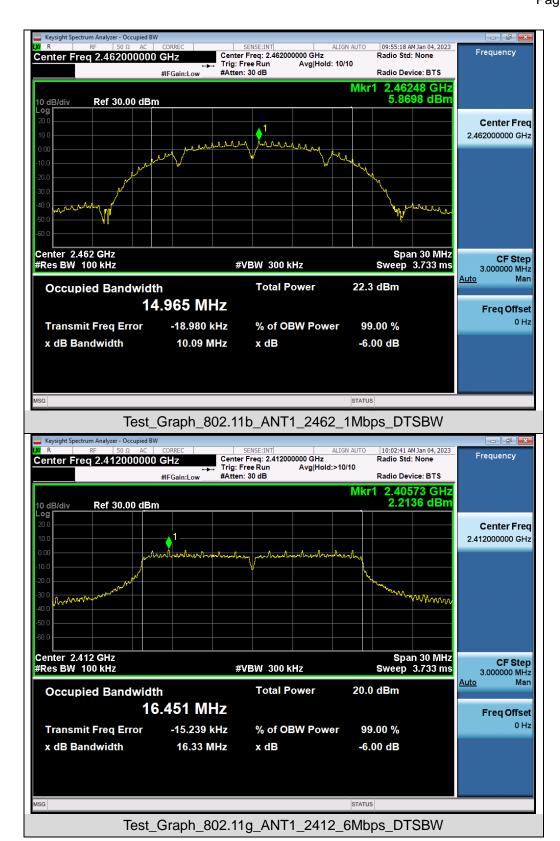


Test Graphs of DTS Bandwidth

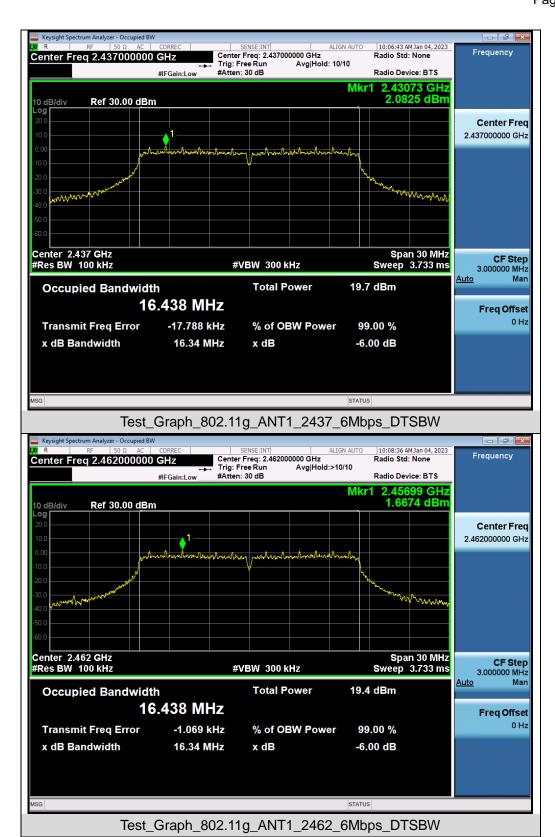


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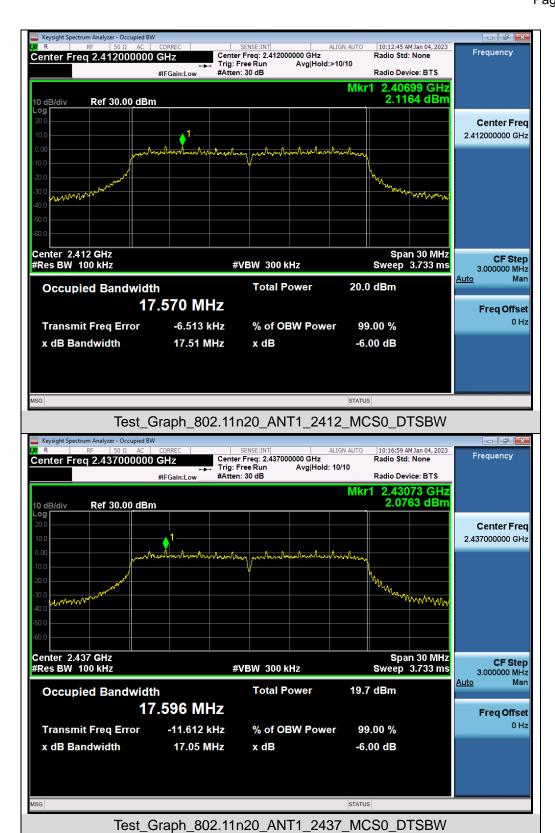




