

# **FCC Test Report**

Report No.: AGC09264210401FE05

**FCC ID** : 2ARPE-SAL

**APPLICATION PURPOSE** : Original Equipment

**PRODUCT DESIGNATION**: Smart Ambiance Light

**BRAND NAME** : N/A

**MODEL NAME** : SAL, SAL001S, SAL001B

**APPLICANT**: Shenzhen Juku Intelligent Technology Co., Ltd.

**DATE OF ISSUE** : May 17, 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	9/	May 17, 2021	Valid	Initial Release

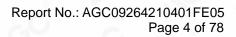
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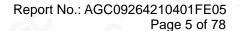
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# 1. VERIFICATION OF CONFORMITY

Shenzhen Juku Intelligent Technology Co., Ltd.		
Room 511, Building 11, No.2018, Xuegang North Road, Gangtou Community, Bantian Street, Longgang District, Shenzhen		
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Shenzhen Juku Intelligent Technology Co., Ltd.		
Room 511, Building 11, No.2018, Xuegang North Road, Gangtou Community, Bantian Street, Longgang District, Shenzhen		
Smart Ambiance Light		
N/A		
SAL		
SAL001S, SAL001B		
All the same except for the model name		
Apr. 26, 2021 to May 10, 2021		
No any deviation from the test method		
Normal		
Pass		
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

John Zeng
Project Engineer

May 17, 2021

May 2441

May 17, 2021

May 17, 2021

Approved By

Forrest Lei
Authorized Officer

May 17, 2021

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# 2. GENERAL INFORMATION

# 2.1. PRODUCT DESCRIPTION

The EUT is designed as "Smart Ambiance Light". 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	2.412GHz~2.462GHz		
Output Power (Average)	IEEE 802.11b:15.61dBm; IEEE 802.11g:13.72dBm;		
Catpati Onoi (Attorago)	IEEE 802.11n(20):13.42dBm		
Output Power (Peak)	IEEE 802.11b:18.43dBm; IEEE 802.11g:20.69dBm;		
Output Fower (Feak)	IEEE 802.11n(20):20.69dBm		
Modulation	DSSS(DBPSK/DQPSK/CCK); OFDM(BPSK/QPSK/16-QAM/64-QAM)		
Number of channels	11 Channels		
Hardware Version	V3.0		
Software Version	V3.0		
Antenna Designation	PCB antenna (Comply with requirements of the FCC part 15.203)		
Antenna Gain	1dBi		
Power Supply	DC 3.7V by battery or DC 5V by adapter		

#### 2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
	10	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.

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#### 2.3. IEEE 802.11N MODULATION SCHEME

MCS	Mara	Mallada		NDDOO	NCI	BPS	NDBPS		Data rate(Mbps)	
Index	Nss	Modulation	R	NBPSC					800nsGI	
					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	<u></u> 1	64-QAM	5/6	6	312	648	260	540	65.0	135.0

Symbol	Explanation  Number of spatial streams		
NSS			
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: 2ARPE-SAL** 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 <sub>c</sub> = ±2 %		
Uncertainty of Occupied Channel Bandwidth	U <sub>c</sub> = ±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 amebaZ2\_mptool\_1v3 which can set the EUT into the individual test modes.

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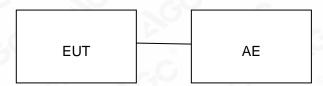


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# 5. SYSTEM TEST CONFIGURATION

# **5.1. CONFIGURATION OF EUT SYSTEM**

Configure:



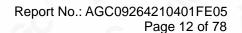
# **5.2. EQUIPMENT USED IN EUT SYSTEM**

Item	Equipment	Model No.	ID or Specification	Remark	
1	Smart Ambiance Light	SAL	2ARPE-SAL	EUT	
2	Adapter	TPA-46050200UU	1.2m unshielded	Accessory	

