Guangdong Hailea Group Co., Ltd.

RF TEST REPORT

Report Type:
FCC Part 15.247 RF report

Model:
74012
74013

REPORT NUMBER:
220302634SHA-003

ISSUE DATE:
Aug 17, 2022

DOCUMENT CONTROL NUMBER:
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TEST REPORT

Report no. 220302634SHA-003

Applicant:	Guangdong Hailea Group Co., Ltd. Hailea Industrial Zone, Hailea Road, Raoping County, Chaozhou, Guangdong Province 515700, China.
Manufacturer:	Guangdong Hailea Group Co., Ltd. Hailea Industrial Zone, Hailea Road, Raoping County, Chaozhou, Guangdong Province 515700, China.
PRODUCT NAME:	Smart Pond Thermometer
TYPE/MODEL:	74012 74013
FCC ID:	2AVM6-74013

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:
47CFR Part 15 (2020): Radio Frequency Devices (Subpart C) **ANSI C63.10 (2013):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

PREPARED BY:	**REVIEWED BY:**
Scout Gong	Wakeyou Wang
Project Engineer	Reviewer

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Content

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Revision History

Report No.	Version	Description	Issued Date
220302634SHA-003	Rev. 01	Initial issue of report	Aug 17, 2022

Measurement result summary

TEST ITEM	FCC REFERANCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)(3)	Pass
Power spectrum density	15.247(e)	Pass
Emission outside the frequency band	15.247(d)	Pass
Radiated Emissions in restricted frequency bands	15.247(d), 15.205&15.209	Pass
Power line conducted emission	15.207(a)	Pass
Occupied bandwidth	-	Tested
Antenna requirement	15.203	Pass

Notes: 1: NA =Not Applicable

TEST REPORT

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Smart Pond Thermometer
Type/Model/PMN/HVIN:	74012 74013
Description of EUT:	The EUTs covered by this report are smart pond thermometers with Wi-Fi function. There are two models, they use the same electrical system, the only different is that the model 74013 equipped with low-voltage transformer. After assessment, model 74013 was tested as representative. The worst RF data were listed in this report.
Rating:	AC Adaptor: Input 120VAC, 60Hz, Output 12VDC, 300mA, 3.6W RF module: 3.3V DC
Category of EUT:	Class B
Brand name:	/
EUT type:	☒ Tabletop ☐ Floor standing
Software Version:	/
Hardware Version:	/
Sample Identification No.:	0220803-15-002
Sample received date:	July 22, 2022
Date of test:	July 23, 2022~August 10, 2022

1.2 Technical Specification

Frequency Band:	2400MHz ~ 2483.5MHz
Support Standards:	IEEE 802.11b, IEEE 802.11g, IEEE 802.11n(HT20)
Type of Modulation:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n(HT20): OFDM (64-QAM, 16-QAM, QPSK, BPSK)
Channel Number:	11 Channels for 802.11b, 802.11g and 802.11n(HT20)
Data Rate:	IEEE 802.11b: Up to 11Mbps IEEE 802.11g: Up to 54Mbps IEEE 802.11n(HT20): Up to MCS7
Channel Separation:	5 MHz
Antenna:	PCB Antenna, 2dBi Gain

1.3 Antenna information

Mode	Tx/Rx Function	Beamforming function	CDD function	Directional gain (dBi)
802.11b	1Tx/1Rx	NO	NO	-
802.11g	1Tx/1Rx	NO	NO	-
802.11n(HT20)	1Tx/1Rx	NO	NO	-

1.4 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road (North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN1175
	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

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Power line conducted emission test and Radiated Emissions in restricted frequency bands test were sub-contracted.

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng Science and Technology Park, Longhua District, Shenzhen, China 518109

Telephone: +86 (0) 755 2823 0888

Fax: +86 (0) 755 2823 0886

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

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

IC-Registration No.: 21600-1

The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 21600-1.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2020)
ANSI C63.10 (2013)
KDB 558074 (v05r02)

2.2 Mode of operation during the test

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

Software name	Manufacturer	Version	Supplied by
EspRFT Test Tool	-	V2.8	Client

The lowest, middle and highest channel were tested as representatives.

Frequency Band (MHz)	Mode	Lowest (MHz)	Middle (MHz)	Highest (MHz)
2412-2462	802.11b	2412	2437	2462
	802.11g	2412	2437	2462
	802.11n(HT20)	2412	2437	2462

Data rate and Power setting:
The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases. After this pre-scan, we choose the following table of the data rata as the worst case.

Frequency Band (MHz)	Mode	Worst case data rate	Power Setting
2412-2462	802.11b	1Mbps	Default
	802.11g	6Mbps	Default
	802.11n(HT20)	MCS0	Default

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	e3	Audix	9.160323
Radiated emission	e3	Audix	9.20151119i

2.4 Test peripherals list

Item No.	Name	Brand and Model	Description
1	Laptop computer	DELL, Latitude 3400	NA

2.5 Test environment condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	24°C	53%RH
Maximum conducted output power and e.i.r.p.		
Power spectrum density		
Emission outside the frequency band		
Occupied bandwidth		
Radiated Emissions in restricted frequency bands	24°C	49%RH
Power line conducted emission	25°C	48%RH

2.6 Instrument list

Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	3m Chamber SAC	ETS-LINDGREN	3m	NA	2024-01-21
☒	Receiver	R&S	ESIB26	100114	2022-11-04
☒	Broadband Antenna (Pre-amplifier)	ETS-Lindgren	3142E-PA	00201891	2023-04-29
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	2023-11-10
☒	Preamplifier	HP	8447F	2805A02960	2022-11-04
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-Lindgren	3117-PA	00201541	2023-04-29
☒	Pre-amplifier	ETS-Lindgren	00118385	00201874	2022-11-05
☒	Band Reject Filter(2400MHz~2500MHz)	Micro-Tronics	BRM50702	G248	2022-11-05
☒	Test Software	Audix	e3	Software Version: 9.160323	
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2023-03-14
☒	Power sensor	Agilent	U2021XA	EC 5338-1	2023-03-14
☒	Vector Signal Generator	Agilent	N5182B	EC 5175	2023-03-14
☒	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2023-03-14
☒	Test Receiver	R&S	ESCI 7	EC 4501	2022-12-09
☒	Climate chamber	GWS	MT3065	EC 6021	2023-03-06
☒	Spectrum Analyzer	Keysight	N9030b	EC 6078	2022-09-08
☒	Universal Radio Communication Tester	R&S	CMW500	EC 6209	2023-01-20
☒	Signal generator	Agilent	N5182A	EC 6172	2022-11-18
☒	Signal generator	Agilent	N5181A	EC 6171	2022-11-18
Conducted Emission Test Equipment List					
Used	Equipment	Manufacturer	Model No.	Serial Number	Due date
☒	Receiver	R&S	ESR7	1316.3003K07-101181-K3	2022-11-04
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	2022-11-04
☒	LISN	R&S	ESH2-Z5	860014/024	2022-11-04

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2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	± 0.68dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 4.80dB
Emission outside the frequency band	± 4.80dB
Power line conducted emission	± 2.7dB

3 Minimum 6dB bandwidth

Test result: Pass

3.1 Limit

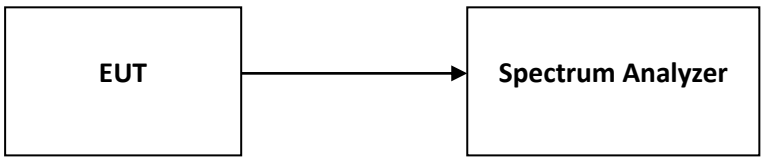
For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

3.2 Measurement Procedure

The EUT was tested according to Subclause 11.8 of ANSI C63.10.

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

3.3 Test Configuration



3.4 Test Results of Minimum 6dB bandwidth

Please refer to Appendix A

4 Maximum conducted output power and e.i.r.p.

Test result: Pass

4.1 Limit

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 W. (The e.i.r.p. shall not exceed 4 W)

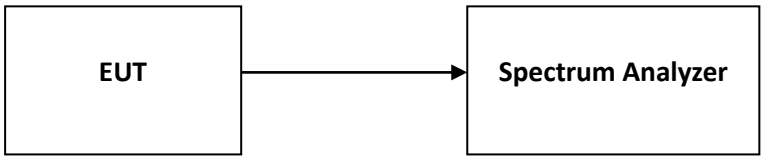
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

4.2 Measurement Procedure

The EUT was tested according to Subclause 11.9.2.2 of ANSI C63.10.

a) Measure the duty cycle, x, of the transmitter output signal as described in Section 6.0.
b) Set span to at least 1.5 x OBW.
c) Set RBW = 1 % to 5 % of the OBW, not to exceed 1 MHz.
d) Set VBW ≥ 3 x RBW.
e) Number of points in sweep ≥ 2 x span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
f) Sweep time = auto.
g) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
h) Do not use sweep triggering. Allow the sweep to “free run”.
i) Trace average at least 100 traces in power averaging (i.e., RMS) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the on and off periods of the transmitter.
j) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
k) Add 10 log (1/x), where x is the duty cycle, to the measured power in order 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 %.

4.3 Test Configuration



4.4 Test Results of Maximum conducted output power

Please refer to Appendix A.
Note: tested with power sensor.

5 Power spectrum density

Test result: **Pass**

5.1 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

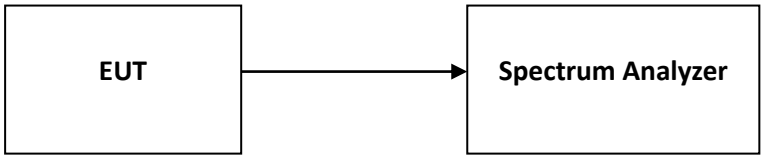
5.2 Measurement Procedure

The EUT was tested according to Subclause 11.10 of ANSI C63.10.

This procedure is applicable when the EUT cannot be configured to transmit continuously (i.e., duty cycle < 98 %), and when sweep triggering/signal gating cannot be used to measure only when the EUT is transmitting at its maximum power control level, and when the transmission duty cycle is constant (i.e., duty cycle variations are less than ± 2 %):

a) Measure the duty cycle (x) of the transmitter output signal as described in Section 6.0.
b) Set instrument center frequency to DTS channel center frequency.
c) Set span to at least 1.5 x OBW.
d) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
e) Set VBW ≥3 x RBW.
f) Detector = power averaging (RMS) or sample detector (when RMS not available).
g) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
h) Sweep time = auto couple.
i) Do not use sweep triggering. Allow sweep to “free run”.
j) Employ trace averaging (RMS) mode over a minimum of 100 traces.
k) Use the peak marker function to determine the maximum amplitude level.
l) Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the average PSD during the actual transmission time.
m) If resultant value exceeds the limit, then reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

5.3 Test Configuration



5.4 Test Results of Power spectrum density

Please refer to Appendix A

6 Emission outside the frequency band

Test result: **Pass**

6.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

6.2 Measurement Procedure

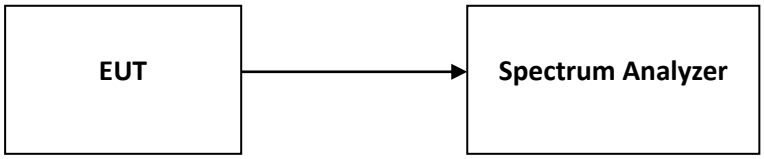
The EUT was tested according to Subclause 11.11 of ANSI C63.10.

