

FCC Test Report

Report No.: AGC05877211205FE05

FCC ID : 2APA9-CMSXJ56B

APPLICATION PURPOSE : Original Equipment

PRODUCT DESIGNATION : IMILAB C20 Pro

BRAND NAME : N/A

MODEL NAME : CMSXJ56B

APPLICANT: Shanghai Imilab Technology Co., Ltd.

DATE OF ISSUE : Dec. 29, 2021

STANDARD(S)

TEST PROCEDURE(S)

: FCC Part 15.247

REPORT VERSION : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Dec. 29, 2021	Valid	Initial Release

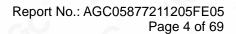
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1. VERIFICATION OF CONFORMITY

Applicant	Shanghai Imilab Technology Co., Ltd.
Address	Room 001A, Floor 11, Block 1, No. 588 Zixing Road, Minhang District, Shanghai, China
Manufacturer	Shanghai Imilab Technology Co., Ltd.
Address	Room 001A, Floor 11, Block 1, No. 588 Zixing Road, Minhang District, Shanghai, China
Product Designation	IMILAB C20 Pro
Brand Name	N/A
Test Model	CMSXJ56B
Date of test	Dec. 15, 2021 to Dec. 29, 2021
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

Bibo Zhang
(Project Engineer)

Calvin Liu
(Reviewer)

Approved By

Max Zhang
(Authorized Officer)

Dec. 29, 2021

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as "IMILAB C20 Pro". 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

Operation Frequency	2.412 GHz ~ 2.462GHz
Output Power (Average)	IEEE 802.11b:14.15dBm; IEEE 802.11g:10.09dBm; IEEE 802.11n(20):9.31dBm
Output Power (Peak)	IEEE 802.11b:16.99dBm; IEEE 802.11g:17.84dBm; IEEE 802.11n(20):17.09dBm
Modulation	DSSS(DBPSK/DQPSK/CCK); OFDM(BPSK/QPSK/16-QAM/64-QAM)
Number of channels	11
Hardware Version	LSAM088C1-1
Software Version	056101_2.1.5_0079
Antenna Designation	PCB Antenna (Comply with requirements of the FCC part 15.203)
Antenna Gain	1dBi
Power Supply	DC 5V by adapter

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
GC C	。 1	2412 MHZ
	2	2417 MHZ
	3	2422 MHZ
100 2C	4	2427 MHZ
	5	2432 MHZ
2400~2483.5MHZ	6	2437 MHZ
30 -0	7	2442 MHZ
	8	2447 MHZ
	9	2452 MHZ
10° 20	10	2457 MHZ
	11	2462 MHZ

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

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2.3. IEEE 802.11N MODULATION SCHEME

MCS Index	Nss	Modulation	R	NBPSC	NCI	BPS	NDI	BPS	rate(I	ata Mbps) nsGl
					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	9 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**: **2APA9-CMSXJ56B** 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.

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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.

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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 = ±2 %	
Uncertainty of Occupied Channel Bandwidth	U _c = ±2 %	

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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)

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

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.
- 3. The test software is the iwpriv which can set the EUT into the individual test modes.

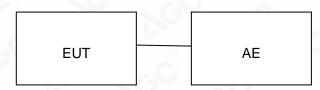
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5. SYSTEM TEST CONFIGURATION 5.1. CONFIGURATION OF EUT SYSTEM

Configure:



5.2. EQUIPMENT USED IN EUT SYSTEM

_								
	ltem	Equipment	Model No.	ID or Specification	Remark			
	1	IMILAB C20 Pro	CMSXJ56B	2APA9-CMSXJ56B	EUT			
	2	Adapter	A232-050200U-EU2	INPUT: 100-240V~50/60Hz 0.35A OUTPUT: 5V, 2A 10W	EUT			

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.247	Output Power	Compliant
§15.247	6 dB Bandwidth	Compliant
§15.247	Conducted Spurious Emission	Compliant
§15.247	Maximum Conducted Output Power Spectral Density	Compliant
§15.209	Radiated Emission	Compliant
§15.247	Band Edges	Compliant
§15.207	Line Conduction Emission	Compliant