# **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	15.247 Conducted Spurious Emission	
§15.247	Maximum Conducted Output Power Spectral Density	Compliant
§15.209	5.209 Radiated Emission	
§15.247	§15.247 Band Edges	
§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, 2020	May 14, 2021
LISN	R&S	ESH2-Z5	100086	Jul. 03,2020	Jul. 02, 2021
Test software	FARA	EZ-EMC(Ver. AGC-CON03A1)	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, 2020	May 14, 2021
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 07, 2020	Dec. 06, 2021
2.4GHz Fliter	Micro-tronics	087	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	Weinachel Corp	58-30-33	N/A	Sep. 03, 2020	Sep. 02, 2022
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep.21, 2019	Sep. 20, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	00034609	May. 17, 2019	May. 16, 2021
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May. 17, 2019	May. 16, 2021
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
ANTENNA	SCHWARZBECK	VULB9168	D69250	Sep. 20, 2019	Sep. 19, 2021
Test software	FARA	EZ-EMC (Ver.RA-03A)	N/A	N/A	N/A

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# 7. OUTPUT POWER

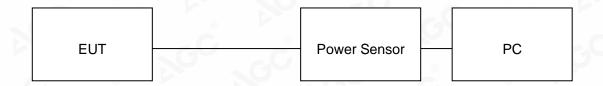
# 7.1. MEASUREMENT PROCEDURE

For average power test:

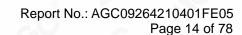
- 1. Connect EUT RF output port to power sensor through an RF attenuator.
- 2. Connect the power sensor to the PC.
- 3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 4. Record the maximum power from the software.

**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
- G	2412	11.91	14.54	≪30	Pass
802.11b	2437	12.19	14.84	<b>\$</b> 0	Pass
	2462	12.31	15.12	<b>\$</b> 0	Pass
802.11g	2412	8.82	16.41	<b>≪3</b> 0	Pass
	2437	9.23	16.75	<b>≼3</b> 0	Pass
	2462	9.46	17.03	<b>\$</b> 0	Pass
802.11n20	2412	8.84	16.56	<b>₹30</b>	Pass
	2437	9.22	16.84	<b>≪3</b> 0	Pass
	2462	9.51	17.08	<b>\$</b> 0	Pass

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#### 8. BANDWIDTH

# **8.1. MEASUREMENT PROCEDURE**

#### 6dB bandwidth:

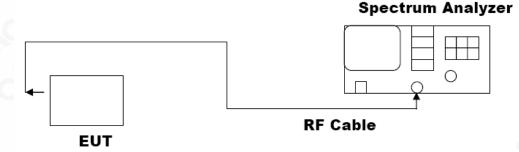
- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 kHz, VBW≥3×RBW.
- 4. Set SPA Trace 1 Max hold, then View.

# Occupied bandwidth:

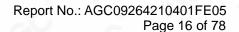
- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hoping channel
  The nominal IF filter bandwidth (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

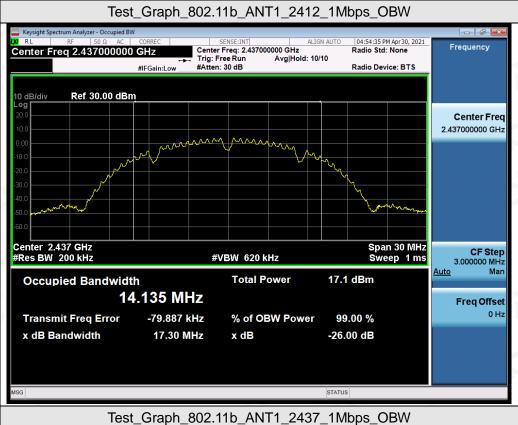
	Test Data o	of Occupied Bandwid	dth and DTS Bandwi	dth	
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-6dB Bandwidth (MHz)	Limits (MHz)	Pass or Fail
- C	2412	14.143	9.098	∌.5	Pass
802.11b	2437	14.135	9.098	∌.5	Pass
	2462	14.140	9.081	∌.5	Pass
802.11g	2412	16.646	16.354	₹9.5	Pass
	2437	16.646	16.350	₹9.5	Pass
	2462	16.699	16.389	∌.5	Pass
802.11n20	2412	17.846	17.566	∌.5	Pass
	2437	17.809	17.586	∌.5	Pass
	2462	17.809	17.563	∌.5	Pass