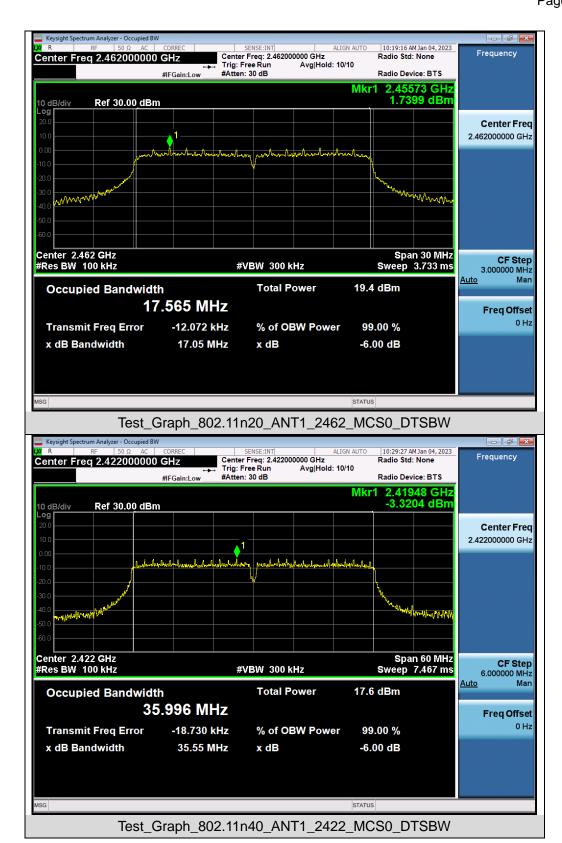




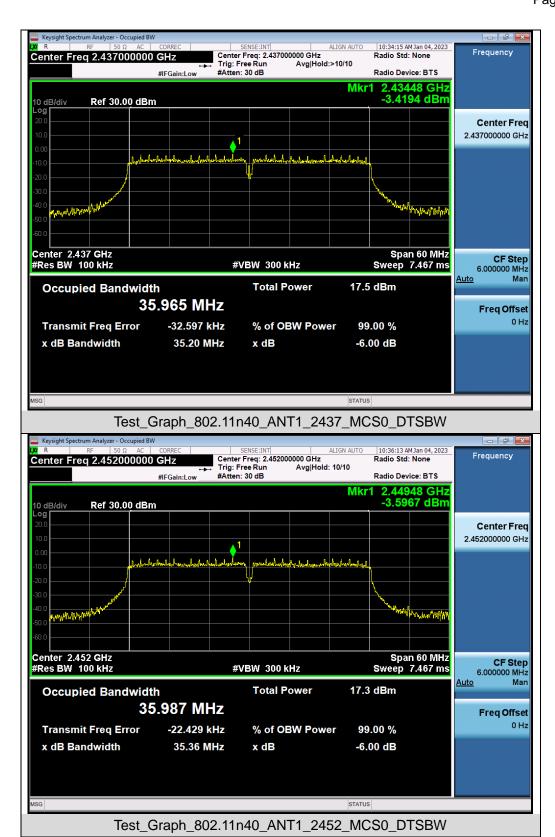














Page 30 of 80

9. CONDUCTED SPURIOUS EMISSION

9.1. MEASUREMENT PROCEDURE

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to ANSI C63.10 (2013) for compliance to FCC 47CFR 15.247 requirements. Owing to satisfy the requirements of the number of measurement points, we set the RBW=1MHz, VBW>RBW, scan up through 10th harmonic, and consider the tested results as the worst case, if the tested results conform to the requirement, we can deem that the real tested results(set the RBW=100KHz, VBW>RBW) are conform to the requirement.