Reference level measurement
Establish a reference level by using the following procedure:
a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.

Emission level measurement
a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ 3 x RBW.
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

6.3 Test Configuration



6.4 The results of Emission outside the frequency band

Please refer to Appendix A

7 Radiated Emissions in restricted frequency bands

Test result: **Pass**

7.1 Limit

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified showed as below:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

7.2 Measurement Procedure

The EUT was tested according to Subclause 11.12 of ANSI C63.10.

For Radiated emission below 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c) Both X and Y axes of the antenna are set to make the measurement.
d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c) The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

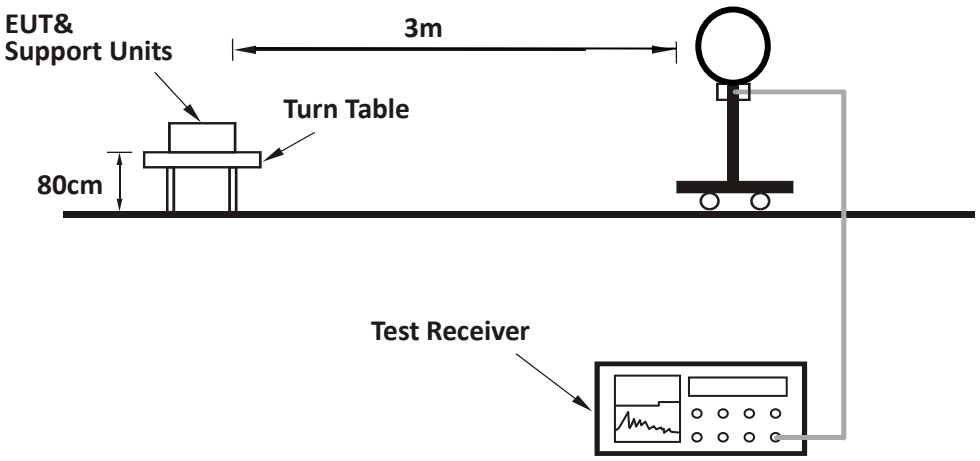
f) The test-receiver system was set to peak and average detector function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

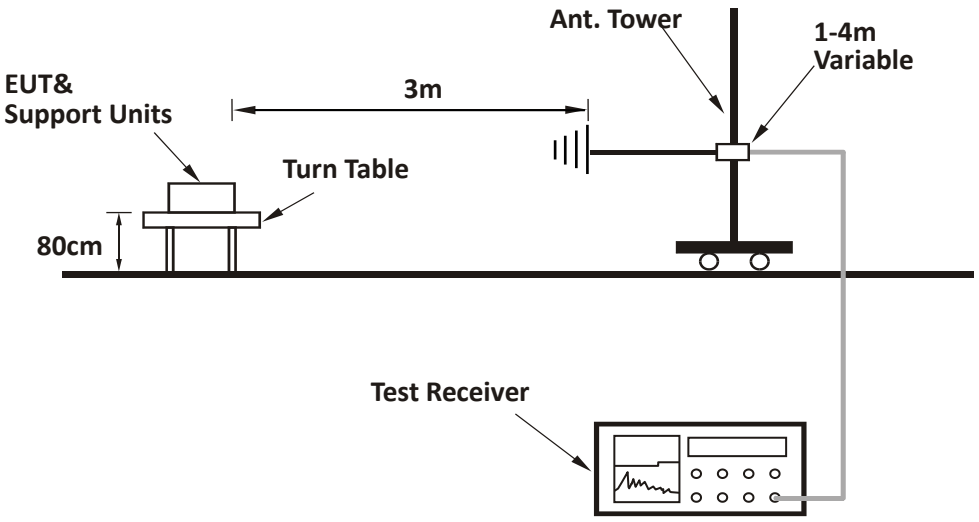
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 3 x RBW (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions were reported.

7.3 Test Configuration

For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



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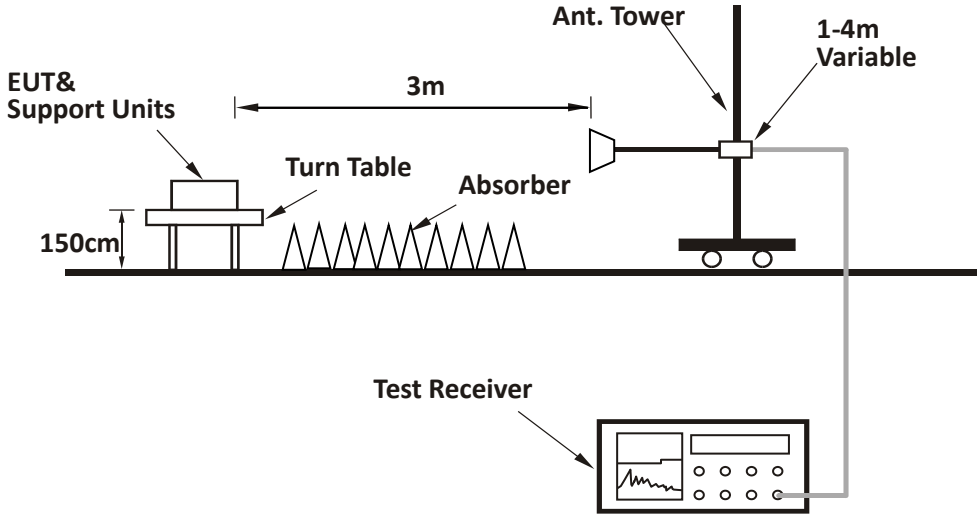
For Radiated emission above 1GHz:



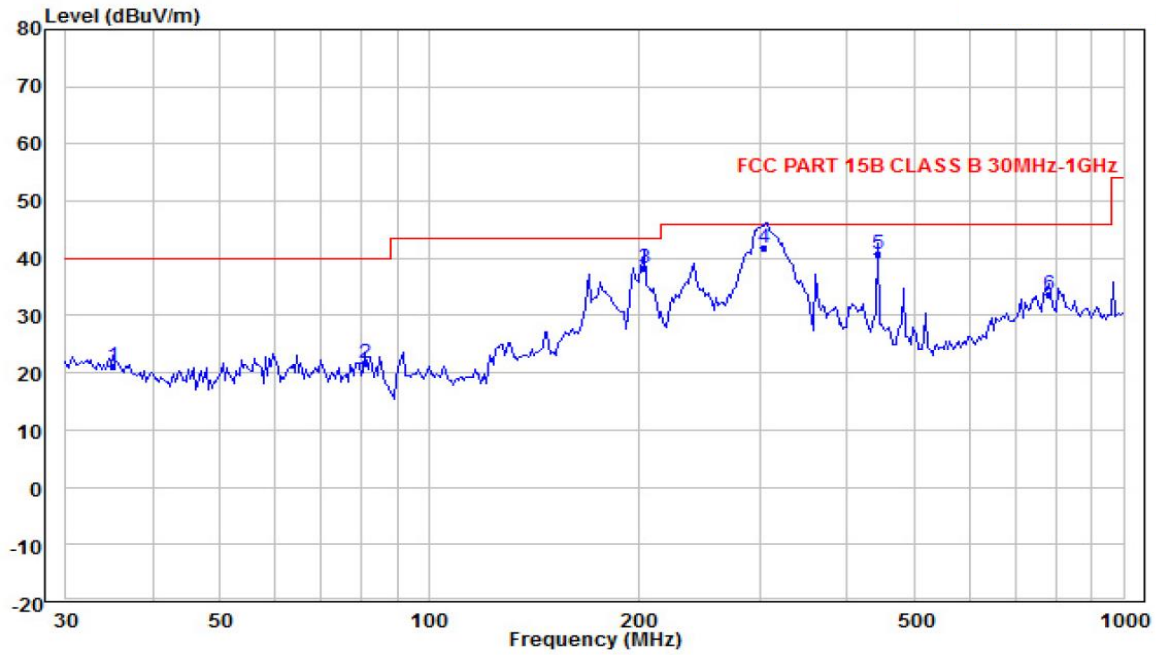
7.4 Test Results of Radiated Emissions

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

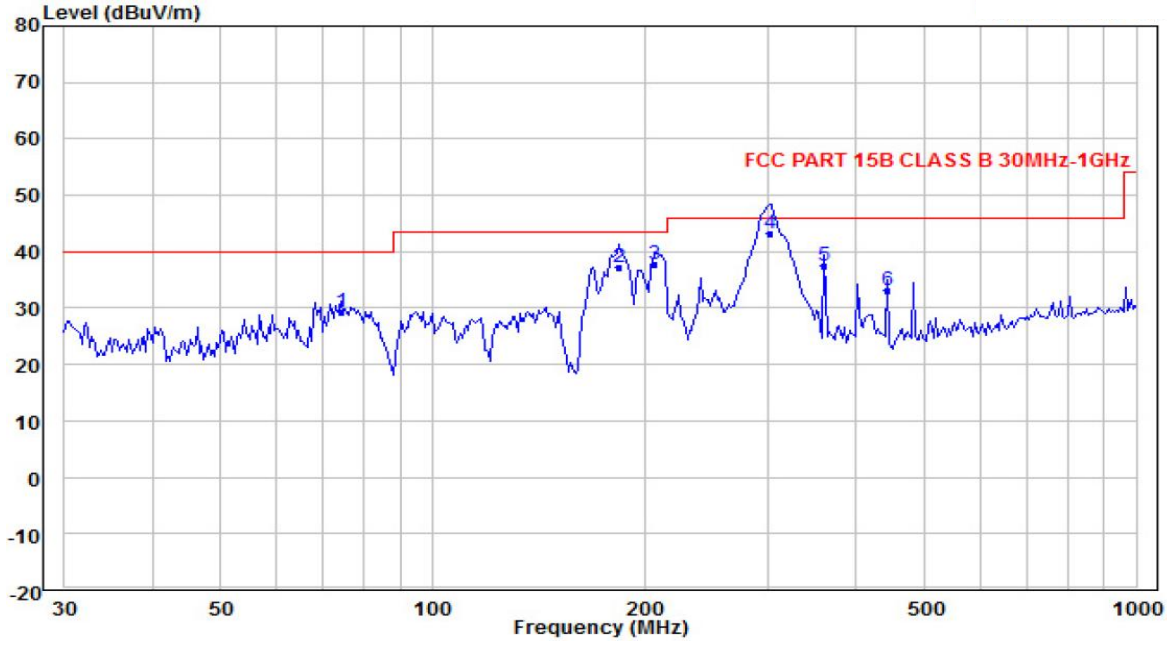
We test all models, and the worst waveform from 30MHz to 1000MHz is listed as below:

30M~1GHz:

Horizontal



Vertical



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Test data:

Test Data:

Antenna Polarization	Frequency (MHz)	Measured level (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detector
H	35.01	21.14	24.53	40.00	18.86	QP
	80.80	21.70	11.43	40.00	18.30	QP
	204.30	38.26	17.45	43.50	5.24	QP
	302.81	41.96	21.46	46.00	4.04	QP
	442.57	40.68	24.62	46.00	5.32	QP
	781.96	33.62	31.25	46.00	12.38	QP
V	74.27	29.21	11.27	40.00	10.79	QP
	183.86	37.30	17.98	43.50	5.20	QP
	207.19	37.69	17.36	43.50	5.81	QP
	301.43	43.26	21.45	46.00	2.74	QP
	360.97	37.41	23.32	46.00	8.59	QP
	442.57	33.10	24.62	46.00	12.90	QP

Remark:

1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Measured Level = Original Receiver Reading + Correct Factor
3. Margin= Limit - Measured Level
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

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Test data:
The emission was conducted from 1GHz to 25GHz
We test all models and the worst result above 1GHz is listed as below.

802.11b

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detector
L	H	2390.00	50.00	74.00	24.00	PK
	H	2390.00	38.90	54.00	15.10	AV
	V	2390.00	44.00	74.00	30.00	PK
	V	2390.00	29.20	54.00	24.80	AV
	H	4824.00	35.80	74.00	38.20	PK
	V	4824.00	37.90	74.00	36.10	PK
M	H	4874.00	37.40	74.00	36.60	PK
	V	4874.00	36.60	74.00	37.40	PK
H	H	2483.50	49.10	74.00	24.90	PK
	H	2483.50	36.30	54.00	17.70	AV
	V	2483.50	44.70	74.00	29.30	PK
	V	2483.50	30.00	54.00	24.00	AV
	H	4824.00	35.60	74.00	38.40	PK
	V	4824.00	37.50	74.00	36.50	PK

TEST REPORT

802.11g

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detector
L	H	2390.00	69.30	74.00	4.70	PK
	H	2390.00	49.60	54.00	4.40	AV
	V	2390.00	48.90	74.00	25.10	PK
	V	2390.00	32.90	54.00	21.10	AV
	H	4824.00	34.80	74.00	39.20	PK
	V	4824.00	36.60	74.00	37.40	PK
M	H	4874.00	35.40	74.00	38.60	PK
	V	4874.00	35.90	74.00	38.10	PK
H	H	2483.50	62.80	74.00	11.20	PK
	H	2483.50	46.80	54.00	7.20	AV
	V	2483.50	50.20	74.00	23.80	PK
	V	2483.50	33.70	54.00	20.30	AV
	H	4824.00	36.50	74.00	37.50	PK
	V	4824.00	36.20	74.00	37.80	PK

TEST REPORT

802.11n(HT20)

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detector
L	H	2390.00	70.30	74.00	3.70	PK
	H	2390.00	51.20	54.00	2.80	AV
	V	2390.00	48.60	74.00	25.40	PK
	V	2390.00	33.50	54.00	20.50	AV
	H	4824.00	35.30	74.00	38.70	PK
	V	4824.00	35.70	74.00	38.30	PK
M	H	4874.00	36.80	74.00	37.20	PK
	V	4874.00	36.10	74.00	37.90	PK
H	H	2483.50	66.20	74.00	7.80	PK
	H	2483.50	48.70	54.00	5.30	AV
	V	2483.50	51.20	74.00	22.80	PK
	V	2483.50	34.60	54.00	19.40	AV
	H	4824.00	36.70	74.00	37.30	PK
	V	4824.00	36.90	74.00	37.10	PK

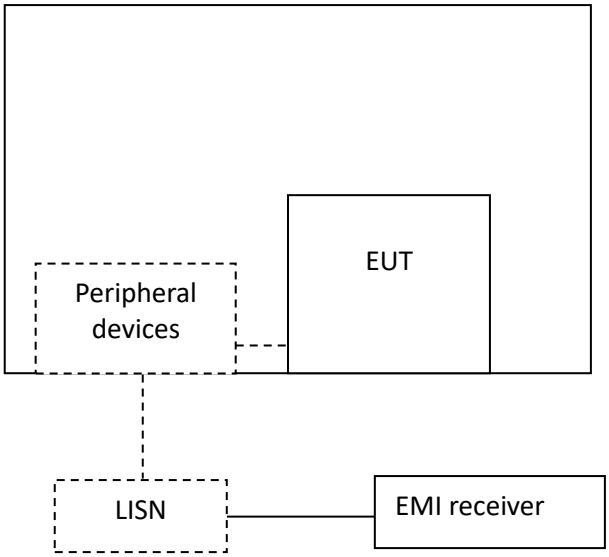
8 Power line conducted emission

Test result: **Pass**

8.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

8.2 Test Configuration



8.3 Measurement Procedure

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

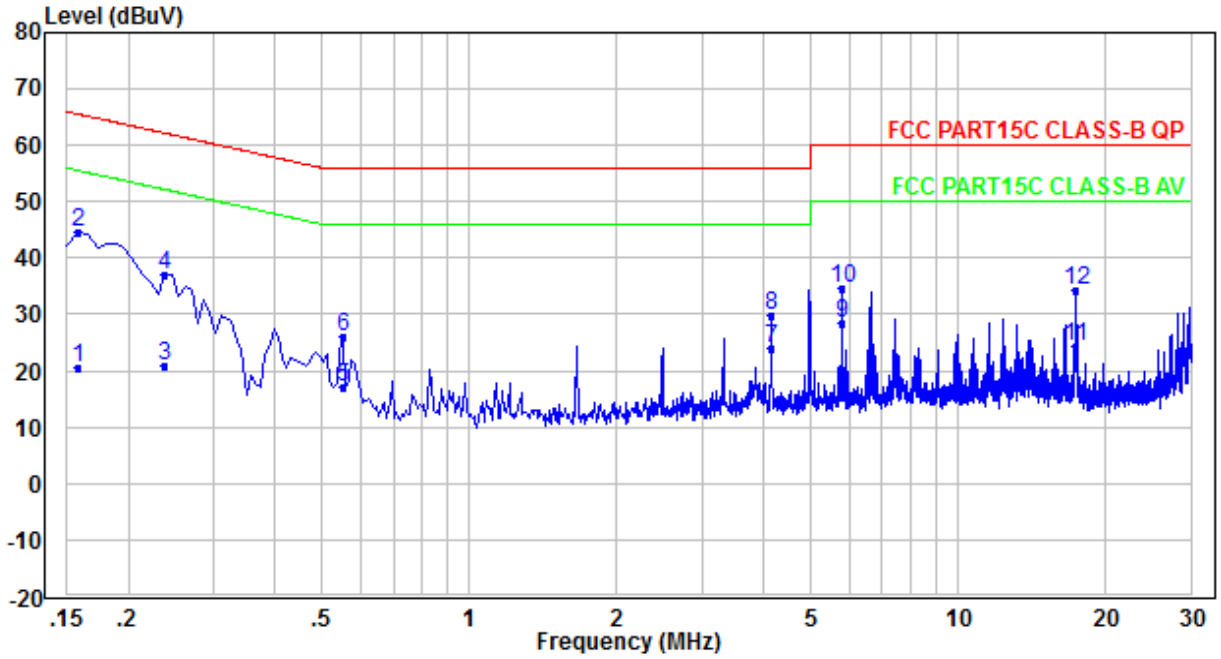
The bandwidth of the test receiver is set at 9 kHz.

TEST REPORT

8.4 Test Results of Power line conducted emission

Test Curve:

L Line

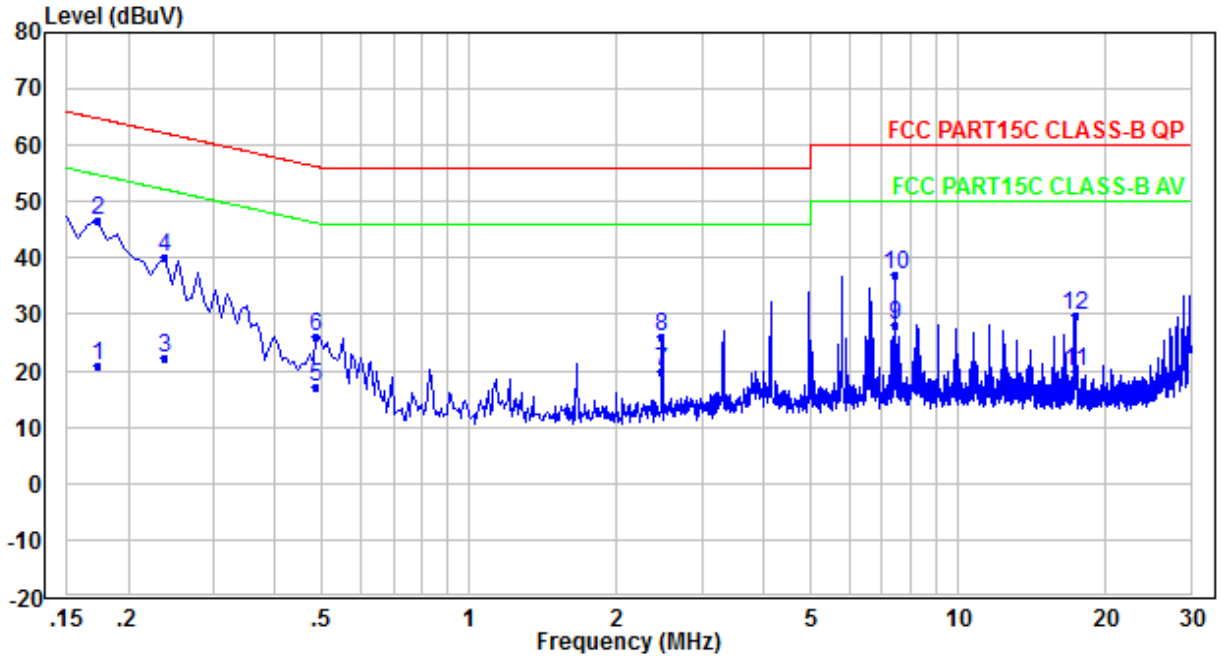


Test Data:

Frequency (MHz)	QuasiPeak (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)	CAverage (dBµV)	Margin - AV (dB)	Limit - AV (dBµV)
0.158	44.68	20.89	65.57	20.68	34.89	55.57
0.238	37.04	25.13	62.17	21.04	31.13	52.17
0.550	26.15	29.85	56.00	17.15	28.85	46.00
4.157	29.94	26.06	56.00	23.94	22.06	46.00
5.813	34.53	25.47	60.00	28.53	21.47	50.00
17.387	34.44	25.56	60.00	24.44	25.56	50.00

TEST REPORT

N Line



Test Data:

Frequency (MHz)	QuasiPeak (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)	CAverage (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.174	46.80	17.97	64.77	20.80	33.97	54.77
0.237	40.29	21.88	62.17	22.29	29.88	52.17
0.485	25.96	30.28	56.24	16.96	29.28	46.24
2.478	26.02	29.98	56.00	20.02	25.98	46.00
7.453	37.01	22.99	60.00	28.01	21.99	50.00
17.363	29.94	30.06	60.00	19.94	30.06	50.00

Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Corrected Reading = Original Receiver Reading + Correct Factor

3. Margin = Limit - Corrected Reading

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

9 Occupied Bandwidth

Test result: **Pass**

9.1 Limit

None

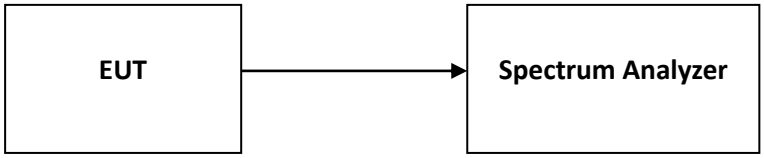
9.2 Measurement Procedure

The occupied bandwidth per RSS-Gen Issue 4 Clause 6.6 was measured using the Spectrum Analyzer.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

9.3 Test Configuration



9.4 The results of Occupied Bandwidth

Please refer to Appendix A

10 Antenna requirement

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 shall be considered sufficient to comply with the provisions of this section.

Result:
EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

Appendix A: Test results

Minimum 6dB bandwidth

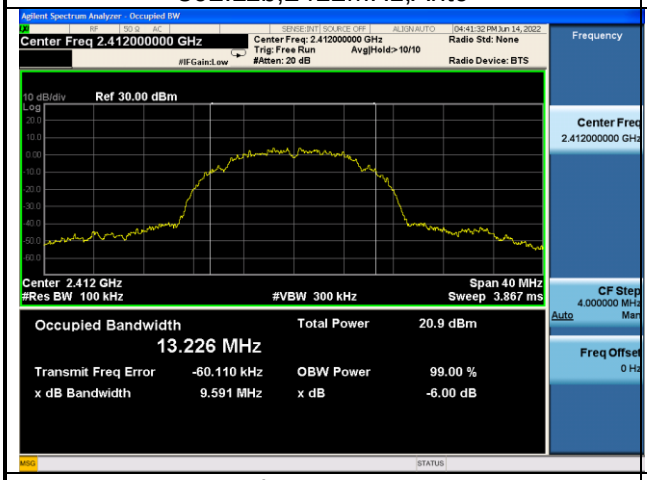
Test Data

WLAN Occupied 6dB Bandwidth				
Mode	Test Frequency (MHz)	Ant	Occupied Bandwidth (MHz)	Result
802.11b	2412	Ant0	9.591	Pass
802.11b	2437	Ant0	9.592	Pass
802.11b	2462	Ant0	9.585	Pass
802.11g	2412	Ant0	16.46	Pass
802.11g	2437	Ant0	16.45	Pass
802.11g	2462	Ant0	16.46	Pass
802.11n (HT20)	2412	Ant0	17.32	Pass
802.11n (HT20)	2437	Ant0	17.34	Pass
802.11n (HT20)	2462	Ant0	17.33	Pass