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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	May 15, 2021	May 14, 2022
LISN	R&S	ESH2-Z5	100086	Jun. 09, 2021	Jun. 08, 2022
Test software	R&S	ES-K1(Ver.V1.71)	N/A	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	May 15, 2021	May 14, 2022
EXA Signal Analyzer	Aglient	N9010A	MY53470504	May 11, 2021	May 10, 2025
2.4GHz Fliter	Micro-tronics	087	N/A	May 11, 2021	May 10, 2025
Attenuator	Weinachel Corp	58-30-33	N/A	Sep. 03, 2020	Sep. 02, 2022
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Mar. 23, 2020	Mar. 22, 2022
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	00034609	Sep. 03, 2020	Sep. 02, 2022
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	Oct. 31, 2021	Oct. 30, 2023
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	May 22, 2020	May 21, 2022
ANTENNA	SCHWARZBECK	VULB9168	D69250	Apr. 23, 2021	Apr. 22, 2022
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A
Power Sensor	Agilent	U2021XA	MY54110007	May 11, 2021	May 10, 2025

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7. OUTPUT POWER

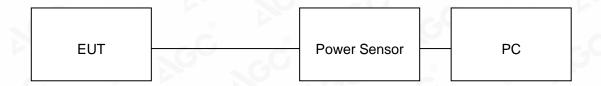
7.1. MEASUREMENT PROCEDURE

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)



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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
C	2412	14.15	16.99	≪30	Pass
802.11b	2437	13.11	15.96	\$ 0	Pass
	2462	11.93	14.55	≼30	Pass
802.11g	2412	10.09	17.84	≪3 0	Pass
	2437	9.68	17.24	\$ 0	Pass
	2462	8.09	15.71	\$ 0	Pass
802.11n20	2412	9.31	17.09	₹30	Pass
	2437	8.43	16.28	≪3 0	Pass
	2462	7.03	14.77	\$ 0	Pass

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8. BANDWIDTH

8.1. MEASUREMENT PROCEDURE

6dB bandwidth:

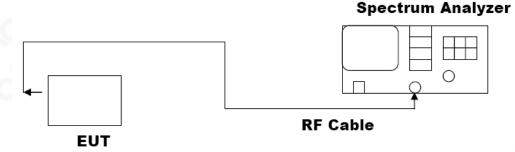
- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 kHz, VBW≥3×RBW.
- 4. Set SPA Trace 1 Max hold, then View.

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)



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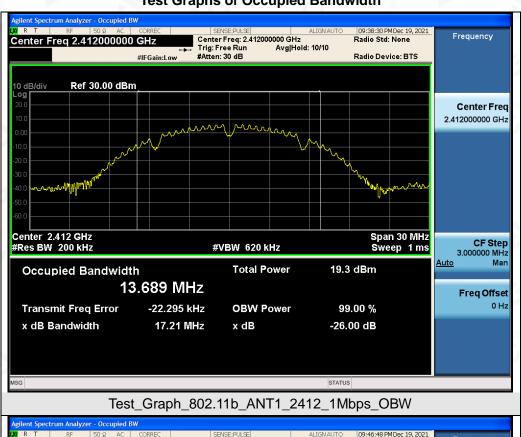
8.3. LIMITS AND MEASUREMENT RESULTS

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
-G	2412	13.689	9.019	₹9.5	Pass
802.11b	2437	13.806	9.032	∌.5	Pass
	2462	13.763	8.569	∌.5	Pass
802.11g	2412	16.749	16.37	∌.5	Pass
	2437	16.655	16.41	₹9.5	Pass
	2462	16.635	16.35	∌.5	Pass
802.11n20	2412	17.736	17.56	∌.5	Pass
	2437	17.745	17.57	₹0.5	Pass
	2462	17.711	17.33	∌.5	Pass

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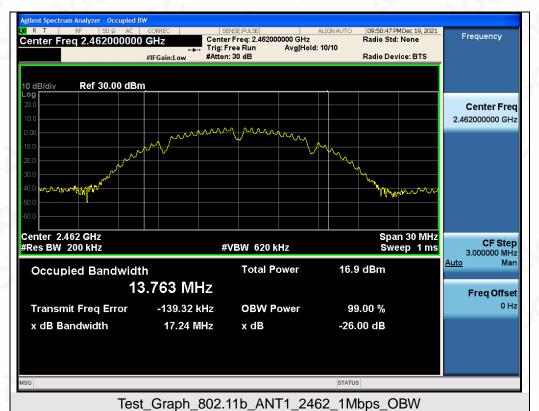
Test Graphs of Occupied Bandwidth





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Test_Graph_802.11g_ANT1_2412_6Mbps_OBW

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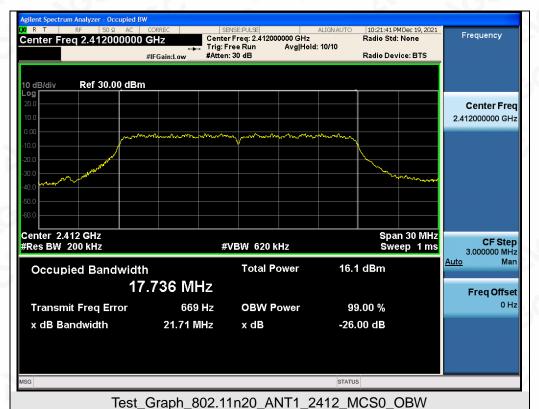