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# **Test Graphs of Occupied Bandwidth**





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Auto

Freq Offset

15.3 dBm

99.00 %

-26.00 dB





Test\_Graph\_802.11g\_ANT1\_2412\_6Mbps\_OBW

**Total Power** 

x dB

% of OBW Power

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**Occupied Bandwidth** 

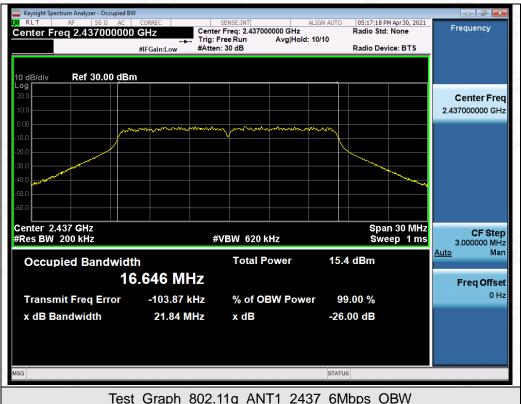
Transmit Freq Error x dB Bandwidth

16.646 MHz

-55.920 kHz

21.78 MHz

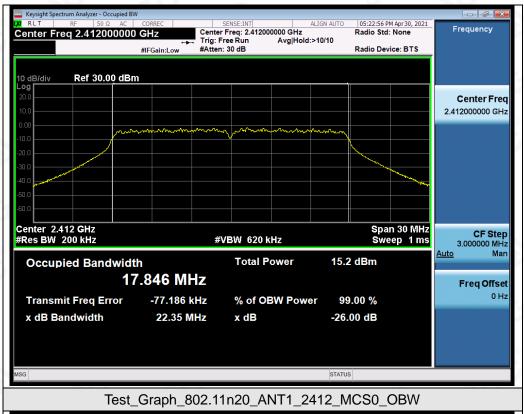


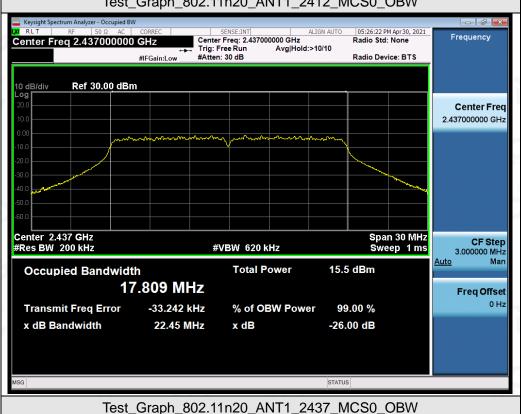




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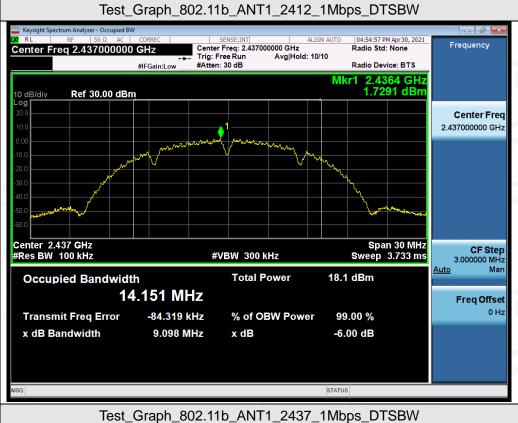