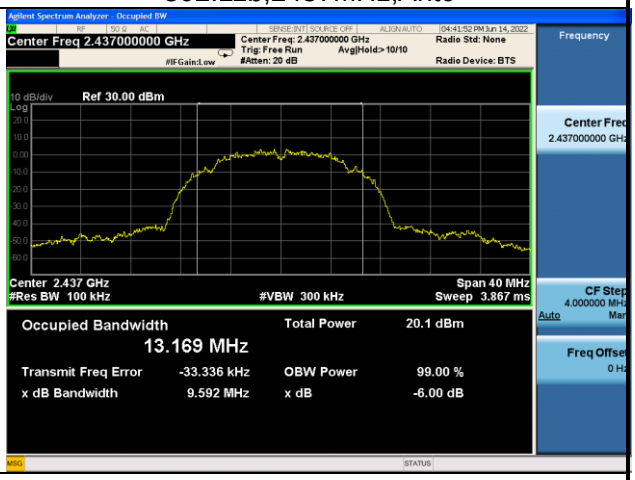
TEST REPORT

Test Plots

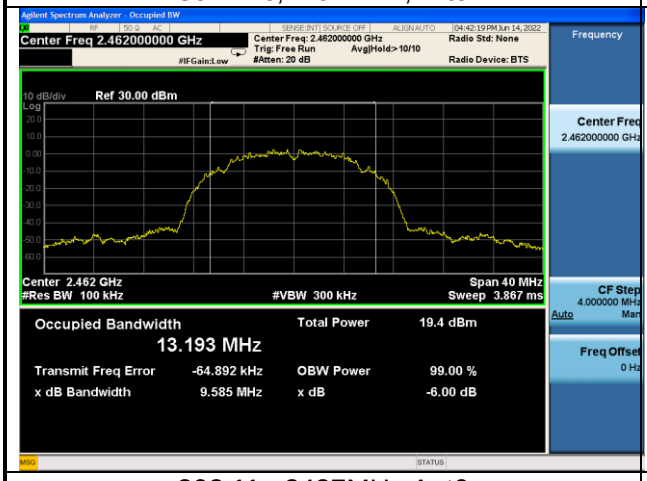
802.11b,2412MHz,Ant0



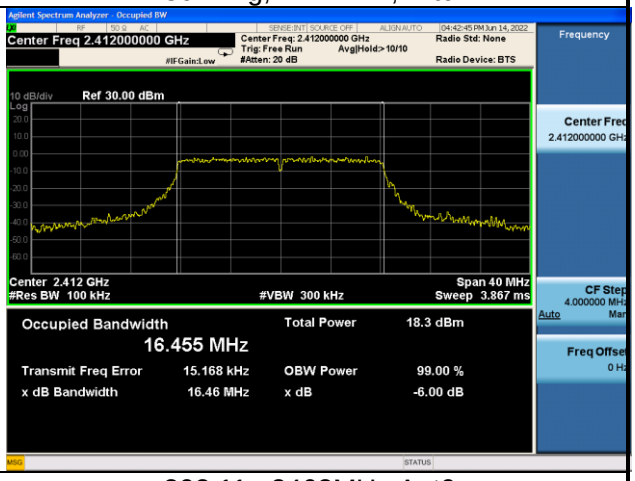
802.11b,2437MHz,Ant0



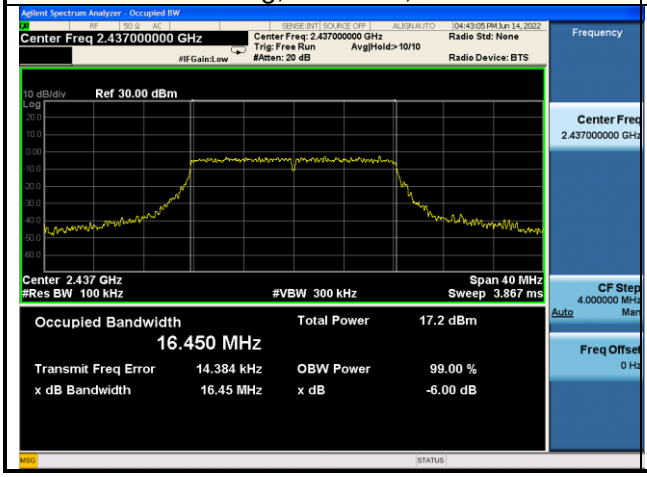
802.11b,2462MHz,Ant0



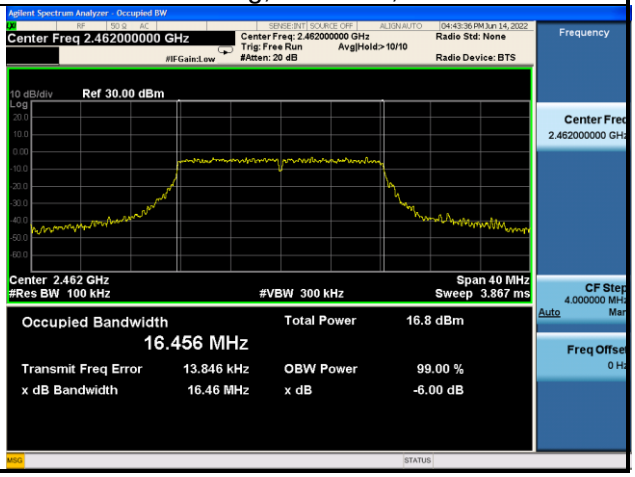
802.11g,2412MHz,Ant0



802.11g,2437MHz,Ant0

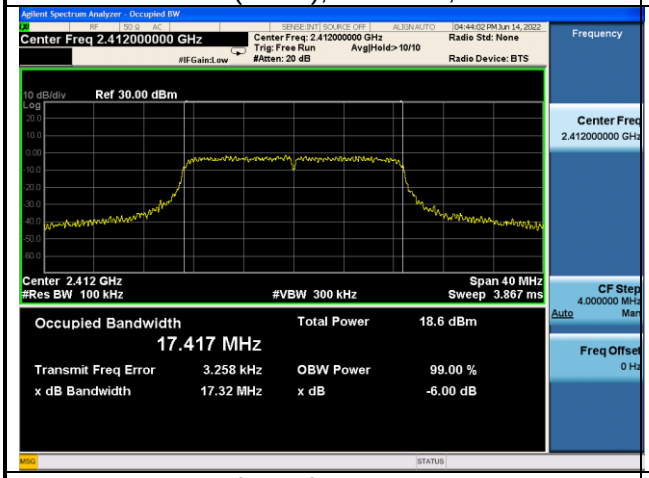


802.11g,2462MHz,Ant0

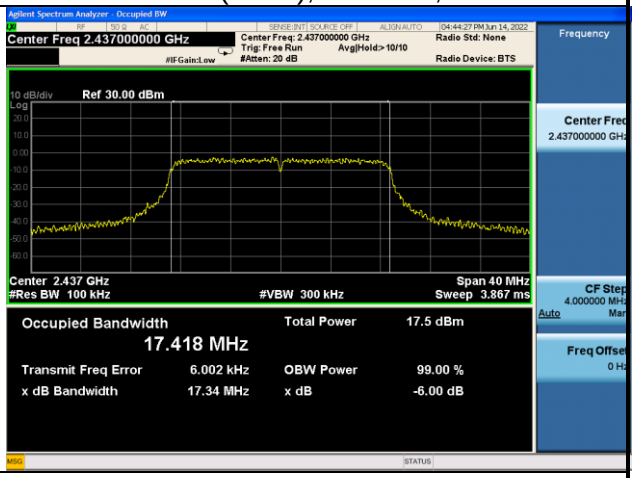


TEST REPORT

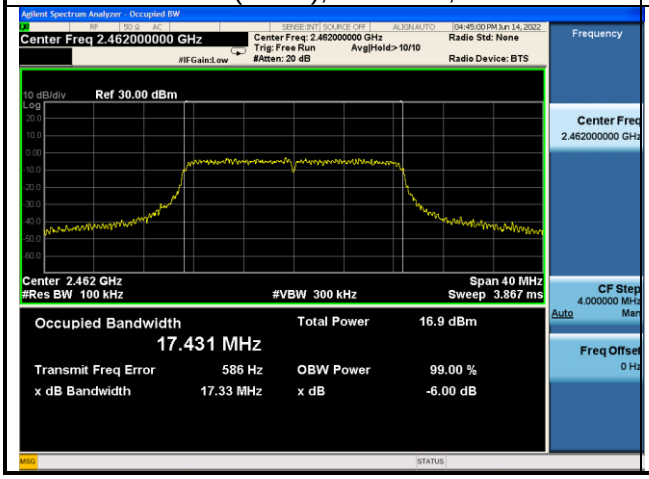
802.11n(HT20),2412MHz,Ant0



802.11n(HT20),2437MHz,Ant0



802.11n(HT20),2462MHz,Ant0



10.1 Occupied Bandwidth

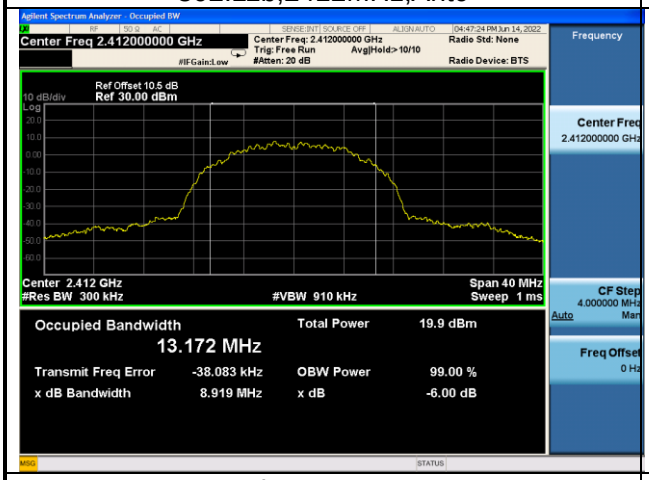
Test Data

WLAN 99% Occupied Bandwidth				
Mode	Test Frequency (MHz)	Ant	99% Occupied Bandwidth (MHz)	Result
802.11b	2412	Ant0	13.172	Pass
802.11b	2437	Ant0	13.156	Pass
802.11b	2462	Ant0	13.140	Pass
802.11g	2412	Ant0	16.573	Pass
802.11g	2437	Ant0	16.559	Pass
802.11g	2462	Ant0	16.563	Pass
802.11n (HT20)	2412	Ant0	17.372	Pass
802.11n (HT20)	2437	Ant0	17.361	Pass
802.11n (HT20)	2462	Ant0	17.358	Pass