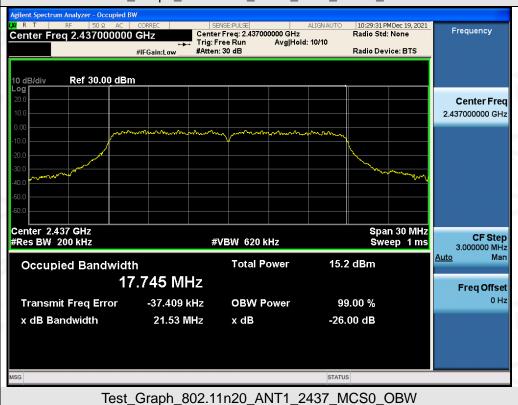


Test_Graph_802.11g_ANT1_2462_6Mbps_OBW

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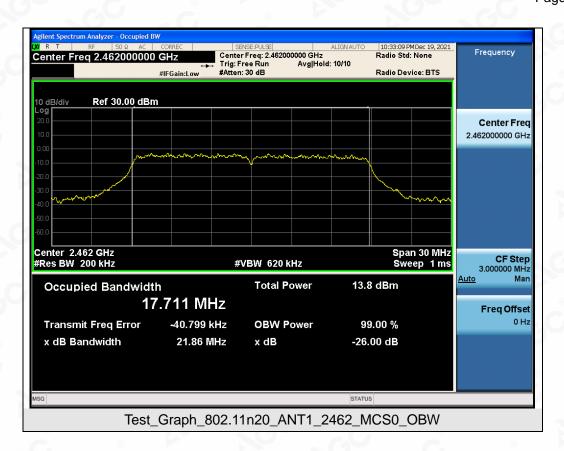






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Test Graphs of DTS Bandwidth



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Test_Graph_802.11b_ANT1_2437_1Mbps_DTSBW



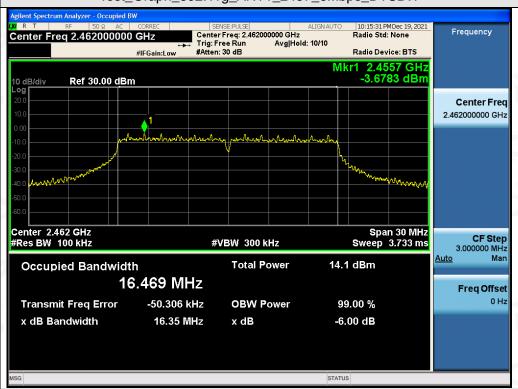




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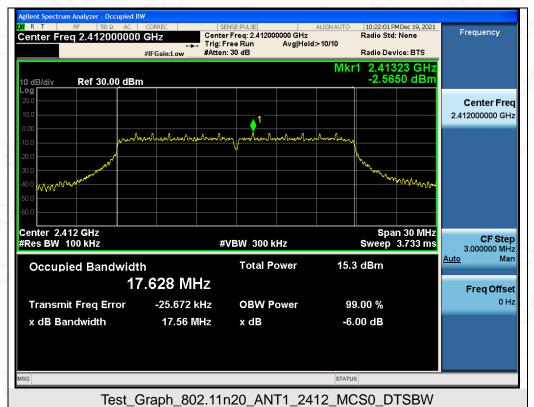