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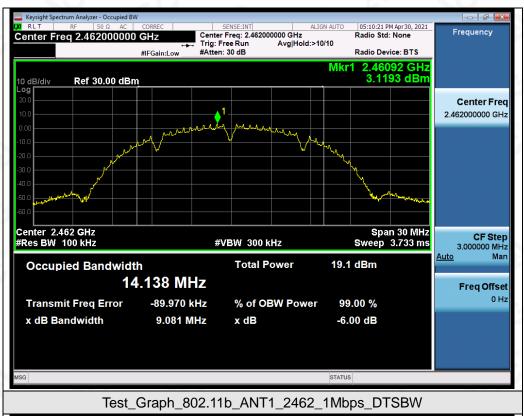
#### **Test Graphs of DTS Bandwidth**





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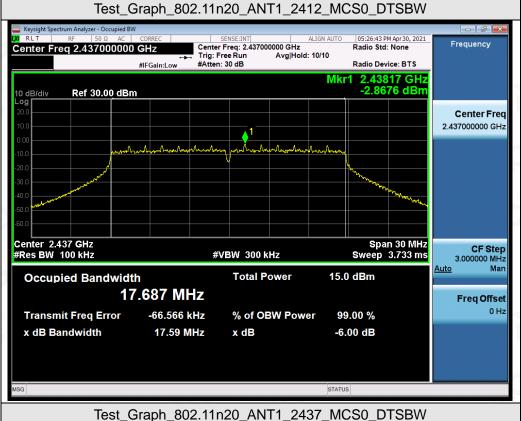




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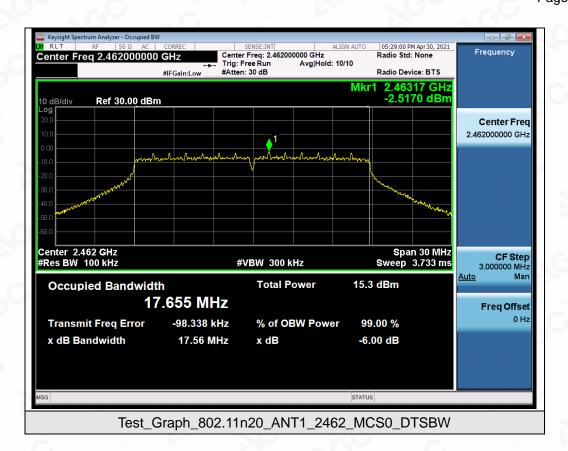






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# 9. CONDUCTED SPURIOUS EMISSION

#### 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

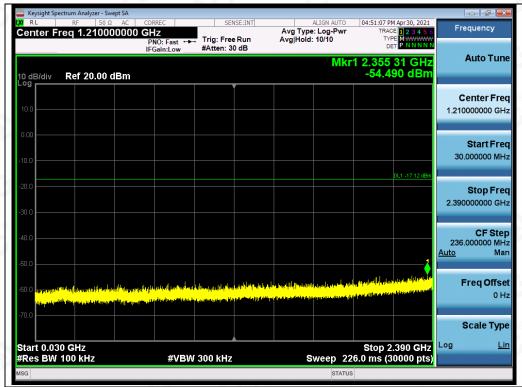
LIMITS AND MEASUREMENT RESULT					
Annii alda Limita	Measurement Result				
Applicable Limits	Test Data	Criteria			
In any 100 KHz Bandwidth Outside the	At least -20dBc than the limit				
frequency band in which the spread spectrum	Specified on the BOTTOM	PASS			
intentional radiator is operating, the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