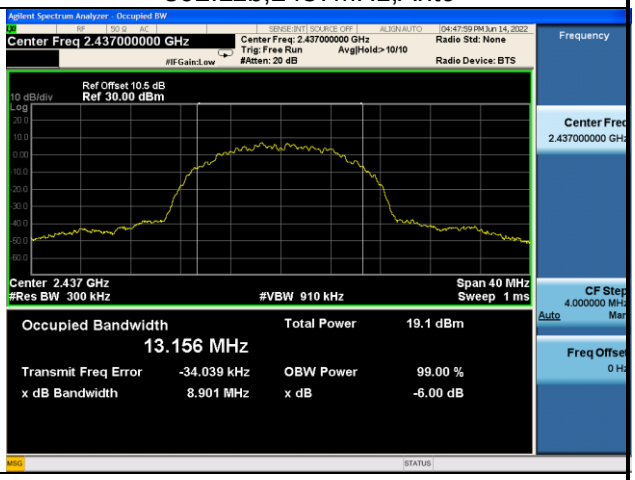
TEST REPORT

Test Plots

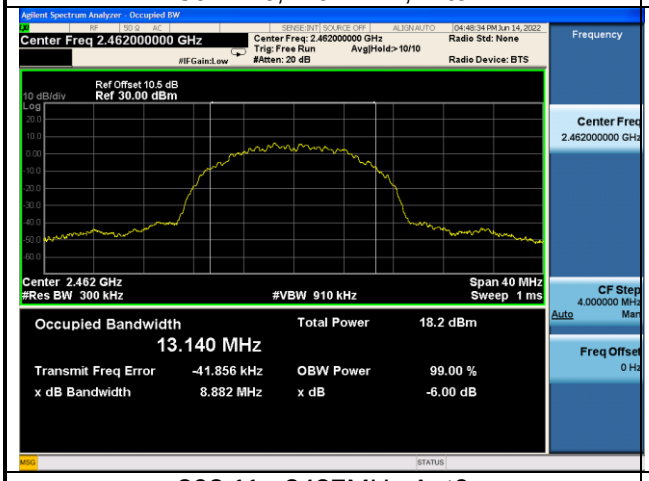
802.11b,2412MHz,Ant0



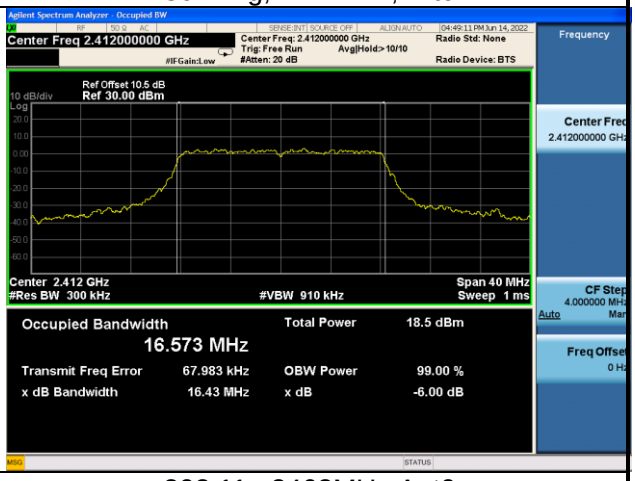
802.11b,2437MHz,Ant0



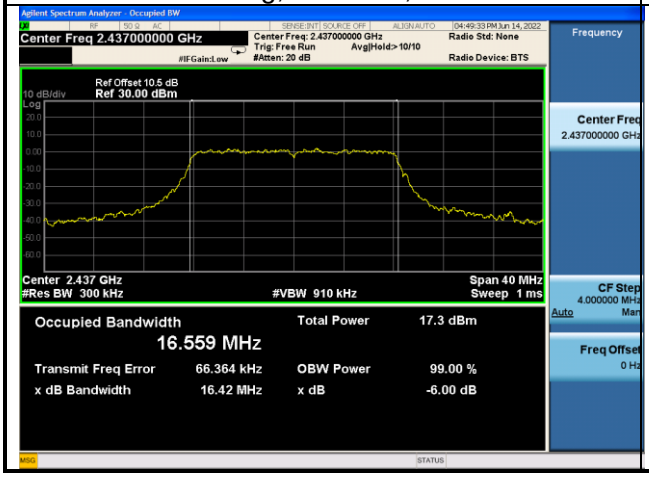
802.11b,2462MHz,Ant0



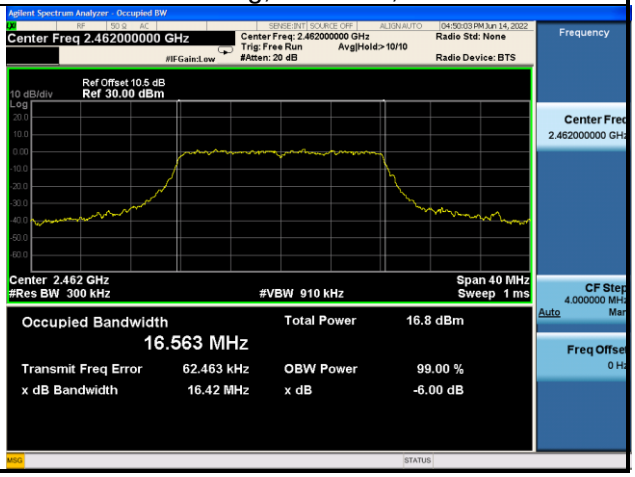
802.11g,2412MHz,Ant0



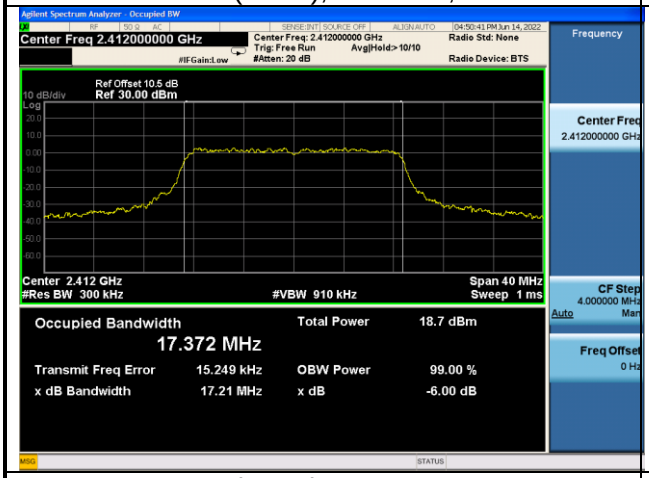
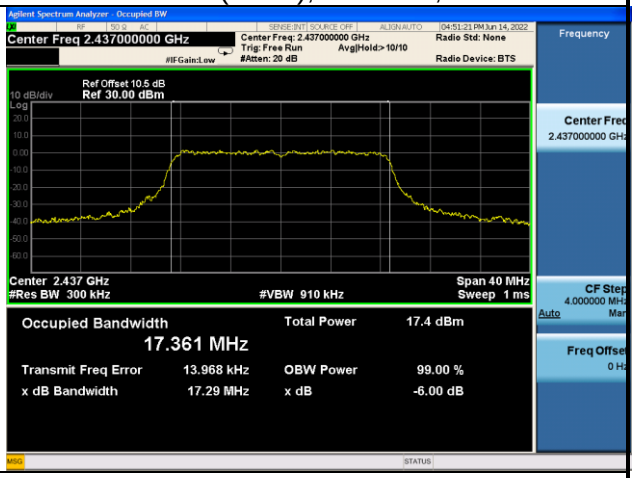
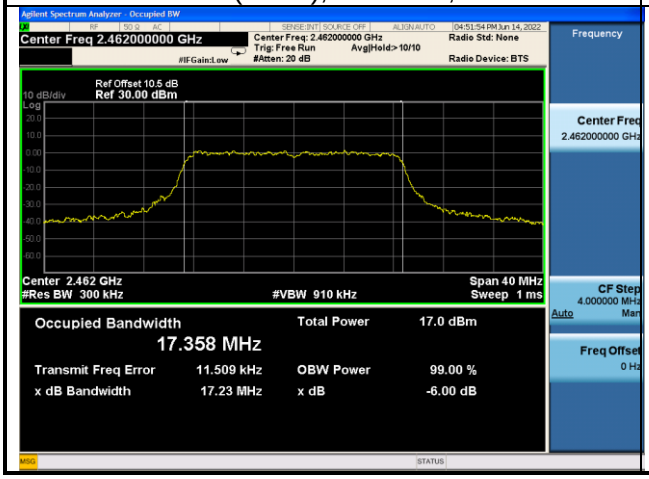
802.11g,2437MHz,Ant0



802.11g,2462MHz,Ant0



TEST REPORT

802.11n(HT20),2412MHz,Ant0	802.11n(HT20),2437MHz,Ant0
	
802.11n(HT20),2462MHz,Ant0	
	

10.2 Maximum conducted output power and e.i.r.p

Test Data

WLAN AVGSA Output Power							
Mode	Test Frequency (MHz)	Ant	Duty Cycle Factor (dB)	Max Power (dBm)	Limit (dBm)	EIRP (dBm)	Result
802.11b	2412	Ant0	0.00	13.00	30	13.00	Pass
802.11b	2437	Ant0	0.00	12.32	30	12.32	Pass
802.11b	2462	Ant0	0.00	11.02	30	11.02	Pass
802.11g	2412	Ant0	0.00	11.58	30	11.58	Pass
802.11g	2437	Ant0	0.00	10.51	30	10.51	Pass
802.11g	2462	Ant0	0.00	9.86	30	9.86	Pass
802.11n (HT20)	2412	Ant0	0.00	11.22	30	11.22	Pass
802.11n (HT20)	2437	Ant0	0.00	10.25	30	10.25	Pass
802.11n (HT20)	2462	Ant0	0.00	9.61	30	9.61	Pass

10.3 Power spectrum density

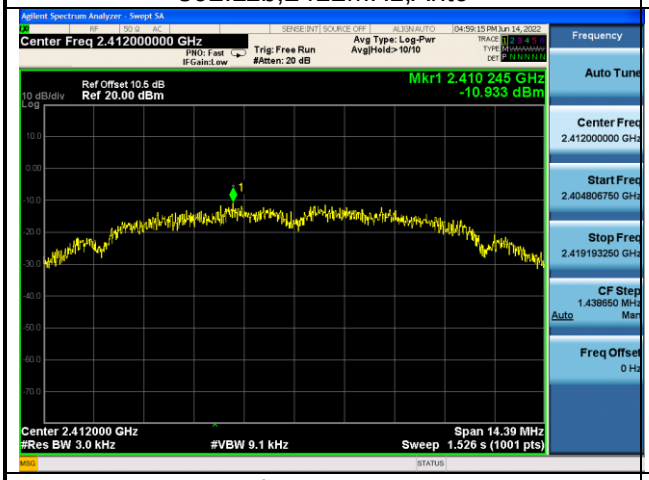
Test Data

WLAN AVGSA Power Spectral Density							
Mode	Test Frequency (MHz)	Ant	Duty Cycle Factor (dB)	PSD (dBm)	RBW (kHz)	Limit (dBm)	Result
802.11b	2412	Ant0	0.00	-10.933	3	8	Pass
802.11b	2437	Ant0	0.00	-11.766	3	8	Pass
802.11b	2462	Ant0	0.00	-12.660	3	8	Pass
802.11g	2412	Ant0	0.00	-16.445	3	8	Pass
802.11g	2437	Ant0	0.00	-17.554	3	8	Pass
802.11g	2462	Ant0	0.00	-17.978	3	8	Pass
802.11n (HT20)	2412	Ant0	0.00	-16.550	3	8	Pass
802.11n (HT20)	2437	Ant0	0.00	-17.474	3	8	Pass
802.11n (HT20)	2462	Ant0	0.00	-18.092	3	8	Pass

TEST REPORT

Test Plots

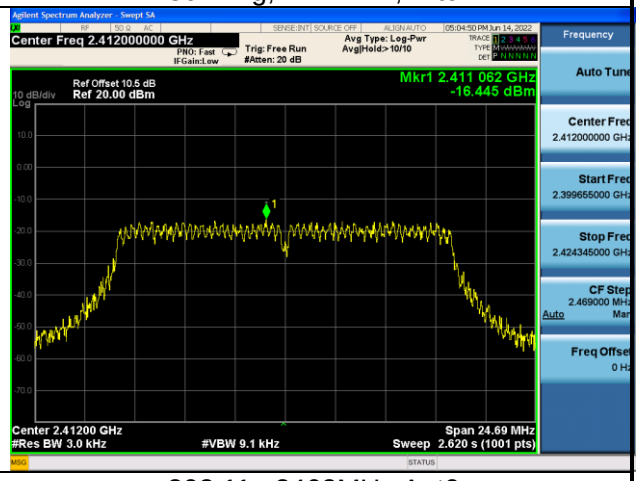
802.11b,2412MHz,Ant0



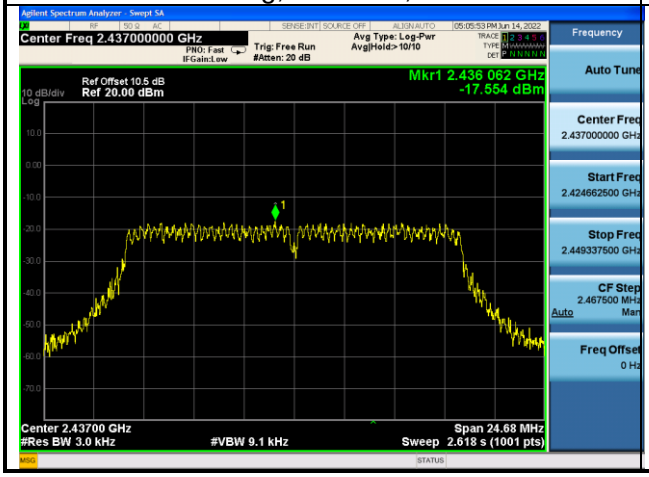
802.11b,2437MHz,Ant0

802.11b,2462MHz,Ant0

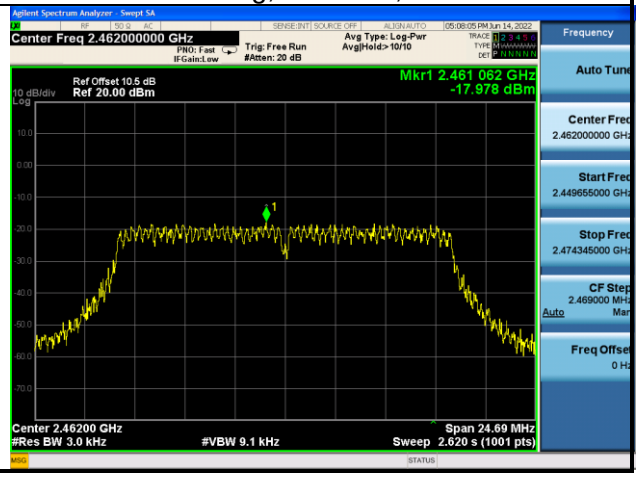
802.11g,2412MHz,Ant0



802.11g,2437MHz,Ant0

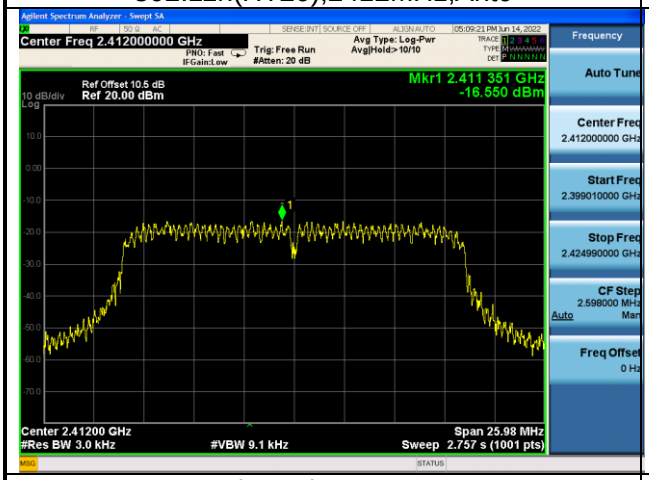
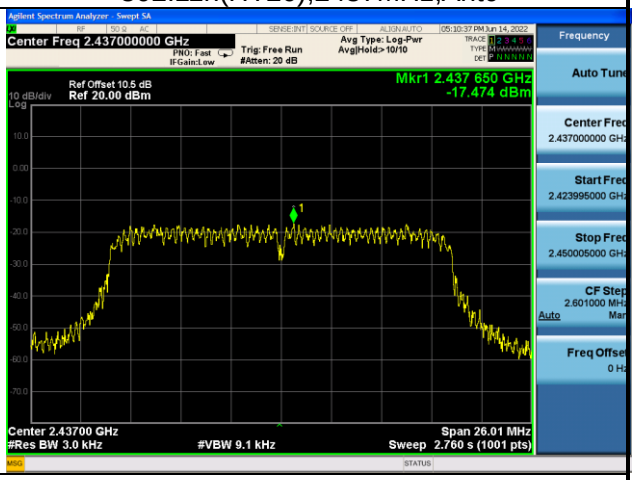
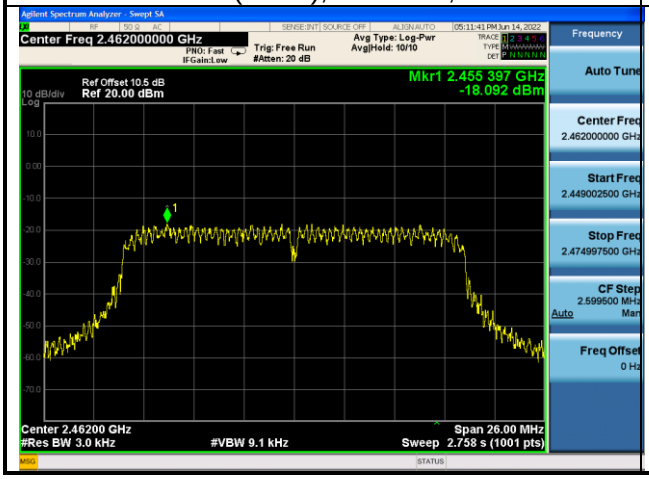


802.11g,2462MHz,Ant0



Total Quality. Assured.