9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 8.2.

9.3. MEASUREMENT EQUIPMENT USEDJN

The same as described in section 6.

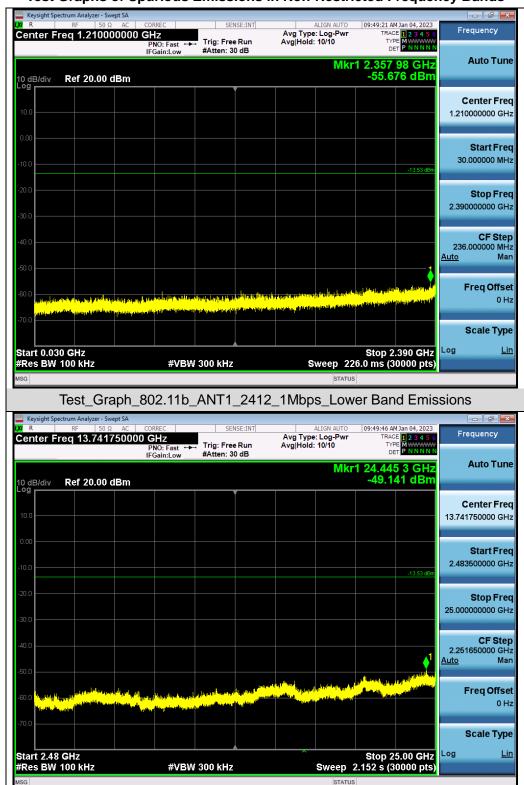
9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT				
Applicable Limite	Measurement Result			
Applicable Limits	Test Data	Criteria		
In any 100 KHz Bandwidth Outside the	At least -20dBc than the limit			
frequency band in which the spread spectrum	Specified on the BOTTOM	PASS		
intentional radiator is operating, the radio frequency	Channel			
power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the TOP Channel	PASS		

Note: The limits reference level is according to the test plot of -6dB bandwidth.



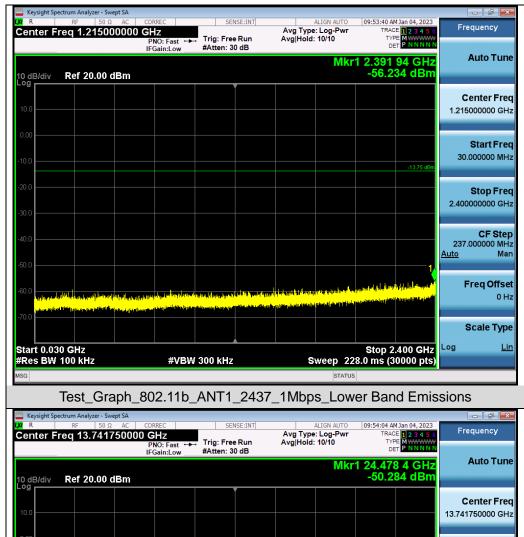
Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands



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Test_Graph_802.11b_ANT1_2412_1Mbps_Higher Band Emissions





| Test_Graph_802.11b_ANT1_2437_1Mbps_Higher Band Emissions | AutoTune | Avg Hybra Higher Band Emissions | Avg Hybra Hybra Hybra Hybra Higher Band Emissions | Avg Hybra Hy