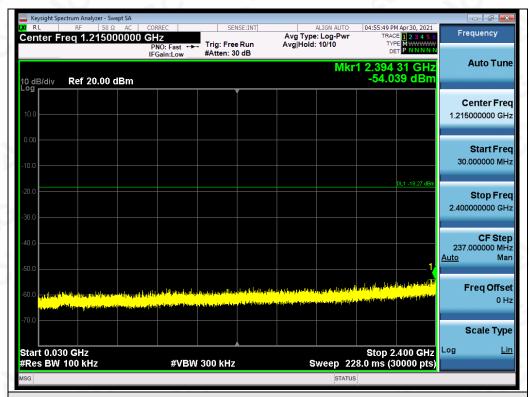


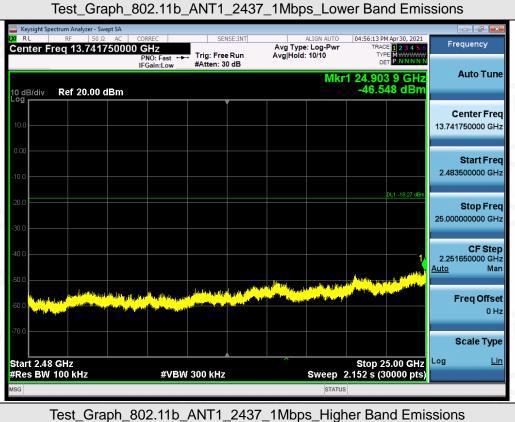
Test\_Graph\_802.11b\_ANT1\_2412\_1Mbps\_Higher Band Emissions

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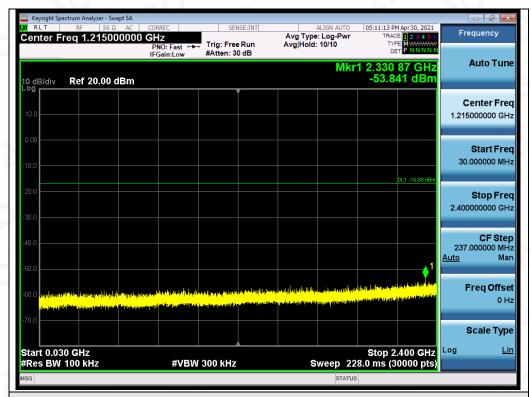


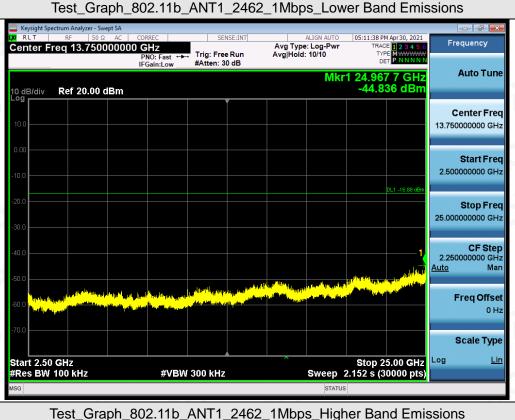




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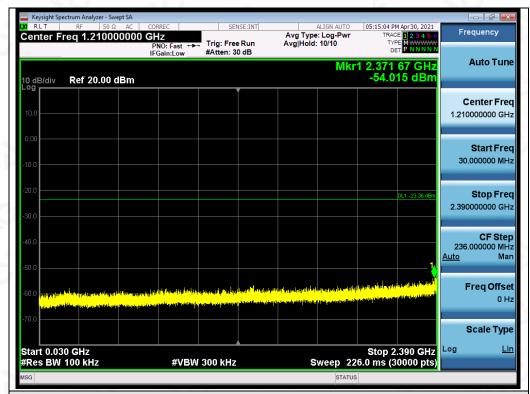