TEST REPORT

802.11n(HT20),2412MHz,Ant0	802.11n(HT20),2437MHz,Ant0
	
802.11n(HT20),2462MHz,Ant0	
	

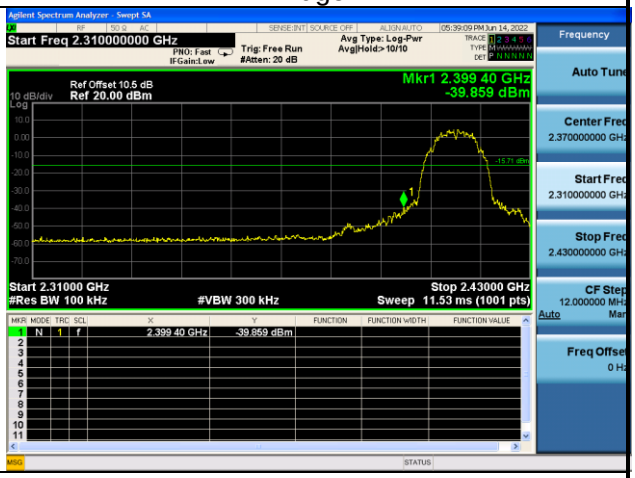
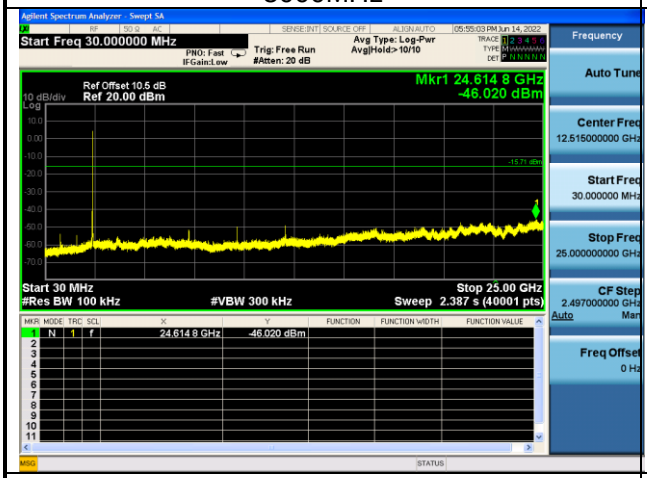
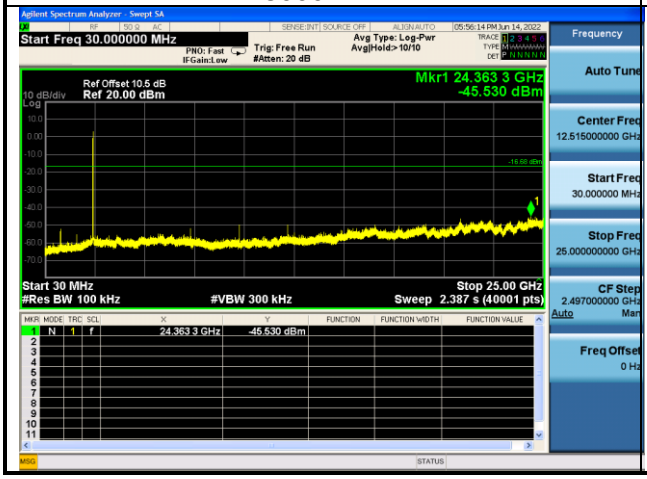
10.4 Emission outside the frequency band

Test Data

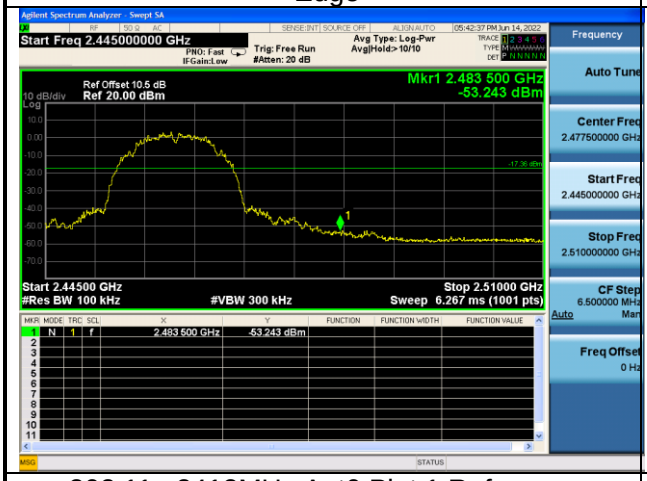
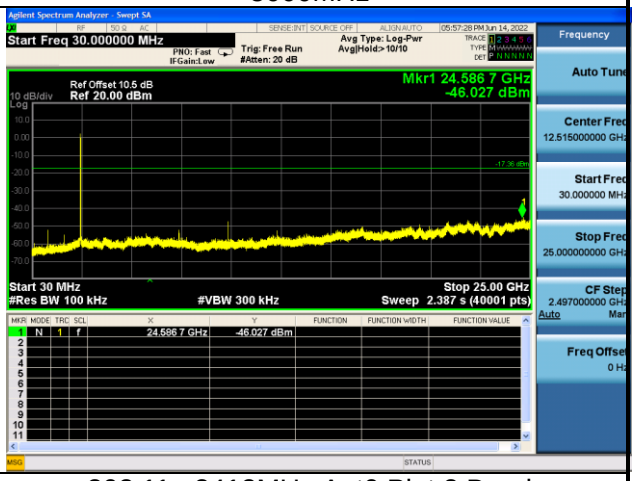
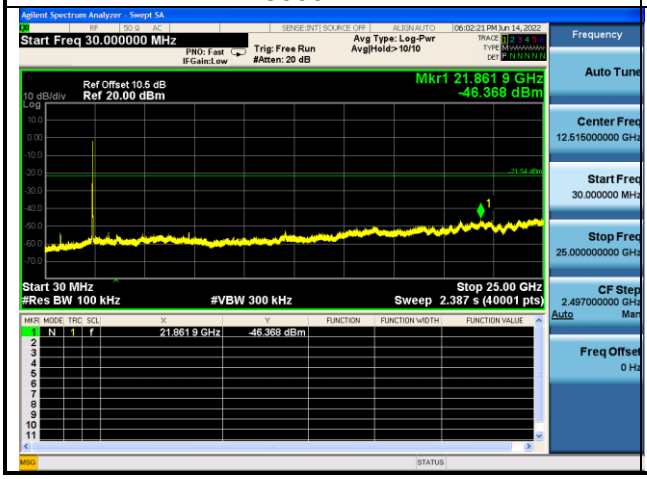
WLAN Transmitter Spurious Emission						
Mode	Test Frequency (MHz)	Ant	Plot No.	Frequency Range	Emission (dBm)	Result
802.11b	2412	Ant0	1	Reference Level	4.28	Pass
802.11b	2412	Ant0	2	Band Edge	-39.85	Pass
802.11b	2412	Ant0	3	30MHz~25000MHz	-46.02	Pass
802.11b	2437	Ant0	1	Reference Level	3.32	Pass
802.11b	2437	Ant0	2	30MHz~25000MHz	-45.53	Pass
802.11b	2462	Ant0	1	Reference Level	2.64	Pass
802.11b	2462	Ant0	2	Band Edge	-53.24	Pass
802.11b	2462	Ant0	3	30MHz~25000MHz	-46.02	Pass
802.11g	2412	Ant0	1	Reference Level	-1.53	Pass
802.11g	2412	Ant0	2	Band Edge	-36.27	Pass
802.11g	2412	Ant0	3	30MHz~25000MHz	-46.36	Pass
802.11g	2437	Ant0	1	Reference Level	-2.65	Pass
802.11g	2437	Ant0	2	30MHz~25000MHz	-46.55	Pass
802.11g	2462	Ant0	1	Reference Level	-2.71	Pass
802.11g	2462	Ant0	2	Band Edge	-49.39	Pass
802.11g	2462	Ant0	3	30MHz~25000MHz	-46.10	Pass
802.11n (HT20)	2412	Ant0	1	Reference Level	-1.39	Pass
802.11n (HT20)	2412	Ant0	2	Band Edge	-36.13	Pass
802.11n (HT20)	2412	Ant0	3	30MHz~25000MHz	-45.84	Pass
802.11n (HT20)	2437	Ant0	1	Reference Level	-2.49	Pass
802.11n (HT20)	2437	Ant0	2	30MHz~25000MHz	-46.05	Pass
802.11n (HT20)	2462	Ant0	1	Reference Level	-2.97	Pass
802.11n (HT20)	2462	Ant0	2	Band Edge	-47.61	Pass
802.11n (HT20)	2462	Ant0	3	30MHz~25000MHz	-45.76	Pass