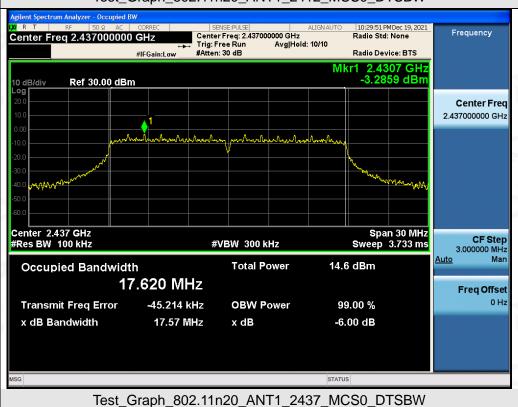


Test_Graph_802.11g_ANT1_2462_6Mbps_DTSBW

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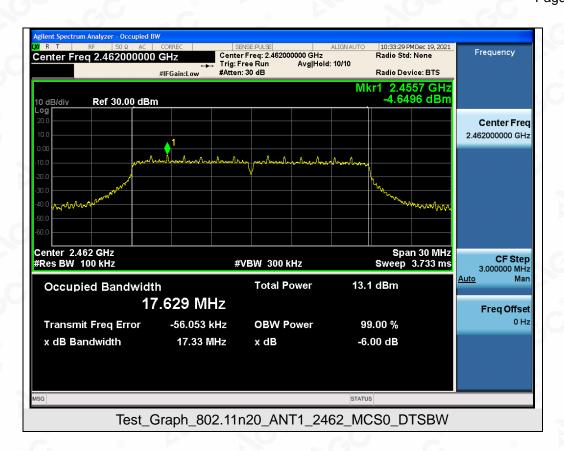






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9. CONDUCTED SPURIOUS EMISSION

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

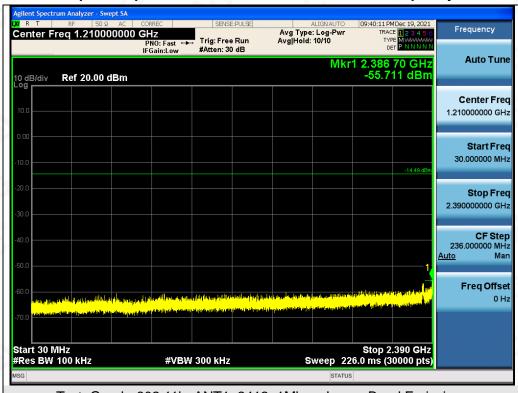
LIMITS AND MEASUREMENT RESULT					
Annelia de la limita	Measurement Result				
Applicable Limits	Test Data	Criteria			
In any 100 KHz Bandwidth Outside the	At least -20dBc than the limit				
frequency band in which the spread spectrum	Specified on the BOTTOM	PASS			
intentional radiator is operating, the radio frequency	Channel	a.C			
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.

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Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands



Test_Graph_802.11b_ANT1_2412_1Mbps_Lower Band Emissions

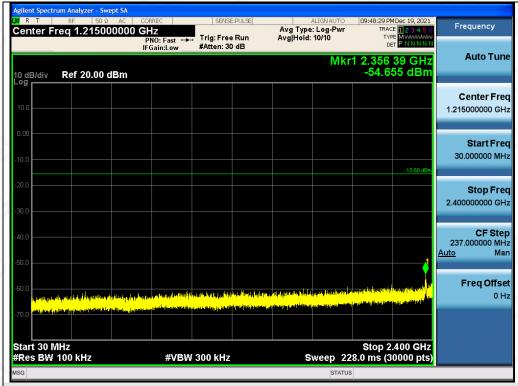


Test_Graph_802.11b_ANT1_2412_1Mbps_Higher Band Emissions

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The test results



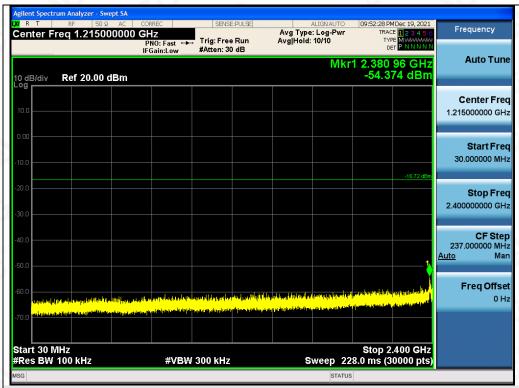


Test_Graph_802.11b_ANT1_2437_1Mbps_Lower Band Emissions



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Test_Graph_802.11b_ANT1_2462_1Mbps_Lower Band Emissions



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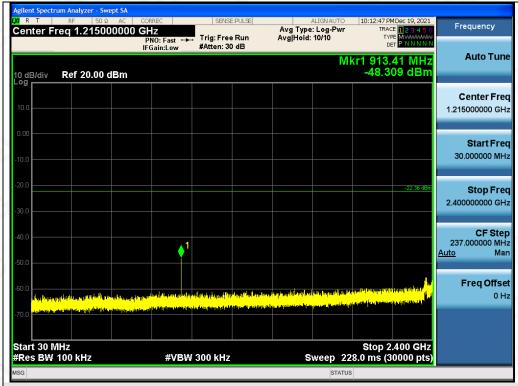


Test_Graph_802.11g_ANT1_2412_6Mbps_Lower Band Emissions



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Test_Graph_802.11g_ANT1_2437_6Mbps_Lower Band Emissions