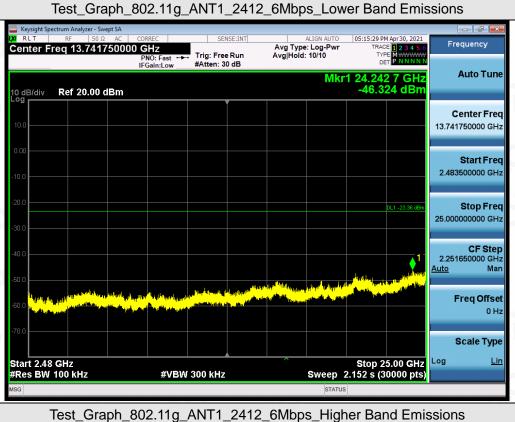




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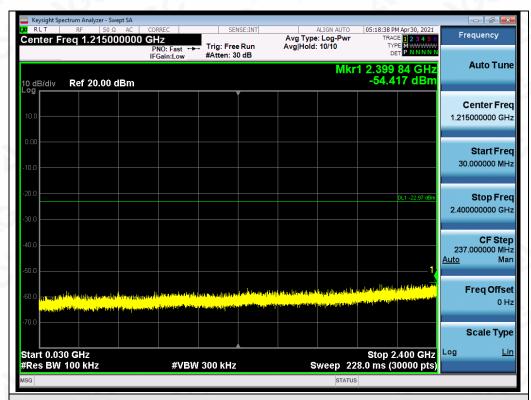






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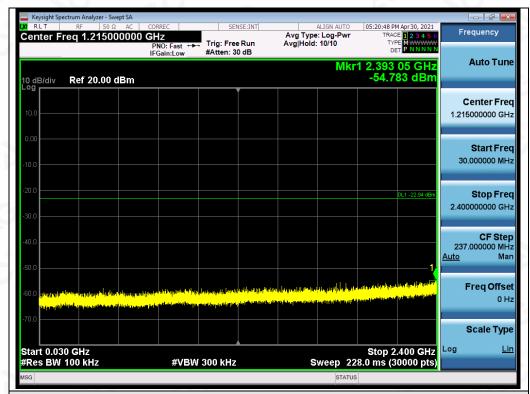


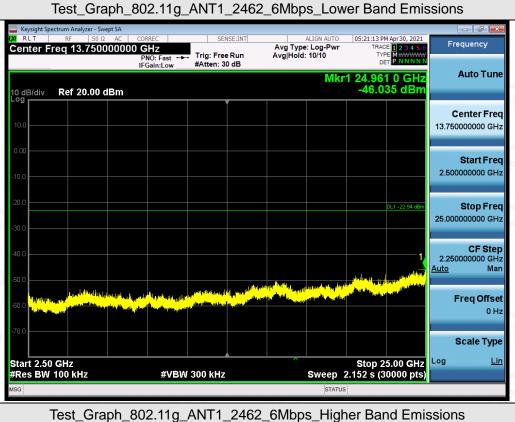


Test\_Graph\_802.11g\_ANT1\_2437\_6Mbps\_Higher Band Emissions

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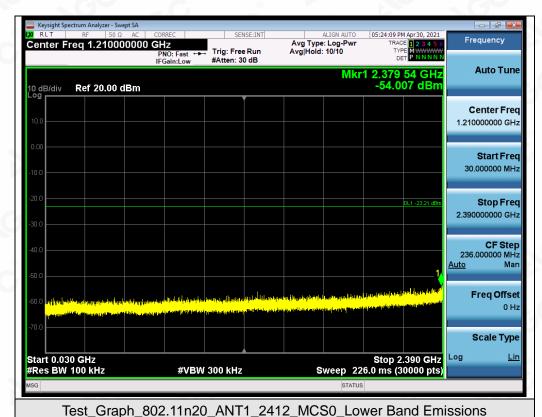