CF Step 2.250000000 GHz

> Freq Offset 0 Hz

Scale Type

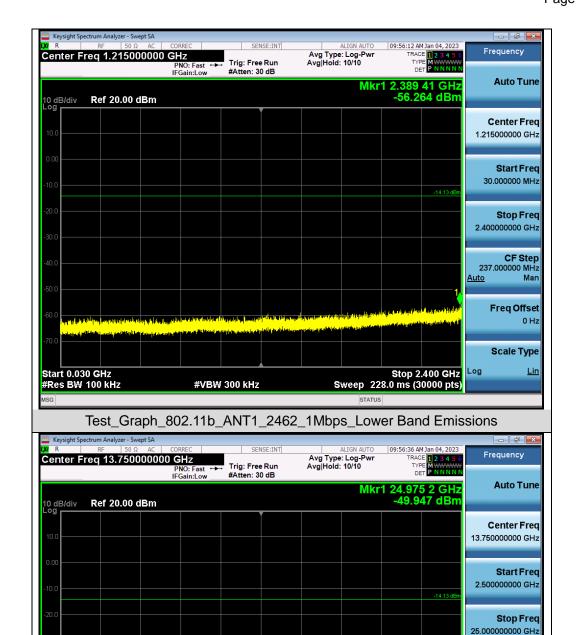
Mar

<u>Auto</u>

Log

Stop 25.00 GHz Sweep 2.152 s (30000 pts)





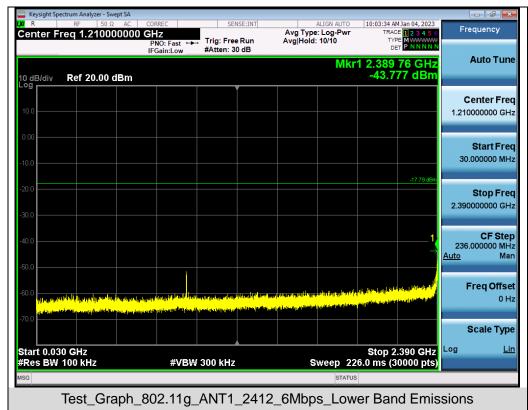
Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the 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.