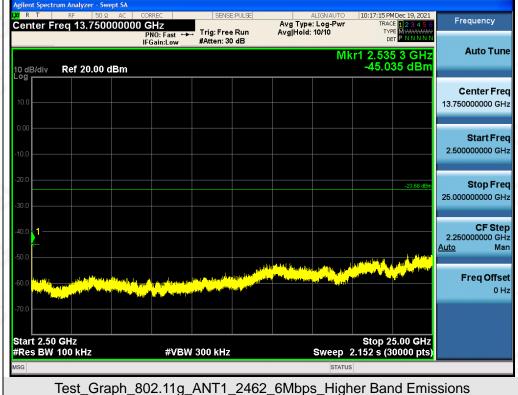
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The test results



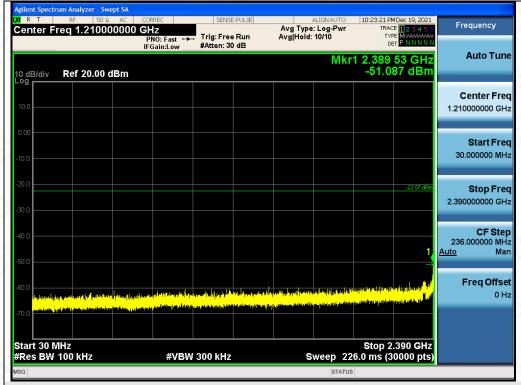


Test_Graph_802.11g_ANT1_2462_6Mbps_Lower Band Emissions



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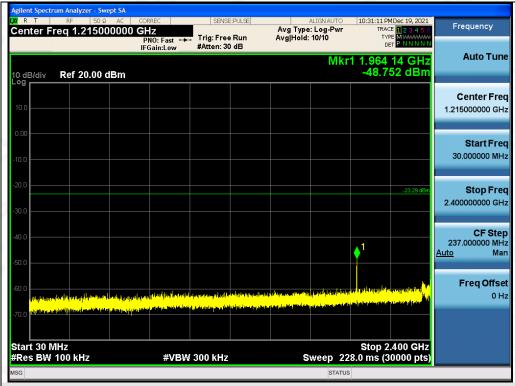


Test_Graph_802.11n20_ANT1_2412_MCS0_Lower Band Emissions



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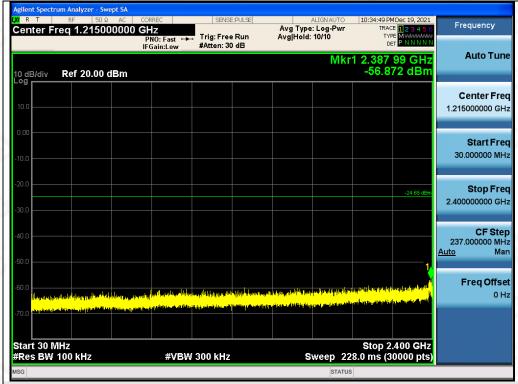


Test_Graph_802.11n20_ANT1_2437_MCS0_Lower Band Emissions



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Test_Graph_802.11n20_ANT1_2462_MCS0_Lower Band Emissions



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a/Inspection

The test results

the test report.



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



Test_Graph_802.11b_ANT1_2412_1Mbps_Lower Band Edge Emissions



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

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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		
	2412	0.782	-7.457		Pass		
802.11b	2437	-0.506	-8.745		Pass		
	2462	-0.234	-8.473	- \$8	Pass		
S. C.C.	2412	-6.836	-15.075		Pass		
802.11g	2437	-7.612	-15.851	- \$8	Pass		
	2462	-9.080	-17.319	- \$8	Pass		
60	2412	-8.694	-16.933		Pass		
802.11n20	2437	-7.674	-15.913		Pass		
	2462	-9.804	-18.043	- \$8	Pass		

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

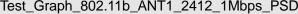
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ad/Inspection



Test Graphs of Conducted Output Power Spectral Density







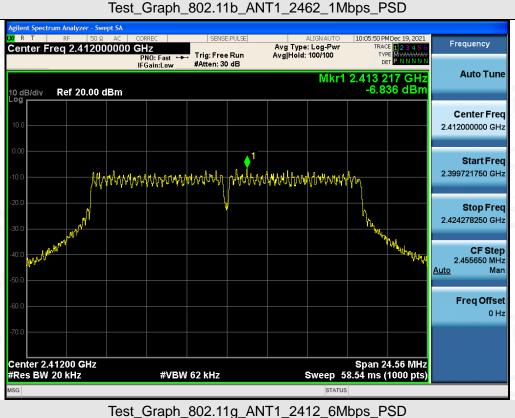
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