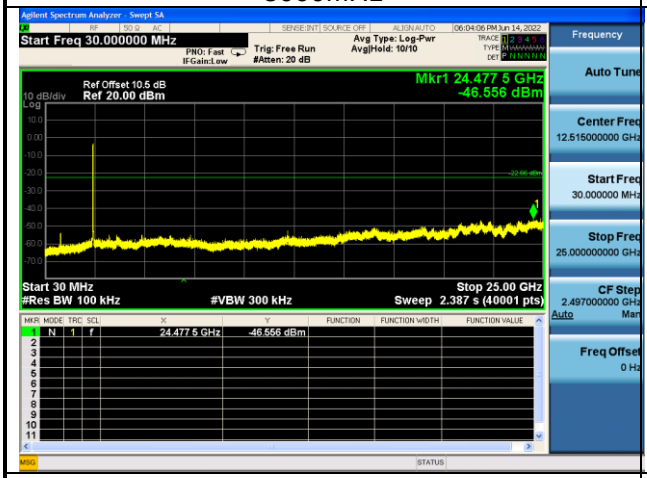
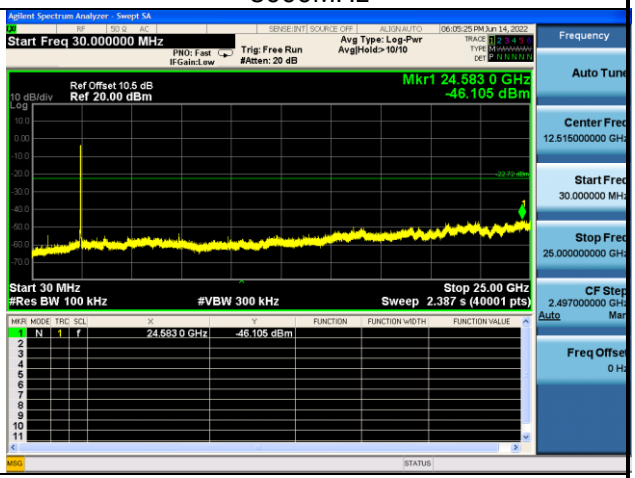
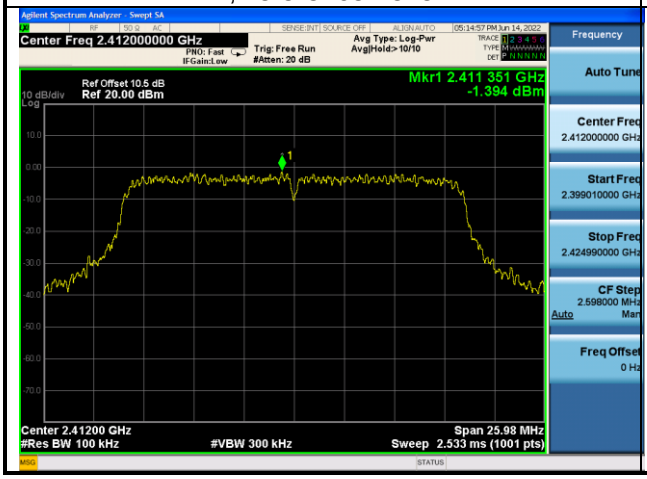
TEST REPORT

Test Plots

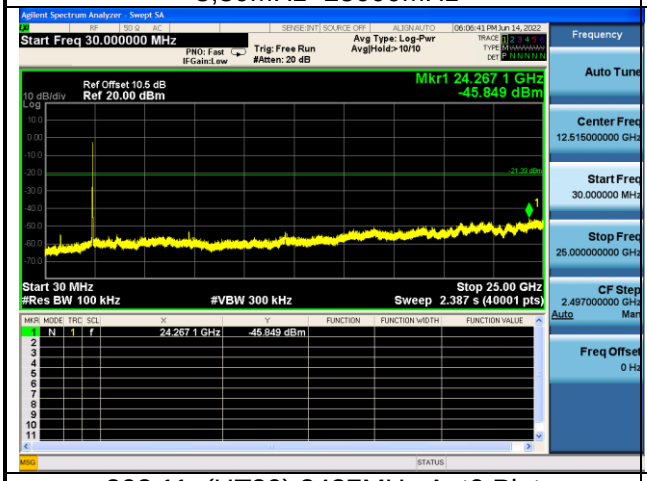
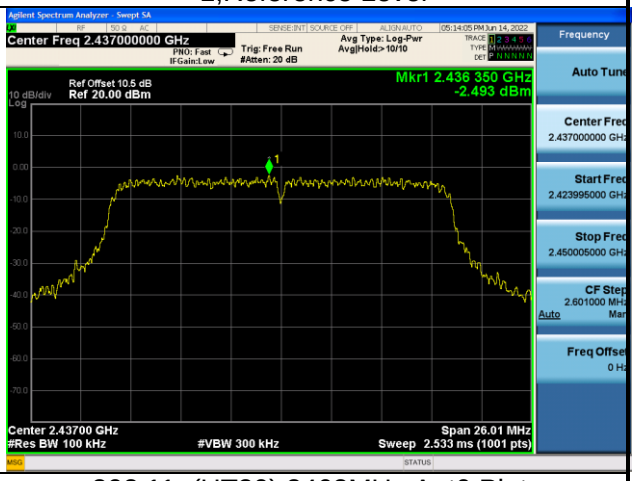
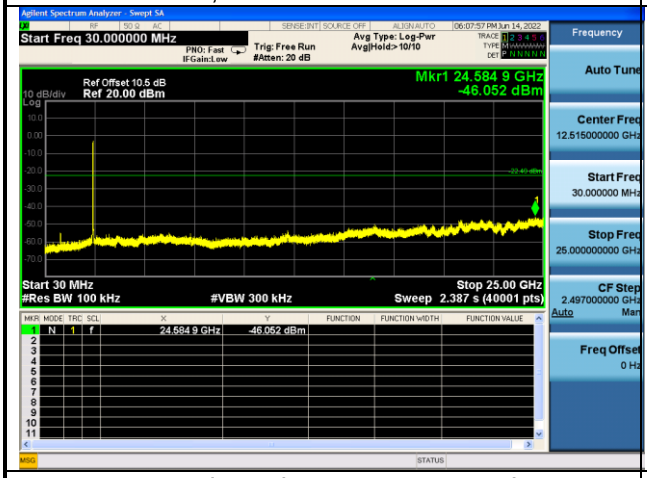
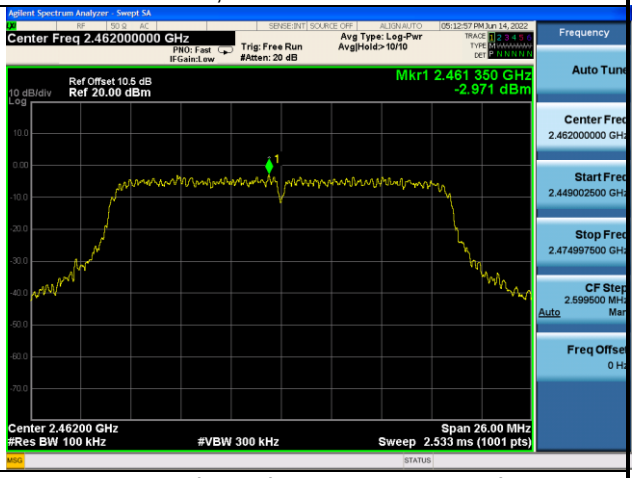
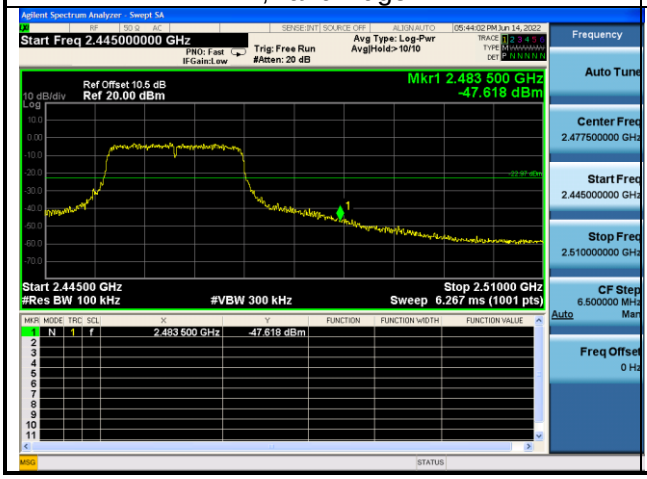
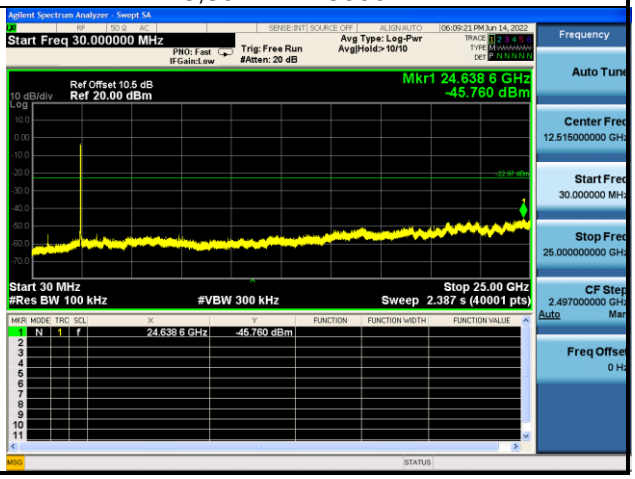
802.11b,2412MHz,Ant0,Plot 1,Reference Level	802.11b,2412MHz,Ant0,Plot 2,Band Edge
	
802.11b,2412MHz,Ant0,Plot 3,30MHz~25000MHz	802.11b,2437MHz,Ant0,Plot 1,Reference Level
	
802.11b,2437MHz,Ant0,Plot 2,30MHz~25000MHz	802.11b,2462MHz,Ant0,Plot 1,Reference Level
	

TEST REPORT

802.11b,2462MHz,Ant0,Plot 2,Band Edge	802.11b,2462MHz,Ant0,Plot 3,30MHz~25000MHz
	
802.11g,2412MHz,Ant0,Plot 1,Reference Level	802.11g,2412MHz,Ant0,Plot 2,Band Edge
	
802.11g,2412MHz,Ant0,Plot 3,30MHz~25000MHz	802.11g,2437MHz,Ant0,Plot 1,Reference Level
	

802.11g,2437MHz,Ant0,Plot 2,30MHz~25000MHz	802.11g,2462MHz,Ant0,Plot 1,Reference Level
	
802.11g,2462MHz,Ant0,Plot 2,Band Edge	802.11g,2462MHz,Ant0,Plot 3,30MHz~25000MHz
	
802.11n(HT20),2412MHz,Ant0,Plot 1,Reference Level	802.11n(HT20),2412MHz,Ant0,Plot 2,Band Edge
	

TEST REPORT

802.11n(HT20),2412MHz,Ant0,Plot 3,30MHz~25000MHz	802.11n(HT20),2437MHz,Ant0,Plot 1,Reference Level
	
802.11n(HT20),2437MHz,Ant0,Plot 2,30MHz~25000MHz	802.11n(HT20),2462MHz,Ant0,Plot 1,Reference Level
	
802.11n(HT20),2462MHz,Ant0,Plot 2,Band Edge	802.11n(HT20),2462MHz,Ant0,Plot 3,30MHz~25000MHz
	

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