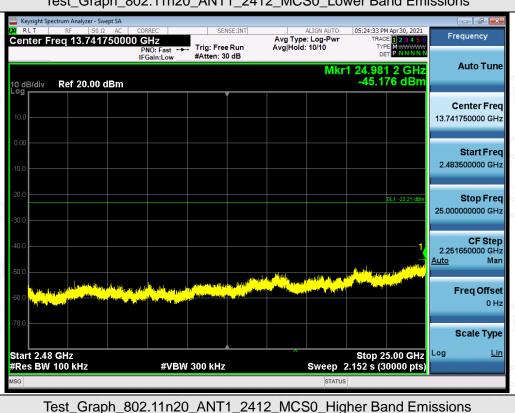




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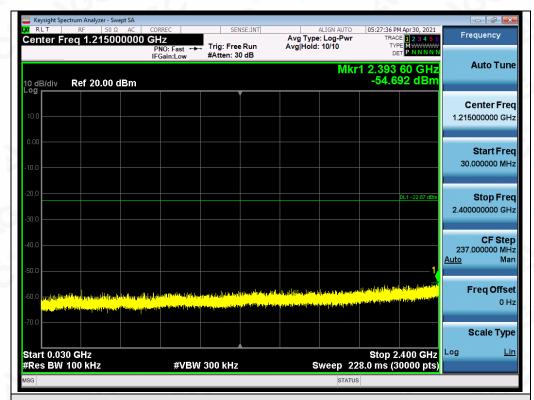






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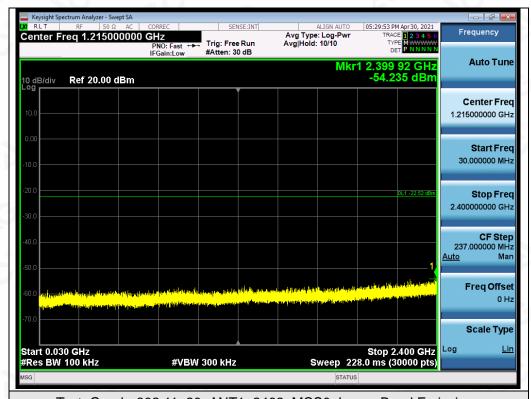




Test\_Graph\_802.11n20\_ANT1\_2437\_MCS0\_Higher Band Emissions

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Test\_Graph\_802.11n20\_ANT1\_2462\_MCS0\_Higher Band Emissions

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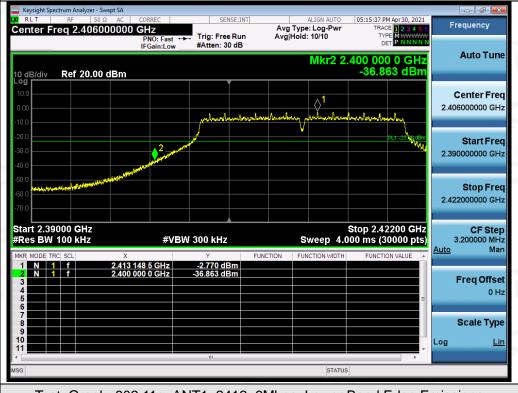
g/Inspection



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



# Test\_Graph\_802.11b\_ANT1\_2412\_1Mbps\_Lower Band Edge Emissions



Test\_Graph\_802.11g\_ANT1\_2412\_6Mbps\_Lower Band Edge Emissions

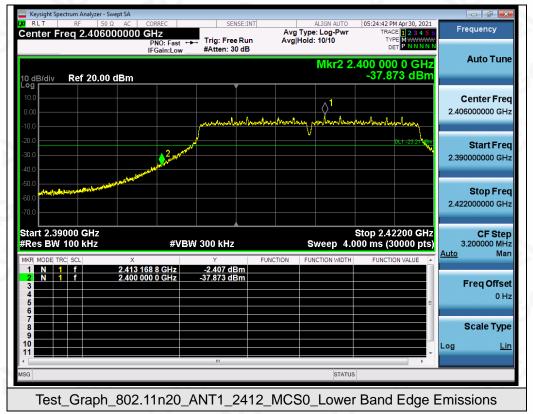
Compliance Bedicated Fest Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written exchorization 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 15day after the issuence of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc@agc-cert.com.

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g/Inspection
The test results
the test report.





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	-4.057	-12.296		Pass ®		
802.11b	2437	-3.738	-11.977	-88	Pass		
	2462	-0.304	-8.543		Pass		
60	2412	-8.759	-16.998	-88	Pass		
802.11g	2437	-8.241	-16.48		Pass		
	2462	-7.624	-15.863		Pass		
60	2412	-9.316	-17.555		Pass		
802.11n20	2437	-7.977	-16.216		Pass		
	2462	-8.062	-16.301		Pass		

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

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