Test_Graph_802.11b_ANT1_2462_1Mbps_Higher Band Emissions

#VBW 300 kHz

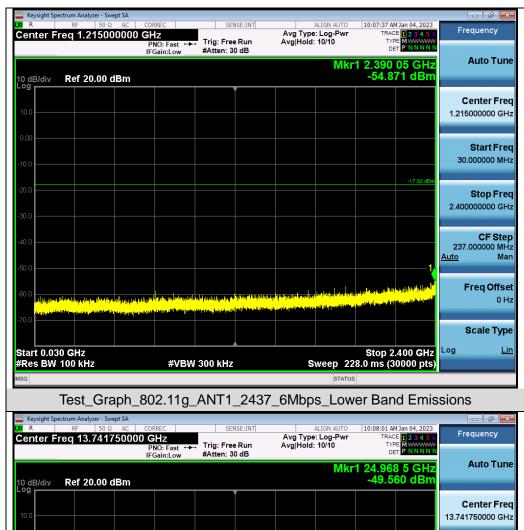
Start 2.50 GHz #Res BW 100 kHz



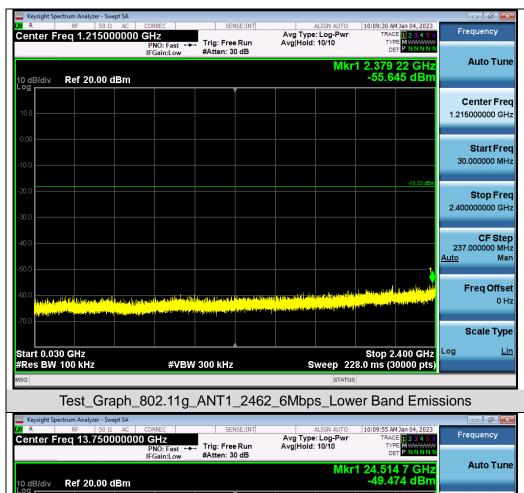






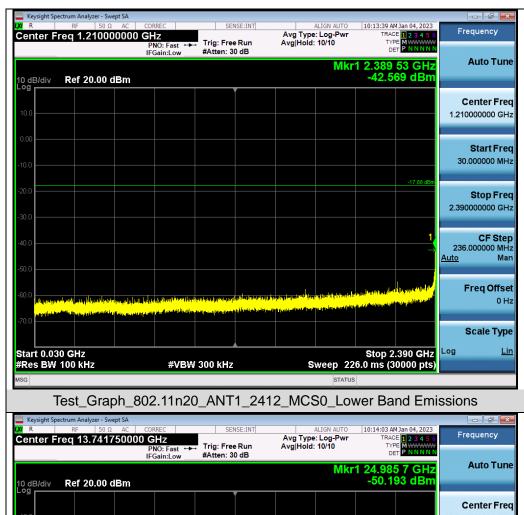






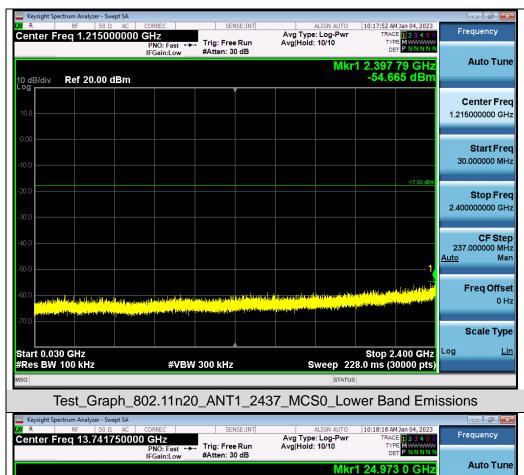






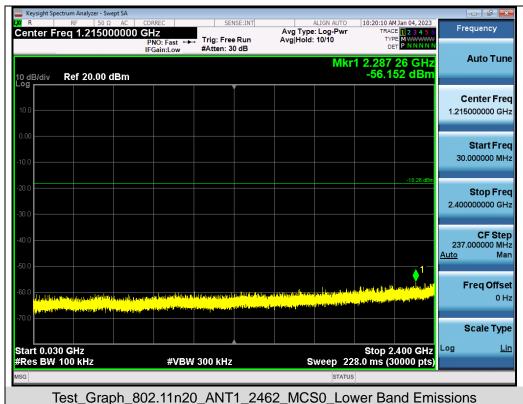








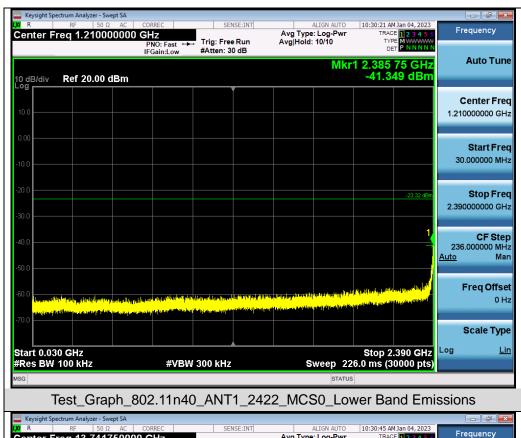






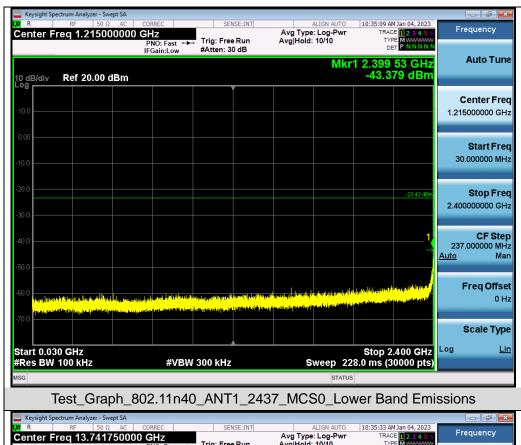
Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: http://www.agccert.com/













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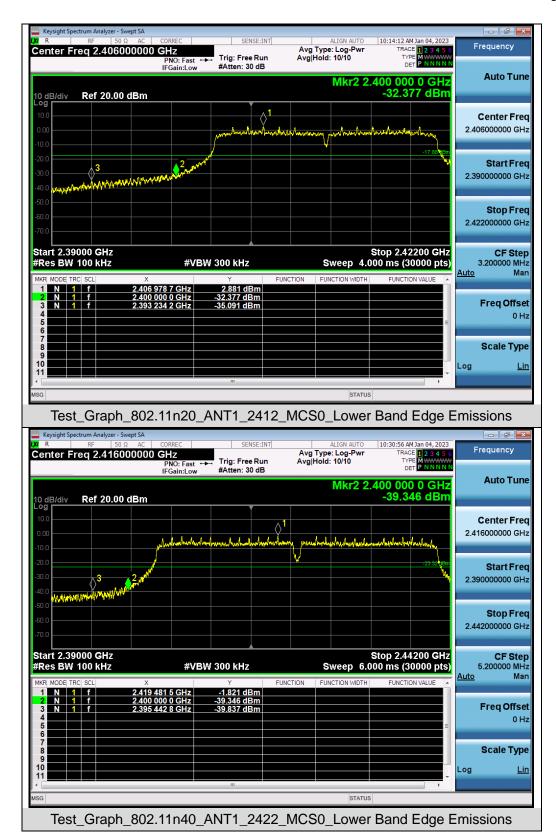
Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands



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Test_Graph_802.11g_ANT1_2412_6Mbps_Lower Band Edge Emissions





Note: Emissions from 2483.5-2500MHz which fall in the restricted bands had been considered with the radiated emission limits specified.



Report No.: AGC12845221006FE05

Page 45 of 80

10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

10.1 MEASUREMENT PROCEDURE

- (1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- (2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- (3). Set SPA Trace 1 Max hold, then View.

Note: The method of PKPSD in the ANSI C63.10 (2013) item 11.10 was used in this testing.

10.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

Refer to Section 8.2.

10.3 MEASUREMENT EQUIPMENT USED

Refer to Section 6.

10.4 LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power Spectral Density					
Test Mode	Test Channel (MHz)	Power density (dBm/20kHz)	Power density (dBm/3kHz)	Limit (dBm/3kHz)	Pass or Fail
802.11b	2412	2.526	-5.713		Pass
	2437	1.542	-6.697	- ₹8	Pass
	2462	1.174	-7.065	- ≪8	Pass
802.11g	2412	-3.276	-11.515	- ₹8	Pass
	2437	-2.342	-10.581		Pass
	2462	-3.261	-11.5	- ₹8	Pass
802.11n20	2412	-3.691	-11.93		Pass
	2437	-3.862	-12.101	- ₹8	Pass
	2462	-4.197	-12.436	- \$8	Pass
802.11n40	2422	-7.617	-15.856	- ₹8	Pass
	2437	-7.703	-15.942	- ≪8	Pass
	2452	-8.608	-16.847	- ₹8	Pass

Note: Power density(dBm/3kHz) = Power density(dBm/20kHz) - 10*log(20/3).



Test Graphs of Conducted Output Power Spectral Density



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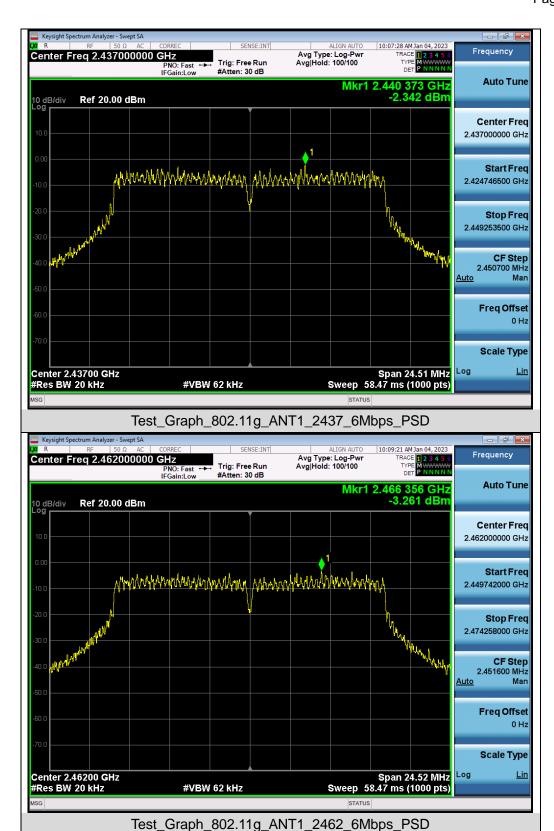
Test_Graph_802.11b_ANT1_2437_1Mbps_PSD



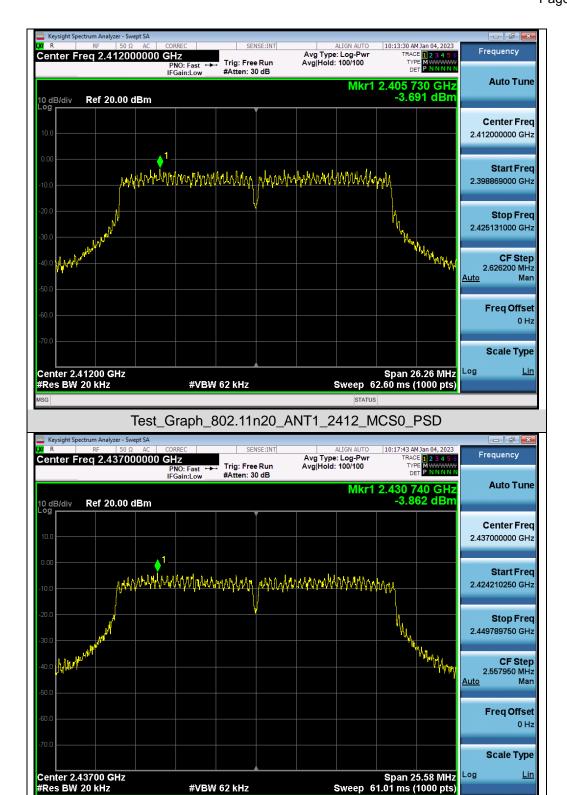


Test_Graph_802.11g_ANT1_2412_6Mbps_PSD





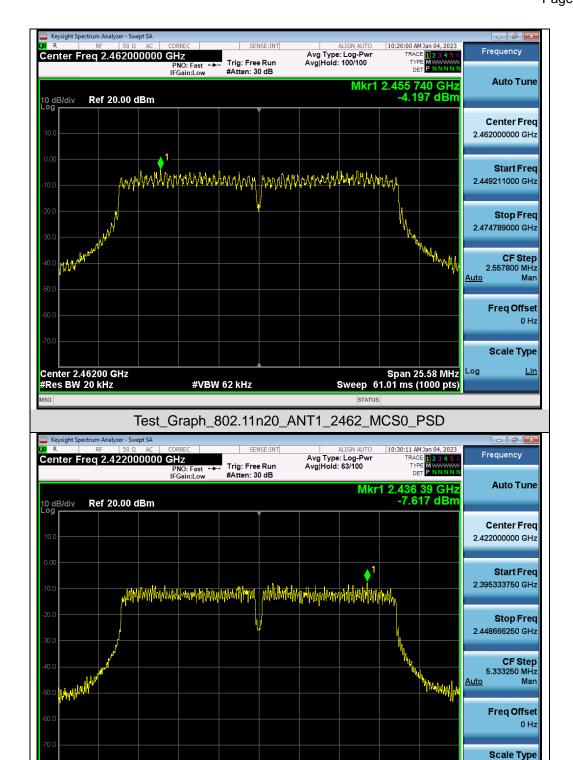




Test_Graph_802.11n20_ANT1_2437_MCS0_PSD

#VBW 62 kHz





Test_Graph_802.11n40_ANT1_2422_MCS0_PSD

#VBW 62 kHz

Span 53.33 MHz Sweep 127.1 ms (1000 pts)

Log

Center 2.42200 GHz #Res BW 20 kHz



